



IESTA: evaluating air transport systems using a rich, modular, generic, managed platform

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retour sur innovation

A reusable simulation platform

- Current air traffic simulators are often:
 - monolithic
 - dedicated for a single type of study
- Need for modular simulator:
 - simulation scope may change
 - simulated parameters must grow more complex
- Need for connectable simulation:
 - other simulators may be more specialized in a precise field
 - develop simulation cooperation

Outline

- Development methodology used to face:
 - aggregation of various complex models
 - efficient development of a complex software infrastructure
 - complex data exploitation
- General infrastructure & software products
- Applications, conclusion & perspectives

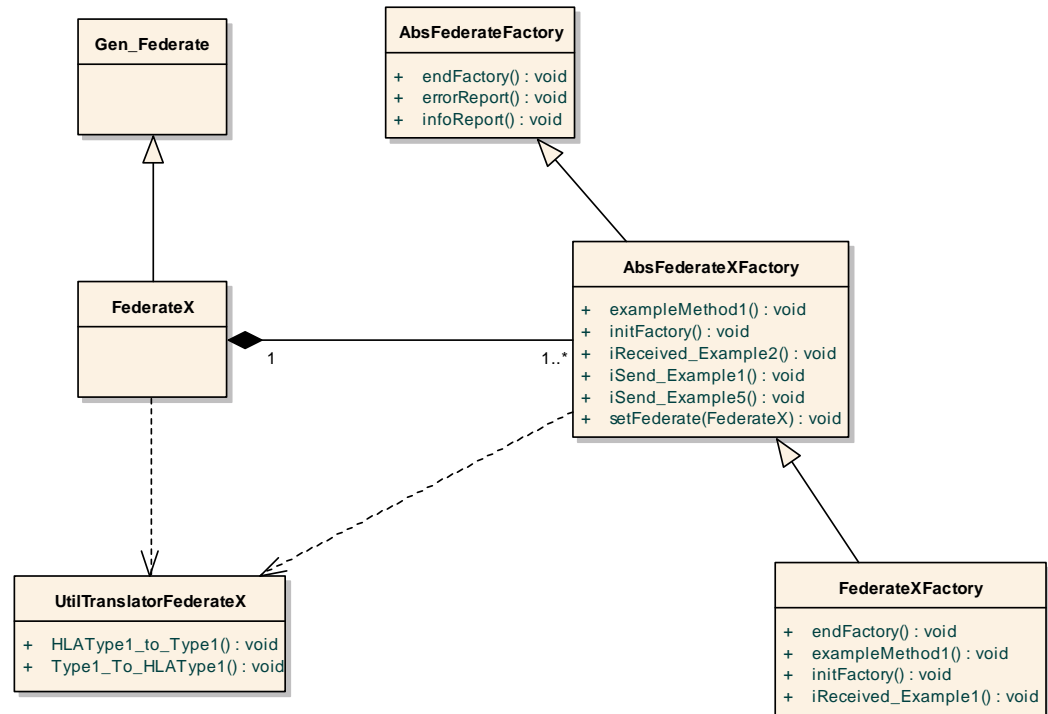
The High Level Architecture

- Commonly used in industry; standardized by IEEE
- A modular approach for distributed simulation:
 - precise development framework
 - various interoperating models at different levels of granularity
 - model capitalization
- Genesis:
 - an ONERA tool for creating HLA simulations
 - designing, specifying, generating code
 - allows to use the power of the HLA standard without its heaviness



