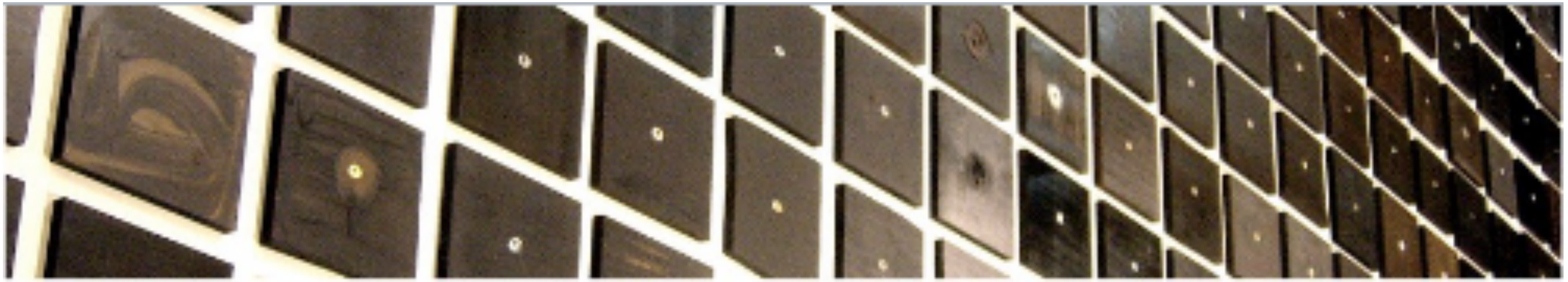


UiO : Universitetet i Oslo

EyeNetworks Fagdag 19Apr2016

Wireless - full speed into Chaos?

Josef Noll

Co Founder and Visionary at **Basic Internet Foundation**
Prof. at **University Graduate Studies (UNIK), University of Oslo (UiO)**
Head of Research at **Movation AS**
Norway

"Our Journey of Today"

- "The last time we were connected by wire was at birth!" [Motorola]
- The history of mobile
- Wireless & Mobile Today
- Upcoming challenges
  - ➡ Scalability in IoT
  - ➡ Security & Privacy
  - ➡ Co-operative access
- "*Some meat for discussion*"

Basic Internet Foundation

iMVNO - invers Mobile Virtual Network Operator

what has happened in the last 11 years?

Nordic Mobile Plansammling, 8Jun2005

telenor

4G and disruptive technologies

Josef Noll
Researcher, Telenor R&D, N-1331 Fornebu
Prof. stip., Univ. graduate studies, UniK, N-2027 Kjeller
josef@unik.no

and what is my vision for 2026?

Other/open access networks

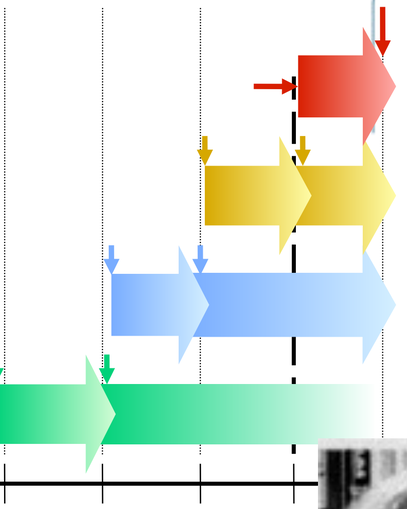
- New radio technologies (802.11, WiMAX, …)
  → traffic vanishes into private networks
- Services in WLAN/Bluetooth bands (UMA)
  → reduces traffic in mobile network, e.g. BT's Bluephone
- Expensive Mobile Network ←→ cheap home network

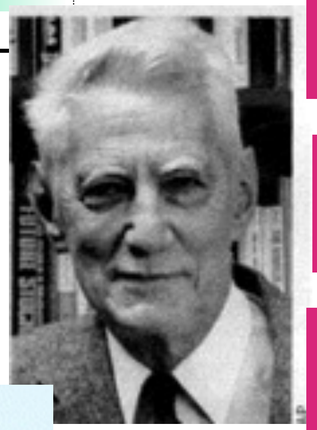
- "No way out"
- Think service delivery, not "GSM/GPRS/UMTS"
- Do it yourself, don't wait until others do it

Postulation 1:

Challenge yourself to survive: How can I kill my business?

Postulations from 8Jun2005





Postulation 1:
Challenge yourself to survive: How can I kill my business?

Postulation 2:
The time for "generations" is over, the winner provides integrated service access
(still needs: seamless authentication, seamless service access)

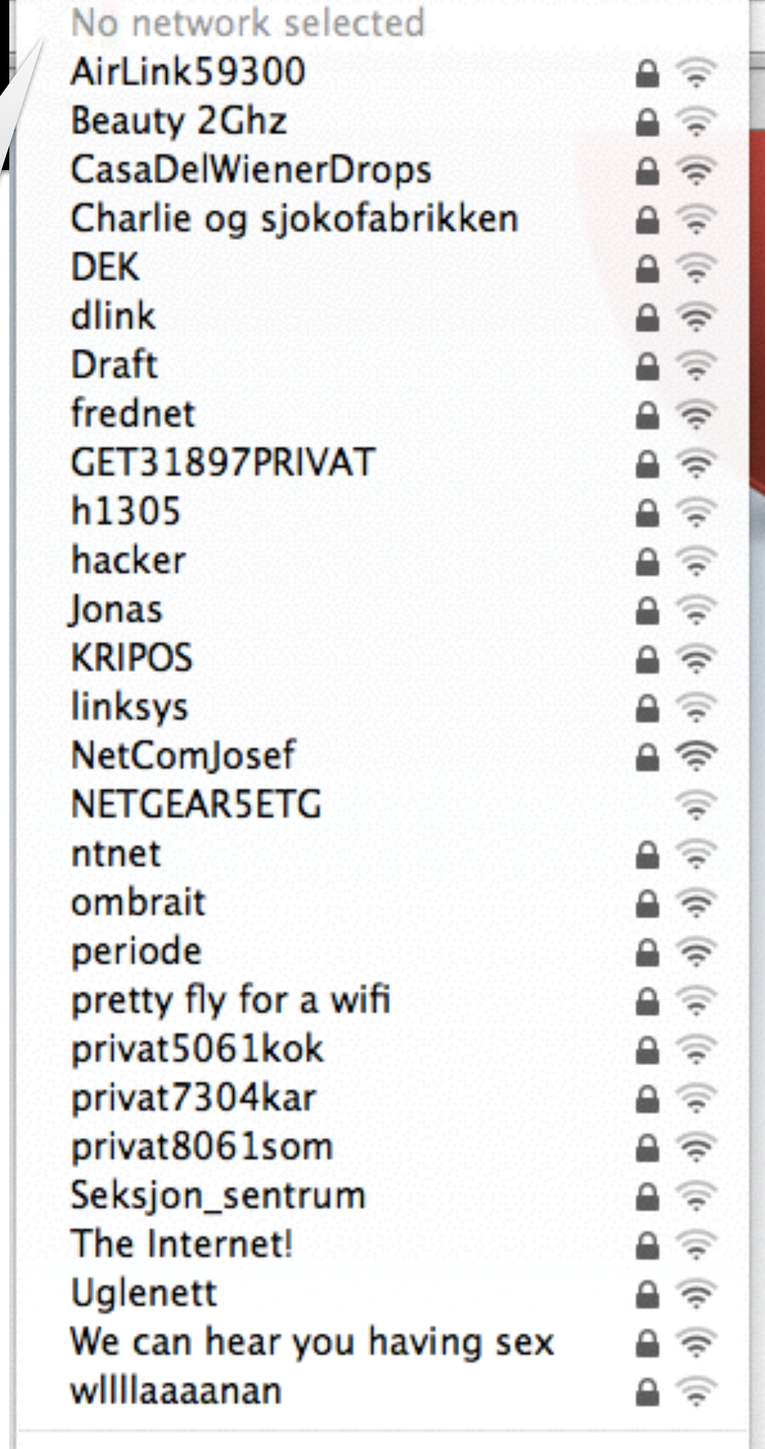
Postulation 3:
HSPDA does not help you, you still need more and smaller cells.

