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

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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?

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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.

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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 ™.

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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…

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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!

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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?

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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?

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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?

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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?

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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

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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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Questions?

- Please?
- Still awake?

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