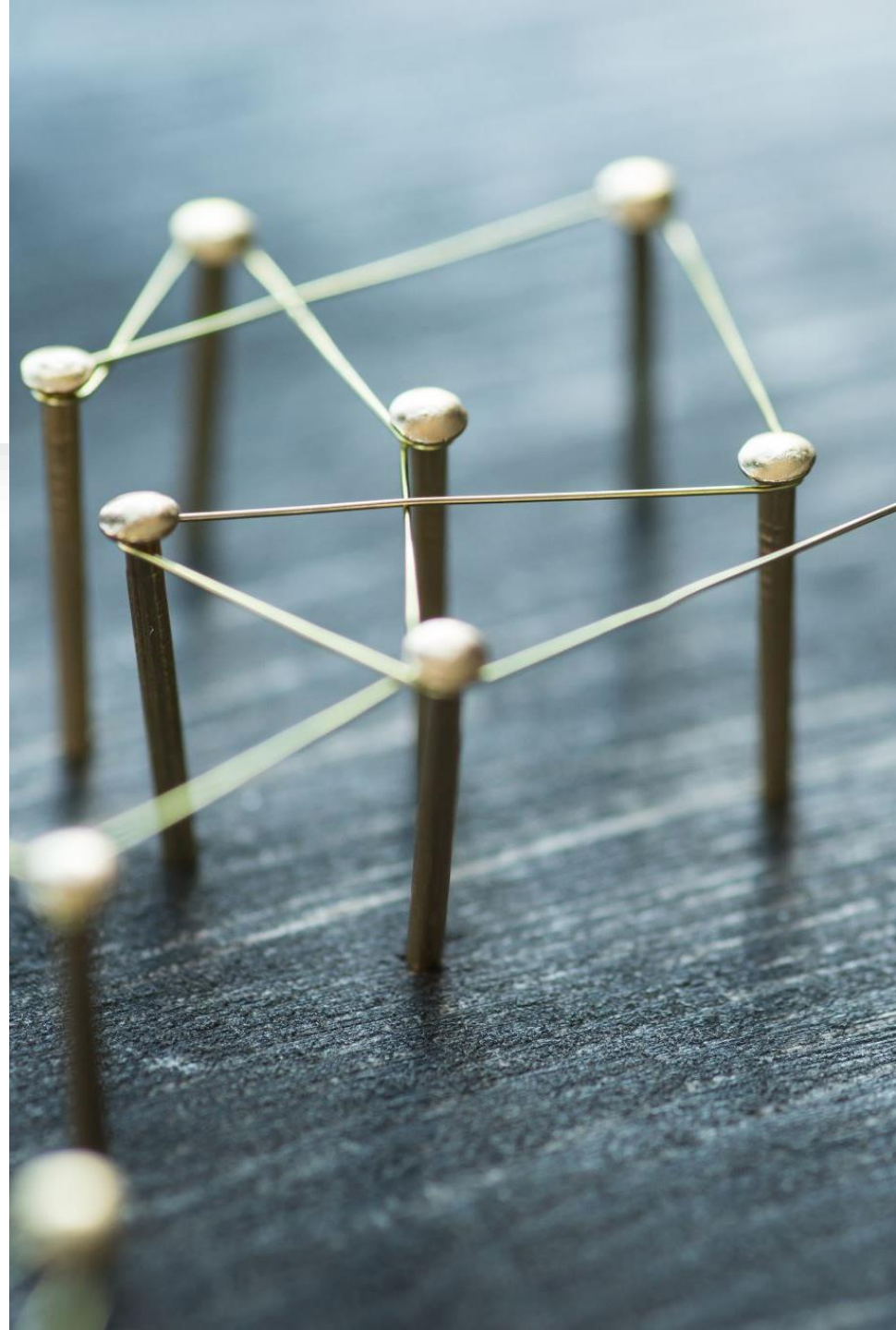


INFORMATION

