Interoperability based on collaborative work

indra

AIDC/NAM/CAR/ICD/4
9 - 11 March 2021

A leading global technology and consulting company

We are the technological partner for core business operations of our customers world-wide

Main figures
2019

3,204 M€
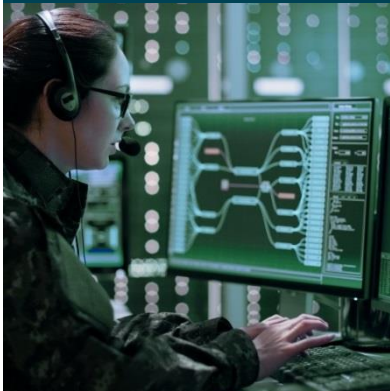in Revenues

+49,000
Professionals

+180
Countries

225 M€
in R&D

Two businesses joined by their technological nature

Transport & Defence

World-leader in providing proprietary solutions in specific segments in Transport and Defence markets

Digital & Information Technologies

Leading firm in Digital Transformation and IT in Spain and Latin America, through its affiliate Minsait

Defence and Security

Envisioning a safer tomorrow

Air Traffic

Creating skies together

Transport

Unlocking life in motion

minsait

An Indra company

Mark making the way forward

Indra in Air Traffic Management

Global player

Guaranteeing safe, efficient and profitable flights, in a difficult context with constantly increasing air traffic

Innovative solutions

Our innovations improve the service resilience of our partners

Environmental benefit

Enabling CO2 and noise reduction of flights, whilst improving capacity

+ 5,700

Implementations in over 180 countries

+ 100

Years of experience in ATM solutions

+ 85%

Passengers worldwide travel making use of Indra ATM technology at some point during the flight

Solutions y Services

Indra Air
Automation

We are your
reliable
partner in ATM
business

Indra Air
Communication

We implement Full
VoIP Dual Dissimilar
VCCS solutions

Indra Air
Navigation

We enable
more than
100,000,000
safe landings

Indra Air
Surveillance

We have deployed
over 400
surveillance
systems

Indra Air
Drones

Connecting Drones
safely, creating a
better airspace

Indra Air
Information

We guarantee the right
digital Aeronautical
information at the right
time

iTEC Suite

The most advanced, safe and reliable Air Traffic Management
System available today

Interoperability Through European Collaboration

iTEC is an ATM system collaboratively developed by ENAIRE, DFS, NATS, (original ANSPs), LVNL, AVINOR, ORO NAVIGACIJA y PANSA and Indra as technological partner and supplier

Interoperability Through European Collaboration

The objective is to deliver improved operational performance and increased cost efficiency through the introduction of a common:

- Concept of operations based on SESAR, including 4D-trajectory management
- Airspace structure aligned with FABS and based on common airspace types
- System architecture that features improved interoperability via FOs and SWIM
- ATS system with interchangeable ATS components supported by open standards

Risks shared

Cost of development reduced

Speed up development reduced

User – centred design

Sharing of best practices

Fully aligned with:

SESAR JOINT UNDERTAKING

EUROCONTROL
SESAR Master Plan

ICAO
Aviation System Blocks Upgrades (ASBUs)

Interoperability Through European Collaboration

iTEC

iTEC ATM Benefits

- Increase in capacity by minimizing routine tasks while increasing safety and productivity

- Interoperability between ATM systems using SESAR data interfaces

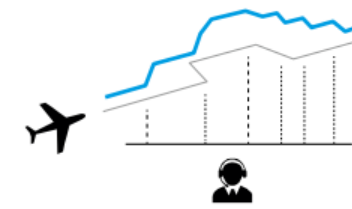- Trajectory-based operations reduce flight diversions, flight time, fuel consumption and CO_2 emissions

NOT TRAJECTORY BASED
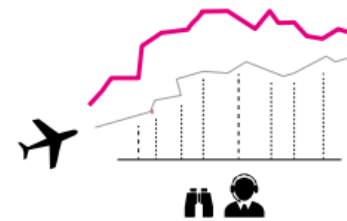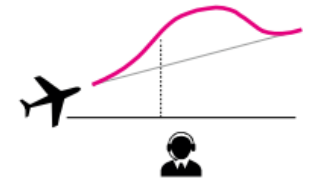
TRAJECTORY BASED

