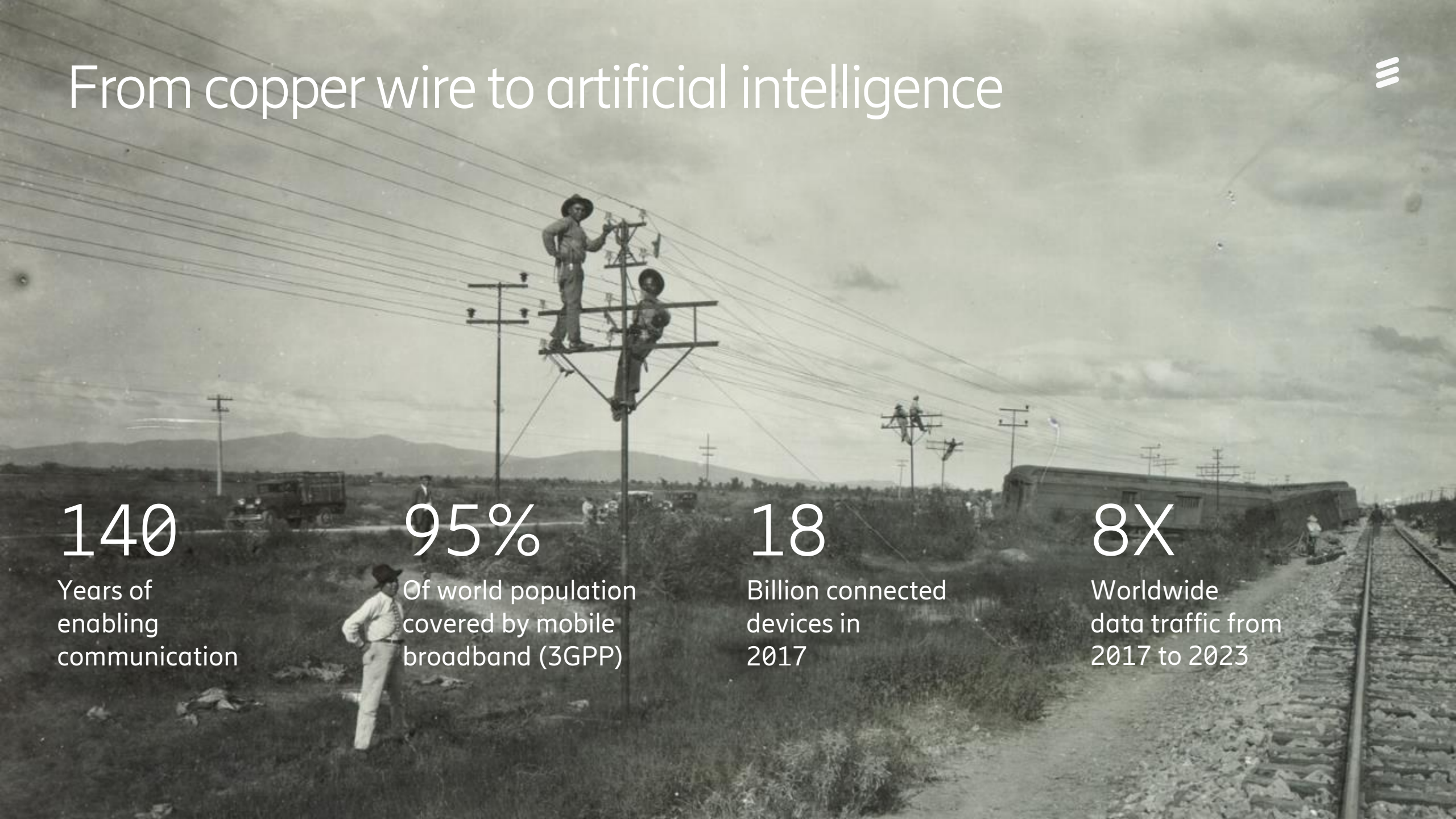
eScience @ Ericsson

1. Introduction to next generation of networks
2. Machine Intelligence
3. MI Lab
4. ER Cloud DC

From copper wire to artificial intelligence



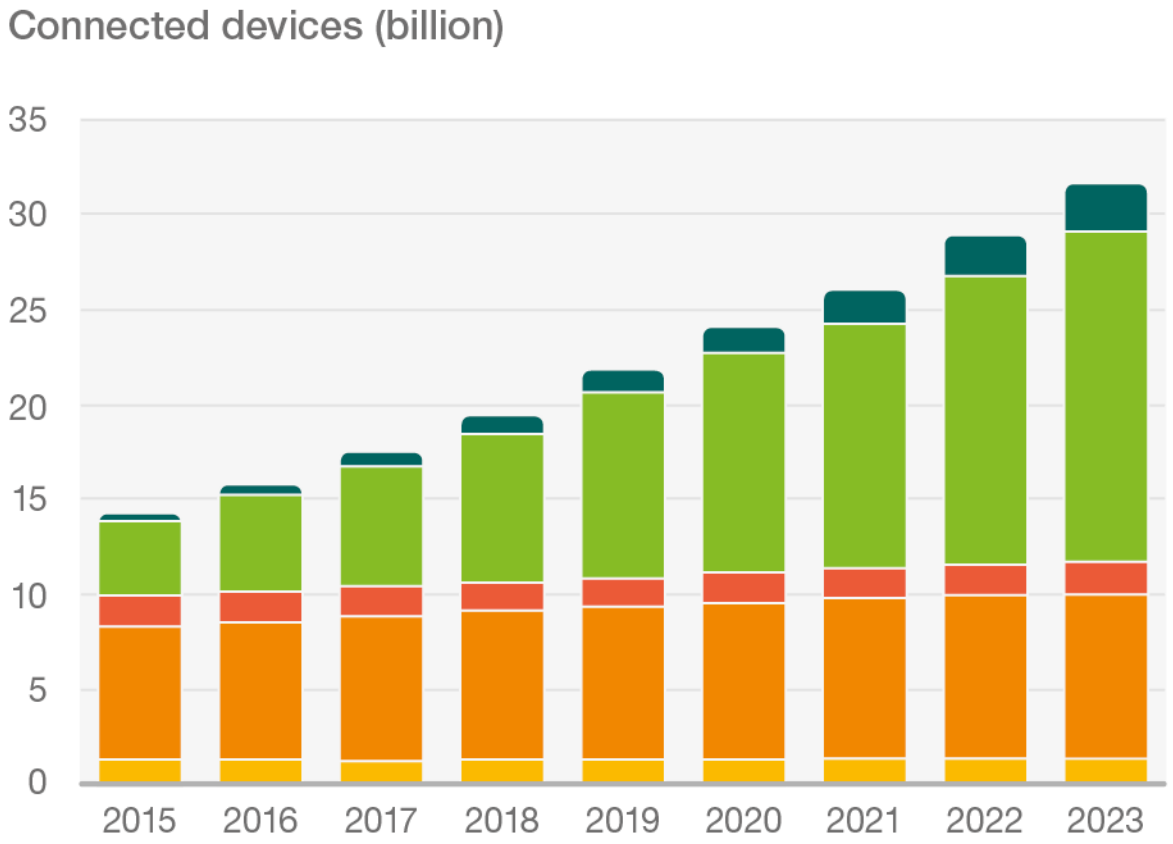
140
Years of enabling communication

95%
Of world population covered by mobile broadband (3GPP)

18
Billion connected devices in 2017

8X
Worldwide data traffic from 2017 to 2023

20 billion connected IoT devices in 2023



	2017	2023	CAGR
Wide-area IoT	0.6	2.4	26%
Short-range IoT	6.4	17.4	18%
PC/laptop/tablet	1.6	1.7	0%
Mobile phones	7.5	8.8	3%
Fixed phones	1.4	1.3	0%
	17.5 billion	31.6 billion	

