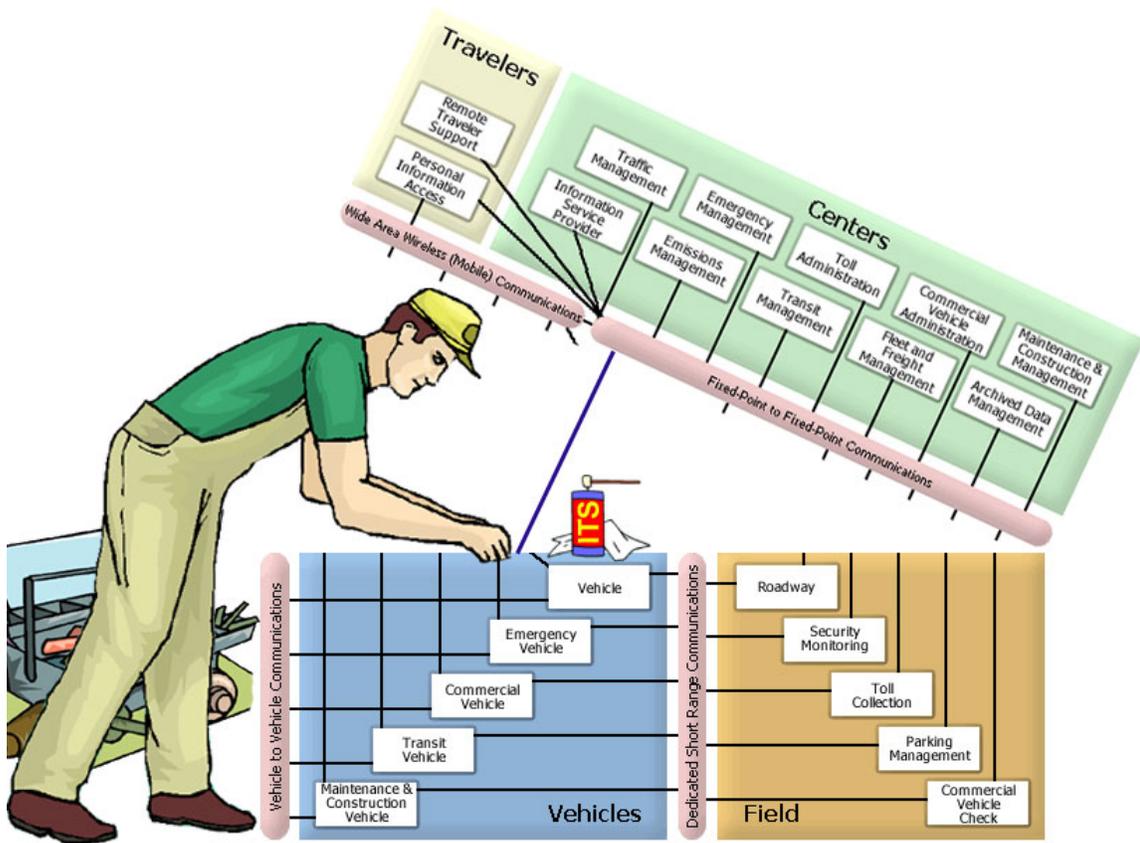


Regional ITS Architecture Maintenance Resources

Technical Advisory



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Regional ITS Architecture Maintenance Resources Technical Advisory

1 Introduction

Over the last several years regions throughout the United States have established their regional Intelligent Transportation Systems (ITS) architectures and to varying degrees are incorporating this work into their overall Transportation Planning Process. Due to state, regional, and local variations in the practice of transportation planning, local stakeholders decide how best to incorporate the regional ITS architecture and the products produced during its development into the Transportation Planning Process, and vice versa. The planning process has two primary planning and programming documents as its overall output. They are Transportation Plan¹ and the Transportation Improvement Program (TIP). Numerous transportation planning activities feed information to the development of the Transportation Plan and TIP. Resources needed for these planning process developments are well understood. Incorporation of the regional ITS architecture as another input to that process has not challenged those resource allocations. Resources needed for the maintenance of a regional ITS architecture and facilitating its use during project development are not as clearly understood or documented to date. This Technical Advisory begins to clarify these needs.

The regional ITS architecture becomes the blueprint or framework for integrating ITS systems operationally from a regional perspective. This cooperative development results from efforts to comply with the FHWA published Final Rule on *ITS Architecture and Standards* (23 CFR 940) and the FTA published companion Final Policy. There are two aspects to the Final Rule/Final Policy architecture requirement: 1.) develop the architecture, 2.) establish the maintenance plan to manage change and facilitate use by project sponsors.

