

CPDLC Mandate, Future Communication and Applications

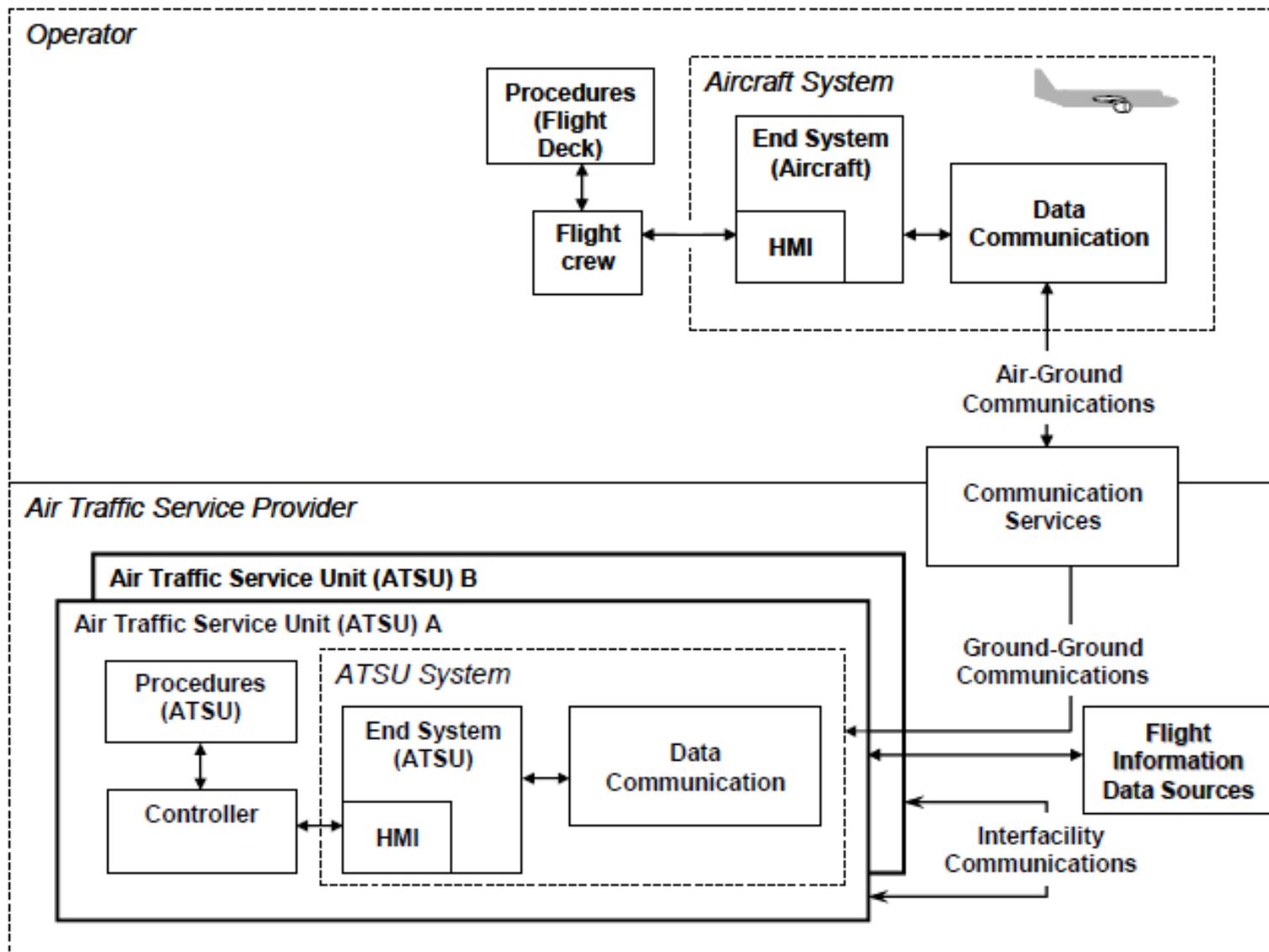
World ATM Congress 2016
8-10 March, Madrid



www.airtel-atn.com

- This presentation will cover the components required to meet the European CPDLC Mandate and how new future communications (satellite, AeroMACS, etc.) would impact them. It will also look at the future ATN-B2 services.

