

CSGE602055 Operating Systems  
CSF2600505 Sistem Operasi  
Minggu 08: Scheduling & Network Sockets  
Programming

Rahmat M. Samik-Ibrahim

Universitas Indonesia

<http://rms46.vlsm.org/2/207.html>

REV75 22-Sep-2017

|           |                      |  |
|-----------|----------------------|--|
| Minggu 00 | 29 Aug - 05 Sep 2017 | Intro & Review                                       |
| Minggu 01 | 07 Sep - 12 Sep 2017 | IPR, SED, AWK, REGEX, & Scripting                    |
| Minggu 02 | 14 Sep - 19 Sep 2017 | Protection, Security, Privacy,<br>& C-language       |
| Minggu 03 | 26 Sep - 30 Sep 2017 | BIOS, Loader, Systemd, & I/O                         |
| Minggu 04 | 03 Okt - 07 Okt 2017 | Addressing, Shared Lib, Pointer<br>& I/O Programming |
| Minggu 05 | 10 Okt - 14 Okt 2017 | Virtual Memory                                       |
| Ming. UTS | 15 Okt - 24 Okt 2017 |  |
| Minggu 06 | 26 Okt - 31 Okt 2017 | Concurrency: Processes & Threads                     |
| Minggu 07 | 02 Nov - 07 Nov 2017 | Synchronization                                      |
| Minggu 08 | 09 Nov - 14 Nov 2017 | Scheduling<br>& Network Sockets Programming          |
| Minggu 09 | 16 Nov - 21 Nov 2017 | File System & Persistent Storage                     |
| Minggu 10 | 23 Nov - 28 Nov 2017 | Special Topic: Blockchain                            |
| Cadangan  | 30 Nov - 09 Des 2017 |  |
| Ming. UAS | 10 Des - 23 Des 2017 |  |

# Agenda

- 1 Start
- 2 Agenda
- 3 Scheduling
- 4 Threads
- 5 Sockets
- 6 server.c
- 7 client.c
- 8 Lab
- 9 The End

# Week 08: Scheduling

- Reference: (OSCE2e ch6) (UCB 9/10) (UDA P3L1) (OLD 05)
- Scheduling
  - Basic Concepts
    - **WARNING:** It's just a BURST
    - IO Burst
    - CPU Burst
    - CPU Burst vs. Freq (OLD)
  - Utilization, throughput, {turnaround, waiting, response} time.
  - (Burst) Algorithm
    - FCFS
    - SJF
    - RR
    - Priority
    - Multilevel Queue
  - Preemptive / Non-preemptive Scheduling
  - I/O Bound / CPU Bound Processes
- Standard Linux Scheduling
  - Completely Fair Scheduler (CFS).
  - Real Time Scheduling.

# Thread Scheduling

- Thread Scheduling
- Level
  - User-level thread scheduling
  - Kernel-level thread scheduling
- Contention Scope
  - Process-Contention Scope (PCS).
  - System-Contention Scope (SCS).
- Pthread
- MultiCore/ MultiProcessor/ MultiThread
  - affinity
  - load balancing
- Soft / Hard Real Time
- Big O Notation
  - $O(1)$
  - $O(\log N)$
  - $O(N)$

- Sockets

- `atoi()`
- `accept()`
- `bind()`
- `connect()`
- `exit()`
- `fprintf()`
- `getenv()`
- `gethostbyname()`
- `htons()`
- `listen()`
- `memcpy()`
- `memset()`

- Sockets

- perror()
- sizeof()
- socket()
- snprintf()
- strchr()
- strcmp()
- strncpy()
- strlen()
- read()
- write()

```

/*
 * (c) 2007-2016 Rahmat M. Samik-Ibrahim -- This is free software
 * This program was copased from the net and hacked until it works.
 * Feel free to copy and/or modify and/or distribute it,
 * provided this notice, and the copyright notice, are preserved.
 * REV00 Tue Nov 8 11:45:35 WIB 2016
 * START Xxx Xxx XX XX:XX:XX UTC 2007
 */
char pesan[]="[FROM SERVER] ACK MESSAGE...\n";
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <netdb.h>
#include <sys/socket.h>
#include <arpa/inet.h>
typedef struct sockaddr      sockad;
typedef struct sockaddr_in   sockadin;
typedef struct hostent       shostent;
void error(char *msg){
    perror(msg);
    exit(0);
}

