IMPORTANT NOTICE TO STUDENTS

These slides are **NOT** to be used as a replacement for student notes.
These **slides** are sometimes **vague and incomplete on purpose** to spark class discussions

Enterprise Web-based Software Architecture & Design

CS 446/646 ECE452
Jun 6th, 2011

WATERLOO
CHERITON SCHOOL OF COMPUTER SCIENCE

Characteristics

Servers

- application server
- web server
- proxy servers

Platforms & Technologies

- heterogeneous

Focus/Scope

- usually well defined

Clients

- heterogeneous
  - users, business partners (B2B)
- scale
  - **large number** of clients
- distributed

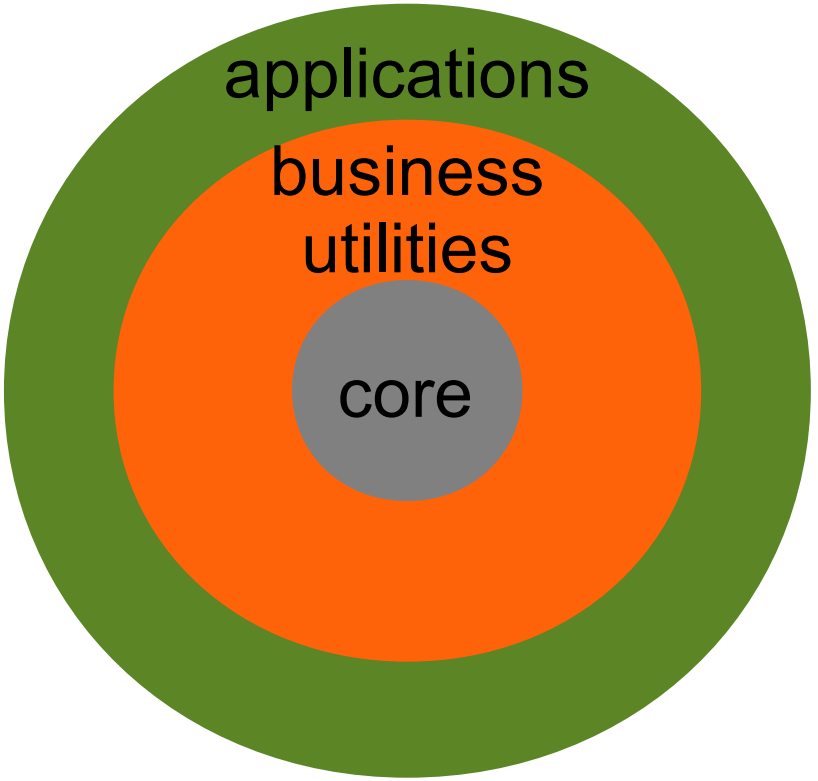
Characteristics

Data

- large amounts of data
- long-term & short term persistence
- distributed in nature
- governed by schema
  - global company wide
  - local application specific
  - complex & **resistant to change** (why?)

Architectural Style

Layered Style



Are you sure?

Architectural Style

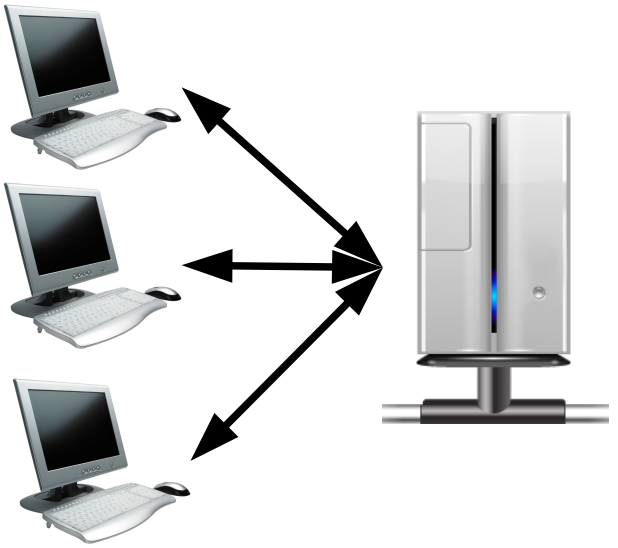
Tiered Style

- from layered to tiered
  - physical separation
  - each tier
    - acts as a **client** of the tier to the right
    - provides a **service** to the tier on the left

- consequences?

