HELLENIC REPUBLIC
National and Kapodistrian University of Athens
EST. 1837

DEPARTMENT OF INFORMATICS & TELECOMMUNICATIONS

Towards a Decentralized, Trusted, Intelligent and Linked Public Sector: A Report from the Greek Trenches*

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ΕΚΔΔΑ
Ημερίδα Τεχνητής Νοημοσύνης στη Δημόσια Διοίκηση

Talk Outline

- Motivation
- Vision
- The Greek legislation platform Nomothesi@
- Reengineering Diavgeia
- Conclusions and Future Work

Motivation

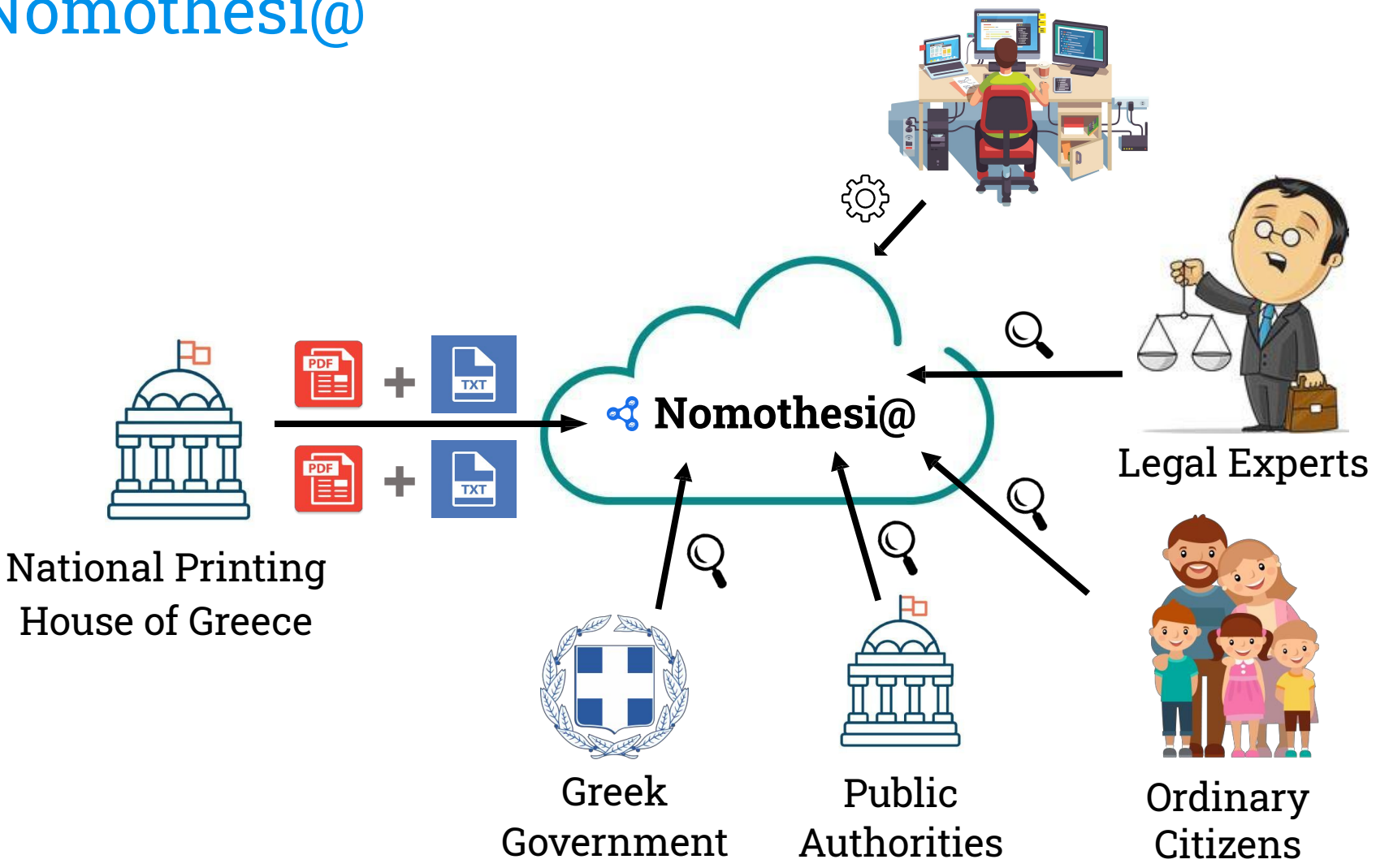
- The current state of the art in the Greek public sector amounts to a lot of **paper** and **PDF** or **Word** documents.

