

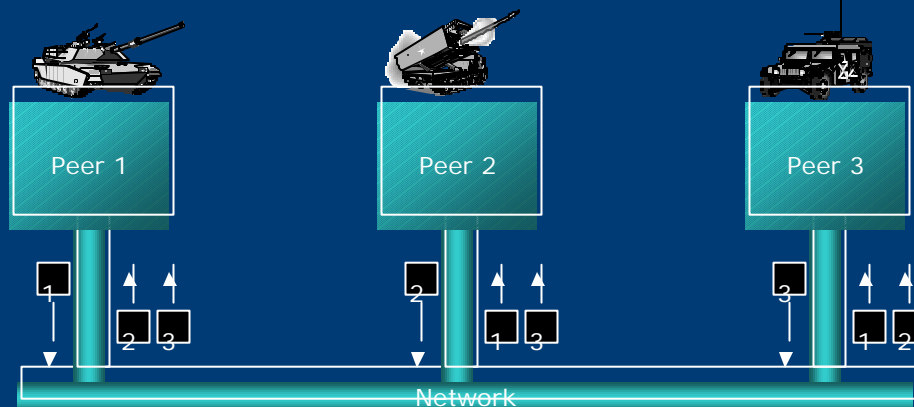
Communication Architectures & Computer Game Architectures

Class 9
Dr. Roger Smith

<http://www.simulationfirst.com/ein5255/>

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Peer-to-Peer Virtual Environment



- Each play is equal. Makes its own decisions about objects it controls.
- Each node has complete set of software and data
 - Models, Terrain, User Interfaces

LAN World Size

DIS Entity State PDU = 144 bytes = 1152 bits
100Mbps Ethernet => 86,800 PDUs/second

Homogeneous World:

Aircraft generate 12 PDUs/second => 7,233 aircraft
Ground vehicles generate 5 PDUs/second => 17,360 ground vehicles
Articulated humans generate 30 PDUs/second => 2,893 people

Useful Heterogeneous World:

2,000 Aircraft
9,000 Ground Vehicles
500 Humans

} 11,500 Objects on 100Mb LAN

(leaves 540 PDUs/second for everything else)

Ref: A variation on numbers given in Singhal & Zyda (1999)

56K Modem World Size

DIS Entity State PDU = 144 bytes = 1152 bits
56Kbps Ethernet => 48 PDUs/second

Homogeneous World:

Aircraft generate 12 PDUs/second => 4 aircraft
Ground vehicles generate 5 PDUs/second => 9 ground vehicles
Articulated humans generate 30 PDUs/second => 1 person

Useful Heterogeneous World:

2 Aircraft
4 Ground Vehicles
0 Humans

} 6 Objects on 56K Modem

(leaves 4 PDUs/second for everything else)

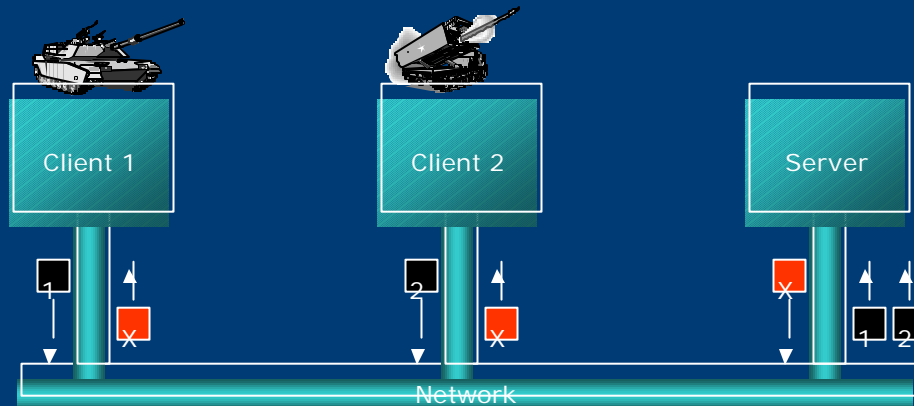
Ref: A variation on numbers given in Singhal & Zyda (1999)

