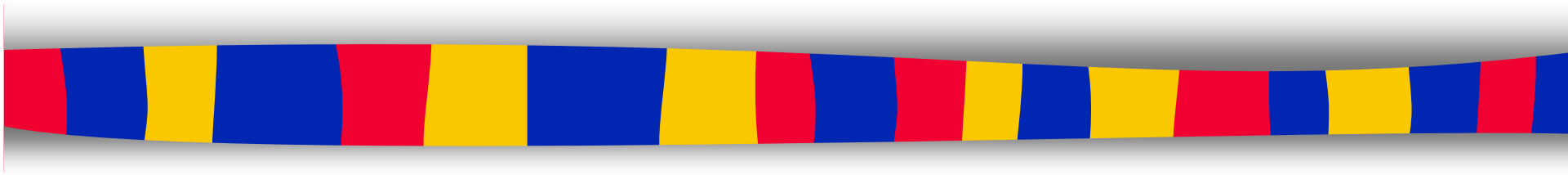
CISC 322
Software Architecture



Lecture 11:
Reference Architecture

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Schedule

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
25	26	27	28	29	30	1
2	3 Today	4	5	6	7	8
9	10 No class	11	12	13	14 Midterm	15
16	17 Concep. Arch. Pres.	18	19	20	21 Concep. Arch. Report	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Recap of Last Class

- Architecture Recovery
  - Conceptual Architecture
    - In the mind of the developers
  - Concrete Architecture
    - The real architecture based on the code

Reference Architecture

- What is a reference architecture?

Defines the fundamental components for a domain and the relations between them

Reference Architecture

- Why do we need a reference architecture?

Different domains have common requirements that largely shape their architecture

Advantages of Reference Architecture

- Provides a common nomenclature across all software systems in the same domain
- Establishes common understanding and assists in comparing different architectures
- Provides a set of expected subsystems and relations between them (in RE)

Reference vs. Conceptual

- Architecture of a product is an instance of the reference architecture
  - Specific products refine and extend the reference architecture based on the product's requirements and constraints

Reference Architecture of Web Servers

Reference architecture of web servers

- Investigated 3 different web servers
  - Developed by 3 different organizations
  - Using different development techniques
  - Different programming languages
  - Source code publically available

