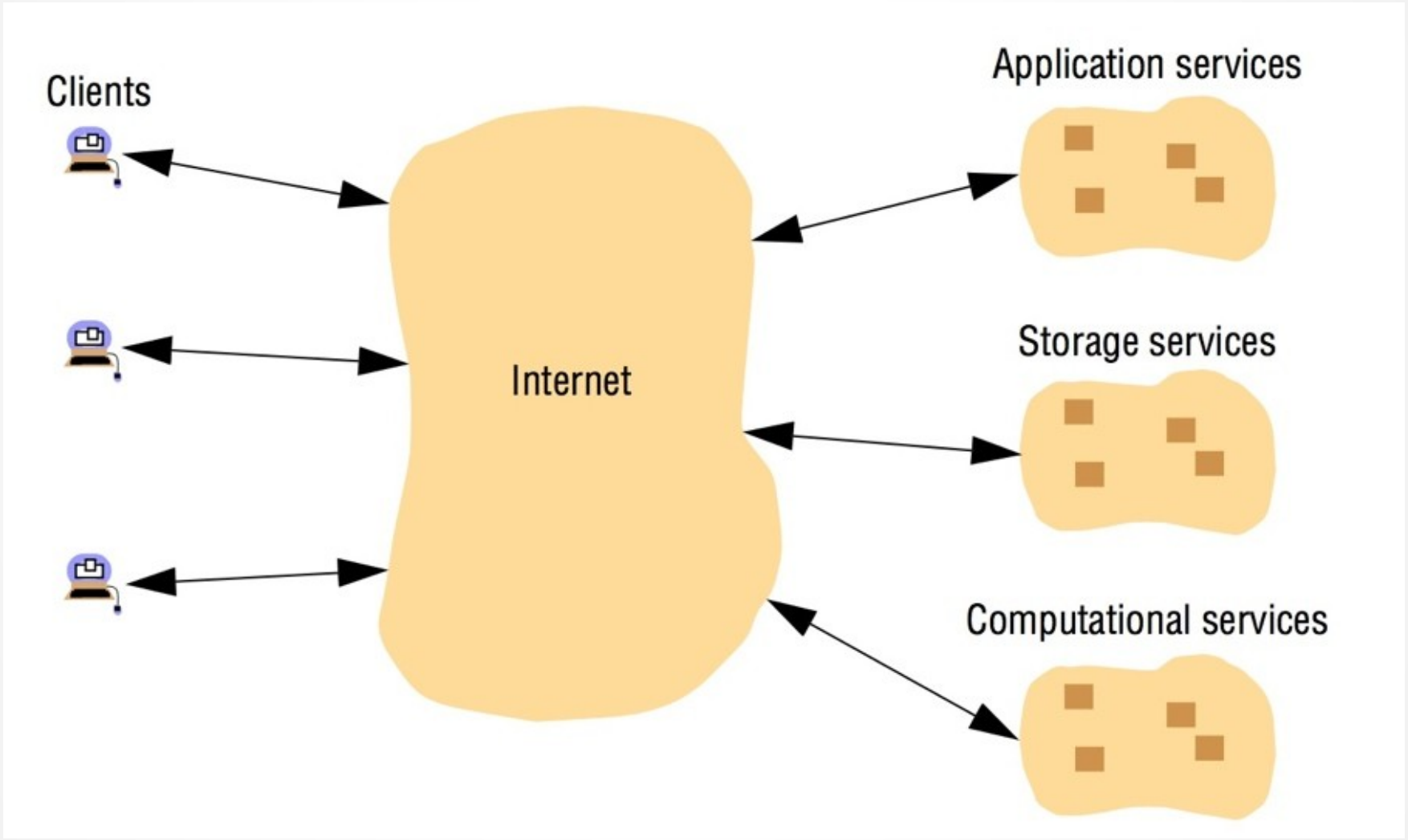
Procesos Distribuidos

- CI – 2205
- III - 2013
- Lunes y miércoles, 5:00 pm a 9:00 pm
- Aula 205
- Profesor: Diego Villalba

Recursos distribuidos

- Commodity
- Utility
- Cloud

Cloud computing



Crecimiento de Internet

Date	*Computers*	*Web servers*	*Percentage*
1993, July	1,776,000	130	0.008
1995, July	6,642,000	23,500	0.4
1997, July	19,540,000	1,203,096	6
1999, July	56,218,000	6,598,697	12
2001, July	125,888,197	31,299,592	25
2003, July	~200,000,000	42,298,371	21
2005, July	353,284,187	67,571,581	19

