

WEATHER-SAVVY ROADS



Using the National ITS Architecture for Implementing Weather-Savvy Roads: Integrating Mobile Observations

Through round 4 of Every Day Counts (EDC-4), the Weather-Savvy Roads effort deploys two distinct road weather management solutions—Pathfinder and Integrating Mobile Observations (IMO)—that allow State and local agencies to proactively manage the surface transportation system ahead of and during adverse weather events. IMO promotes the collection of mobile weather, road, and vehicle data from agency fleets to improve situational awareness of road conditions.

As more State Departments of Transportation (DOTs) begin to consider vehicle-based data integration, it becomes increasingly important to have standardized installations, common lexicons, and normalized data formats to maximize benefits to the State and the larger community. To achieve this, State DOTs can utilize the USDOT Intelligent Transportation Systems (ITS) Joint Program Office (JPO) National ITS Architecture tools. This factsheet shares high-level information on using the National ITS Architecture to support the systems engineering process necessary for IMO projects.



What Is the National ITS Architecture?

The National ITS Architecture is a common framework for transportation practitioners looking to design and deploy ITS in their jurisdictions. For over 20 years, the architecture has continued to evolve to meet changing transportation-related needs. The most recent version of the architecture (version 8)—as shown in the figure below—is referred to as the Architecture References for Cooperative and Intelligent Transportation (ARC-IT). It is a combination of the traditional architecture and the Connected Vehicle Reference Implementation Architecture (CVRIA). This resulting reference architecture provides a common language for planners and engineers to use a systems engineering process for creating and implementing regional and project-based ITS architectures. ARC-IT consists of four views: enterprise, functional, physical, and communications. For more information, visit <http://local.iteris.com/arc-it/index.html>.

How It Works

The steps to share IMO data with the Weather Data Environment (WxDE) are shown and described below.

ARC-IT includes two software tools that support tasks on the left side of the Systems Engineering Vee Diagram, found on the next page. This includes high-level system design and project-specific deployment.

Regional Architecture Development for Intelligent Transportation (RAD-IT), is focused on the design steps of the Vee Diagram. It is used for regional planning and operations concepts to develop high-level enterprise and physical views. It is a replacement for the previous Turbo Architecture and has a more modern interface.

System Engineering Tool for Intelligent Transportation (SET-IT), is project-focused and graphically defines the functionality within subsystems and the interfaces between them.

ARC-IT (version 8.0)

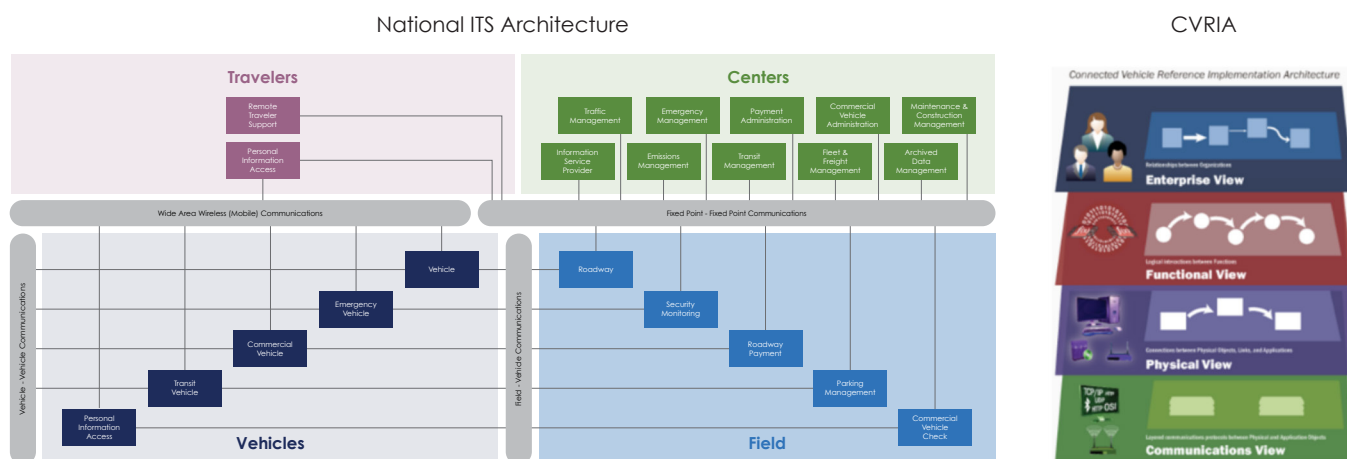


Figure 1: ARC-IT (version 8.0) flow charts. (Source: Adapted from ITS JPO)

For Weather-Savvy Roads IMO-related efforts, practitioners are likely to use the SET-IT tool. SET-IT supports the development of detailed project ITS architectures and systems engineering documentation. It includes service packages (i.e., templates) for IMO-related topics under four service areas.

1. Area: Commercial Vehicle Operations

- CVO10: Road Weather Information for Freight Carries.

2. Area: Maintenance and Construction

- MC03: Roadway Automated Treatment.
- MC04: Winter Maintenance.

3. Area: Vehicle Safety

- VS07: Road Weather Motorists Alert and Warning.

4. Area: Weather

- WX01: Weather Data Collection.
- WX02: Weather Information Processing and Distribution.

