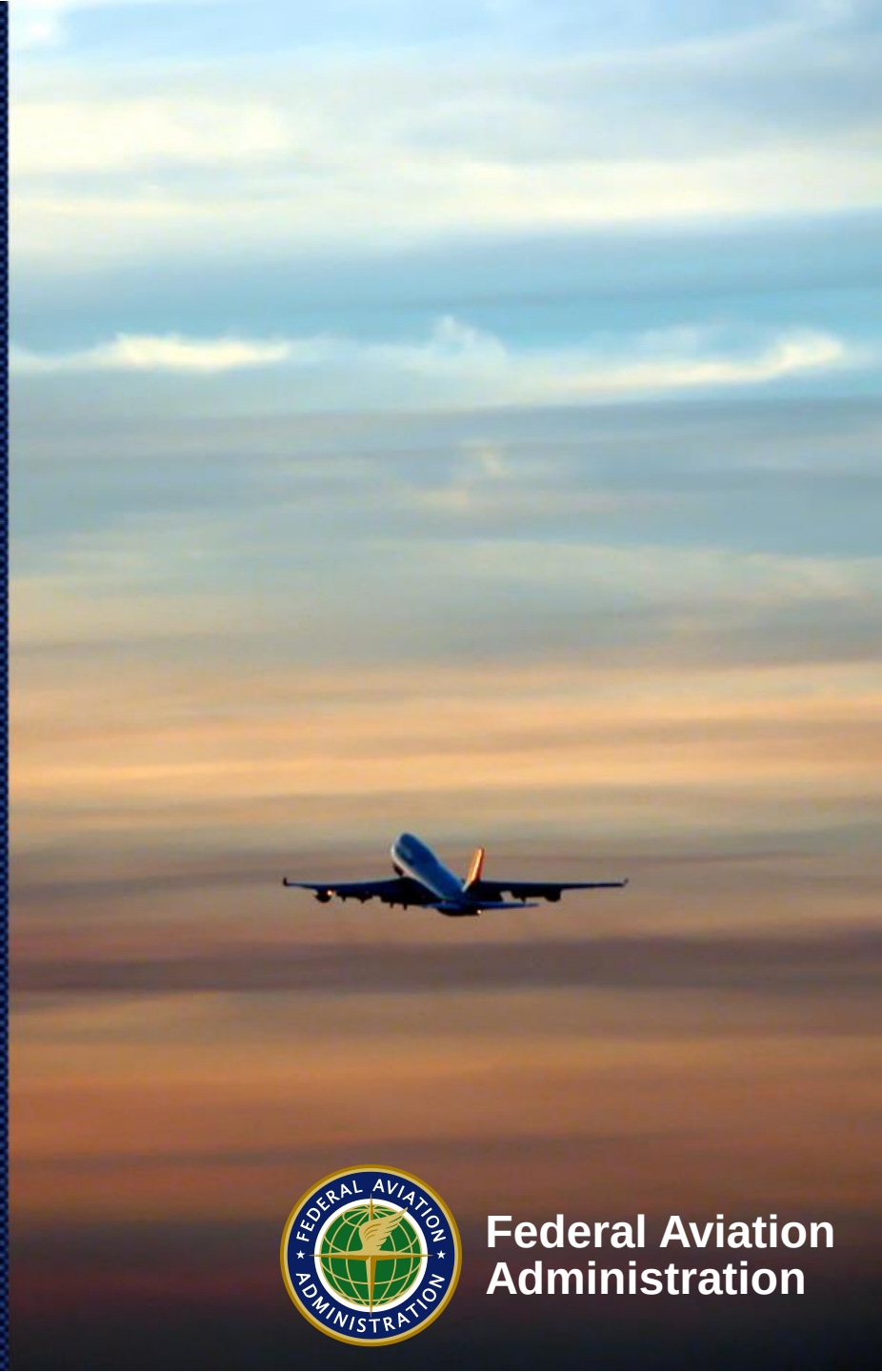
FAA Enterprise Network Services (FENS)

Industry Day—April 25, 2018



Federal Aviation Administration

Joe Lahoud | Program Manager, FENS

FAA Introduction and Welcome

Agenda

TIME (AM)	TOPICS	PRESENTER
8:00 – 8:30	**Check-in**	
8:30 – 8:40	**Welcome and Logistics**	John Kreger, VP for Public Center Programs, Center for Programs and Technology, MITRE
8:40 – 8:50	**FAA Introduction: FENS Industry Day**	Joe Lahoud, Program Manager, FENS
8:50 – 9:10	**Keynote Remarks: Turning Great Ideas into Improvements**	Kristen G. Burnham, VP, PMO
9:10 – 9:30	**How the FAA's Needs for Communications Services Are Expected to Evolve**	Pamela Whitley, (A) Assistant Administrator, NextGen
9:30 – 9:45	**Acquisition Excellence: A Landscape for FENS**	Nathan Tash, Deputy Assistant Administrator, Office of Acquisitions and Business Services, Chief Acquisitions Officer
9:45 – 10:00	**Break**	N/A
10:00 –10:20	**FAA Overview**	Joe Lahoud, Program Manager, FENS
10:20 – 11:00	**Overview of the FAA's Current Network Environment**	Patton Turner, Chief Systems Engineer, Communications, Information and Network Programs
11:00 – 11:15	**Insights Gained from Market Research**	Todd Gardner, Lead Engineer, FENS
11:15 – 11:45	**FAA Vision for the Future Network Environment**	Ray Goulet, Architecture Lead, Communications, Information and Network Programs

Agenda

TIME (PM)	TOPICS	PRESENTER
11:45 am– 1:00 pm	**Lunch**	MITRE
1:00 – 1:30	**Potential Differences in Requirements**	Todd Gardner, Lead Engineer, FENS
1:30 – 1:45	**Current State of SWIM and Future Direction**	Jeri Groce, Program Manager, SWIM
1:45 – 2:00	**Break**	N/A
2:00 – 2:20	**What's Next? FAA's Near-term and Longer-term Plans for the FAA Enterprise Network Services Program**	Dennis Scanlon, Contracting Officer, FENS
2:20 – 2:35	**Closing: Network of the Future**	Steven Bradford, Chief Scientist, NextGen, ANG·3
2:35 – 3:45	**Questions and Answers**	FENS Program Office
3:45 – 4:00	**Closing**	Joe Lahoud, Program Manager, FENS

Today's presentation slides will be made available to industry via FAACO.

At Today's Meeting – You Will Hear:

- FENS is critical to the FAA, the National Airspace System (NAS), and Next Generation Air Traffic Control System (NextGen)
- FAA knows communications technology is changing, and we must keep pace to achieve benefits
- FAA is committed to fostering competition and allowing offerors the flexibility to propose their service-based solution to meet FAA's requirements
- FAA has been engaging with industry throughout the process; we are listening to you
- FAA, with industry, has accomplished much to advance the FENS program; you will learn our current thoughts, plans, and projected schedule

Question Submission

We will have a question and answer session in the afternoon.

Please write your questions on the cards provided. They will be collected at the end of each session.

