Event Parking Management System Requirements
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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the Author(s) and do not necessarily reflect the view of the U.S. Department of Transportation.
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TODAY’S AGENDA

01 | PURPOSE OF THIS WEBINAR
• Share concept development activities from Smart Columbus with stakeholders

02 | WEBINAR CONTENT
• Smart City Challenge and Smart Columbus Program Overview
• Smart Columbus Event Parking Management Project Overview
• Smart Columbus Event Parking Management System Requirements
• Subject Matter Expert Q&A
• How to Stay Connected
• Stakeholder Q&A

03 | WEBINAR PROTOCOL
• All participant lines have been muted during the webinar in order to reduce background noise
• Questions are welcome via chatbox during the Q&A Section
• The webinar recording and presentation materials will be posted on the Smart Columbus website
CHALLENGE AND PROGRAM OVERVIEW
$40 MILLION 78 APPLIED COLUMBUS WON

VISION:
To empower our residents to live their best lives through responsive, innovative and safe mobility solutions.

MISSION:
To demonstrate how an intelligent transportation system and equitable access to transportation can have positive impacts on every day challenges faced by cities.

OUTCOMES:
Safety, Mobility, Opportunity, Environment, Agency Efficiency, Customer Satisfaction
EPM OVERVIEW
EPM Central System

- Components
- Functionality

Facilities

- 40,000+ spaces in parking garages
- 30,000+ spaces in surface lots
- 4,300 parking meters
- 130 loading zones
PROBLEM STATEMENT & CHALLENGES

- Finding parking options in the Downtown and Short North area is difficult even with the multiple parking applications currently available.
- No single source exists for parking options, reservations, or payments
- No parking meter availability
- No comprehensive view into current parking facilities and parking meter usage data for Operators

Source: Experience Columbus
Source: iStockphotos
CONCEPT FOR PROPOSED SYSTEM

- One stop shop for parking
- Real-time parking information
- Connection to parking meters

* Driver strongly encouraged to be parked safely before using phone application
SYSTEM REQUIREMENTS
SYSTEM REQUIREMENTS TECHNICAL WALKTHROUGH

Development Process
1. Break down the system into functional group categories
2. Develop the technical requirements for system components
3. Link requirements with user needs, constraints and interfaces as described by the ConOps
Step 1
Break down the system into functional group categories

**Functional Group**

- EPM Central System
- Ungated Parking Facility System
- Gated Parking Facility System
- Parking Operator Application
- City Parking Meter System
- Traveler Mobile Application
- Traveler Website
- Common Payment System (CPS)
- Smart Columbus Operating System
- Probe Vehicles
- City of Columbus Users
- Third-Party Users
SYSTEM REQUIREMENTS

Step 2
Develop the technical requirements for system components

<table>
<thead>
<tr>
<th>Requirement Name</th>
<th>Availability and Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraints</td>
<td></td>
</tr>
<tr>
<td>Disposal</td>
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<tr>
<td>Data</td>
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<tr>
<td>Enabling</td>
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<td>Functional</td>
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<td>Interface</td>
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<td>Information Management</td>
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<td>Life Cycle Sustainment</td>
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<td>Non-Functional</td>
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<td>Maintainability</td>
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<td>Performance</td>
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<td>Physical</td>
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<td>Policy and Regulation</td>
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<td>Security</td>
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<td>Storage and Transport</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Verification Method</th>
<th>Inspection</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Demonstration</td>
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<tr>
<td></td>
<td>Test</td>
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<tr>
<td></td>
<td>Analyze</td>
</tr>
</tbody>
</table>

**Requirement Description (EPM Central System)**

The EPMCS shall be capable of notifying Travelers via text, email, or push notification of warnings of expiration of paid parking session.

The EPMCS shall provide Travelers with access to real-time parking restrictions at each parking facility.

**The EPMCS shall reflect operational changes (such as rates, hours of operation, number of spaces, etc.) without any system downtime or data latency, when operational details are entered or modified by the Parking Operators.**

The EPMCS shall take into consideration the location of the Traveler when calculating the probability of finding a metered parking space (i.e. how long it is going to take the Traveler to get to the space).

