# Digitaization in Mining Summary

Göran Kördel

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# What is Digitalization?

Mobility

Automation

Digitalization

NEW BOLIDEN

# Introduction of Göran Kördel

CV Göran Kördel

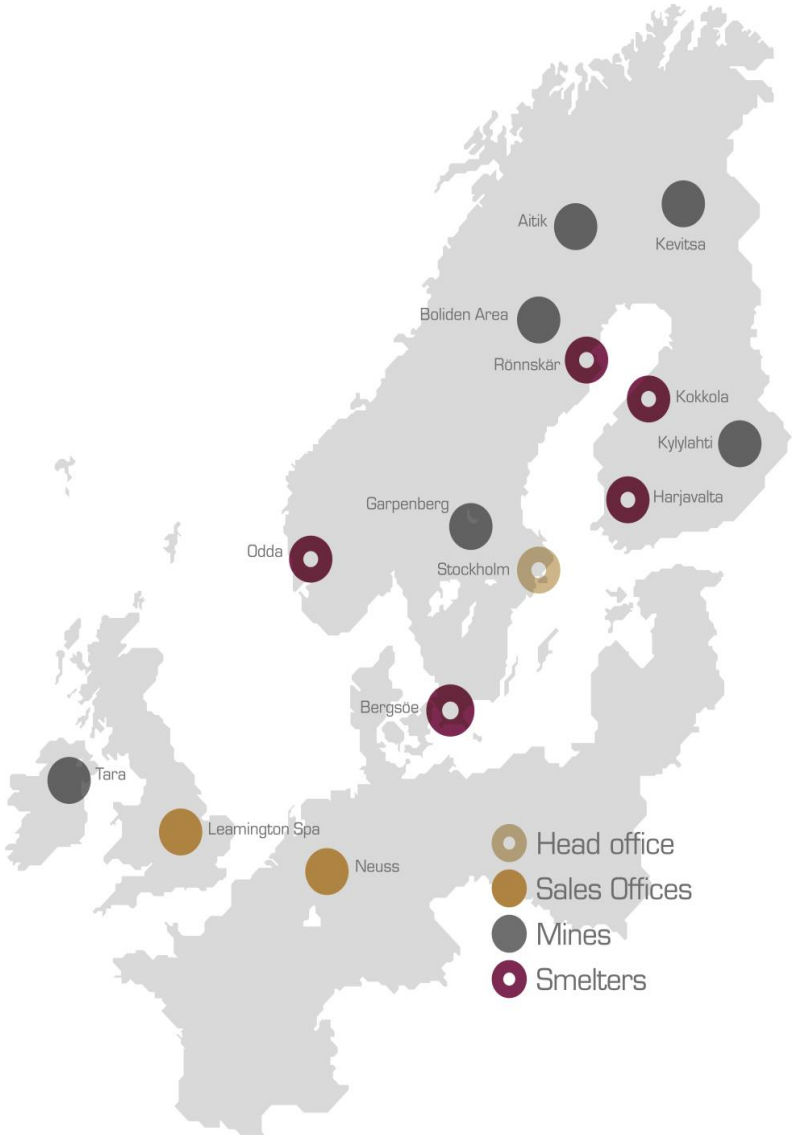
- M.Sc. Linköping, Sweden
- Ericsson
  - Business Controller, Ericsson Global Services, IT Management
- Sandvik
  - President Sandvik IT Services
  - CIO
- Nordwise Management / 3gamma
  - CEO and Senior Advisor / Business Development Executive
- Boliden, CIO

# Digitalization in Mining

- Boliden and business driver
- Technology enabler
- Use cases in mining
- Summary & recommendations

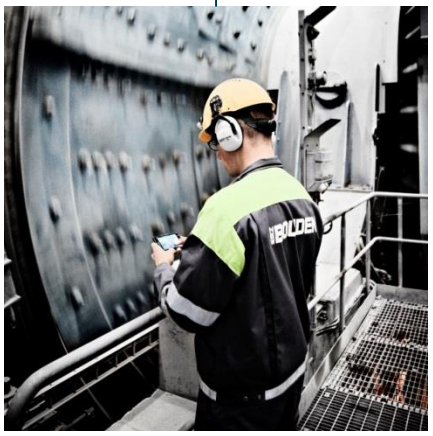
# Boliden produces metals for modern life

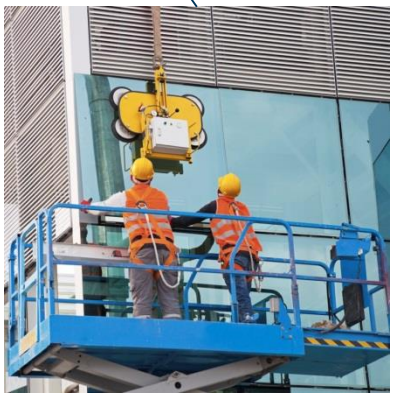
- Boliden is a leading metals company with a commitment to sustainable development
- The company's core competence is within the fields of exploration, mining, smelting and metals recycling
- Six mining areas and five smelters in Sweden, Norway, Finland and Ireland
- Balanced metal mix
  - Zinc and copper
  - Precious metals, lead, nickel as by-metals
- Revenues 40 BSEK
- 5,500 employees



