



SAPIENZA
UNIVERSITÀ DI ROMA

MCLab

Model Checking Lab

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<http://mclab.di.uniroma1.it>

Sapienza University of Rome

- Founded in **1303**
- The **largest** university in Europe
 - **115K** students
 - **7K** foreign students
 - **1K** incoming Erasmus students / year
- Steadily within **top 3%** world universities [Shanghai Ranking]
- **250** Bachelor & Master Programmes
- **11** Faculties
- **63** Departments



Computer Science Dept. @ Sapienza

- **45** Faculty Members
- **23** Post-Doc Researchers
- **20** PhD Students
- Internationally active in most of the major CS **research areas**:
 - ◆ Algorithms & Data Structures
 - ◆ **Artificial Intelligence**
 - ◆ Combinatorics
 - ◆ Computational Complexity
 - ◆ **Computer Architectures**
 - ◆ Computer Networks
 - ◆ Computer Security
 - ◆ **Database Systems**
 - ◆ Web Information Retrieval
 - ◆ **Formal Methods**
 - ◆ Human-Computer Interaction
 - ◆ Computer Graphics
 - ◆ Information Theory
 - ◆ **Software Engineering**

Model Checking Lab @ Sapienza

- Research group within the Computer Science Department
- **6** faculty members, **1** post-docs, **5** PhD students, **1** research fellow, **10** graduate students
- **Research focus:** design and development of software tools for **model-based** verification, validation and synthesis of **mission- and safety-critical embedded control systems:**
 - aerospace
 - critical infrastructures
 - transportation
 - medicine
 - smart grids



MCLab

Model-Based System Verification @ MCLab

Disturbance Model (formal model of operational scenarios)

SyLVer System Level Formal Verifier

<https://bitbucket.org/mclab/sylver-simulink-driver>

LOAD - RUN - FREE -STORE

Optimised
Simulation
Campaign

Simulator
Driver

CPS
Model

Monitor

Omission Probability

Monitor output
fail
1
0
pass

Parallel (cluster)