Past

ATC based on where we THOUGHT the aircraft was

Present

ATC based on where we KNOW the aircraft is, with limited prediction

Future

ATC based on where we KNOW the aircraft will be along its entire trajectory

Interoperability Through European Collaboration

iTEC will manage the air space under responsibility of 7 ANSPs

Over 7 million flights a year

18 control centres

Operational Savings
- Less fuel consumption
- CO2 emissions reduction
- Direct routes
- Cost savings for airlines
- Increase of air space capacity

New generation ATM system features
- 4D trajectory flight system
- Improved conflict detection tools
- Trajectory conformance monitoring
- SWIM
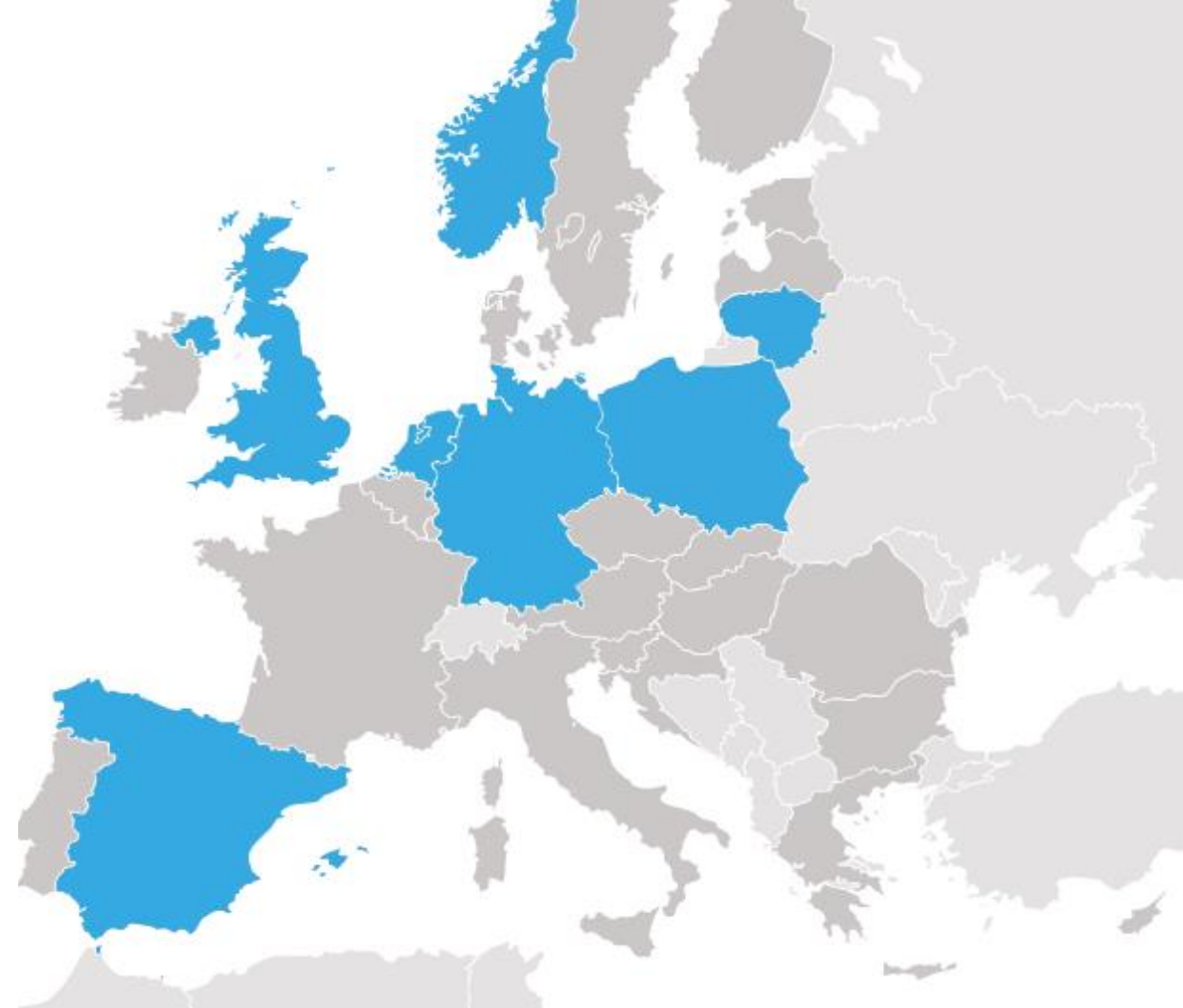
It manage flights in some of the most complex airspace in the World: UK, Germany, Spain, the Netherlands, Norway, Lithuania and Poland

