Flight Information Exchange Model

FIXM
Flight Information Exchange Model

Presented to: EIWAC 2013
Presented by: Midori Tanino, FAA
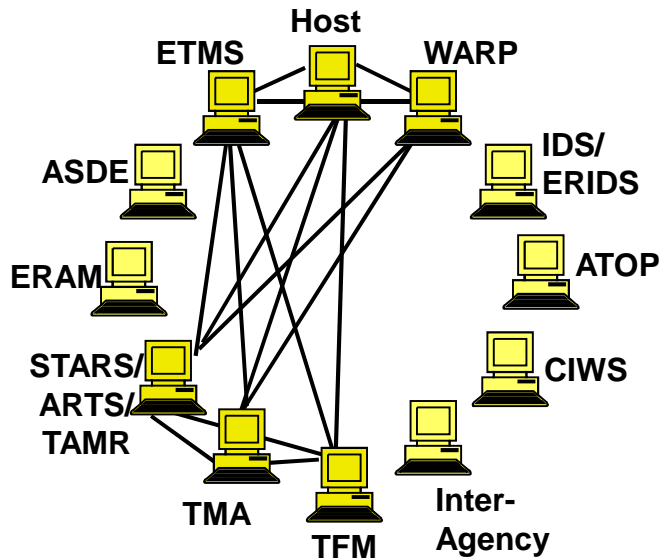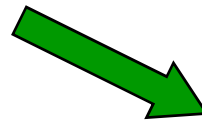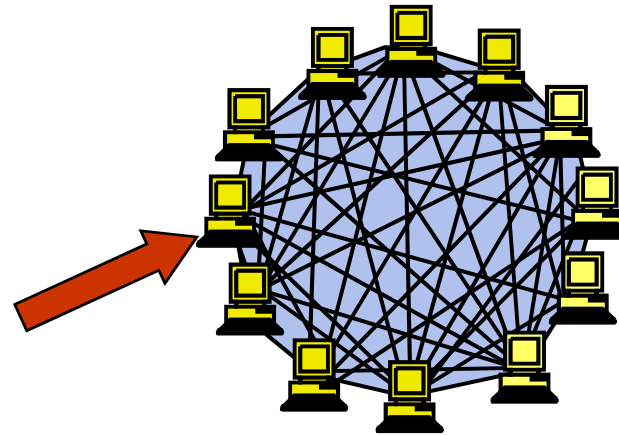Date: February, 2013

Globalization

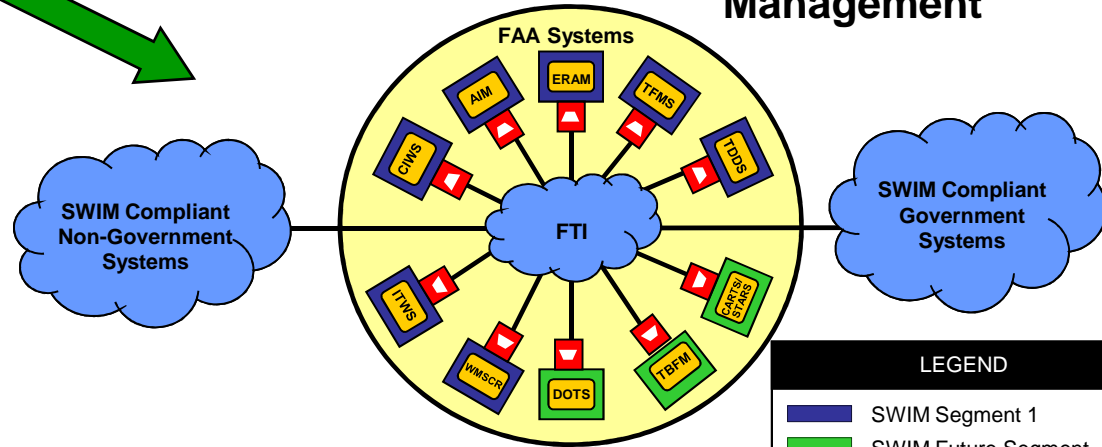
* CDM Logo

State of the System (from SWIM presentation)

