

Why Air traffic Flow & Capacity Management

ACAO/ICAO ATFM workshop
(Casablanca 17-18 March 2019)



Why ATFCM

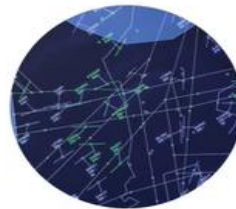
Air Traffic Flow and Capacity Management aims to provide a smoothing mechanism to avoid the overloads and maximize the use of airspace,

1
Protect
Air Traffic Control
from over-delivery



ATFCM

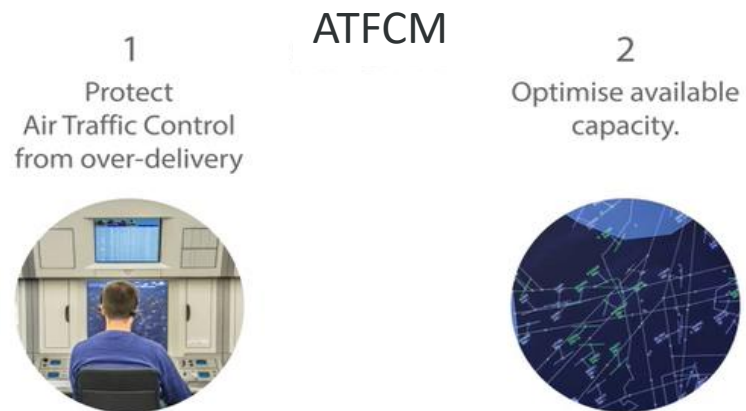
2
Optimise available
capacity.



Why ATFCM

ATFCM has two main objectives:

- **Protect Air traffic Control from overdelivery or overload**
- **Optimize the available capacity**



Why ATFCM

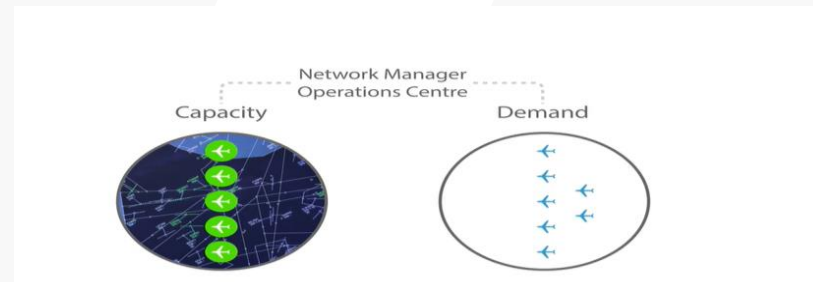
- **Capacity is the number of flights that can be handled safely and efficiently in a sector during a given time period , normally 1 hour,**
- **The capacity figures are provided by the ANSPs,**
- **Demand is the number of flights that intend to fly in a sector during a given time period,**
- **The demand is based on the Flight plans that have been filed,**



Why ATFCM

**If demand exceeds capacity, either the capacity or the demand need to be adjusted,
The Network Manager Operations Centre (NMOC) provides a management role to:**

- **Propose modifications to capacity and/or adjustments to demand**
- **Additionally provide alternatives to its customers,**
- **The NMOC may propose an increase of the capacity; however sometimes capacity cannot be increased, so the NMOC will try to adjust the demand,**



Why ATFCM

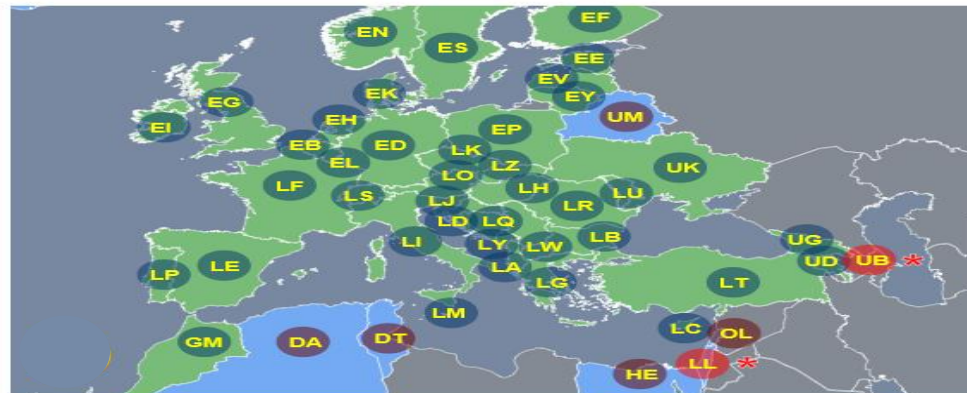
The Flow Management Position (FMP), is able to participate as local experts in the collaborative Decision Making (CDM) process used to optimize the capacity and manage demand,



Network Manager Area of Operation

ATFCM Areas

- **ATFCM Area includes States receiving the full ATFCM service from NMOC,**
- **ATFCM Adjacent Area includes FIRs directly adjacent to the NMOC Area where a limited ATFCM service may be provided by NMOC,**

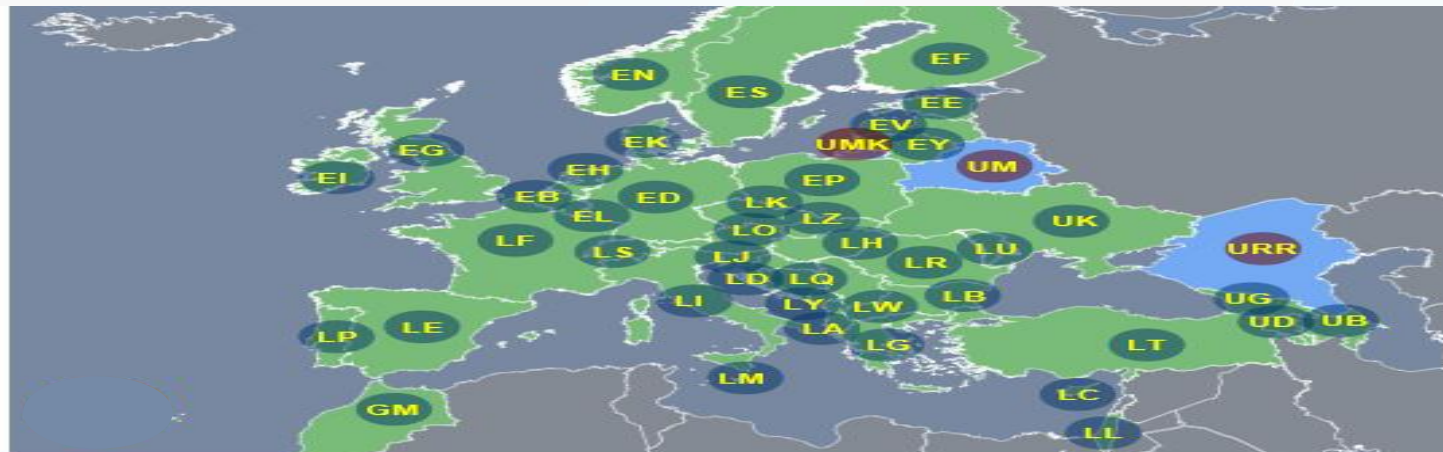


■ States receiving full ATFCM service
■ Adjacent areas

Network Manager Area of Operation

IFPS Distribution Area

- **IFPS Zone** : is the area which NMOC is responsible for the distribution of flight plans and associated messages to the ATC world,



