RELEASE 1.00

SAE ATIS use with ADUS GUIDE DOCUMENT

A training document developed to teach the
ATIS message set standards

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HTTP://SERV1.ITSWARE.NET/ITSSCHEMAS/ATIS%20GUIDE/ATIS-ADUS/

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HTTP://WWW.ITSWARE.NET/ATISWORKINGDRAFTS/GUIDE/

CURRENT TECHNICAL SUPPORT AND INFORMATION EXCHANGE ABOUT USING THE ATIS STANDARDS IN DEPLOYMENT AND WITH OTHER ITS STANDARDS CAN BE OBTAINED AT THE *ITS STANDARDS FORUM*, A COMMUNITY RESOURCE AVAILABLE HTTP://WWW.ITSSTANDARDS.NET/BB/INDEX.PHP

THERE IS A SET OF FORUMS DEDICATED TO ATIS RELATED ISSUES AT
HTTP://WWW.ITSSTANDARDS.NET/BB/INDEX.PHP?C=3

ATIS used with ADUS Guide – Table of Contents

Part I Considerations for use of ADUS in ATIS

Part I of this guide covers a number ADUS topics and the required metadata elements. **Part II** of the guide provides a few additional recommendations for using ADUS with and XML schema style deployments found in ATIS.

An Overview of the ADUS in ATIS

At a broad level "supporting ADUS" means formatting, sending and capturing your ATIS information (and storing it) in a way that is helpful to others who may wish to use it beyond its immediate applicability and prime function as a message set to inform about current traffic situations. This means supporting a wider user community, made up of planners, statistical researchers, and other persons who may have uses for the data which you (or they) never considered until the need arose.

Supporting this may involve sending additional data elements, or documenting additional aspects of your data sets and how they were collected or processed, but most of the effort is typically found in how the data is kept or archived so that its full usefulness can be extended. Admittedly, it is harder to plan for such vague requirements, but the essence of a good ADUS approach is one that lets others put your data to new uses long after your original need has passed. The ADUS committee has formulated a number of recommendations on how best to do this. This guide addresses using this information in an ATIS style deployment.

The first fundamental requirement to support ADUS is one we have stressed in the entire set of guides, that of documenting your own baseline approach. Many aspects of the data sets which you consider obvious or of common knowledge will be lost over time unless stored and kept. The other ATIS guides stress the need to precisely document the data semantics and XML schema set being used at any given time (being focused on the message formats themselves). The ADUS committee adds similar requirments for how the data is gathered, processed, filtered, smoothed, etc., so that can become of importance to the end user.

Many of these concerns have more of an impact on message sets such as TMDD where real time device measurements are kept, but they also apply to ATIS messages for events, links, weather, etc.[1] Researchers may mine your data in ways which never occurred to you (such as gathering statistical data on how many incidents involved multiple vehicles, etc.). Often ADUS data uses span wide ranges of time. The baseline of your data will

[1] In fact, while ATIS tends to use a model of a each event being updated as new data about it arrives and sending that "then current" data in a summary message to various subscribers, the ADUS user may be interested in much of the transitory information that can be lost in the ATIS updating process. Details like the time intervals between updates and the evolving nature of the events are rich areas for ADUS mining that need to be considered.

change over time. Without a known baseline process this will contribute problems for ADUS users when the details of older data sets become confused.

Often the ADUS user may need access to the raw SQL and tables in order to perform direct queries on it. They typicaslly will not have an intermediate logic layer providing a well formed standardized message format, as is found in most of the ITS message sets. A good database design anticipates this need and allows such queries while maintaining the needed security in the system.

Relevant ADUS documents

The ADUS standards are published by ASTM and the committee itself is organized as "Subcommittee E17.54" (Committee E17 is the ASTM group called *Vehicle-Pavement Systems*). As a committee they have something of a cross-cutting role because effective ADUS use and data capture affects all of the message sets as well as a number of the NTCIP device standards. As a consequence, the standards that they produce are not in the same format as the data dictionaries which "message set" standards such as ATIS or TMDD produces. Rather, their work is a collection of recommended methods and approaches for supporting ADUS usage with these other standards. Where most of the other message set standards deal with interfaces, these standards delve a bit deeper into relational database matters, data processing, and other system design issues.

At this time there are three standards of interest to developers of ATIS systems that would want to support ADUS. They are:

1. Adopted E2259-03a
   Standard Guide for Archiving and Retrieving ITS-Generated Data
2. Adopted E2468-05
   Standard Practice for Metadata to Support Archived Data Management Systems
3. Work Item WK7604
   Specification for Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data

The first of these (E2259-03a) is a 24 page document that generally outlines the key considerations for creating a system supportive of ADUS needs. While it provides no *specific* requirements for builders, it should be consulted and considered for the points it raises. The concepts of a repository operating as a *data-mart*, *data-warehouse*, and *virtual-data-warehouse* all relate well to the typically types of data senders found in

ATIS systems. All these systems have in common some storage ability, typically implemented in some type of SQL style database discussed in greater depth in the ATIS DB guide documents.

The second of these (E2468-05) consists of 83 pages of information relating *how* to add some types of meta-data to messages and records to increase their value for ADUS use, and describing a recommended *meta-data framework* system. The document makes extensive use of the Federal Geographic Data Committee's *Standard for Digital Geospatial Metadata* (FGDC-STD-001-1998[2]) in these recommendations. This is part of a larger effort to capture and classify geospatial data on a national basis. The supporting "workbook," titled *Content Standard for Digital Geospatial Metadata Workbook,*[3] is recommended as a guide to understanding the process and the uses to which ADUS put it. The ramifications of this for ATIS deployment will be discussed in the next section.

The current work item (WK7604) deals with additional details of how to save and store information using the ADUS approach. The general goal of this is to provide additional recommendations for traffic flow measurement applications (speed, occupancy, headway, density, vehicle classifications, etc.). A secondary goal is to provide additional recommendations for "vehicle probe" measurement applications as well. The content of this document would be of interest of any ATIS deployment using the *link* message where this information is transmitted. However, a greater level of applicability is expected to be found in the TMDD message set.

At the preset time, the WK7604 document consists of two major sections: a textual section, and a collection of Excel spreadsheets that relates the crucial data elements and concepts to the meta-naming needed and the SQL table structures to be used. The columns of this table are arranged to express the concepts in a format related to ISO 14817. At this time there remains some controversy regarding how ISO 14817 is to be applied and used in US standards efforts, so the ADUS production forms should be regarded as drafts. XML schemas for these concepts do not exist at this time. It is anticipated that the document will begin the balloting and adopting process in early 2008.