iTEC Suite

Guaranteeing iTEC Suite evolution

- Having a roadmap aligned with the SESAR functionality roadmap and Pilot Common Project (PCP) ATM functionalities (AFs).
  - Driven by the requirements of very demanding ANSP, whilst sharing the development costs of such evolution.
    - Meets the conditions to call for INEA funds for the deployment of the iTEC Suite.

iTEC V1:
4D Trajectory Based Operations

- AF1. Extended AMAN
- AF2. A-CDM
- AF2. A-SMGCS
- AF2. Airport Safety Nets
- AF3. Dynamic Sect. and Advanced FUA
- AF3. FRA and DCT
- AF3. MTCD and CMON
- AF3. Civil/Military coordination
- AF5. FMTP, AMHS, METAR/GRIB2
- AF6. AGDL (FANS1A & ATN)

iTEC V2.1&V2.5:
Full support to Upper and Lower Airspace. Provision of advanced separation management tools for Planning and Tactical Control

- AF1. Enhanced TMA using RNP
- AF2. Integrated AMAN/DMAN
- AF2. TBS
- AF3. Tactical Trajectory and Risk Modules
- AF3. LARA Itf
- AF3. Dynamic FRA
- AF3. Contingency sectors
- AF4. Complexity Manager
- AF5. Flight service FIXM
- AF6. ADS-C tracks

iTEC V3:
Full support to IOP, SWIM and i4D

- AF3. NOP Itf
- AF4. Collaborative NOP
- AF4. ADS-C EPP trajectory
- AF5. SWIM full (FIXM, AIXM, WXXM)
- AF6. i4D
- AF6. IOP (ATC-ATC and ATC-NM)

iTEC Suite

CORE Products

FDP – Flight Data Processor

Processing and managing of flight plan data, including 4D trajectory calculation
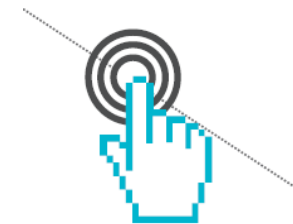
CWP – Controller Working Position

Data presentation and interaction for the controller, fully configurable according to each user role

MTCD – Medium Term Conflict Detection
CTM – Coordination Trajectory Management
TTM – Tactical Trajectory Management

Conflict detection between aircraft based on the 4D trajectory computation
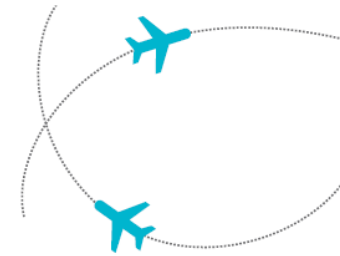
iTEC Suite

CORE Products

IOMP – Integrated Operational Management Position

Data presentation and interaction for both flight data operator and operational supervisor

CMS – Control and Monitoring Support

TSP – Technical Supervision Position

CN – Communications Node

RS – Recording Server

DAT – Data Analysis Tool

Ensuring that the iTEC Suite Core product is performing as expected and according to Service Level Agreements (SLAs)

ISS – Information Subscriber Subsystem

ATM data distribution to a set of authorised users

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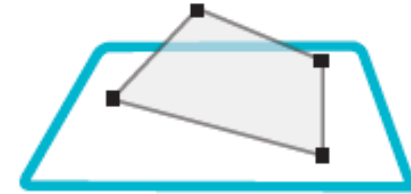
iTEC Suite

