THEME 2: DATA FOR SCIENCE

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UNIVERSITY OF AMSTERDAM

plus ENVRI
Supporting environmental research with integrated solutions
- the Earth is our lab


AnaEE
Analysis and Experimentation on Ecosystems
INTER ⇄ ACT
EMBRC
EUROPEAN MARINE BIOLOGICAL RESOURCE CENTRE
Euro Argo
SIOS
FixO3
FIXED-POINT OPEN OCEAN OBSERVATORIES
SeaDataNet
IAGOS
ACTRiS
EPOS
EUROPEANPLATEOBSERVINGSYSTEM
elixir
LTER Europe
ESONET NOE
JERICO
Eurofleets
Towards an alliance of European research fleets
EuroGOOS
European Global Ocean Observing System
ICOS
INTEGRATED CARBON OBSERVATION SYSTEM
3D EISCAT
is-enes

Challenge 1: support system level of sciences

Challenge 2: share solutions to common problems

Challenge 3: Interface virtual research environment(s)

Challenge 4: re-use technologies (e.g. from e-Infrastructures)

EUDAT

Public clouds

Objectives of the "Data for Science" theme

1. to **optimize data processing and to develop common models**, **rules** and **guidance** for research data workflow documentation;
2. to **facilitate data discovery and use**, and to provide integrated end-user information technology to access heterogeneous data sources;
3. to **facilitate discovery of software services** and their composition;
4. to **make data citable by developing approaches** with practical examples, exchange of expertise, and agreements with publishers;
5. to **characterise users and build a community** evolving from current RI communities;
6. to **characterise ICT resources** (including sensors and detectors) to allow virtualisation of the environment (for instance onto Grid- or Cloud-based platforms);
7. to **facilitate the connection of users**, composed software services, appropriate data and necessary resources in order to meet end-user requirements

Direct Benefits to environmental RIs

1. A **reference model** guided design and engineering approach
2. A **knowledge base** for reusable solutions to common challenges
3. A set of **recommended services** and **a reference architecture**
4. A set of **developed services deployed** on e-Infrastructures (e.g. EUDAT or EGI)

Outline

- Overview of the *data for science* theme
- Activities and achievements
- Summary

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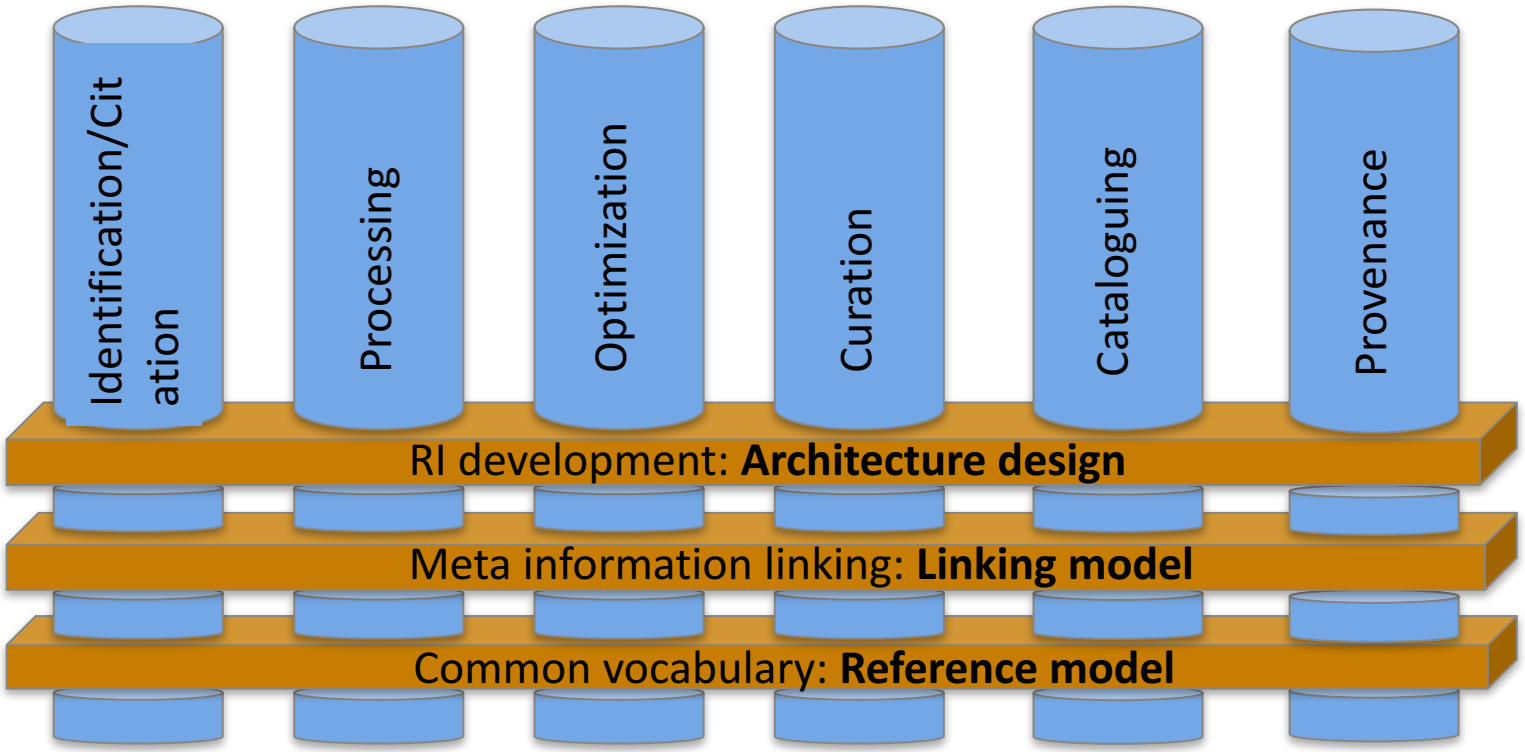
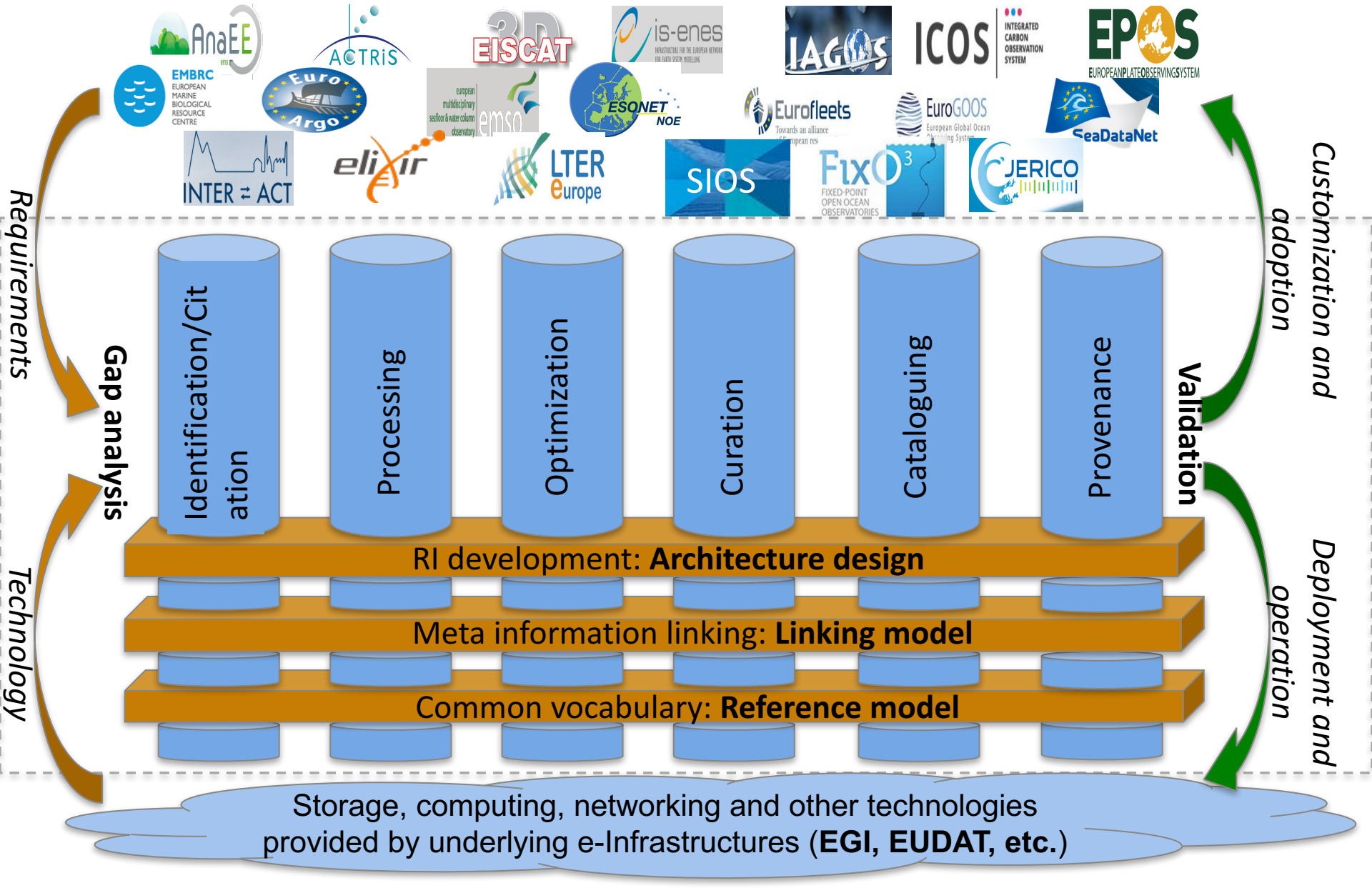
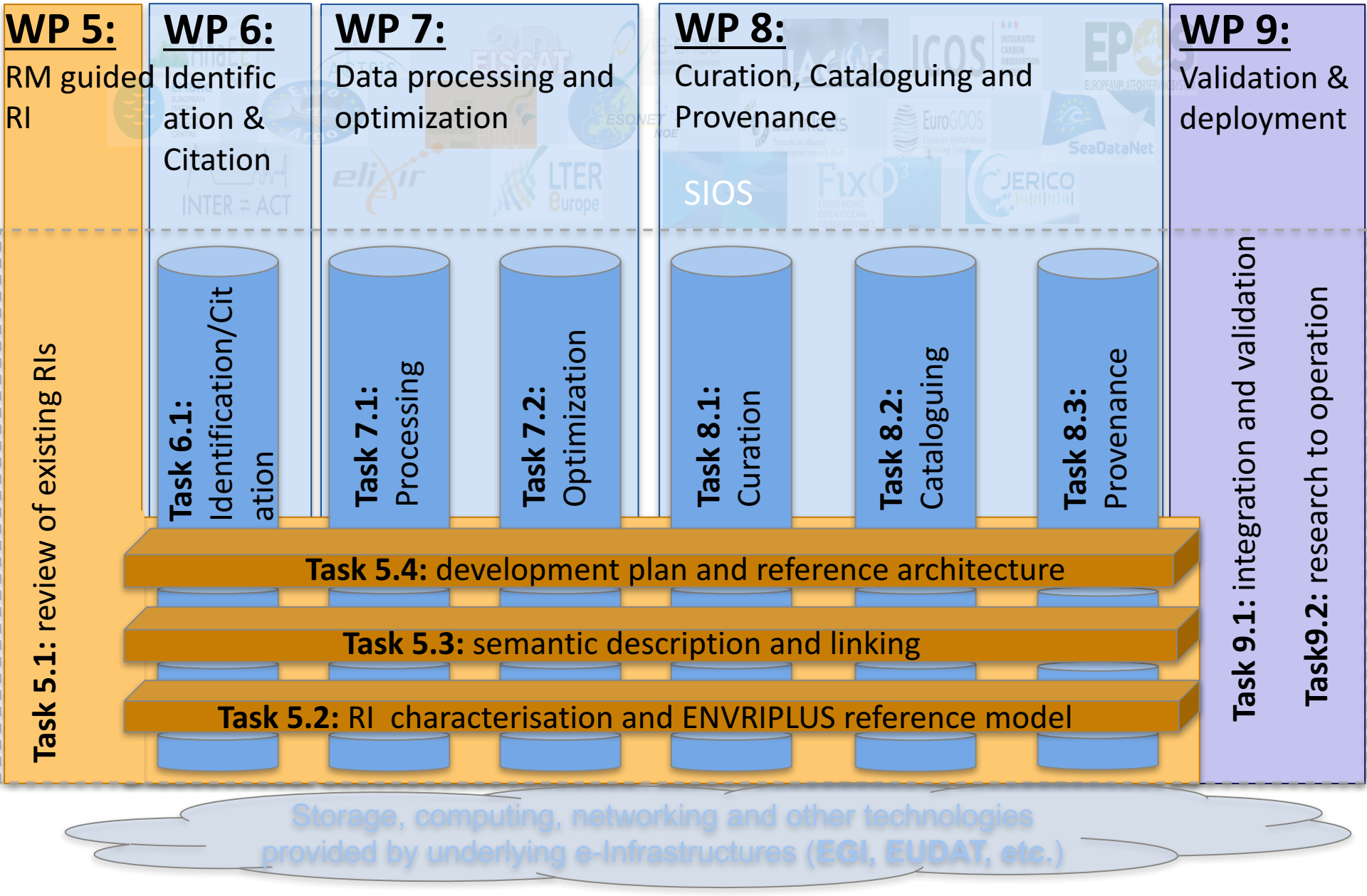
Adopted approach: identify common challenges



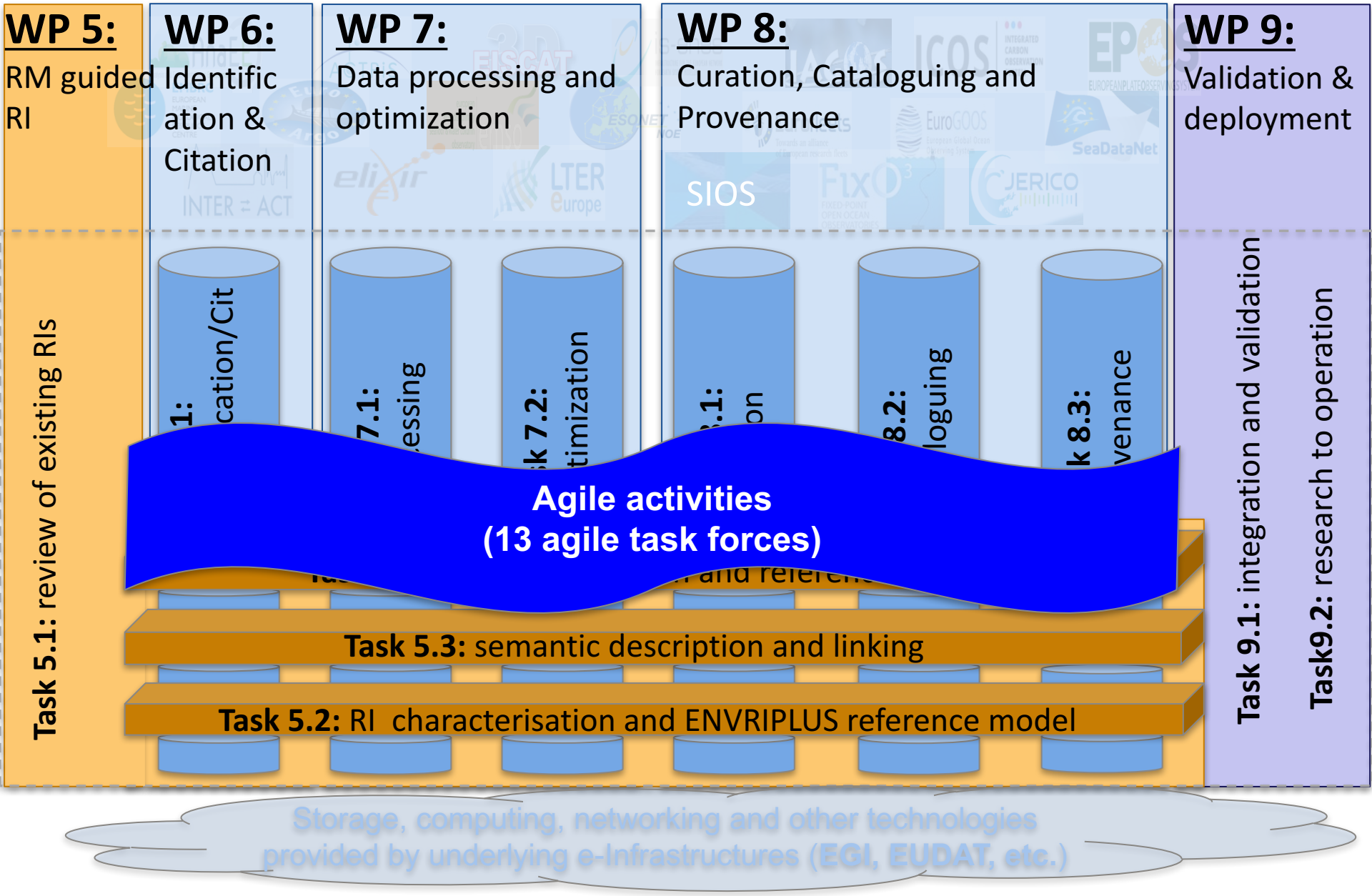
Adopted approach: RI and e-Infrastructures



Adopted approach: work package and tasks



Adopted approach: agile task forces



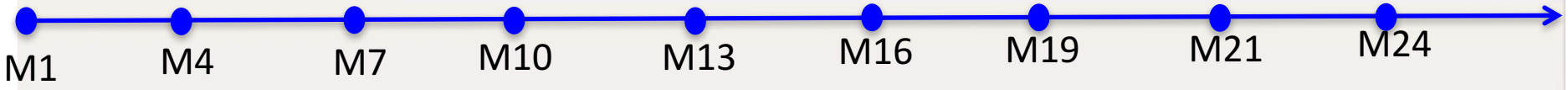
Use Cases: science, test & implementation cases

#	Use Case	Agile Group Leaders
SC_3	How do mosquito born deseases emerge and what are trends?	Matthias O. (UGOT)
TC_2	Euro-ArgoData subscription service	Thierry (IFREMER) & Yin (EGI)
TC_4	Sensor registry	Thomas B. (IFREMER)
TC_16	Description of a National Marine Biodiversity Data Archive Centre	Dan L.(MBA) & Abraham, Alex (CU)
IC_1	Dynamic data citation, identification & citation	Alex V. (LU)
IC_2	Provenance Implementation case	Barbara Magagna (EAA)
IC_3	User support to re-process data using their own algorithms (EISCAT 3D)	Ingemar H. (EISCAT) & Leonardo C.(CNR)
IC_8	Cataloguing, curation, provenance across RIs WP8	Keith J. (NERC)
IC_9	Provenance - use of DOI for tracing of data re-use.	Markus F. (NILU)
IC_10	Domain extension of existing thesauri	Barbara M. (EAA)
IC_11	Semantic Linking Framework	Zhiming, Z., Paul M. (UvA) Barbara M. (EAA)
IC_12	Implementation of ENVRI(plus) RM for EUFAR and LTER	Barbara M. (EAA)
IC_13	The eddy covariance fluxes of GHGs	Dario P., Domenico V. (UNITUS)
IC_14	SOS&SSN ontology based data acquisition & NRT data quality checking services	Robert H., Markus S. (UniHB)

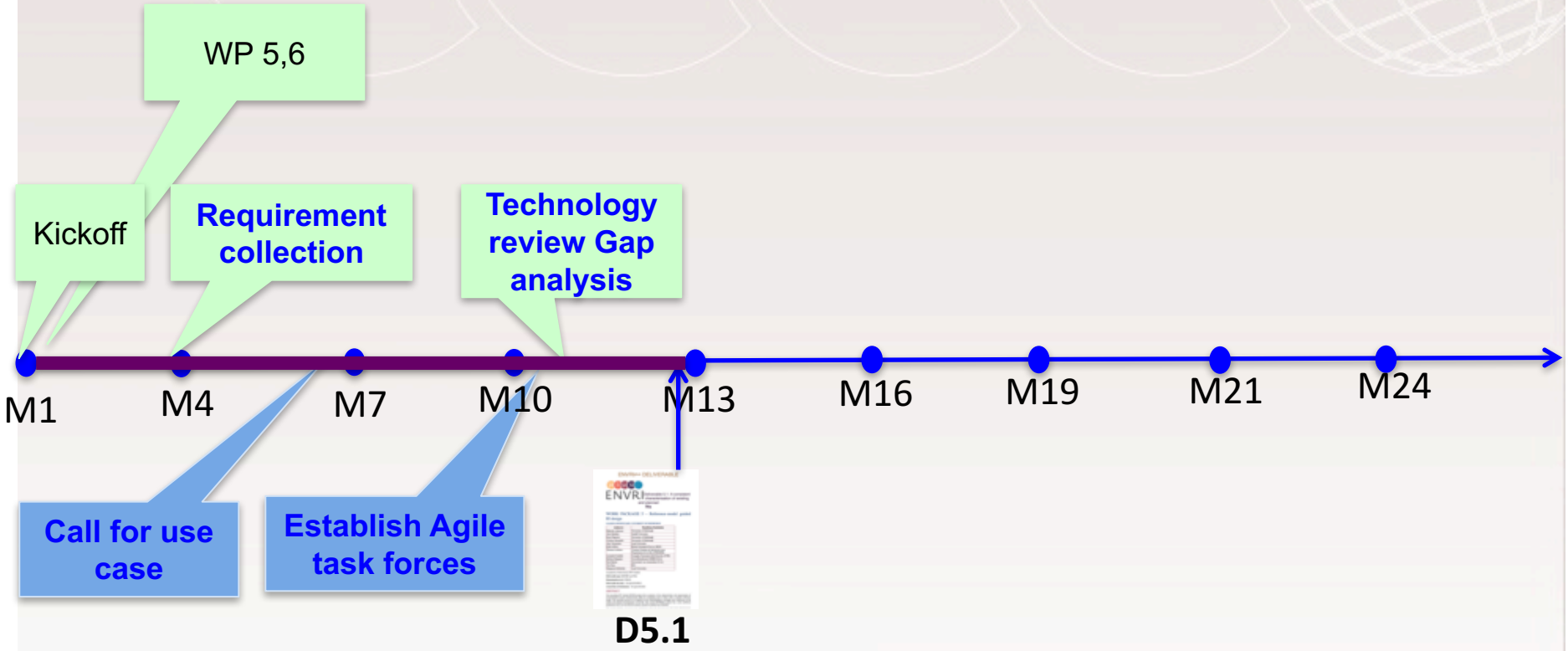
Diversity: across RIs, WPs & Partners

US#	Theme2 WPs	RIs	Partners
SC_3	WP7, WP8, WP9	LifeWatch-SW, EGI	UGOT, EGI, CNR, CU, EPOS, PANGEA
TC_2	WP9	EuroArgo, EMSO, ICOS-SOCAT, EGI, EUDAT	IFREMER, Uni of Bremen, EGI, Uni of Bergan, CNR, EUDAT, Uni Westminster
TC_4	WP8, WP5, WP9	EMSO, EPOS, EuroArgo, Marine Gliders, ICOS, Drones, EGI	IFREMER, CU, Plocan, NERC/BODC, LOCEAN, RESIF, IPSL
TC_16	WP5, WP9	EMSO, SeadataNet, JERICO, EMBRC, EMODNET, COPERNICUS, EGI	CU, MBA, EGI
IC_1	WP6	ICOS, ANAEE, ACTRIS, LTER, IAGOS	ICOS, ANAEE, ACTRIS, LTER, IAGOS, PANGAEA
IC_2	WP5, WP6, WP8	LTER, ICOS, EUDAT	EAA, EUDAT
IC_3	WP7, WP9	EISCAT-3D, EGI	EISCAT, CNR, EGI
IC_8	WP8	EMSO, EuroArgo, EPOS, ICOS, LTER, EUDAT	IFREMER, ANAEE, EUDAT, IAGOS, ICOS, LTER
IC_10	WP5, WP8	LTER, EMBEC, LifeWatch-ITA	EAA, LifeWatch-ITA
IC_11	WP5	LTER, ICOS	UvA, EAA
IC_12	WP5	EUFAR, LTER	EAA, DLR, Umweltbundesamt
IC_13	WP7, WP9	ICOS, LTER, ANAEE	UNITUS, CNR, LU
IC_14	WP4, WP9	EMSO, FIXO3, ANAEE, EGI	UniHB, ANAEE, EGI

