IREDES
INTERNATIONAL ROCK EXCAVATION DATA EXCHANGE STANDARD

IREDES
Information Exchange for Digital Mining

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AGENDA

1) What is IREDES?
2) Main principles
3) Architecture
4) Profiles of IREDES
5) What’s next?
6) Summary

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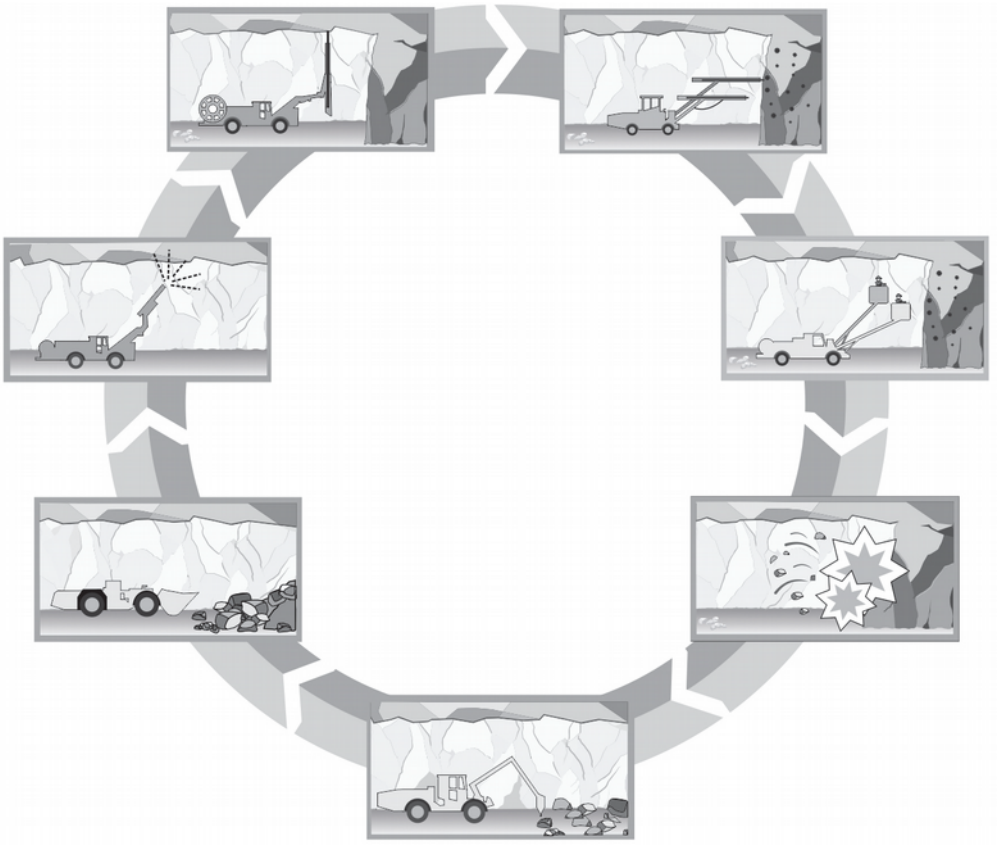
International
Rock
Excavation
Data
Exchange
Standard



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Purpose

Integration of mining / tunneling equipment into IT-Infrastructures:

- Building Information Modeling (Tunneling)
- Planning software
- Reporting, Maintenance and and Operational Databases
- Access to online status for coordination purposes

Purpose

Integration of mining / tunneling equipment into Automation:

- SCADA - Systems
- Machine – to – Machine Communication

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WHAT IS IREDES?

IREDES is an IT standard designed specifically for mining process:

- Designed by Industry for use in Industry
- Designed to covers many areas of the operational mining process
- Open for integration of all kind of equipment
- Basis for interoperability

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IREDES MEMBERS

Atlas Copco
LKAB
BARRICK
BOLIDEN
VALE
Rio Tinto
SANDVIK
ORICA
normet
FOR TOUGH JOBS
ABB
AngloAmerican
HATCH
MICROMINE
Intuitive Mining Solutions
Bever Control
AMBERG TECHNOLOGIES
symboticware
PeckTech Consulting Limited
DYNO
Dyno Nobel

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SOME IREDES PRINCIPLES

Profiles in IREDES are developed by professionals from different parts of the mining industry. It allows to cover many aspects of works.

