BELGIAN JAVA USER GROUP PRESENTS

ENTERPRISE SOA CONFERENCE

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www.bejug.org

REST - the Better Web Services Model

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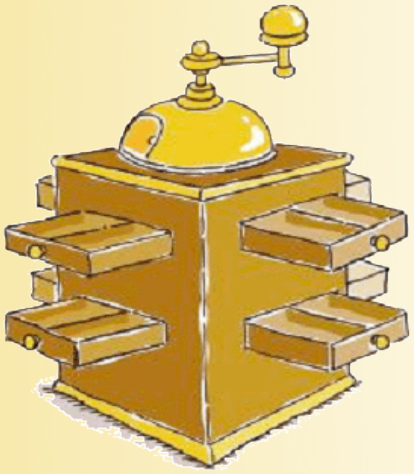
innoQ Deutschland GmbH

innoQ



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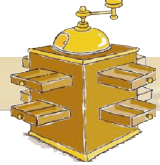
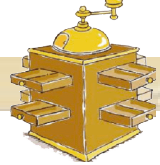


Overall presentation goal

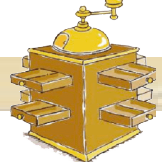
Understand the value of REST and its use for building scalable systems



Speaker's Qualifications

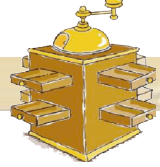
- Architecting mission-critical systems since 1995
- Background with C/DCE, C++/CORBA, Java/J2EE
- SOA Community editor at InfoQ (www.infoq.com)
- Numerous articles and presentations on SOA, Web services, and architecture

See: http://www.innoq.com/blog/st/



REST as an Alternative to Web Services

If your goal is to create a loosely-coupled, evolvable, distributed system architecture based on standards and accessible to as many people as possible, you might think *Web services* are the best option.



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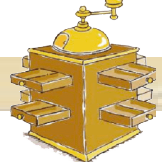
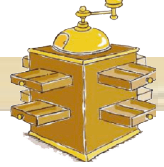
You would be wrong.



Agenda

- Introducing REST
- REST vs. Web services
- Advanced use cases
- Summary



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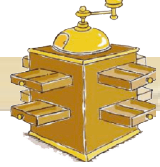
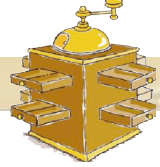


What is REST?

- **RE**presentational **S**tate **T**ransfer
- Described by Roy Fielding in his dissertation
- One of a number of “architectural styles”
- Architectural principles underlying HTTP, defined *a posteriori*

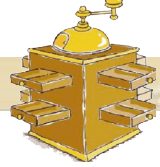
See: http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm



REST and HTTP

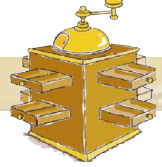
- REST is an abstraction that could be implemented with any technology
- Best-known implementation of REST is HTTP
- Bear this in mind when HTTP is used to illustrate REST in the rest of this talk

http://savas.parastatidis.name/2005/03/12/505b74f7-d5d3-4b94-95d4-65129ce2bf2b.aspx



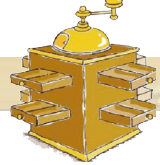
REST Key Principles

- Identifiable resources
- Uniform interface
- Stateless communication
- Resource representations
- Hypermedia



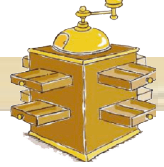
Identifiable resources

- A resource represents a real or virtual entity - a customer, vehicle fleet, shopping cart ...
- On the Web, resources are identified by URIs
- Each URI adds value to the Net as a whole
- Imagine Amazom.com without URIs!