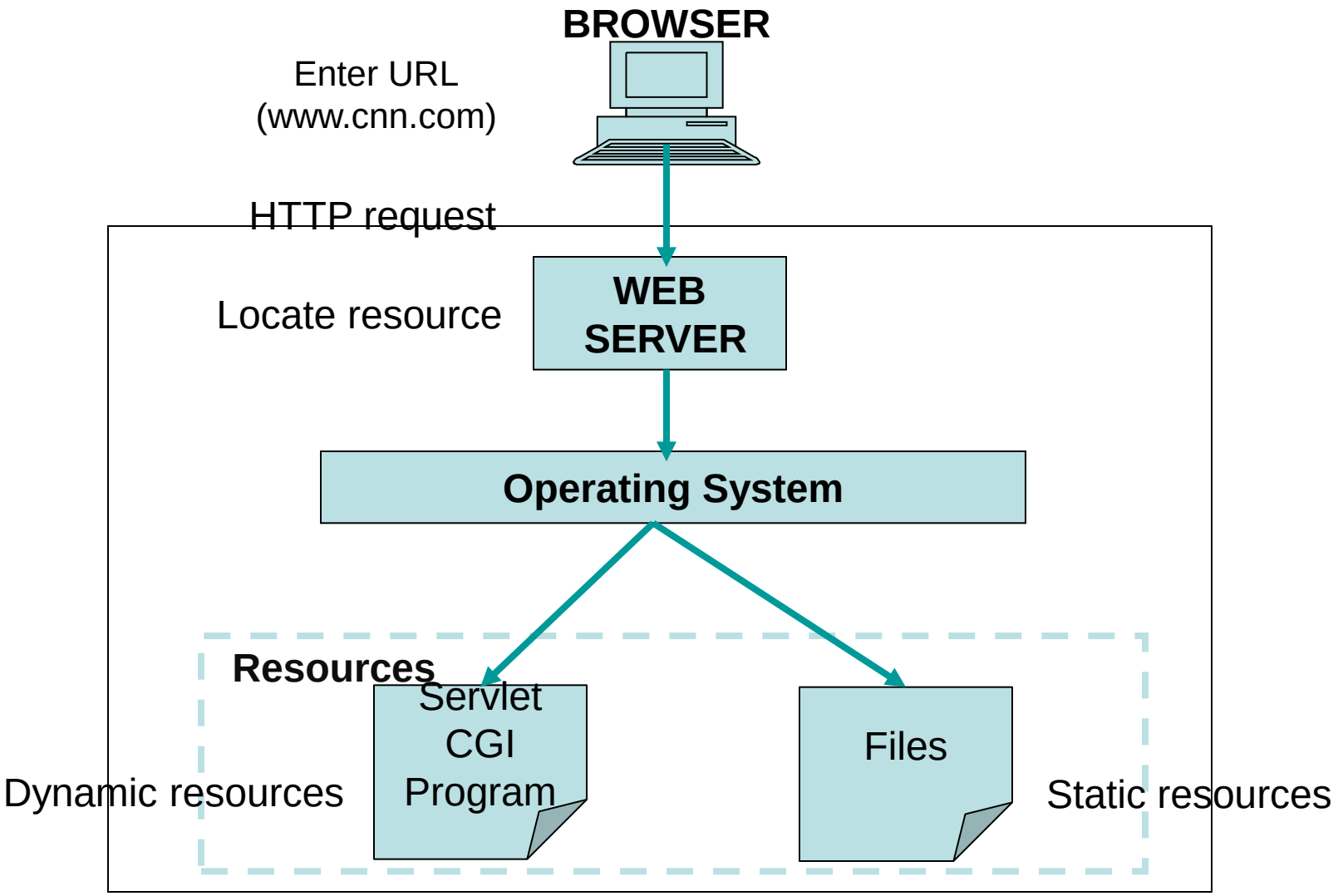
Web Browsers and Web Servers

- Web servers provide features for users, email, news etc..
- Need a web browser to access these features

Web Browsers and Web Servers

- Web servers are different, but usually have common features
  - All web servers can serve simple text
  - Not all can serve Java servlets
- Existence of common features leads to common reference arch

