

What's covered here?

- Monitoring Implementation
- Monitoring Tools

Operating System Monitoring Tool

- Performance Monitor (Windows Server)
 - CPU, Memory, IO (mainly disk I/O)
 - Counters

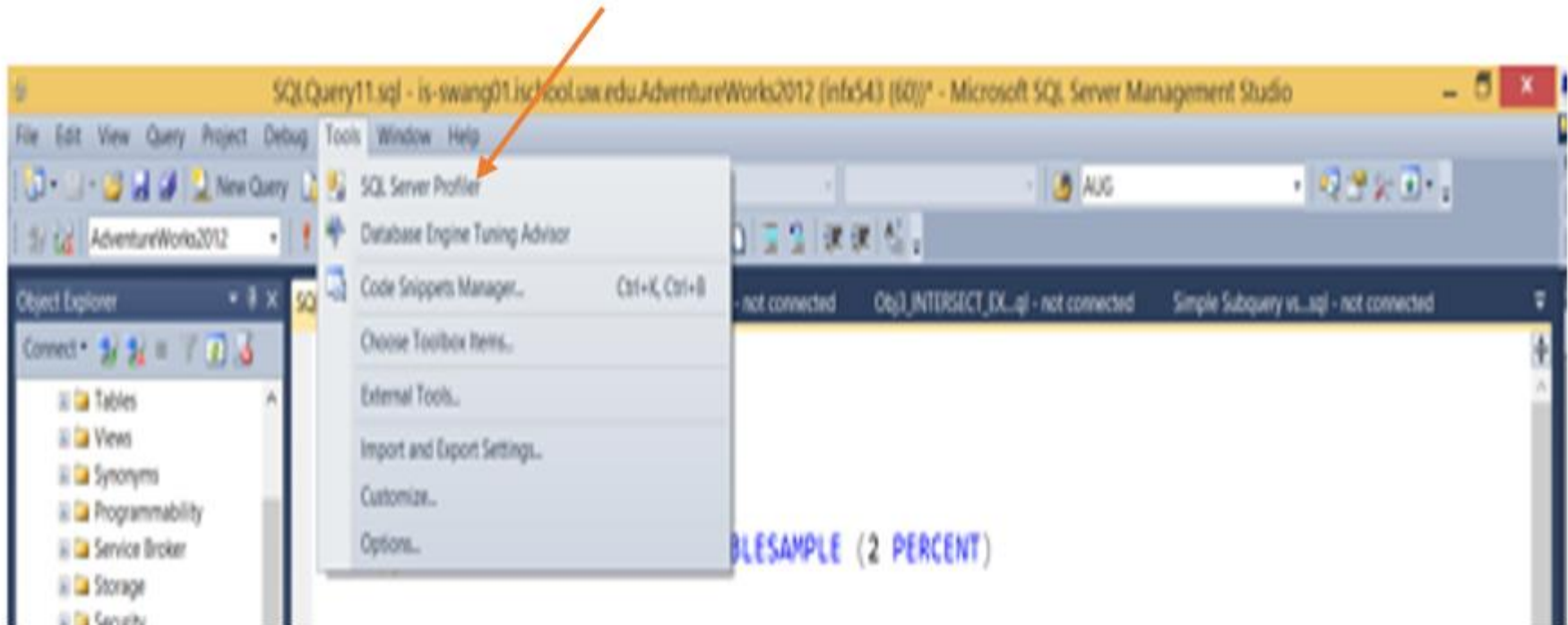
SQL Server Monitoring Tool

- SQL Profiler
 - Graphical Application
 - Capture SQL Server events
 - Captured events can be replayed

SQL Server Monitoring Tool

- SQL Profiler
 - Capture events for investigating slow-running queries
 - RPC:Starting
 - **RPC:Completed**
 - SP:StmtStarting
 - **SP:StmtCompleted**
 - **SQL:BatchStarting**
 - **SQL:BatchCompleted**

SQL Profiler



SQL Server Monitoring Tool

- SQL Server Extended Events (XEEvents)
 - Deep insight into SQL Server internals
 - Respond synchronously or asynchronously to SQL events
 - Light weight and scalable
 - Will replace SQL Server profiler

Extended Events Examples – Select Events

Select the events you want to capture from the event library.

