



ENVRI
Week
2023

30.1-3.2.23
Leipzig



Identify and address end users expectations: ensuring effective requirements elicitation

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Welcome to today's WP6 workshop!

- The latest training event organised by WP6 for ENVRI (data center) staff members
- Follows the themes of our schools in 2019, 2020/2021 and 2022:
 - “Data FAIRness”
 - “Services for FAIRness”
- We've covered general FAIR, relevant technologies as well as “softer” aspects of service development
 - basic RDM pillars, FAIR evaluation, semantics, ...
 - cloud computing, AAI, designing APIs, operating Jupyter Hubs, ...
 - service documentation, evaluation/validation, user requirements, ...
- All materials from the schools are available via the Training Catalogue
- Please give us some feedback!



A request for feedback!

We've prepared a very short form to collect your feedback on the training provided by WP6

Please tell us

- who you are (domain, audience)
- what you liked
- your wish list

<https://tinyurl.com/ENVRI-WP6> (will stay open until mid-February)

You can also get in touch directly with the WP6 co-leads Nicola, Jacco and Maggie!



Outline

Introduction

- The FAIR Service LifeCycle
- What are project requirements?
- Why do requirements need to be elicited?
- Requirements elicitation techniques

Hands-on exercise (scenario-based)

- Requirement elicitation process
 - Prepare for elicitation
 - Conduct elicitation
 - Confirm elicitation results



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- What are project requirements?
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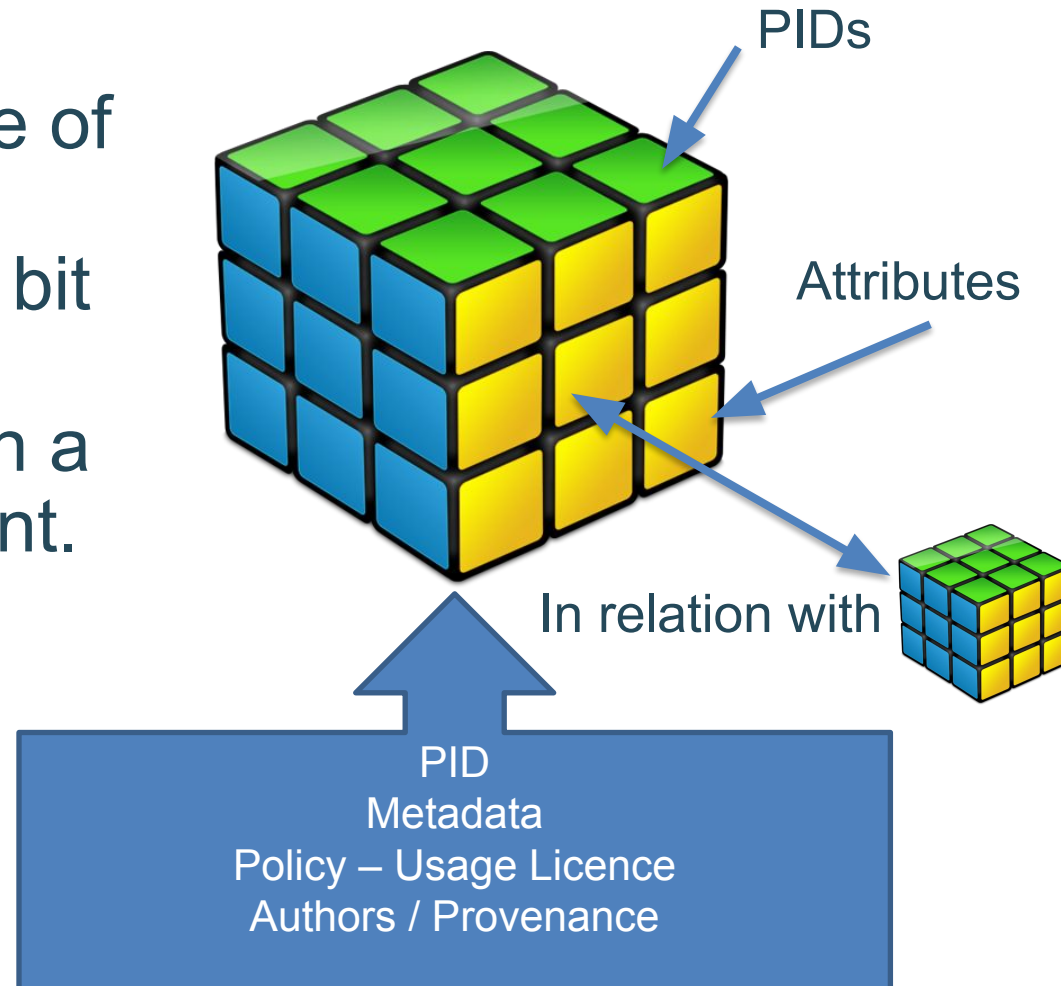
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(FAIR) Digital Object

An encoded piece of information, represented by a bit sequence (the content), stored in a digital environment.



