CSC 402 – Internet Technology

Recap

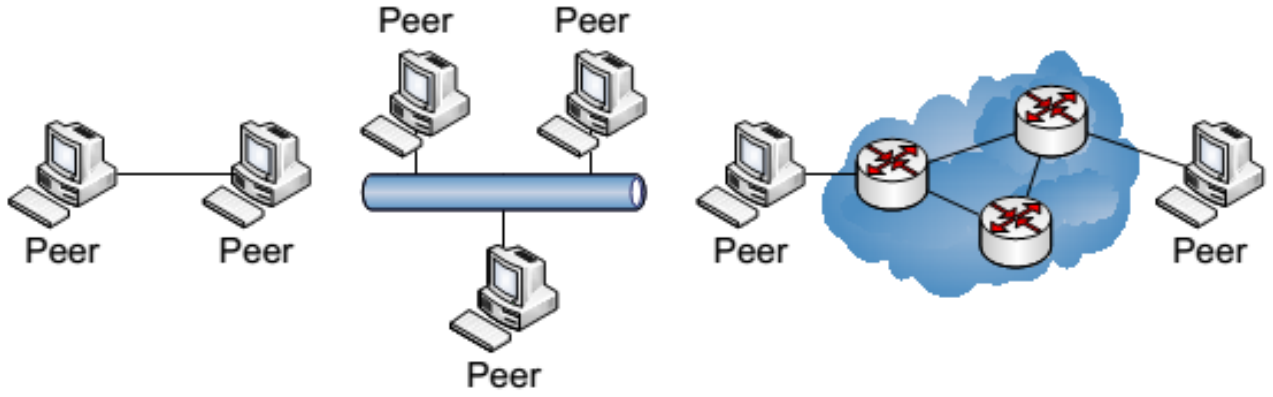
- Interaction Model
- Client/Server Model
- Client/Server Model – Server Type
- Client/Server Model – Client Type
- Client/Server Model – Logical Tiers
- Client/Server Model – Physical Tiers

P2P Model

- In the P2P model, all end systems have equivalent capabilities and responsibilities and either party can initiate a communication session.
- The participants share a part of their own hardware resources.
  - E.g., storage capacity, link capacity, CPU power
- These shared resources are necessary to provide the service or content offered by the P2P network.
- Thus, the participants are both resource providers and resource requestors and use similar networking programs to connect with each other.
- In P2P networks, downlink and uplink data flows tend to be (but not necessarily) symmetric.
  - This is because each connected host simultaneously operates as both client and server, thus receiving and transmitting on average the same amount of data.

P2P Model

- The P2P model does not have the notion of clients or servers but only equal peers (aka servents, servent = SERVer + cliENT) that simultaneously function as both clients and servers.
- But for any communication session we can still distinguish between requesting peers as ”clients” and responding peers as ”servers”.
- Again, this model is relevant to end systems only, regardless of how the end systems are connected to each other.



P2P – Pros and Cons

- Benefits:
  - No need for dedicated application and database servers
  - Improved scalability and reliability (no single point of failure)
- Shortcomings of P2P:
  - Poor security
  - Lack of centralized control
  - Computers with shared resources may suffer from sluggish performance
- P2P networking allows easily to share and download copyrighted files
  - Is it a benefit or a shortcoming? :-)

P2P – Types

- In P2P systems, cooperative peers self-organize themselves into overlay networks and store or relay data for each other
- 2 types of P2P systems :
  - Pure
  - Hybrid
- Pure P2P system – a P2P system that has no central service of any kind
  - I.e., the entire communication occurs among connected peers without any assistance from any server
- Pure P2P systems represent the reference type of P2P design
- Examples of pure P2P systems:
  - Workgroups in Microsoft Windows Network
  - Gnutella v0.4
  - Freenet

P2P – Types

- The major challenge of P2P systems is how to achieve efficient resource search.
  - Pure P2P systems work well only in a small-scale environment.
- **Hybrid P2P system** – a P2P system which depends partially on central servers or allocates selected functions to a subset of dedicated peers.
  - **Central servers** act as central directories where either connected users or indexed content can be mapped to the current location.
  - **Dedicated peers** direct control information among other peers.
- Thus, **client/server and P2P systems** are not mutually exclusive.
- Examples of hybrid P2P systems:
  - Usenet
  - Napster
  - Gnutella v0.6
  - eDonkey2000
  - BitTorrent

