Digital TMI

Creation, Storage, Retrieval, and Transmission of TMI Data

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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 TMI data for all stakeholders. This will include historical, current, and near-future TMI data. The TMI Cube will be accessible 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
Reroute

Time Slices

AbstractAXMFeature

<Reroute>

<TimeSlice>

<XSComplexType>

<RerouteTimeSliceType>

<XSGroup>

<RerouteTimeSlicePropertyGroup>

<XSAttribute>

ext_ref: :gmt1:OwnershipAttributeGroup

</XSGroup>

</XSComplexType>

</TimeSlice>

</Reroute>

Segment Filter

AbstractAXMTimeSliceType

<RerouteTimeSlice>

<XSComplexType>

<RerouteTimeSliceType>

<XSGroup>

<RerouteSegmentPropertyGroup>

<XSAttribute>

segment: :CodeRerouteSegmentType [0..1]

route: :CodeRerouteRoutingInstructionType [0..1]

flightLevelLow: :aimx:ValFLType [0]

flightLevelHigh: :aimx:ValFLType [0]

aircraftCategory: :aimx:CodeAircraftEngineType [0]

weightClass: :aimx:CodeAircraftWeightClassType [0..1]

userCategory: :aimx:CodeAircraftUserCategoryType [0..1]

rnav: :aimx:CodeRSMIFilterType [0..1]

timeType: :aimx:CodeFlightDestinationType [0]

filterTime: :TimePeriod [0..1]

</XSGroup>

</XSComplexType>

</RerouteSegment>

</RerouteTimeSlice>

</Reroute>

Reroute Properties

<XSComplexType>

<ReroutePropertyGroup>

<XSAttribute>

designator: :CodeRerouteDesignatorType

domain: :CodeRerouteDomainType

originalCreateTime: :TimeInstant

site: :aimx:TextDesignatorType

workstation: :aimx:TextDesignatorType

status: :CodeRerouteStatusType

timeType: :CodeRerouteTimeType

fcaName: :aimx:TextDesignatorType [0..1]

cfaFeatureTime: :TimePeriod [0..1]

cfaName: :TextDesignatorType

</XSGroup>

</XSComplexType>

</ReroutePropertyGroup>

</Reroute>

Reroute Waypoints

<XSComplexType>

<RerouteWaypointType>

<XSGroup>

<RerouteWaypointPropertyGroup>

<XSAttribute>

name: :aimx:TextDesignatorType

type: :CodeRerouteWaypointType

point: :Point [0..1]

</XSGroup>

</XSComplexType>

</RerouteWaypointType>

</Reroute>


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

ATCSCC ADVZY 011 DCC 07/06/10 FCA RQD
NAME: FCABKW: NO_BKW_2_EWR
CONSTRAINED AREA: ZDC
REASON: VOLUME

INCLUDE TRAFFIC: ZFW/ZHU/ZME DEPARTURES TO EWR
FACILITIES INCLUDED: ZFW/ZHU/ZME
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:
  ORIG DEST ROUTE
  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

061135-062230
10/07/06 11:35 FSB./lxstn08a 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 TMXM

- 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

| Frfac | ZBW | Tofac | N90 | Entryid | 132493495 | Rstnid | 2920474 | Rstnsource | DYN | Passback | N | Appevtime |              | Acft Type | JETS | Provider List | N90 | Arr Airport | 0 | Nas Element | MERIT | Impact Element |              | Reason Txt | VOL:Volume | Mitnum | 278529 | Mitval | 15 | Alt Type | 0 | Alt | - | Spd Type | 0 | Spd | - | Qualifier | AS ONE | Oldendtime | 0 | Modid | 0 | Remarks | 0 | SwxRerte | N |   |
|-------|-----|-------|-----|---------|-----------|--------|---------|-----------|------|----------|---|------------|          |          |      |              |     |            |     |            |       |          |      |          |    |        |   |        |   |        |   |

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