(T40)討論 DynamicSql。討論 SqlInjection 在 Asp.NetWebForm 的 SearchBar
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(T40)討論 DynamicSql。討論 SqlInjection 在 Asp.NetWebForm 的 SearchBar
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# 0. Summary

```
1.
--CREATE PROCEDURE spSearchGamer
--    @FirstName NVARCHAR(100) = NULL ,
--    @LastName NVARCHAR(100) = NULL ,
--    @Gender NVARCHAR(50) = NULL ,
--    @GameScoreGreaterThanOrEqual INT = NULL
--AS
--    BEGIN
--        SELECT  *
--        FROM    Gamer
--        WHERE   ( FirstName LIKE ( '%' + @FirstName + '%' )
--                  OR @FirstName IS NULL
--                )
--                AND ( LastName LIKE ( '%' + @LastName + '%' )
--                      OR @LastName IS NULL
--                    )
```

```
--          AND ( Gender = @Gender
--              OR @Gender IS NULL
--            )
--          AND ( GameScore >= @GameScoreGreaterThanOrEqual
--              OR @GameScoreGreaterThanOrEqual IS NULL
--            );
--   END;
```

If we set the default value for the parameter,
that will make the parameter become optional.
Without the parameter default value,
the parameter will become compulsory.
Thus, in where clause we need to add the IS NULL for each parameter

---

2.
2.0.
In Summary:
Building a dynamic sql queries by concatenating strings cause the vulnerability of SQL injection.
Using sp_executesql parameters is always the best dynamic sql queries.
2.1.
sp_executesql Syntax
--EXECUTE sp_executesql @statement, @params, ...user-defined parameters...
sp_executesql has 2 pre-defined parameters
and any number of user-defined parameters.
2.1.1.
@statement
is the SQL statements to execute
2.1.2.
@params
is a optional pre-defined parameter
and it is used to declare parameters specified in @statement.
2.2.
E.g.

```
--DECLARE @sql1 NVARCHAR(1000)
--= 'SELECT *
--FROM Gamer
--WHERE FirstName LIKE ''%' + 'B' + '%'' AND ' + 'LastName LIKE ''%' + 'Y'
--    + '%''';
--EXECUTE sp_executesql @sql1;
```

Building a dynamic sql queries by concatenating strings
is a bad dynamic sql queries and
it cause the vulnerability of SQL injection.
2.3.
E.g.

```
--DECLARE @sq2 NVARCHAR(1000)
--= 'SELECT *
--FROM Gamer
--WHERE FirstName LIKE ''%''+@FirstName+''%''
--AND LastName LIKE ''%''+@LastName+''%''';
--DECLARE @params NVARCHAR(1000) = '@FirstName NVARCHAR(100), @LastName NVARCHAR(100)';
--EXECUTE sp_executesql @sq2, @params, @FirstName = 'B', @LastName = 'Y';
```

Using sp_executesql parameters is always the best for dynamic sql queries.

==========

# 1. Create Sample Data

```
--=====================================================================
--T040_01_Create Sample Data
--=====================================================================
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Gamer' ) )
    BEGIN
        TRUNCATE TABLE dbo.Gamer;
```

```
        DROP TABLE Gamer;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE Gamer
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  FirstName NVARCHAR(50) ,
  LastName NVARCHAR(50) ,
  Gender NVARCHAR(50) ,
  GameScore INT
);
GO -- Run the previous command and begins new batch
INSERT  INTO Gamer
VALUES  ( 'AFirst01', 'XLast01', 'Female', 3500 );
INSERT  INTO Gamer
VALUES  ( 'AFirst02', 'YLast02', 'Female', 4000 );
INSERT  INTO Gamer
VALUES  ( 'BFirst03', 'YLast03', 'Male', 4600 );
INSERT  INTO Gamer
VALUES  ( 'BFirst04', 'YLast04', 'Male', 5400 );
INSERT  INTO Gamer
VALUES  ( 'BFirst05', 'ZLast05', 'Female', 2000 );
INSERT  INTO Gamer
VALUES  ( 'CFirst06', 'YLast06', 'Male', 4320 );
INSERT  INTO Gamer
VALUES  ( 'CFirst07', 'YLast07', 'Male', 4400 );
GO -- Run the previous command and begins new batch
SELECT  *
FROM     Gamer;
GO -- Run the previous command and begins new batch
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 1 | AFirst01 | XLast01 | Female | 3500 |
| 2 | 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 5 | 5 | BFirst05 | ZLast05 | Female | 2000 |
| 6 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | 7 | CFirst07 | YLast07 | Male | 4400 |

==========

# 2. stored procedure spSearchGamer

```
--=====================================================================
--T040_02_stored procedure spSearchGamer
--=====================================================================
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'PROCEDURE'
```

```
                        AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                        AND SPECIFIC_NAME = 'spSearchGamer' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer;
    END;
GO -- Run the previous command and begins new batch
CREATE PROCEDURE spSearchGamer
    @FirstName NVARCHAR(100) = NULL ,
    @LastName NVARCHAR(100) = NULL ,
    @Gender NVARCHAR(50) = NULL ,
    @GameScoreGreaterThanOrEqual INT = NULL
AS
    BEGIN
        SELECT  *
        FROM    Gamer
        WHERE   ( FirstName LIKE ( '%' + @FirstName + '%' )
                  OR @FirstName IS NULL
                )
                AND ( LastName LIKE ( '%' + @LastName + '%' )
                      OR @LastName IS NULL
                    )
                AND ( Gender = @Gender
                      OR @Gender IS NULL
                    )
                AND ( GameScore >= @GameScoreGreaterThanOrEqual
                      OR @GameScoreGreaterThanOrEqual IS NULL
                    );
    END;
GO -- Run the previous command and begins new batch
EXECUTE spSearchGamer;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 1 | AFirst01 | XLast01 | Female | 3500 |
| 2 | 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 5 | 5 | BFirst05 | ZLast05 | Female | 2000 |
| 6 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer @Gender = 'Male';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer @Gender = 'Male', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer @Gender = 'Male', @FirstName = 'B', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
EXECUTE spSearchGamer @Gender = 'Male', @FirstName = 'B', @LastName = 'Y',
    @GameScoreGreaterThanOrEqual = 5000;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
GO -- Run the previous command and begins new batch
/*
1.
--@FirstName NVARCHAR(100) = NULL ,
...
--WHERE   ( FirstName LIKE ( '%' + @FirstName + '%' )
--    OR @FirstName IS NULL
--)
If we set the default value for the parameter,
that will make the parameter become optional.
Without the parameter default value,
the parameter will become compulsory.
Thus, in where clause we need to add the IS NULL for each parameter
2.
In this case, the stored procedure is easy to maintan,
because it only has 4 filters.
When it has more than 10 filters,
it will contain a lof of AND, OR ... in the filters
and this is too complex to maintain.
Thus, we need Dynamic SQL stored procedure, sp_executesql.
*/