Vision

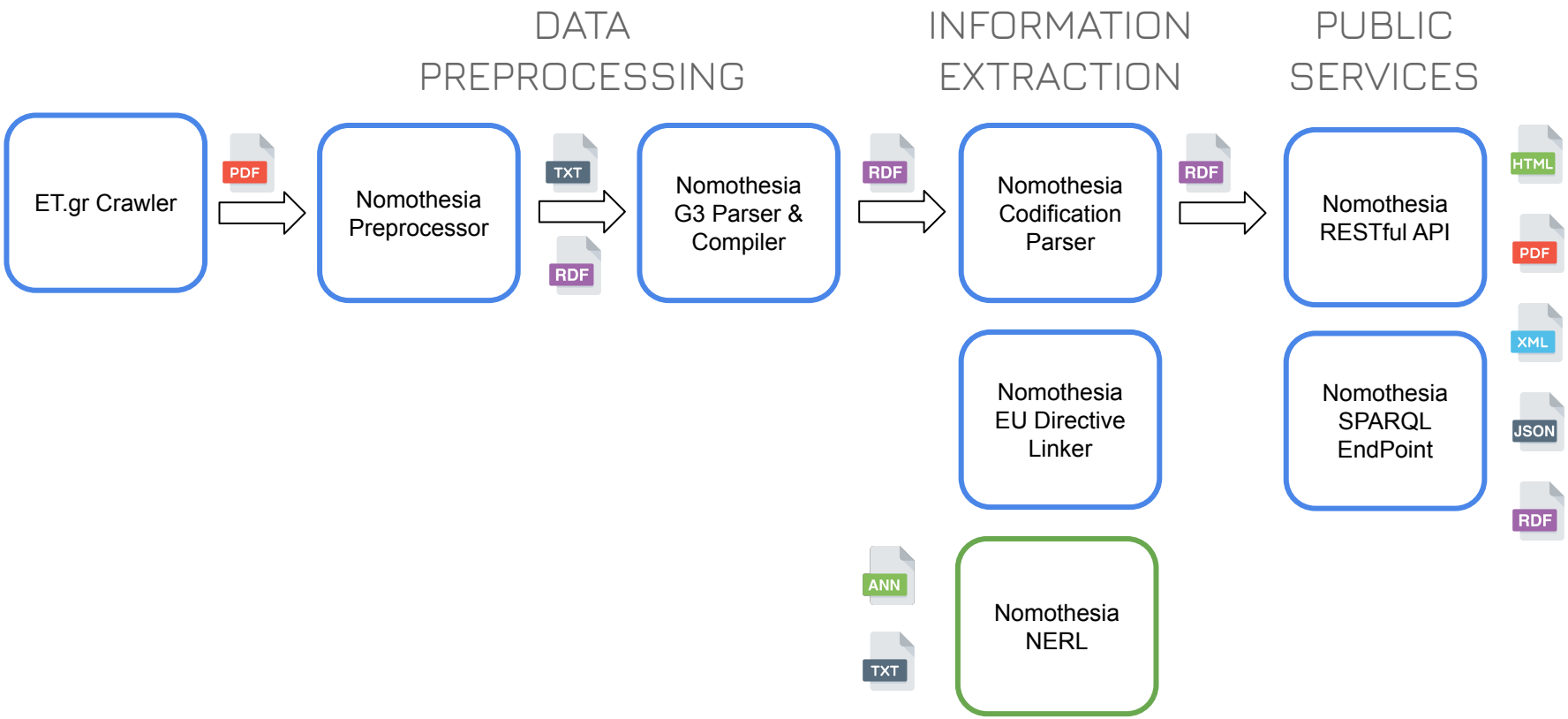
- Our vision is to go beyond the current state of the public sector to one which is **decentralized, trusted, intelligent and linked using Artificial Intelligence technologies**.

- We are developing technologies that make public sector information available on the **Web as linked data** so that it can be exploited by its users (e.g., public sector employees, professionals, software developers and ordinary citizens).

