



**COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT**

Contract No. UCPJM5505

This contract entered into this 1st day of March 2019, by Park Assist, LLC, hereinafter called the "Contractor" and Commonwealth of Virginia, James Madison University called the "Purchasing Agency".

WITNESSETH that the Contractor and the Purchasing Agency, in consideration of the mutual covenants, promises and agreements herein contained, agree as follows:

SCOPE OF CONTRACT: The Contractor shall provide the services to the Purchasing Agency as set forth in the Contract Documents.


PERIOD OF PERFORMANCE: From May 8, 2019 through May 7, 2020 with four (4) one-year renewal options.

The contract documents shall consist of:

- (1) This signed form;
- (2) The following portions of the Request for Proposal MPM-1034 dated 10/7/2018
 - (a) The Statement of Needs,
 - (b) The General Terms and Conditions,
 - (c) The Special Terms and Conditions together with any negotiated modifications of those Special Conditions;
 - (d) Addendum #1
 - (e) Addendum #2
- (3) The Contractor's Proposal dated January 14, 2019 and the following negotiated modification to the Proposal, all of which documents are incorporated herein.
 - (a) Negotiations Summary, dated February 23, 2019.

IN WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

CONTRACTOR:

By: 
(Signature)

JOSEPH RUGGERO

(Printed Name)

Title: EVP

PURCHASING AGENCY:

By: 
(Signature)

Michael Morrison

(Printed Name)

Title: Buyer Senior

NEGOTIATION SUMMARY

PARK ASSIST LLC

RFP# MPM-1034 VEHICLE COUNT SYSTEMS

2/23/2019

The Primary Point of Contact for this Contract is:

Jake Morgenstern

Regional Account Manager

201-780-8671

Jake.Morgenstern@parkassist.com

- Park Assist, LLC acknowledges that this contract shall be governed by the terms and conditions set forth in the RFP and that no additional terms and conditions shall apply.

PRICING SCHEDULE: All Zones

See Attached Rate Sheet for products to be offered to the University.

Other Fees	
Charge Card Processing Fees:	0 %
No travel-related costs or travel time shall be charged.	

James Madison University - Hypothetical Pricing					
Part No.	Description	Quantity	List Price	Unit Price After Discount	Note
Sensors					
M4-100	M4 Sensor w/ one camera covering 1 space	1	\$600.00	\$330.00	
M4-100	M4 Sensor w/ one camera covering 2 adjacent spaces	1	\$600.00	\$330.00	
M4-200	M4 Sensor w/ two cameras covering 2 opposite spaces	1	\$700.00	\$385.00	
M4-200	M4 Sensor w/ two cameras covering 4 spaces	1	\$700.00	\$385.00	
DET-DSP-21-RSPA	Loop Detector, 1 per lane required, RS485	1	\$1,045.00	\$574.75	
C3-DEL-TW-521052-W	2.25" x 36" White Boomerang Reboundable Delineator w/2 - 3" Yellow Bands	1	\$105.00	\$57.75	
Network & Headend					
CAB-C300F-110	Floor Cabinet - Class 2 - 110VAC	1	\$19,494.00	\$10,721.70	
IT-DELL-PE-R630	Server, rack mount	1	\$11,500.00	\$6,325.00	
IT-CISCO-C9300-24T-E	Distribution Switch - Catalyst 9300 24-Port Data Only, Network Essentials	1	\$14,049.00	\$7,726.95	
IT-APC-UPS-2200-110	UPS - Rack Mount - 110VAC	1	\$2,400.00	\$1,320.00	
IT-TRIIP-SRW12US33	Server Rack - 12U	1	\$1,050.00	\$577.50	
CAB-L100-LC-110	Cabinet - Loop System - 110VAC	1	\$5,085.00	\$2,796.75	
IT-CISCO-892-FSP	Cisco 892 FSP Router	1	\$3,013.92	\$1,657.66	
CAB-LPR400-110	Camera Cabinet - 110VAC	1	\$6,565.00	\$3,610.75	
SW-CSERV1	Park Assist Business Intelligence Software Suite	1	\$12,000.00	\$6,800.00	
IT-CISCO-9300-NM-8X	9300 Series 8x 10G Network Module	1	\$5,888.40	\$3,238.62	
IT-MS-SQL-2K16-STD-LIC	SQL License	1	\$3,662.40	\$2,014.32	
IT-MS-WIN-2K16-STD-2CORE-LIC	Windows User License	1	\$420.00	\$231.00	
Cable					
CBL-D00-8	Pre-terminated data cable, green, 26/8 m	1	\$16.00	\$8.80	
CBL-P00-8	Pre-terminated power cable, gray, 26/8 m	1	\$30.00	\$16.50	
Channel & Related					
CS-CHNL-3	Channel system, channel, standard aluminum, 10' - 3.05 m, with 2 clips	1	\$30.00	\$16.50	
Signage					
SN-130-3A-SS-210	130mm, 4-digit OR 3-digit with Arrow, 7-segment, Multi-Color, IP54 Enclosure	1	\$1,250.00	\$687.50	
SN-200-4-SS-210	200mm, 4-digit, 7-segment, Multi-Color, IP54 Enclosure	1	\$2,080.00	\$1,144.00	
SE-MN6-200-1R	monument, 6 inserts, 200mm character height, single-faced, reflective vinyl lettering	1	\$18,150.00	\$9,982.50	
SN-130-ADS-BL-210	130mm, Disabled, Arrow, Blue, IP54 Enclosure	1	\$1,060.00	\$583.00	
SN-130-2ADS-SS-BL-210	130mm, Disabled, 2-digit, Arrow, 7-segment, Blue, IP54 Enclosure	1	\$1,375.00	\$756.25	
Installation & Initial Services					
SRV-INSTALL	Park Assist Installation				Approximately \$115/space. This number includes basic signage and assumes non-union labor for installation. This pricing may vary depending on local installation costs, desired sign package and additional optional modules
SRV-PM	Park Assist Project Management			\$15,000.00	
SRV-CAD	CAD Design			\$4,000.00	If the project is Design Build this number may fluctuate
SRV-COM	Commissioning/Networking			\$20,000.00	
SRV-LOGISTIC	Logistics			\$20,000.00	

Optional Modules					
Part No.	Description	Quantity	List Price	Unit Price After Discount	Note
KS-N200-110	27 In. Find Your Car Kiosk - 110VAC	1	\$20,335.00	\$11,184.25	
PA-FIND-A	Park Finder	Yes	\$15,000.00	\$8,250.00	Includes perpetual license. Covers up to 2,000 spaces. There are additional charges for every 1,000 spaces after the initial 2,000
PA-ALERT-A	Park Alerts	Yes	\$15,000.00	\$8,250.00	Includes perpetual license. Covers up to 2,000 spaces. There are additional charges for every 1,000 spaces after the initial 2,000
PA-SRATE-A	Park Select-Rate API	Yes	\$30,000.00	\$16,500.00	Includes perpetual license. Covers up to 2,000 spaces. There are additional charges for every 1,000 spaces after the initial 2,000
SURVEILLANCE	Surveillance	TBD	TBD pending number of video streams/licenses. This can only be determined once we have PDF or CAD files displaying bay striping for each level. Provided as perpetual license.		
PA-MAPI	Access to Mobile API	Yes	\$15,000.00	\$8,250.00	Includes perpetual license. Covers up to 2,000 spaces. There are additional charges for every 1,000 spaces after the initial 2,000

Park Assist will hold pricing as long as model numbers are current at time of purchase

REQUEST FOR PROPOSAL
RFP# MPM-1034

Issue Date: 10/7/2018
Title: Vehicle Count Systems
Issuing Agency: Commonwealth of Virginia
James Madison University
Procurement Services MSC 5720
752 Ott Street, Wine Price Building
First Floor, Suite 1023
Harrisonburg, VA 22807

Period of Contract: From Date of Award Through One Year (Renewable)

Sealed Proposals Will Be Received Until 2:00 PM on January 8, 2019 for Furnishing The Services Described Herein.

MANDATORY PRE-PROPOSAL: No Pre-Proposal meeting is scheduled/required for this RFP.

SEALED PROPOSALS MAY BE MAILED, EXPRESS MAILED, OR HAND DELIVERED DIRECTLY TO THE ISSUING AGENCY SHOWN ABOVE.

All Inquiries For Information And Clarification Should Be Directed To: Michael Morrison, Buyer Senior, Procurement Services, morrismp@jmu.edu; 540-568-6181; (Fax) 540-568-7935 not later than five business days before the proposal closing date.

NOTE: THE SIGNED PROPOSAL AND ALL ATTACHMENTS SHALL BE RETURNED.

In compliance with this Request for Proposal and to all the conditions imposed herein, the undersigned offers and agrees to furnish the goods/services in accordance with the attached signed proposal or as mutually agreed upon by subsequent negotiation.

Name and Address of Firm:

Park Assist LLC.

57 West 38th Street, 11th Floor

New York, NY 10018

By: 
(Signature in Ink)

Name: Joe Ruggero

(Please Print)

Date: 1/14/2019

Title: Executive Vice President

Web Address: www.parkassist.com

Phone: 646-620-3109

Email: joe.ruggero@parkassist.com

Fax #:

ACKNOWLEDGE RECEIPT OF ADDENDUM: #1 JR #2 JR #3 #4 #5 (please initial)

SMALL, WOMAN OR MINORITY OWNED BUSINESS:

☐ YES; ☒ NO; *IF YES* ⇒ ☐ SMALL; ☐ WOMAN; ☐ MINORITY *IF MINORITY:* ☐ AA; ☐ HA; ☐ AsA; ☐ NW; ☐ Micro

Note: This public body does not discriminate against faith-based organizations in accordance with the Code of Virginia, § 2.2-4343.1 or against an offeror because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.



December 18, 2018

**ADDENDUM NO.: ONE (1)
TO ALL OFFERORS:**

REFERENCE: Request for Proposal No: **RFP# MPM-1034**
Dated: **December 7, 2018**
RFP Closing On: **January 8, 2019 at 2:00 p.m. (Eastern)**

Please note the clarifications and/or changes made on this proposal program:

1. Does the parking technology vendor need to provide technology for all 80 lots and 6 garages?
 - a. The University is currently more interested in providing occupancy information for existing and future parking decks with the potential to expand to include surface lots at a later date.
2. If yes, are you able to provide offerors with a list of the lots and garages?
 - a. The JMU campus currently includes the following 5 garages that employ vehicle count systems.
 - i. Champions Drive Parking Deck – 492 spaces (453 commuter – 13 faculty/staff – 12 service vehicle – 8 ADA – 6 parking customers)
 - ii. Chesapeake Avenue Parking Deck – 650 spaces (637 commuter – 13 ADA)
 - iii. Grace Street Parking Deck – 477 spaces (402 commuter – 63 faculty/staff – 12 ADA)
 - iv. Mason Street Parking Deck – 1015 spaces (602 faculty/staff – 172 hotel guest – 119 hotel valet – 99 metered – 23 ADA)
 - v. Warsaw Avenue Parking Deck – 782 spaces (542 commuter – 223 faculty/staff – 17 ADA)
 - vi. A 6th parking deck that will include vehicle count system equipment is currently under construction and will provide approximately 1500 spaces for faculty/staff, commuters and guests.
3. How many spaces are in the parking lots and how many are in the garages?
 - a. Our parking decks include a total of approximately 3,600 parking spaces with our surface lots providing approximately 8,500 additional parking spaces for a total of just over 12,000 parking spaces campus wide.
4. Is the vendor responsible for delivering a full turn-key solution?
 - a. Any viable solution should include on-site installation, training and technical support with the university's initial responsibility being limited to operating and maintaining the software and hardware once it's up and running.
5. Please elaborate on the seamless communication between two potential parking systems.
 - a. The university has vehicle count system equipment in five existing parking decks that provides real-time occupancy information that is communicated to constituents via the Parking Services website and on electronic signage strategically located near facilities and on nearby streets. As indicated in the RFP, any vehicle count system that is introduced will need to be capable of sharing occupancy information via electronic signage, porting information to the Parking Services website and sharing information with a future smart phone app. In order for the university to continue to provide occupancy information for existing and future facilities, both the current

solution and future solution will need to provide count data that can be combined to provide real-time occupancy information for constituents.

6. Is there currently Wi-Fi available in the parking lots/garages requiring single space detection?

- a. While Wi-Fi is routinely available throughout the campus, no Wi-Fi access points are currently available in the university's parking decks. Some decks may have access to Wi-Fi due to proximity to campus buildings but they do not have their own Wi-Fi service. Single space counting is currently accomplished by hardwiring individual sensors to a modem that then communicates wireless with a gateway that is directly connected to the university's network.

7. Please list the number of entry and exit lanes, reversible lanes, etc.

- a. Warsaw Deck:
 - 1 entry lane on ground at the north entrance
 - 1 exit lane on ground at the north entrance
 - 1 entry lane on ground at the south entrance
 - 1 exit lane on ground at the south entrance
 - 2 entry lanes on the second level
 - 2 exit lanes on the second level
- b. Grace Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
 - 1 entry lane at the second floor entrance
 - 1 exit lane at the second floor entrance
- c. Mason Deck:
 - 1 entry lane on the ground floor on MLK Jr. Way
 - 1 exit lane on the ground floor on MLK Jr. Way
 - 1 exit lane on the ground floor on Mason Street
 - 1 entry lane on the second floor on Mason Street
 - 1 exit lane on the second floor on Mason Street
 - 1 entry lane on the third level
 - 1 exit lane on the third level
- d. Champions Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
- e. Chesapeake Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
 - 1 entry lane on level 3 at the gate location
 - 1 exit lane on level 3 at the gate location
 - 1 entry lane on level 4 at the gate location
 - 1 exit lane on level 4 at the gate location
 - 1 entry lane on level 5 at the gate location
 - 1 exit lane on level 5 at the gate location
- f. Note: all entry and exit points will need to be bidirectional as vehicular traffic cannot be consistently relied upon to utilize the proper lane

8. Will electrical and network be provided to each location?



- a. The current vehicle count system relies upon wireless communication back to a gateway in the telecom room located in each garage and low voltage (24v) power for sensors. There is electrical conduit in place at each of the entry/exit locations mentioned above but wire may have to be pulled because, in many instances, the installation relied upon 6 conductor cable to provide a pathway for both data and low voltage power.
9. How many signs at each location?
- a. The number of signs per location varies between 1 and 3 with a total of 17 campus-wide at this time.
10. Do you want simply an overall count of each garage or lot or do you want level by level counts or space by space counts?
- a. Most of our garages are split between multiple use groups so we want to provide counts of spaces for each group that utilizes a portion of each garage. That can include commuters, faculty/staff, hotel guests, valet parking, metered parking, etc.

Signify receipt of this addendum by initialing “*Addendum # 1*” on the signature page of your proposal.

Sincerely,

Michael Morrison

Michael Morrison
Buyer Senior
Phone: (540-568-6181)



December 26, 2018

ADDENDUM NO.: TWO (2)
TO ALL OFFERORS:

REFERENCE: Request for Proposal No: **RFP# MPM-1034**
Dated: **December 7, 2018**
RFP Closing On: **January 16, 2019 at 2:00 p.m. (Eastern)**

Please note the clarifications and/or changes made on this proposal program:

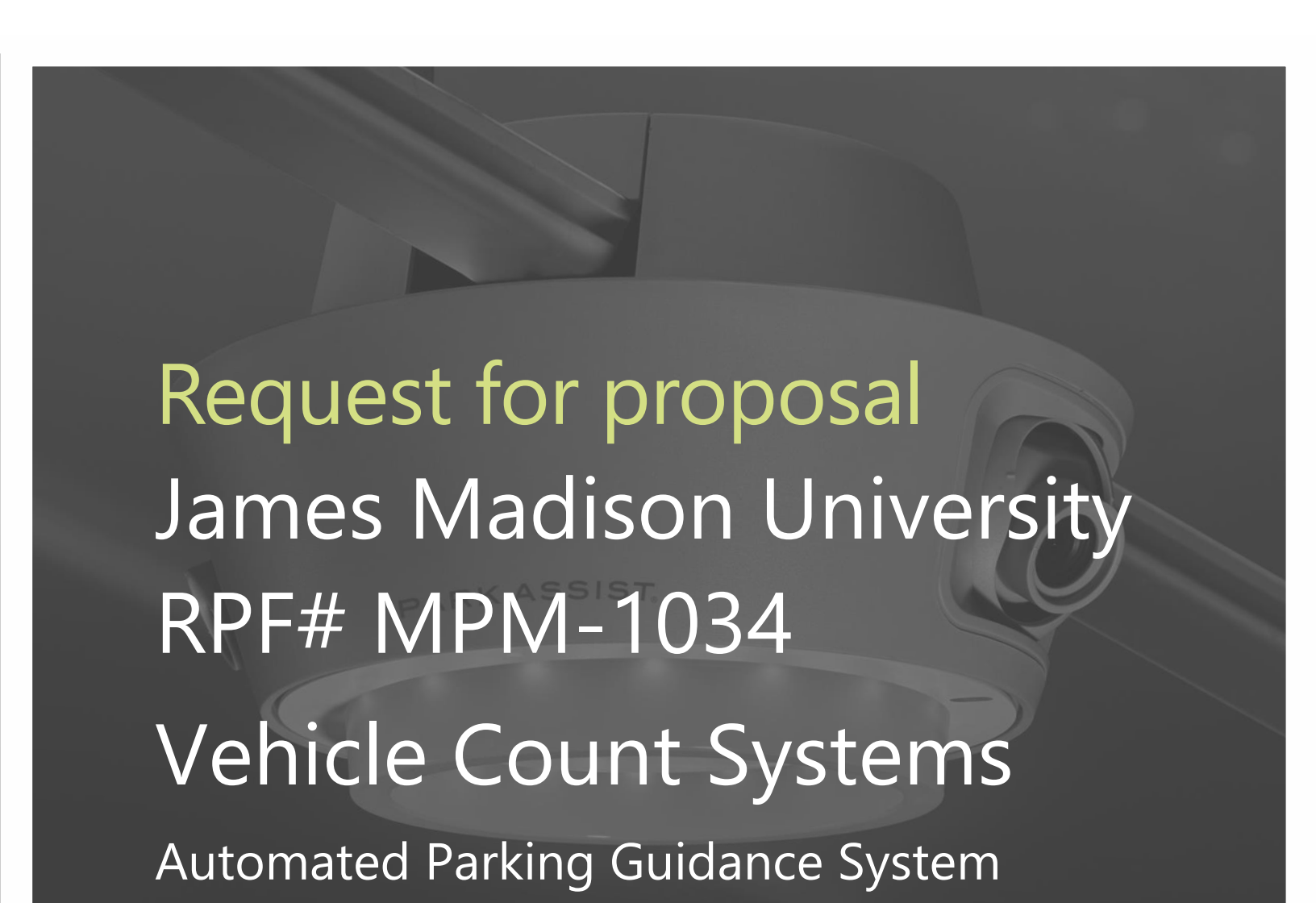
1. Please note the following change to the RFP Closing Date.
 - a. Proposals are due no later than 2:00 PM on **Wednesday January 16, 2019.**
2. Please note the following clarification.
 - a. The University has received numerous questions asking for specific technical data and drawings, specifications, etc. for this RFP. Please read the Statement of Needs carefully and provide the requested information. This RFP is not for a specific project but seeks proposals describing the Offeror's proposed vehicle count system, related costs, and the ability of that count system to share information.
3. Regarding the Zone Map.
 - a. James Madison University intends this contract to be cooperative, such that other agencies may be able to utilize this contract. The zone map is included to show the different VASCUPP regions (<https://vascupp.org/>) with cooperating institutions. JMU is part of region two. Any pricing differences which might apply to your proposals for other regions can be enumerated using the various zones for guidance. If location is not a specific factor, then pricing shall be established as being the same as offered to JMU in the Offeror's proposal.

Signify receipt of this addendum by initialing "*Addendum # 2*" on the signature page of your proposal.

Sincerely,

Michael Morrison

Michael Morrison
Buyer Senior
Phone: (540-568-6181)



Request for proposal

James Madison University

RPF# MPM-1034

Vehicle Count Systems

Automated Parking Guidance System

Proposal presented to
James Madison University
January 17, 2019

Automated Parking
Guidance System (APGS)
RFP# MPM-1034



January 16, 2019

James Madison University
Michael Morrison
752 Ott Street, Wine Price Building First Floor, Suite 1023
Harrisonburg, VA 22807



RE: Park Assist response to Vehicle Count System RFP

Dear Mr. Morrison,

Thank you for the opportunity to submit a proposal to James Madison University (JMU) for the Vehicle Count System in Harrisonburg, Virginia. We greatly appreciate the invitation to bid on this exciting project and are confident that our solutions and organization are the best fit for this project.

Park Assist is the pioneer of imaging technology in the parking industry. Our engineering team invented the first camera-based parking guidance solution. Today, Park Assist is the industry leader with successful installations of its patented solution in over 33 countries around the globe. Park Assist is the only parking guidance company in the world that has a camera-based solution for the garage, rooftop and surface lot

Attached is our response for the Vehicle Count Systems RFP. In the proposal response you will find why Park Assist has the best camera-based guidance solutions for JMU:

- Proven, patented camera-based guidance technology with industry-leading accuracy, including *Find Your Car* functionality
- Innovative camera detection technology
- 99%+ accuracy with monthly verifiable reports
- Real-time alerts to assist operations with enforcement & automated license inventory
- Live streaming or motion-activated video surveillance
- Future software add-ons to further enhance the hardware system

On behalf of Park Assist, I want to assure you of our steadfast commitment to make parking at JMU just as enjoyable and profitable as the asset itself. Equally important to us is your complete satisfaction. We appreciate the opportunity to work with JMU and we look forward to working with you and your team!

Sincerely,

Jake Morgenstern
Regional Account Manager
Jake.Morgenstern@parkassist.com
(201) 780-8671

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Executive Summary:

Situation Analysis:

James Madison University accommodates thousands of students each semester in its diverse and progressive campus. A university with immense traffic such as this cannot afford to have a parking experience less than excellent. Setting the tone for this University with the very first visitor touchpoint, parking, will be key to making the entire visitor, student and faculty experience world class.

Client Goals

- Provide an accurate space by space occupancy and guidance system
- Convey occupancy information ahead of time, in real time and through site-wide signage and mobile applications to enhance customer satisfaction and loyalty
- Monitor parking operations/ occupancy/ dwell time information on a space by space basis automatically
- Provide a sense of a safer parking environment
- Provide a solution that is capable of growing and expanding with the asset itself through key features such as *Find Your Car*, *Surveillance*, *Select-Rate*, and *Alerts*

Overview

Instead of spending time enjoying the beautiful JMU campus, visitors and students may have to circle around in an effort to find a parking space.

JMU will enjoy distinct benefits such as:

- A reduction of time driving around looking for a parking space adds up to significant reductions in carbon emissions and a dramatic improvement in the visitor experience.
- *PARK Finder* (aka *Find Your Car*) increases visitor experience as well as turnover by ensuring visitors are able to find their cars efficiently, quickly, and safely through smartphone application or kiosk.
- Ability to integrate with PARCS Provider.
- *PARK Alerts* allows enforcement of policies to be set for individual or groups of parking spaces (i.e. employees) based on license plates and parking behavior.
- The *PARK Surveillance* feature takes security measures to an all-new level with total, real-time streaming coverage of every parking space inside the garage.
- *PARK Select-Rate* would allow JMU to charge a premium rate for the most convenient spaces within the parking facility on a completely flexible basis.
- PR and marketing around the M4 System positions the development as a clear market leader and boosts exposure

Methodology and Statement of Needs

A. Work Hours

Contractor shall perform work between 7:30 AM – 4:00 PM, Mon-Fri

Park Assist complies.

B. Proposed Solution

Vehicle counting technology that can be installed in parking garages or surface lots that detects vehicles upon entry and exit to facilities or zones within facilities in order to provide accurate counts of available spaces within each facility or zone.

M4 Solution for Parking Garage

The M4 Camera System is a patented network of sensing, processing, and displaying elements. This system is built for the garage. The array of sensors collect data about parking status across the facility and then distribute that information to the network for use in guiding drivers and assisting operations staff.



M4 Solution

The M4 system is installed down the center of the drive aisle. Each sensor is capable of monitoring up to four (4) parking spaces. Bright LED lights will remain green if one of the four (4) monitored spaces are available and it will turn red if all of the spaces are taken. The M4 sensors operate on low voltage power and connect to the level garage controller via Ethernet cable.

Park Assist's proprietary tracks are designed to work with all garage designs for a clean installation. Our tracks use specially designed joiners to maneuver around beams and obstacles inside the garage. We are able to install our camera sensors with minimum affect to clearance height.

Park Assist understands the difficulty and unpredictable cost involved in clearing sections of an operating university garage for installation. Since Park Assist's installation is down the center of

Proposed Solution (cont.)

the drive aisle, we do not require parked cars to be removed during installation. We will select slow traffic hours for installation to minimize disruption to operation. **Not a single space was lost for any amount of time during our recent installation at Fort Lauderdale International Airport.**



B1: This technology needs to be capable of being relocated to alternate locations within the facilities in order to adjust to future changes in parking allocations.

If striping within the garage changes, we are easily able to adjust the positioning of the sensors to adjust for these changes.

B2: Inductive loops are not desirable as they require cutting into precast concrete thus compromising the structural integrity of parking garages

Park Assist has other rooftop solutions that do not require cutting into the precast concrete. In 2017 we released the S1 camera-based outdoor solution.

S1 Solution for Surface Lot

Park Assist's S1 solution detects real-time parking occupancy for each bay and relays this information to commuters using surface lots or rooftops. Its core software engine uses machine learning and AI algorithms to process live video streams from cameras installed in the parking lot. The information is then presented in our mobile app or signage installed in the parking lots. The solution also provides parking managers a dashboard



S1 Solution

B. Proposed Solution (cont.)

for reviewing current occupancy, peak occupancy, daily turnover, historical information and other critical data parameters to efficiently manage their parking assets and operations.

The installation of the S1 system starts with a detailed survey of the parking lot to create a system design. Based on the design, IP cameras are installed overlooking the parking bays. The cameras are installed on a light pole or other tall structures nearby.

C. Monitoring Occupancy

Technology that is capable of monitoring the occupancy of individual parking spaces within facilities and incorporating that information into the overall occupancy of those facilities. This technology or technologies should be capable of counting individual spaces within both parking garages and surface lots.

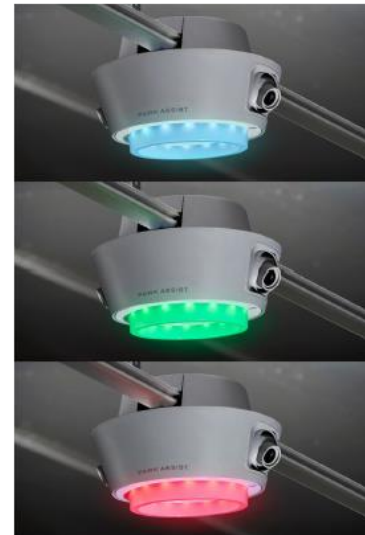
M4 Solution for Parking Garage

The M4 Camera Sensor offers the ability to sense, identify and count vehicles **per individual parking space**. Configured with one or two CMOS digital cameras, the M4 sensor can monitor up to four parking spaces simultaneously. Captured images are continuously processed to detect parking space occupancy changes using proprietary image processing software.

The sensor sends parking status and images to the site's Core Server for management and reporting. Because the M4 sensor is based on digital imaging, it is the key enabling element for license plate recognition.

To indicate parking status to visitors, a highly visible Light Emitting Diode (LED) indicator is built into the M4 Camera Sensor, capable of displaying thousands of different colors. Each M4 Camera Sensor autonomously manages its own occupancy status and indicator color, providing visitors with real-time parking information.

Park Assist's M4 solution uses a ring of RGB LED for space indication capable displaying one of thousands of colors, all configurable via *Park Insights*. Our light rings are on average 8 times the size of the indicator lights used by other parking guidance solutions. With Park Assist's ring design, our parking



C Monitoring Occupancy (cont.)

guidance solution will have a brighter indicator light and many more light color options to choose from.

Park Assist indicator lights are installed down the center of the drive aisle where each indicator light will cover 2 to 4 parking stalls. With fewer indicator lights than ultrasonic solutions, our system is more environmentally friendly and each light is easily recognized.

Each sensor will communicate with *Park Insights*, which will aggregate all the count data and communicate with the dynamic signage. Real-time space available counts are displayed on these dynamic signs.

Park Insights is Park Assist's proprietary cloud-base command center. It will allow end users to connect to all dynamic signage to communicate real-time parking data and control displayed messages.

Park Insights is able to detect any irregularities and troubleshoot the issue remotely. An alert can be emailed to designated recipients in real time. Park Assist support will follow up with a resolution and update email when the issue has been resolved or to provide next steps.

S1 Solution for Surface Lot

Each camera covers multiple bays, the higher the camera installation the more bays a camera covers and lesser the overall hardware. A local network connects all the cameras in the lot and the data is streamed to an onsite server for video processing.

After the pre-processing is completed, the data is securely transmitted to our cloud based processing engine for occupancy detection. The occupancy information is then relayed back to the local server onsite for distribution. The bay availability information is then displayed on signage onsite to guide the commuters. The information is also made available on a API for integration with Mobile Apps or other applications. Note the S1 Solution does not have the ability to conduct license plate recognition at this time.



The video stream from the local network can also be forwarded to a local DVR or a security command center for surveillance of the bays for public safety.

D. Electronic Signage

Electronic signage that is capable of displaying current occupancy within facilities in real-time in order to guide drivers to facilities with open parking spaces. This signage should also include the capability to scroll messaging as needed in order communicate pertinent information to drivers.

For James Madison University the parking experience makes a crucial first impression on students, faculty, & both first-time and frequent visitors. To complement our revolutionary camera based smart-sensor system for parking guidance, Park Assist has developed a diverse portfolio of leading-edge wayfinding signage elements. This wealth of advanced options helps provide hurried parkers with assurance and peace-of-mind from the moment they arrive, creating a positive experience that encourages repeat visits in a brand-building way. Park Assist offers our dynamic signage as a standalone signage offering as well as the option to incorporate the dynamic signage into custom enclosures to offer a seamless and consistent message to your customer.

Below are images showing options.



Park Assist dynamic signage with custom enclosures



Park Assist dynamic signage without custom enclosures



Park Assist Monument Enclosure

E. Specifications

Provide the complete specifications of all new equipment and operational components for a turn-key installation.

Please see following pages with system specification sheets:

M4 Smart-Sensor

The M4 camera based Smart-Sensor has the ability to sense, identify and count vehicles for individual parking spaces. Configured with one or two CMOS digital cameras, each smart-sensor can monitor up to four parking spaces simultaneously.



Camera images are continuously processed by the onboard computer to detect parking space occupancy changes using proprietary image processing software. For surveillance purposes, the output of the cameras can be streamed over the network. The M4's housing has a seal rating of IP64, preventing the ingress of water and dirt.

Built into the M4 Smart-Sensor is a Light Emitting Diode (LED) indicator, configurable to any of thousands of colors to indicate the status of the spaces it monitors. In a typical configuration, the indicator is green when at least one monitored space is unoccupied, and red when all monitored spaces are occupied. Status colors can be set remotely via software to meet local standards and/or address special needs.

Each M4 Smart-Sensor is autonomous, managing its own occupancy status and indicator color. Data and images flow from sensors to the core server for the system via standard TCP/IP Ethernet network. An internal Ethernet switch and power pass-throughs enable daisy-chain installation. The smart-sensors also feature network-accessible interfaces for remote configuration and maintenance.

PART NUMBER	DESCRIPTION
M4-100	Camera Sensor, 4th Generation, single camera
M4-200	Camera Sensor, 4th Generation, dual camera

M4 Smart-Sensor Specifications

ARCHITECTURE:

- | | |
|-------------|--|
| - Processor | 800 MHz Cortex A9 dual-core processor |
| - Imaging | One or two 5.0 megapixel CMOS cameras |
| - Network | RJ45 Ethernet connection designed for daisy chained installation |

INDICATOR:

- | | |
|--------------|--|
| - Technology | 16 RGB LEDs; color mixing for thousands of possible colors |
|--------------|--|

INTERFACES:

- | | |
|-----------|---|
| - Network | TCP/IP |
| - Video | 640 x 480 @ 15 fps Streaming H.264 via RTSP |

ENVIRONMENT:

- | | |
|-------------------------|------------------------------|
| - Operating Temperature | -30° to 50°C (-22° to 122°F) |
| - Environmental sealing | IP64 |

MECHANICAL:

- | | |
|------------|-------------------------------|
| - Mounting | Spring-loaded mounting clip |
| - Material | ABS and polycarbonate plastic |

ELECTRICAL:

- | | |
|------------------|---|
| - Voltage | 7-30V DC |
| - Power Draw | 6W typical |
| - Product Safety | Conforms to ANSI/UL Std 60950-1
Certified to CSA Std C22.2 NO. 60950-1 |

DIMENSIONS:

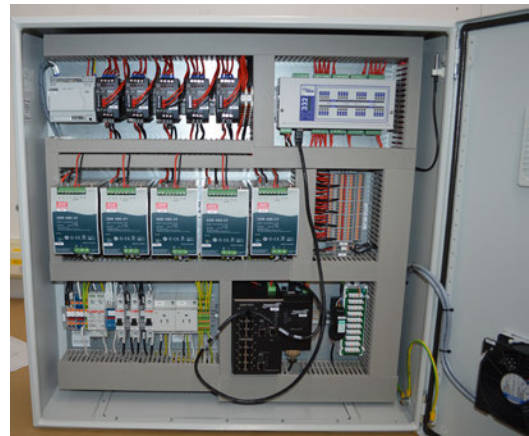
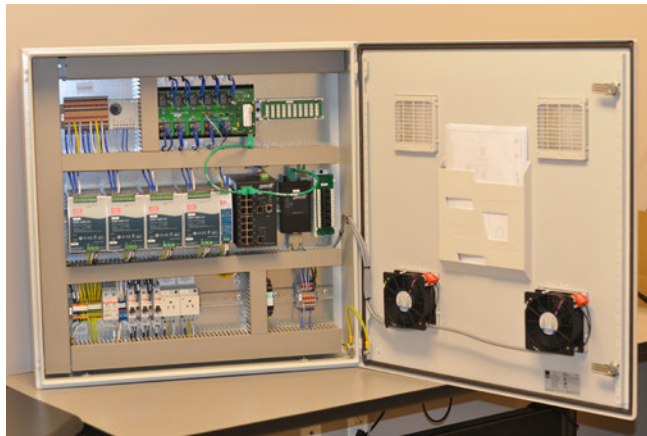
- | | |
|----------|------------------|
| - Height | 142 mm (5.6") |
| - Width | 228 mm (9.0") |
| - Depth | 228 mm (9.0") |
| - Weight | 1.0 kg (2.2 lbs) |



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Floor Cabinet

Each floor or region of a Park Assist installation includes at least one Floor Cabinet. The equipment housed in the cabinet includes a network switch for the camera based smart-sensor network, along with supplies used to distribute power to the smart-sensor units. Power and data for the digital wayfinding signage on each floor are also routed through the Floor Cabinet.



Floor Cabinets are linked via copper twisted-pair or fiber optic cable to the core switch, which manages the entire network.

The managed Ethernet switch can control up to 300 smart-sensors. The terminal block can accommodate up to 31 interior digital signs.

Optional ventilation allows for operation in warmer climates.

PART NUMBER	DESCRIPTION
CAB-C300-110	Cabinet, Camera system, 110V AC Input, 24V DC Output
CAB-C300F-110	Cabinet, Camera system, 110V AC, 24V DC Output, with active ventilation
CAB-C300-110-CLASS2	Cabinet, Camera system, 110V AC Input, 24V DC NEC Class 2 Output
CAB-C300F-110-CLASS2	Cabinet, Camera system, 110V AC Input, 24V DC NEC Class 2 Output, with active ventilation
CAB-C300-230	Cabinet, Camera system, 230V AC Input, 24V DC Output
CAB-C300F-230	Cabinet, Camera system, 230V AC Input, 24V DC Output, with active ventilation

Floor Cabinet Specifications

COMMUNICATIONS:

- | | |
|------------|---|
| - Ethernet | Contains managed Ethernet switch |
| - RS485 | Contains Ethernet-to-serial bridge with internal connection to managed switch, and serial punchdown block |

ENVIRONMENT:

- | | |
|-------------------------|---|
| - Operating temperature | -25° to 40°C (-13° to 104°F)
-25° to 50°C (-13° to 122°F) (CAB-C300F-xxx models) |
| - Sealing | IP66 / NEMA 4
IP54 / NEMA 12 (CAB-C300F-xxx models) |

ELECTRICAL:

- | | |
|--------------------|--|
| - Power Input | 110V AC 50/60 Hz 21A
110V AC 50/60 Hz 26A (CLASS2 models)
230V AC 50/60 Hz 11A |
| - Power Output | 24V DC 1920W total, (8) 240W circuits
24V DC 1780W total, (20) NEC Class 2 circuits (CLASS2 models) |
| - Surge Protection | Type 2, 40kA surge protection |
| - Product Safety | UL 508A |

CONSTRUCTION:

- | | |
|---------|---|
| - Body | 1.5 mm (16 ga) Powder-coated steel |
| - Door | 2 mm (14 ga) Powder-coated steel with PU seal |
| - Color | Light gray (RAL 7035) |

DIMENSIONS:

- | | |
|----------|----------------|
| - Height | 760 mm (29.9") |
| - Width | 760 mm (29.9") |
| - Depth | 210 mm (8.3") |



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Cabling

Park Assist cables for power and data create connections between smart-sensor units. Ends are pre-terminated with proper connectors to speed installation. Each cable is roughly 8 m (26') in length, designed for typical sensor spacing in most facilities.



PART NUMBER	DESCRIPTION
CBL-P00-8	Cable, power, 12 AWG, 8 m / 26' length
CBL-D00-8	Cable, data, Cat5e, 8 m / 26' length

Specifications

POWER CABLE:

- Length	7.9 m +/-0.1 m (26' +/- 4")
- Connector type	TE Connectivity 796640-2
- Wire gauge	12 AWG (3.3 mm ²)
- Wire type	Stranded
- Number of conductors	2
- Insulation material	Polyvinyl Chloride (PVC)
- Cable rating	NEC type CL3R, FPLR
- Flame Test	UL 1666

DATA CABLE:

- Length	7.9 m +/-0.1 m (26' +/- 4")
- Connector type	RJ45
- Wire type	Category 5e
- Wire sequence	EIA/TIA-568B
- Insulation material	Polyvinyl Chloride (PVC)

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Channel System

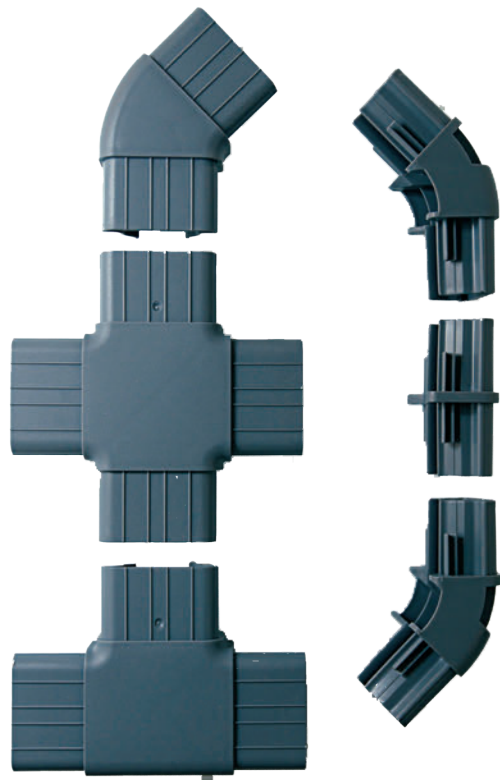
The specially-designed aluminum mounting channel simplifies the installation of the Park Assist smart-sensor system. From initial hanging to mounting smart-sensors, the channel reduces the time to get a system up and running.



Park Assist smart-sensors attach to the channel without tools. The open channel holds the wiring that connects each unit to the high-speed network. Channel sections can be assembled into long straight runs, or junction pieces can be used to alter the channel's path in height and direction. The channel hangs from the ceiling using standard anchors, threaded rods, and nuts attached to Park Assist hanger clips that fit inside the channel.

PART NUMBER DESCRIPTION

CS-CHNL-3	Channel system, channel, standard aluminum, 10' / 3.05 m
CS-HANGER-0	Channel system, hanger clip, short profile
CS-JS	Channel system, Straight duct junction
CS-JH90	Channel system, 90 degree connector <i>(not pictured)</i>
CS-JH45	Channel system, 45 degree junction
CS-JT	Channel system, T Junction
CS-JX	Channel system, X Junction
CS-JV45U	Channel system, 45 degree up junction
CS-JV45D	Channel system, 45 degree down junction <i>(not pictured)</i>
CS-CAP	Channel system, Conduit end-caps <i>(not pictured)</i>



Core Server



The Park Assist Core Server is the central manager of the entire camera based smart-sensor system. It consists of an industry-standard rackmount server running multiple virtual machines, each tasked with a different aspect of system operation. At the heart of the Core Server is our Park Server software, occupying one of the virtual machines. In total, the responsibilities of the Core Server include:

PART NUMBER	DESCRIPTION
IT-CSERV-300	IT head end, Core server, standard, 1RU

Specifications

HARDWARE:

- CPU	Dual Intel Xeon E5-2630 v4
- DRAM	64 GB
- Storage	3 x 300 GB HDD with RAID5
- Network	4 x Gigabit Ethernet
- Mounting	1U height rack mount

SOFTWARE:

- Operating Systems	Windows Server 2008 Ubuntu Linux
- Database	SQL Server Standard
- Virtualization	VMware®

ELECTRICAL:

- Power Input	100-240 V AC, 50-60 Hz
- Power Supply	Redundant 750W
- Thermal Output	2891 BTU/hr (max)

- Receiving and processing transactional data from smart-sensors
- Updating information displayed on signage: interior and exterior
- Processing images from smart-sensors with License Plate Recognition (LPR) software
- Network management (e.g. IP addressing, time synchronization)
- Supporting advanced optional software features
- Communication with other onsite systems being used (e.g. kiosks for *Park Finder*, PARCS or other systems)
- Time-limited local storage of all data
- Transmitting data (excluding images) to *Park Insights*: a cloud-hosted portal to access the parking data gathered by the system
- Presenting a web-accessible interface for commissioning, configuration and ongoing administration of the camera based smart-sensors

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Core Switch



Specifications

NETWORK:

- Switch type Managed layer 3
- Ports 24x 1G RJ45
4x 1G SFP network module
8x 10G SFP network module

ELECTRICAL:

- Input Voltage 100-240V AC, 50-60 Hz
350W Power Supply
- Input Current 2-4A
- Thermal Output 1207BTU/hr

REGULATORY:

- Product Safety UL 60950-1,
CSA-C22.2 No. 60950-1,
EN 60950-1,
IEC 60950-1,
CCC,
CE Marking
- EMI FCC Part 15 Class A,
ICES-003 Class A,
EN 55022 Class A,
CISPR 22 Class A,
AS/NZS 3548 Class A,
others

DIMENSIONS:

- Mounting 1U height rack mount

At the center of the Park Assist network is the Core Switch. Data from all types of sensors is concentrated at the Core Switch, which features ample ports and room for expansion via network modules. All switch configuration is controlled by Park Assist to manage traffic, ports, and security protocols.

For installations with high bandwidth requirements, this switch can be used for distribution within parking structures to allow dedicated 1G links to each floor cabinet. Uplink from the distribution switch to the core switch at the head end would be via 10G network module.

PART NUMBER	DESCRIPTION
IT-CISCO-C9300-24T-E	IT head end, Core Switch, 24x 1G RJ45 ports, support for 4x 1G SFP or 8x 10G SFP network module
IT-CISCO-C9300-NM-4G	Network module, 4x 1G SFP (optional)
IT-CISCO-C9300-NM-8X	Network module, 8x 10G SFP (optional)

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Uninterruptible Power Supply



Specifications

ELECTRICAL:

- Nominal input voltage 120V AC (-110)
230V AC (-230)
- Input frequency range 57-63 Hz (-110)
47-53 Hz (-230)
- Input voltage range 90-140V (-110)
160-280V (-230)
- Output type Sine wave
- Output capacity 1800W / 2200VA
- Output connections 4x NEMA 5-15R (-110)
4x IEC 320 C13 (-230)
- Surge suppression 500 joules

REGULATORY:

- Approvals (-110) UL 1778, FCC Part 15 Class A
RoHS
- Approvals (-230) CE, EN/IEC 62040-1,
EN/IEC 62040-2

PHYSICAL:

- Mounting 2U height rack mount
- Weight 43 kg (95 lbs)
- Online Thermal Dissipation 306 BTU/hr
- Management Port RJ45 Ethernet, SNMP

The Uninterruptible Power Supply protects the Park Assist Core Server from electric power fluctuations, including surges, spikes, lightning, and other disturbances. If power is interrupted the UPS supplies power to the Core Server from its internal battery, providing the server time to shut down gracefully. Internal systems manage the battery, maximizing battery life by regulating recharging operations.

PART NUMBER	DESCRIPTION
IT-UPS-2200-110	IT head end, UPS, 2200VA, 2RU, 110V AC
IT-UPS-2200-230	IT head end, UPS, 2200VA, 2RU, 230V AC

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Core Router



The Core Router allows the Park Assist network to securely connect to the internet for a variety of purposes including Park Assist's data mining applications, API access, and remote support. It includes a firewall, providing robust security coming in and out of the network, access control for users via IPsec VPN, and NAT of local subnets for internet access.

