WXXM in the ATM-Weather Integration Process

Federal Aviation Administration

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WXXM Conveys Weather Information
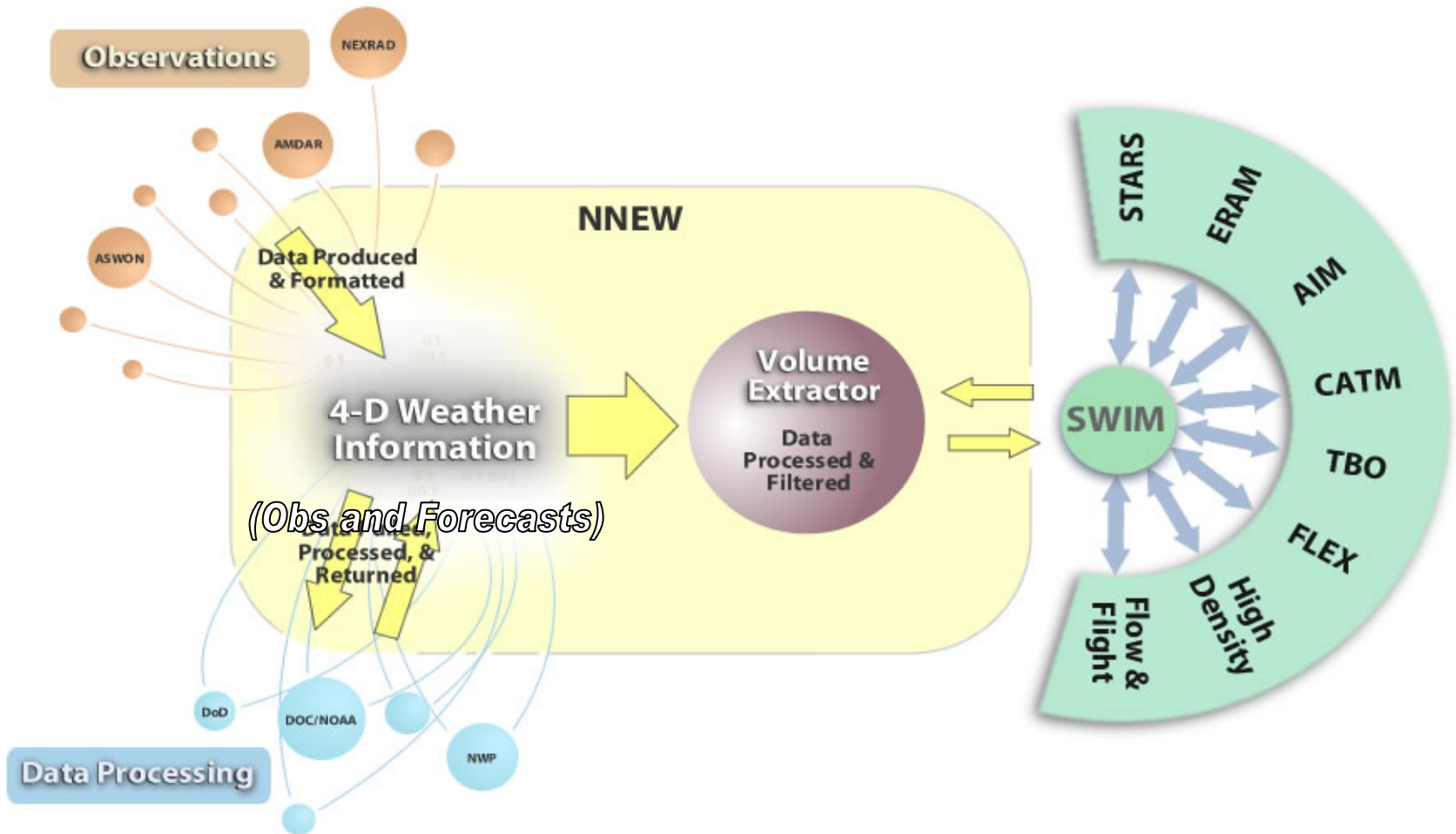
NextGen ATM-Weather Integration

Weather Information	Weather Translation	ATM Impact Conversion	ATM Decision Support
Observations → Analyses → Forecasts	Translation of weather data into: • Constraints • Threshold Events	Conversion into: • NAS Impacts • State Changes	DSTs use impacts to develop TFM solutions

