Evaluation March 2012

Theme: Networks and Telecommunication

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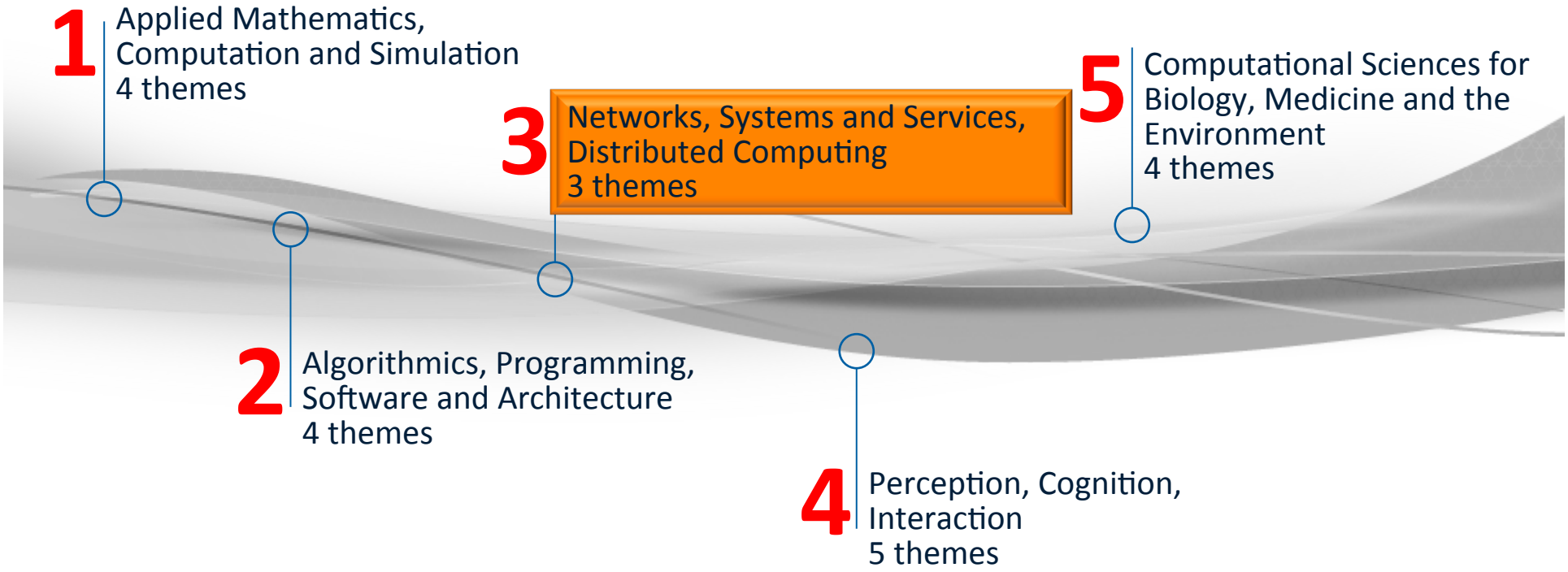
March 21, 2012

Outlines

1. Where within Inria?
2. Contributions to the strategic plan
3. Composition, history and evolution
4. Challenges associated with the theme
5. Scope of the theme
6. Collaborative research
7. Collaboration with the industry
8. Participation to European & International Initiatives

1. Where within Inria ?



Domain 3: Networks, Systems and Services, Distributed Computing

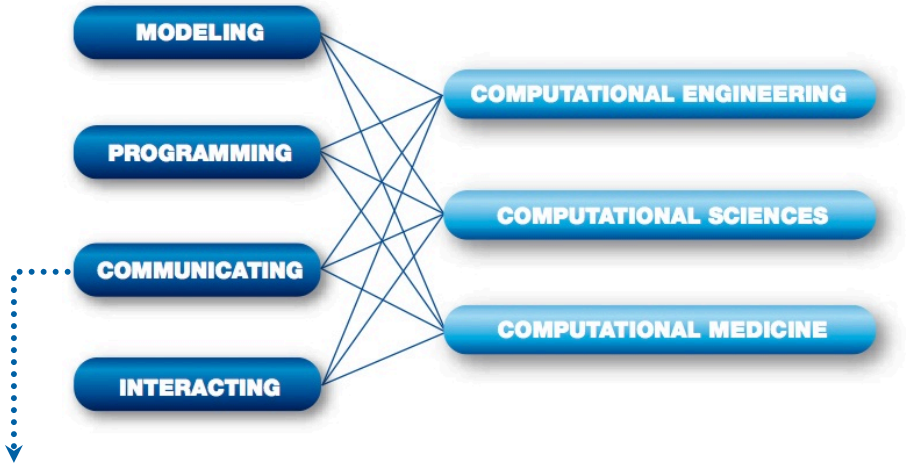
- Networks and Telecommunications
  - Topics: models & analysis, algorithms, protocols, new paradigm, management/monitoring, QoS/QoE, economics, security & privacy, green
  - 11 project-teams, 2 teams

- Distributed Systems and Services
  - Topics: ambient computing, middleware, P2P, software engineering, distributed programming, autonomic computing, security & privacy, cloud
  - 16 project-teams, 3 teams

- Distributed and High-Performance Computing
  - Topics: runtime & tools, parallel computing, peta/exaScale, grid, cloud
  - 8 project-teams, 3 teams

2. Contribution to the implementation of the strategic plan

- Seven priorities in the strategic plan:



Objective: Modeling network of the futures, designing their architectures and protocols and overcoming the heterogeneous nature of communication infrastructures to work toward a network which is continuous across ***space*** and ***time***.

Key Challenges: Design and evaluation of new Internet architectures

3. Composition, history and evolution

11 Project-teams to be evaluated

DIONYSOS - Dependability Interoperability and perfOrmance aNalYsiS Of networkS

DISTRIBCOM - Distributed models and algorithms for the management of telecommunications systems

GANG – Networks, Graphs and Algorithms

HIPERCOM - High Performance communication in mobile and wireless ad hoc networks

MADYNES - Management of dynamic networks and services

MAESTRO - Models for Performance Analysis and Control of Networks

MASCOTTE - Algorithms, simulation, combinatorics and optimization for telecommunications

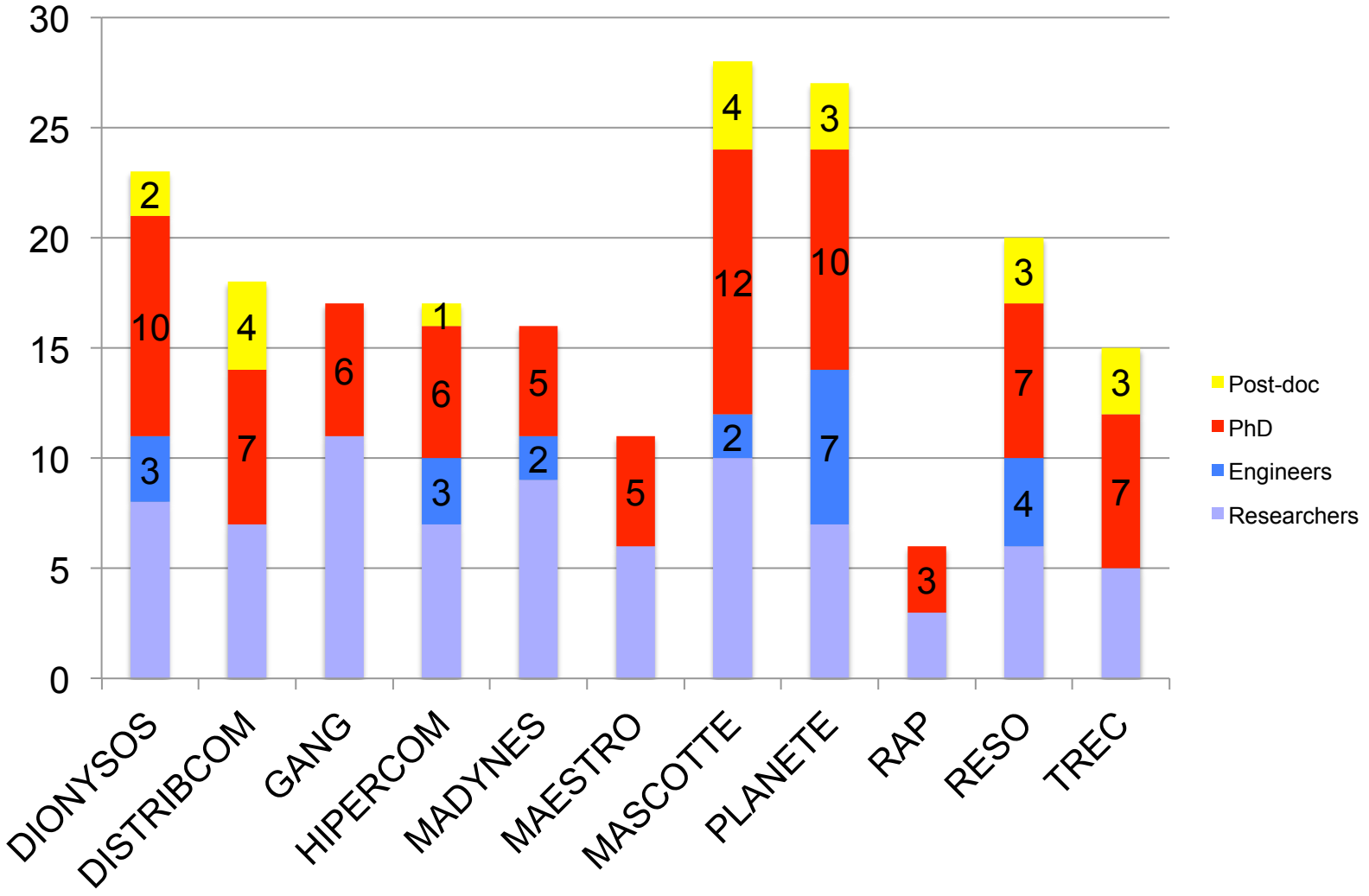
PLANETE - Protocols and Applications for the Internet

