IREDES Initiative
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Chargers profile ver. 1.0

Documentation – draft

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1. General information

As modern mining machinery today is controlled electronically and even operates autonomously, a smooth and cost efficient flow of data in the mining process will be crucial for cost efficient future mine operations. Therefore, the International Rock Excavation Data Exchange Standard (IREDES) was launched by major players in the industry. The task of this initiative is to define a common electronic language for easy and standardized data exchange between mining machines and central computer systems.

This standard is expected to have significant impact on the use of automated mining equipment. Multi vendor installations will be controlled much easier than today as IREDES offers a standardized interface to all machines. Cost can be reduced as no vendor specific import/export filters have to be developed.

By using IREDES, the mining equipment will become an active part of a mining companies IT infrastructure. All data produced by IREDES compliant machines can be stored in databases. This will lead to a continuous productivity control and helps improving production planning. The XML technology used in IREDES is widely supported and open for the future.

This document is an additional textual documentation to provide documentation which cannot be integrated into the DrillRig XML schema definitions.

In case of ambiguities, the standard's XML schema is the standard's normative basis. It supersedes all other information given in text documents, presentations etc.

As the XML definitions only can contain the formal aspects of the standarization, this document adds all content definitions which base on mutual agreement. Therefore it is an important document for correct interpretation of the standard and for crossover compatibility. An fully IREDES compliant implementation has to fulfill all demands stated in the IREDES XML schema as well as in this accompanying documentation.

The Chargers Profile standardizes all the mining processes connected with charging and blasting.

Errors in the documentation as well as in the XML schemes have to be reported to the IREDES office (mkorczynski@iredes.org or info@iredes.org). Thank you for you help!

2. History of the document

Date	Person	Changes
26.05.2013	Mateusz Korczyński	First draft of the document.
29.05.2013	Mateusz Korczyński	Update after profile meeting

3. Referenced standards

ISO 8859-1: 1987, Part 1: Latin Alphabet No 1

XML Schema Part 0: Primer: http://www.ww3.org/TR/xml-schema-0/

XML Schema Part 1: Structures: http://www.ww3.org/TR/xml-schema-1/

XML Schema Part 2: Datatypes: http://www.ww3.org/TR/xml-schema-2/

XML base: http://www.ww3.org/TR/xmlbase/

Extensible Markup Language (XML) 1.0: http://www.ww3.org/TR/2000/REC-xml-20001006

XML Namespaces:

RFC1321:

Please note: The IREDES office is not responsible for the content provided by the above mentioned links. Please let us know if a link is not longer working or if content has changed so it does not relate to the intended purpose any longer.

4. Related documents

This document is a part of a set of documents describing the different parts of the IREDES standard:

The uppermost document is the IREDES Architecture description explaining the general setup and collaboration of the different parts of the standard. The “IREDES Architecture” document will be

the best choice to start with as it gives an overview and basic information needed to understand the structure of IREDES.

Detail information about single parts of the IREDES standard are available from separate documents. Readers of these documents should be familiar with XML, XML schemas and implementation relevant issues.

Standard definition used in common throughout multiple equipment profiles are covered by the corresponding documentation of the “General Objects” (Application Profiles, General Data Types etc) and “Commonly used Objects” (CuO's).

All standard information concerning a particular equipment type (Drill Rigs, LHD's, …) is contained in a separate document related to the equipment profile.

Beside the textual descriptions, the entire standard is available as XML schemes as they contain the formal description of the standard. In case of ambiguities, the definitions in the XML schema override all definitions made in the accompanying textual documentation. Textual description available for different IREDES profile is additional information mainly containing parts of the standard not definable in XML schemes. Implementors should take care of these documents as they may contain important information which must be defined basing on “mutual agreement” to make the standard work.

5. Structure of the profile

The flow of schemas is illustrated below.

The new type ECRecipe contains info how the explosives should be prepared – it is used optionally in ECChargeHole. ECPQual describes the quality of prepared mixture.

Charging machines generate ECPerf files during their work.

ECChargeHole describes every particular hole in the wall with detailed info about explosives which should be used for blasting.

