



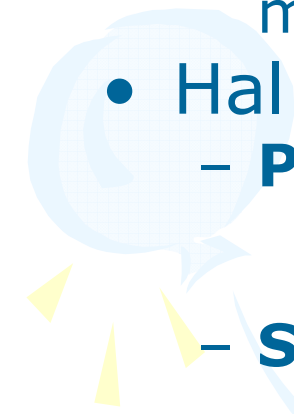

Sistem Operasi 3

“Process”

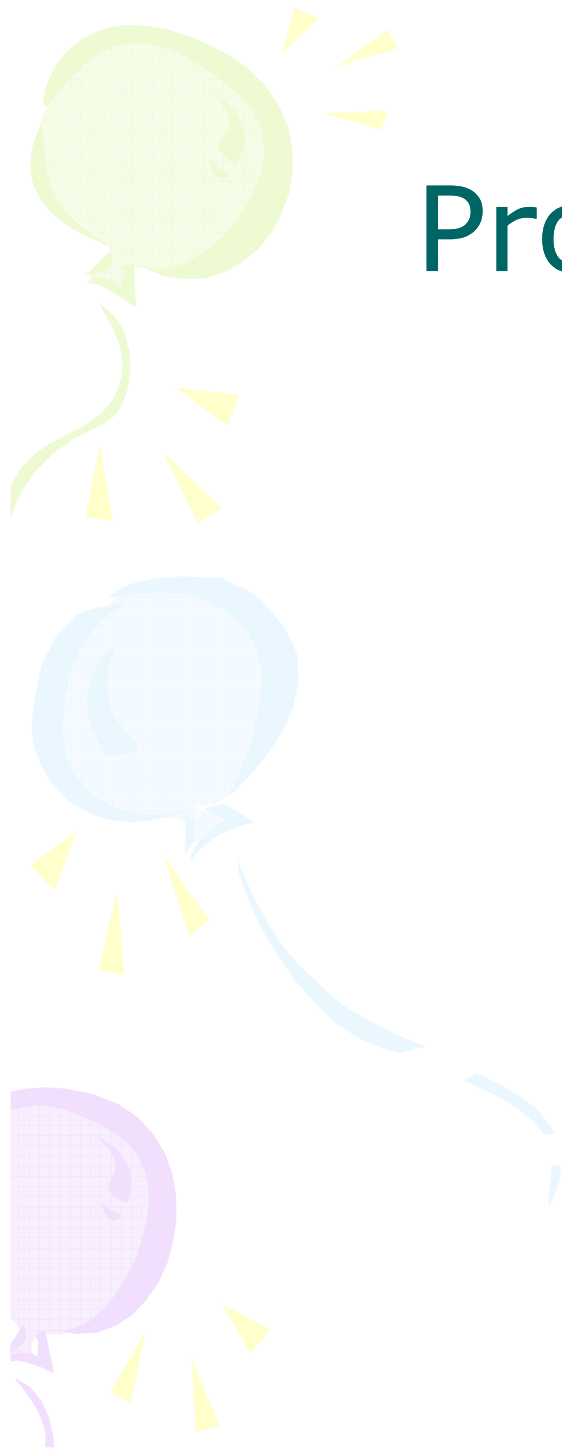
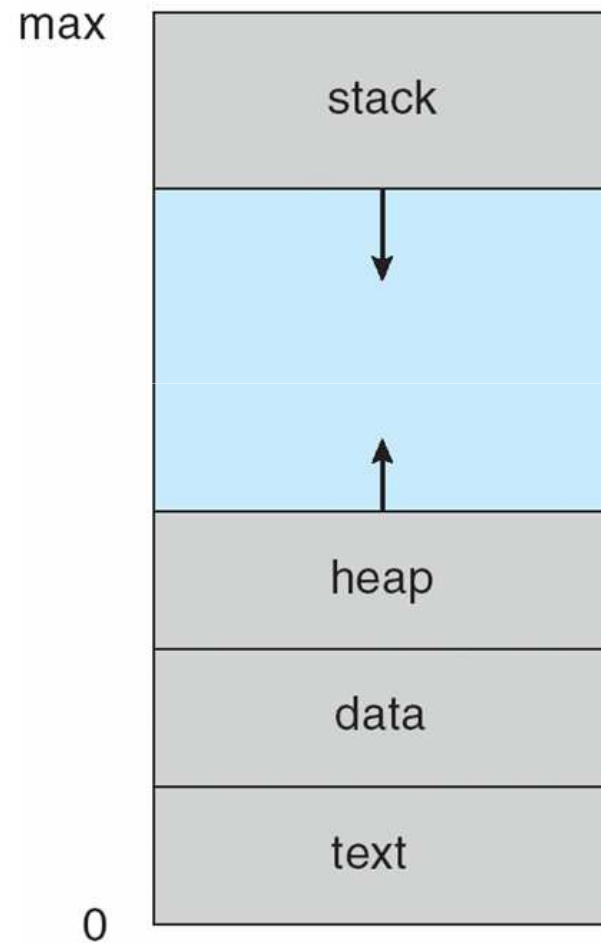
**Antonius Rachmat C, S.Kom,
M.Cs**



Konsep Proses

- **Proses** adalah suatu program yang sedang dieksekusi (running)
 - Alokasi process: batch / multiprogramming / multitasking
 - Hal yang dicatat pada saat process running:
 - **Program counter**
 - variabel untuk menyimpan alamat suatu proses yang akan dieksekusi selanjutnya
 - **Stack / Heap**
 - Tempat penyimpanan temporary data yang dibutuhkan selama program dieksekusi secara dinamis
 - **Data section**
 - Berisi variabel global dari suatu proses
 - **Text**
 - Berisi kode programnya
- 
- 