Kristen G. Burnham | Vice President, PMO

Keynote Remarks

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Pamela Whitley | (A) Assistant Administrator, NextGen

How the FAA's Needs for Communications Services Are Expected to Evolve

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Nathan Tash

Deputy Assistant Administrator
Office of Acquisitions and Business Services
Chief Acquisitions Officer

Acquisition Excellence: A Landscape for FENS

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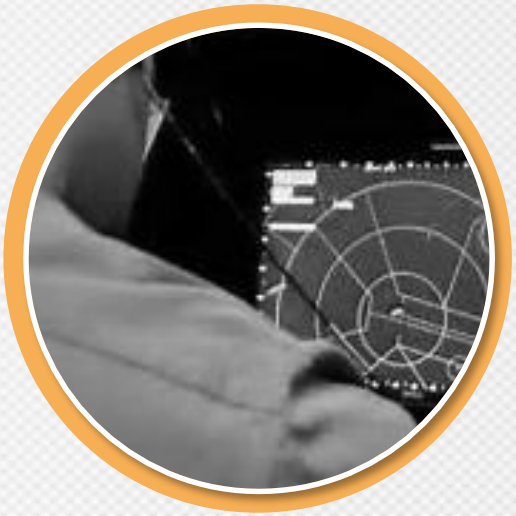
Break

Joe Lahoud | Program Manager, FENS

Overview

Introduction



FENS is a new acquisition that will provide the communications services required by the FAA

At program inception…

FENS must be backwards-compatible with FAA legacy systems to ensure continuity of operations

At the same time…

FENS must provide flexible and scalable networking capabilities for meeting the FAA's future requirements for communications services including support of NextGen

FTI bridge contract period of performance ends September 2022

FENS is targeting the award of one or more contracts in FY20

FAA Mission, NextGen, and the Role of FENS

FAA'S MISSION

- Provide the safest, most efficient aerospace system in the world
- Maintain the goal of Air traffic operations safety as the FAA's highest priority
- Provide safe and efficient air navigation services to 29.4 million square miles of airspace including all of the United States, large portions of the Atlantic and Pacific Oceans, and the Gulf of Mexico

NextGen Air Traffic Control System

- NextGen is the FAA-led modernization of America's air transportation system
- Goal is to increase the safety, efficiency, capacity, predictability, and resiliency of American air travel
- New interconnected systems will fundamentally change and improve how NAS users fly, navigate, and communicate

Role of FENS

- FAA's communications systems are key components of the U.S. critical infrastructure
- Network availability, integrity, efficiency, and resiliency are critical to FAA's mission
- They enable FAA's enterprise network and security requirements
- FENS will deliver enterprise network services that enable FAA's mission

Program Overview

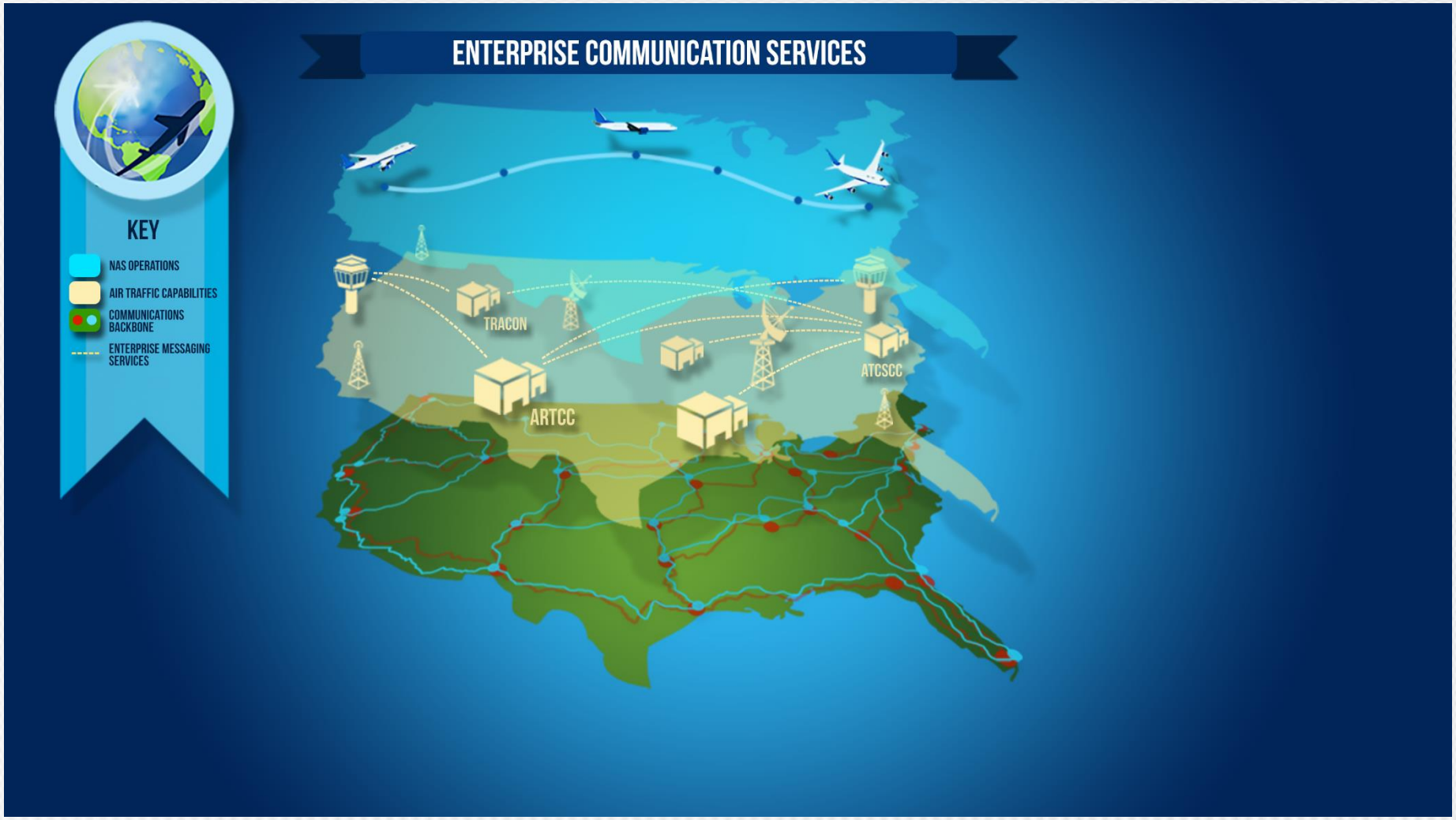
FENS will provide all of the capabilities available from the current FTI contract, plus the next generation of networking, messaging, and infrastructure services required by FAA programs.

- FENS will be the primary means through which FAA obtains telecom services for NAS and agency operations
- FAA must plan for continuation of services in order to allow FAA automation to continue to work seamlessly
- New network capabilities are needed to meet future requirements for communications services and supporting NextGen's concept of operations

