U.S. Department of Transportation

ITS4US

IT'S TRANSPORTATION FOR ALL OF US

Task 2-E:
Software Development and Integration

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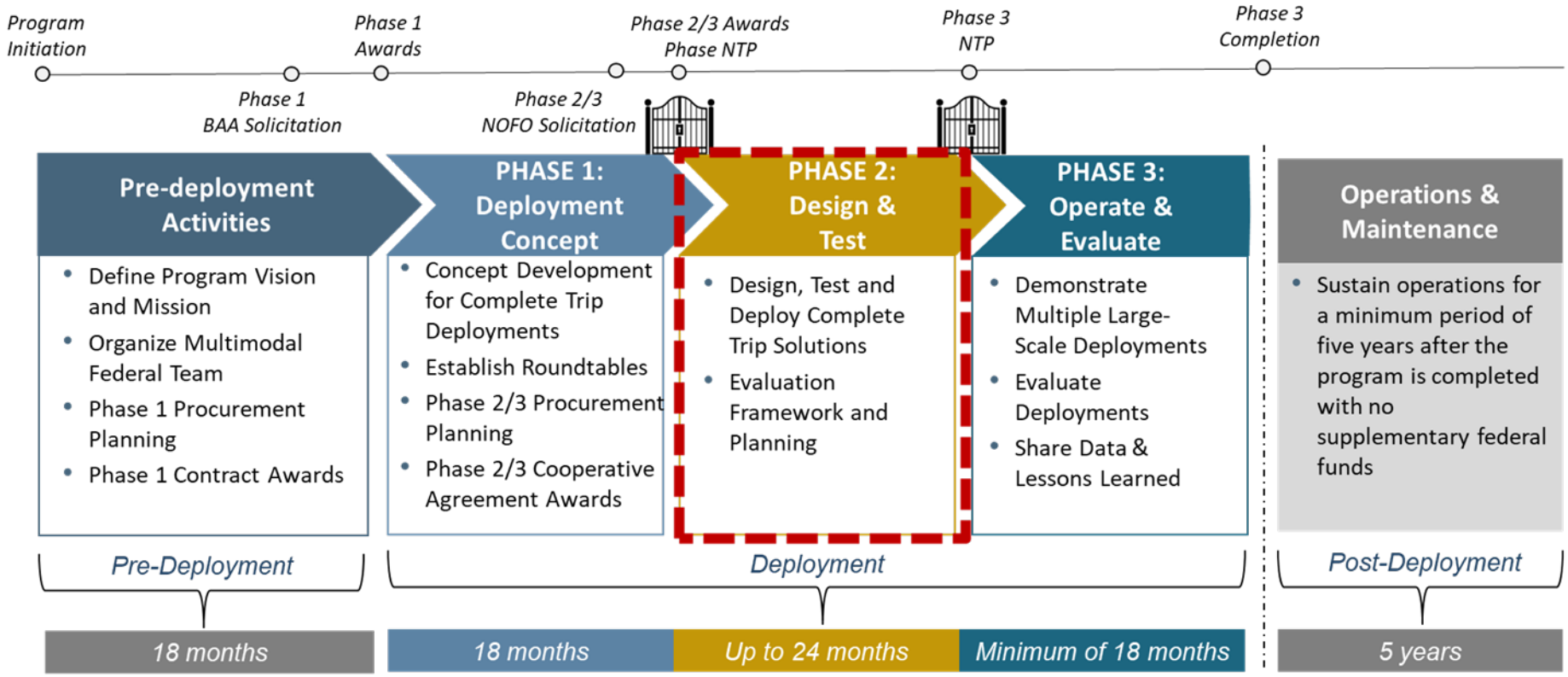
ITS4US Program Overview

