

Mobile VCE

A Review of the first 5 years of the
Virtual Centre of Excellence

97-02

“To say that mobile communications is a fast-moving industry would be an understatement...”



purpose of review

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“When Mobile VCE was founded just 5 years ago, UMTS was not yet standardized and the wireless Internet was being conceived. Today 3G services are in commercial service and ‘All-IP’ is acknowledged as an emerging practical reality - in Japan NTT recently announced cessation of investment in other wired infrastructure.



The value of developing shared long-term future visions as a tool to grow the overall market for us all, a key feature of Mobile VCE's approach, is today widely acknowledged and, in the present climate, all the more necessary. Industry-led vision can direct research to stimulate new concepts and enabling technology.

Such an approach, coupled with the world-class competencies of our researchers, has been an important factor in the development of Mobile VCE from its early origins as a UK-based national initiative to its role today, acknowledged on the international stage as a pioneer of future mobile communications.

The 21st century has begun with difficult times for the industry. The reality is, however, that basic technology advances will result in wireless technologies becoming embedded in all aspects of everyday life, creating multiplied opportunities for new lifestyle services, products and revenue streams far beyond traditional mobile communications. The vision and technologies being created by Mobile VCE will support our members in accelerating such new offerings.

Mobile VCE has not stood still in its first five years. The challenges of the future will be no less than those of the past - as we look forward it is clear that Mobile VCE has the potential to play an increasingly significant role.”

Dr Keith Baughan
Nokia
Chairman

“Many of you will have heard me say over the past 2 years that one of the best aspects of my role as Chief Executive of Mobile VCE is the privilege of working alongside such highly capable people - talented and mature individuals, from both industry and academia, who are not content to live within today's constraints but who strive to create the world of tomorrow. The significant value that Mobile VCE brings to our industrial members is a reflection not only of the high financial gearing that arises from shared funding but also derives from the willingness of these members to collaborate and share ideas, skills and experience, within the context of long term research, to pioneer new technology to grow future markets from which the whole industry will benefit.



In this review we have sought to present to our members a concise overview of the contribution and development of Mobile VCE over its first five years and to give some preliminary views of the way ahead.

One of the keys to maximizing the benefits of membership is to identify relevant outcomes from Mobile VCE research and to secure exploitation by connecting internal company R&D staff to the activity and researchers within Mobile VCE. Such linkages enable ‘seeding and feeding’ of in-house research. My hope is that the material presented in this review will stimulate our members in this respect and help them to better understand the appreciating value of their investment in Mobile VCE”.

Dr Walter Tuttlebee
on behalf of the
Executive Committee

context

Origins of Mobile VCE

The Virtual Centre of Excellence originated as a joint initiative of industry, university and the UK government, through its 'Foresight Exercise' in the mid-1990's, which aimed to encourage long-term industry growth and sustainability through improved planning and exploitation of research. It was intended that Mobile VCE should be industry-led, should fully benefit from the research expertise of the universities, and should retain strong relationships with government. Mobile VCE was thus constituted as a not-for-profit company with a Board of Directors comprising 5 industrials, 3 academics, 1 executive director and 2 observer members from government.

Objectives

- To harness the research efforts of a selected group of UK universities into a cohesive world-class virtual research Centre of Excellence, focused on mobile radio and personal communications technologies and applications
- To influence the direction of long-term research through dialogue between industry and the academic community
- To carry out programmes of research with a particular emphasis on encouraging a cross-disciplinary approach and well managed programmes
- To provide a mechanism for industry to work collectively with key universities to ensure it has the necessary flow of the most skilled experts in the new technologies
- To project internationally the work and reputation of the Virtual Centre of Excellence

executive committee 2002



Dr Keith Baughan
Nokia
Chairman



Dr Walter Tuttlebee
Mobile VCE
Executive Director



Dr Mike Barnard
Philips



Dr Peter Keevill
Lucent



Prof Mike Walker
Vodafone



Dr Sen Lin Zhang
O2



Prof Hamid Aghvami
Kings College London



Prof Peter Grant
Edinburgh University



Prof Joe McGeehan
Bristol University

Observer Members

Graham Worsley
Dept of Trade & Industry

Pilar Sepulvida
Engineering & Physical
Sciences Research Council

achievements

The original objectives have been and continue to be achieved. Mobile VCE's unique model and successful modus operandi has become widely valued. By the end of 2001, Industrial membership had grown around 50%, from 20 founder members to 29, with a significant involvement from elsewhere in Europe, and beyond, reflecting the increasing reputation of Mobile VCE's research across Europe, America and Asia.

