U.S. Department of Transportation

COMPLETE TRIP

ITS4US

Task 1.B Training:

User Needs Identification and Requirements Planning

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Agenda

- **Brief Program Overview**
- **User Needs Identification & Requirements Planning**
  - Deliverable Overview
  - User Needs Identification
  - Requirements Planning
  - Configuration Management
- **Resources**
  - Useful References
  - Stay Connected

Program Overview

Complete Trip - ITS4US Deployment Program

- A USDOT Multimodal Deployment effort, led by ITS JPO and supported by OST, FHWA and FTA
- Supports multiple large-scale replicable deployments to address the challenges of planning and executing all segments of a complete trip

Source: USDOT

Vision

*Innovative and integrated **complete trip deployments** to support seamless travel for all users across **all modes**, regardless of **location, income, or disability***

Program Goals

Spur high-impact integrated Complete Trip deployments nationwide

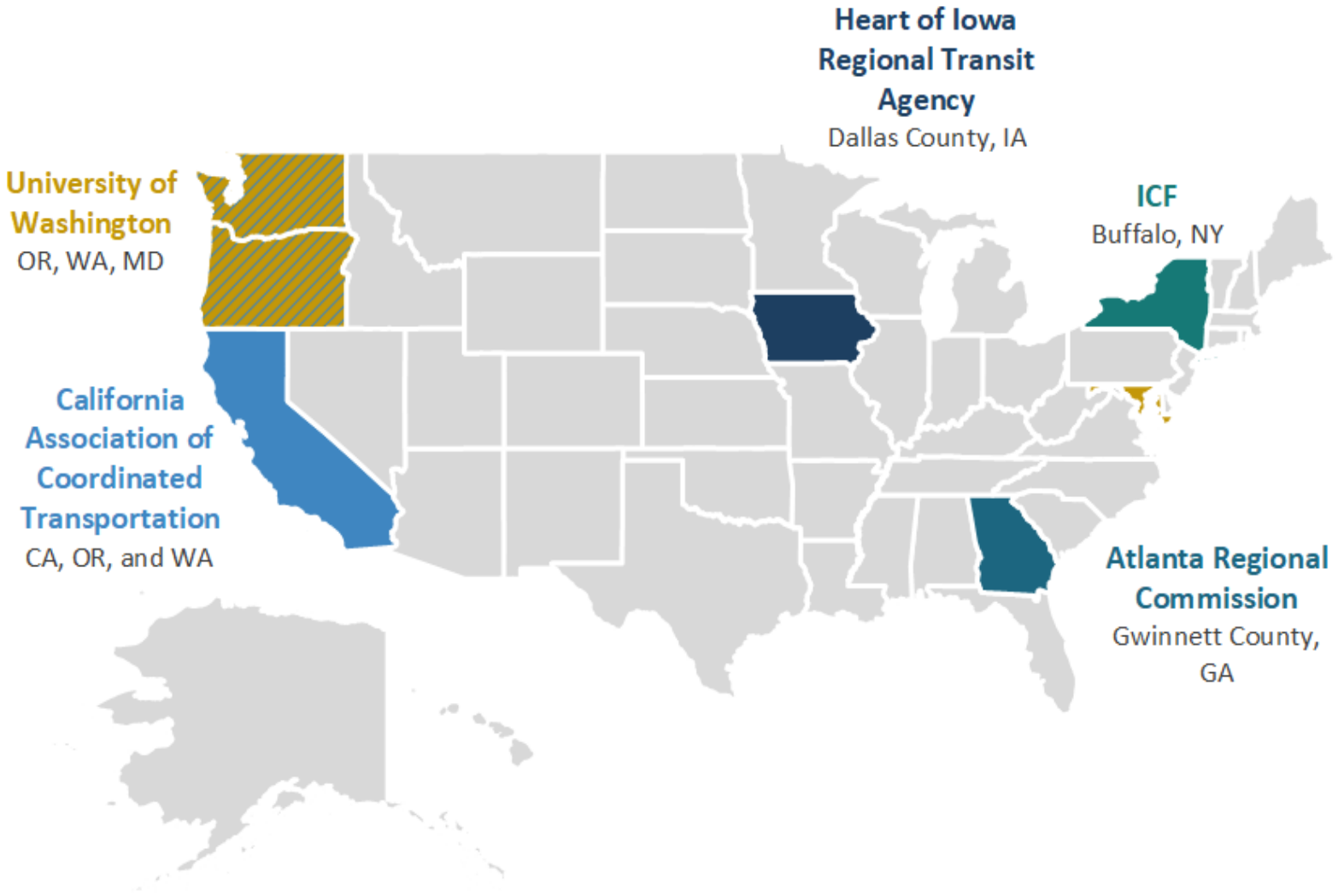
Identify needs and challenges by populations

