



BRENT OZAR
UNLIMITED®

ISV Best Practices Starter Kit

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables		
Write queries		
Deploy changes		
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		
Install & configure SQL Server		
Buy & test hardware & storage		
Design & test HA/DR		

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓

Design and test a HA/DR solution

High Availability



For isolated server failures:

Windows crash, RAID controller failure, SQL or Windows patch fails, C drive full, bad memory chip, wrong box unplugged

RPO: Max acceptable data loss:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day

Disaster Recovery



For widespread outages:

Data center power or network outage, domain controller failure, SAN failure, fire, quake, zombies in the data center

RPO: Max acceptable data loss:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day

"Oops" Deletions



For human T-SQL error:

DELETE without a where clause, bug in stored procedure for updates, end user needing a restore due to human error

RPO: Max acceptable data loss:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Biz Goal IT Goal Current

		Zero
		1 minute
		1 hour
		1 day



BRENT OZAR © 2014 Brent Ozar Unlimited. All rights reserved. Reproduction prohibited without the express written consent of Brent Ozar Unlimited.
Learn more at www.BrentOzar.com/go/fail. Your mileage may vary. Professional driver on closed course. Your eyesight is great.

Recovery Time Objective (RTO) - Downtime				
	Zero-1 Sec	1 Minute	1 Hour	1 Day
Recovery Point Objective (RPO) - Data Loss	Zero-1 Sec	>\$1,000,000 Multiple active servers with bidirectional replication (usually requires code change)	\$100k-\$500k Clustering w/SAN, synch AlwaysOn Availability Groups (EE), synch database mirroring	\$100k-\$250k Synch SAN replication, synch VM replication
	1 Minute		\$50k-\$250k Async AlwaysOn Avail Groups (EE), async DB mirroring (EE)	\$5k-\$100k Log shipping, async SAN replication, async VM replication
	1 Hour		\$5k-\$100k Log shipping, async SAN replication, async VM	
	1 Day			

©2014 Brent Ozar Unlimited. All rights reserved. Reproduction prohibited without the express written consent of Brent Ozar Unlimited.
Learn more at www.BrentOzar.com/go/fail - except in Nebraska, as Steve Ballmer explains: BrentOzar.com/go/nebraska



Comparison of SQL Server Availability Features											
	>\$1mm	\$100k-\$500k			\$100k-\$250k		\$50k-\$250k		\$5k-\$100k		
	Replication	Failover Clustered Instances (FCI)	AlwaysOn Availability Groups - Synch	Database Mirroring - Synch	SAN Replication - Synch	VM Replication - Synch	AlwaysOn Availability Groups - Async	Database Mirroring - Async	Log Shipping	SAN Replication - Async	VM Replication - Async
Recovery Point Objective (Data Loss)											
Data loss possible	Yes	No*	No*	No*	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Typical RPO goal	Zero	Zero	Zero	Zero	Zero	Zero	1 Minute	1 Minute	1 Hour	1 Hour	1 Hour
Recovery Time Objective (Downtime)											
Failover automatic or manual	Automatic	Automatic	Automatic	Automatic	Optional	Optional	Manual	Manual	Manual	Manual	Manual
Can be failed over by the DBA alone	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Easy to fail back and forth for patching	Some	Yes	Yes	Yes	No	No	Yes	Yes	Some	No	No
Multiple live writeable servers	Optional	No	No	No	No	No	No	No	No	No	No
Fails over Agent jobs, SQL logins	No	Yes	No	No	Optional	Yes	No	No	No	Optional	Yes
3rd party apps fail over easily	No	Yes	Yes	Some	Yes	Yes	Yes	Some	No	Yes	Yes
Typical RTO goal	Zero	1 Minute	1 Minute	1 Minute	1 Hour	1 Hour	1 Hour	1 Hour	1 Day	1 Day	1 Day
Groups of Databases											
Are the same point in time	No	Yes	No*	No	Yes	Yes	No	No	No	No	No
Fail over together	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hardware & Software Requirements											
SQL Server minimum version supported	Apps vary	Any	2012	2005	Any	Any	2012	2005	Any	Any	Any
SQL Server minimum edition required	Apps vary	Any	Enterprise	Standard	Any	Any	Enterprise	Enterprise	Any	Any	Any
May require application changes	Yes	No	No	No	No	No	No	No	No	No	No
Req storage for multiple copies of DBs	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Requires shared storage (SAN)	No	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes
Requires virtualization	No	No	No	No	No	Yes	No	No	No	No	Yes
Can use local solid state storage	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Performance											
Has noticeable performance impact	Maybe	No	Yes	Yes	Maybe	Maybe	Minimal	Minimal	No	Maybe	Maybe
Can offload backups, DBCCs, reports	Yes	No	Yes	No	No	No	Yes	No	Some	No	No

