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|  | Florida ITS Architecture Support and Maintenance ProjectDistrict 1 RITSA Conversion Report (ARC-IT 9.0) Version 1.0 |

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Table of Contents

[1.0 Introduction 5](#_Toc84548800)

[2.0 Conversion Process 5](#_Toc84548801)

[3.0 Architecture Conversion Results 6](#_Toc84548802)

[3.1 Architecture Inventory Elements 6](#_Toc84548803)

[3.2 Architecture Services 8](#_Toc84548804)

[3.3 Architecture Functional Requirements 10](#_Toc84548805)

[3.4 Architecture Information Flows 12](#_Toc84548806)

[3.5 Architecture User Defined Information Flows 12](#_Toc84548807)

[3.6 Standards 13](#_Toc84548808)

[3.7 Projects 14](#_Toc84548809)

List of Tables

[Table 1 Conversion Analysis of Inventory Elements 6](#_Toc84548811)

[Table 2 Conversion Analysis of Services 9](#_Toc84548812)

[Table 3 Functional Requirements Conversion Examples 11](#_Toc84548813)

[Table 4 Information Flow Conversion Change Examples 12](#_Toc84548814)

[Table 5 User Defined Information Flow Change Examples 13](#_Toc84548815)

[Table 6 Project Conversion Disposition 15](#_Toc84548816)

# Introduction

This Architecture Conversion Report records the District 1 Regional Intelligent Transportation System (ITS) Architecture (RITSA) conversion from its reference in the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) Version 8.3 to ARC-IT Version 9.0. This report addresses the results of the conversion process.

# Conversion Process

The architecture conversion process uses the Regional Architecture Development for Intelligent Transportation (RAD-IT) software Version 9.0 to convert the architecture to be compatible with ARC-IT Version 9.0. The process includes the following steps to accomplish the conversion.

* Architecture conversion: Conversion features in RAD-IT Version 9.0 convert the architecture database schema to be compatible with RAD-IT Version 9.0 and aligned to reference ARC-IT Version 9.0 content.
* Conversion analysis: Conversion information is produced by RAD-IT for the architecture conversion noting the changes made. The conversion information notes the schema and content changes, such as service splits or consolidations, element divisions, and information flow adjustments. Analysis is required for each converted item to assess the appropriateness of each change for the architecture. For example, the roadway equipment coordination information flow was split into 14 separate information flows which need to be analyzed to determine which apply for each architecture. Another example includes the addition of the new CVO05 Commercial Vehicle Parking service which also involves the division of the Parking Management System element into two new elements, namely the Parking Area Equipment and Parking Management Center elements. These new elements along with the new CVO05 service are applicable to all eight Florida ITS Architectures requiring analysis and update of the architectures to accommodate the new ARC-IT content.

A substantial change that ARC-IT Version 9.0 imposes on the Florida ITS Architectures during conversion is the reorganization of the standards associated with each information flow in each of the architectures and their associated projects. The reorganization introduces solutions which associate sets of standards that are required to address an interface or information flow implementation. The conversion process does not provide the solutions information automatically. The standards solutions were populated with default selections and the selections were analyzed for their applicability for the architecture and each project. In the RAD-IT software, the Standards tab in the user interface is now the Communications tab.

* Architecture content update: The intent of the conversion process was to maintain the alignment of the converted Architecture content to the greatest extent possible with the pre-conversion Architecture content. As noted above, element physical object mapping changes, service package changes, information flow additions and adjustments, and the evolution of the standards mappings in ARC-IT Version 9.0 required changes to be made to the Architecture content. Unless it was necessary, no additional changes beyond those required to align the pre-conversion and converted architecture content were made. During the course of the Annual Architecture Maintenance Update, ARC-IT Version 9.0 features that could be considered as additional information to the Architecture will be assessed.
* Architecture website posting: The converted architecture will be posted to the Florida ITS Architecture website.

# Architecture Conversion Results

The District 1 RITSA was converted to be compatible with ARC-IT Version 9.0. The following sections highlight the changes made to the architecture as a result of the conversion process.

## Architecture Inventory Elements

Table 1 provides conversion results for architecture inventory elements impacted by the conversion process. The table information shows the element impacted, the results of the element conversion, the analysis disposition, and the notes of the conversion implementation.

