

Applying peer-to-peer networks to massively multiplayer games

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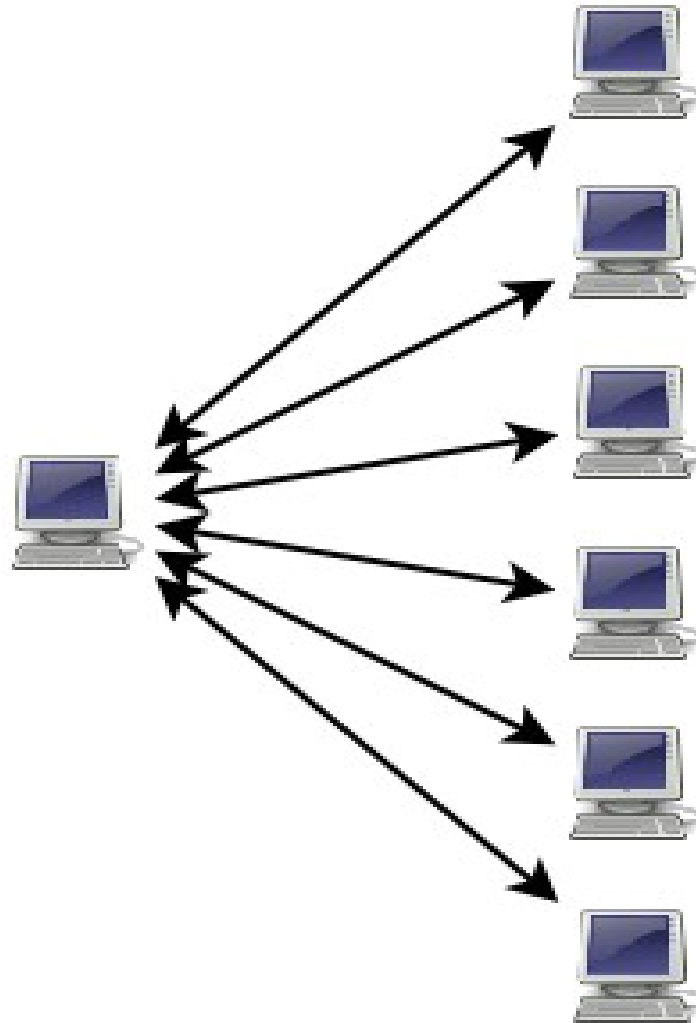
Computer game



