



The Single Integrated Airspace Approach to Global Airspace: One World – One Airspace – One Perception



Outline



- **INTRODUCTION**
- **THE NAS TODAY**
- **THE ROAD AHEAD**
- **SIAP – ONE POSSIBILITY**
- **CONCLUSION**

Introduction

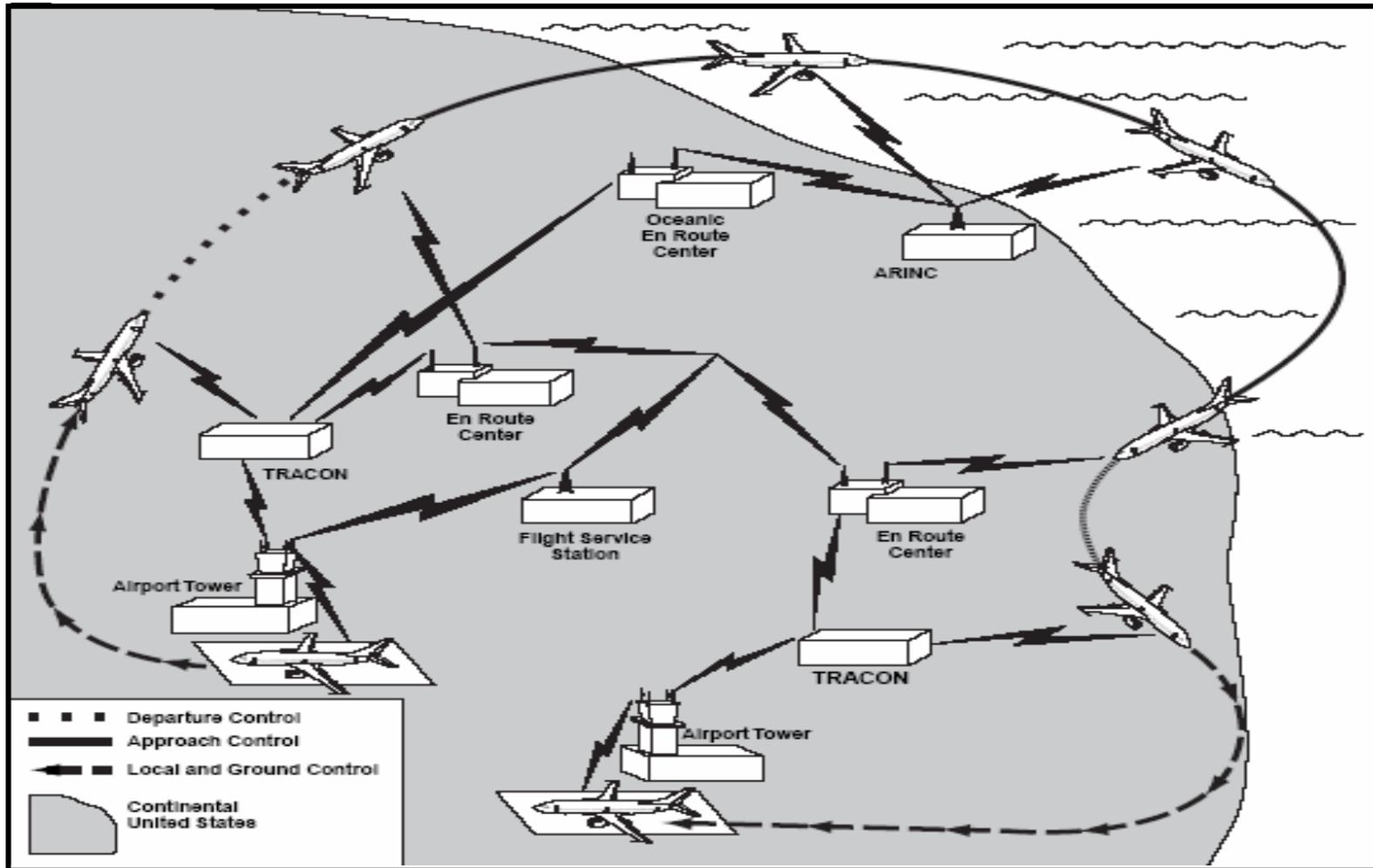


National Airspace System (NAS) Problem:

- Increasing Demand of Airspace**
- Current approach has limited growth**
- Exceed ability to accommodate that demand**

Without improvements the NAS will only accommodate about 42% of the FAA's forecast from 1996 -2017.