Complementary Products

iSDPS – Surveillance Data Processing System

Establishing and distribution of the air situation picture of all traffic over a geographical area

iSNS – Safety Nets System

Ground based safety nets to assist controller on detecting conflicts which compromise safety levels

iACM – Airspace Capacity Management

Sector loading calculation based on planned trajectories to predict areas of high traffic density

iTAP – iTEC Adaptation Platform

Managing and distributing the required sets of Airspace Adaptation data for all iTEC Suite products

iTEC Suite

Complementary Products

SIS – Support Information System

Collecting, organising and serving all relevant air traffic information

iGS – Global Supervision

Provides control and monitoring of multiple assets through a single interface

iIS – Installation Server

Facilitates and controls the deployment of new Software builds and Adaptation Data sets

RDU – Remote Display Unit, part of ATM Console

Supports the displays and peripherals for operator positions

iXMAN – Integrated Arrival Departure Manager

Generating a smooth flow of arrival and departure traffic at an aerodrome to reduce flight delays

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iTEC Suite

Complementary Products

iTBS – Time Based Separation

Using time-based scheduling to optimise the traffic stream of aircraft into capacity-constrained areas

iSWIM – SWIM Interoperability Node

Enabling all ATC stakeholders to have suitably controlled access to flight data

iSIM – ATM Simulator

A total training for 2D/3D-TMA/APP/En-Route controllers in a multi-exercise and multi-adaptation system

Indra ATM Console

A complete ATM working environment designed to satisfy all controller needs
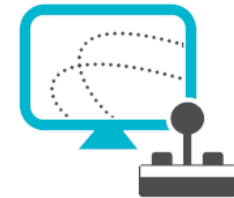
iTEC Suite

Tower Products

FDS – Flight Data Server

Process flight-plans through the entire arrival/departure cycle

SDS – Surveillance Data Server, incl. safety nets

Surveillance and Safety Nets functions for Approach and Airport

CWP – Controller Working Position, incl. Air, Ground and EFS

HMI applications for Tower controllers

TECAMS – Technical Control and Monitoring Subsystem

Provides facilities for system configuration, system monitoring, editing, and general maintenance

iTEC Suite

Cloud

iTEC Cloud is the latest ongoing development from Indra, consisting in iTEC Suite applications providing ATM services from a Private Cloud infrastructure

Objectives of new product are:

- Take advantage of the benefits that brings Cloud Computing, mainly costs saving and flexibility.
- Improve security, availability, reliability and resilience of safety-critical system (iTEC)
- Improve business continuity (very close of 100% availability)
- Provision of ATM System which is operational seamlessly at two locations in a geo-redundant mode

- Provider/Owner:
  - Increase infrastructure efficiency, maximizing commonality
  - Reduce costs (lower OPEX), common and commoditized hardware, and easier maintenance and service monitoring
  - Location independence and increase flexibility to use the infrastructure
  - Smaller physical footprint, using higher density equipment
  - Responsive load balancing, can be instantly scalable to respond to changing demands

- User:
  - Increase availability (close to 100% uptime) and business continuity. VMs take resources from an extensive pool of underlying physical resources, if one goes offline, service is not affected
  - Scalability and Flexibility, extra resources can be accessed as and when required
  - Increased resilience with greater fault tolerance and ability to move software between hardware
  - Faster contingency

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Regional Interoperability Propose

Based on iTEC Concept

iTEC Cronology

History and unification concept

SACTA - ENAIRE

P1/VAFORIT - DFS

Precedent

ENAIRE

| Adaptation to iTEC | iTEC common V_0 | iTEC common V_i | Plan iTEC a Target |

| | Adaptation Enaire | | Adaptation Enaire |

DFS Deutsche Flugsicherung

| Adaptation to iTEC | iTEC common V_0 | iTEC common V_i | Plan iTEC a Target |

| | Adaptation DFS | | Adaptation DFS |

NATS

| Adaptation to iTEC | iTEC common V_0 | iTEC common V_i | Plan iTEC a Target |

| | Adaptation NATS | | Adaptation NATS |

New ANSP

| Adaptation to iTEC | iTEC common V_{ANSP} | New plan ANSP |

iTEC -Target

iTEC-Target Definition

V_0 V_{ANSP} V_i

2007 — iTEC Kick-Off: DFS, ENAIRE, NATS, Indra

2011 — LVNL joins iTEC alliance

2014 — 1° Version of iTEC ready

2015 — Signing of the iTEC CWP collaboration agreement. The new CWP generation integrates seamlessly with iTEC

