UiO : Department of Technology Systems
University of Oslo

NEK & Standard Norge, Frokostseminar IoT, 2Feb2018, Oslo

Hvilke muligheter kan skapes i norsk og global sammenheng med basis i IoT?

Josef Noll

Department of Technology Systems, University of Oslo

m: +47 9083 8066, e: josef.noll@its.uio.no

IoTSec.no - SCOTT.IoTSec.no

“The last time I was connected by wire was at birth” - our when Internet of Things (IoT) meets people

- Internet has changed, IoT will accelerate
  - the ecosystem of making business
  - automated processes
- The Nordic Model - Opportunities

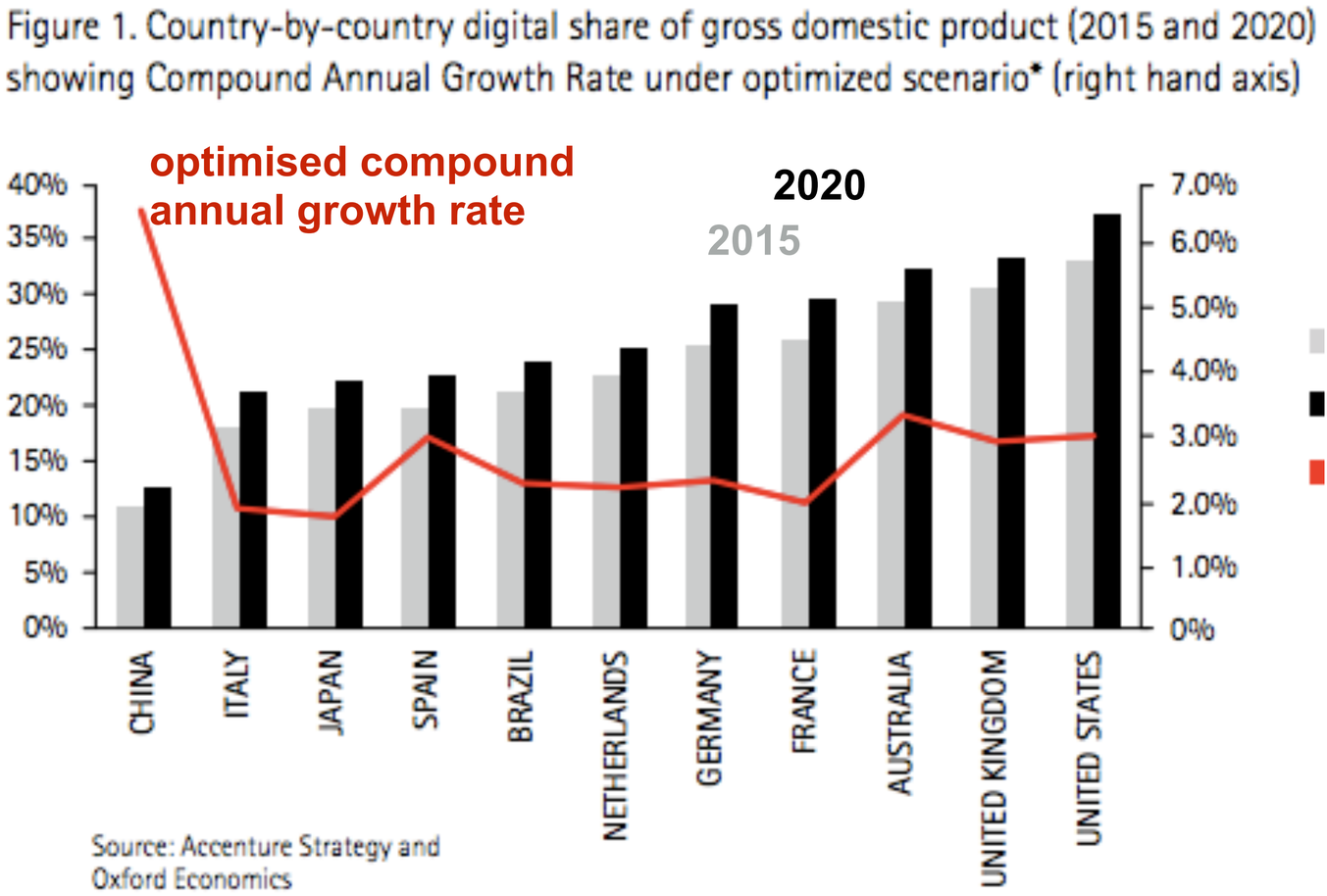
- Security in IoT
  - “teach our sensors to talk Norwegian”
  - The changing role of security in HMS -> HMSS
  - new paradigm: measurable security
  - security classes “design”
- related to projects:
  - Security in IoT for Smart Grids: IoTSec.no
  - Secure Trusted IoT: SCOTT.IoTSec.no,

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

Digital share of GDP (2015 - 2020)

- Accenture Strategy & Oxford Economics, 2016
- Today: USA, 33% og GDP due to digital
- Financial Services 57% digital
  Business Services 54%
  Communications 47%
- 22% of global retail from digital,
  28% in health,
  20% in consumer goods
- digital achievements: *technology, skills, accelerators*



[Source:Accenture, “Digital Disruption Growth” 2016]

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

Share this article:

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."

Volvo to 'accept full liability' for crashes with its driverless cars

But decide on rules so we can make the dang vehicles

)UT-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”

Home About Visit esmartsystems.com

Prosumer bidding and scheduling in electricity markets

12. January 2016 Ukategorisert Administrator

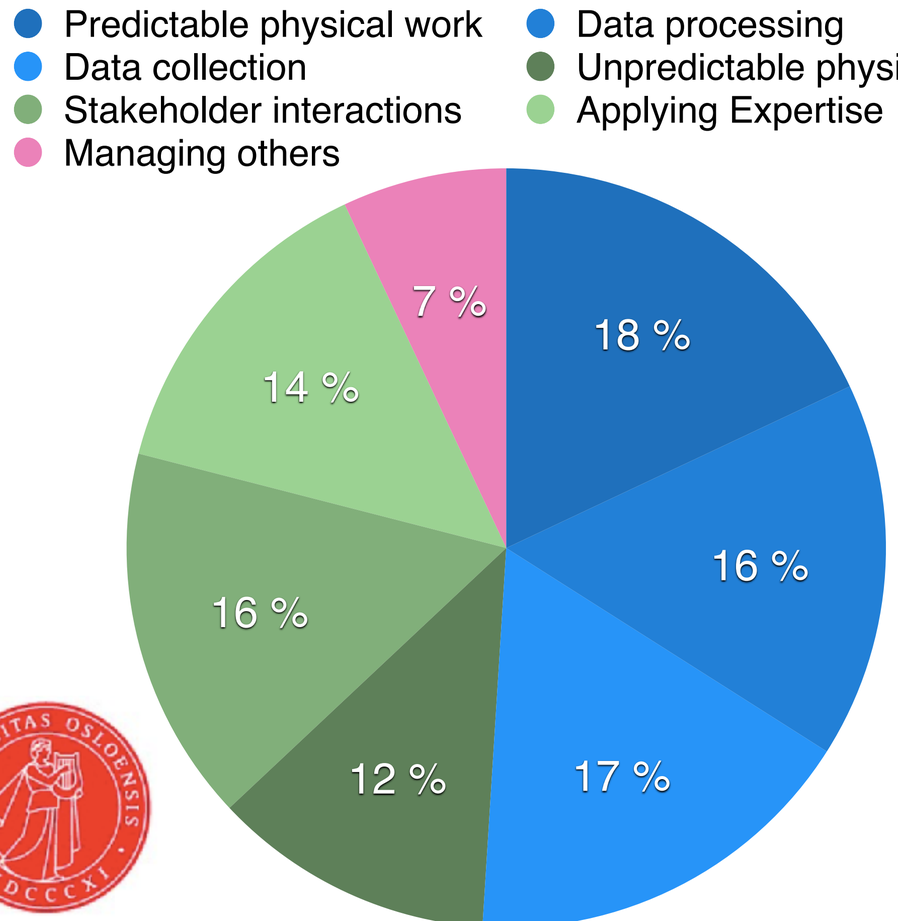
[Source: eSmartSystems.com]

