CSE 451 Sectional

April 16, 2015

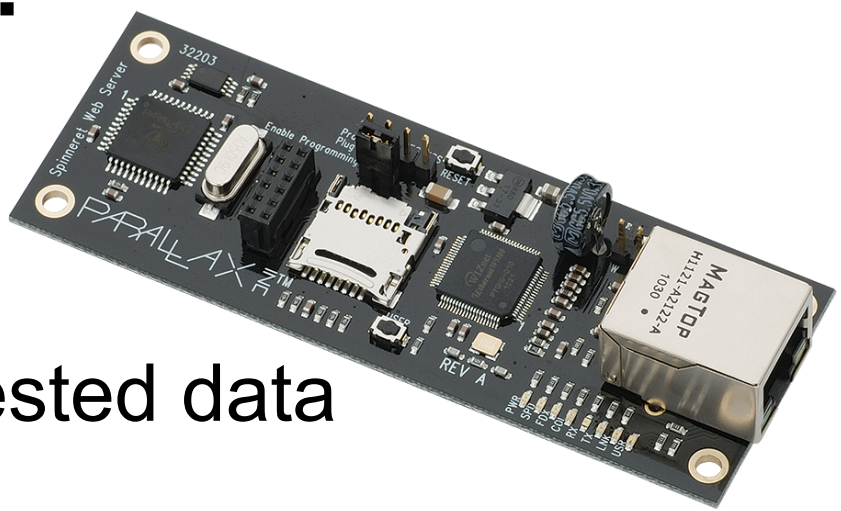
Webserver vs OS

How are webservers similar to an OS?

How are they different?

What lessons can be learned from web functionality?

What is a Webserver?



Serves files (index.html)

- javascript files, css, etc.

Receives and serves requested data

- From local or remote sources

Processes requests

- Computations, ‘likes’, data storage, etc.

Comparison to OS

Many things need to happen at the same time

- Multiple Users, Multiple Requests

Work queues

- How does user / req get something done?

I/O behaviors

- Access to disk and other processes

Implementations

New process on request

- Process can do what compared to threads?

Work pool / work queue

- Pool of threads or process are always available

Event-Driven vs Polling

- What’s more efficient?

