

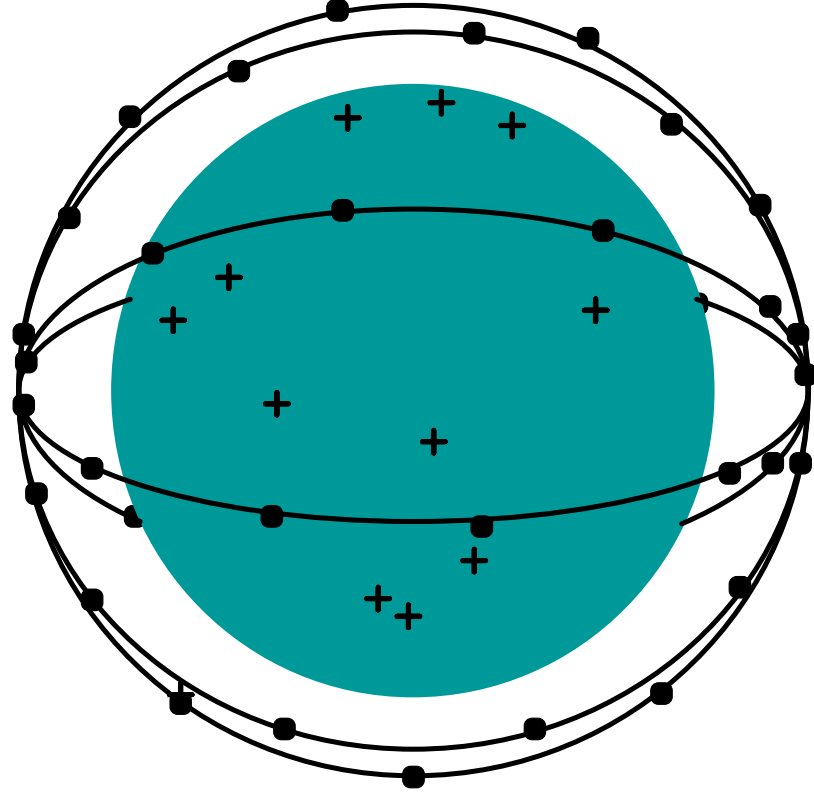


Galileo progress report

Laurent Franck and Francesco Potortì

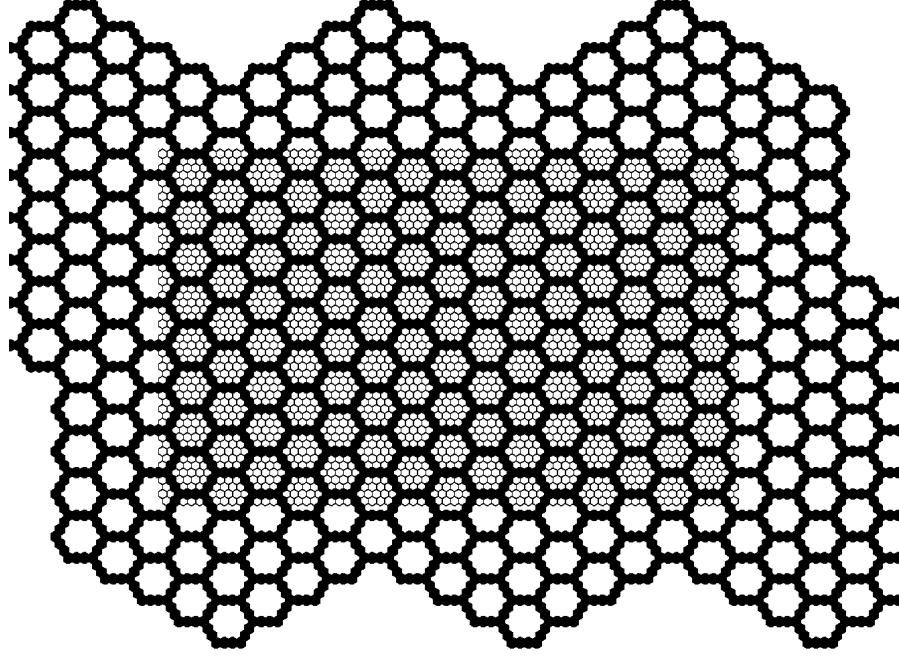
- **A comprehensive simulator for satellite constellations, targeted towards LEO/MEO communication systems**
- **Experience from previous projects (SimToc, LeoSim, Fracas), involves different academic institutions**
- **Free software entirely implemented in Java**
- **Possible studies include:**
 - algorithms for cell frequency reuse
 - QoS routing for both UDL and ISL
 - QoS aware channel access techniques

