

**Improving .NET Application Performance and Scalability**

J.D. Meier, Srinath Vasireddy, Ashish Babbar, and Alex Mackman  
Microsoft Corporation

May 2004

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**How to Use This Checklist**

This checklist is a companion to Chapter 14, "[Improving SQL Server Performance](http://msdn.microsoft.com/en-us/library/ff647793.aspx)"

**SQL: Scale Up vs. Scale Out**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Optimize the application before scaling up or scaling out. |
| Ff647681.checkbox(en-us,PandP.10).gif | Address historical and reporting data. |
| Ff647681.checkbox(en-us,PandP.10).gif | Scale up for most applications. |
| Ff647681.checkbox(en-us,PandP.10).gif | Scale out when scaling up does not suffice or is cost-prohibitive. |

**Schema**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Devote the appropriate resources to schema design. |
| Ff647681.checkbox(en-us,PandP.10).gif | Separate online analytical processing (OLAP) and online transaction processing (OLTP) workloads. |
| Ff647681.checkbox(en-us,PandP.10).gif | Normalize first, denormalize later for performance. |
| Ff647681.checkbox(en-us,PandP.10).gif | Define all primary keys and foreign key relationships. |
| Ff647681.checkbox(en-us,PandP.10).gif | Define all unique constraints and check constraints. |
| Ff647681.checkbox(en-us,PandP.10).gif | Choose the most appropriate data type. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use indexed views for denormalization. |
| Ff647681.checkbox(en-us,PandP.10).gif | Partition tables vertically and horizontally. |

**Queries**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Know the performance and scalability characteristics of queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Write correctly formed queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Return only the rows and columns needed. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid expensive operators such as NOT LIKE. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid explicit or implicit functions in WHERE clauses. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use locking and isolation level hints to minimize locking. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use stored procedures or parameterized queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Minimize cursor use. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid long actions in triggers. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use temporary tables and table variables appropriately. |
| Ff647681.checkbox(en-us,PandP.10).gif | Limit query and index hint use. |
| Ff647681.checkbox(en-us,PandP.10).gif | Fully qualify database objects. |

**Indexes**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Create indexes based on use. |
| Ff647681.checkbox(en-us,PandP.10).gif | Keep clustered index keys as small as possible. |
| Ff647681.checkbox(en-us,PandP.10).gif | Consider range data for clustered indexes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Create an index on all foreign keys. |
| Ff647681.checkbox(en-us,PandP.10).gif | Create highly selective indexes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Create a covering index for often-used, high-impact queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use multiple narrow indexes rather than a few wide indexes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Create composite indexes with the most restrictive column first. |
| Ff647681.checkbox(en-us,PandP.10).gif | Consider indexes on columns used in WHERE, ORDER BY, GROUP BY, and DISTINCT clauses. |
| Ff647681.checkbox(en-us,PandP.10).gif | Remove unused indexes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use the Index Tuning Wizard. |

**Transactions**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid long-running transactions. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid transactions that require user input to commit. |
| Ff647681.checkbox(en-us,PandP.10).gif | Access heavily used data at the end of the transaction. |
| Ff647681.checkbox(en-us,PandP.10).gif | Try to access resources in the same order. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use isolation level hints to minimize locking. |
| Ff647681.checkbox(en-us,PandP.10).gif | Ensure that explicit transactions commit or roll back. |

**Stored Procedures**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Use Set NOCOUNT ON in stored procedures. |
| Ff647681.checkbox(en-us,PandP.10).gif | Do not use the **sp\_prefix** for custom stored procedures. |

**Execution Plans**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Evaluate the query execution plan. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid table and index scans. |
| Ff647681.checkbox(en-us,PandP.10).gif | Evaluate hash joins. |
| Ff647681.checkbox(en-us,PandP.10).gif | Evaluate bookmarks. |
| Ff647681.checkbox(en-us,PandP.10).gif | Evaluate sorts and filters. |
| Ff647681.checkbox(en-us,PandP.10).gif | Compare actual versus estimated rows and executions. |