Vast majority of wide-area IOT devices will use 3GPP technology 2023

Five to watch: Technology trends driving innovation

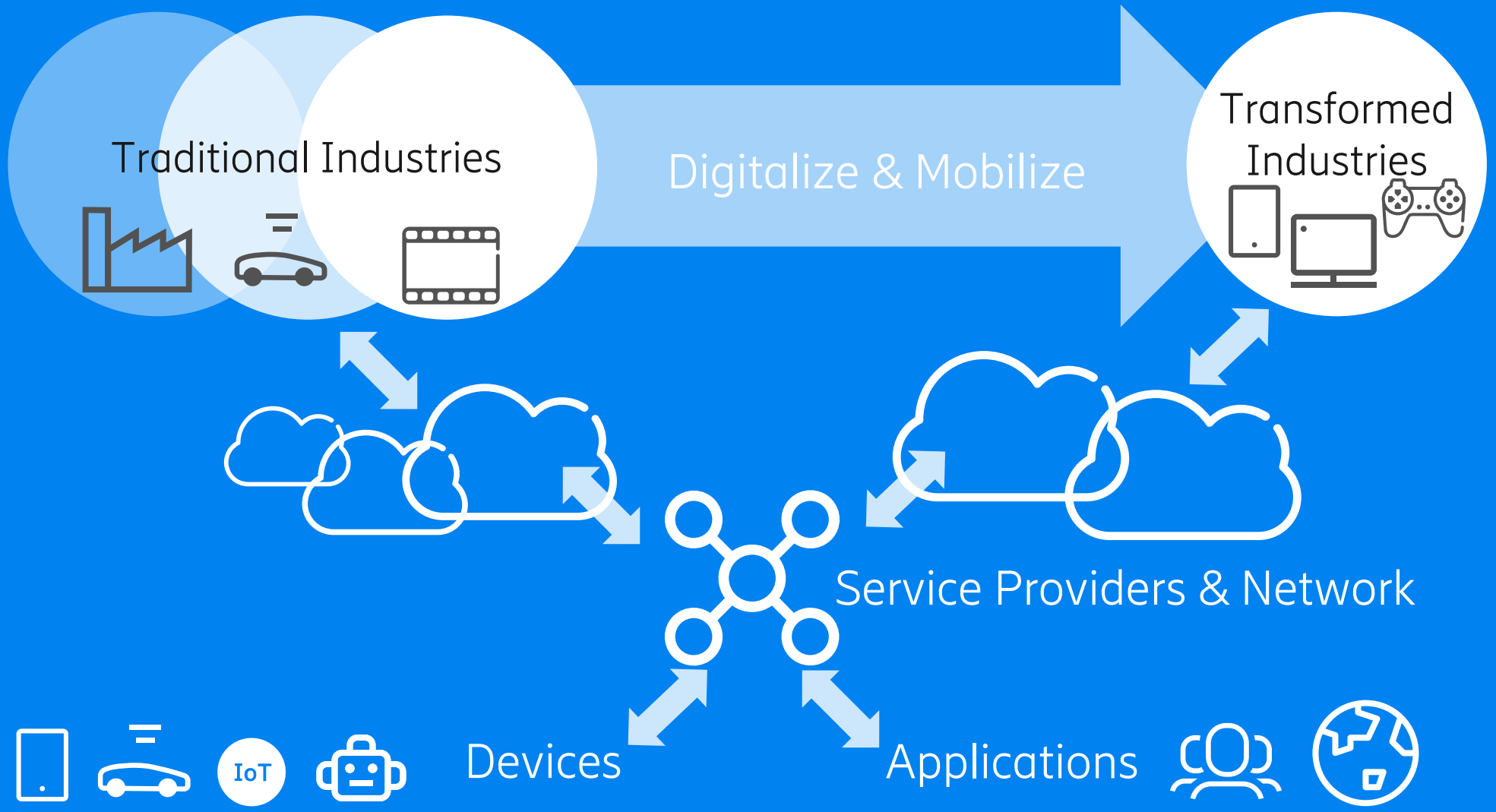
01. An adaptable technology base

02. The dawn of true machine intelligence

03. End-to-end security and identity for the IoT

04. An extended distributed IoT platform

05. Overlaying reality with knowledge


Traditional Industries
Digitalize & Mobilize
Transformed Industries
Service Providers & Network
IoT
Devices
Applications

Use cases – addressed with 5G

Platform for addressing industry and society transformations

Cost effective delivery of increased data traffic

Massive machine type communication

- Smart meter
- Tracking
- Fleet management

Critical machine type communication

- Industrial applications
- Traffic safety & control
- Remote manufacturing

Enhanced mobile broadband

- VR/AR
- 4K/8K UHD
- Smartphones

Fixed wireless access

- Mobile / wireless / fixed
- Enterprise
- Home

Technologies that drive Network evolution

Machine intelligence

- Analytics & Big Data
- Cognitive technologies and Machine learning
- Reinforced Learning

Management & Automation

- Model driven
- Automated life cycle management
- Autonomous systems

Radio evolution

- mm Wave and massive antenna technologies
- Multi-purpose, multi-characteristic radio
- Flexible spectrum assignment and utilization

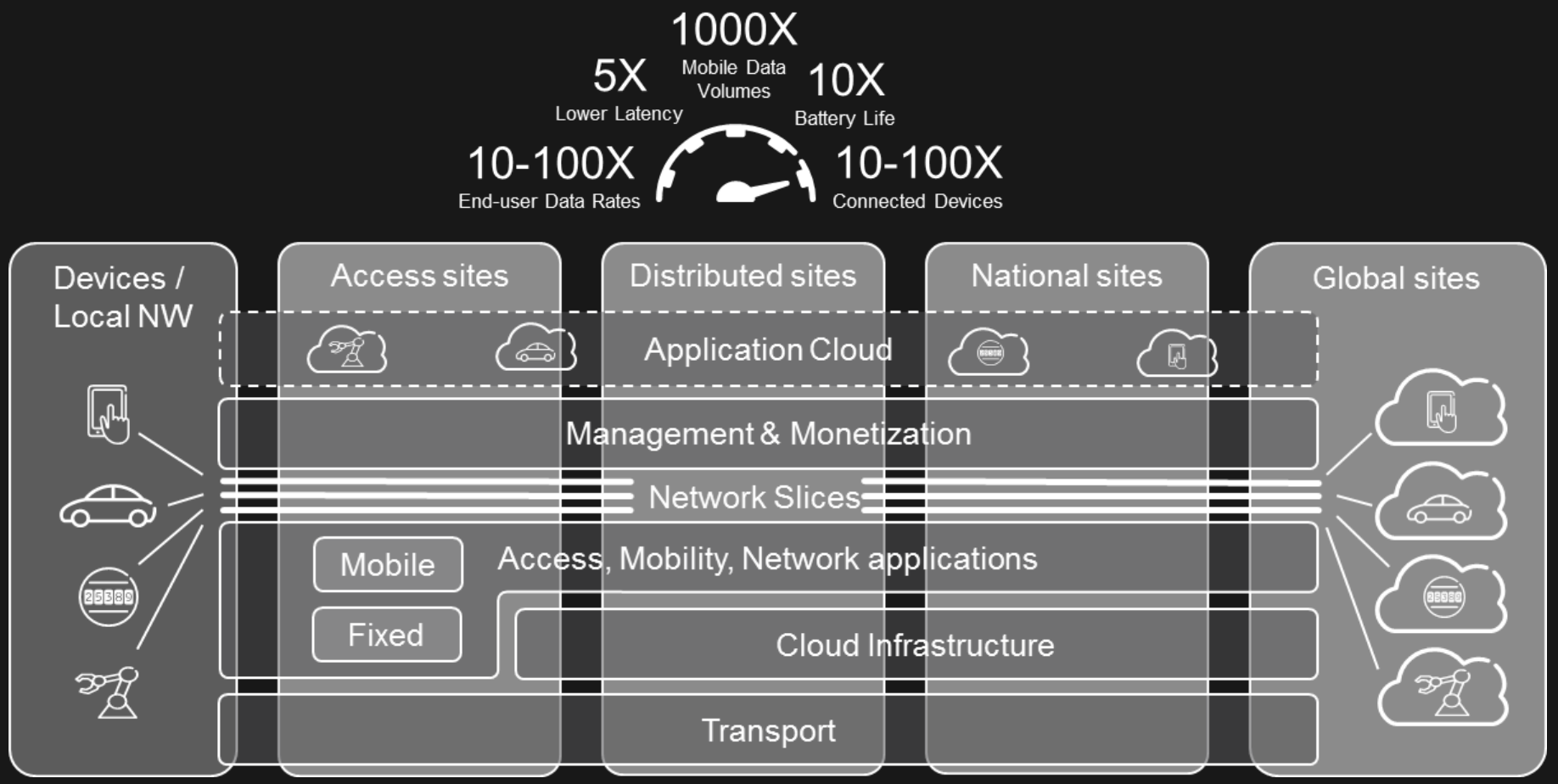
Programmable networks

- Software defined networking
- Network abstraction
- Network slicing

Cloud technologies

- Distributed cloud and edge computing
- Micro services and DevOps
- Virtualization, containers

