



ICARUS Research Group

UNIVERSITAT POLITÈCNICA DE CATALUNYA

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Location

- **Technical University of Catalonia – Barcelona TECH**

- 15 schools and 40 departments
- 30.000 students - 2.500 researchers



UNIVERSITAT POLITÈCNICA
DE CATALUNYA
BARCELONATECH



Escola Superior d'Enginyeries Industrielles,
Aeroespacial i Audiovisual de Terrassa

UNIVERSITAT POLITÈCNICA DE CATALUNYA

- B.Sc. Aerospace Technology
- B.Sc.. Aerospace Vehicles
- MSc. Aeronautical Engineering



Escola d'Enginyeria de Telecomunicació i
Aeroespacial de Castelldefels

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

- B.Sc Aerospace systems (airport + air navigation)
+ double degree with Telecom Engineering
- M.Sc. Aerospace Science and Technology
- M.Sc. Unmanned Aircraft Systems Engineering



Location

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Mar 2018



ICARUS Research group

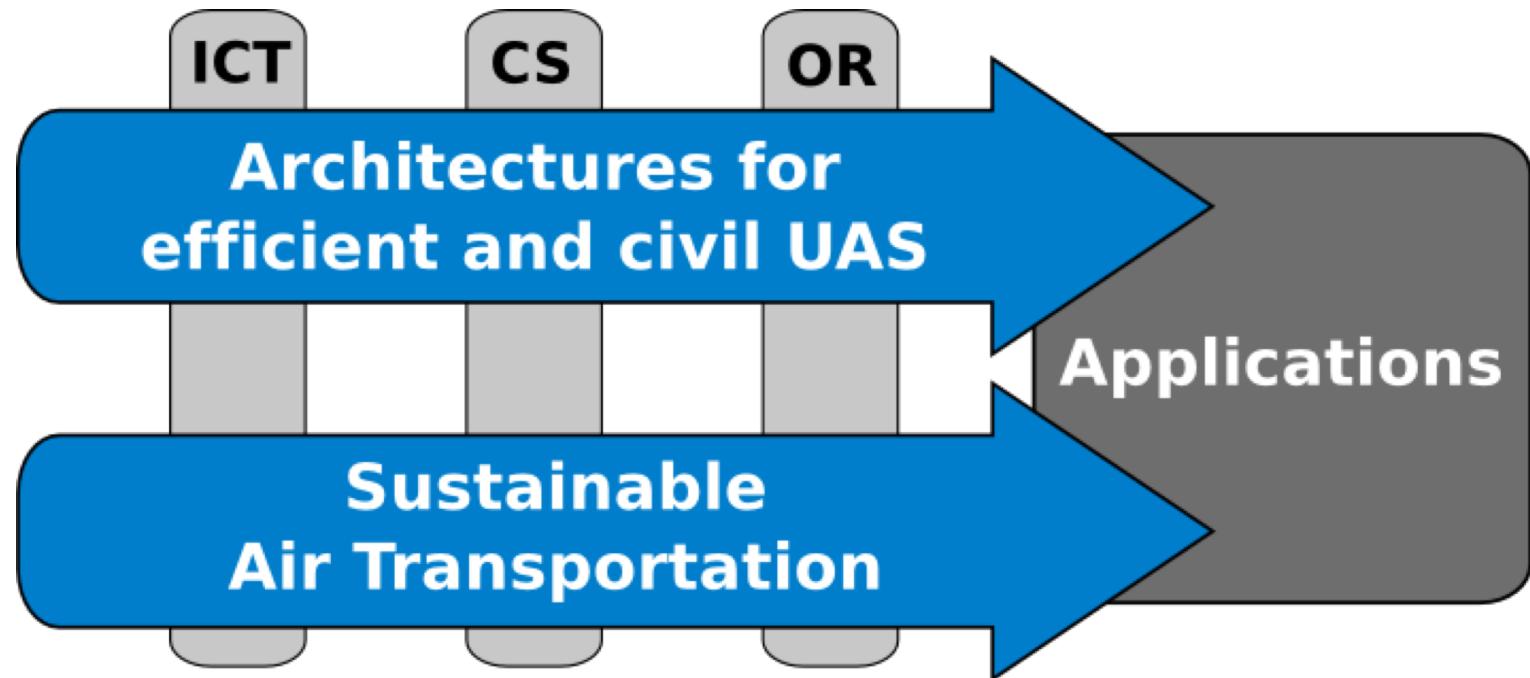
- 9 faculty* + 1 technical staff + 6 PhD + n students/interns.
- Located in *Castelldefels* UPC Campus (16km from Barcelona)
- Complementary skills on aeronautics, telecommunication engineering and computer science.