Business as Usual

Today

- Existing point-to-point hardwired NAS
- Unique interfaces, custom designs

- More point-to-point unique interfaces
- Costly development, test, maintenance, CM
- New decisions linked to old data constructs
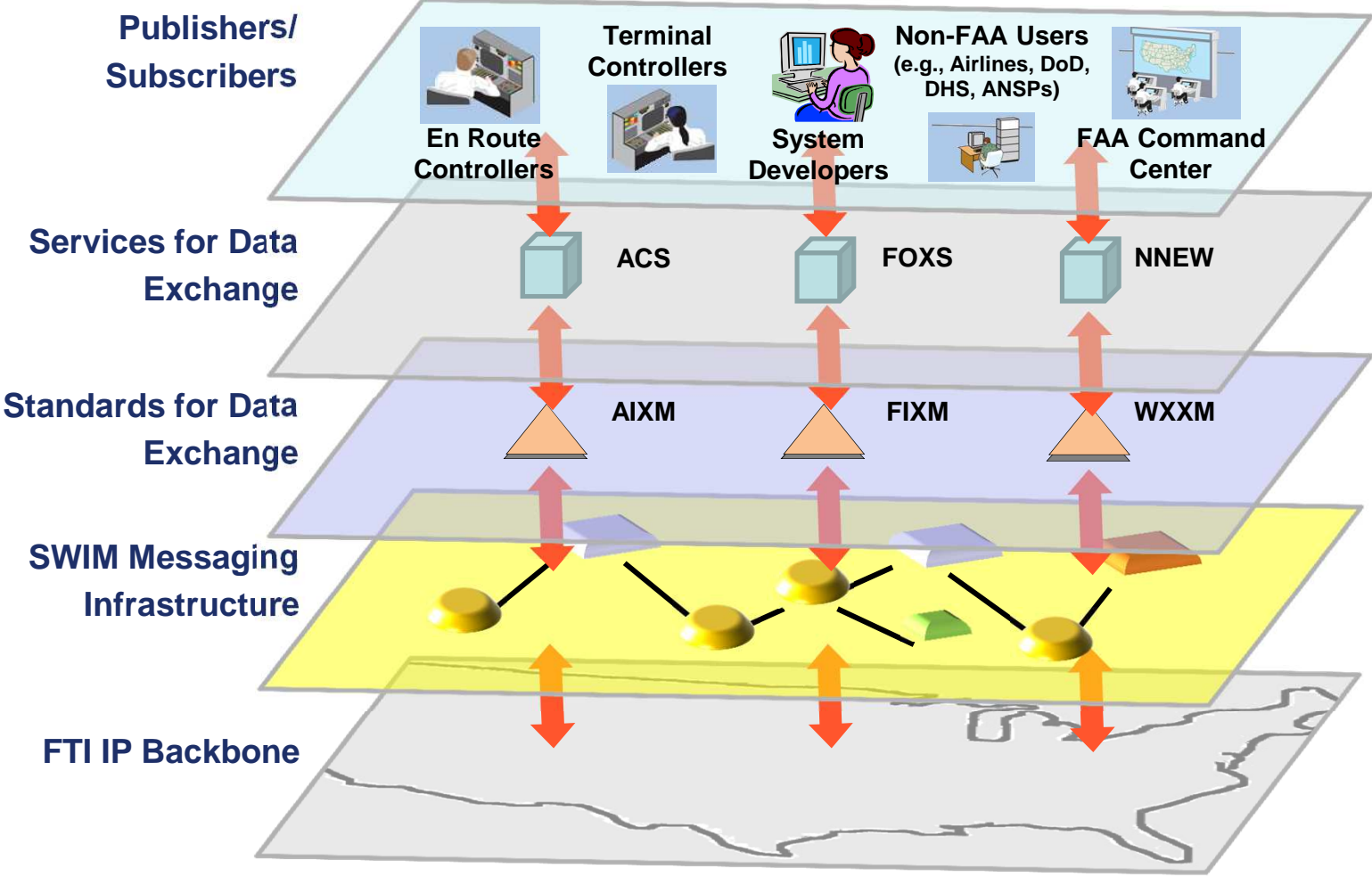- Cumbersome data access outside the NAS

Enterprise Management

LEGEND

■ SWIM Segment 1	
■ SWIM Future Segment	
🔺 SWIM Adapter	

F I X M — Flight Information Exchange Model

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Conceptual Overview of Operation

Publishers/Subscribers

En Route Controllers · Terminal Controllers · System Developers · Non-FAA Users (e.g., Airlines, DoD, DHS, ANSPs) · FAA Command Center

Services for Data Exchange

ACS · FOXS · NNEW

Standards for Data Exchange

AIXM · FIXM · WXXM

SWIM Messaging Infrastructure
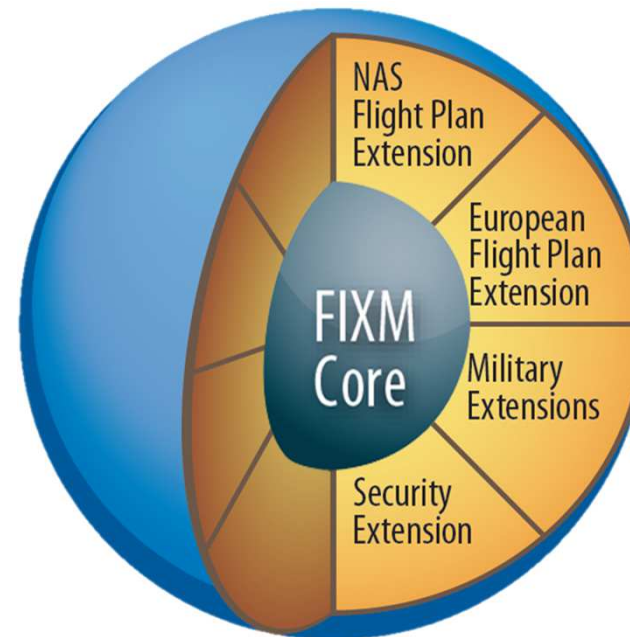
FTI IP Backbone