Table 1 Conversion Analysis of Inventory Elements

| **Element in Source Architecture** | **Element in Converted Architecture** | **Conversion Disposition** | **Conversion Notes** |
| --- | --- | --- | --- |
| FDOT CV Parking Management System. Mapped to: * Parking Management System
 | FDOT CV Parking Management System. Mapped to: * Parking Management Center
* Parking Area Equipment
 | Remove the mapping to the ‘Parking Area Equipment’ Physical Object. Add a ‘Parking Area Equipment’ element and an interface with appropriate flows to the ‘FDOT CV Parking Management System’ element using CVO05 SP which will replace the existing PM04: Regional Parking Management (CV Parking) SP.  | Added ‘FDOT CV Parking Area Equipment’ element. Removed ‘PM04: Regional Parking Management (CV Parking)’ SP and added ‘CVO05: Commercial Vehicle Parking (CV Parking)’ SP.  |
| City of Fort Myers Public Parking. Mapped to: * Parking Management System
 | City of Fort Myers Public Parking. Mapped to: * Parking Management Center
* Parking Area Equipment
 | Remove the mapping to the ‘Parking Area Equipment’ Physical Object. Add a ‘Parking Area Equipment’ element and an interface with appropriate flows with ‘PM01: Parking Space Management (City of Fort Myers)’ SP and the ‘PM03: Parking Electronic Payment (City of Fort Myers)’ SP. | Added ‘City of Fort Myers Public Parking Area Equipment’ element and interfaces in the ‘PM01: Parking Space Management (City of Fort Myers)’ SP and the ‘PM03: Parking Electronic Payment (City of Fort Myers)’ SP. |
| Offstreet Parking System. Mapped to: * Parking Management System
 | Offstreet Parking System. Mapped to: * Parking Management Center
* Parking Area Equipment
 | Remove the mapping to the ‘Parking Area Equipment’ Physical Object. Add a ‘Parking Area Equipment’ element and an interface with appropriate flows with ‘PM01: Parking Space Management (Municipalities and Beach Parking)’ SP and the ‘PM03: Parking Electronic Payment (Municipalities and Beach Parking)’ SP. | Added ‘Offstreet Parking Area Equipment’ element and interfaces in the ‘PM01: Parking Space Management (Municipalities and Beach Parking)’ SP and the ‘PM03: Parking Electronic Payment (Municipalities and Beach Parking)’ SP. |
| Private/Public Parking Facility Operators. Mapped to: * Parking Management System
 | Private/Public Parking Facility Operators. Mapped to: * Parking Management Center
* Parking Area Equipment
 | Remove the mapping to the ‘Parking Area Equipment’ Physical Object. Add a ‘Parking Area Equipment’ element and an interface with appropriate flows with ‘PM01: Parking Space Management (Municipalities and Beach Parking)’ SP and the ‘PM03: Parking Electronic Payment (Municipalities and Beach Parking)’ SP. | Added ‘Parking Facility Operators Parking Area Equipment’ element and interfaces in the ‘PM01: Parking Space Management (Municipalities and Beach Parking)’ SP and the ‘PM03: Parking Electronic Payment (Municipalities and Beach Parking)’ SP. |
| Southwest Florida International Airport. Mapped to: * Parking Management System
* Alternative Mode Transportation Center
 | Southwest Florida International Airport. Mapped to: * Parking Management Center
* Parking Area Equipment
* Alternative Mode Transportation Center
 | Remove the mapping to the ‘Parking Area Equipment’ Physical Object. Add a ‘Parking Area Equipment’ element and an interface with appropriate flows with ‘PM03: Parking Electronic Payment (Southwest Florida International Airport)’ SP. | Added ‘Southwest Florida International Airport Parking Area Equipment’ element and interfaces in ‘PM03: Parking Electronic Payment (Southwest Florida International Airport)’ SP. |

## Architecture Services

Table 2 provides conversion results for architecture services impacted by the conversion process. The table information shows the service impacted, the results of the service conversion, the analysis disposition, and the notes of the conversion implementation.

