ALASKA IWAYS ARCHITECTURE UPDATE:
USE & MAINTENANCE GUIDE

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1 Introduction

The 2016 Alaska Iways Architecture (AKIA) update was implemented in a way to lower the complexity and improve the readability of its corresponding documents in comparison to the previous update. The previous AKIA update was completed in 2009 and consisted of six core documents that breaks down the ITS goals, ITS functions, stakeholder needs, and connections between the technological transportation systems within the state. Although the information covered in the previous update was extensive, it resulted in a complex package that was difficult to read and navigate through. The aim of the 2016 update was to simplify all of those core documents into one concise AKIA report. This guide follows that trend of easy readability and simplicity. A Use and Maintenance guide is critical to any ITS Architecture to maximize the benefits of the architecture and facilitate a smooth maintenance process. Stakeholder input from interviews and webinars were incorporated into this guide to ensure its relevancy and effectiveness in future applications. A similar Use and Maintenance guide was completed for the Anchorage ITS Architecture (ARIA) in 2015.

1.1 AKIA Update

The Alaska Iways Architecture report is a companion to this guide. The AKIA was updated to incorporate technological advancements, changes in stakeholder needs, and future implementations of technology into the state's transportation system. The update adheres to the Federal Highway Administration (FHWA) National ITS conformity rule (23 CRF Part 940) and the FTA National ITS Architecture Policy on Transit Projects. Rule 940 states that an ITS architecture is required for ITS projects that are considered significant for the region and eligible for Federal funding.

1.2 Turbo Architecture™

Turbo Architecture™ is a software application that aids in the development of regional and project ITS architectures based on the National ITS Architecture. This program is widely used throughout the U.S. in the development and maintenance of ITS architectures, and supports better usability and accessibility to the ITS Architecture. The update to the Alaska Iways Architecture was implemented in Turbo Architecture™ (version 7.1). The software is free and available for download at

http://www.iteris.com/itsarch/html/turbo/turbomain.htm

Turbo Architecture™ supports the FHWA Rule 940 and the FTA National ITS Architecture Policy on Transit Projects; specifically, it provides:

- Support for defining and documenting Functional Requirements
- Support for documenting Operational Concepts (i.e. Roles and Responsibilities)
- Additional fields in Regional Description to fully define an architecture's scope
- Support for documenting any required or existing Agreements
- Support for identifying any ITS Standards available to support the implementation of the architecture

1.3 How to Use this Guide

This guide is organized into three main sections:

- Section 1 : Introduction
  - This section provides information on the AKIA update and how to use this guide.
- Section 2 : Uses of the ITS Architecture
  - This section describes the different ways the ITS Architecture can be used after it has been developed. For example, how the architecture can be used to support integration among ITS elements or how ITS can be incorporated into state plans and projects.
- Section 3 : Maintenance of the ITS Architecture
  - This section outlines the recommended methods to maintain the ITS architecture to extend the life of its use.

In each of the major sections, the following questions are answered (in no particular order) in relation to the section in which it belongs to:

- Who?
- When?
- Why?
- What?
- How?

Further details are outlined below. An example of a question in the use section that could be answered is *if a planner or engineer is developing a transportation plan, how does he/she incorporate the ITS architecture into the project?* An example of a question that applies to the maintenance section is *who is responsible for changes to the architecture?* The following sections aim to answer these questions.

1.4 Who Should Use this Guide?

This guide should be used by the appropriate agencies and transportation professionals involved in planning or implementing ITS projects in the state. Appropriate stakeholders could include staff from a variety of Alaska Department of Transportation & Public Facilities (ADOT&PF) departments, Alaska Marine Highway System (AMHS) staff, Alaska State Troopers (AST), and others. Individuals who are responsible for updating the AKIA should also use this guide. These individuals are likely to include ADOT&PF staff or consultant team members.

1.5 When to Use this Guide?

This guide should be used for projects with ITS elements in them and/or to make changes to the AKIA. If the purpose is to use the AKIA for projects with ITS elements, this guide should be used in at least four different contexts:

- Planning
- Program Development
- Project Development
- Project Design

In state transportation planning processes, the AKIA can be a great resource with which to consult. There are overlapping steps between planning processes and ITS architectures. By using this guide to supplement transportation planning, redundant efforts can be reduced and efficiency increased.

ITS projects, like other transportation projects, need to be programmed in funding plans in order to be implemented. The programming process includes the high level determination of project requirements and scope. The AKIA outlines existing and proposed systems, including ITS activities, elements, and stakeholders. This information will help in scoping and developing a program-level cost estimates for ITS projects being included in the funding program.

Following the program development phases is project development. Once the requirements for a project have been identified, the concepts of the project can be developed. Federally funded ITS projects must complete the Systems Engineering checklist and some of those checklist components can be obtained from the architecture. Some of these checklist components include participating agencies, their roles and requirements, project requirements, and standards.

Project design is another phase in which the AKIA can prove to be useful. The AKIA contains design requirements such as concepts, interconnects, and flows. By examining how existing and proposed ITS services operate and the different types of data that are exchanged, project design steps can be facilitated.

Often times, usage of the AKIA can result in the discovery of inaccuracies or outdated information within the architecture. In such instances, maintenance of the AKIA is recommended to be performed as soon as possible. By keeping the architecture up-to-date, the effectiveness of the AKIA can be maximized for future use. If the architecture needs to be updated, refer to Section 193 Maintenance of the ITS Architecture for details on how that process should be applied.

1.6 Why Use this Guide?

This guide should be used because it provides a user-friendly way to make use of the ITS architecture after development. This guide outlines how to use the AKIA in the four different phases of a project described above. It also describes how to make changes to the ITS architecture when necessary. The changes to the architecture could include minor changes or major updates.

2 Uses of the ITS Architecture

The recommended uses of the ITS Architecture are summarized in this section. The effectiveness of an ITS architecture can be gauged by how it is used. The AKIA can be a useful tool for planning and project implementation. It is especially effective at pinpointing opportunities and possibilities for minimizing the costs of integrating different ITS elements, especially when those elements are not implemented under a single contract.

2.1 Introduction to Uses

One of the objectives of the AKIA update is to streamline integration with the state's planning processes. The first portion of this chapter outlines how the AKIA can be used in coordination with the state's planning processes. Other sections of this chapter highlight the other uses of the architecture, identifies potential users, when to use the AKIA, where to find the architecture, and why someone would use the architecture.

2.1.1 General Planning Uses

Coordination and integration of the ITS architecture with planning processes can provide many benefits. One major benefit is that the architecture can support and help define the goals and objectives of ITS related projects that may be included in state plans. Here are the categories of planning efforts that Alaska DOT is involved with:

- Statewide Plan
- Area Transportation Plans
- Metropolitan Transportation Plans
- Modal and System Plans

For general planning processes, the AKIA service areas can be used as a starting point for coordination using project categories in which potential projects will fit. By pinpointing the category a potential project belongs to, the user can identify the potential service areas that are associated with that project. This mapping of project categories, potential projects, and service areas (from both the AKIA and ARIA) can be summarized in Table 1.

Table 1. Mapping of ITS/Operational Projects to Architecture Service Areas

Project Categories	Potential Projects	Service Area
Traveler Information Systems	• Detector systems • Probe data systems • Dynamic message sign • 511, web site mobile services	• Traffic Management • Traveler Information • Public Transportation • Winter Maintenance • Data Archive • Arterial Management (ARIA) • Traveler Information (ARIA)
Signal Improvements	• Intersection upgrades • Corridor upgrades • Retiming • Central control • Transit signal priority • Emergency preemption	• Traffic Management • Incident & Emergency Management • Traveler Information • Data Archive • Arterial Management (ARIA) • Transit Operations (ARIA)
Transit ITS Operations	• AVL deployment • Automated passenger count system • Fare collection upgrade • Bus safety and collision avoidance systems	• Public Transportation • Traveler Information • Transit Operations (ARIA) • Traveler Information (ARIA) • Archived Data Services (ARIA)
Carpooling and Vanpooling Systems	• Dynamic ride matching	• Traffic Management • Traveler Information • Data Archive • Arterial Management (ARIA) • Traveler Information (ARIA)
Non Motorized ITS and Operations	• Safety warning systems	• Traffic Management • Traveler Information • Data Archive • Archived Data Services (ARIA) • Arterial Management (ARIA)
Freeway Management	• Detection and Surveillance System • Traffic Management Center • Ramp Metering • Active Traffic Management	• Traffic Management • Traveler Information • Data Archive • Archived Data Services (ARIA) • Traveler Information (ARIA) • Roadway Maintenance and Construction (ARIA)

Project Categories	Potential Projects	Service Area
Emergency Management, Incident Management	• Emergency signal preemption • Emergency center – transportation center links	• Traffic Management • Public Transportation • Incident and Emergency Management • Data Archive • Arterial Management (ARIA) • Traveler Information (ARIA) • Roadway Maintenance and Construction (ARIA) • Transit Operations (ARIA)
Road Weather Management	• Road weather information systems • Mobile sensors • Winter maintenance decision support	• Winter Maintenance • CVO & Freight • Incident and Emergency Management • Traveler Information • Data Archive • Archived Data Services (ARIA) • Arterial Management (ARIA) • Traveler Information (ARIA) • Roadway Maintenance and Construction (ARIA) • Transit Operations (ARIA)
Construction and Workzones	• Work zone monitoring systems • Active traffic management (for example, variable speed limits or advisories)	• Traffic Management • Winter Maintenance • Traveler Information • Data Archive • Archived Data Services (ARIA) • Arterial Management (ARIA) • Traveler Information (ARIA) • Roadway Maintenance and Construction (ARIA)

Based on this mapping, users can easily identify how certain ITS or operations projects relate to the ITS architecture. This is a great starting point for integrating planning processes with relevant portions of the architecture at a high level. Additional information pertaining to the uses of the architecture can be found in the following sections.

2.1.2 Where to Find the ITS Architecture?

The Alaska Iways Architecture update document can be found on the ADOT&PF Iways website:

iways.alaska.gov

The Alaska Iways Architecture update is stored in a Turbo Architecture™ file. (Access to this file for download only is open to anyone who cares to download the file. Changes can only be made by authorized stakeholder members involved in the update and maintenance process.)

2.1.3 Who Should Use the ITS Architecture?

Members of the identified stakeholders involved in the planning and/or development of projects relating to ITS in the state of Alaska should use the AKIA. These members are most likely staff members of transportation agencies and responsible for implementing ITS in the state or their consultants.

As a result of the availability of the document on the ADOT&PF Iways website, the public is a potential group that could use the ITS architecture to gather information.

2.1.4 When to Use the ITS Architecture?

The updated AKIA should be used in developing any of the plans mentioned above when ITS related projects are involved, whether the project is in the planning or implementation phases. This also applies to the development of long range transportation plans in Alaska.

2.1.5 Why Use the ITS Architecture?

The AKIA provides stakeholders with the opportunity to further improve on the state's ITS functions and operations. The identification of possible ITS implementations can result in new ITS projects that are consistent with the state's transportation plans. The architecture provides possibilities and options without forcing the stakeholder into commitments regarding ITS projects.

2.1.6 What are the Uses of the ITS Architecture?

The uses of the ITS architecture include, but are not limited to the following:

- Gathering general ITS architecture information
- Identifying regional ITS goals and objectives
- Identifying current and future stakeholders involved in ITS operations and maintenance
- Identifying roles and responsibilities of stakeholders
- Viewing standards applicable to the ITS architecture
- Viewing existing ITS agreements in the region
- Examining current and proposed ITS functions, connections, and data exchanges
- Integrating ITS into transportation plans
- Integrating ITS with programming processes
- Developing ITS projects
- Designing ITS projects

2.2 How to Use the Architecture in the Alaska DOT&PF Planning Processes?

2.2.1 Long-Range Statewide Transportation Plan Background

The development of a long-range Statewide Transportation Plan is required according to Federal regulation 23 CFR 450.214. The long-range statewide transportation plan provides a minimum 20 year forecast of the development and implementation of multimodal transportation systems for the state. This would include future direction for the state of Alaska's highways, rail, transit, aviation, marine, bicycle, and pedestrian travel.

At the time of this writing, the Alaska 2035 statewide long-range transportation plan (LRTP) is in the process of being updated by ADOT&PF. The LRTP incorporates agency and public input to develop a plan that accommodates the interests from a variety of stakeholders. Not only does the plan address the statewide needs for all modes of transport, issues and solutions are also examined. The LRTP is also used as a guide for regional and area planning processes which are more focused on local problems and solutions. The LRTP will examine both the near-term (10 year) and future (20 year) needs, issues, funding opportunities, and projects through 2035.

2.2.2 Coordination with MTPs in Anchorage and Fairbanks

The Metropolitan Transportation Plans in Alaska (MTP) were originally developed in 2005 as part of the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This Federal transportation legislation guaranteed funding for highways, highway safety, and public transportation. The 2035 MTP for Anchorage was approved in 2012 by the Anchorage Metropolitan Area Transportation Solutions (AMATS) MPO and aims to improve the transportation system for more than 20 years into the future.

In the city of Fairbanks, their 2040 MTP was approved in 2015 by the Fairbanks Metropolitan Area Transportation System (FMATS) Policy Committee. The FMATS MTP aims to balance investment in the various transportation modes in the Fairbanks North Star Borough based on anticipated funding from federal, state, and local sources. This includes the identification of construction projects up until 2040.

Coordination of the AKIA with the MTPs in Anchorage and Fairbanks is a natural complementary step in the use of the ITS architecture since both the MTPs and the AKIA were updated during a similar timeframe. The ITS architecture identifies the technology used in operations and how they are integrated. The MTPs identified strategies to improve the transportation systems in their respective regions. Integration of the technology and operations identified in the AKIA with the strategies and planning processes in the MTPs makes sense in both the statewide and regional aspects.

2.2.3 Area (Regional) Transportation Plans

Similar to the MTPs are the Area and Regional Transportation Plans. These are multi-modal transportation plans that were developed for specific areas within the state to address movement between regions and from regions to other locations. These plans focus more on specific projects and the implementation of those projects. The Area Transportation Plans in Alaska include:

- Southeast Alaska Transportation Plan (SATP)
- Prince William Sound (PWS) Area Transportation Plan
- Southwest Area Transportation Plan (SWATP)
- Northwest Alaska Transportation Plan - Community Transportation Analysis
- Yukon-Kuskokwim (Y-K) Delta Transportation Plan
- Interior Alaska Transportation Plan (IATP)

2.2.4 Modal and System Plans

Modal and System Plans are statewide transportation plans that look at improve the operations of particular modes. System needs, issues, goals, objectives, standards, and processes are all addressed in these plans for the respective modes. These plans look at both the policies involved as well the implementation of projects. The Modal and System Plans that currently exist today include:

- Southeast Alaska Transportation Plan (SATP)
- Prince William Sound (PWS) Area Transportation Plan
- Southwest Area Transportation Plan (SWATP)
- Northwest Alaska Transportation Plan - Community Transportation Analysis
- Yukon-Kuskokwim (Y-K) Delta Transportation Plan
- Interior Alaska Transportation Plan (IATP)

Figure 2-1 below shows the relationship among these various plans.

These ADOT&PF planning processes may focus on different goals and regions, but the overall steps associated with these planning processes are generally similar:

- Develop Objectives
- Define the Network
- Develop Multimodal Performance Measures
- Collect Data and Monitor System Performance
- Analyze Problems & Needs
- Identify and Assess Strategies
- Implement Strategies
- Evaluate Effectiveness

Alaska’s transportation plans involves a wide range of stakeholders and is implemented following the framework outlined in Figure 2-2.

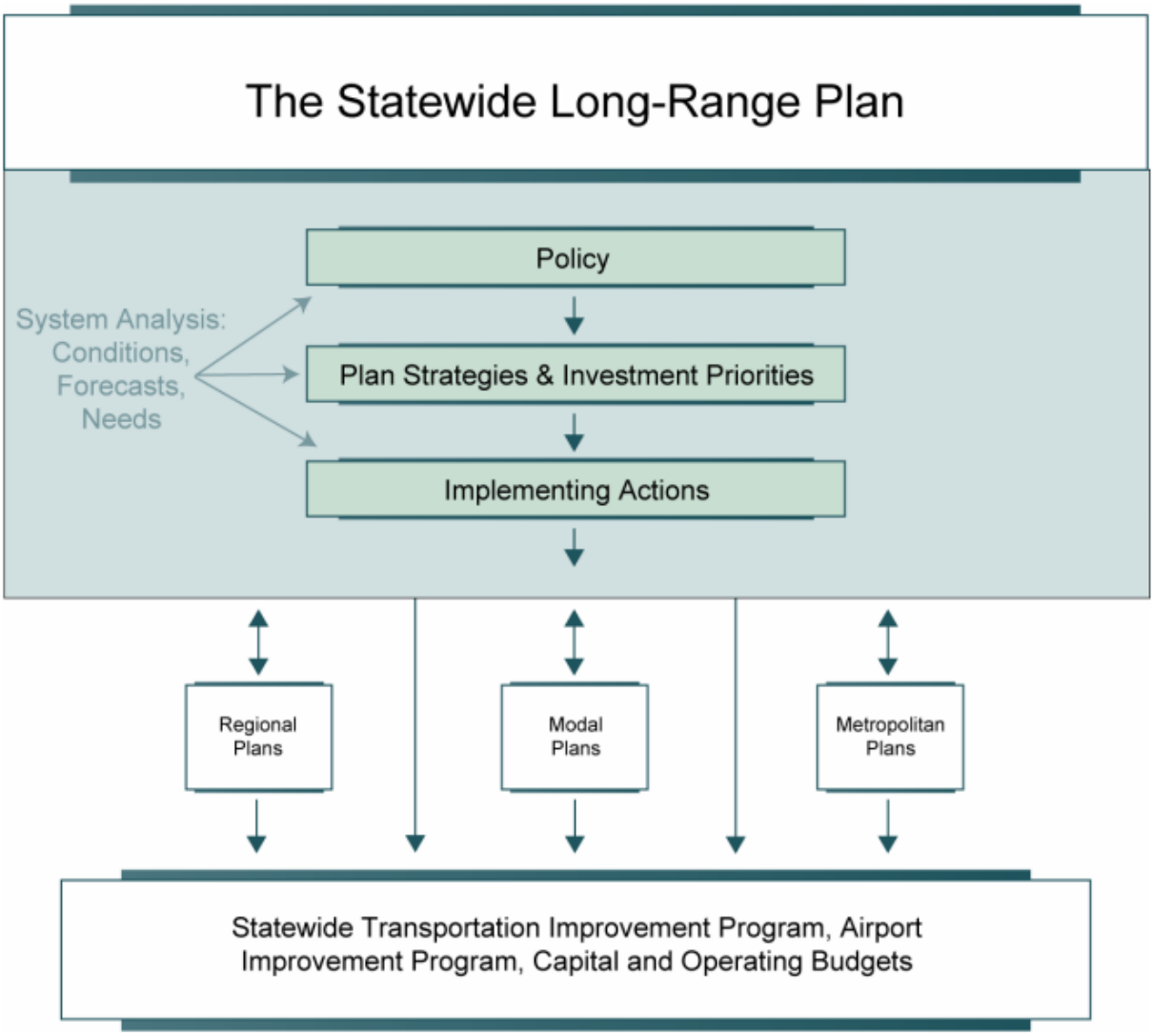


Figure 2-1: Relationship Among Transportation Plans in Alaska

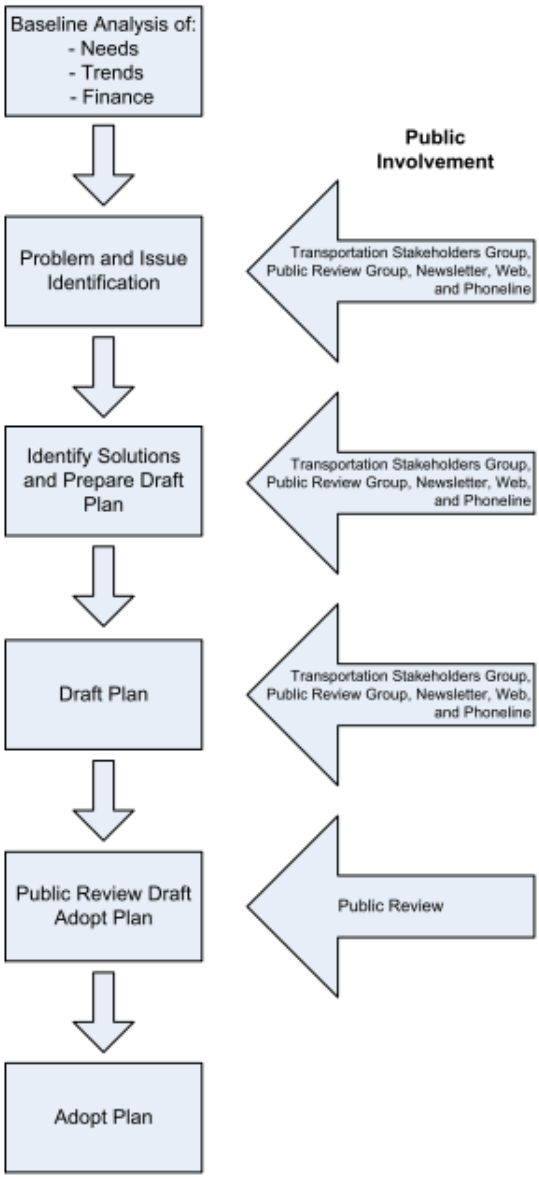


Figure 2-2: ADOT&PF Transportation Planning Process

2.2.5 Integration with Planning Processes

The ITS architecture identifies operations and technology integration recommended for ITS throughout the state. It also identifies ITS elements envisioned, stakeholders for each element, interfaces recommended for the ITS elements. Alaska's transportation plans follow a series of general planning steps. Each of these planning steps can be coordinated with the ITS Architecture in terms of extracting information and making changes as necessary. The planning steps, the method of coordination with the ITS Architecture, and the output from the coordination are all summarized in Table 2. The proposed touch points with the ITS Architecture are shown in bold.