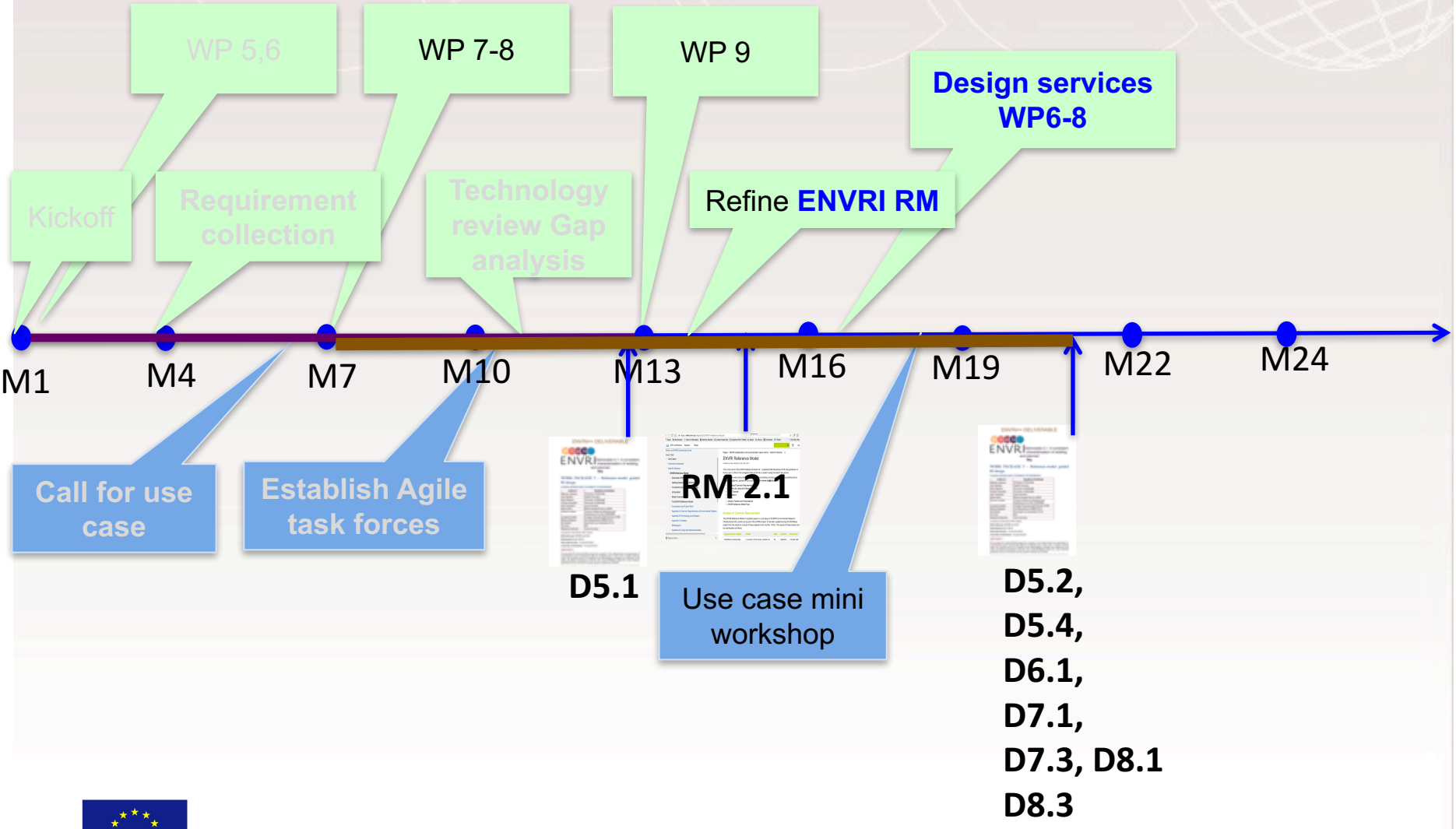
Theme 2 activities during last two years



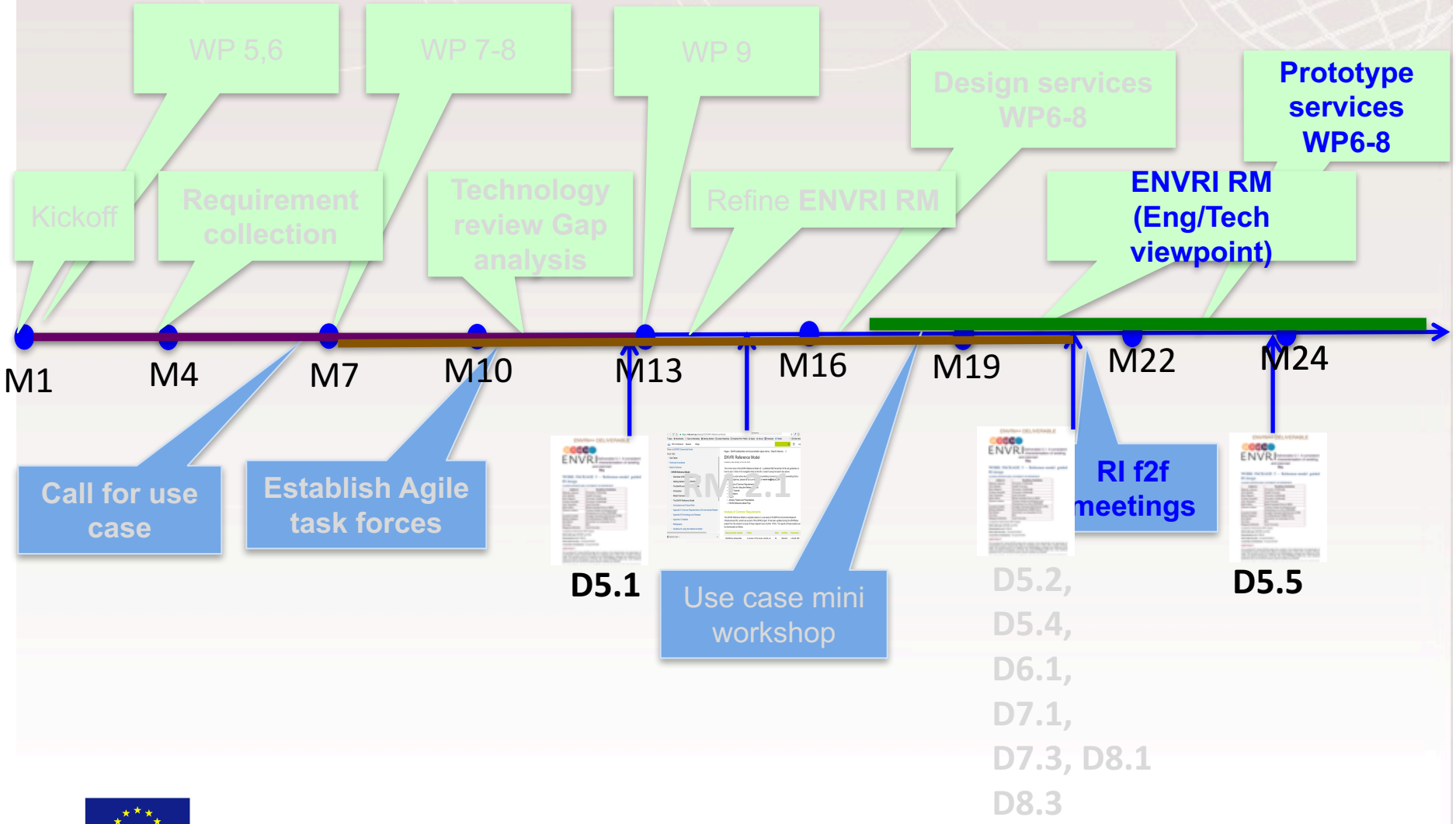
Phase 1: requirement, technology and gap analysis



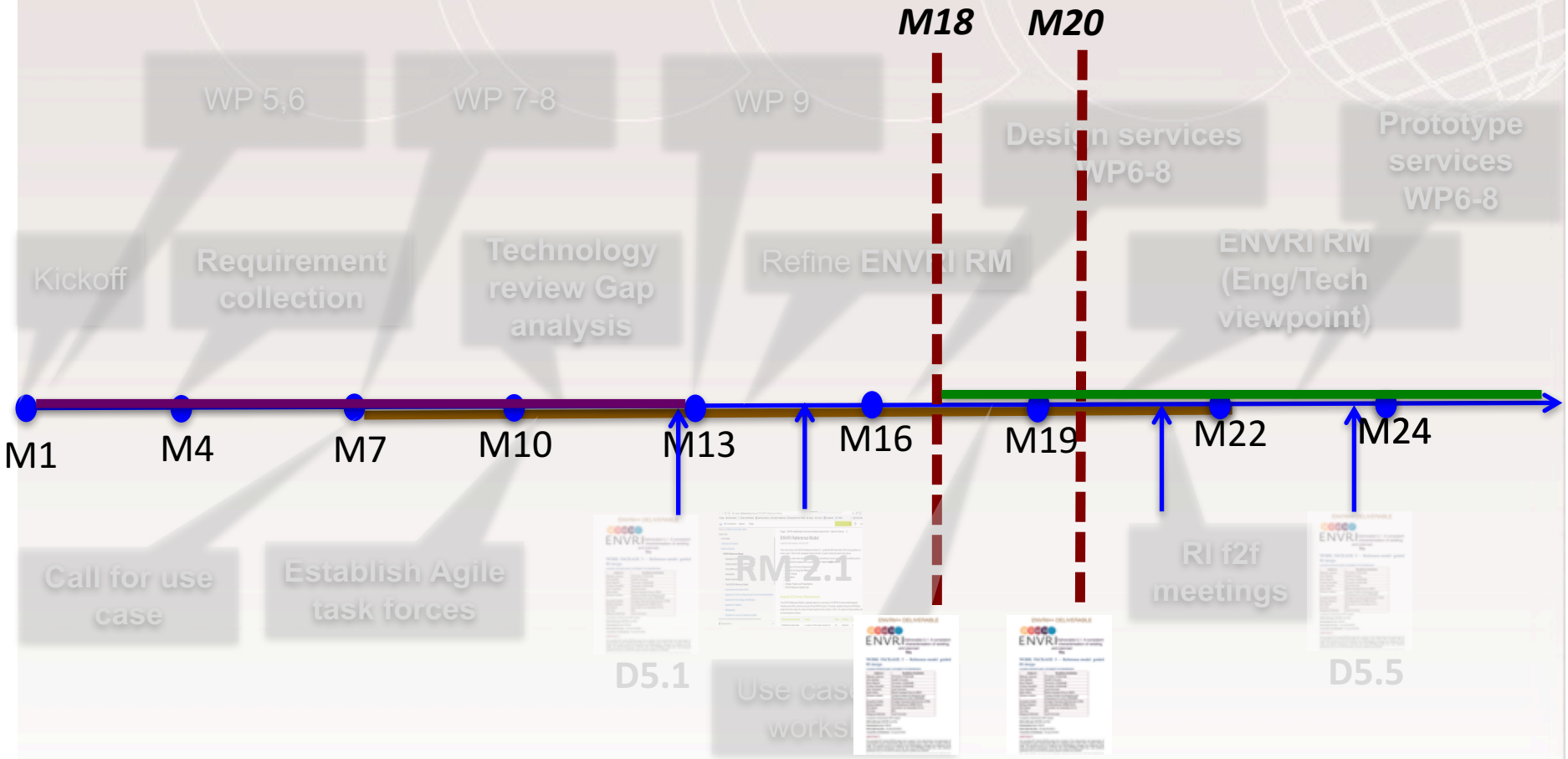
Phase 2: Reference model guided service design



Phase 3: service prototype and validation



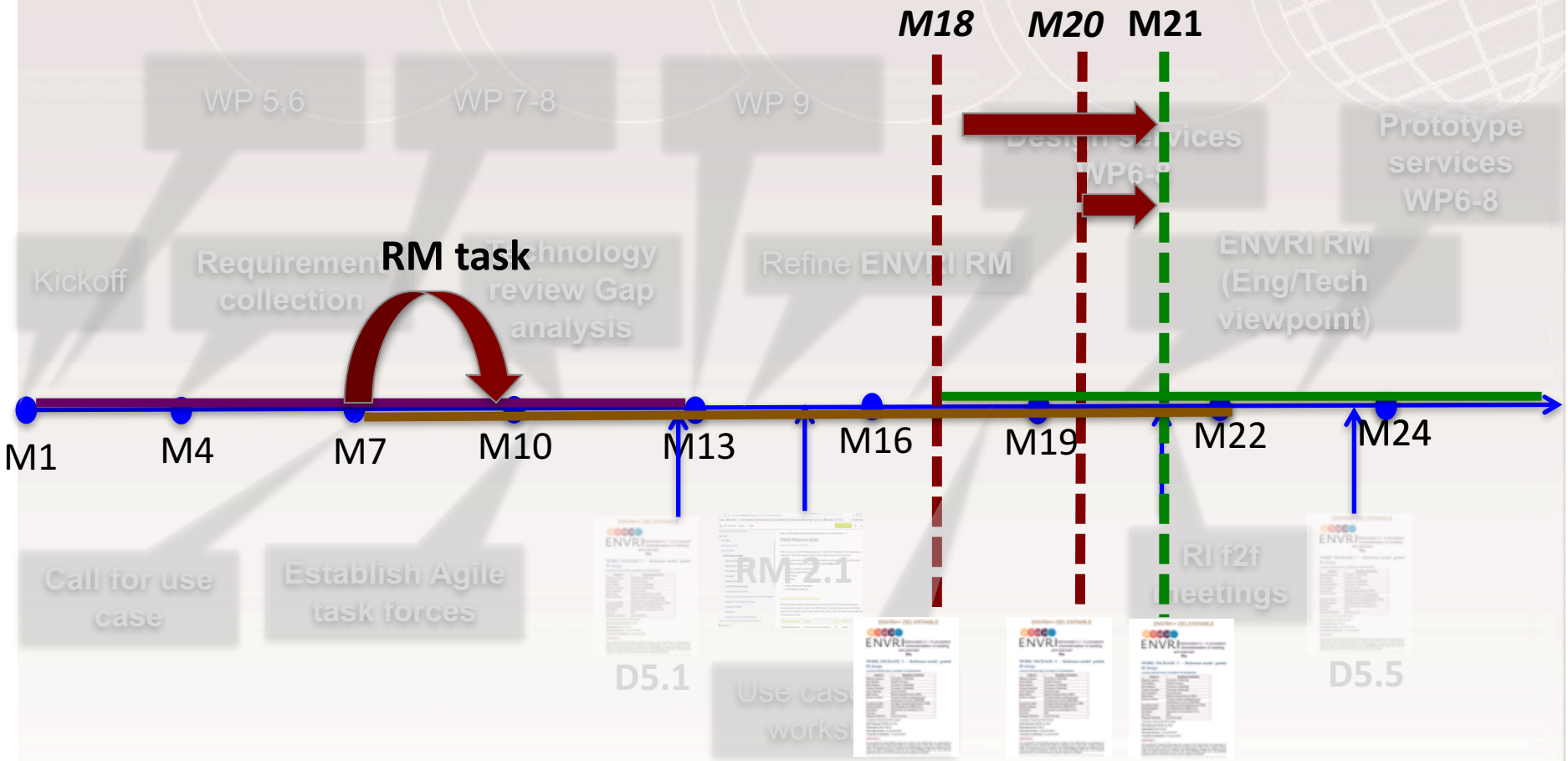
Milestones: time line



MS19 *(Reference model)*
MS20*(development plan)*
MS22 *(curation and cataloguing)*

MS25 *(processing and optimization)*

Milestones: deviations



MS19
MS20
MS22

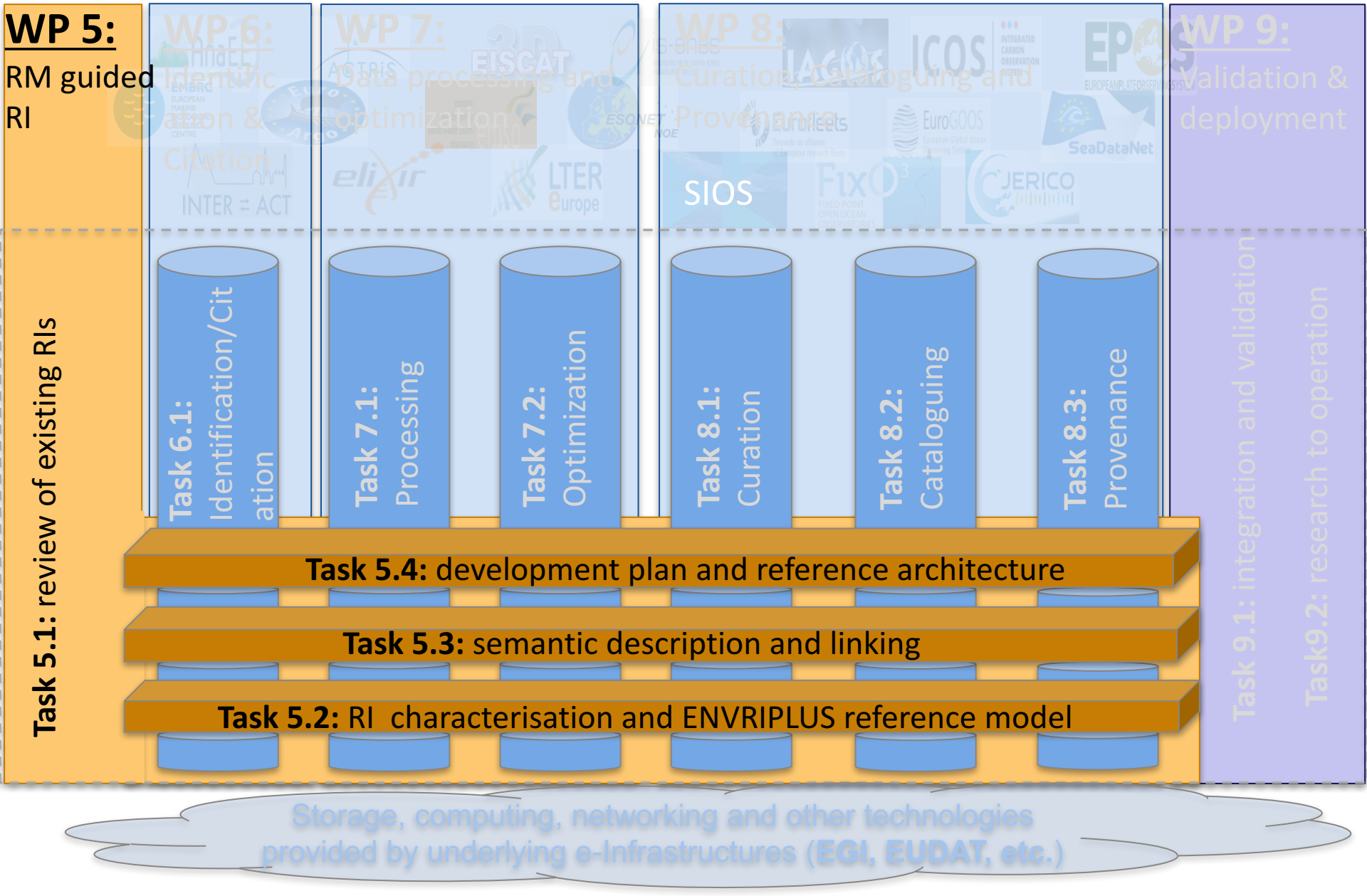
MS25

MS19, MS20, MS22, MS25
D5.2, D5.4, D6.1, D7.1,
D7.2, D8.1, D8.3

Outline

- Overview of the *data for science* theme
- **Activities and achievements**
- Summary

WP 5: Reference model guided RI design



WP 5: Objectives

1. **Update the requirement analysis and technology review** performed in the ENVRI project to reflect the progress many RIs have made in their architecture design and system implementation.
2. **To promote interoperability across** RIs by providing a **novel reference model** (RM) that should be developed based on the existing ENVRI RM, with consideration of the latest development insights from successful RIs.
3. **To provide an ontological framework** based on the ENVRI RM to describe the requirements and system architecture of RIs, and to link these descriptions with the technologies provided by data and computing infrastructures.
4. **To provide a design and implementation plan and a reference architecture** for an abstract yet customisable research environment by engaging RI developers from different domains, in particular via work packages 6–9, and using the updated ENVRI RM.

