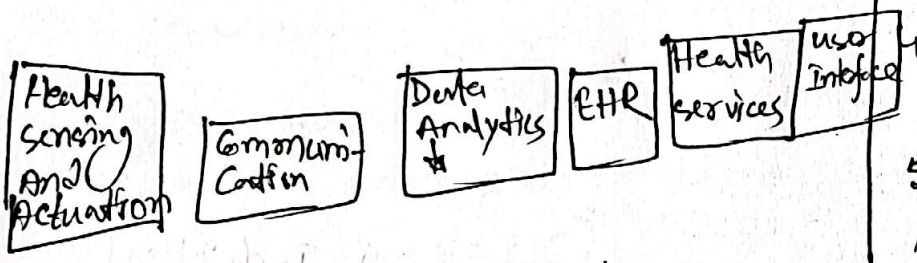
Research work (6G talk - Erkki)

Generic healthcare problem
1. Aging population
2. Growing healthcare cost
3. Lack of workforce
4. Chronical and lifestyle disease
5. Pandemics and other threats

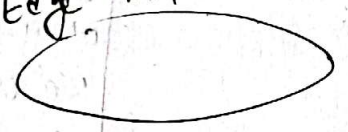
Growing requirements for communication Architecture
1. Developing sensing/instrument
2. Novel user interface
3. AI/ML, Big data, explainability.

Challenges for healthcare communication system:
1. Lack of integration
2. Complexity of technology
3. Regulation and legislation
4. cost and resource inefficiency.
5. Support for novel technologies

Technical requirements
1. Real time comm.
2. High reliability and resilience
3. Interoperability between systems and components Open interface
4. Resource and energy efficiency.
5. elastic scalability
6. Security, privacy and trust



5G/6G
M2M

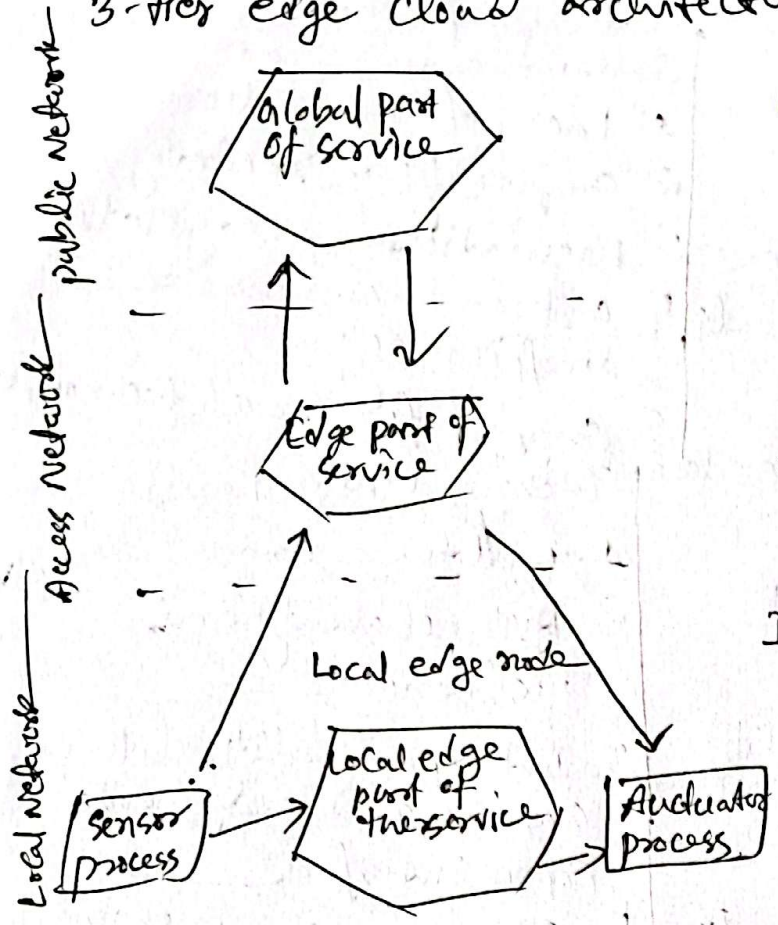


Service virtualization

Network virtualization
Adaptive security
Zero trust

Decentralized service Architecture

3-tier edge cloud architecture



Challenges

1. mutually conflicting requirements
2. Limited computational and network resources
3. mobility of nodes and availability of serving nodes.

Intelligent edge cloud continuum

- use of AI/ML for optimizing the computing continuum.

AI for edge-cloud

project:

Tomohead: Business Finland, 5.4 ME
Edge cloud Reconstruction.
Time: 01.01.2023 - 31.12.2025

Eware

- optimizing end to end communication path
- 1.5 ME, 2023-2025.
- 01.01.2023 - 30.06.2025

Hola 5G

- RF measurements.
- 2.1 ME, 2024-2025.
- 01.01.2024 - 28.02.2025

Tech 2 Heal

01.01.2025 - 30.09.2027.

Future topics: LLM & CoGenAI for a digital care pathway.

- emergency response
- surgical navigation
- clinical monitoring.

B Dr. Erkki Harjula

- tenure track professor, CWC-NS (Network and System)
- D.Sc - 2016
  MSc - 2007.

WEALTH = wireless system level architectures for future digital healthcare.

WiMeC = Wireless Medical Communication.