RAP - Networks, Algorithms and Probabilities

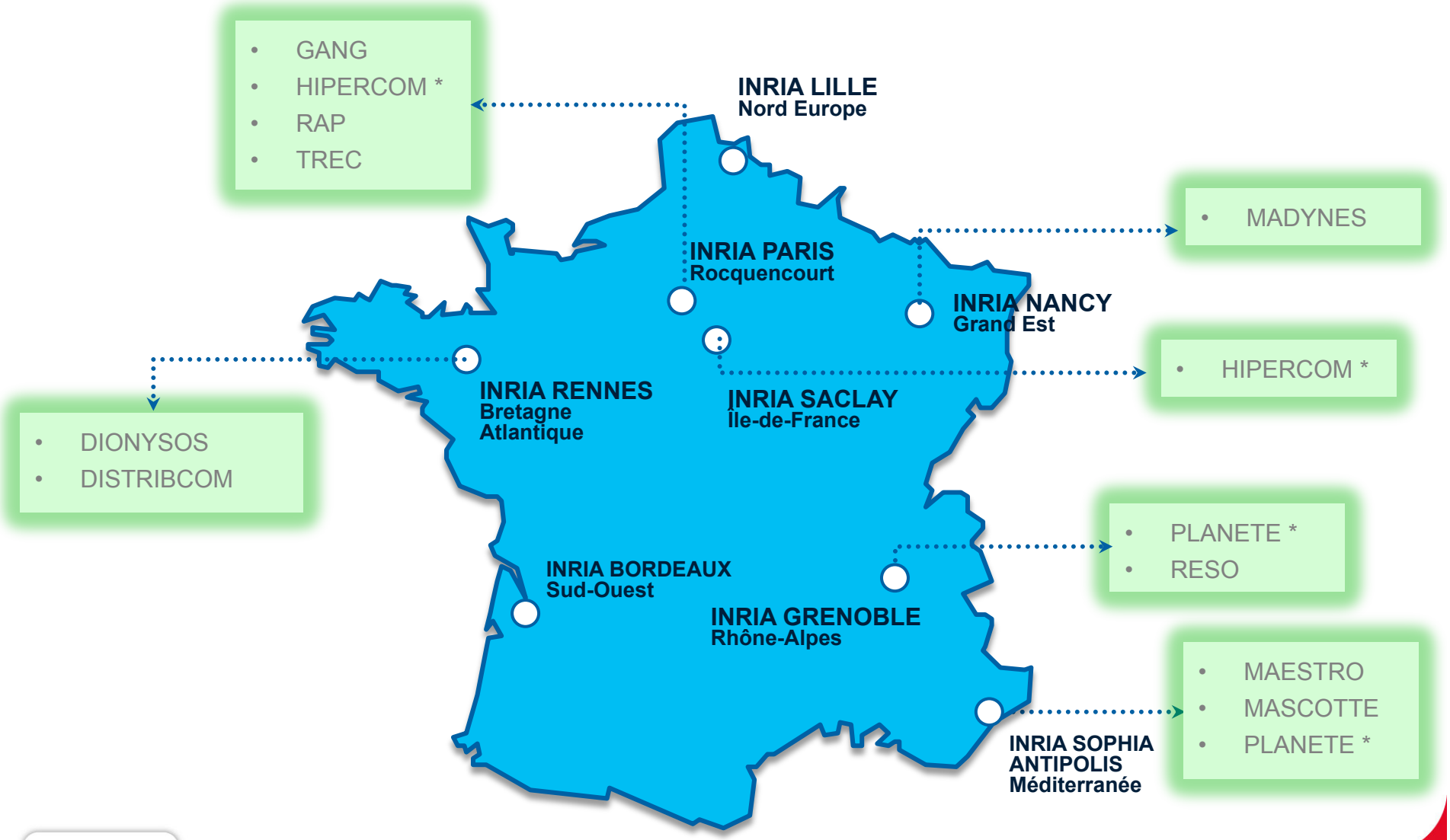
RESO - Protocols and software for very high-performance network

TREC - Theory of networks and communications

Personnel (2012)



The project-teams: where they are ?



Networks and Telecommunication
2 Teams

To be presented:

SWING - Smart Wireless Networking

D-NET - Dynamic Networks

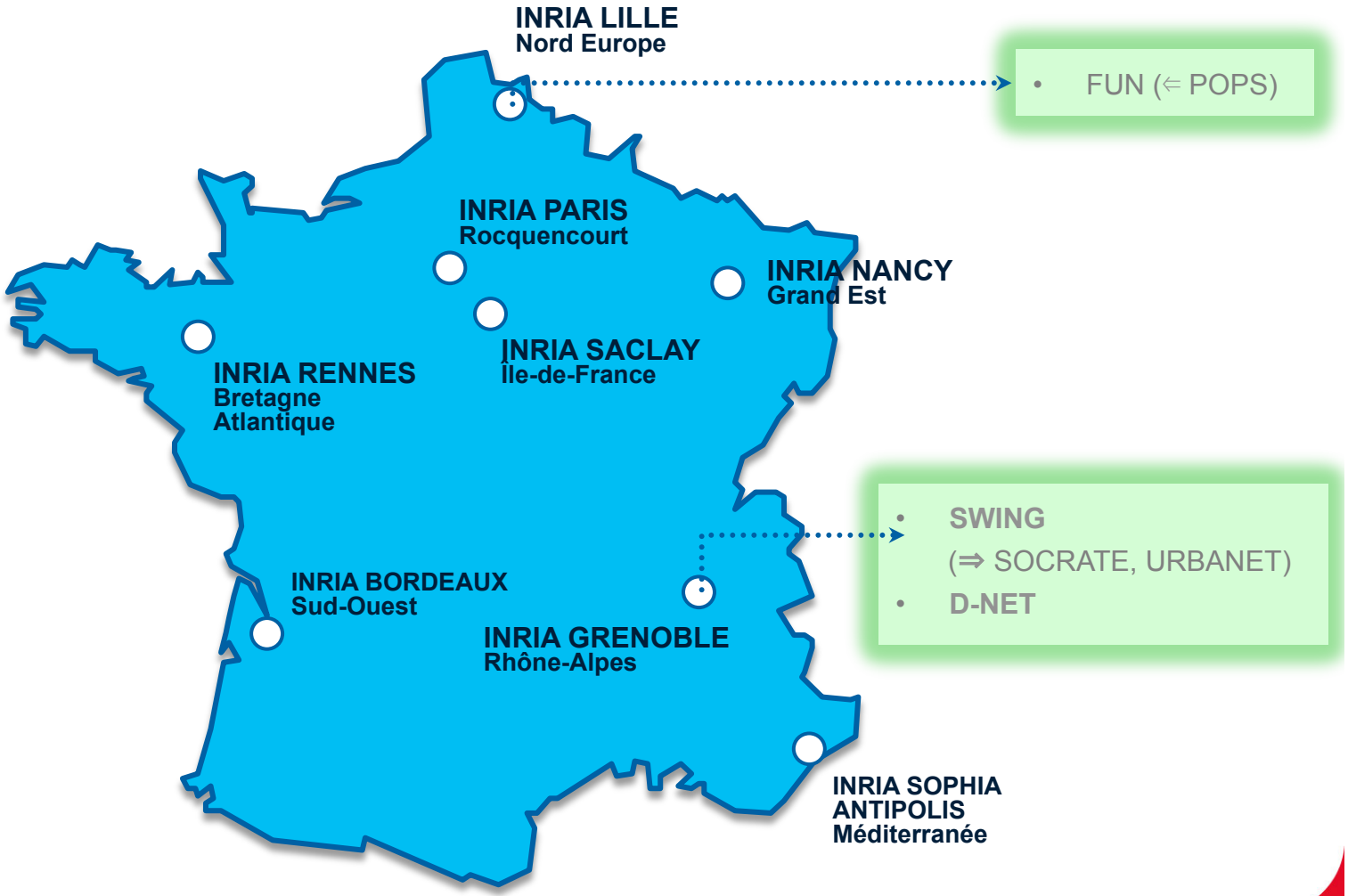
Under incubation:

FUN (⇐ POPS) – Self-organizing Future Ubiquitous Networks

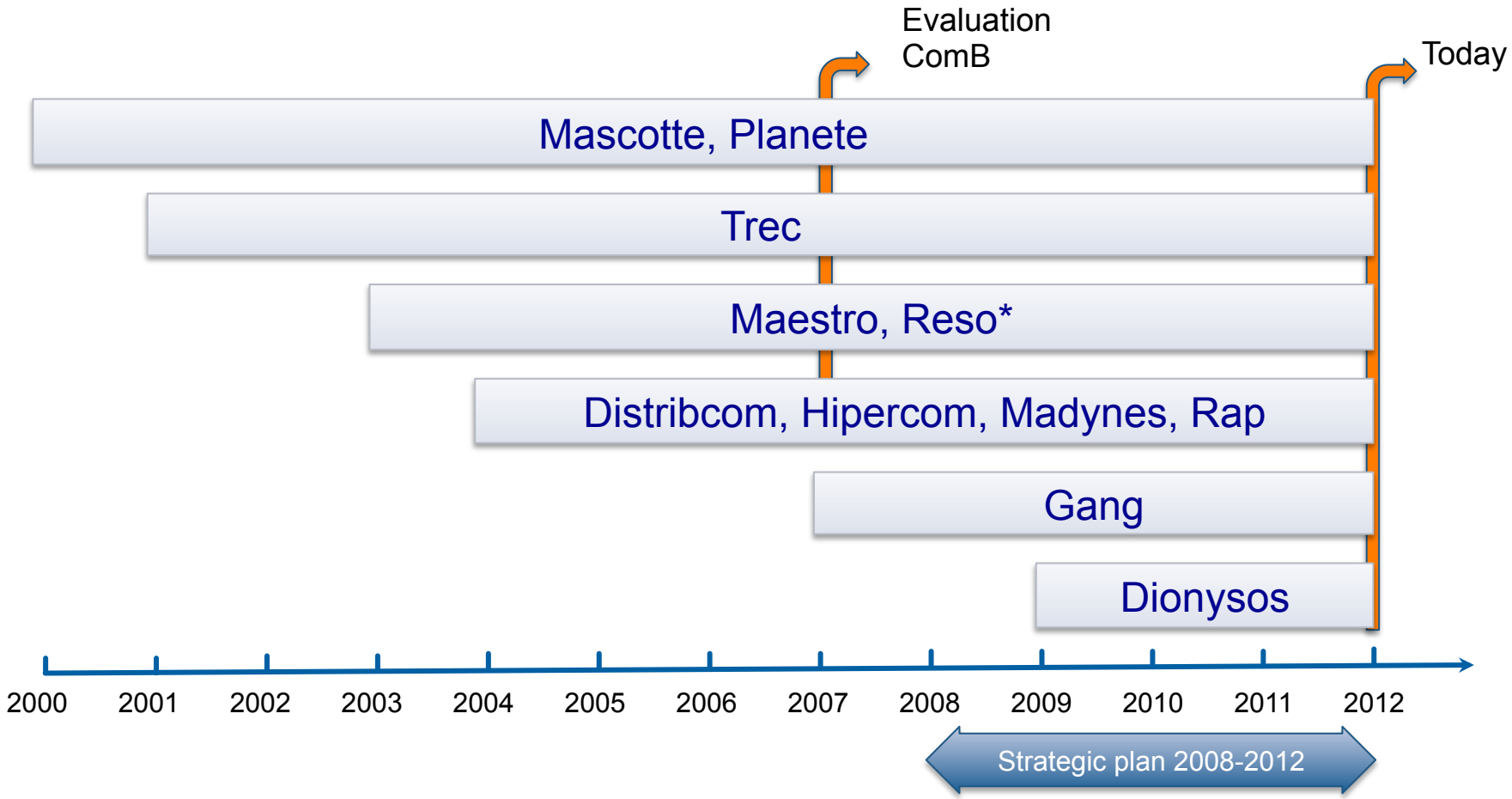
SOCRATE (⇐ SWING) – Software and Cognitive Radio Telecommunications

URBANET (⇐ SWING) – Network for Digital Cities

The teams: where they are ?



History and evolutions

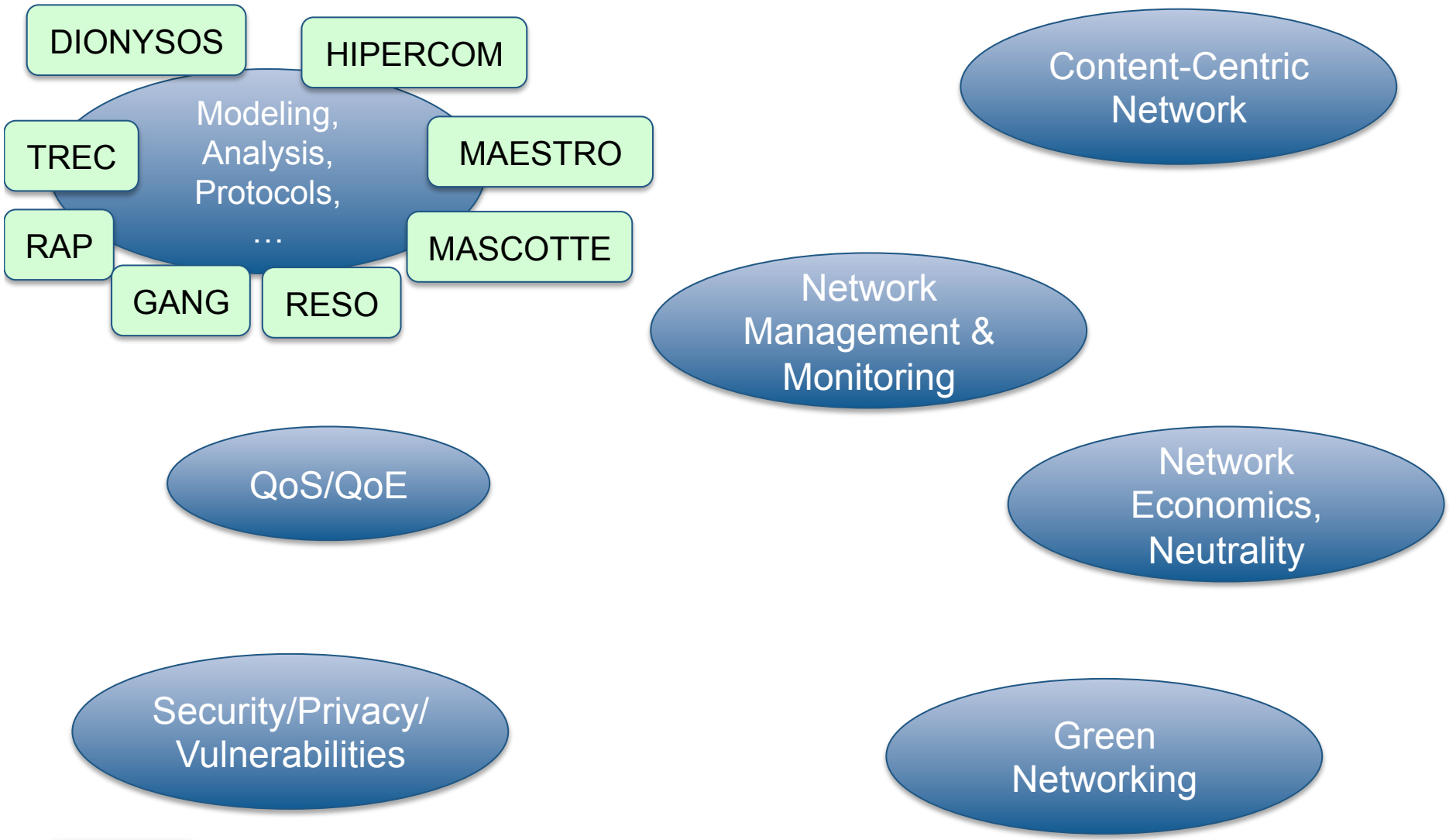


* Reso was assigned to the “NumB” theme and was evaluated in 2008

4. Challenges associated with the theme

- Increasing complexity of networks and communication
  - Physical and logical networks
  - Radio communication (MIMO, software radio)
- Increasing dynamicity
  - Both in time (churn, connectivity) and space (mobility)
- Increasing heterogeneity
  - Devices: Things, Smartphone, Tablet, PC, Servers, Datacenters, …
  - Networks (cross-layer/cross domain)
  - Traffic: Video, VoIP, P2P, from/to Cloud infrastructures, flash crowd
- Managing constrained resources (energy, bandwidth, memory, CPU)
  - Sensors networks, MANET
- Paradigm shift
  - From host centric to content centric
- More concerns on Security, Privacy and Neutrality issues

5. Scope of the Theme



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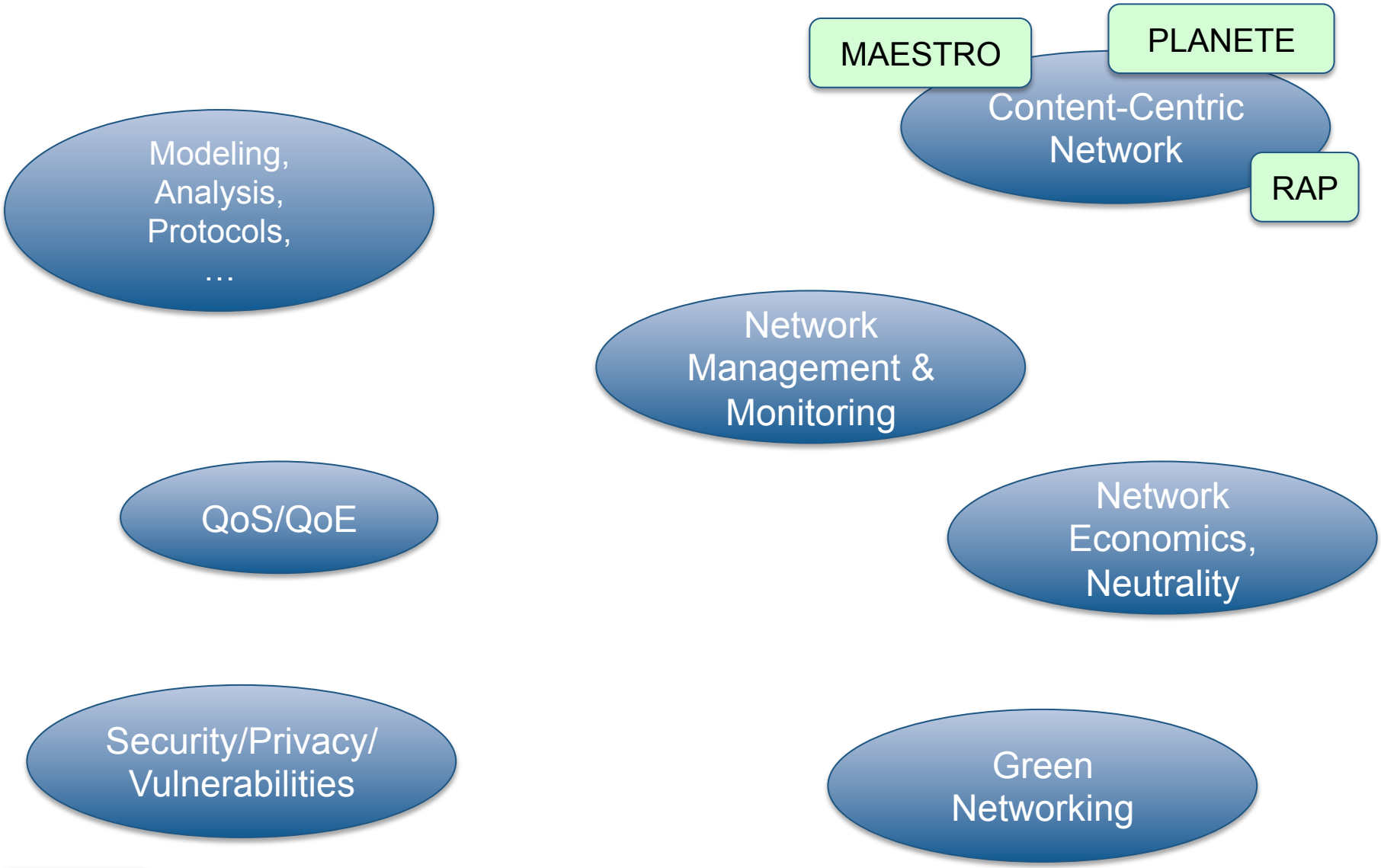

