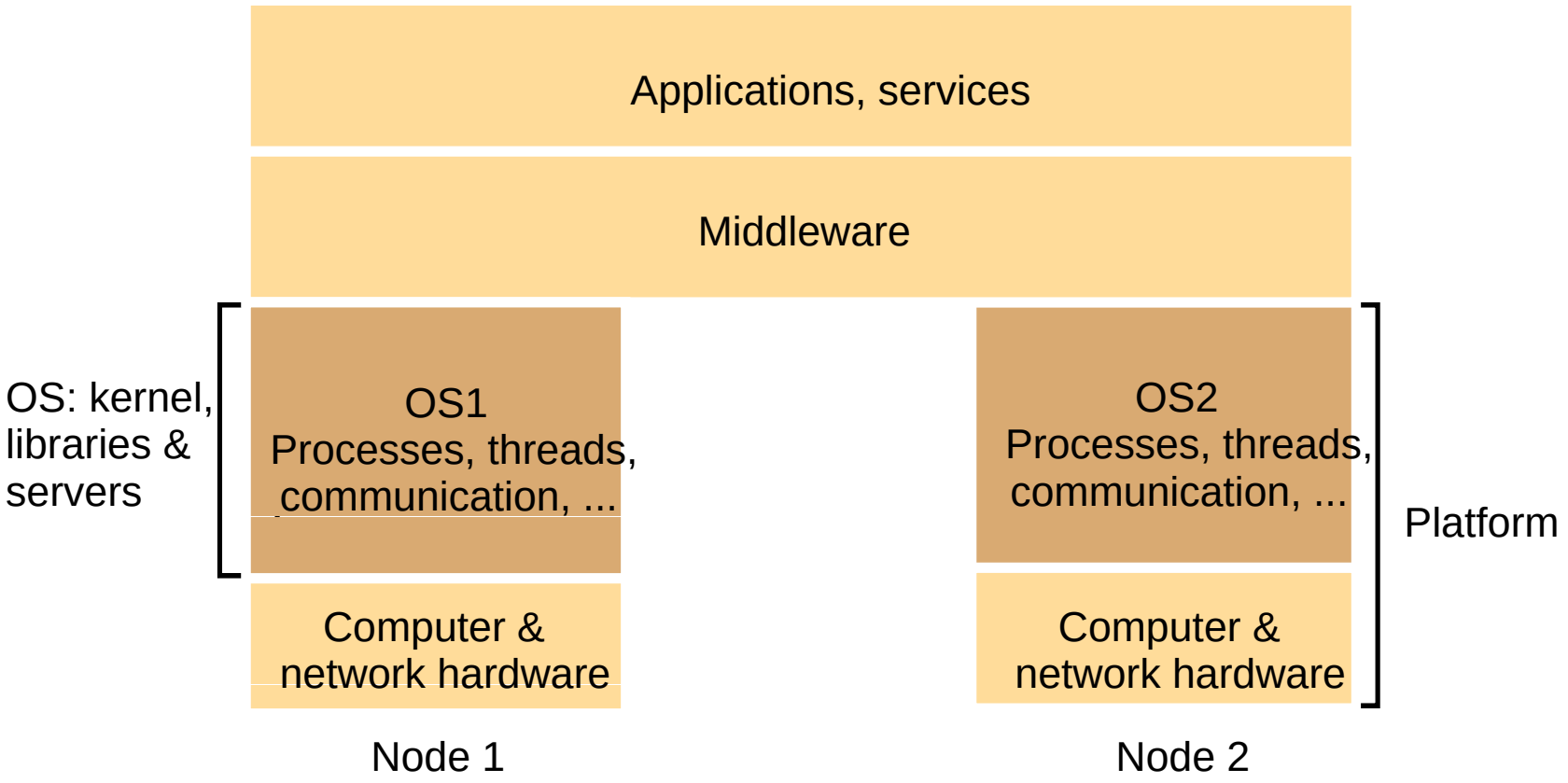
Sistem Terdistribusi

Sistem Operasi Terdistribusi

Peran sistem operasi

- Menyediakan abstraksi **kontrol sumber daya fisik** bagi user
- Manajemen **resource**
- Menyediakan **sistem call** terhadap sumber daya baik fisik / non fisik
  - Dalam bentuk API
    - Win 32 api, POSIX api, Java api, .NET api
- Jenis OS:
  - Desktop OS
  - Network OS
  - Mobile OS
  - Distributed OS

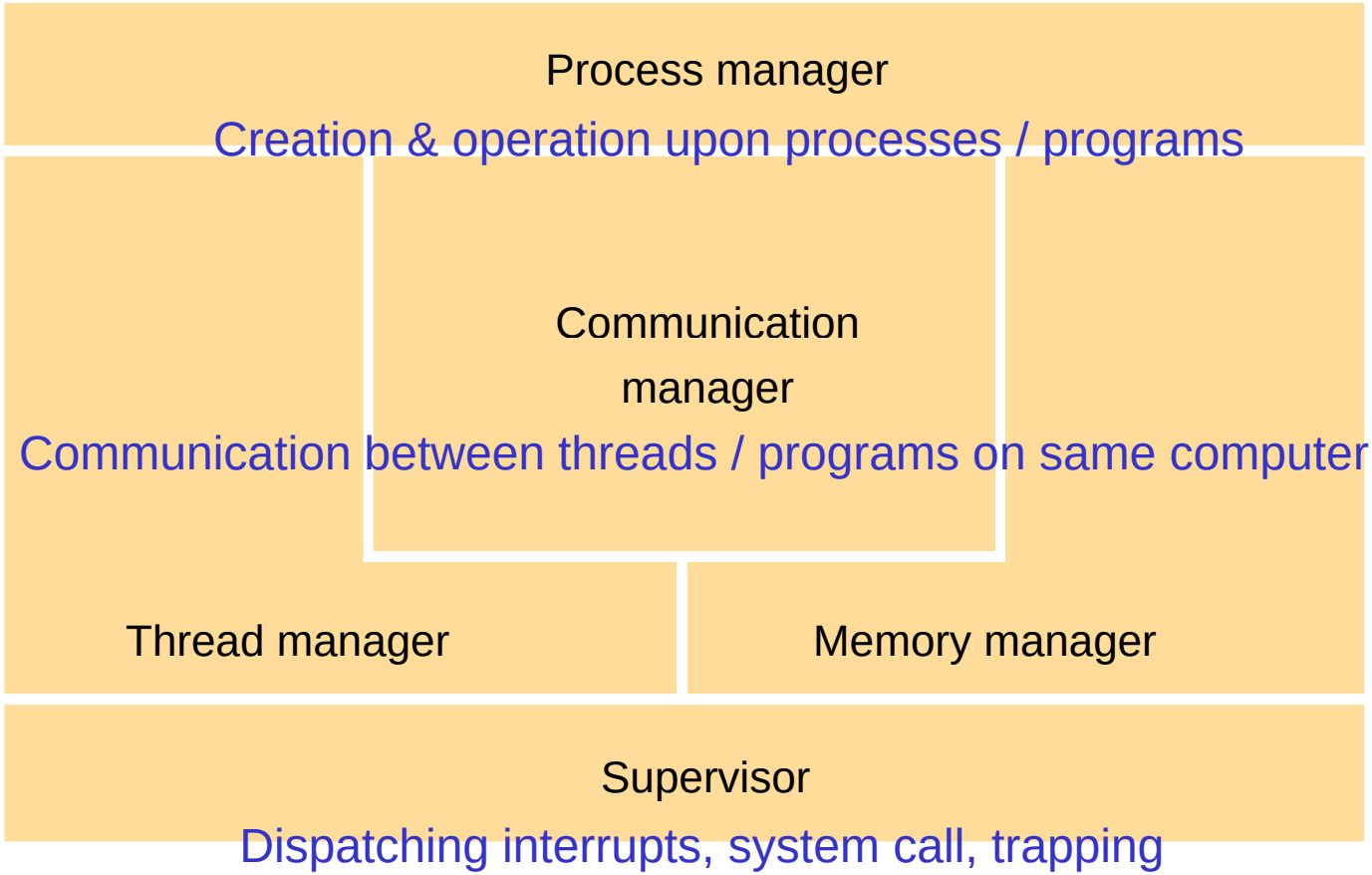
System layers



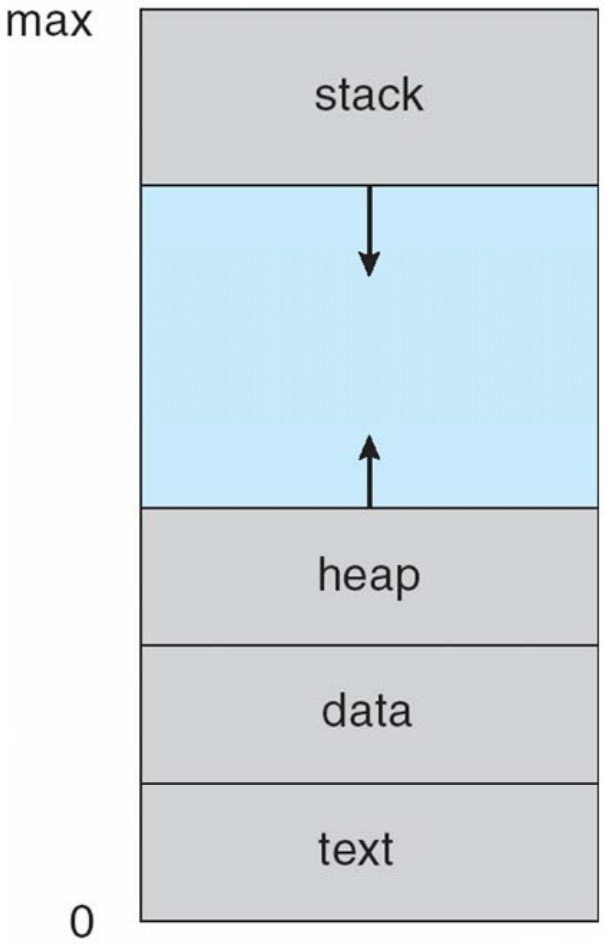
OS Tasks

- Raise the **programming interface** for resources to a more useful level:
  - By providing **abstractions / encapsulation** of the basic resources such as:
    processes, virtual memory, files, communication channels
  - **Protection** of the resources used by applications
  - **Concurrent processing** to enable applications to complete their work with minimum interference from other applications
- **Provide** the resources needed for (distributed) services and applications to complete their task:
  - **Communication -** network access provided
  - **Scheduling -** processors scheduled at the relevant computers