Automated processes

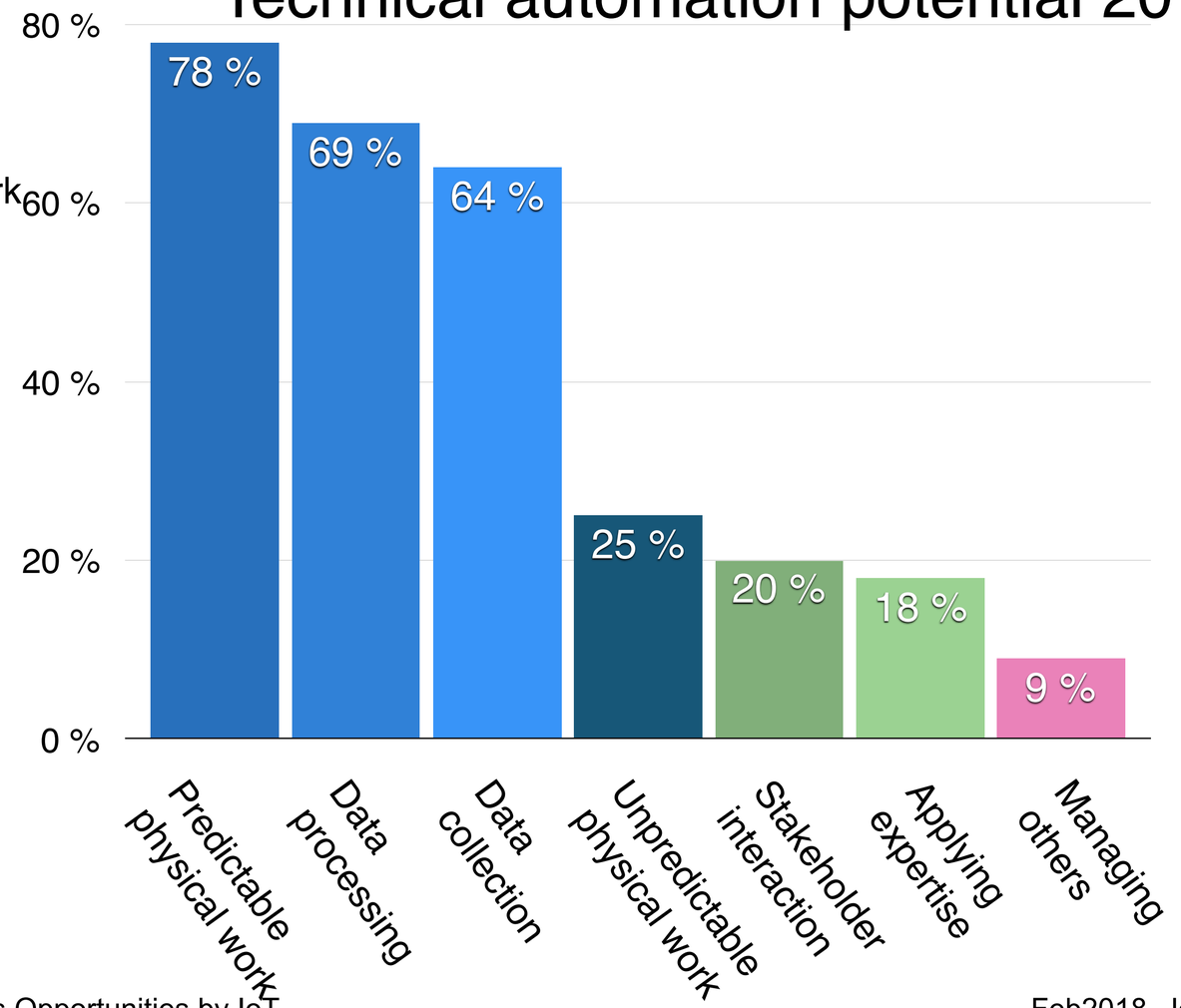
- Work force demand
- Blockchain, IOTA
- The state business model

The challenge from automation

USA work force time spent [%]



Technical automation potential 2016 [%]

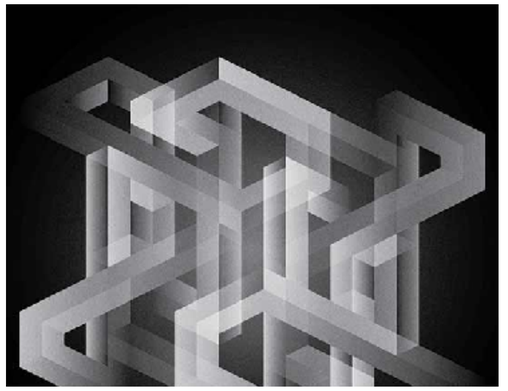


Source: EU commission(2015)

Blockchain, IOTA, and automated money

- ☑ Increased security in micro-data handling
- ☑ Trust enabler for IoT data

- ☐ No trustworthy organisation backing crypto currencies
- ☐ US$ covered by U.S. Department of Justice, U.S. Treasury, the Federal Reserve
  - ➡ centralized digital currencies



Price Manipulation in the Bitcoin Ecosystem

Neil Gandal [a] ✉, JT Hamrick [b] ✉, Tyler Moore [b] ✉, Tali Oberman [a] ✉

The Blockchain Will Do to the Financial System What the Internet Did to Media

Summary of discussion [Kåkå festival 2017]

- Skattesystem:
  - ➡ data kontrolle forsvinner -> penger forsvinner
  - ➡ digital kompetanse: “Internet light for all”?
  - ➡ styreforhold: industri vs politikk
- framtidens fordeling av inntekter
  - ➡ god lønn til toppene, luselønn til arbeidere
- tidligere: 50% av jobber for ufaglærte, nå bare 10% av jobber
  - ➡ re-industrialisere Norge
  - ➡ god utdannelse viktig
- “5 største teknologiselskaper hadde 950 milliard USD økning i verdi i 2016/2017 (siste 10 mnd), mer enn BNP av NO, DK, FI sammen

