

# SMIG - Towards fully automated mining operation

- SMIG  
**SM**art **I**ntegrerad testmiljö för **G**ruvindustrin  
Smart Integrated Test environment for the mining industry
- A project that will create the basis / prerequisites for a smart test and demo environment for the mining industry that integrates existing, new and future virtual and operational environments.
- A way to accelerate the use of innovations and new solutions that are needed to reach a fully automated mining operation



# SMIG

## PROVIDING:

- relevant test environments for future sustainable mining as foreseen 5-10 years from now
- infrastructure and integration of systems in relevant environments
- an organisation that maintains the infrastructure and gives support to users
- an environment for seamless exchange of data, interoperability and the use of plug and play
- technical and commercial due diligence for new innovations

# SMIG – Background

- The Swedish Government has launched five innovation partnership programmes to help meet a range of the societal challenges that Sweden is facing
- One program is “A connected industry and new materials”
  - Test beds were and are prioritized
  - The 17 strategic innovation programs (SIP) was invited to propose projects during winter 2016-17
- SIP STRIM and PiiA (Process Industrial IT and Automation) proposed SMIG
  - Vinnova, as the funding agency, approved SMIG as a two phase project and the project started mid 2017

	Digitalisation	Life Sciences	Environment and climate
3 challenges – 5 programmes			
Next generation travel and transport	✓	✓	✓
Smart cities	✓	✓	✓
Circular and bio-based economy	✓	✓	✓
Life science	✓	✓	✓
Connected industry and new materials	✓	✓	✓



# SMIG – Schedule, budget and deliveries in phase 1

## Phase 1

- Decided, financed and running for a year.
- From mid 2017 to autumn 2018
- Budget: **5 MSEK** ( 3 MSEK public funding, 2 MSEK co-funding)
- Main deliveries are:
  - Project description for phase 2
  - A number of use cases defined (currently 4)
  - Report on existing test beds/labs and collaboration strategy .

## Phase 2

- Public funding decided.
- Will start when the project description for phase 2 is ready and approved
- Three Years. From Autumn 2018 to mid 2021
- Budget: **61 MSEK** ( 30 MSEK public funding, 31 MSEK co-funding)

# SMIG Partners

Projektpart	Roll / Agerande i projektet som
Rock Tech Centre	Projektägare med projektledning
Boliden	Gruvföretag / Test siter
LKAB	Gruvföretag / Test siter
Atlas Copco	Maskinleverantör, Testsite
Sandvik	Maskinleverantör
Volvo CE	Maskinleverantör
ABB	Global system leverantör
Ericsson	Global systemleverantör
IBM	Global systemleverantör
Algoryx	Delsystemleverantör

Projektpart	Roll / Agerande i projektet som
BnearIT	Delsystemleverantör
DataDuctus	Delsystemleverantör
Mobilaris	Delsystemleverantör
Optimation	Delsystemleverantör
Oryx	Delsystemleverantör
Bergteamet	Tjänsteleverantör
SKB / Aspö	Test site
LTU	Test lab + pilotutvecklare mm
Umeå Universitet	Test lab + pilotutvecklare mm
Uppsala Universitet	Test lab + pilotutvecklare mm

# SMIG – WPs and use cases

## Work packages in the project

1. Project management
2. Collaboration with other test initiatives
3. Pilot test
  - Three use cases
4. Security and business model
5. Technical integration and system issues
  - One system integration use case
6. Dissemination of project results

# SMIG – WPs and use cases (cont.)

## About, and intentions with use cases

- Describing the requirements on an integrated test bed
- Try, test and verify that the test bed works and can be set in operation
- Conduct **Use cases** and give valuable results for the partners in each use case
- SMIG will use **User stories** so that it can be verified that every partner interested in a test will get valuable results
  - **As a** *< type of user >*, **I want** *< some goal / wish >* **so that** *< some reason >*.
- Uses case descriptions will be presented och discussed at the SMIG consortium, June 11 at Arlanda airport