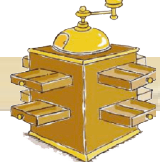
Uniform interface

- Once you a know a resource's ID, you can interact with it using a single standard interface
- Limited set of operations (verbs) in HTTP: GET, PUT, POST, DELETE (+ some more)
- Pre-defined semantics allow for optimization (e.g. caching)



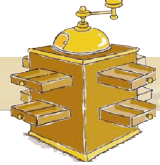
Resource representations

- Resources are always accessed through a representation
- There can be more than one
  - e.g. HTML, PDF, XML
- HTTP provides content types and content negotiation
- If possible, resources should be represented using well-known (ideally: standardized) content types



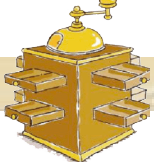
Stateless communication

- A server does not need to maintain state for each client
- Massive advantages in terms of scalability
- Enforces loose coupling (no shared session knowledge)

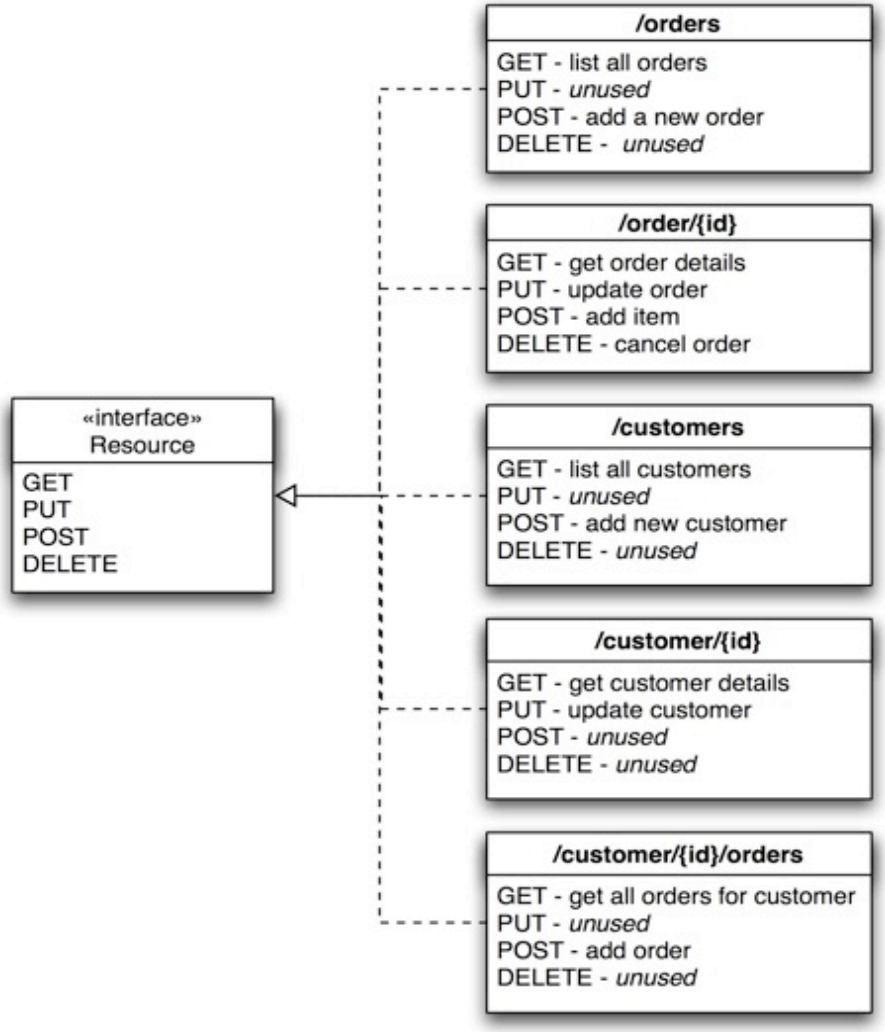


Hypermedia

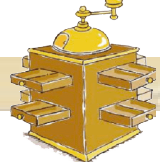
- Possible (client) state transitions are made explicit through links
- Enable following of part-whole, detail, belongs-to and arbitrary other connections
- Links are (ideally) always provided by the server, not created by the client
- Enables seamless evolution and distribution



REST Approach

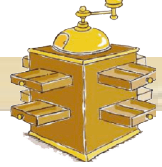


- A single *generic* (uniform) interface for everything
- Generic verbs mapped to resource semantics
- A standard application protocol (e.g. HTTP)



Contribution to the Net's Value

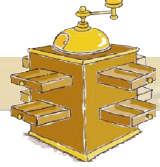
- 1 URL *for each resource* - possibly millions
  - every customer
  - every order
- 4-7 supported methods per resource
  - GET, PUT, POST, DELETE
  - TRACE, OPTIONS, HEAD
- Cacheable, addressable, linkable, ...



