

Devices and Technologies for Telematic Networks



The modern telecommunication systems, the fast diffusion of new applications of radio communication systems, and the more and more urgent requests by the scientific community for applications relevant to multimedia data transmissions, telemetry, environmental monitoring, meteorology, cosmos's observations, info-mobility, diagnostic, and, finally, the strong requirements of the Future Internet impose new hard performance on the devices and the networking systems used.

Devices and Technologies for Telematic Networks is one of the seven projects of the ICT (Information and Communication Technologies) Department of the Italian National Research Council (CNR). In the framework of the Future Internet it mainly covers the aspects relevant to the "Internet of the networks".

The project aggregates all the competences fundable in CNR in the sector of telematic networks;

it covers many aspects of the following four research areas:

1. Applied Electromagnetics
2. Distributed Automation Systems
3. Wireless Networks
4. Network Design and Management

From a macroscopic point of view, the project comprises the design and development of hardware and firmware components, the study of communication protocols, the definition of new models, the organization of measurement campaigns, the development of industrial, social, and environmental applications, the study of the problems related to the interconnection of heterogeneous networks (access, protocols, QoS, bandwidth allocation, etc.), and the planning, design and management of telematic networks. All communication technologies are here treated: cabled networks, wireless terrestrial networks, optical networks, satellite networks, sensor networks, HAPs (High Altitude Platforms), and the various, possible interconnections among them; security in communications is also considered. Each research area aggregates one or more Research Units (RUs), each of them being composed by groups of researchers spread in different CNR Institutes.

Research Units of the Project

Systems and Devices for the Information Technologies
 Networks and Protocols for Automation and Process Control
 Integrated Wireless Networks for High Speed Access
 Wireless Networks in Realistic Scenario (environmental monitoring and info-mobility)
 Heterogeneous Interconnected Wireless Technologies and Systems
 Planning, Design and Monitoring of Telematic Networks

TERIT ACTION

A special result of the Project is the TERIT action ((Telecommunication Research in Italy), an Italian Approach to the Future Internet, promoted by the ICT Department of CNR together with CNIT (Consorzio Nazionale Interuniversitario delle Telecomunicazioni - National Inter-universities Telecommunications Consortium), in collaboration Centro Ricerche Fiat (CRF), Ericsson, Finmeccanica, and Telecom Italia. TERIT aims at developing and realizing a new generation telecommunication infrastructure based on innovative technologies, suitable for developing advanced applications and services in the ICT sector, thus highlighting the force of the competences present in Italy and, at the same time, filling the scientific and technological gaps where Italy has to conquer the market. The "Internet of the Future" paradigm is the unifying context of the R&D research lines of TERIT.

Documents related to the TERIT action can be downloaded from <http://www.ict.cnr.it/documents>, selecting the ACTION item (registration to the web site is necessary).



Systems and devices for the information technologies

Mathematical models and numerical methods for the electromagnetic analysis; Electromagnetic characterization of materials and meta-materials; Synthesis techniques for microwave devices; Microwave and millimeter-wave system modelling; Wideband antennas; Electromagnetic scattering; Troposphere propagation; Electronic nanodevices; Vertical-cavity surface-emitting lasers; Measurement techniques; Manufacturing.

Head Person:

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Networks and protocols for automation and process control

Industrial Ethernet networks for automation; Performance measurement and evaluation of industrial WLANs; Internetworking techniques and protocols for hybrid wired/wireless real-time industrial communication networks; H/w virtualisation techniques for micro-kernels able to support real-time and multimedia applications; Robust control techniques for telecommunication networks and distributed applications; Modelling, simulation, control and decision support techniques for natural, manufacturing, physiological, and socio-economic processes.

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Integrated wireless networks for high speed access

Modulation/demodulation for new generation systems (MIMO OFDM); Low complexity algorithms for reception/decoding; Efficient type II HARQ coding and decoding schemes; Virtual instruments for analysis and testing of standard wireless and radio systems; MIMO test-bed for on-line acquisition systems and fast system prototyping; Radio localization systems in WLAN/WPAN networks; Indoor radio channel modelling for wireless networks.

Head Person:

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Planning, design, and monitoring of telematic networks

VoIP; Multicast protocols and applications; IPv6; Complex LANs planning, protection and troubleshooting; Distributed Authorization and Authentication Infrastructures (AAL); Participation in the experimentation activities of both the Italian NREN (GARR) and the NRENs international (TERENA and DANTE task forces) communities; Internet Governance.

Head Person:

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Wireless networks in realistic scenarios (environmental monitoring and info-mobility)

Performance of heterogeneous networks in realistic scenarios (environmental monitoring and info-mobility); Models for data throughput analysis; Multicarrier and multiple-input-multiple-output (MIMO) systems; Cooperative diversity techniques; Simulation of heterogeneous wireless networks (SHINE platform); Simulation of wireless sensor networks based on Zigbee technology; Design and characterization of power amplifiers for micro-wave applications; Transceiver design and implementation on FPGA boards.

Head Person:

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Heterogeneous interconnected wireless technologies and systems

Digital satellite communications; Wireless terrestrial networks; Sensor networks; Integration of heterogeneous networks (satellite, wireless, sensors, HAPs); Optimized bandwidth allocation schemes; Security in satellite video and audio streaming transmissions; Measurement campaigns; Packet level wireless channel modelling; Fade countermeasure techniques; Middleware platforms for advanced services.

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"The Net is a world of ends: you are at one end, and everybody and everything else are at the other ends. The Internet's value is founded in its technical architecture."

by D. Searls and D. Weinberger

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