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[2] The ADUS committee has referenced the 1998 edition, which is now superceded by the January 2006 edition, see http://www.fgdc.gov/metadata/fgdc-std-001-1998.dtd/view

[3] Available at http://www.fgdc.gov/metadata/documents/workbook_0501_bmk.pdf

The term **ADMS** (Archived Data Management System) is also frequently associated with the ADUS group. The terminology here can get as confusing as the rest of the ITS acronym pile, as in this excerpt from an ADUS committee press release:

> [The document...] ASTM E 2259, Standard Guide for Archiving and Retrieving ITS-Generated Data, offers approaches to transportation data users who plan, develop, and operate Archived Data Management Systems (ADMS) to store or obtain ITS-generated data. ADUS developed ADMS to support compatible sharing of information among ITS-data users from a cross-section of public and private organizations.

From the Introduction section of ASTM E 2259 (the *Archiving and Retrieving Intelligent Transportation Systems-Generated Data* specification) we also have:

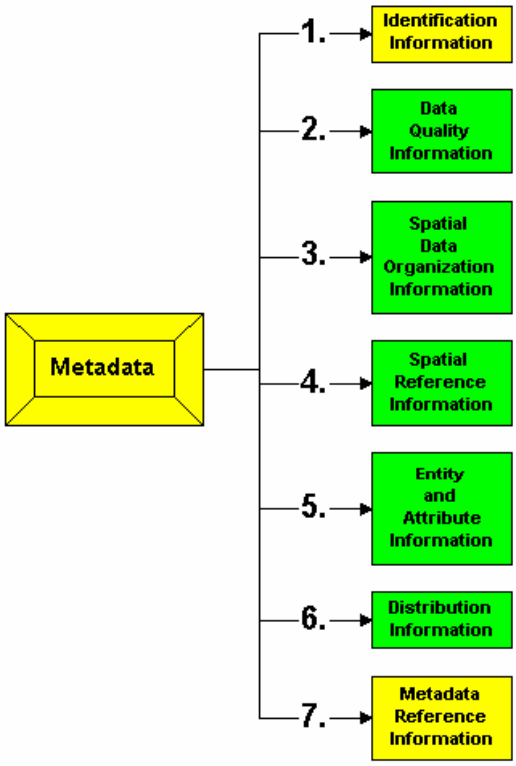
> It should be noted that there is a subtle distinction in the use of the acronym ADMS throughout this guide. When it is being used in the context of the National ITS Architecture the *S* stands for a *subsystem* of the National ITS Architecture. When the acronym ADMS is being used in the context of an Archived Data Management System in general, or a particular deployment of one, then the *S* stands for *System*. It is also noted that Appendix X1 to this guide presents relationships of the guide to several other activities and standards.

The similarity of the terms ADUS and ATIS often produces confusion, especially for those who hear them.

ADUS Applied

If you wish to build a system that follows the ADUS recommendations, most of the requirements to be met will be found in the ASTM E.2468 document. The bulk of this document deals with applying the FGDC *Content Standard for Metadata* to ITS records. The ADUS standard could be considered a "profiling" of how to apply the FGDC work (which you will also need) so that messages[4] can be stored in a suitable format.

The FDGC process establishes seven general areas of information which should all be considered and for which provisions must be made (typically in the design of the database tables) to keep and record. Fundamentally, each record (say an ATIS *event report* or *link report* or any other content) would be bound to the appropriate additional metadata and stored. The ADUS standard also allows binding complete sets of related records (when the data is common and constant).[5] This metadata is grouped as shown.



All of these areas have mandatory elements for ADUS conformity, if present. Many of these can be handled by mapping or using content already present in the ATIS messages, although some require additional information to be provided which is outside the scope of the current ATIS standards. Some, like the *spatial* ones, can be very challenging to meet and seem ill-fitted with other related ITS work (such as the LRMS profiles). The ADUS standard does not specify how the required data is to be stored (implementation details, where kept, what it is called, and some aspect of its structure are left to the builder to decide). For example, many metadata elements required in the reoccurring "citation" element can be grouped together, and this is recommended by ADUS (see Annex A8).

Each of these seven sections will be considered in turn below.

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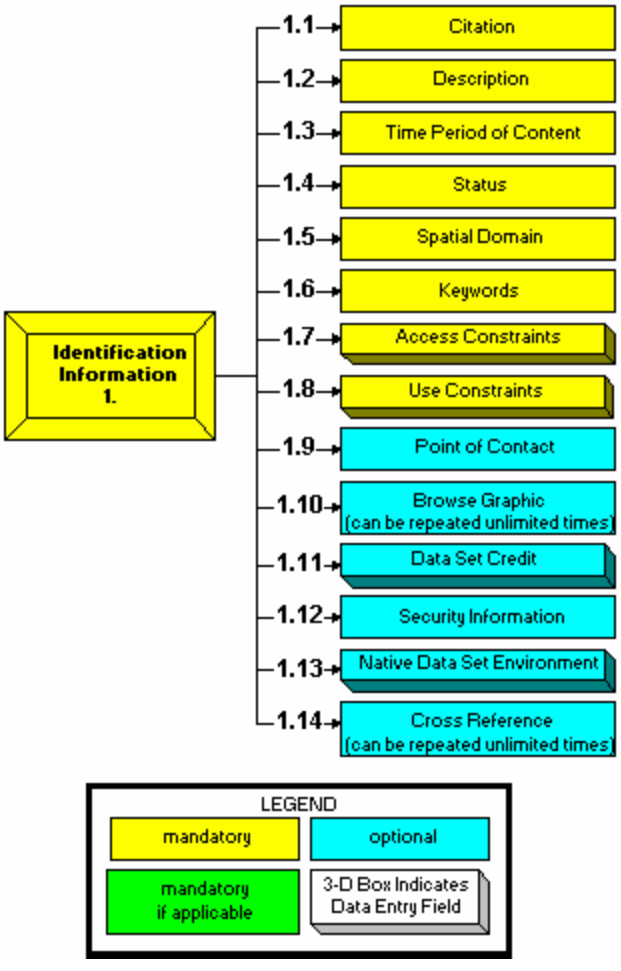
[4] Here *message* and *record* can be considered more or less the same; a structured array of data elements which should to be recorded in a way that allows ADUS processing to occur at some time.

[5] Because much of the ATIS data is related, and is likely to come from the same sources, this becomes a critical aspect of implementing the E.2468 standard in a an effective way. Most of the requirements of the ADUS work can be met in such cases with the use of simple table pointers to a few (somewhat static) records which consistently provide the same supporting information for each record.