The EPMCS shall allow local merchants to offer discounted parking options through the TRAVAPP.
SYSTEM REQUIREMENTS

**User Need** | **Description**
--- | ---
EPM-UN001-v01 | EPM Real-Time Parking Information
EPM-UN002-v01 | EPM Map Display
EPM-UN003-v01 | EPM Parking Meter Availability
EPM-UN004-v01 | EPM Loading Zone Availability
EPM-UN005-v01 | EPM One-Stop-Shop
EPM-UN006-v01 | EPM Parking Reservation
EPM-UN007-v01 | EPM Facility Access
EPM-UN008-v01 | EPM Navigation
EPM-UN009-v01 | EPM CPS Management
EPM-UN010-v01 | EPM Parking Meter Time Left
EPM-UN021-v01 | EPM Parking Facility Reservation
EPM-UN022-v01 | EPM Demand-Based Pricing

**Constraint** | **Description**
--- | ---
Constraint 2 | The EPM system needs to integrate and work with existing public and private parking management systems.
Constraint 3 | The EPM must adhere to the policies and technical requirements put forth by the Operating System team.
Constraint 4 | The City will be responsible for establishing policies and agreements for interactions with any third-party developers, third-party reservation providers, testers and facility owners.

**Requirement Description (Interactive Kiosk)**
The Gated Parking Facilities shall confirm the reservation with the EPM Central System.

**Step 3**
Link the requirements with user needs, constraints and interfaces as described by the ConOps

<table>
<thead>
<tr>
<th>Interface</th>
<th>Source Element</th>
<th>Destination Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPM-IX1843-v1</td>
<td>EPM Central System</td>
<td>Gated Parking Facilities</td>
</tr>
<tr>
<td>EPM-IX1844-v1</td>
<td>EPM Central System</td>
<td>Gated Parking Facilities</td>
</tr>
<tr>
<td>EPM-IX1845-v1</td>
<td>Gated Parking Facilities</td>
<td>EPM Central System</td>
</tr>
<tr>
<td>EPM-IX1846-v1</td>
<td>Gated Parking Facilities</td>
<td>EPM Central System</td>
</tr>
</tbody>
</table>
REQUIREMENTS BY THE NUMBERS

- 220+ Requirements
- 20+ Subcomponents
  - Payment Collection System, Parking Probability, Traveler Accounts, etc.
- 17 Requirement Types
  - Functional, Performance, Interface, Data, Security, etc.
- 12 Functional Groups
  - EPMCS, TRAVAPP, PARKOP, CPS, UFAC, GFAC, etc.
- 5 Levels of Importance
  - Shall, Shall Not, Should, Should Not, May
- 4 Verification Methods
  - Inspection, Demonstration, Test, Analysis
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Access and Parking Manager, City of Boulder, Colorado

DANIEL FORTINBERRY, CAPP, CPP
Parking Division Manager, City of Cincinnati

ROBERT FERRIN
Assistant Director for Parking Services, City of Columbus
REQUIREMENTS DISCUSSION

• Four categories of requirements
  • EPM Central System
  • Integration (gated/ungated facilities)
  • Mobile application
  • Payment

• For each category:
  • Description
  • Example requirements
  • Questions and discussion