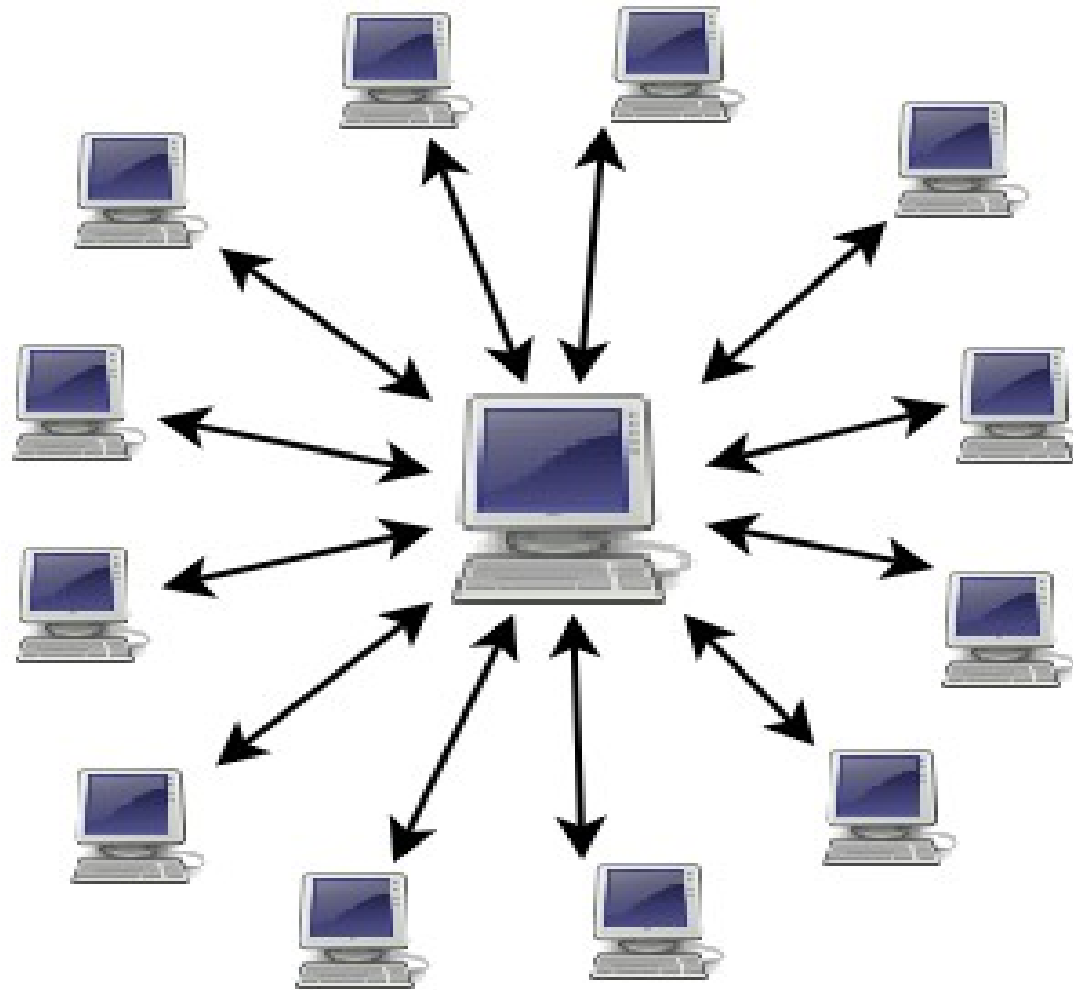
Two player game



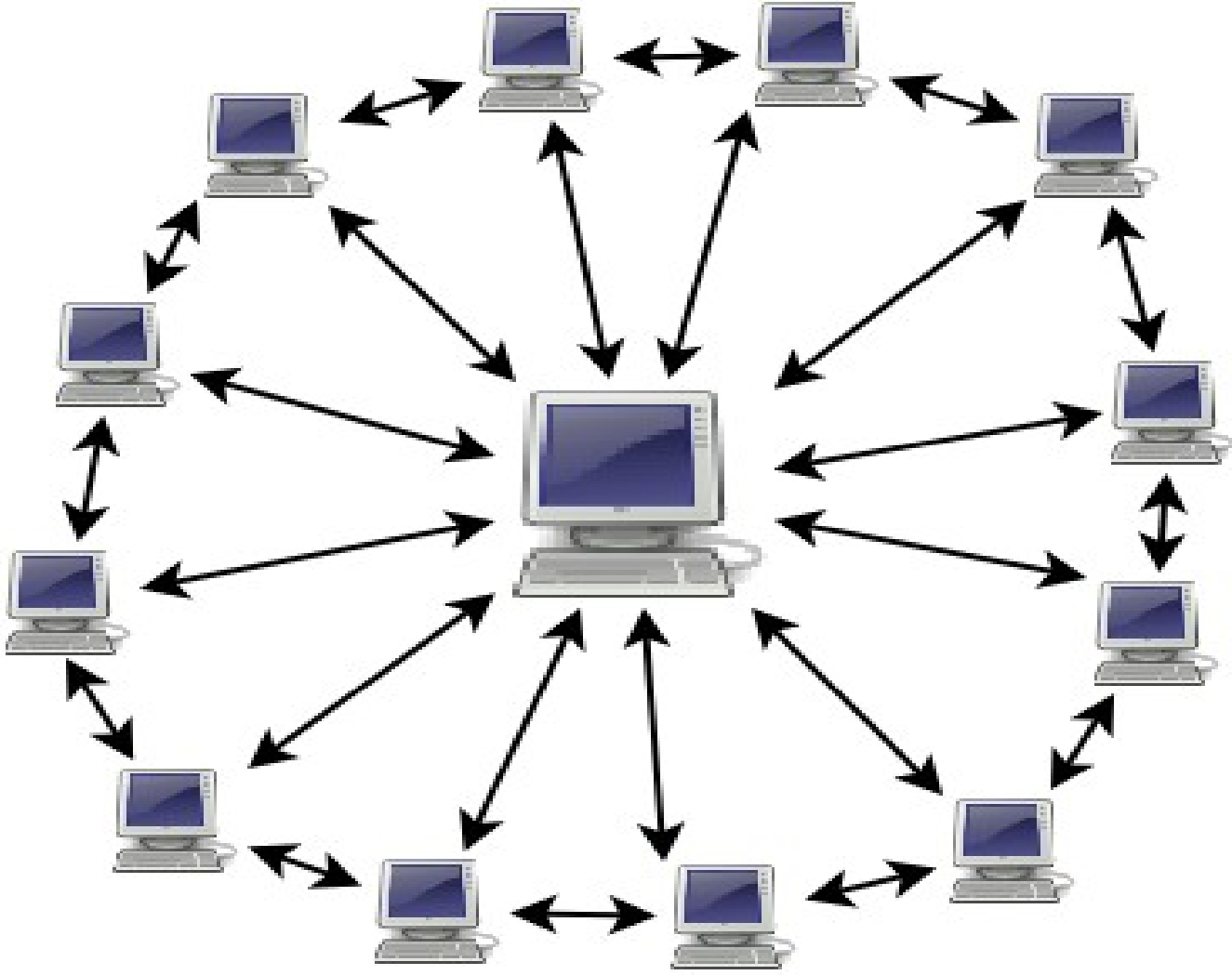
Multiplayer game



