

SCAN-Amsud Kick-off Meeting

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UPMC, LIP6/CNRS
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Universidad del Museo Social Argentino
Buenos Aires, Argentina



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Université Pierre et Marie Curie

- Largest French Medical and Science University
- Created in 1971, from the split of the Sorbonne Science Faculty
- 30,000 students (2,800 doctoral candidates)
- 4,000 Faculties, 3,000 other personal
- 180 research labs
- 700 doctoral thesis defended per year
- 15,000 publications in the last four years



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Laboratoire d'Informatique de Paris 6 Institutional Partners

- LIP6 is a joint laboratory of
 - University Pierre et Marie Curie
 - CNRS (French National Center for Scientific Research)
 - Largest European fundamental research organization
 - 11 K researchers, 14 K technical staff & Engineers
 - Covers several most fundamental fields
 - Information and Engineering Sciences and Technologies
 - Mathematics, Physics, Earth Sciences and Astronomy, Chemistry, Life Sciences, Humanities and Social Sciences, Environmental Sciences and Sustainable Development
- LIP6 has common teams with
 - INRIA (National Institute for Research on Computer Science)



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LIP6

- 460 Lab members
 - 156 academics and researchers
 - 266 PhD students – post doct., research engineers
 - 22 Staff
- Missions
 - Research
 - Technological transfer
 - Research education (Masters– PhD program)



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Budget

- Total budget around 12.5 ME
 - Salaries: 7.4 ME
 - Institutional credits: 0.6 ME
 - Contracts: 4.5 ME
 - European Union (IST)
 - ANR: National Research Agency
 - Industry
 - ...



Lab. Organization

5 research departments

- Networks and Distributed systems
 - Large Scale telecommunication networks, Ubiquitous and Mobile network, Metrology
 - Large scale distributed operating systems - Grid computing, Peer-to-peer (INRIA Team)
 - Distributed software components – modeling techniques, verification tools
- System on chip
- Scientific computing
- Decision making, Intelligent systems
- Databases and Machine learning



Team Composition (current)

- 11 E/C + 5 CR CNRS
- 21 PhDs
- 4 Engineers (CDD)
- 3 Post-Docs
- A shared secretariat
- Shared engineers (production/LIP6)



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Team Composition

Baey	Sébastien	MC
Baynat	Bruno	MC
Cruz Teixeira	Renata	CR2 (10/2006 – PhD UCSD/USA)
Dias De Amorim	Marcelo	CR2
Fdida	Serge	PU1 (Team leader) - <i>HDR</i>
Fladenmuller	Anne	MC
Fourmaux	Olivier	MC
Friedman	Timur	MC
Latapy	Mathieu	CR1 (1/2007 – CR1 LIAFA) – <i>HDR</i>
Le Grand	Bénédicte	MC
Magnin	Clémence	CR2 (1/2007 – CR2 CREA)
Malouch	Naceur	MC
Marzouki	Meryem	CR1 (1-2006) - <i>HDR</i>
Salamatian	Kavé	MC - <i>HDR</i>
Spathis	Prométhée	MC
Thai	Kim Loan	MC



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Research vision

- Evolution of the Internet
 - Commodity
 - New requirements have pushed the Internet principles closer to their limits
 - Small improvements, higher cost & complexity
 - Opposite forces shapes the future Internet
 - Therefore, limited innovation
- Question the future(s) of the Internet



Changes

- *Networked Systems* are predominant, with various forms
- Increased **heterogeneity** of devices and networks
- Mobility and Dynamicity
- Increased management **complexity**
- Moving more from **connectivity** to **content**
- An increasing variety of **applications**
- User-centric approach to system design
- Other factors than technology will be instrumental
 - Economics, Social behaviors, Regulation...
- Security and Trust



Research activities

- Shape the future Internet
 - Fundamentals, complementary skills
 - Distributed algorithms, Modeling, Signal, Graph
 - Experimentally driven research : Testbeds
 - CNRS RECAP (sensors), RNRT Infradio (Wireless Mesh), CAP Digital Heterogeneous networks (Gigacom), IST Onelab (large-scale Overlay testbed)
- Two complementary targets
 - Short-Medium Term
 - Improve/adapt Today's Internet
 - Medium-Long Term
 - Innovation / Disruptive technologies
- Governance and usage
 - New Internet usage and observation, ICT impact



Research Directions (2004-2008)

- Wireless and Ambient Networking
- Measurement and Monitoring
- Modeling and Performance Analysis
- Content Networking
- Internet Governance and Usage



