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Introduction to wireless systems

Wireless Systems a.a. 2014/2015

Un. of Rome "La Sapienza"

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[†] *Department of Computer Science – University of Rome "Sapienza" – Italy*



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- Office: Dip. di Informatica, Via Salaria 113, 3° piano, room n. 311, Tel: 06 4991 8354
- E-mail: petrioli@di.uniroma1.it
- What I do:



- Director of the Sensor Networks and Embedded Systems laboratory (SENSES lab); Coordinator of the Cyber Physical System lab of "La Sapienza" center for Cyber Intelligence and Information Security. Member of "La Sapienza" spinoff committee.
 - Founding partner of "La Sapienza" spinoff WSENSE S.r.l.
 - Research interests: design and optimization of wireless, embedded and cyber physical systems; design of solutions for the Future Internet. Over a hundred papers published in international journals and conferences (h-index 27, over 3150 citations).
 - International activities: Member of the steering committee of ACM SenSys, program co-chair of IEEE INFOCOM 2016, general chair of ACM SenSys 2013. She has been member of the steering committee and associate editor of IEEE Transactions on Mobile Computing, associate editor of IEEE Transactions on Vehicular Technology, member of the executive committee of ACM SIGMOBILE, and has been program co-chair of leading conferences in the field such as ACM MobiCom and IEEE SECON.
 - Research Projects: PI of over twenty national and international research projects. Coordinator of two EC projects (FP7 projects GENESI and SUNRISE).
 - Regularly serves as reviewer for the European Commission and other international research funding institutions.
- SENSES lab web page: http://reti.dsi.uniroma1.it/SENSES_lab/index.html
 - Web page : <http://twiki.di.uniroma1.it> → laurea magistrale → sistemi wireless
 - Orario di ricevimento/office hours:
 - Send me an email to agree on a schedule (fast answer) +
 - After the class



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Who we are...