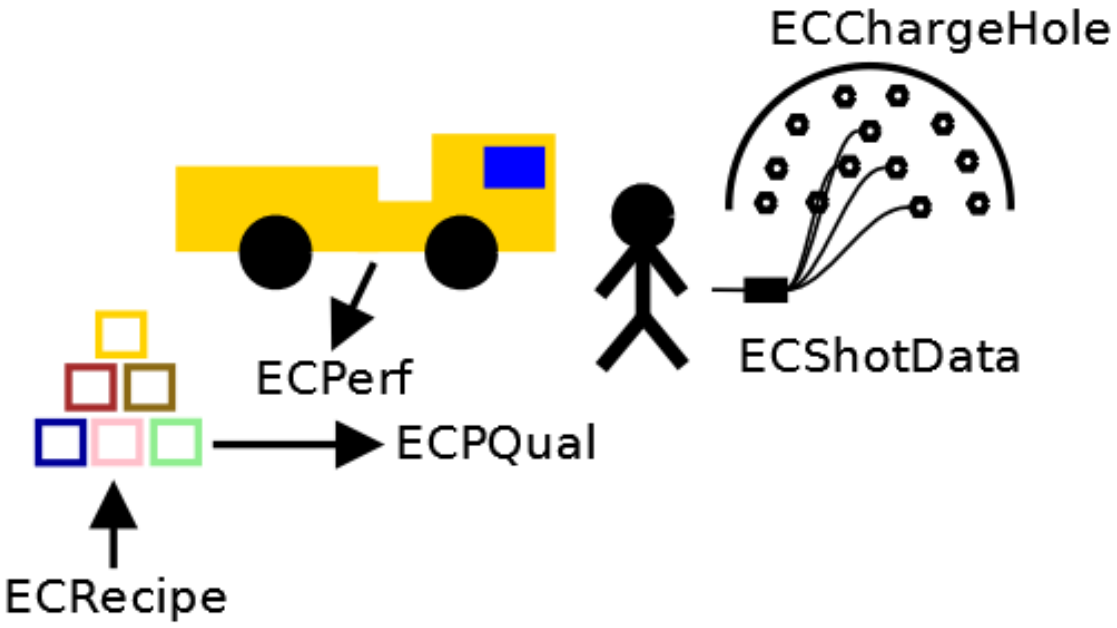

Illustration 1: Structure of the chargers profile

6. Performance – ECPPerf

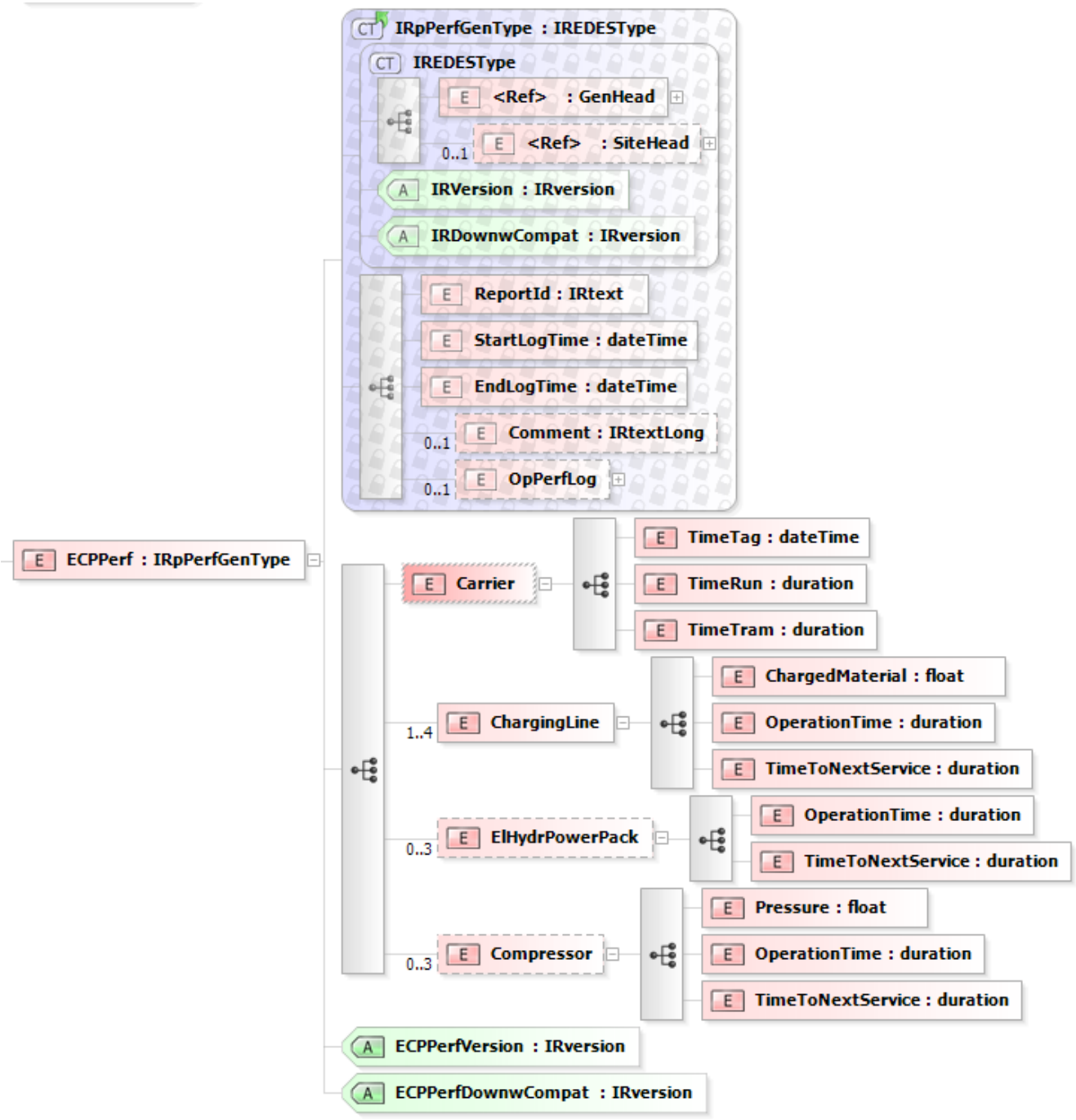

Illustration 2: ECPPerf

Type: IRpPerfGenType

Carrier – carrier's time of work

TimeTag (dateTime)

TimeRun (duration) – duration of run

TimeTram (duration) – duration of tramming

Time of work = TimeRun-TimeTram

ChargingLine (1..4)

ChargedMaterial (float) – pumped material [kg]

OperationTime (duration) – time of operation

TimeToNextService (duration) – time to next service

ElHydrPowerPack (0..3)

OperationTime (duration) – time of operation

TimeToNextService (duration) – time to next service

Compressor (0..3)

Pressure (float) – pressure of compressor [Pa]