Standard Format

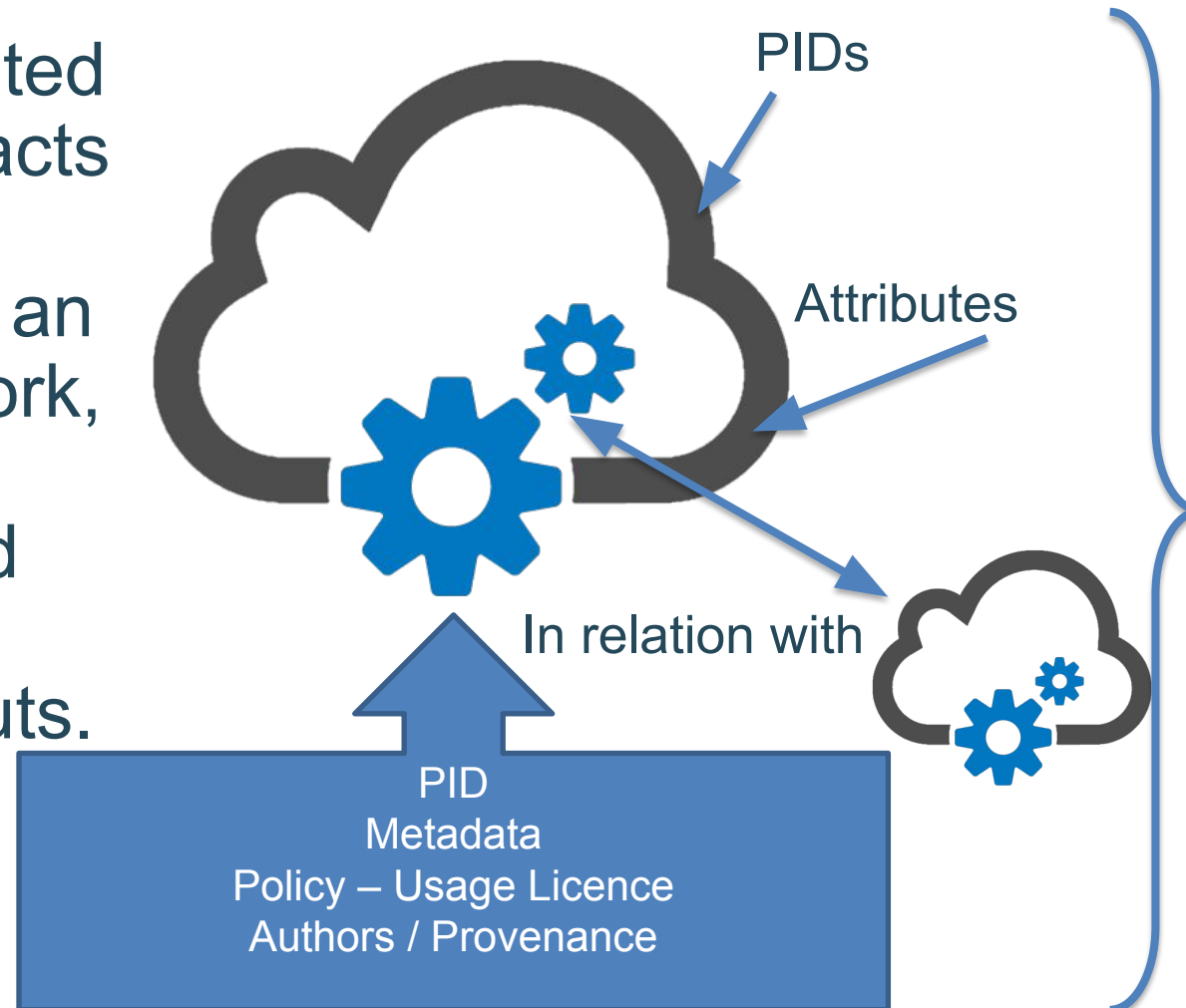
based on
Thesauri &
Ontologies

<https://ecoportal.lifewatch.eu>



(FAIR) e-Service

A service automated by nature that reacts to mechanical requests through an information network, receiving inputs, manipulating, and sending back appropriate outputs.