(*) Computer
Architecture Department
+ Physics Department
(Aerospace Division)



Research lines



ICT: Information and Communication Technologies

CS: Computer science

OR: Operational research

UAS: Unmanned Aerial Systems



Main research interests

1- Highly automated civil operations for drones

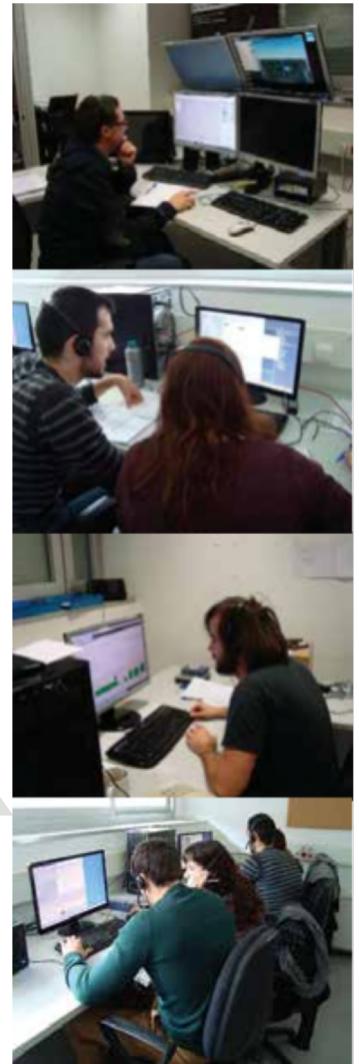
- Mission planning, payload management and flight planning
- Contingency management
- Embedded avionics and avionic architectures

2- Integration of UAS/RPAS into civil airspace and ATM

- Unmanned Traffic Management (UTM)
- Trajectory prediction and optimisation
- Separation and collision avoidance
- ATM performance impact of RPAS operations
- Simulation tools