Overview of CNS/ATM System



- *European CPDLC Mandate*
- Future A/G Data links
- Future Applications
- Roadmap
- Programs
- Summary

- At the Single Sky Committee (SSC) Meeting 55, which took place on 14/15 Jan 2015, the SSC passed a favourable opinion on the proposed amendments to Regulation (EC) 29/2009 (DLS-IR). The regulation 2015/310 which amends Regulation 29/2009 has now been published and is available from the [European Commission web site](#).
- The important date changes to Regulation (EC) 29/2009 – in a simplified form - are:
 - The amended regulation will be applicable as from 05 Feb 2018
 - All ANSPs should be ready by 05 Feb 2018
 - All aircraft should be equipped by 05 Feb 2020 (there is no longer a distinction between forward fit and retrofit)

<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R0310>

- EUROCONTROL Specification on Data Link Services (EUROCONTROL-SPEC-0116) is the primary document
- Complements the Implementing Rule (EC 29/2009)
- It applies to all ATN/VDL 2 Data Link Equipment
 - Aircraft communication and display systems, including an ATN Router and an ATN End System
 - VDL 2 Airborne Radios
 - VDL 2 Ground Radios and Stations
 - ATN Air-Ground and Ground-Ground Routers
 - ATC Ground Centre communication and display systems, including an ATN End System
 - Ground Data Recording equipment
- Defines detailed requirements, explanatory materials and conformity assessment materials providing means of compliance (MOC) associated with the DLS implementing rule

- Defines the ATC Services (DLIC, ACM, ACL, AMC)
- Defines the mandatory and optional CPDLC Messages
- References other relevant standards documents including:
 - ICAO Doc 9705 (ATN), which will be superseded by ICAO 9880
 - ISO/IEC Documents specifying the OSI documents
 - EUROCAE (ED-110B) and equivalent RTCA (DO-280B) documents
 - ARINC Specification 631, VHF Digital Link (VDL) Mode 2 Implementation