©2014 Brent Ozar Unlimited. All rights reserved. Reproduction prohibited without the express written consent of Brent Ozar Unlimited.
Learn more at www.BrentOzar.com/go/fail - Your mission requires a professional disaster recovery plan.



High Availability gotchas for ISVs

- 0/0 – bidirectional transactional replication usually means data model changes and conflict resolution
- Failover Clustered Instances – everything fails over, including the server name. Totally transparent to your app – but things are down for a min.
- Database Mirroring – individual databases fail over, but not logins, Agent jobs, groups of databases, or the server name.
- AlwaysOn Availability Groups – like clustering, the name and groups of databases fail over together. Like mirroring, jobs/logins don't.

How to phrase it with clients

Your tolerance for data loss and downtime is up to your business goals and your budget.

Here's a helpful spreadsheet to help you guesstimate the costs of your goals: <http://BrentOzar.com/go/rpowsheet>

We have customers using (failover clustering, database mirroring, and duct tape) successfully. They typically have (two DBAs) on staff to manage it.

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓

Install and configure SQL Server

BrentOzar.com/go/setup

- Free 20-page e-book with the basics
- This way it comes from independent experts
- Updated with new SQL versions, guidance
- Make a list of additional changes you recommend as an addendum



BRENT OZAR
UNLIMITED

SQL Server Setup Checklist

Copyright Brent Ozar Unlimited® 2014

Last Updated: August 2, 2014



© Copyright 2014 Brent Ozar Unlimited®
Page 1 of 20

help@brentozar.com
<http://BrentOzar.com/go/setup>

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓



Troubleshoot outages

Define outage

- One query is responding slowly
- One table is locked
- The database is offline, but the SQL Server is up
- The SQL Server service is down, but Windows is up
- Windows is not responding to pings
- The hardware cannot power on

Troubleshooting a performance emergency

- These steps are for your clients and your first tier support desk.
- Rule out server-level problems with `sp_AskBrent` –
<http://BrentOzar.com/askbrent>
- Find session-level problems with `sp_WhoIsActive @get_plans = 1`
<http://BrentOzar.com/go/active>
 - Look for long-running queries or blockers
 - Find out where they're coming from (app server/workstation name, app name)
 - Save the execution plans and queries for later troubleshooting

Troubleshooting a corruption emergency

- If the SQL Server is online, but it's reporting corruption or an individual database shows as offline...
- Restore the most recent backups onto a different server.
- Have the client call Microsoft Support at 1-800-642-7676 for \$500.
 - They work the problem with you until it's fixed
 - Clearly state how many users are affected
 - Don't be afraid to ask for escalation
 - Be willing to stay on the phone with them continuously until it's fixed
- Fixing it yourself? <http://BrentOzar.com/go/corruption>
(and no, don't call us.)

Troubleshooting an outage

- When the SQL Server isn't responding or multiple databases are down:
<http://BrentOzar.com/responder>
- Also has performance outage troubleshooting steps
- Print it out, fill it out as you go, and save it for the post-mortem

SQL Server First Responder Kit

This is a living document. Make it your own!

Instance Name: _____

Triaged By: _____

Date and Time: _____

1) Can you connect ?

Connect to SQL Server and run:

```
SELECT name, user_access_desc, state_desc, log_reuse_wait_desc
```

```
FROM sys.databases;
```

Did you connect successfully? _____

Anything notable in returned columns? _____

Problems connecting? _____

Try the dedicated admin connection: <http://BrentOzar.com/go/DAG>

2) Who's running?

