Information as Architecture
Architecture As Information

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Speaker Qualifications

- Specialize in next-generation technologies
- Author of O'Reilly Videos on Hypermedia, Linking Data, Security and Encryption
- Author of 'Resource-Oriented Architecture Patterns for Webs of Data'
- Teaches and speaks internationally about REST, Semantic Web, Data Science, Security, Visualization, Architecture
- Worked in Defense, Finance, Retail, Hospitality, Video Game, Health Care, Telecommunications and Publishing Industries
- International Pop Recording Artist

Agenda

- Introduction
- Information
- Architecture
- Information as Architecture
- Architecture as Information
Introduction
People keep thinking I care.

Weird.
Information
"We're witnessing the beginning of a massive, culturally saturated feedback loop where our behavior changes the product and the product changes our behavior. Technology makes this possible: infrastructure for large-scale data processing, increased memory, and bandwidth, as well as a cultural acceptance of technology in the fabric of our lives. This wasn't true a decade ago."

Cathy O'Neil and Rachel Schutt
“The Important Stuff. Whatever that is.”
Design Principles

- Connect architectural principles to properties
- Choose combinations to meet desired qualities
- Constraints

“An architectural style is a named, coordinated set of architectural constraints.”

Dr. Roy T. Fielding
Desired Properties

- Performance
- Scalability
- Generality
- Simplicity
- Modifiability
- Extensibility

Client Server
Stateless Client Server

Stateless Client Server w/ Cache and Uniform Interface
Layered Stateless Client Server w/ Cache and Uniform Interface

Credit: Architectural Styles and the Design of Network-based Software Architectures

REST on a Slide
Modularity

- Reduce complexity via decomposition
- Loose coupling for independence
- High cohesion
- Visible properties via interface
- Information hiding and encapsulation
- Increase modifiability

Modular Architecture
Integrated Architecture

Credit: http://www.videomaker.com

Integrated Architecture

Credit: http://www.eoshd.com
Modular Architecture

Results of Modularity

- Reduced coordination of design decisions
- Easier to understand, build and test
- Interface can constrain innovation
- May impact performance
- Contrasted with Integrated approach
Layering

- A form of modularity with additional constraints
- Control the interactions to downward dependencies
- Flexibility of assigning functionality to layers
Relaxed Layered Architecture

Results of Layering

- Simplified complexity
- Additional capabilities are built upon more general layers
- Increased specialization up the layer stack
- May impact performance
Relaxed Layered Architecture w/ Portability Layer

Internet Architecture

- Modular
- Layered
- Portability Layer
- End-to-End Principles
- Internetwork Transmission Control Protocol
Horizontal and Vertical Protocols

- Horizontal Exchange of messages
- Vertical service dependency
- Separation of concerns for a layer (what vs how)
- Lower layers make no assumption about the messages
- Lower layers are transparent to horizontal messaging
Where do we place

- Connection-handling?
- Error-handling?
- Encryption?
- Performance optimizations?
“End-to-end principle (first version) : A function should only be implemented in a lower layer, if it can be completely and correctly implemented at that layer. Sometimes an incomplete implementation of the function at the lower layer may be useful as a performance enhancement.”

Peterson and Davie
Computer Networks : A Systems Approach

“End-to-end principle (second version) : A function or service should be carried out within a network layer only if it is needed by all clients of that layer, and it can be completely implemented in that layer.”

Reed, Saltzer and Clark
IEEE Network
Architectural Implications

- Difficult to guess future uses
- Network is robust due to simplicity
- Network is unaware of what is running on it
- Users control which applications get attached to the network

Information as Architecture
http://tinyurl.com/j4vmf5t

http://tinyurl.com/jljgtlw
http://tinyurl.com/zkwdsnn

http://tinyurl.com/n9hhs68
Naming Issue

https://w3id.org/people/bsletten

http://bosatsu.net/people/brian.html

http://bosatsu.net/people/brian.rdf

Brian is the author of this document about Brian.
303 See Other

> http get https://w3id.org/people/bsletten

HTTP/1.1 303 See Other
Date: Thu, 27 Feb 2014 15:44:58 GMT
Server: Apache/2.2.22 (Ubuntu)
Access-Control-Allow-Origin: *
Location: http://bosatsu.net/foaf/brian.rdf
Vary: Accept-Encoding
Content-Length: 315
Content-Type: text/html; charset=iso-8859-1
200 Ok
> http get http://bosatsu.net/foaf/brian.rdf

Date: Thu, 27 Feb 2014 16:01:03 GMT
Server: Apache/2.2.16 (Debian)
Last-Modified: Thu, 09 May 2013 07:26:55 GMT
ETag: "402ab-2242-4dc43f9942dc0"
Accept-Ranges: bytes
Content-Length: 8770
Content-Type: application/rdf+xml

