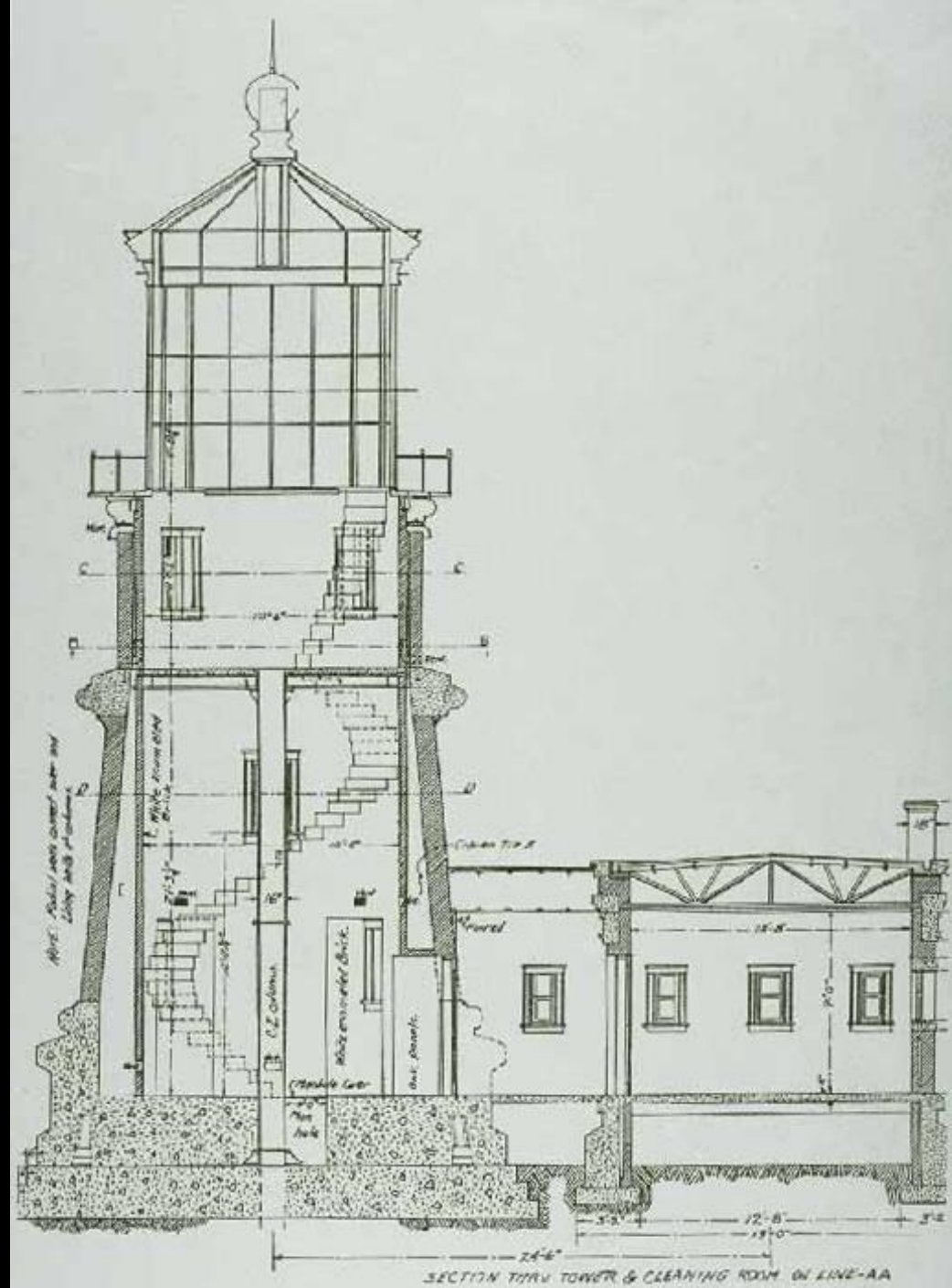


Software Architecture & Design





Server Infrastructure

Server Frameworks & Enterprise Services

Contents

- Introduction
- History & Context: The evolution of the Server Framework.
 - Server Frameworks
 - Enterprise Services
 - Modern Enterprise Frameworks

