


**SQLskills**  
**Triad SQL Server User Group**  
**27<sup>th</sup> January 2015**

**Making the Leap from Profiler  
to Extended Events**

Erin Stellato  
Erin@SQLskills.com





- **Team of world-renowned SQL Server experts:**
  - Paul S. Randal (@PaulRandal)
  - Glenn Berry (@GlennAlanBerry)
  - Jonathan Kehayias (@SQLPoolBoy)
  - Kimberly L. Tripp (@KimberlyLTripp)
  - Erin Stellato (@ErinStellato)
  - Tim Radney (@TRadney)
- **Instructor-led training: Immersion Events (US, UK, and Australia)**
- **Online training:  <http://pluralsight.com/>**
- **Consulting: health checks, hardware, performance, upgrades**
- **Remote DBA: system monitoring and troubleshooting**
- **Conferences: PASS Summit, SQLintersection**
- **Become a SQLskills Insider**
  - <https://www.sqlskills.com/Insider>



# 2015 Immersion Events

- **Classes in Chicago, Bellevue (WA), London, Dublin, Sydney (Australia)**
  - IE0: Immersion Event for Junior/Accidental DBA
  - IEPTO1/2: Immersion Events on Performance Tuning – Parts 1 and 2
  - IEHADR: Immersion Event on High Availability and Disaster Recovery
  - IEBI: Immersion Event on Business Intelligence
- **In-depth, instructor-led, technical training for SQL Server**
- **Here's our topic list for **IEPTO2: Immersion Event on Performance Tuning, Part 2****

SQL Server I/O	I/O Concepts for DBAs	SANs for DBAs
SQLOS Scheduling and CPU Performance Tuning	SQLOS Memory Management and Memory Performance Tuning	Data Collection and Baselineing
Wait and Latch Statistics	Query Plan Analysis	Extended Events
Performance Issue Patterns	Statement Execution, Stored Procedures, and the Plan Cache	
Deadlock Analysis	Advanced Extended Events	

- **For more information:** <https://www.sqlskills.com/training/>

# Author/Instructor:

## Erin Stellato



- Consultant/Trainer/Speaker
- Principal Consultant, [SQLskills.com](http://www.SQLskills.com)
  - Email: [Erin@SQLskills.com](mailto:Erin@SQLskills.com)
  - Blog: <http://www.SQLskills.com/blogs/Erin>
  - Twitter: @ErinStellato
- SQL Server MVP since January 2012
- Board Member of Ohio North SQL Server User Group
- PASS volunteer since 2010
- 12 years working for software vendors, helping to support customer implementations in a variety of ways



- Email [paul@SQLskills.com](mailto:paul@SQLskills.com) with the subject line: **User Group Pluralsight code** to get a FREE (no catches, no credit card) 30-day trial of our 120+ hours of SQLskills content on Pluralsight
- For example:
  - <http://www.pluralsight.com/training/Courses/TableOfContents/sqlserver-waits>
    - 4.5 hours on waits, latches, spinlocks
  - <http://www.pluralsight.com/courses/sqlserver-optimizing-stored-procedure-performance>
    - 7 hours on stored procedure performance tuning
  - <http://www.pluralsight.com/courses/sql-server-2014-dmv-diagnostic-queries-part1>
    - Part one of a three part course on using DMVs for performance tuning

# Abstract

If you're like me, you've been using SQL Trace and Profiler since you started using SQL Server. They're like old friends, tried and true. You know how they work, you know what you can capture, you know how to find the data you need. But now you've been told that your good friends have been deprecated in SQL Server 2012, and you need to become best friends with Extended Events. What is THAT all about?

It's ok. Really. In this session we'll look at Profiler and Extended Events side by side to see how easy it is to transition to Extended Events. We'll step through real world examples using Extended Events to do what you're used to doing with Trace, and even more. You can find the time learn Extended Events...today.