OperationTime (duration) – time of operation

TimeToNextService (duration) – time to next service

7. Quality – ECPQual

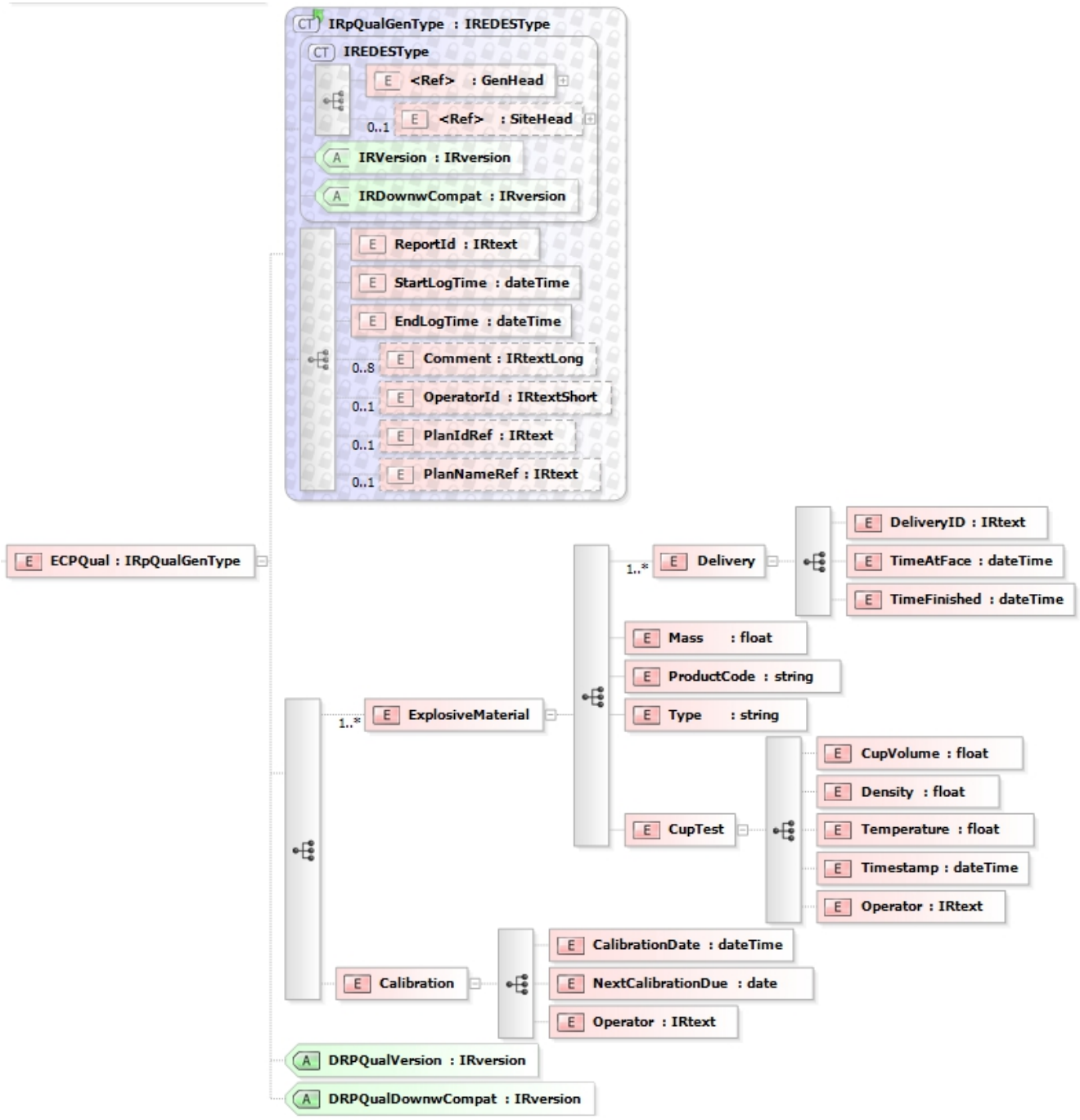

Illustration 3: ECPQual

ExplosiveMaterial (1..*)

Delivery

DeliveryID (IRtext) – identification of delivery

TimeAtFace (dateTime) – time of delivery at face

TimeFinished (dateTime) – time when the explosive is ready to shoot

ProductCode (string)

Mass (float) – mass of explosive material

Type (string) – type of explosive material

CupTest – information about cup test

CupVolume (float)

Density (float) – [g/cm^3]

Temperature (float) – temperature of cup test [°C]