TIP: We are indebted to the www.fgdc.gov site and to Susan Stitt of the USGS Biological Resources Division for the images used in this and the following sections. You can find a linked HTML presentation of these elements in a graphical form very similar to the way XML schemas are presented in the schema repository at http://www.fgdc.gov/csdgmgraphical/index.html Please keep in mind that this document does NOT show the minor changes which ADUS has made. If you prefer the XML style of graphical documentations, see: http://www.itsware.net/itsschemas/FGDC/FGDC-001-1998/

Adding *Identification Information* Metadata

This section refers to basic information about the data set or record to be stored.



The required elements (shown here in yellow[6]) consists of eight complex items, each with some addition sub-elements. A system which wishes to comply with the ADUS recommendations should provide this data, although the precise form and organization is not specified by ADUS. With the exception of time representation (where some formatting requirements of ADUS exist) most of these can be handled in short free-form text fields.

The **citation** element is a complex data frame which is handled in more detail in a later section. It establishes whose data this is and who published it.

The **description** element is a two-part text summary proving an *abstract* and a *purpose* entry. If one were storing typical ATIS messages, one would expect these to be terse lines relating to the type of data (the messages covered) and the gross purpose of storing it.

The **time period** formatted is covered elsewhere, but here one would expect the range of time covered by the data set to be outlined. If the data set was a single message then the issuance time would be represented. If the data set was a sequence of messages in a

[6] This color encoding is repeated in the images that follow, but not the legend.

response group form or a sequence of responses over some period of time, then that range of time would be shown.[7]

The **status** for this type of message would typically indicate that the message set was complete in the *progress* element and then indicate the rate at which the data was updated in the *maintenance and update frequency* element.

The **spatial domain** element outlines the overall span and boundary area that this data pertains to. A simple bounding box rectangular set of elements is used. One could compute this for each individual data set involved each time, or one could determine the possible extent of the covered data set statically. The ADUS document gives no specific recommendation.

The **keywords** element allows specifying a theme[8] and keywords for the data set. Several other optional keywords can also be specified.

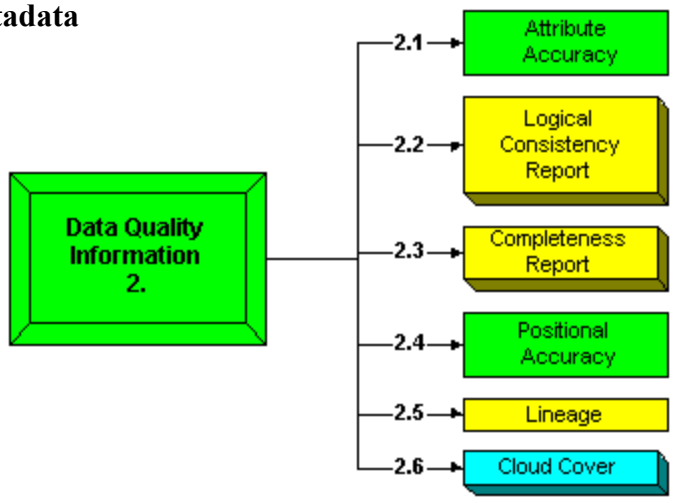
The **access constraints** element allows specifying restrictions for access to the data set. Use "None" if not needed.

The **use constraints** element allows specifying restrictions for use of the data AFTER access is granted to the data set. Use "None" if not needed.

Note that the time period and the spatial domain are the only elements here where content would change each time if one were storing typical incoming ATIS messages. The rest are essentially static, as is typical for much of the rest of the required ADUS data.

Adding *Data Quality Information* Metadata

This section refers to a basic assessment of the quality of the data set or record to be stored. ADUS requires this section. Here three elements are required to be present.



The **logical consistency report** element allows "a free text explanation of the fidelity of relationships in the data set and tests used" to be given.

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[7] So, if one were to use one of the freely available ATIS client code stubs to record a week's worth of event data into various files, then the time period would reflect that week.

[8] A theme is a "reference to a formally registered thesaurus or a similar authoritative source of theme keywords" but no such references exist in ITS at this time. The keyword "transportation" has been used here.

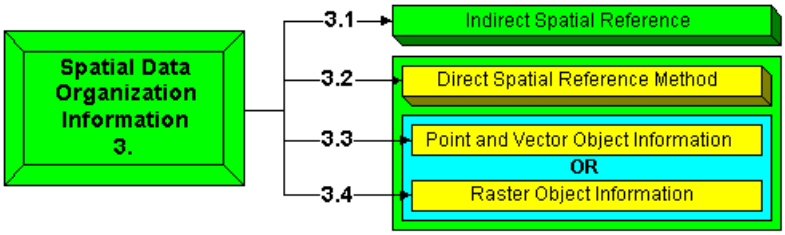
The **completeness report** element contains "information about omissions, selection criteria, generalization, definitions used, and other rules used to derive the data set" in it.

The **lineage** element contains "information about the events, parameters, and source data which constructed the data set, and information about the responsible parties" but it is not clear how the "responsible parties" might differ from the data found in the *citation* sections. Linkages to any reports on how your ATIS system gathers data, particularly any collection, filtering and post-processing steps followed, should be added here.

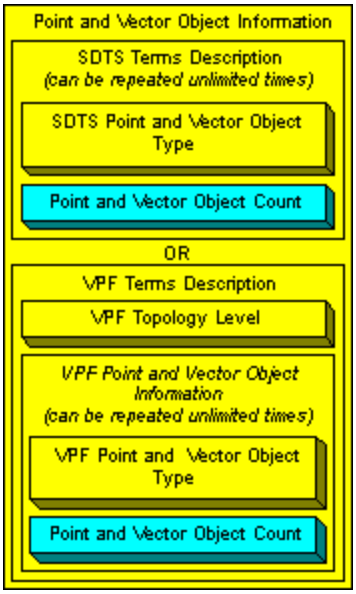
Note that the optional **cloud cover** can be filled in by the use of ESS data elements, if available.

Adding *Spatial Data Reference Information* Metadata

This section refers to a basic mechanism used to represent spatial information in the data set or record to be stored. Here three elements are required to be present.



The **direct spatial reference method** element allows "the system of objects used to represent space in the data set" to be expressed. In ATIS this would be either "Point" of "Vector" in most cases. The term "Raster" would not generally be used (wide area weather events would be considered *Vector* types).



The **point and vector object information** element allows converting aspects of your LRMS profile to the general SDTS format[9] which FGDC uses. The resulting point and vector object is shown at right.