Specifications

NETWORK:

- | | |
|-------------|---|
| - WAN Ports | 2x 1Gb Ethernet RJ45
1x 1Gb SFP |
| - LAN Ports | 8x 1Gb Ethernet RJ45 |
| - Security | 50x IPsec VPN tunnels
MAC filtering & port security
Stateful inspection
transparent firewall
Dynamic and static port security |

ELECTRICAL:

- | | |
|-----------------|-----------------------|
| - Input Voltage | 100-240V AC, 50-60 Hz |
| - Power Supply | 12V DC 60W |
| - Heat Output | 205 BTU/hr (max) |

REGULATORY:

- | | |
|------------|---------------------------------------|
| - Emission | FCC Part 15, CISPR22, EN55022, others |
| - Immunity | CISPR24, EN55024, others |

DIMENSIONS:

- | | |
|------------|----------------------|
| - Mounting | 1U height rack mount |
| - Weight | 2.5kg (5.5lbs) |

PART NUMBER

DESCRIPTION

IT-CISCO-892-FSP	IT head end, Core Router, 2x 1Gb RJ45 WAN, 1x Gb SFP WAN, 8x 1Gb RJ45 LAN, managed switch, rack mount kit not included
IT-CISCO-ACS-890-RM-19	1U rack mount kit for IT-CISCO-892-FSP

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Equipment Rack

The Equipment Rack provides a mounting frame for Park Assist head-end hardware. Designed for standard 19" rack-mount equipment, racks are available with vertical capacity of 12U, 25U, or 42U depending on project-specific requirements.

Rack rails are adjustable to accommodate different sizes of equipment. Ventilation on multiple sides facilitates cooling by convection. Removable side panels are lockable, and the front door is lockable and reversible.



PART NUMBER	DESCRIPTION
IT-RACK12	IT head end, Enclosed equipment rack, 12RU
IT-RACK25	IT head end, Enclosed equipment rack, 25RU
IT-RACK42	IT head end, Enclosed equipment rack, 42RU

Specifications

DIMENSIONS:

- Rack height	12U	25U	42U
- Unit height	637.5 mm (25.1")	1245 mm (49")	2000 mm (78.5")
- Unit width	600 mm (23.6")	600 mm (23.6")	600 mm (23.6")
- Unit depth	851 mm (33.5")	1092 mm (43")	1092 mm (43")
- Maximum rack depth	826 mm (32.5")	940 mm (37")	940 mm (37")
- Unit weight	47.6 kg (105 lbs)	88.5 kg (195 lbs)	128 kg (281 lbs)
- Weight capacity (stationary)	453.6 kg (1000 lbs)	1360 kg (3000 lbs)	1360 kg (3000 lbs)
- Weight capacity (rolling)	453.6 kg (1000 lbs)	1020 kg (2250 lbs)	1020 kg (2250 lbs)
- Color	Black	Black	Black

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4-Digit/3-Digit+Arrow Sign Insert

With a Park Assist smart-sensor system, digital sign inserts are placed at key driver wayfinding decision points within parking structures. Each insert displays the currently available number of spaces for its indicated area, enabling visitors to quickly make decisions about where to park. Multiple inserts may be grouped into a single enclosure.



Light emitting diodes (LEDs) are the key optical element, forming the basis for all illuminated characters and symbols. Character display color is selectable to meet client preferences. Power and network access are provided by Park Assist Floor Cabinets, which make wayfinding signage an extension of the smart-sensor network.

PART NUMBER	DESCRIPTION
SN-130-3A-SS-210	Sign insert, 7 segment, 4-digit OR 3-digit w/arrow, multicolor, 130 mm char height



4-Digit/3-Digit+Arrow Sign Insert Specifications

CONTENT DISPLAY:

- Capabilities	Four characters, right-justified, leading zero suppression Three characters, right-justified, leading zero suppression with green arrow and red cross, 8 selectable directions Capable of displaying 0-999 and 'Full' or 0-9999 and 'FULL'
- Active Area	130 mm x 435 mm (5.1" x 17.1")
- Digit Color	Green, amber, or red
- Brightness	Continuously adjustable via software
- Orientation	Normal or inverted, with software compensation
- Maximum Viewing Range	78 m @ 24-40 km/h (256' @ 15-25 mph)

ENVIRONMENT:

- Operating Temperature	-30° to 50°C (-22° to 122°F)
- Environmental Sealing	IP54

MECHANICAL:

- Mounting Options	2x M8x1.25 threaded inserts on top and bottom 2x L-brackets bolted to back housing (adjustable location)
- Case	Black powder-coated aluminum

ELECTRICAL:

- Voltage	24V DC nominal
- Power Draw	36W maximum
- Power Connection	Includes 2 m (78"), 1.5mm ² (16AWG) stranded 2-conductor cable with soldered IP68 keyed connector
- Communication	RS485 via sealed RJ45 port
- Product Safety	UL Listed to UL Std. 48 Conforms to UL Std. 60950-1 / 60950-22 Certified to CSA Std. C22.2 No. 60950-1 / 60950-22

DIMENSIONS:

- Height	200 mm (7.9")
- Width	510 mm (20.1")
- Depth (cabinet only)	86 mm (3.4")
- Depth (with connectors)	156 mm (6.2")
- Weight	2.8 kg (6.1 lbs)



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200mm 4-Digit Sign Insert

With a Park Assist smart-sensor system, digit sign inserts are placed at key driver wayfinding decision points within and around parking structures. Each insert displays the currently available number of spaces for its indicated area, enabling visitors to quickly make decisions about where to park. Multiple inserts may be grouped into a single enclosure.



Light emitting diodes (LEDs) are the key optical element, forming the basis for all illuminated characters and symbols. Character display color is selectable to meet client preferences. Power and network access are provided by Park Assist Floor Cabinets, which make wayfinding signage an extension of the smart-sensor network.

PART NUMBER	DESCRIPTION
SN-200-4-SS-210	Sign insert, 7 segment, 4 digit, multicolor, IP54, 200mm char height

200mm 4-Digit Sign Insert Specifications

CONTENT DISPLAY:

- Capabilities	Four characters, right-justified, leading zero suppression Capable of displaying 0-9999, 'FULL', 'OPEN', and 'CLSd'
- Active area	200 mm x 582 mm (7.9" x 22.9")
- Digit Color	Green, amber, or red
- Brightness	Continuously adjustable via software
- Orientation	Normal or inverted, with software compensation
- Maximum Viewing Range	135 m @ 24-40 km/h (450' @ 15-35 mph)

ENVIRONMENT:

- Operating Temperature	-30° to 50°C (-22° to 122°F)
- Environmental Sealing	IP54

MECHANICAL:

- Mounting Options	2x M8x1.25 threaded inserts on top and bottom 2x L-brackets bolted to back housing (adjustable location)
- Case	Black powder-coated aluminum

ELECTRICAL:

- Voltage	24V DC nominal
- Power Draw	33W maximum
- Power Connection	Includes 2 m (78"), 1.5mm ² (16AWG) stranded 2-conductor cable with soldered IP68 keyed connector
- Communication	RS485 via sealed RJ45 port
- Product Safety	UL Listed to UL Std. 48 Conforms to UL Std. 60950-1 / 60950-22 Certified to CSA Std. C22.2 No. 60950-1 / 60950-22

DIMENSIONS:

- Height	275 mm (10.8")
- Width	742 mm (29.5")
- Depth (cabinet only)	86 mm (3.4")
- Depth (with connectors)	156 mm (6.2")
- Weight	6 kg (13.2 lbs)



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FD820v2M1IR

4MP IP Fixed Dome Camera with IR

- ✓ 1/3" Progressive scan CMOS imager
- ✓ 3.0 - 9.0 mm Motorised varifocal lens
- ✓ 4MP @ 15 fps frame rate
- ✓ Quad-stream H.264 and MJPEG video
- ✓ 120 dB WDR
- ✓ Day/Night with IR-cut filter
- ✓ Built-in IR illuminator (effective distance: 40 m)
- ✓ IP66 Ingress protection rating
- ✓ IK10
- ✓ 24 Vac / 24 Vdc / 12 Vdc / 802.3af PoE
- ✓ ONVIF Profile S conformant



Description

The FD820v2M1IR is a 4MP HD fixed dome camera with built-in IR illumination providing clear images under any lighting condition. With its IP66 construction, IK10 vandal resistant housing and motorised lens, installation is fast and easy, and remote adjustment is simple.

Multistream high definition

The camera has quad-stream capability for simultaneous streaming of H.264/H.264 or H.264/MJPEG. Multiple combinations of resolution and frame rate can be configured to satisfy different live viewing and recording scenarios. 4 Mpixel resolution is available at 15 fps, a full-HD 1080p stream at 30fps can be combined with a SXGA stream at 30 fps. Each selected resolution-frame rate combination can be freely set to a stream number.

Open standards

Multiple options are available to easily integrate the FD820v2M1IR to a video management system. In support of open standards, the camera is compliant with the ONVIF Profile S specification.

Image optimisation

The FD820v2M1IR provides automatic day/night functionality with configurable thresholds and built-in IR illuminator, for use in low-light situations. Backlight compensation enhances image visibility in difficult lighting situations. The FD820v2M1IR provides two modes for wide dynamic range. The first mode uses different gain ratios for different illuminated areas to bring details in the darker areas of an image without saturation in the brighter parts. The second mode uses a 2 shutter mechanism which applies two different exposure settings to capture both darker and lighter areas with excellent details. The resulting image is the optimal aggregation of both exposures. The available image optimisation methods ensure quality pictures at all times.

Power source choices

The FD820v2M1IR can be powered by 12 Vdc, 24 Vdc, 24 Vac, or over the network with 802.3af-compliant PoE sources.

Privacy masks

Privacy masks cover sections of the image. This feature is often requested for such situations as city centre surveillance and point of sale keypads.

FD820v2M1IR

Technical specifications

Camera	
Image sensor	1/3" Progressive scan CMOS
Effective pixels	2688(H) x 1520(V)
Minimum scene illumination	0.1 lux colour, 0.01 lux (b/w), 0 lux with IR
Shutter speed	1 - 1/10000 s
Lens	3.0 to 9.0 mm, F1.7
Lens type	DC Auto iris, motorised zoom, push-to-focus
Horizontal field of view	109° (W) - 33° (T)
Functions	
Privacy masks	5
Text and picture overlay	Date, time, date & time, 5x subtitle (16 characters each), text string (25 characters), image, image transparency
Video motion detection	On / off / by schedule
Video motion detection alarm	Alarm output, record video clip, send alarm message, upload image
Network failure detection	On / off / by schedule
Network failure detection alarm	Alarm output, record video clip, send alarm message, upload image
Tamper detection	On / off / by schedule
Tamper detection alarm	Alarm output, record video clip, send alarm message, upload image
Periodical event	On/Off
Periodical event action	Upload image
Recording	On / off / by schedule
Recording destination	SD card/ Network share
Image control	
Wide dynamic range	
- gamma WDR	On/Off
- dual shutter WDR	On/Off (>120 dB)
Exposure	Auto (P-iris priority, iris size, max gain and min shutter speed configurable) / Manual
White balance	Auto, ATW, Manual, One push
Contrast	Manual
Brightness	Manual
Saturation	Manual
Hue	Manual
Sharpness	Manual
Day/Night function	Auto / night / day / light sensor / LED on / LED off Configurable day/night threshold levels/ IR light compensation
Noise reduction	Off, 3DNR (low, medium, high), 2DNR (On/Off), ColorNR (low, medium, high)
Backlight compensation	On/Off
Digital zoom	Up to 10x
Image rotation	Normal / Flip / Mirror / 90° (clockwise, counterclockwise) and 180° Rotate

FD820v2M1IR

Technical specifications

Video				
Compression algorithm(s)	H.264 (baseline / main / high profile); MJPEG			
Number of compression instances	Quad stream. Any combination of H.264 streams with possibly one MJPEG stream.			
Output streams	Any output stream can be freely configured to one of the resolution/frame rate formats.			
Supported resolutions	2688x1512 (4MP); 2560x1440; 2304x1296 (3MP); 1920x1080 (1080p); 1280x1024; 1280x720 (720p); 1024x768; 800x600; 720x576 (D1); 640x480; 352x288 (CIF)			
Compression capabilities	(indication, other combinations possible)			
Resolution format	format 1	format 2	format 3	format 4
H.264 in 15 fps	2688x1512	1280x720		
H.264 instances in 50/60fps	1280x720	-	-	-
(at lower frame rate higher resolution may be possible)	1280x720	640x480	-	-
	1280x720	640x480	352x288	-
H.264 instances in 25/30fps	2304x1296	-	-	-
(at lower frame rate higher resolution may be possible)	2304x1296	800x600	-	-
	1920x1080	1280x1024	-	-
	1920x1080	1280x1024	352x288	-
	1920x1080	1280x720	720x576	352x288
H.264 instances in 25/30fps WDR 2 shutter mode (one can be MJPEG)	1920x1080	-	-	-
(at lower frame rate higher resolution may be possible)	1920x1080	720x576	-	-
	1920x1080	720x576 (15fps)	352x288 (15fps)	-
MJPEG	One of the above resolution formats in each instance can be MJPEG instead of H.264 if the resolution is lower than or equal to 1920x1080			
Compression bit rate control	Constant bit rate (CBR), variable bit rate (VBR)			
Output bit rate (per H.264 stream)	Up to 20480 kbit/s			
Total H.264 output	26624 kbit/s			
Number of video output streams	Up to 20 (RTSP)			
Total output data rate (max)	50000 kbit/s			
Video frame rate	1 to 60 fps / 1 to 50 fps			
Analogue video output	PAL/NTSC			
Connector type	BNC (1.0 Vpp in 75 Ω)			
Audio				
Two-way stereo audio	Microphone in / line in / line out			
Compression	G.711 (μ-law, a-law) / G.726 / AAC / PCM			
Bit rate	G.711: 64 Kbps G.726: 16 Kbps, 24 Kbps, 32 Kbps, 40 Kbps AAC: 128 Kbps PCM: 128 Kbps, 256 Kbps, 384 Kbps, 768 Kbps			
Sample rate	G.711: 8 KHz / G.726: 8 KHz / AAC: 48 KHz / PCM: 8, 16, 24, 48 KHz			
Input level, Output level	Adjustable gain			
Connector type	Multifunction terminal block (Audio In L, Audio In R, GND, Audio Out L, Audio Out R)			
Alarm inputs/output				
Input	1x 0 - 5 V, 10 kΩ pull-up			
Output	1x Photo relay output 300 Vdc/ac			
Operational modes	Normally open; normally closed			
Connector type	Multifunction terminal block (Alarm In+, Alarm In-, Alarm Out+, Alarm Out-)			

FD820v2M1IR

Technical specifications

Storage	
Storage options	Micro SDXC card, 64 GB
Network	
Interface(s)	10/100 Ethernet
Network protocols	IPv4/v6, TCP/IP, UDP, RTP, RTSP, HTTP, HTTPS, ICMP, FTP, SMTP, DHCP, PPPoE, IGMP, PNAC (IEEE 802.1x), QoS
Connector type	RJ-45
Management	
Supported browsers	Internet Explorer (6.0+), Chrome, Firefox, Safari
Security	HTTPS, IP Filter, PNAC (IEEE 802.1x)
Protocols	UPnP, SNMP, ONVIF Profile S
Password levels	User and Administrator
User accounts	20
Powering	
Power consumption	
- System	Max. 3.7 W
- IR LED	Max. 4 W
- Heater	Max. 4 W (cold start: 8.5 W)
- Motorised lens	Max. 0.55 W
Power	24 Vac / 24 Vdc / 12 Vdc / 802.3af PoE
Connector type	2-pin terminal block
Environmental	
Start-up temperature	-55 °C (-67 °F)
Operating temperature	-50 °C to +50 °C (-58 °F to +122°F)
Relative humidity	10% to 90%, no condensation
Mechanical	
Dimensions (camera body)	Ø 133.8 x 117.4 mm (Ø 5.2 x 4.6 in)
Weight	0.76 kg (1.68 lbs)
Colour	RAL 9003 (Signal white)
Built-in IR illuminator	
- Working distance	Up to 40 m
- Wavelength	850 nm
- Number of LEDs	6
Ingress protection	IP66
Impact rating	Ik10
Ordering information	
FD820v2M1IR	Network Outdoor fixed dome, 3-9mm motorized zoom, 4MP, H.264/MJPEG, IR
TA01/FD	Tube adapter/pendant mount for FD8xx
WM01A	Wall mount bracket
CM02	Ceiling Mount, Straight Tube, 50cm
WM19FD/FD	Wall mount for FD8xx
DC21C-R	Dome cover, rain wash, for FD8xx
CM13/FD	Flush mount kit for FD8xx

FD820v2M1IR

Technical specifications

Accessoires

TA01/FD



Tube adapter/pendant mount for FD8xx

WM01A



Wall Mount Bracket

CM02



Ceiling Mount, Straight Tube, 50cm

WM19/FD



Wall Mount for FD8xx

DC21C-R



Rain-Wash-Vandal Resistant Clear Dome Cover

CM13/FD

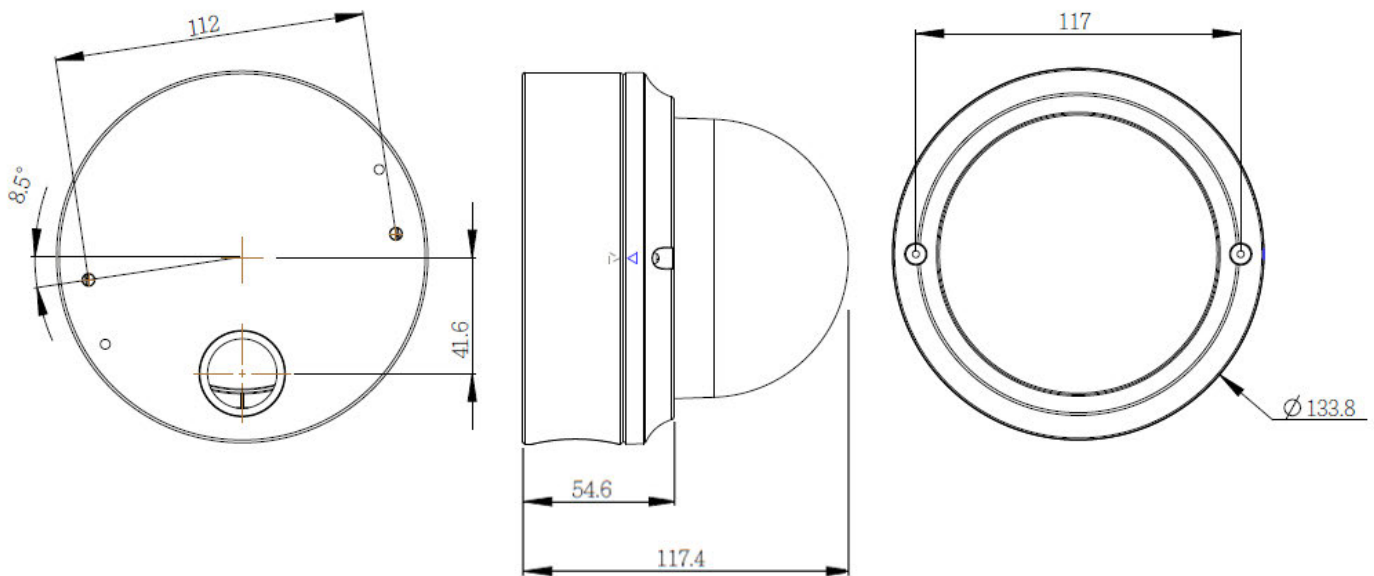


Flush-Mount Adapter

FD820v2M1IR

Technical specifications

Dimensions



The quality management system used in the development, production, sales, and support of this product is ISO 9001 certified by LRQA.

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**SECURITY
SOLUTIONS**



NanoBeam[®] ac

airMAX[®] ac CPE with Dedicated Management Radio

Model: NBE-2AC-13

Uniform Beamwidth Maximizes Noise Immunity

airMAX ac Processor for Superior Performance

Dedicated Wi-Fi Radio for Management

Overview

Ubiquiti Networks launches the latest generation of airMAX CPE (Customer Premises Equipment), the NanoBeam[®] 2AC with dedicated Wi-Fi management.

Improved Noise Immunity

The NanoBeam 2AC directs RF energy in a tighter beamwidth. With the focus in one direction, the NanoBeam 2AC blocks or spatially filters out noise, so noise immunity is improved. This feature is especially important in an area crowded with other RF signals of the same or similar frequency.

Integrated Design

The radio and antenna are combined to create a more efficient and compact CPE. The NanoBeam 2AC gets maximum gain out of the smallest footprint.

Providing high performance and an innovative form factor, the NanoBeam 2AC is versatile and cost-effective to deploy.

Software

airOS[®] 8

airOS[®] 8 is the revolutionary operating system for Ubiquiti[®] airMAX ac products.

Powerful Wireless Features

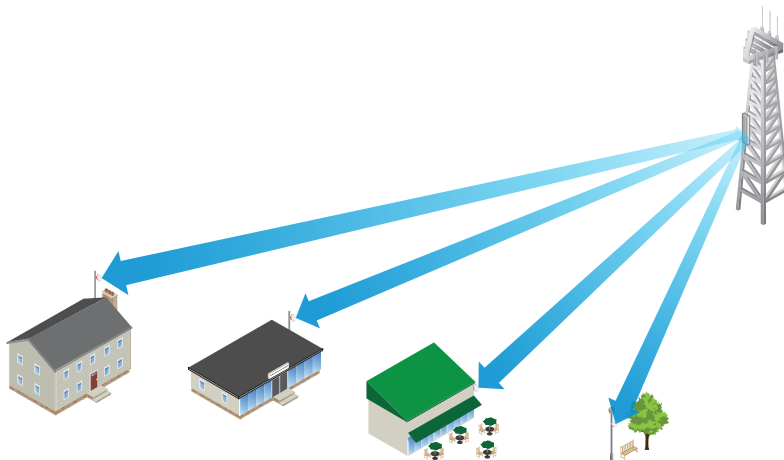
- Access Point PtMP airMAX Mixed Mode
- airMAX ac Protocol Support
- Long-Range Point-to-Point (PtP) Link Mode
- Selectable Channel Width
 - PtP: 10/20/40 MHz
 - PtMP: 10/20/40 MHz
- Automatic Channel Selection
- Transmit Power Control: Automatic/Manual
- Automatic Distance Selection (ACK Timing)
- Strongest WPA2 Security

Usability Enhancements

- airMagic[®] Channel Selection Tool
- Dynamic Configuration Changes
- Instant Input Validation
- HTML5 Technology
- Optimization for Mobile Devices
- Detailed Device Statistics
- Comprehensive Array of Diagnostic Tools, including RF Diagnostics and airView[®] Spectrum Analyzer

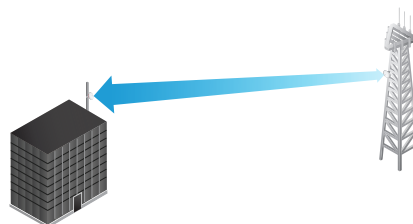
Application Examples

PtMP Client Links

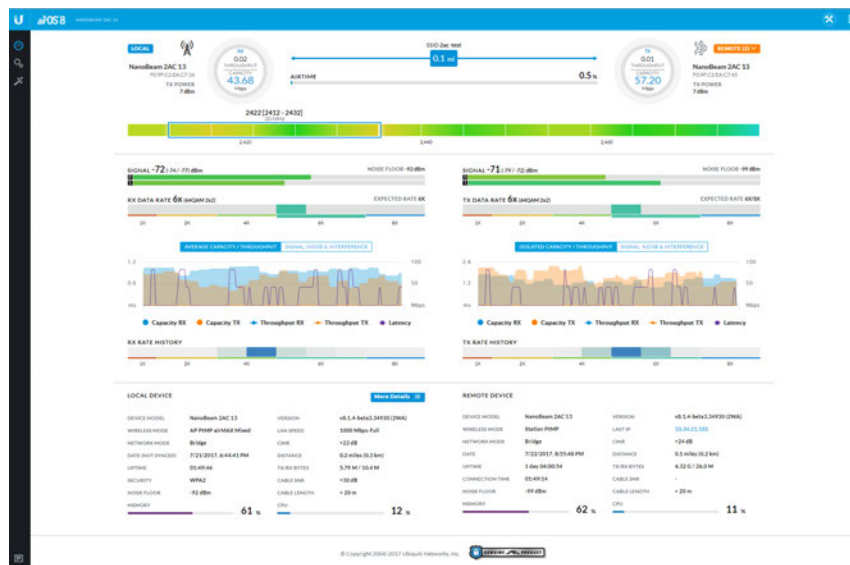


The NanoBeam 2AC used as a CPE device for each client in an airMAX PtMP network.

PtP Link



Use a NanoBeam 2AC on each side of a PtP link.



Advanced RF Analytics

airMAX ac devices feature a multi-radio architecture to power a revolutionary RF analytics engine.

An independent processor on the PCBA powers a second, dedicated radio, which persistently analyzes the full 2.4 GHz spectrum and every received symbol to provide you with the most advanced RF analytics in the industry.

Real-Time Reporting

airOS 8 displays the following RF information:

- Persistent RF Error Vector Magnitude (EVM) constellation diagrams
- Signal, Noise, and Interference (SNI) diagrams
- Carrier to Interference-plus-Noise Ratio (CINR) histograms

Spectral Analysis

airView allows you to identify noise signatures and plan your networks to minimize noise interference. airView performs the following functions:

- Constantly monitors environmental noise
- Collects energy data points in real-time spectral views
- Helps optimize channel selection, network design, and wireless performance

airView runs in the background without disabling the wireless link, so there is no disruption to the network.

In airView, there are three spectral views, each of which represents different data: waveform, waterfall, and ambient noise level.

airView provides powerful spectrum analyzer functionality, eliminating the need to rent or purchase additional equipment for conducting site surveys.

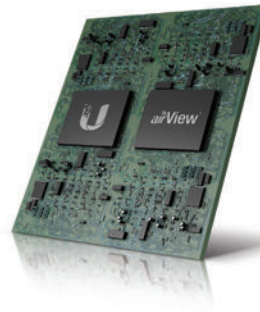
UNMS App

The NanoBeam 2AC integrates a separate Wi-Fi radio for fast and easy setup using your mobile device.

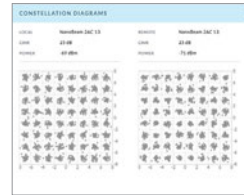
Accessing airOS via Wi-Fi

The UNMS™ app provides instant accessibility to the airOS configuration interface and can be downloaded from the App Store (iOS) or Google Play™ (Android). UNMS allows you to set up, configure, and manage the NanoBeam 2AC and offers various configuration options once you're connected or logged in.

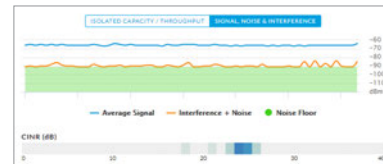
Multi-Radio Architecture



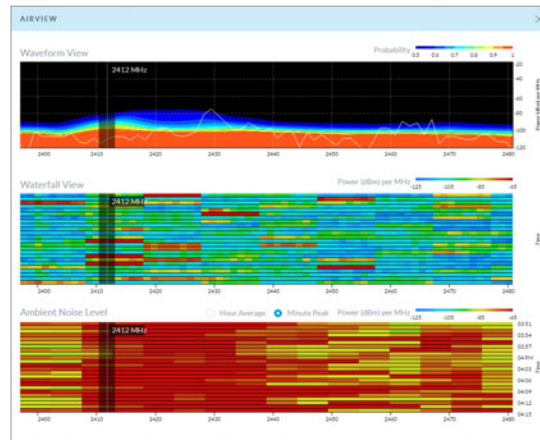
Constellation Diagrams



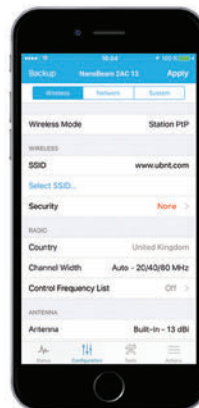
SNI Diagram and CINR Histogram



Dedicated Spectral Analysis



UNMS Configuration Screen



Technology



Unlike standard Wi-Fi protocol, Ubiquiti's Time Division Multiple Access (TDMA) airMAX protocol allows each client to send and receive data using pre-designated time slots scheduled by an intelligent AP controller.

This time slot method eliminates hidden node collisions and maximizes airtime efficiency, so airMAX technology provides performance improvements in latency, noise immunity, scalability, and throughput compared to other outdoor systems in its class.

Intelligent QoS Priority assigned to voice/video for seamless streaming.

Scalability High capacity and scalability.

Long Distance Capable of high-speed, carrier-class links.

Superior Performance

The next-generation airMAX ac technology boosts the advantages of our proprietary TDMA protocol.

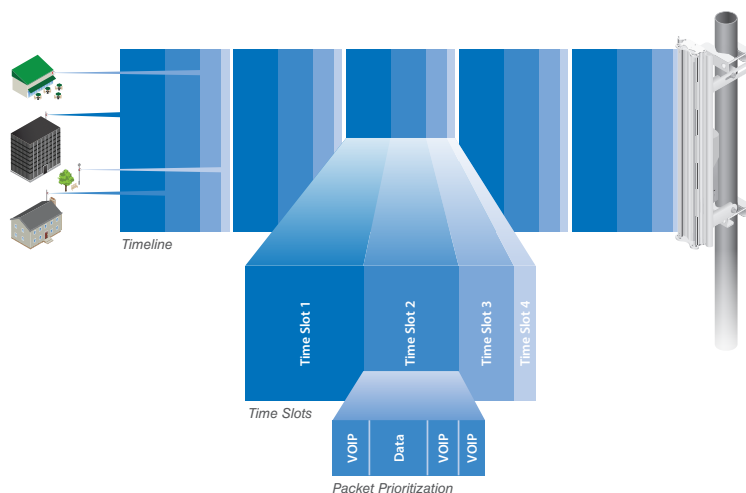
Ubiquiti's airMAX engine with custom IC dramatically improves TDMA latency and network scalability. The custom silicon provides hardware acceleration capabilities to the airMAX scheduler, to support the high data rates and dense modulation used in airMAX ac technology.

Throughput Breakthrough

airMAX ac supports high data rates, which require dense modulation: 256QAM – a significant increase from 64QAM, which is used in airMAX.

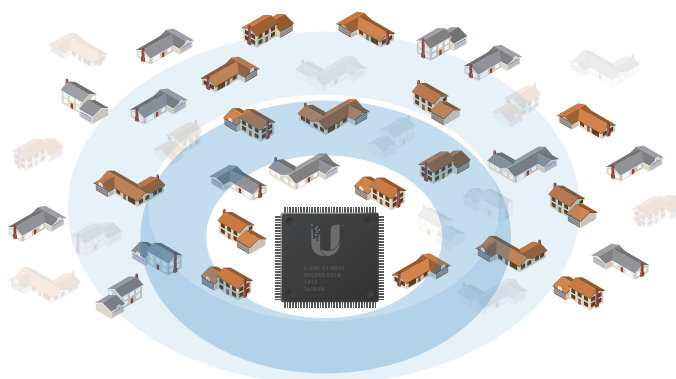
With their use of proprietary airMAX ac technology, 2.4 GHz airMAX ac products support up to 330+ Mbps real TCP/IP throughput – more than double the throughput of standard airMAX products.

airMAX ac TDMA Technology

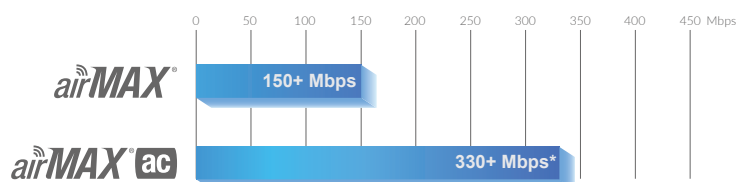


Up to 100 airMAX ac stations can be connected to an airMAX ac Sector; four airMAX ac stations are shown to illustrate the general concept.

airMAX Network Scalability



Superior Throughput Performance



* The 330+ Mbps throughput value is specific to 2.4 GHz airMAX ac products.

Hardware Overview

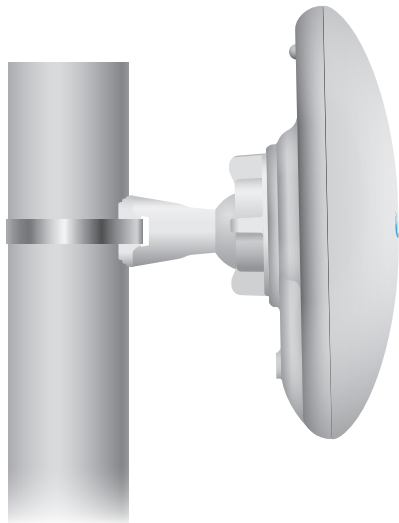
The NanoBeam 2AC features airMAX ac technology and a dedicated Wi-Fi radio for management.

Ease of Installation

- **Quick Installation** No fasteners are required for pole-mounting, and a single wall fastener (not included) is required for wall-mounting.
- **Convenient Alignment** The NanoBeam 2AC pivots on its ball joint mount for easy aiming.

Innovative Mechanical Design

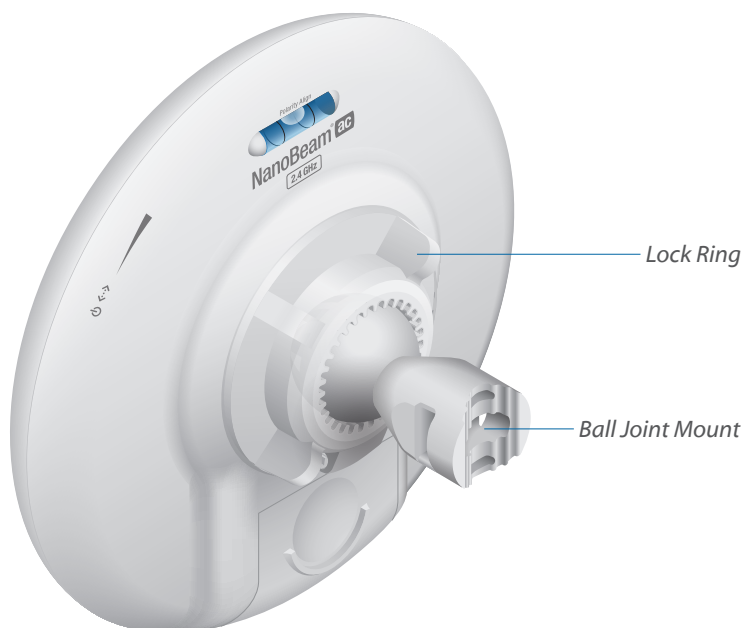
- **Efficient Footprint** The radio and antenna are combined into a single body that takes up minimal space. The form factor features the highest gain for its size.
- **Aesthetics** The NanoBeam 2AC is small enough to blend discreetly into the background at a customer's location.
- **Versatile Mounting** The NanoBeam 2AC can be mounted in almost any position needed for line of sight.



Pole-Mounted NanoBeam 2AC



Wall-Mounted NanoBeam 2AC



NanoBeam 2AC with Mounting Hardware

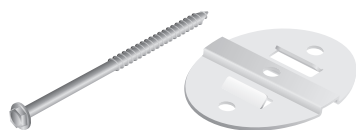
Mounting Accessories

NanoBeam® Wall Mount Kit

Model: NBE-WMK

A wall mount kit is available as an optional accessory to enhance stability for wall-mounting.

Wall-Mount Bracket Dimensions: 75mm x 55mm x 4mm



NanoBeam® Window Mount

Model: NBE-19-WM

A suction cup mount is available as an optional accessory to mount the NanoBeam 2AC on a window.

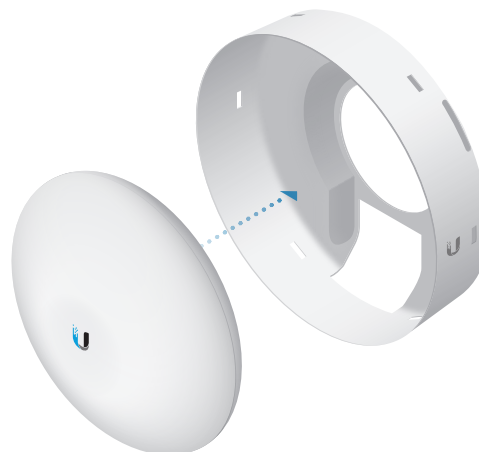


IsoBeam Accessory

IsoBeam™

Model: ISO-BEAM-19

An RF isolator shield is available as an optional accessory to enhance signal isolation.



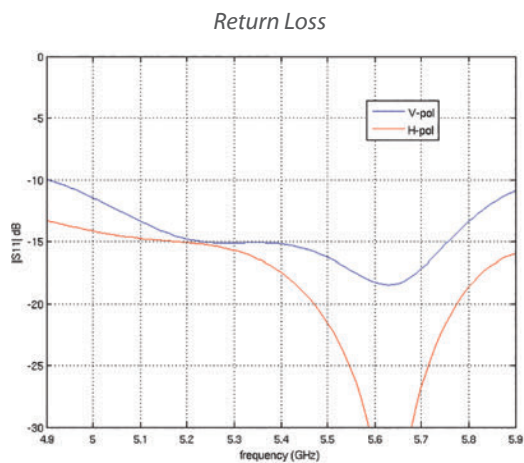
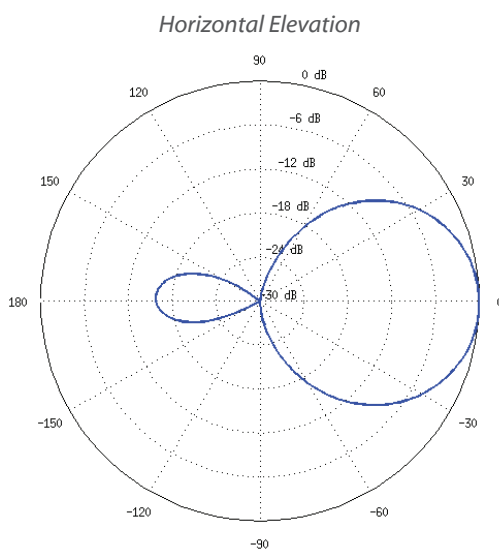
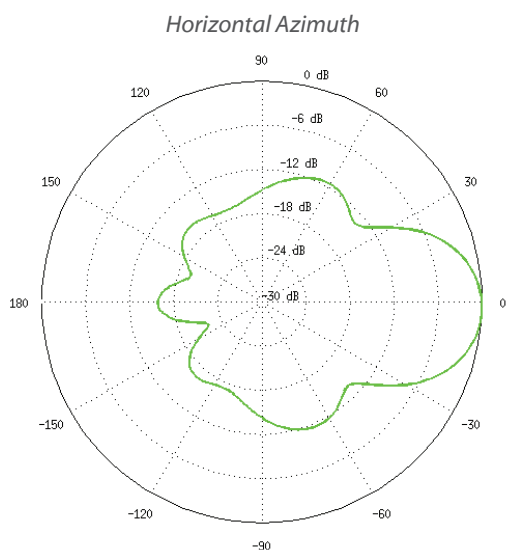
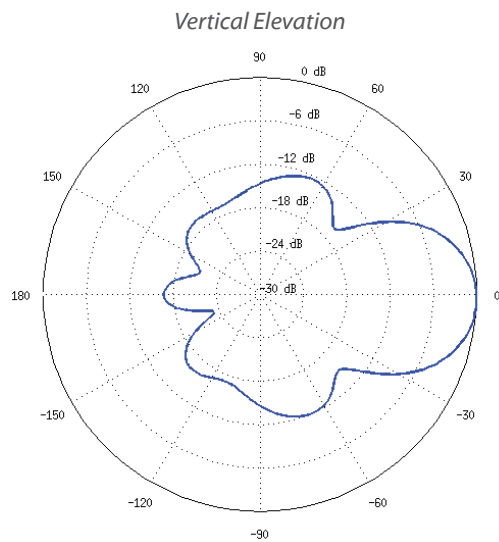
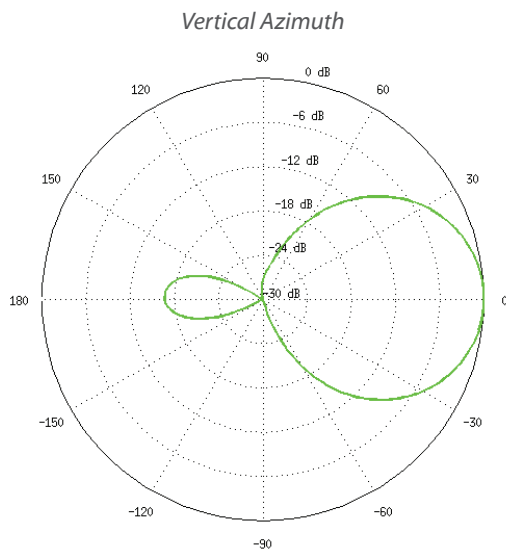
Specifications

NBE-2AC-13		
Dimensions (Mount Included)	189 x 189 x 125 mm (7.44 x 7.44 x 4.92")	
Weight (Mount Included)	0.530 kg (1.17 lb)	
Power Supply	24V, 0.5A Gigabit PoE Adapter (Included)	
Max. Power Consumption	7.5W	
Gain	13 dBi	
Networking Interface	(1) 10/100/1000 Ethernet Port Wi-Fi for Management	
Processor Specs	Atheros MIPS 74Kc, 533 MHz	
Memory	64 MB DDR2	
LEDs	Power, Ethernet, (4) Signal Strength	
Signal Strength LEDs	Software-Adjustable to Correspond to Custom RSSI Levels	
Max. VSWR	1.5:1	
Channel Sizes	PtP Mode	PtMP Mode
	10/20/40MHz	10/20/40 MHz
Polarization	Dual Linear	
Enclosure	Outdoor UV Stabilized Plastic	
Mounting	Pole-Mount (Kit Included), Wall-Mount	
Wind Loading	45.4 N @ 200 km/h (10.2 lbf @ 125 mph)	
Wind Survivability	200 km/h (125 mph)	
ESD/EMP Protection	Air: ± 24 kV, Contact: ± 24 kV	
RoHS Compliance	Yes	
Salt Fog Test	IEC 68-2-11 (ASTM B117), Equivalent: MIL-STD-810 G Method 509.5	
Vibration Test	IEC 68-2-6	
Temperature Shock Test	IEC 68-2-14	
UV Test	IEC 68-2-5 at 40° C (104° F), Equivalent: ETS 300 019-1-4	
Wind-Driven Rain Test	ETS 300 019-1-4, Equivalent: MIL-STD-810 G Method 506.5	
Operating Temperature	-40 to 70° C (-40 to 158° F)	
Operating Humidity	5 to 95% Noncondensing	
Certifications	CE, FCC, IC	

Operating Frequency (MHz)	
Worldwide	2412 - 2472
USA	2412 - 2462

Management Radio (MHz)	
Worldwide	5150 - 5250
USA	U-NII-3: 5725 - 5850

NBE-2AC-13 Output Power: 27 dBm							
TX Power Specifications				RX Power Specifications			
Modulation	Data Rate	Avg. TX	Tolerance	Modulation	Data Rate	Sensitivity	Tolerance
airMAX ac	1x BPSK (½)	27 dBm	± 2 dB	airMAX ac	1x BPSK (½)	-96 dBm	± 2 dB
	2x QPSK (½)	27 dBm	± 2 dB		2x QPSK (½)	-95 dBm	± 2 dB
	2x QPSK (¾)	27 dBm	± 2 dB		2x QPSK (¾)	-92 dBm	± 2 dB
	4x 16QAM (½)	27 dBm	± 2 dB		4x 16QAM (½)	-90 dBm	± 2 dB
	4x 16QAM (¾)	26 dBm	± 2 dB		4x 16QAM (¾)	-86 dBm	± 2 dB
	6x 64QAM (¾)	25 dBm	± 2 dB		6x 64QAM (¾)	-83 dBm	± 2 dB
	6x 64QAM (¾)	24 dBm	± 2 dB		6x 64QAM (¾)	-77 dBm	± 2 dB
	6x 64QAM (¾)	23 dBm	± 2 dB		6x 64QAM (¾)	-74 dBm	± 2 dB
	8x 256QAM (¾)	22 dBm	± 2 dB		8x 256QAM (¾)	-71 dBm	± 2 dB
	8x 256QAM (¾)	21 dBm	± 2 dB		8x 256QAM (¾)	-68 dBm	± 2 dB



Specifications are subject to change. Ubiquiti products are sold with a limited warranty described at: www.ubnt.com/support/warranty
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PPISM Station™ AC

Shielded airMAX® ac Radio Base
with airPrism® Technology

Model: PS-5AC

Proprietary Ubiquiti® airMAX ac Processor

airPrism Active RF Filtering Technology

Dedicated Wi-Fi Radio for Management

Overview

The PrismStation™ 5AC combines airPrism technology with dedicated Wi-Fi management.

Improved Noise Immunity

The PrismStation 5AC directs RF energy in a tighter beamwidth using one of these compatible antennas*:

- Horn-5-30
- Horn-5-45
- Horn-5-60
- Horn-5-90
- U-OMT-Dish

With the focus in one direction, the PrismStation 5AC blocks or spatially filters out noise, so noise immunity is improved. This feature is especially important in an area crowded with other RF signals of the same or similar frequency.

Modular Design

The interchangeable antenna improves beam-shaping for specific deployment needs.

Scalability

Horn antennas increase co-location performance without sacrificing gain.

Symmetrical horn antennas (30° model: Horn-5-30 and 45° model: Horn-5-45) offer breakthrough scalability options for wireless systems. Unique beam performance and great co-location characteristics allow for a higher density of sectors than traditional sector technology.

Enhanced Co-Location

Asymmetrical horn antennas (60° model: Horn-5-60 and 90° model: Horn-5-90) have naturally attenuated side lobes and extremely low back radiation. They offer the best front-to-back ratio in the industry and the lowest side lobe radiation. Asymmetrical horn antennas are ideal for cluster sector installations with high co-location requirements.

Extended Performance

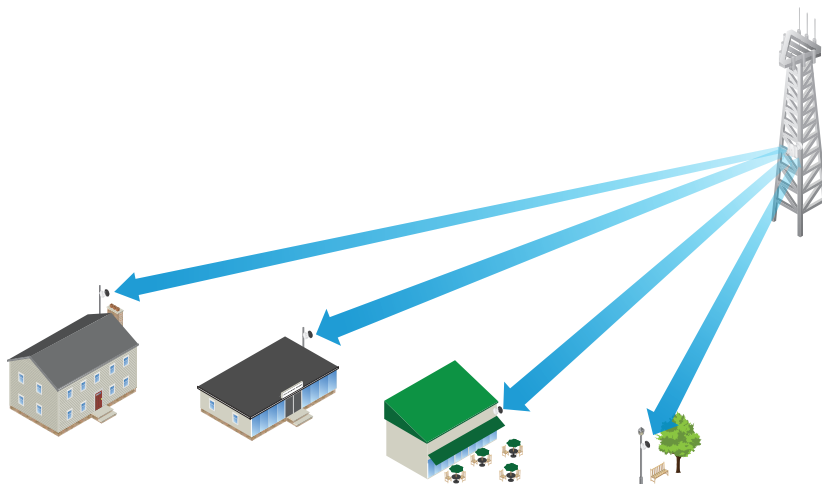
A robust dish antenna, model U-OMT-Dish, offers excellent beam directivity with 27 dBi of gain. It can be paired with the PrismStation 5AC to extend radio performance for a greater number of WISP customers.

