



SQL Server: Concatenate Multiple Rows Into Single String

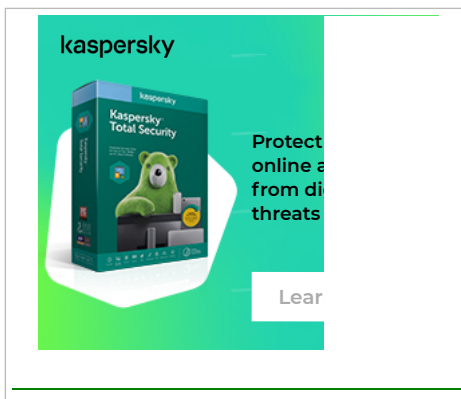
Beaulin Twinkle SQL Server Published Jan 6, 2017 Updated Feb 13, 2019 10 Comments



I came across a situation where I have to concatenate multiple rows (a column) into single string of text for reporting purpose. There are multiple ways to concatenate rows into string. Now we will see a couple of the easiest techniques here.

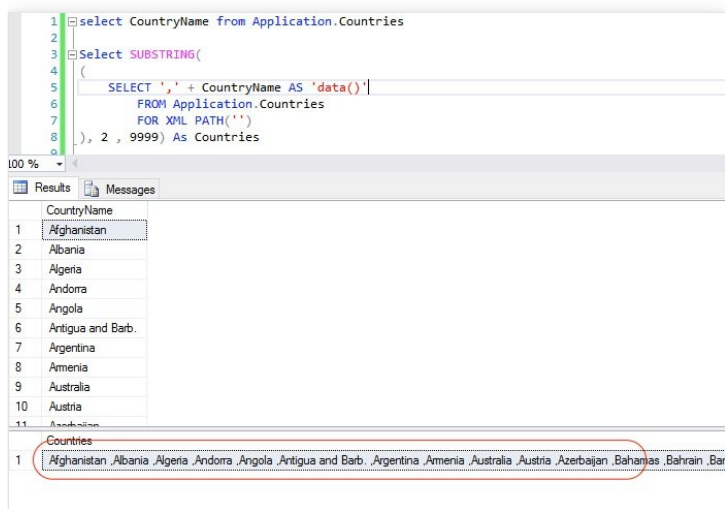
1. Concatenate Multiple Rows Using FOR XML PATH

The simplest and straight forward way to concatenate rows into a string value is to use **FOR XML PATH** in a select query. This FOR XML PATH method can be used in SQL Server version 2005 and higher.



In the below sample query, I've concatenated multiple rows of the column "CountryName" to a single string and added a comma between the country names. Then using a substring function, I'm removing the leading comma.

```
1 Select CountryName from Application.Countries;
2
3 Select SUBSTRING(
4 (
5     SELECT ',' + CountryName AS 'data()'
6     FROM Application.Countries FOR XML PATH('')
7 ), 2 , 9999) As Countries
```



NOTE: If you notice the result produced by this method, there is a space added after every country name. This is because of the path specified as column name is "data()". Once the path specified as data(), the value is treated as an atomic value and a space char is added to the XML.

If you don't need the trailing space and just want a comma along as a separator, then remove the "data()" part. An example query without data() part is below.

```
1 SELECT Countries = STUFF((
2     SELECT ',' + CountryName
3     FROM Application.Countries
4     FOR XML PATH('')
5     ), 1, 1, '')
```

2. Concatenate Rows Using COALESCE

You can concatenate rows into single string using COALESCE method. This COALESCE method can be used in SQL Server version 2008 and higher. All you have to do is, declare a varchar variable and inside the coalesce, concat the variable with comma and the column, then assign the COALESCE to the variable.

In this method, you don't need to worry about the trailing comma. You may need a stored procedure or a function to do this operation and get the concatenated string value.

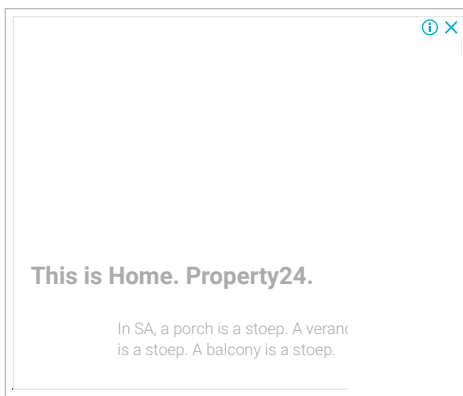
```
1 Select CountryName from Application.Countries
2
3 Declare @val Varchar(MAX);
4 Select @val = COALESCE(@val + ', ' + CountryName, CountryName)
5 From Application.Countries Select @val;
```

3. Using STRING_AGG

The STRING_AGG is a string function which will simplify the concatenation of rows. STRING_AGG is designed for this purpose.

Unfortunately it will be available in the feature release of SQL Server. **This new function is available from SQL Server 2017 onwards.**

The syntax for using STRING_AGG is as below. Read [more about using STRING_AGG here](#).



