Rules-Based Content Correlations

Making microDocs work
by Semantic Correlation Rules

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• Karlsruhe Univ. Appl. Sciences
  Hochschule KA (HSKA), Information Management & Media

• Institute for Information & Content Management (I4ICM)
  Research Transfer: PI-Class, REx, CVM, Content Delivery, microDocs
Research & Development of Semantic Correlation Rules (SCR)

• (Re-)Introducing microDocs
• How to implement microDocs by SCR
• How SCR are implemented
• Summary
Re-Introducing microDocs
Introduction

Recent Situation in Information Management

- **Content Management**
  as a standard technology for content creation and process automation

- **Content Delivery**
  as a driver for content provisioning and digital information services

- **Semantic Modelling**
  as an enabling technology for linked data, model-based engineering and
  and for **sharing knowledge**

*Market maturity / penetration*
How Metadata are used in CCMS

### Standardization of Metadata

<table>
<thead>
<tr>
<th>Concept</th>
<th>Straub/Ziegler 2019</th>
<th>Keine CMS Nutzung</th>
<th>CMS Nutzung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nein, keine weiteren Standardisierungsmethoden für Metadaten und Modularisierung</td>
<td>24,0%</td>
<td>68,3%</td>
<td></td>
</tr>
<tr>
<td>Klassifikation der Inhalte / Module gemäß Vorgaben des CMS</td>
<td>2,7%</td>
<td></td>
<td>37,4%</td>
</tr>
<tr>
<td>Klassifikation der Inhalte / Module gemäß Vorgaben der XML-Standardstruktur</td>
<td>5,5%</td>
<td></td>
<td>19,6%</td>
</tr>
<tr>
<td>Eigenes Konzept</td>
<td>19,8%</td>
<td></td>
<td>36,5%</td>
</tr>
<tr>
<td>Klassenkonzept (nach Closs)</td>
<td>2,4%</td>
<td></td>
<td>2,3%</td>
</tr>
<tr>
<td>iiRDS (tekom)</td>
<td>2,0%</td>
<td></td>
<td>2,6%</td>
</tr>
<tr>
<td>PI-Klassifikation/ PI-Class (nach Ziegler)</td>
<td>3,8%</td>
<td></td>
<td>14,0%</td>
</tr>
</tbody>
</table>

### Use of Metadata

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Metadata</td>
<td>76%</td>
<td>24%</td>
</tr>
</tbody>
</table>

Variety of different metadata concepts and system implementations
Introduction

Content Delivery: System Introduction Phases

Inform
- Informieren: 29%

Plan
- Vorplanen: 14%
- Evaluieren: 12%
- Prototyp testen: 10%
- Einführen: 9%
- Produktiv einsetzen: 8%
- Optimierung: 7%
- Wechsel: 3%
- "Ist derzeit kein Thema": 9%

Implement
Introduction

Metadata are used for
• search facets for retrieval
• object identification
• API parameter call & deep linking

Content Delivery

Machine
Z-006

Configuration
\(a_1 \ | b_3 \ | … \ | x_5 \ | y_1 \ | z_5\)

Component
Hydraulic system
Oil Pump

Information
Procedure
Testing

Introduction

Oil Pump

Hydraulic system

Testing

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Procedure
Testing
Retrieve Objects in CDP

microDocs

Single topic

Lack of context

What is needed?

A structured set of topics with relevant context and sufficient content

Relevance and sufficiency ist defined by use cases!

Document (complete topic assembly)

Abundance of content

Retrieved Objects in CDP

Single topic

Lack of context

What is needed?

A structured set of topics with relevant context and sufficient content

Relevance and sufficiency ist defined by use cases!

Retrieved Objects in CDP

Single topic

Lack of context

What is needed?

A structured set of topics with relevant context and sufficient content

Relevance and sufficiency ist defined by use cases!
**Definition**

A microDoc is a (sub-)set of topics required by predefined use cases and connected by a logical concept as a dynamic publication in search media.