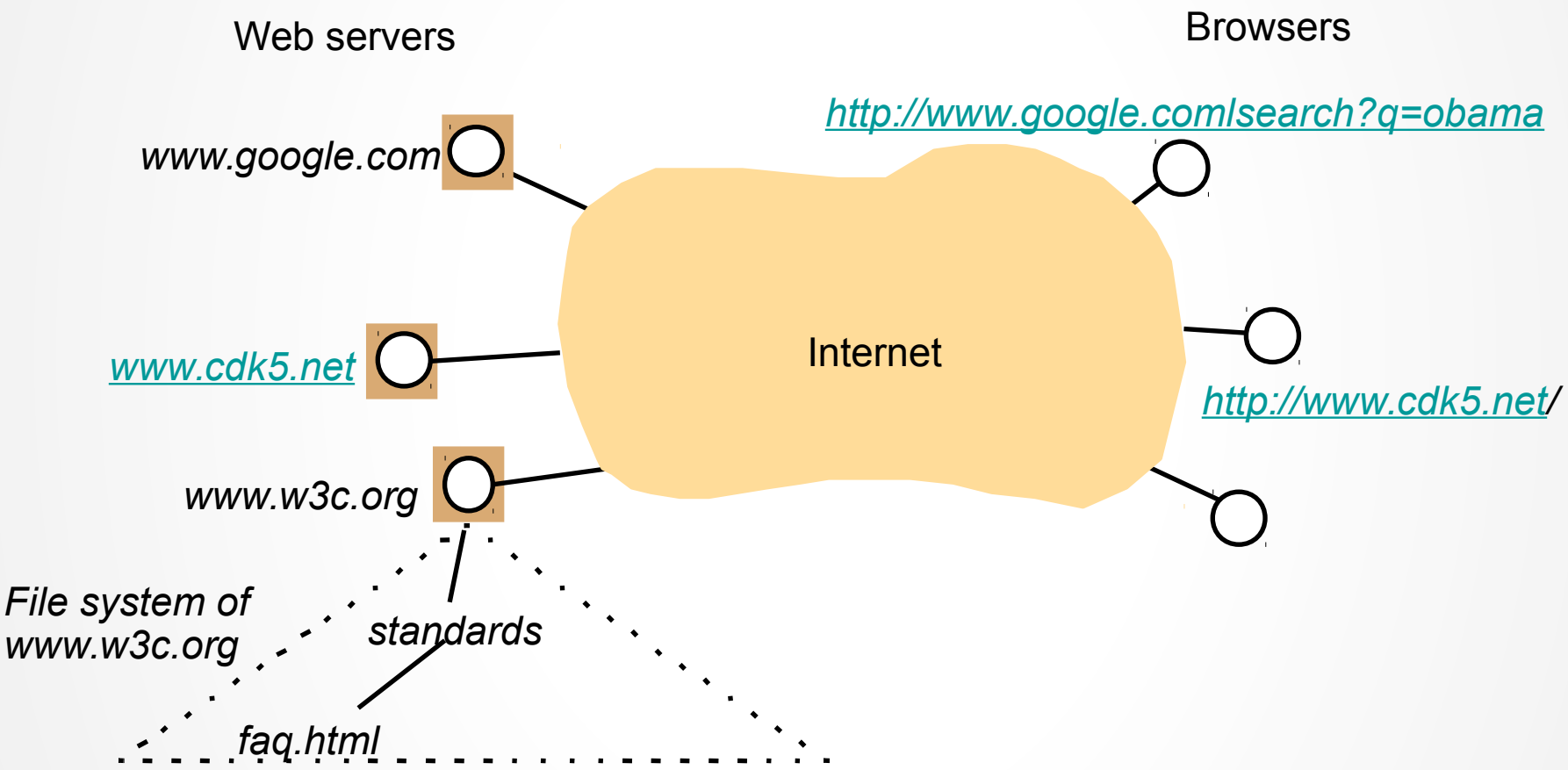
Transparencias

- Transparencia de acceso (local o remoto)
- Transparencia de ubicación (eg IPs)
- Transparencia de concurrencia: varios procesos operan concurrentemente utilizando recursos compartidos sin interferir entre ellos
- Transparencia de replicación: muchas instancias de recursos pueden ser utilizadas para increntar confiabilidad o rendimiento sin que los usuarios sepan (eg cachés)

Transparencias

- Transparencia de fallas: permite esconder fallas, permitiendo a los usuarios completar tareas
- Transparencia de movilidad: permite mover recursos o clientes sin afectar operación
- Transparencia de rendimiento: permite reconfigurar el sistema para mejorar rendimiento cuando la carga de trabajo varía
- Transparencia de escalabilidad: permite expanderse sin cambiar estructura o algoritmos

Servidores y navegadores



Modelos

- Modelos físicos
  - Hardware (computadoras y redes)
- Modelos arquitectónicos: tareas computacionales y tareas de comunicación
  - Cliente-servidor
  - Peer to Peer
- Modelos fundamentales: perspectiva abstracta para describir soluciones

Generaciones

Distributed systems:	*Early*	*Internet-scale*	*Contemporary*
Scale	Small	Large	Ultra-large
Heterogeneity	Limited (typically relatively homogenous configurations)	Significant in terms of platforms, languages and middleware	Added dimensions introduced including radically different styles of architecture
Openness	Not a priority	Significant priority with range of standards introduced	Major research challenge with existing standards not yet able to embrace complex systems
Quality of service	In its infancy	Significant priority with range of services introduced	Major research challenge with existing services not yet able to embrace complex systems

Elementos arquitectónicos

- Cuatro preguntas fundamentales:
  - ¿Qué entidades se están comunicando?
  - ¿Cómo se comunican? ¿Qué paradigma de comunicación utilizan?
  - ¿Qué roles y responsabilidades tienen en la arquitectura global?
  - ¿Cómo son mapeados a la infraestructura física distribuida?

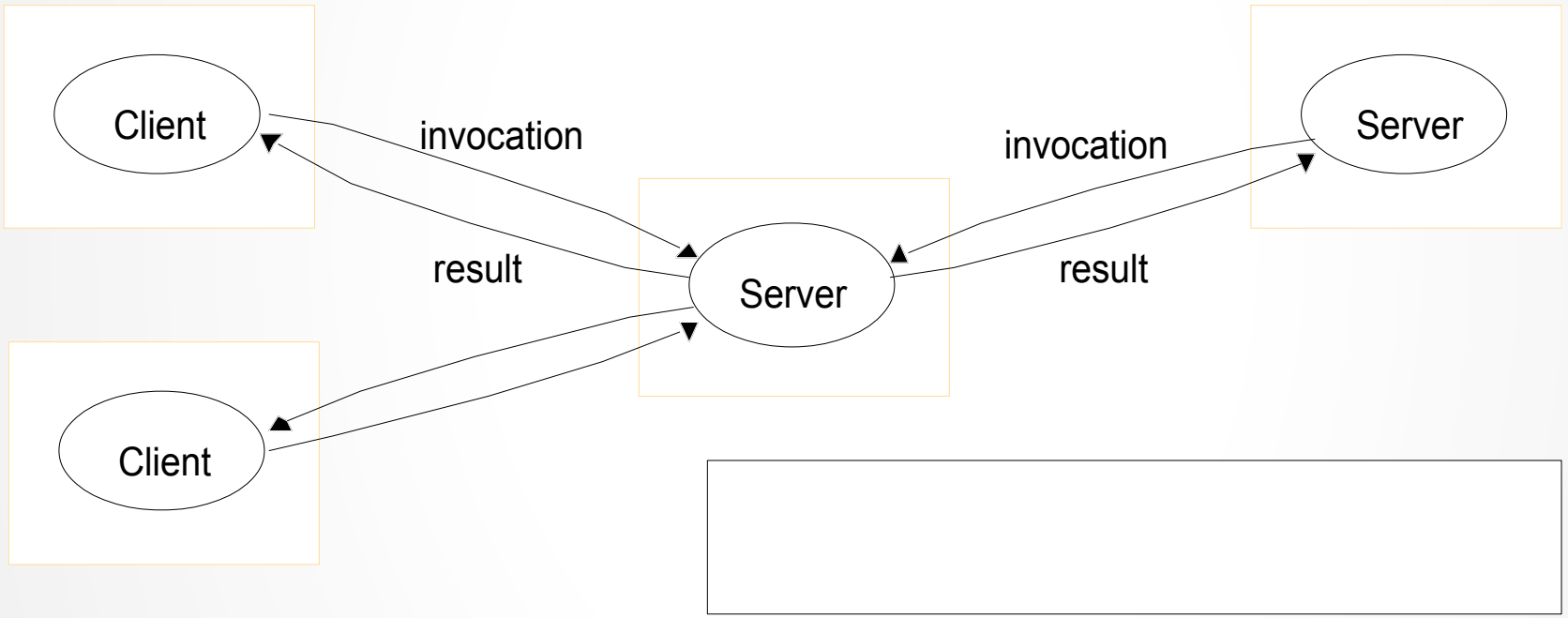
Elementos arquitectónicos

Communicating entities (what is communicating)		*Communication paradigms (how they communicate)*		
System-oriented entities	*Problem-oriented entities*	*Interprocess communication*	*Remote invocation*	*Indirect communication*
Nodes	Objects	Message passing	Request-reply	Group communication
Processes	Components	Sockets	RPC	Publish-subscribe
	Web services	Multicast	RMI	Message queues
				Tuple spaces
				DSM

