ARINC 424A

424A Team

!!!VERSION 0 IS DONE!!!

Version 0

- ARINC 424A Version 0 XML Schemas are complete
- Version 0 is a beta release to the community
  - Beta phase generally begins when the software is feature complete but likely to contain a number of known or unknown bugs. Software in the beta phase will generally have many more bugs in it than completed software, as well as speed/performance issues and may still cause crashes or data loss
  - The focus of beta testing is reducing impacts to users, often incorporating usability testing. The process of delivering a beta version to the users is called beta release and this is typically the first time that the software is available outside of the organization that developed it.
  - Beta version software is often useful for demonstrations and previews within an organization and to prospective customers

https://en.wikipedia.org/wiki/Software_release_life_cycle

Known Issues With Version 0

- Data Types:
  - Some data types will need to change: decimal vs. float vs. double vs. enumeration vs. boolean
  - Some data types will need to move to other 424a XML schemas or move within the 424A data structures
- Multiplicities:
  - We know some data elements are minOccurs=1 when they should be 0
- Consistency in xml data type definitions
  - A few areas in the schema are modeled differently (not wrong just a different design approach) and we should harmonize these to help make sustaining 424A easier

Known Issues With Version 0

- A few duplicate data types:
  - Complex data types that created their own child data types vs. re-use of a common data type:
    - (e.g., isFAF vs. isFinalApproachFix)

Known Issues With Version 0

- Helicopters:
  - Heliport/Helipad
  - Airport/Helipad
  - PINS Path Point Records
- Attempted to make the helicopter material similar to -19 per instructions, however …
  - Converting 424 to an XML structure means we had to organize the heliport/airport/helipad somewhere logical in the data structure
- Consider the helicopter data a known issue until the committee decides what to do with helipads + airports + heliports

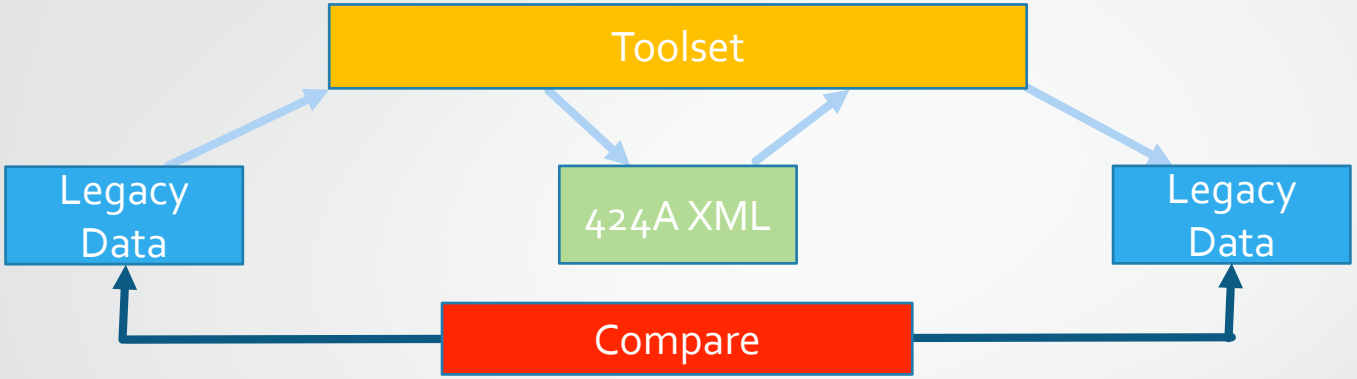
Technical Risk

- 424A XML is currently one XML file that contains all data
  - This may end up too big of a file for COTS XML tools
- Risk should be categorized as medium likelihood & high potential impact to the current data structure design
  - A file that is too big is not practical for operational use
- Mitigations are available:
  - Put the XML on a ‘diet’
  - Create a new XML instance document structure (files vs. file)
  - Switch to JSON

424A Updates

- Plan for 2 near term versions of 424A XML in the near term
  - Version 1 (+1 year from version 0):
    - Will incorporate changes from the test we are planning
    - Source software project to create 424A data from 424 data
    - Implement helicopter data per desire
  - Version 2 (+1 year from version 1):
    - Will incorporate changes from an early leaning/prototype data exchange

Methodology Driving Updates in Version 1/2



- Advantages
  - Rapidly iterate the model toward correctness and usability
  - Rapidly validate against large real world datasets
  - Automate validation against large datasets
- Drawbacks
  - Does not rigorously validate all fields and possible values
- Traditional verification and validation process will be required for production code