Designing a RESTful application

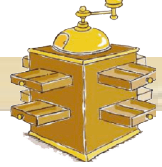
- Identify resources & design URIs
- Select formats (or create new ones)
- Identify method semantics
- Select response codes

See: http://bitworking.org/news/How_to_create_a_REST_Protocol



RESTful HTTP Advantages

- Universal support (programming languages, operating systems, servers, ...)
- Proven scalability
- Support for redirect, caching, different representations, resource identification, ...
- “Real” web integration for machine-2-machine communication
- Support for XML, but also other formats



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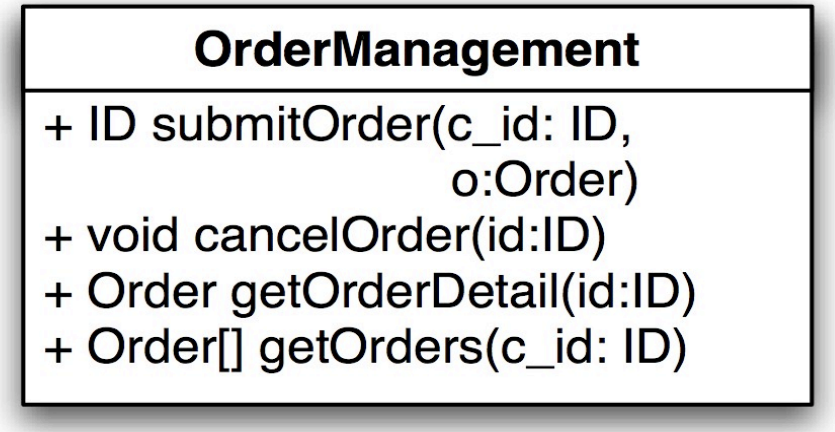
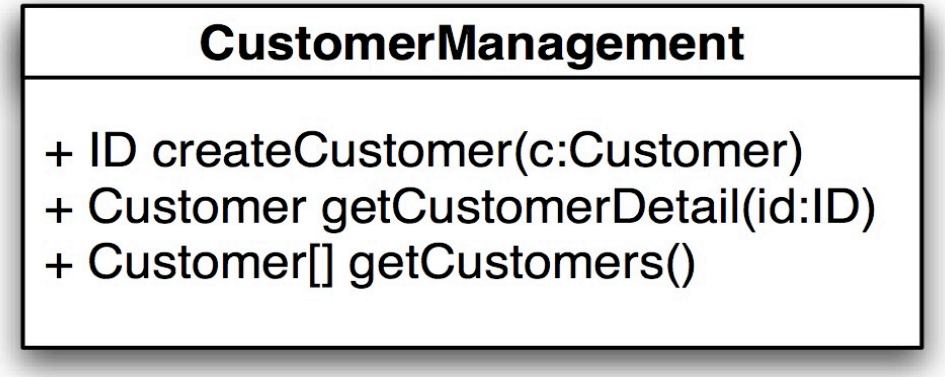
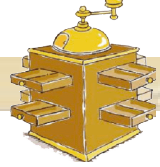
Distributed Objects Approach



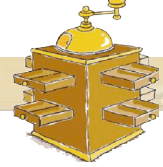


- A separate interface (façade) for each purpose
- As known CORBA, DCOM, RMI/EJB
- Often used for SOA ("CORBA w/ angle brackets)
- Application-specific protocol



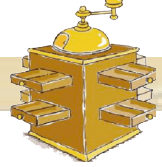
Web Services and the Web

- WSDL/SOAP-based Web services are “protocol independent”
- Examples:
  - Microsoft supports SOAP over TCP
  - Many Java implementations allow for SOAP with proprietary JMS implementations
  - HTTP is just one more “transport protocol”



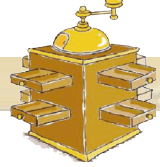
Contribution to the Net's Value

- 2 URLs
  - http://example.com/customerservice
  - http://example.com/orderservice
- 1 method
  - POST



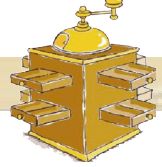
$ 64,000 Question:

- So how can one use HTTP's features with SOAP Web services?