Develop and deploy mobility solutions that meet user needs

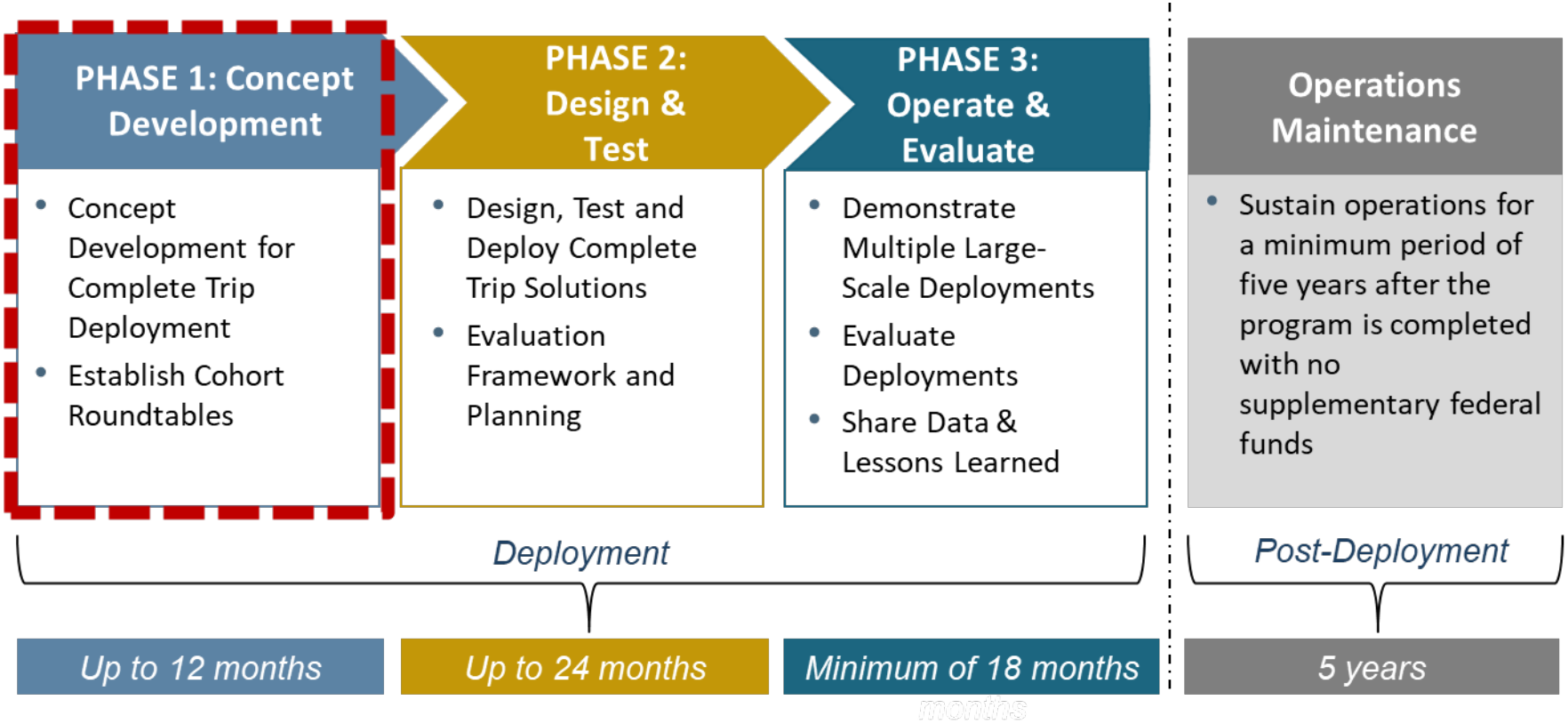
Measure impact of integrated deployments

Identify replicable solutions and disseminate lessons learned

Complete Trip Phase 1 Awardees



Deployment Phases



User Needs Identification and Requirements Planning (UNIRP)

User Needs Identification and Requirements Planning (UNIRP) Document

Task 1B

Defines the processes that will be used to generate, coordinate, approve, and support the configuration control of user needs and system requirements. Forms the foundation of the Systems Engineering Management Plan (SEMP) that will be delivered later in Task 12.