Core OS functionality

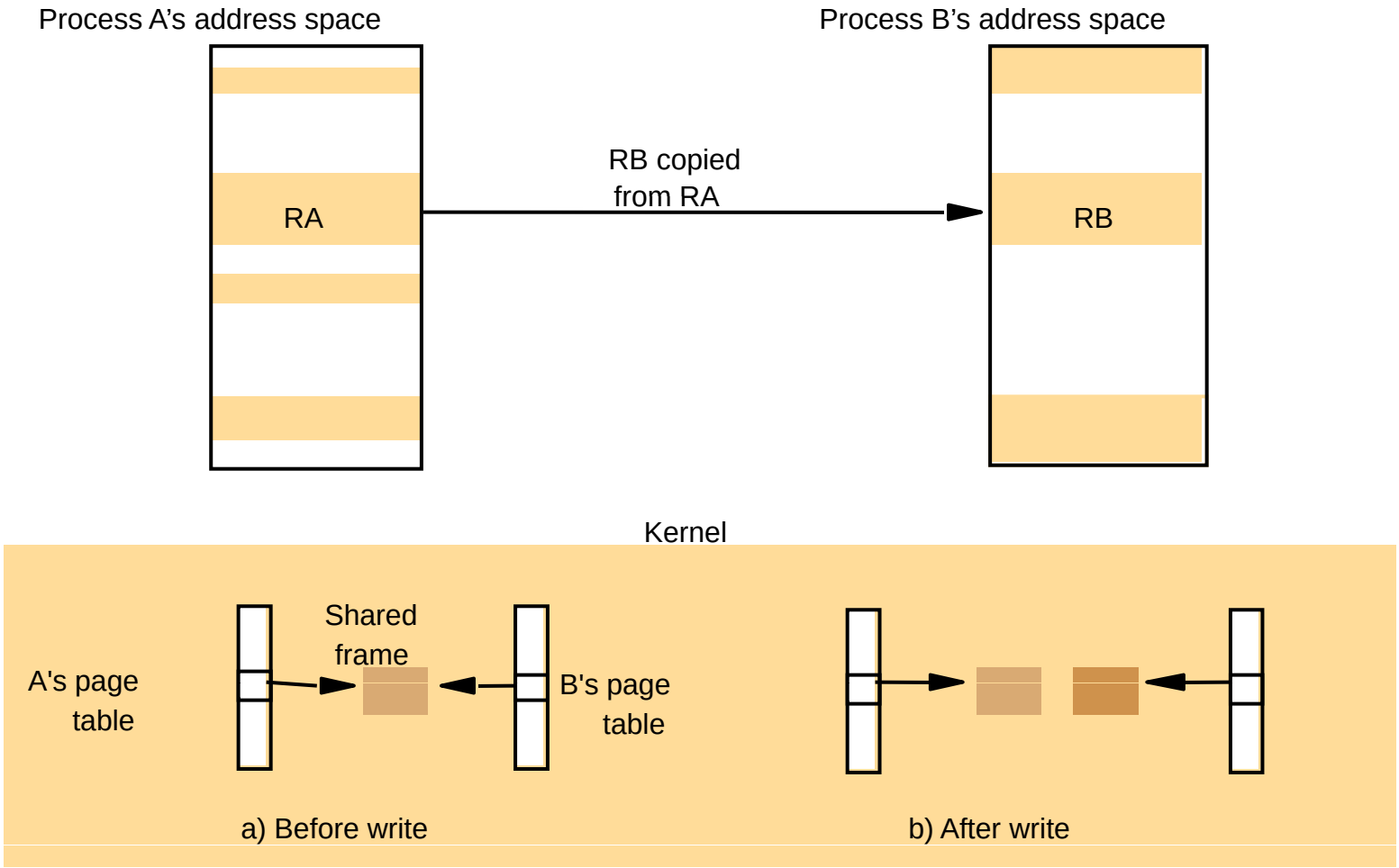


Process address space



- Memory's regions can be shared
  - kernel code
  - libraries
  - shared data & communication
  - stack / heap
  - **copy-on-write system**
- Files can be mapped to memory
  - Virtual memory system

Copy-on-write



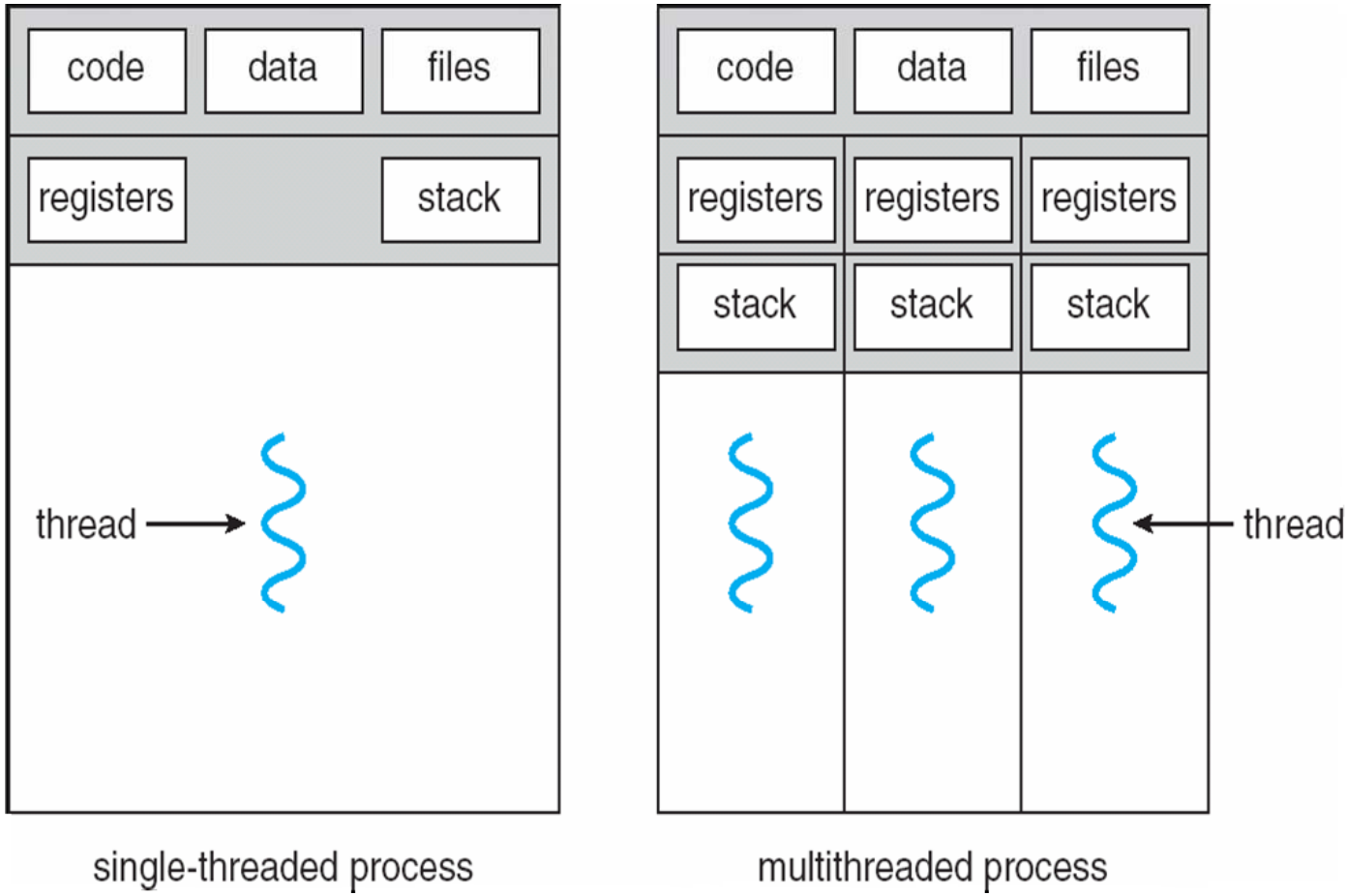
Copy on Write

- Region RA dan RB merupakan sharing memori dengan teknik **copy-on write** antara dua proses A dan B
- Ketika proses B hendak menulis ke share memory, maka akan terjadi **memory protection page fault,** sehingga akan mengalokasikan frame baru dari hasil duplikasi frame asli sehingga akan terdapat 2 page frame
- Data bisa dishare tanpa “merusak” data masing-masing jika ada penulisan / pengupdate-an

