Centre for Wireless Technology Eindhoven (CWTe)

CWTe 2016 Research Retreat

October 12, 2016

Pushing the envelope of wireless technology
Speaker: Sonia Heemstra – de Groot, TU/e

Abstract:

The use cases for 5G are well known: sensors everywhere, broadband and media everywhere, smart vehicles and transportation systems, critical control of remote devices, human-IoT interaction, and infrastructure monitoring and control. These have dictated the challenges for the future 5G infrastructure: orders of magnitude improvements of access network capacity, per-user data rates, latency, and energy consumption, in conjunction with high reliability and security.
Industry, research organizations, universities and standardization bodies are intensively working on this to meet the 2020 objectives. The wireless technologies that are needed, e.g., densification, massive MIMO, higher frequencies, etc. have reached the testbed stage. Still a lot of research needs to be done to make these technologies feasible from an industrial and commercial point of view.
Thinking beyond 2020, new applications and application domains are envisaged, that require technologies that push the boundaries beyond the 5G specifications.
In this talk we will present the way CWTe intends to contribute to these new wireless technologies, in particular the pursuit of extremely high capacities and data rates, extremely low energy consumption and the exploration of THz technology for sensing and communication.

Speaker's bio:

Sonia Heemstra de Groot holds M.Sc. degrees in Electrical Engineering from Universidad Nacional de Mar del Plata, Argentina and Philips International Institute/NUFFIC, The Netherlands. She obtained the Ph.D. degree in Electrical Engineering at the University of Twente, The Netherlands, in 1990. Since 2012 she is a full professor at Eindhoven University of Technology where she holds the part-time chair in Heterogeneous Network Architectures and leads the Ultra High Data Rate program at the Center for Wireless Technology Eindhoven. Before she has held assistant and associate professor positions at the University of Twente and a full-professor position at the Delft University of Technology in Personal and Ambient Networking. After having worked some years as a senior researcher at Ericsson EuroLab, The Netherlands, she co-founded the Twente Institute for Wireless and Mobile where she has been Chief Scientist from 2003 to 2014. Her expertise and interests are in the areas of wireless and mobile communications, 5G, vehicular networks, wireless indoor communications, Internet of Things, and wireless security.

What's the real game changer in 5G
Speaker: Taco Kluwer, Agentschap Telecom

Abstract:

5G is considered by many as the promised land of wireless telecommunication. But why do we need 5G and what is changing? In the "rural pilot" 5Groningen useful applications will be demonstrated, such as the smart potato or high resolution crop monitoring for precision agriculture. No doubt that these and other applications in for example healthcare and transport will benefit from the promise of high capacity, low latency and massive connectivity. The real game changer however is many times left unnoticed, and is hidden under the hood of 5G. The architectural evolution of 5G is what really changes the way we look at wireless telecommunication in the future.

Speaker's bio:

Taco Kluwer is Senior Advisor Innovation and Strategy at the Radio Communications Agency of the Netherlands. He has received his master's degree in electrical engineering at the University of Twente in 2001. Passionate about innovation he has initiated many changes in spectrum management, such as the recent Dutch trail for Licensed Shared Access. In 5Groningen he advises on the spectral challenges and architecture of the 5G field lab. He recently contributed to the new spectrum policy which defines the future of spectrum management in the Netherlands for the next 10 years.

Wireless electronic systems: Trading off performance, reliability and energy efficiency
Speaker: Twan Basten, TU/e

Abstract:

Electronic circuits and systems are driving modern society. With the Internet of Things rapidly becoming reality, the need for energy-efficient, high performant, reliable electronic circuits and systems integrating wireless communication support is apparent. Finding the right trade-off between performance, reliability, and energy efficiency requires an integral system-level design of wireless systems, taking into account the circuitry, the processing architecture and the protocol stack. This talk will illustrate some of the challenges and state-of-the-art solutions in the design of wireless electronic systems.

Speaker's bio:

Twan Basten is a professor in the Electrical Engineering department at Eindhoven University of Technology (TU/e), the Netherlands, where he chairs the Electronic Systems group. He is also a senior research fellow of TNO Embedded Systems Innovation in the Netherlands. His research interests include embedded, networked and cyber-physical systems, dependable computing and computational models. Twan Basten served in over 60 TPCs. He (co)authored 1 book and over 200 scientific publications, of which five received a best paper award. He (co)supervised 14 PhD degrees. Twan Basten is a senior member of the IEEE and a life member of the ACM.

IoT solutions to a telecom paradigm shift
Speaker: Raoul Mallart, SIGFOX

Abstract:

SIGFOX is a global telecom operator for the Internet of Things. SIGFOX is based on a radical change of the paradigm in the way telecom networks are built, operated, and promoted.

The paradigm shift consists of the following principles:
- The network adapts to the objects.
- For an object, there is a single network, spanning the whole world.
- The network uses license-free radio frequencies.
- A telecom network dedicated to particular segments of the Internet of Things (e.g. it is not trying to address ALL use-cases).

Technology-wise, SIGFOX uses multiple innovations in all domains of the network to cater to these principles:
- Statistical approach to ensuring data delivery and capacity scaling.
- Simplification of the protocol stack, compensated by increased complexity in the core of the network.
- Single domain of device management and network operation. Even if some of the networks are not deployed by SIGFOX itself, their networks are operated by SIGFOX.

Speaker's bio:

Raoul Mallart completed his PhD in Physics in 1991 while working at Philips Research where he was involved in the improvement of Medical Ultrasonic Imaging. In 1995 his research focus changed to Multimedia Systems, Internet and real-time 3D graphics. During this period, Raoul was involved in the standardization efforts that led to the definition of the MPEG-4 standard. From 1997 to 2000, Raoul was posted in Silicon Valley where he interacted with the start-up ecosystem working on a new paradigm for interactive TV leveraging both Internet and broadcast connectivity. Upon his return to Paris, he led a research department at Philips Research France involved in Multimedia applications over wireless networks. More recently, Raoul was leading the product innovation team of Philips Software (now part of NXP), a leading Independent Software Vendor that has shipped multimedia software of over one Billion mobile phones, then at ARCHOS, a French vendor of Android Tablets and Mobile phones.
In 2014 Raoul joined SIGFOX to take in charge the Technology Innovation department.

Wi-5 Prosumer Networking: a full-fledged managed Wi-Fi consumer network
Speaker: Jan de Nijs, TNO

Abstract:

The H2020 Wi-5 project studies the technical and business solutions needed to integrate private consumer Wi-Fi networks into a single prosumer network. Individual customers contribute their Wi-Fi resources in terms of spectrum and access to a pool. This pool is managed like a managed network. A Radio System Operator is introduced that manages and operates the Wi-Fi AP. A Wi-Fi Spectrum Usage Broker assigns spectrum or access resources on a per session basis. The control position of the Wi-Fi Spectrum Usage Broker brings the possibility to optimize the Wi-Fi network resources by dynamically assigning the AP, the frequency channel and the transmit power on a per user and per session basis. Customer participation is fully voluntary and cannot be imposed, nevertheless it is beneficial for them.

Speaker's bio:

Dr. Jan de Nijs (male) is a Senior Scientist and Senior Consultant Network Technology at TNO. In 1989 he received a PhD in Applied Physics from the University of Twente. Until 1998 Jan was researching silicon technologies at the University of Twente, TU Eindhoven and the TU Delft, where after he joined the group of Wireless Communications of the TU Delft. In 2001, he started working at TNO as a senior consultant in the area of access networks with a focus on cable networks. In this role he has been one of the initiators of the as "excellent" rated FP7 ReDeSign project and he convener of CENELEC TC209 working group 7. He provided a crucial contribution for the policy development of the Dutch government on the licensing new 800 MHz mobile networks. Jan is member of the board of GlasLokaal, a non-for profit fiber network for public institutions in the Hague area. His current activities focus on network strategy and regulatory consultancy, and on developing and leading research and innovation projects. Currently Jan is involved in the development of new business models needed for Wi-Fi prosumer networks.

