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SQL SERVER – MAXDOP Settings to Limit Query to Run on Specific CPU

March 15, 2010 by pinaldave

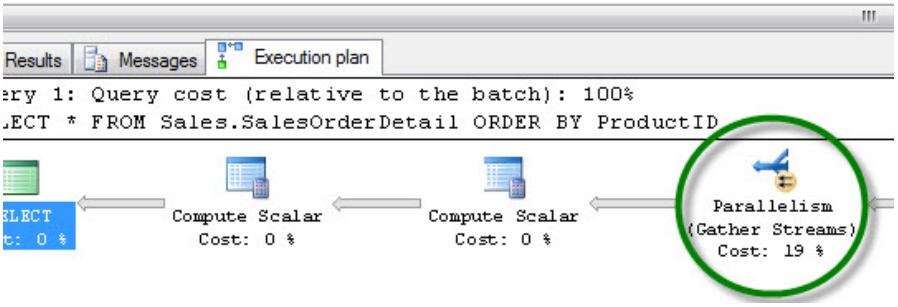
This is very simple and known tip. Query Hint MAXDOP – Maximum Degree Of Parallelism can be set to restrict query to run on a certain CPU. Please note that this query cannot restrict or dictate which CPU to be used, but for sure, it restricts the usage of number of CPUs in a single batch.

Let us consider the following example of this query.

The following query usually runs on multicore on a dual core machine (please note it may not be the case with your machine).

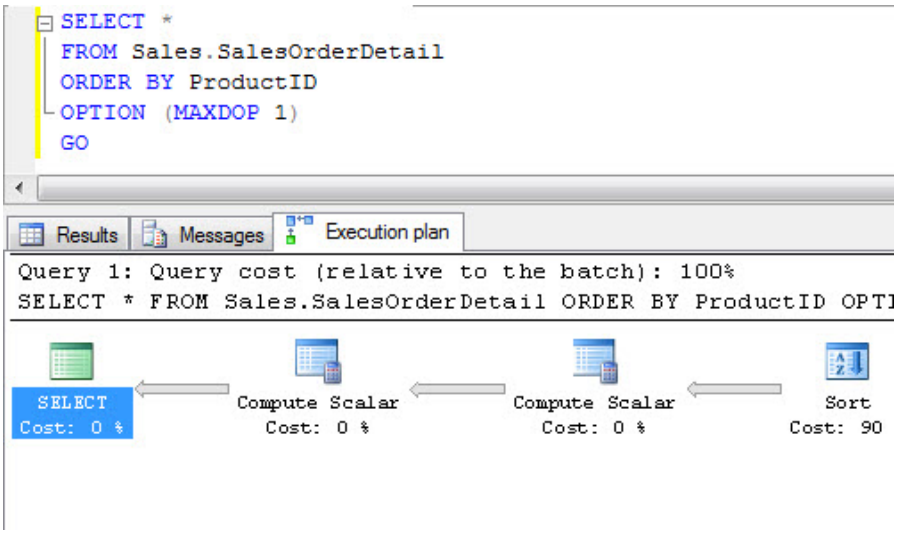
```
USE AdventureWorks
GO
SELECT *
FROM Sales.SalesOrderDetail
ORDER BY ProductID
GO
```

```
USE AdventureWorks
GO
SELECT *
FROM Sales.SalesOrderDetail
ORDER BY ProductID
GO
```



Now the same query can be ran on a single core with the usage of MAXDOP query hint. Let us see the query for the same.

```
USE AdventureWorks
GO
SELECT *
FROM Sales.SalesOrderDetail
ORDER BY ProductID
OPTION (MAXDOP 1)
GO
```



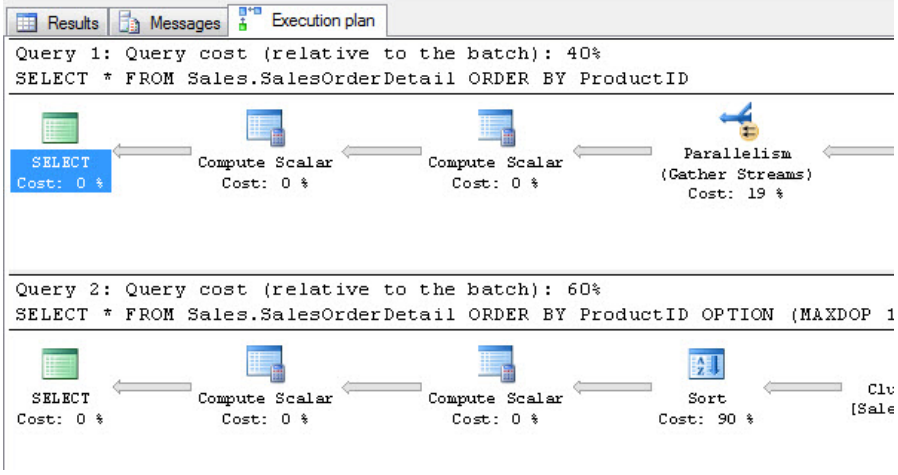
Execution plan for the query with query hint of maxdop (1) does not have parallelism operator in it. This way we can remove the parallelism using MAXDOP.

