Digital TMI

Creation, Storage, Retrieval, and Transmission of TMI Data

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ATCSCC Visitors
June 27, 2012
• Traffic demo
Project Overview

• The goal of Digital TMI is to offer specific and reasonable suggestions for improvements to the creation, storage, retrieval, and transmission of Traffic Management Initiative data, which may facilitate day-of-operations decisions and historical analysis.

• The TMI Cube will offer a unified view of TMIIs for all stakeholders. This will include historical, current, and near-future TMIIs. The TMI Cube will be accessed through the FAA’s NAS Common Reference.

• Started August 2011, currently funded through August 2013 by Rich Jehlen’s group
Traffic Management Data

- The National Traffic Management Log (NTML) and Traffic Flow Management Data to Industry (TFMDI) are two primary sources.

- Currently, Traffic Management Initiative (TMI) data is generated, stored, and retrieved (mostly) to aid day-of-operations.

- TMI data serve their intended purposes well.

- Future sources? FPS?
Downside

• The major drawback to the current state of data in the NAS is the difficulty of historical analysis

• Examples
  – Non-trivial to extract meaningful relationships between the data within the NTML
  – Archive of TFMDI data not readily available and is stored only as a set of individual XML files

• Secondary drawback is the data living in (and accessed from) different systems
Fundamental, ‘Hard’ TMI Questions

• What are all the current TMIs affecting flights from ZOA to ZNY? To ATL?

• Given a choice between 3 routes, which one is least likely (based on history) to receive multiple TMIs?

• On May 3rd, 2011, how did the day’s TMI plan evolve? How many changes to the plan were required?
Approach

• Create a unified data source for TMIs that is suitable for analysis and for ‘day-of’ operations

• Leverage existing/developing models and architectures
  – AIXM, GML, etc.
  – SWIM
Development Plan and Progress

- Gather domain knowledge, create requirements
- Develop necessary schema
- Implement database
- Implement interface to outside world
- Test, refine
- Deliver documentation for potential FAA implementation

In progress
Complete
Reroute

**Time Slices**

- TimeSlice
  - TimeSliceProperty
  - TimeSliceType
  - AbstractXMTimeSliceType

**Segment Filter**

- Segment
  - Filter
  - FilterPropertyGroup
  - FilterType

**Reroute Properties**

- Property
  - PropertyGroup
  - PropertyType

**Reroute Segments**

- Segment
  - SegmentPropertyGroup
  - SegmentType

**Reroute Waypoints**

- Waypoint
  - WaypointPropertyGroup
  - WaypointType

**Reroute**

- AbstractXMFeature
  - Reroute
  - TimeSlice
  - Segment
  - Waypoint
Reroute Advisory from NTML

- Reroutes only occur in the ‘Advisories’ table of NTML.
- Few columns:
  - Times
  - Cause
  - Text blob (example)
- Difficult to parse, error-prone

### Table: Reroutes

<table>
<thead>
<tr>
<th>ORIG</th>
<th>DEST</th>
<th>ROUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZME</td>
<td>ZFW(-BNA-MEM)</td>
<td>EWR</td>
</tr>
<tr>
<td>ZME</td>
<td>ZFW(-BNA-MEM)</td>
<td>EWR</td>
</tr>
<tr>
<td>ZHU</td>
<td>EWR</td>
<td>HRV J37 SPA J14 CREWE J51</td>
</tr>
<tr>
<td>ZHU</td>
<td>EWR</td>
<td>MEM J29 DORET J584 FQM FQM1</td>
</tr>
</tbody>
</table>