Students



Career Aspirations



Background



Status



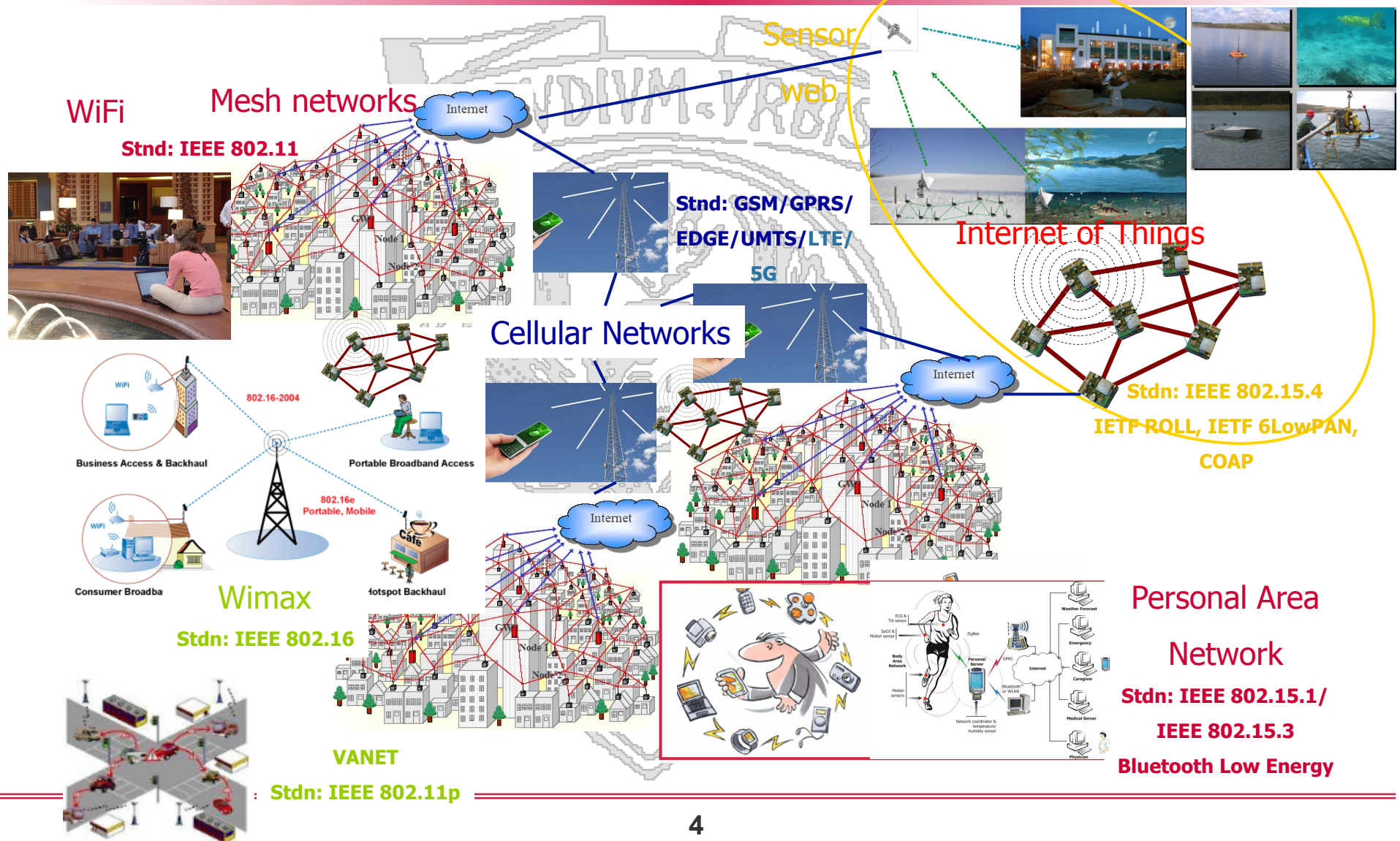
Interests



What we will do

Why a class on wireless systems?

Wireless systems are becoming the usual way to connect to the Internet, and communicate...





What we will do
Why a class on wireless systems?

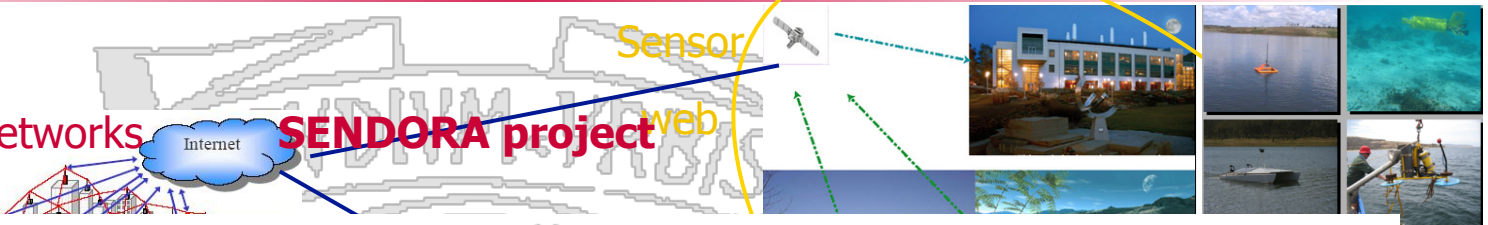
Wireless systems are becoming the usual way to connect to the Internet, and communicate...