2016 — iTEC enters into operation in Prestwick (UK)

Avinor joins iTEC alliance

2017 — iTEC Centre. Automation System (iCAS) goes live in Karlsruhe (DE)

ORO NAVIGACIJA & PANSA joins iTEC alliance

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Regional Interoperability Propose

Based on iTEC Concept

Regional Interoperability Propose

Definition Mision & Vision

Objetives

| Environmental impact -10% | Capacity x3 |
| Unit cost ATM /2 | Operational safety x10 |

Political targets High level

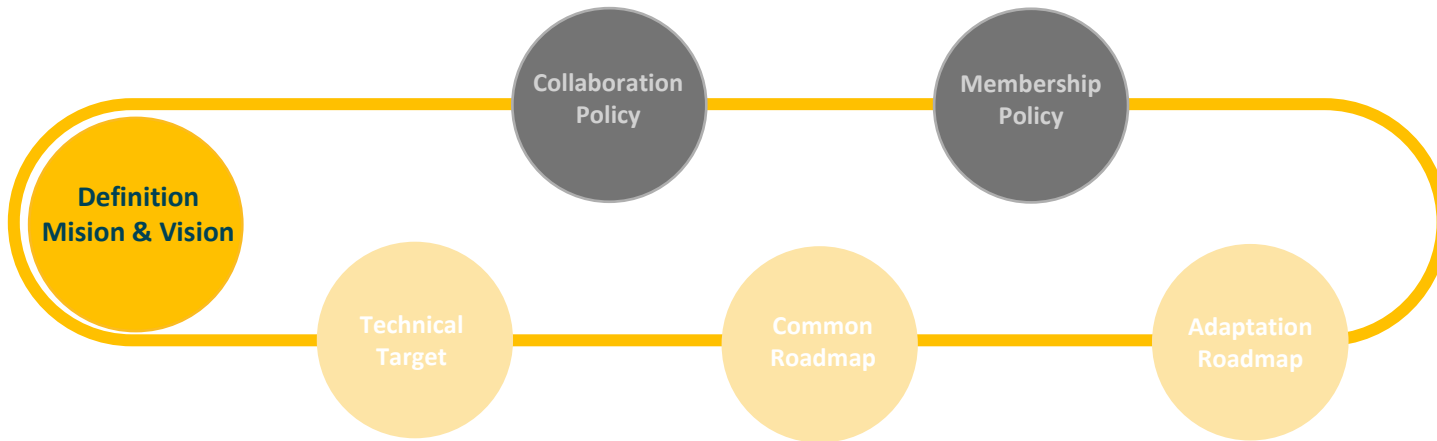It implies the synchronization of the plans and actions of the different stakeholders and the federation of resources in a performance partnership for the development and implementation of the required improvements throughout Europe

- Collaboration Policy
- Membership Policy
- Definition Mision & Vision
- Technical Target
- Common Roadmap
- Adaptation Roadmap
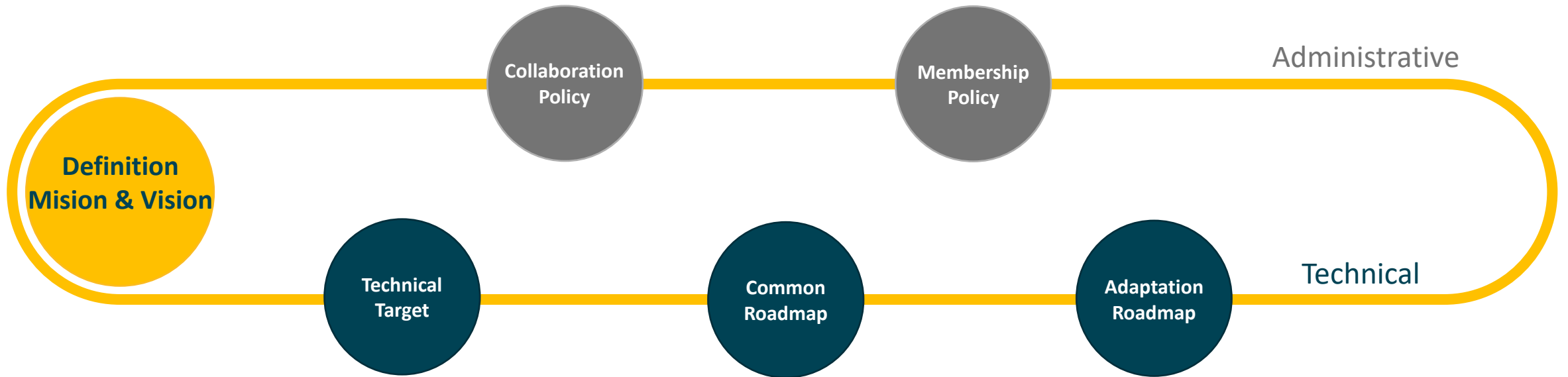
Collaboration Partners
Environment REGIONAL REGULATION
Synergy ANSP Regulation National NextGen COST Capacity
Strategic Safety
Plan Innovation Security
Regional Strategic Plan
ASBU CGANP - 6º Edition SESAR