However, before playing with this query hint, please make sure that you check your performance using an execution plan. It is quite possible that the performance of Query with MAXDOP as query hint may be quite degraded when compared to the original performance. You should be very careful with this hint.

Let us compare in our case what is the performance difference between the two above queries. The difference between those two queries is only the query hint of MAXDOP.

```
USE AdventureWorks
GO
SELECT *
FROM Sales.SalesOrderDetail
ORDER BY ProductID
GO

SELECT *
FROM Sales.SalesOrderDetail
ORDER BY ProductID
OPTION (MAXDOP 1)
GO
```



In our example, we got degraded performance as we restricted our query on a single CPU. This is not necessary in the case of all the queries. MAXDOP may improve or reduce performance, test your query out.

I have now one question for all readers. Do you use this query hint? If you do use it, then what is the purpose of the same. Please leave a comment here.

Reference : **Pinal Dave (http://blog.SQLAuthority.com)**

Server, SQL Tips and Tricks, SQLServer, T SQL, Technology | Tagged MAXDOP | 17 Comments

17 Responses

1. *on March 15, 2010 at 11:50 am | Reply*  *Feodor Georgiev*

   Pinal, I use this query hint only for debugging in order to compare performance of 2 queries.
   I your post you forgot to mention that there is a global configuration setting for SQL Server which manages parallelism on the entire server. General rule is, that for the OLTP databases parallelism can seriously degrade performance, hence it is most likely better to turn it off.
   Here is a script on how to do this: http://feodorgeorgiev.com/blog/2010/03/how-to-disable-parallelism-on-your-sql-server/

   - *on March 15, 2010 at 4:36 pm | Reply*  *Paresh Prajapati*

     Hi Feodor ,

     It is better if we use hint for the parallelism instead of general setting. Because we require it sometime for the query and sometime not requite.

2. *on March 15, 2010 at 10:49 pm | Reply*  *andrewhogg*

   On an OLTP server where the MaxDop server setting is at 1, I use the hint on any large index creation or large data query that would benefit.

   Overriding it upwards like this is rare to see, but has some very good scenarios in which I would want to do it – in a high end transactional environment, and online index operation has the ability to get out of hand and runaway as new data is coming in and existing data is changing, whilst a single thread is trying to put together a new index. Overriding it upwards so that it has more threads allocated brings it under control.

3. *on March 16, 2010 at 10:19 am | Reply*  *Chintak Chhapia*

   Yes, I have experienced that by setting off parallelism by MAXDOP =1 or by setting max degree of parallelism to 1, generally on development and QA environments where we have less amount of RAM, we are getting measurable performance improvement.

   Also, before setting this off we used to have too mach wait for CXPACKET wait type, but after setting parallelism off we are not getting wait for this wait type. This is applicable to DEV and QA environments having less then 3/4 GB ram.

4. *on April 7, 2010 at 5:26 am | Reply*  *Mike G.*

   The MAXDOP hint becomes very useful when working with large datasets. For some reason, running certain queries referencing large datasets performs better when the query is restricted to 1 processor than when allowed to use them all. The question is WHY?

   I have not found a solid explanation for this behavior. I would be very interested to know WHY it's works

if anyone has found such an explanation.

5. *on June 2, 2010 at 9:39 pm | Reply*  *N Dog*

   I use MAXDROP because I currently have no testing environment. Server performance drops when running large queries. So I restrict the query to 1 processor, allowing the other processor to handle the end user's day to day tasks.

   I know it isn't how it is meant to be used but it certainly is a decent workaround.

6. *on September 1, 2010 at 5:31 am | Reply*  *Savita*

   I recently came accros an issue with one of UPDATE statement that was using JOIN before updating data. But, for large amout of data, this was giving me following error:

   Transaction (Process ID 62) was deadlocked on lock | communication buffer resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

   I added Option(MaxDOP 1) query hint to my update query and that solved issue.

   - *on November 13, 2010 at 7:36 pm | Reply* *Aivars*

     Hi Savita,
     I think setting MAXDOP=1 has nothing to do with solving deadlock problems.

     - *on December 30, 2010 at 12:17 pm | Reply* *yaushin*

       Hi, Aivars
       Do you have better solution/suggestion?
       Thank you

     - *on May 6, 2011 at 7:28 pm | Reply*  *Prashant Chaudhari*

       I know the thread is pretty old, but I also faced a similar problem recently where I was consistently getting "Transaction (Process ID ??) was deadlocked on communication buffer resources with another process and has been chosen as the deadlock victim" with a complex Select query on a huge database. Using the MAXDOP=1 option resolved the issue, though I don;t know how or why.

7. *on December 21, 2010 at 5:11 pm | Reply*  *Ramdas*

   how to Force a Parallel Plan

8. *on February 16, 2011 at 9:23 am | Reply*  *Maurice*

   Well, I have had the same problem with parallel queries when making updates.

   I get the message Transaction (Process ID 62) was deadlocked on lock | communication buffer resources with another process and has been chosen as the deadlock victim. Rerun the transaction.

