US Federal NOTAM System

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AIXM/WXXM Conference | 2009

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Aeronautical Information Management

US-FAA

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Federal NOTAM System (FNS) Team

- Introductions
  - Barry Davis – Manager Aeronautical Information Management (AIM), FAA
  - Brett Brunk - AIM Architecture and Planning, FAA
  - Danny Miller – AIM Project Manager
  - Digital NOTAM Team
    - Don Smith, CSSI
    - Vinod Vallikat and Team, CGH
    - CGH Team

FAA Goals

- FAA moving AIXM from proposal to production
  - Coordination
    - EuroControl
    - National Geospatial Agency
    - US Department of Defense
    - AirServices Australia
    - NavCanada
  - Multiple software products in AIM under development to use AIXM

FAA Goals

- **Federal NOTAM System (FNS)**
  - Stores NOTAM data in AIXM
  - Distributes NOTAM data in AIXM
  - All digital, nothing manual
  - FNS Submission Web Service
  - FNS Distribution Web Service
  - Instant translation from AIXM into ICAO, FAA traditional and in the future, graphic maps
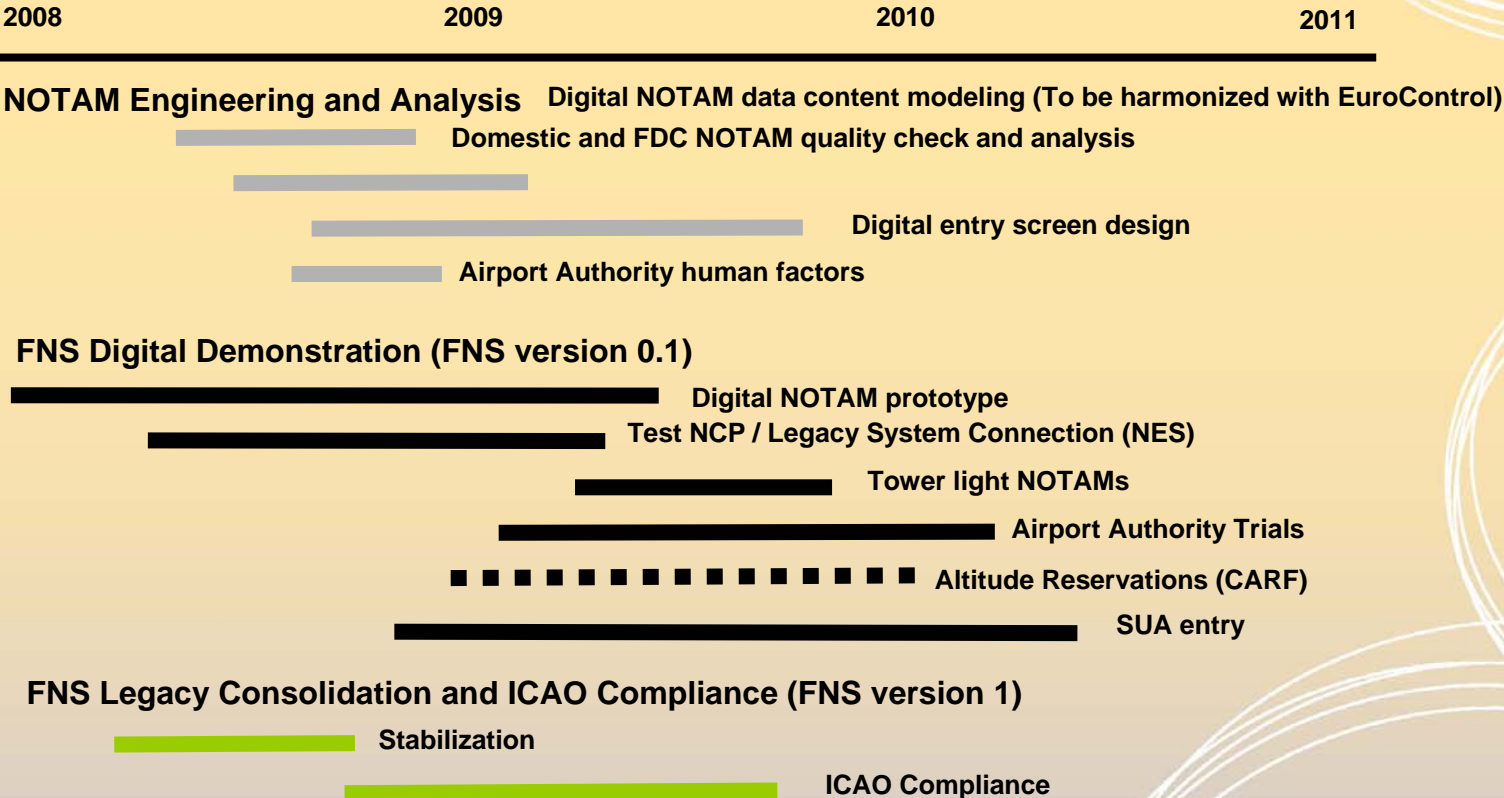
Introduction to FNS