- **Mision**
- **Vision**
- **Objetives**

Airports	Institutes	Industry
Exhibition	SESAR Consortium	Alliances
Users	Unions	ANSPs

All agents participate

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Regional Interoperability Propose

Definition of Technical Target

Example of work packages for high-level technical requirements

4D Trajectory – Based Operations
ATC Tools
PBN – Performance Based Navigation
FRA – Free Route Airspace
FUA – Flexible Use of Airspace
AOI – Area of Interest
Silent Coordination
VPW – Vertical Progression Window
GRIB – Meteorological Information
Strategic Constrains
Contingency
Multi-sector Planner
Cyber-security
EFS Electronic Flight Strips
CDM – Collaborative Decision Making
Integrated Billing
D/AMAN Departure & Arrival Manager
Incidence Evaluation
ADS-B Server

Collaboration Policy

Membership Policy

Definition Mision & Vision

Technical Target

Common Roadmap

Adaptation Roadmap

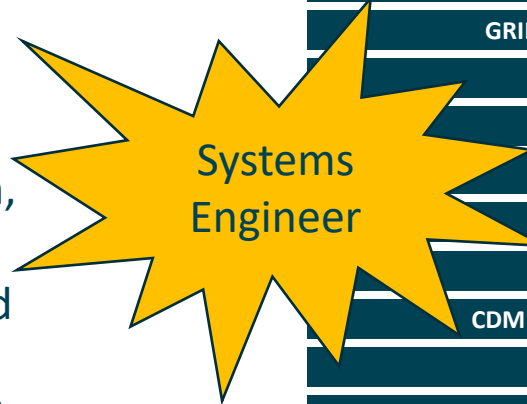Systems Engineer

In a distant time horizon, it is defined how it is expected to operate and then they are divided into high-level technical requirements

- **Mision**
- **Vision**
- **Objetives**

Capability Maturity Model Integration (CMMI) - **Level 5**

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Regional Interoperability Propose