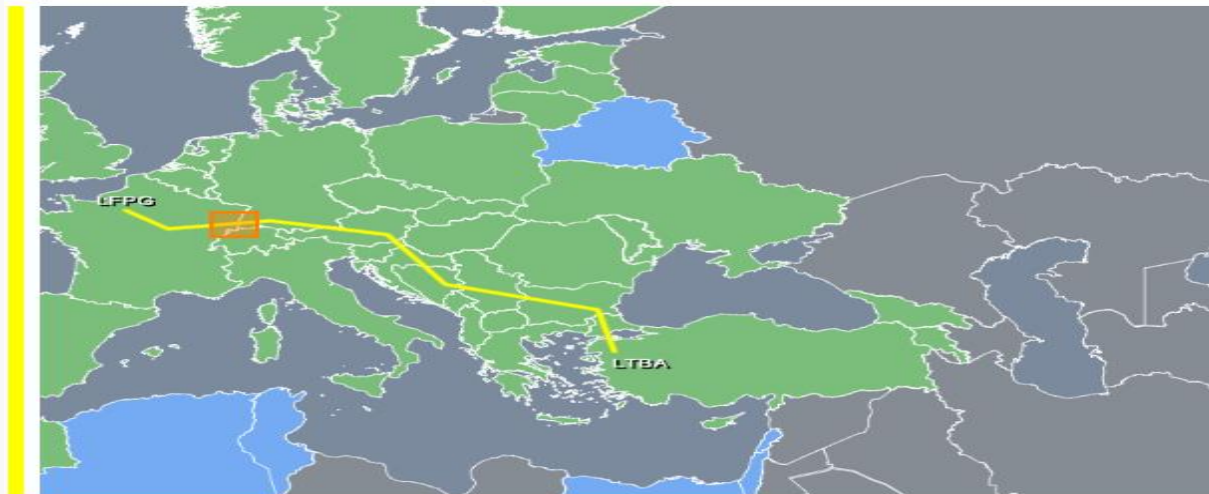
■ Countries in Distribution Area
■ Countries in "copy only".

How are different flights affected?

All IFR GAT flights intending to operate within the NMOC areas of operation must file a flight plan (inform NMOC). These flight plans are used when comparing demand and capacity:

- A flight departing from within the ATFCM area to anywhere .

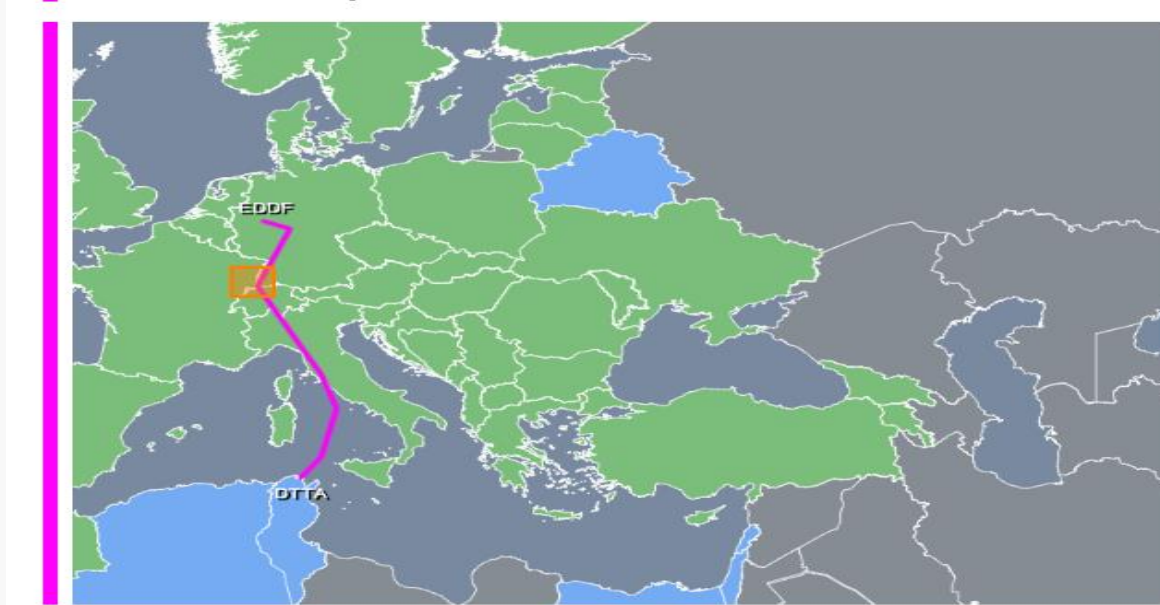
LTBA to LFPO : **is subject** to ATFCM measures



How are different flights affected?

- A flight departing from an IFR immediately adjacent to the ATFCM area of the NMOC ,and entering the ATFCM area.

EDDF to DTTA : **is subject** to ATFCM measures



How are different flights affected?

- A flight departing from an IFR immediately adjacent to the ATFCM area of the NMOC not entering the ATFCM area.

