



# Service Broker: Async in the DB!

Ryan Booz, Senior Dev, KCF Technologies



Please silence  
cell phones



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# Ryan Booz

## Senior Dev., KCF Technologies



/ryanbooz



@ryanbooz



<https://www.SoftwareAndBooz.com>

### DBA/Dev for 18+ years

MySQL, PostgreSQL, DB2, SQL Server

Currently admin hundreds of SaaS DBs for thousands of clients world-wide

### First Email Account in 1992

High school senior project with the Pittsburgh Supercomputing Center on a DEC 5000.  
Gopher, Lynx and X-Windows!

### Large Family

Married for 16+ years with our 6th child due two weeks after Summit. This also means I will have changed diapers for ~17 years! Totally worth it!

# Agenda

- EnergyCAP: A Case Study
- What problem is Service Broker solving?
- Anatomy of Service Broker
- Service Broker in Action
- Use Cases
- Demo: Realtime Reporting
- Tips and Gotchas
- Resources



# EnergyCAP Ecosystem

- Single DB accessed by three independent apps
  - Legacy desktop C++ client
  - (Almost) legacy Flash-based web app with .NET 4.5 web services
  - Modern Angular app backed by .NET Core web services
- SQL 2008R2, 2012 & 2014, 2017 currently in use
- SaaS offering with ~300 production databases (representing ~2000 clients)

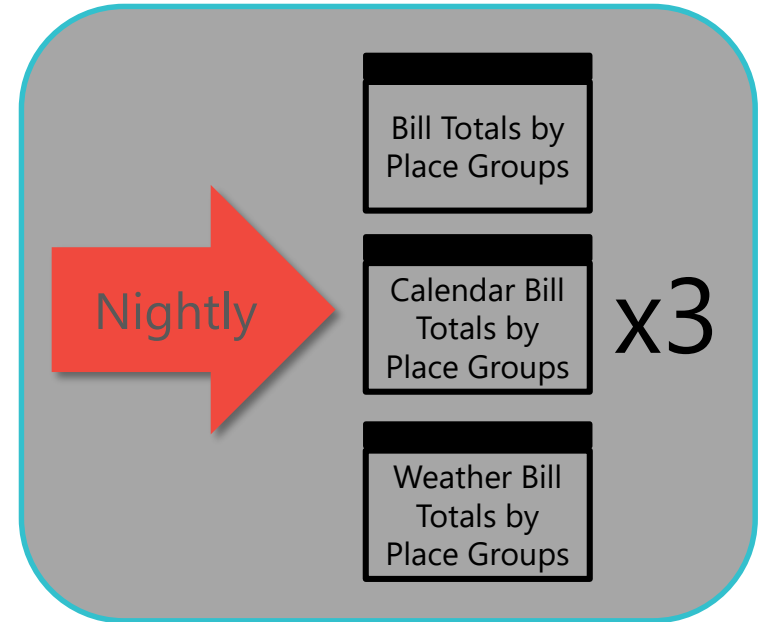
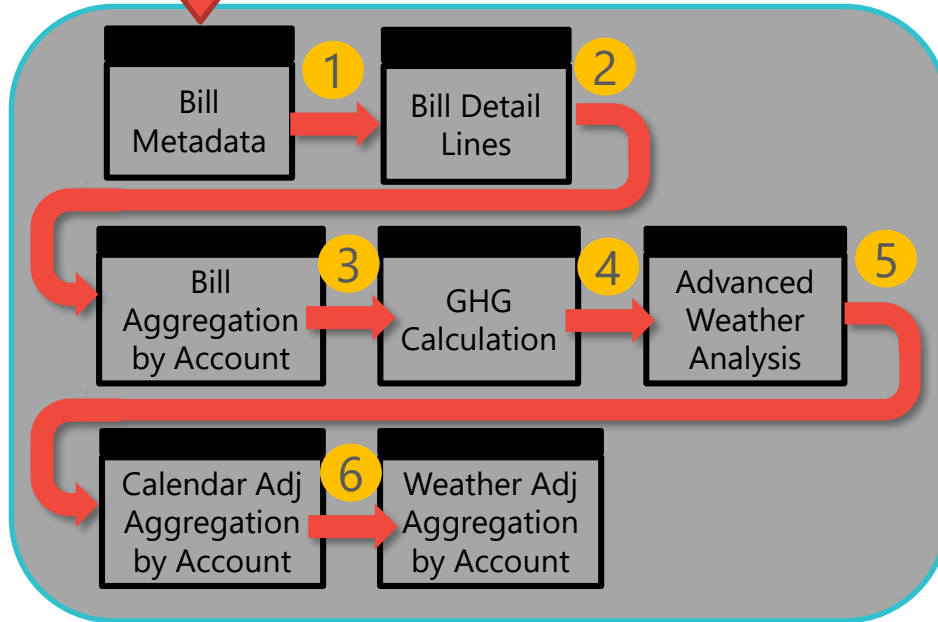
# EnergyCAP Ecosystem

- Client-hosted DBs are:
  - Usually the largest databases
    - 3-10 million bills
    - 15-30 million bill detail lines
  - Often our limiting factor because of environment limitations



# The Constant Thorn...

- Business critical processing in SPROCs and Triggers
- Unfortunately, the most repeated statements tend to be:
  - "Just add a flag..."
  - "Put it in the trigger..."
- A tangled web of triggers looking at flags, calling SPROCs, which call other SPROCs, which reset flags...