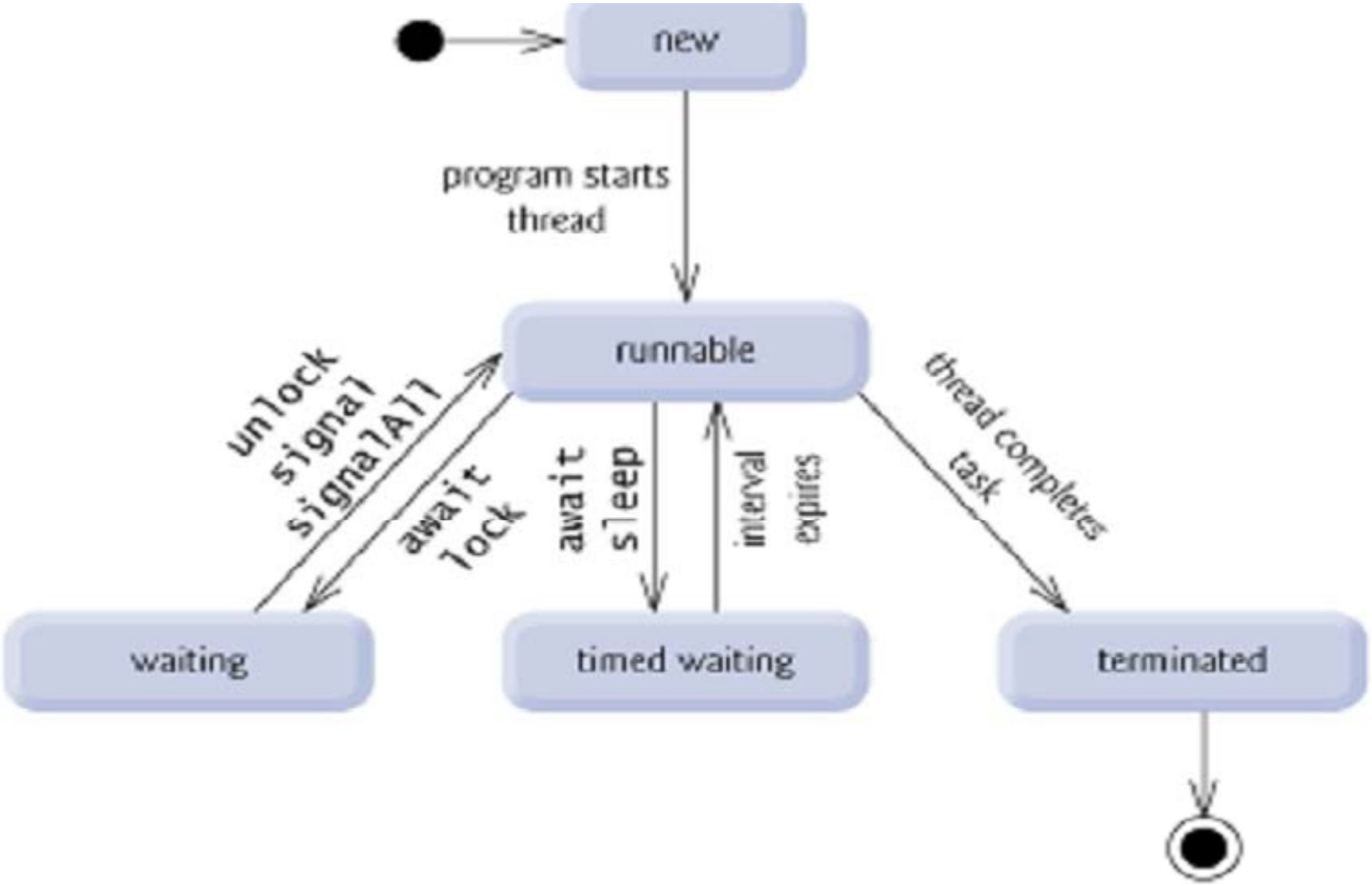
Thread

- Thread = **Lightweight Process**
- Thread = **satuan dasar** penggunaan CPU
- Pembuatan Thread dilakukan oleh:
  - **Kernel Thread** – lebih lambat
  - **User Thread** – lebih cepat, berbasis API
- Kernel juga digunakan dalam Distributed OS
  - Menggunakan konsep **multithreading**