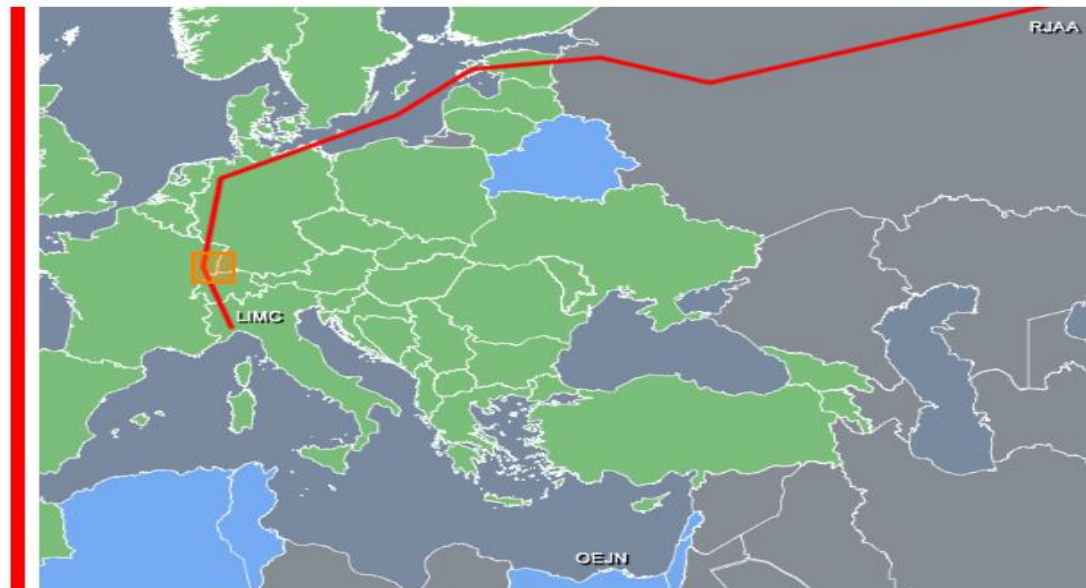
DTTA to OEJN : **is not subject** to ATFCM measures



How are different flights affected?

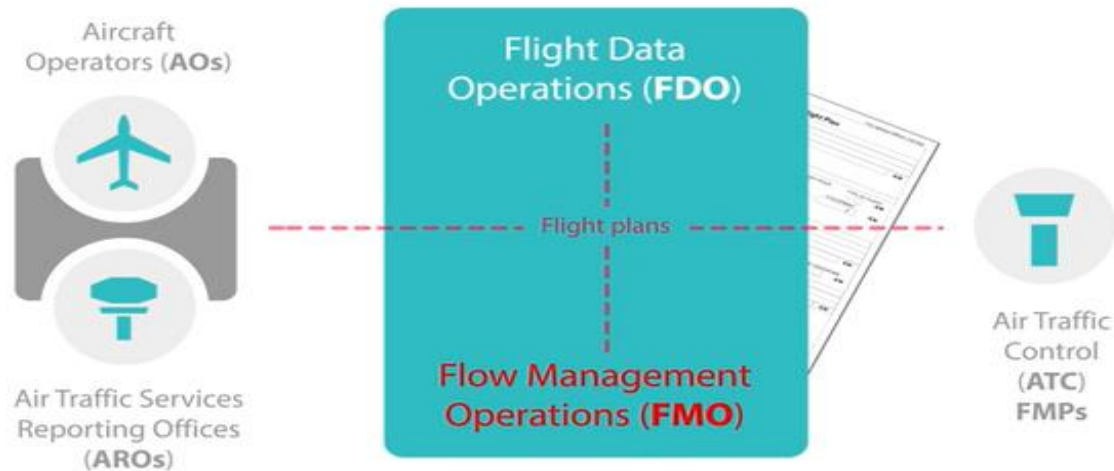
- A flight departing from outside the ATFCM area of the NMOC and outside FIRs immediately adjacent ,to anywhere.

RJAA to LIMC : **is not subject** to ATFCM measures



Network Operations systems & Main Data Flows

FPLs are sent by AOs or AROs to the Flight Data Operations, once the flight plan has been checked and validated by the FDO, a copy it is sent to the relevant air traffic control centres and flow management positions.



Network Operations systems & Main Data Flows

A copy is also sent internally, to the Flow Management Operations. All of these flight plans that are sent to the FMO are used to work out what the demand is at any particular moment in time.

In addition, the FMPs are requested to communicate their capacity to the Network Manager Operations Centre. If there is an imbalance between the demands on the airspace and the available capacity, ATFCM measures are discussed between the Network Manager Operations Centre and the FMPs.



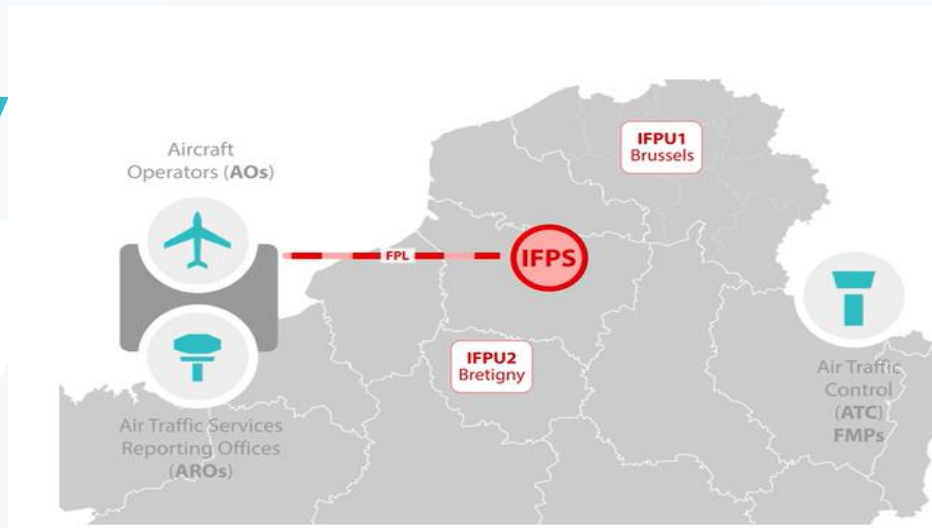
Network Operations systems & Main Data Flows

This could result in slots being issued and/or rerouting of flights. These measures would then be communicated to the originator of the flight plan. The FMPs are also asked to communicate any updates concerning the actual traffic situation and sector capacities.



Network Operations systems & Main Data Flows

The flight plans are sent to the IFPS or Integrated Initial Flight Plan Processing System. IFPS operations are carried out at two locations, IFPS1 is located in Brussels and IFPS2 is located in Bretigny which is close to Paris. The Repetitive Flight Planning System generates flight plans 20 hours before the estimated off blocks time for each flight.