Process in Memory



Process	PID	CPU	Description	Company Name	Window Title	Image Type	Window Status	CPU Time	Threads	CSwitch Delta	Cycles	Page Faults	Memory Priority
sqlwriter.exe	2684							0:00:00.031	4		0	1,886	
StarWindServiceAE.exe	2724							0:00:00.015	5	2	0	1,511	
TeamViewer_Service.exe	2780							0:00:00.374	11	19	0	6,470	
TeamViewer.exe	380		TeamViewer Remot...	TeamViewer GmbH		32-bit		0:00:00.530	5	4	10,790,691,941	10,708	5
svchost.exe	2860							0:00:38.204	14	2	0	321,244	
YahooAUService.exe	2892							0:00:00.093	5		0	2,648	
IAStorDataMgrSvc.exe	2996							0:00:05.928	10	9	0	6,791	
McShield.exe	3036							0:01:26.845	49	1	0	476,052	
mfeann.exe	2668							0:00:04.352	8		0	24,040	
svchost.exe	356	0.38						0:00:02.106	11	7	0	9,739	
UNS.exe	2360							0:00:50.793	18	5	0	23,722	
SearchIndexer.exe	3832							0:00:07.394	14	1	0	23,040	
taskhost.exe	2760		Host Process for Wi...	Microsoft Corpora...				0:00:00.327	9		1,493,172,335	4,154	5
svchost.exe	2740							0:00:00.234	4		0	2,255	
taskhost.exe	6104							0:00:00.078	5		167,554,721	1,622	5
lsass.exe	644							0:00:09.001	8		0	10,561	
lsm.exe	652							0:00:00.156	11		0	1,768	
csrss.exe	588							0:00:30.310	11	596	0	95,319	
winlogon.exe	700							0:00:00.202	3		0	9,019	
explorer.exe	1216		Windows Explorer	Microsoft Corpora...	Process Explorer		Running	0:00:50.123	34	20	253,412,087,...	193,915	5
igfxtray.exe	4272		igfxTray Module	Intel Corporation				0:00:00.031	3		137,281,107	1,917	5
hkcmd.exe	4280		hkcmd Module	Intel Corporation				0:00:00.140	3		408,116,808	2,837	5
igfxpers.exe	4288		persistence Module	Intel Corporation				0:00:00.062	3		324,519,792	2,157	5
RAVCpl64.exe	4296		Realtek HD Audio ...	Realtek Semicon...				0:00:00.156	9		480,501,136	3,234	5
sidebar.exe	4316		Windows Desktop ...	Microsoft Corpora...	All CPU Meter		Running	0:03:18.324	11	199	1,274,982,27...	4,189,946	5
Connectify.exe	4532		Connectify	Connectify		32-bit		0:00:02.230	16	61	64,000,632,318	21,641	5
firefox.exe	4820	1.89	Firefox	Mozilla Corporation	Process Explorer - ...	32-bit	Running	0:12:58.101	30	260	2,783,606,72...	2,356,122	5
plugin-container.exe	6016		Plugin Container for...	Mozilla Corporation		32-bit		0:00:00.655	3		8,184,861,968	6,021	5
YahooMessenger.exe	4324		Yahoo! Messenger	Yahoo! Inc.	teen choo (teen_c...	32-bit	Running	0:02:34.877	45	681	1,665,982,83...	693,552	5
NeroExpress.exe	4468	1.51	Nero Express	Nero AG	Nero Express Ess...	32-bit	Running	0:00:43.914	12	862	194,438,877,...	93,608	5
POWERPNT.EXE	2420		Microsoft Office Po...	Microsoft Corpora...	Microsoft PowerP...	32-bit	Running	0:00:02.574	8		8,256,866,579	19,212	5
splwow64.exe	716		Print driver host for ...	Microsoft Corpora...				0:00:00.015	5		91,842,260	1,881	5
procexp.exe	5140		Sysinternals Proces...	Sysinternals		32-bit		0:00:00.265	1		852,726,313	7,271	5
procexp64.exe	5604	0.76	Sysinternals Proces...	Sysinternals	Process Explorer - ...		Running	0:00:05.397	7	567	17,933,104,518	24,188	5
FSCapture.exe	4612	0.76			FastStone Capture	32-bit	Running	0:00:00.156	1	61	371,995,672	3,719	5
RunUpd.exe	3816							0:00:01.435	7		7,754,924,055	13,241	5
UdaterUI.exe	4656		Common User Interf...	McAfee, Inc.		32-bit		0:00:00.343	7	42	41,883,851,673	3,310	5
shstat.exe	4724					32-bit		0:00:00.202	10	4	7,397,431,557	75,823	5
IAStorIcon.exe	4788		IAStorIcon	Intel Corporation		32-bit		0:00:00.514	12	3	5,136,935,715	7,757	5



Status Proses


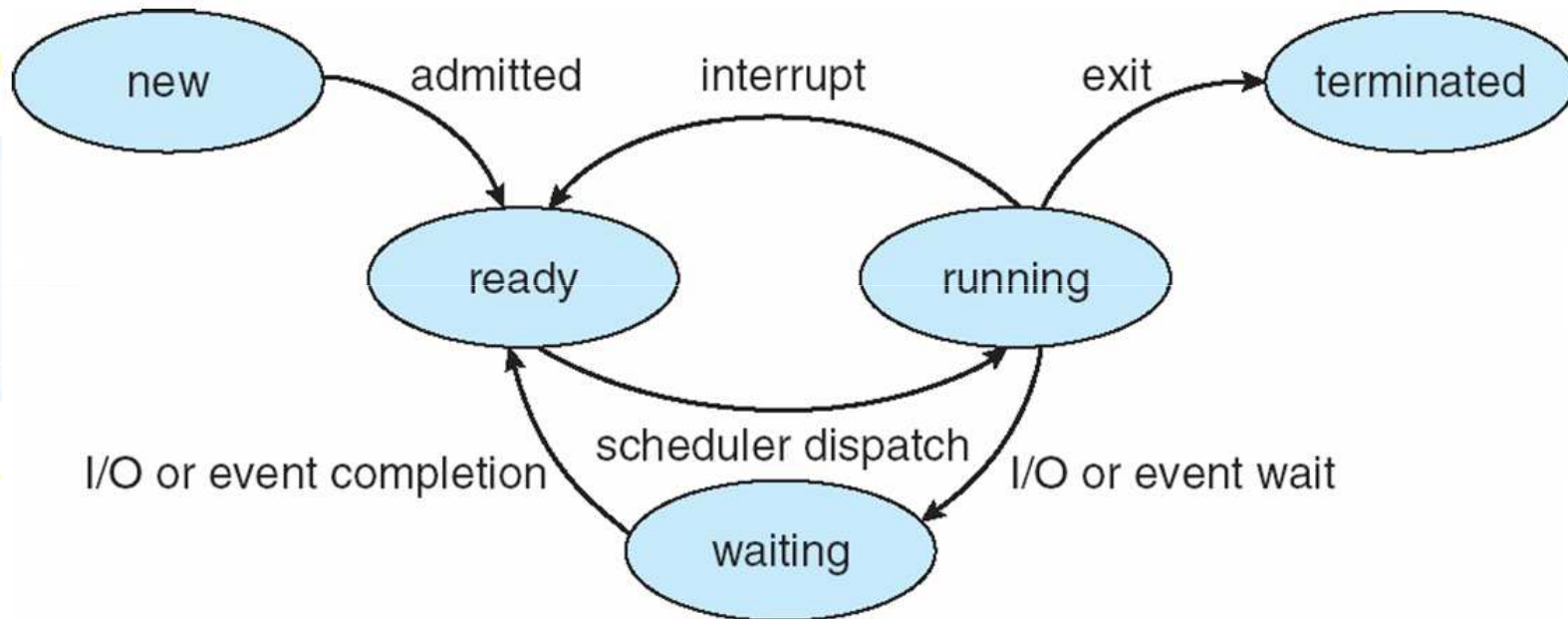
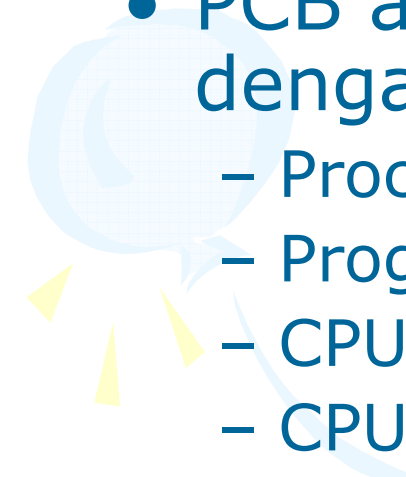

