STANDARDS ITS TRAINING

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U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology

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Module A325:

Determining Known Risks with Standards in Your Deployment

Instructor

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President

Trevilon LLC

Learning Objectives

Explain System Architectures

Compare ITS Reference Architectures

Link Reference Architecture Content to Standards

Identify Known Risks with Standards

Provide Recommended Resources to Learn More About Architecture Efforts

Learning Objective 1

Explain System Architectures

Explain System Architectures

Overview

- Levels of Architectural Abstraction Used in ITS
  - Reference architectures
  - Regional architectures
  - Deployment architectures

- Purpose of Architectures
  - Document system design
  - Define key interfaces for integration
  - Promote a common marketplace

Levels of Architectural Abstraction

**Three Levels of Abstraction**

- # Reference architecture
  - Provides overall template solutions

- # Regional (a.k.a. planning) architecture
  - Provides long-term vision of what is to be deployed within a geographic region

- # Project (a.k.a. deployment) architecture
  - Provides technical details related to a specific project deployment

Introduction
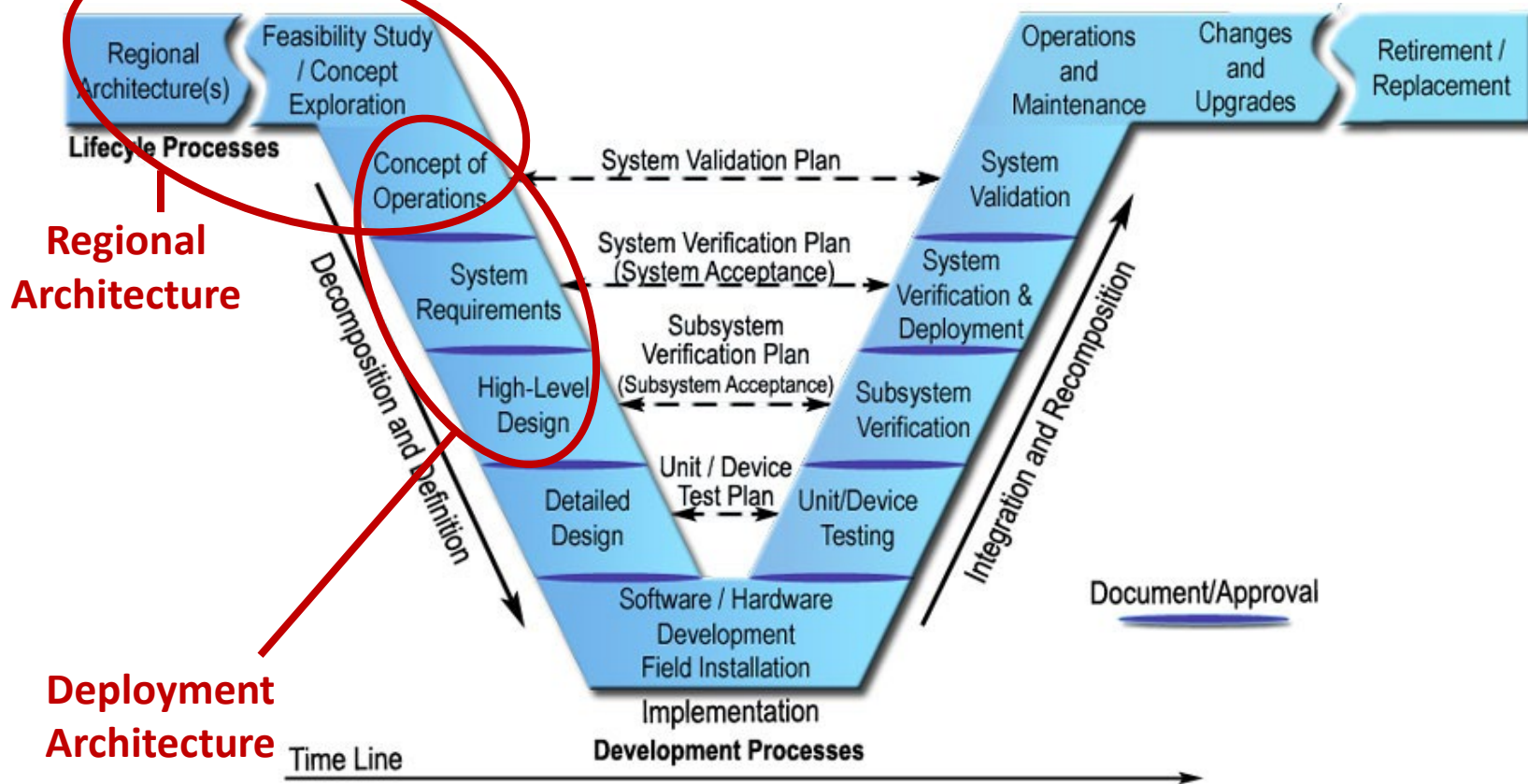
When do you want to know about risks on your project?

Systems Engineering "V" Diagram

Introduction

When do you want to know about risks on your project? **As soon as possible!**
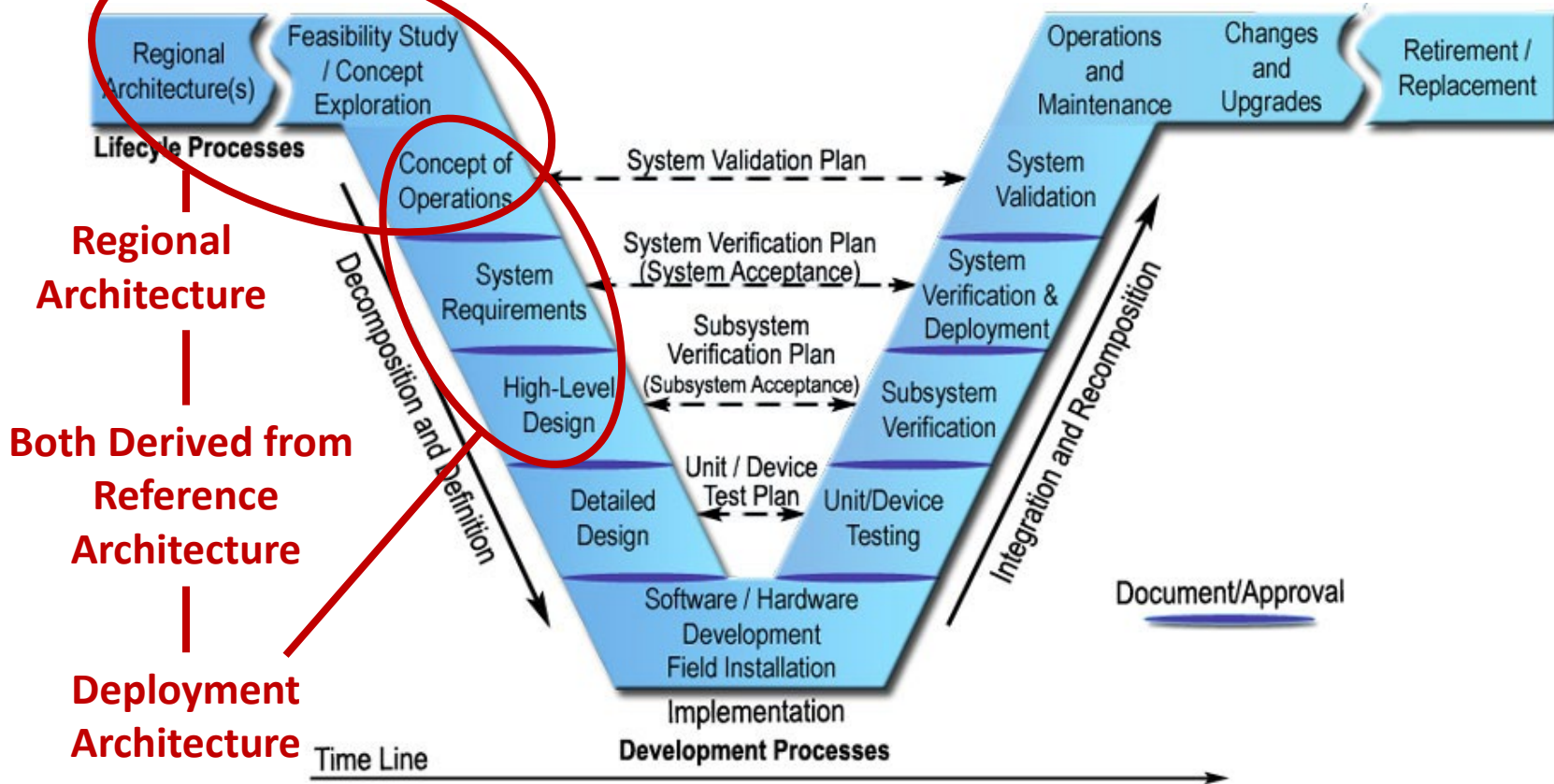

Regional Architecture

Deployment Architecture

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Introduction

When do you want to know about risks on your project?

As soon as possible!