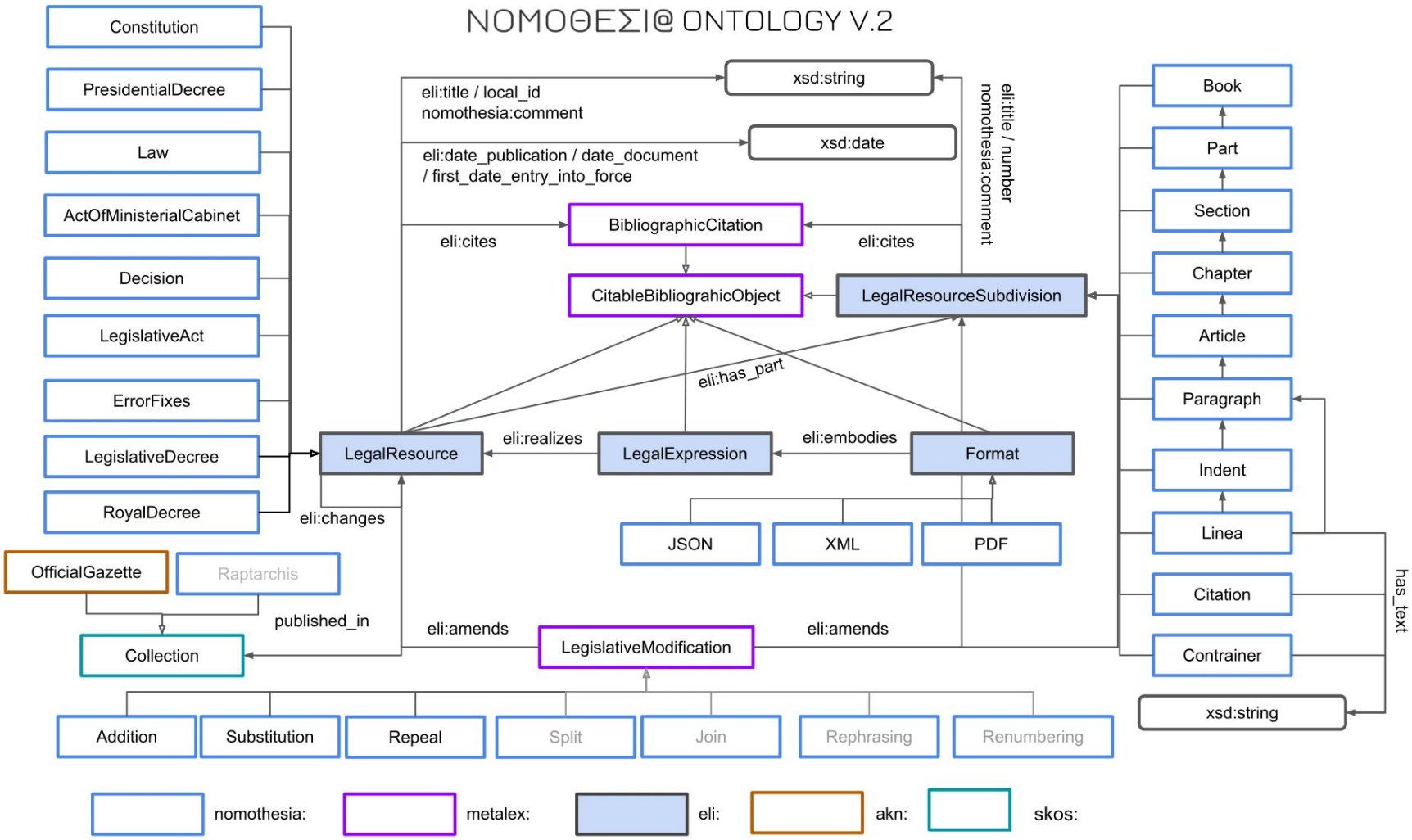
Nomothesi@


Nomothesi@
PDF
TXT
PDF
TXT
National Printing House of Greece
Legal Experts
Greek Government
Public Authorities
Ordinary Citizens