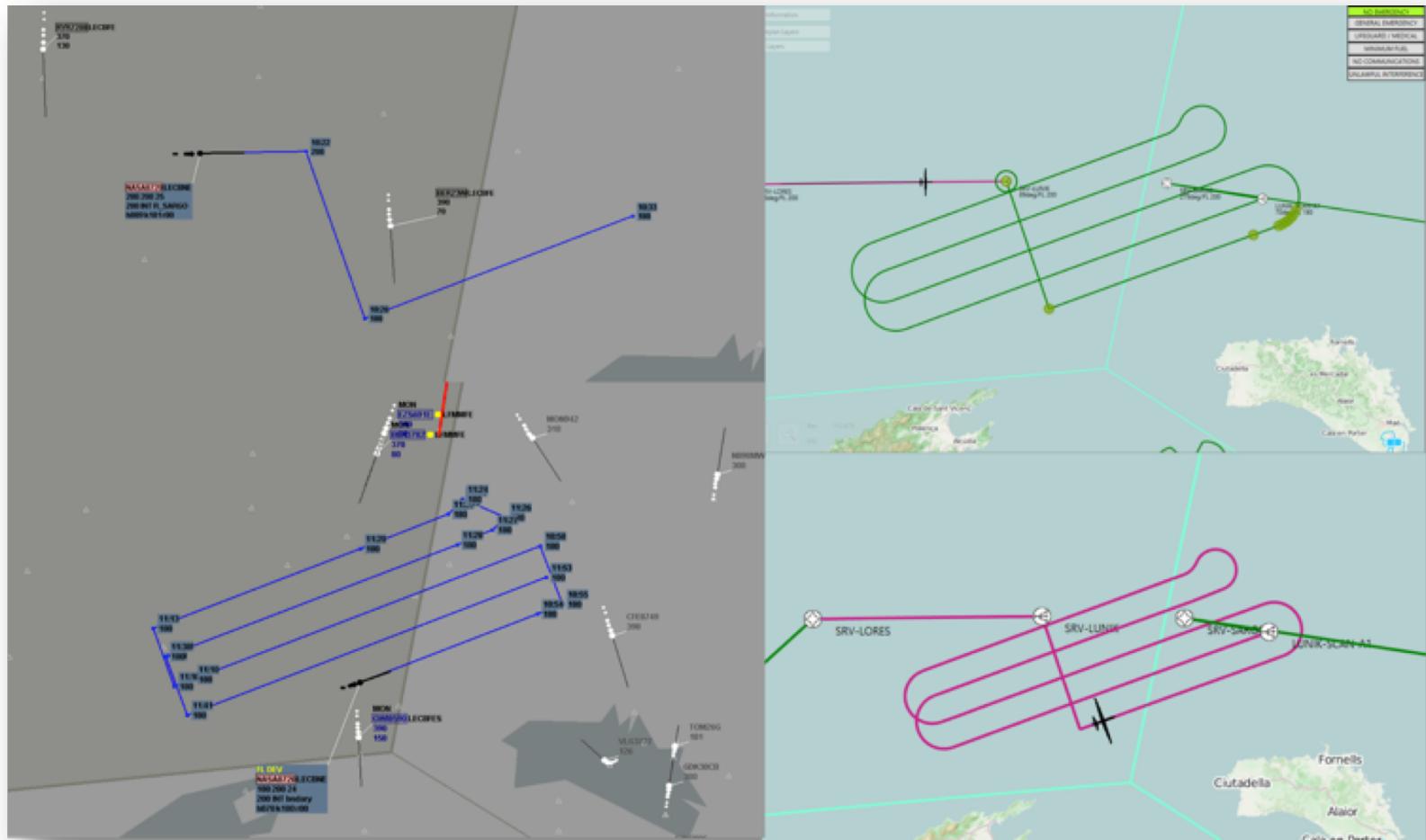
Main research interests



Main research projects



Main research projects



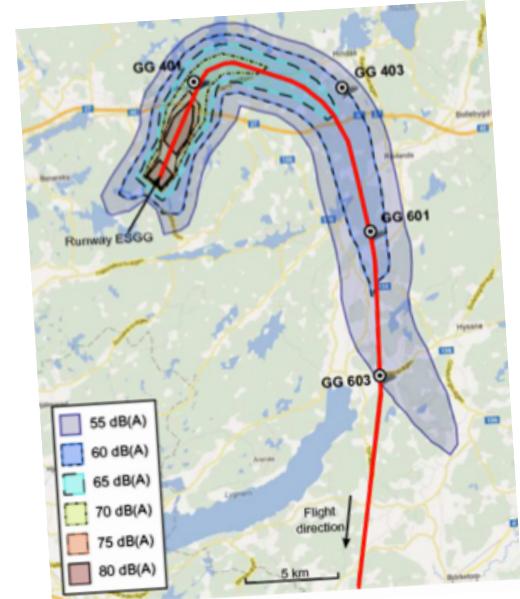
ATC interface
(different levels of flight intents)

RPAS ground station
interface

Main research interests

3- Trajectory based operations

- Trajectory optimisation (optimal control)
- Real-time and algorithm stability aspects
- Environmental impact assessment and mitigation
- On-board trajectory planning and guidance
- Self-separation algorithms
- On-board/ground trajectory prediction and estimation