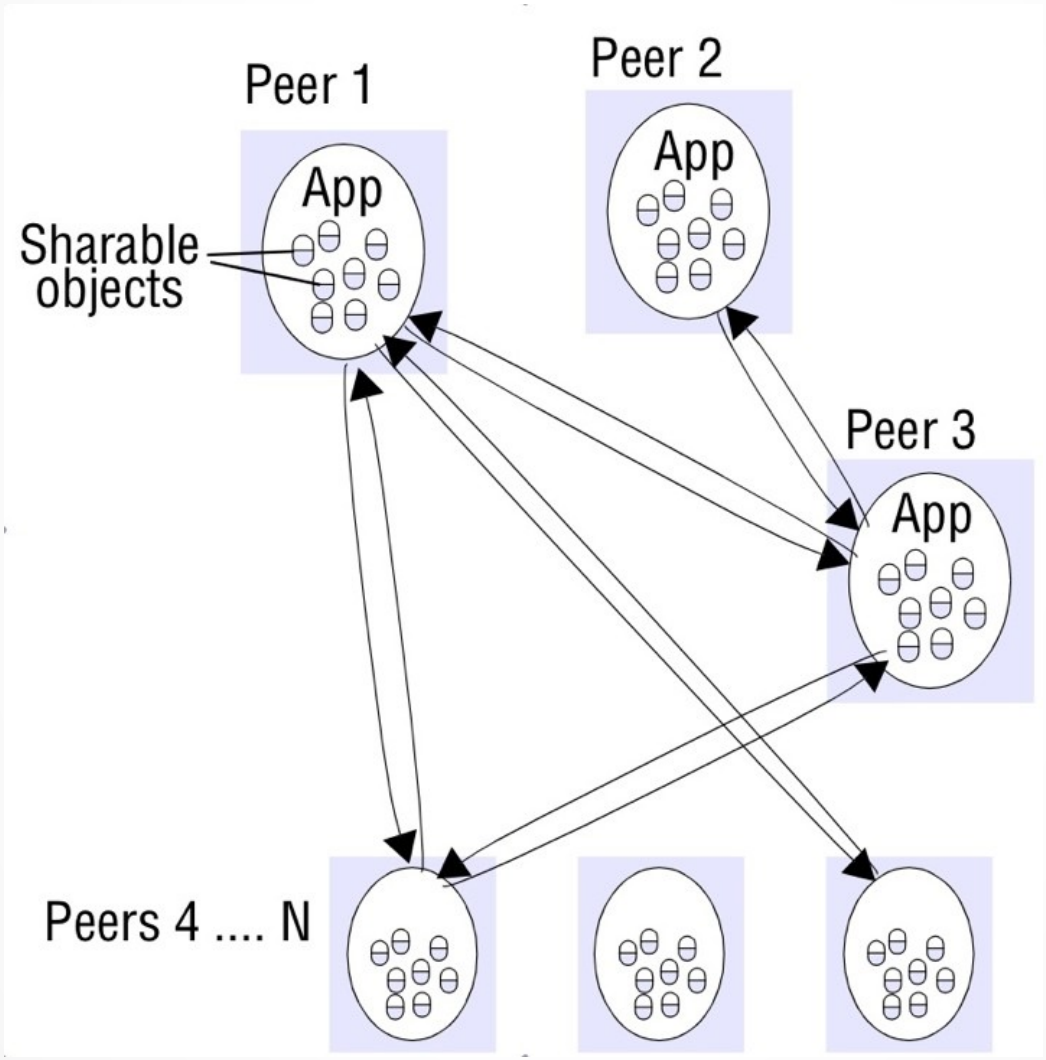
Tarea # 2

- Compare las siguientes abstracciones orientadas a problemas (desde una perspectiva de programación):
  - Objetos
  - Componentes
  - Servicios Web
  - Agentes