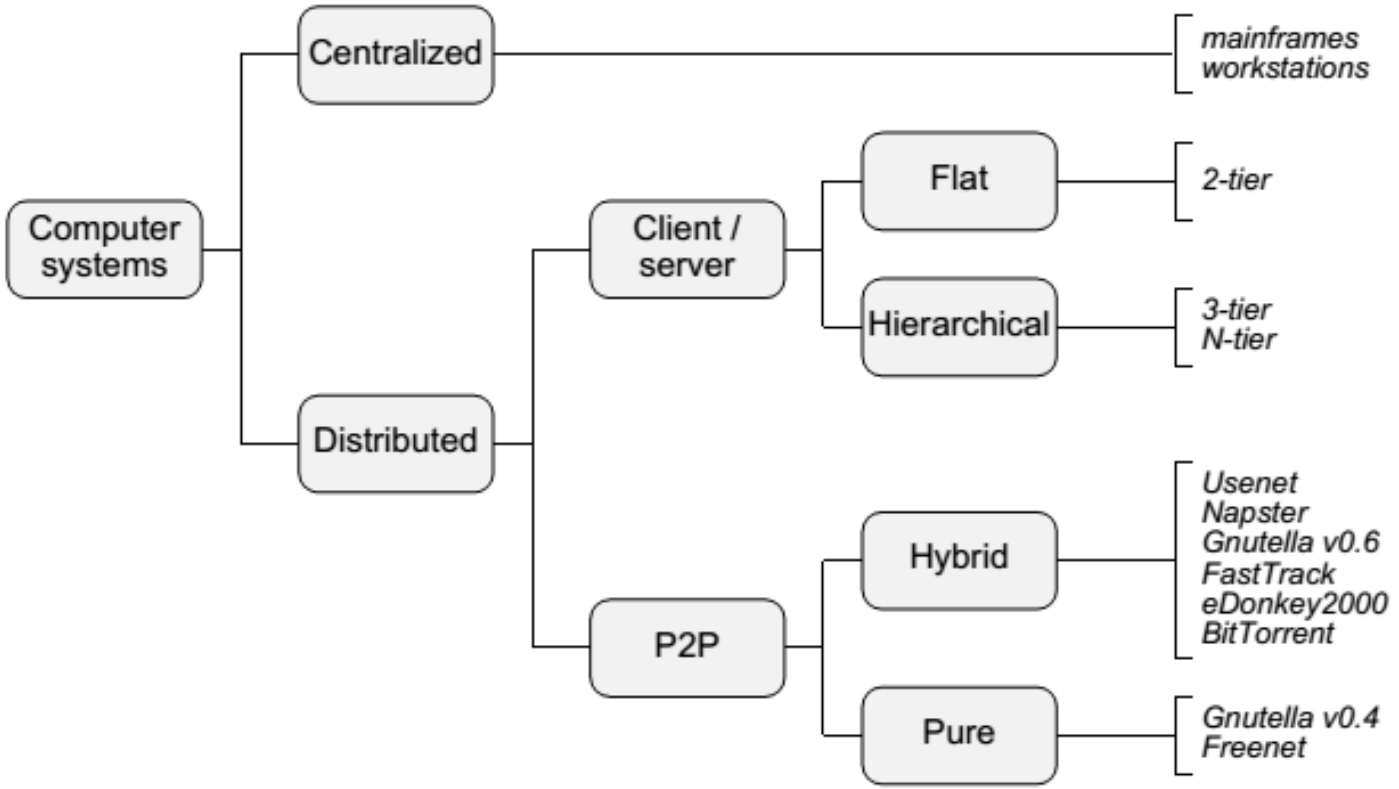
Client Server Vs. P2P

Parameters (in general)	Client Server	P2P
Participants	Clients and Servers	Equal Peers
Networking Software	Different for clients and Servers	Similar for all
Active Role (Requester)	Client	Any participant
Passive Role (Provider)	Server	Any participant
Interaction	Clients with Servers	Arbitary
Service/ content/ resource provider	Servers	Active Participants
Data Flows (theoretical)	Asymmetric	Symmetric

- Client/server vs. P2P as lecture-based vs. project-based learning
- Client/server vs. P2P as eating at restaurant vs. eating at home

Taxonomy

- Taxonomy of computer systems architectures



Summary

- **Centralized systems** represent single-unit solutions, including singleand multi-processor machines, as well as high-end machines, such as supercomputers and mainframes.
- **Distributed systems** are those in which components located at networked computers communicate and coordinate their actions by passing messages.
- **Flat client/server systems** – all clients only communicate with a single server (possibly replicated for improved reliability).
- **Hierarchical client/server systems** – servers of one level are acting as clients to higher-level servers.
- **Pure P2P systems** – there are no central servers.
- **Hybrid P2P systems** – a server is approached first, then the P2P communication is performed.