Regional Architecture

Both Derived from Reference Architecture
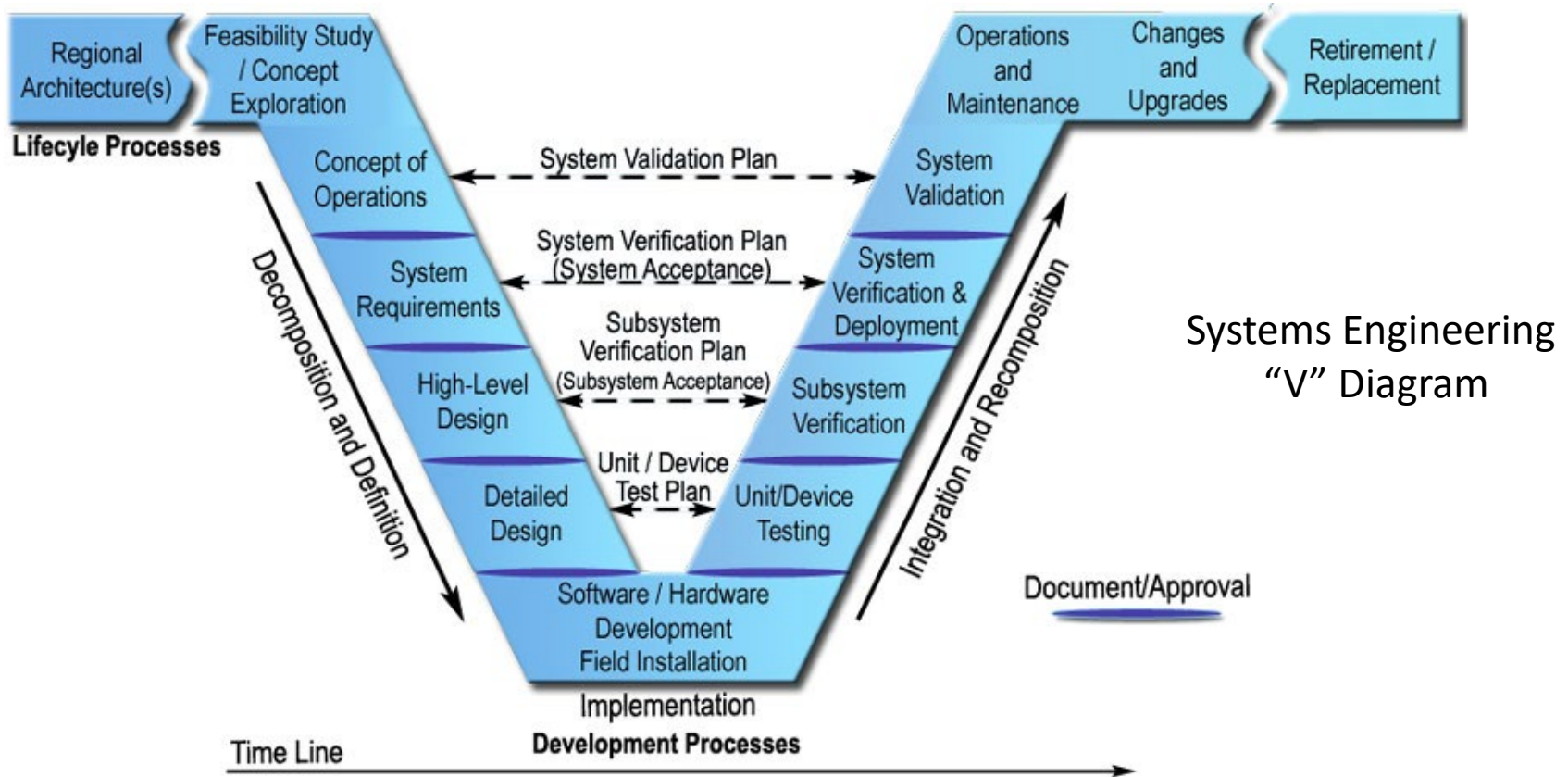
Deployment Architecture

Purpose of Architectures

Document System Design

- Every deployment should be based on an architecture
  - Reference architecture simplifies process

- Purpose of system architecture is similar to that for a building
  - Create a design to address all stakeholder concerns
  - Requires multiple "views" to address different concerns
  - Up front planning and refinements are ___much___ cheaper than change orders during construction

- One major concern is:
 - What are the known issues and risks with my project?

Purpose of Architectures

Define Key Interfaces for Integration

- ## A system deployment typically involves multiple parties
  - If more than one supplier, products must be integrated
  - Reference architecture supports standardization efforts

Sample "Service Package" diagram
- Collection of physical objects and information flows between them required to deliver a set of inter-related services

13
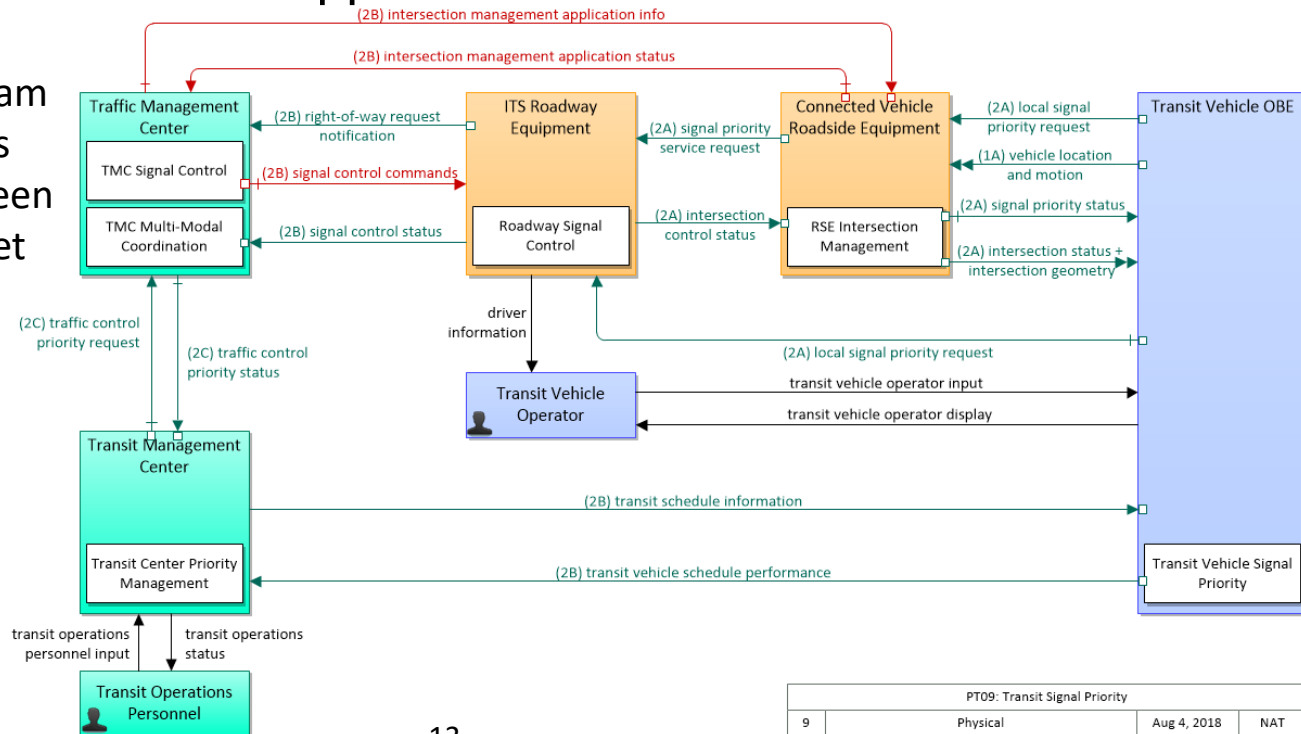
Purpose of Architectures

Promote a Common Marketplace

- A reference architecture promotes a common marketplace
  - Greater interchangeability of components
  - Cost sharing for testing and debugging components
  - Creates a larger pool of experts with a common skillset
  - More competitive pricing

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Question

Which type of architecture provides a <u>solution template</u> that can be customized for each region or project?

Answer Choices

a) Deployment architecture

b) Planning architecture

c) Reference architecture

d) Regional architecture

Review of Answers

a) Deployment architecture
   Incorrect. A deployment architecture defines the before and after details for a specific deployment project

b) Planning architecture
   Incorrect. A planning architecture defines the long-term plan for the architecture within a specific region

c) Reference architecture
   Correct! A reference architecture is a template solution that can be customized for each site, such as the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)

d) Regional architecture
   Incorrect. The term "regional architecture" is a synonym for a "planning architecture," and is used mainly within the U.S.

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Learning Objective 2

Compare ITS Reference Architectures

Compare ITS Reference Architectures

Overview

- Template Solution for ITS Deployments
- Major ITS Reference Architectures
- Typical ITS Reference Architecture Viewpoints
- Support Tools

Template Solution for ITS Deployments

- Allows customization to meet local needs
  - Identify specific instances of each component
  - Select services to be included
  - Add additional services as needed
  - Refine security and other details as needed
  - Identify interfaces and interface standards

Major ITS Reference Architectures
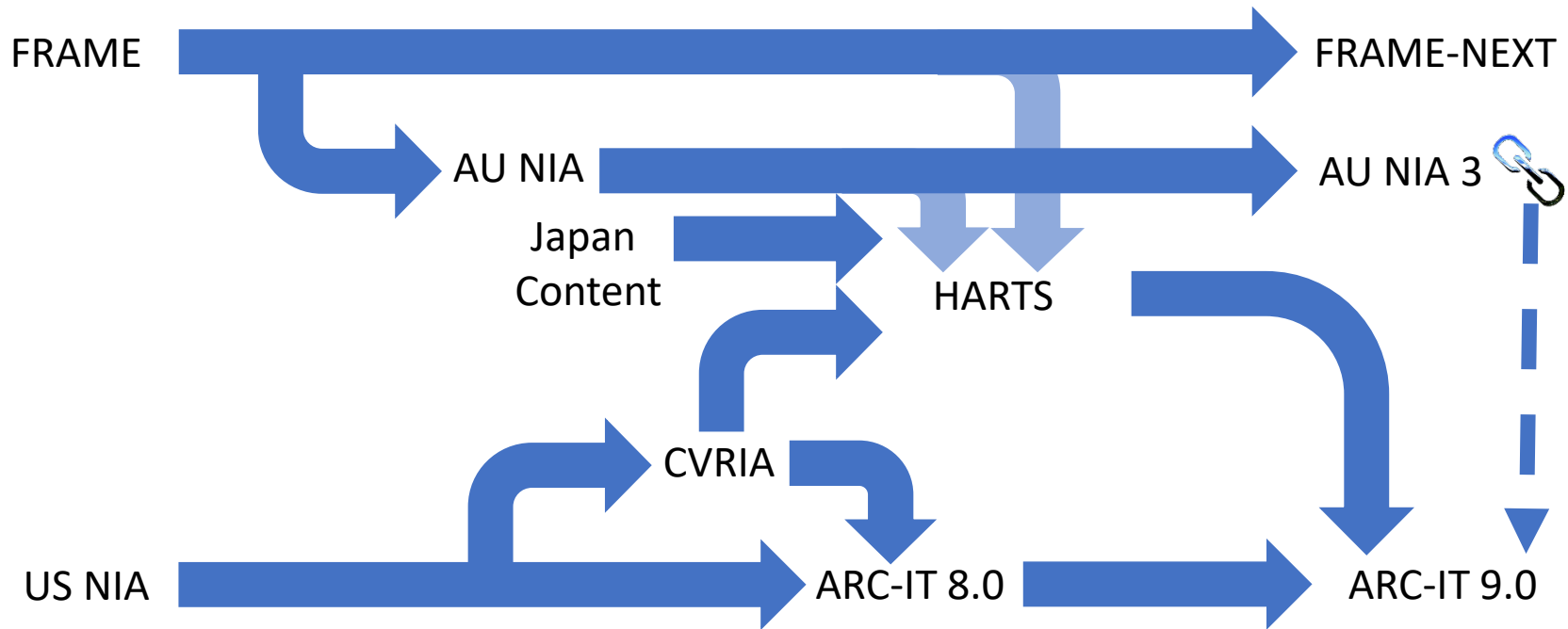
ARC-IT = Architecture Reference for Cooperative and Intelligent Transport

