SatNEx III

Summer School 2011

Faculty of Engineering – University of Siena

Via Roma 56, 53100 Siena

5-9 September 2011

Final Program

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SATNEX III - Summer School 2011

Faculty of Engineering – University of Siena, Via Roma 56, 53100 Siena

5-9 September 2011

http://satnexiiisummerschool2011.dii.unisi.it/

Final Program

Organizer:

Dr. Giovanni Giambene

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Supporting Institutions:

Welcome Message

Following the successful experience of the Summer School organized within the SatNEx I and II NoE projects (years 2005 - 2009), the new SatNEx (*Satellite Communication Network of Experts*) – Phase III project, coordinated by the German Aerospace Center (DLR), has organized a Summer School for PhD students and young researchers in Siena, 5-9 September 2011. SatNEx III (http://www.satnex3.org/) comprises 19 partners and is funded by ESA from 2010 to 2013. A core team consisting of DLR (D), University of Surrey (UK), and University of Bologna (IT) is coordinating the research activities.

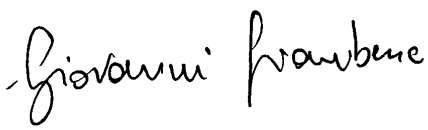
The Summer School, addressed to both SatNEx and non-SatNEx participants upon a registration, will focus on state-of-the-art issues on satellite communications and networking. This year, the following topics will be addressed:

- Future trends on satellite communication systems (Keynote Talk)
- Exploitation of Q/V bands
- MIMO antenna technologies for satellites
- Channel modeling and cooperative satellite communications
- DVB-S2 and DVB-RCS NG: recent advances
- Reliable satellite multicast protocols
- Delay Tolerant Networking: protocols, performance, applications, and security
- Satellite communications for disaster management and e-health
- Satellite communications for aeronautical and maritime applications.

The school will cover one week: a keynote talk will introduce the school the first day; 4 days will be devoted to lessons (two 4-hour lessons per day) from international experts; at the end of each lesson a test will be carried out to evaluate the participants. The last day of the school (September 9, 2011) will be devoted to the "SatCom Innovation Day" with presentations form industries, operators, and institutions together with selected presentations from participants (*innovative ideas*). The best innovative idea from participating PhD students and young researchers will be awarded. A certification will be released at the end of the school (1 ECTS). A school banquet will be organized on September 7, 2011. In addition to this, optional tours will be available for individual booking (September 6, 8, 9, and 10).

Courses will be held at the Faculty of Engineering of the University of Siena. The SatNEx III Summer School 2011 is organized by Dr. Giovanni Giambene of the CNIT - Research Unit of the University of Siena.

I hope you enjoy the Summer School time in Siena!



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SATNEX III Summer School 2011

Program-at-a-glance

	September 5, 2011 Room 149	September 6, 2011 Room 149	September 7, 2011 Room 149	September 8, 2011 Room 149	September 9, 2011 Room 145	September 10, 2011
8:30 – 9:00	**Registration**	"DVB-S2 and DVB-RCS NG: Recent Advances on Resource Management, Access Protocols and Standardization"	"Delay Tolerant Networking: Protocols, Performance, Applications, and Security"	"Satellite Communications for Aeronautical and Maritime Applications"		
9:00 – 13:30	Keynote: "Trends in Satellite Networking" "Exploitation of Q/V Bands: Propagation Issues and Payloads for Terabit Satellite Networks"				***SatCom Innovation day***	*Relaxing Tour at the end of the school!* ***(optional*)***
13:30 – 14:30	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**	
14:30 – 18:15	"Satellite Communications for Disaster Management and e-Health"	"Channel Modelling, Modulation/Demodulation Systems and Performance Improvement Techniques"	"Reliable Multicast Distribution on Fixed and Land Mobile Satellite Channels"	"MIMO Techniques for Satellite Communications"	***SatCom Innovation day*** & Award for the Most Innovative Idea & Delivery of Certificates	
		Siena Trekking Tour ***(optional *)***	"Graphical System Design for Communications - LabVIEW Hands-On"	*Siena Classic Tour* ***(optional *)***	*Wine Tasting Event in the "Meleto" Castle* ***(optional*)***	
20:30 –			**School Banquet in Siena**			

***** Individual online booking is needed by **August 20, 2011** via the link: http://www.bookingsiena.it/congressi_en.php?convegno=SatNEx%20III%20Summer%20School

At the end of each lesson a test will be carried out to evaluate the students. A school certification (1 ECTS) will be released at the end.

Detailed Program

September 5, 2011

9:00 - 9:05 School Opening Ceremony - Welcome Message by the Organizer

9:05 - 9:35 School Keynote Talk: “Trends in Satellite Networking for the Emerging ICT Services”

Dr. Sastri Kota, SoHum Consultants & University of Oulu, Finland

Abstract - Advances in IP-based network- centric architectures enable the fusion of digital video, and mobile broadband Internet. It is estimated that 90% of the world population now has access to mobile networks making mobile telephony truly ubiquitous. However, to deliver the Global Information and Communication Technology (ICT) services while reducing the gap of “Digital Divide” between the developed and the developing Nations, Satellites have a significant role to play. This talk will provide a quick journey of the evolution of satellite communications and highlight the emerging applications such as emergency and disaster recovery, digital broadcasting, m-health and m-learning including both urban and rural areas. It will emphasize the demand for new network architectures such as hybrid/integrated and Advanced IMT-2000, to meet the challenging service requirements, e.g. QoS, security and broadband. The talk concludes with a note on the current status on the International Standards framework.

Biography - Dr. Sastri Kota is president of SoHum Consultants and an Adjunct Professor at the University of Oulu, Finland. He has held several technical and management positions at Harris, Loral, Lockheed Martin, SRI International, The MITRE Corp. Xerox, and Computer Science Corp. Currently he is head of the U.S. delegation and chair of the ITU-R Working Party 4B involved with Fixed and Mobile satellite system performance. He has authored/co-authored five books, 150 research publications; received US patents and professional awards. His research interests include hybrid satellite-terrestrial Next Generation Networks, cognitive networks, mobile wireless, and DVB Satellite networks. He is a Life Senior Member of IEEE, and Associate Fellow of AIAA.

9:35 - 13:30 "Exploitation of Q/V Bands: Propagation Issues and Payloads for Terabit Satellite Networks"

Dr. Gennaro Gallinaro, Space Engineering, Italy

Abstract - This lesson reviews the evolution of satellite communication payloads to cope with the ever increasing communication needs of modern world. Future evolution aims at increasing the offered bandwidth. This requires implementing multi-beam satellite coverage with hundreds of beams. Exploitation of higher frequency bands, like the Q/V bands, offers the opportunity to increase the number of beams for a given on-board antenna size as well as providing new spectrum resources to complement the congested lower frequency bands. However, new technical solutions have to be exploited to overcome the significant propagation impairments associated to the Q/V bands and contain the payload complexity whilst assuring enough flexibility for coping with ever-changing market requirements.

