

UiO : Universitetet i Oslo

Master Studies at ITS@UiO, focus:

- Wireless Networks and Security**
- Sustainable Infrastructures**

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<http://ITS-wiki.no>



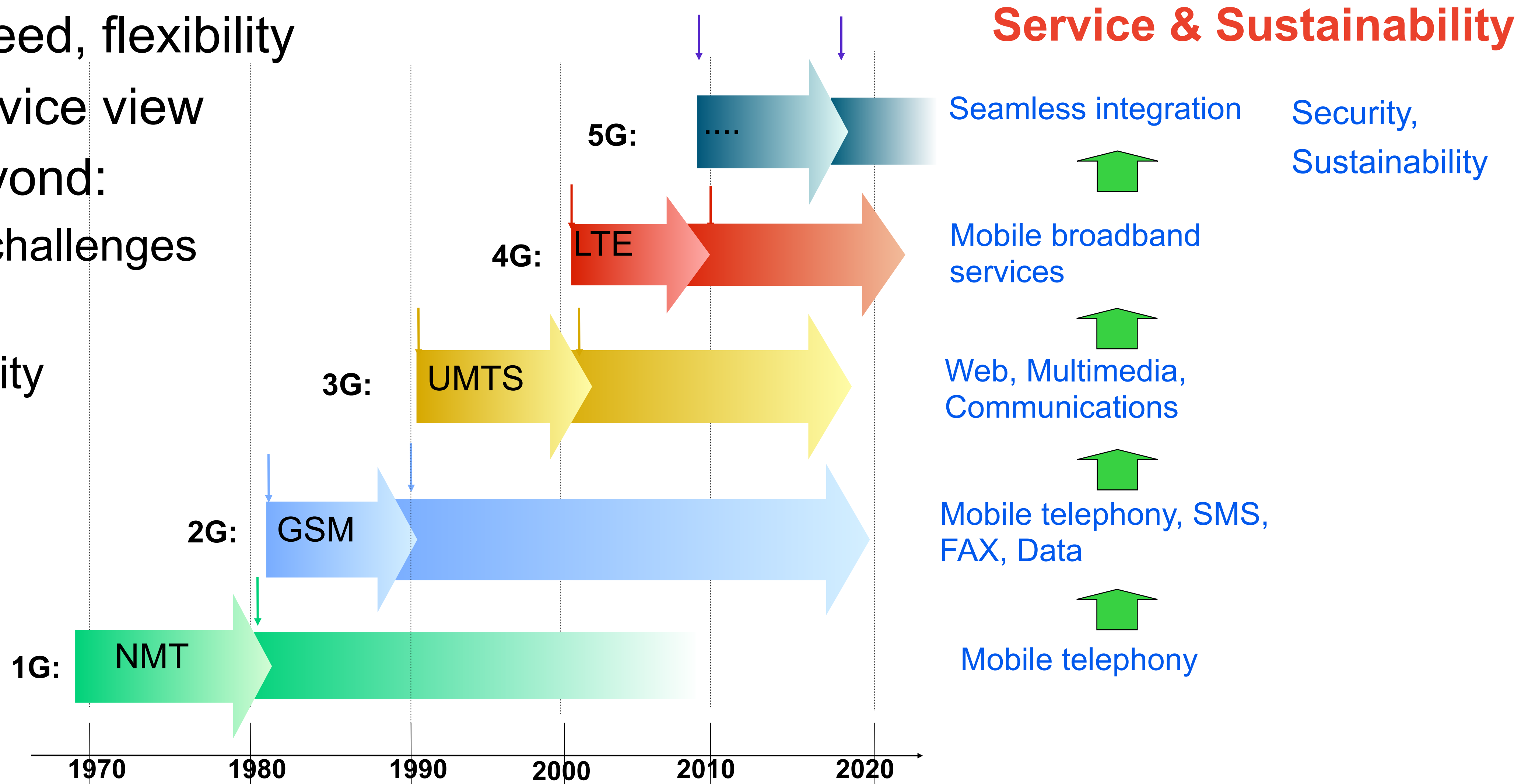
“Our Journey of Today”

- “The last time we were connected by wire was at birth!” [Motorola]
 - Three main Areas
 - ➔ Security and Privacy in IoT
 - ➔ Change of Business Models
 - ➔ Sustainability and Digital Inclusion
 - Social responsibility: access for everyone
- Basic Internet Foundation