AU = Australia

CVRIA = Connected Vehicle Reference Implementation Architecture
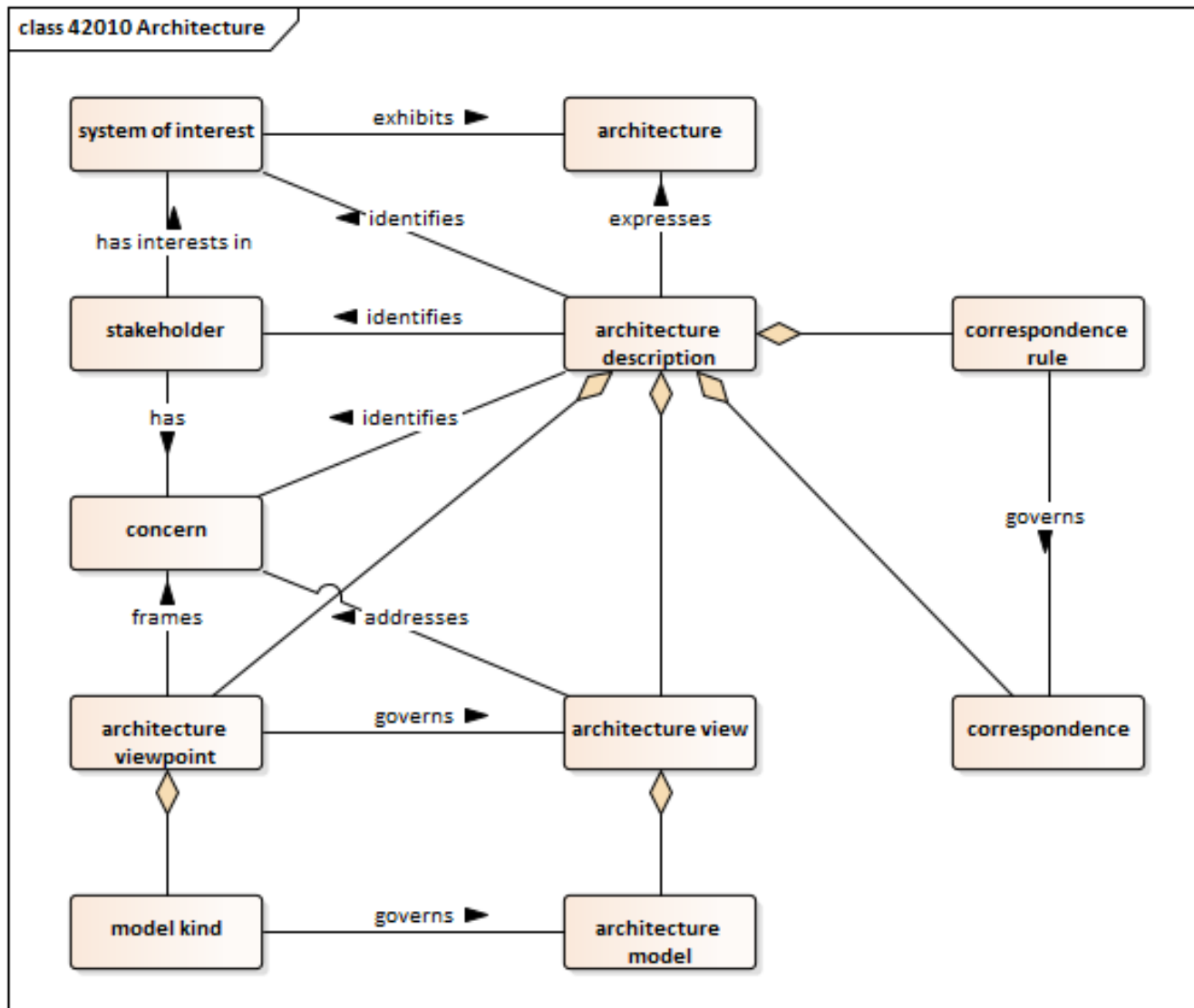
FRAME = European Framework Architecture

HARTS = Harmonized Architecture Reference for Technical Standards

NIA = National ITS Architecture

US = United States

Typical ITS Reference Architecture Viewpoints

[Source: ISO 42010:2011]

SUPPLEMENT

Typical ITS Reference Architecture Viewpoints

Stakeholder Concerns

- What relationships are needed for the entire lifecycle?
- What functionality needs to be provided?
- What components will fulfill this functionality?
- What interfaces do components need to support?
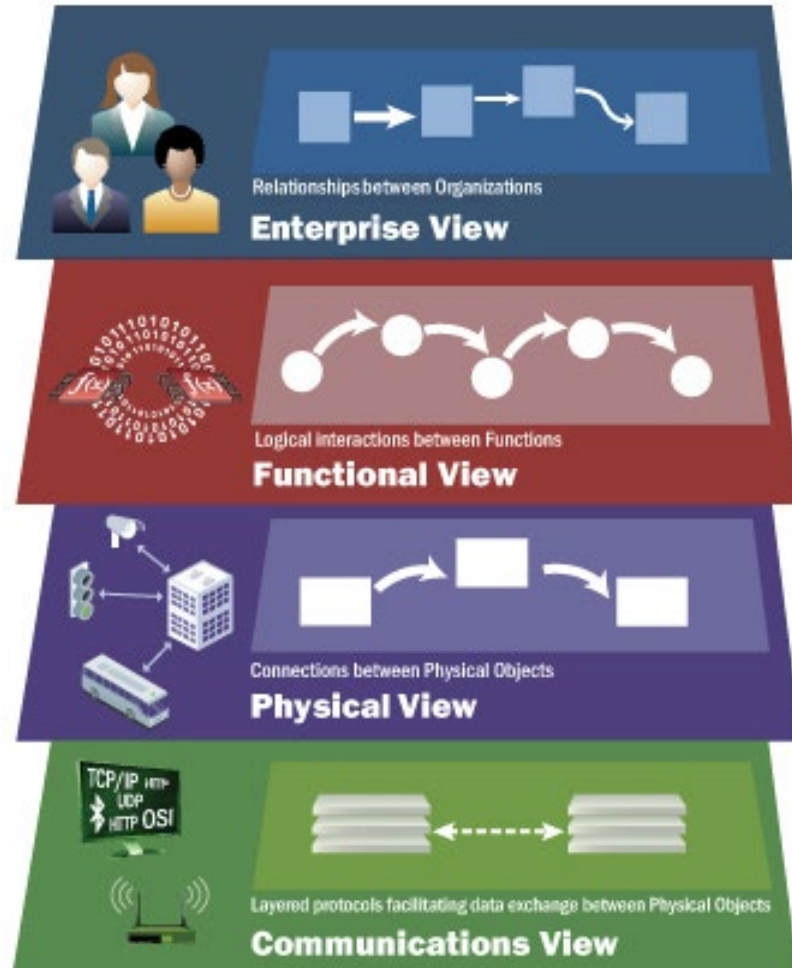- What data is produced, and can this data be shared?

Typical ITS Reference Architecture Viewpoints

ARC-IT Viewpoints

- ## ARC-IT provides a template solution for ITS
  - □ "Reference architecture"
- ## ARC-IT currently provides four views
  - □ ARC-IT 9.0 will begin adding a fifth view: Information

Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)

Relationships between Organizations
Enterprise View

Logical interactions between Functions
Functional View

Connections between Physical Objects
Physical View

TCP/IP HTTP UDP HTTP OSI

Layered protocols facilitating data exchange between Physical Objects
Communications View

Typical ITS Reference Architecture Viewpoints

	Enterprise	Functional	Physical	Communication	Information
FRAME		●			
US NIA 7		●	●	●	
AU NIA	●	●			
Japan		○			
CVRIA	●	●	●	●	
HARTS		●	●	●	
ARC-IT 8	●	●	●	●	
ARC-IT 9	●	●	●	●	○

Legend
● Fully defined
○ Partially defined

Support Tools

ARC-IT Website

- Template solution for ITS deployments
  - Allows customization to meet local needs
  - Website also hosts other important resources

http://arc-it.net

Support Tools

RAD-IT

- Key tool for creating regional (a.k.a. planning) architectures:
  - Detailed vision
  - For a specific geographical region
- Assists users in customizing ARC-IT to their region
- Available from ARC-IT website

Support Tools

SET-IT

- Key tool for creating systems engineering (a.k.a. deployment) architectures:
  - Allows a more detailed architecture description for a project
  - Identifies items as existing/project/future
  - Defines standards to be deployed for each interface
- SET-IT assists users in building their project architectures
- Available from ARC-IT website

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Question

Which tool is designed to assist in developing a customized deployment architecture?

Answer Choices

a) CVRIA

b) SET-IT

c) RAD-IT

d) HARTS

Review of Answers

a) CVRIA

Incorrect. CVRIA is the old US reference architecture for connected vehicles; its content is now in ARC-IT.

b) SET-IT

Correct! SET-IT assists in the development of the systems engineering details of a deployment architecture.

c) RAD-IT

Incorrect. RAD-IT is a tool to assist in developing customized "regional architectures", also known as planning architectures.

d) HARTS

Incorrect. HARTS is an international ITS reference architecture that is being incorporated into ARC-IT 9.0.