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]

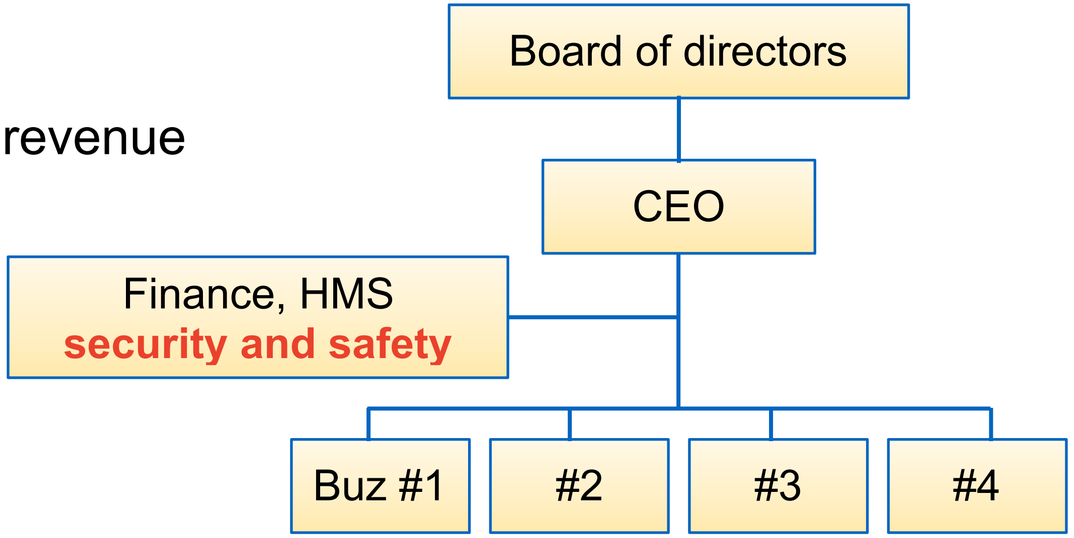
Zwei Hacker zeigen, wie sich UMTS-Antennen lassen sich knacken (Foto: dpa)

Health, Security and Environment
Helse, Miljø og Sikkerhet

? *safety*

- Security affects safety
  - ➡ IoT attack -> car crashes
- Security affects core business
  - ➡ company confidential information
  - ➡ Customer information
    - Privacy regulative (GDPR May2018): 4% of revenue

➡IoT is corporate governance



SCOTT key message
"elevator pitch"

largest security project in EU

57 partners from 12 countries

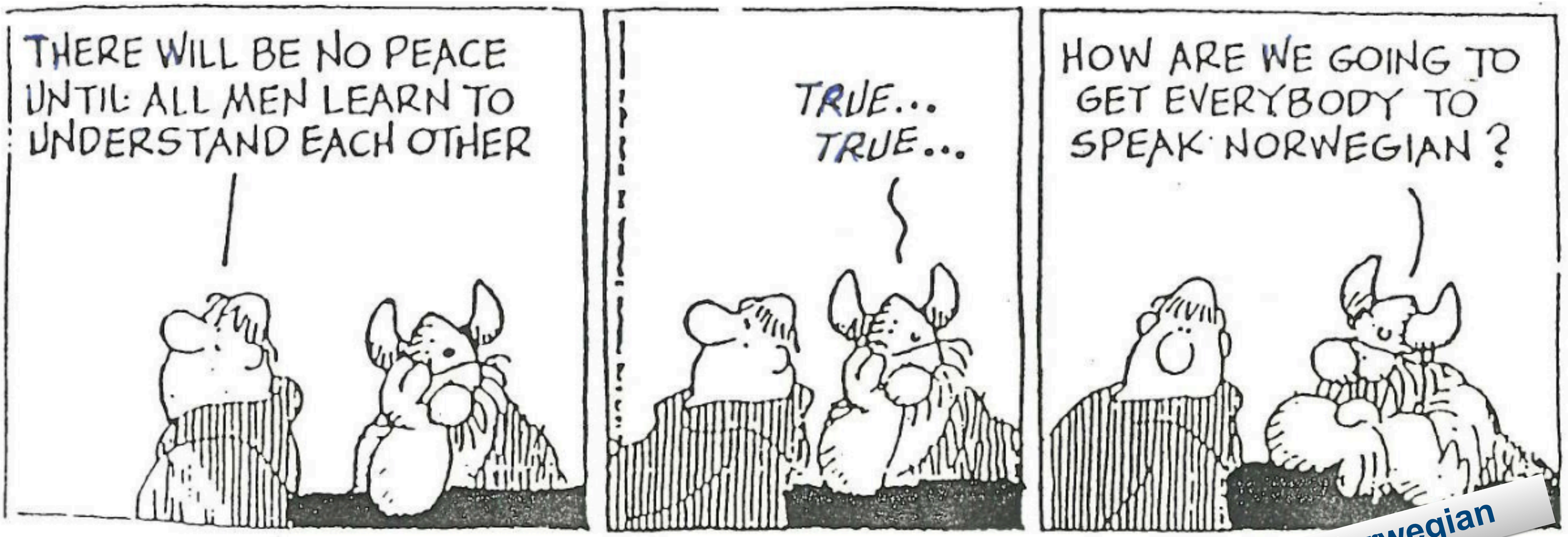
80 M€ budget
35 M€ EU&national

8 partners from Norway

IoT is the game changer and driver for digitalisation, and SCOTT contributes through:

- **Answer the IoT need for a new and more advanced security paradigm through security classes**
- **Create a Convincing privacy assessment through privacy labelling**
- **Establish a clear link between security and safety**