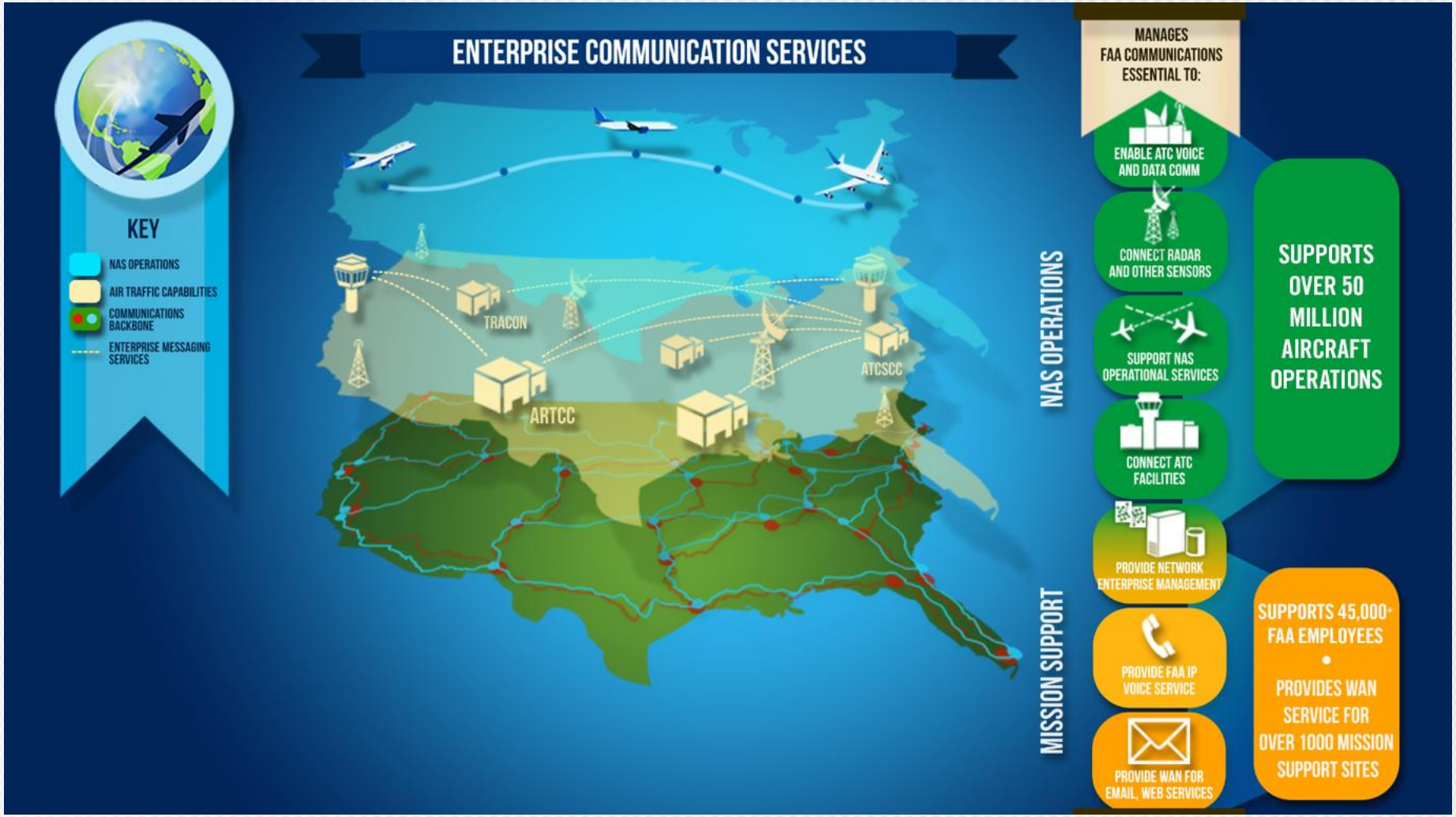
FENS is the successor to the existing FTI program through which the FAA currently obtains approximately 26,000 telecom services to more than 4,000 locations.

- FTI also provides enterprise messaging services (SWIM data distribution infrastructure) and specialized services such as DNS, NTP, Security Gateways

FAA Enterprise Communications



FAA Enterprise Communications



FENS: A New Way of Thinking

Need to align with the direction of industry instead of expecting industry to follow the FAA

NEED TO ALIGN

Express requirements in terms of services rather than specifying implementations

EXPRESS REQUIREMENTS

Adjust FAA policies and requirements as appropriate

ADJUST

THESE ACTIONS ARE UNDERWAY

- This will allow FAA to better leverage carrier offerings

- Current FAA orders and policies reflect network operations philosophies from nearly 20 years ago
- Need to update, modify, or discontinue restrictive orders and policies to allow FENS vendors maximum design flexibility while still ensuring that NAS requirements are met

FENS Acquisition Approach

Open competition	Offers best opportunity to fully leverage new technologies
Define service-oriented requirements	Leaves vendors free to choose the most cost-effective implementations
Simplify service ordering and contract management processes	Reduces transition and execution complexity
Enhanced information management capabilities	Supports cross-domain data flows and dissemination to aviation partners
Establish a framework that allows both integrators and carriers to compete	Broadens opportunities for cost savings and innovation such as Cloud, SDN, NFV

FENS Support of Future Concepts

Flexible **USER-DIRECTED RE-ROUTING** of traffic flows based on **OPERATIONAL CONDITIONS** to support Failover and Contingency operational scenarios

Service (including bandwidth)-On-Demand to support the type of adaptive traffic flows in a **MORE COST EFFECTIVE MANNER**

Enhanced **SITUATIONAL AWARENESS** of infrastructure and associated service capabilities

Increased **SERVICE RESILIENCY** against catastrophic failures

Enhanced **INFORMATION MANAGEMENT** capabilities to support cross-domain data flows and dissemination to aviation partners

Leveraging Industry Capabilities & Processes

Encourage the use of new & innovative solutions

Take advantage of industry strengths & experience

Control costs

Leverage existing service solutions for delivering high performance & availability, low latency, diversity, and avoidance

Tailor and/or augment offerings to meet agency needs for:

- Security services and controls
- Operational visibility and reporting

Seek innovation for FAA-specific elements:

- Support for FAA legacy interfaces, e.g., VG-x, low-speed serial data, etc.
- Provide international interfaces for safety-critical air traffic control operations
- Provide FAA operational stakeholders with improved situational awareness