4.1 Constituents of a DLS System

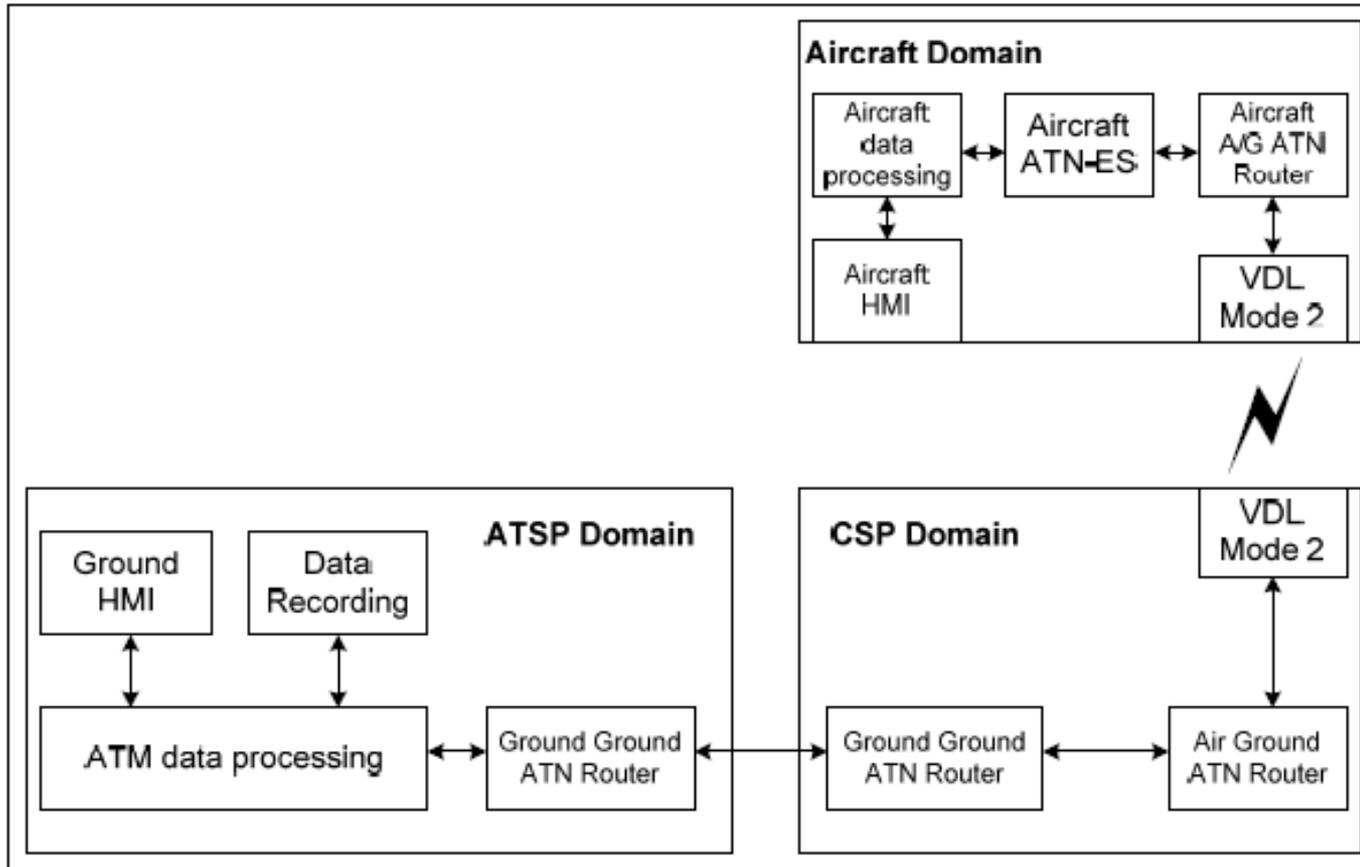


Figure 1: ATN Data Link System Architecture

Source http://www.etsi.org/deliver/etsi_en/303200_303299/303214/01.01.01_20/en_303214v010101c.pdf

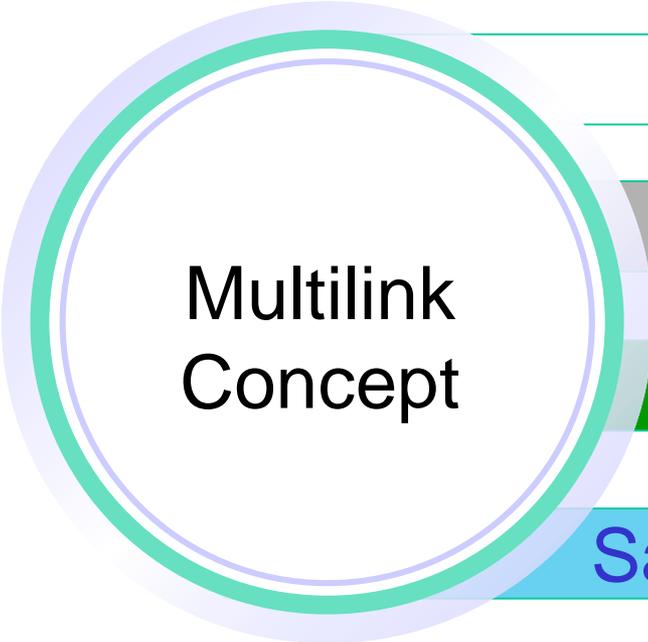
ETSI EN 303 214 V1.2.1 (2012-04)



Data Link Services (DLS) System;
Community Specification for application under the
Single European Sky Interoperability Regulation EC 552/2004;
Requirements for ground constituents and system testing

- European CPDLC Mandate
- *Future A/G Data links*
- Future Applications
- Roadmap
- Programs
- Summary

- A/G datalink: 3 Key Components
 - Physical Links
 - Networks
 - Applications/Services