Optimised
Simulation
Campaign

Simulator
Driver

CPS
Model

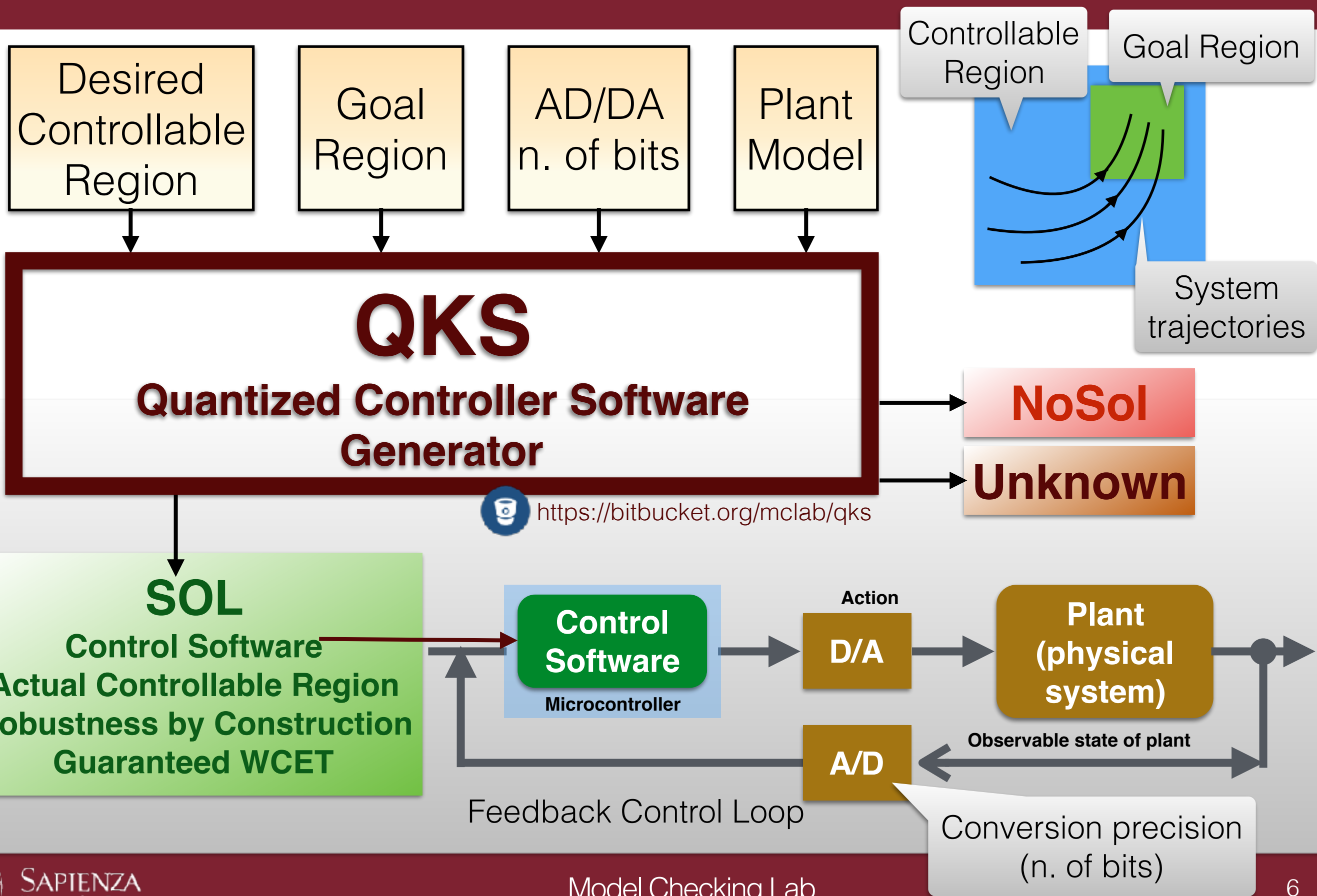
Monitor

Omission Probability

Monitor output
fail
1
0
pass

Hardware-in-the-Loop Simulation (HILS)

Model-Based Control SW Synthesis @ MCLab



MCLab in Aerospace

EC FP7 Ulisse (4.8 M€)

Verification & Validation of mission planning and on-board procedures



ESA ITI Verifying Satellite Operational Procedures (150 k€)

Verification & Validation of ground segment satellite operational procedures



ESA ITT System & Software Functional Requirements Technique (200 k€)

Verification & Validation of system level design for satellite and avionics vehicles



MCLab in Transportation

MIUR Tramp, Setram, Interception (3.5 M€)

Optimal management of intermodal transportation of dangerous goods, guaranteeing security standards

Safety verification of communication protocols and control policies for the control center



FILAS Sintesi (100 k€)

Sense and response system for critical resource management



MCLab in Critical Infrastructures

SAPP, IRRIS, Safeguard, SafeTunnel, Icaro (10 M€)

Design and safety verification of control and communication systems for critical infrastructures



MCLab in Smart Grids

EC FP7 SmartHG (3.5 M€)

Energy Demand Aware Open Services for Smart Grid Intelligent Automation



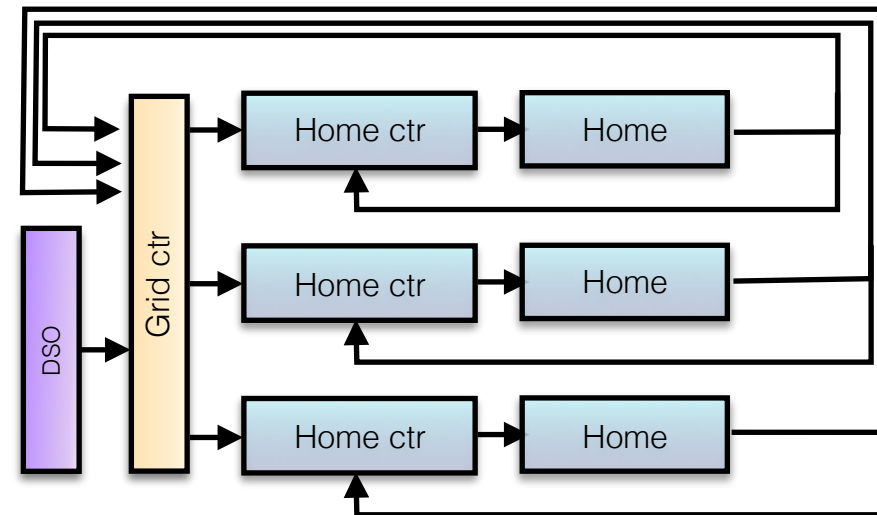
Coordinator: MCLab



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Design and formal verification of hierarchical **control policies** for the Smart Grid

SmartHG benefits: optimisation of grid **management**, minimisation of energy **cost** and CO2 **emissions**



A.V. LUTKOV HEAT AND MASS TRANSFER INSTITUTE OF THE NATIONAL ACADEMY OF SCIENCES OF BELARUS



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MCLab in Medicine

EC FP7 Paeon (2.5 M€)

Model Driven Computation of Treatments for Infertility Related Endocrinological Diseases



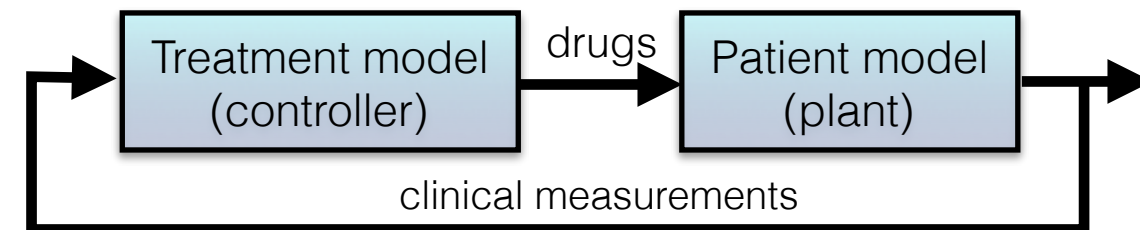
Coordinator: MCLab



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Modelling of **human physiology** (virtual physiological human)

Model based automatic verification and synthesis of **personalised** clinical treatments



Contacts

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