Interesting World Sizes

Desert Storm	Quake II	Everquest
1,000,000 Combat Objects	24 Human Players	10,000 Human Players
87 100Mb LANs	4 56K Modems	1,667 56K Modems

Not Peer-to-Peer
Not DIS

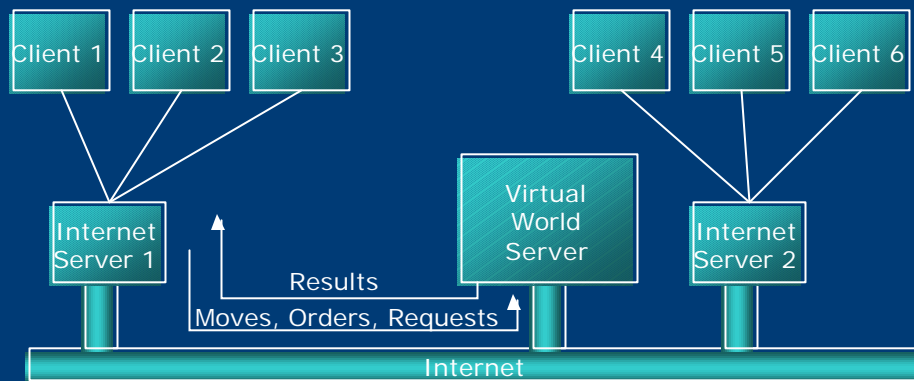
Client/Server on a LAN



- Server controls some interactions (maybe all)
- Clients are input/output stations
- Allows tighter synchronization between target & shooter on the server
- Reduce network traffic
- Clients can be weaker machines – server can be very powerful

