INFORMATION SHEET

IoT and networks

For dynamic and on-demand next generation networks

Over the past decade, the needs and requirements of end-users for digital services have continued to grow.

This has led telecom operators and equipment manufacturers to radically rethink network architectures and associated services.

These so-called next-generation networks are adaptive, intelligent and autonomous, and enable object connectivity and massive data collection with less centralised approaches than before.

CHALLENGES

Businesses face the challenge of providing high quality services at low cost and on demand. European sovereignty issues are also identified, to ensure reversibility and confidentiality of end-user data.

POSITIONING OF THE INSTITUTE

IRT SystemX has solid skills in the field of future networks and meets the expectations of vertical industrial players (industry 4.0, defence, connected mobility, etc.), for whom the deployment of dynamic networks has become a priority. The institute is particularly interested in the cloud-edge continuum, virtual network functions, 5G and vehicular networks, and IoT embeddability.

EXPERTISE

Mobile networks, programmable networks, 5G, cloud-RAN, industrial IoT, edge computing, cloud computing, resource allocation, data centre networks, edge-cloud continuum, virtualisation, V2X.

Projects in this field

STC projet

Addressing the agility and performance needs of Telecommunications and Cloud Services

- Approach based on Branch&Cut techniques to optimise network coverage
- Study of different splits for 5G: Exploratory research

EFE projet

Developing Low Footprint Ethernet for new in-vehicle services

- Simulation-based method for transmission time evaluation
- Testing and validation of connectivity and transmission tools
- Comparison of these solutions to the IEEE Ethernet standard before integration

Exploratory research

- Mathematical models for calculating joint network and CPU (central processing unit) resource trade-offs
- Proposal of a framework for the redundancy of the analysis of collected video streams
- Any-time approach for reconfigurable IoT networks
- Joint planning of radio and computational resources in C-RAN

Roadmap

SCIENTIFIC AND TECHNOLOGICAL CHALLENGES	RELATED RESEARCH FIELDS
Hybrid Connectivity for IoT Networks	• Reliable and secure connectivity • Massive connection of connected objects and vehicles
Adaptive networks under real-time constraints	• Resource-performance and location balancing • Slicing of shared infrastructures • Smart surfaces for networks
End-to-end urbanisation of future networks	• Bringing intelligence and computing closer to data sensors • Orchestration and IoT/IT convergence (Edge computing) • Managing and orchestrating the IoT-Edge-Cloud continuum
Embeddability of IoTs	• Performance of embedded computing (GPU, multi-OS, etc.) • Embeddability and consistency of hardware vs. software solutions • Management of IoTs and their energy consumption (green networks)

Platforms and demonstrators

IONET

- Industrial data collection
- Distributed and secure data storage
- Performance evaluation of different resource allocation algorithms aiming at network-CPU resource balance, scalability and convergence in constrained time

OPEN AIR INTERFACE

- Placement of certain functions from 5G New Radio Interfaces specifications, established by the 3GPP (3rd Generation Partnership), closer to the antenna.
- Moving other functions to the central clouds
- Optimising the performance of 5G networks

Target of IRT SystemX publications in this field (HAL collection)

● JOURNALS

Journal of Transactions on Parallel and Distributed systems, Journal of Computer Networks, Transactions on Cloud Computing, Ad-hoc networks, IEEE Access, SIAM Journal of Discrete Maths, IEEE/ACM transactions on Networks

● CONFERENCES

IEEE WCNC (Wireless Communications and Networking Conference), IEEE CCNC (Consumer Communications & Networking Conference), VTC (Vehicular Technology Conference), ICC (International Conference on Communications), ICT (International Conference on Thinking), IEEE Globecom (Global Communication), IEEE HPSR (International Conference on High Performance Switching and Routing), IEEE LCN (Conference on Local Computer Networks), ICIN (onference on Innovation in Clouds, Internet and Networks), IEEE/IFIP NOMS (Network Operations and Management Symposium), ACM SIGCOMM (annual conference of the ACM Special Interest Group on Data Communication), IEEE/ACM CCGRID (International Symposium on Cluster, Cloud and Internet Computing), IEEE NCA (International Symposium on Network Computing and Applications), FiCloud (International Conference on Future Internet of Things and Cloud)

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ACADEMIC PARTNERS

CentraleSupélec

Institut Mines-Télécom

LINCS

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

université PARIS-SACLAY

RESEARCH GROUPS AND SCHOLARLY ORGANIZATIONS

Embedded France
L'EMBARQUÉ MADE IN FRANCE

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INDUSTRIAL PARTNERS

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THALES
Building a future we can all trust

ABOUT IRT SYSTEMX

SystemX is a technological research institute (IRT) with expertise in the fields of analysis, modelling, simulation and decision support for complex systems. As the only IRT dedicated to digital systems engineering, it coordinates partnership research projects, bringing together academics and industry in a multi-sector perspective. Together, they work to solve major scientific and technological problems in four priority application sectors: Mobility and Autonomous Transport, Industry of the Future, Defence and Security, Environment and Sustainable Development.
Through use-case oriented projects, SystemX's research engineers respond to the major societal and technological challenges of our time, and thus contribute to the acceleration of the digital transformation of industries, services and territories.
Located at the Paris-Saclay plateau and in Lyon, SystemX was created in 2012 as part of the future investment programme.

IN THE TEAMS

16 engineers and researchers

6 PhD projects
5 of which have been defended

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