

Web Services

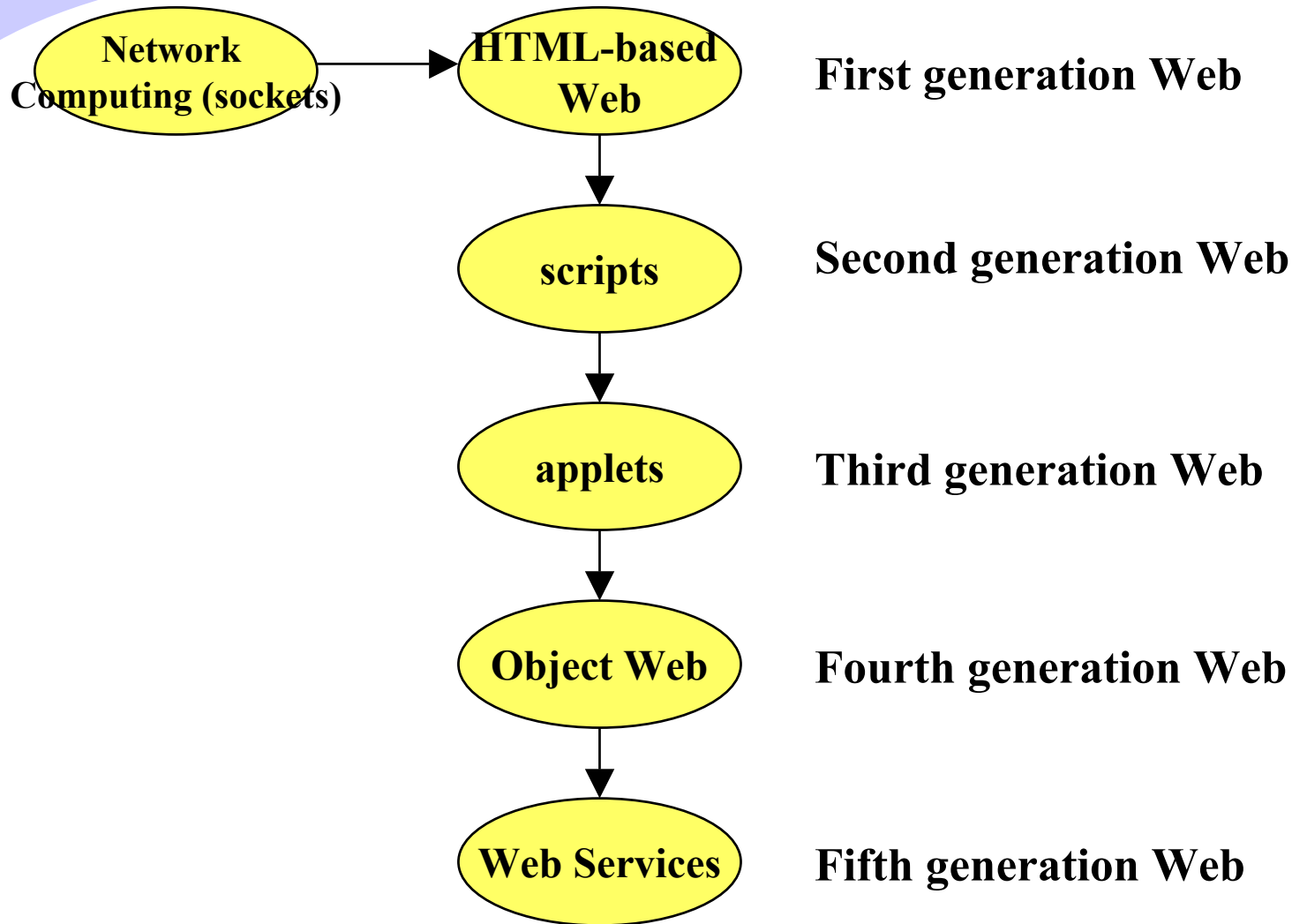
P. Kacsuk

MTA SZTAKI

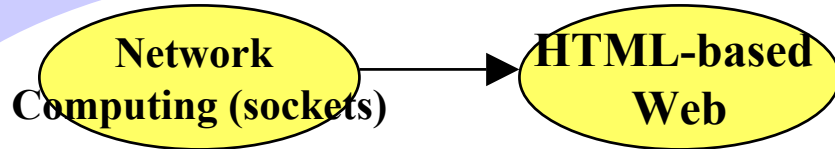
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Progress in Web technology

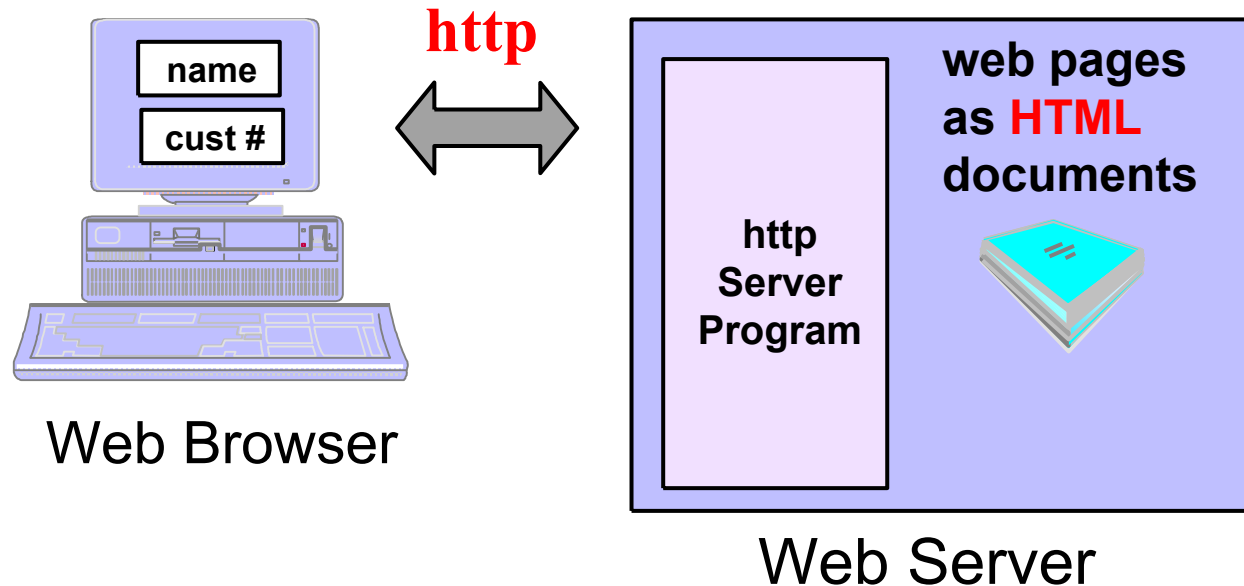


Progress in Web technology



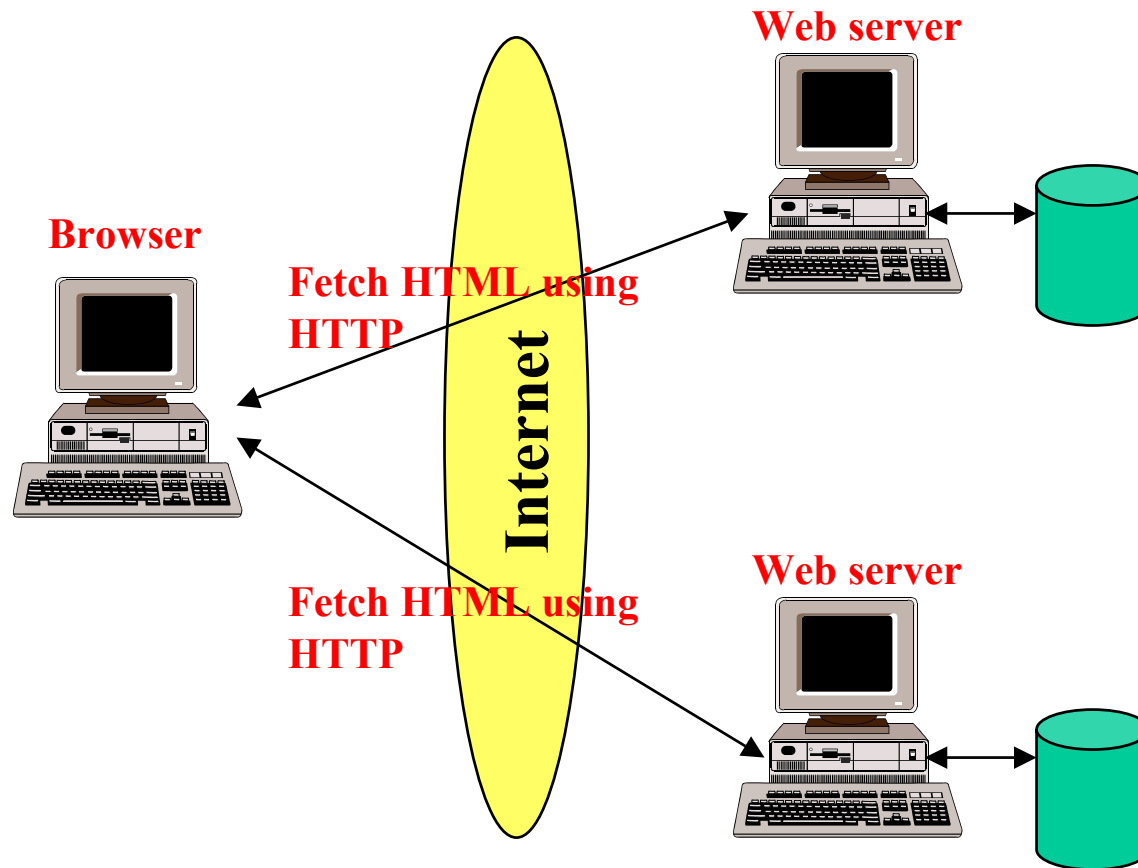
First generation Web

HTML-based Web



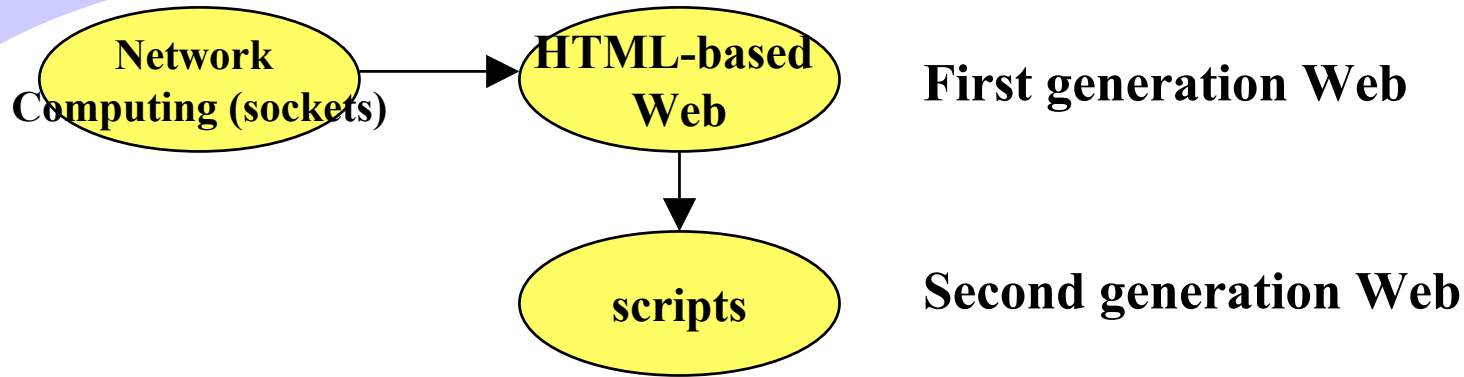
- Access to **HTML** documents
- Using the **HTTP** protocol
- Only information (data) retrieval
- No server-side processing

