Mental Break

A few trends in distributed computing techniques

Agenda

- Introduction: Centralization vs. decentalization
  - The breathing model, Pluses and minus
- Networking, Recent advances: Quality of Service
  - Needs, problems to solve
  - Options: RSVP, Diffserv, MPLS, GMPLS
  - Congestion control, Unfair competition (TCP/UDP)
- Networking: Real-time media over the Internet
  - Requirements
  - Technologies
- Some trends in distributed computing techniques
  - WebDAV (File sharing and web folders)
  - From Client Server to Per-to-Peer (P2P)?
  - Application communication (From HTML to XML, SOAP)
- Concluding remarks and Epilog

- **WebDAV (File sharing and web storage)**
- **SOAP and XML**
  - **What is it, what is it good for?**
  - **XML basics**
  - **What it looks like**
- **Peer-to-Peer Networking**
  - **What is it**
  - **More than one model**

What is WebDAV?

- **Recent IETF standard**
- ***HTTP Extensions for Distributed Authoring* *(WebDAV)* released by the IETF as RFC 2518**
- **For managing files on web servers as if these would be part of the local file system**
- **Several commercial and public-domain implementations exist already**

Part based on A.Pace's Work

Current functions

- **File access:**
  - Create / delete files and folders
  - Read / write files
  - Copy / Move / Delete / rename files and folders
- **Document locking**
  - prevent the overwrite problem

Coming functions

- **Access control**
  - Set / View / Modify Access Control lists using http
- **Versioning and Configuration Management**
  - Document check-out, check-in
  - Retrieval of the history list
  - Offline files and folders

An alternative to AFS ?

- **Not yet**
- **Problems:**
  - File system services offer more
    - Random Access / direct access
    - Multi open count / Multiple authors simultaneously on the same file, ...
  - WebDAV currently implemented at “application” level
    - Only “WebDAV enabled” applications can see files on web servers

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What is SOAP?

Simple Object Access Protocol

- **A mechanism for communication between applications**
- ***That is :***
  to replace conventional RPC techniques (e.g. Corba)
- **Messages (Requests and responses) coded using XML**
- **Uses HTTP as the transport mechanism**

Based on A.Pace's work

SOAP: Where does it come from?

- **Created by** *Microsoft, DevelopMentor, Userland SW*

- **Proposed to W3C by**

  Microsoft, DevelopMentor, Userland, Ariba,

  CommerceOnee, Compaq, HP, IBM, IONA, Lotus, SAP

Ideas behind SOAP

- **Transport: HTTP**
  - conventional RPC represents security problems (firewalls, proxy)
  - HTTP is **standard**, supported by all browsers, servers
  - HTTP is **stateless**
- **Encoding: XML**
  - XML is a **standard** for structuring text
  - XML parsers widely available
  - XML is **open**

Positioning of SOAP

- **Not a new technology:** standardizes existing practice of using HTTP and XML
- **Not fundamentally different from existing ORPCs**

but

- **Standard** (thus increases interoperability)
- **Lighter**
- **Allows global applications** (can run over firewalls)

Using HTTP

- **De facto transport protocol over the Internet**
- **Simple, light**
- **Stateless (we also say session-less):**
  - no delay for setting up the session
  - no traffic to maintain it
- **Other RPC "transport" protocols**
  - IIOP, DCOM: complex, heavy
  - DCOM: connection oriented

Observations, Trends

SOAP (and HTTP)