Providing high throughput and an innovative form factor, the PrismStation 5AC is versatile and cost-effective to deploy. It also uses the latest ESD protection to help protect against power surges.

* Antennas not included with the PS-5AC.

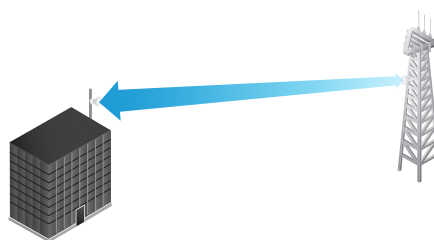
Application Example

PtMP Client Links



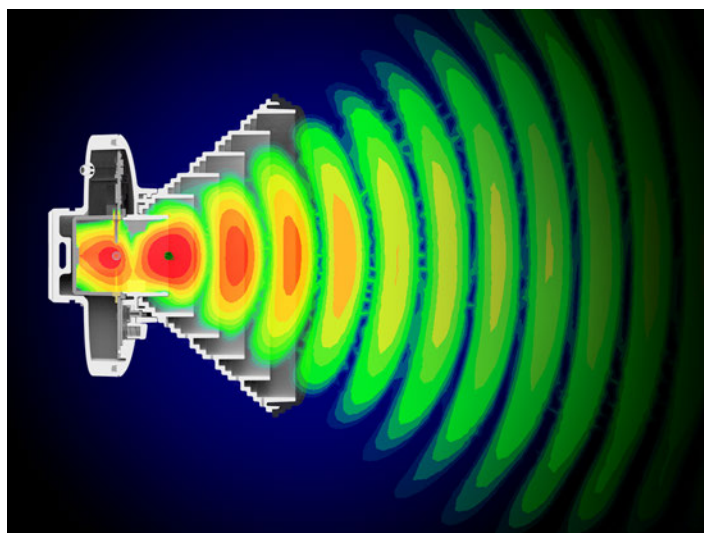
The PrismStation 5AC (with a horn antenna) is used as an AP to communicate with the IsoStation™ 5AC for each client in an airMAX PtMP (Point-to-MultiPoint) network.

PtP Link



Use a PrismStation 5AC on each side of a PtP (Point-to-Point) link.

Beam Performance Perfected



Software

airOS®8

Sporting an all-new design for improved usability, airOS® v8 is the revolutionary operating system for Ubiquiti® airMAX ac products.

Powerful Wireless Features

- Access Point PtMP airMAX Mixed Mode
- airMAX ac Protocol Support
- Long-Range Point-to-Point (PtP) Link Mode
- Selectable Channel Width
 - PtP: 10/20/30/40/50/60/80 MHz
 - PtMP: 10/20/30/40 MHz
- Automatic Channel Selection
- Transmit Power Control: Automatic/Manual
- Automatic Distance Selection (ACK Timing)
- Strongest WPA2 Security

Usability Enhancements

- airMagic® Channel Selection Tool
- Dynamic Configuration Changes
- Instant Input Validation
- Redesigned User Interface
- HTML5 Technology
- Optimization for Mobile Devices
- Detailed Device Statistics
- Diagnostic Tools, including RF Diagnostics, and airView® Spectrum Analyzer

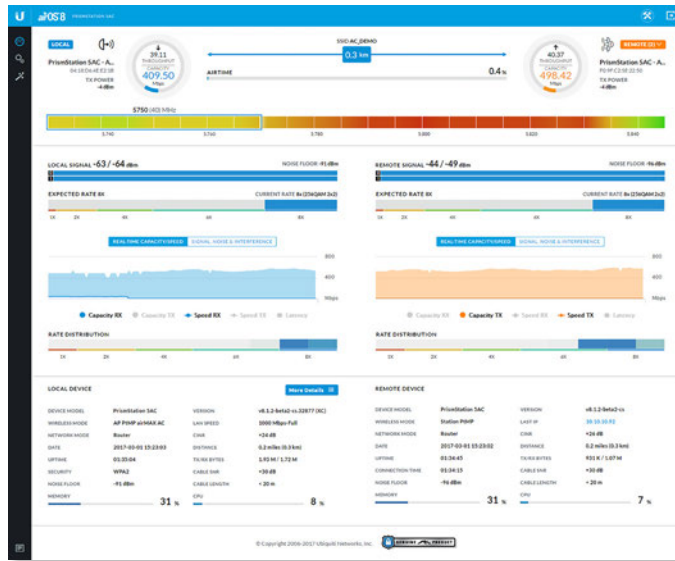
UNMS App

The PrismStation 5AC integrates a separate Wi-Fi radio for fast and easy setup using your mobile device.

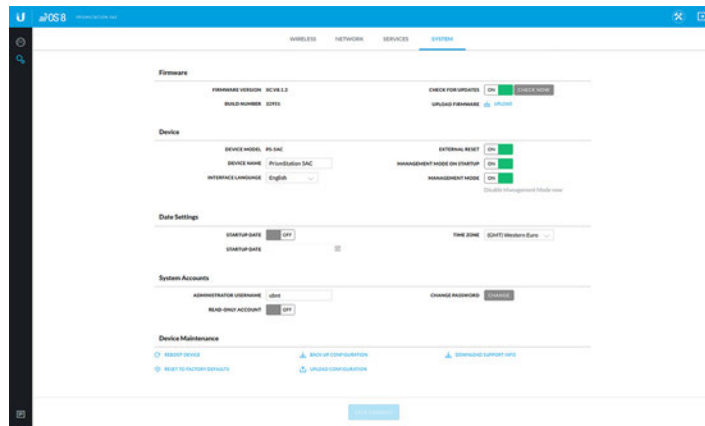
Accessing airOS via Wi-Fi

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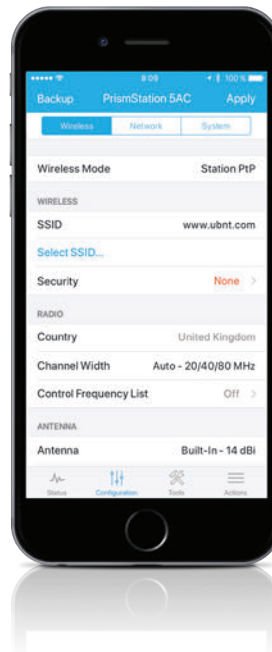
Dashboard



System Settings



UNMS Configuration



Advanced RF Analytics

airMAX ac devices feature a multi-radio architecture to power a revolutionary RF analytics engine.

An independent processor on the PCBA powers a second, dedicated radio, which persistently analyzes the full 5 GHz spectrum and every received symbol to provide you with the most advanced RF analytics in the industry.

Real-Time Reporting

airOS 8 displays the following RF information:

- Persistent RF Error Vector Magnitude (EVM) constellation diagrams
- Carrier to Interference-plus-Noise Ratio (CINR) histograms
- Signal-to-Noise Ratio (SNR) time series plots

Spectral Analysis

airView allows you to identify noise signatures and plan your networks to minimize noise interference. airView performs the following functions:

- Constantly monitors environmental noise
- Collects energy data points in real-time spectral views
- Helps optimize channel selection, network design, and wireless performance

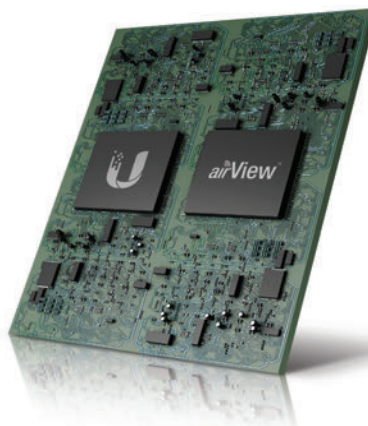
airView runs in the background without disabling the wireless link, so there is no disruption to the network.

In airView, there are three spectral views, each of which represents different data.

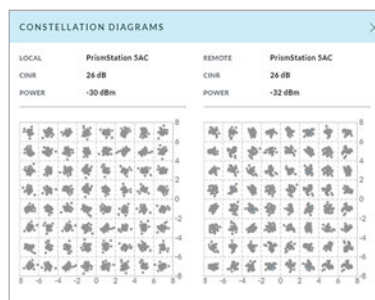
- **Waterfall** Aggregate energy collected for each frequency
- **Waveform** Aggregate energy collected
- **Ambient Noise Level** Background noise energy shown as a function of frequency

airView provides powerful spectrum analyzer functionality, eliminating the need to rent or purchase additional equipment for conducting site surveys.

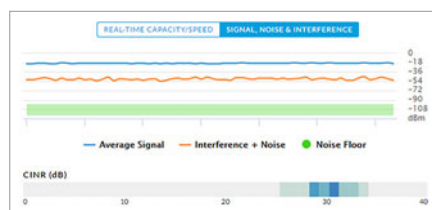
Multi-Radio Architecture



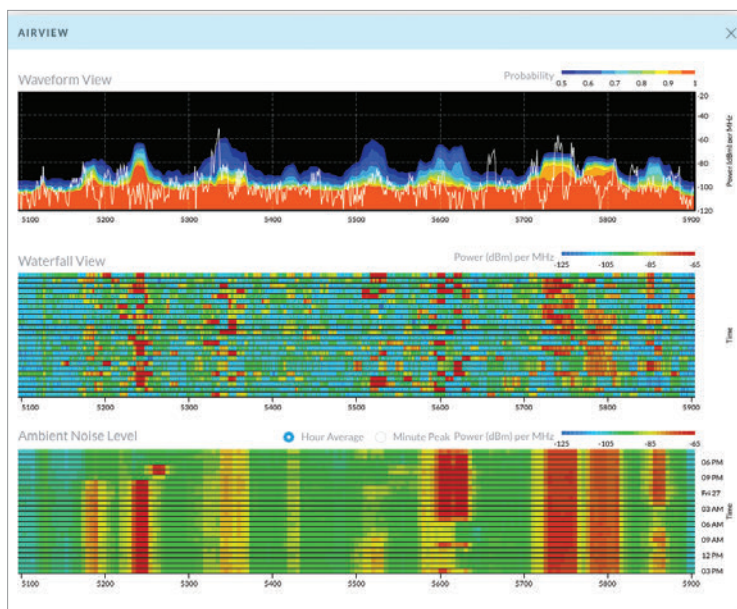
Constellation Diagrams



SNI Diagram and CINR Histogram



Dedicated Spectral Analysis



Technology



Unlike standard Wi-Fi protocol, Ubiquiti's Time Division Multiple Access (TDMA) airMAX protocol allows each client to send and receive data using pre-designated time slots scheduled by an intelligent AP controller.

This time slot method eliminates hidden node collisions and maximizes airtime efficiency, so airMAX technology provides performance improvements in latency, noise immunity, scalability, and throughput compared to other outdoor systems in its class.

Intelligent QoS Priority assigned to voice/video for seamless streaming.

Scalability High capacity and scalability.

Long Distance Capable of high-speed, carrier-class links.

Superior Performance

The next-generation airMAX ac technology boosts the advantages of our proprietary TDMA protocol.

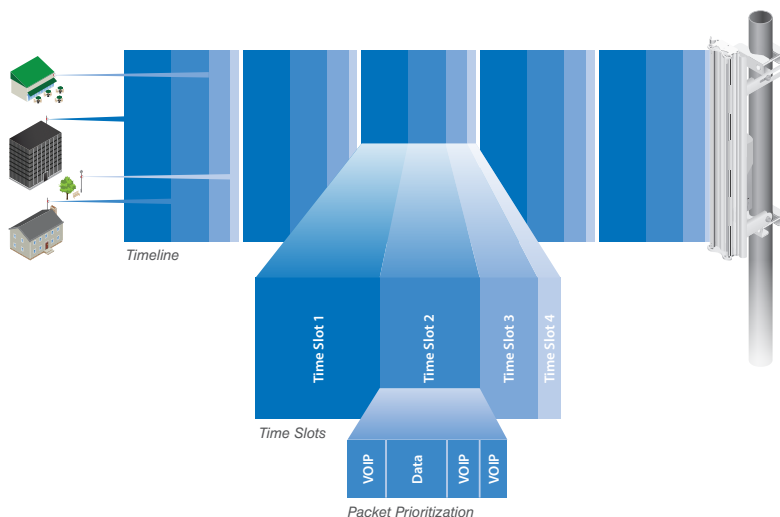
Ubiquiti's airMAX engine with custom IC dramatically improves TDMA latency and network scalability. The custom silicon provides hardware acceleration capabilities to the airMAX scheduler, to support the high data rates and dense modulation used in airMAX ac technology.

Throughput Breakthrough

airMAX ac supports high data rates, which require dense modulation: 256QAM – a significant increase from 64QAM, which is used in airMAX.

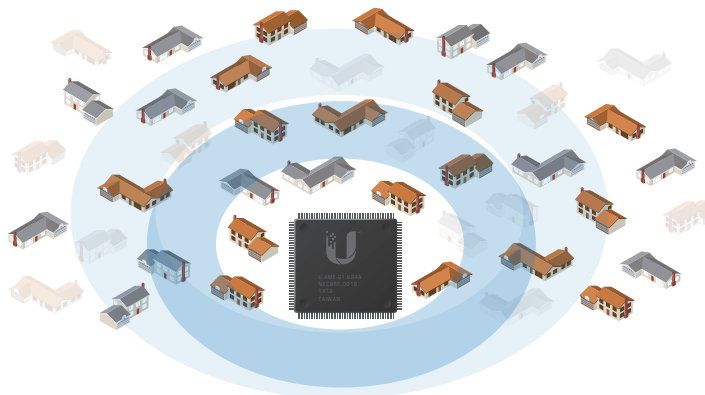
With their use of proprietary airMAX ac technology, airMAX ac products support up to 500+ Mbps real TCP/IP throughput – up to triple the throughput of standard airMAX products.

airMAX ac TDMA Technology

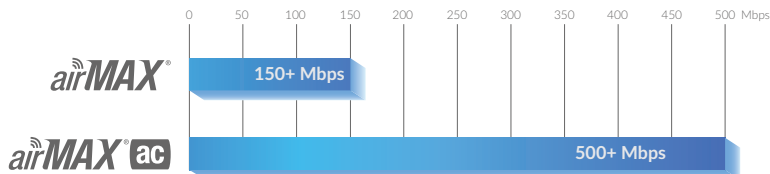


Up to 100 airMAX ac stations can be connected to an airMAX ac Sector; four airMAX ac stations are shown to illustrate the general concept.

airMAX Network Scalability



Superior Throughput Performance



Technology

airPRISM[®]

To enhance airMAX ac performance, Ubiquiti Networks introduces our patented airPrism technology, which is featured on the PrismStation 5AC, model PS-5AC.

Improves SNR

High data rates require a high Signal-to-Noise Ratio (SNR), which is challenging to achieve, especially in noisy, high-density areas.

Integrated into Ubiquiti's custom silicon, airPrism technology creates a high SNR by isolating signals within the operating channel and rejecting interference using the specialized circuitry of the High-Selectivity Receiver (HSR).

Removes Interference

Depending on the product model and operating mode, available channel widths may include 10, 20, 30, 40, 50, 60, and/or 80 MHz.

Theoretically, APs operate on different channels; however, because of the wider channel bandwidths, there can be overlap in spectrum usage.

airPrism technology removes up to an additional 30+ dB of adjacent channel interference through the active filtering design, so an airMAX ac AP with airPrism technology can provide significantly greater performance than a typical AP.

Facilitates AP Co-Location

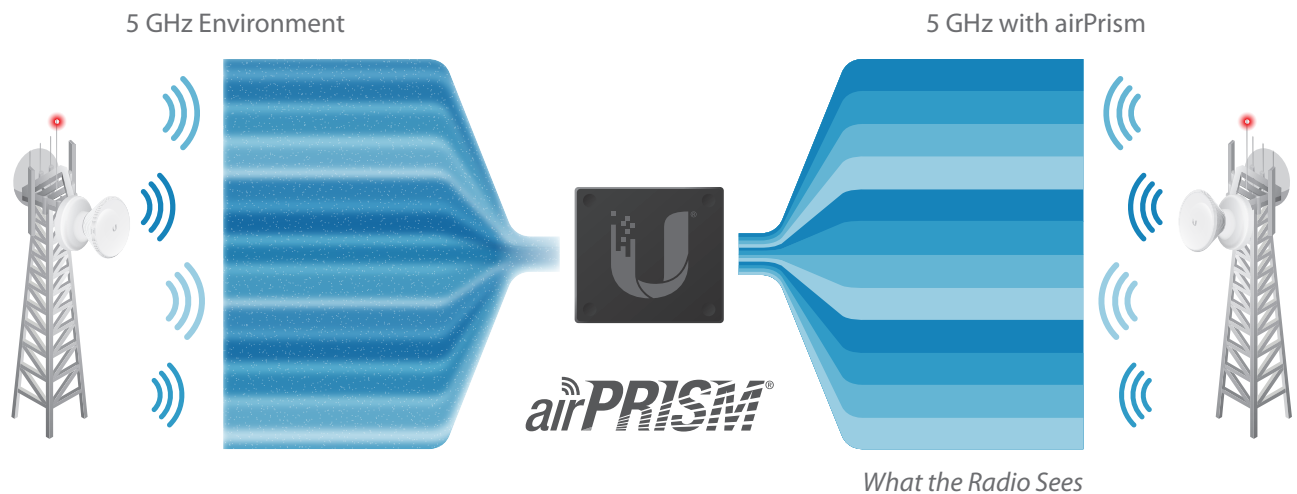
Co-location is vital in many scenarios. For example, a WISP may have limited tower space, so it must co-locate all APs within that allotted footprint. Shielding and other means can lessen interference but may be impractical.

By deploying airMAX ac APs with airPrism technology, you can co-locate APs and enhance the overall performance of your wireless network.

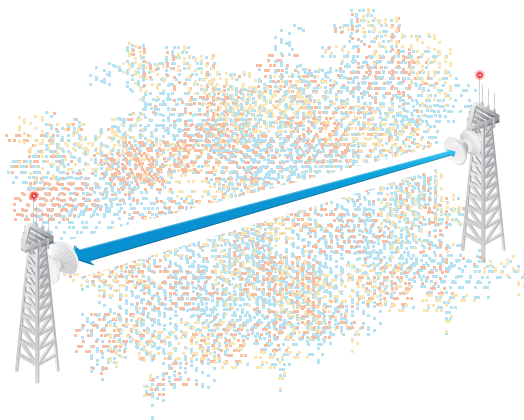
Number of APs	Channel Width
4	80 MHz*
8	40 MHz
16	20 MHz

* PtP only

Active Radio Frequency Filtering



Improved Latency and Noise Immunity



Hardware Overview

The PrismStation 5AC comes with a mounting bracket that allows for $\pm 20^\circ$ tilt adjustments of the horn's elevation. This pole-mounting method allows for easy adjustments depending on your deployment needs.

Modular Design

For versatility, the PrismStation 5AC is compatible with four different isolation horn antennas and one dish antenna (not included).

- All metal, shielded radio base
- Antenna interchangeability
- Single button release for ease of changing antennas



PrismStation 5AC with Horn-5-45
Mounted on Pole

Horn™ 5

Horn Antennas

Each horn antenna model is designed with a precise radiation angle for specific beam shaping.

These models are available in 30° , 45° , 60° , and 90° angle designs with different antenna gain specs to suit your application.

- Symmetrical horn antennas: unique beam performance and great co-location characteristics for a higher density of sectors than traditional sector technology
- Asymmetrical horn antennas: naturally attenuated side lobes and extremely low back radiation for cluster sector installations with high co-location requirements

Horn Antenna Model Comparison

	Horn-5-30	Horn-5-45	Horn-5-60	Horn-5-90	PS-5AC
Beamwidth	 30°	 45°	 60°	 90°	
Gain	19 dBi	15.5 dBi	16 dBi	13 dBi	

OMT-Dish

Dish Antenna

Pair the PrismStation with a robust dish antenna, model U-OMT-Dish, to provide SISO or 2x2 MIMO, dual-polarity performance as a client in a PtMP link. This radio/antenna combination delivers bandwidth to an extended number of WISP customers.

- Dish reflector design for excellent beam directivity
- Industrial-strength hardware for outdoor use
- HPOL and VPOL Beamwidth: 6.5°
- Antenna gain: 27 dBi



Specifications

PS-5AC	
Dimensions	155 x 155 x 104 mm (5.16 x 5.16 x 4.09")
Mounting Hardware Only	83 x 117 x 69 mm (3.27 x 4.61 x 2.72")
Weight	770 g (1.70 lb)
Mounting Hardware Only	790 g (1.74 lb)
Networking Interface	(1) 10/100/1000 Ethernet Port
RF Connector	(1) GPS*
LED	Power
Max. Power Consumption	10W
Power Supply	24V, 1A Gigabit PoE Adapter (Included)
Power Method	Passive PoE (Pairs 4, 5+; 7, 8 Return)
Supported Voltage Range	20 to 26VDC
Processor Specs	MIPS 74 Kc
Memory	128 MB DDR2 SDRAM, 16 M NOR FLASH
Max. VSWR	2:1
Polarization	Dual-Linear
Wind Loading	31 N @ 200 km/h (7 lbf @ 125 mph)
Wind Survivability	200 km/h (125 mph)
Operating Temperature	-40 to 70° C (-40 to 158° F)
Operating Humidity	5 to 95% Noncondensing
Mounting	Pole-Mount (Kit Included)
ESD/EMP Protection	± 24 kV Contact/Air
Certifications	FCC, IC, CE

* GPS sync support available in airOS firmware v8.3.0 and newer.

Operating Frequency (MHz)				
Worldwide	5150 - 5875			
USA	U-NII-1: 5150 - 5250	U-NII-2A: 5250 - 5350 MHz	U-NII-2C: 5470 - 5725 MHz	U-NII-3: 5725 - 5850

Management Radio (MHz)	
Worldwide	2412 - 2472
USA	2412 - 2462

PS-5AC Output Power: 28 dBm							
TX Power Specifications				RX Power Specifications			
Modulation	Data Rate	Avg. TX	Tolerance	Modulation	Data Rate	Sensitivity	Tolerance
airMAX ac	1x BPSK (½)	28 dBm	± 2 dB	airMAX ac	1x BPSK (½)	-96 dBm	± 2 dB
	2x QPSK (½)	28 dBm	± 2 dB		2x QPSK (½)	-95 dBm	± 2 dB
	2x QPSK (¾)	28 dBm	± 2 dB		2x QPSK (¾)	-92 dBm	± 2 dB
	4x 16QAM (½)	28 dBm	± 2 dB		4x 16QAM (½)	-90 dBm	± 2 dB
	4x 16QAM (¾)	28 dBm	± 2 dB		4x 16QAM (¾)	-86 dBm	± 2 dB
	6x 64QAM (¾)	28 dBm	± 2 dB		6x 64QAM (¾)	-83 dBm	± 2 dB
	6x 64QAM (¾)	27 dBm	± 2 dB		6x 64QAM (¾)	-77 dBm	± 2 dB
	6x 64QAM (¾)	26 dBm	± 2 dB		6x 64QAM (¾)	-74 dBm	± 2 dB
	8x 256QAM (¾)	24 dBm	± 2 dB		8x 256QAM (¾)	-69 dBm	± 2 dB
	8x 256QAM (¾)	22 dBm	± 2 dB		8x 256QAM (¾)	-65 dBm	± 2 dB

Specifications are subject to change. Ubiquiti products are sold with a limited warranty described at: www.ubnt.com/support/warranty
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www.ubnt.com

SISPM1040-384-LRT-C

Managed Hardened Gigabit Ethernet PoE+ Switch

(8) 10/100/1000Base-T Ports + (4) 100/1000Base-X SFP Slots



The SISPM1040-384-LRT-C is a full managed PoE+ switch suitable for connecting and powering devices in hardened environments. The switch can supply up to 30 Watts per port on all eight ports simultaneously. The switch also includes the embedded Device Management System (DMS) software that provides the advanced tools necessary for total management of all IP addressable devices. The unique DMS provides security integrators with lower overall cost, less downtime and easier management of the entire PoE+ network.

Transition Networks' hardened switches are certified to operate reliably in harsh environments such as those found on factory floors, outdoor enclosures or other challenging environments.

Features

- Store-and-Forward Architecture with 24 Gbps Switching Bandwidth
- Supports Jumbo frames up to 9.6K Bytes
- Ring Protections
 - Industry standard G.8032 Ethernet Ring Protection Switching (ERPS)
 - Support G.8031 Ethernet Linear Protection Switching (EPS)
 - Rapid Ring with recovery time less than 20ms
- Radius, TACACS+, User Authentication
- Supports LLDP Protocol
- HTTPS/SSH v1/v2 Network Security
- Temperature Detection and Alarm
- Support HW Watchdog to resume operation from CPU hang up
- IEEE 1588 v2 PTP
- Port Mirroring
- Power-over-Ethernet
 - Port Configuration
 - Auto Power Reset (APR)
 - DHCP per Port
 - PoE Scheduling
 - Complies to IEEE 802.3at, IEEE802.3af
 - 240 Watts PoE budget
 - 30 Watts output on all 8 ports
- IEEE 802.3ad LACP, up to 6 groups and up to 4 ports per group
- Up to 4K VLAN groups, Port based, 802.1Q tag, Q-in-Q, MAC based VLAN, Management VLAN, Private VLAN Edge, Voice VLAN, GVRP

Specifications

Standards	IEEE 802.3 IEEE 802.3u IEEE 802.3z IEEE 802.3ab IEEE 802.3x IEEE 802.3ad IEEE 802.1p IEEE 802.1Q IEEE 802.1w IEEE 802.1s IEEE 802.1x IEEE 802.1AB IEEE 802.3ad IEEE 802.3af IEEE 802.3at IEEE 802.3ah IEEE 802.1ag IEEE 1588 v2 ITU-T Y.1731 ITU-T G.8031 ITU-T G.8032
MAC Address	8K
Backplane	24Gbps
Serial Console	RJ-45
Status LEDs	System, Power1, Ring Master, Coupling, Power2, Alarm, Port Status
Dimensions	Width: 2.4" [62 mm] Depth: 5.3" [135 mm] Height: 5.4" [130 mm]
DIP Switch (2-pin)	Rapid Ring setting
Reset button	Reset the switch, Restore Factory default
Digital output (relay)	24VDC/1A
Digital input	Level 0 (Low): 0V to 6V Level 1 (High): 10V to 24V
Power Input	48 - 57VDC; redundant inputs
Power Consumption Without PoE	11.1 Watts
Ingress Protection	IP30
Environment	Operating: -40°C to +75°C Storage: -40°C to 85°C Humidity: 5% to 95% (non-condensing) Altitude: 0 – 10,000 ft.
Weight	2.2 lbs. [1 kg]
Compliance	EMI: CE, FCC Part 15, EN61000-4-2, EN61000-4-3, EN-61000-4-4, EN61000- 4-5, EN61000-4-6, EN61000-4-8, IEC60068-2-32 (Free fall), IEC60068-2-27 (Shock), IEC60068-2-6 (Vibration), NEMA TS-2 Safety: IEC60950-1, UL Class 1/Div 2
Compliant	EN50155, EN50121-4, DNV, IEC61850-3, IEEE1613
Warranty	5 Years

Ordering Information

SISPM1040-384-LRT-C
(8) 10/100/1000Base-T PoE+ [100 m/328 ft.]
with (4) 100/1000Base-X SFP slots

Optional Accessories (sold separately)

SFP Modules

Industrial Power Supplies:

25104
Input: 88-264 VAC, 124-370 VDC
Output: 48~55 VDC, 5.0A, 240 Watts

25105
Input: 88-264 VAC, 124-370 VDC
Output: 48~55 VDC, 2.5A, 120 Watts

Mounting Brackets

WMBH-01
Wall Mount Bracket

Features (Continued)

- ACL - up to 256 entries, Drop or Rate limiting based on: Source and Destinations MAC, VLAN ID and IP address, protocol, port, DSCP/ IP precedence, TCP/UDP source and destination ports, 802.1p priority, Ethernet type, ICMP packets and TCP flag
- Loop Protection
- Quality of Service
 - Supports 8 hardware queues
 - Scheduling: strict priority and WRR, Queue assignment based on DSCP and class of service
 - Classification: Port based, 802.1p VLAN priority based, IPV4/IPV6 precedence / DSCP based, DiffServ, Classification and re-marking ACLs
 - Rate limiting: Ingress policer, Egress shaping and rate control, per port
- IPv4/IPV6 dual stacks and static routing
- Port Security, IP Source Guard
- System Alarms via SYSLOG / SNMP Trap
- DHCP Client/Server, DHCP relay, Option 82
- Port based network access control (802.1x)
- Web / SNMP v1,v2c,v3 / Telnet / CLI management
- Device Management System (DMS)
 - Graphical Monitoring - Topology View, Floor view, Map view
 - Find my Switch
 - Traffic Monitoring
 - Trouble shooting - Network diagnostic, protection mechanism, performance and Link Management

F. Communication/Network

The various technologies employed need to communicate seamlessly in order to provide real-time information about facility occupancy to drivers. Where possible, communication between components should be achieved wirelessly in order to reduce the cost of installation and increase flexibility with regards to placement. A mesh network is preferred.

M4 Solution for Parking Garage

The M4 System consists of a network of camera sensor units providing image-based surveillance of every bay in a parking garage. Each unit contains one or two cameras, a bright, multicolor LED indicator light, and Ethernet network communication capabilities. The collection of camera sensors in the network communicates with the Core Server, a central management system. This server provides centralized management of the sensor network, updates connected signage for driver guidance, performs advanced processing steps, and responds to external inquiries for information.

Designed from the beginning for adaptability, the network architecture is expandable to support a large number of bays. Camera sensors are grouped into daisy-chained 'strings'; a Floor Cabinet, acting as a network concentrator and central power supply, hosts multiple strings. All Floor Cabinets at an installation connect to a core switch, completing the network. *Park Insights* can drive signage external to its immediate network, and is accessible remotely for reporting and basic configuration. For direct customer guidance, *Park Insights* can also provide information to customer kiosks, enabling features such as *Park Finder*.

Some system functions are distributed, whereas others are centralized. For example, camera sensors individually perform detection of a vehicle in a bay and setting LED color from unoccupied to occupied. The Core Server performs license plate recognition. Regardless of where the function occurs, driver guidance via LED indicators and adjustments to signage are provided in real time. The system is extensible, with future updates adding new capabilities to the system.

Camera sensor units use machine vision processing to determine if a vehicle is present in a parking bay. Upon system installation, a four-sided polygon is defined in the camera sensor's software for every bay. The cameras capture images constantly, each being processed within the camera sensor for activity within the polygons. When a valid change in the state of a bay is detected, the camera sensor follows its assigned rules for changing the color of the LED indicator (for example, green to red), and also reports the event to *Park Insights*.

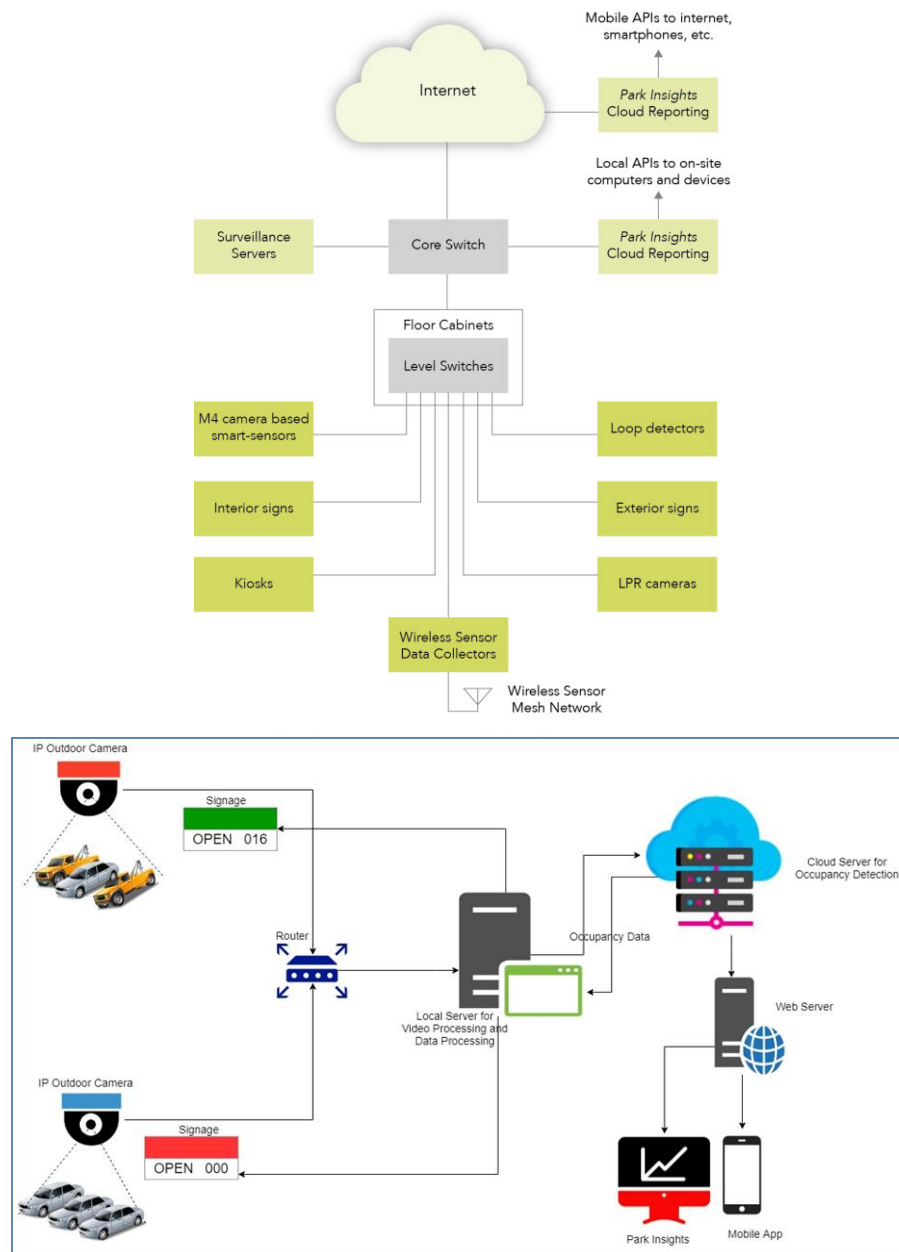
F Communication/Network (cont.)

S1 Solution for Surface Lot

A local network connects all the cameras in the lot and the data is streamed to an onsite server for video processing. After the pre-processing is completed, the data is securely transmitted to our cloud based processing engine for occupancy detection. The occupancy information is then relayed back to the local server onsite for distribution. The bay availability information is then displayed on signage onsite to guide the commuters. The information is also made available on a API for integration with Mobile Apps or other applications.

F Communication/Network (cont.)

These network flowcharts fully describe our software interface:



G. Insights Reporting/Software Features

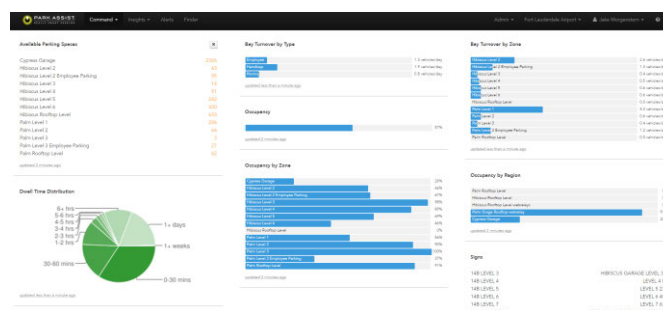
A software application that communicates with the various pieces of technology located across the campus, provides information in real-time about parking availability and includes the status of each piece of equipment included in the system.

All Park Assist installations include a license to *Park Insights*. *Park Insights* is the central computer collecting, managing and storing all parking data from the sensors. Offering a simple, single point of access to parking garage data, it helps asset owners measure the performance of their garage and gather insights into user behavior. This cloud-based reporting system can be accessed on any computer, tablet, or smartphone with internet connection. *Park Insights* equips operations staff with a browser-based dashboard.

(G1) The software should include a customizable graphical user interface that provides a visual representation of the signage and equipment across the campus as well as the current status of the pieces of equipment in specific facilities

This intuitive and customizable graphical user interface provides cloud-empowered access to system parameters across a site or a network of sites, including:

- Master configuration of bay groups, bay types and specified zones.
- Adjustment of multiple parameters, including guidance LED colors, for individual smart-sensors or groups of sensors.
- Parameters and permissions for designated user groups such as managers, attendants and data analysts.
- The ability to build complex conditional rules to adjust LED colors and way-finding signs according to percentage of occupancy, time of day, etc.



G Insights Reporting/Software Features (cont.)

(G2) Users must have the capability to correct counts of open spaces remotely via the graphical user interface

Users with administrative access can control signage displays, reset, or manually adjust garage availability. In the scenario that no computer is located onsite, we will price one as an alternate. Workstations are not required for any Park Assist system. Designated users with a password can access *Park Insights* to view, search, and export reports.

Live maps capture the current state of the facility, and historic visitor patterns can be analyzed to drive staffing for parking, security, and customer service staff. All reports can be accessed remotely via the public web through unique secure user logins. *Park Insights* securely connects to each site's Core Server installation via an encrypted HTTPS connection at 1 AM local time daily. Data from each site is analyzed, aggregated, and distributed to the *Park Insights* reporting system.

Park Insights is installed in a private, dedicated, and load-balanced server farm, offering a 99.9% availability guarantee with twice daily secure back-ups. Furthermore, the centralized architecture for *Park Insights* allows for the controlled release of new software upgrades, maintenance services, and new innovations seamlessly. As a privacy and security measure, *Park Insights* does not collect or store any images from sites' Core Servers.

Data is reported in near-real time, with information typically less than 10 minutes old. The home page dashboard contains moveable widgets, displaying a variety of data. These widgets can also be embedded in other end-user applications. Widgets include:

- A site summary, with total number of bays and total number of visits today
- Site occupancy as a percentage, with statistics for occupancy by bay type and by level
- Available parking spaces per level
- Occupancy by region
- Sign status, showing the values displayed on all signs
- Available bays per level
- Bay turnover (how many times during the day a bay is occupied)

G Insights Reporting/Software Features (cont.)

(G3) The software should include reporting capabilities that allow users to view, generate and store occupancy reports.

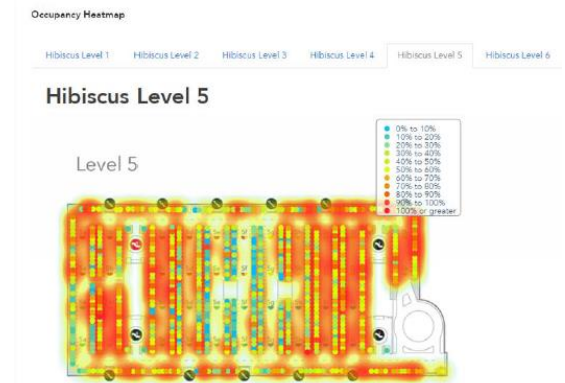
More detailed reports are also possible with **Park Insights**, including:

- Occupancy reports covering total average occupancy, daily occupancy, average number of daily visits, and hourly occupancy.
- Dwell time reports for understanding total average dwell time (length of stay in a bay), daily occupancy, and average number of daily visits.
- Turnover reports showing total average turnover, daily turnover, and hourly turnover.
- License plate reports: Most common license plates, license plates detected by day, log of license plates detected by day (Note: Available with LPR-based Software Applications).
- Heat maps showing a graphical representation of bay statistics: Utilization, dwell time, and turnover. Red areas are “hotter” and have higher values, yellow areas are middle values and blue areas are “cooler.”

With *Park Insights*, your data view can be as expansive or granular as you need. You can also create custom charts and graphs – fine-tuned to display exact timeframes, types of spaces, and other data categories.

Examples Include:

- Intuitive live heat maps showing the most heavily utilized zones and levels in your garage
- Daily-occupancy line graphs with separate curves for each day of the week
- A month’s worth of afternoon and evening data, comparing weekdays to weekends
- Unique-visitor frequency reports, including graphs showing how the proportion of weekly, monthly and infrequent visitors is changing over time
- Visualization graphs for vehicle entry and exit counts



G Insights Reporting/Software Features (cont.)

- Data for an individual vehicle visits complete with duration, entry/exit timestamps, parking location, and specific vehicle ID through integrated License Plate Recognition (LPR)

(G4) The software should have the capability to send alerts via email. The GUI needs to support sending and creating custom messages for variable message signs.

One of the optional software features Park Assist provides is **Park Alerts**. This can only be used for the M4 system at this time as the S1 system does not have license plate recognition functionality.

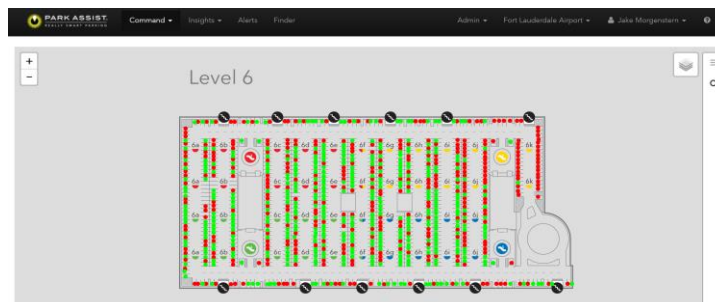
Park Alerts is an automatic, rule-based alert system that assesses each individual car against the relevant set of rules or zones. Tapping into the integrated LPR built into our camera-based system, our *Park Alerts* software extension enables JMU to specify policies and rules for selected bays, zones, durations or license plates. *Park Alerts* integrates seamlessly with some of the well-known PARCs and mobile payment platforms.



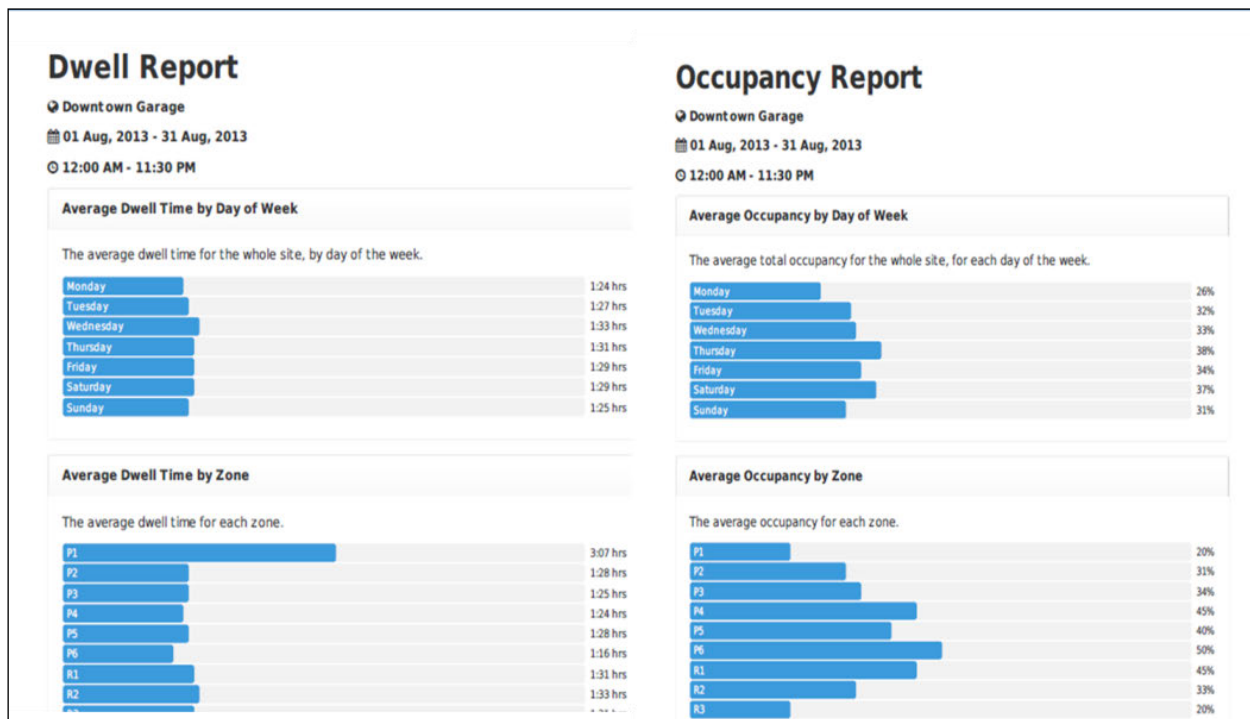
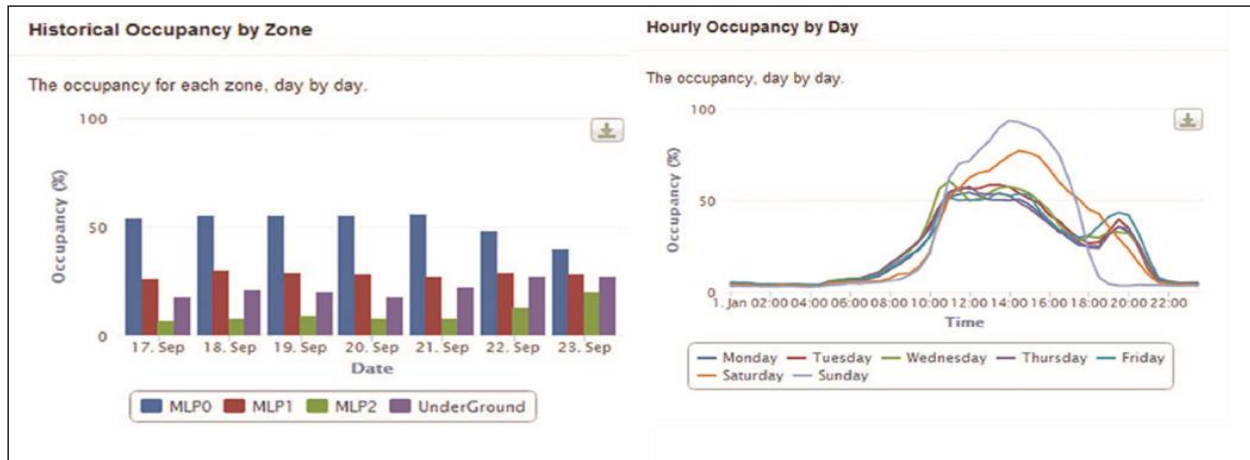
Park Assist has the ability to provide signage with custom messaging.