The NAS Today



*Source: General Accounting Office

The NAS Today



Airport	Operations			Enplanements		
	1996	2007	2017	1996	2007	2017
• BOS	462	509	543	12.3	16.0	18.9
• BDL	151	181	214	2.7	4.1	5.9
• HPN	153	160	159	0.5	0.9	1.3
• ISP	109	117	122	0.6	0.9	1.3
• LGA	342	381	413	10.3	13.8	17.0
• JFK	360	397	432	15.0	20.7	26.0
• EWR	443	561	661	14.2	20.7	26.7
• PHL	401	509	584	9.1	14.8	19.7
• BWI	260	338	411	6.6	10.3	13.8
• DCA	305	318	330	7.2	8.6	10.1
• IAD	323	397	463	6.0	9.7	13.3

Table shows the FAA's values for operations and enplanements at select airports for 1996, 2007, and 2017.
Annual Operations (thousands) and Enplanements (millions)

- 9,000 A/C in Commercial Use
- 211,000 Registered Private A/C
- 600,000 Registered Pilots

Between 10:00 – 18:00 there are between 5000 to 6000 A/C under positive control by the ATC.

The NAS Today



- **Flight Delays**
 - NAS non-linear queuing network
 - Operating close to its present capacity
 - Safety and Security Under Pressure

	Hours Delayed	% of Total Delayed Hours
Weather	49,754.1	81.4%
Volume	6,145.1	10.1%
Equipment	142.8	0.2%
Closed Runway	1,799.7	2.9%
Other	3,259.8	5.3%
Total	61,101.5	100.0%

*Source: *BTS Data*

The NAS Today



- Based on traffic patterns of the past.
- Information is isolated by limitations of obsolete equipment.
- Preliminary Analysis indicates that a 50% Increase in Operations at Capacitated Airports (e.g.ATL, ORD, LGA) may lead to an 8 fold Decrease in Safety!
- 10 Major Hub Airports are Operating at > 0.65 Capacity.
 - Delays at these airports spread non-linearly throughout the Network.
 - Runway additions at one airport may have little network effect.
- NAS is a Complex Adaptive System (CAS), highly Non-Linear and the benefits of any given Sub-System are NOT additive.
 - About 2% annual growth in OPS – threefold increase of delay.**

System-wide improvements have a larger effect than individual airport improvements!

*Source: 3rd USA/Europe Air Traffic Management R&D Seminar Napoli, 13-16 June 2000: UNITED STATES and EUROPEAN Airport Capacity Assessment using the GMU Macroscopic Capacity Model (MCM) George L. Donohue, William D. Laska

**Source: BTS Data

The Road Ahead



- Additional Airspace Might Be Obtained by Using Airspace More Efficiently.
- Flexible Use of Airspace.
- Reduce Separation Buffer.
- More Flexible Re-Routing Processes.
- Optimize Queuing Across the NAS Network.

Pertinent, shared, ubiquitous data/information is required to perform the above optimizations.