Table 2 Conversion Analysis of Services

| **Service in Source Architecture** | **Service in Converted Architecture** | **Conversion Disposition** | **Conversion Notes** |
| --- | --- | --- | --- |
| TM12: Dynamic Roadway Warning (FDOT District 1 Connected Vehicle Wrong-Way Driving) | TM12: Dynamic Roadway Warning (FDOT District 1 Connected Vehicle Wrong-Way Driving)  | Replaced this SP with TM25: Wrong Way Vehicle Detection and Warning SP. | Added TM25: Wrong Way Vehicle Detection and Warning (FDOT District 1 Connected Vehicle Wrong-Way Driving). Deleted TM12: Dynamic Roadway Warning (FDOT District 1 Connected Vehicle Wrong-Way Driving). Added FDOT District 1 CAV Field Equipment and Vehicles elements with information flows appropriate for the TM25 SP. |
| TM12: Dynamic Roadway Warning (FDOT District 1 Wrong-Way Vehicle Detection) | TM12: Dynamic Roadway Warning (FDOT District 1 Wrong-Way Vehicle Detection)  | Replaced this SP with TM25: Wrong Way Vehicle Detection and Warning SP. | Added Infrastructure based TM25: Wrong Way Vehicle Detection and Warning (FDOT District 1 Wrong-Way Vehicle Detection). Deleted TM12: Dynamic Roadway Warning (FDOT District 1 Wrong-Way Vehicle Detection). |
| PM01: Parking Space Management (Municipalities and Beach Parking) | PM01: Parking Space Management (Municipalities and Beach Parking) | Add Parking Area Equipment element and include it in the PM01: Parking Space Management (Municipalities and Beach Parking) SP. | Added ‘Offstreet Parking Area Equipment’ and Parking Facility Operators Parking Equipment elements and interfaces to PM01: Parking Space Management (Municipalities and Beach Parking) SP. |
| PM01: Parking Space Management (City of Fort Myers) | M01: Parking Space Management (City of Fort Myers) | Add Parking Area Equipment element and include it in the PM01: Parking Space Management (City of Fort Myers) SP. | Added ‘City of Fort Myers Public Parking Area Equipment’ element and interfaces to PM01: Parking Space Management (City of Fort Myers) SP. |
| PM03: Parking Electronic Payment (Southwest Florida International Airport) | PM03: Parking Electronic Payment (Southwest Florida International Airport) | Add Parking Area Equipment element and include it in the PM03: Parking Electronic Payment (Southwest Florida International Airport) SP. | Added ‘Southwest Florida International Airport Parking Area Equipment’ element and interface to PM03: Parking Electronic Payment (Southwest Florida International Airport) SP. |
| PM04: Regional Parking Management (CV Parking) | PM04: Regional Parking Management (CV Parking) | Replace PM04: Regional Parking Management (CV Parking) with CVO05: Commercial Vehicle Parking (CV Parking). Add a ‘Parking Area Equipment’ element and an interface with appropriate flows to the FDOT SWIFT Center and FDOT I-75 Satellite Center elements in CVO05.  | Added ‘CVO05: Commercial Vehicle Parking (CV Parking)’ SP. Removed the ‘PM04: Regional Parking Management (CV Parking)’ SP. |

## Architecture Functional Requirements

The functional requirements were reviewed in the converted architecture for any changes resulting from conversion. Minor changes resulted from the conversion process to 285 functional requirements. No issues were found with the conversion changes. An example of the changes to the requirements are provided in Table 3.

Table 3 Functional Requirements Conversion Examples

| **Element Name** | **Functional Object** | **Req Num** | **Old Requirement** | **New Requirement** |
| --- | --- | --- | --- | --- |
| City of Lakeland Advanced Traffic Management System | TMC Environmental Monitoring | 4 | The center shall be able to receive road condition information from weather service providers. | The traffic center shall be able to receive road condition information from weather service providers. |
| City of Lakeland CAV Field Equipment (in the FDOT District 1 I-4 FRAME (Lakeland) project) | RSE Map Management | 11 | The field element shall provide parking facility geometry information to proximate Vehicles. | The field element shall provide parking facility geometry information to proximate Personal devices. |
| Collier Area Paratransit Dispatch | Transit Center Data Collection | 2 | The center shall assign quality control metrics and meta-data to be stored along with the data. Meta-data may include attributes that describe the source and quality of the data and the conditions surrounding the collection of the data. | The transit management center shall assign quality control metrics and meta-data to be stored along with the data. Meta-data may include attributes that describe the source and quality of the data and the conditions surrounding the collection of the data. |
| Commercial Vehicle | CV On-Board Electronic Screening Support | 1 | The commercial vehicle shall receive pass/pull-in messages from the roadside check facilities and present them to the driver in either audible or visual forms. | The commercial vehicle shall receive electronic screening (pass/pull-in) messages from the roadside check facilities and present them to the driver in either audible or visual forms. |
| County and City Public Information System | TIC Data Collection | 5 | The center shall collect, process, and store parking information, including location, availability, and fees. | The transportation information center shall collect, process, and store parking information, including location, availability, and fees. |
| FDOT District 7 Tampa Bay SunGuide Center | TMC Traffic Information Dissemination | 15 | The center shall coordinate information and controls with other traffic management centers. | The center shall coordinate information dissemination with other traffic management centers. |
| FDOT I-75 Satellite Center | Emergency Secure Area Sensor Management | 12 | The center shall monitor maintenance status of the security sensor field equipment. | The center shall maintain the status of the security sensor field equipment. |

