and

Integrating iiRDS into DITA

Harald Stadlbauer, August 14, 2024

Harald.stadlbauer@ninefeb.com

Boston DITA User's Group

Who is NINEFEB

Who is NINEFEB

NINEFEB offers a comprehensive portfolio covering the following services:

- Technical Documentation
- Risk assesment
- eLearning
- Knowledge processing

NINEFEB is a member of the tekom and the iiRDS consortium

956 successful projects

4 NINEFEB companies in 2 countries

Our slogan:
Everything is possible

Market domains:
Automotive, Machinery, Aviation, Defense, MedTech, Railway, . . .

Over **90** customers

50 people

1 650 kg coffee

Member of the IDTA since start, working on the AAS Submodels

Industrial Digital Twin Association

OASIS OPEN Boston DITA User's Group NINEFEB

Introduction to iiRDS

iiRDS – is what?

Intelligent Information Retrieval and Delivery Standard

since 2016

current version 1.2: https://iirds.org

A Metadata Scheme in RDF

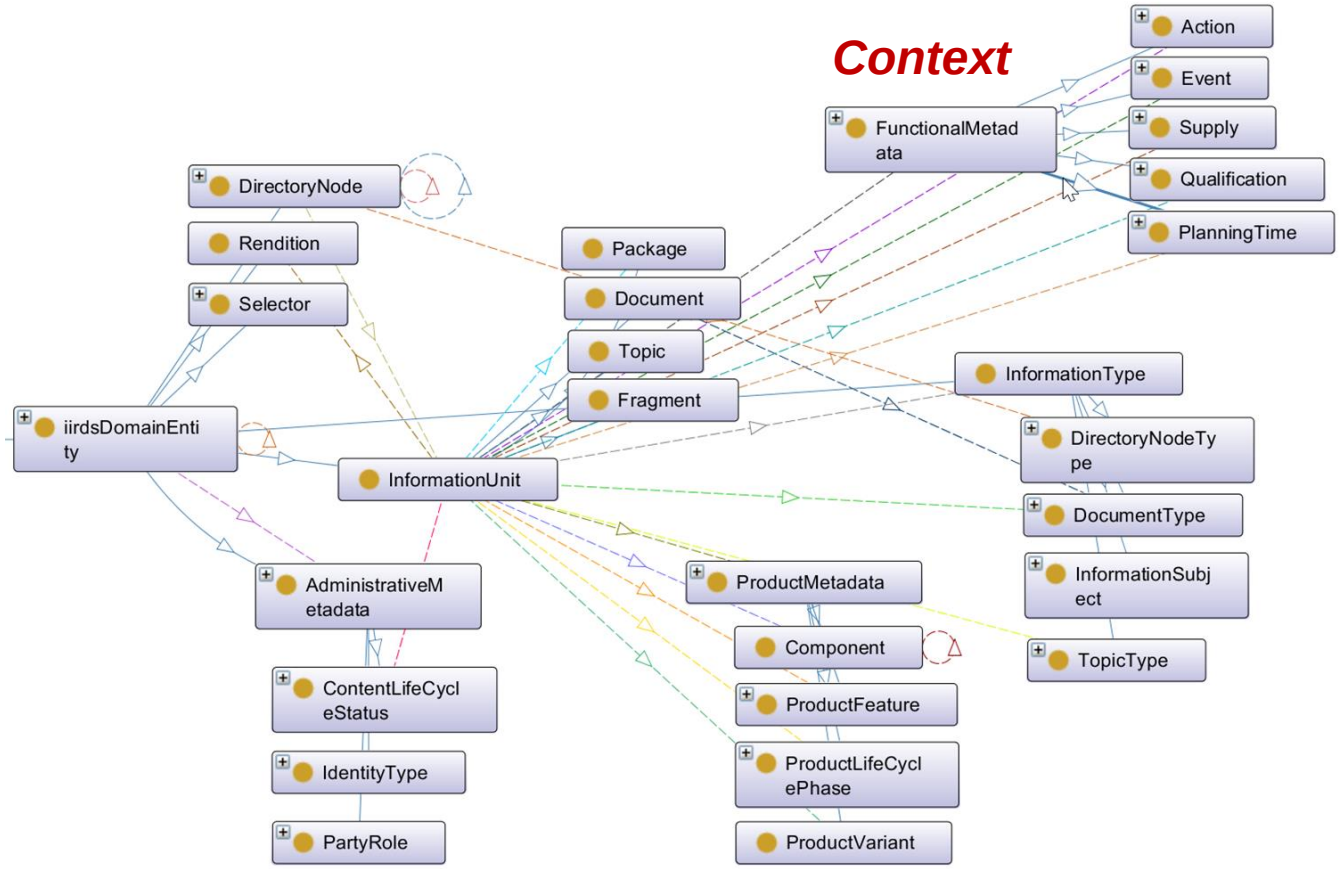
Boston DITA User's Group

The Start of iiRDS

Subgroup prepared 10 epics with 59 user stories.

ID	Name	As…	I would like	because/so that	priority (MOSCOW)	Is metadata needed? If yes, what? Resulting information/meta data requirements	Note
E1	Epic: Matching the information to persons, roles, context and task						
E2	Epic: Information for scheduled servicing						
E3	Epic: User requires information for operating the machine/plant in normal operation and has access to the necessary information						
E4	Epic: As an operator I would like to receive information relevant to my current system						
E5	Epic: Compile specific documentation sections for different application purposes (tests, export,…)						This does not refer to the functionalities of an editing system but to content from different information sources which can be put together dynamically
E6	Epic: Assistance information and operating parameters						If applicable, functional demands on an application but not on the delivery standard
E7	Epic: Search functions						If applicable, functional demands on an application but not on the delivery standard
E8	Epic: Media compatible presentation						
E9	Epic: Extension of documentation by user						If applicable, functional demands on an application but not on the delivery standard
E10	Epic: Security						

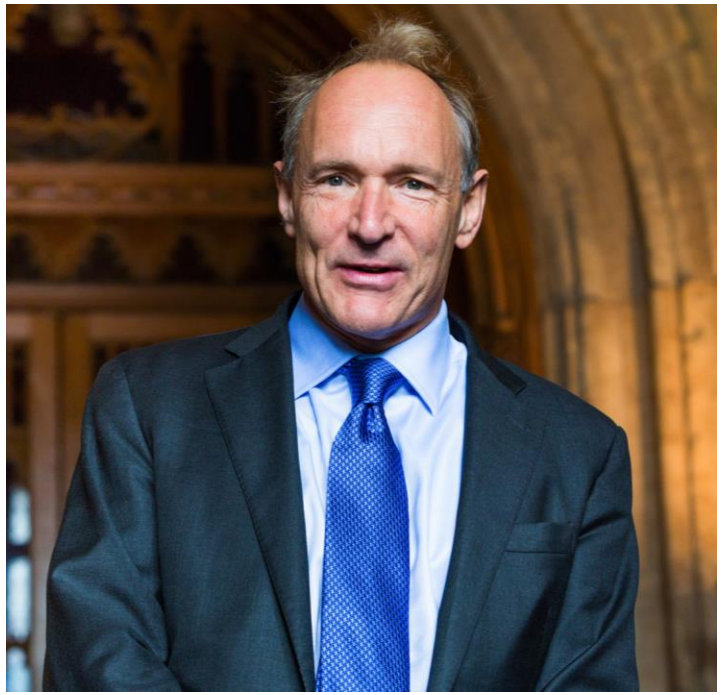
Types of iiRDS metadata



iiRDS is based on RDF (W3C)

RDF is based on triples:

„Product“ ***hasA*** „Document“



Tim Berners-Lee: Semantic Web

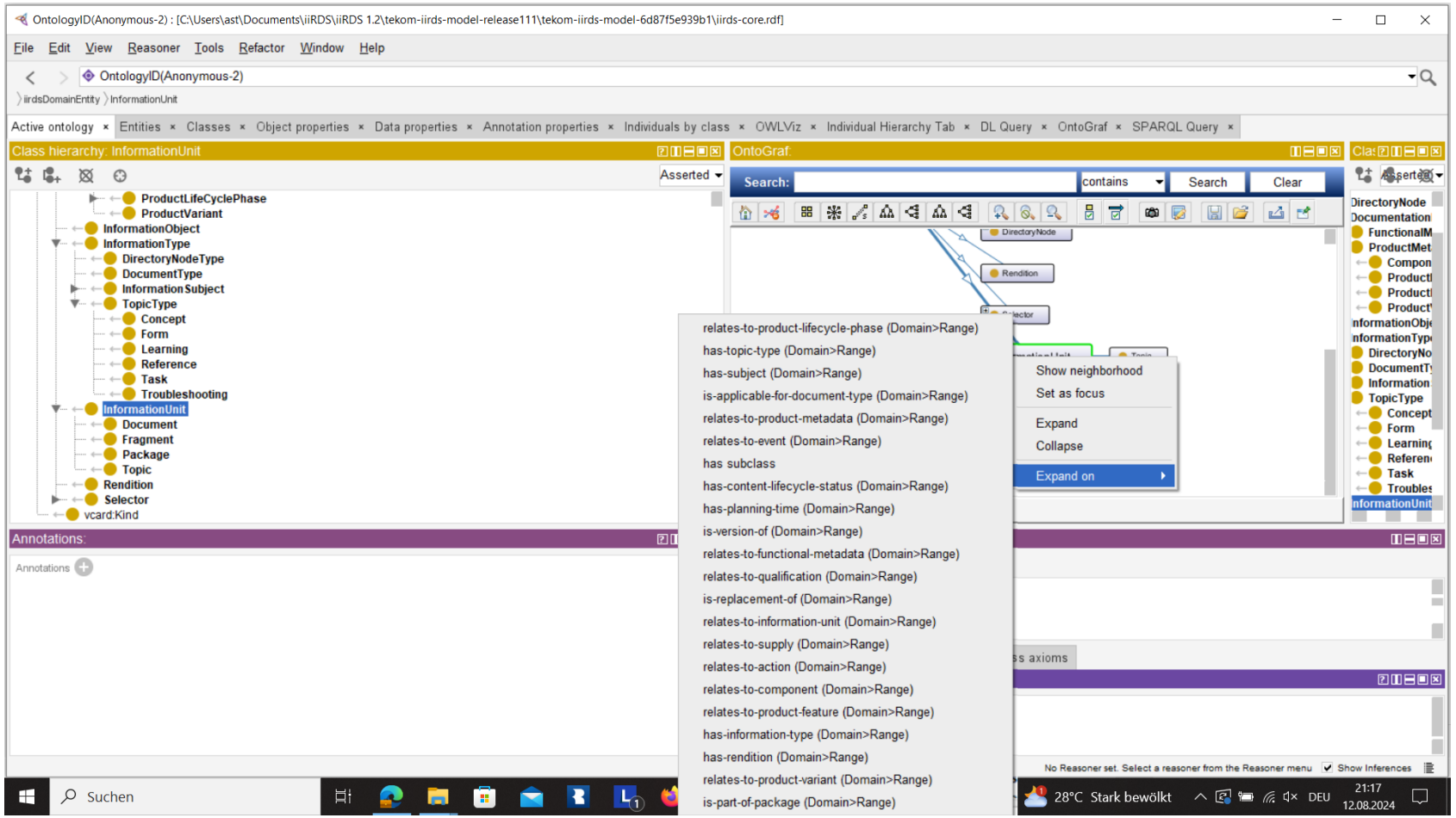
DITA and Metadata

In DITA, metadata are integrative parts of structures like maps and topics:

```
<?xml version="1.0" encoding="utf-8"?><!DOCTYPE concept PUBLIC "-//Sandvik Mining//DTD DITA Concept//EN" "sandvikConcept.dtd"[]><concept class="- topic/topic concept/concept " id=
"GUID-6145A0F3-FE73-44B3-BCF0-FDBCC4D7B038" xml:lang="en-US"><title class="- topic/title " translate="no" id="GUID-CAE3962A-4BEA-4906-8845-501DC7AB8522">Hydraulic power unit
</title><titlealts class="- topic/titlealts "><searchtitle class="- topic/searchtitle ">Hydraulic power unit</searchtitle></titlealts><prolog class="- topic/prolog "><metadata
class="- topic/metadata "><keywords class="- topic/keywords "><indexterm class="- topic/indexterm ">hydraulic system<indexterm class="- topic/indexterm ">hydraulic power unit
</indexterm></indexterm><indexterm class="- topic/indexterm ">hydraulic power unit</indexterm></keywords></metadata></prolog><conbody class="- topic/body  concept/conbody " id=
"CONBODY_F4917324099247DB8DCAA342422FCB90"><p class="- topic/p " id="P_16D80F40704D41989EE754215C5586C5"> The hydraulic power unit consists of
        the following main components:</p><ul class="- topic/ul " id="UL_7358DEAD34D44DC6905051B1E7478181"><li class="- topic/li " id="LI_86667E8C52E048FD84562A0E5EC06AB8">
        Hydraulic tank.</li><li class="- topic/li " id="LI_C06FEA2558DA4A1FA3386F01CB2EC97A">Hydraulic pumps.</li><li class="- topic/li " id=
        "LI_236CE7924CF044B9A724410286B18AF7">Electric motor for the pumps.</li><li class="- topic/li " id="LI_0D17D1F19EF84CB28A1AD372EB344FFA">Hydraulic filters.</li><li
        class="- topic/li " id="LI_09E4B555226845988E3996E46E3758E7">Monitoring devices.</li></ul>
    <fig id="fig_rtt_4rc_qkb" varref="hydraulic-power-pack">
        <title id="GUID-29DC34CA-ECBB-4A00-8619-975531D300D7">Hydraulic power pack</title>
        <image align="center" href="GUID-819DA564-9AF5-427B-8BCC-C3FE37E0611B" id="image_stt_4rc_qkb" outputclass="page_wide" placement="break" />
        <simpletable id="simpletable_ttt_4rc_qkb">
            <strow>
                <stentry>1</stentry>
                <stentry>Hydraulic power pack drive (e-motor) </stentry>
            </strow>
            <strow>
                <stentry>2</stentry>
                <stentry>Axial piston pump - hydraulic circuit 1 </stentry>
            </strow>
            <strow>
                <stentry>3</stentry>
```

How can we connect these to other sources of Enterprise data“

Linking Product Metadata with Information Metadata

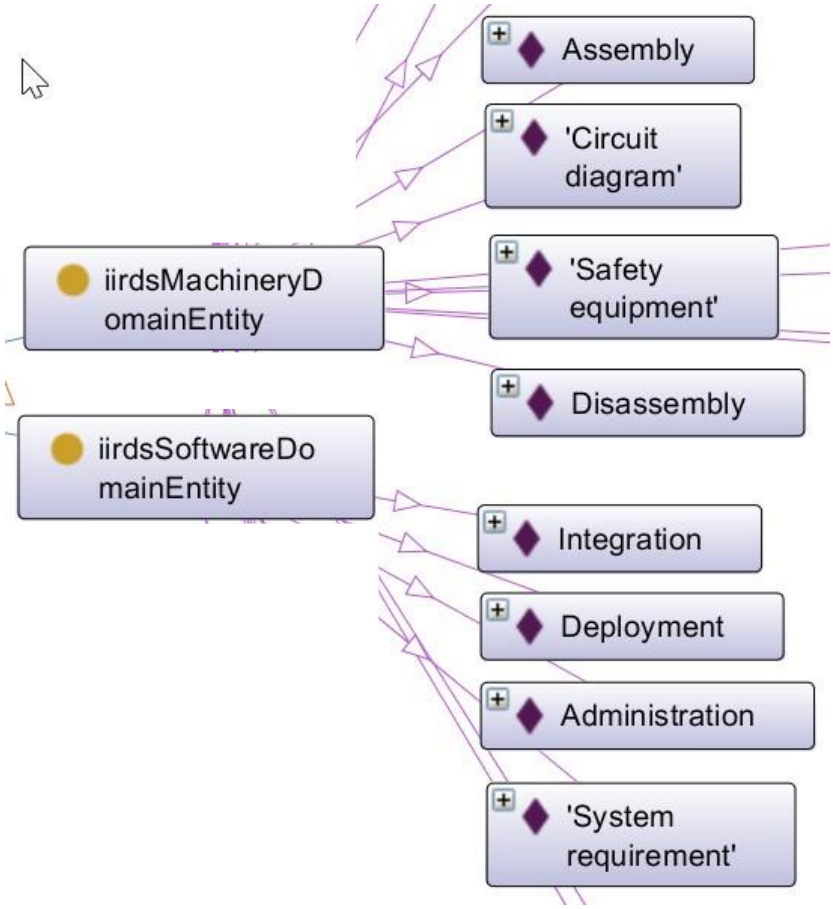


Relations of the Information Unit

Relations assign metadata to InformationUnits

- `relates-to-event`:
  Documentation describes a specific event, e.g. for troubleshooting
- `relates-to-product-metadata`:
  Content applies for a specific product, a component, or a phase of the product life cycle
- `has-subject`:
  Content deals with one or more specific subjects
- `requires-supply/requires-qualification/requires-time`:
  The content contains information about required tools, supplies, time intervals or time period. The documented working task requires a specific skill or qualification.

iiRDS Domains linking up together



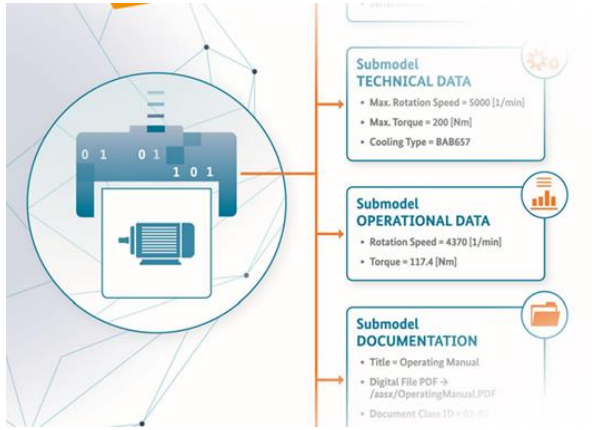
- Domains collect classes and instances that extend the core vocabulary
- Keeps core vocabulary lean and easily accessible
- Sub-namespaces of iiRDS
- Machinery domain and software domain
- Collect subjects, product lifecycle phases, functional metadata

