No “Big Bang” Theory: A Two-Way Data Synchronization Pattern

AWS Midwest Community Day 2026

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Today's Speakers

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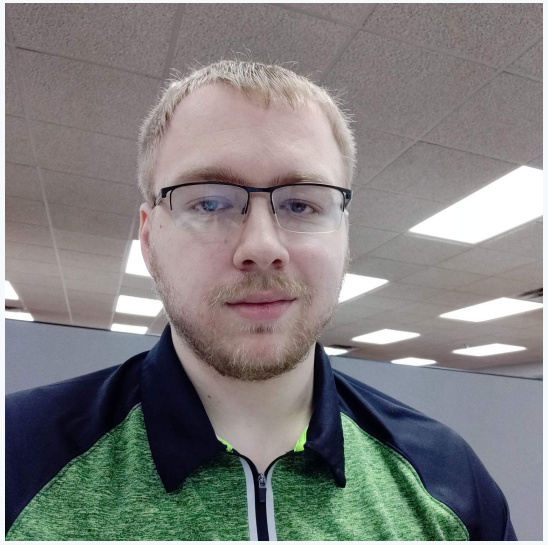

Aaron Thomas
Senior Software Engineer
Byrider

The Problem

Why "Big Bang" migrations fail

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The "Big Bang" Problem

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“Big Bang” Migrations

- Typical modernization efforts: Multi-year (3+) projects, complete rewrites and tech stack overhauls
- No containers, no lift + shift, a whole presentation by itself on rationale
- Key issue: **flip the switch and hope it works**
- Keeps key stakeholders and executives up at night
- They would much rather build in small pieces and deliver incrementally (strangler pattern)

The "Big Bang" Problem

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So why not just deliver incrementally?

- The reason is always the same: Having to synchronize the old system with the new system…bi-directionally
- Complicated, expensive, and generally awful…many companies give up

The Ask

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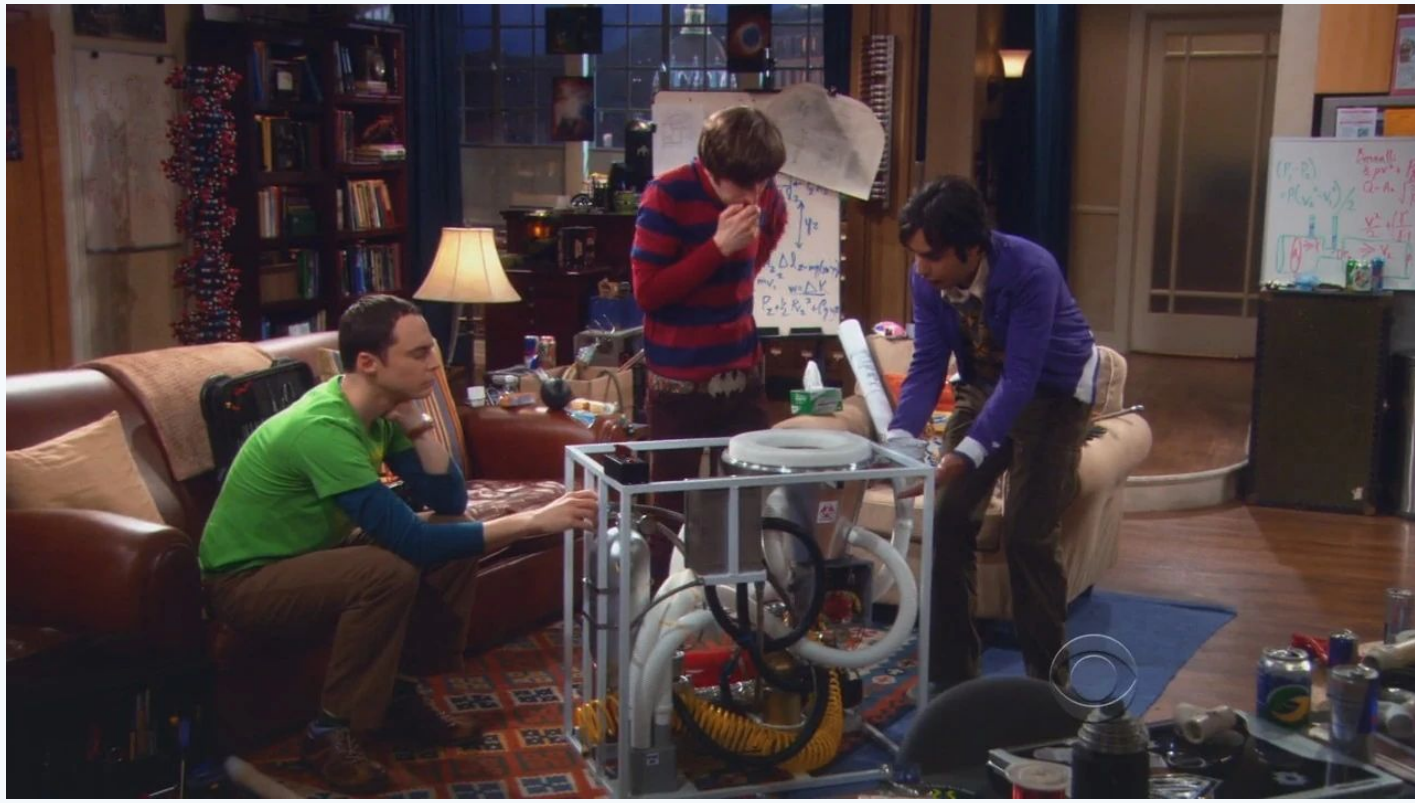
- Replace 25-year-old ASP.NET Framework 4.6.1 app and AWS ECS services, legacy AWS account
- New serverless application stack in AWS
- Move ~5 Terabytes of SQL Server to a dozen DynamoDB tables
- One source of truth
- Both systems used simultaneously
- Clean cutover when ready to retire legacy