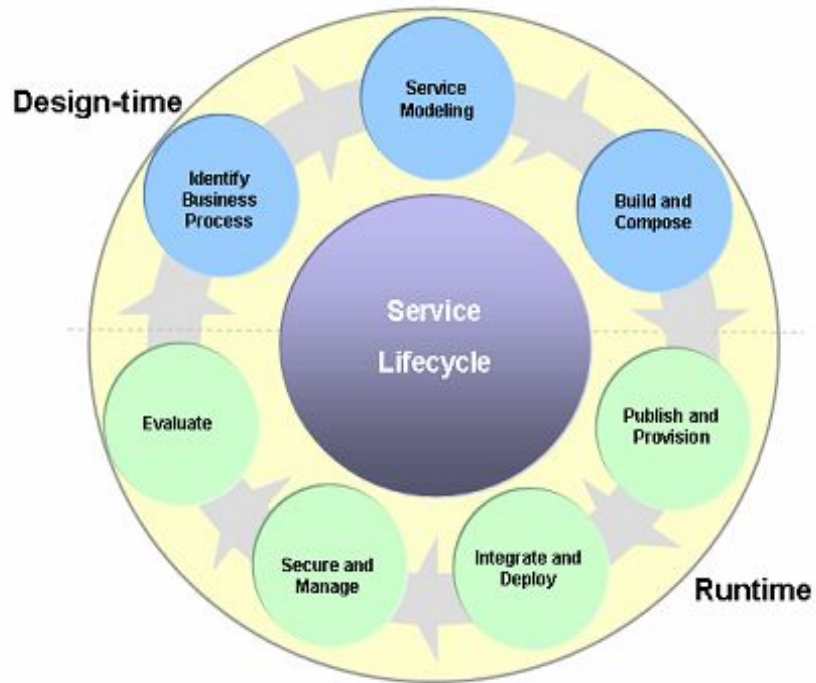


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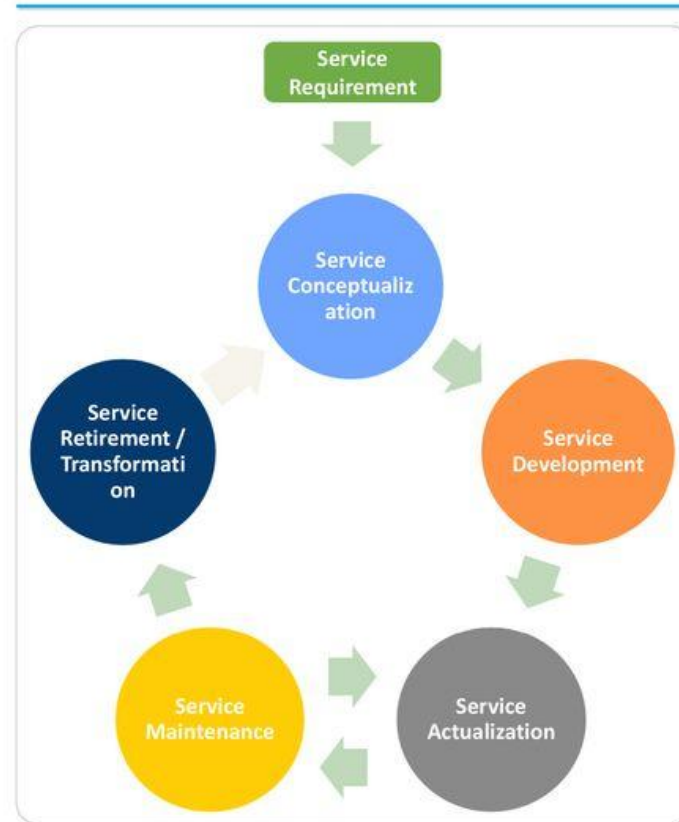
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E-Service LifeCycle



Service Delivery Lifecycle



Conceptualization



Development



Actualization



Maintenance



Retirement/Transformation





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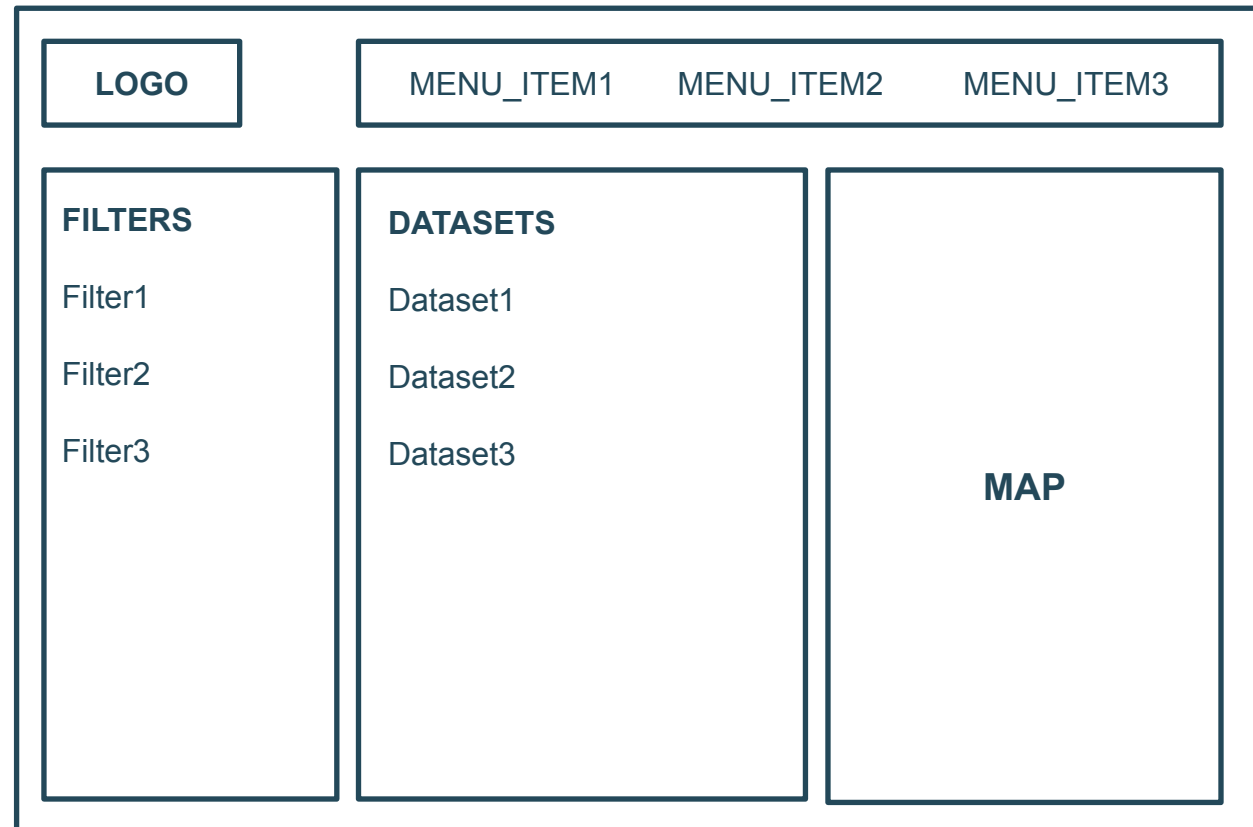
What are project requirements?