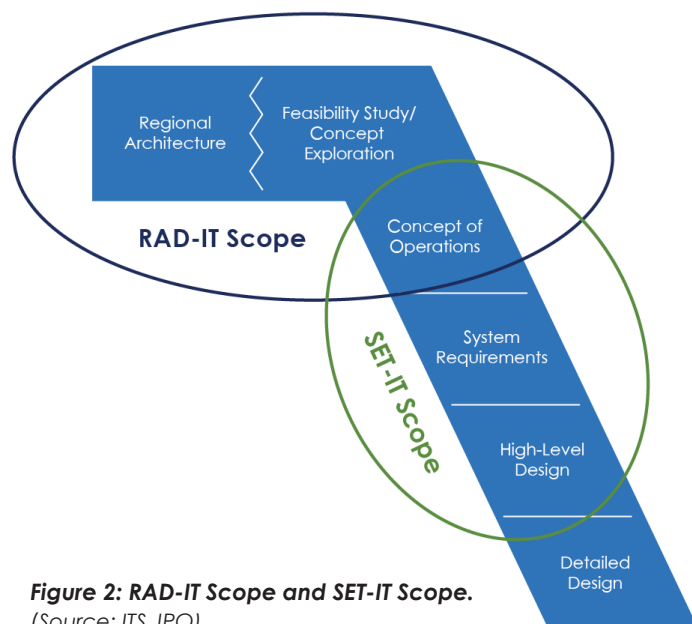


Figure 2: RAD-IT Scope and SET-IT Scope.
(Source: ITS JPO)

For more information on service packages, visit <http://local.iteris.com/arc-it/html/servicepackages/servicepackages-areaspsort.html>.

Each service package includes a set of physical objects, functional objects, and information flows (see table below) and can be customized to best meet regional needs. An example service package is shown on the next page (<http://local.iteris.com/arc-it/html/servicepackages/sp40.html#tab-3>).

DIAGRAM OBJECTS	
Physical Object	Color coded rectangle.
Functional Object	White rectangle placed inside a physical object.
Human Actor	Physical object with small human icon in lower left corner.

DIAGRAM FLOWS	
Information Flows	Solid lines with arrowheads to indicate direction of flow.
Flow Time Context	Number to the left of the flow name indicating time constraints for receipt of data.
Flow Spatial Context	Letter adjacent to time context indicating distant constraints from source of data.
Flow Cardinality	Arrowhead style indicating flow is unicast, multicast, or broadcast.
Flow Control	Shown by a box and a slash attached to the flow arrow.
Flow Security	Colored arrow derived from a security analysis.

Why Use It?

Benefits of Standardization. Within each service package, interfaces can be standardized to enable data sharing with both internal system components (e.g., central servers) and outside entities like the WxDE. Using these data definitions and communications standards enables the use of commonly available tools resulting in more cost effective solutions. It also makes collaboration with other teams more efficient.

Flexibility in Communication Technology.

SET-IT is flexible with respect to wireless vehicle connectivity. It fully supports cellular, Wi-Fi, satellite, DSRC, and radio.

Common Lexicon. SET-IT is used to organize the data flows and protections between entities in a graphical environment. Doing this with SET-IT helps quickly produce documents that use the National Architecture terminology, assisting in collaborating with other groups and vendors in a common lexicon.

Next Steps

For stakeholders interested in taking advantage of the benefits of ARC-IT and its software tools, free training and software downloads are available. For more information, contact Ray Murphy (Ray.Murphy@dot.gov) or review the following resources.

- ARC-IT Website:
<http://local.iteris.com/arc-it/index.html>
- Free Training Courses and Workshops:
<http://local.iteris.com/arc-it/html/resources/training.html>
- Free Software Downloads:
 - ▶ **RAD-IT:** <http://local.iteris.com/arc-it/html/forms/raditform.php>
 - ▶ **SET-IT:** <http://local.iteris.com/arc-it/html/forms/setitform.php>

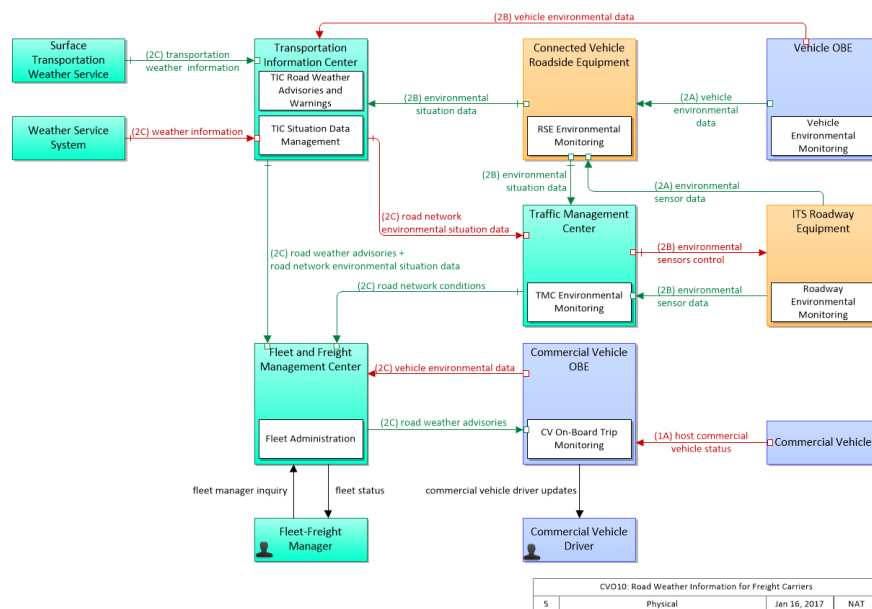


Figure 3: Vehicle environmental data flow chart. (Source: ITS JPO)