History & Context

The ever changing face of server infrastructure

“The more things change, the more they stay the same.” *Jean-Baptiste Alphonse Karr*
"plus ça change, plus c'est la même chose"

Client/Server Revolution

- Discrete Technologies for ‘clients’ and ‘servers’
- No single solution programming language
- Programming Language Specialties
 - Some languages better suited to
 - UI Interface Development
 - Full Client
 - Web
 - Business Logic
 - Databases

Client/Server Revolution

- Shift from 2-Tier Client/Server to 3-Tier Client/Server and N-Tiered Client/Server provided focus on the role of '**server programmer**'.
 - Differed from Application Developer
 - Concentrated on the 'how', not the 'what'
 - Concerned with Infrastructure – i.e. Focus on *infrastructure requirements* rather than *functional requirements*

Client/Server Revolution

Application Programmer

- UI/UX Design
- UI Control
- How to use UI Framework
- Appropriate UI Widget
- Multithreading & Parallelism
- Making requests & handling results
- Active Views

Server Programmer

- Receiving requests - i.e. Middleware
- Concurrency Control & Reentrancy
- Transactions & Consistency
- Model
- Persistency
- Recoverability
- Scalability

Client/Server Revolution

2-Tiered Client/Server using DBMS

- SQL-Server Engine
- Relation Model/Entity Model
- SQL, Stored Procedures, Triggers
- Built-in Security

3-Tiered Client/Server using OO

- Roll your own Server (or F/X)
- Object-Oriented Model
- C++, Design Patterns
- Incorporate 3rd Party library