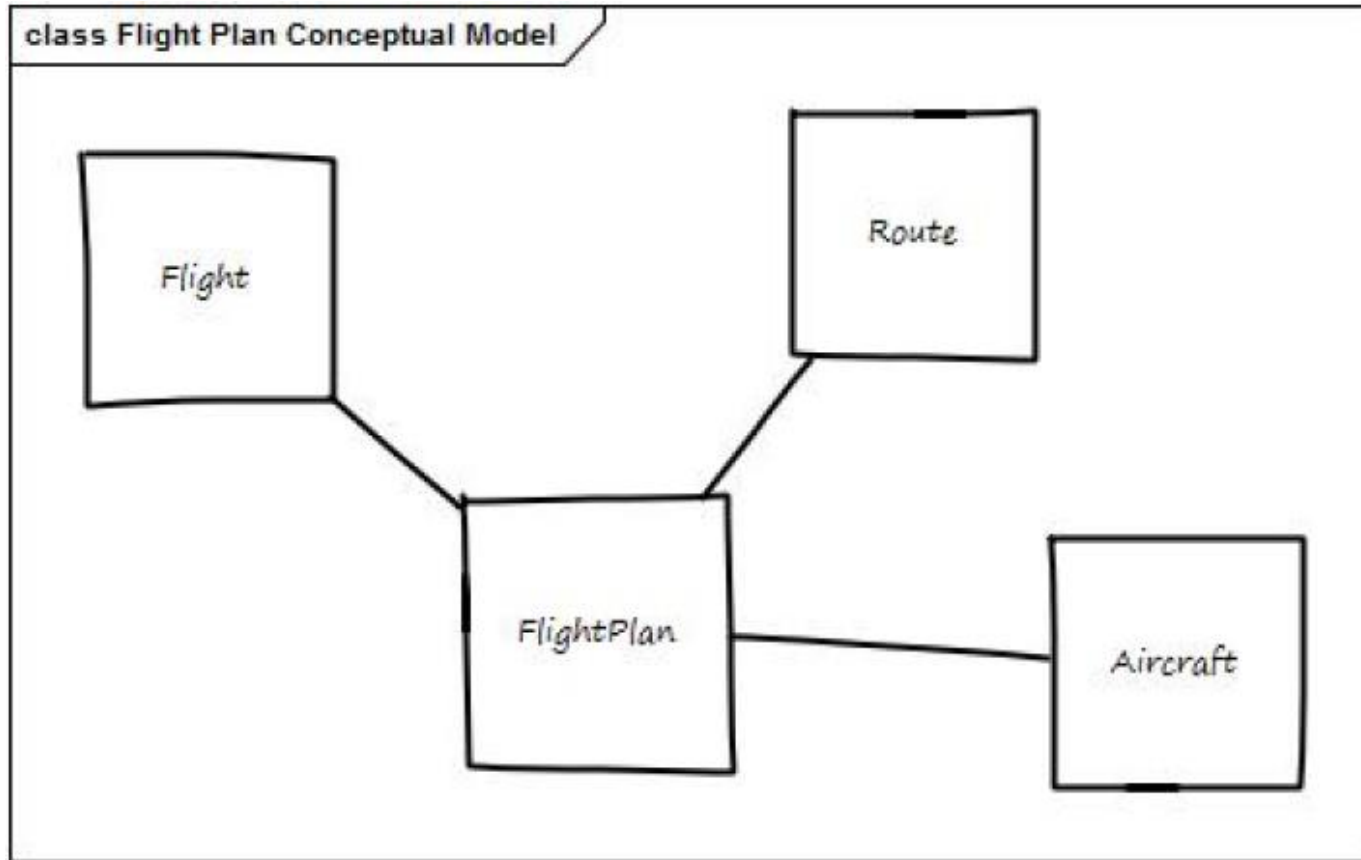
Modeling – Information eXchange Models - AIRM