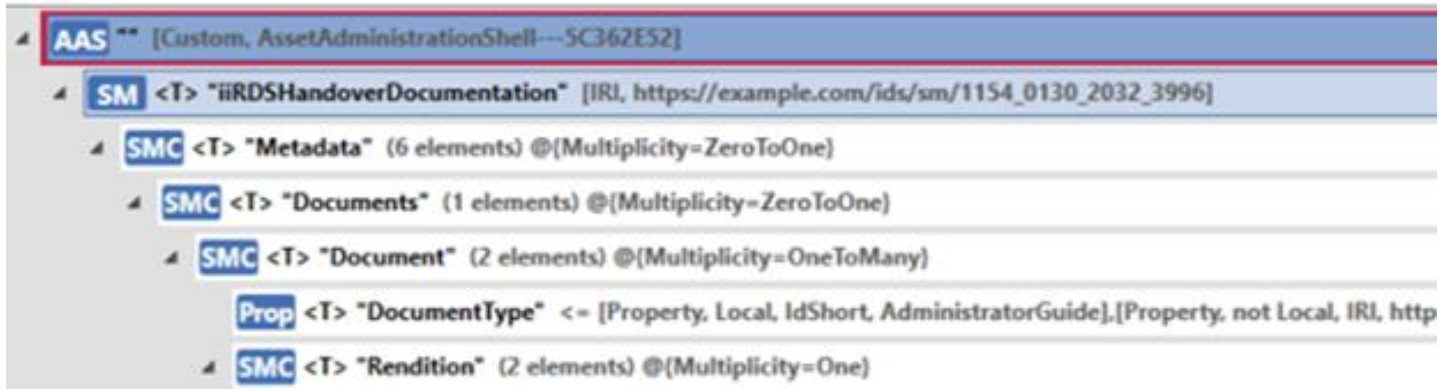
Why iiRDS

The world is embracing RDF…

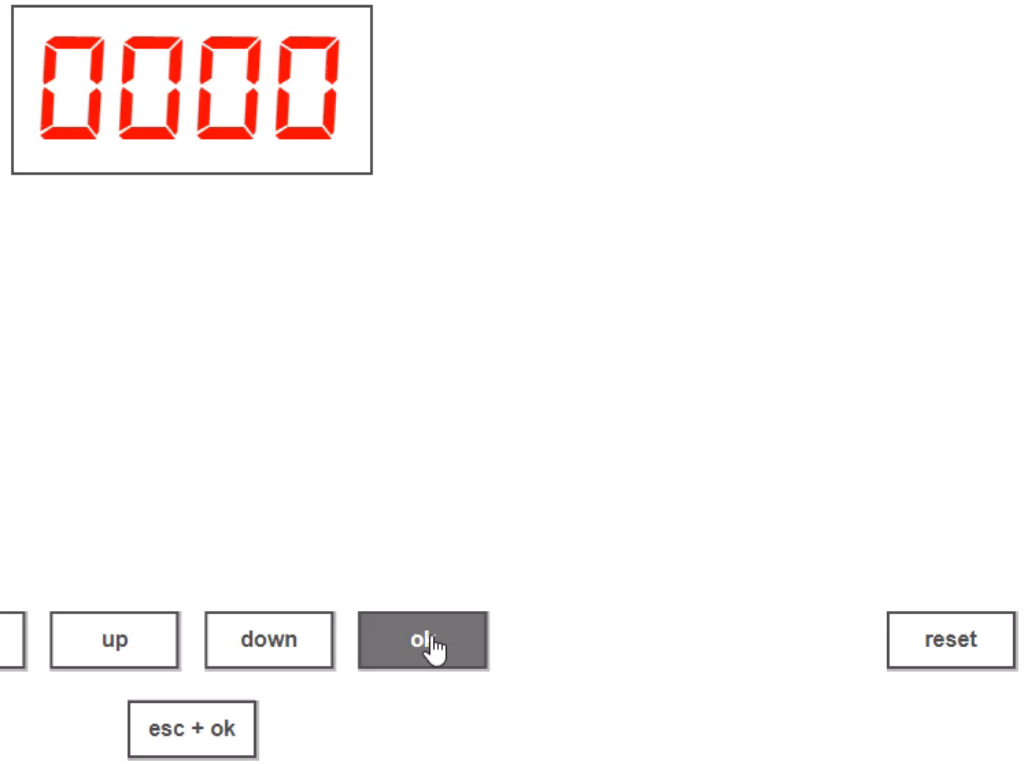
- CLASS is now going in direction RDF (Product Data Management)

- AAS (Asset Administration Shell – Digital Product Passport) is offering a RDF serialisation

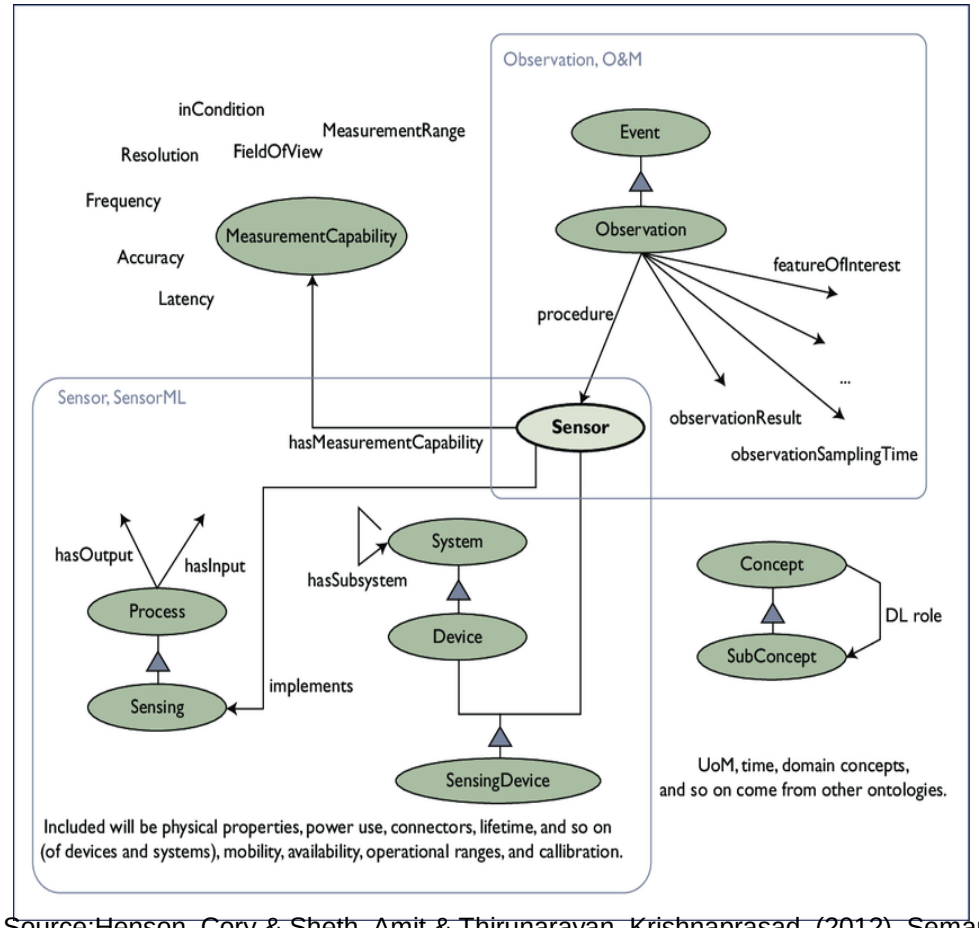




Wouldn't it be nice....



Connecting to context



`iirds:Event`: Represents events in the technical equipment. Instances of the `iirds:Event` class *MUST* have the following properties: `iirds:eventCode` and `iirds:eventType`. The `iirds:Event` class is a docking point for iiRDS Generators to link documentation content with event information code according to a standard like OPC-UA or a custom convention. The property `iirds:relates-to-event` links `iirds:InformationUnit` with `iirds:Event`.

Source:Henson, Cory & Sheth, Amit & Thirunarayan, Krishnaprasad. (2012). Semantic Perception: Converting Sensory Observations to Abstractions. IEEE Internet Computing - INTERNET. 16. 26-34. 10.1109/MIC.2012.20.

DITA and Taxonomy

Subject Schemes in DITA are fit for expressing hierarchies, alternatively classification maps might be used for classification purposes.

However, there are two scenarios, where you need a common standard of a taxonomy:

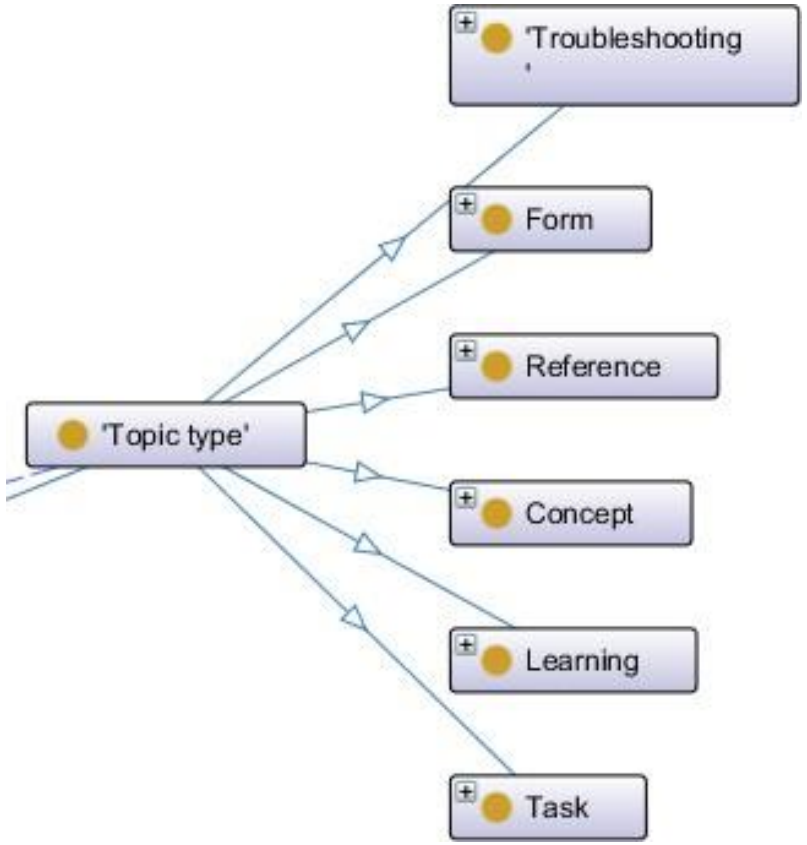
1. Information exchange between supplier and OEM:
   they definitely need a common ground of a joint vocabulary and a joint taxonomy to be able to integrate the information without a lot of rework

2. Targeted information search and retrieval based on a standard vocabulary and taxonomy.

iiRDS is offering the standard for that.