Deliverables

1. Draft UNIRP Document – Kick-Off + 4 weeks (March 22nd)
2. Final UNIRP Document – Kick-Off + 7 weeks (April 12th)

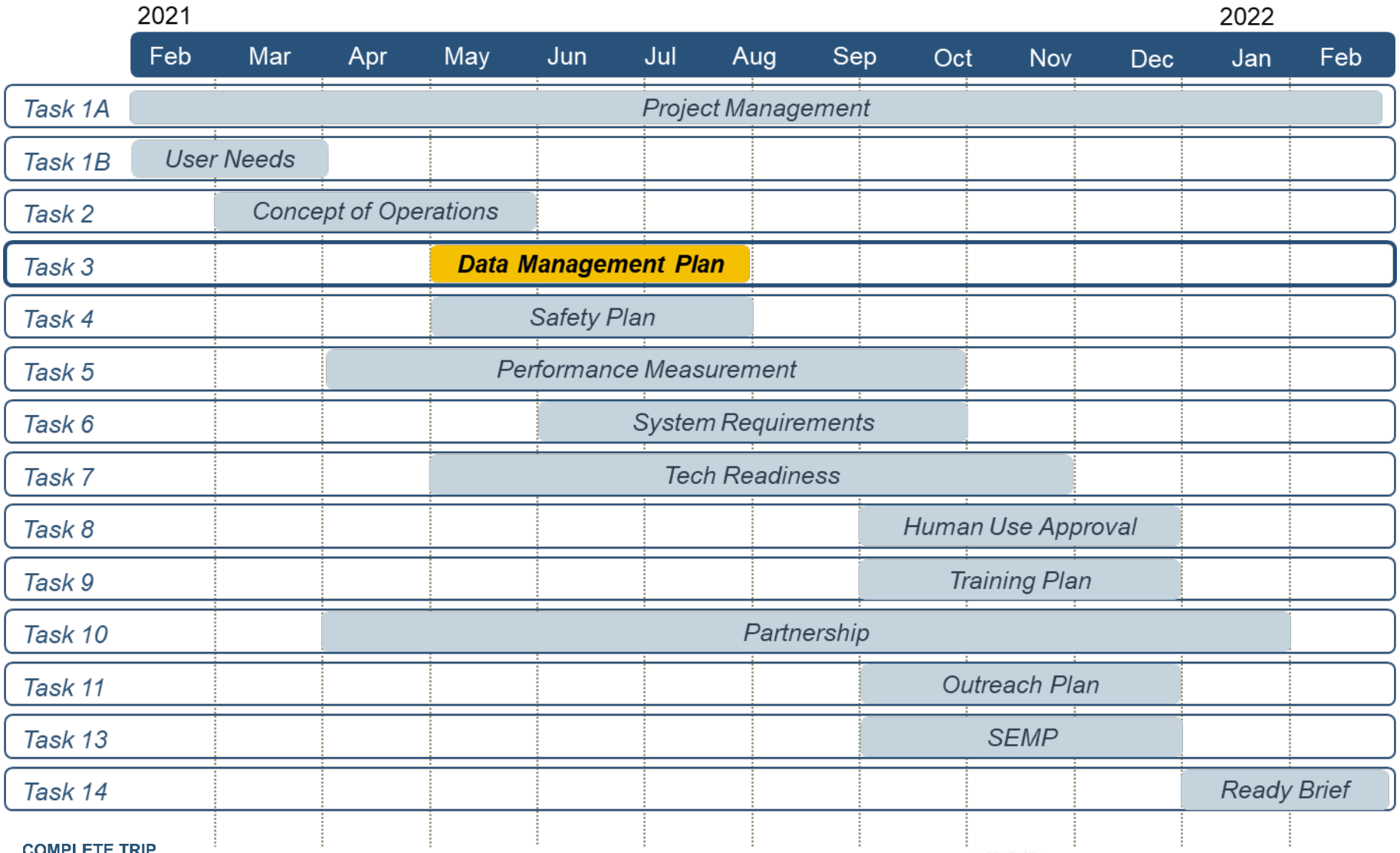
UNIRP Major Components

Task 1B

User Needs Identification	Process of how team will identify user needs.
Requirements Planning	Process of how team will identify system requirements.
Configuration Management	Process of how team will maintain configuration management.

