Calgary User Group
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Replacing Profiler with Extended Events

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Trainer/Speaker

In addition to consulting, I teach content for our IE0: Accidental DBA course, and our IEPTO2: Performance Tuning and Optimization course

PASS Volunteer

I was a member of the PASS Nomination Committee this past year, have previously served on the board of my local user group (ONSSUG) and supported the Performance Virtual Chapter

Data Platform MVP

I have been fortunate to be recognized as an MVP by Microsoft since 2012

SQLskills
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- Team of SQL Server consultants:
  - Kimberly Tripp (@KimberlyLTripp)
  - Jonathan Kehayias (@SQLPoolBoy)
  - Tim Radney (@Tim Radney)
  - Paul Randal (@PaulRandal)
  - Erin Stellato (@ErinStellato)

- Instructor-led training: Immersion Events and onsite

- Online training through Pluralsight (www.pluralsight.com)

- Consulting: Health checks, design, performance, upgrades, Azure

- Remote DBA: system monitoring and troubleshooting

- Conferences: PASS Summit, SQLintersection, SQLBits

- Get our newsletter: https://www.sqlskills.com/Insider

2020 Classes and Discounts

- **In-depth, instructor-led, technical training for SQL Server**
  - Held in the US in 2020 – IEPTO1/2, IE0, IEAzure, IEReporting, IECAG
- **Online, live, Immersion Events throughout the year**
  - Columnstore, Transactions/locking/blocking, Query performance, Upgrade, VLTs and Partitioning
- **Always announced first, and with a special discount, in our Insider newsletter**
  - https://www.sqlskills.com/Insider
- **For more information: https://www.sqlskills.com/training/**
- **Services information: https://wwww.sqlskills.com/services/**

- Email paul@sqlskills.com with the subject line: User Group Pluralsight code to get a FREE (no catches, no credit card) 30-day trial of over 150+ hours of SQLskills content (and more)
- For example:
  - https://app.pluralsight.com/library/courses/sqlserver-replacing-profiler-extended-events/table-of-contents
    - 2.5 hours on migrating from Profiler to Extended Events (Erin)
  - https://app.pluralsight.com/library/courses/sqlserver-basicxevents/table-of-contents
    - 5 hours of an introduction to Extended Events (Jonathan)
  - https://app.pluralsight.com/library/courses/sqlserver-advanced-xevents/table-of-contents
    - 4 hours on advanced Extended Events (Jonathan)

Scripts for this session, along with a PDF of the slides, can be downloaded from:
http://www.sqlskills.com/sql-server-resources/sql-server-user-groups/

Abstract

Extended Events was released over 10 years ago, with SQL Server 2008, and DBAs and developers alike *still* prefer Profiler. However, if you want to troubleshoot anything related to new features, you have to use Extended Events. If you've tried XE and struggled, or if you've been thinking about it but just aren't sure where to begin, then come to this session. Using your existing knowledge and experience, we bridge the gap between Profiler and Extended Events with demos, starting with the Profiler UI you know and love, and ending with an understanding of how to leverage functionality in the Extended Events UI for data analysis. By the end of this session, you'll know how to use Extended Events in place of Profiler to continue the tasks you've been doing for years, and you'll have the foundation to better understand how you can leverage Extended Events to troubleshoot other issues in ways not previously possible.