WP 5: Deliverable and deviations

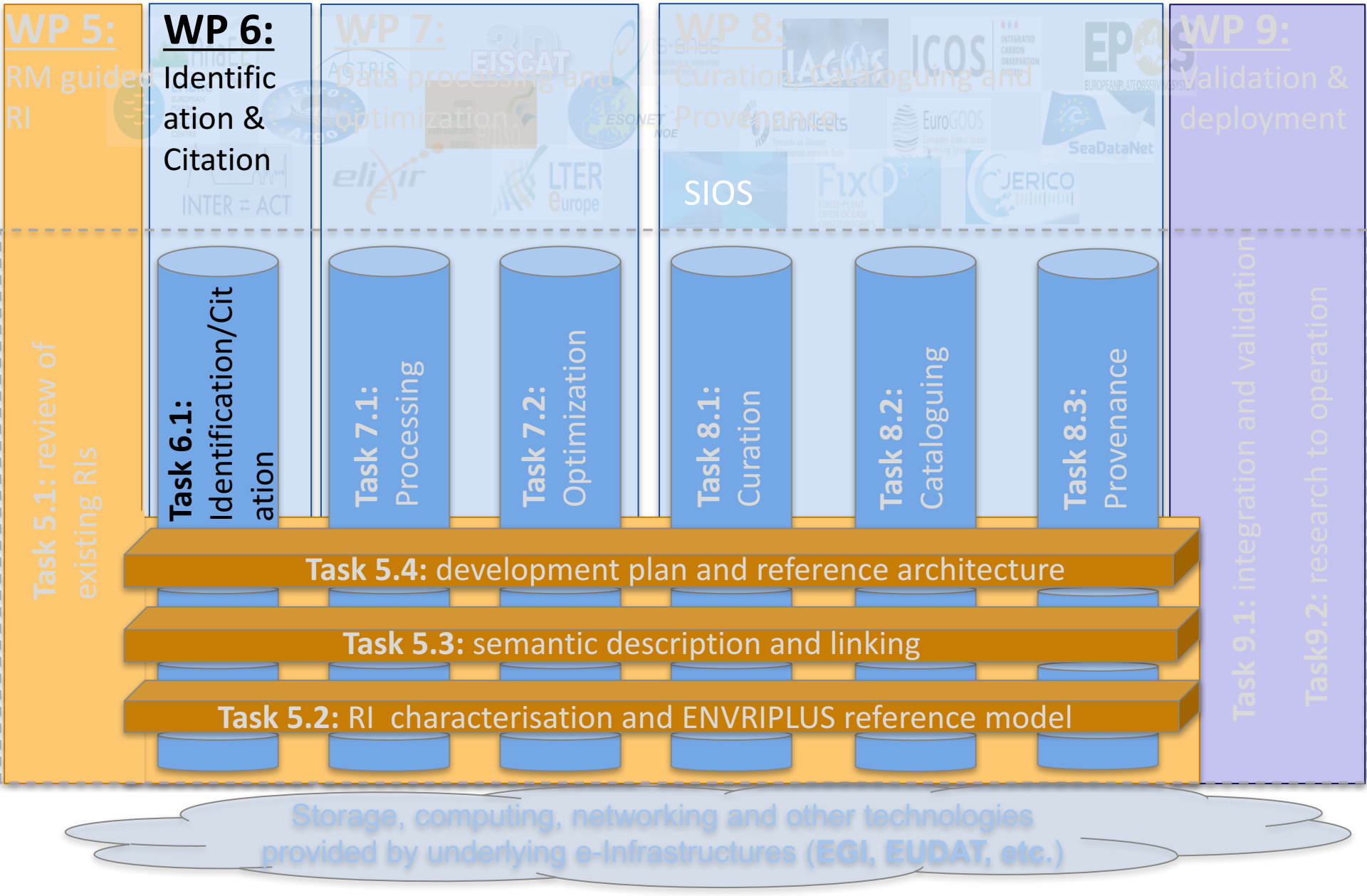
No.	Title	Deadline	Status
D5.1	A consistent characterisation of existing and planned RIs	M12	Submitted in time
D5.2	A definition of ENVRIPLUS Reference Model	M18	Delayed to M21
D5.4	A development plan for common operations and cross-cutting services	M18	Delayed to M21
D5.5	A model architecture for new RIs to adopt and to act as a guide for existing RIs in their development	M24	Submitted in time
D5.3	*A definition of the ENVRIPLUS Semantic linking framework at conceptual and formal levels*	*M36*	*On track*

No.	Title	Deadline	Status
MS19	Reference model defined	M18	Online available in time, but D5.2 delayed
MS20	A development plan for common operations and cross-cutting services	M18	Delayed to M21, due to the delay of RM

WP 5: Overall Status

1. **Successes**
   a. **Reference model, v2.1: envri.eu/rm**
   b. **OIL-e: v2.1 (**http://www.oil-e.net/ontology/rm-archetypes.owl**)**
   c. **Mapping between OIL-e and CERIF**
   d. **RM has been applied by ICOS, EISCAT-3D, EUFAR, LTER etc. (Highlight: reference model guided design)**
   e. **Publications and other achievements**
      - Organized 1st IT4RIs, in eScience 2015: https://staff.fnwi.uva.nl/z.zhao/workshop/it4ris/
      - Two book chapters
      - 4 workshop paper in e-Science 15, AINA 16 and RTSS 16
      - Talks and special session in DI4R 16
      - Article in newsletter #2, blog article, and also T15.1 training materials outputs.
2. **Issues and corrective actions**
   a. **Practical guidelines and tools of RM will be highlighted in the next phase**
3. **Plans for the next period**
   a. **Proceed with engineering/technology view of RM**
   b. **Build tools for RM guided design, semantic linking and engineering**

WP 6: Inter RI Data Identification and Citation Services



WP 6: Objectives

- To **improve the efficiency of data identification and citation** by providing convenient, effective and interoperable identifier management and citation services.

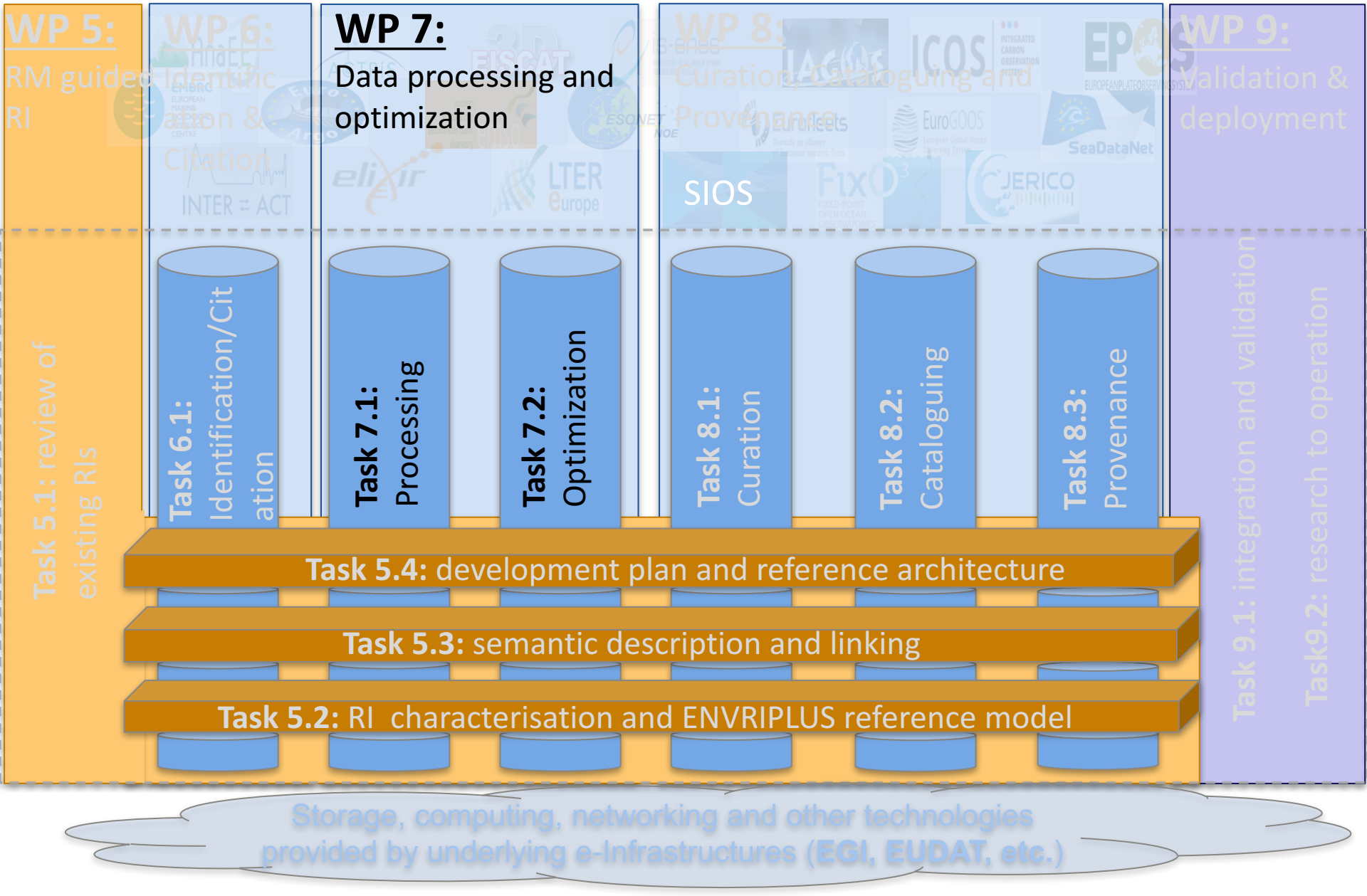
WP 6: Deliverable and deviation

No.	Title	Deadline	Status
D6.1	**A system design for data identifier and citation services for environmental RIs projects to prepare an ENVRIPLUS strategy to negotiate with external organisations**	**M20**	**Delayed to M21**
D6.2	*A report on negotiations with publishers, providers of existing data citation systems and other scientific organisations on implementing a global data citation system.*	*M36*	*On track*
D6.3	*Use-case study reports: (a) an online, standards based publication mechanism for marine biological data; (b) workflow and guidance for tested citation tracking models*	*M46*	*On track*

WP 6: Overall Status

1. **Success**
   a. **Publications**:
      - Margareta H., et al., (2016). *Near Real Time Data Processing In ICOS RI.* 2nd IT4RIs, in RTSS, Zenodo. http://doi.org/10.5281/zenodo.204817
      - Klump, J., et al.,(2016), *DOI for geoscience data – how early practices shape present perceptions*, Earth Science Informatics 9 (1)
      - Klump, J.et al., (2016). *20 Years of persistent identifiers – Which systems are here to stay*? Geophysical Research Abstracts
   b. **Software**:
      - The ICOS meta data service software repository(https://github.com/ICOS-Carbon-Portal/meta)
2. **Issues and corrective actions**
   a. **Alignment with the reference architecture will be improved**
3. **Plans for the next period**
   a. **Further prototype identification and citation services**
   b. **Negotiation with publishers**
   c. **Use cases**

WP 7: Data Processing and Analysis



WP 7: Objectives

- **Improving the efficiency of data processing** by providing system-level optimisation to select, provision and use interoperable infrastructure services for data integration, processing and storage.
- **Improving the performance of the research infrastructures** by providing system-level optimisation among data, processing, and underlying services, including their digital networks.

WP 7: Deliverable and deviations

No.	Title	Deadline	Status
D7.1	**Interoperable data processing for environmental RI projects: system design**	**M20**	**Delayed to M21**
D7.3	**Performance optimisation for environmental RI projects: system design**	**M20**	**Delayed to M21**
D7.2	*Interoperable data processing for environmental RI projects: system design: prototype*	*M42*	*On track*
D7.3	*Performance optimisation for environmental RI projects: prototype*	*M42*	*On track*

No.	Title	Deadline	Status
MS25	System design for data processing and optimization services	M20	Delayed to M21, when D7.1 and D7.3 were submitted

WP 7: Overall Status

1. Success

a. Publications

- M. Assante, et al. (2016) Virtual Research Environments as-a-Service by gCube. 8th IWSG
- Wang, J., et al., (2017) Planning Virtual Infrastructures for Time Critical Applications, FGCS
- Zhao, Z., et al. (2016) Time critical requirements and technical considerations, IT4RIs, RTSS 16
- Zhou, H., et al.(2016) Inter-locale Virtual Cloud For Nearly Real-time Big Data Applications, IT4RIs, RTSS
- Zhou, H., et al.(2016) Fast Resource Co-provisioning for Time Critical Application IEEE CLOUD
- Zhou, H., et al.(2016) Fast and Dynamic Resource Provisioning for Cloud Applications, ISORC
- Mork, R., et al. (2015) Contemporary Challenges for Data-intensive Scientific Workflow Management Systems, WORKS IEEE Supercomputing 2015.

b. Organized 2nd IT4RIs in RTSS 2016: on nearly real time data processing

c. Use cases

- SC_3, **TC_2**, TC_3 and TC_13 (**Highlight: data subscription service**)

c. Software services:

- Data Miner and
- Infrastructure optimizer

2. Issues and corrective actions

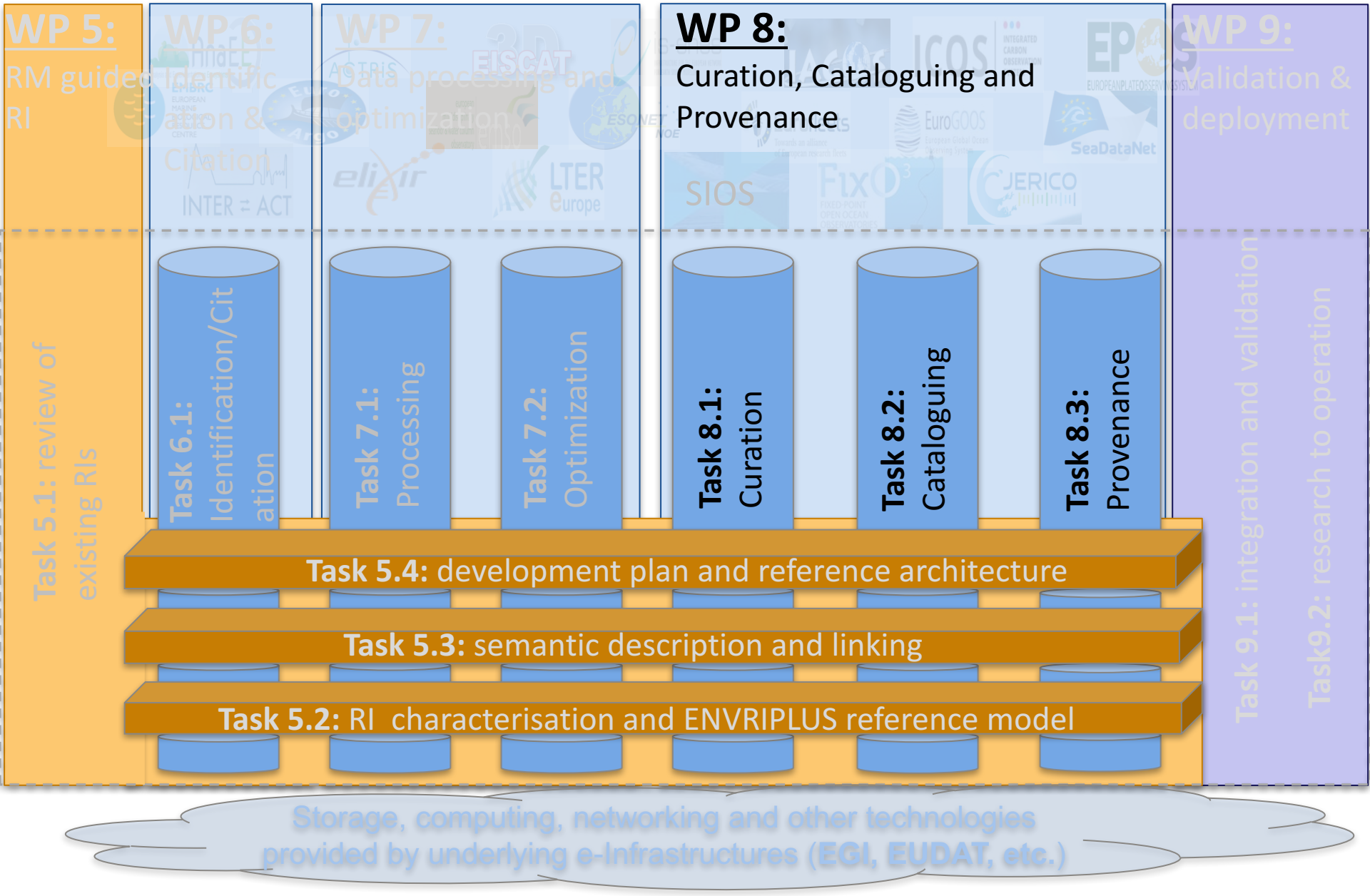
a. Engage more RIs in the development loop

3. Plan for next step

a. Refine software services based on existing use cases and new requirements

b. Apply the services to new use cases

WP 8: Data Curation and Cataloguing



WP 8: Objectives

- **Improving the efficiency and quality of user experience** for data curation by providing automatic and self-adaptable curation and semantic annotation services,
- **Improving catalogue interoperability** among different Research Infrastructures,
- **Improving the efficiency of data provenance and tracing** by providing convenient, effective and interoperable standards-based data provenance services.

WP 8: Deliverable and deviation

No.	Title	Deadline	Status
D8.1	**Data curation in system level of sciences: system design**	**M18**	**Delayed to M21**
D8.3	**Interoperable cataloguing and harmonization: system design**	**M18**	**Delayed to M21**
D8.2	*Data curation in system level of sciences: prototype and deployment*	*M42*	*On track*
D8.4	*Interoperable cataloguing and harmonization: prototype and deployment*	*M42*	*On track*
D8.5	*Data provenance and tracing for Environmental sciences: system design*	*M36*	*On track*
D8.6	*Data provenance and tracing for Environmental sciences: prototype and deployment*	*M42*	*On track*

No.	Title	Deadline	Status
MS22	System design for data curation and cataloguing	M18	Delayed to M21, when D8.1 and D8.3 were submitted

WP 8: Overall Status

1. Achievements

a. Publications:

- Zhao, Z., et al., (2015) Reference Model Guided System Design and Implementation for Interoperable Environmental Research Infrastructures. IT4RIs IEEE e-Science
- Martin, P., et al., (2015) Open Information Linking for Environmental Research Infrastructures. IT4RIs, IEEE e-Science
- Martin, P., et al., (2016) Research Data Infrastructures for Environmental Societal Challenges, book Chapter

b. Use cases:

- TC_4, IC_2 and **IC_8 (Highlight: flagship catalogue)**

2. Issues and corrective actions

a. Metadata mapping will be highlighted in the next phase jointly with T5.3

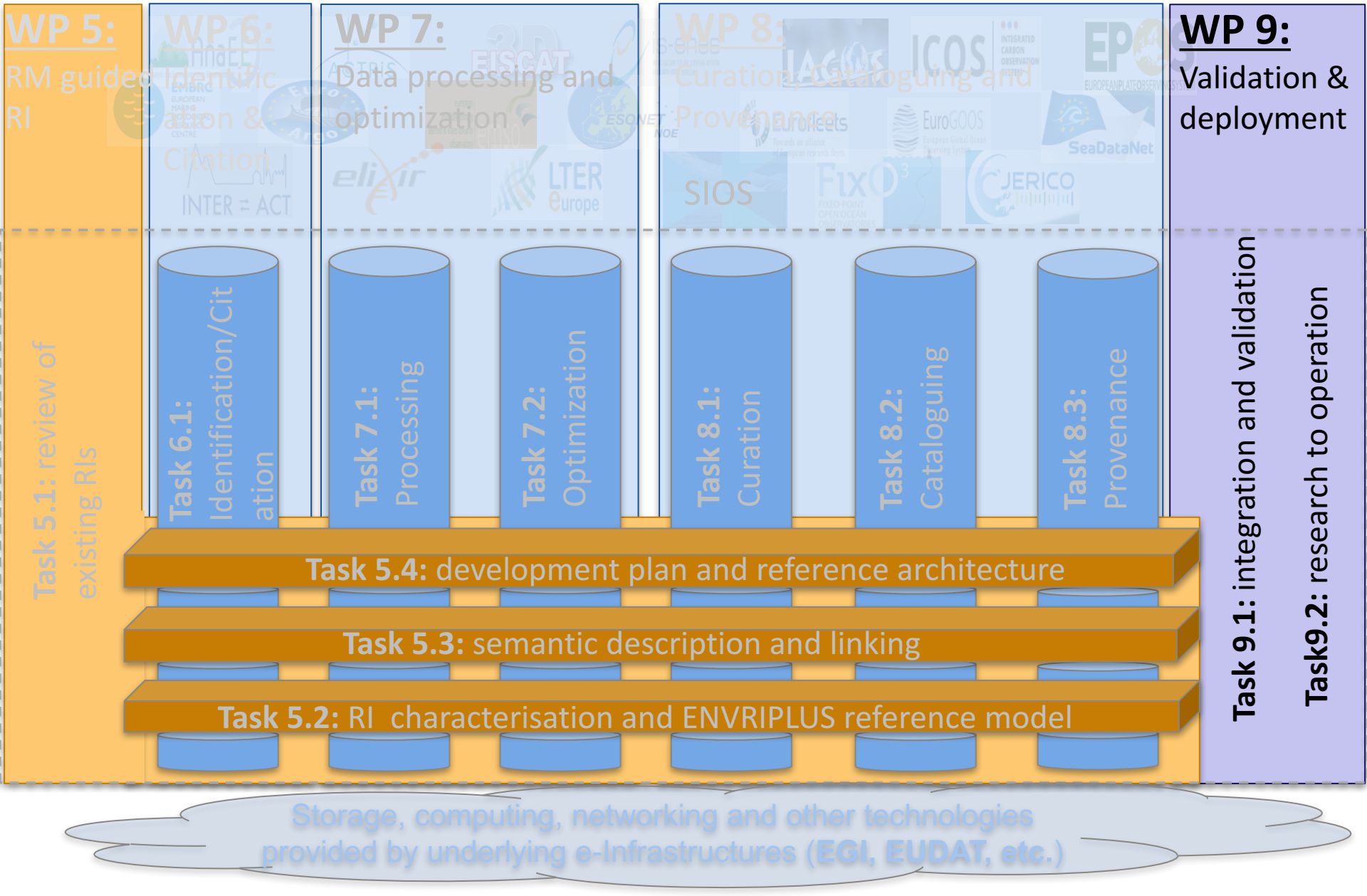
3. Plans for the next period

a. Start provenance service

b. Continue with the service prototype of catalogue and curation

c. More use cases

WP 9: Service Validation And Deployment



WP 9: Objectives

- **Improve the usability of developed services** in their intended environment. The results will be demonstrated, validated and refined via use cases.
- **Improve the deployment of the developed results**. Services and environment will be deployed in the research infrastructure, possibly via resources of the e-Infrastructure and data infrastructures.