Learning Objective 3

Link reference architecture content to standards

Link Reference Architecture Content to Standards

Overview

- Concerns addressed by Communications View

- Elements of the Communications View

- Solution stack

  - Traditional Open Systems Interconnect (OSI) reference model

  - ITS Station architecture

  - Bundles

  - Standards information

  - Gaps

Link Reference Architecture Content to Standards

Concerns addressed by Communications View

- What is the purpose of the information transfer?

- Where is an information transfer used?

- What are the characteristics of the information transfer?

- What are the security requirements for the information transfer?

- What protocols does my device need to support for interoperability?

- What risks are involved with deploying the solution?

Elements of the Communications View

Overview

- Communications View includes several artifacts for each information transfer (a.k.a., "triple")
    - Definition
    - Correspondence links showing where the transfer is used
    - Characteristics of the information transfer
    - Security analysis for the transfer
    - Communication diagrams

Information transfer defined by
- Source
- Destination
- Information flow

Connected Vehicle Roadside Equipment --> **Vehicle OBE:** intersection status

Link Type: Short Range Wireless

| Definition | Included In | Communication Diagrams | Characteristics | Security |

Elements of the Communications View

Definition

- Addresses purpose of information transfer by defining:
    - The information flow contained in the transfer
    - The physical object that is the source of the information transfer
    - The physical object that is the destination of the information transfer

Definitions

intersection status (Information Flow): Current signal phase and timing information for all lanes at a signalized intersection. This flow identifies active lanes and lanes that are being stopped and specifies the length of time that the current state will persist for each lane. It also identifies signal priority and preemption status and pedestrian crossing status information where applicable.

Connected Vehicle Roadside Equipment (Source Physical Object): 'Connected Vehicle Roadside Equipment' (CV RSE) represents the Connected Vehicle roadside devices that are used to send messages to, and receive messages from, nearby vehicles using Dedicated Short Range Communications (DSRC) or other alternative wireless communications technologies. Communications with adjacent field equipment and back office centers that monitor and control the RSE are also supported. This device operates from a fixed position and may be permanently deployed or a portable device that is located temporarily in the vicinity of a traffic incident, road construction, or a special event. It includes a processor, data storage, and communications capabilities that support secure communications with passing vehicles, other field equipment, and centers.

Vehicle OBE (Destination Physical Object): The Vehicle On-Board Equipment (OBE) provides the vehicle-based sensory, processing, storage, and communications functions that support efficient, safe, and convenient travel. The Vehicle OBE includes
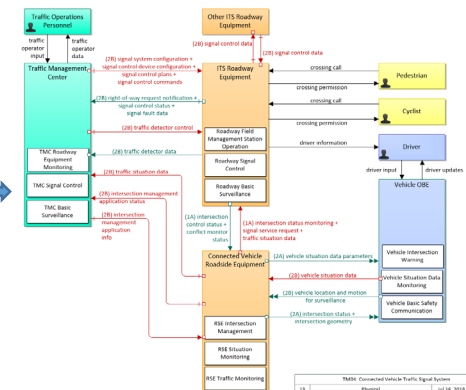
Included In: (a.k.a., Correspondences)

- Identifies where the information transfer is used:
  - In service packages

This Triple is in the following Service Packages:
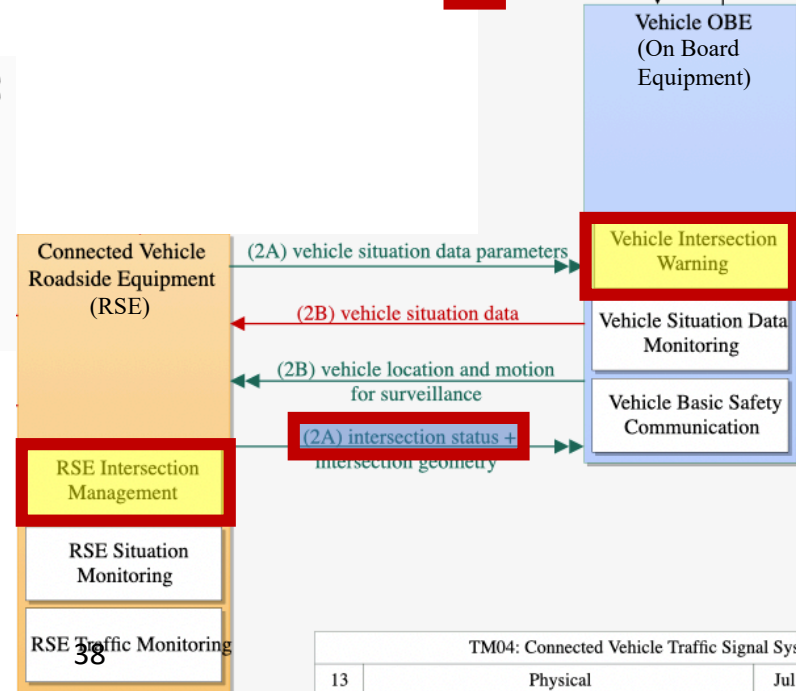
- ST08: Eco-Approach and Departure at Signalized Intersections
- TM04: Connected Vehicle Traffic Signal System
- VS12: Pedestrian and Cyclist Safety
- VS13: Intersection Safety Warning and Collision Avoidance
- VS15: Infrastructure Enhanced Cooperative Adaptive Cruise Control

Elements of the Communications View

Included In: (a.k.a., Correspondences)

- Identifies where the information transfer is used:

  - In service packages

  - In functional objects

Information Transfer

Functional Object

This Triple is in the following Functional Objects:

- RSE Intersection Management
- RSE Intersection Safety
- Vehicle Eco-Driving Assist
- Vehicle Intersection Warning

Overview

'Vehicle Intersection Warning' uses V2V and V2I communicati...
the intersection. Driver warnings are provided and the applica...
infrastructure and other vehicles if it detects an unsafe infring...

Vehicle OBE (On Board Equipment)

Connected Vehicle Roadside Equipment (RSE)

(2A) vehicle situation data parameters

Vehicle Intersection Warning

(2B) vehicle situation data

Vehicle Situation Data Monitoring

(2B) vehicle location and motion for surveillance

Vehicle Basic Safety Communication

(2A) intersection status + intersection geometry

RSE Intersection Management

RSE Situation Monitoring

RSE Traffic Monitoring

TM04: Connected Vehicle Traffic Signal System			
13	Physical	Jul 16, 2018	NAT

Elements of the Communications View

Included In: (a.k.a., Correspondences)

- Identifies where the information transfer is used:

  - In service packages

  - In functional objects

  - In data flows

This Triple is described by the following Functional View Data Flows:

- intersection_collision_avoidance_data
- intersection_status_data_for_vehicle
- signal_phase_indication_to_vehicle
- signal_phase_response_state_to_vehicle
- signal_phase_timing_to_vehicle ⟶
- vehicle_signage_intersection_message

signal_phase_timing_to_vehicle

This data flow sent from Provide Device Control processes to onboard processes indicates the amount of time remaining in the current phase (red, amber, green, left-turn, etc.) that is being transmitted by a signal controller.

Sub Data Flows

- Primitive Element

Parent Data Flows

- None

Associated PSpecs/Terminators

- 1.2.7.7 - Process Vehicle Safety and Environmental Data for Output
- 3.1.1 - Produce Collision and Crash Avoidance Data

Parent Information Flows

- intersection status

Elements of the Communications View

Characteristics

- Every information transfer is characterized to determine appropriate communication technologies

Characteristics

Characteristic	Value
Time Context	Recent
Spatial Context	Adjacent
Acknowledgement	False
Cardinality	Broadcast
Initiator	Source
Authenticable	True
Encrypt	False

Security

- Confidentiality, Integrity, and Availability (CIA) analysis provided with justification

Security

Information Flow Security

	Confidentiality	Integrity	Availability
Rating	Not Applicable	Moderate	Moderate
Basis	This data is intended for all vehicles in the immediate area of the sender.	If this is compromised, the Vehicle OBE will receive messages that are inconsistent with what the traffic signals are displaying. This could lead to confusion and reduce the ability of the application to provide value.	If this is down, the Vehicle OBE doesn't get the information it needs to stay in synch with the actual signal state, reducing or eliminating the value add from having this application. We assume that the Vehicle OBE will detect a lack of availability and choose not to send out-of-date information, so a failure of availability cannot have worse consequences than a failure of integrity which we have previously assessed at MEDIUM.

Security Characteristics	Value
Authenticable	True
Encrypt	False

Elements of the Communications View

Communication diagrams

- ARC-IT 8.3

    □ Based on ISO 7498 *Open Systems Interconnection (OSI) – Basic Reference Model*

    □ Adds an application information layer

    □ Adds a security plane
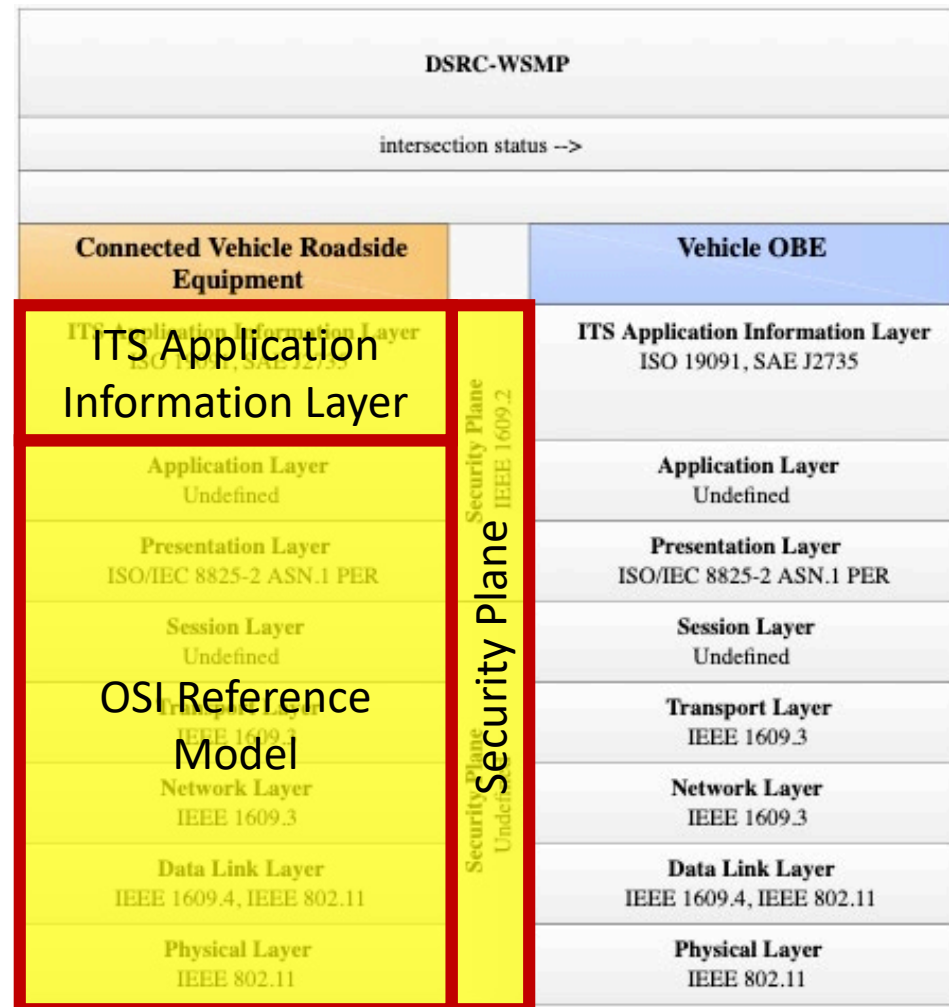
Elements of the Communications View

