Material and some slide content from:
- Emerson Murphy-Hill
- Reid Holmes
- Mehdi Mirakhorli
- Software Architecture: Foundations, Theory, and Practice
- Essential Software Architecture

SE2: Introduction to Software Architecture

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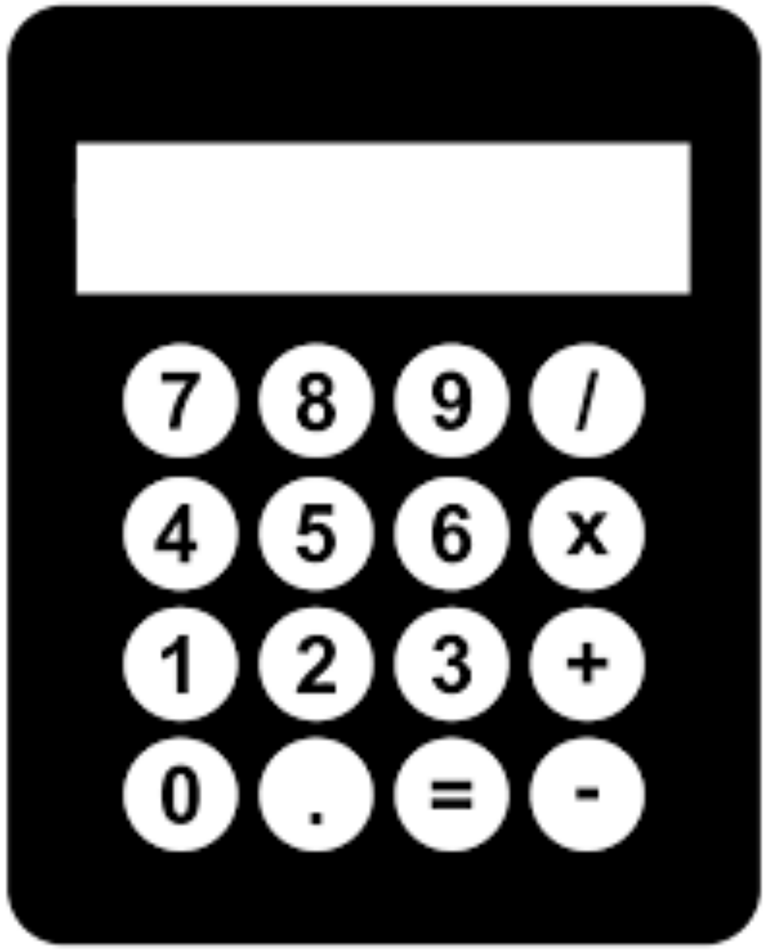
Lecture 2 - Thursday, Jan 5 2016.

Why do we need Architecture?

The Software Equivalent



Architecture

- Architecture is:
  - All about communication.
  - What ‘parts’ are there?
  - How do the ‘parts’ fit together?
- Architecture is not:
  - About development.
  - About algorithms.
  - About data structures.

What is Software Architecture?

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- The conceptual fabric that defines a system
  - All architecture is design but not all design is architecture.

