EURAD-2 DITOCO2030

Digital transformation parallel session
(DITOCO2030 AND HERMES)

Insights from the DITOCO Green paper:

Current practices of Digital twins and Gap analysis

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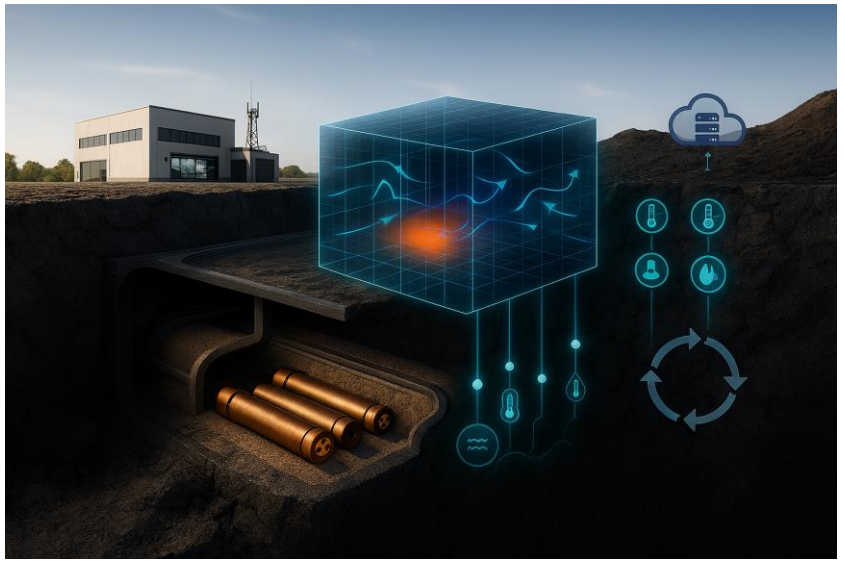
INTRODUCTION – INVOLVED TASKS

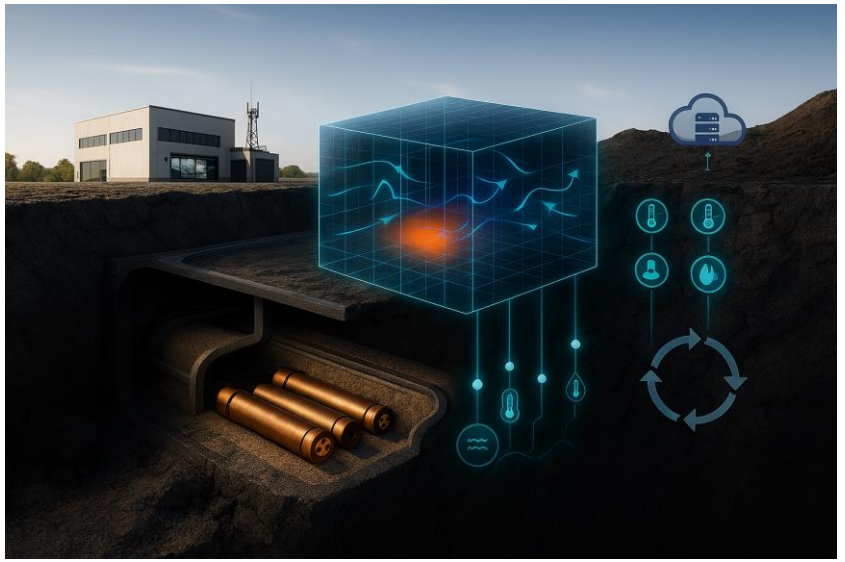
- **Task 3: Current practices of digital twins (DT) – Lead: VTT – Total pm: 15,7 – Start month 1 – End month 20**
  - Partners: VTT, SURAO, Amphos 21, SCK CEN, BRGM, IRSN, UniPI, UCLM, ANDRA, EGIS, SOGIN, UFZ, UTARTU. Also: Nagra, IFE.
- **Task 4: Gap analyses – Lead: SCK CEN – Total pm: 14 – Start month: 1 – End month 12**
  - Partners: Amphos 21, SCK CEN, TS ENERCON, GRS, TUS, UFZ, HZDR, BGE, FTMC, Tractebel, Golder WSP. Also: Nagra, IFE.



- **Original plan:**
  - D15.1 – Green paper: Current practices of digital twins (Task 3)
  - D15.2 – Green paper: Gap analysis report (Task 4)

INTRODUCTION – INVOLVED TASKS

- **Task 3: Current practices of digital twins (DT) – Lead: VTT – Total pm: 15,7 – Start month 1 – End month 20**
  - Partners: VTT, SURAO, Amphos 21, SCK CEN, BRGM, IRSN, UniPI, UCLM, ANDRA, EGIS, SOGIN, UFZ, UTARTU. Also: Nagra, IFE.
- **Task 4: Gap analyses – Lead: SCK CEN – Total pm: 14 – Start month: 1 – End month 12+**
  - Partners: Amphos 21, SCK CEN, TS ENERCON, GRS, TUS, UFZ, HZDR, BGE, FTMC, Tractebel, Golder WSP. Also: Nagra, IFE.



