



Common Payment System (CPS) System Requirements

SPEAKERS



MANDY BISHOP, PE
Program Manager,
City of Columbus
mkbishop@columbus.gov



ANDY WOLPERT, PE
Project Manager,
City of Columbus
ADWolpert@Columbus.gov



ALEX KAVANAGH,
Technical Lead,
HNTB
Akavanagh@hntb.com



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 Common Payment System Project Overview
- Smart Columbus Common Payment System Requirements
- Technical Details Discussion
- 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



CPS OVERVIEW



PROBLEM STATEMENT & CHALLENGES

- **Disconnected mobile apps and payment options**
- **Lack of a comprehensive platform to plan, book, and pay**
- **Unbanked users must rely on cash for transportation options**
- **Public agencies face obstacles when requesting trip data from Mobility Providers**





CONCEPT FOR PROPOSED SYSTEM

- Pay for all transportation services using a single account
- Ability to register multiple payment methods
- Integration with COTA's back-office
- Fund CPS accounts using prepaid debit cards or cash at COTA TVMs
- IVR System
- Use the OS share anonymous trip and payment data





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

- 1. Smart Columbus
- 2. System Requirements
- 3. for Common Payment System (CPS)
- 4. for the Smart Columbus
- 5. Demonstration Program

6. www.its.dot.gov/index.htm

7. Draft Report – October 22, 2018



8. Source: City of Columbus – November 2015



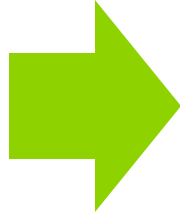
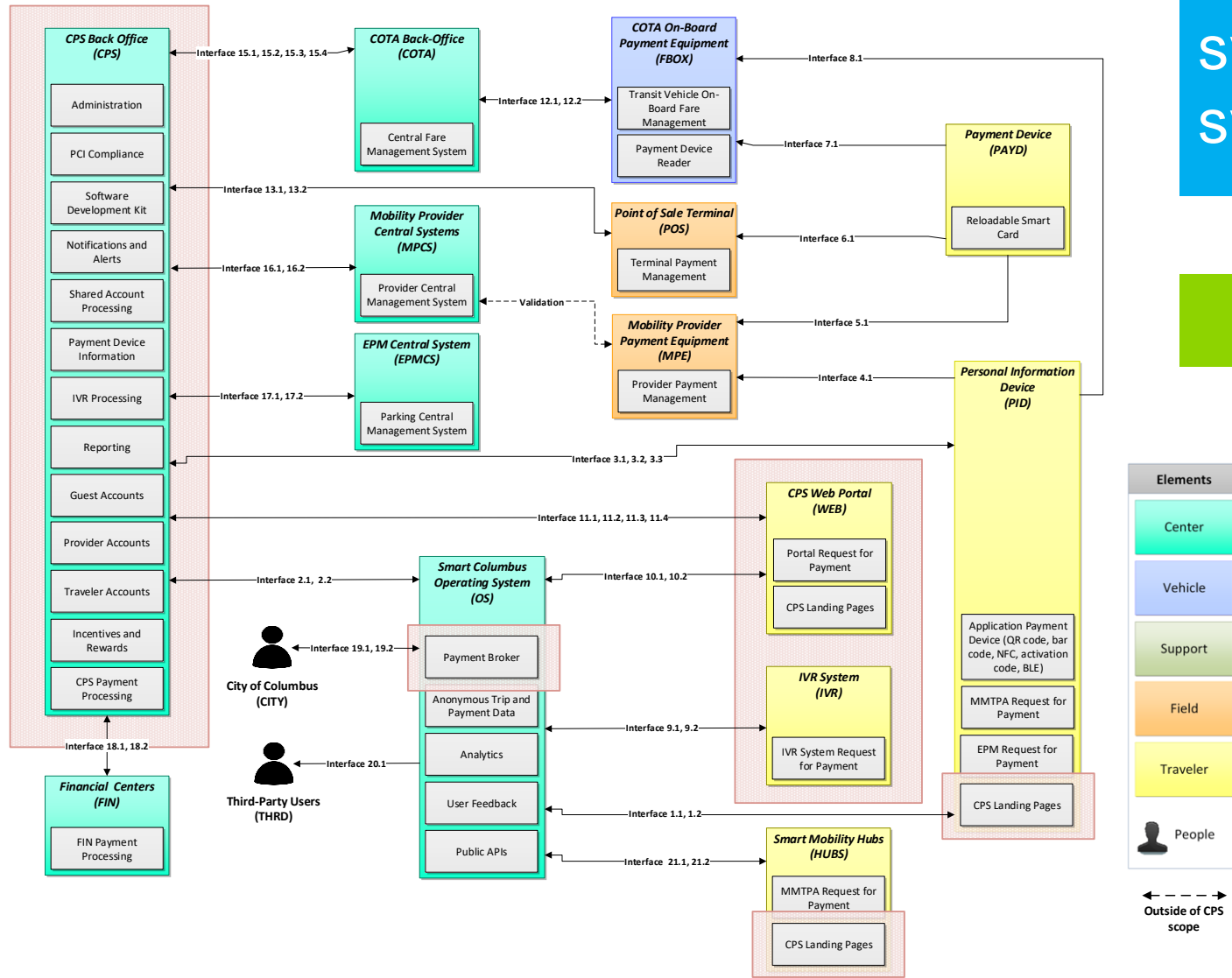
U.S. Department of Transportation