Information Modeling

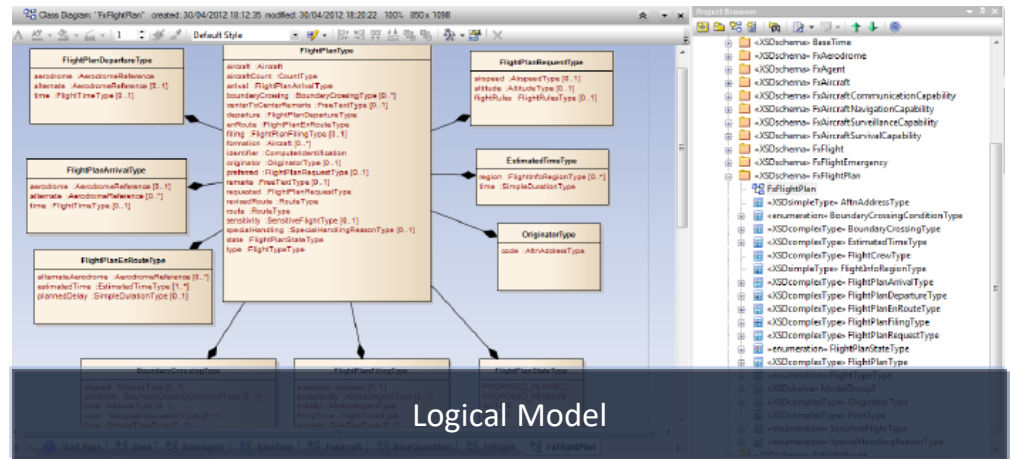
- Three Modeling Perspectives
 - Conceptual Model
 - Platform independent
 - Logical Model
 - Platform specific
 - Physical Model
 - Implementation specific



Modeling example (flight plan)



Logical and Physical models



```

<xsd:include schemalocation="fxAerodrome.xsd"/>

<xsd:complexType name="FlightPlanType">
  <xsd:annotation>
    <xsd:appinfo source="fx:implements">Aircraft Quantity</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Flight Plan Remarks</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Route</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Route - Revised Destination</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Center to Center External Remarks</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Flight Plan Originator</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Flight Type</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Special Handling Reasons</xsd:appinfo>
    <xsd:appinfo source="fx:implements">Estimated Elapsed Time</xsd:appinfo>
  </xsd:annotation>
  <xsd:complexContent>
    <xsd:extension base="base:AbstractFeatureType">
      <xsd:sequence>
        <xsd:element name="aircraftCount" type="base:CountType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="aircraft" type="fx:AircraftType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="formation" type="fx:AircraftType" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element name="originator" type="fx:OriginatorType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="remarks" type="base:FreeTextType" minOccurs="0" maxOccurs="1" nillable="true"/>
        <xsd:element name="filing" type="fx:FlightPlanFilingType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="sensitivity" type="fx:SensitiveFlightType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="specialHandling" type="fx:SpecialHandlingReasonType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="departure" type="fx:FlightPlanDepartureType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="arrival" type="fx:FlightPlanArrivalType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="enRoute" type="fx:FlightPlanEnRouteType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="requested" type="fx:FlightPlanRequestType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="assigned" type="fx:FlightPlanRequestType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="route" type="fx:RouteType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="revisedRoute" type="fx:RouteType" minOccurs="1" maxOccurs="1"/>
        <xsd:element name="boundaryCrossing" type="fx:BoundaryCrossingType" minOccurs="0" maxOccurs="unbounded"/>
        <xsd:element name="centerToCenterRemarks" type="base:FreeTextType" minOccurs="0" maxOccurs="1"/>
        <xsd:element name="type" type="fx:FlightTypeType" minOccurs="1" maxOccurs="1"/>
      </xsd:sequence>
      <xsd:attribute name="state" type="fx:FlightPlanStateType" use="required"/>
      <xsd:attribute name="identifier" type="fx:FlightPlanIdentifierType" use="required"/>
    </xsd:extension>
  </xsd:complexContent>