WP 9: Deliverables

No.	Title	Deadline	Status
D9.1	*Service deployment in computing and internal e-Infrastructures Version1*	*M28*	*On track*
D9.2	*Serving key data service stakeholders and policy initiatives version 1*	*M30*	*On track*
D9.3	*Service deployment in computing and internal e-Infrastructures Version2*	*M40*	*On track*
D9.4	*Serving key data service stakeholders and policy initiatives version 2*	*M46*	*On track*

No.	Title	Deadline	Status
MS29	*Service deployment in computing and internal e- Infrastructures*	*M28*	*On track*

WP 9: Overall Status

1. **Success**
   a. **Use cases**
      - E-Infrastructure support for 13 use case agile teams
   b. **Deployment guidelines**
      - https://confluence.egi.eu/display/EC/Guideline+for+Service+Deployment
   c. **Service portfolio**
      - https://confluence.egi.eu/display/EC/ENVRIplus+Service+Portfolios
2. **Issues and corrective actions**
   a. **Training and support for e-infrastructure services will be enhanced**
3. **Plans for the next period**
   a. **Use case support, refine deployment guidelines and service portfolio**
   b. **Enhance the connection among communities of developers and e-Infrastructures**

Outline

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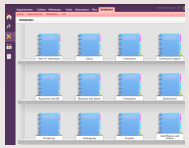
- **Summary**

SUMMARY 1: ENVRI RM and development plan



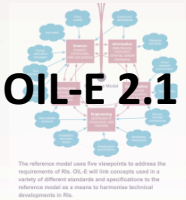
Interview notes

D5.1 requirements, technology review, gap analysis

RM 2.x

Envri.eu/rm

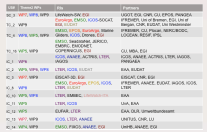
D5.2 Reference model



OIL-E 2.1

Semantic linking framework

http://www.oil-e.net/ontology/rm-core.owl

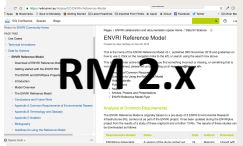


Use cases

D5.4 Development plan

SUMMARY 2: Reference model guided design

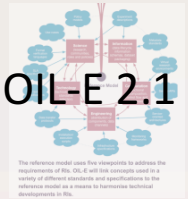
D5.1: Requirements, technology review, gap analysis



RM 2.x

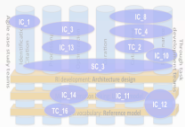
Envri.eu/rm

D5.2 RM

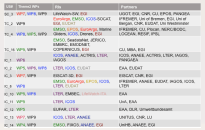


OIL-E 2.1

D5.4 Development plan



Input from agile use case teams



Use cases

D6.1: Identification and citation service architecture and recommendations

D7.1: Data processing service architecture and recommendations

D7.3: Optimization service architecture and recommendations

D8.1: Curation service architecture and recommendations

D8.3: Cataloguing service architecture and recommendations

SUMMARY 3: Reference architecture

D5.1: Requirements, technology review, gap analysis

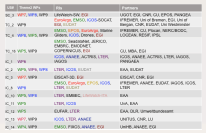
D6.1: identification and citation service architecture and recommendations

D7.1: Data processing service architecture and recommendations

D7.3: Optimization service architecture and recommendations

D8.1: Curation service architecture and recommendations

D8.3: Cataloguing service architecture and recommendations



Use cases

D5.5 Reference architecture

D5.2 Reference model

D5.4 Development plan

SUMMARY 4: RI engagement

SC_3
TC_2
TC_4
TC_16
IC_1
IC_2
IC_3
IC_8
IC_9
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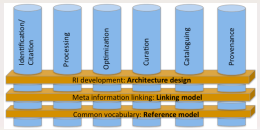


EUDAT egi


D5.1: Requirements, technology review, gap analysis


D5.2, D5.4, and D5.5: Reference model, development plan and reference architecture


Design of Citation/identification, processing, optimization, curation and cataloguing (D6.1, D7.1, D7.3, D8.1 and D8.3)

Deployment and validation on E-infrastructure

SUMMARY 5: meet WP 5 objectives

Objectives

1. **Update the requirements analysis** and technology review

D5.1

Executive summary

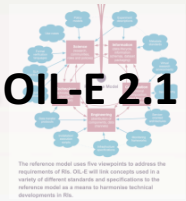
2. **To promote interoperability across** RIs by providing a **novel reference model** (RM)

RM 2.x

Envri.eu/rm

D5.2

3. **To provide an ontological** framework



OIL-E 2.1

4. **To provide a design and implementation** plan and a reference

D5.4

D5.5

SUMMARY 6: next steps in WP 5

Objectives

1. **Update the requirements analysis** and technology review

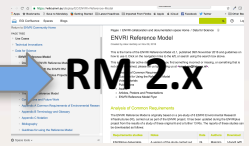
D5.1

Executive summary

Next step

1. **Refinement** and **revisiting** in the context of WP6-9

2. **To promote interoperability across** RIs by providing a **novel reference model** (RM)



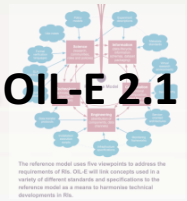
RM 2.x

Envri.eu/rm

D5.2

2. Continue with **engineering/technology** viewpoints

3. **To provide an ontological** framework



OIL-E 2.1

3. **Annotation, search** and other tools

4. **To provide a design and implementation** plan and a reference

D5.4

D5.5

4. **Refinement** in the context of WP6-8

SUMMARY 7: meet WP 6-8 objectives

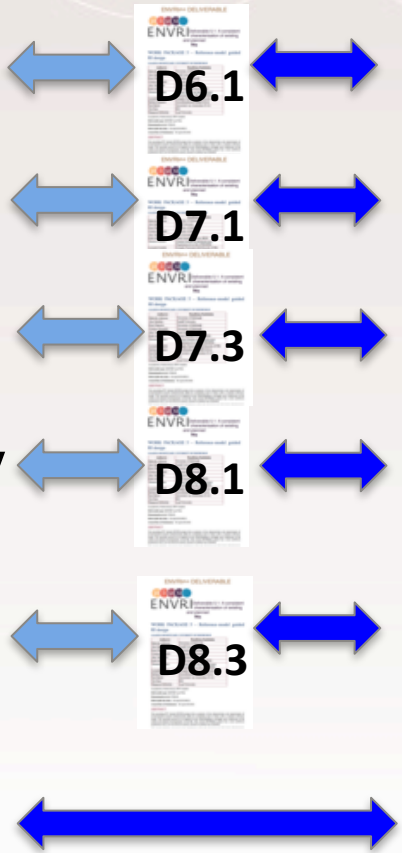
Objectives

1. (**WP6**) to improve the efficiency of **data identification and citation** ⟷ D6.1
2. (**WP7 -1**) to improve the efficiency of **data processing** ⟷ D7.1
3. (**WP7 -2**) to improve the **performance** of the research infrastructures ⟷ D7.3
4. (**WP8 -1**) to improve the **efficiency and quality** of user experience for data curation ⟷ D8.1
5. (**WP8 -2**) to improve **catalogue interoperability** among different research infrastructures ⟷ D8.3
6. (**WP8 -3**) to improve the efficiency of **data provenance and tracing**

SUMMARY 8: next steps in WP 6-8

Objectives

1. (**WP6**) to improve the efficiency of **data identification and citation**
2. (**WP7 -1**) to improve the efficiency of **data processing**
3. (**WP7 -2**) to improve the **performance** of the research infrastructures
4. (**WP8 -1**) to improve the **efficiency and quality** of user experience for data curation
5. (**WP8 -2**) to improve **catalogue interoperability** among different research infrastructures
6. (**WP8 -3**) to improve the efficiency of **data provenance and tracing**



Next step

1. Refine services based on **roadmap and recommended architecture** (defined in D5.3, D5.4)
2. **Validate the prototypes** in more use cases
3. Start **provenance** tasks

SUMMARY 9: meet WP 9 objectives

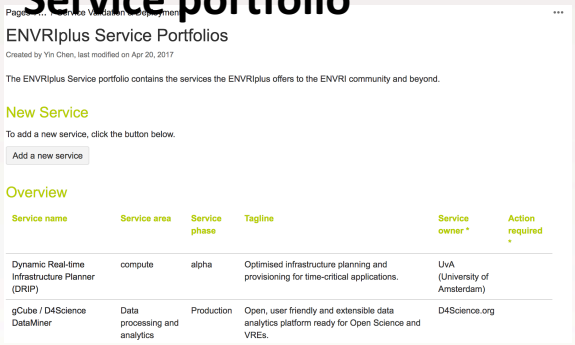
1. **Improve the usability of developed services in their intended environment.**

Use cases

US#	Theme2 WPs	RIs	Partners
SC_3	WP7, WP8, WP9	LifeWatch-SW, EGI	UGOT, EGI, CNR, CU, EPOS, PANGEA
TC_2	WP9	EuroArgo, EMSO, ICOS-SOCAT, EGI, EUDAT	IFREMER, Uni of Bremen, EGI, Uni of Bergan, CNR, EUDAT, Uni Westminster
TC_4	WP8, WP5, WP9	EMSO, EPOS, EuroArgo, Marine Gliders, ICOS, Drones, EGI	IFREMER, CU, Plocan, NERC/BODC, LOCEAN, RESIF, IPSL
TC_16	WP5, WP9	EMSO, SeadataNet, JERICO, EMBRC, EMODNET, COPERNICUS, EGI	CU, MBA, EGI
IC_1	WP6	ICOS, ANAEE, ACTRIS, LTER, IAGOS	ICOS, ANAEE, ACTRIS, LTER, IAGOS, PANGAEA
IC_2	WP5, WP6, WP8	LTER, ICOS, EUDAT	EAA, EUDAT
IC_3	WP7, WP9	EISCAT-3D, EGI	EISCAT, CNR, EGI
IC_8	WP8	EMSO, EuroArgo, EPOS, ICOS, LTER, EUDAT	IFREMER, ANAEE, EUDAT, IAGOS, ICOS, LTER
IC_10	WP5, WP8	LTER, EMBEC, LifeWatch-ITA	EAA
IC_11	WP5	LTER, ICOS	UvA, EAA
IC_12	WP5	EUFAR, LTER	EAA, DLR, Umweltbundesamt
IC_13	WP7, WP9	ICOS, LTER, ANAEE	UNITUS, CNR, LU
IC_14	WP4, WP9	EMSO, FIXO3, ANAEE, EGI	UniHB, ANAEE, EGI

2. **Improve the deployment of the developed results.**

Deployment guidelines & Service portfolio



ENVRIplus Service Portfolios

Created by Yin Chen, last modified on Apr 20, 2017

The ENVRIplus Service portfolio contains the services the ENVRIplus offers to the ENVRI community and beyond.

New Service

To add a new service, click the button below.

Add a new service

Overview

Service name	Service area	Service phase	Tagline	Service owner *	Action required *
Dynamic Real-time Infrastructure Planner (DRIP)	compute	alpha	Optimised infrastructure planning and provisioning for time-critical applications.	UvA (University of Amsterdam)	
gCube / D4Science DataMiner	Data processing and analytics	Production	Open, user friendly and extensible data analytics platform ready for Open Science and VREs.	D4Science.org	

SUMMARY 10: next steps in WP 9

1. **Improve the usability of developed services in their intended environment.**

2. **Improve the deployment of the developed results.**

Use cases

US#	Theme2 WPs	RIs	Partners
SC_3	WP7, WP8, WP9	LifeWatch-SW, EGI	UGOT, EGI, CNR, CU, EPOS, PANGEA
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TC_4	WP8, WP5, WP9	EMSO, EPOS, EuroArgo, Marine Gliders, ICOS, Drones, EGI	IFREMER, CU, Plocan, NERC/BODC, LOCEAN, RESIF, IPSL
TC_16	WP5, WP9	EMSO, SeadataNet, JERICO, EMBRC, EMODNET, COPERNICUS, EGI	CU, MBA, EGI
IC_1	WP6	ICOS, ANAEE, ACTRIS, LTER, IAGOS	ICOS, ANAEE, ACTRIS, LTER, IAGOS, PANGAEA
IC_2	WP5, WP6, WP8	LTER, ICOS, EUDAT	EAA, EUDAT
IC_3	WP7, WP9	EISCAT-3D, EGI	EISCAT, CNR, EGI
IC_8	WP8	EMSO, EuroArgo, EPOS, ICOS, LTER, EUDAT	IFREMER, ANAEE, EUDAT, IAGOS, ICOS, LTER
IC_10	WP5, WP8	LTER, EMBEC, LifeWatch-ITA	EAA
IC_11	WP5	LTER, ICOS	UvA, EAA
IC_12	WP5	EUFAR, LTER	EAA, DLR, Umweltbundesamt
IC_13	WP7, WP9	ICOS, LTER, ANAEE	UNITUS, CNR, LU
IC_14	WP4, WP9	EMSO, FIXO3, ANAEE, EGI	UniHB, ANAEE, EGI

Deployment guidelines & Service portfolio

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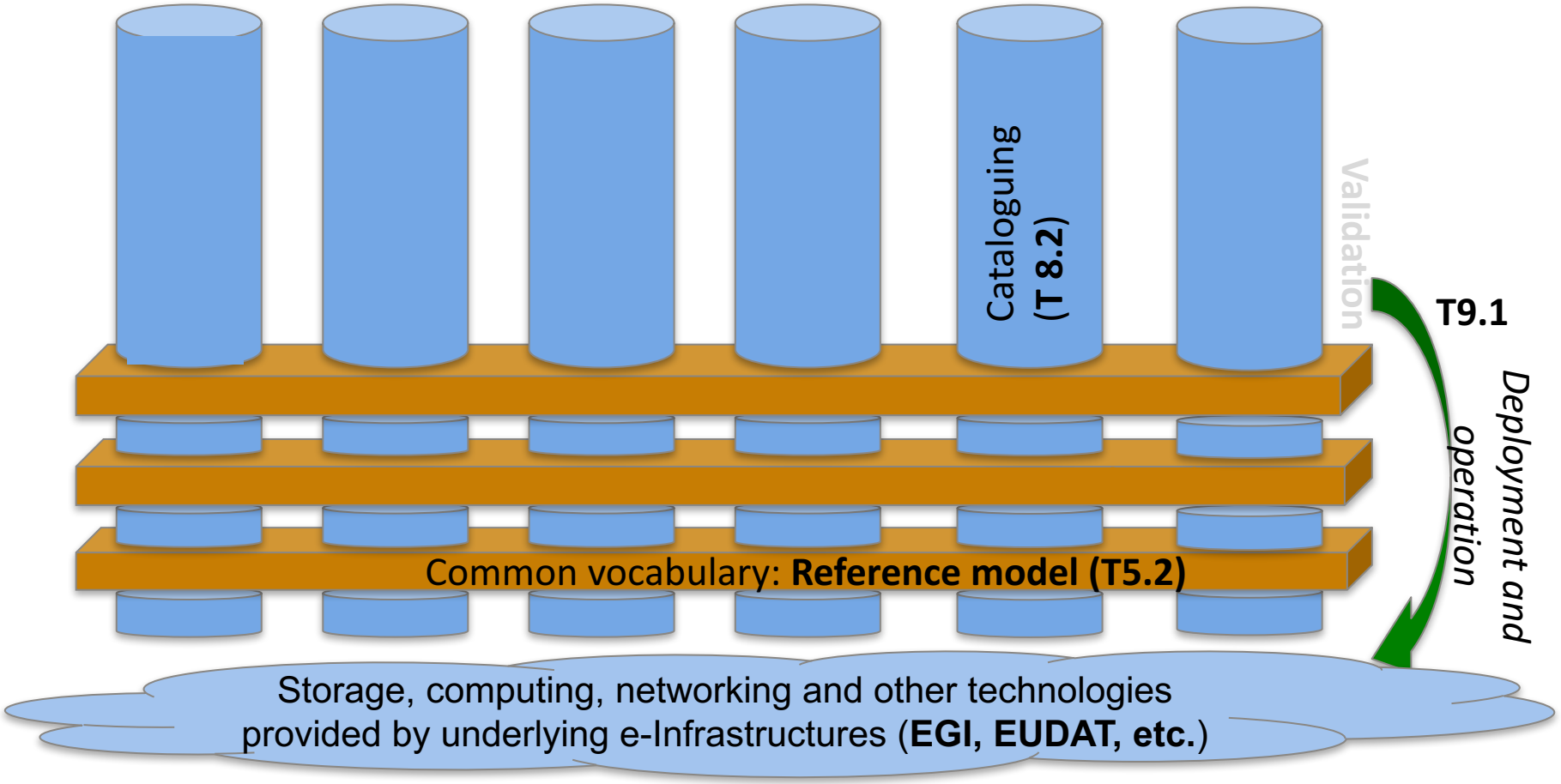
Next steps

1. More **demonstrators** of use cases
2. More concrete services in **portfolio**
3. More deployments on **e-infrastructures**

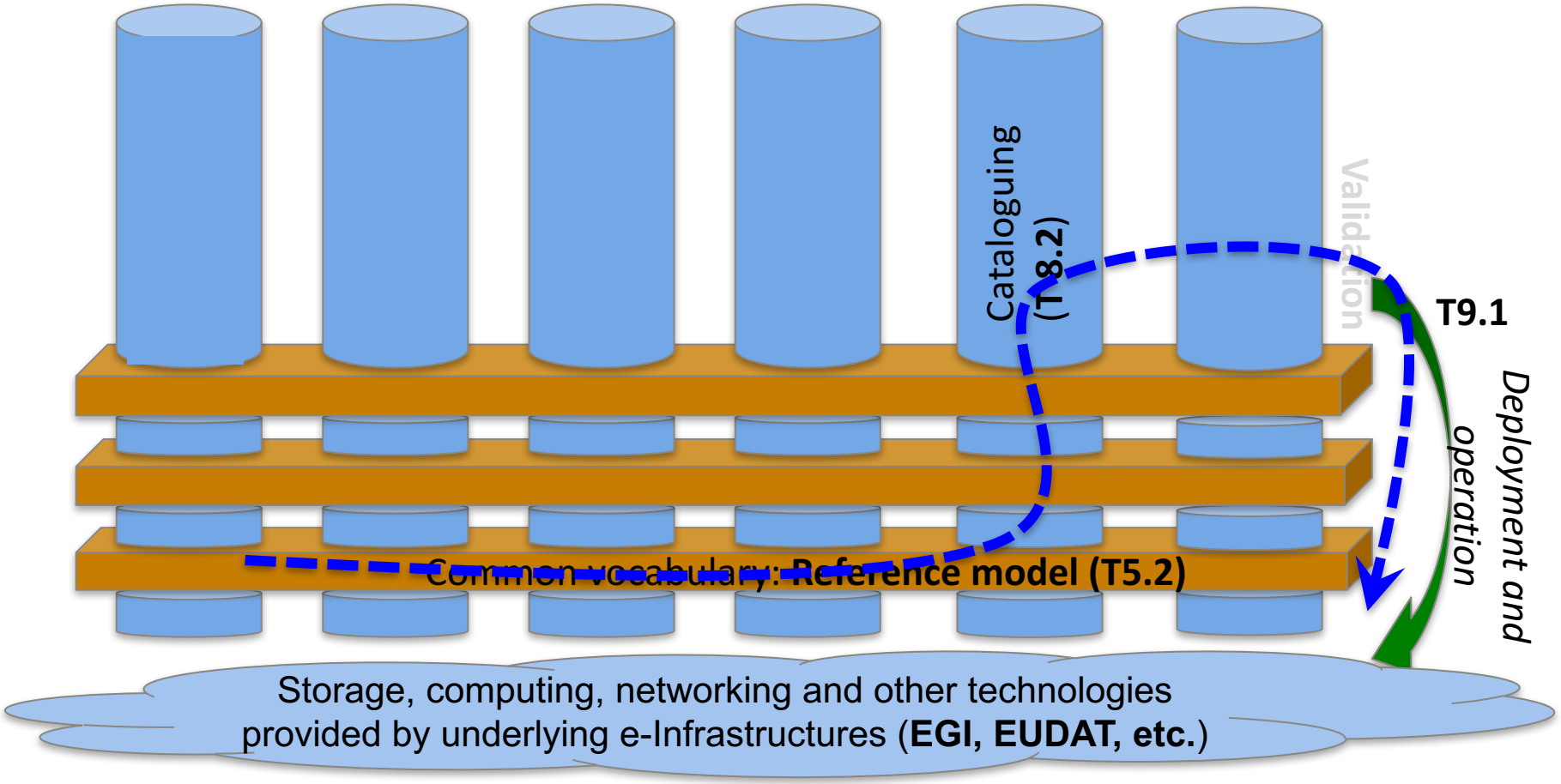
HIGHLIGHTS IN THEME 2

Supporting environmental research
with integrated solutions
- the Earth is our lab

Highlights


Cataloguing
(T 8.2)
Validation
T9.1
Deployment and
operation
Common vocabulary: **Reference model (T5.2)**
Storage, computing, networking and other technologies
provided by underlying e-Infrastructures (**EGI, EUDAT, etc.**)

Highlights


Cataloguing
(T8.2)
Validation
T9.1
Deployment and
operation
Common vocabulary: Reference model (T5.2)
Storage, computing, networking and other technologies
provided by underlying e-Infrastructures (EGI, EUDAT, etc.)