ONE ARCHITECTURE MULTIPLE INDUSTRIES



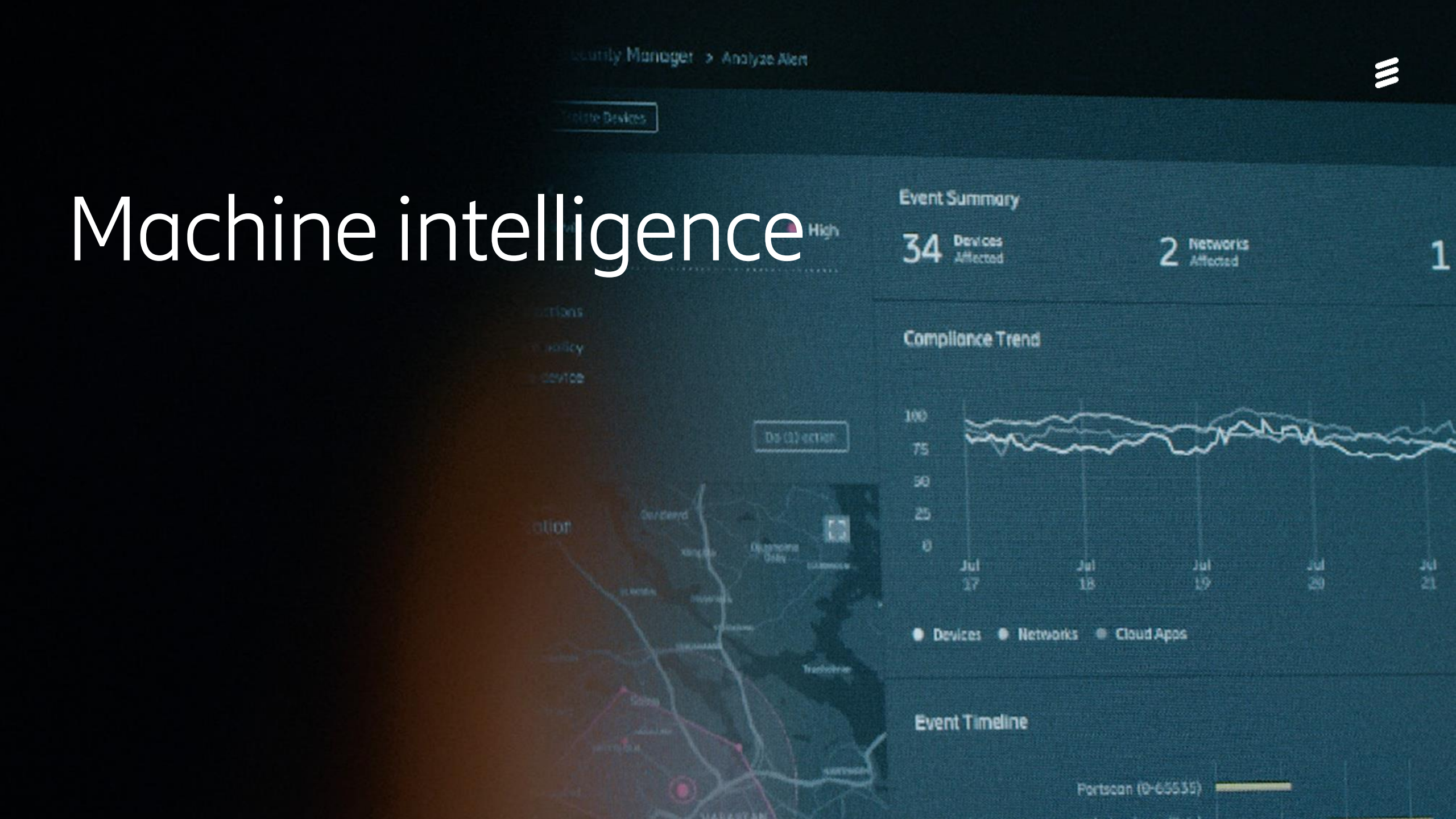
Energy Performance

5G

Security

Programmable IP, Cloud Technologies, Full Mobility, Data & Analytics, Automation

Machine intelligence



Evolution to 5G will see increase in network complexity

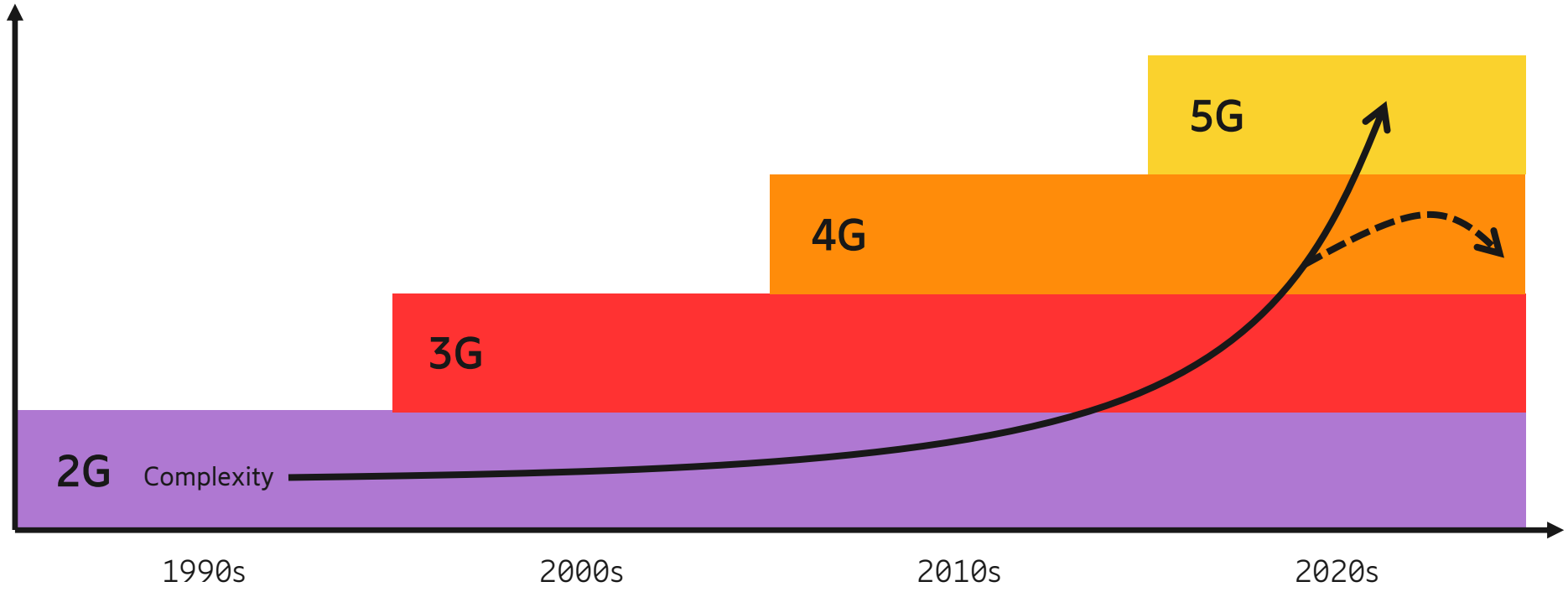
Multiple coexisting technologies

Network function virtualization

Vast differences in terminal capability

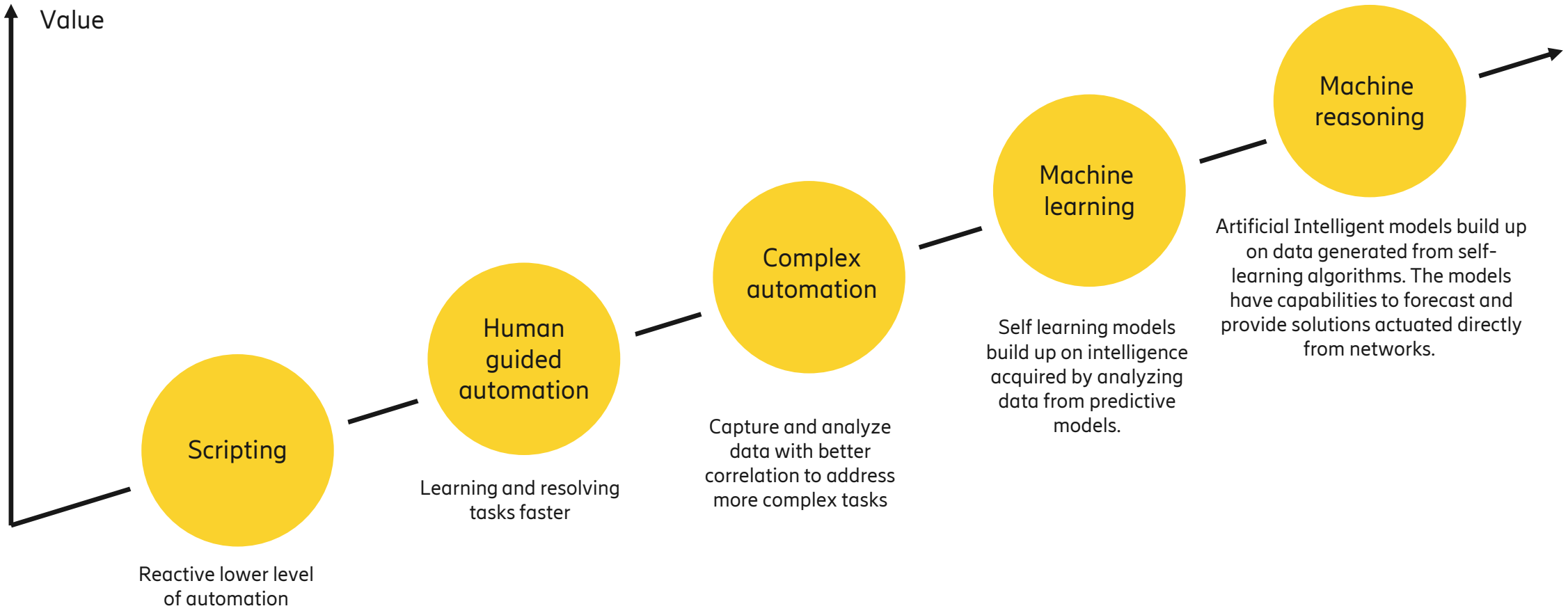
Significant variation in traffic demand

Completely new & varied use cases