(G5) Describe licensing. If licensing of the software is based on number of users or screens, etc. describe the models used to obtain numbers for both current and future usage.

Park Assist provides a perpetual license for the *Park Insights* platform where multiple users can have their own login that is password protected. We do not place a limit on the number of users.



G Insights Reporting/Software Features (cont.)

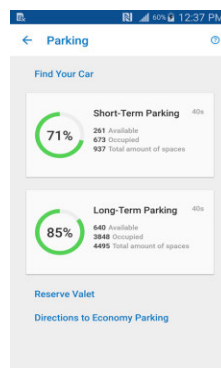
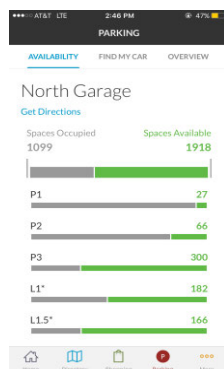


H. Mobile API

An open web API module that allows the occupancy information generated by the system to be shared with websites and mobile applications in order to port real-time parking availability information to the department's website and an anticipated future mobile application for Android and iOS smart phones.

Our next generation *Mobile API* allows for integrating the Park Assist system data into mobile apps and websites to allow for an array of functionality. Utilizing our Mobile API brings real-time parking availability straight to the customer's phone and computer directing them as to which lots, garages, and specific levels have parking availability. The Mobile API also brings Park Assist's *Find Your Car* functionality to any mobile device allowing customers to find their lost vehicle right from their phone.

Park Assist's mobile app is currently available on iOS and Android. The Park Assist app will allow users to search for available parking ahead of time so they can plan their commute accordingly. If James Madison University prefers to develop an interface to be part of their own university mobile app or website, Park Assist can provide the Web API for their developers. Many of our clients have utilized this API to develop their own custom applications.



I. Support

All system hardware and software needs to be able to be maintained by department personnel and vendor tech support needs to be available via remote access

Park Assist has a full in-house team dedicated to support and maintenance. Unique only to Park Assist's system is a quarterly accuracy reading report breaking down accuracy, occupancy, trends by zones, levels and garage. Every sensor will be constantly monitored for connectivity, performance and accuracy. James Madison University can have the peace of mind that Park Assist will detect and troubleshoot any and all issues before it affects operation and customer experience.

Park Assist maintenance goes far beyond a basic check on system operation; rather, it follows a detailed, holistic approach to every aspect of the sensor network, from hardware to software. With Park Assist taking numerous proactive measures to ensure system operation, your network will provide years of trouble-free operation and high performance. Inspection program is customized for each site, which assures complete coverage for each system's unique aspects.

Software maintenance is a key component of Park Assist's maintenance package. At its foundation are basic information technology maintenance practices, with remote inspections for the entire network. Using modern, secure remote access technology, Park Assist monitors and adjusts your sensor network without the need for intervention or presence. Software updates for sensing components and head-end gear are also applied using this approach. Another advantage of Park Assist's software design is the built-in capacity for customization. If parking conditions or site design change in the future, Park Assist can create customized detection patterns tailored to the unique aspects of a site

J. Maintenance

Consistency and stability of the hardware and software – as well as rapid correction of system failures – are critical to JMU.

Support & Maintenance

(J1) Describe the maintenance philosophy including frequency of updates as well as the approach to obtaining and completing updates.

Park Assist has a full in-house team dedicated to support and maintenance. Unique only to Park Assist's system is a quarterly accuracy reading report breaking down accuracy, occupancy, trends by zones, levels and garage. Every M4 and S1 sensor will be constantly monitored for connectivity, performance and accuracy. James Madison University can have the peace of mind that Park Assist will detect and troubleshoot any and all issues before it affects operation and customer experience.

Park Assist maintenance goes far beyond a basic check on system operation; rather, it follows a detailed, holistic approach to every aspect of the sensor network, from hardware to software. With Park Assist taking numerous proactive measures to ensure system operation, your network will provide years of trouble-free operation and high performance. Inspection program is customized for each site, which assures complete coverage for each system's unique aspects.

Park Assist firmware upgrades are provided every 6 months.

J Maintenance (cont.)

Service Levels

(J2) Describe your ability to respond to emergency situations to include average response time, costs associated with responding to emergency situations (to include weekend, nights and holidays). Include method of communication for emergency situations

Park Assist is committed to meeting and exceeding the following Service Levels:

Priority	Coverage Period	Support Channel	Acknowledgement Period	Remote Diagnosis Period	Resolution Period
P1	9AM to 5PM Business Days	Phone/email	1 hour	3 hours	48 hours
P2	9AM to 5PM Business Days	email or online support system	4 hours		3 Business Days
P3			8 hours		7 Business Days
P4					14 Business Days

J Maintenance (cont.)

The following definitions are used to identify and prioritize problems with the system.

Priority	Problem
Priority 1 ("P1")	<ul style="list-style-type: none"> Any fault which causes a significant Safety Hazard Complete failure of all Supported Hardware and Supported Software The public API for integration partners being unavailable for reasons other than network/Internet connectivity loss (where "Public API" is Supported Software)
Priority 2 ("P2")	<ul style="list-style-type: none"> >20% of parking sensors on the Client Site being faulty or offline >20% of signs on the Client Site being faulty or offline >50% of loops on the Client Site being faulty or offline <95% of scored Vehicle Occupancy Detection Accuracy (VODA) <85% of collected License Plate Recognition accuracy Email alerts not being sent for reasons other than network/Internet connectivity loss (where "PARK Alerts" is Supported Software)
Priority 3 ("P3")	<ul style="list-style-type: none"> >2% of parking sensors on the Client Site being faulty or offline >10% of signs on the Client Site being faulty or offline >20% of loops at the Client Site being faulty or offline <98% scored Vehicle Occupancy Detection Accuracy (VODA) <90% of collected License Plate Recognition accuracy PARK Insights being unavailable, or data not updating in PARK Insights, for reasons other than network/Internet connectivity loss (where "PARK Insights" is Supported Software)
Priority 4 ("P4")	<ul style="list-style-type: none"> >1% of parking sensors on the Client Site being faulty or offline >5% of signs on the Client Site being faulty or offline >5% of loops at the Client Site being faulty or offline

Onsite Priority Response

We appreciate that there are times when regardless of the formal problem prioritization, there is a need for an expedited onsite response to an incident. It's for this reason that we offer *Priority Onsite Response*.

Priority Onsite Response ensures a Technician will be onsite within 48 hours from the time of your request. This can be requested at your discretion on a case by case basis.

J Maintenance (cont.)

(J3) Describe capabilities for remote support and describe what access to accounts and system is required. Describe the locations from which this activity would take place.

Software maintenance is a key component of Park Assist’s maintenance package. At its foundation are basic information technology maintenance practices, with remote inspections for the entire network. Using modern, secure remote access technology, Park Assist monitors and adjusts your sensor network without the need for intervention or presence. Software updates for sensing components and head-end gear are also applied using this approach. Our remote team is located in New York and Connecticut.

Another advantage of Park Assist’s software design is the built-in capacity for customization. If parking conditions or site design change in the future, Park Assist can create customized detection patterns tailored to the unique aspects of a site.

Each Park Assist system includes a one-year warranty on parts and labor for defects in materials or manufacture. Park Assist will repair or replace all work delivered under the Contract and correct any defect within the Warranty Period at no additional cost. Software updates to the current installed version of our software are also included as required. This warranty does not apply to situations where damage or malfunctions resulting from fire, flood, earthquakes, elements of nature or acts of God, strikes, riots, collision, vandalism, misuse, electrical surges, power failure, use of non-manufacturer approved parts, or any other similar cause beyond the reasonable control of Park Assist.

Hardware Maintenance

With field hardware spread across your entire car-park, it’s important to keep a trained and focused eye on your equipment. Trained Park Assist technicians perform scheduled inspections of all field equipment to ensure that it is functioning correctly and that any degradation or minor issues are identified and resolved before they compound and significantly impact system performance.

While onsite, our Technicians will also perform a subset of corrective works to keep the system running smoothly.

INCLUDED CORRECTIVE WORKS

- Lens cleaning
- Re-aiming cameras
- Tucking exposed cables back into trays
- Reconnecting any undamaged dislodged duct
- Repair or Replace Defective Equipment

J Maintenance (cont.)

We have placed an emphasis on ensuring you are provided clear and direct feedback following each scheduled visit. Your Account Manager will provide a comprehensive report highlighting the work completed, any issues identified and proposed rectification recommendations.

The local installer will be full trained on providing hardware maintenance for the Park Assist system.

Software Maintenance

- Daily system health checks
- Accuracy Optimization of Vehicle Detection
- PARK Server Administration & Updates

Our well architected technology, vision-based sensors and internet connection, enable much of the system maintenance and optimization to be performed remotely. This is not only a more cost effective service delivery model but also enables us to thoroughly monitor your system, keeping our finger on the pulse.

With advanced monitoring capabilities and daily checks, our Support Team is able to detect and address many issues before

they materially impact system performance. Should an issue require onsite intervention, our extensive remote diagnosis capabilities ensure that our technicians arrive onsite informed, appropriately equipped and with a clear plan for resolution.

Whether it be seasonal lighting changes or oil stains on the floor, every parking bay experiences environmental changes over time. Our Support Team ensures that no matter what

environmental challenges are thrown our way; our camera-based sensors are always calibrated to deliver optimum detection accuracy. In addition, any issue which cannot be remotely resolved (e.g. re-aiming of a camera) are brought to your attention and resolved.

At the core of our industry leading parking guidance solution is PARK Server, a sophisticated and highly configurable piece of software which drives the system. Our Software Team constantly enhances and refines PARK Server and as a customer of our maintenance plans, all updates to this software are included.

J Maintenance (cont.)

Maintenance Options

(J4) Describe any maintenance options/tiers and whether they vary in cost by time of day, response time, etc.

Pricing will depend on the number of spaces covered by the system.

Service Plan Comparison

	Software Only	Extended Warranty (Software + Hardware)
Onsite Hardware Maintenance Visit	✗	Quarterly
Software Monitoring, Maintenance & Optimization	✓	✓
Account Management	✓	✓
Operator Training	1 per year	2 per year
Executive Training	1 per year	2 per year
System Health Review	1 per year	2 per year
“All In” Service Desk (incl. Service Levels)	✓	✓
Priority Onsite Response	✗	Available
Parts and Labor Discount	15%	100%

K. Travel Costs

All cost shall be exclusive of travel. Exception may be granted by JMU on a case-by-case basis. In the event an exception is made, contractors billing for travel-related expenses must be billed in accordance with the Commonwealth of Virginia's per diem allowance for lodging, meals, and incidental expenses at the time of travel.

Park Assist complies

L. Repair Technicians

All services provided under this contract shall be by trained repair technicians and all work shall be performed in a workmanlike manner in accordance with the manufacturer's recommended equipment maintenance procedures. Submit all qualifications and certifications associated with the different systems.

Park Assist complies

Park Assist Information

Company Overview

Company Name:	Park Assist LLC
Parent Company:	TKH Group
Year Founded:	2005
State of Incorporation:	New York
Corporate HQ:	57 West 38 th Street, 11 th Floor, New York, NY 10018
Federal Tax ID#:	
Email Address:	Jake.Morgenstern@parkassist.com
Phone Numbers:	Corporate – 1.646.666.7525 Jake Morgenstern – 1.201.780.8671

Company History

Park Assist is a business intelligence technology company that utilizes camera-based sensor applications to improve the parking experience. Park Assist's patented camera-based sensor systems are highly regarded in over 33 countries around the globe for their ability to improve the overall parking experience, integrate with other systems in place, and enhance operational efficiencies and security coverage. This year, Park Assist celebrates 14 years as the global leader in parking sensor technology and the pioneer of camera based parking systems. Park Assist is part of the TKH Group (Euronext: TWEKA), a \$1.6 billion publicly traded company headquartered in the Netherlands.

About Park Assist

Park Assist is the largest provider of camera-based parking guidance solutions in the world. Additionally, Park Assist is the only parking guidance company to call New York state and New York City their home, with the company's HQ having been in NYC since the company's inception in 2006.

Park Assist invented the first camera-based parking guidance system in 2010.

Park Assist's camera-based system is the only patented solution (US Patent #0113936A1).

Park Assist's systems have demonstrated stable reliability through a myriad of conditions in over 33 countries, spanning the Americas, Australia, Europe, and Asia.

Park Assist has a dedicated engineering team based in the New York HQ focused on forward-thinking innovation in parking technology to ensure clients will always be ready for the future.

Headquartered in New York City, Park Assist has corporate offices in Australia, Panama, Chile, the Netherlands, UK, and UAE. In the US, Park Assist's branch office is in New York with regional offices in San Francisco and Los Angeles.

Key Personnel

Park Assist, Chief Executive Officer: Gary Neff

As CEO, Gary is responsible for the worldwide delivery of Park Assist's mission and vision. He sets the standards for meeting client expectations and the performance required to meet Park Assist's promise. Gary has 30 years of experience in Parking Access and Revenue Control Systems (PARCS) as well as a wide range of parking technologies. He has also been an advisor to BMW on the development of the automaker's mobility platform. He is experienced in the parking industry and often speaks at national and international parking conferences on trends, issues and innovations.

Role for this project: Overall responsibility for the delivery of Park Assist's promise.

North America General Manager: Vince Balsamo

As General Manager, Vince is responsible for all North American operations activities for Park Assist. Vince has been with Park Assist since 2013 and has managed client accounts totaling over 60,000 parking spaces. Vince's commitment and dedication to customer satisfaction ensures that all client needs are addressed with the utmost attention and sensitivity. Vince is located out of Park Assist's HQ in New York.

Role for this project: Oversees all account management, installation, logistics, project management, service and support.

Director of Project Management: Jason DeChello

As Director of Project Management, Jason brings the experience of installing and servicing contracts for over 20,000 parking spaces nationwide. He is experienced in both large-scale, single space, and level counting parking systems with involvement from planning phase to project completion. Jason has installed a plethora of parking technologies ranging from leading PARCS systems to single-space parking guidance systems.

Jason has installed solutions at leading airports for Park Assist including Fort Lauderdale, Omaha and Montreal. Jason works with clients, contractors and the Park Assist development teams to

ensure that every part of the project is carried out with care and the highest standards for quality. Jason's attention to detail and responsiveness to client requests are just two powerful reasons why Jason and Park Assist are successful in each project managed.

Role for this project: Lead project manager overseeing all installation and system commissioning.

Regional Account Manager: Molly Silverstein

As Regional Account Manager, Molly manages Park Assist clients and associated projects in the Northeastern Region of North America, through the procurement and managing accounts post-installation, executing from start to finish.

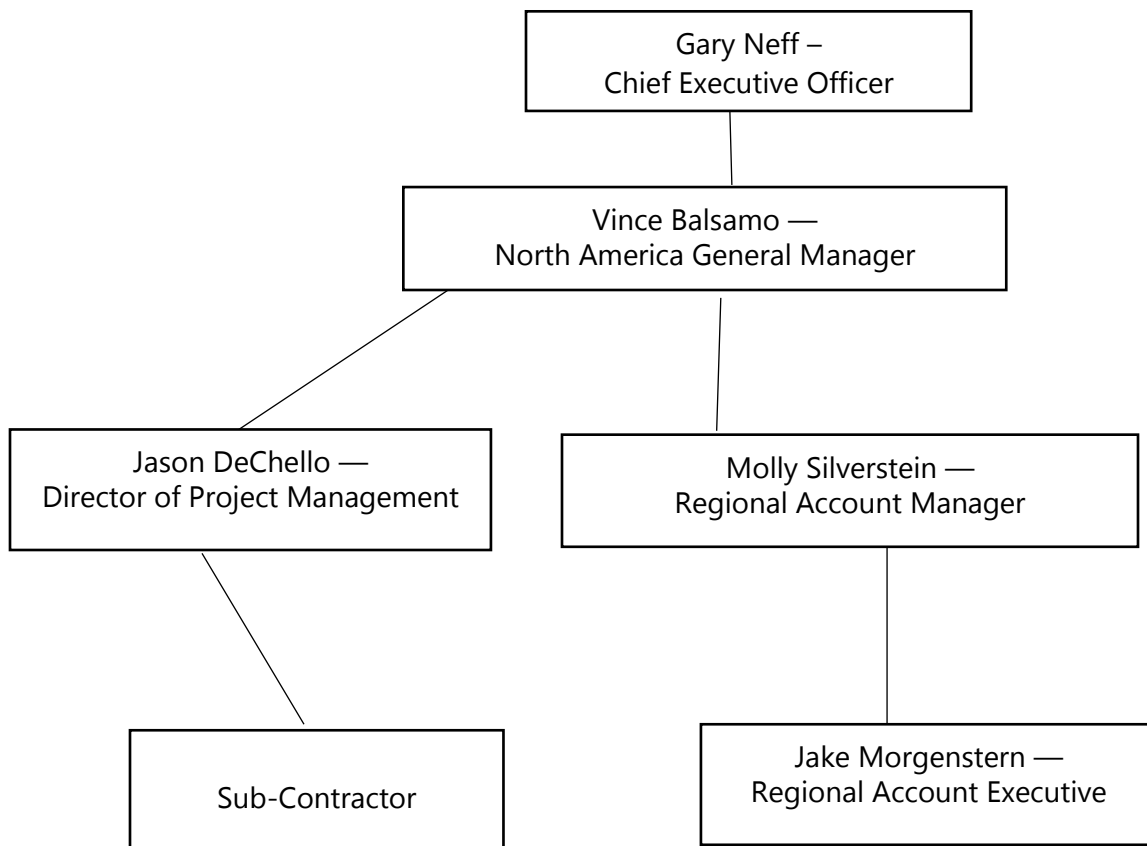
Role for this project: Primary contract for the RFP process, installation, account management and support.

Regional Account Executive: Jake Morgenstern

Jake is a Regional Account Manager for the Eastern Region of North America. He has great experience with the procurement process and managing accounts post-installation. Jake emphasizes customer experience to ensure all details are covered from start to finish.

Role for this project: Primary contact for the RFP process, installation, account management and support.

Organizational Chart



Experience & Qualifications

Project Experience

1. Headquartered in the United States, Park Assist has the most experience of any guidance manufacturer worldwide in designing, deploying, and supporting guidance systems for parking.
2. Park Assist has deployed these systems in over 33 countries around the globe, including 80+ installations in North America with top retail centers, municipalities, airports, healthcare centers, corporate campuses and casinos.
3. Park Assist has a fully staffed technical support team to assist with maintenance and support after installation.
4. Park Assist has the most camera-based installations in North America compared to its competitors

Past Projects

1. University of Texas at Dallas

800 W Campbell Rd
Richardson, TX 75080

Spaces: 1,100

Features: *Park Alerts*, Mobile App

University of Texas at Dallas selected Park Assist's industry-leading M4 over Indect in an open bid. As the inventor of the camera-based parking guidance, Park Assist was selected not only for our experience but for our *PARK Alerts* function where they can monitor administrative and faculty reserve parking so students don't park in those spaces. Additionally, the campus-wide mobile app gives students and visitors the ability to search in advance for available parking in real-time, thereby reducing campus congestion and increasing visitor satisfaction.



2. Maryland Live Casino

7002 Arundel Mills Cir
Hanover, MD 21076

Spaces: 3,100

Features: *Park Finder, Park Alerts, Surveillance*



Maryland Live implemented Park Assist's M4 technology in 2017. The M4 camera-based system and correlated way-finding signage is installed in all 3,100 spaces of the deck which is shared by the Casino as well as the Simon Mills Mall attached to the casino. The ownership groups number one goal for putting in the system was to ensure patrons had a quick and easy parking experience in a very busy garage. They implemented Park Assist Surveillance feature to allow for increased security of each and every parking space as well as Park Alerts for notifications for certain plates and Park Finder to assist their operations team in finding missing vehicles.

3. Towson Town Center

825 Dulaney Valley Rd
Towson, MD 21204

Spaces: 4,000

Features: *Park Finder, Park Alerts and Park Surveillance*

General Growth Properties engaged Park Assist at over 5 of their sites to improve and enhance the visitor experience. Towson Town Center was one of the cornerstone site of this initiative as the asset had a very stressful experience relating to the parking environment. Park Assist developed a wayfinding package with dynamic signage that alleviated the troublesome wayfinding experienced at the site as well as push vehicles to areas of the facility that were usually unoccupied due to lack of knowledge about their availability among drivers.



Attachment A

ATTACHMENT A

OFFEROR DATA SHEET

TO BE COMPLETED BY OFFEROR

1. **QUALIFICATIONS OF OFFEROR:** Offerors must have the capability and capacity in all respects to fully satisfy the contractual requirements.
2. **YEARS IN BUSINESS:** Indicate the length of time you have been in business providing these types of goods and services.

Years 14 Months _____

3. **REFERENCES:** Indicate below a listing of at least five (5) organizations, either commercial or governmental/educational, that your agency is servicing. Include the name and address of the person the purchasing agency has your permission to contact.

CLIENT	LENGTH OF SERVICE	ADDRESS	CONTACT PERSON/PHONE #
University of Texas at Dallas	2 years	800 W Campbell Road Richardson, TX 75080	Bob Fishbein/ 972-883-2661
University of California San Diego	1 year	9500 Gilman Drive La Jolla, CA 92093	Eliud Escobedo Jr / 858-534-6070
Towson Town Center	2 years	825 Dulaney Valey Road Towson, MD 21204	Justin Edwards/ 312-960-6311
Maryland Live Casino	2 years	7002 Arundel Mills Circle Hanover, MD 21076	Tom Coppinger/ 443-745-3236
General Motors Corporate Campus	1 year	300 Renaissance Center Detroit, MI 48265	Jason Harris/ 586-713-2228

4. List full names and addresses of Offeror and any branch offices which may be responsible for administering the contract.

Park Assist LLC.

57 West 38th Street, 11th Floor

New York, NY 10018

3. **RELATIONSHIP WITH THE COMMONWEALTH OF VIRGINIA:** Is any member of the firm an employee of the Commonwealth of Virginia who has a personal interest in this contract pursuant to the [CODE OF VIRGINIA](#), SECTION 2.2-3100 – 3131?

[] YES [x] NO

IF YES, EXPLAIN: _____

Attachment B

ATTACHMENT B

Small, Women and Minority-owned Businesses (SWaM) Utilization Plan

Offeror Name: Park Assist LLC. **Preparer Name:** Jake Morgenstern

Date: 1/10/19

Is your firm a **Small Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes No X

If yes, certification number: Certification date:

Is your firm a **Woman-owned Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes No X

If yes, certification number: Certification date:

Is your firm a **Minority-Owned Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes No X

If yes, certification number: Certification date:

Is your firm a **Micro Business** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes No X

If yes, certification number: Certification date:

Instructions: *Populate the table below to show your firm's plans for utilization of small, women-owned and minority-owned business enterprises in the performance of the contract. Describe plans to utilize SWAMs businesses as part of joint ventures, partnerships, subcontractors, suppliers, etc.*

Small Business: "Small business " means a business, independently owned or operated by one or more persons who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, which, together with affiliates, has 250 or fewer employees, or average annual gross receipts of \$10 million or less averaged over the previous three years.

Woman-Owned Business Enterprise: A business concern which is at least 51 percent owned by one or more women who are U.S. citizens or legal resident aliens, or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest in which is owned by one or more women, and whose management and daily business operations are controlled by one or more of such individuals. **For purposes of the SWAM Program, all certified women-owned businesses are also a small business enterprise.**

Minority-Owned Business Enterprise: A business concern which is at least 51 percent owned by one or more minorities or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest in which is owned by one or more minorities and whose management and daily business operations are controlled by one or more of such individuals. **For purposes of the SWAM Program, all certified minority-owned businesses are also a small business enterprise.**

Micro Business is a certified Small Business under the SWaM Program and has no more than twenty-five (25) employees **AND** no more than \$3 million in average annual revenue over the three-year period prior to their certification.

All small, women, and minority owned businesses must be certified by the Commonwealth of Virginia Department of Small Business and Supplier Diversity (SBSD) to be counted in the SWAM program. Certification applications are available through SBSD at 800-223-0671 in Virginia, 804-786-6585 outside Virginia, or online at <http://www.sbsd.virginia.gov/> (Customer Service).

RETURN OF THIS PAGE IS REQUIRED

ATTACHMENT B (CNT'D)

Small, Women and Minority-owned Businesses (SWaM) Utilization Plan

Procurement Name and Number: Vehicle Counts System RFP MPM-1034-3

Date Form Completed: 1/10/19

Listing of Sub-Contractors, to include, Small, Woman Owned and Minority Owned Businesses
for this Proposal and Subsequent Contract

Offeror / Proposer:
Park Assist LLC.

57 West 38th Street, 11th Floor, New York, NY 10018

201-780-8671

Firm

Address

Contact Person/No.

Sub-Contractor's Name and Address	Contact Person & Phone Number	SBSD Certification Number	Services or Materials Provided	Total Subcontractor Contract Amount (to include change orders)	Total Dollars Paid Subcontractor to date (to be submitted with request for payment from JMU)
Clear Communications Inc.	Yonathan Fassil 301-495-8989	*In Progress	System Installer	TBD	

See certifications on following pages

(Form shall be submitted with proposal and if awarded, again with submission of each request for payment)

RETURN OF THIS PAGE IS REQUIRED

COMMONWEALTH of VIRGINIA

Department of Professional and Occupational Regulation

9960 Mayland Drive, Suite 400, Richmond, VA 23233

Telephone: (804) 367-8500

EXPIRES ON

08-31-2020

NUMBER

2705169025

BOARD FOR CONTRACTORS
CLASS A CONTRACTOR
CLASSIFICATIONS ELE



CLEAR COMMUNICATIONS MD INC
CLEAR COMMUNICATIONS INC
813 SILVER SPRING AVE
UNIT B
SILVER SPRING, MD 20910

DPOR

Jay W. DeBoer
Jay W. DeBoer, Director

Status can be verified at <http://www.dpor.virginia.gov>

(SEE REVERSE SIDE FOR PRIVILEGES AND INSTRUCTIONS)

DPOR-LIC (02/2017)



Maryland Department of Transportation
The Secretary's Office

April 7, 2016

Larry Hogan
Governor

Boyd K. Rutherford
Lt. Governor

Pete K. Rahn
Secretary

NOAH FISSEHAZION
CLEAR COMMUNICATIONS, INC.
8313 FENTON STREET
SILVER SPRING, MD 20910

Dear NOAH FISSEHAZION:

CERTIFICATION NO. 16-157

The Maryland Department of Transportation's (MDOT) Office of Minority Business Enterprise (OMBE) is pleased to notify you that pursuant to the Minority Business Enterprise (MBE) Program, the Disadvantaged Business Enterprise (DBE) Program and the Small Business Enterprise (SBE) Program, it has been determined that your firm meets the eligibility standards and is certified in the following capacity:

NAICS Code – NAICS Industry Title

(Specific areas of work your firm is certified to perform within that NAICS Code)

238210 - MBE/DBE/SBE - ELECTRICAL CONTRACTORS AND OTHER WIRING INSTALLATION CONTRACTORS (SPECIFICALLY: COMMUNICATION EQUIPMENT INSTALLATION, COMPUTER AND NETWORK CABLE INSTALLATION, ELECTRICAL WIRING, AND LOW VOLTAGE ELECTRICAL WORK)

Only certified firms are eligible to fulfill minority participation goals on contracts issued by the State of Maryland.

As of the date of this letter, your firm is listed in MDOT's online Directory of Certified Firms. The Directory is maintained in real time and serves as the *official* source of your firm's certification status. It is used by prime contractors and consultants seeking participation from minority/disadvantaged subcontractors.

It is important that you check your Directory listing and contact the OMBE at 410-865-1269 regarding corrections or changes. Any changes in ownership or control of your firm (i.e. stockholders, officers, directors) as well as any changes to your contact information (i.e. address, email, fax) must be reported to OMBE immediately. View your listing at <http://mbe.mdod.state.md.us/directory>.

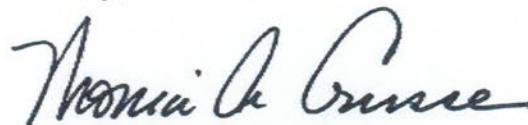
My telephone number is 1-800-544-6056 or 410-865-1269
Toll Free Number 1-888-713-1414 TTY Users Call Via MD Relay
7201 Corporate Center Drive, Hanover, Maryland 21076

Your firm must be reviewed annually in order to maintain its MBE, DBE and/or ACDBE certification status. We will contact you when it is time to begin the Annual Review process.

Please review the attached Minority Business Resources. If you are not already registered with Maryland's Small Business Reserve Program and *eMarylandMarketplace*, I strongly encourage you to learn more about these programs and complete the free, online registration at your earliest convenience.

The Governor's Office of Minority Affairs has oversight of the State's Minority Business Enterprise Program. They help small businesses compete with confidence in the public and private sectors. They will reach out to you via email and share information about educational and business development programs. Visit their website at www.goma.maryland.gov to access procurement forecasts and connect with a wide variety of small business resources.

Sincerely,

A handwritten signature in black ink, reading "Monica A. Crusse". The signature is fluid and cursive, with the first name "Monica" being the most prominent part.

Monica A. Crusse, Chairperson
Minority Business Enterprise Advisory Committee
Office of Minority Business Enterprise

cc: Sabrina Bass
Director
Office of Minority Business Enterprise

Part 6

Park Assist has the most experience of any guidance manufacturer worldwide in designing, deploying, and supporting guidance systems for parking. We created the camera-based system in 2010 and received our patent in 2017. We have deployed these systems in 33 countries across the globe including 80+ installations in North America with top retail centers, municipalities, international airports, healthcare centers, corporate campuses and casinos. Park Assist has 3 installations in the state of Virginia. Park assist serves many government entities including international airports around the world. At this point, Park Assist does not have any installations with VASCUPP member institutions.

Section X Pricing

To properly quote the patented M4 camera-based system and S1 outdoor system for JMU, Park Assist requires PDF and CAD drawings with bay striping for each level and surface lot. This will allow us to understand the layout of each garage and surface lot.

Based on the limited information provided, Park Assist estimates the following costs for each camera-based system solution:

M4 Solution (Parking Garage)

- Approximately \$435/space (includes basic signage, software maintenance. Non-Union labor installation)

S1 Solution (Outdoor Surface Lot/Rooftop)

- Approximately \$295/space for 5 years excluding signage. This number includes software maintenance.

*****The pricing above is a NON-BINDING ESTIMATE*****

Exhibit A: Optional Software

All Park Assist software is optional and can be enrolled in at any time. Park Assist's software comes with a perpetual license.

Park Assist's M4 solution not only provides accurate parking guidance functions, it also provides wide ranges of software features. These features can be added on during installation phase or any time after the system has been installed. This provides James Madison University with flexibility and future growth possibilities without ever needing to upgrade hardware.

Park Finder

With our *Find Your Car* locator feature, the parker enters the number for a license plate/parking ticket at a touchscreen kiosk or on a smartphone app. In seconds, the score system scours a database of currently parked vehicles, which were identified through our integrated LPR when they entered a space. Parkers will see exact locations of their vehicle on a digital map along with step by step walking directions from the kiosk to their car.



Park Alerts

Park Alerts is an automatic, rule-based alert system that assesses each individual car against the relevant set of rules or zones. Tapping into the integrated LPR built into our camera-based system, our *Park Alerts* software extension enables JMU to specify policies and rules for selected bays, zones, durations or license plates. *Park Alerts* integrates seamlessly with some of the well-known PARCs and mobile payment platforms.



Park Select-Rate

Park Assist's M4 system allows JMU to designate spaces for premium and conditional pricing. A color-coded LED on the M4 sensor attracts premium parkers to those spaces. Vehicle ID and location data is fed to PARC system, which already knows the premium rate to apply. This function removes the need for expensive gate systems or loss of spaces. *Park Select-Rate* can also be used for short-stay



zones for high turnover areas or zones for special events.

Park Surveillance

With *Park Surveillance*, Park Assist's M4 system is able to capture streaming surveillance video whenever motion is detected in or around a space. Or continuously, if desired. Since the M4 system is perched above the driving lane, their dual CMOS cameras have an unobstructed view of each vehicle during its entire stay in a parking space. This provides an expanded level of security that would otherwise be cost-prohibitive.



Park Assist Mobile/Web API

Our next generation *Mobile API* allows for integrating the Park Assist system data into mobile apps and websites to allow for an array of functionality. Utilizing our Mobile API brings real-time parking availability straight to the customer's phone and computer directing them as to which lots, garages, and specific levels have parking availability. The Mobile API also brings Park Assist's *Find Your Car* functionality to any mobile device allowing customers to find their lost vehicle right from their phone.

Park Assist's mobile app is currently available on iOS and Android. The Park Assist app will allow users to search for available parking ahead of time so they can plan their commute accordingly. If James Madison University prefers to develop an interface to be part of their own university mobile app or website, Park Assist can provide the Web API for their developers. Many of our clients have utilized this API to develop their own custom applications.

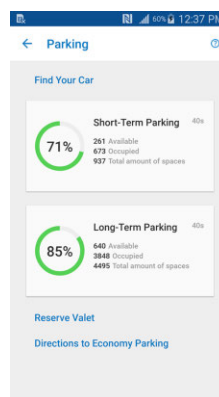
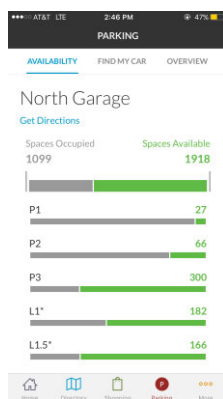


Exhibit B: Project Management & Install

Pre-installation

Park Assist will provide James Madison University with required drawings pertaining to the installation and installation schedule for the project for approval before the start of installation. All signage design, build specifications, and placement location will be submitted to JMU for approval. Park Assist will hold the following meetings prior to installation.

1. Operational initial review
2. Project kick-off meeting
3. Final design acceptance review

Communication

Weekly progress status conference calls will be scheduled between the James Madison University project management team and Park Assist's account and project management teams to streamline the project timeline. Detailed conference call minutes will be recorded for follow-up and documentation.

Park Assist project managers will also provide weekly progress reports to JMU detailing work performed during the week and projected work for the following week.

Although subcontractors perform some of the electrical and installation work, full-time Park Assist employees do all the testing and commissioning. Every step of the way we will get approvals and sign offs from JMU, and will provide JMU with status updates in effort to remain as transparent as possible.

Park Assist manages all steps of project management directly; we do not go through distributors or resellers at any point throughout this process. This provides JMU with the peace of mind that all parts and service are warranted by and directly through Park Assist.

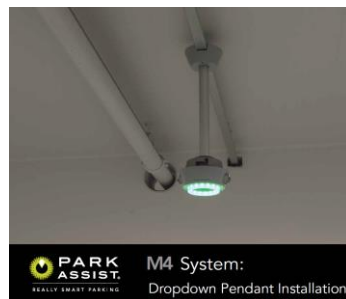
Installation

Park Assist project managers will be hands on with local sub-contractors on all aspects of the installation. Our project managers will make sure all work performed by James Madison University approved sub-contractors will be at the highest standards and consistent with the high standards we set for a Park Assist installations.

Since Park Assist installs our solution down the center of the drive aisle instead of over each individual stall, Park Assist does not require JMU to close sections of the garage or relocate vehicles during installation, thus allowing for minimal disruption and maximum revenue generation during install. During our installations for Omaha Airport and Fort Lauderdale Airport, not a single parking space was out of service during installation.

Installation Flexibility

Park Assist understands that no two garage designs are the same, and with installations in over 33 countries, Park Assist has seen and accommodated it all. Our proprietary channel has been designed with the utmost flexibility to allow the same product to be installed regardless of design obstacles such as low clearance, beams, drop ceilings, tiled ceilings, etc.



Commissioning

After all hardware has been installed, Park Assist will begin a systematic testing process to ensure the system is operating at the highest levels. Our testing phase will include detection accuracy, signage accuracy, communication performance and reporting accuracy. Every single piece of equipment installed by Park Assist and our sub-contractors will be tested to the highest standard.

Exhibit C: Training & Testing

Park Assist Training Outline

Qualified Park Assist technicians or trainers in person will lead all training. Park Assist will provide James Madison University with an outline of the instruction material and approximate duration of the session. Each session will include hands on experience with the system and/or reporting software.

Park Assist Training falls into 3 different areas:

1. Software Training – Operations, reporting & statistics software
2. Software Training – Light configuration and backend changes
3. Technical Training – Basic fault finding

Software Training - Park Insights

Park Assist has developed the industry leading cloud based reporting tool *Park Insights*.

Park Insights enables real time and “anywhere” access to:

- Live occupancy levels
- Historic occupancy
- Dwell times, (M4 System Only)
- Turnover, (M4 System Only)
- Plate history, (M4 System Only)
- *Park Finder* (M4 System Only)
- Email Alerts

The functional design of *Park Insights* is very similar to that of Google, as such the training session is more about explaining and demonstrating the types of data available, rather than how to use the software.

Duration

2 sessions, 4 hours each

Who should attend?

This training is aimed typically at the non-technical users/operators. This training is kept at a high level, and looks purely at the remote data and system details.

Requirements

This can be demonstrated on any PC, though Internet access is required. Chrome or Safari Internet browsers are recommended for best experience.

Technical Training

The Technical Training is customized to suit the level of involvement required by the end user. This can entail:

- Basic Faultfinding
- Detailed Faultfinding
- Sensor replacement
- Sensor commissioning
- System calibration
- System configuration

Duration

2 sessions, 4 hours each

Who should attend?

This training is technically intensive, aimed at the advanced electrician/systems integrator. A sound knowledge of Faultfinding, Ethernet networks, IP addressing and general electrical knowledge will enable the user to extract full value from this session.

Requirements

Training is conducted with a mix of on-the-ground and IT-based tasks. Access equipment, garage access and system access is required.

Installation Testing

Detection Sensors: Park Assist will test connectivity strength between all sensors and the garage controller, verify equipment status updates are uploaded periodically and test offline functionality and UPS backup time.

Signs: Park Assist will test connectivity between sign displays and garage controller. All signs will go through multiple power cycles and brightness testing.

Head End Equipment: Park Assist will test connectivity between the 3 parking garages to make sure data is successfully transmitted to and from the central computer, test remote access to the central computer, and test offline functionality and UPS backup time.

Duration: 1 day

Operational Testing

Once all equipment pass installation testing, Park Assist will begin operational testing of the equipment and signs. Operational testing consists of 3 phases.

1. Detection Accuracy: Park Assist will observe all sensor detection readings with real-time observations. We will recalibrate sensor sensitivity and logic until accuracy level is above 99%.

2. Sign Accuracy: Park Assist will verify all signs are displaying the correct count for the region it is supposed to represent. We will also test signs for latency to make sure counts are changing in real time.

3. Reporting: Verify all parking data is correctly stored in the database and uploaded to the cloud server. Verify if pre-define zones are calculated correctly.

Park Assist will conduct 2 operational testing period of the equipment. First, before the system goes live, and another test 20 days later. The second test is to make sure the system is still performing up to standard after a longer usage period.

Duration: 2 days

Exhibit D: Terms

General

1. Pricing provided is a non-binding estimate. Park Assist requires PDF and CAD files to properly quote the M4 and S1 system
2. Images are retained locally for approximately 3 weeks. Images are not stored in Park Insights.
3. Customers accepting this proposal are subject to these terms and conditions as well as the Park Assist software license agreement.
4. This proposal is based on engineering site plans provided by James Madison University at the time of quotation. Variation in M4 or S1 System design to accommodate changes in scope or errors in customer's drawings will be charged as separate variations or will be re-quoted.
5. Prices are in US Dollars and are subject to any applicable state or local sales taxes.
6. Installation is assumed to be non-union labor unless specifically communicated before the contract is signed. Prevailing wage, union, PLA install will be in addition to this proposal unless otherwise noted.
7. Assumes access to site amenities.
8. Park Assist assumes penalties, liabilities, and/or consequential damages will not be part of the contract terms and conditions.
9. Any bonding requirements are not included in this proposal and shall be provided at an additional charge based upon scope.
10. Any insurance requirements outside of standard coverage carried by Park Assist are not included in this proposal and shall be provided at an additional charge based upon additional requirements and terms of coverage. Liquidated damages are not included in this proposal.
11. Park Assist reserves the right to negotiate mutually acceptable contract terms.
12. Final striping, high voltage power, and networking setup, provided by client, must be aligned with overall project schedule.
13. Park Assist has reviewed the General Terms and wishes to negotiate with good faith if awarded the project
14. Prior to installation start, the following conditions must be met/allowances provided:
 - a. The most current representation of the parking levels must be provided in AutoCAD.
 - b. All information regarding the site must be conveyed to Park Assist. This includes but is not limited to: pole heights, quantity of lighting poles, lighting pole placements, clearance heights, ceiling heights, lane widths, space widths, server room location (headend equipment).
 - c. Security badging and access if needed.
 - d. All bay striping must be painted and final.
 - e. Mounting surfaces must be structurally sound.

- f. Toxic substances (e.g. asbestos) abated to acceptable levels.
- g. All 120-240V power will be delivered by the owner or quoted separately.
- h. On-site storage area for a 40' shipping container for materials, with vehicular access.
- i. 15 Mbps upload/download speed or faster, static public IP, internet access at the headend equipment location setup for Park Assist to manage their own network.
- j. 12-25U rack space in an appropriate server or network room. (variable based on surveillance module).
- k. Connection between headend equipment location and the first floor cabinet of each garage will be a, client provided, Park Assist managed network connection. (Cat5 or Fiber dependent upon ethernet distance restrictions).
- l. All M4 floor cabinets will require a client provided dedicated 30A circuit, all other ancillary cabinets/ equipment require a dedicated 20A circuit.
- m. All S1 cabinets will require a client provided 110V/5A circuit, all other ancillary cabinets/ equipment require a 5A circuit.
- n. All Park Assist cabinets and ancillary equipment requires a, client provided, Park Assist managed network interconnection (copper/fiber).
- o. Surveillance module requires copper/fiber connection from headend equipment location to client remote workstation. (Client provided).
- p. This proposal includes One Year warranty on parts and labor for defects in materials or manufacture. Warranty does not cover damage or malfunctions resulting from acts of God, collision, vandalism, misuse, electrical surges, power failure, or use of non-manufacturer approved parts or consumable supplies.
- q. Project is subject to a 25% restocking fee plus shipping for any material deduct post contract execution

Contractor Responsibilities

1. This Contractor shall provide an M4 system for the parking garages and S1 system for the surface lots at JMU per the Bill of Quantity (BoQ) provided above.
2. This contractor shall furnish and install all equipment as quantified in the BoQ above.
3. LED lights on M4 camera sensors to be color customizable to indicate if parking spaces are occupied or unoccupied. Handicap spots are to receive blue LED lighting.
4. M4Camera sensors are to be secured to channel and conduit hanging of parking garage.
5. M4 channel system is to be installed at a maximum height above floor to be determined upon further garage details such as the presence of beams, pipes, and sprinkler systems. This Contractor shall meet minimum clearance heights provided throughout the garage.
6. S1 camera sensors are to be secured to existing light poles, Park Assist provided poles or nearby buildings.
7. If applicable, interior garage signs are to be furnished and installed with customizable displays. Casings for signs shall be provided and determined by this Contractor.

8. This Contractor includes all mounting equipment necessary to install the signs for wall or floor mounted configurations. This includes any steel supports, angles, etc.
9. Arrow signs shall display parking count spaces available and directional arrows.
10. This Contractor shall provide signs as described on BOQ above. Installation will be done by the Contractor. All power and data to level-signs or outdoor signs will be run by others. Specially designed enclosures are not included unless if specifically priced on the proposal.
11. If applicable, site signage shall use a wireless configuration for data transfer. This contractor shall be responsible to install, configure, and maintain during agreed maintenance period.
12. Final termination of power and data wiring connections shall be the responsibility of this Contractor.
13. This Contractor shall provide all head-end equipment required to operate the system. This includes 2-D design and software setup, server hardware, server licenses and core switch.
14. All areas of work will be cleaned and debris free at the end of each shift.
15. Practical Completion
16. As installation of field components is completed, there shall be a maximum of 4 week commissioning period. The following criteria shall be met to pass a practical completion test:
17. A commissioning report issued by this Contractor that shows the number of parking spaces covered. The report shall include images of each parking space and a location on the level map.
18. The M4 LED light for the parking sensor shall change color within 10 seconds from the moment a parking vehicle parked and turned off the engine.
19. The signage count shall be updated within 60 seconds from the moment the vehicle is detected in the parking space. This is adjusted to a timeframe of 1.5 minute for wireless signs.
20. Average detection accuracy shall not be less than 99% across the entire garage and surface lot, during the entire day.
21. During the commissioning period Park Assist will analyze images of vehicles to improve detection accuracy, accuracy may be lower than spec during this period.

Exclusions Include

1. Cost associated with Internet access. Internet connection needs to be minimum 15Mbps up/down. Each additional S1 camera requires 0.5Mbps up/down. Speed and bandwidth requirements to be clarified in system detail design.
2. Costs associated with lost time due to client or third party delays, alterations to scope, or union/industrial disputes.
3. Power and data connections between all cabinets and ancillary equipment unless noted otherwise.