Content sharing across the Internet

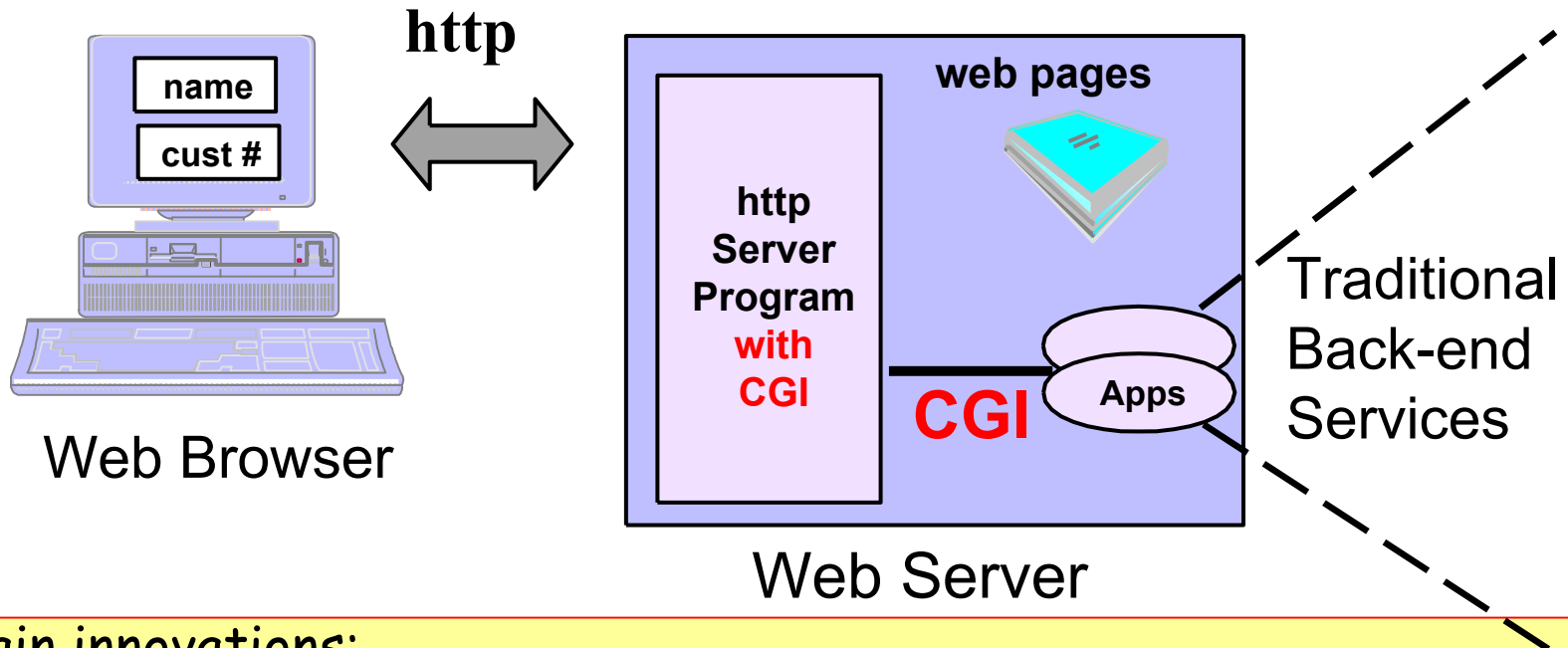


HTML and HTTP enable content sharing across the Internet

Progress in Web technology



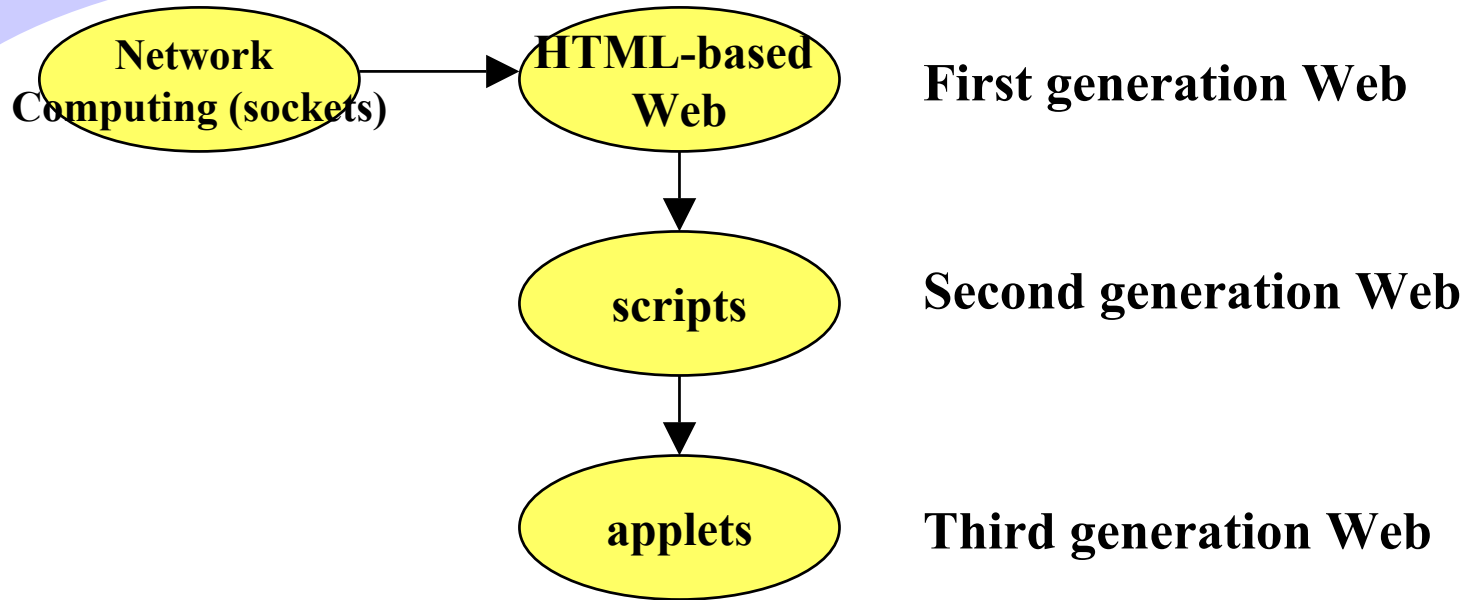
Script-based Web



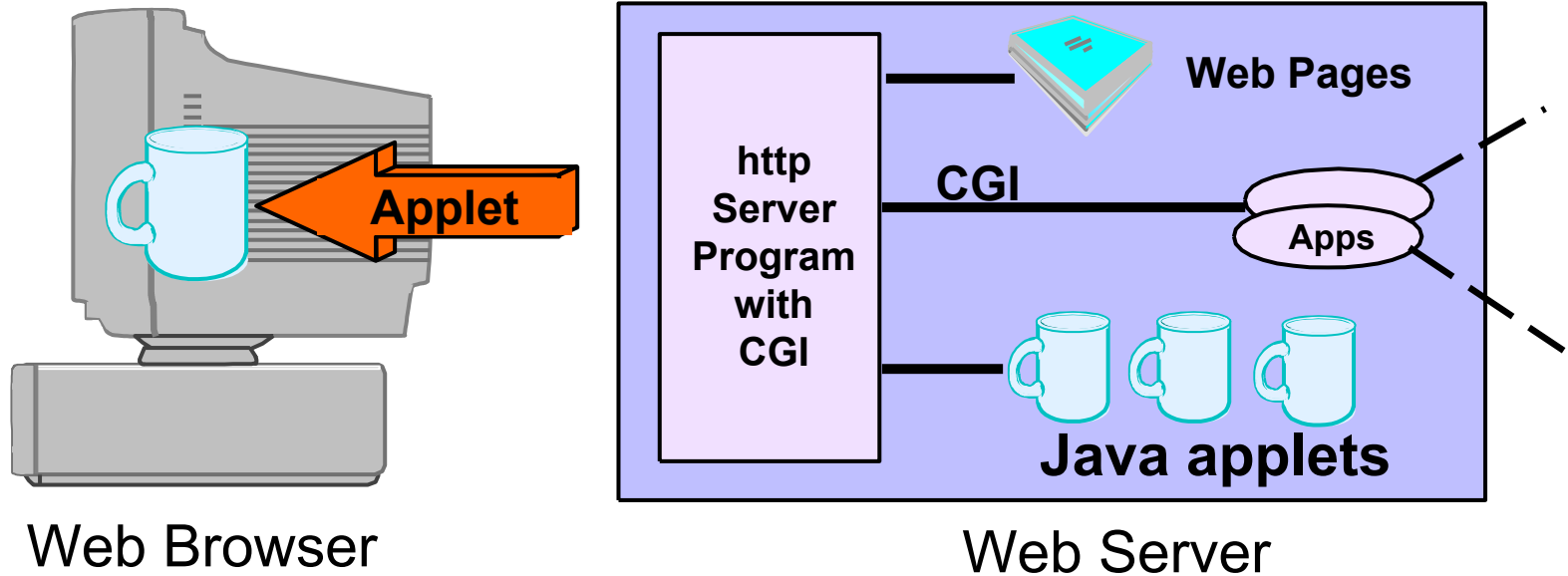
Main innovations:

1. **Fields, forms** - dynamic page content
 2. **Server-side processing** - CGI (Common Gateway Interface)
 3. **Access to legacy data**
-
1. A program on a server, triggered by input from a browser
 2. The **CGI** program links the **HTTP** server to another program, such as a database or transaction system

Progress in Web technology



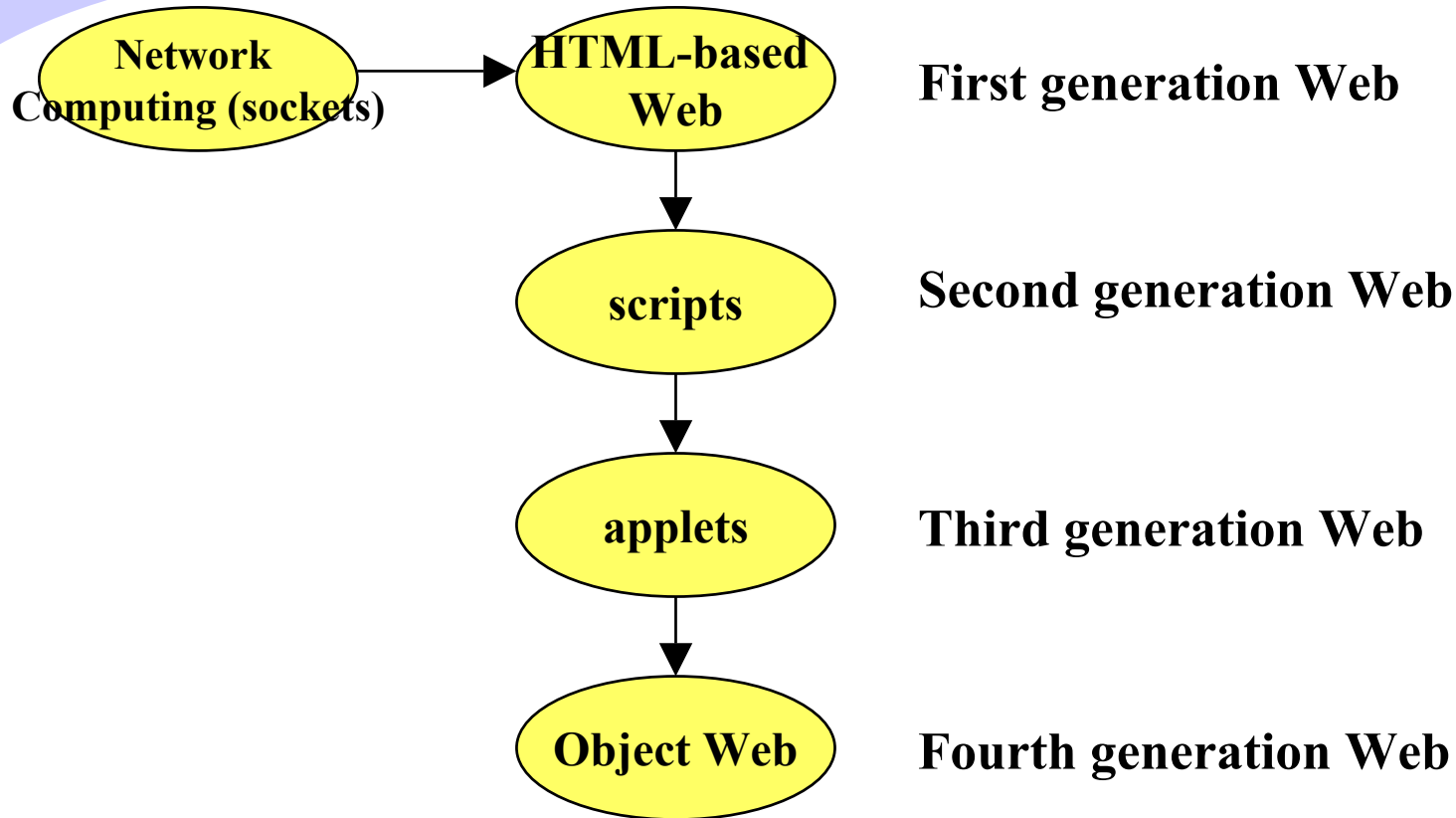
Applet-based Web



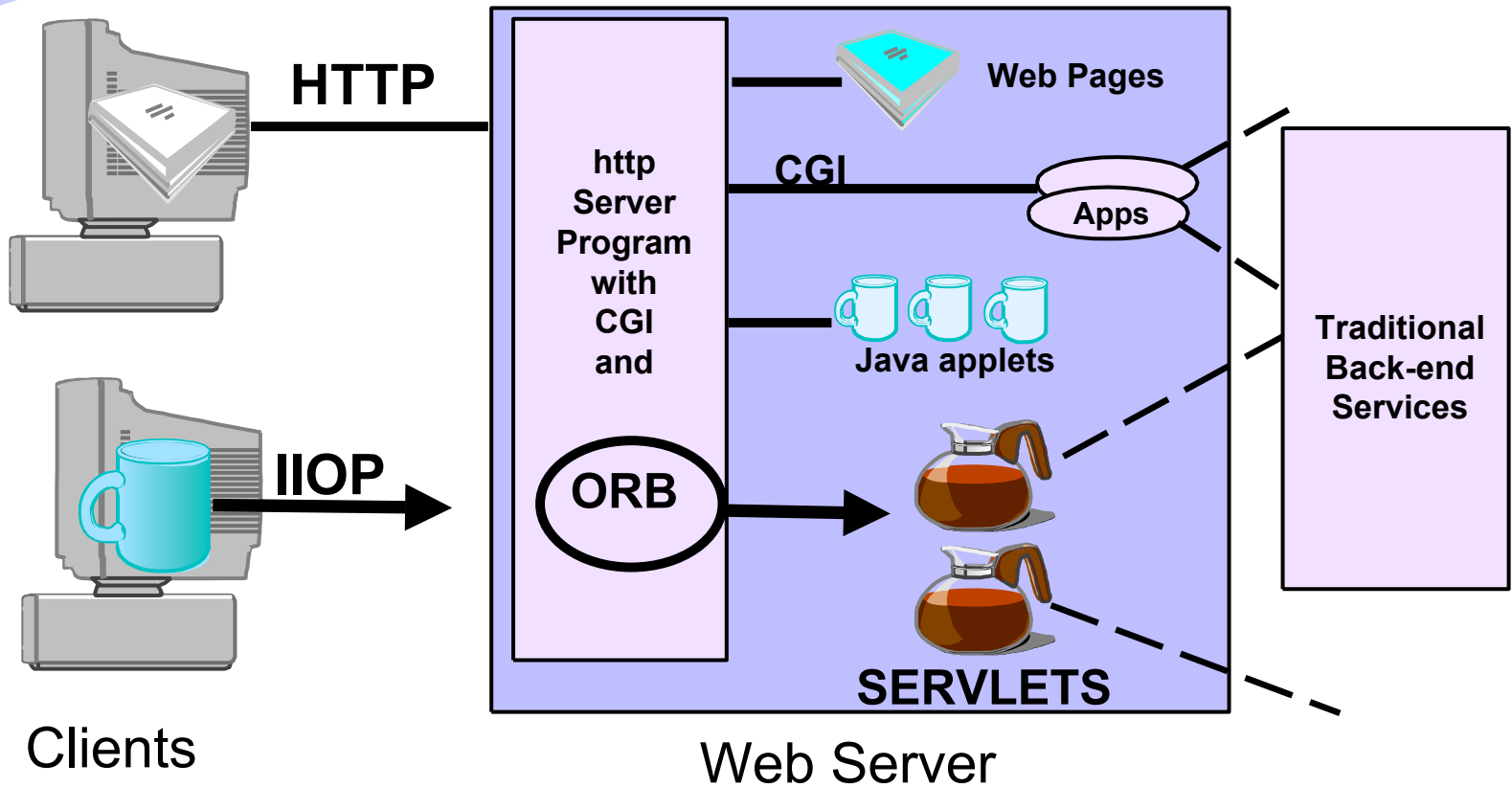
Main innovations:

1. Application processing on the **client**
2. Provide GUI applications through browser
3. Offload server => Faster user response