- 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

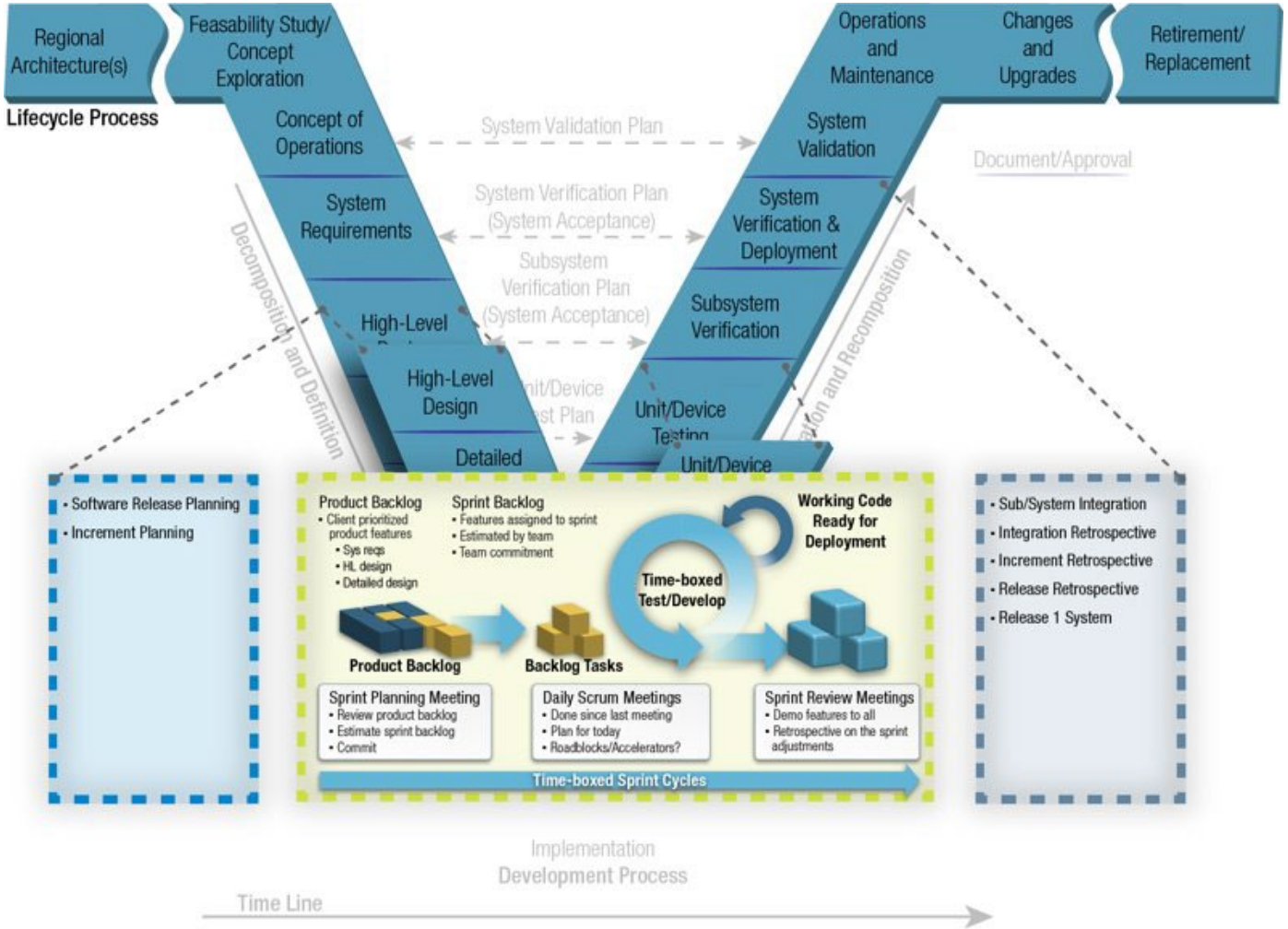
ITS4US
IT'S TRANSPORTATION FOR ALL OF US

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-E:
Software Development and Integration

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2-E Software Development and Integration

Task 2-E extends from Month 1 to end of Phase 1. The key activity is to create an initial software development schedule (SDS) that is updated monthly with progress and risk summaries provided with each update. The key documents of this task are the SDS and the open-source software and supporting document(s). The objective of this task is to cover all non-COTS/MOTS software development efforts conducted under this NOFO to support or create applications, integrate deployment functions, or enable testing at the system (or sub-system) level.

Deliverables

1. ***Initial Software Development Schedule (SDS)***
2. ***Open-Source Software and Supporting Documentation***

2-E Deliverables

- Initial Software Development Schedule (SDS)
  - Each site shall prepare an initial Software Development Schedule (SDS) that identifies the work breakdown structure (noting all dependencies among activities) required to make all Task 2-E capabilities deployment-ready
  - The SDS will also include a software testing schedule
- Open-Source Software and Support Documentation
  - Per the SEMP and ICTDP documents, identified open-source software and supporting documentation to be provided in this task shall be identified as deliverables/milestones within the SDS. All identified open-source code and supporting documentations need to be publicly posted.

2-E Key Activities

- Monthly SDS Update
  - Each site shall prepare monthly updates to the SDS in response to DOT comments on format and content, as well as to document progress against plan and track risks/issues.
  - The updated SDS will be accompanied by a concise summary of development activities underway, progress made since the last update, and any/all technical issues/risks with any/all mitigation actions taken since the last update.
  - Monthly schedule and risk updates are expected to be delivered from the time that this task is initiated until the end of Phase 2.

2-E Challenges and Possible Strategies

- **Beware of new user needs that extend development**
  - Issue: Flexible software development strategies like Agile are great for ensuring user buy in but sometimes users request too much to meet schedule or budget needs.
  - Possible Strategy: Have a clear vision on what features make up the Minimum Viable Product (MVP) and vet any new needs/features against the MVP and the project roadmap. Should a new feature push the schedule too far out consider moving it to later releases to stay on schedule.

- **COTs Integration**
  - Issue: Newly developed software does not properly interface with COTs as needed increasing cost and development time.
  - Possible Strategy: Develop around COTs early to ensure everything works as expected to allow for more time in the schedule to address issues with COTs products that maybe out of your control. Be very leery of COTs products promising features that are not currently avalible yet.

2-E Lessons Learned

- Stick to the Plan
  - Software methodologies like Agile are only good if used correctly. Make sure everyone on the Team understands the processes and their roles.
- Learn from Your Past
  - Use retrospective meetings to review and improve your development process as often as possible. Don’t be afraid to change or even remove tasks that are not adding value to the development process.
- Setup and Test Systems and Environments Early
  - Don’t wait for the backlog to be finalized before starting to standup your different environments and systems. Consider having an initial setup or support sprint to get everything up and running so when Sprint 1 is started you don’t need to waste time on system setup.

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

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Visit the ITS4US Deployment Program Website:

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

ITS4US Deployment Program Video

https://youtu.be/pztl1lRyXAc