Architectural Style

Client-Server Style

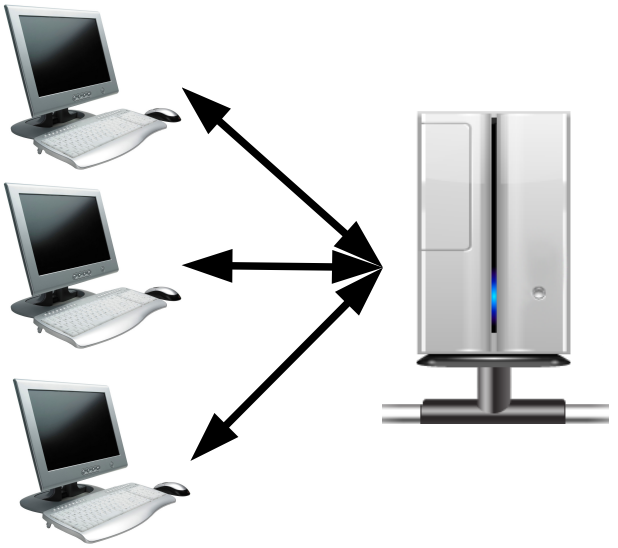


- distributed heterogeneous clients
  - thick & thin
  - isolated from each other
- centralized servers
  - computationally powerful
  - one server to support many clients
- design considerations?

Architectural Style

Client-Server Style

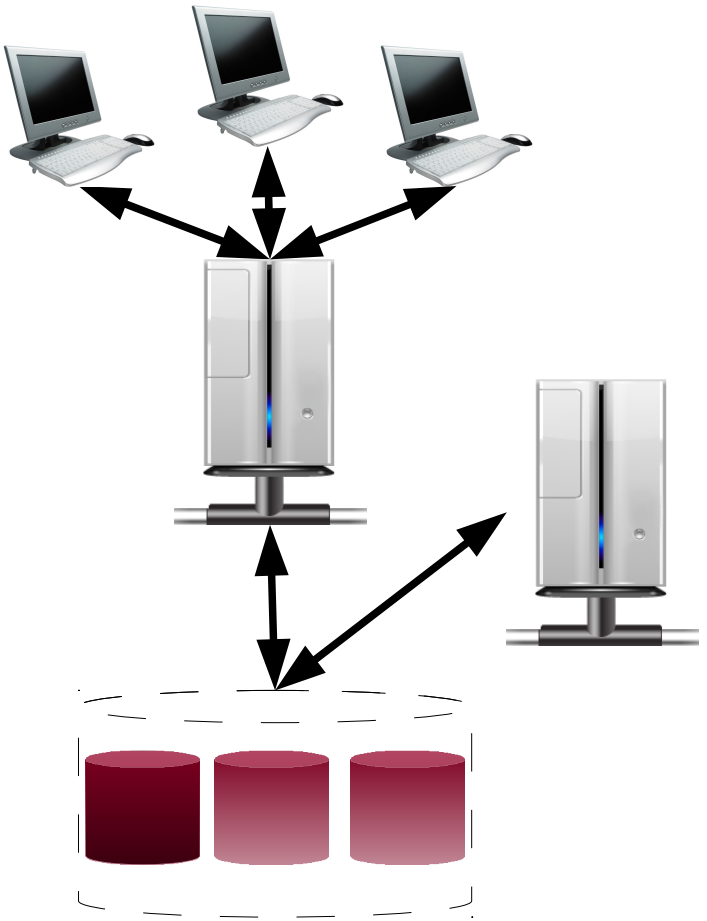
- observations
  - main functionality processed at the central server
  - user interface at each client
  - flows
    - data flows from server to client
    - control flows from client to server
  - ***did some body say data?***



Architectural Style

Repository Style

- central repository
  - multiple data-sources
  - generally database type (why?)
- data is shared across
  - clients
  - applications
- data is dynamic



Functional Concerns

Application {functional components}

- collection of business functionality
- generally divided over **multiple** tiers

Data

- transactional
  - ACID
    - **a**tomicity – all or nothing
    - **c**onsistency – from one consistent state to another consistent state
    - **i**solation – interaction of other operations with the modified data
    - **d**urability – data after a successful transaction is never lost

Non-functional Concerns

- concurrency
- availability
- security
- performance
- fault-tolerance
- application distribution & deployment
- evolution
- re-usability