Capacity of global coverage



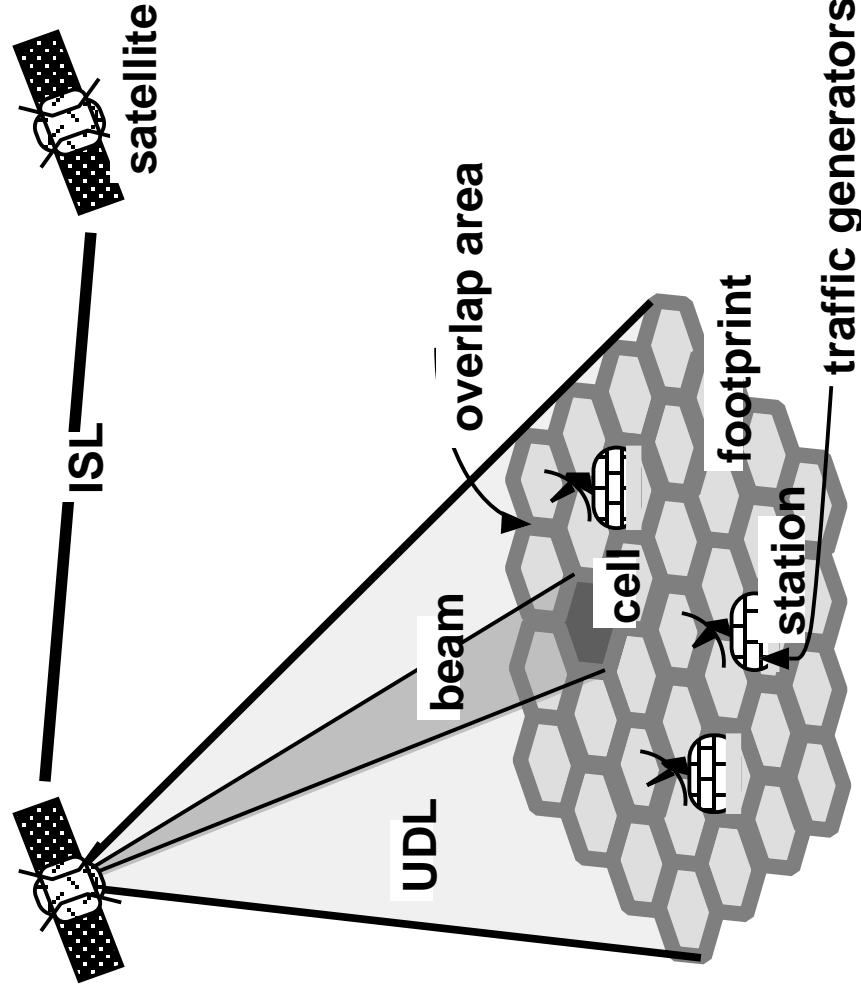
- Emulation of an entire constellation
- Definition of individual earth stations and traffic generators
- Complete map of traffic patterns
- Ability to individually follow any traffic connection