**Valid:**
- 061135-062230

**Modification:**
- RQD to EWR only today.

**Remarks:**
- SEE DYNAMIC LIST FOR UPDATES.
- VIA NTML.

**Associated Restrictions:**
- Via NTML.

**Probabilities:**
- Low extension probability.

**Facilities Included:**
- ZFW/ZHU/ZME

**Include Traffic:**
- ZFW/ZHU/ZME departures to EWR

**Flight Status:**
- All Flights

**Valid:**
- FCA entry time from 061800 to 062230

**Probability of Extension:**
- Low

**Remarks:**
- See dynamic list for updates.

**Associated Restrictions:**
- Via NTML.

**Modifications:**
- RQD to EWR only today.

**Routes:**
- ZME ZFW(-BNA-MEM) EWR MEM J29 DORET J584 FQM FQM1
- ZME ZFW(-BNA-MEM) EWR VUZ J14 SPA J14 CREWE J51
- ZHU EWR HRV J37 SPA J14 CREWE J51
- ZHU EWR MEM J29 DORET J584 FQM FQM1

**Entry Time:**
- 061135-062230

**Modification Date:**
- 10/07/06 11:35

**Contact:**
- FSB/Intnl 703-925-5308
Traffic Flow Management Data to Industry

- TFMDI is available similarly to ASDI
- XML-formatted reroute, FCA, and FEA data
- “Publish-Subscribe” system
  - New reroute is issued
  - Encoded in TFMDI XML format and saved
  - “Announced” to all clients that it is downloadable
- Example…
Translating TFMDI to TMX.

- Since both formats are well-structured, translation is not difficult.
- Example...
MIT Data

• MIT sourced from NTML

• Important columns from RSTN database table:
  – Frfac
  – Tofac
  – Rstn Type (MIT, ALT, STOP, SPD, etc.)
  – Start/Stop Times
  – Rstntype (Departures, Arrivals, Enroute)
  – Airports (Arrival, Departure)
  – NAS Element (Usually a fix/waypoint?)
  – Various parameters (MIT value, ALT type, Spd, etc.)

• Not yet implemented in Digital TMI system
Ultimately, this will become a single DB query.

<table>
<thead>
<tr>
<th>Frfac</th>
<th>ZBW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tofac</td>
<td>N90</td>
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<tr>
<td>Entryid</td>
<td>132493495</td>
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<tr>
<td>Rstnid</td>
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<tr>
<td>Rstnsource</td>
<td>DYN</td>
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<tr>
<td>Passback</td>
<td>N</td>
</tr>
<tr>
<td>Appevtime</td>
<td></td>
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<tr>
<td>Acft Type</td>
<td>JETS</td>
</tr>
<tr>
<td>Provider List</td>
<td>N90</td>
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<tr>
<td>Rstn Start</td>
<td></td>
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<tr>
<td>Rstn Stop</td>
<td></td>
</tr>
<tr>
<td>Stopflag</td>
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</tr>
<tr>
<td>Rstntype Text</td>
<td>Departures</td>
</tr>
<tr>
<td>Airport</td>
<td>N90/ZNY</td>
</tr>
<tr>
<td>Dep Airport</td>
<td>N90/ZNY</td>
</tr>
<tr>
<td>Arr Airport</td>
<td>0</td>
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<tr>
<td>Nas Element</td>
<td>MERIT</td>
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<td>Impact Element</td>
<td></td>
</tr>
<tr>
<td>Reason Txt</td>
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<tr>
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</tr>
<tr>
<td>Remarks</td>
<td>0</td>
</tr>
<tr>
<td>SwxRerte</td>
<td>N</td>
</tr>
</tbody>
</table>

Is Flight ZZ100 affected by any MITs?

Check: ZZ100 flight path goes through MERIT during this MIT?

Check: ZZ100 is a jet?

Check: ZZ100 departs from N90/ZNY?

ZZ100 is affected by this MIT
Playbook Reroute Data
Data Needs

• Historical TFMDI data
  – We collect all TFMDI data now
  – Only have a number of months in archive

• “Digitized” Playbook Reroute data
  – Only access to playbooks is via website
  – ATCSCC has ‘machine readable’ playbook data

• Scheduled NTML query
  – At least a daily query, but perhaps an hourly?
  – System is in place to do this already, need permissions

• TMA samples
  – Members of FCT noted importance of TMA data
  – Even though TMA data is not centralized, we’d like to examine it