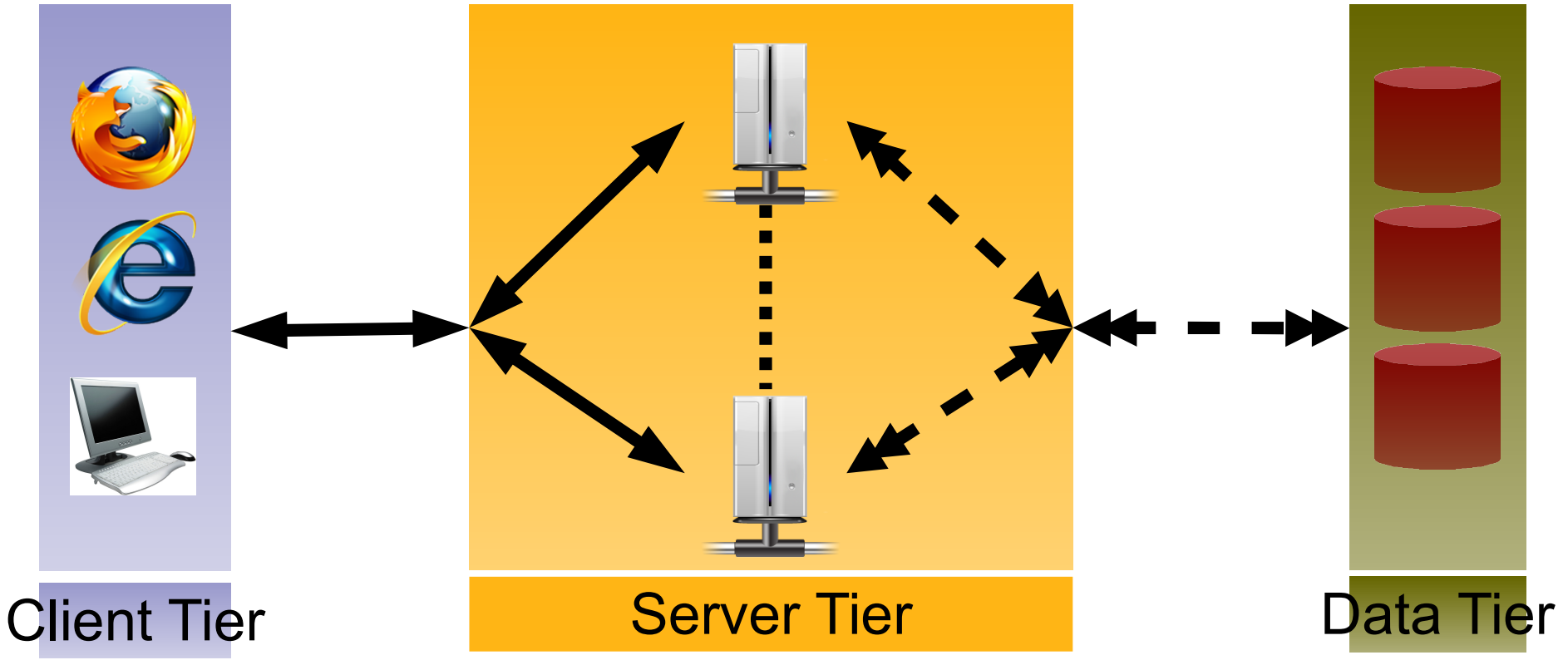
Mostly Honoured

Non-functional Concerns

