

Semantic Web Applications

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Nine by Nine

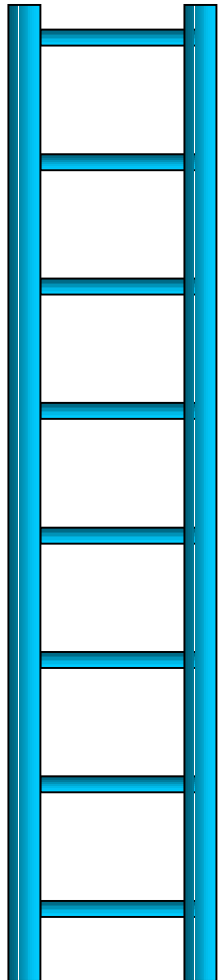
<http://www.ninebynine.net/>
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Nine by Nine

Who am I?

- Scientific, engineering and networked software systems architecture
 - Motion capture, mechanism design, IP address translation, MIMESweeper
- Internet and Web standards
 - Internet fax, email, instant messaging, content negotiation
- Most recently, Semantic Web (RDF)
 - I believe this technology is set to have a big impact on computer application development

Data – Knowledge – Meaning



Meaning?

Deep philosophical territory: not going here

In the limited sense of KR

Knowledge *semantics*

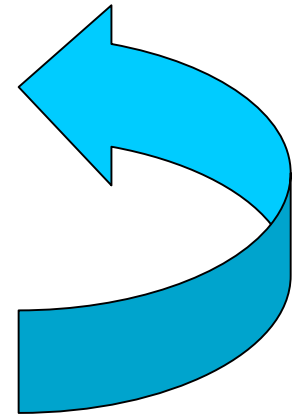
RDF
Applications

Data

structure
character
raw

XML
Unicode
Bits, Octets

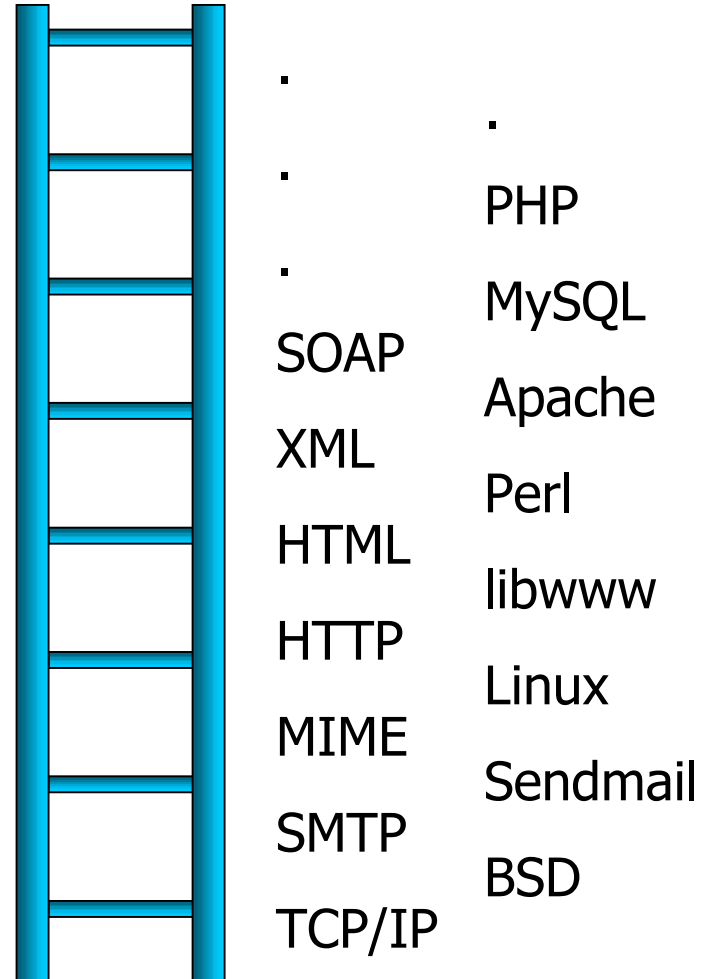
Physical



Open Building Blocks

Standing on the shoulders of giants

- Much recent progress in Internet software is built upon open standards and open building blocks
- Open infrastructure is not hostage to proprietary systems vendors
- *There's a freedom about the Internet: As long as we accept the rules of sending packets around, we can send packets containing anything to anywhere.*
 - Tim Berners-Lee
- Semantic Web technology follows this pattern

