SWEN 262

Engineering of Software Subsystems

Proxy

- You are designing a Tic-Tac-Toe game that can be played locally against a friend, or over a network against another player.
- The user interface needs to work in exactly the same way whether the game is played locally or against a remote opponent.

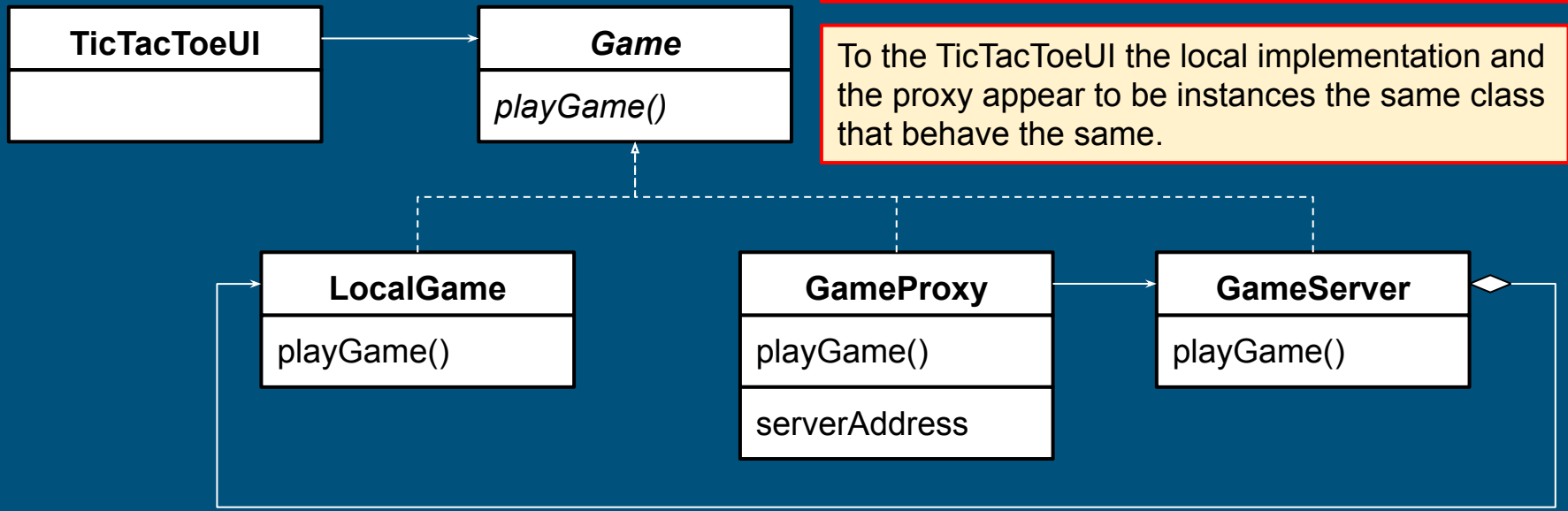
Q: How would you implement a system that behaves in the same way whether the game is local or remote?

Proxy

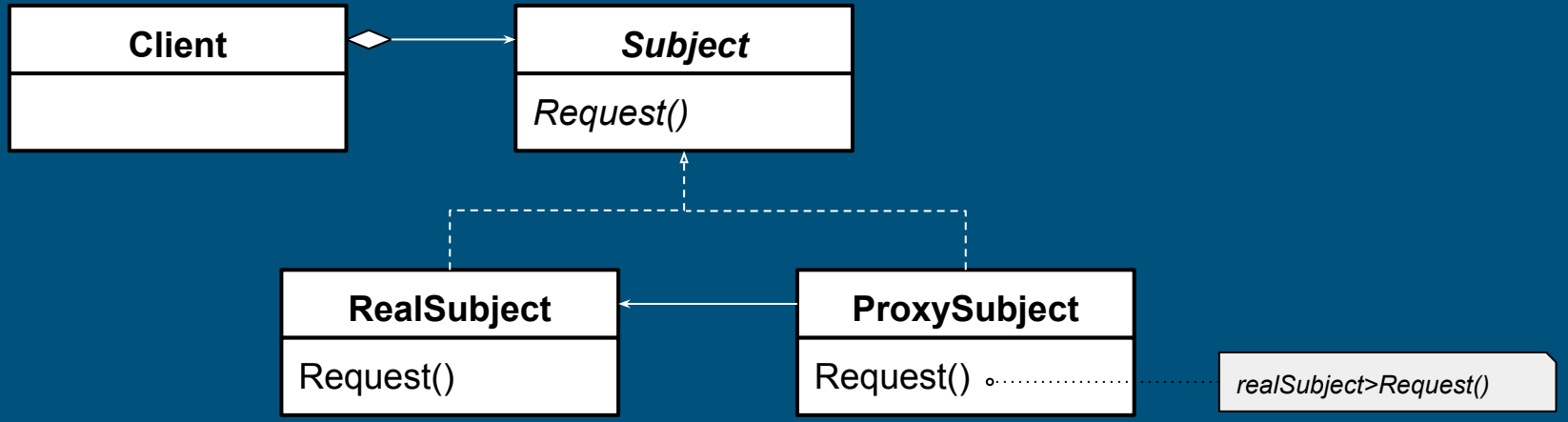
A: Create an interface with all of the necessary methods for playing the game. Implement a functional game, and a *proxy* that also implements the same interface.

Each time a method is called on the *proxy*, a *remote procedure call* is made against a game that is running on another computer.

To the TicTacToeUI the local implementation and the proxy appear to be instances the same class that behave the same.



Proxy



Intent
Provide a surrogate or placeholder for another object to control access to it.

(Structural)

Proxy Examples

- Remote Proxy - e.g. Tic Tac Toe
  - Local representative for something in a different address space (e.g. over a network)
  - Java RMI (remote method invocation) and Unix RPC (remote procedure call) are tools that help set up remote proxies
  - Object brokers handle remote objects (CORBA or DCOM)
- Virtual Proxy
  - Stand-in for an object that is expensive to implement or access
    - e.g. Documents with Graphics/Images from the GOF book
  - May be able to access some state at low cost
    - Use image headers to get height/width
  - Defer high costs until it must be incurred
    - i.e. image must be displayed on screen

Proxy Examples

- Protection Proxy
  - Control access to the “real” object
    - Similar to the “student portal” example used for the State pattern
  - Different proxies provide different levels of access for different clients
    - e.g. normal users vs. admin accessing operating system functions
- Smart Pointers
  - Used to reference an object in memory, but performs actions normal references do not.
    - Counts references for memory management (e.g. garbage collection)
  - Ensure locking semantics on shared objects
  - Array bounds checking
    - Throw a bounds exception rather than crash with a core dump/segmentation fault

Proxy Consequences

- *A remote proxy hides the fact that an object resides in a different address space.*
- *A virtual proxy can perform optimizations such as creating an object on demand.*
- *Both protection proxies and smart pointers allow additional housekeeping tasks when an object is accessed.*
- *Proxies can increase the coupling in a system.*
- *Remote procedure calls introduce a significant amount of complexity to the system.*