As preparations get underway for each new planning year, a main consideration for regions is actual administration of the maintenance plan. Having a regional ITS architecture change management plan is one thing, having the resources identified to administer the plan is another. **THIS IS NOT A ONE-TIME NEED.** A region has made substantial investment in their regional ITS architecture and it will pay dividends over the long run. By failing to keep the architecture current, it will become obsolete, and potential benefits of regional implementation and operations will be lost.

To maintain a regional ITS architecture consensus, all stakeholders will need to participate to some extent. Typically, one agency or institutional group will take

¹ Because it is called various names across the country, in this Technical Advisory the Transportation Plan refers to the product of the process of long-range planning.

the lead responsibility to maintain the regional ITS architecture. Although the responsibility may be delegated to an individual at any given time, overall responsibility is the stated role of an institution or agency in the region. For the purposes of this Technical Advisory, the term “regional ITS architecture maintainer” will refer to that organizational body, not a specific individual or champion. It is important that the regional ITS architecture maintainer identify their planned architecture maintenance plan activities and applied resources, within their operational emphasis area and related budget.

The discussion that follows will do the following:

- Suggest a resource estimate to start with, in a work-load/budget analysis
- Describe the variables that influence resource allocation up or down, and
- Explain where substantially more resources may be needed

The Regional ITS Architecture Maintenance White Paper, dated January 31, 2004 is recommended reading. It is a complete and detailed guide for the development of a regional ITS architecture maintenance plan and the activities involved in maintaining it. This Technical Advisory builds upon that White Paper, providing an understanding of resources needed to effectively maintain a regional ITS architecture. This may be downloaded from the FHWA's ITS Electronic Document Library (EDL) at http://itsdocs.fhwa.dot.gov/ipodocs/repts_te/13957.html.

2 Estimate of resource allocation

An estimate **to start with** in a workload and budget analysis is 5 percent to 10 percent of a mid-level managers' compensation (salary and benefits) devoted to maintaining and facilitating the use of the regional ITS architecture for one year (there is no empirical data available nationally). In addition, there are several factors to consider when evaluating where in this range is reasonable, or whether considerably more is needed. These factors are categorized as:

- Comprehensiveness of the current regional ITS architecture, i.e., number of stakeholders or services not addressed
- Technical and institutional complexity of the regional ITS architecture, i.e., number of stakeholders, number and scope of transportation services, how many elements or connections could potentially be changed, or the number and types of interagency operational agreements existing
- Complexity of the Regional ITS architecture maintenance plan, i.e., extent of configuration management process, frequency of incremental changes, and full baseline updates
- Level of ITS investment, e.g., amount of planned deployment in the TIP and the Transportation Plan
- Staff knowledge and experience with ITS and the regional ITS architecture

A higher percentage than 5 percent to 10 percent may be reasonable under certain combinations of these factors; or perhaps full-time staffing may be suitable for extremely complex regions (e.g., dozens of public transit agencies, and hundreds of transportation governmental agencies and emergency services providers). The discussion that follows should help tighten these ranges for an individual region.

3 Variables influencing resource allocation

Maintenance for allocating resources by looking at three categorical functions that are carried out is discussed here. They are prioritized from a time-critical standpoint. The functions are:

1. *Using* the regional ITS architecture for project development
2. *Maintaining* the regional ITS architecture to address project-related incremental revisions
3. *Evolving* the regional ITS architecture as a full baseline update (i.e., version 1.x to 2.x)

3.1 USING the regional ITS architecture for project development

With the Final Rule/Final Policy project eligibility requirement of “Identification of portions of the regional ITS architecture being implemented”, time is needed to make the regional ITS architecture accessible to project sponsors’ design staff, and to assist them in becoming familiar with it. Even though many of the projects that come forward for design during the first few years will likely have been reflected in the regional ITS architecture, the reality is that the specific project designer within the State or local agency is going to need assistance to become familiar with the regional ITS architecture and process for comparing the project to the architecture. Most likely, any participation in the dialogue that led to the regional ITS architecture was by an agency manager or senior staff member. This “start up” outreach and education to project designers can take considerable time. Another consideration is that the project developer will likely not use these skills again soon enough to remember them, particularly if the use of the Turbo Architecture electronic database is involved. Maintainer resources that educate and provide access to the regional ITS architecture will have to be weighed against effort to extract the information for the project designer.

Peripherally for the regional ITS architecture maintainer and directly for the project sponsor, time may also be needed to establish new ITS project development procedures established to meet the Final Rule/Final Policy. In the meantime, resources will need to be allocated on a project-by-project basis to instruct design staff in the use of these new procedures in adherence to the regional ITS architecture.