Event library:

Search Events in Event names only

Name ▲	Category ▼	Channel ▼
additional_memory_grant	errors	Analytic
alter_table_update_data	execution	Analytic
alwayson_ddl_executed	alwayson	Analytic
assembly_load	dr	Operational
attention	errors	Analytic
auto_stats	execution	Operational
availability_group_lease_expired	alwayson	Operational
availability_replica_automatic_failover_validation	alwayson	Analytic
availability_replica_manager_state_change	alwayson	Operational
availability_replica_state_change	alwayson	Operational
background_job_error	errors	Operational

additional_memory_grant

Occurs when a query tries to get more memory grant during execution. Failure to get this additional memory grant may cause the query slowdown.

Event Fields ▲	Description
granted_memory_kb	The actual granted me...
requested_memory_kb	The size of requested ...
resource_pool_id	ID of resource pool w...

Selected events:

Name ▲	Count
dr_allocation_failure	2
dr_virtual_alloc_failure	2
connectivity_ring_buffer_recorded	0
error_reported	5
memory_broker_ring_buffer_rec...	0
memory_node_oom_ring_buffer_...	4
scheduler_monitor_deadlock_ring...	0
scheduler_monitor_non_yielding_...	0
scheduler_monitor_non_yielding_...	0
scheduler_monitor_non_yielding_...	0
scheduler_monitor_stalled_dispat...	0
scheduler_monitor_system_health...	0

error_reported

Occurs when an error is reported.

Extended Events Examples – Configure Events

Select

Configure the events to collect additional fields and specify filters.

Configure

Selected events:

Name	Count	Details
_allocation_failure	2	
_virtual_alloc_failure	2	
connectivity_ring_buffer_recorded	0	
error_reported	5	
memory_broker_ring_buffer_rec...	0	
memory_node_oom_ring_buffer_...	4	
scheduler_monitor_deadlock_ring...	0	
scheduler_monitor_non_yielding_...	0	
scheduler_monitor_non_yielding_...	0	
scheduler_monitor_non_yielding_...	0	
scheduler_monitor_stalled_dispat...	0	
scheduler_monitor_system_healt...	0	

Event configuration options:

Global Fields (Actions) | Filter (Predicate) | Event Fields

Name	Description
<input checked="" type="checkbox"/> callstack	Collect the current call stack
<input type="checkbox"/> client_app_n...	Collect client application name
<input type="checkbox"/> client_conne...	Collects the optional identifier provided at con...
<input type="checkbox"/> client_hostn...	Collect client hostname
<input type="checkbox"/> client_pid	Collect client process ID
<input type="checkbox"/> collect_cpu_...	Collect the current CPU's cycle count
<input type="checkbox"/> collect_curre...	Collect the current Windows thread ID
<input type="checkbox"/> collect_syste...	Collect the current system time with 100 micro...
<input type="checkbox"/> context_info	Collect the same value as the CONTEXT_INFO...
<input type="checkbox"/> cpu_id	Collect current CPU ID
<input type="checkbox"/> create_dump...	Create mini dump including all threads
<input type="checkbox"/> create_dump...	Create mini dump for the current thread
<input checked="" type="checkbox"/> database_id	Collect database ID
<input type="checkbox"/> database_na...	Collect current database name
<input type="checkbox"/> debug_break	Break the process in the default debugger
<input type="checkbox"/> event_seque...	Collect event sequence number
<input type="checkbox"/> is_system	Collect whether current session is system
<input type="checkbox"/> last_error	Collects the value of the thread's last Window...
<input type="checkbox"/> nt_username	Collect NT username
<input type="checkbox"/> numa_node_id	Collect current NUMA node ID

error_reported

Occurs when an error is reported.

