Telenor Research Agenda and Experience of Celtic-Plus projects

3 March 2014, prepared by Telenor Research

Telenor Research targets five key areas

Competition	Data Analytics	Service Innovation	Next Generation Network Technology	Next Generation Services
Develop **insight on competitors, customers and regulations** in order to navigate the complex competitive landscape	**Leveraging our data,** using all tools and sources available, to enhance customer insight and improve decision making	Transforming Telenor into a **customer centric company** based on service design, customer insight and organizational analysis	Researching the **future network technologies** and service **network architectures** with focus on disruptive changes	Explore the use of next generation **mobile**, **web** and **Internet** technologies for developing and delivering services on various devices
				

Next Generation Network Technology: Researching architectural frameworks and technologies to strengthen Telenor's ability in pursuing business opportunities with new network solutions

Next Generation Network Technology

Researching the **future network technologies** and service **network architectures** with focus on disruptive changes

Competence Profile:

Researchers trained in engineering of future network platforms. Specialist in '5G', self-organizing networks, Network Function Virtualization, Software Defined Networks, end-to-end quality of service , IP-networking, technology innovation, SIM and identity.

Research Focus 2014:

- *Smart 5G mobile technology* with focus on the technical realization of the future smart networks and on strategic and operational implications for Telenor.
  - *Innovative network infrastructure* with focus on Software Defined Networks and Network Function Virtualization
  - *Network radio resource optimization* with focus on self-optimized network (SON) functions, cognitive radio principles, and spectrum sharing.
  - *Network capacity and traffic handling* with focus on Backhaul and Network MIMO and Distributed Antenna Network Topology.
- End-2-End Differentiated Services with focus on traffic differentiation techniques, robustness and enabling technologies and solutions.
- Future Service Concepts with focus on technology innovation analysis, future of SIM and identity management.

Example: 5G – Smart Future Networks

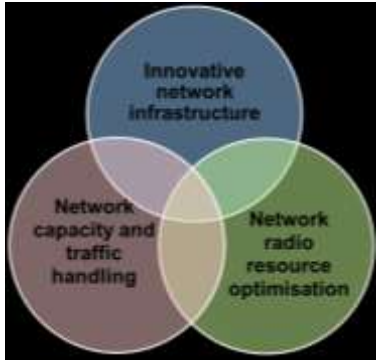
Rationale

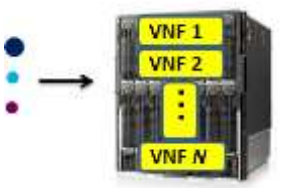
- The radio and network parts of architecture and topologies are at the core of being a mobile operator
- Telenor will operate parallel technologies, face decisions on adding new technologies and need to handle exponential growth in network complexity
- Solutions are needed mitigating the increasing technology complexity as well as facilitating new product and service differentiation opportunities

Research Objective

- Research and evaluate technologies in the transport and core and in the radio access part, with a potentially disruptive impact on our business
- How to design robust mobile broadband data networks with improved spectrum utilization, handling of complex heterogeneous networks, efficient use of software virtualization and considerations on the technology implications when the Internet meets the mobile network
- Enable Telenor to be positioned to pursue business opportunities based on new efficient network solutions and provide strategic guidelines for future network investments
- Develop centre of excellence through international collaboration, publications in journals, conferences, and workshops

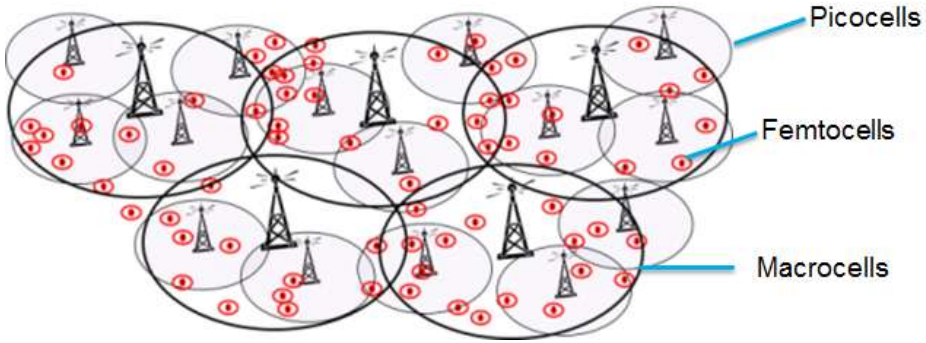
Example: 5G – Smart Future Networks





Flexible network infrastructure through using NFV and SDN with differentiated QoS

Investigate new spectrum sharing regimes e.g. micro-trading to reduce spectrum associated cost and develop cognitive radio based solution for cost-efficient shared spectrum utilisation



To tackle the challenges, the use of new advanced self-optimized network (SON) functions, cognitive radio principles, and spectrum sharing are of high interest

Next Generation Services develops and applies methods to identify new disruptive technologies and determine how Telenor can use them to develop and/or differentiate on own and 3rd party services.

Next Generation Services

Explore the use of next generation **mobile**, **web** and **Internet** technologies for developing and delivering services on various devices

Competence Profile:
Researchers trained in computer science, telecommunications and industrial economy, addressing technical and business opportunities and challenges posed by new digital and mobile services. Specialist in service prototyping, service eco-systems, end-to-end QoS, Internet of Things (IoT), Internet and web services, machine learning, recommendation systems, and cloud computing. NGS also hosts our Trend watching function.

Research Focus 2014:

- Understanding how personalized services can be exploited as a differentiation strategy for Telenor BUs, through running explorative pilots and measuring resulting effects
- NFC as a new service platform to create service stickiness and an enabler for new eco-systems. Knowledge and experience on how NFC and SIM technology can strengthen Telenor's end-user position and enable new digital services
- How to increase customer satisfaction, increase revenue and be more cost-efficient by offering services with differentiated QoE, exploiting existing and new, disruptive technologies
- Watching trends in the mobile, web and Internet space to give timely input on effects for Telenor

Example: Personalized services

Rationale

Personalization can help Telenor differentiate from competitors, while achieving the strategic vision of being loved by customers, and contribute to increasing the use of Internet services in Asia.

Customers in the maximalist segment prefers services that are tailored to them and are willing to pay more for those services. Accordingly, personalization can aid in attracting maximalists and improving their satisfaction and loyalty.

Research Objectives

Personalization is achieved through a 3-step iterative process:

1. Understand customers by collecting data and converting it into knowledge stored in the form of customer profiles;

2. Deliver personalized products, services and offerings based on the knowledge about each customer; and

3. Measure the effects by determining the customers' level of satisfaction or dissatisfaction with the delivered personalized offerings.

Telenor Research will target these three steps through pilots, and use results to guide Telenor BUs in adopting successful personalization strategies

CELTIC projects with Telenor participation

- Techno-economics of integrated communication systems and services (***ECOSYS***); 2004 – 2007

  Improved the techno-economic methodology and framework for telecom business analysis of real applications and traffic patterns
- Personalised adaptive portals framework (***ADPO***); 2004-2006

  The ADPO project provides a platform framework that enables the personalization and composition of services
- Federated identity management based on liberty (***FIDELITY***); 2005 – 2006

  Reinforced Identity Management is a key enabler for Internet such that telcos can play an important role due to their trust relationship with customers
- Multilink architecture for multiplay services (***MARCH***); 2008 – 2011

  With multiple access links simultaneously users can get higher bandwidth and more robust broadband access, both at lower cost and improved experience

Experience from running MARCH as coordinator and scientific contributor

- Project ***quality*** establish with the Celtic label
  - Prepared with ideas worked at for FP7 project proposals
  - Presented to Celtic and achieved the label indicating a satisfactory quality of ides and partnership
- Strength of a pan-European ***collaboration***
  - Much more done with joined forces
  - Different qualifications: equipment manufacturer, telecom service provides, consultancies, and academia
- Coordinating role to ***direct*** and ***promote***
  - Lead to work both in preparing what the project shall concentrate on and to reach the goals in it's operating phase
  - Lead role in promoting the results outside the project
- ***Strength*** of Celtic-Plus
  - The label is given if the project has a sound approach and high quality content
  - Norwegian funding easier accessible than EU Framework funding

MARCH results in summary (as seen 2011)

- Explorative project on broadband access market and economics, and multilink techniques and architectures
- Broadband access market forecast until 2015
- Multilink business scenarios show positive return after 2-3 years
- Analyses of and forecasts for consumer market spending on content and communication services
- Research on multilink techniques covers both access and core network layers
- Reference and application oriented multilink network architecture developed
- Multilink solutions demonstrated

URL: http://projects.celtic-initiative.org/MARCH/march/

Summary

- Telenor Research Agenda presented
  - Focusing on role of research competence for an operator
  - Detailed five key areas
- Telenor past participation in Celtic
  - ECOSYS, FIDELITY, and MARH
  - Example Celtic-Plus projects, focussing on MARCH
- Main take-away
  - Celtic-Plus ensure quality and strengthen the research through collaboration
  - Participants can get much more done and promoted than using only own resources