Technologies Bring Opportunities

NEW TECHNOLOGIES PROVIDE NEW OPPORTUNITIES

Technology for Enhanced Capabilities and Increased Competition

TDM Transition to IP

NFV/SDN/SD-WAN

Wireless Access

ENSURING PROGRAM SUCCESS

Transition Planning

New Technology Tests and Evaluation

Outreach to Key Stakeholders

ATC Process Reengineering

POTENTIAL TO REDUCE COSTS AND PROVIDE FOR INCREASED CAPABILITIES

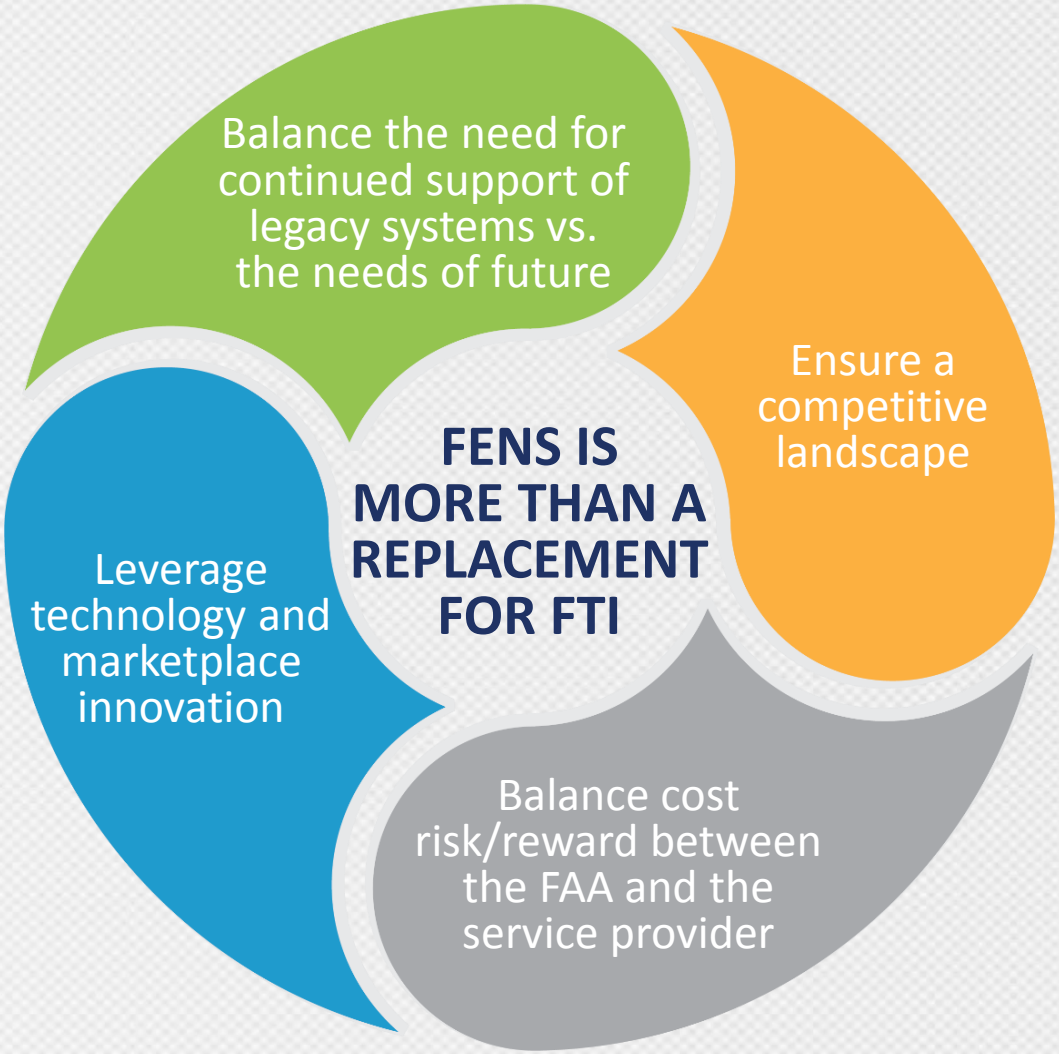
Service on Demand

Increased Situational Awareness

Dynamic Traffic Engineering

LEVERAGE TECHNOLOGY TO ENHANCE CAPABILITIES

FENS Scope and Principles



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Patton Turner
Chief Systems Engineer
Communications, Information, and Network Programs

Overview Of FAA's Current Network Environment

Background

The FAA currently acquires the majority of the telecommunication services it requires through the FTI contract

- Awarded in July 2002 to Harris Corporation
- 15-year period of performance, $3.5B ceiling

5-year extension of existing contract approved in anticipation of the FENS competition

Characteristics of the Current Environment

Premise equipment installed at most FAA Facilities

Supports legacy requirements for voice grade services, dedicated point- to-point circuits, etc.

Various transmission technologies

e.g. SONET, DWDM, T1, Analog, etc.

Large air traffic control facilities connected via private optical backbone

Numerous off-backbone sites in remote areas that require high availability but typically lower bandwidth

Dedicated Network Operations Control Centers (NOCC) and Security Operations Control Centers (SOCC)

FTI Service Paradigm

FAA focuses on identifying user needs for telecommunications services.

The FAA does not own, operate, or maintain any of the telecommunications equipment operated under FTI.

The Contractor is responsible for service provisioning, including design, engineering, implementation, operations, maintenance, and network upgrades.

FTI Services Description Document (FTSD or FTI Spec) defines the orderable services.

Distinguished by RMA level, latency level, physical interface, and other parameters.

Enhanced security features, such as encryption and Firewalls, can be ordered as optional features.

FTI Service Delivery Model

FAA

- *Identifies user-specific requirements for availability, latency, avoidance, security, electrical interfaces, etc.*
- *Manages requirements*
- *Service Acceptance*
- *Grants Service Maintenance Releases*

Service-Specific Management and Reporting

FAA OVERSIGHT AND CONTROL

FAA Access to Real-Time Network Performance

FTI CONTRACT

- ***Service Level Agreements***
- ***Price Management Mechanism***
- ***Financial Performance Incentives***
- ***Testing, Certification, and Verification Requirements***

FTI VENDOR

- *Engineers solutions*
- *Responsible for service delivery and performance*
- *Technology assessments*
- *Manages day-to-day operations*
- *Service restoral*
- *Coordinate Maintenance Actions*

Services Acquired

DEDICATED TELECOM

- ***TDM-based and IP-based***
- AeroMACS
- Satellite
- Private microwave

ENTERPRISE MESSAGING

- Implemented to support the requirements of the System-Wide Information Management (SWIM) program

INFRASTRUCTURE

- Network Boundary Protection Services (NBPS)
  - NAS Enterprise Security Gateways (NESG) and dedicated NESG connectivity
- Network Time Protocol / Precision Time Protocol (NTP/PTP)
- Domain Name Services (DNS)
- International User Portal (IUP)

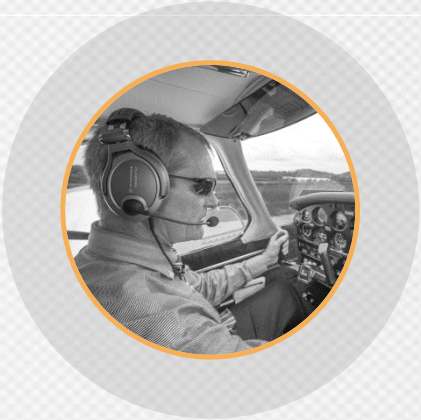
Service Classes

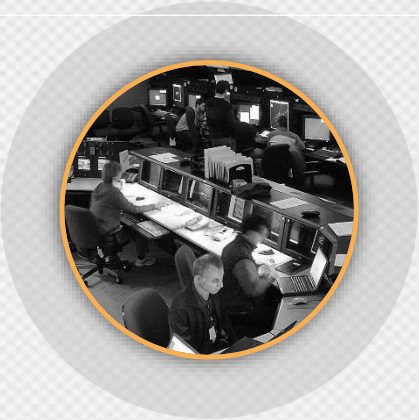
FTI contract defines "service classes" to describe the basic types of telecom services that can be ordered

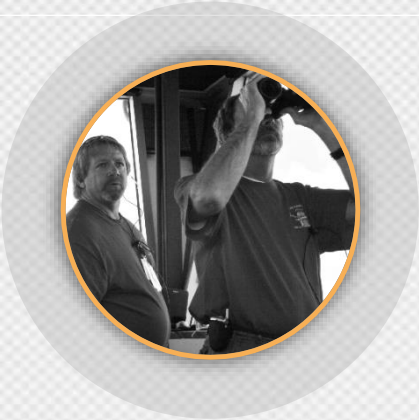
Service class characteristics include:

- Reliability, Maintainability, Availability (RMA) level
- Latency level
- Basic security level
- Physical Interface type (often multiple options in SC)
- Voice Quality (if applicable)
- Modem Compatibility (if applicable)

Over 135+ distinct service classes







Service Performance Levels

RMA Level*	Required Availability	Max Restoration Time	Max Resolution of Jeopardy Condition	
1	0.9999971	6 Seconds	3 Hours	High Availability (HA)
2	0.9999719	58.8 Seconds	3 Hours	
3	0.9998478	8 Minutes	3 Hours	
4	0.9979452	3 Hours	N/A	Standard Availability (SA)
5	0.9972603	4 Hours	N/A	
6	0.9904215	Next Business Day	N/A	
7	0.9970000	24 Hours	N/A	

NAS and Admin/MS

Admin/MS Only

FTI-SAT Only

** RMA Level applies to performance of individual services*

Existing Telecom Services

Service	Interfaces Supported
Direct Digital Connect (DDC)	• DDS-56, RS-232, EIA-530(A), V.35, X.21
High-Speed Digital	• FT-1, T-1 (1536 kbps and 1544 kbps), DS-3 • Point to Point and Asymmetric
Analog (voice and data)	• VG-1/VG-3/VG-6/VG-8 • 2-wire, 4-wire, FX, Ringdown, E&M
Internet Protocol (IP) data	• Ethernet • RS-232, EIA/TIA-449, EIA-530(A), V.35, T-1, DS-3

FAA Network Domains

FAA has separate networks for:

- National Airspace System (NAS) Operational Systems
- Administrative/ mission support applications
- Research and Development (R&D)

Isolation required to comply with FAA security policies and protect the NAS

- FAA Security Policies based on NIST 800-53
- Currently FIPS-199 Moderate
- Moving to FIPS-199 High for NAS Domain

NAS operational domain also has a test bed for interoperability testing with FAA systems

NAS services are structured, patterned...

