Module 9

Extended Events

Module overview

- Extended Events concepts
- Working with Extended Events

- Extended Events, SQL Trace, and SQL Server Profiler
- Packages
- Events
- Predicates
- Actions
- Targets
- Sessions
- Types and Maps

Extended Events, SQL Trace, and SQL Server Profiler

- SQL Trace and Profiler are tools for collecting information about activity on a SQL Server instance
- Extended Events is the successor to SQL Trace
  - SQL Trace and Profiler has been deprecated since SQL Server 2012
  - Extended Events is richer and more powerful SQL Trace
    - But also slightly more complex

SQL SERVER – SQL Profiler vs Extended Events
https://blog.sqlauthority.com/2016/06/22/sql-server-sql-profiler-vs-extended-events/

Extended Events vs SQL Trace
http://andreas-wolter.com/en/extended-events-vs-sql-trace/

Quickstart: Extended events in SQL Server
https://docs.microsoft.com/en-us/sql/relational-databases/extended-events/quick-start-extended-events-in-sql-server

Extended events overview
https://docs.microsoft.com/en-us/sql/relational-databases/extended-events/extended-events

Packages

- Executables and executable modules expose Extended Events packages
- A package is a container for other object types:
  - Events
  - Predicates
  - Actions
  - Targets
  - Maps
  - Types

SQL Server Extended Events Packages
https://docs.microsoft.com/en-us/sql/relational-databases/extended-events/sql-server-extended-events-packages

Events

- Events are logging points in executable code
  - When an event fires, it indicates that the associated code has been executed
  - Returns data in a fixed schema
  - Events are compatible with Event Tracing for Windows

Predicates

- Allow the construction of rules to filter event capture
  - Made up of two subcategories:
    - Comparisons—logical operators (=, <, > and so on)
    - Sources—values that might be used as inputs to comparisons
  - Complex predicates might be constructed; every *n* events, or every *n* seconds

Predicate Order Matters in Extended Events
https://sqlperformance.com/2014/06/extended-events/predicate-order-matters

Actions

- Actions provide supplementary information about an event
  - Each event might be linked to one or more actions
  - Actions are triggered synchronously after an associated event has fired

Actions In Extended Events
https://www.sqlservercentral.com/blogs/actions-in-extended-events

- Targets collect data from Extended Events sessions
  - A session may write to multiple targets
  - Commonly used targets are
    - Event counter
    - Event file
    - Histogram
    - Ring buffer
      - There's no GUI to "decode" the XML for this in SSMS
      - Avoid this unless you want to parse this your self, using T-SQL for example

Targets for Extended Events in SQL Server
https://docs.microsoft.com/en-us/sql/relational-databases/extended-events/targets-for-extended-events-in-sql-server

Sessions

- A session links events to targets
  - Events may include actions
  - Events may be filtered with predicates
  - Sessions are isolated from one another
  - A session has a state (started or stopped)
  - A session has a buffer to hold event data as it is captured

SQL Server Extended Events Sessions
https://docs.microsoft.com/en-us/sql/relational-databases/extended-events/sql-server-extended-events-sessions

Types and Maps

- Types
  - Data type definitions for Extended Events data
- Maps
  - Lookup tables to convert integer values to text values

Lesson: Working with Extended Events

- Configuring sessions
- The system_health session
- Best practices

Configuring sessions

- Session configuration options:
  - MAX_MEMORY
  - EVENT_RETENTION_MODE
  - MAX_DISPATCH_LATENCY
  - MAX_EVENT_SIZE
  - MEMORY_PARTITION_MODE
  - STARTUP_STATE
  - TRACK_CAUSALITY

CREATE EVENT SESSION (Transact-SQL)
https://docs.microsoft.com/en-us/sql/t-sql/statements/create-event-session-transact-sql

Tips for getting started with Extended Events
http://sqlblog.karaszi.com/tips-for-getting-started-with-extended-events/

The system_health session

- Created by default on all database engines
  - Starts at instance startup
  - Captures events useful for troubleshooting
  - Ring buffer and file targets

Using sp_HumanEvents

- A more user-friendly way to run a focused XE session for a while
  - And then look at the output
- Get information about things such as
  - Blocking
  - Query performance
  - Compiles
  - Recompiles
  - Wait stats

sp_HumanEvents
https://www.erikdarlingdata.com/sp_humanevents/

sp_HumanEvents: Usage and Guidelines
https://www.erikdarlingdata.com/sp_humanevents-usage-and-guidelines/

List of blog posts, including some that give tips on using sp_HumanEvents for various purposes
https://www.brentozar.com/archive/2022/10/erik-darlings-month-of-free-tools-training/

Best practices

- Run Extended Events sessions only when you need them
- Use the SSMS GUI to browse available events
- Understand the limitations of the ring buffer target
  - No GUI
  - Limited to 4 MB when you view the data
- Consider the performance impact of collecting query execution plans
- Understand the deadlock graph format

New XE events in SQL Server 2022

- There are 500 new XE events in 2022
- Here are some that might be especially interesting from performance viewpoint
  - query_abort
  - query_antipattern
  - plan_not_cached
  - meta_data_changed
  - spills_to_tempdb
  - parameter_sensitive_plan_optimization_skipped_reason

Lab 9: Extended Events

- Ex 1: Capturing SQL commands from an application
- Ex 2: Capturing strange events

Estimated Time: 40 minutes