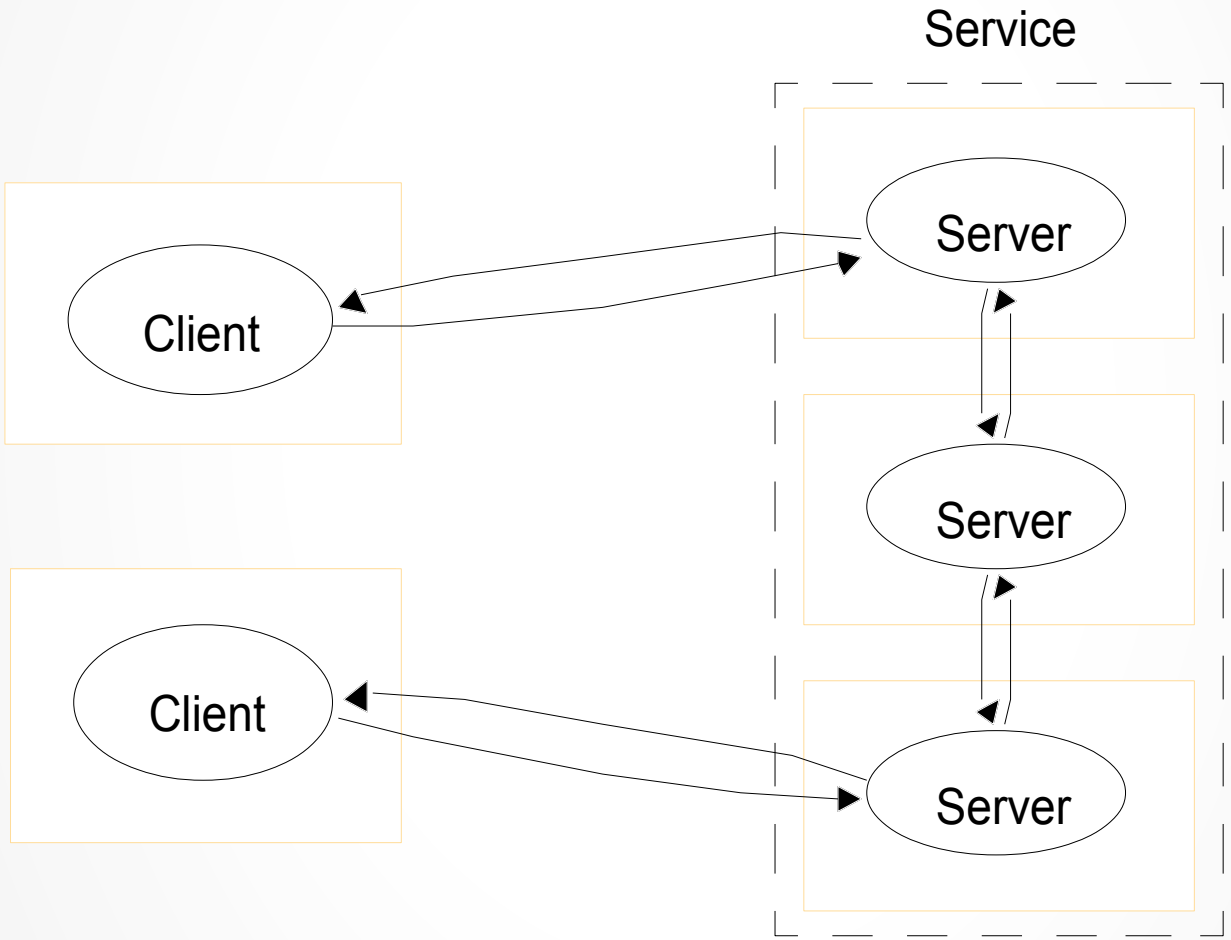
Clientes invocan servidores



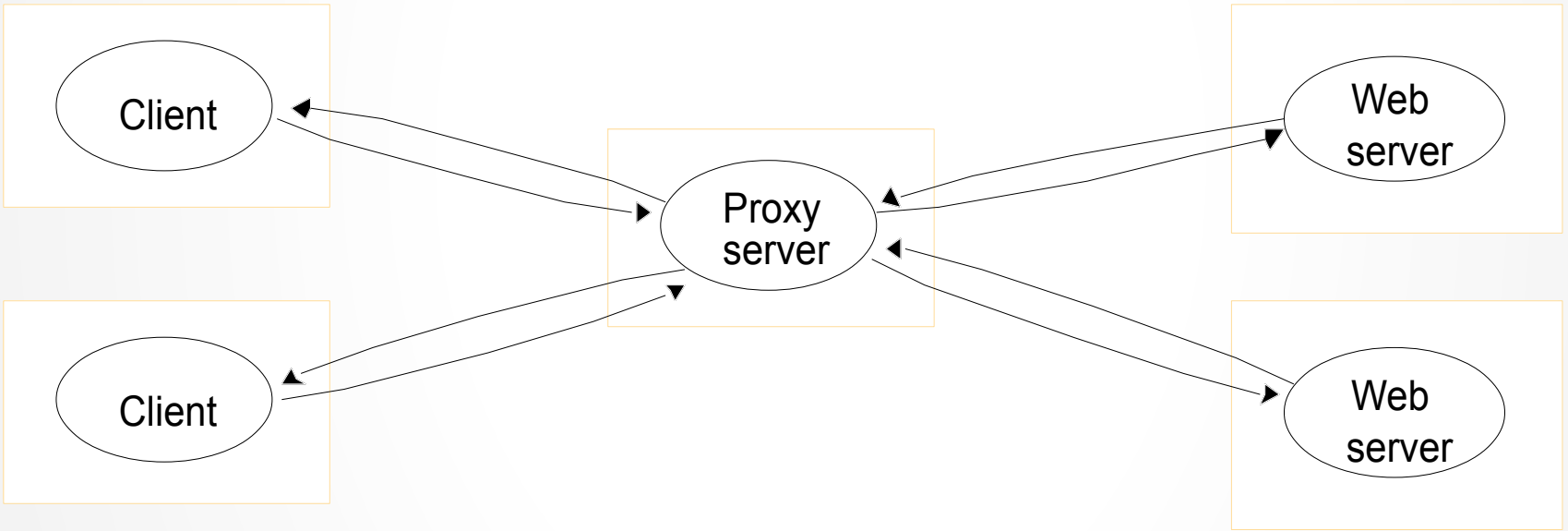
Arquitecturas Peer to Peer



Servicio provisto por n servidores

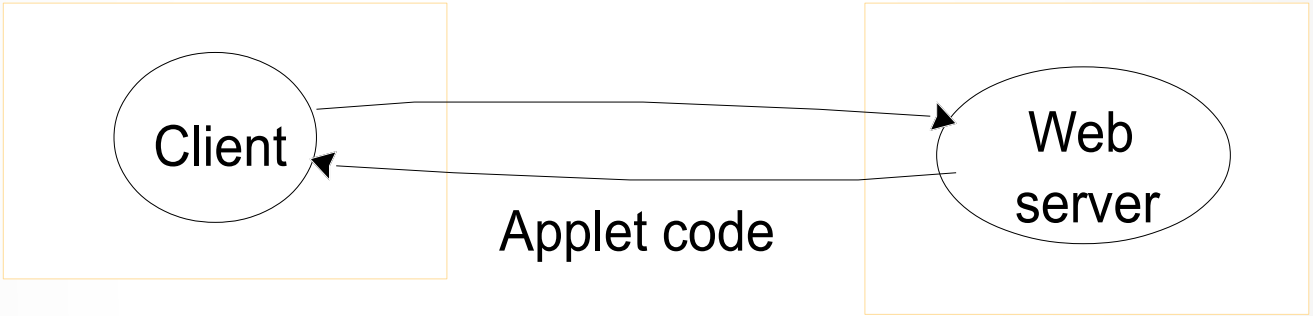


Un servidor Proxy



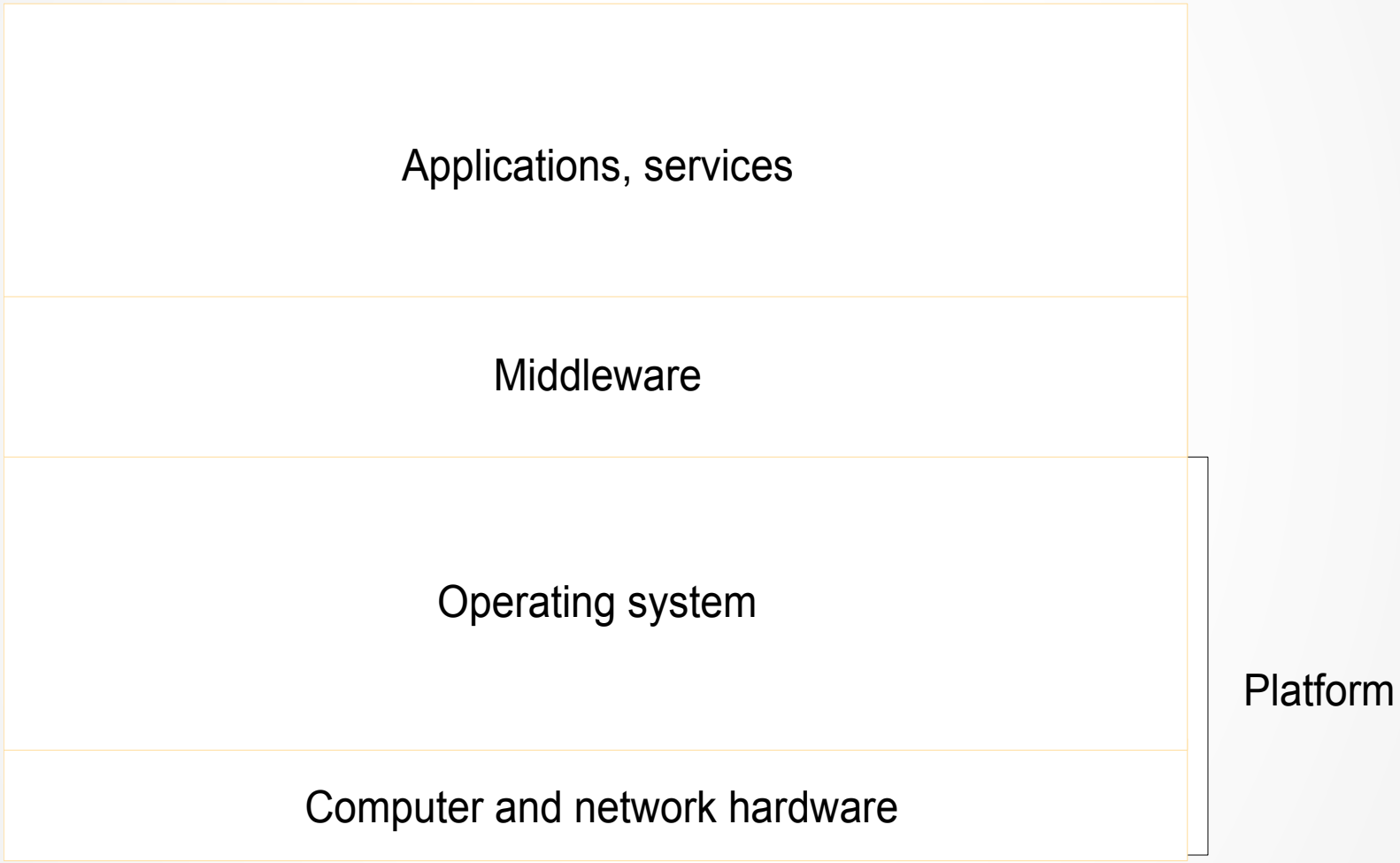
Applets