Together with success in securing additional government funding, this increased membership has enabled the research activities undertaken for our industrial members to grow from 1998 levels of £1m pa to an anticipated £1.8m pa in 2002, representing a significant increase in the research leverage available to our industry members, the training of more high quality researchers with experience of working closely with industry, subsequently available for recruitment, and a reorientation of the university research capability towards the needs of industry, without any compromise of its academic integrity.

Core Research

The first core research programme of some 50 man years ran from 1997-2000. Its scope was comprehensively summarized in a dedicated special issue of the IEE's Electronics & Communications Engineering Journal (December 2000).

The plan for the second core research programme of 100 man-years, was reviewed by a panel of international experts from Europe and North America, and received many positive comments. This programme, now over half way through, is yielding important results in a number of key areas, such as software defined radio, wireless capacity enhancement techniques and traffic modelling and network dimensioning. Further important outputs are anticipated over the coming 12 months.

The third core programme, defined by our members during 2001, is now ramping up, and will overlap with the second core programme during 2002 and 2003. Recognising the increasing impact of short range wireless communications, the Internet and digital broadcasting the new programme seeks to create a solutions toolbox that individual member companies can use in different ways to support new commercial opportunities emerging from network interworking.

Industrial Steering

Research is overseen by Steering Groups, headed up and staffed by our Industrial members, supported by an academic co-ordinator. Their role includes the assessment of the research and identification of potential patents. A very substantial number of publications have been approved by the Steering Groups, including contributions to major international conferences and journals.

Each industrial steering group organises seminars each year designed to allow senior managers from our member companies to receive an overview of our latest research. Tutorials and seminars with presentations from our industrial members are a more recent innovation, designed to encourage cross-pollination of knowledge and ideas across the industry value chain.



Individual member companies collaborate closely with different research teams, reflecting their own company's specific interests, pulling through results and research approaches to 'seed and feed' their own in-house research programmes.

Elective Research

Within a core research programme strategic innovations may emerge, worthy of commercialisation but of prime interest to a sub set of our members - eg handset manufacturers, mobile operators. Such companies may individually or jointly commission an elective research programme to bring the technology closer to market. A current example is a programme to incorporate an adaptive directional antenna into a handset; based on patented techniques developed in the core 1 programme this work has already resulted in a further patent filing.

Specific examples of research outputs are available as Research Briefs enclosed in the back pocket of this brochure or from the Mobile VCE office.

International Recognition

The creation of Mobile VCE was only possible because of the strong mobile research infrastructure that has developed since the 1970s within the UK. Mobile VCE has helped to consolidate and deepen this infrastructure and industry relationships and has become a very tangible demonstration of this national asset. As such it serves a valuable role in communicating the availability of this resource to the global mobile industry and attracting inward investment to the UK.

Mobile VCE has developed however into a truly international organisation, today having industrial members from most parts of the world and undertaking research which is having increasing international impact. Mobile VCE meetings and seminars are attended by staff not only from European countries but also further afield. We also receive frequent requests to contribute to international industry fora. Relationships with the Software Defined Radio Forum and the Wireless World Research Forum are strong and links with ITU WP8F and with activities in Asia are strengthening.

During this transition, our relationships with national government have prospered, one recent example being the financial and organisational support received from the Department of Trade & Industry's International Technology Service for a technology mission to Japan. This explored future evolution of mobile communications through meetings with mobile operators, manufacturers, the mITF, ARIB and MPHPT, the Japanese government ministry responsible for mobile communications.



A symposium held at Yokosuka Research Park, YRP, was organised through the British Embassy in Tokyo, with speakers from both Mobile VCE and leading Japanese operators, manufacturers and universities. The event attracted almost 250 invited industry attendees, including some from the USA, Australia and other Asian countries.

Over the past two years Mobile VCE has participated, by invitation, in the annual UK- Japan and UK-Korea High Technology Industry Fora. The latter resulted in an invitation during 2002 to meet with several Korean manufacturers and operators interested in learning about our activities. Korea's strength in mobile communications is well known, but it also leads the world in broadband Internet rollout.

2001 saw the establishment of the Wireless World Research Forum, WWRF, an outcome of the earlier Wireless Strategic Initiative, WSI. Mobile VCE's original Core 2 vision - 'Scenario 2010' - was presented to the WSI group during 2000 by Prof Barry Evans, chair of the Mobile VCE Visions Group. Mobile VCE has chosen to be an active contributor to WWRF, which is seen as a useful forum for communicating overviews of significant research achievements to a wider audience.

Mobile VCE has also become a valued contributor to the work of the SDR Forum, following an initial invitation to their Seattle, June 2001, meeting. The relevance and importance of our research was quickly recognised and the ongoing dialogue which resulted has seen Mobile VCE input playing an important role in the Forum's response to the current FCC notice of inquiry on security aspects of software radio. Ongoing dialogue with the UK, Japanese and other national regulators may result in further initiatives relating to software radio over the coming year.

the way ahead

Several members have encouraged Mobile VCE to explore the possibility of training provision. To this end a one week residential course in Mobile Cellular Communication Systems is being developed for first delivery around Easter 2003. Further plans will depend upon the perceived value and success of this first event.