- Why FNS?
- Improve the Quality of the NOTAM
  - AIXM follows a standard format
    - Example: Runway NOTAMs will ALWAYS look the same now
- Expand NOTAM Usability
  - AIXM contains data usable by third party software developers
  - AIXM means users can filter and sort on their requirements
- Improve the NOTAM speed from creation to distribution
  - User creates quality NOTAM using interpretation of AIXM
  - Instant NOTAM activation means NOTAMs for temporary issues like runway icing
  - Less human manipulation means less room for error

Federal NOTAM System (FNS)
Milestone Schedule

2008   **2009**   **2010**   **2011**

NOTAM Engineering and Analysis **Digital NOTAM data content modeling (To be harmonized with EuroControl)**

Domestic and FDC NOTAM quality check and analysis

Digital entry screen design

Airport Authority human factors

FNS Digital Demonstration (FNS version 0.1)

Digital NOTAM prototype

Test NCP / Legacy System Connection (NES)

Tower light NOTAMs

Airport Authority Trials

Altitude Reservations (CARF)

SUA entry

FNS Legacy Consolidation and ICAO Compliance (FNS version 1)

Stabilization

ICAO Compliance
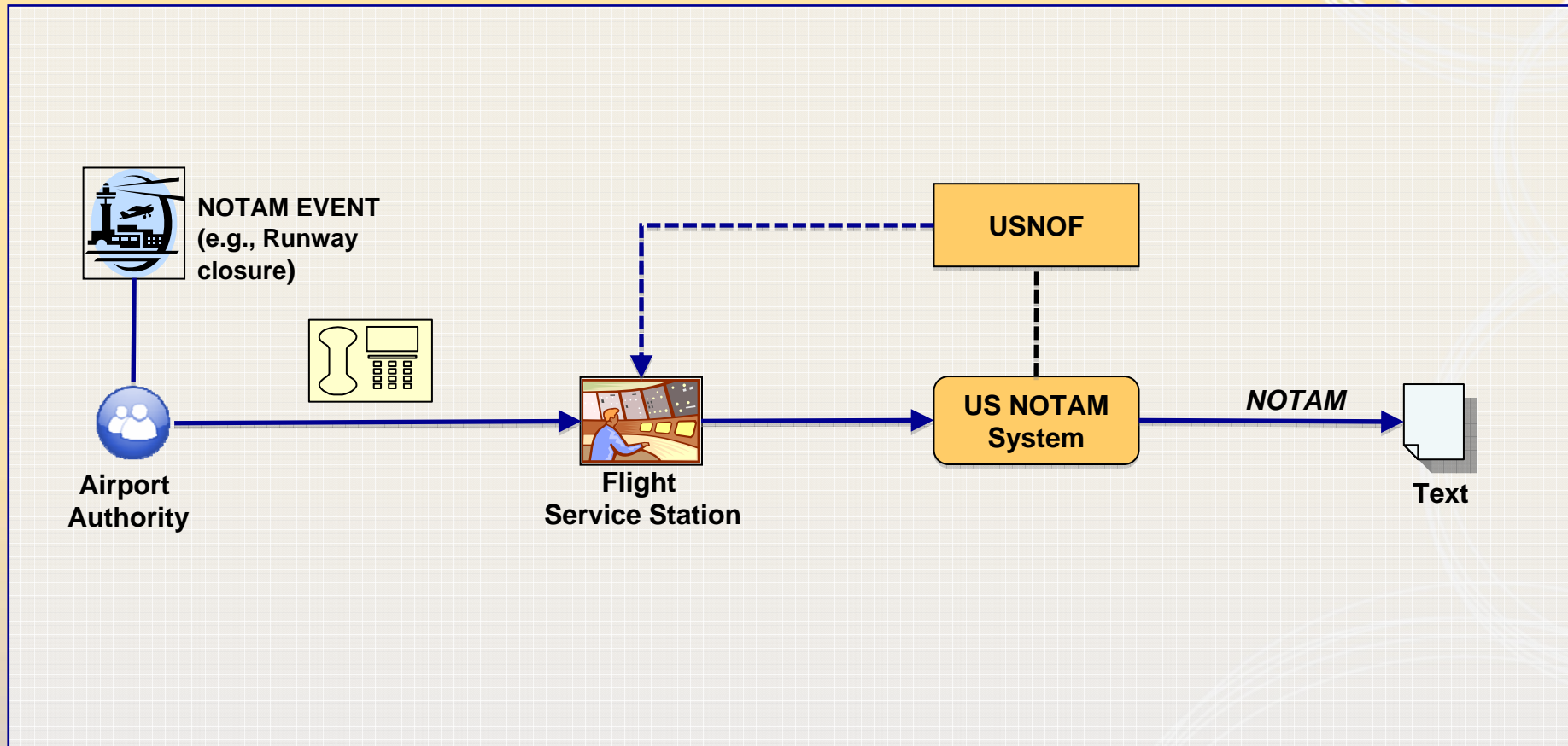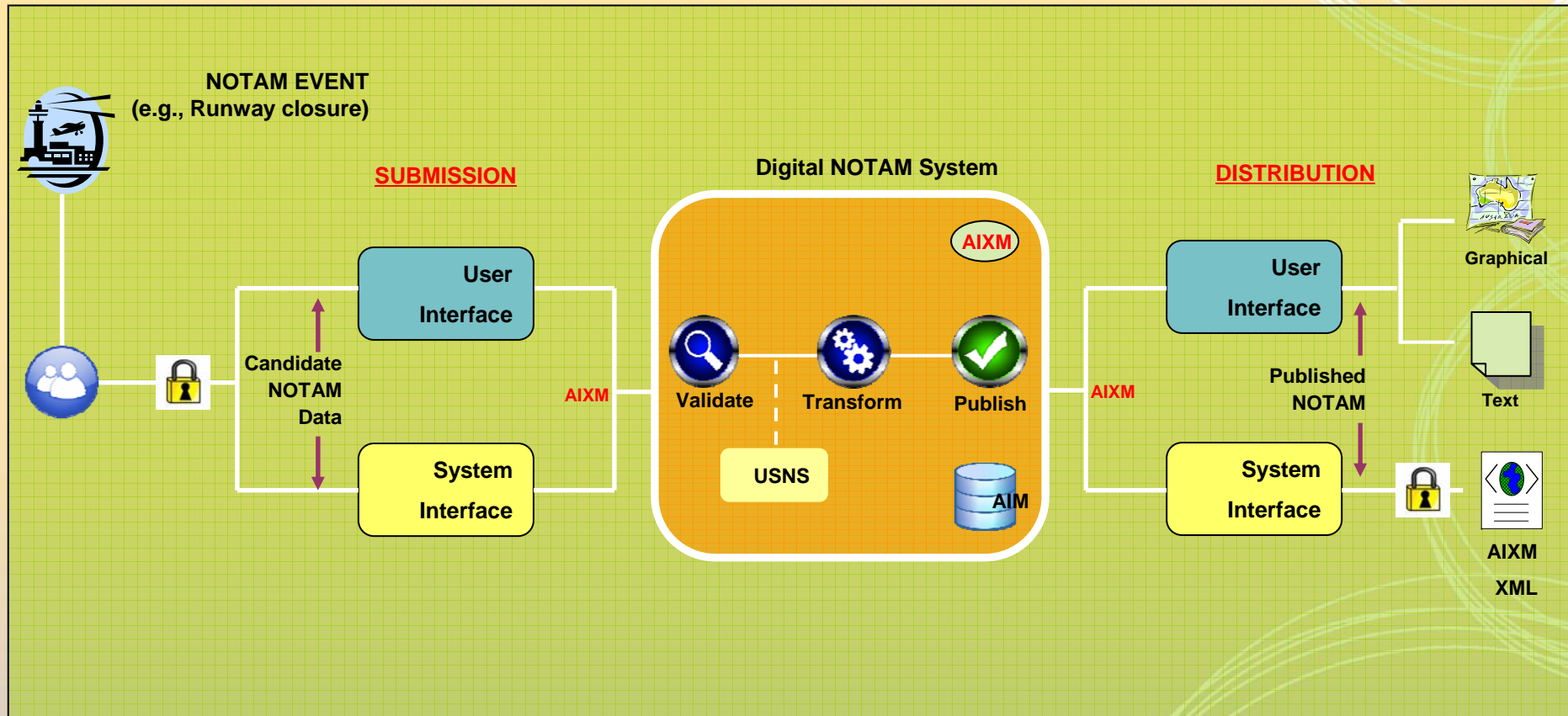
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FAA Goals