~~• **Original plan:**~~

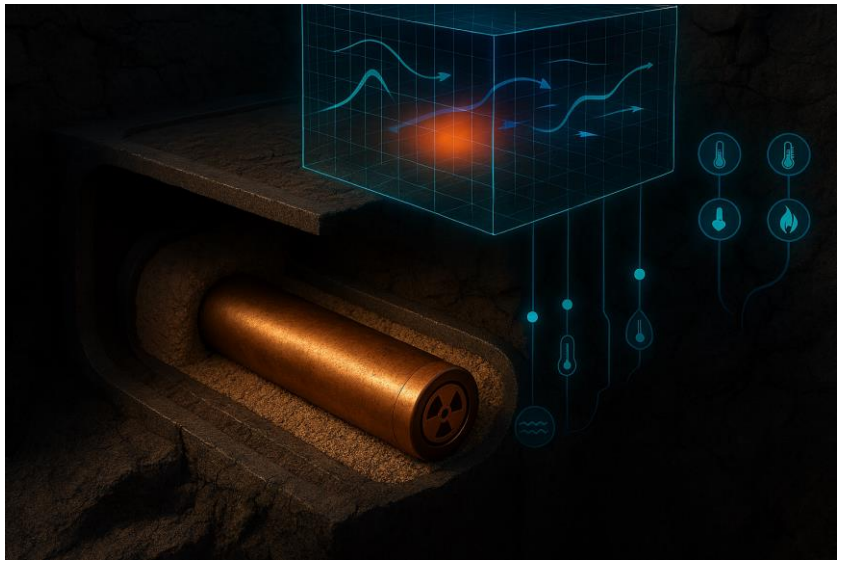
- ~~D15.1 – Green paper:~~ Current practices of digital twins (Task 3)
- ~~D15.2 – Green paper:~~ Gap analysis report (Task 4)

Current plan:

One common merged Green paper (due M13) D15.5

METHOD FOR THE GREEN PAPER PRODUCTION

- **Initial table of contents defined**
- **Online survey for initial contributors performed, express interests for topics for (per ToC item):**
  - Current practices of digital twins
  - Gap analyses
- **Short example contributions included in the draft document to guide the contributions**
- **All involved partners encouraged to contribute**
  - Freedom and overlapping allowed, no restrictions set
  - Sources: literature, example projects, company best practices, …
- **Draft contribution document will be used as a library source for the actual green paper.**



One common merged Green paper (due M13) D15.5

DRAFT DOCUMENT TOC

- **Original T3 document ToC →**
  - Also lower-level headings exist
- **Gap analysis subchapter added in the chapters:**

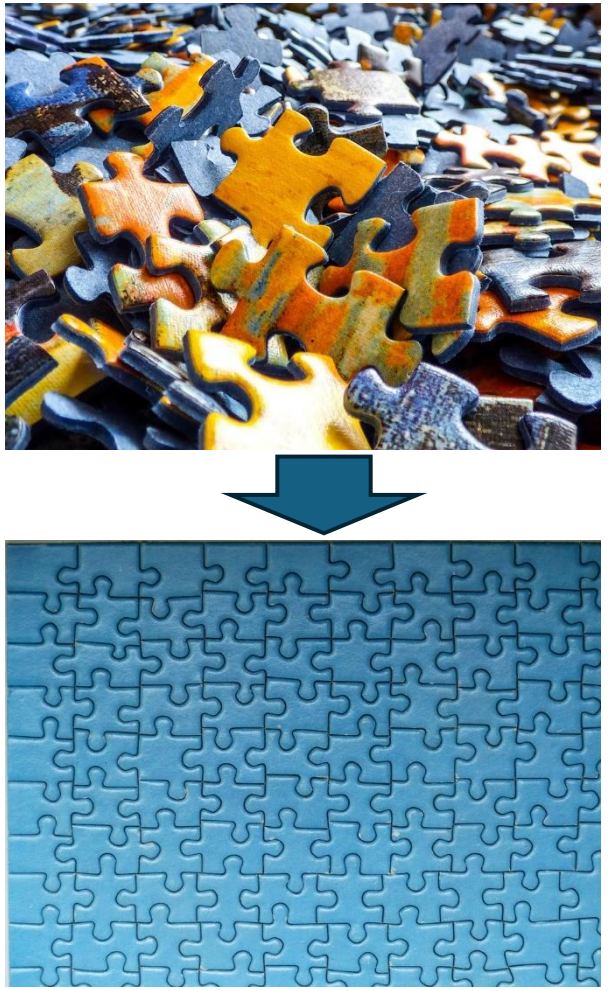
  3, 4, 5, 6, 7, 8, 10 (bolded in ToC)

  - Chapter 9, *reflections from possible identified gaps in other industries can be added, but they are not the highest priority.*
- **Gap analysis to be collected after each section. In the green paper, they will be moved to an own Gap analysis chapter.**

