



# Control of large-scale distributed and cooperating systems: *Recent achievements within the Network of Excellence HYCON2*

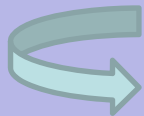
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CNRS-INS2I-L2S & EECI, lamnabhi @Iss.supelec.fr





## HYCON2 Network of Excellence “Highly-Complex and Networked Control Systems”

HYCON2 is addressing engineering technologies for **highly-complex and networked control systems** (large scale, distributed and cooperating systems, wireless sensor networks...)



HYCON2 lies and develops theoretical foundations for **modelling, analysing and controlling** the behavior of these systems.

### HYCON2 objectives :

- To foster in both ways fundamental studies and applications,
- To develop generic modelling and the design of control methods,
- To design dynamical reconfiguration of architectures & implementation of languages and scalable algorithms ,
- To master the complexity in terms of temporal and spatial uncertainties: parameters, delays and disturbances, limited bandwidth in communications, actuation constraints and node availability...





- Total grant: **3 900 000 €**
- Duration: **48 months +3**
- Start date: **01/09/2010**
- **24 partners from 7 European countries** (Research Institutes and Universities)

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	CNRS	FR
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE	INRIA	FR
INSTITUT EUROPEEN POUR LE CONTROLE DE SYSTEMES EMBARQUES	ECCI	FR
EIDGENOSSISCHE TECHNISCHE HOCHSCHULE ZURICH	ETHZ	CH
TECHNISCHE UNIVERSITAET DORTMUND	TUDO	DE
TECHNISCHE UNIVERSITAET BERLIN	TUB	DE
UNIVERSITAET KASSEL	UKS	DE
RUHR-UNIVERSITAET BOCHUM	RUB	DE
UNIVERSIDAD DE SEVILLA	USE	ES
UNIVERSIDAD DE VALLADOLID	UVA	ES
UNIVERSITA DEGLI STUDI DELL'AQUILA	UNIVAQ	IT
UNIVERSITA DI PISA	UNIFI	IT
UNIVERSITA DEGLI STUDI DI TRENTO	UNITN	IT
CONSIGLIO NAZIONALE DELLE RICERCHE	CNR	IT
UNIVERSITA DEGLI STUDI DI CAGLIARI	UNICA	IT
UNIVERSITA DEGLI STUDI DI PADOVA	UNIPD	IT
UNIVERSITA DEGLI STUDI DI PAVIA	UNIPV	IT
TECHNISCHE UNIVERSITEIT EINDHOVEN	TUE	NL
TECHNISCHE UNIVERSITEIT DELFT	TUDELFT	NL
RIJKSUNIVERSITEIT GRONINGEN	RUG	NL
KUNGLIGA TEKNISKA HOEGSKOLAN	KTH	SE
LUNDS UNIVERSITET	ULUND	SE
INSTITUTE FOR ADVANCED STUDIES LUCCA	IMT	IT
INSTITUT FRANÇAIS DES SCIENCES ET TECHNOLOGIES DES TRANSPORTS, DE L'AMENAGEMENT ET DES RESEAUX	IFSTTAR	FR





## HYCON2 Executive Committee

WP1	Analysis of complex systems	ETHZ	<i>John Lygeros</i>
WP2	Networked control	UNIVAQ	<i>Maria Domenica Di Benedetto</i>
WP3	System-wide coordination and control	UNIDO	<i>Sebastian Engell</i>
WP4	Self-organizing systems and control	UNIPD / UNIPI	<i>Sandro Zampieri / Antonio Bicchi</i>
WP5	Benchmarks	UVA	<i>Cesar de Prada</i>
WP6	Tool integration	UNITN / IMT	<i>Alberto Bemporad</i>
WP7	Training	CNRS / UNIPI	<i>Jamal Daafouz / Antonio Bicchi</i>
WP8	Outreach and Industrial Advisory Board	CNRS	<i>Gilney Damm</i>
WP9	Dissemination, networking & roadmapping	USE	<i>Eduardo Camacho</i>
WP10	Project coordination and management	CNRS	<i>Françoise Lamnabhi-Lagarrigue</i>
AD1	Transportation	INRIA / IFSTTAR	<i>Carlos Canudas-de-Wit/ Mariana Netto</i>
AD2	Energy	ETHZ / UNIDO	<i>Manfred Morari/ Sebastian Engell</i>
AD2	Biomedical and Medical systems	UNIPV / CNRS	<i>Giancarlo Ferrari-Trecate/Elena Panteley</i>





