QUERYING SQL SERVER METADATA

BASIS DATA LANJUT

OUTLINE

- System Catalog Views & Functions
- System Stored Procedure
- System Dynamic Management Objects

METADATA

- Meta data memberikan informasi dasar dan relevan tentang data

- Fungsi metadata di SQL Server mengembalikan informasi tentang properti pada suatu obyek (basis data, schema, tabel, kolom, file database)

- Properti yang dimaksud antara lain id, nama, deskripsi

- Terdapat **view, fungsi dan stored procedure bawaan** dari SQL Server yang berkaitan dengan katalog sistem atau metadata
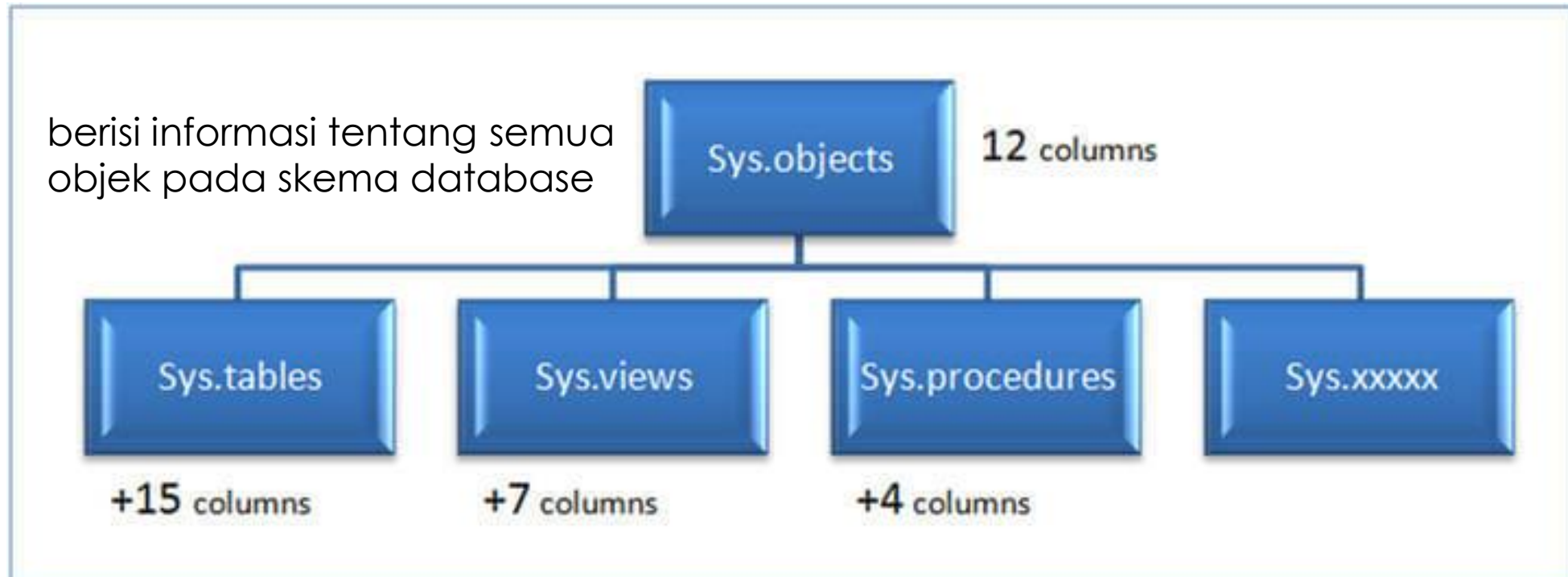
SYSTEM CATALOG VIEWS & FUNCTIONS

SYSTEM CATALOG VIEWS

- Merupakan tabel pada database yang menampilkan informasi sistema secara keseluruhan mengenai SQL Server Database Engine.

- Menyediakan cara paling efisien untuk mendapatkan, mengubah, dan menyajikan informasi dari objek database.