SIAP – One Perception



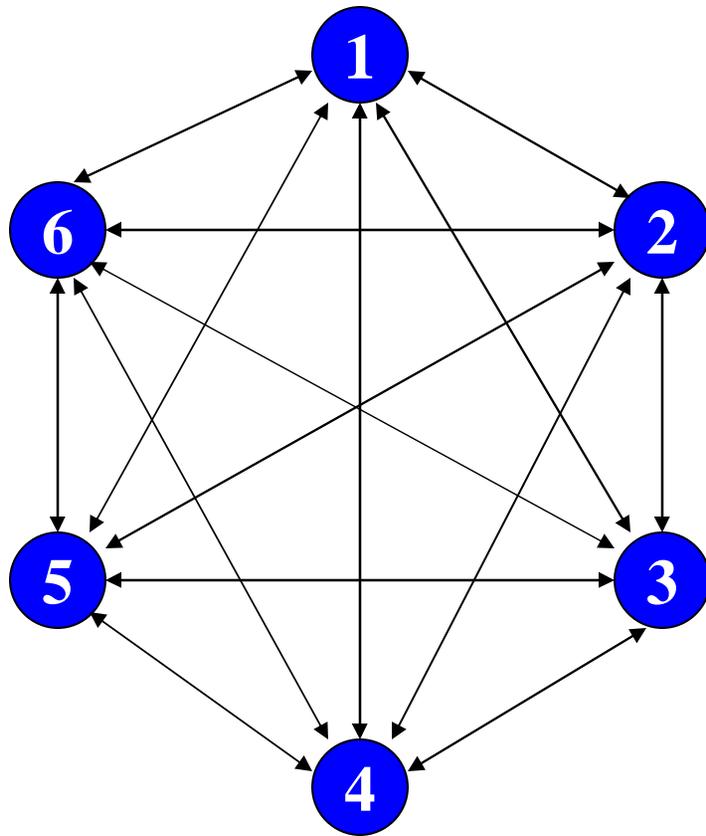
- **Single Integrated Air Picture (SIAP) concept**
 - DoD Sponsored under the control of the Joint SIAP Systems Engineering Office (JSSEO).
 - All users have a common perception of their surroundings resulting in a robust system that is fault tolerant.
 - The IABM creates a common, independently generated perception of the airspace.
- **Integrated Architecture Behavior Model (IABM)**
 - Consumer of information - platform independent model.
 - Creates common, single perception of environment among all users.

SIAP – One Perception



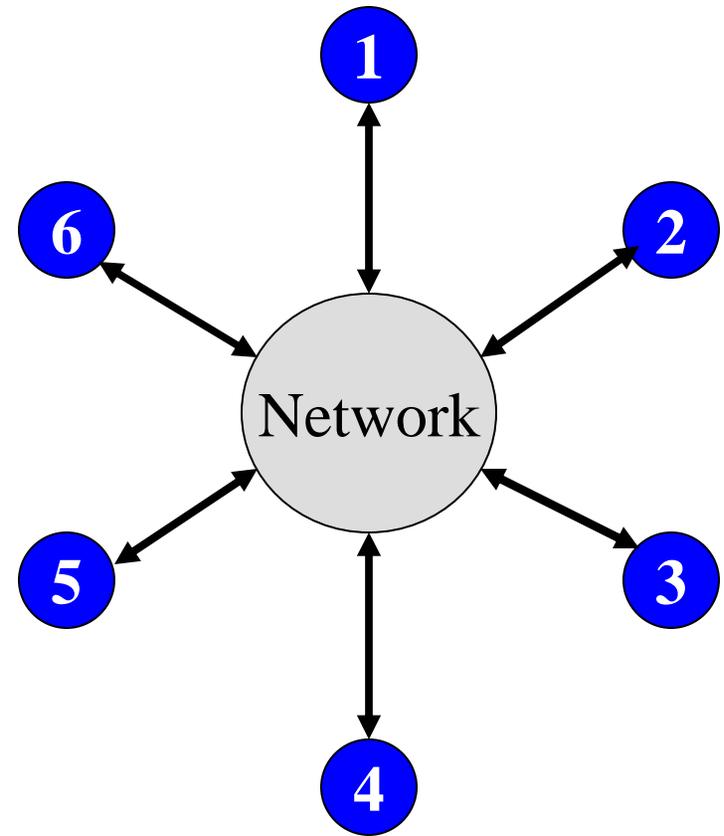
- Software based technology resulting in an domain architecture of separable components.
(Upgradeable)
- Loosely coupled with the network allowing the network to change without a measurable impact on the IABMs. ***(Scalable)***
- Framework for additional applications enabling the harmonization of already existing and future products. ***(Extensible)***