4. Any extra work due to special conditions brought about after the date of contract execution or general site allowances.
5. Costs to integrate the Park Assist technology with other platforms, requests outside the standard Park Assist offering or customized reports unless specifically included in this proposal.
6. Costs for any fiber/fiber components
7. Costs for any trenching, civil, site or concrete work.
8. Any type of X-ray work, GPR scanning or civil work including but not limited to ceiling, roads, and ramps.
9. All 120VAC power to system equipment
10. Core drilling
11. Any cost, or responsibility for local permits
12. Any cost, or responsibility for correction or upgrades of existing conditions and code violations
13. Costs accrued based on misinformation provided by the client using email, CAD drawing or by phone, including but not limited to outdated drawings, wrong/missing: ceiling height, clearance height, lane width, bay width, column width.
14. Traffic management cost is not included.
15. This scope of work does not include any night work, holiday work or overtime work.
16. Cost for premium time, overtime or shift work is not included unless our own forces create the cause of delay
17. Costs or schedule impacts associated with vandalism.
18. Costs or schedule impacts associated with restriping requiring updated design.
19. Demolition, other than 'safe-off' so that demolition can proceed safely
20. Back charges for damaged finished surfaces, except negligence
21. Painting, other than standard factory finishes (including touchup)
22. Sealing of roof penetrations and flashings
23. Estimate is based upon construction proceeding on a normal schedule (five days per week-eight hours a day), not an accelerated schedule
24. Installation requests outside the trade standard including but not limited to: mounting cabinets at expansion joints, mounting cabinets in direct exposure to elements (direct sun, rain), mounting sensors outside the operational range.
25. Equipment storage costs throughout installation, if not provided onsite in a secure location by client.
26. Embedded conduit
27. Power and data to S1 equipment

Signage Statement

1. Unless otherwise noted, Signage is being offered as an Estimated Allowance and is not included in the Base System Pricing.

- a. The initial Signage Allowance is based upon client requests, and/or engineered estimates by Park Assist based upon decision points down a drive aisle or at a ramp level. The estimates are based upon the current drawings of record provided by the client.
2. A Signage Plan will be submitted once a thorough Technical Review has been performed at the site. This Technical Review normally occurs in the late stages of the Sales Cycle, and is in accordance with the specific needs of the client.
 - a. The Signage Plan will include a Mockup of each level showing all Interior Aisle, Level, and other signage. Each Sign will have its own unique ID.
 - b. The Signage Plan will also include Bay Grouping to identify which Bay Group is assigned to a specific sign. Note: Each Sign has its own reference number.
 - c. A Table is also provided per level that identifies what Sign is assigned to a particular set of Bay Groups. This table will allow the client to understand the count information each particular sign is displaying.
3. We understand that the Signage Plan is dynamic until the final Signoff. Our Proposal will be adjusted throughout this process and only until the Final Signoff, will the Signage Package be included in the Base System.
4. Any changes to the Signage Plan, after Contract will be subject to a Change Order (whether positive or negative based upon the scope of the change(s)).

Payment Schedule

Phase	Amount
*Deposit due upon order	50%
*Upon delivery	35%
**As installed	15%

*Invoice due upon receipt

**Net 30 days

Exhibit E: Warranty

Park Assist Warranty Statement

For 1 year from the date of shipment (the "Equipment Warranty Period"), Park Assist warrants the Replacement Equipment will be free from substantial defects in materials and workmanship under conditions of normal use (the "Equipment Warranty"). If applicable, Park Assist further warrants for a period of thirty (30) days from substantial completion, Installation Services shall be performed in accordance with industry standards.

EXCLUSIVE REMEDY

Park Assist's exclusive obligation under the Equipment Warranty shall be to, at its sole option, repair or replace defective Equipment, at no charge to Customer, so long as notice describing the nature of the defect and location of the Equipment is received by Park Assist within the Equipment Warranty Period and within fourteen (14) days after the defect is discovered. If Customer purchased Installation Services to install the Equipment originally, the Equipment Warranty shall also include the necessary labor required to replace a defective part if Park Assist, in its reasonable judgment, determines that such replacement is required. In no event shall the Equipment Warranty Period be extended by the repair or replacement of an item of Equipment. For the avoidance of doubt, to the extent there are any labor costs that are the responsibility of Park Assist in connection with the Equipment Warranty, any such labor shall be arranged by Park Assist and Park Assist will not reimburse Customer for any costs incurred by Customer to service the Equipment.

WARRANTY EXCLUSIONS

The Equipment Warranty shall not apply to any defect, loss or damage arising in connection with:

1. Installation, maintenance or attempted repairs that are not performed by Park Assist or its designees;
2. Improper system maintenance not performed by Park Assist or its designees;
3. Improper software configuration not performed by Park Assist or its designees;
4. Product operation outside of specifications;
5. Unauthorized modification or tampering; or
6. any act or omission of a person or entity other than Park Assist or from fire, water, burglary, accident, transit, vandalism, acts of God, terrorism

DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU ANY AND ALL OTHER WARRANTIES WHETHER WRITTEN, EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE).

PARK ASSIST FURTHER DISCLAIMS ANY AND ALL WARRANTIES WHETHER WRITTEN, EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) RELATED TO PRODUCTS OR HARDWARE NOT PROVIDED BY PARK ASSIST, WHETHER OR NOT PARK ASSIST INSTALLS SUCH PRODUCTS OR HARDWARE.

Exhibit F: Functionality

Currently in the market, there are two main methods for single space detection within a garage, ultrasonic and camera-based sensors. Both technologies are very accurate in vehicle detection, however ultrasonic sensors are limited in their capabilities.

	Park Assist M4
Level by level parking availability	✓
Space by space parking guidance with LED lights	✓
License plate recognition capabilities	✓
Thousands of programmable LED light colors	✓
Exact location of customer's car (<i>Park Finder</i>)	✓
Automatic license plate recognition alerts	✓
Streaming motion detected video surveillance	✓
Increase revenue through dynamic pricing	✓
Monitor and enforce different parking zones	✓
Integration with PARC for <i>Park Finder</i> , Flex-Rate	✓
Monthly verifiable accuracy report	✓
Integration with security video management system	✓

Comparing Accuracy Reporting

Factory ratings for ultrasonic sensors are 99%. There is not a true measuring method to verify ongoing accuracy once the system is installed. In order to truly test the accuracy of an ultrasonic system, the facility needs to count every single car inside the garage and verify with the sensor indication lights for accuracy.

M4 cameras are rated at 99+% accurate for space by space counting. Park Assist's accuracy rating is verified monthly by a third party company remotely. Since the M4 system captures still

images of every parking stall being monitored, it is very easy to compare sensor readings with the picture to determine accuracy.

In 2018, Park Assist launched the S1 System to deliver an outdoor camera-based solution. This solution provides greater accuracy and functionality than older technology (i.e., loops)

	Park Assist S1
Reduces driver's search time for a bay in a parking lot	✓
Security system that covers every parking bay in the lot	✓
Improves traffic flow, lot operations and minimizes congestion	✓
Reduces greenhouse gas emissions by guiding drive to the open bays	✓
Visual verification through camera views to test and report system accuracy	✓
Easy to install compared to in-ground sensors or other similar systems	✓
Camera covers multiple spaces thus reducing the amount of hardware required for each bay	✓
Smart analytics portal to improve planning, operational efficiency and optimal budget allocation	✓
Easy API based integration to all third party systems or integrators	✓

Exhibit G: Parking Guidance Assessment

Overview:

When comparing parking guidance solutions, a variety of factors will go into assessing which solution would be most beneficial in the long term. From our assessment, the conclusions have found that when comparing Single Space Guidance systems, Camera Based guidance has significant benefits over older technologies such as a Level Count or Ultrasonic solution. These factors range from the ability to control user groups, open new revenue streams, improve the visitor experience and minimize maintenance to accuracy and security.

Camera- Based Guidance Benefits vs. Ultrasonic Single Space Sensors:

Park Assist Camera-Based Guidance:

- A **Park Assist Camera Based system** will allow the asset owner to add a brand new revenue stream while also increasing asset value by offering options beyond guidance and not possible with other technologies such as ultrasonic, these options include:
 - **Premium Parking (in the future):** allows operators to charge a premium for the most convenient parking spaces providing a boost to parking revenues.
 - **Surveillance:** Real time video streaming to a central server that monitors activity of every individual parking space in the garage
 - **Find Your Car:** increases the visitor experience exponentially
 - **Alerts:** Allows owner to define and control parking policies within the garage automatically
 - **Automatic License Plate Inventory is only possible with Camera Based Guidance**
- Camera Based technology positions owner as a progressive leader in innovation, intelligent transportation systems and its sustainability benefits.
- Requires no manual maintenance → 99% of issues can be solved remotely

Ultrasonic Sensors:

- Bulk of cost lies in installation/ hardware
- Binary functionality with no ability to offer any security or operational benefits
- Manual system upkeep is required should a sensor become faulty
- No functionality in terms of premium parking, car finding, surveillance or alerts
- Visually cluttered by having a light over every space
- Accuracy is based on “what you see” vs. human-detected accuracy and associated site-health reports

Conclusions:

The business case for a Park Assist installation can be supported from numerous angles; while a high quality customer experience is important, a number of leading asset owners use a variety of business cases to justify the capital cost such as increased revenues, financial returns and software intelligence which isn't possible through Ultrasonic sensor technology.

Qualifying the Benefits for Owners:

Visitor Experience → more competitive offering against nearby garages using guidance and Find Your Car

Capacity → control where staff park without nesting, unlocking 2-5% extra spaces for visitors

Security → track vehicles of interest (i.e. black lists, long stays) is now automated

Automatically track how long each vehicle has stayed so no need for manual inventories or LPR enabled vehicles

Comparing Guidance Solutions

Item	Level-Count	Ultrasonic	Camera
CAPX	Low cost of entry / High cost of maintenance	Installation weighted cost	Software/efficiency driven
System Upkeep	Daily, manual	Infrequent, manual	Infrequent, remote
Find Your Car	No functionality	No functionality	Available
Alerts	No functionality	No functionality	Available
Flex-Rate	No functionality	No functionality	Available
Single Space Surveillance	No functionality	No functionality	Available
Reporting	Limited	Basic	Robust

80% less wiring and conduit with M4 than ultrasonic

Optional modules add powerful functionality that deliver improved parker experience, garage efficiency and increased revenue

M4 system's data access provides more data access than any guidance system

Exhibit H: Why Park Assist

Universities are no place for untried technology. Your chosen system provider also needs to have a comprehensive handle on the current and future needs of your parking facility/portfolio. Here are some big-picture factors to consider.

	Park Assist Advantage
Innovation Leadership	Successful real-world proven solutions for both hardware and software, Enables us to continue to enhance our patented system.
Deep Industry Expertise	100+ years of intensive C-Level experience in the parking sector. Our prime movers have literally evolved with the industry itself.
Prominent Portfolio of Global Successes	Success in 31+ countries. The only camera based provider serving Fortune 500 clients, leading North America developers, and the premier developer in the Middle East.
Account Management & Support	Each client is assigned a dedicated Account Manager. A responsive, trusted guide throughout the system lifecycle. From pre-planning through installation, commissioning and ongoing support.
Financial Stability	Our remarkable growth trajectory is one source of confidence. So is the billion-dollar backing and resources of our parent, The TKH Group. Both of which fuel our ability to evolve and expand.
Service Infrastructure	A comprehensive offering including monitoring, fine-tuning, expert remote/onsite support and training. To ensure extended peak system performance and ROI.

Exhibit I: Innovation

As the leading innovator of both level count and camera-based parking guidance technologies and with deployments in over 33 countries around the world, Park Assist offers James Madison University the depth of system design and experience, portfolio account support experience and a commitment to the future development unparalleled by any competitor in the market place.

System Design and Experience

Park Assist's technology is more tested and proven than any other parking guidance system in the world. Park Assist's technology has been deployed longer than any other system in the world and Park Assist also has more installations with camera-based guidance than any other manufacturer, dealer or distributor.

Designed by parking industry experts with well over 100 years of combined industry and parking technology experience, Park Assist's system is the most advanced and powerful product capable of adding future functionality as far out as ten years.

The Future

Because Park Assist has perfected both camera-based technology and level count solutions, we have been able to focus on the future of parking technology. We have developed forward-thinking software extensions that will add new functionalities, as well as releasing an enhanced API capable of integrating security, lighting, reservations, driverless and connected cars as well as PARCS.

Today, Park Assist is not only focused on parking guidance but also the business intelligence our systems can provide, as well as combining our technology with other analytic platforms. The company's roadmap for 2019 includes many exciting offerings far beyond what our competition can offer and this future-driven mindset is what led Park Assist to create the first camera-based parking guidance system in 2010.

Park Assist's commitment to our clients is the promise that while we are delivering you the most innovative solution today, we are also focused on the solutions you will need tomorrow. In 2018, we are developing innovative and groundbreaking technology for in-car communication with autonomous vehicles, integration with in-mall analytic platforms, and integration with mobile payment providers, employing applications with location-based services (Blue-dot technology) and more.

With Park Assist, you get substance and experience not pretense and promises. Our

commitment to James Madison University is to bring all the strength of respected industry leadership, comprehensive parking and technology experience, proven innovation, and unequalled service to exceed your expectations. We want your business and are the most prepared parking guidance provider in the industry to deliver it.

Exhibit J: Patent



US009594956B2

(12) **United States Patent**
Cohen et al.

(10) **Patent No.:** **US 9,594,956 B2**
(45) **Date of Patent:** **Mar. 14, 2017**

(54) **METHOD AND SYSTEM FOR MANAGING A PARKING LOT BASED ON INTELLIGENT IMAGING**

Related U.S. Application Data

(60) Provisional application No. 61/332,822, filed on May 10, 2010.

(75) Inventors: **Daniel Cohen**, Brooklyn, NY (US); **Richard Joffe**, New York, NY (US); **Bob Caspe**, Sherborn, MA (US); **Aaron Isaksen**, Brooklyn, NY (US); **Ilan Goodman**, New York, NY (US); **Ian Yamey**, New York, NY (US); **Michael Klevansky**, New York, NY (US); **Andrew Crawford**, Naas (IE); **Konstantyn Prokopenko**, Brooklyn, NY (US); **Steven Hartman**, Commack, NY (US); **Aurelien Ramondou**, New York, NY (US); **Mark Kudas**, Astoria, NY (US); **Ezequiel Cura**, New York, NY (US)

(51) **Int. Cl.**
G06K 9/00 (2006.01)
H04N 7/18 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **G06K 9/00624** (2013.01); **G07B 15/02** (2013.01); **G08G 1/14** (2013.01); **H04N 7/18** (2013.01)

(58) **Field of Classification Search**
CPC G08G 1/14; G06K 9/00624; H04N 7/18
(Continued)

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Primary Examiner — Christopher S Kelley

Assistant Examiner — Deirdre Beasley

(74) *Attorney, Agent, or Firm* — Mark M. Friedman

(73) Assignee: **PARK ASSIST LLC.**, New York, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 232 days.

(21) Appl. No.: **13/697,380**

(22) PCT Filed: **May 8, 2011**

(86) PCT No.: **PCT/IB2011/052024**

§ 371 (c)(1),
(2), (4) Date: **Jan. 13, 2013**

(87) PCT Pub. No.: **WO2011/141861**

PCT Pub. Date: **Nov. 17, 2011**

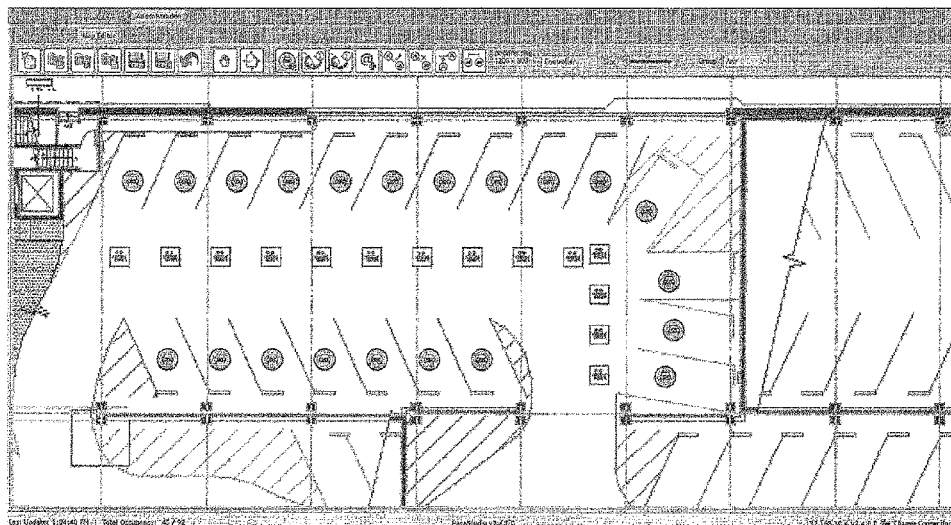
(65) **Prior Publication Data**

US 2013/0113936 A1 May 9, 2013

(57) **ABSTRACT**

To manage a plurality of parking spaces, one or more images are acquired, with each parking space appearing in at least one image. Periodically acquired images of occupancy and identity are used in directing a customer to a parked vehicle. Periodically acquired images of just occupancy are used in controlling respective environmental aspects, such as illumination and ventilation, of the parking spaces. For these purposes, the images are classified automatically as “vacant” or “occupied”, and are displayed along with their classifications so that the classifications can be corrected manually.

2 Claims, 15 Drawing Sheets



(51) **Int. Cl.***G07B 15/02* (2011.01)*G08G 1/14* (2006.01)(58) **Field of Classification Search**

USPC 348/148; 340/932.2; 382/104

See application file for complete search history.

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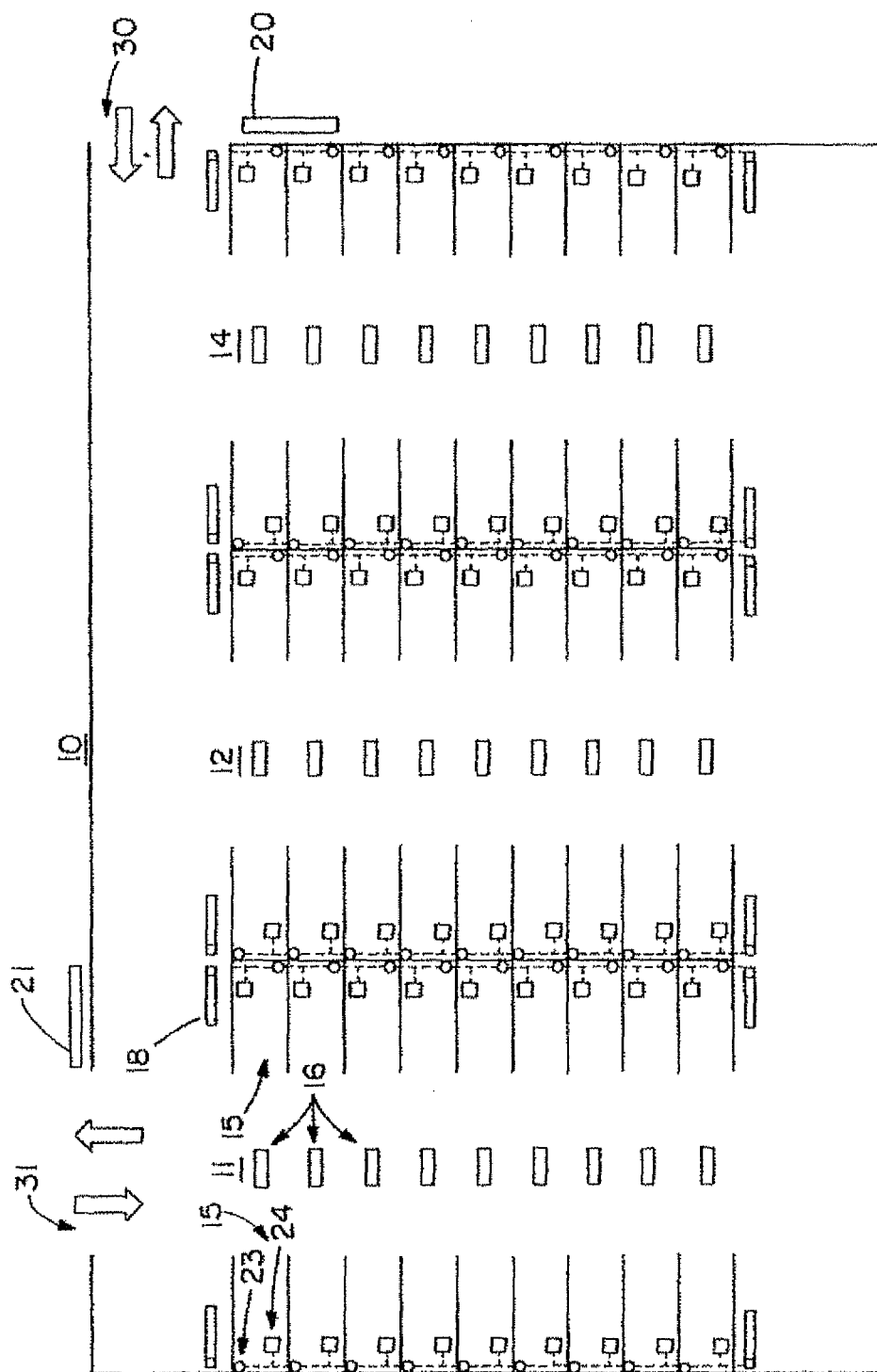


FIG. 1

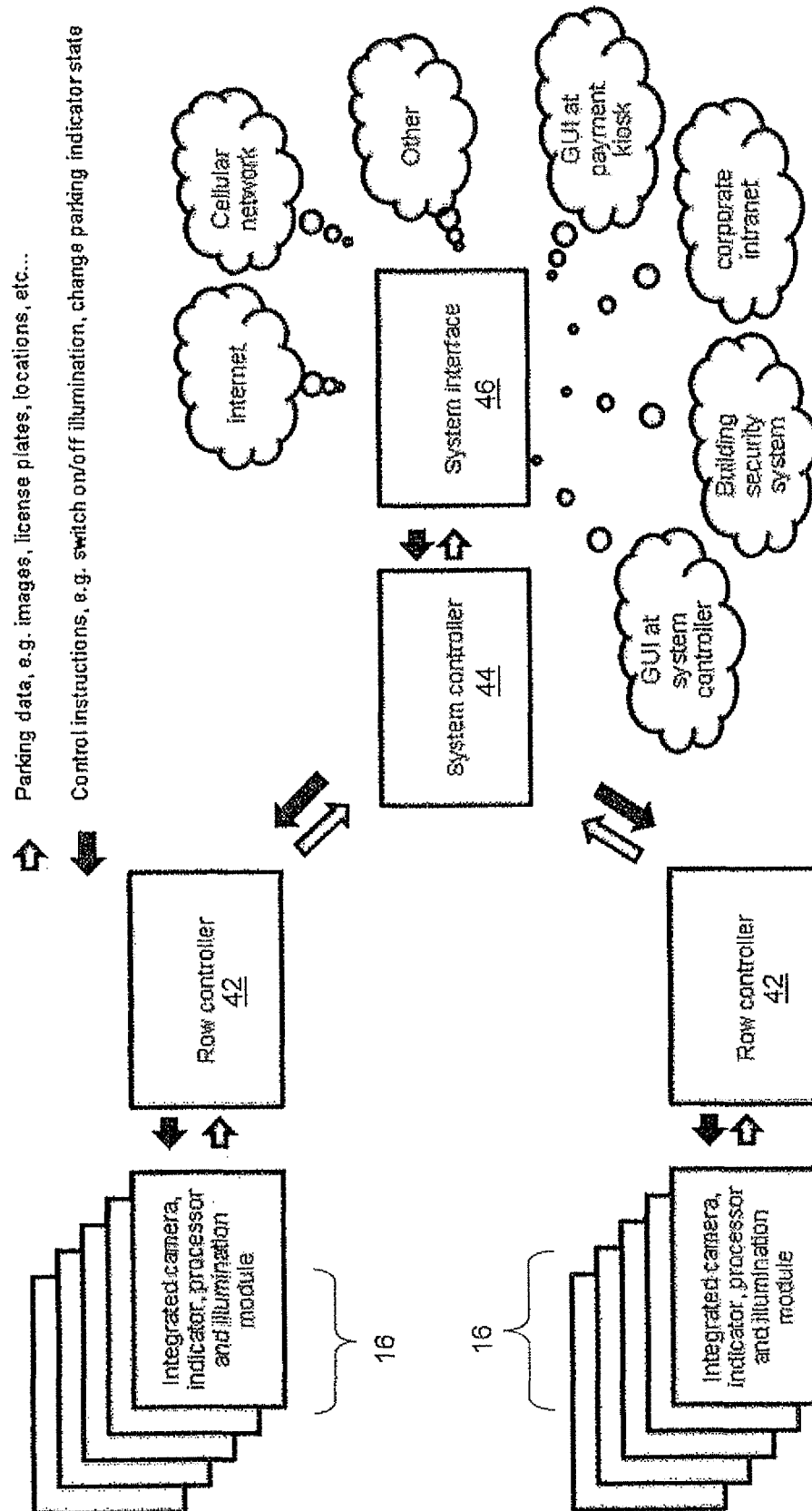
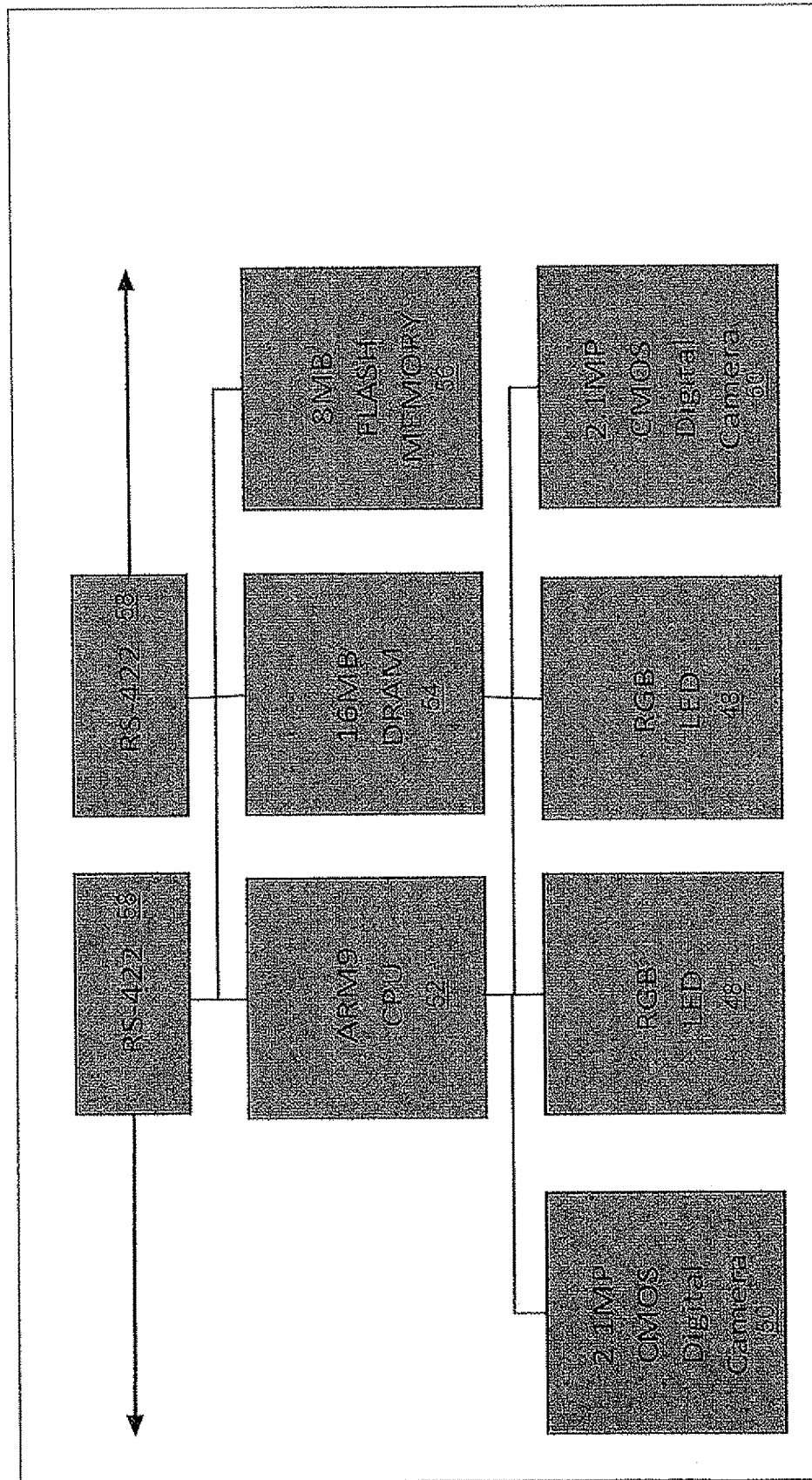