<?xml version="1.0"?>
<rdf:RDF xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/">
  ...
  <foaf:Person rdf:about="https://w3id.org/people/bsletten">
    ...
  </foaf:Person>
</rdf:RDF>

200 Ok
> http --follow get https://w3id.org/people/bsletten

Date: Thu, 27 Feb 2014 16:01:03 GMT
Server: Apache/2.2.16 (Debian)
Last-Modified: Thu, 09 May 2013 07:26:55 GMT
ETag: "402ab-2242-4dc43f9942dc0"
Accept-Ranges: bytes
Content-Length: 8770
Content-Type: application/rdf+xml

<?xml version="1.0"?>
<rdf:RDF xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  ...
  <foaf:Person rdf:about="https://w3id.org/people/bsletten">
    ...
  </foaf:Person>
</rdf:RDF>
Fragment Identifier

- Not everyone loves the 303 solution
- http://bosatsu.net/foaf#me
- Not directly resolvable
- Fragments are not sent to the server

200 Ok

> http get http://bosatsu.net/foaf#me

Date: Thu, 27 Feb 2014 16:01:03 GMT
Server: Apache/2.2.16 (Debian)
Last-Modified: Thu, 09 May 2013 07:26:55 GMT
ETag: "402ab-2242-4dc43f9942dc0"
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<?xml version="1.0"?>
<rdf:RDF xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  ...
  <foaf:Person rdf:about="http://bosatsu.net/foaf#me">
    ...
  </foaf:Person>
</rdf:RDF>
DESCRIBE https://w3id.org/people/bsletten

> sparql --query describe.rq --data https://w3id.org/people/bsletten

<https://w3id.org/people/bsletten>
  a foaf:Person ;
  rdf:value "Brian Sletten, brian@bosatsu.net" ;
  cert:key [ a cert:RSAPublicKey ;
    cert:exponent 65537 ;
    cert:modulus "ca9acce293..." ] ;
  foaf:based_near [ a geo:Point ;
    geo:lat "34.0736111" ;
    geo:long "-118.3994444" ] ;
  foaf:birthday "05-26" ;
  foaf:family_name "Sletten" ;
  foaf:givenname "Brian" ;
  foaf:homepage <http://www.bosatsu.net> ;
...

PREFIX foaf: <http://xmlns.com/foaf/0.1/>

ASK
WHERE 
{ ?who foaf:knows ?whom 
}

> sparql --query ask-knows.rq --data https://w3id.org/people/bsletten

Ask => Yes
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT ?who ?whom
WHERE {
  ?who foaf:knows ?whom
}

> sparql --query knows.rq --data https://w3id.org/people/bsletten

| who                                | whom                                              |
|-----------------------------------------------------------------------------------|
| <https://w3id.org/people/bsletten>                                                   |
| _:b0                                                                               |
| <https://w3id.org/people/bsletten>                                                   |
| _:b1                                                                               |
| <https://w3id.org/people/bsletten>                                                   |
| _:b2                                                                               |
| <https://w3id.org/people/bsletten>                                                   |
| <http://tomayac.com/thomas_steiner.rdf#me>                                         |
| _:b13                                                                              |
| <https://w3id.org/people/bsletten>                                                   |
| <http://norman.walsh.name/knows/who#norman-walsh>                                 |
| <https://w3id.org/people/bsletten>                                                   |
| <http://www.snee.com/bob/foaf.rdf#bob>                                             |
| _:b15                                                                              |
| <https://w3id.org/people/bsletten>                                                   |
| <http://ericaxel.com/foaf.rdf#me>                                                  |

---

PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT ?whom ?name
WHERE {
  ?whom foaf:name ?name .
}

| whom                                              | name                |
|---------------------------------------------------|
| _:b0                                              | "Mike Amundsen"    |
| _:b1                                              | "Andrae Muys"      |
| _:b2                                              | "Laurent Tonneler" |
| <http://tomayac.com/thomas_steiner.rdf#me>         | "Thomas Steiner"   |
| _:b13                                             | "Andy Sinesio"     |
| <http://norman.walsh.name/knows/who#norman-walsh> | "Norm Walsh"       |
| <http://www.snee.com/bob/foaf.rdf#bob>             | "Bob DuCharme"     |
| _:b15                                             | "Ian Davis"        |
| <http://ericaxel.com/foaf.rdf#me>                  | "Eric Franzon"     |
Architecture as Information
https://openapis.org

http://petstore.swagger.io/
NetKernel Architectural Diagram
http://localhost:1060/tools/ae/view/allModules

NetKernel Cache
http://localhost:1060/tools/cache-representation
NetKernel Visualizer
http://localhost:1060/tools/ae/view/visualizer
http://www.oreilly.com/pub/au/6476
Questions?

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🐦 @bsletten

🔗 http://tinyurl.com/bjs-gplus

🔍 bsletten