Timestamp (dateTime) – timestamp of cup test

Operator (IRtext) – operator name

Calibration

CalibrationDate (dateTime) – date of last calibration

NextCalibrationDue (date) – date of next calibration

Operator (IRtext) – operator name

8. Shot Data – ECShotData

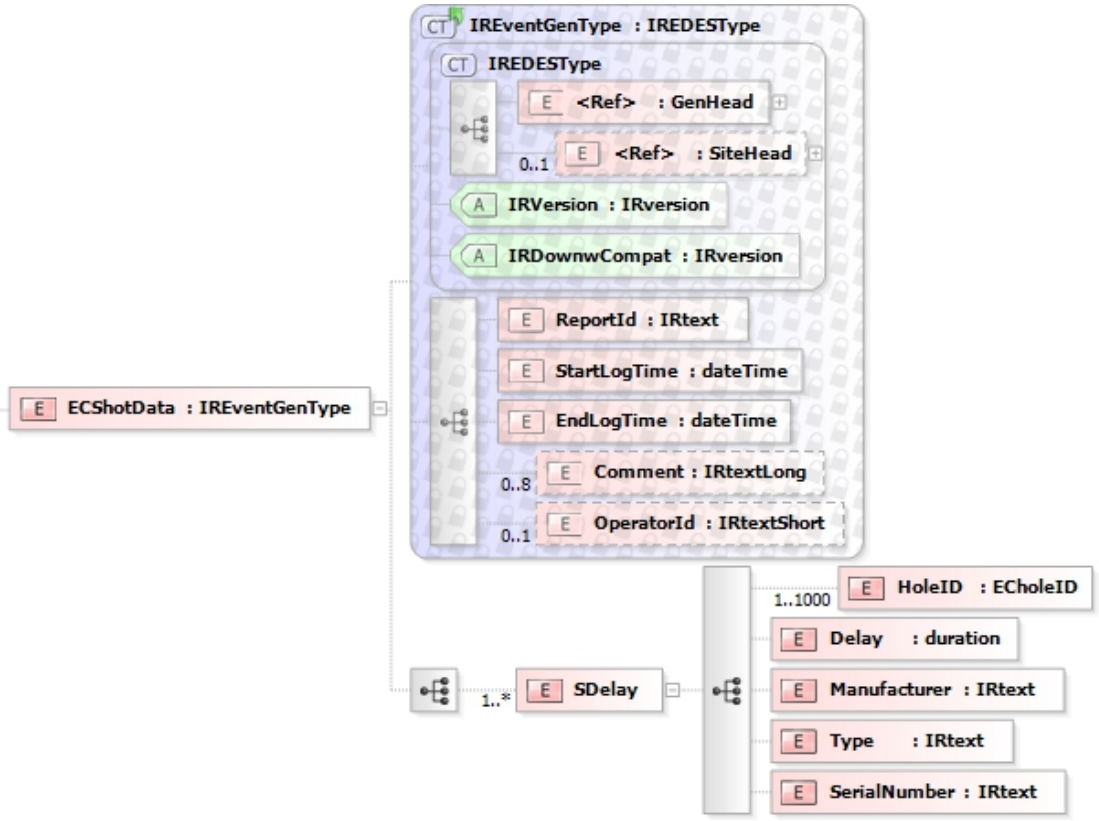

Illustration 4: ECShotData

SDelay

HoleID (ECholeID)

Delay (time) – surface delay

Manufacturer (IRtext) – name of manufacturer

Type (IRtext)

SerialNumber (IRtext)