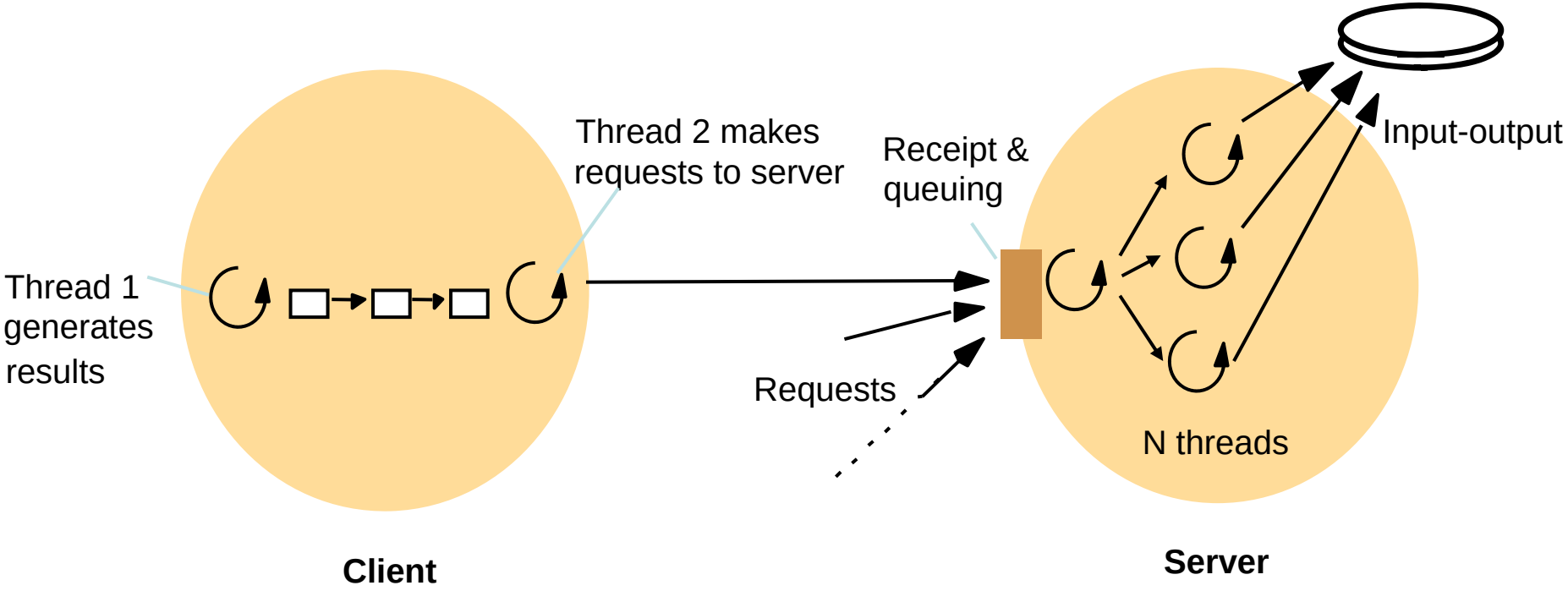
Single and Multithreaded Processes



Thread Life Cycles

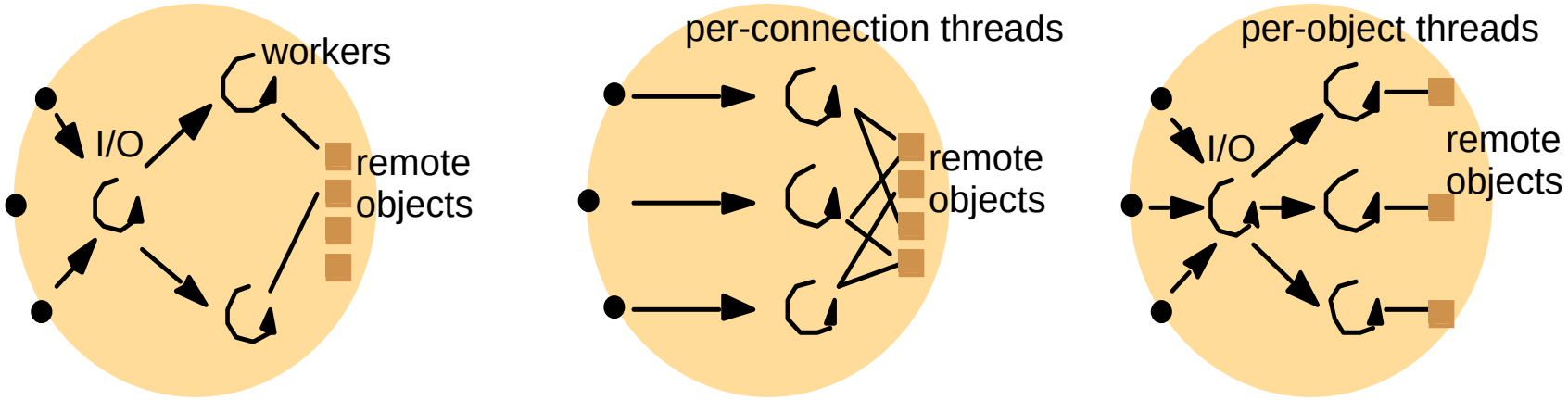


Client and server with threads



The threads 'worker pool' architecture on server

Alternative server threading architectures – remote object



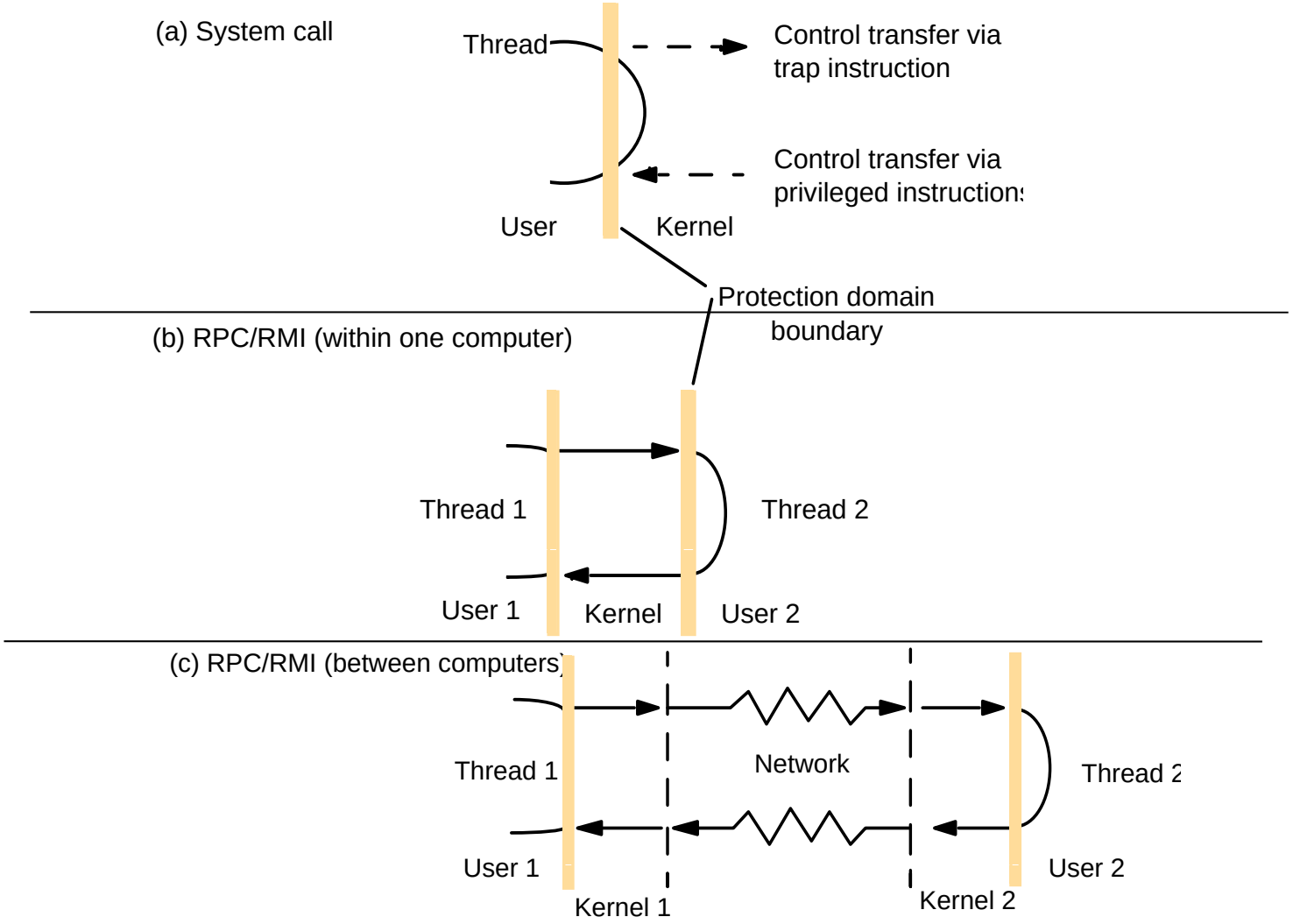
a. Thread-per-request

b. Thread-per-connection

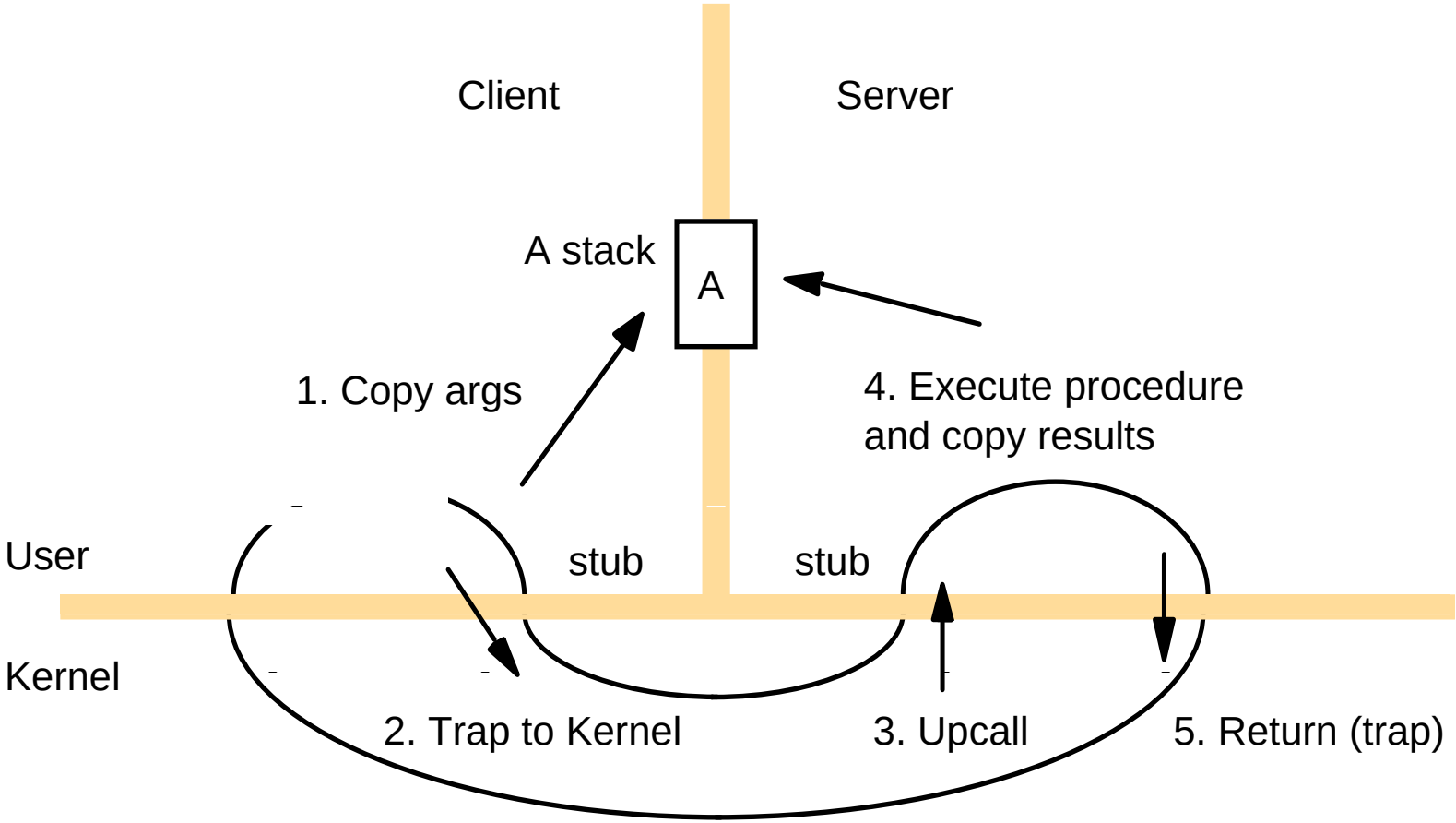
c. Thread-per-object

Implemented by the server-side ORB in CORBA

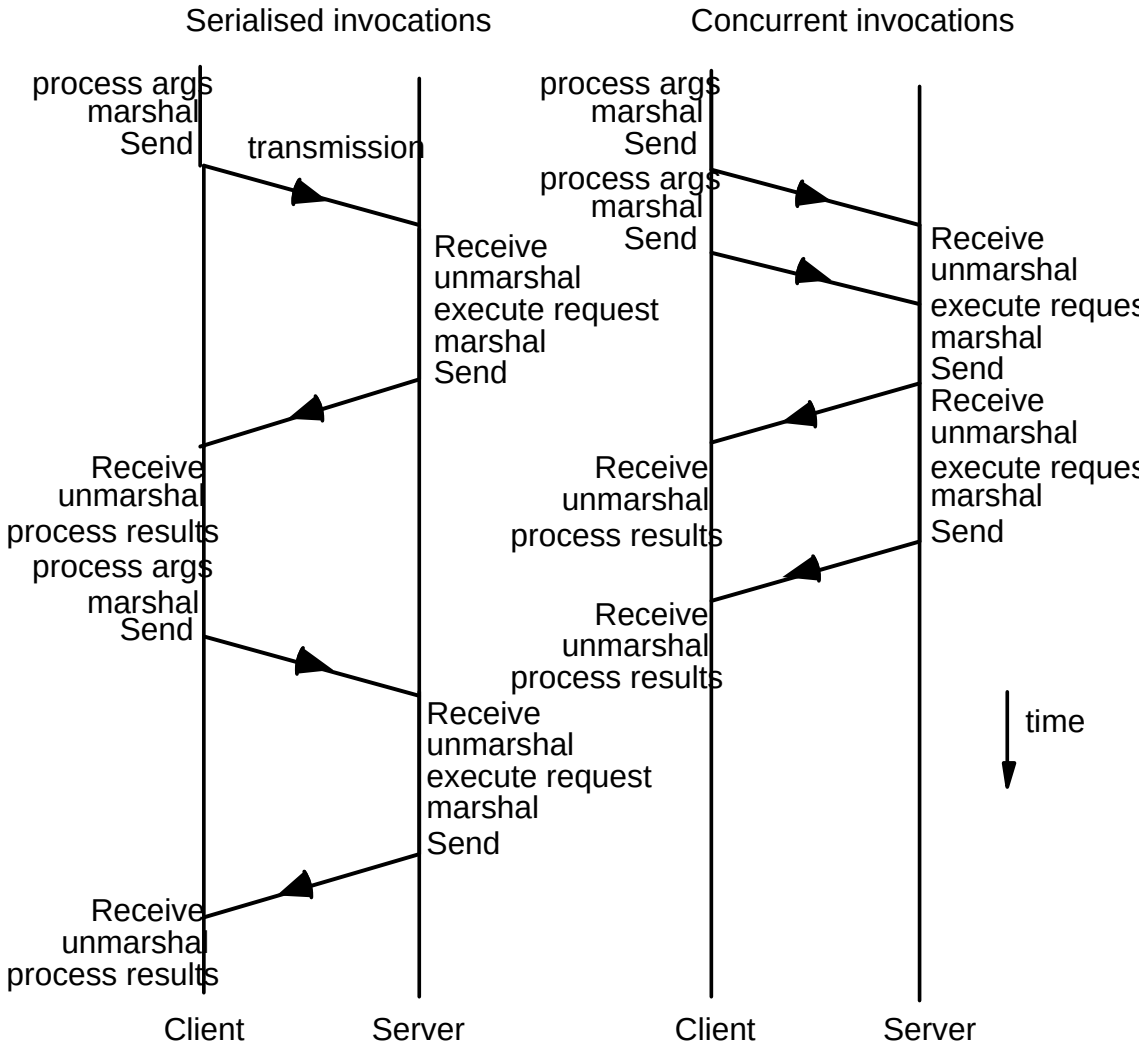
Invocations between address spaces



remote procedure call in OS prespective



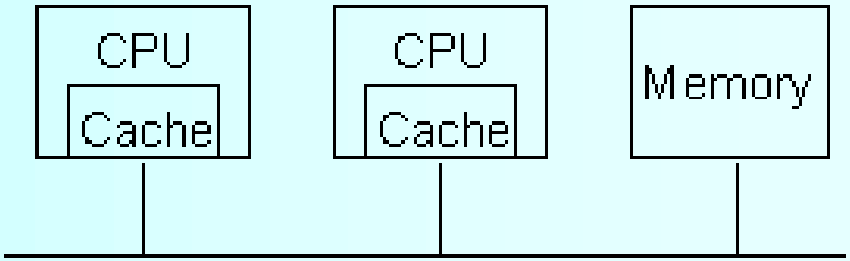
Times for serialized and concurrent invocations