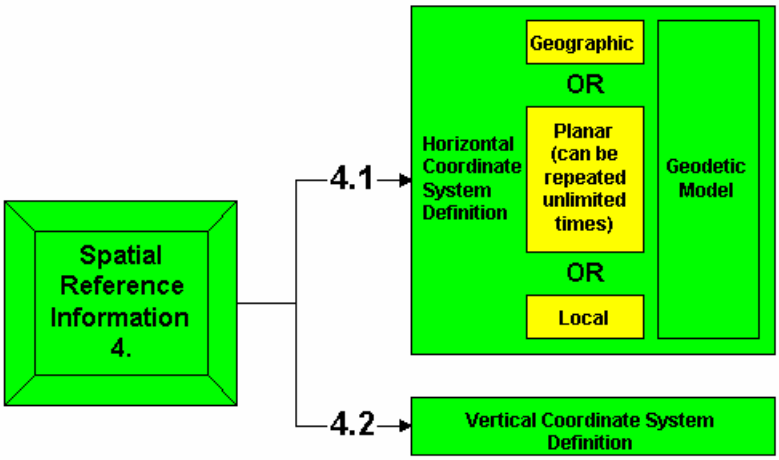
The **raster object information** element would not typically be used in ITS systems (although it might for weather image maps).

[9] See the text from "Spatial Data Concepts," found in chapter 2 of part 1 *in* Department of Commerce, 1992, Spatial Data Transfer Standard (SDTS) (Federal Information Processing Standard 173): Washington, Department of Commerce, National Institute of Standards and Technology. In theory the LRMS profile can be converted into this, but this author has no first hand knowledge of the process involved.

Adding *Spatial Reference Information* Metadata

This section refers to a description of the "reference frame" about the data set or record to be stored.[10] You will typically have one of the first two items to describe the coordinate system you are using.

The **geographic** element allows "the quantities of latitude and longitude which define the position of a point on the Earth's surface with respect to a reference spheroid." In English, if you are using any common coordinate (say from a GPS set), then you will use this form.



The **planar** element allows "the quantities of distances, or distances and angles, which define the position of a point on a reference plane to which the surface of the Earth has been projected" which relates to various conics found in State plan systems, as well as most local grid style coordinate systems.

The **local** element allows a free text description of any other spatial reference system, and typically would not be used in an ITS system.

While the above looks forbidding at first glance, the values to be stored here are typically static constants for any coordinate system you may be using.

[10] In the parlance of FGDC, this refers to the general coordinate system being used and various parametric values needed to reconstruct it.

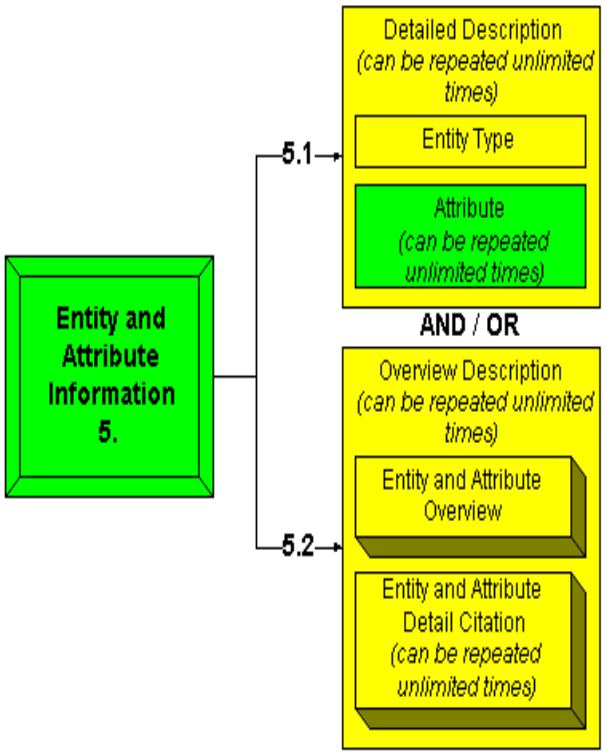
Adding *Entity and Attribute Information* Metadata

This section refers to the information content of the data set or record to be stored. In a *pure* FGDC approach this would outline the various codes and enumerations used and their complete definitions and meanings. In a standards-based ITS system (where such data is already generally well defined by the message set being used, the local schema documentation it came from, and the various national standards which that came from), this is of a more limited context. As a consequence, much of this section can be handled by citing the standards which are being used, thereby providing a "detailed summary of the information contained in a data set" for the end user. ADUS requires this section.

The **detailed description – entity type** element is used for "the definition and description of a set into which similar entity instances are classified."

The **overview description – entity attribute overview** element is used for a "detailed summary of the information contained in a data set."

The **overview description – entity attribute detail citations** element is used to provide a "reference to the complete description of the entity types, attributes, and attribute values for the data set."

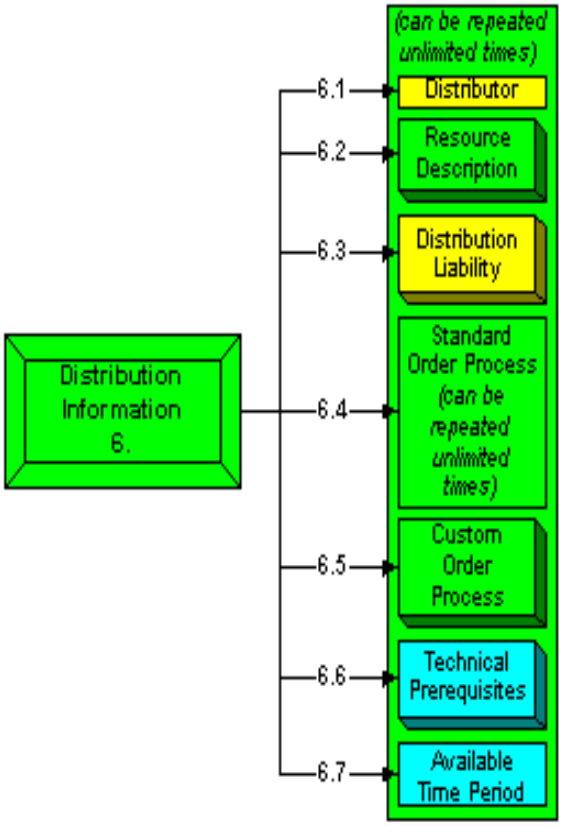


It is suggested you use the **detailed description – entity type** element and specify precisely *which* revision of the standard (and any exceptions to this) is being used for that data set. If you have used an XSD schema, also use the standard release numbering format to provide the revision sequence. For example, the reduced ATIS standard used in the examples in this mini-guide is referred to by its namespace[11] as **http://www.ATIS-Partial-03-00-79.**

[11] Recall that an XML namespace is NOT a valid URL, it is simply a unique identifier string for that file. In this case the schema file which uses this namespace can be found in the ITS repository at http://serv1.itsware.net/itsschemas/ATIS%20Guide/ATIS-03-00-79guide/

Adding *Distribution Information* Metadata

This section refers to information about distribution and usage right associated with the data set or record to be stored. The ADUS standard outlines representative issues of available output formats or the price of data. The rights to reuse of the data by others (and any privacy concerns) is also typically also an issue handled here. Here two elements are required to be present.



