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28 August 2018

# IPS DEPLOYMENT SCENARIOS

AEEC IPS Subcommittee – PP858

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# Objectives



## This presentation

- High-level, notional architecture diagrams for *potential* IPS deployment scenarios based on application-set + network combinations for both airborne and ground systems
  - Expands upon initial architecture options in Santi Ibarz' (Airtel) presentation on "Air Ground Considerations"
- Scenarios consider:
  - Multiple sub-options (for some scenarios)
  - Security and data compression
    - *Two key topics of discussions during AEEC IPS Meeting 07*
  - Potential deployment region(s) and notional deployment timing
    - Based on "EU-US Air/Ground Data Communications Strategy" roadmap, 7 Nov 2017

## Next steps, through stakeholder discussions

- Identify/prioritize most likely deployment scenarios, and *if possible*, eliminate scenarios that are least likely based on some criteria (e.g., cost, timing, practicality, certification, etc.)
- Assess transition options and gateway placement for the most likely scenarios.

# Potential IPS Deployment Scenarios

| Deployment Scenario & Sub options | | Airborne System Capability [5] | | Ground System Capability | | Description | Notes |
|---|---|---|---|---|---|---|---|
| | | App Set | Network | App Set | Network | | |
| DS-01 | -- | B1, B2 | IPS | B1, B2 | IPS | B1, B2: IPS aircraft to IPS ground | |
| DS-02 | -- | B1, B2 | IPS | B1, B2 | IPS + OSI | B1, B2: IPS aircraft to dual-stack ground | |
| DS-03 | a-d | B1, B2 | IPS | B1, B2 | OSI | B1, B2: IPS aircraft to legacy OSI ground | |
| DS-04 | a-b | B1, B2 | OSI | B1, B2 | IPS | B1, B2: OSI aircraft to IPS ground | 1, 2 |
| DS-05 | -- | FANS1/A | IPS | FANS1/A | IPS | FANS1/A: IPS aircraft to IPS ground | |
| DS-06 | -- | FANS1/A | IPS | FANS1/A | IPS + ACARS | FANS1/A: IPS aircraft to dual-stack ground | |
| DS-07 | a-d | FANS1/A | IPS | FANS1/A | ACARS | FANS1/A: IPS aircraft to legacy ACARS ground | |
| DS-08 | | FANS1/A | ACARS | FANS1/A | IPS | FANS1/A: ACARS aircraft to IPS ground | 3, 4 |

Notes:

1. An B1,B2/OSI airborne system communicating with a dual-stack B1,B2/IPS+OSI ground system is shown notionally on DS-02
2. An B1,B2/OSI airborne system communicating with a legacy B1,B2/OSI ground system is an existing deployment.
3. A FANS1/1A -ACARS airborne system communicating with a dual-stack FANS1/A-IPS+ACARS ground system is shown notionally on DS-06
4. A FANS1/A-ACARS airborne system communicating with a FANS1/A-ACARS ground system is an existing deployment.
5. Dual-stack aircraft is not shown explicitly, but is a combination of multiple deployment scenarios.

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# Deployment Scenario Diagram Notes

## Applications

- FANS1/A = FANS1/A+ application set
  - AFN, CPDLC, ADS-C
- B1, B2 = B1, B2 application set
  - CM, CPDLC, ADS-C

## Airborne and Ground Systems

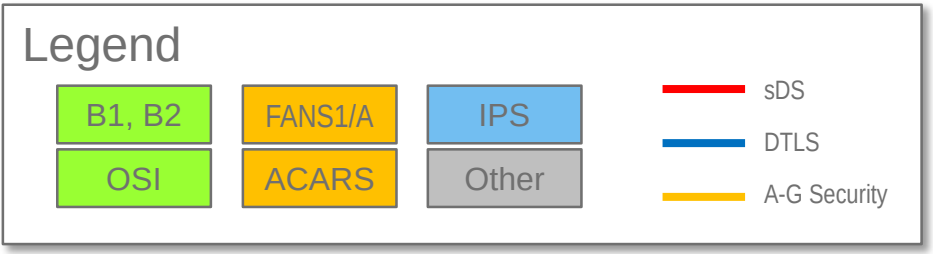
- High-level protocol stack representations
- Does not illustrate aircraft implementation detail (e.g., MCDU, FMC, CMF, VDR, on-aircraft networking etc.)
- Does not illustrate ground implementation detail (e.g., datalink front-end/back-end processors, flight data processor, user consoles/systems, intra-networking, etc.)

## Communications

- Wires-and-clouds representation
- Does not illustrate sub-network detail (e.g., radios, ground stations, internal routing, etc.)
- Does not illustrate mobility

## Security & Compression

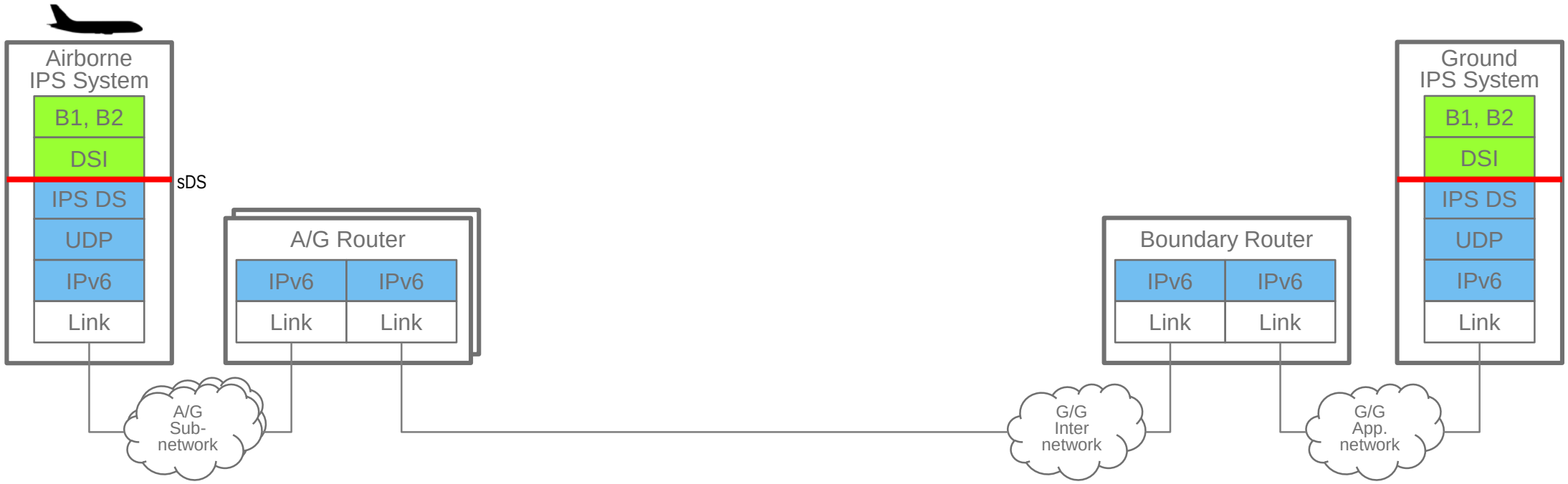
- Considers air-ground and end-to-end security
  - Assumes Airborne IPS systems implement a VDLm2 security solution
- Does not illustrate ground-ground security
- Considers data compression only.
- Application layer data compression is not shown and is considered transparent to IPS (i.e., part of the user data payload)