MISSION SUPPORT IS FLUID

NAS Operational Network

- Privately managed, highly secure network
- Service at 4,000+ sites, many in remote areas
- 25,000+ individual telecom services
- Services to foreign countries and International Boundary Points (IBPs)
- Enhanced security functions (e.g., encryption, firewalling, intrusion protection/detection)
- Resilient and survivable architecture for NAS OPIP service to mitigate system-wide failures
  Including protection against routing failures

FAA Service Delivery Locations

FAA requires telecommunications services at

> 4,000 locations

84% of sites have <10 services, and present telecommunications access challenges; installation space may be limited at all sites

FAA service delivery locations **will remain similar** during FENS timeframe

FAA Small Site Environment

Small Site Statistics

- 1-10 Services at 3425 sites
- 1124 with high availability or avoided connections
  - Radars (hundreds) and communications (thousands) facilities

Facility Characteristics

- Locations can be very remote
- Typically unmanned facilities
- Access challenges can exist at remote sites
- Can be as small as 7’ x 7’ or stand alone field box
- Few physical configurations
  Only certain radars are standard configurations

FAA Medium Site Environment

Medium Site Statistics

- 10-89 Services at 643 Sites,
- 606 with high availability or avoided connections
  - Typically small ATCTs or TRACONs

Facility Characteristics

- Lack of space is typical
  - Footprint may be floor space or wall mount
- May be 24 x 7 environment
- “Hotcuts” and temporary installations may apply
- No consistency between sites
  - Floor plans or power configurations (E/G and/or UPS)

FAA Large Site Environment

Large Site Statistics

- 90 or more Services at 62 Sites,
- 60 with high availability or avoided connections
  - Air Route Traffic Control Centers (ARTCC),
  - Large Airport Traffic Control Towers (ATCT), or
  - Terminal Radar Approach Control Facilities (TRACON)

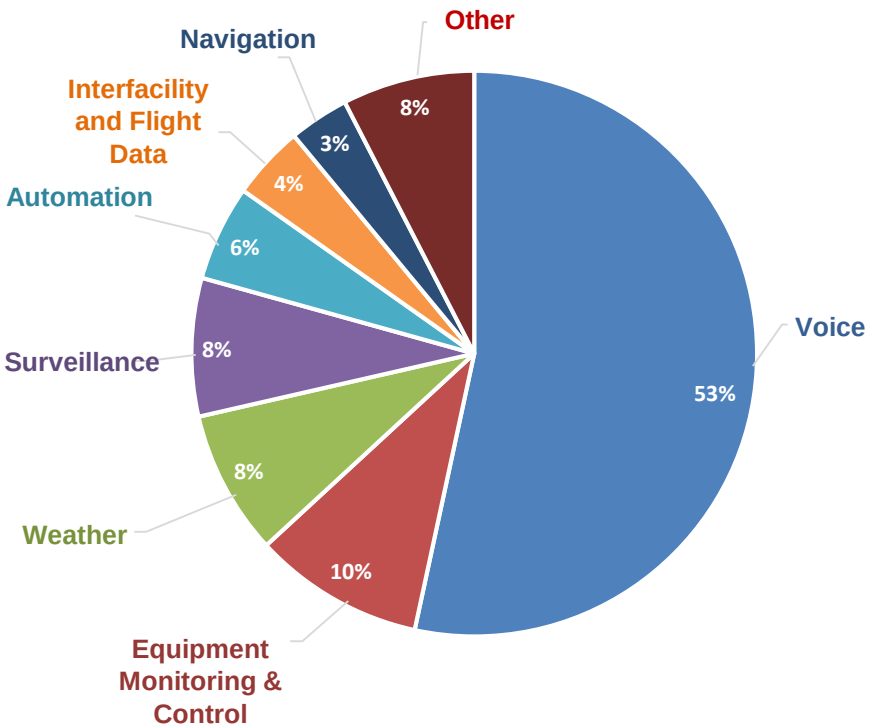
Facility Characteristics

- Space is more available
  - Footprint may be floor space
- Will be 24 x 7 environment
- Better consistency between sites
  - Floor plans configuration managed (especially at ARTCCs)
  - Power configurations typically UPS systems
- Possible separation of main/standby equipment

Current NAS Service Profile

The NAS is a large and diverse enterprise that relies on more than 25,000+ telecom services; 88% are TDM-based

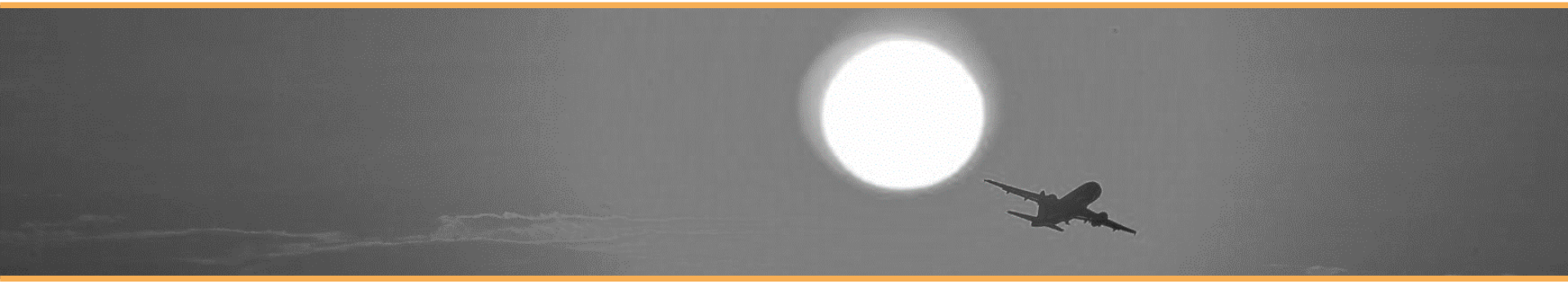
Breakdown of TDM Services by NAS Application



Breakdown of NAS Services	Count	%
TDM-based	22,160	88%
IP-based	2,545	10%
Layer 7 (SWIM)	594	2%
Total	**25,299**	

	Category of TDM-Based Services	# of services
	Voice (A/G:RCAG, BUEC, RTR, RCO G/G: Voice Switches)	11,829
	Equipment Monitoring & Control (RMLS)	2,164
	Weather (ASOS, NEXRAD, TDWR, RVR's, IDS-R)	1,833
	Surveillance (Radars, Sensor)	1,751
	Automation (TAMR, STARS)	1,211
	Inter-Facility and Flight Data (FDAT, IDAT, FDIO)	934
	Navigation	761
	Other	1,677
	Total	**22,160**

Diversity and Avoidance



DIVERSITY corresponds to redundant transmission paths that are physically and/or electrically separated for high availability services

AVOIDANCE provides end-to-end physical and/or electrical separation between two or more services

- Includes many remote facilities like radars or air-to-ground communications

Diversity (for HA services) and avoidance (for SA services) can be ordered in addition to the specified availability that comes with the service class

IP service avoidance means physical and/ or electrical separation of the connectivity of SDPs to the OPIP backbone for two IP services

Diversity/ Avoidance paths are documented from the SDP to the carrier POP on both ends of the service and provided to the FAA as a monthly deliverable

FAA Administrative IP Network

1

~1,100 services at 1,000+ FAA facilities

- RMA4 at major traffic hubs, RMA6 at all other sites

2

Typical of a large Government agency network

3

Supports many bandwidth-intensive applications

- FAA administrative services including: phone, email, training, payroll & internet access
- Client based Video & Web Conferencing
- Interactive web-based training

4

OMB-compliant Trusted Internet Connection Points

5

Data replication between data centers

6

30,000+ Virtual Private Network (VPN) accounts for remote access

7

Some backup/ NAS support services

FAA Telecommunications Security Approach

Enterprise Approach to Information Security Management

- Real-time 24 x 7 monitoring of security incidents by SOCC
  - Average of 2K security events/calls per month analyzed
- Immediate incident reporting to the FAA
- Coordinated FAA-Service Provider response for incident resolution

