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Chapter 6: Transit Network and Related Data Concepts

In This Chapter

- Understand the requirements relating to the Transit Network Branch Model.
- Discover how transit network and related data concepts are used.
- Learn how to apply the Pattern, Transit Point Event and Transit Path Event elements.
- Learn how to convert route segments to Transit Point Events.

Generic Network Model

Several networks are needed to describe the provision of transit service. Theoretically, in a generic model, the transit network is composed of three "logical" layers, which might be described as the:

- Geographic Network (geography) layer
- Transit Network (transit features and paths) layer
- Transit Service (temporal) layer

Transit Network

The transit network branch describes the physical path over which transit service is delivered. The Transit Network data concepts are designed to describe fixed route operations. It includes the following elements:

- Pattern
- Transit Path

Pattern Definition

A unique, non-branching, ordered sequence of transit paths, timepoints or transit stops to be followed by a transit vehicle in scheduled service for a route in a given direction.

These "layers" are shown in Figure 6-1. Each layer builds upon the physical reality or physical locations, such as streets or rail alignments. In the generic model, this base layer is called the *Geographic Network* and it is represented by the geographic database comprised of the digital base map, surveyed points, and other location features.

This chapter focuses on the data concepts related to the Transit Network. The *Transit Network* represents the paths traversed by transit vehicles and is composed of route segments (also known at Transit Paths) and Patterns. The Transit Network layer also includes events (e.g., timepoints, stops) that occur along the path, which may be used to define the Transit Paths and Patterns. The *Transit Service* layer is composed of trips and includes the times when events are scheduled to occur at a particular location (e.g., trip times).

In developing a conceptual data reference model, it is useful to logically separate these layers and store their representations separately. Further, it is critical for transit agencies and their ITS applications, to be able to accurately and unambiguously connect or link data elements between the network layers. For example, bus stops need to be linked to their physical locations on the Geographic Network, to the Patterns in the Transit Network, and to the trip times in the Transit Service layer.

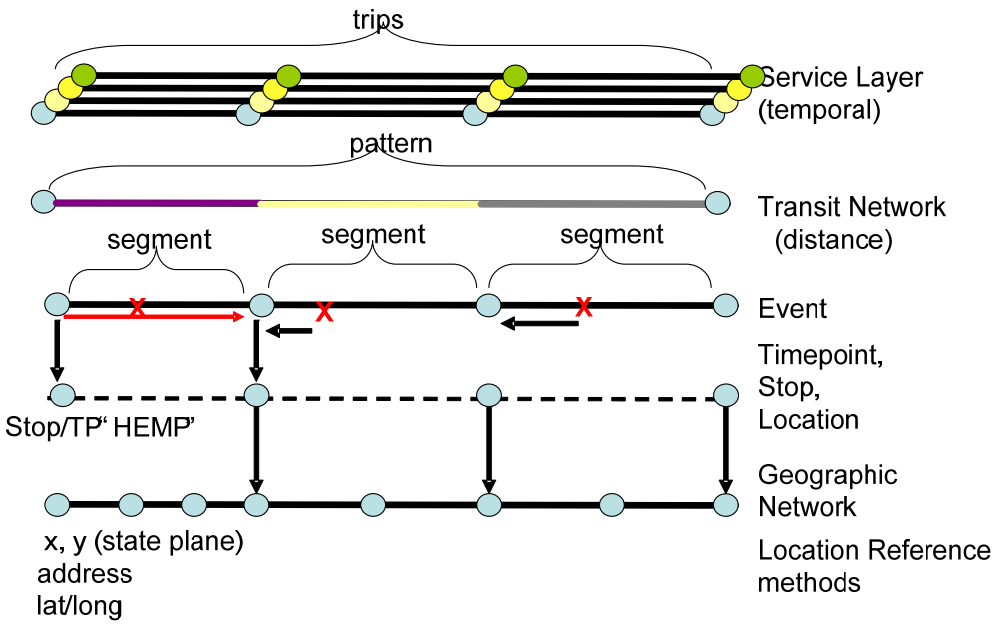

Figure 6-1: Network Layers

The Transit Network, and issues related to implementing the Transit Network data concepts, will be described in this chapter.

Conceptual Data Reference Model (CDRM) Description for Transit Network

A core concept in the CDRM for the Transit Network is the Pattern. Although there are many ways to describe a Pattern, the SDP defines it as a non-branching path that flows in a given direction. That is, a Pattern is directed from origin to destination along a defined set of physical locations. The Pattern may be composed of points or modal paths. Some transit agencies define a Pattern by a series of points, such as bus stops or timepoints. Many other transit agencies use an ordered set of timepoint intervals (TPIs) or route segments to describe a Pattern. If a Route branches, there are common segments that occur over and over again in the set of Patterns that make up the route. Often, transit agencies aggregate and analyze service performance by route segment, for example running time, passenger load, etc.

