



Catalogue of resources Metadata-schema

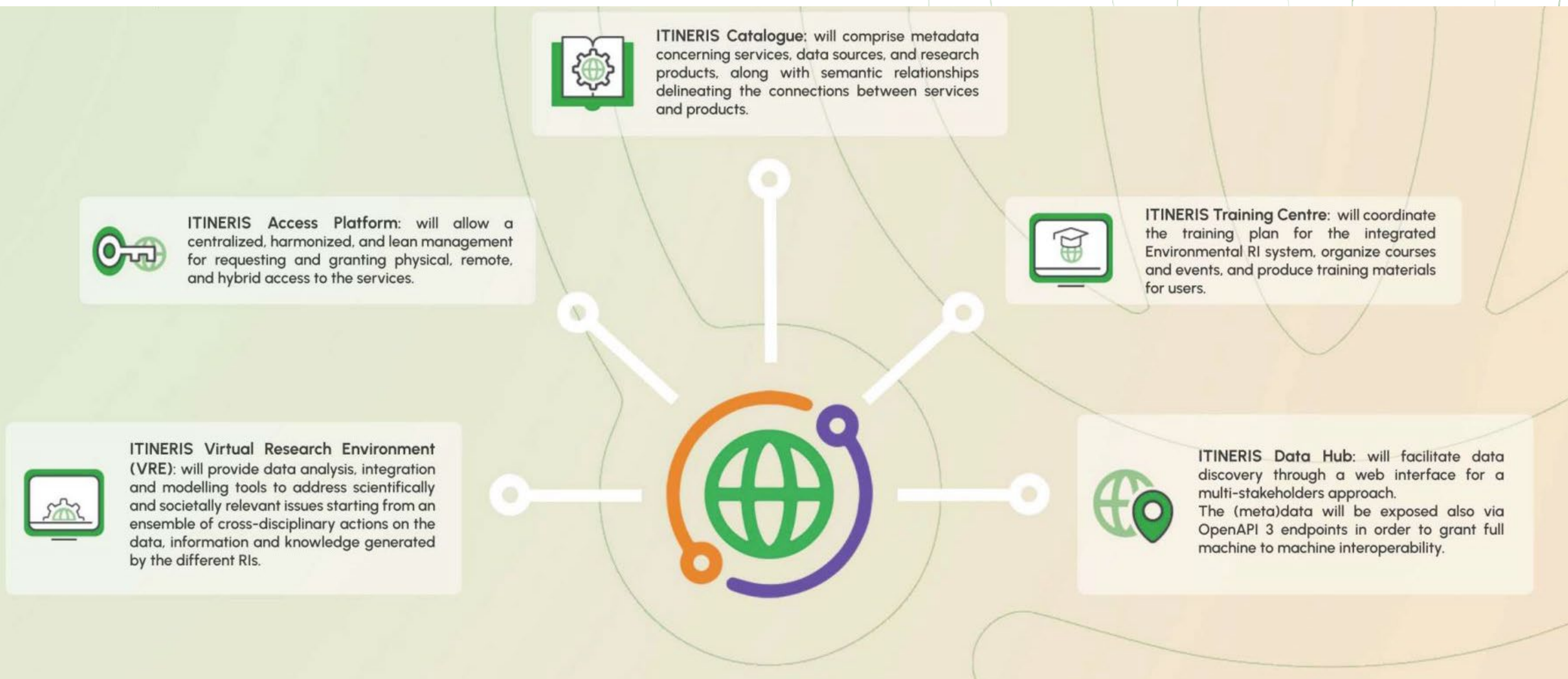
Quinzia Palazzo, Lucia Saganeiti

19 March 2025

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”



The ITINERIS HUB



The ITINERIS Catalogue



ITINERIS Catalogue: will comprise metadata concerning services, data sources, and research products, along with semantic relationships delineating the connections between services and products.



ITINERIS Access Platform: will allow a centralized, harmonized, and lean management for requesting and granting physical, remote, and hybrid access to the services.



ITINERIS Training Centre: will coordinate the training plan for the integrated Environmental RI system, organize courses and events, and produce training materials for users.



ITINERIS Virtual Research Environment (VRE): will provide data analysis, integration and modelling tools to address scientifically and societally relevant issues starting from an ensemble of cross-disciplinary actions on the data, information and knowledge generated by the different RIs.



ITINERIS Data Hub: will facilitate data discovery through a web interface for a multi-stakeholders approach. The (meta)data will be exposed also via OpenAPI 3 endpoints in order to grant full machine to machine interoperability.



Building the ITINERIS Catalogue

A metadata catalog serving as a standardized framework for organizing and detailing information pertaining to resources within Research Infrastructures (RIs) across the various environmental research domains. Despite its simple premise, the implementation of this concept involves a considerable amount of complexity.



Resources of the ITINERIS Catalogue

Research Infrastructures

Providers

Dataset



Services



Training resources



VRE



Research products



Resources of the ITINERIS Catalogue

Research Infrastructures

Providers

Dataset



Services



Training resources



VRE



Research products



Research infrastructures:

- The **22** RIs participating in ITINERIS provide facilities, resources and services used by the research communities to conduct research and foster innovation in their fields.
- They include associated human resources major scientific equipment or sets of instruments, knowledge-related facilities such as collections, archives and/or scientific data infrastructures, such as data and computing systems and communication networks and any other infrastructure of a unique nature and open to different Users, essential to achieve excellence in research and innovation. Where relevant, these resources may be used beyond research, for example for training and education or public services.
- They may be virtual, 'single-sited' or 'distributed'.

Resources of the ITINERIS Catalogue

Research Infrastructures

Providers

Dataset



Services



Training resources



VRE



Research products



Research infrastructures:

- The **22** RIs participating in ITINERIS providing facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields.
 - They include associated human resources major scientific equipment or sets of instruments, knowledge-related facilities such as collections, archives and/or scientific data infrastructures, such as data and computing systems and communication networks and any other infrastructure of a unique nature and open to different Users, essential to achieve excellence in research and innovation. Where relevant, these resources may be used beyond research, for example for training and education or public services.
- They may be virtual, 'single-sited' or 'distributed'.