1. Executive summary
2. Introduction
   a. What is a Digital Twin for the DITOCO2030 work package?
3. **Drivers for digital twins in RADWASTE and nuclear sector**
4. **Digital twin related important technologies**
   a. Industrial IoT (IIoT)
   b. Data management
   c. Big data
   d. Artificial Intelligence (AI)
   e. High performance computing
   f. Cyber security
   g. Virtual reality
5. **Regulatory requirements and restrictions for digital twins in nuclear**
6. **Digital twin standardisation**
7. **Digital twins in radioactive waste domain**
8. **Digital twins in nuclear domain**
   1. Multiple sub-chapters
9. Digital twins in other industries and domains
   a. Industry Domain 1
   b. Industry Domain N
   c. Research Domain
10. **Final considerations and future work**
    a. Summary and final considerations
    b. Guidelines for digital twin usage in nuclear / radwaste domain
    c. Future work considerations
11. References
12. Appendices

NEXT STEPS AFTER PARTNER CONTRIBUTIONS

- **Task leaders (T3 & T4) process the received contributions and create a new document for the harmonised green paper.**
  - Some sections have a lot of text, some less. Many styles received.
  - More images and illustrations are foreseen to be added.
  - Page count of received contributions, mainly text, is ~80 pages
- **Green paper Table of Contents will be the same, as is for the draft contribution collection document.**
  - Except the Gap-analysis contributions will be moved into an own Gap-analysis section. Fine tuning done, if needed.
- **In the harmonisation phase the new green paper document is reserved only for the task leaders!**
- **After harmonisation of the texts, discussions with the partners will continue.**



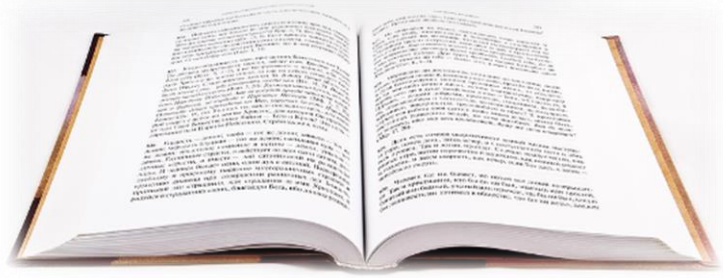
INSIGHTS FROM THE CONTRIBUTIONS "SUPPORTING MATERIAL SECTIONS – PART 1"

- **Lot of contributions for the digital twin related technologies received, like expected.**
- **Lot of contributions for the digital twins in other industries and domains received**
  - E.g. from medical, maritime, manufacturing, agriculture and research domains.
- **These sections are supporting material and useful, when considering future pathways and potential gaps.**
- **These chapters are kind of low hanging fruits.**

INSIGHTS FROM THE CONTRIBUTIONS "SUPPORTING MATERIAL SECTIONS – PART 2"

- **Regulatory requirements will be gathered "indirectly", as we don't have regulators involved in the work package.**
  - DTs are kind of "novel" technologies – they are "tools" in this domain
  - Are the regulators seeing this yet as an own separate item?
  - Other projects have involved regulators, from which findings can be used (e.g. HARPERS)

- **Digital twin standardization is a wide domain, as digital twins are used in many domains and related pure ICT standardization is also a wide field.**
  - There are a lot (really lot) ICT related (directly or indirectly) standardization existing and ongoing. E.g. in ISO, IEC, IEEE, ETSI, …



INSIGHTS FROM THE CONTRIBUTIONS
EXAMPLES FROM "OUR" DOMAINS

- We have examples from the radioactive waste domain
- We have many short examples from the nuclear domain
- Purpose is not to collect an all-inclusive list, but to give a quick overview of the current landscape
- Also, these chapters can be considered partly as supporting material

INSIGHTS FROM THE CONTRIBUTIONS
THE CHALLENGING PARTS

- **Drivers for the digital twins in RADWASTE (and nuclear) sector(s)**
  - Cost savings
  - Safety
  - Efficiency increase
  - Improved operations
  - New features
  - Why this might be challenging?

- **What is a digital twin for the DITOCO2030 work package?**

INSIGHTS FROM THE CONTRIBUTIONS
WHAT IS A DIGITAL TWIN?

- **Lifecycle of the repository is very long**
  - Many repository phases are not yet existing
  - We won't even see those phases
  - Technologies evolve fast – or slow

- **Terminology, are we speaking the same language?**

- **For what is the digital twin is used for?**
- **What size the digital twin is?**
- **For whom is the digital twin made for?**
- **Who is using the digital twin?**
- **Who is making the digital twin?**

FROM GREEN PAPER TO THE WHITE PAPER

- **Green paper**
  - Outlines the landscape
  - Presents gaps
  - Gives some answers, maybe also leaves some questions to answered
- **White paper**
  - Continues to provide next steps
  - Which we shall hear in the next presentation


Grazie mille