Communication diagrams

- ARC-IT 9.0 (HARTS)

    - Based on ISO 21217 *ITS Station Communication Architecture*

    - Simplifies OSI Model

    - Includes Security and Application "entities"

    - Adds a Management entity
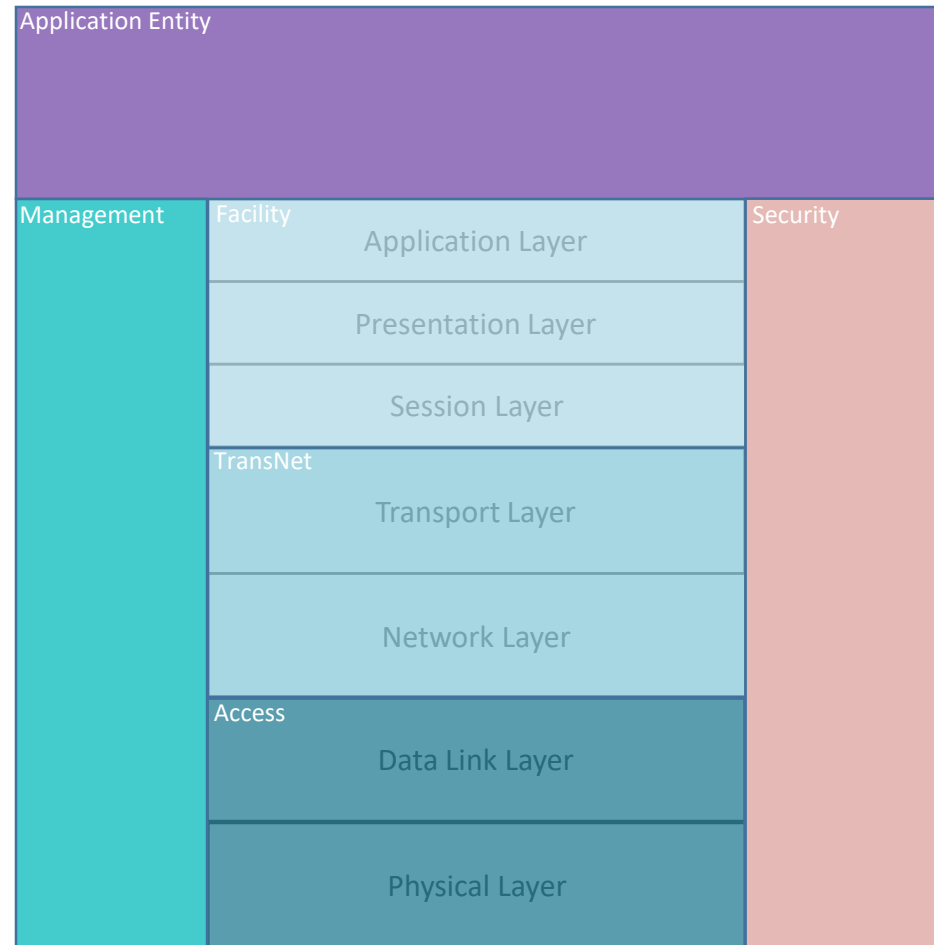
Application Entity		
Management	Facility Application Layer Presentation Layer Session Layer TransNet Transport Layer Network Layer Access Data Link Layer Physical Layer	Security

Elements of the Communications View

Communication diagrams

- ARC-IT 9.0 (HARTS)

  - Identifies standards for each area

Application Entity
- SAE J2735 ⓘ
- CEN ISO 19091 ⓘ
- SAE J2945/A ⓘ

Management: No Standard Needed ⓘ

Facility
- SAE J2375 ⓘ
- SAE J2945/A ⓘ

TransNet
- IEEE 1609.3 ⓘ

Access
- Bundle: WAVE - Subnet ⓘ

Security
- Bundle: IEEE 1609.2 ⓘ

SUPPLEMENT

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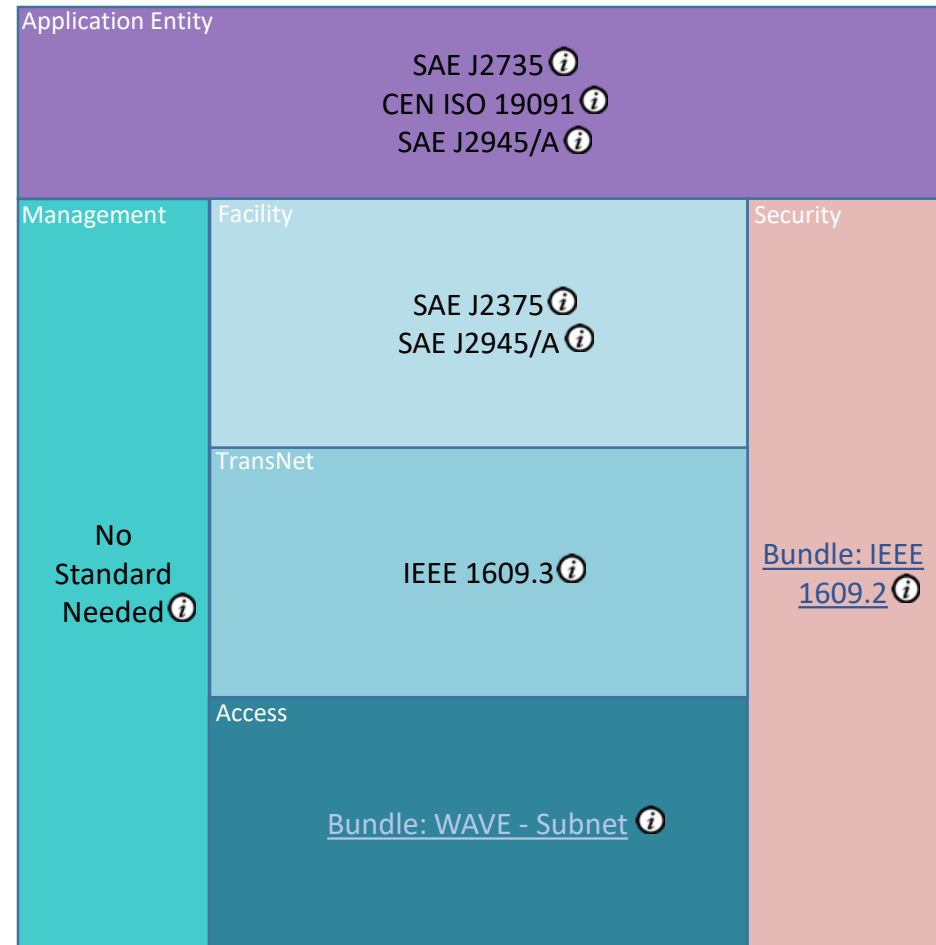
Communication diagrams

- ARC-IT 9.0 (HARTS)
  - □ Identifies standards for each area
  - □ Information icons provide additional details about each standard
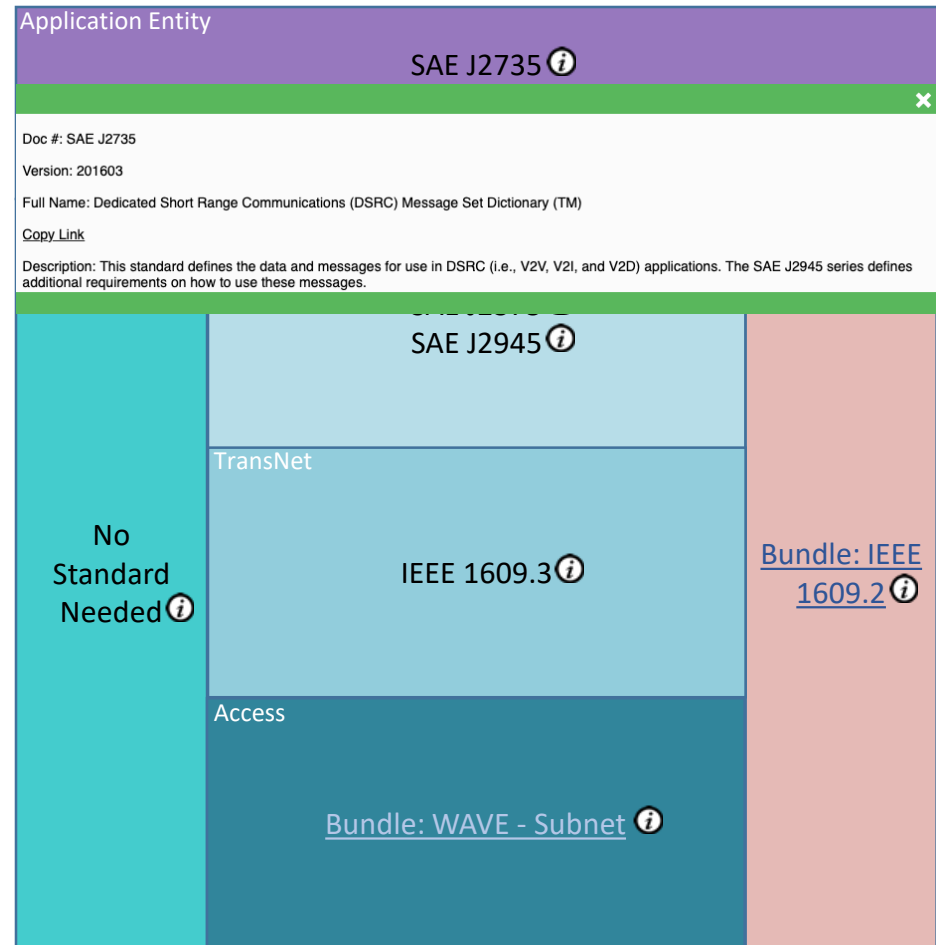
Elements of the Communications View