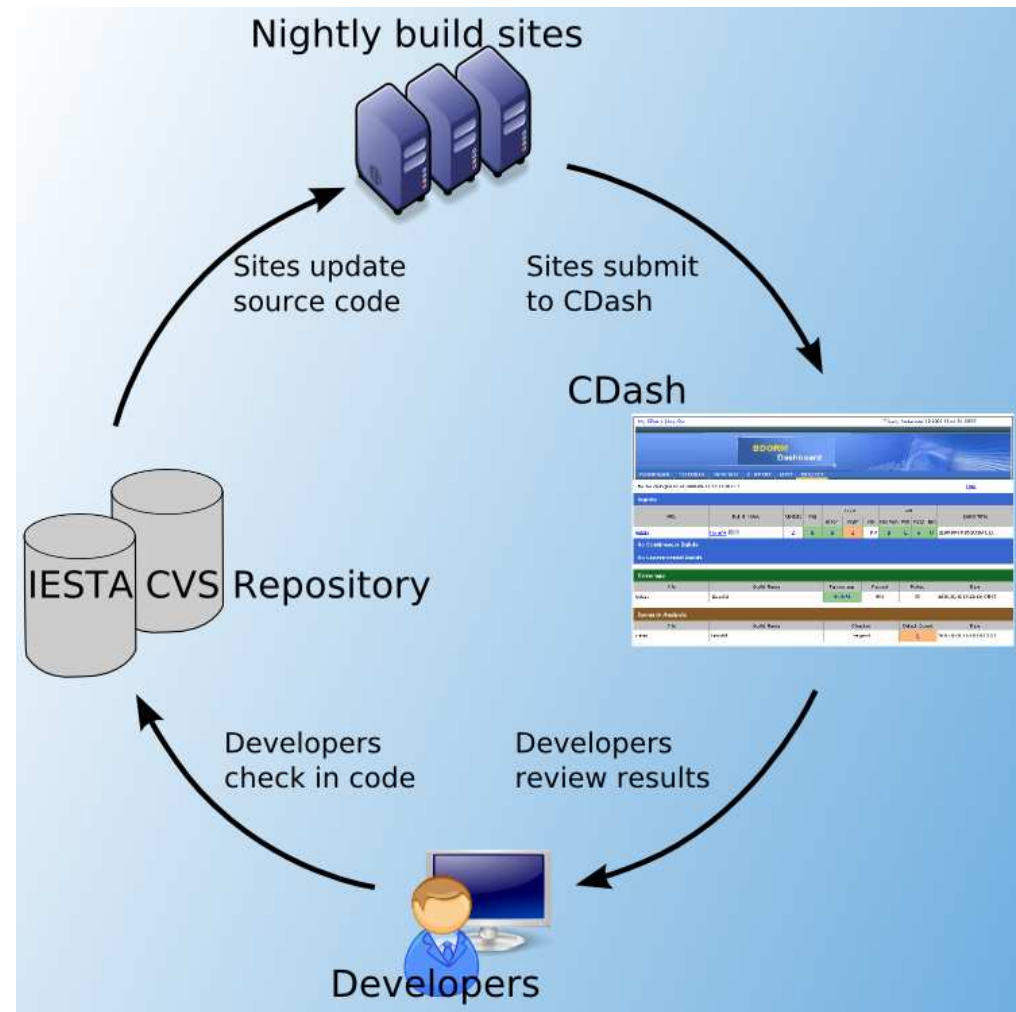
Federates and encapsulation

- The platform is designed to use external physical models
- HLA standards connect models if they can handle communication standards
- Encapsulation software are designed to translate communication



Build quality process of the IESTA platform

- Code quality requires rigorous review methods:
 - integration cycle
 - specialized maintenance tools
 - unit test
- CMake / CDash:
 - nightly code build
 - failed build reports
 - code inspection tools