5G: Speed, Bandwidth, latency and **much more**

- 1G-3G: Speed, flexibility
- 3G-4G: service view
- 5G and beyond:
 - ➔ Business challenges
 - ➔ ownership
 - ➔ sustainability



[adapted from Per Hjalmar Lehne, Telenor, 2000]

Area 1:

Security and Privacy in IoT

- Car industry: Liability in IoT driven business models
- Energy: Cost of providing of Energy -> Cost of Reliable Network
- Telecom:

The change of Business Models



Background: Mobility

Challenging Research

- 5G = Heterogeneous Networks
- Small Cells
- Indoor communication
- Virtual Networks
- Internet of Things
- Privacy



- Mobilnettet vil svikte igjen

Endelig har Telenor funnet ut hva som gikk galt da nettet brøt sammen, men professor og mobilekspert Josef Noll tror ikke vi har sett slutten på Telenors problemer.

Addressing the Threat Dimension for IoT

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

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

So lässt sich das UMTS-Netz knacken




[source: Süddeutsche Zeitung,
18Dec2014]

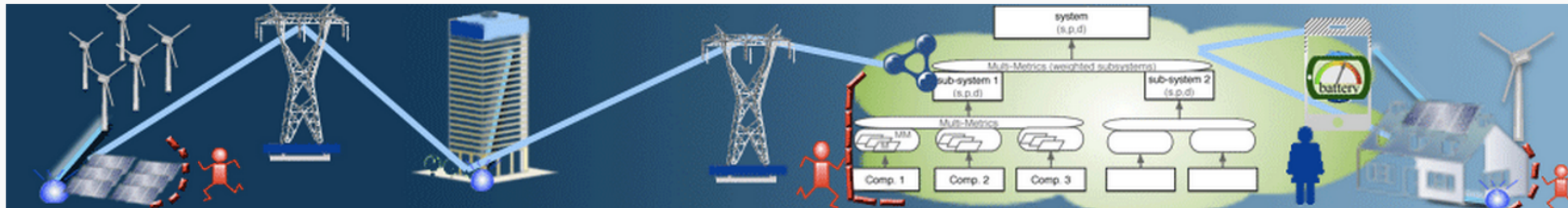
[source: www.rediff.com]

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

Building the Norwegian Smart Grid Security Centre

IoTSec.no

[Home](#)
[Research Areas](#)
[Security Centre](#)
[Publications](#)
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The **IoTSec - Security in IoT for Smart Grids** initiative was established in 2015 to promote the development of a safe and secure Internet-of-Things (IoT)-enabled smart power grid infrastructure. The [Research Project](#) received funding from the [Research Council of Norway](#) (RCN) to contribute to a safe information society.

IoTSec addresses the basic needs for a reliable and efficient, uninterrupted power network with dynamic configuration and security properties. It addresses in addition the needs of businesses and end users of additional IoT services by exploring use cases for value-added services with the intent to design the building blocks for future services that consider the necessary security and privacy preconditions of successfully deployed large-scale services. IoTSec will apply the research in the envisaged Security Centre for Smart Grids, co-located with the Norwegian Centre of Excellence (NCE Smart).

About

The IoTSec initiatives drives Research for secure IoT and Smart Grids

#iotsecno



Josef Noll
@josefnoll

NCE Smart Partnerkonferansen
@KristinHalvorsen og Nasjonal sikkerhetsråd for
Sikkerhet i SmartGrid #IoT
pic.twitter.com/FLLua94



