

REpresentational State
Transfer and ARRESTED
(Northrop Grumman)

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June 28, 2005

What is Architectural Style?

- Designers have a free hand. But...
- *Architectural styles* bring sanity to the madness.
 - ◆ Higher level of abstraction than patterns.
 - Affect choices of fundamental building blocks, data exchanged, and interaction mechanisms.
 - ◆ Proven design expertise for problem domains.
 - ◆ Induce system-wide properties.
 - ◆ Embody design tradeoffs.

Internet Domain

- Characteristics:

- ◆ Distributed clients and servers.
- ◆ Hypertext is primary means of exchange.
- ◆ Desired properties:
 - Low barrier of entry.
 - Extensibility and fault-tolerance
 - ◆ No central design authority.

REpresentational State Transfer (REST)

- Codification of the Web's design principles.
 - ◆ Roy Fielding's doctoral dissertation (Richard Taylor).
- Basic architectural elements:
 - ◆ Components (origin servers, clients)
 - ◆ Connectors (intermediate servers, tunnels)
 - ◆ Data (resources, representations, identifiers)
- Constraints:
 - ◆ Client-Server
 - Separation of concerns for independent evolution.
 - ◆ Caching
 - Elimination of interactions for efficiency.

REST (2)

- More important constraints:
 - ◆ Uniform Interface
 - General, consistent interactions.
 - ◆ Stateless Interactions
 - Visibility and scalability.
 - ◆ This does not mean “no state;” it means pushing the state to the “edges” of the network.
 - ◆ One Resource, Many Representations
 - Scalability and extensibility.
 - ◆ Server provides representations depending on what the client requests; there may be a URI for each.

An Example

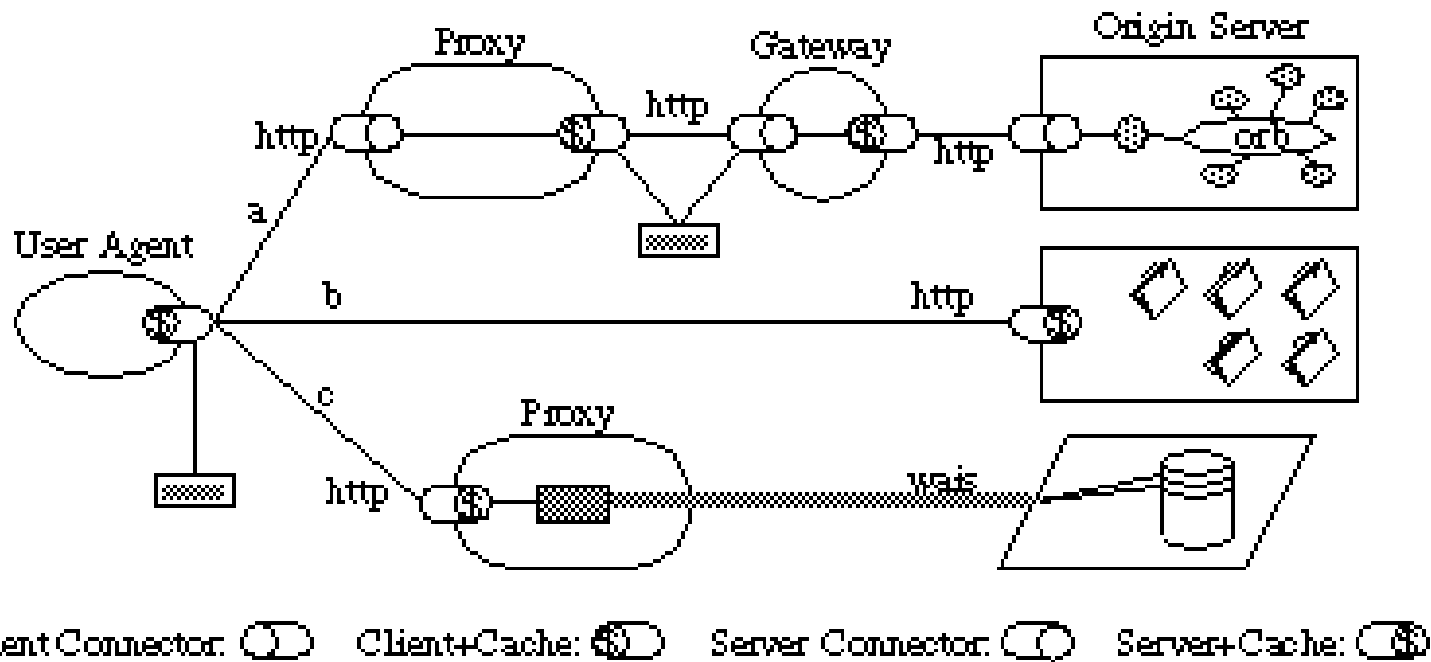


Figure 5-10. Process View of a REST-based Architecture

But, Other Forces Also At Work

- Latency

- ◆ Physical challenge; “stale” representations.