Biography - Gennaro Gallinaro got its Doctoral Degree in Electronic Engineering (magna cum laude) from the University of Rome in 1979 with a thesis on TV signals digital compression techniques. From 1979 to 1980 he worked at Fondazione Bordoni (Government Research Center on Advanced Telecommunications) on Teletex signal simulations. After serving in the Italian Navy, he joined Telespazio in 1981 where he was first involved in system planning studies, and then in the analysis and simulation of RF transmission links, payload hardware assessment, new modulation access techniques and analogue/digital signal processing technologies. Since 1989 he has been with Space Engineering S.p.A. where he was involved in several space communications related projects and studies. He has got in-depth experience in the analysis, computer-aided design and simulation of transmission systems (modulation, coding, etc.) and digital signal processing hardware (on-board multi-carrier demodulators (MCDs), digital beam forming, etc.). He is co-author of several papers, on signal processing and satellite communication techniques and was a co-recipient of the 2003 and 2009 IEEE Vehicular Technology Society Jack Neubauer Memorial Awards which recognize the best systems paper published in the IEEE Transactions on Vehicular Technology.

13:30 - 14:30 Lunch Break

14:30 - 18:15 "Satellite Communications for Disaster Management and e-Health"

Anton Donner, DLR, Germany, and Prof. Laurent Franck, Télécom Bretagne, France

Abstract - Satellite communications are ideally suited to contribute to effective and efficient disaster management and e-health applications. Because technology for emergencies must fit the users' needs without causing additional stress and complexity, we will start this lecture with some background on disaster management and emergency telecommunications. Then, we will cover a few key enabling technologies (e.g., backhauling of Private Mobile Radio over satellite links). We will conclude the lecture by portraying applications under study that will shape the landscape of tomorrow's ICT-supported disaster management and e-health.

Biographies:

Laurent Franck has a PhD degree in telecommunications from Telecom ParisTech in 2001. Since 2007, he is with Telecom Bretagne (Toulouse site) where he teaches and conducts research on satellite networking. His main research interests are in the development of satellite-based emergency communications. Laurent is also a volunteer first-aid worker for the French Red Cross.

Anton Donner received the Dipl.-Ing. degree in electrical engineering from Technische Universität München, Germany, in 1999. Since 2000 he has been with the German Aerospace Center (DLR), Oberpfaffenhofen, working on different EU, ESA and industry projects. Since kick-off in 2009 Anton has been coordinator of the national e-Triage research project, which addresses IT-supported management of mass casualty incidents. He is organizer of a yearly seminar on TETRA and is volunteer fire fighter and fire brigade instructor.

September 6, 2011

8:30 - 12:30 "DVB-S2 and DVB-RCS NG: Recent Advances on Resource Management, Access Protocols and Standardization"

Dr. Ana Yun Garcia, Thales Alenia Space España, Spain

Abstract – The recent work of TM-RCS NG group has produced a multi-part deliverable covering the DVB Interactive Satellite System specification (TS 101 545-1, EN 101 545-2, TS 101 545-3). In particular, Part1 and Part2 have been just approved by the DVB TM group. This lesson will review the work still being performed on Part3 to be finalized in June 2011. This specification covers, for the first time in DVB standardization, the higher layers satellite architecture, networking, and management signalling functions required for the two-way interactive satellite networks specified in the system document.

Biography - Ana Yun Garcia graduated at the University Polytechnic of Madrid (UPM) with specialisation on Wired Communications, Radio Communication and Telecom Networks. Her PhD studies deals with NGN over Satellite Systems. In 1997 she joined Alcatel BELL in the Business Access Division, being involved in the development of Telecom Access Networks. In the period 1999-2001, she was engaged to HP Telecom Consultant Department being responsible for Telecom Operators Interconnection projects. Since 2001 Ana Yun Garcia joined Alcatel Espacio, now Thales Alenia Space Spain. Today, Ana Yun is responsible of the Satellite Telecom Services & Solutions department in the Business Telecom Systems Unit of Thales Alenia Space - Spain. She is responsible for the R&D activity, commercial and marketing activity related to telecom satellite systems. She is also Thales Alenia Space representative in International Standardization bodies: ETSI SES BSM (Satellite Earth Stations – Broadband Satellite Multimedia), TM-RCS (Digital Video Broadcasting – Return Channel by Satellite), ESA-SatLabs (Laboratory for DVB-RCS interoperability), and most recently rappourteur of the Higher Layers for satellite standard of the TM-RCS NG group.

12:30 - 13:30 Lunch Break

13:30 - 17:15 "Channel Modelling, Modulation/Demodulation Systems and Performance Improvement Techniques"

Prof. Takis Mathiopulos, National Observatory of Athens Institute for Space Applications and Remote Sensing (ISARS), Greece

Abstract - In this lecture, we will be first reviewing the various channel models which can be used to model communication links of satellite and/or terrestrial wireless telecommunication systems. We will then present an overview of the different modulation/demodulation (modem) techniques that are used for transmitting and receiving digital signals over the previously-described channel models. Techniques for improving the bit error rate performance

of digital communication systems operating over such channel will be also discussed with emphasis on fading mitigation techniques, diversity and cooperative communication systems.

Biography - P. Takis Mathiopoulos received the Diploma in Electrical Engineering from the University of Patras, Greece, in 1979, the M. Eng. degree in microwave engineering from Carleton University, in 1983, and the PhD degree in digital communications from the University of Ottawa, Canada, in 1989. From 1982 - 1986, he was with Raytheon Canada Ltd., working in the areas of air navigational and satellite communications. In 1989, he joined the Department of Electrical and Computer Engineering (ECE), University of British Columbia (UBC), Vancouver, BC, Canada, where he was a Faculty Member for 14 years, last holding the rank of Full Professor. Maintaining his ties with academia, he is teaching part time at the Department of Informatics and Telecommunications, University of Athens, Athens, Greece. In 2008 and for a period of 5 years, he was appointed by the President of Southwest Jiaotong University, Chengdu, China, of as a Guest Professor in the School of Information and Science Technology. He is currently the Director of Research with the Institute for Space Applications and Remote Sensing (ISARS), National Observatory of Athens, where he established the Wireless Communications Research Group. As ISARS' Director, he has led the Institute to a significant expansion, R&D growth, and international scientific recognition. For these achievements, ISARS has been selected as one of the national Centres of Excellence for the years 2005 to 2008. His research contributions include original research in the areas of optimal communications over fading channels, channel characterization and measurements, and advanced coding techniques, including turbo codes, diversity and synchronization, HDTV, neural networks, smart antennas, UMTS and SUMTS, software radios, MIMOs, and UWB. He authored, together with Prof. D. Makrakis of the University of Ottawa, Ottawa, ON, Canada, a paper in the 1989 IEEE GLOBECOM, establishing, for the first time in the open technical literature, the link between MLSE and multiple (also known as "multi-symbol") differential detection for the AWGN and fading channels. He has authored more than 200 papers in journals and international conference proceedings, about 80 of which have been published in IEEE journals. He was an ASI Fellow, a UBC Killam Research Fellow and a co-recipient of the best paper award from the 2008 International Conference on Communication, Control, and Signal Processing (ICCSP). Prof. Mathiopoulos has been or currently serves on the editorial board of several scientific journals, including the IET Communications, and the IEEE Transactions on Communications from 1993 to 2005 as the Editor for Wireless Personal Communications.