Theme - edge to cloud continuum

6G flagship strategic Area 3: Distributed intelligence

PI in Ewaree6G, Tomohead (Co-PI), Tech2Heal, Distech 6G

Associate editor in springer wireless network (WINE) journal.

postdoc at CWC-NS (2016-2020)

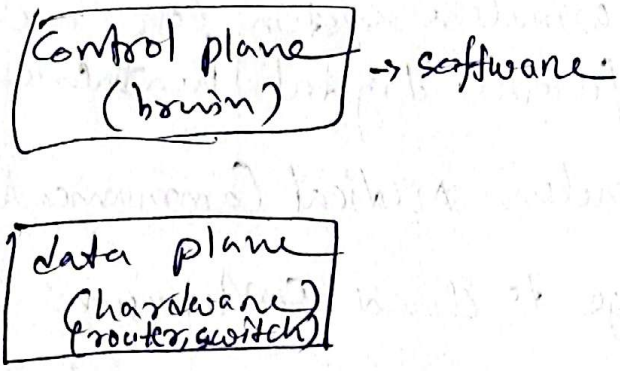
project manager at center for internet excellence (CIE) (2013-2015)

visiting scientist at Columbia university in 2008-2009

Date: 09.04.25.

Paper title: Delay aware dynamic resource (QHR) orchestration for IoT-enabled Software defined networks.

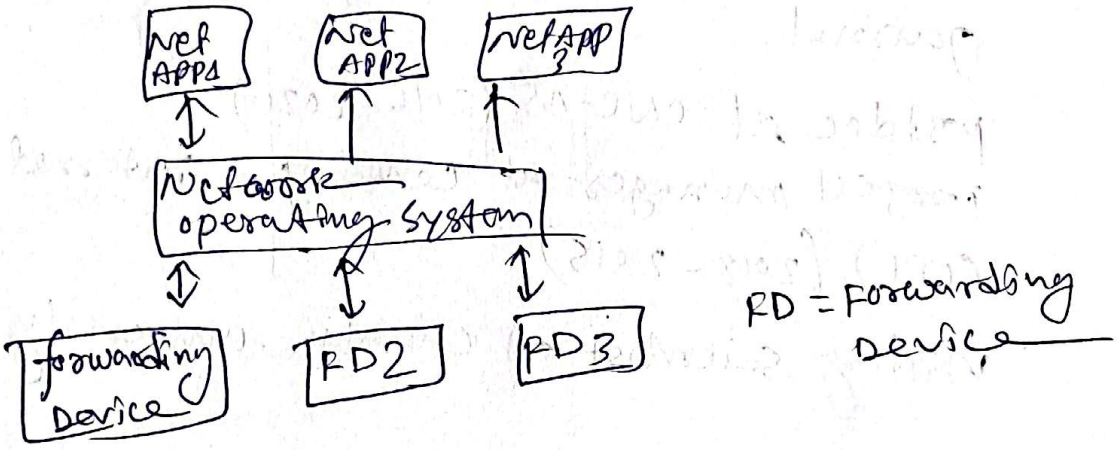
SDN:



Application: openDaylight, ONOS

Emulator: VSDNEmul, EstiNet, Mininet

~~Forces~~

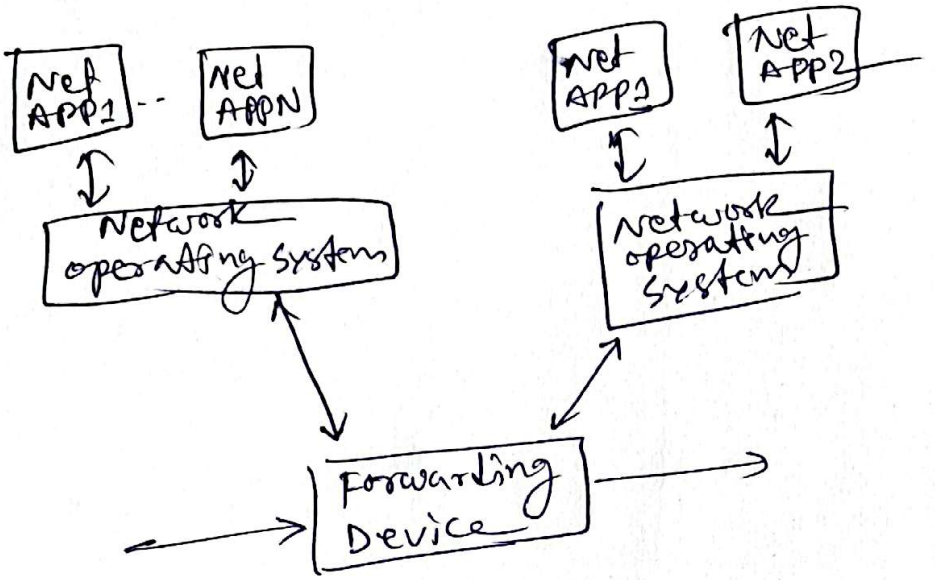


Main Components

1. Network application
2. Application Interface
   a) Java API
   b) Northbound (RESTConf)
3. SDN Controller/ Control plane
   a) Topology service
   b) Inventory service
   c) Statistics service
   d) Host Tracking

4. Southbound Interface —
   a) openflow d) SNMP
   b) OVSDB
   c) NetConf

5. Forwarding device / Data plane —



Tools and stack —

1. mininet / mininet-wifi – Network emulation
2. Ryu / POX / ONOS / OpenDaylight – SDN Controller
3. openflow
4. python – for controller logic and APIs
5. wireshark / tcpdump – for packet Analysis
6. Grafana + Prometheus / ELK stack – visualization.

Date: 04.10.25.

Title: From Technical prerequisites to improved care: Distributed Edge AI for Tomographic Imaging.

- Claim: It improves processing and management data
  Q: what experiment/data it provide to backup this claim.