FTI is currently categorized as FIPS-199 "Moderate", but is being recategorized as "High" to meet NAS Integrity and Availability requirements

Basic Information Security Is Included with Each Service Class

Enhanced security capabilities (e.g., VPNs, encryption, etc.) can be optionally ordered depending on user requirements

Enterprise Security Gateways provide secure interface with external partners (e.g. Airlines, DoD)

NAS Enterprise Security Gateways (NESGs) provide NAS boundary protection from external networks and other FAA domains

Summary

Current telecom environment driven by the needs of connected systems and users

- 4,000+ locations, many in remote areas
- Extensive inventory of TDM-based voice services and low-speed serial data services supporting safety-critical ATC operations
- Fewer sites and services in the Admin/Mission Support domain, but applications are much more bandwidth-intensive
- Currently FIPS-199 **MODERATE,** will become **HIGH**

FAA is gradually migrating from TDM-based to IP-based services

- Expected to continue under FENS

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Todd Gardner | Lead Engineer, FENS

Insights Gained from the FAA's Market Research

FENS Market Research Activities

2015

2016

2017

2018

- Requests for Information (RFIs) issued on FAA Contracting Opportunities (FAACO) website
- Industry one-on-ones
- American Council for Technology – Industry Advisory Council (ACT-IAC) Joint FAA/Industry Working Group
- Technology Demonstrations with the vendor community
- Meetings with other Government agencies
- Release of Draft SIR and solicitation of feedback from interested parties
- Refinement of Draft SIR based upon industry feedback
- FENS Industry Day

Thank you for your significant involvement and inputs

ACT-IAC Overview

- **FAA identified specific challenges and areas of interest for industry to consider**
- **Efforts divided across three sub-committees:**
  - Acquisition Strategy
  - Implementation and Transition
  - Technology, Performance, and Operations
- **Industry led sub-committees met to discuss the challenges and marketplace trends specific to their areas**
- **Industry participants developed white papers with recommendations on how to address challenges**

ACT-IAC Results

The ACT-IAC subcommittees developed and presented white papers on the following topics:

- Acquisition Strategy
- Technology, Performance & Operations
  - Architectures
  - Software-defined Networking (SDN) & Network Function Virtualization (NFV)
  - TDM-to-IP Migration
  - Wireless Technologies
  - Security Considerations
- Implementation and Transition
  - IP Transition Best Practices
  - Parallel Operations
  - Risks and Challenges (FAA unique requirements relative to the marketplace)

Papers available on the ACT-IAC and FAA websites:

https://www.faa.gov/air_traffic/technology/cinp/fti2/

Key Take-Aways

- **The communications marketplace is changing**
  - May present some challenges
    - *Are new technologies ready for the FAA?*
    - *Is the FAA ready for new technologies?*
- **Definitely presents opportunities for improvements within the FAA operating environment**
  - Faster provisioning
  - Enhanced scalability
  - Improved resiliency
  - Fewer “truck rolls”
  - Streamlined business processes
  - Reduced operating costs

Key Take-Aways

- **Analog and Time Division Multiplexing (TDM) services are being phased out in favor of IP-based solutions**
  - Replaced by Ethernet and MPLS services
  - Different approach to separation/isolation may be needed
  - Logical security controls may suffice to address confidentiality / integrity concerns, but will require adjustments to FAA orders
- **Wireline access may be discontinued as existing infrastructure reaches end-of-life**
  - Recognize that wireless may be the only option in some areas
  - Need to evaluate the ability of commercial wireless, VSAT, and other wireless alternatives to support NAS requirements
  - 5G LTE has promise but availability may be limited in rural areas where some of the FAA's most critical sites are located
  - Both Carrier and Technology diversity may be required

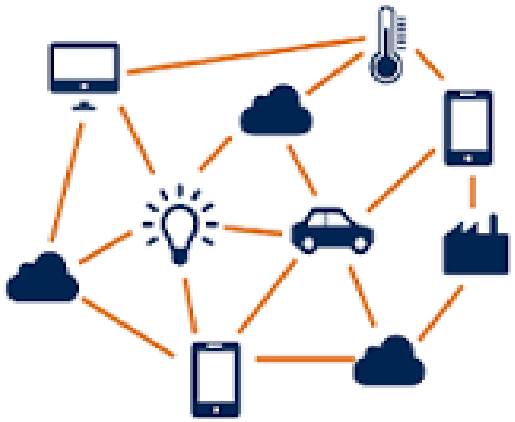
Key Take-Aways

- **Network Function Virtualization (NFV) technologies**
  - Can enable upgrades without having to replace hardware
  - Can provide ability to tailor solutions to specific applications
- **Software Defined Networking (SDN) technologies**
  - Can facilitate centralized control of networks
  - Potential for enhanced situational awareness, increased flexibility, and more cost-effective operational transformations
- **SDN and NFV may be future technologies from the FAA's perspective but they are "here and now" from industry's perspective**
- **Ability to fully leverage SDN and NFV depends on FAA's migration from TDM-based services to IP-based services**

Key Take-Aways

- **Internet of Things (IoT)**
  - Can provide opportunities for new FAA services
  - Can provide flexible approach to monitoring numerous sensors, ability to optimize resource allocation/consumption, and instantaneous control and response
- **FAA should expect to move from IPv4 to IPv6**
  - Dual stack implementation likely required initially for FAA legacy systems using IPv4

Internet of Things – Example Use Case



FAA may leverage Internet of Things (IoT) technologies to deliver enhanced services

ABILITY TO MONITOR ANY NUMBER OF SENSORS	• Runway lights • Vehicle locations • Noise measurements, etc.
FOR ANY NUMBER OF METRICS	• Temperature • Motion • Diagnostic data, etc.
IoT CAN ALSO PROVIDE	• Enhanced situational awareness • Sensor-driven decision analytics • Optimized resource consumption • Instantaneous control and response in complex autonomous systems

Market Research Summary

- **The industry is changing, and the FAA must prepare**
- **Newer technologies provide significant capabilities and opportunities beneficial to the FAA operating environment, e.g.,**
  - Only paying for the bandwidth actually used, rather than paying for a fixed capacity
  - Greater ability to rapidly re-route around failures
    - Fewer outages observable by users
    - Reduced need for maintenance releases
  - Faster recovery when outages do occur
  - Greater ability to perform maintenance actions and network upgrades remotely
  - Improved situational awareness

Increases the likelihood of achieving FENS programmatic objectives

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Ray Goulet
Architecture Lead
Communications, Information, and Network Programs

FAA Vision for the Future Network

FAA Vision For Future Operations

- **Reliable and Resilient Air Traffic Control**
  - *Maintain* a highly secure, resilient and survivable network infrastructure for NAS Operations
- **Net-Enabled Information Access**
  - Air Traffic Management (ATM) is evolving to information centric operations with collaboration across ANSPs and industry partners
  - Flexibility to support future mission needs and resilience
  - FAA administrative IP network requirements growing
- **New technologies enable the FAA Vision**

FAA Reliance on Communications

Communications
provide the foundation for NAS Operations

See and talk to aircraft
Air-to-Ground Communications and Radar are the most important functions supported by the communications network

Reliability and resilience
are critical considerations

Air traffic voice communications
comprise 60% of inventory

GROUND-TO-GROUND VOICE	AIR-TO-GROUND VOICE	SURVEILLANCE/ AUTOMATION	AERONAUTICAL INFORMATION	FLIGHT SERVICES
WEATHER	NAVIGATION SERVICES	REMOTE MAINTENANCE	MONITORING AND CONTROL	TRAFFIC FLOW MANAGEMENT

Future Network Environment
What do we need?

