

Introduction to Extended Events

Kathi Kellenberger



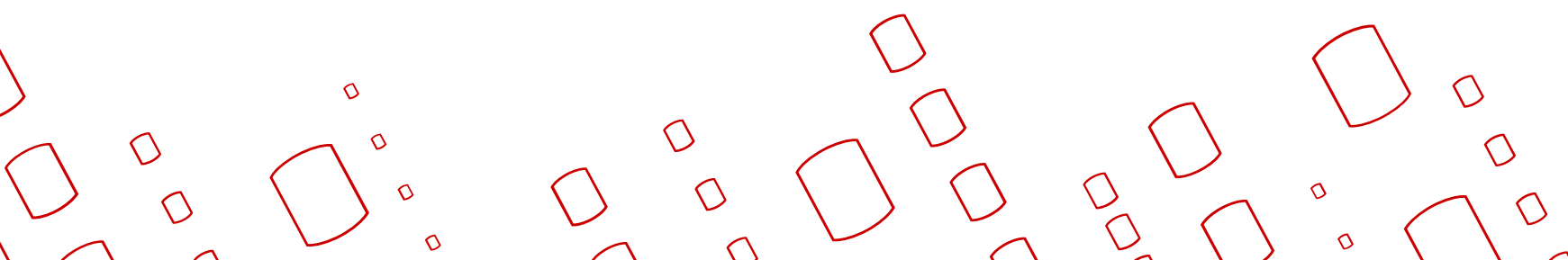
Kathi Kellenberger

Simple Talk Editor and DevOps Advocate

Microsoft Data Platform MVP



@aunkathi



What are Extended Events?

Used to capture “things that happen” on the server

Data returned in XML

Easy to use interface in SSMS

Create – ALTER EVENT SESSION

Query – VIEW SERVER STATE

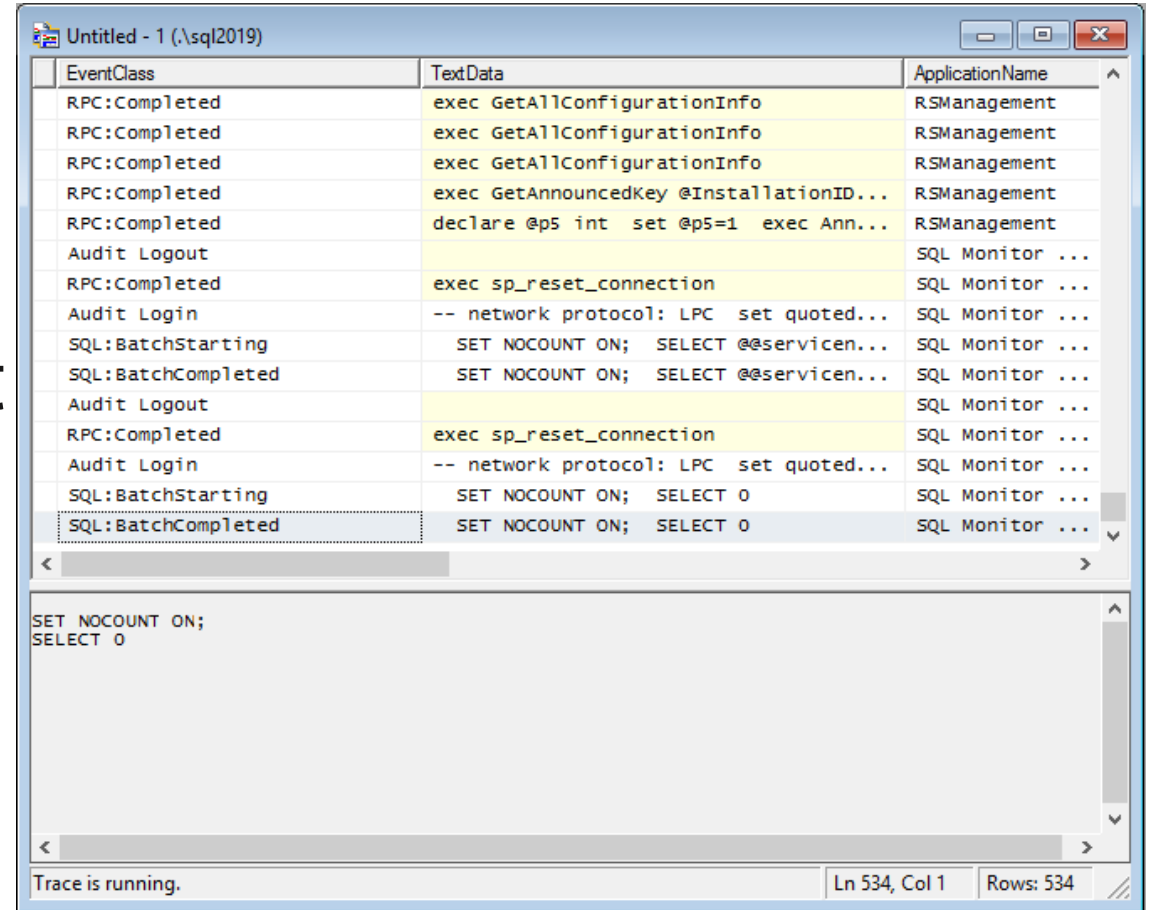
.sql2019 - Configur...Changed: event_file X .sql2019 - Configur...hanged: ring_buffer SQLQuery3.sql - (I...N2016\redgate			
Displaying 6 Events			
	name	timestamp	message
▶	error_reported	2020-07-08 16:55:12.6636683	Configuration option 'max server memory (MB)' changed from 12000 to ...
	error_reported	2020-07-08 16:55:12.8014953	Configuration option 'cost threshold for parallelism' changed from 5 to 5...
	error_reported	2020-07-08 16:55:12.8088398	Configuration option 'max degree of parallelism' changed from 1 to 1. R...
	error_reported	2020-07-08 16:55:12.8965766	Configuration option 'cost threshold for parallelism' changed from 5 to 3...
	error_reported	2020-07-08 16:55:12.9007259	Configuration option 'max degree of parallelism' changed from 1 to 5. R...
	error_reported	2020-07-08 16:55:12.9045368	Configuration option 'max server memory (MB)' changed from 6000 to 1...