Pipeline - Nomothesi@

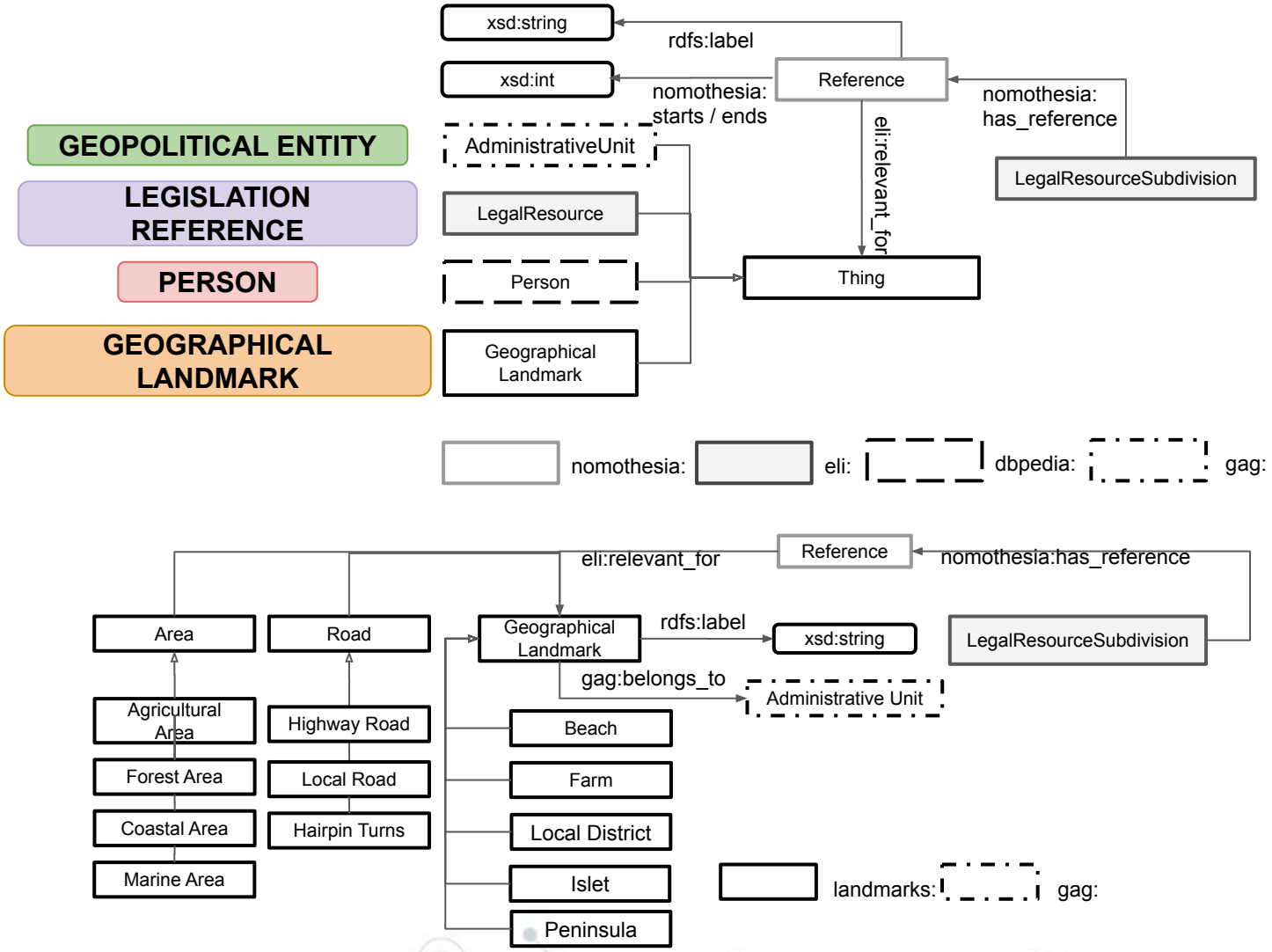


Ontology - Nomothesi@ (ELI)



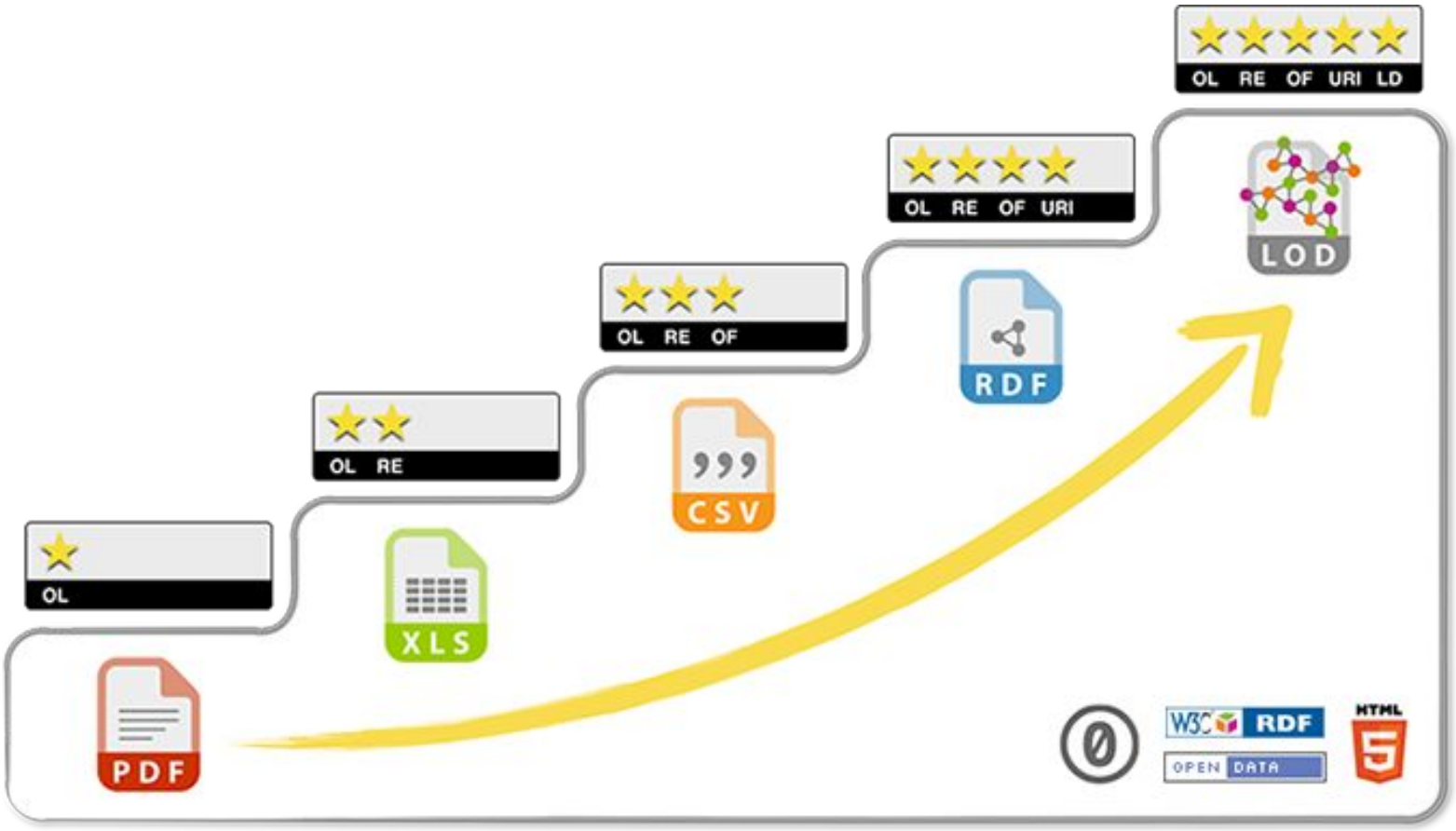
Persistent URI: *http://legislation.di.uoa.gr/eli/{typeoflegislation}/{year}/{id}*