Table 2. Planning & ITS Architecture Coordination

Alaska's Planning Step	Coordination with ITS Architecture	Output
1. Baseline Analysis (Needs, Trends, Finance)	**1. Identify key ITS Architecture stakeholders associated with each need (safety, mobility, etc.) identified**	List of contact information for ITS stakeholders for each need
2. Identification of Problems and Issues (using performance measures)	1. Identify the problems and issues that could be addressed all or in part with ITS solutions	List of problems and issues that may have ITS solutions
3. Identify Solutions (including refinement and evaluation of alternatives)	1. Use output list identified in step 2 to identify potential ITS and operational solutions. **2. Review ITS architecture to determine whether proposed solutions are included** 3. For those solutions included identify key stakeholders 4. Determine whether project is stand-alone or should be incorporated into capital project **5. Review ITS architecture for refinement – identify linkages, data flows and stakeholders** 6. Refine project definition as needed 7. Conduct evaluation of ITS alternatives identified in step 4 Output. 8. Develop project ranking / selection criteria. 9. Rank ITS projects and develop prioritized list, applying ranking/selection criteria developed in step 1. 10. Reprioritize based on financial constraints 11. **Identify needed changes and/or additions to ITS architecture based on selected project list**	List of potential ITS solutions, whether or not they are currently in the architecture and key stakeholders (if included) List of refined ITS solutions to be evaluated Final list of prioritized ITS projects, based on fiscal constraints Update the ITS Architecture to reflect changes based on final list of prioritized ITS projects. For projects not in ITS define full architecture inputs, including stakeholders, service packages and data flows

In addition, institutional arrangements should be made to ensure that the proposed coordinating activities take place. These include:

- Establishment of clear ownership and responsibility for making changes to the ITS Architecture.
- Establishment of contact personnel for each key stakeholder organization.
    - Ensure that this position continues to be filled through personnel changes
- Identification of ITS owners and operators at the beginning of planning processes.

    - Maintain contact to ensure that the designated individual(s) are involved in the planning activities.
- Reinforce the Iways website as a mechanism to share updated ITS Architecture documents.
- Inclusion of ITS Architecture coordination in the scope and work plans for planning processes with an adequate budget attached.
- Ensure availability of ITS and Operations tools and expertise in their use with TOPS-BC capability as a minimum.
- Encourage the use of the AKIA Change Request Form to be used to submit requested changes to the ITS Architecture. (See Table 4. AKIA Sample Change Request Form in Section 3.5.1.)

It should be noted that all changes do not have to be made dynamically but can be a part of periodic updates.

2.2.6 Planning Processes Flow Charts

In addition to the planning and ITS architecture integration methods outlined in Section 2.2.5, FHWA also created flow charts to document the linkages between planning and ITS architectures. This chart is presented in Figure 2-3, and although it doesn't show direct linkages to the ITS architecture process, the M&O process on the right hand side of the diagram can be considered to include it. The "Systematic process to develop and select M&O Strategies to meet objectives" step in Figure 2-3 - Figure 2-5 embodies what would be included in an ITS strategic plan or Operations/ITS plan.

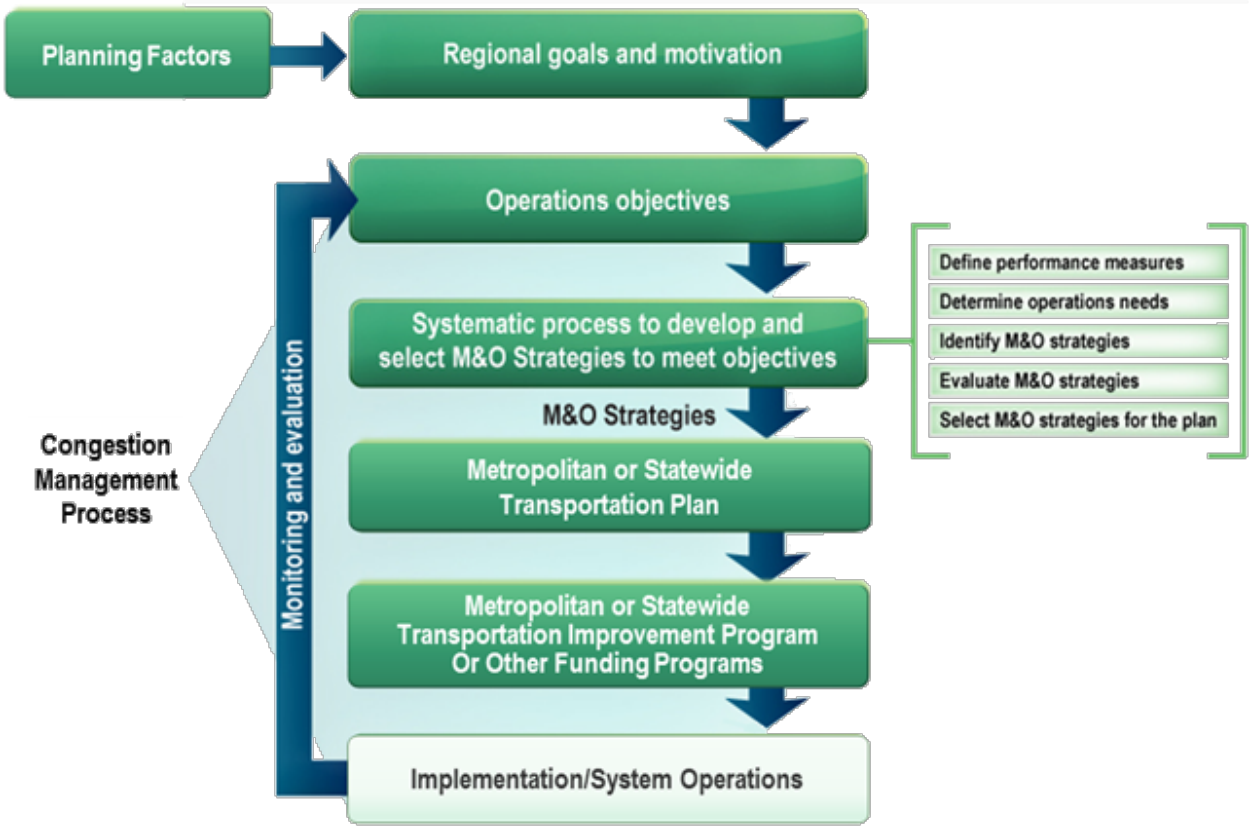


Figure 2-3. Transportation Planning Process (source: FHWA Planning for Operations)

Another one of these flow charts display the points of possible integration between the planning process and the ITS architecture process. This chart is presented in Figure 2-4 with the planning process on the left hand side, and the ITS architecture process on the right hand side.

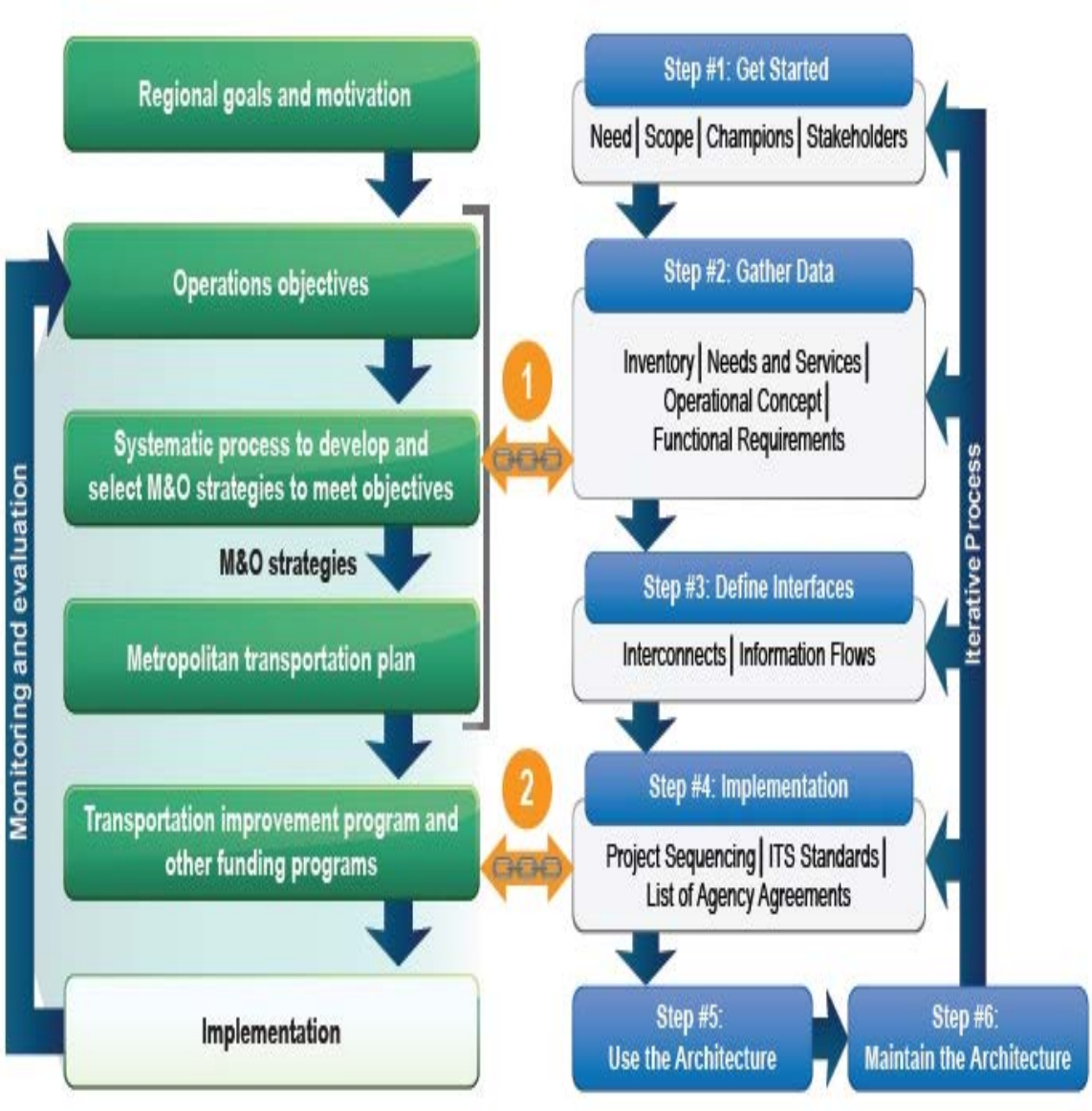


Figure 2-4. Transportation Planning and ITS Architecture Process (source: Planning for Operations Manual)

FHWA also created a flow chart to present how ITS architectures can link to both Operational Planning and Regional Planning efforts. This chart is displayed in Figure 2-5.

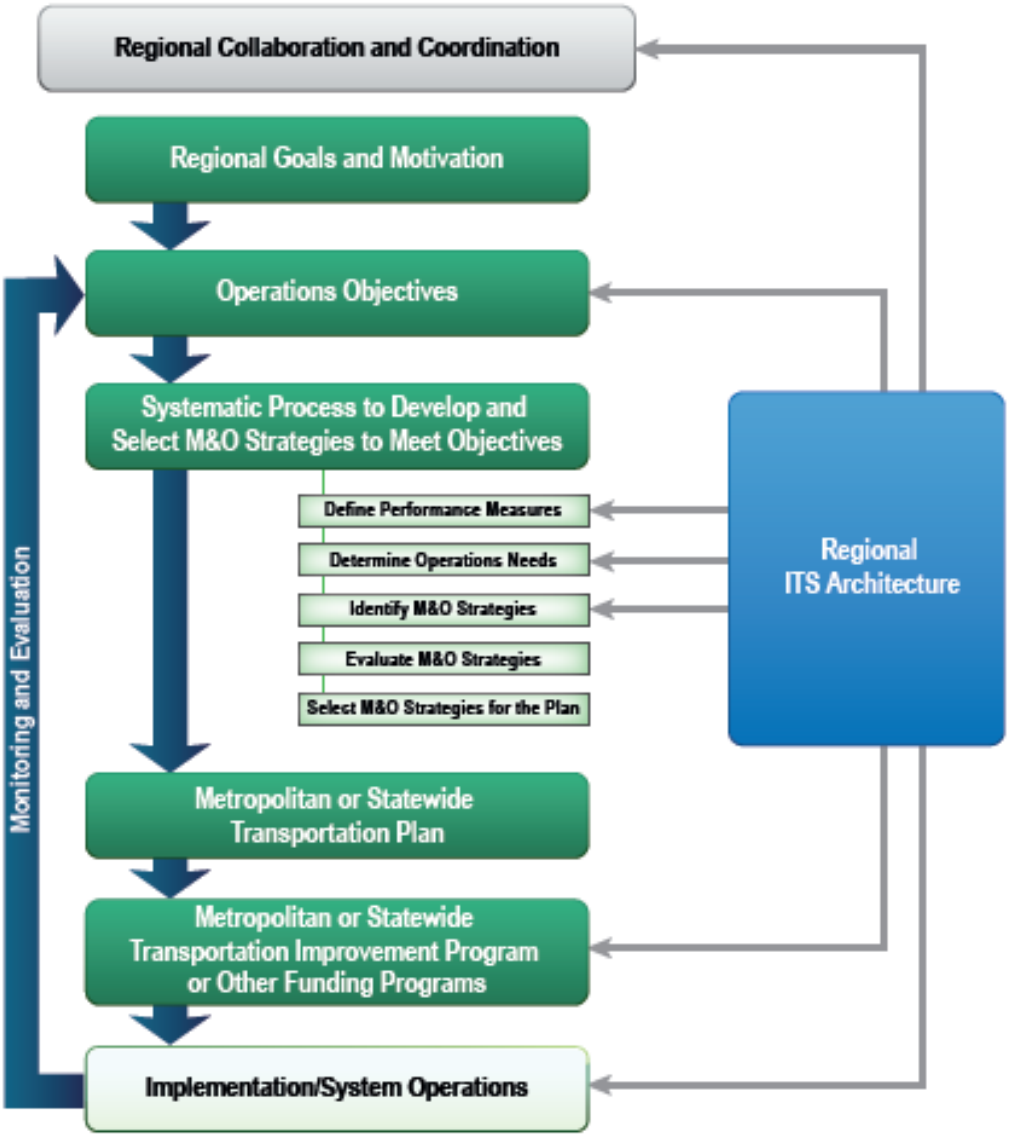


Figure 2-5. ITS Architecture in Planning for Operations (source: Turbo Architecture website)

2.3 How to Use the Architecture When Programming Projects?

2.3.1 Using the Architecture for Programming Projects

Before a project can be implemented, a plan of action must be completed to determine the feasibility of the project and identify what needs to be done. The AKIA is a great source to support the programming process of ITS projects.

Since the AKIA is in conformity with USDOT policies, it contains information that is beneficial to the process of programming projects. When programming projects that include ITS elements, it is important to identify the proposed ITS activities, elements, and projects within the ITS architecture. This will paint a clear picture of the current status of ITS in the state.

The next step is to identify stakeholders who may need to be involved as the projects move forward. The AKIA has identified significant stakeholders to statewide ITS operations for both existing and proposed systems. If a similar project has already been proposed, the potential stakeholders have already been identified. An opportunity to reduce redundancy is present here. If the project has not been proposed, the programmers can then see how their project can fit into the overall system.

In addition, feedback can be provided to the maintainers of the architecture if new ITS elements or flows are not represented. This is beneficial to the AKIA maintenance process as well. An example of a potential project programming process is the implementation of a statewide transportation operations center. The process is similar to the planning approach where the user can identify the service area that relates to a statewide transportation operations center (in this case that would be the Traffic management service area). Another method is to search for a term relating to a transportation operations center and see how it fits in the overall framework.

2.3.2 Institutional Requirements for Programming Projects

When using an ITS architecture to support program development, institutional requirements need to be fulfilled. One such requirement would be to identify an ITS “owner” for program development. This would be a staff person that program managers can consult with regarding the architecture. Furthermore, continuous architecture coordination needs to be performed during program development to ensure ITS projects, elements, and activities are in the architecture. Finally, knowledge of the existence of the architecture and the Use and Maintenance document is critical.

2.4 How to Use the Architecture in Project Development?

2.4.1 Using the Architecture for Project Development

An ITS architecture can continue to provide support in the project development phase. The ITS architecture can be used to identify proposed projects and/or project elements in the region. If a project or project elements have already been proposed, the ITS architecture can provide project developers with a head start in the process. The ITS architecture also provides information to aid in the completion of the Systems Engineering Checklist, which is required for ITS projects that use Federal funds. Information on what Systems Engineering Checklist components can be found in the AKIA are summarized in Table 3. The checklist can be found at http://www.dot.state.ak.us/iways/sys-eng.shtml.

Finally, by using the AKIA in this phase, the user can provide feedback to the architecture if new ITS elements or activities are not properly represented in the AKIA so that changes can be made. ADOT&PF’s Alaska Highway Preconstruction Manual is a guidance document used in the development and design of highway and road projects in Alaska. Section 485 of the Preconstruction Manual covers ITS projects. Section 485.4 covers identification of ITS elements. The AKIA can be used to determine what ITS elements have been identified for the State of Alaska to help determine if a given project has ITS elements or not. Section 485.5 covers the need for a systems engineering analysis. As mentioned above,

Table 3 indicates where the AKIA can be used to provide information essential to the systems engineering analysis.

Table 3. Systems Engineering Components in the AKIA

Systems Engineering Component	Does AKIA Provide It? If So, Where?
Portions of the Regional ITS or Statewide Iways Architecture being implemented.	Yes, for regional concepts. Service Areas, Chapter 4 and Appendix C.
Participating agencies roles and responsibilities.	Yes. Stakeholders identified for Service Areas, Chapter 4 and Appendix C.
Requirements definitions.	Yes, if no Concept of Operations exists. Requirements by Service Area, Appendix C.
Analysis of alternative system configurations and technology options to meet requirements.	No.
Procurement option(s).	No.
Applicable ITS standards that are being implemented and testing procedures that will be used upon project implementation.	Yes. Appendix E.
Procedures and resources necessary for operations and management of the system.	No.

2.4.2 Institutional Requirements for Project Development

Similar with the process for using the architecture with program development, institutional requirements need to be met. The ITS "owner" for project development should be identified. This is a staff person that project managers can consult with regarding the architecture and how to use it. This is especially important for the Systems Engineering Checklist. Architecture coordination during project development also needs to be performed to ensure that ITS projects and/or project elements are in the architecture. Finally, knowledge of the existence of the architecture and this document is critical.

2.5 How to Use the Architecture for Design?

2.5.1 Using the Architecture for Design

The AKIA can be a useful tool during project design phases. If no Concept of Operations exists for a project, the requirements for that project design can be identified within the AKIA. The AKIA includes an Operational Concept chapter in which service areas with differing purposes are presented. These service areas are supported by functional requirement tables that can assist the project designer in identifying the requirements for a project. Additionally, interconnects and flows identified in the AKIA can narrow down the needs to be included in the system design. Standards are also identified in the AKIA, which is needed for the project specifications. Similar to the previous project phases, discovery of missing or outdated components in the AKIA would be useful for the maintenance of the architecture.

An example of a project design phase that is supported by the AKIA is the deployment of a new avalanche detection system. The project designer would start by identifying the service area in which the project design most closely relates to (in this case that would be the Incident & Emergency Management service area). Another way to do this is to simply search the document for the term “avalanche.” Appendix C Functional Requirements for the service area can also be used to find instances of the search word for requirements pertaining to the design. Appendix E for that service area provides the standards, which can be used to narrow down the search for relevant standards in project design.

2.5.2 Institutional Requirements for Design

As with the program and project development phases, institutional requirements need to be met for the project design phase as well. The ITS “owner” for the design process also needs to be identified. This is the staff person that project designers can consult in regards to the architecture and how to use it. As with the other phases, architecture coordination and knowledge of the existence of the architecture and the Use and Maintenance document is critical. Architecture coordination during the design phase can help to identify requirements and standards. In addition, a policy or accepted practices in regards to the standards need to be created. This includes a way to determine which standards to use, identifying local standards, and how to access them. Finally, institutional knowledge of the project’s existing Concepts of Operations is critical.

3 Maintenance of the ITS Architecture

The FHWA Rule 940 states that agencies and stakeholders that are involved in the development of the regional ITS architecture must develop procedures and responsibilities for maintaining the architecture as needs change with time across the region. The maintenance of an ITS architecture is a critical component and was therefore mandated by FHWA.

This section presents the maintenance approach for the Alaska Iways Architecture. This plan identifies how the architecture update will be kept current based on stakeholder input and Federal policies. Integration with transportation planning processes can result in new priorities and strategies as time advances. Technology also has a tendency to change and evolve with time at rapid rates. Maintenance of the AKIA is imperative for enhancing the usefulness of the architecture in the future.

The maintenance section was created based on the original maintenance plan developed for the original AKIA. The plan was developed in 2003 and this section adjusts the plan as necessary to make it more compatible with the AKIA update.

3.1 Who Should Maintain the ITS Architecture?

Typically, ADOT&PF staff is the primary entity responsible for overseeing the architecture update process. ADOT&PF has the ability to share of this responsibility depending on certain situations. For example, different projects may result in necessary changes in roles and responsibilities of involved stakeholders. In such cases, individual members from key stakeholders may form a team/panel to update the architecture per ADOT&PF guidance. By having a team of maintainer instead of an individual, assembling input from multiple sources and making those changes to the architecture becomes a less strenuous task. Another benefit to forming a teaming to update the architecture is that multiple agencies can be more directly involved in the update process. This provides potential for more agencies to be on the same page when these changes are implemented. ADOT&PF may also choose to hire a consultant to maintain the architecture.

When selecting individual(s) to be responsible for updating the architecture, it is important that at least one person is experienced in using the Turbo Architecture software. Maintenance of the architecture implies that both of the architecture products (the report document and the Turbo Architecture database file) be updated.