Postulation 4:
Indoor high bandwidth coverage comes from indoor access → Challenge Nokia/Ericsson on the price for indoor access (max 400 NOK)

Postulation 5:
Beyond 3G (or 4G) is the integration of access, and higher bandwidths access speed

The world of 2016

Wifi at “Legevakten” Feb2011



- Interference-limited Wifi
  - ➡ increased demand on customer services
  - ➡ “meaningless discussions” on “Wifi”
- Operators in the need of becoming “Digital Companies”
  - ➡ Revenue, Investors?
  - ➡ Digital Ecosystem: Identity, Federation
- 5G dilemma
  - ➡ revenue versus costs
  - ➡ network infrastructure (core vs access network costs)
- Societal challenges

Energy, Health, “Internet for all”

Security, Privacy, “Digital Societies”

Addressing the Threat Dimension for IoT

- Hollande (FR), Merkel (DE) had their mobile being monitored
- «and we believe it is not happening in Norway?

[source: www.rediff.com]

18. Dezember 2014, 18:14 Uhr Abhören von Handys

So lässt sich das UMTS-Netz knacken

[source: Süddeutsche Zeitung, 18Dec2014]

Zwei Hacker zeigen
d? UMTS-Antenne lassen
sich knacken (Foto: dpa)

7Mar2015

www.aftenposten.no

Hard kritikk mot justisministeren i mobilspionasje-saken:

- Dette er forklaringer som ikke holder vann

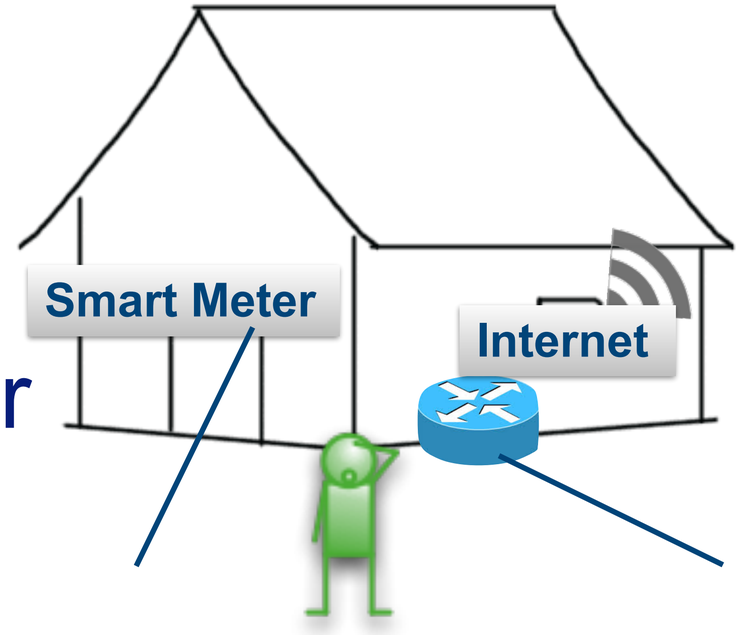
LES OGSÅ: Spionjegere avfeier Anundsens nye mobilforklaring

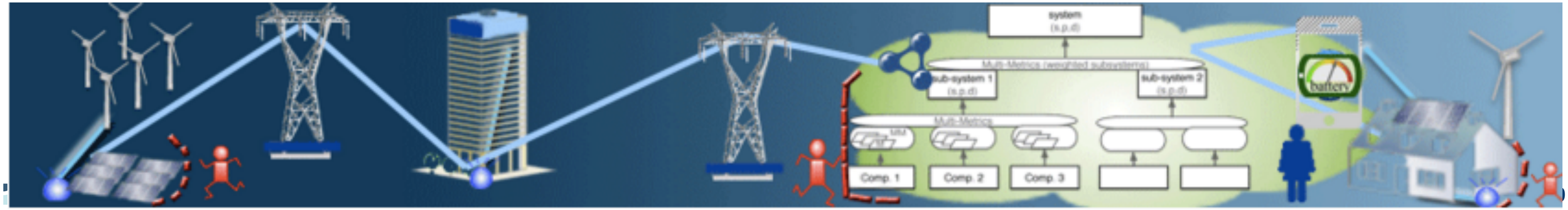
Communication & IoT for society

IoTSec.no

"Research on IoT security"
"Building the national Security Centre for Smart Grid"

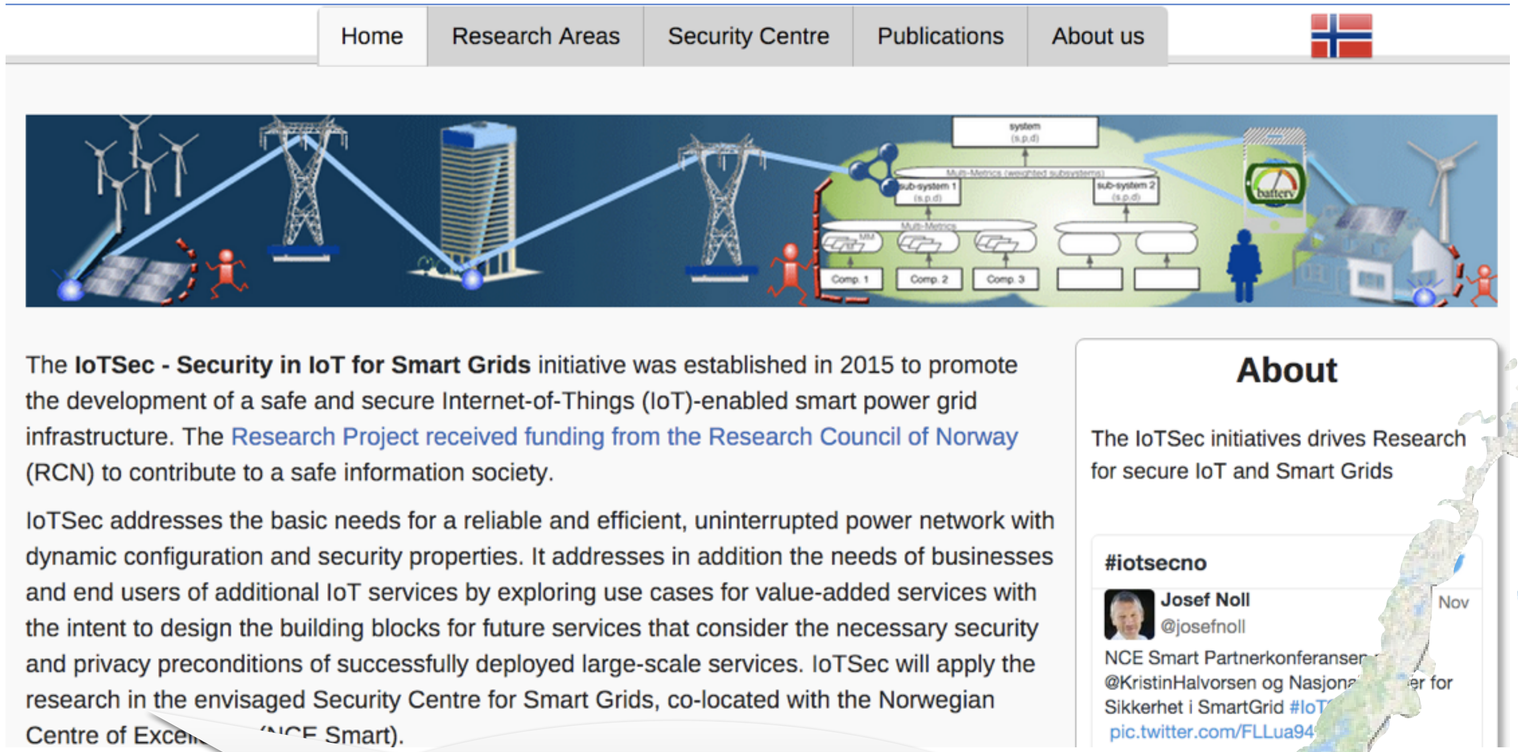
http://IoTSec.no





Knowledge and collaboration space

IoTSec.no #IoTSecNO



«Open World Approach»
everything that is not declared closed is open

Partners and Collaborations

- UiO
- UNIK
- NR
- Simula
- NTNU

Academia

- Smart Innovation Østfold
- eSmart Systems
- Fredrikstad Energi
- EB Nett
- Movation

Industry

- Smartgrid Centre
- Norw. Data Protection Auth.
- Forbrukerrådet

Interest Org.