Communication diagrams

- ARC-IT 9.0 (HARTS)

    - Identifies standards for each area

    - Information icons provide additional details about each standard

    - Introduces "Bundles" – clicking on hyperlink exposes contents
        - Required items
        - Optional items
        - Alternative items

Application Entity
SAE J2735 ⓘ
CEN ISO 19091 ⓘ
SAE J2945/A ⓘ

Management

No Standard Needed ⓘ

Facility

SAE J2375 ⓘ
SAE J2945 ⓘ

TransNet

IEEE 1609.3 ⓘ

Access – Bundle: WAVE - Subnet

IEEE 802.11 (Required) ⓘ
IEEE 1609.4 (Required) ⓘ
ISO/IEC 8802-2 (Required) ⓘ

Security

Bundle: IEEE 1609.2 ⓘ
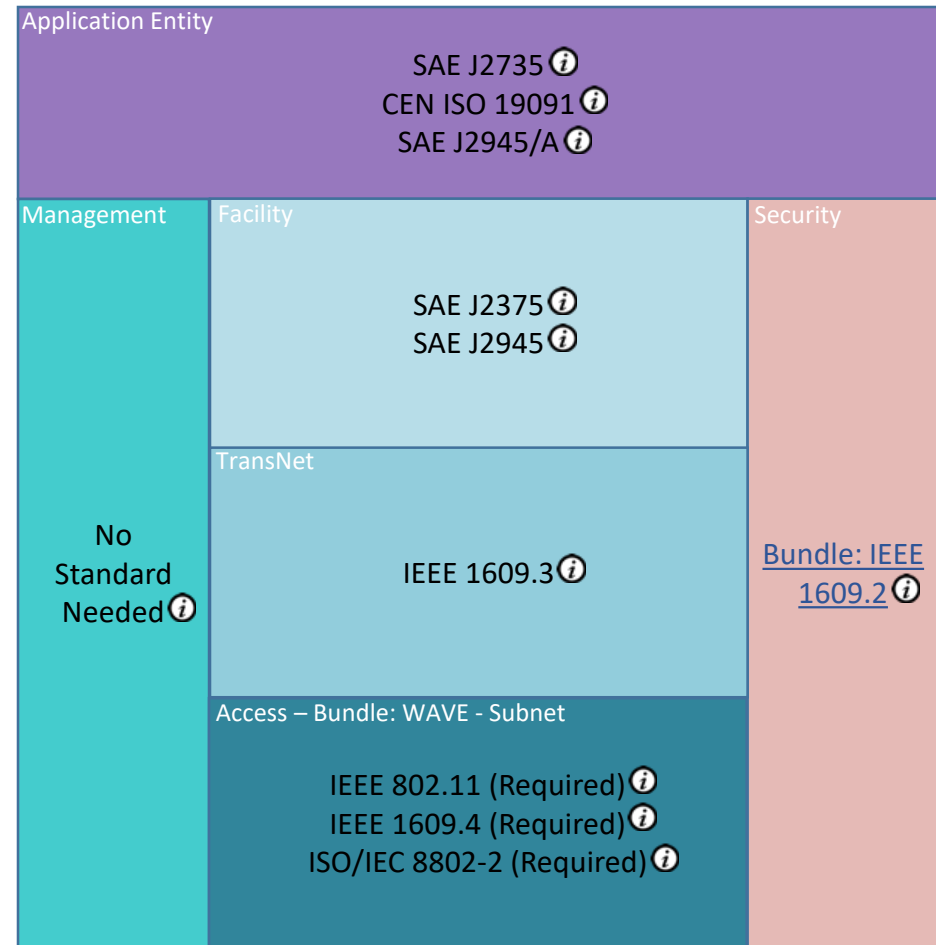
Elements of the Communications View

Communication diagrams

- ARC-IT 9.0 (HARTS)
  - Identifies issues with solution
    - Gaps
    - Overlaps

Issues equate to risks for a project

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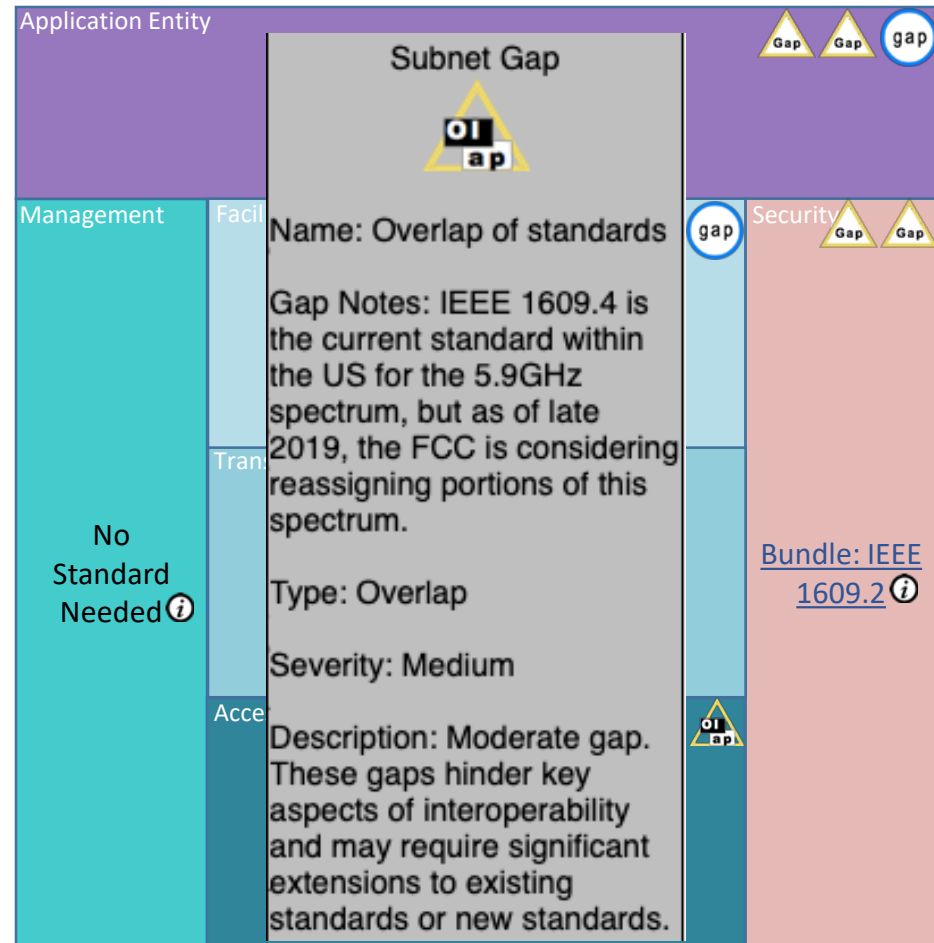
Elements of the Communications View

Communication diagrams

- ARC-IT 9.0 (HARTS)

  - Identifies all known potential solutions
  - Solutions with fewest issues on top

Solutions

EU: Signal Control Messages - BTP/GeoNetworking/G5
US: SAE Signal Control Messages - WAVE WSMP
US: SAE Other J2735 - C-V2X WSMP

Solution Description

This solution is used within the U.S.. It combines standards associated with US: SAE Signal Control Messages with those for V-X: WAVE WSMP. The US: SAE Signal Control Messages standards include upper-layer standards required to implement signal control information flows. The V-X: WAVE WSMP standards include lower-layer standards that support connectionless, near constant, ultra-low latency vehicle-to-any communications within ~300m using the WAVE Short Messaging Protocol (WSMP) over IEEE WAVE in the 5.9GHz spectrum. The broadcast mode is interoperable with M5 FNTP.

Reference Architecture Content to Standards Summary

Concerns addressed by Communications View

- What is the purpose of the information transfer?

  - Definition

- Where is an information transfer used?

  - Included in

- What are the characteristics of the information transfer?

  - Characteristics

- What are the security requirements for the information transfer?

  - Security

- What protocols does my device need to support for interoperability?

- What risks are involved with deploying the solution?

  - Shown on ITS Station architecture model

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Question

Which of the following OSI Layers are not part of the Facility Layer?

Answer Choices

a) Session Layer

b) Application Layer

c) Presentation Layer

d) Data Link Layer

Review of Answers

a) Session Layer

Incorrect. The Session Layer is a part of the Facility Layer.

b) Application Layer

Incorrect. The Application Layer is a part of the Facility Layer.

c) Presentation Layer

Incorrect. The Presentation Layer is a part of the Facility Layer.

d) Data Link Layer

Correct! The OSI Data Link Layer is contained within the Access Layer of the ITS Station Architecture.

Learning Objective 4

Identify known risks with standards

Identify Known Risks with Standards

Overview

- Identify issue severities

- List types of issues

- Describe practical example

- Describe how to provide feedback

- Explain how standards developers can use information

Identify Known Risks with Standards

Identify issue severities

Gap	Overlap	Severity	Description
gap	OI ap	Low	May be sufficient for full-scale deployment, but deployment should consider issue
Gap	OI ap	Moderate	May be sufficient for pilot deployments but not recommended for full-scale deployment
GAP	OI AP	High	Fails to provide a base level of interoperability and security as recommended for pilot deployments
GAP		Ultra	Standardization efforts for major aspects have not yet begun

Issue severity rankings are somewhat subjective and "recommendations" are theoretical; agencies have to weight competing demands to determine what might be appropriate to deploy.