The **distributor** element allows capturing "the party from whom the data set may be obtained" - which would typically be the same party running the data service in the ATIS model, but in a multi-agency data fusion style deployment it may be the name (or center ID) of the original data creating agency

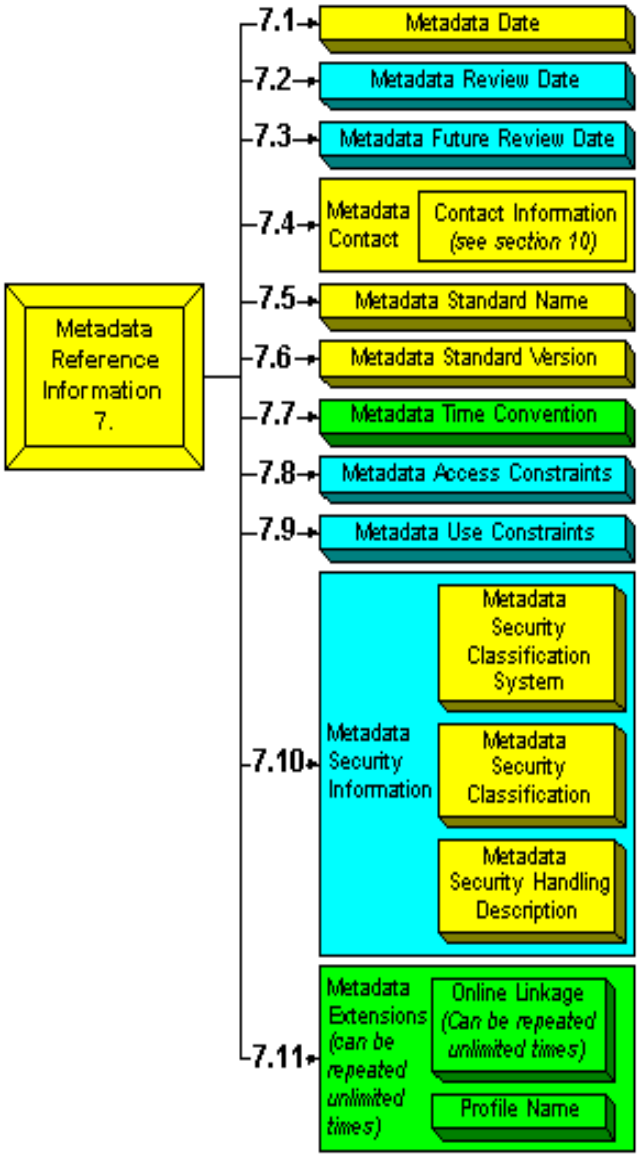
The **distribution liability** element provides a "statement of the liability assumed by the distributor." In most ATIS deployment at this time, such a statement would disavow all responsibility for any damages arising out of the use of the data and expressly make no claims regarding any fitness for use. It is likely that the deployment's governing rules of operation have already established some boilerplate text of this sort which can be used.

Note that the metadata section also contains some data relating to access rights for this data.

If the data supplier has a purging system whereby old data is disposed of after a period of time (say an interval after an event is declared as closed or completed), consider reflecting these rules in the *available time period* element.

Adding *Metadata Reference Information*

This section refers to information on the *currency* of the data compilations of the data set, and the responsibility for the data set or record to be stored. ADUS requires this section. Here, four elements are required (although several others may be required depending on needs).



The **metadata date** element contains "the date that the metadata were created or last updated" - note that this is free text, therefore also adding the *time* (say in an XML date-time string format) is probably also allowed. And would be useful for most ATIS records.

The **metadata contact** element contains "the party responsible for the metadata information" which is likely to be whoever is running the database itself. This is made up of the contact data frame, covered below.

The **metadata standard name** element contains "the name of the metadata standard used to document the data set" – in other words, your own name for your normative database system baseline.

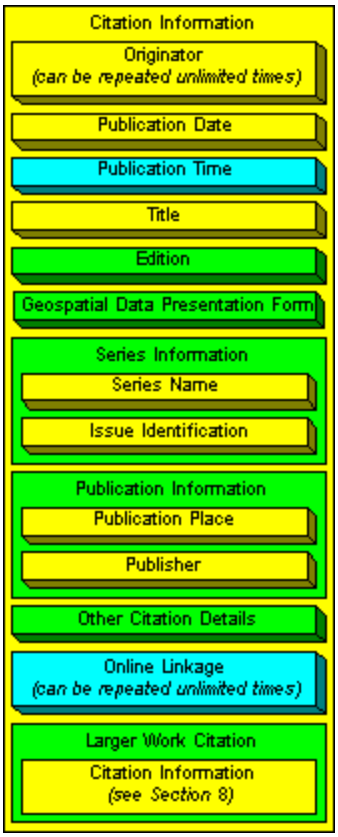
The **metadata standard version** element contains "identification of the version of the metadata standard used to document the data set" – in other words, your revision numbering system for your normative database system baseline.

Note the optional *access constraints* element is used for "restrictions and legal prerequisites for accessing the metadata. These include any access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the metadata." Typically personal privacy is not an issue with

ATIS-style data (as it is with IEEE IM 1512 style data), but data generating agencies may still need to restrict what others can do with the data, so this must be considered.

Handling the *Citation Data* element

The citation element structure is used in multiple places in the above but can generally be filled out the same way each time. Three elements are required, although more may be present.



The **originator** element contains "the name of an organization or individual that developed the data set. If the name of editors or compilers are provided, the name must be followed by "(ed.)" or "(comp.)" respectively."

The **publication date** element contains "the date when the data set is published or otherwise made available for release." Adding the time[12] as well is also recommended; see the discussion on date and time, next.