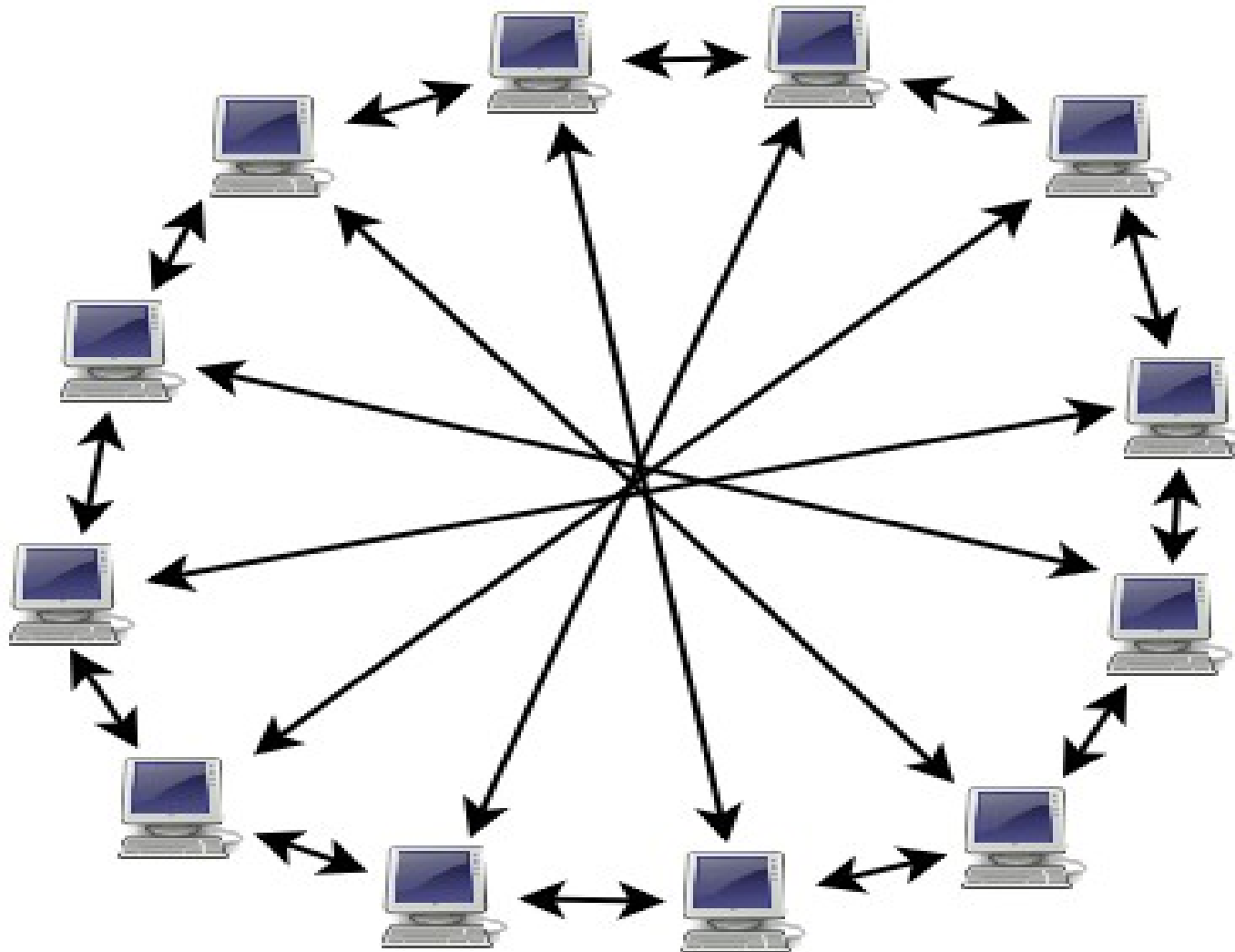
Client-Server



Hybrid



Peer-to-Peer network



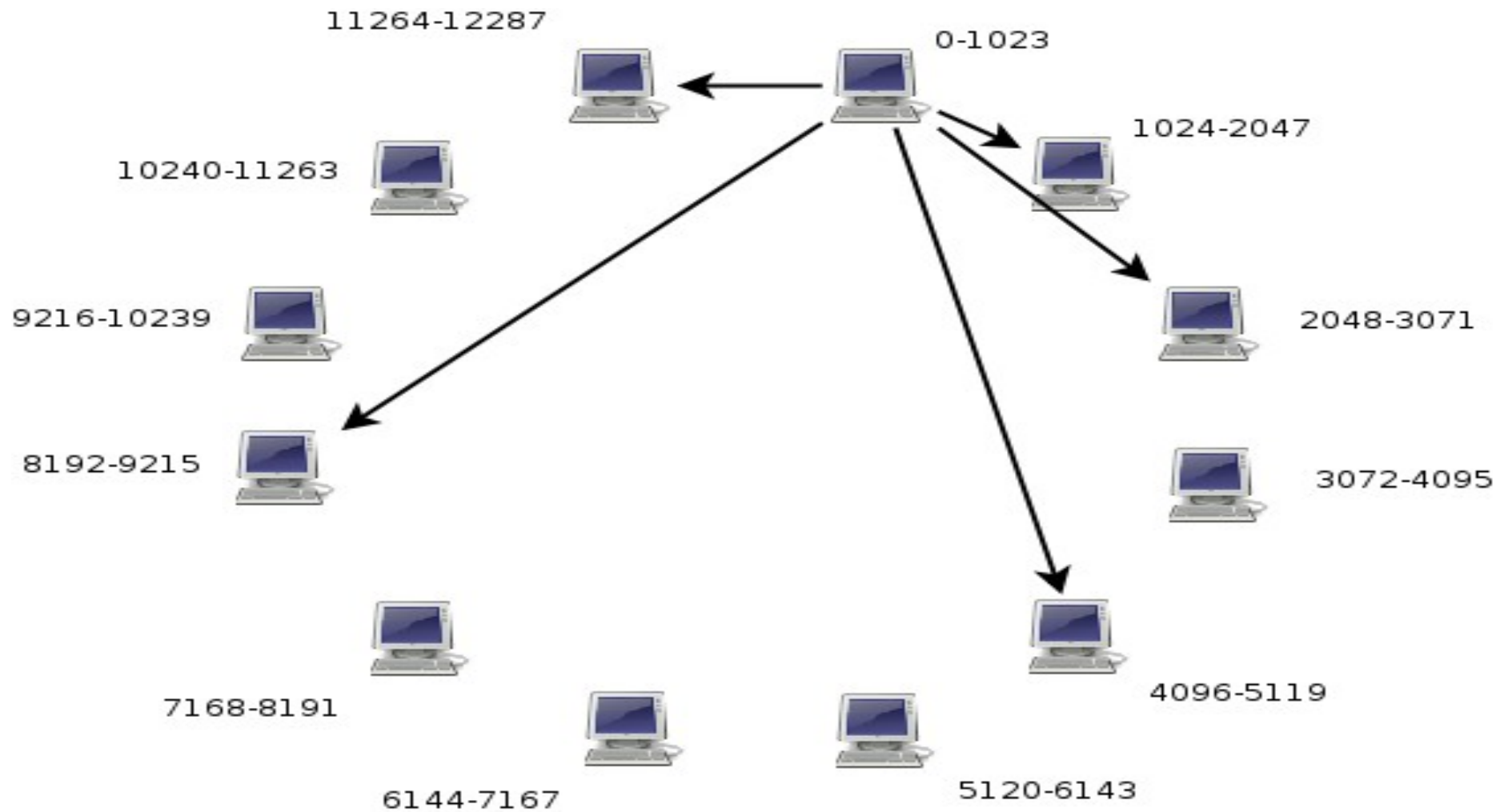
Hybrid

- Server is an essential part of the network
 - Example: Napster
 - Server's duties:
 - Authentication
 - Administration
 - Assists in joining the network
 - Assists in connecting to other peers
 - etc.
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Structured P2P network (DHT)