• Procurement
EPM CENTRAL SYSTEM REQUIREMENTS

- Parking and payment coordination
- Traveler notifications
- Probe vehicle data
- Parking probability calculation
# EPM CENTRAL SYSTEM REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement ID</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>EPM-FN1905-V01</td>
<td>The EPMCS shall allow purchase of additional parking meter time.</td>
</tr>
<tr>
<td>EPM-FN1918-V01</td>
<td>The EPMCS shall allow local merchants to offer discounted parking options through the TRAVAPP.</td>
</tr>
<tr>
<td>EPM-FN1906-V01</td>
<td>The EPMCS shall not allow purchase of additional parking meter time past the maximum time allowed for that parking location.</td>
</tr>
<tr>
<td>EPM-FN1907-V01</td>
<td>The EPMCS shall not allow purchase of parking when desired time includes restricted parking periods (i.e. after parking hours have ended).</td>
</tr>
<tr>
<td>EPM-FN1908-V01</td>
<td>The EPMCS shall calculate the probability of a Traveler finding a metered parking space in a designated search area.</td>
</tr>
<tr>
<td>EPM-FN1909-V01</td>
<td>The EPMCS shall take into consideration the location of the Traveler when calculating the probability of finding a metered parking space (i.e. how long it is going to take the Traveler to get to the space).</td>
</tr>
<tr>
<td>EPM-FN1910-V01</td>
<td>The EPMCS shall calculate the probability of finding an open loading zone in a designated area by the Traveler.</td>
</tr>
<tr>
<td>EPM-FN1923-V01</td>
<td>The EPMCS shall reflect operational changes (such as rates, hours of operation, number of spaces, etc.) without any system downtime or data latency, when operational details are entered or modified by the Parking Operators.</td>
</tr>
<tr>
<td>EPM-DR2036-v1</td>
<td>The EPMCS shall collect probe vehicle data related to parking availability (as well as other car specific data) to be used to calculate the probability of an open parking meter or loading zone space.</td>
</tr>
<tr>
<td>EPM-FN1982-V01</td>
<td>The EPMCS shall be capable of mobile device payments by presenting a reservation ID via an optical barcode on the Traveler’s device screen.</td>
</tr>
<tr>
<td>EPM-FN1983-V01</td>
<td>The EPMCS shall be capable of mobile device payments by presenting a reservation ID through NFC, if supported by the Traveler’s device.</td>
</tr>
</tbody>
</table>
1. What are the benefits of centralizing parking and payment information?

2. What types of notifications should the mobile parking application include to benefit the user?
3. What experience or recommendations can you offer for using probe vehicle data?

4. What is your experience in offering discounts for local merchants? What methods have you implemented that have been successful?

5. What reporting and/or data requirements do you have from your parking management systems? How do you use the data your parking application has collected?
INTEGRATION (GATED/UNGATED FACILITIES) REQUIREMENTS

- Parking operator application
- Facility information
- Real-time parking availability
## INTEGRATION (GATED AND UNGATED FACILITIES) REQUIREMENTS

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<td>EPM-FN1923-V01</td>
<td>The EPMCS shall reflect operational changes (such as rates, hours of operation, number of spaces, etc.) without any system downtime or data latency, when operational details are entered or modified by the Parking Operators.</td>
</tr>
<tr>
<td>EPM-FN1972-V01</td>
<td>UFAC parking operators shall be able to interface with the EPMCS through the PARKOP.</td>
</tr>
<tr>
<td>EPM-FN1973-V01</td>
<td>UFAC parking operators shall be able to enter and modify event rates and schedules in real-time through the PARKOP.</td>
</tr>
<tr>
<td>EPM-IM2059-V01</td>
<td>The PARKOP shall send parking information to the EPM Central System.</td>
</tr>
<tr>
<td>EPM-FN1912-V01</td>
<td>The GFAC shall confirm the reservation with the EPMCS.</td>
</tr>
<tr>
<td>EPM-FN1975-V01</td>
<td>GFAC parking operators shall be able to create and manage CPS Provider accounts.</td>
</tr>
<tr>
<td>EPM-IM2057-V01</td>
<td>Gated parking facilities shall provide APIs to send and receive parking and reservation information with the EPM Central System.</td>
</tr>
<tr>
<td>EPM-FN1913-V01</td>
<td>The UFAC shall confirm the reservation with the EPMCS.</td>
</tr>
<tr>
<td>EPM-FN1974-V01</td>
<td>UFAC parking operators shall be able to create and manage CPS Provider accounts.</td>
</tr>
<tr>
<td>EPM-IF2001-V01</td>
<td>The system shall provide an interface to send and receive information between the UFAC and the PARKOP.</td>
</tr>
</tbody>
</table>
1. Does your parking staff have access to an app that allows for the tracking of availability or real-time changes for events/emergencies?