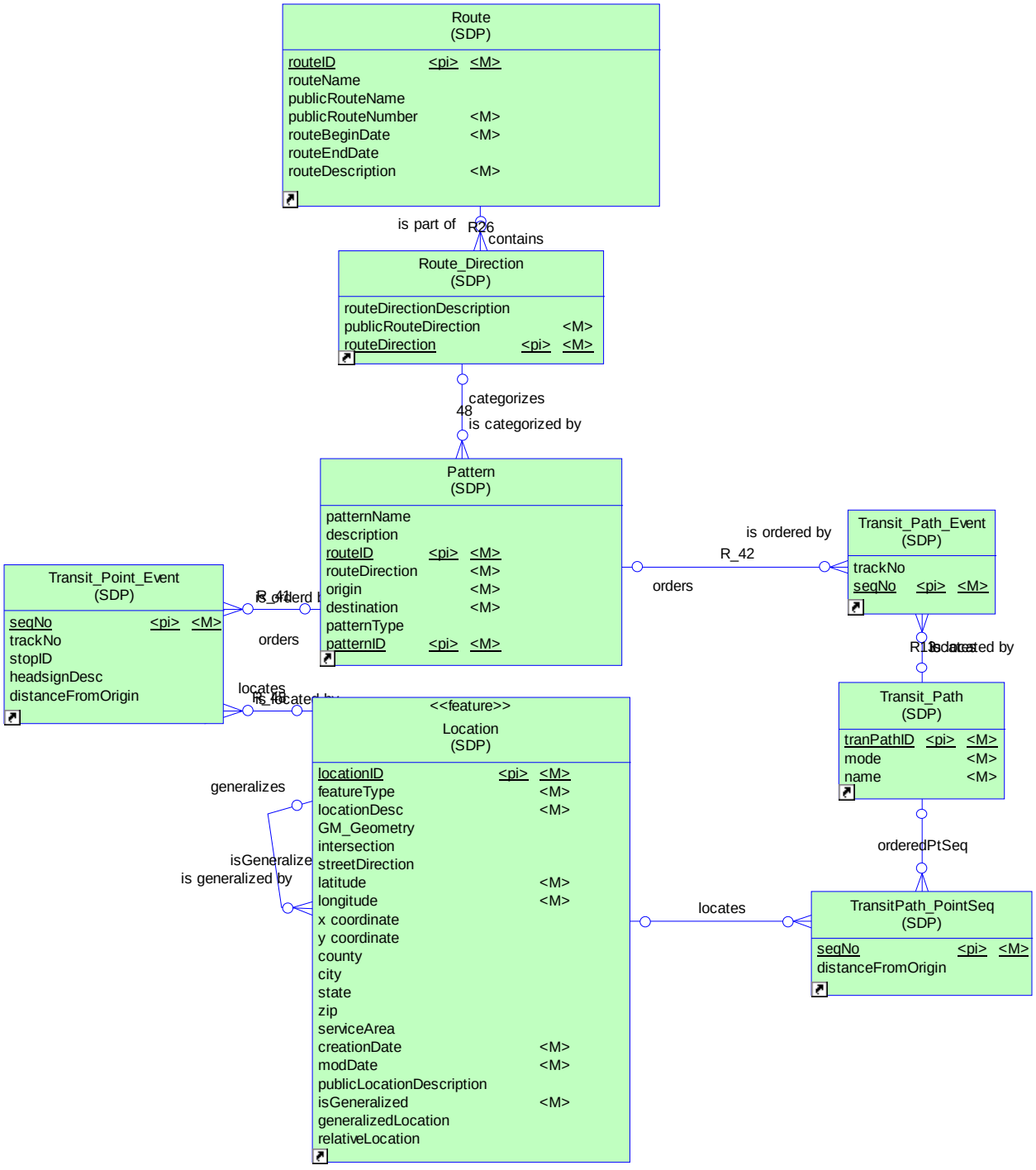

Figure 6-2: Transit Network CDRM Data Concept

The CDRM data model illustrated in Figure 6-2 may be described as follows:

- A Pattern consists of zero-to-many ordered Transit_Point_Events (Locations) or one-to-many ordered Transit_Path_Events. A Pattern is associated with a Route in a given direction (Route_Direction).

- A Pattern may have one or more Trips associated with it. The Pattern is a physical template on which to relate times at specific events. In that way, a Trip may use events (either point or path) upon which to build service descriptions. As such, scheduled service or Trips should correspond to Pattern descriptions. Each Trip should link to an appropriate Pattern, and Trip events should correspond to Pattern events (i.e., Transit Point Events).
- A Transit_Point_Event describes a Location of an activity that occurs along the Pattern. The Point_Event_Type describes the category of events that may occur at the point.
- A Transit_Path_Event (like an instance of a route segment) may be composed of one or more Transit_Paths.
- The Transit_Path is an ordered sequence of Locations (using TransitPath_PointSeq to order each Location along the path). The Transit_Path may be used to represent a route segment or timepoint interval. Although this feature will not be used in this version of the SDP, the entity may be used to define running times or as building blocks for entities that will be used by downstream applications.
- A rail system may have created its own network or rail layer. The rail layer may be represented by the Transit Network layer through the Transit Path element.

As shown in the model above, the Transit Network layer must be associated with location information that is in the geographic network description or digital map, which is used by transit stakeholders and downstream applications. The real world location information may be represented by GPS values, digital base map coordinates, linear measures, or relative locations. In order for the location data throughout the SDP to be consistent, all the geographic information is stored in one place in the SDP model (both XML Schema and CDRM). The coordinate and linear referencing methods are exclusively stored in the Transit Gazetteer elements, specifically, the Location element.

A downstream system will need to know if a Pattern is composed of points or paths, and for that reason, although path definitions are allowed, Transit Point Events *are preferred in the early development and adoption of this specification.* Guidance on implementing a Transit Path and Transit Path Events are also included in order to be comprehensive.

Since the Transit Network Branch must link with other branches or layers of the SDP model, there are several rules included in the Requirements Table (see Table 6-1) to ensure the unambiguous association among the objects that compose each branch.

High Level SDP XML Schema Description for the Transit Network Branch

The rules applied to implement the CDRM as an XML Schema are similar to the other branches. The entity relationships are flattened so that Pattern and Transit Path are hierarchically on the same level. Figure 6-3 depicts the highest level of the Transit Network branch from the SDP XML Schema.