Example of Web Request



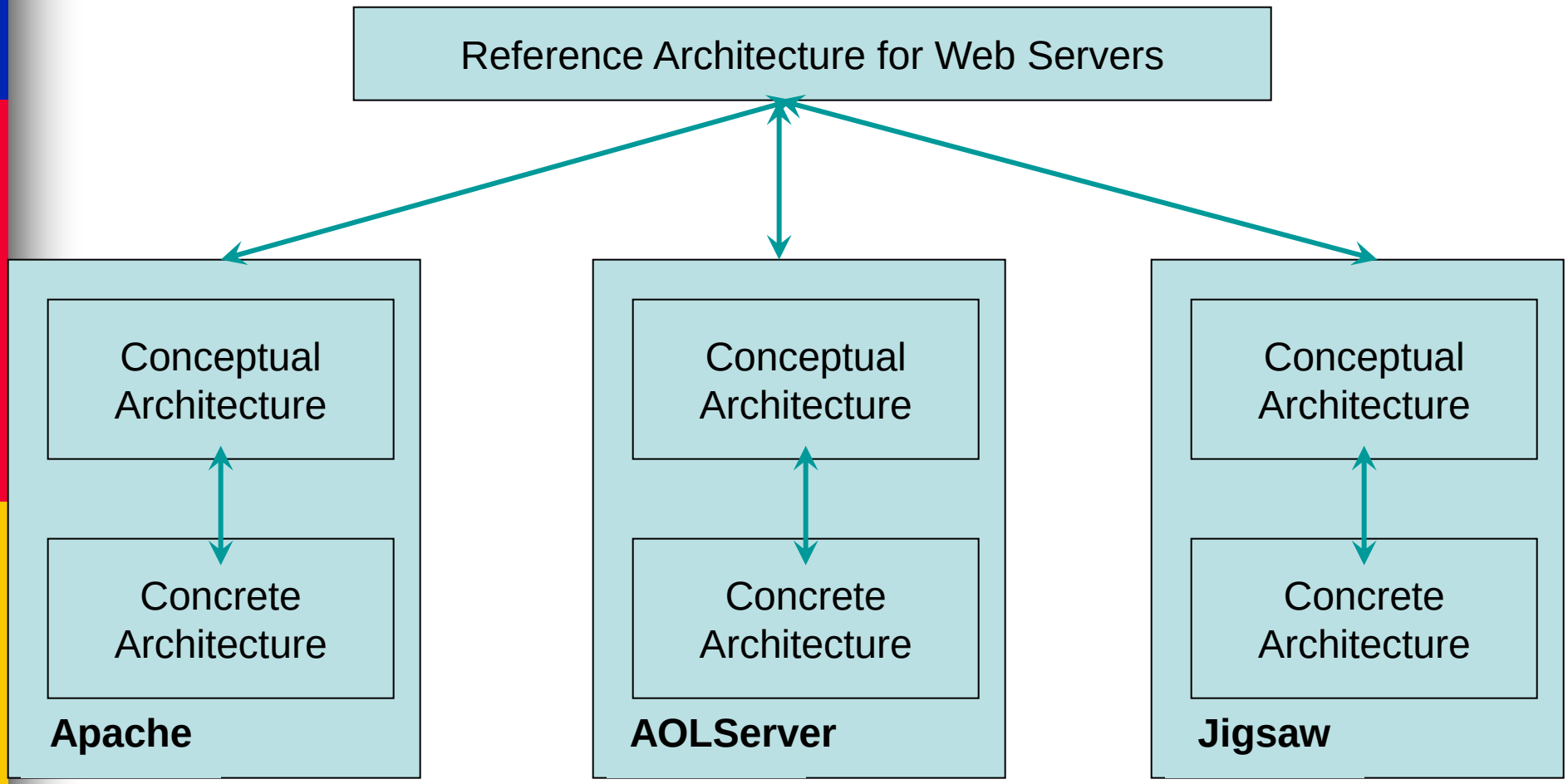
Deriving the Reference Architecture

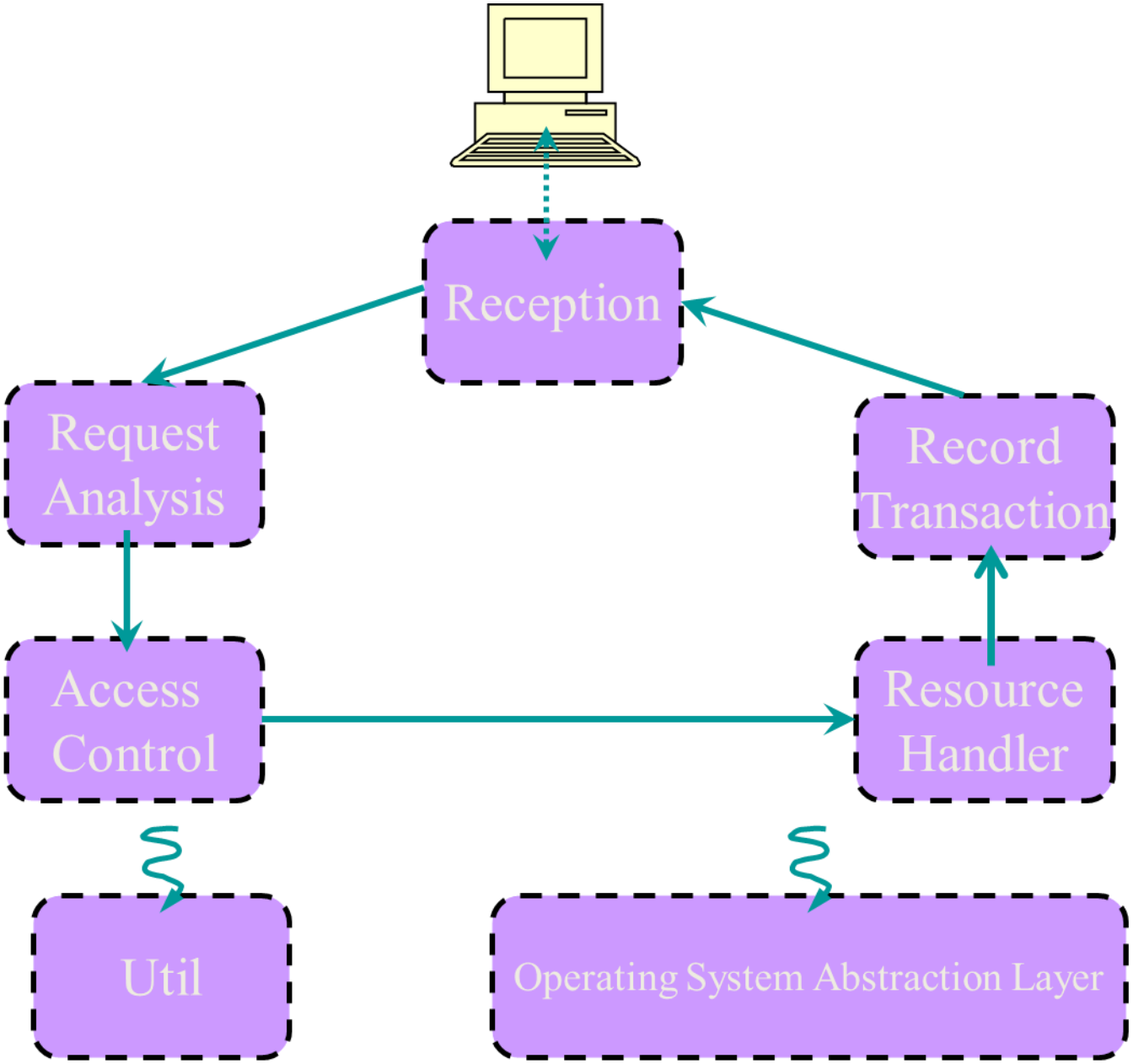
- **Step1:** Derive conceptual architecture
  - Propose a conceptual architecture based on domain knowledge and documentation
  - Refine conceptual architecture using concrete architecture

Deriving the Reference Architecture

- **Step2:** Derive reference architecture using the conceptual architectures
  - Propose reference architecture based on domain knowledge and common structure between conceptual architectures
  - Refine the reference architecture using conceptual architectures

Reference Architecture Derivation Process





Web Server Reference Architecture

Control flow

All depend on

Reception

- Interprets resource request protocol
- Waits for browser requests
- Determines capabilities of the browser
- Data structure and logic to handle multiple requests simultaneously

Request Analyzer

- Operates on the internal representation of the request
- Translates the location of the resource from a network location to a local file name
  - e.x. ~/index.html -> /usr/https/pub/webfiles/index.html

Access Control

- Enforces access rules employed by the server
- Authenticates the browser and authorizes access to requested resources
  - e.x. username and password