STRUKTUR SYSTEM CATALOG VIEWS

berisi informasi tentang semua
objek pada skema database

Sys.objects — 12 columns

Sys.tables — +15 columns

Sys.views — +7 columns

Sys.procedures — +4 columns

Sys.xxxxx

Sys.objects:

https://docs.microsoft.com/en-us/sql/relational-databases/system-catalog-views/sys-objects-transact-sql?view=sql-server-ver15

OBJECT CATALOG VIEWS

sys.allocation_units	sys.objects	sys.foreign_keys	sys.stats
sys.assembly_modules	sys.parameters	sys.function_order_columns	sys.stats_columns
sys.check_constraints	sys.partitions	sys.hash_indexes	sys.synonyms
sys.columns	sys.periods	sys.identity_columns	sys.table_types
sys.computed_columns	sys.procedures	sys.index_columns	sys.tables
sys.default_constraints	sys.sequences	sys.trigger_event_types	sys.key_constraints
sys.events	sys.service_queues	sys.trigger_events	sys.masked_columns
sys.event_notifications	sys.sql_dependencies	sys.triggers	sys.memory_optimized_tables_internal_attributes
sys.extended_procedures	sys.sql_expression_dependencies	sys.views	sys.numbered_procedure_parameters
sys.foreign_key_columns	sys.sql_modules	sys.numbered_procedures	

https://docs.microsoft.com/en-us/sql/relational-databases/system-catalog-views/object-catalog-views-transact-sql?view=sql-server-ver15

SYS.DATABASE

- Sys.Database merupakan bagian dari System Catalog View yang digunakan untuk menampilkan informasi database yang terletak pada sebuah server.

- Informasi mengenai database yang bisa ditampilkan:

https://docs.microsoft.com/en-us/sql/relational-databases/system-catalog-views/sys-databases-transact-sql?view=sql-server-ver15

QUERYING SYSTEM CATALOG VIEWS

- Semua catalog views diakses melalui pernyataan SQL **SELECT** dari jenis katalog tertentu menggunakan **sys.***

- Syntax:

```
SELECT <column_name>

FROM <Object Catalog Views>

WHERE [Optional]

ORDER BY [Optional];
```

CONTOH

Query untuk melihat Primary Key apa saja yang terdapat pada database TSQL

```sql
SELECT    *
FROM      sys.objects
WHERE     type = 'PK';
```

	name	object_id	principal_id	schema_id	parent_object_id	type	type_desc	create_date
1	PK__sysdiagr__C2B05B6161A31387	462624691	NULL	1	446624634	PK	PRIMARY_KEY_CONSTRAINT	2019-10-28 10:11:15.710
2	PK_Employees	917578307	NULL	5	901578250	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.513
3	PK_Suppliers	981578535	NULL	6	965578478	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.520
4	PK_Categories	1013578649	NULL	6	997578592	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.523
5	PK_Products	1045578763	NULL	6	1029578706	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.527
6	PK_Customers	1157579162	NULL	7	1141579105	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.530
7	PK_Shippers	1189579276	NULL	7	1173579219	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.537
8	PK_Orders	1221579390	NULL	7	1205579333	PK	PRIMARY_KEY_CONSTRAINT	2019-09-04 13:52:14.540

CONTOH

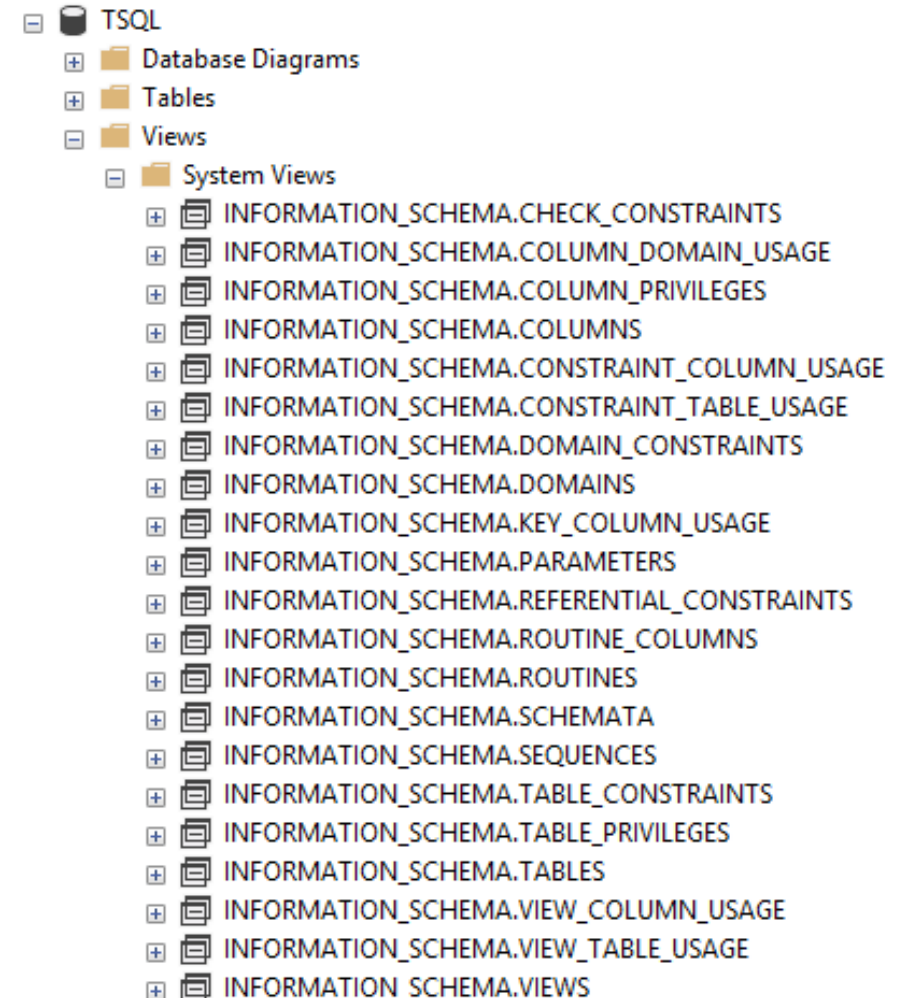Query untuk menampilkan semua objek yang telah dimodifikasi dalam 10 hari terakhir

```sql
SELECT name AS object_name,
SCHEMA_NAME(schema_id) AS schema_name,
type_desc, create_date, modify_date
FROM sys.objects WHERE modify_date > GETDATE() - 10
ORDER BY modify_date;
```

