Scalability and Load in Online Games

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Promise & peril of live game operations

- Re-launched 8/17/12
- Top-grossing game for **nearly 3 years**

- Launched 3/2/12
- Shot to top 10
- **Servers crashed**
- Offline for **168 days**
- **$27M lost revenue**

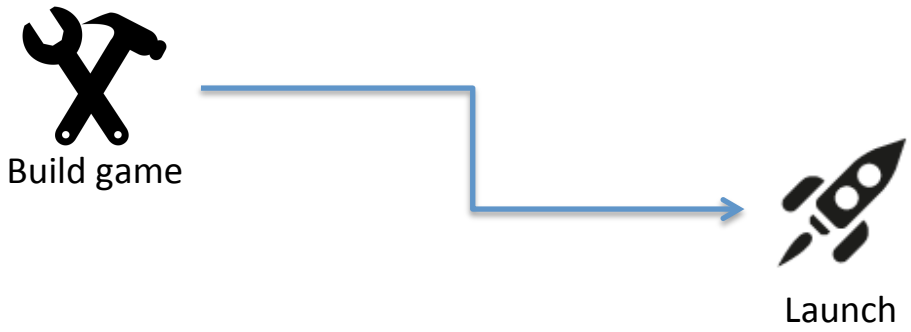
LTD revenue: **$150M+**

Updated more than 45 times

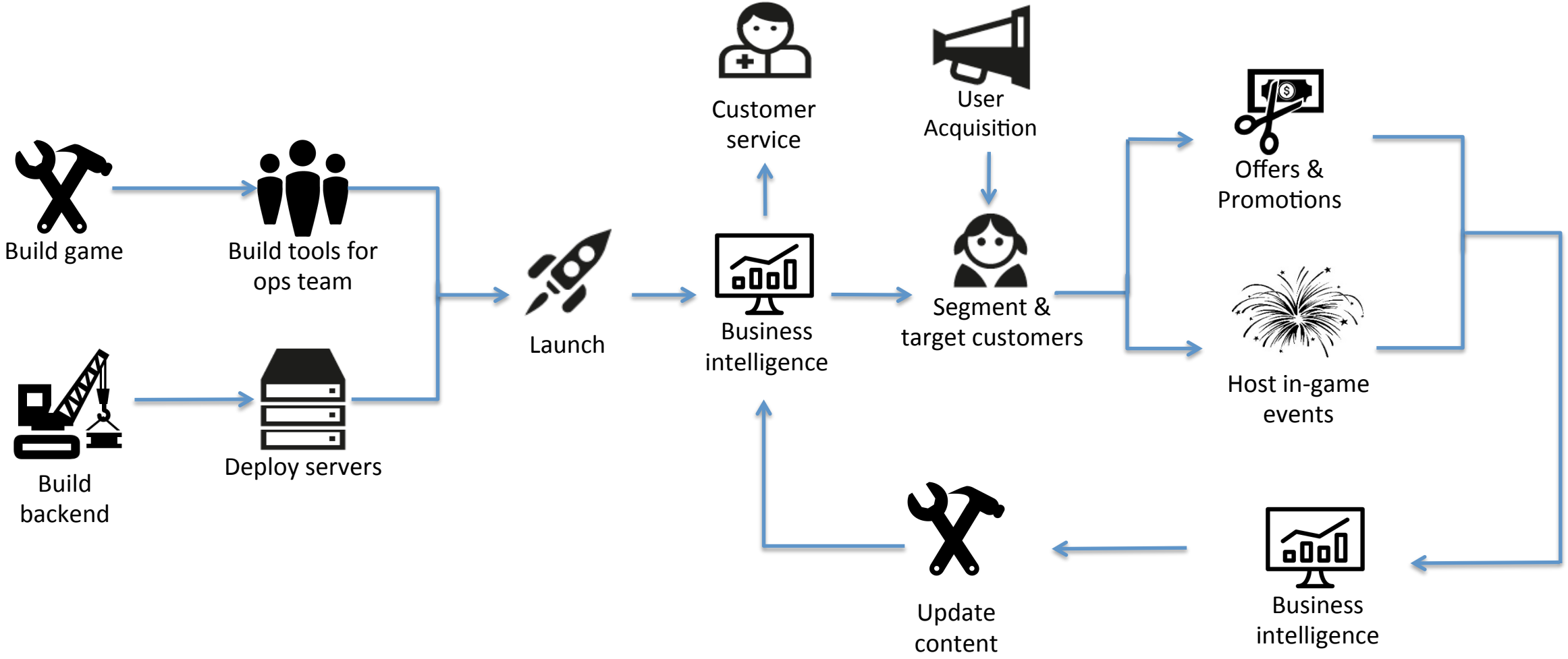
Rank history for top grossing games, iOS in United States

Source: AppAnnie, NPD, ThinkGaming

The old days...