a) client request results in the downloading of applet code

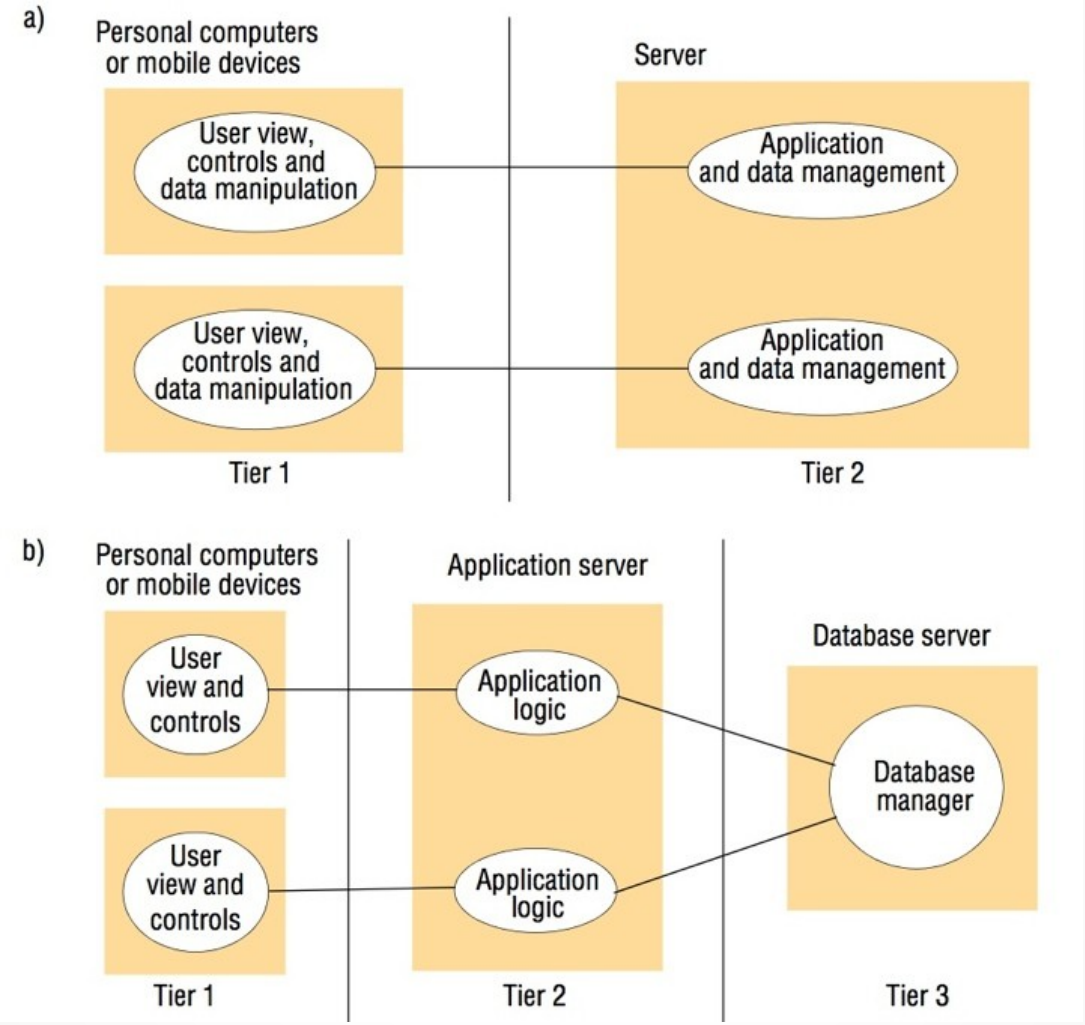


b) client interacts with the applet

Capas de HW y SW



Arquitecturas de 2 y 3 capas



Ajax

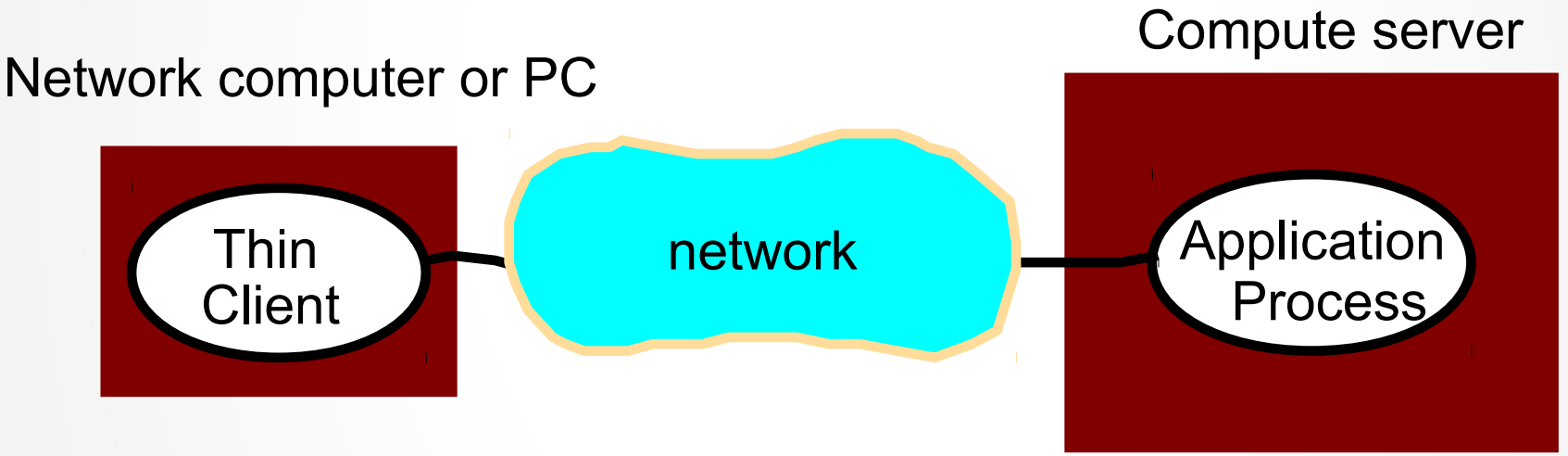
```
new Ajax.Request('scores.php?
                    game=Arsenal:Liverpool’,
                   {onSuccess: updateScore});