10



Step 1

Break down the system into major system components



Major System Components	
	CPS Back-Office
	COTA Back-Office
	Operating System
	Personal Information Device
	Parking Operator Application
	Website
	Interactive Voice Response System
	Smart Mobility Hubs
	Mobility Provider Central Systems
	Mobility Provider Equipment
	Event Parking Management Central System
	Point of Sale Terminals
	Third-Party Users
	Farebox





SYSTEM REQUIREMENTS

Step 2 Develop the technical requirements for system components

Requirement Name
Availability and Recovery
Constraints
Disposal
Data
Enabling
Functional
Interface
Information Management
Life Cycle Sustainment
Non-Functional
Maintainability
Performance
Physical
Policy and Regulation
Security
Storage and Transport

Verification Method
Inspection
Demonstration
Test
Analyze

Requirement Description (EPM Central System)
In the event that the service for which the funds are being held is not realized, the hold on the funds shall be removed and credit restored to the Traveler account as necessary.
The CPS shall be fully compliant with Payment Card Industry (PCI) standards, including ensuring that all customer credit card payments completed using the system shall avoid any access to or storage of credit card numbers on any City or COTA-operated computers.
The CPS shall be capable of integration with COTA's back-office account-based system, allowing users to associate any COTA-issued fare product with a registered CPS account.



SYSTEM REQUIREMENTS

User Need	Description
MMTPA/CPS-UN019-v01	NFC Integration
MMTPA/CPS-UN022-v01	CPS Account
MMTPA/CPS-UN023-v01	Payment Media
MMTPA/CPS-UN025-v01	Pay Once
MMTPA/CPS-UN026-v01	Existing Fare Products
MMTPA/CPS-UN021-v01	Mobile Ticketing
MMTPA/CPS-UN034-v01	Operations and Maintenance
MMTPA/CPS-UN035-v01	Future Growth and Maintainability
MMTPA/CPS-UN036-v01	Compliance
MMTPA/CPS-UN029-v01	Storage of Sensitive Data
MMTPA/CPS-UN030-v01	Reimbursement
MMTPA/CPS-UN031-v01	Security and Encryption

Requirement Description (Interactive Kiosk)
 COTA shall be responsible for managing COTA fare information and will make fare information available to the CPS.

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

Constraint	Description
Constraint 2	The MMTPA/CPS system must integrate with COTA's new Fare System. It is necessary for COTA's new Fare System vendor to develop modules for the Operating System and adhere to open data and open architecture design principles.
Constraint 3	Mobility Providers must be willing to integrate with the Operating System through open standards and to accept the CPS as payment method.