Results | Messages

	object_name	schema_name	type_desc	create_date	modify_date
1	sp_upgraddiagrams	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.687	2019-10-28 10:11:15.687
2	sysdiagrams	dbo	USER_TABLE	2019-10-28 10:11:15.697	2019-10-28 10:11:15.697
3	PK__sysdiagr__C2B05B6161A31387	dbo	PRIMARY_KEY_CONSTRAINT	2019-10-28 10:11:15.710	2019-10-28 10:11:15.710
4	UK_principal_name	dbo	UNIQUE_CONSTRAINT	2019-10-28 10:11:15.710	2019-10-28 10:11:15.710
5	sp_helpdiagrams	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.713	2019-10-28 10:11:15.713
6	sp_helpdiagramdefinition	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.717	2019-10-28 10:11:15.717
7	sp_creatediagram	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.723	2019-10-28 10:11:15.723
8	sp_renamediagram	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.727	2019-10-28 10:11:15.727
9	sp_alterdiagram	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.730	2019-10-28 10:11:15.730
10	sp_dropdiagram	dbo	SQL_STORED_PROCEDURE	2019-10-28 10:11:15.733	2019-10-28 10:11:15.733
11	fn_diagramobjects	dbo	SQL_SCALAR_FUNCTION	2019-10-28 10:11:15.737	2019-10-28 10:11:15.737
12	CustGroups	Sales	VIEW	2019-10-29 06:21:36.370	2019-10-29 10:12:27.873
13	PivotCust	Sales	VIEW	2019-10-29 11:08:24.810	2019-10-29 11:08:24.810
14	CategorySales	Sales	VIEW	2019-10-29 11:46:56.963	2019-10-29 11:46:56.963
15	CategoryQtyYear	Sales	VIEW	2019-10-29 13:38:40.877	2019-10-29 13:38:40.877

INFORMATION SCHEMA VIEWS

- Salah satu metode di SQL Server untuk mendapatkan metadata

- Setiap information schema views berisi metadata untuk semua objek data yang disimpan pada database tertentu.

```
☐ ■ TSQL
   ⊞ 📁 Database Diagrams
   ⊞ 📁 Tables
   ☐ 📁 Views
      ☐ 📁 System Views
         ⊞ 🔲 INFORMATION_SCHEMA.CHECK_CONSTRAINTS
         ⊞ 🔲 INFORMATION_SCHEMA.COLUMN_DOMAIN_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.COLUMN_PRIVILEGES
         ⊞ 🔲 INFORMATION_SCHEMA.COLUMNS
         ⊞ 🔲 INFORMATION_SCHEMA.CONSTRAINT_COLUMN_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.CONSTRAINT_TABLE_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.DOMAIN_CONSTRAINTS
         ⊞ 🔲 INFORMATION_SCHEMA.DOMAINS
         ⊞ 🔲 INFORMATION_SCHEMA.KEY_COLUMN_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.PARAMETERS
         ⊞ 🔲 INFORMATION_SCHEMA.REFERENTIAL_CONSTRAINTS
         ⊞ 🔲 INFORMATION_SCHEMA.ROUTINE_COLUMNS
         ⊞ 🔲 INFORMATION_SCHEMA.ROUTINES
         ⊞ 🔲 INFORMATION_SCHEMA.SCHEMATA
         ⊞ 🔲 INFORMATION_SCHEMA.SEQUENCES
         ⊞ 🔲 INFORMATION_SCHEMA.TABLE_CONSTRAINTS
         ⊞ 🔲 INFORMATION_SCHEMA.TABLE_PRIVILEGES
         ⊞ 🔲 INFORMATION_SCHEMA.TABLES
         ⊞ 🔲 INFORMATION_SCHEMA.VIEW_COLUMN_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.VIEW_TABLE_USAGE
         ⊞ 🔲 INFORMATION_SCHEMA.VIEWS
```