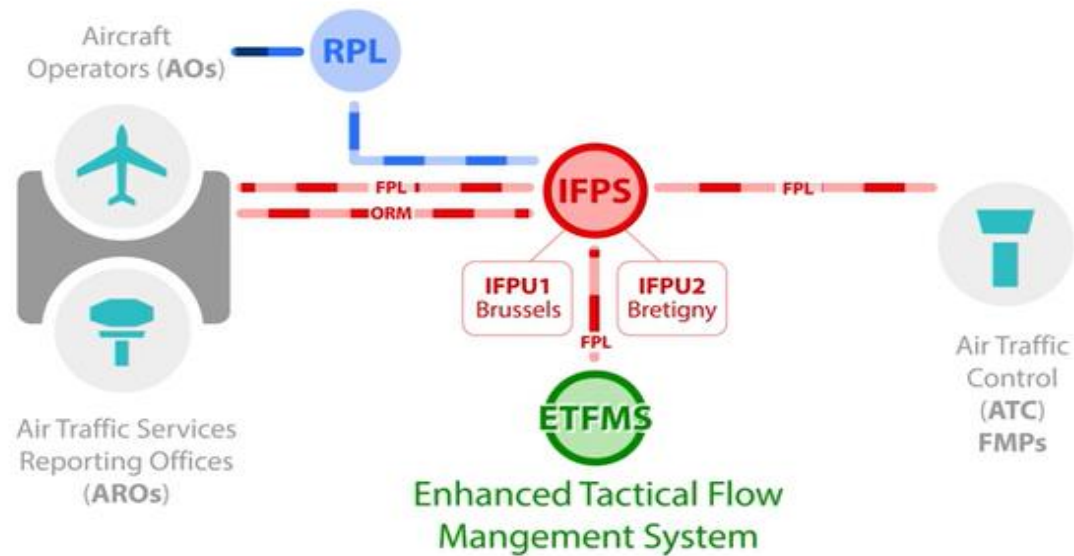


RPL



Network Operations systems & Main Data Flows

When the Operational Reply Message is an Acknowledge message, then a copy of the flight plan is sent to the FMPs and internally, to the Enhanced Tactical Flow Management System.

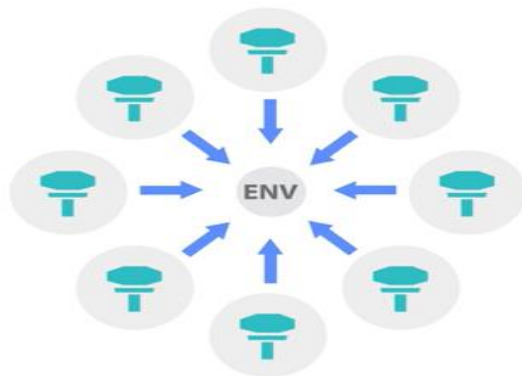


Network Operations systems & Main Data Flows

All the information about the operational areas and organisation of the air traffic services within the network are kept in the Network Management Environment Database.

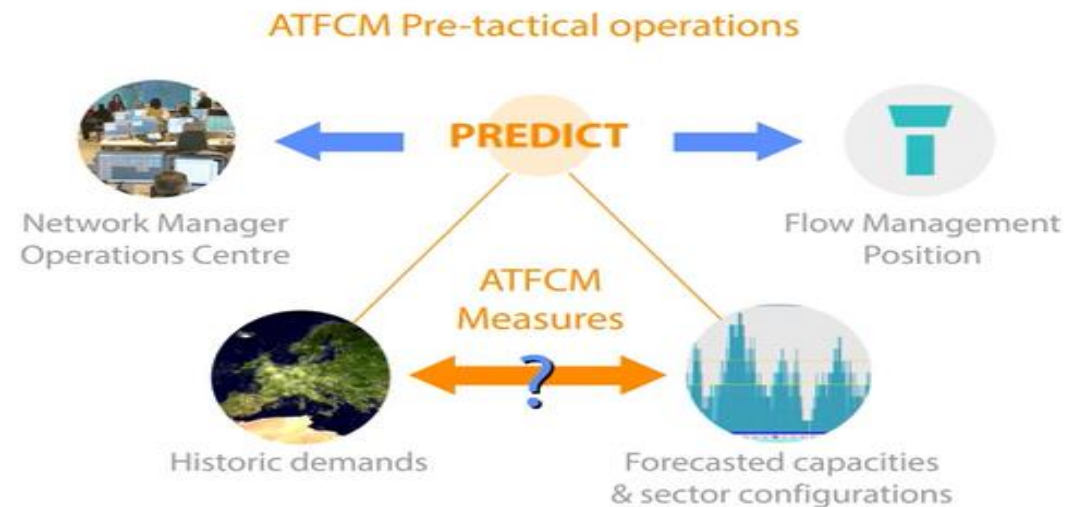
This Environment System provides data that is used by the IFPS, the RPL and ETFMS systems.

The FMPs feed this database with all information such as ATC Sectors and their configurations and capacity, ATS routes, routing systems, SIDs and STARs and NavAids.....



Network Operations systems & Main Data Flows

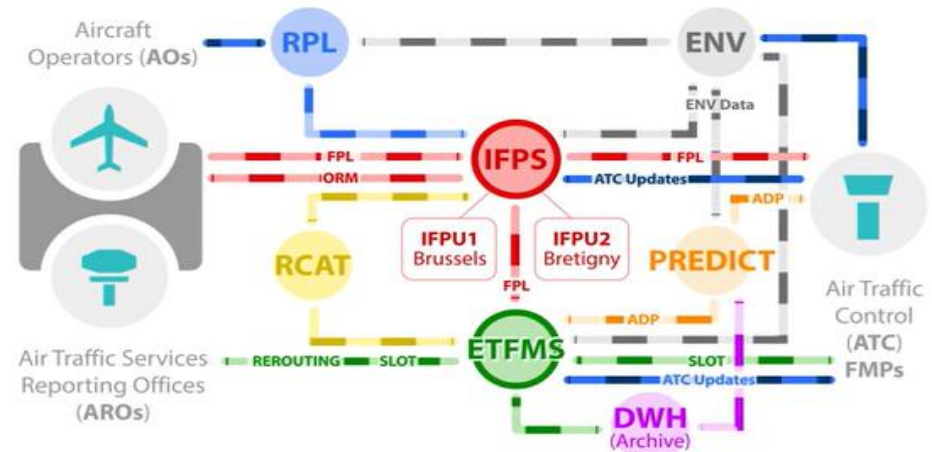
The Environment Database, also forwards information to the PREDICT system. This system is used by Network Manager Operations Centre and the FMPs during ATFCM Pre-tactical operations. This system compares historic demands with the forecasted capacities and sector configurations to predict if there will be a need for ATFCM measures on the following day



Network Operations systems & Main Data Flows

The regulation can be inputted into the system so as to assess its impact before being applied in the ETFMS. From this assessment an ATFCM Daily Plan is created.