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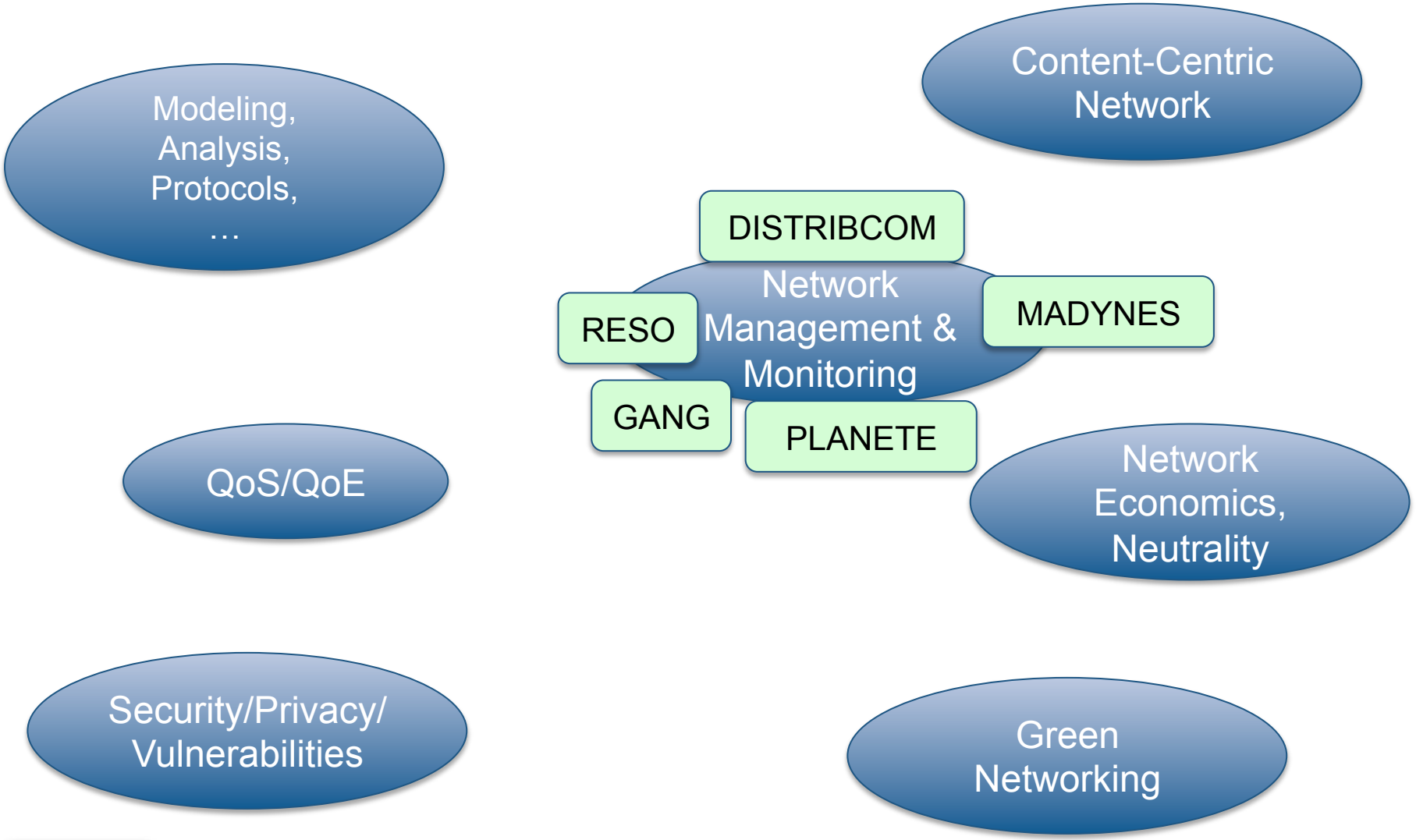

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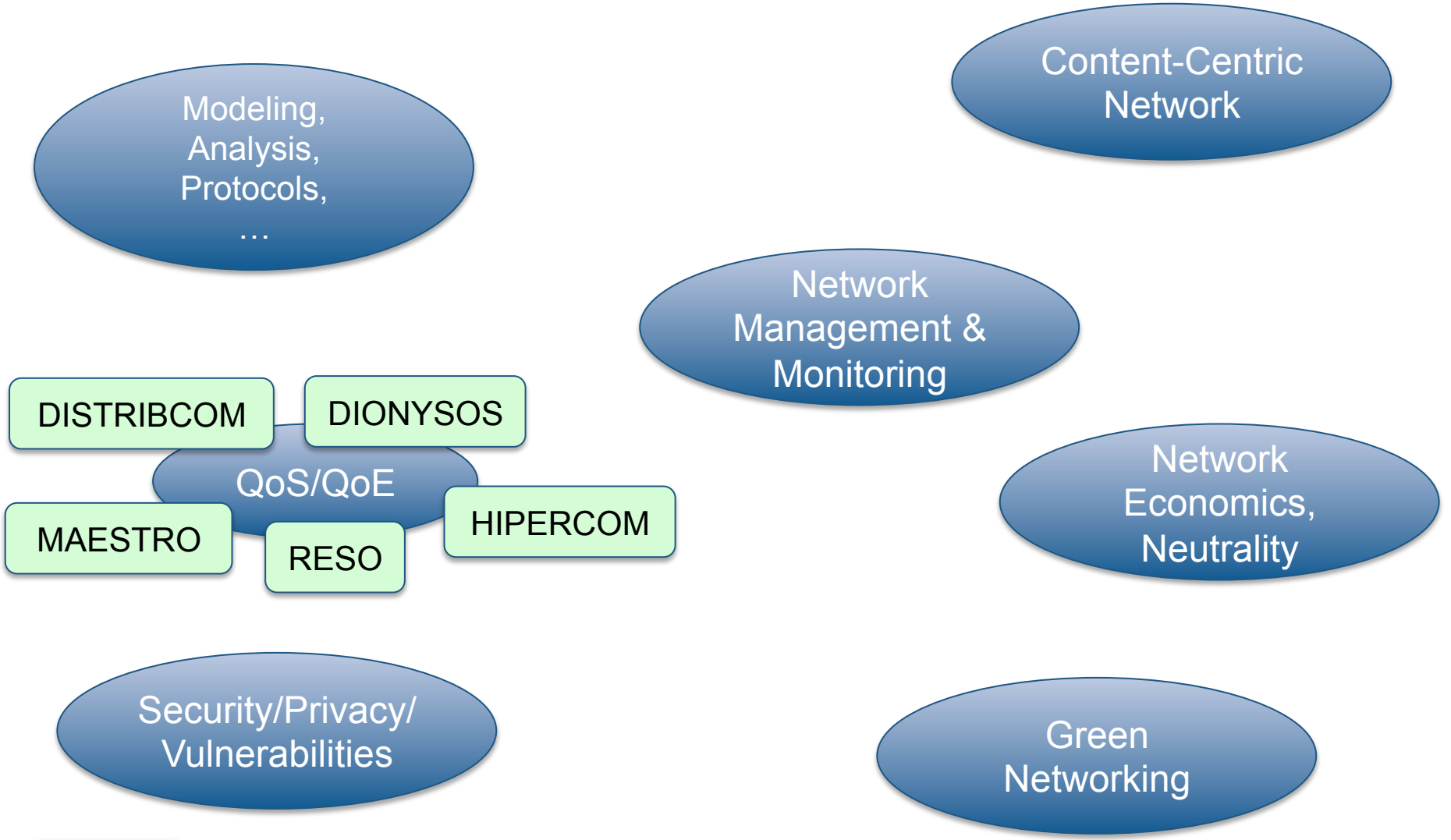