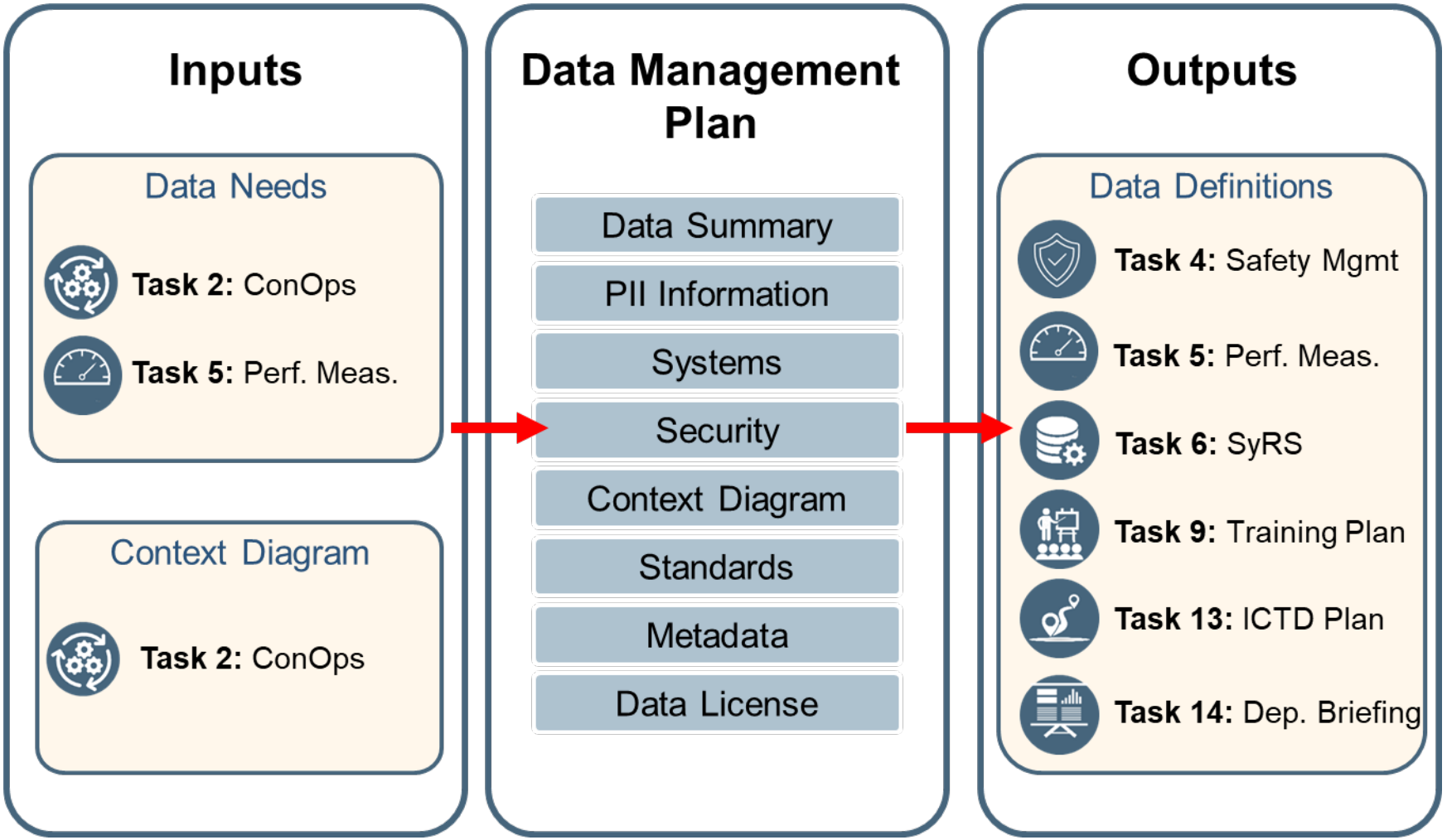
UNIRP Schedule

Task 1B



UNIRP Interdependencies

Task 1B



User Needs Identification

Process for Identifying User Needs

- Describe the process of how sites will identify user needs.
- Creating the user needs will come at a later stage.