==================================================================
```

# 3. Dynamic SQL stored procedure

```
--==================================================================
--T040_03_Dynamic SQL stored procedure
--==================================================================
--Dynamic SQL stored procedure
--EXECUTE sp_executesql @statement, @params, ...user-defined parameters...
--==================================================================
--T040_03_01
SELECT  *
FROM    Gamer
WHERE   FirstName LIKE '%B%'
        AND LastName LIKE '%Y%';
GO -- Run the previous command and begins new batch
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
--=====================================================================
--T040_03_02
--Bad dynamic sql queries.
--Building a dynamic sql queries by concatenating strings cause the vulnerability of SQL injection.
DECLARE @sql1 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%' + 'B' + '%'' AND ' + 'LastName LIKE ''%' + 'Y'
    + '%''';
EXECUTE sp_executesql @sql1;
GO -- Run the previous command and begins new batch
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
--=====================================================================
--T040_03_03
--Good dynamic sql queries.
--Using sp_executesql parameters is always the best for dynamic sql queries.
DECLARE @sq2 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%''+@FirstName+''%''
AND LastName LIKE ''%''+@LastName+''%''';
DECLARE @params NVARCHAR(1000) = '@FirstName NVARCHAR(100), @LastName NVARCHAR(100)';
EXECUTE sp_executesql @sq2, @params, @FirstName = 'B', @LastName = 'Y';
GO -- Run the previous command and begins new batch
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
/*
1.
1.0.
In Summary:
Building a dynamic sql queries by concatenating strings cause the vulnerability of SQL injection.
Using sp_executesql parameters is always the best dynamic sql queries.
1.1.
sp_executesql Syntax
--EXECUTE sp_executesql @statement, @params, ...user-defined parameters...
sp_executesql has 2 pre-defined parameters
and any number of user-defined parameters.
1.1.1.
@statement
is the SQL statements to execute
1.1.2.
@params
is a optional pre-defined parameter
and it is used to declare parameters specified in @statement.
1.2.
E.g.
--DECLARE @sql1 NVARCHAR(1000)
--= 'SELECT *
--FROM Gamer
```

```
--WHERE FirstName LIKE ''%' + 'B' + '%'' AND ' + 'LastName LIKE ''%' + 'Y'
--    + '%''';
--EXECUTE sp_executesql @sql1;
Building a dynamic sql queries by concatenating strings
is a bad dynamic sql queries and
it cause the vulnerability of SQL injection.
1.3.
--DECLARE @sq2 NVARCHAR(1000)
--= 'SELECT *
--FROM Gamer
--WHERE FirstName LIKE ''%''+@FirstName+''%''
--AND LastName LIKE ''%''+@LastName+''%''';
--DECLARE @params NVARCHAR(1000) = '@FirstName NVARCHAR(100), @LastName NVARCHAR(100)';
--EXECUTE sp_executesql @sq2, @params, @FirstName = 'B', @LastName = 'Y';
Using sp_executesql parameters is always the best for dynamic sql queries.
*/
```

==========

# 4. Dynamic SQL stored procedure

```
--=====================================================================
--T040_04_Bad dynamic sql queries
--=====================================================================
--=====================================================================
--T040_04_01
--Drop Store Procedure if it exists then recreate.
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE      ROUTINE_TYPE = 'PROCEDURE'
                         AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                         AND SPECIFIC_NAME = 'spSearchGamer2' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer2;
    END;
GO -- Run the previous command and begins new batch
CREATE PROCEDURE spSearchGamer2
(
  @FirstName NVARCHAR(100) = NULL ,
  @LastName NVARCHAR(100) = NULL ,
  @Gender NVARCHAR(50) = NULL ,
  @GameScoreGreaterThanOrEqual INT = NULL
)
AS
    BEGIN
        DECLARE @sql NVARCHAR(MAX);
        SET @sql = 'SELECT * FROM Gamer WHERE 1 = 1';
        IF ( @FirstName IS NOT NULL )
            SET @sql = @sql + ' AND FirstName LIKE ''%' + @FirstName + '%''';
        IF ( @LastName IS NOT NULL )
            SET @sql = @sql + ' AND LastName LIKE ''%' + @LastName + '%''';
        IF ( @Gender IS NOT NULL )
            SET @sql = @sql + ' AND Gender=''' + @Gender + '''';
        IF ( @GameScoreGreaterThanOrEqual IS NOT NULL )
            SET @sql = @sql + ' AND GameScore>='''
                + CAST(@GameScoreGreaterThanOrEqual AS NVARCHAR(100)) + '''';
        EXECUTE sp_executesql @sql;
    END;
GO -- Run the previous command and begins new batch
```

```
--=====================================================================
--T040_04_02
--EXECUTE spSearchGamer2
EXECUTE spSearchGamer2;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 1 | AFirst01 | XLast01 | Female | 3500 |
| 2 | 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 5 | 5 | BFirst05 | ZLast05 | Female | 2000 |
| 6 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer2 @Gender = 'Male';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer2 @Gender = 'Male', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer2 @Gender = 'Male', @FirstName = 'B', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
EXECUTE spSearchGamer2 @Gender = 'Male', @FirstName = 'B', @LastName = 'Y',
    @GameScoreGreaterThanOrEqual = 5000;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 4 | BFirst04 | YLast04 | Male | 5400 |