ITS projects listed in the TIP should prove useful in a workload and budget analysis to determine annual resource allocation. Knowing the level of ITS

investment for the upcoming year will judge how much the regional ITS architecture will be used. The TIP listing will also assist in providing timely outreach and education of systems engineering best practices before project design considerations begin.

Regional ITS architecture mapping is an eligibility criterion for federal funding of ITS projects; therefore, use of the architecture is the most important and time-critical function of the regional ITS architecture maintainer. This will represent a large portion of time allocated by the regional ITS architecture maintainer. Staff turnover may increase the amount of time needed, unless duties are carefully documented as part of job responsibilities. In general, the more the architecture is used to support planning and project development activities, the greater the level of changes it will probably see. This leads to the discussion in Section 3.2 on revising the regional ITS architecture.

3.2 MAINTAINING the regional ITS architecture to address incremental revisions

Minimum maintenance may be needed for projects currently going forward to design that are direct products of a recently completed or updated regional ITS architecture. It is important to recognize, though, that projects will not always be implemented exactly as they were described in the regional ITS architecture. Detailed design scope and operational considerations will result from the initial tasks of project development using the systems engineering process. There is a need to “close the loop” by ensuring that “as-built” information is fed back into the regional ITS architecture in a timely fashion (e.g., immediately after detailed design). If the project was not well described in the regional ITS architecture (i.e., a generic description of bus signal priority), or if significant changes to the project occurred, the maintenance effort will be greater and more time-critical.

As time eclipses and the current TIP and new projects/applications come forward, considerable more time may need to be devoted to changing the regional ITS architecture. There may be an increase in the number of changes submitted between updates. Applications may broaden in scope and significance across stakeholder groups. Changes may trace deeper into the strategic planning process (i.e., changes to operational concept rather than simply changing an information flow). Through an accumulation of these factors, incremental revision may eventually prove unreasonable. Evolving the regional ITS architecture into a full baseline update (as discussed below in Section 3.3) may better reflect time and effort needed for maintenance. It will be a regional judgement when that balance may possibly shift from incremental change to full update.

The regional ITS architecture development may not have included participation by all stakeholders or stakeholder groups. Depending on the level of consolidation represented in the regional ITS architecture, resources may need

to be allocated for outreach to stakeholders that have not been engaged. Whether in group discussions, or individually, it is important to validate whether the regional ITS architecture represents their ITS requirements as well. Depending on the number of additional stakeholders, number of new ITS requirements, and extent of change needed for the strategic planning that led to the regional ITS architecture, incremental revision may eventually prove unreasonable. Evolving the regional ITS architecture into a full baseline update may better reflect time and effort needed for introducing a number of new stakeholders. A broader initiative to periodically reach out to *all* stakeholders within a region to validate their interests is the subject of evolving the regional ITS architecture into a full baseline update, covered in Section 3.3.

Making these incremental revisions to the regional ITS architecture is less time-critical than assuring access and use, but may need to be done at least every 6-12 months.

3.3 *EVOLVING* the regional ITS architecture into a full baseline update

The regional ITS architecture is a snapshot in time that may not have engaged every stakeholder group in the region, nor cover every transportation service in the most recent update to the National ITS Architecture. An initiative needs to be in place to periodically reach out to all stakeholders in a region to assure that new applications are represented and their operation reflects regional interests. Periodic validation of regional horizon goals and existing stakeholder interests is a byproduct of this initiative. Additional time will be spent getting some subset of the stakeholders together in one or more workshops to review the architecture. A series of changes will naturally flow from these meetings that can be incorporated into the architecture. The level of effort required for these meetings will be dependent on how many meetings are planned and the presentation of the architecture to the stakeholders and the documentation of their discussions. This can be a challenge when the stakeholders are outside the historically traditional transportation community, for example emergency services providers.

New elements from the National ITS Architecture will also have to be considered, such as the recent addition of improved coverage of transportation security applications. These applications may result in revisiting the early stages of strategic planning to establish new operational concepts and functional requirements driven by the need for these services in the region.

The regional ITS architecture maintainer is not expected to have a full depth of knowledge in all National ITS Architecture transportation services. An update of this scale using strategic planning from needs and analysis to final regional ITS architecture project can be daunting for the regional ITS architecture maintainer. Contracting out this update may be a more practical solution. Certainly costs and resource time will increase with this scenario, whether performed in-house or outsourced.