function updateScore(request) {
.....
```

(request contains the state of the Ajax request including the returned result.

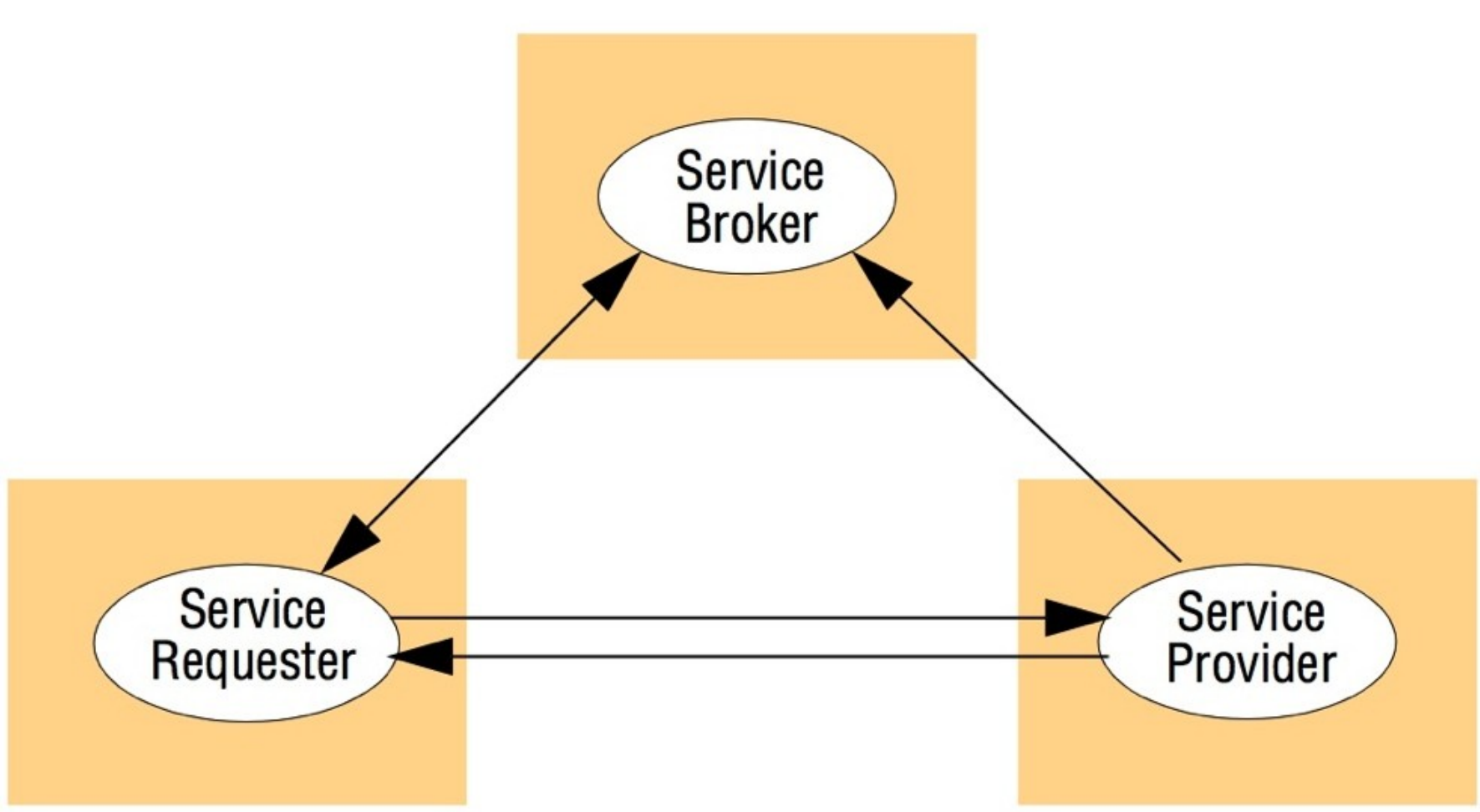
The result is parsed to obtain some text giving the score, which is used to update the relevant portion of the current page.)

```
.....
}
```