Known Risks with Standards

Sample Issues – Ultra Severity

- Standardization has not started

- Data or messages not defined

- Performance/functionality requirements not defined

- Use case not considered in design

Known Risks with Standards

Sample Issues – High Severity

- Standard exists or is under development, but major problem(s) exist

    - Data or messages not defined

    - Performance/functionality requirements not defined

    - Use case not considered in design

    - Inadequate guidance for complex data

    - Security not provided

    - Data/communications profile pairing

    - Draft not available

Known Risks with Standards

Sample Issues – Moderate Severity

- Standard exists but noteworthy problems are known

  - Data or messages not fully defined

  - Performance/functionality requirements not fully defined

  - Use case not fully considered in design

  - Inadequate security

  - Data formatting issues

  - Not defined in an open, vetted standard

  - Overlap of standards

Known Risks with Standards

Sample Issues – Low Severity

- Projects should consider known issues

    - Implementations may not implement optional features in a consistent manner

    - Data accuracy issues may cause problems if not addressed in specifications

    - A specific security option within the standard must be required in project specifications

    - Standard is under revision

    - Relatively new standard

Known Risks with Standards Example

Practical Example

- Select the service package of interest: Transit Signal Priority

    - Provide priority to transit vehicles that are behind schedule

    - Onboard logic determines when to request priority

Public Transportation	PT01	Transit Vehicle Tracking
	PT02	Transit Fixed-Route Operations
	PT03	Dynamic Transit Operations
	PT04	Transit Fare Collection Management
	PT05	Transit Security
	PT06	Transit Fleet Management
	PT07	Transit Passenger Counting
	PT08	Transit Traveler Information
	PT09	Transit Signal Priority
	PT10	Intermittent Bus Lanes
	PT11	Transit Pedestrian Indication

Known Risks with Standards Example

Practical Example

- Select the information transfer of interest

PT09: Transit Signal Priority			
9	Physical	Aug 4, 2018	NAT
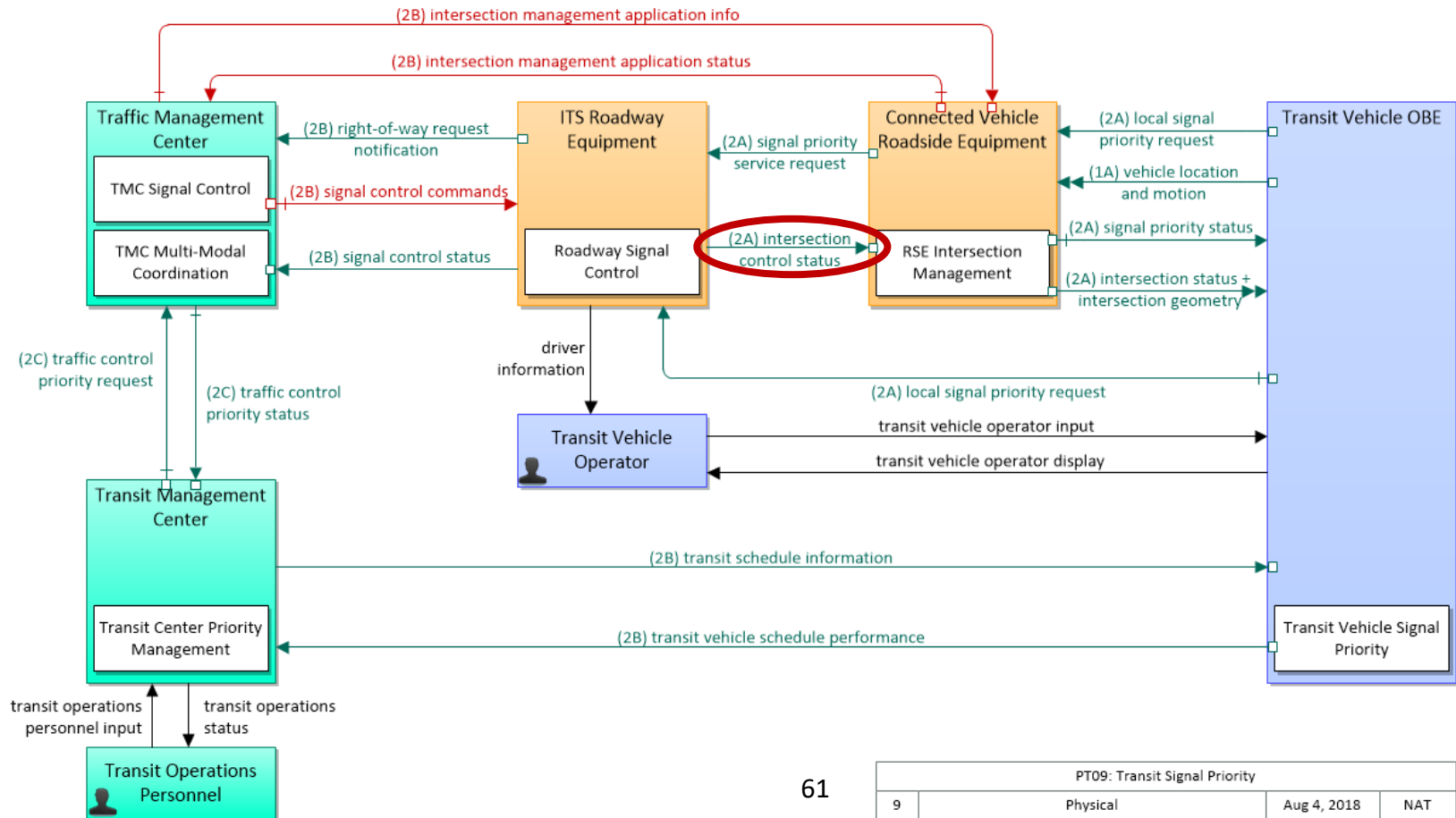
Known Risks with Standards Example

Practical Example

- Select the communications diagram
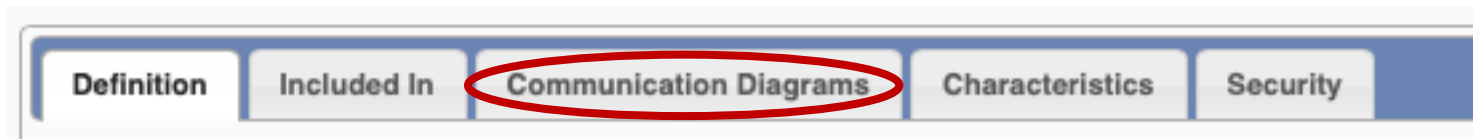
Known Risks with Standards Example

Practical Example

Solutions
- EU: UTMC Data - UTMC
- US: NTCIP Traffic Signal - SNMPv3
- EU: OCIT-O Signal Control - OCIT-O
- DDS: NTCIP Traffic Signal - OMG DDS RPC
- (None-Data) - AU IFCP
- (None-Data) - EU-ICIP-C2F

Application Entity
NTCIP 1202

Mgmt — NTCIP 1201 Bundle: SNMPv3 MIB

Facilities — Gap
NTCIP 1202
ISO 15784-2 — SNMPv3

TransNet
TLS for SNMP
Field TransNet Alternatives

SubNet
Field SubNet Alternatives

Security — gap
IETF RFC 6353
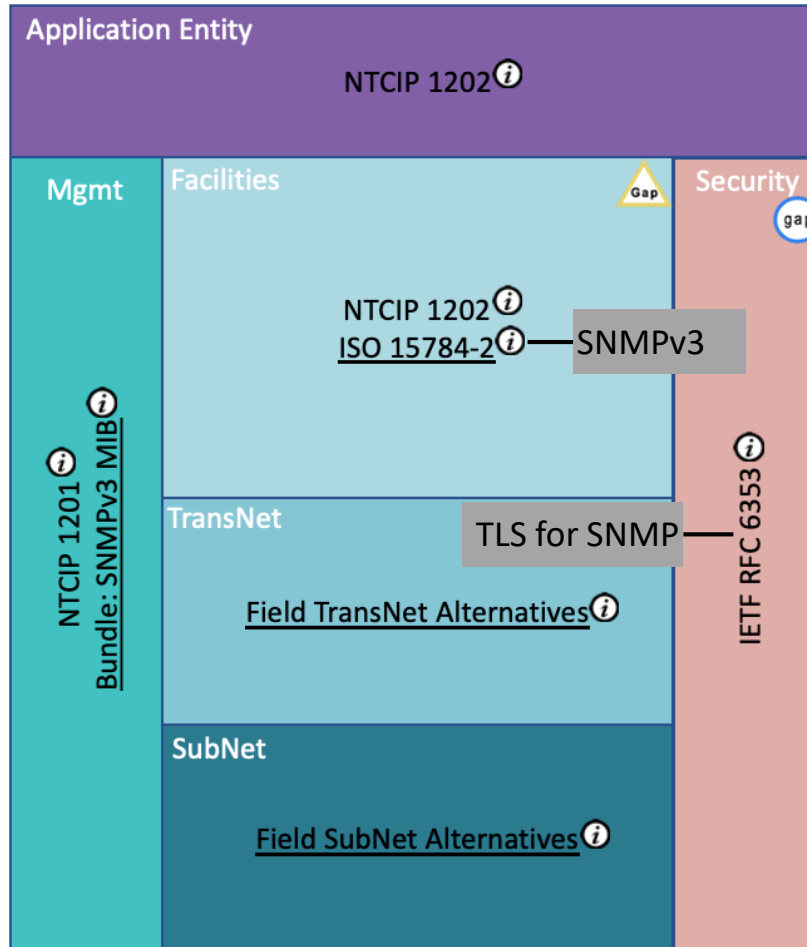
NTCIP – National Transportation Communications for ITS Protocol

SNMP – Simple Network Management Protocol

TLS – Transport Layer Security

SUPPLEMENT

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Known Risks with Standards Example

Practical Example

- Identify list of potential solutions for your given region, four possibilities:

    - Multiple solutions for your region

    - Single solution for your region

    - No solutions or "None-Data" for your region

    - Interface labeled as "Out-of-Scope"

Known Risks with Standards Example

Practical Example

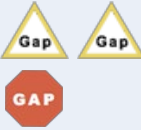US: NTCIP Traffic Signal - SNMPv3
US: NTCIP Traffic Signal - SNMPv1/TLS
US: NTCIP Traffic Signal - SNMPv1