We've never built a space toilet, but we imagine it was a fun as this project

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The Challenge

Strategies attempted and obstacles faced

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Strategy 1: DMS

- Views → DMS → Staging DynamoDB Table → Streams → Target DynamoDB Table
- "It worked for Oracle, so we're good!"
- Problem: can't use SQL Server Views with DMS
- Dead end 💀

Our DBA discovering the DMS didn't support SQL Server views a.k.a. "read the documentation" wasn't as dramatic as this "Campaign for North Africa" moment, but sure felt like it

Strategy 2: Roll-Your-Own

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- Stored procedure model
- Unexpected benefits
  - Input parameters precisely control data volume per Lambda
  - Solved the "data purge" that never actually happened
- Not really a major shift, we were going to have to create views anyway

Scale

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- Initial Load: 10s of millions of records per table
- Ongoing Load: 1000s of records per week
- Load impact at several points
  - SQL Server (still-running production DB)
  - DynamoDB Streams
  - Concurrent Lambda Invocations
  - SQS
  - CloudWatch

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Daniel Schnipke, opening the floodgates on a full-size dataset

The Challenges

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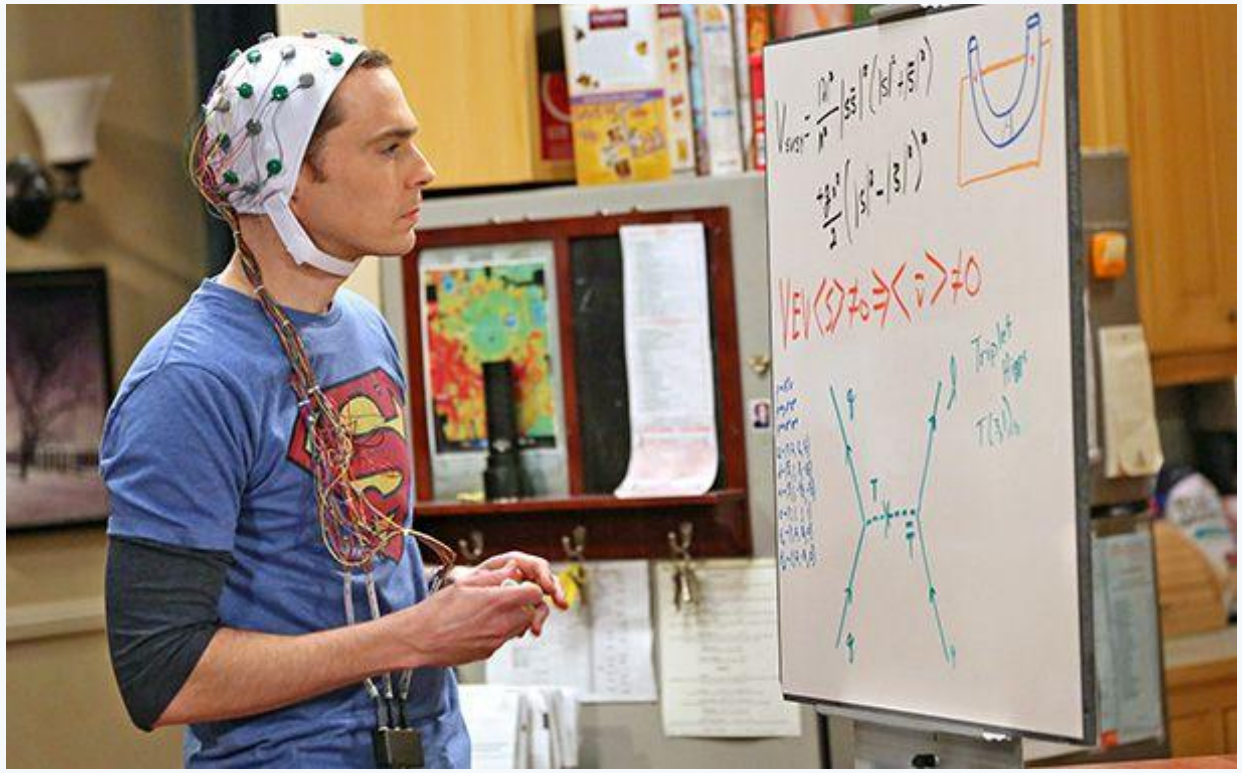
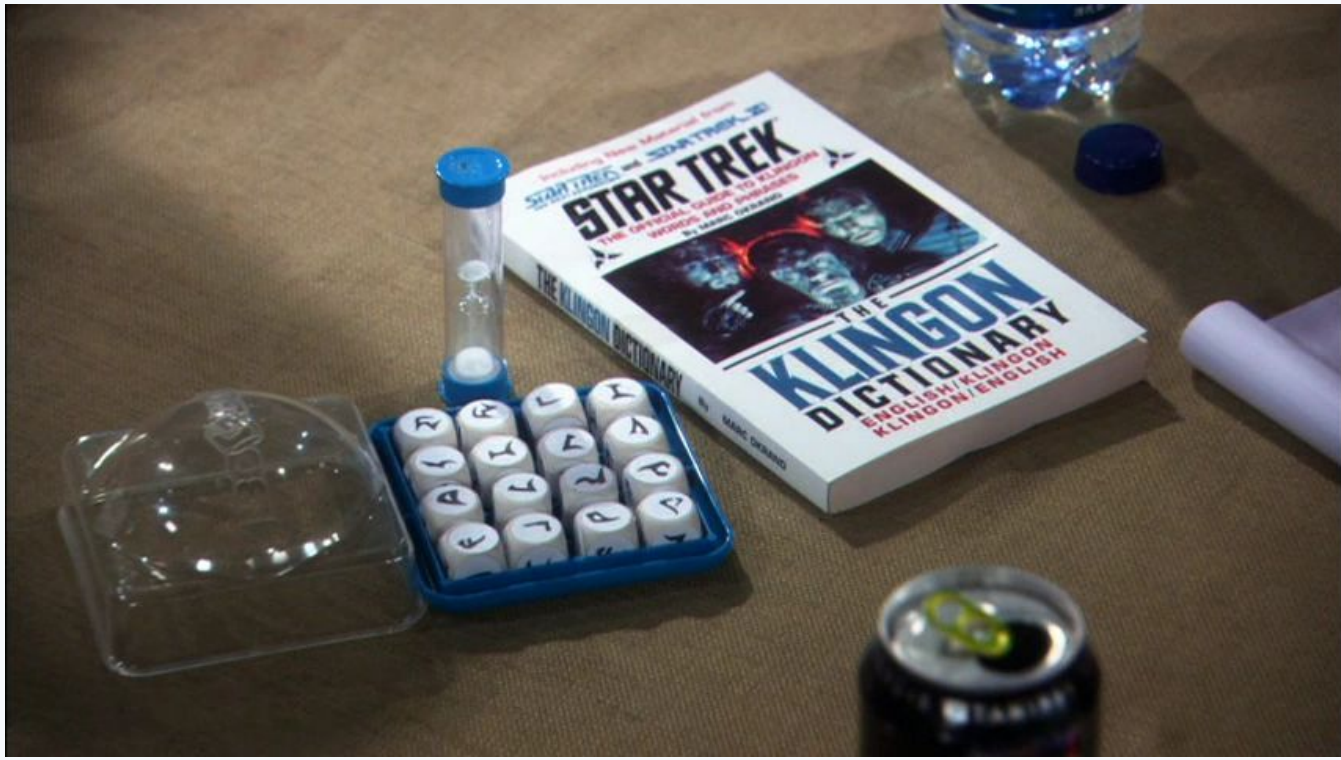
- Wildly different data implementations
- New system "fixed" problems at data layer
- Sync “fixed” ↔ “broken” data bidirectionally
- Circular updates / circuit breaker needed