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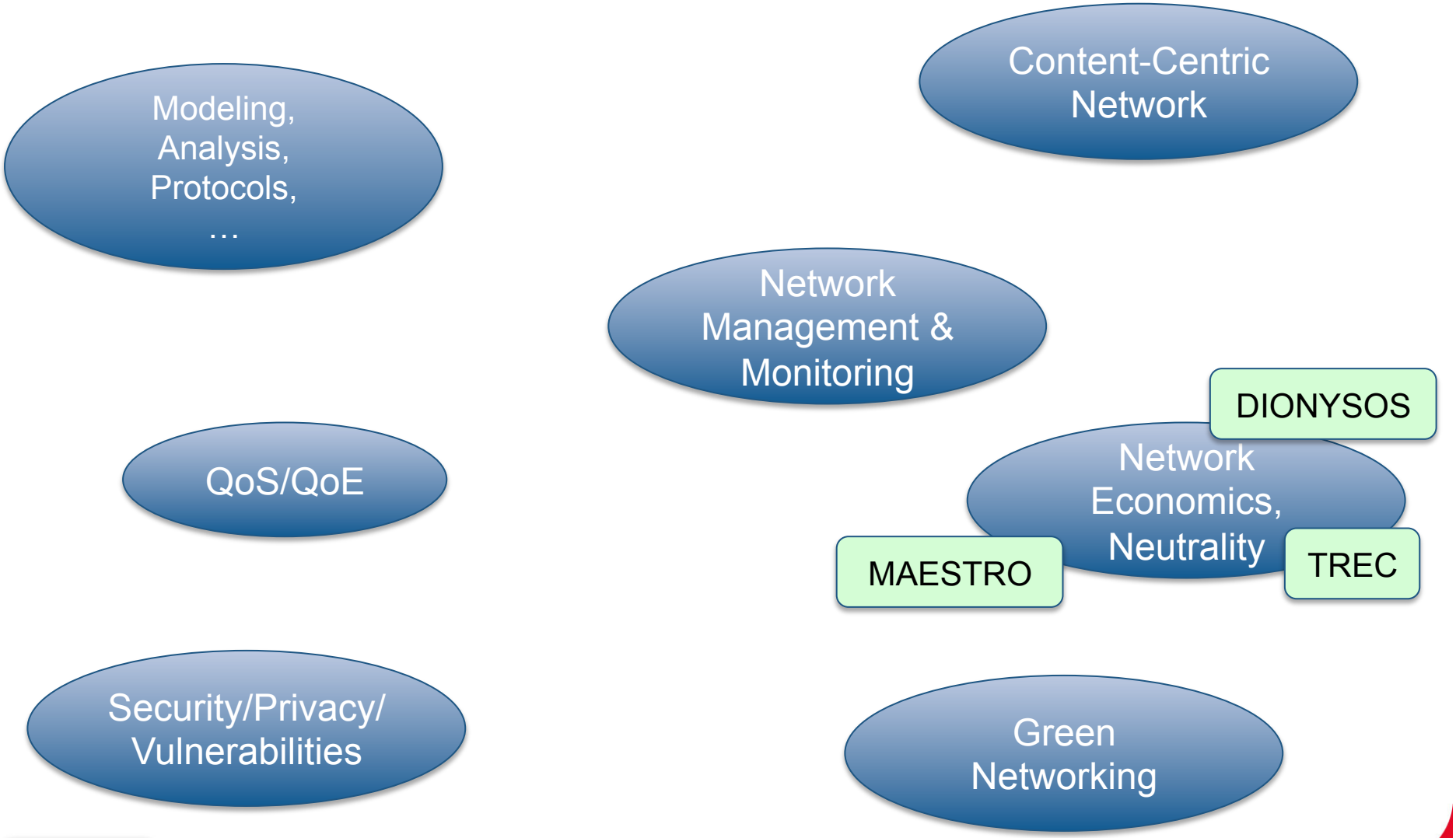

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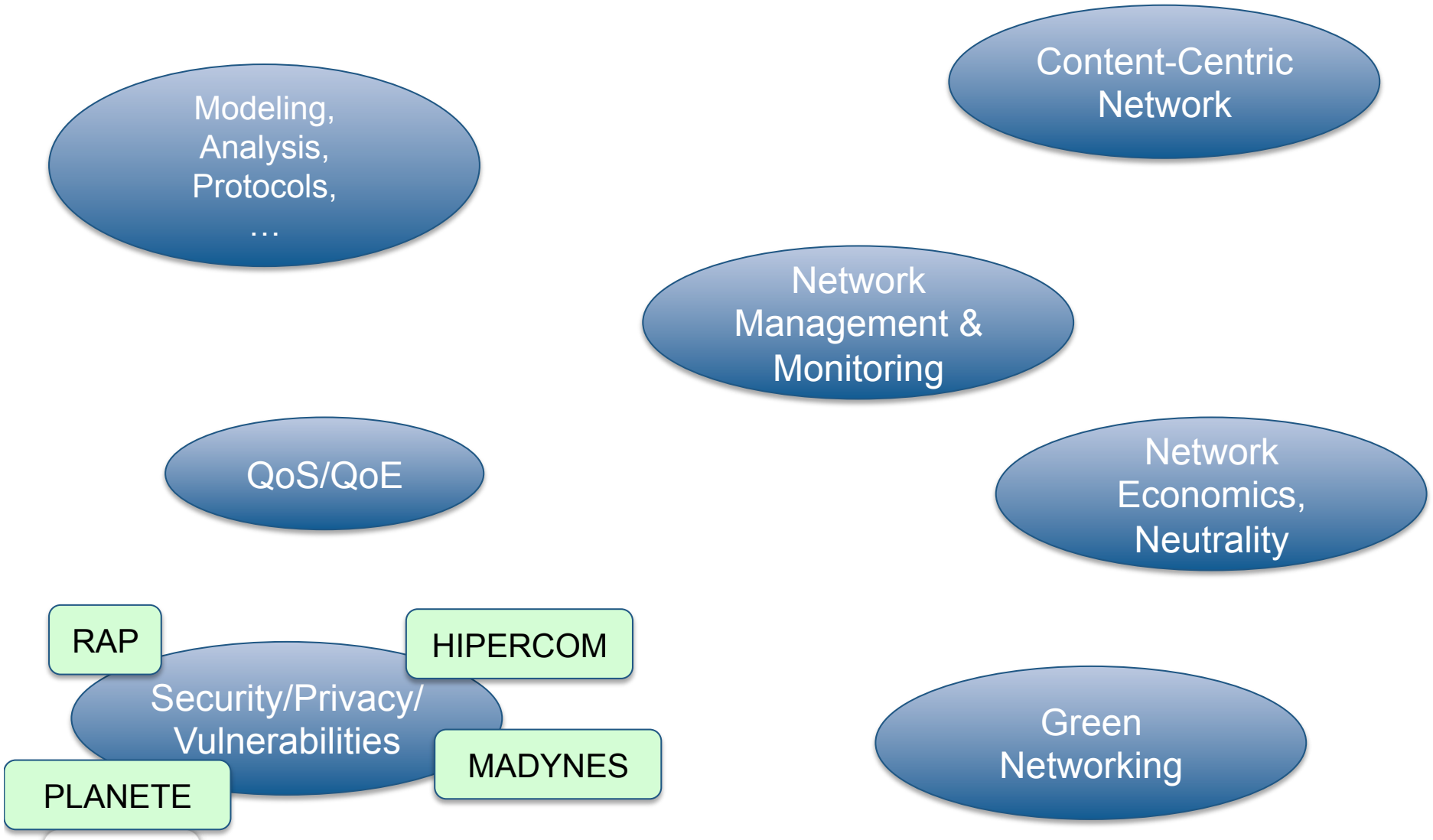

