Semantic Web: An Introduction

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Course: Semantic Web
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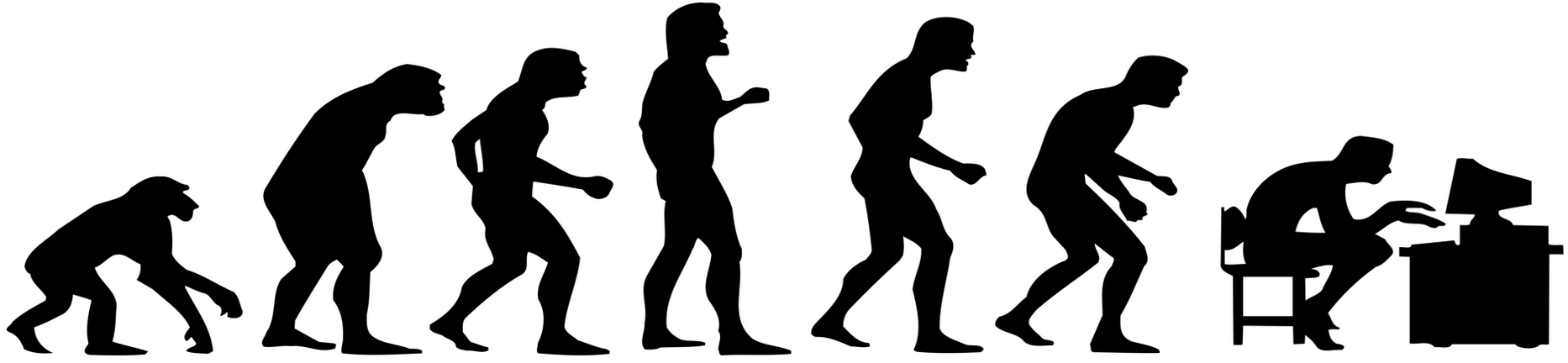
Summary

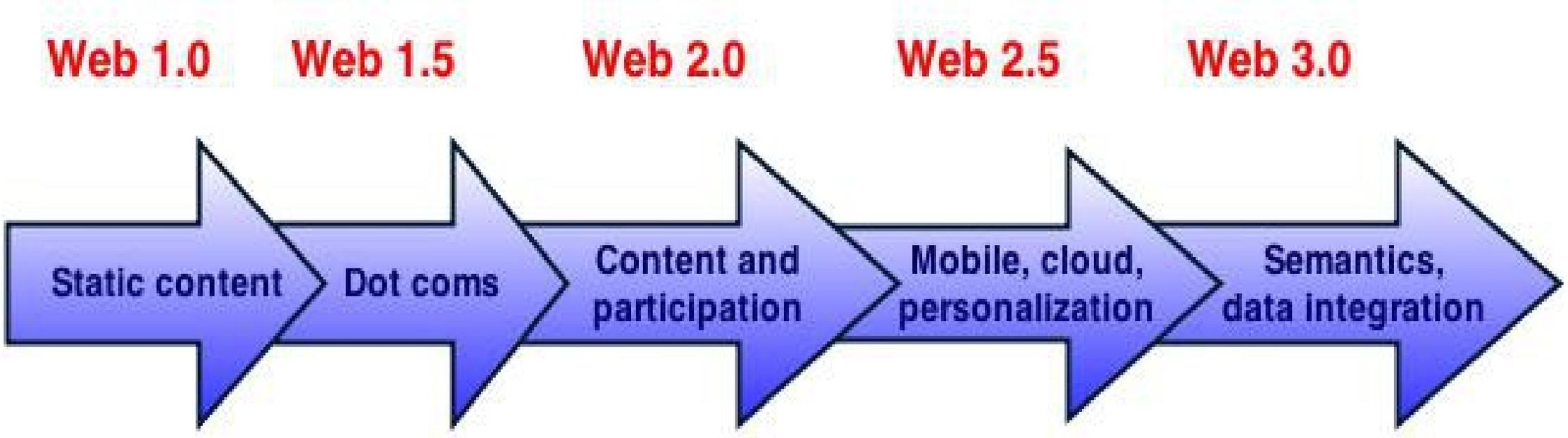
1) WHY: Context and Reasons
2) WHAT: Vision and Goals
3) HOW: Features and Technologies
4) Issues and Challenges
5) WHO/WHERE/WHEN: Semantic Web in the Real World

The very origin: people

- **Human beings as producers and consumers of information**
- Through the history, many **information-related issues** had to be dealt with
- Computers allow for efficient and effective information management...
- ... but new possibilities generate new needs



The evolution of Web



Today: a world of data

The scenario has changed

- Big Data
- Data democratization and Open Data
- Emerging data-driven culture
- Increasing data-information gap

The ultimate need is the same

- People wants to acquire and communicate information effectively and efficiently

For this purpose, software-support is essential

- Due to the complexity of the current and future data-driven activities

Why the Semantic Web?

Main features of ''Plain Old'' Web

- Some degree of structure allows processing of documents
- Hyperlinks allow syntactic connection of distributed documents

Limitations

''Too much ~~information~~ [data] with too little structure and made for human consumption''

- Lack of semantics → hindering machine-processing of Web content
- Heterogeneity → hindering information integration
- Keyword-based search is not very effective → hindering information discovery
- Reliability of information → hindering trust

We would like to move...

...from a **Syntactic Web** to a **Semantic Web**...

...from a **Web of Documents** to a **Web of Data**...