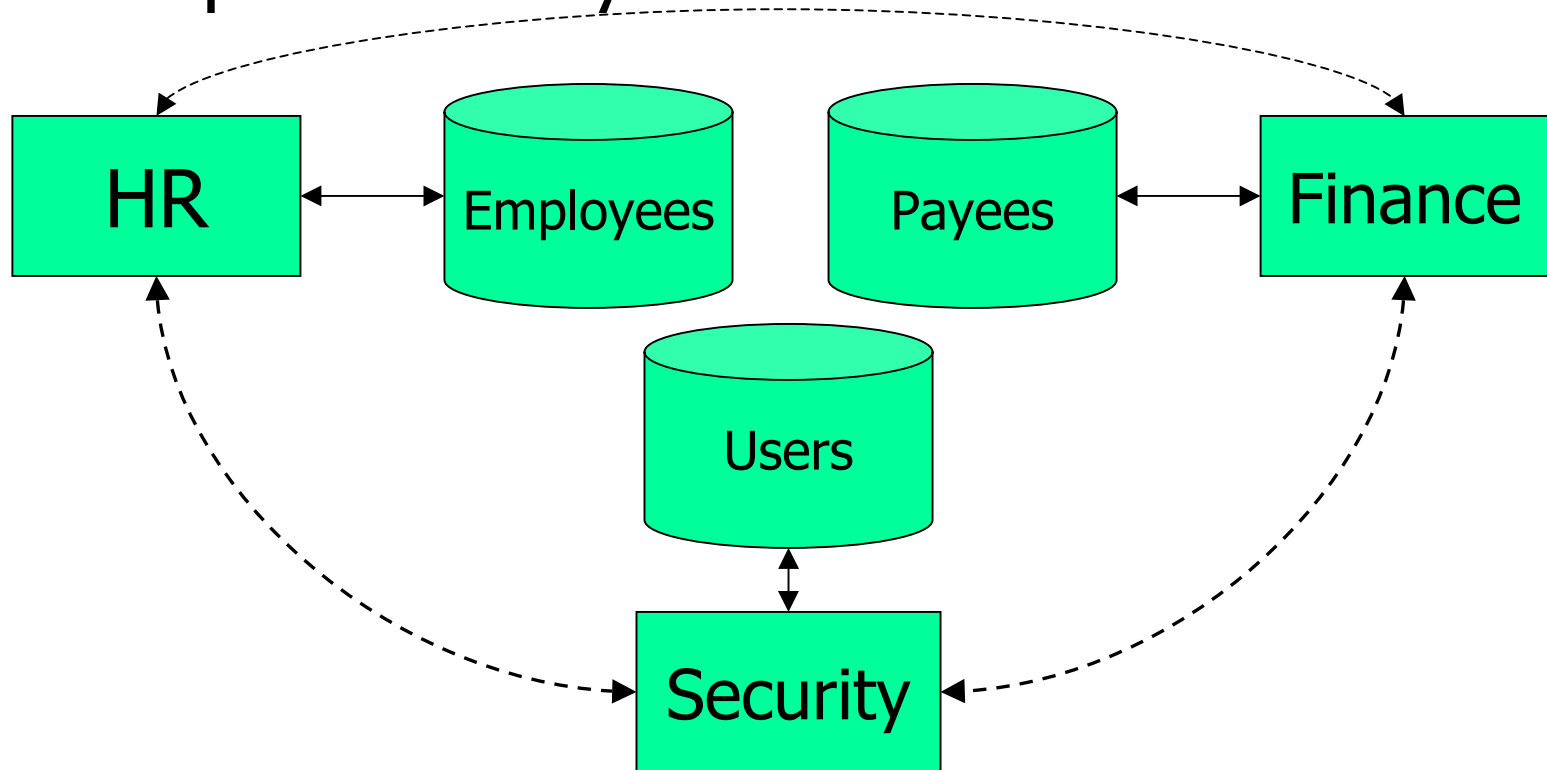


Evolving Use of Information

- Consider computer applications that should be sharing common information
- Typically, data is not readily shared
- Data must be re-entered or converted, which is expensive and error-prone