In terms of updating the report document, a high level of expertise is not required in comparison to the Turbo Architecture file. Changes made to the report document should be a dependent on the changes made in the Turbo file. Therefore, selecting a trained individual to work on the Turbo file is critical. If there are no available individuals with the required experience in Turbo Architecture, free online training is available by visiting the National ITS Architecture website:

http://www.iteris.com/itsarch/html/training/training.htm

Following the instructions on the National ITS Architecture website will direct the user to the National Highway Institute (NHI) website where the user can sign up for the Turbo Architecture training course. It may be beneficial multiple individuals to partake in the online training so there is a higher number of qualified people to make changes to the file.

3.2 When Should Maintenance of the ITS Architecture Occur?

It is recommended that when a necessary change to architecture is identified, it is implemented as soon as possible. A necessary change to the architecture could be a result of a major change in the state ITS system. By implementing major changes in the architecture in a timely manner, the AKIA can be kept up-to-date for potential future projects. An example of this is a change in user needs that require the architecture to add a new element or system to a service area. The change in user need could be that the state now needs to start the process of implementing connected vehicle technology. The new element to be added could be on-board connected vehicle technology in roadway vehicles. The architecture should be updated to reflect that change within a few months, rather than 4-5 years later.

In the situation that a minor change is discovered (e.g. new information flow between existing elements), then updating the architecture may not be as pressing. In this case, the architecture should be updated at a time more convenient for the maintainer(s). If there are multiple minor changes to be applied to the architecture, it may be beneficial to wait to apply those updates to the architecture at the same time.

To keep the maintenance process efficient, it is recommended that a list of necessary changes to the architecture be managed so that it is easier to keep track of them (see Section 3.5.1 How to Manage Changes). It is also important to take into account the time and resources required to maintain such a list and update the architecture. These tasks may be time consuming. Planning in advance will allow for staff time and funds to be effectively allocated.

If there have been no major ITS related changes within the state for an extended period of time, a workshop should be organized to gather stakeholder input on any changes. At this workshop, key stakeholders can discuss any changes that have occurred within the state since the last update. If no significant changes can be identified, potential future changes and projects can be discussed. The results of this workshop will determine whether an update to the architecture is needed. These workshop should occur, at a minimum, once every five years if no changes have been identified within that time. Otherwise, the update process should be a change responsive process rather than an interval one.

3.3 Why Should Maintenance of the ITS Architecture Occur?

There are many potential instances that may result in the AKIA needing to be updated. Discovery of inaccuracies within the architecture in relation to the current state practices/projects is one reason. Minor reasons to update the architecture may require only a few chapters of the architecture report document to be modified. Understanding the reason to update the architecture is key in making the process easier. More specifically, these reasons could be a result of changes in:

- State of Alaska needs
    - As transportation problems are solved and new ones arise, needs could change.
    - New stakeholders could result in changes in needs.
- Institutional framework
    - Prior stakeholders may no longer be relevant as projects end and agencies split/merge.
    - New stakeholders may become regionally relevant with new needs and ITS.
- Project definition
    - Proposed ITS projects may be modified (elements, connections, flows, functionality, or implementation), therefore the architecture needs to be modified accordingly.

- Project acceptance and status
  - Addition, modification, or elimination of projects could result in necessary changes to the architecture.
  - Changes in project status are to be reflected in the architecture (e.g. planned, existing, etc.).
- Project priority
  - Project implementation delays may occur due to funding complications or institutional matters, which may affect implementation of other projects. An architecture update may be needed.
  - Project implementation may be advanced due to increased need, which may affect other projects' implementation. An architecture update may be needed.
- National ITS Architecture framework
  - Changes to the National ITS Architecture and the Turbo Architecture software may result in changes to user services, subsystems, and flows. The architecture may need to be updated accordingly.
- Changes to FHWA Rule 940 and other Federal Statues
  - FHWA Rule 940 has specific requirements for the development of a regional ITS architecture. Some of these requirements include identifying stakeholders, roles and responsibilities, agreements and standards. Although these requirements are not likely to be changed any time soon, there is always the possibility of modifications in the future. Changes in Federal policies such as FHWA Rule 940 need to be reflected in the architecture.

3.4 What is Maintained in the ITS Architecture?

The ITS Architecture consists of two main products: the AKIA report document and the Turbo Architecture database file. The FHWA Rule 940 and FTA National ITS Architecture Policy on Transit Projects identifies components required in ITS architecture development. These components are listed below, along with where to find them within the architecture products.

- Description of the region
  - Document
    - *Section 1.1.1 Description of the Region*
  - Turbo Architecture File
    - A description of the region was not inputted into the Turbo Architecture file. However, the user may choose to do so in the *Start* tab if desired.
- List of stakeholders
  - Document
    - *Section 3.2 Stakeholder Outreach*
  - Turbo Architecture File
    - *Stakeholders* tab of the respective service area
- Operational concept
  - Document
    - *Chapter 4 Operational Concept*
  - Turbo Architecture File
    - Each service area is displayed as separate "Project architectures" that can be selected in the *Start* tab. The best way to examine the operational concept is to output a flow diagram for each service area. Do not mistake the *Ops Concept* tab in Turbo for

operation concept in the document. The *Ops Concept* tab is actually for inputting stakeholder roles and responsibilities.

- Agency agreements
  - Document
    - *Chapter 7 Agreements*
  - Turbo Architecture File
    - Agreements were not inputted into the Turbo Architecture file. However, there is an *Agreements* tab where agreements can be inputted if desired.
- Functional requirements
  - Document
    - *Appendix C: Functional Requirements*
  - Turbo Architecture File
    - *Requirements* tab of the respective service area
- Existing and planned interconnects/flows
  - Document
    - *Appendix D: Architecture (Data) Flows & Flow Diagrams*. *Chapter 4 Operational Concepts* also displays some flows in the diagrams. *Chapter 5 Interfaces and Information Exchanges* displays the interconnect diagram.
  - Turbo Architecture File
    - *Interfaces* tab
- Applicable ITS standards
  - Document
    - *Chapter 6 Standards* and *Appendix E: Standards*
  - Turbo Architecture File
    - *Standards* tab of the respective service area
- Project sequencing
  - Document
    - There was no project sequencing in this project.
  - Turbo Architecture File
    - N/A

3.4.1 Turbo Database Structure & Components

The Turbo Architecture file contains the physical ITS architecture for the state of Alaska. Changes made in this file need to be completed carefully so that future changes can be made with relative ease. Use of the software also allows for an easy comparison to the Anchorage Regional ITS Architecture (ARIA) and the National ITS Architecture. Any future updates to the National ITS Architecture should result in an update to the Turbo Architecture software to reflect those changes.

As the AKIA was updated, the same sequence outlined by the FHWA for developing an ITS architecture was followed. This process can be reviewed by examining the FHWA Regional ITS Architecture Guidance Document's flow chart:

http://ops.fhwa.dot.gov/publications/regitsarchguide/2procoverview.htm

In the Turbo Architecture software, there are 10 tabs in which data can be inputted to build an ITS architecture. These 10 tabs are displayed at the top of the program interface as shown in Figure 3-1.

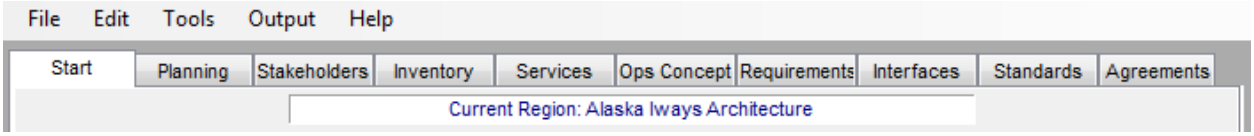


Figure 3-1. Turbo Architecture Tabs

See below for a quick overview of the 10 tabs in the Turbo Architecture main interface:

- Start
  - This tab is where architectures can be managed within a single file. The user can create a regional architecture and multiple project architectures.
- Planning
  - The planning tab is where the transportation planning process objectives and strategies can be linked to the ITS architecture components. **This tab was not used in the AKIA.**
- Stakeholders
  - This is the tab where stakeholders are inputted into the architecture. Users can group similar stakeholders performing similar functions into a stakeholder group.
- Inventory
  - This is where the user can input the ITS elements into the architecture
- Services
  - This tab allows for the user to associate elements inputted in the Inventory tab to National ITS Architecture defined service packages. **This tab was not used in the AKIA.**
- Ops Concept
  - The Operational Concepts tab allows for the user to specific the roles and responsibilities of the stakeholders in the architecture. Users can create project areas that narrow down the responsibilities to specific service packages.
- Requirements
  - This tab is where the user can specify the functional requirements of each architecture element.
- Interfaces
  - This tab is where the architecture interconnects and flows are built from the inputted data in the previous tabs.

- Standards
  - This tab contains a list of standards that apply to the selected flows in the interfaces tab. This list of standards is automatically populated based on the interface tab.
- Agreements
  - Users can input agreements amongst different stakeholder agencies in this tab. **This tab was not used in the AKIA.**

In summary, only seven out of the 10 available tabs in the software were used in the 2016 AKIA update. Therefore, it is only necessary to update those seven tabs because the remaining three have no information in them. The three tabs not used are the Planning, Services, and Agreement tabs.

Tailored flows were needed for the AKIA in order to reflect the needs of stakeholders in the State. Customizing service packages was not possible due to the lack of this capability in the Turbo Architecture software (version 7.1). A workaround was used to address this issue. Customized individual service areas were created as project architectures instead. By creating each service area as individual architectures, Turbo Architecture was able to display the tailored flows in project architecture flow diagrams.

In addition, the services tab was not used because the benefits of using service packages did not outweigh the work required for the implementation and maintenance of service packages in the AKIA. Creating service areas that consist of flows from varying service packages without using service packages themselves reduces extra steps and simplifies the architecture. By removing this extra layer of complexity, the AKIA becomes easier to use and maintain.

There are seven service areas created as a project architectures within the Turbo database. These seven service areas are labeled as:

1) AKIA: Traffic Management
2) AKIA: Winter Maintenance
3) AKIA: CVO and Freight
4) AKIA: Public Transportation
5) AKIA: Incident and Emergency Management
6) AKIA: Traveler Information
7) AKIA: Data Archive

These seven service areas are treated as project architectures and can be accessed in the *Start* tab as shown in Figure 3-2.

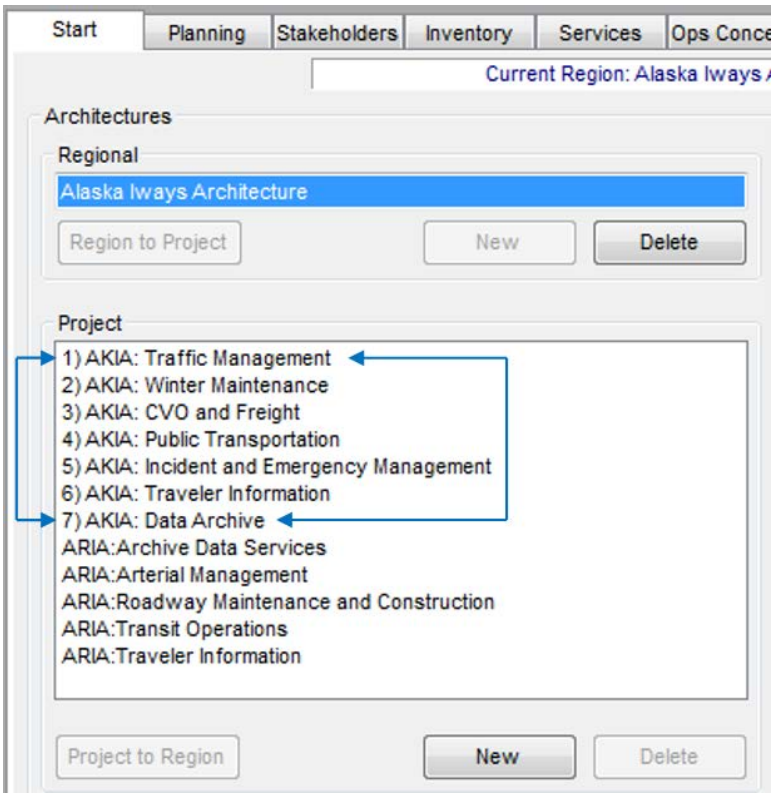


Figure 3-2. AKIA Service Areas in Turbo Architecture

It is recommended that the review of the architecture products should be completed in sequential order starting with the Turbo Architecture file. When checking for changes to be made to the Turbo file, the maintainer(s) should start with the leftmost *Start* tab, and end with the rightmost *Agreements* tab (assuming anything is input into the *Agreements* tab).

After the Turbo file has been modified, the document should be updated to reflect those modifications. The AKIA report document should also be updated in sequential order starting with Chapter 1 and ending with Appendix E as outlined in Section 3.4.2 Document Structure & Components. The document starts with high level concepts and then moves into more specific details further into the report. Updating the details could change the high level ideas in the beginning so it is important to be thorough in updating the document.

3.4.2 Document Structure & Components

The AKIA update document is broken up into seven major chapters and five appendices that outline the revamped architecture. These seven major chapters are as follows:

- Chapter 1: Introduction
  - This chapter provides an overview of the update process, including the contents of the report, the description of the region, timeframe, and purposes and objectives.
- Chapter 2: Background
  - This chapter summarizes the past events and projects that lead up to the implementation of the AKIA update.

- Chapter 3: Processes and Outcomes
  - This chapter mainly focuses on the key stakeholders involved in the AKIA update process.
- Chapter 4: Operational Concept
  - This chapter presents the service areas that were tailored from the National ITS Architecture to support the stakeholder needs and regional goals. This includes the architecture flow diagrams and the stakeholder roles and responsibilities in each service area.
- Chapter 5: Interfaces and Information Exchanges
  - This chapter displays an overview of the interconnects and flows used in the AKIA.
- Chapter 6: Standards
  - This chapter discusses the standards that may be applicable to the flows identified in the ITS architecture.
- Chapter 7: Agreements
  - This chapter outlines any existing and future agreements within the region that may be required to implement the architecture service areas.

The architecture document also contains appendices that should be checked:

- Appendix A: Glossary of Terms
  - This appendix provides a list of definitions for words used in the document as well as key words relating to the National ITS Architecture.
- Appendix B: Architecture Flow Definitions
  - This appendix differentiates user-defined flows and default National ITS Architecture flows used in the AKIA. It also provides a description of what the flow entails.
- Appendix C: Functional Requirements
  - This appendix provides the requirements of individual elements within each service area as well as the high-level status of each.
- Appendix D: Architecture Flows
  - This appendix presents the every flow documented in each service area. To aid in the interpretation of the flows, service flow diagrams are provided as well.
- Appendix E: Standards

This appendix displays the standards applicable to each service area.

3.5 How to Maintain the Architecture?

The maintainer(s) of the AKIA should have a few minimum required responsibilities. These responsibilities include:

- Informing agencies and departments of meetings and workshops with the purpose of measuring current ITS activities that may have an impact on the maintenance of the architecture.
- Archiving files and documents (electronic or hardcopy) and sending them out to agencies as needed.
- Performing architecture updates as changes are approved.
- Maintaining a list of changes that need to be made to the architecture.
- Maintaining a change log of the architecture throughout the maintenance process.
- Archiving comments in regards to the architecture and implementing them as necessary.
- Responding to stakeholders if asked how changes were made.

In order to successfully perform these responsibilities, the maintainer(s) should understand the following:

- How to manage changes to the architecture
- How to maintain the Turbo Architecture file
- How to maintain the report document

Recommended methods on the maintenance of the AKIA are summarized in the following sections.

3.5.1 How to Manage Changes

Before any changes are made to the architecture products, the changes should be approved by the appropriate authority. In this case, ADOT&PF. By developing a change management process, the maintenance approach becomes more standardized and less confusing. Tracking changes made to the architecture and archiving maintenance products becomes easier as well. A sample change request has been created and can be seen in Table 4. These forms should be sent to ADOT&PF at the following email address for approval prior to a change being implemented:

Alaska Department of Transportation & Public Facilities
ISSD
3132 Channel Drive, Suite 250
Juneau, AK 99811
E-mail: lisa.idell-sassi@alaska.gov

Table 4. AKIA Sample Change Request Form

Change Information			
Project Name:		Request Date:	
Description of Requested Change:			
Type of Change:	☐ New Project (if new project select one of the following) ☐ Proposed (funding not secured) ☐ Planned (funding secured) ☐ Under Construction (project currently being deployed) ☐ Existing ☐ Deleted Project ☐ Modified Project ☐ Change to a User Need ☐ Change to Project Status ☐ Change to Project Priority ☐ Change to National ITS Architecture ☐ Other		
Change Rationale:			
Agencies Involved, Including Roles:			
Additional Notes:			
Submitter Information			
Name and Title:			
Agency / Division / Section:			
Address:			
Phone Number:			
E-mail:			

3.5.2 How to Maintain the Turbo Architecture Database

Changes made to the architecture should occur in the Turbo Architecture file prior to the architecture report document. In order to make changes to the Turbo Architecture file, several guidelines should be followed to prevent confusion and support future maintenance. These guidelines are summarized in the Turbo Architecture Usage Guidelines below.

Turbo Architecture Usage Guidelines

Create copies of the file

The more complex the architecture, the more difficult it is to track changes made in the Turbo file. Often times, major changes made can result in undesired consequences that can be difficult to undo. By creating copies of the file throughout the maintenance process before major changes, the user will have "restore points" in which he/she can turn back to in the event of a major mishap in the process. This is especially useful for new users of Turbo Architecture.

Track changes made to the file

Creating copies of the file helps to mitigate unintentional changes to the file. Tracking changes made to the file will help the user backtrack on minor mistakes. It also creates a timeline of changes made so if something goes wrong, it will be easier to pinpoint where and when the error occurred.

Follow naming conventions of elements, stakeholders, & tailored flows

By establishing a naming convention, the user can prevent duplicate entries and unintentionally parsed data. These are common issues when there are multiple users editing a single file. This is why a naming convention was created for stakeholders, elements, and tailored flows. The naming convention of each is summarized in Table 5.

Table 5. Stakeholder, Element, & Tailored Flow Naming Conventions

	Stakeholder Naming Convention	Element Naming Convention	Tailored Flow Naming Convention
Format	Agency/ Division	Class/ Element	.flow name.
Example	ADOTPF/ Measurement Standards and Commercial Vehicle Enforcement	Center/ MSCVE Headquarters	.freight equipment information.
Agencies or Classes Used	• ADOTPF • Combined • DMVA • EMS Providers • Federal Motor Carrier Safety Administration • Media • NOAA • Public • State of Alaska • U.S. Geological Survey	• Center • Field • Vehicle • Terminator • Travelers	N/A

Following a naming convention also makes flow diagrams easier to follow and understand. It is important that maintainers are on the same page with naming convention to avoid confusion. Figure 3-3 displays an example of an element extracted from Turbo Architecture's flow diagrams that follows the naming convention for stakeholders and elements.

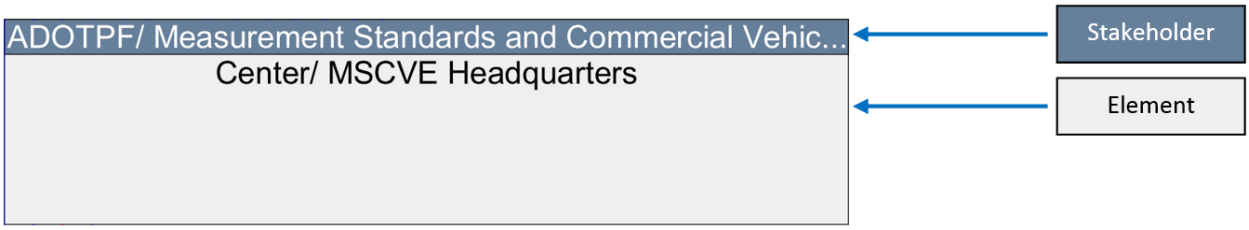


Figure 3-3. Turbo Architecture Element

In terms of flow naming convention, periods were used before and after flow names as a subtle way to differentiate between user-defined flows and National ITS Architecture flows. It makes it easier to locate user-defined flows in the *Interface* tab of the Turbo Architecture file. For example, when flows are sorted, the user defined flows will appear at the top of the list as shown in Figure 3-4.

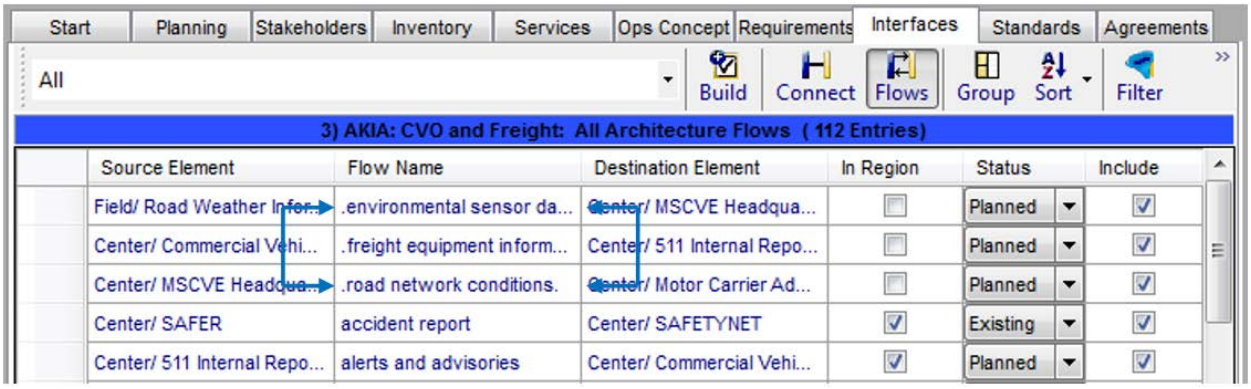


Figure 3-4. Sorted User-Defined Flows

Gain User Expertise

The maintenance of the Turbo Architecture file requires a higher level of expertise compared to maintenance of the document. It is recommended that the maintainer(s) be familiar with the software or has received the proper training to make changes. This guide does not provide step-by-step instructions on how to perform tasks in Turbo Architecture. For high level of detail instructions, training for the Turbo Architecture software is available for free online via a sign-up process. For more information on how to receive online training, please refer to the following link:

http://www.iteris.com/itsarch/html/training/turbowebbasedtraining.htm

Once the course has been completed, the maintainer can review Section 4 Appendix: Basic Turbo Maintenance Tasks in this document. This section provides step-by-step instructions on how to perform some common maintenance tasks within the Turbo Architecture program. This will provide the maintainer with key information including tips and tricks that are specific to the AKIA.