- Distributed Hash Tables
 - A key is calculated for every piece of data put to the network
 - Key is within a certain range, for example 0- $2^{160}-1$
 - Each participating node is responsible for a certain range of the keyspace
 - Even though nodes know only a few neighbours, search is efficient
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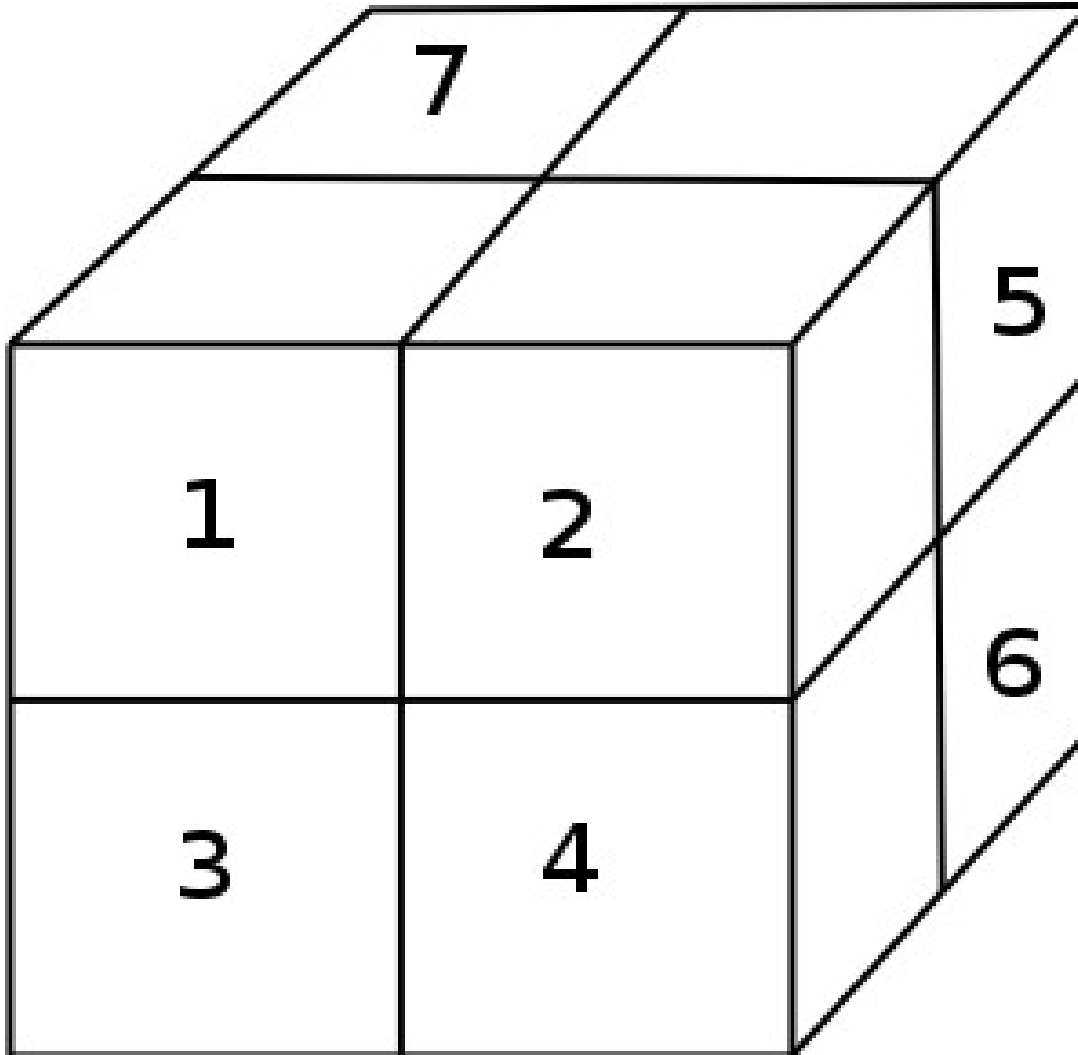
DHT example