Progress in Web technology

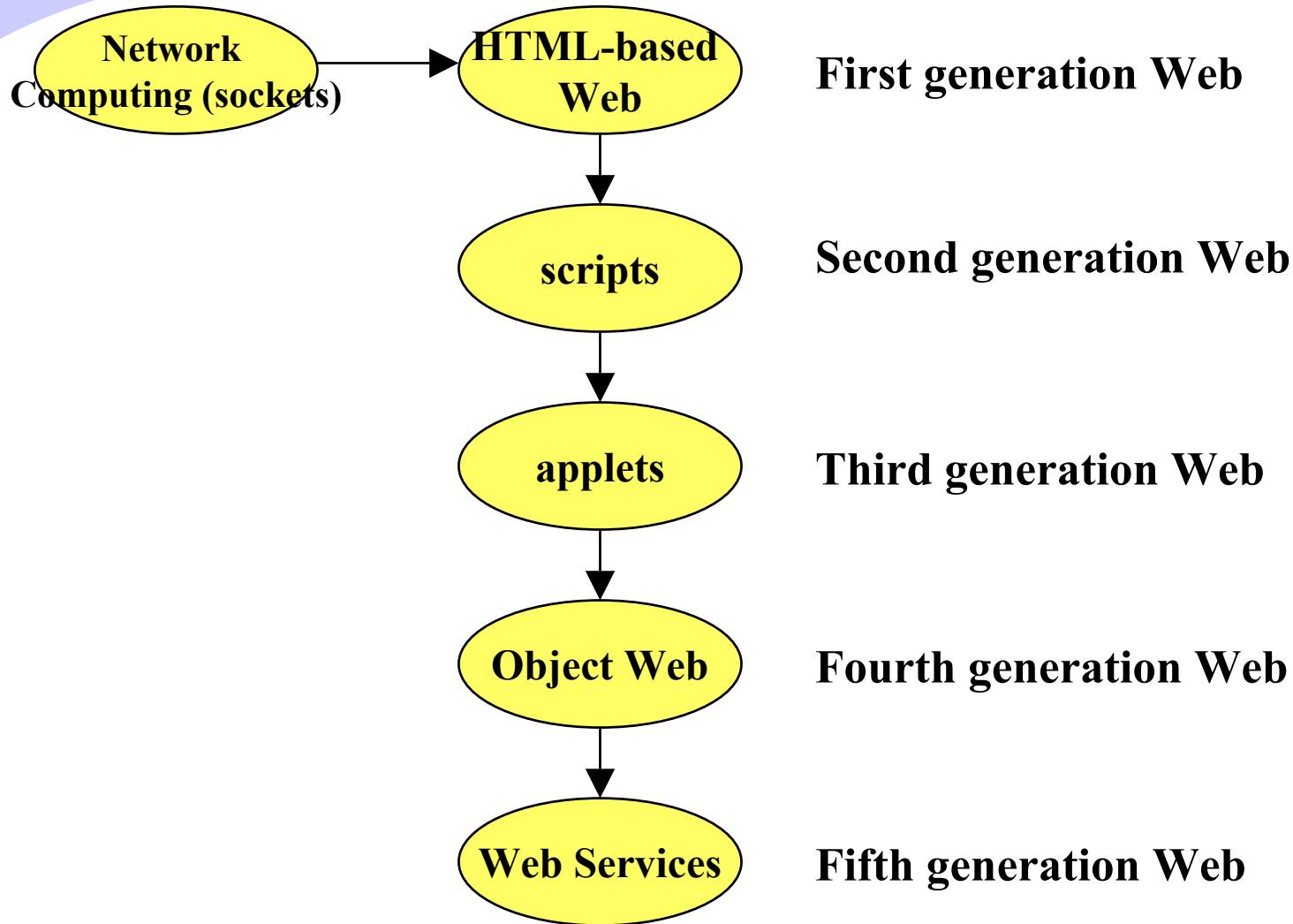


Object Web



- CORBA, DCOM, Java RMI, etc.
- What is missing?
- **A way to share data and software services across the Internet**

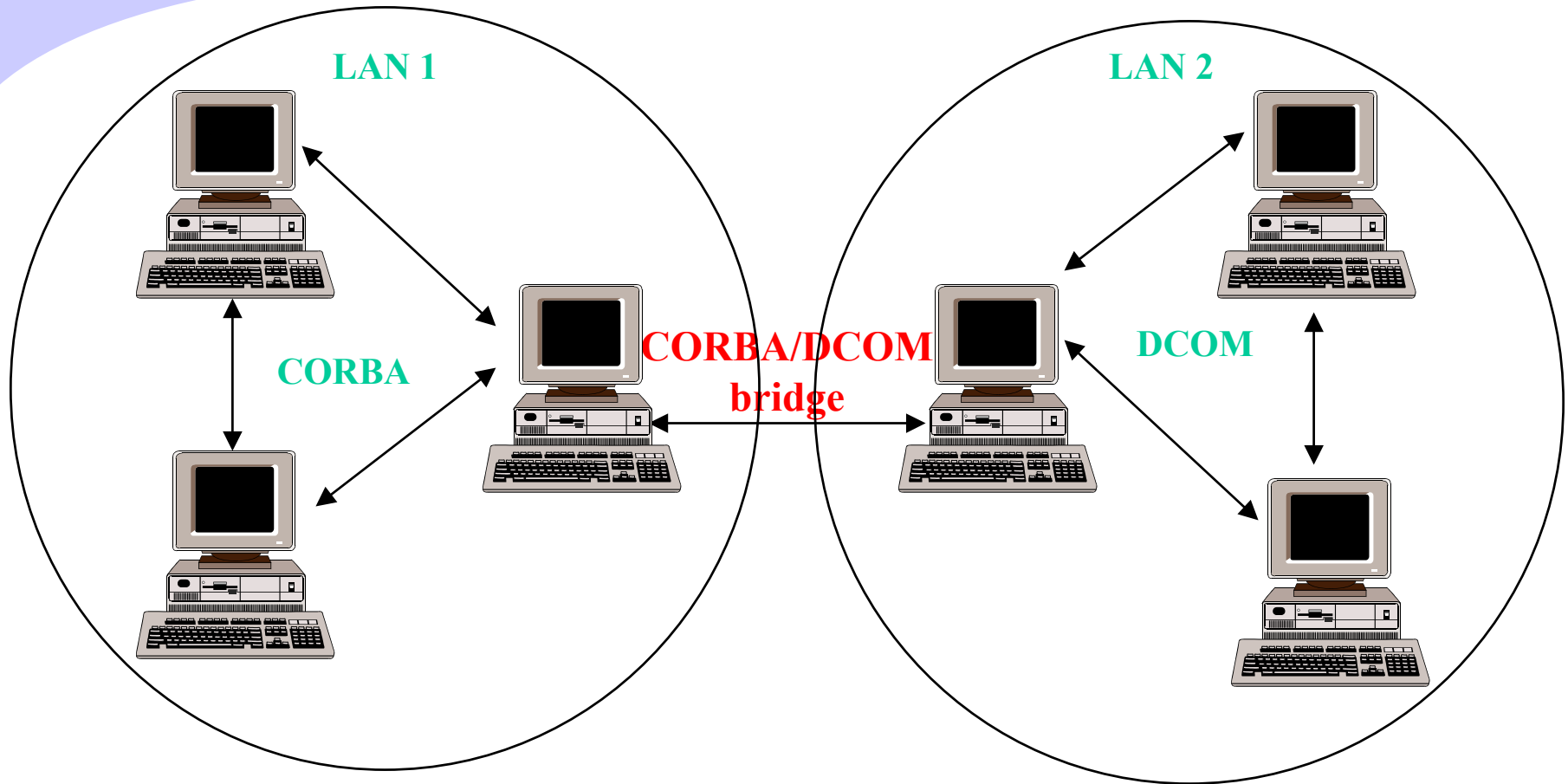
Progress in Web technology



Web services

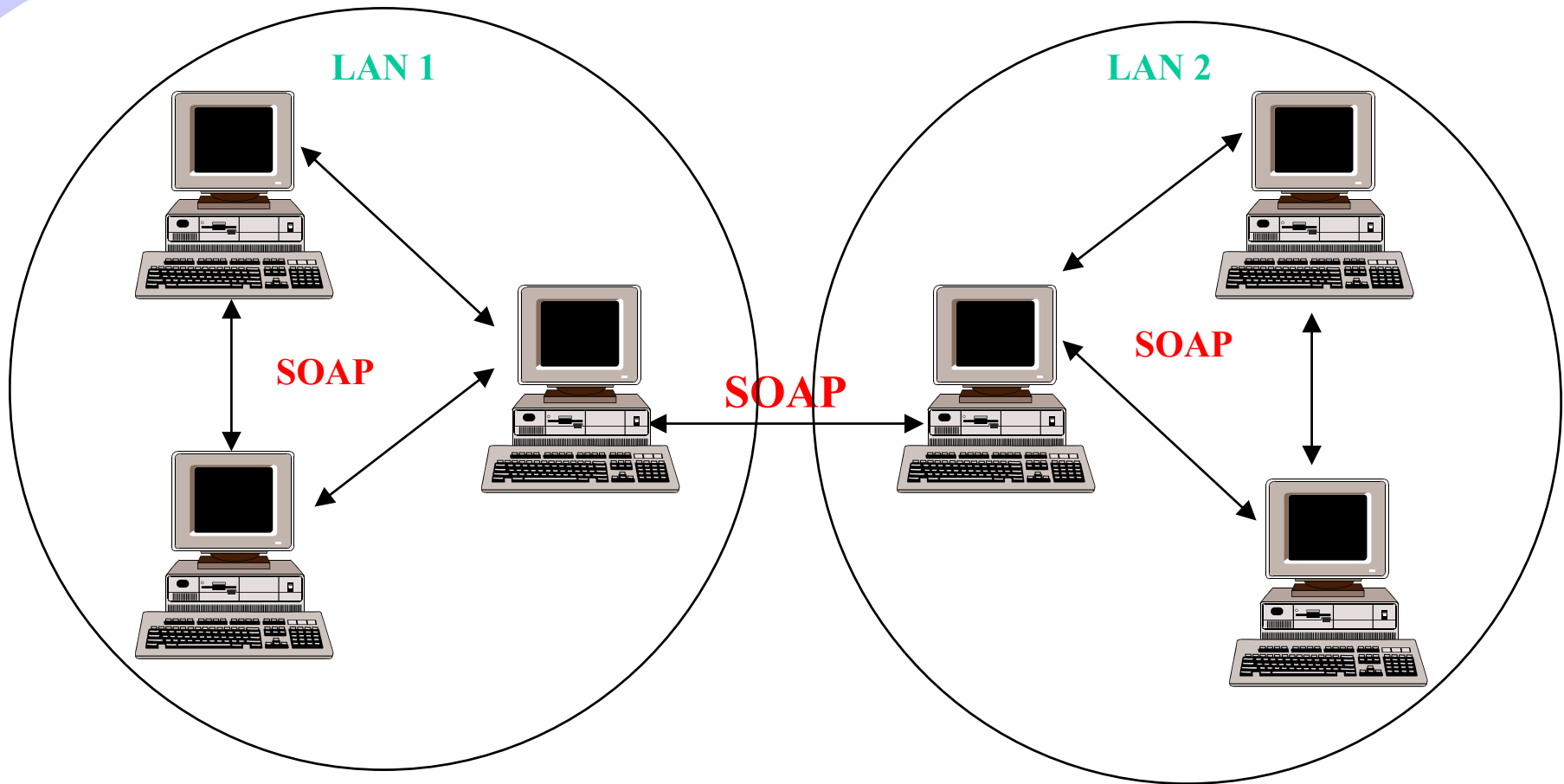
- Sharing of services is being tackled by a new set of standards:
 - **SOAP** (Simple Object Access Protocol)
 - **WSDL** (Web Services Description Language)
 - **UDDI** (Universal Description, Discovery and Integration)
- These standards allow software services to be published, located and invoked in a way that is
 - Language independent
 - Platform independent
 - Location independent
- Software building blocks created and deployed using this technology are called **web services**.