- **Federal NOTAM System (FNS)**
  - Denver Field Test
    - Late Spring 2009
    - Airport Operations Tests
    - Live NOTAMs safely created in the NAS
    - Denver Airport Users submit to FNS
    - FNS submits to USNS
    - All data stored in AIXM
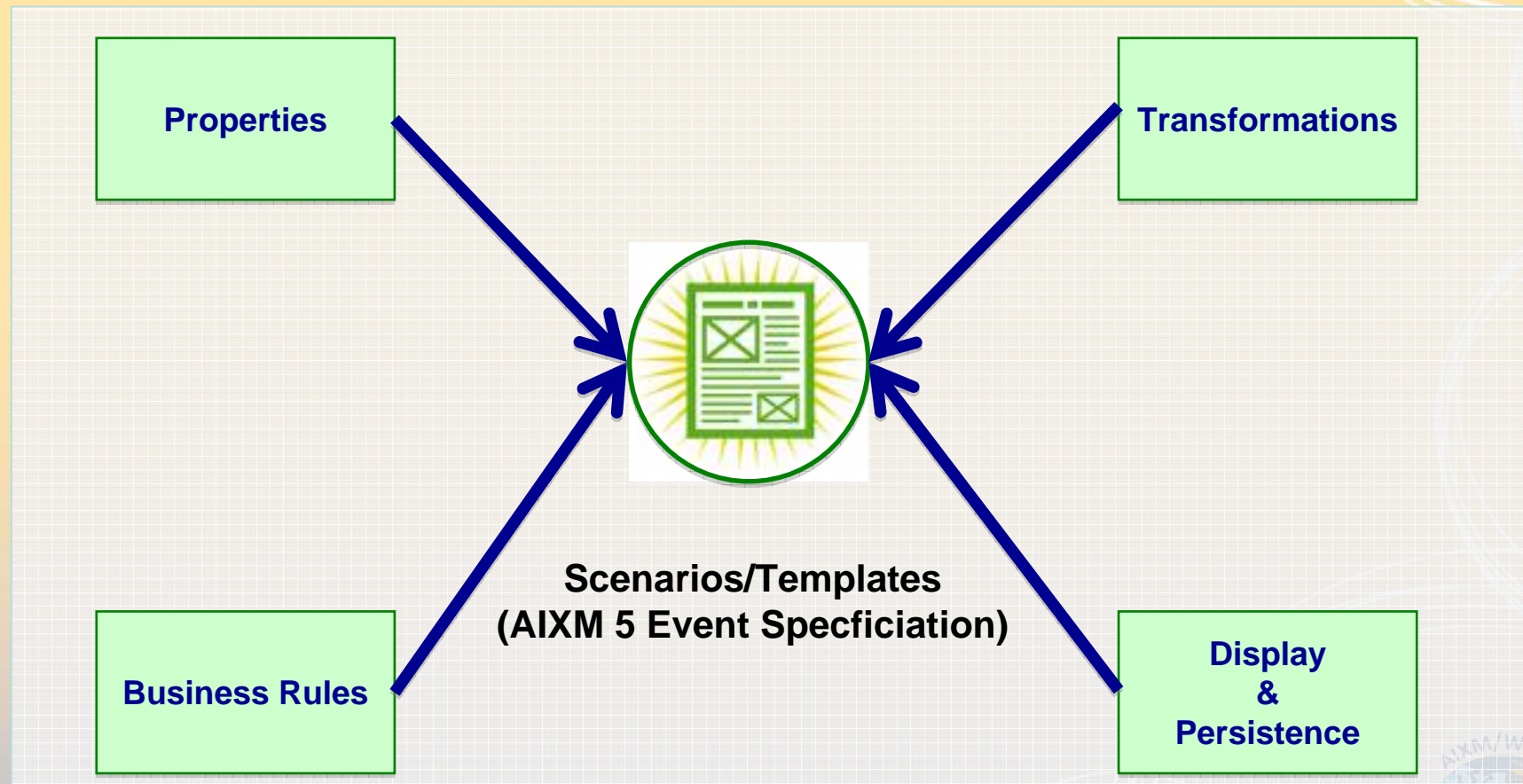
US NOTAM System – As-Is