## Architecture Information Flows

During the conversion process, 9,498 new information flows were added to the interface tab in the RAD-IT software but were not added to the architecture. This makes these new flows available for future tailoring based on stakeholder needs or requests, but did not change the architecture content represented by the pre-conversion architecture.

The conversion process included the renaming of 530 information flows corresponding to ARC-IT Version 9.0 changes. The modified information flow names were reviewed in the converted architecture and no issues were found that would impact the architecture content and meaning. Table 4 provides examples of the information flow changes resulting from conversion.

Table 4 Information Flow Conversion Change Examples

| **Source Element** | **Destination Element** | **Old Flow Name** | **New Flow Name** |
| --- | --- | --- | --- |
| FDOT District 1 I-4 and I-275 Road Ranger Service Patrol Vehicles | FDOT SWIFT Center | incident status | incident scene status |
| Waterborne Public Transit, Water Taxis and Ferry System | Collier Area Transit Dispatch | multimodal service data | alternate mode service data |
| Private Travelers Personal Computing Devices | Manatee County MCAT Fixed Route Transit Vehicles | payment | actuate secure payment |
| Lee County and Cities Field Equipment | Vehicles | restricted lanes parameters | restricted lanes information |

## Architecture User Defined Information Flows

The conversion process can generate information flow alternatives for user defined flows in the original architecture. Where these information flow alternatives were available, they were reviewed against the user defined flows in the architecture for potential replacement. This a manual process requiring comparison of the user defined information flows with alternatives. In many cases, the user defined flows exist between inventory elements that are not functionally supported by the physical object pairs and selected services. In those cases, the user defined flows were retained. Where information flow alternatives provided an exact replacement, the user defined flows were replaced with the ARC-IT information flows. Examples of user defined information flows that were revised during conversion are provided in Table 5.

Table 5 User Defined Information Flow Change Examples

| **Source Element** | **Destination Element** | **User Defined Flow** | **ARC-IT Flow** |
| --- | --- | --- | --- |
| Commercial Vehicle | FDOT District 1 Field Equipment | cooperative adaptive cruise control status\_ud\_cvria | cooperative adaptive cruise control status |
| FDOT SWIFT Center | Lee County-Wide Advanced Traffic Management System | road weather information\_ud | road weather information |

## Standards

ARC-IT Version 9.0 reorganized the standards associated with each information flow. The reorganization introduces solutions which associate sets of standards for consideration to address an interface or information flow implementation. During the conversion process, standards solutions are not automatically converted. The auto-selection function was used to populate the standards solutions associated with the architecture interface content. The standards solutions selections were reviewed for consistency with the pre-conversion architecture. While additional standards information is now available in the converted architecture, the information was found to be appropriate for each interface to support system design considerations and decisions. The following is an example of the type of standards information now available in the architecture.

**Source Element:** Charlotte County/Punta Gorda Advanced Traffic Management System

**Destination Element**: FDOT SWIFT Center

**Information Flow**: road network conditions

**Standards Solution**: TMDD - NTCIP Messaging

**Solution Description**: This solution is used within the U.S. It combines standards associated with US: TMDD with those for C-C: NTCIP Messaging. The US: TMDD standards include upper-layer standards required to implement center-to-center communications with traffic management systems. The C-C: NTCIP Messaging standards include lower-layer standards that support partially secure communications between two centers as commonly used in the US.