Integrating iiRDS into DITA

iiRDS

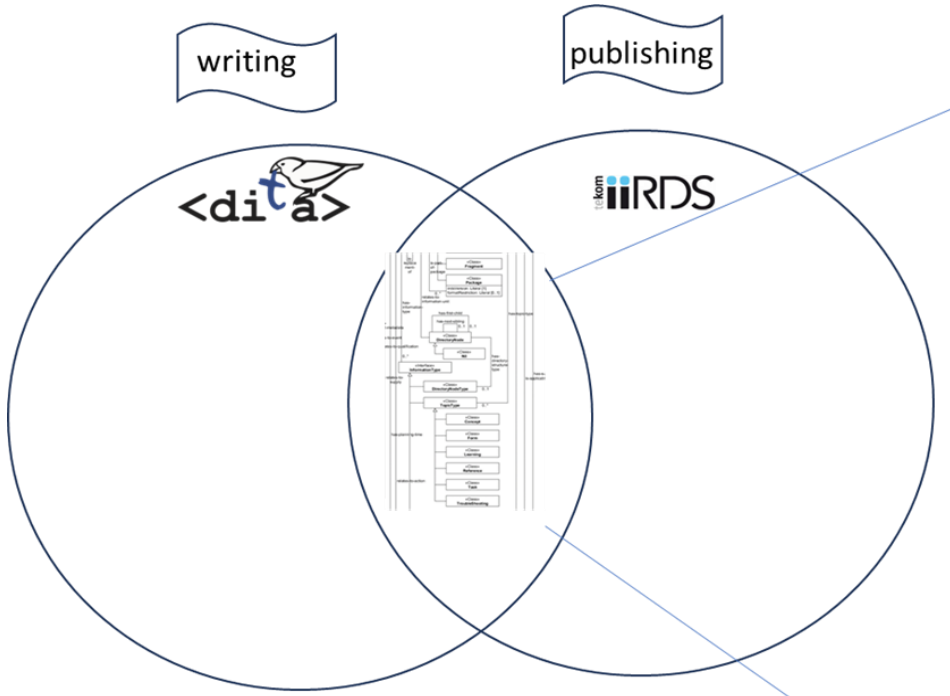


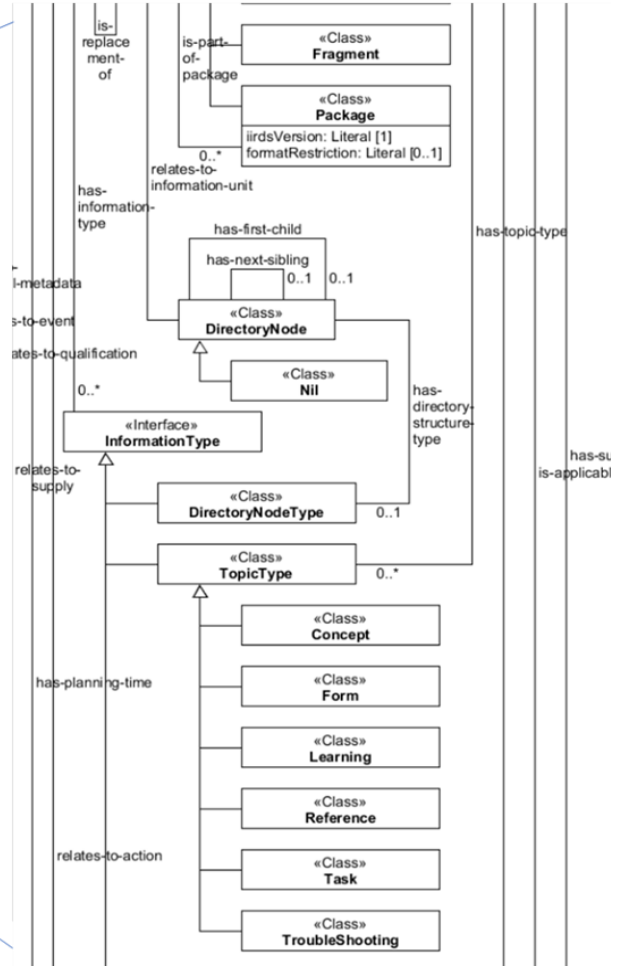
- All instances of the `InformationUnit` subclasses may have one or more relations to one of the standardized topic types

iiRDS and DITA – where do they match

iiRDS took over some elements from DITA like the Topic types, granting to use the modularity of DITA and already the used Topic Types as metadata for iiRDS.

And even more, DITA has the structure of a “component” like iiRDS, too, and DITA offers audience as a structural element, which matches to role and skilllevel in iiRDS.

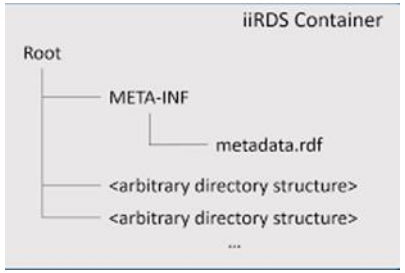




Integratin iiRDS into DITA

In general, there are **2** ways of bringing DITA and iiRDS together:

- Use **DITA-OT and the NEW iiRDS plugin from Empolis and Parson** to publish a container with the following iiRDS structure:



  Result: publishing result is the package

- Set up a DITA RDF scheme, mapping the RDF „DITA Classes“ to iiRDS Classes
  Result: dynamic knowledge graph; dynamic information retrieval

THE CONTAINER STRUCTURE IS INTENDED TO EXCHANGE DATA, SUCH THAT OEMS MIGHT USE THE DATA OF THE SUPPLIER.

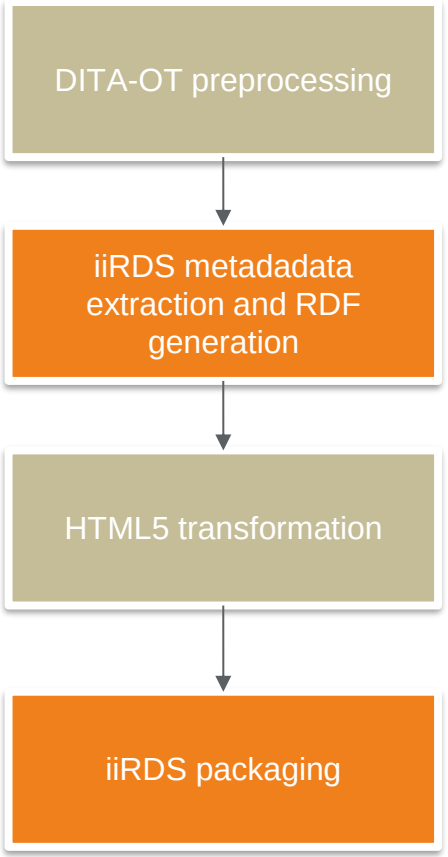
DITA-OT and the NEW iiRDS plugin into DITA?

Available in „Basic“ milestone

- Extraction of metadata:
  - title
  - topic type from topic root element
  - `<prodname>` as iiRDS ProductVariant
  - `<shortdesc>` as iiRDS has-abstract
  - `@xml:lang` as iiRDS language
- Default IRI assignment

Generation

- DirectoryNodes
- Topics
- Renditions
- InformationObjects
- iiRDS Document for the root map
  (!) Document always gets type „Operation instructions“
- HTML output using the HTML transformation



DITA-OT and the NEW iiRDS plugin into DITA?

Available in „Extended“ milestone – “Basic” plus…

- Extraction of metadata
  - from semantic elements
    - <product>
    - <audience>
    - <component>
    - <copyright>
    - <created>
    - <revised>
  - from attributes
    - @product
    - @audience

Extension points

- custom IRI handler
  - to provide additional methods to assign IRIs to information unit, information objects and metadata vocabulary instances
- custom metadata handler
  - to provide additional metadata extraction methods
- generic extensions
  - to intercept the DITA-OT process

DITA-OT and the NEW iiRDS plugin into DITA?

- Additional metadata extractors
  - Properties `@product` and `@audience` on root elements
  - Element `<audience>`: `@type` ➔ Role, @experiencelevel ➔ SkillLevel
  - Element `<copyright>` ➔ rights
  - Element `<critdates>` ➔ dateOfCreation, dateOfLastModification, ContentLifecycleStatus/Released/dafeOfEffect/datefOfExpiry

- Sample plugin demonstrating how to extend the iiRDS plugin
  - Additional IRI provider using a CSV file
  - Additional metadata extractor
  - Implementing iiRDS specific DITA-OT extension points

Snapshots using a Toaster

toaster v3	01.05.2024 15:06	Microsoft Edge HT...	21 KB
toaster	01.05.2024 23:30	DITAMAP-Datei	2 KB
Toaster	01.05.2024 22:02	PNG-Datei	4 KB
Topic-002	01.05.2024 13:41	DITA-Datei	4 KB
Topic-003	01.05.2024 13:49	DITA-Datei	3 KB
Topic-004	publish_toaster_modmkr	14.08.2024 13:45	Windows-Befehlss...
Topic-004a	publish_toaster_modmkr_docx	14.08.2024 13:46	Windows-Befehlss...
Topic-005a	publish_toaster_modmkr_html5	14.08.2024 13:46	Windows-Befehlss...
Topic-005b	publish_toaster_modmkr_iiRDS	14.08.2024 13:46	Windows-Befehlss...
Topic-005b1	publish_toaster_modmkr_pdf	14.08.2024 13:46	Windows-Befehlss...
Topic-005c	toaster	14.08.2024 13:45	IIRDS-Datei
Topic-005d			
Topic-005e			
Topic-006			
Topic-007			