The logical concept, the relevant context and the amount of required content can be derived at different levels from rules and semantic models.
How to implement microDocs by Semantic Correlation Rules (SCR)
Use Case Harvesting & Knowledge Sources

Use Cases are typically reported and described by
- Service-technicians
- Help-Desks
- Direct and indirect user feedback
- Training staff
- Developers, engineers (prospective)
- UX professionals, Web analytics experts
- Regulatories, standards & laws experts
- Admins (IT), Configurator
- Content architects and writers (by exchanging knowledge with other groups)
Semantic Correlation Rules Requirements

SCR should...

• ... describe correlations of (information) objects in a simple, but formalized and standardized way (XML/RDFS/OWL) using existing object metadata

• ... be independent of specific content and explicite (CMS) linking processes

• ... be (able to be) modelled in different system environments

• ... be interpreted in search and delivery environments (e.g. as microDocs)
Correlation Rules applied for demonstration purposes to the PI-Fan reference content (www.pi-fan.de) & PI-Class + iiRDS Classification.

**Test and Demo Case**

**Primary Object**

**Getting started**

- The device is operated with a mains power voltage of 230V. Contact the device to the mains as described below.
- The device is now ready to use.

**Secondary Objects**

Correlated with

- **PI-Class:** P: PI-Fan I: Diagnostics/ManualDiag
  - **iiRDS:** TopicType: Reference Lifecycle: Fault Subject: ManualCheck Component: PI-Fan

- **PI-Class:** P: PI-Fan I: Diagnostics/Errorcodes
  - **iiRDS:** TopicType: Reference Lifecycle: -- Subject: -- Component: --

- **PI-Class:** P: PI-Fan I: Descriptive/ContactData
  - **iiRDS:** TopicType: Reference Lifecycle: Fault Subject: ContactInformation Component: PI-Fan
Use Case

Demo Case
applied to the PI-Fan reference content & PI-Class

Getting started
The device is operated with a mains power voltage of 230V. Connect the device to the floor as described below.

Manual troubleshooting
Not all problems are electronically detected. Some common problems are listed here with their possible causes and the actions to be taken.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>The device does not turn on.</td>
<td>· The power plug is not fully plugged into the socket outlet.</td>
<td>See Checking the power supply.</td>
</tr>
<tr>
<td>· The extension plug socket is not turned on or not plugged into a wall socket.</td>
<td>The power plug is not fully plugged into the socket outlet.</td>
<td></td>
</tr>
<tr>
<td>· The socket is defective.</td>
<td>· The power plug is not fully plugged into the socket outlet.</td>
<td></td>
</tr>
</tbody>
</table>

The indicator does not illuminate even though the device is turned on.

The indicator lights up. Handle the indicator.

Correlated with

Primary Object

<NamedIndividual rdf:about="http://www.i4icm.de/PI-Fan/InRule1">
  <rdf:type rdf:resource="http://www.i4icm.de/scr#InRule"/>
  <scr:hasCorrelation rdf:resource="http://www.i4icm.de/PI-Fan/OutRule1"/>
  <scr:hasCorrelation rdf:resource="http://www.i4icm.de/PI-Fan/OutRule2"/>
  <scr:hasCorrelation rdf:resource="http://www.i4icm.de/PI-Fan/OutRule3"/>
  <scr:sources rdf:resource="http://www.i4icm.de/PI-Fan/Connection"/>
  <scr:sources rdf:resource="http://www.i4icm.de/PI-Fan/GettingStarted"/>
</NamedIndividual>
Correlations: generalized, untyped relations

Objects (Topics) are selected by In/OutRules via relations to the metadata values.

(In general, the metadata values are treated by RDF/OWL as instances of ontology classes.)