==========

# 5. Good dynamic sql queries

```
--=====================================================================
--T040_05_Good dynamic sql queries
--=====================================================================
--=====================================================================
--T040_05_01
--Drop Store Procedure if it exists then recreate.
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
```

```
            WHERE      ROUTINE_TYPE = 'PROCEDURE'
                       AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                       AND SPECIFIC_NAME = 'spSearchGamer3' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer3;
    END;
GO -- Run the previous command and begins new batch
CREATE PROCEDURE spSearchGamer3
    @FirstName NVARCHAR(100) = NULL ,
    @LastName NVARCHAR(100) = NULL ,
    @Gender NVARCHAR(50) = NULL ,
    @GameScoreGreaterThanOrEqual INT = NULL
AS
    BEGIN
        DECLARE @sqlParams NVARCHAR(MAX) = N'@FN NVARCHAR(100), @LN NVARCHAR(100), @Gen NVARCHAR(50),
@Gsgtoe INT';
        DECLARE @sql NVARCHAR(MAX);
        SET @sql = 'SELECT * FROM Gamer WHERE 1 = 1';
        IF ( @FirstName IS NOT NULL )
            SET @sql = @sql + ' AND FirstName LIKE ''%''+@FN+''%''';
        IF ( @LastName IS NOT NULL )
            SET @sql = @sql + ' AND LastName LIKE ''%''+@LN+''%''';
        IF ( @Gender IS NOT NULL )
            SET @sql = @sql + ' AND Gender=@Gen';
        IF ( @GameScoreGreaterThanOrEqual IS NOT NULL )
            SET @sql = @sql + ' AND GameScore>=@Gsgtoe';
        EXECUTE sp_executesql @sql, @sqlParams, @FN = @FirstName,
             @LN = @LastName, @Gen = @Gender,
             @Gsgtoe = @GameScoreGreaterThanOrEqual;
    END;

GO -- Run the previous command and begins new batch

-------------------------------------------------------
--T040_05_02
--EXECUTE spSearchGamer3
EXECUTE spSearchGamer3;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 1 | AFirst01 | XLast01 | Female | 3500 |
| 2 | 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 5 | 5 | BFirst05 | ZLast05 | Female | 2000 |
| 6 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer3 @Gender = 'Male';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer3 @Gender = 'Male', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |
| 3 | 6 | CFirst06 | YLast06 | Male | 4320 |
| 4 | 7 | CFirst07 | YLast07 | Male | 4400 |

```
EXECUTE spSearchGamer3 @Gender = 'Male', @FirstName = 'B', @LastName = 'Y';
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 3 | BFirst03 | YLast03 | Male | 4600 |
| 2 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
EXECUTE spSearchGamer3 @Gender = 'Male', @FirstName = 'B', @LastName = 'Y',
    @GameScoreGreaterThanOrEqual = 5000;
```

| | Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|---|
| 1 | 4 | BFirst04 | YLast04 | Male | 5400 |

```
GO -- Run the previous command and begins new batch
```

# 6. SQL Injection

```
--=====================================================================
--T040_06_SQL Injection
--=====================================================================
--=====================================================================
--T040_06_01
--Create Sample data
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Table1' ) )
   BEGIN
       TRUNCATE TABLE dbo.Table1;
       DROP TABLE Table1;
   END;
GO -- Run the previous command and begins new batch
CREATE TABLE Table1
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  [Name] NVARCHAR(50)
);
```

```sql
GO -- Run the previous command and begins new batch

--=====================================================================
--T040_06_02
EXECUTE sp_executesql N'SELECT * FROM Gamer WHERE 1 = 1 AND FirstName=@FirstName',
    N'@FirstName NVARCHAR(26)', @FirstName = N'AFirst01';
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
Display the FirstName=N'AFirst01'
*/

--=====================================================================
--T040_06_03
EXECUTE sp_executesql N'SELECT * FROM Gamer WHERE 1 = 1 AND FirstName=@FirstName',
    N'@FirstName NVARCHAR(26)', @FirstName = N'''; DROP TABLE dbo.Table1; --';
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
sp_executesql with parameters is parameterised queries.
Thus, it prevent SQL Injection
*/
--=====================================================================
--T040_06_04
DECLARE @sql2 NVARCHAR(1000) = N'SELECT * FROM Gamer WHERE 1 = 1 AND FirstName='''
    + '''; DROP TABLE dbo.Table1; --' + ', AND LastName=@LastName';
EXECUTE sp_executesql @sql2;
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
**SQL Injection
The Table1 will be dropped.
*/

--=====================================================================
--T040_06_05
--Create Sample data
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Table1' ) )
    BEGIN
        TRUNCATE TABLE dbo.Table1;
        DROP TABLE Table1;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE Table1
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  [Name] NVARCHAR(50)
);
GO -- Run the previous command and begins new batch
--=====================================================================
--T040_06_06
EXECUTE spSearchGamer2 @Gender = 'Male';
SELECT  *
```

```sql
FROM    Table1;
GO -- Run the previous command and begins new batch
--=====================================================================
--T040_06_07
EXECUTE spSearchGamer2 @Gender = N'''; DROP TABLE dbo.Table1; --';
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
**SQL Injection
The Table1 will be dropped.
*/
--=====================================================================
--T040_06_08
--Create Sample data
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Table1' ) )
    BEGIN
        TRUNCATE TABLE dbo.Table1;
        DROP TABLE Table1;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE Table1
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  [Name] NVARCHAR(50)
);
GO -- Run the previous command and begins new batch
--=====================================================================
--T040_06_09
--Bad dynamic sql queries.
--Building a dynamic sql queries by concatenating strings cause the vulnerability of SQL injection.
DECLARE @sql1 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%' + 'B' + '%'' AND ' + 'LastName LIKE ''%' + 'Y'
    + '%''';
EXECUTE sp_executesql @sql1;
GO -- Run the previous command and begins new batch
/*
Display the FirstName LIKE '%B%' AND LastName LIKE '%Y%'
*/


--=====================================================================
--T040_06_10
--Bad dynamic sql queries.
--Building a dynamic sql queries by concatenating strings cause the vulnerability of SQL injection.
DECLARE @sql1 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%' + N'''; DROP TABLE dbo.Table1; --' + '%'' AND ' + 'LastName LIKE ''%' + 'Y'
    + '%''';
EXECUTE sp_executesql @sql1;
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
```

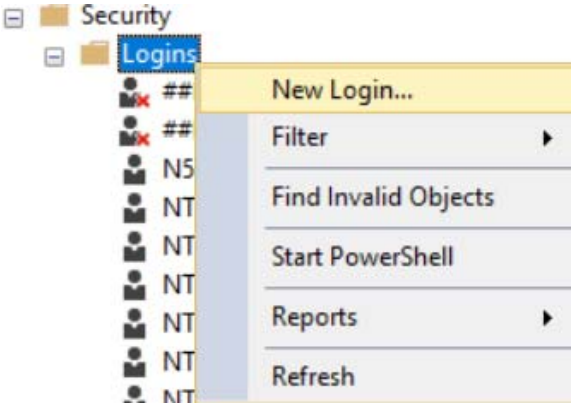
```sql
/*
**SQL Injection
The Table1 will be dropped.
*/