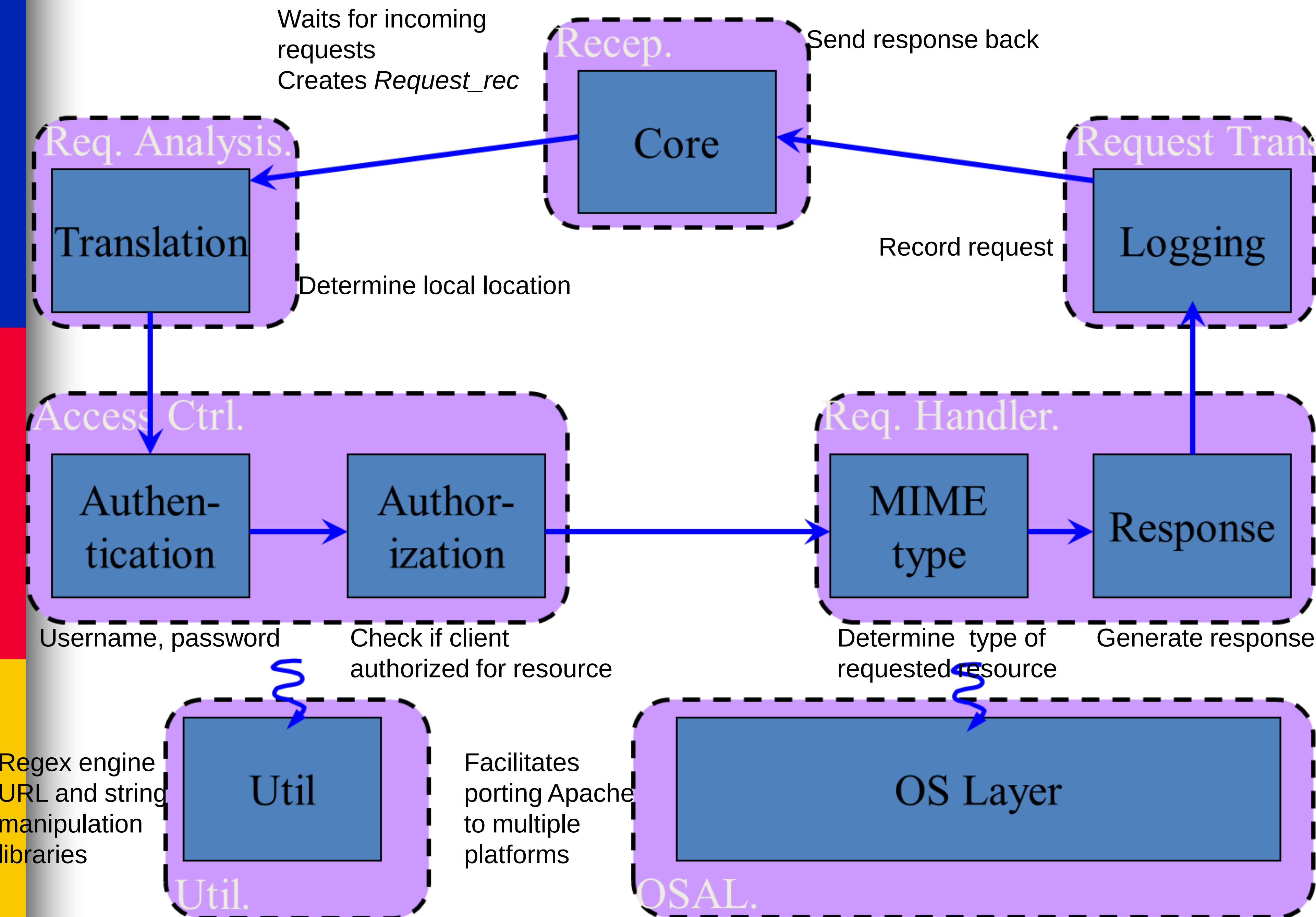
Resource Handler and Transaction Log

- Determines the type of the resource requested by the browser, executes and generates response
  - e.x. Resource Handler determines if requested resource is static response that is sent directly to the user or dynamic
- Transaction log records all requests and their results