NextGen 4D Wx Data Cube

Direct External Users

Weather Community

ATM Community

Primary:　　*NWS*　　　　*FAA Met*　　　　*FAA ATM*

Weather Technical Interchange

Weather Information

Observations
↓
Analyses
↓
Forecasts
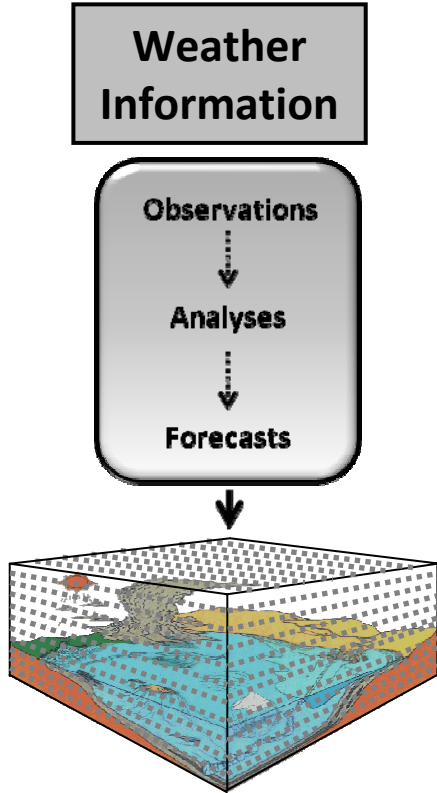
NextGen 4D Wx Data Cube

Information in the NextGen 4D Wx Data Cube:

- Is to be WXXM compliant
- Is to be discoverable via the NNEW registry/repository

Weather Constraints Technical Interchange

Weather Translation

Translation of weather data into:
- Constraints
- Threshold Events

Information in the constraints virtual data base:
- Also is to be WXXM compliant by an extension to WXXM
- Also is to be discoverable via the NNEW registry/repository

ATM Impacts Technical Interchange

ATM Impact Conversion

Conversion into:
• NAS Impacts
• State Changes

For common use, impacts could also be stored in a virtual data base:
- Whether by an extension to WXXM is TBD
- Would be discoverable via a registry/repository, not necessarily NNEW

Example: Flow Constrained Areas

Scenario:

- Convective weather is causing en route traffic to fly irregular tracks around storms, increasing controller workload

- Controllers cannot manage as many flights as they could on a fair weather day

- Controllers request aircraft not be fed to them as rapidly as normal

- This is achieved by increasing the miles in trail between aircraft

- Increased miles in trail means fewer aircraft per hour: less capacity

- Traffic managers establish a "flow constrained area" (FCA), meaning that the throughput capacity of the area will be considered reduced and some flights will be diverted elsewhere

Example (cont)

- **Question:**
  - By how much should the capacity be reduced in the FCA?

- **To get the Answer:**
  1. Translate weather into constraints
  2. From constraints get the impact on capacity
 3. Use WXXM/NNEW/SWIM as the dissemination model

Step 1: Translate weather into constraints

- **Knowing the constraint from the convective weather is about predicting pilot decisions**
- **Will they penetrate the weather, or will they divert around it.**
- **MIT LL has studied past pilot behavior and has drawn a correlation between storm intensity and storm tops**
- **Applying the correlation to the weather of the day produces the Weather Avoidance Field (WAF), which is the probability of pilots deviating around a storm**