Ontology - Nomothesi@ (Entities)



Persistent URI: *http://legislation.di.uoa.gr/entity/{typeofentity}/{id}*

Greek legislation is now 5-star open linked data forming the Greek legal knowledge graph



Some numbers

- We provide all legal documents of issues A and D of the FEK for the years 1990-2019, the penal and civil code of Greece and all European directives and treaties extracted from EUR-Lex in Greek.
- 12.000 legal documents.
- 195.000 references to entities.
- 5 million RDF triples in the Greek legal knowledge graph.

AI technologies used

- Ontologies and knowledge graphs
- RDF, SPARQL, linked data
- Entity recognition and disambiguation using deep neural networks (LSTMs)

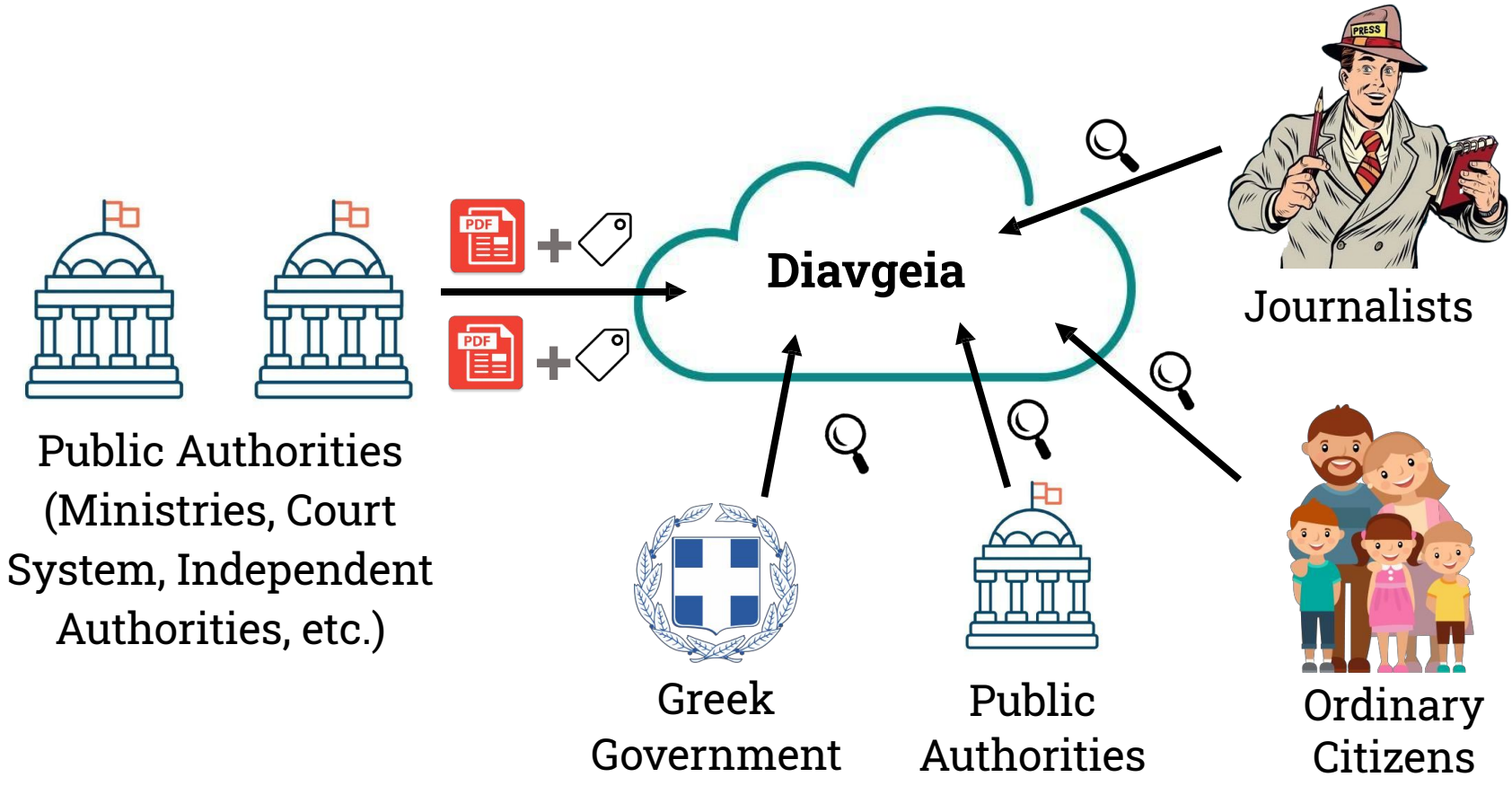
Nomothesi@: why it is important?

- Information discovery or application development is just a few SPARQL queries away.