Aviation Related Data Models

- **AIXM (Aeronautical Information Exchange Model)**
- **WXXM (Weather Information Exchange Model)**
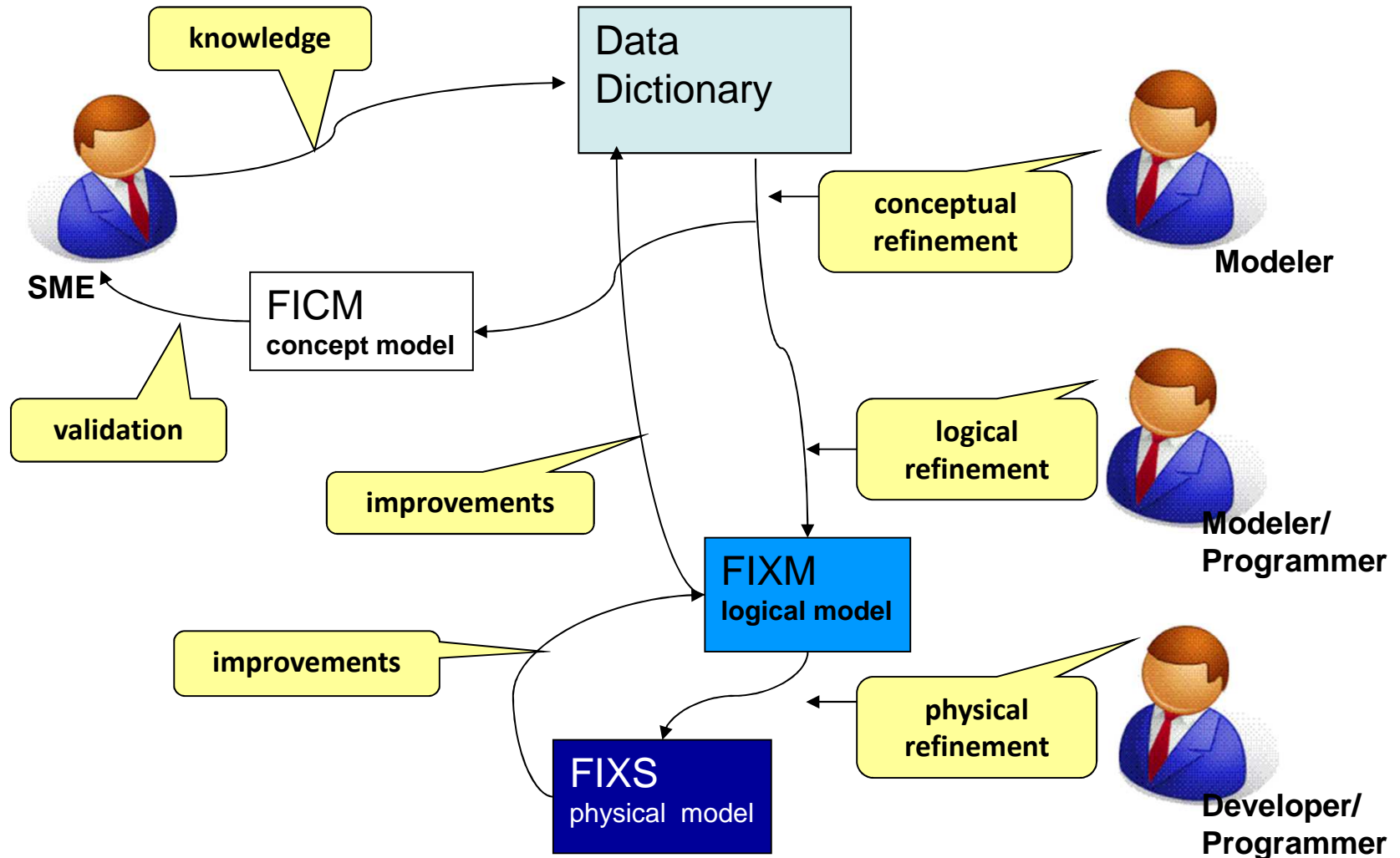- **FIXM (Flight Information Exchange Model)**

- **AIDX (Aviation Information Data Exchange)**

FIXM Overview

- **Flight Data Exchange among ANSPs and users**
- **ICAO ATM Requirement and Performance Panel**
- **ISO19103, ISO19107, ISO19108**
- **Consists of:**
  - Data Dictionary
  - UML Model
  - XML Schema
- **Architecture**
  - Core and Extensions