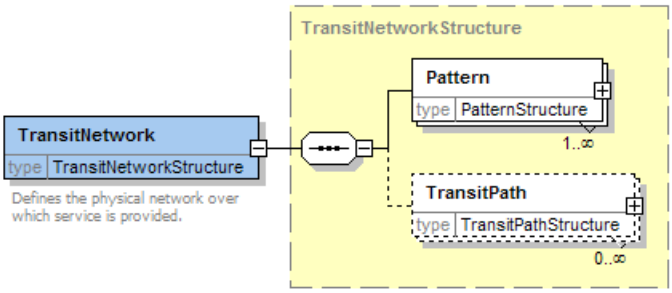

Figure 6-3: Transit Network Model Implemented in the SDP XML Schema

Detailed descriptions of embedded elements in the Pattern and Transit Path elements are discussed in Sections 6.1 and 6.2, respectively.

Section 6.1: Pattern and Related Data Concepts

In This Section

- Learn about the Pattern and Transit Event Data Concepts.
- Learn how to apply the elements in the Pattern and Transit Event Data Concepts.

Pattern Definition
A unique, non-branching, ordered sequence of transit paths, timepoints or transit stops to be followed by a transit vehicle in scheduled service for a route in a given direction.

Transit Point Event Definition
A place where transit service is delivered along the transit network.

Purpose of Pattern Data Concept

A Pattern is used to describe the physical path traversed by a transit vehicle in revenue service. It can either be described by an ordered sequence of points along the path where planned events occur, or as an ordered sequence of segments (Transit Paths). In the SDP, the sequenced list of points or paths are referred to as events. For example, if the event list is describing a sequence of points, the event list may represent an ordered sequence of locations that describe the Pattern, or it may describe an ordered sequence of stops and timepoints. Alternately, the event list refers to a sequenced list of Transit Paths.

The Pattern is the physical alignment where transit service is delivered, while the Trip is the temporal representation of revenue service.

Requirements for Pattern Data Concept

The requirements that drive the Pattern data concept are listed in Table 6.1-1. Some of the requirements for the Transit Point Event and Transit Path Event elements are also discussed in the table.

Table 6.1-1: Requirements for Pattern and Related Data Concepts

#	Category	Requirements
1	Unique/Identity	• A Pattern is unique to a route in a given direction. • A Pattern is referenced by a unique identifier.
2	Geo-spatial Composition as a set of *points*	• A Pattern is a one-way, directed path associated with way points that are used to schedule service. • At a minimum, a Pattern is composed of two (first and last) or more points, and any additional points needed to make it unique. Circular (clockwise and counter clockwise), lollipop and clover leaf configurations may create ambiguity in the path and direction since a Pattern may pass through the same point more than once. To that end, a Pattern should be composed of a sufficient number of ordered geo- or linearly referenced Transit Point Events (may include timepoints and transit stops) to the transportation network to ensure an unambiguous traversal description. • The "way points" consist of a unique, ordered sequence of Transit Point Events such as timepoints, transit stops and events, and additional geo-located points that may be necessary to sufficiently describe the physical path. • A Pattern has an origin and destination. The first and last (origin and

Table 6.1-1: Requirements for Pattern and Related Data Concepts

#	Category	Requirements
		destination) points constitute the termini of the Pattern. Since a trip is a temporal instance of the Pattern, the trip locationBegin and locationEnd should correspond to the Pattern origin and destination, respectively.
3	Geo-spatial Composition as a set of transit *paths* (alternative to set of points)	• Alternatively, a Pattern may be described by a sequence of one or more ordered topologically connected transit paths or street links. • A transit path, sometimes called a *route segment* or *timepoint interval*, is composed of transit point events. (Note: a Transit Path in the SDP expands the definition and use of a Transit Path to mean any carriageway or alignment that is used to deliver transit services.) • A *route segment* is a generic term for a segment that contains an ordered sequence of transit stops, timepoints or events. The directed segment contains at least two points, an origin and destination, and contains sufficient number of points to unambiguously associate the path of travel to the transportation network. • A *timepoint interval* designates a link terminated by two timepoints. Other Transit Point Events such as transit stops may be linearly referenced to the interval. A running time, optionally qualified by time period, day type or other characteristic, may be associated with the interval. (Note: the timepoint interval is not necessarily geo-referenced to a physical path.) • A terminus (destination) of a Transit Path must be coincident with the terminus (origin) of a sequential path in order for the paths to be topologically connected. The paths must flow in the same direction as the previous path. • A Pattern may include an associated "variant." A *variant* is a branch at the beginning, middle or end of a Pattern. ***Variants are not supported in the SDP.*** They should be incorporated into a new Pattern from origin to destination. • A Pattern may be associated with trips that perform "short turns" that do not include an exception or special consideration. • The SDP requires that the points describing a transit pattern (or transit path event) be associated as an event to its respective pattern.
4	Subtypes	• A Pattern may be designated as revenue or non-revenue. • A non-revenue generating Pattern may be a deadhead, pull out, pull in, or non-scheduled path used for training, maintenance or other vehicle journey. Only those non-revenue Patterns that are needed to ensure coordination need be included in the SDP. • Rail transit does not always designate stopping patterns, although the patterns may be derived from a set of trains (or trips) trip times.
5	Transit Point Events	• The Pattern may be composed of an ordered set of Transit Point Events. These events (points) may correspond to: - Transit stops serviced by the route; - Timing points that schedule service; - Operational events that are scheduled to occur during scheduled service. These events may include pull out and pull in points (from depot or layover points that may be neither a transit stop nor a timepoint), fare set change point, headsign change point, short turn,

Table 6.1-1: Requirements for Pattern and Related Data Concepts

#	Category	Requirements
		and other events that may be designated by each local agency. - Physical points to provide shape and reduce path ambiguity.
6	Route Direction	• A Pattern is associated with one of the two Route Directions designated for the route.
7	Attributes	• A Pattern may be associated with a particular service such as regular, express, skip stop, charter, school, etc. • A Pattern may be associated with a particular mode of operation. (This attribute may be better associated with each Transit Path since some construction or other event may necessitate use of an alternate mode for part of the Pattern.) • Schedulers or other staff may sometimes attach one or more notes to a Pattern or event to convey information that applies to all scheduled service on that Pattern, e.g., "construction will occur at this point…"

SDP XML Schema for Pattern, Transit Point Event and Transit Path Event

In implementing the Pattern and related entities into the SDP XML Schema (see Figure 6-4 for XML Schema fragment) a number of rules were applied.