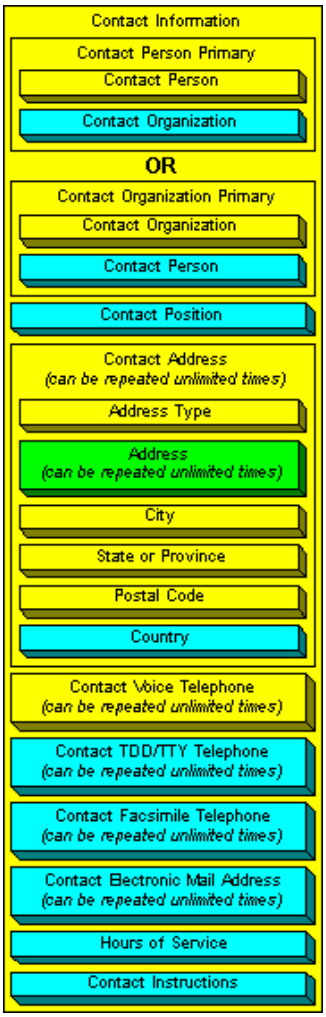
The **title** element allows adding "the name by which the data set is known" in free text.

If the data record is part of a series or a larger related works, some of the other optional elements may be useful to relate these groupings.

Note that the citation definition calls out the citation as the last element (a circular reference) - which can be problematic to implement in some technologies.

[12] If you choose to add time to the date values, you would also need to make sure the XSD schema reflected this change, if you were to use the schema files that are provided in the next section. If the date-time values of the original ATIS message can be preserved and searched, then this may not longer be needed.

Handling the *Contact Data* element



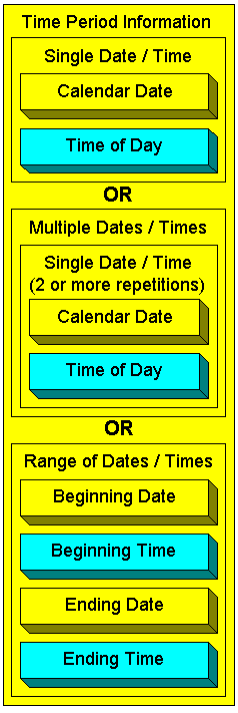
The contact element structure is used in multiple places in the above but can be filled out the same way each time. About six elements are required, depending on how the form is filled out.

The **contact - person** and **contact - organization** elements allow relating the agency or person "to which the contact applies" - typically this would be taken from content found in the *head* or *header* structures in the ATIS messages.

The **address type** element specifically denotes the *type* of address (mailing or physical) which follows. This is then followed by the normal city, state type addressing elements.

The **contact – voice telephone** element allows the normal North American style phone number. Note that it is free text, so you would have to flatten the phone number format found in ATIS and other ITS message set into a single string for use here.

Handling the *Time Period* element



The time period element structure is used in multiple places in the above but can be filled out the same way each time. Either one or two elements are required, depending on how the form is filled out. This structure differentiates *date* and *time*, concepts which are now often blurred in XML representations of time. It then allows time to be optional, implying that a date and time can be represented as only a date (which XML also allows).

Further, the ADUS standard has some recommendations, see clause 6.5 and 6.6 (page 6) where the allowed formats for time do not directly allow an XML style expression. This text is more or less copied[13] from the FGDC work, but it still presents some slight

[13] See http://www.xmdr.org/standards/cmaps/FGDC001Text.doc

formatting issues for those who want to save things as "pure" XML time directly (typically this would be a local date-time with an offset factor, but legal XML can also contain the day of the week). You may want to express time with the "Z form" (for universal time) to overcome this issue.

Customizing ATIS for Local Use

This part of the process is best handled by reviewing the content found in the companion *Event Guide*, where extensive practical details on customizing the schema for local use are given. The content is not duplicated here.

When considering how to support the needs of ADUS in the deployment schema, it may be of value to use the local extensions section or the *tail* section of each message to add specific data elements needed by the ADUS application, when known. Refer to the other guides for details of this process is performed.

- The goal of good systems specification is to turn the *subjective* goals of one level into *objective* goals at the next level, in a way that is clear, traceable, implementable, and testable to all concerned.

One key outcome of this process will be a local document set with the local set of XML schema files that reflect the profiled standards to be used.[14] The schema set produced for this guide has with it event and weather message instance examples and will be used for the examples presented in the other guides as well.

Other Supporting Guides

To reiterate the other guides, these documents are: (click links for document downloads)

The General ATIS Guide

Using the Event Messages

Using the Weather Messages

Using the Routing Messages

Supporting DB uses in the message set

Supporting ADUS needs (this document)

[14] As in the rest of this guide, we presume an XML embodiment is to be developed. If ASN were to be used, this same information would be in a collection of ASN source code modules.

Part II Implementing ADUS in ATIS deployments

Part I of this guide covers a number ADUS topics and the required metadata elements. **Part II** of the guide provides a few additional recommendations for using ADUS with and XML schema style deployments found in ATIS.

Naming Conventions

One of the basic issues every deployment using ADUS must come to gripe with is what to name the various optional and mandatory elements defined in E2468 and the FGDC work, both in any message and in any SQL tables. While not mandated by either document, the "short names" given in E2468 are useful for this purpose. Interoperability across deployments is greatly hampered when such naming varies. Some of the tools available for implementing FGDC also provide naming, and if you will be using one of these you will need to consider what names to use. Finally, there are several valid XSD schemas for this effort now available, and most of these have adopted some cryptic and short (typically 8 chars or less) names that work well as valid XML tags and as SQL column names. It is generally recommended that you use one of the XML schema sets presented below and drive your local naming conventions from that.

Tools and Templates

The FGDC effort has been fairly successful in the marketplace and there exists today a growing number of tools that can assist with the metadata collection processing problem. Many of these support XML as a common output format. Most of this are more "traditional GIS" style tools and utilities and are not ITS centric in any way. Many of these are low cost or freely given away by other departments of the US government which have an interest in the FGDC process .

The FGDC site itself has:
http://www.fgdc.gov/metadata/geospatial-metadata-tools

The USGS maintains a list of such tools at:
http://geology.usgs.gov/tools/metadata/

And a private list provided by Colorado Plateau Metadata at:
http://www.mpcer.nau.edu/metadata/MetadataTools.htm

There is also a growing number of "data warehouses" claiming to use this system as well, but none to this authors knowledge that implement any ITS messaging data sets. A web search for "FGDC" and "warehouse" will produce useful results.

XML Schema Sets

There is no *official* and approved XML schema for FGDC, but several generally accepted ones do exist and are mentioned below. This is not as large an issue as it might appear, because the standard itself does not demand conformance in element naming and expression, therefore interoperability is not a paramount concern in the same fashion as found in ITS message set standards.