FIXM Data Modeling Process

FIXM Release Roadmap

Release	Target Release	Release Contents
1.0	Aug 2012 *(completed)*	▪ ICAO 2012 ATS – FPL message ▪ GUFI ▪ NAS Flight Plan Data ▪ Initial ED-133 Element inclusion
1.1	Dec 2012 *(completed)*	▪ Hazardous Cargo (Dangerous Goods)
2.0	Aug 2013	▪ ICAO 2012 ATS (15 remaining messages) ▪ ICAO 2012 AIDC messages ▪ TFM (Strategic) ▪ **TFM Data Exchange** ▪ **ANSP-Airline CDM** ▪ **Fleet Prioritization** ▪ Airport CDM
3.0	Aug 2014	▪ Surface data (anything not covered in Airport CDM and TFM/CDM elements) ▪ ANSP-ANSP boundary crossing (Tactical) ▪ 4D Trajectories (1st package)
4.0	Aug 2015	▪ Security elements (1st package) ▪ Unmanned Aircraft Systems (UAS) ▪ 4D Trajectories (2nd package)

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FIXM 1.0 Data Elements – Harmonization
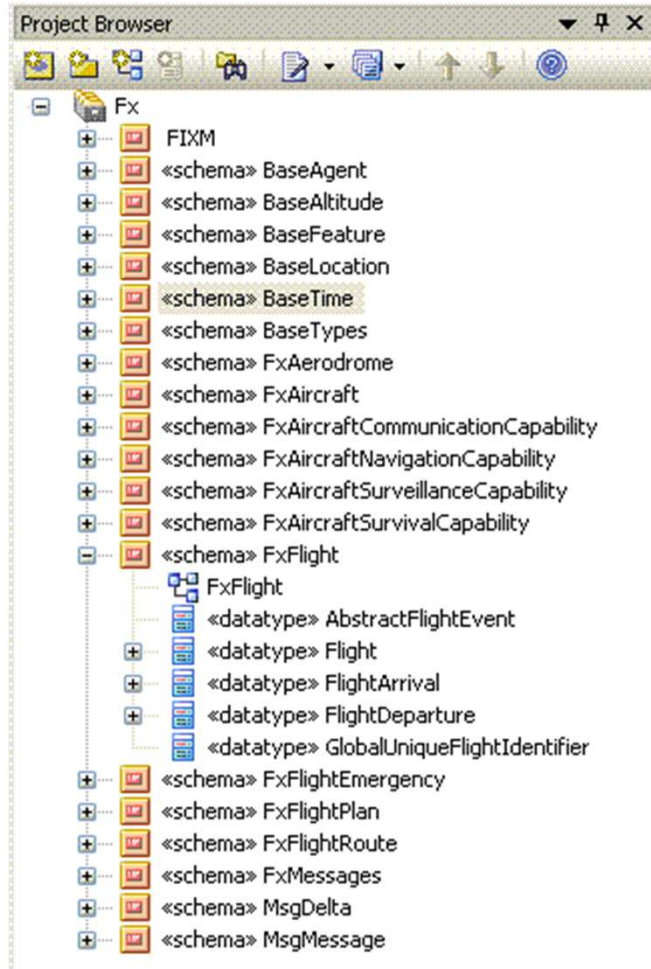
		ICAO 2012 Flight Plan Messages		Flight Object Data Dictionary (FODD)		ATM Information Reference Model (AIRM)		FDR Element Name		Flight Information Exchange Model (FIXM)	
Field	Plan Message – FPL	Definition	Reference & Element Name	Definition	Element Name	Definition	FDR Element Name	Definition	FIXM Proposed Element Name	Proposed Definition
ICAO 09 a	Number of Aircraft	Number of aircraft in the flight expressed as one or two digits if the number is greater than 1	7.128 Number of Aircraft	Number of aircraft associated with the flight plan, typically used for formation flights.	NumberOf Aircraft	The number of aircraft which participate to the formation.	Aircraft_Quantity-Integer-R001 (Field 9a)	The number of aircraft (when there are more than one) in a flight.	Number of Aircraft	The number of aircraft which participate to the formation.
ICAO 09 b	Type of Aircraft	Authorized aircraft type expressed as 1 letter followed by 1 to 3 alphanumeric characters. Must be an approved type designator consistent with ICAO Doc. 8643. ICAO type designators are available at http://www.icao.int/anb/aig/8643/index.cfm. / If there is no approved type designator for the aircraft, insert the characters ZZZZ and enter the aircraft type in Field 18 after "TYP/".	7.17 Aircraft Type (and qualifier)	Specification of the type of aircraft assigned to a particular flight. This data element contains the type(s) of aircraft, preceded if necessary by number(s) of aircraft if ZZZZ is used as "typeOfAircraft." This data element follows the ICAO usage of TYP/, or Type(s) of Aircraft. This data element is a designator for those aircraft types which are most commonly provided with air traffic service (ATS).	AircraftType	The designator(s) of the aircraft type(s) (e.g. B747).	Aircraft_TypeDesignator_Code-R001 (Field 9b)	An aircraft type identifier that informs an air traffic controller of the performance characteristics of an aircraft represented as a two to four character identifier that classifies types of aircraft. Values are listed in ICAO 8643, Aircraft Type Designators. If the type is not listed or there is more than one type of aircraft in a flight, ZZZZ is placed in this element and the type information is specified using the 'Type of Aircraft' portion of the ICAO flight plan's 'Other Information' field. Refer to FlightPlanFiled_OtherSequencedInformation_Text-R001.	Type of Aircraft	The aircraft type designator (e.g. B747).
ICAO 09 c	Wake Turbulence Category	1 character ICAO wake turbulence category which must be one of the following: H (heavy), M (medium), L (light)	7.190 Wake Turbulence Category	Characterization of the wake turbulence produced by an aircraft. ICAO defines three categories, as follows: H – HEAVY, to indicate an aircraft type with a maximum take-off mass (MOTM) of 136,000 kg or more; M – MEDIUM, to indicate an aircraft type with a MOTM of less than 136,000 kg but more than 7000; L – LIGHT, to indicate an aircraft type with a MOTM of 7,000 kg or less / The FAA use the following categorization: HEAVY – Aircraft capable of...	Wake Turbulence Category	Wake Turbulence Category (e.g. heavy)	Aircraft_WakeTurbulenceCategory_Code-R001 (Field 9c)	A classification of the aircraft wake turbulence based on the maximum certified takeoff mass of an aircraft represented as a one character code: H – Heavy, M – Medium, L – Light.	Wake Turbulence Category	Wake Turbulence Category (e.g. heavy)