ATFCM Pre-tactical operations



ATFCM Phases

ATFCM aims to optimise traffic flow across Europe while taking all customer needs into account. This requires a lot of planning and coordination. The NMOC applies a planning process to every day in the calendar. Each date is referred to as the “Day of Operation**” . The process starts well before that date and continues after it. The process is made up of four phases**

Network Manager Operations Centre



ATFCM Phases

- **Strategic Flow Management phase: seven days or before the Day of Operation**
Different stakeholders, NM, FMPs and AOs, aim to share information quickly and accurately to ensure activities are highly coordinated. This process is called **Collaborative Decision Making (CDM)**.



Collaborative Decision Making



ATFCM Phases

- **The Pre-Tactical Flow Management phase occurs over the six days before the Day of Operations. During that time, coordination continues and plans are further refined.**
- **Demand on the Day of Operation is compared with the predicted capacity. As a result, necessary adjustments are made to the plan created in the Strategic Phase.**



ATFCM Phases

- The main objective of the pre-tactical phase is to optimize efficiency and balance demand and capacity. This is done by effectively organising resources using, for example, sector configuration management and scenarios.
- Collaborative Decision Making is essential to ensuring the whole network is taken into account when deciding what action to take.
- The output from this phase is the ATFCM Daily Plan (ADP). It is published via ATFCM Notification Message (ANM) and via the NOP portal



Collaborative Decision Making



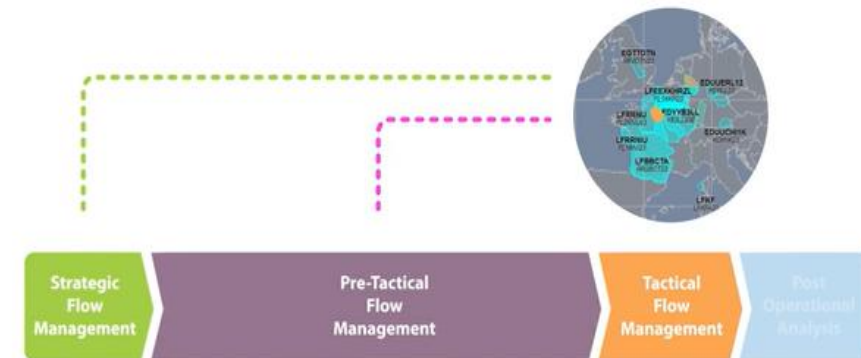
ATFCM Phases

- The output from the pre-tactical phase is the **ATFCM Daily Plan (ADP)**. It is published via **ATFCM Notification Message (ANM)** and via the **NOP portal**



ATFCM Phases

- **Tactical Flow Management phase takes place on the day of operations. Events that affect the ATFCM Daily Plan are considered in real-time and changes to the plan are made as required.**
- **This phase is aimed at ensuring that the measures proposed in the strategic and pre-tactical phases are the minimum required to solve demand capacity imbalances.**



ATFCM Phases

- **The provision of accurate information is vital as this phase produces short-term forecasts, including the impact of any event, and maximises the existing capacity without jeopardising safety.**



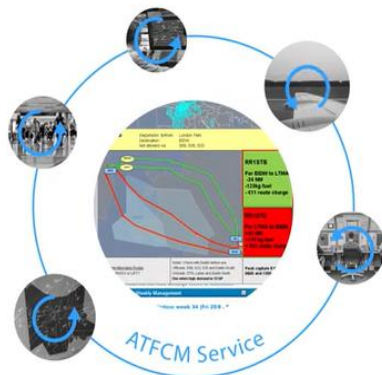
ATFCM Phases

- **Post Operational Analysis phase is the final step in the ATFCM planning and management process and takes place following the tactical phase of operations.**
- **During this phase, an in depth analysis measures, investigates and reports on the operational processes and activities from all relevant domains and external units.**



ATFCM Phases

- **All stakeholders within the ATFCM service should provide feedback on the efficiency of the ADP, including elements like ATFM measures and delays and the use of predefined scenarios. Feedback should also be given on any issues relating to flight planning and airspace data.**
- **The outcome of this phase is the progressive development of best practices and identification of actions to be avoided in future. This results in a continual improvement in operations.**



ATFCM Solutions to Capacity Shortfalls

- **When there is a need to manage the network capacity, but at the same time minimise the constraints placed on the operators, or when there are capacity shortfalls in parts of the network, then various ATFCM solutions need to be considered**



ATFCM Solutions to Capacity Shortfalls

The Network Manager along with the affected FMPs, evaluate various solutions for managing overloads before taking a decision on which solutions to implement. This is part of the Collaborative Decision-making process. This process ensures that the needs of all the Stakeholders are taken into account before implementing a solution.

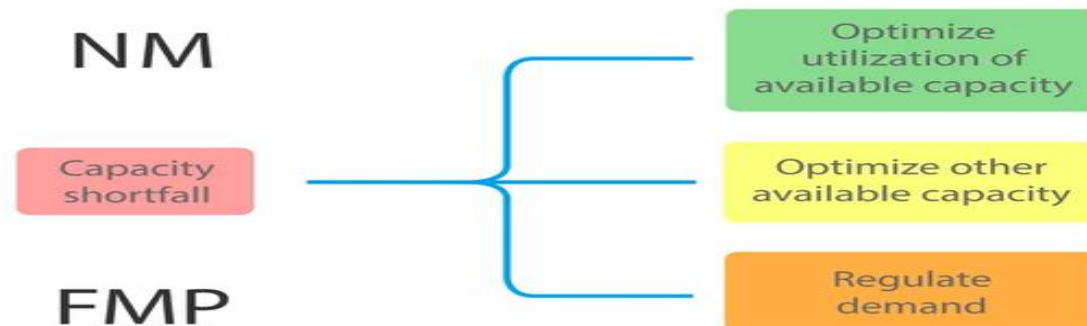


ATFCM Solutions to Capacity Shortfalls

The first step is to optimize the use of the available capacity:

- **Sector Management**

- **Changing sector Configuration**
- **Changing the number of Sectors, or**
- **Collapsing or splitting the sectors**
- **By Balancing the Arrival and Departure Capacity for an aerodrome**
- **Negotiating extra capacity**
- **Co-ordinating with the military for airspace usage**



ATFCM Solutions to Capacity Shortfalls

When those solutions have been exhausted, and If there is still a capacity issue, the Network Manager Operations Centre will attempt to shift traffic demand into areas where capacity is still available:

- Re-routeing of entire traffic flows
- Or re-routing of individual Flights
- Implementing Flight Level management with specific flights
- Or in the case of aerodromes, by Advancing the traffic that is capable of departing earlier than originally flight planned
- Tactical ATFCM measures can be implemented by the FMPs

Network Manager
Operations Centre



Capacity
shortfall



Capacity
available

ATFCM Solutions to Capacity Shortfalls

However, if these solutions have been implemented and there are still capacity shortfalls, then the traffic will be managed by **Regulating the Demand**.