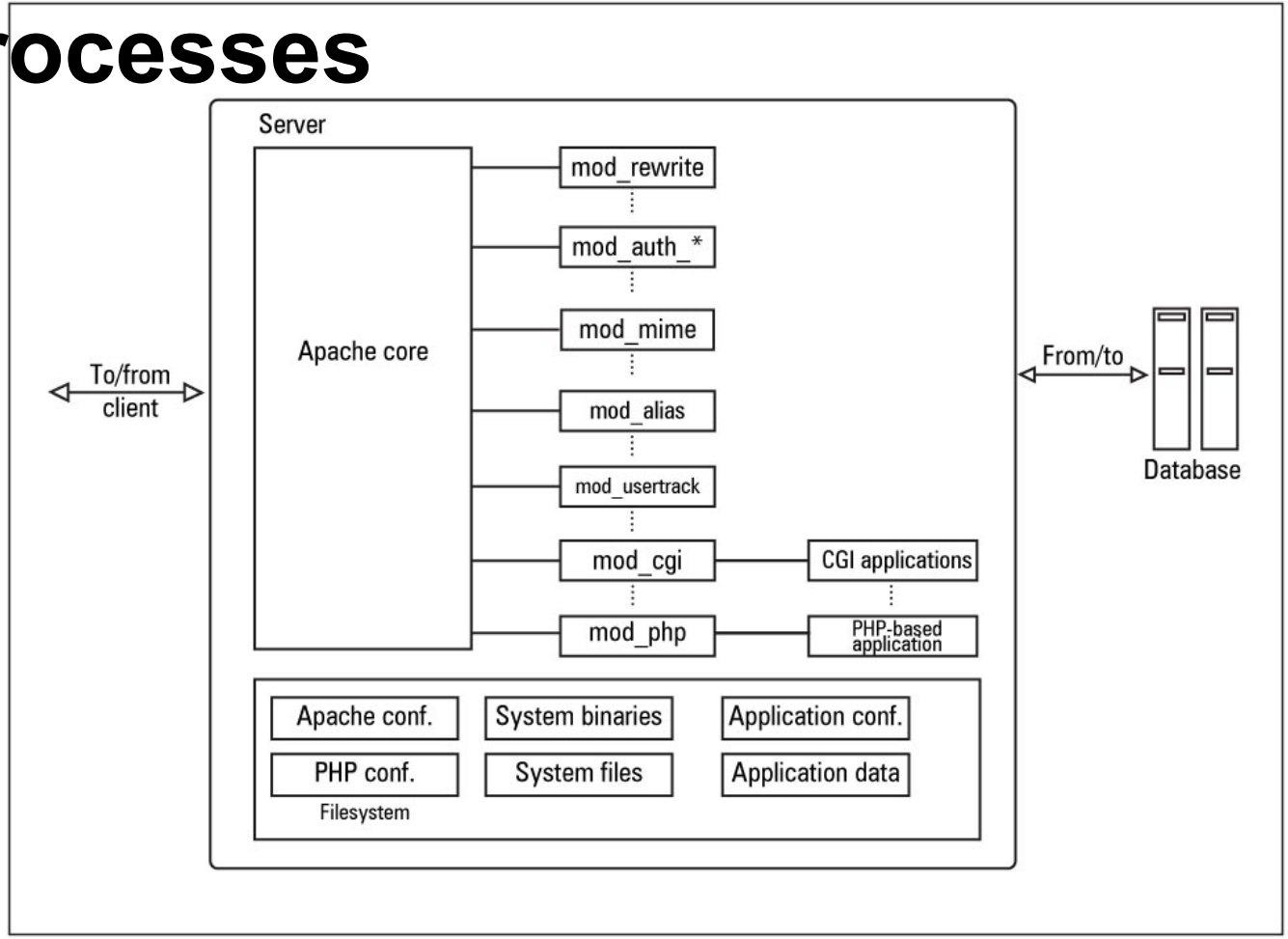
Server vs OS

Why are server tasks not handled by OS?

How do they work together?