Number and Type of Aircraft and Wake Turbulence Category

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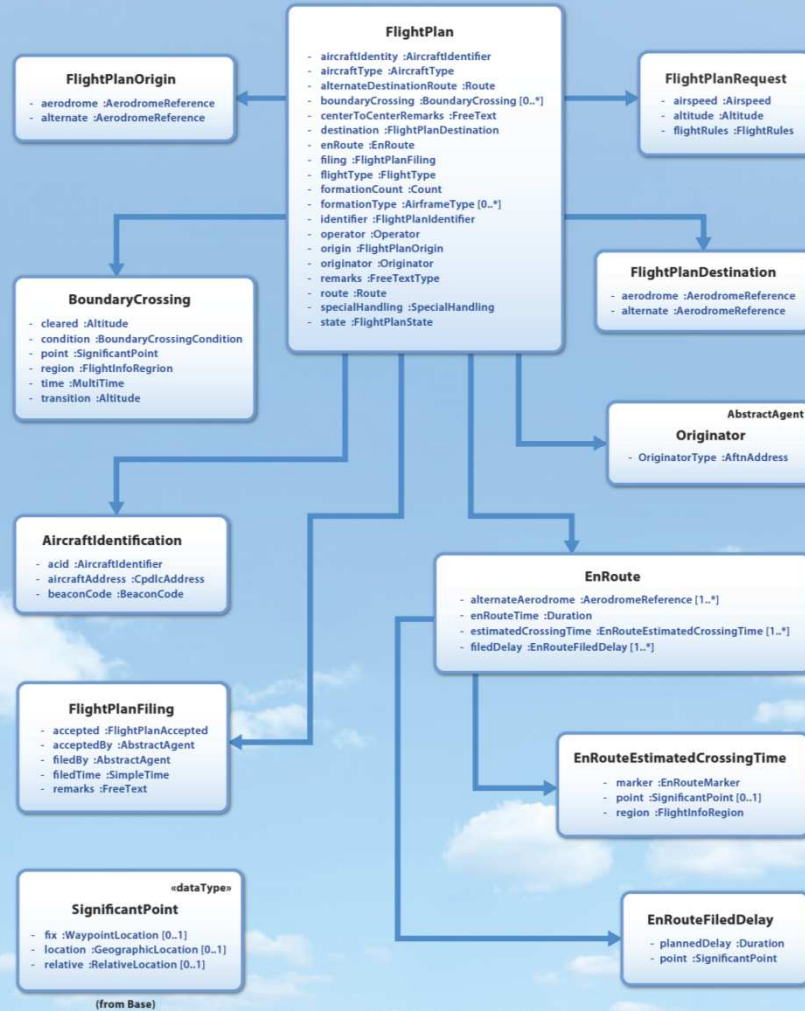
Data Dictionary – Data Entry Sample