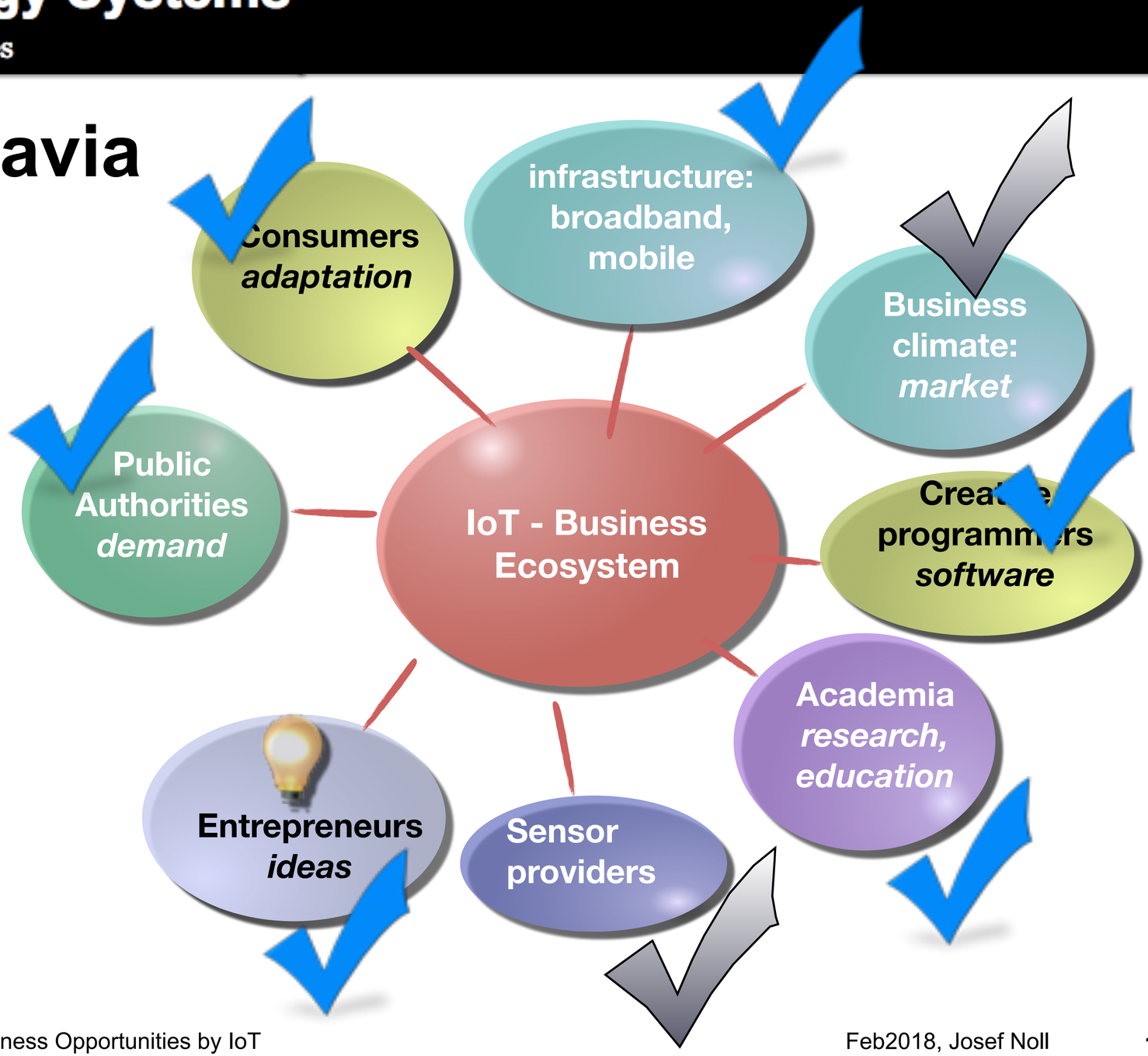
Automotive
Home
Rail
5G
Avionics



teach our sensors to talk Norwegian

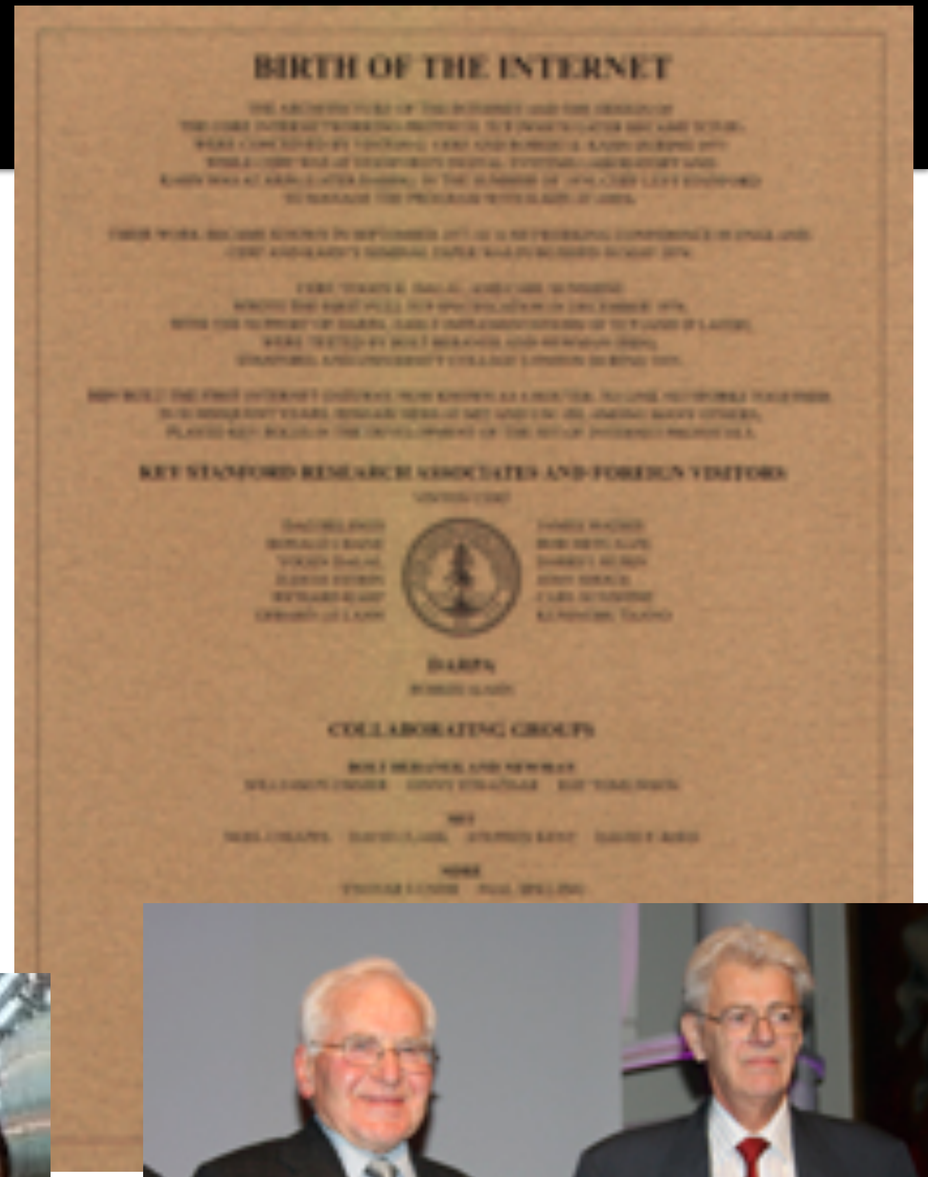
IoT impact for Scandinavia

- Demand
  - mobile
  - distances
- Adaptation
  - infrastructure
  - business environment
  - Trust relation
- Challenges
  - sensor industry
  - distance to Brussels
  - economy of scale