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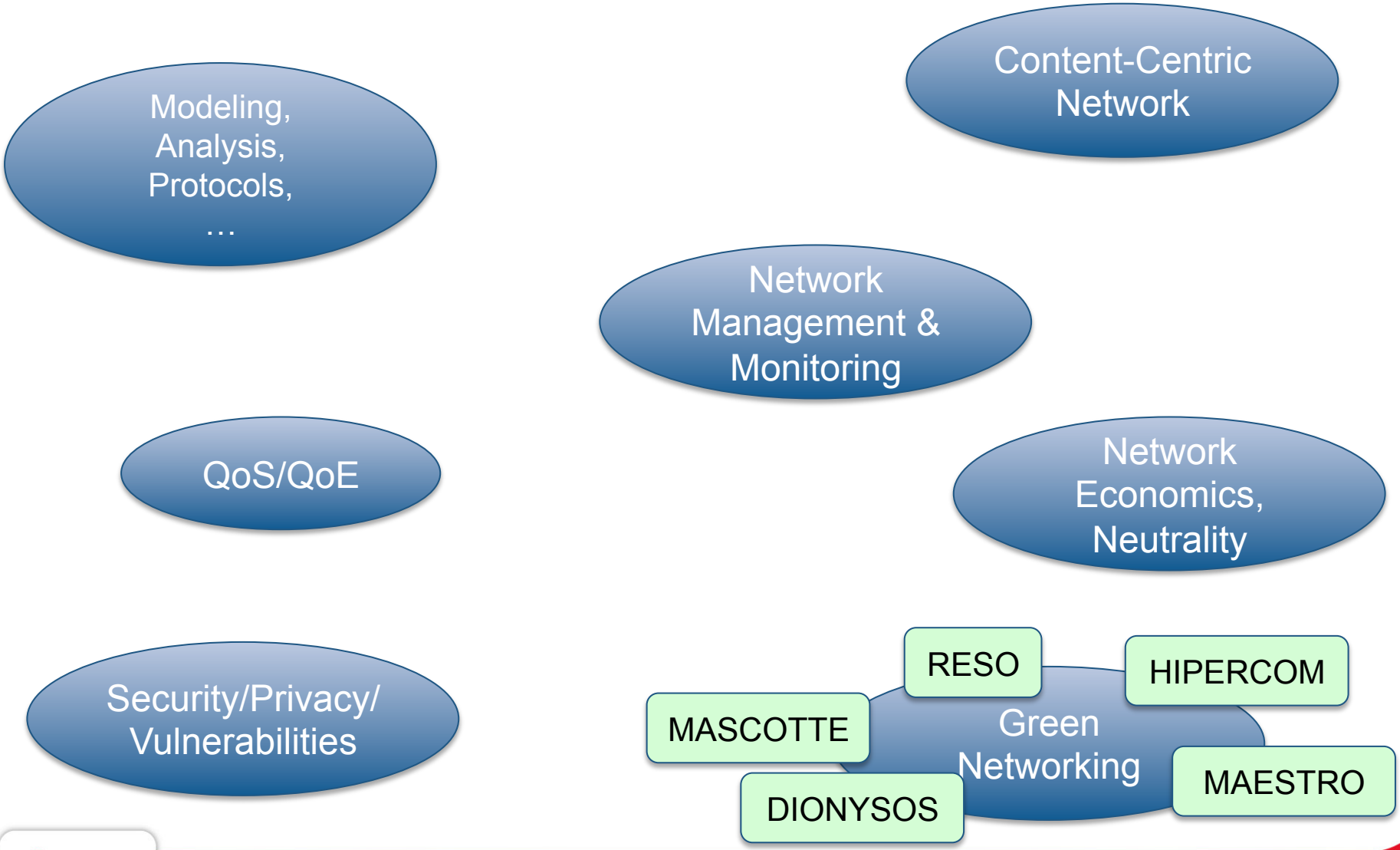
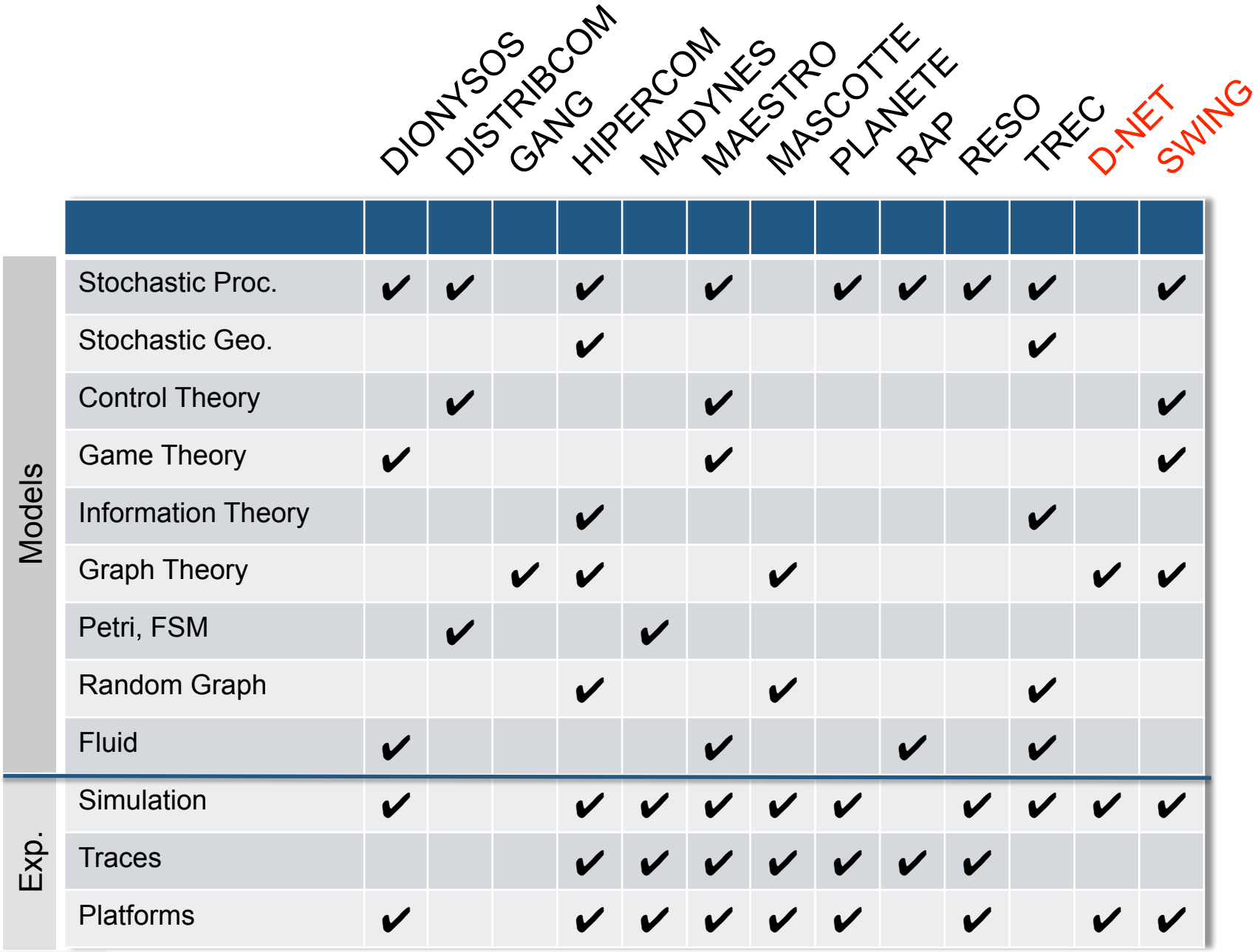


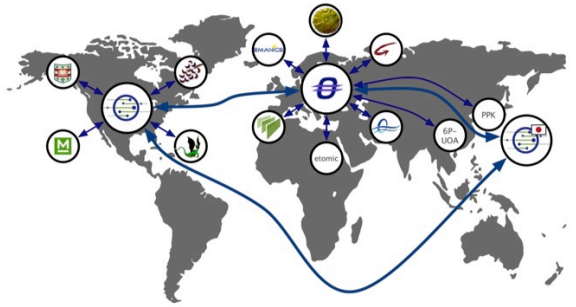
	Networks	DIONYSOS	DISTRIBCOM	GANG	HIPERCOM	MADYNES	MAESTRO	MASCOTTE	PLANETE	RAP	RESO	TREC	D-NET	SWING
PHYSICAL	Optical	✔	✔					✔		✔	✔			
	Wireless	✔			✔	✔	✔	✔	✔		✔	✔		✔
	Ad-hoc			✔	✔	✔	✔					✔		✔
	↳ DTN/VANET				✔		✔		✔					
	Sensor	✔			✔	✔	✔		✔			✔	✔	✔
	Cellular						✔					✔		✔
LOGICAL	Content-centric					✔	✔		✔	✔				
	Interaction												✔	
	P2P/Overlay	✔		✔		✔	✔	✔	✔			✔		
	Social			✔			✔					✔	✔	


DIONYSOS
DISTRIBCOM
GANG
HIPERCOM
MADYNES
MAESTRO
MASCOTTE
PLANETE
RAP
RESO
TREC
D-NET
SWING
Models
Stochastic Proc.
Stochastic Geo.
Control Theory
Game Theory
Information Theory
Graph Theory
Petri, FSM
Random Graph
Fluid
Exp.
Simulation
Traces
Platforms

Testbed and platforms

OneLab testbed federation

OneLab



OneLab's worldwide federation of testbeds.

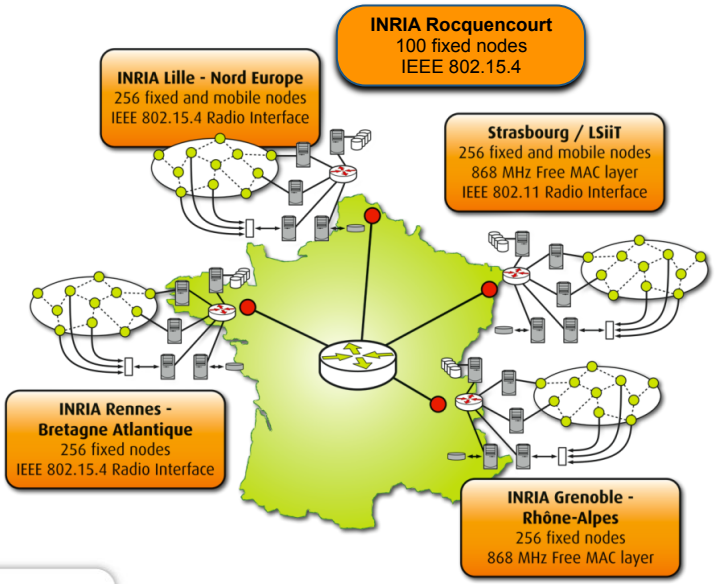
PLANETLAB

An open platform for developing, deploying, and accessing planetary-scale services

Grid'5000

Senslab

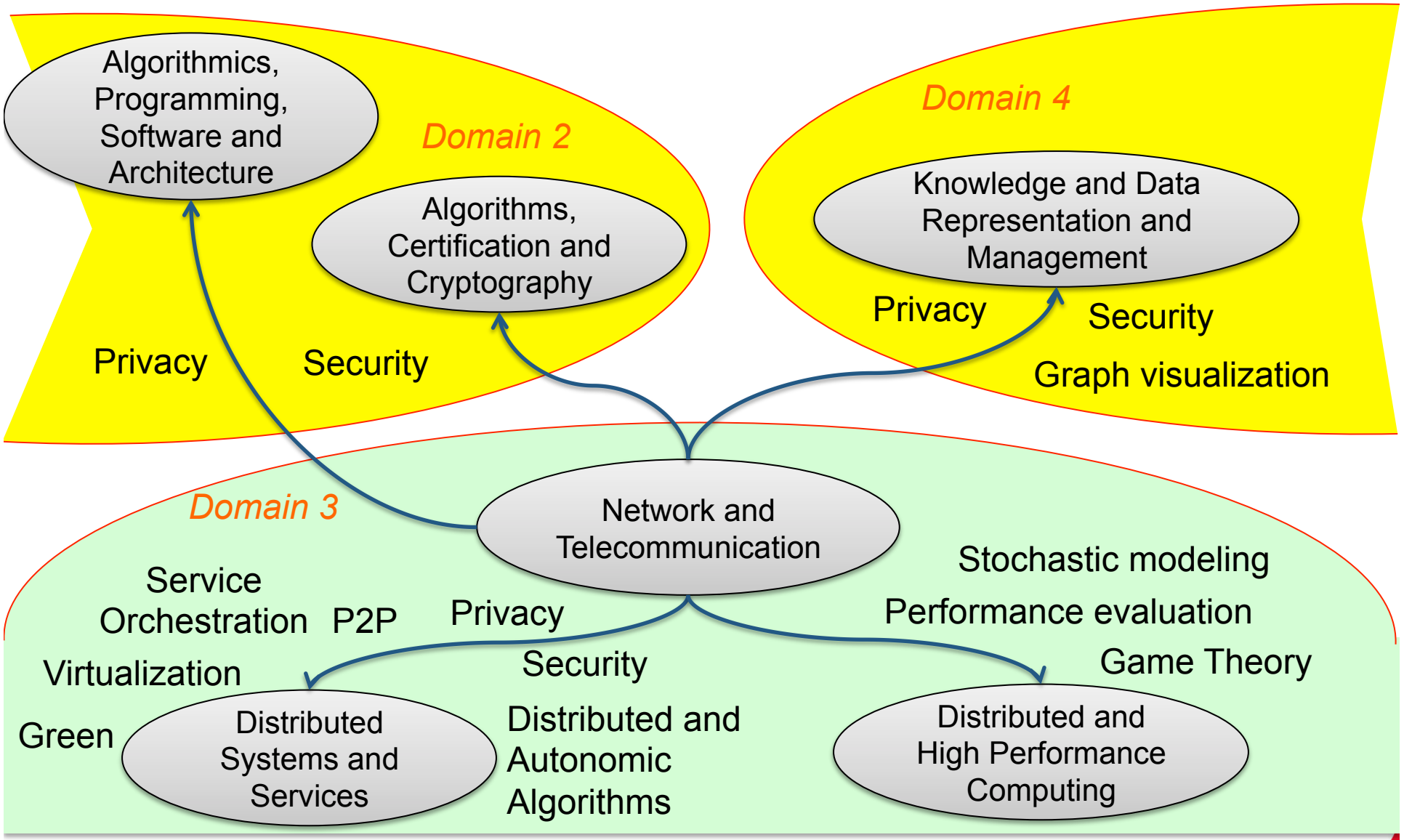
Very large scale open wireless sensor network testbed