Mobile VCE has also received encouragement, within the national context, to seek Faraday Partnership funding, which could allow Mobile VCE to provide additional services to our industrial members aimed at improving technology pull-through and at developing new linkages between existing members and smaller companies, perhaps in the applications development space. In considering such an option the Board of Mobile VCE is determined not to jeopardize the existing highly successful activity.

Within the wider European context, the 6th Framework Programme is at an advanced stage of preparation at the time of writing. Some of our industrial members have encouraged Mobile VCE to act as a catalyst for members with common interests to form consortia. The European Commission, and other non-members, have expressed a desire to see Mobile VCE participation in the new Programme. Clearly Mobile VCE has the expertise to build upon its existing base to develop a much more extensive Network of Excellence, or potentially to facilitate Integrated Projects; other approaches also exist.

The development of international relationships with similar collaborative research organizations outside Europe is also under consideration. Again, the Board will not take any steps which would weaken existing strengths or competences, but rather wishes to develop options that will add value for our members.

Publications

Publication of research overviews is encouraged, as one way of increasing awareness of the results within our member companies and increasing the likelihood of the research being taken forward by members and others into standards activities (although Mobile VCE leaves this activity to its members). During the first five years of activity some 150 publications and conference presentations have resulted from our research.

Patent Filings

Decisions on patent filings are made by our industrial members through the mechanism of the Industrial Steering Groups and to date include over 30 active cases. The majority of these have proceeded to international (PCT) filing and 8 to specific national filings, generally in Europe, the USA and Japan. Further details are available on the members' website.

- **Communications Terminal & Operating Method**
- **Adaptive Multifilar Antenna**
- **Dual Direction Channel Estimator**
- **Media Access Control for Wireless Systems**
- **Telecommunications Receiver (Fast Adaptive Algorithms)**
- **Mobile Communications - Virtual Bus**
- **New ATM Protocol Stack for Wireless Communications**
- **Communication Networks (Internet Protocols)**
- **Dynamic Selection of Radio Communication Network Operator or Service Provider (Digital Marketplace)**
- **Generic Framework for Resource Management in Mobile Communication Networks**
- **Adaptive Multifilar Antenna II**
- **Pre-emptive Bandwidth Allocation by Dynamic Positioning**
- **Adaptive Hybrid Interference Cancellation, Multi-User Detection for Multi-rate System**
- **Dynamic Threshold Soft Handover**
- **Open Protocol Programming Interface Model & Architecture for Re-configuration in Software Radios (Optima)**
- **Antenna Combiners: Summed Taps**
- **Channel Allocation & Assignment Methods & Systems**
- **Reconfiguration Management Architecture & Reconfiguration Protocol for SDR Terminals**
- **Mobile Positioning using Integrated Ad-hoc Network**
- **Location Update & Selective Paging Strategy in a Wireless IP Network for Fast Moving Users**
- **Cooperative Diversity - Virtual Antenna Array**
- **Cooperative Diversity - Forced Synchronisation**
- **Cooperative Diversity - Frequency Relaying**
- **A Novel Active Queue Management Technique**
- **Remote User Authentication**
- **Generic Framework for Distributed Mobile Entity and Service Management in Wireless Communications Systems**
- **Routing Update Procedure**
- **Generic Call Admission Control and Scheduling**
- **Mechanism for Diverse Services**
- **Beamforming & Intelligent Scheduling for Layer Separation in Hierarchical Cell Structures**
- **Improvements Relating to Multifilar Helix Antennas**

***available from the
mobile vce office***

A range of Information Sheets and Research Briefs are available from the Mobile VCE office on request.

Information Sheets provide detail of how Mobile VCE is structured and operates.

Research Briefs provide succinct summaries of potentially strategic research, available for commercial exploitation by our industry member companies.

Details of information available may be found at:
www.mobilevce.com/information.htm

Industrial Members

BBC
Crown Castle
Degree2 Innovations
Fujitsu
Hutchinson 3G
Inmarsat
ITC
Lucent
Matsushita (Panasonic)
Motorola
NEC
Nokia
Nortel Networks
ntl
O2
Orange
Philips
Radiocommunications
Agency
Samsung
Siemens
SK Telecom
Sony
Tality
Texas Instruments
Thales
T-Mobile (One2One)
Toshiba
Vodafone

Academic Members

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University of Bristol
University of Edinburgh
King's College, London
Royal Holloway College
University of Southampton
University of Strathclyde
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