- EyeSaaS
- mnemonic

Industry

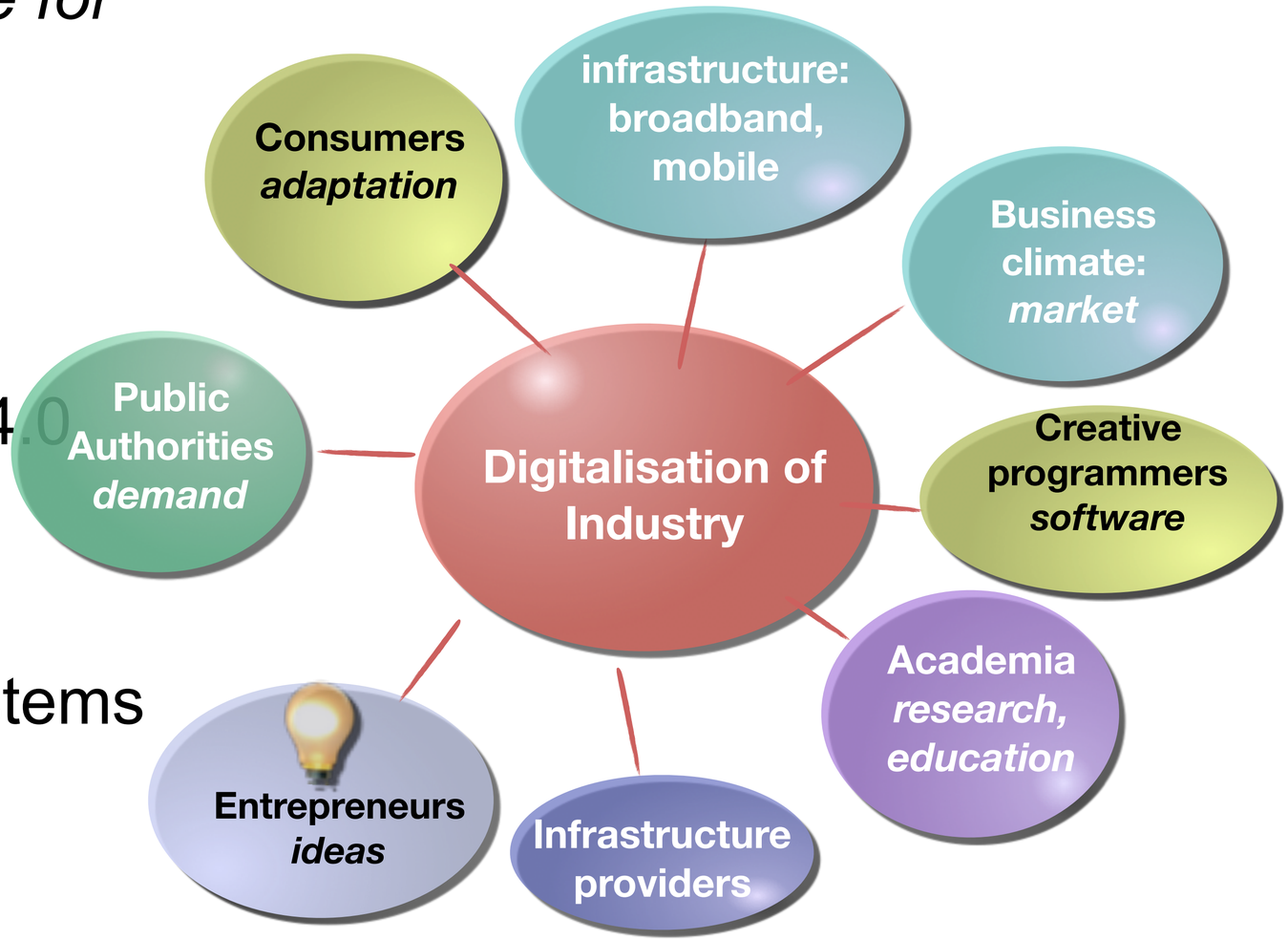
- Mondragon Unibersitatea
- University of Victoria
- Universidad Carlos III
- La Sapienza
- COINS Research School
- Nimbeo
- H2020 and ECSEL projects

International

Focus of IoTSec

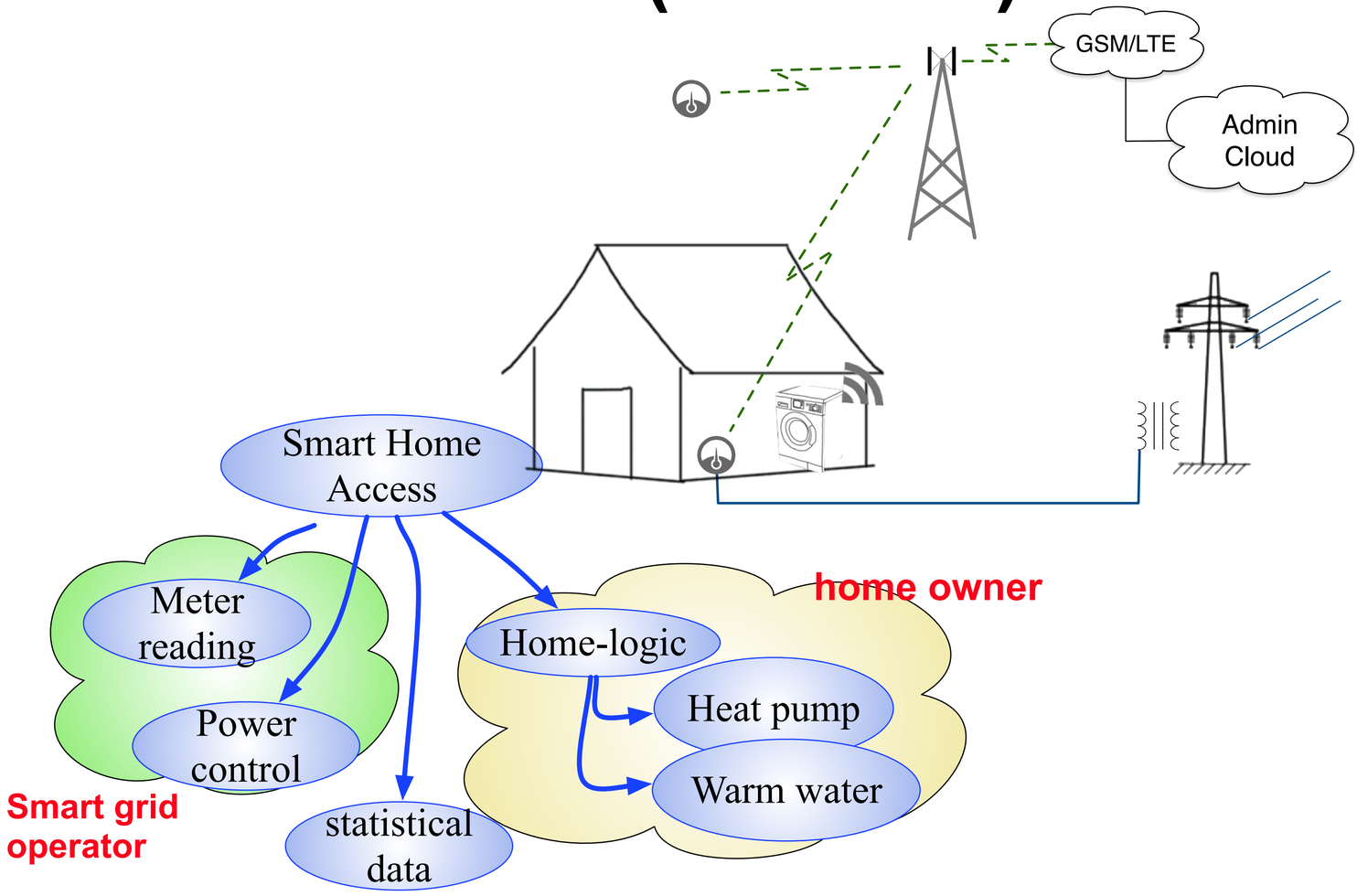
- "*we are building the Security Centre for Smart Grid*"
- Smart Grid infrastructure
  - ➡ towards Smart Homes, Smart Cities
  - ➡ towards Autonomous systems
- Security & Robustness of Industrie4.0
- Model System of Systems
- Networked Autonomous Systems
- Smart Grid enabled Distributed Systems

based on: security & privacy for systems of systems



Semantic attribute based access control (S-ABAC)

- Access to information
  - ➡ who (sensor, person, service)
  - ➡ what kind of information
  - ➡ from where
- Attribute-based access
  - ➡ role (in organisation, home)
  - ➡ device, network
  - ➡ security tokens
- Rules inferring access rights



Attributes: roles, access, device, reputation, behaviour, ...