Old approach



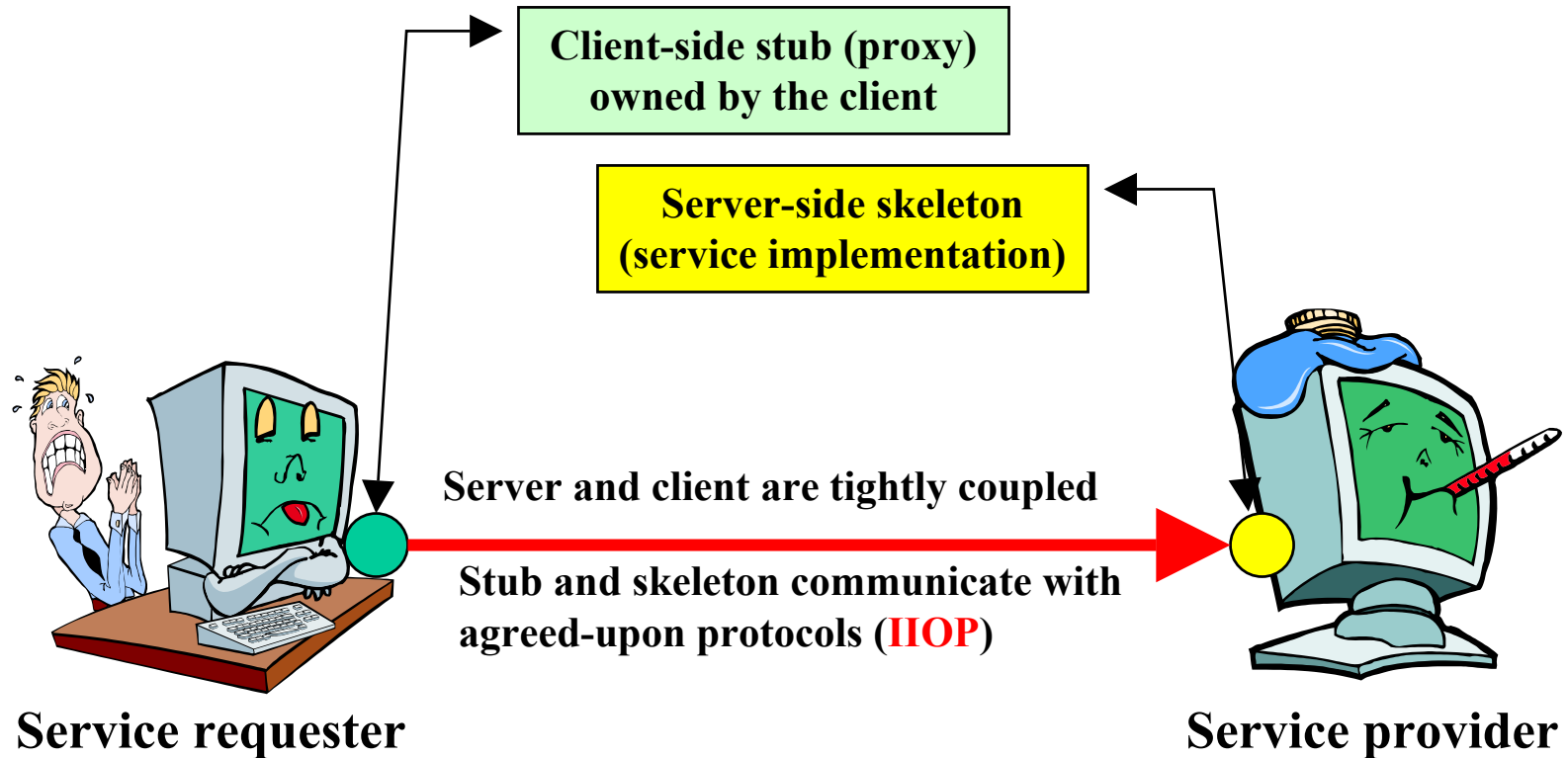
- CORBA and DCOM are incompatible and it is hard work to make them communicate with each other.
- You need protocol converters on each gateway.