Providers:

- The entities (academic institutions, research organizations, ERIC, etc.) that supply the variety of resources listed in the Catalogue. ITINERIS providers play a pivotal role in the research ecosystem by ensuring the provision and maintenance of these resources in the Catalogue.

Resources of the ITINERIS Catalogue

Research Infrastructures

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Training resources



VRE



Research products



A set or collection of data, records or information that constitutes distinct units of information in the knowledge generation process.

Metadata harvesting should be possible through metadata services implementing Catalogue Service for WEB (CSW), an Open Geospatial Consortium (OGC) standard. The dataset will be catalogued in ISO/TS 19139, a metadata schema based on the international standard for geographic metadata (gmd) representation, which provides the XML implementation schema derived from ISO 19115.

OGC Catalogue interface standards specify the interfaces, bindings, and framework for defining application profiles required to publish and access digital catalogues of metadata for geospatial data, services, and related resource information. Metadata acts as generalized properties that can be queried and returned through catalogue services for resource evaluation and, in many cases, invocation or retrieval of the referenced resource.

Resources of the ITINERIS Catalogue

Research Infrastructures

Providers

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Services



Training resources 

VRE 

Research products 

"Way to provide value to customers through bringing about results that they want to achieve ". ITINERIS service refers to any support, tool, or functionality provided to enabling users to conduct scientific/technical/innovation activities and offered in the framework of ITINERIS through physical, remote, and hybrid access by the participating RIs.

Resources of the ITINERIS Catalogue

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Training resources



VRE



Research products



“By training resource, we mean a persistent resource that has one or more physical or digital representation, and that explicitly involves, specifies or entails a learning activity or learning experience ”. ITINERIS Training resources include and are not limited to tutorials, webinars, and video lectures, documentation (manuals, user guides, etc.), workshops and courses, interactive modules (quizzes, simulations, and hands-on exercises to reinforce learning), case studies (examples and detailed descriptions of how specific tools or datasets have been used in real research scenarios, illustrating best practices and successful applications), etc.

Resources of the ITINERIS Catalogue

Research Infrastructures

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Services



Training resources



VRE



Research products



The ITINERIS Virtual Research Environment (VRE) is a sophisticated platform designed to integrate data analysis and external datasets (such as Copernicus, NASA, and local data). This environment combines data, analysis, and modeling tools, enabling users to gain comprehensive insights into various problems and incorporate their own data and analysis methods to address evolving needs. Each VRE service focuses on a specific topic, and all VRE services are harmonized to share information across different activities. The outcome will be a prototype of operational VRE services aimed at addressing environmental issues with significant societal impacts, with potential for extension to other topics and challenges.

Resources of the ITINERIS Catalogue

Research Infrastructures

Providers

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Services



Training resources



VRE



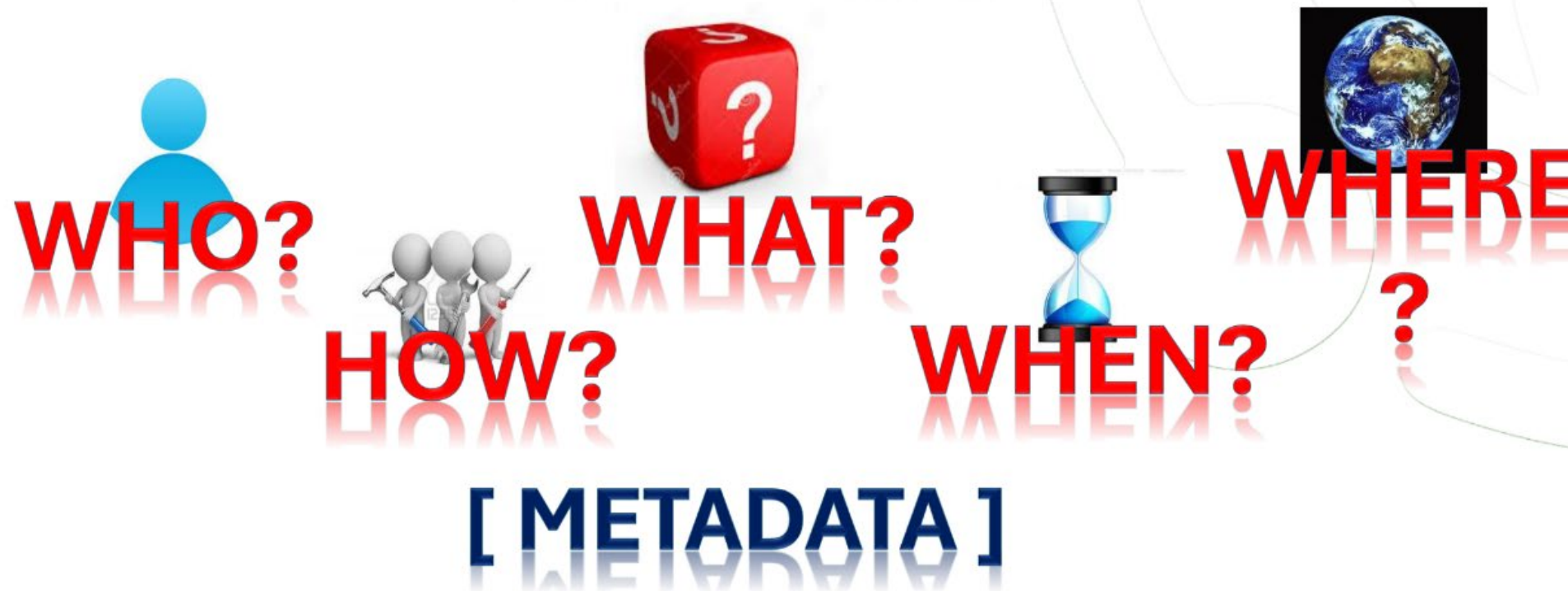
Research products



“Digital objects, described by metadata, resulting from a scientific process”. It includes Publication, Software and Other research products not included in the two previous subtypes.

Metadata

It is data that describes some properties of another data



Standard

It is a set of guidelines or standards governing the use of metadata and/or the format of data to ensure interoperability, quality and consistency between various systems and catalogues. Standards can include both technical specifications (e.g. data formats, transmission protocols) and requirements for the metadata itself.