Arsitektur Model Prosesor

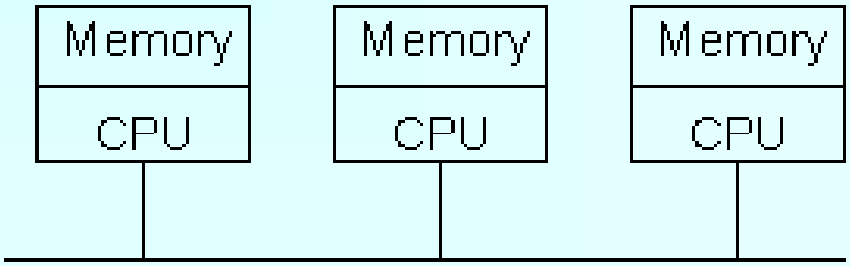
- Multiprocessors
  - Tightly coupled.
  - Shared memory.

Parallel architecture



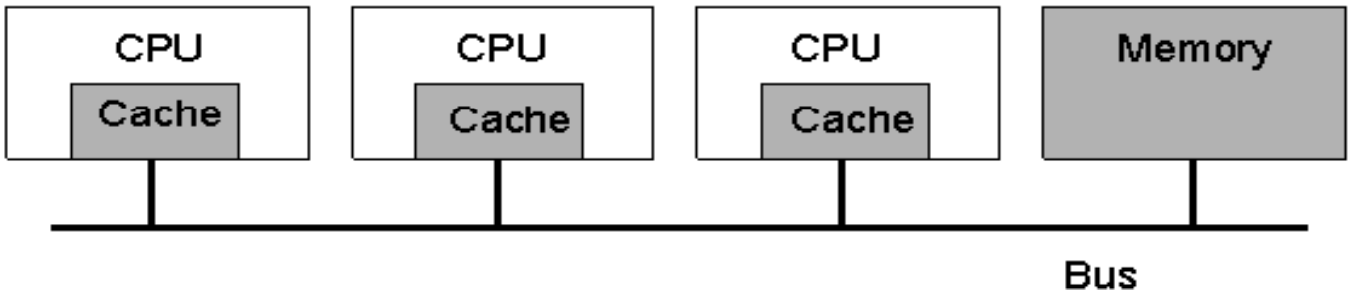
- Multicomputers.
  - Loosely coupled.
  - Private memory.
  - Autonomous.

Distributed architecture



Univprocessor vs Multiprocessors

- Uniprocessor has **only one** processor for OS
- Multiprocessor
  - Memory: could be shared or be private to each CPU
- Data is sent by bus-based multiprocessor**.**



Uniprocessor Operating Systems

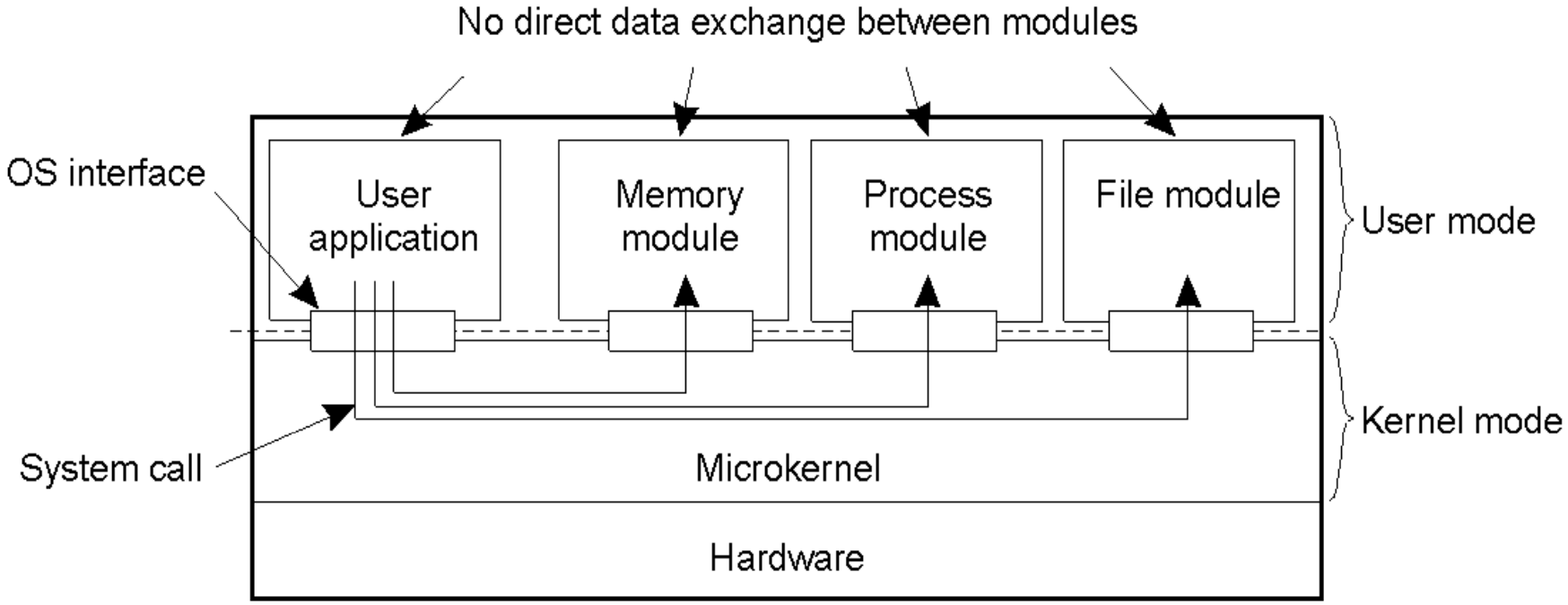
- An OS acts as a **resource manager**
  - Manages CPU, I/O devices, memory
- OS provides a **virtual interface** that is easier to use than **hardware**

- Structure model of uniprocessor operating systems, can be:
  - **Monolithic** (e.g., MS-DOS, early UNIX)
    - One large kernel that handles everything
  - **Micro Kernel**
    - Only essential kernel function, otherwise in user space

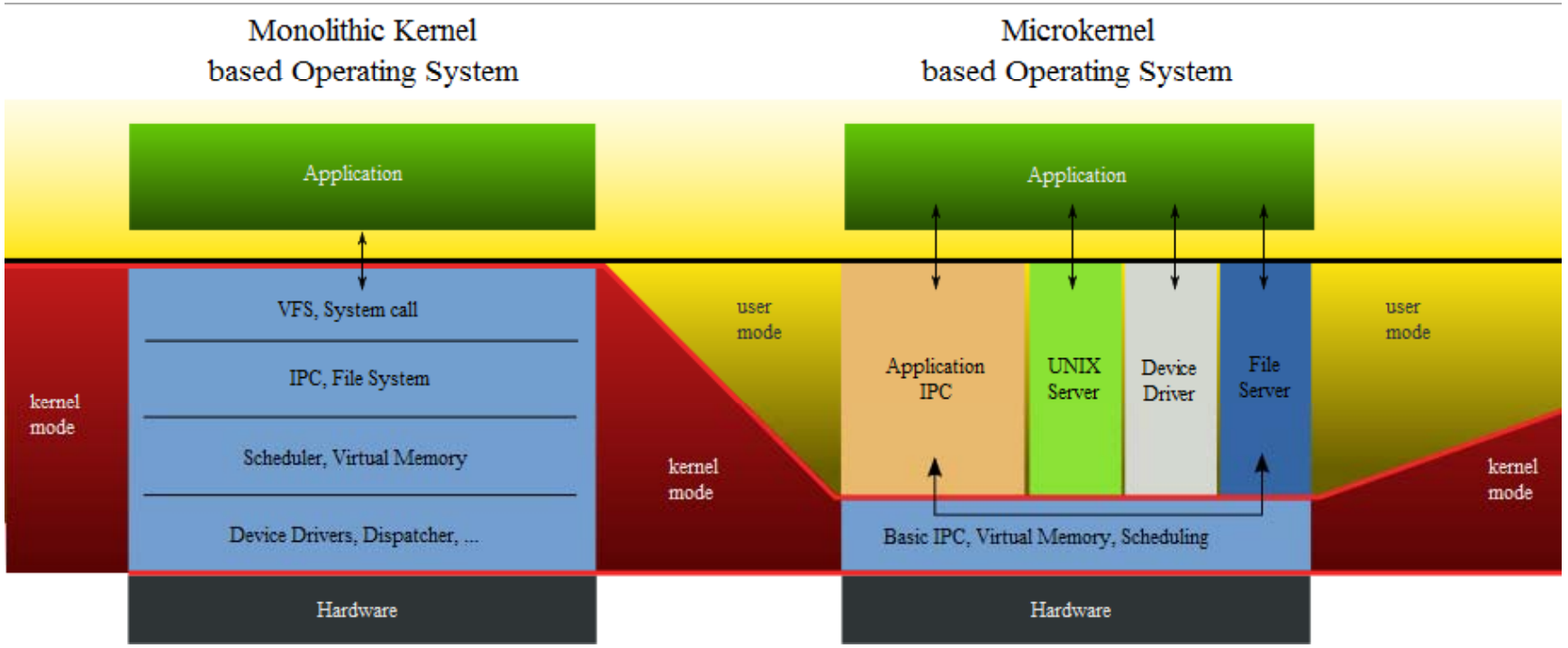
Uniprocessor Operating Systems

Microkernel architecture

- **Small kernel**: interprocess coomunication, low level I/O, memory, process management & scheduling
- **user-level** implement **additional functionality**