Study of a limited region



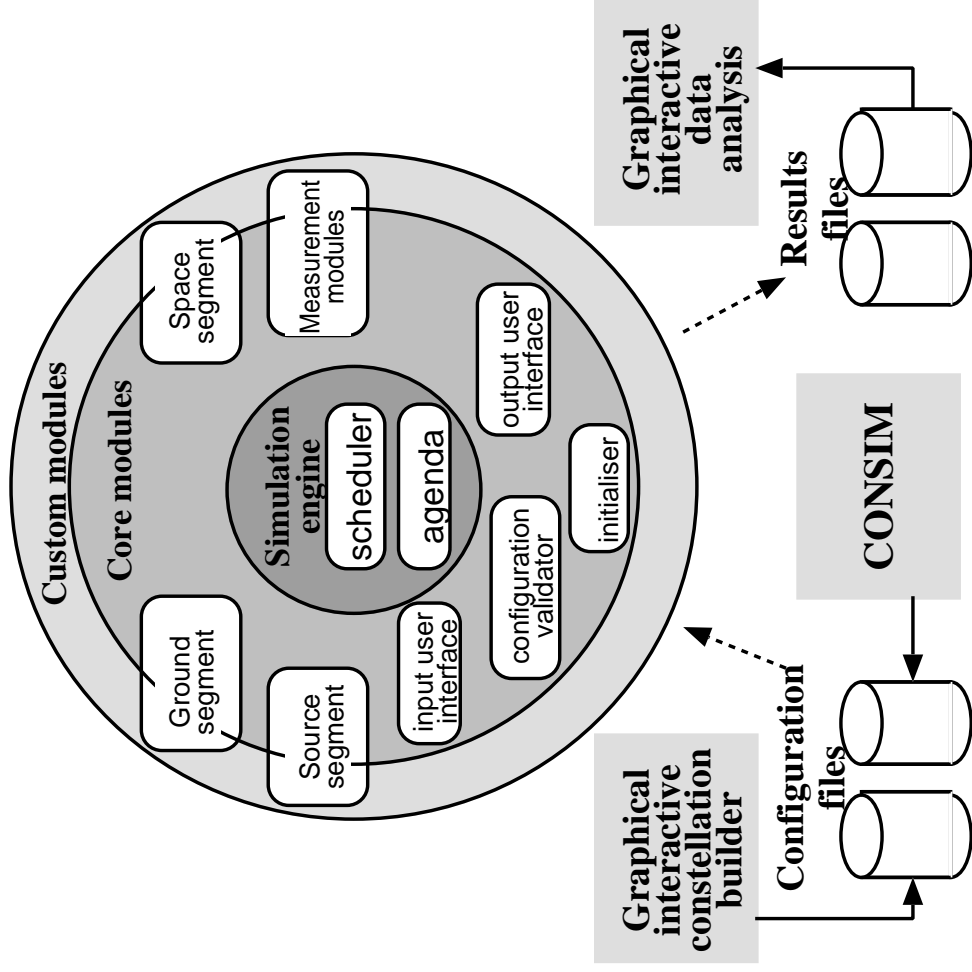
- **Emulation over a limited geographical region**
- **Detailed and realistic traffic generation**
 - complex access techniques
 - complex frequency reuse strategies
- **Nearby network simulated by mathematical description**

Basic terminology



- A **UDL** (up-down link) covers a **satellite's footprint**
- A UDL is made of **beams**, each covering partially overlapping **cells**
- Satellites are connected by **ISLs**
- A **station** is fed by one or more **traffic generators**

Architecture of Galileo



- An event scheduler is at the core of the simulation engine
- The core modules come with the simulator
- Custom modules can be added at will
- Custom modules include traffic generation, constellation layouts, access protocols etc.