Exploiting simulation data

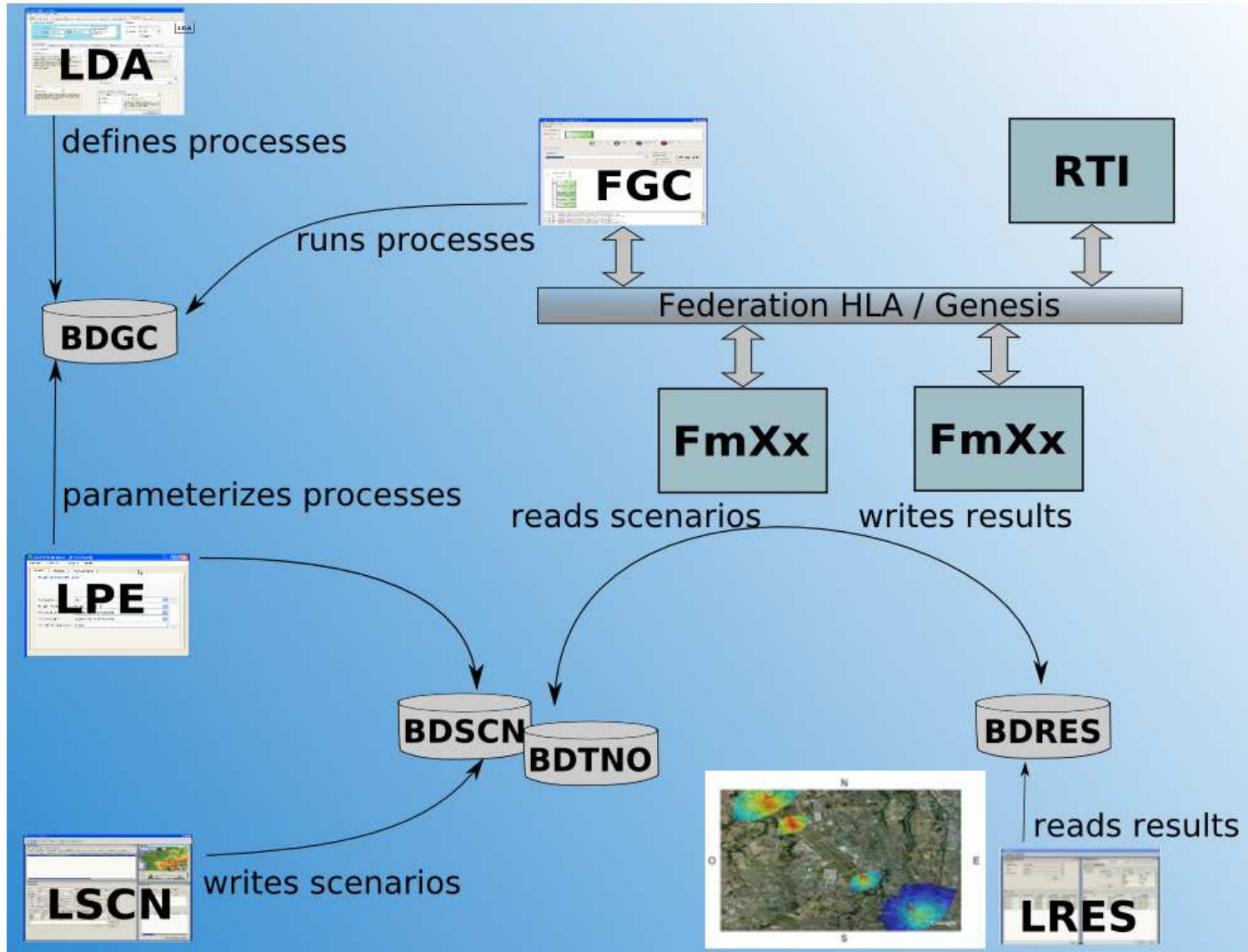
- External libraries are used to enrich the platform display tools
 - Qt as a well-supported C++ graphic library
 - LuciadMap as a complete GIS solution for Java
 - Delta3D as an open-source 3D engine for C++



Outline

- Development methodology
- General infrastructure & software products:
 - an overview of the infrastructure
 - databases
 - user accessibility: the IESTA tools
- Applications, conclusion & perspectives

IESTA platform description: sample experiment

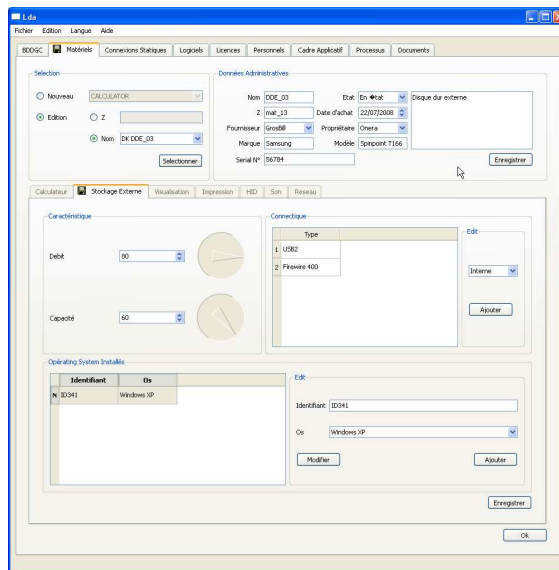


IESTA database architecture

- Databases are at the core of the IESTA platform:
 - ensure data consistency
 - protect data confidentiality
- Different systems for different types of data:
 - 2 relational databases to handle complex simulation description objects
 - 2 file databases for massive and results data
- The use of dedicated APIs ensures the independance of the platform software from the databases