ARINC 424A Data Model Validation

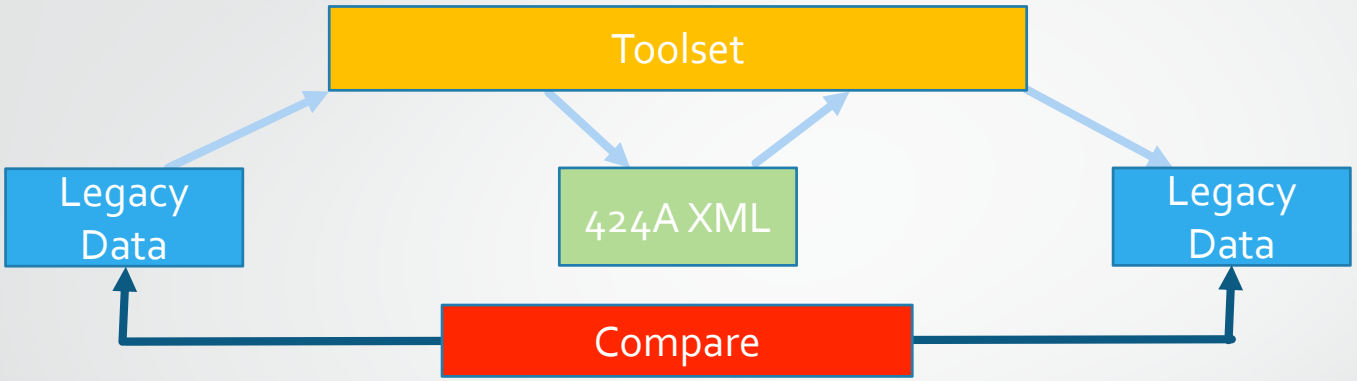
Status

- CIFP is currently our only validation dataset
- Most CIFP record types are currently supported
- Model will require further changes as we add record types
- Need additional validation data sets!

Section Code	Section Name	Subsect. Code	Subsection Name	Currently Supported
A	MORA	S	Grid MORA	
D	Navaid	Blank	VHF Navaid	✓
		B	NDB Navaid	✓
		T	TACAN Duplicates	
E	Enroute	A	Waypoints	✓
		M	Airway Markers	
		P	Holding Patterns	
		R	Airways and Routes	✓
		S	Special Activity Areas	
		T	Preferred Routes	
		U	Airway Restrictions	
		V	Communications	
P & H	Airport and Heliport	A	Reference Points / Helipad	✓
		B	Gates (P only)	✓
		C	Terminal Waypoints	✓
		D	SIDs	✓
		E	STARs	✓
		F	Approach Procedures	✓
		G	Runways (P only)	✓
		I	Localizer/Glide Slope	✓
		K	TAA	
		L	MLS (P only)	
		M	Localizer Marker	
		N	Terminal NDB	✓
		P	SBAS Path Point	
		Q	GBAS Path Point	
		R	Flt Planning ARR/DEP	
		S	MSA	
		T	GLS Station	
		V	Communications	
R	Company Routes	Blank	Company Routes (Master Airline File)	
		A	Alternate Records	
		H	Helicopter operation Routes (Master Helicopter File)	
T	Tables	C	Cruising Tables	
		G	Geographical Reference	
		N	RNAV Name Table	
		V	Communication Type	
U	Airspace	C	Controlled Airspace	
		F	FIR/UIR	
		R	Restrictive Airspace	

ARINC 424A Data Model

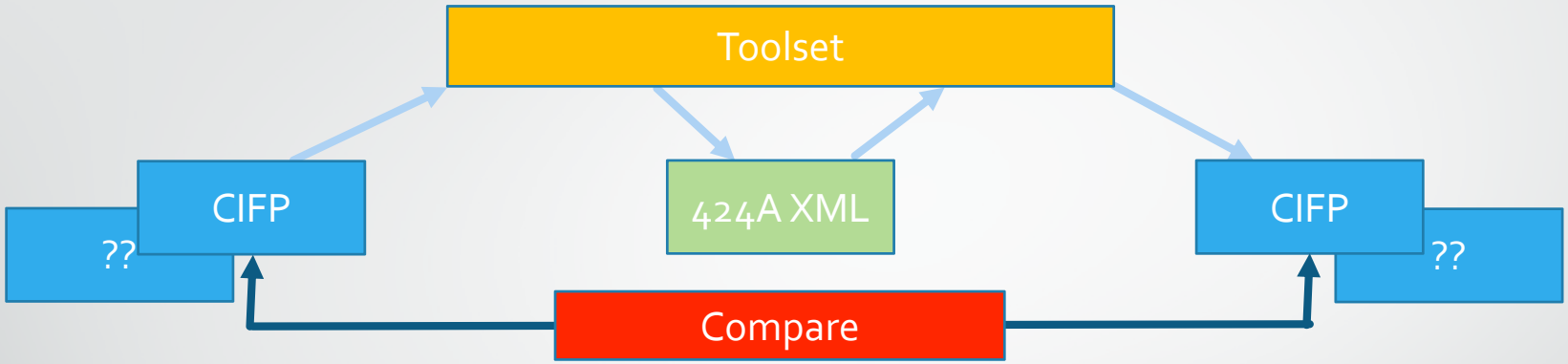
Toolset



- Toolset
  - Built on a reference implementation of navigation data objects based on 424A model
  - Java
  - JAXB to automate XML reading and writing based on data model XSD output
  - Creates an in memory object graph representing navigation data
  - Enables reasoning about navigation data
    - E.g. check tangency for RF legs
- Will be available as an inexpensive license or open source

ARINC 424A Data Model

What Is Needed for Next Steps?



- Additional datasets
  - More geographic data
  - More record types
- Define use case targets (2-3) for Version 1

Summary

- Initial Version of ARINC 424A is finished
- Updates are planned based on a verification strategy
- Questions?