Thin clients



Web services



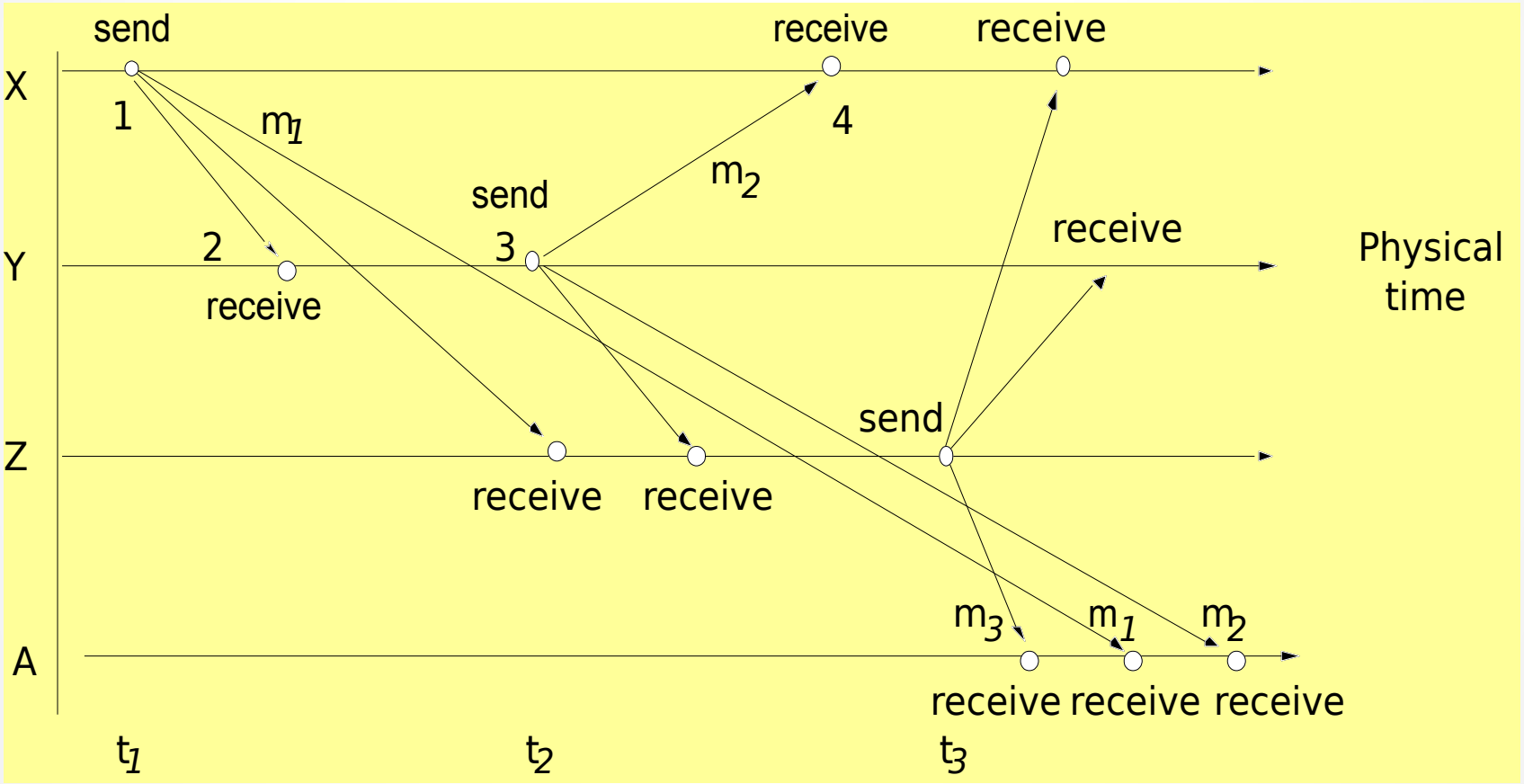
Middleware

Major categories:	*Subcategory*	*Example systems*
Distributed objects (Chapters 5, 8)	Standard	RM-ODP
	Platform	CORBA
	Platform	Java RMI
Distributed components (Chapter 8)	Lightweight components	Fractal
	Lightweight components	OpenCOM
	Application servers	SUN EJB
	Application servers	CORBA Component Model
	Application servers	JBoss
Publish-subscribe systems (Chapter 6)	-	CORBA Event Service
	-	Scribe
	-	JMS
Message queues (Chapter 6)	-	Websphere MQ
	-	JMS
Web services (Chapter 9)	Web services	Apache Axis
	Grid services	The Globus Toolkit
Peer-to-peer (Chapter 10)	Routing overlays	Pastry
	Routing overlays	Tapestry
	Application-specific	Squirrel
	Application-specific	OceanStore
	Application-specific	Ivy
	Application-specific	Gnutella