# DS-01 – B1,B2: IPS to IPS



***Architecture***




***Security***

***Compression***

Option 1 –
A-G datalink

Option 2 –
ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

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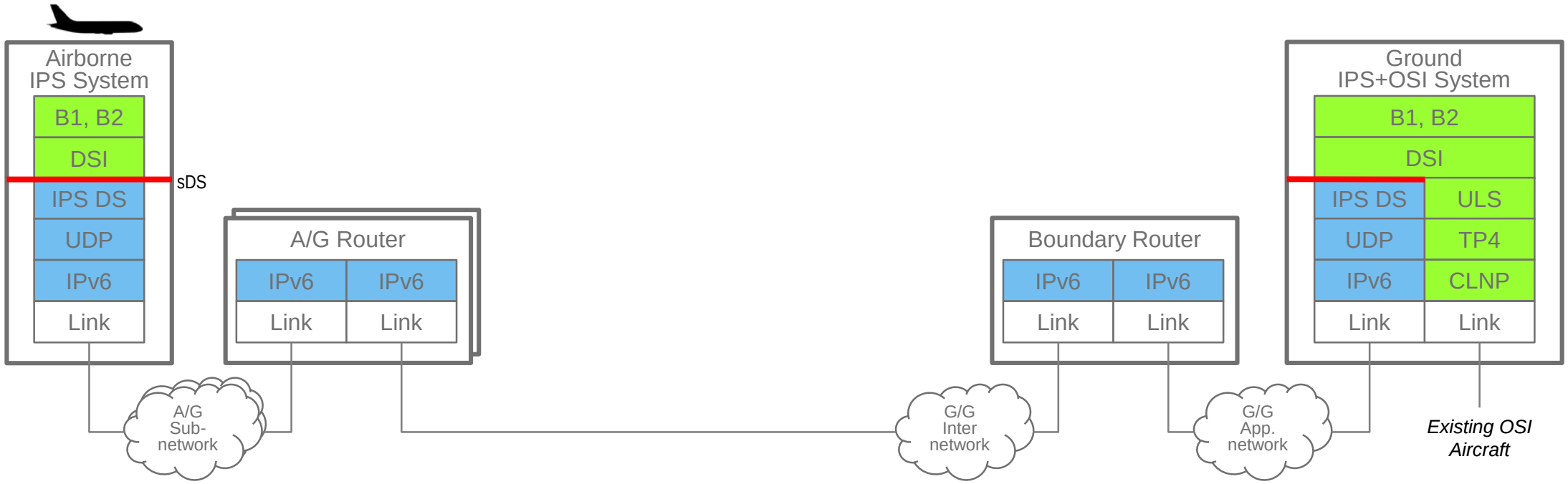
# DS-02 – B1,B2: IPS to IPS *(dual-stack ES)*

Scenario likely to be demonstrated as part of IRIS IOC/FOC Project (without sDS)



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other

*Notional Timeframe* Earlier Mid **Later**

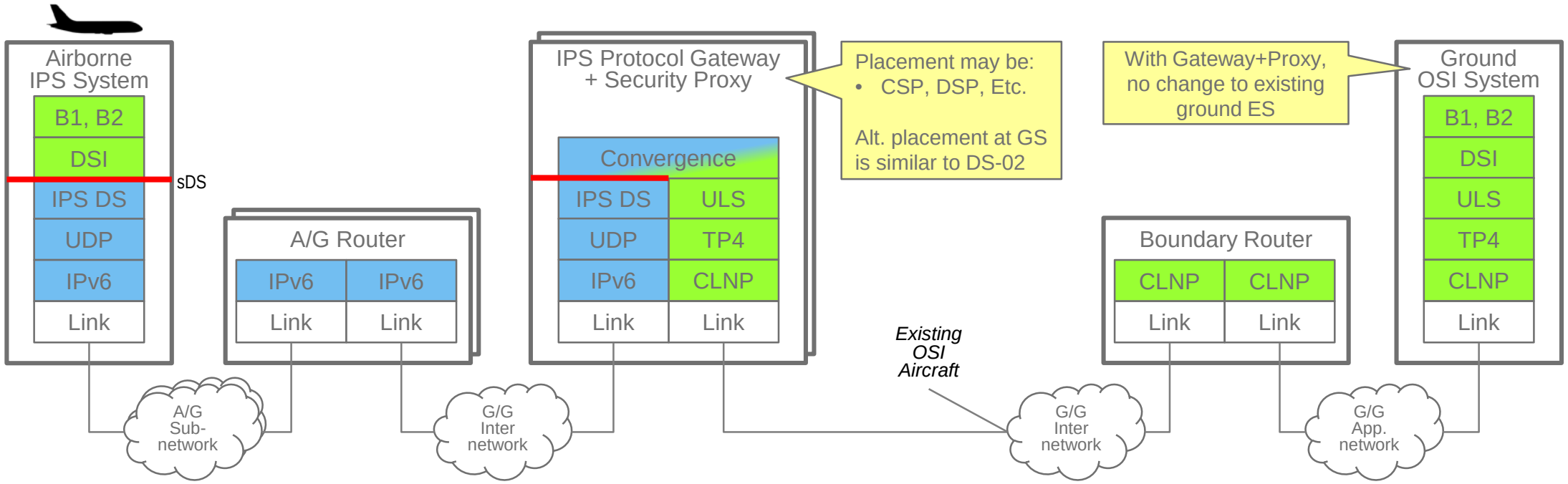
Transition **End State**

# DS-03a – B1,B2: IPS to OSI *(IPS Gateway+Proxy)*

Scenario likely to be demonstrated as part of SESAR PJ14.2.4 (without sDS)



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

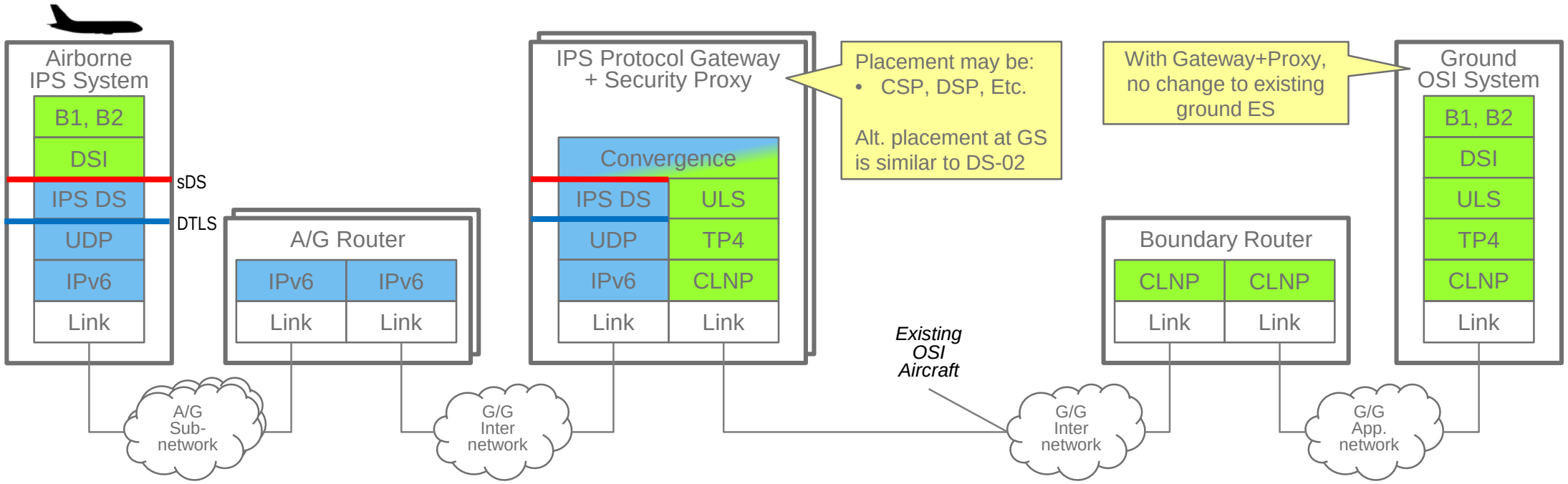
*Potential Deployment Region* US **EU** Other

*Notional Timeframe* Earlier **Mid** Later **Transition** End State

# DS-03b – B1,B2: IPS to OSI *(IPS Gateway+Proxy w/ DTLS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other *Notional Timeframe* Earlier **Mid** Later **Transition** End State