Monolithic vs Microkernel



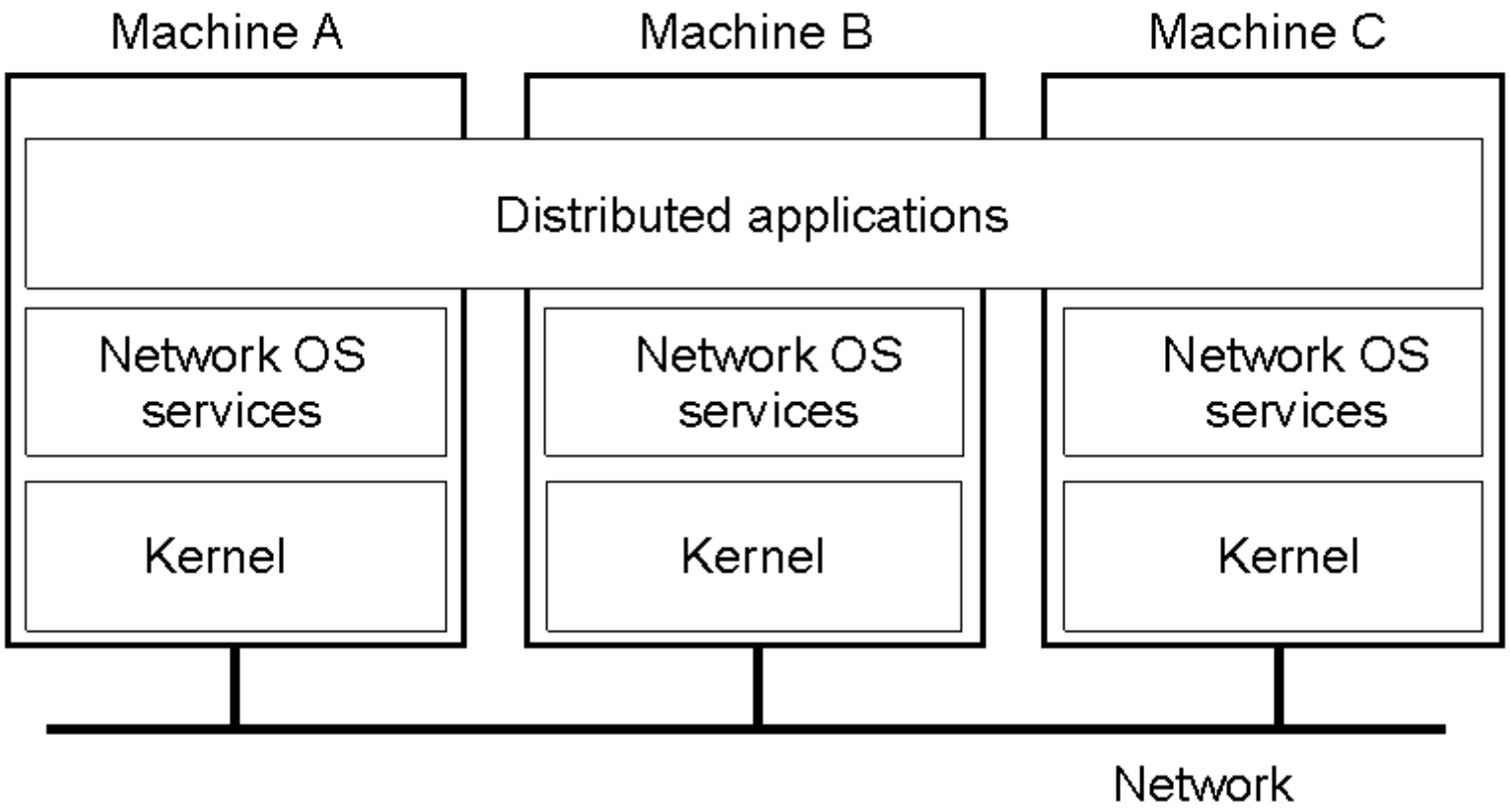
Jenis OS selain Uniprocessor OS

- Multiprocessor OS
  - Looks like a virtual uniprocessor, contains only one copy of the operating system, communication via shared memory, single run-queue
- Network OS
  - Does not look like a virtual uniprocessor, contains n copies of the operating system, communication via shared files, n run-queues
- Distributed OS
  - Looks like a virtual uniprocessor (more or less), contains n copies of the operating system, communication via messages, n run-queues

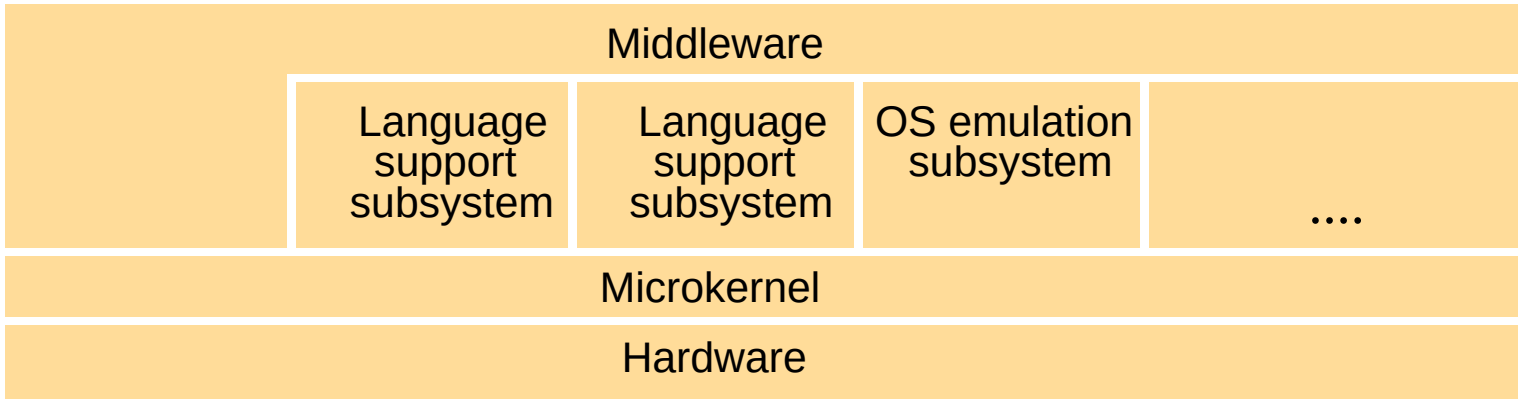
Network OS

- Setiap host menjalankan Sistem Operasi untuk mengatur sumber daya yang dimiliki nya termasuk mengakses sumber daya di jaringan
- It provides an environment where users are **aware** of the multiplicity of machines.
- Users can access remote resources by
  - **logging** into the remote machine OR
  - **transferring** data from the remote machine to their own machine
- Users **should know** where the required files and directories are and mount them.
- Each machine could act like a server and a client at the same time.
- Contoh OS: Windows 2000 dan Windows NT
- Contoh implementasi:
  - NFS (Network File System)
  - Samba – implementasi protokol SMB di Win & Linux