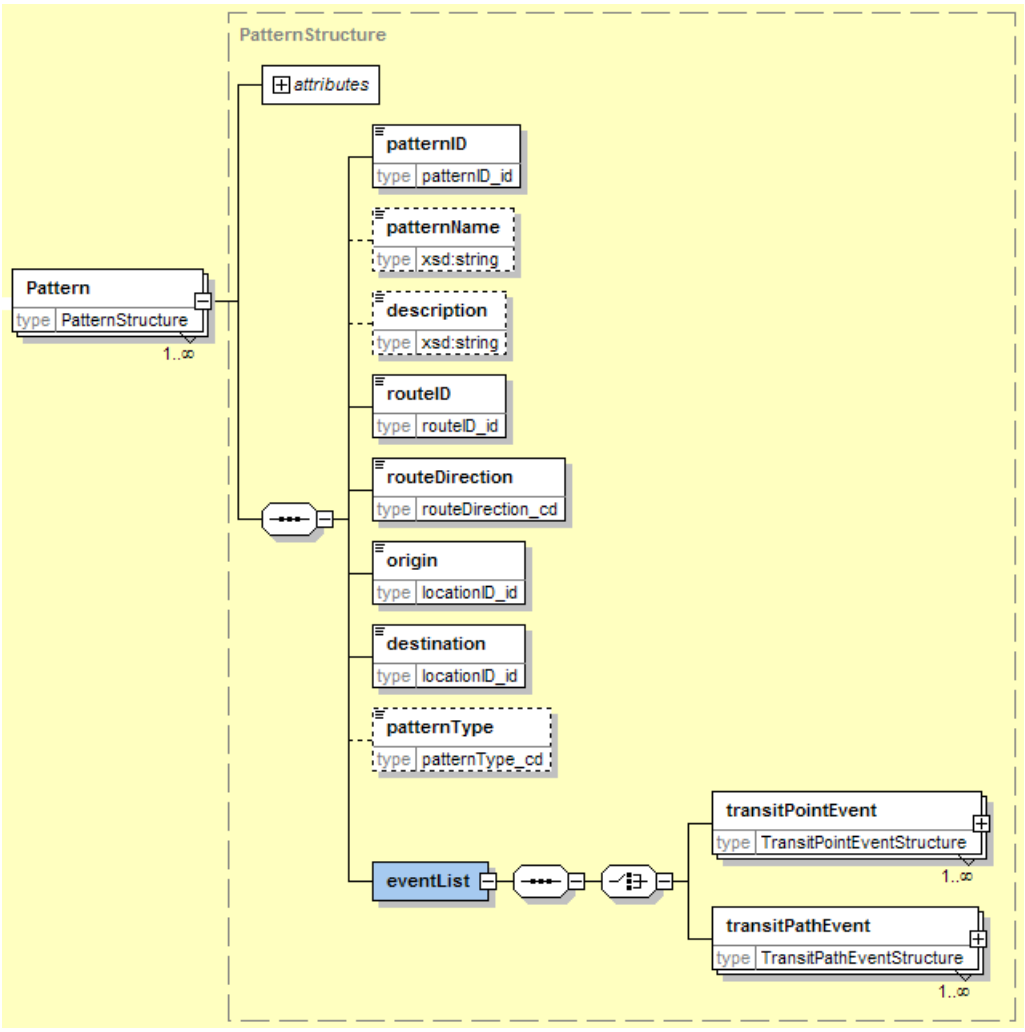

Figure 6-4: SDP XML Schema Fragment of Pattern Element

The rules applied to the Pattern element (in addition to the requirements listed in the Functional Requirements table, Table 6.1-1) include:

- Six mandatory elements are necessary, as shown in Figure 6-4. They include patternID, routeID, routeDirection, origin, destination and an eventList, which is embedded as a child element of Pattern and includes a set of events (either transitPointEvent or transitPathEvent).
- In addition patternID, routeID and routeDirection are required to unambiguously identify each Pattern.
- The routeDirection [first or second] describes a routeDirection value whose native value may be looked up in the Route element routeDirectionList (see Section 4.3).
- The direction of the Pattern's path is derived from origin to destination direction; to ensure the correspondence between the Pattern and eventList elements, the origin (locationID) should be the first event in the eventList and destination (locationID) the last event in the eventList.
- patternType is described as an enumerated value with two values.

- eventList is *either* a set of Transit Point Events or Transit Path Events. This is a CHOICE option in the XML Schema. (Point and path events are discussed later in this section.)
- Attributes, consisting of effectiveDate and endDate, may be used to record the placement dates of the information content.

Transit Path Event / Transit Point Event

Only one structure, TransitPointEventStructure or TransitPathEventStructure, is permitted in the eventList element. At least one or more events should be ordered between the eventList tags. Figure 6-5 shows transitPathEvent and transitPointEvent relative to eventList in the relevant fragment of the SDP XML Schema's hierarchical structure. (See eventList nested in Pattern in Figure 6-5, which is nested in TransitNetwork as shown in Figure 6-4.) The transitPathEvent is linked to the TransitPath, which describes where the path is, via the tranPathID, as shown in Figure 6-4.