THEME 2 HIGHLIGHT 1
Reference model guided approach

FROM **WP5**

T5.2, Cardiff University (Alex Hardisty)

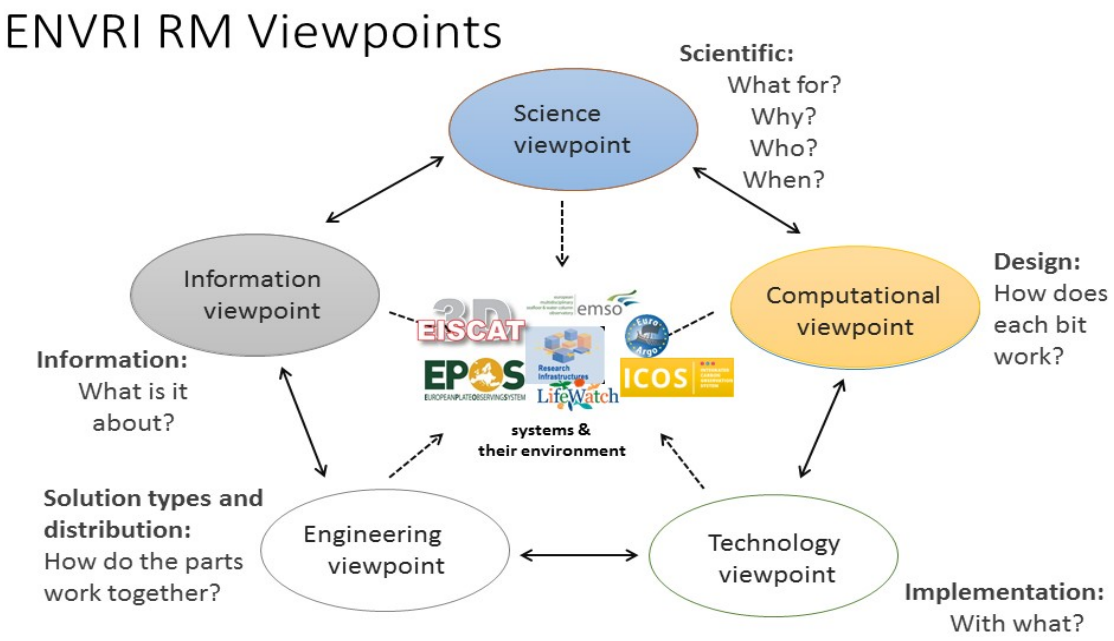
T5.3, University of Amsterdam (Paul Martin, Zhiming Zhao)

Abraham Nieva, Malcolm Atkinson, Aurora Constantin, Barbara Magagna, Markus Stocker

REFERENCE MODEL GUIDED APPROACH

AIDS ENGINEERING DESIGN

- **The ENVRI Reference Model (RM)**, started in the former ENVRI project, is an ongoing development of ENVRIplus that can be applied to the informatics engineering design challenges faced by RIs.
- **Like the design of buildings**, the RM decomposes the modelling procedure for a complex distributed system into different viewpoints.
- **The RM promotes** a standard vocabulary for **describing** environmental research infrastructures and for **modelling** their components and architecture from the ***scientific***, ***informational***, ***computational***, ***engineering*** and ***technology*** viewpoints.
- Current version: V2.1
  http://envri.eu/rm



WHO IS USING THE ENVRI RM?

PRESENTLY APPLIED TO DESIGN WORK

- By RIs, assisting research infrastructure engineers with systems design:

DASSH—archive for marine species and habitats data; deliver metadata and access capabilities into partner infrastructures (MEDIN, NBN, EMBRC, etc.).

EISCAT-3D—designing and investigating big data strategies via outsourcing to e-Infrastructure providers such as EGI.eu and EUDAT.

EMSO—Data Management Architecture Design; EMSOdev D6.2, 08/16.

EUFAR—identifying/understanding missing business processes.

ICOS—consolidation of thinking regarding different design sub-groups.

LTER, Euro-Argo, SeaDataCloud and EPOS—recently started.

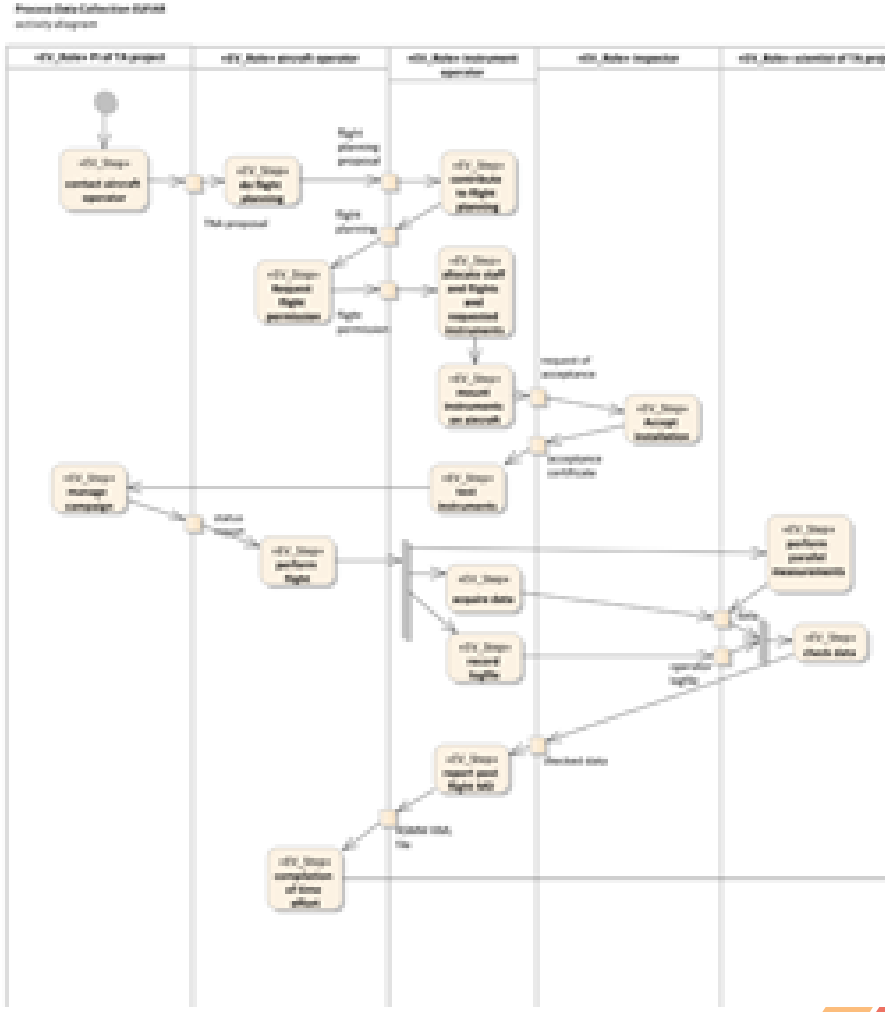
**Having a "personal trainer" helped a lot to start working with the RM. Gaps within EUFAR's working procedures could already be identified.*

**EISCAT is developing a new portal within EGI and EUDAT projects. The RM helps to define the structure and content of the new data model the portal is dependent on.*

**The RM represents an incredibly useful tool to help crystallise one's thinking, once an initial familiarity has been achieved.*

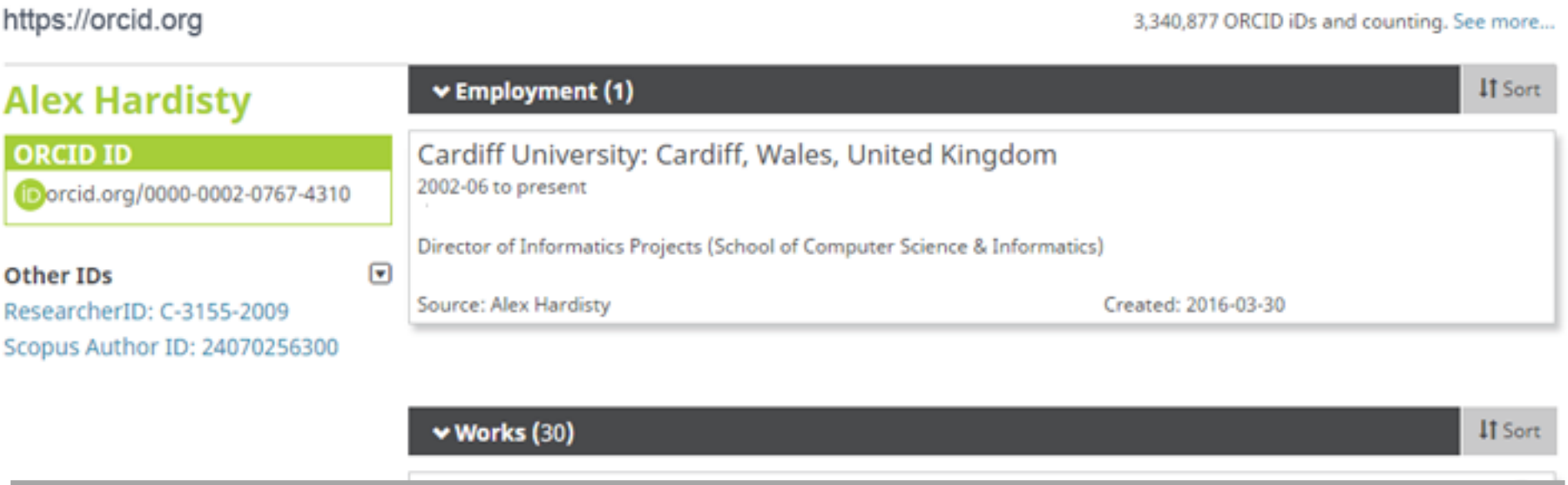
RI DESIGN EXAMPLE

EUROPEAN FACILITY FOR AIRBORNE RESEARCH



- **EUFAR** brings together operators of instrumented research aircraft and remote-sensing instruments with the scientific user community.
- Using RM to model their **processes:**
  - **Process** of applying for Trans-National Access to aircraft.
  - **Process** of managing a complete campaign to collect data—from initial contact with the aircraft operator, through flight planning and action, instrument installation and test, data acquisition and checking/logging to final reporting on success and costs of the campaign.

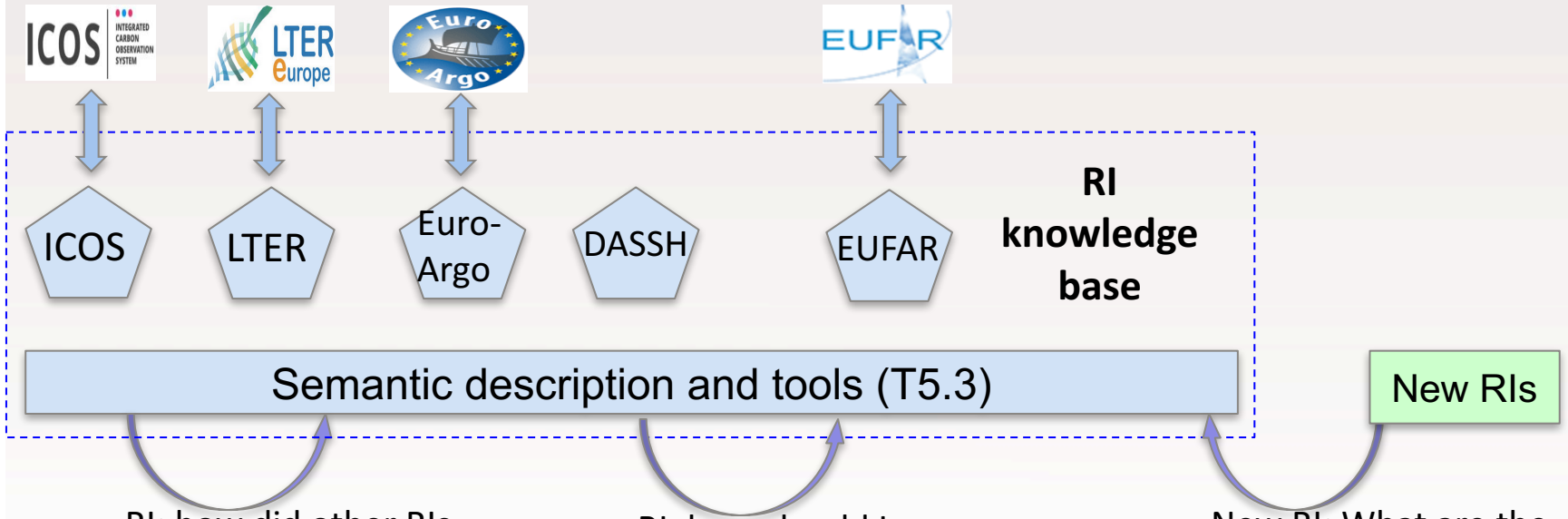
INTEGRATION EXAMPLE
ORCID PERSONAL PERSISTENT IDENTIFIERS



- **ORCID integration in RIs** enables automated linking of submitted and curated datasets to contributors' ORCID identifiers.
- As demonstrated by Argo, RIs can credit contributors by automatically updating their ORCID record on their behalf whenever new data is published.
- The ENVRI Reference Model **guides ORCID integration** in RIs by:
  - specifying ORCID's role in relation to RIs.
  - suggesting computational components required for RIs to integrate with ORCID.
  - Showing that the ORCID iD is an information object manipulated by RIs.

WHY IS THE RM IMPORTANT?
FOR KNOWLEDGE SHARING

- **Discover** reusable components among research infrastructures.
- **Design** new research infrastructures.
- **Optimise** the evolutionary path.



WHY IS THE RM IMPORTANT?
FOR FRAMING LONG-TERM STRATEGIC ICT

- **RIs will last much longer than ENVRIPLUS**. ICT provision transforms radically over time. Technologies come and go but logicalities are more stable.
- Those responsible for RIs should know **what the important RI elements** are and **where and what are the interfaces to them**—so that **interoperability** can be achieved, and so that **third-party components/services** can be widely exploited.
  - e.g., in the cataloguing highlight that you will hear about next.
- **The goal is** not to have all RI functions implemented in the same or similar ways (although there are 'critical mass' benefits arising from that as well) but **to standardise external and inter-RI interfaces** to simplify the task of using or building tools for multiple RIs.
- **RM provides the framework** within which medium to long-term ICT options can be considered and proposed, for example by a strategic "ENV RI Information Systems Strategy and Engineering Group".

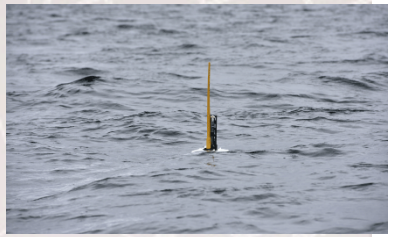
THEME 2 HIGHLIGHT 2
Flagship product catalogue

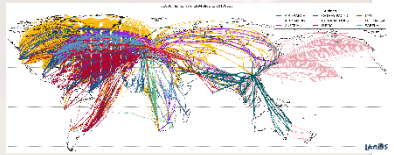
FROM **WP 8**

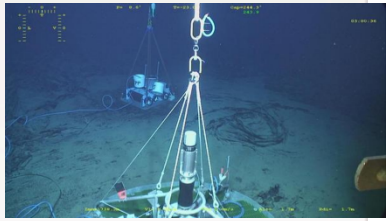
Thomas Loubrieu, Keith Jeffery

Euro-ARGO, SeaDataNet (IFREMER), EPOS (NERC, INGV, GFZ), ICOS (LU), IAGOS (CNRS), LTER (UBA-GmbH), ANAEE (INRA), EMBRC (MBA)

FLAGSHIP PRODUCT CATALOGUE







- Any resources provided by an RI that are open to users and should be discoverable, easy understandable, advertised… think of it as a **marketing tool for RIs.**
- **Data services**:
  - Global Ocean physics properties from 0 to 2000 meters deep by Euro-ARGO profiling floats (ARGO).
  - Atmosphere Carbon concentrations measured by IAGOS planes.
  - …
- **Acquisition services**:
  - Ecological Research Station in Tropical forest, French Guyana (ANAEE).
  - Marine observatory of mid-ocean ridge processes, from the subsea floor to the water column (EMSO).
  - …
- Not always trivial to synthesize: some RIs provide a collection of heterogeneous datasets.

FLAGSHIP PRODUCT CATALOGUE

- The main challenge: get **sustainable involvement and support from RIs** for the catalogue activity at transdisciplinary level.
- Strategy:
  - Benefit from the **transdisciplinary** nature of ENVRIplus RIs.
  - **Get RIs involved** by offering them advantage **by advertising their outcomes**.
  - Focus on an immediate, low risk development.
- Use Case: a **flagship data and acquisition services catalogue** to expose products of RI beyond their traditional communities:
  - The products from different RIs should be presented as homogeneously, intuitively and with good looking descriptions.
  - The products from different RIs will be balanced.
- Success will be measured by:
  - How users can actually retrieve resources in the catalogue, of course, but also…
  - The satisfaction of RIs regarding how they are represented in the catalogue.

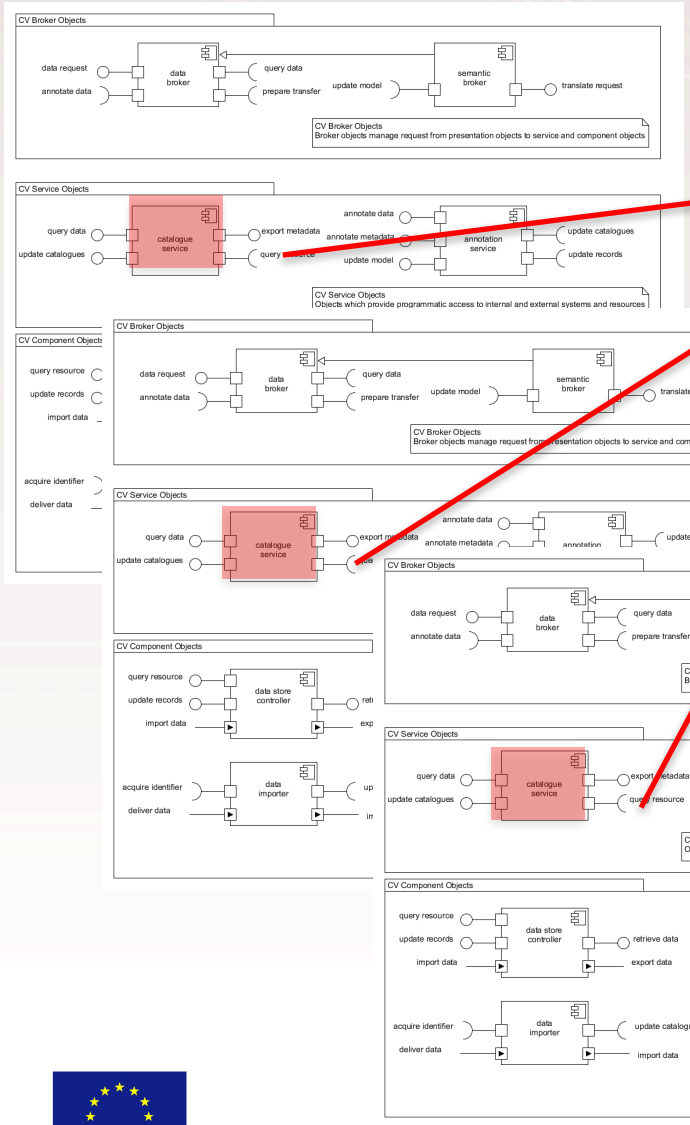
THE DEMONSTRATOR WILL HAVE:

- Products from:
  - Euro-ARGO, SeaDataNet (IFREMER)
  - EPOS (NERC, INGV, GFZ)
  - ICOS (LU)
  - IAGOS (CNRS)
  - LTER (UBA-GmbH)
  - ANAEE (INRA)
  - EMBRC (MBA)

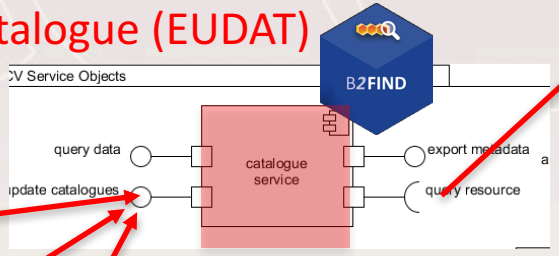
- Show them in EUDAT/B2FIND infrastructure implemented by DKRZ with CKAN software (up and running system, flexible, open-source and popular, quick win, and an RI-neutral service).