17:30 - 20:00 Siena Trekking Tour (note that individual booking is needed)

September 7, 2011

8:30 - 12:30 " Delay Tolerant Networking: Protocols, Performance, Applications, and Security"

Prof. Carlo Caini, University of Bologna, Italy

Abstract - The origin of the DTN concept lies in the requirements identified for Inter-Planetary Networking (IPN). Then, it was observed that the same approach had benefits when applied to challenging networking scenarios on Earth as well as in deep-space, and that led to the creation of the Internet Research Task Force's (IRTF) DTN Research Group (DTNRG). In particular, three main classes of terrestrial DTN applications have been widely studied so far: military tactical networking, sparse sensor networks, and networking in developing communications-challenged regions. However, DTN can provide real benefits to all "challenged networks", i.e. networks where the usual TCP/IP is unable to provide a satisfactory performance. Among them, we also have satellite networks, as it will be shown in this lesson. Two main characteristics differentiate DTN from the usual Internet protocol stack. First, the introduction of a new layer, namely the *bundle layer*, between application and transport layers, which redefines the end-to-end role of the transport layer. Second, the fact that information can be stored at intermediate DTN nodes, which can also optionally act as "custodians", i.e. as intermediate entities in charge of information forwarding. The consequences of these innovative features when applied to satellite scenarios are many and substantial, ranging from performance to security. All of them will be analyzed in detail during the seminar, with reference to both GEO and LEO satellite constellations.

Biography - Carlo Caini was born in Bologna, Italy, in 1960, and received the Master degree in Electrical Engineering "summa cum laude" from the University of Bologna, in 1986. Since 1990 he has been with the Department of

Electronics Computer Science and Systems of the same University, where is now working as Associate Professor of Telecommunications. He is a member of IEEE Communication Society. The present research interests are mainly focused on DTN applications to space and mobile telecommunication scenarios.

12:30 - 13:30 Lunch Break

13:30 - 17:15 "Reliable Multicast Distribution on Fixed and Land Mobile Satellite Channels"

Dr. Alberto Gotta, Italian National Research Council (CNR-ISTI), Italy

Abstract - Multipoint communication across the Internet via satellite fosters the development of applications for video, audio and data both in fix and mobile environments, thanks to the ubiquitous coverage provided by satellites. Some of these applications may require real-time delivery and can tolerate the partial loss of the information; other applications, such as data distribution, require the complete delivery of the original information at the application level. There is, however, a growing number of applications that could benefit from a reliable multicast transport service. Two well-known techniques provides loss recovery features: automatic repeat request (ARQ), which reactively retransmits the lost data, and forward error correction (FEC), which proactively transmits redundant data, called parity data, along with the original data. FEC by itself cannot provide full reliability. However, when coupled with ARQ, FEC can be used to produce scalable reliable multicast transport protocols. If introduced as a separate layer beneath the ARQ layer, it has the effect of reducing the packet loss probability and thus reducing the number of packet retransmissions and network bandwidth requirements. If integrated with ARQ, FEC has a very high repair efficiency and, therefore, substantially reduces the network bandwidth requirements of an application requiring reliable multicast data transport. Integrated FEC/ARQ is one of the features applied in Nack Oriented Reliable Multicast (NORM [RFC 5740]). However, land mobile satellite channels introduce further reliability problems since intermittent connectivity negatively affects NORM behaviour, in terms of scalability and reliability. This tutorial first describes the available technologies and standard for reliable multicast distribution; then it provides a view on the state-of-the-art on combined error recovery techniques, giving special emphasis to satellite communications on disruptive land mobile channels.

Biography - In July 2002, when he was 24 year old, Alberto Gotta graduated in Telecommunications Engineering, at the University of Genoa, with a mark of 110/110. He presented a thesis entitled "Systems for allocating bandwidth to geostationary satellite networks" under the direction of both DIST department of Genoa University and ISTI-CNR institute in Pisa. In September 2002 he was engaged by the "Consorzio Nazionale Interuniversitario per le Telecommunicazioni" (CNIT), where he started his research activity. In May 2004 he joined the laboratory for Wireless Networks (WN Lab), at the Institute "ISTI" of CNR in Pisa; his goal was to study and address the issues of resource allocations, quality of service and fading countermeasures for rain attenuation in geostationary satellite networks. In 2005 he also started the studies in order to attain the PhD, which he achieved in April 2008 with the thesis "Quality Of Service and Bandwidth Allocation In GEO Satellite Networks: Optimization and Cross-Layer Design". Today, he is a researcher of the WN Lab of ISTI, where he is studying architectures for wireless, satellite and sensor networks applied in the context of vehicular ubiquitous networks for entertainment, multimedia and environmental monitoring. His curriculum presents over thirty scientific publications in international journals and proceedings of international conferences, on issues related to the quality of service over integrated terrestrial wireless and satellite networks. He has been actively participating in projects funded by the European Community and in Industrial Innovation (PII) projects, of which he is the scientific referee for the ISTI's unit.

17:15 - 18:30 "Graphical System Design for Communications - LabVIEW Hands-On"

by National Instruments

Abstract - Participating Students will receive hands-on technical training from a senior engineer on NI LabVIEW, the graphical development environment used by thousands of companies and schools in virtually every industry and discipline. In this training, small applications will be developed using the latest features in LabVIEW, including streamlined algorithm development for signal processing and communications, and integration will be addressed between m-file scripts, created using The MathWorks, Inc. MATLAB®, with LabVIEW MathScript. Students will receive free copies of the LabVIEW Student Edition.

20:30 – Social Event: School Banquet in Siena in Tortoise quarter ("Contrada della Tartuca") !