These initiatives to evolve the regional ITS architecture into a new baseline version are the most negotiable and exchangeable because a little or a lot can be done as time allows. This may be an initiative to undertake as part of the 3- to 5-year Regional Transportation Plan update.

4 Where substantially more resources may be needed

As an estimate, the following issues could double the original estimate from 10 percent to 20 percent time allocated by the regional ITS architecture maintainer for regional ITS architecture maintenance or, full-time staffing may apply for extremely complex regions (dozens of public transit agencies, and hundreds of transportation governmental agencies and emergency services providers).

These overriding issues are:

- Regional ITS architecture maintainer experience in ITS and the regional ITS architecture
- Region size and complexity

4.1 Regional ITS architecture maintainer experience

The discussion of this Technical Advisory – up to now – has been from the viewpoint that the regional ITS architecture maintainer personnel have been involved in the regional ITS architecture development all along and/or have a good understanding of ITS. When new personnel are assigned to ITS and the regional ITS architecture, they must “climb the learning curve”. At this point, the resource allocation for maintenance becomes several orders of magnitude larger. They will need training on the National ITS Architecture, training on the Turbo Architecture software tool for regional ITS architecture documentation, possibly an introduction to ITS in general, plus time to become familiar with the contents of their regional ITS architecture. Familiarity with new ITS project development procedures established to meet 23CFR940 will also be necessary.

This professional capacity building regimen assumes the availability of training courses and orientations, instead of learning by “self-study”. Nationally developed training courses are available through the National Highway Institute (NHI) and the National Transit Institute (NTI). However, these are not always available when needed, have a cost associated with them, and require a minimum class size. More information can be found on the NHI and NTI internet web sites:

<http://www.nhi.fhwa.dot.gov/> and <http://www.ntionline.com/>. One-stop access to training, education and technical resources for ITS success can be found at <http://www.pcb.its.dot.gov/default.asp>. FHWA Division and Resource Center offices can offer basic introductions to ITS and architecture, help arrange for delivery of National courses, and provide technical assistance. Travel costs of participants will be needed for multiple-day classes centrally delivered within the state in order to meet minimum class size requirements.

4.2 Region size and complexity

The size of the region, complexity of intergovernmental relations, and ITS activities already underway and proposed will impact the need for resources. This will reflect on resource time of the regional ITS architecture maintainer, most likely it has already been a factor in all aspects of the regional ITS architecture maintainer's transportation program. Large regions here are defined to have multiple municipalities, diverse and/or large number of governmental organizations or service providers, and often perceived to have incompatible agendas. Where individual counties within a region have developed regional ITS architectures, there may be maintenance agreements with the county partners to pool resources for maintenance of the several regional ITS architectures.

Mediation of conflicting implementation approaches can lead to new resource considerations where institutional complexity of regions and conflicting policies exist. While keeping the regional ITS architecture relevant, there will be times when consensus or buy-in to the architecture breaks down. Maintenance plans usually point to an existing institutional management group for overarching policy decisions and as the venue for executive information. The regional ITS architecture maintainer's management board of supervisors, policy committee, commission, or council has this responsibility. The role is often assumed as simply endorsement of staff recommendations associated with the regional ITS architecture, with outstanding differences resolved at the staff level. Where strong local initiatives move quickly and precedent decisions on systems integration are made without regard for the whole region, conflict may need to be elevated to the management board (or other agreed upon policy group) without staff resolution. This has occurred in the past with regard to the telecommunications backbone communications architecture and the related protocols for agency systems to share information and control with each other (electronically talk to each other). This should not be taken lightly and may sometimes be contentious. Two ingredients to produce compromise are time and committed members. Depending on what form this policy group takes in the regional ITS architecture Maintenance Plan, the members should understand that these issues arise. This should be kept in mind as regional integration unfolds and resources are needed to make it happen.

In summary, as you can see there is variability in what resources will be needed to guide successful integration of ITS systems. Considering all of the issues brought out here, the perception is that regional ITS architecture maintenance is a huge order. That is not the case. Not all of the issues discussed here will have an impact in every region. This paper, will assure that no major surprises surface during the year and cause a debate of priority, an imbalance in staff time, or delay in project funding. The 1997 Transportation Bill (TEA-21) sought to take the transportation operations community to a new level of collaboration and cooperation. The concept of a framework for tying systems together in a region

for better control and to share information was new to many transportation professionals. Today, there is the growing realization that regionalism is achievable and has potential benefits. Executing maintenance planning of these architectures is also new territory and will assure realization of those benefits and sustainability of the effort. As we progress through these formative years, knowledge and understanding will be gained. As regions' experience in implementing 23CFR940 grows, better information will be captured and shared.