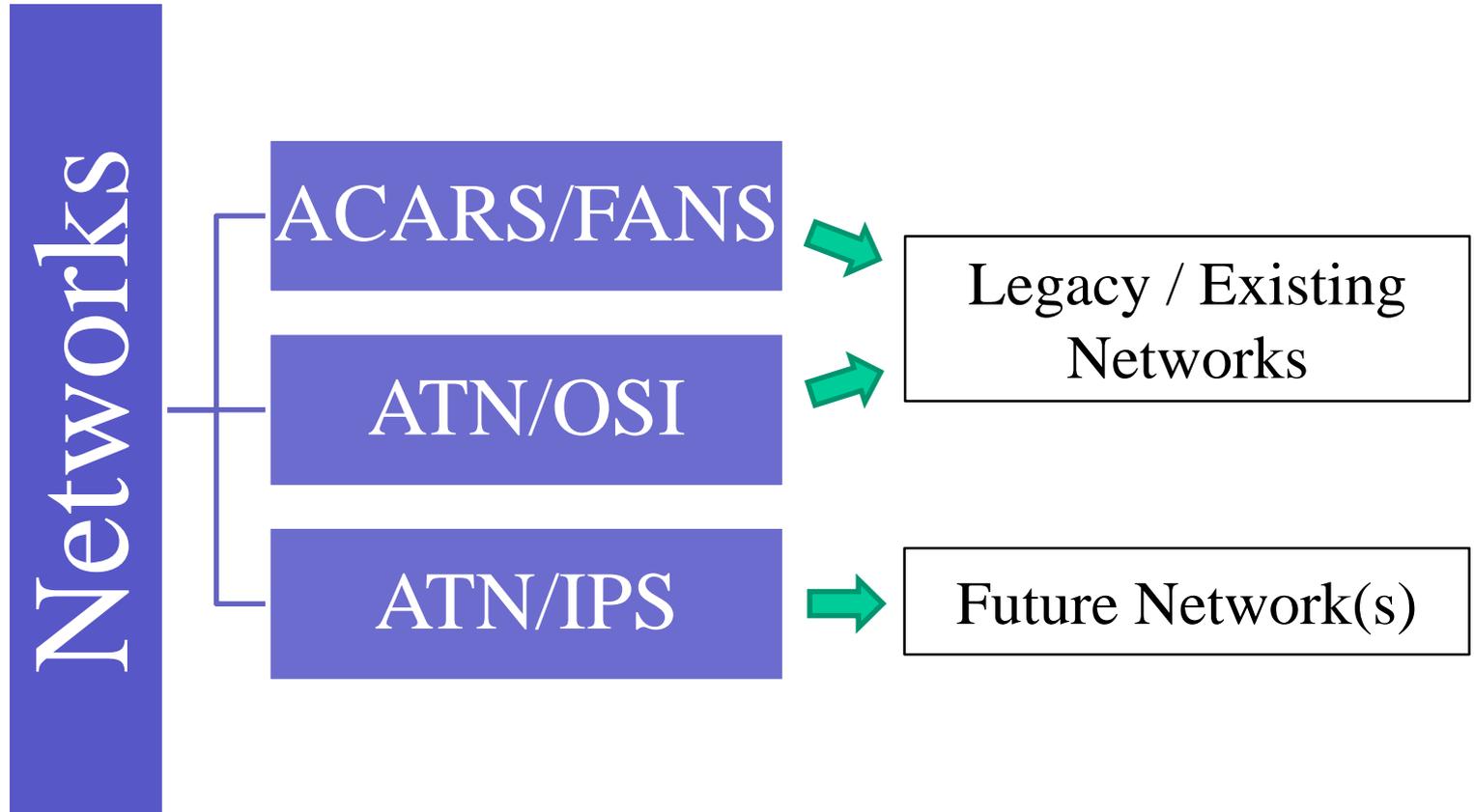
Multilink
Concept

Existing Systems (VDL2)

Airport surface: AeroMACS

General terrestrial: LDACS

Satellite: Oceanic + Continental



- Need to **distinguish Standardisation of ATN/IPS** (agreement and development required specifications) **from Implementation of ATN/IPS** (deployment of required infrastructure).
- Standardisation of IPS started this year
 - ICAO WG-I (2016-2020)
 - AEEC IPS Safety Services (2016-2019)
- Implementation.
 - 2-5 years after standardization completed.