New approach

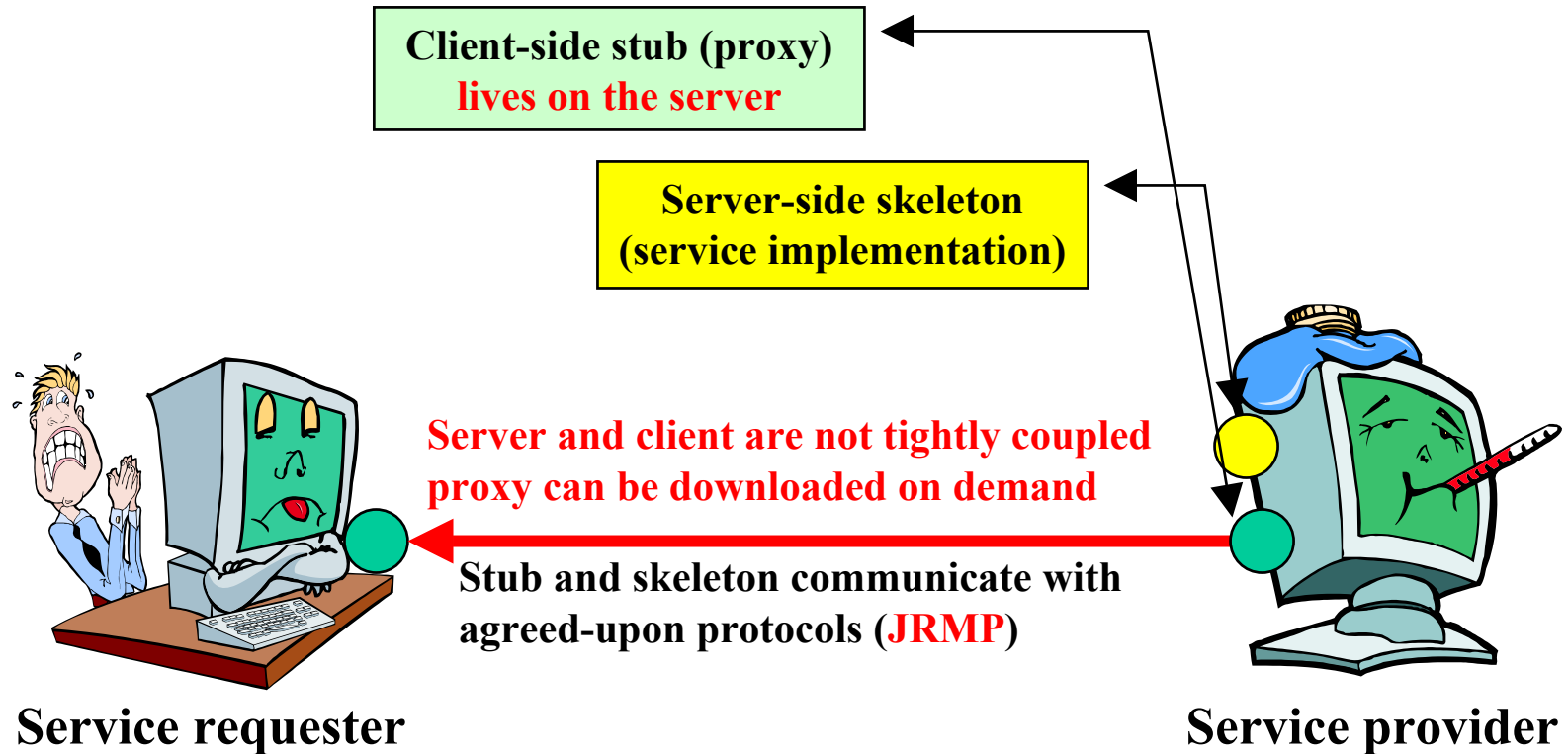


SOAP is a universal protocol for connecting everything

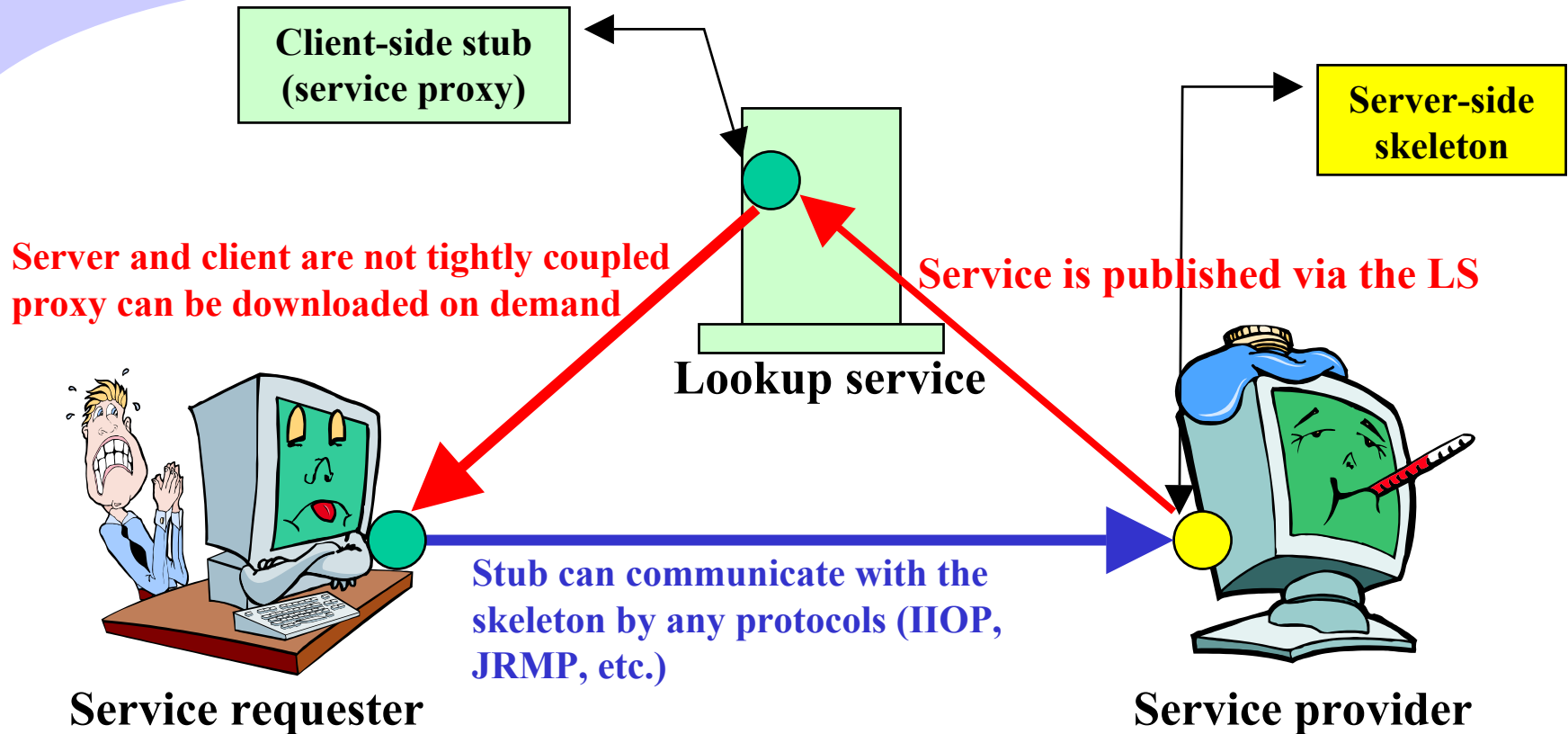
CORBA: Protocol-dependent system



RMI: Protocol-dependent system

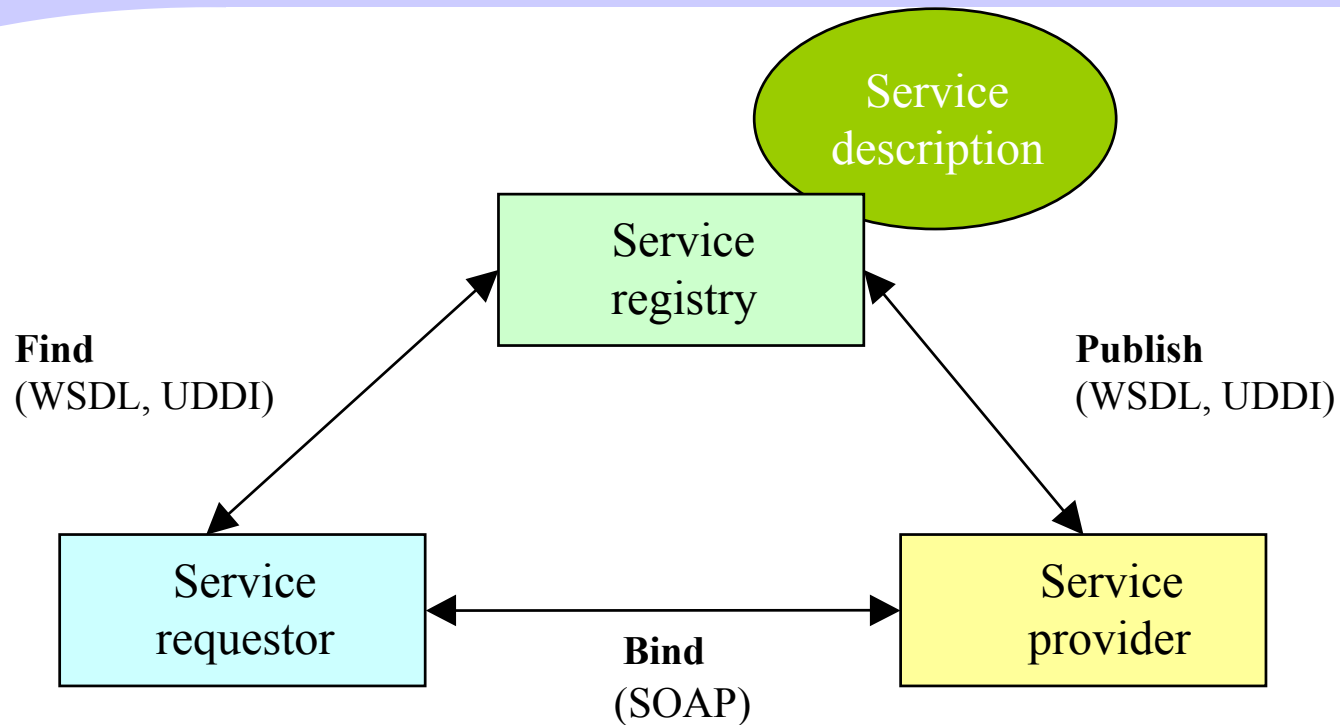


Jini: Protocol-independent system



Originally, a cluster technology and not web technology

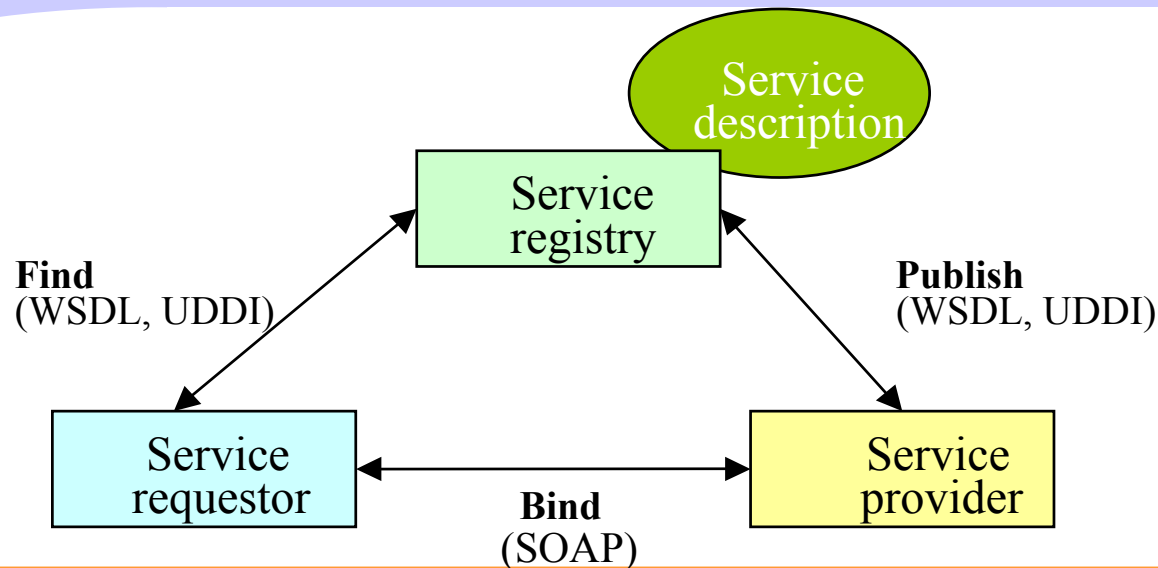
The Web services model



Predefined programs (services) wait for your invocation

- **HTML** catalyzed a vast **web** of **human-accessible content**
- **SOAP, WSDL** and **UDDI** enable a **web** of **machine-accessible content**

What is Web services?

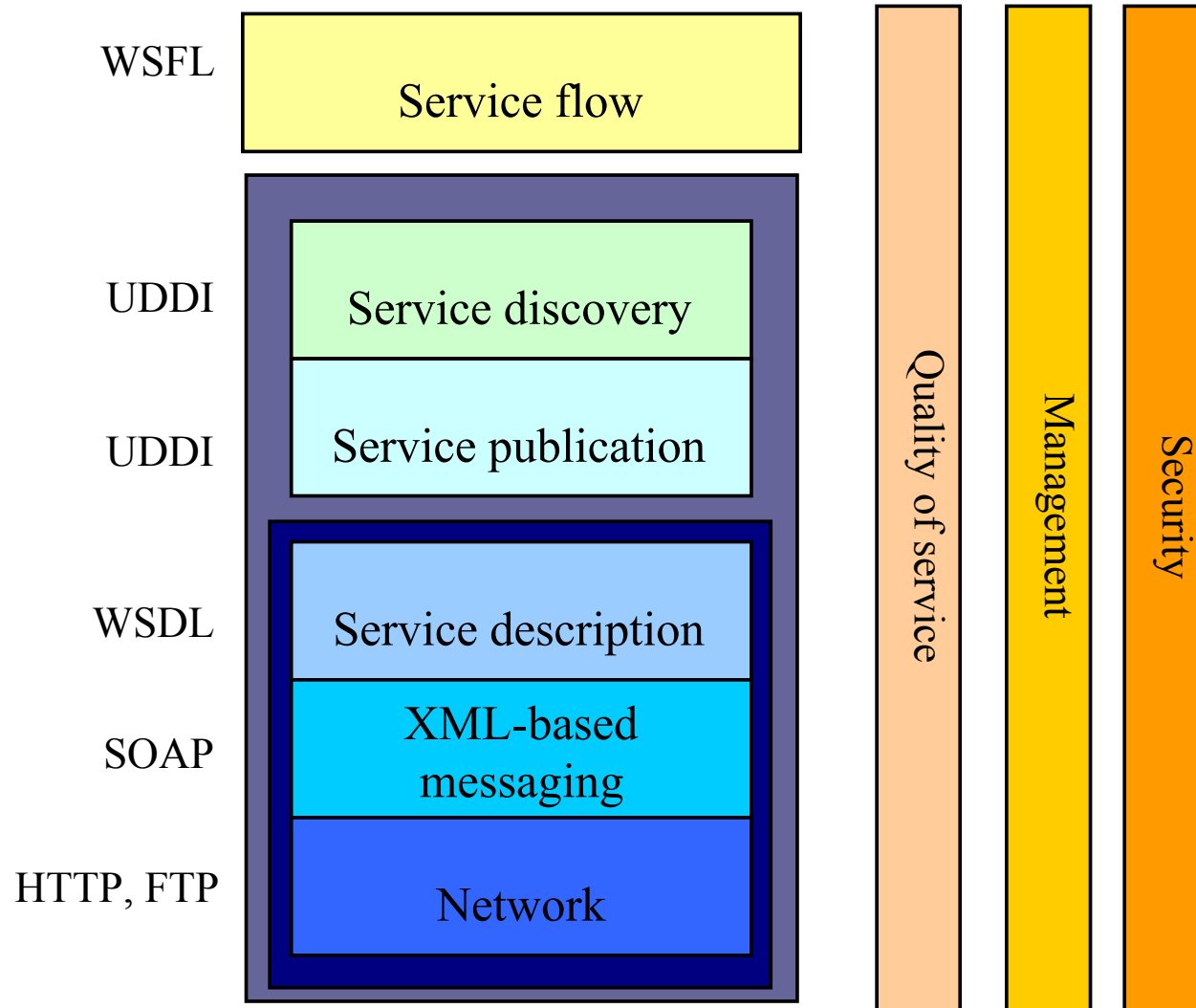


- Web services is a service oriented architecture with a set of standards that can be used to:
 - Describe WSDL
 - Publish UDDI (or WSIL)
 - Find UDDI (or WSIL)
 - Bind SOAP
 - Invoke SOAP
 - Compose WSFL (Web Service Flow Language)