FIGURE 2



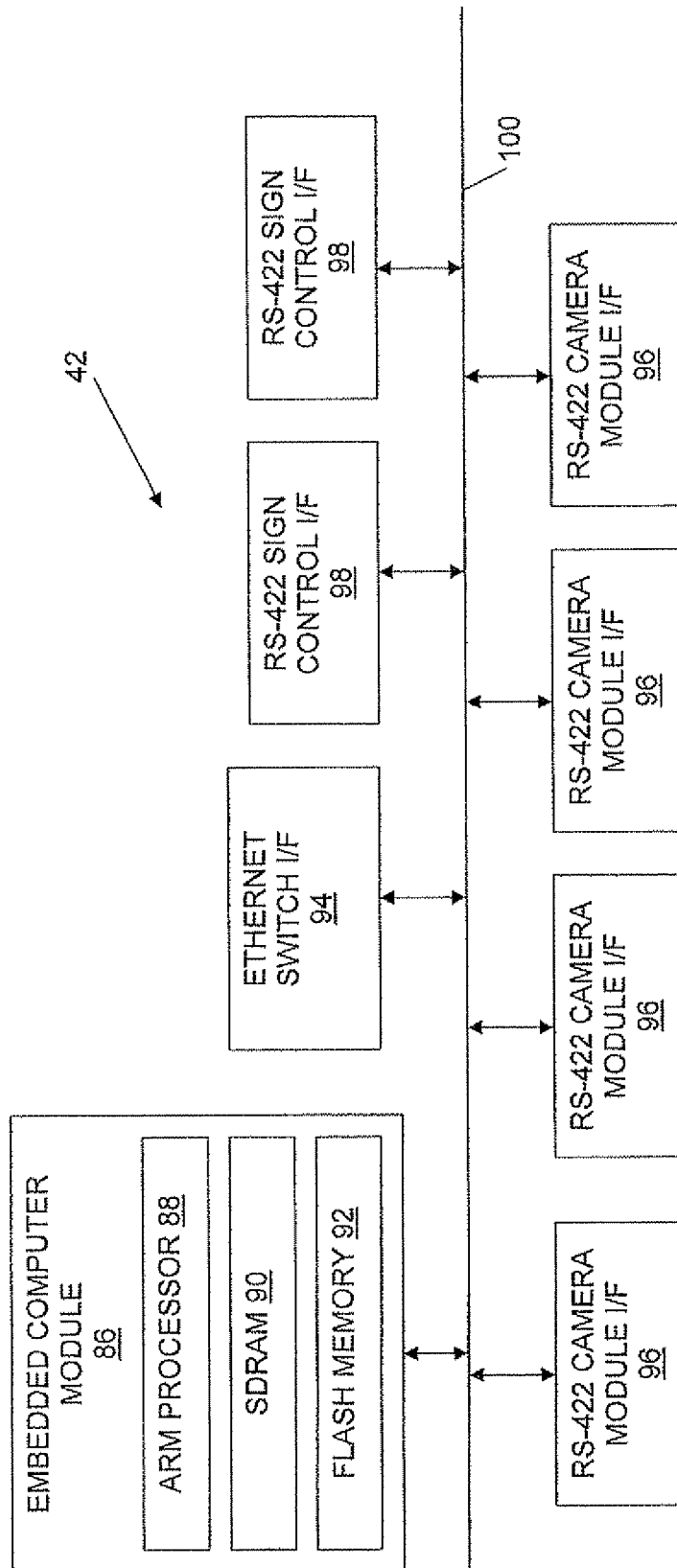


FIGURE 4

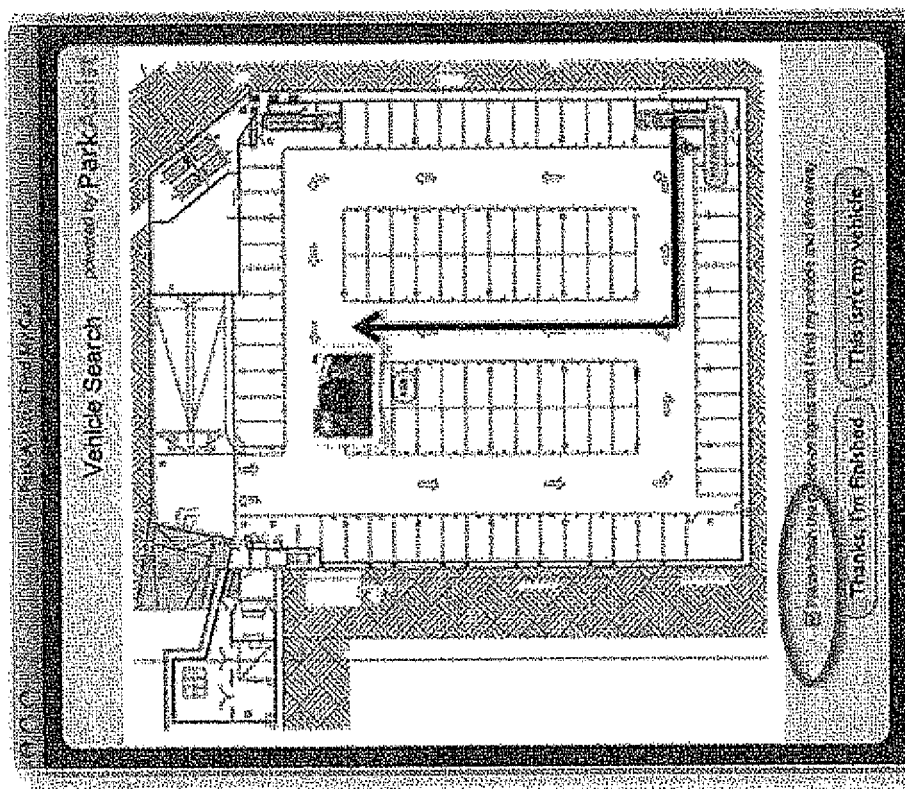


FIGURE 5

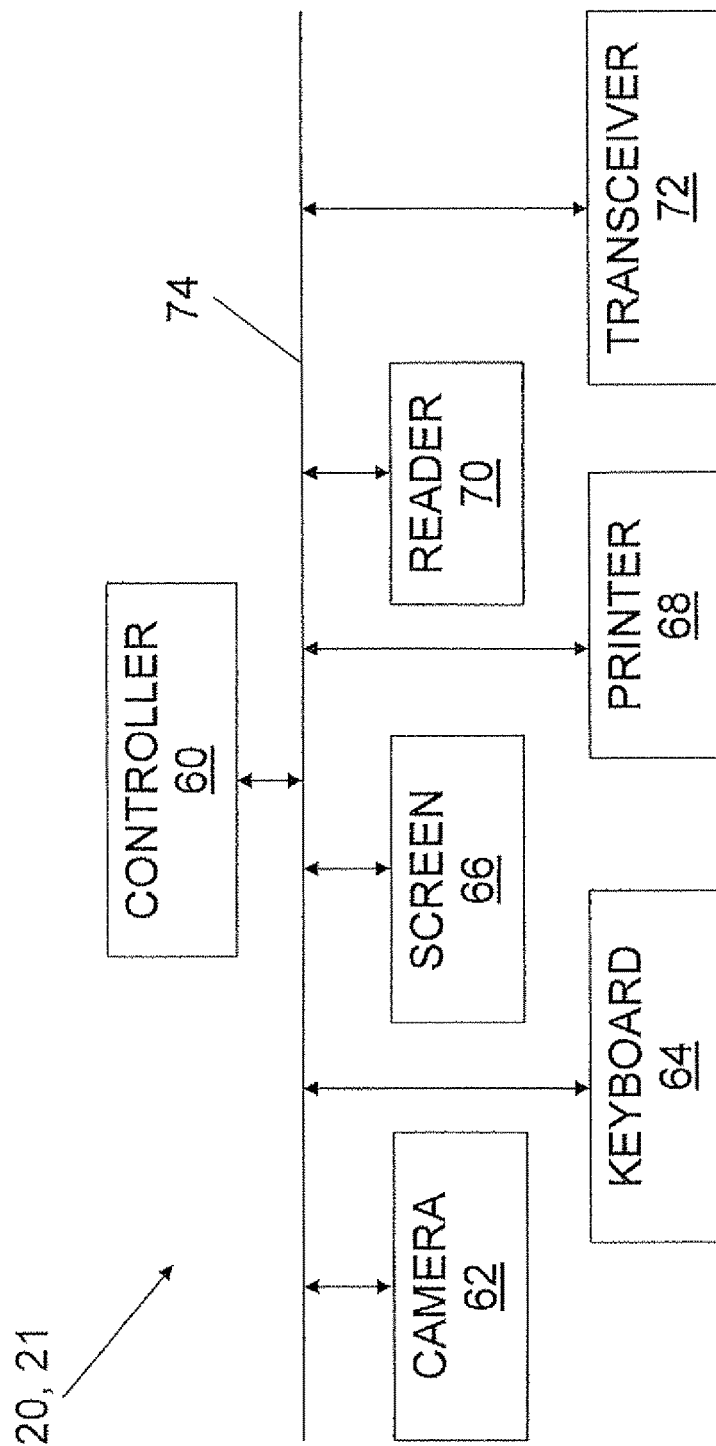


FIGURE 6

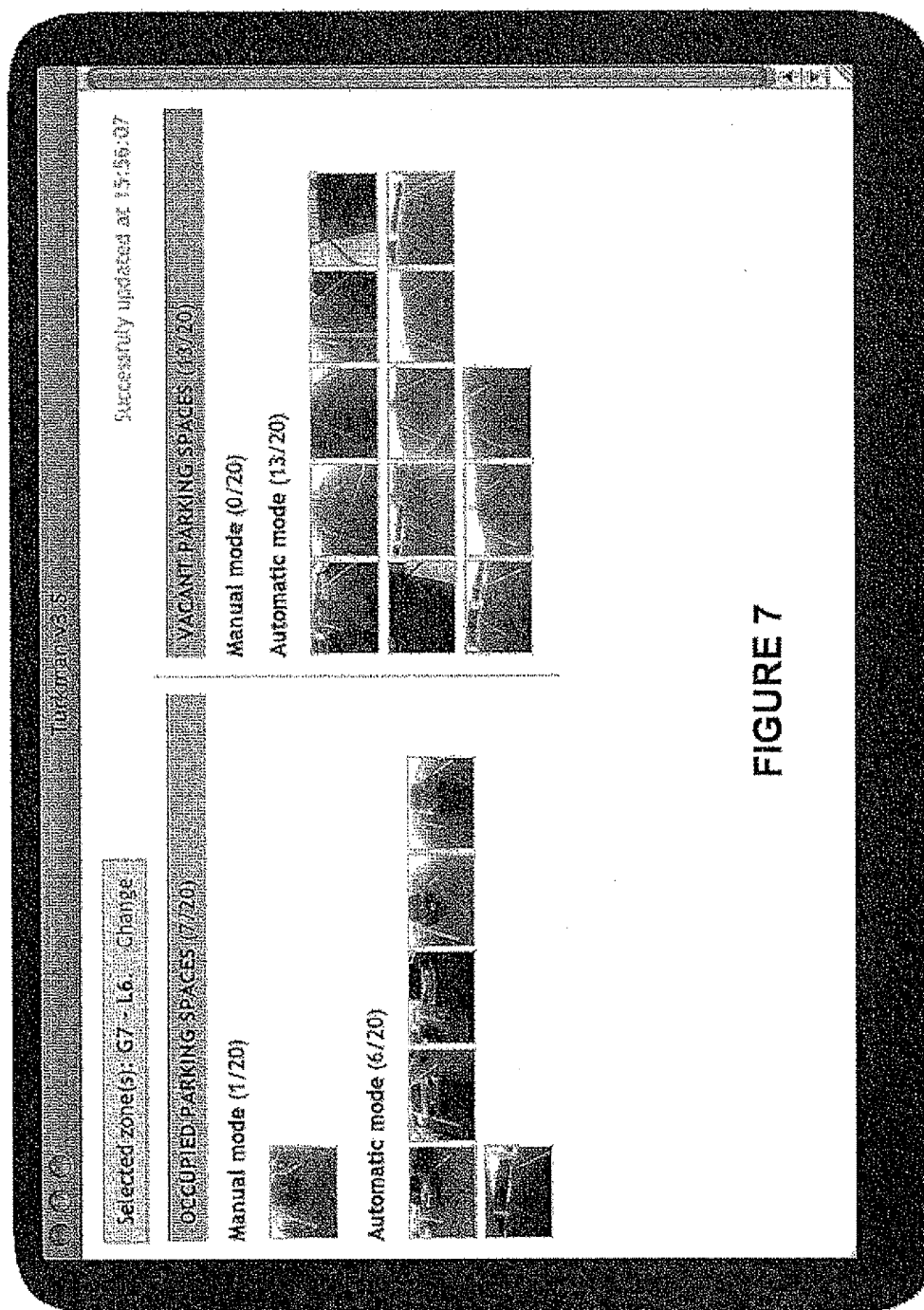


FIGURE 7

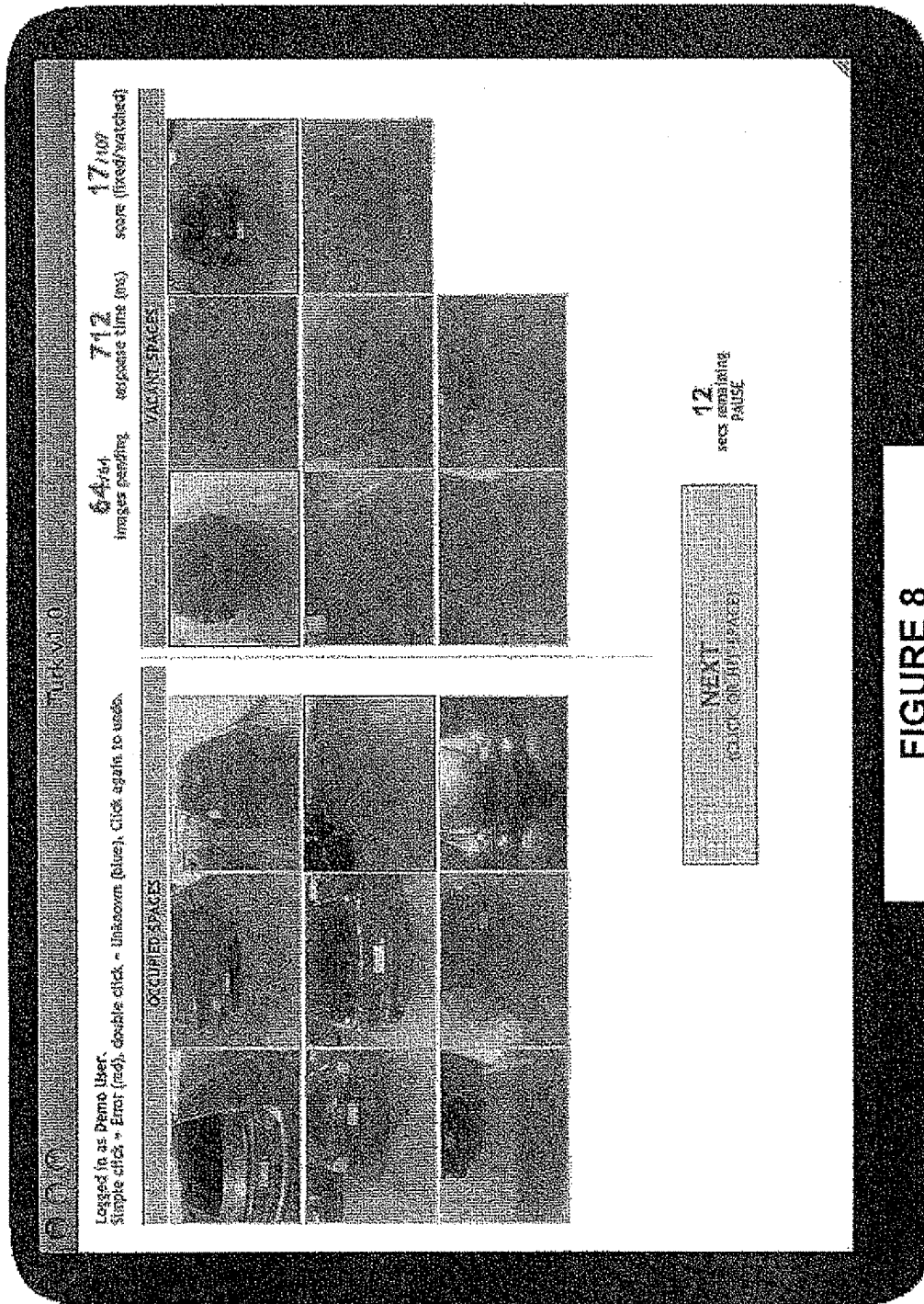


FIGURE 8

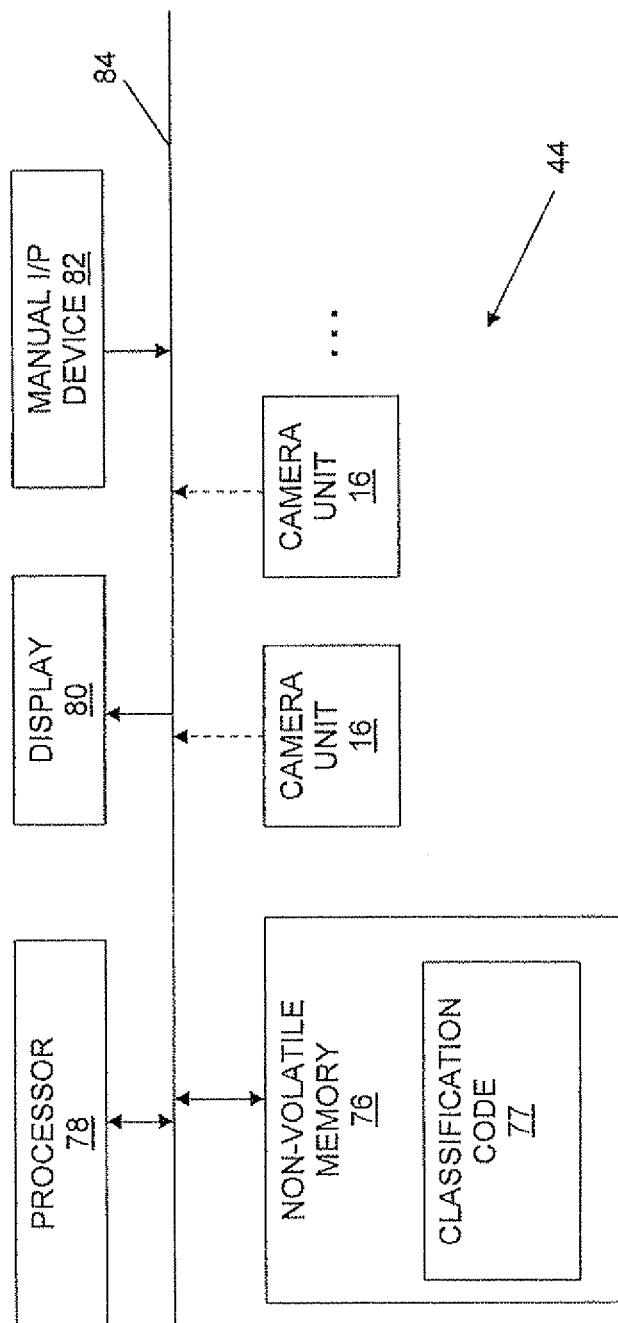


FIGURE 9

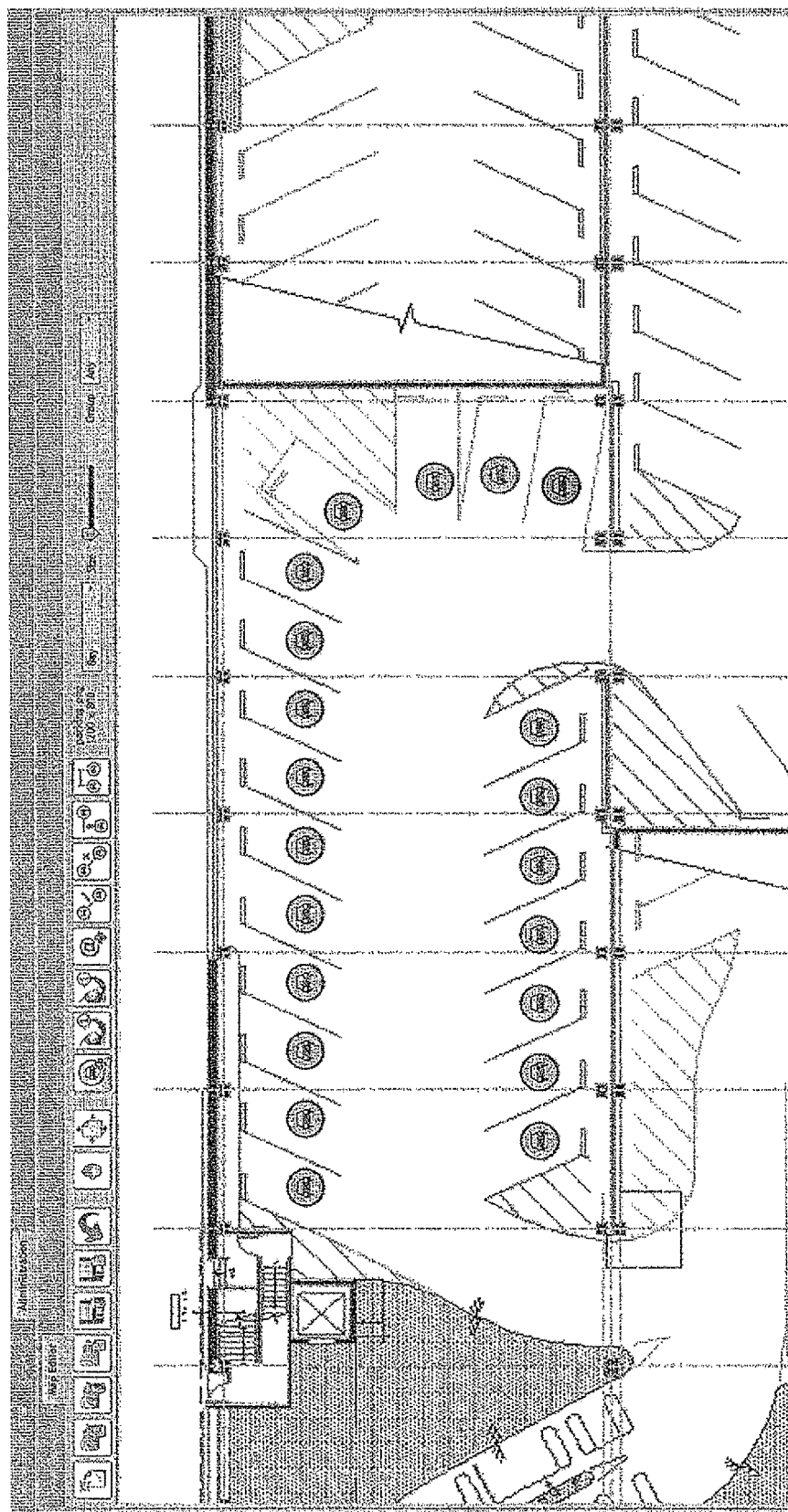


FIGURE 10A

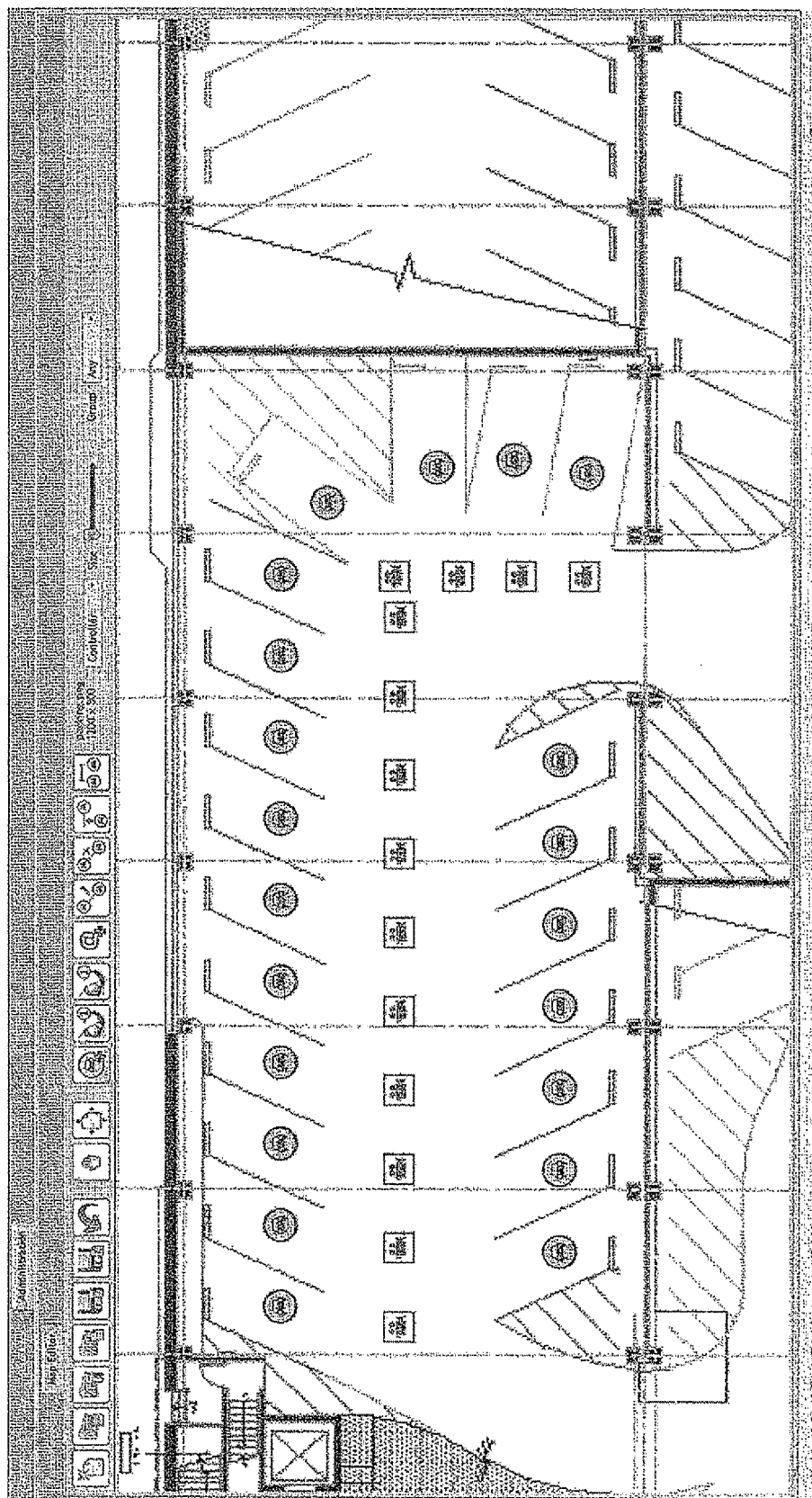
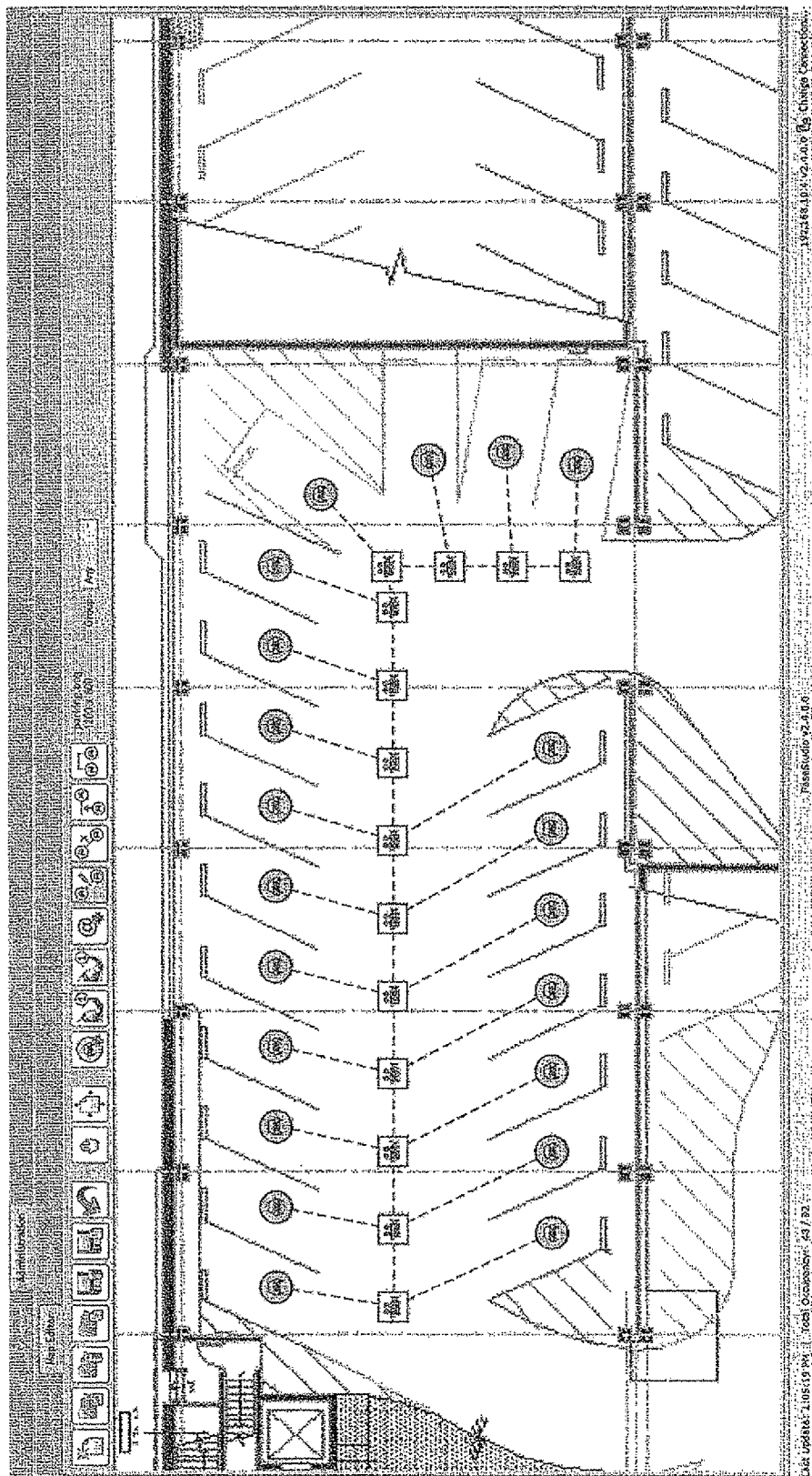


FIGURE 10B



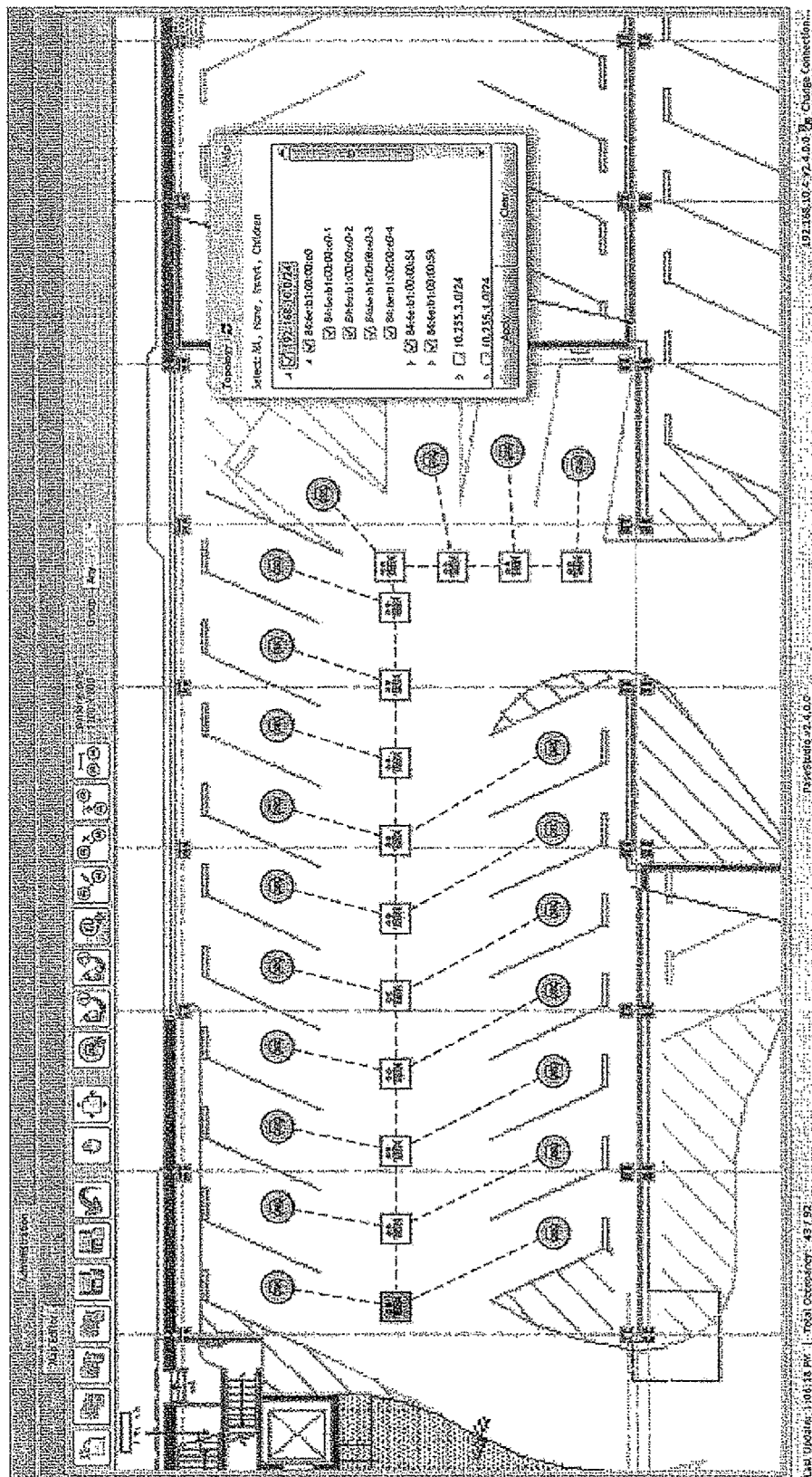


FIGURE 10D

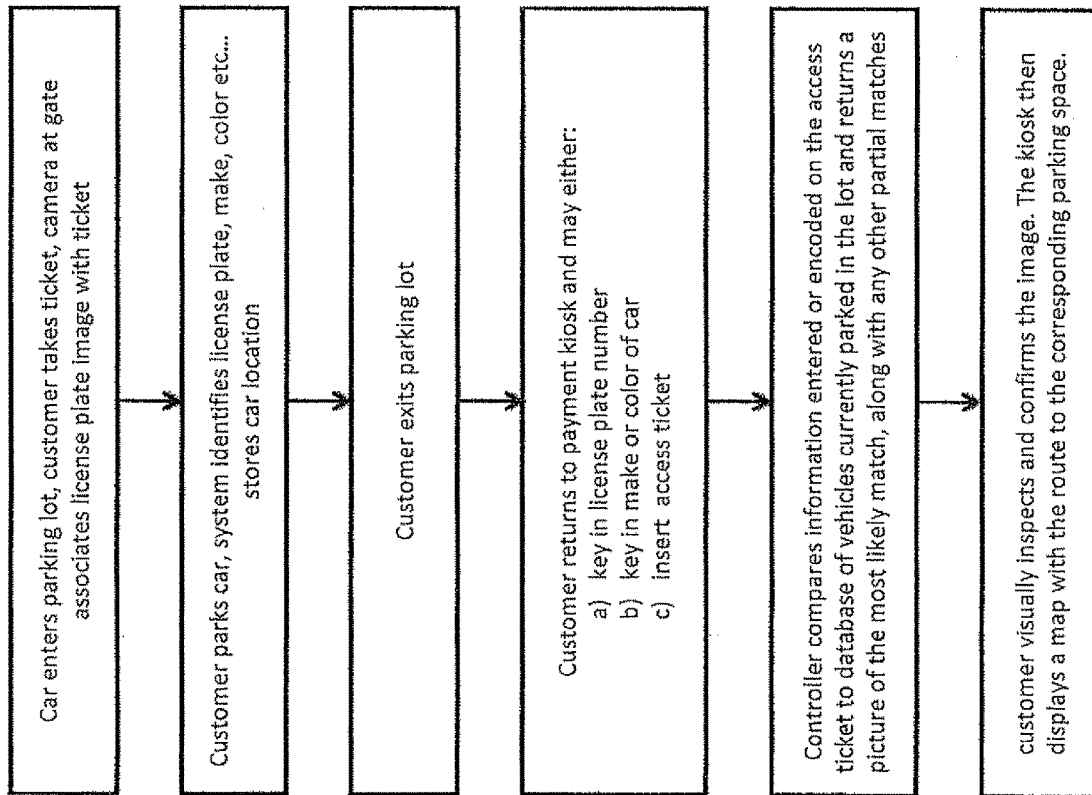


FIGURE 11

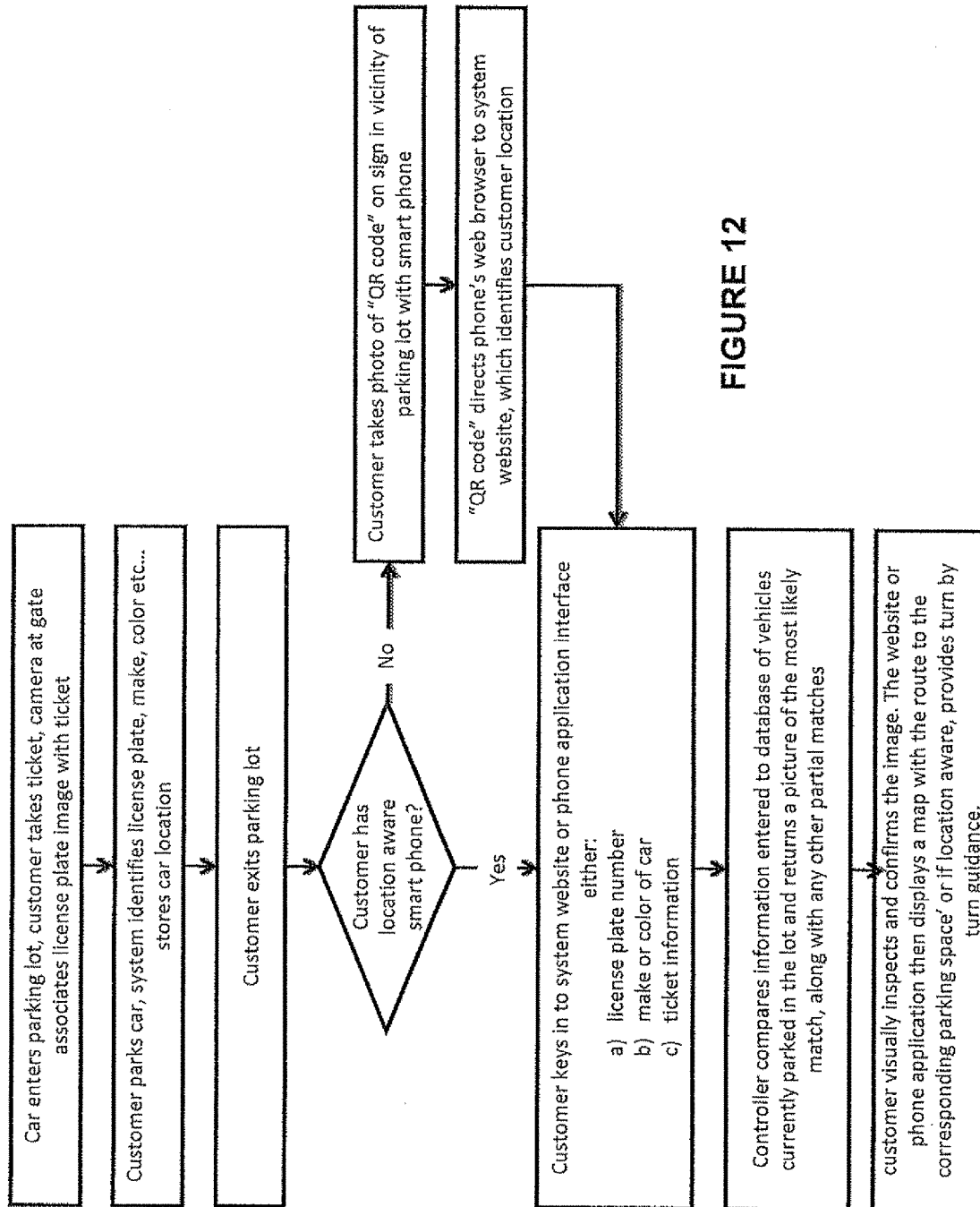


FIGURE 12

METHOD AND SYSTEM FOR MANAGING A PARKING LOT BASED ON INTELLIGENT IMAGING

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to the management of a parking lot and, more particularly, to setting up and using a parking lot managing system that relies on intelligent processing of images of the various parking spaces.

A number of methods have been proposed in the past in order to provide customers guidance within a parking lot to quickly find available space. The use of different sensor technologies, such as ultrasonics or image processing is known. These methods may determine occupancy of slots and provide the driver with guidance to available spaces either upon entry to the parking lot or by displays strategically located within the lot. See for example Trajkovic et al., U.S. Pat. No. 6,426,708, which patent is incorporated by reference for all purposes as if fully set forth herein. However, these methods do not provide customers with guidance to find their car when leaving the parking lot. They do not allow the parking lot proprietor the opportunity to preferentially charge the customer according their parking location within the parking lot. Furthermore, these systems do not integrate the parking lot illumination system with the parking control system so as to enable illumination levels or ventilation systems to be controlled based on parking occupancy, reducing energy consumption. In addition, they do not detect the type of object that is stored in the space, determining if it is a car, motorcycle, parking cart, or other object. They also do not recognize unique aspects of the vehicle, such as make, model, color, and license plate, and thus do not allow the opportunity to present targeted advertisements or marketing programs based on such information. They also do not enable remote viewing of individual parking spaces, enabling human intervention to correct mistakes, detect faulty hardware, or provide real-time feedback to improve system accuracy. Finally, they are not integrated with closed circuit security systems, nor do they offer any information about vehicle and passenger security, such as thefts and violent attacks.

DEFINITIONS

An "occupancy and identity image" is understood herein to mean an image from which either a human operator or a computer equipped with appropriate image processing software can decide whether a parking space is occupied and also can determine the identity of a vehicle that occupies an occupied parking space. A typical example of such an image is an image from which a license plate detection algorithm can extract a license plate number.

An "occupancy image" is understood herein to mean an image from which either a human operator or a computer equipped with appropriate image processing software can decide whether a parking space is occupied.

An "identification image" is understood herein to mean an image from which either a human operator or a computer equipped with appropriate image processing software can determine the identity of a vehicle given that the image is known to be an image of a vehicle.

The images may be acquired in any convenient wavelength band: infrared, visible or ultraviolet. Usually, the images are RGB images at visible wavelengths.

SUMMARY OF THE INVENTION

One objective of the present invention is to provide guidance to customers to efficiently find available parking in a parking lot. A second objective of the present invention is to provide customers guidance in finding their car within a parking lot. A third objective of the present invention is to enable preferential pricing for parking based on location within the parking lot. A fourth objective of the present invention is to reduce parking lot energy consumption. A fifth objective of the present invention is to improve parking lot security. A sixth objective of the present invention is to determine the type of object or vehicle that is currently parked in the parking space, to determine if it is a car, motorcycle, person, parking cart, or other object. A seventh objective of the present invention is to improve enforcement of parking lot rules and regulations. An eighth objective of the present invention is to administer targeted advertising and loyalty programs through vehicle identification. A ninth objective of the present invention is to automatically discover the network topology to enable efficient mapping of the sensor locations onto a map of the parking lot, enabling all services already mentioned to be location-based. A tenth objective of the present invention is to provide a platform for real-time remote monitoring and human control of the parking system.

Therefore, according to the present invention there is provided a method of managing a plurality of parking spaces, including: (a) acquiring at least one occupancy and identity image, such that each parking space is imaged in at least one the occupancy and identity image; and (b) in response to an inquiry by a customer who has parked a vehicle in one of the parking spaces, directing the customer to the vehicle, at least in part in accordance with the at least one occupancy and identity image in which the parking space in which the vehicle is parked is imaged.

Furthermore, according to the present invention there is provided a system for managing a plurality of parking spaces, including: (a) at least one parking space camera for acquiring at least one occupancy and identity image, such that each parking space is imaged in at least one the occupancy and identity image; and (b) a controller that, in response to an inquiry by a customer who has parked a vehicle in one of the parking spaces, directs the customer to the vehicle, at least in part in accordance with the at least one occupancy and identity image in which the parking space in which the vehicle is parked is imaged.

Furthermore, according to the present invention there is provided a method of managing a plurality of parking spaces, including: (a) acquiring at least one occupancy image, such that each parking space is imaged in at least one the occupancy image; and (b) controlling at least one respective environmental aspect of the parking spaces at least in part in accordance with the at least one occupancy image.

Furthermore, according to the present invention there is provided a system for managing a plurality of parking spaces, including: (a) at least one camera for acquiring at least one occupancy image, such that each parking space is imaged in at least one the occupancy image; (b) for each of at least one environmental aspect of the parking spaces, a plurality of devices for controlling the each environmental aspect; and (c) a controller that uses the devices to controls the at least one environmental aspect at least in part in accordance with the at least one occupancy image.

Furthermore, according to the present invention there is provided a method of managing a plurality of parking

spaces, including: (a) acquiring a respective occupancy image of each parking space; (b) providing a system that assigns each occupancy image a respective status selected from the group consisting of vacant and occupied; (c) displaying the occupancy images along with the statuses thereof; and (d) in response to the displaying: for each occupancy image: (i) deciding whether the respective status of the each occupancy image is incorrect, and (ii) if the respective status of the each occupancy image is incorrect, correcting the respective status of the each occupancy image.

Furthermore, according to the present invention there is provided a system for managing a plurality of parking spaces, including: (a) at least one camera for acquiring a respective occupancy image of each parking space; (b) a display device for displaying at least a portion of the occupancy images; (c) a memory for storing program code for: (i) assigning each occupancy image a respective status selected from the group consisting of vacant and occupied, and (ii) displaying the occupancy images on the display device along with the respective assigned statuses thereof; (d) a processor for executing the program code; and (e) an input device for correcting the respective assigned statuses as displayed on the display device.

Furthermore, according to the present invention there is provided a computer-readable storage medium having computer-readable code embodied on the computer-readable storage medium, the computer-readable code for managing a plurality of parking spaces, the computer-readable code including: (a) program code for assigning to each of a plurality of respective occupancy images of the parking spaces a respective status selected from the group consisting of vacant and occupied; (b) program code for displaying the occupancy images along with the respective assigned statuses thereof; and (c) program code for receiving corrections of the respective assigned statuses.

Furthermore, according to the present invention there is provided a method of configuring a plurality of sensors to monitor parking spaces of a plurality of aisles, each aisle including a respective plurality of the parking spaces, the method including: (a) for each aisle: (i) providing a respective sub-plurality of the sensors for monitoring the parking spaces of the each aisle, each sensor being for monitoring a respective at least one of the parking spaces of the each aisle, and (ii) operationally connecting the sensors of the respective sub-plurality to each other in an ordered string, such that a first sensor of the string is a root node of the string; (b) operationally connecting the root nodes to a central controller, thereby providing a network of the sensors; (c) by the central controller: discovering a topology of the network; and (d) for each string: (i) mapping only one sensor of the string to the respective at least one parking space that the one sensor is to monitor, and (ii) using the topology to map each other sensor of the respective string to the respective at least one parking space that the each other sensor is to monitor.

Furthermore, according to the present invention there is provided a system for monitoring parking spaces of a plurality of aisles, each aisle including a respective plurality of the parking spaces, the system including: (a) for each aisle, a respective plurality of sensors operationally connected to each other in an ordered string, the sensors being for monitoring a respective at least one of the parking spaces of the each aisle, with a first sensor of the string being a root node of the string; and (b) a controller to which the root nodes are operationally connected so that the controller and the strings form a network, the controller being operative: (i) to discover a topology of the network, (ii) to present

a user interface for mapping only one sensor of each string to the respective at least one parking space that the one sensor is to monitor, and (iii) for each string, to use the topology to map each sensor of the each string other than the only one sensor of the each string to the respective at least one parking space that the each sensor is to monitor.

Furthermore, according to the present invention there is provided a computer-readable storage medium having computer-readable code embodied on the computer-readable storage medium, the computer-readable code being for configuring a plurality of sensors to monitor parking spaces of a plurality of aisles, each aisle including a respective plurality of the parking spaces, the sensors of each aisle being operationally connected to each other in an ordered string with a first sensor of the string being a root node of the string, the root nodes being operationally connected to a controller so that the controller and the strings form a network, the computer-readable code including: (a) program code for discovering a topology of the network; (b) program code for presenting a user interface for mapping only one sensor of each string to the respective at least one parking space that the one sensor is to monitor; and (c) program code for, for each string, using the topology to map each sensor of the each string other than the only one sensor of the each string to the respective at least one parking space that the each sensor is to monitor.

The methods of the present invention are methods of managing a plurality of parking spaces.

According to a first basic method, one or more occupancy and identity images of the parking spaces are acquired, with each parking space being imaged in at least one of the occupancy and identity images. In response to an inquiry by a customer who has parked a vehicle in one of the parking spaces, the customer is directed to the vehicle, at least in part in accordance with the occupancy and identity image(s) in which the parking space occupied by the vehicle is/is/are imaged.

Preferably, the occupancy and identity image(s) is/are acquired periodically.

Preferably, the method also includes obtaining an identifier of the vehicle, either before the vehicle is parked or as a part of the inquiry. Examples of such identifiers include license plate numbers and partial or complete visual characterizations such as make and color. One example of an inquiry that provides a vehicle identifier is a typed inquiry that includes the license plate number of the vehicle. The parking space in which the vehicle is parked then is identified, in response to the inquiry, at least in part by comparing the identifier to the occupancy and identity image(s) in which the parking space occupied by the vehicle is/is/are imaged.

If the identifier of the vehicle is obtained before the vehicle is parked, then the obtaining of the identifier of the vehicle includes acquiring an identification image of the vehicle. Most preferably, the method then includes issuing to the customer a receipt, such as a printed access ticket or a packet that is transmitted wirelessly to a mobile device of the customer, before the customer parks the vehicle. The receipt includes a representation of the identifier.

Preferred modes of directing the customer to the vehicle include displaying a map that shows a route to where the vehicle is parked or issuing navigation instructions, as a printed list or as interactive instructions transmitted wirelessly to a mobile device borne by the customer.

A system for implementing the first basic method includes at least one parking space camera (e.g. cameras 50 in the preferred embodiments described below) and a controller.

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The parking space camera(s) is/are for acquiring the occupancy and identity image(s). The controller, in response to the customer's inquiry, directs the customer to the vehicle at least in part in accordance with the occupancy and identity image(s) in which the parking space occupied by the vehicle is/are imaged. Preferably, the system includes a plurality of such parking space cameras, with each parking space camera acquiring respective one or more occupancy and identity images of one or more respective parking spaces. Usually, each parking space camera is dedicated to one, two or four specific respective parking spaces.

Preferably, the system also includes an information terminal at which the customer enters the query. Most preferably, the information terminal includes a display mechanism for displaying instructions that direct the customer to the vehicle. Examples of such display mechanisms include a display screen for displaying a map with directions to the parking space, a printer for printing such a map or for printing a list of navigation instructions, and a transceiver for transmitting such instructions interactively to a mobile device borne by the customer as the customer walks to the parking space. Most preferably, the information terminal also includes an input mechanism that the customer uses to input an identifier of the vehicle. A typical example of such an input mechanism is a keyboard at which the customer types the license plate number of the vehicle. In response to the inquiry, the controller identifies the parking space, in which the vehicle is parked, at least in part by comparing the identifier to (one or more of) the occupancy and identity image(s).

Alternatively or additionally, the system also includes a gateway terminal for obtaining an identifier of the vehicle before the customer parks the vehicle in the parking space. In response to the inquiry, the controller identifies the parking space, in which the vehicle is parked, at least in part by comparing the identifier to (one or more of) the occupancy and identity image(s). Most preferably, the gateway terminal includes a mechanism for issuing to the customer a receipt such as an access ticket that includes a representation of the identifier. Also most preferably, the gateway terminal includes an identification camera for acquiring an identification image of the vehicle.

In the preferred embodiments below, entry kiosks 20 and 21 serve both as information terminals and gateway terminals.

According to a second basic method, one or more occupancy images of the parking spaces are acquired, preferably periodically, with each parking space being imaged in at least one of the occupancy images. One or more respective environmental aspects of the parking spaces are controlled at least in part in accordance with the occupancy image(s). Typically, the environmental aspect(s) that is/are controlled is/are illumination and/or ventilation. A corresponding system includes one or more cameras for acquiring the occupancy image(s), a plurality of devices per environmental aspect for controlling the environmental aspect, and a controller that uses the devices to control the environmental aspect(s) at least in part according to the occupancy image(s).

A third basic method starts with acquiring respective occupancy images of the parking spaces. An image classification system automatically designates each occupancy image either "vacant" or "occupied". The occupancy images are displayed along with their "vacant/occupied" statuses. In response to the display, a human operator decides whether the classifications are correct and corrects the incorrect classifications. Preferably, the image classification system

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uses a self-modifying classification algorithm, i.e., an algorithm that can be trained to improve the classification accuracy thereof. In response to the corrections by the human operator, the classification system modifies the classification algorithm to be more accurate.

A corresponding system includes one or more cameras for acquiring the occupancy images, a display device for displaying the occupancy images, a memory for storing program code for classifying the occupancy images as either "vacant" or "occupied" and for displaying the occupancy images along with their respective "vacant/occupied" classifications, a processor for executing the code, and an input device that a human operator uses to correct the classifications as displayed on the display device. Preferably, the algorithm that the program code uses to classify the occupancy images is self-modifying. The scope of the invention also includes a computer-readable storage medium bearing such computer-readable program code.

A fourth basic method of the present invention is a method of configuring a plurality of sensors, such as camera units 16 of FIG. 1 below, to monitor parking spaces of a plurality of aisles, such as aisles 11, 12 and 14 of FIG. 1 below, each of which includes its own respective plurality of parking spaces. Each aisle is provided with two or more sensors. It is intended that each sensor be responsible for monitoring one or more respective parking spaces of the aisle. In each aisle, the sensors are connected operationally to each other in an ordered string. (That the string is ordered means that, with $N \geq 2$ sensors in the string, the first sensor is connected only to the second sensor, the last sensor is connected only to the next-to-last sensor, and, if $N > 2$, sensor i ($1 < i < N$) is connected only to sensors $i-1$ and $i+1$.) The first camera in each string is the root node of the string. All the root nodes are connected operationally to a central controller such as system controller 44 of the preferred embodiments described below, either directly or indirectly via intermediate devices such as row controllers 42 of the preferred embodiments described below, thereby providing a network of the sensors. The central controller discovers the topology of the network. Only one sensor of each string (preferably the root node sensor) is mapped to the respective parking space(s) that that sensor is to monitor. The topology is used to map the other sensors of each string to their respective parking spaces.

A corresponding system includes, for each aisle, a respective plurality of sensors operationally connected to each other in an ordered string with a first sensor of the string being a root node of the string, and a controller to which all the root nodes are operationally connected, so that the controller and the strings form a network. The controller is operative to discover the topology of the network, to present a user interface for mapping only one sensor of each string to its respective parking space(s), and to use the topology to map the rest of the sensors to their respective parking spaces. The scope of the invention also includes a computer-readable storage medium bearing computer-readable program code that the controller executes to accomplish those ends.

The controllers of the systems of the present invention may be local to the parking lot that includes the managed parking spaces or, as illustrated in FIG. 2 below, may be distributed among two or more sites with the various components of the controllers communicating with each other via a network such as the Internet.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments are herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a plan view of a parking lot;

FIG. 2 is a schematic illustration of a system of the present invention;

FIG. 3 is a block diagram of a camera unit of FIG. 2;

FIG. 4 is a block diagram of a row controller of FIG. 2;

FIG. 5 shows screen captures that illustrate the "find your car" feature;

FIG. 6 is a partial block diagram of an entry kiosk of FIG. 1;

FIGS. 7 and 8 shows web page user interfaces for manual tuning of the automatic vehicle detection algorithm;

FIG. 9 is a partial block diagram of a system controller that is configured to support interactive correction of automatic occupancy detection;

FIGS. 10A-10D illustrate mapping of camera units to their locations following camera unit network topology discovery;

FIGS. 11 and 12 are flowcharts of the "find your car" feature.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The principles and operation of a parking lot according to the present invention may be better understood with reference to the drawings and the accompanying description.

Referring now to the drawings, FIG. 1 is a plan view of the interior of an exemplary enclosed parking lot 10 that is managed according to the principles of the present invention. Parking lot 10 includes three aisles 11, 12 and 14, each aisle including two rows of parking spaces 15. Each pair of parking spaces is monitored by an associated camera unit 16. Each parking space 15 is provided with its own ventilation vent 23 and its own lighting fixture 24, in the ceiling of parking lot 10. Each row of parking spaces 15 has two row displays 18 at either end. Each entrance 30, 31 of parking lot 10 has adjacent to it an entry kiosk 20, 21.

FIG. 2 illustrates an exemplary embodiment of a system of the current invention. The system includes camera units 16, row controllers 42, a system controller 44 and a system user interface 46. System user interface 46 may be connected to multiple additional external systems as shown in FIG. 2.

In one embodiment of the system of FIG. 2, high resolution, low noise, CMOS digital camera technology is used for the purpose of monitoring every parking space 15. Images that are collected are processed within the individual camera module 16. Images, license plate data or occupancy data or any combination of the three can be passed through row controllers 42 to the central system controller 44 for actual live inspection down to the individual space 15 from the central station.

Remote access to the central station through the Internet can provide control and access including live images from any of up to thousands of cameras throughout a parking garage. Each unit 16 is designed to monitor one or more parking spaces 15 through directly detecting occupancy in the specific parking space 15. In the example of FIG. 1, each unit 16 monitors two parking spaces 15. Furthermore, an energy efficient multicolor LED indicator within unit 16 may be used to indicate the occupancy status of that space 15. For example, a green light may indicate the space 15 is vacant

and available for general parking, a blue light may indicate that space 15 is vacant and available for handicapped parking only, and a red light that the space 15 is occupied. In addition to or in place of illumination fixtures 24, energy efficient LED area illumination can also be incorporated into unit 16, with the illumination via units 16 and/or via fixtures 24 controlled by system controller 44 on the basis of local occupancy levels, conserving energy when occupancy levels are low.

Digital scoreboard signs, such as row displays 18, showing the number of vacant spaces 15 in a particular physical area of the parking lot such as the rows of aisles 11, 12 and 14, can be updated by system controller 44 directly, or via row controllers 42.

In one specific embodiment, the system configuration provides centralized access and control down to the individual space 15 level. System controller 44 connects to up to 512 individual row controllers 42 over an extended range Ethernet CAT5e network. Each row controller 42 can be attached to up to 4 rows of 128 individual camera units 16 per row, for a total of 512 cameras per row controller 42. Each camera unit 16 can monitor one or more parking spaces 15, either on opposing sides of the camera unit 16 or in side by side parking bays 15. Thus a single system of the present invention can monitor and control up to one million individual parking spaces 15.

FIG. 3 is a high level block diagram of a camera unit 16. Camera unit 16 is used to detect, identify and indicate the occupancy of a garage parking space 15.

Each camera unit 16 includes:

- high intensity red, green, and blue LED indicators 48 with diffuser
- two high resolution, high sensitivity CMOS multi-megapixel digital cameras 50
- one or more 400 MHz ARM9 processor 52, available from ARM Ltd. of Cambridge GB, with SDRAM 54 and flash memory 56
- two 10 Mbyte/second RS-422 serial ports 58 for daisy chain installation (or 3-port Ethernet switch)
- optional LPR (License Plate Recognition) software in flash memory 56

Row controller 42 attaches to system controller 44 through extended range CAT5e Ethernet. Each row controller can control up to 4 rows of 128 dual camera modules 16 per row. Because each camera module 16 can monitor multiple spaces, a row controller 42 can monitor more than 1024 parking spaces (in two opposing rows).

Each row controller 42 can be used to control multiple independent signs 18 through two independent RS-422 interfaces.

FIG. 4 is a high-level block diagram of a row controller 42. Each row controller 42 includes:

- embedded computer module 86 with ARM processor 88, SDRAM 90 and flash memory 92
- ethernet switch interface 94
- up to 4 RS-422 camera module interfaces 96
- up to 2 sign control interfaces 98

These components communicate with each other via a bus 100.

System controller 44 is a desktop or server grade computer that monitors the entire system and provides a user interface 46 to other external systems that can connect to the parking system. The system is designed in a way that the parking lot signs 18, row controllers 42, and camera units 16 can run even if the system controller 46 is unavailable.

In another exemplary embodiment, camera modules 16 communicate via Ethernet through an on-board three-port

Ethernet switch such as the Micrel KSZ8873MLL available from Micrel, San Jose Calif., USA. System controller 44 can then be connected directly to camera units 16, without the intervening row controllers 42. Standard network components such as routers and switches can be used to extend the network in a star topology across any physical layout. In that case, the number of camera units 16 per row is effectively unlimited.

In another exemplary embodiment, peripherals such as digital scoreboard signs 18 are connected to the same Ethernet network, either directly or via Serial-to-Ethernet conversion, and are updated through the network by system controller 44 or by row controllers 42.

In another exemplary embodiment, camera units 16, which may be serial or Ethernet based, are mounted in the center of the driving lane and have two cameras 50, one per side, to monitor bays on opposite sides of the lane. If either of the two spaces 15 is vacant, then LED indicator 48 is turned green to show a vacant regular space and blue to show a vacant handicapped space. If both spaces 15 are occupied, LED indicator 48 is turned red.

In another exemplary embodiment, each camera 50 is aimed such that two adjacent parking spaces 15 are visible in its field of view, so that the camera unit 16 captures information about up to four spaces 15. In that case, if at least one of four (or one of three, or one of two) spaces 15 is vacant, LED indicator 48 is turned green to show a vacant regular space and blue to show a vacant handicapped space. If all spaces 15 are occupied, LED indicator 48 is turned red. This architecture can be further embellished to include N spaces per camera 48 (and thus 2*N spaces per unit 16), provided all N spaces are visible in the field of view of camera 48. Wide-angle lenses can be used to increase the field of view of camera 48.

One preferred aspect of the system is the ability to automatically determine the network topology and map camera units 16 physically onto a map of the parking structure. This can be achieved in a variety of ways, depending on the specific embodiment of the invention:

1. Serial Communication

Packet Decoding Method

For serial communicating camera units 16, each packet gets retransmitted by a camera unit 16 if destination address is somewhere down the row. Each packet includes a header with several fields necessary for discovery of the location of a camera unit 16:

“original address”
“source address”
“destination address”

When packet is received, camera unit 16 checks if a location was assigned. If not, the following applies:

Camera unit 16 checks for a source address. The source address is the address of row controller 42 or the first neighbor on the way to the row controller 42. If ID is 0, then camera unit 16 is the first on the row.

Camera unit 16 increments the source address of the packet and assigns its own ID.

Camera unit 16 also marks the port where packet was received as HOME port and the other as AWAY port.

HOME port is the port towards the row controller 42. After location is assigned, camera unit 16 uses this ID to mark all outgoing packets in the “source address” field.

2. Ethernet Sorting Version 1

Server Initiated Topology Discovery and Sorting Algorithm

This method assumes that the network of camera units 16 is organized into several IP subnets, each with one or more daisy-chain strings of nodes (star topology).

1. System controller 44 sends “Get Version” request to each IP in the IP network group to find out number of camera units 16 and their IP/MAC addresses.
2. System controller 44 assembles a list of all active camera units 16 in the network group.
3. System controller 44 issues request to each camera unit 16 to ping the assembled list of camera units 16 in order to populate MAC table of its Ethernet switch.
4. System controller 44 requests MAC tables from all camera units 16.
5. System controller 44 performs topology discovery and sorting algorithm as follows:

Topology Discovery Algorithm:

System controller 44 finds end camera units 16. End camera units 16 do not have any other camera unit 16 MAC addresses on one of the ports of their Ethernet switch.

