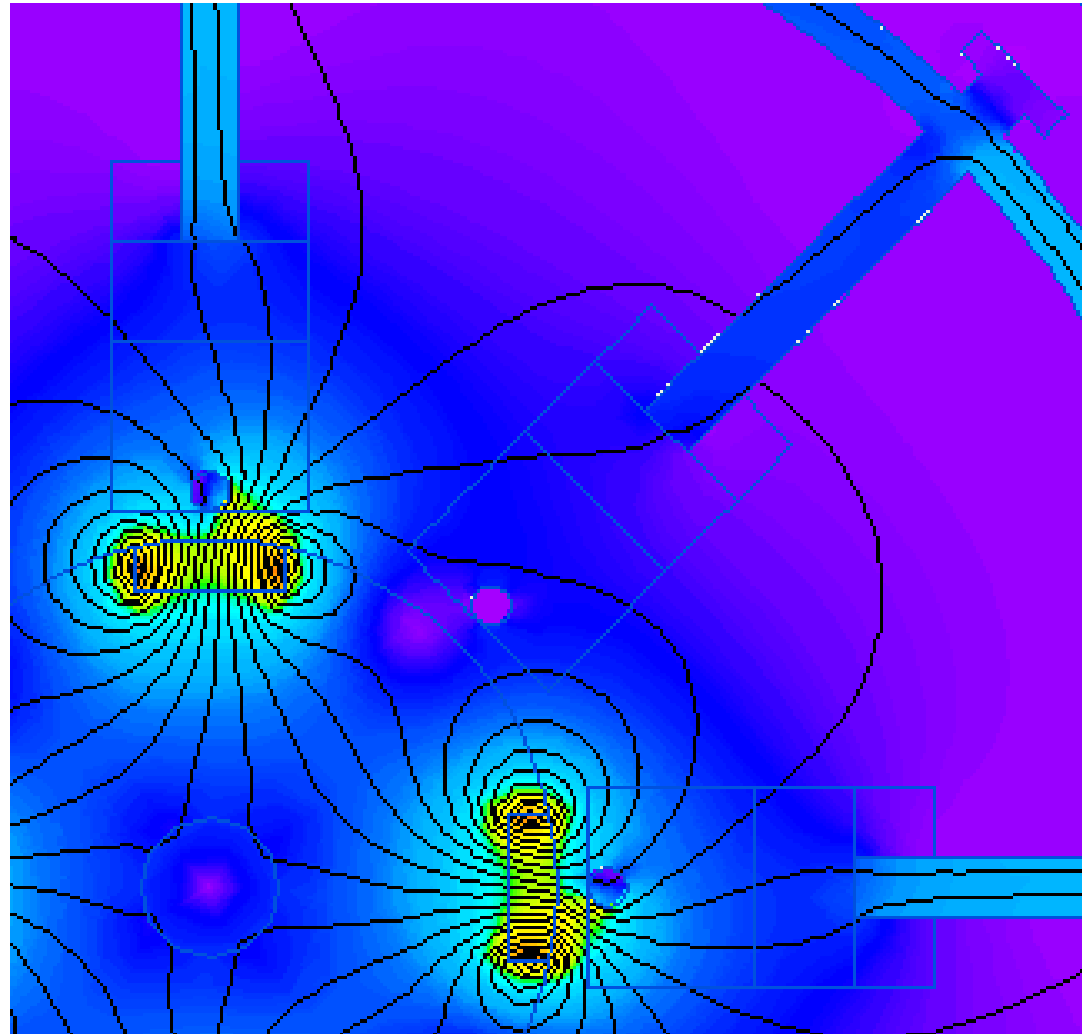


ICS 362 Distributed Systems

Distributed Systems: Part 7

Lecturer: Toby Daniel

Persistence and Synchronicity

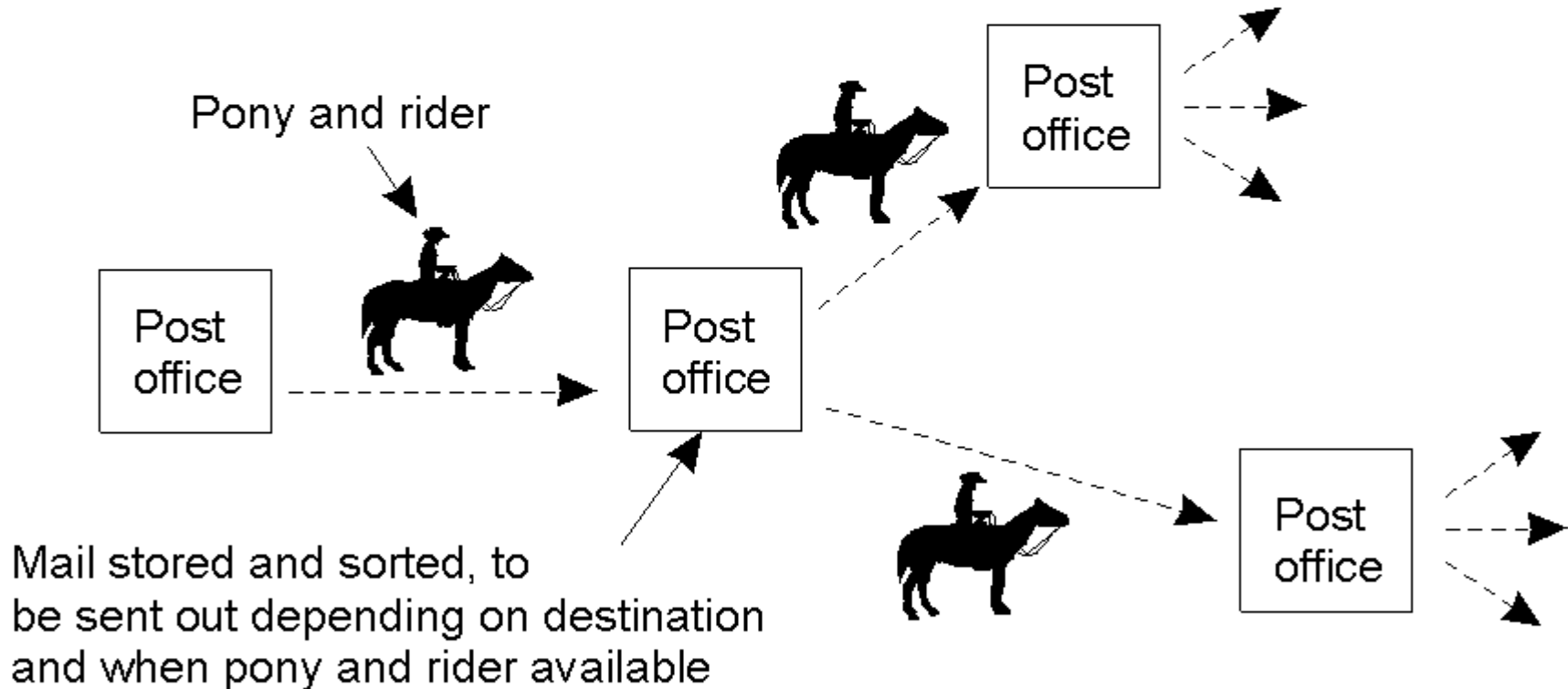


Persistence

- A '***persistent***' communication service stores messages at collection locations until they can satisfactorily reach their destination.
 - The postal service is a good 'real-life' example.
- Alternative systems are '***transient***', where messages are stored by the system only while the sending and receiving applications are running.
 - Transport layer services are often transient, leaving persistent features for application layers.

Persistency

Persistent communication of letters back in the days of the Pony Express.



Examples

- Compare the following three methods we commonly use on the Internet to communicate:
 - Email
 - Instant Chat
 - Internet Telephony (VoIP)
- Which are persistent and which are transient?



Synchronicity

- The relation that exists when things occur at the same time (*syn = same, chrono = time*)
- The state or fact of being synchronous or **simultaneous**
- Synchronicity in communications is the ability of the transmitter and receiver to be working in conjunction at the same time.
 - Remember Persistence and Synchronicity are not the same!

Synchronicity

In data communications what does
Asynchronous mean?



MOC

- What is MOC?