Gather key pieces of information using Adam Machanic's sp_whoisactive:

```
EXEC dbo.sp_whoisactive;
```

Did you run this successfully? _____

How many rows did it return? _____

Was blocking present? (blocking_session_id column) _____

More info: <http://BrentOzar.com/go/active>

3) What does Brent say?

Check activity over a short sample using sp_AskBrent@:

```
EXEC dbo.sp_AskBrent @ExpertMode=1, @Seconds=10;
```

Did you run this successfully? _____

Did it find running queries? _____

Did it make a diagnosis? _____

More info: <http://BrentOzar.com/AskBrent>

4) Identify root cause of blocking (if present)

If there's blocking, save off the sql_text from the root query of the blocking. Get a screenshot that records the runtime, host name, and other relevant information from sp_whoisactive.

If you didn't catch it in time, consider setting up alerts or the Blocked Process Report. More info at: <http://BrentOzar.com/go/lockthis>

This document originally came from: <http://BrentOzar.com/Responder>

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓

[illegible]

Availability monitoring

Complexity	SQL Server Response Test	SQL Server Health	Windows Health
Low	Connection Test	Alerts for High Severity Errors	Ping Response
	Log in as application user	Notifications for SQL Agent job failures	Read recent errors and warnings in system log
	Measure time to run a query	Alerts for specialized components	Expand to application and security logs
High	Measure time to run a meaningful application query	Event notifications for availability-impacting events	Filter and add extra searches for informational events

What's most critical for your customers to know?

Complexity	SQL Server Response Test	SQL Server Health	Windows Health
Low	Connection Test	Alerts for High Severity Errors	Ping Response
	Log in as application user	Notifications for SQL Agent job failures	Read recent errors and warnings in system log
	Measure time to run a query	Alerts for specialized components	Expand to application and security logs
High	Measure time to run a meaningful application query	Event notifications for availability-impacting events	Filter and add extra searches for informational events

What's most meaningful for you?

Complexity	SQL Server Response Test	SQL Server Health	Windows Health
Low	Connection Test	Alerts for High Severity Errors	Ping Response
	Log in as application user	Notifications for SQL Agent job failures	Read recent errors and warnings in system log
	Measure time to run a query	Alerts for specialized components	Expand to application and security logs
High	Measure time to run a meaningful application query	Event notifications for availability-impacting events	Filter and add extra searches for informational events

Performance monitoring and trending

Comple xity	SQL Server Query Performance	SQL Server General Performance	Windows Performance
Low	Query snapshots	Basic SQL counters	Basic counters (Processor, Memory, Storage)
	Sample statement execution data from DMVs	Trend SQL waits, file waits, using DMVs	Counters from related systems (hypervisor host, apps, etc.)
	Measure workloads with server side trace or extended events	Graph trends in index usage	Correlate server side traces with perfmon data
High	Graph execution time of meaningful application query	Analyze trends of data on a weekly or monthly basis	Analyze trends of data on a weekly or monthly basis

What do customers typically monitor?

Comple xity	SQL Server Query Performance	SQL Server General Performance	Windows Performance
Low	Query snapshots	Basic SQL counters	Basic counters (Processor, Memory, Storage)
	Sample statement execution data from DMVs	Trend SQL waits, file waits, using DMVs	Counters from related systems (hypervisor host, apps, etc.)
	Measure workloads with server side trace or extended events	Graph trends in index usage	Correlate server side traces with perfmon data
High	Graph execution time of meaningful application query	Analyze trends of data on a weekly or monthly basis	Analyze trends of data on a weekly or monthly basis

What's the most meaningful for you?

Comple xity	SQL Server Query Performance	SQL Server General Performance	Windows Performance
Low	Query snapshots	Basic SQL counters	Basic counters (Processor, Memory, Storage)
	Sample statement execution data from DMVs	Trend SQL waits, file waits, using DMVs	Counters from related systems (hypervisor host, apps, etc.)
	Measure workloads with server side trace or extended events	Graph trends in index usage	Correlate server side traces with perfmon data
High	Graph execution time of meaningful application query	Analyze trends of data on a weekly or monthly basis	Analyze trends of data on a weekly or monthly basis

The solution: split monitoring.