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

Economics in IoT



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

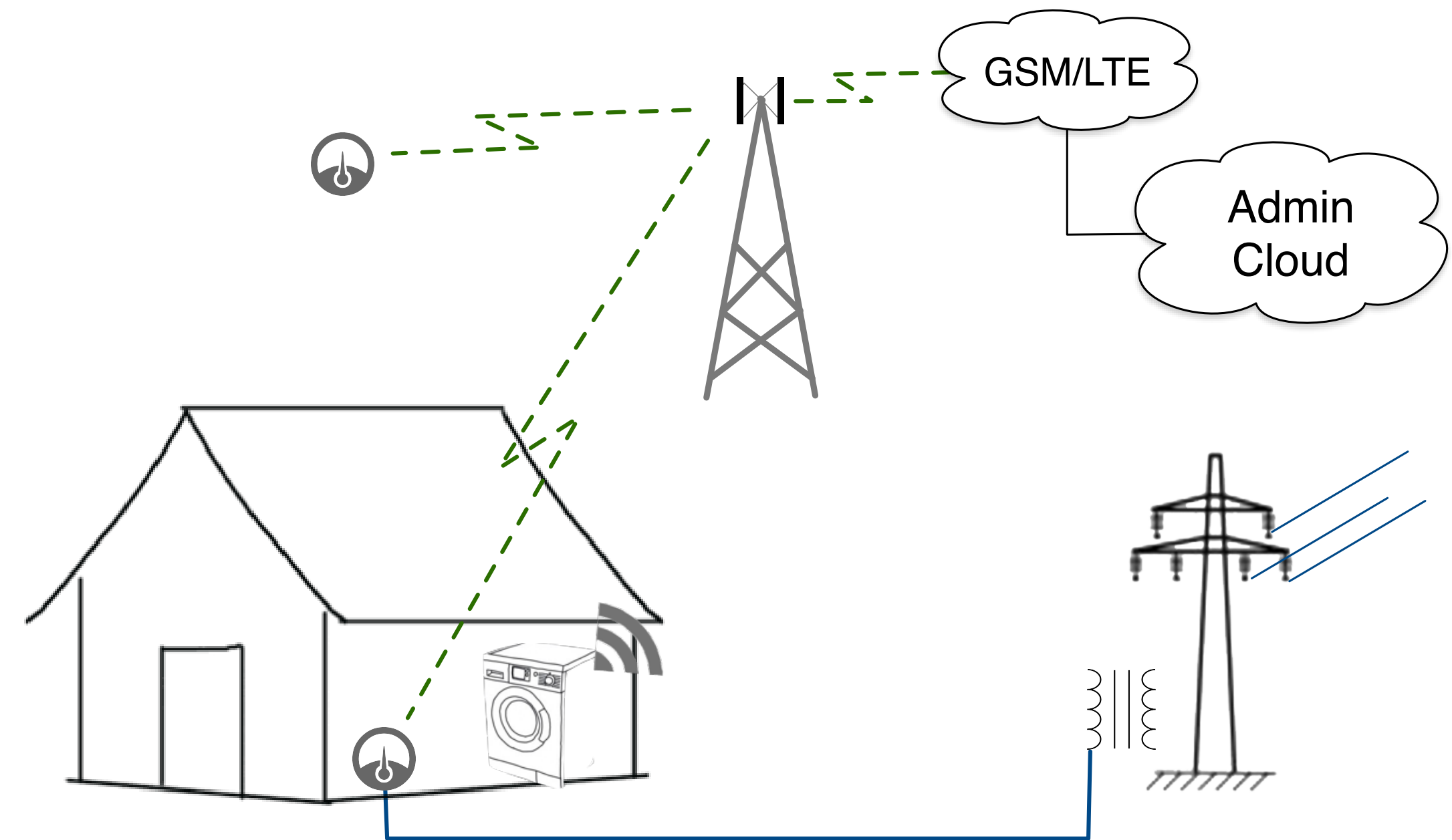
Industry

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

International

Application Scenarios for Smart Meters

- Monitoring the grid to achieve a **grid stability** of at least 99,96%,
- **Alarm functionality**, addressing
 - ➔ failure of components in the grid,
 - ➔ alarms related to the Smart Home, e.g. burglary, fire, or water leakage,
- **Intrusion detection**, monitoring both hacking attempts to the home as well as the control center and any entity in between,
- **Billing functionality**, providing at least the total consumption every hour, or even providing information such as max usage,
- **Remote home control**, interacting with e.g. the heating system
- **Fault tolerance and failure recovery**, providing a quick recovery from a failure.
- **Future services**
 - Monitoring of activity at home, e.g. “virtual fall sensor”



Area 2:

The change of Business Models

- **Car industry: Liability in IoT driven business models**
- **Energy: Cost of providing of Energy -> Cost of Reliable Network**
- **Telecom: uO (MicroOperator), Partnership**



But decide on rules so we can make the dang vehicles



<http://www.scmagazine.com/iot-security-forcing-business-model-changes-panel-says/article/448668/>

SC Magazine > News > IoT security forcing business model changes, panel says

Teri Robinson, Associate Editor

Follow @TeriRnNY

October 22, 2015

IoT security forcing business model changes, panel says

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To secure the **Internet of Things** and to build trust with customers, the way that vendors approach manufacturing, distributing and supporting devices and solutions must change, a panel of security pros said Monday at the National Cyber Security Alliance's (NCSA's) Cybersecurity Summit held at Nasdaq.