```

Physical Model

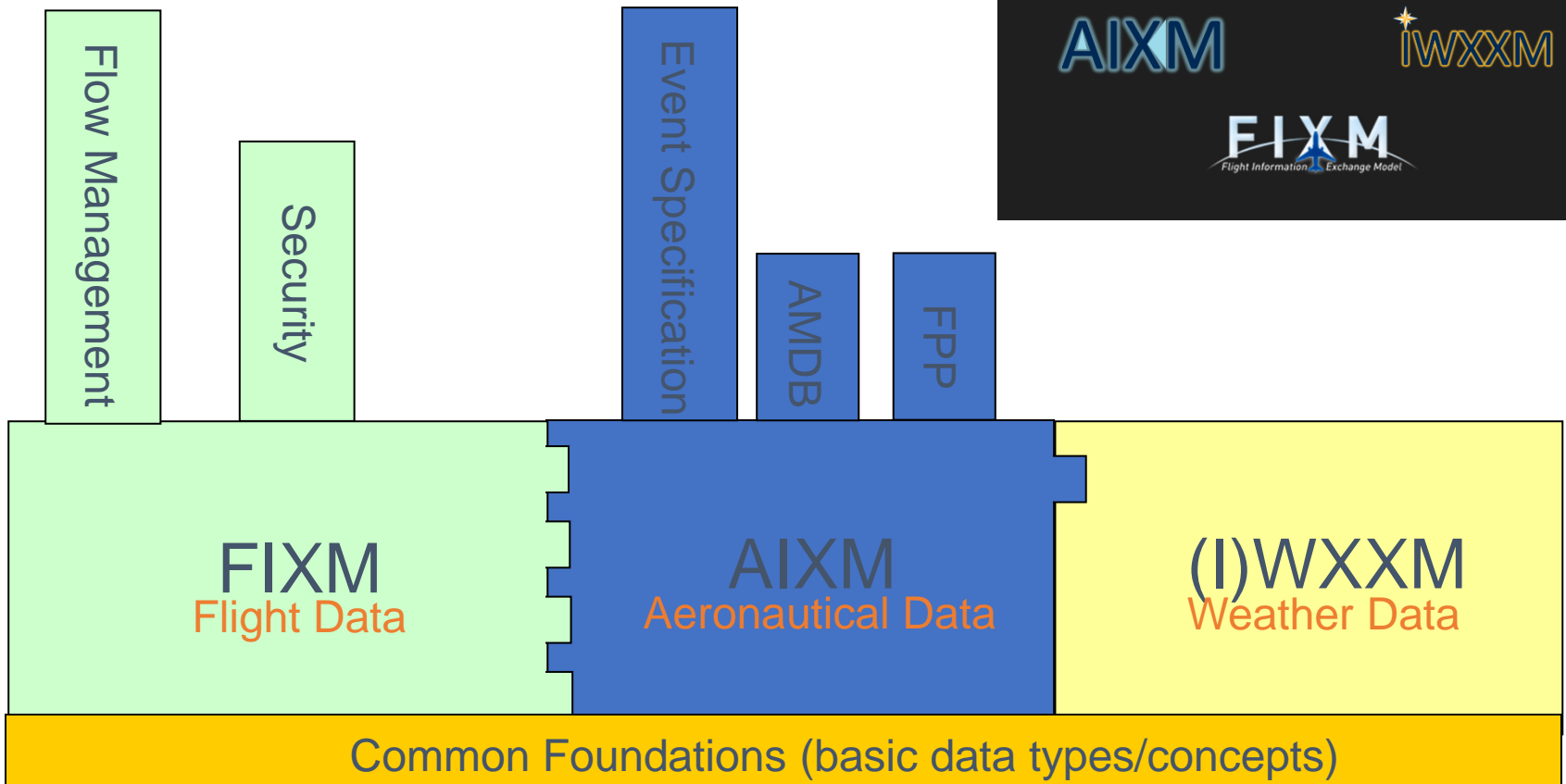
Aeronautical Data Exchange



Role of data models

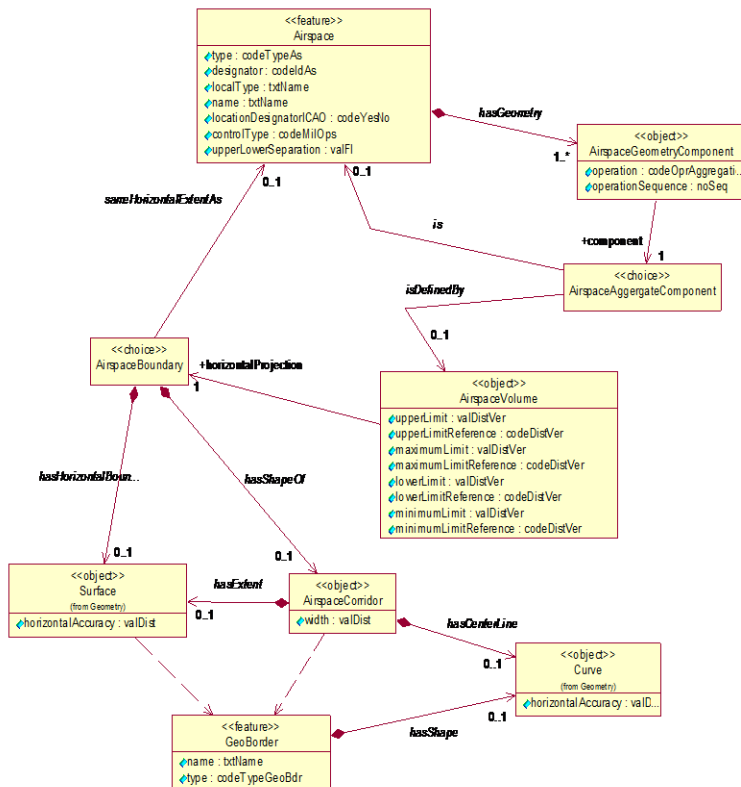
- To represent real world concepts as a theoretical construct which can be represented and understood by automated systems
- To standardize the conceptual understanding of aeronautical data by all actors - "speak the same language"
- To provide a basis for logical data structures used during the software implementation
- To provide basis for formal 'contracts' between interoperable systems – example: "use the same format"