Use WXXM to disseminate the WAF!
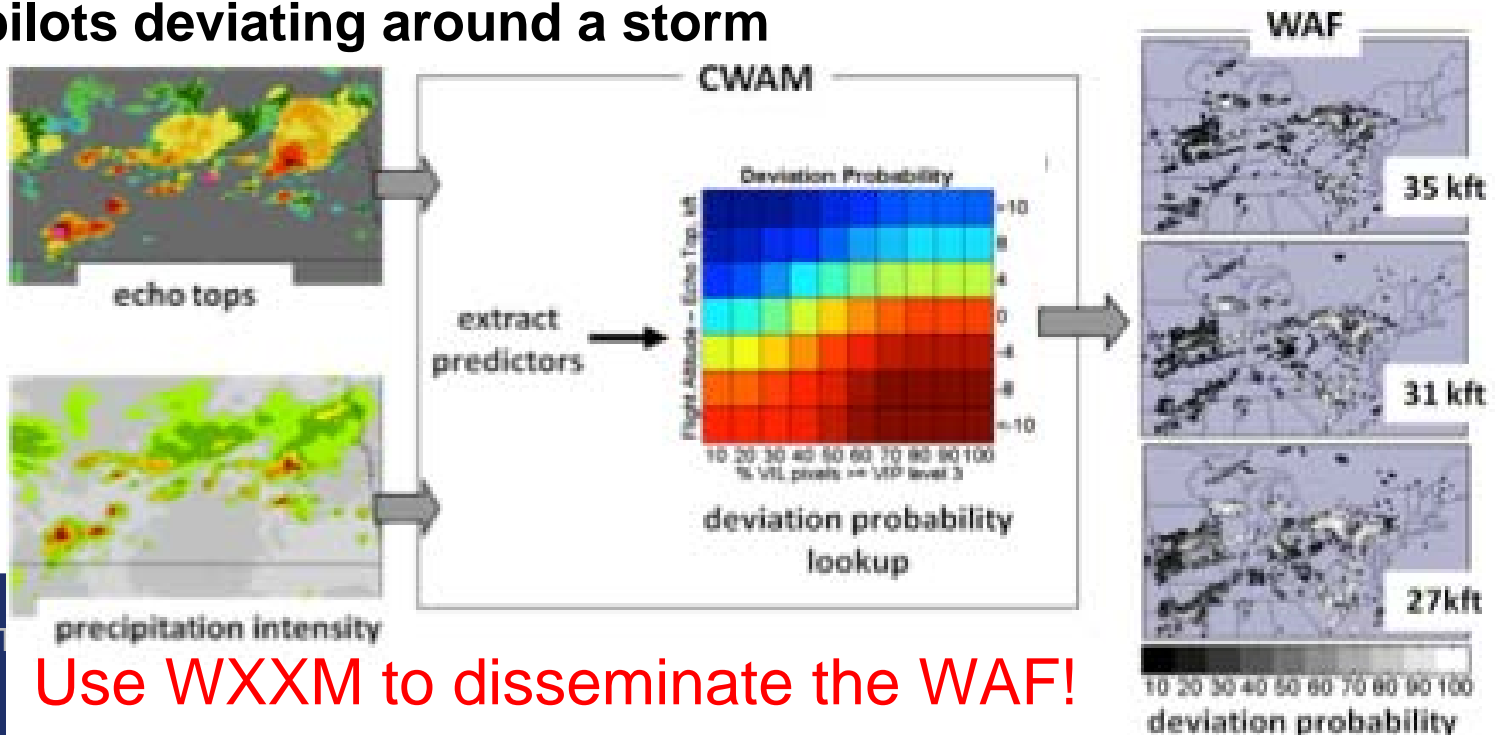
Step 2: From constraints get capacity

- **Apply weather avoidance field (WAF) constraint prediction to corridors across an FCA**
- **Obtain the total capacity across the FCA**

Weather Avoidance Field (WAF)

FCAA05 2007/06/27_19:00Z

FCAA05

+20 min
+10 min
0 min
-10 min
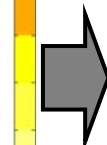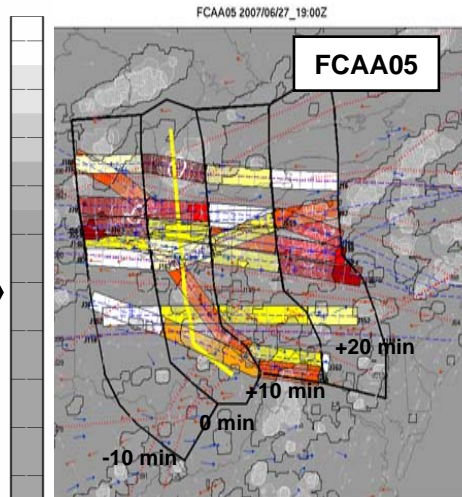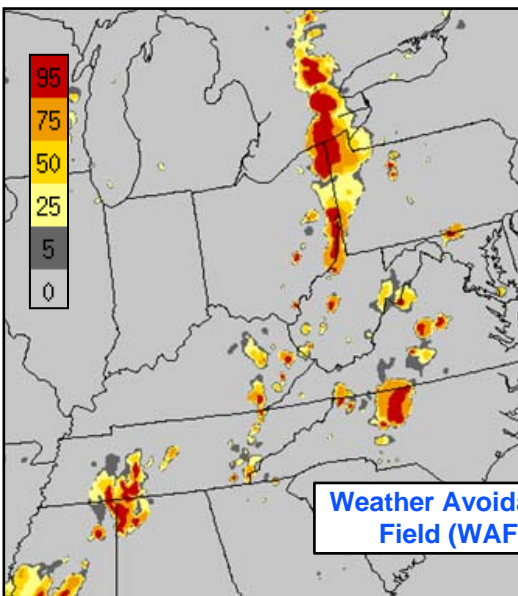
FCA Capacity Forecast Matrix

