

DigiDecom 2021 – DIGITAL

Online international workshop focusing on digital transformation, robotics and other game changing trends in nuclear decommissioning







Towards a Common Ontology for Decommissioning



iUS Institut für Umwelttechnologien und Strahlenschutz GmbH

Current Developments - Coincidences

- Expansion of IAEA IDN wiki to nuclear wiki
- New formation of OECD NEA groups towards KM ind D&D EGKM
- Considerations within EU/EC to allign European approaches JRC and IIDSF
- Formation of the IAEA collaboration centres on decommissioning many digital approaches
- PLEIADES EU project on common plattform for decommissioning planning
- Talks between several international agencies on "Network of networks"





- Modern approaches to decommissioning using BIM or other 3-D information
- Most of these are specific standalone tools
- The major effort is the generation of the data
- It would be helpful to reuse models and scenarios in order to look at them from different angles, e.g.
 - Engineering
 - Radiation protection
 - Costing
- A common platform with a defined data interface would allow to use all these tools with the same dataset

The Participants



*	*	*

Abbrev.	Name	Туре	
CEA	Commissariat á L'Energie Atomique et aux Energies Alternatives	R&D	FR
EDF	Electricité de France	Industry	FR
ENRESA	Empresa Nacional de Residuos Radioactivos SA	Industry	ES
IFE	Institutt for Energieteknikk	R&D	NO
IRSN	Institut de Radioprotection et de Sûreté Nucléaire	TSO	FR
IUS	iUS Institut für Umwelttechnologien und Strahlenschutz GmbH	SME	DE
КІТ	Karlsruher Institut für Technologie	ACADEMIA	DE
LGI	LGI Consulting	SME	FR
LS	Light and Shadows	SME	FR
CYCLIFE	Cyclife Digital	Industry	FR
CATENDA	Catenda AS	SME	NO
VTT	VTT Technical Research Centre of Finland Ltd	R&D	FI
TRACTEBEL	Tractebel Engineering S.A.	Industry	BE
WAI	WAI s.r.o.	SME	SK



The Concept





Smarter Plant Decommissioning





The Technology

PLEIADES Smarter Plant Decommissioning



Safety authorities **D&D** Contractors **D&D** Engineering **End-users** Utilities Nuclear training organizations & Scenario feasibility, waste estimation Training **End-uses** Assistance during operations Costs assessments, planning... Future possible developments: UI of each other user-centric design, data App / module **BIM tool UI** visualization tools, external apps module developers (institutional & private developers) VR Aquila DEM **iDROP** RadPIM LivePlan plus dose costing 3D IMS **DIM** tool ALVAR LLWAA INTERACT Future possible scanPF developments: Spatialised PLATFORM intelligence, Machine API API API API learning... Data fusion BIM data exchange format **Data layers** 3D Physical Processes. by category data inventory resources

DigiDecom 2021: Common Ontology on Decommissioning - Borrmann



The Vision







JS Institut für Umwelttechnologien und Strahlenschutz GmbH

Context of semantic technologies



9

Data conectivity and formal logic

Building blocks of digital knowledge management





Next Steps

- Definition of terms
 - Safety glossary / other official glossaries
 - Nuclear wiki definitions
 - Own definitions
- Further layers
 - Instances of class members
 - Connecting properties, auxiliary classes & properties
- Formalisation
 - Protégé / OWL
 - Graph building
 - Reasoning?
- Data structure generation
- Exemplar implementation for testing

Ontology development schedule





The Conclusions

- Ontology will be the basis of PLEIADES
- Provision of an interface will only work if all participants have a common understanding of the content
- Development follows
 - A top-down approach ensuring compatibility i.a. to IAEA approach for the top layer
 - A bottom-up approach from the participants existing solutions to ensure a common understanding
- Alignment of approaches highly recommended and beneficial for all sides
- Time window is rather narrow (ends Mid 2021)



Example Taxonomy – Decontamination Technologies



Each item has exactly one parent item No connection between items on the same level

Good to sort hierarchically ordered items – tree structure

Ontologies

- Ontologies describe a model of a section of the real world
- Categories or classes are used to describe concepts, processes or things
- Inheritance allows to make instances of classes for example KKE as an instance of the class power reactors
- Properties connect classes and instances network structure
- Example: KKE is a Siemens Konvoi Reactor
- Siemens Konvoi Reactor is subclass of power reactor
- Inference: KKE is a power reactor
- Information Triple: Subject predicate object





Example Ontology - Measurements



16 DigiDecom 2021: Common Ontology on Decommissioning - Borrmann

US Institut für Umwelttechnologien und Strahlenschutz GmbH

Ontology, taxonomy, thesaurus/SKOS



PLEIADES – Ontology development



Meaning of common ontology beyond PLEIADES

- A common ontology allows:
 - Search for related concepts in other KM systems
 - Different terms for the same concepts depending on context
 - Later alignment of structures and a common platform on the long run
- A common ontology fosters:
 - A common understanding of the matter
 - Exchange amongst different organizations
 - Avoidance of group thinking inside organizations
 - A better understanding of the variety of concepts