--=====================================================================
--T040_06_11
--Create Sample data
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Table1' ) )
    BEGIN
        TRUNCATE TABLE dbo.Table1;
        DROP TABLE Table1;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE Table1
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  [Name] NVARCHAR(50)
);
GO -- Run the previous command and begins new batch
--=====================================================================
--T040_06_12
--Good dynamic sql queries.
--Using sp_executesql parameters is always the best for dynamic sql queries.
DECLARE @sq2 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%''+@FirstName+''%''
AND LastName LIKE ''%''+@LastName+''%''';
DECLARE @params NVARCHAR(1000) = '@FirstName NVARCHAR(100), @LastName NVARCHAR(100)';
EXECUTE sp_executesql @sq2, @params, @FirstName = 'B', @LastName = 'Y';
GO -- Run the previous command and begins new batch
/*
Display the FirstName LIKE '%B%' AND LastName LIKE '%Y%'
*/
--=====================================================================
--T040_06_13
--Good dynamic sql queries.
--Using sp_executesql parameters is always the best for dynamic sql queries.
DECLARE @sq2 NVARCHAR(1000)
= 'SELECT *
FROM Gamer
WHERE FirstName LIKE ''%''+@FirstName+''%''
AND LastName LIKE ''%''+@LastName+''%''';
DECLARE @params NVARCHAR(1000) = '@FirstName NVARCHAR(100), @LastName NVARCHAR(100)';
EXECUTE sp_executesql @sq2, @params, @FirstName =  N'''; DROP TABLE dbo.Table1; --', @LastName = 'Y';
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
**Prevent SQL Injection
The Table1 will NOT be dropped.
*/
--=====================================================================
--T040_06_14
EXECUTE spSearchGamer3 @Gender = 'Male';
EXECUTE spSearchGamer3 @Gender = 'Male', @FirstName = 'B', @LastName = 'Y',
```

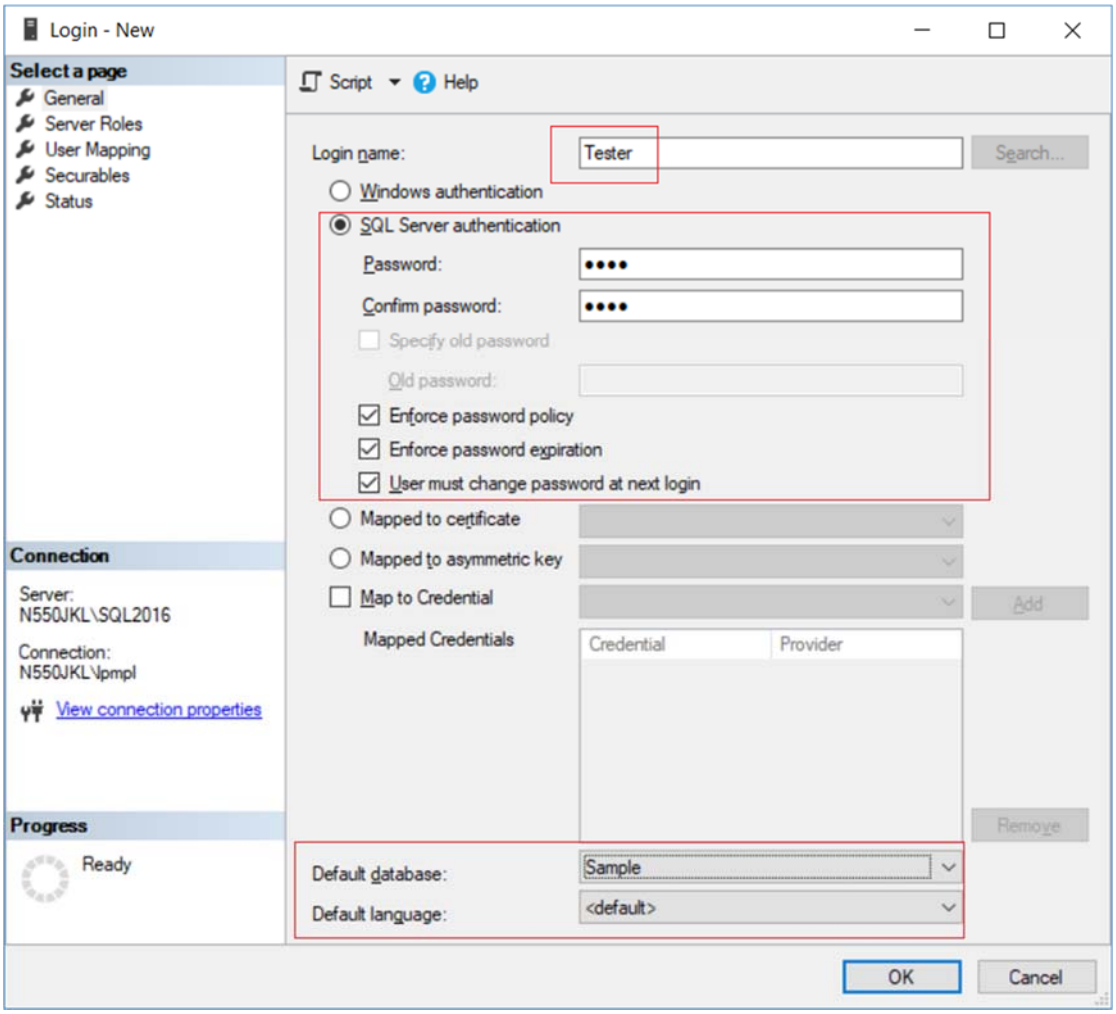
```
    @GameScoreGreaterThanOrEqual = 5000;
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
--=====================================================================
--T040_06_15
EXECUTE spSearchGamer3 @Gender = N'''; DROP TABLE dbo.Table1; --';
SELECT  *
FROM    Table1;
EXECUTE spSearchGamer3 @Gender = 'Male', @FirstName = N'''; DROP TABLE dbo.Table1; --', @LastName = 'Y',
    @GameScoreGreaterThanOrEqual = 5000;
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
**Prevent SQL Injection
The Table1 will NOT be dropped.
*/
```

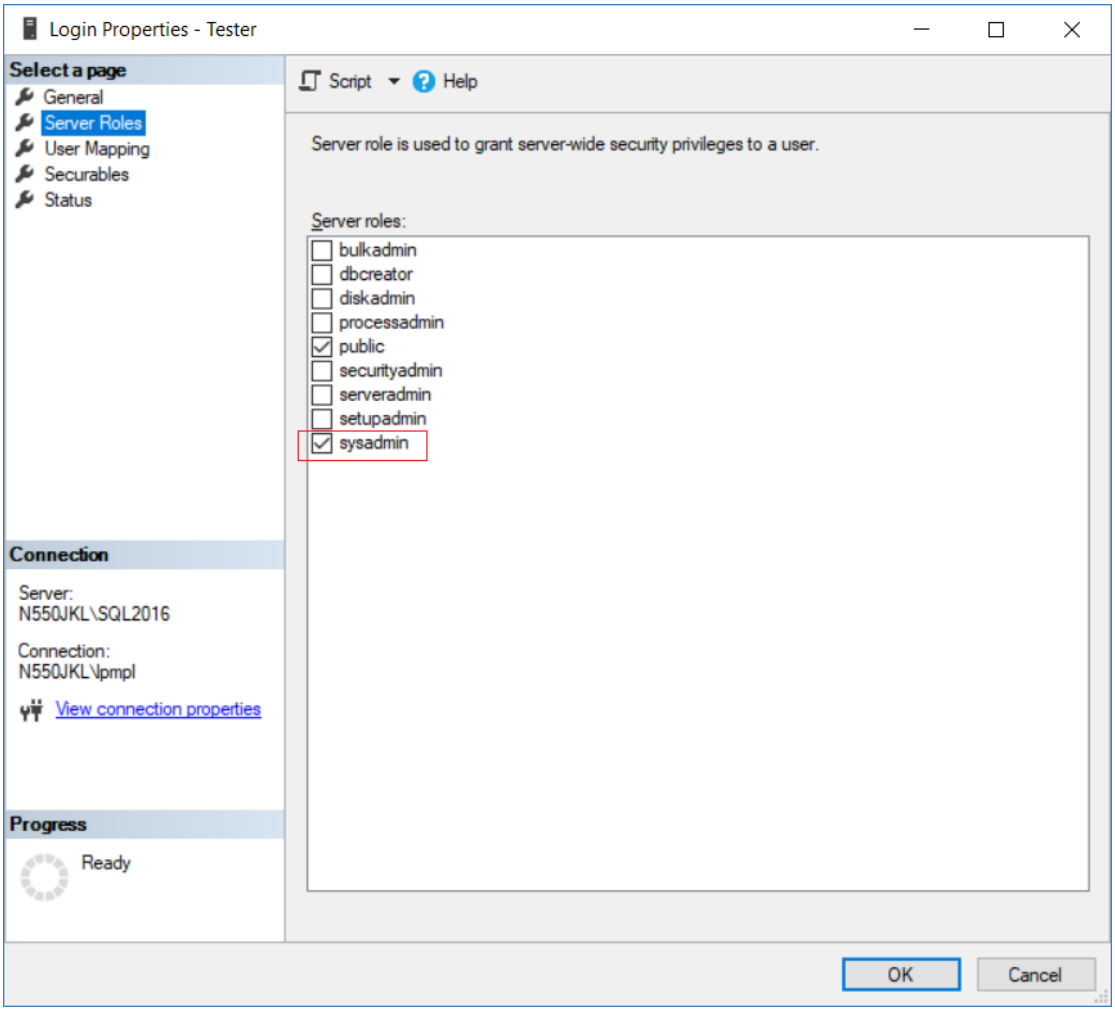