What about Profiler?

Light-weight replacement for Profiler/Trace introduced in 2008

Profiler/Trace deprecated but still available

No updates to Profiler/Trace for new features



EventClass	TextData	ApplicationName
RPC:Completed	exec GetAllConfigurationInfo	RSMangement
RPC:Completed	exec GetAllConfigurationInfo	RSMangement
RPC:Completed	exec GetAllConfigurationInfo	RSMangement
RPC:Completed	exec GetAnnouncedKey @InstallationID...	RSMangement
RPC:Completed	declare @p5 int set @p5=1 exec Ann...	RSMangement
Audit Logout		SQL Monitor ...
RPC:Completed	exec sp_reset_connection	SQL Monitor ...
Audit Login	-- network protocol: LPC set quoted...	SQL Monitor ...
SQL:BatchStarting	SET NOCOUNT ON; SELECT @@servicen...	SQL Monitor ...
SQL:BatchCompleted	SET NOCOUNT ON; SELECT @@servicen...	SQL Monitor ...
Audit Logout		SQL Monitor ...
RPC:Completed	exec sp_reset_connection	SQL Monitor ...
Audit Login	-- network protocol: LPC set quoted...	SQL Monitor ...
SQL:BatchStarting	SET NOCOUNT ON; SELECT 0	SQL Monitor ...
SQL:BatchCompleted	SET NOCOUNT ON; SELECT 0	SQL Monitor ...

SET NOCOUNT ON;
SELECT 0

Trace is running. Ln 534, Col 1 Rows: 534

DEMO 1: See an XEvent

How to create a session?

New Session

Ready

Select a page

- General
- Events
- Data Storage
- Advanced

Connection

localhost\sql2019
[RED-GATE\Kathi.Kellenberger]

[View connection properties](#)

Progress

Ready

Script | Help

Session name: tempdbGrowth

Template: <Blank>

Schedule:

- ☒ Start the event session at server startup.
- ☒ Start the event session immediately after session creation.
- ☐ Watch live data on screen as it is captured.

Causality tracking:

- ☐ Track how events are related to one another.

