Centre for Communication Systems Research (CCSR)

Faculty of Engineering and Physical Sciences
About CCSR

CCSR is a major research centre within the Faculty of Engineering and Physical Sciences at the University of Surrey.

It is part of the Electronic Engineering Department that came top in the 2008 Research and Assessment Exercise measured by the Research fortnight Power League Tables.

- **Largest academic research centre** in communications in Europe with over 150 personnel
- **Currently active in over 30 research projects** with £10m of funding – sponsors from Engineering and Physical Sciences Research Council (EPSRC), The European Commission and Industry
- **Significant involvement in European Framework 7 Projects** including:
  - 26 FP6 projects
  - 9 FP7 projects (at the end of call1)
  - 5 Networks of Excellence
  - Major roles in EU Techno logy Platforms, e-mobility, NEM and ISI
- **Industrial partners** – we work with around 50 industrial partners around the world and have strategic partnerships with Nokia, Ericsson, Vodafone, NPL, Quinetiq and Thales.
- **Mobile Virtual Centre of Excellence** – CCSR is a key player in this UK VCE which consists of 6 Universities and 25 companies.
- **EPSRC Portfolio** – Integrated Electronics: CCSR is one of the Surrey centres involved in the £6.2m, 5 year EPSRC grant award
- **Recepients of 2 Research Councils UK academic fellowships**
- **Involvement in Set Squared Science Bridge** with University of California in Wireless.
- **Asian Partnerships** with China (Tsinghua, South Eastern, Beijing and Nanjing UPT’s) in 4G futures, Korea (ETRI), Japan (NICT exchange programme) and 5 Indian IIT’s in UK-India Next Generation Networks research programme.
- **PhD scholarships and grants** – The Centre provides a number of scholarships and grants to recruit top quality PhD students world-wide as well as, University Scholarships and Industrial funding.
- **Industrial sponsored research prizes** – Industry has continued to support our research excellence awards made annually to CCSR researchers for outstanding research with industrial relevance Vodafone, Nokia, Thales, Motorola and Inmarsat are contributors.
- **On key standards bodies** – EISI, SCS, MSS, BSM, DVB-SH, HNQ, RCSNG, IEEE and IETFWG’s.

**Building the 4th Generation Mobile/Wireless Networks**

Our research is firmly aimed towards the “beyond 3G” or 4G era, which we see as a smoother evolution from the current 3G than the discrete change of an air-interface which has characterised the generation changes thus far. We also see much more convergence between fixed, mobile, wireless and broadcast networks and their integration as a key research challenge as we move towards an all IP ubiquitous scenario. We have research in all layers including the application and services area as well as service platforms and sensor networks.

CCSR plays a central role in both the UK and the European research initiatives in these areas. In Europe we are a partner in all of the key integrated projects coordinated by the five major industrial companies in Europe. We are also involved in the key multicast/broadcast and broadband access integrated projects and a number of smaller targeted projects and key

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networks of excellence. In the UK, CCSR is a key player in the Mobile Virtual Centre of Excellence which bridges six Universities and twenty plus companies working on long-term research towards 4G in key areas such as efficiency, complexity, ubiquity and security.

CCSR is really at the heart of Mobile/Wireless research world wide. We lead the European strategic research agenda of the e-mobility platform to shape the FP7 research programme and chair the MVCE visions group. In addition we have joint research programmes in Asia and in the US which give us influence and a World wide perspective as well as a very International research team.

Research for the Future Internet
The future of all communications networks is all IP from end-to-end. This provides many challenges for research in areas such as the provision of quality of service to a range of users over a range of different services. Users will find themselves in different environments and some, such as mobile, provide real challenges to existing IP and the scalability of mobile IP. The integration of various types of network and the ability to move between networks in a seamless manner whilst retaining quality and security are all research issues that CCSR are tackling and that will funnel into the future internet.

Looking further ahead we are investigating the form of a more efficient IP that will enable radio as well as fixed networks to efficiently co-exist. CCSR is a prominent player in the European network of excellence formed to research the next generation internet, which spans 18 countries and includes over 300 PhD students. We have an IPv6 based wireless testbed within CCSR integrated with an IMS service platform and a sensor network which is used as a real environment to test new IP networking schemes and services.

Partnerships and Collaboration
We have a range of partnerships with industry and international collaborations with key players – CCSR is well connected to the real world. We would like to extend these and other collaborations with industry as we regard partnership as the key to future research.

Users and Applications – the driver of future Communication Systems and Services
The emphasis for the future is now very much based on services and applications for the 4th Generation Networks. In CCSR we had pre-empted this some time ago and are now accentuating the role of the users of communication systems in our research. Our multimedia systems activities are now embedded in a new media laboratory – the I-Lab, together with social science and HCI researchers. This multidisciplinary team approach is key to developing the new ranges of applications and services. Immersive environments and virtual presence as well as ambience are key to such developments. Our new I-Lab contains a 7.5 x 2.5m digital stereo rear projected display together with an advanced 340 speaker (wave field synthesis) 3D audio system – which is unique in Europe to allow us to study future environments with real users in a complete audio-visual experience.

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Research Areas

• Mobile Ambient Networking
• Mobile Satellites and HAPS
• Physical Layer – Air interfaces-Access/Modulation/Coding
• Wireless Sensor and Ad-hoc/Mesh Networking
• Context-based Service Platforms and Applications
• Radio Environment, Propagation and Modelling
• Audio, Speech and Video Coding
• Immersive Environments – 3D Video and Audio
• Network and Service Management
• Traffic Engineering and Modelling
• IP Networking and Security
• Traffic Engineering for Future IP Networks
• Software and Cognitive Radio
• Spectrum Engineering – Dynamic Bandwidth Allocation and Management
• Autonomous/Reconfigurable Wireless Networks
• Radio Resource Management – CAC, Scheduling and Cross Layer
• Policy Based Management Systems

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