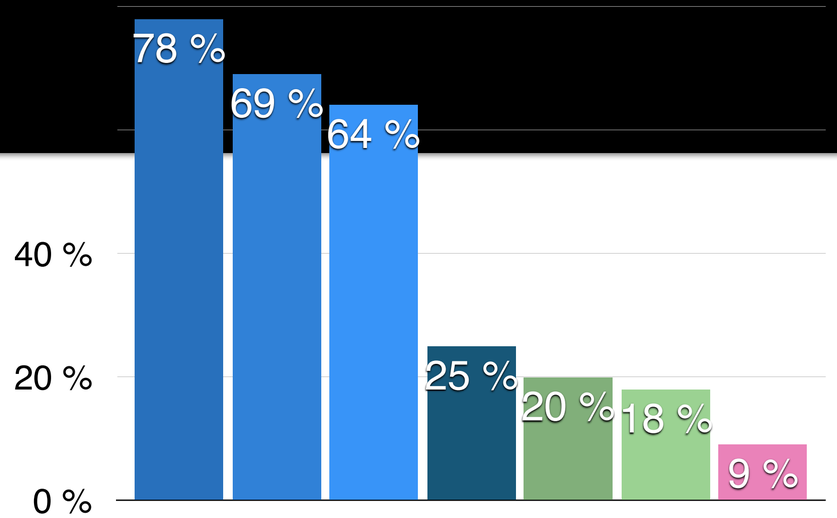
The Internet and Scandinavia

- 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



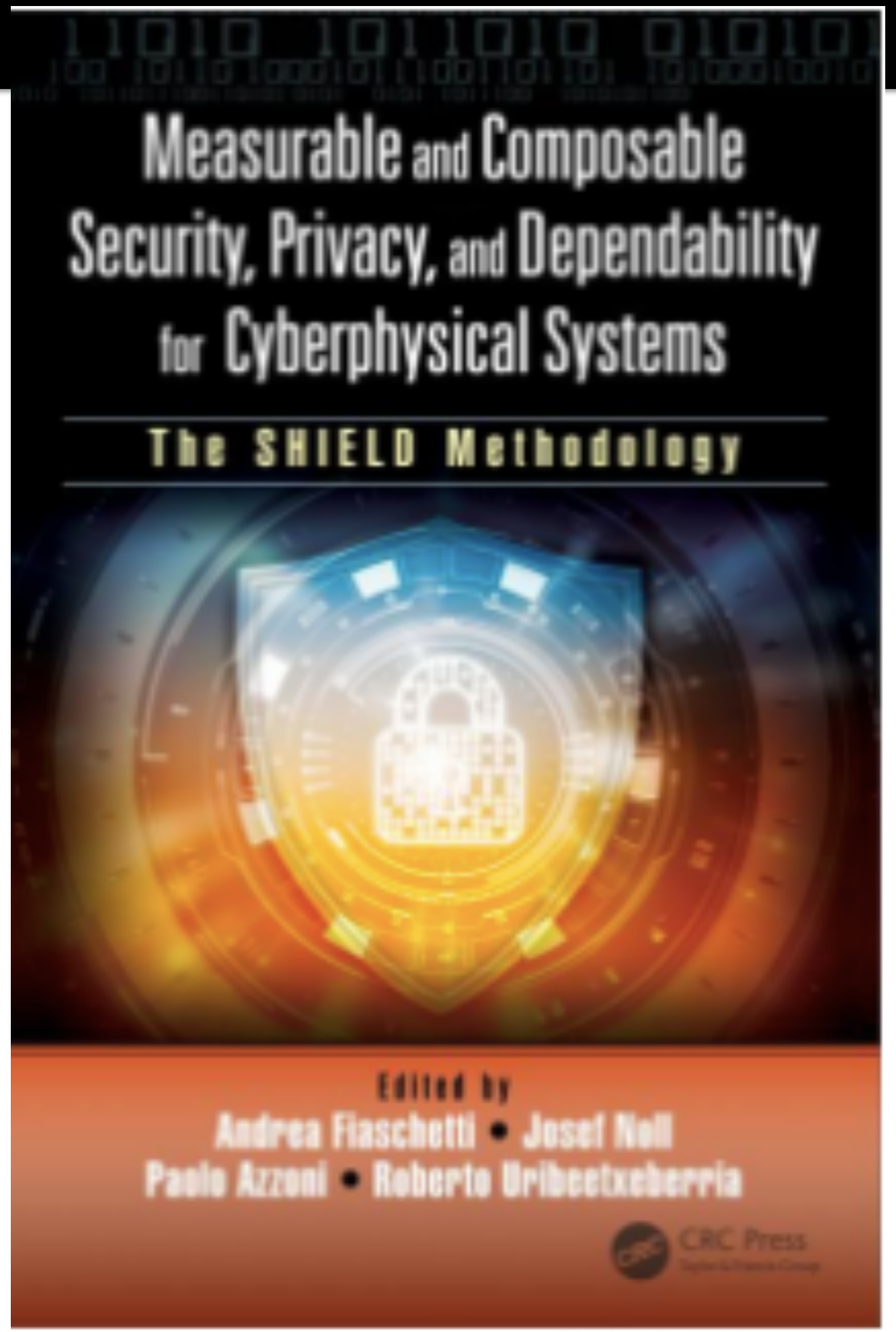
Conclusions

- Things (IoT) are driving the digital societies
- IoT: Business merger
  - ➡ Internet + Semantics + Things = IoT
  - ➡ Digitisation of the Society
- IoT ecosystem
  - ➡ Promote the Nordic system
  - ➡ Security classes, accountable security
- competitive advantage e.g.:
  - ➡ Privacy label (A++, A+…D)
  - ➡ business advantage for SMEs



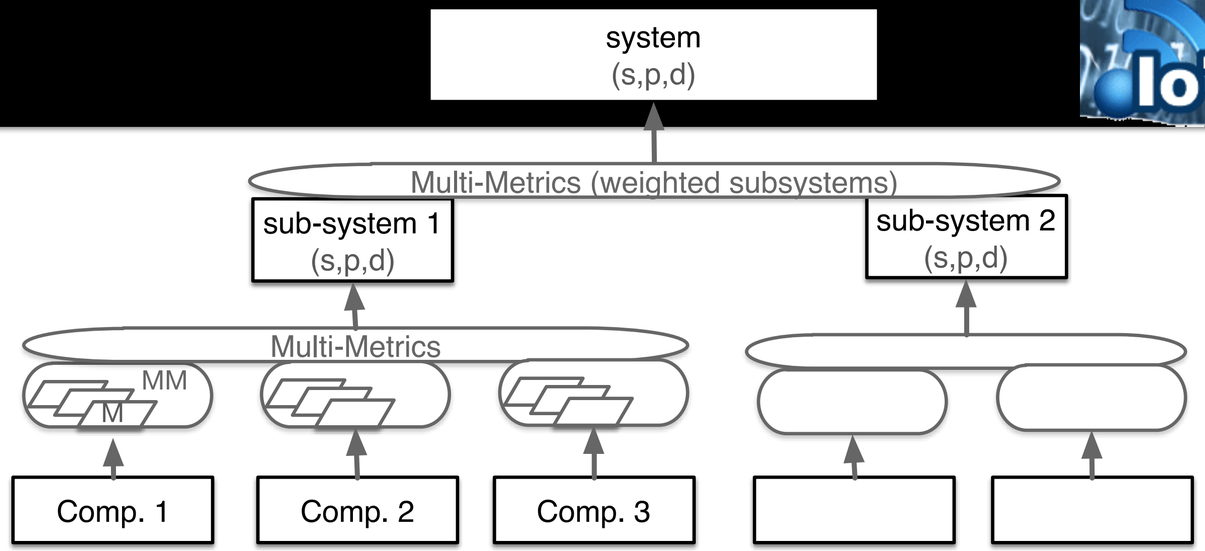
5	Class 5	Class 5	Class 5	Class 5
4	Class 4	Class 4	Class 4	Class 5
3	Class 3	Class 4	Class 4	Class 4
2	Class 1	Class 3	Class 3	Class 3
1	Class 1	Class 1	Class 2	Class 2
Impact/Exposure	1	2	3	4+