- In software development, requirements describe the solution that has to be developed and are usually formulated by the client and the stakeholders.
- In general, there are three types of requirements:
 - **Business requirements** (*WHY*): describe why a project is needed and how the client will benefit from it.
 - **User requirements** (*WHO*): capture the needs and expectations of stakeholders, highlighting how the user will interact with the project.
 - **Software requirements** (*HOW*): contain technical demands that can be functional (what the system should do) and non-functional (the qualities the system should have).



What are project requirements?

Example: Data Portal X of the Research Infrastructure Y





What are project requirements?

Basic formats and examples:

- Business requirements (*WHY*)

The [project name] software will [meet a business goal] in order to [realize a business benefit].

The Data Portal will allow users to access the datasets and the corresponding metadata of the Research Infrastructure to have a unique access point.

- User requirements (*WHO*)

The [user type] shall [interact with the software] in order to [meet a business goal or achieve a result].

The researcher shall be able to filter the available published datasets in order to search the resources on which is interested in.

- Software requirements (*HOW*)

The [feature or function] shall [do something based on user inputs and provide corresponding outputs].

The filtering function shall allow users to select the keywords and the time interval related to the publication date in order to filter the datasets.



What are project requirements?

- Gathering accurate requirements is a crucial task carried out by business analysts.
- A single missed or unclear requirement may lead to budget overruns, creation of irrelevant or wrong functionalities and a waste of development time.





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- What are project requirements?
- **Why do requirements need to be elicited?**
- Requirements elicitation techniques

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Why do requirements need to be elicited?

Imagine to be in a clothing store. You receive a phone call from “a woman” telling you “I urgently need a dress for an important business dinner tonight. Please, buy it for me! You know my style!”

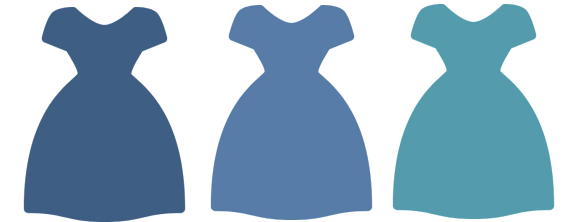
Which kind of dress come to your mind?



Which is the exact model of the dress that she would like to have?



Which is the exact colour of the dress that she would like to have?





Why do requirements need to be elicited?

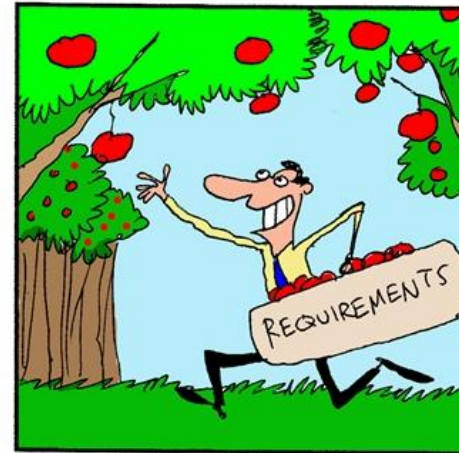
- You can buy **THE** right dress for her only if you ask for more information!
- Some details may seem irrelevant or too obvious for her until you ask about them:
 - which shade of blue?
 - is it a pleated skirt?
 - which is the exact length?
 -
- That's exactly how elicitation works in software development.



Why do requirements need to be elicited?

- **Elicitation:** term used to raise the fact that good requirements cannot just be gathered/collected from the client.
- Requirements elicitation: one of the most difficult, error-prone and communication-intensive activity in the software development.
- Non-trivial process: you can never be sure you get all requirements from the customers by just asking them what a system should do or not do.

How stakeholders think requirement gathering works.



How requirement gathering really works.



 Modern Analyst Media LLC



Why do requirements need to be elicited?

- **Result of the elicitation:** a set of clear and prioritised objectives, which have to represent all the client's demands and needs.
- For a successful elicitation, the business analysts work closely with the client and all stakeholders, studying and validating their needs and assumptions as well as the potential risks.
- The discussion ends when stakeholders can think of no new use cases or when the use cases they can think of have a low priority and can be implemented during future iterations.



Why do requirements need to be elicited?