- **New:** pada saat proses pertama kali dibuat
 - **Running:** pada saat proses sedang dieksekusi
 - **Waiting:** proses menunggu suatu event lain (contoh: proses I/O)
 - **Ready:** proses siap untuk dieksekusi
 - **Terminated:** pada saat proses sudah selesai dieksekusi
- 

Diagram of Process State

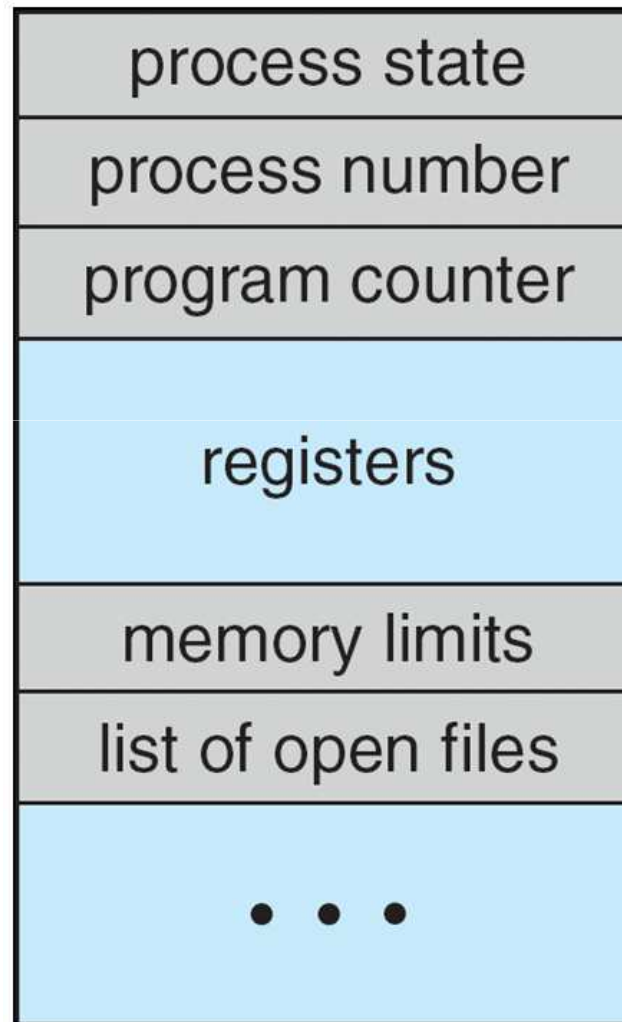




Program Control Block


- Setiap proses direpresentasikan kedalam sistem operasi oleh **PCB**
 - PCB adalah informasi yang berhubungan dengan proses:
 - Process state
 - Program counter
 - CPU registers
 - CPU scheduling information
 - Memory-management information
 - Accounting information
 - I/O status information, etc
- 
- 

Process Control Block (PCB)