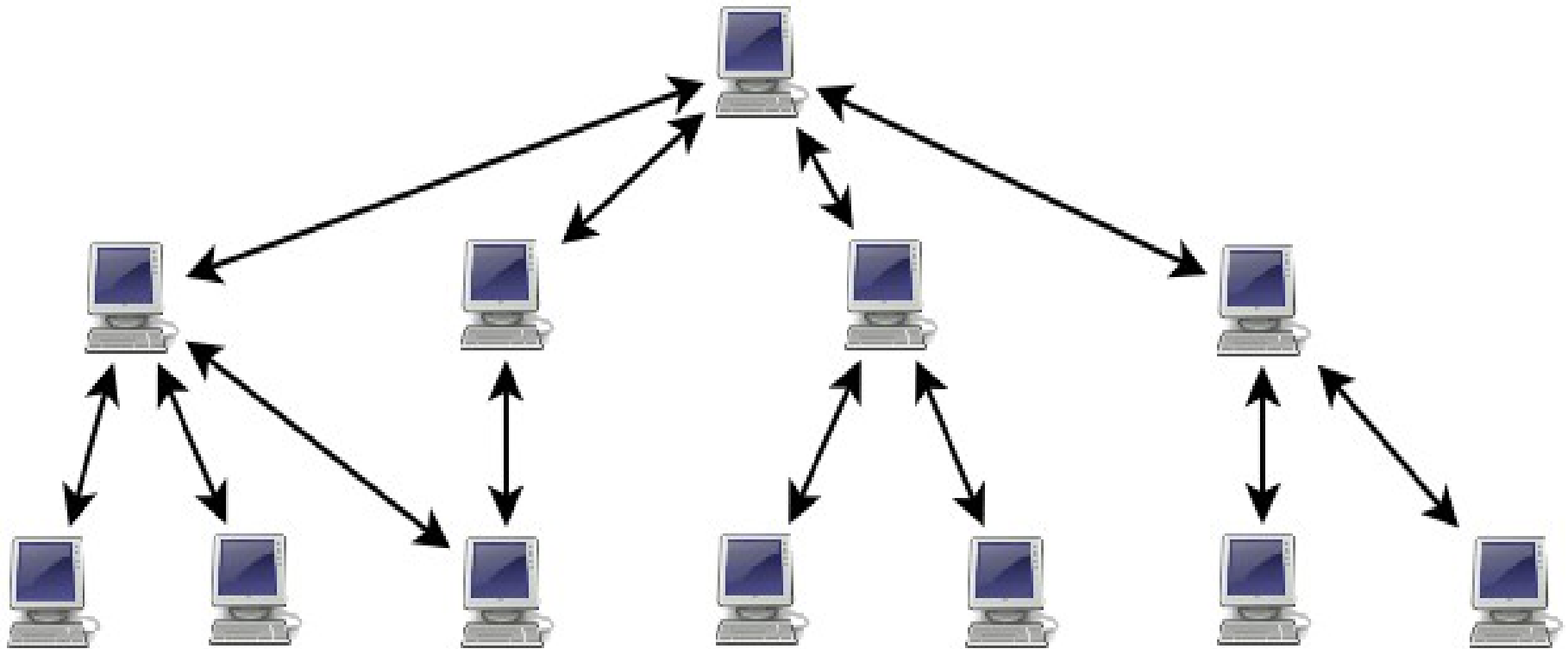
P2P in massively multiplayer games

- A key is generated for each dynamic object in the game (player's character, treasure chest, ...)
 - Each object is administered by a random peer chosen by the DHT implementation
 - This is also an attempt to prevent cheating
 - Gameplay area is divided into areas and each area is administered by a random peer
 - Actions that happen within an area, are notified to the area's administrative peer
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Partitioning the gameplay area



Updates within gameplay areas



Distributed game logic

- Nodes each handle the game logic
 - For example administrator of a NPC (non-player character) handles the NPC's AI
 - To prevent cheating, a voting system might be implemented
 - If a node wants to do a certain action, the game area's administrator asks others if the action is permitted
 - Distributed physics could also be implemented
 - Allows users the possibility create their own worlds by changing the game's rules
 - Also might allow them to cheat easier
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Obstacles in applying P2P to massively multiplayer games

- Joining the peer-to-peer network
 - Authentication
 - Firewalls
 - Persistent storage of data
 - Low bandwidth or slow processor
 - Latency
 - Information security
 - Cheating
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Benefits from P2P networks

- Maintenance costs are reduced significantly
 - No need for expensive server or bandwidth for it
- Players aren't dependant of the server
- In ideal case, it's much more faster than client-server architecture
- Better scalability

Current status of P2P in games

- Currently no commercial massively multiplayer game uses P2P
 - Developers of a game called Outback Online have reported that it will be using P2P
 - Some research on using P2P on games has been done
 - Part of that research some small games with P2P support have been developed
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About the master's thesis

- Study how well P2P networks can be applied to massively multiplayer games
 - Compare different network architectures (client-server, peer-to-peer, hybrid)
 - Study how to overcome the obstacles mentioned earlier
 - Simulate network architectures with varying number of peers with each having varying bandwidth and different movement models
 - Thesis should be complete by the end of 2007
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