# SMIG – Use case 1

## “Rock excavation production system”

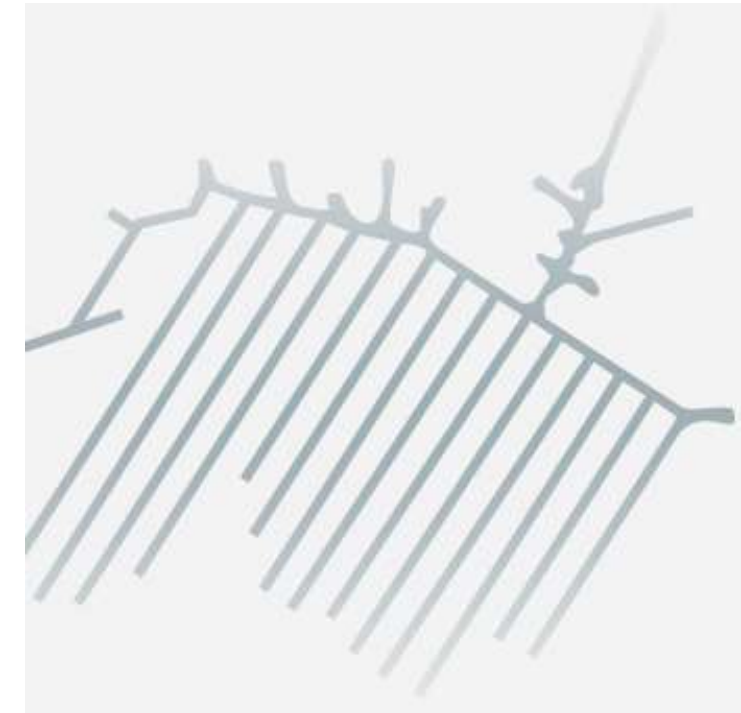
Simulate the rock production process (production flow) in a mine / tunnel when a mobile miner is used. Purpose is to analyse collaboration machine and production system. Also involving transferring of data from operation to simulation model and the production planning systems



Epiroc



BERGTEAMET





# SMIG – Use case 2

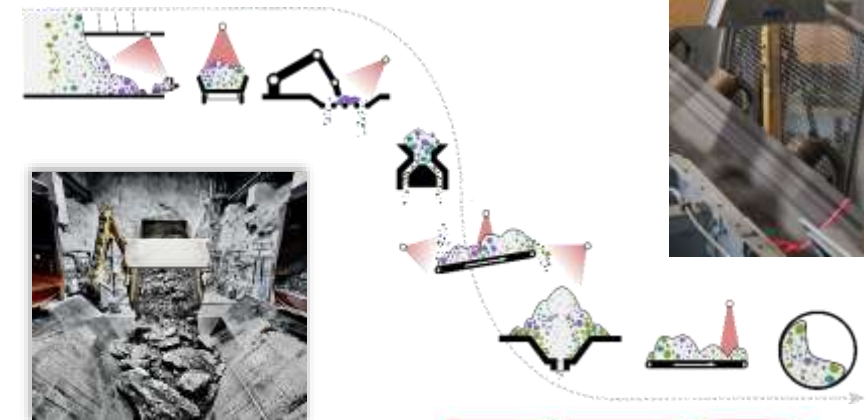
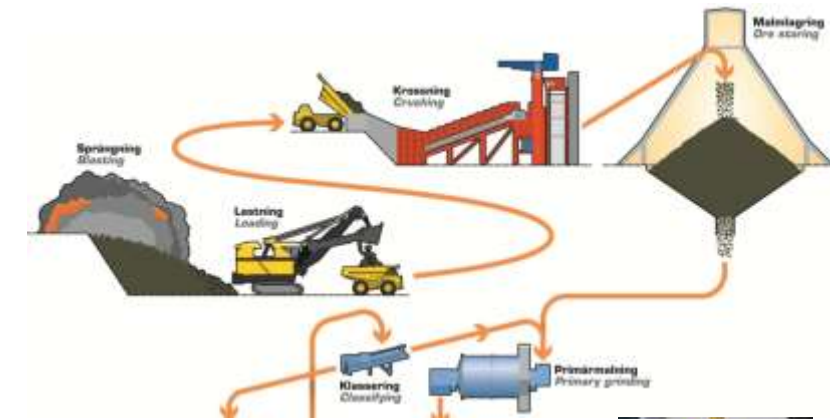
## Digitized material tracking through the value chain

Material tracking through the value chain supports analysis of causal relationship, production planning and optimization of the process value chain with all unit operations from drilling / blasting to grinding.