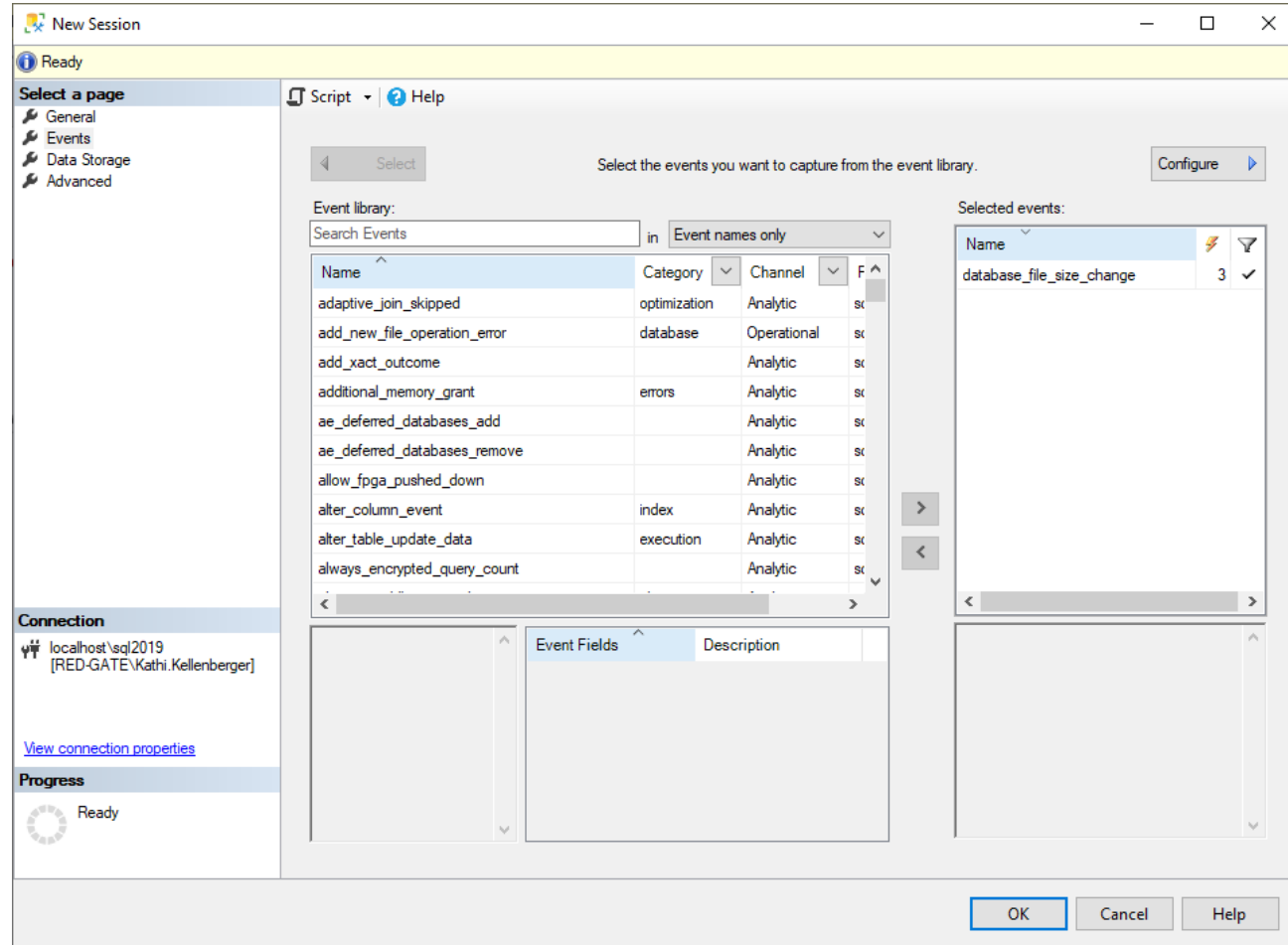
OK Cancel Help

How to create a session?

```
CREATE EVENT SESSION [FileSizeChange] ON SERVER
ADD EVENT sqlserver.database_file_size_change(
    ACTION(sqlserver.client_hostname))
ADD TARGET package0.ring_buffer
WITH (MAX_MEMORY=4096 KB,EVENT_RETENTION_MODE=ALLOW_SINGLE_EVENT_LOSS,
    MAX_DISPATCH_LATENCY=30 SECONDS,MAX_EVENT_SIZE=0 KB,
    MEMORY_PARTITION_MODE=NONE,TRACK_CAUSALITY=OFF,STARTUP_STATE=OFF)
GO
```

What's needed?