5.13 Arrival Time – Estimated

Arrival Time - Estimated	
Definition	The estimated time at which the aircraft will arrive (wheels down) at the aerodrome point. This time is given in UTC.
Alternate Names	Estimated Time of Arrival, ETA
Data Type	Date Time
Range of Values	N/A
Business Rules	This data element is supplied only if the Time Enroute - Estimated was filed with the flight plan.
Notes	• [NAS CMS] This data element corresponds to Field 28a. It can also be appended to the route field after the last fix. • [SESAR Harmonization] – Element not present in SESAR 10.02.05 FO. Element has been added to a list for consideration for inclusion in SESAR model.
References	• National Airspace System (NAS)-IR-82422412-01, En Route Automation Modernization (ERAM)/Air Traffic Management (ATM) Intermediate Point of Presence (IPOP) Interface Control Document, Rev A, September 30, 2008

FIXM UML Model v1.0

Find FIXM at www.FIXM.aero

FIXM 1.0 Lessons Learned and Future Challenges

- **Tight deadline**
- **GML initially included, then abandoned**
- **Hand crafted physical model (XML schema)**
- **Lack of consistency with AIXM and WXXM**
- **Logical model massaged to comply with physical model**
- **Blurring between conceptual and logical models**
- **Security**
- **Relatively closed process due to timeframe**

FIXM v2.0 Development Process

- **ANSP Partners Expanded to include: FAA/NextGen; Eurocontrol/SESAR; Airservices Australia; JCAB; NAV CANADA; NATS UK**

- **Collaboration and Transparency**
  - Change Control Board
  - Alignment with other models
  - Working with standardization organizations
  - Handling of Extensions
  - Usage of www.FIXM.aero

- **Design Philosophies**
  - FIXM 1.0 and FIXM 1.1 and FIXM 2.0 approaches

FIXM 2.0 Development Activities
- Capabilities to Support Transparency

Once registered as a member, the user can:
1. Participate in the discussion boards
2. Access all comments for Data Dictionary and website related.
3. Access issue tracker that manages all issues related to Data Dictionary or website.
4. Subscribe to email notifications when documents have been posted or updated.

(Models and Schemas will be supported in a similar manner in the future.)

Engineering Analysis

- **Examined areas such as:**
  - Globally Unique Flight Identifier (GUFI)
  - Flight Data Server Architecture
  - Transition
  - Compression
  - Data Correlation
  - Data Reconstruction
  - Data Exchange Mode
  - Data Access Control
  - Data Consistency
  - Data Customization
  - Data Validation
  - Data Discovery
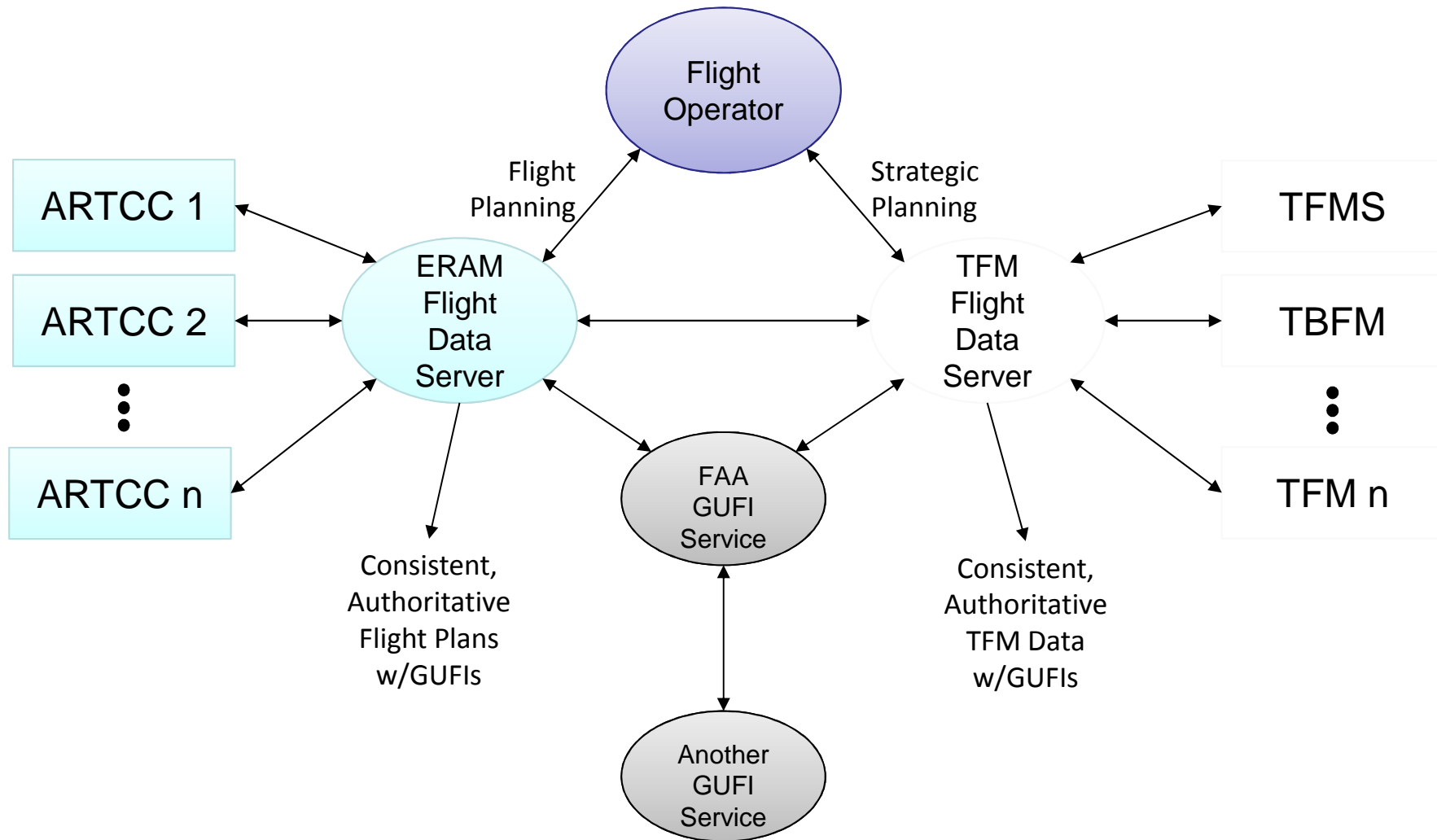 - Failure Modes
  - Messaging