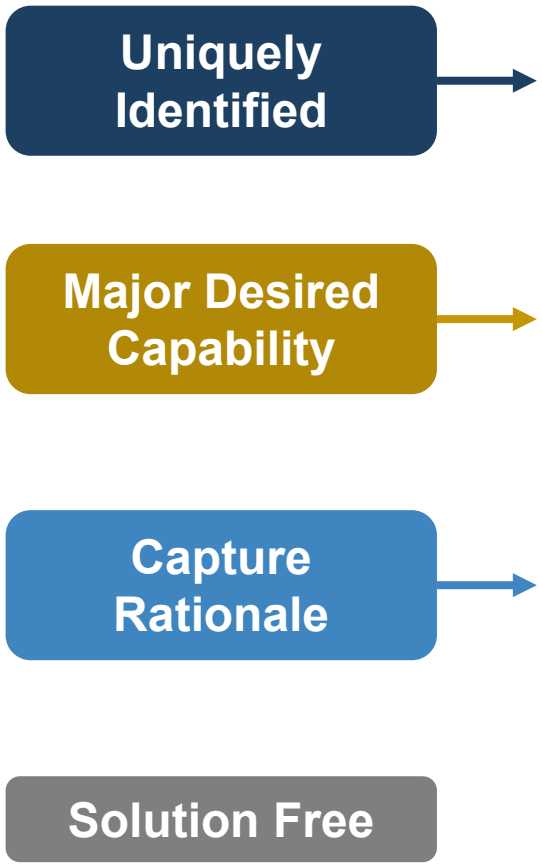
A Refresher: **What are user needs?**

User needs are statements that describe a users desired action and what is required to make that action possible.

Introduction to User Needs

- Well written user needs use the following criteria:
  - **Uniquely Identifiable**: Each need must be uniquely identified (i.e., each need shall be assigned a unique number and title).
  - **Major Desired Capability (MDC)**: Each need shall express a major desired capability in the system, regardless of whether the capability exists in the current system or situation or is a gap.
  - **Solution Free**: Each need shall be solution free, thus giving designers flexibility and latitude to produce the best feasible solution.
  - **Capture Rationale**: Each need shall capture the rationale or intent as to why the capability is needed in the system

User Need Example



2.6.2.1 Transferring from subway platform to shared use service boarding location transit users need to navigate from the subway platform to the shared services hailing location. A solution that helps the user navigate from the location where they disembark the subway train to the location where they can access a shared use service, will allow the user to change modes and continue their trip.

Planning for Identifying User Needs

METHOD	PROCESS DESCRIPTION
Previously Identified User Needs	Describe plans for validating user needs identified during the development of the ITS4US proposal.
Stakeholder Engagements	Discuss plans for engaging stakeholders to identify their unique user needs. Such as workshops, surveys or one-on-one stakeholder interviews.
Use Case Decomposition	Document how the project team plans to develop use cases for specific system functions or applications and how those can be deconstructed into user needs. • Needs and use cases are closely related. • Use cases are typically used to derive and validate user needs. • Use cases and user needs development is an iterative process to help identify holes and gaps in the user needs until the system owner is satisfied.