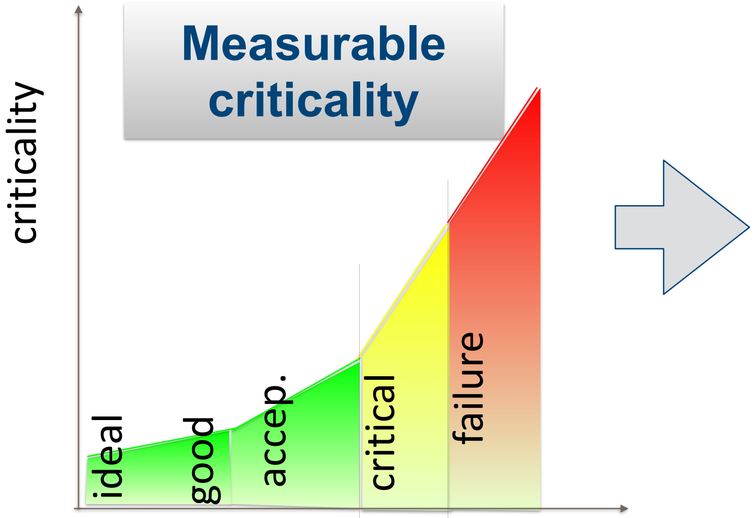
Further information



Accountable security

- Assessment
  - ➡ Comparison desired Class vs Calculated class
  - ➡ PROSA modelling
- Modelling
  - ➡ SPD Metrics, from criticality to SPD value
- Framework
  - ➡ Examples of applicability
- Measurable Security
  - ➡ Security is not 0/1