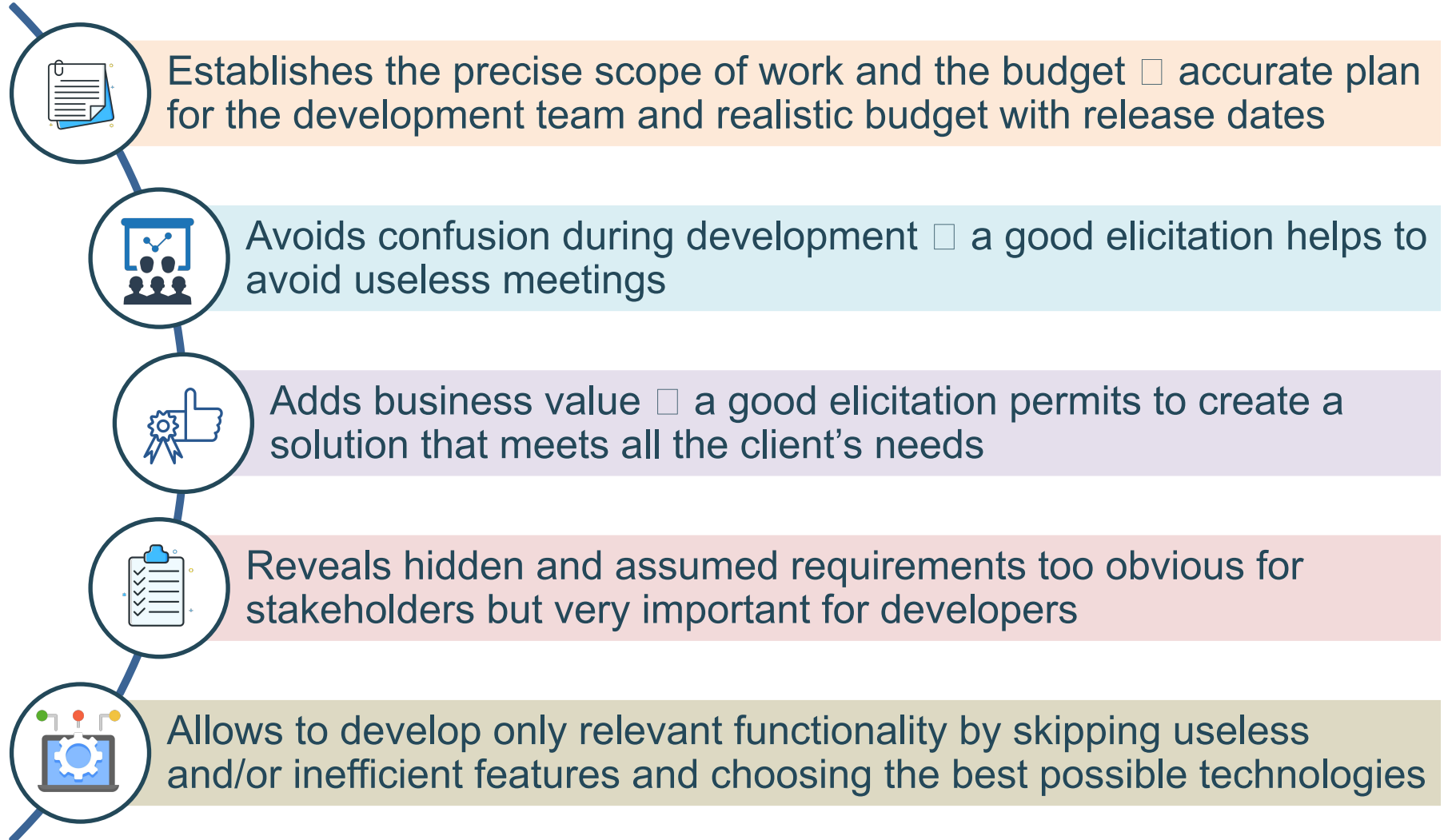
- Pay attention!
 - never-ending requirements
 - increasing complexity





Why do requirements need to be elicited?

• Key benefits





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- Why do requirements need to be elicited?
- **Requirements elicitation techniques**

Hands-on exercise (scenario-based)

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Requirements Elicitation Techniques



In this interactive training session we will adopt the “Brainstorming” technique

Take a look at the Session 3 of the 1st day of the *ENVRI Community International Summer School 2022* to have a detailed description of all these techniques:
<https://training.envri.eu/course/view.php?id=61>



Requirements Elicitation Techniques



Brainstorming

Brainstorming

- Technique used to generate new ideas, to build a repository of knowledge and to find solutions for specific issues.
- All participants should have an equal amount of time to express their ideas and a highly trained facilitator is required to handle group bias and group conflicts.
- Brainstorming technique is used to answer the questions:
 - What is the expectation of the project?
 - What are the risk factors that can affect the development of the proposed project and what to do to avoid that?
 - What are the business and organization rules required to follow?
 - What are the options available to solve a specific issue?
 - What has to be done so that a particular issue does not happen in the future?