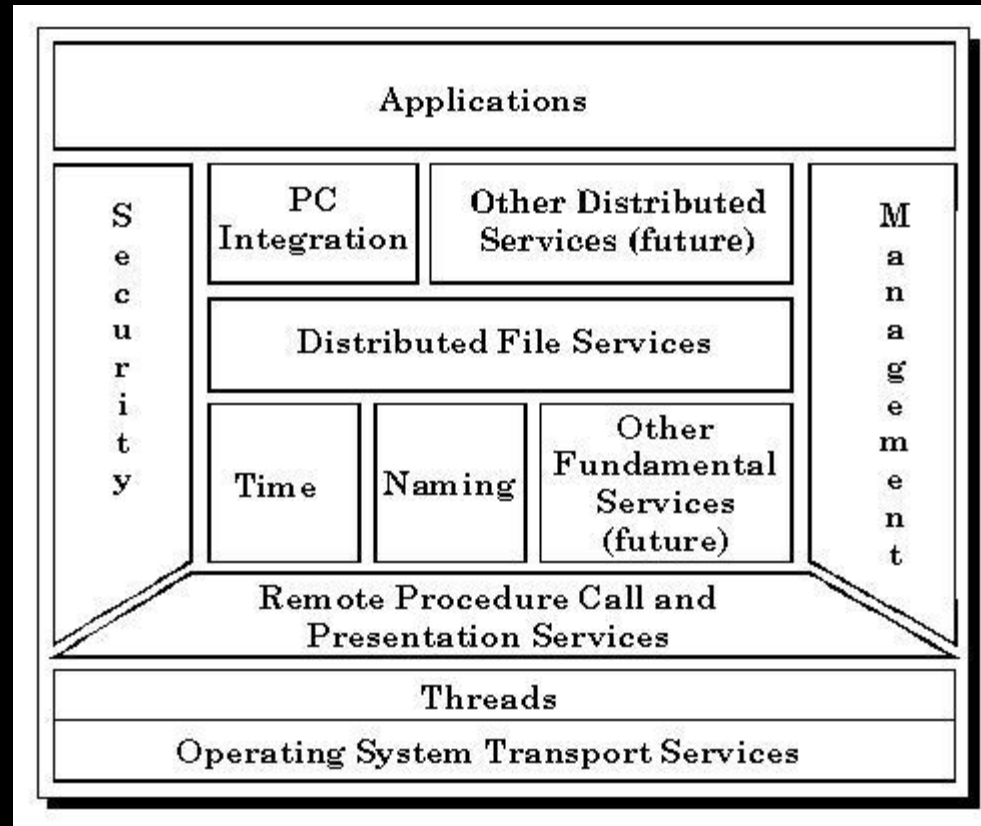
Early Servers

- RPC Server
- Interfaces defined in IDL
- Generators for 'C'
- Implemented in 'C'

DCE – Distributed Computing Environment

- **OSF – Open Software Foundation**
 - Founded in 1988
 - Organization created out of the ‘Unix Wars’ https://en.wikipedia.org/wiki/Unix_wars
 - Merged with X/Open in 1996 to form **The Open Group**
 - Focus on Distributed Software Development
- Defined **DCE – Distributed Computing Environment**
 - Remote Procedure Call (DCE/RPC)
 - Naming/Directory Service
 - Time Service
 - Authentication Service (Kerberos)
 - Distributed File System

DCE – Distributed Computing Environment



http://farm4.static.flickr.com/3224/2903983774_83ca7909bb_o.jpg

The move to OO

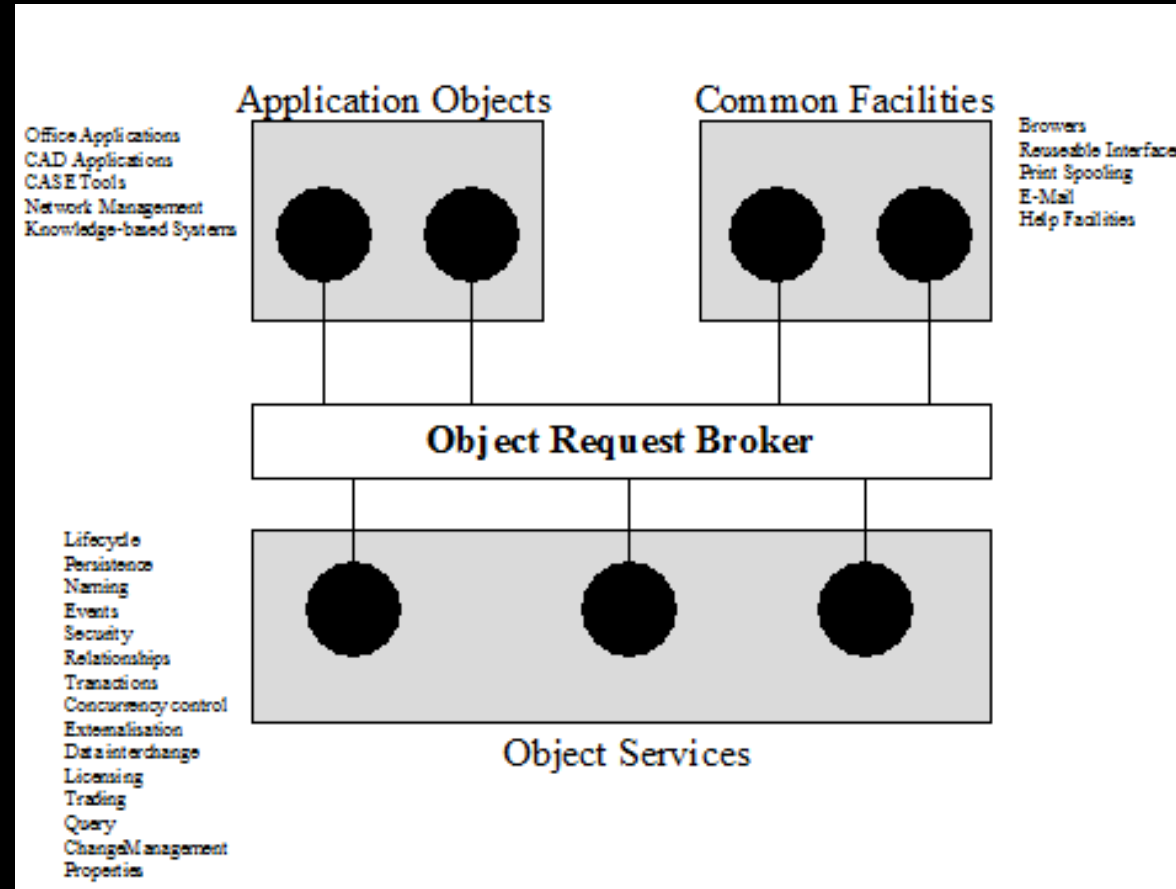
- RPC → OO RPC → CORBA
 - Interfaces defined in IDL
 - Generators for 'C', C++, Smalltalk, Java, etc.
 - Implemented in multiple Languages
 - Standardized language mappings
- General Industry Trend