Network Operating System



NOS supports middleware



The microkernel supports middleware via subsystems

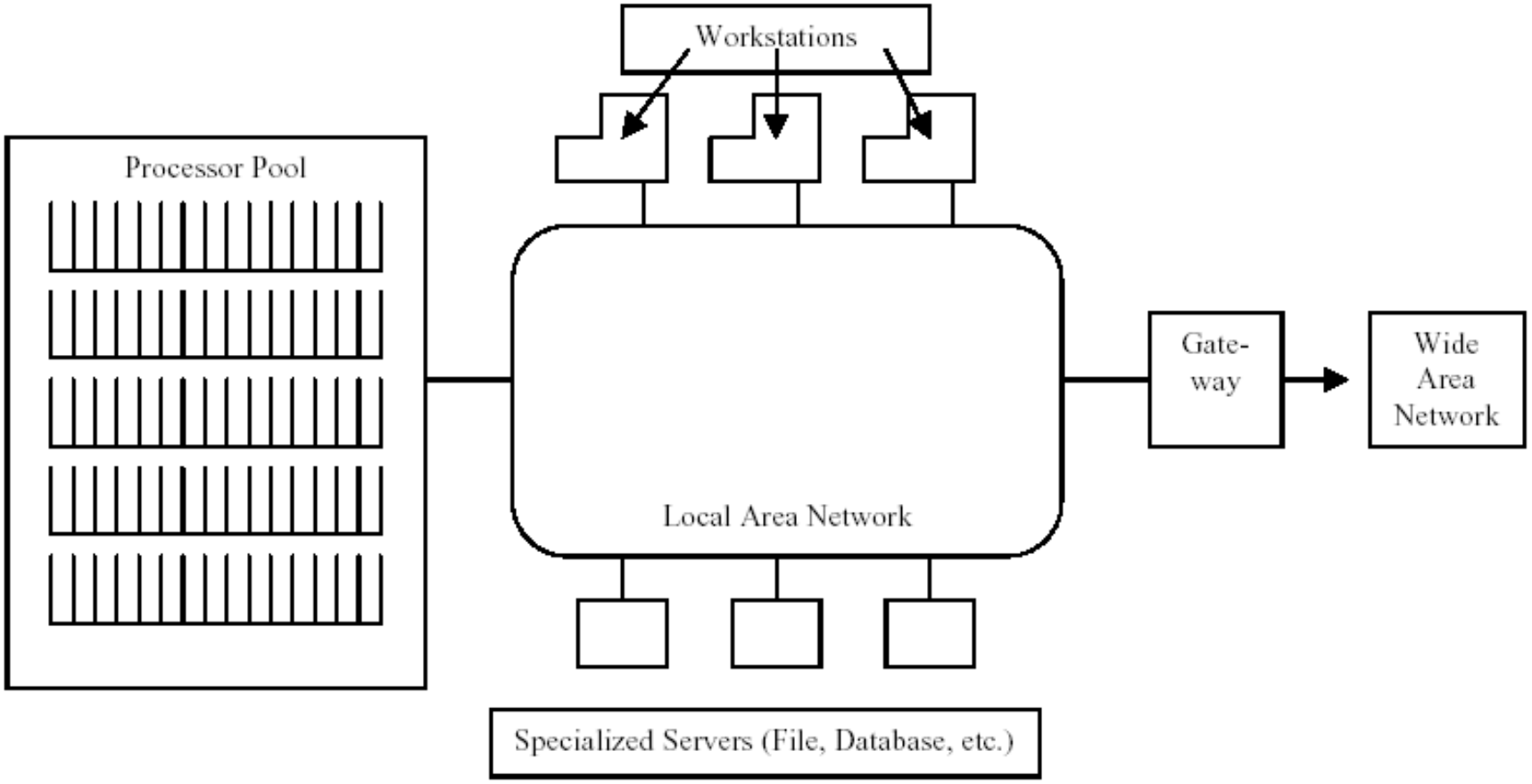
flexibility and extensibility

- services can be added, modified and debugged
- small kernel -> fewer bugs
- protection of services and resources is still maintained

Distributed Operating System

- Dapat memanajemen komputer-komputer dan membuat “mereka” **tampak** sebagai **single** komputer
- Dapat menjalankan proses di komputer lain **tanpa** mengetahui *siapa yang meresponnya*
- Manages resources in a distributed system
  - t**ransparently** to the user
- Looks to the user like a **centralized OS**
  - But operates on multiple independent CPUs
- Provides **transparency**
  - Location, migration, concurrency, replication,…
- Presents users with a **virtual uniprocessor**

DOS infrastructure



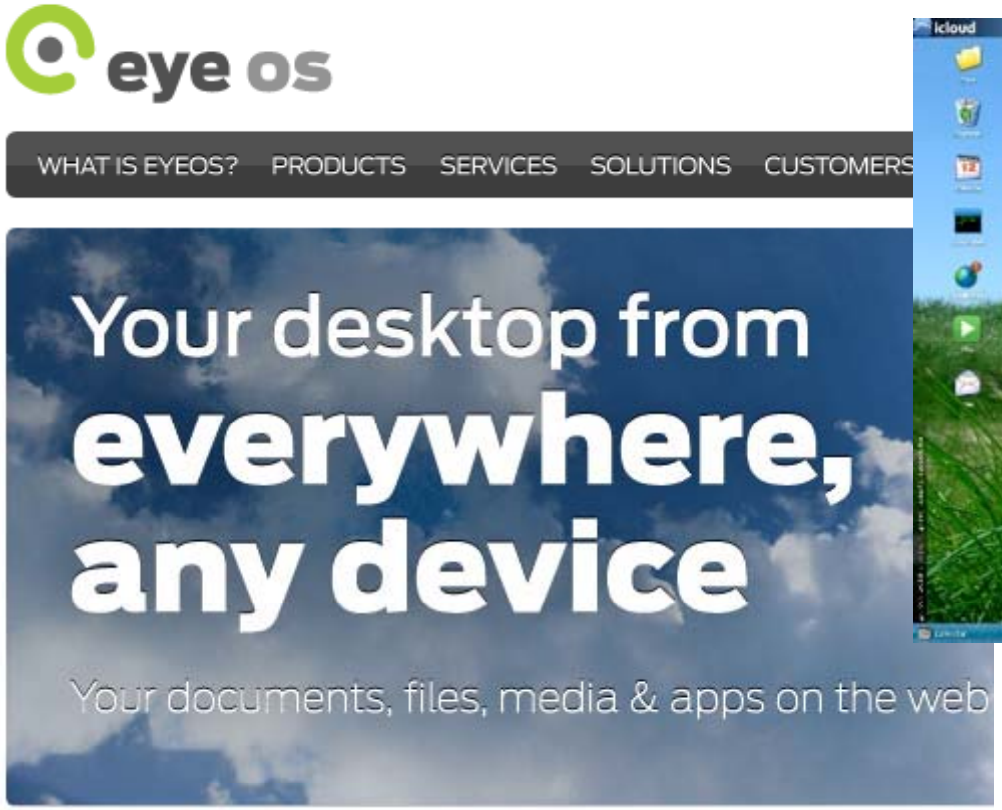
Keterangan DOS

- *Workstation* atau PC mengeksekusi proses yang memerlukan interaksi dari user seperti *text editor* atau window *manager*
  - Spesific task
- *Processor pool*:kumpulan prosesor, tiap unitnya biasanya terdiri dari prosesor, memori lokal, dan koneksi jaringan.
  - Tiap prosesor mengerjakan satu buah proses

Distributed OS

- Presents users (and applications) with an **integrated computing** platform that **hides** the individual computers.
- Has **control over all** of the nodes (computers) in the network and allocates their resources to tasks **without** user involvement.
  - In a distributed OS, the user **doesn't know** (or care) where his programs are running.
- Examples:
  - Amoeba (http://amoebaos.org)
  - EyeOS (www.eyeos.org)

More examples



ICloud

More Examples

G.HO.ST

jolicloud

Glide os

Daftar web OS

Name	Browser support	Developer	Engine	Free	License	3rd party applications	Productivity Suite	Graphical user interface	Downloadable to Web server
DesktopTwo	IE7	Sapotek	Flash	Yes (Beta)	Open Source AGPL	Yes	OpenOffice	Mac+Windows-like	No
Glide OS	IE7, Firefox 3, Safari, Chrome	TransMedia	Flash	Yes (30 GB limit)	Proprietary	From Glide Community	Glide Writer	Mac+Windows-like	No
eyeOS	IE6/7/8, Firefox2/3, Safari, Opera, Chrome	eyeOS Team	PHP + AJAX	Yes	Open Source: AGPL3	Yes	Yes	Customizable	Yes
G.ho.st	IE6+, Firefox2+, Safari. Partial: Chrome & Opera	Ghost Inc ("G.ho.st")	Flash + AJAX (mobile version is WAP)	No	Proprietary	Yes	Yahoo! Zimbra, Zoho, Google Docs, ILoveIM	Windows-like	No
icloud	IE 6/7/8, Firefox 3.5+, Mobile Version: all browsers, Chrome	Xcerion AB	AJAX	Yes	Proprietary	Yes	Zoho, proprietary email, calendar, IM	Windows-like	No
Netvibes	IE7, IE6 is supported, but not recommended, FF 1+, Safari 2+ Opera 9.02+, Google Chrome	Netvibes Team	? + Ajax	Yes	Proprietary	Yes	Yes	Tab-based	No
Online OS	FF 1.5 and higher, IE7	iCUBE Network Solutions	Java + Ajax	Yes	Proprietary	Yes	Yes	Windows-like	No
Spiral Universe	Firefox, Safari, IE, Chrome	Spiral Universe	Java + Ajax (GWT/Ext)	Yes (Bronze package)	Proprietary	No	Proprietary email, calendar, school software	Mac+Windows-like	No