Interface	Source Element	Destination Element
CPS-IX2842-V01	CPS	COTA
CPS-IX2842-V01	COTA	CPS
CPS-IX2843-V01	CPS	COTA
CPS-IX2844-V01	COTA	CPS



REQUIREMENTS BY THE NUMBERS

- 350+ Requirements
- 35+ Subcomponents
 - Shared Accounts, Administration, PCI Compliance, Notifications, etc.
- 17 Requirement Types
 - Functional, Performance, Interface, Data, Security, etc.
- 14 Functional Groups
 - CPS Back-Office, COTA Back-Office, Personal Information Device, etc.
- 5 Levels of Importance
 - Shall, Shall Not, Should, Should Not, May
- 4 Verification Methods
 - Inspection, Demonstration, Test, Analysis



SYSTEM REQUIREMENTS DISCUSSION PANEL

DISCUSSION PANEL



MICHEAL D. CARROLL
Chief Information Officer,
Central Ohio Transit Agency



ROBERT JAMES
Lead Systems Engineer,
HNTB Corporation



BRIAN KING
Technical PM,
Smart Columbus
Operating System



ALEX KAVANAGH
Technical Lead,
HNTB Corporation

SYSTEM REQUIREMENTS DISCUSSION

Three categories of requirements based on major system components:

- Payment Processing (Back-Office)
- Hardware (Farebox, POS, TVM)
- Operating System

For each category:

- Description
- Example requirements
- Discussion

Summary and Lessons Learned

PAYMENT PROCESSING (BACK-OFFICE)

Sub-Components

- Shared Accounts
- Payment Processing
- Administration
- PCI Compliance
- Software Development Kit
- Payment Device Information
- Reporting
- Guest Accounts
- Provider Accounts
- Traveler Accounts
- PCI Compliance
- Incentives and Rewards
- IVR Processing
- COTA Central Fare Management System



PAYMENT PROCESSING (BACK-OFFICE) REQUIREMENTS

REQ ID	Description
CPS-FN2500-V01	The CPS shall provide back-end integration with COTA's fare management system.
CPS-FN2559-V01	The CPS shall be capable of integration with COTA's Back Office account-based system, allowing Users to associate any COTA-issued fare product with a registered CPS account.
CPS-FN2560-V01	The CPS shall be capable of integration with COTA's smart card.
CPS-FN2561-V01	The CPS shall be capable of integration with COTA's fare subsidy programs.
CPS-FN2564-V01	The CPS shall provide landing pages for integration with the MMTPA to pay for multimodal trips.
CPS-FN2565-V01	The CPS shall provide landing page for integration with the EPM application to pay for parking.
CPS-FN2591-V01	Integration with the MMTPA shall provide a seamless User experience for the Traveler by not requiring a separate logon to the MMTPA.
CPS-FN2488-V01	The CPS shall allow travelers to utilize existing COTA period pass products, which permit journeys within the COTA network, subject to time restrictions.
CPS-FN2644-V01	Payment transactions shall be processed in real-time through the CPS.
CPS-FN2645-V01	The CPS shall provide access to landing pages allowing Travelers to pay instantly without being redirected away from the app to complete the transaction.
CPS-FN2646-V01	The CPS shall provide landing pages to manage Traveler and Provider accounts.
CPS-FN2730-V01	All virtual fare product interfaces presented on the PID shall be configurable by authorized City/COTA individuals.
CPS-FN2491-V01	When applying virtual transfer credits toward a multi-leg transit trip, the remainder of the cost of the trip shall be taken from the Traveler account (stored cash value).
CPS-FN2500-V01	The CPS shall provide back-end integration with COTA's fare management system.
CPS-FN2506-V01	Administrative accounts shall include fine-grained permission levels (e.g., View Only, Limited Access, and Full Control)



PAYMENT PROCESSING (BACK-OFFICE) TOPICS

1. Integration with the COTA is a critical part of the CPS project. What does integration look like? What COTA systems will the CPS be integrated with?
2. The CPS will ultimately be owned and administered by an NGO. How does this align with COTA's vision for the CPS?