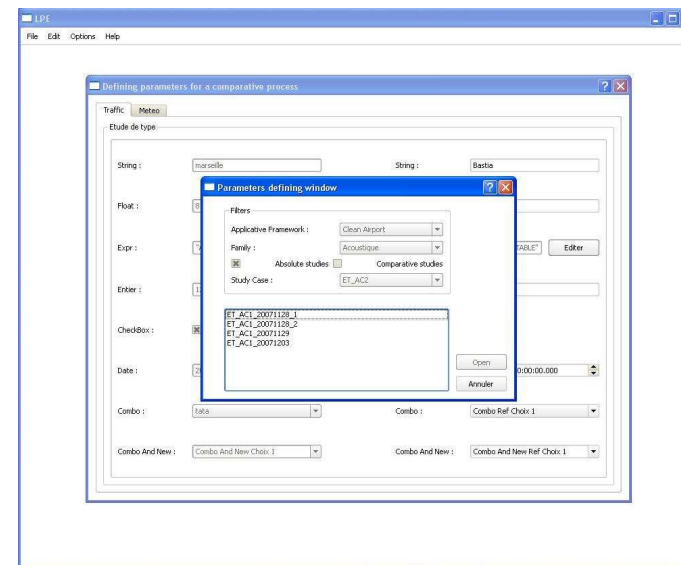
IESTA administrative tools

- LDA (Architecture Definition Software)
 - platform management: clients, networks, software, licences...
 - creating a new study: study parameters, tasks and programs...



- LPE (Process Parameters Definition Software)
 - study parameter management
 - absolute or comparative studies

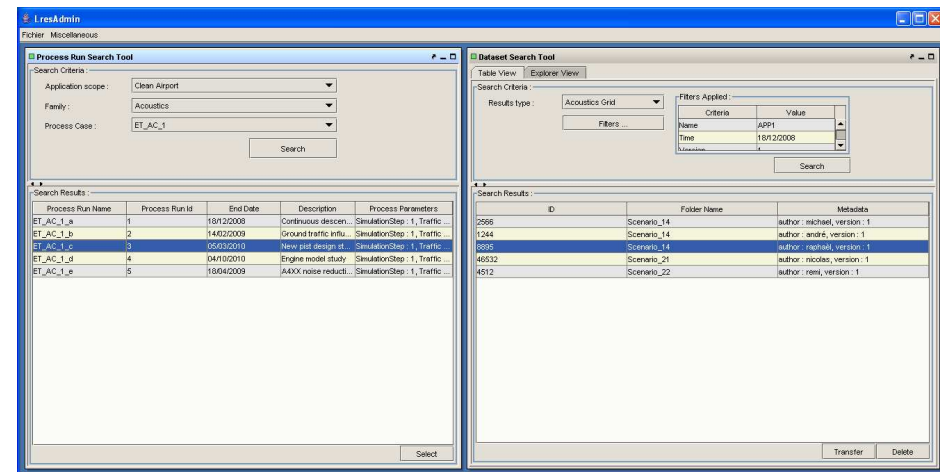
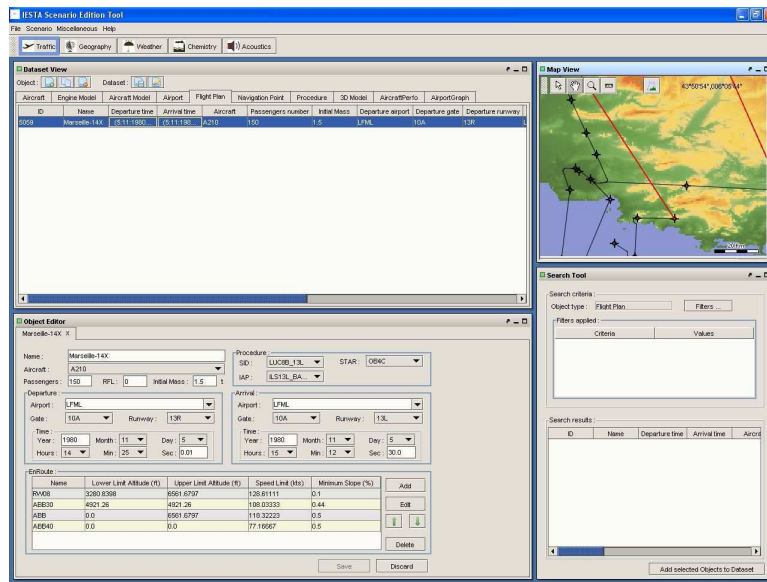
=> Interface with the IESTA user



IESTA data managing tools

- LSCN (Scenario Definition Software)
 - allows the management of simulation data
 - a visualization tool helps to insert data in the airport environment

