U.S. Department of Transportation

ITS4US

IT'S TRANSPORTATION FOR ALL OF US

**Task 2-H:**
Installation and Operational Readiness Testing

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# ITS4US Program Overview

- 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

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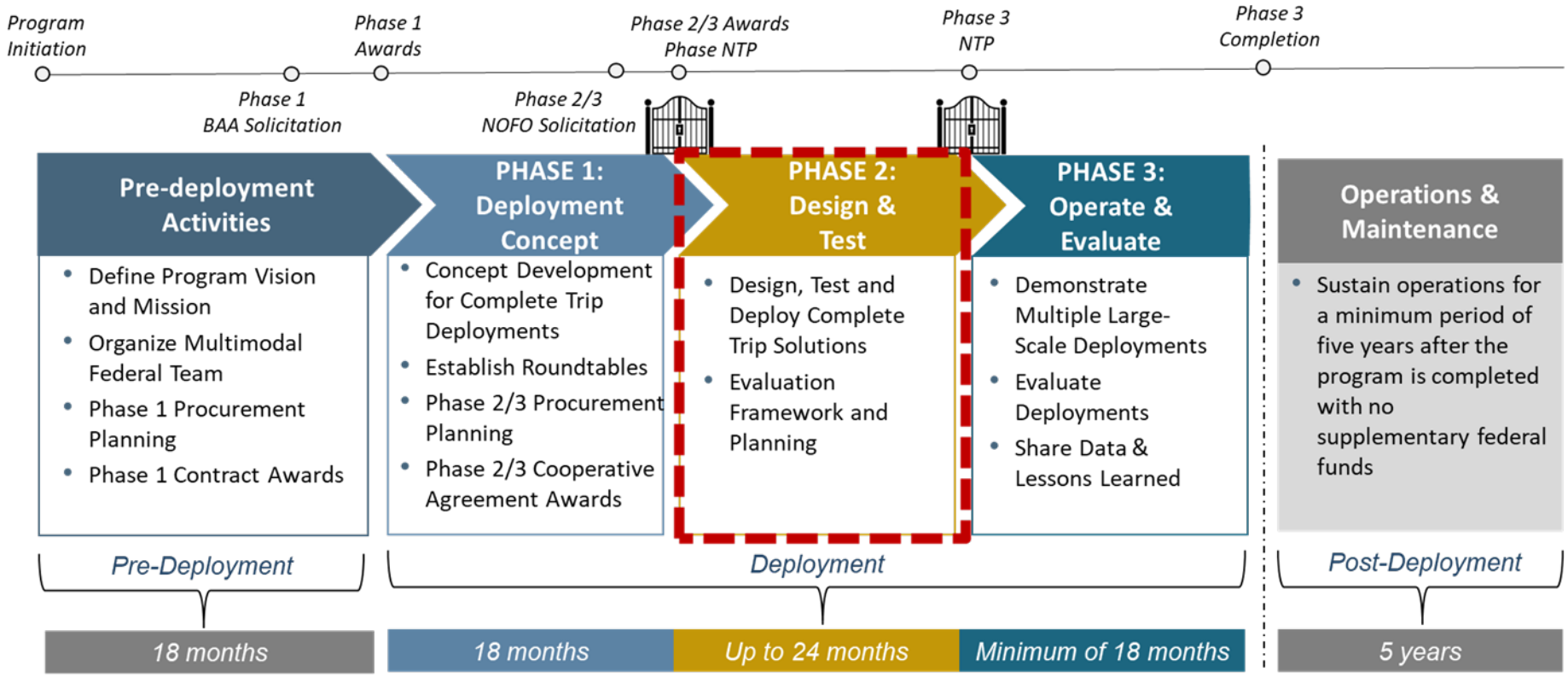
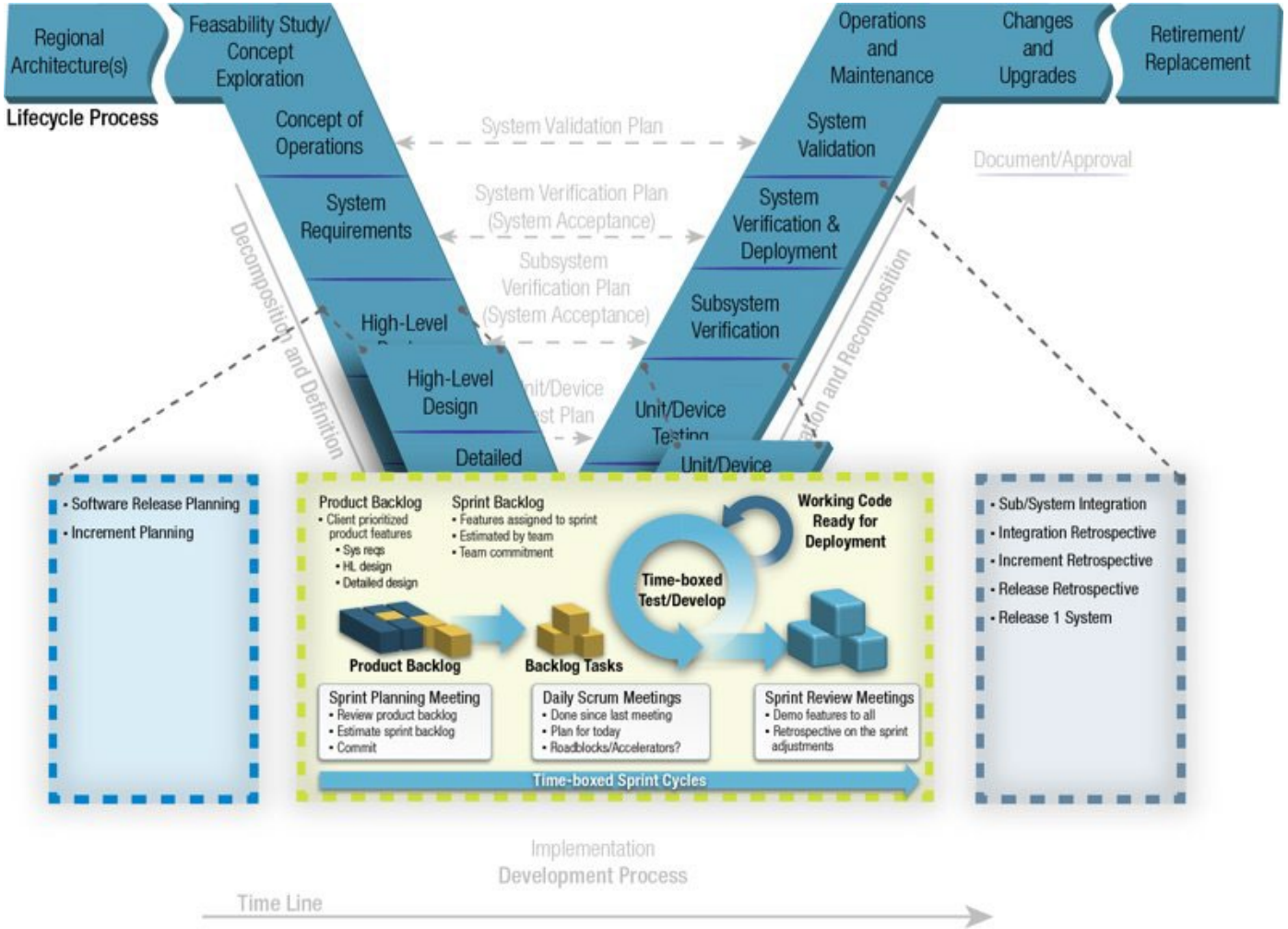
**Vision:** Innovative and integrated complete trip deployments to support seamless travel for all users across all modes, regardless of location, income, or disability