Definition of Common Roadmap

Definition Mision & Vision

Collaboration Policy

Membership Policy

Technical Target

Common Roadmap

Adaptation Roadmap

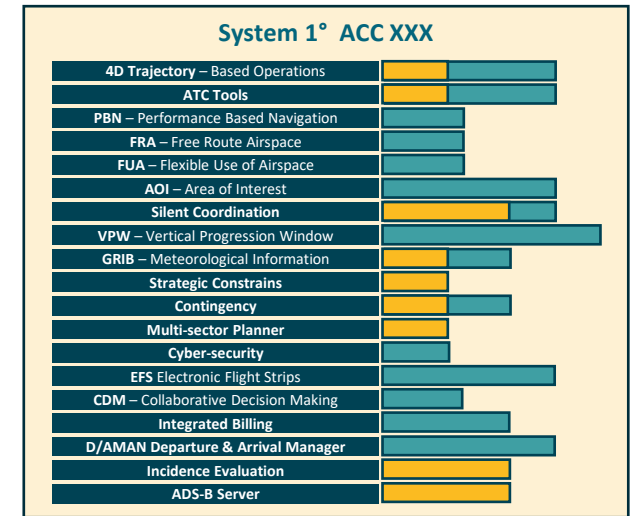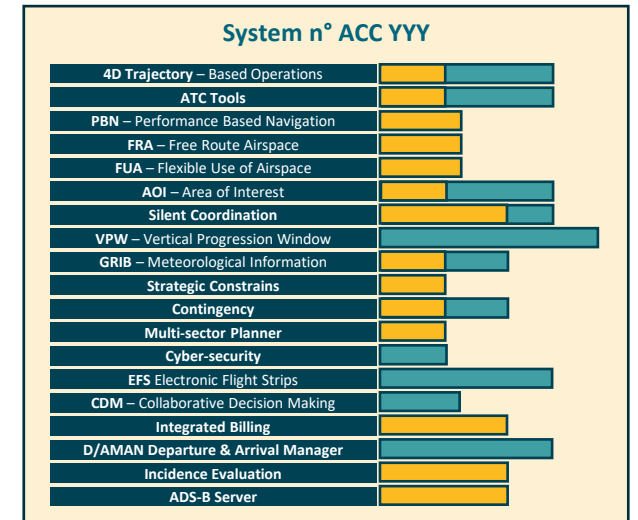**Harmonization**

Functionalities

- **4D Trajectory** – Based Operations
- **ATC Tools**
- **PBN** – Performance Based Navigation
- **FRA** – Free Route Airspace
- **FUA** – Flexible Use of Airspace
- **AOI** – Area of Interest
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- **Cyber-security**
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- **CDM** – Collaborative Decision Making
- **Integrated Billing**
- **D/AMAN Departure & Arrival Manager**
- **Incidence Evaluation**
- **ADS-B Server**

Harmonization Scope

Differences between actuality and harmonization

System 1° ACC XXX

- **4D Trajectory** – Based Operations
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- **ADS-B Server**

Current compliance with functionalities
v/s **harmonization** System 1°

⋮

System n° ACC YYY

- **4D Trajectory** – Based Operations
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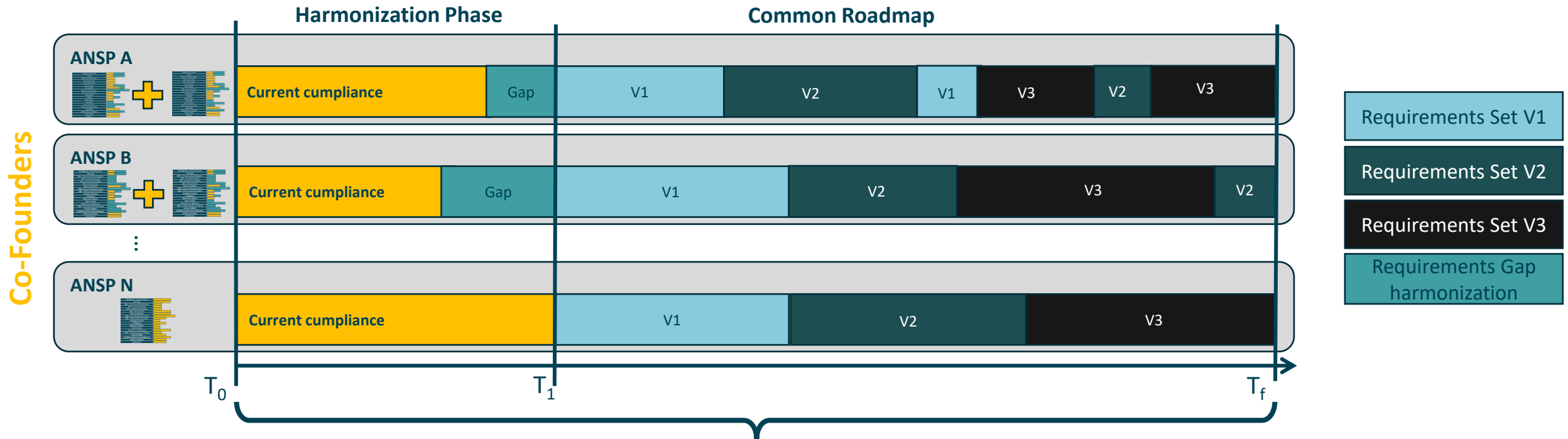- **ADS-B Server**