… as well as …

…from **Plain Old Data** to **Smart Data**…

…from **Data Islands** to **Linked Data**…

Semantic Web: vision and goals

Vision

- Extending the principles of the Web from documents to data

Goals

- Improving information production and generation
- Improving information searching and retrieval
- Improving information analysis, discovery, reasoning

Doing this while reusing, as much as possible, existing data in its existing form

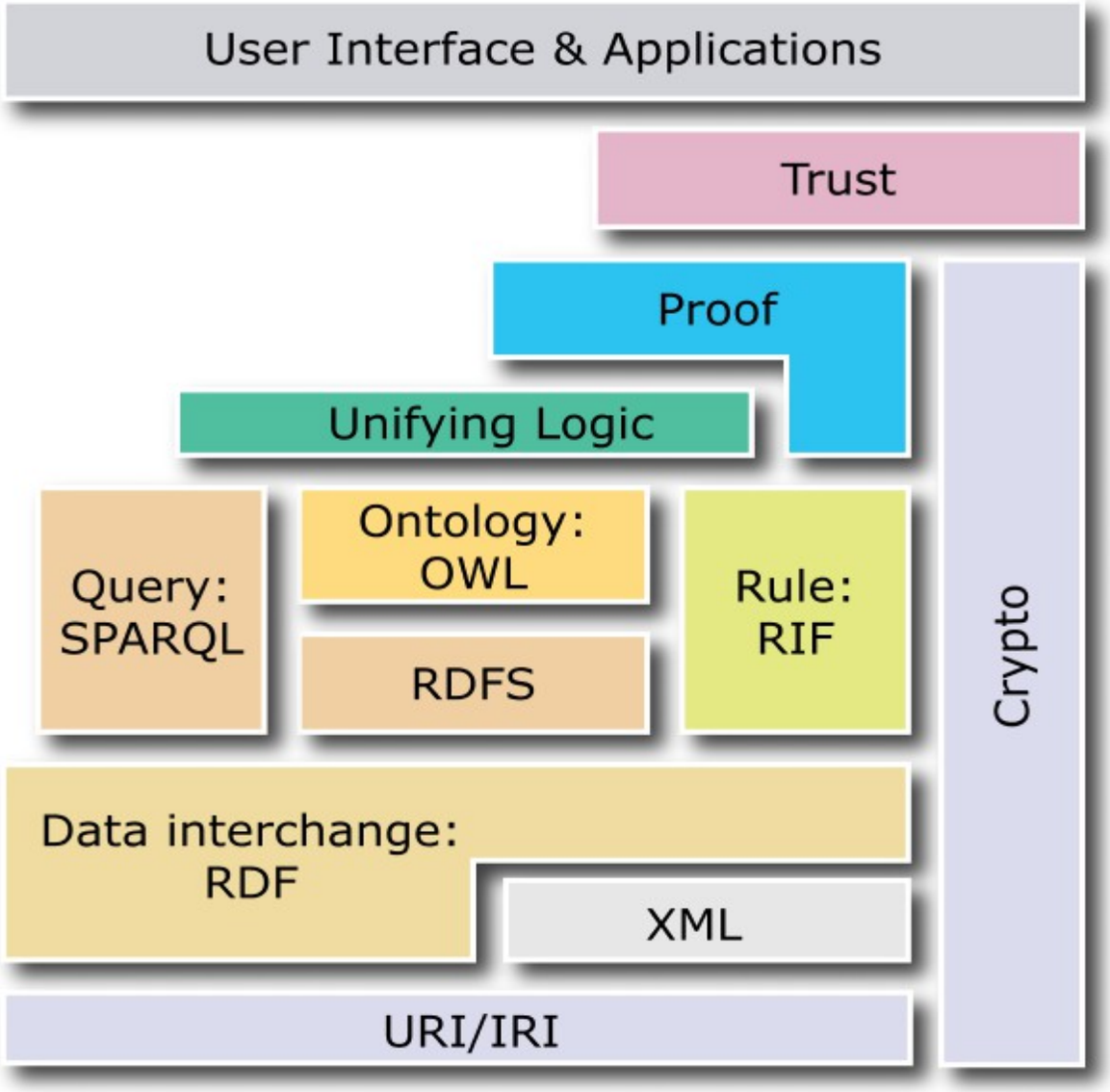
Semantic Web: how

Through a **paradigm shift** supported by **enabling technology**

Adding capabilities to the Web

- Semantics → machine-processable data
- Knowledge representation
- Data linking
- Data integration
- Standards and common models

Semantic Web: technology stack



Semantic web: issues

- Privacy
- Legacy data
- Ontology development / evolution / integration
- Standardization
- Proof
- Trust
- Scalability
- Multilingualism
- Stability of technologies/languages

Semantic Web: case studies

- http://www.w3.org/2001/sw/sweo/public/UseCases/
  - ''Case studies include descriptions of systems that have been deployed within an organization, and **are now being used within a production environment**''

- Many case studies about web search improvement
- *Use of Semantic Web Technologies on the BBC Web Sites*
  - Goal: better interlinking among BBC microsites and feeds & search improvement
  - http://www.bbc.co.uk/nature/wildlife
- *Using the Semantic Web to Enhance the Teaching of Dance*
  - Goal: allowing dancers to take advantage of video collections to support learning and auto-assessment
- *Composing a Safer Drug Regimen for each Patient with Semantic Web Technologies*
  - Goal: allowing composition of a safe drug regimen via multiple criteria

Semantic Web: current state

- Around 50 significant case studies from W3C
- Many other stories are available from vendor's websites
  - e.g., http://www.ontotext.com/clients
- Many well-established standards: URI, XML, RDF, RDFS, SPARQL, OWL, RIF
- Over 300 tools: https://www.w3.org/2001/sw/wiki/Tools
- Many dataset projects: DBpedia, FOAF, Linked History, Dublin Core, ...