2. Does your off-street parking facility accept payments from a mobile device? Is it done by barcode or near field communication?
MOBILE APPLICATION REQUIREMENTS

• Essential features
• User interface considerations
• Privacy
<table>
<thead>
<tr>
<th>Requirement ID</th>
<th>Description</th>
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<tbody>
<tr>
<td>EPM-FN1922-V01</td>
<td>The TRAVAPP shall allow the Traveler to pay for a specific period of parking time.</td>
</tr>
<tr>
<td>EPM-FN1925-V01</td>
<td>The TRAVAPP shall allow Travelers to create a profile to store profile information and mobile application settings.</td>
</tr>
<tr>
<td>EPM-FN1942-V01</td>
<td>The TRAVAPP shall provide a history/transaction log to the Traveler with information relevant to reservations and payments (receipt/proof of payment).</td>
</tr>
<tr>
<td>EPM-FN1943-V01</td>
<td>The history/transaction log shall be accessible within the previous one month.</td>
</tr>
<tr>
<td>EPM-FN1944-V01</td>
<td>The TRAVAPP shall provide the ability for the Traveler to store favorite destinations (such as place of work).</td>
</tr>
<tr>
<td>EPM-FN1946-V01</td>
<td>The TRAVAPP shall use the GPS device of the smartphone to determine the Traveler's current location to search for parking options.</td>
</tr>
<tr>
<td>EPM-FN1947-V01</td>
<td>The TRAVAPP shall obtain affirmative express consent from the Traveler before accessing sensitive content, such as geolocation information or contact info.</td>
</tr>
<tr>
<td>EPM-FN1948-V01</td>
<td>The TRAVAPP shall provide the Traveler the ability to search for parking options by entering a street address.</td>
</tr>
<tr>
<td>EPM-FN1949-V01</td>
<td>The TRAVAPP shall provide the Traveler the ability to search for parking options by selecting a parking meter zone or parking loading zone.</td>
</tr>
<tr>
<td>EPM-FN1960-V01</td>
<td>The TRAVAPP shall display the probability of finding a metered parking space in a designated search area.</td>
</tr>
<tr>
<td>EPM-FN1961-V01</td>
<td>The TRAVAPP shall display the probability of finding an open loading zone in a designated area by the user.</td>
</tr>
<tr>
<td>EPM-FN1962-V01</td>
<td>The TRAVAPP shall provide the ability to turn on and off meter/loading zone locations.</td>
</tr>
<tr>
<td>EPM-FN1963-V01</td>
<td>The TRAVAPP shall provide an interactive map display showing real-time parking options.</td>
</tr>
<tr>
<td>EPM-FN1964-V01</td>
<td>The TRAVAPP shall include map-based navigation to direct a user to the designated parking location.</td>
</tr>
<tr>
<td>EPM-FN1966-V01</td>
<td>The TRAVAPP shall provide the ability to reserve parking in accordance with the policies of individual facilities.</td>
</tr>
<tr>
<td>EPM-FN1967-V01</td>
<td>The TRAVAPP shall provide the ability to pay for parking in accordance with the policies of individual facilities.</td>
</tr>
</tbody>
</table>
1. What should be considered when designing the user interface and user experience for a mobile app? Any unique features that you use? Any enhancements that you are considering?