ARCHITECTURE

RI components



Flagship product Catalogue (EUDAT)

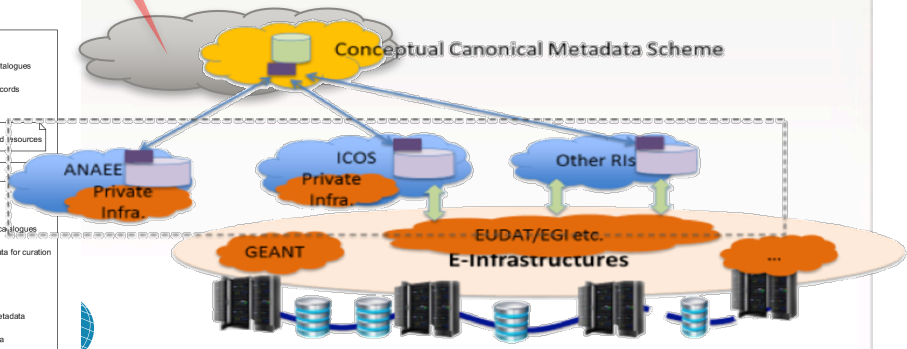


USERS

ISO19115-2, DC, DCAT

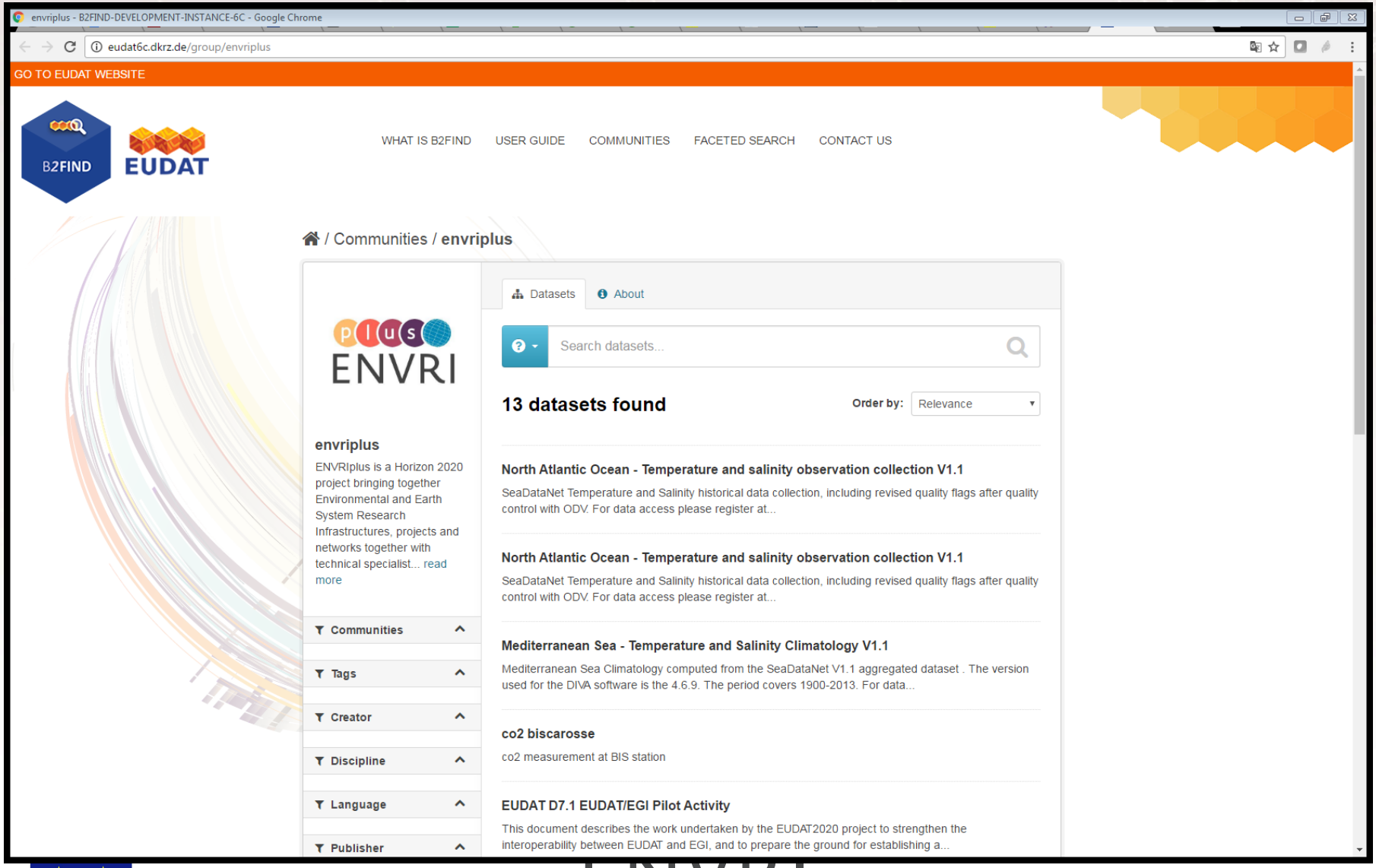
ckan

https://ckan.org/

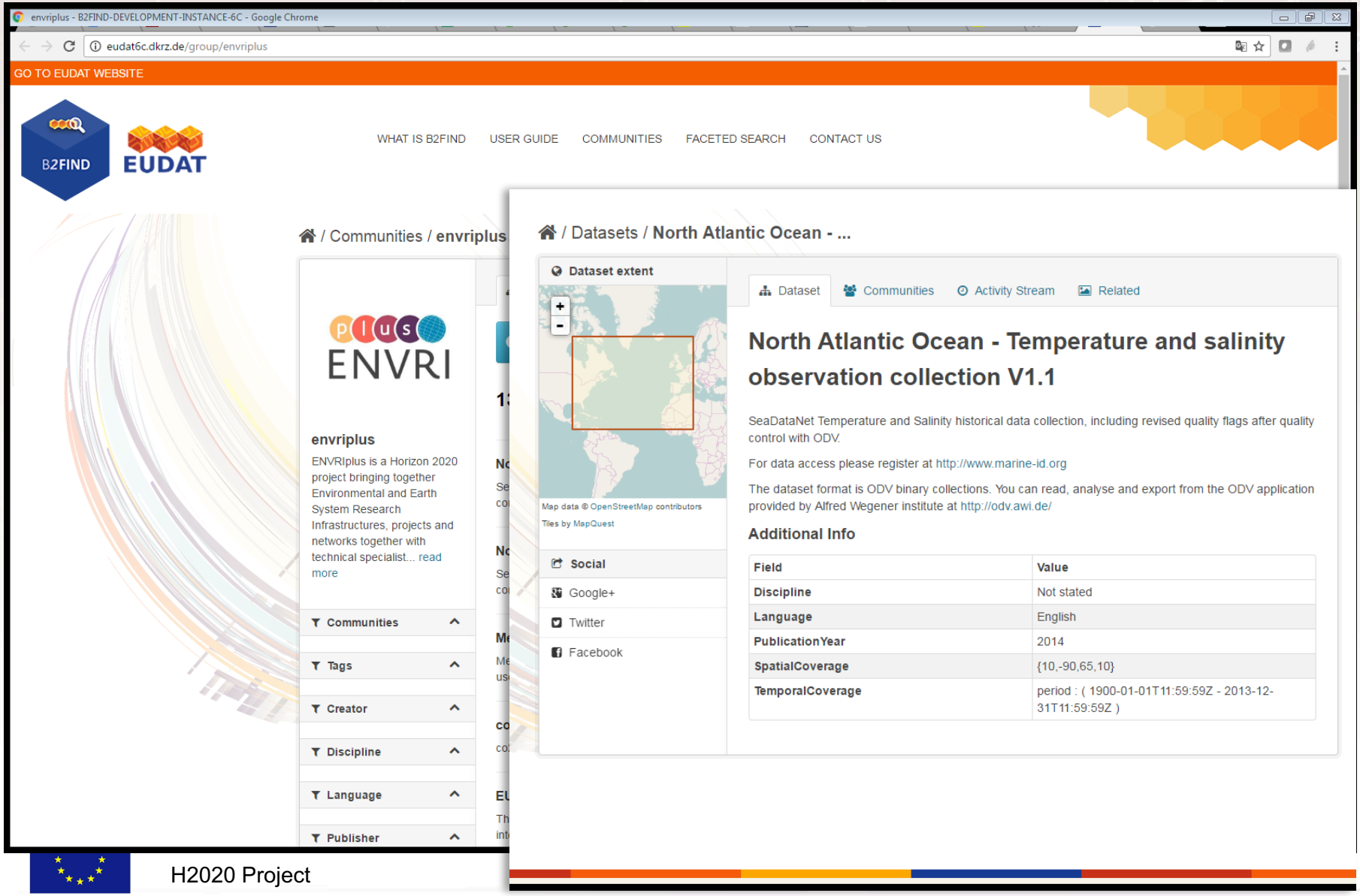


Convertors to the canonical metadata superset recommendation.

ACHIEVEMENTS



ACHIEVEMENTS



OUTCOMES

- A technical platform with a collection of RI metadata in B2FIND, where **both data managers / IT people in RI and ITC work together** to share descriptions of data and acquisition services.

- Fundamental questions on how the RI products should be made visible at a trandisciplinary level are raised:
  - Which user questions the RI answers ?
  - How to preserve visibility of PIs ?

NEXT STEPS

- **EUDAT/B2FIND** actions:
  - Automate metadata collection from RI (harvesting in OAI-PMH and CSW protocols).
  - add attributes: quicklooks, related documents (bibliography, user manual, etc.).
- Refine metadata profile mapping for **all demonstration RIs**:
  - Syntax, semantics: detailed format, agreement on shared keywords (e.g. RI labels and data service vs acquisition service).
  - Measure metadata quality.
  - Refine metadata granularity for all demonstration RIs (balance outcomes of each).
- **Link** data services in flagship product catalogue **with datasets.**

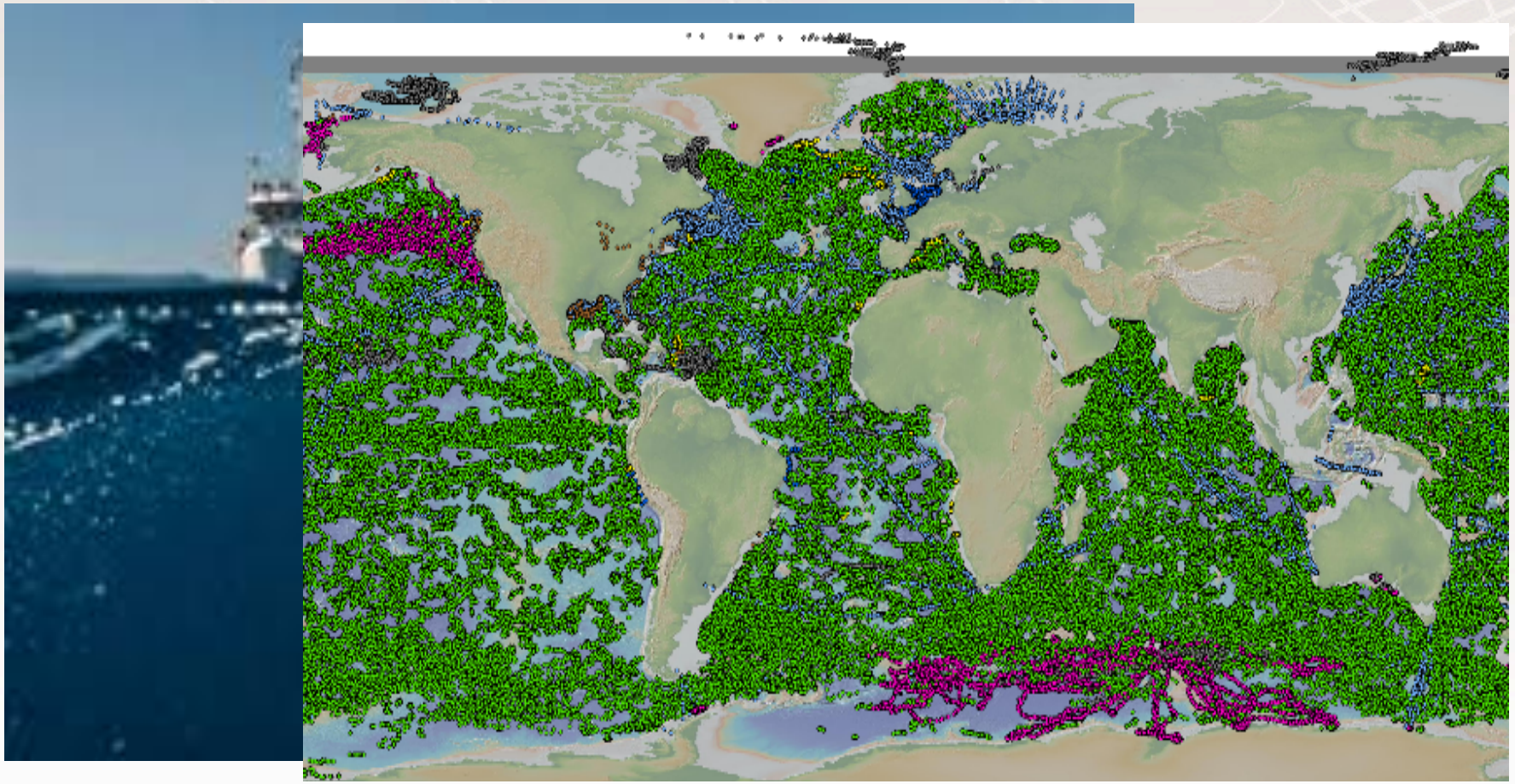
THEME 2 HIGHLIGHT 3
Data subscription service

FROM WP **7 & 9**
Thierry Carval, Baptiste Grenier, Jani Heikkinen,
Glenn Judeau, Spiros Koulouzis

Broadcast Argo RI observations via EU E-infrastructures

- RIs products such as the Argo dataset are registered in the ENVRIPLUS catalogue.
- In the catalogue, an inter-thematic data subscription service derived from RIs' data is proposed, starting with Argo dataset, then with additional RIs (such as EMSO and ICOS).
- The data subscription use case is implemented under the guidance of the ENVRI Reference Model:
  - Data curation: managing continuous updates
  - Data citation scheme
  - Accounting of data distribution

Broadcast Argo observations over EU E-infrastructures



A data subscription use case

To provide regularly specific data to scientists

The user provides his criteria:

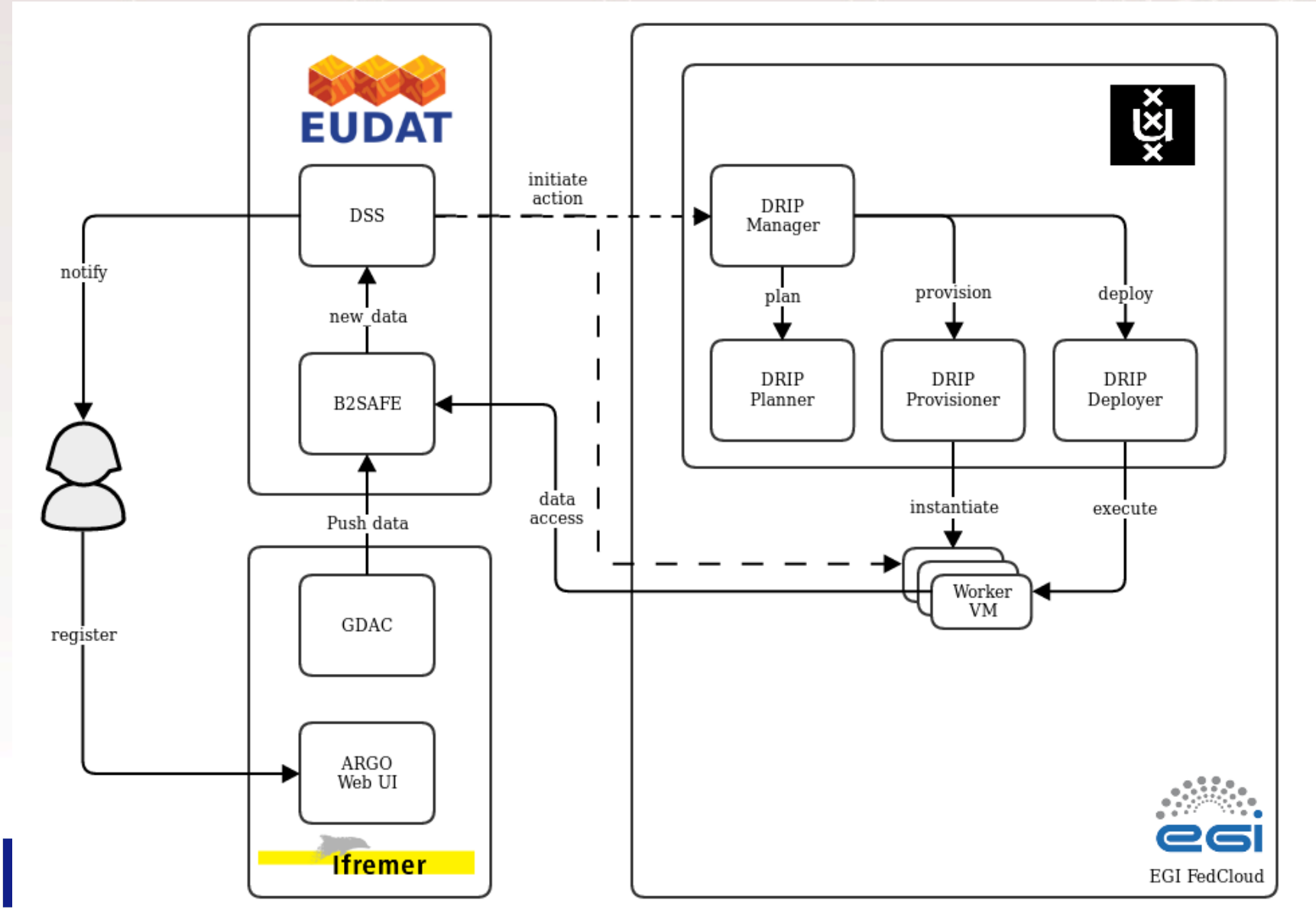
- time, spatial area, parameters, data types, update period for delivery (e.g. daily, monthly, etc.).

- Data are extracted from E-infrastructures and formatted on the cloud.

- The user's cloud account is updated regularly with new data.

- An accounting of data delivery is performed:
  - A citation scheme is attached to the delivered data (ID):
    - bibliographic surveys can track the use of these data in publications
    - reproducibility is possible
  - A user's identification scheme could be implemented **(e.g. Marine-ID, Shibboleth, OpenID, etc.).**

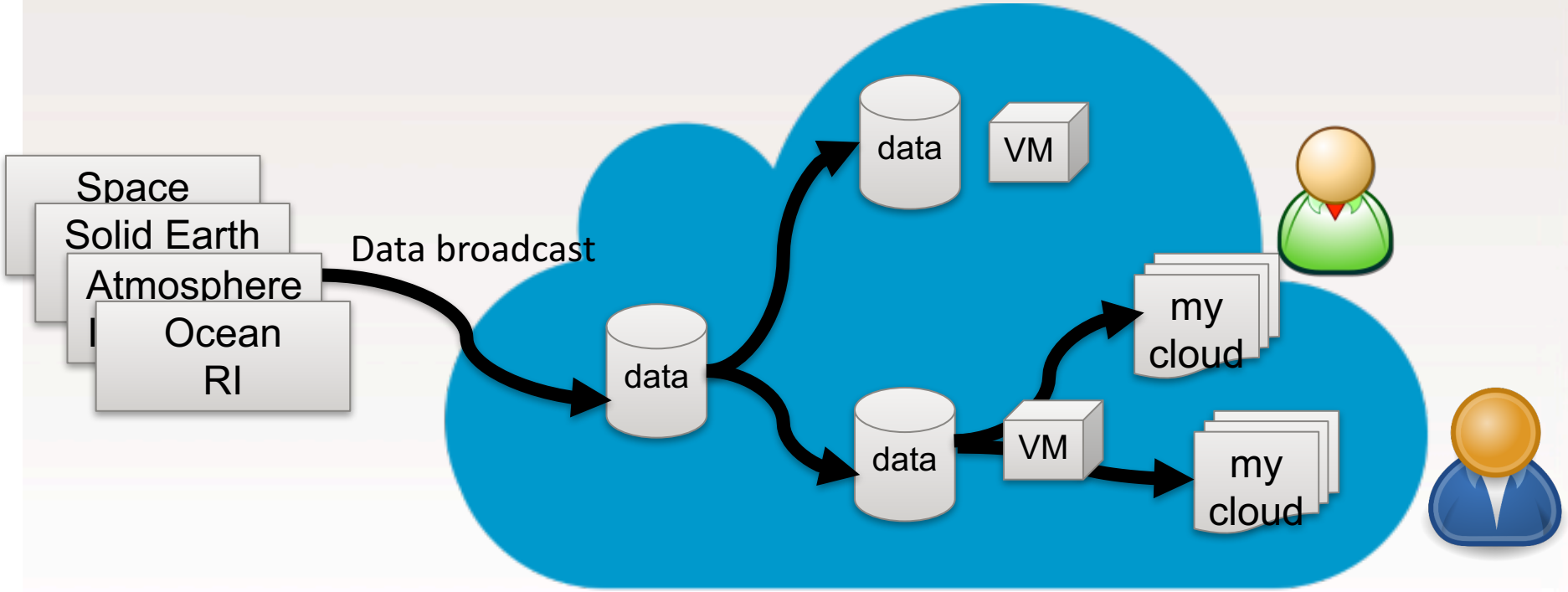
USE CASE: DATA SUBSCRIPTION



Generalization with other Research Infrastructures

Feeds VREs for trans-disciplinary science: ocean, space, atmosphere, earth, etc.

- Environmental monitoring and forecasting: EU ocean-atmosphere models
- Calibration and validation with in-situ data: SMOS, Sentinel satellite missions, etc.
- Efficient workplace for advanced services



DEMO

END OF THE THEME 2 REPORT

THE FOLLOWING SLIDES ARE BACKUP

WP 5: REFERENCE MODEL GUIDED RI DESIGN

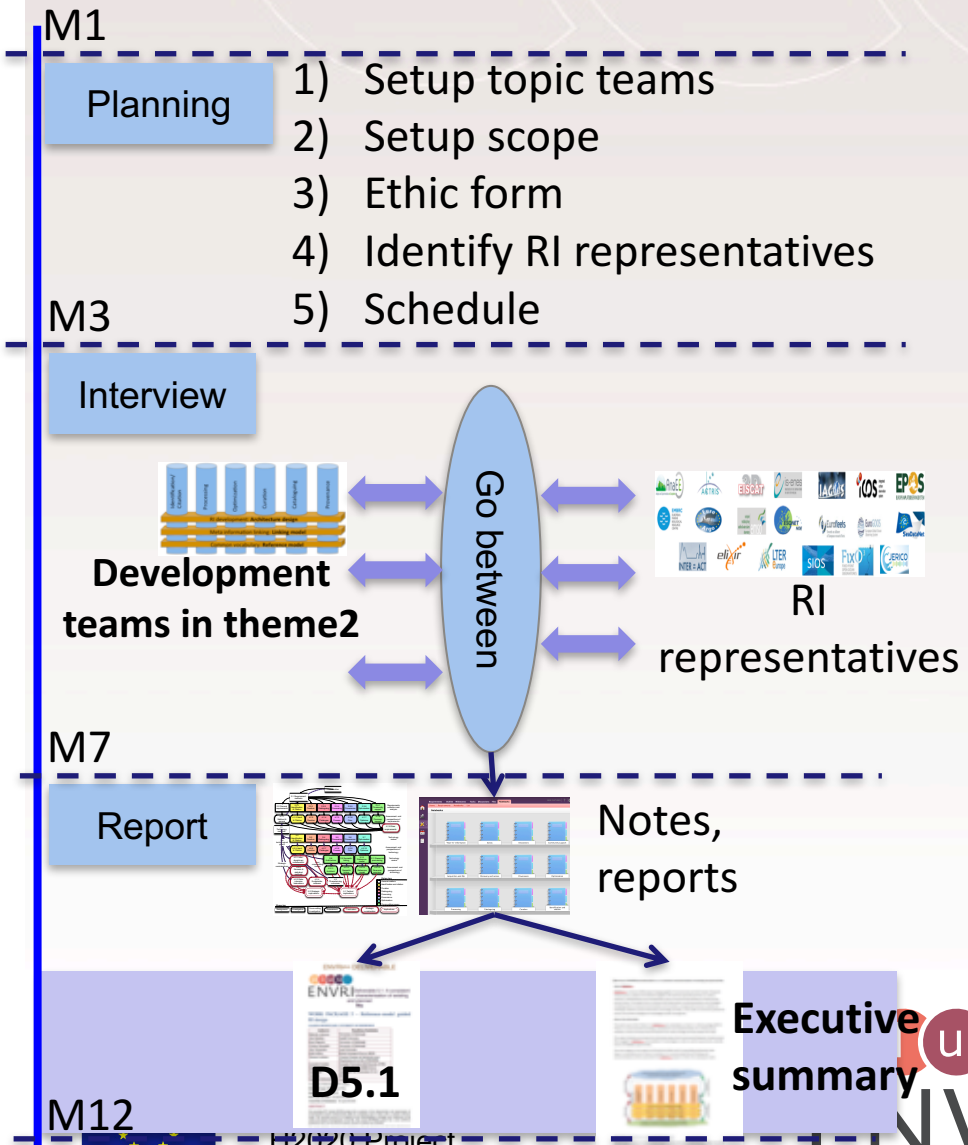
WP LEADER: DR. PAOLA GROSSO (UVA)