Overview

- Transitioning from Profiler's UI to Extended Events
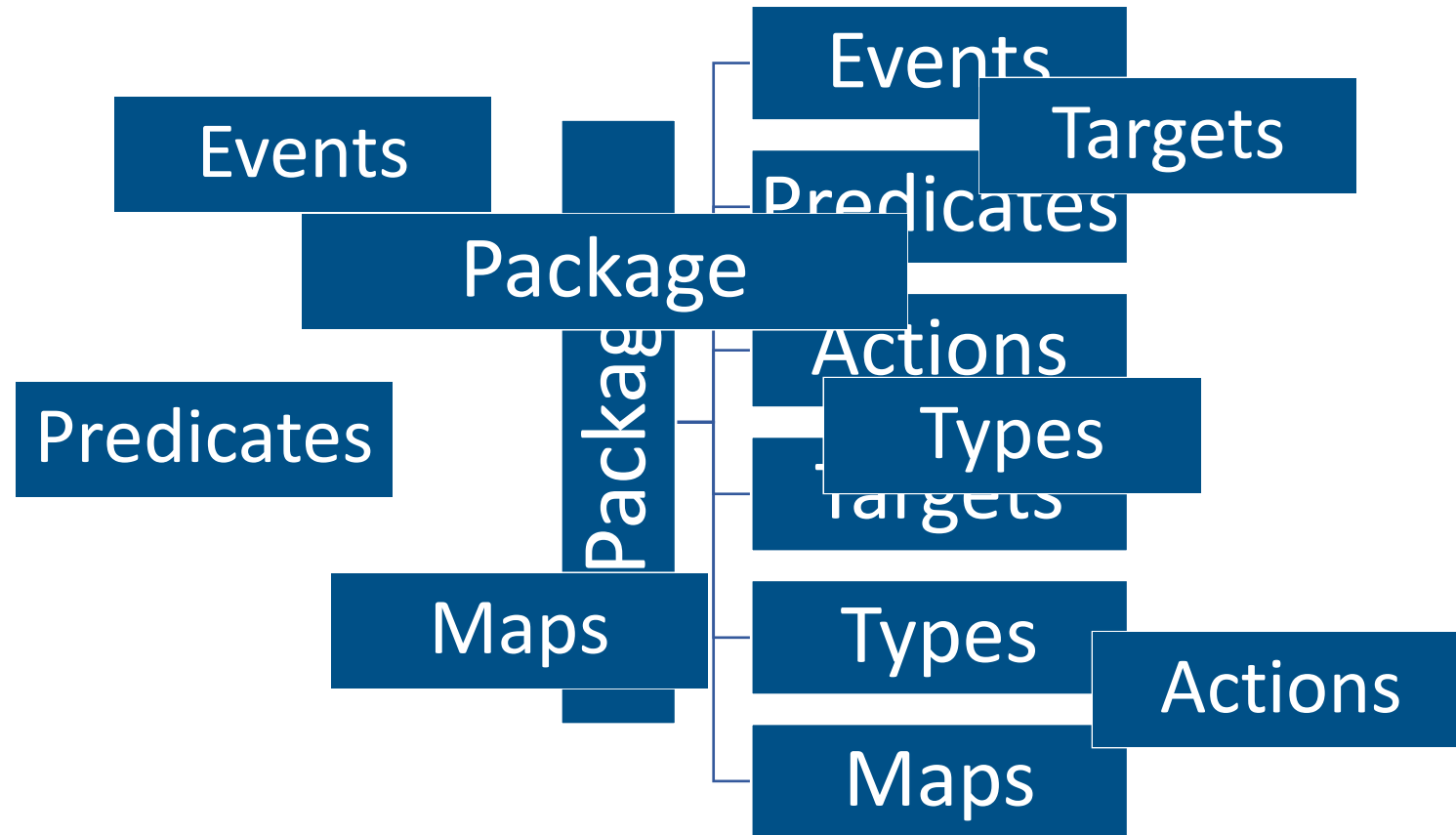- Potential performance killers

What is Extended Events, REALLY?

- It's a "general event-handling system for server systems"

- "The Extended Events infrastructure supports the correlation of data from SQL Server"

- An infrastructure which provides the ability to create complex sessions to collect event information

- Introduced in SQL Server 2008, provided by SQLOS

Extended Events Engine

- Database Engine
  - SQLOS
    - Extended Events Engine

- The XE engine is a collection of services and objects that it manages, and is an interaction point for other SQL Server processes

Extended Events Objects

Demo: Migrating a Trace Definition to an XE Session

Events

- An event corresponds to a well-known point in the code
  - Data File Auto Grow
  - Sort Warning
  - Object: Created
  - SP: StmtCompleted
  - Lock: Acquired
  - SQL: StmtRecompile
  - Deadlock graph

- Events have a default payload – a set of data elements that are always returned by an event and cannot be altered