9. ChargeHole – ECChargeHole

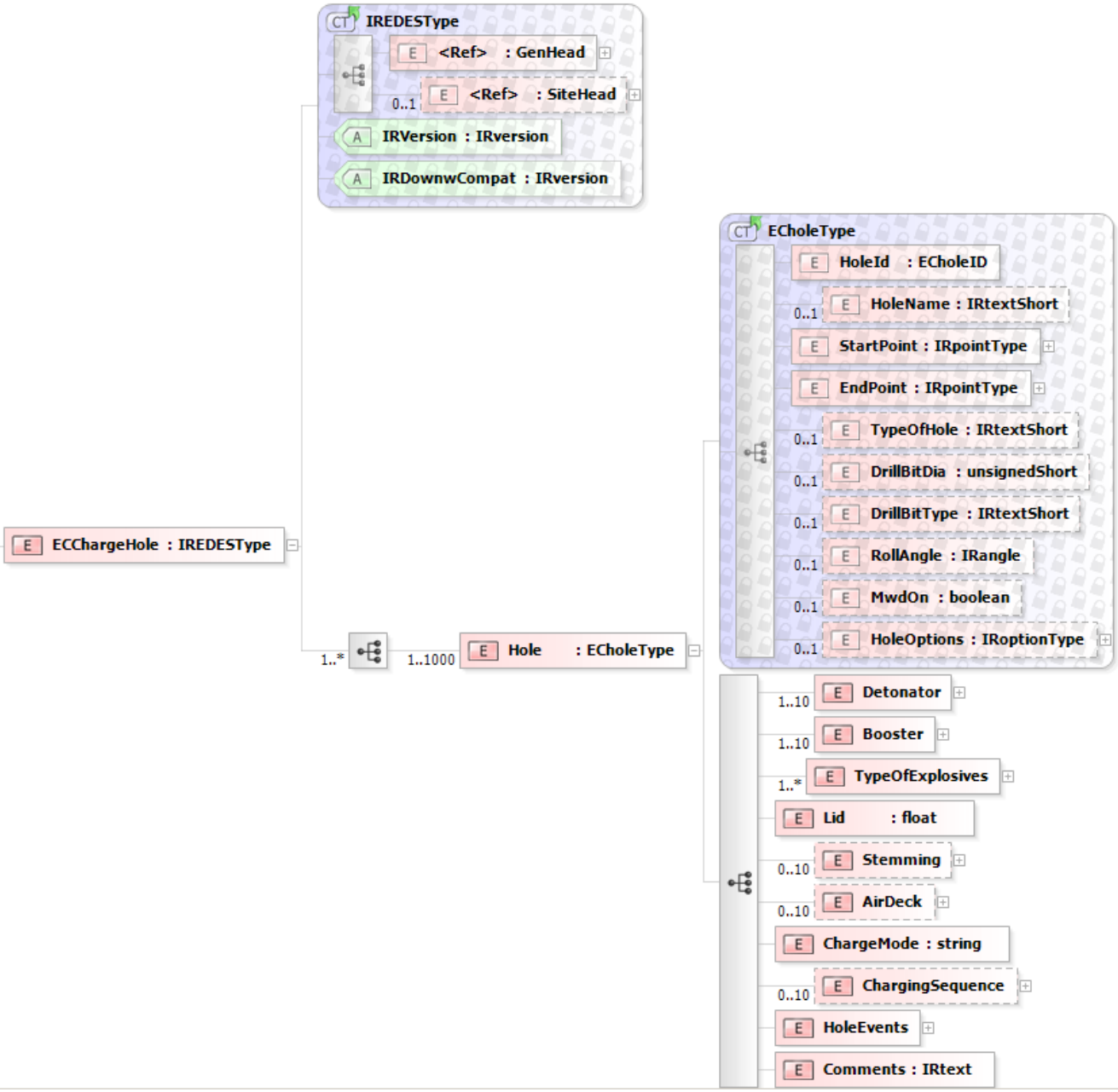

Illustration 5: ECChargeHole

Hole (ECholeType)

Detonator (1..10)

Type (string/enum) – type of detonator: electric, non-electric, electronic

Manufacturer (IRtext) – name of manufacturer

PartNo (IRtext) – part number

ProductText (IRtext) – additional text about the product

SerialNo (IRtext) – serial number of the detonator

Delay (duration) – detonator delay

LocationInHole (float) – location of the detonator in the hole

Booster (1..10)

Type (string) – type of booster

Manufacturer (IRtext) – name of manufacturer

PartNo (IRtext) – part number

ProductText (IRtext) – additional text about the product

SerialNo (IRtext) – serial number of the booster

PrimerType (IRtext) – type of primer

AmountUsed (float) – amount of used booster [kg]

LocationInHole (float) – location of booster in hole

TypeOfExplosives (1..*)

Manufacturer (IRtext) – name of manufacturer

ProductID (IRtext) – product ID

DeliveryID (IRtext) – delivery ID

ProductText (IRtext) – additional text about product

StartPoint (float) – start point of explosive

EndPoint (float) – end point of explosive

MassOfExplosives (float) – mass of explosives [kg]

LengthOfExplosives (float) – length of explosives

Type (string/enum) – type of explosives: bulk, pumped, packaged

Lid (float) – location of lid

Stemming (0..10)

StartPoint (float) – start point of stemming

EndPoint (float) – end point of stemming

AirDeck (0..10)