In addition, the user should be familiar with the overall scope of the architecture. The more the user understands the goals and purposes of the components of the architecture, the easier it is to make changes. Understanding why a change is made will clear up confusion and limit potential mistakes when editing the file.

Updates to Service Areas

In this AKIA update, service areas were created as individual project architectures to create data flow diagrams that were better suited for the stakeholder needs. As of version 7.1 of the Turbo Architecture software, this is a workaround for a lack of the software's capability to create flow diagrams that display tailored service packages. In addition, creating these service areas as separate project architectures will make them more accessible and easier to understand. Updates to the AKIA are to be completed via the individual project architectures. Since these project architectures use elements and stakeholders from the overall "regional architecture," changes made to these components in one project architecture will be automatically reflected in the rest of the projects.

To update a service area, the maintainer should use the same approach to update an overall regional architecture. The user selects the service area project architecture from the *Start* tab and check for changes to be made in the other tabs. Once a service area has been selected from the *Start* tab, every tab that follows it applies to that service area (i.e. the stakeholders tab will only display stakeholders directly

involved in that service area). Updating the architecture will involve making changes to each service area as necessary.

Adding Service Areas

As mentioned, service areas were used instead of the National ITS Architecture service packages to tailor the architecture to the systems in Alaska. Essentially, these service areas are made up of components of service packages without directly using the service packages themselves. These service areas were created from scratch by adding individual elements and flows. Guidance from the National ITS Architecture website was useful in the creation of service areas from scratch without adding service packages and modifying them. Users can gain access to information on the National ITS Architecture service packages by referring to the following link:

http://www.iteris.com/itsarch/html/mp/mpindex.htm

To create a service area as a project architecture, the user would do so in the *Start* tab by selecting "New" as shown in Figure 3-5.

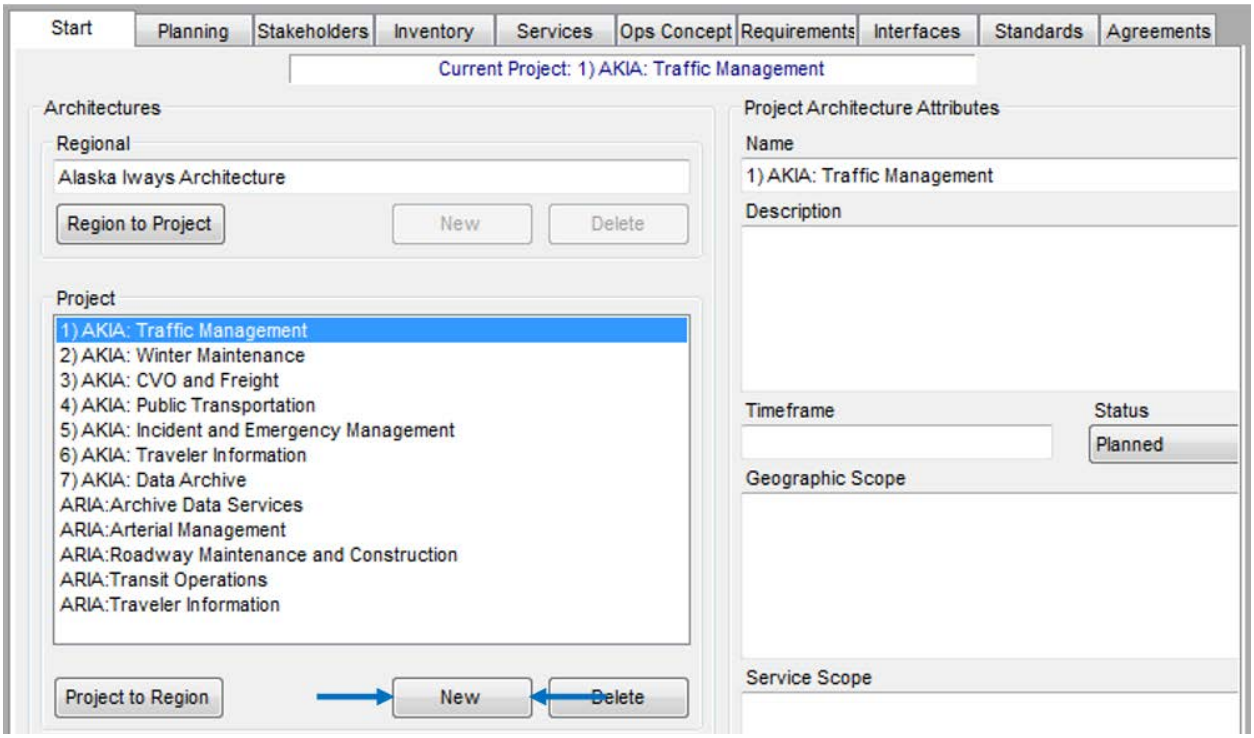


Figure 3-5. Creating a New Service Area

Accessing/Creating Flow Diagrams

The main way to analyze service areas is to create Turbo Architecture flow diagrams. Creating flow diagrams requires that the tabs prior to the *Standards* tab be completed. Specifically, the *Stakeholders*, *Inventory*, and *Interfaces* tabs are required. Once these tabs are ready, flow diagrams can be completed in Turbo Architecture by selecting *Diagrams* in the *Output* menu at the top of the program.

Extracting Tables

Tables can also be output from the Turbo Architecture software based on the data inputted. To output a table, the user would have to select *Tables* from the *Output* menu. Tables that can be created are listed below with tables included in the architecture in bold:

- Architecture Summary
- Change Log
- Planning
- Stakeholders
- Inventory
- Services
- **Operational Concept**
    - Roles and Responsibilities Tables in Chapter 4
- **Requirements**
    - Functional Requirements Tables in Appendix C
- Interconnects
- **Interfaces**
    - Architecture Flow Tables in Appendix D
- Flow Definitions
- **Standards**
    - Standards Tables in Appendix E
- Standard Group Definitions
- Agreements
- Status Values
- Subsystems and Terminators

Individuals that need help performing tasks such as creating tables at higher levels of detail need to take the free online turbo training as specified in Section 3.1 of this document.

3.5.3 How to Maintain the Architecture Document

Once the required changes have been completed in the Turbo Architecture software, the changes need to be reflected in the document as well. The seven chapters of the AKIA update document should be reviewed in sequential order to identify where the changes implemented in the Turbo Architecture apply. Once those changes have been made, the changes can be made with relative ease in the appendices of the report. The tables created in the appendices are direct outputs of the Turbo Architecture software. Since the changes should have already been implemented in Turbo by this point, outputting the tables would be the final steps in terms of the Turbo software and document modification.

3.5.4 Notifying the Stakeholders

It is recommended that the maintainer(s) identify key stakeholders that would benefit from notifications of changes to the architecture. This also includes identifying the type of notification the stakeholders would be receiving (e.g. phone call, email, web conference, etc.). After taking these initial steps, notification of the appropriate stakeholders should occur when changes are made to architecture products. By notifying stakeholders, entities responsible for transportation activities in the region can adjust plans and operations based on those changes.

3.5.5 Archive Files

It is recommended that the maintainer(s) archive all files that were created during the maintenance process. A change management process was developed to guide in the architecture update process. Usage of a change request form such as the sample form presented in Table 4 can make the archiving process easier.

It is also recommended that hardcopy files be converted to electronic files such as PDF and stored on a cloud service such as Dropbox or Google Drive or on an agency network drive. Hardcopy files are easier to lose and more difficult to share with others. Electronic files stored in the cloud or network drive makes it more accessible to the individuals who have been given access to the archive. Placing the files on the cloud reduces the risks of losing files due to hardware failure or network compromises. Even if a computer is wiped, the files will still be saved in the cloud. If stored on a network server, it is recommended that a server administrator be in charge of the file. This will prevent a wide range of users to make changes to the file. An additional copy of the files should also be kept in a separate location in case something does happen to the original files such as accidental deletion. By having these files readily accessible, future updates and changes would be more easily implemented.

4 Appendix: Basic Turbo Maintenance Tasks

As mentioned in Section 3.1 it is recommended that the maintainer(s) of the architecture take the free online training made available on the National ITS Architecture website. This is critical to ensure that the maintainer(s) have a strong understanding of how to perform different actions in the Turbo architecture file. After training has been completed, the maintainer(s) can review the following sections to learn how to perform simple maintenance tasks as well as recommended "Tips & Tricks" that may be key specifically to the AKIA.

The basic tasks are broken up into sections as follows:

- Section 4.1 Adding, Deleting, and Modifying Stakeholders
- Section 4.2 Adding, Deleting, and Modifying Elements
- Section 4.3 Adding, Removing, and Creating Flows
- Section 4.4 Outputting Flow Diagrams
- Section 4.5 Outputting Tables

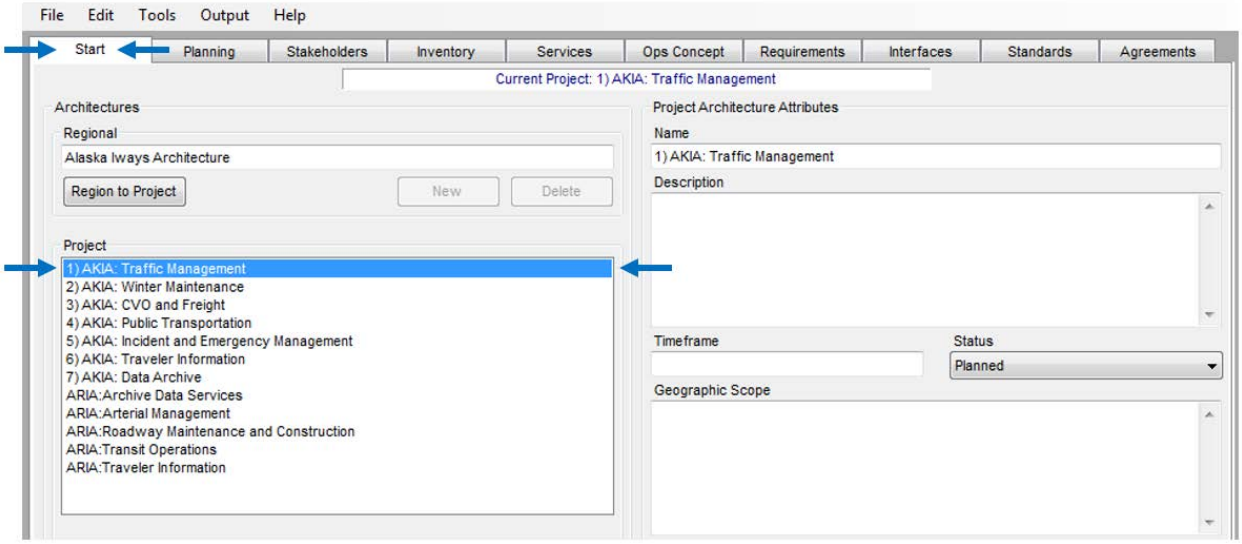
You will also find "TIPS & TRICKS" boxes in the following sections. These will provide you with recommendations that will make your update process easier. Here is a general "TIPS & TRICKS" box:

TIPS & TRICKS

Regardless of which tab you are currently working in, there is a white text box below the all of tabs at the top of the Turbo interface that informs you of the "**Current Project**" (Service Area) that tab belongs to. It is helpful to check this box to make sure the changes you make are in the correct Service Area. It can be easy to make changes in a different Service Area without realizing it.

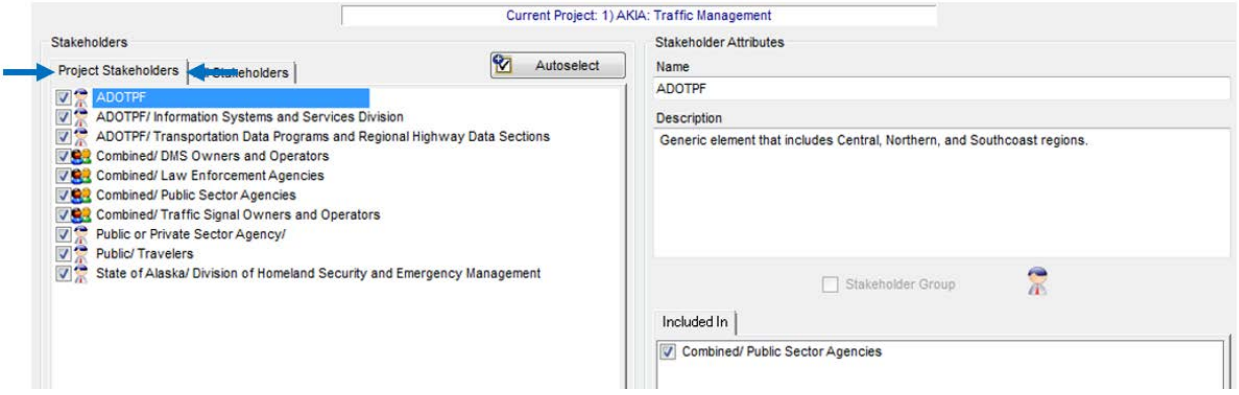
4.1 Adding, Deleting, and Modifying Stakeholders

1) In the **Start tab**, select the Service Area you want to modify stakeholders for. In the AKIA, Service Areas are presented as **Project Architectures**:

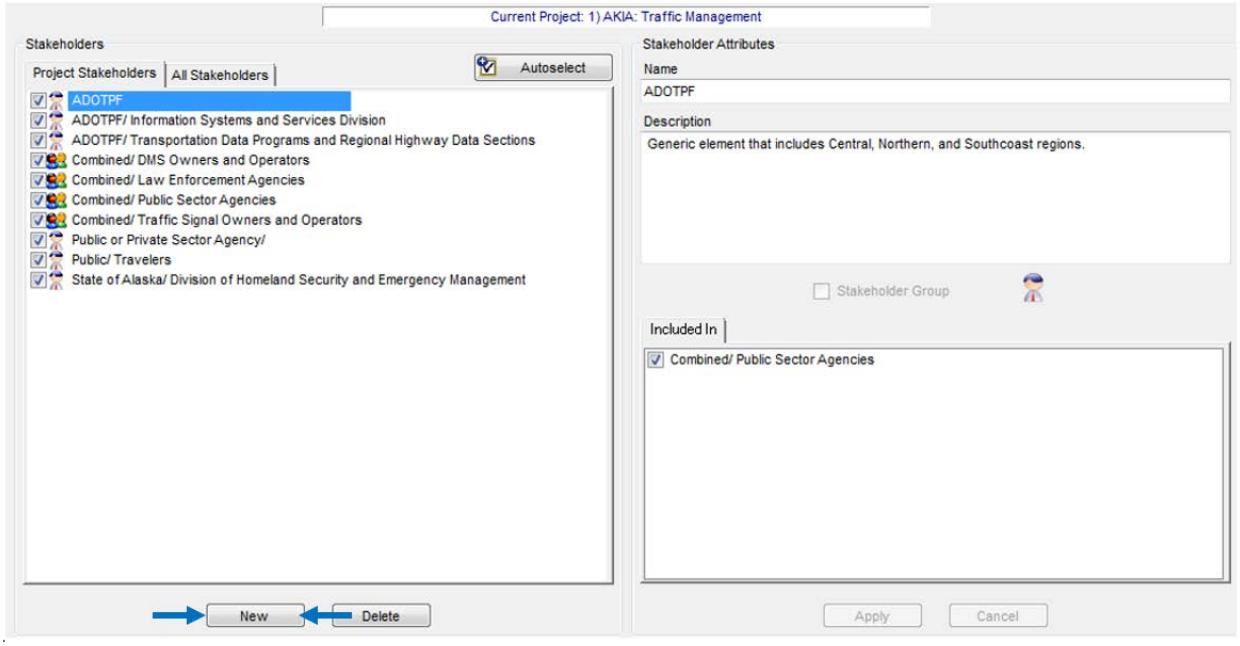


2) Once the Service Area has been selected, edits to all of the remaining tabs will result in changes to that selected Service Area. Click on the **Stakeholders tab**:

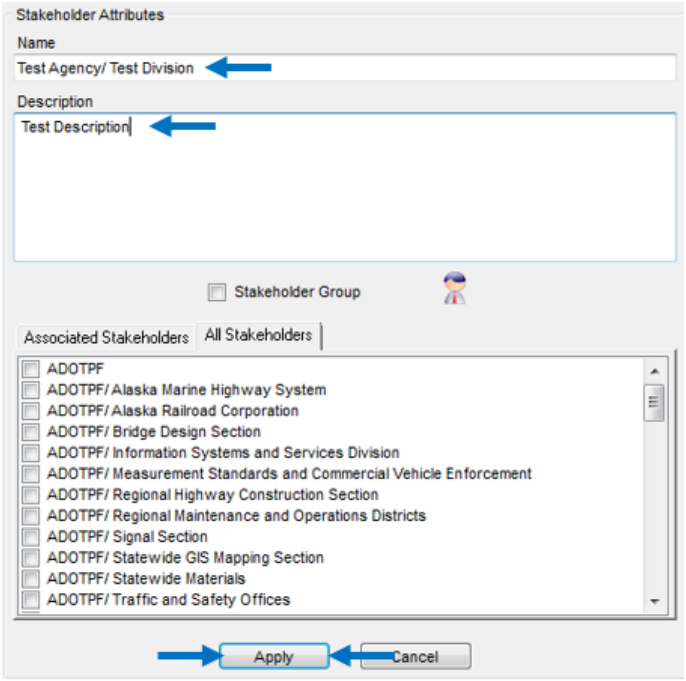
3) Once you have selected the **Stakeholders tab**, the stakeholders belonging to that Service Area should appear. These are listed under the **Project Stakeholders** tab to the left:



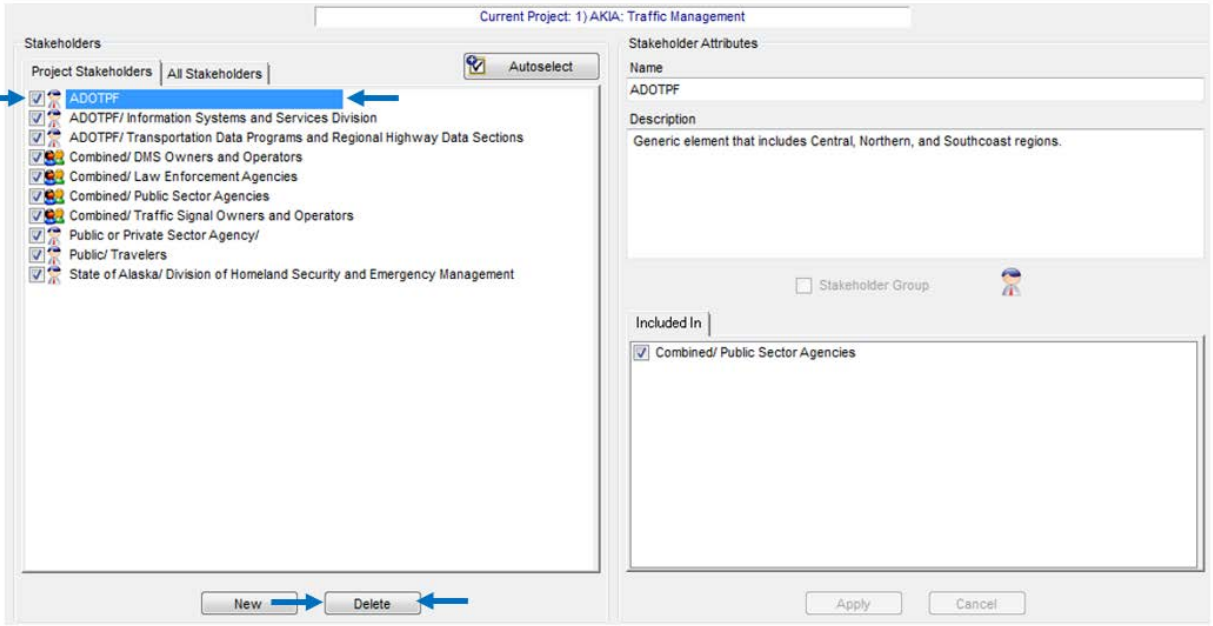
4) **TO ADD A NEW STAKEHOLDER**: Click on the **New button** at the bottom left of the screen:



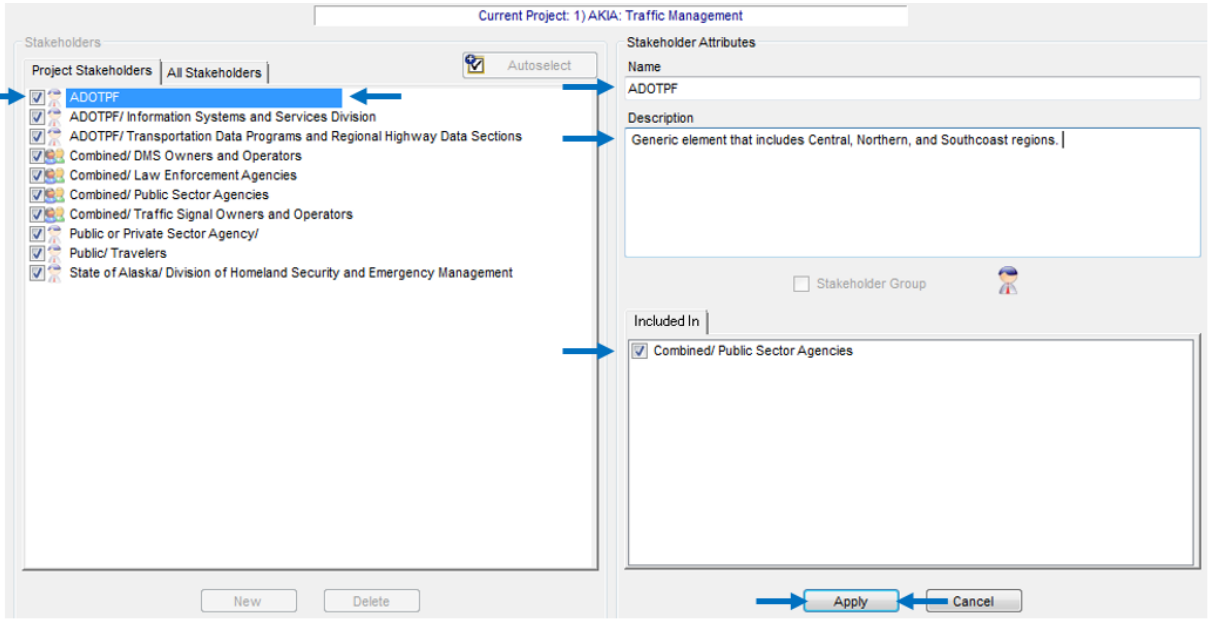
5) The blinking text cursor will automatically appear on the right hand side under **Name**. Enter the name of the Stakeholder and a **Description**, then click on **Apply** at the bottom.