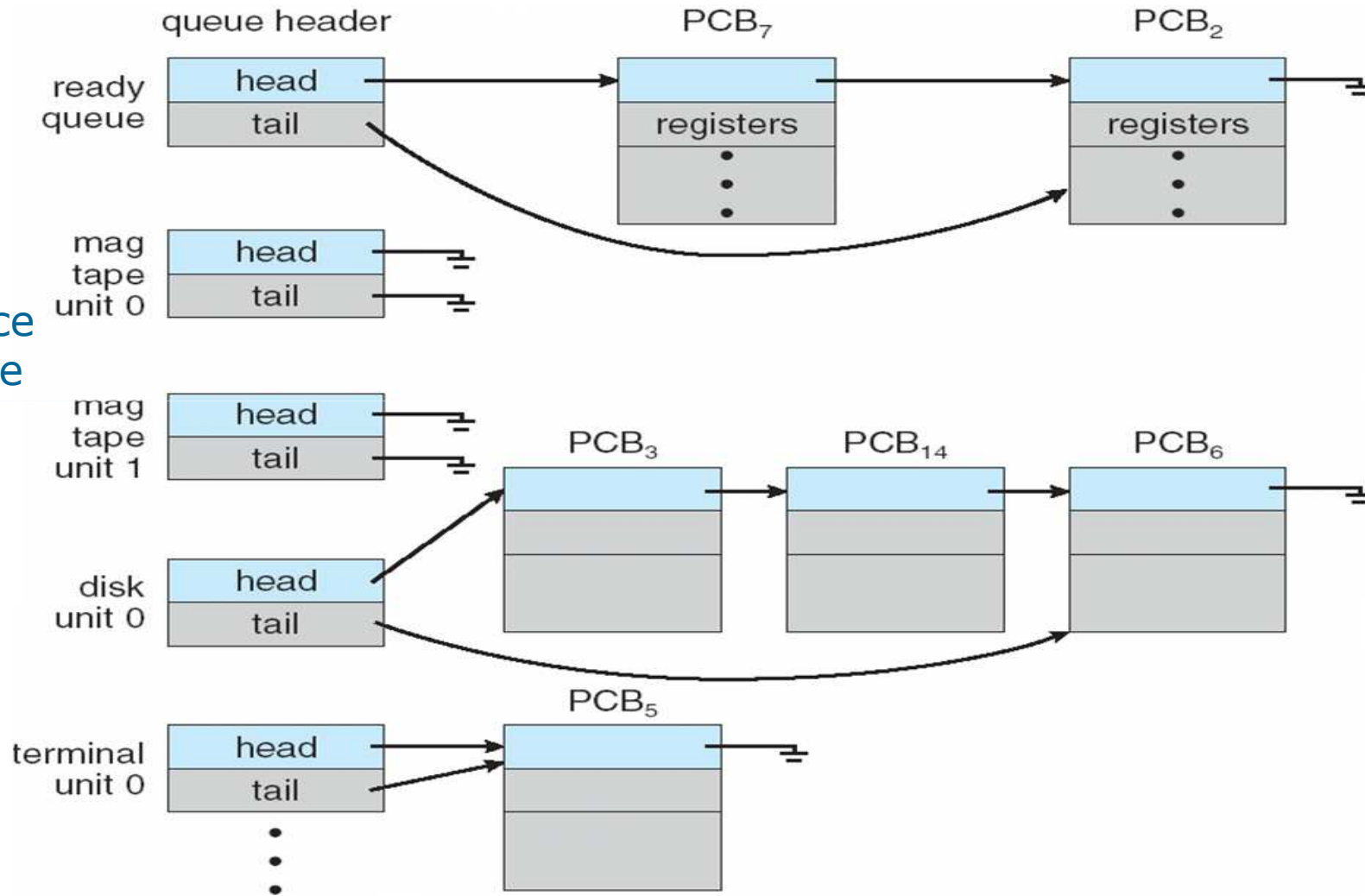




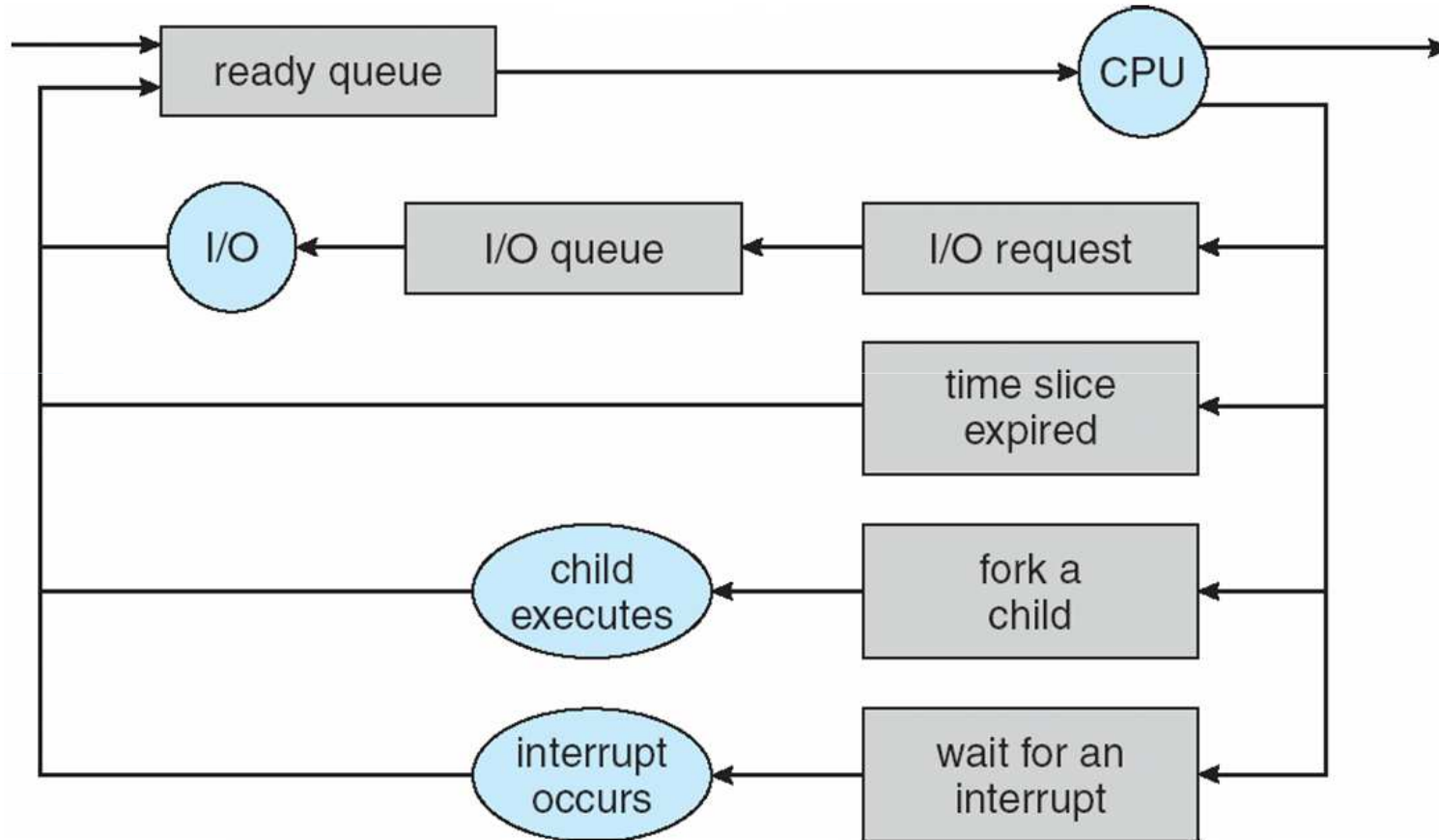
Penjadwalan Antrian Proses

- **job queue:** antrian ketika proses berada di CPU, siap dieksekusi
 - **ready queue:** antrian proses yang running pada memori utama, siap dan menunggu untuk masuk ke job queue
 - **device queue:** antrian bila proses tersebut menunggu siapnya peralatan I/O tertentu
 - Setiap proses bisa **berpindah** dari satu antrian ke antrian lain
- 

Ready Queue And Various I/O Device Queues

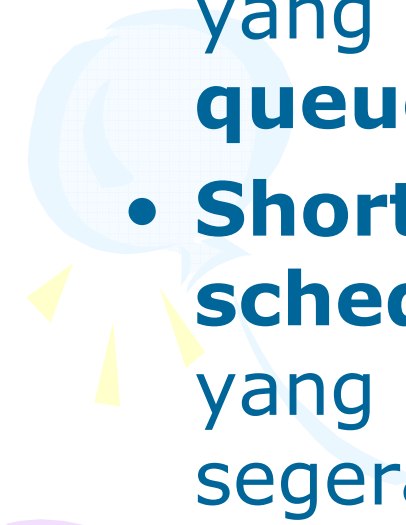



Representation of Process Scheduling



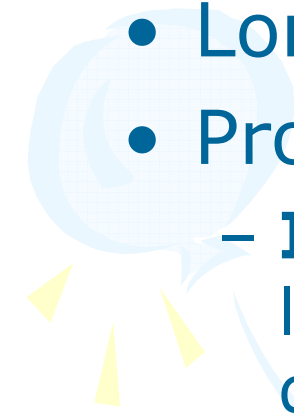
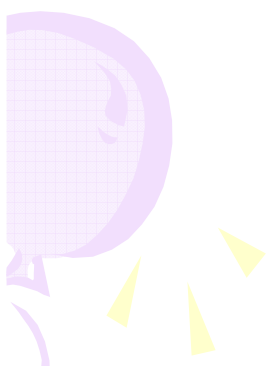


Penjadwal Antrian

- **Long-term scheduler (or job scheduler)**: menentukan proses mana yang harus dimasukkan ke dalam **ready queue**.
 - **Short-term scheduler (or CPU scheduler)**: menentukan proses mana yang selanjutnya akan **dieksekusi** dan segera mengalokasikan CPU (masuk ke **job queue**)
- 
- 