Recognizes Merits of Stateless

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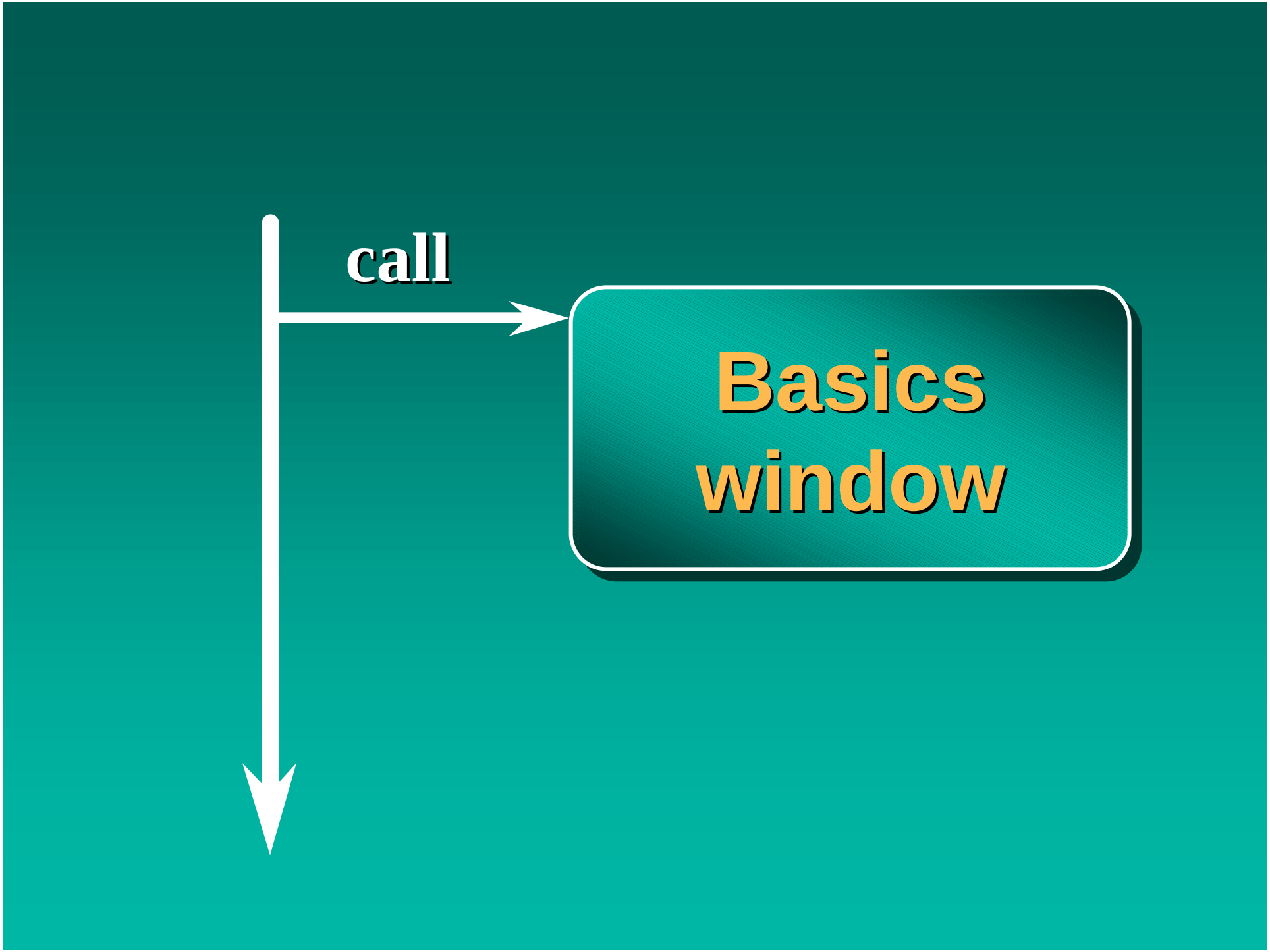

call
Basics window

What is XML?

Extensible ark-Up language

- **A standard for Structuring Text**
- **Based on mark ups, like HTML**
- **Mark-up: way of encoding data with information about it**
  - e.g. Yellow highlighter :

    ... We will come back to this point next week ...

    Information about marked text (meaning of the markup) = important point
  - need agreed convention (a standard) to define what yellow means

What is XML?

- **Unlike HTML, rather a meta language for defining other mark-up languages**
  - You may define your own mark-up language with your own set of tags
  - ... as you define the field names in a data structure
- **Of course, applications must**
  - recognize your tags
  - understand their semantics (what to do with them)

Making your XML useful

- **Your own XML = an XML "Schema"**
- **Valid tags, syntax for marking up**
  - Specified in **Document Type Definition** (DTD)
- **Semantics (meaning) of the tags**
  - Specified in **styles sheets**

  (associated with XML documents)

Example of XML document

An XML schema could define formatting of **email messages**

```
<message>
  <to>you@yourAddress</to>
  <from>me@myAddress</from>
  <subject>Breaking news for IN2P3</subject>
  <text>IN2P3 days extend next week,
  beware!</text>
</message>
```

Example of XML doc. with attributes(1)