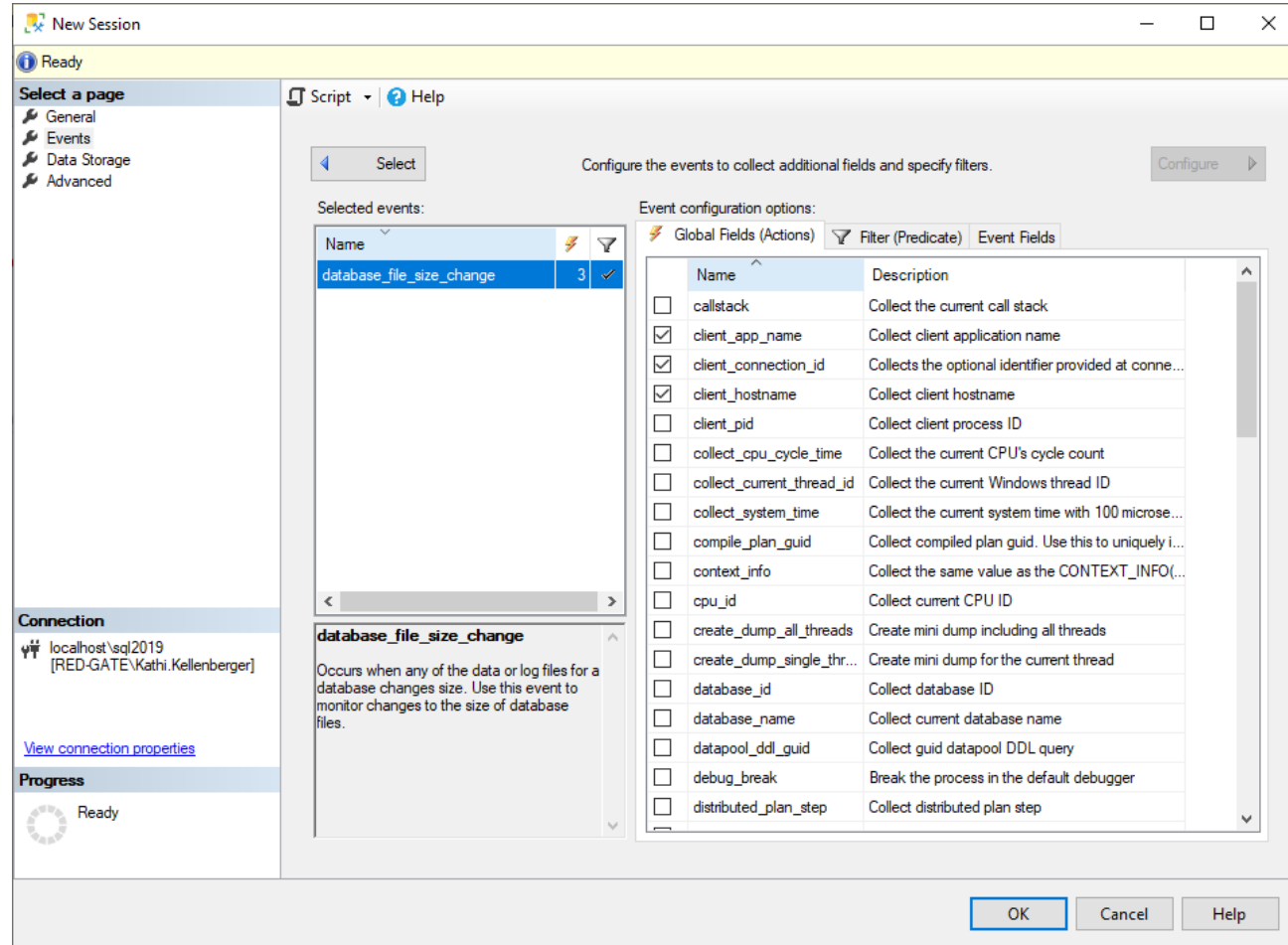
Events



What's needed?

Events

Actions (optional)