6) **TO DELETE A STAKEHOLDER**: Select the stakeholder you wish to delete, then click on the **Delete button** at the bottom left of the screen:

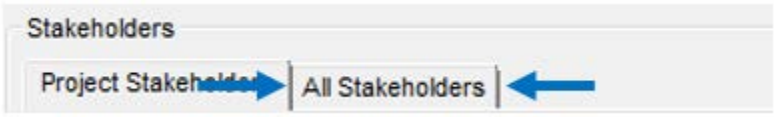


7) **TO MODIFY A STAKEHOLDER**: Simply select the stakeholder you wish to modify, then make the changes under **Stakeholder Attributes**, then click the **Apply button** at the bottom right hand corner:



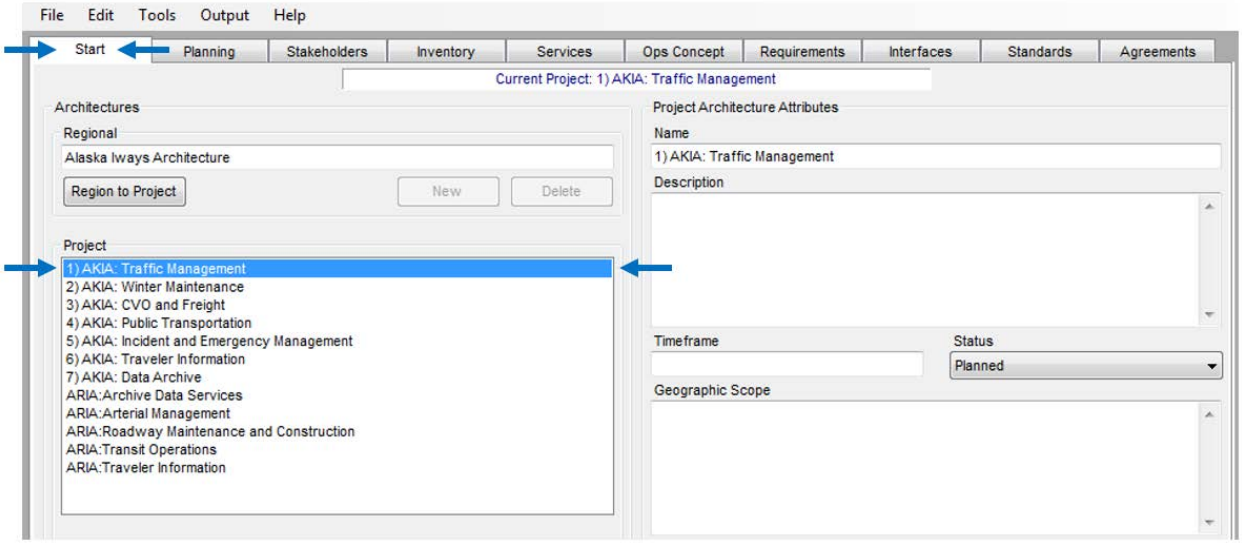
TIPS & TRICKS

Once a stakeholder has been created in Turbo, it is readily available for use in other Project Architectures (in this case Service Areas). This way, you don't have to recreate a stakeholder for each Service Area. **To add an existing Stakeholder** to a Service area, click on the **All Stakeholders tab** and select the stakeholder you wish to add and then click **Apply**.



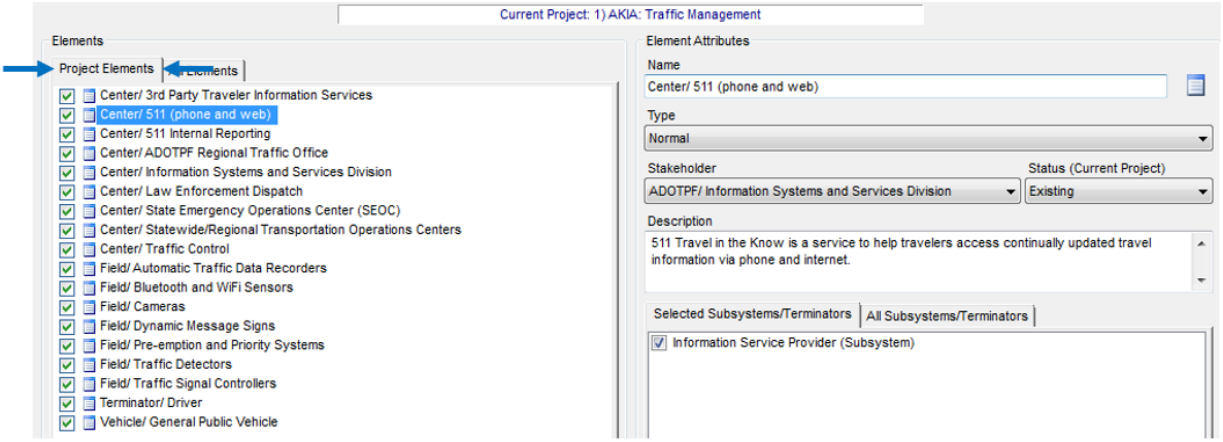
4.2 Adding, Deleting, and Modifying Elements

1) In the **Start tab**, select the Service Area you want to modify elements for. In the AKIA, Service Areas are presented as **Project Architectures**:

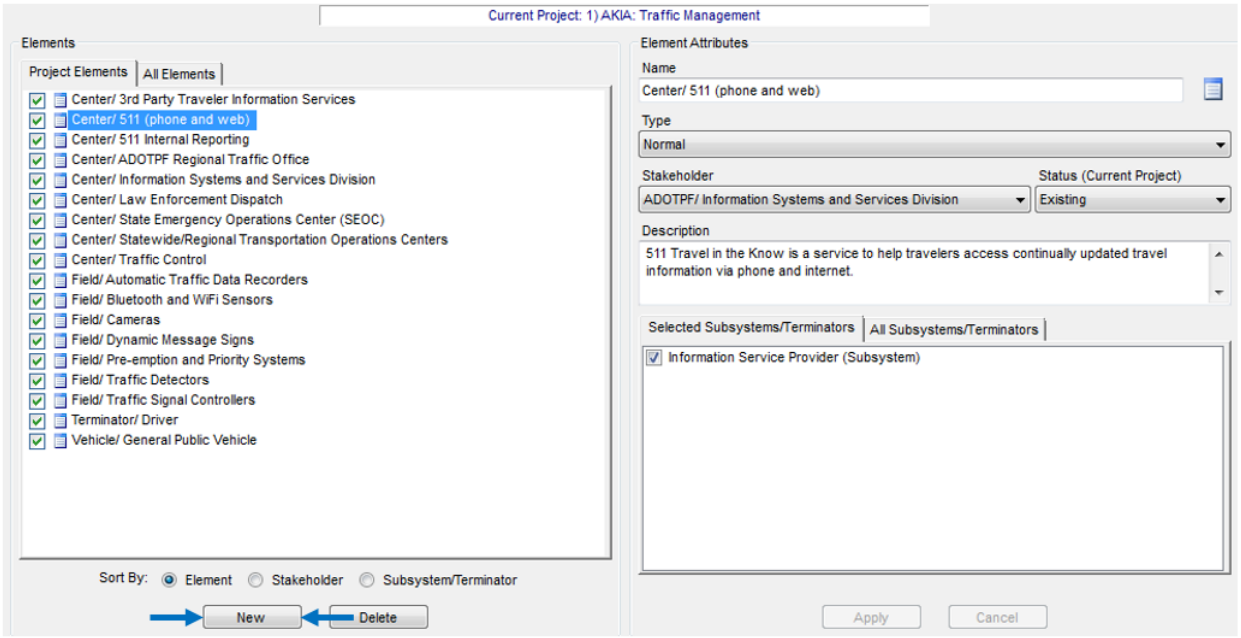


2) Once the Service Area has been selected, edits to all of the remaining tabs will result in changes to that selected Service Area. Click on the **Inventory tab**:

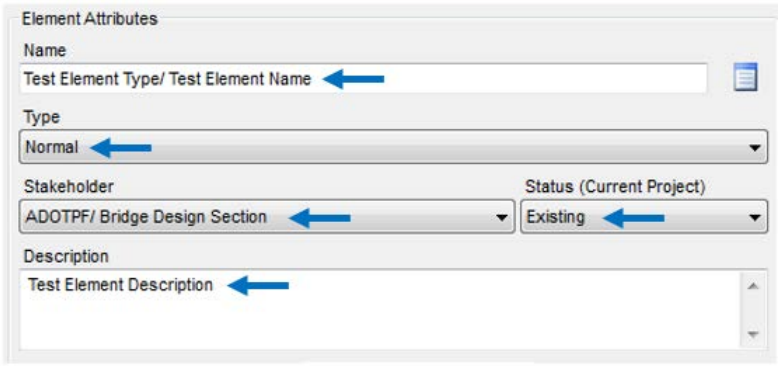
3) Once you have selected the **Inventory tab**, the elements belonging to that Service Area should appear. These are listed under the **Project Elements** tab to the left:



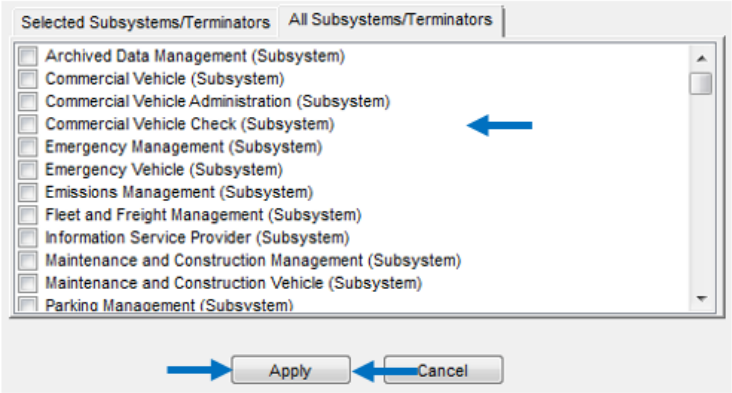
4) **TO ADD A NEW ELEMENT**: Click on the **New button** at the bottom left of the screen:



5) The blinking text cursor will automatically appear on the right hand side under **Name**. Enter the name of the element, select **Normal** under the **Type** pulldown menu, select the **Stakeholder** that owns this element, select the **Status** of the element (Planned or Existing), and enter in a **Description**.

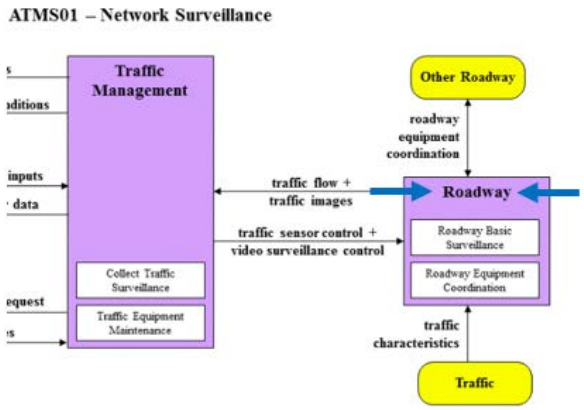


6) Once all of that information has been entered, you will notice **Subsystems/Terminator tabs** below the Description box. This is the most important attribute for your new element. Select the subsystem(s) or terminator(s) that your element is associated with, then click **Apply**:

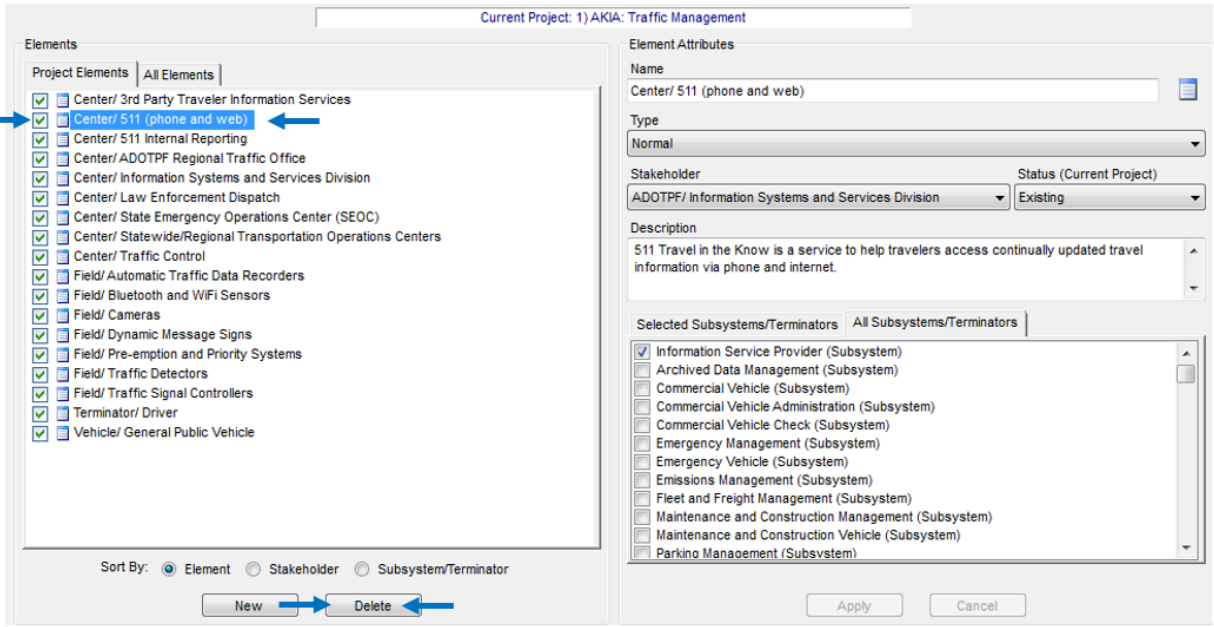


TIPS & TRICKS

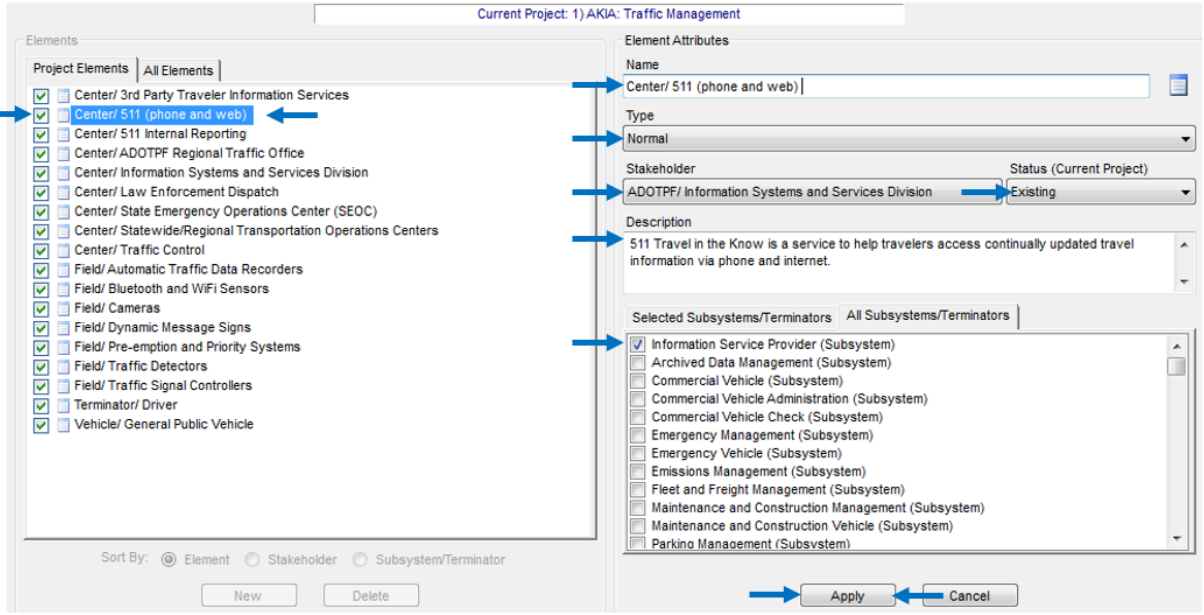
When creating an element, it is important that you understand what subsystem(s)/terminator(s) that element should be comprised of. It is recommended that you examine the **Service Package diagrams** on the **National ITS Architecture website** (http://www.iteris.com/itsarch/html/mp/mpindex.htm) when creating an element. The Service Package diagrams will show you the flows connecting to and from elements that are comprised of specific subsystems and terminators. For example, if you wanted to create a "Field/ Traffic Cameras" element that sends traffic images to a Traffic Management center, you would want to select a subsystem for that camera element that would allow for flows to and from traffic management centers. Find the likely Service Package that would have these flows. In this case, that could be ATMS01 Network Surveillance. Examining the service package diagram reveals that "Roadway" could be an appropriate subsystem for your "Field/ Traffic Cameras" element:



7) **TO DELETE AN ELEMENT**: Select the element you wish to delete, then click on the **Delete button** at the bottom left of the screen:

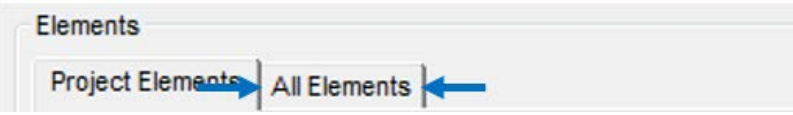


8) **TO MODIFY AN ELEMENT**: Simply select the element you wish to modify, then make the changes under **Element Attributes**, then click the **Apply button** at the bottom right hand corner:



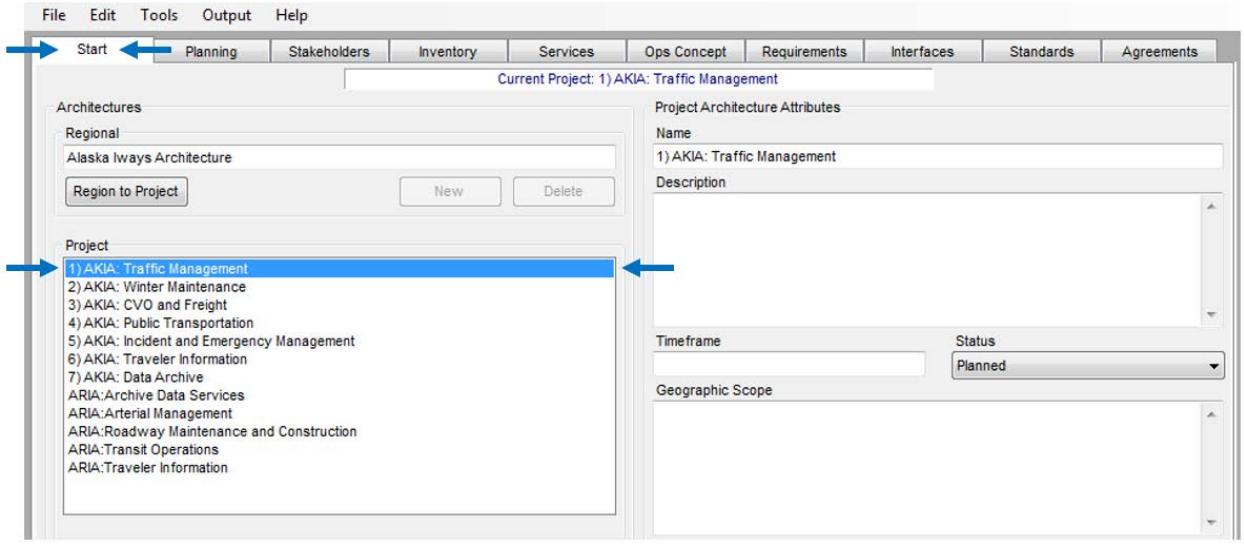
TIPS & TRICKS

Once an element has been created in Turbo, it is readily available for use in other Project Architectures (in this case Service Areas). This way, you don't have to recreate an element for each Service Area. **To add an existing Element** to a Service area, click on the **All Elements tab** and select the element you wish to add and then click **Apply**.