The three main Information eXchange Model

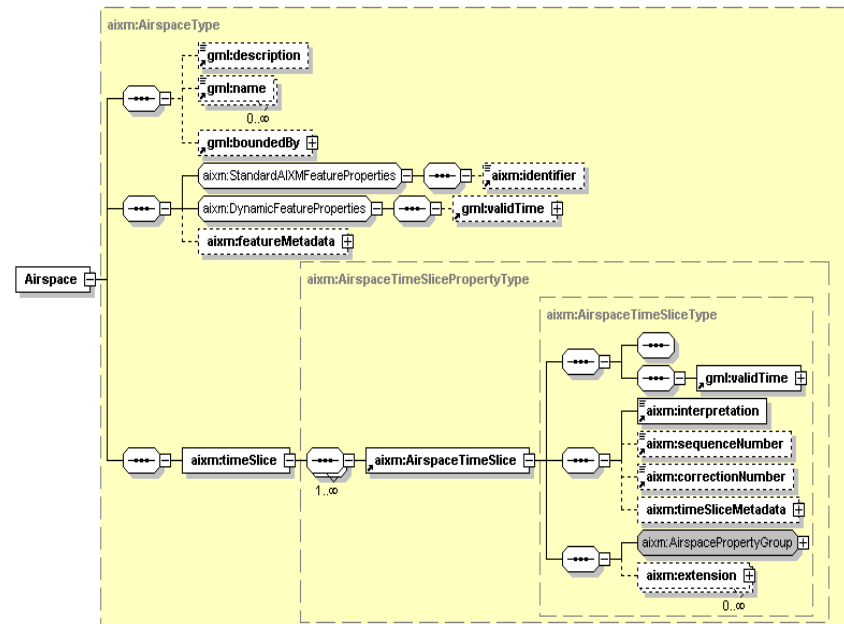


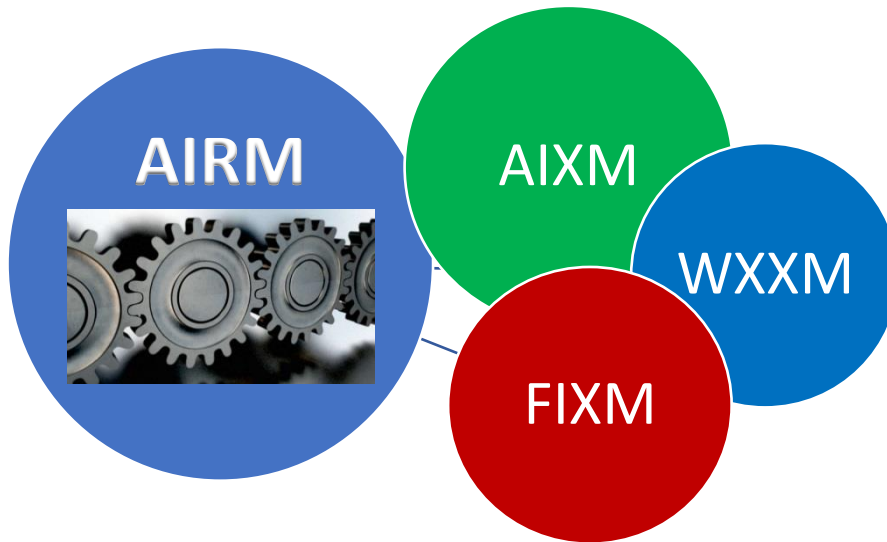
AIXM components

Conceptual (content) Model



Exchange format specification





ATM Information Reference Model (AIRM)
<https://airm.aero/>

What is the AIRM



- The System Wide Information Management (SWIM) concept describes a seamless and networked ATM community, enabling **data exchange between information providers and consumers** over interoperable ATM Services
- The information is provided by a large number of different participants and is made available to a wide range of ATM information consumers. Therefore, the information needs to be clearly and uniquely defined and well understood. In other words, there is a need for **semantic interoperability**.