DURATION: M1-M36

PARTNERS: CU, CNR_{SIOS}, CNRS $_{IAGOS, IS\text{-}ENES, FIXOS}$, EAA_{LTER}, EGI.EU, EISCAT, $EMBL_{ELIXIER}$, $ETHZ_{EPOS}$, EURO-ARGO, FZJ_{IAGOS}, $IFREMER_{JERICO}$, $INGV_{EPOS}$, $INRA_{ANAEE}$, LU_{ICOS}, MBA_{EMBRC}, $NERC_{EPOS}$, $UNIHB_{EMSO}$, $USTAN_{EMBRC}$, $UCPH_{INTERACT}$, UEDIN, $UHEL_{ICOS}$, **UVA**,

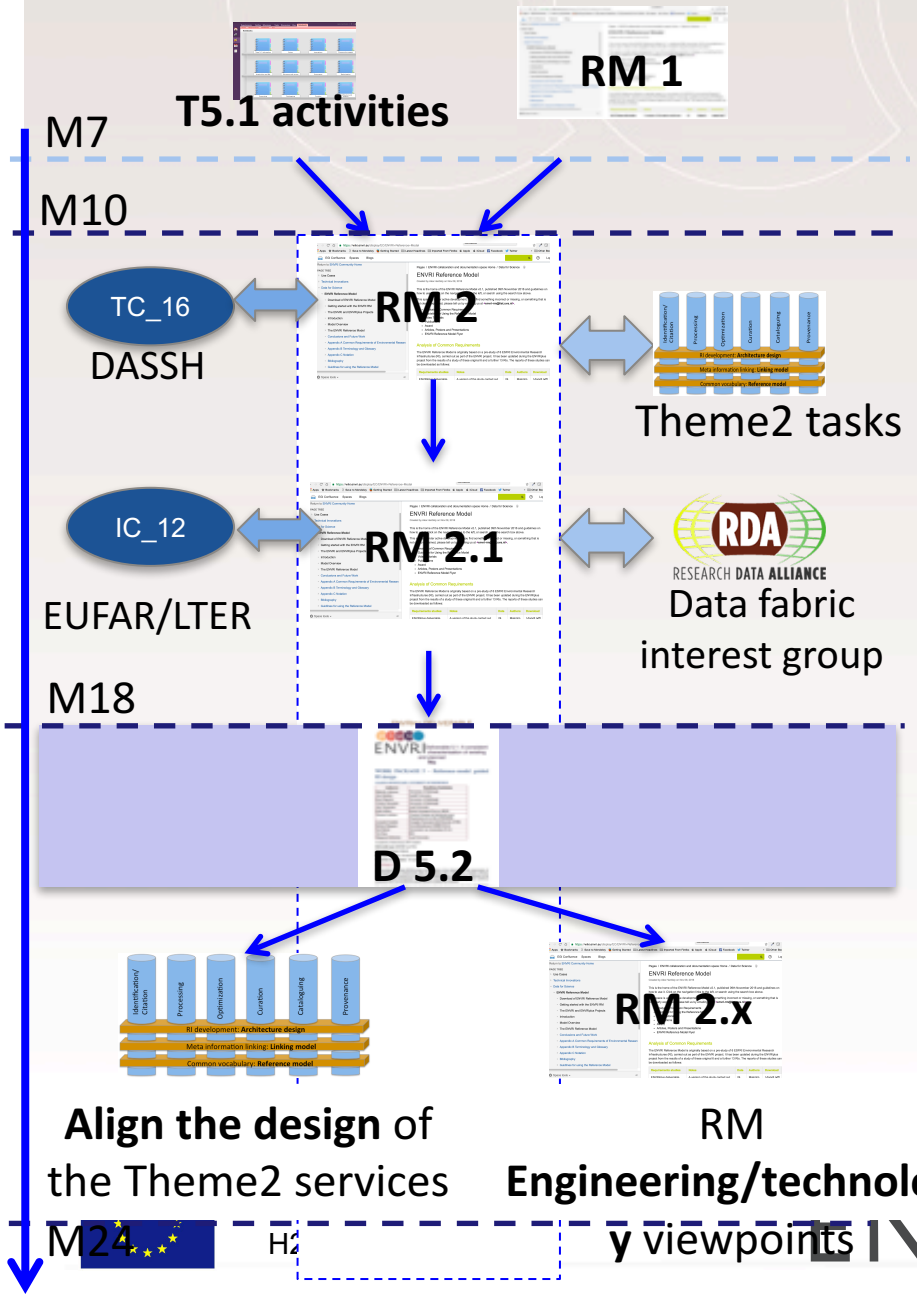
EFFORT: 187PM

Task 5.1: Requirement Analysis, Technology review and Gap analysis



- **Leader: UEDIN (prof. dr. M. Atkinson)**
- **Duration: M1- M12**
- **Achievements**
  - **D5.1** of requirement analysis, technology review and gap analysis.
  - **An executive summary** of the report has been composed (led by Alex V.)
  - the need to **achieve data harmonisation**,
  - the need to **learn from one another and pool efforts**
  - sustainably delivering data services immediately to **meet current RI priorities** while taking into account **longer-term issues and technology trends**.

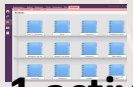
Task 5.2: Reference model for ENVRI PLUS



- Leader: CU
  (mr. A. Hardisty & dr. A. Nieva)
- Duration: M7-M30
  - Refine the **ENVRI RM** based on updated requirements
  - **EV and TV design** in progress
- Key achievements
  - **M15: ENVRI RM V2**
  - **M18: ENVRI RM V2.1**
  - **D 5.2**
  - **Aligned D6.1, 7.1, 7.3, 8.1 and 8.3**
  - **Driving specification** of common and cross-cutting services in D5.5 (Ident & Cit, Cataloguing, etc.)

Project Number: 654182

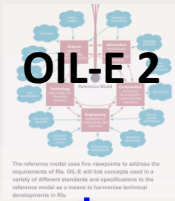
Task 5.3: Semantic description and linking

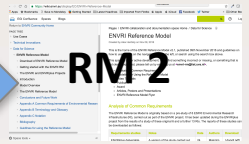

T5.1 activities


OIL-E 1


RM 1

M7

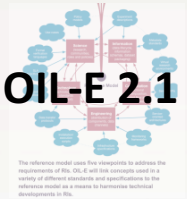

OIL-E 2


RM 2

IC_11

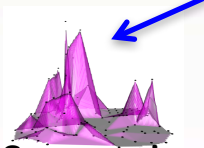
OIL-E/CERIF

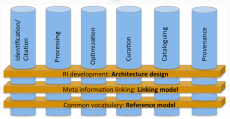

Theme2 tasks


OIL-E 2.1


RM 2.1

M18


Semantic landscape


Interact With WP 6, 7 and 8


Annotation, discovery

M24

H2020 Project

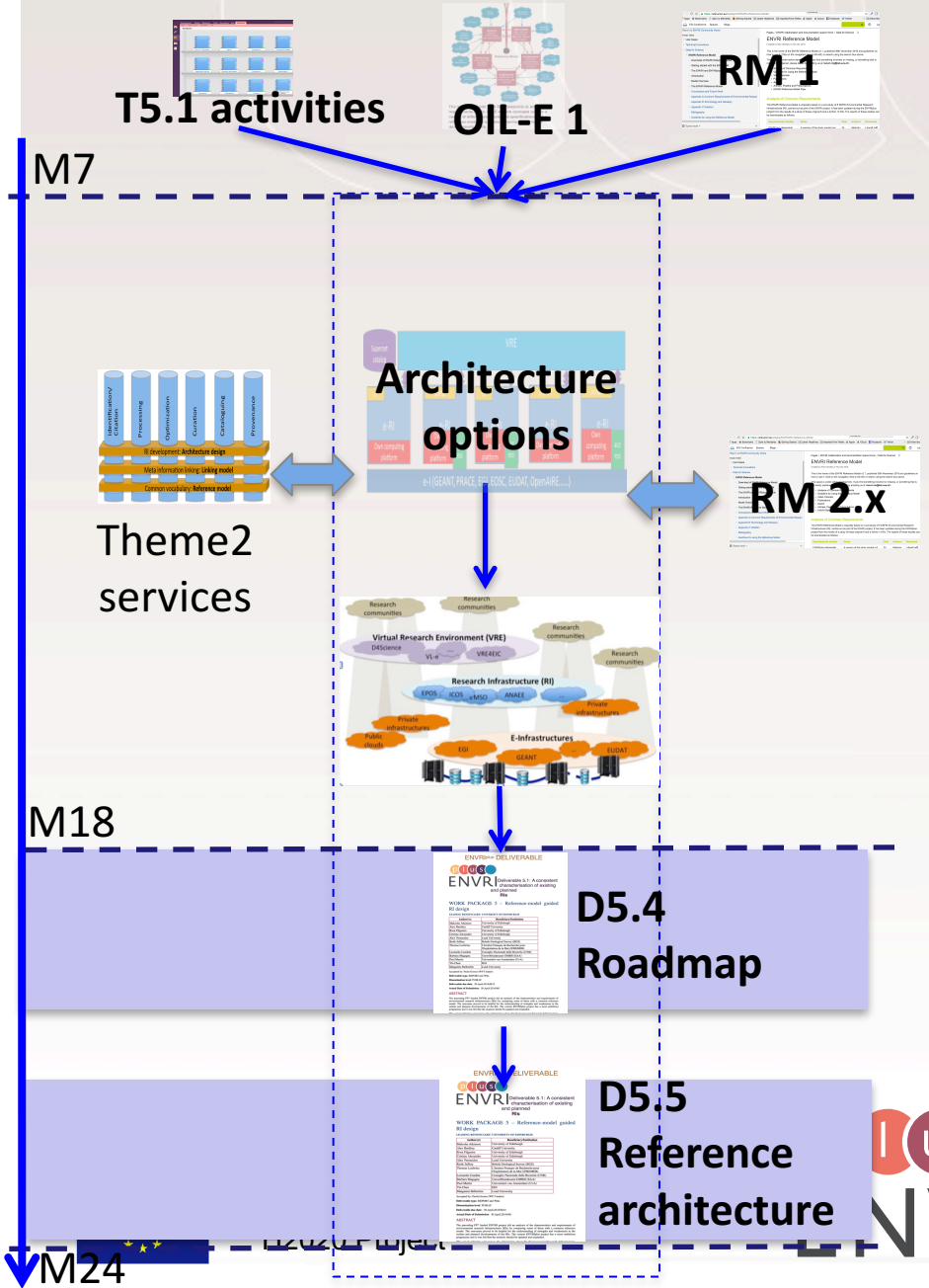
- **Leader: UvA**
  (dr. P. Martin and dr. Z. Zhao)
- **Duration: M7-M36**
  - Open information linking for environmental science (OIL-e)
  - Align OIL-e with ENVRI RM
  - Mapping OIL-e with other metadata models, e.g., CERIF
  - Describe more RIs via f2f meetings
- **Key achievements**:
  - Mapped OIL-e (semantic linking ontology) with CERIF. Agile team IC_11

EUDAT

ENVRI

Project Number: 654182

Task 5.4: Interoperation based architecture



- **Leader: NERC (prof. dr. K. Jeffery)**
- **Duration: M7-M36**
  - Design an architecture which meets the requirements from T5.1, takes account of the reference elements in T5.2 (i.e. which satisfies the RIs);
  - Design an architecture that is effective, efficient and sustainable;
  - Design an architecture based on best practice in ICT for research;
  - Design an architecture that is evolvable based on changing RI requirements and changing ICT opportunities;
- **Key achievements**:
  - M18, D 5.4: theme2 roadmap
  - M24, D 5.5: reference architecture

Project Number: 654182

WP 6: INTER RI DATA IDENTIFICATION AND CITATION SERVICES

WP LEADER: ALEX VERMEULEN (LU)

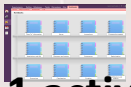
DURATION: M1-M48

PARTNERS: $CINECA_{EUDAT}$, CNR_{SIOS}, $CNRS_{IS\text{-}ENES}$, $DKRZ_{IS\text{-}ENES}$, EAA_{LTER}, EISCAT, $INRA_{ANAEE}$, **LU_{ICOS}**, MBA_{EMBRC}, $IFREMER_{SEADATANET}$, $NILU_{ACTRIS}$, UHB_{EMSO},

EFFORT: 65PM

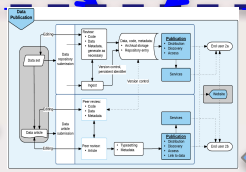
Task 6.1: Identification and Citation

M1



T5.1 activities

M7

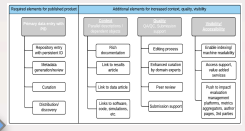


IC_01

ICOS INTEGRATED CARBON OBSERVATION SYSTEM

IC_09

DASSH



WP 6 services, tools, and recommend-ations.

RDA RESEARCH DATA ALLIANCE

THOR

EUDAT

M20

Case study

Service prototype deployment

M24

H2020 Project

- Leader: LU
  (dr. A. Vermeulen and dr. M. Hellström)
- Duration: M1-M48
  - Data uptake tool for ICOS: data PID'ing, store at trusted repository, enrich metadata in versionable meta data store, dynamic landing pages
  - Libraries, publishers on data citation systems
  - Publishing subsets, collections with adequate citation based on PID'ed DO
  - Progress in ICOS data lifecycle & GBIF marine biological data
  - Participation and contributing to relevant **RDA working groups** and activities:
    - **Data Citation**
    - **Data Type Registries**
    - **Research Data Collections**

ENVRIplus

Project Number: 654182

WP 7: DATA PROCESSING AND ANALYSIS

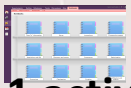
WP LEADER: DR. LEONARDO CANDELA (CNR)

DURATION: M7-M42

PARTNERS: $CINECA_{EUDAT,}$ **CNR**, CSC_{EUDAT}, $DKRZ_{IS\text{-}ENES}$, EISCAT, $ETHZ_{EPOS}$, EURO-ARGO, INGV $_{EPOS}$, $UNIHB_{EMSO}$, $UNITUS_{ICOS}$, UVA,

EFFORT: 92PM

Task 7.1 Data processing



T5.1 activities

D4Science

M7

Data processing platform

RM

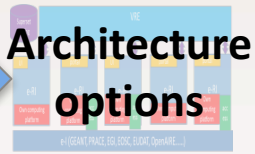
SC_3

TC_2

IC_3

IC_13

Data miner



Architecture options

Processing technologies: gcube workflow, etc.

M18

D 7.1

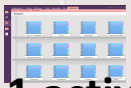
Case study

Service prototype deployment

M24

- **Leader: CNR (dr. L. Candela)**
- **Duration: M7-M42**
  - Investigated the feasibility of using D4Science in a number of agile case studies: SC_3, TC_2, IC_3, IC_13
  - Re-engineered the entire system and released DataMiner framework
    - Performance enhancement
  - Reinforced algorithm importing facility (input typologies enlarged)
- **Key achievements**:
  - D7.1
  - Publications
  - Software deployment
  - Use case prototype

Task 7.2 Performance optimization



T5.1 activities

Technology review

M7

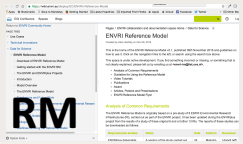
Optimization for data transfer, processing, virtual infrastructure

SC_3

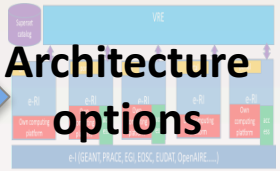
TC_2

IC_3

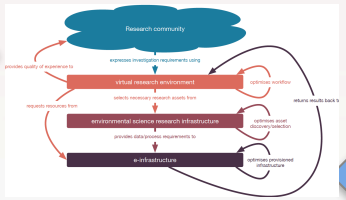
IC_13

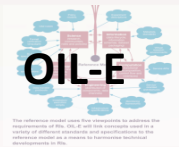


RM



Architecture options





OIL-E

M18

D 7.3

Case study

Service prototype deployment

- **Leader: UvA (dr. P. Martin and dr. Z. Zhao)**
- **Duration: M7-M42**
  - Investigated the feasibility of using D4Science in a number of agile case studies: SC_3, TC_2, IC_3, IC_13
  - QoS based virtual infrastructure planning and provisioning (experiments on EGI FedCloud)
  - RI provisioning of assets: datasets but also software, access to resources, persons…
  - End-user discovery/contextualization/action: workflow construction including datasets and software and access to resources
- **Key achievements**:
  - Software prototype
  - Use case
  - Publications

WP 8: DATA CURATION AND CATALOGUING

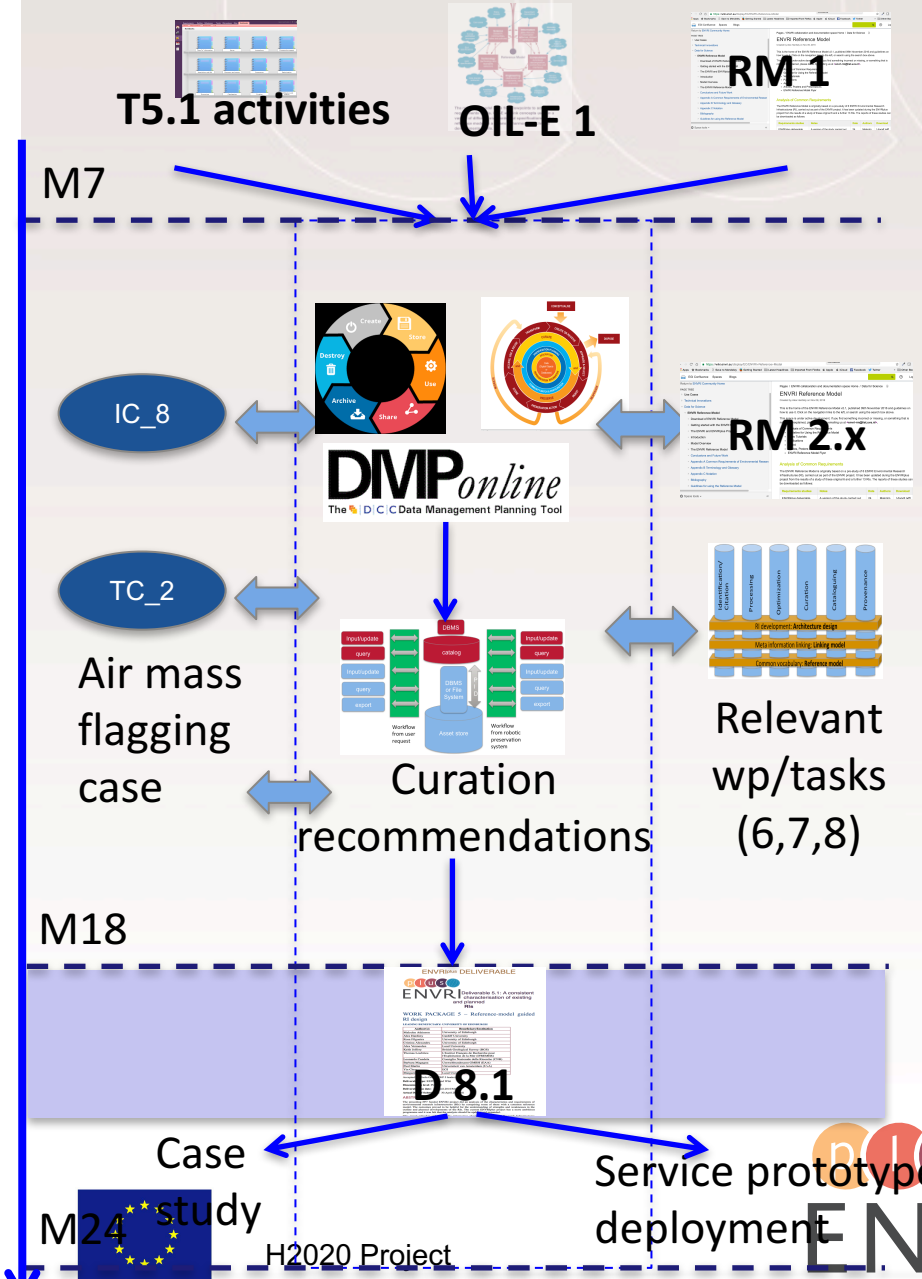
WP LEADER: PROF. DR. KEITH JEFFERY (NERC)

DURATION: M7-M42

PARTNERS: CEA_{ICOS}, $CINECA_{EUDAT,}$ CNR_{EXP}, $SIOS$, $CNRS_{IAGOS}$, CSC_{EUDAT}, $DKRZ_{EPOS}$, EAA_{LTER}, EISCAT, IFREMER SEADATANET, EUROFLEET, $INGV_{EPOS, EMSO}$, $INRA_{ANAEE}$, LU_{IOCS}, MBA_{EMBRC}, **NERC $_{EPOS}$**, $NILU_{ACTRIS}$, $USTAN_{EMBRC}$, UVA