Including things like cloud computing, digital twins, material characteristics, IT infrastructure, models, algorithms, sensors, monitoring and control systems

In each process section, the expected material flow can be predicted and followed using "virtual tags".

- 10 + 2 partners has confirmed interest to participate
- Work further to delimit and concretize plans

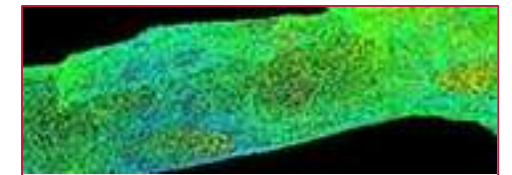
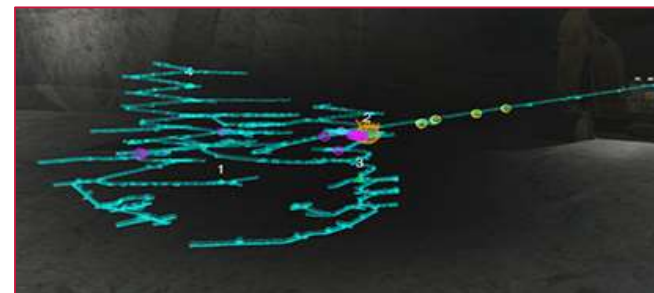
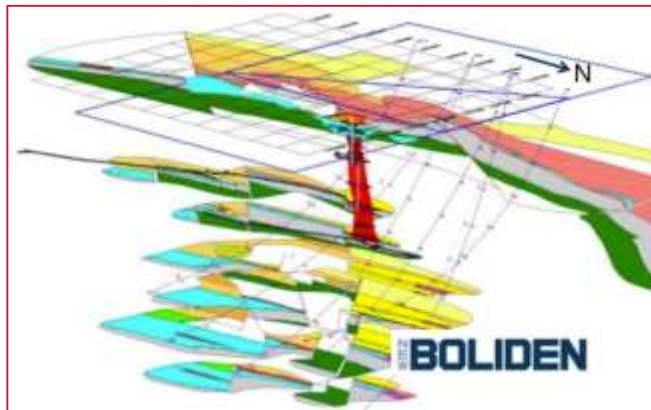


# SMIG – Use case 3

## “Intelligent rock reinforcement system”

Simulate/test the rock reinforcement process including relevant equipment, sensors and systems.