2. What type of privacy issues do mobile applications with user accounts have to consider?
PAYMENT REQUIREMENTS

- Common Payment System
- Pre-payment issues
- Various revenue systems
- Discounts
## PAYMENT REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement ID</th>
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</tr>
</thead>
<tbody>
<tr>
<td>EPM-FN1977-V01</td>
<td>The EPMCS shall allow pre-payment of parking up to the allowable timeframe prior to paid parking operational hours.</td>
</tr>
<tr>
<td>EPM-FN1982-V01</td>
<td>The EPMCS shall be capable of mobile device payments by presenting a reservation ID via an optical barcode on the Traveler's device screen.</td>
</tr>
<tr>
<td>EPM-FN1983-V01</td>
<td>The EPMCS shall be capable of mobile device payments by presenting a reservation ID through NFC, if supported by the Traveler's device.</td>
</tr>
<tr>
<td>EPM-FN1916-V01</td>
<td>A reservation confirmation code shall not be provided if payment is not complete.</td>
</tr>
<tr>
<td>EPM-FN1917-V01</td>
<td>The confirmation response provided to the TRAVAPP shall include payment status.</td>
</tr>
<tr>
<td>EPM-FN1976-V01</td>
<td>The CPS shall process payment transactions in real-time.</td>
</tr>
<tr>
<td>EPM-FN1978-V01</td>
<td>Payment shall be held in reserve in the Traveler's CPS account for the vehicle until the parking reservation goes into effect.</td>
</tr>
<tr>
<td>EPM-IF1998-V01</td>
<td>The CPS shall provide an interface to send and receive information between the CPS and GFAC.</td>
</tr>
<tr>
<td>EPM-IF2006-V01</td>
<td>The CPS shall provide an interface to send and receive information between the PARKOP and the CPS.</td>
</tr>
<tr>
<td>EPM-IM2060-V01</td>
<td>APIs for CPS account management shall be provided by the CPS.</td>
</tr>
<tr>
<td>EPM-IM2061-V01</td>
<td>APIs for parking payment shall be provided by the CPS.</td>
</tr>
<tr>
<td>EPM-RG2081-V01</td>
<td>The CPS shall be responsible for all applicable card transaction security rules and regulations including payment card industry and data security standards (PCI DSS) compliance, all laws and any other governing authority requirements that may apply.</td>
</tr>
<tr>
<td>EPM-RG2080-V01</td>
<td>The system shall not save any PCI information as a result of a payment transaction using the CPS.</td>
</tr>
<tr>
<td>EPM-IF2009-V01</td>
<td>The system shall provide an interface to send and receive payment information between the EPMCS and the CPS.</td>
</tr>
<tr>
<td>EPM-FN1975-V01</td>
<td>GFAC parking operators shall be able to manage create and manage CPS Provider accounts.</td>
</tr>
</tbody>
</table>
1. What are some of the challenges around pre-payment that need to be considered?

2. Describe your experience with payments by mobile devices? Any lessons learned or room for improvement?
PROCUREMENT

• Considerations and recommendations
1. What considerations and recommendations can you offer the City of Columbus as they pursue the procurement for a mobile parking application solution?
Public comment period open for the EPM System Requirements:

• November 8-22

• Where to find it:
  • View the ConOps at: https://smart.columbus.gov/projects
    • Click Event Parking Management
  • Direct link to file:
    • https://smart.columbus.gov/uploadedFiles/Projects/SCC-B-SysReq_EPM_DRAFT_20180924.pdf

• How to comment:
  • Please email comments to: kldepenhart@columbus.gov
    • Subject line: EPM Comments
      • Include your contact information
  • State whether or not you represent a vendor interest
WHERE WE GO FROM HERE

- **System Requirements Specification**
  December 2018

- **Interface Control Document**
  December 2018 – April 2019

- **System Design**
  February 2019 – August 2019

- **Test Plan**
  May 2019 – September 2019

- **Procurement/Vendor Notice to Proceed**
  January 2019 – June 2019

- **Deploy/Testing**
  June 2019 – March 2020

- **EPM Live**
  March 2020
USDOT SMART CITY CHALLENGE PROGRAM INQUIRIES:
Kate Hartman, Chief - Research, Evaluation and Program Management Intelligent Transportation Systems Joint Program Office
Kate.Hartman@dot.gov

SMART COLUMBUS INQUIRIES:
Alyssa Chenault, Communications Project Manager
anchenault@columbus.gov

Upcoming Smart Columbus Webinars:
• Common Payment System System Requirements –11/28
• Overview of Emerging Technologies: Connected Electric Autonomous Vehicles and Truck Platooning –1/30

Webinar recording and materials will be available at itsa.org and smart.columbus.gov
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QUESTIONS?