SIAP – Connections



User-Centric

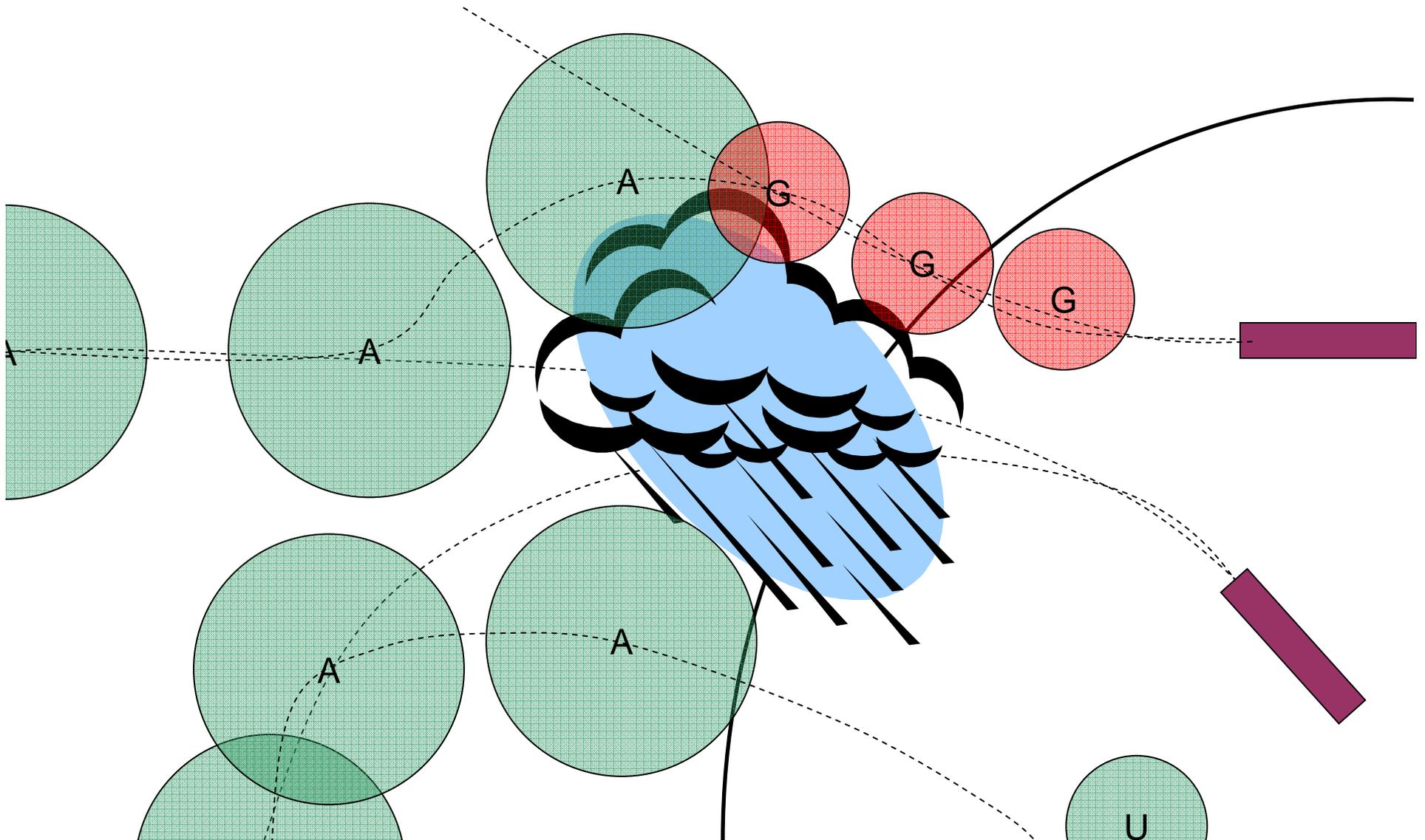
$$\#connections = \frac{n(n-1)}{2}$$



Network-Centric

$$\#connections = n$$

Demonstration



SIAP – One Perception



- **Real**: DoD spent over **\$100 M** on SIAP
- **Available**: 1st DoD iteration will be implemented **October 2005**
- **Supported**: Spiral upgrades every two years allowing for open competition
 - More efficient algorithms
 - Increased extensibility by the number and range of applications available

Conclusion



- Requires adaptation to specific computer platform.
- The IABM is an **enabling** technology that can harmonize all current efforts into a single structure. It is already here and can be implemented with a little effort and cooperation.
- Dual use provides an opportunity for DoD and FAA to work together to develop applications that can increase functionality of the IABM.
- The SIAP concept creates a robust, fault tolerant perception of the airspace.
- Can be utilized globally due to its information consumer based approach.

Questions



???