Example: ISO 19139 is an international standard for the description of data.

Metadata - schema

It is a structured framework or set of rules that defines the elements and properties used to describe data.

It specifies how metadata should be organized and encoded to ensure consistency, interoperability, and usability across different systems and contexts.

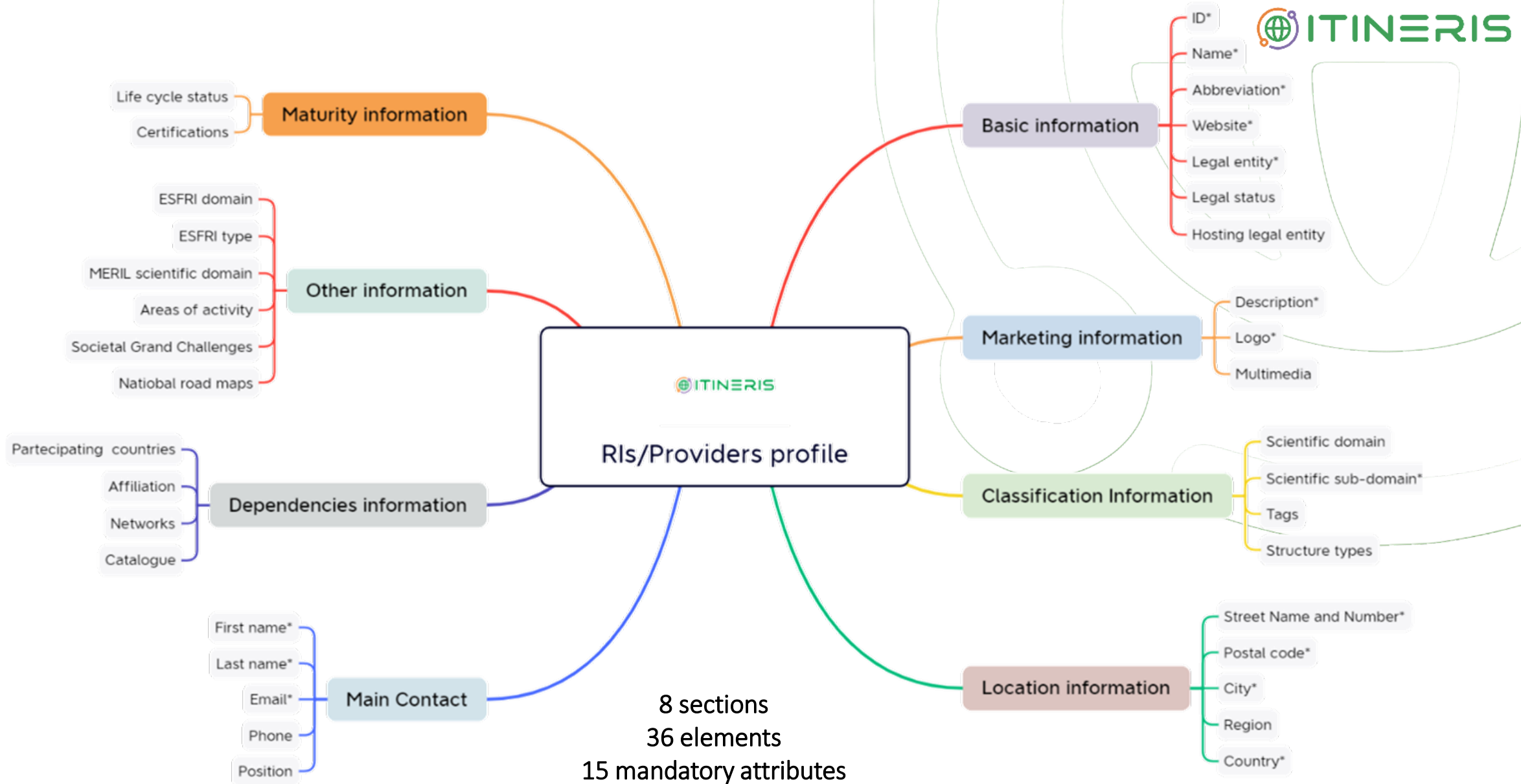
A metadata schema includes definitions for:

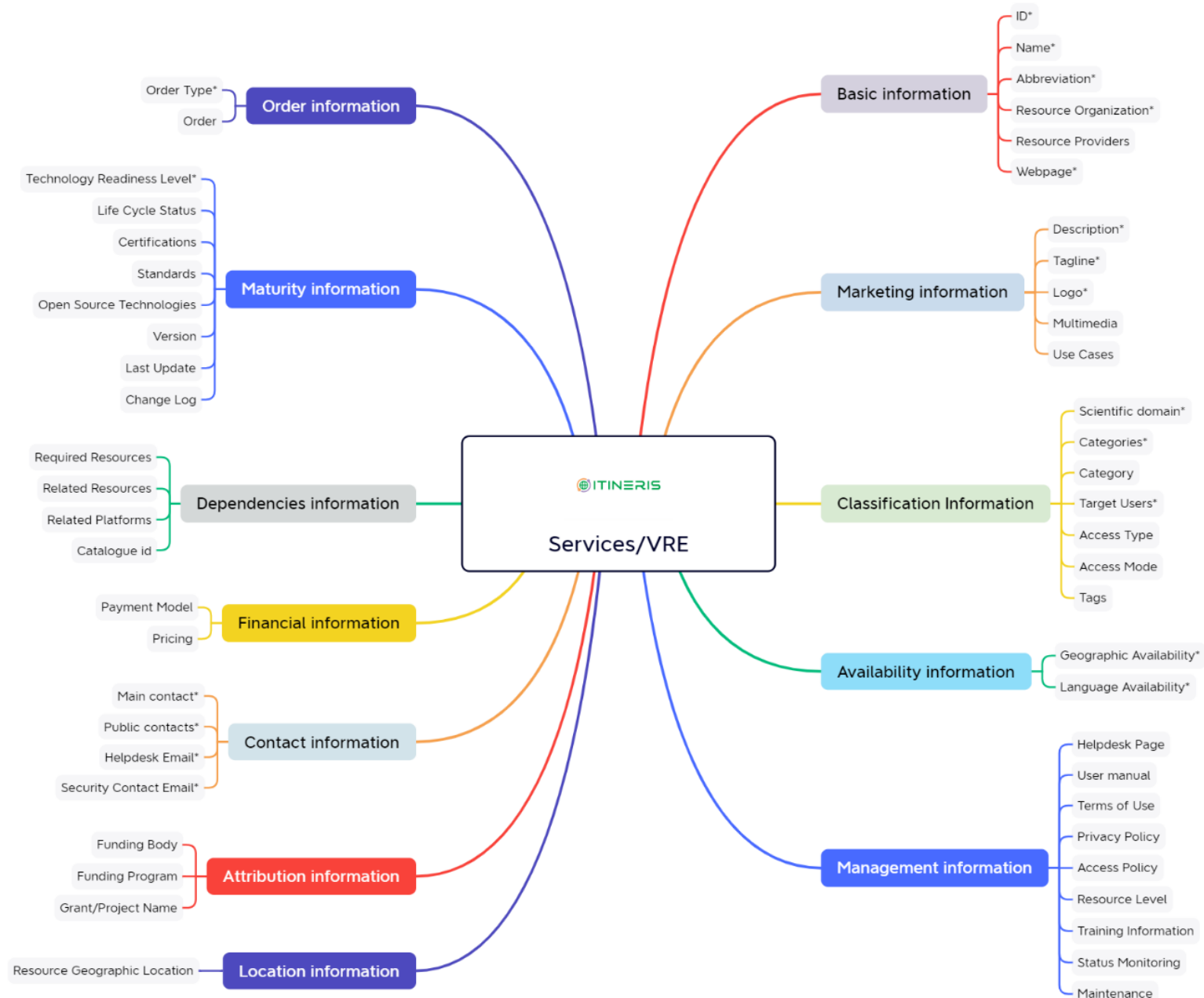
1. Elements/Fields: The specific pieces of information or attributes used to describe a resource (e.g., title, author, date).
2. Syntax Rules: How the data should be formatted and structured.
3. Controlled Vocabularies: Standardized terms and values that can be used in the fields to ensure consistency.

B	C	D	E	F	G				
Type of information	Attribute Name	Required	Type	Multiplicity	Definition				
Basic	ID	Mandatory	ProviderID	1	A persistent identifier, a unique reference for research infrastructure				
Basic	Name	Mandatory	String (max 100)	1	Full name of the RI offering the resource and acting as main contact point				
Basic	Abbreviation	Mandatory	String (max 30)	1	Abbreviation or short name of the RI				
Basic	Website	Mandatory	URL	1	Webpage with information about the RI				
Basic	Legal entity	Mandatory	Boolean (Y/N)	1	A Yes/No question to define whether the RI is a Legal Entity or not				
Basic	Legal status	Optional	List of controlled value (Example: Association, Consortium, Corporation, ERIC, European Economic Interest Grouping, Foundation etc.)	1	Legal status of the RI. The legal status is usually noted in the registration act/statutes. For independent legal entities (1) - legal status of the RI. For embedded RIs (2) - legal status of the hosting legal entity. It is also possible to select Not a legal entity.				
Basic	Hosting legal entity	Optional	String (max 80)	1	Name of the organisation/institution legally hosting (housing) the research infrastructure or its coordinating centre. A distinction is made between: (1) research infrastructures that are self-standing and have a defined and distinct legal entity, (2) research infrastructures that are embedded into another institution which is a legal entity (such as a university, a research organisation, etc.). If (1) - name of the research infrastructure, If (2) - ROR id				
Provider	RI	Legal Status	Scientific Domain and subdomain	Structure type	Life cycle status	ESFRI domain	ESFRI type	MERIL	..