IREDES provides a flexible version handling with the aim to prevent from regular updates of field equipment.

Any IREDES Data Set can be extended by additional, not (yet) standardized information which however may not be essential to operate the equipment.

IREDES is object oriented to prevent from redefinition of commonly used information. It uses modern web based technology (XML schemas).

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Mining Equipment versus Industrial Automation

Criterion	Mob. Mining Equipment	Industry Automation
Network availability	No / temporarily	permanent
Software update distribution	Frozen “as delivered”	permanent
Equipment dependence	Machine = Indep. System	Part of fixed plant

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INFORMATION COVERED

1. Production plan
2. Performance report
3. Quality report
4. Maintenance report
5. Real Time Status Information

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APPLICATIONS

- Production Plans
- Performance Reports
- Maintenance Reports
- Quality Reports
- Machine Status Reports

and more

for:

- Drill Rigs
- LHD Trucks
- Chargers
- Profilers

and more

TECHNOLOGY

- XML (eXtensible Markup Language) and its schema (XSD) are the basis of the IREDES standard
- A well known, mature IT standard applied to mining process optimization
- Human-readable and machine readable
- Wide selection of supporting software, programming libraries and tools.

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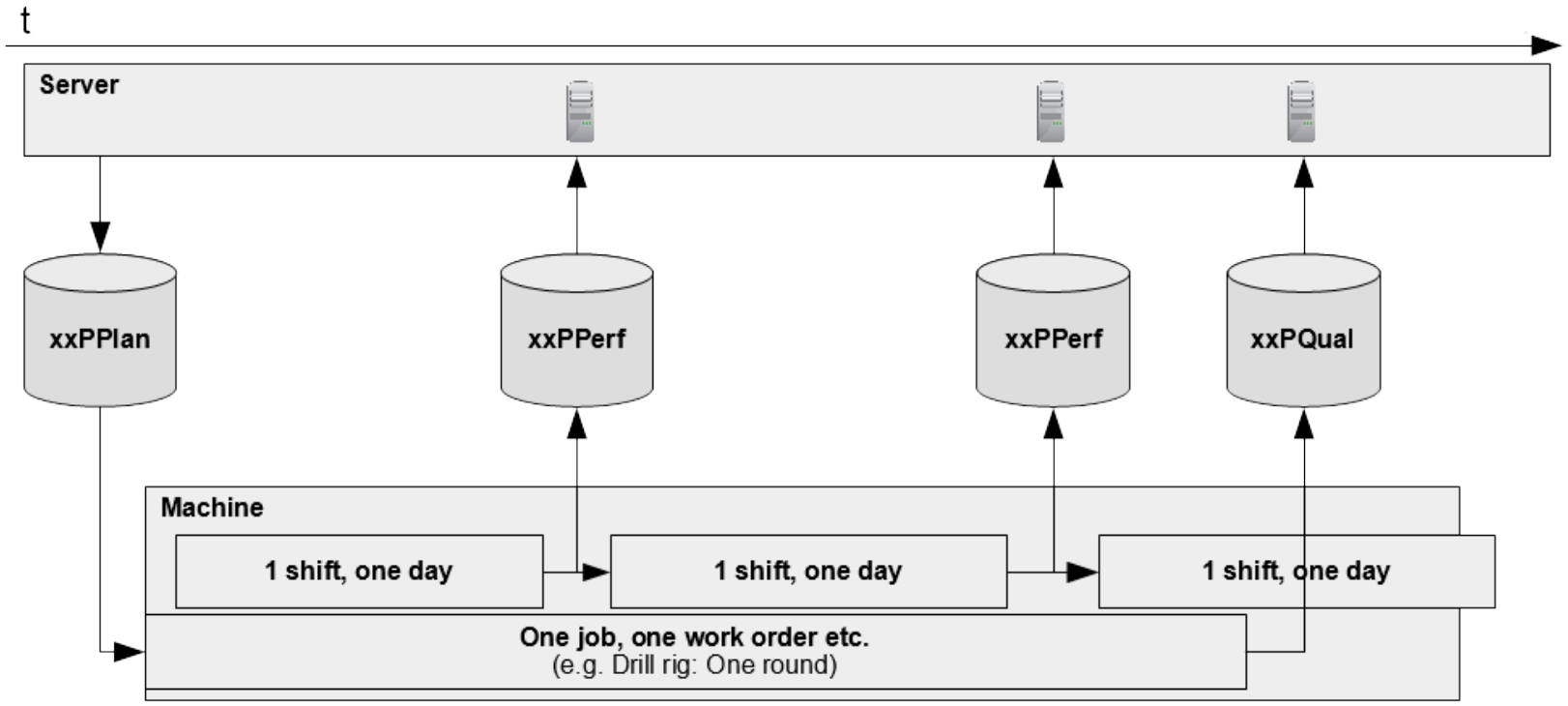
REPORTS EXCHANGE