FIT

Future Internet (of Things)

Links with other domains/themes



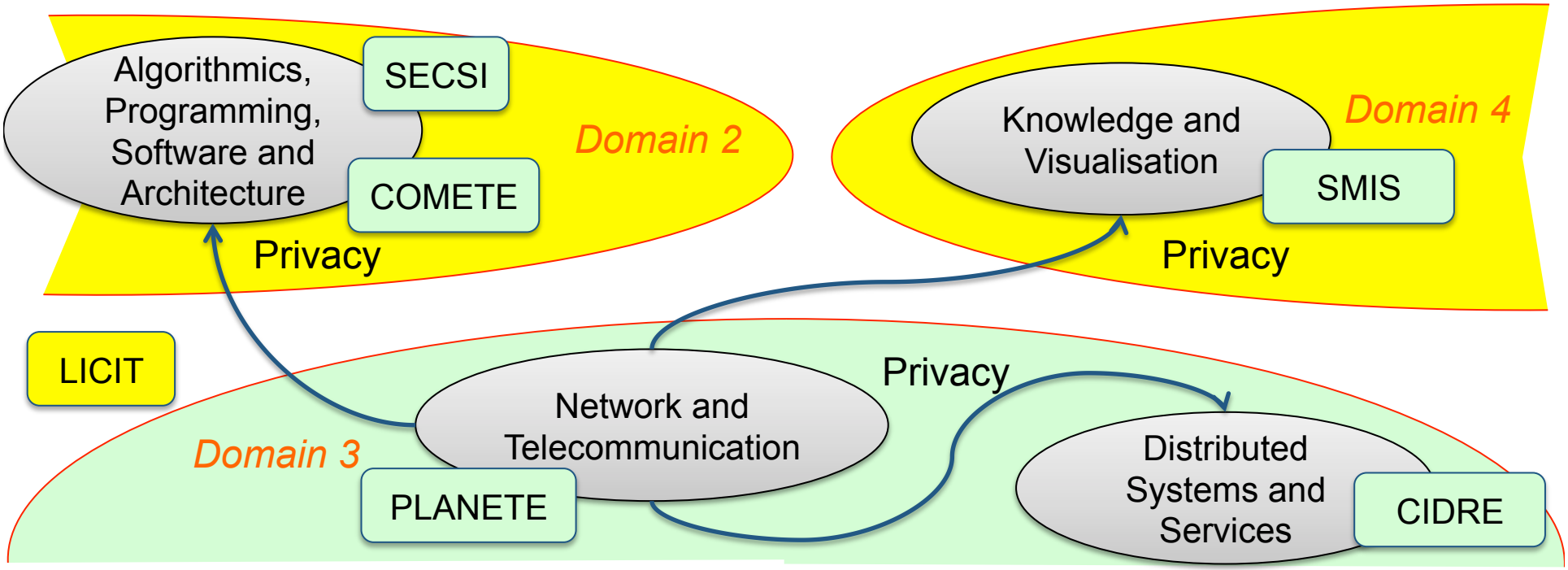
6. Collaborative research

- **Inria support for collaborative research**
  - Large Scale Initiative (AE)
    - Enable the launch of ambitious research projects (often interdisciplinary)
  - Collaborative research action (ARC)
    - Allow several research teams to work together on promising new fields
  - Technological Development action (ADT)
    - A collaborative project involving project-teams and technical support teams

- **National funding for collaborative research**
  - The French National Research Agency (ANR)

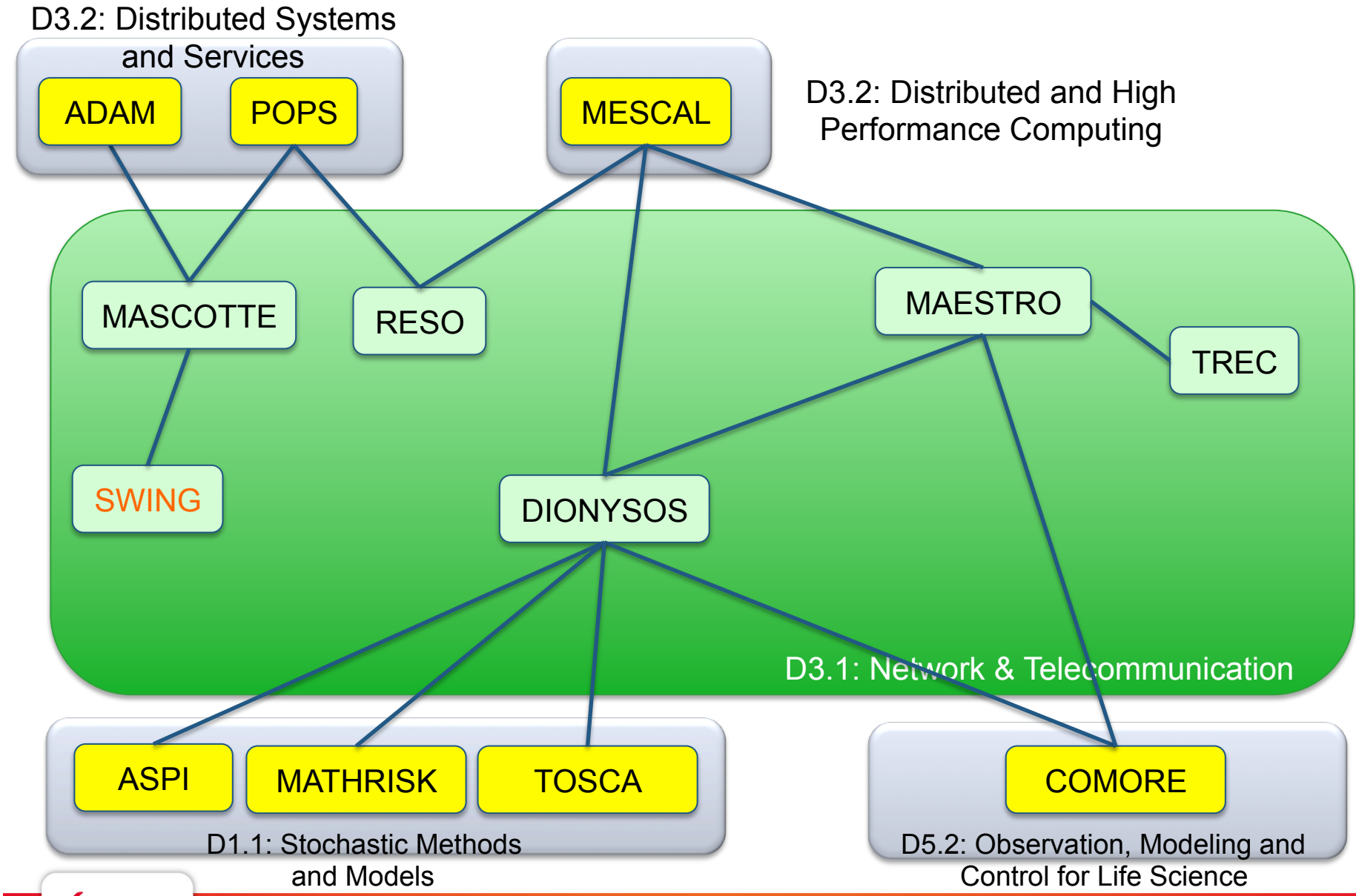
- **Laboratory of Information, Network and Communication Sciences (LINCS)**
  - Created on Oct. 2010 by 3 French institutions of higher education and research
    - INRIA (**Gang**, **Trec**), Institut Telecom and UPMC
  - Alcatel-Lucent joined the LINCS in February 2011 as a strategic partner
  - 65 researchers (including PhD and visitors)

Large Scale Initiative: CAPPRIS



- Protection of Privacy Rights in the Information Society
  - Inria (5 project-teams + 1 exploratory action) + University of Namur + Eurecom + LAAS
  - Topics: Identification of privacy threats, privacy analysis, privacy by design, social and legal issues