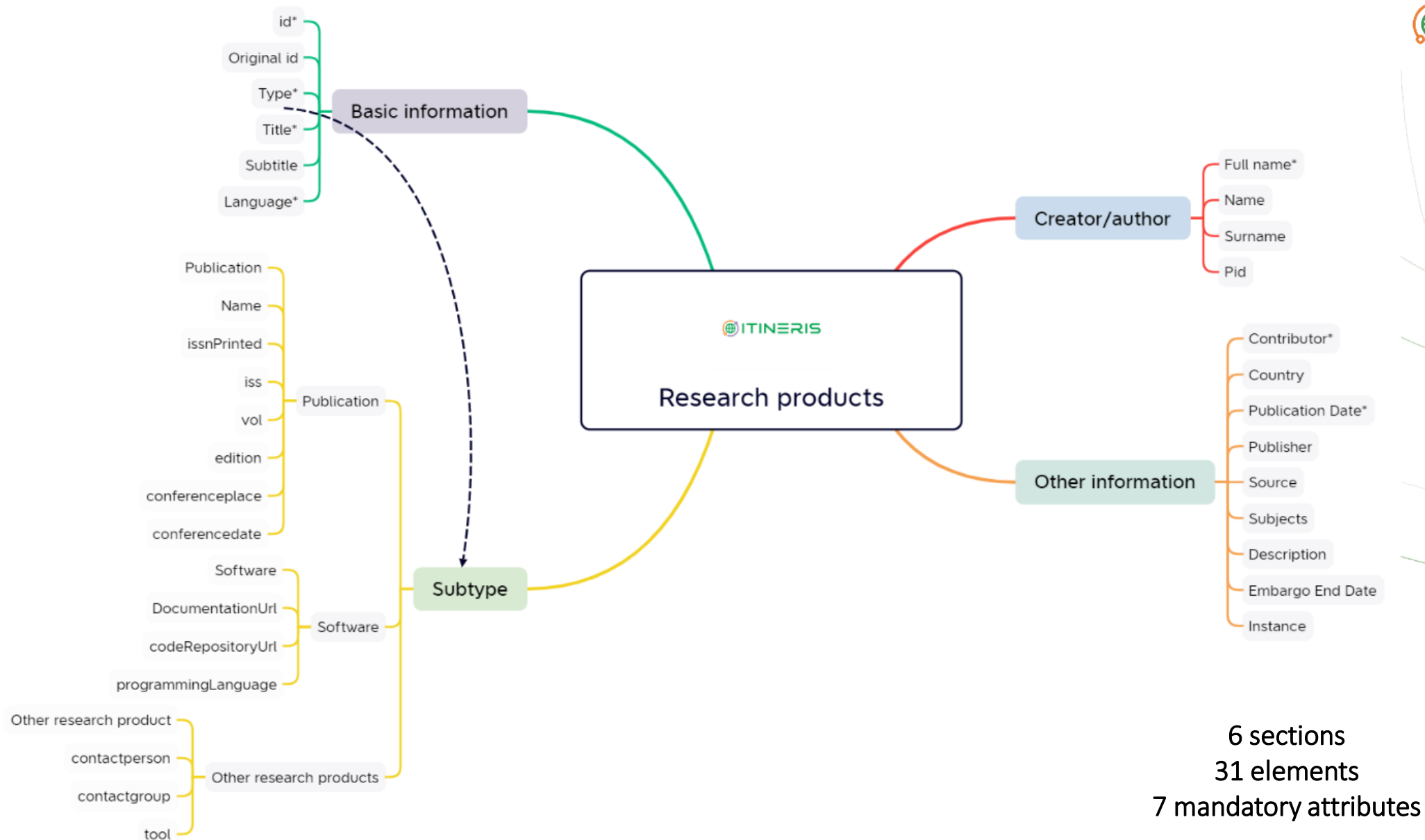
Itineris Catalogue Metadata Schema

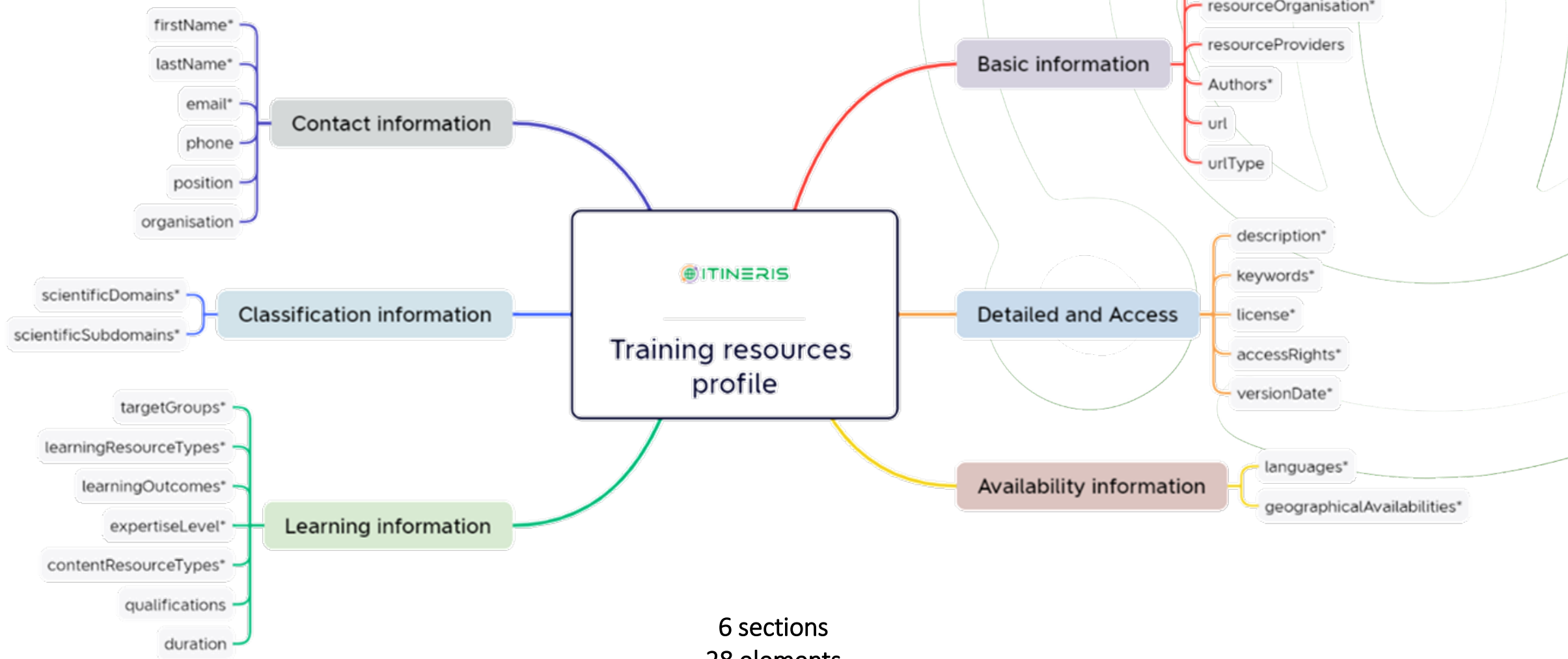
Resource	Adopted metadata schema
Research Infrastructure	EOSC Provider profile EOSC V. 5.0
Providers	EOSC Provider profile EOSC V. 5.0
Services	EOSC Resource profile EOSC V. 5.0
Dataset	ISO19139
Research products	Research products profile OpenAire V. 4.0
Training resources	EOSC Training Resource Profile EOSC V. 5.0
VRE	EOSC Resource profile EOSC V. 5.0





