Xerox PARC experimented in the 1970's with distributed applications (Alto workstation, Ethernet).
A book of Ken Birman (chap 27) gives a brief overview of a number of distributed systems, e.g. Amoeba, NavTech, Telen, Argus, etc.

Sun Network File System (NFS)
Java 2 Platform Enterprise Edition (J2EE)
Google

Characteristics

File catalogs are exported (by server subsystems) and mounted (by the client machines).

Support of a mount service:

- file /etc/exports on NFS server lists names of local filesystem available for remote mounting.
- mounting request by client with: remote host, directory pathname and local name with which it is to be mounted.
- automounter: dynamically mounting of a remote directory whenever an 'empty' mount point is referenced by a client.
NFS implementation is based on RPC calls between the involved operating systems. It can be configured to use UDP or TCP.

The current version of NFS is a **stateful** file server, i.e., a server subsystem supports locking and delegation of actions to clients to improve client-side caching.

Java 2 Platform Enterprise Edition (J2EE)

The J2EE platform (now called Java Platform, Enterprise Edition - Java EE) is essentially a distributed application server environment. It is a Java environment that provides the following:

- a runtime infrastructure for hosting applications,
- a set of Java extension APIs to build applications.

**Objectives of J2EE**

- **J2EE architecture**
- **J2EE container**
- **J2EE application**
- **Java Server Pages**

**Example implementations**

- IBM **WebSphere**: proprietary integration and application infrastructure software; provides J2EE support
- JBoss: Open Source advanced middleware for J2EE based distributed applications

J2EE is continuously extended by new technologies, e.g., integrating the support for Web Services.

Sun Network File System (NFS)

NFS implementation

Characteristics

NFS implementation

network extension to Unix and other operating systems for distributed file management.

- **Characteristics**
- **NFS implementation**

An earlier version of NFS was a **stateless** file server, i.e., a server subsystem does not store state information about its clients and their past operations.
A J2EE platform consists of the J2EE application server (runtime environment), one or several J2EE containers, and the data storage.

J2EE container

A typical J2EE platform has one or several containers. A J2EE container has two principal tasks: runtime environment for managing application components, to provide access to J2EE APIs.

Available APIs of the J2EE platform:
- RMI/IOP: Remote Method Invocation (via IIOP)
- JNDI: Java Naming and Directory Interface
- JTA: Java Transaction API
- JDBC: Java Database Connectivity Extension
- JMS: Java Message Service
- Java Mail
- JAF: Java Beans Activation Framework

Examples for application components: Java Servlets, Java Server Pages, Enterprise JavaBeans.

J2EE supports the following general containers:
- Web container: Java Servlets, JSP pages
- EJB container: Enterprise Java Bean components

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J2EE application

A J2EE application consists of several modules, each of which again contains several application components. Modules and application components are listed in an archive file:

- EAR (Enterprise archive), WAR (Web archive) or JAR (Java archive)

Generated by Targenstar
Java Server Pages technology uses XML-like tags and snippets written in the Java programming language to encapsulate the logic that generates the content for the Web page.

- Comment: <%--Comment -->%
- Declaration: <%! int x = 0; %>
- Expression: <%= expression %>

Scriptlets <contain Java Code>

```
<% if (value.getName().length != 0) { %>
   <h2>The value is: <%= value.getName()%></h2>
<% } else { %>
   <h2>Value is empty</h2>
<% }%>
```

Explicit objects available to JSP
- request, response, session, out, page

### Influential distributed systems

- Xerox PARC experimented in the 1970s with distributed applications (Altos workstation, Ethernet).
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### Mach
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- Java 2 Platform Enterprise Edition (J2EE)
- Google