The SAE ATIS committee has posted three major variants of the FGDC system expressed in validating XML schemas on the ITS repository. In addition, for each variant we have created the normal ~/docs directory with HTML image created by XMLSpy. Conventions used in the XML here vary in some way from those found in ITS, but not significantly. The release numbering system used is generally the same, but with slight differences. If you were to use these schema in an ITS project, it would be wise to profile them by adding bounding facets to the "unbounded" sequences present in some parts and to express the enumerated lists of control strings correctly.

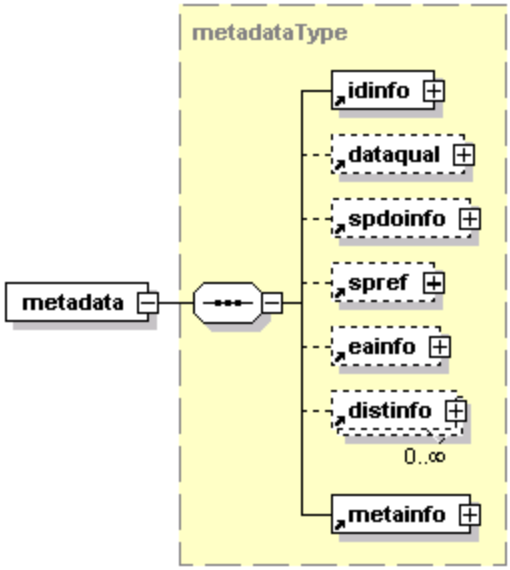
The schema sets available at this time are:

1. FGDC Revision "001" (1998)
   http://serv1.itsware.net/itsschemas/FGDC/FGDC-001-1998/
2. FGDC Revision "001" (1998) as above, but with annotation data present
   http://serv1.itsware.net/itsschemas/FGDC/FGDC-001-1998-ann/
3. FGDC Revision 0.1.6 (1998)
   http://serv1.itsware.net/itsschemas/FGDC/FGDC-00-01-06/fgdc-schema-0.1.6/fgdc-std-001-1998/
4. FGDC Revision "12" (2002) A profiled copy with "banding" information
   http://serv1.itsware.net/itsschemas/FGDC/FGDC-00-01-06/fgdc-schema-0.1.6/fgdc-std-012-2002/

The precise relationships of these schema sets to each other and the current standard is not clearly known, but they are believed to all be current with minor differences. This is because each was constructed by a different volunteer effort.

In addition, some slightly outdated schema sets are available in zip and tar file formats, see the contents of http://serv1.itsware.net/itsschemas/FGDC/FGDC-00-01-06/

In each of the above cases the normal ~/doc directory can be found and one can link around and explore the data model. For example, the graphic shown previously , when expressed in the normal XML way is found there as:



Note how terms like "identification information" have been expressed as "idinfo" here.

It should be pointed out that none of the XML schemas sets will tell you *how* to attach or link the ADUS-FGDC information to the actual subject data set, this is left as an exercise for the deployment. A simple foreign key and linked table is the recommended approach.

If you wish to automatically load the schema[15] to an XML editor, this URL can be used: http://serv1.itsware.net/itsschemas/FGDC/FGDC-001-1998/fgdc-std-001-1998.xsd

A valid ADUS XML Fragment

These schemas are still very primitive and do not reflect *all* of the rules found in either the ADUS or the FGDC documents. Many defined enumeration strings are missing. Valid fragments of XML (that is those that meet the schema rules outlined in the above links and therefore *validate*) may not be valid from the point of view of ADUS-FGDC due to the lack of some mandated content. Here is an example of a validating XML fragment, which contains simple valid content according to the ADUS rules.

[15] The schema repository is provided as a service to allow you to download an authorative copy of the various ITS schema standards to your own machines. You should not make a habit of connecting production server systems to it, rather copy the files you need. If you are new to using the repository, see the documentation pages at http://serv1.itsware.net/itsschemas/ReadMe.htm to set up your own system.

```
<?xml version="1.0" encoding="UTF-8"?>
<metadata xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="http://serv1.itsware.net/itsschemas/FGDC/FGDC-001-1998/fgdc-std-
001-1998.xsd">
        <idinfo>
                <citation>
                        <citeinfo>
                                <origin>Orange County CA, USA</origin>
                                <pubdate>Unpublished material</pubdate>
                                <title>My Example ATIS data set, ADUS documention</title>
                        </citeinfo>
                </citation>
                <descript>

                        <abstract>(a brief narrative summary of the data set)</abstract>
                        <purpose>To show how to fill this out (a summary of the intentions with which
the data set was developed.)</purpose>

                </descript>
                <timeperd>
                        <timeinfo>
                                <sngdate>
                                        <caldate>08312007</caldate>
                                </sngdate>
                        </timeinfo>
                        <current>publication date</current>
                </timeperd>
                <status>
                        <progress>Complete</progress>
                        <update>Continually</update>
                </status>
                <spdom>
                        <bounding>
                                <westbc>-130</westbc>
                                <eastbc>-125</eastbc>
                                <northbc>38</northbc>
                                <southbc>36</southbc>
                        </bounding>
                </spdom>
                <keywords>
                        <theme>
                                <themekt>transportation</themekt>
                                <themekey>ATIS</themekey>
                        </theme>
                </keywords>
                <accconst>none</accconst>
                <useconst>none</useconst>
        </idinfo>
        <dataqual>
                <logic>As per ATIS msg set rev 79 rules</logic>
                <complete>complete</complete>
                <lineage>
                        <procstep>
                                <procdesc>URL to processing rules to go here</procdesc>
                                <procdate>08312007</procdate>
```

```
                    </procstep>
                </lineage>
        </dataqual>
        <eainfo>
                <overview>
                    <eaover>As per ATIS msg set rev 79 rules, cite exact stds used here and provide
a link to local forms</eaover>
                    <eadetcit>as per above</eadetcit>
                </overview>
        </eainfo>
        <metainfo>
                <metd>08312007</metd>
                <metc>
                    <cntinfo>
                        <cntperp>
                            <cntper>DC Kelley</cntper>
                            <cntorg>SCSC</cntorg>
                        </cntperp>
                        <cntaddr>
                            <addrtype>mailing</addrtype>
                            <city>Covina</city>
                            <state>CA</state>
                            <postal>91723</postal>
                        </cntaddr>
                        <cntvoice>626-915-4488</cntvoice>
                    </cntinfo>
                </metc>
                <metstdn>FGDC Content Standards for Digital Geospatial Metadata</metstdn>
                <metstdv>http://serv1.itsware.net/itsschemas/FGDC/FGDC-001-1998/</metstdv>
        </metainfo>
</metadata>
```

A Last Word of Advice

When in doubt, ask others. The best place to ask questions and get advice is the ATIS part of the ITS standards forums at: http://www.ITSstandards.net/bb/index.php?c=3

Part III Supporting Work

Part III of this guide consists of various files, resources, and records, containing supporting documents which a builder would need. Links to the various public resources which SAE and the other SDOs use are provided.