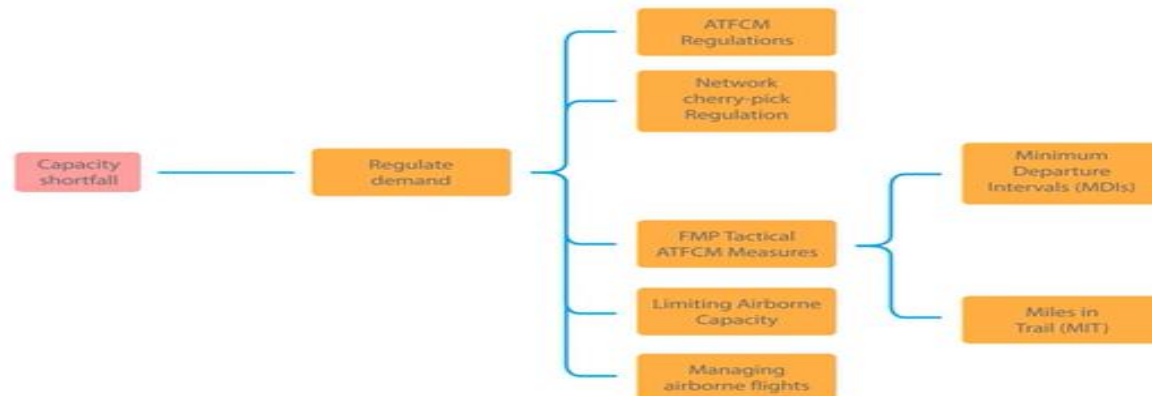
Flights taking place on that day will receive the benefit of ATFCM, which includes the allocation of **individual aircraft departure times, re-routings to avoid bottlenecks, and alternative flight profiles to maximize efficiency.**



ATFCM Solutions to Capacity Shortfalls

This can be achieved through the:

- Implementation of ATFCM Regulations,
- Regulating the demand may also be achieved by tactical ATFCM, measures that are implemented by FMPs, such as
 - establishing Minimum Departure Intervals between aircraft,
- Or by limiting the airborne Capacity,
- Managing the already airborne flights.



Morocco experience with implementation of ATFCM

The Comprehensive Agreement signed between Morocco/ONDA and Eurocontrol allowed in terms of the ATFCM to benefit from all the services provided by the NMOC.

Casablanca FMP shall ensure that the NMOC has all relevant data to enable it to carry out its responsibilities in all phases of the ATFCM operations:

- **Sector configurations.**
- **Capacities values.**
- **Traffic volumes.**
- **Taxitimes and Runway configurations .**
- **All the Env Data**
- **SIDs &STARs**

Morocco experience with implementation of ATFCM

- **Casablanca FMP is the local ATFCM partner for the ACC, other ATS units (military and civil) within Casablanca FMP area of responsibility (GMMM FIR) and local Aircraft Operators.**
- **The FMP of Casablanca is responsible for providing advice and information to ACC and to AOs as may be required.**
- **Casablanca FMP covers 24 hours.**

Morocco experience with implementation of ATFCM

Responsibilities of Casablanca FMP on pre-tactical Phase:

- **On D-1 the FMP should access PREDICT (same day of last week and the corresponding day in the last year) and evaluate the situation of the traffic for the day of operation D,**
- **Possibility to discuss the Pre-tactical Plan with the NMOC,**
- **Discuss this plan with the supervisor on duty if necessary,**
- **Anticipate the required solutions (dispatching).**

Morocco experience with implementation of ATFCM

Responsibilities of Casablanca FMP on tactical Phase

Monitor the load and compare demand with the monitoring capacity value of critical sectors.

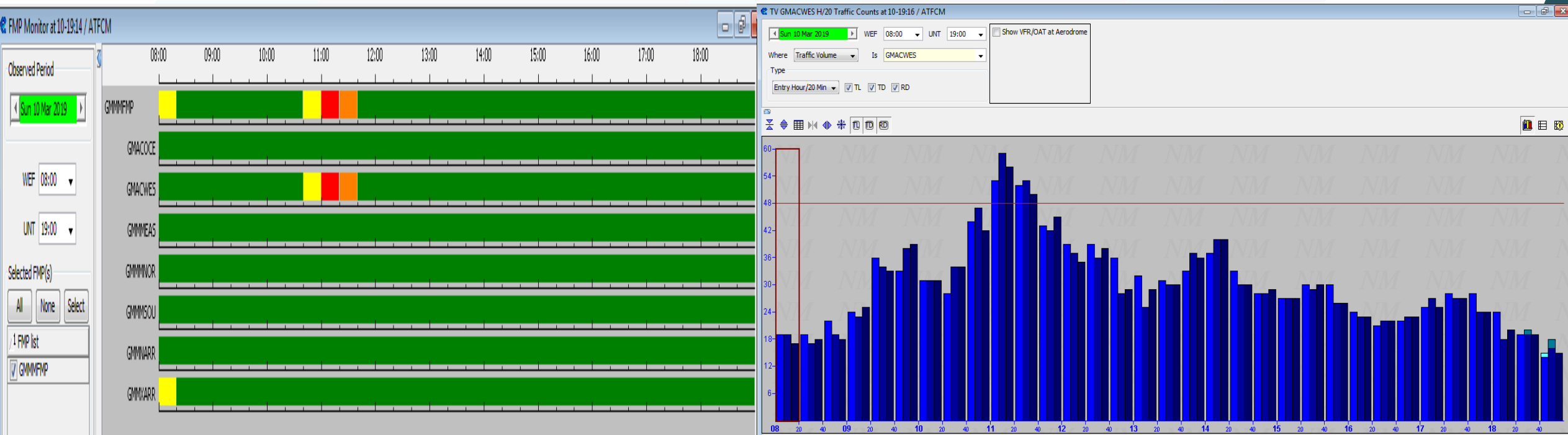
Taking appropriate actions if demand exceeds the capacity such as:

- **Coordinate with the supervisor the reinforcement of the concerned control positions by the adequate ATCO staff,**
- **Opening additional sectors.**
- **Coordinate some Rerouting with the NMOC.**
- **Coordinate tactical Rerouting with adjacent ACCs/FMPs to off load sectors,**
- **Coordinate temporary increase capacity with supervisor and NMOC ,or**
- **Coordinate with NMOC implementation of ATFCM measure in the affected Sector.**

Morocco experience with implementation of ATFCM

Responsibilities of Casablanca FMP on tactical Phase

- Monitor the effect of implemented Measures and take any appropriate action if require;
- Analyze delays in the slot list and try to reduce them in coordination with the NMOC;
- Provide support ,advice and information to ATC,airports and AOs as required.