Trajectory based operations

Long term (year/months)

BDT: Business Development Trajectory



Internal amendments by airline

Mid/short term (months/days)

SBT: Shared Business Trajectory



Network manager

NOP

ANSPs

Other airlines

Execution (minutes)

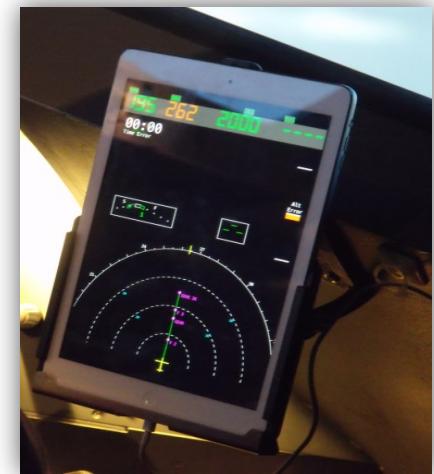
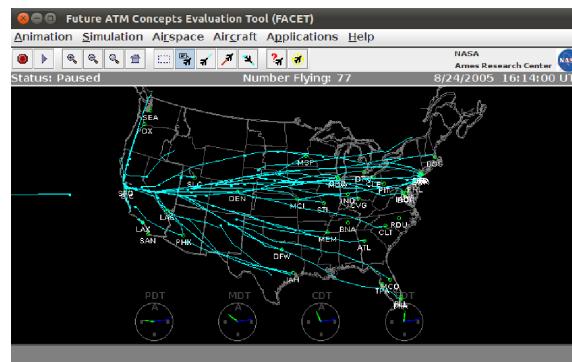
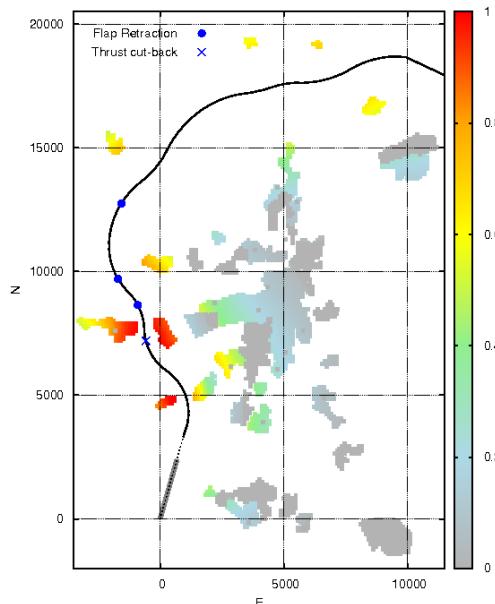
RBT: Reference Business Trajectory