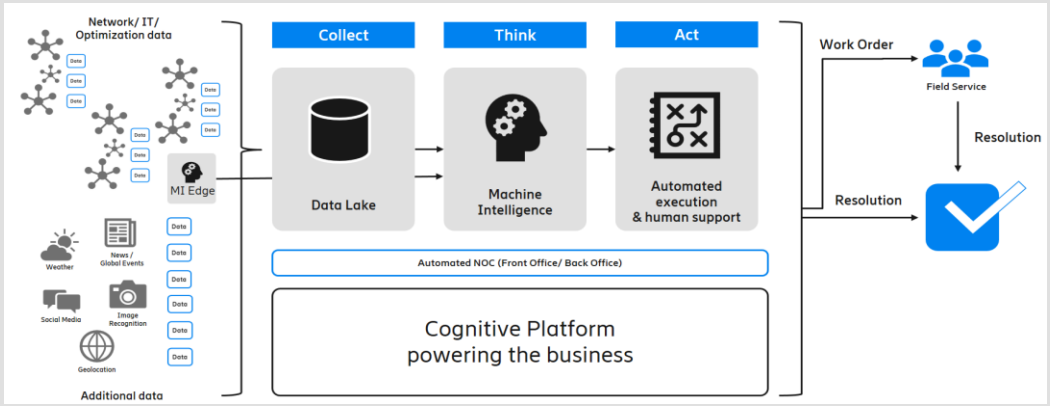
Dealing with opex and network performance in this environment will go beyond the reach of humans

Evolving network automation models



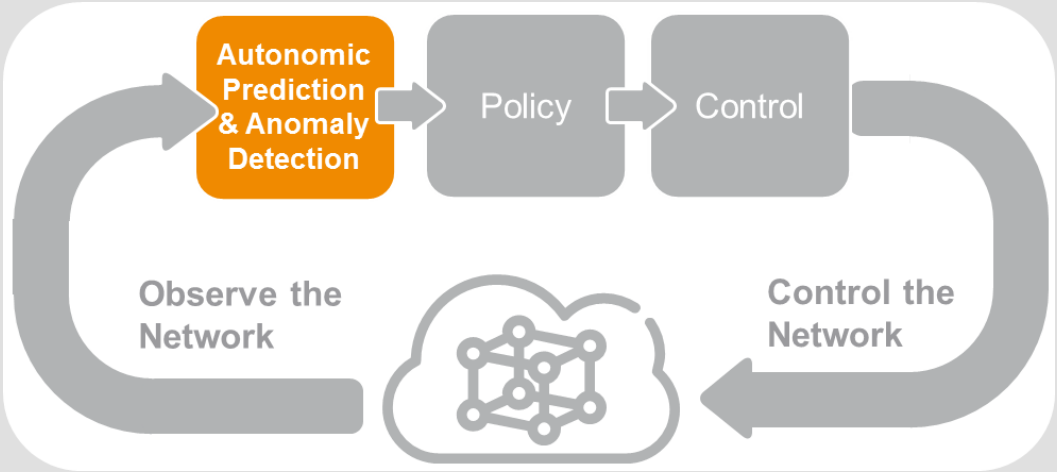
Automation

Automation | Evolution | Disruption



InSITE – Intelligent Site

Explores advanced automation in order to enable a Learning NOC which prevents incidents and reduces number of expensive site visits.

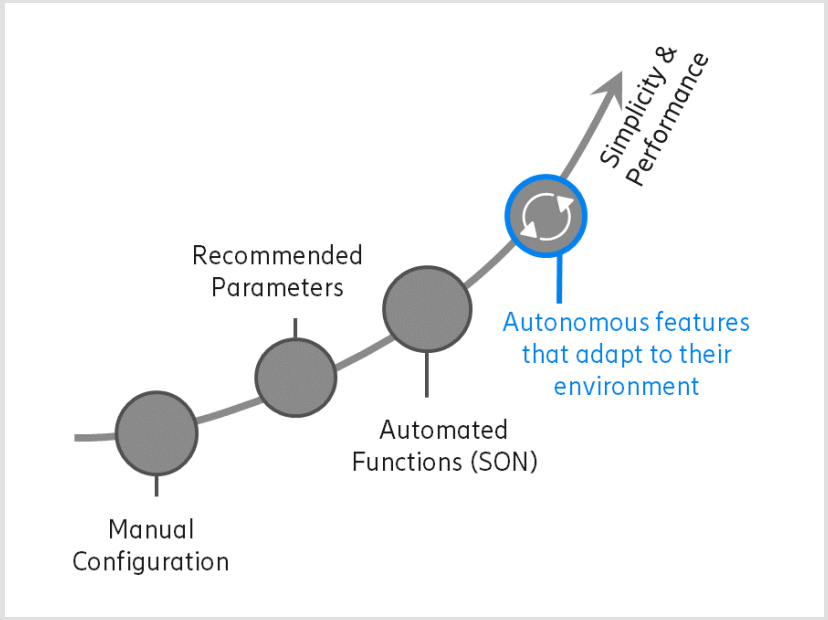


Autonomic Incident Manager

Enables data driven insights and proactive alarm management.