- Example queries:
  - Find all laws and their revisions that refer to geographical areas affected by the Peloponnese fires of 2007.
  - Find all laws signed by a minister that refer to the administrative area which he or she represents.

- Points the way for the **use of AI technologies in the production of legislation**.

Diavgeia: The Greek Transparency portal (current state)



Four problems of the current implementation

1. The decisions are PDF files which follow no structuring of their textual content → Keyword search

2. The decisions also make references to the Greek legislation → How can we be sure that the decisions are taken according to the law (e.g., that legislative references exist)?

3. Possible Metadata – Text Document inconsistency

4. No integrity mechanism which ensures the immutability of all decisions over time

Our goal:

Diavgeia Redefined

A reengineering of Diavgeia to solve these problems, using Semantic Web Technologies and Permissionless Blockchains

The decisions follow a common pattern:

Appointment of R.F. as Full Professor

In accordance with:

1. The provisions of Law 3549/2007, article 25, paragraph 1.
2. The provisions of Presidential Decree 2011/54.
3. The provisions of Law 4386/2016, article 70, paragraph 4.

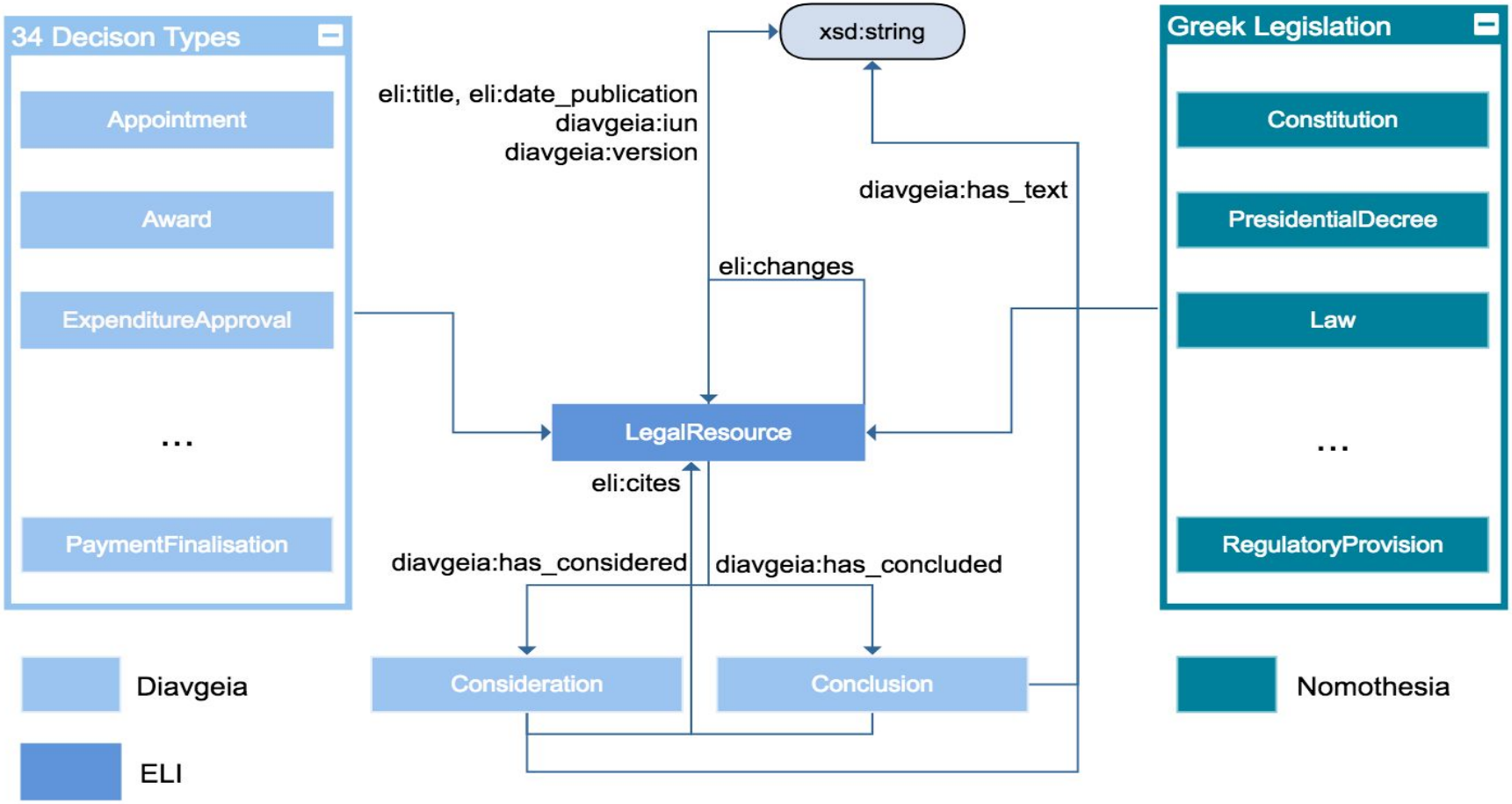
We decide:

1. The appointment of R.F. as Full Professor at the X department, at the Y university, on the subject of “Semantic Web”.

The decision is also assigned a unique **Internet Uploading Number (IUN)** and **Version token** that are its identifiers.