"Flight Object Engineering Analysis Report"
at www.FIXM.aero

Globally Unique Flight Identifier (GUFI)

- **Key element for the FIXM success**

- **GUFI Construct Requirements**
  1. Unique world-wide.
  2. Could represent flight leg or flight plan.
  3. Unique for given time range.
  4. Won't constrain number of GUFIs created in any given time period.
  5. Constant for life-cycle of flight.
  6. Allow any entity to create unique GUFIs.
  7. Allow any number of entities to create GUFIs.
  8. Allow variety of entity name formats.
  9. Usable by human or machine.
  10. Conform to international standards.

- **Sample format that would meet requirements:**
  - us.aal.20110210.0631.105
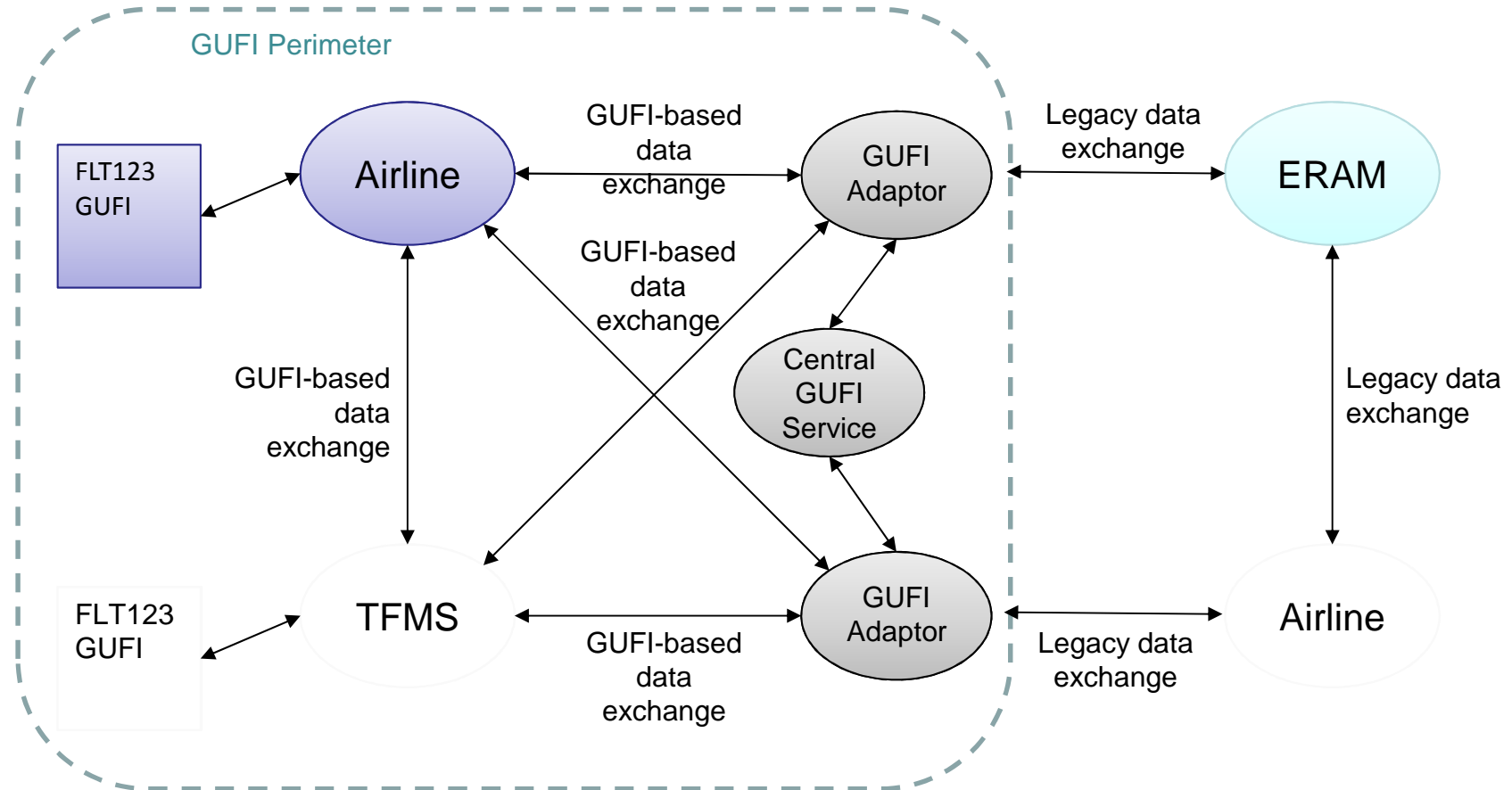 - fr.f9893rl.20110930.1745.1
  - us.kzbw.20110211.1400.24