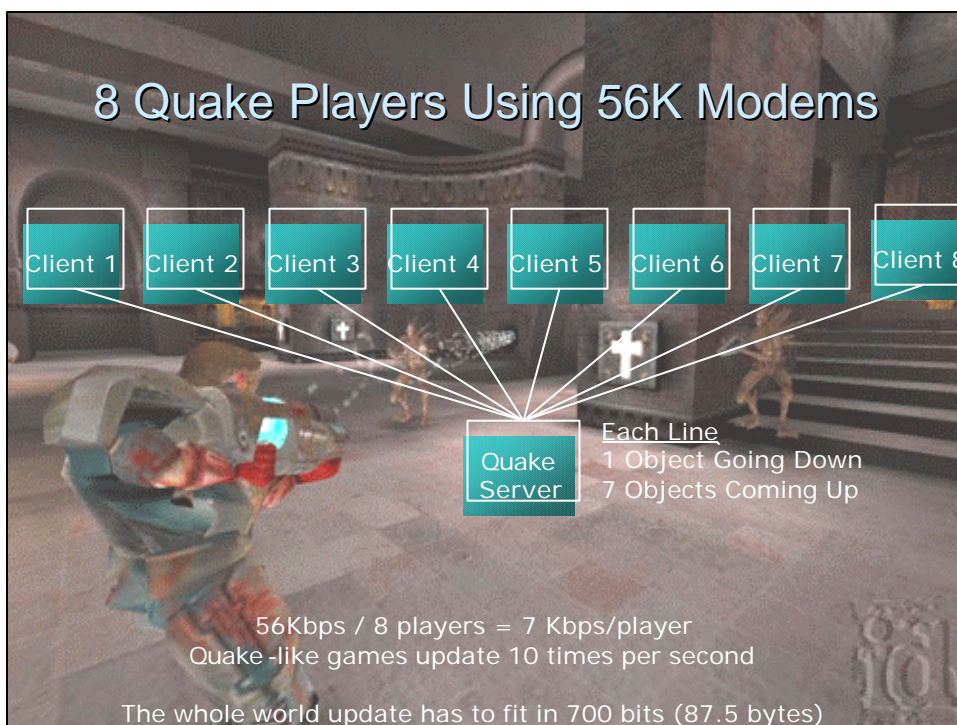
Interactive Simulation: UCF EIN5255

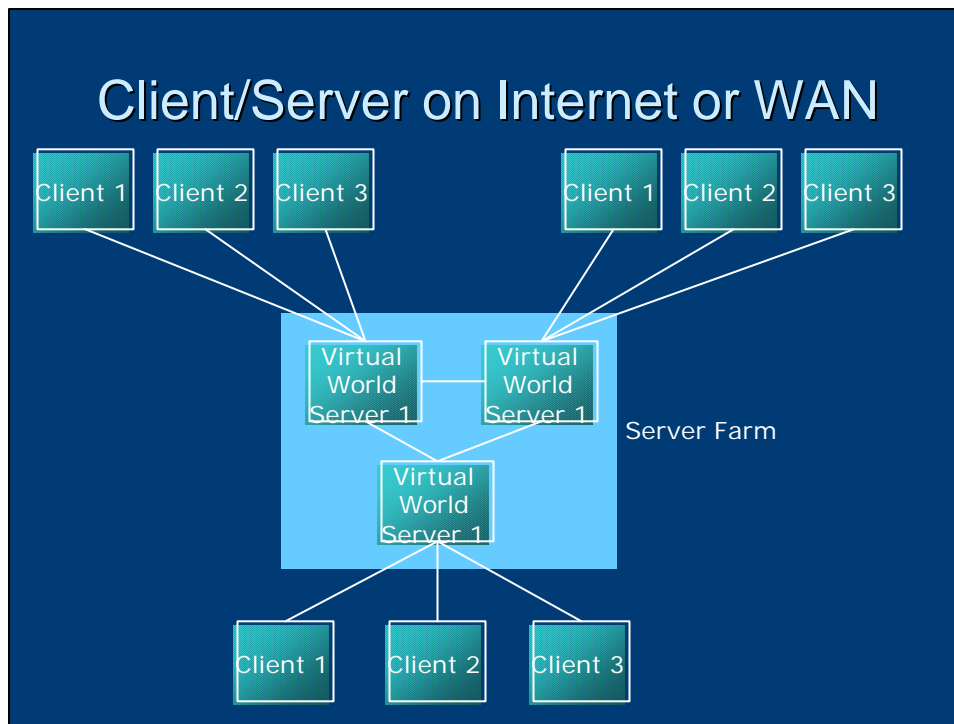
Client/Server on Internet or WAN



- Server controls some interactions (maybe all)
 - VW Server is the authority on world events
- Clients are input/output stations
- Internet allows interaction around the world