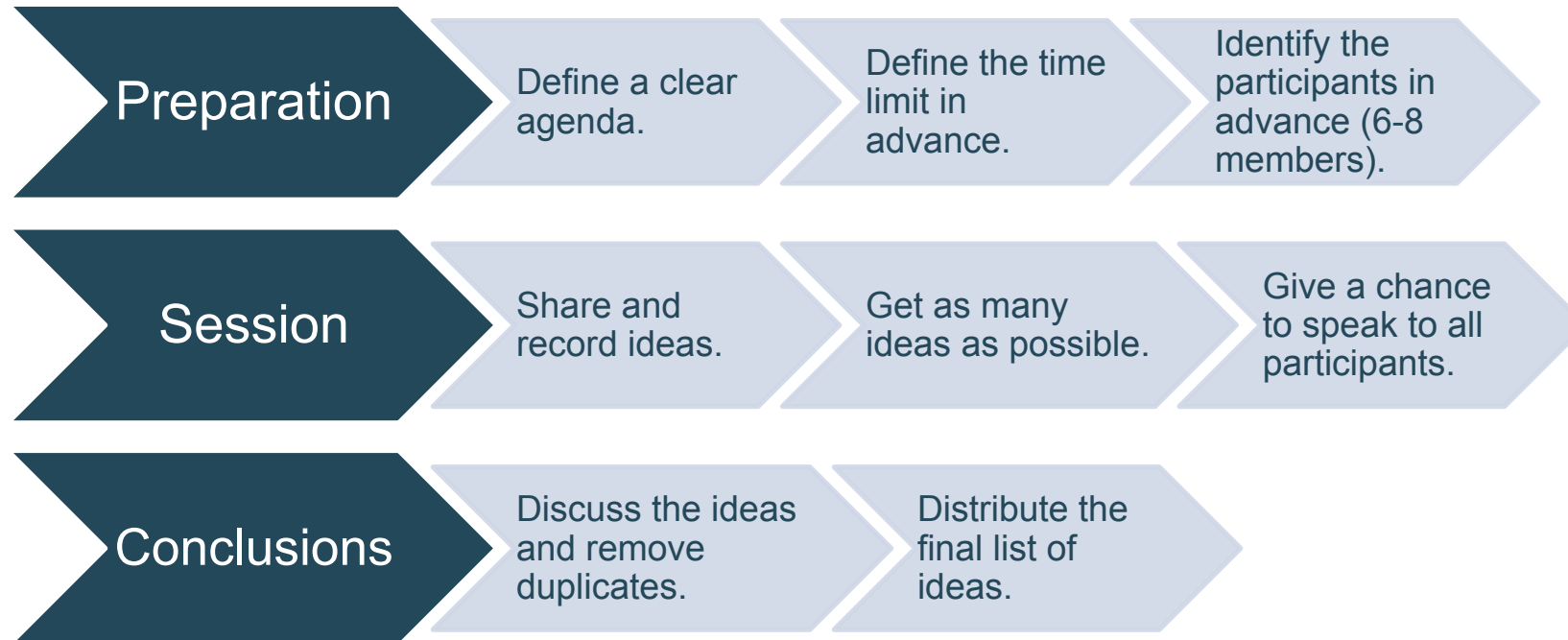


Requirements Elicitation Techniques



Brainstorming

- Can be described in the following phases:





Requirements Elicitation Techniques



Brainstorming



Benefits

Plenty of ideas in a short time (*creative thinking*).

Promotes equal participation.

Drawbacks



Participants can be involved in debating ideas.

There can be multiple duplicate ideas.



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Hands-on exercise (scenario-based)

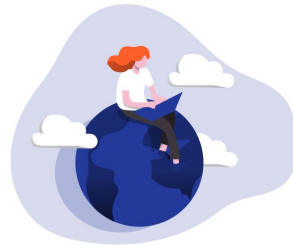
Search ENVRI's Knowledge Base

Welcome to the ENVRI-Hub


ENVRI-Hub is the central gateway to environmental data and services offered by the European environmental research infrastructures.

Our data is open and free to use by anyone for interdisciplinary environmental research.

We offer Virtual Research Environments that will allow environmental scientists to access scientific data and explore our comprehensive Knowledge Base and FAIRness Training, all through the ENVRI-Hub.




Browse the ENVRI-Hub




ENVRI Catalogue of Services

Access the machine-actionable interface to the ENVRI ecosystem: A Catalogue of all RIs in the ENVRI domain with the mapping of all metadata and description of services that provide access to data.




ENVRI Knowledge Base

Access technical practices, common data and service requirements that facilitate search and analysis of existing RI solutions for interoperability challenges shared among environmental RIs.



ENVRI Training Gateway

Access training resources developed by and for the ENVRI Community.