"Business models will have to change. We used to build them [products], ship them and forget about them until we had to service them," said John Ellis, founder and managing director of Ellis & Associates. "We've moved to a new world where we have to ship and remember."



OUT-LAW.COM



68



22



78

ability" for collisions involving its autonomous vehicles, the company has

The “sharing economy” for energy companies?



Ved å bygge internett for alle, og ved å skape relevante og uunnværlige digitale tjenester, kan vi bidra til en bedre verden, skriver Sigve Brekke.

FOTO: Heiko Junge, NTB scanpix

IKT er den nye oljen! | Sigve Brekke

[Source: aftenposten.no]

**Sharing Economy:
“Telenor will create a
digital ecosystem in
Pakistan”**



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Prosumer bidding and scheduling in electricity markets

🕒 12. January 2016

📁 Ukategorisert

👤 Administrator

[Source: eSmartSystems.com]



Area 3:

Sustainability and the Agenda 2030

- 17 main goals
- 169 associated targets
- “Free access to Information” (InfoInternet)



Google translate Partnership for Digital Africa

<http://www.aftenposten.no/meninger/debatt/Kronikk-Som-gjesteland-pa-G20-toppmotet-ma-vi-bidra-til-a-endre-verden--Erna-Solberg-614076b.html>



Comment: As a guest country at the G20 summit, we must help to change the world | Erna Solberg

ERNA SOLBERG (H), PRIME MINISTER

UPDATED: 30.JAN.2017 9:39 P.M. | PUBLISHED: 30.JAN.2017 7:58 P.M.



In July last year was Erna Solberg invited by Angela Merkel for this year's G20 meeting. Here from a meeting between the German Chancellor and the Norwegian Prime Minister in Berlin in November, where Norway's participation as guest country at the economic summit were among issues discussed.

1. UN sustainability goals and Agenda 2030:

Germany has chosen this agenda as a backdrop for their entire program for the presidency, and I lead a group at the United Nations that will drive towards implementation.

We will work to ensure that the G20 goes ahead with its own specific commitments to help achieve sustainability goals.

2. Migration and partnership with Africa:

The world is experiencing the greatest influx of refugees since World War II. Europe, and especially Germany, have seen the consequences of that.

It is necessary to improve the situation where people break up close. Germany will use its chairmanship to do something about the problems which people belong. There is no minimum job creation and private investment. There are agreements with African countries wishing to achieve it.

G20 can therefore help the countries and international organizations use their resources more on measures which create growth and job creation.

3. Health and education.

Norway has long had a heavy international involvement. Education and health are associated with economic growth.

Sustainability Goals (SDGs) and Agenda 2030



Goal: Include people with 1 USD/month for communications

Free local info
– health
– education

1. UN sustainability goals and Agenda 2030:

Germany has chosen this agenda as a backdrop for their entire program for the presidency, and I lead a group at the United Nations that will drive towards implementation.

We will work to ensure that the G20 goes ahead with its own specific commitments to help achieve sustainability goals.

Our contribution:

- Information for all (**InfoInternet**)
 - **free access** to text and pictures
 - the “**walk** on the Internet”
 - paid access to amusement
 - “Toll Roads”
- The **catalyst** for the SDGs



Non-discriminating access for Digital Inclusion

Pilot in Rural Areas for Information for All

Tanzania

- health as basis for development
- reach women and girls
- towards global digital health



Congo (DRC)

- Internet + GSM network
- enabler for digital society
- digital services, light, radio

Partnership for Information for All



Come and visit our
Digital Health Spot
at
Kjeller



UiO :



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
Developed World	0.9
Developing World	4.3
Total	5.2