- Multiple solutions for your region

    - Consider each solution and compare the issues for each

    - Make a selection for your project

    - Develop a mitigation plan for the risks associated with the issues

Solution	Rating	Issue Summary
SNMPv3	Gap gap	NTCIP 1202 data is designed for SNMPv1; Should couple SNMPv3 with TLS
SNMPv1/TLS	Gap Gap GAP	Application-level security is not provided; Use of TLS not vetted by industry with SNMPv1; SNMPv1 not allowed by RSU specification
SNMPv1	GAP GAP	Does not provide any security; SNMPv1 not allowed by RSU specification

Known Risks with Standards Example

Practical Example

- Practical considerations

  - Best solution has a moderate gap; products may not exist

  - Some solution is needed to communicate with traffic signals

  - ARC-IT presents options; agencies are responsible for deciding what should be deployed

Solution	Rating	Issue Summary
SNMPv3	Gap gap	NTCIP 1202 data is designed for SNMPv1; Should couple SNMPv3 with TLS
SNMPv1/TLS	Gap Gap GAP	Application-level security is not provided; Use of TLS not vetted by industry with SNMPv1; SNMPv1 not allowed by RSU specification
SNMPv1	GAP GAP	Does not provide any security; SNMPv1 not allowed by RSU specification

Known Risks with Standards Example

Practical Example

- Single solution for your region

  - Typically, select the solution and note the issues

Triple

Vehicle OBE to Transportation Information Center: vehicle situation data

Flow Description

This flow represents vehicle snapshots that may be provided by the vehicle to support traffic and environmental conditions monitoring. Snapshots are collected by the vehicle for specific events (e.g., when a sensor exceeds a threshold) or periodically and reported based on control parameters when communications is available. Traffic-related data includes snapshots of measured speed and heading and events including starts and stops, speed changes, and other vehicle control events. Environmental data may include measured air temperature, exterior light status, wiper status, sun sensor status, rain sensor status, traction control status, anti-lock brake status, and other collected vehicle system status and sensor information. The collected data is reported along with the location, heading, and time that the data was collected.

Solutions

EU: Probe Data - Mobile Internet (X.509)

US: SAE Other J2735 - Mobile Internet (US)

Known Risks with Standards Example

Practical Example

- No solutions for your region, or "None-Data"

  - Typically occurs in flows that are not in common usage today

  - Consider if flow is really needed for your project

  - Consider if solutions used by other regions might be appropriate or if they could be tailored for use

Triple
Alternate Mode Transportation Center to Traffic Management Center: alternate mode incident information

Flow Description
Details of accidents and other service disruptions that have occurred in an alternative mode. This information supports assessment of their impact upon the road network.

Solutions
EU: DATEX - DATEX Messaging TCP

Solution Description
This solution is used within the European Union. It combines standards associated with EU: DATEX with those for C-C: DATEX Messaging TCP. The EU: DATEX standards include upper-layer standards required to exchange and share data and information in the field of traffic and travel. The C-C: DATEX Messaging TCP standards include lower-layer standards that support partially secure communications between two centres as commonly used in Europe.

Known Risks with Standards Example

Practical Example

- Shown as "Out-of-Scope"

  - Typically indicates an information transfer not subject to ITS standards

    - Payment request to Financial Center

  - Work with external service provider to identify appropriate standards

Triple

Transit Management Center to Financial Center: payment request

Flow Description

Request for payment from financial institution or related financial service requests (e.g., balance inquiry)

Solutions

(Out of Scope) - [Out of Scope]

Solution Description

This solution is used within the U.S., E.U., and Australia. It combines standards associated with (Out of Scope) with those for [Out of Scope]. The (Out of Scope) standards include a set of upper layer standards that are outside the scope of the HTG7 analysis process. The [Out of Scope] standards include a set of lower layer standards that are outside the scope of the HTG7 analysis process

Provide Feedback

Provide Feedback

- Issue content in ARC-IT reflects composite industry knowledge

- Comments are welcome

  - Requests for clarification
  - Requests for additional solutions
  - Requests for alternative architectural designs
  - Requests to remove issues that have been resolved
  - Identification of issues not shown

Provide Feedback

Provide Feedback

- Issue content in ARC-IT is provided "as-is"

- The ARC-IT team welcomes feedback

Provide Feedback

Provide Feedback

- Comments are handled in a maintenance cycle

    - Evaluation

    - Assignment to a release

    - Response

    - Implementation

    - Release

Standards Developer Perspective

Standards Developer Perspective

- Issues in ARC-IT also serves as a resource for the standards development community

    - Comments from users help

        - Improve the list of known issues

        - Provide real-world feedback

    - Database used to prioritize issues to be addressed

- By working with the ARC-IT team, standards developers can ensure that information about their standards are maintained up-to-date

ACTIVITY

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

What does a moderately severe issue indicate?

Answer Choices

a) The issue is expected to be resolved within two years

b) The solution is not recommended for full-scale deployments

c) Users should delay their project until the issue is resolved

d) The solution does not provide adequate security

Review of Answers

a) The issue is expected to be resolved within two years

Incorrect. ARC-IT does not attempt to estimate when issues will be resolved.

b) The solution is not recommended for full-scale deployments

Correct! While agencies may use the solution in their projects, full-scale deployments are likely to encounter expensive upgrade efforts once the issue is resolved.

c) Users should delay their project until the issue is resolved

Incorrect. Agencies must consider their own competing demands and determine if the risk is worth deployment.

d) The solution does not provide adequate security

Incorrect. While "not providing adequate security" is a moderate gap, there are other types of moderate gaps as well.

Learning Objective

Provide Recommended Resources to Learn More

Recommended Resources

Overview

- Links to architectures

- Links to architecture courses

- Links to toolsets

Recommended Website Resources
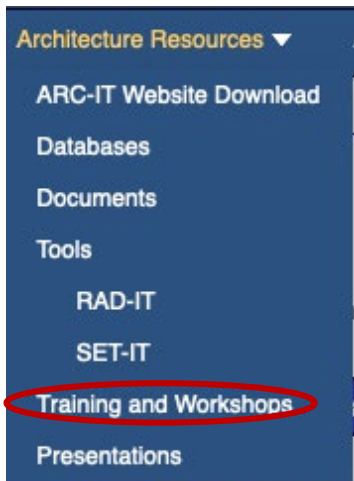
Architecture Websites

Applicability	Architecture	Link
🇺🇸 🇪🇺 🇦🇺 🇯🇵	ARC-IT 9.0	http://arc-it.net (mid-year 2020)
🇺🇸	ARC-IT 8.3	http://arc-it.net
🇺🇸	CVRIA	http://cvria.net
🇪🇺	FRAME-NEXT	https://frame-next.eu
🇪🇺	FRAME	https://frame-online.eu
🇦🇺	Australia NIA	Reports available at https://austroads.com.au/
🇺🇸 🇪🇺 🇦🇺 🇯🇵	HARTS	http://htg7.org

Recommended Course Resources

Architecture Courses

Available in three topic areas

- ITS architecture

- Software tools

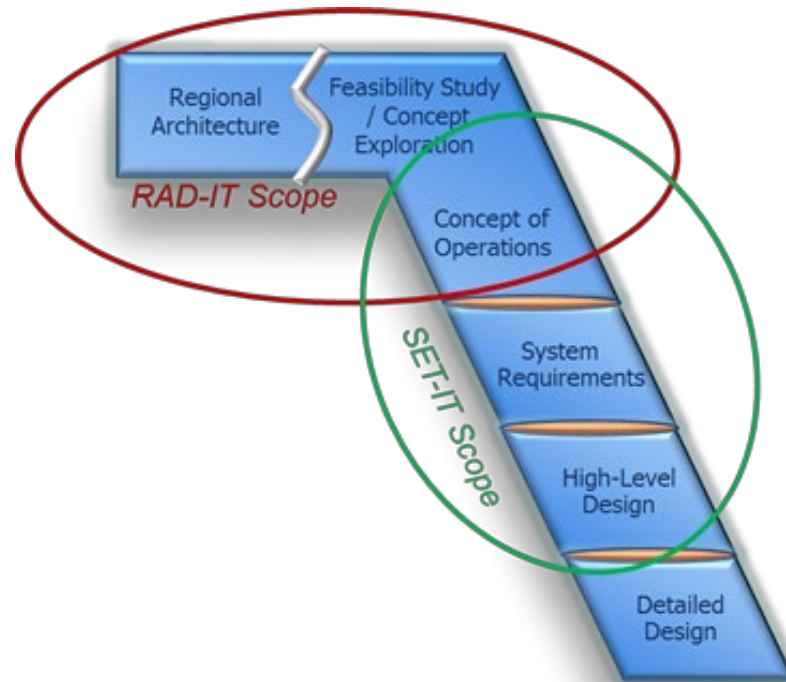- Systems engineering

Architecture Resources ▼
- ARC-IT Website Download
- Databases
- Documents
- Tools
  - RAD-IT
  - SET-IT
- Training and Workshops
- Presentations

Web-Based Training

On-Site Training

Workshops

Recommended Resources

Toolsets

A C T I V I T Y

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Question

What types of training are advertised on the ARC-IT website?

Answer Choices

a) Systems engineering

b) Software tools for architecture

c) ITS architecture

d) All of the above

Review of Answers

a) Systems engineering

Incorrect. Software tools and ITS architecture training are also available.

b) Software tools for architecture

Incorrect. Systems engineering and ITS architecture training are also available.

c) ITS architecture

Incorrect. Systems engineering and Software tools training are also available.

d) All of the above

Correct! All three types of training are advertised.

Module Summary

Explain System Architectures

Compare ITS Reference Architectures

Link Reference Architecture Content to Standards

Identify Known Risks with Standards

Provide Recommended Resources to Learn More About Architecture Efforts

We Have Now Completed the Curriculum for Determining Risks in Deployments

Module 1. I101: Using ITS Standards: An Overview

Module A325: Determining Known Risks with Standards in Your Deployment

Thank you for completing this module.

Feedback
Please use the Feedback link below to provide us with your thoughts and comments about the value of the training.

Thank you!