Correlations exist between primarily selected objects (InRule) and secondarily selected objects (OutRule)

RDF/Ontology Visualization in Protégé
Metadata as instances of metadata classes given by custom/standardized (CCMS) ontologies

here, iiRDS classes are used and partially displayed
Implementation of SCR as RDF/OWL-rules (using iiRDS classes)
Documentation

In-code documentation (see scr.owl file)

RDF explanations on usage of classes, relations, instances and data properties

- **Classes**
  - scr
  - InRule
  - OutRule

- **Relations**
  - hasCorrelation
  - selects
  - equals

- **Instances**
  - (scr.root)

- **Properties**
  - ID
  - ReleaseDate
  - Role
  - Scope
  - Strength
  - Title
  - Version
hasCorrelation

- Untyped correlation pointing from InRules to OutRules.
- The correlation describes the binding of secondary objects (information deliverables; often topics) to primary objects within a delivery scenario.
- In general, there are 1:N correlations as relations from InRules to OutRules, so that a certain number of information deliverables are displayed as microDocs. MicroDocs are therefore bound to the primarily requested object.
- Subtypes of the relation might be typed in further versions.
How (and where) Semantic Correlation Rules have been implemented (2020)
microDocs

CCMS

Smart Media Creator
(Expert Communication Systems)
System implementation & visualization

microDocs

CCMS

Smart Media Creator
(Expert Communication Systems)
System implementation & visualization

CCMS
Klar: Suite (Klarso)
microDocs
microDocs

System implementation & visualization

SMS: Ontolis
SMS: Sherlock
Fischer Information
Technologies
System implementation & visualization

**WAKO Press ZXUN 78 Inbetriebnahme Konfiguration**

**Inhalt**

**WAKO Press ZXUN 78 Variante 100-AAE-CFK**

DIP-Schalter-/ Potbelegung 1

Einstellelemente 0.37 ... 3 kW

Auf der Innenseite der Drive Unit finden Sie die Einstellelemente. Vorgenommene Einstellungen durch DIP1, DIP2, P2, P3 und P1 müssen mit DIP1/aktiviert werden. Die Einstellungen werden bei jedem Netzanschalten erneut übernommen.

**Verknüpfte Inhalte**

- Fehlerbehandlung
- Technische Daten
- Kontaktdaten
SCR processing

CDP: CDS

Expert Comm. Systems

System implementation & visualization
SCR processing

System implementation & visualization

CDP:
CMDS (Ontolis)
SCR processing

CDP:
CMDS (Ontolis)
System implementation & visualization

Connecting the device
The device is operated with a mains power voltage of 230V. Connect the device to the mains as described below.

1. Make sure that the plug (A) and the plug socket, which you wish to use to operate the device, are not damaged.
2. Connect the plug (A) to the socket (B).

- The device is now ready to use.

Figure 1: Connection to the mains

SCR processing

CDP: I-Views Content

Basis: iiRDS + SCR
**SCR API (Content Service / headless CMS/CDP)**

**Querying scr:InRules correlated to Information Unit**

- **subject** – ID of certain iiRDS information Unit
- **Result** is JSON, with meta information of `scr:InRule`

```json
{
    "items": [
        {
            "hasCorrelation": [
                {
                    "id": "http://www.i4icm.de/scr/scr#OutRule1"
                },
                {
                    "id": "http://www.i4icm.de/scr/scr#OutRule2"
                },
                {
                    "id": "http://www.i4icm.de/scr/scr#OutRule3"
                }
            ],
            "selects": [
                {
                    "id": "http://iirds.tekom.de/iirds#GenericFunctionality"
                },
                {
                    "id": "http://iirds.tekom.de/iirds#GenericPuttingToUse"
                },
                {
                    "id": "http://iirds.tekom.de/iirds#GenericTask"
                },
                {
                    "id": "https://www.i4icm.de/pifan#Connection"
                }
            ],
            "titles": [
                {
                    "language": "de", "value": "Dynamische Beziehungen (SCR)"
                }
            ],
            "id": "http://www.i4icm.de/scr/scr#InRulePiFan"
        }
    ]
}
```
SCR processing

CDP/DCS
Digital Content Service
C-REX.net IDS
Practice Innovation

Getting started

The device is operated with a mains power voltage of 230V. Connect the device to the mains as described below.