ANSPs

Other airlines

Trajectory updating and renegotiation



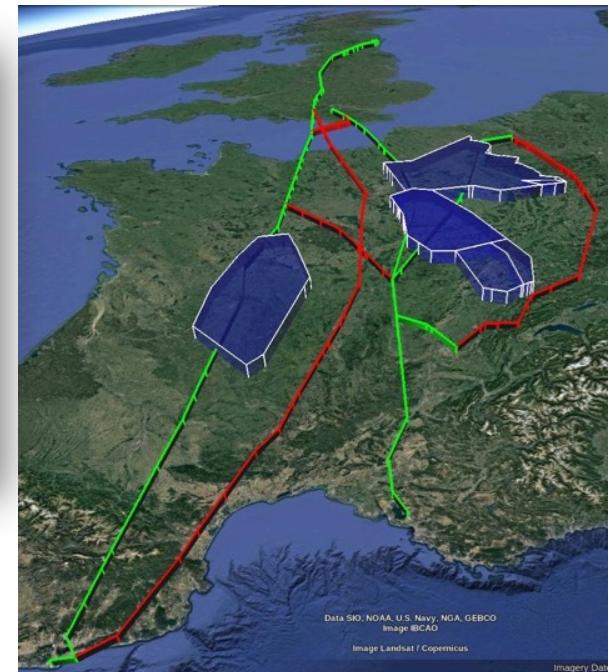
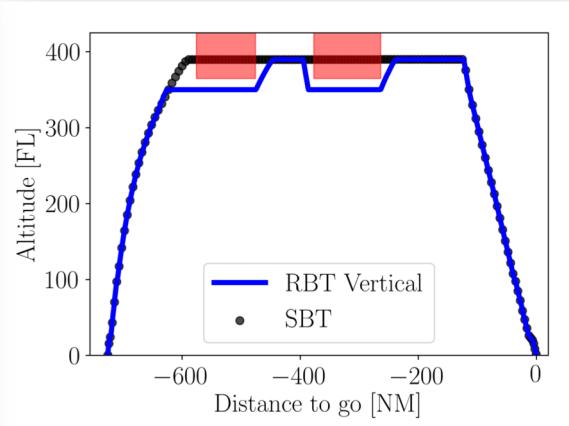
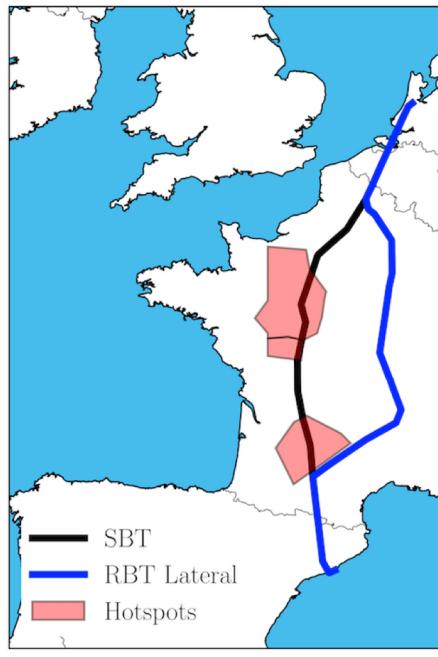
Main research projects



Main research interests

4- Network optimisation in strategic and pre-tactical phases

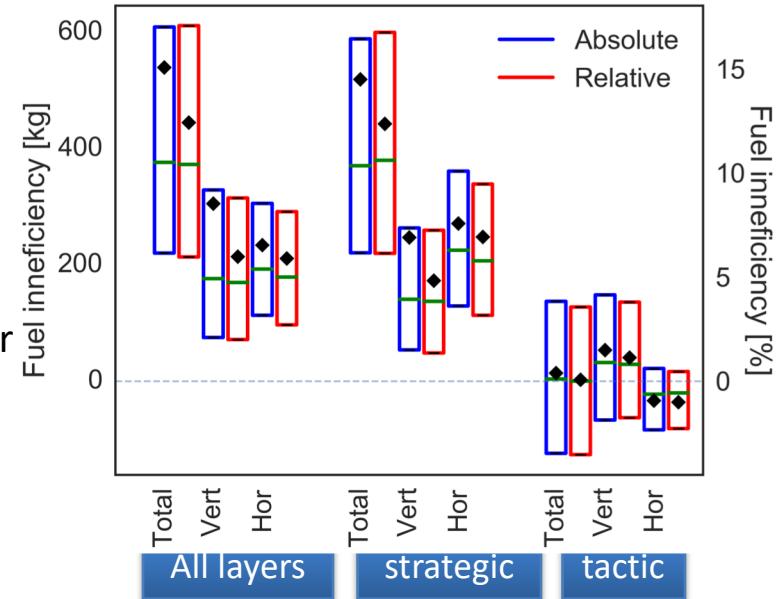
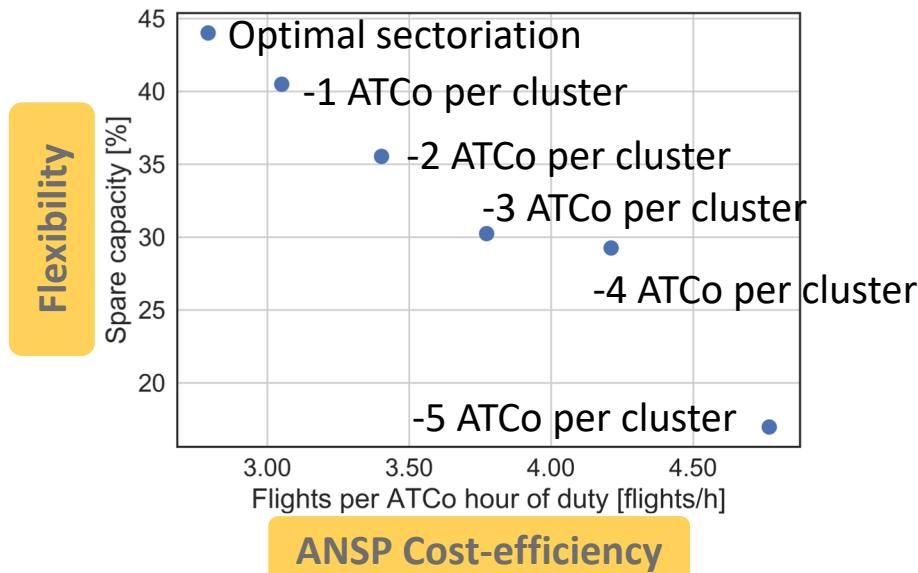
- Advanced demand and capacity balance (DCB) algorithms
- Multi-objective optimisation of ATM network performance
- User driven prioritisation protocols (UDPP)