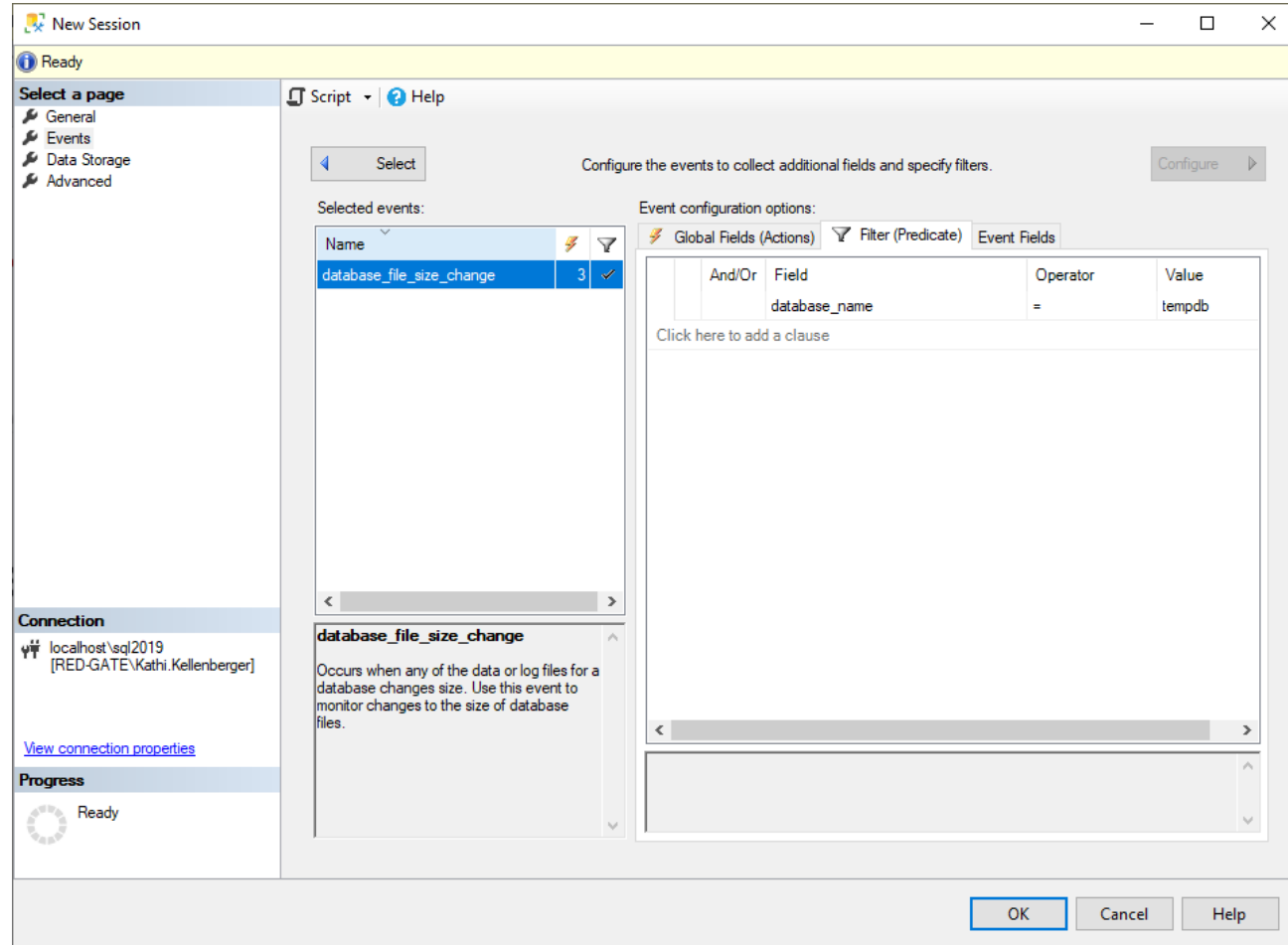


What's needed?

Events

Actions (optional)

Filter (optional)



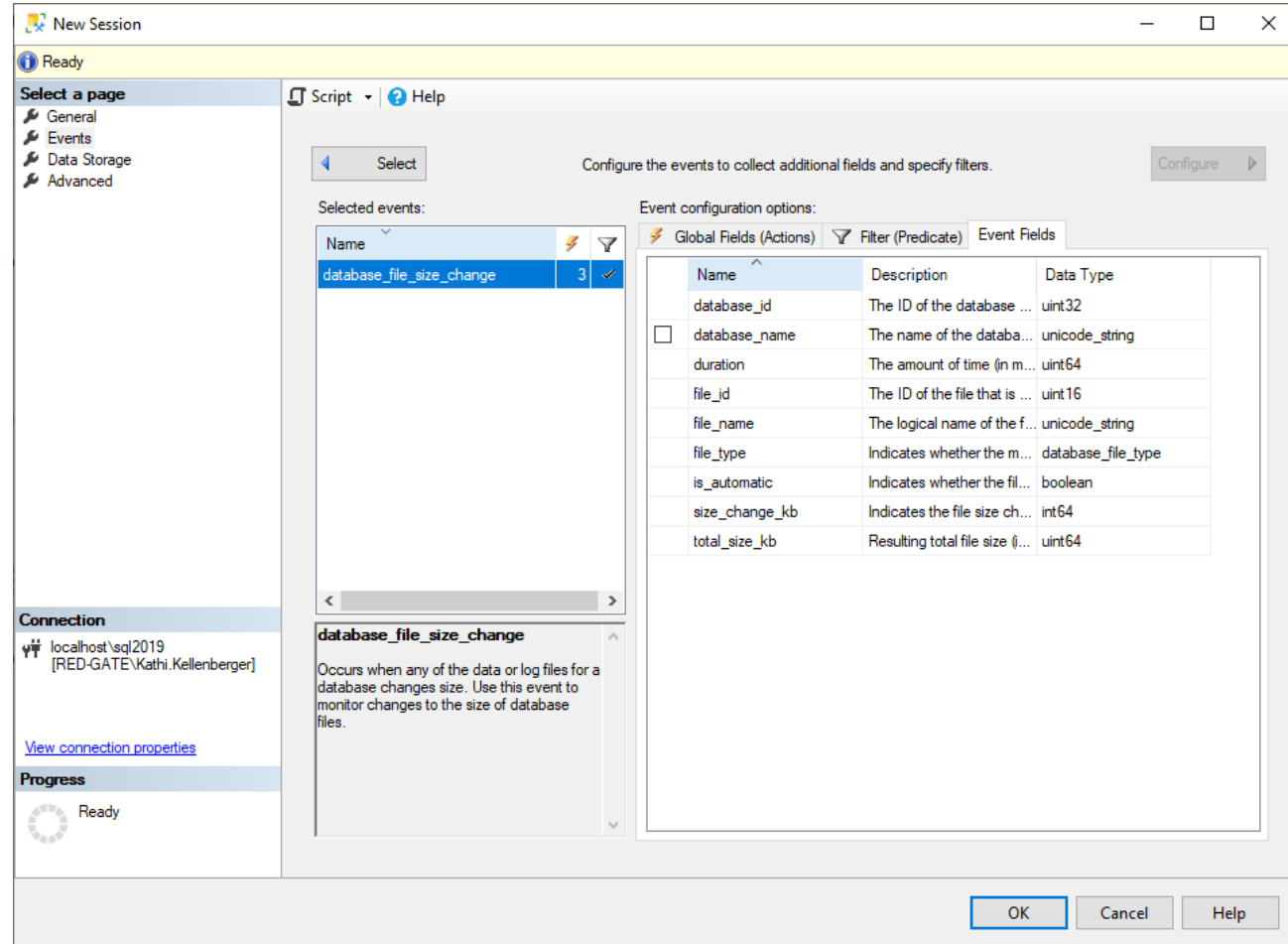
What's needed?