Feels like this...



# Which leads to this...

**Server:** [REDACTED]

**URL:**[http://\[REDACTED\].com//Services/Managers/Accounts/Bill.aspx/WriteBill](http://[REDACTED].com//Services/Managers/Accounts/Bill.aspx/WriteBill)

**Exception:** Flex

**User:** [REDACTED]

**Database:** [REDACTED]

**Comment:** EVERYTIME I HIT SAVE AND AUDIT, I GET THIS BOX. THIS IS LIKE TIME NUMBER 9

**Time:** 3/6/2017 3:37:03 PM

# Messaging Options

- We explored external queuing and messaging systems numerous times
- Self-hosted clients were always the limitation
- If only...



**I Am Developer**

@IAmDeveloper



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If only SQL Server had a built-in mechanism for queuing work that all clients had access to and didn't have to pay extra for!



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[@IAmDeveloper](#) - Where have you been? That's so 2005. Service Broker. Sheesh...



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# Enter Service Broker

- A messaging system included with SQL Server 2005+
- All versions except Azure SQL DB
- Available in Azure Managed Instances
- Types of messaging:
  - In DB
  - Local instance
  - Between instances
  - Remote messaging
- Reliable, transactional

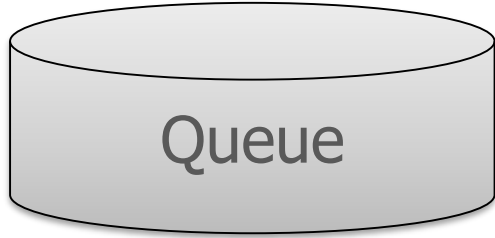
# Service Broker:

## The Basics





# Queue



Local or Remote

Messages can be processed manually or automatically with Activation

2GB Message Size Limit

# Service



The “air traffic controller” of messages  
Messages are sent to a **Service**,  
not a Queue

# Message Types



The “name” of the Message  
Content can be validated as XML to  
prevent bad data or have no validation

# Contracts



Specifies exactly what **Message Types**  
are allowed in a **Conversation**  
Provides more control for the **Service**

# Conversations

- Service Broker apps are conversations
- There are at **always** two sides to the conversation – an Initiator and a Target
- **Not** a fire-and-forget queuing system like MSMQ
- The conversation must always be completed