Home infrastructure Communications and Insight

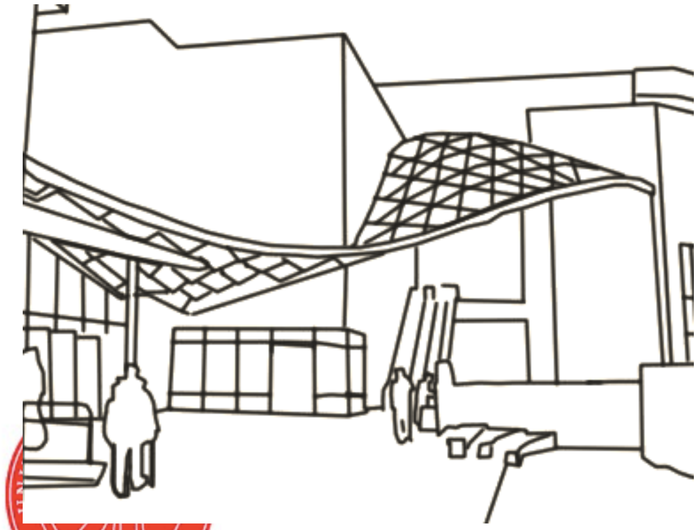
- Distributed equipment
  - router, TV, mobile,…
  - authentication
  - traffic routing
  - service logics (where, what)
- Collaborative services
  - owner information
  - service data
  - statistics, e.g. urban,…
- Local decisions
  - knowledge cloud
  - fog computing

Challenges: Set-up, Connectivity

Addressing the challenges of IoT connectivity

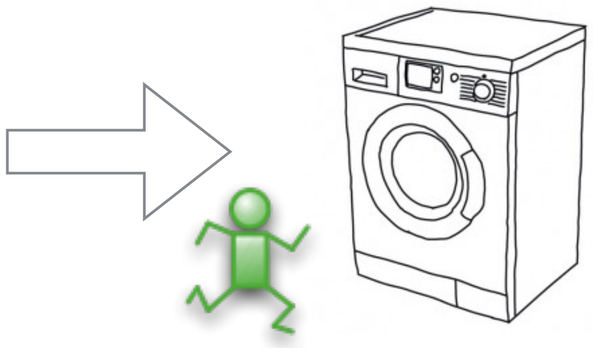
Device ownership

- who owns the device
- which data are going to whom
  - ➡ maintenance



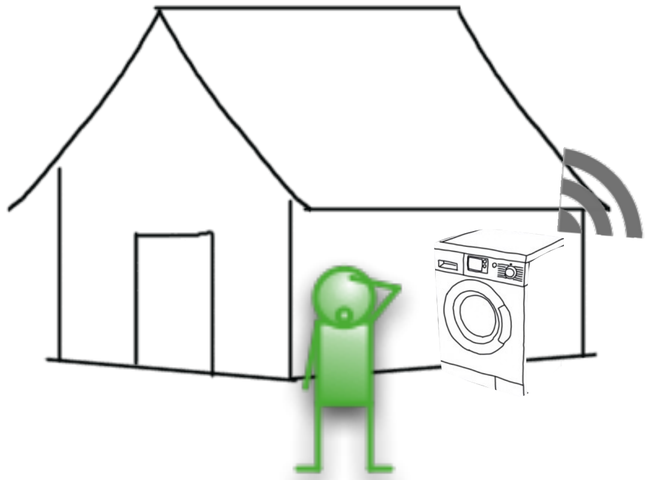
Easyness Setup

- 1. step ownership
- take control



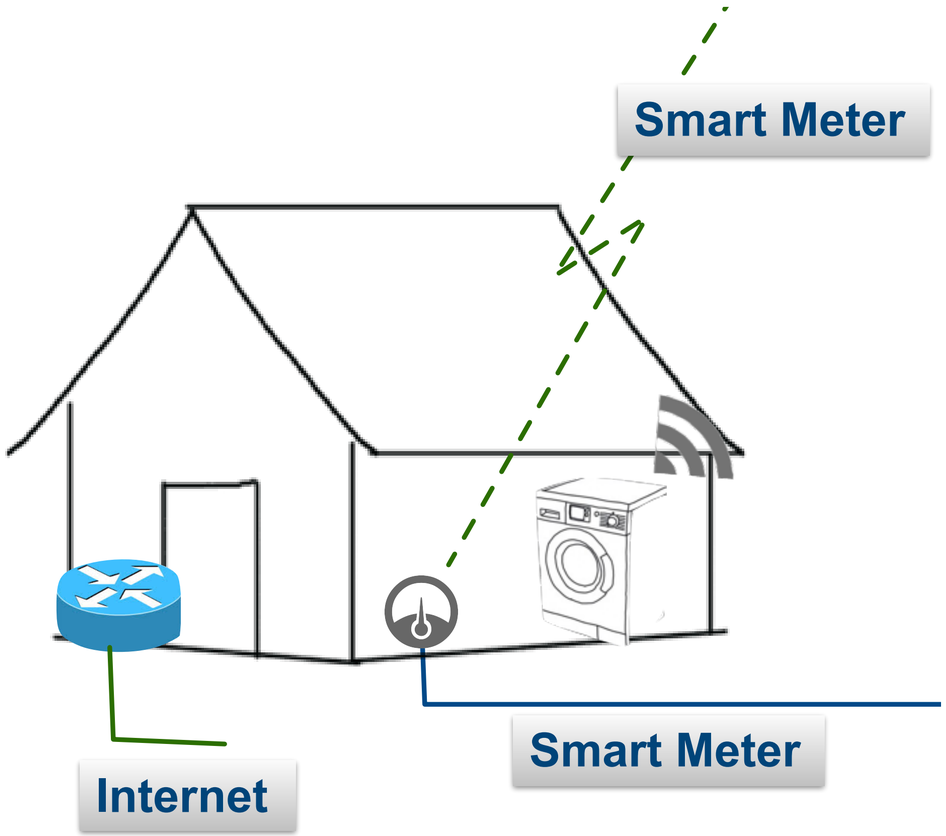
Scalability

- business model for SIM/device not scalable
- free wireless for IoT data



Upcoming Infrastructure

- Smart Meter
  - read and control
  - logic?
- Smart Home
  - intelligent devices
  - on-demand regulation
- Challenges
  - Logic: Centralised <—-> Fog
  - Smart Meter: Information <—> Control
  - Smart Grid Information <—> Internet Info