Events

Actions (optional)

Filter (optional)

Event Fields



What's needed?

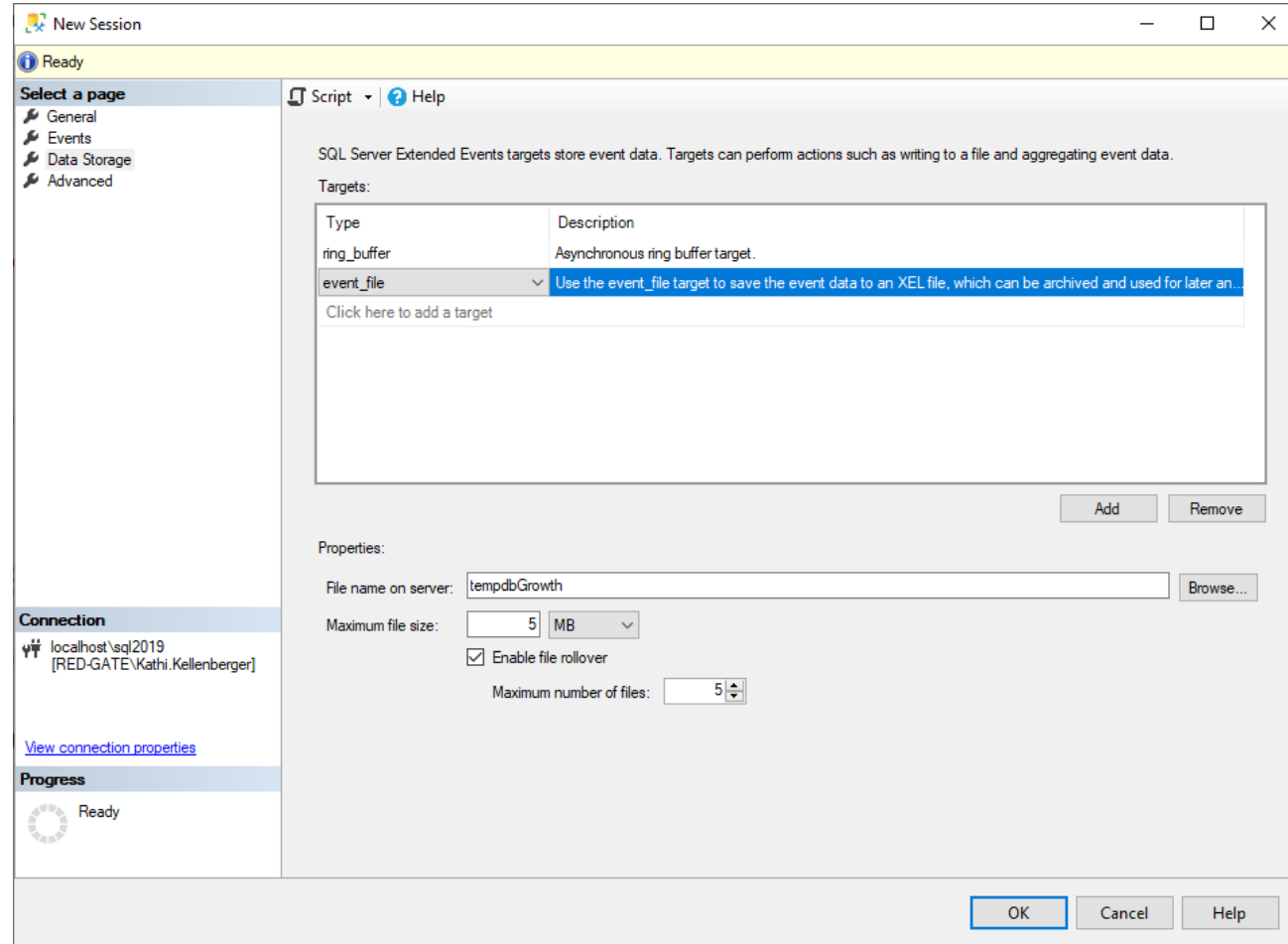
Events

Actions (optional)

Filter (optional)

