

Technical Developments Roundup

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Highlights

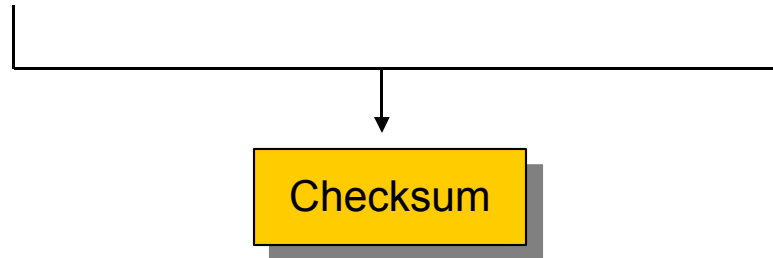
- ATN Technical Manual 4th Edition
 - PM-CPDLC
 - IP SNDCF
 - Consolidate editorial and minor technical revisions
- TCP/IP Report
- Start of Voice over IP work

Protected Mode-CPDLC

- Adds a checksum to each CPDLC Message
 - “protects” message from change
 - Detects mis-delivery

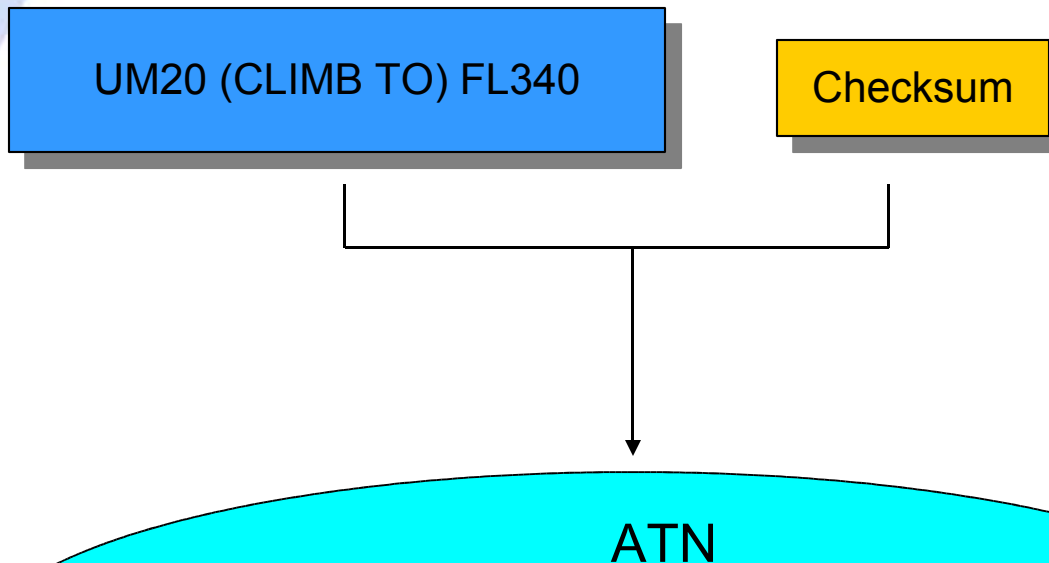
UM20 (CLIMB TO) FL340

- Flight ID (Callsign)
- Ground Facility Designation
- ICAO 24-bit Aircraft Address



Protected Mode-CPDLC

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 - “protects” message from change
 - Detects mis-delivery



PM-CPDLC Benefits

- Satisfies a key Safety Requirement
 - Prevention of undetected mis-delivery
 - “Standard Mode” CPDLC relied upon a chain of dependent events (too many risks)
- Removes Safety Requirements from ATN
 - Potential for Implementation Benefits

Deployment of PM-CPDLC

- Included in LINK2000+ Baseline
 - Post Pioneer Phase
 - Required for removal of “Voice Readback” for clearances
 - Will be mandated by the Implementing Rule
- DO178B Level C Certification required for Avionics
- Ground Systems Approved to ED-109 AL4

PM-CPDLC Follow On

- Same Issue applies to ADS
 - And to a lesser extent to Flight Information Services
- ICAO ACP/WGN to develop SARPs for
 - PM-ADS
 - PM-FIS
- Boeing and Airbus providing resource

PM-CPDLC and Security

- ATN Security seen as
 - Desirable, but
 - Implementation “not easy”
- Alternative approach proposed
 - Uses a cryptographic version of PM-CPDLC checksum
 - Much lower protocol overhead
 - Easier to add to existing implementations

IP SNDCF

- Procedures for use of IPv4 and IPv4 Networks as part of the ground ATN
 - “Tunnels” ATN protocols through an IP Network
 - Based on RFC 1070
- Not seen as suitable for Air/Ground use
 - Too much overhead
 - No mobility support

ICAO ACP/WGN TCP/IP Report

- Considers use of TCP/IP for ATS Communications
 - In Ground-Ground Communications
 - In Air/Ground Communications
- Rationale
 - ICAO ATN uses OSI specification
 - OSI never replaced TCP/IP in the marketplace
 - Need to align ICAO work with external industry

The Desire for Change

- ICAO Secretariat appears to be more interested than ANSPs and industry
 - Concerned to avoid changes that deliver no end-user benefits
- We have working systems based on current standards
 - Any change to ICAO SARPs must be cost justifiable
 - Must not delay necessary operational improvements

Ground-Ground Communications

- Ground-Ground Environment is generally more flexible than Air/Ground
 - More use of “industry standard” products
- Report supports development of ICAO SARPs for use of TCP/IP in ground environment
 - Recommendation endorsed by ICAO
 - IP SND CF is first deliverable
 - AMHS and Inter-facility communications also expected to use TCP/IP
- ICAO ACP/WGN to provide guidelines for use of TCP/IP in the ground environment

Air/Ground Communications

- Much less enthusiasm for change
 - Products developed and validated
 - Products mostly ATS specific
 - No direct end user benefits from TCP/IP
 - Risk of delay to LINK2000+, CASCADE, etc.
- Any change to TCP/IP should be linked to more general enhancements
 - Result of experience gained
 - “Lightweight” protocols for tactical CPDLC?
 - Improvements to mobile routing strategies?
 - New air/ground networks?
 - Voice over IP Air/Ground?
- Desire for evolutionary rather than revolutionary change

Voice over IP

- A new activity for ICAO ACP to study
- Lots of issues
 - Stability and choice of standards
 - Product maturity
 - Acceptability and containment of end-to-end delays
 - Selection of codecs
 - Integration with data communications
 - ATS specific services

Voice over IP

- Ground-Ground use (and SARPs)
 - Likely in next five to ten years
 - Time needed for stability of standards and products
 - Testing and Operational acceptance
- Air/Ground
 - Study topic for many years to come
 - A possible basis for next generation air/ground voice

Conclusion

- Now into an evolutionary phase
 - Experience gained is being fed back into standards and product development
 - Trend is to move functionality into applications
 - Meeting Safety Requirements, resilient operation, etc.
 - Next Generation datalinks will be the catalyst for the next significant change