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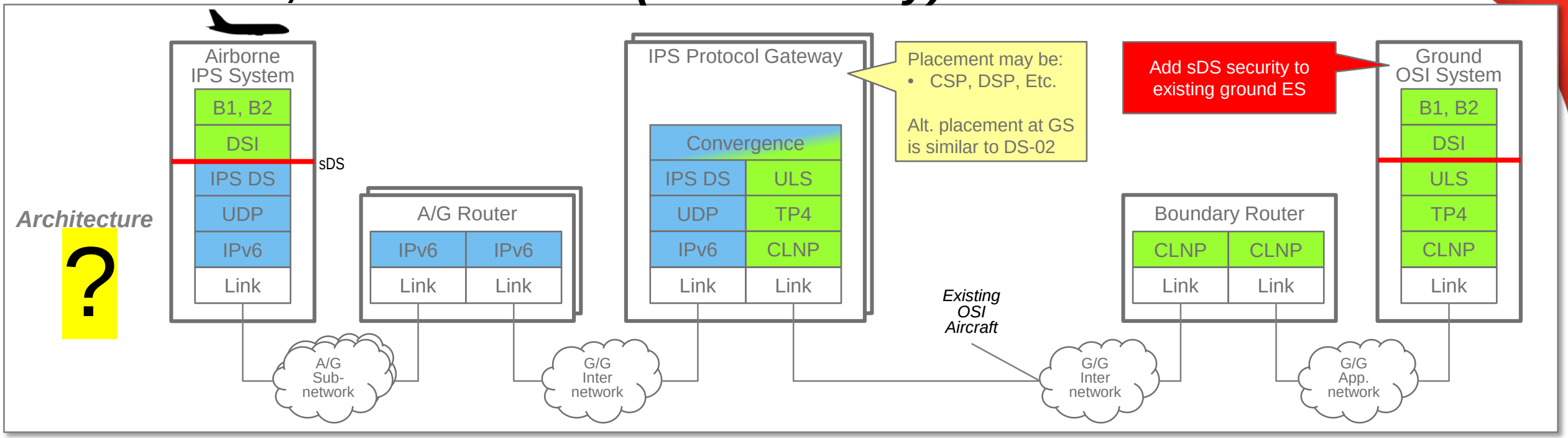
# DS-03c – B1,B2: IPS to OSI *(IPS Gateway)*






***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other *Notional Timeframe* Earlier Mid **Later** **Transition** End State

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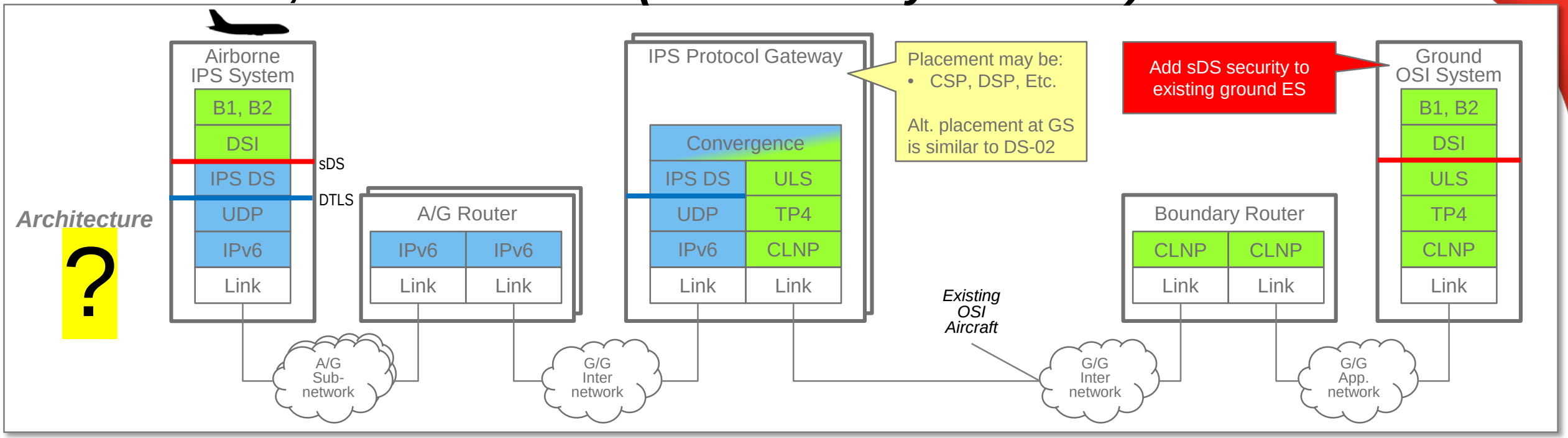
# DS-03d – B1,B2: IPS to OSI *(IPS Gateway w/ DTLS)*






***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other *Notional Timeframe* Earlier Mid **Later** **Transition** End State

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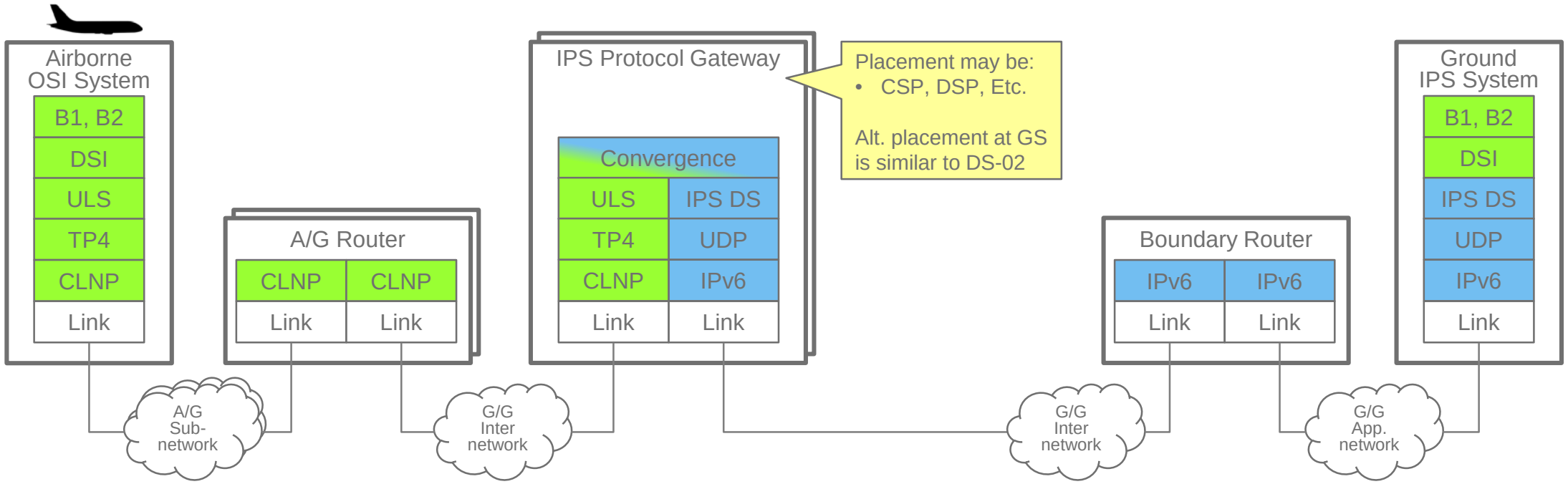
# DS-04a – B1,B2: OSI to IPS *(IPS Gateway, no sDS)*

Impact on IPS Gateway, but not relevant to PP858 specification of Airborne IPS system.



***Architecture***




***Security***

SATCOM & AeroMACS
(not VDLm2)

***Compression***

Option 1 – A-G datalink

SATCOM & VDLm2

Option 2 – ATNPKT

*Potential Deployment Region* US? EU? Other

*Notional Timeframe* Earlier Mid Later Transition End State

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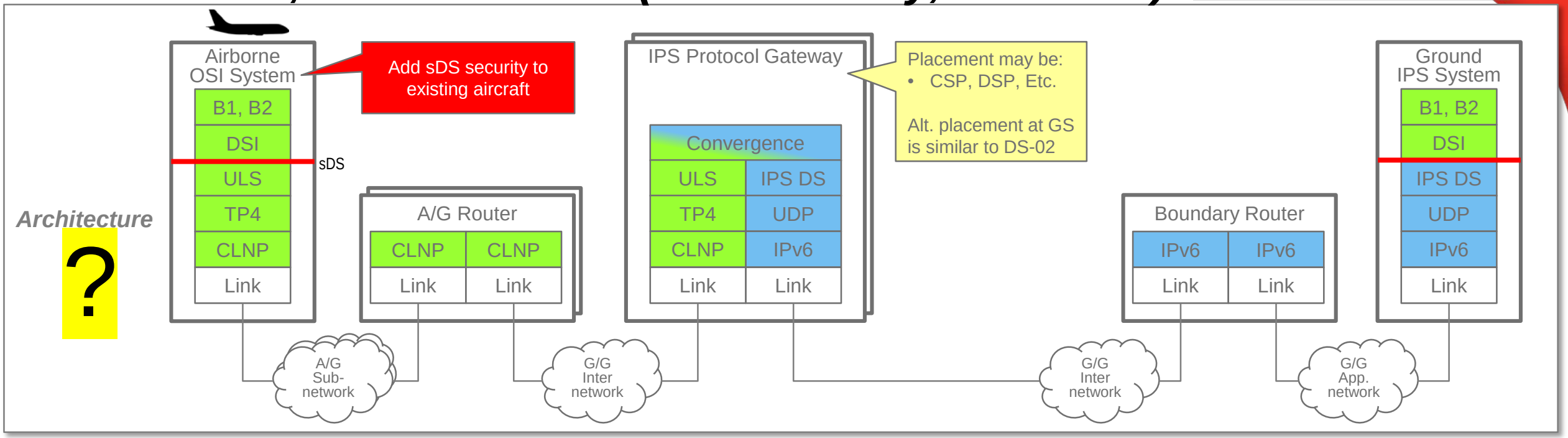
# DS-04b – B1,B2: OSI to IPS *(IPS Gateway, with sDS)*

Impact on IPS Gateway, but not relevant to PP858 specification of Airborne IPS system.