Event Comparison

Trace	Extended Events
SP: StmtCompleted	sp_statement_completed
SQL: StmtRecompile	sql_statement_recompile
Data File Auto Grow	database_file_size_changed
Deadlock graph	xml_deadlock_report
Audit: Login	~~login~~

- Event names between Trace and XE are similar
- All events from Trace have a comparable event in XE as of SQL Server 2012 (Audit events are an exception)
- Use the trace_xe_event_map DMV for mapping

Event Comparison

Version	XE	Notes
2008 SP4	253	
2008 R2 SP3	262	
2012 SP4	625	Includes all events available in Trace
2014 SP3 CU4	890+	
2016 SP2 CU13	1300+	
2017 CU20	1500+	
2019 CU5	1800+	

- There are only 180 Trace events in each of the versions listed above
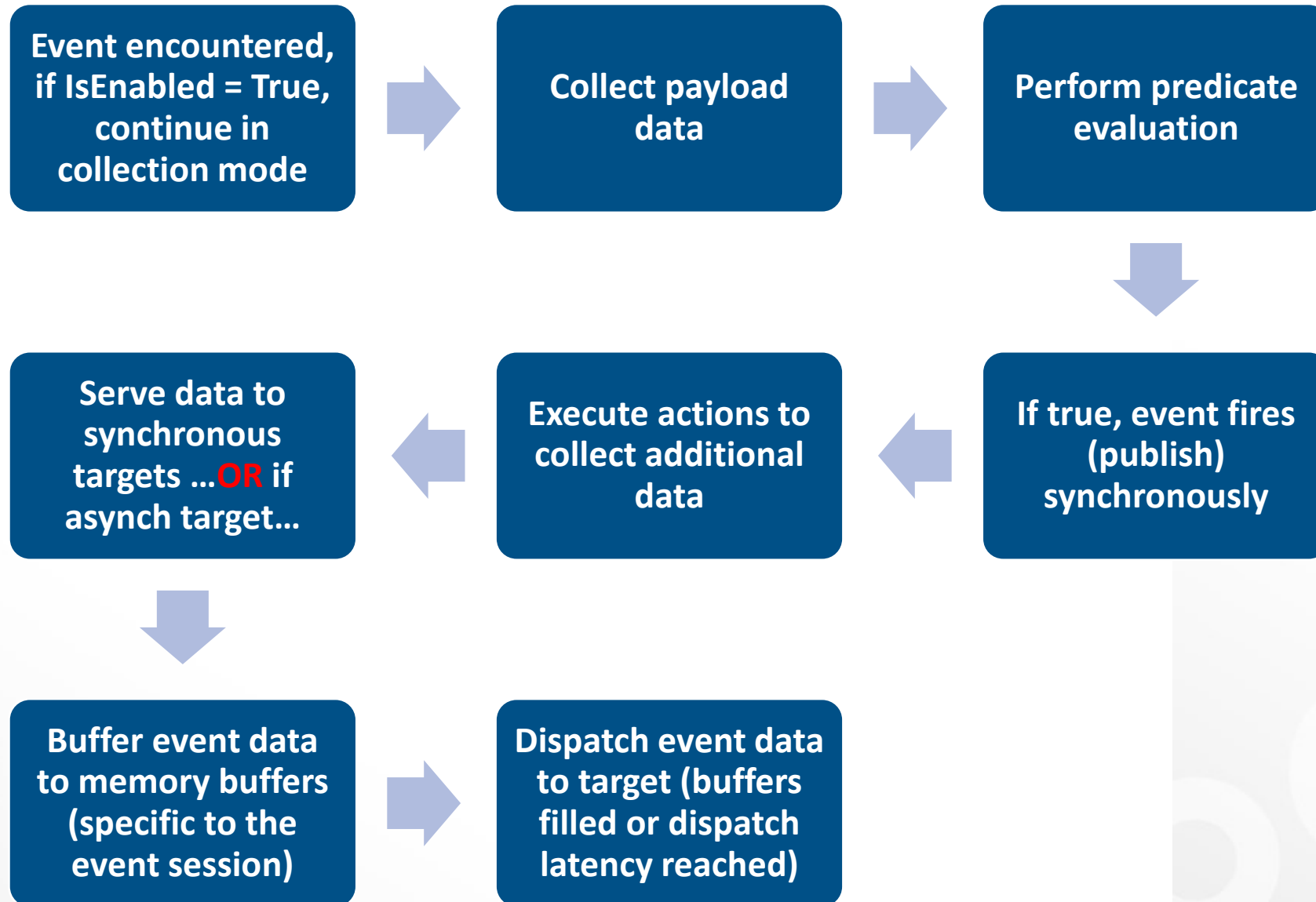
Predicates: Filtering out the fluff