Wireless connectivity in automotive
Speaker: Alessio Filippi, NXP

Abstract:

The automotive world is undergoing major changes with practically all stakeholders working to enable the self-driving car. The impacts will be extremely positive with drastic reduction of fatalities, a much more efficient management of the traffic flows, and, basically, a better quality of life. The semiconductor industry, and NXP in particular, is working hard to enable this compelling vision, focusing on developing the required advanced integrated solutions for sensing, communicating, and actuating. In this talk, we present NXP view on the key technical challenges ahead of us to enable the self-driving cars focusing particularly on vehicle-to-vehicle communications and automotive radar.

Speaker's bio:

Dr. Alessio Filippi graduated from the University of Padova, Italy, in Telecommunications Engineer and obtained his doctor degree from University of Kaiserlsautern, Germany, in 2005. During his doctoral studies, he was with Siemens AG working on air interfaces for 4G cellular systems. In 2005, he joined Philips Research in the Netherlands and his research interest moved on algorithms for improved broadcast reception, and algorithms to monitor water and energy consumption. In 2012, Dr Filippi joined NXP Semiconductor as department head of the modem and signal processing group and started working on car2car communications, broadcast reception, and radar algorithms.

Wireless connectivity in lighting: Challenges towards the IoT
Speaker: Jean-Paul Linnartz, Philips Lighting

<u>Abstract</u>:

The lighting infrastructure may well be the first large scale network in the Internet of Things. We see that lamps are increasingly controlled via wireless links. This leads to very dense multi-hop radio networks. The scalability of such networks and the requirement of guaranteed throughput of control messages and the latency requirements appeared a challenge. Moreover sensors need to become truly wireless but need power. Neither mains wiring nor battery powering are attractive. RF scavenging is a promising direction that can facilitate the roll out of an IoT. Meanwhile, the first buildings are being installed with a wired full internet connection to every luminaire. 5G networks improve the bandwidth towards the user by even denser frequency reuse. Optical and radio wireless technologies are potential solutions for high speed links toward the end user. Luminaires are located at an excellent position to multiplex different signals to different users via the same medium.

<u>Speaker's bio</u>:

Jean-Paul Linnartz is Research Fellow with Philips Lighting Research and part-time Professor with CWTe. Previously he was a faculty member at the University of California at Berkeley where he worked on the Infopad wireless multimedia project and Autonomous Vehicle Highway Systems. His background is in performance optimization of radio networks, including modulation methods and access protocols. His work on data security with Philips Research also lead to three successful spin-outs. As Senior Director he headed research groups on information protection, connectivity and IC design. Currently his research team at TU/e works on intelligent lighting systems and on radio as well as visual light communication.

Game changing antenna technology, inspired by nature
Speaker: Diego Caratelli, Antenna Company

Abstract:

As the need for network capacity increases, the number of antennas in wireless devices increases to support the required bandwidth and spectrum. As the physical size of wireless devices continues to shrink, it is obvious that these two trends are in direct conflict. An innovative antenna solution relying on the use of supershaped dielectric resonator will be presented to solve this problem. These antennas can be optimized to meet the needs of stringent networking and consumer applications, where extended range and high application throughput is required to deliver the best user experience. The use of polymer technology allows for simple and cost-effective integration of SDRA solutions into embedded applications, where size and cost are important considerations.

Speaker's bio:

Diego Caratelli (CTO) is a founding member of Antenna Company and is responsible for its technical direction and product development. Diego received the Laurea (summa cum laude) and Ph.D. degrees in Electronic Engineering, as well the M.Sc. degree (summa cum laude) in Applied Mathematics from Sapienza University of Rome, Italy. From 2007 to 2013, he was Senior Researcher at the International Research Centre for Telecommunications and Radar of Delft University of Technology, the Netherlands. Diego has been published in more than 100 international journals, book chapters, and conference proceedings.