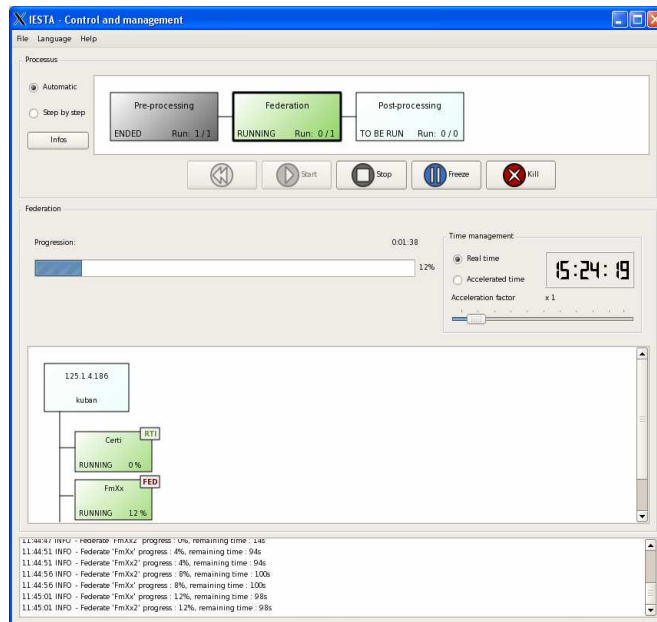
- LRES (Result Software)
 - handles result data post-processing
 - output formats let the user use its results with a wide range of common tools (Excel, GoogleMap,...)



IESTA federate tools

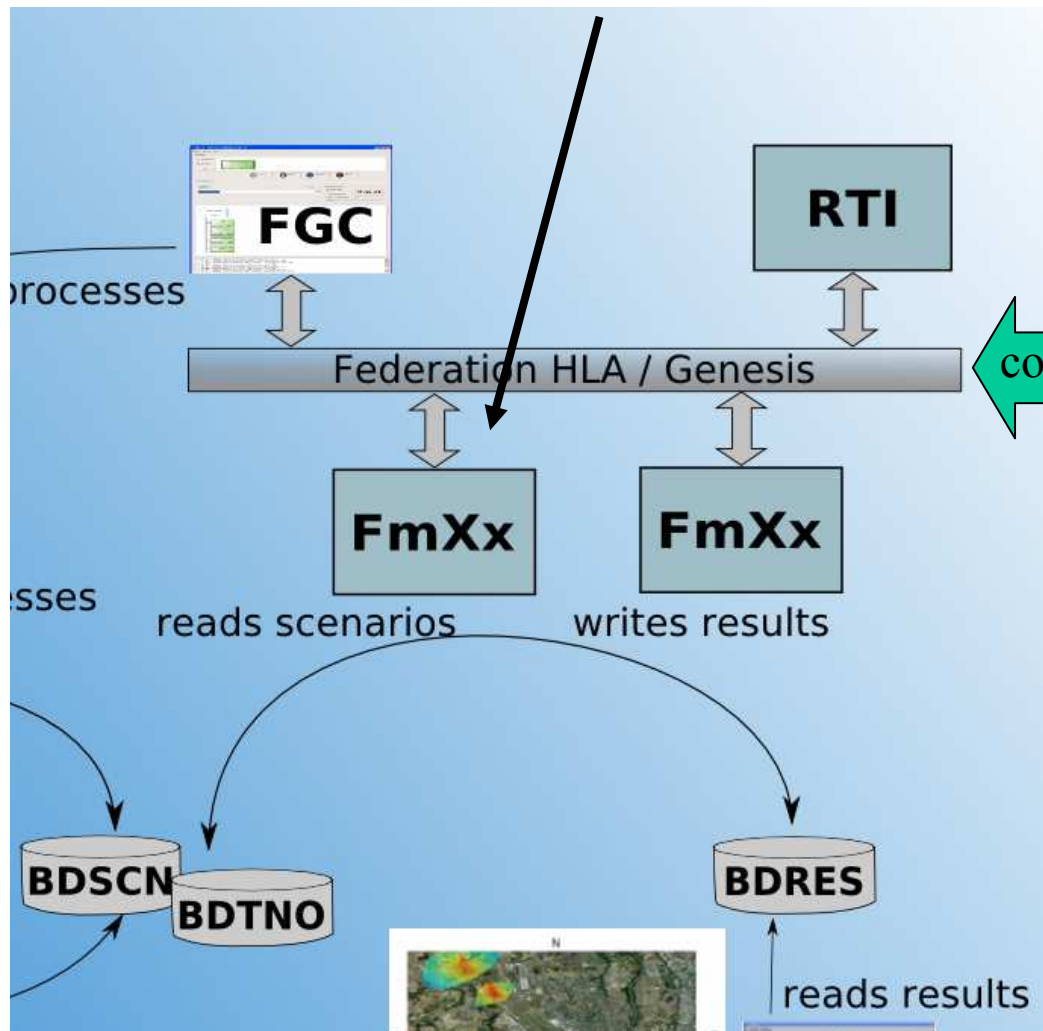
- FGC (Federate of Management & Control)
 - progression of the tasks
 - programs