The rules applied to the transitPointEvent element include:

- locationID references an identifier of a point that exists in the Location element (Transit Gazetteer branch).
- trackNo and stopID are optional feature references. They may be found using a join through the locationID (with the Track or TransitStop elements). The data is included in the transitPointEvent because many downstream applications use this information directly from the transitPointEvent description.
- The stopID may also refer to a platformNo.
- Similar to distance in TransitPath, distanceFromOrigin is the linear, as-traveled distance from the origin of the Pattern to this event location. The element includes an attribute of unit wherein the unit of measure—meters or feet—may be designated. The default value when no attribute is present is "feet."
- seqNo is the order of the event in the list.
- headsignDesc is the content of the headsign at the event. By associating the headsign with the event, and not the pattern, a series of messages, such as "via a destination," or next trip information, may be changed during a journey or prior to the end of a path. *The first event should contain the default headsign message.*

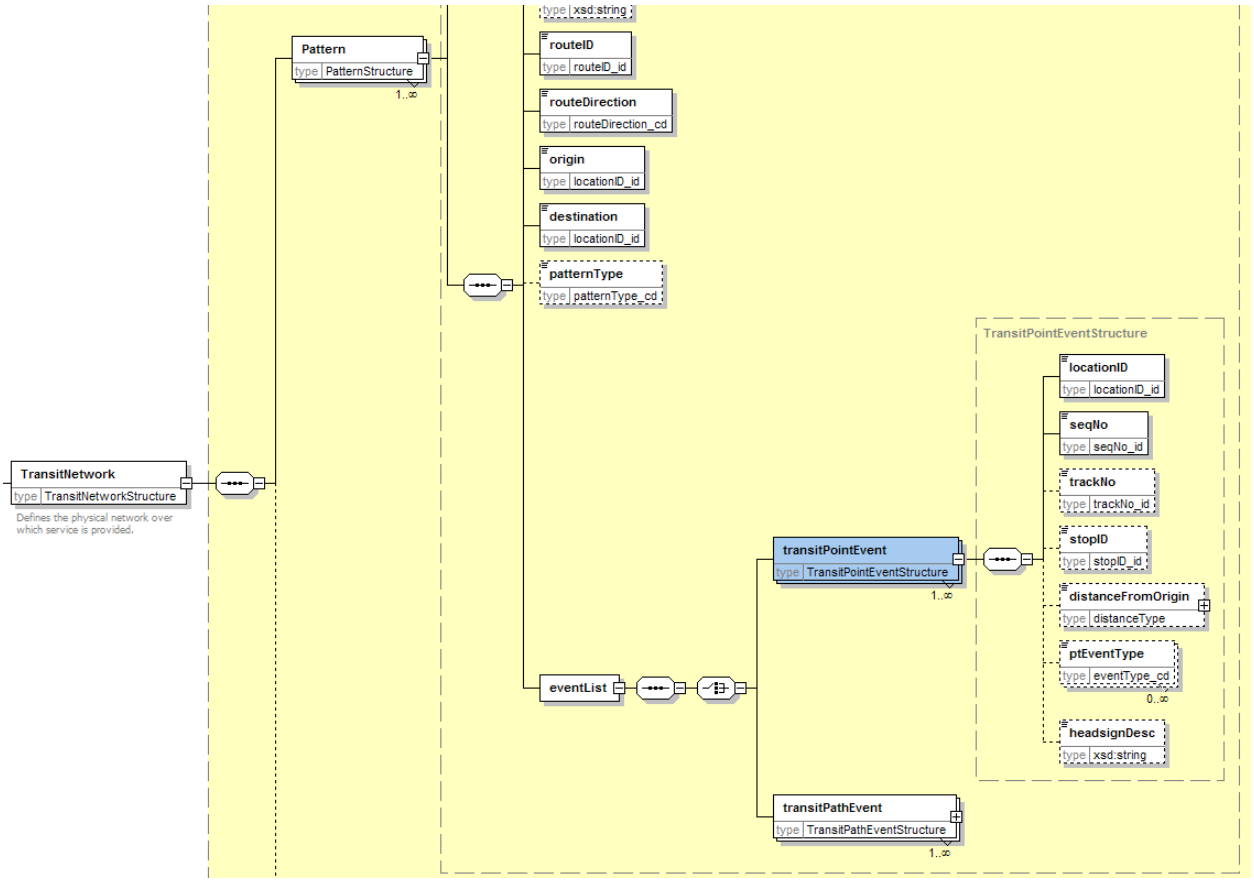

Figure 6-5: SDP XML Schema fragment showing eventList CHOICE elements transitPointEvent and transitPathEvent

The transitPathEvent element conforms to the requirements listed in Table 6-1. The rules applied to the transitPathEvent element include:

- At least one or more transitPathEvents should be ordered between the eventList tags.
- The linkage between the transitPathEvent and the actual Transit Path (see Section 6.2) is through the tranPathID.
- seqNo is the order of the transitPathEvent in the eventList. It determines the sequence of the Transit Paths in the Pattern.
- trackNo is an optional feature reference. It may be found by using a join through the trackNo with the Track element described in the Transit Facilities Branch (See Figure 8-8 in Chapter 8).

Data Formats and Guidance for Pattern, Transit Point Event and Transit Path Event

This section provides descriptions and guidance for the elements associated with Pattern in Table 6.1-2, for Transit Point Event elements in Table 6.1-3, and for Transit Path Events in Table 6.1-4. The guidance is consolidated into tables that include a list of baseline requirements (M for mandatory and O for optional), the element name, the data type and guidance related to element. The guidance provides clarity to the data definition. The first column of each table designates the baseline requirements based on the SDP XML Schema version 1.0. A

downstream application may further restrict these requirements in order for the data set to meet its data needs. The element name corresponds to the related CDRM entities and attributes. The type may refer to a native XML type, or declared type in the XML schema. The Guidance column is called "Questions to Ask." These questions direct the analyst to a similar or equivalent concept in their own schedule data set. In addition, some comments describe the impact of the data structures on the SDP XML Document deployment.