# 7. Web Application - DynamicSQL, SearchWebPage

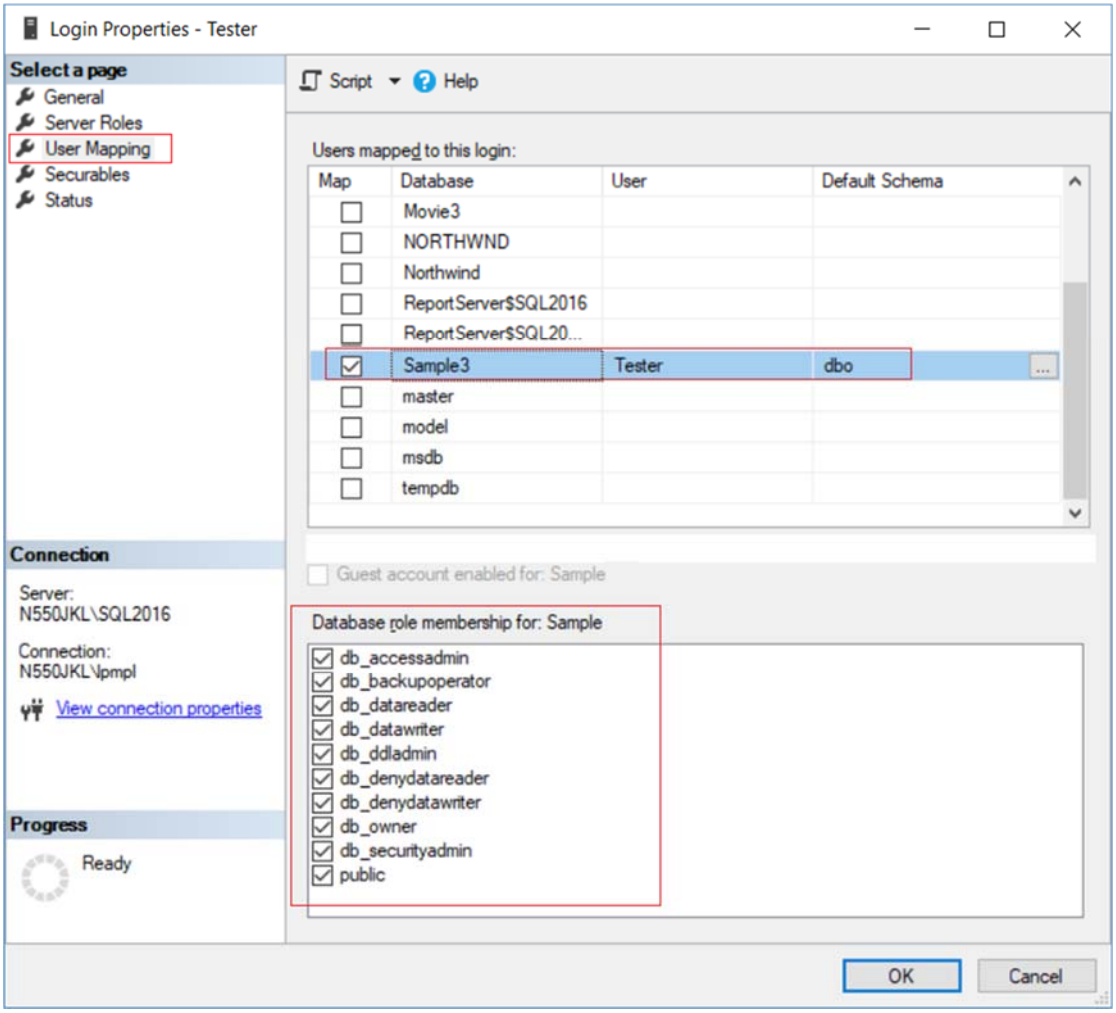
## 7.1. Set up SQL Authentication

In SQL server
Object Explorer --> Security --> Logins --> New Logins
-->
General Tab
Login Name :
Tester
Password:
1234
Default Database:
Sample
-->
Server Roles Tab
Select
**sysadmin**
-->
User Mapping Tab
Select Sample
Select every Roles.


Security
Logins
New Login...
Filter
Find Invalid Objects
Start PowerShell
Reports
Refresh


Login - New
Select a page
General
Server Roles
User Mapping
Securables
Status
Script
Help
Login name:
Tester
Search...
Windows authentication
SQL Server authentication
Password:
Confirm password:
Specify old password
Old password:
Enforce password policy
Enforce password expiration
User must change password at next login
Mapped to certificate
Mapped to asymmetric key
Map to Credential
Add
Mapped Credentials
Credential
Provider
Remove
Connection
Server:
N550JKL\SQL2016
Connection:
N550JKL\lpmpl
View connection properties
Progress
Ready
Default database:
Sample
Default language:
<default>
OK
Cancel

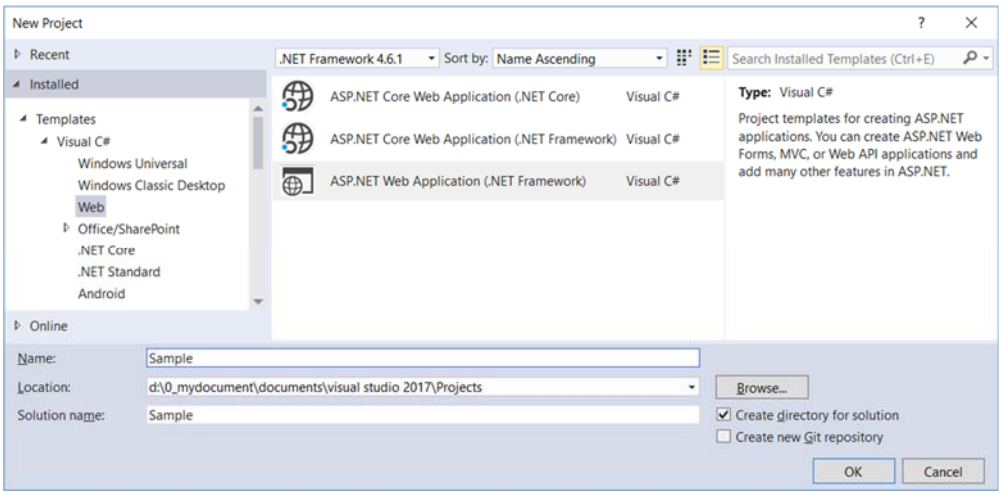

Login Properties - Tester
Select a page
General
Server Roles
User Mapping
Securables
Status
Script
Help
Server role is used to grant server-wide security privileges to a user.
Server roles:
bulkadmin
dbcreator
diskadmin
processadmin
public
securityadmin
serveradmin
setupadmin
sysadmin
Connection
Server:
N550JKL\SQL2016
Connection:
N550JKL\lpmpl
View connection properties
Progress
Ready
OK
Cancel

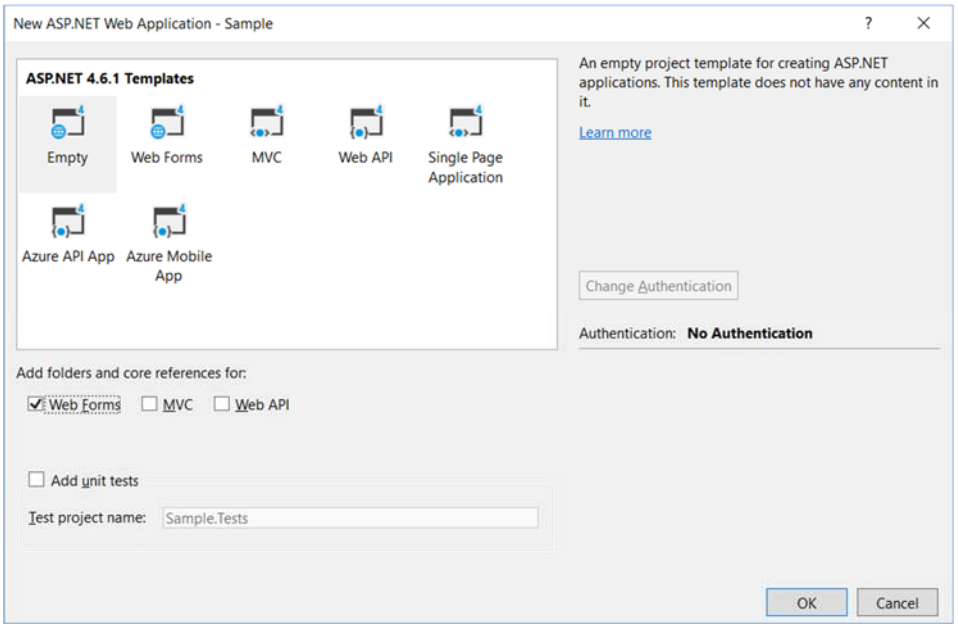

Login Properties - Tester
Select a page
General
Server Roles
User Mapping
Securables
Status
Script
Help
Users mapped to this login:
Map
Database
User
Default Schema
Movie3
NORTHWND
Northwind
ReportServer$SQL2016
ReportServer$SQL20...
Sample3
Tester
dbo
master
model
msdb
tempdb
Guest account enabled for: Sample
Database role membership for: Sample
db_accessadmin
db_backupoperator
db_datareader
db_datawriter
db_ddladmin
db_denydatareader
db_denydatawriter
db_owner
db_securityadmin
public
Connection
Server:
N550JKL\SQL2016
Connection:
N550JKL\lpmpl
View connection properties
Progress
Ready
OK
Cancel

# 7.2. Create Web Application

Do **not** Execute
--Clean up
in previous section

New Project --> Web --> ASP.NET Web Application (.Net Framework)
-->
Name:
Sample
--> Web Forms --> OK




# 8. Code

# 8.1. Web.config

Add connection String

Web.config | WebForm1.aspx.cs | WebForm1.aspx