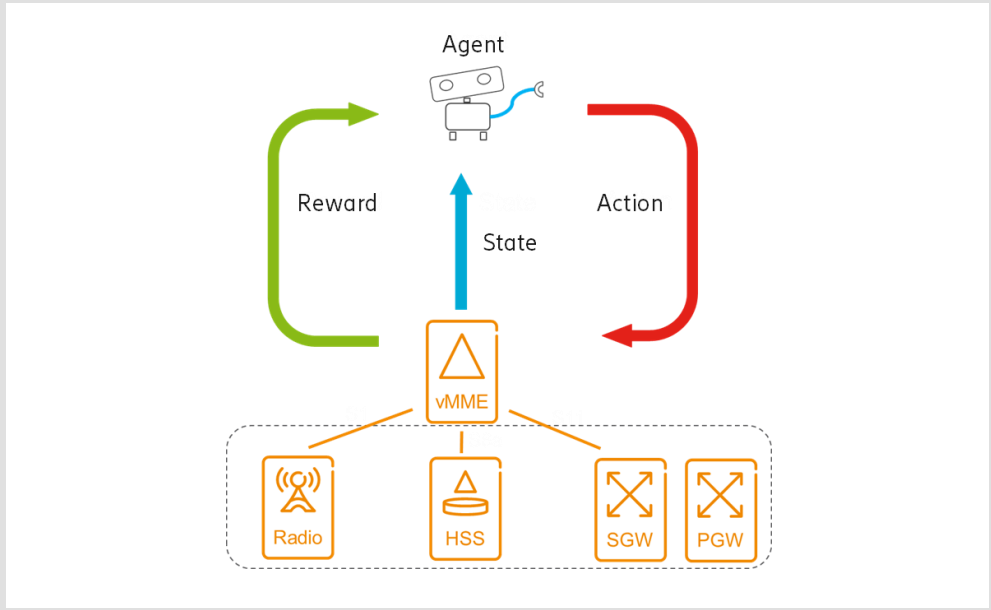
Evolution

Automation | Evolution | Disruption



RAN Edge analytics

Self-Learning algorithms in RAN base stations increase performance and optimization!



Self-Learning Agent for vEPC

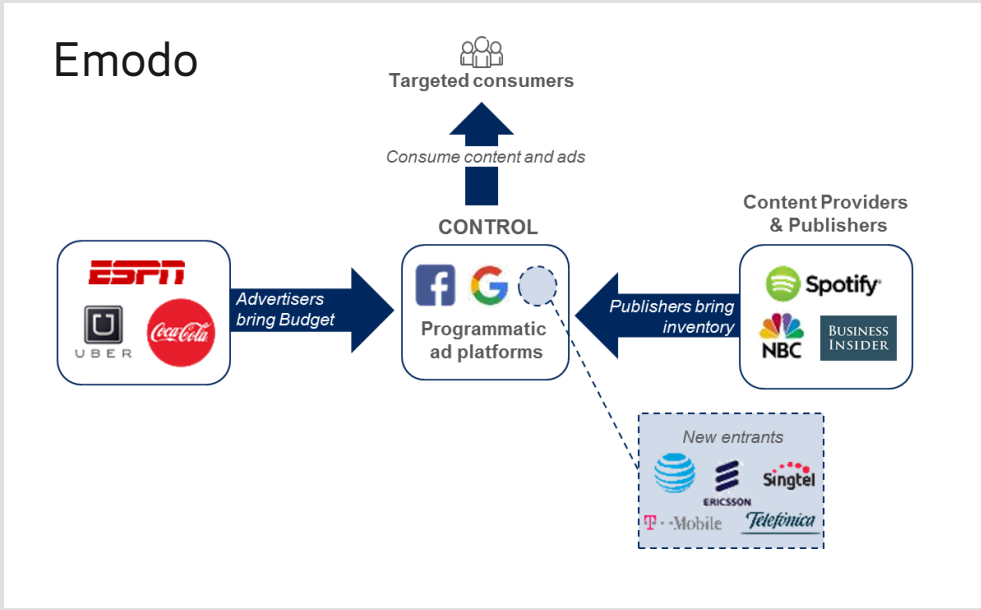
Self-Learning Agents for vMME in CORE for system optimization target to reduce OPEX and improve energy efficiency!

Disruption

Automation | Evolution | Disruption

AR Assistant for ERS

A cognitive virtual assistant for Field Operations to reduce OPEX!



Data aaS & Monetization

Monetization of MNO data in double-sided business models enabling new revenue streams

Creating a digital twin of a network

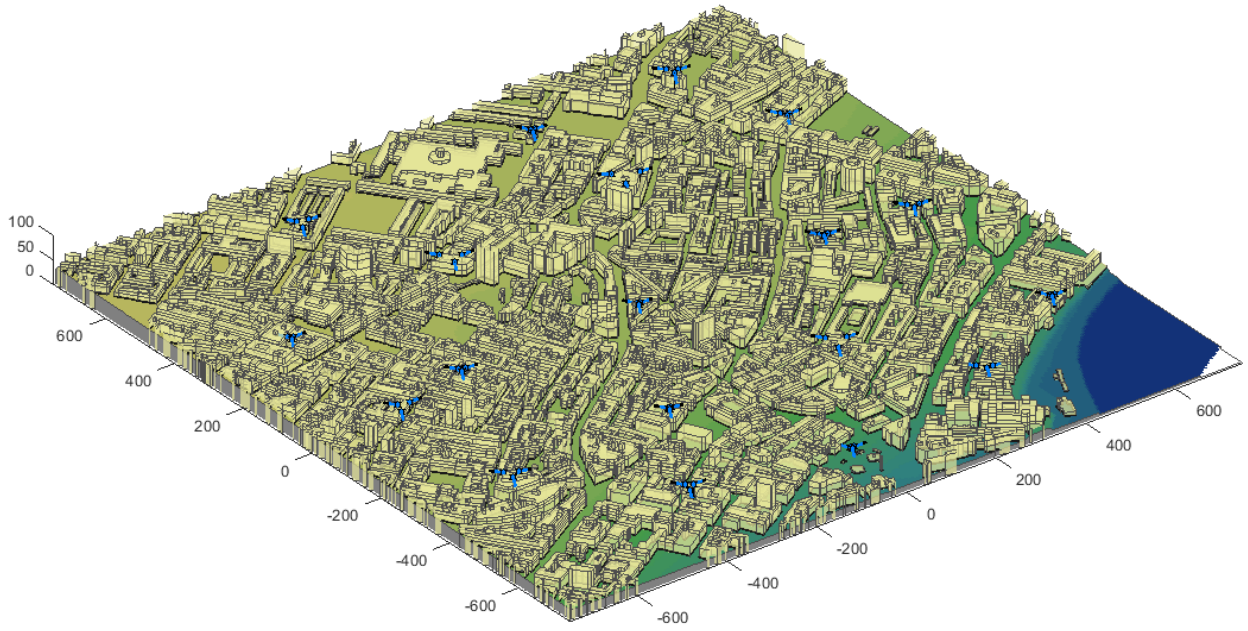
InSite: Intelligent Site

- More complex networks
- More data to manage
- From reactive to proactive

InSite applies machine intelligence to provide insights not previously available, then triggers our automation platform that executes a preventive or resolution action.