**Execution Plan Recompiles**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Use stored procedures or parameterized queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use **sp\_executesql** for dynamic code. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid interleaving data definition language (DDL) and data manipulation language (DML) in stored procedures, including the tempdb database DDL. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid cursors over temporary tables. |

**SQL XML**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid OPENXML over large XML documents. |
| Ff647681.checkbox(en-us,PandP.10).gif | Avoid large numbers of concurrent OPENXML statements over XML documents. |

**Tuning**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Use SQL Profiler to identify long-running queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Take note of small queries called often. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use **sp\_lock** and **sp\_who2** to evaluate locking and blocking. |
| Ff647681.checkbox(en-us,PandP.10).gif | Evaluate **waittype** and **waittime** in **master..sysprocesses**. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use DBCC OPENTRAN to locate long-running transactions. |

**Testing**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Ensure that your transactions logs do not fill up. |
| Ff647681.checkbox(en-us,PandP.10).gif | Budget your database growth. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use tools to populate data. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use existing production data. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use common user scenarios, with appropriate balances between reads and writes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use testing tools to perform stress and load tests on the system. |

**Monitoring**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Keep statistics up to date. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use SQL Profiler to tune long-running queries. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use SQL Profiler to monitor table and index scans. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use Performance Monitor to monitor high resource usage. |
| Ff647681.checkbox(en-us,PandP.10).gif | Set up an operations and development feedback loop. |

**Deployment Considerations**

| Check | Description |
| --- | --- |
| Ff647681.checkbox(en-us,PandP.10).gif | Use default server configuration settings for most applications. |
| Ff647681.checkbox(en-us,PandP.10).gif | Locate logs and the tempdb database on separate devices from the data. |
| Ff647681.checkbox(en-us,PandP.10).gif | Provide separate devices for heavily accessed tables and indexes. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use the correct RAID configuration. |
| Ff647681.checkbox(en-us,PandP.10).gif | Use multiple disk controllers. |
| Ff647681.checkbox(en-us,PandP.10).gif | Pre-grow databases and logs to avoid automatic growth and fragmentation performance impact. |
| Ff647681.checkbox(en-us,PandP.10).gif | Maximize available memory. |
| Ff647681.checkbox(en-us,PandP.10).gif | Manage index fragmentation. |
| Ff647681.checkbox(en-us,PandP.10).gif | Keep database administrator tasks in mind. |

| **Transact-SQL Checklist** | **Your Response** |
| --- | --- |
| Does the Transact-SQL code return more data than needed? |  |
| Are cursors being used when they don’t need to be? |  |
| Are UNION and UNION SELECT properly used? |  |
| Is SELECT DISTINCT being used properly? |  |
| Is the WHERE clause sargable? |  |
| Are temp tables being used when they don’t need to be? |  |
| Are hints being properly used in queries? |  |
| Are views unnecessarily being used? |  |
| Are stored procedures being used whenever possible? |  |
| Inside stored procedures, is SET NOCOUNT ON being used? |  |
| Do any of your stored procedures start with sp\_? |  |
| Are all stored procedures owned by DBO, and referred to in the form of databaseowner.objectname? |  |
| Are you using constraints or triggers for referential integrity? |  |
| Are transactions being kept as short as possible? |  |
|  |  |
| **Application Checklist** |  |
| Is the application using stored procedures, strings of Transact-SQL code, or using an object model, like ADO, to communicate with SQL Server? |  |
| What method is the application using to communicate with SQL Server: DB-LIB, DAO, RDO, ADO, .NET? |  |
| Is the application using ODBC or OLE DB to communication with SQL Server? |  |
| Is the application taking advantage of connection pooling? |  |
| Is the application properly opening, reusing, and closing connections? |  |
| Is the Transact-SQL code being sent to SQL Server optimized for SQL Server, or is it generic SQL? |  |
| Does the application return more data from SQL Server than it needs? |  |
| Does the application keep transactions open when the user is modifying data? |  |

*Enter your results in the table above.*