Example

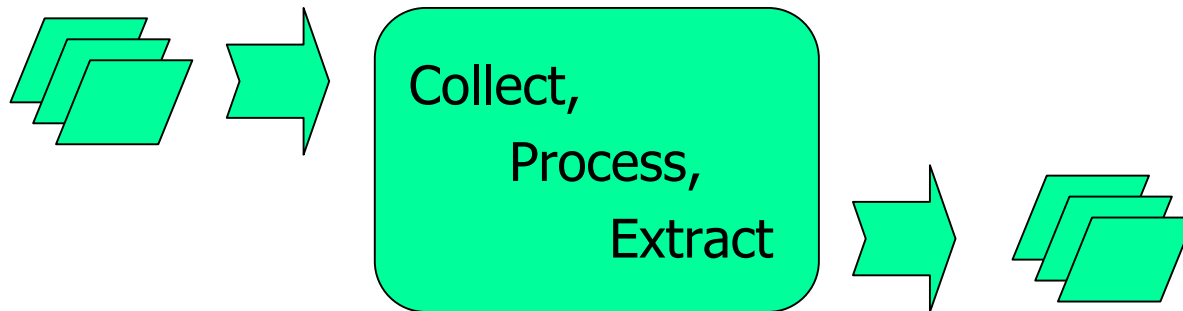
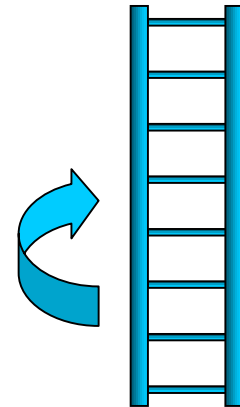
- Employee information distributed across disparate IT systems



Semantic Web Technologies

Proposed benefits

- Re-use information designs
- Use open building blocks to process common information
- Integrate data sources: new uses for existing data



The Semantic Web

Evolving the Web

- Evolution of the Web to a network of *application-usable* information
 - open standards from W3C
 - open software from many sources
- An open-ended framework for combining and exploiting information from a wide range of sources

Semantic Web Building Blocks

- Resource Description Framework (RDF)
 - An XML-based standard knowledge representation format for exchanging arbitrary information
- Web Ontology Language (OWL)
 - A standard for describing classes of objects and enabling inference
- RDF Query, RDF Rules, Access, and more
 - Pre-standardization, software components

(Detour: example data)

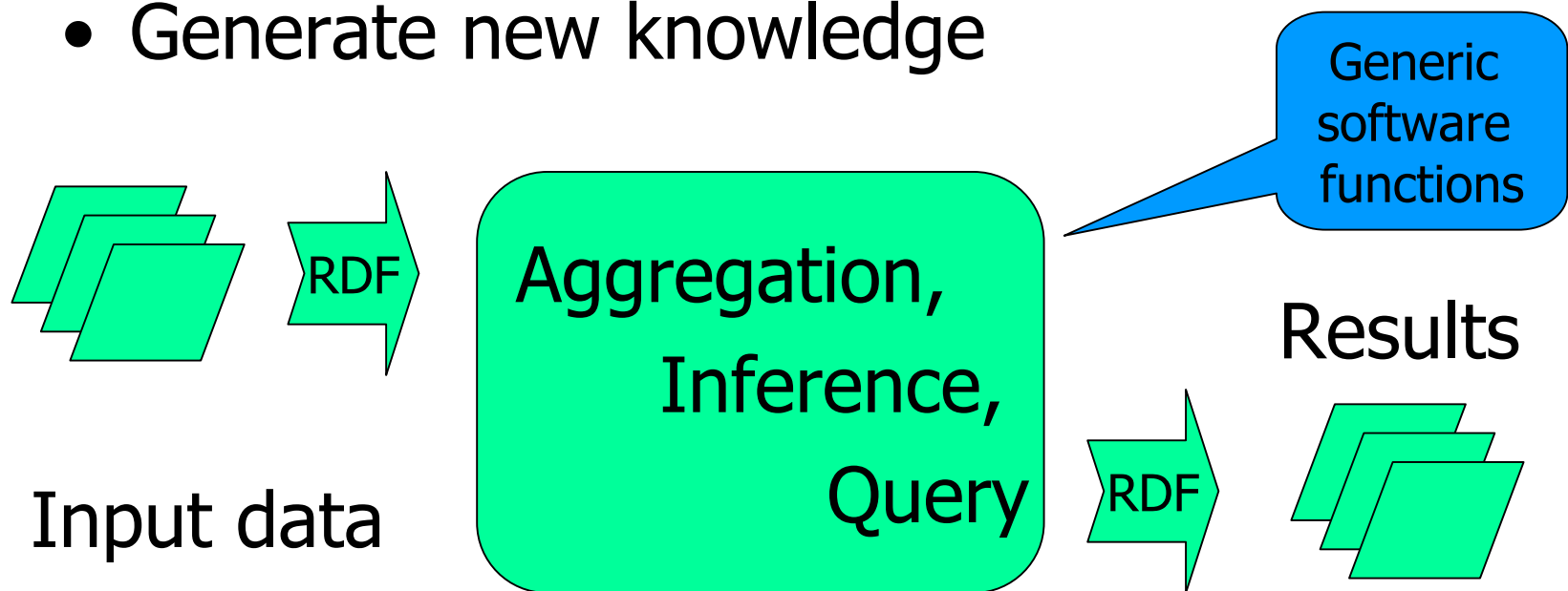
- Example from network configuration, describes features of a user and a computer system
 - RDF/XML ([link](#))
 - Notation 3 ([link](#))
 - Graph ([link:PNG](#))

What kinds of application?