Aligning FAA Telecommunications to the Future Network Environment

NETWORK

- Enterprise Ethernet
- MPLS

ACCESS

- Carrier Ethernet
- Wireless (LTE, Satellite)

MONITORING AND CONTROL

- Software Defined Networking
- Network Function Virtualization

APPLICATION

- Cloud Computing
- Big Data
- Internet of Things (Sensor)

Technology Challenges for the NAS

CHALLENGES

Technology ready for the NAS?

- Can it support Safety Critical operations?
- How special do we have to remain?

NAS ready for new technology?

- System interfaces?
- Cultural standpoint

MITIGATION STRATEGIES

Validate Capabilities

Continue evaluation of emerging technologies and integration options

ATC Coordination

Continue outreach to FAA stakeholders to socialize the changes that are coming and how their requirements will be met in the future

Technologies Bring Opportunities

NEW TECHNOLOGIES PROVIDE NEW OPPORTUNITIES

Technology for enhanced capabilities and increased competition

TDM Transition to IP

NFV/SDN/SD-WAN

Wireless Access

ENSURING PROGRAM SUCCESS

Transition Planning

New Technology tests and evaluation

Outreach to key stakeholders

ATC Process Reengineering

POTENTIAL TO REDUCE COSTS AND PROVIDE FOR INCREASED CAPABILITIES

Service on Demand

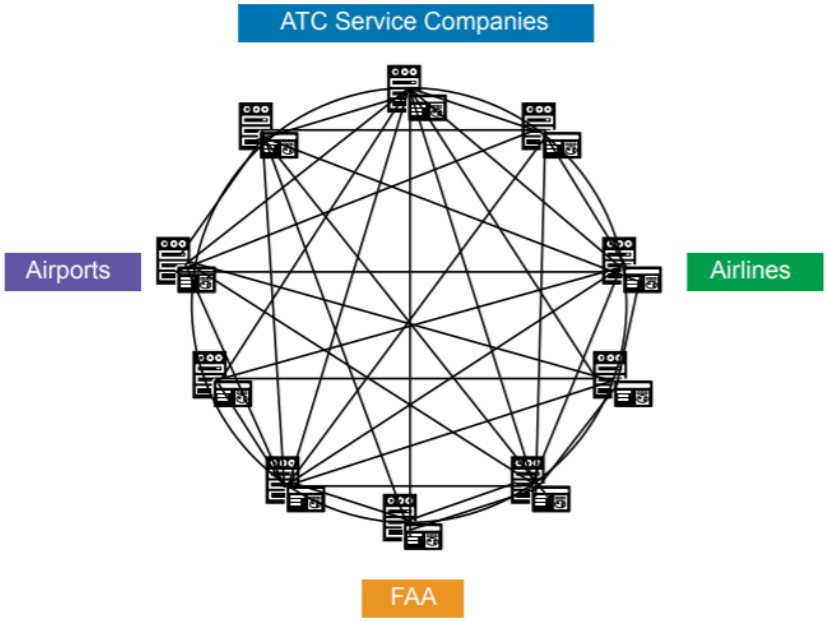
Increased Situational Awareness

Dynamic Traffic Engineering

LEVERAGE TECHNOLOGY TO ENHANCE CAPABILITIES

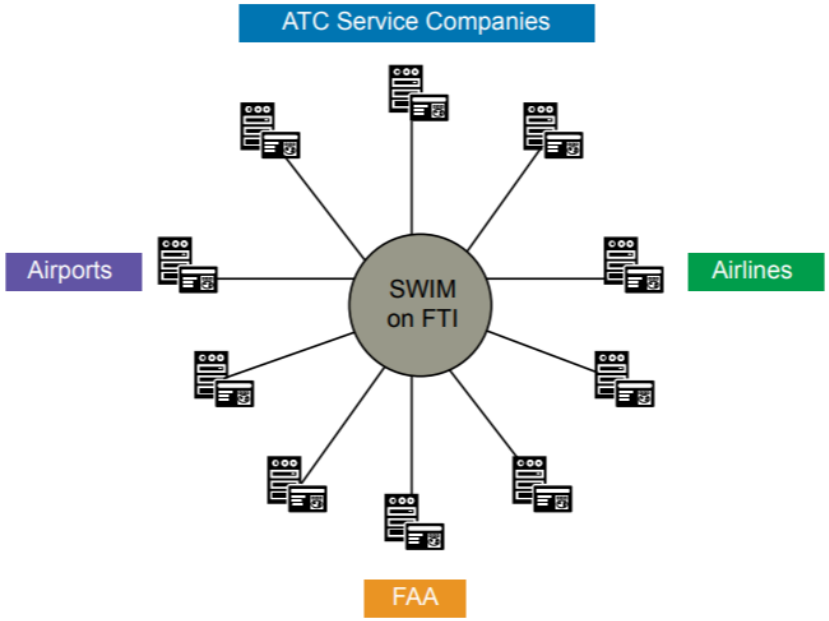
Interoperability with SWIM

BEFORE SWIM



Users could only share information point-to-point

WITH SWIM



All users can publish and retrieve subscribed information using a common source

For further information:

https://www.faa.gov/nextgen/media/futureofthenas.pdf

FENS Program Objectives

Mission Critical network availability, survivability, security, and performance

Evolution to future technologies

Manage transition and lifecycle costs

Dynamic and flexible service provisioning

- Seamless user ordering experience
- Service-on-Demand

Insight and visibility into the network service configuration and operations

Synergies with other FAA programs

Leveraging Newer Technologies

1

Embrace a secure framework for emerging technologies:

- Wireless technologies
- IoT

2

More easily adopt and implement standard industry network features, such as:

- SDN/QoS/ Traffic prioritization
- Content distribution networks

3

Support elastic provisioning models consistent with:

- NextGen flexible facilities concepts
- Dynamic cloud provisioning

4

Enable competitively priced and higher capacity network interfaces

- Promote increased innovation in NAS system design

5

Prepare for increased consolidation of enterprise information

- Big data/ Cloud advances are expected

Leveraging Newer Technologies

6

Secure and resilient interfacing for an increasingly global ATM environment:

- Reliable message exchange
- Interfaces to foreign ANSP networks
- Standardized information exchange models (AIXM, FIXM, WWIXM)

7

Promote innovative but secure frameworks for interaction between NAS systems, Mission Support systems, and contracted services

- Protect core ATM communications but enable appropriate exchange with Mission Support Services
- Enable FAA communication to contracted services such as UAV Management Systems, Flight Services, Data Communications

8

Maintain highly secure (FISMA High) network environment

- Boundary protection
- Intelligent traffic monitoring
- Agile security framework to support continuous threat evaluation models

9

Establish open framework for common situational awareness for network and security operations

- Artificial intelligence, anomalous behavior detection, data mining and trending

Align FENS with FAA TDM-to-IP Strategy

Upgrade NAS Systems

User Side Solution

- Promote System Modernization whenever feasible
- Coordinate Legacy System Interface Enhancements
  - New telecom service(s) testing