- The predicate is a filter that defines whether or not the event will fire

- These are extremely powerful as they support short-circuit evaluation

- They can operate on event payload data or global predicate source fields
  - The global predicate source fields that can be used for predicates are *not* the same as Actions, even though the same names *might* be used

Actions: When Event data isn't enough

- An action is an additional operation performed when the event fires
    - *Collect* the database ID
    - *Collect* the session ID
    - *Create* a mini dump for the current thread

- An action executes *only* when the event fires, therefore the predicate must evaluate to true first

Targets

- Targets consume the events, they can store the data (temporarily or permanently) in either raw or aggregate format
  - Event file
  - Ring buffer
  - Event counter
  - Histogram
  - Event pairing

Demo: Creating Event Sessions in the UI

Performance must still be considered

- Specific events are still expensive, such as query_post_execution_showplan

- Filtering on global state data adds overhead

- Adding actions adds overhead
  - Select actions have serious side effects (perform a memory dump, insert a debug break)
  - Other actions (e.g. tsql_stack vs. tsql_frame) can have high overhead based on the event and how frequently it fires

Performance must still be considered

- Even if you have a lot of memory on the server, you still need set limits when using the ring_buffer target

What you're going to grumble about

- It will feel like it takes longer to create an Event Session than it does to setup a Trace
  - It does…initially
  - It will take you longer to do everything…initially

- With the histogram target you can only bucket on one field

- You cannot integrate PerfMon data with XE data in the UI

- Distributed Replay requires .trc files

My favorite things about XE

- Create multiple sessions and start and stop them as needed (and they persist through restarts)
- Search capability in the list of events
- Track causality
- Write to multiple targets
- Work with the data in the UI

When you're back in the office...

- Every time you go to open Trace, set aside 15 minutes to try what you want in XE (or just use Jon's script to convert it and then take 15 minutes!)

- Use the resources referenced here – and ask for help!

- If you're struggling, let me know:
  - https://www.sqlskills.com/blogs/erin/why-do-you-avoid-extended-events/

Overview

- Transitioning from Profiler's UI to Extended Events
- Potential performance killers

Resources

- **Pluralsight Course**
  - SQL Server: Introduction to Extended Events, Jonathan Kehayias
    - http://bit.ly/1uhYXv4
  - SQL Server: Replacing Profiler with Extended Events, Erin Stellato
    - http://bit.ly/2e5fByz

- **SQL Server Central Stairway**
  - http://www.sqlservercentral.com/stairway/134867/

Resources

- **Blog Posts**
  - 31 Days of Extended Events, Jonathan Kehayias
    - http://www.sqlskills.com/blogs/jonathan/category/xevent-a-day-series/
  - Introducing the Extended Events User Interface
    - http://blogs.msdn.com/b/extended_events/archive/2011/07/13/introducing-the-extended-events-user-interface.aspx

Resources

- ## TechNet
  - Using the system_health Session
    - http://technet.microsoft.com/en-us/library/ff877955.aspx
  - Extended Events
    - http://technet.microsoft.com/en-us/library/bb630282.aspx

- ## Utilities
  - SQL Server 2008/2008R2 Extended Events Add-In for SSMS
    - http://extendedeventmanager.codeplex.com/
  - SQL Server 2012 Extended Events Add-in
    - http://www.sqlskills.com/free-tools/sql-server-2012-extended-events-add-in/