Main research interests

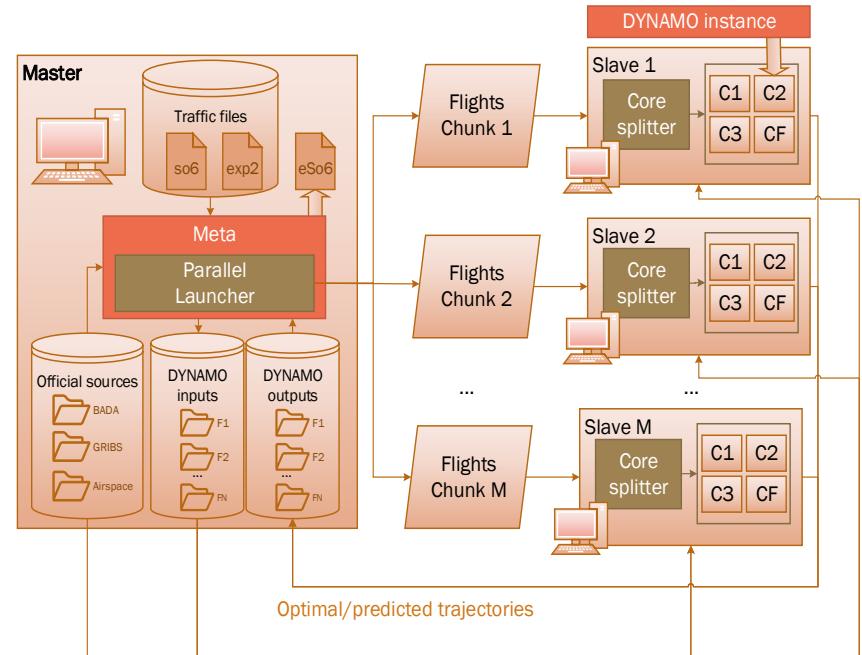
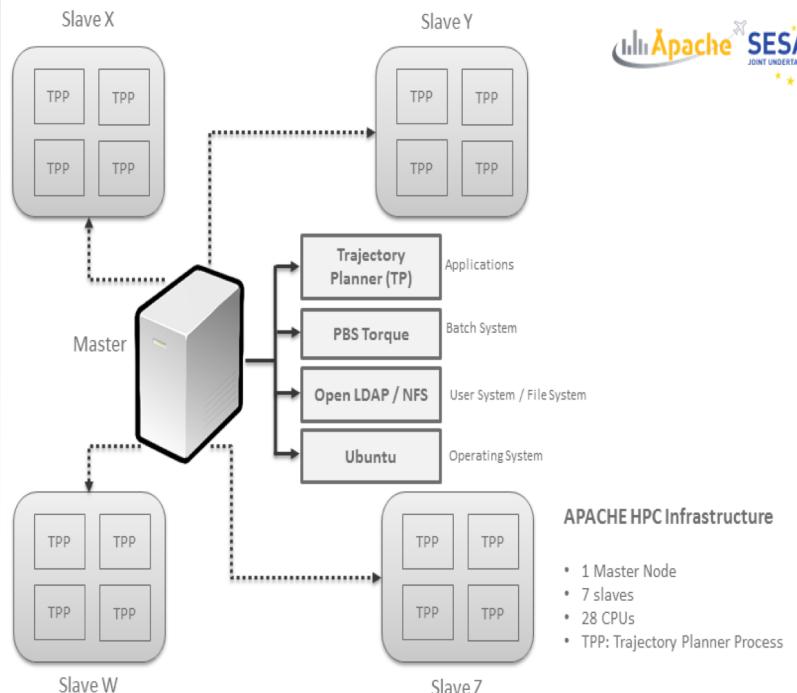
5- ATM analytics and ATM performance