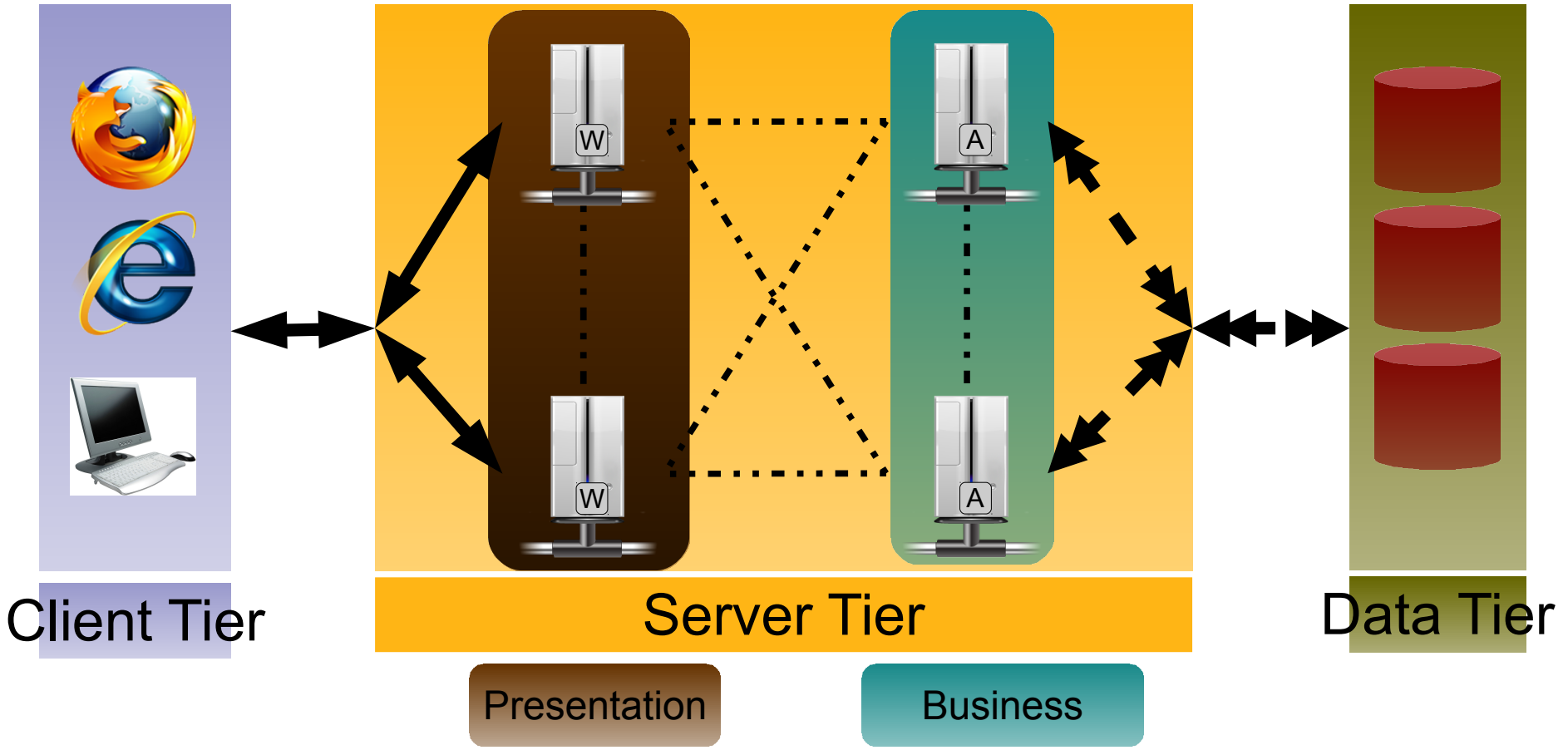
- cost
- ease of use
- interoperability
- portability
- throughput