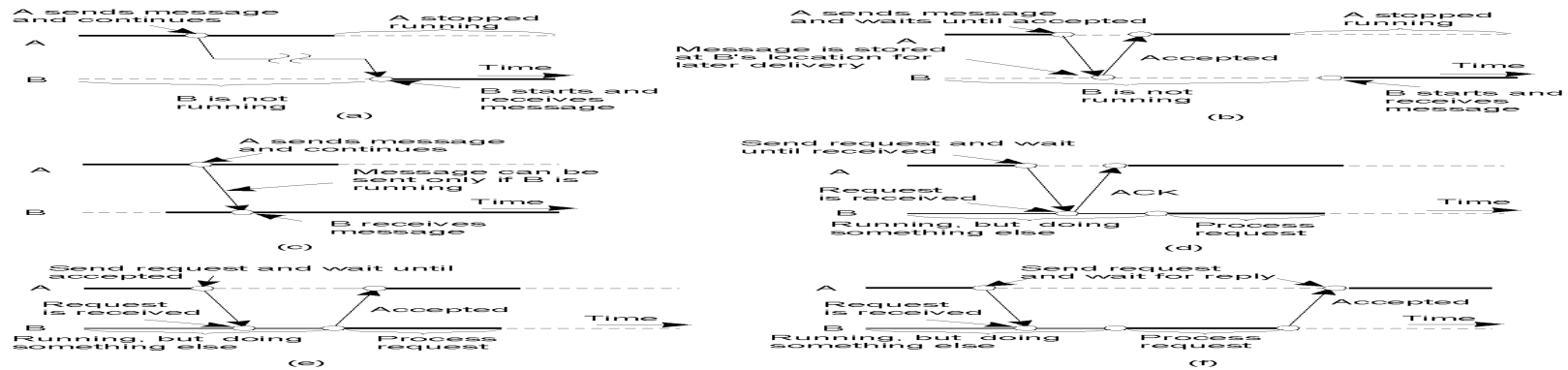


MOC

- **Message Oriented Communication (MOC)**, is an alternative way of allowing asynchronous communication.
- It is also sometimes known as Messaging Oriented Middleware (MOM)

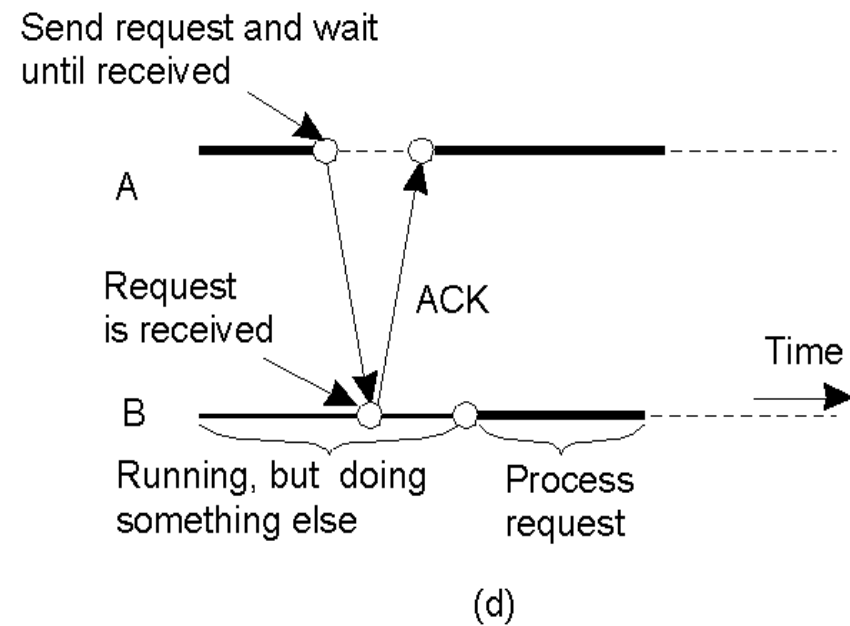
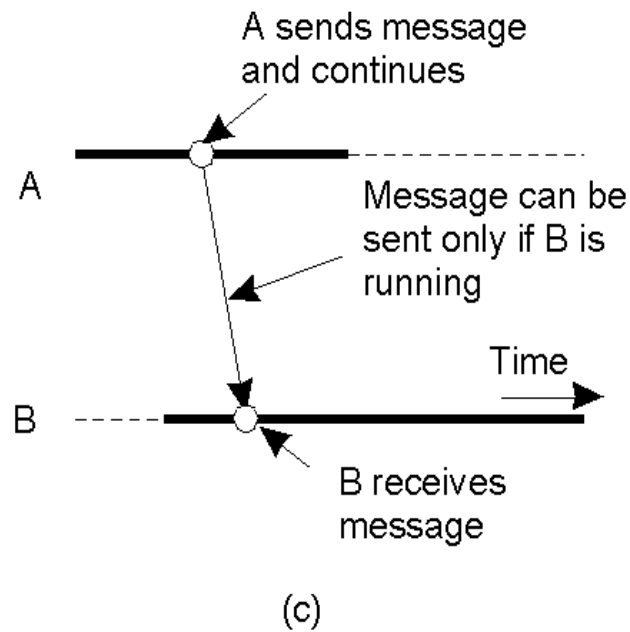
Persistence and Synchronicity in Communication

- a) Persistent asynchronous communication
- b) Persistent synchronous communication



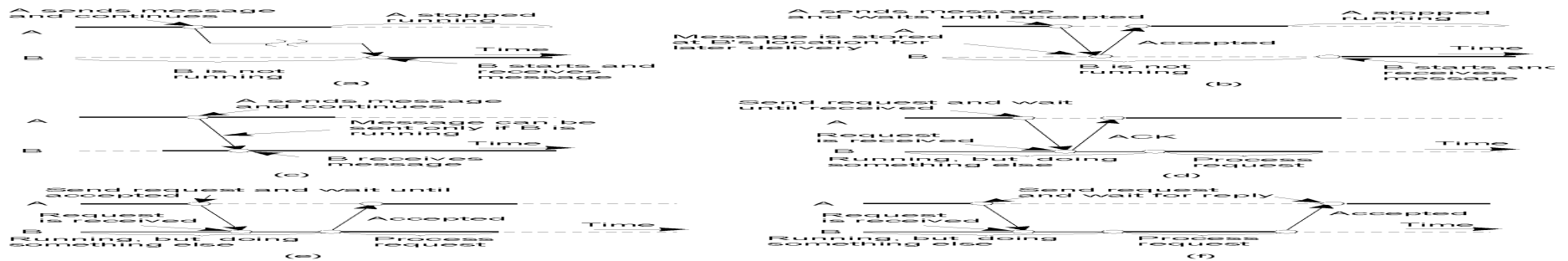
Persistence and Synchronicity in Communication