Current compliance with functionalities
v/s **harmonization** System n°

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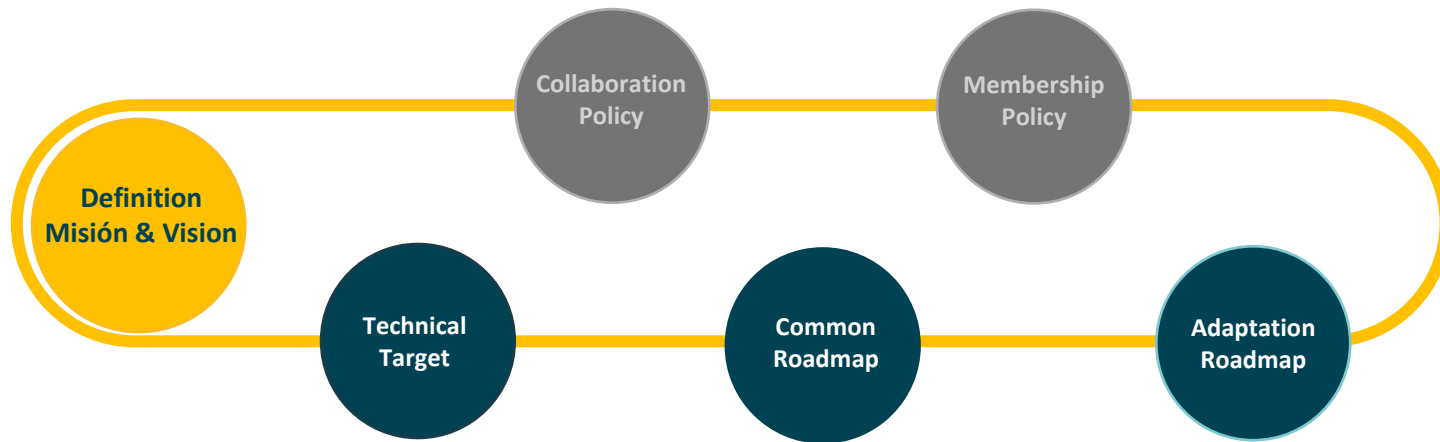# Regional Interoperability Propose

Definition of Common Roadmap
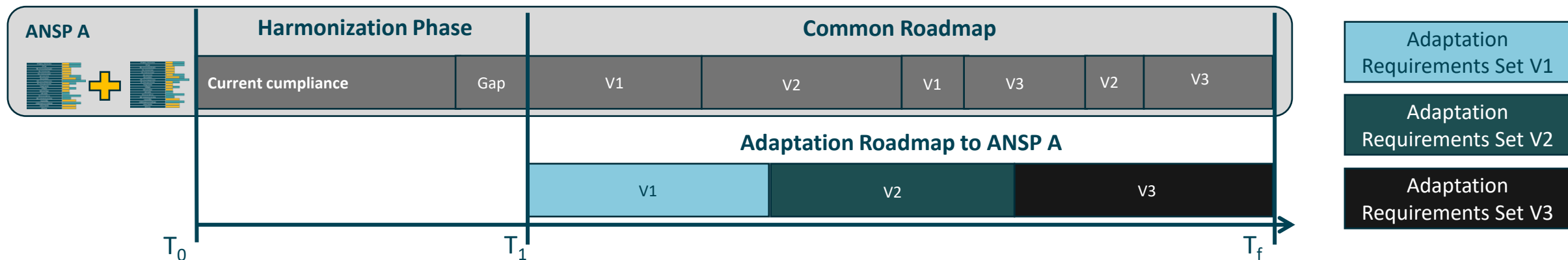
Regional Interoperability Propose

Definition of Adaptation Roadmap

Additional requirements will be delivered to support the required functionality not covered by the Common roadmap or own requirements of ANSP.
Example:

- IFPS- Initial Flight Plan System
- Datalink Front-End Processor
- Billing System
- Video Recording and Replay
- Cybersecurity
- …

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