Appointment is 1 out of **34** different decision types that a public authority may upload on the transparency portal.

DiavgeiaRedefined Ontology



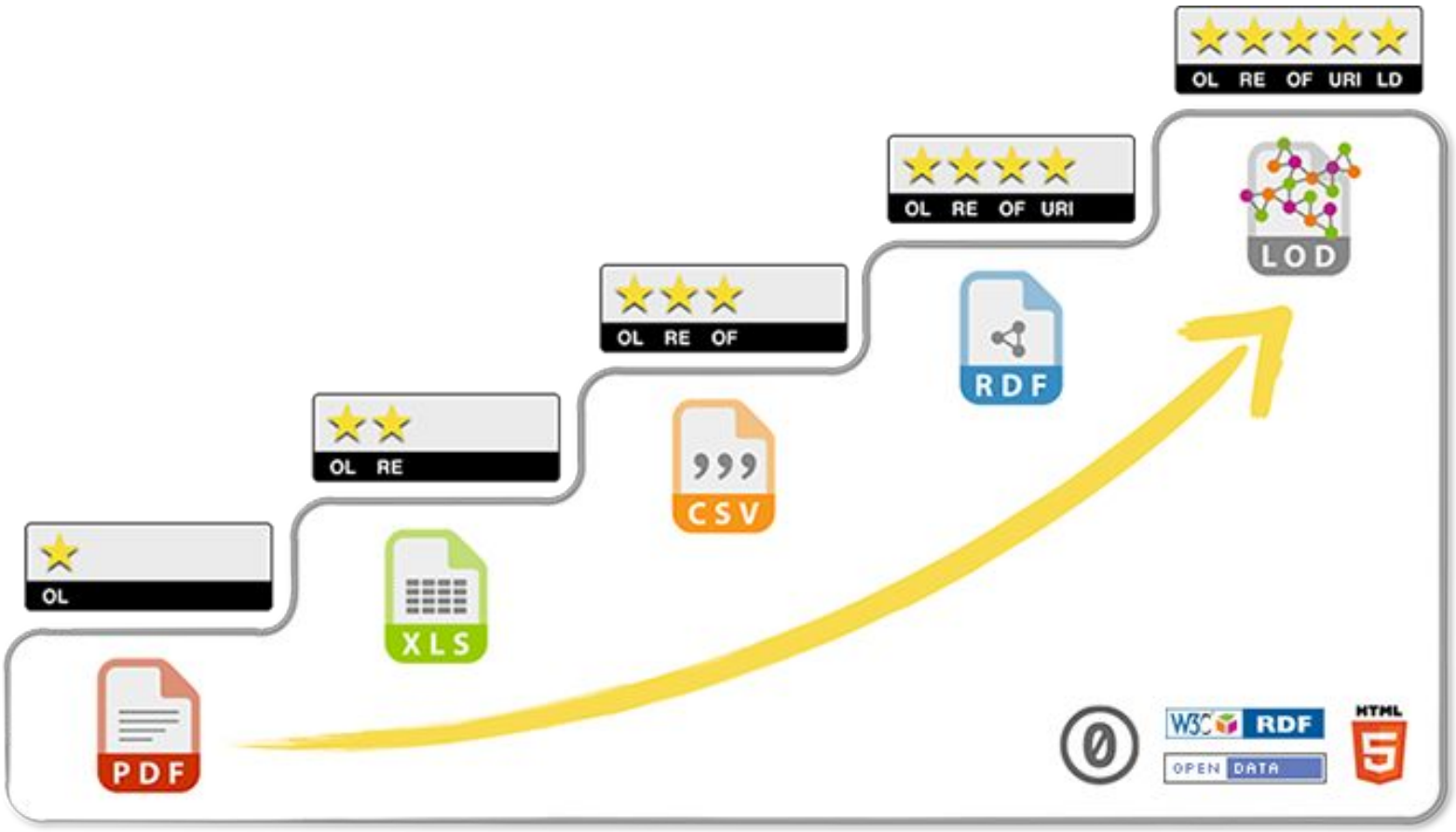
Persistent URI: *http://www.diavgeia.gov.gr/eli/{iun}/{version}*

121 different properties to cover all the particularities of different decision types.

Web Editor: A tool to author the decisions

- This tool is used exclusively by the public sector authorities.
- The Web Editor is a well-structured HTML form that authorities use to write online their decisions → The entities of the HTML form are mappings to the properties of the Diavgeia ontology.
- Upon the form submission, the decision is stored both as a compressed Notation3 file in the filesystem of Diavgeia and in Jena Apache's triple store.
- **Interlinking** with other public sector datasets (Nomothesia and administrative geography dataset of Greece).

Decisions are now 5-star open linked data



Visualizer

- This tool is used both by the public sector authorities and citizens.
- Provides a visualization of the RDF decisions inside a Web browser → The entities of the RDF decisions are mappings to HTML entities.

Experimental results: Disk Space reduction

Diavgeia hosted over 26 million PDF decisions when we did our implementation.

- Disk space limitations.