## HYCON2 fulfills the objectives of a Network of Excellence - we contribute to:

- develop a solid **research** programme internationally recognized with publications involving several HYCON2 teams
- deeply emphasize the coordination activities carried out in **the fundamental research tasks and the application domains**,
- increase fruitful **collaborations outside HYCON2**,
- increase fruitful **collaborations with industrials and with the socio-economic world**
- organize **International Conferences and Workshops**
- organize **outstanding graduate and undergraduate programmes**
- determine what are the essential topics for the future European **infrastructures and technologies** and their **economic success** and **social impact** and what are the research needs in management and coordination for efficiently developing these topics



**Speaker:**

8:50 – 9:00	Introduction
	<b>Chairperson : Françoise Lamnabhi-Lagarrigue</b>
9:00 – 9:40	Traffic control show case, Antonella Ferrara and Carlos Canudas-de-Wit
9:40 – 10:00	Distributed coordination of autonomous vehicles in industrial environments, Lucia Pallottino and Antonio Bicchi
10:00 – 10:20	A new solution method for the distributed multi-agent assignment problem Chathuranga Weeraddana, Elisabetta Alfonsetti, Carlo Fischione
	break
	<b>Chairperson : Cesar de Prada</b>
10:40 – 11:20	Tutorial on stability and power sharing in microgrids, Johannes Schiffer, Romeo Ortega, Jorg Raisch and Tefvik Sezi
11:20 – 11:40	Energy management based on urban micro-grid multi-source network, Alexandre de Bernardinis and Gérard Cocquery
11:40 – 12:00	A distributed feedback control strategy for optimal reactive power flow in smart grids, Saverio Bolognani, Ruggero Carli, Guido Cavraro, and Sandro Zampieri
12:00 – 12:20	Distributed local estimation in interconnected systems with applications to localization and smart grid state estimation, Luca Schenato and Ruggero Carli
	lunch
	<b>Chairperson : Antonella Ferrara</b>
13:30 – 14:00	Tutorial modeling, analysis and design over wireless networking protocols for control tasks, Maria Domenica Di Benedetto and Alessandro D'Innocenzo
14:00 – 14:20	Control over finite capacity channels: the role of data losses, delays and signal-to-noise limitations, Alessandro Chiuso, Nicola Laurenti, Luca Schenato and Andrea Zanella
14:20 – 14:40	Rollout event-triggered control: beyond periodic performance, Duarte Antunes and Maurice Heemels
14:40 – 15:00	Soft real-time scheduling for embedded control systems, Luigi Palopoli or Daniele Fontanelli
15:00 – 15:40	Sugar process management show case C. de Prada, L. Simora, R. Hernandez, S. Engell, R. Mazaeda, S. Podar, A. Rodriguez, F. Acebes
	break
	<b>Chairperson : Sebastian Engell</b>
16:00 – 16:30	Integrating synthesis, verification, co-simulation, visualization and code generation for supervisory control of complex industrial systems, Bert van Beek
16:30 – 16:50	Data reconciliation and real-time optimization of the hydrogen network in a refinery, Cesar de Prada, E. Gomez, Daniel Sarabia and Gloria Gutierrez
16:50 – 17:10	Steam network management, Stefan Krämer
17:10 – 17:40	H2T: HYCON2 Integrated Matlab Toolbox, Alberto Guiggiani, Carlo A. Pascucci and Alberto Bemporad
17:40 – 18:20	Tutorial on modeling and analysis of population systems with applications to molecular biology, John Lygeros, Giancarlo Ferrari-Trecate and Eugenio Cinquemani
18:20 – 18:50	Future challenges: From distributed and coordinated control to the management of cyber-physical systems of systems, Sebastian Engell
	ECC Welcome reception

This full day Workshop is dedicated to recent achievements within HYCON2 on large-scale distributed and cooperating control systems.

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- Focusing on cross-fertilizing results from advances in foundational research to applications in the domains of
- transportation,
  - energy
  - biological systems

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