```
<?xml version="1.0" encoding="utf-8"?>
<!--
  For more information on how to configure your ASP.NET application, please visit
  https://go.microsoft.com/fwlink/?LinkId=169433
  -->
<configuration>
  <connectionStrings>
    <add name="Sample3ConnectionString" connectionString="Data Source=N550JKL\SQL2016;Initial Catalog=Sample3;User
        providerName="System.Data.SqlClient" />
  </connectionStrings>
  <system.web>
    <compilation debug="true" targetFramework="4.6.1"/>
    <httpRuntime targetFramework="4.6.1"/>
  </system.web>
  <system.codedom>
    <compilers>
      <compiler language="c#;cs;csharp" extension=".cs"
        type="Microsoft.CodeDom.Providers.DotNetCompilerPlatform.CSharpCodeProvider, Microsoft.CodeDom.Providers.D
        warningLevel="4" compilerOptions="/langversion:6 /nowarn:1659;1699;1701"/>
      <compiler language="vb;vbs;visualbasic;vbscript" extension=".vb"
        type="Microsoft.CodeDom.Providers.DotNetCompilerPlatform.VBCodeProvider, Microsoft.CodeDom.Providers.DotNe
        warningLevel="4" compilerOptions="/langversion:14 /nowarn:41008 /define:_MYTYPE=\&quot;Web\&quot; /optionI
    </compilers>
  </system.codedom>
</configuration>
```