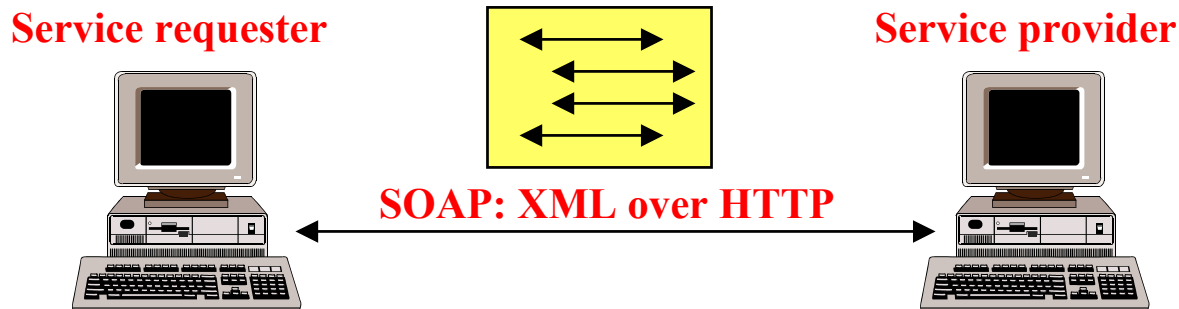
Web services

- **Web services** is a further extension of object Web
- **Web services** define a technique
 - For describing software components to be accessed
 - Methods for accessing these components
 - Discovery methods that enable the identification of relevant service providers
- **Web services** standards are being defined within the W3C (World Wide Web Consortium) and other standard bodies and form the basis for major new industry initiatives such as
 - Microsoft .Net
 - IBM Dynamic e-Business
 - Sun One

Web Services Stack

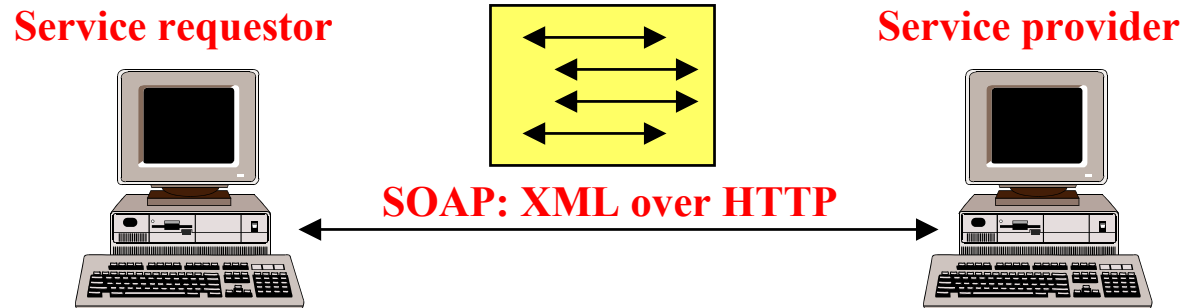


Simple Object Access Protocol



- **SOAP** provides a means of messaging between a service provider and a service requester.
- **SOAP** is a simple enveloping mechanism for XML payloads that defines an RPC convention.
- **SOAP** is independent of the underlying transport protocol
- **SOAP** payloads can be carried on HTTP, FTP, Java Messaging Service (JMS) and the like.

Simple Object Access Protocol

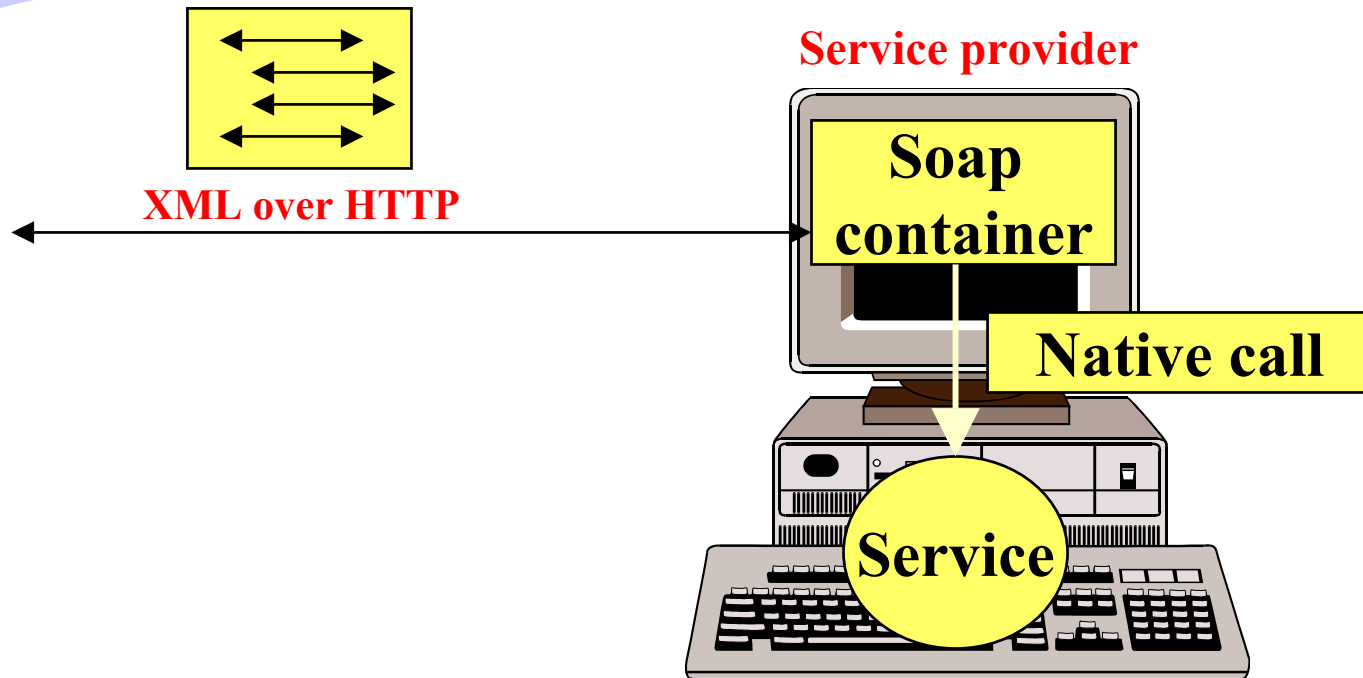


SOAP messages are XML documents, usually sent over HTTP

A simple XML document:

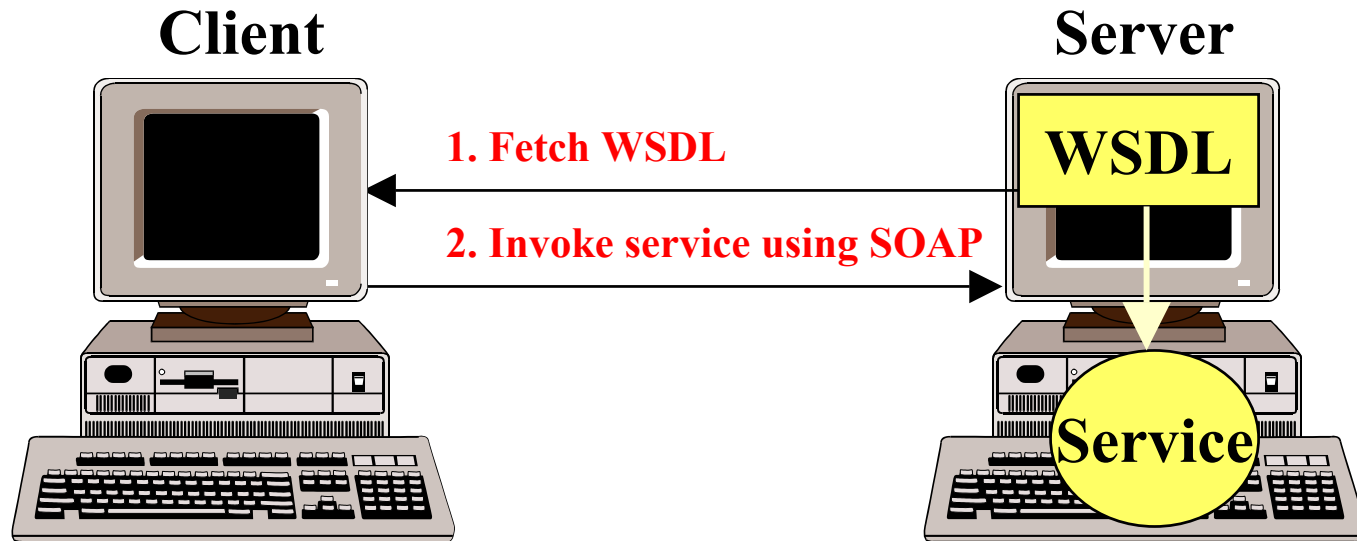
```
<invoice id = '12345'>  
  <item> ball <\item>  
  <amount> 400 <\amount>  
<\invoice>
```


SOAP container



- The easiest way to publish a sw component as a web service is to use a **Soap container** which
 - Accepts incoming requests
 - Dispatches them to published components
 - Translates them to the component's native language interface
- Soap containers are available for Java, C++, Perl and C#

Role of WSDL



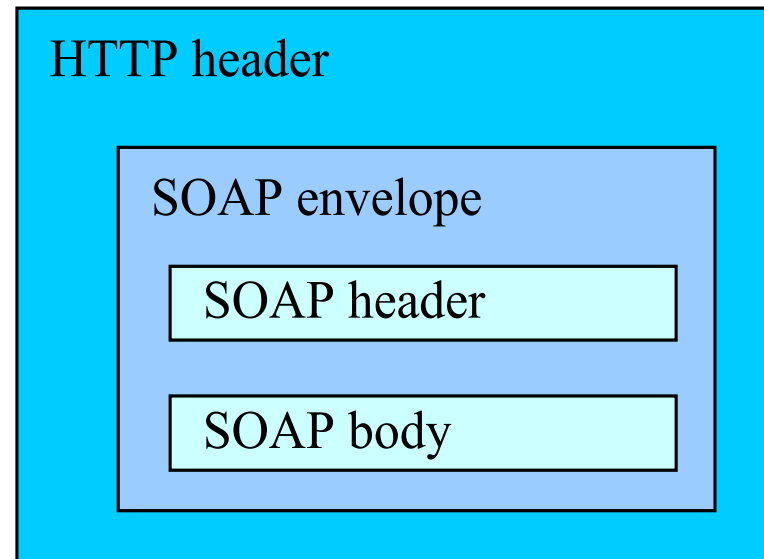
A client needs WSDL before invoking service

- SOAP clients read a WSDL file to get
 - the address
 - and message information of a web service.
- SOAP containers **automatically generate WSDL**, so developers don't have to write WSDL manually.
- Once the WSDL file is read, the client can start sending SOAP messages to the web service.