- Stealth Viewer
 - aircraft trajectories and airport scene
 - 3D representation
 - inside or outside the cockpit



Why such a complex infrastructure?

10+ models / federates



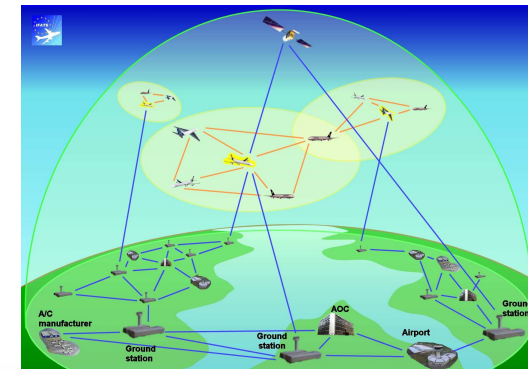
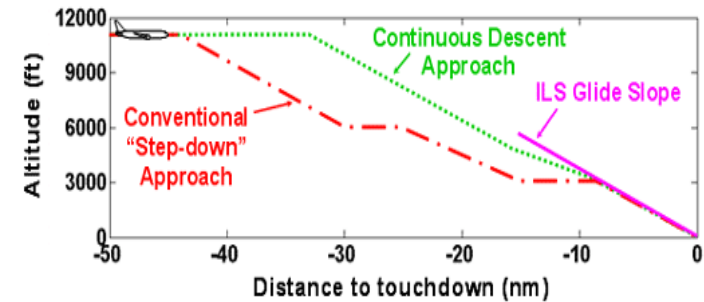
Models / federates from partners, other platforms...

Outline

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- General infrastructure & software products
- Applications, conclusion & perspectives

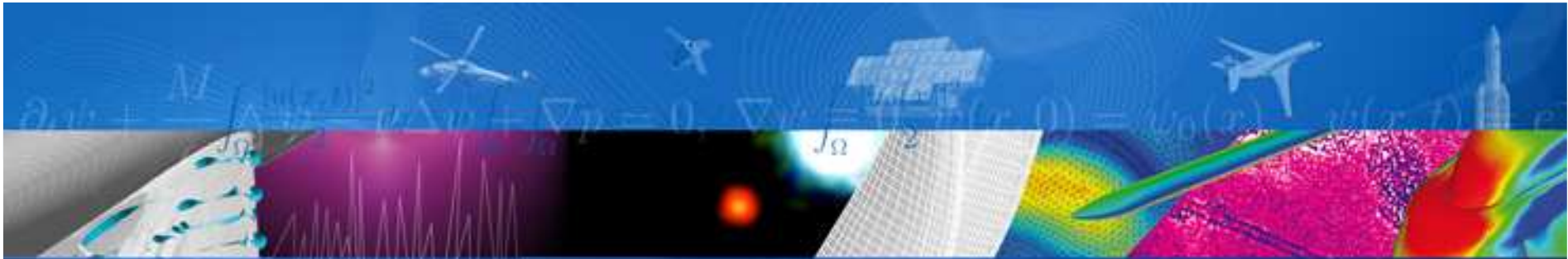
Using the IESTA platform

- First application: *CDA (Continuous Descent Approach)*:
 - with the French Civil Aviation University
- First version: *Clean Airport*:
 - impact of the airport on the environment
 - reduce acoustical and chemical pollution
- Future version: *SimSky*:
 - evaluate new Air Transport Systems
 - SESAR, Super Highways



Conclusion & Perspectives

- The IESTA platform:
 - fast-time
 - modular (HLA-compliant)
 - user-friendly
 - aiming at encompassing all aspects of air traffic evaluation
- First applications: measuring chemical and acoustic pollution around an airport
 - *talk by Basora, Aubry, Brunet, Chaboud & Rivière tomorrow*
- Perspectives: new applications
 - ATM concept simulation
 - military tactical and strategic planning



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