NOTAM EVENT (e.g., Runway closure)

Airport Authority

Flight Service Station

USNOF

US NOTAM System

NOTAM

Text

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FNS: To-Be

NOTAM EVENT
(e.g., Runway closure)

SUBMISSION

Digital NOTAM System

DISTRIBUTION

Candidate NOTAM Data

User Interface

System Interface

AIXM

AIXM

Validate   Transform   Publish

USNS

AIM

AIXM

User Interface

Published NOTAM

System Interface
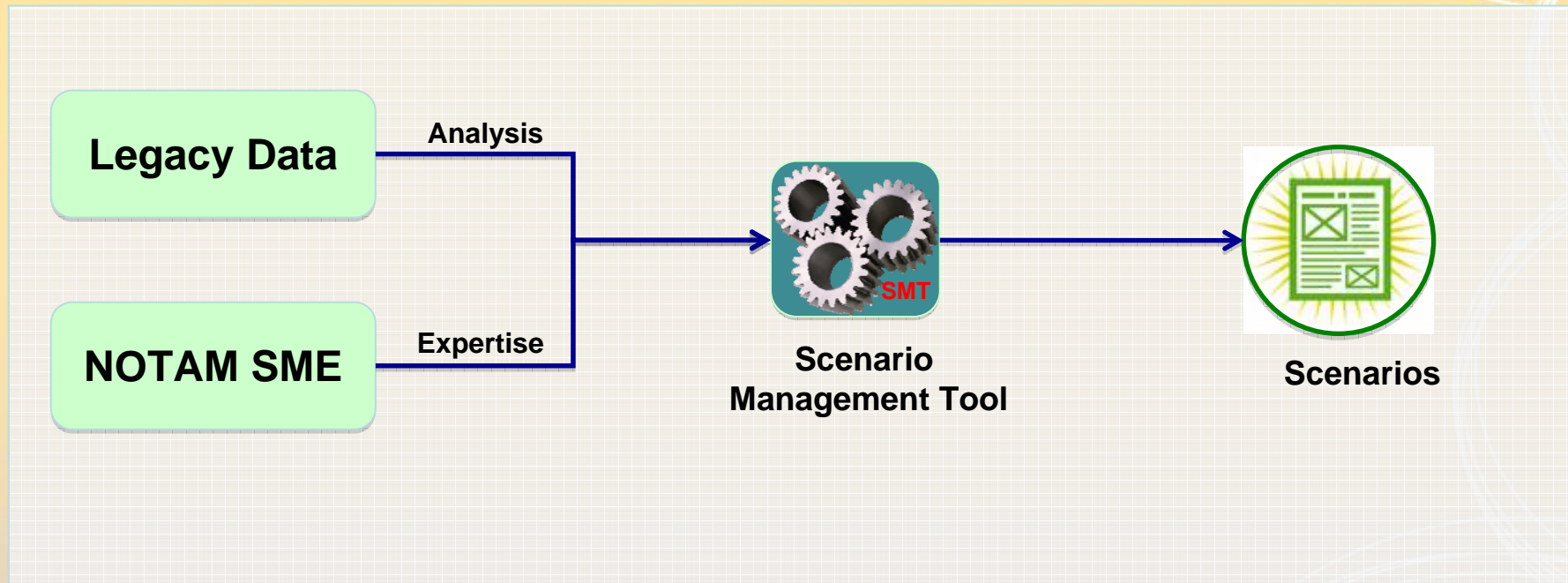
Graphical

Text

AIXM XML

FNS: Scenario Based Approach

<u>Scenario</u> - A predefined list of properties that can be used to report an event that causes changes to an aeronautical feature.

Properties

Transformations

**Scenarios/Templates
(AIXM 5 Event Specficiation)**

Business Rules

Display
&
Persistence

FNS: How are Scenarios Derived?

```
Legacy Data  --Analysis--┐
                          ├──→  [SMT]              ──→  ( Scenarios )