# The Building Blocks

Message Type

Message Type

Message Type

Message Type

Contract

Contract

Service

Queues

# Basic Service Broker Conversation



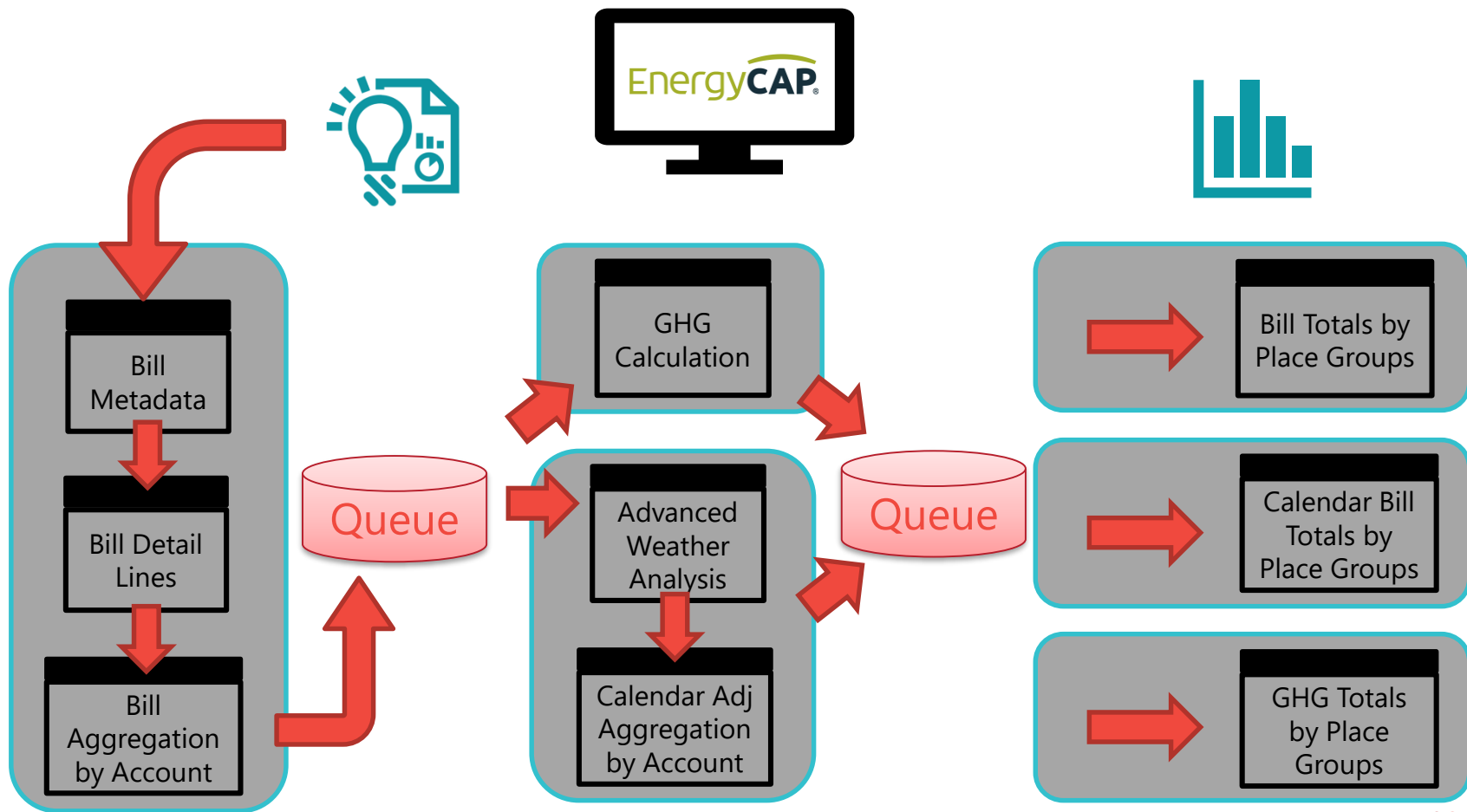
# Demo

## Your First Conversation



# Async Processing!

- Message processing (saving and retrieving) is very lightweight and non-blocking
- The linear, synchronous processing in SPROCs and Triggers can now be ordered and adapted by adding messages to a queue
- Messages are processed by new threads, freeing the original transaction to return quickly





# Common Uses

- Table logging as an alternative to Temporal Tables
- Storing requests for long-running processes that can happen later (Reports)
- Committing information that starts other work out of process
- Shipping messages to another DB
- Triggering an external process (External Activation)
- External Cache busting (eg. Redis)

# Demo

## Queue Activation



# Demo

Automated processing



# Behind the Curtain

The Ugly Side of SSB





# The Less Pretty Stuff

- Lots of Boiler Plate
- Little to no UI
- Intellisense doesn't know about queues
- Very little management assistance
- Steep learning curve initially

# First-time Gotchas

An First-time Tips



# Gotchas & Tips

## CLOSE THE CONVERSATION!

- `sys.conversation_endpoints` will fill with unclosed conversations
- Consider reusing dialog handles/conversations to reduce overhead

## Encryption is on by default

- Inner DB communication does not require it
- For same DB/Instance messaging set `WITH ENCRYPTION=OFF` on the conversation

# Gotchas & Tips

## Consider T-SQL Refactoring

- Separating work across multiple threads allows you to re-think workflow
- Knowing specific items or rows to work on can simplify older code
- Look for new locking/blocking issues from concurrent code
- BUT, avoid over complicating the work!

## Error logs & Activated SPROC

- Activated SPROC will always attempt one last retrieve
- If the SPROC is not written correctly it will always log an error for 'conversation\_handle' being empty

IF (@conversation\_handle IS NOT NULL)

IF(@@rowcount > 0)



# Gotchas & Tips

## ENABLE\_BROKER vs NEW\_BROKER

- Any restore or creation of a database must enable SSB
- ENABLE\_BROKER when the database is new on a server
- NEW\_BROKER when restoring a copy or template database to reset the GUID
- WARNING! NEW\_BROKER will clean queues and start fresh

## Set the Database owner

- SSB runs as the database owner
- Simplest solution is to set AUTHORIZATION on the database to SA

