Networked games: ooga to nooga

- Different games make writing general server difficult
  - Turn based games...
  - Multiplayer asynchronous games like Boggle...
  - Noah’s Ark, Samegame, ...

- Nooga story at Duke
  - Each summer for the past N summers ...
    - Do we have a general, usable architecture?
    - What should we do next?

- What are key issues in developing networked games
  - Don’t worry about robustness or generality

multi-platform, multi-os client/server

- Suppose we send data between clients and servers...

- Architectural issues impact client/server code
  - Little-endian/Big-endian issues
    - 0xabcd is a 32-bit value, which is MSB? How is this stored?
    - How big is an int? 32-bits, 64 bits, ...

- Towards raising the level of discussion
  - Worrying about integer byte order is not fun
  - Let’s worry about sending objects back-and-forth, not bytes
  - How do we send and receive objects?

Client/Server Communication

- The Java stream hierarchy is a rich source of options
  - Object streams, Data streams, Buffered Readers, ...
  - Often these convert between bytes and characters
    - What’s the story with Unicode? (e.g. compared to ASCII)
    - FileInputStream, BufferedReader, ...

- We can read and write objects over sockets
  - Advantages compared to lower-level protocols?
  - Disadvantages?

- Issues in understanding and implementing
  - Where do objects “live”, are classes different?
  - Subclass/Superclass issues
  - What about connection issues (where, how, knowledge)

Clients and Servers: server side

- Server socket exists on some machine, listens to a “port”
  - A port isn’t a physical concept, it’s an OS concept
  - The OS manages ports, some services listen at predetermined ports, e.g., mail at port 25
    - User programs use ports above 1024

- Server gets a connection and handles the request, but what about other connection requests?
  - Can’t be too busy processing request, or will miss other attempts at connections
  - Spin off handler as a separate program/process

- Server blocks on accepting connections, new jdk1.4 API for java.nio.channels might improve things
  - Why is blocking not ideal?
Networked Games

- What will go over the network?
  - Board?
  - Move?
  - Other?

- Where is the controller?
  - Server?
  - Client?
  - Combination?

- How does the server work for many games?
  - Rules important?

Simple Client/Server code

- The example shows how a client communicates commands to server
  - Deciding how to process a command is simple, but not robust/OO in the current model

- How are client and server similar? Different?
  - Both know about all commands?
  - How do they know this?

Architectural considerations

- What can we do to generalize things, move away from chain of if/else code
  - Create commands corresponding to protocol
  - Execute command obtained by map

- What’s in the map? Some commands require state, e.g., more data from server or client
  - Can have a map of string to object, but how to get information into the object?
  - Can map string to object factory, have a per-command factory
  - Factory knows how to create each command