Typ: IIRDS-Datei
Größe: 79,5 KB
Änderungsdatum: 14.08.2024 13:45

C:\Users\ast\Documents\DITA\Boston DITA Group\DITA-OT\

Name	Size	Packed Size	Modified
commonltr.css	8 839	8 839	2024-05-02...
commonrtl.css	9 535	9 535	2024-05-02...
index.html	2 052	2 052	2024-05-02...
Toaster.png	3 161	3 161	2024-05-02...
Topic-002.html	3 902	3 902	2024-05-02...
Topic-003.html	3 318	3 318	2024-05-02...
Topic-004.html	1 931	1 931	2024-05-02...
Topic-004a.html	3 202	3 202	2024-05-02...
Topic-005a.html	5 100	5 100	2024-05-02...
Topic-005b.html	2 141	2 141	2024-05-02...
Topic-005b1.html	3 737	3 737	2024-05-02...
Topic-005c.html	1 787	1 787	2024-05-02...
Topic-005d.html	2 459	2 459	2024-05-02...
Topic-005e.html	1 458	1 458	2024-05-02...
Topic-006.html	3 342	3 342	2024-05-02...
Topic-007.html	5 320	5 320	2024-05-02...

```
<?xml version="1.0"?>
<rdf:RDF
    xmlns:dcterms="http://purl.org/dc/terms/"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:iirdsMch="http://iirds.tekom.de/iirds/domain/machinery#"
    xmlns:iirds="http://iirds.tekom.de/iirds#"
    xmlns:vcard="http://www.w3.org/2006/vcard/ns#"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:iirdsSft="http://iirds.tekom.de/iirds/domain/software#">
 <iirds:Package rdf:about="urn:uuid:fa971f1d-0a16-4702-a77a-afde3f3a59c9">
  <iirds:iiRDSVersion>1.2</iirds:iiRDSVersion>
 </iirds:Package>
 <iirds:Document rdf:about="urn:uuid:2d9e3d84-82df-40d6-bf6b-87587e7a8457">
  <iirds:has-document-type rdf:resource="http://iirds.tekom.de/iirds#OperatingInstructions"/>
  <iirds:relates-to-product-variant>
   <iirds:ProductVariant rdf:about="urn:md5:fe2baeda502185ee96979d0d5aa3cb20">
    <rdfs:label>2-Slice Toaster</rdfs:label>
   </iirds:ProductVariant>
  </iirds:relates-to-product-variant>
 </iirds:Document>
 <iirds:Topic rdf:about="urn:ditaid:cleaning_your_toaster:35d2b527c4a6cb5baca63af0aac0426af3d599fa6ca2b9ce9c1ef17ccf0e1985">
  <iirds:relates-to-product-variant rdf:resource="urn:md5:fe2baeda502185ee96979d0d5aa3cb20"/>
  <iirds:relates-to-qualification>
   <iirds:Role rdf:about="urn:md5:2b5622c0b992b624d0f92f8f3a658486">
    <rdfs:label>household consumers</rdfs:label>
   </iirds:Role>
  </iirds:relates-to-qualification>
  <iirds:is-version-of>
   <iirds:InformationObject rdf:about="urn:ditaid:cleaning_your_toaster"/>
  </iirds:is-version-of>
  <iirds:has-rendition>
   <iirds:Rendition>
    <iirds:format>text/html</iirds:format>
    <iirds:source>content/Topic-006.html</iirds:source>
   </iirds:Rendition>
  </iirds:has-rendition>
  <iirds:title>Cleaning Your Toaster</iirds:title>
  <iirds:is-part-of-package rdf:resource="urn:uuid:fa971f1d-0a16-4702-a77a-afde3f3a59c9"/>
  <iirds:has-topic-type rdf:resource="http://iirds.tekom.de/iirds#GenericTask"/>
 </iirds:Topic>
 <iirds:Topic rdf:about="urn:ditaid:power_cord_instructions:343ce5d38fb0cac59552a5692815e3e86397cea8e064d79763e167754117fbed">
  <iirds:relates-to-product-variant rdf:resource="urn:md5:fe2baeda502185ee96979d0d5aa3cb20"/>
  <iirds:relates-to-qualification rdf:resource="urn:md5:2b5622c0b992b624d0f92f8f3a658486"/>
  <iirds:is-version-of>
   <iirds:InformationObject rdf:about="urn:ditaid:power_cord_instructions"/>
  </iirds:is-version-of>
  <iirds:has-rendition>
   <iirds:Rendition>
    <iirds:format>text/html</iirds:format>
    <iirds:source>content/Topic-003.html</iirds:source>
   </iirds:Rendition>
  </iirds:has-rendition>
  <iirds:title>Power Cord Instructions</iirds:title>
  <iirds:is-part-of-package rdf:resource="urn:uuid:fa971f1d-0a16-4702-a77a-afde3f3a59c9"/>
  <iirds:has-topic-type rdf:resource="http://iirds.tekom.de/iirds#GenericReference"/>
 </iirds:Topic>
 <iirds:Topic rdf:about="urn:ditaid:important_safeguards:8db88bed61d8a0aa6d227a90665d05614c93950b27c4685e7940308d10fb8174">
  <iirds:relates-to-product-variant rdf:resource="urn:md5:fe2baeda502185ee96979d0d5aa3cb20"/>
  <iirds:relates-to-qualification rdf:resource="urn:md5:2b5622c0b992b624d0f92f8f3a658486"/>
  <iirds:is-version-of>
   <iirds:InformationObject rdf:about="urn:ditaid:important_safeguards"/>
  </iirds:is-version-of>
  <iirds:has-rendition>
   <iirds:Rendition>
    <iirds:format>text/html</iirds:format>
    <iirds:source>content/Topic-002.html</iirds:source>
   </iirds:Rendition>
```

...aster.iirds\

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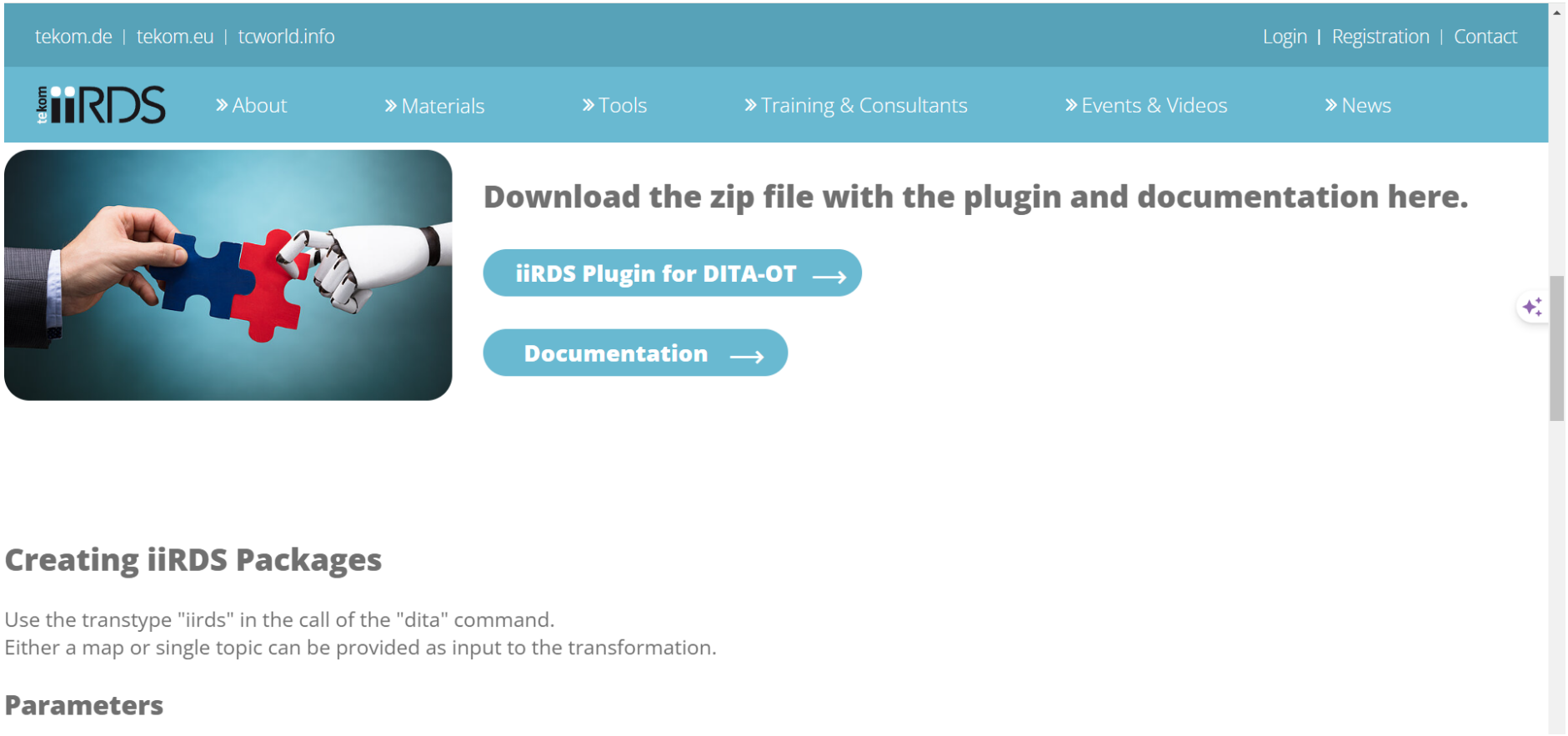
Where do I get the iiRDS plugin for DITA-OT?

https://www.iirds.org/tools/dita-plugin



DITA RDF – a second way using Thesaurus server Poolparty

A different way is to:

- Create a DITA representation in RDF
- Create a Mapping between DITA RDF classes and iiRDS classes

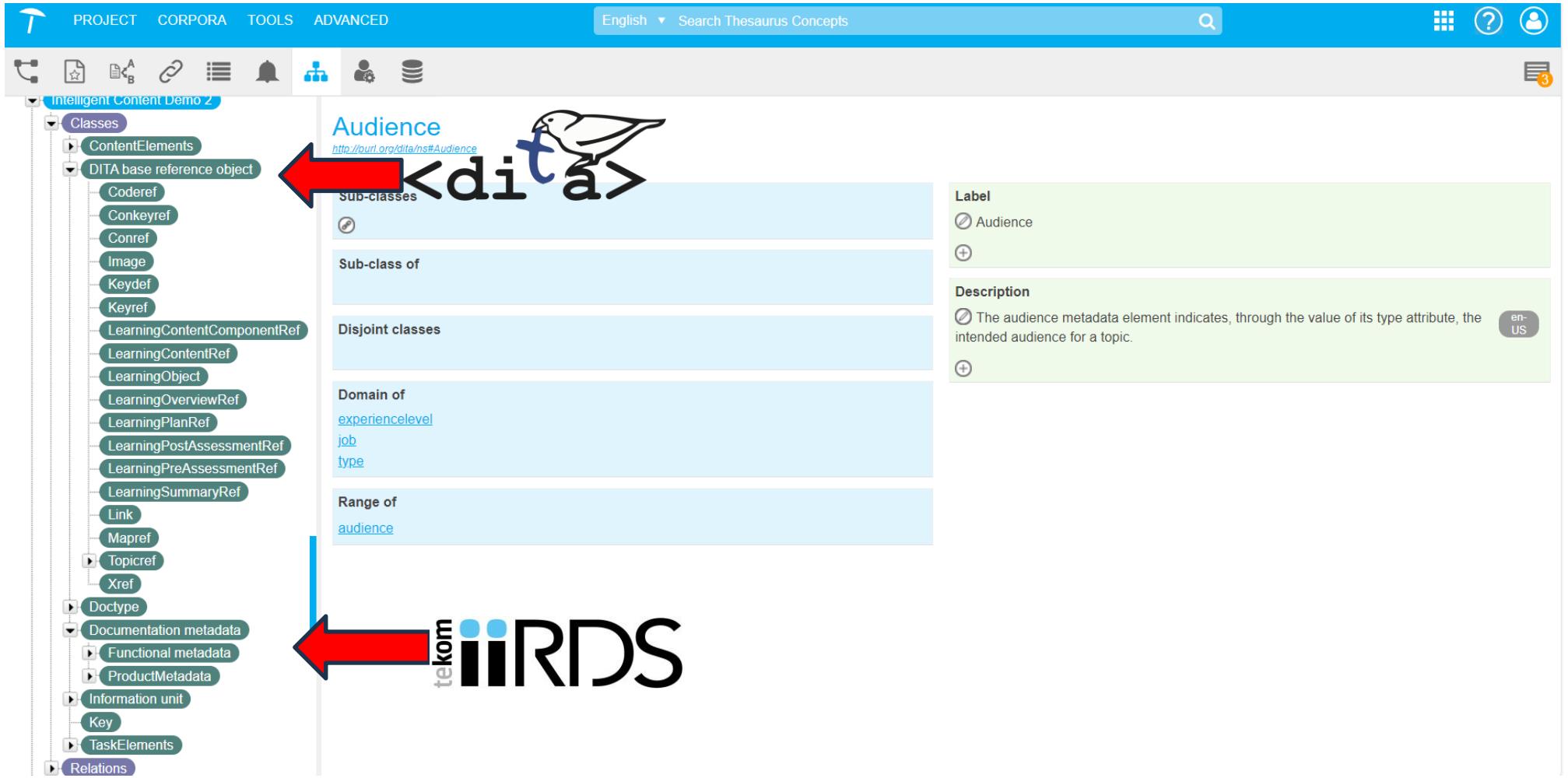
What is the drawback:

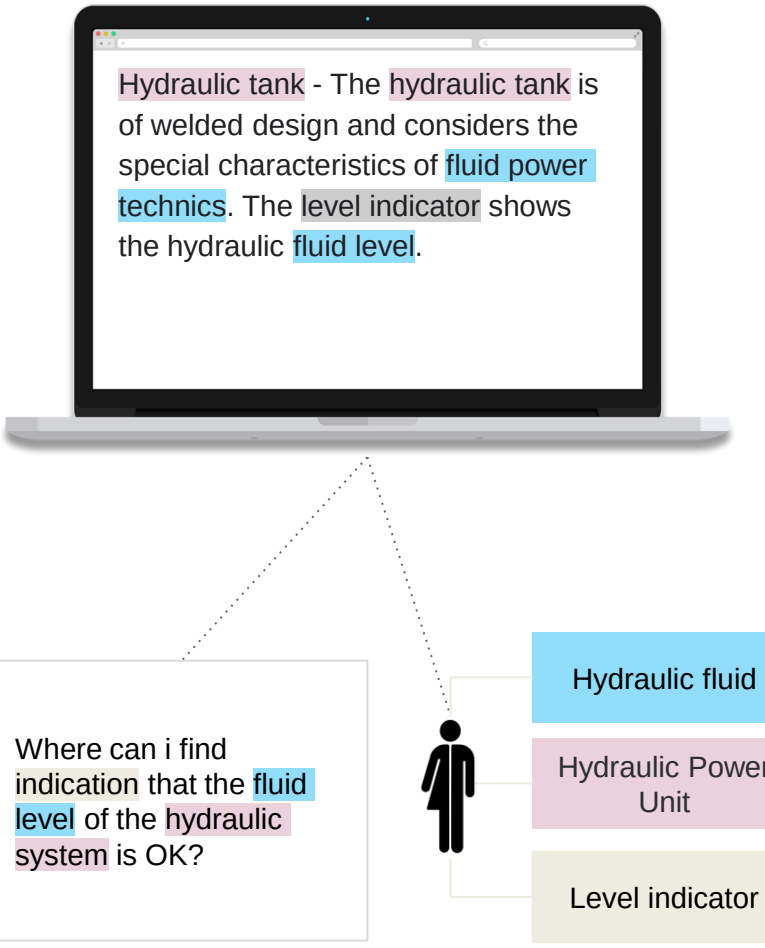
- It is a one-time effort to create this.

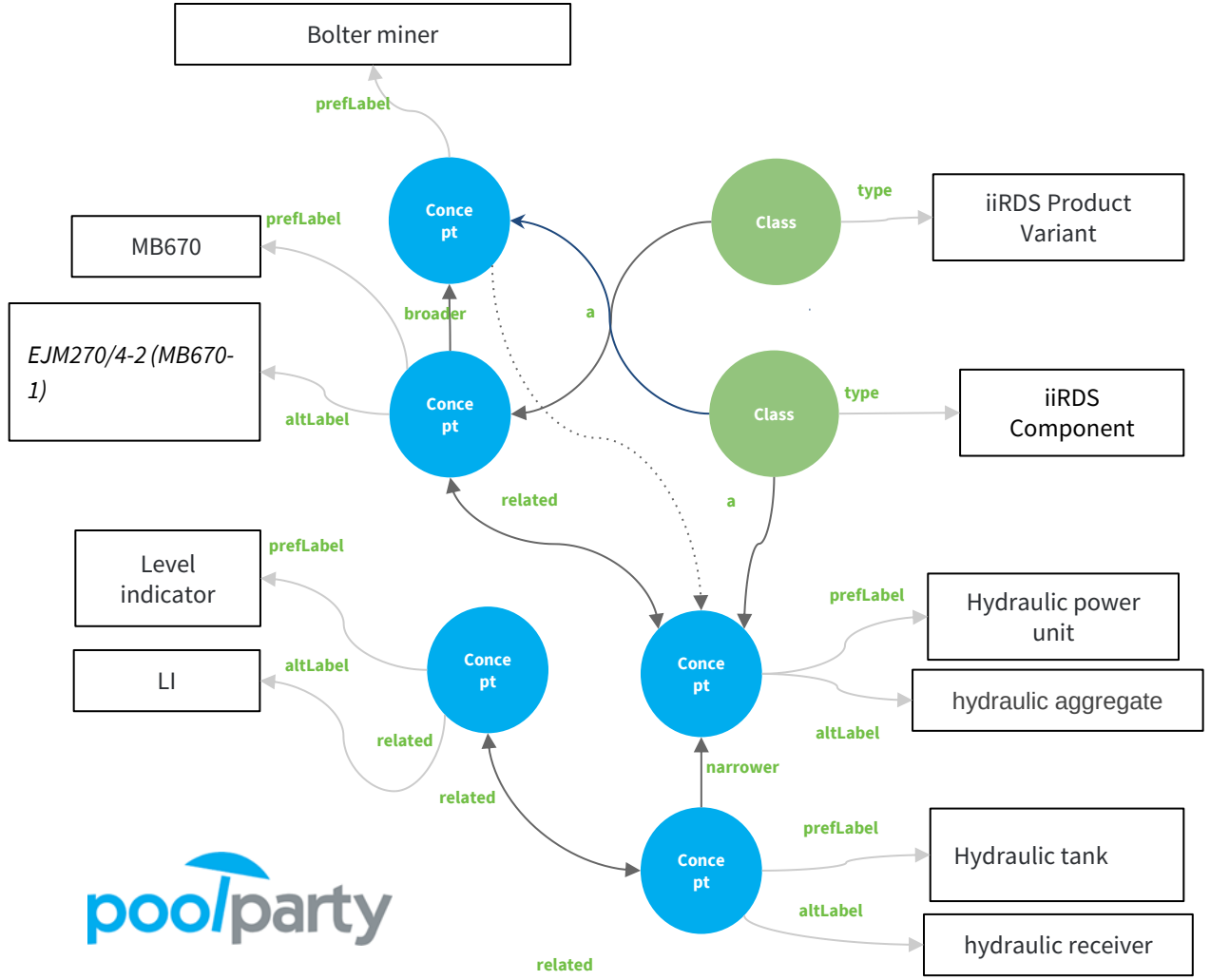
What is the advantage:

- We can create a Knowledge Graph using the DITA classes and the DITA metadata
- We can create contextual retrieval mechanisms using best of both worlds between DITA and iiRDS

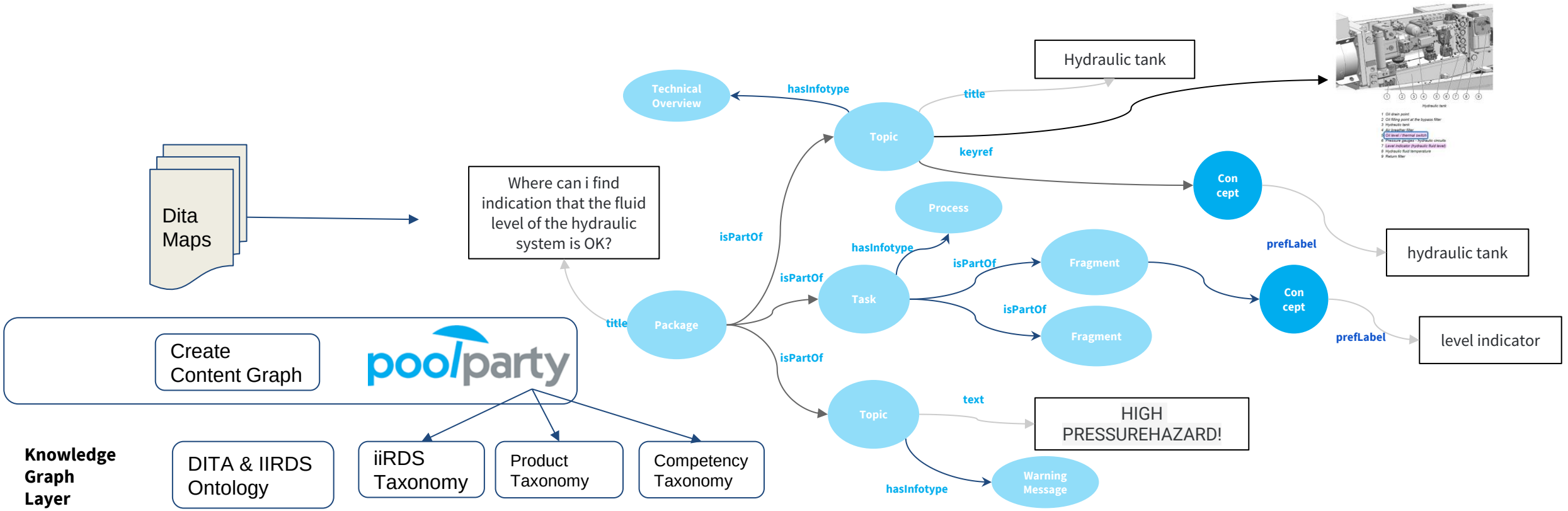
DITA RDF


PROJECT
CORPORA
TOOLS
ADVANCED
English
Search Thesaurus Concepts
Intelligent Content Demo 2
Classes
ContentElements
DITA base reference object
Coderef
Conkeyref
Conref
Image
Keydef
Keyref
LearningContentComponentRef
LearningContentRef
LearningObject
LearningOverviewRef
LearningPlanRef
LearningPostAssessmentRef
LearningPreAssessmentRef
LearningSummaryRef
Link
Mapref
Topicref
Xref
Doctype
Documentation metadata
Functional metadata
ProductMetadata
Information unit
Key
TaskElements
Relations
Audience
http://purl.org/dita/ns#Audience
Sub-classes
Sub-class of
Disjoint classes
Domain of
experiencelevel
job
type
Range of
audience
Label
Audience
Description
The audience metadata element indicates, through the value of its type attribute, the intended audience for a topic.
en-US