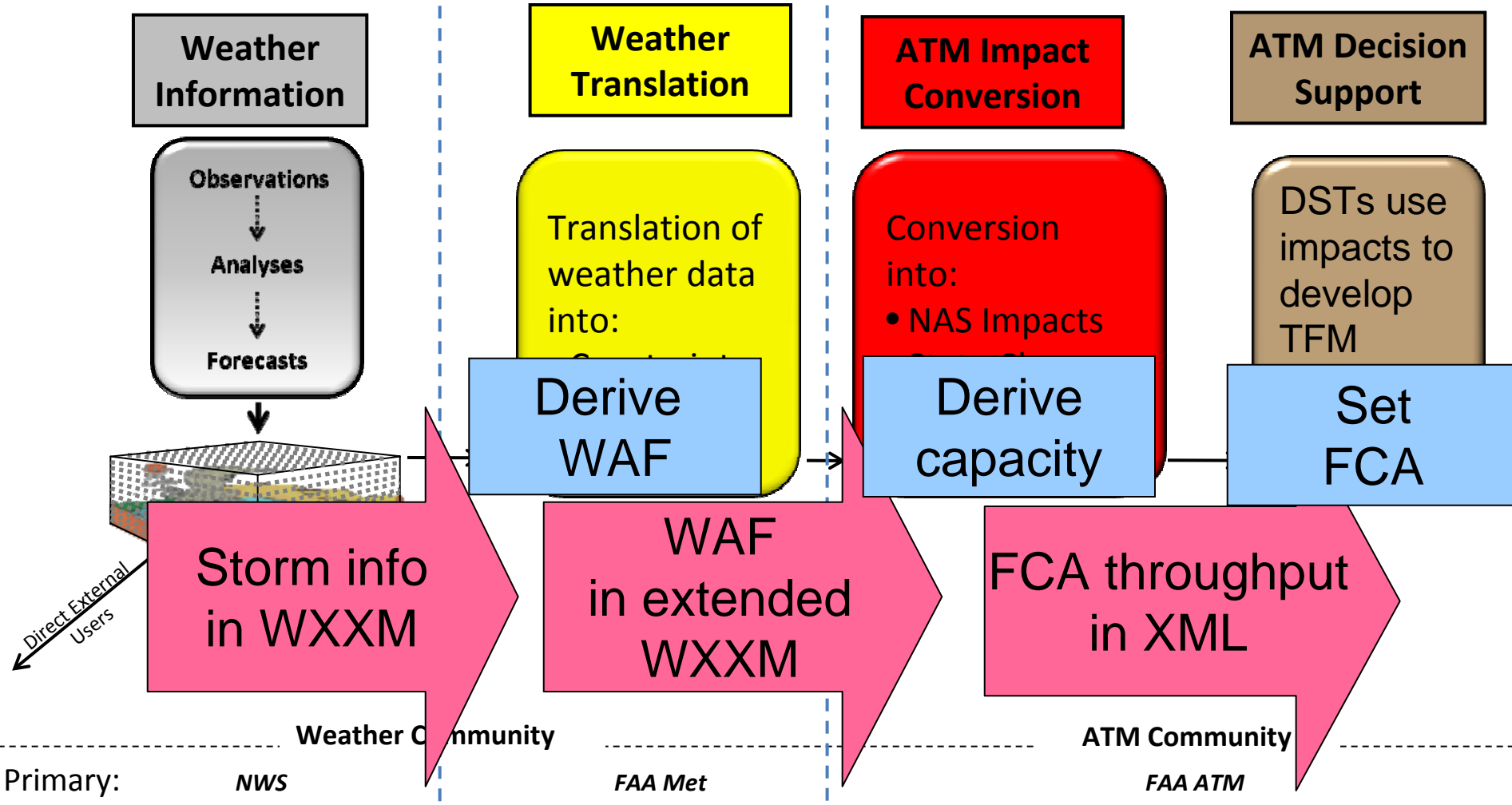|	11	12	13	14	15	16	17	18	19	20	21	22	23
11	81	96	78	38	72	85	78	68	40				
12		90	78	46	64	88	91	82	39	37			
13			89	57	71	76	88	84	66	28	20		
14				88	85	81	86	89	74	51	17	20	
15					96	88	85	90	70	47	16	19	49
16						90	61	65	68	28	6	13	30
17							77	67	69	63	20	9	17
18								78	61	54	59	19	3
19									50	36	29	33	20
20										0	10	13	16
21											11	5	7
22												6	4
23													6

Predicted Available A05 Capacity
< 75%   < 50%

Use XML to disseminate the throughput!

Summary

Weather Information	Weather Translation	ATM Impact Conversion	ATM Decision Support
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Derive WAF

Derive capacity

Set FCA

Storm info in WXXM →

WAF in extended WXXM →

FCA throughput in XML →

Direct External Users

Weather Community   **ATM Community**

Primary:	*NWS*	*FAA Met*	*FAA ATM*

Questions?