12 sections
53 elements
19 mandatory attributes





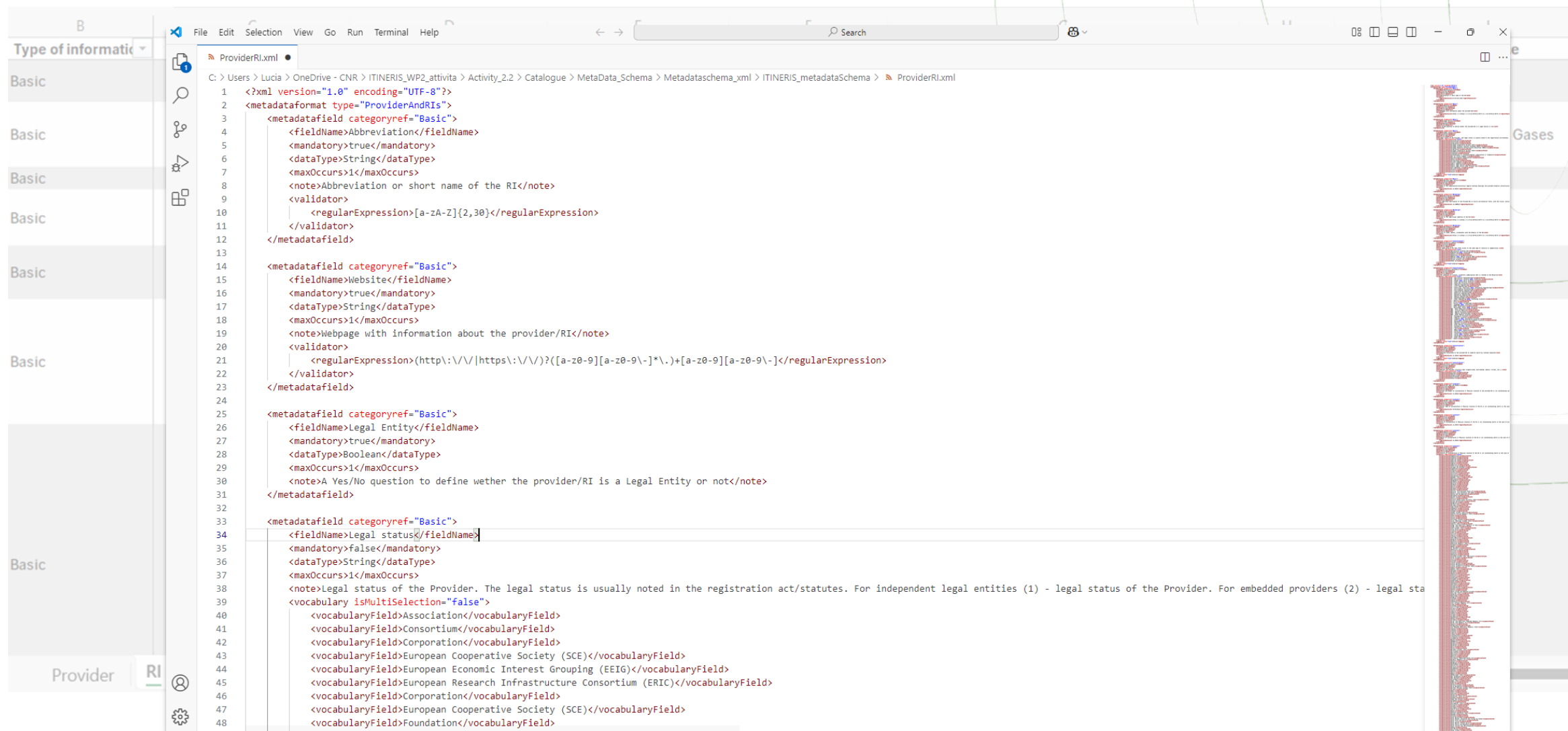
6 sections
28 elements
21 mandatory attributes

From analysis to excel

B	C	D	E	F	G	H	I
Type of information	Attribute Name	Required	Type	Multiplicity	Definition	Public	Example
Basic	ID	Mandatory	ProviderID	1	A persistent identifier, a unique reference for research infrastructure	Yes	Automatically assigned
Basic	Name	Mandatory	String (max 100)	1	Full name of the RI offering the resource and acting as main contact point	Yes	Aerosol, Clouds and Trace Gases
Basic	Abbreviation	Mandatory	String (max 30)	1	Abbreviation or short name of the RI	Yes	ACTRIS
Basic	Website	Mandatory	URL	1	Webpage with information about the RI	Yes	https://www.actris.eu/
Basic	Legal entity	Mandatory	Boolean (Y/N)	1	A Yes/No question to define whether the RI is a Legal Entity or not	Yes	Yes
Basic	Legal status	Optional	List of controlled value (Example: Association, Consortium, Corporation, ERIC, European Economic Interest Grouping, Foundation etc.)	1	Legal status of the RI. The legal status is usually noted in the registration act/statutes. For independent legal entities (1) - legal status of the RI. For embedded RIs (2) - legal status of the hosting legal entity. It is also possible to select Not a legal entity.	Yes	ERIC
Basic	Hosting legal entity	Optional	String (max 80)	1	Name of the organisation/institution legally hosting (housing) the research infrastructure or its coordinating centre. A distinction is made between: (1) research infrastructures that are self-standing and have a defined and distinct legal entity, (2) research infrastructures that are embedded into another institution which is a legal entity (such as a university, a research organisation, etc.). If (1) - name of the research infrastructure, If (2) - ROR id	Yes	ROR