8 Quake Players Using 56K Modems



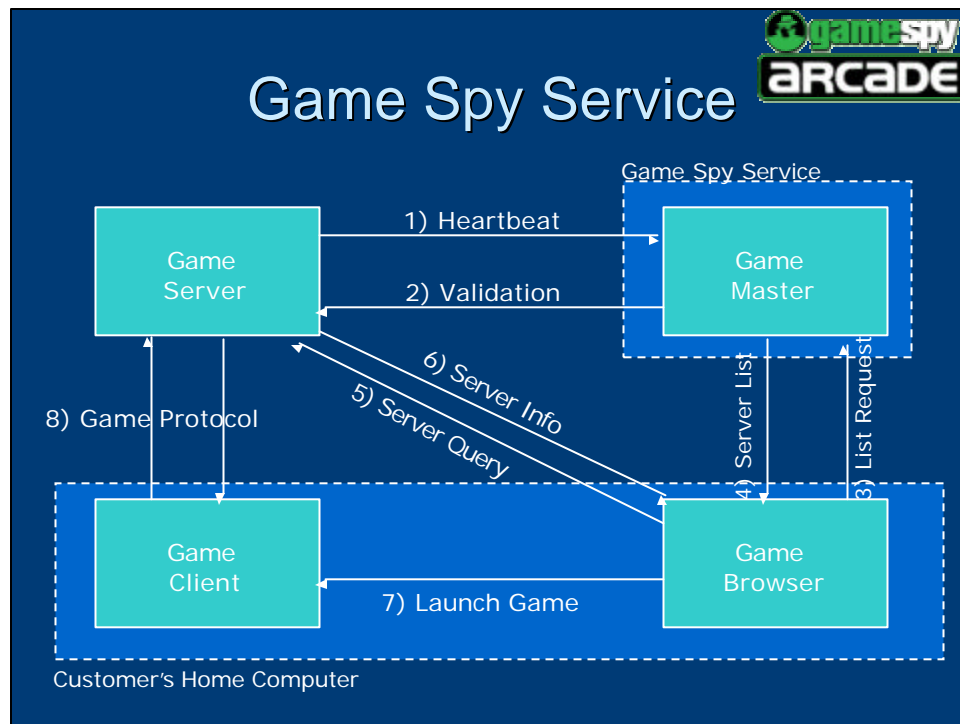


Massively Multi-Player Games

- Real-time interactivity
- Large worlds
 - Partitioned with mountains, forests, buildings
- 10,000 simultaneous players (100,000 registered players)
 - \$13/month subscription
- Variety of client computer capabilities

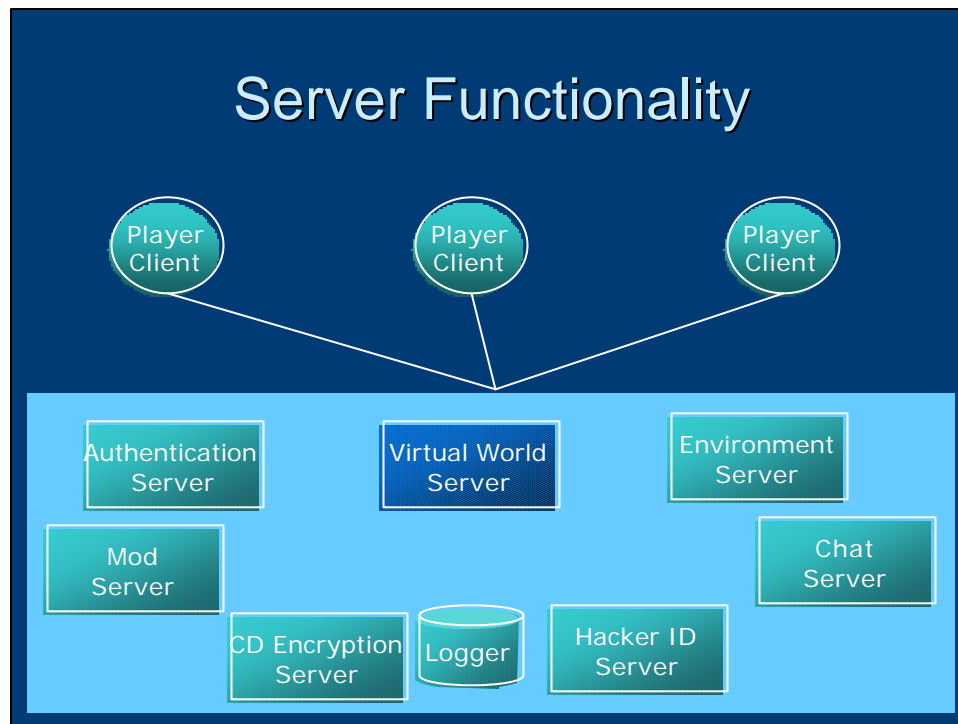


Everquest, Asheron's Call, Ultima Online, Anarchy Online, Star Wars Galaxies, etc. etc.