Mostly commonly violated

Putting it all Together



Putting it all Together



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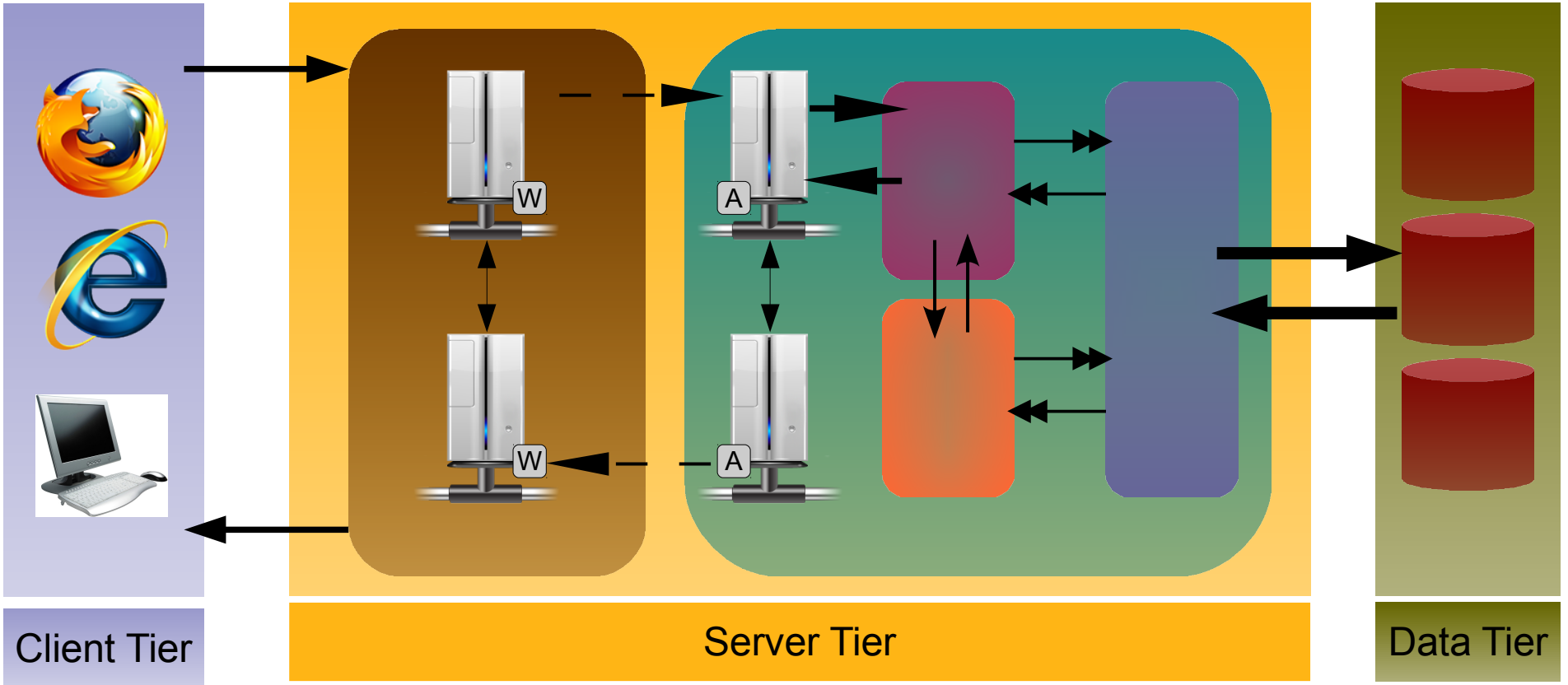
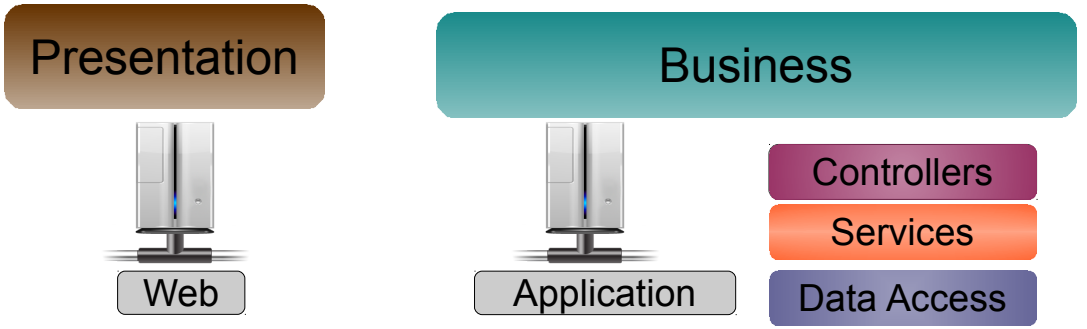




Web-based Enterprise Apps

Why web applications?

- what non-functional requirements are we solving?

Web-based Enterprise Apps

Why web applications?

- what non-functional requirements are we solving?