Object Management Group

- Industry Consortium
- Founded 1989
- Heterogenous Distributed Object Standard
- CORBA - 1991

Object Management Group





CORBA Services

- Lifecycle
- Persistence
- Naming
- Trading
- Events
- Security
- Relationships
- Properties
- Transaction
- Concurrency Control
- Externalization
- Data Interchange
- Licensing
- Query
- Change Management

Competing Paradigms

The battle for the server

- CORBA
 - C/C++ First Class Citizen
 - Widespread Unix Support
- COM
 - Microsoft
- J2EE → JEE
 - Java

Microsoft Windows

- Microsoft – Application & Document based
 - DDE
 - OLE
 - OLE 2.0
 - COM
 - DCOM
 - COM+
 - .NET



COM+

- Application Pooling
- Application Recycling
- Applications Running as Service Applications
- Compensating Resource Manager
- Events
- Instrumentation
- Just-in-Time Activation
- Low-Memory Activation Gates
- Object Constructor Strings
- Object Pooling
- Partitions
- Queued Components
- Resource Dispenser Service
- Security
- Services Without Components
- Shared Property Manager
- SOAP Service
- Synchronization
- Tracking
- Transactions

Java Enterprise Edition

- Established as Server-side Programming Language
- RMI – Remote Method Invocation
- JEE - Services



JEE Services

- Naming (JNDI)
- Security (JACC)
- Transaction Management
- Message Services (JMS)
- Database Connectivity (JDBC)
- Mail
- RMI
- Java Servlets
- Java Server Pages (JSP)
- EJB
- Java/XML

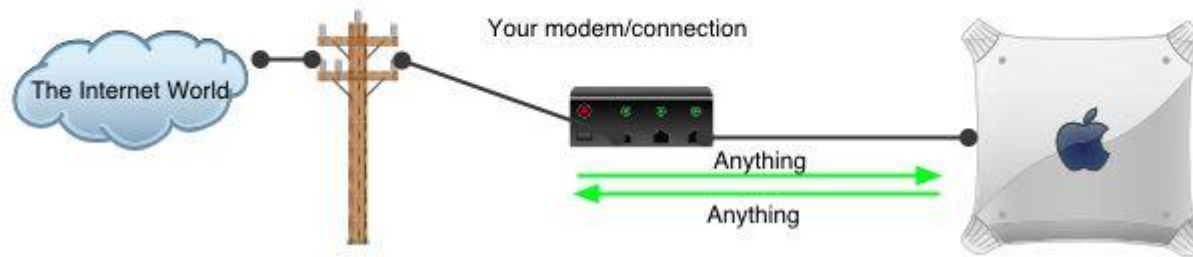
And then...