The ATIS schema, reduced

The schema file set used in this guide was derived from the then most current revision of the national SAE ATIS standard, revision #79, which was at that time stable but not yet adopted by the committee balloting process. The schema and supporting documentation can be found at the below link. A useful *ReadMe* is also provided outlining additional materials in this folder:

http://www.itsware.net/itsschemas/ATIS/ATIS-03-00-79/
http://www.itsware.net/itsschemas/ATIS/ATIS-03-00-79/ReadMe.htm

The process of building a local reduced schema file set for these guides (the same schema file set is used in all five of the smaller guide efforts) follows the same rules and best practices as outlined in Part I. The result represents a useful starting point if a deployment wanted to take it and simply add additional content to suit local needs. In keeping with the practice of publishing local work, this reduced schema is also part of the national ITS schema repository and can be found at:

http://www.itsware.net/itsschemas/ATIS/ATIS-03-00-79guide/

Also notice that the Mini-Edit database is also available there, as is the complete ASN source code. The file "all.zip" provides a single point download of this material.

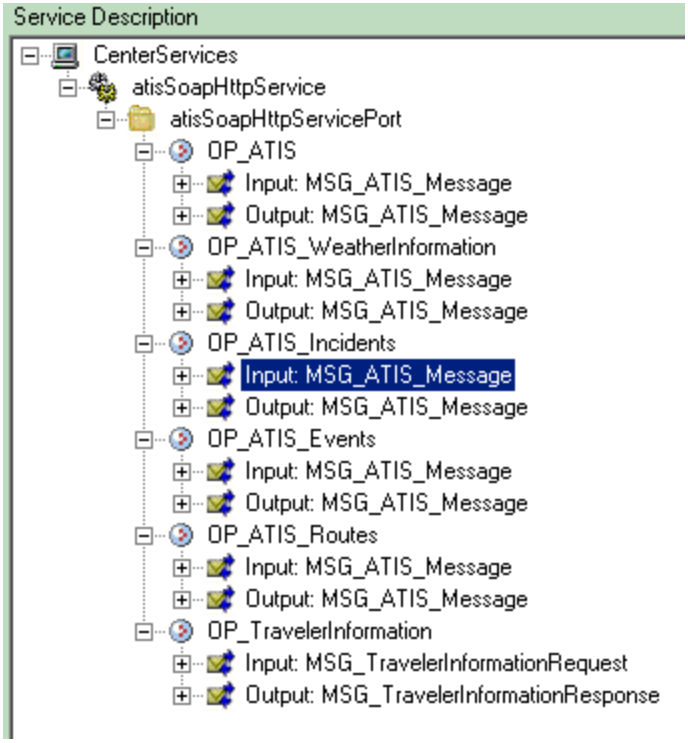
If the concept of a schema repository is new to you, you may want to read these two documents regarding proper naming and suggestions for how to set up your own repository on a local machine in a way that will allow you to best re-use the national efforts.

http://www.itsware.net/itsschemas/ReadMe.htm
http://www.itsware.net/itsschemas/FileNaming.htm

An Example WSDL system

In order to use web services to connect to the complete local ATIS deployment and the event message, a WSDL file is typically[16] used. This binds the messages defined in the ATIS standard (and found in the locally developed schema files) to ports and protocols on a web server which can in turn exchange these messages. The ATIS standard itself (in Clause 5) provides several illustrative examples of how this works, but it is expected that every deployment will need to develop its own, if for no other reason than to express *where* its service in fact resides. This contrasts with the way the XSD is used, where it is entirely possible to use the national XSD schema files as published without change[17].

For use in this guide effort, a simple WSDL was developed with six basic operations. A graphical viewpoint of these services is shown below.



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[16] Presuming that XML technologies are used, then a WSDL and SOAP bound to HTTP is most common. In the examples of this guide, this technology is used. It should be pointed out however that WSDL is in fact technology neutral and one could, in theory, map ASN.1 to it. The so-called "XML direct" method is an example of this, mapping a simple FTP transfer (of XML) to the WSDL to support legacy uses in ITS. See Section 9 of the NTCIP 2306 for details of that method.

[17] However, doing so is discouraged in ATIS because a reduced set is much easier to build and validate against; see Part I. Some deployment tools will automatically build code for a large schema with no additional human labor, but the testability aspects of this remain a problem for some. It should again be pointed out that conformity to ATIS is judged only by the normative messages which the deployment expressly supports, unlike (for example) the IEEE IM effort where the conformance requirements expressly states that the deployment must be able to consume (read) all valid messages defined in the standard.

The WSDL developed for these examples can be found here:

http://www.itsware.net/itsschemas/ATIS/ATIS-03-00-79guide/ATIS-WSDL-03-00-79-Partial.wsdl

Documentation of this WSDL can be found here:

http://www.itsware.net/itsschemas/ATIS/ATIS-03-00-79guide/docs/wsdlDocs.html

In order to use this as a starting point for a deployment, the *soap:address* line must be edited[18] to reflect a real server:

```
<soap:address location="http://www.mycenter.org/c2cxml/" />
```

The style of all WSDL used in ITS follows rules which were developed by the NTCIP C2C committee in their document "2306" titled *Application Profile for XML Message Encoding and Transport in ITS C2C Communications*. Some of these have already been covered in passing, such as the requirement to use the *doc/literal* style. It is vitally important that any WSDL developed and used in ATIS (or any ITS for that matter) adhere to the requirements of this document. Conformity with ATIS, by definition, also requires conformity with the 2306 standard in the area of the WSDL style.

The subject of building WSDL is not covered in this guide, but the IEEE 1512 Incident Management Guide (currently in development) has several sections touching on this topic. The Annex sections of the 1512 Guide have a number of useful templates in the form of spreadsheets that Mr. Manny Insignares (chairman of the C2C committee) has developed. It is recommended that deployments use this or a similar system to develop the WSDL that they will require.

Further Support: Like the other specialty areas of ITS, this subject has forums devoted to supporting its user community.

In the ITS standards forum at
http://www.ITSstandards.net/bb/viewforum.php?f=12

And in the NTCIP device forum under "**NTCIP 2306 AP-XML in C2C**" at
http://forum.ntcip.org/~NTCIP_Standards

fin

[18] Avoid using the term *local host* for this.