- Agency

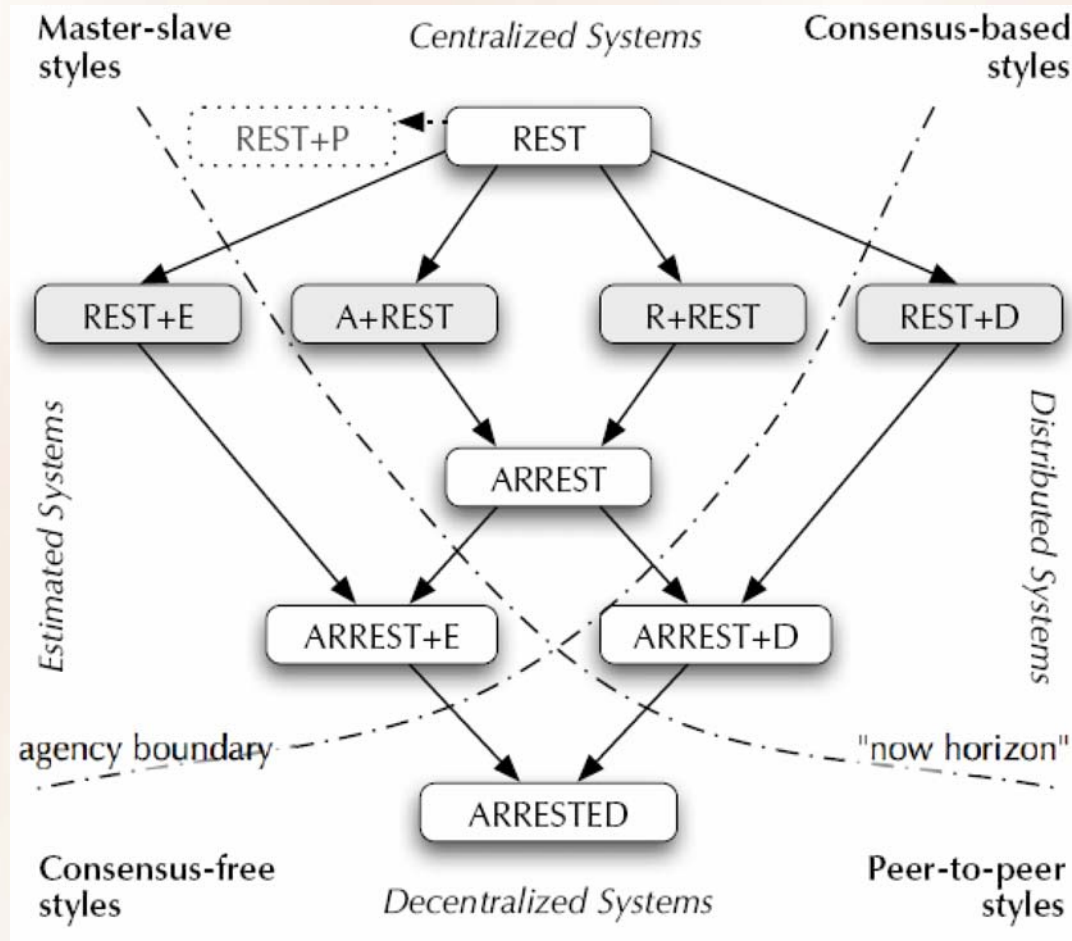
- ◆ Social challenge; *multiple* representations.

- Truly decentralized systems have to deal with both *agency* and *latency*.

ARRESTED

- An extension of REST.
 - ◆ Rohit Khare's doctoral dissertation (Richard Taylor).
- Four independent extensions for decentralization:
 - ◆ **A**ynchronous Notifications
 - Servers *push* notifications of changes.
 - ◆ **R**outing
 - Non-linear chaining and response redirection.
 - ◆ **E**stimations
 - Selfish estimation of representations based on past values.
 - ◆ **D**ecision-making
 - Decision functions for shared resource control/manipulation (file locks, for example).

ARRESTED Style Family Derivation



Conclusion

- Styles provide useful help in system design.
 - ◆ Induced properties, proven design experience.
- Internet-scale systems require specific properties.
 - ◆ REST addresses decoupling, efficiency, scalability, and extensibility.
 - ◆ ARRESTED family addresses decentralization (latency and agency).
- ISR is continuing work on RESTful design principles; “on the prowl” for application domains and industrial-grade validation (seeking RESTafarians).