Collaborative research action

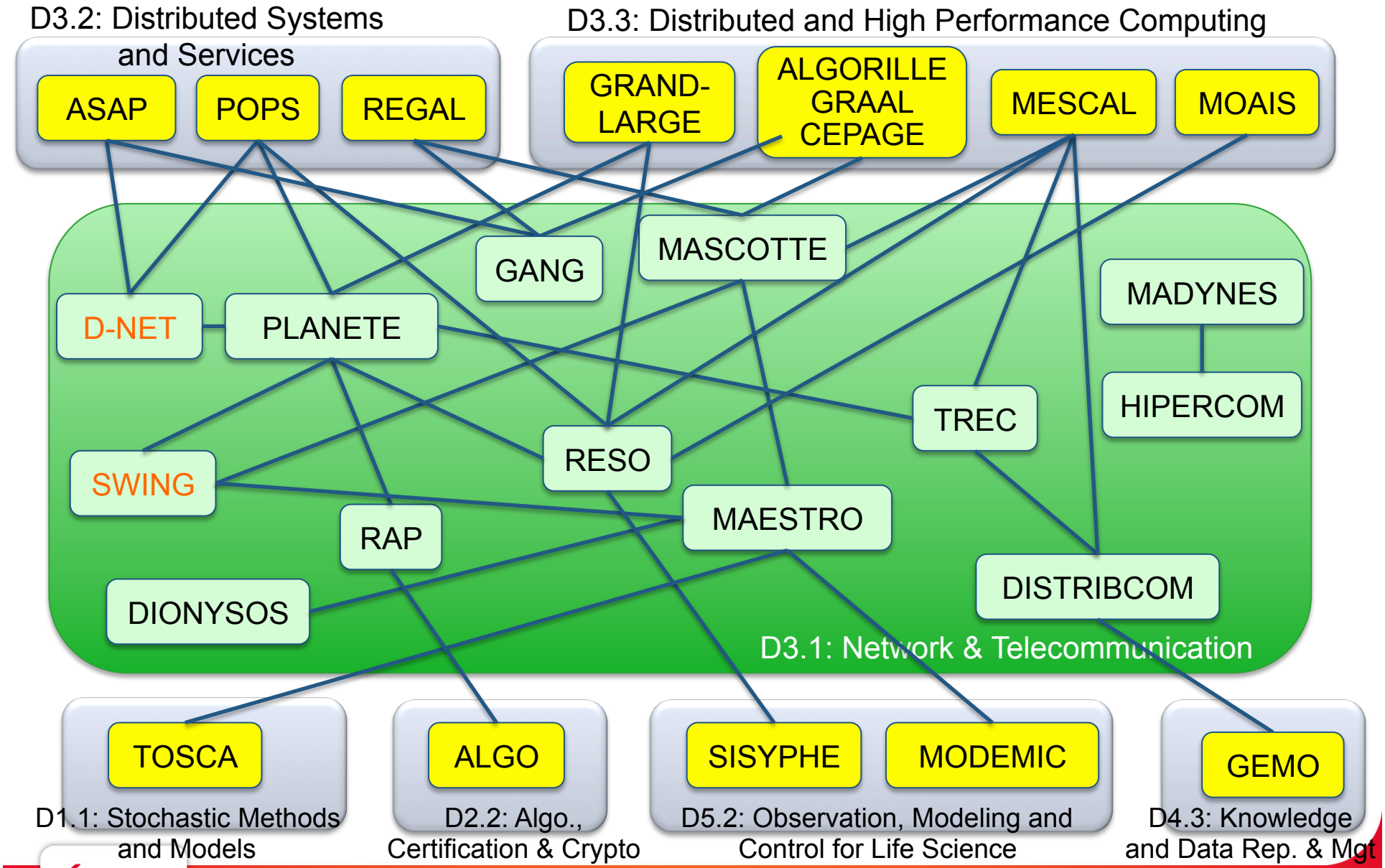


Technological Development actions

- MOBSIM – Simulation platform for mobile networks
  - 3 project-teams/team involved (**Planete**, **Swing**, **Hipercom**)
  - Objective
    - Avoid fragmentation in the development of simulation tools
    - Foster collaboration in the development of NS-3
    - Add new simulation models to NS-3 for wireless networks
  - Agreement between Inria and University of Washington

- SENSAS – Sensor Network Applications
  - 7 project-teams/team involved (Non-A, Amazones, Demar, **D-Net**, **Madynes**, Necs, Pops)
  - Objective
    - Develop innovative applications using sensor networks or mobile robots (surveillance, drone flotilla, body area network, fuzzing for sensor networks

Collaborative research (ANR Funding)



7. Collaboration with the industry/ standardisation

- Main collaborations:
  - Alcatel-Lucent
    - Inria / Alcatel Lucent Bell Labs Common Lab (⇒ A. Benveniste's talk)
    - **Dionysos**, **Disribcom**, **Gang**, **Madynes**, **Maestro**, **Mascotte**, **Planete**, **Rap**, **Reso**, **Trec**, **Swing**
  - Orange Labs
    - **Dionysos**, **Distribcom**, **Gang**, **Maestro**, **Mascotte**, **Rap**, **Reso**, **Trec**, **Swing**
  - Technicolor
    - **Dionysos**, **Gang**, **Mascotte, Trec**
- Standardization
  - IRTF - Network Management Research Group (**Madynes**)
  - IETF - IPv6 conformance (**Dionysos**), ad-hoc, WSN (**Hipercom**, **Swing**), mesh networks (**Hipercom**), Early Retransmit for TCP and SCTP (**Maestro**), Forward Error Correction Codes for Broadcast/Multicast Systems (**Planete**)
  - ETSI - Language for interoperability tests (**Dionysos**), VANET (**Hypercom**)
  - OGF - Network Mark-up Language and Network Service Interface (**Reso**)

8. Participation to European Initiatives

- FP7 ICT, Challenge 1: Pervasive and Trusted Network and Service Infrastructures
  - Obj 1.1 – Future Network (5 projects)
    - AUTOI (**Reso**), EuroNF (**Dionysos**, **Maestro**, **Reso**, **Trec**), GEYSERS (**Reso**), SAIL (**Reso**), UNIVERSELF (**Distribcom**, **Madynes**)
  - Obj 1.6 – FIRE (7 projects)
    - ECODE (**Planete**, **Maestro**), ONELAB2 (**Planete**), OPNEX (**Hipercom**), BonFIRE (**Reso**), EULER (**Gang**, **Mascotte**), NOVI (**Planete**), OPENLAB (**Planete**)
  - Obj 1.7 – PPP Future Internet – Core Platform (1 project)
    - FI-WARE (**Madynes**)
- EIT ICT Labs (O. Festor is Research Director of EIT ICT Labs)
  - "Internet Technologies and Architectures" Action Line
    - Fundamental of networking (**Gang**, **Trec**), Future Internet (of ThINGs) Facility (**Planete**), Software-Defined Networking (**Planete**)
  - "Computing in the Cloud" Action Line
    - Information-centric and device clouds (**Planete**)

Participation to International Initiatives

- Inria@SiliconValley, USA
  - Foster collaboration between Inria, UC Berkeley and Stanford University
  - **Planete**, **Trec**
- CIRIC (Communication and information Research and Innovation Center, Chili)
  - Research and innovation centre in Chile involving 9 Chilean Universities & Inria
  - Internet and telecommunications networks is one of the 3 lines of research
  - **Dionysos**, **Planete**
- JFLI (Japanese French Laboratory for Informatics), Japan
  - Associated with the CNRS, 3 Japanese research institutions
  - Next Generation Networks is one of the the 5 lines of research
  - **Madynes**, **Reso**, **Planete**
- LIRIMA (International Research Laboratory in Informatics and Applied Mathematics, Africa)
  - **Madynes**

Thank you

Research Department

www.inria.fr

Collaborative research (ANR Funding)

- CMON (2007-2010) – End-to-end measurement for Internet (**Trec, Planete**)
- CONNECT (2011-) - Content-Oriented Networking (**Planete**, **Rap**)
- DOCFLOW (2007-2010) - Composite web services (**Distribcom**, Gemo)
- DMASC (2008_2012) – Advanced multifractal analysis tools (**Reso**, Sisyphe)
- DSLLAB (2006-2008) – Experimental platform on DSL Internet (**Reso**, Mescal)
- ECOSCELLS (2009-2012) – Efficient Cooperating Small Cells (**Maestro, Mascotte**, **Swing**)
- F-LAB (2011-2013) – Federation of testbeds (**Planete, Fun, D-Net**)
- GRATEL (2010-2013) - Graphs and Telecommunications (**Mascotte**, RealOpt)
- HIPCAL (2007-2008) – virtual private execution infrastructure (**Reso**, Grand Large, **Planete**)
- MODECOL (2009-2012) - Using mathematical MODeling to improve ECOLogical services of prairial ecosystems (**Maestro,** Modemic, Tosca)
- PEGASE (2009-2012) - Network Calculus for embedded networks (**Distribcom**, Mescal, **Trec**)
- PETAFLOW (2009-2012) - distributed simulation and visualization of unsteady flows of peta-scale size (**Reso**, Moais)
- RESCUE (2010-2013) – mobile coordinated substitution network (**Reso**, Pops)
- SARAH (2007-2010) – Pervasive Computing and Ubiquitous Networks (**Madynes**, **Hipercom**)
- SADA (2005-2008) – Discrete Random Structure (**Rap**, Algorithms)
- SENSLAB (2007-2011) – Very Large Scale Open Wireless Sensor Network Testbed (**D-NET,** Asap, Pops))
- SPREADS (2007-2010) – Safe p2p-based reliable architecture for data storage (**Mascotte,** Regal)
- USS-SIMGRID (2010-2012) - Ultra Scalable Simulations (Algorille, Cepage, Mescal, Graal, **Mascotte**)
- WINEM (2007-2009) - WiMAX Network Engineering and Multihoming (**Dionysos, Maestro**)

Collaborative research (ARC)

- BROCCOLI (2008-2009): Building instrumenting and deploying component-based architecture for large-scale applications (**Mascotte,** Adam)
- CARMA (2007-2008): mesh network capacity (**Mascotte, Swing,** Pops)
- GREEN-NET - Power aware software frameworks for high performance data transport and computing in large scale distributed systems (**Reso**, Mescal)
- MENEUR - Examining the economic relations between service and content providers (**Dionysos**, **Maestro**, Mescal, Comore)
- MISSION (2010-2011 - Wireless emergency networks (Pops, **Reso**)
- OCOQS (2011-2013) - Optimal threshold policies in COntrolled Queuing Systems (**Trec**, **Maestro**)
- POPEYE (2008-2010): behavior of large complex systems that involve interactions among one or more populations (**Maestro**, Mescal)
- RARE (**Dionysos**, Aspi, Mathrisk, Mescal, Tosca)