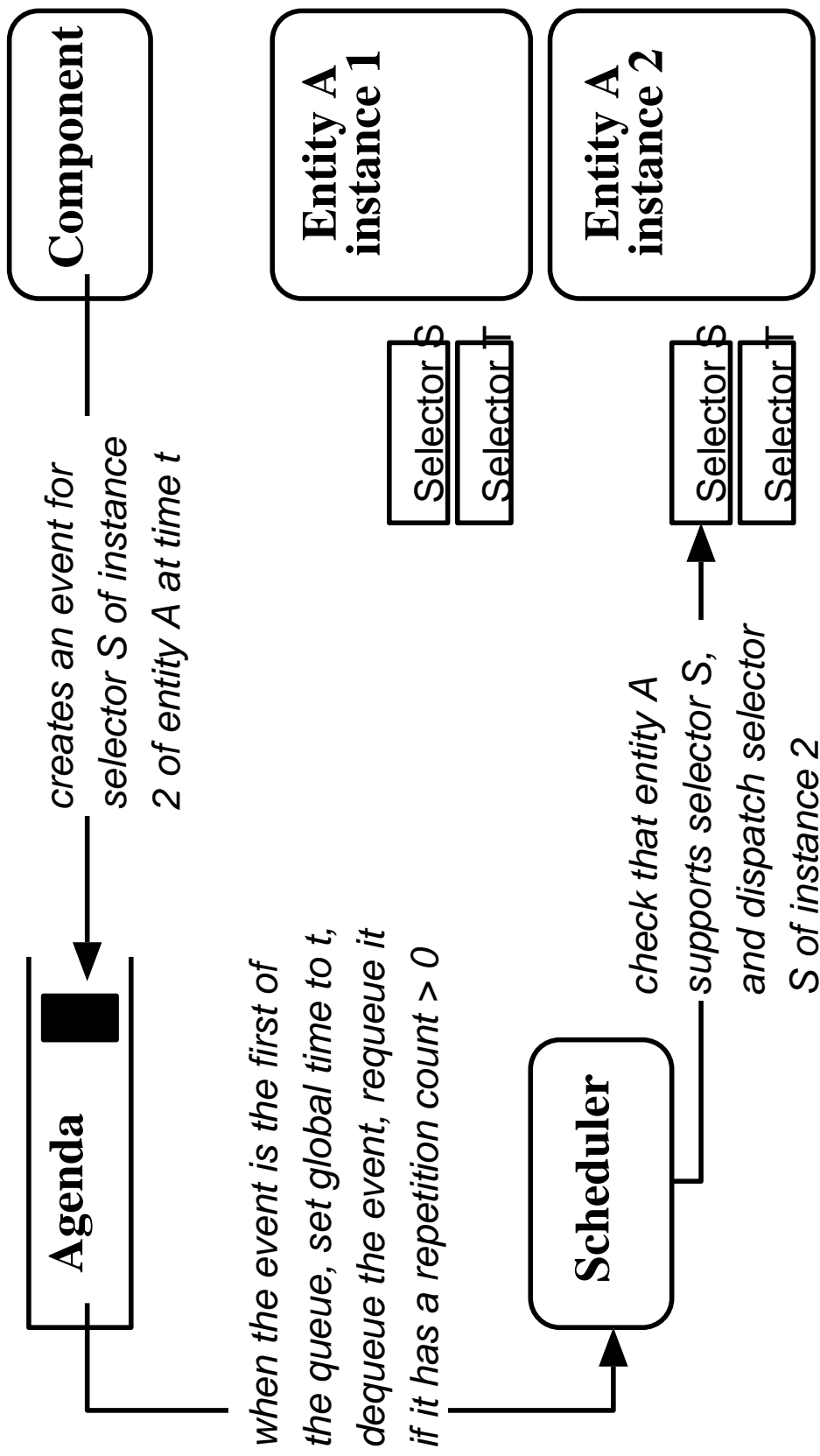


The two inner layers

- **The simulation engine provides**
 - the event scheduler
 - the framework for building modules
 - the communications facility between modules
 - the input file structure, statistics gathering and display facility
- **The standard modules provide some basic features:**
 - a Leonet and a polar constellation
 - a deterministic periodical traffic generator
 - scalar resources for allocation in stations and satellites
 - simple routing and load-dependent adaptive routing
 - basic allocation strategies for stations and satellites
 - basic station and satellite structures