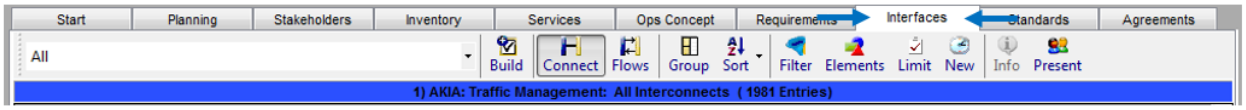


4.3 Adding, Removing, and Creating Flows

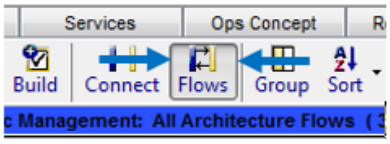
1) In the **Start tab**, select the Service Area you want to modify. In the AKIA, Service Areas are presented as **Project Architectures**:



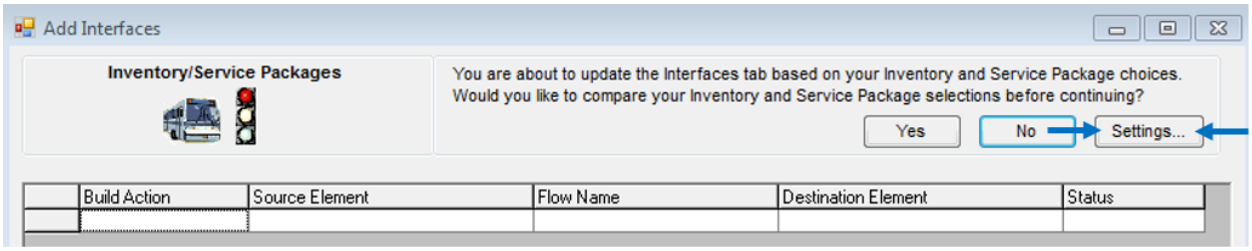
2) Once the Service Area has been selected, edits to all of the remaining tabs will result in changes to that selected Service Area. Click on the **Interfaces tab**:



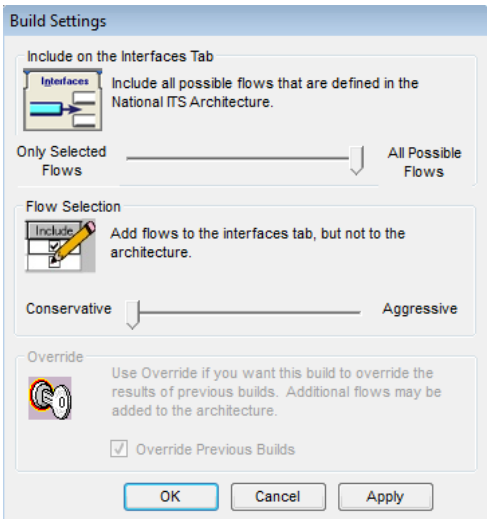
3) Once you have selected the **Interfaces tab**, the interconnects for your selected Service Area should appear. Click on the **Flows button** near the top to display all of the flows that have been generated for the Service Area. Most of the time, you will be working with Flows, not interconnects. If this is a new Service Area, no flows will appear:



4) **TO ADD A FLOW**: Flows can be added to your Service Area by using the **Build button**. The Build button essentially generates flows that you can select to include in your Service Area based on you subsystems/terminators that make up your elements, your selected service packages (no services packages were included in the AKIA), and your selected Build settings. Click on the Build button, and an **Add Interfaces** dialogue box will appear. Click on **Settings**:

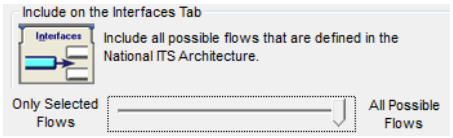


5) A **Build Settings dialogue box** should appear. There are two sliders that changes the way flows are generated and selected for your Service area. The **Include on the Interfaces slider** determines what flows Turbo will generate. The **Flow Selection slider** determines which of those generated flows will be automatically selected for your Service Area. Adjust the sliders to the settings you want, then click **OK**. See the **TIPS & TRICKS** box below for the recommended settings.

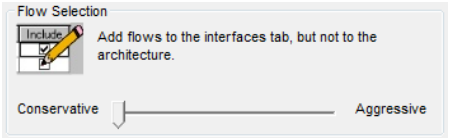


TIPS & TRICKS

As mentioned previously, the AKIA does not use the Services tab. This tab was neglected to simplify the maintenance process by eliminating an additional tab that would have to be maintained. As such, this limits some of the usefulness of certain Build Settings to generate and select flows based on Service Packages (which are selected in the Services tab). As a result, it is recommended that you keep the **Include on Interfaces Tab slider** all the way to the **right** to generate **All Possible Flows**.

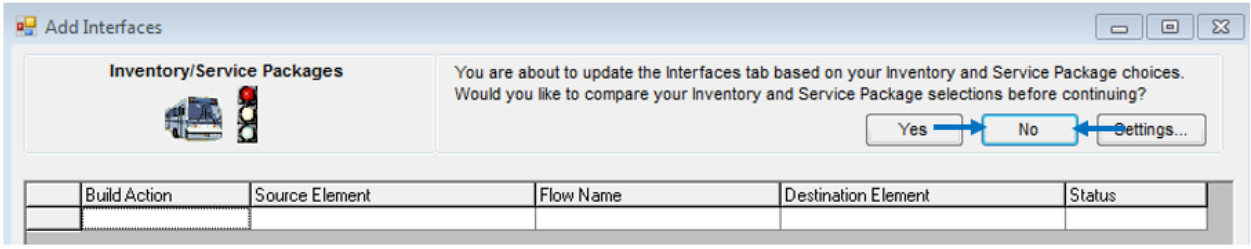


By doing so, Turbo will generate all possible flows amongst the elements that are in the Service Area. This will essentially give you a wider range of flows to select from instead of having to continuously build and generate flows based on service packages that you would have to update every time you create/add a new element to your Service Area. Finally, it is recommended that you keep the **Flow Selection slider** all the way to the **left** to add flows to the interfaces tab, but not select them to be included in the Service Area.

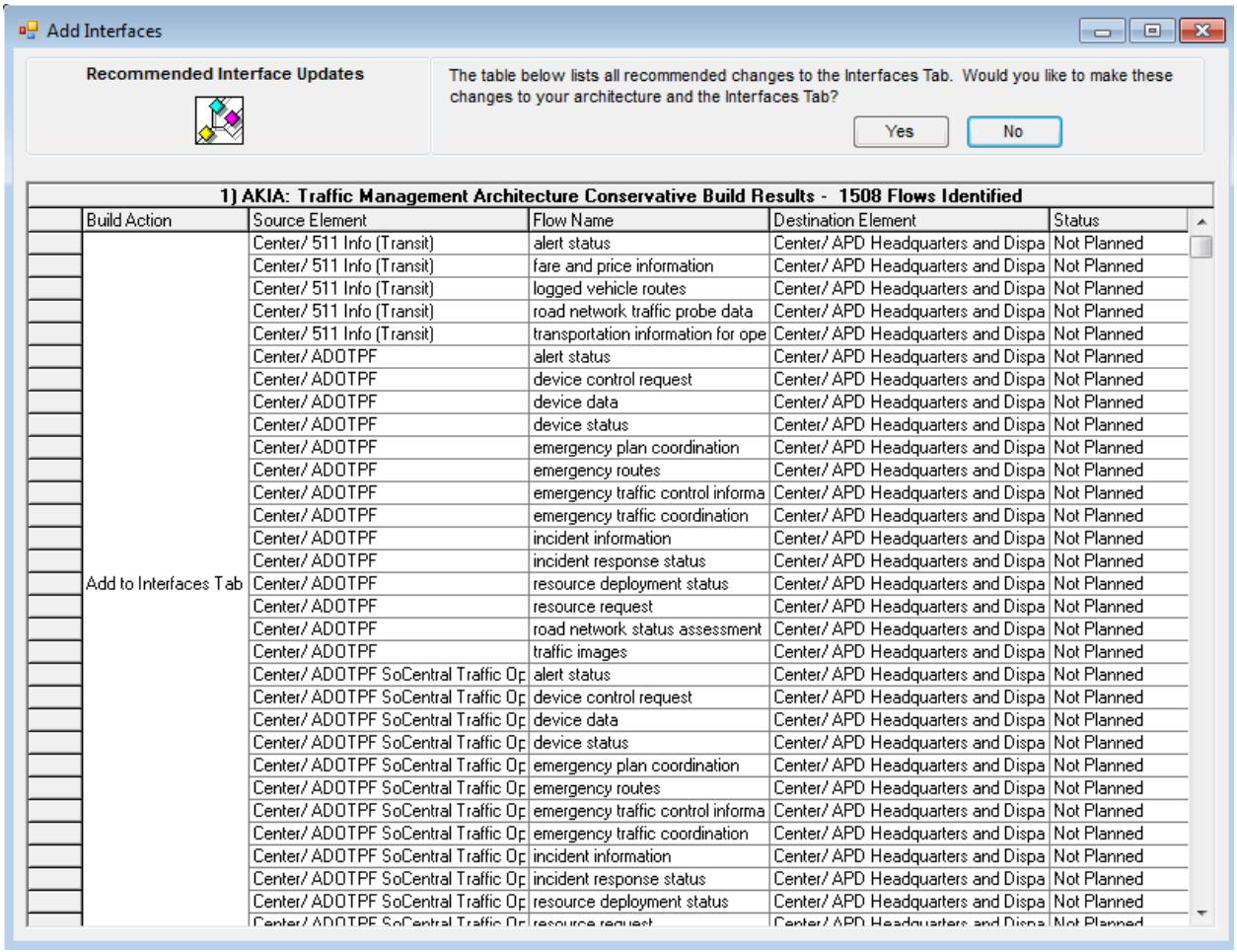


This allows for you to manually select the flows that you want instead of Turbo batch selecting multiple flows based on Service Packages which you may or may not want. Especially when updating the architecture, it is often better to manually select your flows. It can be a pain to figure out what flows have been automatically added by Turbo and having to deselect the ones you don't need later on.

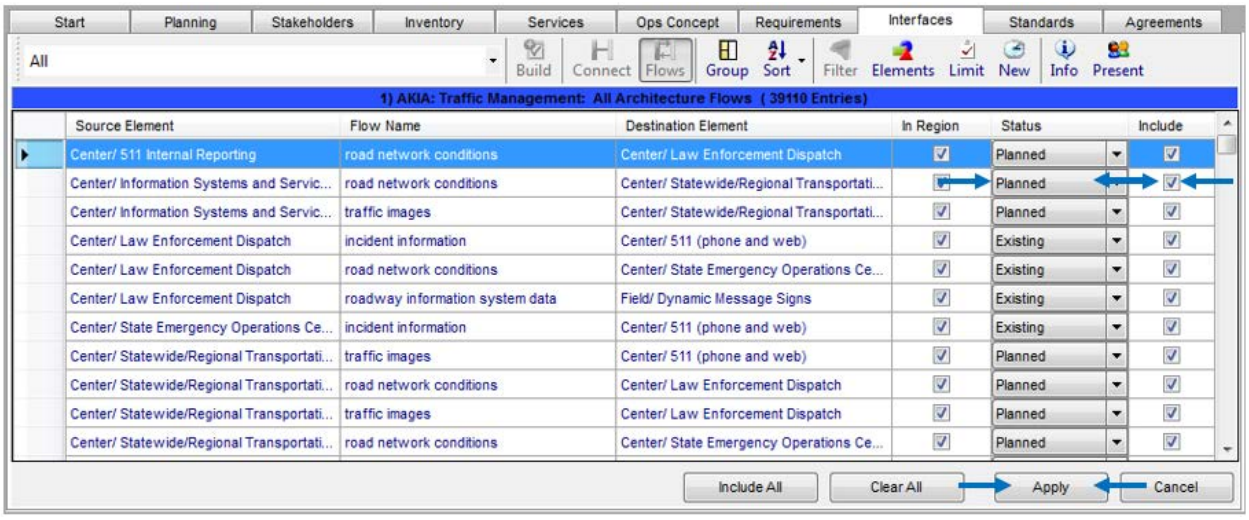
6) After selecting the desired Build Settings and clicking OK, you will return to the **Add Interfaces dialogue box**. Click **No** to start the build process. This may take some time depending on how many flows have to be generated:



7) Once the build is complete, the Add Interfaces dialogue box will show you all of the flows to be added to the Service Area. At this point, you can decide to accept the build by clicking **Yes**, or decline the build by clicking **No**:

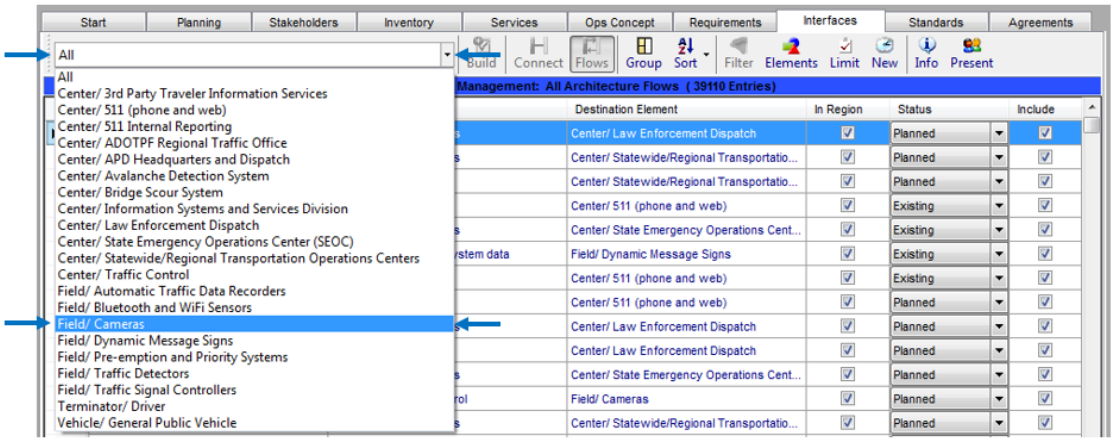


8) Once the build has been completed, you can go back to the **Interfaces tab** where all of your generated flows will reside. Flows are shown by their **Source Element** (where the flow originates), the **Flow Name**, and the **Destination Element** (where the flow ends up). To add a flow to your Service Area, make sure the **Include checkbox** is checked for that flow, then click **Apply** at the bottom. Clicking on the Include checkbox will default the Status of the flow to planned. You can change the Status of the flow by clicking on the **Status dropdown** menu for that flow:

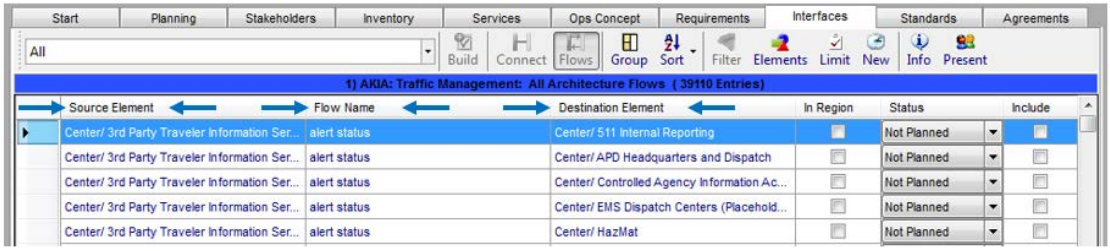


TIPS & TRICKS

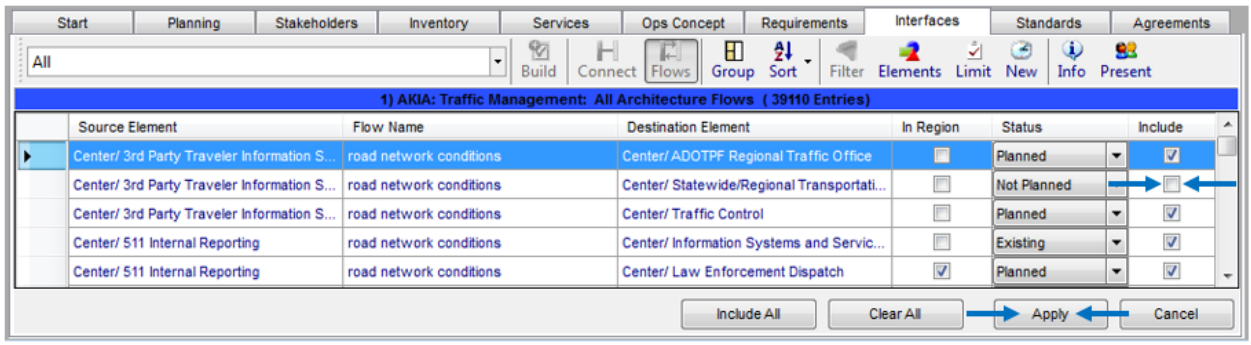
Often times, the number of flows available in the Interfaces tab can be overwhelming. Luckily, Turbo Architecture has several functions to help make your life easier to find the flows you want. One of the first things you can do is to have Turbo only show you the flows that connect to the specific element you are working with. To do this click on the **white dropdown menu** at the top left hand corner. This will allow you to select the element you are looking for:



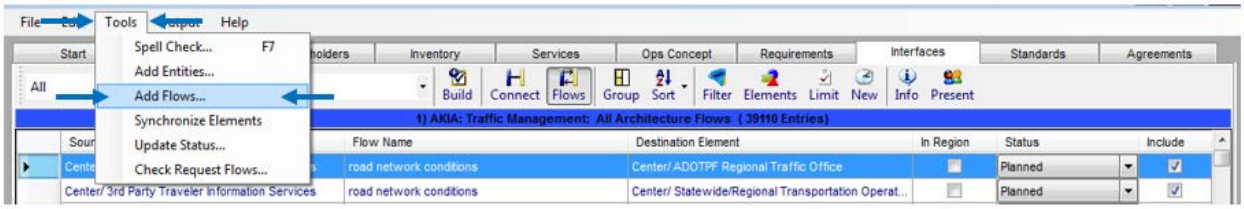
This will lower the number of flows you have to scroll through. Additionally, you can **sort** by any of the columns by clicking on the column header. Typically, **Source Element**, **Flow Name**, and **Destination Element** are good columns to sort by:



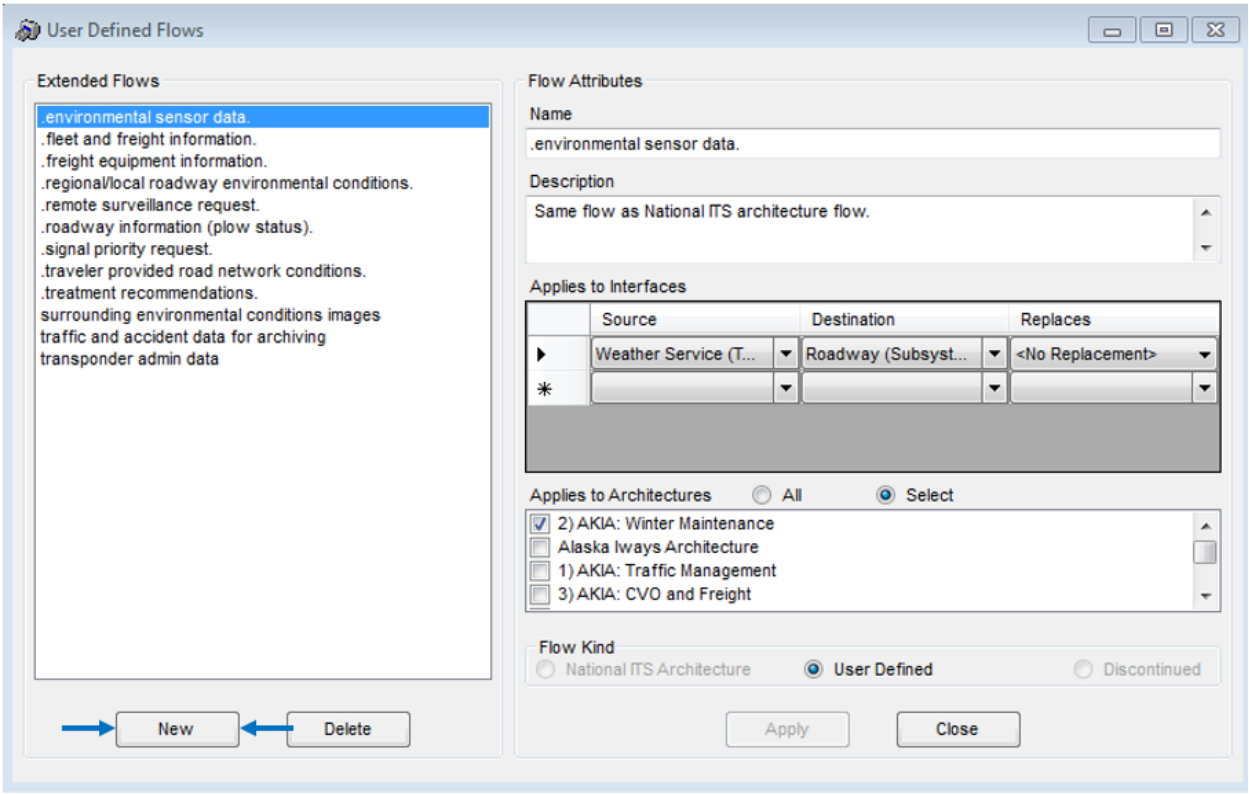
9) **TO REMOVE A FLOW**: Simply uncheck the Include checkbox of the flow you no longer want to include in your Service Area. It will still remain in your **Interfaces tab** if you decide you want to re-include it later on. Click **Apply** at the bottom of the Interfaces tab to confirm your changes:



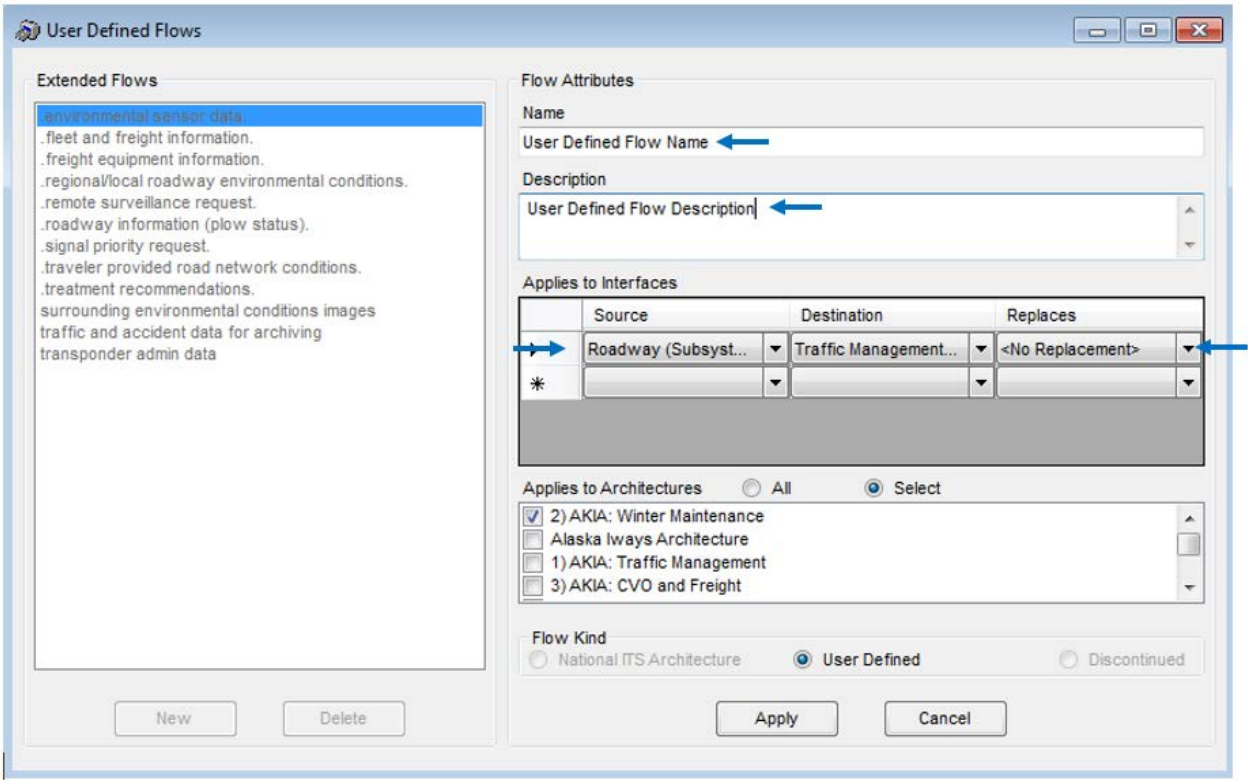
10) **TO CREATE A FLOW**: Sometimes a flow doesn't exist in the National ITS Architecture or the specific flow you want does not connect to the elements you want. In either case, you can create a **user defined flow**. Click on the **Tools menu** at the top of the Turbo screen and then click on **Add Flows…**:



11) The **User Defined Flows window** will pop up. You can edit any existing user defined flows here. To create a new user defined flow, click on **New** at the bottom left hand corner:

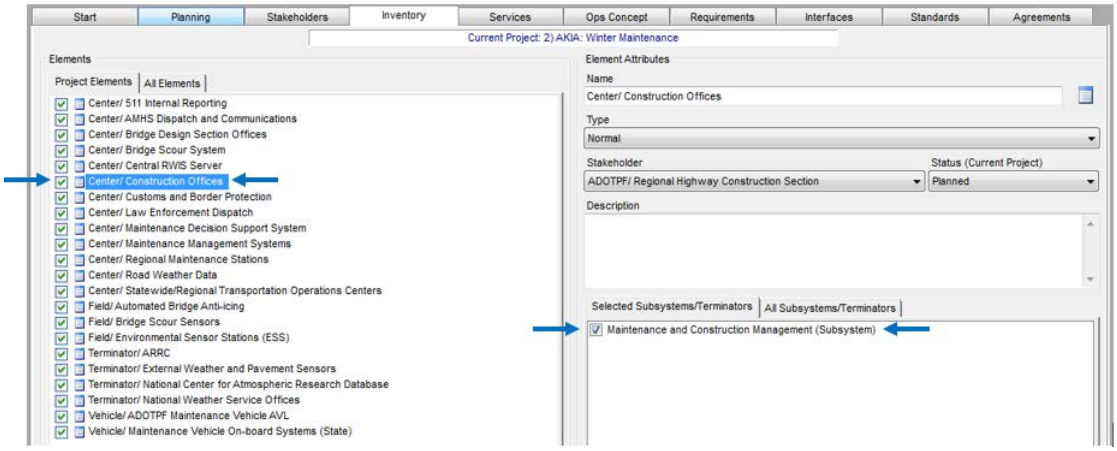


12) The blinking text cursor will automatically appear on the right hand side under **Name**. Enter the name of the flow, enter in a **Description** for the flow**,** select the **source element subsystem/terminator**, **destination element subsystem/terminator**, and if the flow replaces any National ITS Architecture flow.

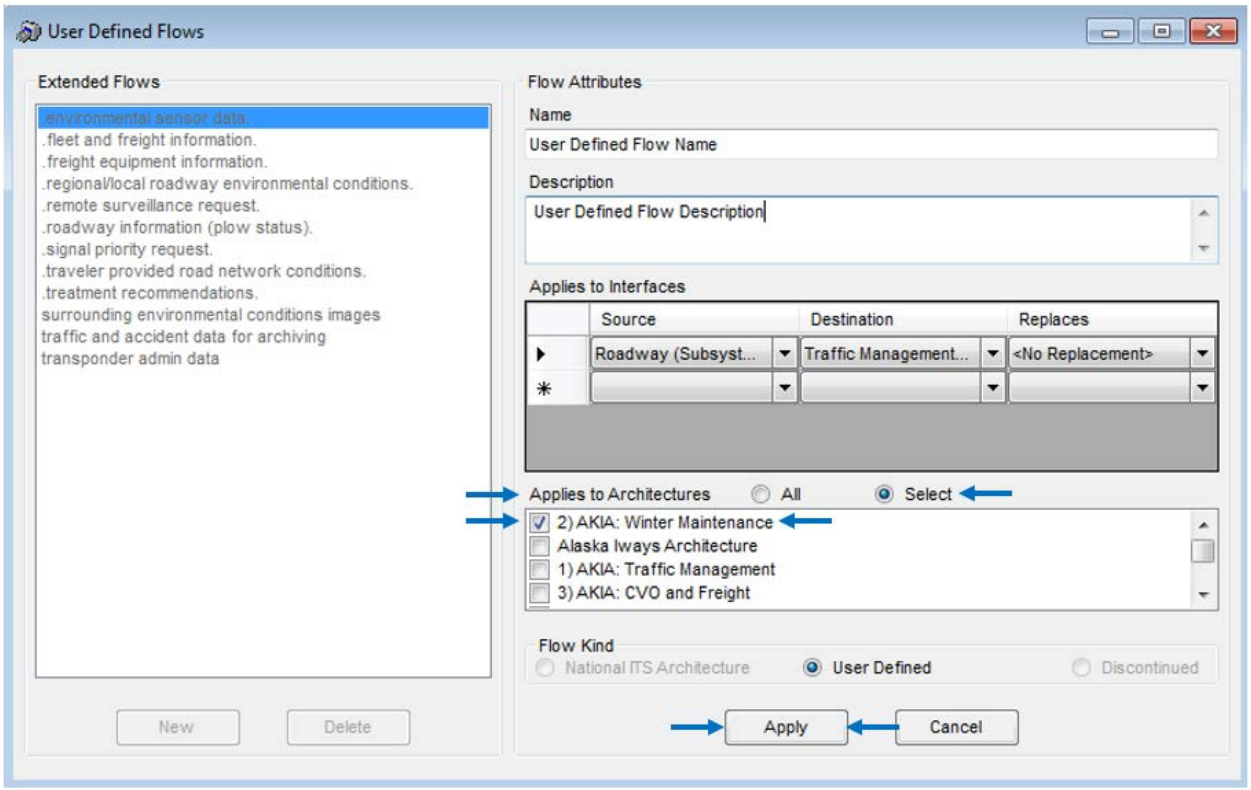


TIPS & TRICKS

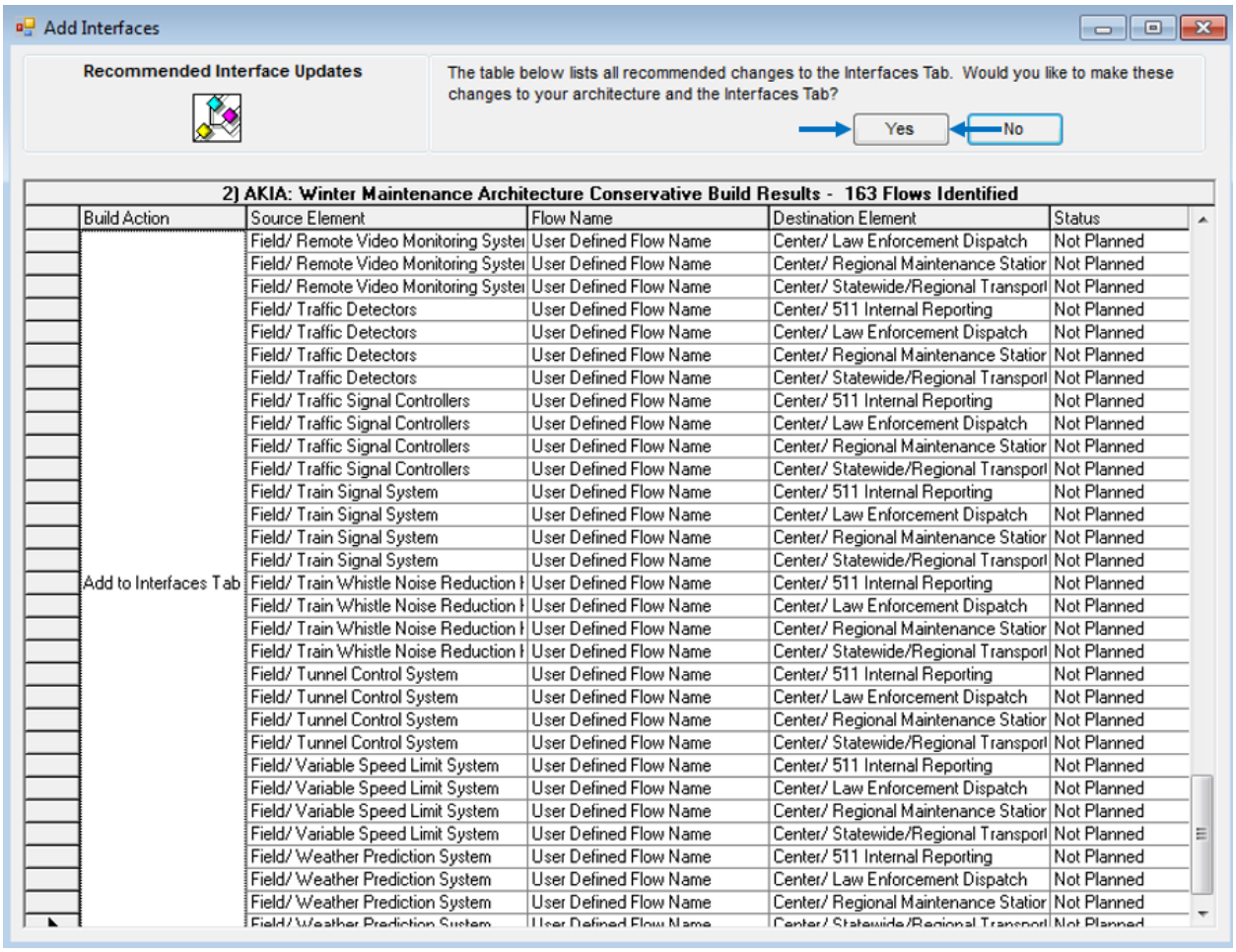
In order to successfully create a flow that will connect to the elements you want, you have to determine what the subsystems/terminators are that make up the elements you want the flow to connect to. Go to the Inventory tab of the subject Service Area to create a user defined flow. Select the elements you are interested in, and the corresponding subsystems/terminator for that element will appear:



13) Then, you are given the option to select which Architecture (Service Area) this flow applies to or if it applies to all of them. If you are only adding this flow to one Service Area, it is recommended that you only select that specific Service Area. Otherwise, you will be filling up all of your Service Area Interfaces tab with unnecessary clutter. Once you have made a decision, click **Apply**.



14) Even though you have created a new user defined flow, Turbo Architecture still has to generate it in your selected Service Area. Go to the corresponding **Interfaces tab** and start a **Build**. The new user defined flow should be generated if you have the correct elements and subsystems/terminators in your architecture. Click **Yes** to accept the generated flows:

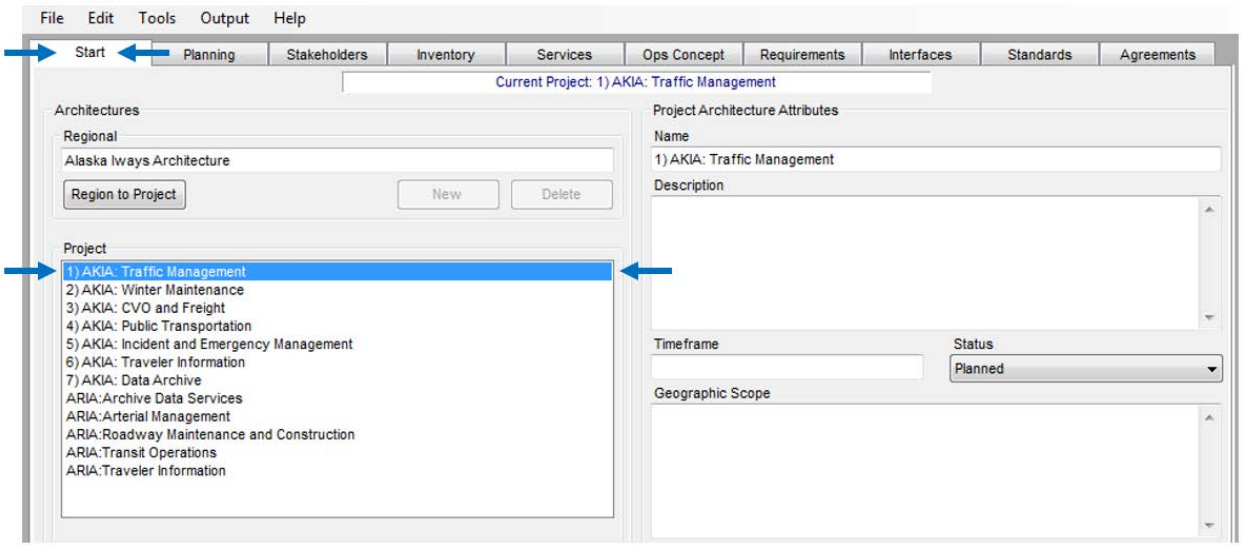


2) AKIA: Winter Maintenance Architecture Conservative Build Results - 163 Flows Identified

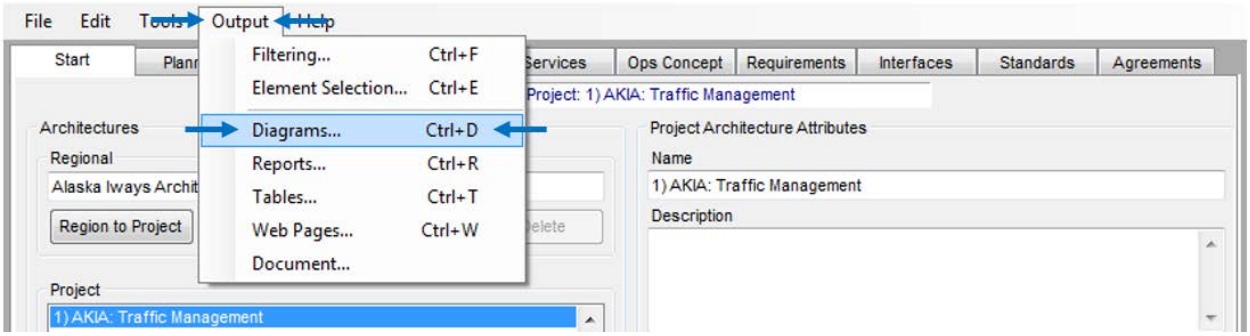
Build Action	Source Element	Flow Name	Destination Element	Status
Add to Interfaces Tab	Field/ Remote Video Monitoring Syste	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Remote Video Monitoring Syste	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Remote Video Monitoring Syste	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Traffic Detectors	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Traffic Detectors	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Traffic Detectors	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Traffic Detectors	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Traffic Signal Controllers	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Traffic Signal Controllers	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Traffic Signal Controllers	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Traffic Signal Controllers	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Train Signal System	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Train Signal System	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Train Signal System	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Train Signal System	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Train Whistle Noise Reduction I	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Train Whistle Noise Reduction I	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Train Whistle Noise Reduction I	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Train Whistle Noise Reduction I	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Tunnel Control System	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Tunnel Control System	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Tunnel Control System	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Tunnel Control System	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Variable Speed Limit System	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Variable Speed Limit System	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Variable Speed Limit System	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Variable Speed Limit System	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned
	Field/ Weather Prediction System	User Defined Flow Name	Center/ 511 Internal Reporting	Not Planned
	Field/ Weather Prediction System	User Defined Flow Name	Center/ Law Enforcement Dispatch	Not Planned
	Field/ Weather Prediction System	User Defined Flow Name	Center/ Regional Maintenance Statior	Not Planned
	Field/ Weather Prediction System	User Defined Flow Name	Center/ Statewide/Regional Transport	Not Planned

4.4 Outputting Flow Diagrams

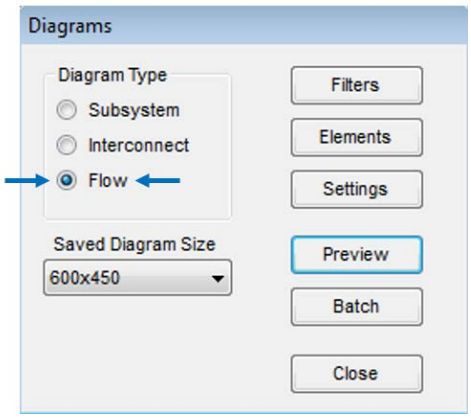
1) Once you have developed a Service Area with stakeholders, elements, and flows, you can create Turbo's Flow Diagrams. In the **Start tab**, select the Service Area you want to create a flow diagram for. In the AKIA, service areas are presented as **Project Architectures**:



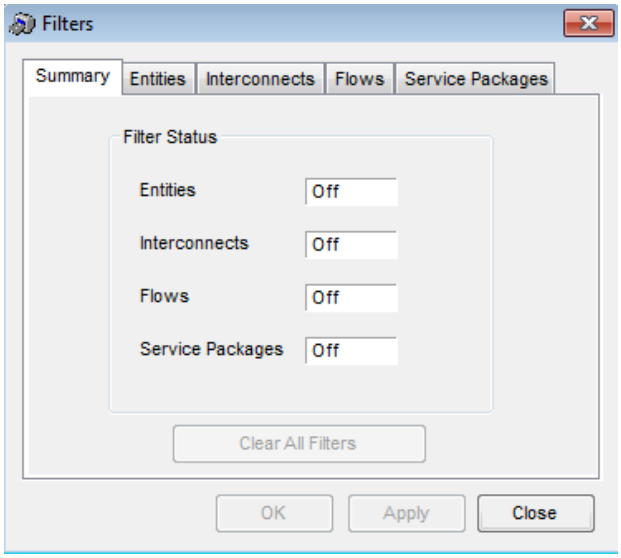
2) Once the Service Area has been selected, click on the **Output menu,** then click **Diagrams…**:



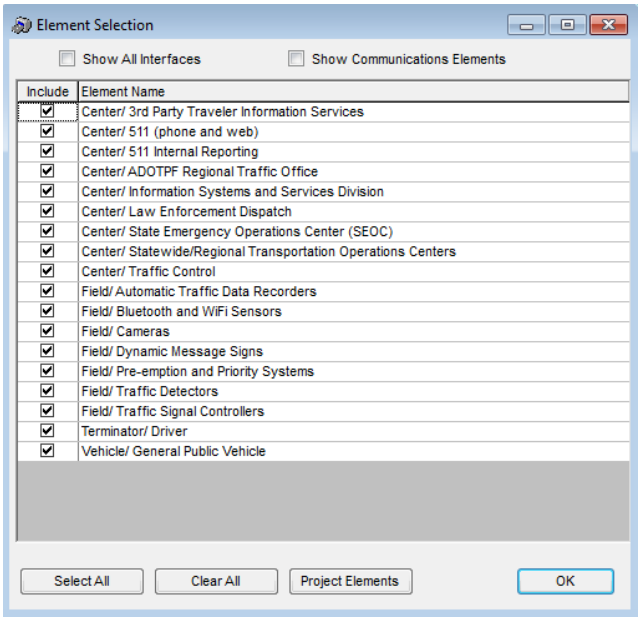
3) The **Diagrams window** will pop up. You can create several types of diagrams here. We will focus on the Flow Diagram. To create a Flow diagram for your Service Area, select the **Flow** option under **Diagram Type**:



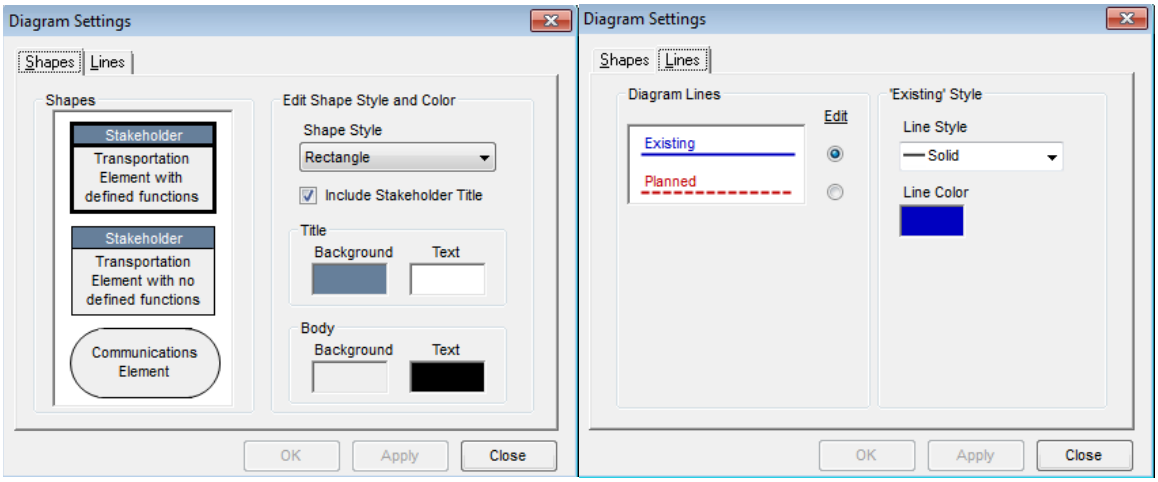
4) Once you have selected the Flow option, the other options become available. Most of these other options you won't need to use. If you just want to create a flow diagram for your entire Service Area, skip to **step 5)**. There are three main options we can go over:
    a. **Filters**: This option allows for you to change what is shown in your flow diagrams. You filter out your diagram to show different **Entities** (Classes and Types). You can also filter by different **Interconnects**, such as Center to Center connections only. Another option is to only show certain types of **Flows** such as existing or planned only. Finally, you can filter to show only certain **Service Packages**, which won't apply to the AKIA with no Services Packages.