ERICSSON

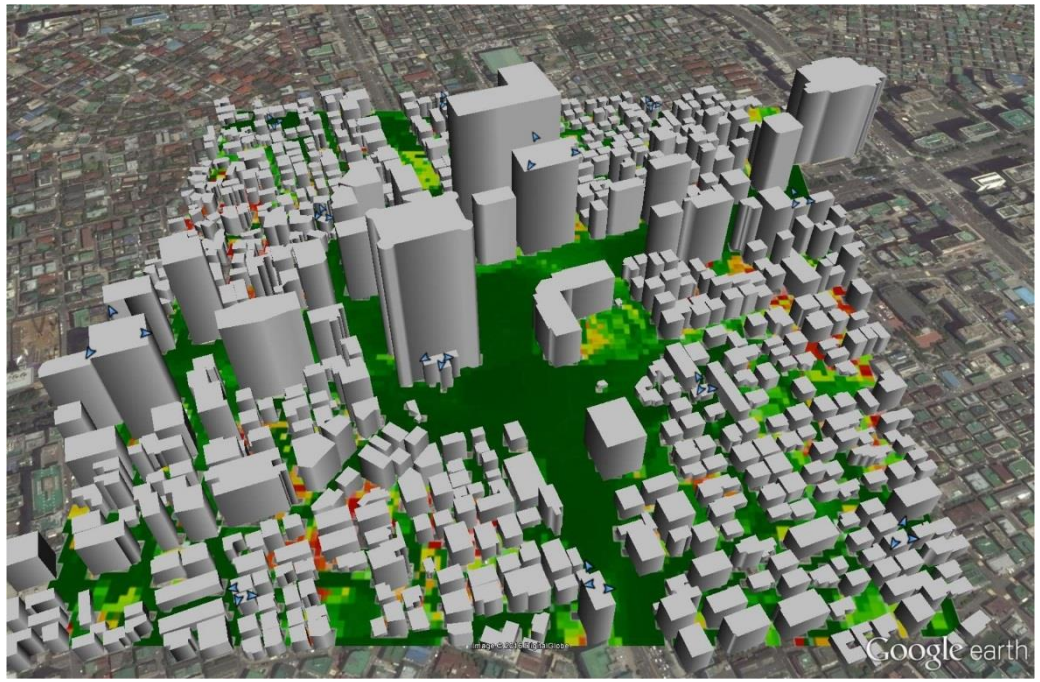
DEPLOYMENT STUDIES



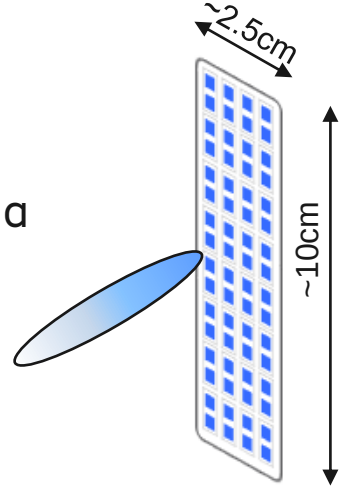
GANGNAM – 28GHZ

- Gangnam - dense urban hotspot
  - ISD ~ 200m
  - Digital 3D map
  - Raytracing propagation model

- NR 800MHz TDD at 28GHz
  - 2x4 SU-MIMO
- LTE 60MHz FDD up to 2.6GHz
  - 4x4 SU-MIMO



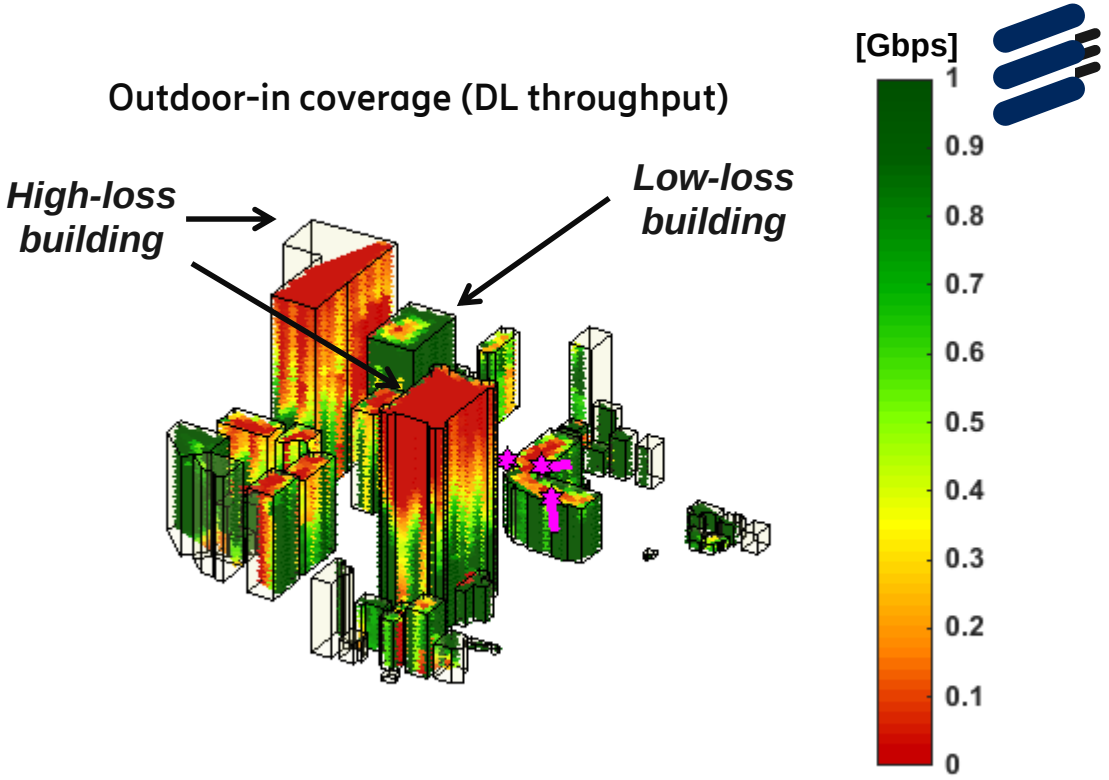
NR base station antenna

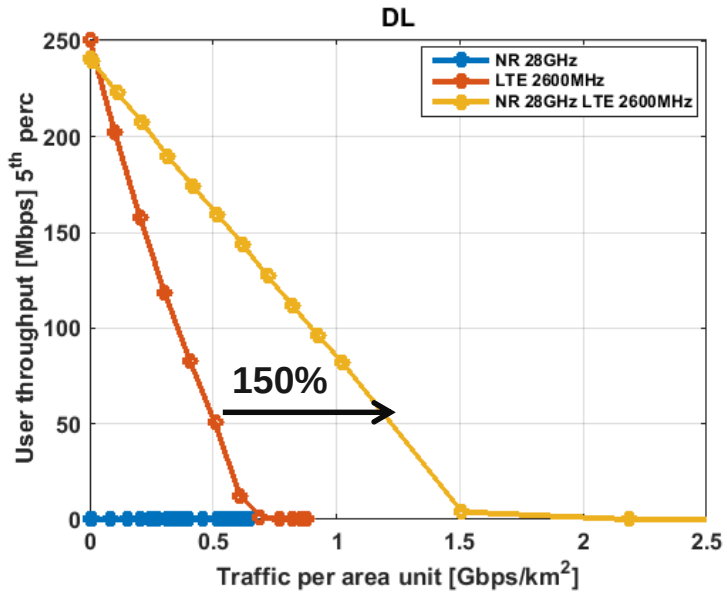


GANGNAM – 28GHZ

- Good coverage in low-loss buildings
  - Concrete, 2-layer glass
- Large high-loss buildings may lack deep indoor coverage and at top floors
  - IRR glass and steel