Figure 1. Connection to the mains
In Preparation

• ... more to come
microDoc (Draft)

CDP

Classification-based Rules for Linking (CDS / Schema 2019)
Visualization

Installation

Getting started

The device is operated with a mains power voltage of 230V. Connect the device to the mains as described below.

Abb. 1: Connection to the mains

Make sure that the plug A and the plug socket, which you wish to use to operate the device, are not damaged.

1. Connect the plug A to the socket B.

The device is now ready to use.
Höhe einstellen

Die Höhe des Geräts ist stufenlos einstellbar.

Abbildung: Höhe einstellen

1. Drehen Sie die Ventilatorachse am Griff auf der Oberseite.
2. Lösen Sie mit der anderen Hand die Halteschraube in der Rückseite der Teleskopstange.
3. Ziehen Sie die Ventilatorachse auf die gewünschte Höhe.
4. Ziehen Sie die Halteschraube mit der Hand wieder fest an.
5. Lassen Sie den Griff aus.

Das Gerät hat nun die gewünschte Höhe.
Summary
Semantic Correlation Rules

• are a technical and standardized implementation of microDocs
• store and apply knowledge from relevant use cases for information delivery (and other tasks...)
• describe class-to-class relations (e.g. links) between objects
Summary

SCR aspects and features

• Adaptable to user- and industry-relevant use cases of information requests and delivery events
• Compatible with widely adopted CMS technologies for semantic metadata (taxonomy, classifications, properties)
• Easy-to-use creation tools and interfaces; import/export mechanisms
• „(Ultra-)Light-weight ontology“: Easy modelling without deep knowledge of semantic technologies
• First implementations in CDP; import mechanisms and management by CDP; Processing and integration depth depend strongly on CDP!
• Starting point of for more complex semantic modelling; integration into semantic models and modelling tools
• Allows for systematic improvement of correlations and subsequently content, systems and products
• Allows for sharing and using knowledge of critical use cases
Version 1.0.0 of Semantic Correlation Rules (SCR)

Intent:
Provide a generic object correlation mechanism for implementing microDocs concepts in delivery scenarios.
Typically used in content delivery portals (CDP) or other kinds of search portals.

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Karlsruhe Univ. of Applied Sciences &
Institute for Information and Content Management (I4ICM)

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Ressources

https://www.i4icm.de/
→ Publikationen

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Literature & Downloads

  https://doi.org/10.1051/shsconf/20207703009
• SCR Downloads https://www.i4icm.de/downloads/scr/1.1.0/ https://www.i4icm.de/scr/
  • SCR Definition in OWL/RDF notation (Base classes and relations): SCR.owl
  • Example of SCR-file for the PI-Fan using iiRDS: PI-Fan.iiRDS.scr.owl
  • Example of SCR-file for the PI-Fan using PI-Class: PI-Fan.PI-Class.scr.owl
    The corresponding complete files including correlations and classes/instances are also included for information purposes
• PI-Downloads (https://www.i4icm.de/downloads/)
  • PI-Fan classes/instances (slightly modified for demonstration purposes) using the PI-Class classification schema
  • PI-Class core classes of the PI-Classification methodology
• iiRDS Downloads
  • PI-Fan Reference content using iiRDS https://iirds.org/material-downloads/sample-content/
  • iiRDS Definition https://iirds.org/material-downloads/iirds-version-1-0-1/
Acknowledgement

- The author/speaker thanks all cooperation partners for use cases, helpful discussions and system implementations!
- Support was also provided by HSKA (research sabbatical)