***Security***

SATCOM & AeroMACS
(not VDLm2)

***Compression***

Option 1 – A-G datalink

SATCOM & VDLm2

Option 2 – ATNPKT

*Potential Deployment Region* US? EU? Other

*Notional Timeframe* Earlier Mid Later

Transition End State

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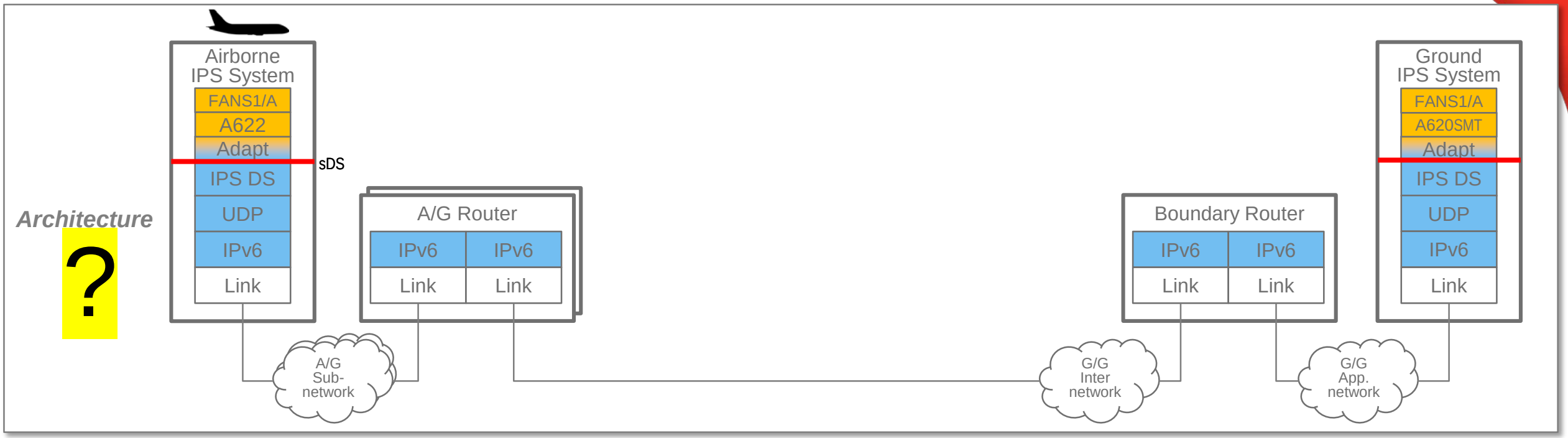
# DS-05 – FANS1/A: IPS to IPS






***Architecture***

?

***Security***

***Compression***

Option 1 –
A-G datalink

Option 2 –
ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

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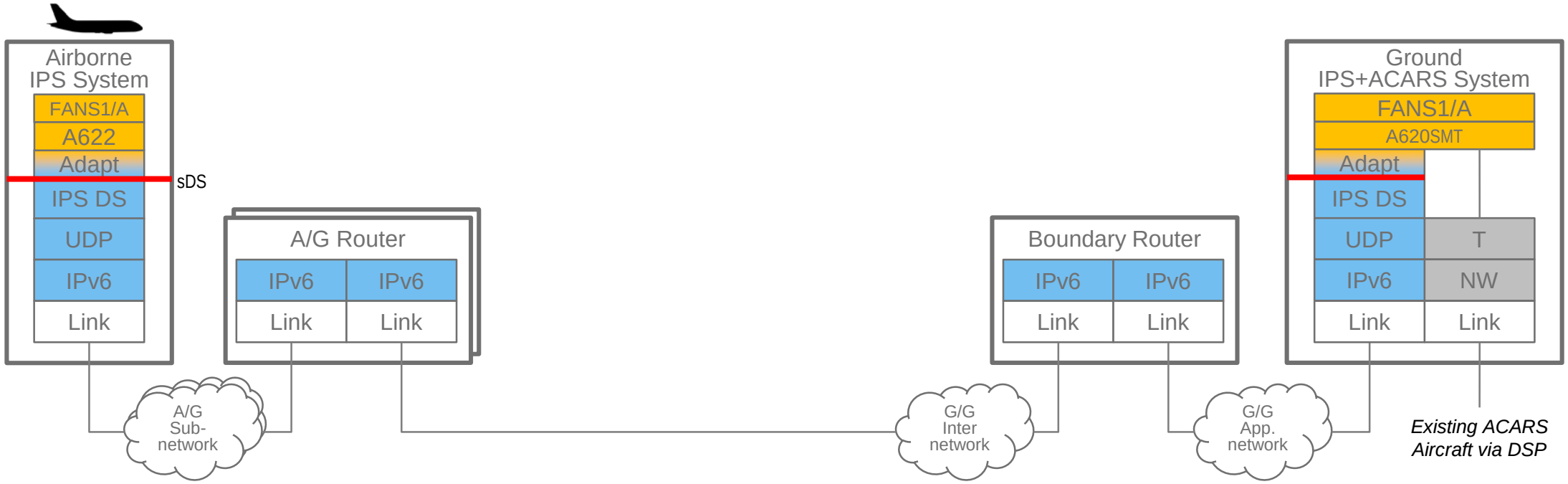
# DS-06 – FANS1/A: IPS to IPS *(dual-stack ES)*



***Architecture***




***Security***

***Compression***

Option 1 –
A-G datalink

Option 2 –
ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

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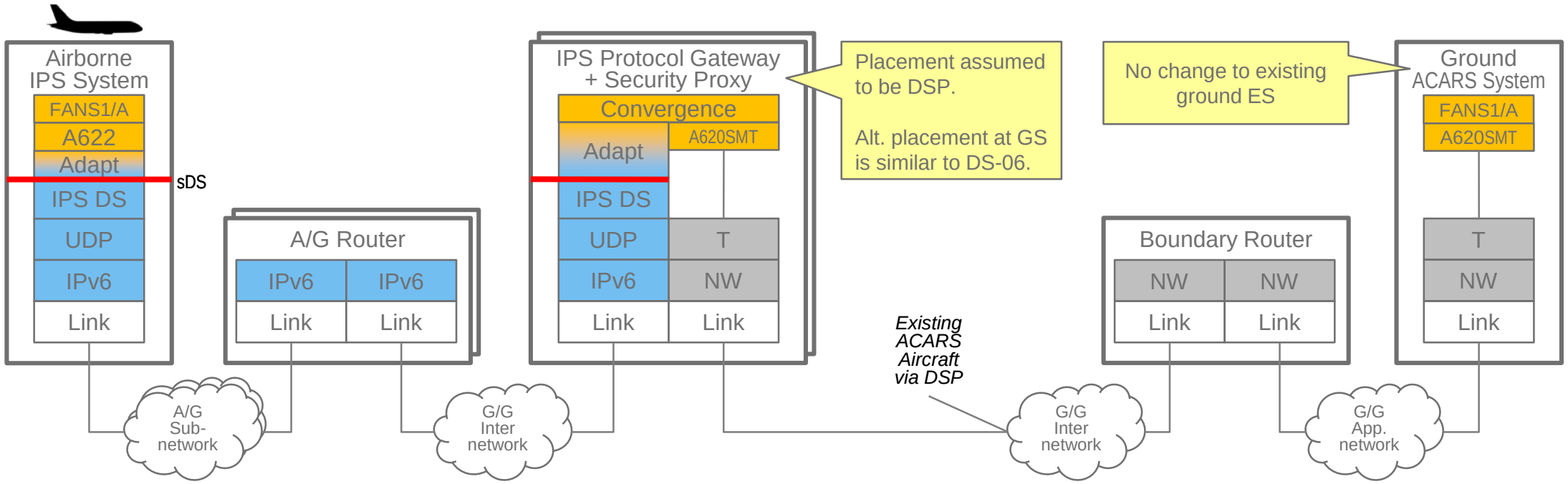
# DS-07a – FANS1/A: IPS to ACARS *(IPS Gateway+Proxy)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