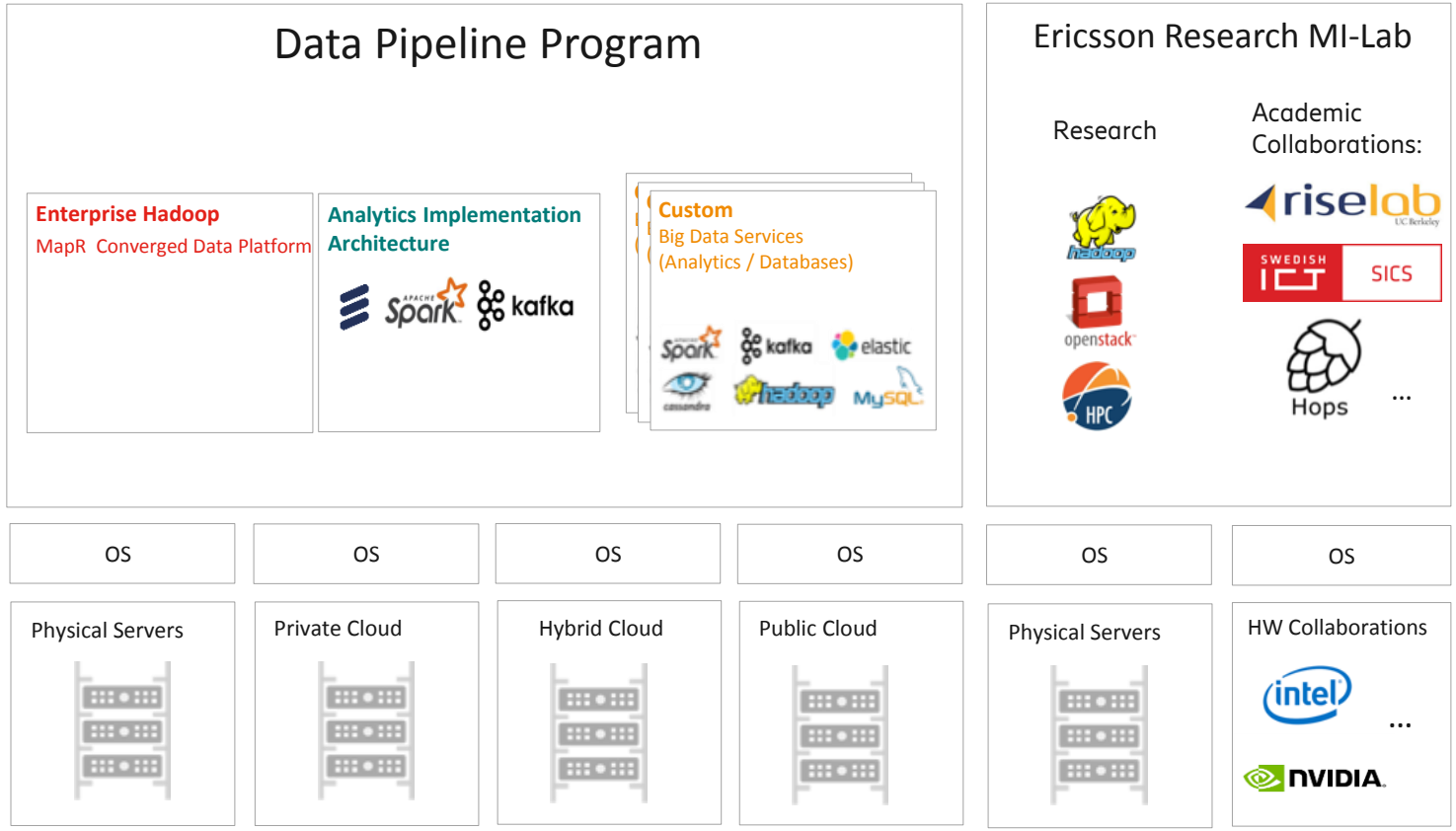
- LTE and NR interworking improves user throughput and capacity