- Hardware abstraction, security, process safety

Spawn Processes

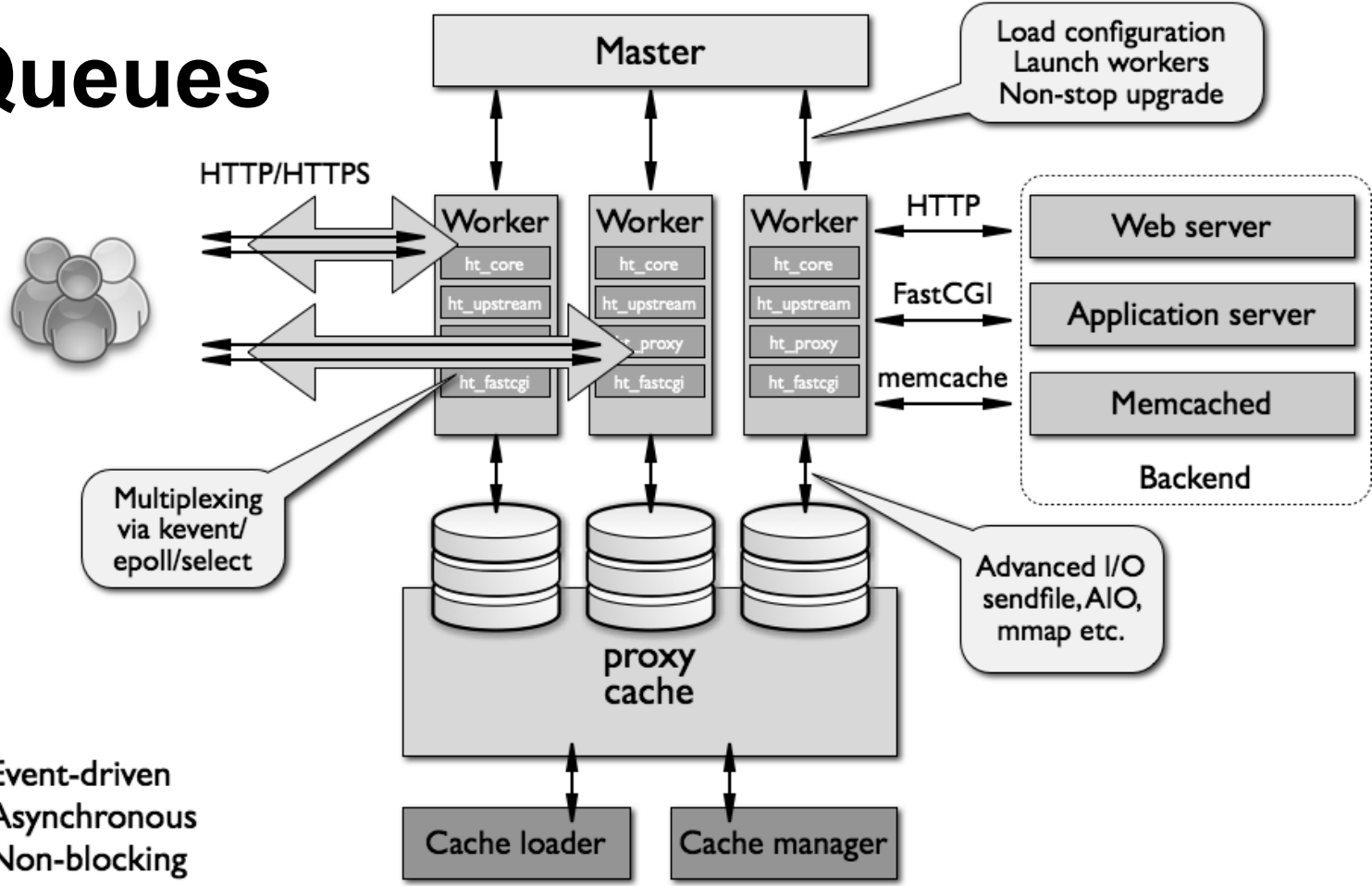


Event Driven (node.js)

```
// Loading required modules
var http = require('http');

var SERVER_PORT = 8124;

// Creating HTTP Server
var server = http.createServer(function(request, response){
    // Called each time a request is made.
    response.writeHead(200, {'Content-Type': 'text/plain'});
    response.end('Hello World\n');
});

// Starting the server
server.listen(SERVER_PORT);

console.log('Server running on port : ' + SERVER_PORT);
```

```
char response[] = "HTTP/1.1 200 OK\r\n"
"Content-Type: text/html; charset=UTF-8\r\n\r\n"
"<!DOCTYPE html><html><head><title>Bye-bye baby bye-bye</title>"
"<style>body { background-color: #111 }"
"h1 { font-size: 4cm; text-align: center; color: black;"
" text-shadow: 0 0 2mm red}</style></head>"
"<body><h1>Goodbye, world!</h1></body></html>\r\n";

int main()
{
 int one = 1, client_fd;
 struct sockaddr_in svr_addr, cli_addr;
 socklen_t sin_len = sizeof(cli_addr);
 int sock = socket(AF_INET, SOCK_STREAM, 0);
 if (sock < 0)
  err(1, "can't open socket");

 setsockopt(sock, SOL_SOCKET, SO_REUSEADDR, &one, sizeof(int));
 int port = 8080;
 svr_addr.sin_family = AF_INET;
 svr_addr.sin_addr.s_addr = INADDR_ANY;
 svr_addr.sin_port = htons(port);

 if (bind(sock, (struct sockaddr *) &svr_addr, sizeof(svr_addr)) == -1) {
  close(sock);
  err(1, "Can't bind");
 }

 listen(sock, 5);
 while (1) {
  client_fd = accept(sock, (struct sockaddr *) &cli_addr, &sin_len);
  printf("got connection\n");

  if (client_fd == -1) {
   perror("Can't accept");
   continue;
  }

  write(client_fd, response, sizeof(response) - 1); /*-1:'\0'*/
  close(client_fd);
 }
}
```

Work Queues



- Event-driven
- Asynchronous
- Non-blocking

Parallelism

How to do more at the same time

- Multiple cores, multiple threads
- Buffered I/O, Batch processing
- Nagle’s Algorithm
- Cluster programming, OpenMP

Asynchronous vs Synchronous

Maximize efficiency by min. waiting (for resources, other processes)

Requires different programming model

Deferred processing

Coroutines

Phone call vs text

Message passing

Other examples?