Some HTTP features

- Verbs (in order of popularity):
  - GET, POST
  - PUT, DELETE
  - HEAD, OPTIONS, TRACE
- Standardized (& meaningful) response codes
- Content negotiation
- Redirection
- Caching (incl. validation/expiry)
- Compression
- Chunking



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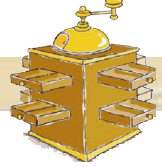

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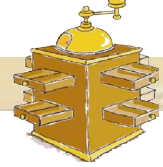

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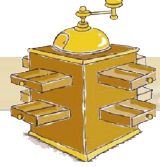

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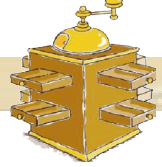
- So how can one use HTTP's features with SOAP Web services?
  - Not at all. At least not without breaking protocol independence.
- HTTP is not a "dumb" transport protocol, but an application protocol



Web Services Issues

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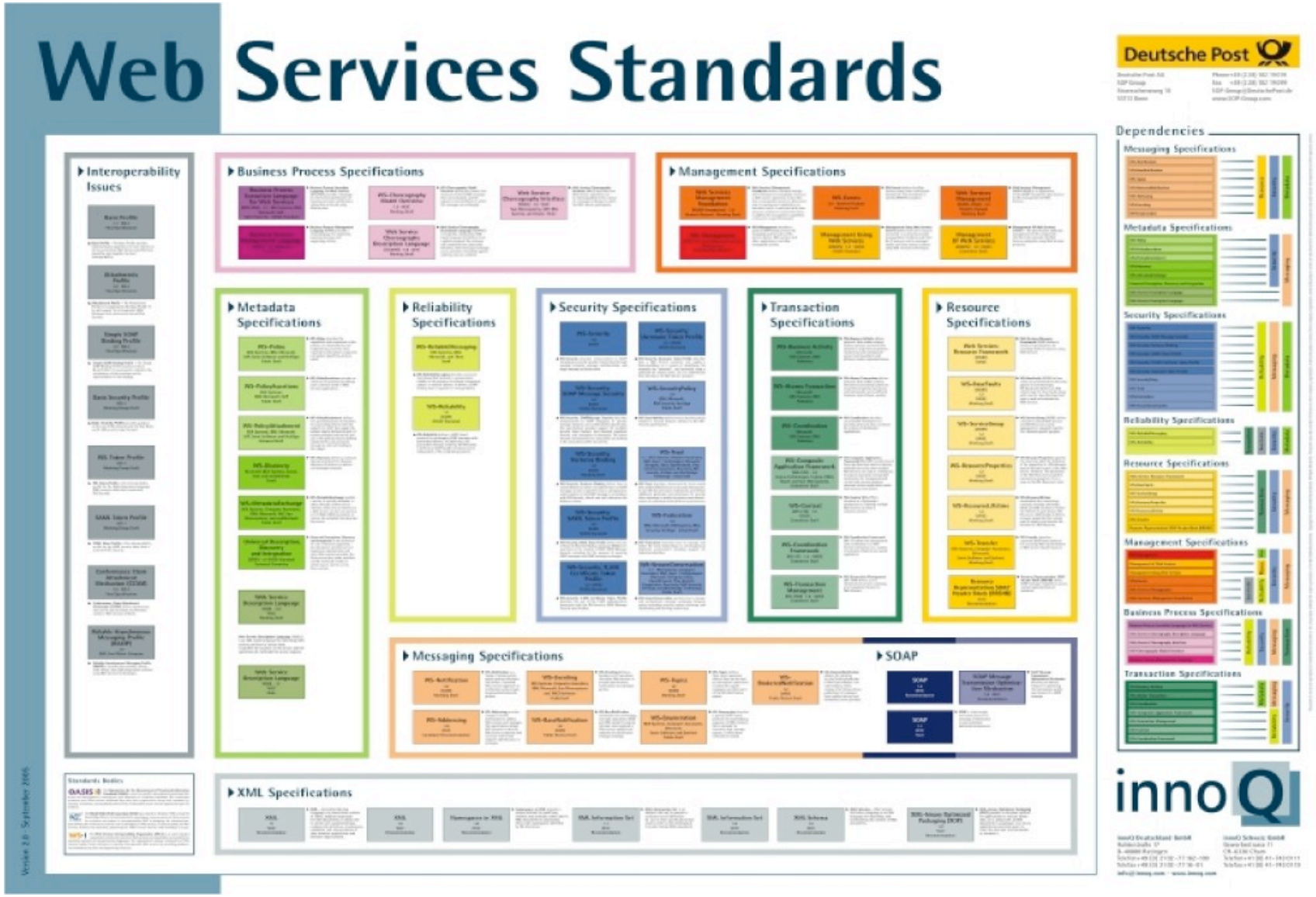