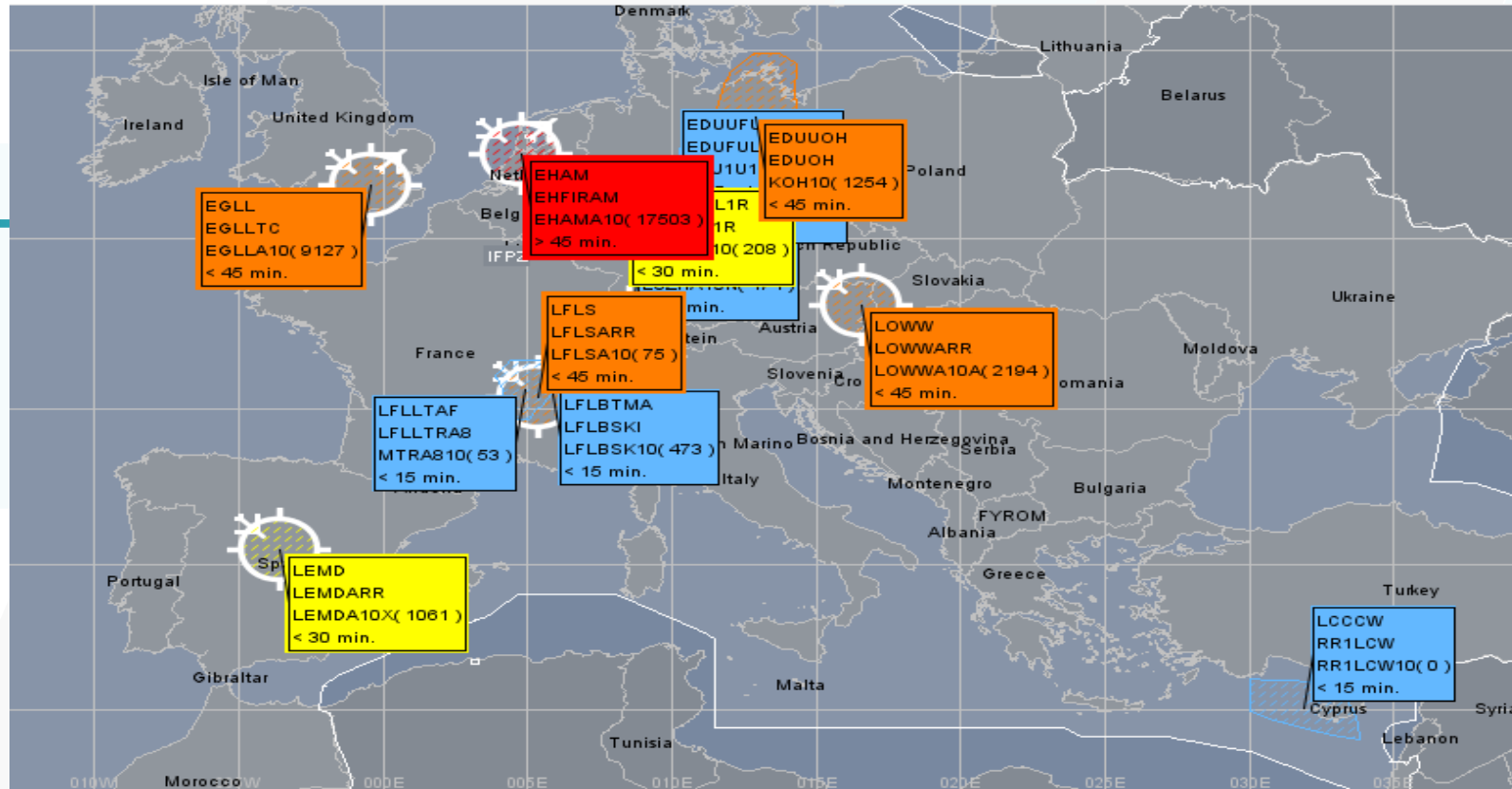
Morocco experience with implementation of ATFCM

Case of special events within the area of responsibility of Casablanca FMP
(COP22, Marrakech airshow , volcanic ash , Aerodrome closure...):

Close coordination with the NMOC to take the appropriate measures to manage the traffic and to reduce delays to the users.
NMOC will inform the AOs by an AIM, NOP portal ...

Morocco experience with implementation of ATFCM

Casablanca FMP can have a full picture regarding the ATFCM measures implemented in the NMOC area,



Morocco experience with implementation of ATFCM

Flight Planning Procedures

- On 05 June 2008 Morocco has become part of the IFPS Zone,
- An AIC is published to describe the flight planning procedures within GMMM FIR,
- Morocco has delegated responsibility for the provision of flight planning services to the Integrated Initial Flight Plan Processing System(IFPS),

Morocco experience with implementation of ATFCM

Flight Planning Procedures

Access to RAD (Route Availability Document)

- ATFCM Tool,
- Updated each AIRAC Cycle,
- Facilitate flight planning to improve ATFCM,
- Allow AOS flight planning flexibility.