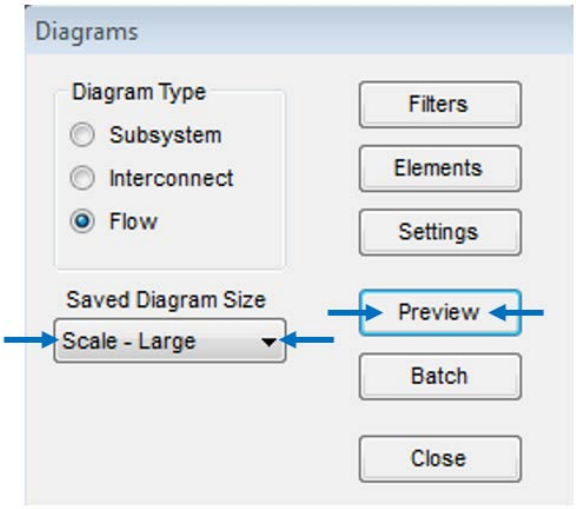
    b. **Elements**: This option is essentially another filter. This allows for you to only show certain elements in your diagram.



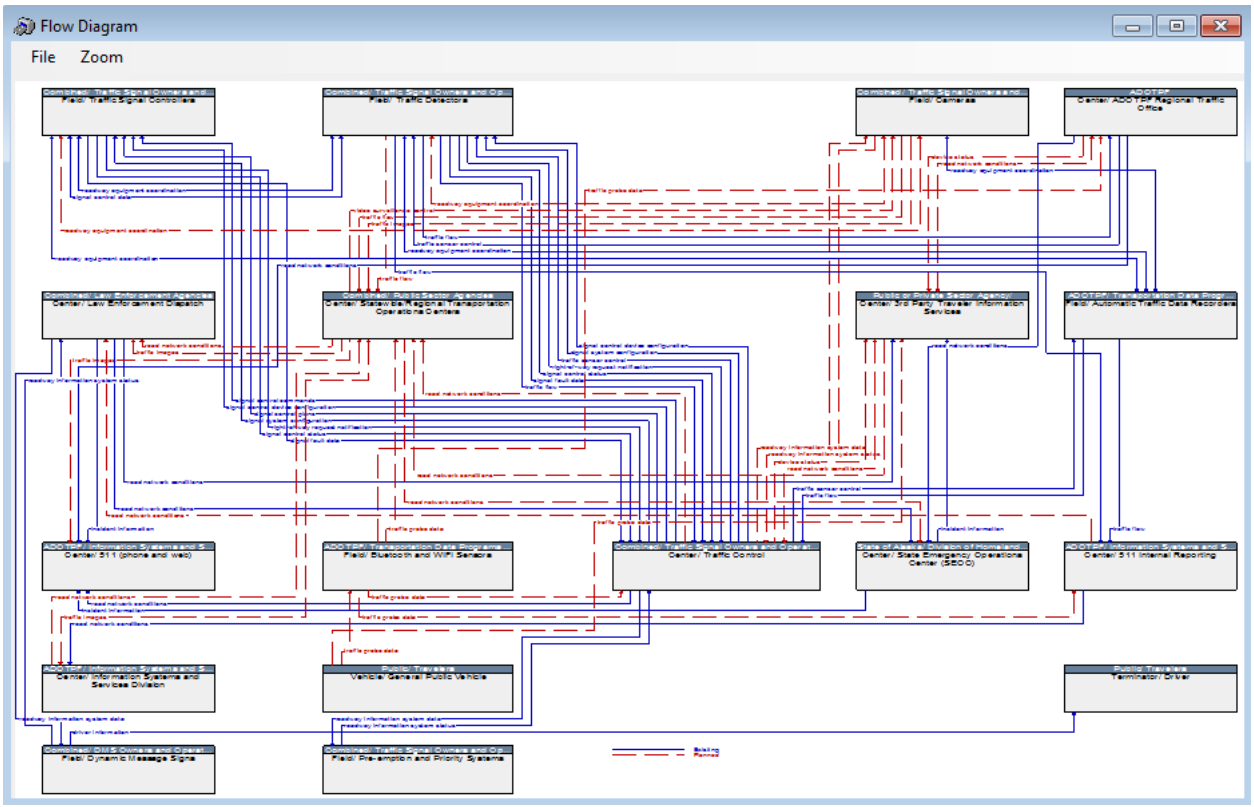
c. **Settings**: This option allows you to adjust the visuals of your diagram. You can change the shape and color of your elements, stakeholders, and flows. Additionally, you can change the line type of your flows.



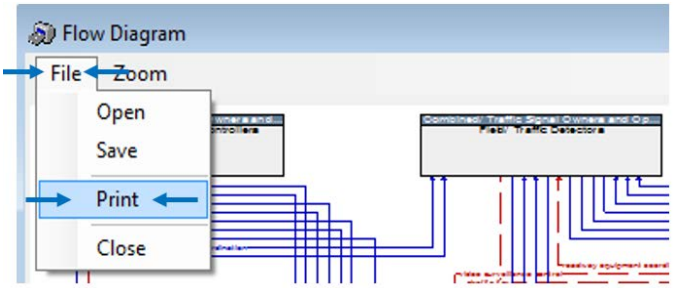
5) It is recommended that the **Saved Diagram Size pulldown** be changed to either **Scale – Large** or **1280x1024**. This will allow for your diagrams to be printed more clearly on large sheets of paper if desired. Once that has been selected, click on Preview to generate your flow diagram:



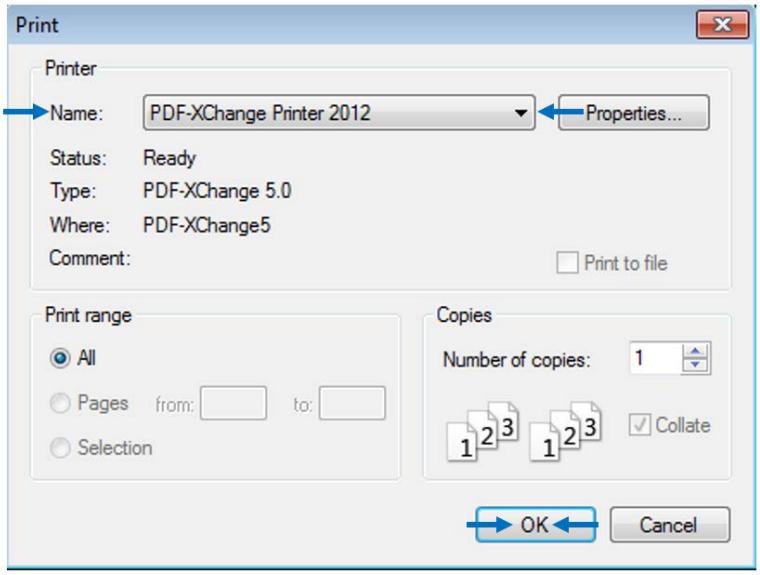
6) Your generated flow diagram will look something like this:



7) To save/print your flow diagram you can either **Save** your flow diagram (it will generate your flow diagram into an image file) or you can **Print** your flow diagram. If you have a program that can read .PDF files, it is recommended you choose the Print option to both save and print the flow diagram. PDFs are easier to deal with in terms of sharing your diagram and printing. Click on the **File menu** at the top of the screen and then the **Print** option:



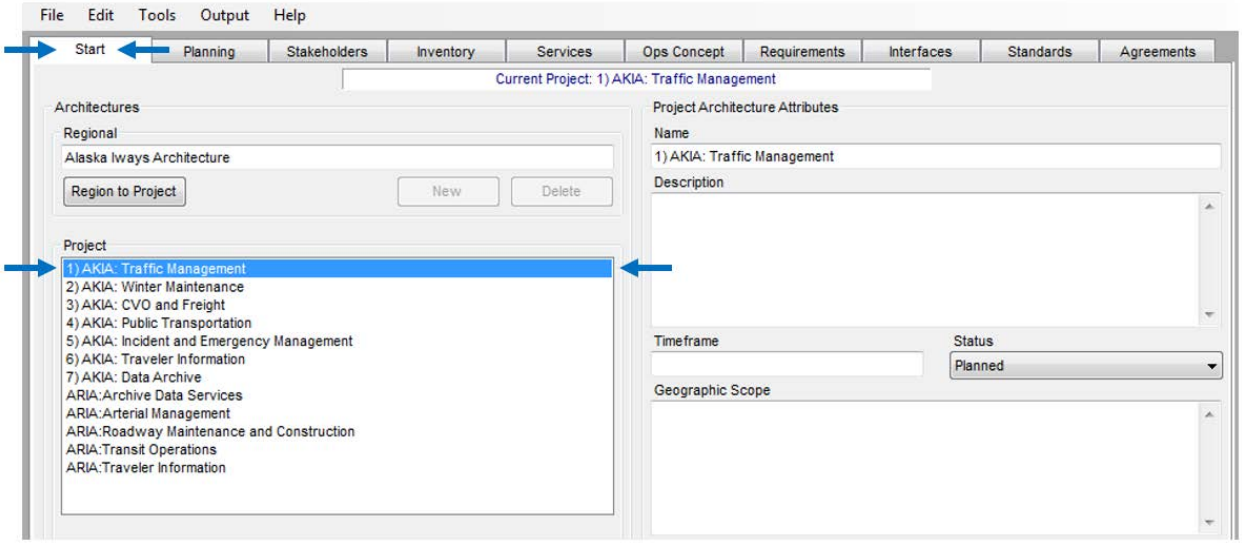
8) If you have a .PDF viewer that allows you to print to it, it should show up under the Name dropdown menu. Select your .PDF viewer and then click **OK** to save to .PDF:



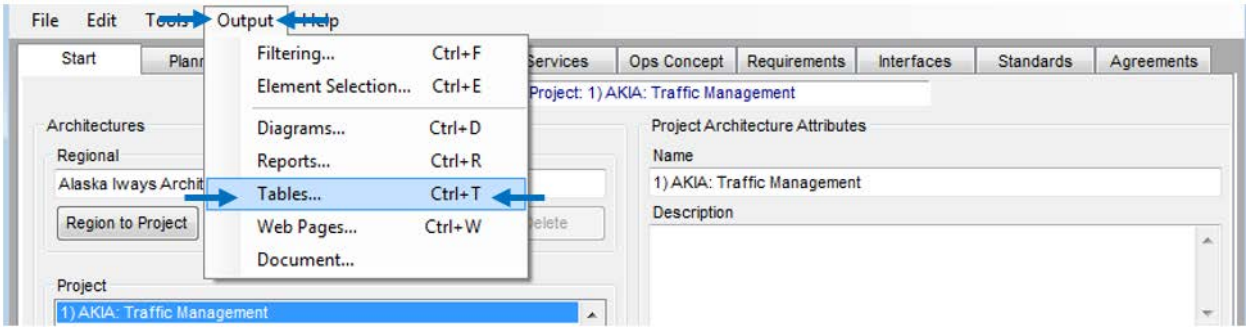
9) Finally, name your new .PDF of your flow diagram and save it at your desired location. You now have a .PDF of your flow diagram for easy viewing and sharing.

4.5 Outputting Tables

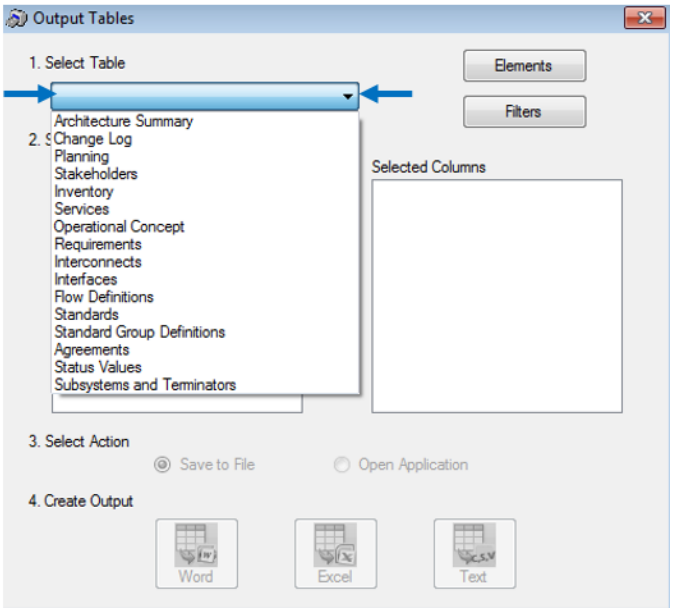
1) In the **Start tab**, select the Service Area you want to create a table for. In the AKIA, Service Areas are presented as **Project Architectures**:



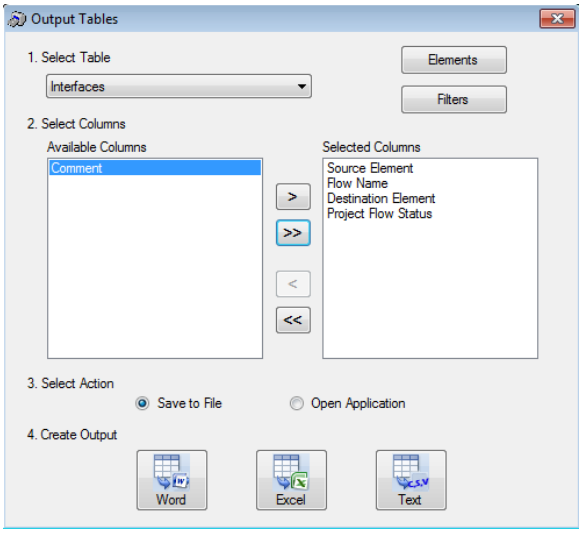
2) Once the Service Area has been selected, click on the **Output menu,** then click **Tables…**:



3) The **Tables window** will pop up. You can create several types of tables here. Click on the **Select Table dropdown menu** to select the table you want to generate:

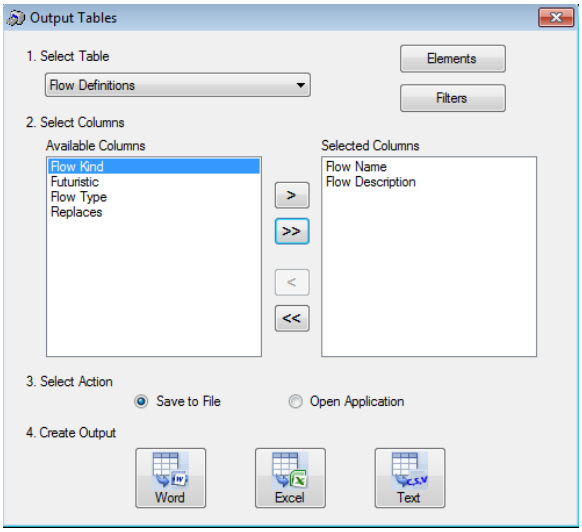


4) After selecting the table you want to create, you can choose which columns Turbo will generate for that table. The columns available are unique to each table. We will focus on the tables presented in the AKIA report. Below is the list of tables used in the AKIA report and what is needed to generate them:
    a. **Architecture Flows Table** (labeled as the **Interfaces** table in Turbo): These tables exist in Appendix D of the AKIA report. These tables summarize all of the flows that is included in your selected Service Area, including the source element, the flow name, the destination element, and the status of that flow. To create this table, you need to have flows "**Included**" in the Interfaces tab. Here are the columns selected to generate the tables in the AKIA:

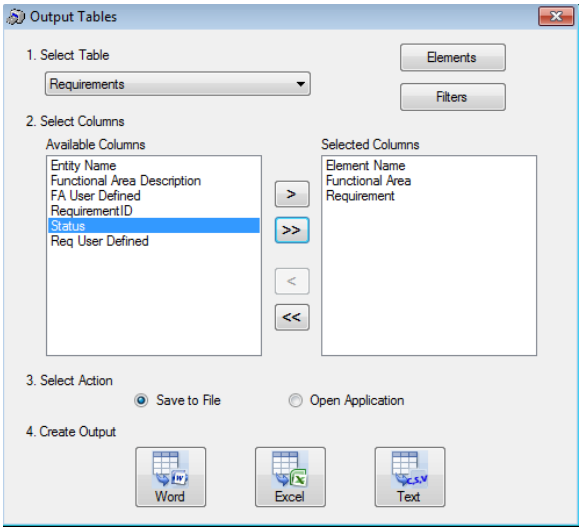


    b. **Flow Definitions Table** (also labeled as **Flow Definitions** table in Turbo): These tables exist in Appendix C of the AKIA report. These tables provide the National ITS Architecture definitions of each flow used in the Service Area. To create this table, you

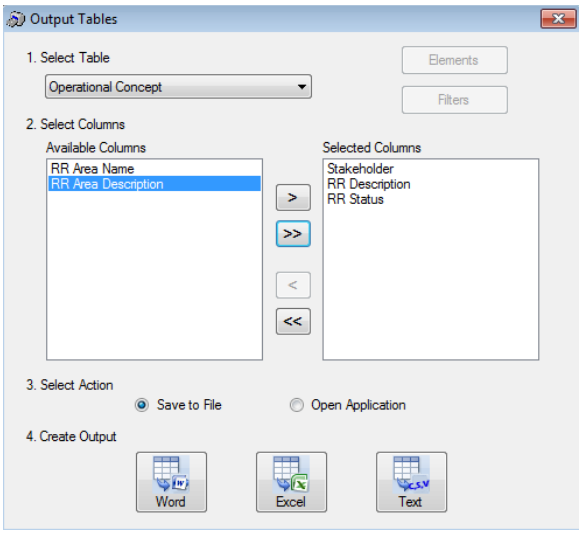
need to have flows "**Included**" in the Interfaces tab. Here are the columns selected to generate the tables in the AKIA:



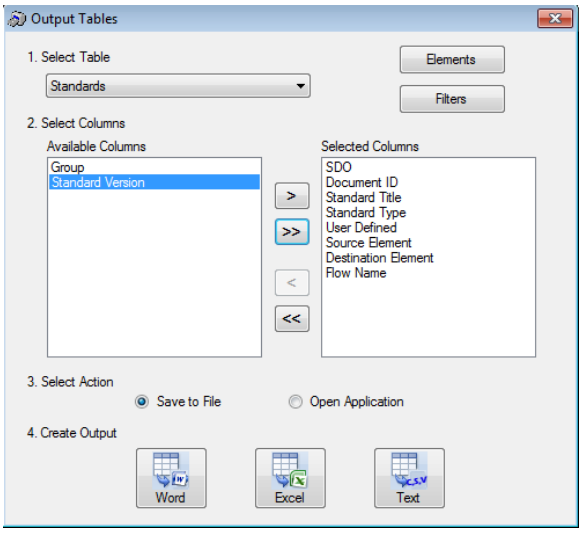
c. **Functional Requirements Table** (labeled as the **Requirements** table in Turbo): These tables exist in Appendix B of the AKIA report. These tables summarize what each element can do in the Service Area. To create this table, you need to have the Requirements tab completed for the elements in the Service Area. Here are the columns selected to generate the tables in the AKIA:



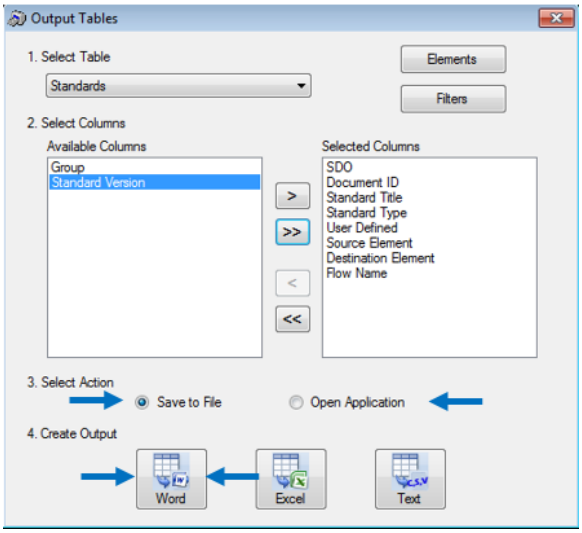
d. **Roles & Responsibilities Table** (labeled as the **Operational Concept** table in Turbo): These tables exist in Section 4 Operational Concept of the AKIA report. These tables summarize the roles and responsibilities of each stakeholder within the Service Area. To create this table, you need to have the Ops Concept tab completed for the Service Area. These roles and responsibilities are manually entered by the maintainer for each stakeholder in the Ops Concept tab. Here are the columns selected to generate the tables in the AKIA:



e. **Standards Table** (also labeled as the **Standards** table in Turbo): These tables exist in Appendix E of the AKIA report. These tables summarize the applicable USDOT ITS Standards for each flow in the Service Area. To create this table, you need to have flows "**Included**" in the Interfaces tab. Here are the columns selected to generate the tables in the AKIA:



5) Once you have selected the columns for your table, you can select to either **Save to File** or **Open Application**. Select the action you want then click on the type of output you want. You can choose between **Word**, **Excel**, or **Text**. It is recommended that you choose the **Word** output if you are updating the AKIA report. This allows for you to easily copy and paste the tables into the report:



6) Once you've clicked on your desired Output, Turbo will either Save your file to a location of your choosing, or open the file based on the type of output you've selected. You have now successfully generated a table.