Digital TMI

Creation, Storage, Retrieval, and Transmission of TMI Data

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ATCSCC Visitors
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• Traffic demo
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 TMIs for all stakeholders. This will include historical, current, and near-future TMIs. 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 TMIIs 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
class TMI_Features Reroute

Reroute

Time Slices

Reroute Time Slice

Reroute Time Slice Property Group

Abstract AXM Time Slice Type

Reroute Time Slice

Reroute Time Slice Property Group

Reroute Segment Property Group

Reroute Segment

Reroute Segment Property Group

Reroute Filter Property Group

Abstract AXM Feature

Reroute

Reroute Filter Property Group

Waypoint

Reroute Waypoint Type

Reroute Waypoint

Reroute Properties

Reroute Filter

Segment Filter
### 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**

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<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>
</tbody>
</table>

**Reroutes:**

- ZME ZFW(-BNA-MEM) EWR MEM J29 DORET J584 FQM FQM1 FAK PHLBO2
- ZME ZFW(-BNA-MEM) EWR VUZ J14 SPA J14 CREWE J51
- ZHU EWR HRV J37 SPA J14 CREWE J51 FAK PHLBO2
- ZHU EWR MEM J29 DORET J584 FQM FQM1

**Valid:**

- FCA ENTRY TIME FROM 061800 TO 062230

**Remarks:**

- SEE DYNAMIC LIST FOR UPDATES.

**Associated Restrictions:** VIA NTML.

**Modifications:** RQD TO EWR ONLY TODAY.
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 TMXNM

- 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
### MIT Example

<table>
<thead>
<tr>
<th>Frfac</th>
<th>ZBW</th>
<th>Arr Airport</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tofac</td>
<td>N90</td>
<td>Nas Element</td>
<td>MERIT</td>
</tr>
<tr>
<td>Entryid</td>
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<td>Impact Element</td>
<td></td>
</tr>
<tr>
<td>Rstnid</td>
<td>2920474</td>
<td>Reason Txt</td>
<td>VOL:Volume</td>
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<td>Mitnum</td>
<td>278529</td>
</tr>
<tr>
<td>Passback</td>
<td>N</td>
<td>Mitval</td>
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</tr>
<tr>
<td>Appevtime</td>
<td></td>
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<tr>
<td>Acft Type</td>
<td>JETS</td>
<td>Alt</td>
<td>-</td>
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<tr>
<td>Provider List</td>
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<td>Spd Type</td>
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<td>Spd</td>
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<td>Oldendtime</td>
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</tr>
<tr>
<td>Airport</td>
<td>N90/ZNY</td>
<td>Remarks</td>
<td>0</td>
</tr>
<tr>
<td>Dep Airport</td>
<td>N90/ZNY</td>
<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

Ultimately, this will become a single DB query.
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