September 8, 2011

8:30 - 12:30 "Satellite Communications for Aeronautical and Maritime Applications"

PART I : "The Role of Satellites for Aeronautical Communications"

Prof. Yim Fun Hu, University of Bradford, UK

Abstract - Over the past two decades, the air transport industry has experienced continuous growth and the demand for passenger air traffic is forecast to double the current level by about 2025. Small-to-medium sized low-cost airlines such as EasyJet and Ryanair have observed a considerable percentage of passenger increase between 2008 and 2009. These low-cost carriers also brought forth growth in the number of regional airports and offer more choices of international destinations. It can be said that air travel has become an integral part of many people's daily lives, be it for business or for leisure travel. This lecture will look into the role of satellites in providing aeronautical passenger communications. In particular, the network and protocol architecture, the interworking functions between the aircraft network and on-ground network for mobility management support, AAA (Authentication, Authorisation and Accounting), etc. will be examined in details.

Biography - Fun Hu received a 1st Class BSc Honours degree in Mathematical Sciences and a PhD degree in Information Systems Engineering, both from the University of Bradford, UK. Since taking up her academic post in 1994, Fun has been involved in and led Bradford's contributions to several defence, European Space Agency and EU-funded projects. She was promoted to Professor of Wireless Communications Engineering in 2005 and currently she is the Head of the Future Ubiquitous Networks Research Group and research activities of the group encompass mobile, wireless and satellite networking, wireless sensor technologies, SOA-based information and network management, establishing strong links with industries and other research and academic institutions. In 2007, Fun was awarded the Yorkshire Forward Chair of Wireless Communications by the Regional Development Agency, Yorkshire Forward, for her efforts and contributions to knowledge transfer activities.

PART II : "Satellite-based Automatic Identification Systems: Potentialities, Design Issues, PHY Layer, and Applications"

Dr. Alberto Ginesi, ESA-ESTEC, The Netherlands

Abstract - The Automatic Identification System (AIS) was developed to provide identification and location information to vessels and shore stations with the aim of exchanging different types of data, including position, identification, course, speed and others. Its main purpose is to facilitate an efficient exchange of messages between ships and between ships and shore stations. In this lesson an extension of the system to a long-range ship positioning reporting through a constellation of LEO satellites is presented. The applications of such long ship positioning reporting tool are described. The technical challenges of such system including the high rate of message collisions from ships located in the field of view of a satellite are outlined. Technical solutions are presented at system and sub-system level to cope with those challenges together with the estimated (simulated) system level performance.

Biography - Alberto Ginesi was born in Parma, Italy, in November 1967. He received the Dr. Ing. cum laude and PhD degrees in electronic engineering from the University of Pisa, Italy, in 1993 and 1998, respectively. In 1996-1997 he spent one year at the Carleton University, Ottawa, Canada, doing research on digital transmissions for wireless applications. In 1997, he joined Nortel Networks and in 2000 Catena Networks, both in Ottawa, Canada, where he worked on Digital Subscriber Loop (DSL) technologies and contributed to the definition of the second-generation ADSL standard. Since 2002 he joined ESA Research and Technology Centre (ESTEC), Noordwijk, The Netherlands, where he is currently covering the position of Head of the Communication-TT&C Systems & Techniques Section. His main current research interests lie in the area of advanced digital communication systems and techniques from theory to HW implementation.

12:30 - 13:30 Lunch Break

13:30 - 17:15 "MIMO Techniques for Satellite Communications"

Prof. Ana Peréz and Dr. Bertrand Devillers, CTTC, Spain

Abstract - Relying on the use of multiple antennas at the transmitter and receiver, multiple input multiple output (MIMO) systems have been shown to significantly improve the performance of wireless links, both in point-to-point

and multi-user scenarios. First introducing the MIMO basics, the objective of this lesson is to provide an overview on the applicability of MIMO techniques to satellites communications.

Biographies

Ana I. Pérez-Neira is full professor at UPC (Technical University of Catalonia) in the Signal Theory and Communication department. Currently she is associate researcher of CTTC (Centre Tecnologic de Telecomnicacions de Catalonia). Her research field is signal processing applied to wireless communications (both mobile and satellite). She has been the leader of 18 projects, author of 25 journal papers (SCI indexed) and more than 150 conference papers (18 invited). She is member of Eurasip (European Signal Processing Association) and of the IEEE Signal Processing Theory and Methods Technical Committee. She has chaired 2 international conferences, IWCLD09 and EUSIPCO 2011, and participated in the organization of other 2 (ESA conference'96, SAM'04). Currently she is Deputy Vice-president for Research at UPC.

Bertrand Devillers (Charleroi, Belgium, 1980) received the Electrical Engineering and PhD degrees from the Université Catholique de Louvain (UCL), in 2004 and 2009, respectively. From October 2004 to September 2008, he was a Research Fellow of F.R.S.-FNRS (Belgium) in the digital communication group of the Communications and Remote Sensing Laboratory of UCL. From October 2008 to march 2009, he was a research assistant at UCL. Since April 2009, he is a research associate at the Centre Tecnològic de Telecomunicaciones de Catalunya (CTTC).

17:30 - 20:00 Siena Classic Tour (note that individual booking is needed)

September 9, 2011 - "*The SatCom Innovation Day*"

9:00 - 13:00 R&D Presentations by Industries and Institutions

"A Satellite-Based Solution for the Modernization of Air Traffic Management"

Dr. Antonio Sposito, ASI, Italy

Abstract - Iris, a Program funded by the European Space Agency, aims to develop a new air-ground communication system for Air Traffic Management (ATM). Currently, the VHF is the primary air-ground communications medium in European en-route airspace and is starting to suffer great congestion. Iris proposes a satellite-based solution to support the evolution from voice-based communications toward digital data links in continental and oceanic airspace.

Biography - Antonio Sposito was born in Formia (LT), Italy, in 1958. He received the degree in Physics in 1984 from the University of Rome, Italy. He also received from the same University a Master in Electromagnetic Compatibility (EMC) and Environmental Impact of Electromagnetic Fields. From 1985 to 1988 he was with SESA Italia and he was involved in design and development of data communication systems. From 1988 to 2002, he was with Telespazio S.p.A. and he was involved in project management and design and development of systems in the field of satellite communication. In 2002, he joined the Italian Space Agency (ASI). Currently he is Deputy Head of the Telecommunication and Integrated Applications Unit of ASI and responsible for several R&D projects in satellite communications. He is "Advisor" at the "Joint Communication Board" of the European Space Agency, Member of the ATM Satellite Communications Safety Board (ASSB) and Member of the ESA JCB Iris Advisory Committee.

"Satellite Research Meets Industry: Current Status and the Steps Ahead"

Dr. Claudio Cicconetti, INTECS, Italy

Abstract - This talk will give a brief introduction on some of the hot R&D topics in satellite communications and related fields, from the perspective of Intecs, an industry player in the domain of complex electronic system for space, avionics, defence, transportation, and telecommunications.

