# Using Database Administration Services With Managed Hosting:

## Preventing database crashes and revenue losses.

**A PEER 1 White Paper**

**December 10, 2008**

**Table of Contents**

# Introduction

More companies are moving to Managed Hosting services as a way to maintain their servers and IT infrastructure 24x7x365 without the hassles of finding, hiring, and paying a team of server engineers, network engineers, and support technicians. Managed Hosting services provide everything a company needs in order to make sure their websites and applications are available to customers. Managed Hosting providers ensure hardware, security, data center infrastructure, backups, and network systems are functional and performing at optimal levels.

Advanced websites and applications running Microsoft SQL 2005 or MySQL 4 & 5 databases require specific attention to detail in addition to the standard maintenance Service Level Agreements (SLAs) offered by most IT hosting providers. Whether a company is running a single SQL server or a SQL Clusters solution, further planning and preventative maintenance is necessary to ensure databases are fail-proof. Companies have two choices in today's competitive market: hire expensive database administrators or utilize the benefits of Database Administration services from a top Managed Hosting solutions provider.

Not utilizing the benefits of Database Administration services from a top Managed Hosting provider can cost your business thousands, even millions of dollars in lost revenue.

# The Cost of Database Downtime

Mission critical databases are the foundation of today's rapidly evolving and exponentially expanding business enterprises. An organization's ability to succeed in an information-driven economy depends on how its database applications can efficiently process complex business data, sustain peak performance levels, and provide 24x7 availability. Web-based applications and e-commerce engines, by virtue of their global presence, are expected to maintain continuous uptime or high availability.

For a company that aims to stay competitive, even the shortest database downtime can escalate into a disaster situation. Millions of dollars can circle the drain with every hour of unavailability, as these statistics show: [1]

---

[1] Burleson, Donald. "Cost Factors Driving Highly Available Systems." TechRepublic Mar. 2002
http://articles.techrepublic.com.com/5100-10878_11-1045599.html

| Downtime cost statistics | |
| --- | --- |
| **Application segment affected** | **Average cost of downtime** (measured per hour) |
| Shipping | $28,000 |
| Teleticket sales | $69,000 |
| Airline reservations | $89,000 |
| Home shopping | $113,000 |
| Pay-per-view | $150,000 |
| Credit card sales | $2.65 million |
| Financial markets | $6.45 million |
| | Source: Giga Information Group |

Database failures caused by human error, poor system performance, or mandatory maintenance upgrades, lead to not only quantifiable damage like lost data and sales revenue, but also non-quantifiable costs like hampered worker productivity and disgruntled customers. As a result, this worst-case scenario can lead to a business meltdown known as bankruptcy. Fortunately, preventative measures can be implemented.

According to a Gartner Executive Report, information systems executives consider data storage and storage area networks as high importance growth areas in IT spending; therefore, it is a top technology priority to leverage and enhance already-installed technologies.[2] Essentially, partnering with a Managed Hosting service provider is still considered the best scenario for a cost-effective database infrastructure. But because of the potentially catastrophic effects of database downtime, professional administration of the database design, implementation, maintenance, and monitoring would also be indispensable. Therefore, a Managed Hosting service coupled with proper database administration is crucial to sustaining high availability applications and websites.

## Preventing Costly Database Downtime

Clearly not an option for today's business enterprise, database downtime can be prevented through proper database design and implementation, benchmark testing, performance tuning, and application advice.

### Database Design and Implementation

Experienced database administrators start with proper database design and implementation to prevent costly database downtime. The foundation of a robust database hinges on proper design including table structure, indexes, and SQL statements. When an

---

[2] IT Spending: How Do You Stack Up, Gartner Executive Report Series, 2003, http://www.gartner.com/research/attributes/attr_47450_115.pdf

organization does not adhere to best practices in database design, disaster can strike including data loss on mission-critical systems.

The two most common areas of design include proper table structure development and creation of indexes for optimal database performance. Table structure is the most crucial element of design, while indexes provide faster access to data as a database grows.

- **Table Structure**
  Table structure represents the first and most basic constraint on the application and is one of the most important aspects to a properly functioning database. Tables hold data and must be designed properly to ensure maximum data accessibility, performance, and speed. Database designers build tables according to the needs of the application or website, often "normalizing" tables for database stability and accessibility.

- **Indexes**
  Indexes are created and used as an internal mechanism for accessing data quickly. Without proper indexes on database tables, performance and speed can be affected, often times slowing to a crawl or complete failure. When indexes are not used, the database looks through each row of data in a given table. The larger the table, the more constraints and time needed to find the requested information are placed on the database. As a result, the application or website using the database slows down drastically. With indexes, searches are completed on individual rows, thereby speeding up database performance and increasing database uptime.