- a) Transient asynchronous communication
- b) Receipt-based transient synchronous communication



Persistence and Synchronicity in Communication

- a) Delivery-based transient synchronous communication at message delivery
- b) Response-based transient synchronous communication



Message Queuing Systems

- Message Queuing Systems is a MOM, designed to support persistent asynchronous communication.
 - They provide intermediate storage capacity for messages on route from sender to receiver.
- Sender is guaranteed that the message will be inserted into a queue for the receiver.
 - But no guarantees when, or if, the receiver will get the message, or whether the receiver can do anything with the message when they receive it.

Message Queuing Systems

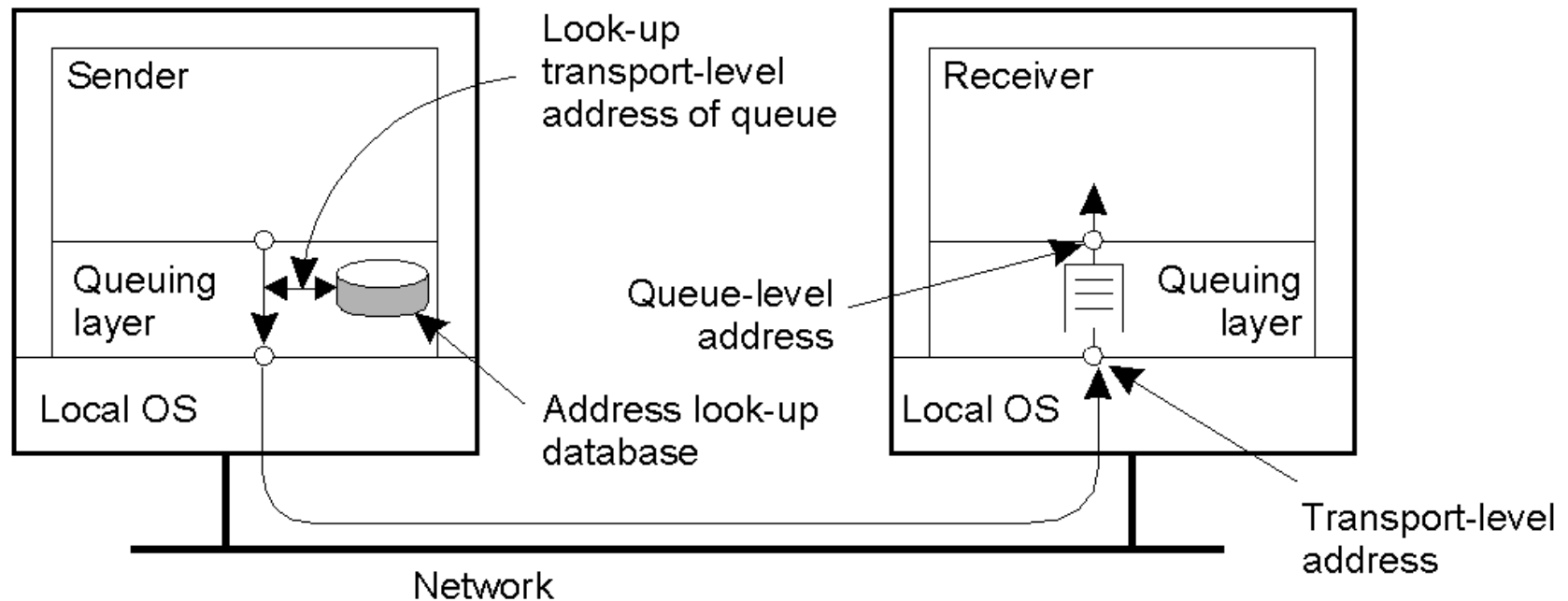
- Message Queuing Systems need few basic primitives;

Primitive	Meaning
Put	Append a message to a specified queue
Get	Block until the specified queue is nonempty, and remove the first message
Poll	Check a specified queue for messages, and remove the first. Never block.
Notify	Install a handler to be called when a message is put into the specified queue.

- A restriction is that applications may only place messages on queues on their local machine, queue managers are responsible for relaying messages to other machines.