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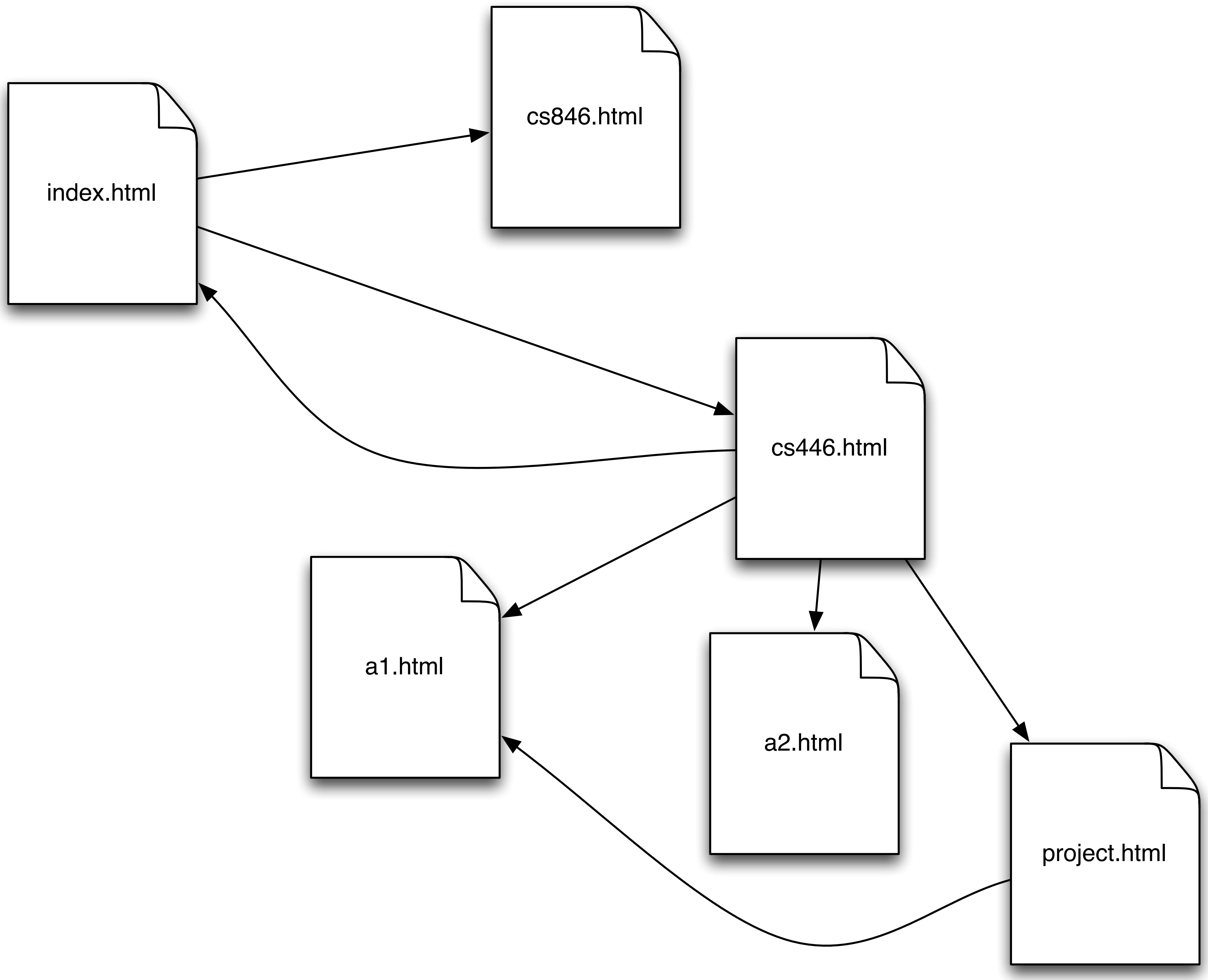
  - All architecture is design but not all design is architecture.
- Architectures capture three primary dimensions:
  - Structure
  - Communication
  - Nonfunctional requirements