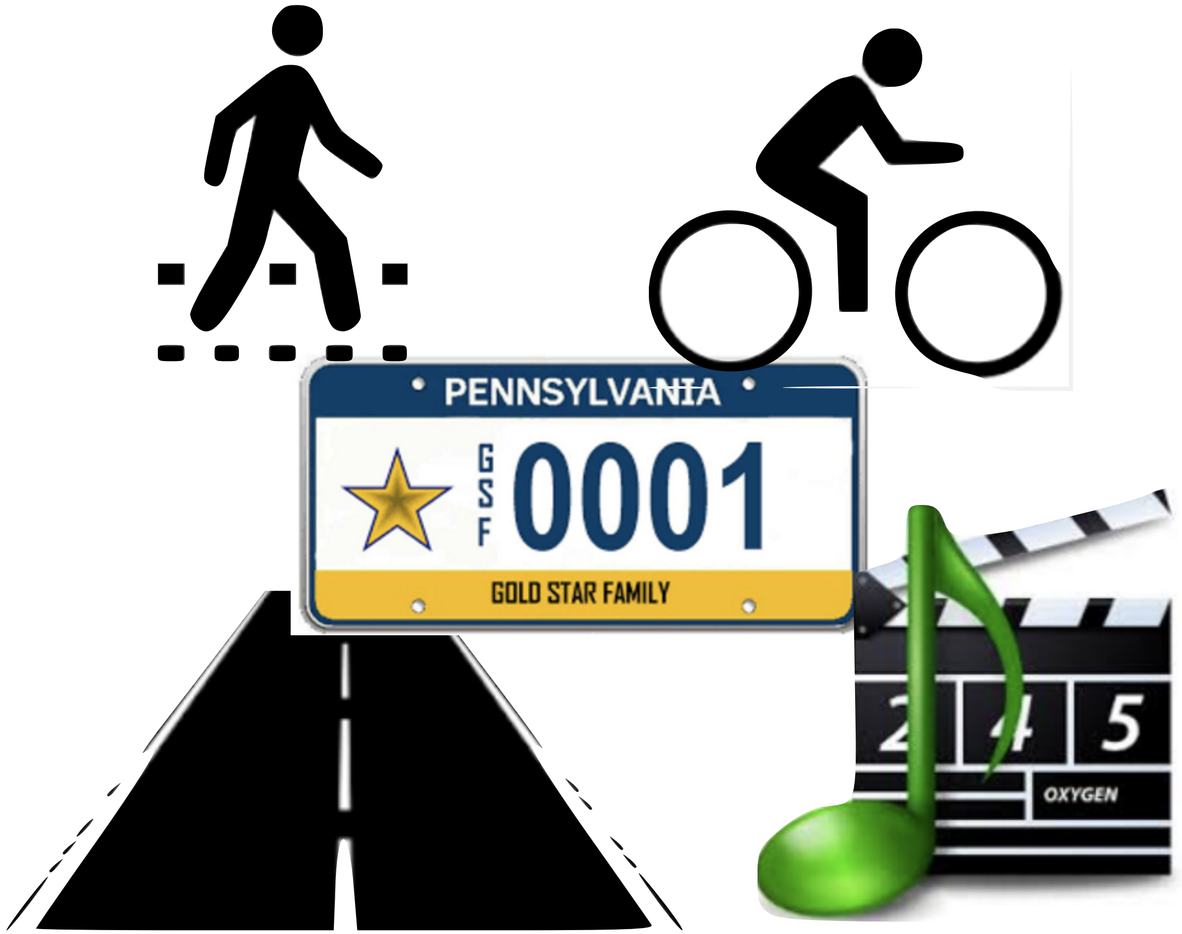


WWRF vision for 2017; “7 trillion wireless devices serving 7 billion people by 2017”,

The vision of 2026

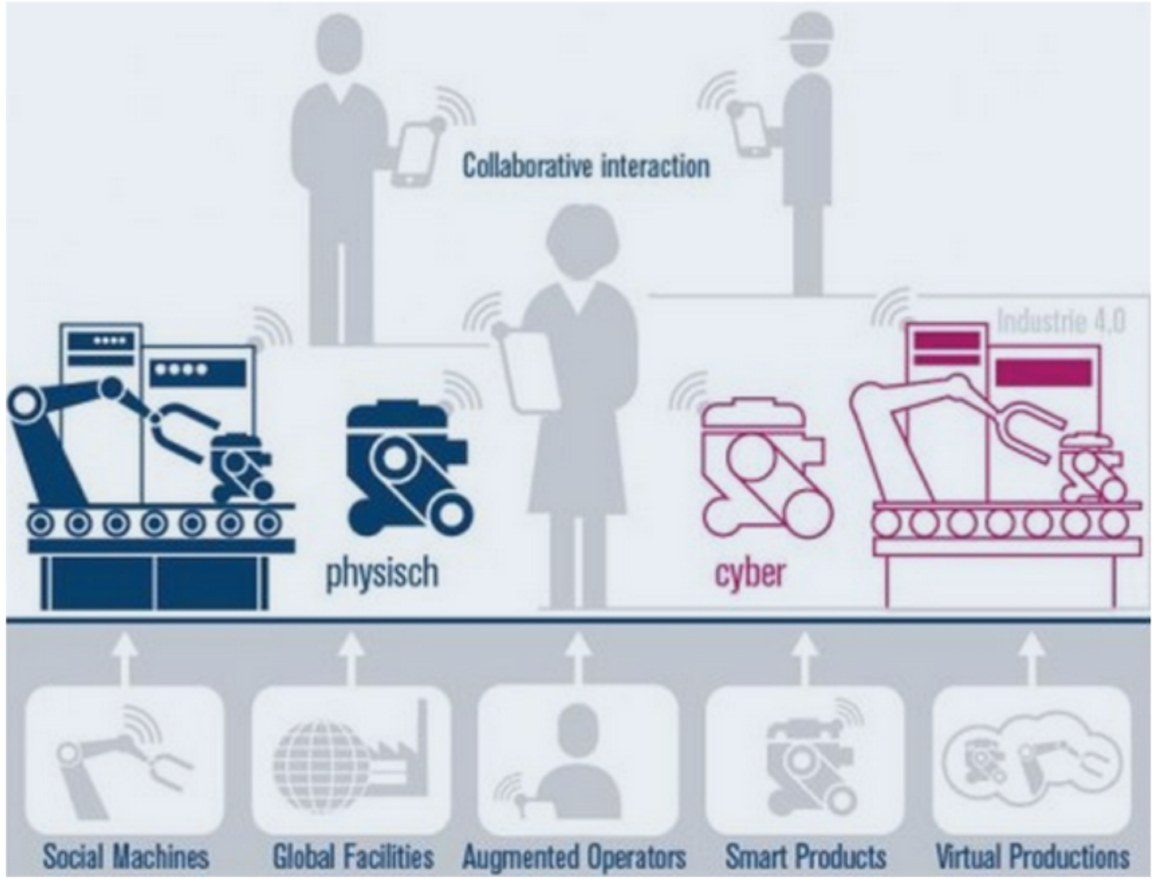
- “Digital and Inclusive Society”
- Networks adopting to service needs
  - ➡ Security, privacy, dependability
- “the Road Network Infrastructure”
- Low-capacity Internet
  - ➡ free and open access
- Broadband services
  - ➡ authenticated access

or



Background: Digitalisation of Industry

- EU has introduced[1] Industrie4.0
  - digital innovation hubs,
  - leadership in digital platforms,
  - closing the digital divide gap
  - providing framework conditions
- Norwegian Government has established[2] "Klyngene som omstillingsmotorer" (Sep2015)
  - NCE Smart Energy Markets on "**Digitalisation of Industry**"
  - NCE Systems Engineering på Kongsberg og NCE Raufoss on Productivity and Innovation



Source: Trumpf / Forschungsunion Wirtschaft & Wissenschaft

[1] http://europa.eu/rapid/press-release_SPEECH-15-4772_en.htm
[2] http://abelia.no/innovasjon/klyngene-skal-omstille-norge-article3563-135.html

Digitalisation of the Society

Source: EU commission(?)