PAYMENT PROCESSING (BACK-OFFICE) TOPICS

3. How will payment processing and reconciliation with the various service providers be handled?
4. Several requirements identify the collection of PII data. How will this data be managed to ensure privacy?

HARDWARE (FAREBOX, POS, TVM)

Sub-Components:

- Transit Vehicle On-Board Fare Management
- Payment Device Reader
- Point of Sale Terminal Payment Management
- Mobility Provider Payment Management





SAMPLE HARDWARE (FAREBOX, POS, TV) REQUIREMENTS

REQ ID	Description
CPS-FN2602-V01	The CPS may integrate with the contactless RFID reader (compliant with ISO 14443 Type A and B standard) of existing COTA fareboxes for NFC-enabled mobile devices.
CPS-FN2603-V01	The CPS shall integrate with COTA's existing fareboxes to allow recognition of a mobile app presenting a ticket ID via an optical barcode on the device screen, or (if supported by the device) through NFC.
CPS-FN2604-V01	Activating an e-ticket shall cause the ticket to expire from the Traveler account.
CPS-FN2605-V01	If the mobile device of the Traveler is NFC enabled, and compliant with ISO 18092/ISO 21481, the device shall broadcast the same unique serial number that is encoded in the QR code.
CPS-FN2606-V01	The CPS shall be capable of digitally rendering optical codes (mobile e-tickets) for optical scanning at provider reader equipment.
CPS-FN2607-V01	Mobile e-tickets shall be machine readable 2D optical code compliant with ISO-15415, encoding the unique serial number.
CPS-FN2608-V01	Mobile e-tickets shall serve to create the identifier used to validate and track the ticket and associated transactions in the system.
CPS-FN2792-V01	COTA fareboxes shall manage COTA fare information on transit vehicles.
CPS-FN2793-V01	COTA fareboxes shall provide traveler fare collection interface on transit vehicles.
CPS-FN2794-V01	COTA fareboxes shall provide COTA fare collection data.
CPS-FN2795-V01	COTA fareboxes shall provide COTA payment device interface.
CPS-DR2776-V01	The CPS shall generate QR code, bar code, NFC, BLE or activation code, as appropriate.
CPS-DR2776-V01	The CPS shall generate QR code, bar code, NFC, BLE or activation code, as appropriate.
CPS-IF2563-V01	The CPS shall provide an interface between POS and CPS to allow users (e.g. unbanked users) to load cash at COTA ticket vending machines (TVMs) to fund a Traveler account.

HARDWARE (FAREBOX, POS, TVM) TOPICS

1. The SyRS includes several requirements focused on hardware functionality (i.e., Bluetooth and NFC transponders). Does Columbus have plans to install hardware as part of the project? How will the CPS interface with existing COTA fareboxes?
2. How will unbanked users, or users who prefer to pay with cash, use the system?

OPERATING SYSTEM

Sub-Components

- Payment Broker
- Anonymous Data
- Analytics
- User Feedback
- Public APIs





SAMPLE OPERATING SYSTEM REQUIREMENTS

REQ ID	Description
CPS-FN2468-V01	The payment broker in the OS shall provide a shared account ledger.
CPS-FN2469-V01	The payment broker shall not maintain PCI data. The CPS Back-Office will maintain this sensitive information in a secure environment.
CPS-FN2470-V01	The payment broker shall receive payment information from the MMTPA through CPS landing pages.
CPS-FN2471-V01	The payment broker shall receive payment information from the EPM application through CPS landing pages.
CPS-FN2469-V01	The payment broker shall not maintain PCI data. The CPS Back-Office will maintain this sensitive information in a secure environment.
CPS-FN2470-V01	The payment broker shall receive payment information from the MMTPA through CPS landing pages.
CPS-FN2471-V01	The payment broker shall receive payment information from the EPM application through CPS landing pages.
CPS-FN2641-V01	Data posted to the OS shall have PII obfuscated so that it may be available to third-party users.
CPS-FN2642-V01	Third-party users shall be given access into the Operating System for anonymous trip and payment data.
CPS-FN2643-V01	City of Columbus users shall be given access into the OS for performance measurement data and reports.
CPS-FN2642-V01	Third-party users shall be given access into the Operating System for anonymous trip and payment data.
CPS-DR2647-V01	The CPS shall provide anonymous payment data to the OS for storage in accordance with OS practices.
CPS-DR2775-V01	The storage time of anonymous payment data in the OS shall be configurable up to a maximum of 10 years by the City/COTA.