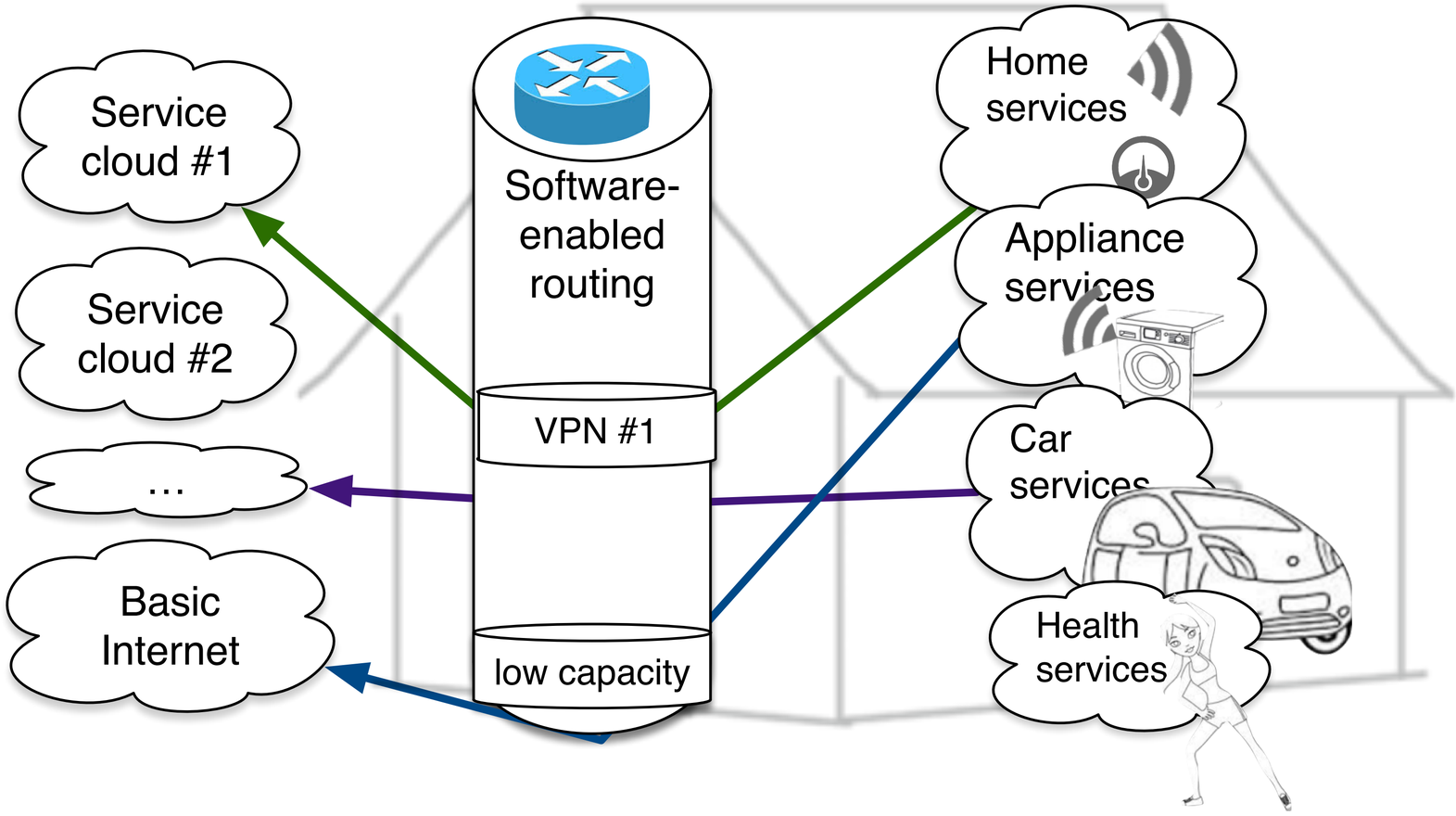


to measurable: security, privacy and dependability

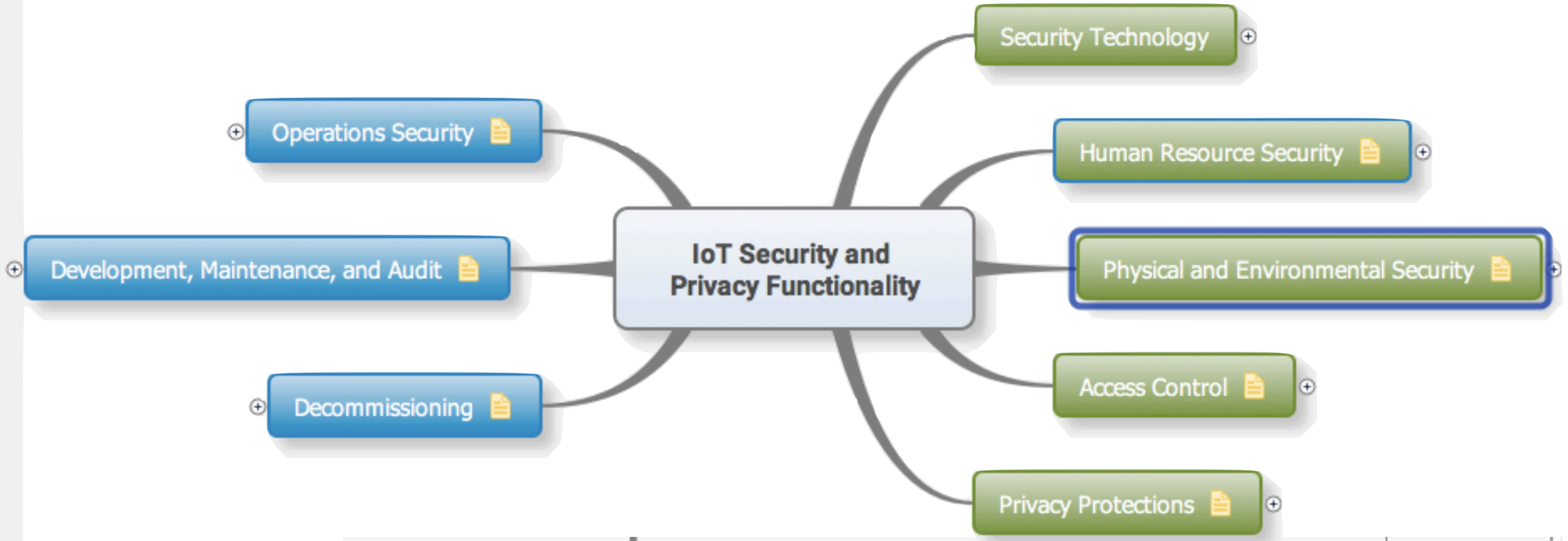
SPD level	SPD vs SPD_{Goal}
(67,61,47)	(●,●,●)
(67,61,47)	(●,●,●)
(31,33,63)	(●,●,●)

Learn from Industrial Automation and Mobile Networks

- "What to secure?"
- Network segregation
  - ➡ *Network slicing*
- From Confidentiality, Integrity, Availability (CIA)
- to Availability, Integrity, Confidentiality (AIC)



Security and Privacy Functionality



References:
https://www.owasp.org/index.php/IoT_Security_Guidance

Industrial Internet of Things Volume G4: Security Framework, 2016

Future-proofing the Connected World - Cloud Security Alliance, 2016

The trust matrix

- trust as a positive user attitude
  - ➡ engaging voluntarily
- security based trust issues
  - ➡ building trusted systems
- technological factors
  - ➡ data storage, distribution
  - ➡ insight
- human/societal factors
  - ➡ government
  - ➡ family, friends

SCOTT
Secure Connected Trustable Things

http://SCOTT.IoTSec.no

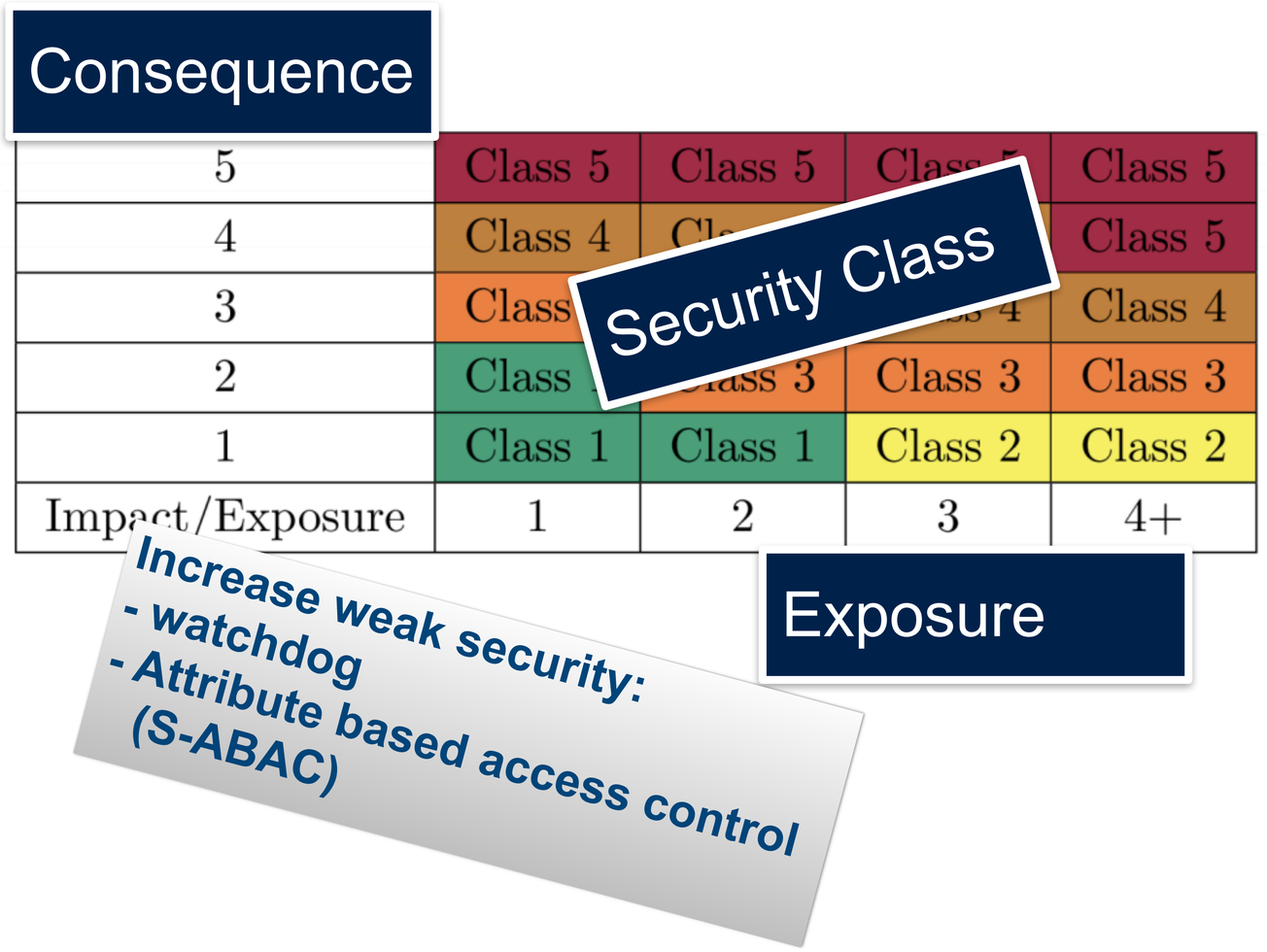
http://SCOTT-project.eu

Trust factor
Security
Privacy (social)
Acceptability
Usability
Reliability
Availability
Maintainability
Safety
Integrity
Confidentiality
Predictability
Reputation (social)
Configurability (social)
Consistency
Functionality