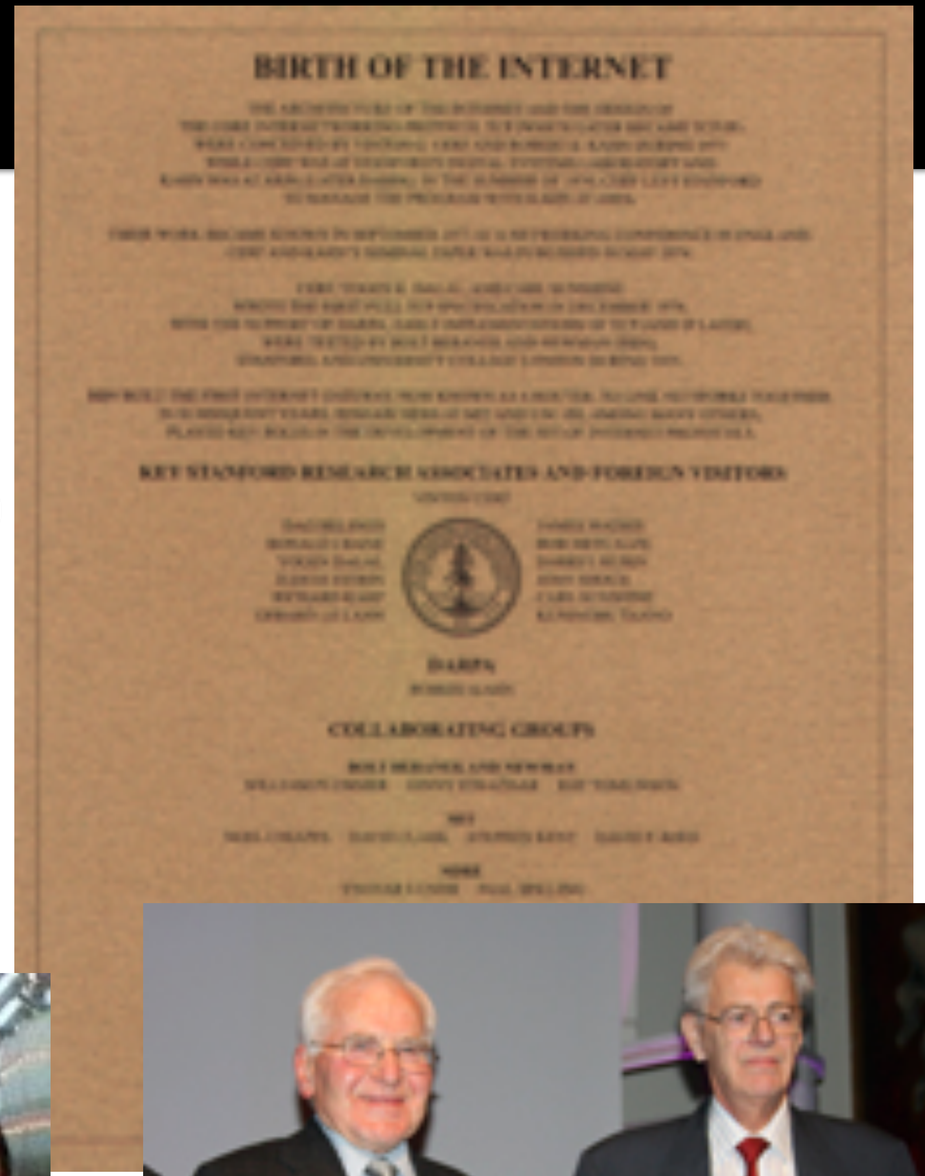
Internet is a basic human right

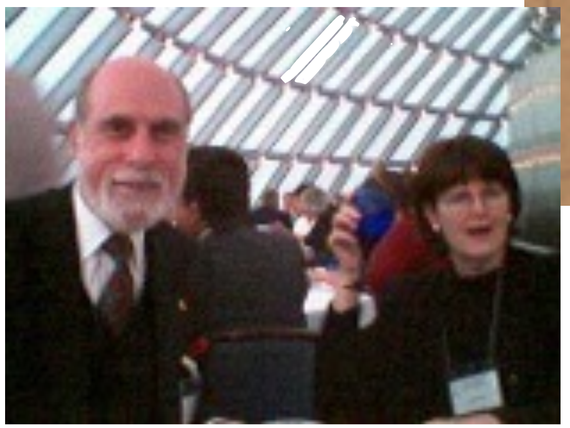
- Is Internet access and online freedom of expression a basic human right?
- "All people should be allowed to connect to and express themselves freely on the Internet."

- The United Nations' Human Rights Council unanimously backed that notion in a resolution on 5July2012. All 47 members of the Human Rights Council including China and Cuba signed the resolution.

The Internet and Scandinavia

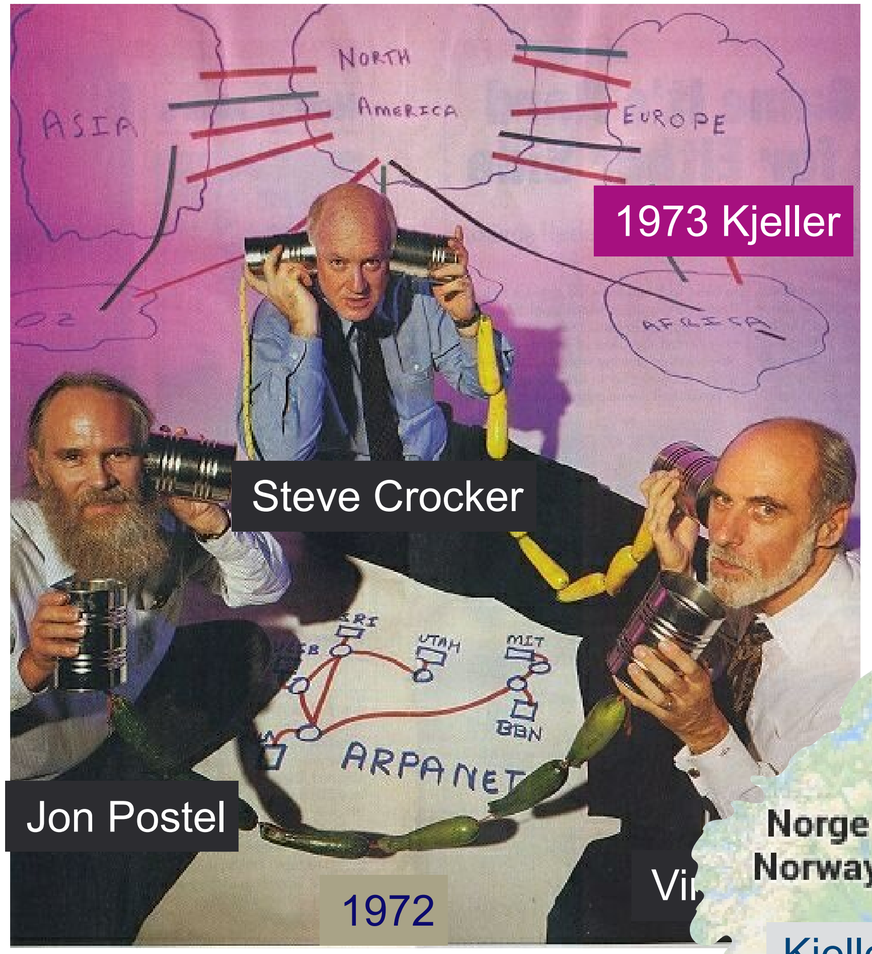
- The first connection of Arpanet outside of the USA (and Hawaii) was to **Scandinavia** (Kjeller, June 1973)
- List_of_Internet_pioneers [Wikipedia]
  - Yngvar Lundh, Paal Spilling
- Application development
  - .php, OpenSource, Linux, Skype, Spotify
  - OperaSoftware, FAST Search
  - Nokia, Ericsson
  - Telenor, TeliaSonera
- Mobile Internet:
  - GSM
  - Service adaptation





UNIK .... and the Internet

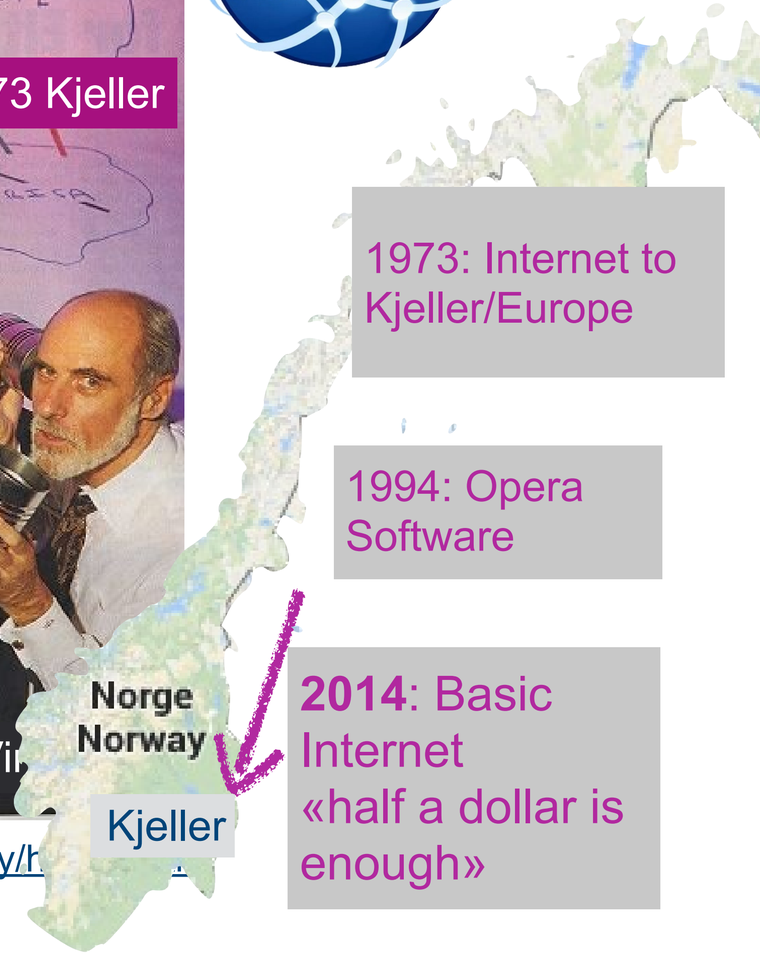
- The building where the Internet (Arpanet) came to Europe in June 1973



1973: Internet to Kjeller/Europe

1994: Opera Software

2014: Basic Internet «half a dollar is enough»