The Internet happened

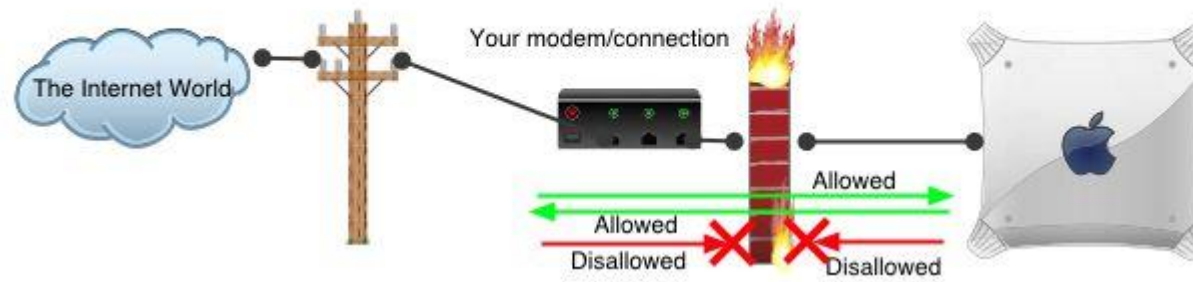
IPC Limitations

- IPC designed for the LAN didn't scale/adapt to the Internet/Web
- Firewalls

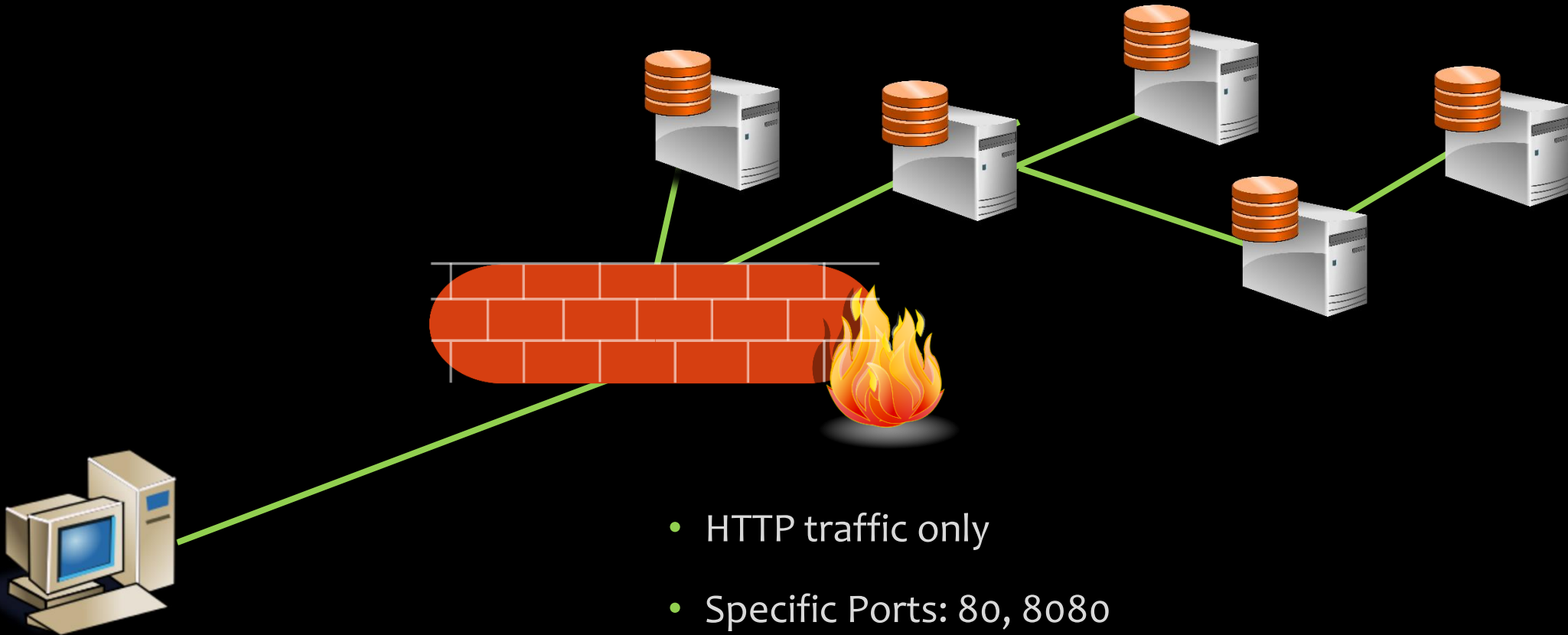
Without a firewall



With a firewall



Firewall



- HTTP traffic only
- Specific Ports: 80, 8080
- HTTPS/SSL?

CORBA - IIOP

- IIOP specialization of GIOP for TCP/IP
 - IIOP Protocol
 - Any Port
- Result: CORBA Traffic prohibited
- Solution: HTTP tunneling (IIOP over HTTP – i.e. HTIOP HyperText InterORB)
- Effect: Performance Degradation

Case Study – Microsoft DCOM

Distributed Reference Counting

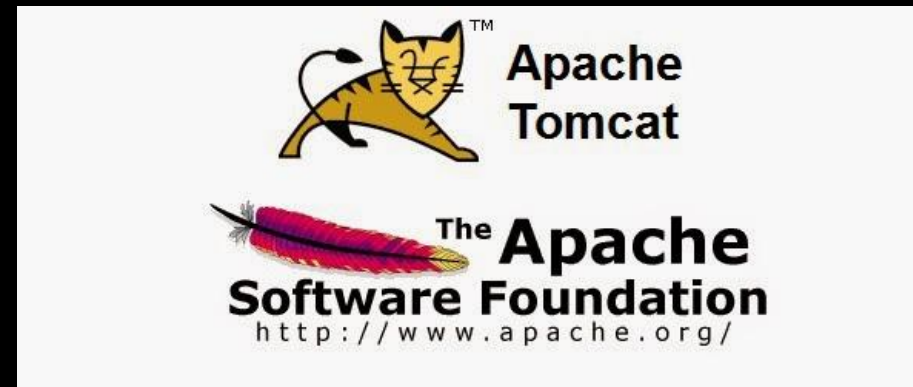
- Q: How to manage Object/Component Lifecycle Management?
- A: Use Reference Counting
- Client increments count when acquiring reference to object + decrements count when release reference.
- Limitations:
 - Relies on well-behaved clients.
 - Logic can become complex.
- Server needs to ensure clients are really still there.
 - Pings them – every 2 minutes
 - If 3 x consecutive fail, give up.



HTTP Adoption

- Sun JavaServlets
 - Java Server side programming paradigm
- SOAP & WebServices
- Scale of JEE Engines → lighter models

Popularity of HTTP Servers



Born of frustration with EJB



- Expert One-on-one J2EE Design and Development
 - Rod Johnson
 - October 2002



- Expert One-on-One J2EE Development without EJB
 - Rod Johnson, Juergen Hoeller
 - July 2004

Node.js

- JavaScript – from web client to server
- Functional Programming Model
- JSON



Ruby on Rails



Q&A

Discussion Time

Recommended Reading

- The Rise and Fall of CORBA *by Michi Henning*
 - <http://www.triodia.com/staff/michi/queue/riseAndFallOfCorba.pdf>
 - <http://queue.acm.org/detail.cfm?id=1142044>
- Discussion on comp.object.com circa Oct '99 between Michi Henning and Don Box about ORB versus HTTP + XML Parser
 - <https://groups.google.com/forum/#!searchin/comp.object.corba/michi%20henning%20don%20box|sort:date/comp.object.corba/QKhegWyQ2qU/mK-ZdkG1p7kJ>

Thank You