Sample consisting of equivalent PDF and compressed Notation3 files.

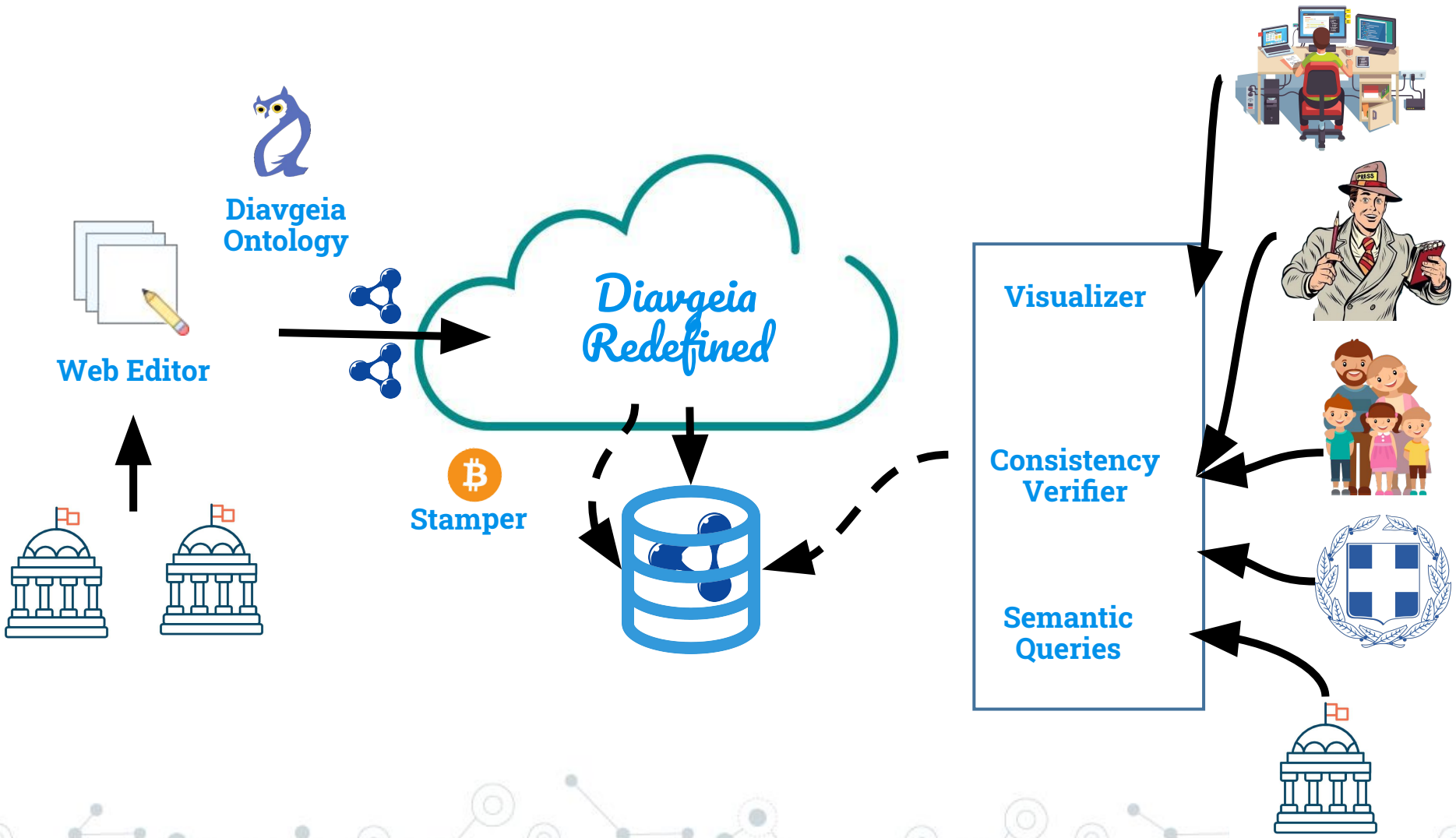
- Compressed Notation3 files → x86 disk space reduction.

Blockchain tools

- Stamper: stores decisions expressed in RDF on Bitcoin blockchain
- Consistency Verifier: verifies the immutability of the decisions

Details omitted.

Diavgeia Redefined in a nutshell



Lessons Learned (*socially*)

- Bringing new technologies to the public sector in Greece is very difficult (fighting in the trenches!).
- We will keep working on systems which positively disrupt the public sector.
- Knowledge of AI technologies may makes the public more supportive but also more worried.
- Teaching AI techniques at universities is beneficial.
- Collaborate with researchers from other disciplines when developing technologies for the public sector.

Future Work

Nomothesia

- Implementation of QA systems, chatbots.
- Extract geospatial information from FEKs (project Choronomothesia).

DiavgeiaRedefined

- Use other underlying blockchain technologies (e.g., Ethereum).
  - Transaction cost
- Full verification procedure to ensure the data integrity of the SPARQL endpoint.

Thanks!

Any questions?

http://legislation.di.uoa.gr

http://pyravlos-vm5.di.uoa.gr/diavgeia

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