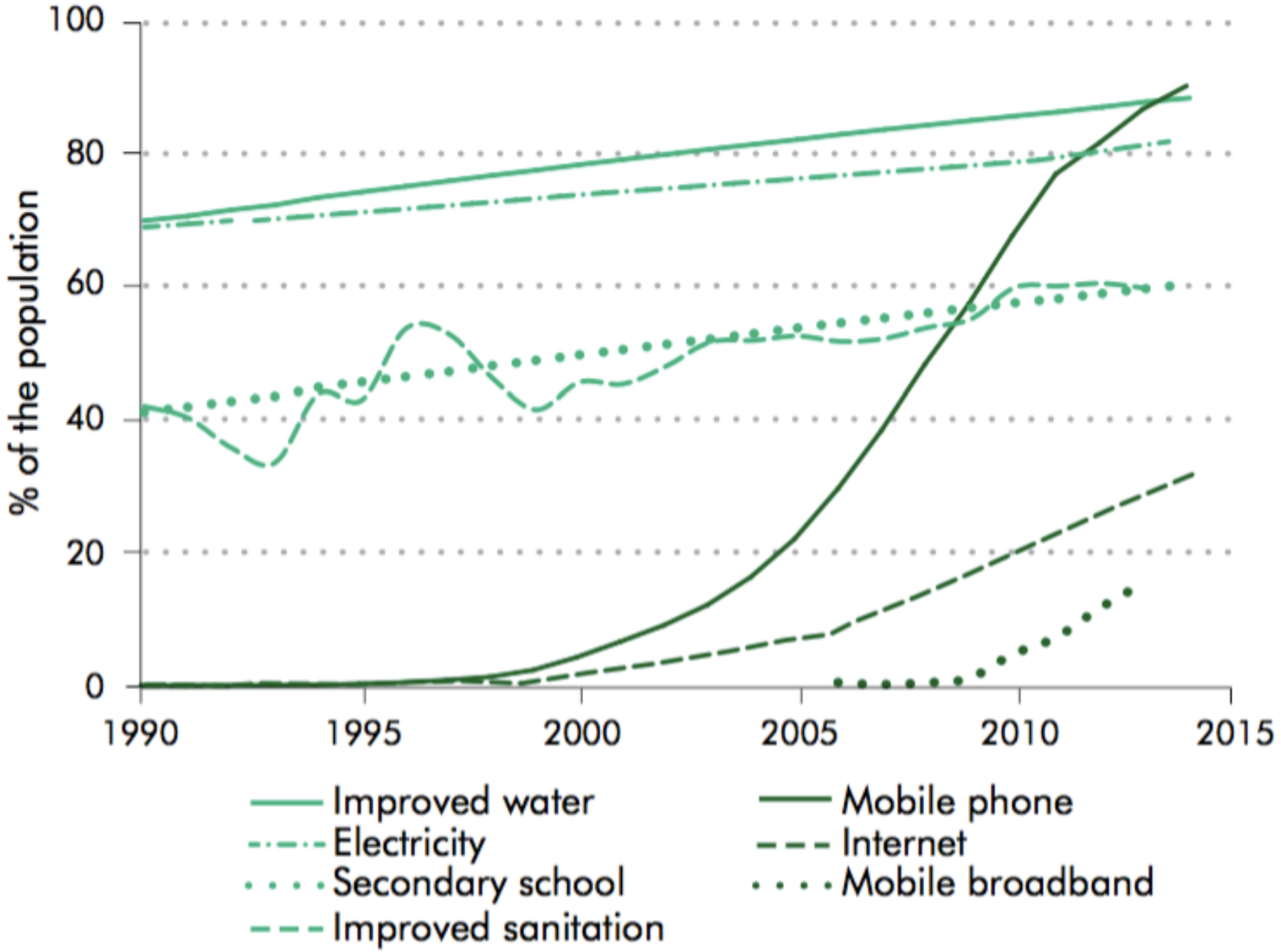


Source: http://www.michaelkaul.de/History/h

1971 (at which point 23 hosts, at universities and government research centers, were connected to the ARPANET); 29 by August, 1972, and 40 by September, 1973.

At that point, two satellite links, across the Pacific and Atlantic Oceans to Hawaii and Norway (NORSAR) had been added to the network. From Norway, a terrestrial circuit added an IMP in London to the growing network.

a. Digital technologies are spreading rapidly in developing countries



[Source: World Development Report 2016]

Connectivity & Affordability

- Mobile supported development
- Affordability (costs of data)
- industrial perspective (Ind4.0)

The Unconnected Market Landscape

Unique Mobile Internet Users

Population 15+ (bn)	Total	BMI	NMI	Unconnected	
Developed World	0.9	0.6	0.1	0.3	
Developing World	4.3	1.0	0.8	2.5	3.3
Total	5.2	1.6	0.9	2.8	

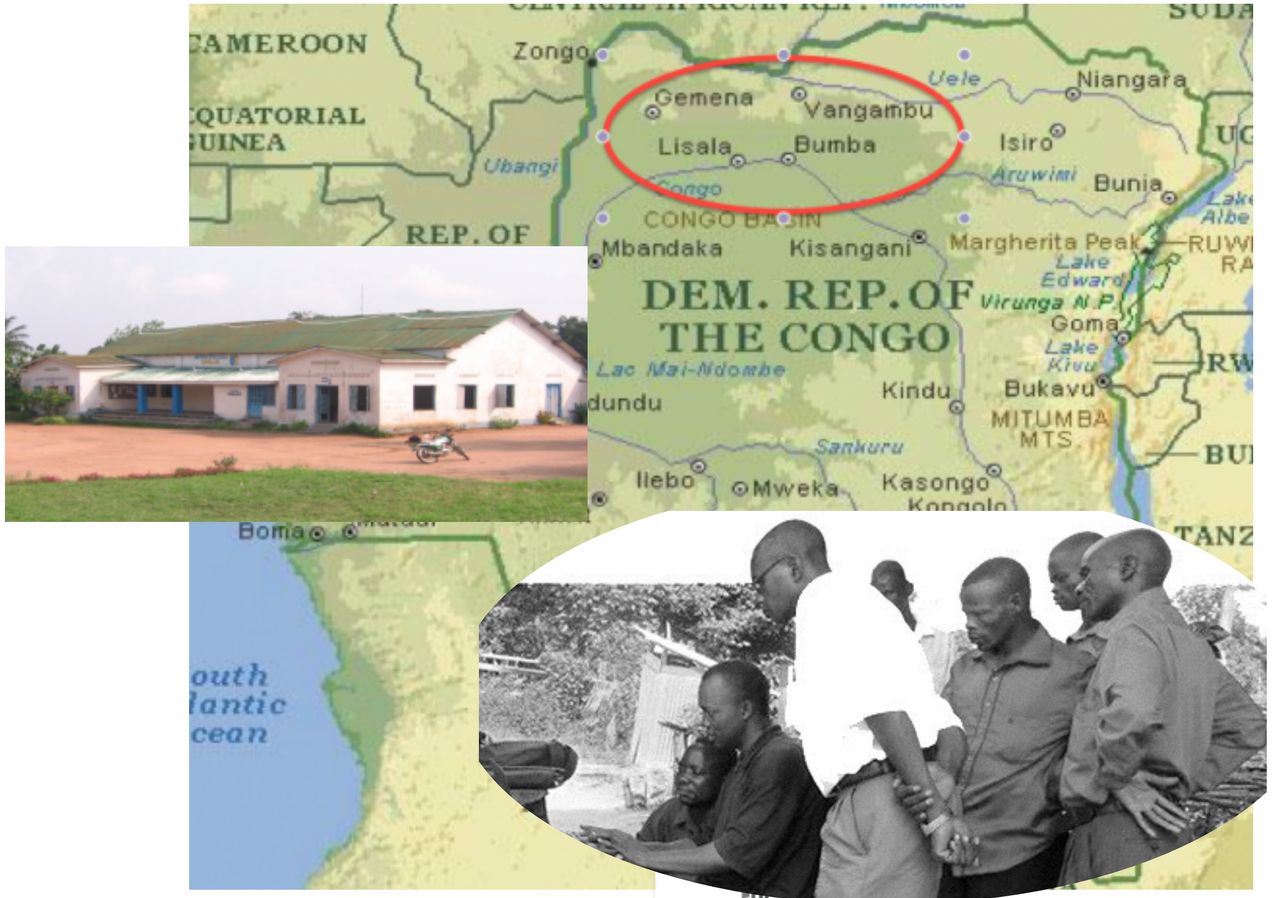
Penetration 15+ (%)	Total	BMI	NMI	Unconnected	
Developed World	100%	64%	[illegible]	27%	
Developing World	100%	23%	18%	59%	77%
Total	100%	30%	17%	53%	