Extended Events Examples – Watch Live Data

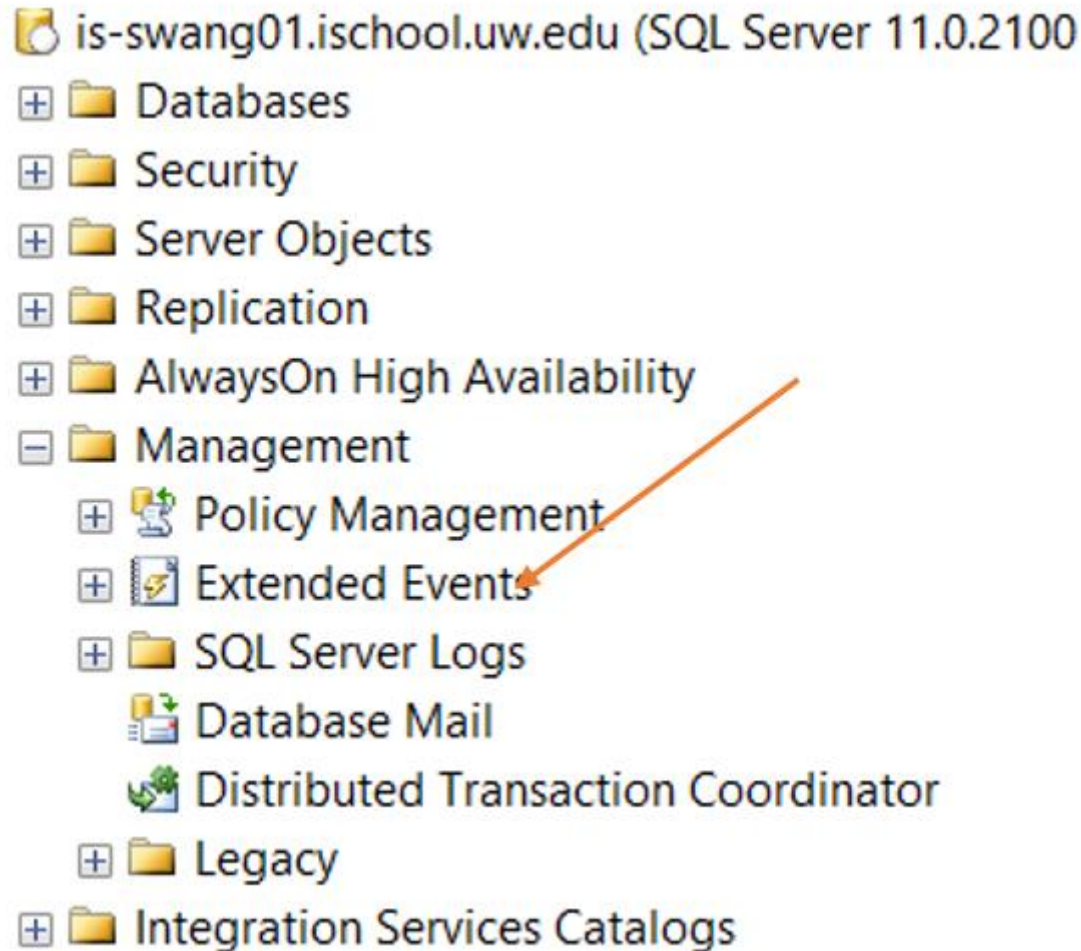
	name	timestamp
	sql_batch_completed	2012-03-14 09:38:13.7764143
	error_reported	2012-03-14 09:38:13.7864149
	sql_batch_completed	2012-03-14 09:38:13.7864149
	sql_batch_completed	2012-03-14 09:38:13.7954154
	error_reported	2012-03-14 09:38:13.8064160
	sql_batch_completed	2012-03-14 09:38:13.8064160
	sql_batch_completed	2012-03-14 09:38:13.8204168
	sql_batch_completed	2012-03-14 09:38:17.3098772
	sql_batch_completed	2012-03-14 09:38:20.5690636
▶	sql_batch_completed	2012-03-14 09:38:26.3847846