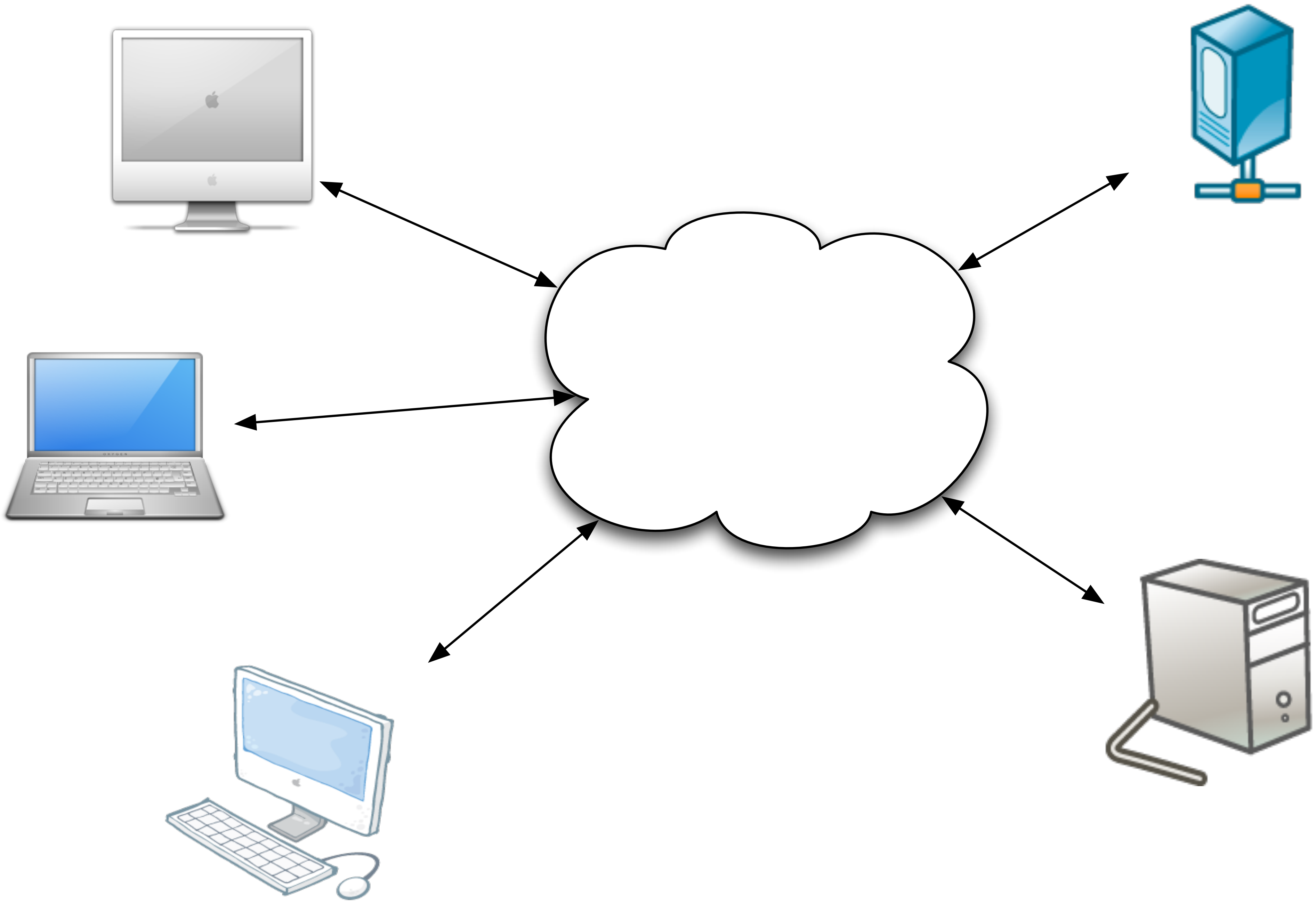
ANSI/IEEE 1471-200

“Architecture is the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution”