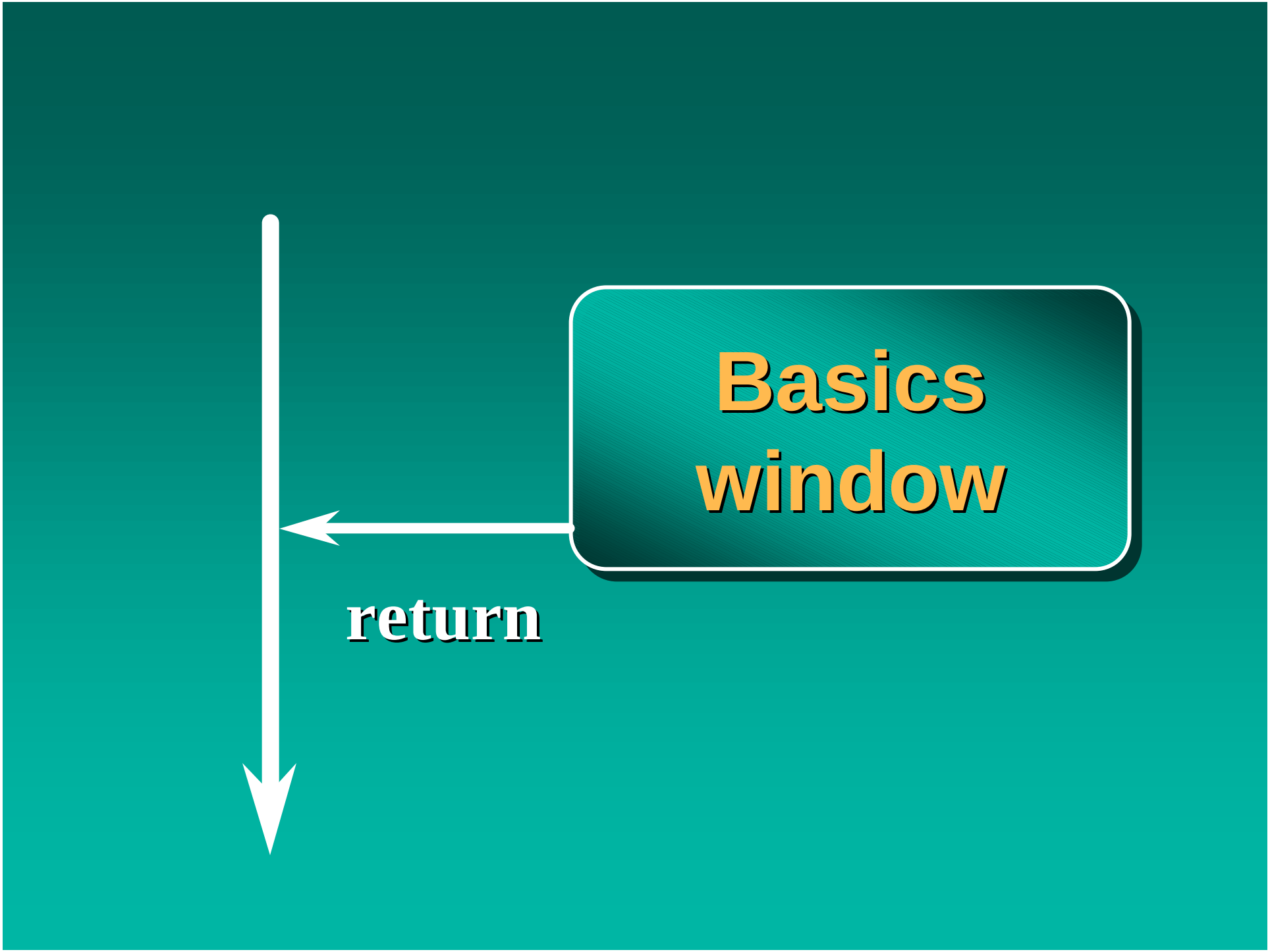
```
<purchaseOrder orderDate="2001-07-27">
   <comment>Urgent!</comment>
   <item partNum="872-AA">
        <productName>Lawnmower</productName>
        <quantity>1</quantity>
        <Price>148.95</Price>
   </item>
</purchaseOrder>
```

(1) From A.Pace, CERN

XML and HTML

- **HTML** tags tells you **how to display** the data
- **XML** tells you **what it means** (as a field name in a program)
- **If data needs to be displayed:**
  - Stylesheet standard **XLS:** specifies translation to HTML