Scheduler

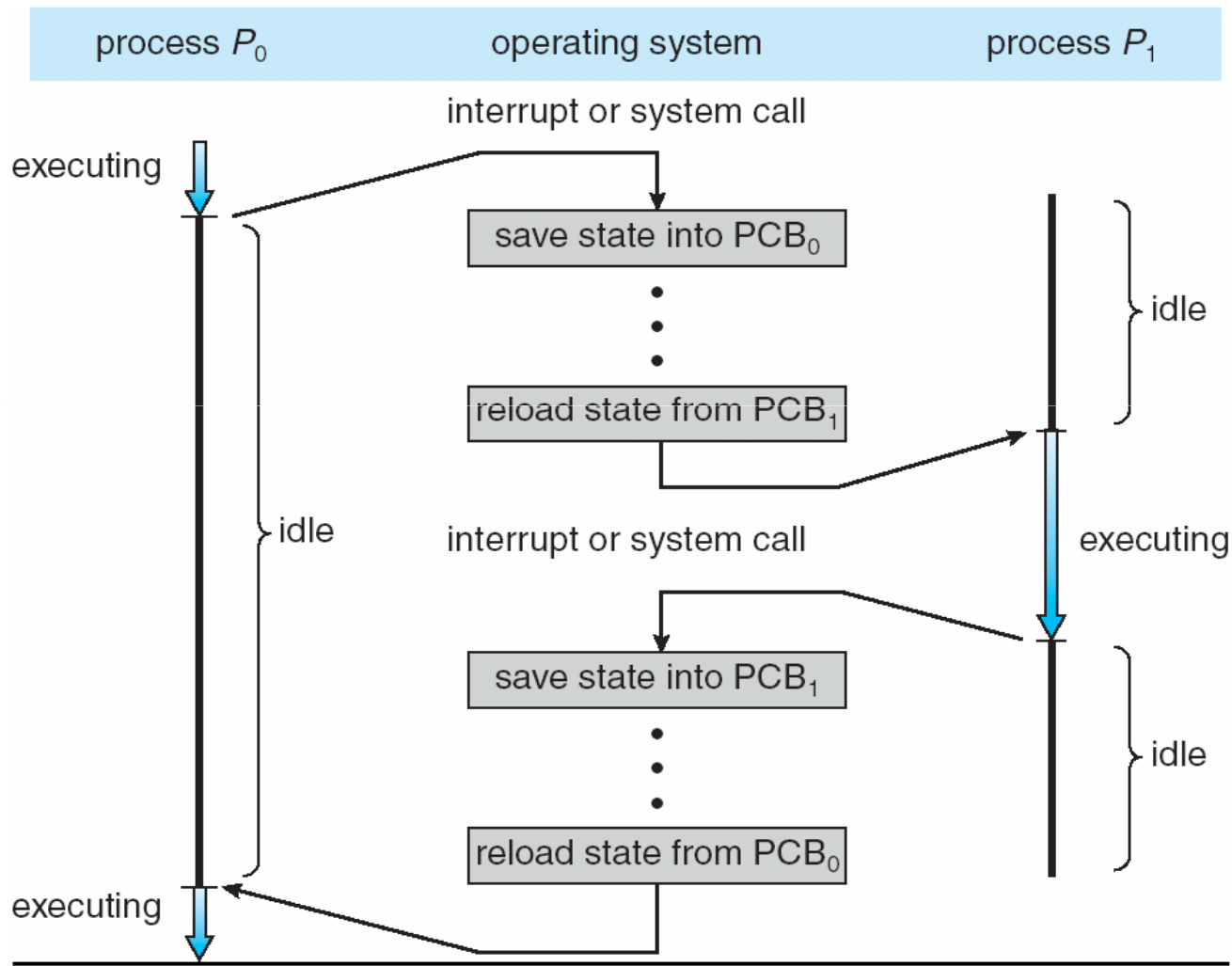
- Short-term scheduler lebih **sering** dikerjakan
 - Long-term scheduler **jarang** dikerjakan
 - Proses dapat juga dibagi atas 2 macam :
 - **I/O-bound process** – menghabiskan waktu lebih banyak untuk mengerjakan I/O daripada di CPU (short CPU bursts)
 - **CPU-bound process** – jarang melakukan permintaan I/O, menggunakan lebih banyak waktunya di CPU (long CPU bursts)
- 
- 



Context Switch

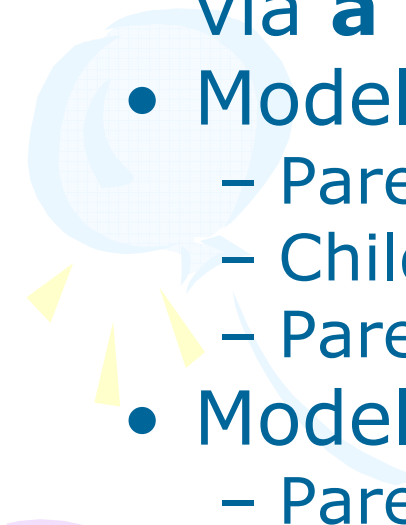

- Pada saat CPU beralih ke proses lain, sistem harus **menyimpan state** dari proses lama dan **mengambil state** dari proses yang baru => **context switch**
- Context-switch time is **overhead**; the system **does no useful work** while switching
- **Time dependent** on hardware support

CPU Switch From Process to Process




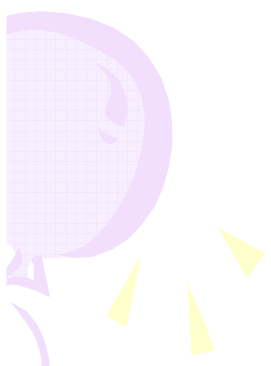


Process Creation

- **Parent** process can create **children** processes
 - Generally, process identified and managed via a **process identifier (pid)**
 - Model Resource sharing
 - Parent and children share **all resources**
 - Children share **subset** of parent's resources
 - Parent and child share **no resources**
 - Model Execution
 - Parent and children execute **concurrently**
 - Parent **waits until children terminate**
- 
- 

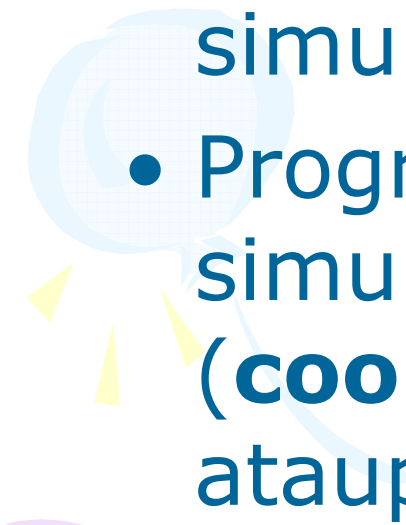
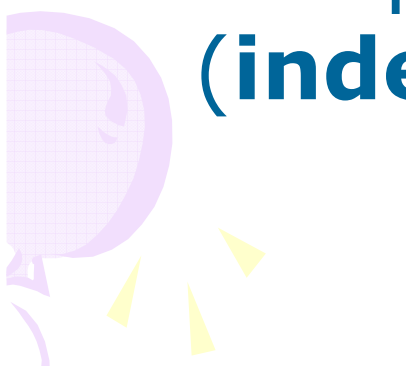


Process Termination Model

- Process mengeksekusi perintah terakhir dan meminta OS untuk menghapusnya (**exiting**)
 - Sumber daya proses tersebut **didealokasi** oleh OS
 - Parent akan men-terminate eksekusi child dengan paksa (**abort**), karena
 - Child telah menghabiskan resources
 - Task yang ditugaskan pada child sudah selesai
 - Jika parent melakukan exiting
 - Beberapa OS tidak memperbolehkan child untuk melanjutkan kegiatannya
 - All children terminated - **cascading termination**
- 
- 