Biography - Claudio Cicconetti holds a PhD in Information Engineering from the university of Pisa (2007), where he also received his Laurea degree (5 years) in Computer Science Engineering in 2003. He has been working in Intecs since 2009, where he is a Research Engineer in the fields of advanced networking topics and radio communications. He has been actively involved in many R&D projects both European (SANDRA - FP7, EuQoS - FP6, Celtic - Eureka) and Italian (QuaSAR, NADIR) and has served as a member of the organization and technical program committees of several international conferences (WiOpt, European Wireless, SIMUTools, Valuetools, QoSim, NSTools, WoWMoM, MeshTech, MACOM). He is in the editorial board of Computer Networks (Elsevier) and co-authored 40+ papers in international journals, peer-reviewed conference proceedings and book chapters, and one international patent.

"Inmarsat R&D, and its Innovative Programs"

Eyal Trachtman, INMARSAT, UK

Abstract - This presentation will introduce the strategic objectives, and scope of the Inmarsat R&D programmes. Selected innovative projects will be presented in more detail. These will include, among others, the Alphasat Extension program for further exploitation of the Inmarsat-4 constellation with the addition of the new Alphasat satellite in 2013; and the SB-SAT program for providing data relay links to LEO spacecraft using the Inmarsat-4 constellation and the BGAN network.

Biography - Eyal Trachtman received BSc in Electronics engineering ('82), and MSc in Telecommunications ('89) from Tel-Aviv University, Israel. His technical expertise covers various disciplines in the field of Mobile Satellite Systems, including modulation and coding, source coding, satellite multiple access, wireless packet, circuit networking, and IP networking. He holds six patents in the field of telecommunications. In 1990 Eyal joined Inmarsat Ltd, London, United Kingdom, and since 1994 he has been leading the Research and Development activities at Inmarsat, with a growing involvement in collaborative, strategic initiatives within the Satcom Industry in the UK, Europe, and worldwide.

"Innovation from an R&D SME Perspective "

Dr. Markus Werner, TriaGnoSys, Germany

Abstract - A fresh view on innovation in R&D – through specific SME glasses. Can innovation be planned, organized, managed? Current R&D programmes and innovation – a critical review. Recent, current, and on-going TriaGnoSys R&D and product development that (we believe) has innovative elements.

Biography - Dr. Markus Werner is one of the founders of TriaGnoSys and has been managing director since 2002. Markus is responsible for TriaGnoSys' research activities and quality management. Markus worked at the German Aerospace Center, DLR, from 1991, where he gained experience in satellite networking. He held positions as a scientist, a project manager and a group leader. His project experience includes several national and ESA studies and various projects in the framework of European ACTS and IST research programmes. He was also the national delegate to the COST Actions 227, 252, and 272. In 2004 and 2005, he was project coordinator of the European Network of Excellence in Satellite Communications (SatNEx). Markus lectures on satellite communications at several Universities. Markus received a Dipl.-Ing. degree from Darmstadt Technical University, Darmstadt, Germany, in 1991, and a PhD degree from Munich Technical University, Munich, Germany, in 2002, both in electrical engineering. Markus received the Best Paper Award of ITG conference ''Mobile Communications'' in 1993. He has co-authored more than 120 publications, including two scientific textbooks and numerous scientific journal papers.

"Satellite Systems: the Invisible infrastructure, Key Element for Homeland Security Integrated System"

Dr. Ing. Antonio Saitto, Telespazio, Italy

Abstract - The use of satellites is nowadays extremely common so that we do not even realize how much we depend on these invisible "fellow travellers". If we could imagine not to use them anymore, thousands of everyday activities would be stopped, such as: meteorological information, TV services, logistic services, management of plants and fleets, air traffic support, communications, civil services, emergency services, geo-location services, and land register. This talk will describe how the satellite component is an important part of a security system, future perspectives, and how satellite technology represents a critical infrastructure to extend in space and time protection and security at national as well as global levels.

Biography - Antonio Saitto is presently senior advisor in the Directorate of Grants and IPR. Up to 2010 he was director of the development of Innovative Systems always in Telespazio and up to 2004 director of security and defence business development. Before joining Telespazio he has been in a few companies such as Marconi, Alenia Spazio and the European Space Agency. He is professor of Mobile Transmissions at the University of Rome "TorVergata".

"More Space. In Tuscany"

Prof. Marco Luise, Università degli Studi di Pisa, Italy

Abstract - Tuscany is the region in central Italy well known for its artistic heritage that can be found in cities like Florence, Pisa, Siena, San Gimignano, as well as for its culture and lifestyle (fashion, wine making). When we think of Tuscany we can figure out a distinctive, special flavour and lifestyle: "Under the Tuscan Sun". What is less known is that this cultural excellence is day by day renewed through the activity of micro-companies and SMEs, large industrial

groups, research bodies and universities, that have built a consolidated tradition of technologies and services in the fields of space and aeronautics, both at the national and inter-national level, through partnerships with private companies and/or public Institutions. All those space-related entities in the region met in September 2010 to initiate a process of networking across the whole region with the intent of recognizing and improving excellence, attain a better awareness of the different competences, and in the long rung improve the occasions of interaction with national and European partners. To make everybody understand their intent, they coined the motto "More Space. In Tuscany". The aim of this talk is to briefly outline the profile and personality of the space-related activities that are being carried out in Tuscany (especially in the field of Telecommunications, but not only in that), and to describe the networking actions mentioned above that led to the foundation of the TOSCANASPAZIO association.

Biography - Marco Luise is a Full Professor of Telecommunications at the University of Pisa, Italy. After receiving his MEng and PhD degrees in Electronic Engineering from the University of Pisa he was a Research Fellow of the European Space Agency (ESA) at ESTEC Noordwijk, The Netherlands, and a Researcher of the Italian National Research Council, at the CSMDR Pisa. Prof. Luise co-chaired four editions of the Tyrrhenian International Workshop on Digital Communications, was the General Chairman of the URSI Symposium ISSSE'98, and the General Chairman of EUSIPCO 2006 in Florence. He was the co-chairman the conference European Wireless in 2010 in Lucca and will be the co-general-chair of IEEE's ICASSP to be held in Florence in 2014. A Senior Member of the IEEE, Prof. Luise served as Editor for Synchronization of the IEEE Transactions on Communications, and Editor for Communications Theory of the European Transactions on Telecommunications. He is the co-Editor-in-Chief of the recently-founded International Journal of Navigation and Observation, and an Associate Editor of the Journal of Communications and Networks. He also acts as General Secretary of the Italian GTTI Association, "Gruppo Telecomunicazioni Tecnologie dell'Informazione" and sits in the Board of CNIT, "Consorzio Nazionale Interuniversitario per le Telecomunicazioni". He's authored more than 200 publications on international journals and contributions to major international conferences, and holds a few international patents. He is also the incoming Chairman of URSI's Commission C and a member of the International Committee on Global Navigation Satellite Systems (ICG) of the UNO. His main research interests lie in the broad area of signal processing for communications, wireless communications, and positioning.