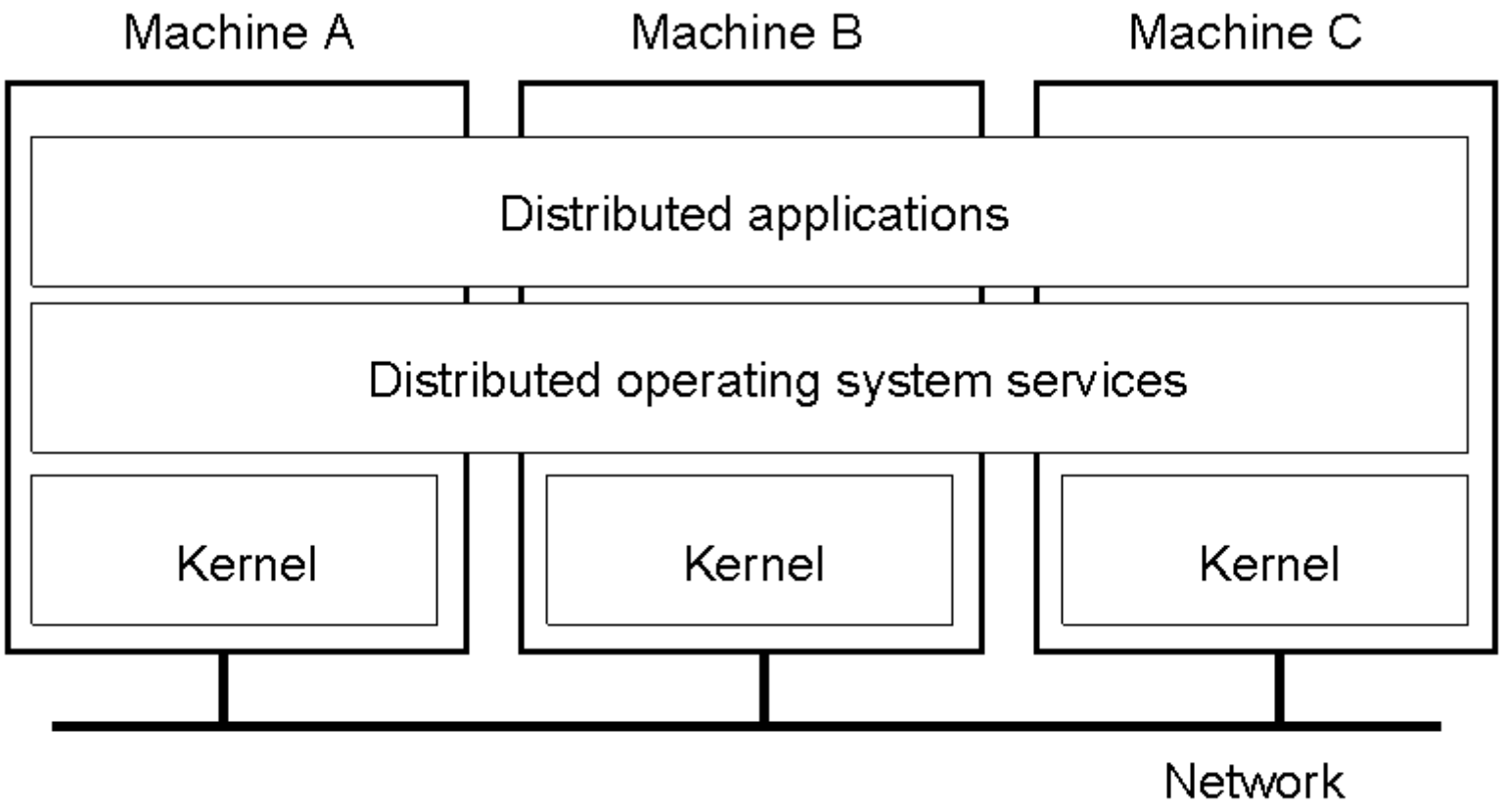
DOS: Transparency

- **Location** Transparency
  - Users are not aware of the positioning of the resources in the system.
- **Migration** Transparency
  - Resources can move without changing names / URL
- **Replication** Transparency
  - Users should not be aware of the presence of multiple copies of a resource
- **Failure** Transparency
  - Masking the partial failures in the system

Transparency Cont'd...

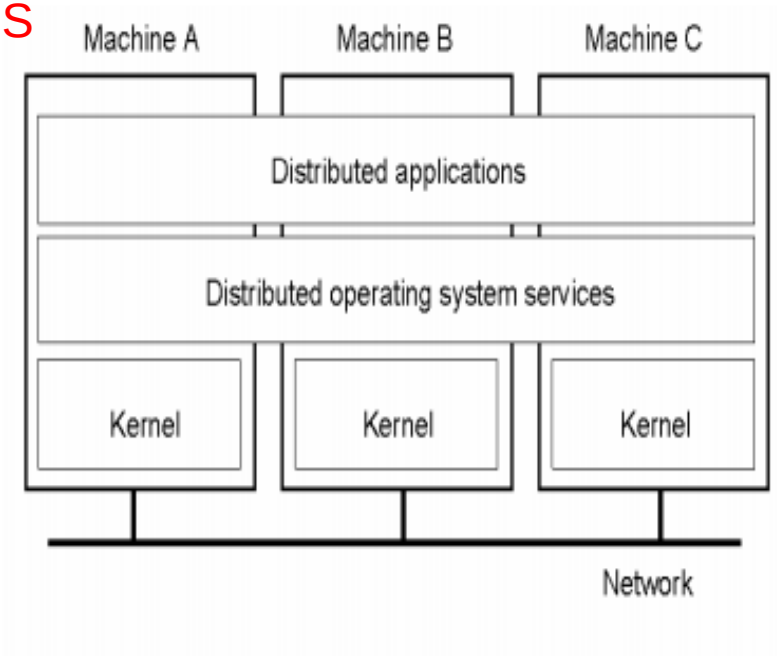
- **Performance** Transparency
  - Reconfiguring the resources to improve the performance of the system
- **Concurrency** Transparency
  - Resource sharing is automatic
- **Parallelism** transparency
  - Activities can happen in parallel without the knowledge of the user. Users sees only speedup.
- **Scaling** Transparency
  - Allowing the system to expand in scale without disrupting the activities of the users

Distributed Operating Systems



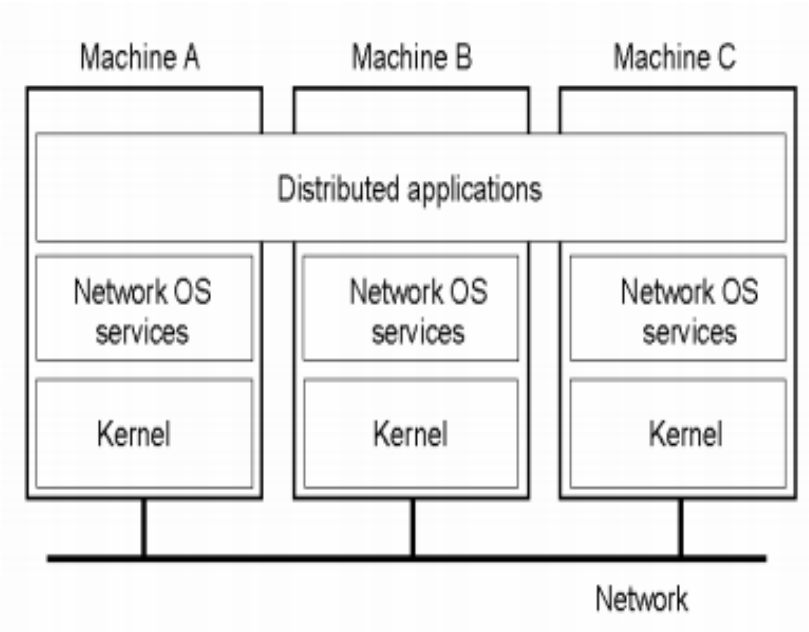
The differences

DOS



- User is not aware of the multiple CPUs.
- Each machine runs a part of the Distributed Operating System.
- The system is fault-tolerant.

NOS



- User is aware of the existence of multiple CPUs.
- Each machine has its own private Operating System.
- The system is not fault-tolerant.

What is Amoeba?

- Amoeba is a **distributed operating system**
- Runs on a **simple micro-kernel**
- Developed by **Andrew Tanenbaum**
- Has **user transparency**
  - The user logs into the system **not a specific** machine
  - When a program is initiated, the system **decides** what machine will run it.

The History of Amoeba

- Developed by Andrew Tanenbaum at the *Vrije Universiteit* in conjunction with *Centrum voor Wiskunde en Informatica*
- First prototype was released in 1983
- The last official update was in 1996
- Others have developed their own versions
  - **Fireball Amoeba** by Fireball Software Distribution

Goals of Amoeba

- There are four main goals
  - **Distribution**
    - Connecting together many machines
  - **Parallelism**
    - Allowing individual jobs to use multiple CPUs easily
  - **Transparency**
    - Having the collection of computer act like a single system
  - **Performance**

Key Concepts

- **Micro-kernel**
  - A simple micro-kernel is the basis for Amoeba
  - All computers in the network run this kernel
  - It handles the memory management, I/O, communication, object primitive, and basic processes
- **Remote Procedure Calls (RPC)**
  - Used for communication between client and server
  - Accessed by stubs which are created by **Amoeba Interface Language**

Key Concepts

- **Threads**
  - Each process has its own address space and contains multiple threads
  - These threads have their own stack and program counter, but share the global data and code of the process
- **FLIP (the protocol)**
  - Fast Local Internet Protocol
  - Developed by Andrew Tanenbaum
  - Designed to optimize the speed of RPCs

Key Concepts

- **Objects**
  - The abstract data type used by Amoeba
  - Each object has a list of operations that can be preformed
- **Capability (Protection)**
  - Store data in 128 bit value
  - Used to verify that the user has permission to access the object
  - Capabilities are encrypted

Key Concepts

- **Bullet / File Server**
  - Store files in a contiguously fashion
  - Most files can be sent in a single RPC
  - Designed to be a dedicated server
- **Directory Server**
  - Handles naming of files
  - Knows the physical location of each file

Significant Points

- The system is **free**
- It has not had an official update in over **10 years**
- Can use **older/slower CPUs** to create a powerful system
- **Micro-Kernel** allows for other file systems to be created
- Has many **UNIX like** commands and programs
- Can only hold programs as large as its physical memory

Comparison of DOS

	Cambridge	***Amoeba***	***V Kernel***	***Eden Project***
Developed By	Computing Laboratory@ Univ. of Cambridge	Tanenbaum@ Vrije Universiteit-Amsterdam	David Cheriton@ Stanford University	University of Washington-Seattle
Communication Primitives	RPC	RPC	RPC	RPC
Naming and Protection	Single Name Server	Sparse capabilities with encryption	Three-level naming mechanism	Capabilities without protection
Resources	Processor Bank	Processor Pool	Workstation Model	Workstation Model
Fault tolerance	Small server to startup services	Some fault tolerance through boot server	No fault tolerance	Uses Recorder process.
File Server	Universal file service and Filing Machine	Several file services.	Similar to Unix	No file server. One process for each file

amoebaOS


Welcome to
amoebaOS.
Boston - Don't Look Back
amoebaOS
username
Create an Account

Paper Diskusi (20%)

- Topik:
  - Cloud Computing
  - Bit Torrent System
  - Database Terdistribusi
  - VOIP dan Streamming
  - Grid computing
  - Jabber Protocol
  - JINI – Service Oriented Architecture Framework in Java
  - DCOM (distributed component)
  - Master - Slave MySQL database (Replication)
  - Konfigurasi File Sharing di Linux
- Dibuat dalam doc dan ppt dipresentasikan pada **19/10 2010**
- Dikerjakan kelompok
- Referensi dari jurnal minimal **1** buah

NEXT

TTS dan Presentasi dan Diskusi 1

Bahan TTS:

- Awal smp slide ini
- Bentuk soal: pil ganda dan essay
- Sifat: open 1 lembar kertas A4 bolak balik boleh diketik