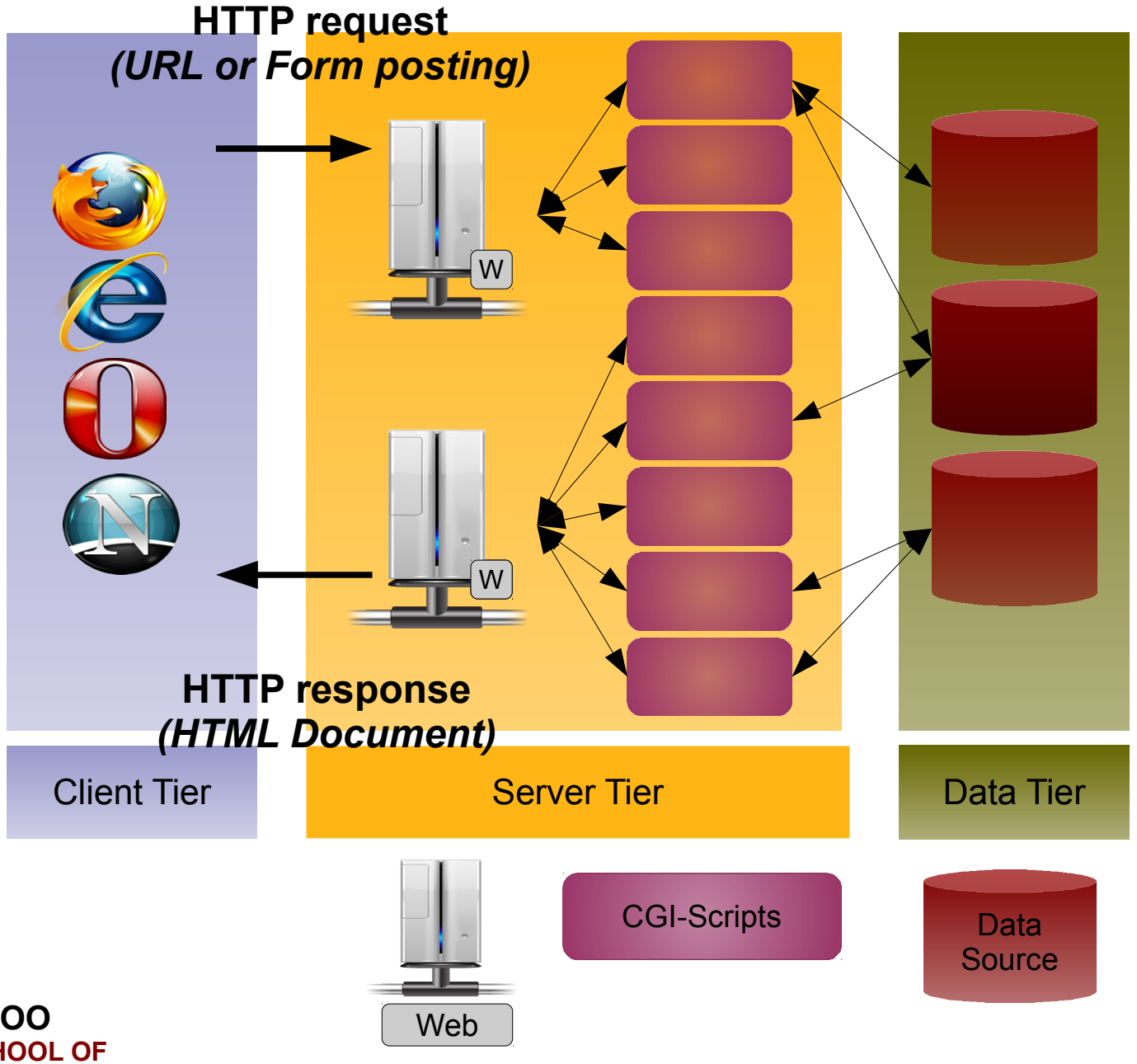
concurrency	evolution
availability	re-usability
security	cost
performance	ease of use
fault-tolerance	interoperability
application distribution	portability
application deployment	throughput

Web-based Enterprise Apps

Key Attributes

- thin clients – web browsers
  - computationally challenged
- user interface – HTML, javascript, css
  - simple & static (mostly)
  - resides at client tier
- communication
  - synchronous request response cycle
  - HTTP over TCP/IP
  - what about data