NOTAM SME   --Expertise--┘    Scenario
                              Management Tool
```
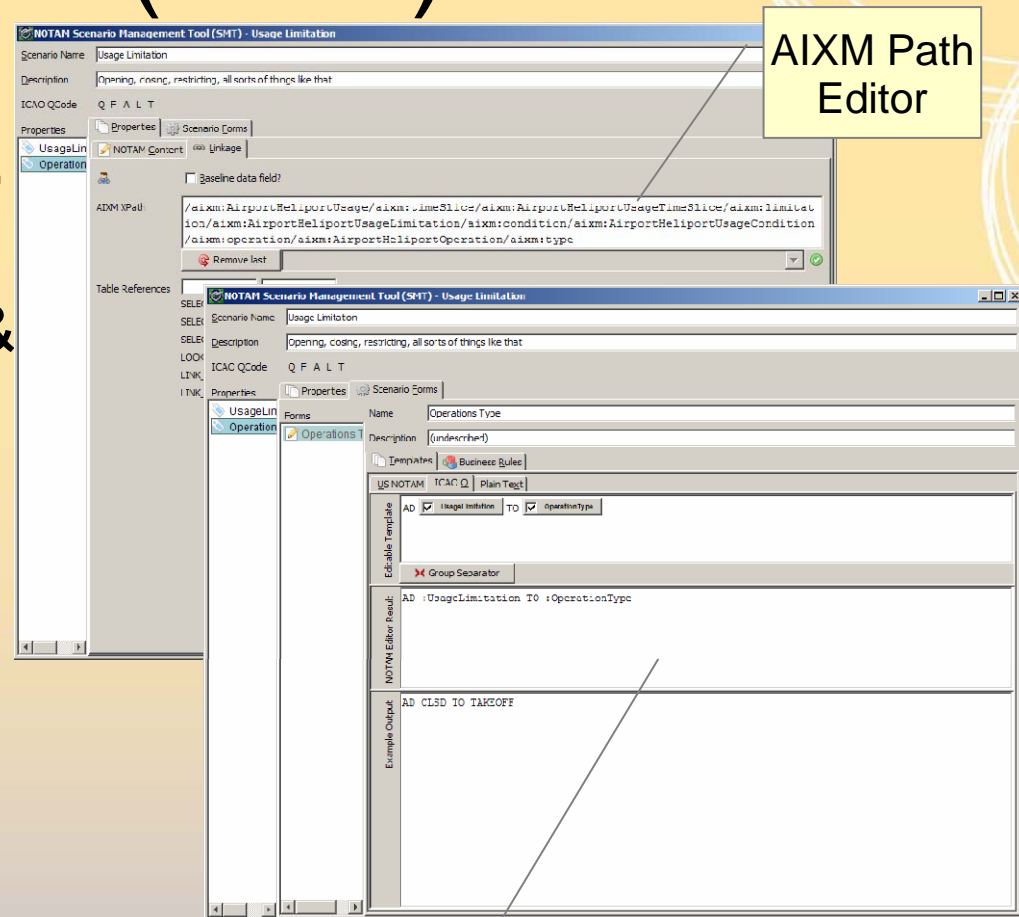
FNS Engine: SMT

- Scenario Modeling Tool
  - Controls the construction of NOTAMs
  - Defines and organizes available Scenarios and their Properties
  - Defines Transformation Templates (FAA, ICAO, and Plain Language)
  - Defines Business Rules
  - Uses AIXM model
    - XSL Transformation that "walks" the nodes
    - AIXM_Features.xsd schema as input
    - Next level nodes

FNS Scenario Management Tool (SMT)

- Powerful search (substring and regex),

- Built-in testing framework for policy & rules

- Built-in testing framework for template formats

AIXM Path Editor

Template definition & Testing

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FNS Engine: Dynamic Engine

- Data from SMT is fed into the dynamic engine of the FNS entry system.