Hydraulic tank - The hydraulic tank is of welded design and considers the special characteristics of fluid power technics. The level indicator shows the hydraulic fluid level.
Where can i find indication that the fluid level of the hydraulic system is OK?
Hydraulic fluid
Hydraulic Power Unit
Level indicator


Bolter miner
prefLabel
Concept
MB670
prefLabel
broader
a
Class
type
iiRDS Product Variant
EJM270/4-2 (MB670-1)
altLabel
Concept
Class
type
iiRDS Component
related
a
Level indicator
prefLabel
LI
altLabel
Concept
Concept
prefLabel
Hydraulic power unit
hydraulic aggregate
altLabel
related
narrower
related
Concept
prefLabel
Hydraulic tank
altLabel
hydraulic receiver
related
poolparty

On the way to Intelligent Content



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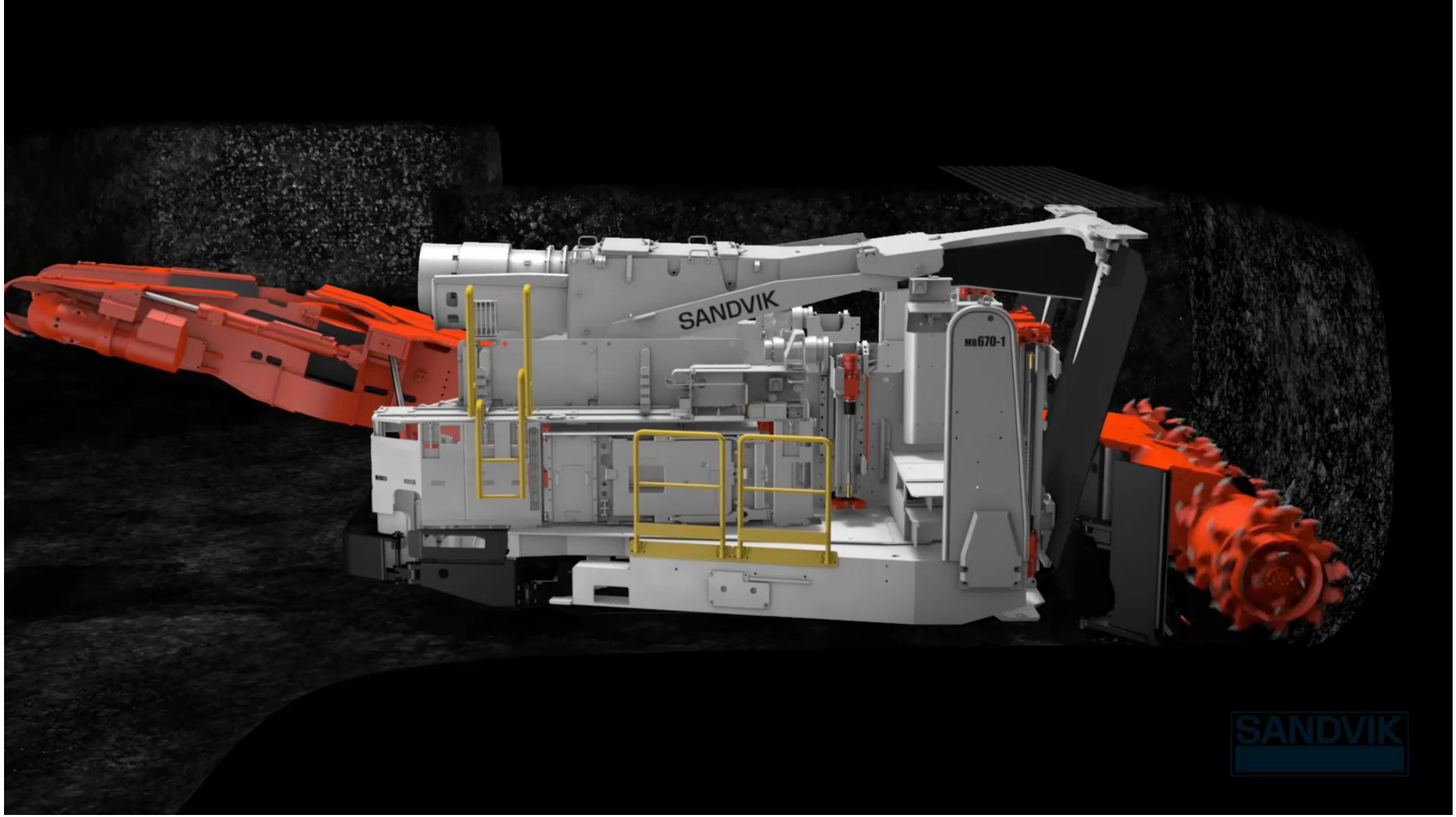
The Business Value – the Case SANDVIK



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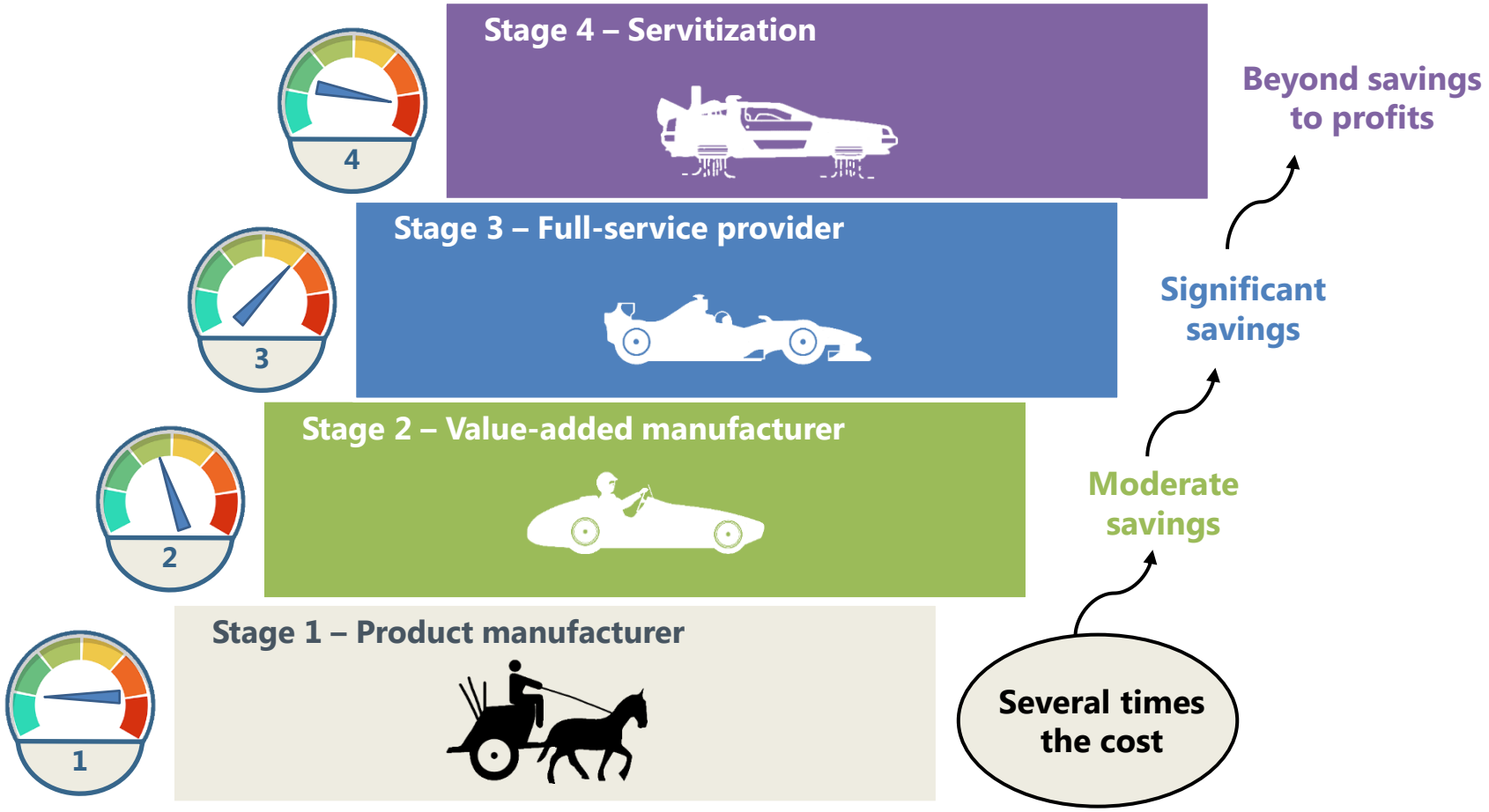
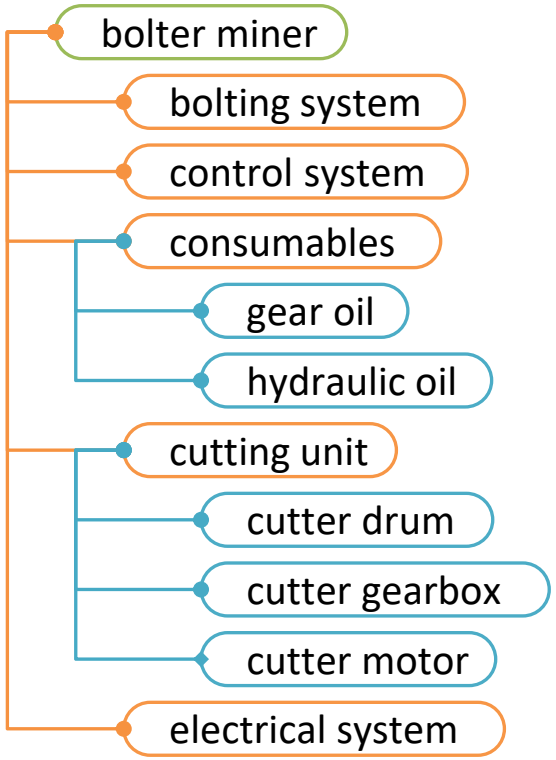
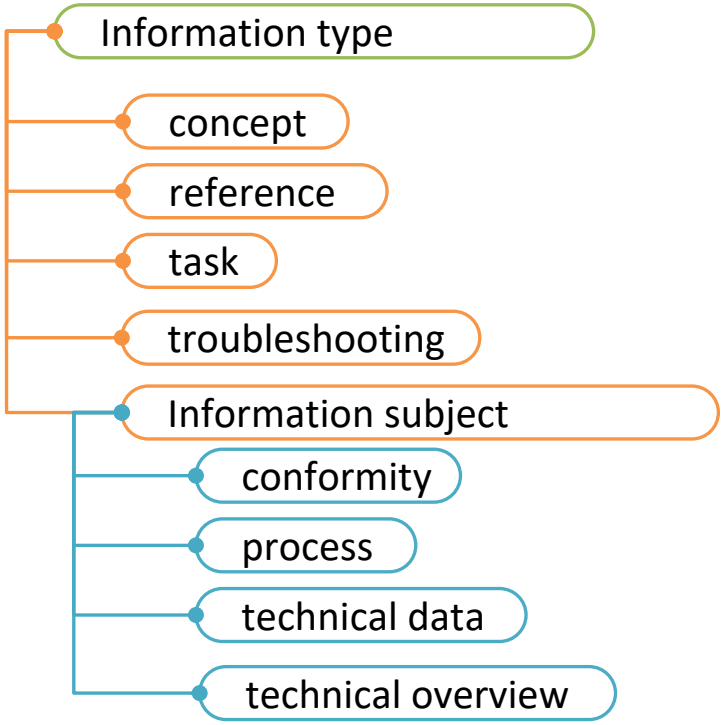
Servitization is a business strategy for product manufacturers to adopt service-based practices