Nowadays...


Build game
Build tools for ops team
Build backend
Deploy servers
Launch
Customer service
Business intelligence
User Acquisition
Segment & target customers
Offers & Promotions
Host in-game events
Business intelligence
Update content

Characteristics of live games

- Many more writes than reads (primarily driven by analytics)
- Authoritative server-side game logic (to prevent cheating)
- Millions of users (often with transient relationships)
- Peak load often hits on day one of release
- Must be scalable, global, and reliable all at once
- Game studios often inexperienced at large-scale system design
- Testing w/ real user “stories” at scale is hard but critical

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Back-end services
(cross-platform, one-stop shop)

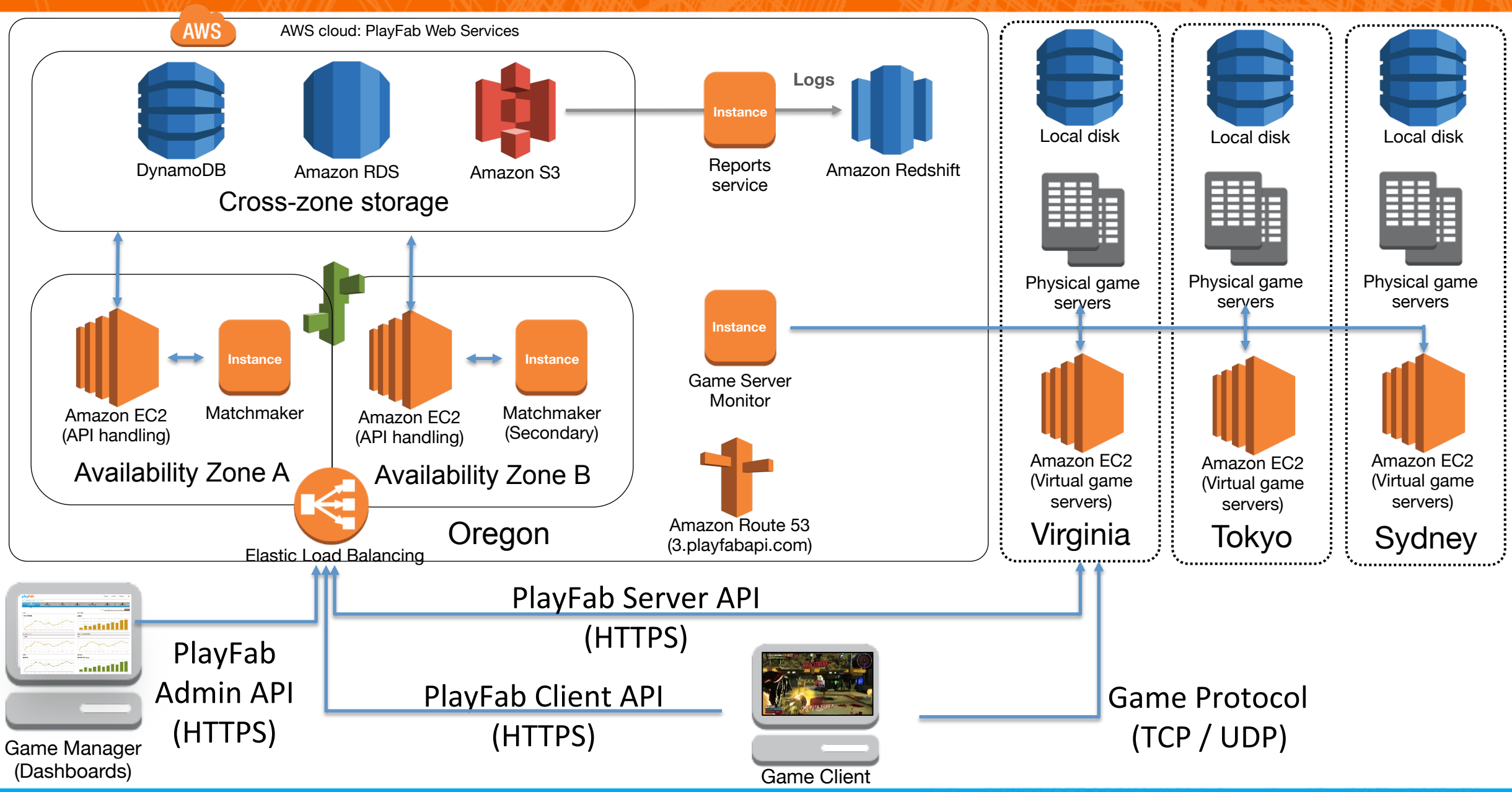
Live ops tools and dashboards
(mission control for the whole team)