    (or to other formats)


Basics window
return

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SOAP HTTP messages example

```
POST /path/foo.pl HTTP/1.1
Content-Type: text/xml
SOAPActor: interfaceURI#Add
Content-Length: nnnn

<soap:Envelope>
  <soap:Body>
    <Add>
      <arg1>24</arg1>
      <arg2>53.2</arg2>
    </Add>
  </soap:Body>
</soap:Envelope>
```

```
200 OK
Content-Type: text/xml
Content-Length: nnnn

<soap:Envelope>
  <soap:Body>
    <Response>
      <sum>77.2</sum>
    </Response>
  </soap:Body>
</soap:Envelope>
```

Future of SOAP

- **Attracts increasing interest**
- **Key element of MS's Windows DNA 2000 architecture for future Internet Application development**

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What is Peer-to-Peer Networking?

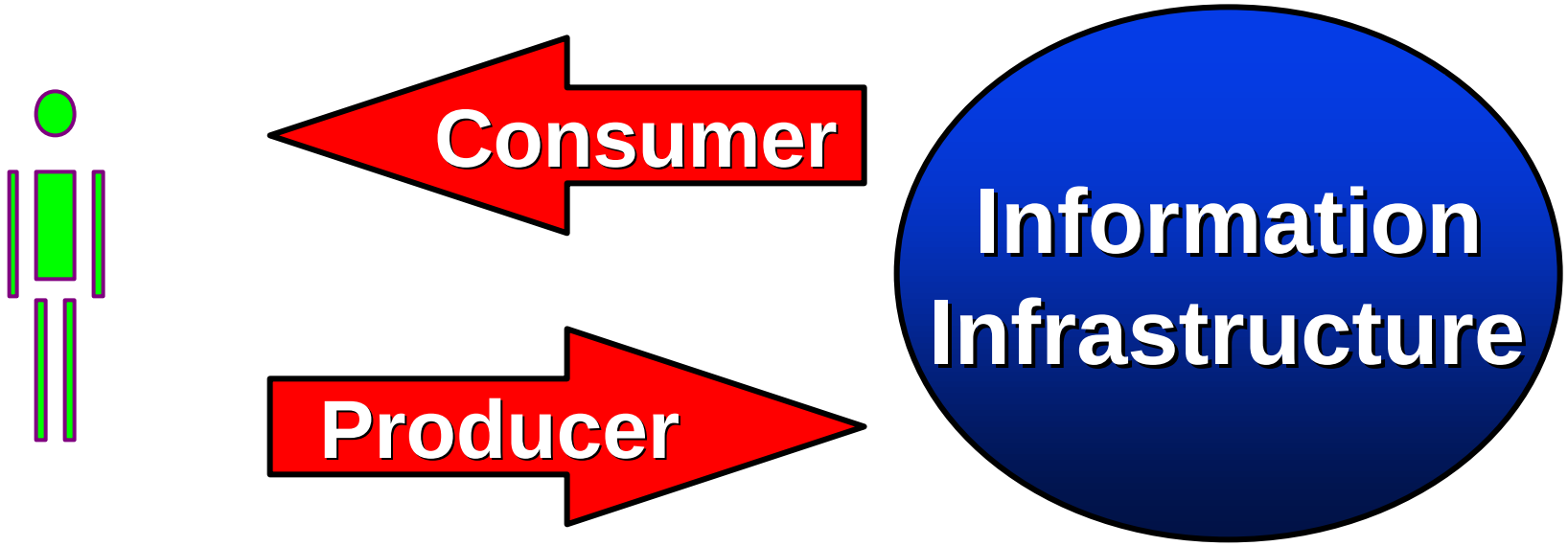
- **Sometimes presented as a new paradigm**
  - **Opposed to client-server model**
- **In fact an old model**

  "A set of technologies that enable the direct exchange of services or data between any group of computers"

- **My definition:**

  "An attempt to make more symmetrical the relationships between systems which communicate at a distance"

Initial Web idea (Tim B.L.)



