|  |
| --- |
| November 2021 |

|  |  |
| --- | --- |
|  | Florida ITS Architecture Support and Maintenance ProjectDistrict 7 RITSA Conversion Report (ARC-IT 9.0) Version 1.0 |

|  |
| --- |
|   |
|  |

Document Version Control

|  |  |  |
| --- | --- | --- |
| Author / Action | Submittal Date | Version No. |
| Cliff Heise / Draft Document | October 7, 2021 | 1.0 |
| Cliff Heise / Final Document | November 23, 2021 | 1.0 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Table of Contents

[1.0 Introduction 4](#_Toc84548800)

[2.0 Conversion Process 4](#_Toc84548801)

[3.0 Architecture Conversion Results 5](#_Toc84548802)

[3.1 Architecture Inventory Elements 5](#_Toc84548803)

[3.2 Architecture Services 6](#_Toc84548804)

[3.3 Architecture Functional Requirements 8](#_Toc84548805)

[3.4 Architecture Information Flows 9](#_Toc84548806)

[3.5 Architecture User Defined Information Flows 10](#_Toc84548807)

[3.6 Standards 10](#_Toc84548808)

[3.7 Projects 11](#_Toc84548809)

List of Tables

[Table 1 Conversion Analysis of Inventory Elements 5](#_Toc84548811)

[Table 2 Conversion Analysis of Services 7](#_Toc84548812)

[Table 3 Functional Requirements Conversion Examples 8](#_Toc84548813)

[Table 4 Information Flow Conversion Change Examples 9](#_Toc84548814)

[Table 5 User Defined Information Flow Change Examples 10](#_Toc84548815)

[Table 6 Project Conversion Disposition 12](#_Toc84548816)

# Introduction

This Architecture Conversion Report records the District 7 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 7 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 TPAS. Mapped to: * Parking Management System
 | FDOT TPAS. 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 TPAS’ element using CVO05 SP which will replace the existing PM04: Regional Parking Management (FDOT Commercial Vehicle Parking) SP.  | Added ‘FDOT TPAS Equipment’ element. Deleted’ PM04: Regional Parking Management (FDOT Commercial Vehicle Parking)’ and added ‘ CVO05: Commercial Vehicle Parking (FDOT Commercial Vehicle Parking)” SP.  |
| Tampa International Airport Parking Management System. Mapped to: * Parking Management System
* Traffic Management Center
 | Tampa International Airport Parking Management System. Mapped to: * Parking Management Center
* Traffic 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 the ‘PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) SP.  | Added ‘Tampa International Airport Parking Area Equipment’ element and added interface in PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) 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 the ‘PM03: Parking Electronic Payment (Private/Public Parking Facilities) SP. | Added ‘Parking Facility Operators Parking Equipment’ element and interfaces in PM03: Parking Electronic Payment (Private/Public Parking Facilities) 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 (Connected Vehicle Wrong-Way Driving) | TM12: Dynamic Roadway Warning (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 (Connected Vehicle Wrong-Way Driving). Deleted TM12: Dynamic Roadway Warning (Connected Vehicle Wrong-Way Driving). |
| TM12: Dynamic Roadway Warning (FDOT Wrong-Way Driving) | TM12: Dynamic Roadway Warning (FDOT Wrong-Way Driving)  | Replaced this SP with TM25: Wrong Way Vehicle Detection and Warning SP. | Added Infrastructure based TM25: Wrong Way Vehicle Detection and Warning (FDOT Wrong-Way Driving). Deleted TM12: Dynamic Roadway Warning (FDOT Wrong-Way Driving). |
| PM03: Parking Electronic Payment (Private/Public Parking Facilities) | PM03: Parking Electronic Payment (Private/Public Parking Facilities) | Add Parking Area Equipment element and include it in the PM03: Parking Electronic Payment (Private/Public Parking Facilities) SP. | Added ‘Parking Facility Operators Parking Equipment’ element and interface to PM03: Parking Electronic Payment (Private/Public Parking Facilities) SP. |
| PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) | PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) | Add Parking Area Equipment element and include it in the PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) SP. | Added ‘Tampa International Airport Parking Area Equipment’ element and interface to PM03: Parking Electronic Payment (Tampa International Airport Parking Facilities) SP. |
| PM04: Regional Parking Management (FDOT Commercial Vehicle Parking) | PM04: Regional Parking Management (FDOT Commercial Vehicle Parking) | Replace PM04: Regional Parking Management (FDOT Commercial Vehicle Parking) with CVO05: Commercial Vehicle Parking (FDOT Commercial Vehicle Parking). Add a ‘Parking Area Equipment’ element and an interface with appropriate flows to the ‘FDOT District 7 Tampa Bay SunGuide Center’ in CVO05.  | Added ‘CVO05: Commercial Vehicle Parking (FDOT Commercial Vehicle Parking)’ SP. Removed the ‘PM04: Regional Parking Management (FDOT Commercial Vehicle 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 40 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 Clearwater Traffic Control Center (element in City of Clearwater Beach Parking Management) | 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. |
| City of Tampa Police Dispatch (element in City of Tampa ATMS Expansion project) | Emergency Call-Taking | 1 | The center shall support the interface to the Emergency Telecommunications System (e.g. 911 or 7-digit call routing) to receive emergency notification information and provide it to the emergency system operator. | The emergency call-taking center shall support the interface to the Emergency Telecommunications System (e.g. 911 or 7-digit call routing) to receive emergency notification information and provide it to the emergency system operator. |
| Commercial Vehicle (element in FDOT District 7 Wrong-way Driver Detection – V2I project) | Vehicle Control Warning | 1 | The vehicle shall monitor the area to the sides of the vehicle to determine the proximity of other objects to the vehicle. | The vehicle shall monitor the area to the sides of the vehicle to determine the proximity of other objects to the vehicle and if a warning is needed. |