WiFi

Std: IEEE 802.11

Mesh networks

SENDORA project



UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

RADIO SERVICES-COLOR LEGEND

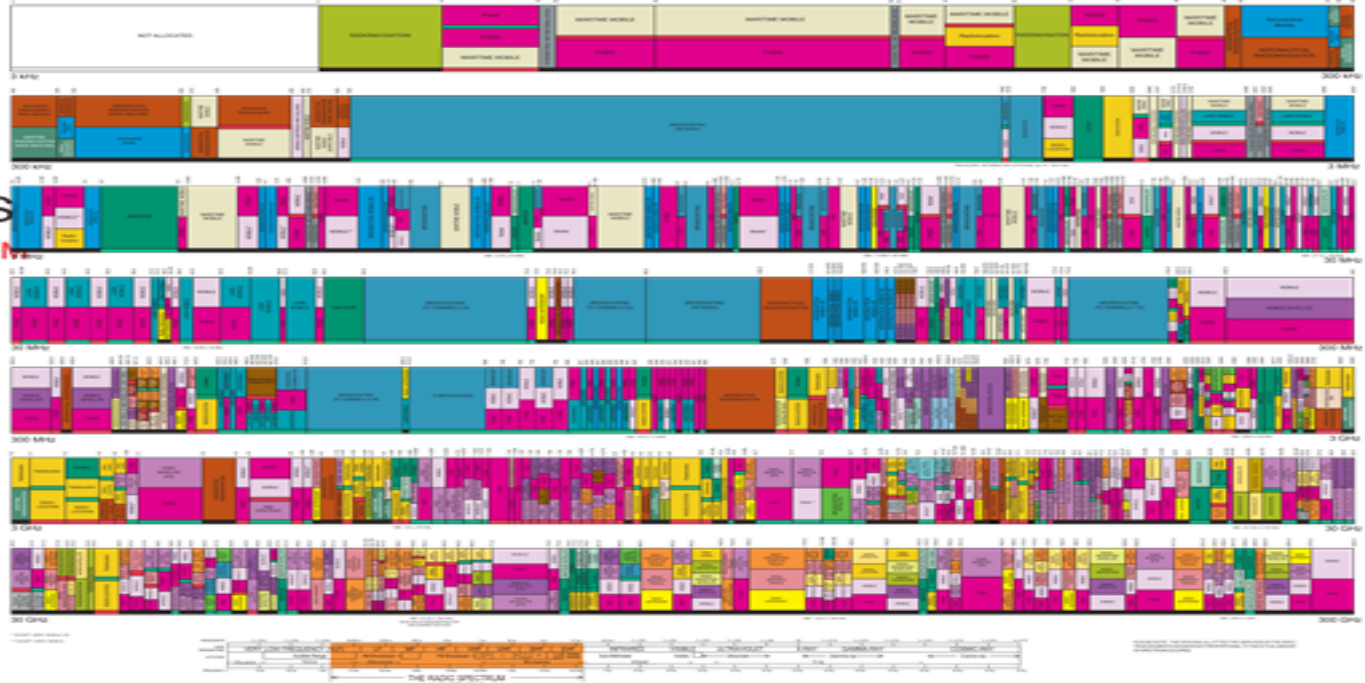
Mobile Services	Land Mobile Services	Fixed Services
Mobile Satellite Services	Land Mobile Satellite Services	Fixed Satellite Services
Mobile Earth Station Services	Land Mobile Earth Station Services	Fixed Earth Station Services
Mobile Earth Station Satellite Services	Land Mobile Earth Station Satellite Services	Fixed Earth Station Satellite Services
Mobile Earth Station Earth Station Services	Land Mobile Earth Station Earth Station Services	Fixed Earth Station Earth Station Services
Mobile Earth Station Earth Station Satellite Services	Land Mobile Earth Station Earth Station Satellite Services	Fixed Earth Station Earth Station Satellite Services