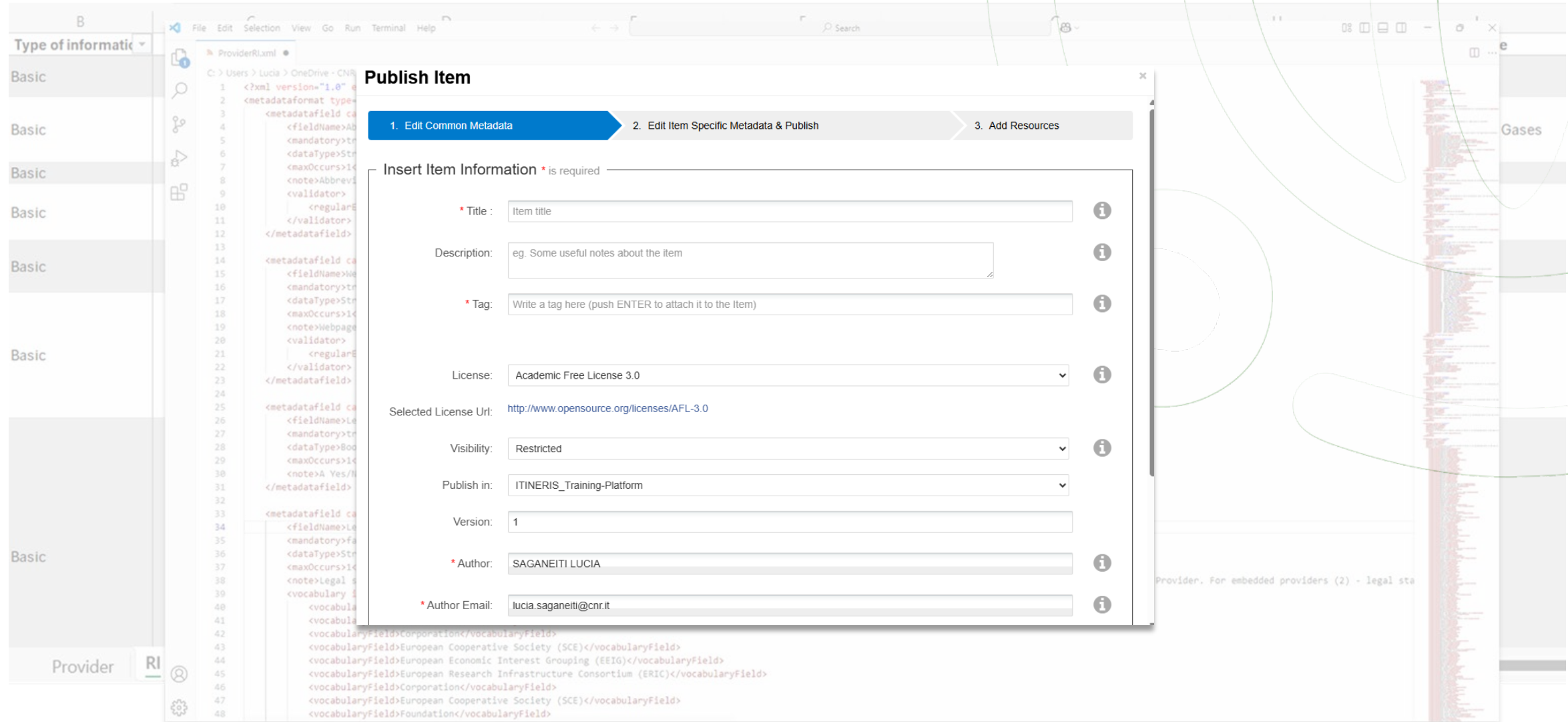
Provider
RI
Legal Status
Scientific Domain and subdomain
Structure type
Life cycle status
ESFRI domain
ESFRI type
MERIL
...
+
:
◀

From excel to xml



```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <metadataformat type="ProviderAndRIs">
3   <metadatafield categoryref="Basic">
4     <fieldName>Abbreviation</fieldName>
5     <mandatory>true</mandatory>
6     <dataType>String</dataType>
7     <maxOccurs>1</maxOccurs>
8     <note>Abbreviation or short name of the RI</note>
9     <validator>
10      <regularExpression>[a-zA-Z]{2,30}</regularExpression>
11    </validator>
12  </metadatafield>
13
14  <metadatafield categoryref="Basic">
15    <fieldName>Website</fieldName>
16    <mandatory>true</mandatory>
17    <dataType>String</dataType>
18    <maxOccurs>1</maxOccurs>
19    <note>Webpage with information about the provider/RI</note>
20    <validator>
21      <regularExpression>(http\:\/\/|https\:\/\/)?([a-z0-9][a-z0-9\-\_]*\.)+[a-z0-9][a-z0-9\-\_]</regularExpression>
22    </validator>
23  </metadatafield>
24
25  <metadatafield categoryref="Basic">
26    <fieldName>Legal Entity</fieldName>
27    <mandatory>true</mandatory>
28    <dataType>Boolean</dataType>
29    <maxOccurs>1</maxOccurs>
30    <note>A Yes/No question to define whether the provider/RI is a Legal Entity or not</note>
31  </metadatafield>
32
33  <metadatafield categoryref="Basic">
34    <fieldName>Legal status</fieldName>
35    <mandatory>false</mandatory>
36    <dataType>String</dataType>
37    <maxOccurs>1</maxOccurs>
38    <note>Legal status of the Provider. The legal status is usually noted in the registration act/statutes. For independent legal entities (1) - legal status of the Provider. For embedded providers (2) - legal sta
39    <vocabulary isMultiSelection="false">
40      <vocabularyField>Association</vocabularyField>
41      <vocabularyField>Consortium</vocabularyField>
42      <vocabularyField>Corporation</vocabularyField>
43      <vocabularyField>European Cooperative Society (SCE)</vocabularyField>
44      <vocabularyField>European Economic Interest Grouping (EEIG)</vocabularyField>
45      <vocabularyField>European Research Infrastructure Consortium (ERIC)</vocabularyField>
46      <vocabularyField>Corporation</vocabularyField>
47      <vocabularyField>European Cooperative Society (SCE)</vocabularyField>
48      <vocabularyField>Foundation</vocabularyField>
```