Database implementation involves many steps, starting with the server hardware itself, followed by organizing the data storage and creating the file system. If these steps are not performed properly, the future performance of the database is jeopardized. The ultimate goal is to implement a stable and responsive database system that can be easily maintained. Databases must be designed to meet the needs of the application or website and its intended use to allow for growth and scalability.

## Benchmark Testing

After a database has been designed, database administrators perform benchmark testing. Benchmark testing is done by creating various scenarios that test the database and server performance under different workloads while running different applications. Automation tools are used to insert massive amounts of data to overload the database. Results of the tests indicate how much the database structure can withstand before crashing. Without benchmark testing, a database is vulnerable to future heavy workloads and possible application or website failure.

## Performance Tuning

Performance tuning and benchmark testing go hand-in-hand. Database administrators review the results of benchmark testing and modify specific attributes of the database for optimal performance. The cycle starts over again with further benchmark testing and modification to ensure the database is performing for current and future needs.

Performance tuning requires adjustments and modifications on database files including tables, indexes, and application queries. Without performance tuning, databases can slow down, causing users to become irritated. Worst case scenario, the database will crash, causing application or website failure, resulting in catastrophic downtime.

**Application Advice**

Business applications and websites are the backbone of financial stability. Building a reliable database-driven application or website can be a complicated and time-consuming task, even for the most qualified database engineer. When developing mission-critical applications or websites, developers should seek the advice of professional database engineers to plan and develop a system that provides stability and scalability. A database administrator will provide advice on how to build a database that performs beyond the expectations of the application or website developer, including preventing database crashes and catastrophic failure.

# Defining Database Administration Services

Managed Hosting services provide everything an enterprise needs to make sure its applications, websites, products, and services are available to customers 24x7x365. Managed Hosting providers ensure that the infrastructure, hardware, security, backups, and network systems are all functional and performing at optimal levels. Integral to effective Managed Hosting services is database administration because it focuses on preventing costly database corruption, downtime, or a worst-case scenario of catastrophic failure leading to revenue losses and possible bankruptcy.

Dependency on database integrity is fundamental in every business concept, but more integral in today's innovative Web 2.0 business models that live and breathe on user-created content. Driven by a participative online experience, a growing number of people are creating, distributing, and exploiting user-created content, commanding an expanding array of intelligent web services and applications.[3]

By defining a database management plan that aligns with the company's business objectives and long-term goals, database administration becomes an indispensable component of any company's IT environment. Data management, however, can be a complex endeavor that requires not only major investments in hardware and application systems and upgrades, but also tedious installation and maintenance tasks to ensure flawless operations. Managed Hosting database administration service providers handle all the tedious tasks while clients focus on core business objectives.

---

[3] Participative Web and User-created Content: Web 2.0, Wikis and Social Networking, <u>SourceOECD</u>, Oct 2007, <u>http://213.253.134.43/oecd/pdfs/browseit/9307031E.PDF</u>

# Three Key Areas of Professional Database Administration Services

The fundamental role of professional Managed Hosting database administration service providers is to prevent costly data loss, corruption, and catastrophic failures. Striving for database efficiency and increased productivity, competent solutions providers target three key areas of database administration:

- Design/Implementation
- Maintenance
- Monitoring

These key areas are the concentration points of skilled database administration engineers at the helm of qualified Managed Hosting service providers. Teams of proficient engineers with extensive knowledge of database hosting environments have the experience and ability to fine-tune and enhance database performance. As a result, the synergy of using professional database administration services coupled with a prominent Managed Hosting provider virtually eliminates database and information bottlenecks, and reduces technical glitches common in environments developed and maintained by less experienced administrators.

## Design/Implementation

Database administration engineers install database applications like Microsoft SQL or MySQL using best practices and up-to-date processes on Windows and Linux operating systems. Customers initially request for advice on database design regarding best practices for speed, maintainability, and ease of programming when integrating a database with an application. Database administration engineers then create all aspects of a database including tables, indices, and upon requests, populate the database with actual data provided by the customer.

For example, if a customer needs a state to area code table, database administration engineers populate the table automatically during the design and implementation phase. More advanced design and implementation requests include the creation of objects, stored procedures, triggers, views, and other available options based on database type and version.

## Maintenance

Proper database maintenance is crucial to database reliability, uptime, and overall performance. Professional database administration engineers are experts at troubleshooting possible connectivity issues with the hosting network to identify possible bottlenecks or failure points within the network. Efficient maintenance includes installation of patches from the respective database vendors (Microsoft SQL and MySQL) needed to keep the database running properly.