ENVRI Science Demonstrators

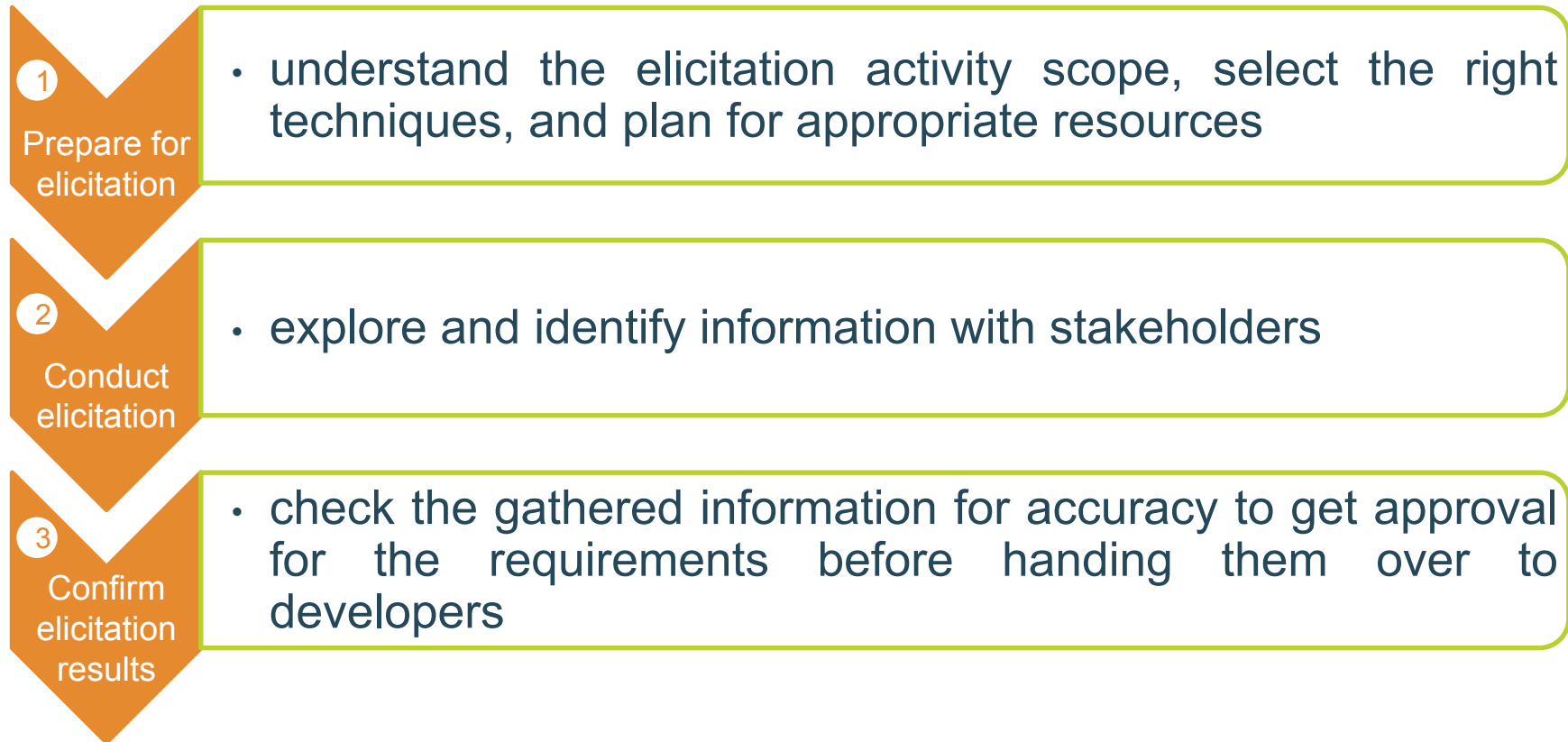
Use reliable Jupyter Notebooks to support interactive data science and scientific computing.

- We will consider the ENVRI HUB as scenario for our hands-on exercise!
- The prototype (<https://hubtest.envri-fair.eu>) will be used as “as-is” version of the HUB.
- A reverse-engineering process will be adopted.
- Result: list of suggestions, improvements, new requirements, etc.



Requirement elicitation process

- Eliciting requirements usually happens in three stages:





Main tasks of the requirements elicitation process

Prepare for elicitation 1

Conduct elicitation 2

Confirm elicitation results 3

If an “as-is” version of the system already exists, start analysing it by collecting all details (requirements, documentation, reports, manuals, etc.).

This helps to have a knowledge of the overall area where the project is applied.

Collect documentation



Identify all stakeholders affected by the project and decide which of them should be involved in elicitation.

Engaging only relevant stakeholders speeds up the elicitation process.

Analyse stakeholder roles



Prepare use case diagrams to discuss them with stakeholders.

This helps to improve the understanding of stakeholders on scenarios and possible issues.

Prepare use cases and process flow diagrams



Make sure all participants understand the goal and process of elicitation by choosing the most appropriate means of communication.

This helps to make discussions short and effective.

Prepare stakeholders for elicitation





Main tasks of the requirements elicitation process

Prepare for elicitation 1

Conduct elicitation 2

Confirm elicitation results 3

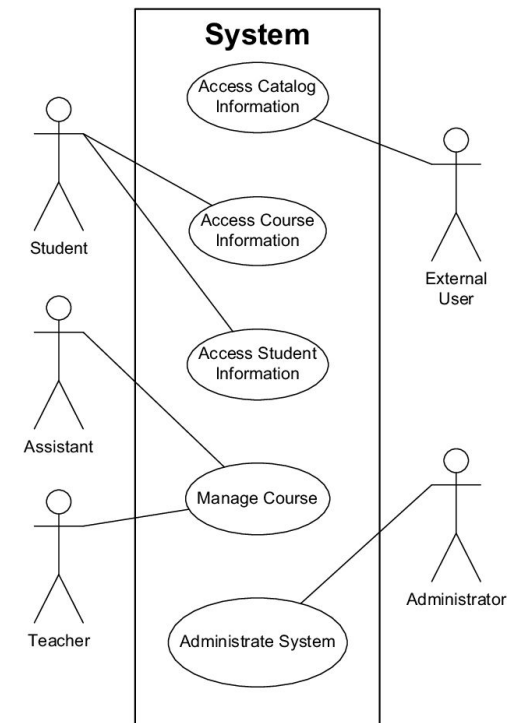
Prepare use case and process flow diagrams to discuss them with stakeholders.

This helps to improve the understanding of stakeholders on scenarios and possible issues.