# Goals

- **Introduce you to Extended Events using what you already know (Trace/Profiler)**
  - How to create, start, stop, and drop Event Sessions
  - Information you can capture
  - Filters you can use
  - Terminology
- **Understand potential “gotchas” with Extended Events**
- **Appreciate the power of Extended Events**

# History Review

- **SQL Trace was introduced in SQL Server 6.5 as a graphical tool, which was external to the SQL Server architecture**
  - Saved output to a trace or script
  - Very limited in what it could capture
- **SQL Profiler was introduced in SQL Server 7.0, and provided new capabilities for capturing and analyzing data**



# Basic Uses of SQL Trace

- Provide real-time insight into SQL Server activity
- Allows DBAs to capture duration, frequency, and resource use of queries
- Can be used to capture a baseline, or replay a workload (one client)
- May be used to audit user activity
- Most frequently used to troubleshoot performance issues and errors

# Additional Facts About Trace

- You can capture a lot of useful information
- You can filter on different columns (e.g. reads, duration, CPU)
- You can automate SQL Trace
- You can load the data into a table and query it
- There are several free tools to help you analyze the data (ReadTrace, Clear Trace, Qure)
- It can bring down a system if you're not careful
- It's deprecated starting in SQL Server 2012

# Why do we avoid Extended Events?

- There were a lot of new features introduced in SQL 2008
- There was no GUI until SQL 2012
  - Unless you installed the Extended Events SSMS Add-in  
<http://extendedeventmanager.codeplex.com/>
- All this new vocabulary
- Shredding the data initially required knowledge of XML and XQuery
  - Can now analyze data in the UI, or with ReadTrace
- It's new, it's different, it requires change...

# Now it's time to say goodbye...to Trace

- **Extended Events is the replacement for SQL Trace**
- **XE provides the same functionality as Trace:**
  - Capture information about what's going on inside SQL Server
  - Choose which fields to capture
  - Filter on different fields
  - Automate capture
- **Extended Events has a UI in SQL Server 2012+**
  - No need to use Xquery to view the data (*with some exceptions*)
- **XE is more lightweight than Profiler and SQL Trace, and can do more than SQL Trace ever could**
- **Extended Events is the only method for tracing \*new\* SQL Server features**

# What are Extended Events?

- **Advanced event collection infrastructure introduced in SQL Server 2008 and provided by SQLOS**
- **Highly-flexible solution which allows complex configurations for event collection that simplify problem identification**
- **Provides the ability to perform performance troubleshooting that's not possible any other way:**
  - Find the accumulated effect of queries using the query\_hash
  - Identify stored procedures that exceed previous max duration, CPU, or I/O values
  - Identify statement timeouts/attention events
  - Capturing the first N executions of an event
  - Find statements that recompile most frequently



## **Transitioning from Profiler to Extended Events**



# Changes in XE by SQL Server Version

SQL Server Version	Number of Events	Notes
2008 SP3	253	
2008 R2 SP2	262	
2012 SP1	625	Includes <i>all events</i> available in Trace
2014 CU5	872	v. 12.0.2546

- There are only **180** Trace events in each of the versions listed here

# Definitions

## ■ Events

- Correspond to a specific point in the code where something of interest occurs in the DB Engine

## ■ Actions

- Perform a specific task when its event fires
  - Collect additional information
  - Perform a task inside the engine

## ■ Predicates

- Used to filter, defined on individual events and control when the event actually fires
- Support short-circuit evaluation

## ■ Targets

- Event consumers
  - Synchronous vs. asynchronous
  - Basic vs. aggregate



# Targets

- **Synchronous**

- Events are buffered by the thread that's executing

- **Asynchronous**

- Events are dispatched by Extended Engine dispatchers when:
    - the buffers fill up, or
    - the maximum duration for dispatch, which is defined for the session, is exceeded for the event

# Targets<sub>(2)</sub>

## ■ ring\_buffer

- Collects raw data in memory
- Events are collected in a First In First Out (FIFO) order
- Data is in binary format but then materialized as XML when the target is queried via the sys.dm\_xe\_session\_targets DMV
  - DMV limitations may result in unreadable XML from sys.dm\_xe\_session\_targets
  - If viewed in the UI, the XML is shown, not the processed events
- Data is “lost” when event session is stopped
  - Retained if events are just removed

## ■ event\_file

- Collects raw data in a file
- Data persists after event session is stopped
  - Files can be shared, useful for long-term and/or detailed analysis
- Two files in 2008/2008R2; only one file in 2012 and higher
  - Can view the 2008/2008R2 files in the 2012+ UI

# Targets<sub>(3)</sub>

- **event\_counter**

- Aggregates data based on event
- Good for testing to confirm event session set up correctly, the right predicate is being used, etc.
- This target is synchronous