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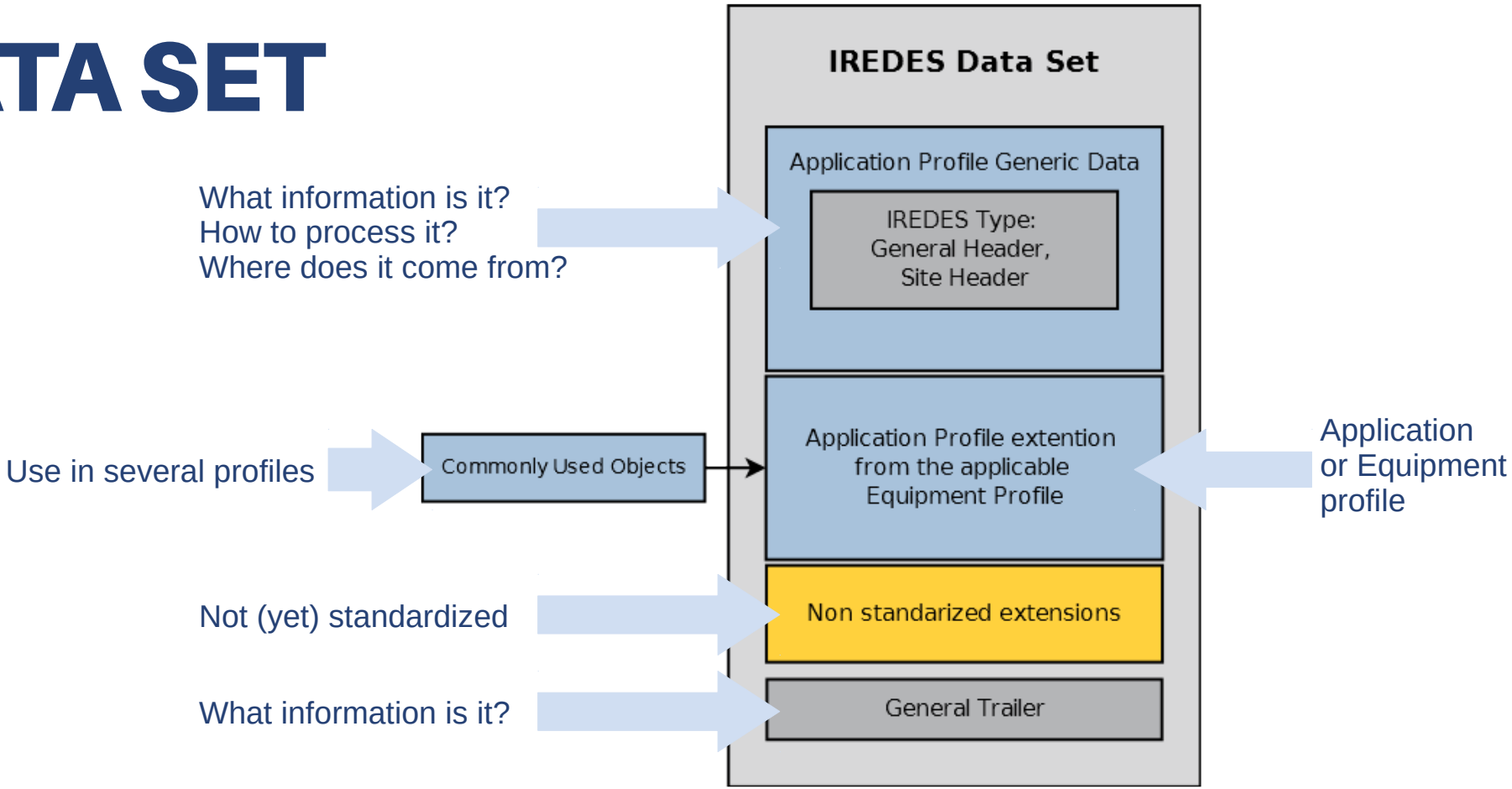
DATA SET