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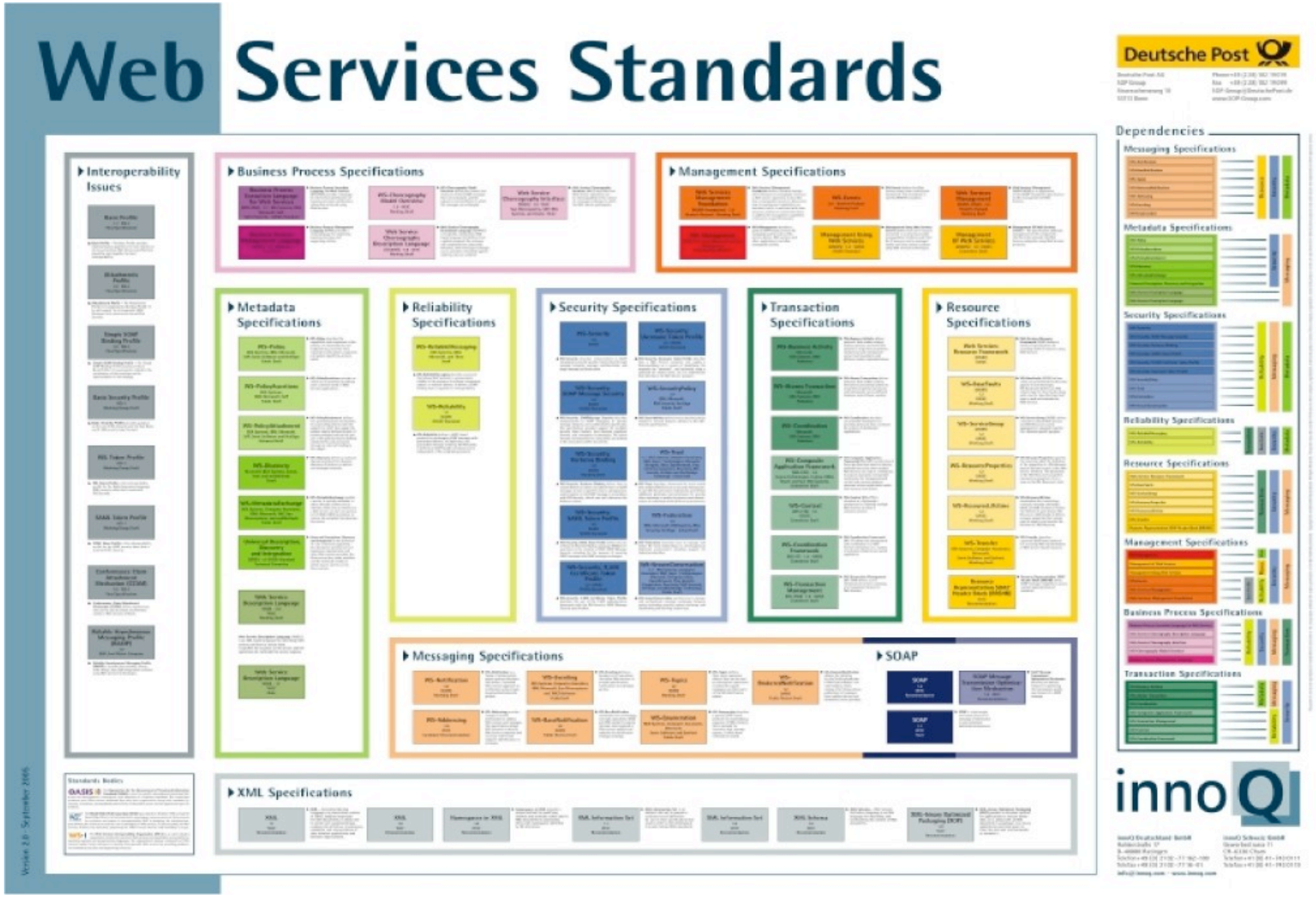
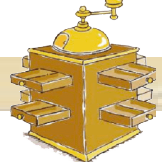