Mitigate Near Term Risk to NAS

Network Side Solution in Existing Environment

- Network Provided Conversion as needed

Upgrade the Network

Steady-State Network Solution

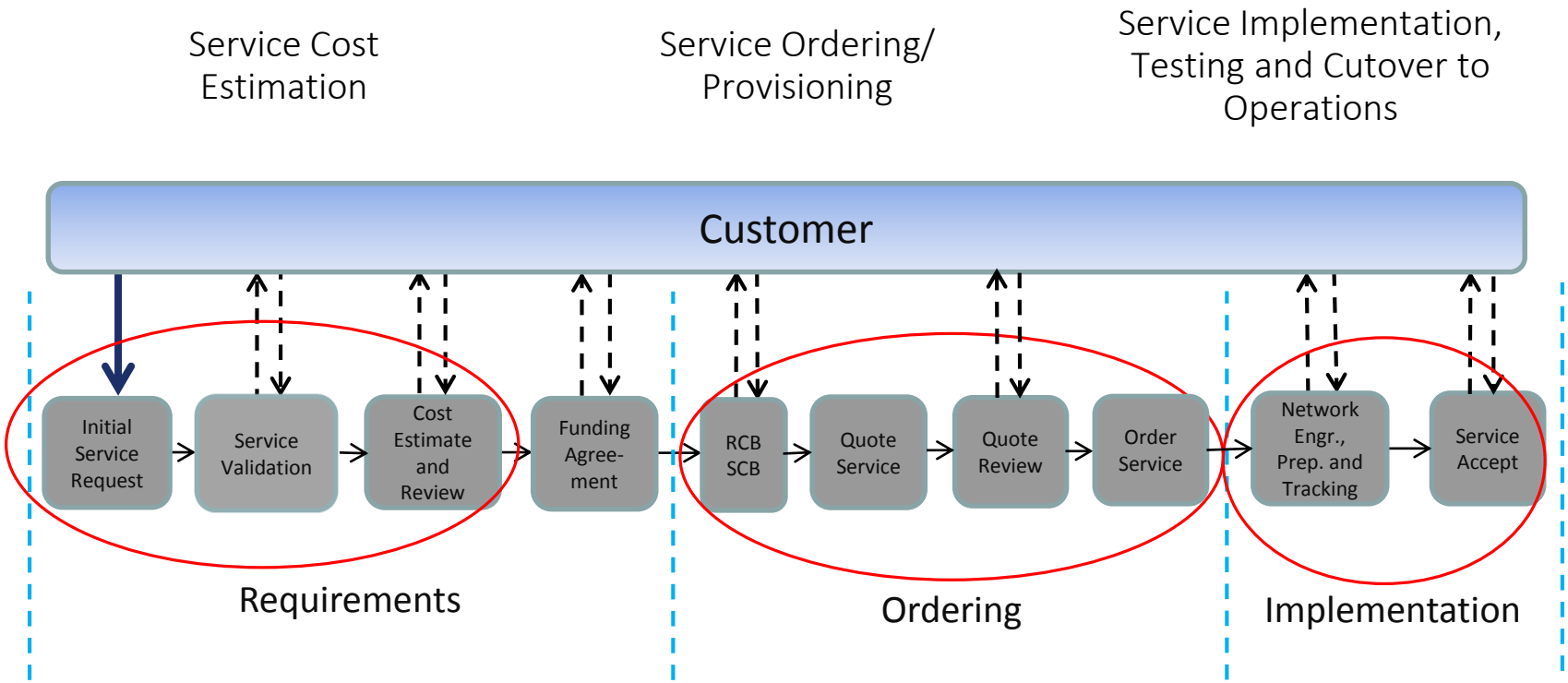
- FENS Ethernet/IP Based Infrastructure
- Coordinate FENS Support with TDM-IP PO
  - Conversion will be phased out as NAS Legacy Systems continue to modernize

Provided/managed under TDM-to-IP Program

Provided/managed under FENS Program

FENS Business Process Improvements

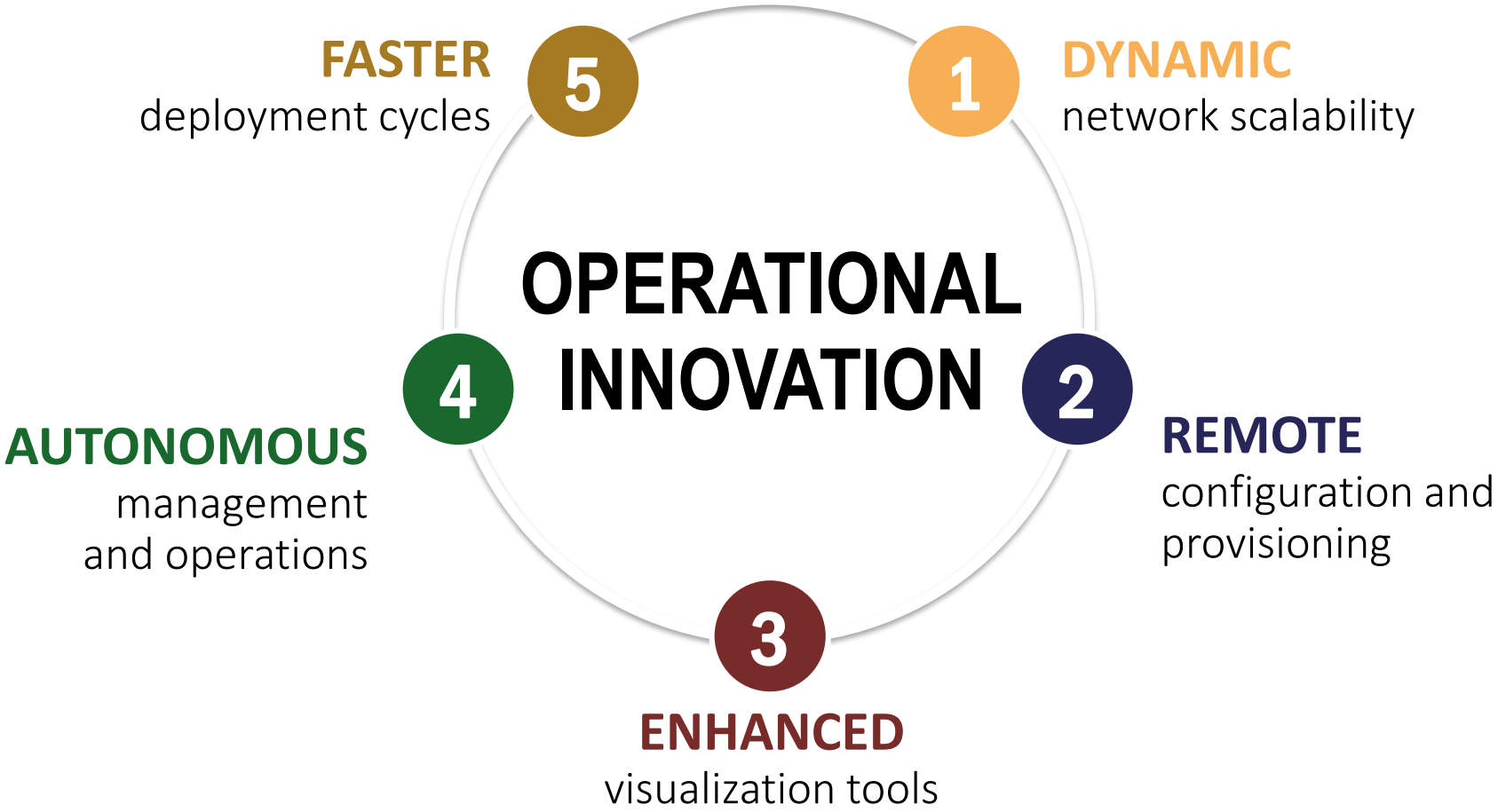
FENS is targeting several areas of the telecommunications service provisioning process for efficiency improvements



FENS: An Opportunity to Evolve

- **FENS coincides with significant industry changes**
  - Phasing out of TDM (Legacy) Services
  - Access to advances in networking technology
- **Provides Opportunity for FAA to:**
  - Improve network operations
  - Meet evolving ATC System needs
  - Reduce operational costs
- **FAA is collaborating with Industry to ensure we take full advantage of opportunity**

Facilitate Operational Innovation



- Single pane of glass to support network-wide situational awareness

Question Submission

We will have a question and answer session in the afternoon.

Please write your questions on the cards provided. They will be collected at the end of each session.

Lunch