```



# server 1

```
int main(int argc, char *argv[]) {
    char    buffer[256];
    int     clilen, newsockfd, nn, portno, sockfd;
    sockad_t serv_addr, cli_addr;

    if (argc < 2) {
        fprintf(stderr, "ERROR, no port provided\n");
        exit(1);
    }
    sockfd = socket(AF_INET, SOCK_STREAM, 0);
    if (sockfd < 0)
        error("ERROR opening socket");
    memset(&serv_addr, 0, sizeof(serv_addr));
    portno = atoi(argv[1]);
    serv_addr.sin_family      = AF_INET;
    serv_addr.sin_addr.s_addr = INADDR_ANY;
    serv_addr.sin_port        = htons(portno);
    if (bind(sockfd, (sockad_t) &serv_addr, sizeof(serv_addr)) < 0)
        error("ERROR on binding");
}
```

```
listen(sockfd, 5);
clilen = sizeof(cli_addr);
newsockfd=accept(sockfd,(sockad*)&cli_addr,(socklen_t*)&clilen);
if (newsockfd < 0)
    error("ERROR on accept");
memset(buffer, 0, 256);
nn = read(newsockfd,buffer,255);
if (nn < 0)
    error("ERROR reading from socket");
printf("[FROM CLIENT]:\n %s\n",buffer);
nn = write(newsockfd, pesan, sizeof(pesan));
if (nn < 0)
    error("ERROR writing to socket");
return 0;
}
```

```

/*
 * (c) 2007-2016 Rahmat M. Samik-Ibrahim -- This is free software
 * This program was copased from the net and hacked until it works.
 * Feel free to copy and/or modify and/or distribute it,
 * provided this notice, and the copyright notice, are preserved.
 * REV00 Tue Nov  8 11:45:52 WIB 2016
 * START Xxx Xxx XX XX:XX:XX UTC 2007
 */
char pesan[]="[FROM SERVER] ACK MESSAGE...\n";
#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <unistd.h>
#include <netdb.h>
#include <sys/socket.h>
#include <arpa/inet.h>
typedef struct sockaddr    sockad;
typedef struct sockaddr_in sockadin;
typedef struct hostent     shostent;
void error(char *msg){
    perror(msg);
    exit(0);
}

```

# client 1

```
int main(int argc, char *argv[]) {
    char        buffer[256];
    int         nn, portno, sockfd;
    sockadin    serv_addr;
    shostent*   server;
    if (argc < 3) {
        fprintf(stderr, "usage %s hostname port\n", argv[0]);
        exit(0);
    }
    portno = atoi(argv[2]);
    sockfd = socket(AF_INET, SOCK_STREAM, 0);
    if (sockfd < 0)
        error("ERROR opening socket");
    server = gethostbyname(argv[1]);
    if (server == NULL) {
        fprintf(stderr, "ERROR, no such host\n");
        exit(0);
    }
    memset(&serv_addr, 0, sizeof(serv_addr));
    serv_addr.sin_family = AF_INET;
    memmove(&serv_addr.sin_addr.s_addr, server->h_addr, server->h_length);
    serv_addr.sin_port = htons(portno);
```

```
if(connect(sockfd,(const struct sockaddr*) &serv_addr, sizeof(serv_addr))<0)
    error("ERROR connecting");
printf("Enter the message: ");
memset(buffer, 0, 256);
fgets (buffer, 255, stdin);
nn = write(sockfd,buffer,strlen(buffer));
if (nn < 0)
    error("ERROR writing to socket");
memset(buffer, 0, 256);
nn = read(sockfd,buffer,255);
if (nn < 0)
    error("ERROR reading from socket");
printf("%s\n",buffer);
return 0;
}
```

- client
- server
- client-server

# The End

- This is the end of the presentation.