System controller 44 chooses randomly a single end camera unit 16.

System controller 44 builds a route by selecting another end camera unit 16 and checking all camera units’ 16 MAC tables. A camera unit 16 belongs to this route if both end camera unit 16 MACs are located on separate ports of the camera unit’s 16 MAC table. Each camera unit 16 is checked and route is built as a list.

System controller 44 finds the first end camera unit 16 by checking the table for either the System controller’s 44 MAC or the router’s MAC. The First System controller’s 44 MAC should be located on the same port with the System controller’s 44 MAC.

Sorting Algorithm

System controller 44 picks a random camera unit 16 in a middle of the discovered route.

System controller 44 moves all camera unit 16 of the route on either side of the selected camera unit 16 based on a MAC location in the selected camera unit 16 MAC table. For example: camera unit 16 that appeared on port 0 are moved to the left of the selected camera unit 16, and the rest are moved to the right. The selected camera unit 16 becomes “top” of the two branch tree.

System controller 44 chooses right branch first and walks through the camera unit 16 applying a sliding window of three camera unit 16 including the top camera unit 16. System Controller 44 arranges the three camera unit 16 between each other.

System controller 44 slides the window down by one camera unit 16 and performs arrangement again until the bottom is reached.

System controller 44 slides the window again from the top until no camera unit 16 are shifted in this branch.

The left branch is sorted the same way. This can be done in parallel with the right branch in two separate threads. Sorting of the branches is an independent task.

System controller 44 builds routes for remaining end camera units 16 and repeats sorting for each branch.

Every time routes cross on a camera unit 16, system controller 44 marks camera unit 16 as joint camera unit 16.

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At the end we've got a sorted tree which can have any number of branches and cross-branches.

3. Ethernet Sorting V2

Camera Unit 16 Initiated Topology Discovery

This sorting method includes a requirement that the network avoid branching, and that each string of camera units 16 exists on a single router entry. This method invokes two components: TDD: Topology Discovery Daemon—a program running constantly in the background on the ARM processor of each camera unit 16, and a SensorIdentity library which is called on demand by the main application running on the camera unit 16 to find out its location at any time. The TDD daemon's main responsibility is to refresh all MAC tables in the string.

TDD is called by a watchdog agent on the TDD's camera unit 16 every 30 seconds.

TDD checks if its camera unit 16 is the last camera unit 16 in the string. TDD gets MAC table from the camera unit 16 Ethernet Switch and checks if there are no camera unit 16 MAC entries on one of the ports.

If the TDD's camera unit 16 determines that it is the last camera unit 16 in the string:

TDD gets broadcast address from socket control functions.

TDD sends ping for a single packet on the broadcast address. This ensures that each camera unit 16 in the string receives the ping packet and that the MAC table of the Ethernet switch of each camera unit 16 in the string gets populated.

TDD exits.

SensorIdentity library is called by the main application running on the camera unit 16 to get its location ID in real-time. SensorIdentity library performs the following actions:

Gets gateway address from network tools (socket control functions)

Finds MAC address of a gateway by ARPing the address.

Finds which port of the MAC table includes the gateway MAC.

Calculates the number of camera unit 16 on the same port. The camera unit 16 location ID is the calculated number+1.

Vehicle and Event Detection Algorithms

In one embodiment, the car detection algorithms run inside each camera unit 16, and work even if the connection to the row controller 42 is missing. Periodically, for example several times a second, an image is captured by the internal CMOS sensor of the camera unit 16 and is transmitted to the SDRAM 54 of the unit 16. ARM processor 52 in unit 16 then examines the image, calculating several metrics based on the content of the current image. These metrics are fed into a classification routine which has been previously trained on several thousand car and empty space images. The output of this classifier determines if a car is in the space 15 or not. Based on the values of the metrics, different types of vehicles and objects can be determined. Any classification routine or machine learning algorithm can be used; some common algorithms in the literature include Classification and Regression Trees, Support Vector Machines, and Artificial Neural Networks.

In one extension to the method described above, the metrics that are computed can themselves be learned from

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training data, using a variety of methods known in the art such as Kernel Methods, Principal Components Analysis, Independent Component Analysis, Feature Detection Methods, etc.

In a second extension, the determination of parking space occupancy can take into account time and historical activity. For example, using methods of background modeling, the detection routine can learn a model of the empty space over time and compare new images to the learned model to determine if a vehicle has entered or exited. Another implementation could use a change detection algorithm to determine when an event has occurred in the parking space (i.e. a car has entered or departed), by computing a running average or variance of the image or some other aspect or aspects of the image, and comparing the aspect of the image to the same aspect of each other image frame.

In a third extension, both of the above methods could be combined to provide a more accurate and robust method to detect vehicles in the parking space. For example, the output of the classifier could be used as feedback for the modeling routine to refine or prune its model. This could be further refined by using the "confidence" value of the classification output. In addition, the change detector could be used to bias the decision, depending on the current state. Moreover, the combination of methods can be tuned to trade off between false alarms (saying the space is occupied when it is really empty) and misses (saying the space is empty when it is really occupied), depending on the operator's preference.

In a fourth extension, a complete time- and history-dependent Markov model of the parking space can be constructed and updated in real-time. For example, at each time step (usually the acquisition time of a single image), the likelihood of the space being occupied is a function of the previous state, the current image metrics, the previous n image metrics, and the current time. This function can be optimized offline from training images, or can be learned and updated in real time.

The decision space of any or all of these algorithms can be expanded to include other events or characteristics to be detected, such as vehicle make, model, class, and color, as well as security events such as suspicious activity and physical violence.

License Plate Detection Algorithm

License plate detection by a camera unit 16 occurs in two stages. First, the image patch containing the license plate can be found using a variety of methods, such as template matching, or edge detection, looking for rectangular edges in the image and finding the most likely candidates for a license plate, based on the relative location and aspect ratio of the license plate. The license plate image is then processed by an Optical Character Recognition (OCR) routine that determines the values of the text and symbols contained in the license plate. This information is then transferred to system controller 44 (directly, or via the row controller 42) for storage and use.

In alternative embodiments, any or all of these algorithms run in the row controllers 42, in the system controller 44, or in the Ethernet level, or in a combination thereof. For example, in one such embodiment a camera unit 16 detects a vehicle entering a parking space and notifies system controller 44. System Controller 44 then requests a high resolution image from that camera unit 16. When system controller 44 receives the image from the camera unit 16, system controller 44 processes the image to extract the

license plate image and presents the extracted license plate image to an OCR module for text extraction.

Additional Features

Find Your Car Feature

The system captures and analyses license plates and their location to the individual spaces **15** in parking lot **10**. A customer enters his/her license plate number at the one of the entry kiosks **20** or **21**, to locate the exact space at which the vehicle is parked. FIG. **5** shows exemplary screen captures, from the display screen of an entry kiosk such as entry kiosks **20** and **21**, of the process. The customer may either key in the license plate number, make or color of car. Alternately, in an embodiment in which a camera similar to camera **50** in the relevant entry kiosk **20** or **21** captured the customer's license plate number when the customer's vehicle entered parking lot **10** and encoded the license plate number in the access ticket issued by the entry kiosk, the customer inserts the access ticket into the entry kiosk, which reads the encoded license plate number. System controller **44** then compares the information entered or encoded on the access ticket to its database of vehicles currently parked in the lot, and returns a picture of the most likely match, along with any other partial matches, as shown in the left screen capture of FIG. **5**. The customer can then visually inspect and confirm the image. The kiosk then displays and/or prints a map with the route to the corresponding parking space, as shown in the right screen capture of FIG. **5**. FIG. **11** shows a flowchart of this embodiment of the "find your car" feature.

In an alternative embodiment, the customer may use his/her smart phone or similar mobile device instead of a kiosk. For example, the customer could take a picture of a "QR code" printed on a sign near the parking lot, which will direct the phone's web browser to a website where the customer can enter the vehicle information as in the kiosk method. Each QR code can be associated with a specific spatial location, allowing the system to compute a route from the customer's specific location. FIG. **12** shows a flowchart of the alternative embodiment of the "find your car" feature.

FIG. **6** is a partial high-level functional diagram of entry kiosk **20** or **21**, showing the functional elements of entry kiosk **20** and **21** that may be needed for the "find your car" feature. Kiosk **20** or **21** includes a camera **62**, similar to camera **50**, for capturing identification images of vehicles entering parking lot **10**, a keyboard **64** at which a customer types the license plate number of his/her vehicle, a display screen **66** for displaying responses such as shown in FIG. **5** in response to the customer's inquiry, a printer **68** for printing access tickets, a reader **70** for reading access tickets and a transceiver **72** for communicating with customers' mobile devices. Components **62**, **64**, **66**, **68**, **70** and **72** are under the control of an entry kiosk controller **60** via a bus **74**.

In another embodiment, the customer's smart phone location-awareness can be used to compute a route to the parking space from the customer's current location. With a precise location-aware system, such as a location-aware system based on WiFi time-difference-of-arrival, the customer can be directed with turn-by-turn directions, or through an updating, homing-beacon process.

Tiered Parking Control

Under the tired parking control scheme, the cost of parking varies depending on the location of each individual parking space **15**. The present invention records the license plate of a vehicle on entrance to the car park, using a camera

in the relevant entry kiosk **20** or **21**, and reconciles the ticket with the license plate number captured at the individual parking space **15** by camera unit **16**. Alternatively, the individual space number is reconciled with the license plate under a pay by space format. Finally, the customer may attach a prepayment to the customer's license plate number, and the system can automatically bill the customer for the exact space the customer parks in. This method allows billing of customers for use of a specific parking space at a specific time without requiring any form of physical access control such as barrier gates, ticket or credit card payment terminals. Following reconciliation on system back-end software, a tariff is charged based on the location of the parking space at the automated pay station of the garage. This enables differential pricing to be efficiently varied based on the location, type or demand down to the individual space of the car park. Alternately, this could be varied by amount of time spent in car park, number of previous times a vehicle has been parked, etc

Permit Parking Control

Detection algorithms in the system software are capable of identifying permit badges to ensure that parking spaces that are allocated for permit use are occupied by authorised permit holder only. If a permit is not displayed, the system takes a picture of the vehicle for infringement processing. Parking garage management need no longer allocate a nested staff area; simply create a designated area and staff will be notified if they park outside this area. In an alternative embodiment, permit parking can be allocated by license plate, or unique combination of vehicle make, model, color, and other identifying marks.

Parking Lot Lighting and Ventilation System Efficiency Enhancement

Since the system of the present invention enables all parking slots **15** to be surveyed in real time, illumination of slots and driveways can be controlled according to real time usage of each parking space **15**. As a result, lighting levels can be changed for individual spaces, zones or floors, e.g. via differential control of lighting fixtures **24**, leading to energy power savings. Furthermore, the same is true for ventilation systems whose power output and usage levels can automatically be adjusted based on individual parking space **15** utilization e.g. via differential control of ventilation vents **23**.

Customer "Profiling"

Different types of cars may correlate to different types of fee structures. Furthermore, different types of vehicles, such as hybrids, vehicles with permits, or vehicles subject to manufacture promotions, may be allowed to park in individual spaces **15** at a discount or premium. The detection algorithms are able to correlate the type of car to the promotion, discount or incentive. Furthermore, vehicle identification can be linked to customer loyalty rewards programs, allowing operators to provide shopping incentives at the point of parking. More details of such loyalty programs are provided below.

Enforcement

The system can track in real time whether a particular parking space **15** is correctly occupied, for every parking space **15**, 24 hours a day. If a vehicle stays longer than the proscribed length of time, enforcement action can be taken automatically using vehicle identification information (e.g. license plate) or manually by alerting enforcement personnel. Other infractions to parking rules and regulations, such as a single vehicle occupying more than one space **15**, can also be detected and acted upon.

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Object Type Detection

Via image processing algorithms run either in camera units **16** or in row controllers **42** or in system controller **44**, the system can monitor the type of object that is parked in a space **15**. This can identify the make and model of a vehicle, and also tell if the item parked in the space **15** is a motorcycle, parking cart or a person. This can be used to notify the parking lot manager that the parking cart needs to be removed, that someone is loitering in the parking lot, or other such uses.

Security

The image processing algorithms are capable of detecting other types of events, including suspicious activity that might indicate a theft in progress or a physical attack on a customer. This information can be sent to security personnel for immediate action, thereby improving the accuracy and coverage of existing closed circuit camera systems and other security measures already in place.

Remote Monitoring and Control

System controller **44** can be connected to the Internet, as shown in FIG. **2**, enabling a large-scale system for real-time monitoring and control of any parking lot **10** from anywhere in the world. This can be achieved through a client-server architecture that combines software running on a remote computer, Internet-based communications, and server software running on system controller **44**. In the following discussion, the term “server” refers to server software running on system controller **44**. This remote monitoring system can be used for the following purposes:

Remote monitoring of parking spaces **15** for security and enforcement

To improve the accuracy of the automatic detection through human intervention

As an input to the automatic detection algorithm, to refine the computer vision models by correcting errors and providing new labeled data

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a) The camera module **16** notifies the system controller **44** that an entry/exit was detected by sending a Visit Event

b) The camera module **16** notifies the server that camera module **16** image has changed by sending a Change Detected Event

c) The system controller **44** cached copy of the thumbnail is greater than 10 minutes old

The parking lot manager interfaces with the system through a web browser, opened to a web page that is served up by system controller **44** using a combination of HTML and JavaScript. An example of the web page user interface is shown in FIG. **7**. In this overview monitoring system, the parking lot manager selects one or more zones that s/he wishes to monitor. A zone is a group of bays **15**, usually an entire level of parking spaces.

Every 10 seconds, a periodic task running in the web browser client queries a JSON webservice on the system controller **44** that returns the list of all bays **15** in the selected zones. The response includes a timestamp of each of the server's thumbnails. If the client's copy of the thumbnail is out of date (or it has never been downloaded) the client downloads the thumbnail from the server and inserts the thumbnail onto the page.

The page is split into 4 buckets. In each bucket, there is a grid of the thumbnails belonging to that category. The manager can click on any images associated with incorrect detection decisions to toggle the override mode of a camera unit **16**. If the camera unit **16** is in automatic mode, a mouse click forces it to the opposite detection decision. If the camera unit **16** has been forced into an overridden state, a mouse click puts the camera unit **16** back into automatic mode. Based on its next detection decision, the camera unit **16** will go to the VACANT or OCCUPIED state in automatic mode.

The following table shows how the manager corrects erroneous detection decisions.

State	New State	Why the user should click
VACANT in automatic detection mode	FORCE_OCCUPIED	There is a vehicle visible in the image that was not being detected by the algorithm
FORCE_VACANT (override active)	Automatic mode	There is a vehicle visible and the camera module 16 had been forced into a vacant mode. The click puts the camera module 16 into automatic mode and it goes into VACANT or OCCUPIED in automatic mode based on the outcome of the detection algorithm's decision
OCCUPIED in automatic detection mode	FORCE_VACANT	There is no vehicle in the image, and it is being detected as occupied by the algorithm
FORCE_OCCUPIED	Automatic mode	There is no vehicle in the image but the camera module 16 had been forced into a OCCUPIED mode. The click puts the camera module 16 into automatic mode and it goes into VACANT or OCCUPIED in automatic mode based on the outcome of the detection algorithm's decision

To identify system faults such as broken cameras **50**, **62** and take corrective action.

In one embodiment of this system, system controller **44** keeps a copy of a thumbnail image from each camera **50** on the site. When any of the following three actions are triggered, system controller **44** requests an image from the associated camera unit **16** and places it into a server-side cache located on the system controller **44**:

Of course, such correction of erroneous detection decisions also can be done locally, directly at system controller **44**.

The decision space of the grid can be expanded to allow error correction and model update for other types of decisions, such as vehicle make, color, vandalism, etc.

In an alternate embodiment, the system is further optimized for allowing human intervention for correcting errors

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and updating models, either off-line or in real-time. In this case, human intervention to correct detection mistakes and label data takes the form of a simple web-based game, as depicted in FIG. 8. The human operator is presented with two grids of up to 9 images each. In the grid on the left, thumbnails are displayed of bays 15 that the vision algorithms have labelled as being occupied. Similarly, on the right are thumbnails of bays 15 that the algorithm has labelled as vacant. The human operator must click on any mislabeled data on the screen before submitting the changes to the server. A 30 second timer and the tracking of how many corrections have been made can be used to incentivize the operator to make many corrections as fast as s/he can.

As this preferably is a distributed system allowing many simultaneous operators to label the data, the server must decide which images are being allocated to users. The server maintains a priority queue, and a client request for images returns a block of images with the highest priority. These images are immediately removed from the priority queue to ensure that each user is getting a unique set of images. Each of the following criteria adds to the image's priority score, with the highest scores denoting the images with the highest priority:

1. The camera module 16 detected a significant change in its image
2. The camera module 16 is currently overridden
3. This parking space has previously been marked as incorrect (for spaces with recurring errors)
4. The algorithm's detection confidence is low
5. This space has not been "watched" for more than 20 minutes

FIG. 9 is a high-level partial block diagram of an embodiment of a system controller 44 that is configured to support such interactive correction of the parking space occupancy detection algorithm. This system controller 44 includes a non-volatile memory 76 such as a hard disk or a flash disk, a processor 78, a display device 80 such as a display screen, and a manual input device 82 such as a keyboard or a mouse, all communicating with each other via a bus 84. This system controller 44 also is coupled, usually indirectly (as indicated by the dashed arrows), to camera units 16 to receive occupancy images of parking spaces 15. Non-volatile memory 76 is used to store executable code 77 for classifying the occupancy images as occupied or vacant, for displaying these classifications on display device 80, for receiving corrections of these classifications via manual input device 82, and for modifying the classification algorithm in response to the corrections to make the classification algorithm more accurate, as described above.

Non-volatile memory 76 is an example of a computer-readable storage medium bearing code for classifying occupancy images, for interactively correcting these classifications and for modifying the classification algorithm.

Efficient Mapping of Sensor Locations

To enable any method that requires knowledge of the location in a parking lot 10 of a specific parking space 15, we need a method for mapping each camera unit 16 to the specific parking bay or bays 15 that the camera unit 16 monitors. The naïve approach is to manually record the unique address (MAC, IP, etc) of the corresponding camera unit 16 for each bay 15, along with the bay's unique number. These numbers can be linked and cross-referenced in a table or a database. In addition, the bay locations can be manually marked on a map image of parking lot 10, for use in helping

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customers find their cars, or for providing a pictorial view of the parking lot occupancy status to the parking lot manager.

Unfortunately, the process of manually recording and associating parking bays 15 with camera units 16 is extremely time consuming, costly, and error prone. Moreover, if the physical layout changes at any time during the life of the system—for example, if a camera unit 16 is replaced, or if the bay locations are changed—the associations must be manually updated to ensure the mappings remain accurate.

A better method is to use automatic discovery of the network topology to simplify the process of mapping bays 15 to camera units 16 in software. The system of the present invention can use any of a number of automatic topology discovery algorithms to identify and map the topology of the network of camera units 16, including the Packet Decoding Method described above for serial communications, the Server Initiated Topology Discovery and Sorting Algorithm described above for Ethernet communications, the Sensor Initiated Topology Discovery Algorithm described above for Ethernet communications, or any of a number of protocols known in the art, such as the Spanning Tree algorithm used by the Simple Network Management Protocol (Internet Engineering Task Force RFC 3411—An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks).

Once the network topology is known, mapping bays 15 in a map image and associating them with camera units 16 is simply a matter of associating just one camera unit 16 of each string of camera units, as recorded in the network topology, with the intended map coordinates of that camera unit 16 and of the bay(s) 15 that that camera unit 16 monitors. Because system controller 44 knows the network topology and also knows the map coordinates of all camera units 16 and of all the other bays 15, system controller 44 can associate all the remaining camera units 16 with their respective map coordinates and with the map coordinates of the bays that those camera units monitor. FIGS. 10A-10D are screen captures of a graphical user interface (GUI) that illustrate how this can be done simply in a single step, as follows:

1. User loads a map image of the parking lot, such as an engineering plan or other pictorial of the parking lot layout, into the GUI.
2. User marks the locations of the parking bays 15 by placing "bay pushpins" at the appropriate places in the image, as illustrated in FIG. 10A. The software automatically saves the relative x- and y-coordinates in the image for each bay pushpin.
3. User marks the locations of camera units 16 by placing "camera pushpins" at the appropriate places in the image, as illustrated in FIG. 10B. The software automatically saves the relative x- and y-coordinates in the image for each camera pushpin. Note that at this point the system knows the map coordinates of camera units 16 but does not yet know which camera unit 16 goes with which map coordinates.
4. User associates each bay pushpin with a camera pushpin by drawing a line from the bay pushpin to the camera pushpin, as illustrated in FIG. 10C. A camera pushpin can be linked to multiple bay pushpins, but each bay pushpin can only be linked to a single camera pushpin.
5. User links the camera pushpins in a string by drawing a line to connect them, as illustrated in FIG. 10C. A camera string corresponds to a physical string of camera units 16 daisy-chained together. A camera string begins at a "root node" attached directly to a row controller or an IP

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network switch, and terminates at an “end node” which is a camera unit **16** that has one empty communications port (either Serial or Ethernet switch).

6. User opens the Topology Discovery Tool window and finds the appropriate camera string, identified by the IP address of the row controller or Ethernet switch attached to its root node, as illustrated in FIG. **10D**.
7. User selects the camera pushpin corresponding to the camera string’s root node (this pushpin is shaded in FIG. **10D**), and presses Apply in the Topology Discovery Tool window. The software automatically links and cross-references the camera pushpins along the camera string with the physical MAC addresses of the camera units **16**, in order, according to the discovered network topology.
8. The user repeats this process for every physical string of camera units **16** in the parking lot.
9. If a camera unit **16** is ever replaced, the system can detect a change in the topology and automatically update the mapping to reflect the new change without requiring user intervention.
10. If bays **15** are ever moved or reconfigured or added or removed, or if camera units **16** are added or removed, the user can easily detect and correct the change using the GUI.

FIG. **9** serves to illustrate a system controller **44** configured to map the locations of camera units **16** as described above, provided that executable code **77** is understood as executable code for implementing the mapping of the locations of camera units **16** as described above. Non-volatile memory **76** then is an example of a computer-readable storage medium bearing code for mapping the locations of camera units **16** as described above.

Loyalty Programs

The information collected by the system can be used to enhance customer loyalty and shopping incentive programs by identifying customers automatically as soon as they park their car and notifying the customers and/or the merchants and/or the parking lot manager of qualifying loyalty rewards, shopping incentives, discounts, and other targeted programs. Customers can be notified directly in the parking space **15**, or at any point between the garage entrance **30, 31** and the parking space **15**, or at any point between the parking space **15** and the customer’s ultimate destination such as a store, restaurant, or shopping area. Advertising can be in the form of audio and or visual signals, presented through one or more audio speakers and/or one or more video displays that are integrated with the system or that can communicate with system controller **44**, and/or with row controllers **42**, and/or with camera units **16**. This can be achieved as follows:

1. Customer parks car in a parking space **15**.
2. A camera unit **16** detects a car and sends an image of the car to system controller **44**.
3. System controller **44** extracts the license plate number from image acquired by camera unit **16** and compares the extracted license plate number to a database maintained either on system controller **44** or on a server co-located on a network such as the Internet. Alternatively, the license plate could be extracted directly on the camera unit **16** and sent to system controller **44**.
4. If a user record is found matching the recorded license plate, system controller **44** triggers a loyalty program event, which can include any or all of the following:
 - a. Offer audio and/or visual advertisements and/or shopping incentives and/or other loyalty rewards directly to

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the customer in the parking space **15**, through a speaker and/or video panel integrated into the camera unit **16** or external to it.

- b. Send advertisements and/or shopping incentives and/or notification of other loyalty rewards directly to the customer via mobile phone.
- c. Link discounts and other point-of-sale offers directly to the customer’s loyalty account, which will be applied at point-of-sale when the customer uses his/her loyalty program card or a credit card associated with the account.
- d. Notify stores in the shopping area that the customer is on-site, allowing the stores to offer qualified incentives, advertisements, and discounts directly to the customer.

Advertising

The information collected by the system can be used to target advertising to specific demographics as soon as a customer parks his/her car. This can be done even without the use of license plate recognition and/or without consulting a user database, by examining demographic information such as make and model and color of the vehicle, license plate design, and other identifying marks such as bumper stickers and sports team insignias. Advertising can be presented to the customer directly in the parking space **15**, or at any point between the garage entrance **30, 31** and the parking space **15**, or at any point between the parking space **15** and the customer’s ultimate destination such as a store, restaurant, or shopping area. Advertising can be in the form of audio and or visual signals, presented through one or more audio speakers and/or one or more video displays that are integrated with the system or that can communicate with system controller **44**, and/or with row controllers **42**, and/or with camera units **16**. This can be achieved as follows:

1. Customer parks car in a parking space **15**.
2. A camera unit **16** detects a car and sends an image of the car to system controller **44**.
3. System controller **44** extracts from the image anonymous demographic information such as: make/model/color of vehicle, license plate information, symbols and bumper stickers (such as sports teams, university, political affiliation, etc). Alternatively, this information could be extracted directly in the camera unit **16** and sent to system controller **44**.
4. if demographic information is found, system controller **44** can offer audio and/or visual targeted advertisements directly to the customer in the parking space **15**, through a speaker and/or video panel integrated into the camera unit **16** or external to it.

Valet Parking

The system can be used to simplify the process of valet parking for the valet operator, and enhance the valet parking experience for the customer. This can be achieved as follows:

1. Customer arrives at valet stand, receives a ticket with a unique i.d. number on it. Number can also be encoded in a bar code or QR code.
2. Valet parks car in a parking space **15**.
3. A camera unit **16** detects the car and sends an image of the car to system controller **44**.
4. System controller **44** extracts the license plate number from the image and automatically associates the license plate number with the ticket i.d. number. Valet can also manually associate the license plate number with the

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ticket i.d. number using a terminal or handheld portable device, or using a bar code reader. The license plate number could also be extracted directly by the camera unit **16**.

5. Customer can surf to a website at any time to see a live image of his/her car to ensure that the car is safe. The website can be accessed from any web browser or through a smart phone application, or the URL of the website can be encoded into the QR code so that the customer can simply scan the QR code with his/her smart phone to open up the website to the appropriate page. The customer can manually enter his/her license plate number to locate and view the live image of his/her car.
6. The customer can enter his/her phone number or email address through the website or through a phone application to be automatically notified if the car moves.
7. The customer can use the website or the phone application to alert Valet that s/he is returning, so the valet has the car ready when s/he returns.
8. The valet simply enters the ticket i.d. number into the terminal or into a handheld device, or scans the bar code, or enters the license plate number, and the system tells the valet which parking space number is associated with that record, and may even display a map so that the valet can easily locate the vehicle.

Renting Out Private Spaces

In a mixed-use (commercial+residential) facility, the system enables residents to rent out their spaces if/when they aren't using them. This can both increase the effective capacity of a commercial parking garage, and provide a monetary incentive or subsidy to residents. This can be achieved as follows:

1. When a resident signs a lease or purchases a parking space or purchases a residential or commercial unit, s/he get an online account associated with his/her parking space(s) **15**.
2. A resident can log on to an online system to access and manage his/her account.
3. A resident can configure his/her account with his/her license plate number, phone number, email address, and any other identifying information.
4. A resident can configure the system to automatically notify him/her if a car with an unknown license plate parks in his/her space **15**.
5. A resident can opt-in to a system that allows his/her space **15** to be used by visitors to the commercial entities that share the parking lot **10**. This can be 24 hours/day, or for fixed time periods and/or specified days of the week/month/year. This can also be configured in the online system, or by phone or at a kiosk or in person with the parking manager.
6. If a visitor parks in the resident's space **15** during the designated times, the resident either receives a percentage of the parking revenue, or a share of the facility's revenue calculated as a percentage of the revenue collected from the entire pool of shared private spaces. Money can be disbursed as a credit against rent, or directly as a deposit into the resident's bank account, check, money order, cash, PayPal™, etc.

Individual Security Monitoring

When parking a car, particularly in a public parking lot, safety and security of the vehicle is a major concern for

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many people. The system can be used to provide an extra measure of security by allowing customers to monitor their vehicles directly, as follows:

1. Customer loads a smart phone application, or navigates a web browser to a particular web site, or sends a text message to a particular phone number, and enters the unique identification number printed on the access ticket received upon entry to the parking lot **10**.
2. System controller **44** receives request, queries its database for the vehicle record, and responds with a live or recent (e.g. within the past 5 minutes) image of the vehicle in the parking space **15**.
3. Customer can configure the system, through the web site or phone application or via text message commands, to automatically alert the customer via text message and/or email if any of the following occurs:
 - a. The image captured by camera unit **16** of parking space **15** has changed compared to a previously captured image; this could indicate an attempt to vandalize or break into the vehicle.
 - b. The parking space **15** has become vacant; this could indicate a possible theft of the vehicle.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made. Therefore, the claimed invention as recited in the claims that follow is not limited to the embodiments described herein.

What is claimed is:

1. A method of managing a plurality of parking spaces, comprising:
 - (a) monitoring a parking space with an imaging device of an imaging unit;
 - (b) detecting, by said imaging unit, occupancy of said parking space;
 - (c) assigning said parking space, in which said occupancy was detected, an occupied status, wherein said occupied status is indicated by illuminating a first color of a multicolor indicator collocated with said imaging device, said first color predefined to determine said occupied status;
 - (d) obtaining, as a result of said parking space having said occupied status, a single high resolution image of a vehicle occupying said parking space, said high resolution image obtained by said imaging device;
 - (e) storing at least part of said high resolution image on a storage device;
 - (f) displaying a thumbnail image of said parking space on a graphic user interface (GUI), said thumbnail image digitally processed from an image electronically communicated to said GUI from said imaging unit;
 - (g) deciding whether said occupied status is incorrect, based on a visual review of said thumbnail image on said GUI;
 - (h) correcting said occupied status, by inputting computer-readable instructions to a computer terminal of said GUI, if said parking space shown in said thumbnail image is vacant and said computer terminal electronically communicating a command to toggle said multicolor indicator to illuminate a second color, said second color predefined to indicate a vacant status;
 - (i) extracting from said high resolution image, by digital image processing, a permit identifier for said vehicle and comparing said permit identifier with at least one parking permit identification stored on said storage to determine a permit status of said parked vehicle; and

- (j) initiating an infringement process for said vehicle having said permit identifier that fails to coincide with at least one of said at least one parking permit identification.

2. The method of claim 1, wherein said detecting includes providing machine-readable code of a self-modifying classification algorithm for assigning said respective statuses, the method further comprising:

- (e) said system executing said machine-readable code to modify said classification algorithm in response to said correcting.

* * * * *



December 18, 2018

**ADDENDUM NO.: ONE (1)
TO ALL OFFERORS:**

REFERENCE: Request for Proposal No: **RFP# MPM-1034**
Dated: **December 7, 2018**
RFP Closing On: **January 8, 2019 at 2:00 p.m. (Eastern)**

Please note the clarifications and/or changes made on this proposal program:

1. Does the parking technology vendor need to provide technology for all 80 lots and 6 garages?
 - a. The University is currently more interested in providing occupancy information for existing and future parking decks with the potential to expand to include surface lots at a later date.
2. If yes, are you able to provide offerors with a list of the lots and garages?
 - a. The JMU campus currently includes the following 5 garages that employ vehicle count systems.
 - i. Champions Drive Parking Deck – 492 spaces (453 commuter – 13 faculty/staff – 12 service vehicle – 8 ADA – 6 parking customers)
 - ii. Chesapeake Avenue Parking Deck – 650 spaces (637 commuter – 13 ADA)
 - iii. Grace Street Parking Deck – 477 spaces (402 commuter – 63 faculty/staff – 12 ADA)
 - iv. Mason Street Parking Deck – 1015 spaces (602 faculty/staff – 172 hotel guest – 119 hotel valet – 99 metered – 23 ADA)
 - v. Warsaw Avenue Parking Deck – 782 spaces (542 commuter – 223 faculty/staff – 17 ADA)
 - vi. A 6th parking deck that will include vehicle count system equipment is currently under construction and will provide approximately 1500 spaces for faculty/staff, commuters and guests.
3. How many spaces are in the parking lots and how many are in the garages?
 - a. Our parking decks include a total of approximately 3,600 parking spaces with our surface lots providing approximately 8,500 additional parking spaces for a total of just over 12,000 parking spaces campus wide.
4. Is the vendor responsible for delivering a full turn-key solution?
 - a. Any viable solution should include on-site installation, training and technical support with the university's initial responsibility being limited to operating and maintaining the software and hardware once it's up and running.
5. Please elaborate on the seamless communication between two potential parking systems.
 - a. The university has vehicle count system equipment in five existing parking decks that provides real-time occupancy information that is communicated to constituents via the Parking Services website and on electronic signage strategically located near facilities and on nearby streets. As indicated in the RFP, any vehicle count system that is introduced will need to be capable of sharing occupancy information via electronic signage, porting information to the Parking Services website and sharing information with a future smart phone app. In order for the university to continue to provide occupancy information for existing and future facilities, both the current

solution and future solution will need to provide count data that can be combined to provide real-time occupancy information for constituents.

6. Is there currently Wi-Fi available in the parking lots/garages requiring single space detection?

- a. While Wi-Fi is routinely available throughout the campus, no Wi-Fi access points are currently available in the university's parking decks. Some decks may have access to Wi-Fi due to proximity to campus buildings but they do not have their own Wi-Fi service. Single space counting is currently accomplished by hardwiring individual sensors to a modem that then communicates wireless with a gateway that is directly connected to the university's network.

7. Please list the number of entry and exit lanes, reversible lanes, etc.

- a. Warsaw Deck:
 - 1 entry lane on ground at the north entrance
 - 1 exit lane on ground at the north entrance
 - 1 entry lane on ground at the south entrance
 - 1 exit lane on ground at the south entrance
 - 2 entry lanes on the second level
 - 2 exit lanes on the second level
- b. Grace Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
 - 1 entry lane at the second floor entrance
 - 1 exit lane at the second floor entrance
- c. Mason Deck:
 - 1 entry lane on the ground floor on MLK Jr. Way
 - 1 exit lane on the ground floor on MLK Jr. Way
 - 1 exit lane on the ground floor on Mason Street
 - 1 entry lane on the second floor on Mason Street
 - 1 exit lane on the second floor on Mason Street
 - 1 entry lane on the third level
 - 1 exit lane on the third level
- d. Champions Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
- e. Chesapeake Deck:
 - 1 entry lane at the ground floor entrance
 - 1 exit lane at the ground floor entrance
 - 1 entry lane on level 3 at the gate location
 - 1 exit lane on level 3 at the gate location
 - 1 entry lane on level 4 at the gate location
 - 1 exit lane on level 4 at the gate location
 - 1 entry lane on level 5 at the gate location
 - 1 exit lane on level 5 at the gate location
- f. Note: all entry and exit points will need to be bidirectional as vehicular traffic cannot be consistently relied upon to utilize the proper lane

8. Will electrical and network be provided to each location?



- a. The current vehicle count system relies upon wireless communication back to a gateway in the telecom room located in each garage and low voltage (24v) power for sensors. There is electrical conduit in place at each of the entry/exit locations mentioned above but wire may have to be pulled because, in many instances, the installation relied upon 6 conductor cable to provide a pathway for both data and low voltage power.
9. How many signs at each location?
 - a. The number of signs per location varies between 1 and 3 with a total of 17 campus-wide at this time.
10. Do you want simply an overall count of each garage or lot or do you want level by level counts or space by space counts?
 - a. Most of our garages are split between multiple use groups so we want to provide counts of spaces for each group that utilizes a portion of each garage. That can include commuters, faculty/staff, hotel guests, valet parking, metered parking, etc.

Signify receipt of this addendum by initialing “*Addendum # 1*” on the signature page of your proposal.

Sincerely,

Michael Morrison

Michael Morrison
Buyer Senior
Phone: (540-568-6181)



December 26, 2018

**ADDENDUM NO.: TWO (2)
TO ALL OFFERORS:**

REFERENCE: Request for Proposal No: **RFP# MPM-1034**
Dated: **December 7, 2018**
RFP Closing On: **January 16, 2019 at 2:00 p.m. (Eastern)**

Please note the clarifications and/or changes made on this proposal program:

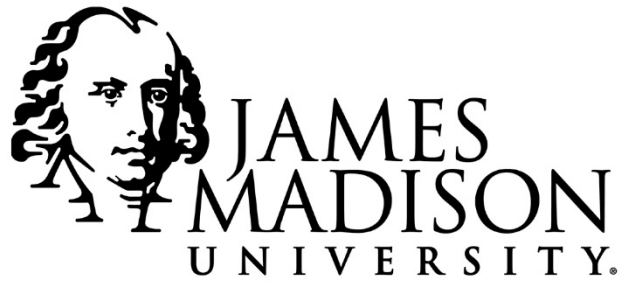
1. Please note the following change to the RFP Closing Date.
 - a. **Proposals are due no later than 2:00 PM on Wednesday January 16, 2019.**
2. Please note the following clarification.
 - a. **The University has received numerous questions asking for specific technical data and drawings, specifications, etc. for this RFP. Please read the Statement of Needs carefully and provide the requested information. This RFP is not for a specific project but seeks proposals describing the Offeror's proposed vehicle count system, related costs, and the ability of that count system to share information.**
3. Regarding the Zone Map.
 - a. **James Madison University intends this contract to be cooperative, such that other agencies may be able to utilize this contract. The zone map is included to show the different VASCUPP regions (<https://vascupp.org/>) with cooperating institutions. JMU is part of region two. Any pricing differences which might apply to your proposals for other regions can be enumerated using the various zones for guidance. If location is not a specific factor, then pricing shall be established as being the same as offered to JMU in the Offeror's proposal.**

Signify receipt of this addendum by initialing "*Addendum # 2*" on the signature page of your proposal.

Sincerely,

Michael Morrison

Michael Morrison
Buyer Senior
Phone: (540-568-6181)



Request for Proposal

RFP# MPM-1034

VEHICLE COUNT SYSTEMS

December 7, 2018



REQUEST FOR PROPOSAL

RFP# MPM-1034

Issue Date: 10/7/2018
Title: Vehicle Count Systems
Issuing Agency: Commonwealth of Virginia
James Madison University
Procurement Services MSC 5720
752 Ott Street, Wine Price Building
First Floor, Suite 1023
Harrisonburg, VA 22807

Period of Contract: From Date of Award Through One Year (Renewable)

Sealed Proposals Will Be Received Until 2:00 PM on January 8, 2019 for Furnishing The Services Described Herein.

MANDATORY PRE-PROPOSAL: No Pre-Proposal meeting is scheduled/required for this RFP.

SEALED PROPOSALS MAY BE MAILED, EXPRESS MAILED, OR HAND DELIVERED DIRECTLY TO THE ISSUING AGENCY SHOWN ABOVE.

All Inquiries For Information And Clarification Should Be Directed To: Michael Morrison, Buyer Senior, Procurement Services, morrismp@jmu.edu; 540-568-6181; (Fax) 540-568-7935 not later than five business days before the proposal closing date.

NOTE: THE SIGNED PROPOSAL AND ALL ATTACHMENTS SHALL BE RETURNED.

In compliance with this Request for Proposal and to all the conditions imposed herein, the undersigned offers and agrees to furnish the goods/services in accordance with the attached signed proposal or as mutually agreed upon by subsequent negotiation.

Name and Address of Firm:

By: _____

(Signature in Ink)

Name: _____

(Please Print)

Date: _____

Title: _____

Web Address: _____

Phone: _____

Email: _____

Fax #: _____

ACKNOWLEDGE RECEIPT OF ADDENDUM: #1_____ #2_____ #3_____ #4_____ #5_____ (please initial)

SMALL, WOMAN OR MINORITY OWNED BUSINESS:

☐ YES; ☐ NO; *IF YES* ⇒ ⇒ ☐ SMALL; ☐ WOMAN; ☐ MINORITY *IF MINORITY:* ☐ AA; ☐ HA; ☐ AsA; ☐ NW; ☐ Micro

Note: This public body does not discriminate against faith-based organizations in accordance with the *Code of Virginia*, § 2.2-4343.1 or against an offeror because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.

REQUEST FOR PROPOSAL

RFP# MPM-1034

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I. PURPOSE

The purpose of this Request for Proposal (RFP) is to solicit sealed proposals from qualified sources to enter into a contract to provide vehicle count systems for James Madison University (JMU), an agency of the Commonwealth of Virginia. Initial contract shall be for one (1) year with an option to renew for four (4) additional one-year periods.

II. BACKGROUND

James Madison University (JMU) is a comprehensive public institution in Harrisonburg, Virginia with an enrollment of nearly 22,000 students and over 3,000 faculty and staff. There are over 600 individual departments on campus that support seven academic divisions. The University offers over 120 majors, minors, and concentrations. Further information about the University may be found at the following website: <http://www.jmu.edu>.

Currently, JMU Parking Services operates 6 parking decks and approximately 80 surface lots for faculty, staff, and student permit parking.

III. SMALL, WOMAN-OWNED AND MINORITY PARTICIPATION

It is the policy of the Commonwealth of Virginia to contribute to the establishment, preservation, and strengthening of small businesses and businesses owned by women and minorities, and to encourage their participation in State procurement activities. The Commonwealth encourages contractors to provide for the participation of small businesses and businesses owned by women and minorities through partnerships, joint ventures, subcontracts, and other contractual opportunities. Attachment B contains information on reporting spend data with subcontractors.

IV. STATEMENT OF NEEDS

Contractor shall describe their ability to provide the following to the University. JMU reserves the right to change, add, or delete services; in the best interest of the University.

- A. Contractor shall perform work between 7:30 AM – 4:00 PM, Monday through Friday.
- B. Vehicle counting technology that can be installed in parking garages or surface lots that detects vehicles upon entry and exit to facilities or zones within facilities in order to provide accurate counts of available spaces within each facility or zone.
 - 1. This technology needs to be capable of being relocated to alternate locations within facilities in order to adjust to future changes in parking allocations.
 - 2. Inductive loops are not desirable as they require cutting into precast concrete thus compromising the structural integrity of parking garages.
- C. Technology that is capable of monitoring the occupancy of individual parking spaces within facilities and incorporating that information into the overall occupancy of those facilities. This technology or technologies should be capable of counting individual spaces within both parking garages and surface lots.

- D. Electronic signage that is capable of displaying current occupancy within facilities in real-time in order to guide drivers to facilities with open parking spaces. This signage should also include the capability to scroll messaging as needed in order to communicate pertinent information to drivers.
- E. Provide the complete specifications of all new equipment and operational components for a turn-key installation.
- F. The various technologies employed need to communicate seamlessly in order to provide real-time information about facility occupancy to drivers. Where possible, communication between components should be achieved wirelessly in order to reduce the cost of installation and increase flexibility with regards to placement. A mesh network is preferred.
- G. A software application that communicates with the various pieces of technology located across the campus, provides information in real-time about parking availability and includes the status of each piece of equipment included in the system.
 - 1. The software should include a customizable graphical user interface that provides a visual representation of the signage and equipment across the campus as well as the current status of the pieces of equipment in specific facilities.
 - 2. Users must have the capability to correct counts of open spaces remotely via the graphical user interface.
 - 3. The software should include reporting capabilities that allow users to view, generate and store occupancy reports.
 - 4. The software should have the capability to send alerts via email. The GUI needs to support sending and creating custom messages for variable message signs.
 - 5. Describe licensing. If licensing of the software is based on number of users or screens, etc. describe the models used to obtain numbers both for current and future usage.
- H. An open web API module that allows the occupancy information generated by the system to be shared with websites and mobile applications in order to port real-time parking availability information to the department's website and an anticipated future mobile application for Android and iOS smart phones.
- I. All system hardware and software needs to be able to be maintained by department personnel and vendor tech support needs to be available via remote access.
- J. Consistency and stability of the hardware and software – as well as rapid correction of system failures – are critical to JMU.
 - 1. Describe the maintenance philosophy including frequency of updates as well as the approach to obtaining and completing updates.
 - 2. Describe your ability to respond to emergency situations to include average response time, costs associated with responding to emergency situations (to include weekend, nights, and holidays). Include method of communication for emergency situations.
 - 3. Describe capabilities for remote support and describe what access to accounts and systems is required. Describe the locations from which this activity would take place.
 - 4. Describe any maintenance options/tiers and whether they vary in cost by time of day, response time, etc.
- K. All costs shall be exclusive of travel. Exception may be granted by JMU on a case-by-case basis. In the event an exception is made, contractors billing for travel-related expenses must be billed in accordance with the Commonwealth of Virginia's per diem allowance for lodging,

meals, and incidental expenses at the time of travel which can be referenced at <http://www.jmu.edu/finprocedures/4000/4215mie.shtml>.

- L. All services provided under this contract shall be by trained repair technicians and all work shall be performed in a workmanlike manner in accordance with the manufacturer's recommended equipment maintenance procedures. Submit all qualifications and certifications associated with the different systems.

V. PROPOSAL PREPARATION AND SUBMISSION

A. GENERAL INSTRUCTIONS

To ensure timely and adequate consideration of your proposal, offerors are to limit all contact, whether verbal or written, pertaining to this RFP to the James Madison University Procurement Office for the duration of this Proposal process. Failure to do so may jeopardize further consideration of Offeror's proposal.

1. RFP Response: In order to be considered for selection, the **Offeror shall submit a complete response to this RFP**; and shall submit to the issuing Purchasing Agency:
 - a. **One (1) original and one (1) copy** of the entire proposal, INCLUDING ALL ATTACHMENTS. Any proprietary information should be clearly marked in accordance with 3.f. below.
 - b. **One (1) electronic copy in WORD format or searchable PDF** (*CD or flash drive*) of the entire proposal, INCLUDING ALL ATTACHMENTS. Any proprietary information should be clearly marked in accordance with 3.f. below.
 - c. Should the proposal contain **proprietary information**, provide **one (1) redacted hard copy** of the proposal and all attachments with **proprietary portions removed or blacked out**. This copy should be clearly marked "*Redacted Copy*" on the front cover. The classification of an entire proposal document, line item prices, and/or total proposal prices as proprietary or trade secrets is not acceptable. JMU shall not be responsible for the Contractor's failure to exclude proprietary information from this redacted copy.

No other distribution of the proposal shall be made by the Offeror.