see http://www.innoq.com/soa/ws-standards/poster



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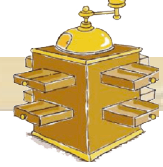

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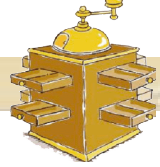
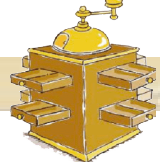
See http://www.loudthinking.com/arc/000585.html



Web Services Issues

"No matter how hard I try, I still think the WS- stack is bloated, opaque, and insanely complex. I think it is going to be hard to understand, hard to implement, hard to interoperate, and hard to secure."*



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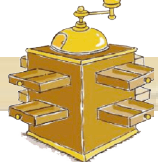

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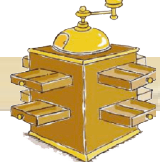

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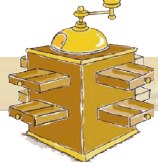
"Show me the interoperable, full and free implementations of WS- in Python, Perl, Ruby and PHP. You won't see them, because there's no intrinsic value in WS-* unless you're trying to suck money out of your customers. Its complexity serves as a barrier to entry at the same time that it creates "value" that can be sold."*



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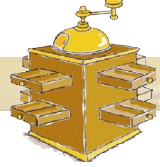

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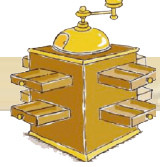

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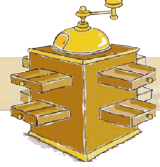
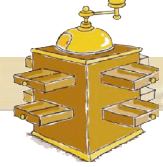
http://www.mnot.net/blog/2006/05/10/vendors



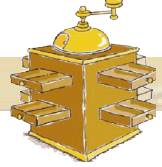
Web Services Issues

- Web services and WS-* stack are supposed to create a new ubiquitous protocol stack
  - on top of another ubiquitous protocol stack
- WS-* tends to ignore the web
- Abstractions “leak”, anyway
- Protocol independence is a bug, not a feature



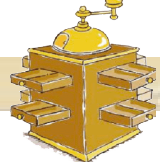
Web Services Issues *(contd.)*

- The Web and the Internet architecture is based on standard protocols
- Not only HTTP, but also SMTP, FTP, DNS, ...
- If *web* services are supposed to work on Internet scale, they should be inspired by the Web, not by Distributed Objects



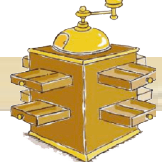
Agenda

- Introducing REST
- REST vs. Web services
- Advanced use cases
- Summary



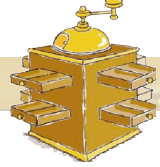
Asynchronous Communication

- HTTP is always synchronous request/ response
- For lengthy interactions, the server should return `202 Accepted` and a URI for the result
- Poll or pass a URI to be notified
- WS-Addressing is just URIs used badly



Reliable Messaging w/ HTTP

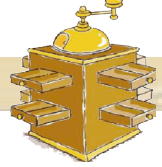
- First question: What does “reliable” mean?
- Often solved at the application level
- Existing proposals:
  - Bill de hÓra’s HTTPLR
  - Yaron Goland’s SOA-Reliability (“SOA-Rity”)



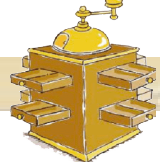
2-Phase-Commit Transactions

- The Holy Grail of Applied Computer Science
- In practice, not used as often as you think

  "It hurts when I do that, Doctor." – "Then don't do that!"
- 2PC and loose coupling don't work together very well
- Compensating transactions are business logic anyway
- A light-weight protocol could be created, but no one has cared so far



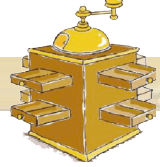
Resource Access



Resource Access

- WS-Transfer

  This specification defines a mechanism for acquiring XML-based representations of entities using the Web service infrastructure. [...] Specifically, it defines two operations for sending and receiving the representation of a given resource and two operations for creating and deleting a resource and its corresponding representation.