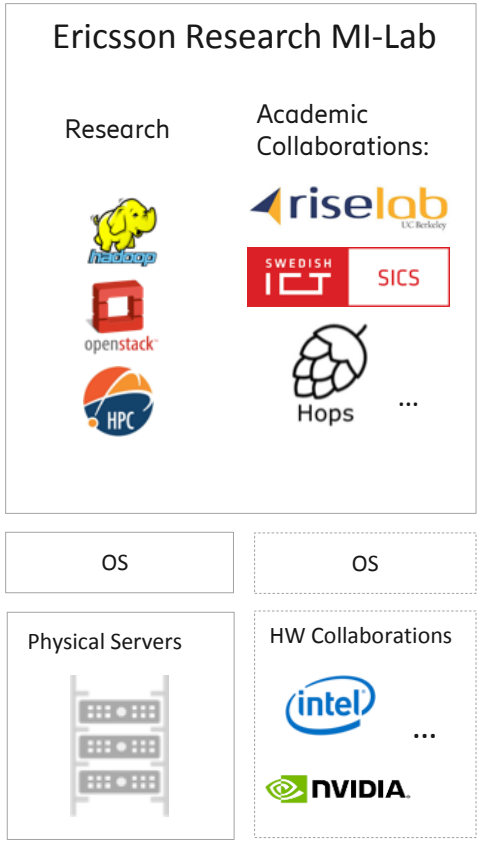


MI LAB

Data Pipeline program & ER Collaboration

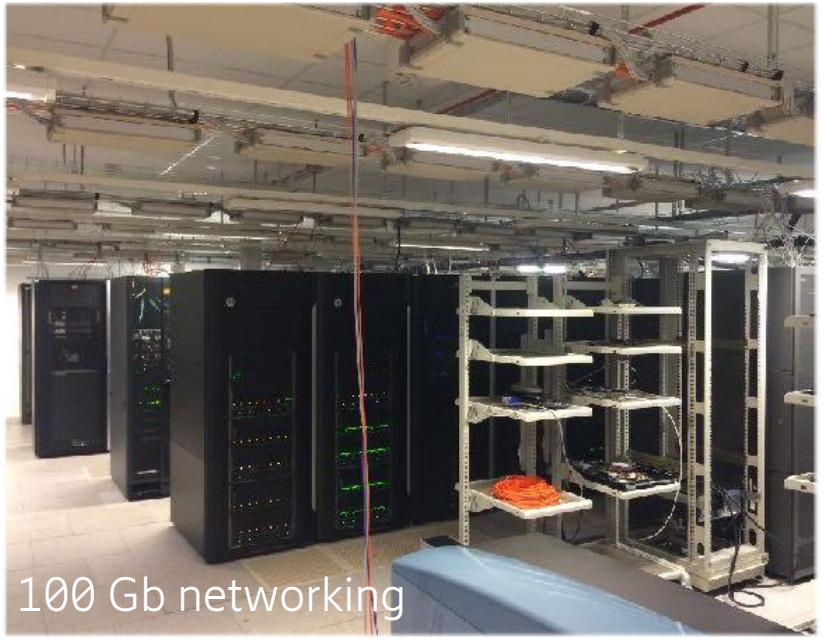


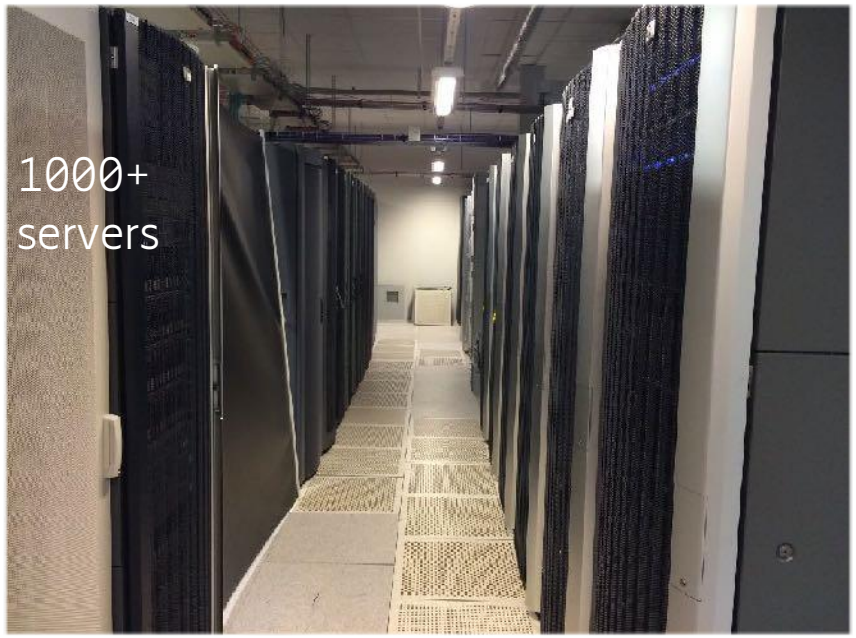
HOW WE USE LAB



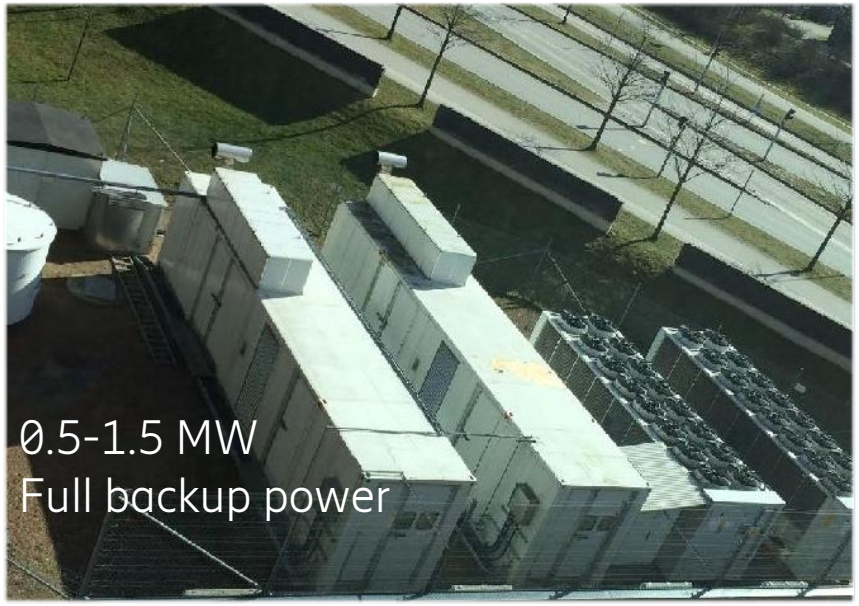
- Lab is used for MI Workloads
  - Spark, Tensorflow,
- Testing and evaluating MI frameworks and tools
- Testing and evaluating hardware accelleration for MI workloads/tools (e.g. Phi, GPU)
- All MI researchers can have root-access to lab
  - Possible to install any software
  - Data is backed up on separate system
  - There are two zones, one internet and one ECN
- Build and host demonstrators and PoC:s
  - Rapid HW, SW & NW config & development
  - Exposure to remote sites, external parties

Ericsson Research Cloud Data Center


100 Gb networking


1000+
servers

PB storage scale


0.5-1.5 MW
Full backup power

ER DC Status

"Provide a laboratory for cloud research and at the same time offer a compute platform for big data, analytics, & simulations."

Foglight

Self-service cloud [ECN]

- 600+ user accounts on Foglight
- 75+ projects (ER, BA, S&T, etc.)
- ~300 servers

Xerces

Self-service cloud [Internet]

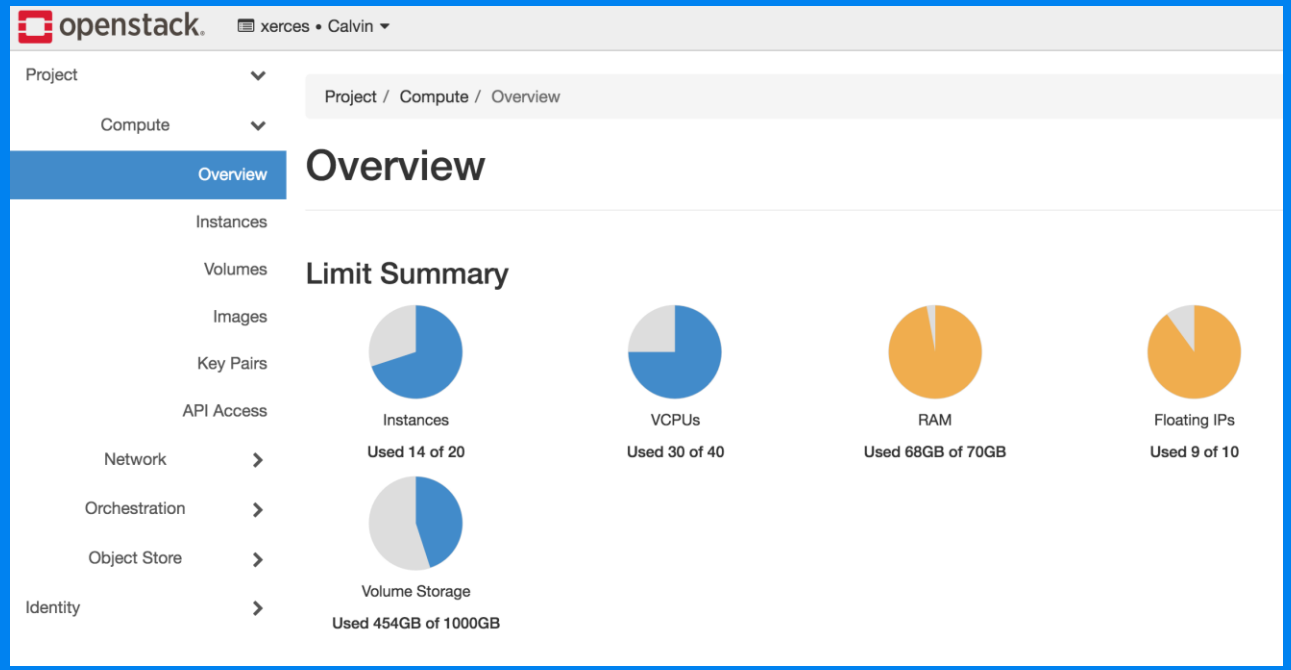
- 75+ projects (including multiple C3 engagements)
- WASP support (~75-100 students)
- WASP edge cloud setup
- ~300 servers

Iron Lab

Bare metal servers [EDN]

- ~400 servers

Services



2 017:Virtual servers: Compute & storage

2018: Kubernetes, databases, analytics, ML, etc.

SKF

Automation

Vejdirektoratet

NordicWay

NordicWay is a pilot project that seeks to enable vehicles to communicate safety hazards through cellular networks on a road corridor through Finland, Norway, Sweden and Denmark.

The project is a collaboration between public and private partners in the four countries, and is co-financed by the European Union within the Connecting Europe Facility programme 2015-2017.

Nordic WAY

Ericsson and SEB make banking personal again

By: Ericsson | 24 February, 2017 | Business | banking, SEB

When was the last time you visited your bank? The advent of internet banking – now accessible via phones as well as PCs – has made the idea of actually traveling to a physical bank branch seem antiquated.

And yet there are still times when, despite the amazing convenience of internet banking, there is no substitute for being able to talk to another human being. So you find some time in your busy schedule, make an appointment and fight the traffic on the way to the bank.

If only there were a better way.

Connected Drone

Telia

WARA-CAT

MicroWeather Example data

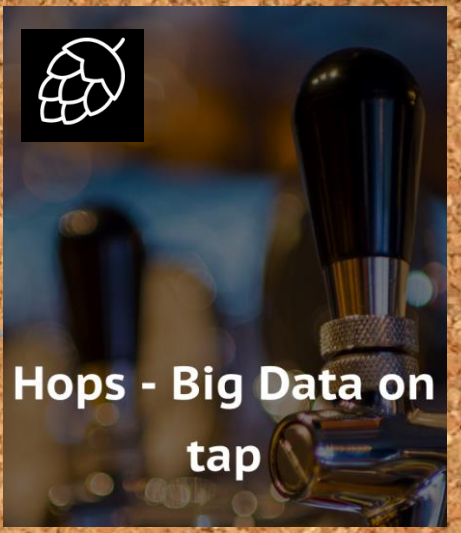
OPNFV

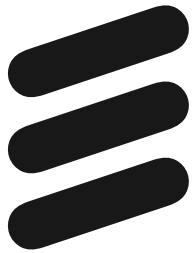
WARA-PS

AXIS COMMUNICATIONS

SAAB

WASP WALLENBERG AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM



Conclusions

1. Digitalization of Industries
2. 5G serving a new set of use cases
3. Technology evolution
4. Extended eScience needs for both R&D and next generations of networks purposes