Aaron Thomas vs the legacy system

Latency and User Experience

- Must be fast enough to avoid user confusion
- No thrashing back and forth during sync
- Example: user writes, edits, shouldn't see unmodified version



An example of high latency and questionable user experience: Klingon Boggle

The Key Problem

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- Legacy SQL Server: sequential numbers (sometimes no IDs at all)
- New DynamoDB: ULID
- Brand new IDs, no place in legacy system
- Need bidirectional key mapping

When you have key problems

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The Solution

Bidirectional sync architecture

All you need is a good flowchart

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Solution: New to Legacy

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- Cross-account DynamoDB stream
- Filter: `ConsistencyState == Pending`
- Lambda to Legacy SQL via stored procedures
- Near real-time sync
- Send data to the backend system, wait for it to come back

When you shoot something into the void…and get a response

Solution: Legacy to New

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- Cross-account DynamoDB access
- EventBridge cron every 5 minutes
- SQL Row Version for predictable ordering
  - Store version number in Databridge DynamoDB
  - Fallback: date fields, then IDs (not great)
- Large batches: complete initial load + low latency
- `ConsistencyState = Current`

Dealing with Keys

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- Record from old system first: Generate ULID, keep old ID on record
- Write to Databridge DynamoDB (pk = legacy ID)
- Record from new system first
  - Check for existing legacy ID
  - Write via stored procedure, get legacy ID back
  - Prevents duplicates in both directions