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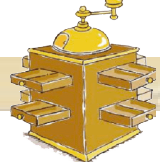
- Sounds familiar?



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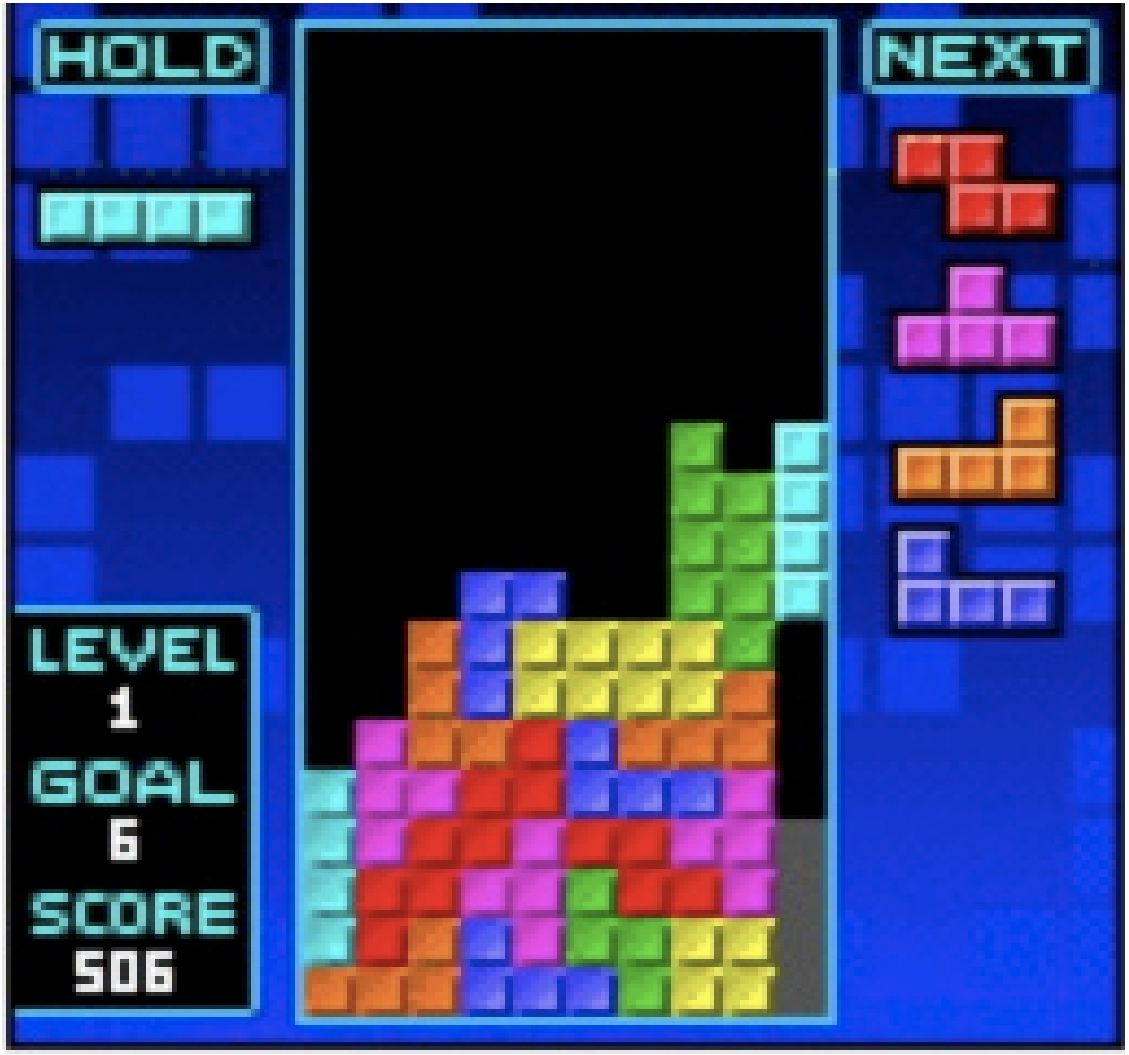
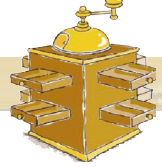
- Sounds familiar?
- HTTP-over-SOAP-over-HTTP