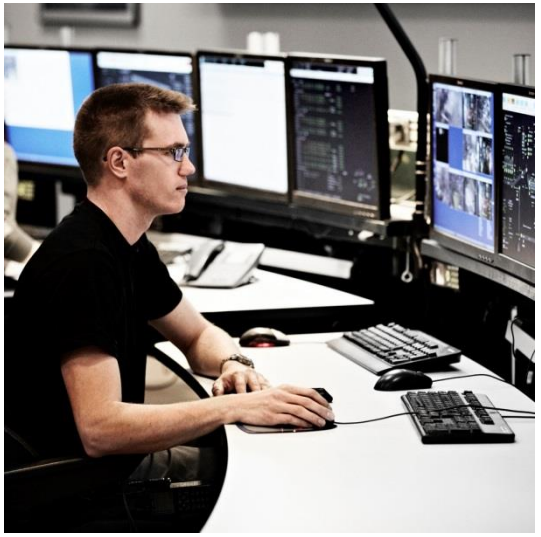
# Boliden Value Chain

Finding it → Mining it → Smelting it → Selling it





# Different Types of Working Environment



# Business Drivers

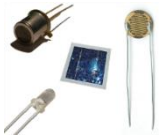
- High labor cost
- Environmental regulations
- Personal safety

Automation

&

Process Optimization

# Technology Enablers



Sensors

Network

Mobility & Positioning

Data analytics

**Business value by automation, productivity & safety**

# Network in a Mine

**Boliden**

- No public network
- Challenges: humidity, large areas and eco (open pits)
- .. but.no leakage through the walls

- Use of standard office WLAN simplifies and enables testing in office environment
- 4G in some open areas

**New technologies**

- Mesh technique (WLAN)
  - \+ faster to build
  - – latency and lower capacity
- 5G
  - \+ Less latency
  - \+ Energy performance
  - \+ Network slicing
  - \+ Cost?
  - – Un-tested technology, unclear business model
- LoRa

# Data Analytics in Mining and Metals Industry

*One smelter site: 48 000 data points*

*A mine: From zero to 10 thousand data points*

**Gartner predicts that :**

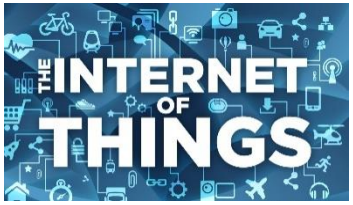
- By 2020, 50% of motor vehicle manufacturers will apply advanced analytics to connected vehicle data to identify and correct product defects.
- By 2020, 50% of employees who are working alone or are operating vehicles/heavy equipment will be monitored by biometric-assisted technology.

# New Technology Accelerate Development

Amount of generated data

- Sensors
- Connected machines
- Smartphones/tablets

Connectivity and network capacity




- WLAN
- 4G ➔ 5G
- LoRa

Computing power and analytic tools

- BI/BA
- Machine Learning
- Artificial Intelligence

# From Data to Information

## Data Refining Model – Based on Sogeti model

Thing → Sensor → Gateway → Communication → Aggregate → Storage → Presentation

# Boliden Prioritization of Areas

– Use-cases of Data Analytics in the Mining Industry

# Use Cases

**Connected machines, sensors and advanced analytics**

1. Process control
2. Predictive maintenance
3. Environmental control
4. Safety
5. Autonomous trucks

# Case 2 – Predictive Maintenance

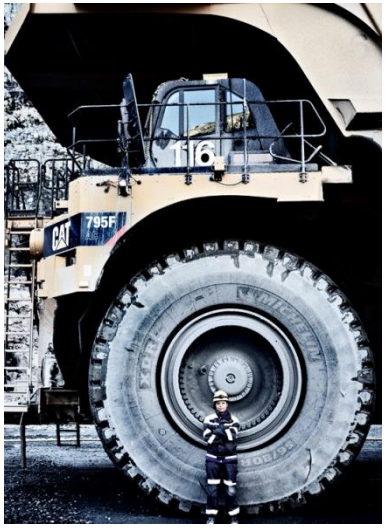
Cognitive Computing → 5. Cognitive Maintenance

Data Analytics → 4. Prescriptive Maintenance
- Optimize and recommend

Internet of Things → 3. Predictive Maintenance
- Based on usage and wear statistics

2. Preventive Maintenance
- Manufacture schedule
- Operational observation

1. Corrective /Reactive Maintenance
- Fail & fix




NEW BOLIDEN

# Case 5: Volvo Autonomous Trucks

**Operator assist**

Operator assist in parts of operation, i.e boom movement, autopositioning, autoleveling

**Remote monitoring**

*Monitoring of autonomous equipment I.e. tunnel rig during lunch*

**Remote & robotics**

*Remote operated assisted by robotics*

**Monitored Semiauto**

*Operator monitored autonomous equipment assisted by operator in parts of operation, i.e boom movement, filling buckets,…*