**Solution Readiness**: Moderate

**Solution Issues**: Data not fully defined (medium)

* Some of the data elements for this information flow are not fully defined.
* The TMDD was designed to exchange roadway sensor data, not aggregated connected vehicle data. The messages would likely be similar but would likely need customization.

Accuracy of data

* The standard is missing accuracy requirements for some of its data, which may result in anomalous behavior.
* The accuracy of the sensors is not currently defined in the TMDD.

## Projects

Each project in the architecture was analyzed for impacts from the conversion process. Results of the project analysis and disposition are provided in Table 6.

During the conversion process, additional information flows were added to the architecture database related specifically to the *roadway equipment coordination* information flow as applied to the following interfaces:

* FDOT District 1 CAV Field Equipment and FDOT District 1 Field Equipment
* Polk County CAV Field Equipment and Polk County Traffic Control Equipment
* Manatee County CAV Field Equipment and Manatee County Field Equipment
* Sarasota County CAV Field Equipment and Sarasota County Field Equipment
* Lee County CAV Field Equipment to Lee County and Cities Field Equipment

The roadway equipment coordination information flow was replaced in ARC-IT Version 9.0 with 14 specific information flows, including:

|  |  |
| --- | --- |
| * advisory radio coordination
* barrier system coordination
* dynamic sign coordination
* environmental sensor coordination
* lane management coordination
* local priority request coordination
* passive vehicle monitoring coordination
 | * reversible lane coordination
* roadway warning coordination
* signal control coordination
* traffic detector coordination
* traffic metering coordination
* vehicle occupancy coordination
* video surveillance coordination
 |

The *roadway equipment coordination* replacement affected the following projects

* FDOT District 1 I-4 FRAME
* FDOT District 1 US 41 Connected Vehicle Deployment in Manatee County
* FDOT District 1 US 41 Connected Vehicle Deployment in Sarasota County
* FDOT District 1 US-41 FRAME in Lee County
* Lee County CAV Study

Each instance of the *roadway equipment coordination* information flow replacement was reviewed based on the services it supported in the original RITSA and decisions on which new information flows to use as replacements were based on the service analysis. The results of the interface analysis are provided in project dispositions in Table 6 for each occurrence of the source-destination pairs.

Table 6 Project Conversion Disposition

| **Project** | **Conversion Disposition** |
| --- | --- |
| City of Fort Myers Parking and ATMS | Added the 'City of Fort Myers Public Parking Area Equipment' to the project and included it in the PM01: Parking Space Management (City of Fort Myers) SP. Added information flows to accommodate ‘City of Fort Myers Public Parking Area Equipment’. |
| FDOT District 1 I-4 FRAME | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* FDOT District 1 CAV Field Equipment to FDOT District 1 Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* FDOT District 1 Field Equipment to FDOT District 1 CAV Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Polk County CAV Field Equipment to Polk County Traffic Control Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Polk County Traffic Control Equipment to Polk County CAV Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |
| FDOT District 1 Office Wrong Way Vehicle Detection System Deployments | Replaced the VS3: Situational Awareness (FDOT District 1 Office Wrong Way Vehicle Detection) SP with the TM25: Wrong Way Vehicle Detection and Warning (FDOT District 1 Office Wrong Way Vehicle Detection System Deployments) SP. Revised information flows to be consistent with the TM25 SP.  |
| FDOT District 1 US 41 Connected Vehicle Deployment in Manatee County | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* Manatee County CAV Field Equipment to Manatee County Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Manatee County Field Equipment to Manatee County CAV Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |
| FDOT District 1 US 41 Connected Vehicle Deployment in Sarasota County | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* Sarasota County CAV Field Equipment to Sarasota County Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Sarasota County Field Equipment to Sarasota County CAV Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |
| FDOT District 1 US-41 FRAME in Lee County | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* Lee County CAV Field Equipment to Lee County and Cities Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Lee County and Cities Field Equipment to Lee County CAV Field Equipment
	+ local priority request coordination
	+ roadway warning coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |
| Lee County CAV Study | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* Lee County CAV Field Equipment to Lee County and Cities Field Equipment
	+ passive vehicle monitoring coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Lee County and Cities Field Equipment to Lee County CAV Field Equipment
	+ passive vehicle monitoring coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |