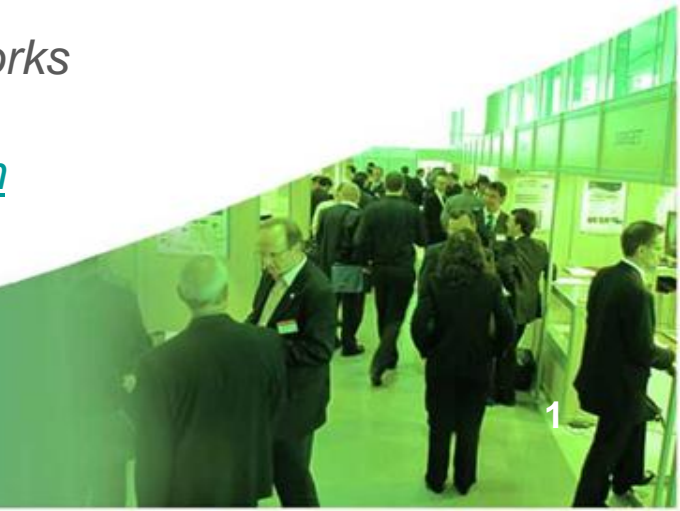Proposers Day
7 May 2015, Oulu

Celtic-Plus Success Stories SIGMONA

SDN Concept in Generalized Mobile Network Architectures

Jari Lehmusvuori, Nokia Networks
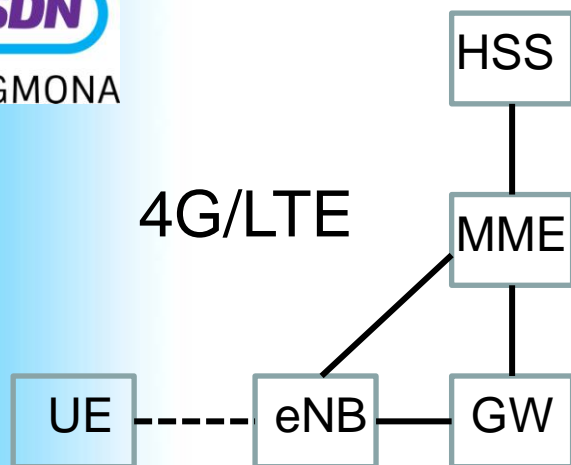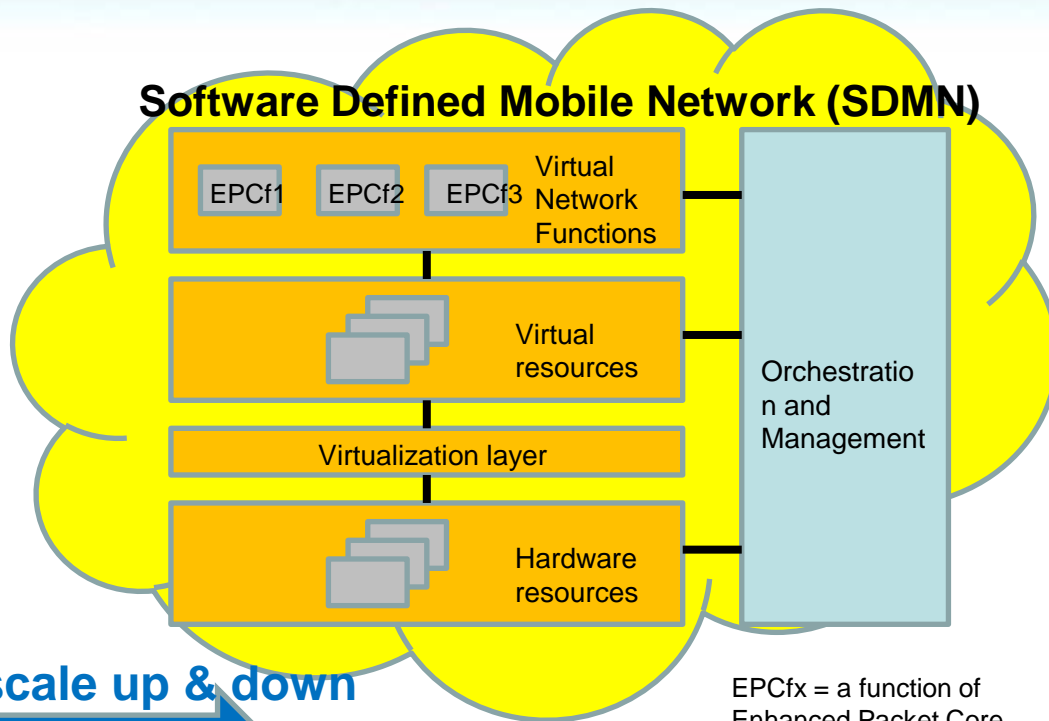*Espoo, Fínland*
jari.lehmusvuori@nokia.com

1

Motivation: New Mobile Network Architecture From HW/SW appliances to virtual resources

SDN

SIGMONA

4G/LTE

HSS

MME

UE ----- eNB — GW

Software Defined Mobile Network (SDMN)

| Virtual Network Functions |
| EPCf1 EPCf2 EPCf3 |

| Virtual resources |

| Virtualization layer |

| Hardware resources |

Orchestration and Management

EPCfx = a function of Enhanced Packet Core (LTE) mobile network

Flexibility to scale up & down

On-demand response to dynamic traffic needs

SIGMONA research areas for virtual networks:
- Transport networks virtualization and management
- Traffic, resource and mobility management
- Security
- Techno-economics

Project contribution on SDMNs:
- Network architectures with SDN control
- Contribution to standards (ETSI ISG NFV)
- Validation systems and test networks
- Business value and cost models

SIGMONA timing for NFV and 5G

Celtic Label

Celtic-Plus

EUREKA

SDN
SIGMONA

Celtic-Plus SIGMONA 6/2013 – 1/2016

Celtic Label

Funding approval in the first country

2012	2013	2014	2015	2016

ETSI ISG NFV, Phase 1

ETSI ISG NFV, Phase 2

Virtualized network function architecture

Both informative and normative work.

- At the right time for a major network technology & industry transformation to virtual networks, NFV and SDN
- The technologies and concepts in the key role also in 5G

EU H2020 5G PPP

5G research, including NFV/SDN

ETSI ISG = ETSI Industry Specification Group
NFV = Network Functions Virtualization
SDN = Software Defined Networking
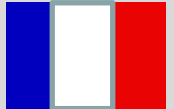
SIGMONA Consortium

Finland
Nokia Networks   **(Project Coord)**
Aalto University
EXFO
Coriant
University of Oulu/Center of Wireless Communic.
VTT Technical Research Center of Finland

Germany
Nokia Networks
Technical University of Chemnitz

Spain
NEXTEL
ENEO
Innovalia Association

France
Bull
Cea
Montimage
6WIND

Hungary
Nokia
Budapest University of Technology and
Economics/ Mobile Innovations Center

Turkey
ARDIC
Avea
TT Argela
Ericsson Turkey

- A total of 21 Partners from 6 countries
- Funding approved in 5 out of 6 countries
- Total effort of 119 person years
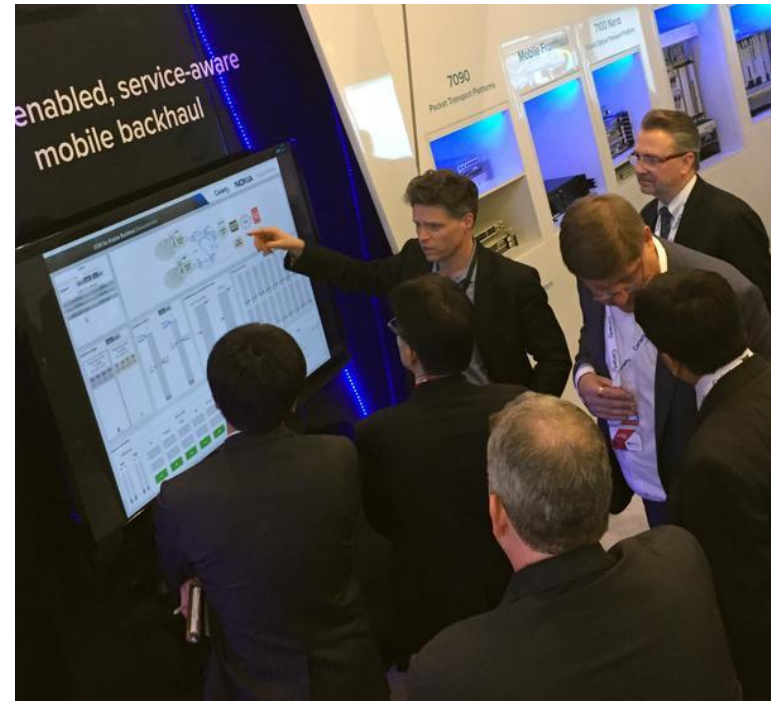- From June 2013 until Jan 2016 (32 months)

SDN and SON for Service-Aware Mobile Backhaul PoC Demo at Mobile World Congress 2015

Pictures from the MWC 2015 demo

https://twitter.com/nokianetworks/status/573053910186926080

https://twitter.com/nokianetworks/status/573053266587750400

https://twitter.com/CoriantConnect/status/572824658321534977

PoC = Proof-of-Concept
SDN = Software Defined Networking
SON = Self-organizing network

Standardisation contribution

- Proof-of-Concept for ETSI ISG Network Functions Virtualization (NFV) based on SIGMONA test bed submitted in cooperation with Nokia, Coriant, EXFO and Telecom Italia.

- Objective: Integration of SDN and NFV functions in mobile backhaul (http://nfvwiki.etsi.org/index.php?title=Virtual_EPC_with_SDN_Function_in_Mobile_Backhaul_Networks)
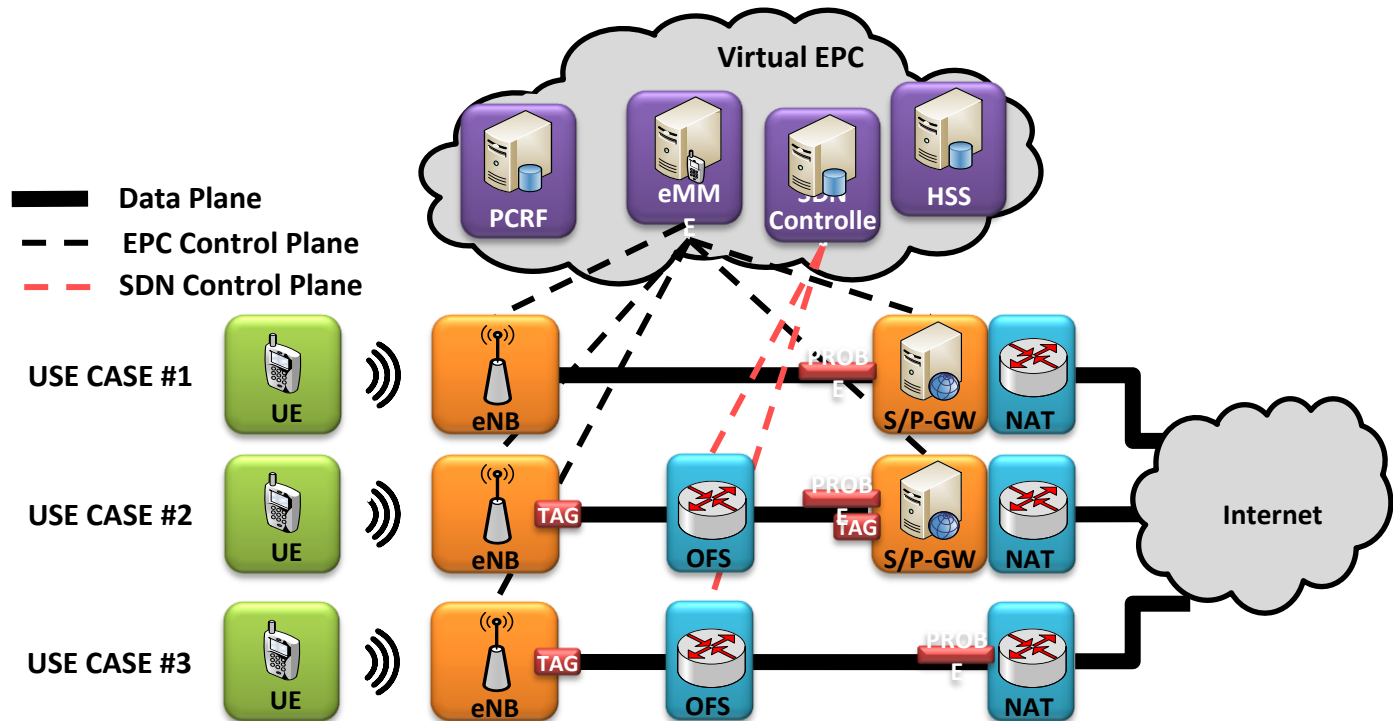
ETSI ISG = ETSI Industry Specification Group
NFV = Network Functions Virtualization
SDN = Software Defined Networking