Support layer

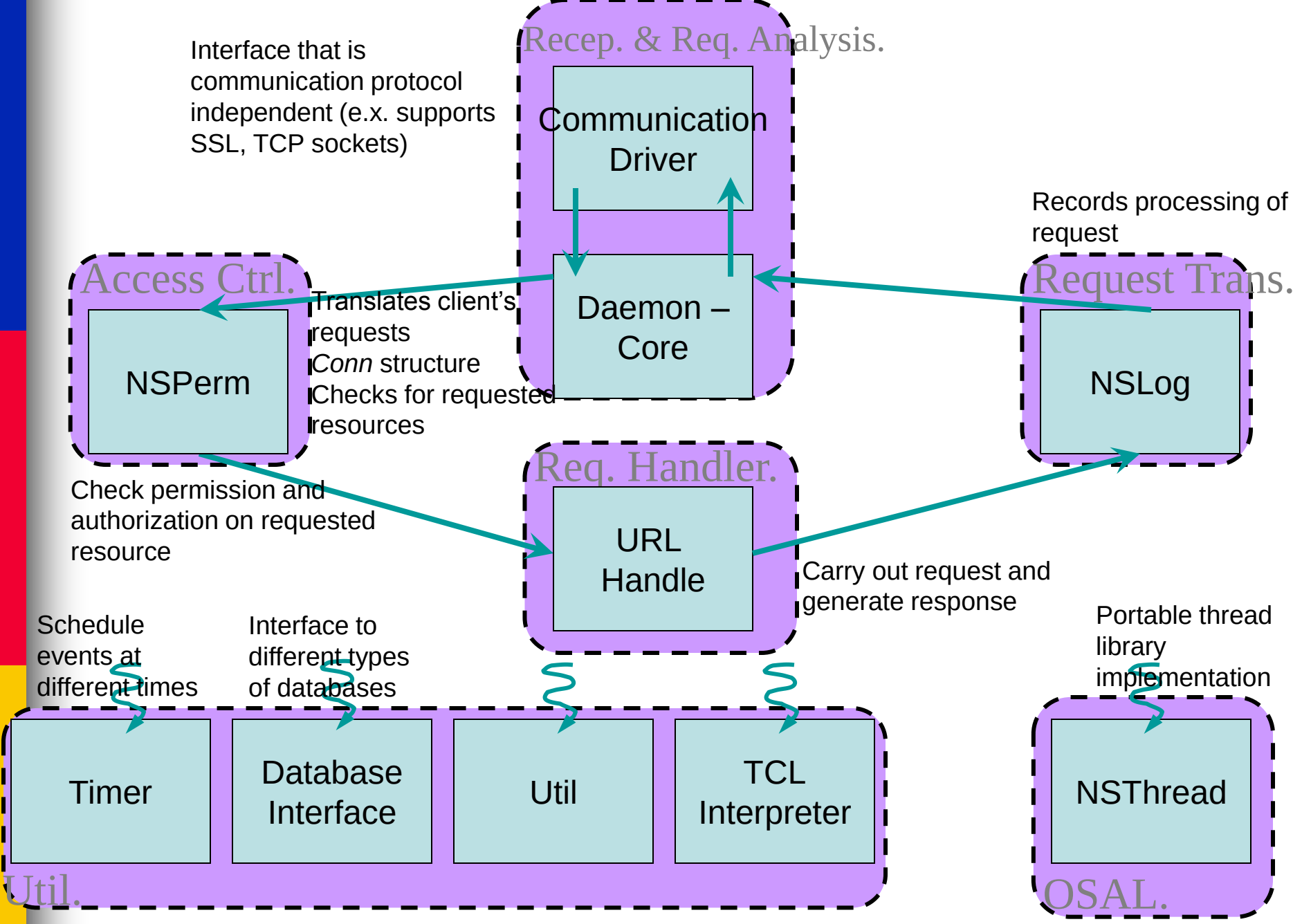
- Utility contains functions used by all subsystems
  - e.x. string manipulation
- OSAL encapsulates operating system specific functionality to support porting of the server to different platforms

Apache



Apache: Conceptual Architecture

AOLServer



AOLServer: Conceptual Architecture

Summary

- Reference Architecture must be flexible enough to encompass many product archs
  - Does not determine implementation details
- Conceptual architecture fits well in the reference architecture
- Structure may be different due to splitting and merging of some subsystems