Globally Unique Flight Identifier (GUFI)
- Architecture with GUFI

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Globally Unique Flight Identifier (GUFI)
- Transition Approach

GUFI Perimeter

FLT123 GUFI → Airline

Airline — *GUFI-based data exchange* → GUFI Adaptor — *Legacy data exchange* → ERAM

Central GUFI Service

TFMS

GUFI-based data exchange

FLT123 GUFI → TFMS

TFMS — *GUFI-based data exchange* → GUFI Adaptor — *Legacy data exchange* → Airline
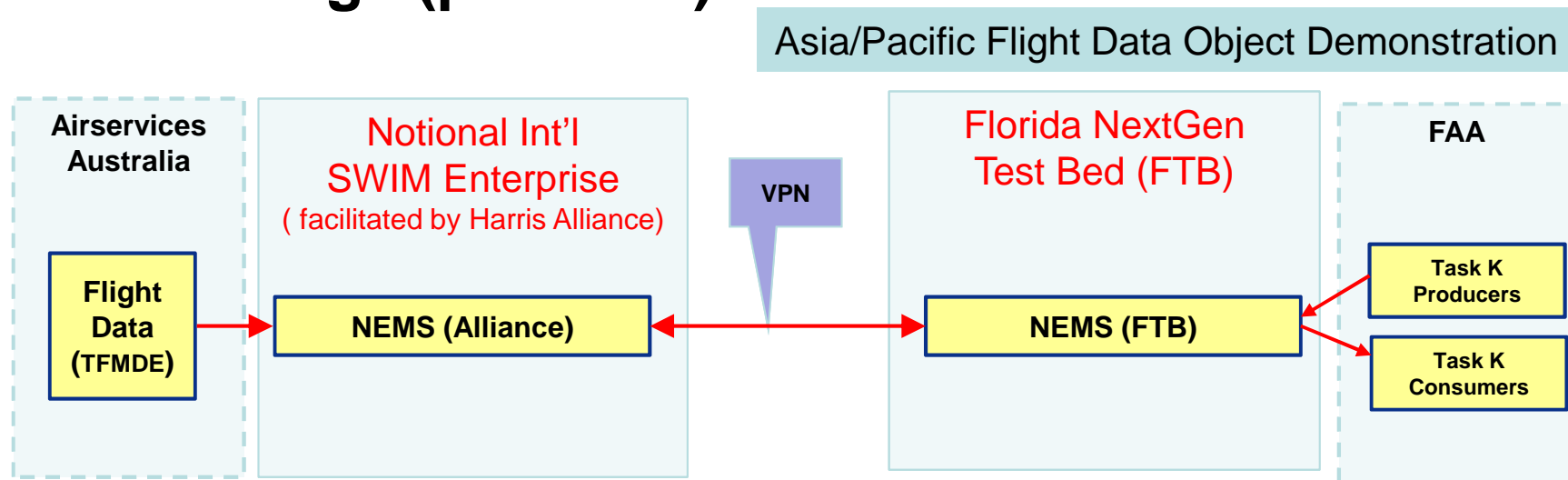
ERAM — *Legacy data exchange* → Airline

NOTES:
ANSP systems can be converted independently of each other, while the airline gets full benefit.
Adaptors can also be applied to data exchange between ANSP systems.

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Early Adopters

- **FAA: Flight Data Publication Services**
- **Airservices Australia: Operational Data Services**
- **International Traffic Flow Management Data Exchange (possible)**

Asia/Pacific Flight Data Object Demonstration

Airservices Australia

Notional Int'l
SWIM Enterprise
(facilitated by Harris Alliance)

VPN

Florida NextGen
Test Bed (FTB)

FAA

| Flight Data (TFMDE) | → | NEMS (Alliance) | ←→ | NEMS (FTB) | → | Task K Producers |
| | | | | | → | Task K Consumers |

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Questions?

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