NOTE: The Use case description just started



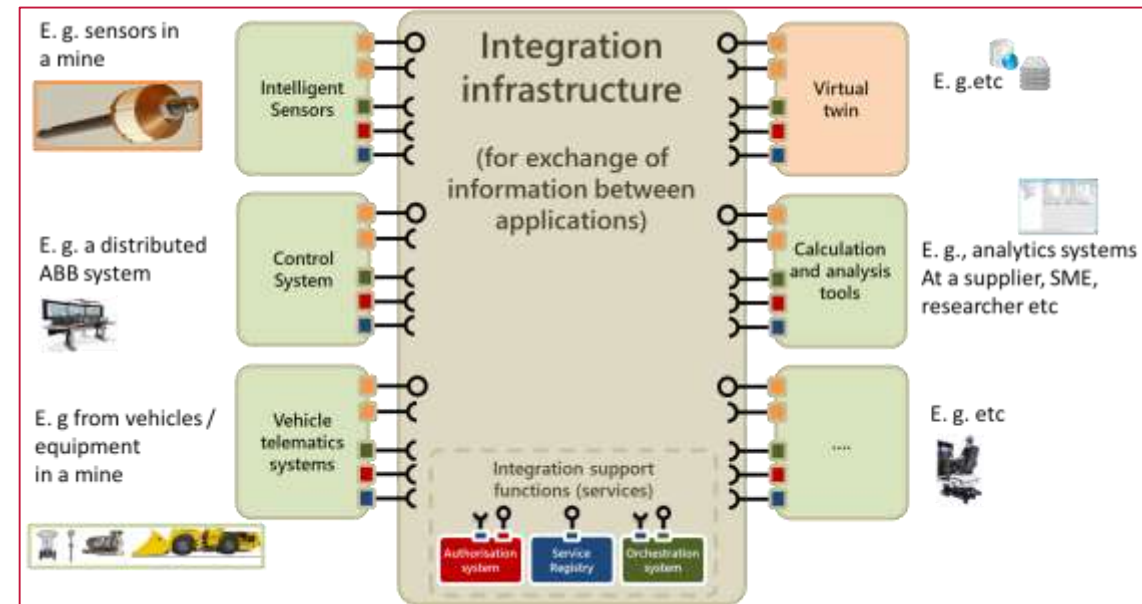
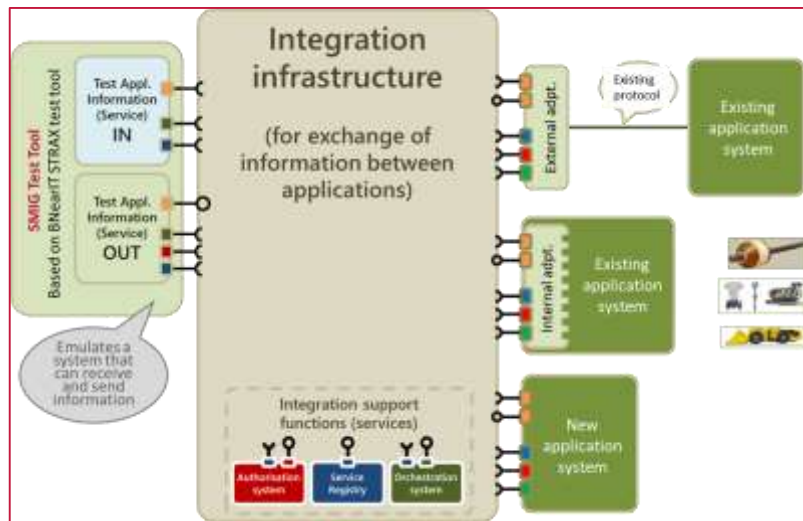
# SMIG – Use case 4

## SMIG integration infrastructure and support

Arrowhead service integration model is used.

Involves technology verification and demonstration of Plug and Play of test components

Includes providing a SMIG Integration test tool



# SMIG – Deliveries

- Description of SMIG - the smart integrated test environment for the mining industry.
- Operating organization decided with agreed business model
- SMIG in operation as an available integrated test environment
- Results and reports from a number of completed use cases
- Report and plan on gender equality supported by SMIG

# SMIG – Contact Info

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The screenshot shows a web browser window with the following details:

- Browser tab: Rock Tech Centre – Board
- Address bar: [www.rocktechcentre.se/about-rtc/board-of-directors-and-ceo/](http://www.rocktechcentre.se/about-rtc/board-of-directors-and-ceo/)
- Page header: RTC, c/o Luleå University of Technology, SE-971 87 Luleå, Phone +46 (0)920 49 30 93
- Logo: **RTC** ROCK TECH CENTRE
- Slogan: *Moving theory into practice*
- Navigation menu: Home, Core business, Added Value, Projects in the pipe, Completed projects, RTC Associated Partners, **About RTC**, Contact us

# SMIG Vision

- The Swedish industry is a global pioneer in 'Automation and Digitalization of Mining' based on the strengths developed in the Process Industrial IT sector.
- The SMIG test bed is the global leading provider of test facilities for intelligent mining technologies supporting innovation for Large mining companies, Original Equipment Manufactures, industry suppliers, academia, institutes, and small medium enterprises.