Dissemination – Press Releases

- Nokia-Coriant / SON & SDN demo at Mobile World Congress 2015: "Nokia Networks, Coriant first to extend self-organizing networks to mobile backhaul #MWC15", 12 Feb 2015

  – Nokia Networks and Coriant are first to extend intelligent self-organizing networks (SON) to mobile backhaul. The innovation will be demonstrated for the first time at Mobile World Congress 2015. The SON for mobile backhaul Proof of Concept shows how advanced analytics and software defined networking (SDN) work together to create programmable, self-aware networks that assure an optimal service experience end-to-end. The same level of experience can be achieved with 20% less transport infrastructure than is needed in today's networks.

- Aalto-Nokia / vEPC & SDN PoC in ETSI NFV: "Nokia Networks, Aalto University and partners combine NFV and SDN for virtualized mobile network", 18 Feb 2015

  – Nokia Networks and Aalto University, Finland, together with Coriant and EXFO, showcase the future of software defined networking (SDN) in mobile backhaul. The parties have developed an ETSI Industry Specification Group for Network Functions Virtualization (NFV) Proof of Concept, in which a virtualized LTE network applies SDN technology to the entire mobile backhaul, transport and core network*.

1) NFV and SDN for virtualized mobile network (Aalto, Nokia, Coriant, Exfo)

- Virtualized 4G (LTE) network that applies software defined networking (SDN) technology to the entire mobile backhaul, transport and core network. This demo system is one of the Proof-of-Concepts in ETSI Industry Specification Group for Network Functions Virtualization (NFV).

2) ISAAR – A SDN-based QoE Monitoring Solution for Video Streaming (Technical University of Chemnitz)

- The setup demonstrates a streaming video monitoring solution which uses in-network parameter measurements and performs quality of experience (QoE) estimations. It makes use of Software Defined Networking (SDN) functions for the parameter probing as well as for the optimization of the traffic transport.

3) Application-layer traffic optimization in software-defined mobile networks (Budapest University of Technology and Economics)

- Application-level traffic optimization protocol specifies a standard network information service to support decision in the selection of the optimal server when someone connects to a distributed service. In this demonstration the network controller will enforce redirection using software-defined networking (SDN) mechanisms.

Scientific publications

1) Articles, conference papers
   - Total of 45 by the mid-term of project at the end-2014

2) Book to be published in mid-2015

"Software Defined Mobile Networks – Beyond LTE Network Architecture"

- Edited by University of Oulu / CWC
  - Madhusanka Liyanage, Andrei Gurtov, Mika Ylianttila
- Publisher: Wiley (available in May-July 2015)

Contact Info

Nokia Networks
Jari Lehmusvuori
jari.lehmusvuori@nokia.com
+358 40 5483362
P.O. Box 6, 02022 NSN, Finland
www.sigmona.org