ACTIVITY CODE

Primary	Secondary
Permitted	Not Permitted

ALLOCATION USAGE DESIGNATION

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS



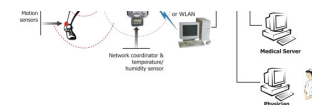
N,



VANET

Std: IEEE 802.11p

Cognitive networks



Std: IEEE 802.15.1/

IEEE 802.15.3

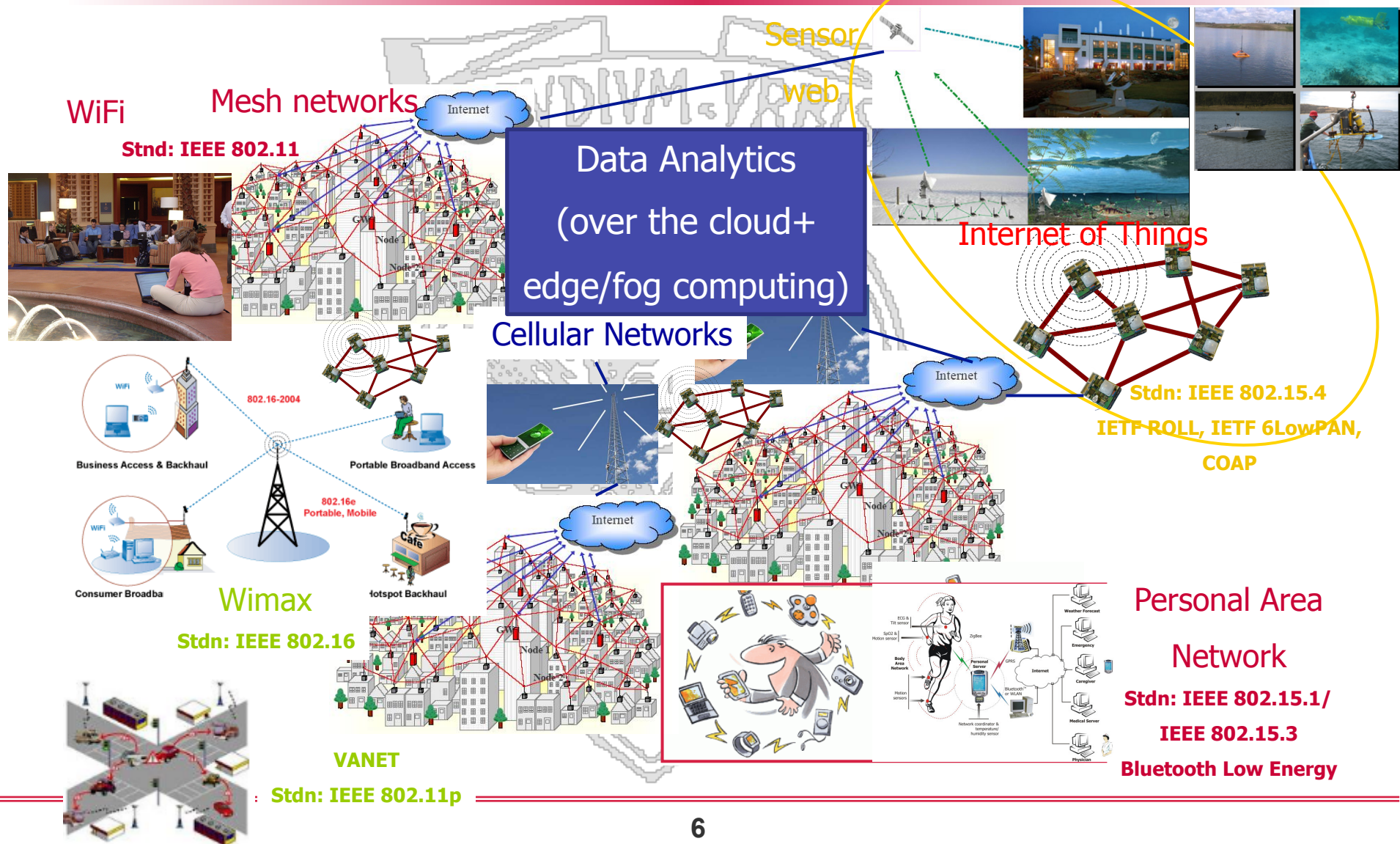
Bluetooth Low Energy



What we will do

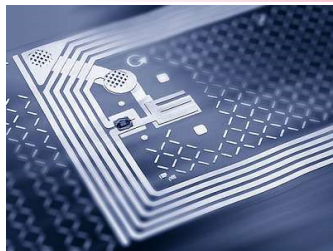
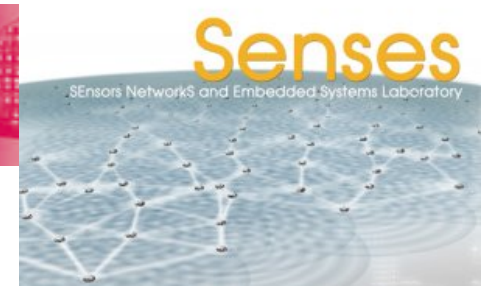
Why a class on wireless systems?

Wireless systems are becoming the usual way to connect to the Internet, and communicate...