Product vs Information Taxonomies





USECASE – TOO MUCH PRESSURE

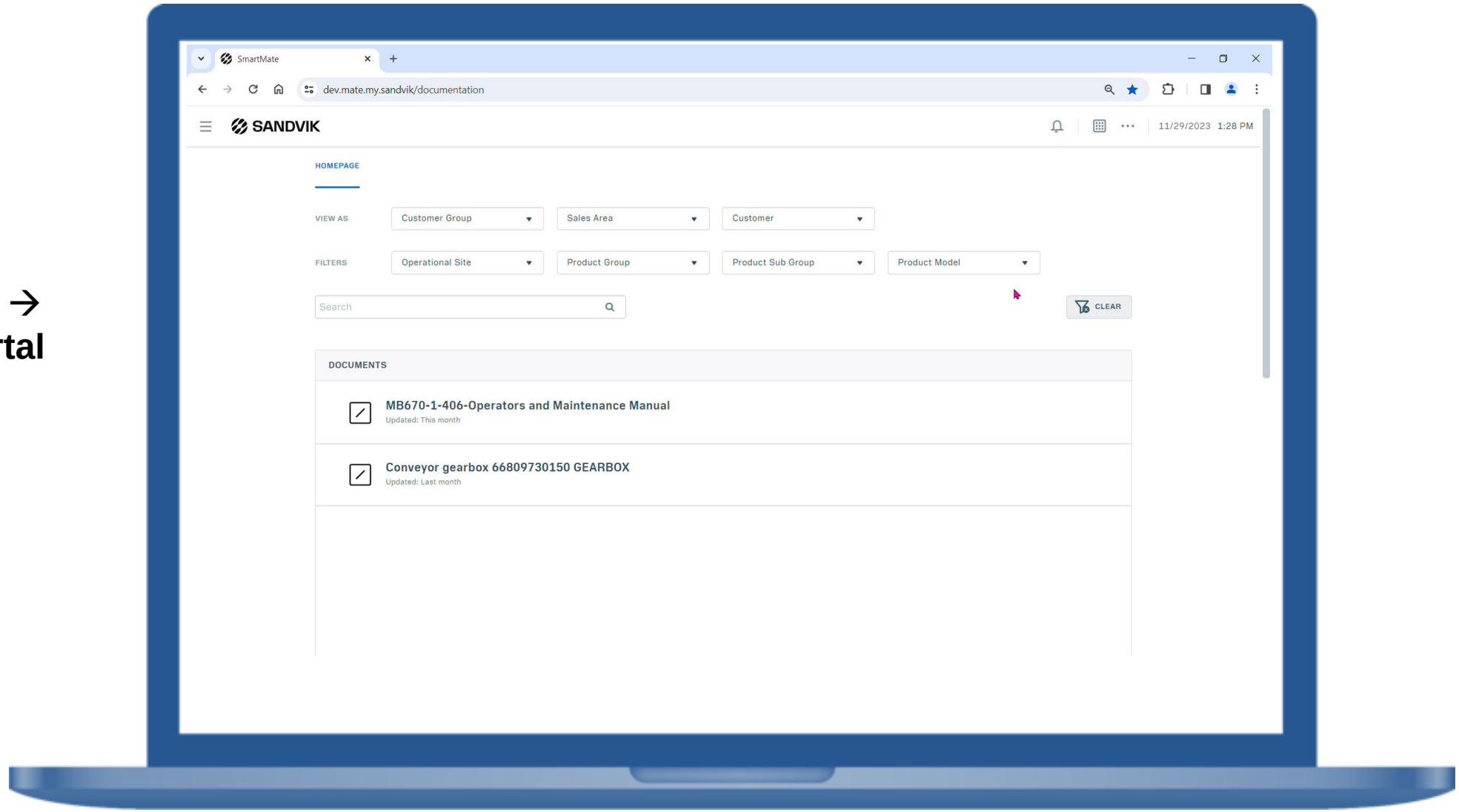
Which information does Johanna need?

SAFETY FIRST!

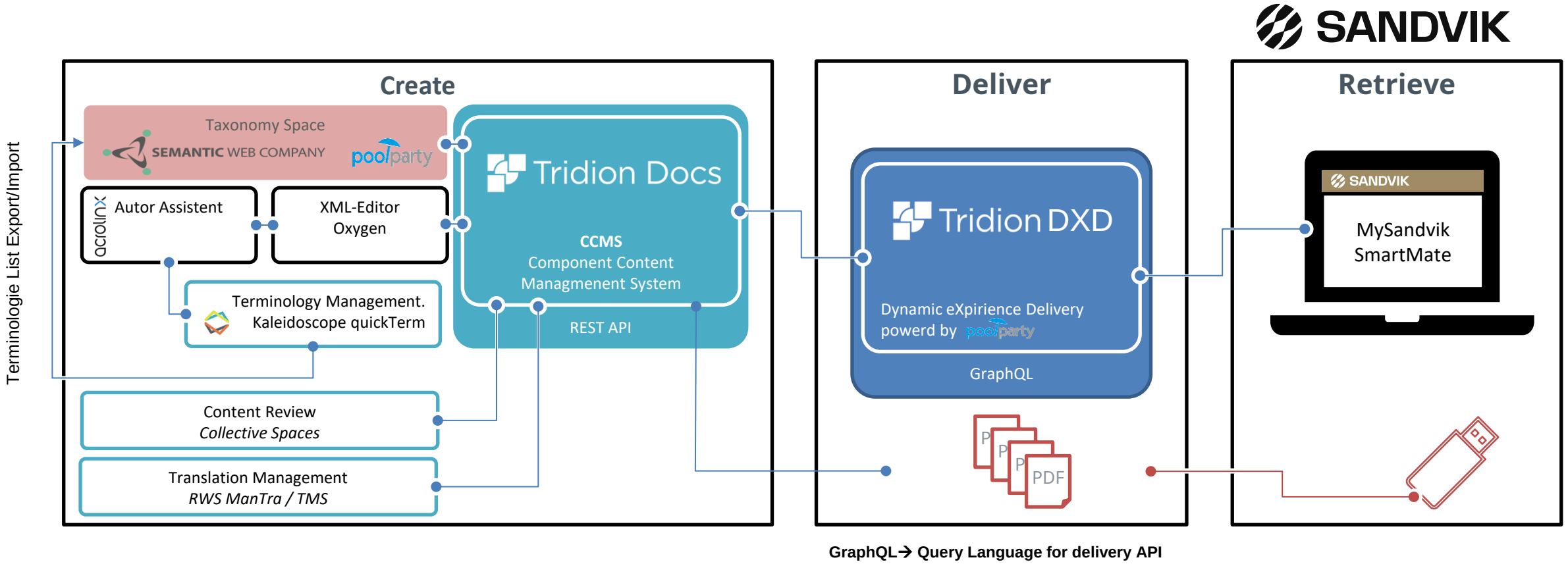
- What must be considered?
  - Working on hydraulic or lubrication systems
- What needs to be checked?
  - Check hydraulic operating pressures
  - Checking stand-by pressures of variable pumps 1 and 2
  - Checking maximum pressures of variable displacement pumps 1 and 2
- What needs to be done?
  - Pressure regulator adjustment
  - Flow controller adjustment
  - Change hydraulic hose

USECASE – TOO MUCH PRESSURE

Find
via DXD →
web portal



The Idea at Sandvik



GraphQL→ Query Language for delivery API

Q & A

Harald.stadlbauer@ninefeb.com

LinkedIn: https://www.linkedin.com/in/harald-s-3074a595/