From xml to web interface

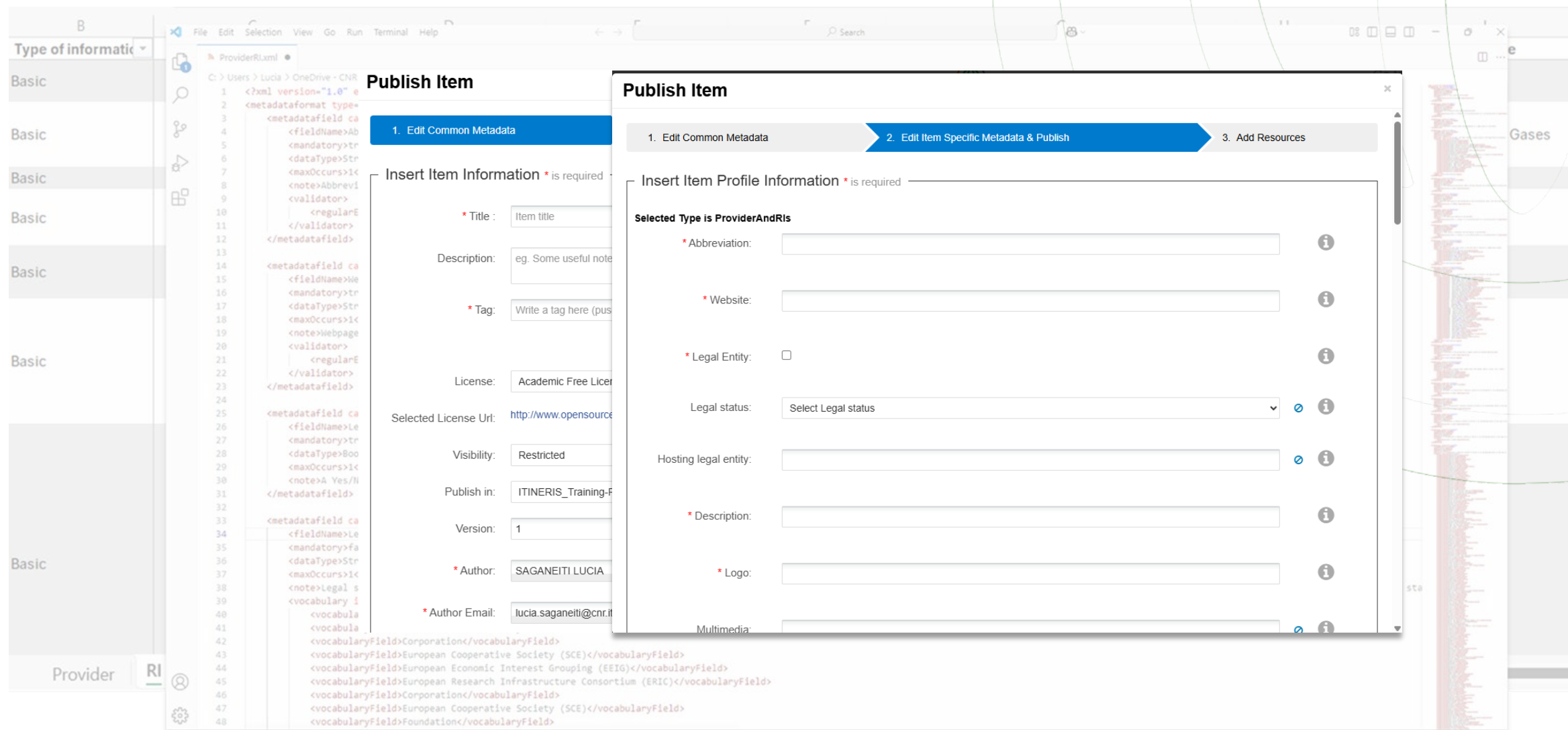


The screenshot displays the ITINERIS web interface. On the left, a sidebar shows a list of 'Basic' items under the 'Type of information' dropdown. The main area is split: the left pane shows an XML file named 'ProviderRI.xml' with various metadata fields like <fieldName>, <mandatory>, <dataType>, <maxOccurs>, <note>, <validator>, and <regularExpression>. The right pane shows a 'Publish Item' dialog box with three steps: 1. Edit Common Metadata (active), 2. Edit Item Specific Metadata & Publish, and 3. Add Resources. The 'Insert Item Information' section contains the following fields:

- * Title: Item title
- Description: eg. Some useful notes about the item
- * Tag: Write a tag here (push ENTER to attach it to the item)
- License: Academic Free License 3.0
- Selected License Url: <http://www.opensource.org/licenses/AFL-3.0>
- Visibility: Restricted
- Publish in: ITINERIS_Training-Platform
- Version: 1
- * Author: SAGANEITI LUCIA
- * Author Email: lucia.saganeiti@cnr.it

Each field has an information icon (i) to its right. The background shows a list of providers, including 'Gases' and 'Provider. For embedded providers (2) - legal sta'.

From xml to web interface



The image illustrates the process of publishing research infrastructure (RI) items, showing the transition from an XML-based backend to a user-friendly web interface.

Left Panel (XML Editor): Displays the XML structure for a 'ProviderRI.xml' file. The XML includes metadata fields for item information, description, tag, license, visibility, publish in, version, author, and author email. A dropdown menu on the left lists various 'Type of information' categories, with 'Basic' selected. The bottom of the panel shows a 'Provider RI' tab.

Right Panel (Web Interface): Shows the 'Publish Item' web form. The interface is divided into three main steps: 1. Edit Common Metadata, 2. Edit Item Specific Metadata & Publish, and 3. Add Resources. The current step is '1. Edit Common Metadata', which includes fields for:

- Title:** Item title
- Description:** eg. Some useful note
- Tag:** Write a tag here (push)
- License:** Academic Free License
- Selected License Url:** <http://www.opensource.org/licenses/by-sa/4.0/>
- Visibility:** Restricted
- Publish in:** ITINERIS_Training-F
- Version:** 1
- Author:** SAGANEITI LUCIA
- Author Email:** lucia.saganeiti@cnr.it

The right panel also shows a 'Selected Type is ProviderAndRis' section with fields for:

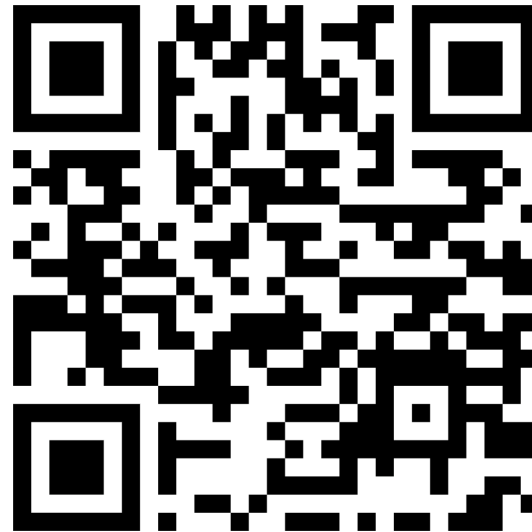
- Abbreviation:**
- Website:**
- Legal Entity:** (checkbox)
- Legal status:** Select Legal status
- Hosting legal entity:**
- Description:**
- Logo:**
- Multimedia:**

Metadata schema



Research Infrastructure

<https://forms.gle/QrSXquphAc326kDF8>



Provider

<https://forms.gle/2KoQ1WgxvuKTEmlp8>



Service

<https://forms.gle/sVthkbDi96JzzFn46>



THANKS!

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