# Gotchas & Tips

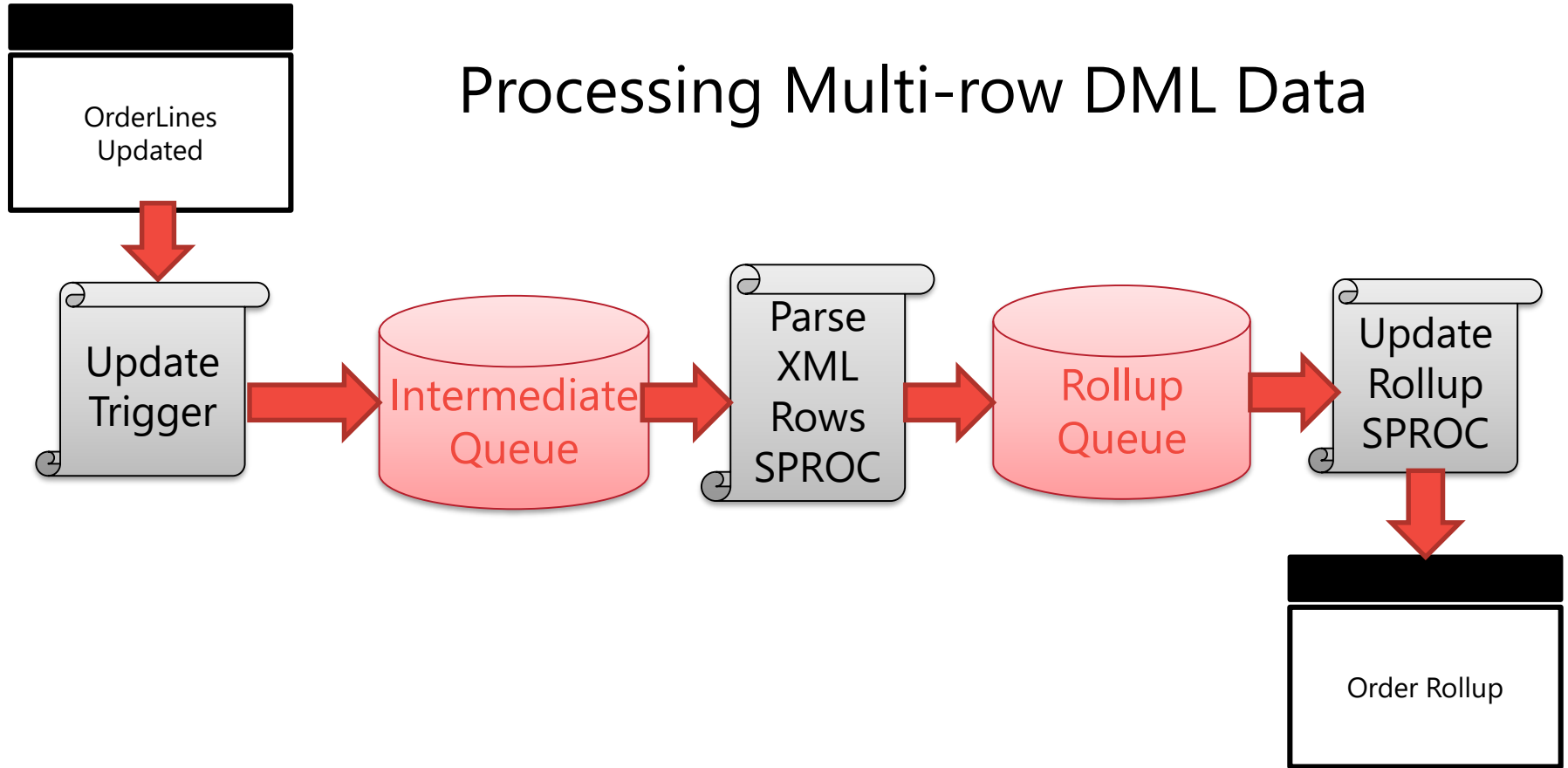
## Poison Message Handling

- On by default
- 5 consecutive errors will disable queue
- Transaction scope matters
- Without proper Transaction handling, Queues will quickly be disabled
- RAISE errors in children SPROC's to correctly CATCH errors and handle messages

## Batch Processing in Triggers

- DML actions act on multiple rows, not one at a time
- Send XML data to a different **Queue** and process row-by-row later
- Do not loop (CURSOR) over rows of changed data in the Trigger!!

# Processing Multi-row DML Data



# Gotchas & Tips

## Reuse Dialogs for large apps

- Starting a new dialog adds overhead
- For large applications, create a **Conversation Handle** repository table to reuse conversations
- Service broker can achieve thousands of messages a second

[https://blogs.msdn.microsoft.com/sql\\_service\\_broker/2008/07/24/reusing-dialogs-with-a-dialog-pool/](https://blogs.msdn.microsoft.com/sql_service_broker/2008/07/24/reusing-dialogs-with-a-dialog-pool/)

# Useful Links

- Remus Rusanu (<http://rusanu.com/blog/>)
- Dave Wentzel (<https://davewentzel.com/content/service-broker-demystified-series-summary/>)
- Jonathan Kehayias (<https://sqlperformance.com/2014/03/sql-performance/configuring-service-broker>)



# Thank You

Learn more from Ryan Booz



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