The simulation engine

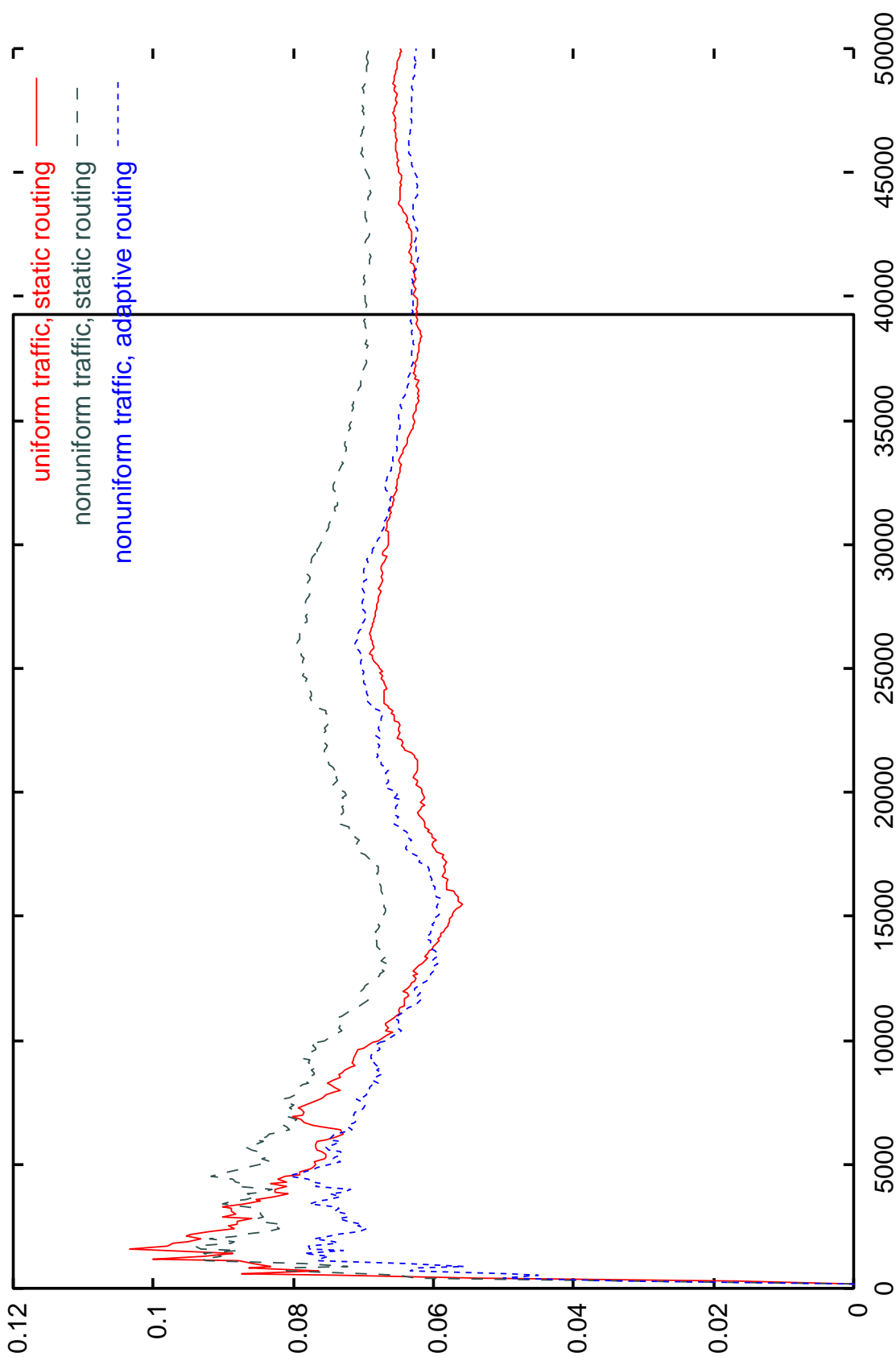




Demo setup

- 12 stations evenly distributed between 45°N and 45°S
- Leonet constellation (15 satellites on 3 orbits)
- ISL capacity is 20 connection, UDL's is 80 connections
- Measuring the connection blocking probability
- For each connection, the first and last satellites are those with max elevation
- The demo is made of three steps, global traffic is the same for all steps:
 - 6 Erlangs per station, static routing
 - 4 adjacent stations at 10 Erlangs, others at 4 Erlangs, static routing
 - same traffic as previous case, adaptive routing

Demo results





GaliLEO summary

Laurent Franck and Francesco Potortì

- **A big simulator for LEO/MEO communication systems**
- **Both overall earth view and geographically limited studies are considered**
- **Very modular; standard modules available, custom modules written in Java can be added**
- **Programming environment is Java**
- **Work in progress: development is open to contributions**
- **Some features usable today for research: demo available**
- **Home page at <http://galileo.tesa.prd.fr/>**