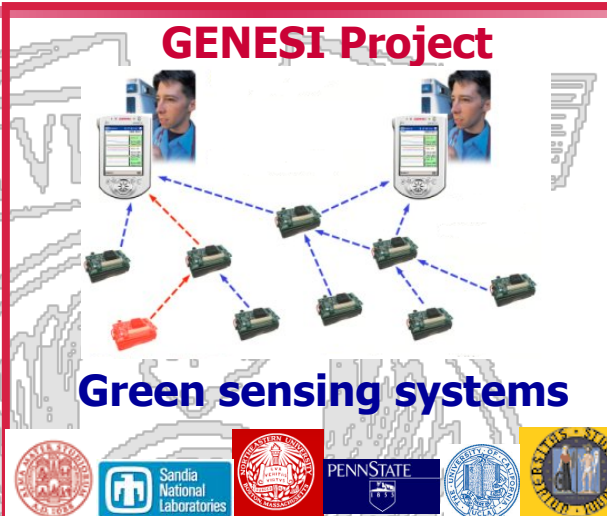


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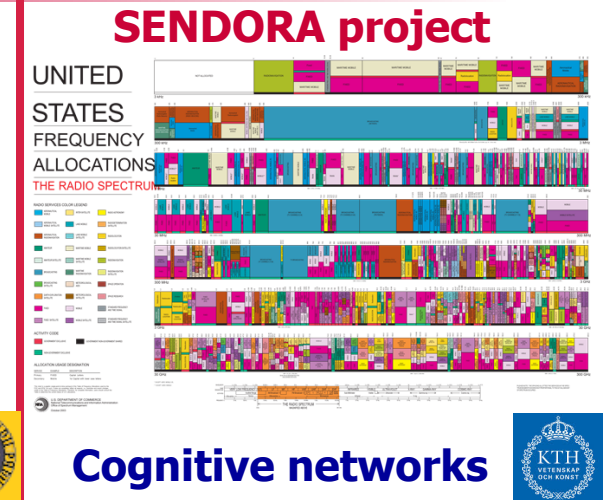
CHIRON project