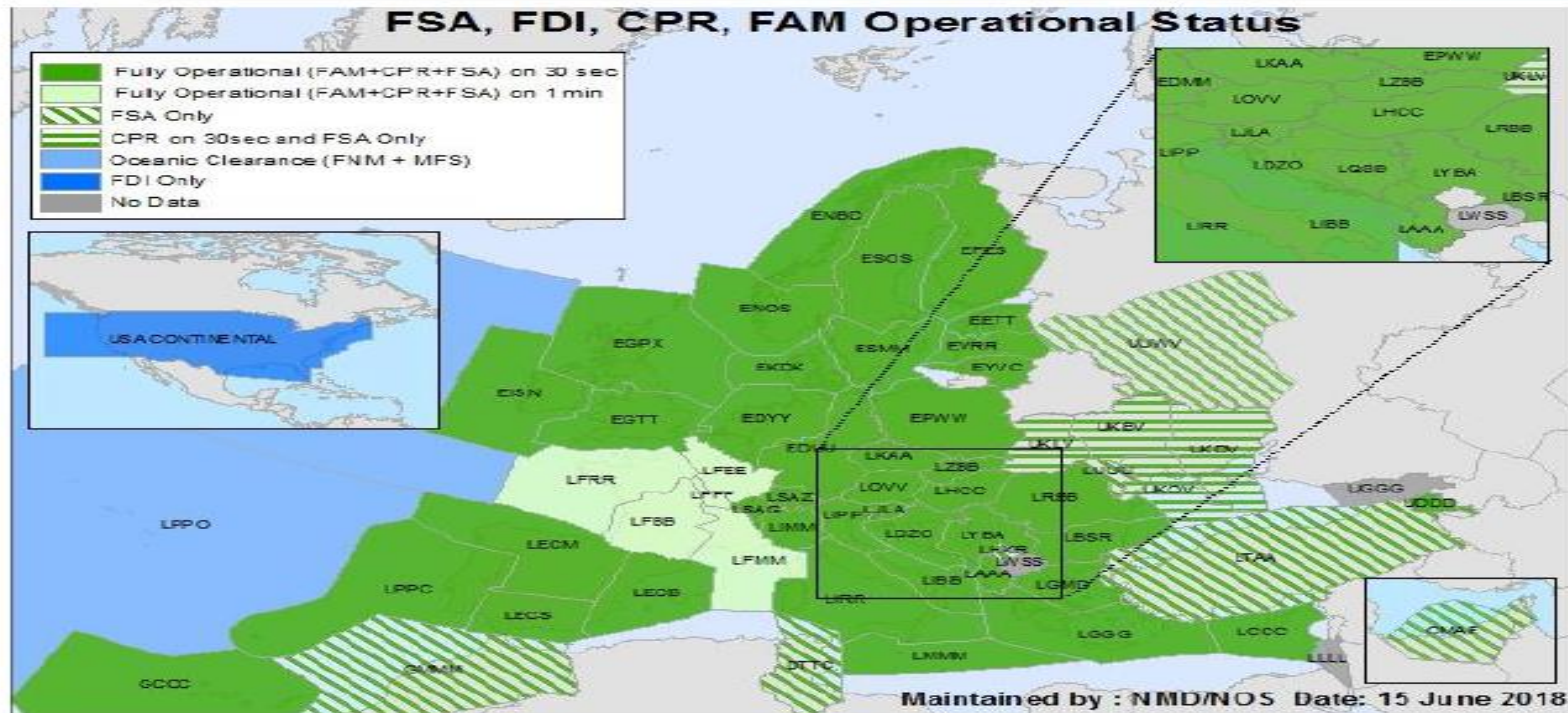
Morocco experience with implementation of ATFCM

Sectors Capacity study

To meet the challenge of the increase in traffic and to better manage the traffic in Casablanca FIR , a Sectors capacity study was developed by Eurocontrol's CAPAN team in 2017.

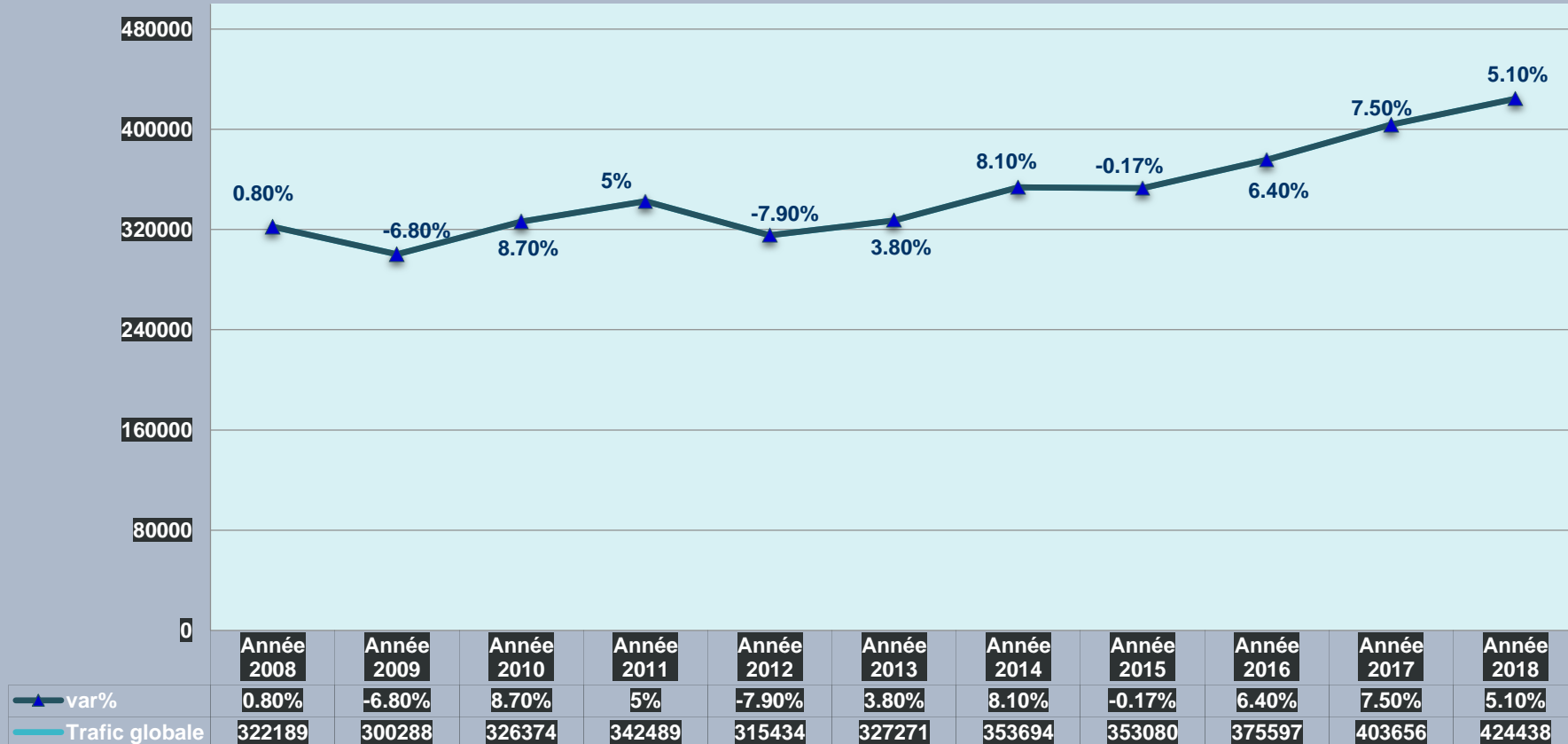
Morocco experience with implementation of ATFCM

To improve ATFCM and flight efficiency within the ATFCM area Morocco ATM system send the FSA (*First system Activation message*) messages to the ETFMS,
The provision of CPRs messages by Morocco is on going,

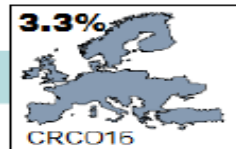


■ IFR flights statistics

Traffic growth in Morocco 2008/2018



■ Average annual growth per State between 2017/2024



EUROCONTROL
Statistical
Reference