Event Fields

Target

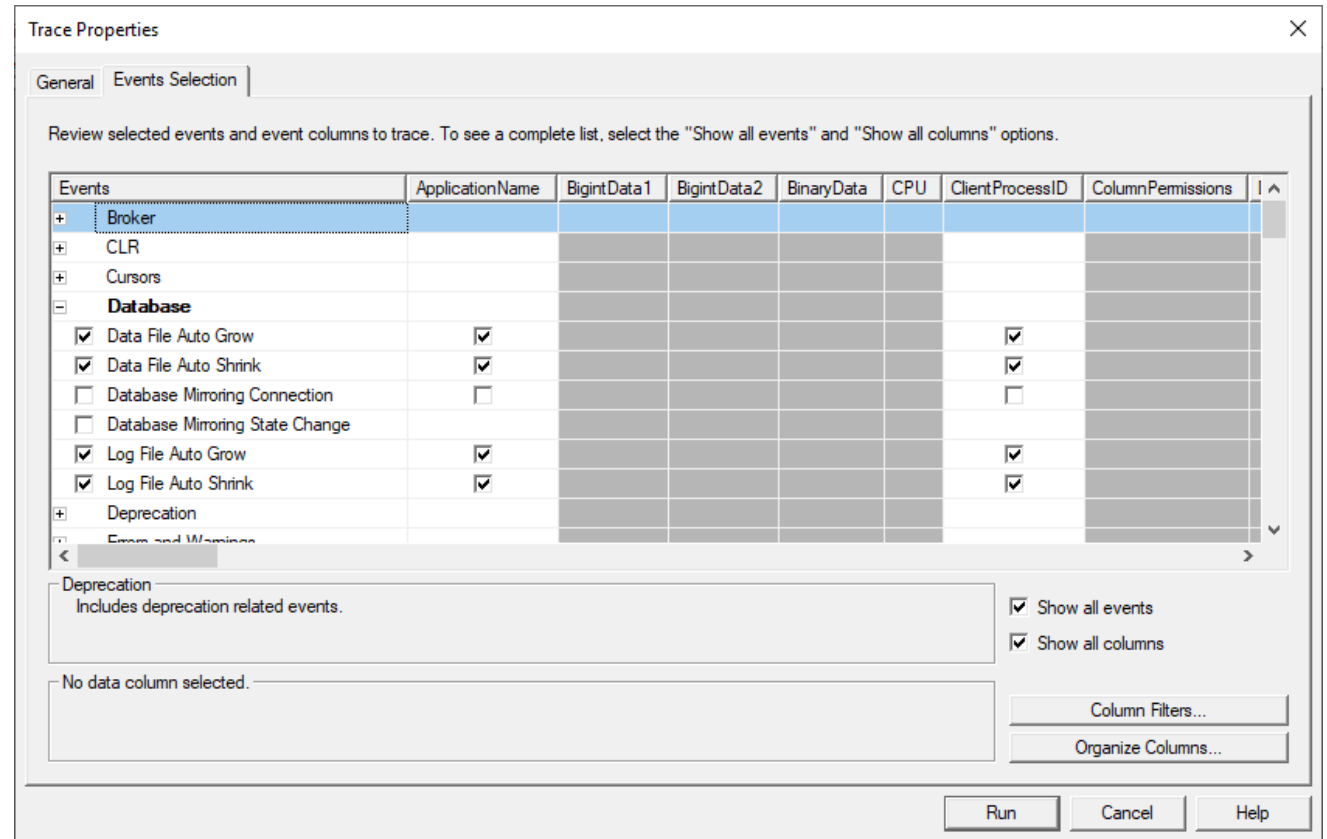


DEMO 2: Create an XEvent

What about all my Profiler Traces?

Use DMVs to map to
events and actions

Find and research filters



DEMO 3: Map an XEvent

What if I want to capture the event somehow?

Query the XML

Set up an Agent job

OR capture with a
monitoring tool

The screenshot shows the 'New Job' dialog box in SQL Server Enterprise Manager. The window has a title bar 'New Job' and standard minimize, maximize, and close buttons. On the left, there is a 'Select a page' sidebar with options: General (selected), Steps, Schedules, Alerts, Notifications, and Targets. Below this sidebar, there are sections for 'Connection' and 'Progress'. The 'Connection' section shows 'Server: localhost\sql2019' and 'Connection: RED-GATE\Kathi.Kellenberger', with a link to 'View connection properties'. The 'Progress' section shows a circular progress indicator and the word 'Ready'. The main area of the dialog is divided into two panes. The top pane has a 'Script' dropdown and a 'Help' icon. It contains fields for 'Name' (set to 'Notify when tempdb grows'), 'Owner' (set to 'sa'), and 'Category' (set to 'Uncategorized (Local)'). There is a large empty text area for 'Description'. Below these fields is a checkbox labeled 'Enabled' which is checked. The bottom pane contains 'OK' and 'Cancel' buttons.