Integration with other partners
(building out a full ecosystem)

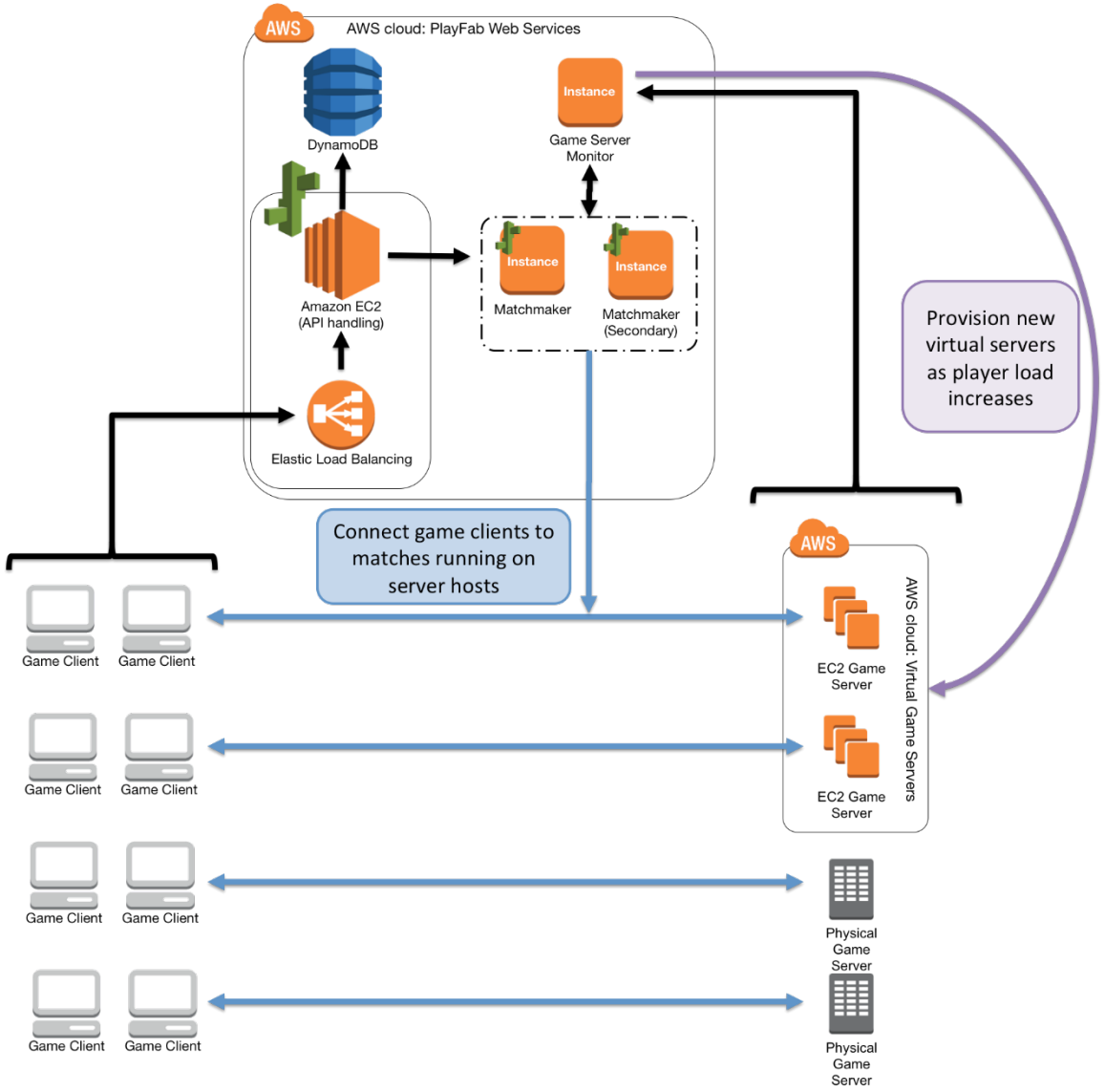
Typical backend services

- Player Accounts
  - Authentication
  - Profile Management
  - Account Linking
- Data Storage
  - Per player
  - Per title
  - Per character (under one player)
  - Files / CDN delivery
- Commerce
  - Catalog Management
  - Virtual Currencies
  - Player Inventory
  - In-game Purchasing
  - Receipt validation (Apple/Google/Amazon)
  - Marketing and Promotion
- In-game Marketing
  - Push Notifications
  - In-game Messaging
- Product Management
  - Analytics and Reporting
  - Customer Segmentation
  - Customer Support Tools
  - Abuse Reporting and Banning
- Social
  - Friends Lists
  - Player Chat
  - Leaderboards
  - Game forum integration
  - Trading / gifting
- Multiplayer
  - Photon integration (real-time / turn-based)
  - Matchmaking
  - Custom game server hosting
  - Server monitoring
- Game logic
  - Server-hosted JavaScript