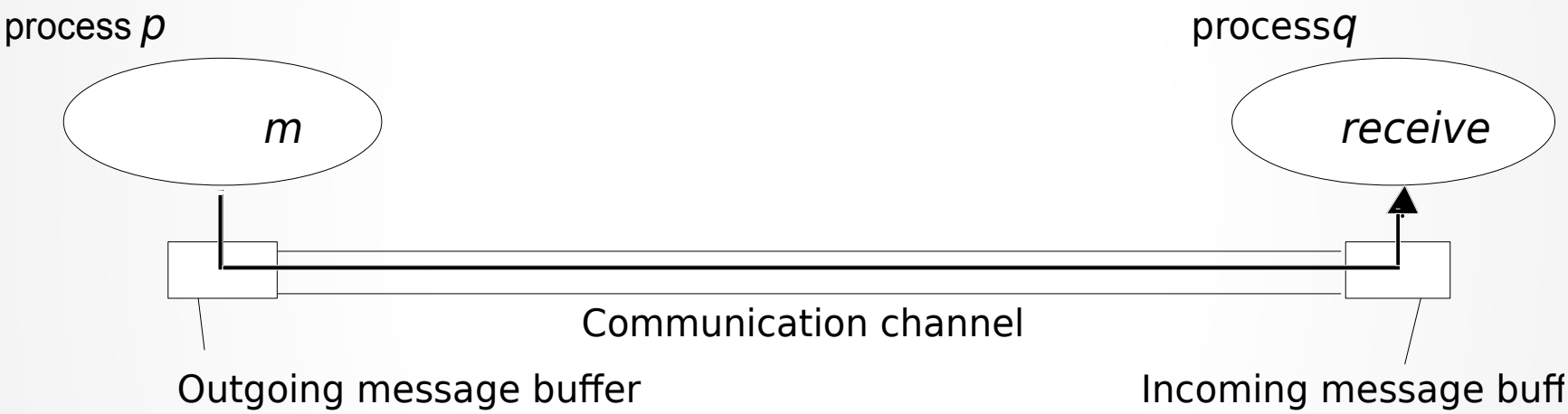
Modelos fundamentales

- Interacción
- Fallos
- Seguridad

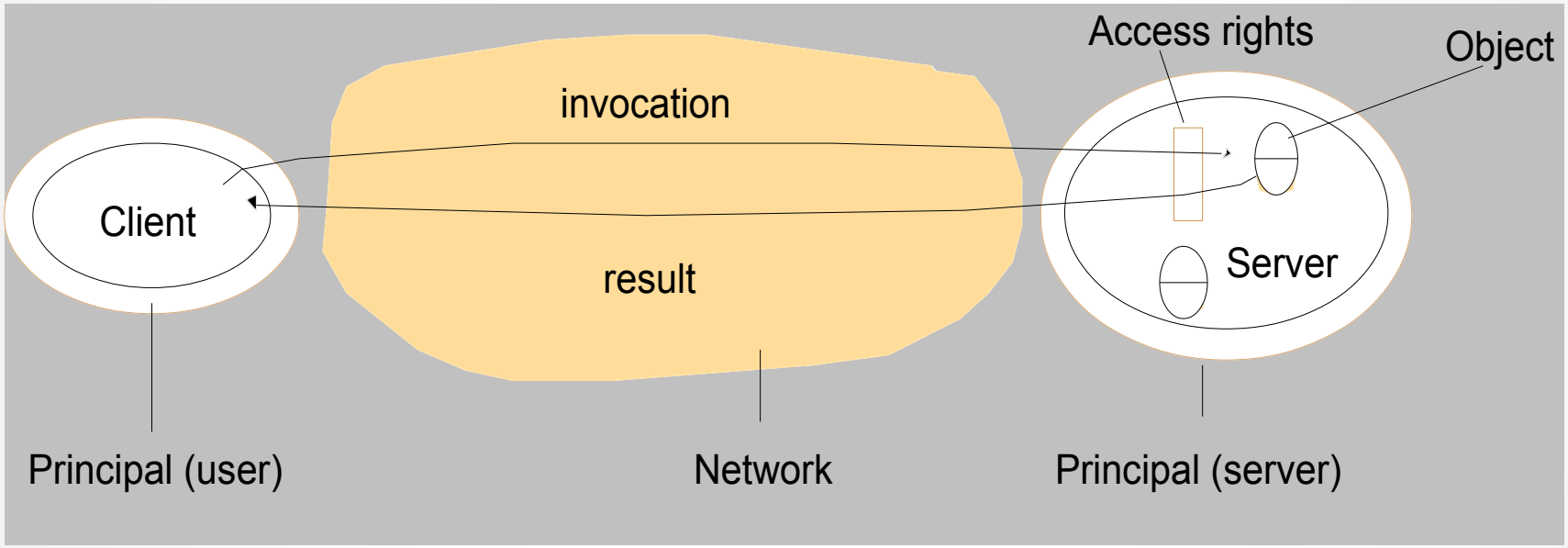
Ordenamiento de eventos en TR



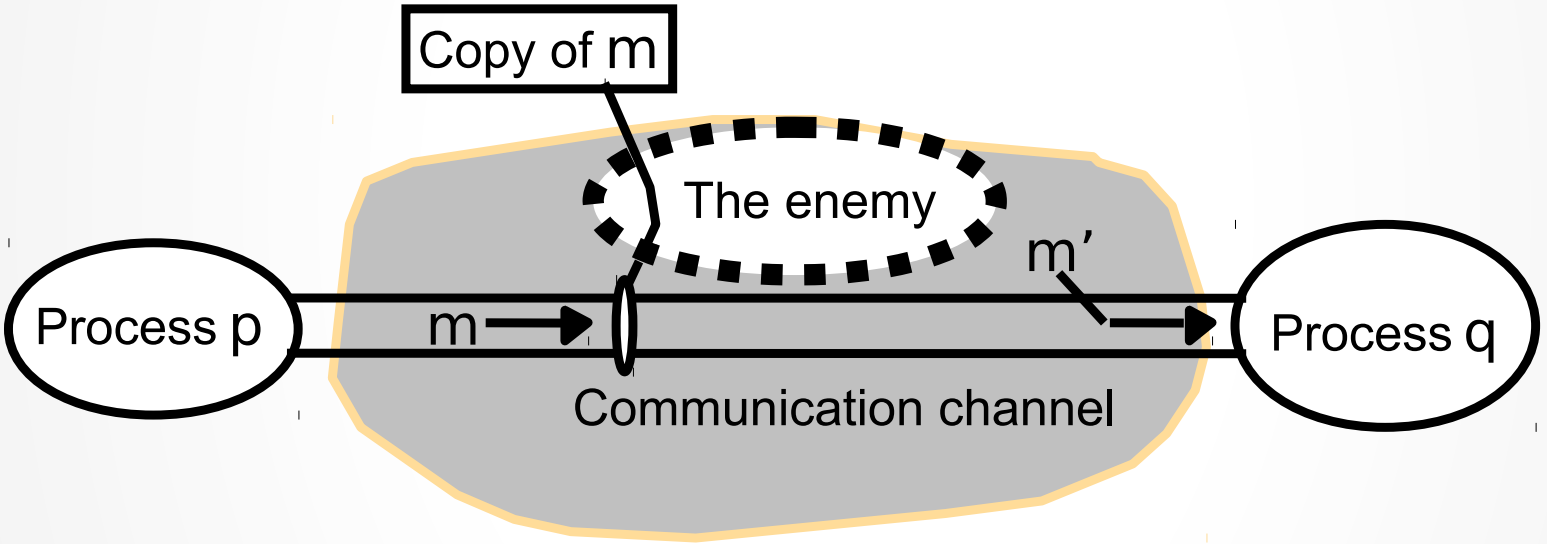
Procesos y canales



Objetos y principales



El enemigo


Copy of m
The enemy
m'
Process p
m
Process q
Communication channel

Canales seguros