DEMO 4: Respond to an XEvent

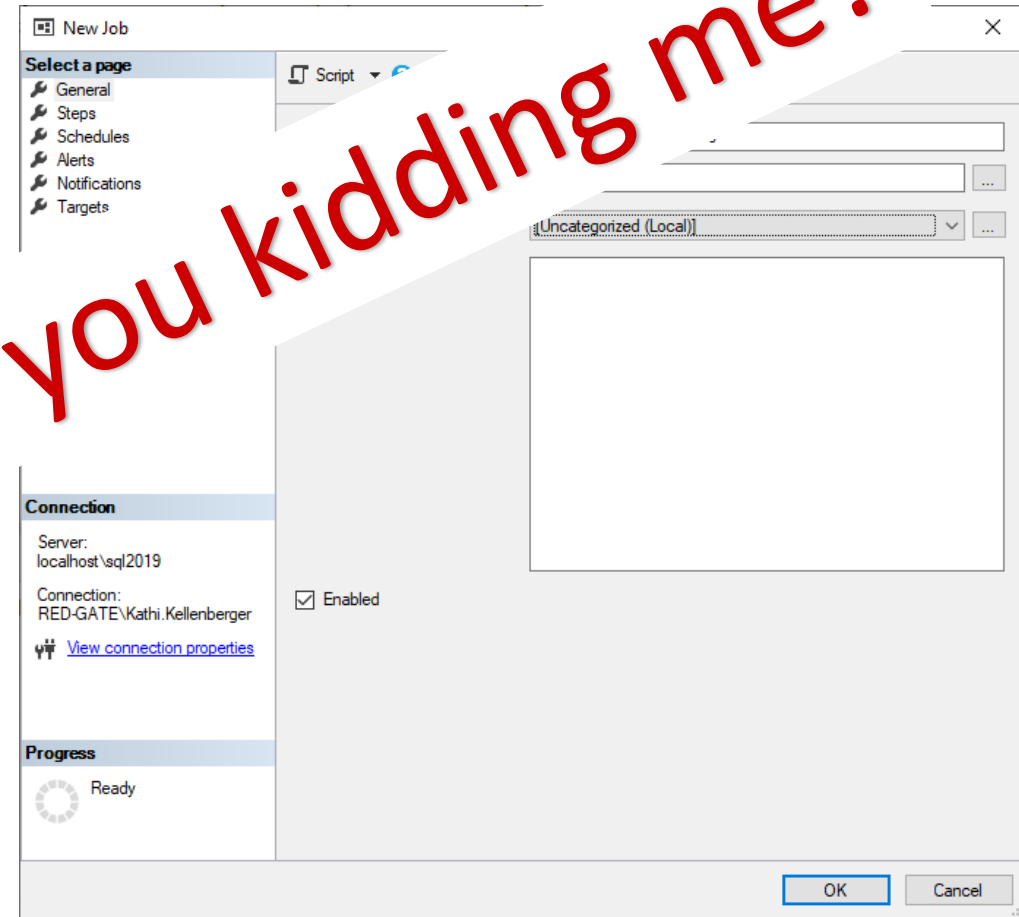
What if I want to capture the event somehow?

Query the XML

Set up an Agent job

OR capture with a
monitoring tool

Query XML? Are you kidding me?



```
<RingBufferTarget truncated="0" processingTime="0" totalEventsProcessed="2" eventCount="2" droppedCount="0" memoryUsed="296">
  <event name="database_file_s" package="sqlserver" timestamp="2020-06-26T15:2">...</event>
  <event name="database_file_s" package="sqlserver" timestamp="2020-06-26T15:2">...</event>
</RingBufferTarget>
```

`nodes('//RingBufferTarget/event')`

	EventData
1	<u><event name="database file size change" package...</u>
2	<u><event name="database file size change" package...</u>

```
<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>
```

```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

Elements

```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

Attributes

```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

Array of default data elements

```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

Array of global action elements


```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_id">...</data>
  <data name="file_type">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

value('(@timestamp)[1]', 'datetime2')

```

<event name="database_file_size_change" package="sqlserver" timestamp="2020-06-26T15:24:30.551Z">
  <data name="duration">
    <type name="uint64" package="package0" />
    <value>1000</value>
  </data>
  <data name="database_id">
    <type name="uint32" package="package0" />
    <value>6</value>
  </data>
  <data name="file_name">...</data>
  <data name="file_type_desc">...</data>
  <data name="is_automatic">...</data>
  <data name="total_size_kb">...</data>
  <data name="size_change_kb">...</data>
  <data name="file_name">...</data>
  <data name="database_name">...</data>
  <action name="client_hostname" package="sqlserver">
    <type name="unicode_string" package="package0" />
    <value>KATHIK</value>
  </action>
</event>

```

value('(data[@name="database_id"])[1]', 'int')

DEMO 5: Query an XEvent

Bonus: Parameters of Stored Procedures

<https://www.scarydba.com/2018/09/24/extended-events-and-stored-procedure-parameter-values/>

	name	timestamp	statement
[-]	name: module_end (167)		
	module_end	2020-07-28 13:09:32.4206618	[dbo].[usp_SalesInfoByProduct] 717
	module_end	2020-07-28 13:09:44.8118676	[dbo].[usp_SalesInfoByProduct] 717
	module_end	2020-07-28 13:36:33.3692446	
	module_end	2020-07-28 14:06:33.6050782	

Bonus: Causality Tracking

<https://www.scarydba.com/2020/01/13/causality-tracking-in-extended-events/>

You have to pull down the bottom of the dialog to see this!

Causality tracking:



Track how events are related to one another.