Komunikasi antar proses

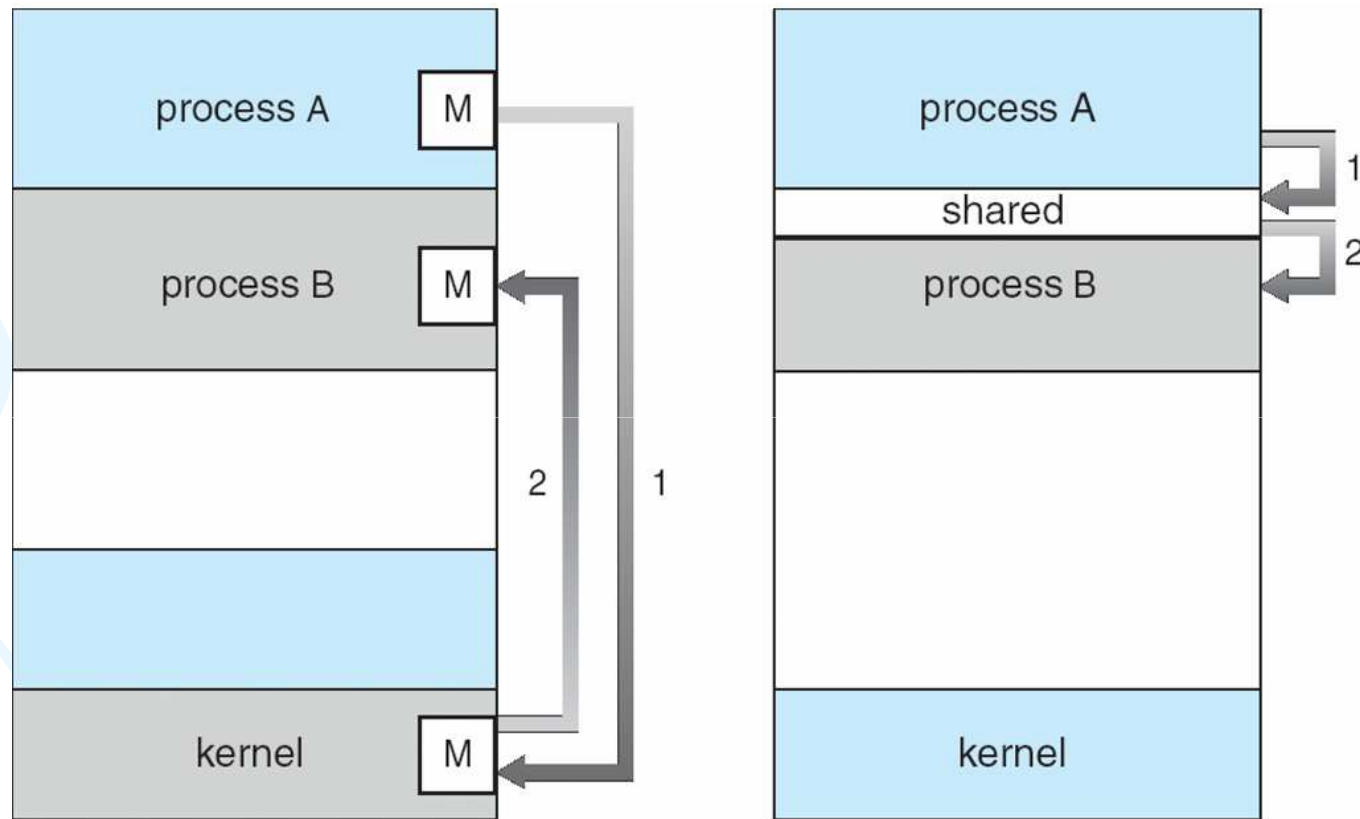
- Sistem operasi kebanyakan menjalankan program secara simultan (**concurrent**).
 - Program yang dijalankan secara simultan itu dapat bekerja sama (**cooperating**) dengan proses lain ataupun bekerja sendiri (**independent**)
- 
- 



Alasan Cooperating Process

- **Information Sharing**
- **Computation Speed-up**
- **Modularity**
- **Convenience** : mudah, concurrent

Communications Models



(a)

(b)

a. Message Passing

b. Shared

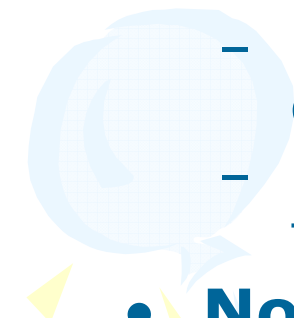
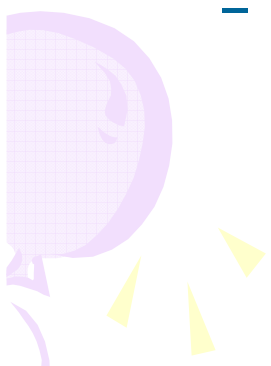


Communication

- IPC melakukan dua operasi:
 - **send**(*message*) – message size fixed or variable
 - **receive**(*message*)
- Jika *P* dan *Q* ingin berkomunikasi, mereka harus:
 - establish a *communication link* between them
 - exchange messages via send/receive




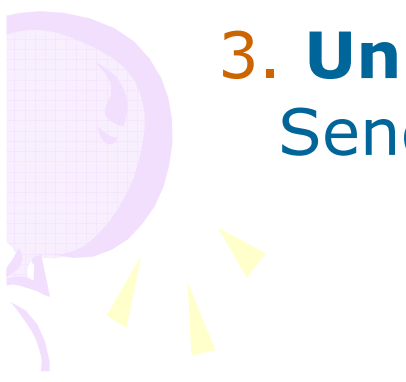
Synchronization on communication

- Communication may be either **blocking** or **non-blocking**
 - **Blocking** is considered **synchronous**
 - **Blocking send** : sender memblok sampai message diterima
 - **Blocking receive** : receiver memblok sampai message tersedia
 - **Non-blocking** is considered **asynchronous**
 - **Non-blocking** : setelah mengirim, sender melanjutkan kegiatannya, tidak perlu menunggu message diterima
 - **Non-blocking** receiver menerima message baik valid ataupun tidak (null)
- 
- 



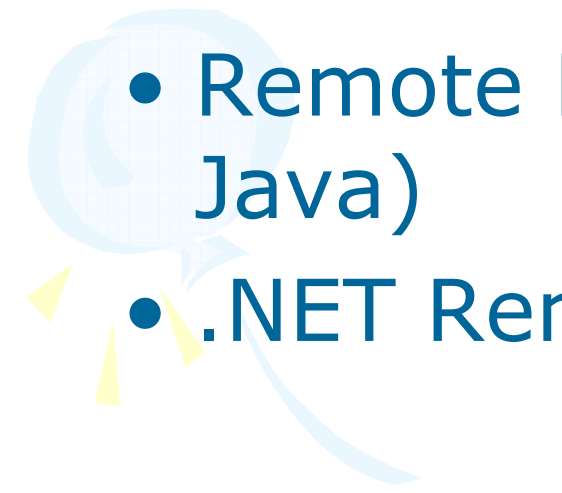
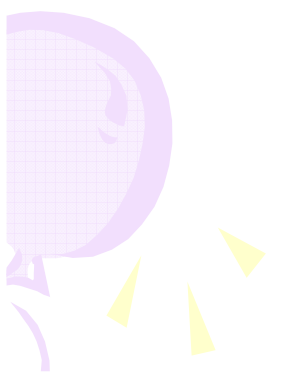
Message Buffering

- Antrian message yang ditempatkan pada link; diimplementasikan dengan:

1. **Zero** capacity – 0 messages
Sender must wait for receiver -> no buffer
 2. **Bounded** capacity – finite length of n messages
Sender must wait if link full
 3. **Unbounded** capacity – infinite length
Sender never waits
- 
- 