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COMMUNICATION CHANNELLS

Files on physical media

File transfer via an TCP/IP based network environments

Web services

OPC UA (ongoing activity)

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RELEASED IREDES PROFILES:

- Drill Rig Equipment Profile
- Chargers Equipment Profile
- Shotcrete Equipment Profile
- LHD Trucks Equipment Profile
- Tracking Equipment Profile
- Coordination System Application Profile

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DRILL RIG EQUIPMENT PROFILE

The purpose of the IREDES Drill Rigs Equipment Profile is to define standardized:

- Electronics Drill Plans to be used by any kind of rig.
- Electronic shift- or daily reports ("*How much work has to be performed during a period*")
- Electronic quality reports ("*How accurate were the holes placed and which problems occurred during the round*")
- Drilling reports per hole ("Measurement-While-Drilling")

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CHARGERS EQUIPMENT PROFILE

The purpose of the EXPLOSIVES CHARGERS Equipment Profile is to define standardized information like:

- Plans for the individual and accurate charging of explosives to each hole in a round
- Reports on the machine productivity ("*Production Performance Report*")
- Reports on the Quality and accuracy of work in relation to the Plan ("*Production Quality Report*")

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COORDINATE SYSTEM

The IREDES COORDINATE SYSTEM defines methods to transform different coordinate systems into each other:

- The coordinate systems for machines do not need to be changed "*just for compliance to IREDES*"
- It is possible to use different coordinate systems in the mining environment
- IREDES defines methods how to exchange the transformation matrices in a standardized way.
- IREDES defines interfaces, not systems!

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LHD TRUCKS EQUIPMENT PROFILE

The purpose of the LHD/TRUCKS Equipment Profile is to define:

- Reporting about the driven distances
- The load carried (as far as electronically available on the machine)
- The number of cycles
- Optional, potentially also site specific information

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TRACKING EQUIPMENT PROFILE

The TRACKING Equipment Profile defines standardized information formats for:

- The location of an object, person or asset in the mine (in IREDES coordinate system format)
- The type of object, person or asset reported
- The time stamp the location information was generated
- Additional optional information if required

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SHOTCRETE EQUIPMENT PROFILE

The SHOTCRETE Equipment Profile defines standardized information for:

- Plans for the application of shotcrete
- Plans for the mixtures to be used
- Reports on the machine productivity (“Production Performance Report”)
- Reports on the Quality and accuracy of work in relation to the Plans (“Production Quality Report”)

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EXAMPLE APPLICATIONS

IREDES on standard equipment

IREDES reports

Date	Shift	Machine	Reports	Number of cycles	Operation time	Fuel level [%]	Fuel usage [l/h]	Start	Stop	Load [t]	Total distance	Avg. time of cycle
2017.08.02	1	Mach1	9	9	7.17	24.92	45.81	12:02	14:02	4722.56	0.78	13
2017.08.02	1	Mach2	24	24	37.55	24.57	56.17	06:02	11:47	13826.5	7.69	14
2017.08.02	2	Mach1	19	19	73.37	2.88	47.43	13:17	17:47	8535.73	1.76	14

M2M communication: LHD – Truck

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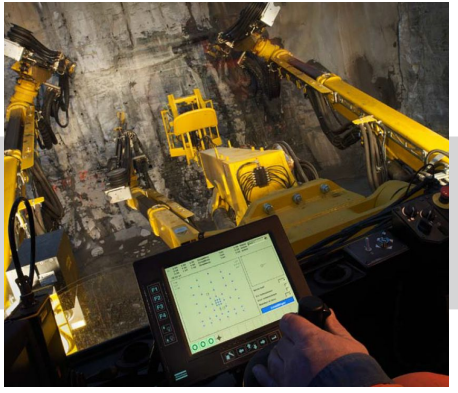
EXAMPLE APPLICATIONS

Atlas Copco – Drilling precision: Boliden Example



Off board information exchange on VirtuRail® Trains

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MAIN BENEFITS

No separate interface developments needed –
Reduced development cost

Open architecture assures possibility for future extensions and mine individual addons

Standard IT technology used enables use of standard IT security methods

Multi vendor equipment fleet seemless integrated into IT
Basis for interoperability

