# Resources Governor Explained

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# Session Objectives And Agenda

- What Resource Governor is
  - Scenarios covered
  - Limitations in scope and scenarios
- Concepts and details
- CPU Demo
- Feedback, Q&A

# Why Resource Governor

- You want to control resources usage
- Prevent a single application from overrunning the system
  - Control the apps regardless off their code
- Balance resources usage/workload among applications
  - Allocate more or less resources to specific application

# Life without Resources Governor

- Kill runaway SPIDs
- Setup instances and affinity settings
- Manually schedule jobs so they don’t overlap
- Create separate VMs so you can allocate memory and CPU
- SET QUERY_GOVERNOR_COST_LIMIT

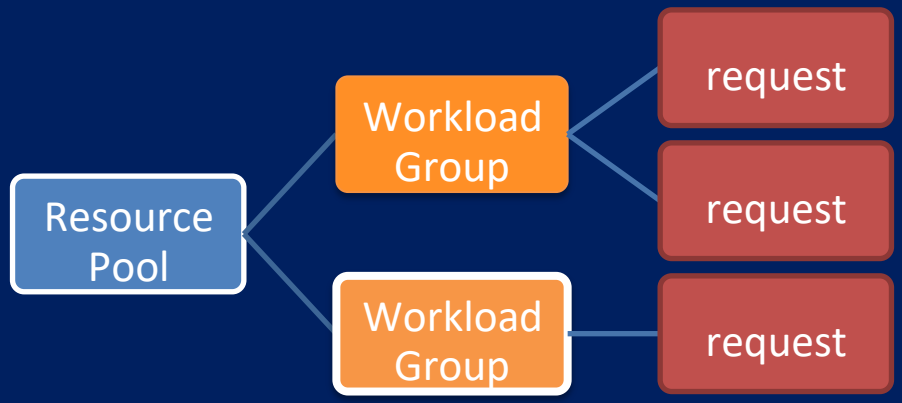
# Resource Governor Limitations

- Database Engine only
  - Analysis Services, Reporting Services, etc. are covered as "regular" applications to SQL Server database engine
- Controls for CPU bandwidth and Memory
  - No I/O governor
- Single instance only
  - Each instance controlled individually
  - Can be combined with Windows Server Resource Manager (WSRM)

# Concepts To Understand

- Resource pools
  - A possible subset of server resources (CPU, memory)
  - A pool of CPU and memory resource
- Workload groups
  - A way to subdivide resource pools (sales, HR)
  - Slices of resource pools for specific scope: apps/db/user
- Classification function
  - How the resources a grouped and mapped to workload group
  - It’s a custom function

# Resource Pool – Workload relationship




# Resource Pools

- A pool of CPU and memory resource
- There are 2 defaults:
  - Internal
- Internal SQL operation – Default
- Any
- processes doesn't match with classifier
- RP settings are applicable to each CPU/memory available for use by SQL Server

# Resource Pool Settings - CPU

- Minimum CPU%
  - MIN_CPU_PERCENT
  - Minimum guaranteed amount of CPU time
    - For all requests in pool when there is contention
    - 0 (default) <= MIN_CPU_PERCENT <= 100
    - Sum of this value for all RP must be <=100
    - Maximum CPU %
  - MAX_CPU_PERCENT
  - Maximum average amount of CPU time
    - For all request in pool when there is contention
    - MIN_CPU_PERCENT < MAX_CPU_PERCENT <= 100 (Defaut)

# Resource Pool Settings - Memory

- Minimum Memory %
  - MIN_MEMORY_PERCENT
  - Minimum memory dedicated to this RP (nor shared with RPs)
- 0 (Default) <= MIN_MEMORY_PERCENT <= 100
- Sum of this value for all resources pools must be <= 100
- Maximum Memory %
  - MAX_MEMORY_PERCENT
  - The maximum amount of memory that can be used by the resource pool
    - MIN_MEMORY_PERCENT < MAX_MEMORY_PERCENT <= 100

# Resource Pool Calculation

| Pool name | Min CPU % | Max CPU % | Calculated Effective Max % | Calculated Shared % |
|---|---|---|---|---|
| internal | 0 | 100 | 100 | 0 |
| default | 20 | 100 | 55 | 35 |
| LowPool | 20 | 50 | 50 | 30 |
| HighPool | 25 | 80 | 60 | 35 |
| | | | 60 = MIN (80, (100-20-20)) | |

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| LowPool | 20 | 50 | 50 | 30 | 30 = 50 - 20 |
| HighPool | 25 | 80 | 60 | 35 | |

# Workload Group

- An RP can be associated to multiple Workload Groups
  - A WG can only be associated to  single RP
- Can be set to low, medium, or high importance
- It’s a balance ratio
  - Low:Medium:High = 1:3:9
- Associate incoming requests to RP

# Workload Group Settings

- REQUEST_MAX_MEMORY_GRANT_PERCENT
  - Percent memory RELATIVE to RP
  - 0 to 100 (default is 25)
  - If larger than 50, big query run one at a time
- REQUEST_MAX_CPU_TIME_SEC
  - Maximum amount CPU time
  - If exceeded, it doesn't stop instead generates trace event
  - Default value:0 (unlimited)

# Workload Group Settings

- GROUP_MAX_REQUESTS
  - Max number of simultaneous requests that are allowed to execute in a WG
  - Default: 0 (unlimited)
- IMPORTANCE
  - Local to RP
  - LOW, MEDIUM, HIGH . Default: MEDIUM

# Classifier Function

- A user defined function located in the master database
- Executed for each incoming session
  - Return type: the name of Workload Group – It maps incoming request to particular WG
- Context criteria example:
  - USER_NAME()
  - APP_NAME(), HOST_NAME()
  - IS_MEMBER(), GETDATE()

# Classifier Function Example

```
CREATE FUNCTION dbo.fn_ClassifyApps() RETURNS sysname
```

Create a classifier function

```
WITH SCHEMABINDING
AS
BEGIN
 DECLARE @ret sysname
 IF  (APP_NAME() LIKE '%Low Importance Application%')
 SET @ret='Low Importance Group'
 RETURN @ret
END
GO
ALTER RESOURCE GOVERNOR
     WITH (CLASSIFIER_FUNCTION = dbo.fn_ClassifyApps)
ALTER RESOURCE GOVERNOR RECONFIGURE
```

# Monitoring

- Performance counters
  - Instance per Pool: **SQLServer: Resource Pool Stats** –
    Instance per Group: **SQLServer: Workload Group Stats**
- DMVs:
  - 3 new: 1 for groups, 1 for pools, 1 for configuration
  - Existing DMVs to include group/pool ID (e.g. sys.dm_exec_sessions)
- Catalog views:
  - 3 new: metadata about configuration
  - Can be used to transfer configuration to another server

# Demo

Resource Governor

# Q/A

- Thank you ☺
- Download PPT and sample scripts from my blog
  - http://choirulamri.org