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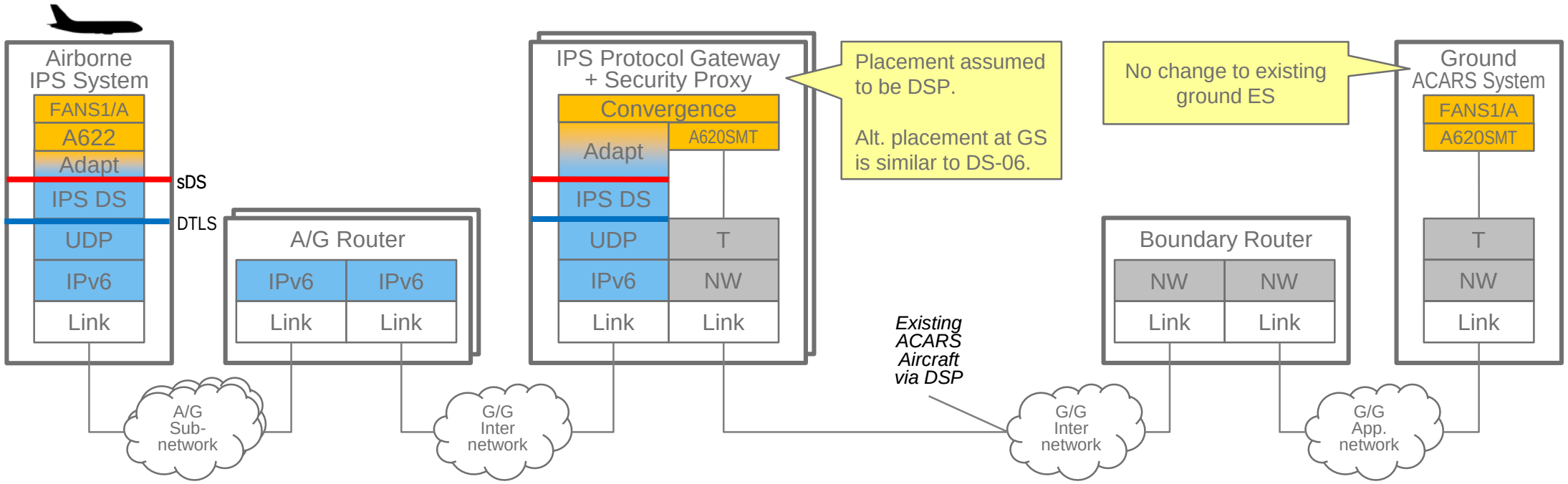
# DS-07b – FANS1/A: IPS to ACARS *(IPS Gateway+Proxy w/ DTLS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* **US** **EU** **Other** *Notional Timeframe* **Earlier** Mid Later **Transition** End State

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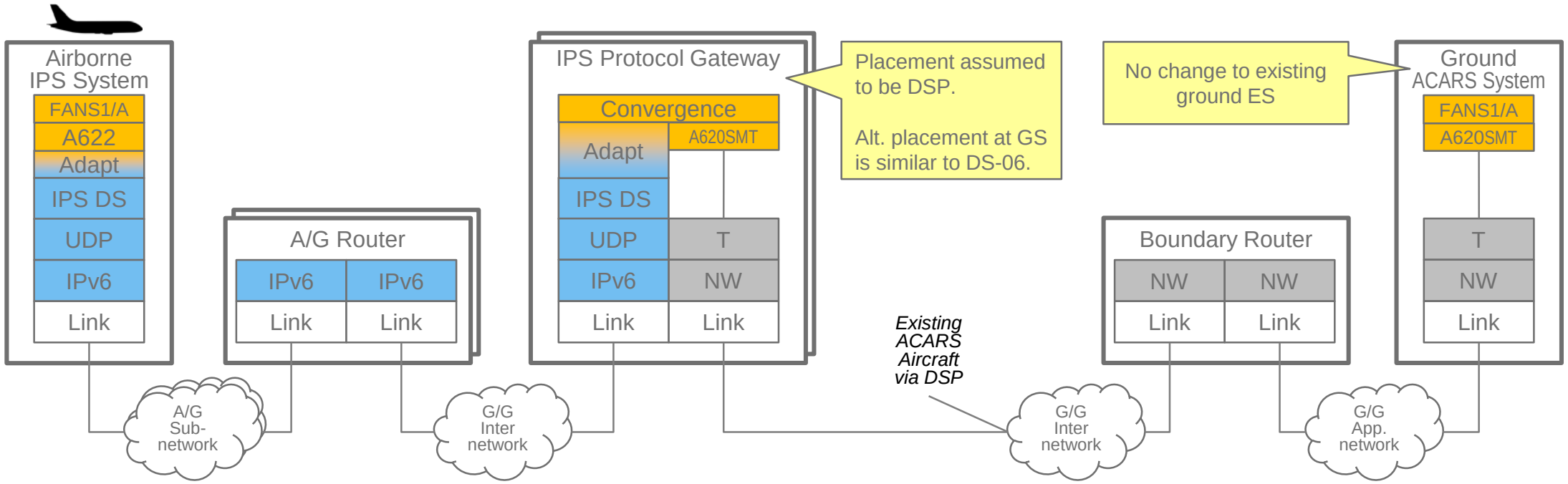
# DS-07c – FANS1/A: IPS to ACARS *(IPS Gateway, no sDS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

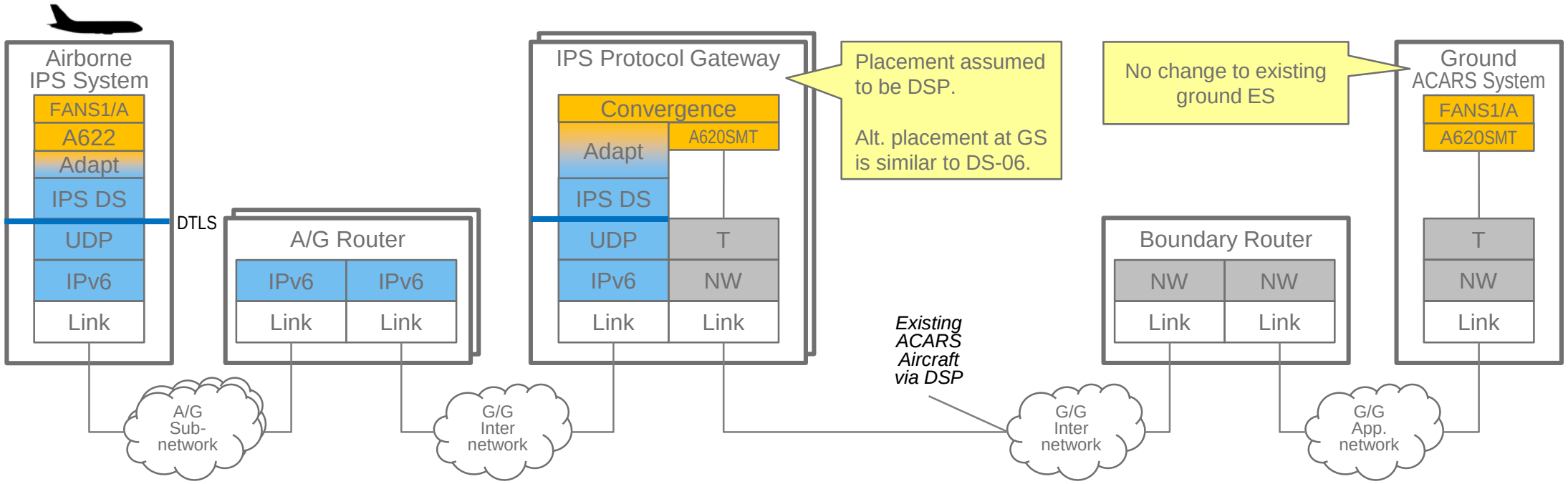
*Potential Deployment Region* US EU Other