2. The version of the solicitation issued by JMU Procurement Services, as amended by an addenda, is the mandatory controlling version of the document. Any modification of, or additions to, the solicitation by the Offeror shall not modify the official version of the solicitation issued by JMU Procurement services unless accepted in writing by the University. Such modifications or additions to the solicitation by the Offeror may be cause for rejection of the proposal; however, JMU reserves the right to decide, on a case-by-case basis in its sole discretion, whether to reject such a proposal. If the modification or additions are not identified until after the award of the contract, the controlling version of the solicitation document shall still be the official state form issued by Procurement Services.
3. Proposal Preparation

- a. Proposals shall be signed by an authorized representative of the Offeror. All information requested should be submitted. Failure to submit all information requested may result in the purchasing agency requiring prompt submissions of missing information and/or giving a lowered evaluation of the proposal. Proposals which are substantially incomplete or lack key information may be rejected by the purchasing agency. Mandatory requirements are those required by law or regulation or are such that they cannot be waived and are not subject to negotiation.
- b. Proposals shall be prepared simply and economically, providing a straightforward, concise description of capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.
- c. Proposals should be organized in the order in which the requirements are presented in the RFP. All pages of the proposal should be numbered. Each paragraph in the proposal should reference the paragraph number of the corresponding section of the RFP. It is also helpful to cite the paragraph number, sub letter, and repeat the text of the requirement as it appears in the RFP. If a response covers more than one page, the paragraph number and sub letter should be repeated at the top of the next page. The proposal should contain a table of contents which cross references the RFP requirements. Information which the offeror desires to present that does not fall within any of the requirements of the RFP should be inserted at the appropriate place or be attached at the end of the proposal and designated as additional material. Proposals that are not organized in this manner risk elimination from consideration if the evaluators are unable to find where the RFP requirements are specifically addressed.
- d. As used in this RFP, the terms “must”, “shall”, “should” and “may” identify the criticality of requirements. “Must” and “shall” identify requirements whose absence will have a major negative impact on the suitability of the proposed solution. Items labeled as “should” or “may” are highly desirable, although their absence will not have a large impact and would be useful, but are not necessary. Depending on the overall response to the RFP, some individual “must” and “shall” items may not be fully satisfied, but it is the intent to satisfy most, if not all, “must” and “shall” requirements. The inability of an offeror to satisfy a “must” or “shall” requirement does not automatically remove that offeror from consideration; however, it may seriously affect the overall rating of the offeror’s proposal.
- e. Each copy of the proposal should be bound or contained in a single volume where practical. All documentation submitted with the proposal should be contained in that single volume.
- f. Ownership of all data, materials and documentation originated and prepared for the State pursuant to the RFP shall belong exclusively to the State and be subject to public inspection in accordance with the Virginia Freedom of Information Act. Trade secrets or proprietary information submitted by the offeror shall not be subject to public disclosure under the Virginia Freedom of Information Act; however, the offeror must invoke the protection of Section 2.2-4342F of the Code of Virginia, in writing, either before or at the time the data is submitted. The written notice must specifically identify the data or materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret materials submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of an entire proposal document, line item prices and/or total proposal

prices as proprietary or trade secrets is not acceptable and will result in rejection and return of the proposal.

4. Oral Presentation: Offerors who submit a proposal in response to this RFP may be required to give an oral presentation of their proposal to James Madison University. This provides an opportunity for the Offeror to clarify or elaborate on the proposal. This is a fact-finding and explanation session only and does not include negotiation. James Madison University will schedule the time and location of these presentations. Oral presentations are an option of the University and may or may not be conducted. Therefore, proposals should be complete.

B. SPECIFIC PROPOSAL INSTRUCTIONS

Proposals should be as thorough and detailed as possible so that James Madison University may properly evaluate your capabilities to provide the required services. Offerors are required to submit the following items as a complete proposal:

1. Return RFP cover sheet and all addenda acknowledgements, if any, signed and filled out as required.
2. Plan and methodology for providing the goods/services as described in Section IV. Statement of Needs of this Request for Proposal.
3. A written narrative statement to include, but not be limited to, the expertise, qualifications, and experience of the firm and resumes of specific personnel to be assigned to perform the work.
4. Offeror Data Sheet, included as *Attachment A* to this RFP.
5. Small Business Subcontracting Plan, included as *Attachment B* to this RFP. Offeror shall provide a Small Business Subcontracting plan which summarizes the planned utilization of Department of Small Business and Supplier Diversity (SBSD)-certified small businesses which include businesses owned by women and minorities, when they have received Department of Small Business and Supplier Diversity (SBSD) small business certification, under the contract to be awarded as a result of this solicitation. This is a requirement for all prime contracts in excess of \$100,000 unless no subcontracting opportunities exist.
6. Identify the amount of sales your company had during the last twelve months with each VASCUPP Member Institution. A list of VASCUPP Members can be found at: www.VASCUPP.org.
7. Proposed Cost. See Section X. Pricing Schedule of this Request for Proposal.

VI. EVALUATION AND AWARD CRITERIA

A. EVALUATION CRITERIA

Proposals shall be evaluated by James Madison University using the following criteria:

	Points
1. Quality of products/services offered and suitability for intended purposes	25
2. Qualifications and experience of Offeror in providing the goods/services	20
3. Specific plans or methodology to be used to perform the services	25
4. Participation of Small, Women-Owned, & Minority (SWaM) Businesses	10
5. Cost	20
	<hr/> 100

- B. **AWARD**: Selection shall be made of two or more offerors deemed to be fully qualified and best suited among those submitting proposals on the basis of the evaluation factors included in the Request for Proposals, including price, if so stated in the Request for Proposals. Negotiations shall be conducted with the offerors so selected. Price shall be considered, but need not be the sole determining factor. After negotiations have been conducted with each offeror so selected, the agency shall select the offeror which, in its opinion, has made the best proposal, and shall award the contract to that offeror. The Commonwealth may cancel this Request for Proposals or reject proposals at any time prior to an award, and is not required to furnish a statement of the reasons why a particular proposal was not deemed to be the most advantageous. Should the Commonwealth determine in writing and in its sole discretion that only one offeror is fully qualified, or that one offeror is clearly more highly qualified than the others under consideration, a contract may be negotiated and awarded to that offeror. The award document will be a contract incorporating by reference all the requirements, terms and conditions of the solicitation and the contractor's proposal as negotiated.

VII. GENERAL TERMS AND CONDITIONS

- A. **PURCHASING MANUAL**: This solicitation is subject to the provisions of the Commonwealth of Virginia's Purchasing Manual for Institutions of Higher Education and Their Vendors and any revisions thereto, which are hereby incorporated into this contract in their entirety. A copy of the manual is available for review at the purchasing office. In addition, the manual may be accessed electronically at <http://www.jmu.edu/procurement> or a copy can be obtained by calling Procurement Services at (540) 568-3145.
- B. **APPLICABLE LAWS AND COURTS**: This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia and any litigation with respect thereto shall be brought in the courts of the Commonwealth. The Contractor shall comply with applicable federal, state and local laws and regulations.
- C. **ANTI-DISCRIMINATION**: By submitting their proposals, offerors certify to the Commonwealth that they will conform to the provisions of the Federal Civil Rights Act of

1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and §10 of the Rules Governing Procurement, Chapter 2, Exhibit J, Attachment 1 (available for review at <http://www.jmu.edu/procurement>). If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender or national origin and shall be subject to the same rules as other organizations that contract with public bodies to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the public body. (*§6 of the Rules Governing Procurement*).

In every contract over \$10,000 the provisions in 1. and 2. below apply:

1. During the performance of this contract, the contractor agrees as follows:
 - a. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
 - b. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.
 - c. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting these requirements.
 2. The contractor will include the provisions of 1. Above in every subcontract or purchase order over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.
- D. ETHICS IN PUBLIC CONTRACTING: By submitting their proposals, offerors certify that their proposals are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other offeror, supplier, manufacturer or subcontractor in connection with their proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.
- E. IMMIGRATION REFORM AND CONTROL ACT OF 1986: By entering into a written contract with the Commonwealth of Virginia, the Contractor certifies that the Contractor does not, and shall not during the performance of the contract for goods and services in the Commonwealth, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.

- F. DEBARMENT STATUS: By submitting their proposals, offerors certify that they are not currently debarred by the Commonwealth of Virginia from submitting proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.
- G. ANTITRUST: By entering into a contract, the contractor conveys, sells, assigns, and transfers to the Commonwealth of Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the Commonwealth of Virginia under said contract.
- H. MANDATORY USE OF STATE FORM AND TERMS AND CONDITIONS RFPs: Failure to submit a proposal on the official state form provided for that purpose may be a cause for rejection of the proposal. Modification of or additions to the General Terms and Conditions of the solicitation may be cause for rejection of the proposal; however, the Commonwealth reserves the right to decide, on a case by case basis, in its sole discretion, whether to reject such a proposal.
- I. CLARIFICATION OF TERMS: If any prospective offeror has questions about the specifications or other solicitation documents, the prospective offeror should contact the buyer whose name appears on the face of the solicitation no later than five working days before the due date. Any revisions to the solicitation will be made only by addendum issued by the buyer.
- J. PAYMENT:
1. To Prime Contractor:
 - a. Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the state contract number and/or purchase order number; social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations).
 - b. Any payment terms requiring payment in less than 30 days will be regarded as requiring payment 30 days after invoice or delivery, whichever occurs last. This shall not affect offers of discounts for payment in less than 30 days, however.
 - c. All goods or services provided under this contract or purchase order, that are to be paid for with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed.
 - d. The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or the date of offset when offset proceedings have been instituted as authorized under the Virginia Debt Collection Act.
 - e. Unreasonable Charges. Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges which appear to be unreasonable

will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon determining that invoiced charges are not reasonable, the Commonwealth shall promptly notify the contractor, in writing, as to those charges which it considers unreasonable and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification. The provisions of this section do not relieve an agency of its prompt payment obligations with respect to those charges which are not in dispute (*Rules Governing Procurement, Chapter 2, Exhibit J, Attachment 1 § 53; available for review at <http://www.jmu.edu/procurement>*).

2. To Subcontractors:
 - a. A contractor awarded a contract under this solicitation is hereby obligated:
 - (1) To pay the subcontractor(s) within seven (7) days of the contractor's receipt of payment from the Commonwealth for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or
 - (2) To notify the agency and the subcontractors, in writing, of the contractor's intention to withhold payment and the reason.
 - b. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the Commonwealth, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the Commonwealth.
 - c. Each prime contractor who wins an award in which provision of a SWAM procurement plan is a payment, evidence and certification of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the SWAM procurement plan. Final payment under the contract in question may be withheld until such certification is delivered and, if necessary, confirmed by the agency or institution, or other appropriate penalties may be assessed in lieu of withholding such payment.
 - d. The Commonwealth of Virginia encourages contractors and subcontractors to accept electronic and credit card payments.
- K. PRECEDENCE OF TERMS: Paragraphs A through J of these General Terms and Conditions and the Commonwealth of Virginia Purchasing Manual for Institutions of Higher Education and their Vendors, shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.
- L. QUALIFICATIONS OF OFFERORS: The Commonwealth may make such reasonable investigations as deemed proper and necessary to determine the ability of the offeror to perform the services/furnish the goods and the offeror shall furnish to the Commonwealth all such information and data for this purpose as may be requested. The Commonwealth reserves the right to inspect offeror's physical facilities prior to award to satisfy questions regarding the

offeror's capabilities. The Commonwealth further reserves the right to reject any proposal if the evidence submitted by, or investigations of, such offeror fails to satisfy the Commonwealth that such offeror is properly qualified to carry out the obligations of the contract and to provide the services and/or furnish the goods contemplated therein.

- M. TESTING AND INSPECTION: The Commonwealth reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.
- N. ASSIGNMENT OF CONTRACT: A contract shall not be assignable by the contractor in whole or in part without the written consent of the Commonwealth.
- O. CHANGES TO THE CONTRACT: Changes can be made to the contract in any of the following ways:
 - 1. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.
 - 2. The Purchasing Agency may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt. The contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Agency a credit for any savings. Said compensation shall be determined by one of the following methods:
 - a. By mutual agreement between the parties in writing; or
 - b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Agency's right to audit the contractor's records and/or to determine the correct number of units independently; or
 - c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Agency with all vouchers and records of expenses incurred and savings realized. The Purchasing Agency shall have the right to audit the records of the contractor as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Agency within thirty (30) days from the date of receipt of the written order from the Purchasing Agency. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Commonwealth of Virginia Purchasing Manual for Institutions of Higher Education and their Vendors. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Agency or with the performance of the contract generally.

- P. DEFAULT: In case of failure to deliver goods or services in accordance with the contract terms and conditions, the Commonwealth, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies which the Commonwealth may have.
- Q. INSURANCE: By signing and submitting a proposal under this solicitation, the offeror certifies that if awarded the contract, it will have the following insurance coverage at the time the contract is awarded. For construction contracts, if any subcontractors are involved, the subcontractor will have workers' compensation insurance in accordance with § 25 of the Rules Governing Procurement – Chapter 2, Exhibit J, Attachment 1, and 65.2-800 et. Seq. of the Code of Virginia (available for review at <http://www.jmu.edu/procurement>) The offeror further certifies that the contractor and any subcontractors will maintain these insurance coverage during the entire term of the contract and that all insurance coverage will be provided by insurance companies authorized to sell insurance in Virginia by the Virginia State Corporation Commission.

MINIMUM INSURANCE COVERAGES AND LIMITS REQUIRED FOR MOST CONTRACTS:

1. Workers' Compensation: Statutory requirements and benefits. Coverage is compulsory for employers of three or more employees, to include the employer. Contractors who fail to notify the Commonwealth of increases in the number of employees that change their workers' compensation requirement under the Code of Virginia during the course of the contract shall be in noncompliance with the contract.
 2. Employer's Liability: \$100,000
 3. Commercial General Liability: \$1,000,000 per occurrence and \$2,000,000 in the aggregate. Commercial General Liability is to include bodily injury and property damage, personal injury and advertising injury, products and completed operations coverage. The Commonwealth of Virginia must be named as an additional insured and so endorsed on the policy.
 4. Automobile Liability: \$1,000,000 combined single limit.
- R. ANNOUNCEMENT OF AWARD: Upon the award or the announcement of the decision to award a contract over \$50,000, as a result of this solicitation, the purchasing agency will publicly post such notice on the DGS/DPS eVA web site (www.eva.virginia.gov) for a minimum of 10 days.
- S. DRUG-FREE WORKPLACE: During the performance of this contract, the contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.

For the purposes of this section, “drug-free workplace” means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

- T. NONDISCRIMINATION OF CONTRACTORS: An offeror, or contractor shall not be discriminated against in the solicitation or award of this contract because of race, religion, color, sex, national origin, age, disability, faith-based organizational status, any other basis prohibited by state law relating to discrimination in employment or because the offeror employs ex-offenders unless the state agency, department or institution has made a written determination that employing ex-offenders on the specific contract is not in its best interest. If the award of this contract is made to a faith-based organization and an individual, who applies for or receives goods, services, or disbursements provided pursuant to this contract objects to the religious character of the faith-based organization from which the individual receives or would receive the goods, services, or disbursements, the public body shall offer the individual, within a reasonable period of time after the date of his objection, access to equivalent goods, services, or disbursements from an alternative provider.
- U. eVA BUSINESS TO GOVERNMENT VENDOR REGISTRATION, CONTRACTS, AND ORDERS: The eVA Internet electronic procurement solution, website portal www.eVA.virginia.gov, streamlines and automates government purchasing activities in the Commonwealth. The eVA portal is the gateway for vendors to conduct business with state agencies and public bodies. All vendors desiring to provide goods and/or services to the Commonwealth shall participate in the eVA Internet procurement solution by completing the free eVA Vendor Registration. All offerors must register in eVA and pay the Vendor Transaction Fees specified below; failure to register will result in the proposal being rejected. Vendor transaction fees are determined by the date the original purchase order is issued and the current fees are as follows:
- Vendor transaction fees are determined by the date the original purchase order is issued and the current fees are as follows:
1. For orders issued July 1, 2014 and after, the Vendor Transaction Fee is:
 - a. Department of Small Business and Supplier Diversity (SBSD) certified Small Businesses: 1% capped at \$500 per order.
 - b. Businesses that are not Department of Small Business and Supplier Diversity (SBSD) certified Small Businesses: 1% capped at \$1,500 per order.
 2. For orders issued prior to July 1, 2014 the vendor transaction fees can be found at www.eVA.virginia.gov.
 3. The specified vendor transaction fee will be invoiced by the Commonwealth of Virginia Department of General Services approximately 60 days after the corresponding purchase order is issued and payable 30 days after the invoice date. Any adjustments (increases/decreases) will be handled through purchase order changes.
- V. AVAILABILITY OF FUNDS: It is understood and agreed between the parties herein that the Commonwealth of Virginia shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this agreement.

- W. PRICING CURRENCY: Unless stated otherwise in the solicitation, offerors shall state offered prices in U.S. dollars.
- X. E-VERIFY REQUIREMENT OF ANY CONTRACTOR: Any employer with more than an average of 50 employees for the previous 12 months entering into a contract in excess of \$50,000 with James Madison University to perform work or provide services pursuant to such contract shall register and participate in the E-Verify program to verify information and work authorization of its newly hired employees performing work pursuant to any awarded contract.

VIII. SPECIAL TERMS AND CONDITIONS

- A. AUDIT: The Contractor hereby agrees to retain all books, records, systems, and other documents relative to this contract for five (5) years after final payment, or until audited by the Commonwealth of Virginia, whichever is sooner. The Commonwealth of Virginia, its authorized agents, and/or State auditors shall have full access to and the right to examine any of said materials during said period.
- B. CANCELLATION OF CONTRACT: James Madison University reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 60 days written notice to the contractor. In the event the initial contract period is for more than 12 months, the resulting contract may be terminated by either party, without penalty, after the initial 12 months of the contract period upon 60 days written notice to the other party. Any contract cancellation notice shall not relieve the contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of cancellation.
- C. IDENTIFICATION OF PROPOSAL ENVELOPE: The signed proposal should be returned in a separate envelope or package, sealed and identified as follows:

From:			
	Name of Offeror	Due Date	Time
	Street or Box No.	RFP #	
	City, State, Zip Code	RFP Title	
Name of Purchasing Officer:			

The envelope should be addressed as directed on the title page of the solicitation.

The Offeror takes the risk that if the envelope is not marked as described above, it may be inadvertently opened and the information compromised, which may cause the proposal to be disqualified. Proposals may be hand-delivered to the designated location in the office issuing the solicitation. No other correspondence or other proposals should be placed in the envelope.

- D. LATE PROPOSALS: To be considered for selection, proposals must be received by the issuing office by the designated date and hour. The official time used in the receipt of proposals is that time on the automatic time stamp machine in the issuing office. Proposals received in the issuing office after the date and hour designated are automatically non responsive and will not be considered. The University is not responsible for delays in the delivery of mail by the U.S. Postal Service, private couriers, or the intra university mail system. It is the sole responsibility of the Offeror to ensure that its proposal reaches the issuing office by the designated date and hour.

- E. UNDERSTANDING OF REQUIREMENTS: It is the responsibility of each offeror to inquire about and clarify any requirements of this solicitation that is not understood. The University will not be bound by oral explanations as to the meaning of specifications or language contained in this solicitation. Therefore, all inquiries deemed to be substantive in nature must be in writing and submitted to the responsible buyer in the Procurement Services Office. Offerors must ensure that written inquiries reach the buyer at least five (5) days prior to the time set for receipt of offerors proposals. A copy of all queries and the respective response will be provided in the form of an addendum to all offerors who have indicated an interest in responding to this solicitation. Your signature on your Offer certifies that you fully understand all facets of this solicitation. These questions may be sent by Fax to 540/ 568-7936 or 540/568-7935.
- F. RENEWAL OF CONTRACT: This contract may be renewed by the Commonwealth for a period of four (4) successive one year periods under the terms and conditions of the original contract except as stated in 1. and 2. below. Price increases may be negotiated only at the time of renewal. Written notice of the Commonwealth's intention to renew shall be given approximately 90 days prior to the expiration date of each contract period.
1. If the Commonwealth elects to exercise the option to renew the contract for an additional one-year period, the contract price(s) for the additional one year shall not exceed the contract price(s) of the original contract increased/decreased by no more than the percentage increase/decrease of the other services category of the CPI-W section of the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.
 2. If during any subsequent renewal periods, the Commonwealth elects to exercise the option to renew the contract, the contract price(s) for the subsequent renewal period shall not exceed the contract price(s) of the previous renewal period increased/decreased by more than the percentage increase/decrease of the other services category of the CPI-W section of the Consumer Price Index of the United States Bureau of Labor Statistics for the latest twelve months for which statistics are available.
- G. SUBMISSION OF INVOICES: All invoices shall be submitted within sixty days of contract term expiration for the initial contract period as well as for each subsequent contract renewal period. Any invoices submitted after the sixty day period will not be processed for payment.
- H. OPERATING VEHICLES ON JAMES MADISON UNIVERSITY CAMPUS: Operating vehicles on sidewalks, plazas, and areas heavily used by pedestrians is prohibited. In the unlikely event a driver should find it necessary to drive on James Madison University sidewalks, plazas, and areas heavily used by pedestrians, the driver must yield to pedestrians. For a complete list of parking regulations, please go to www.jmu.edu/parking; or to acquire a service representative parking permit, contact Parking Services at 540.568.3300. The safety of our students, faculty and staff is of paramount importance to us. Accordingly, violators may be charged.
- I. COOPERATIVE PURCHASING / USE OF AGREEMENT BY THIRD PARTIES: It is the intent of this solicitation and resulting contract(s) to allow for cooperative procurement. Accordingly, any public body, (to include government/state agencies, political subdivisions, etc.), cooperative purchasing organizations, public or private health or educational institutions or any University related foundation and affiliated corporations may access any resulting contract if authorized by the Contractor.

Participation in this cooperative procurement is strictly voluntary. If authorized by the Contractor(s), the resultant contract(s) will be extended to the entities indicated above to purchase goods and services in accordance with contract terms. As a separate contractual relationship, the participating entity will place its own orders directly with the Contractor(s) and shall fully and independently administer its use of the contract(s) to include contractual disputes, invoicing and payments without direct administration from the University. No modification of this contract or execution of a separate agreement is required to participate; however, the participating entity and the Contractor may modify the terms and conditions of this contract to accommodate specific governing laws, regulations, policies, and business goals required by the participating entity. Any such modification will apply solely between the participating entity and the Contractor.

The Contractor will notify the University in writing of any such entities accessing this contract. The Contractor will provide semi-annual usage reports for all entities accessing the contract. The University shall not be held liable for any costs or damages incurred by any other participating entity as a result of any authorization by the Contractor to extend the contract. It is understood and agreed that the University is not responsible for the acts or omissions of any entity and will not be considered in default of the contract no matter the circumstances.

Use of this contract(s) does not preclude any participating entity from using other contracts or competitive processes as needed.

J. SMALL BUSINESS SUBCONTRACTING AND EVIDENCE OF COMPLIANCE:

1. It is the goal of the Commonwealth that 42% of its purchases are made from small businesses. This includes discretionary spending in prime contracts and subcontracts. All potential offerors are required to submit a Small Business Subcontracting Plan. Unless the offeror is registered as a Department of Small Business and Supplier Diversity (SBSD)-certified small business and where it is practicable for any portion of the awarded contract to be subcontracted to other suppliers, the contractor is encouraged to offer such subcontracting opportunities to SBSD-certified small businesses. This shall not exclude SBSD-certified women-owned and minority-owned businesses when they have received SBSD small business certification. No offeror or subcontractor shall be considered a Small Business, a Women-Owned Business or a Minority-Owned Business unless certified as such by the Department of Small Business and Supplier Diversity (SBSD) by the due date for receipt of proposals. If small business subcontractors are used, the prime contractor agrees to report the use of small business subcontractors by providing the purchasing office at a minimum the following information: name of small business with the SBSD certification number or FEIN, phone number, total dollar amount subcontracted, category type (small, women-owned, or minority-owned), and type of product/service provided. **This information shall be submitted to: JMU Office of Procurement Services, Attn: SWAM Subcontracting Compliance, MSC 5720, Harrisonburg, VA 22807.**
2. Each prime contractor who wins an award in which provision of a small business subcontracting plan is a condition of the award, shall deliver to the contracting agency or institution with every request for payment, evidence of compliance (subject only to insubstantial shortfalls and to shortfalls arising from subcontractor default) with the small business subcontracting plan. **This information shall be submitted to: JMU Office of Procurement Services, SWAM Subcontracting Compliance, MSC 5720, Harrisonburg, VA 22807.** When such business has been subcontracted to these firms and upon completion of the contract, the contractor agrees to furnish the purchasing office at a minimum the following information: name of firm with the Department of Small Business and Supplier Diversity (SBSD) certification number or FEIN number, phone number, total

dollar amount subcontracted, category type (small, women-owned, or minority-owned), and type of product or service provided. Payment(s) may be withheld until compliance with the plan is received and confirmed by the agency or institution. The agency or institution reserves the right to pursue other appropriate remedies to include, but not be limited to, termination for default.

3. Each prime contractor who wins an award valued over \$200,000 shall deliver to the contracting agency or institution with every request for payment, information on use of subcontractors that are not Department of Small Business and Supplier Diversity (SBSD)-certified small businesses. When such business has been subcontracted to these firms and upon completion of the contract, the contractor agrees to furnish the purchasing office at a minimum the following information: name of firm, phone number, FEIN number, total dollar amount subcontracted, and type of product or service provided. **This information shall be submitted to: JMU Office of Procurement Services, Attn: SWAM Subcontracting Compliance, MSC 5720, Harrisonburg, VA 22807.**
- K. AUTHORIZATION TO CONDUCT BUSINESS IN THE COMMONWEALTH: A contractor organized as a stock or nonstock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any business entity described above that enters into a contract with a public body shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the contract. A public body may void any contract with a business entity if the business entity fails to remain in compliance with the provisions of this section.
- L. PUBLIC POSTING OF COOPERATIVE CONTRACTS: James Madison University maintains a web-based contracts database with a public gateway access. Any resulting cooperative contract/s to this solicitation will be posted to the publicly accessible website. Contents identified as proprietary information will not be made public.
- M. CRIMINAL BACKGROUND CHECKS OF PERSONNEL ASSIGNED BY CONTRACTOR TO PERFORM WORK ON JMU PROPERTY: The Contractor shall obtain criminal background checks on all of their contracted employees who will be assigned to perform services on James Madison University property. The results of the background checks will be directed solely to the Contractor. The Contractor bears responsibility for confirming to the University contract administrator that the background checks have been completed prior to work being performed by their employees or subcontractors. The Contractor shall only assign to work on the University campus those individuals whom it deems qualified and permissible based on the results of completed background checks. Notwithstanding any other provision herein, and to ensure the safety of students, faculty, staff and facilities, James Madison University reserves the right to approve or disapprove any contract employee that will work on JMU property. Disapproval by the University will solely apply to JMU property and should have no bearing on the Contractor's employment of an individual outside of James Madison University.
- N. INDEMNIFICATION: Contractor agrees to indemnify, defend and hold harmless the Commonwealth of Virginia, its officers, agents, and employees from any claims, damages and actions of any kind or nature, whether at law or in equity, arising from or caused by the use of any materials, goods, or equipment of any kind or nature furnished by the contractor/any services of any kind or nature furnished by the contractor, provided that such liability is not attributable to the sole negligence of the using agency or to failure of the using agency to use

the materials, goods, or equipment in the manner already and permanently described by the contractor on the materials, goods or equipment delivered.

- O. ADVERTISING: In the event a contract is awarded for supplies, equipment, or services resulting from this proposal, no indication of such sales or services to James Madison University will be used in product literature or advertising without the express written consent of the University. The contractor shall not state in any of its advertising or product literature that James Madison University has purchased or uses any of its products or services, and the contractor shall not include James Madison University in any client list in advertising and promotional materials without the express written consent of the University.
- P. ELECTRICAL EQUIPMENT STANDARDS: All equipment/material shall conform to the latest issue of all applicable standards as established by National Electrical Manufacturer's Association (NEMA), American National Standards Institute (ANSI), and Occupational Safety & Health Administration (OSHA). All equipment and material, for which there are OSHA standards, shall bear an appropriate label of approval for use intended from a Nationally Recognized Testing Laboratory (NRTL).
- Q. REPAIR PARTS: In the event that the performance of maintenance services under the contract results in a need to replace defective parts, such items may only be replaced by new parts. In no instance shall the contractor be permitted to replace defective items with refurbished, remanufactured, or surplus items without prior written authorization of the University.
- R. SERVICES WARRANTY: Contractor warrants that all services shall be provided for in accordance with manufacturer's service manuals and as specified in this solicitation. Contractor shall act as the sole point of contact for all units repaired under this agreement.
- S. WARRANTY (COMMERCIAL): The contractor agrees that the goods and services furnished under any award resulting from this solicitation shall be covered by the most favorable commercial warranties that the contractor gives any customer for such goods and services and that the rights and remedies provided therein are in addition to and do not limit those available to the University by any other clause of this solicitation. A copy of this warranty should be provided. Nationwide factory recall or product update repairs or replacement shall be the responsibility of the contractor. In such cases, factory recall and modification work shall be handled in the same manner as warranty work.
- T. PROTECTION OF PERSONS AND PROPERTY: The contractor expressly undertakes both directly and through its subcontractor(s) to take every precaution at all times for the protection of persons and property that may come on the building site or be affected by contractor's operation in connection with the work.

The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. The provisions of all rules and regulations governing safety as adopted by the Safety Codes Commission of the Commonwealth of Virginia, issued by the Department of Labor and Industry under Title 40.1 of the Code of Virginia shall apply to all work under this contract.

- U. PRIME CONTRACTOR RESPONSIBILITIES: The contractor shall be responsible for completely supervising and directing the work under this contract and all subcontractors that they may utilize, using their best skill and attention. Subcontractors who perform work under this contract shall be responsible to the prime contractor. The contractor agrees that they are as fully responsible for the acts and omissions of their subcontractors and of persons employed by them as they are for the acts and omissions of their own employees.

- V. SUBCONTRACTS: No portion of the work shall be subcontracted without prior written consent of the purchasing agency. In the event contractor desires to subcontract some part of the work specified herein, the contractor shall furnish the purchasing agency the names, qualifications, and experience of their proposed subcontractors. The contractor shall, however, remain fully liable and responsible for the work to be done by its subcontractor(s) and shall assure compliance with all requirements of the contract.
- W. CONTINUITY OF SERVICES: The contractor recognizes that the services under this contract are vital to the University and must be continued without interruption and that, upon contract expiration, a successor, either the Agency or another contractor, may continue them. The Contractor agrees:

1. To exercise its best efforts and cooperation to effect an orderly and efficient transition to a successor;
2. To make all agency-owned facilities, equipment, and data available to any successor at an appropriate time prior to the expiration of the contract to facilitate transition to the successor; and
3. That the agency contractor officer shall have final authority to resolve disputes related to the transition of the contract from the Contractor to its successor.

The Contractor shall, upon written notice from the Contract Officer, furnish phase-in/phase-out services for up to ninety (90) days after this contract expires and shall negotiate in good faith a plan with the successor to execute the phase-in/phase-out services. The plan shall be subject to the agency's approval.

The Contractor shall be reimbursed for all reasonable, pre-approved phase-in/phase-out costs (i.e., costs incurred within the agreed period after contract expiration that result from phase-in/phase-out operations) and a fee (profit) not to exceed a pro rata portion of the fee (profit) under this contract. All phase-in/phase-out work fees must be approved by the agency in writing prior to commencement of said work.

- X. ADDITIONAL GOODS AND SERVICES: The University may acquire other goods or services that the supplier provides than those specifically solicited. The University reserves the right, subject to mutual agreement, for the Contractor to provide additional goods and/or services under the same pricing, terms, and conditions and to make modifications or enhancements to the existing goods and services. Such additional goods and services may include other products, components, accessories, subsystems, or related services that are newly introduced during the term of this Agreement. Such additional goods and services will be provided to the University at favored nations pricing, terms, and conditions.
- Y. LATEST SOFTWARE VERSION: Any software product(s) provided under the contract shall be the latest version available to the general public as of the due date of this solicitation.
- Z. NEW EQUIPMENT: Any equipment furnished under the contract shall be new, unused equipment.
- AA. OPERATIONAL COMPONENTS: Stated equipment prices shall include all cables, connectors, interfaces, documentation for all components, and any other items necessary for full systems operation at the user site. This does not include consumable supplies such as paper, tapes, disks, etc., unless such supplies are expressly identified in the pricing schedule.

- BB. MAINTENANCE MANUALS: The contractor shall provide with each piece of equipment an operations and maintenance manual with wiring diagrams, parts list, and a copy of all warranties.
- CC. PRODUCT SUBSTITUTION: During the term of any contract resulting from this solicitation, the vendor is not authorized to substitute any item for that product and/or software identified in the solicitation without the prior written consent of the contracting officer whose name appears on the front of this solicitation, or their designee.
- DD. QUALIFIED REPAIR PERSONNEL: All warranty or maintenance services to be performed on the items specified in this solicitation as well as any associated hardware or software are to be performed by qualified technicians properly authorized by the manufacturer to perform such services. The Commonwealth reserves the right to require proof of certification prior to award and at any time during the term of the contract.
- EE. REPAIR PARTS: In the event that the performance of maintenance services under the contract results in a need to replace defective parts, such items may only be replaced by new parts. In no instance shall the contractor be permitted to replace defective items with refurbished, remanufactured, or surplus items without prior written authorization of the Commonwealth.
- FF. RENEWAL OF MAINTENANCE: Maintenance of the hardware or software specified in the resultant contract may be renewed by the mutual written agreement of both parties for an additional one-year periods, under the terms and conditions of the original contract except as noted herein. Price changes may be negotiated at time of renewal; however, in no case shall the maintenance costs for a succeeding one-year period exceed the prior year's contract price(s), increased or decreased by more than the percentage increase or decrease in the services category of the CPI-W section of the US Bureau of Labor Statistics Consumer Price Index, for the latest twelve months for which statistics are available.
- GG. SOFTWARE UPGRADES: The Commonwealth shall be entitled to any and all upgraded versions of the software covered in the contract that becomes available from the contractor. The maximum charge for upgrade shall not exceed the total difference between the cost of the Commonwealth's current version and the price the contractor sells or licenses
- HH. SOURCE CODE: In the event the contractor ceases to maintain experienced staff and the resources needed to provide required software maintenance, the Commonwealth shall be entitled to have, use, and duplicate for its own use, a copy of the source code and associated documentation for the software products covered by the contract. Until such time as a complete copy of such material is provided, the Commonwealth shall have exclusive right to possess all physical embodiments of such contractor owned materials. The rights of the Commonwealth in this respect shall survive for a period of twenty years after the expiration or termination of the contract. All lease and royalty fees necessary to support this right are included in the initial license fee as contained in the pricing schedule.
- II. TERM OF SOFTWARE LICENSE: Unless otherwise stated in the solicitation, the software license(s) identified in the pricing schedule shall be purchased on a perpetual basis and shall continue in perpetuity. However the Commonwealth reserves the right to terminate the license at any time, although the mere expiration or termination of this contract shall not be construed as an intent to terminate the license. All acquired license(s) shall be for use at any computing facilities, on any equipment, by any number of users, and for any purposes for which it is procured. The Commonwealth further reserves the right to transfer all rights under the license to another state agency to which some or all of its functions are transferred.

- JJ. TITLE TO SOFTWARE: By submitting a bid or proposal, the bidder or offeror represents and warrants that it is the sole owner of the software or, if not the owner, that it has received all legally required authorizations from the owner to license the software, has the full power to grant the rights required by this solicitation, and that neither the software nor its use in accordance with the contract will violate or infringe upon any patent, copyright, trade secret, or any other property rights of another person or organization.
- KK. WARRANTY AGAINST SHUTDOWN DEVICES: The contractor warrants that the equipment and software provided under the contract shall not contain any lock, counter, CPU reference, virus, worm, or other device capable of halting operations or erasing or altering data or programs. Contractor further warrants that neither it, nor its agents, employees, or subcontractors shall insert any shutdown device following delivery of the equipment and software.
- LL. NONVISUAL ACCESS TO TECHNOLOGY: All information technology which, pursuant to this Agreement, is purchased or upgraded by or for the use of any State agency or institution or political subdivision of the Commonwealth (the "Technology") shall comply with the following nonvisual access standards from the date of purchase or upgrade until the expiration of this Agreement:
1. effective, interactive control and use of the Technology shall be readily achievable by nonvisual means;
 2. the Technology equipped for nonvisual access shall be compatible with information technology used by other individuals with whom any blind or visually impaired user of the Technology interacts;
 3. nonvisual access technology shall be integrated into any networks used to share communications among employees, program participants or the public; and
 4. the technology for nonvisual access shall have the capability of providing equivalent access by nonvisual means to telecommunications or other interconnected network services used by persons who are not blind or visually impaired.

Compliance with the foregoing nonvisual access standards shall not be required if the head of the using agency, institution or political subdivision determines that (i) the Technology is not available with nonvisual access because the essential elements of the Technology are visual and (ii) nonvisual equivalence is not available.

Installation of hardware, software or peripheral devices used for nonvisual access is not required when the Technology is being used exclusively by individuals who are not blind or visually impaired, but applications programs and underlying operating systems (including the format of the data) used for the manipulation and presentation of information shall permit the installation and effective use of nonvisual access software and peripheral devices.

If requested, the Contractor must provide a detailed explanation of how compliance with the foregoing nonvisual access standards is achieved and a validation of concept demonstration.

The requirements of this Paragraph shall be construed to achieve full compliance with the Information Technology Access Act, 2.2-3500 through 2.2-3504 of the *Code of Virginia*.

All information technology which, pursuant to this Agreement, is purchased or upgraded by or for the use of any Commonwealth agency or institution or political subdivision of the Commonwealth (the "Technology") shall comply with Section 508 of the Rehabilitation Act (29 U.S.C. 794d), as amended. If requested, the Contractor must provide a detailed explanation of how compliance with Section 508 of the Rehabilitation Act is achieved and a validation of

concept demonstration. (<http://www.section508.gov/>). The requirements of this Paragraph along with the Non-Visual Access to Technology Clause shall be construed to achieve full compliance with.

IX. METHOD OF PAYMENT

The contractor will be paid on the basis of invoices submitted in accordance with the solicitation and any negotiations. James Madison University recognizes the importance of expediting the payment process for our vendors and suppliers. We are asking our vendors and suppliers to enroll in the Wells Fargo Bank single use Commercial Card Number process or electronic deposit (ACH) to your bank account so that future payments are made electronically. Contractors signed up for the Wells Fargo Bank single use Commercial Card Number process will receive the benefit of being paid in Net 15 days. Additional information is available online at:

<http://www.jmu.edu/financeoffice/accounting-operations-disbursements/cash-investments/vendor-payment-methods.shtml>

X. PRICING SCHEDULE

The offeror shall provide pricing for all products and services included in proposal indicating one-time and on-going costs. The resulting contract will be cooperative and pricing shall be inclusive for the attached Zone Map, of which JMU falls within Zone 2.

The offeror shall provide incentives and/or increased discounts that would be offered if multiple VASCUPP institutions utilize the contract for goods and offered services. A list of VASCUPP member schools can be found at www.vascupp.org.

Specify any associated charge card processing fees, if applicable, to be billed to the University.

Add additional rows/pages as needed to list all rates for labor and services as well as goods and equipment offered.

PRICING SCHEDULE BY ZONE									
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9
Regular Time Labor Rates (7:30 a.m. to 4:00 p.m. Monday – Friday)* Service Rates									
“Position”									
Labor Rate \$/hour									
“Position”									
Labor Rate \$/hour									
Overtime/Emergency Labor Rates (Outside of Regular Time working hours)* Service Rates									
“Position”									
Labor Rate \$/hour									
“Position”									
Labor Rate \$/hour									

PRICING SCHEDULE BY ZONE									
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9
Products and Equipment (List by Manufacturer and Discount rate offered)									
Item (or) Manufacturer	% Off List-Price Discount Offered by Zone								

Other Fees

XI. ATTACHMENTS

Attachment A: Offeror Data Sheet

Attachment B: Small, Women, and Minority-owned Business (SWaM) Utilization Plan

Attachment C: Standard Contract Sample

Attachment D: Zone Map

ATTACHMENT A

OFFEROR DATA SHEET

TO BE COMPLETED BY OFFEROR

1. QUALIFICATIONS OF OFFEROR: Offerors must have the capability and capacity in all respects to fully satisfy the contractual requirements.
2. YEARS IN BUSINESS: Indicate the length of time you have been in business providing these types of goods and services.

Years _____ Months _____

3. REFERENCES: Indicate below a listing of at least five (5) organizations, either commercial or governmental/educational, that your agency is servicing. Include the name and address of the person the purchasing agency has your permission to contact.

CLIENT	LENGTH OF SERVICE	ADDRESS	CONTACT PERSON/PHONE #
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4. List full names and addresses of Offeror and any branch offices which may be responsible for administering the contract.

3. RELATIONSHIP WITH THE COMMONWEALTH OF VIRGINIA: Is any member of the firm an employee of the Commonwealth of Virginia who has a personal interest in this contract pursuant to the [CODE OF VIRGINIA](#), SECTION 2.2-3100 – 3131?

[] YES [] NO

IF YES, EXPLAIN: _____

ATTACHMENT B

Small, Women and Minority-owned Businesses (SWaM) Utilization Plan

Offeror Name: _____ **Preparer Name:** _____

Date: _____

Is your firm a **Small Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes _____ No _____

If yes, certification number: _____ Certification date: _____

Is your firm a **Woman-owned Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes _____ No _____

If yes, certification number: _____ Certification date: _____

Is your firm a **Minority-Owned Business Enterprise** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes _____ No _____

If yes, certification number: _____ Certification date: _____

Is your firm a **Micro Business** certified by the Department of Small Business and Supplier Diversity (SBSD)? Yes _____ No _____

If yes, certification number: _____ Certification date: _____

Instructions: *Populate the table below to show your firm's plans for utilization of small, women-owned and minority-owned business enterprises in the performance of the contract. Describe plans to utilize SWAMs businesses as part of joint ventures, partnerships, subcontractors, suppliers, etc.*

Small Business: "Small business " means a business, independently owned or operated by one or more persons who are citizens of the United States or non-citizens who are in full compliance with United States immigration law, which, together with affiliates, has 250 or fewer employees, or average annual gross receipts of \$10 million or less averaged over the previous three years.

Woman-Owned Business Enterprise: A business concern which is at least 51 percent owned by one or more women who are U.S. citizens or legal resident aliens, or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest in which is owned by one or more women, and whose management and daily business operations are controlled by one or more of such individuals. **For purposes of the SWAM Program, all certified women-owned businesses are also a small business enterprise.**

Minority-Owned Business Enterprise: A business concern which is at least 51 percent owned by one or more minorities or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest in which is owned by one or more minorities and whose management and daily business operations are controlled by one or more of such individuals. **For purposes of the SWAM Program, all certified minority-owned businesses are also a small business enterprise.**

Micro Business is a certified Small Business under the SWaM Program and has no more than twenty-five (25) employees **AND** no more than \$3 million in average annual revenue over the three-year period prior to their certification.

All small, women, and minority owned businesses must be certified by the Commonwealth of Virginia Department of Small Business and Supplier Diversity (SBSD) to be counted in the SWAM program. Certification applications are available through SBSD at 800-223-0671 in Virginia, 804-786-6585 outside Virginia, or online at <http://www.sbsd.virginia.gov/> (Customer Service).

RETURN OF THIS PAGE IS REQUIRED

ATTACHMENT B (CNT'D)
Small, Women and Minority-owned Businesses (SWaM) Utilization Plan

Procurement Name and Number: _____

Date Form Completed: _____

Listing of Sub-Contractors, to include, Small, Woman Owned and Minority Owned Businesses
for this Proposal and Subsequent Contract

Offeror / Proposer:

Firm

Address

Contact Person/No.

Sub-Contractor's Name and Address	Contact Person & Phone Number	SBSD Certification Number	Services or Materials Provided	Total Subcontractor Contract Amount (to include change orders)	Total Dollars Paid Subcontractor to date (to be submitted with request for payment from JMU)

(Form shall be submitted with proposal and if awarded, again with submission of each request for payment)

RETURN OF THIS PAGE IS REQUIRED

ATTACHMENT C



**COMMONWEALTH OF VIRGINIA
STANDARD CONTRACT**

Contract No. _____

This contract entered into this _____ day of _____, 20____, by _____ hereinafter called the "Contractor" and Commonwealth of Virginia, James Madison University called the "Purchasing Agency".

WITNESSETH that the Contractor and the Purchasing Agency, in consideration of the mutual covenants, promises and agreements herein contained, agree as follows:

SCOPE OF CONTRACT: The Contractor shall provide the services to the Purchasing Agency as set forth in the Contract Documents.

PERIOD OF PERFORMANCE: From _____ through _____

The contract documents shall consist of:

- (1) This signed form;
- (2) The following portions of the Request for Proposals dated _____:
 - (a) The Statement of Needs,
 - (b) The General Terms and Conditions,
 - (c) The Special Terms and Conditions together with any negotiated modifications of those Special Conditions;
 - (d) List each addendum that may be issued
- (3) The Contractor's Proposal dated _____ and the following negotiated modification to the Proposal, all of which documents are incorporated herein.
 - (a) Negotiations summary dated _____.

IN WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

CONTRACTOR:

PURCHASING AGENCY:

By: _____
(Signature)

By: _____
(Signature)

(Printed Name)

(Printed Name)

Title: _____

Title: _____

ATTACHMENT D

Zone Map



Virginia Association of State College & University Purchasing Professionals (VASCUPP)

List of member institutions by zones

<u>Zone 1</u> George Mason University (Fairfax)	<u>Zone 2</u> James Madison University (Harrisonburg)	<u>Zone 3</u> University of Virginia (Charlottesville)
<u>Zone 4</u> University of Mary Washington (Fredericksburg)	<u>Zone 5</u> College of William and Mary (Williamsburg) Old Dominion University (Norfolk)	<u>Zone 6</u> Virginia Commonwealth University (Richmond)
<u>Zone 7</u> Longwood University (Farmville)	<u>Zone 8</u> Virginia Military Institute (Lexington) Virginia Tech (Blacksburg) Radford University (Radford)	<u>Zone 9</u> University of Virginia - Wise (Wise)