- ATN/IPS shall be designed to support next steps communication requirements, with a long term duration/perspective (e.g. ATN-B3)
- ATN/IPS systems/equipment shall be designed to support data exchanges over future efficient (high speed) A/G subnetworks (AeroMACS, LDACS, SATCOM)
- Ground ATN/IPS infrastructure shall accommodate ATN/OSI avionics ATN B1 & B2 developed for Europe
- Airborne ATN/IPS architecture and systems shall be fully secured and comply with the Security Regulation and associated requirements

- European CPDLC Mandate
- Future A/G Data links
- *Future Applications*
- Roadmap
- Programs
- Summary

- ATN-B1 Applications
 - With European CPDLC Mandate Profile
- ATN-B2 Applications
 - Standards available
- ATN-B3 Applications
 - Future applications (Beyond 2028-2030)

- Standards
 - ED-228/DO-350, *Safety and Performance Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard)*
 - ED-229/DO-351, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard)*
 - ED-230/DO-352, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications, FANS 1/A Accommodation (FANS 1/A - ATS Baseline 2 Interop Standard),*
 - ED-231/DO-353, *Interoperability Requirements Standard for Baseline 2 ATS Data Communications, ATN Baseline 1 Accommodation (ATN Baseline 1 - Baseline 2 Interop Standard).*
- ATN-B2 First publication – April 2014
- ATN-B2 Rev A – April 2016

ATN-B2 Overview

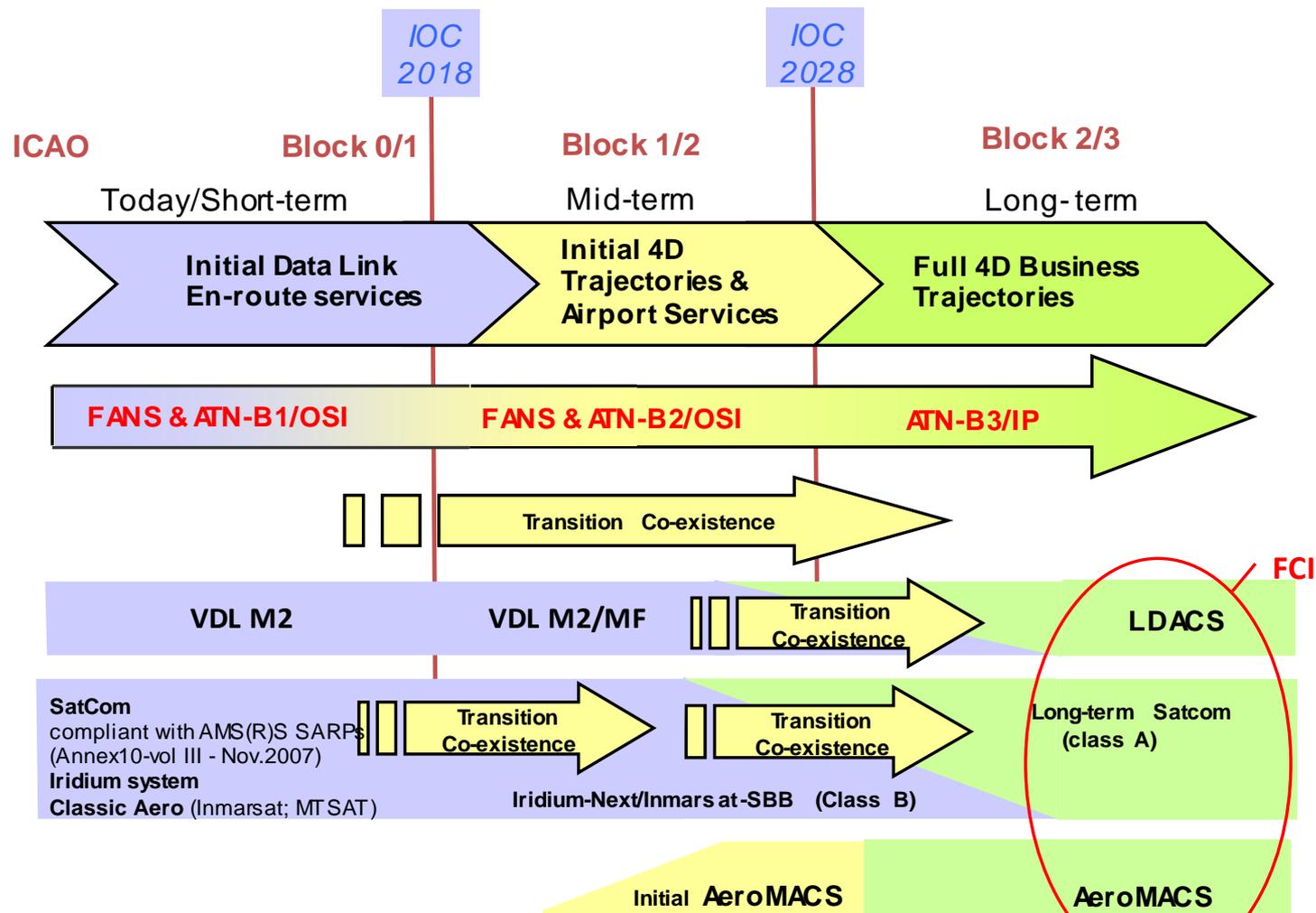
- *Data Link Initiation (DLIC)*
- *ATC Communications Management (ACM)*
- *Clearance Request and Delivery (CRD)*
- *ATC Microphone Check (AMC)*
- *Departure Clearance (DCL)*
- *Data Link Taxi (D-TAXI)*
- *Information Exchange and Reporting (IER)*
- *Position Reporting (PR)*
- *4-Dimensional Trajectory Data Link (4DTRAD)*
- *In-Trail Procedure (ITP)*
- *Interval Management (IM)*
- *Oceanic Clearance Delivery (OCL)*
- *Dynamic Required Navigation Performance (DRNP)*