Penetration 15+ (%)	Total
Developed World	100%
Developing World	100%
Total	100%

BMI	NMI	Unconnected	
0.6	0.1	0.3	
1.0	0.8	2.5	3.3
1.6	0.9	2.8	

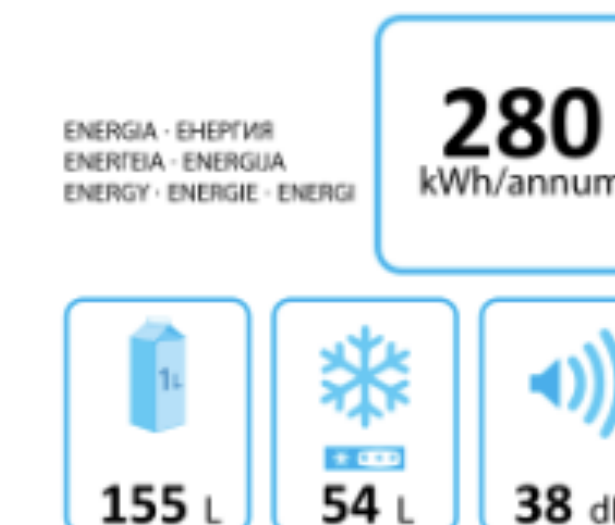
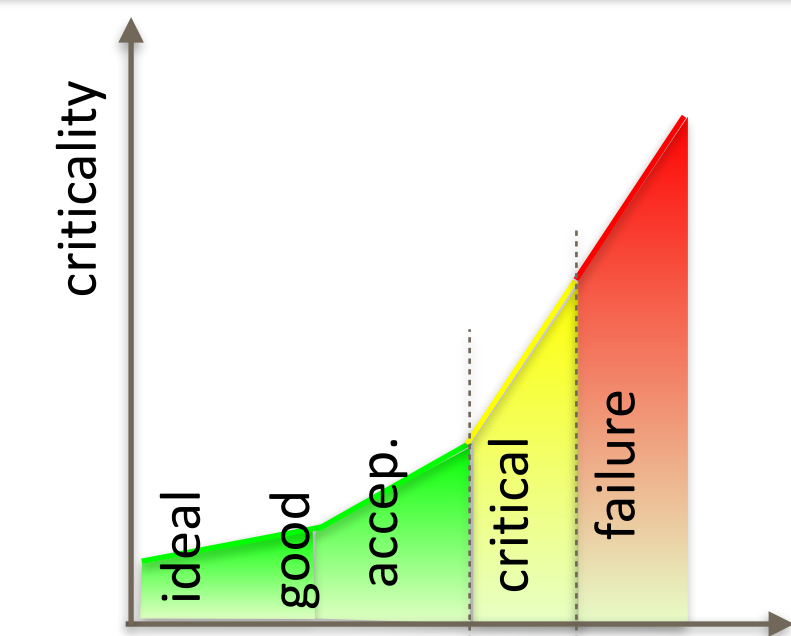
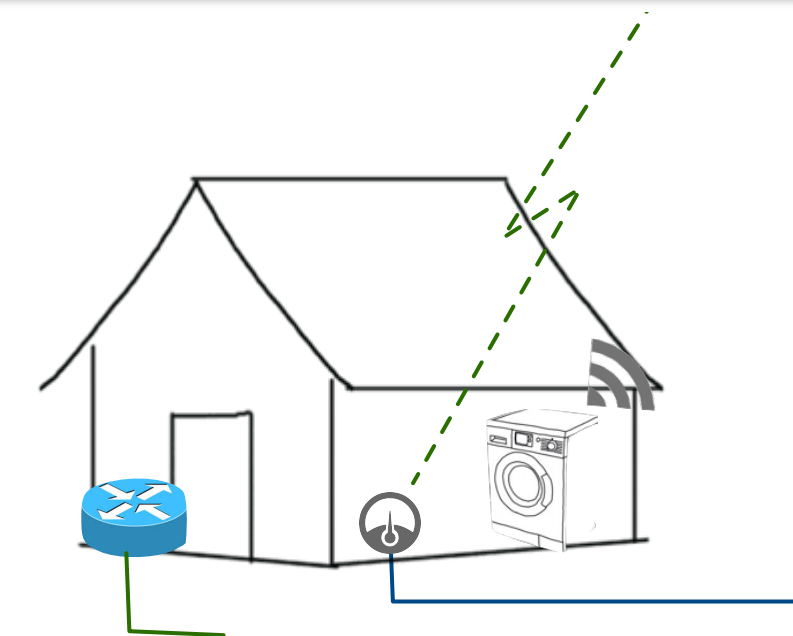
BMI	NMI	Unconnected	
64%	8%	27%	
23%	18%	59%	77%
30%	17%	53%	

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

[Source: GSMA, Nov2015]