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Front-End Strategy

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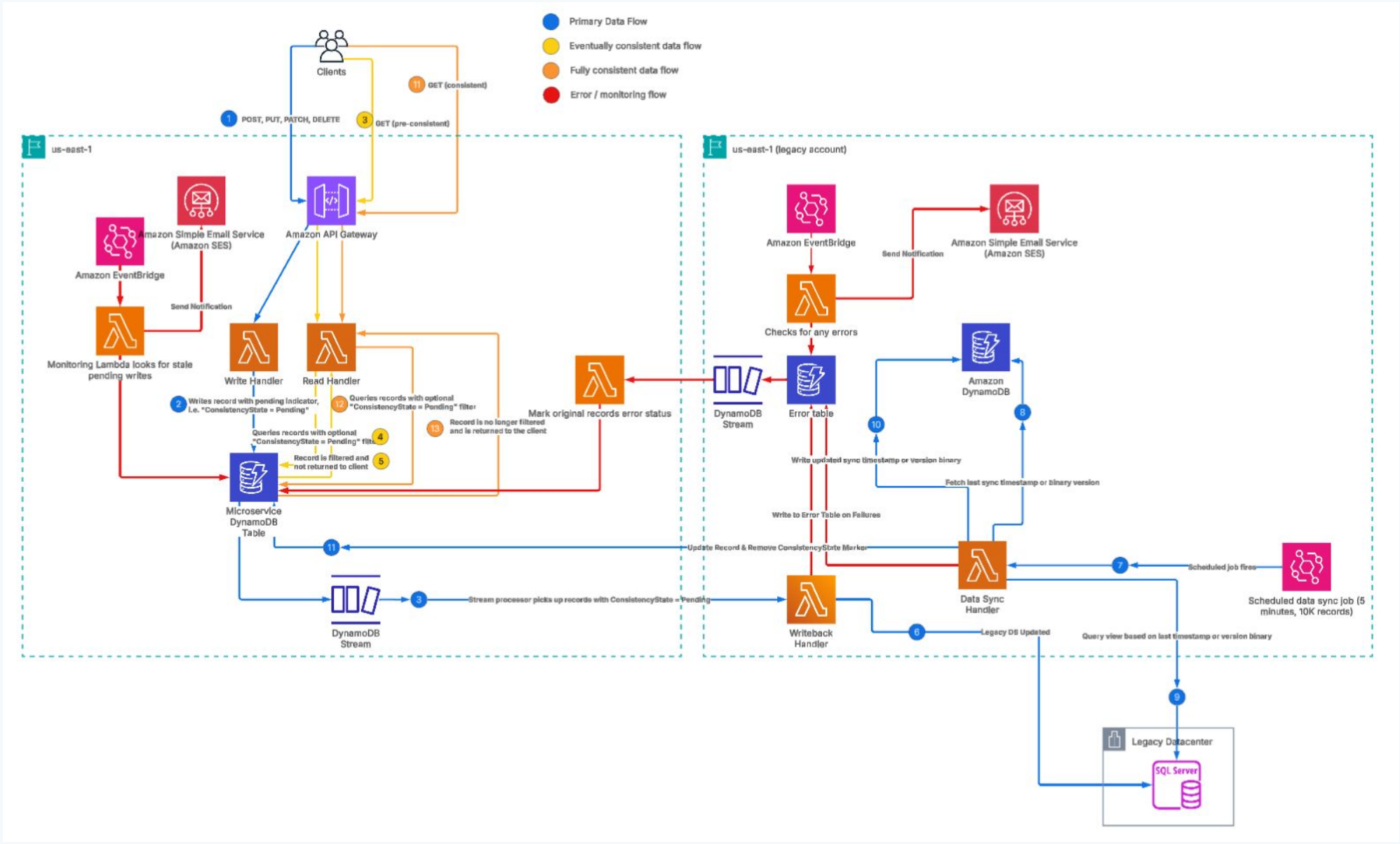
- Borrowed from AWS eventual consistency patterns
- Give UI everything mid-cycle
- Let UX decide what to do with `ConsistencyState`
- Users stay productive during sync

If you keep knocking, “eventually” someone will probably open the door

Architecture Diagram



Questions?

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Continue the Conversation!

- Presentation downloads
- Speaker information
- Additional resources
- Office Hours registration and details
- Follow-up contact information

https://www.cleanslatetg.com/aws-community-day-resources/

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