```
<configuration>
  <connectionStrings>
    <add name="SampleConnectionString" connectionString="Data Source=N550JKL\SQL2016;Initial
Catalog=Sample;User ID=Tester;Password=1234"
        providerName="System.Data.SqlClient" />
  </connectionStrings>
```

.....

# 8.2. WebForm1.aspx

This form will use spSearchGamer

```
<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="WebForm1.aspx.cs" Inherits="Sample.WebForm1" %>
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">;
<head runat="server">
    <title>Web Search</title>
</head>
<body>
    <form id="form1" runat="server">
        <div>
            <h3>Employee Search Form</h3>
            <div>
                <label for="inputFirstname">
                    Firstname
                </label>
                <input type="text" runat="server"
                    id="inputFirstname" />
```

```
            </div>
            <div>
                <label for="inputLastname">
                    Lastname
                </label>
                <input type="text" runat="server" id="inputLastname" />
            </div>
            <div>
                <label for="inputGender">
                    Gender
                </label>
                <input type="text" runat="server"
                    id="inputGender" />
            </div>
            <div>
                <label for="inputGameScoreGreaterThanOrEqual">
                    GameScore >=
                </label>
                <input type="number" runat="server"
                    id="inputGameScoreGreaterThanOrEqual" />
            </div>
            <div>
                <asp:Button ID="btnSearch" runat="server" Text="Search"
                    OnClick="btnSearch_Click" />
            </div>
        </div>
        <div>
            <h3>Search Results</h3>
            <div>
                <asp:GridView
                    ID="gvResults" runat="server">
                </asp:GridView>
            </div>
        </div>
    </form>
</body>
</html>
```

## 8.3. WebForm1.aspx.cs

### This form will use spSearchGamer

```
using System;
using System.Configuration;
using System.Data;
using System.Data.SqlClient;
using System.Web.UI;
namespace Sample
{
    public partial class WebForm1 : Page
    {
        protected void Page_Load(object sender, EventArgs e)
        {
```

```
        }
        protected void btnSearch_Click(object sender, EventArgs e)
        {
            string connectionStr = ConfigurationManager
                .ConnectionStrings["SampleConnectionString"].ConnectionString;
            using (var con = new SqlConnection(connectionStr))
            {
                var cmd = new SqlCommand();
                cmd.Connection = con;
                cmd.CommandText = "spSearchGamer";
                cmd.CommandType = CommandType.StoredProcedure;
                if (inputFirstname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@FirstName", inputFirstname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputLastname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@LastName", inputLastname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputGender.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@Gender", inputGender.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputGameScoreGreaterThanOrEqual.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@GameScoreGreaterThanOrEqual", inputGameScoreGreaterThanOrEqual.Value);
                    cmd.Parameters.Add(param);
                }
                con.Open();
                SqlDataReader rdr = cmd.ExecuteReader();
                gvResults.DataSource = rdr;
                gvResults.DataBind();
            }
        }
    }
}
```

# 8.4. WebForm2.aspx

## This form will use spSearchGamer2

```
<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="WebForm2.aspx.cs" Inherits="Sample.WebForm2" %>
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">;
<head runat="server">
    <title>Web Search</title>
```

```
</head>
<body>
    <form id="form1" runat="server">
        <div>
            <h3>Employee Search Form</h3>
            <div>
                <label for="inputFirstname">
                    Firstname
                </label>
                <input type="text" runat="server"
                    id="inputFirstname" />
            </div>
            <div>
                <label for="inputLastname">
                    Lastname
                </label>
                <input type="text" runat="server" id="inputLastname" />
            </div>
            <div>
                <label for="inputGender">
                    Gender
                </label>
                <input type="text" runat="server"
                    id="inputGender" />
            </div>
            <div>
                <label for="inputGameScoreGreaterThanOrEqual">
                    GameScore >=
                </label>
                <input type="number" runat="server"
                    id="inputGameScoreGreaterThanOrEqual" />
            </div>
            <div>
                <asp:Button ID="btnSearch" runat="server" Text="Search"
                    OnClick="btnSearch_Click" />
            </div>
        </div>
        <div>
            <h3>Search Results</h3>
            <div>
                <asp:GridView
                    ID="gvResults" runat="server">
                </asp:GridView>
            </div>
        </div>
    </form>
</body>
</html>
```

# 8.5. WebForm2.aspx.cs

# This form will use spSearchGamer2

```
using System;
using System.Configuration;
using System.Data;
using System.Data.SqlClient;
using System.Web.UI;
namespace Sample
{
    public partial class WebForm2 : Page
    {
        protected void Page_Load(object sender, EventArgs e)
        {
        }
        protected void btnSearch_Click(object sender, EventArgs e)
        {
            string connectionStr = ConfigurationManager
                .ConnectionStrings["SampleConnectionString"].ConnectionString;
            using (var con = new SqlConnection(connectionStr))
            {
                var cmd = new SqlCommand();
                cmd.Connection = con;
                cmd.CommandText = "spSearchGamer2";
                cmd.CommandType = CommandType.StoredProcedure;
                if (inputFirstname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@FirstName", inputFirstname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputLastname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@LastName", inputLastname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputGender.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@Gender", inputGender.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputGameScoreGreaterThanOrEqual.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@GameScoreGreaterThanOrEqual", inputGameScoreGreaterThanOrEqual.Value);
                    cmd.Parameters.Add(param);
                }
                con.Open();
                SqlDataReader rdr = cmd.ExecuteReader();
                gvResults.DataSource = rdr;
                gvResults.DataBind();
            }
        }
    }
}
```

# 8.6. WebForm3.aspx

This form will use spSearchGamer3