# Deployment Phases



# Systems Engineering "Vee" Diagram




(Source: FHWA 2007 and modified by Noblis 2017)

# Task 2-H:
# Installation and Operational Readiness Testing

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# 2-H Installation and Operational Readiness Testing

Task 2-H extends from Month 9 to Month 24. This task includes installation activities for the system and its components as planned in Task 2-D, and conducting and documenting testing and demonstration activities as planned in Task 2-G. The objective of this task is to complete system installation, complete all system verification activities, and show that the deployment has satisfied all operational readiness criteria before moving to Phase 3.

***Deliverables***

1. Installation and Operational Readiness Schedule (IORS)
2. System Test Results (STRS)
3. Test Results Summary Documentation (per the ORP)
4. Operational Readiness Demonstrations (per the ORP)

# 2-H Deliverables

- Installation and Operational Readiness Testing Schedule (IORS)
  - Each site shall document the work breakdown structure and schedule for implementing the Comprehensive Installation Plan (Task 2-D) and update monthly.
- System Test Results Summary (STRS)
  - Each site shall document the test results as planned in the Task 2-G System Test Plan prior to beginning the Operational Readiness phase.
- Test Results Summary Documentation (per the ORP)
  - Each site shall conduct testing and document the test results from the Operational Readiness Testing.
- Operational Readiness Demonstration (per the ORP)
  - Each site shall conduct demonstrations and document the results from the Operational Readiness Demonstrations.

# 2-H Key Activities

- **Installation Scheduling and Execution**
  - Install system and components according to CIP and schedule with monthly reporting.
- **System Testing Results**
  - Conduct / summarize test results based on System Test Plan
- **Operational Readiness Testing**
  - Execute testing components of Operational Readiness Plan and document results.
- **Operational Readiness Demonstrations**
  - Schedule and conduct demonstration components of Operational Readiness Plan and document results.

# 2-H Challenges and Possible Strategies

- **Maintaining Documentation of Testing Results**
  - Issue: Results of testing conducted earlier in the project may not be in an easy-to-incorporate form.
  - Possible Strategy: In the System Test Plan, consider expected testing activities and determine process for capturing and storing test results that can be efficiently summarized in the STRS.

- **Readiness for Operational Readiness Demonstrations**
  - Issue: Delays or need to resolve issues prior to Operational Readiness Demonstration
  - Possible Strategy: Avoid scheduling the Operational Readiness Demonstrations until confident in ability to achieving readiness, based on pre-established criteria.

# 2-H Lessons Learned

- Testing later in the project lifecycle is time consuming and more expensive due to impacts on other parts of the system.
- Using an independent verification and validation (IV&V) team can greatly improve documentation quality.
- Not following best practice of documenting as-built versions of the implemented system will negatively impact successful operation of the system and increase maintenance costs.
- https://www.its.dot.gov/pilots/disparate_systems.htm

# Relationship between SE Tasks

- Phase 2 SE activities build on the SE activities in Phase 1, adding more technical detail and refining user needs and requirements as appropriate
  - Traceability between the User Needs, Requirements, System Design and Testing is very important in Phase 2
- Phase 2 activities, whether traditional waterfall processes or Agile, become more connected and interrelated
  - Acquisition plans may be heavily reliant on system requirements to drive procurement efforts
  - Installation plans will be driven by requirements and system design
  - A logical test program that builds from lower-level Unit/Component tests, to integration testing to full system testing will be verifying system requirements, validating user needs and demonstrating that the system is ready to enter operations
- Phase 2 activities can move very quickly and the USDOT SE Team is always available to help with any questions and concerns that arise during any of the Phase 2 SE activities

# References for SE Session

- Phase 1 Connected vehicle pilot deployment program phase 1 : lessons learned : final report. (bts.gov)
- Phase 2 Connected Vehicle Pilot Deployment Program: Driving Towards Deployment: Lessons Learned From the Design/Build/Test Phase (bts.gov)
- Architecture Reference for Cooperative and Intelligent Transportation
- https://www.its.dot.gov/pilots/thea_obu.htm
- https://www.its.dot.gov/press/2018/nycdot_airsupport.htm
- https://www.its.dot.gov/pilots/disparate_systems.htm

# ITS4US Contact Information

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Visit the ITS4US Deployment Program Website:

https://its.dot.gov/its4us/

ITS4US Deployment Program Video

https://youtu.be/pztl1lRyXAc