Concept of Operations Development

- Provide a high-level overview of key ConOps dates and activities
  - User needs will be documented in ConOps which will be completed in Task 2

ID	BAA Section	Task 2: Concept of Operations (ConOps)	Due Date	Format	Site Specific Date
P1T02D1	5.2	Stakeholder ConOps Review Panel Roster (Draft)	Kick-off+8 weeks	Word	
P1T02D2	5.2	Needs Summary (Draft)	Kick-off +8 weeks	Word	
P1T02D3	5.2	Stakeholder ConOps Review Panel Roster (Final)	Kick-off+10 weeks	Word	
P1T02D4	5.2	Needs Summary (Final)	Kick-off+10 weeks	Word	
P1T02D5	5.2	ConOps (Draft)	Kick-off+13 weeks	Word	
P1T02D6	5.2	ConOps Walkthrough Briefing Deck	Kick-off+13 weeks	PPT	
P1T02D7	5.2	ConOps Comment Resolution Report (Draft)	Kick-off+15 weeks	Word	
P1T02D8	5.2	ConOps (Final)*	Kick-off+18 weeks	Word	
P1T02D9	5.2	ConOps Comment Resolution Report (Final)	Kick-off+18 weeks	Word	
P1T02D10	5.2	ConOps Webinar (Public)	Kick-off+21 weeks	PPT	

*508 Compliant Deliverables

ConOps Walkthrough

- Describe the plans for the ConOps walkthrough
  - IEEE Standard 1028-2008
  - Walkthrough Plan
    - Number of days
    - Who will participate
    - Where it will be held
    - Approximate timeframe
  - Walkthrough Workbook
    - Format can be Word, PowerPoint (any format that can be edited during walkthrough)

Agile Development Considerations

- If planning to use Agile development during Phase 2, describe plans and backlog for your Agile software development process.
- Use Needs and Use Cases provide the bases for user stories used in the Agile development.
- Document and maintain configuration control of user stories in Phase 2.

Requirements Planning

Process for Identifying System Requirements

- Describe the process of how sites will identify system requirements.
- Creating the system requirements will come at a later stage.

A Refresher: **What are system requirements?**

System requirements are statements that describe the necessary functions of a system to make the realization of user needs possible.

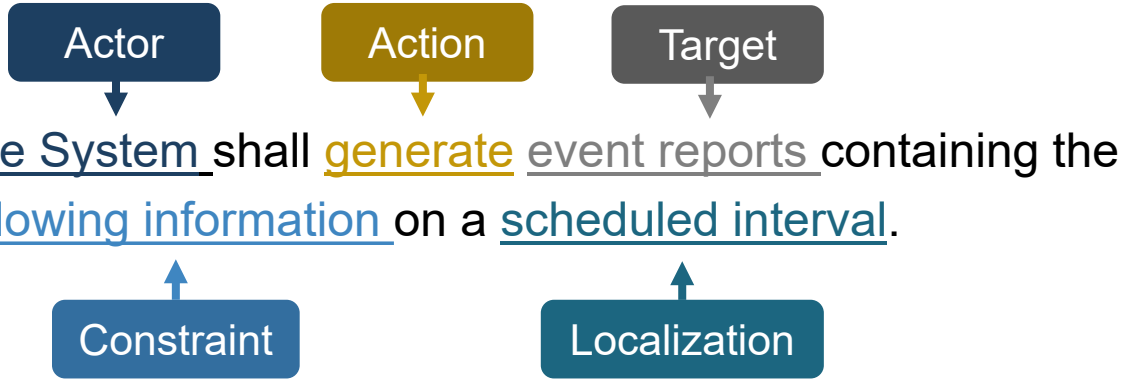
Introduction to System Requirements

- Criteria for well-formed system requirements:
  - Necessary
  - Concise
  - Implementation-free
  - Attainable
  - Complete
  - Consistent
  - Traceable
  - Unambiguous
  - Verifiable
  - Allocate-able
  - Style-compliant

Building a System Requirement

- Requirements have a simple grammar:
  - Actor [The System]
  - Action [shall do/not do something to]
  - Target [the object of the action]
  - Constraint [how, how often, how many, how fast]
  - Localization [if, when, where]
    - Note: Not all requirements will have both localization and constraint portions.

Example:



Requirement Decomposition

- Categories of requirements that are common across many systems:
  - **Functional**: requirements that specify what functions the system must perform
  - **Physical**: requirements that specify the physical characteristics of a system/subsystem/component
  - **Performance**: requirements that specify how the system has to perform
  - **Security**: define what level of security would be necessary for specific parts of the system/subsystem/component
  - **Interface**: define any constraints on how the system/subsystem/component must communicate with other another system/subsystem/component

System Requirements Traceability

- Traceability between user needs and system requirements is critical to ensuring the fully developed system will meet its' goals and objectives.