Standards and Protocols - SOAP

(Simple Object Access Protocol)

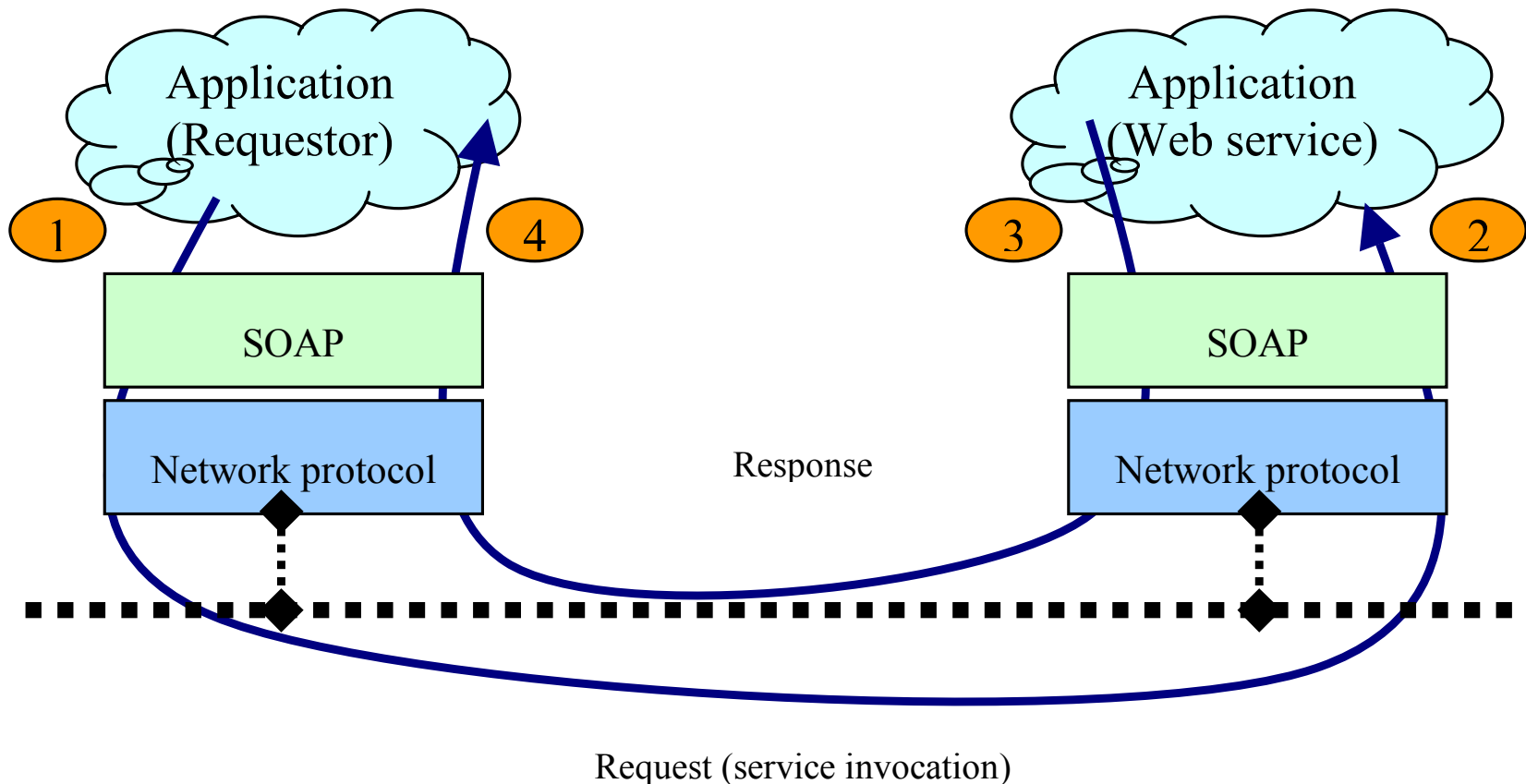
- Protocol for messaging and RPC-style communication between applications and services
- XML-based
- Uses common Internet transport protocols (HTTP, SMTP, FTP, MQ, etc.)
- SOAP elements:



- <http://www.w3.org/TR/SOAP/>

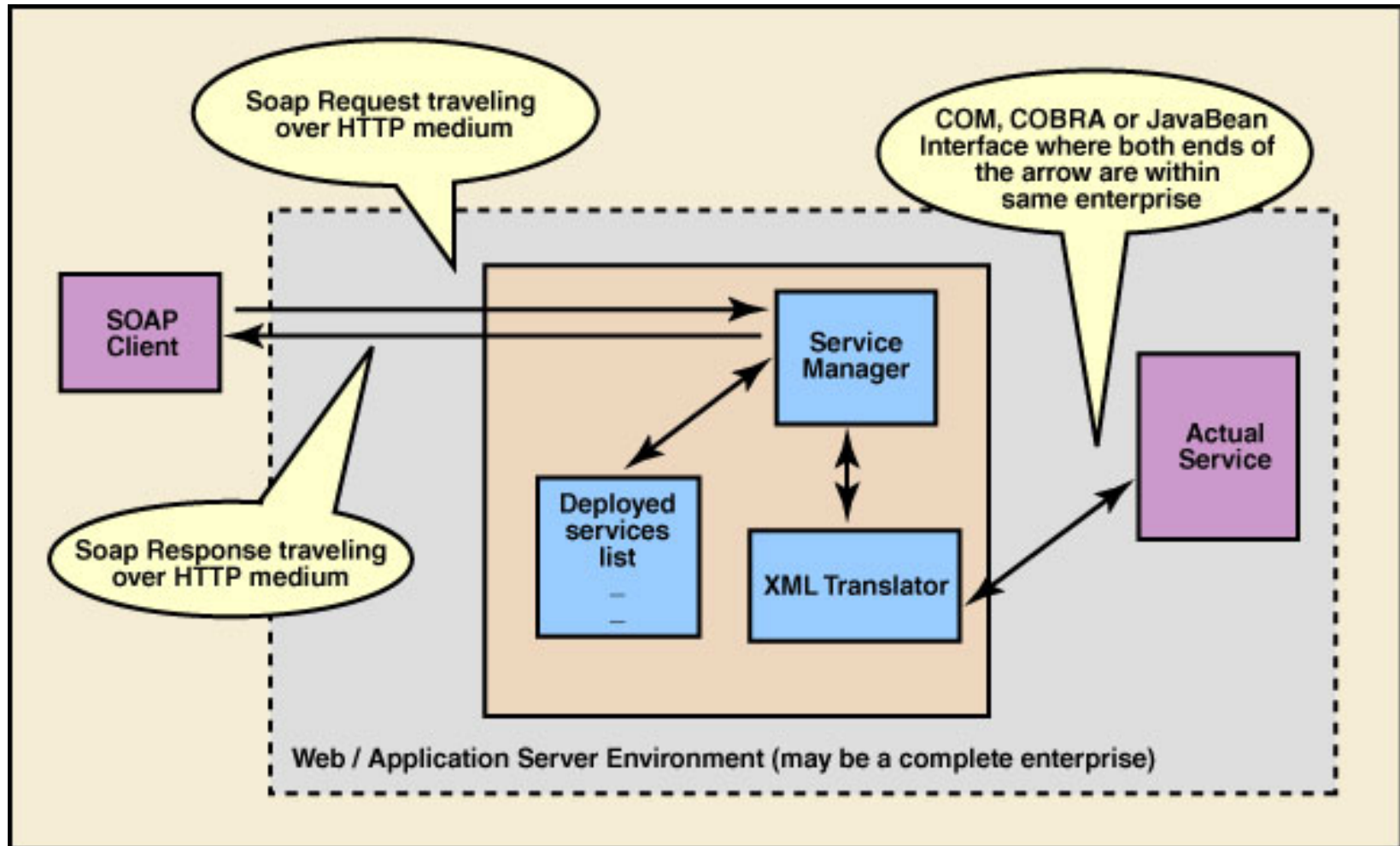
Standards and Protocols - SOAP

- XML messaging using SOAP:



Standards and Protocols - SOAP

- SOAP communication infrastructure:



Standards and Protocols - WSDL

(Web Services Description Language)

- Used by the service provider to describe a service
- XML-based
- Describes
 - what a web service can do
 - where it resides
 - how to invoke it
- Components:
 - PortType
 - Operations
 - Messages
 - Binding
- <http://www.w3.org/TR/wsdl/>

Web Services Description Language

- **WSDL** is an **XML document** for describing Web services as a set of **endpoints** operating on messages containing either docu-oriented or RPC payloads.
- **Service interfaces are defined abstractly** in terms of message structures and then bound to a concrete network protocol.
- Several **standardized binding conventions** are defined describing how to use WSDL in conjunction with SOAP, HTTP GET/POST, and MIME.

Standards and Protocols - UDDI

(Universal Description, Discovery and Integration Service)

- A standard that allows information about businesses and services to be electronically published and queried
- a “meta service” for locating web services by enabling robust queries against rich metadata
 - to find a WS of a particular provider
 - to find providers that offer a required WS
- Under development!
- <http://www.uddi.org/>

Thank you

Web Services Stack

P-GRADE

**Globus
MDS-2
Condor
Negotiator
Condor/Globus
Configuration**

MPI, PVM