Table 6.1-2: Pattern Structure and Guidance

	Element Name	Type	Questions to Ask
Pattern			
M	patternID	patternID_id UNIQUE	What field in the native data is used to designate a Pattern? Are Pattern identifiers unique throughout a route? If no, then add new Pattern identification values to ensure that each Pattern in a route is uniquely identified.
O	patternName	string	Do Patterns have names?
O	description	string	Description of the Pattern. The field may not be needed for most downstream applications.
M	route	routeID_id	The route identifier associated with the Pattern. This field is validated for its existence.
M	routeDirection	routeDirection_cd	The direction of travel. Use standard code 'first' or 'second' and designate publicRouteDirection in the Route.routeDirectionList element.
M	origin	locationID_id	The originating location of the Pattern. This field should match the first entry in the transitPointEvent.locationID element. The locationID should exist in the Location element.
M	destination	locationID_id	The location of the destination of the Pattern. This field should match the last entry record in the eventList (that is transitPointEvent.locationID). The locationID should exist in the Location element.
O	patternType	patternType_cd	A classification for a Pattern. Acceptable values include revenue and non-revenue. Current downstream applications do not need non-revenue patterns or trips.
M	eventList	Choice of ordered list of TransitPointEvent or TransitPathEvent	The elements in this entry are the events that occur along the Pattern. A commuter rail system where each train (trip) may stop at a unique set of stations/events, only one Pattern for each origin-destination pair (along non-branching paths) need be described.

Table 6.1-3: Transit Point Event Elements and Guidance

	Element Name	Type	Questions to Ask
Transit Point Event			
M	location	locationID_id	A reference to the location where the event occurs. The point may be any type of transit feature, physical point, timepoint, transit stop or facility, or other event (e.g., change headsign, trigger location). The locationID should exist in the Location element.
O	trackNo	trackNo_id	For trains, the trackNo on which the event occurs.
O	ptEventType	ptEventType_cd [0..∞]	The type of event that occurs. More than one event may occur at a single point, for example, exiting a bus stop zone and checking out of a Transit Signal Priority zone may be co-located.
O	stopID	stopID_id	If appropriate, the stop identifier or platform number associated with the event.
O	distanceFromOrigin	float	The distance from the Pattern origin. Although this information is not universally collected, it is needed to reduce ambiguity by many downstream applications, and thus is a key field for the SDP. Also includes optional attribute unit= [feet or meters]. Default when no attribute is present is feet.
M	seqNo	integer	The sequence number of the event along the Pattern. This number may be derived if the distanceFromOrigin is defined.
O	headsignDesc	string	Although this field may be included multiple times, the field may also contain additional fields to be used throughout the Pattern, for example, headsign information such as "via Brooklyn/Flatbush" or "Go Mets."

Table 6.1-4: Transit Path Event Elements and Guidance

	Element Name	Type	Questions to Ask
Transit Path Event			
M	tranPathID	tranPathID_ id	A reference to the link or path identifier. This identifier is associated with the Transit Path definition of the geographic path or traversal. The identifier should exist in the Transit Path element.
	trackNo	trackNo	If this is a rail alignment, then the track identifier may be included here.
M	seqNo	integer	An index that orders the transitPathEvents and by direct relationship, the segments or Transit Paths, in a Pattern. The Transit Pattern has direction, so by default, this segment has direction. The ordered set of segments should be topologically valid, that is, the first point of this segment should be the same as the last point of the previous segment.

Usage and Example of Transit Pattern

Example 1: A Pattern with fields completed using Transit Point Events.

This example shows an excerpt from an SDP XML Document, which describes a pattern from Route 3210 (N1 Jamaica-Elmont-Hewlett from Long Island Bus). It was derived from an ordered set of route segments to define a single set of point events (transitPointEvent) from origin to destination of the Pattern.

This Pattern listing includes the mandatory elements patternID, routeID, routeDirection, origin, destination and eventList. The eventList tags enclose an ordered list of transitPointEvent elements. In turn, the transitPointEvent tags distinguish the elements in sequential order from seqNo 1 to the last seqNo 53. Notice that the origin and destination elements match the first and last transitPointEvent locationID elements (respectively). The distanceFromOrigin is a floating point number. As a general rule in the Long Island Bus data set, the native data does not insert an absolute 0.0 value, and so the first point will appear as 1E-005. Values for origin, destination and locationID come from the first and last transitPointEvent elements.

```
<Pattern>
  <patternID>102</patternID>
  <routeID>3210</routeID>
  <routeDirection>second</routeDirection>
  <origin>4918</origin>
  <destination>225</destination>
  <eventList>
    <transitPointEvent>
      <locationID>4918</locationID>
      <seqNo>1</seqNo>
      <distanceFromOrigin units=meters>1E-005</distanceFromOrigin>
      <headsignDesc>N01 HEWLETT DIRECTION South</headsignDesc>
    </transitPointEvent>
    <transitPointEvent>
      <locationID>553</locationID>
      <seqNo>2</seqNo>
      <distanceFromOrigin units=meters >549.64</distanceFromOrigin>
      <headsignDesc>N01 HEWLETT DIRECTION South</headsignDesc>
    </transitPointEvent>
…
    <transitPointEvent>
      <locationID>581</locationID>
      <seqNo>51</seqNo>
      <distanceFromOrigin units=meters >13863.22</distanceFromOrigin>
      <headsignDesc>N01 HEWLETT DIRECTION South</headsignDesc>
    </transitPointEvent>
    <transitPointEvent>
      <locationID>614</locationID>
```

```
      <seqNo>52</seqNo>
      <distanceFromOrigin units=meters >13999.28</distanceFromOrigin>
      <headsignDesc>N01 HEWLETT DIRECTION South</headsignDesc>
    </transitPointEvent>
    <transitPointEvent>
      <locationID>225</locationID>
      <seqNo>53</seqNo>
      <distanceFromOrigin units=meters >14469.5</distanceFromOrigin>
      <headsignDesc>N01 HEWLETT DIRECTION South</headsignDesc>
    </transitPointEvent>
  </eventList>
</Pattern>
```

In the example above, the Route element defines routeDirection “second” as the South, as shown in Figure 6-6.