Event: sql_batch_completed (2012-03-14 09:38:26.3847846)

Details

Field	Value
attach_activity_id.g...	282BDCA5-7ECC-4966-9E49-F2FEA40B15CA
attach_activity_id.s...	1
attach_activity_id_...	1F332795-2C76-4A33-B6AF-FCA277A30DA8
attach_activity_id_...	0
batch_text	SELECT * FROM dbo.X WHERE X.id = 2;
client_app_name	Microsoft SQL Server Management Studio - Query
cpu_time	0
database_id	5
duration	3000

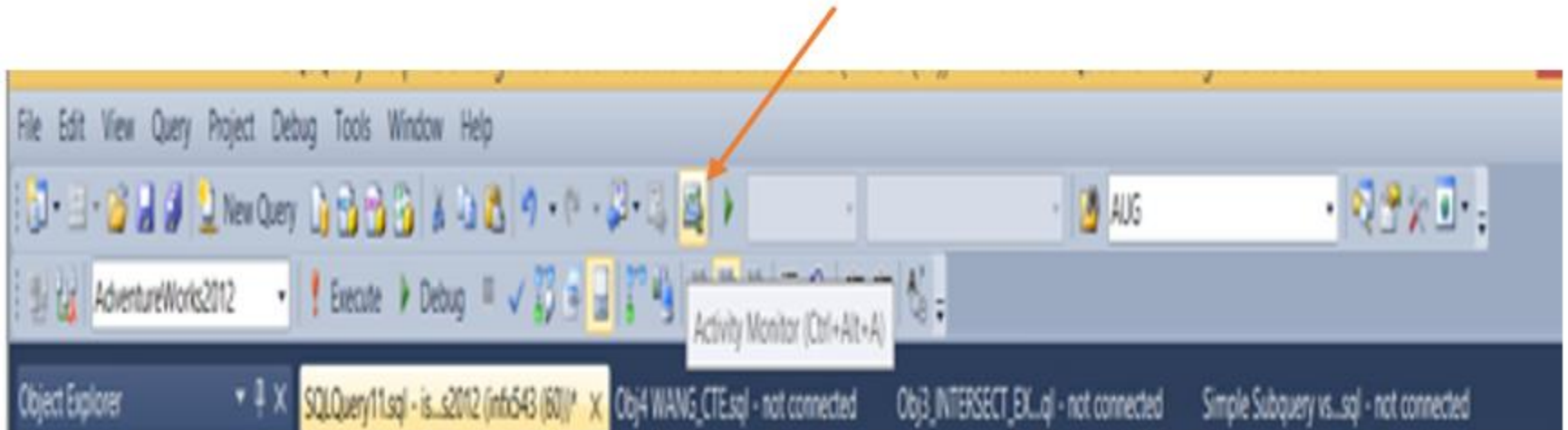
Extended Events



SQL Server Monitoring Tool

- Activity Monitor
 - Graphically displays:
 - Processes running on an instance of SQL Server
 - Resource Waits
 - Data File I/O activity
 - Recent Expensive Queries

Activity Monitor



SQL Server Monitoring Tool

- SQL Commands

```
1
2 SELECT COUNT_BIG(1)
3 FROM [dbo].[CIUserBase]
```

100 %

Results Messages

	(No column name)
1	4085192912

```
1
2 SELECT COUNT(1)
3 FROM [dbo].[CIUserBase]
```

100 %

Results Messages

Msg 8115, Level 16, State 2, Line 2
Arithmetic overflow error converting expression to data type int.