"New Frontiers on the Mobility via Satellite in Ku and Ka Band"

Dr. Eros Feltrin, Eutelsat, France

Abstract - Eutelsat plays an almost historical role in the provision of mobile-satellite services. Starting with narrowband services for land transports (the Euteltracs services in Ku band), through broadband maritime services until the most recent IP and multimedia services on board high-speed means of transport (trains and airplanes), Eutelsat is present in this market for several years, as services provider or just supplying capacity. This presentation gives a technical overview of the evolution the mobility via satellite is having, presenting some main elements of the return of experience composing the background of Eutelsat. The references are to the existing services in Ku band and the future passage to the Ka band, with the annexed open issues that Eutelsat is solving with the co-operation of systems and antenna manufacturers. In particular the problem of the spot/gateway handover required for multi-spots satellites like KA-SAT will be presented together with the possible solutions.

Biography - Eros Feltrin got his PhD degree from the University of Padua. In 2001 he joined Eutelsat where he is responsible for the development of new satellite broadband systems and networks in the Multimedia Department. Today he is particularly involved in projects on the framework of the mobile services in Ku and Ka bands, taking the role of technical manager in the deployment of the satellite infrastructure on board high-speed trains (TGV) in France. His activities concern today the expansion of the trains fleet on which Eutelsat provides connectivity and the extension of these services on board aircrafts.

13:00 - 14:00 Lunch Break

14:00 - 15:00 R&D Presentations by Industries and Institutions

"A New Test Facility for the Investigation of Electric Propulsion Plasma Plumes Effects on RF Satellite Communications"

Ing. Gianfranco Meniconi, Aerospazio Tecnologie, Italy

Abstract - The implementation of any new technology in the telecommunication satellite market requires a careful understanding not only on performance, but also on integration issues. In this regard, Electric Propulsion, especially of high power, requires a particular extensive investigation. Due to the physical nature of the electrodynamic propulsion

process, which produces intrinsic plasma oscillations and instabilities, EP systems generate electromagnetic emissions (with a bandwidth from DC up to 24 GHz at least) that can seriously interfere with the operation of satellite on-board equipment as well as with RF communications. Therefore, a comprehensive set of test activities needs to be performed in order to characterise the EMI/EMC of each EP system. The main problem in making such a type of EMI/EMC test is that electric thrusters, in contrast to other electronic systems, require adequately large vacuum test facilities where high vacuum performance are guaranteed in order the jet exhaust can be freely expanded so as to simulate the on-orbit working operations with adequate fidelity. In order to investigate such effects, AEROSPAZIO has recently started a programme for the development of an integrated test facility consisting of a large vacuum chamber connected through a large flange to a dielectric vacuum chamber hosted in a semi-anechoic room. The two environments, air-vacuum, are separated by the dielectric chamber. In this way problems arising from ambient background radiations, reflections on vacuum tank walls and other interactions are mitigated. The thruster stay inside the anechoic chamber, but it can expand its plume jet inside the main vacuum tank. The dielectric chamber is transparent for electromagnetic waves so it will be possible to investigate the effects of the thruster plasma plume on RF communications, placing the transmitting antenna and the receiving antenna inside the anechoic chamber. This presentation will describe the development status of the test facility as well as new testing opportunities.

Biography - Mr. Gianfranco Meniconi graduated in Telecommunication Engineering at the University of Siena in october 2002 with a thesis dealing with prediction of the field scattered from large bodies. Since 2008 he is part of the Aerospazio team, working in the fields of the power electronics, plasma diagnostics and electromagnetic compatibility. He is the manager of the development programme for the new EMC test facility.

"Graphical System Design for Communications"

Ing. Raffaele Fiengo, National Instruments, Italy

Abstract - Nowadays the rules of the modern global economy require the use of methodologies and technologies enabling such competitive time-to-market, quality of products and services offered by companies and universities. Also the increasing complexity of systems, such as communications systems, suggests to the engineers and technicians the use of flexible and open software development environment and modular hardware to design, prototype and deploy their systems quickly and affordably. In this presentation, National Instruments gives a hint on: Graphical System Design, a unified platform on the whole life cycle of the system that enables the design and development of applications to design and test communications systems; and PXI modular and open system architecture. Some examples related to the topics of SatNEx III will be given.

Biography - Raffaele Fiengo was born in Torre del Greco (Naples, Italy) in 1969 and graduated at the University of Naples "Federico II" in Electronics Engineering in 1997. Member of: IEEE since 1994, INCOSE since 2009, and AFCEA since 2009. Raffaele serves the advisory councils of INCOSE Italia and AFCEA Rome Chapter. Raffaele has been working with National Instruments Italy since 2000, where he covers the role of "Defense and Space Segment Manager". More details about Raffaele are available on http://it.linkedin.com/in/rfiengo

15:00 - 16:30 Presentations of Innovative Ideas by Participants

"Fundamental Capacity Trends of Multibeam Satellite Communication Systems"
D. Christopoulos, P.-D. Arapoglou, B. Ottersten, University of Luxembourg

"Satellite Wireless Sensor Assisted Network SWAN"
I. Thibault, F. Lombardo, University of Bologna, Italy

"Analysis of Link Layer Reliability Schemes over a Bursty Erasure Channel"
N. Kuhn, J. Lacan, E. Lochin, ISAE - TeSA, France; L. Clarac, C. Bes, CNES, France

"Distribution of an Object with Efficient Retransmission"
M. Muhammad, DLR, Germany

"PHY-SES: A Physical Layer Smart Early Selector Algorithm for Improving Video Streaming over GEO Satellite"
B. Azarbad, A. Sali, B.M. Ali, University Putra Malaysia, Malaysia; H.A. Karim, Multimedia University, Malaysia.

16:30 - 16:45 Award for the Most Innovative Idea Presented by Students & End of the School with Delivery of Certificates (1 ECTS for PhD Students)

17:00 - 20:00 It is time to celebrate! Wine Tasting Event in the "Meleto" Castle (note that individual booking is needed)

September 10, 2011 (optional tours)

10:00 - 13:00 Relaxing Tour ... at the end of the school! Two options: baths in Rapolano Terme or Crete Senesi with Monte Oliveto Maggiore Abbey. Note that individual booking is needed.