*Notional Timeframe* Earlier Mid Later

Transition End State

# DS-07d – FANS1/A: IPS to ACARS *(IPS Gateway, no sDS w/ DTLS)*

**Architecture**




**Security**

**Compression**

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

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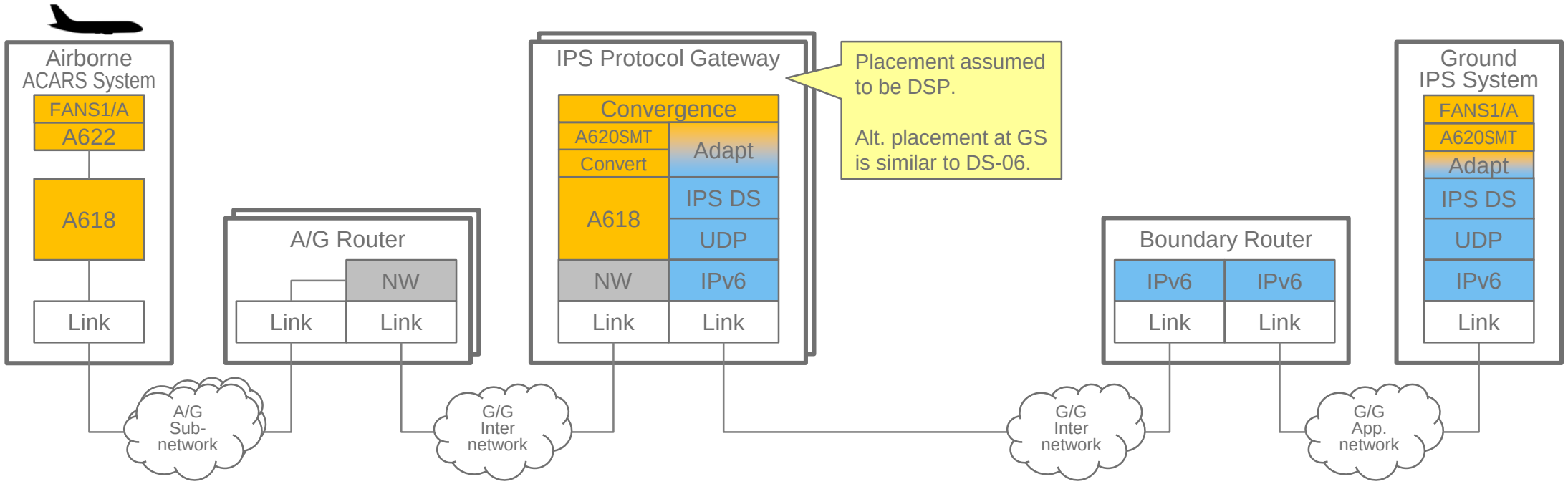
# DS-08 – FANS1/A: ACARS to IPS *(IPS Gateway)*

Impact on IPS Gateway, but not relevant to PP858 specification of Airborne IPS system.



***Architecture***

?




***Security***

***Compression***

Option 1 –
A-G datalink

Option 2 –
ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

# Notional Timeframe Summary

| | Earlier | Middle | Later |
|---|---|---|---|
| **B1,B2** | | **DS-02**<br>*(B1,B2: IPS w/ dual-stack ES)*<br><br>**DS-03a,b**<br>*(B1,B2: IPS-OSI Gateway+Proxy)* | **DS-01**<br>*(B1,B2: IPS-IPS)*<br><br>**DS-03c,d**<br>*(B1,B2: IPS-OSI Gateway, E2E security)*<br><br>**DS-04a,b**<br>*(B1,B2: OSI-IPS Gateway)* |
| **FANS1/A** | **DS-07a,b,c,d**<br>*(FANS1/A: IPS-ACARS Gateway)* | **DS-06**<br>*(FANS1/A: IPS w/ dual-stack ES)* | **DS-05**<br>*(FANS1/A: IPS-IPS)*<br><br>**DS-08**<br>*(FANS1/A: ACARS-IPS Gateway)* |

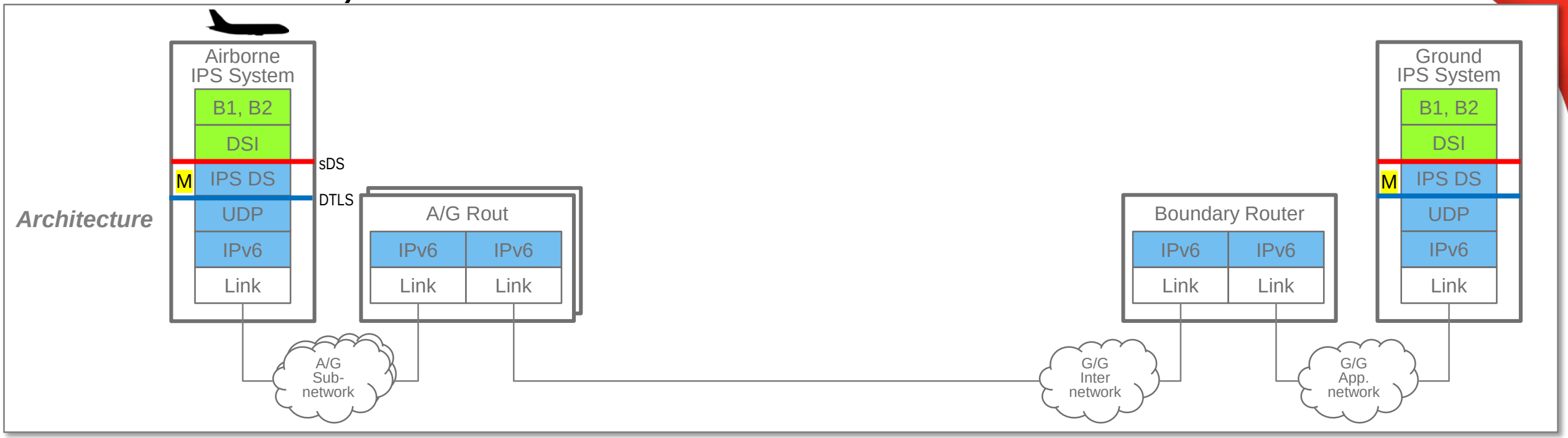
**YELLOW = Select scenarios considered in the next section**

# Discussion:
# RC-IMS Gateway ICD Overlay on Select Deployment Scenarios

M = Protocol Gateway Management Functionality

# DS-01(RC1) – B1,B2: IPS to IPS






***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US EU Other

*Notional Timeframe* Earlier Mid Later Transition End State

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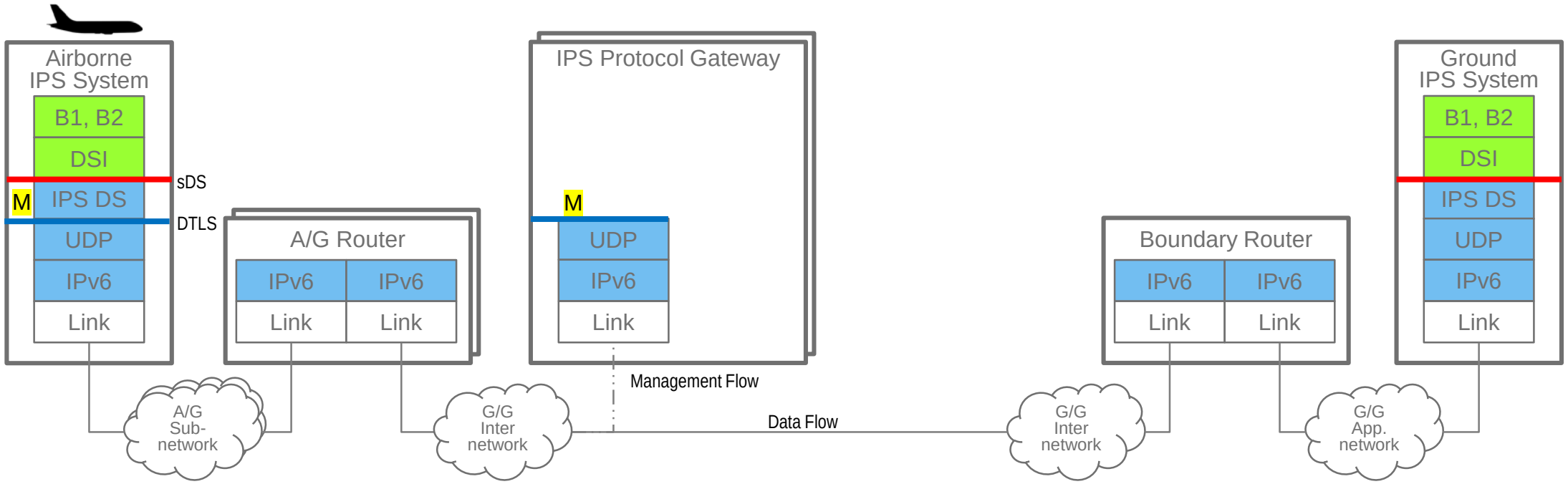
# DS-01(RC2) – B1,B2: IPS to IPS