- Diverse, semi-structured information
- Open-ended: evolving functions and data
- Examples:
 - Personal information management (Chandler)
 - Social networking (FOAF)
 - Information syndication (RSS,PRISM)
 - Library/museum data (Dublin Core, Harmony)
 - Network security and configuration (SWAD-E)

What can be Achieved?

- Integration of diverse data sources
- Focus on information needs
- Generate new knowledge



Aggregation + Inference = New Knowledge

- Building on the success of XML
 - Common syntactic framework for data representation, supporting use of common tools
 - But, lacking semantics, provides no basis for automatic aggregation of diverse sources
- RDF: a semantic framework
 - Automatic aggregation (graph merging)
 - Inference from aggregated data sources generates new knowledge
 - Domain knowledge from ontologies and inference rules

Aggregation + Inference: Example

- Consider three datasets, describing:
 - vehicles' passenger capacities
 - the capacity of some roads
 - the effect of policy options on vehicle usage
- Aggregation and inference may yield:
 - passenger transportation capacity of a given road in response to various policy options
 - using existing open software building blocks
- [Example (link:TBD)]

What needs to be done?

- Information design
- Data-use strategies and inference rules
- Mechanisms for acquisition of existing data sources
- Mechanisms for presentation or utilization of the resulting information

Benefits

- Greater use of off-the-shelf software
 - reduced development cost and risk
- Re-use of information designs
 - reduced application design costs; better information sharing between applications
- Flexibility
 - systems can adapt as requirements evolve
- Open access to information making possible new applications

Recommendation:

Low risk approach

- Focus on information requirements
 - this is unlikely to be wasted effort
- Start with a limited goal, progress by steps
 - adapting to evolving requirements is an advantage of SW technology; if it can do this for large projects it certainly must be able to do so for early experimental projects
- Use existing open building blocks

Proposed evaluation steps

- Decide if this can help your application
 - Identify a *well-defined, constrained* sub-goal
 - Design an initial information model
 - Prototype data and inference rules
 - Explore some variations
- Develop simple mechanisms to present existing data as RDF
- Start with a simple sub-problem, scoped to just a few days work

Where are we now?

- Semantic Web is new technology
 - about 10 years after the original WWW
- Many applications are experimental
- The goals may be inevitable...
 - Applications working together with users' information, not owning it
 - drawing background knowledge from the Web
 - less dependence on hand-coded bespoke software
 - ... but the particular technology is not

Conclusion:

Semantic Web Technology Today

- World Wide Web incremental advance
- Evolvable approach to information
- Leverages open software building blocks
- Builds on diversity
 - creating new knowledge
 - enabling new applications
- Low-risk adoption strategy
 - by incremental, re-usable steps

End

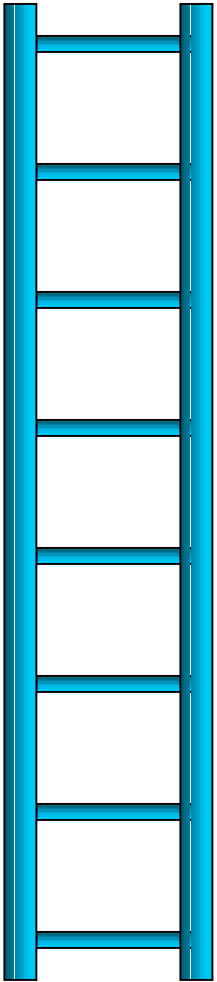
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- **References:**
 - <http://www.ninebynine.net/Papers/SemanticWebApplications.ppt> ~.pdf
 - <http://www.w3.org/2001/sw/>
 - <http://www.scientificamerican.com/article.cfm?articleID=00048144-10D2-1C70-84A9809EC588EF21&catID=2>
 - <http://www.w3.org/rdf>

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What can we offer?

- We have participated actively in development of RDF core standard
- Developed open source software for inference and proof-checking in RDF data
- Design RDF applications
 - including CC/PP, a W3C recommendation
- Offer help with Semantic Web information design and technology evaluation

Data - Information - Knowledge



End