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WHAT NEXT

IREDES in Building Information Modelling (BIM) in commercial tunneling

Major revision of the existing profiles

Integrating OPC/UA for online access to IREDES content

Broadening the use and establish compliance testing

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Roadmap

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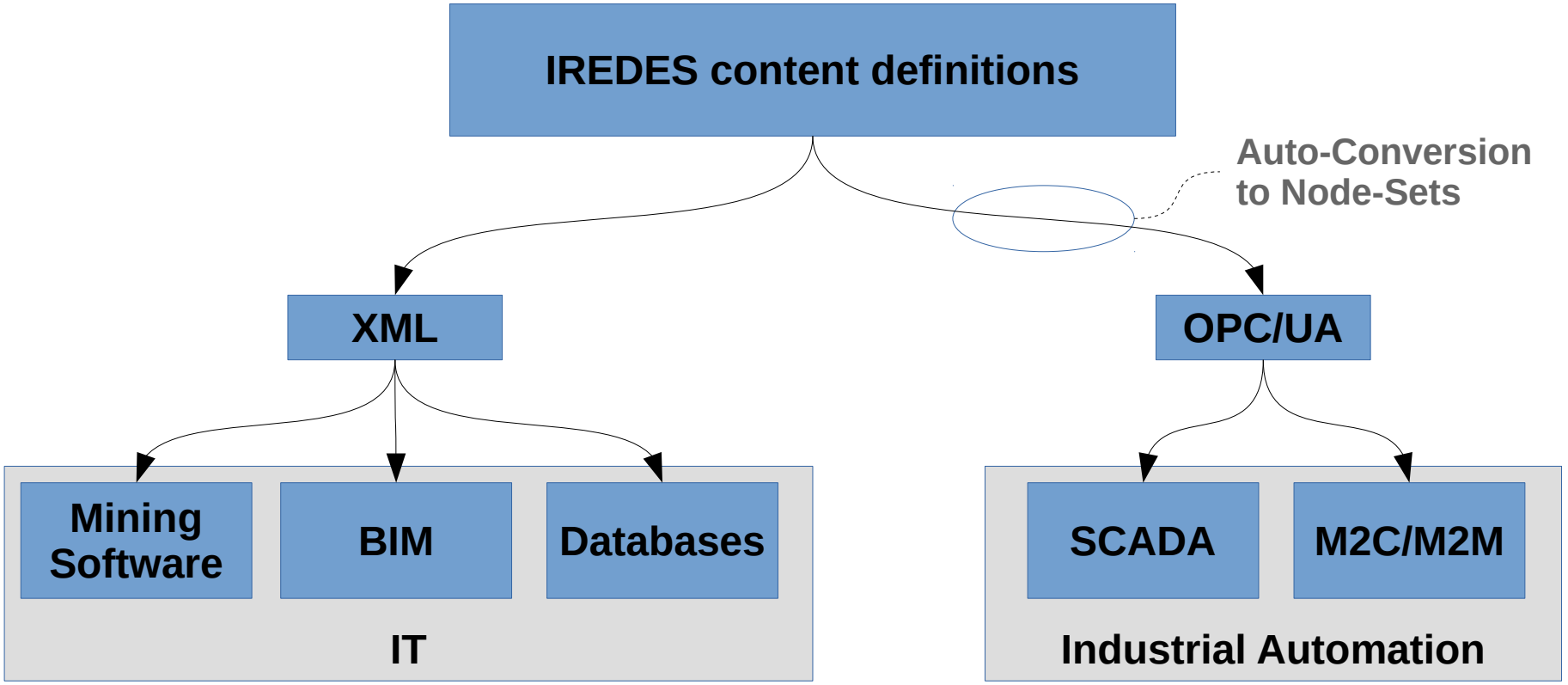

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Timeline Proposal

Timelines to be synchronized with member base

Q3/2019	**Proof of concept OPC/UA profile conversions**
10/2019	**Content Update of LHD/Trucks**
12/2019	**Content Update of Drill Rigs**
Q1/2020	**First project IREDES OPC/UA (e.g. on Loader)**

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SUMMARY

IREDES cuts costs by standardized interfaces – reduction of development cost

IREDES defines interfaces and leaves the choice of systems to the users

IREDES definitions always provide extensions and flexibility needed for technological progress

IREDES enables interoperability between different types of equipment and software in heterogeneous mining environments

THANK YOU

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