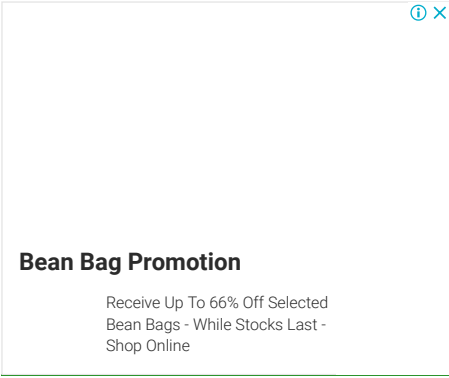
```
1 SELECT STRING_AGG( ISNULL(CountryName, ' '), ',') As Countries
2 From Application.Countries
```

Reference

- Documentation of COALESCE at [msdn](#).
- Documentation of STRING_AGG at [msdn](#).



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Sanket Patel
Jun 14, 2019 at 2:34 pm

Hi Beaulin Twinkle,

Thanks nice article. very helpful to resolve my problem..

Thanks.

Sanket Patel

Reply

Beaulin Twinkle
Jun 14, 2019 at 3:12 pm

Hi Sanket Patel,

Happy to know that it is helpful to you.

Reply

bart

Jan 30, 2019 at 9:38 pm

In example1 there is a space after every country name. How do you get rid of that space (where does it come from)

Reply

Beaulin Twinkle

Feb 13, 2019 at 6:21 pm

Hi Bart,

The space is because of using data(). If the path specified as column name is "data()", the value is treated as an atomic value in the generated XML. A space character is added to the XML if the next item in the serialization is also an atomic value. ([https://docs.microsoft.com/en-us/previous-versions/sql/sql-server-2005/ms189885\(v=sql.90\)#columns-names-with-the-path-specified-as-data](https://docs.microsoft.com/en-us/previous-versions/sql/sql-server-2005/ms189885(v=sql.90)#columns-names-with-the-path-specified-as-data)).

If you don't want the space, you can ignore data() and rewrite the query as:

```
SELECT Countries = STUFF((
SELECT ',' + CountryName
FROM Application.Countries
FOR XML PATH("")
), 1, 1, "")
```

Reply

Erik

Jun 14, 2018 at 9:24 pm

Another option for row concatenation within categories, by using a correlated sub-query you can achieve similar levels of flexibility with a lot less code.

```
SELECT DISTINCT STUFF(
(SELECT ',' + val AS 'data()'
FROM @t i
WHERE i.categ = o.categ
FOR XML PATH ("") ), 1, 1, ""),
categ
FROM @t o;
```

Reply

Beaulin Twinkle

Jun 14, 2018 at 11:29 pm

Thank you Erik,
Your method is short and works great. Thanks.

Reply

Cristinel Boboc

Feb 20, 2018 at 1:22 pm

Here is another idea about how you can achieve the same using recursive CTE. Is very flexible and can be enhanced thoroughly, but I want to show only the proof of concept

```
DECLARE @t TABLE(id INT PRIMARY KEY, val VARCHAR(MAX), categ INT)
```

```
INSERT INTO @t VALUES
```

```
(1, 'abc', 1),  
(2, 'def', 1),  
(3, 'ghi', 1),  
(4, 'xyz', 2),  
(5, 'stu', 2),  
(6, 'prq', 2);
```

```
WITH a AS
```

```
(SELECT row_number() OVER (PARTITION BY categ ORDER BY id ASC) rn_a,  
row_number() OVER (PARTITION BY categ ORDER BY id DESC) rn_d,  
id,
```

```
CAST(val AS VARCHAR(MAX)) val,
```

```
categ,
```

```
@@ROWCOUNT rn_c
```

```
FROM @t
```

```
),
```

```
b AS
```

```
(SELECT * FROM a WHERE rn_a = 1
```

```
UNION ALL
```

```
SELECT a.rn_a, a.rn_d, b.id, CAST(CONCAT(b.val, ' ', a.val) AS VARCHAR(MAX)), b.categ, @@ROWCOUNT rn_c
```

```
FROM a JOIN b ON a.rn_a = b.rn_a + 1 AND a.categ = b.categ
```

```
)
```

```
SELECT * FROM b WHERE rn_d = 1
```

[Reply](#)

Beaulin Twinkle

Feb 20, 2018 at 8:57 pm

Hi Cristinel Boboc,

Good Idea. It works great and it's flexible. Thank you for sharing.

[Reply](#)

Jo

Dec 18, 2017 at 2:42 pm

Hi, this is great. My doubt would be, what if we would like to have some 2 columns grouped? Say on this example, you would have another column with the continent and then the xml string with the countries within that group, can that be done using this function?

Thanks

[Reply](#)

Beaulin Twinkle

Dec 20, 2017 at 4:42 pm

Hi Jo,

You can concatenate based on groups using STRING_AGG like this

```
SELECT
```

```
Continents,
```

```
STRING_AGG(Countries, ',')
```

```
WITHIN GROUP (ORDER BY Countries DESC) As AllCustomers
```

```
FROM TableContinents
```

```
GROUP BY Continents
```

[GO](#)[Read more about STRING_AGG and grouping here.](#)[Reply](#)

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