Consider the following schema for different examples quoted below:

A Tutorial on Stored procedures and user defined functions
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Stored Procedure

A stored procedure is a procedure or a piece of SQL code that is physically stored in the database and it can be executed (like query) again and again for different purposes. It can be as simple as simple SQL selection query and as complex as doing multiple tasks (insertion, selection, joins, deletion) at the same time. Moreover, a stored procedure is precompiled as well.

Syntax:

```sql
CREATE PROCEDURE dbo.StoredProcedureName
/*
   @parameter1 datatype = default value,
```
Example 1:

Create PROCEDURE dbo.GetAllEmployees
As
Select * from Employee

Execution query:
exec GetAllEmployees

Example 2:

ALTER PROCEDURE dbo.GetEmployee
@empid int
As
Select * from Employee where Employee.EmployeeID=@empid

Execution Query:
exec dbo.GetEmployee 1

Example 3:

Create PROCEDURE dbo.UpdateEmpNationalID
(
@empid int
, @newcontactid int
, @oldcontactno int OUTPUT
)
As
```sql
Select @oldcontactno=[ContactID]
FROM [dbo].[Employee] where [Employee].EmployeeID=@empid

if(@oldcontactno=@newcontactid)
begin
  RETURN 0
end
else begin
  update Employee set ContactID=@newcontactid where Employee.EmployeeID=@empid
  return 1
end
```

**Execution Query:**

```sql
Declare @oldcontactno int
Declare @returnvalue int
exec @returnvalue=UpdateEmpNationalID 1,123,@oldcontactno output

Select @oldcontactno 'Old Contact'
Select @returnvalue 'Returned value'
```

**User Defined Functions (UDFs)**

User defined functions are routines that encapsulates SQL logic inside it. Like stored procedures User defined functions can also be passed input parameters but user defined functions are compiled and executed at runtime so pretty slower than stored procedures.

**Syntax:**

```sql
CREATE FUNCTION dbo.Function
(
  /*
   @parameter1 datatype = default value,
   @parameter2 datatype
   */
)
RETURNS /* datatype */
AS
```
Certain limitations for User defined functions:

i) UDF can’t perform DML (data manipulation language) operations like Insertion, Update and Deletion on the base table.

ii) UDF can’t return non deterministic values like GETDATE () etc.

iii) Stored procedure can’t be called from inside a UDF whereas a stored procedure can call a user defined function or another stored procedure inside it.

There are three types of user defined functions:

1) **Scalar Functions** (returns a single value)

Example:

```sql
CREATE FUNCTION EmployeeContactID(@Empid int) 
RETURNS int 
AS 
BEGIN 
Declare @returnvalue int 
Select @returnvalue=Employee.ContactID from Employee where Employee.EmployeeID=@Empid 
RETURN @returnvalue 
END
```

**Execution:**

```sql
select dbo.EmployeeContactID(1)
```

2) **Inline Functions** (returns a table)

Example:

```sql
CREATE FUNCTION dbo.GetEmployeeFunction(@empid int) 
RETURNS TABLE 
AS 
RETURN SELECT * 
FROM employee where employee.EmployeeID=@empid
```

**Execution:**

```sql
select * from dbo.GetEmployeeFunction(1)
```
3) **Table valued Functions (multiple operations, complex logic just like Stored procedures)**

Example:

```sql
CREATE FUNCTION dbo.multi_test(@empid int)
RETURNS @Result TABLE
(
    name varchar(20)
)
AS
BEGIN
    INSERT INTO @Result
    (name)
    SELECT [name] from employee where EmployeeID=1

    UPDATE @Result
    SET name = 'N'

    RETURN
END
```

Execution:

```
Select * from dbo.multi_test(1)
```

**Difference between Stored procedures and User defined functions:**

i) A stored procedure is pre compiled while a User defined function is compiled and executed at runtime.

ii) A Stored procedure is more flexible than user defined function like you can write complex logic (for example exceptional handling using try catch block is possible in stored procedures which is not possible in user defined functions)

iii) A stored procedure can call another stored procedure or user defined function inside it but a user defined function can’t call stored procedure inside it.

iv) A stored procedure can return non deterministic values but a user defined function can’t return a non deterministic values like Get Date () function.

v) A user defined functions does not support DML operations like insertion, deletion and update on the base table but it is possible via stored procedure.

vi) A user defined function is easier to execute and can be used inside selection and even for joins but stored procedure can’t be used inside selection queries and it can’t be used to join with other tables.
Some Comparisons with Views

If you think of view than a question might arise in your mind why don’t we use views instead of stored procedures or user defined functions for basic SQL selection queries. Answer is flexibility. You can’t pass parameters to views for selection of filtered queries but stored procedures and user defined functions provide you this feature.

Similarly Multiple DML operations are restricted in views which are possible through stored procedures and user defined functions.