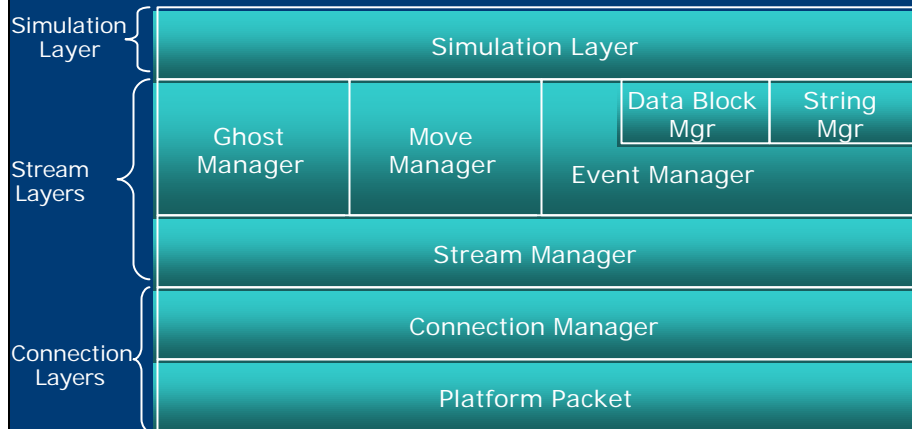


Internet Gaming Services

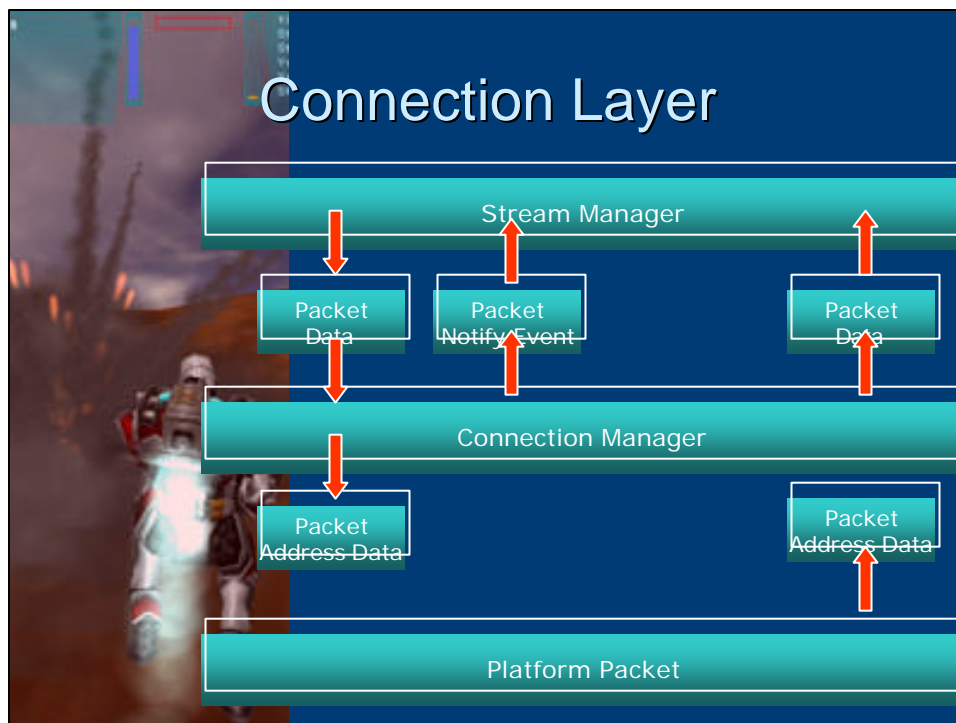
- Identify Available Servers
- Bring together players in the same dungeon at the same time
- Provide player chats about the game
- Provide authentication of game players
- Stop hackers
- Capture and eliminate viruses
- Provide "mod" updates to home users



Tribes Engine Networking Model



Connection Layer



Stream Layer

- Packs multiple data items into a single network message
- Move Data
 - Movement of primary locally controlled objects
- Events
 - Events to be applied in the world
- Ghost States
 - Interactions with specific ghost objects