SQL Server Monitoring Tool

- Dynamic Management Views (DMV's) and Dynamic Management Functions (DMF's)
 - Return real-time SQL Server state info
 - Ad hoc monitoring
 - Can be used in code and allow action to be taken in response to an issue
 - May need more skills to use them effectively

SQL Server Monitoring Tool

- Dynamic Management Views (DMV's) and Dynamic Management Functions (DMF's) Example

SELECT

**t1.resource_type,
t1.resource_database_id,
t1.resource_associated_entity_id,
t1.request_mode,
t1.request_session_id,
t2.blocking_session_id**

FROM sys.dm_tran_locks as t1

INNER JOIN sys.dm_os_waiting_tasks as t2

ON t1.request_session_id = t2.session_id;

SQL Server Monitoring Tool

- Information Schema
 - Industry-standard Interface for Accessing RDBMS Metadata
 - Read-only Views
 - Introduced in SQL-92
 - Information_schema.tables is based on sys.objects

Database Console Commands (DBCC)

- Runs the checks against database snapshot
- When executing against online database and snapshot cannot be used, uses table-locking

Database Console Commands (DBCC)

- DBCC memorystatus
- DBCC opentran
- DBCC showcontig

SQL Server Monitoring Tool

- Standard Reports
 - Display data gathered by some DMV's, Extended Events, and default Trace

SQL Server Monitoring Tool

- Standard Reports

Disk Usage

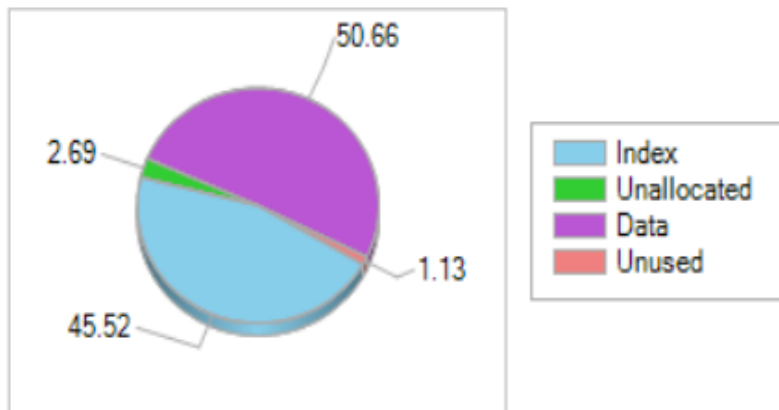
[AdventureWorks2012]



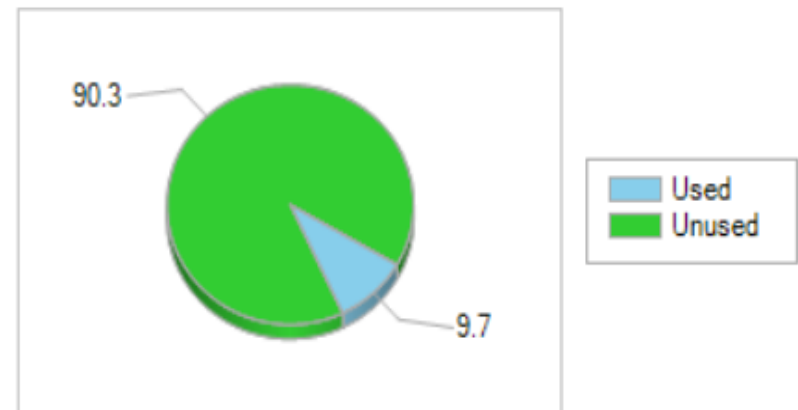
This report provides overview of the utilization of disk space within the Database.

Total Space Usage:	220.69 MB
Data Files Space Usage:	189.00 MB
Transaction Log Space Usage:	31.69 MB

Data Files Space Usage (%)