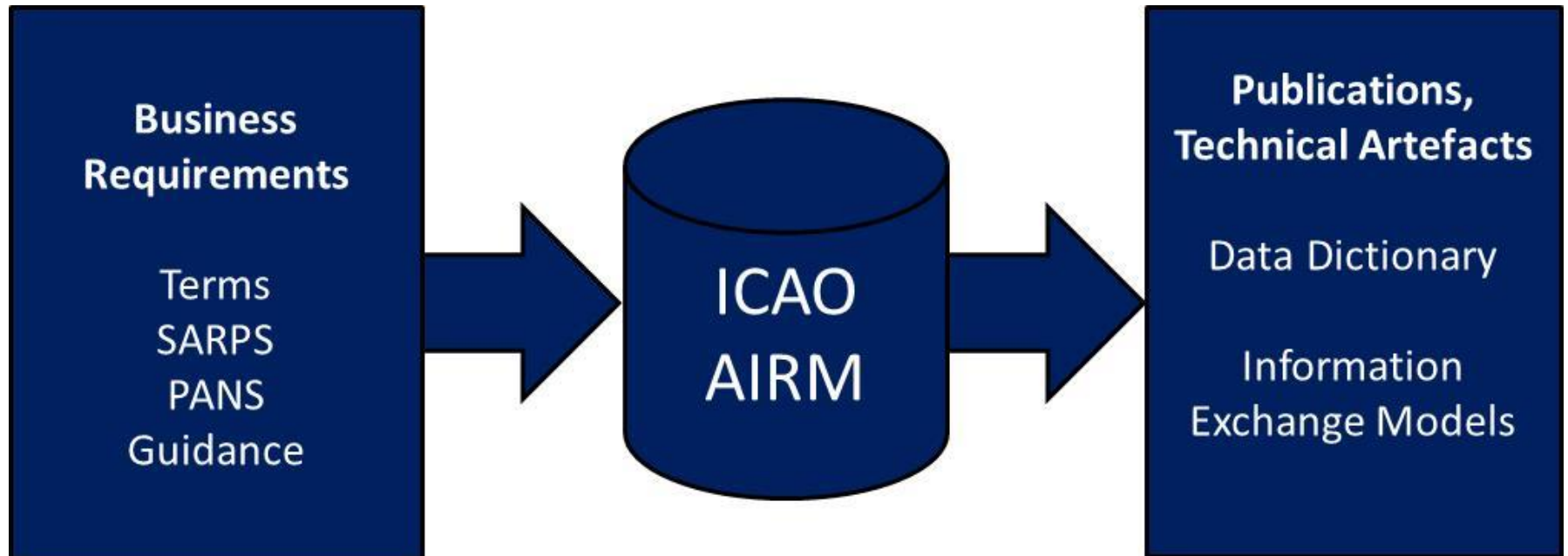


What is the AIRM (2)

The AIRM information constructs can be used, for example:

- To define the information that is exchanged between providers and consumers (e.g. in process models);
- To define and manage domain models;
- As the reference for the definition of the payload of a shared ATM Service.

ICAO AIRM, Inputs and Potential Uses



ATM Information Reference Model

AIRM

- AIRM is **not**

- ✗ A database
- ✗ An application
- ✗ An exchange model

- **AIRM is**

- + Reference material (say building blocks) for all these
- + Based on ICAO SARPs



The ICAO AIRM is intended to support the semantic interoperability aspects of SWIM

A structured, traceable, unified, harmonized, common, digital representation based on standard modelling notation

*The ICAO ATM Information
Reference Model
(ICAO AIRM)*



UML class model comprised of ATM-specific terms, definitions, and essential associations, that serve as the common ICAO reference

What are the benefits of the AIRM



The main benefit of the AIRM is ensuring semantic interoperability within ATM.



It ensures that the meaning of information is not lost or altered as it travels through SWIM.



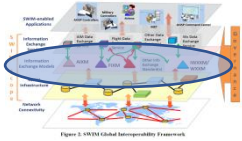
The AIRM, through its foundation, also promotes ATM information standardisation at the global level.

Relation with Information Exchange Models

- AIRM
 - **generic** as it is not bound to a solution
 - **reference** for the XMs and information services
 - **tool** for ensuring collaborative, semantic alignment
- eXchange Models
 - enable the management and distribution of digital data sets
 - SWIM: enable the management and implementation of information services
 - needed for implementation work



Information



AIXM

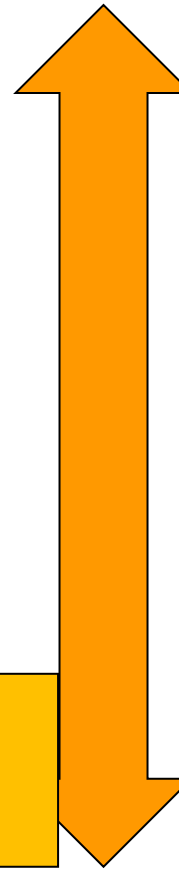
ICAO & Increasing implementations
Digital NOTAM
Lessons learned

WXXM

I(CAO)WXXM
Reality mapping
Data coming (really)

FIXM

V3 / CCB
Towards implementation – V4



**Semantic
Interoperability**