Layers, we've got Layers





UDDI

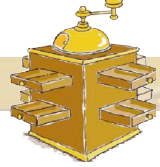
- 420-page specification
- Finding and maintaining (meta-)model objects

Inquiry

- find_binding
- find_business
- find_relatedBusinesses
- find_service
- find_tModel
- get_bindingDetail
- get_businessDetail
- get_operationalInfo
- get_serviceDetail
- get_tModelDetail

Publication

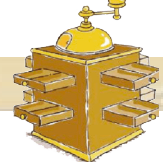
- save_binding
- save_business
- save_service
- save_tModel
- delete_binding
- delete_business
- delete_publisherAssertions
- delete_service
- delete_tModel
- add_publisherAssertions
- set_publisherAssertions
- get_assertionStatusReport
- get_publisherAssertions
- get_registeredInfo



UDDI *(contd.)*

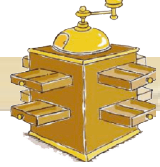
- UDDI could be greatly simplified by using plain HTTP
- It would no longer be protocol-independent
  - Who cares?
- Atom (Syndication Format & Protocol) would be a great match

See: http://www.xml.com/pub/a/ws/2002/02/06/rest.html?page=2



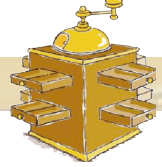
Binary Attachments

- In the WS-* world:
  - SOAP with Attachments (MIME)
  - DIME (supported by Microsoft)
  - XOP/MTOM
- In a RESTful HTTP application:
  - Use a link or
  - provide an alternative representation



Security

- Web services security is message-based
- HTTP relies on
  - transport level security (SSL/TLS)
  - basic and digest authentication
  - access control based on resources and methods
- WSS concepts would be a great value-add for HTTP-based systems



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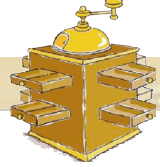
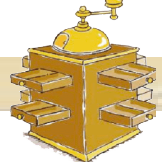


Summary

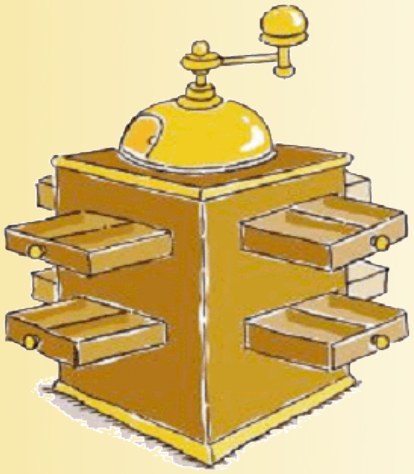
- REST is the architecture of the world's most successful distributed system
- Web Services don't *use* the Web, they *abuse* it
- HTTP is not a transport protocol
- Very often, "Just use HTTP" is the best advice
- Understanding REST will help you build better Web-based systems



If You Only Remember One Thing…

HTTP is Good Enough.

Q&A



BeJUG

Thank you
for your attention!

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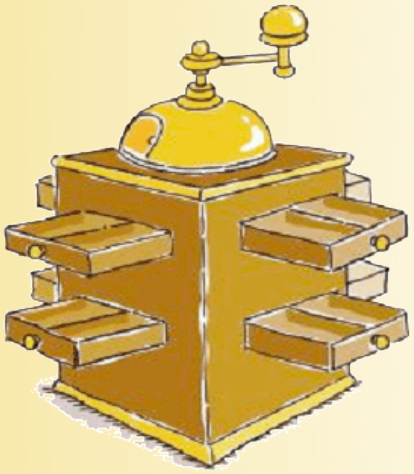

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