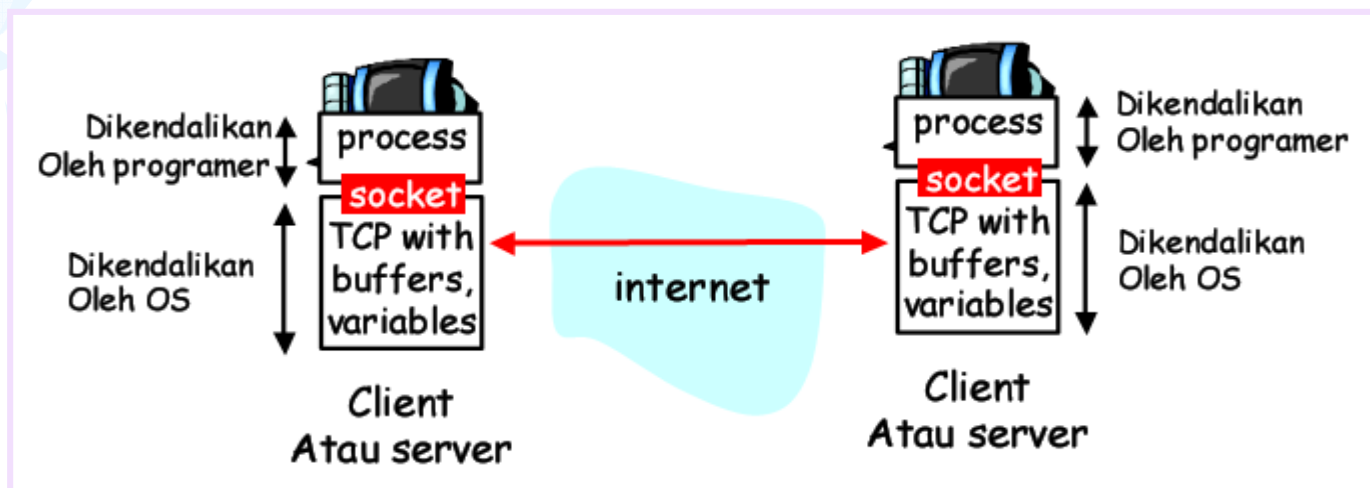


Communications in Client-Server Systems

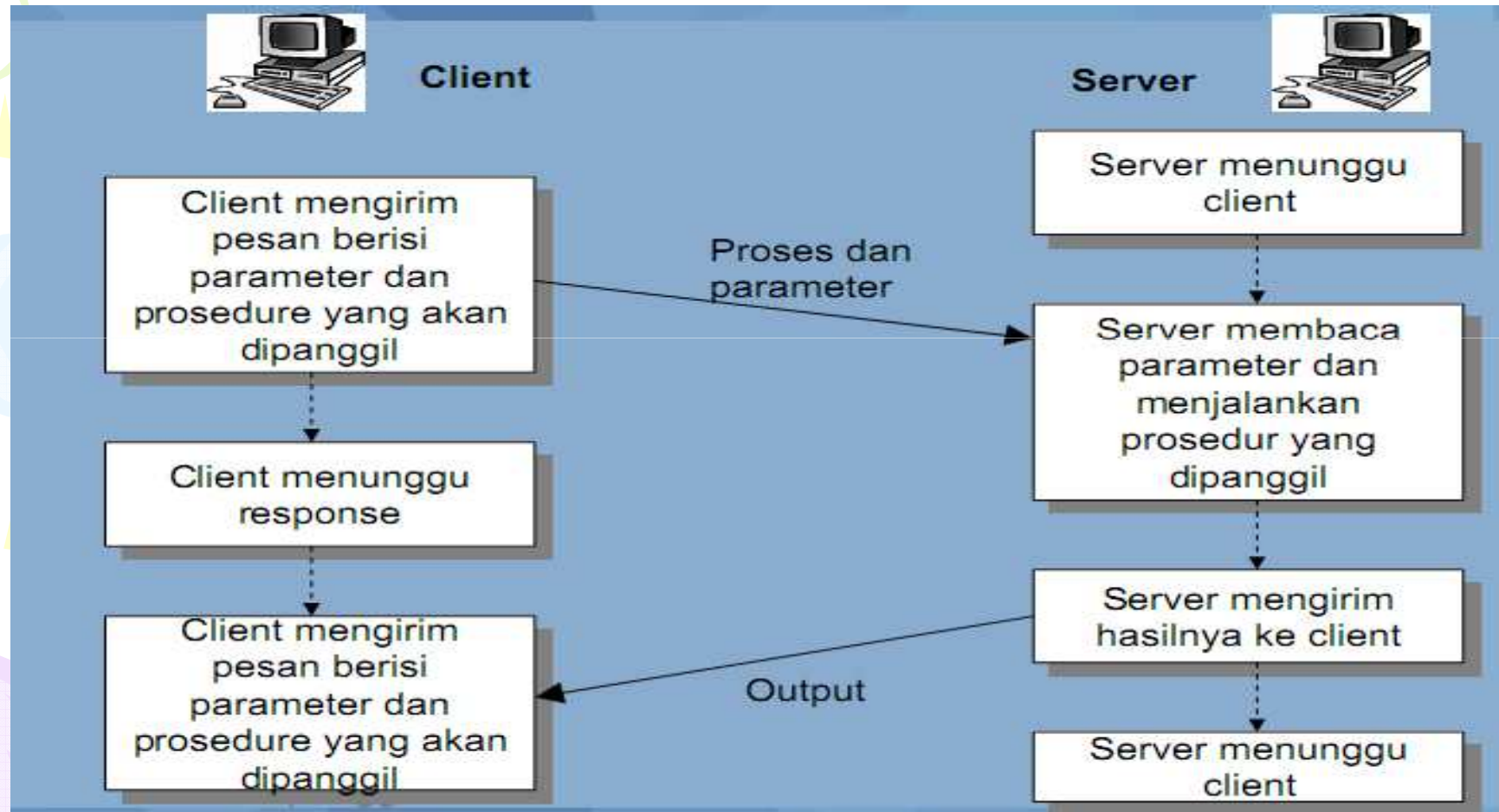
- Sockets
 - Remote Procedure Calls (RPC)
 - Remote Method Invocation (RMI Java)
 - .NET Remoting
- 
- 

Sockets

- Sebuah programming interface yang memungkinkan proses untuk saling berkomunikasi ke proses lainnya
- The socket **161.25.19.8:1625** refers to port **1625** on host **161.25.19.8**
- Communication consists between a pair of sockets