Your customers need monitoring for:

- **Availability:** ping times, connection tests, errors in event logs
- **Performance:** Perfmon counters from BrentOzar.com/go/perfmon
- **Any mainstream tool can accomplish this goal, typically \$500-\$1k per server**
- **At your largest and most critical clients, you need monitoring for:**
 - Average execution time of your most meaningful application queries
 - List of top 10 resource-consuming queries per week
 - Index utilization – sp_BlitzIndex® copy/pasted into Excel



31

© SQLintersection. All rights reserved.
<http://www.SQLintersection.com>

Your performance monitoring needs

At your largest and most critical clients, you need monitoring for:

- Average execution time of your most meaningful application queries
- List of top 10 resource-consuming queries per week
- Index utilization – sp_BlitzIndex® copy/pasted into Excel

Ways to gather it:

- Build telemetry into your application
- Have your support staff or the customer's IT staff run sp_BlitzCache®, sp_BlitzIndex® and export the data to spreadsheet/file
- SQL Sentry Performance Advisor
- Dell (Quest) Spotlight on SQL Server Enterprise
- Idera SQL Diagnostic Manager



32

© SQLintersection. All rights reserved.
<http://www.SQLintersection.com>

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓

Tune indexes

Two options to tune indexes

The sealed-box approach used by MS SharePoint, Dynamics:

- Under no circumstances is a customer allowed to touch the database.
- Change indexes, views, stored procs, etc, and you lose support.
- When the customer experiences performance problems, they contact the vendor, and the vendor gets remote access to the SQL Server.
- The vendor may make short-term recommendations for the customer, but usually any changes are built into the next version of the software, which comes out later.

The customer-tuned approach used by SAP, Relativity:

- Vendors ship a set of starter indexes.
- Customer DBA teams create, alter, and disable indexes to reflect how the application is used in their environment.

The sealed box approach

- Your support team needs a “gold standard” database from each version
- Ideally, they also need a way to detect whether the customer’s database has drifted from the gold standard version
 - sp_BlitzIndex® can be a simple sanity check – look for heaps, too many indexes
- They need a list of harmless changes, versus showstoppers:
 - Added fields to tables
 - Dropped clustered indexes
 - Dropped/disabled nonclustered indexes
 - Added indexes
 - Added indexed views
- They need an escalation process – and typically this involves sales

The customer-tuned approach

- Your packaged app should aim for ≤ 5 nonclustered indexes per table
- Your deployment scripts need to gracefully handle indexes that don't exist, or extra indexes
- It's okay if customers disable indexes: encourage them to drop rather than disabling
- Your support team still needs a "gold standard" database and drift detection tools because critical indexes may have gone missing
 - sp_BlitzIndex® looking for high-value missing indexes is a short-term fix
- Point customers to index training resources:
SQL Server Central's Stairway to SQL Server Indexes:
<http://www.sqlservercentral.com/stairway/72399/>



37

© SQLintersection. All rights reserved.
<http://www.SQLintersection.com>

The Care and Feeding Of a Database Application

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓



38

© SQLintersection. All rights reserved.
<http://www.SQLintersection.com>

Tune indexes

You can't tune what you can't see.

- **The customer has to give you remote access to clear, unbiased data.**
- **Example: SQL Sentry Performance Advisor's cloud-based reports**
- **On a monthly/weekly basis:**
 - The customer builds a list of the top resource-intensive queries (using sp_BlitzCache or your monitoring tool)
 - Whoever's managing indexes tries to mitigate the problems with indexing first
 - The list is then handed off to the vendor to improve it with code
 - The vendor communicates which ones will be fixed in a future version of code, or which ones are expected to be at that level of resource usage

Document your company's defaults.

	Software Vendor	Customer
Design tables	✓	
Write queries	✓	
Deploy changes	✓	
Tune queries		
Tune indexes		
Monitor performance		
Troubleshoot outages		✓
Install & configure SQL Server		✓
Buy & test hardware & storage		✓
Design & test HA/DR		✓



41

© SQLintersection. All rights reserved.
<http://www.SQLintersection.com>

Questions?



Don't forget to complete an online evaluation on EventBoard!

Session: POSTCON05

Developer's Guide to Tuning Somebody Else's SQL Server

Your evaluation helps organizers build better conferences
and helps speakers improve their sessions.



Thank you!