ATS Services	Data Link Applications		
	CM	CPCLC	ADS-C
DLIC	√		
ACM		√	
CRD		√	
AMC		√	
DCL		√	
D-TAXI		√	
IER		√	√
PR			√
4DTRAD		√	√
ITP		√	
IM		√	
OCL		√	
DRNP		√	√

- Reuse of existing deployed physical links and networks
- Transition Considerations
 - Aircraft
 - Monolingual Aircraft (B1 or B2)
 - Bilingual Aircraft (B1 and B2)
 - Ground
 - CPDLC Mandate (B1)
 - SESAR Demonstrations (B2 only)
 - Operational Deployment (B2 with B1 accommodation)

- European CPDLC Mandate
- Future A/G Data links
- Future Applications
- *Roadmap*
- Programs
- Summary

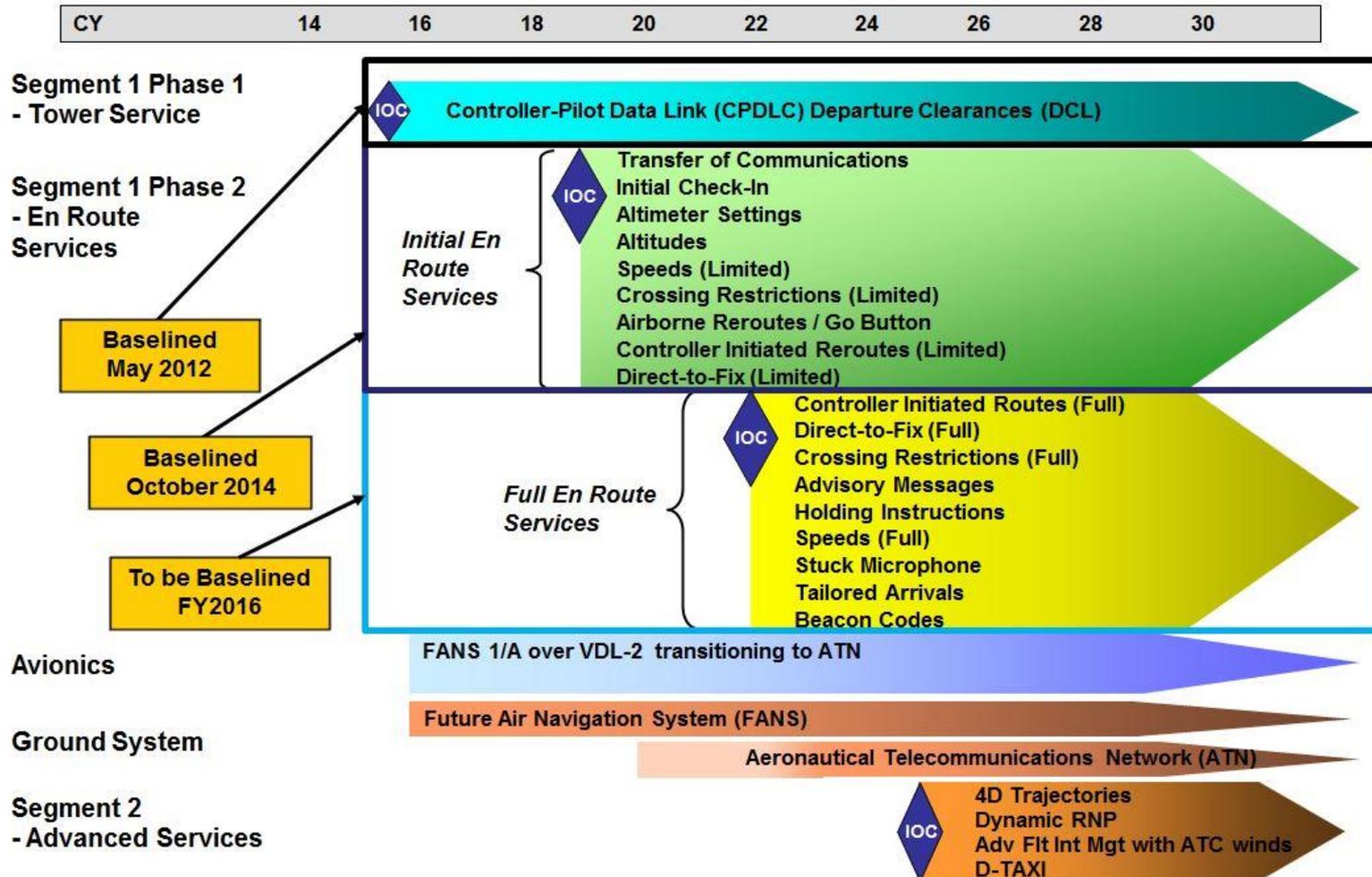
SESAR FCI Roadmap



IOC – Initial Operational Capability

Source: P15.02.04 D3 deliverable

Program Services Roadmap



- Different approaches due to commercial and technical considerations

- European CPDLC Mandate
- Future A/G Data links
- Future Applications
- Roadmap
- *Programs*
- Summary

- SJU ELSA – VDLM2 study
- ESA Iris Precursor and Iris Service Evolution – Satellite subnetwork
- SESAR 2020
 - Industrial Research:
 - Communication, Navigation, Surveillance (CNS)
 - Common Services
 - SWIM
 - 4D trajectory Management
 - Very Large Demonstrator (VDL)
 - Initial Trajectory Management
- Standardisation projects
 - AEEC IPS Safety Services
 - ICAO WG-I/SDS

- European CPDLC Mandate
- Future A/G Data links
- Future Applications
- Roadmap
- Programs
- *Summary*

- Both in Europe and US multi-link systems
 - LDACS, AeroMACS, Satellite
- Different roadmap timelines between Europe and US
- Different technological approaches from avionics

- CPDLC Mandate (ATN-B1)
 - Initial building block for data link communications with pilots
 - Initial Deployment Final Deployment 2018-2020
 - Links (VDLM2)
 - Network (ATN/OSI)
- Transition Phase
 - Initial deployment of pre-operational ATN-B2 systems
 - Operational Network (ATN/OSI).
 - Multiple links (VDLM2, AeroMACS, Satellite, LDACS)
 - Validation of ATN-B2 concepts and ATN/IPS concepts
- Possible ATN-B2 IOC (beyond 2025)
 - Multiple links
 - Accommodation for ATN-B1 and ATN-B2 aircraft (In Europe)
 - ATN/OSI (In Europe) and ATN/IPS (In US)

