Lecture 12
Advanced Topics:
Cheat Avoidance/Detection
Cloud Gaming
Cheat Detection / Avoidance
aimbot
maphack
wallhack
protocol-level cheats:
1. time-stamp cheat
2. look-ahead chat
Timestamp Cheat
Player generates fake, earlier timestamp to gain advantage after knowing the opponent's move.
But such cheat is impossible if a trusted proxy timestamp the messages instead of the players.
The proxy can digitally signed the message to proof that he is the one that added the timestamp.
Look Ahead Cheat
A player waits until the opponent have made its move before making its own.
Lockstep Protocol
One-Way Function $f$: Given $x$, we can compute $f(x)$ easily. Given $f(x)$ it’s hard to find out $x$ if $x$ is random.
Stage 1 (Commit): Everyone decides on its move $x$, and sends $f(x)$ to each other.
Stage 2 (Reveal): After $f(x)$s from all other players are received, sends $x$ to each other.
Stage 3 (Verify): Players check if $f(x)$ is consistent.
f(x) is known as commitment to x.

A player, once committed to its move, can’t change it.
Problem:
Lock-step protocol is slow.
Cheat detection is easier than prevention
Mmm.. player C always sends its update later than the rest.
Player Behavior Analysis

can also be used to detect aimbot
Game Log Analysis

Detect Aimbot/Triggerbot in FPS

http://www.theinquirer.net/inquirer/news/1023279/more-on-intel-anti-cheat-technology-revealed
Idea from Intel Research

Chipset in input devices collect traces
Game server does the same
Compare

http://www.theinquirer.net/inquirer/news/1023279/more-on-intel-anti-cheat-technology-revealed
Game Log Analysis

Detect Maphack in P2P RTS
idea: Send every movement and viewing area to someone during gameplay. That someone replays the game to verify that the viewing area is correct.
idea: Send every movement and viewing area to another player during gameplay.

The other player replays the game to verify that the viewing area is correct.

no server -- other players have to check
but, should not send movement in plain text

idea: use commitment protocol
1. send viewing area to each other
2. **for** each unit u, 
   **if** u is in opponent’s view, 
   send in plain text
3. for each unit $u$
   if $u$ is hidden from opponent
   send encrypted $u$

```plaintext
\[ e(\bigcirc) \quad e(\bigcirc) \quad e(\bigcirc) \quad e(\bigcirc) \]
```
4. after the game, send decryption key
The challenge
how to prevent and reliably
detect cheats in games?
Cloud Gaming
Collect Events → Simulate Games

Wait → Game States

Render → EVENTS

states
Why Cloud Gaming?
1. Can play on any client / anywhere
2. Reduce development cost
3. Prevent game piracy
Join the Agawi Game Partner Program (AGP Gold) for Windows 8 today!
RECOMMENDED SYSTEM REQUIREMENTS

- Internet Connection: 5 Mbps, wired connection or **Wi-Fi** connection
- Operating System: Windows® 7 or Vista (32 or 64-bit) or XP SP3 (32-bit), Mac
- Computer: Dual-core PCs, all Intel-based Macs
- Screen Resolution: 1280x720
- Graphics card with Pixel Shader 2.0 or better (PC)
- CPU must support the SSE2 instruction set (PC)

Almost all OnLive users have had good results if their system meets the above requirements.
threatened legal action, contending that the license agreement did not permit the use of Windows 7 as a hosted client, nor for Office to be provided as a service on Windows 7 since this would be only allowed using Windows Server and Terminal Services. On the 7 April 2012 it was discovered that the OnLive Desktop Service had changed and had now begun to use Windows Server 2008, presumably to settle this dispute.

Architecture

In the U.S., OnLive is hosted in five co-located North American data centers. There are facilities in Santa Clara, California and Virginia, with additional facilities in Dallas, Texas, as well as Illinois, and Georgia. OnLive has stated that users must be located within 1,000 miles (1,600 km) of one of these to receive high-quality service.

The hardware used is a custom set up consisting of OnLive's proprietary video compression chip as well as standard PC CPU and GPU chips. For older, or lower-performance, games such as Lego Batman, multiple instances can be played on each server using virtualization technology. However, high-end games such as Assassin's Creed II will require one GPU per game. Two video streams are created for each game. One (the live stream) is optimised for gameplay and real-world Internet conditions, while the other (the media stream) is a full HD stream that is server-side and used for spectators or for gamers to record videos of their gameplay.

International availability

The service was launched in the United Kingdom on September 22, 2011 in partnership with British Telecom as a bundled service with their broadband packages. The company plans to make its service available in the rest of Europe as well.
Figure 1

- $t_0$: Key event sent
- $t_1$: Key event received
- $t_2$: Frame sent
- $t_3$: Frame received
- $t_4$: Frame displayed

Client

Server

MENU screen shown
Probing $t_3$

- Send ESC at $t_0$
- $t_{\text{block}} = \text{rand}(\text{RD} - 100, \text{RD} + 50) \text{ ms}$
- if menu appears before $t_0 + t_{\text{block}}$
  - $t_3 < t_0 + t_{\text{block}}$
- else
  - block inputs for 1 seconds
  - if menu appears after $t_0 + t_{\text{block}} + 1$
    - $t_3 > t_0 + t_{\text{block}}$
Figure 1

- $t_0$ (Key event sent)
- $t_1$ (Key event received)
- $t_2$ (Frame sent)
- $t_3$ (Frame received)
- $t_4$ (Frame displayed)

MENU screen shown

Client

Server
Figure 4
How cloud-gaming friendly is a game?
Facial Electromyography

http://columbiabusinesstimes.com/17705/2013/05/13/read-my-mind/
“Real-time Strictness”

Increase in Negative Emotion / Latency
“Command Heaviness”

If a single command leads to long and large amount of screen animation, then the game is said to be command-heavy.

Measured in pixels/command
Applications:
1. Allocate cloud server CPU/GPU
2. Server Location
Challenge 1: Latency
Challenge 2: Bandwidth
Challenge 3: Hosting Cost
“the company had deployed thousands of servers that were sitting unused, and only ever had 1,600 concurrent users of the service worldwide.”

The future?

virtualized GPU (e.g., Nvidia Grid)
better video codec
bigger network pipes
An Open Source Cloud Gaming Server