Figure 6-6: Route Direction Description

```
        <routeDirectionList>
          <routeDirection>second</routeDirection>
          <routeDirectionDescription>bound=1 direction=4 tcip=2</routeDirectionDescription>
          <publicRouteDirection>South</publicRouteDirection>
        </routeDirectionList>
```

Section 6.2: Transit Path and Related Data Concepts

In This Section

- Learn about the Transit Path Data Concept.
- Understand how to apply the elements in the Transit Path and relate it to the Transit Pattern's Transit Path Event.

Transit Path Definition
A transit path is a linear section and geographic representation of the Transit Network which is designed for the movement of Public Transit Vehicles.

Purpose of Transit Path Data Concept

A Transit Path is a description of a geographic alignment or guideway over which transit service is delivered. It may be the description of a route segment, timepoint interval, rail track, walking path, bus only lane or other geographic feature. One of its primary purposes is to use the Transit Path as a route segment that is used in a Pattern as an element in the eventList, that is, one of a sequence of transitPathEvents. Although the Transit Path element is optional in general, it becomes mandatory when the Pattern is described by transitPathEvents. In that case, the Transit Network is composed of Transit Paths either along a street network, private road or a transit-only path, such as a rail tracks, bus-only lanes or guideways. It may also be used to describe a "patch" to a transportation network over which a transit vehicle traverses. The Transit Path, by definition, is directed and is composed of termini (end points), and optionally, an ordered set of points along the path between the termini.

The requirements pertaining to the inclusion of a Transit Path in a Pattern are delineated in Table 6.2-1.

SDP XML Schema for Transit Path

Figure 6-7 shows the SDP XML Schema fragment for the Transit Path. In implementing the Transit Path and related entities into the SDP XML Schema, a number of rules were used to implement the data concept. These rules and assumptions include:

- A unique identifier is used to index the Transit Path. A name may optionally be associated with the Transit Path.
- All Transit Paths are directed, starting at the origin and ending at the destination. The origin and destination refer to a Location identifier (locationID).
- An ordered set of points (between the origin and destination) should be included that describes the physical path of the Transit Path.
- The value of the mode element is a code that defines the service mode (e.g., type of transit vehicle) that uses the Transit Path.
- The distance is the linear distance (floating point) from origin to destination. Distance includes an attribute that designates unit of measure. Unit values include feet and meters. Default value (when not present) is "feet."
- Attributes, comprised of effectiveDate and endDate, may be used to record the placement dates of the information content.