RFID Anticollision Protocols,
Passive backscattering systems



GENESI Project

Green sensing systems



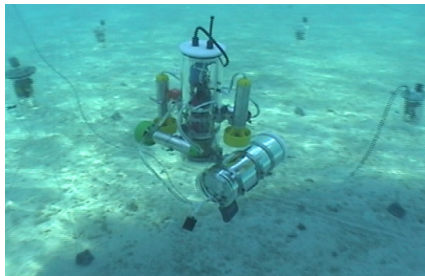
UNITED STATES
FREQUENCY
ALLOCATIONS
THE RADIO SPECTRUM

SENDORA project

Cognitive networks



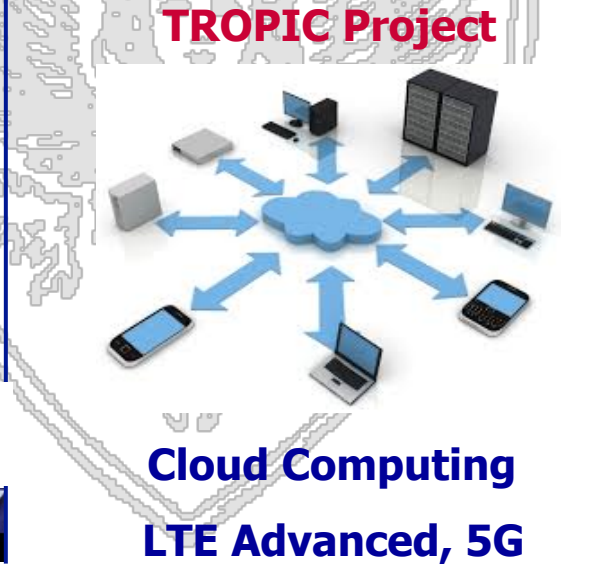
CLAM Project; SUNRISE project



Underwater Monitoring systems

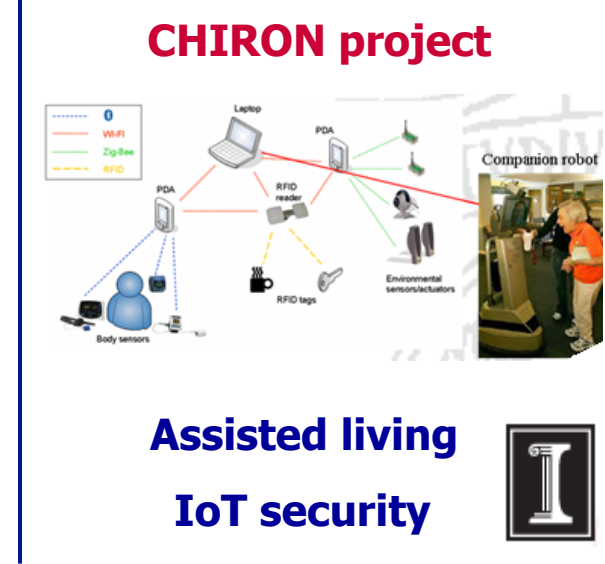


U.PORTO



TROPIC Project

Cloud Computing
LTE Advanced, 5G



CHIRON project

Assisted living
IoT security





Syllabus and mapping on names different from before!!

All students can include both courses in their curriculum

Reti Avanzate

Advanced Topics in Networking

Sistemi Wireless

Wireless Systems

Main Focus on Internet of Things and Sensing Systems

- **Background: Introduction to wireless systems;**
- **Background: Ad Hoc Networks, energy efficiency;**
- **Internet of Things technologies: standards+ cutting edge technologies and solutions (Including energy harvesting low power comms);**
- **Zero power monitoring systems: RFID & passive backscattering enabled systems; energy harvesting enabled-IoT; wake up radio enabled IoT**
- **High data rate indoor IoT systems: visible light communication.**
- **IoT programming (lab);**
- **From IoT to applications for smart cities;**
- **Underwater cyber physical systems;**
- **Methodologies:**
 - **Simulations;**
 - **Implementation and real life testing;**
 - **Implementation of protocols on embedded devices.**

Mobile systems:

- **Introduction to wireless systems (features and design challenges);**
 - **Mobile cellular systems**
 - **Architecture and optimization of cellular systems.**
 - **2G systems: GSM, GPRS,..**
 - **From 3G to LTE**
 - **Crowd sensing: sensing with smartphones (lab)**
 - **Trends in mobile systems: towards 5G**
 - **Technologies to overcome limitation of current systems in terms of energy consumption and bandwidth.**
 - **Cognitive networks and dynamic spectrum allocation.**
 - **Novel architectures for radio access: software defined networking (also lab)**
 - **Interconnection with the Cloud**
 - **Integration of IoT & 5G systems**
- WiFi and extensions (e.g., mesh Networks, VANET, ITS)

Projects within SENSES



Reti Avanzate

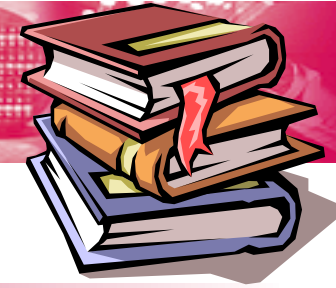
Advanced Topics in Networking

Sistemi Wireless

Wireless Systems

Why is it listed as wireless systems and not R.A.?
Can I attend both courses (advanced topics in networking/wireless Systems) ? Can I do the exam?
Can I attend even if I was enrolled in the advanced topics on networking/wireless system class last year?





- Book chapters, papers, slides, notes of the class
- From theory to hands on experience
 - Classes
 - Seminars of advanced topics on networking, lectures by international experts in the field
 - Discussion of some key recent results in the area
 - Laboratory classes
 - crowdsourcing: how can I read sensed data from my smartphone?
 - The future of networking and mobile access networks: Software Defined Networkwing
- Exam:
 - Full written test+project
 - Short written test(s)+project