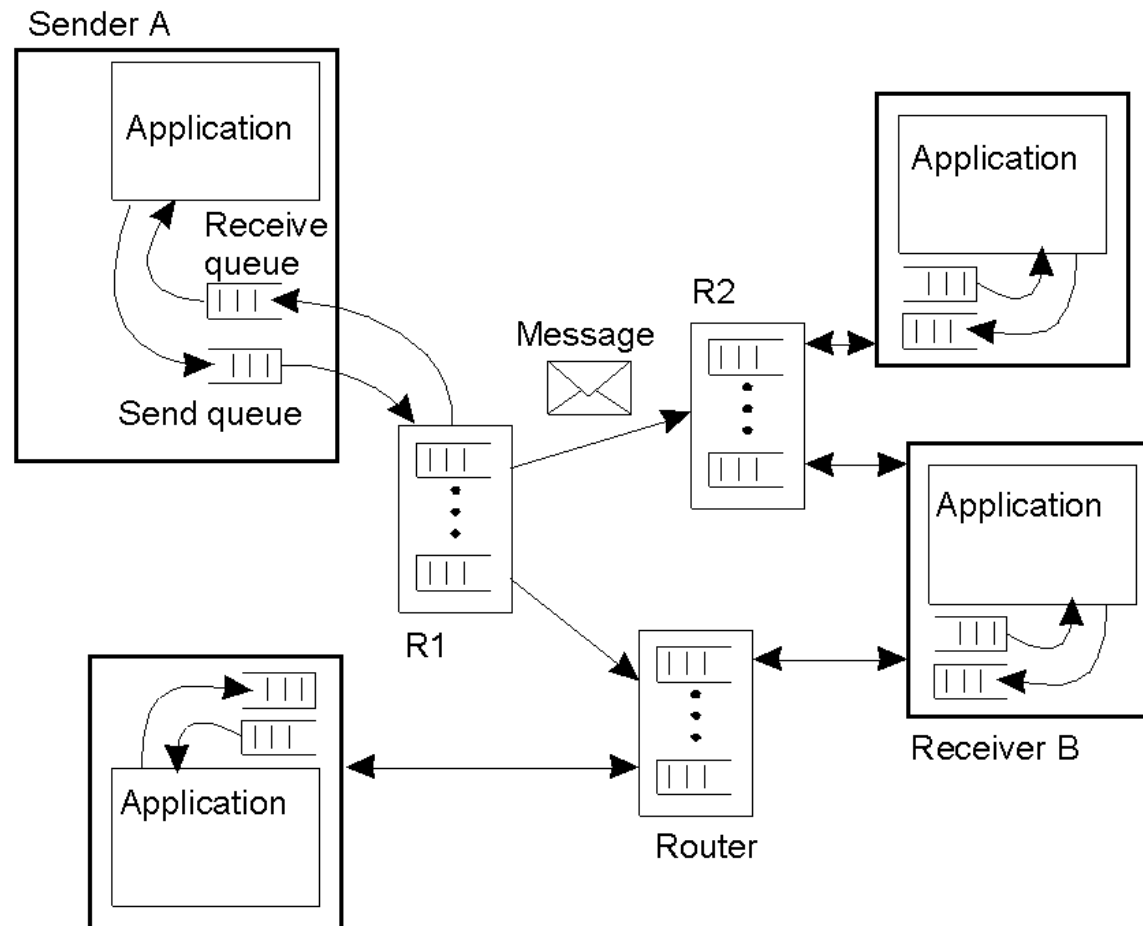
General Architecture of a Message-Queuing System

The relationship between queue-level addressing and network-level addressing.



General Architecture of a Message-Queuing System

The general organization of a message-queuing system with routers.