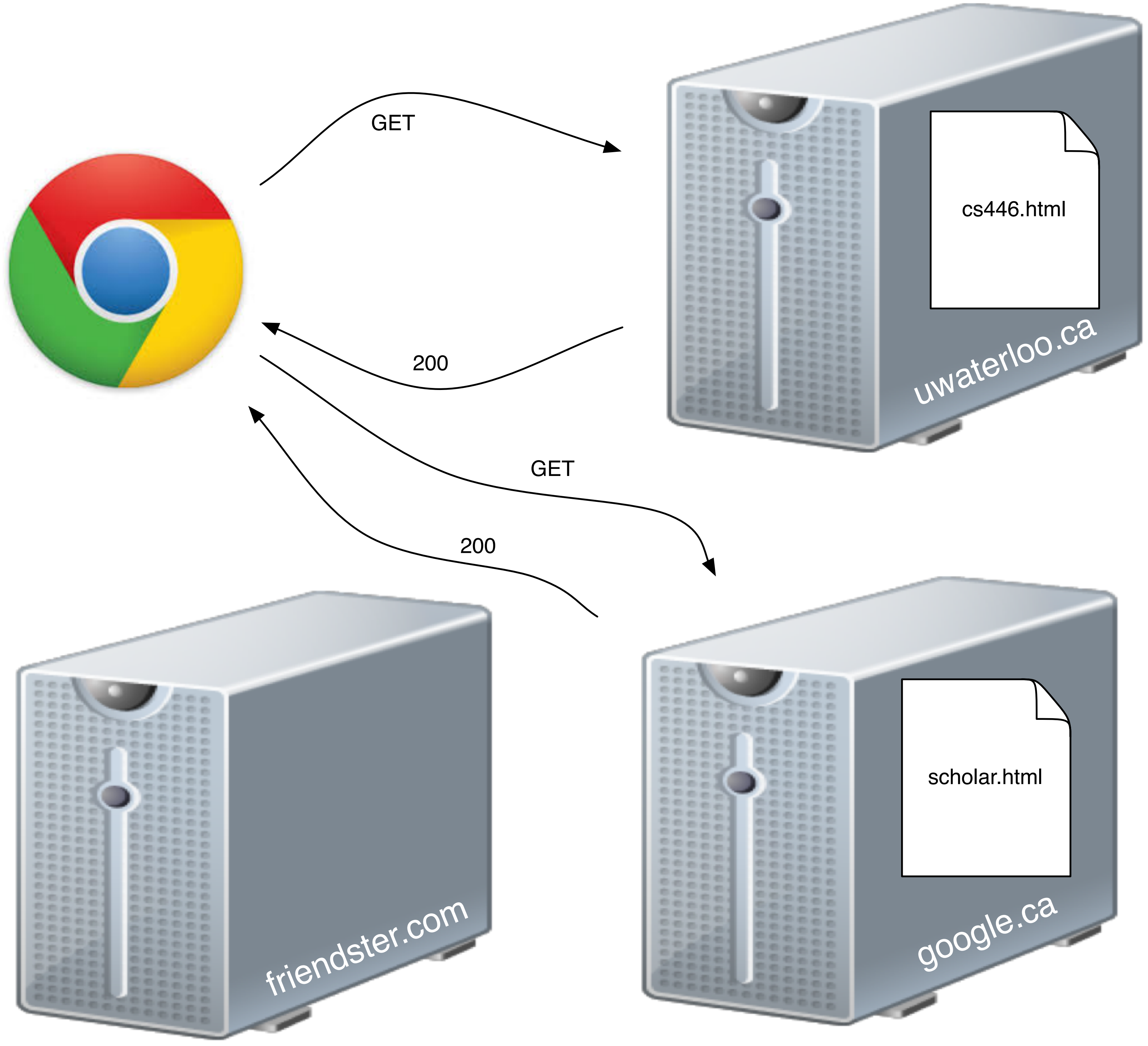
Logical Web Architecture



Physical Web Architecture



Dynamic Web Architecture



Non-functional requirements

- Technical constraints: restrictions made for technical reasons
- Business constraints: restrictions made for business reasons
- Quality attributes: e.g., the *'ilities'*
    - Scalability
    - Security
    - Performance
    - Maintainability
    - Evolvability
    - Reliability/Dependability
    - Deployability

What is Software Architecture?

- Architecture focuses on those aspects of a system that would be difficult to change once the system is built.

Eoin Woods

“Software architecture is the set of design decisions which, if made incorrectly, may cause you project to be cancelled.”

Why is Software Architecture Difficult?

Philippe Krutchen

“The life of a software architect is long (and sometimes painful) succession of sub-optimal decisions made partly in the dark.

What makes building systems so hard?

- Young field.
- High user expectations.
- Software cannot execute independently.

Difficulties Classified

- Incidental difficulties [Brooks MMM].
  - Problems that can be overcome.
- Essential difficulties [Brooks MMM].
  - Those problems that cannot be easily overcome.

Essential Difficulties

- Abstraction alone cannot help.
  - Complexity
    - Grows non-linearly with program size.
  - Conformity
    - System is dependent on its environment.
  - Changeability
    - Perception that software is easily modified.
  - Intangibility
    - Not constrained by physical laws.

[TAILOR ET AL.]

Attacks on Complexity

- High-level languages.
- Development tools & environments.
- Component-based reuse.
- Development strategies.
  - Incremental, evolutionary, spiral models.
- Emphasis on design.
  - Design-centric approach taken from outset.