Architecture Overview

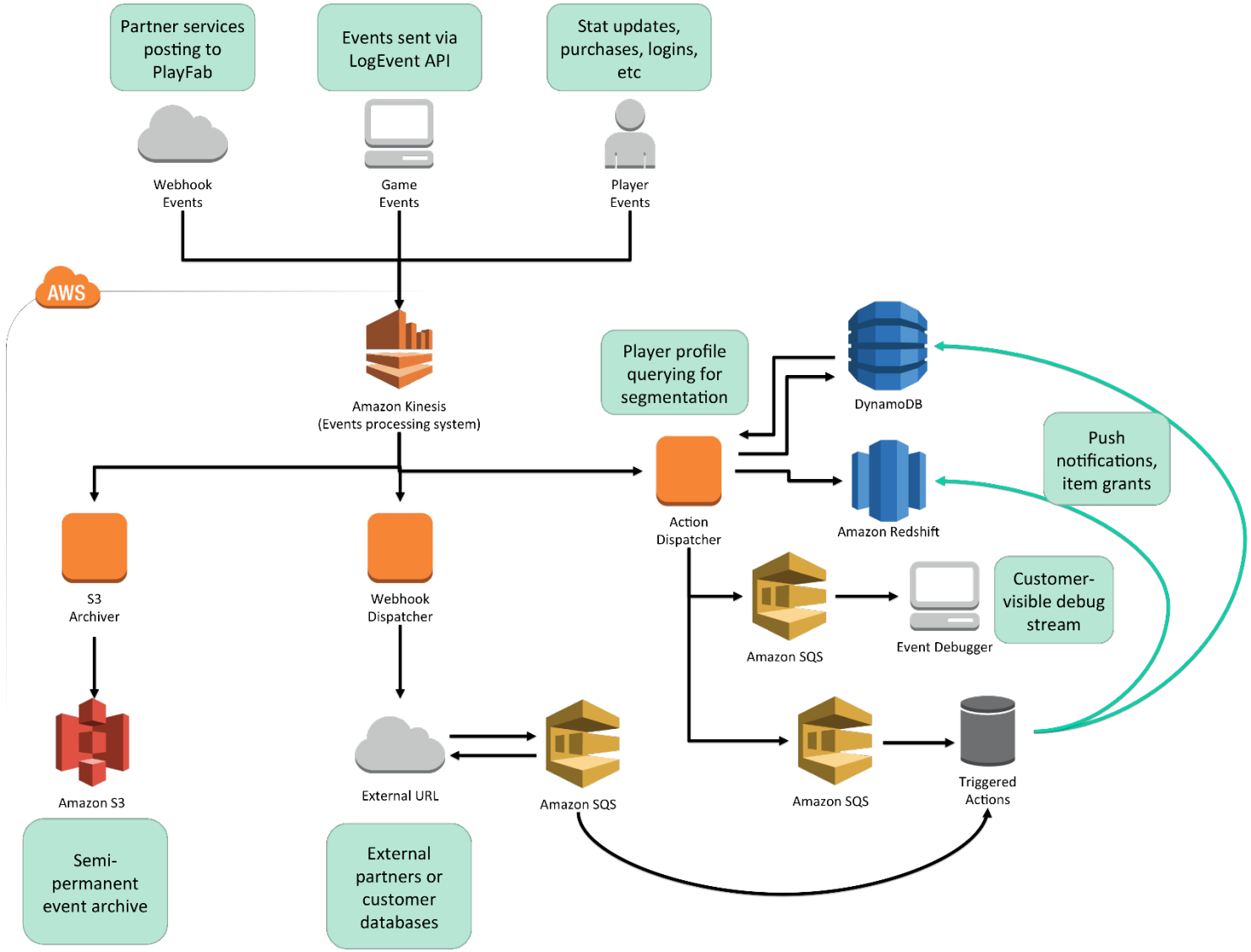


Dealing with elastic load



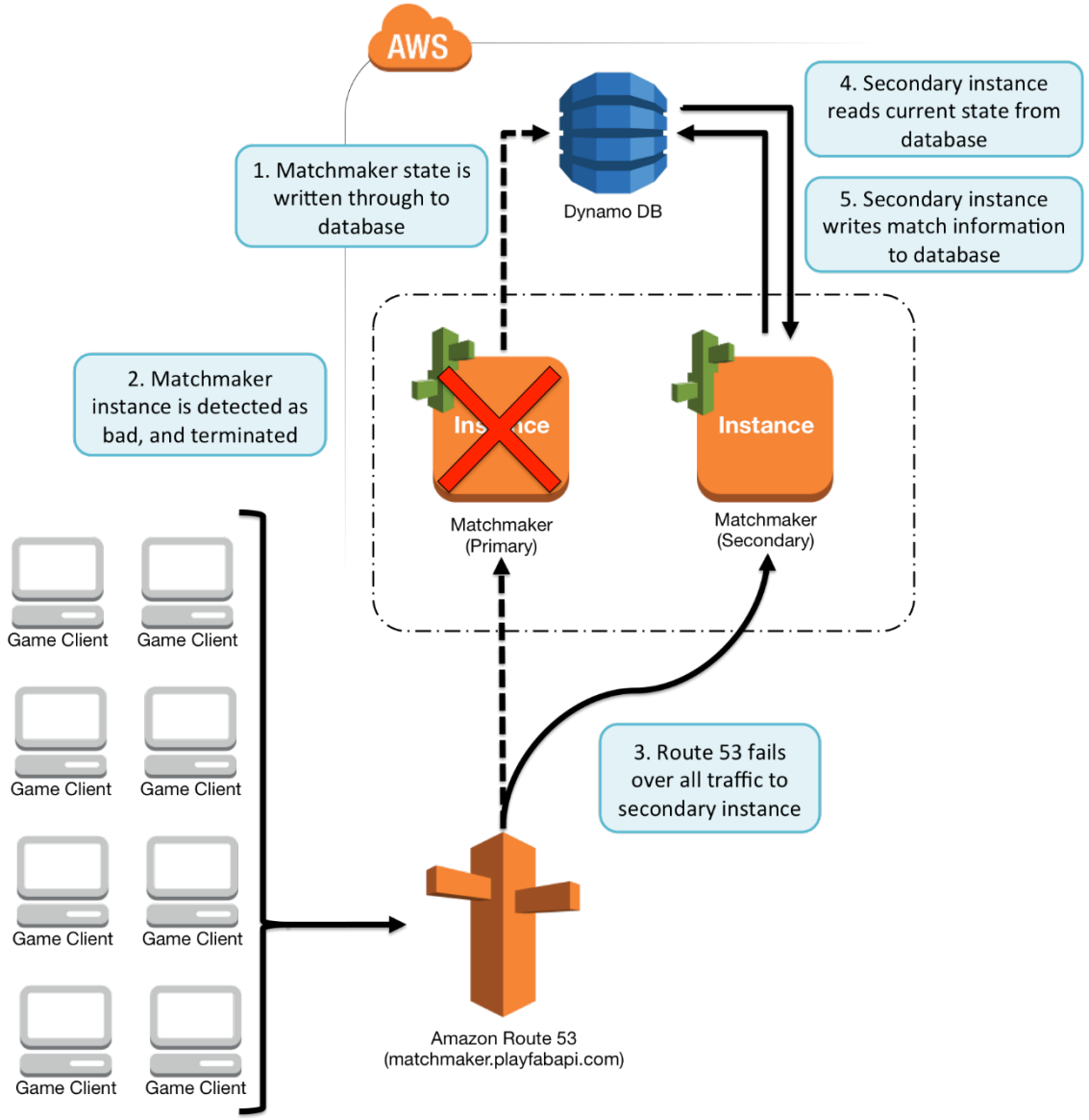
- Peak load is often launch day
  - Hard to predict actual load
- We solve using elastic compute & storage solutions
- No transaction support in DB, so must solve at logic level

Applying actions to user segments



- Users are grouped into segments based on behavior
- Games apply actions to segments
  - Send a push notification
  - Grant an item
- Need both batch and real-time processing
- We use a hybrid model, with duplicate storage
  - Redshift for bulk actions
  - DynamoDB for individual triggers

Global state for matchmaking



- Matching users for a game is harder than it sounds
  - Millions of players
  - Must be atomic
  - Lots of state and complex rules
- We use a single server, w/ fallover
  - State is written though to DB
  - If primary fails, secondary reads in state from DB and takes over
  - This happens very quickly…

Thank you

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