Potential Problems

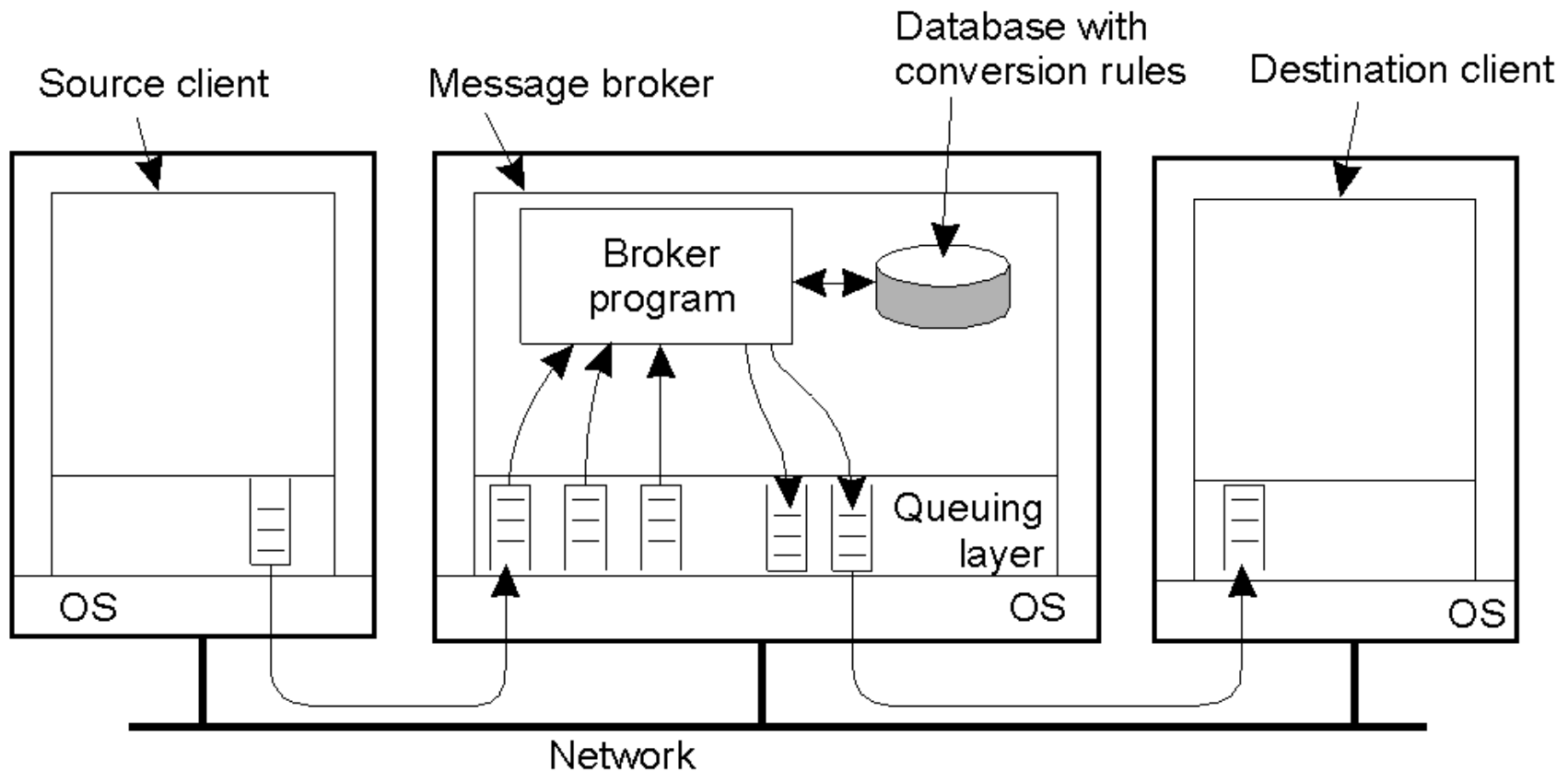
- What happens if the receiving machines are not turned on?
- What happens if the applications on the sender and receiver are different?



- Do you get email when your laptop is off?
- Where is the email stored during this time?

Message Brokers

The general organization of a message broker in a message-queuing system.