- Systematic computation of Performance Indicators
- Advanced environmental and cost-efficiency indicators
- Analysis of trade-offs in ATM key performance areas
- Weather estimation for ATM applications
- Trajectory prediction trajectory parameter estimation



Main research interests

High performance computing (HPC)
For trajectory optimisation/prediction



More than 1M trajectories will be simulated (optimised) in APACHE

Main research projects

Competitive funded projects related with RPAS/UAS

2017-2019	CORUS	Concept of Operations for EuRocean UTM Systems	SESAR JU	
2017-2019	FLOR	Flight Operations of multiple RPAS	MICINN	
2014-2016	ROSES	RPAS Operations in the Single European Sky	MICINN	
2013-2015	ERAINT	Evaluation of the RPAS-ATM interaction in non-segregated airspace	SESAR JU	
2011-2013	ICARUS-II	Intelligent Communications and avionics for robust UAS	MICINN	
2008-2013	Smooth UAV	Evaluation and new strategies for the smooth integration of civil mission oriented UAV in non-segregated airspace	Eurocontrol	
2008-2009	EVSIBURG	Feasibility study of a UAV and GNSS based flight inspection system	CDTI	
2007-2010	ICARUS	Intelligent Communications and avionics for robust UAS	MICINN	
2006-2007	SKY-EYE	Aerial system for the detection, control and analysis of wild forest fires	MICINN	

C

Main research projects

Competitive funded projects related with ATM

2017-2018	ENJAMBRE	<i>Misiones críticas de emergencias con medios aereos tripulados y no tripulados en vuelo cooperativo</i>	CDTI	
2018-2016	APACHE	Assessment of Performance in current ATM operations and of new concepts of operations for its holistic enhancement	H2020 (SESAR)	
2018-2016	R-WAKE	Wake-vortex simulation and analysis to enhance en-route separation management in Europe	H2020 (SESAR)	
2015-20118	AIRPORTS	Airport Improvement Research on Processes & Operations of Runway, TMA and Surface	CDTI	
2015-2016	BUDAPEST2.0	Budapest 2.0	SESAR JU	
2014-2015	CONCORDE	Flight Operations for novel continuous descent approaches	Clean Sky JU	
2012-2013	FASTOP	Fast optimiser for continuous descent approaches	Clean Sky JU	

Technology transfer projects

The ICARUS group also carries out projects in partnership with industry, either offering consultancy services or providing them with technology transfer.

Principal institutions that have trusted the group's services in the last 10 years:



ARINC



inypsa

PildoLabs

Thank you!



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