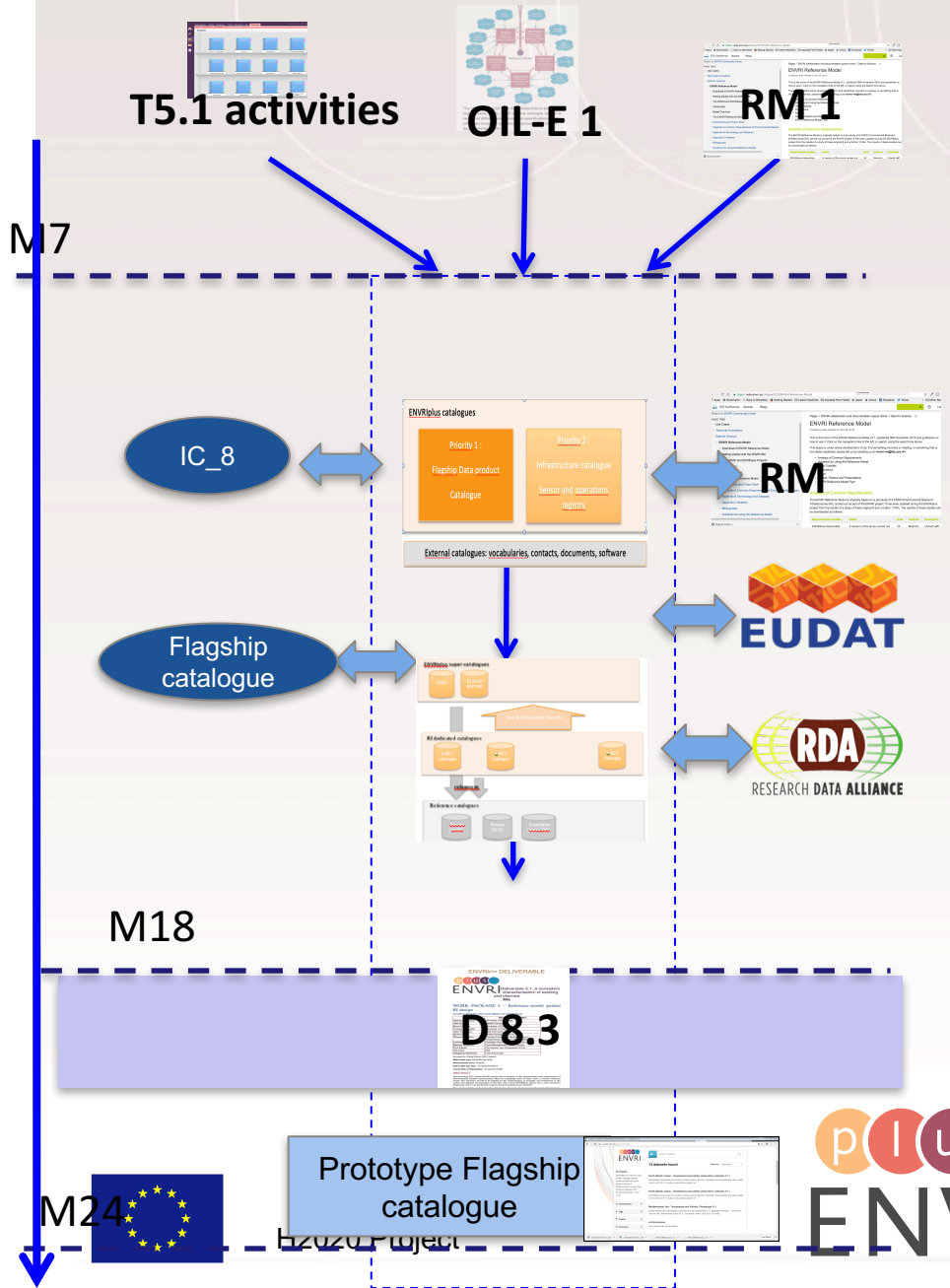
EFFORT: 159PM

Task 8.1: Curation



- NERC
  (prof. dr. K. Jeffery)
- Duration: M7-M42
  - Process of curation related to data collection and quality control (includes annotation)
  - Discovery, contextualization, action using curated datasets
  - Data Management Plan (DCC)
  - Data Lifecycle (DCC)
  - OAIS (architectural recommendation – very flexible)
- Key achievements:
  - D8.1

Task 8.2: Cataloguing



- **Leader: IFREMER (dr. T. Loubrieu)**
- **Duration: M7-M42**
  - Initial agreement on: 1) A superset of attributes to describe the products (RDA, metadata), and 2) A set of support standards to describe products: ISO 19119, 19139, DC and DCAT.
  - Collection of inputs from the RI catalogues
  - Integration in EUDAT/B2FIND catalogue system.
  - CKAN and CERIF are recommended
- **Key achievements**:
  - **D8.3**
  - Flagship catalogue demonstrator

ENVRIplus

Project Number: 654182

Task 8.3: provenance

- **Leader: EAA (dr. B. Magagna)**
- **Duration: M25-M42**
  - Join the requirement analysis (5.1) and RM review (5.2)
  - Contributed to the **D5.1 and D5.2**
- **Key achievements**:
  - An internal discussion wiki

WP 9: SERVICE VALIDATION AND DEPLOYMENT

WP LEADER: DR. YANNICK LEGRE (EGI.EU)

DURATION: M13-M48

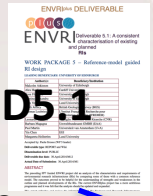
PARTNERS: CEA_{ICOS}, $CINECA_{EUDAT}$, CNR_{ACTRIS}, $CNRS_{IAGOS}$, CSC_{EUDAT}, EAA_{LTER}, **EGI.EU**, EISCAT, $EMSC_{EPOS}$, $ETHZ_{EPOS}$, EURO-ARGO, FZJ_{IAGOS}, $IFREMER_{JERICO}$, $INGV_{EPOS, EMSO}$, $INRA_{ANAEE}$, LU_{IOCS}, NERC $_{EPOS}$, $NILU_{ACTRIS}$, $UCPH_{INTERACT}$, $UHEL_{ICOS}$, $UITE_{SONET-VI}$, $UNIHB_{EMSO}$, $UNITUS_{ICOS}$, $USTAN_{EMBRC}$,

EFFORT: 118PM

plus ENVRI

Supporting environmental research with integrated solutions
- the Earth is our lab

Task 9.1: Validation and integration



D5.1

Call for use cases; and establish agile Case team

M12

SC_3 TC_2 IC_3 IC_13

Technologies: oneData, DIRAC, Hadoop etc.
Test bed for agile case teams

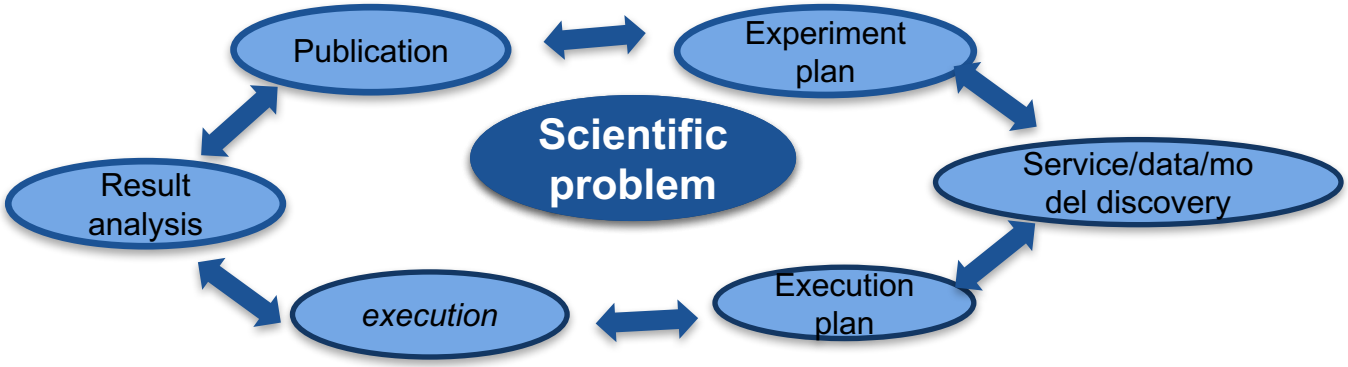
Deployment guidelines

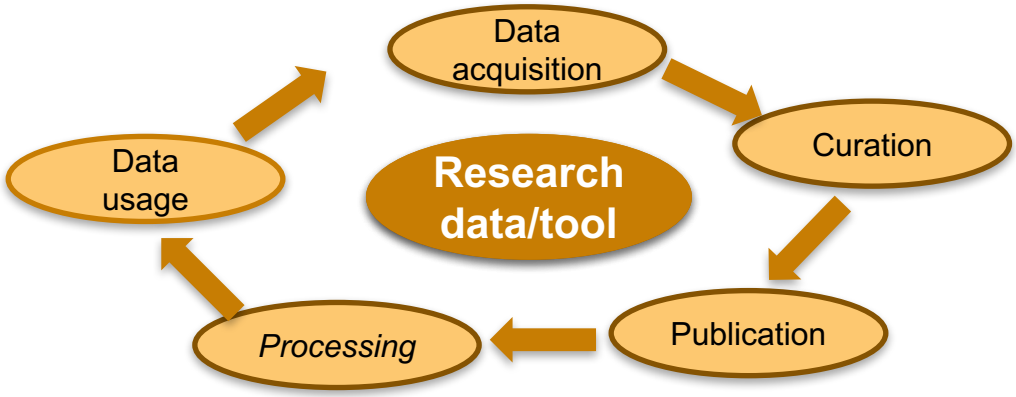
M24

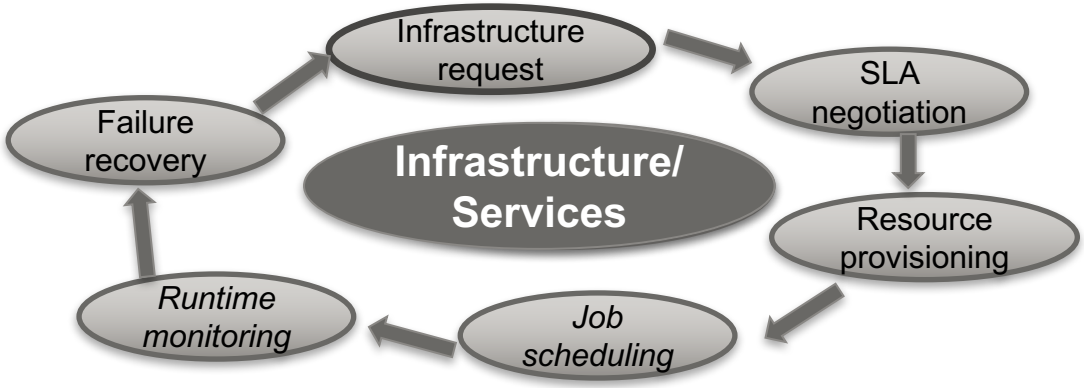
- **Leader: EGI.eu (Y. Legre & Y. Chen)**
- **Duration: M13-M48**
  - Case study teams
  - Deployment technologies in SC_3 (Mosquito), TC_2 (Euro-Argo), TC_13 (ICOS), IC_3(EISCAT-3D)
  - Reviewed a number of technologies
- **Key achievements**:
  - Deployment guideline
  - Initial service portfolio of theme2

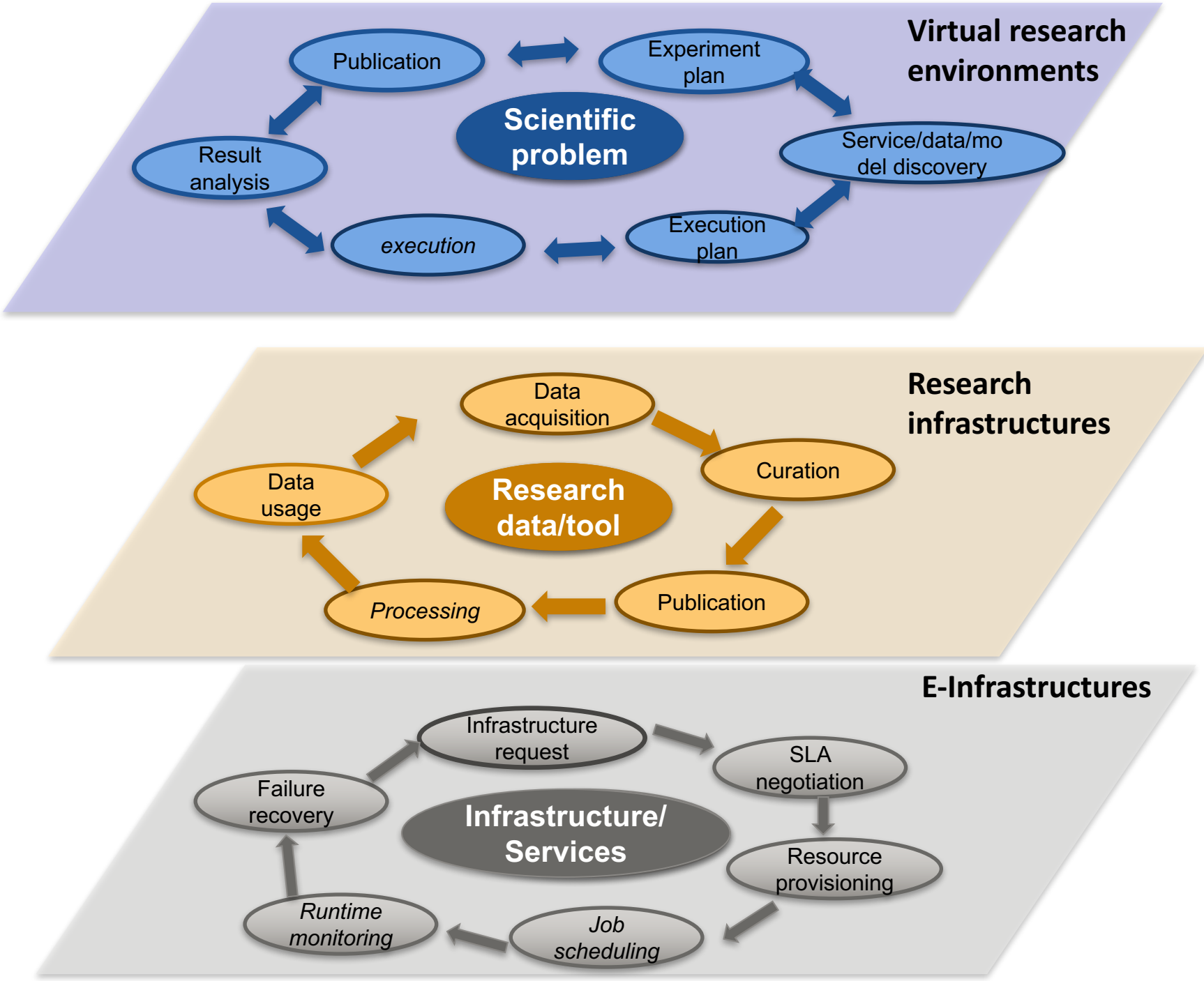
Task 9.2: From research to operation

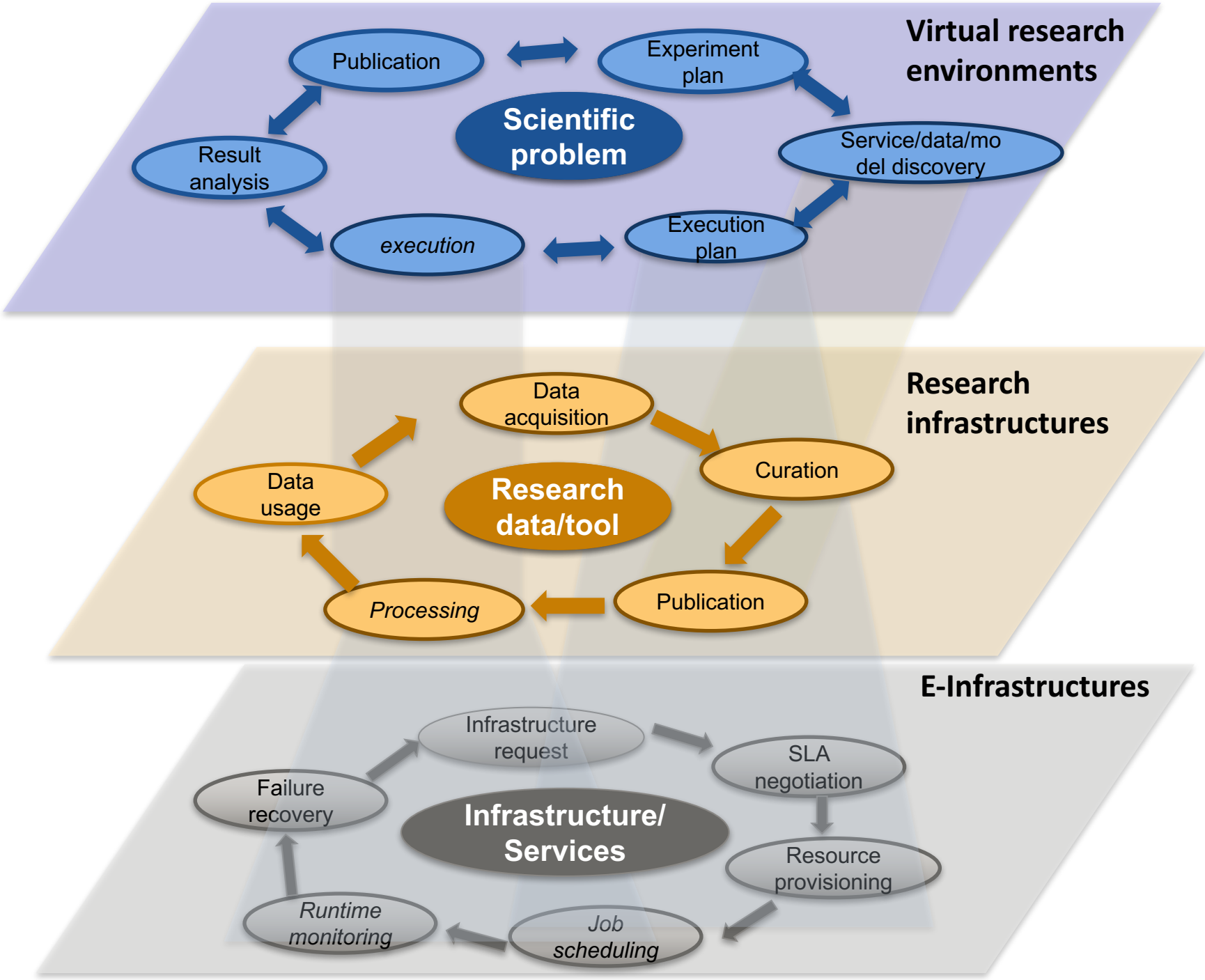
- **Leader: LU (A. Vermeulen)**
- **Duration: M13-M48**
  - Track the usability of the results of 9.1, promote the integration between RI and initiatives: COPERNICUS, EEA, etc.
  - Review the designed mechanisms with the stakeholder together
  - Provide operation support for RIs
- **Key achievements**:
  - Depend on 9.1 and other tasks,
  - More to be expected in coming phases


Publication
Experiment plan
Scientific problem
Service/data/model discovery
Result analysis
execution
Execution plan


Data acquisition
Curation
Data usage
Research data/tool
Processing
Publication


Infrastructure request
SLA negotiation
Failure recovery
Infrastructure/ Services
Resource provisioning
Runtime monitoring
Job scheduling


Virtual research environments
Publication
Experiment plan
Scientific problem
Result analysis
Service/data/model discovery
execution
Execution plan
Research infrastructures
Data acquisition
Curation
Data usage
Research data/tool
Processing
Publication
E-Infrastructures
Infrastructure request
SLA negotiation
Failure recovery
Infrastructure/ Services
Resource provisioning
Runtime monitoring
Job scheduling


Virtual research environments
Publication
Experiment plan
Scientific problem
Result analysis
Service/data/model discovery
execution
Execution plan
Research infrastructures
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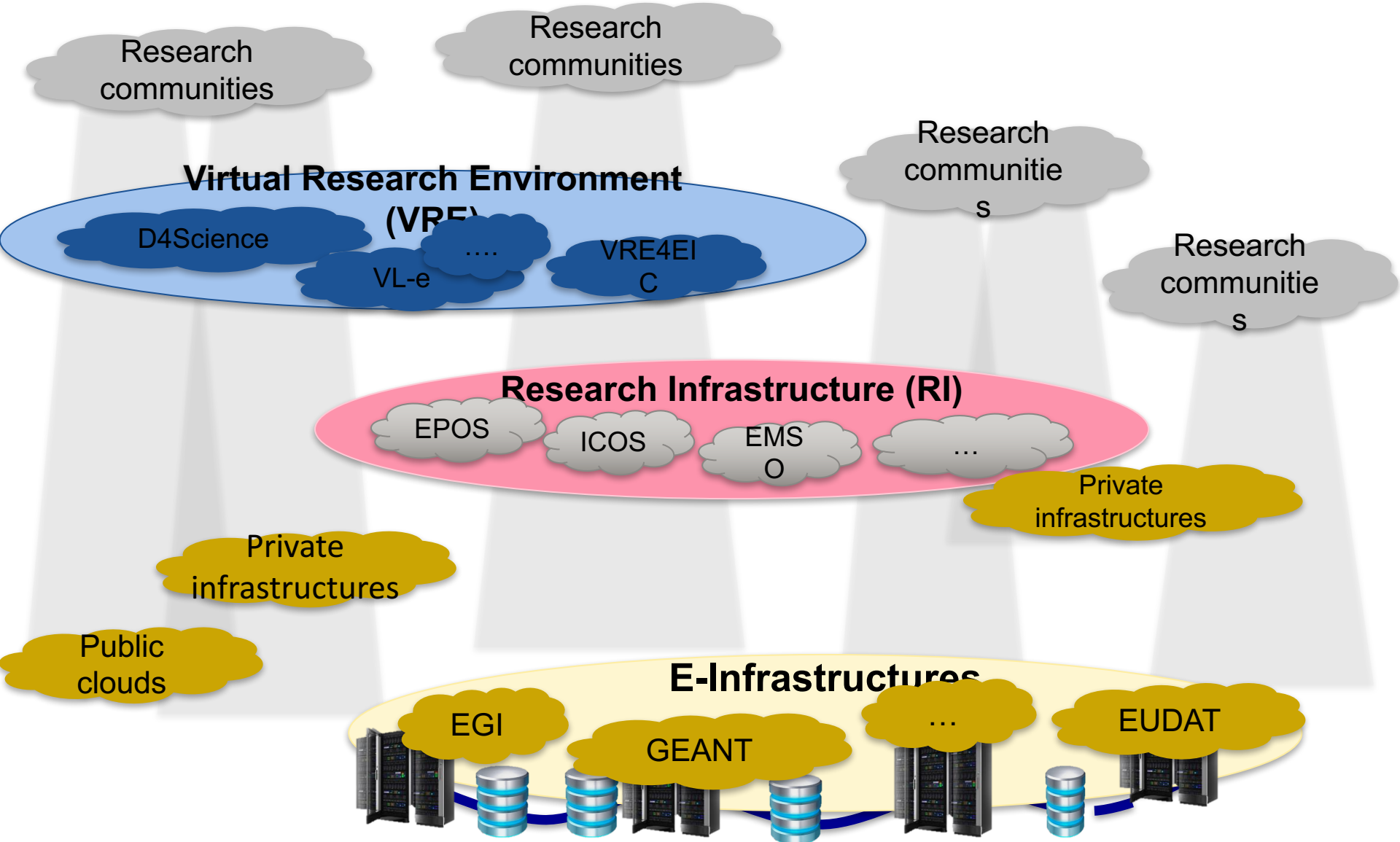
Runtime monitoring
Job scheduling


Research communities
Research communities
Research communities
Research communities
Virtual Research Environment (VRE)
D4Science
VL-e
….
VRE4EIC
Research Infrastructure (RI)
EPOS
ICOS
EMSO
…
Private infrastructures
Private infrastructures
Public clouds
E-Infrastructures
EGI
GEANT
…
EUDAT