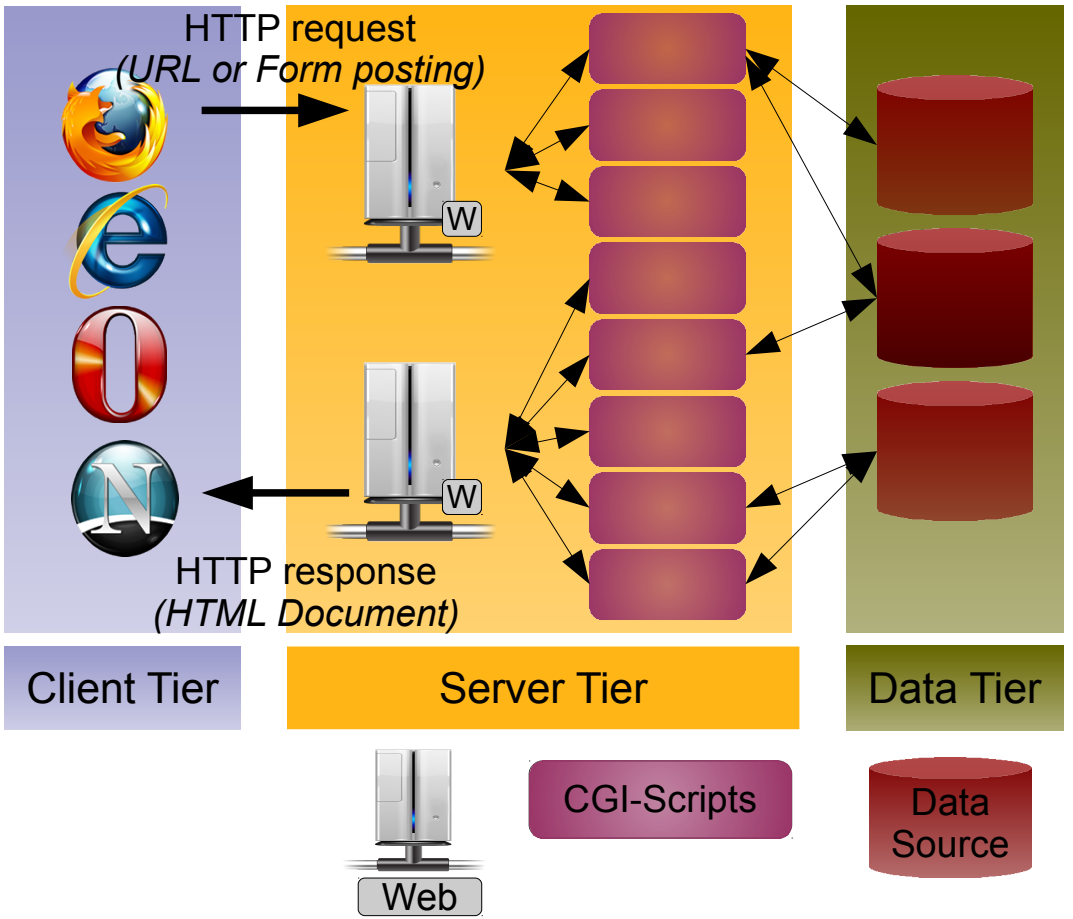
First Generation



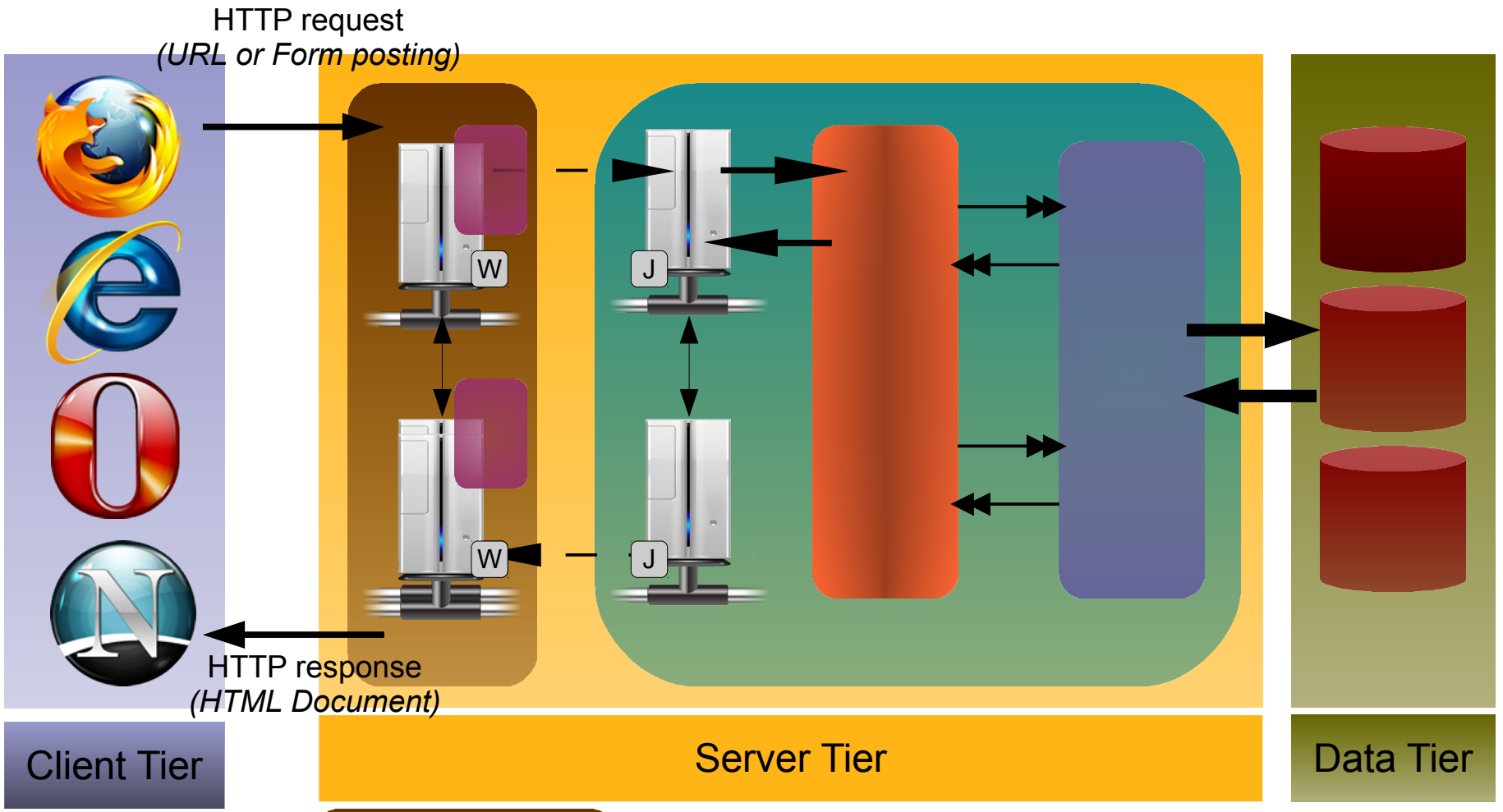
First Generation

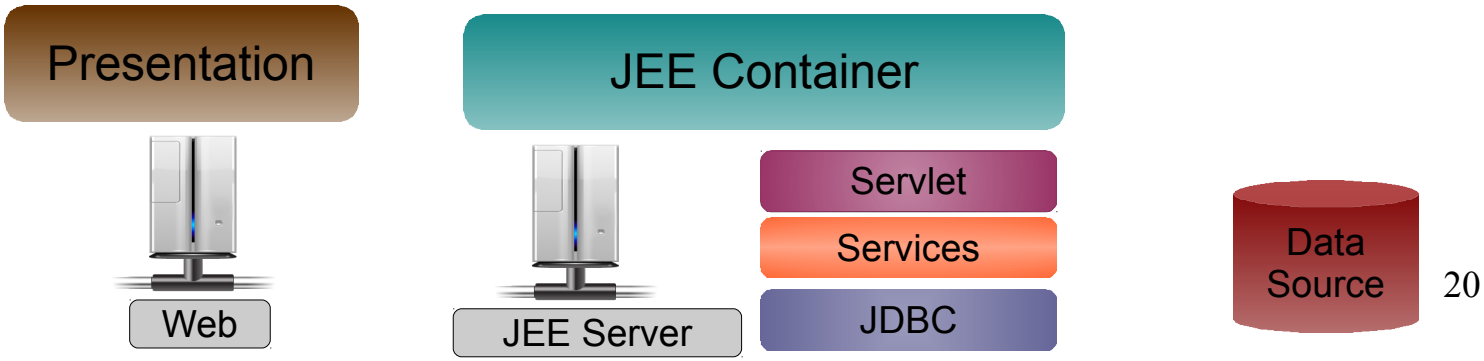
Observations

- simple design
- client-tier
  - building blocks are?
- business tier
  - aggregation of scripts
  - scripts are
    - independent
    - ***stateless***
- ***lacks organic growth*** *(how?)*
- security nightmare



Second Generation





Second Generation

Observations

- not so simple anymore
- **improves business tier** only
  - high level frameworks
    - JEE servlets, struts, spring MVC
  - applications server standardization
    - design by contract
    - provides various services (**like what?**)
- negative impact on
  - **request-response cycle** (**why?**)
  - user interface (**why?**)