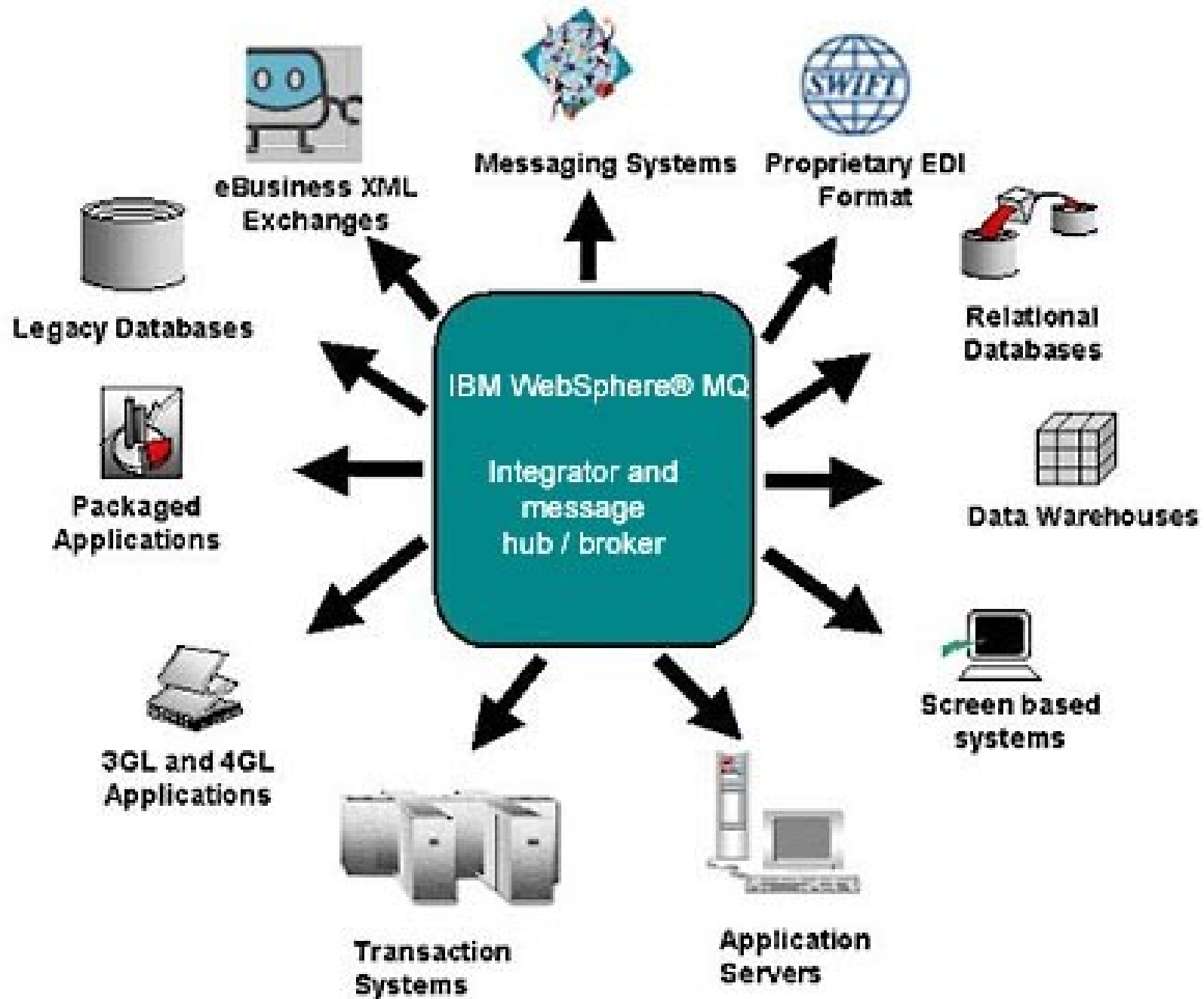


Message Brokers

- In order to integrate distinct applications, messages sent need to be understood by the receiver.
 - Including any intermittent receivers, such as routers or relays.
- One type or relay is a message broker, which is responsible for ensuring that messages can be understood.
 - An alternative approach could be to force a common message format, but this may not work if the application domains have little in common.
- Message Brokers follow a database of rules for converting messages.