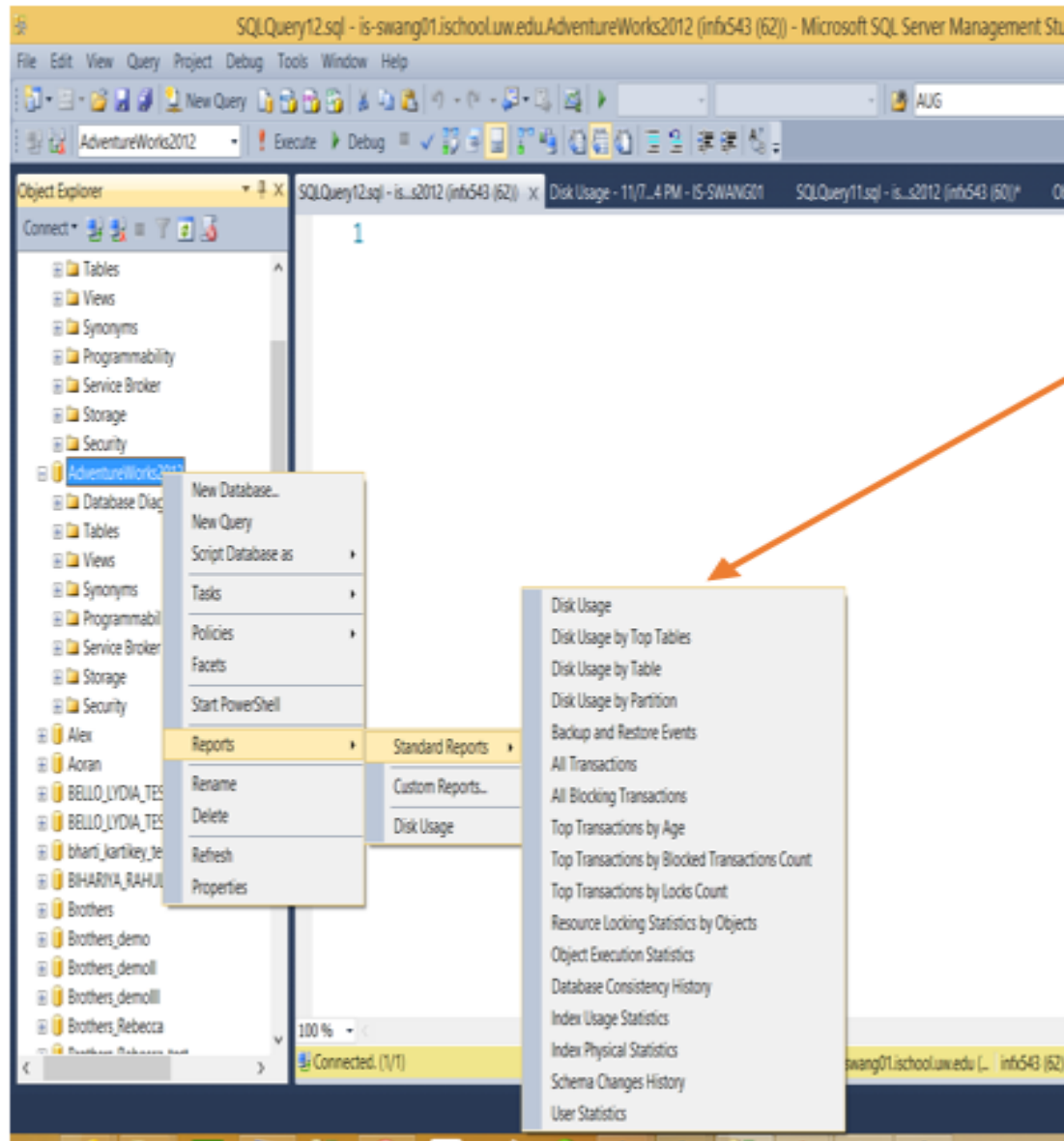
Transaction Log Space Usage (%)



No entry found for autogrow/autoshrink event for AdventureWorks2012 database in the trace log.

☒ Disk Space Used by Data Files

Standard Reports



SQL Server Monitoring Tool

- Other Useful Tools
 - System Stored Procedures (sp_who2)
 - SQL Server Best Practice Analyzer
 - SQL Server Management Pack (SCOM)

3rd Party Monitoring Tool

- Spotlight on SQL Server Enterprise (Quest Software)
 - SQL Server infrastructure health at a glance
 - Monitor SQL Server's relational engine, Analysis Services, Windows, VMware ESX and SQL Azure from a single console
 - Customize built-in metrics and alarms
 - Automate performance metric analysis
 - Resolve issues quickly, including long-running processes, blocking locks, deadlocking and more