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College experience



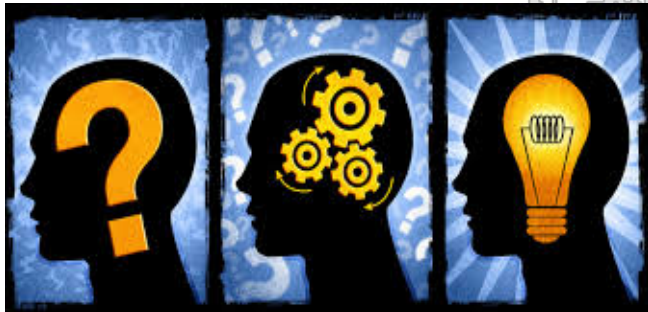
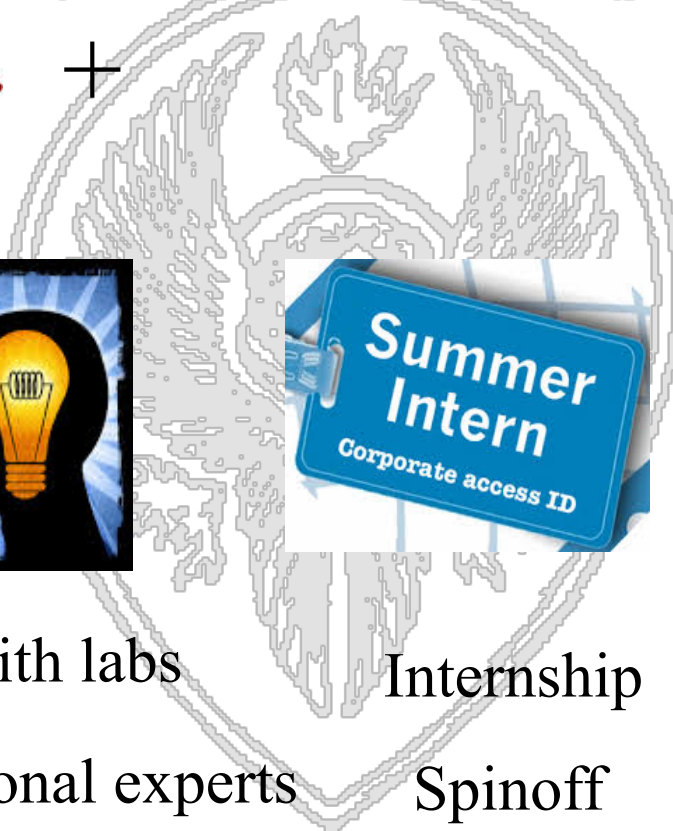


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College experience



+



Collaboration with labs

Internship

Seminars of international experts

Spinoff



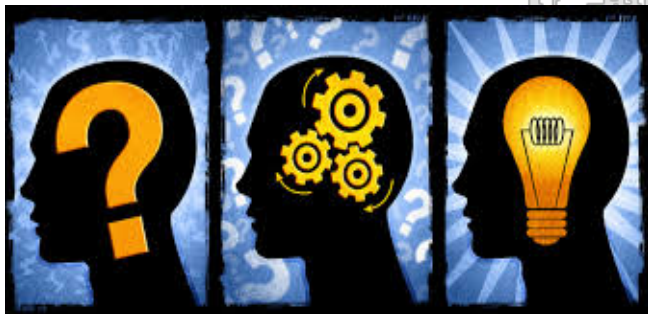
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College experience



+

- International lab environment
- Opportunities for RAs
(Borse di studio per attività di ricerca)
- Working opportunities in the spinoff



Collaboration with labs

Internship

Seminars of international experts

Spinoff



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College experience

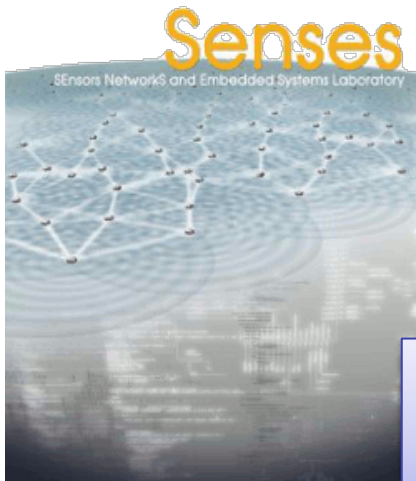


Internet&Networking seminars



Grants to attend the conference

GRANTS
Contact me AT cpetrioli@gmail.it



CIS SAPIENZA
CYBER INTELLIGENCE AND INFORMATION SECURITY

<http://senseslab.di.uniroma1.it>
<http://www.cis.uniroma1.it>



www.wsense.it