- Dynamic engine paints the User Interface screens for data entry and saves it into an AIXM-based data model.

- This digital information is then used to produce NOTAMs.

- Dynamic engine is driven by scenario related metadata.

FNS: Dynamic Database

- Database Binding
  - FNS attempted database binding in 2007
  - Unmarshalling – Convert XML to Relational DB format

App Layer

XML → XML Converted to Java Objects → Database
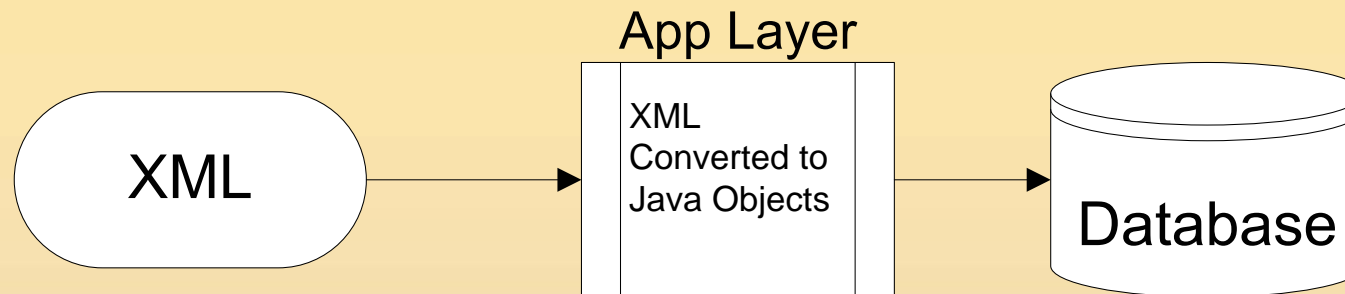
- Database Binding is great for simple XML models
- AIXM however, is a different story
  - Lengthy Data Model that generates mountains of unused code
  - Uses XLink HREF
  - Recursive or circular relationships

FNS Dynamic Database

- FNS Solved the Data Binding problem
    - NOTAM Scenarios are predefined
    - FNS utilizes XQuery to retrieve data
    - XQuery passes data to the database

FNS: Dynamic Database

FNS Engine

- Dynamic Database - Future Plans
  - Implement an XML Database
    - Not as a Character Large Object Block (CLOB)
    - PostGres XML Type
    - Retrieve data using XQuery
  - Quickly generate snapshots of the National Airspace System (NAS) at any time
    - Static (Baseline) Data
    - Dynamic (NOTAM) Data

FNS: Using the software

– Website Interface

- Secure Login account
- Baseline data

– System Interface

- Representational State Transfer (REST)-based Web Service
- Third Party Software developers can submit NOTAMs in AIXM

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FNS: NOTAM Stakeholders

– Digital NOTAM Submission Working Group
  - Stakeholder input on
    - Business Process and Workflow
    - Security / Access / Integrity
    - Safety
    - Data Model(s)
    - Taxonomy
    - System Interface Specifications

  - Past meeting information found at
    http://nfdc.faa.gov/aimnews/digitalNOTAM/index.html

FNS Next Steps

- Spring 2009
  - Human Factors Test
  - Denver Field Test

- Summer 2009
  - Obstruction NOTAM Field Test with Broadcast Towers
  - Four additional Human Factors Tests
  - Introduction of 100+ NOTAM Scenarios

- Fall 2009
  - Four additional Airport Field Tests

- FY10
  - Graphical display of NOTAMs
  - Ten additional Airport Field Tests

FNS: NOTAM Stakeholders

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