Wireless and Ambient Networking

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Problem statement

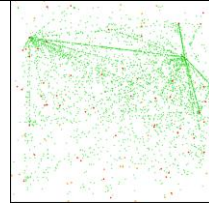
- The world is moving wireless!
 - Internet has been conceived for static users connected through cables
- This requires novel networking techniques that must face new issues
 - Heterogeneity, dynamics, scalability, diversity
- The NPA team addresses the following aspects
 - Routing protocols and algorithms
 - Mobility models and measurement

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Approach



- Cross-layering design
 - Fundamental for efficiency in constrained environments
 - Ex: MeshDV and QualRoute
- Use of mathematical structures for addressing and routing
 - Self-organization techniques
 - Ex: Twins, Taroko and JuMPS
- Investigation of user behavior
 - In mobile networks, nodes behave as the users carrying them
 - Ex: MobiSpace, Ghost, Simps
- Extensive use of experimentation
 - Testbeds, measurements tools, prototyping environments
 - Ex: MeshDVNet, Gigacom, WIP, PRAWN



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Impact

- Projects and Cooperations
 - **European:** IST WIP (571K€), IST ACCA (22K€), CELTIC Boss (180K€)
 - **National:** Infradio (279K€), Gigacom (250K€), Airnet (151K€), SVP (200K€), MosoMuso (135K€)
 - **International cooperations:** NSF/CNRS Manet, CAPES/COFECUB, CNRS/WIDE, LIP6 SoC/NPA
- Publications in major journals and conferences
 - **Journals:** IEEE TPDS, IEEE Magazines (Communications, Wireless, Network), ACM WINET, Ad Hoc Journal, Computer Comm., etc.
 - **Conferences:** IEEE Infocom, ACM Mobihoc, BP in ACM CoNext'05, ACM Wintech, IEEE VTC, IEEE PIMRC, IFIP Networkin, etc.
- Editorial board and program committees
 - **Editorial board:** Computer Comm., Computer Networks, Journal of Wireless and Optical Communications, Annals of Telecommunications, ACM WINET, etc.
 - **PC:** ACM Sigcomm, ACM Conext, IEEE Globecom, ACM Mobihoc, IEEE Infocom, IEEE ICC, etc.
- Softwares
 - Ghost (mobility modeling), Prawn (prototyping environment), WScout (wireless trace visualization, **now at Crowdad**)



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Content Networking



Context and Issues

- Internet is mainly used for data access
 - “get me this data.....”
- Internet was designed for host-to-host communication
 - “contact this host...”
- Mismatch between usage and design: hostname/path
 - data are bound to hosts location
- Application driven research
 - Audio/Video streaming applications
 - Most of the Internet traffic is related to multimedia content
 - Overlays construction for new services
 - Overlays and P2P support with user behavior integration
 - Social Networking
 - Usage evolution and impact on network of users communities
 - Content-based Routing
 - architecture design around data access



Approach

- Emerging applications analysis
 - P2P-TV Traffic Measurement (local and across the internet)
 - Statistic and Scaling Measurement Analysis
 - Application Traffic Characterization
 - User Behaviors and Application Mechanisms inference
- Content-based routing
 - Route-by-name used for name resolution instead of DNS name lookup
 - Attributes-based naming
 - Name not tied to location
- Architectural proposals
 - P2P Live Streaming with Enhanced Incentive Mechanisms
 - Social and Mobile Networking
 - Entity-Centric Routing with Pub/Sub Mechanisms
- Validation
 - Large Scale P2P Streaming Simulation
 - Audio/Video Metrics and Scenarii Standardization
 - Mobile Platform



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Impact

- Research Projects:
 - NoE IST-Content (100K€)
 - RIAM MosoMuso (135K€)
 - IST FET ANA (487K€),
- Intra-LIP6 Project:
 - Projet NPA / REGAL (2005-2006) : Architecture for P2P Streaming
- International Collaborations
 - Technical University of Darmstadt: Large Scale P2P Networks Simulation
 - University of Napoli : P2P Traffic Analysis and Modeling
 - University of Tokyo (WIDE-CNRS) : P2PTV Measurement
 - University of Oslo : Architecture for P2P Streaming
 - University of Athens (NKUA): Benchmarking and Metrics for Streaming
- Main publications:
 - NOSSDAV (Network and Operating Systems Support for Digital Audio & Video)
 - DCCIS (Dynamic Communities: from Connectivity to Information Society)



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NPA Objectives (2009-2011)

- Continue to support our leading role in network research
- Develop a larger spectrum of skills to address future internet challenges



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