



# Quality of I/P Radar data to En Route ARTCC's

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**May 5, 2008**



# Subjects Presented

- History of radar data feeds
  - Lenkurk 26B modem specification (PAM)
  - CODEX 3600 with 3\*2400 (PAMRI)
  - CV-4400 and ASIS II (HOST, DARC & EBUS)
  - DREC (DARC & ECG)
- Quality of data
  - Serial Data Quality
  - FTI delivered Serial data
- Latency
  - Direct connections
  - FTI delivered
- Availability
  - Redundancy
- Certification procedures
  - Current
  - Future



# Subjects Presented

- Advantages
  - Adjacent facility feed if available
  - I/P direct from the radar site vs 3\*2400
    - Converted to any format (RICI/DCG)
    - Can also utilized the ATCBI-6 I/P output
- ECG changes to support I/P radar
  - Additional monitoring and error reporting
  - Radar reconfiguration logic
    - Possible automatic failover in some conditions
- BCP utilization of I/P radar
  - BCP concept
  - Need for a single source (one wire) for radars
  - Next is Interfacility ?
- Summary



# History

- Lenkurk 26b modem specification (PAM)
  - 1964 Specification for Contract FA64WA-5223
    - 600,1200,2400,4800 cps
- CODEX 3600 with 3\*2400 (PAMRI)
- CV-4400 and ASIS II (EBUS)
  - Function of CV4400 and why it was created
    - Short range radar into long range system created skip-scan concept (NAS, DARC)
    - ASIS II - End of Life
    - CV4400 - obsolete



# History

- DREC (DARC & ECG)
  - Created to supply interior U.S. radar data
  - DREC concept created Nov 11,2001
  - DREC prototype available Feb 2002
- Current DREC users
  - FAA
  - Immigration and Customs Enforcement
  - US Customs Service:
  - Home Land Security
  - U.S. Military



# History

- Business Continuity Plan (BCP)
- Currently in concept development phase
  - The FAA Inspector General criticized the FAA for not having a backup plan in place for the situation of a complete loss of an Air Route Traffic Control Center (ARTCC)
  - The BCP addresses this issue
  - The FAA William J. Hughes Technical Center has been designated as the Spare ARTCC (SpARTCC)



# Quality of data

- Serial data delivery via dedicated landlines
  - Serial data quality
    - Current transmission error rate
- I/P delivered serial radar data
  - NNCC monitoring of I/P data (Salt Lake City)
  - Duplicates
  - Missing
  - Sequence errors
    - Effects on tracking
      - HOST
      - EBUS
      - ERAM



# Latency

- Serial direct connected
  - At the speed of light, almost (Maybe) ?
  - Slow 2400 baud causes queue backlog
    - Can exceed 1 second
- Via FTI
  - 140 Micro seconds is typical



# Availability

## ■ Redundancy

### □ One for one connections

- If it goes down, HOST and EBUS can replace with another radar (if adapted)
- Multiple radar failure states
- Is totally independent of any other connectivity

### □ I/P Feed of data (One wire)

- DREC functionality in ECG takes radar data from the ECG BIP, filters the data, and sends ECG packets through the LAN and out the router to the end user.
- FTI provides for the transmission of all DREC data



# Certification Procedures

- Current FAA Order 6100.1g
  - MAINTENANCE OF NAS EN ROUTE STAGE A - AIR TRAFFIC CONTROL SYSTEM
  - Treats each radar as an independent
  - Each radar has measurable parameters
  - Assumes individual connectivity
- Certification changes necessary for a single (I/P) radar feed
  - Additional certification parameters based on a single source of delivery
  - Additional certification if radar is not currently utilized in the system
    - Usage of Military ARSR-4 with conversion to FAA CD format
  - Comparison of multiple site availability
    - If radar is available from 2 (or more) sources, is the quality the same
      - Number of good messages by type of message (Beacon, Search, WX)
      - Same time frame of arrival (or one much delayed)



# Advantages

- Adjacent facility feed if available
- I/P direct from the radar site vs 3\*2400
  - Converted to any format (RICI/DCG)
  - Can also utilized the ATCBI-6 I/P
  - Reduction in delay of transmission of data



# BCP Utilization of I/P Radar

- Business Continuity Plan
  - Preliminary testing has proven the concept can work
  - Incremental demonstrations have included:
    - Primary (HOST) processing with LCN (Primary Display side)
    - Live radar feeds via DREC
    - Live interfacility flight data from Memphis ARTCC
    - NADIN
    - EBUS (Backup) and BCN (backup display side)
    - Live interfacility flight data via FTI
    - URET
- BCP will be the first to utilize I/P radar data for Air Traffic Control
- Prior usage has been limited to Situational Awareness



## ECG Changes to support I/P Radar

- Additional monitoring and error reporting
  - ECG M&C changes to support
- Radar reconfiguration logic
  - Possible automatic failover in some conditions
- Extensive testing of data to validate for ATC usage
  - From the DREC feed
  - To the ECG processing as I/P radar input
  - And everything in-between



# Summary

- Two areas
  - Single source
  - I/P from radar separately
- I/P advantages
  - Growing need for it
  - Allows growth
    - No additional ECG hardware necessary
  - Multiple data formats
- I/P disadvantages
  - How to overcome the disadvantages (single source disadvantages)