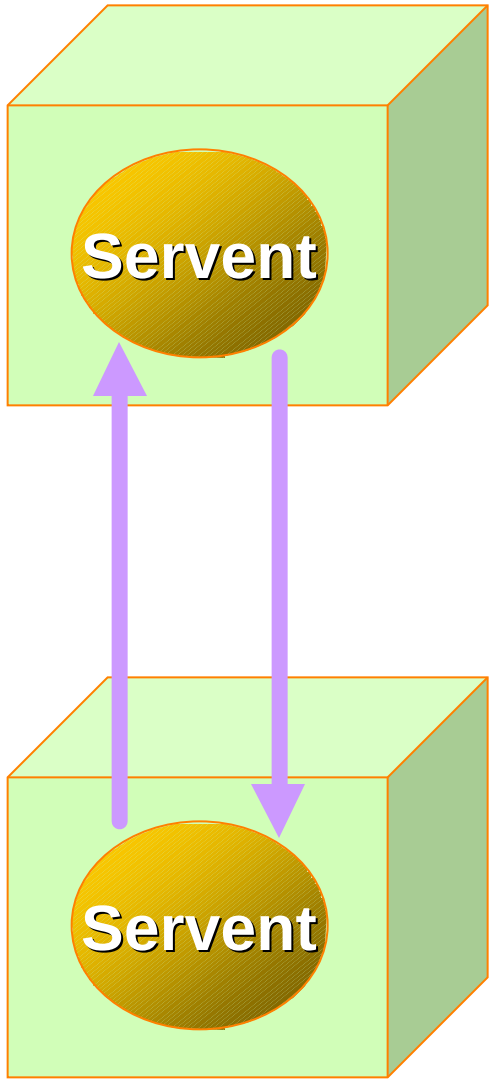
Anyone: consumer and producer

What is Peer-to-Peer?

- **Each “peer” takes on the roles of both client and server**
- **The entertainment industry has been the driving force**
  - Media exchange (Napster)
  - Gaming
- **Computing industry may be jumping up**
  - e.g. SUN’s JXTA (Juxtapose)
- **Viewed by some as a new approach to locate and share resources (processing cycles, disk storage, files)**

Servents

- SW neither server nor client
- Called SERer-cliENT



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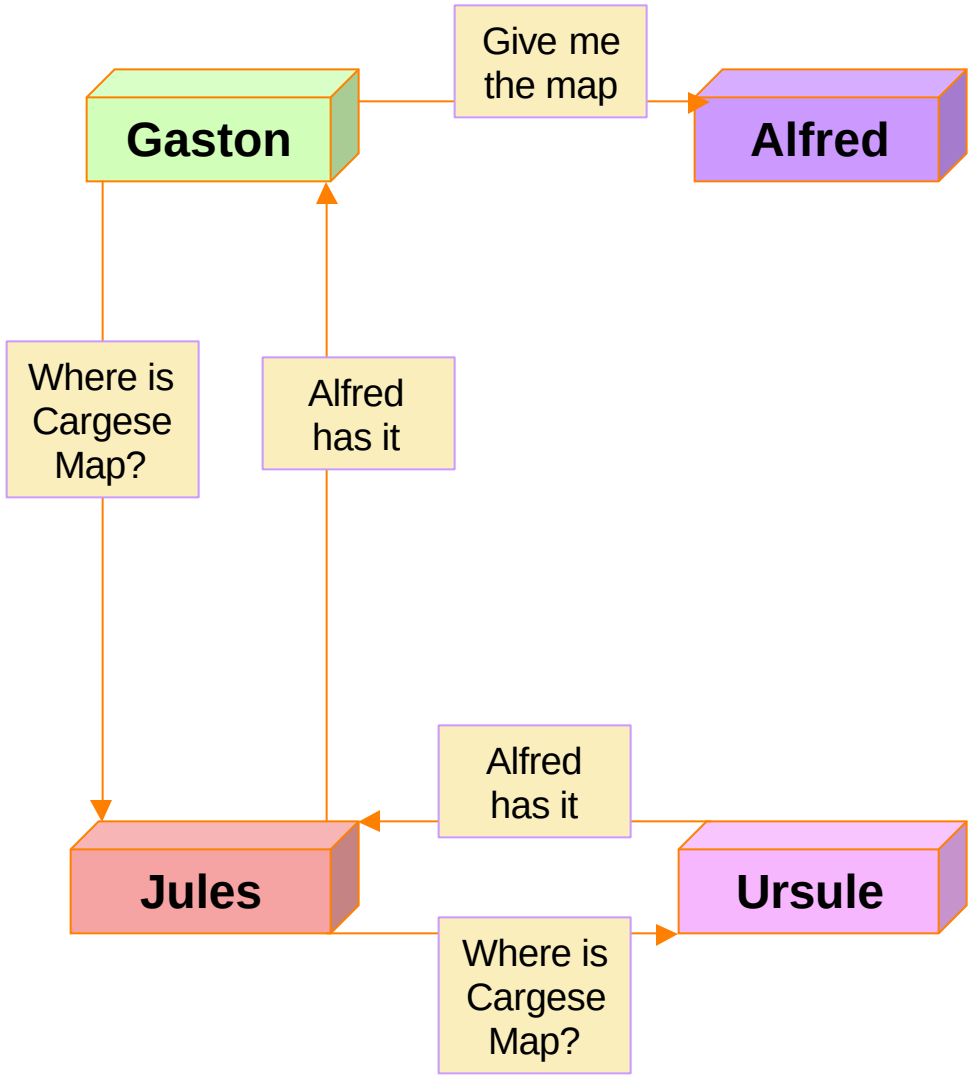
Forms Peer-to-Peer