INFORMATION SCHEMA VIEWS

- **Contoh**: Mendapatkan daftar view yang terdapat pada database TSQL dan pendefinisian view tersebut.

```
SELECT
 table_name, view_definition
FROM
 INFORMATION_SCHEMA.VIEWS
```
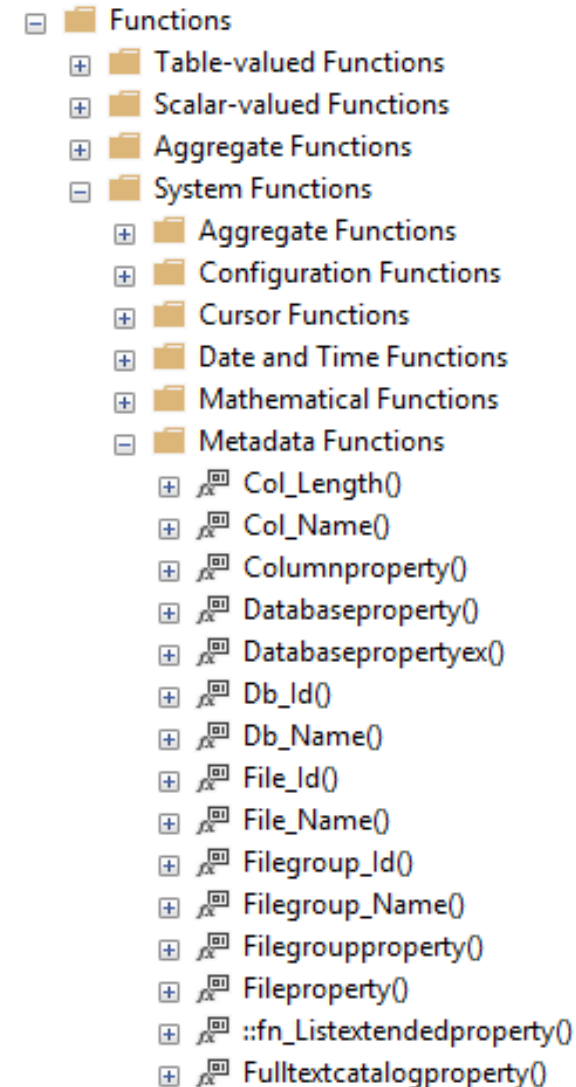

	table_name	view_definition
1	vwpriceorder	create view vwpriceorder as select o.orderid, o.orderdate, od.unitprice from Sal...
2	CustGroups	CREATE VIEW Sales.CustGroups AS SELECT custid, CHOOSE(custid % 4 +...
3	PivotCust	CREATE VIEW Sales.PivotCust AS WITH PivotCustCTE AS (SELECT custid, ...
4	CategorySales	CREATE VIEW [Sales].[CategorySales] AS SELECT c.categoryname AS Catego...
5	ProductsBeverages	CREATE VIEW Production.ProductsBeverages AS SELECT productid, product...
6	CategoryQtyYear	CREATE VIEW Sales.CategoryQtyYear AS SELECT c.categoryname AS Categ...
7	OrderValues	--- -- Create Views and Functions -----...
8	OrderTotalsByYear	CREATE VIEW Sales.OrderTotalsByYear WITH SCHEMABINDING AS SE...
9	CustOrders	CREATE VIEW Sales.CustOrders WITH SCHEMABINDING AS SELECT ...
10	GrainsCereals	CREATE VIEW Production.GrainsCereals AS select p.productid, p.productname,...
11	EmpOrders	CREATE VIEW Sales.EmpOrders WITH SCHEMABINDING AS SELE...