Conclusions

- Things (IoT) are driving the digital societies
- Three main areas for a Master Thesis
 - **Security** and **Privacy** in IoT
 - [IoTSec.no](#), Privacy Label
 - Change in **Business models**
 - Liability, Quality of supply,
 - **Digitisation** of the **Society**
 - 4 Billion without Internet
- Sustainability and Digital Inclusion
 - UNO Sustainable Development Goals (**SDG 2030**)
 - Free access to basic information: **InfoInternet**
 - **Partnership**: IT-industry, Banks, Public, Telecom



SPD level	SPD vs SPD _{Goal}
(67,61,47)	(●, ●, ●)
(67,61,47)	(●, ●, ●)
(31,33,63)	(●, ●, ●)



Digital Health Spot for 300 €

Creating digital access for the unconnected



Digital inclusion
The catalyst for sustainable development



Digital society



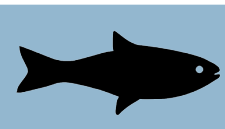
Agricultural and rural development



Education



Health



Food, water and shelter

300 € digital health hotspot
60.000 € connecting a village in TZ
250.000.000 € connecting all villages in TZ
89.000.000.000 € EU border control per year



80 € Solar panel



50 € Hotspot



50 € Tablet



20 € Battery



30 € Regulator



20 € USB-charger



15 € LED light



20 € Materials

Come and visit our
Digital Health Spot
at
Kjeller

Background Slides



Why free access to information? Connect the Unconnected (CTU)

Goal: Include people with 1 USD/month for communications

- Reality in Tanzania (as an example for Africa)
 - ➔ 49 Million people, 69% living in villages
 - ➔ over 4.000 villages are unconnected, accounting for 13 M People
 - ➔ 35% of people without access to mobile data
- Information for all is sustainable (InfoInternet)
 - ➔ free access to text and pictures
 - ➔ requires 2-2,5% of bandwidth, 97.5% available for commercial use
 - ➔ 10 min with video - or - 10 month with information
 - ➔ >300 people with free access - equals - 1 commercial user
 - ➔ Uptake of commercial use ("Free Basics")
 - 40% of Free Basics Users convert to paid subscription within a month
 - Break-even in 3 months



5G - demand: “Connect the Unconnected”



Partnership for digital inclusion	
Telecom	InfoInternet
revenue-driven	non-profit
targeting leveraged creation	targeting no- and limited use
voice & mobile broadband	compressed text & pictures
subscription based (SIM)	free access & voucher
mobile network: coverage & capacity	Wifi-spots: health-/community centres, schools
operator cost model	target: 0.5 US\$/month
operator roll-out	NGO & community roll-out

[Source: GSMA, Nov2015]



2. Migration and Partnership with Africa

- Example: Digital Tanzania
 - ➔ Unconnected: 13 Million people in 4.000 villa
 - ➔ Combined effort of
 - ➔ IT industry,
 - ➔ World Bank,
 - ➔ Telecom and
 - ➔ Industry

GSM + Wifi
 - 200W
 - MicroBTS



Cost: 70 kUS\$/village

2. Migration and partnership with Africa:

The world is experiencing the greatest influx of refugees since World War II. Europe, and especially Germany, have seen the consequences of that.

It is necessary to improve the situation where people break up close. Germany will use its chairmanship to do something about the problems which people belong. There is no minimum job creation and private investment. There are agreements with African countries wishing to achieve it.

G20 can therefore help the countries and international organizations use their resources more on measures which create growth and job creation.

- Funding requirements
 - ➔ 0.25 B€ for Digital Tanzania
 - ➔ 2.5 B€, DE for hosting refugees (2016)
 - ➔ 5.4 B€ asked by Banca Monte dei Paschi di Siena SpA to be saved
 - ➔ 55.2 B€ operational Costs for EU Frontex border control (total 89 B€)

1 USD/month for Telecom

Work in DRC

- Addressing Internet as enabler for
 - ➔ existing mobile (GSM only) network
 - ➔ existing entry through ongoing collaboration
- Potential services:
 - ➔ voucher-sales for digital services,
 - ➔ electrical lights,
 - ➔ programs and mentoring for education and health
- Sustainability
 - ➔ operated by commercial actor
 - ➔ service continuity (free InfoInternet)
 - ➔ only 2-2,5% of bandwidth needed