**Restricted autonomy**

*Autonomous operation within area with restricted access*

**Full autonomy**

*Operation with no restrictions neither for other equipment or personnel*

**Productivity**
**Safety**

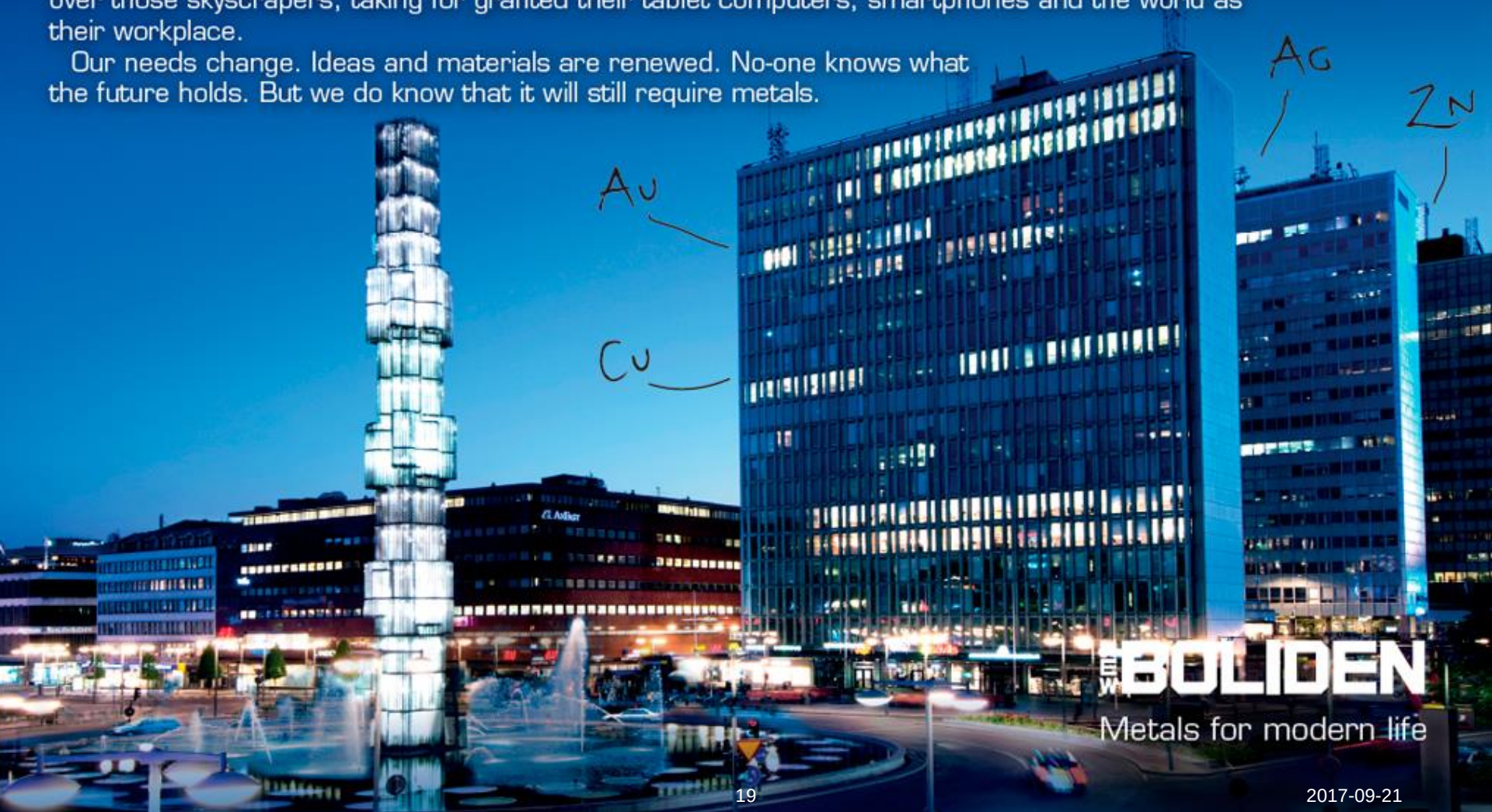
Behind the Scenes - The worlds first self-driving truck in an underground mine https://www.youtube.com/watch?v=DYMEl-1q0Qs

# Challenge1: Data Architecture

# Challenge2: IoT Security

Connected ”things” with IP addresses ➔ Increasing vulnerability

# We are building the future – over and over again

Stockholm's Hötorget skyscrapers in glass and metal reflect the 1950s' take on the future. Office workers were destined to sit and work here on newfangled electric typewriters, dispatching post to each other through an elaborate pneumatic tube system. That, too, was IT. Then. Now the new generation has taken over those skyscrapers, taking for granted their tablet computers, smartphones and the world as their workplace.

Our needs change. Ideas and materials are renewed. No-one knows what the future holds. But we do know that it will still require metals.