```
<%@ Page Language="C#" AutoEventWireup="true" CodeBehind="WebForm3.aspx.cs" Inherits="Sample.WebForm3" %>
<!DOCTYPE html>
<html xmlns="http://www.w3.org/1999/xhtml">;
<head runat="server">
    <title>Web Search</title>
</head>
<body>
    <form id="form1" runat="server">
        <div>
            <h3>Employee Search Form</h3>
            <div>
                <label for="inputFirstname">
                    Firstname
                </label>
                <input type="text" runat="server"
                    id="inputFirstname" />
            </div>
            <div>
                <label for="inputLastname">
                    Lastname
                </label>
                <input type="text" runat="server" id="inputLastname" />
            </div>
            <div>
                <label for="inputGender">
                    Gender
                </label>
                <input type="text" runat="server"
                    id="inputGender" />
            </div>
            <div>
                <label for="inputGameScoreGreaterThanOrEqual">
                    GameScore >=
                </label>
                <input type="number" runat="server"
                    id="inputGameScoreGreaterThanOrEqual" />
            </div>
            <div>
                <asp:Button ID="btnSearch" runat="server" Text="Search"
                    OnClick="btnSearch_Click" />
            </div>
        </div>
        <div>
```

```
            <h3>Search Results</h3>
            <div>
                <asp:GridView
                    ID="gvResults" runat="server">
                </asp:GridView>
            </div>
        </div>
    </form>
</body>
</html>
```

# 8.7. WebForm3.aspx.cs

## This form will use spSearchGamer3

```
using System;
using System.Configuration;
using System.Data;
using System.Data.SqlClient;
using System.Web.UI;
namespace Sample
{
    public partial class WebForm2 : Page
    {
        protected void Page_Load(object sender, EventArgs e)
        {
        }
        protected void btnSearch_Click(object sender, EventArgs e)
        {
            string connectionStr = ConfigurationManager
                .ConnectionStrings["SampleConnectionString"].ConnectionString;
            using (var con = new SqlConnection(connectionStr))
            {
                var cmd = new SqlCommand();
                cmd.Connection = con;
                cmd.CommandText = "spSearchGamer3";
                cmd.CommandType = CommandType.StoredProcedure;
                if (inputFirstname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@FirstName", inputFirstname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputLastname.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@LastName", inputLastname.Value);
                    cmd.Parameters.Add(param);
                }
                if (inputGender.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@Gender", inputGender.Value);
```

```
                    cmd.Parameters.Add(param);
                }
                if (inputGameScoreGreaterThanOrEqual.Value.Trim() != "")
                {
                    var param = new SqlParameter
                        ("@GameScoreGreaterThanOrEqual", inputGameScoreGreaterThanOrEqual.Value);
                    cmd.Parameters.Add(param);
                }
                con.Open();
                SqlDataReader rdr = cmd.ExecuteReader();
                gvResults.DataSource = rdr;
                gvResults.DataBind();
            }
        }
    }
}
```

# 9. Test it

## 9.1. WebForm1.aspx, WebForm1.aspx.cs, spSearchGamer

**Employee Search Form**

Firstname
Lastname Y
Gender
GameScore >=
Search

**Search Results**

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

### Employee Search Form

Firstname
Lastname Y
Gender Male
GameScore >=
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

### Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >=
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

## Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >= 5000
Search

## Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

Test SQL Injection
In any field, type in
**';DROP TABLE dbo.Table1; --**

This form is using spSearchGamer which is not using dynamic sql query.
Thus, the form has no sql injection issue.

## 9.2. WebForm2.aspx, WebForm2.aspx.cs, spSearchGamer2

**Employee Search Form**

Firstname
Lastname Y
Gender
GameScore >=
Search

**Search Results**

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

**Employee Search Form**

Firstname
Lastname Y
Gender Male
GameScore >=
Search

**Search Results**

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

### Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >=
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

### Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >= 5000
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

Test SQL Injection
In any field, type in
**';DROP TABLE dbo.Table1; --**

This form is using **spSearchGamer2** which is using dynamic sql query.

```
EXECUTE spSearchGamer2 @Gender = N'''; DROP TABLE dbo.Table1; --';
SELECT  *
FROM    Table1;
GO -- Run the previous command and begins new batch
/*
**SQL Injection
The Table1 will be dropped.
*/
```

**spSearchGamer2** has sql injection issue during the test in SQL server
But when we are using web form application
In any field, type in
**';DROP TABLE dbo.Table1; --**

The **dbo.Table1** will be dropped.

**Employee Search Form**

Firstname
Lastname ';DROP TABLE dbo.Tabl
Gender
GameScore >=
Search

**Search Results**

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 1 | AFirst01 | XLast01 | Female | 3500 |
| 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 5 | BFirst05 | ZLast05 | Female | 2000 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

## 9.3. WebForm3.aspx, WebForm3.aspx.cs, spSearchGamer3

**Employee Search Form**

Firstname
Lastname Y
Gender
GameScore >=
Search

**Search Results**

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 2 | AFirst02 | YLast02 | Female | 4000 |
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

### Employee Search Form

Firstname
Lastname Y
Gender Male
GameScore >=
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |
| 6 | CFirst06 | YLast06 | Male | 4320 |
| 7 | CFirst07 | YLast07 | Male | 4400 |

---

### Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >=
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 3 | BFirst03 | YLast03 | Male | 4600 |
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

### Employee Search Form

Firstname B
Lastname Y
Gender Male
GameScore >= 5000
Search

### Search Results

| Id | FirstName | LastName | Gender | GameScore |
|---|---|---|---|---|
| 4 | BFirst04 | YLast04 | Male | 5400 |

---

Test SQL Injection
In any field, type in
**';DROP TABLE dbo.Table1; --**

This form is using **spSearchGamer3** which is using **dynamic sql** query **with parameters**.
Thus, the form has no sql injection issue.

==========

# 10. Clean up

```
--=====================================================================
--T040_07_Clean up
--=====================================================================
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Gamer' ) )
    BEGIN
        TRUNCATE TABLE dbo.Gamer;
        DROP TABLE Gamer;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE      TABLE_NAME = 'Table1' ) )
    BEGIN
        TRUNCATE TABLE dbo.Table1;
        DROP TABLE Table1;
    END;
GO -- Run the previous command and begins new batch
-------------------------------------------------------------------
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE      ROUTINE_TYPE = 'PROCEDURE'
                         AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                         AND SPECIFIC_NAME = 'spSearchGamer' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE      ROUTINE_TYPE = 'PROCEDURE'
                         AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                         AND SPECIFIC_NAME = 'spSearchGamer2' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer2;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
```

```
            FROM      INFORMATION_SCHEMA.ROUTINES
            WHERE      ROUTINE_TYPE = 'PROCEDURE'
                       AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                       AND SPECIFIC_NAME = 'spSearchGamer3' ) )
    BEGIN
        DROP PROCEDURE spSearchGamer3;
    END;
GO -- Run the previous command and begins new batch
```