Security Classes and System design

- Security Classes in IoT
  - ➡ Consequence
  - ➡ Exposure
- Consequence
  - ➡ as in risk map
- Exposure
  - ➡ Physical exposure
    - people, building, physical ports,…
  - ➡ IT exposure
    - ports, firewall, connectivity
- Used to assess the security class of Systems, sub-systems and components

New postulate of security class



Impact/Exposure	1	2	3	4+
5	Class 5	Class 5	Class 5	Class 5
4	Class 4	Class 4	Class 4	Class 5
3	Class 3	Class 3	Class 3	Class 4
2	Class 2	Class 2	Class 3	Class 3
1	Class 1	Class 1	Class 2	Class 2

The economic perspective

- The big 5 IT companies have a GDP as big as that of France
- Amazon largest sector in terms of revenue is selling of data
  - ➡ 20% of revenue

- How can SMEs compete?
  - ➡ Each service and device gets a privacy label

- Four areas for Privacy Label
  - ➡ which data are collected
  - ➡ sharing to my phone, my cloud, public cloud,...
  - ➡ data communication integrity and storage
  - ➡ further distribution of data, ownership of data, further processing

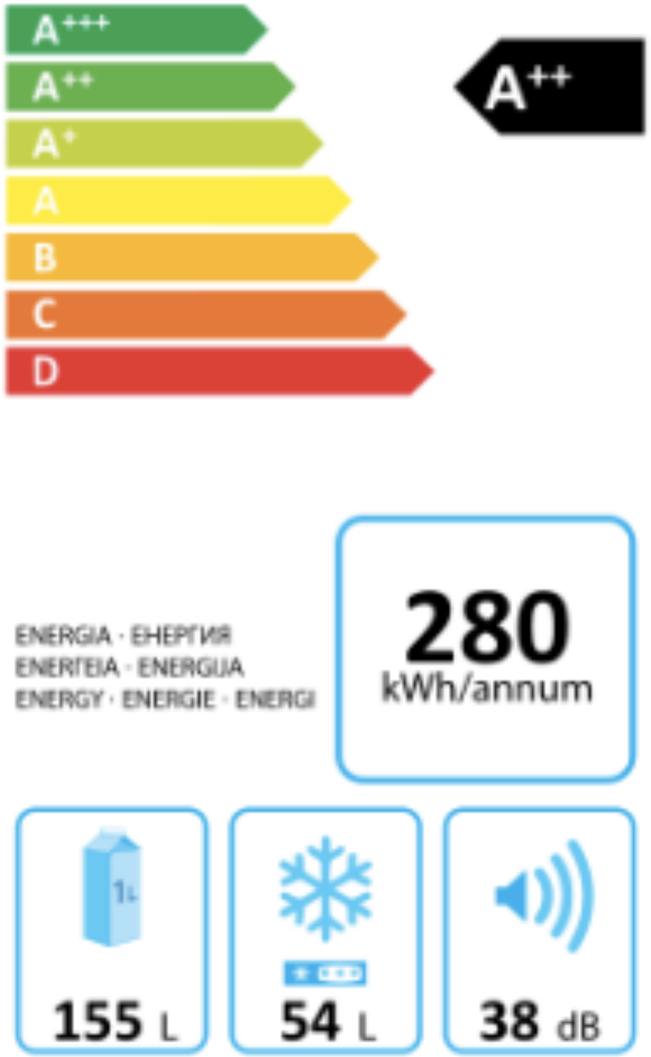
Privacy Label (A-F)

- easy visibility
- customer focus
- transparent

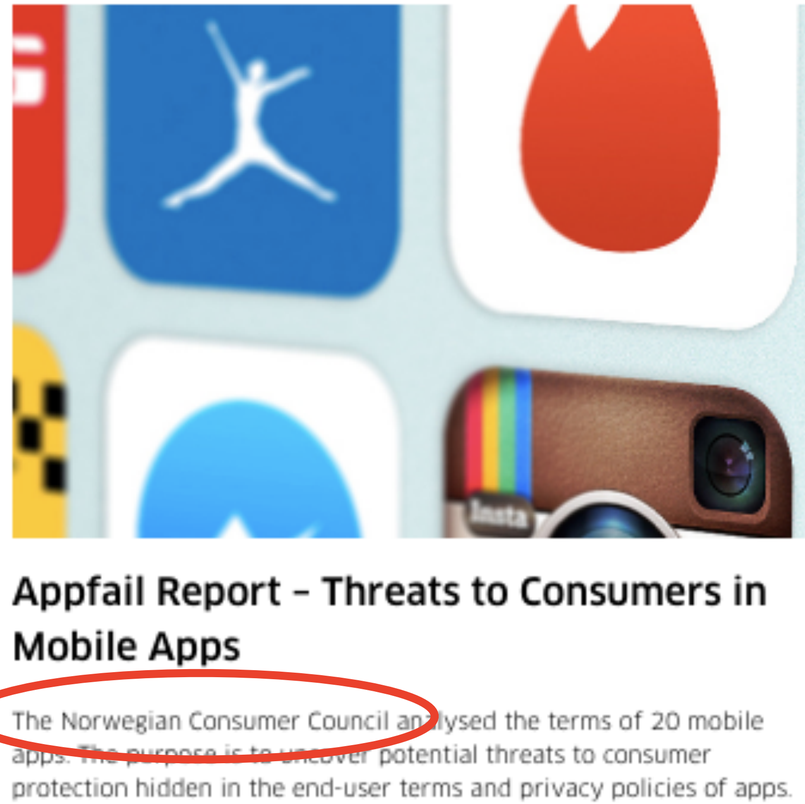
privacylabel.IoTSec.no

Privacy Labelling

http://PrivacyLabel.IoTSec.no



- "Measure, what you can measure - Make measurable, what you can't measure" - Galileo
- Privacy today
  - ➡ based on lawyer terminology
  - ➡ 250.000 words on app terms and conditions
- Privacy tomorrow
  - ➡ A++: sharing with no others
  - ➡ A: …
  - ➡ C: sharing with ….
- The Privacy label for apps and devices



Appfail Report – Threats to Consumers in Mobile Apps

The Norwegian Consumer Council analysed the terms of 20 mobile apps. The purpose is to uncover potential threats to consumer protection hidden in the end-user terms and privacy policies of apps.

Facilitator for economic growth and partnership

- We need more long-term investments
  - ➡ build infrastructure
  - ➡ enable digital services
- Long-term revenue
  - ➡ value creation
  - ➡ inclusion creates novel services
  - ➡ peer-to-peer enabler
  - ➡ supporting the low income segment
- “Creating roads” for digital services
  - ➡ free access to non-profit content: education, health, agriculture, eGov
  - ➡ mobile and Wifi hot-spots
- Done by: Jio, Amazon, Google, Alibaba

The example from India

- 1 GB per day for € ~2.1 per month
- free voice, Zero-rated cloud content
- Schools, railway stations,…
- *“Revenue is not an issue. Services will come”*

[source: Jio Press Release, Jan 2018, India]