## Architecture




## Security

## Compression

Option 1 – A-G datalink

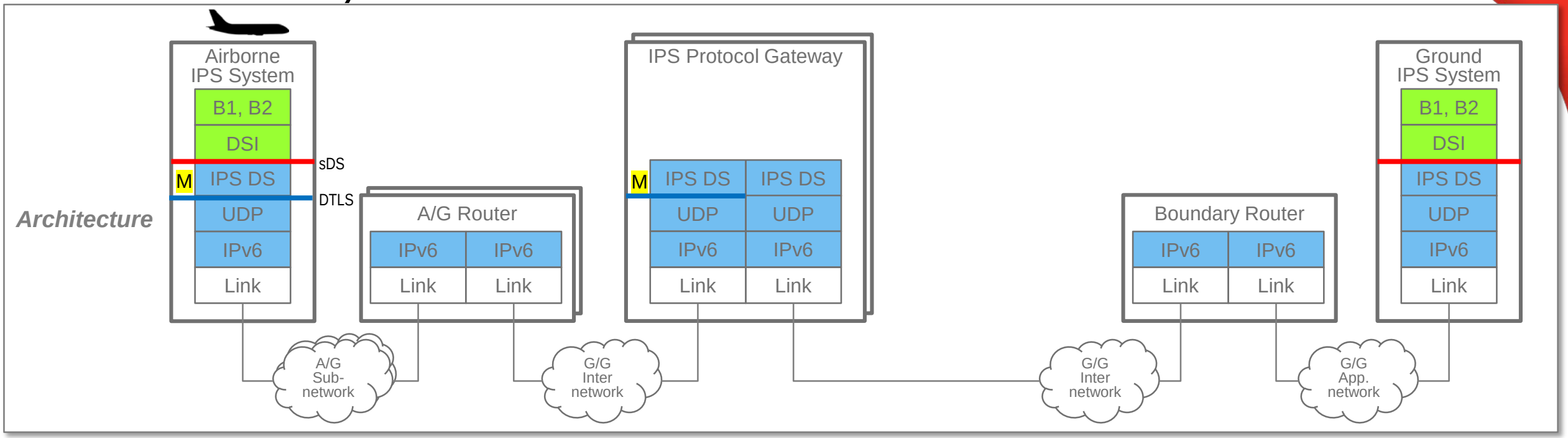
Option 2 – ATNPKT

*Potential Deployment Region* US EU Other

*Notional Timeframe* Earlier Mid Later Transition End State

# DS-01(RC3) – B1,B2: IPS to IPS

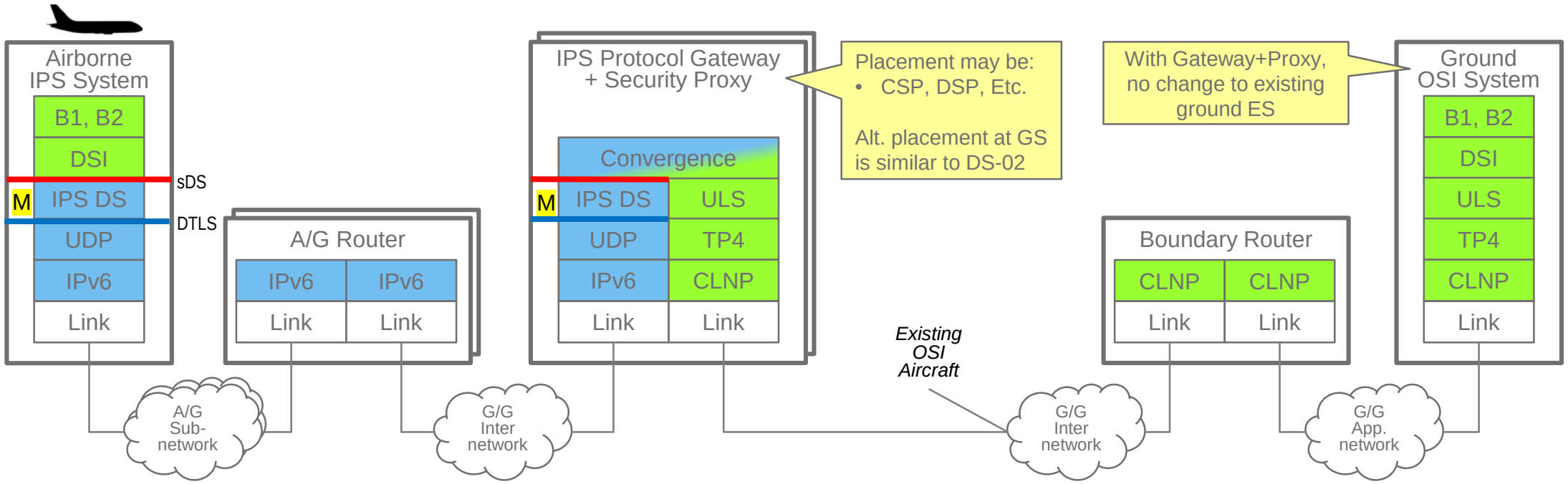




# DS-03b(RC) – B1,B2: IPS to OSI *(IPS Gateway+Proxy w/ DTLS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other *Notional Timeframe* Earlier **Mid** Later **Transition** End State

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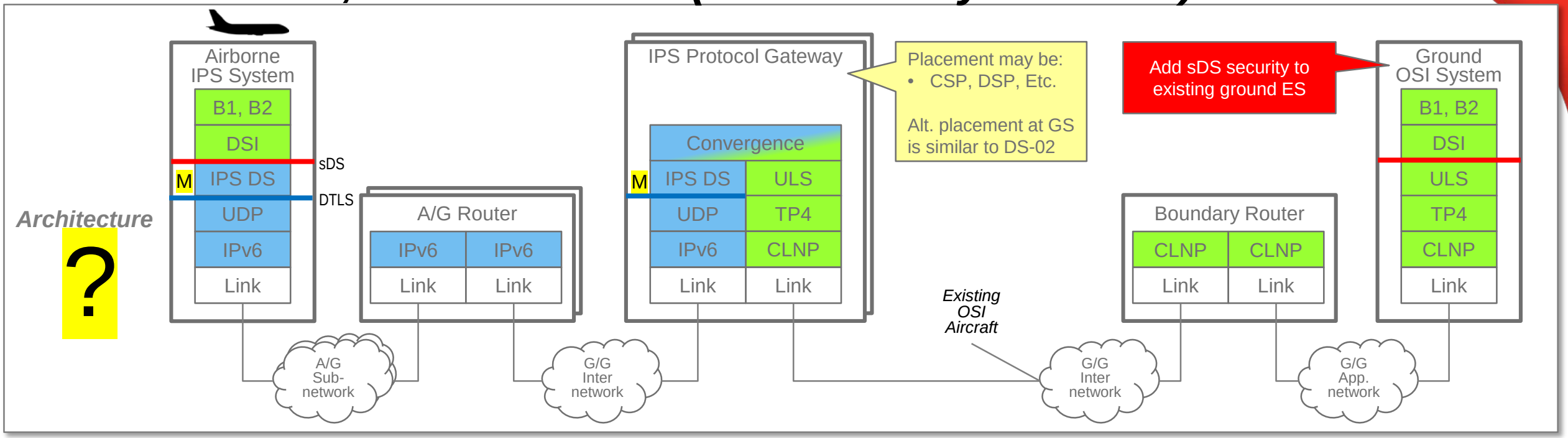
# DS-03d(RC)– B1,B2: IPS to OSI *(IPS Gateway w/ DTLS)*




