How Running A Live Game Impacts Your Code

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Quick Introduction

- Who am I?
- Who is Zynga? What do we do in Eugene?

- Disclaimers:
  - Speed
  - Acronyms
  - Language
Running A Game Versus Building A Game

• How Are They Different?
• When Do You Care?
  • What platform(s) are you developing for?
  • Are you selling a game once?
  • Do you have in-game purchases?
  • Do you have downloadable content?

Where Is He Going With This?

• Cheating / Hacking
• Operating Expenses
• How those impact the way you write code... or the intersection of business and game coding.
Cheating / Hacking

- Cheating is awesome!
  - OK, not really. But it’s an interesting problem
- Do I care?
  - Are you building a single-player game?
  - Would my cheating impact your experience?
  - Or are you building a game where your cheating impacts other players (think PvP, or leaderboards...)?

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Cheating / Hacking

- If other players can see somebody cheating, the game is perceived as unfair.
- People are less likely to spend money in a game they consider unfair.
- This is known as “destroying the economy” and it’s a Bad Thing™.
### Programming Models

- Client-only - insecure, but (shrug)
- Client-authoritative - insecure, but some options
- Server-authoritative (optimistic) – more secure, but not all rainbows & unicorns
- Server-authoritative (lockstep) – very secure, but online-only and impacted by latency

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### Programming Models And Cost

- Server-authoritative games are more secure
- But much harder to develop
- And it costs (potentially a lot) more
  - Up front costs (development time, usually)
  - Ongoing costs (mostly servers, but also storage)

- So you’re not just worried about framerate, battery life and thermal-throttling, you’re worried about server-calls...
### Operating Expenses

- How do you even estimate/calculate this?
  - Estimated DAU? Steady or cyclic?
  - Frequency of calls?
  - CPU time per call?
  - Load testing/server types and ‘padding’?
- Magic around auto-scaling groups or Lambda
- The differences can be Real Money™

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### How About An Example?

- 1M DAU, evenly distributed.
- Each player plays for 30 minutes/day.
- Each client sends a batch of data every 20s.
- Server takes 200ms to process a batch.
- That’s 90M calls / day and 18M CPU-seconds.
- ...
- 208 CPU-days, or ~40 8-core servers running 70% 
- ~$7k/month... but can swing wildly!
Oh Yeah... DevOps

- If you have servers, you need to manage upgrades & versions.
- How does your server deal with new clients, or new downloadable content?
- How does your server deal with old clients?
- Are you running multiple server versions?
- Does your game have downtime when you upgrade? Or do you have rolling releases?

Back To Code Architecture

- Are you going client-auth or server-auth?
  - Hard to change your mind later!
- Do you need determinism to keep things in sync?
  - Often means separating visuals from logic
  - What about physics? Cross-device? Cross-platform?
Performance

• How does your game scale across hardware?
  • Consoles are “easy”
  • Mobile & PC are not
• How do you make it so somebody on a fast system doesn’t have an advantage?
  • Adjust graphics based on hardware specs?
  • Thermal throttling? (Ouch)
  • User choices? Depends on genre?

Stats

• What kinds of data do you need to collect?
  • Business data
  • Technical data
    • Load funnel
    • Performance metrics (by device type?)
    • Crashes (chicken and egg!)
    • Soft-locks, or exceptions.
    • Asserts?
What’s Actually In Stats?

• Do you have enough information to diagnose & fix a problem?
• Or just enough to know that it’s happening?
• In some of our games, we record inputs.
  • If you get into a bad state, we send the inputs to our logging servers
  • Can replay to see what went wrong – if we’re deterministic!
• Logging isn’t free (see operating expenses, above)
• Kinda’ like insurance

Wrap Up...

• Building a game isn’t just about finding the fun (which is hard enough by itself).
• The business of running a game impacts technical decisions – often significantly!
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