StartPoint (float) – start point of air deck

EndPoint (float) – end point of air deck

ChargeMode (string/enum) – manual, automatic

ChargingSequence (0..10)

ChargerID (string) – ID of charger

Sequence (1..1000)

SeqNum (unsignedShort) – number of sequence

HoleID (EcholeID) – hole ID

EquipmentData (EquipmentInfoType) – info about used equipment

HoleEvents

Depth (float) – position of 'event' in the hole

Comment (IRtext/enum) – description of 'event' in the hole

Comments (IRtext)

10. ECRecipe type

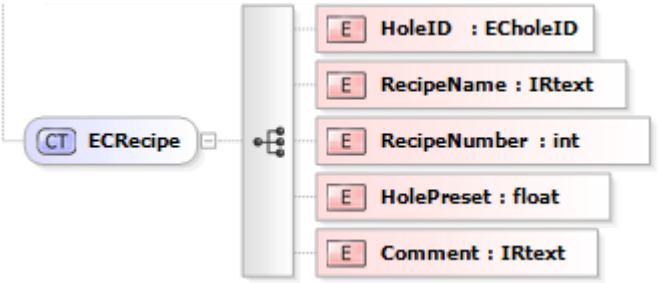

Illustration 6: ECRecipe

ECRecipe is a new element in the ChargebaseClasses. It contains information

Information about how charged explosive material is manufactured in charging unit. New element in ChargebaseClasses.

HoleID (ECHoleID) – hole ID

RecipeName (IRtext) – name of a recipe

RecipeNumber (int) – number of recipe

HolePreset (float)

Comment (IRtext) – comment

11. Location in holes

To define location of boosters, detonators, air decks... is used the method presented below. The zero point is defined as the point where a driller “touch the rock the first time”. The placement is measured from this point “inside”.

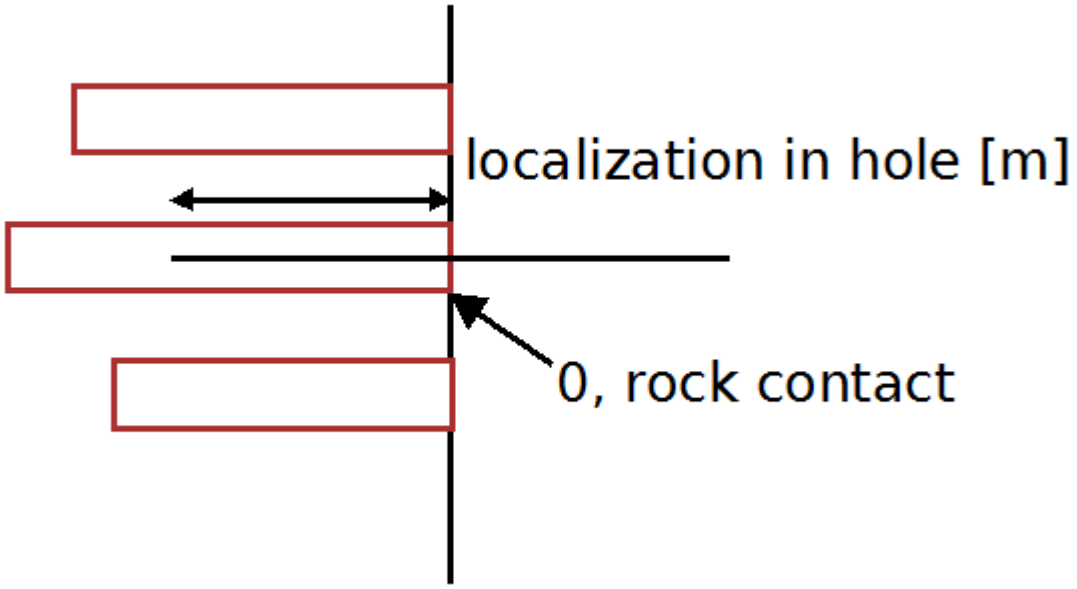

Illustration 7: Localization in a hole - the method of measurement

12. Special thanks

The Chargers Profile was developed by the team of mining professionals.

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Thank you!