4.1 Constituents of a DLS System

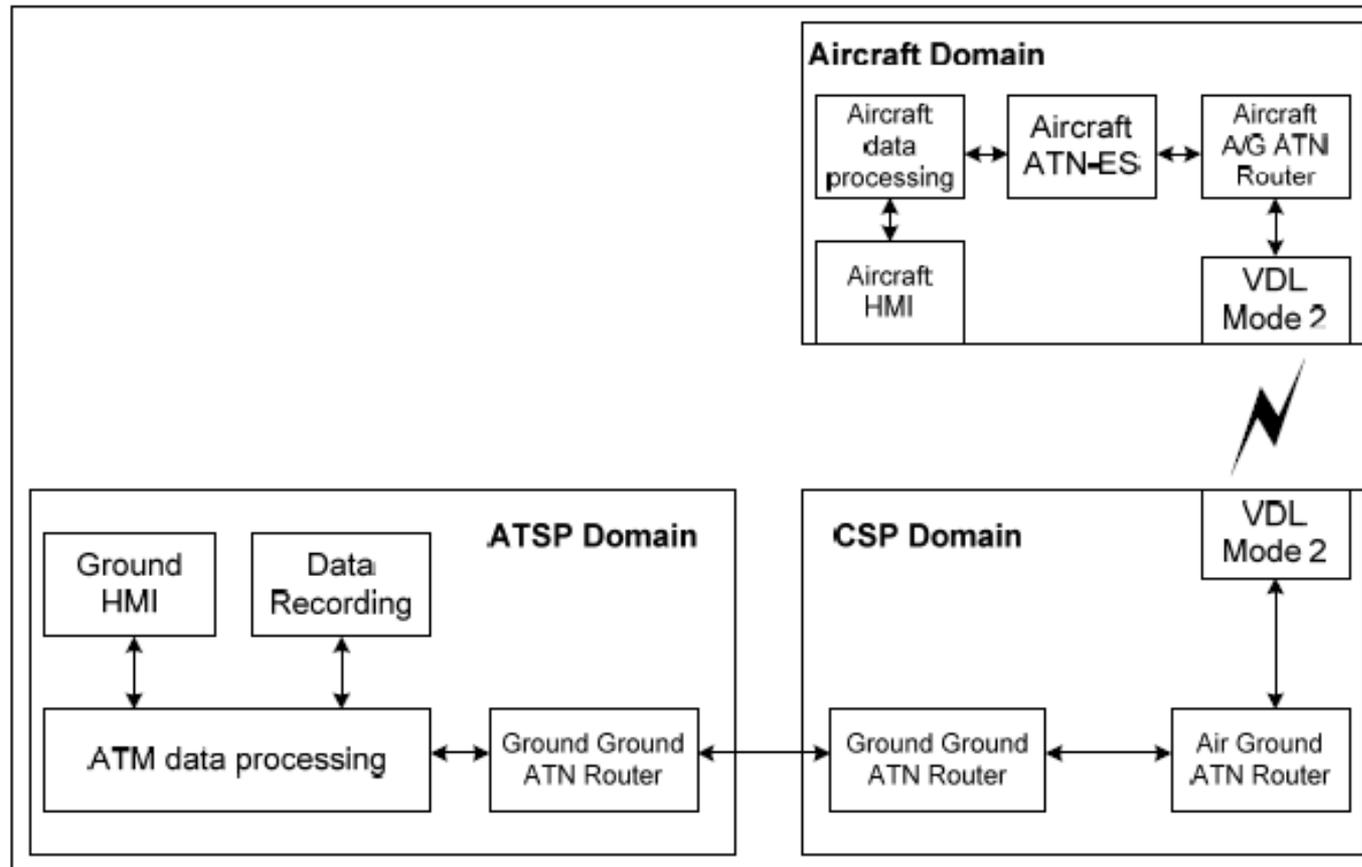


Figure 1: ATN Data Link System Architecture

A/G Data link	Communications	ATSP Domain
New Applications (ATN-B2)	No Impact. Use of existing infrastructure	Requires updates to the ATSP domain <ul style="list-style-type: none"> • New CPDLC Messages for the controller • Initial Trajectory Information Sharing including the use of on-board 4D trajectory data by the ground ATC systems,
New networks (ATN/IPS)	Requires new components	Little Impact. Applications do not change. It might require an upgrade to the DL-FEP for ATN/IPS
New physical network (AeroMACS, Satellite, LDACS)	Requires new infrastructure. Higher availability/bandwidth	No Impact. Transparent

Contact: Santi Ibarz

Email: santi.ibarz@airtel-atn.com

Telephone: +353 1 214 7468

Visit us at Stand 151