Optional Tours

Individual booking is need via the tour operator "Vacanze Senesi" Web site (by August 20, 2011):

http://www.bookingsiena.it/congressi_en.php?convegno=SatNEx%20III%20Summer%20School

Trekking- DISCOVERING THE ANCIENT FOUNTAINS OF SIENA **6th of September 2011** **from 17:30 to 20:00** The scarcity of water has been thwarted since the Middle Ages by an engineering work of great ambition: the 'Bottini' (a long complex of underground tunnels, which has functioned as aqueduct for the city of Siena up to the 20th Century) and the monumental Fountains. From the central fountain built to be seen by most people, as eternal memory of Siena and its rulers (Fonte Gaia), the path winds through the city to end at the most secluded and discreet fountain of Siena , Fonte delle Monache ('the fountain of the Nuns'), risen to act as resource of water for a nearby convent. You cannot miss the oldest and well-known fountain of the city, Fontebranda, which together with Fonte Nuova ('New Fountain') has characteristics of monumentality and elegance that go beyond the practical use for which they were made. You will be also introduced to tiny fountains believed to be minor, but of great beauty, such as Fonte Serena.	
SIENA CLASSIC WALKING TOUR **8th of September 2011** **from 17:30 to 20:00** Siena is in the UNESCO world heritage list and this wonderful itinerary through its most important places gives the visitor a general idea of this city peculiarity. From the Basilica of St. Dominic - where, since many centuries, St. Catherine's relics are revered - we go along the old Via Francigena, Siena's Medieval backbone. The headquarters of the oldest bank in Europe called Monte dei Paschi are to be found along it. Then the noble Sienese elegant mansions accompany us to the Cathedral dedicated to Our Lady of the Assumption. This superb example of a Gothic architecture has got a rich art patrimony: Michelangelo, Donatello, Bernini and Giovanni Pisano left here some of their most well-known masterpieces. The natural end of our itinerary is the famous Piazza del Campo.	
MELETO CASTLE TOUR WITH WINE TASTING **9th of September 2011** **from 17:00 to 20:00** Visit to Piano Nobile of the castle, to the theatre and to the ancient wine cellar. At the need of the visit, you'll taste 3 wines, with crackers, pecorino cheese, salami and bread with olive oil of the castle.	
HALF DAY TO THE SPA **10th of September 2011** **from 9:00 to 13:00** In the morning we will leave from Siena to Terme Antica Querciolaia in Rapolano Terme. The tour includes the entrance to the swimming pools with thermal waters. If you want others treatments, you can verify the availability and pay directly to Antica Querciolaia Spa. **or**	

CRETE SENESI TOUR WITH MONTE OLIVETO MAGGIORE ABBEY
10th of September 2011
from 9:00 to 13:00

This is an interesting journey through one of the most celebrated landscapes in the province. The Crete are a sea of greyish waves not softened by woods or trees to be found just outside Siena when driving towards the South. Here, along the via Cassia, overlapping the ancient via Francigena, we find Asciano, the most important town in the Crete area. We continue to the Abbey of Monte Oliveto Major dramatically set at the edge of a steep slope of clay. This is one of the most well-known and visited monuments in Tuscany thanks to its artistic heritage. The frescoes in the chiostro grande, the inlaid choir or the library are something not to be missed.

Hotel Booking (online)

The school has an agreement with the tour operator "Vacanze Senesi" for providing an online procedure to book hotel rooms for the participants at the following link:

http://www.bookingsiena.it/congressi_en.php?convegno=Soggiorno%20Convegno%20SatNEx%20III%20Summer%20School

The hotels of the tour operator are:

- **BED&BREAKFAST Siena Incentro**
- **Hotel Cannon d'Oro ****
- **Hotel Centrale ****
- **Residenza d'Epoca Il Casato****
- **Hotel Minerva*****
- **Chiostro del Carmine***[5]**

The deadline for hotel booking is July 4, 2011.

SatNEx III Summer School, 5 - 9 September 2011, Siena, Italy

REGISTRATION FORM (to be sent by fax or express mail)

http://satnexiiisummerschool2011.dii.unisi.it/index.html

Return the printed form by fax or by express mail to the CNIT Administration, Via Usberti n.181/A Pal. 3, 43124 Parma, Italy. Fax: +39-0521-905753 (e-mail: direzione@cnit.it)

Registration forms must be completed in all parts (from 1 to 4), otherwise they will not be accepted.

1. YOUR DETAILS (in capital letters):

Role Prof./Dr./Young Researcher/PhD student (**mandatory**): .....

Last name (**mandatory**): .....

Middle initial: ....

First name (**mandatory**): .....

Affiliation (**mandatory**): .....

Address: .....

City, State and ZIP code: .....

Country: .....Email (**mandatory**): .....

Tel (**mandatory**): .....Fax: .....

In case you are vegetarian, please check here: ☐

Is your Institution a SatNEx III Member (mandatory) ? Yes / Not

Do you need a visa form (non-EU citizen) ? please send an email request after registering to giambene@unisi.it

2. SUMMER SCHOOL REGISTRATION FEE CATEGORIES:

(including lesson material on CD ROM, 5-9 September coffee breaks and launches, and the school banquet)

Registration type	Early (before June 20, 2011)	Late (after June 20, 2011)
SatNEx III PhD student - see Note 1	Free	130 €
SatNEx III Senior participant	180 €	250 €
PhD student (non-SatNEx III institution) - see Note 1	230 €	300 €
Senior participant (non-SatNEx III institution)	350 €	430 €

Amount due: € ..... (please select an amount from the above table)

Note 1: PhD students have to attach to these pages also a proof/certificate of their PhD status. Young researchers have to attach a declaration of research activity from less than 5 years.

3. INVOICE TO:

Name: ……

Address: ……

City, State and ZIP code: ……

Country: ……

VAT number/fiscal code* (EU-only): ……

*The VAT number and the fiscal code have to be indicated if the invoice is addressed to an institution or a person respectively.

4. PAYMENT:

Payment can be done by credit card or by direct bank transfer. **If the payment is done by bank transfer, in sending this registration form please attach a copy of your back payment receipt.**

A. By credit card:

□ VISA □ MASTERCARD □ AMERICAN EXPRESS

Credit card no: ……

Expiration date: (mm/yyyy) ……

Security no *: .....

Print name as it appears on card: ……

I agree to charge the amount of € …… on the above credit card.

Date …… Signature……

*The security number corresponds to the last 3 digits of the identification number given on the back of the credit cart given on the back of the credit card.