- Template of a Needs-to-Requirements Traceability Matrix (NRTM):

User Need ID	User Need	Req ID	Requirement
X.X.X.X	**<User Need>**		
		X.X.X.X.X	<Requirement 1>
		X.X.X.X.X	<Requirement 2>

Planning for Requirements Development

- Provide a high-level overview of key Requirements dates and activities.
  - Actual development of requirements will be completed in Task 6.

ID	BAA Section	Task 6: Deployment System Requirements (SyRS)	Due Date	Format	Site Specific Date
P1T06D1	5.6	Stakeholder SyRS Review Panel Roster (Draft)	Kick-off+25 weeks	Word	
P1T06D2	5.6	Stakeholder SyRS Review Panel Roster (Final)	Kick-off+27 weeks	Word	
P1T06D3	5.6	SyRS Document (Draft)	Kick-off+30 weeks	Word	
P1T06D4	5.6	SyRS Walkthrough Workbook	Kick-off+30 weeks	PP	
P1T06D5	5.6	SyRS Walkthrough Comment Resolution Report (Draft)	Kick-off+32 weeks	Word	
P1T06D6	5.6	SyRS Document (Final)*	Kick-off+35 weeks	Word	
P1T06D7	5.6	SyRS Walkthrough Comment Resolution Report (Final)	Kick-off +35 weeks	Word	

*508 Compliant Deliverables

Planning for Requirements Walkthrough

- Describe the plans for the requirements walkthrough
  - IEEE Standard 1028-2008
  - Walkthrough Plan
    - Number of days
    - Who will participate
    - Where it will be held
    - Approximate timeframe
  - Walkthrough Workbook
    - Format can be Word, PowerPoint (any format that can be edited during walkthrough)

Configuration Management

Process for Configuration Management

- Describe the process of how sites will maintain configuration management.
- Configuration Management will come at a later stage.

A Refresher: **What is configuration management?**

Configuration management is the process by which your team is going to manage change control.

Configuration Management Process

- **Initial User Needs and Requirements Development**
  - It is critical that this section describe how the user needs and requirements will be baselined. This could be when USDOT accepts the Final ConOps and Final SyRS.

- **Baselined User Needs and Requirements**
  - Will the project have a Configuration Control Board (CCB) that must approve all changes?
  - Will the CCB require a change package to vote on proposed changes?
  - What analysis is required in those change packages?

Source of User Needs and Requirements

- The **Authoritative source** is the source that other documents will be building against.
  - Typically the ConOps and SyRS,
  - Alternatively, could be a requirements management tool.

- If the ConOps and SyRS are the authoritative source, then state:
  - How often those documents will be updated.
  - Where the authoritative version of those documents can be found.

Resources

UNIRP Key References

ITS4US UNIRP Template

IEEE Resources:

- IEEE Guide for Information Technology - System Definition - Concept of Operations (ConOps) Document, IEEE Standard 1362, 1998, 10.1109/IEEESTD.1998.89424
- IEEE Guide for Software Reviews and Audits, IEEE Standard 1028-2008, 10.1109/IEEESTD.2008.4601584
- ISO/IEC/IEEE International Standard - Systems and Software Engineering -- Life Cycle Processes --Requirements Engineering, IEEE/ISO/IEC 29148-2018, https://standards.ieee.org/standard/29148-2018.html
- IEEE Guide for Developing System Requirements Specifications, IEEE Standard 1233, 1998, 10.1109/IEEESTD.1998.88826

FHWA SE Resources:

- Systems Engineering for Intelligent Transportation Systems - provides an introduction to systems engineering and leads the reader step by step through the project life cycle and describes the systems engineering approach at each step.
- Systems Engineering Guidebook for Intelligent Transportation Systems - provides a more in-depth reference for ITS practitioners applying systems engineering to plan, implement, manage, and operate ITS.
- Applying Scrum Methods to ITS Projects – provides information for those interested in learning about Scrum Methods, one of the Agile Methodologies, and how to incorporate Scrum into ITS project development. Also incudes links to Agile resources.

Stay Connected

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Visit the Complete Trip - ITS4US Deployment Program Website and FAQs:
https://its.dot.gov/its4us/
https://www.its.dot.gov/its4us/its4us_faq.htm

Q&A

Any questions?