***Security***

***Compression***

Option 1 – A-G datalink

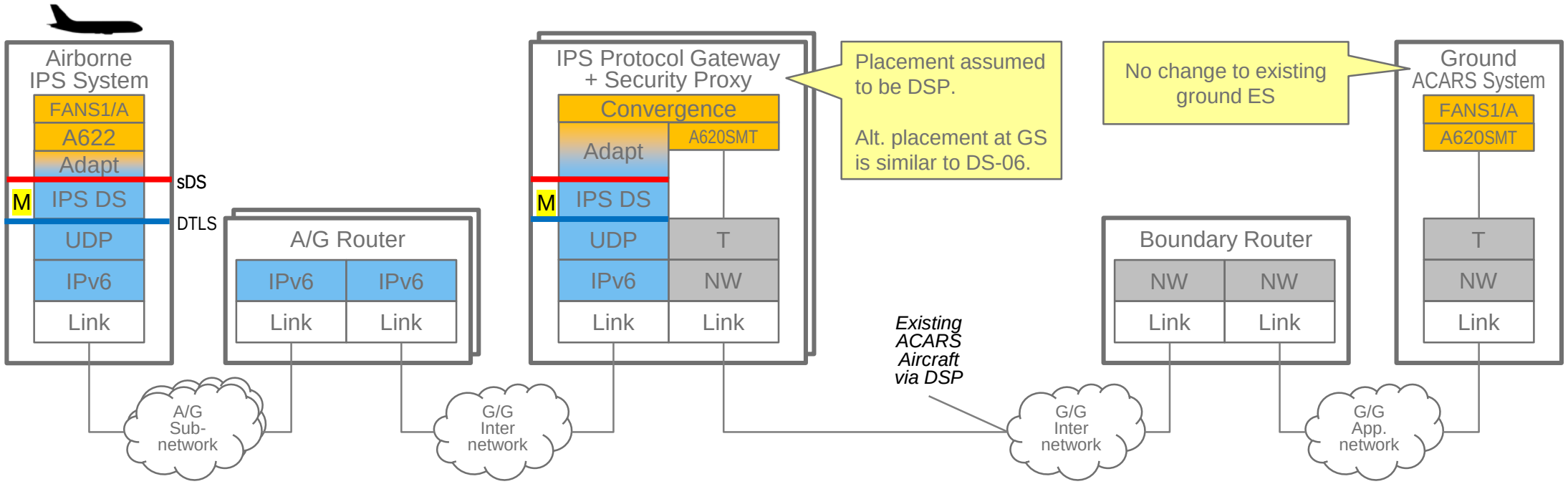
Option 2 – ATNPKT

*Potential Deployment Region* US **EU** Other *Notional Timeframe* Earlier Mid **Later** **Transition** End State

# DS-07b(RC) – FANS1/A: IPS to ACARS *(IPS Gateway+Proxy w/ DTLS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

Option 2 – ATNPKT

*Potential Deployment Region* **US** **EU** **Other** *Notional Timeframe* **Earlier** Mid Later **Transition** End State

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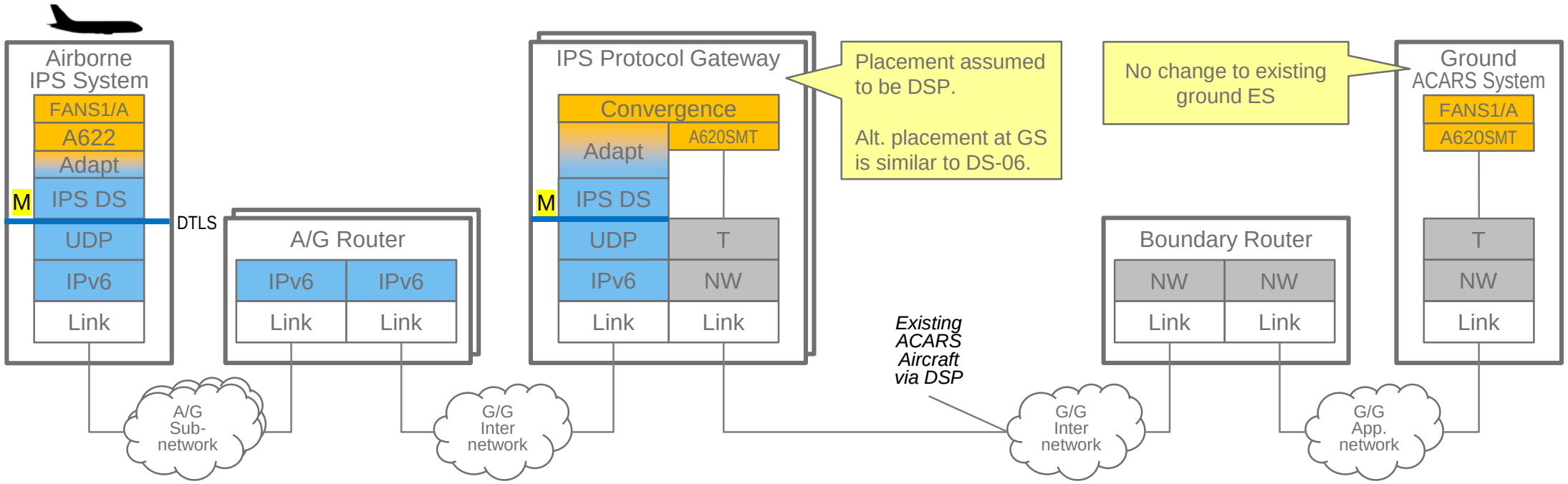
# DS-07d(RC) – FANS1/A: IPS to ACARS *(IPS Gateway, no sDS w/ DTLS)*



***Architecture***




***Security***

***Compression***

Option 1 – A-G datalink

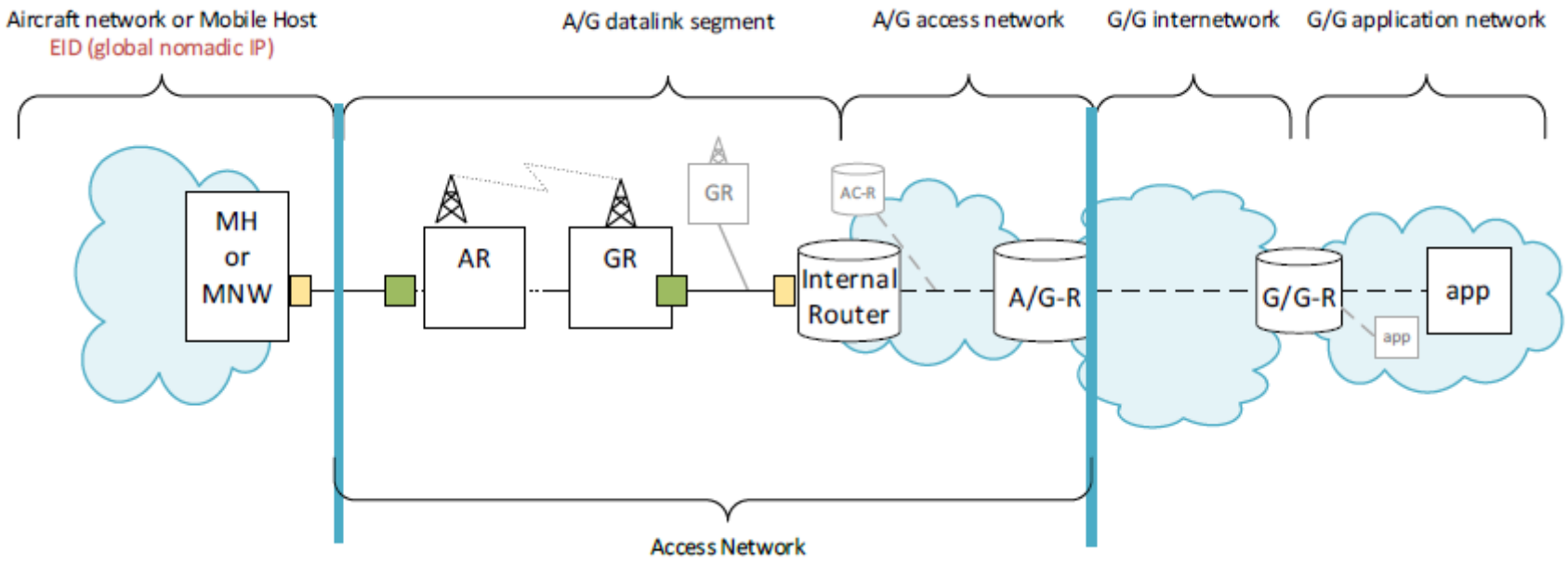
Option 2 – ATNPKT

*Potential Deployment Region* US EU Other *Notional Timeframe* Earlier Mid Later Transition End State

# Backup

# Notional IPS Network Architecture Diagram / Terminology






*Source Reference: ICAO WG-I MSG, WP0504*