Prepare use cases and process flow diagrams



- In the Unified Modeling Language (UML), a use case diagram represents the details of your system's users (actors) and their interactions with the system.
- The use cases describe the *what* of a system and not the *how* → they only give a functional view of the system.
- A stick figure is used to represent an actor.
- An oval is used to represent a use case.
- A line is used to represent a relationship between an actor and a use case.



Pavlich-Mariscal J., 2008



Main tasks of the requirements elicitation process



- Elicitation happens during a series of meetings with the stakeholders.
- During these meetings, you have several tasks:
 - **Define requirements for stakeholders and the development team:** stakeholders of the same project may understand the requirements differently → it's up to you to help them articulate their needs and make sure everyone agrees.
 - **Manage the elicitation:** discussions of requirements may turn in unexpected directions, especially if they involve multiple stakeholders → you should control/guide these discussions to make all questions answered.
 - **Document discussions:** during elicitation, you should take notes about the progress that stakeholders make, in order to improve the initial requirements.
 - **Follow-up with participants:** follow-ups help to structure the discussed topics and the outcome of each elicitation session.



Main tasks of the requirements elicitation process

Prepare for elicitation 1

Conduct elicitation 2

Confirm elicitation results 3

- Once elicitation is done, you go through the requirements to make sure that for each requirement each of these questions is answered.

WHY

Why should the requirement be implemented, what problem does it solve, and what benefits does it provide?

WHAT

What is the exact meaning of the requirement, what are the business rules, and what are the compliance or other requirements?

HOW

What are the possible ways to implement the requirement and what are the possible obstacles to its implementation?

WHEN

How urgent is the requirement and how should it be prioritized?



ENVRI
FAIR

Hands-on





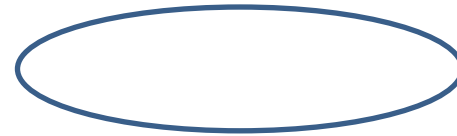
Hands-on

1. Stakeholder identification

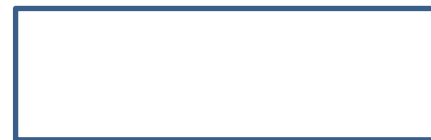


“A stakeholder is an individual, group, or organization who may affect, be affected by or perceive itself to be affected by a decision, activity, or outcome of a project” [the PMBOK Guide]

2. Goal identification

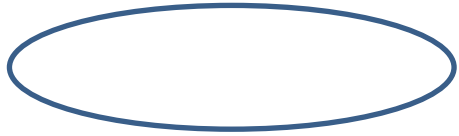


3. Goals Requirements





Hands-on





Challenges of requirements elicitation

- Some common obstacles in the elicitation process:

Unclear project vision

Usually, stakeholders have a basic set of requirements and a general image of the solution they want. Hence, they don't have a clear understanding of what functionality their software needs □ create prototypes to help them visualize possibilities and choose the best one.

Never-ending requirements

Often, after each elicitation session, new requirements come from stakeholders □ review and prioritize all additional requirements. This helps avoid misunderstanding the value of the requested changes and define the scope of the first phase of development.

Limited access to documentation

Some clients don't provide all the necessary documentation because of concerns about disclosing sensitive information, lost or unstructured documents, etc. □ sign non-disclosure agreements with clients and provide a reason for each information request.

Focus on solutions instead of requirements

During elicitation sessions, stakeholders may start discussing the details of solutions (checkboxes, buttons, etc.) instead of requirements □ you have to remember them that they should explain WHAT they want to be done; it's the developer's job to figure out HOW to do it.



Challenges of requirements elicitation

- Some common obstacles in the elicitation process:

Problems of understanding

- users have incomplete understanding of their needs, poor understanding of computer capabilities and limitations;
- analysts have poor knowledge of problem domain;
- user and analyst speak different languages;
- ease of omitting “obvious” information;
- conflicting views and contradictory requirements of different users;
- requirements are often vague and untestable, e.g., “user friendly” and “robust”.

- All these issues may lead to poor requirements, the cancellation of system development, or the development of a system that is later judged unsatisfactory or unacceptable, has high maintenance costs, or undergoes frequent changes.
- By improving requirements elicitation, the requirements engineering process can be improved, resulting in enhanced system requirements and (potentially) a much better system.



Challenges of requirements elicitation

- How can we improve the requirements quality?
 - Use visualization and simulation tools to improve the understanding
 - Use simple and consistent language to define requirements and the business terminology prevalent in the specific client's environment.
 - Follow organizational guidelines that describe the collection techniques and the types of requirements to be collected.
 - Document: produce a set of models and templates to document the requirements and document all the dependencies and interrelationships among requirements.
 - Analyse the changes to requirements and make corrective actions.



Conclusions

- An effective requirements elicitation requires close collaboration with all the involved actors (the business analyst(s), the client, the stakeholders, the contractors, the developers, etc.) to accurately manage the process.
- Requirements elicitation is a crucial stage of software development. Unclear or incomplete requirements will inevitably lead to a lengthy development process, a need to rework parts of the solution, and budget overruns.
- We have seen different requirements elicitation techniques. Which one to use depends on the specific case, on the specific scenario.



The hardest single part of building a software system is deciding what to build. (...) No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later.

*Brooks, F.P. Jr. No Silver Bullet: Essence and Accidents of Software Engineering.
IEEE Computer, 10-19, April 1987.*



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