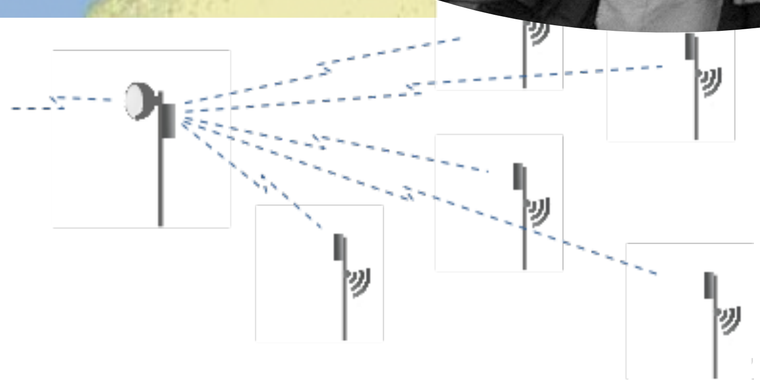
Source: GSMA Intelligence; figures reflect position at end of 2014
BMI = Broadband Mobile Internet (3G/4G); NMI = Narrowband Mobile Internet (<3G)

[Source: GSMA, Nov2015]

Background

- Internet provision to various parts of DRC
  - ➡ operations since 2011
- Connection to a.o. University of Lisala
- Experiences from Internet provision
  - ➡ Expensive access
  - ➡ Requirement for self-sustainable infrastructure





Motivation

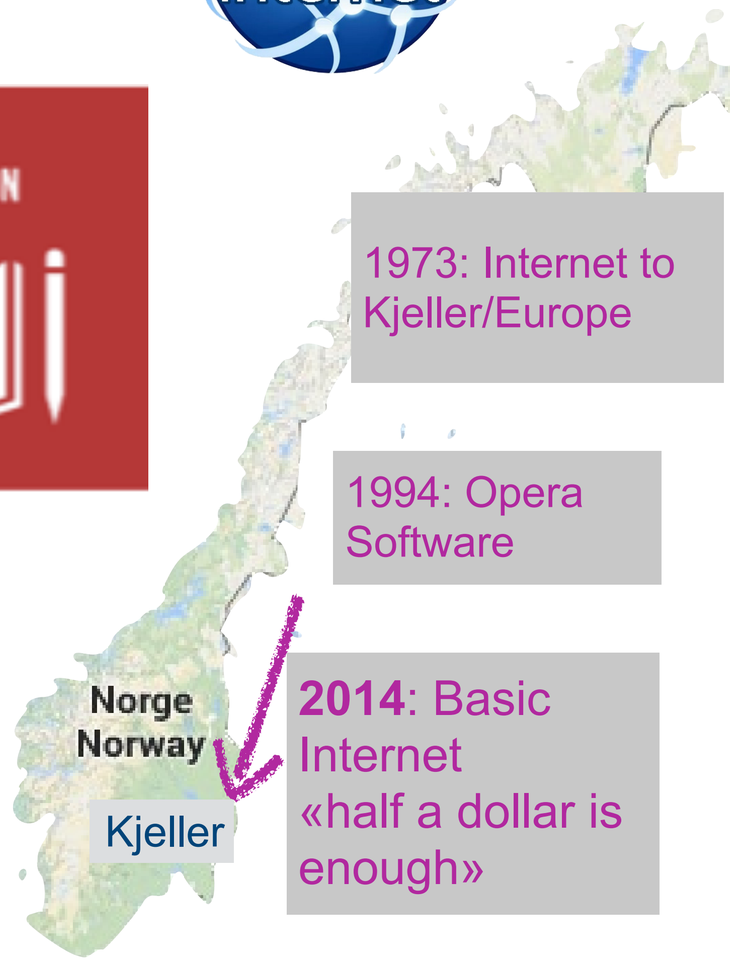
Motivation: "Need to close the digital gap"

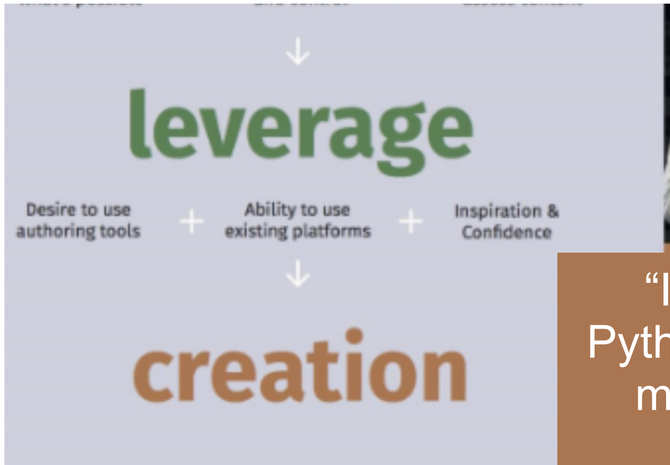
- The Global Goals:
  Norway is the secretariat for Quali
- Internet history
  - 1973 Europe through Kjeller
  - 1994 Opera Software
  - 2014 Basic Internet Foundation

THE GLOBAL GOALS
For Sustainable Development

4 QUALITY EDUCATION

Basic Internet





"Internet is my teacher"

"I'm currently learning Python and HTML, so I can make a website for my parents' business"

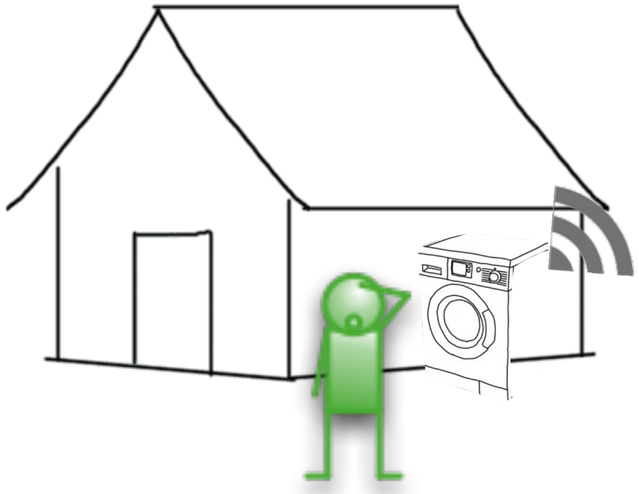
Focus Areas for Privacy

BasicInternet.no

- free access to basic information
  - text & pictures
- Net Neutrality
- Digital Inclusion

IoTSec.no

- Internet of Things (IoT)
- Security Centre for Smart Grid



GravidPluss.no

- Diabetes in pregnancy
- Bluetooth measures
- privacy.gravidpluss.no

Gravid
BEDRE HELSE FOR MOR OG BARN

Carrier 11:51 AM

BEDRE HELSE FOR MOR OG BARN

Blodsukker

Mat & Drikke

Fysisk aktivitet

Diabetes

Hjem | Profil | Notater | Info

LANGUAGE:

Vennligst velg ditt språk
اپنی زبان منتخب کریں
Fadlan dooro luqaddaada

Gravid
BEDRE HELSE FOR MOR OG BARN

Min matkultur

Jeg ønsker å få informasjon basert på et:

Norsk kosthold

Pakistansk kosthold

Somalisk kosthold

Min vekt | Mine mål | Mitt aktivitesn...

MIN PROFIL

- Mitt sykehus og fødeplass
- Min matkultur
- Min vekt og høyde
- Mine mål
- Mitt aktivitesnivå
- Språk

BLODSUKKER

- Registrer blodsukker
- Ditt blodsukker over tid
- Min erfaring med mat og blodsukker
- Om svangerskapsdiabetes
- Skriv ut blodsukkerverdiene

Conclusions

- Internet of Things (IoT) is a game changer
  - ➡ Unfair advantage in the Nordics
  - ➡ Converting Trust into IoT
- Collaborative approach for a (more) secure society
  - ➡ partnership for secure and privacy-aware applications
  - ➡ heterogeneous infrastructure integration
- Vision 2026
  - ➡ networks adapting to service needs
  - ➡ free and open “low-capacity Internet”
  - ➡ “peage” for speed and service quality