SYSTEM METADATA FUNCTIONS

- Mengembalikan informasi mengenai setting, nilai, dan objek pada SQL Server

- Terdapat beberapa format:
  - Menggunakan prefix '@@'
  - Menggunakan suffix '()'
  - Menggunakan '$'
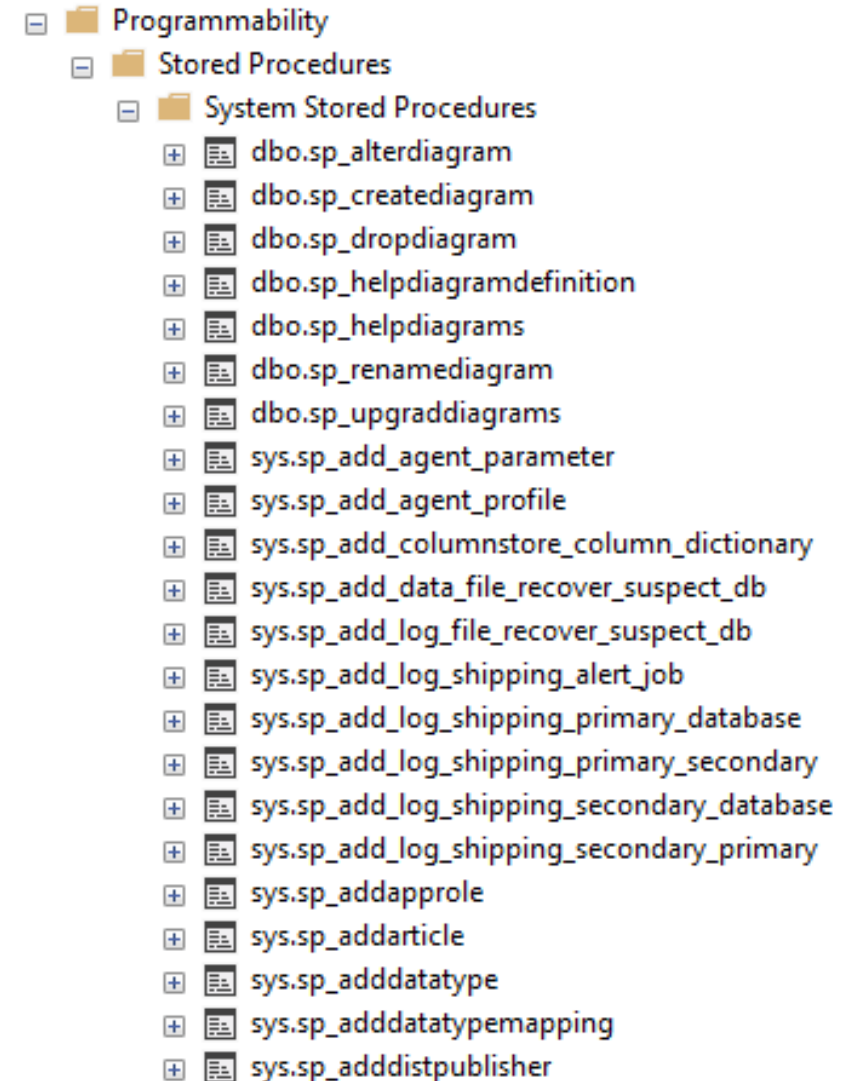
SYSTEM METADATA FUNCTIONS

Function Name	Description	Example
OBJECT_ID(<object_name>)	Returns the object ID of a database object.	OBJECT_ID('Sales.Customer')
OBJECT_NAME(<object_id>)	Returns the name corresponding to an object ID.	OBJECT_NAME(197575742)
@@ERROR	Returns 0 if the last statement succeeded; otherwise returns the error number.	@@ERROR
SERVERPROPERTY(<property >)	Returns the value of the specified server property.	SERVERPROPERTY('Collation')

SYSTEM METADATA FUNCTIONS

- **Contoh**:

```sql
SELECT @@VERSION as SQL_Version;
SELECT SERVERPROPERTY('EDITION') AS SQLEdition;
SELECT OBJECT_ID('Sales.Orders') AS SalesOrder_ID;
```

SYSTEM STORED PROCEDURE

SYSTEM STORED PROCEDURE

- **Stored Procedure**: Sebuah set pernyataan / kode SQL yang disimpan pada database (pre-compiled), dan dapat dipanggil sewaktu-waktu