## Architecture Information Flows

During the conversion process, 25,953 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 506 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 District 7 Tampa Bay SunGuide Center | incident status | incident scene status |
| PSTA Intermodal Center | PSTA Transit Management Center | multimodal service data | alternate mode service data |
| Private Travelers Personal Computing Devices | PSTA Integrated Fare Payment Application | payment | actuate secure payment |
| City of Tampa 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** |
| --- | --- | --- | --- |
| HART Transit Operations | City of Tampa TMC | incident information\_ud | incident information |
| FDOT District 7 Tampa Bay SunGuide Center | FDOT District 1 Traffic Management Centers | 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:** City of St. Petersburg Traffic Control Center

**Destination Element**: County EOCs/Warning Points

**Information Flow**: emergency traffic control information

**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-Low

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

* Some of the data elements for this information flow are not fully defined.
* Center-to-center information for signal preemption and priority are not defined.

## 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 7 CAV Field Equipment and FDOT District 7 Field Equipment
* Hillsborough County CAV Field Equipment and Hillsborough County 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 FDOT District 7 I-4 FRAME project. 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 FDOT District 7 I-4 FRAME project disposition in Table 6 for each occurrence of the source-destination pairs.

Table 6 Project Conversion Disposition

| **Project** | **Conversion Disposition** |
| --- | --- |
| City of Clearwater Beach Parking Management | Removed ‘Private/Public Parking Facility Operators’ element mapping to ‘Parking Area Equipment’ physical object. Added the 'Parking Facility Operators Parking Equipment' to the project and included it in the PM01: Parking Space Management (City of Clearwater Beach Parking Management) SP. Added information flows to accommodate ‘Parking Facility Operators Parking Equipment’. |
| FDOT District 7 Truck Parking Availability System (TPAS) | Added the 'FDOT TPAS Equipment' element to the project in PM01: Parking Space Management (FDOT District 7 TPAS) SP. Added information flows to accommodate ‘FDOT TPAS Equipment’. |
| FDOT District 7 Wrong Way Detection (WWD) Ramp System Expansion | Replaced TM01: Infrastructure-Based Traffic Surveillance (FDOT District 7 WWD Ramp Expansion) and TM06: Traffic Information Dissemination (FDOT District 7 WWD Ramp Expansion) SPs with TM25: Wrong Way Vehicle Detection and Warning (FDOT District 7 WWD Ramp Expansion) SP and revised the information flows to accommodate the SP change. |
| FDOT District 7 Wrong-way Driver Detection - V2I Implementation | Replaced VS03: Situational Awareness (FDOT District 7 Wrong-way Driver Detection -V2I) with TM25: Wrong Way Vehicle Detection and Warning (FDOT District 7 Wrong-way Driver Detection -V2I).  |
| Hillsborough County C2C Communications | Removed ‘Tampa International Airport Parking Management System’ element mapping to Parking Area Equipment physical object. Added 'Tampa International Airport Parking Area Equipment' and 'Parking Facility Operators Parking Equipment' elements to the project and included them in the PM01: Parking Space Management (Hillsborough County C2C Communications) SP. Added information flows to accommodate the 'Tampa International Airport Parking Area Equipment' and 'Parking Facility Operators Parking Equipment' elements. |
| FDOT District 7 I-4 FRAME | The roadway equipment coordination information flow was replaced with the following information flows based on the project services:* FDOT District 7 CAV Field Equipment to FDOT District 7 Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* FDOT District 7 Field Equipment to FDOT District 7 CAV Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Hillsborough County CAV Field Equipment to Hillsborough County Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
* Hillsborough County Field Equipment to Hillsborough County CAV Field Equipment
	+ local priority request coordination
	+ passive vehicle monitoring coordination
	+ signal control coordination
	+ traffic detector coordination
	+ video surveillance coordination
 |