   If I set MAXDOP to 1, the problem gets solved

9. *on July 17, 2011 at 10:18 pm | Reply*  *Mike*

   According to SQL Books online, MAXDOP = 1 is: “Suppresses parallel generation. The operation will be executed serially.”
   This is why in above example, the query got degraded performance.

10. *on September 29, 2011 at 5:56 am | Reply*  *David Hardin*

    I just posted an article to my blog on MSDN called “SQL Server Parallelism-The Dark Side” in which my single threaded, 18 seconds query takes over 60 seconds with parallelism:

    http://blogs.msdn.com/b/davidhardin/archive/2011/09/28/sql-server-parallelism-the-dark-side.aspx

    - *on September 29, 2011 at 6:07 am | Reply*  *pinaldave*

      Thank you David,

      Very interesting read.

11. *on October 19, 2011 at 9:24 pm | Reply*  *RingoSchplingo*

    Over a reasonably large table (~300M rows) I was trying to determine which values in a column which were causing RI violations when I was trying to apply an FK to that column.

    I used a NOT EXISTS approach to find these but the query seemed to be taking an inordinate amount of time, I suspected blocking and so checked the output of SP_WHO2, sure enough blocking was happening to the SPID that was running the query – but the blocking SPID was itself!

    Clearly the parrallel operation was getting under it’s own feet, perhaps I could have used the WITH (NOLOCK) hint to avoid this (dirty reads were’nt an issue for this type of query), but decided instead to use MAXDOP. Sure enough next time round, only one instance of the query’s SPID listed by SP_WHO2, no blocking (of itself!) and the query came back much quicker.

    - *on December 15, 2011 at 8:06 am | Reply*  *Allen McGuire*

@Ringo – that was not a SPID blocking itself; rather it was threads waiting on each other to complete before having the results are reassembled. So basically your query/statement is only as fast as the slowest thread. If the optimizer lost its mind because you have outdated statistics or fragmented tables/indexes, then you may find issues with parallelism.

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Pinal Dave is a Microsoft Technology Evangelist (Database and BI). He has written over 1900 articles on the subject on his blog at http://blog.sqlauthority.com. Along with 8+ years of hands on experience he holds a Masters of Science degree and a number of certifications, including MCTS, MCDBA and MCAD (.NET). He is co-author of three SQL Server books - SQL Server Programming, SQL Wait Stats and SQL Server Interview Questions and Answers. Prior to joining Microsoft he was awarded Microsoft MVP award for three continuous years for his contribution in community.

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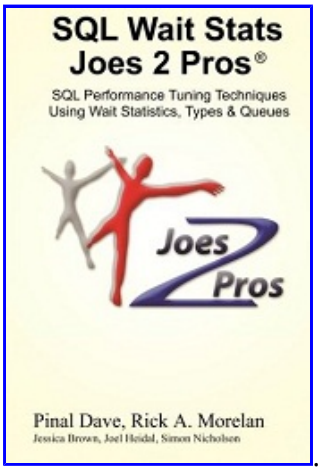

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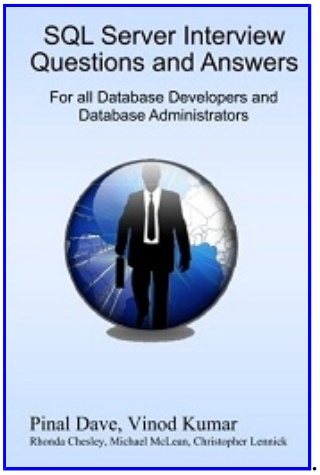

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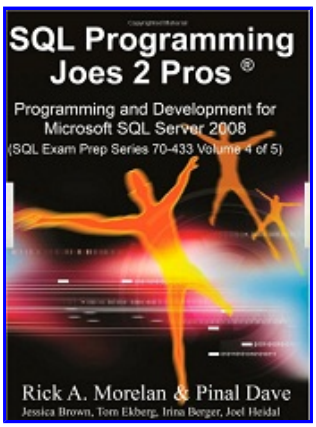

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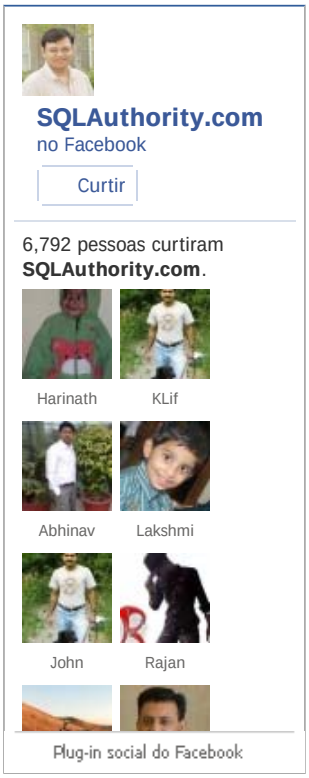

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programs she uses and embraces Windows Live most because she can do lots of things with ease – from photo management to movies; business emails to personal social media connections.

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