B. By direct bank transfer to the following bank account:

Account holder:	Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT)
Bank:	Cassa di Risparmio di Parma e Piacenza S.p.A. Conto Tesoreria Sede Centrale di Parma 1 - Via Università N.1/A - 43125 Parma
Bank codes:	ABI: 06230 – CAB: 12700 – CIN: B – C/C: 000036171682
IBAN:	IT28B0623012700000036171682
Swift Code:	CRPPIT2P452

Reason for payment: **"Registration for SatNEx III Summer School 2011"**

Return the printed form by fax or by express mail to the CNIT Administration, Via Usberti n.181/A Pal. 3, 43124 Parma, Italy. Fax: +39-0521-905753 (**e-mail: direzione@cnit.it)**

Submission of Innovative Ideas by PhD Students and Young Researchers: Instructions

Innovative ideas in the form of conference papers are welcome to be submitted by PhD students and young researchers (less than 5 year research experience). These ideas have to be submitted following the instructions and deadline below. Ideas will be reviewed by the school evaluation board. ***Accepted ideas*** will be included in the program to be presented the last day, devoted to the innovation. In the "SatCom Innovation day" presentations by both participant students and industry/operators will be organized. The best innovative proposal by participant students will be **awarded** (250e net amount).

Submission Instructions:

Submission deadline: **June 20, 2011**.
Acceptance notification: July 28, 2011

Innovative ideas have to be submitted by email to the organizer (Giovanni Giambene) in pdf format, max 5 page (5000 words), using the classical two-column IEEE conference paper format, including references and figures (results). **The submitted document should have the following *structure***:

"TITLE", author, affiliation

1. Introduction (including the envisaged scenario)

2. Description of the idea (including objectives)

3. Details on innovation (originality in comparison with literature)

4. Exploitation and dissemination plan (e.g., industrial aspects, project proposals, papers, etc.)

5. Adopted or envisaged tools (software, hardware)

6. Obtained or expected results (graphs with comments)

7. References

Evaluation Board Members:

Franco Davoli, Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy

Tomaso de Cola, Institute of Communications and Navigation (DLR), Germany

Riccardo de Gaudenzi, ESA-ESTEC, The Netherlands

Barry Evans, University of Surrey, Centre for Communication Systems Research (UniS), UK

Erina Ferro, Italian National Research Council (CNR-ISTI), Italy

Giovanni Giambene, Consorzio Nazionale Interuniversitario per le Telecomunicazioni (CNIT), Italy

Y. Fun Hu, University of Bradford, UK

Takis Mathiopoulos, National Observatory of Athens, Greece

Alessandro Vanelli-Coralli, University of Bologna, Italy

Wireless Internet Access (WiFi)

The University of Siena provides wireless access. In order to gain access to the network for the first time please follow these steps:

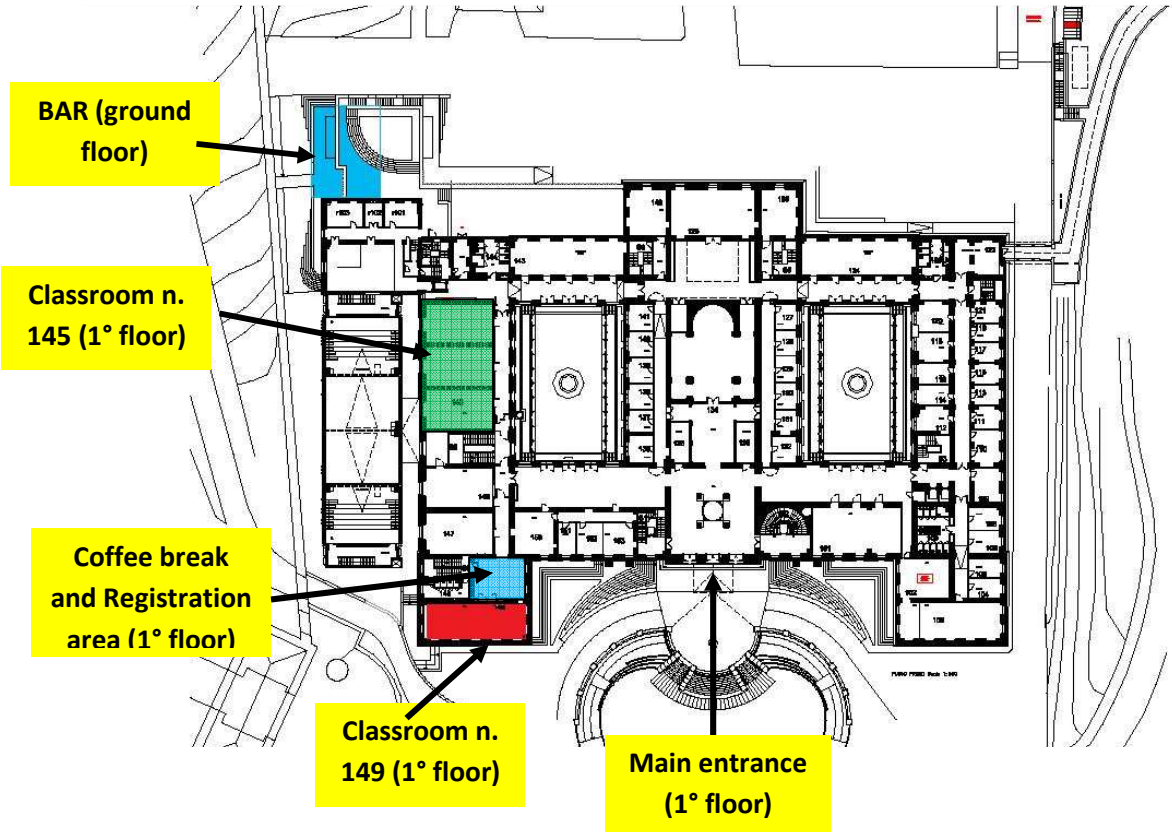
1. Join the network with the **SSID named "silver"**;
2. Open your web browser and you will be redirected to a welcome page;
3. Click on the button "Install GARR CA Cert" and complete the subsequent installation;
4. Enter your **credential and login** (provided at the registration desk*);
5. Download and install the Cisco Clean Access Agent;
6. Fulfil all Cisco Clean Access Agent security requirements if asked (e.g., update your antivirus);
7. Access freely the Web (*)

* Due to the Italian legislations on security policies, in order to obtain credentials to access the wireless, a copy of your passport or ID card has to be provided at the registration desk. GARR access rules: http://www.garr.it/reteGARR/aup.php

Faculty of Engineering Map and Room

Classroom: first floor: **room n. 149** (coffee breaks in adjacent space) for September 5-8 and **room n. 145** for September 9 (***SatCom Innovation Day***)

Lunches: Faculty bar at the ground floor, rear part.



Siena Map and School Location

Faculty of Engineering, Via Roma, 56 53100 Siena – Italy