- **System Stored Procedure**: stored procedure bawaan dari SQL Server yang digunakan untuk mengakses metadata

SYSTEM STORED PROCEDURE

- System Stored Procedure yang sering digunakan:

Name	Description
sp_databases	Lists databases in an instance of SQL Server
sp_tables	Returns a list of tables or views, except synonyms
sp_columns	Returns column information for the specified objects

SYSTEM STORED PROCEDURE

- **Cara mengeksekusi**:

  - Menggunakan perintah **EXECUTE** atau **EXEC** sebelum nama stored procedure

  - Tambahkan schema **sys.*** di depan nama stored procedure

  - Passing parameter setelah nama Stored Procedure, dan menggunakan separator koma (,) jika paramater yangdi-passing lebih dari satu

SYSTEM STORED PROCEDURE

- **Contoh**:

```sql
EXEC sys.sp_databases;
EXEC sys.sp_columns @table_owner='Production', @table_name='Categories';
```

Results | Messages

	DATABASE_NAME	DATABASE_SIZE	REMARKS
1	DB_Toko	16384	NULL
2	master	17408	NULL
3	model	16384	NULL
4	msdb	21760	NULL
5	tempdb	40960	NULL
6	TSQL	81920	NULL

	TABLE_QUALIFIER	TABLE_OWNER	TABLE_NAME	COLUMN_NAME	DATA_TYPE	TYPE_NAME	PRECISION	LENGTH
1	TSQL	Production	Categories	categoryid	4	int identity	10	4
2	TSQL	Production	Categories	categoryname	-9	nvarchar	15	30
3	TSQL	Production	Categories	description	-9	nvarchar	200	400

✅ Query executed successfully. | DESKTOP-0H692G9 (14.0 RTM) | DESKTOP-0H692G9\kunang... | TSQL | 00:00:00 | 9 rows

DYNAMIC MANAGEMENT OBJECTS

DYNAMIC MANAGEMENT OBJECTS

- Dynamic Management Views & Function (DMV) mengembalikan informasi mengenai status dari server, yang dapat digunakan untuk memonitor kinerja server, mendiagnosa masalah, meningkatkan performa server, maupun menangani troubleshoot

- Dibutuhkan permission **VIEW SERVER STATE** atau **VIEW DATABASE STATE** untuk melakukan query terhadap DMV

DYNAMIC MANAGEMENT OBJECTS

- Kategori DMV

Naming pattern	Description
db	Database-related information
exec	Query execution-related information
io	I/O statistics
os	SQL Server Operating System (SQLOS) information
tran	Transaction-related information

DYNAMIC MANAGEMENT OBJECTS

- DMV dapat diimplementasikan sebagai view atau sebagai table-valued function (TVF).

- Jika DMV sebagai view, maka tidak memerlukan parameter.

  Contoh: menampilkan daftar koneksi user pada database TSQL

```sql
SELECT session_id, login_time, program_name
FROM sys.dm_exec_sessions
WHERE is_user_process =1;
```

	session_id	login_time	program_name
1	51	2019-11-03 19:16:27.903	SQLServerCEIP
2	52	2019-11-03 19:16:34.297	Microsoft SQL Server Management Studio - Query
3	53	2019-11-03 19:16:52.370	Microsoft SQL Server Management Studio
4	54	2019-11-03 19:16:52.370	Microsoft SQL Server Management Studio

DYNAMIC MANAGEMENT OBJECTS

- Jika DMV sebagai TVF, maka dibutuhkan passing parameter.

    Contoh: menampilkan metadata mengenai objek yang pendefinisiannya mengacu pada objek pada parameter

```sql
SELECT referencing_schema_name, referencing_entity_name,
referencing_class_desc
FROM sys.dm_sql_referencing_entities('Sales.Orders', 'OBJECT');
```

referencing_schema_name	referencing_entity_name	referencing_class_desc
Sales	EmpOrders	OBJECT_OR_COLUMN
Sales	CategoryQtyYear	OBJECT_OR_COLUMN
Sales	CategorySales	OBJECT_OR_COLUMN
dbo	fnGetTop3ProductsForCust	OBJECT_OR_COLUMN
dbo	vwpriceorder	OBJECT_OR_COLUMN
Sales	OrderValues	OBJECT_OR_COLUMN
Sales	OrderTotalsByYear	OBJECT_OR_COLUMN
Sales	CustOrders	OBJECT_OR_COLUMN

TERIMAKASIH