OPERATING SYSTEM TOPICS

1. What is included in the shared account ledger and how does it work?
2. Will Service Providers be expected to add users to the shared accounts ledger? How will this work for large TNCs, for example?
3. Describe how the Payment Broker works.

OPERATING SYSTEM TOPICS

4. How is Columbus proposing to use open data standards? How can other agencies benefit from what Columbus is doing?
5. How do you plan to capture anonymous data? How will it be shared? What types of reporting will be available?

SUMMARY / LESSONS LEARNED

1. Prioritize early engagement with transportation providers
2. Shared account vs. single pay system
3. Fare System Upgrade
4. Requirements development
5. Sustainability and social equity
6. Agile project development



UPCOMING MILESTONES

 System Requirements Specification
December 2018

 CPS Release 3
November 2019

 Release RFP/Procurement/NTP
December 2018 – March 2019

 MMTPA/CPS Go Live
January 2020

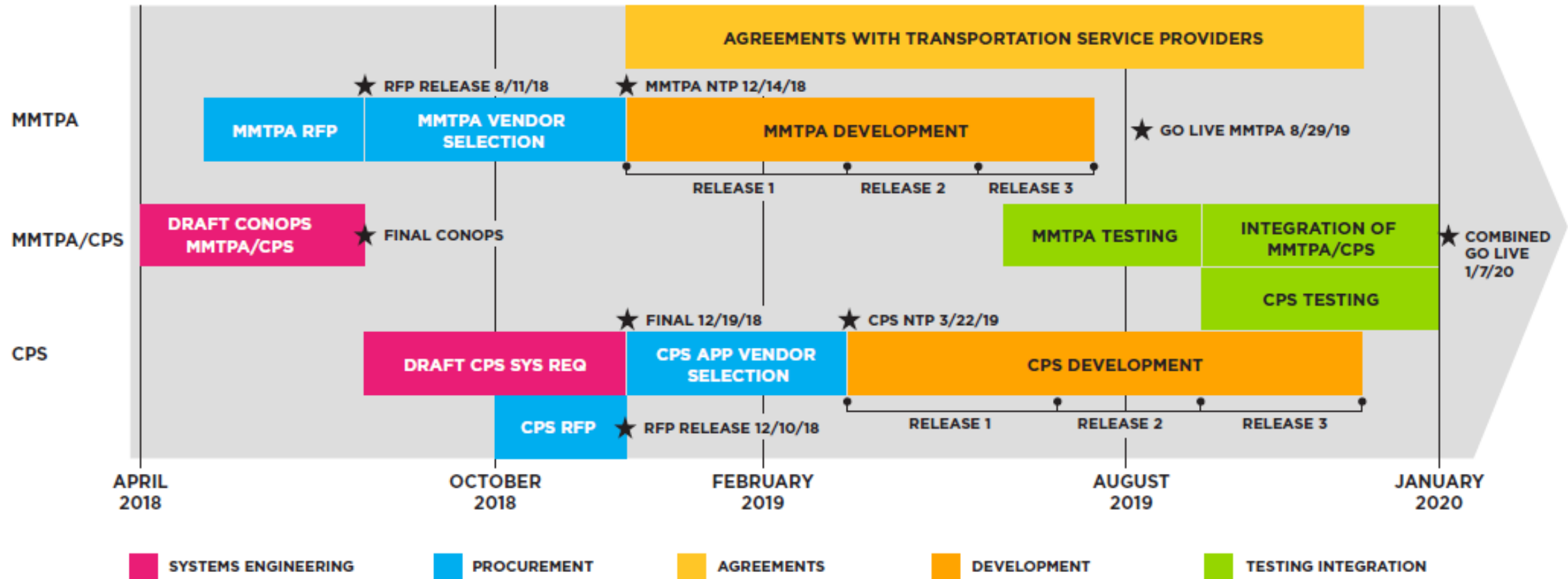
 Vendor Agreements
March 2019 – January 2020

