Onboard Network System

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Agenda

- e-Enabling at Boeing
- Onboard Network System
- SATCOM Offerings at Boeing
- The Future of Connectivity
The Future of Aircraft Networks

As the consumer market becomes a more dominate force in influencing aircraft avionics, the industry is at a crossroads facing a significant paradigm shift. Next generation airplanes will employ Ethernet based networks. These networks will connect aircraft systems together in ways that will leverage each other much more than in previous designs. With these integrated architectures we must tackle issues such as security while taking advantage of ground connectivity and a connected fleet. This will open new frontiers in maintenance, entertainment, and system flexibility.
e- Enabling at Boeing
The Classic Avionics Paradigm

- **Proprietary systems**
  - Unique development
  - High cost for upgrades – obsolescence/new features

- **Unique stand alone solutions**
  - Suppliers develop unique solutions

- **Functional stovepipes**
  - Integration done at interface vs. functional level.
Connectivity Encompasses Several Traditionally Separated Functionalities

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Scope of the Onboard Network System (Conceptual)
The Network Paradigm

- New issues impacting installed systems
  - H/W obsolescence.
  - S/W upgrades/security patches.
  - H/W – S/W compatibility

- Business Issues with upgrades at Airline
  - Will need to plan for issues similar to office computing
  - Costs will have to be factored when implementing

- Will need to model office “IT” model
  - Active management of networks
  - Similar to the evolution of the office computing environment
Network Security

- Transition to IP public networks
  - Protection against malicious activity
  - Security against unauthorized access

- Perceptions…
  - Connectivity options typically non-essential
  - Misconceptions by the public
Onboard Network System
The ONS Vision

- **Transition to a common hardware platform**
  - Common, open, scalable solutions
  - Leverage other networks on the airplane

- **Transition to a single operating system**
  - Layered software with common interfaces to applications
  - Ability to run on multiple platforms
  - Open interfaces leveraging commercial standards

- **Functionality transition from a hardware based to software driven solutions**

- **Open interfaces (Hardware/Software)**
Functional Solutions

- Systems are transitioning from a hardware based solution to a functional (software driven) solution.
- The operating systems will need to support transfer of applications between multiple hardware platforms.
Key Elements

Airborne Elements
- Onboard Network System
- Interfacing Systems
- Operational Applications
- Passenger Interfaces

Air and Ground Link
- TWLU
- Satcom (L-Band)
- Ku Satellite
- Sat TV

Service Providers (i.e.)
- On-Air
- AeroMobile
- Inmarsat
- Panasonic
- Thales
- ARINC/SITA

End User Client
- Airline
- www
- Boeing
- End App Supplier
747-8 Onboard Network System (ONS)

- Network File Server based system
  - Uses upgraded part delivered with EFB/NFS configurations
  - Adds Network Extension Device (A763 package) for switch/router functions and additional 429/discrete capability.
  - 2MCU form factor – scaleable by adding additional file servers or devices.
  - Introduced into ARINC to establish standard.
747-8F ONS Functionality

Applications

- Data loading – ARINC 615A / 615-4
- Intelligent Engines ACARS Proxy
- Hosting Engine Trim Balance GUI
- Wireless Staging of LSAPs on the ONS
- Weight & Balance Application
- Hosting the optional logbook application
- Hosting of new Boeing applications as they are developed via the CNAS framework
- IP Communications Manager for TWLU/SATCOM
SATCOM Offerings at Boeing
777 Airplane Offerings

777 Passenger – ARINC 741 and ARINC 781 Systems

- Avionics (alphabetical order)
  - Honeywell MCS7200 – ARINC 741, TSA signed
  - Rockwell/Collins SAT2200 – ARINC 781, TSA requested, in work
  - Thales TopFlight – ARINC 781, TSA signed

- Antenna systems (alphabetical order)
  - Chelton HGA7001 – ARINC 781, deliveries since Nov 2007
  - CMC Electronics CMA-2102SB – ARINC 741, TSA signed
  - Evaluating EMS Technologies AMT-3800 ARINC 781 antenna system – TSA Requested

777 Freighter – ARINC 781 Systems Only

- Avionics (alphabetical order)
  - Rockwell/Collins SAT2200 – ARINC 781, TSA requested, in work
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- Antenna systems (alphabetical order)
  - Chelton HGA7001 – ARINC 781, deliveries since Nov 2007
  - Evaluating EMS Technologies AMT-3800 ARINC 781 antenna system – TSA Requested
737/747-8/767 Airplane Offerings

- **737 – ARINC 781 Systems Only**
  - Avionics
    - Thales TopFlight – TSA signed
    - Rockwell/Collins SAT2200 – TSA requested, in work
  - Antenna systems
    - Chelton HGA7001 – TSA nearly complete
    - Evaluating viability of IGA for multi-service

- **747-8 – ARINC 781 Rockwell/Collins System Basic**
  - SAT-2200 Avionics
  - HGA-2100 High Gain Antenna system

- **767 – ARINC 741, 761, and 781 Classic Systems**
  - Avionics
    - Rockwell/Collins SAT-906 (ARINC 741)
    - Rockwell/Collins SAT2100 (ARINC 761)
    - Honeywell MCS7000 (ARINC 741)
  - Antenna Systems
    - CMC Electronics CMA-2102 (ARINC 741)
    - Chelton HGA7001 (ARINC 781)
The Future of Connectivity
Airplane Functional Interfaces

- Air to Ground
- Security
- Internet

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SATCOM IP Control

A781/A741 Antenna

Flight Deck Voice

CMU

EBF

TWLU

Satellite Data Unit

Onboard Network System

ONS as the IP Gateway for Offboard Communication

Data 3 and CEPT transition to Ethernet

IFE

Pico Cell

TBD

WWW
Offboard IP Connectivity

- Connectivity primarily through the Onboard Network
- Communication management easily configurable
- Service providers and interfacing systems will need to operate with each other's equipment
- Boeing will not become a service provider
- Boeing will work with a Service Providers to ensure system is integrated in an open architecture
Vision for an e-Enabled Environment

The right information to the right people at the right time for better decision making

Technology to integrate airline and airplane

Disruption recovery and management

Maintenance optimization
- Health prognosis
- Scheduling/task optimization
- Integrated inventory

Cabin/Crew Services

ATC integration

Optimized efficiency, safety, security and passenger experience

Month
Week
Hour
Year
Several Years

Airplane
Maintenance and Engineering
Airline Operations
Commercial Operations

Flight operations
- Planning
- Decision support
- Information dissemination
Steps Forward

• Open requirements must be developed between:
  - Airborne systems and offboard links
  - Offboard links and ground systems

• Network Security must be addressed
  - Safety of Critical and Essential Systems
  - Airline Operations
  - Public Perception

• Leverage all the systems available in a networked system