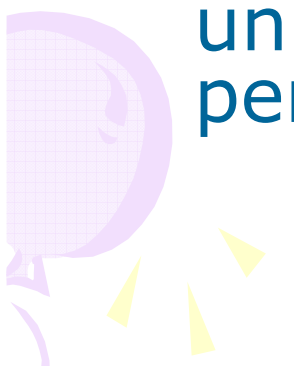


Client - Server



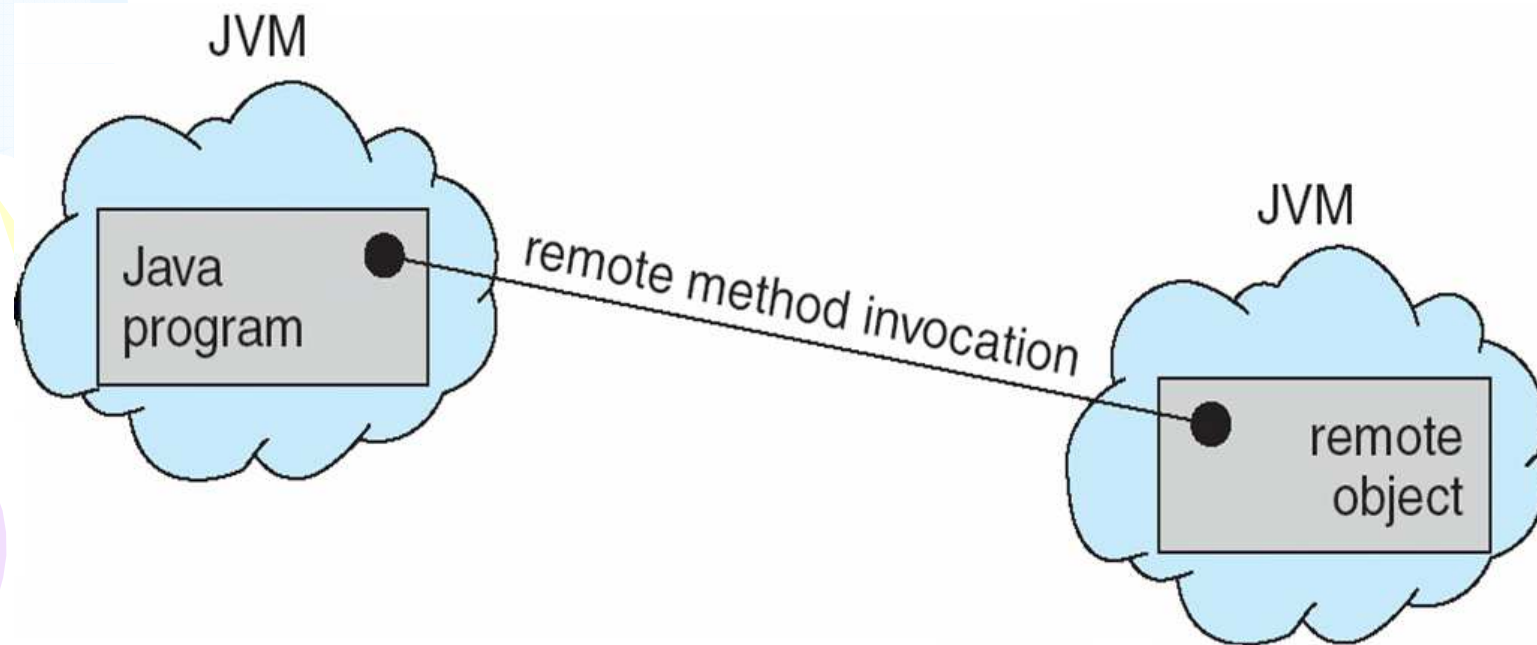


Remote Procedure Calls

- Remote procedure call (RPC) mengabstraksikan procedure calls antara processes pada **jaringan komputer**
 - **Stubs** – client-side proxy for the actual procedure on the server
 - **Skeleton** – server side proxy
 - The client-side stub locates the server and *marshalls* the parameters
 - The server-side stub receives message, unpacks the marshalled parameters, and performs the procedure on the server
- 

Remote Method Invocation

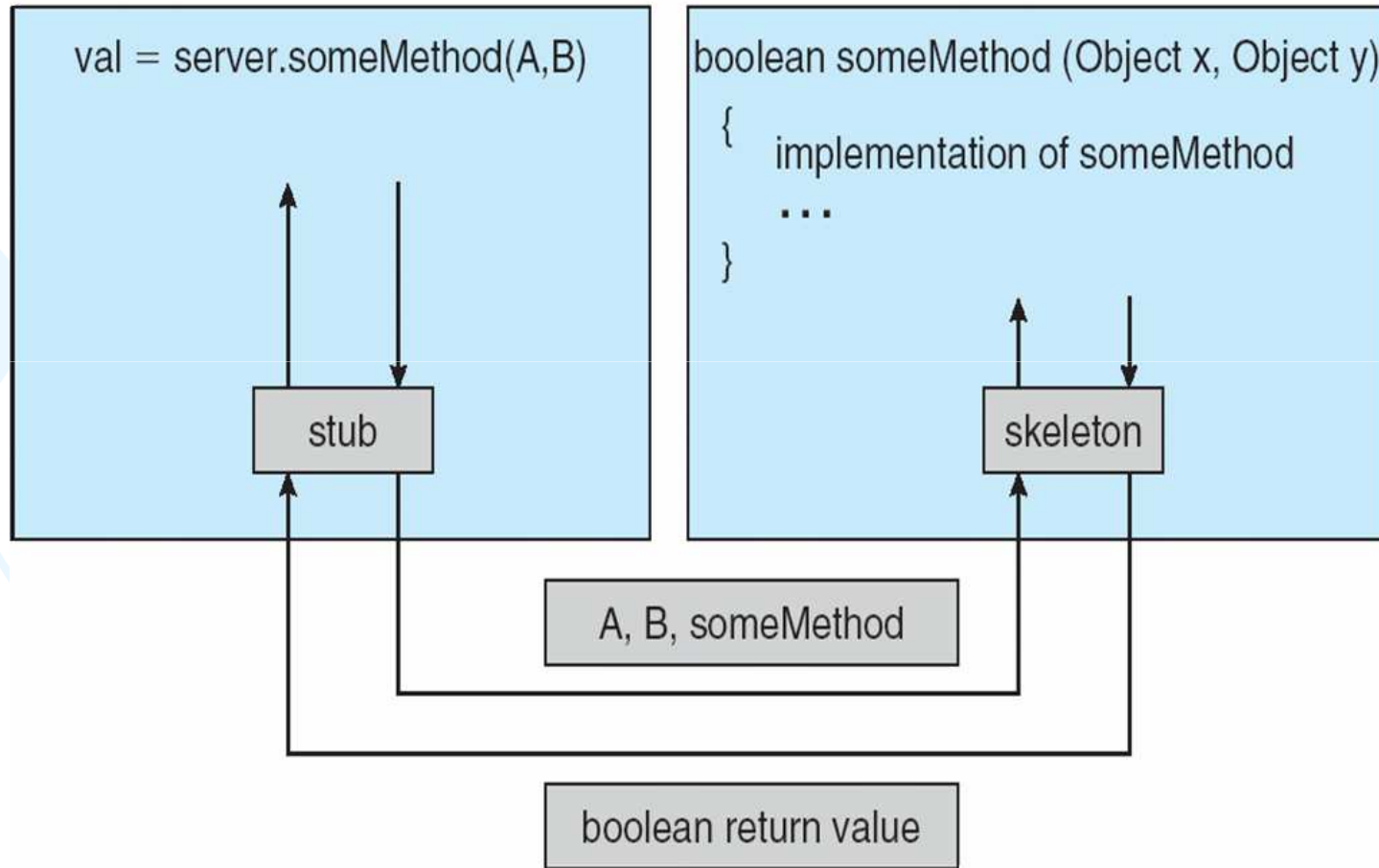
- Remote Method Invocation (RMI) is a Java mechanism similar to RPCs
- RMI allows a Java program on one machine to invoke a method on a remote object



Marshalling Parameters

client

remote object



NEXT

- Threads