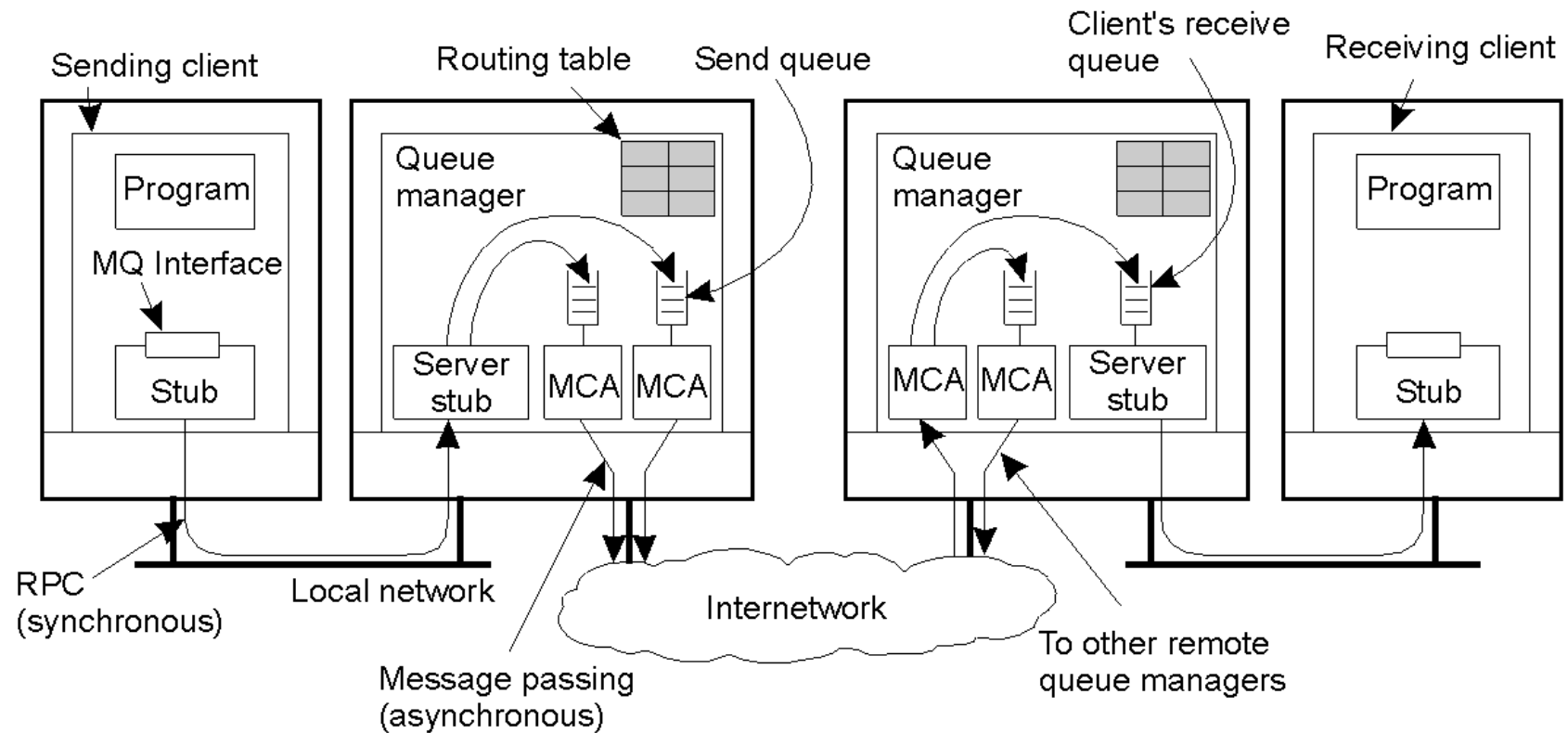
Example: IBM MQSeries

- IBM WebSphere® MQ delivers reliable application integration for applications and Web services, allowing companies to fully leverage their existing software and hardware
- <http://www-306.ibm.com/software/integration/wmq/>



Example: IBM MQSeries

General organization of IBM's MQSeries message-queuing system.



Next lecture...

- Timing

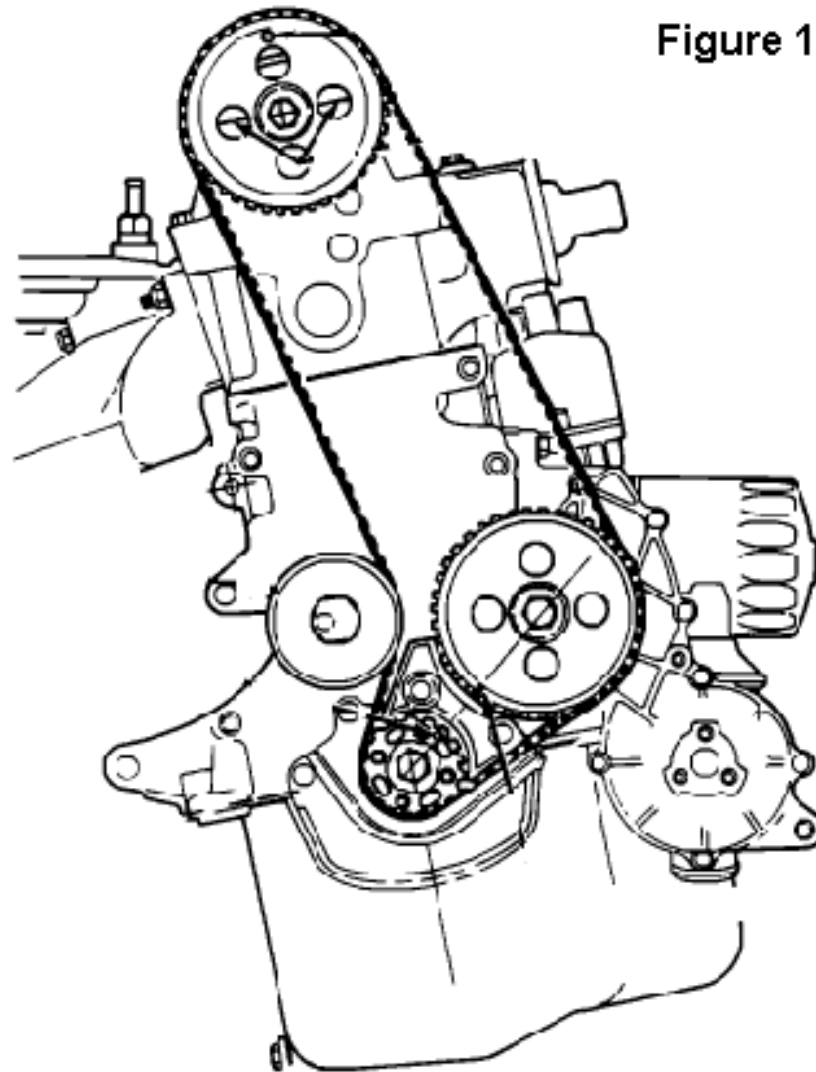


Figure 1