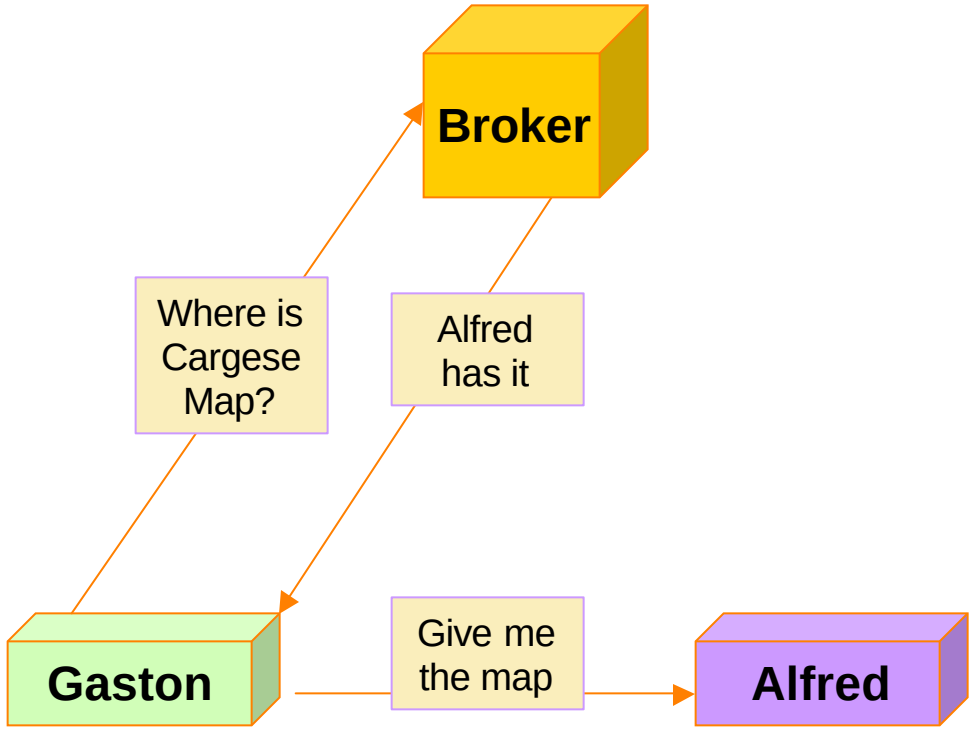
- **Pure P2P**
  - **really symmetrical**
- **E.g. For file sharing**
  - Users register files with network neighbors
  - Requests forwarded
  - No centralized broker

Example: **Gnutella**



Forms of Peer-to-Peer

- **Hybrid P2P**
  - **centralized broker needed**
- **E.g.**
  - Users register files with central broker
  - User query broker
  - User talk in a P2P basis



Example: **Napster**

Observations, Trends

Despite noise,

P2P often requires Centralized Servers

What is Gnutella?

- **A pure P2P search system**
- **Mainly used to find files**
- **Neither a company nor a particular application**
  - Rather, the name of a technology (like “email”)
- **Developed by Nullsoft (March 2000)**
- **Search protocol published**
- **Some Servents are Open Source**

End of

Part 4

A few trends in distributed computing techniques Transporting