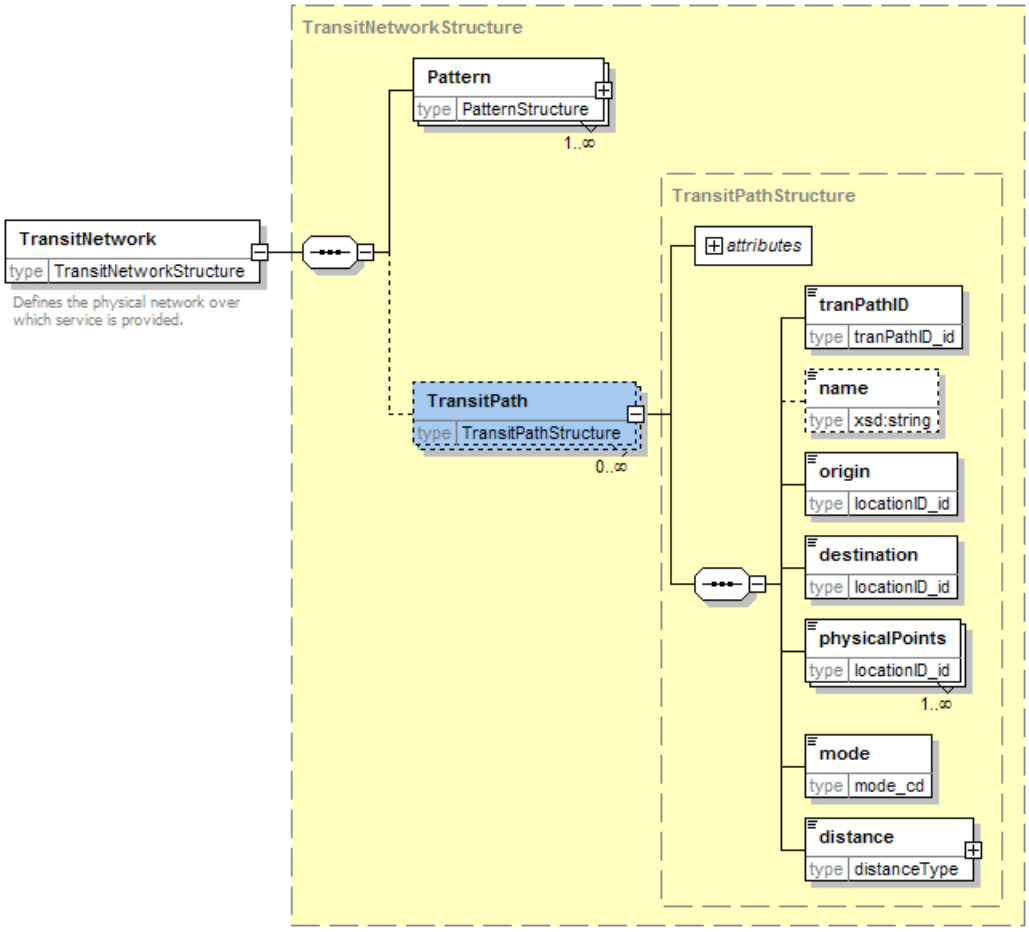

Figure 6-7: SDP XML Schema Fragment of TransitPath

Detailed Data Formats and Guidance for Transit Path

This section explains the formats and guidance associated with each element in the Transit Path data concept illustrated in Figure 6-7 above. The guidance is consolidated into Table 6.2-1, which includes a list of base line requirements (M for mandatory and O for optional), the element name, the data type and guidance related to element. The guidance provides clarity to the data definition. The first column of each table designates the baseline requirements based on the SDP XML Schema version 1.0. A downstream application may further restrict these requirements in order for the data set to meet its data needs. The type may refer to a native XML type, or declared type in the XML schema. The Guidance column is called "Questions to Ask." These questions direct the analyst to a similar or equivalent concept in their own schedule data set. In addition, some comments describe the impact of the data structures on the SDP XML Document.

Table 6.2-1: Transit Path Elements and Guidance

	Element Name	Type	Questions to Ask
Transit Path			
M	tranPathID	tranPathID_id UNIQUE	A unique identifier for the Transit Path.
O	name	string	If the Transit Path has a name, insert it here.
M	origin	locationID_id	The starting point of the segment (Transit Path). The locationID should exist in the Location element.
M	destination	locationID_id	The ending point of the segment (Transit Path). The locationID should exist in the Location element.
M	physicalPoint	ordered set of locationID_id	The ordered or directed set of points (locationID) starting from the origin and ending with the destination. Sufficient number of points should be included to ensure that the physical path is unambiguously defined. If the path loops or backtracks, additional points may be needed to clearly define the physical path of travel. The locationIDs used should exist in the Location element.
M	mode	mode_cd	The type of vehicle or service that uses the Transit Path. For example, the path may be a ferry lane for ferry service, caternary lines for streetcar service, or tracks for commuter rail or subway service.
M	distance:	float	The linear distance of the Transit Path. Also include optional attribute unit [feet or meters]. Default when no attribute is present is feet.
O	effectiveDate	date	[attribute] The date the record was placed or inserted.
O	endDate	date	[attribute] The date the record expires or becomes obsolete. Default value is 9999-12-31.

Usage and Examples of Transit Path Element

A route segment may be represented as a Transit Path. The SDP XML Document fragment below describes Long Island Bus Pattern 116 and its related route segments: 100-103 (first to third segment), and fifth and last segment of Pattern 116, Route 3210.

- The route segment (tranPathID 100) has 5 defined points that ranges over a linear distance of 1526.00 meters.
- The route segment (transPathID 101) has 7 defined points that ranges over the linear distance of 4912.89 meters.
- The route segment (tranPathID 102) has 8 defined points that ranges over a linear distance of 1,736.67 meters.
- The route segment (tranPathID 105) has 3 defined points that ranges over a linear distance of 749.21 meters.

These route segments are ordered as a transitPathEvent in Pattern 116 in its eventList. The example displays the order of elements based on the SDP XML Document. In the SDP, the Pattern elements are listed prior to TransitPath.

```
<Pattern>
  <patternID>116</patternID>
```

```
  <routeID>3210</routeID>
  <routeDirection>second</routeDirection>
  <origin>232</origin>
  <destination>228</destination>
  <eventList>
    <transitPathEvent>
      <tranPathID>100</ tranPathID >
      <seqNo>1</seqNo>
    </transitPathEvent>
    <transitPathEvent>
      < tranPathID >101</ tranPathID >
      <seqNo>2</seqNo>
    </transitPathEvent>
…
    <transitPathEvent>
      < tranPathID >105</ tranPathID >
      <seqNo>5</seqNo>
  </eventList>
</Pattern>
…
<TransitPath>
        <tranPathID>100</tranPathID>
        <name>Route 3210; patternID 116; south; segment 1 </name>
        <origin>232</origin>
        <destination>234</destination>
        <physicalPoints>5249</physicalPoints>
        <physicalPoints>556</physicalPoints>
        <physicalPoints>5250</physicalPoints>
        <mode>MB</mode>
        <distance units=meters>1526.00</distance>
</TransitPath>
<TransitPath>
        <tranPathID>101</tranPathID>
        <name>Route 3210; patternID 116; south; segment 2 </name>
        <origin>540</origin>
        <destination>5257</destination>
        <physicalPoints>566</physicalPoints>
        <physicalPoints>539</physicalPoints>
        <physicalPoints>5254</physicalPoints>
        <physicalPoints>537</physicalPoints>
        <physicalPoints>524</physicalPoints>
        <mode>MB</mode>
        <distance units=meters>4912.89</distance>
</TransitPath>
<TransitPath>
        <tranPathID>102</tranPathID>
```

```
        <name>Route 3210; patternID 116; south; segment 3 </name>
        <origin>235</origin>
        <destination>4918</destination>
        <physicalPoints>661</physicalPoints>
        <physicalPoints>518</physicalPoints>
        <physicalPoints>517</physicalPoints>
        <physicalPoints>516</physicalPoints>
        <physicalPoints>515</physicalPoints>
        <physicalPoints>4316</physicalPoints>
        <mode>MB</mode>
        <distance units=meters>1736.67</distance>
</TransitPath>
…
<TransitPath>
        <tranPathID>105</tranPathID>
        <name>Route 3210; patternID 116; south; segment 5 </name>
        <origin>227</origin>
        <destination>228</destination>
        <physicalPoints>5537</physicalPoints>
        <mode>MB</mode>
        <distance units=meters>749.21</distance>
</TransitPath>
…
```