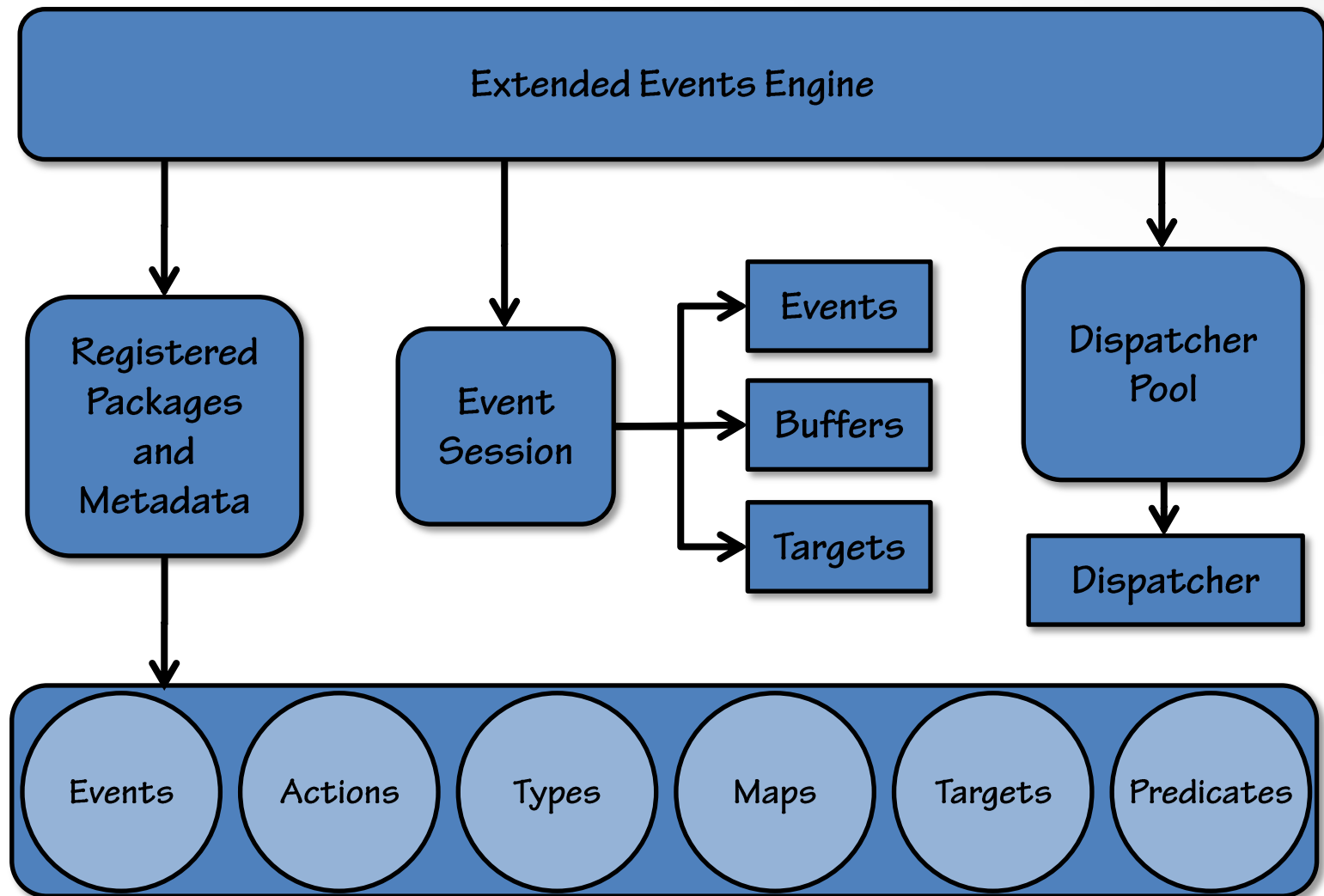
- **histogram**

- Aggregate data based on defined “bucket”
- e.g. database\_id, object\_id
- Good starting point for troubleshooting – perform initial analysis of data

- **pair\_matching**

- Match events based on specific criteria, leaves you with events that do not match
- Carefully consider the match criteria; you must have a 1:1 correlation for the begin\_event and end\_event or you will not get the right data

# Extended Events Architecture



# Templates

- **Templates are an easy way to automate set up of an Extended Events session**
- **Export an existing session to create a template**
- **User templates default to:**  
    %USERPROFILE%\Documents\SQL Server Management Studio\Templates\XEventTemplates
- **Default templates exist in:**  
    C:\Program Files (x86)\Microsoft SQL Server\110\Tools\Templates\sql\xevent
- **Edit the .xml file to add a custom category, the template name, and the description**

# Resources

- **Pluralsight Course**

- SQL Server: Introduction to Extended Events, Jonathan Kehayias
  - <http://bit.ly/1uhYXv4>

- **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](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/>

# Thank you!