 Data Collection
January 2020 – January 2021

 CPS Release 1
June 2019

 CPS Release 2
September 2019

SCHEDULE





COMMENTS

Public comment period open for the CPS System Requirements:

- November 21- December 5, 2018
- Where to find it:
 - View the System Requirements at: <https://smart.columbus.gov/projects>
 - Click Comment Payment System
 - Direct link to file:
 - https://smart.columbus.gov/uploadedFiles/Projects/SCC-B-SysReq_CPS_DRAFT_20181022_for_USDOT.PDF
- How to comment:
 - Please email comments to: kldepenhart@columbus.gov
 - Subject line: CPS Comments
 - Include your contact information
 - State whether or not you represent a vendor interest



HOW TO STAY CONNECTED

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:

- 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



SIGN UP FOR OUR E-NEWSLETTER

Contact:

SmartColumbus@columbus.gov

LEARN MORE



Columbus.gov/smartcolumbus

   **@SmartCbus**



QUESTIONS?

TOPICS – SYSTEM BOUNDARIES

- The boundaries for the system of interest are not well-defined and there appear to be several requirements focused on systems outside the boundaries of the proposed system (i.e., requirements about COTA Fare System).
- Are COTA and the SCOS part of the CPS system? It is not clear what your system boundary is.
- CPS-FN2500-V01 – “The CPS shall provide back-end integration with COTA's fare management system.”
 - Need more details, what will be integrated? What specific data will be shared, etc.

TOPICS – OPERATION AND OWNERSHIP

- Who is responsible for operations and administration of the CPS? The requirements include several activities that will require staff to support day-to-day operations? Who will be doing this? And please note that the context diagram and “Users” don’t define an entity responsible for this functionality. For example:
 - Who is going to be responsible for disputes, etc.?
 - Who will be responsible for providing help to Travelers?
 - Who will be running reports, etc.?

TOPICS – HARDWARE

- The SyRS includes several requirements focused on the functionality of hardware (i.e., Bluetooth and NFC transponders) that appears to be installed in various vehicles (e.g., TNCs, buses, etc.) or in other places.
 - Is Columbus planning to deploy BLE transponders to support transactions?
 - Is Columbus planning to deploy NFC transponders to support transactions?
 - Is Columbus planning to deploy contactless transponders to support transactions?
 - Is this project planning to deploy Fareboxes as part of this project?
- CPS-FN2562-V01 – Do POS terminals currently allow cash to be added? Does the POS terminal issue a pre-paid card for the unbanked?

TOPICS – SHARED LEDGER / DATA BROKER

- CPS-FN2468-V01 – “The payment broker in the OS shall provide a shared account ledger.”
 - What is included in the shared account ledger? Need more details.
 - Recommend establishing parent/child requirements that describe what is included in the shared account ledger
- CPS-FN2514-V01 – “Providers shall have the ability to add Users to the shared accounts ledger in the OS, so that Travelers can access other modes of transportation.”
 - It’s not clear what this means. Why would Uber be adding users to the ledger? I’m confused.

TOPICS – ANONYMOUS DATA

- Line 201 – “The broker will be responsible for directing payment requests to the CPS payment processor and for capturing anonymous trip and payment data for analytics.”
 - It is not clear how anonymous payment data can be collected (payments need to be tied to an account). What are Columbus’ plans to anonymize this type of data?

TOPICS – IVR SYSTEM

- CPS-FN2636-V01 – “The CPS shall be capable of generating a phone number for use by the Traveler to initiate a trip via the IVR system.”
 - I’m confused. Why does a phone number need to be generated and what is the Traveler expected to do with the phone number to initiate a trip?
- CPS-FN2637-V01 – “The CPS shall be capable of generating a trip code for use by the Traveler to initiate a trip via the IVR system.”
 - Once the traveler gets a trip code from the IVR, what do they do with it? How would I pay for a mobility service (i.e., bikeshare) with this code?