Patch logs are maintained as database vendors release new patches to fix bugs. In addition to standard Managed Hosting maintenance, database administration services offer 24x7x365 troubleshooting on physical hardware and database software. Upon request, database administration engineers add users or educate customers on best practices for user permissions, updating passwords, and managing user accounts.

A professional database administration services team usually provides a comprehensive maintenance plan designed to help users get the most out of their database. Maintenance plans include automated backups, scheduling of non-automated maintenance tasks, and most especially, recovery and restoration procedures from onsite or offsite backups.

### Monitoring

Professional database management engineers monitor the database using advanced technological applications such as Concord Monitoring's API for SQL as an external SQL monitoring tool. In addition, tcp/3306 is usually monitored in an open (not closed, filtered, or blocked) state for performance testing. Upon request, database administrators provide recommendations for improving database performance and specific tuning recommendations such as rewriting queries and tweaking system parameters. Other monitoring and advisement includes SQL query tuning and establishing baselines by measuring performance under various loads and identifying system bottlenecks.

A reliable monitoring solution also provides comprehensive statistics of physical disk I/O, query execution time, CPU usage, memory usage, table locking, and query cache hits. Database engineers keep an ongoing record of logs on all aspects of the database during backup, whether they are local or remote such as Tivoli backup systems. For extra reliability, database engineers perform a quarterly health check and review of each database instance or cluster detailing performance and any maintenance issues that have occurred.

Among the logs and reports managed by professional database administration services are proactive tuning reports that identify and alert to I/O problems and missing indices, exceptions reports that show anomalies, trend reports that log abnormalities in usage and consumption, as well as regular summaries and emergency alerts.

## Outsourcing Database Administration Versus Hiring An In-House Team

Database administration is a critical enterprise function best entrusted to skilled and experienced engineers and database administrators. These experts must be continuously available to address all aspects of database design, implementation, application advice, monitoring, and overall database maintenance

## Costs of Skilled Manpower

Employing a team of in-house database experts to maintain a Microsoft SQL Server or MySQL database can be very expensive. In fact, the median expected salary for a typical database administrator in the United States is $82,820.[4] Senior database administrators receive annual compensation of more than $100,000. For on-site 24x7x365 availability, a typical company would need to deploy one database engineer for each eight-hour shift.
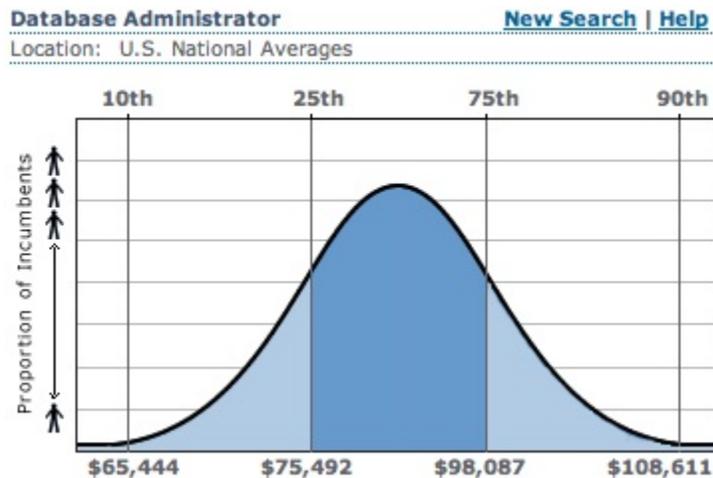


Source: Datamation, 2007[5]

Assuming that each engineer works 40 hours a week, a well staffed database administration team should consist of at least four experts. At a median salary of $82,820 each, the manpower required for proper database management alone would be approximately $331,280 annually. The annual amount does not include insurance, paid time off, bonuses, taxes, computer equipment, office supplies, and other human resource related overhead.

On the other hand, outsourcing database administration to a qualified Managed Hosting provider translates to significant cost savings. A prominent Managed Hosting provider offering database administration services has the staff and resources to commit to round-the-clock monitoring. A full- time dedicated team of database engineers will be available 24x7x365 to maintain, monitor, and resolve issues as they arise. Overall costs incurred in outsourcing database management are considerably lower compared to hiring and keeping technical employees on staff.

## Allocating High-Priced Human Resources

Even for companies that already have database administrators on staff, utilizing database administration services from a prominent Managed Hosting provider frees up these highly paid specialists to engage in higher-valued projects, strategic agenda, business

---

[4] Database Administrator – U.S. National Averages, Salary.com, http://www.salary.com
[5] Mafguire, James. "Tech Salaries: From High to Low." Datamation. Sept 2007
http://itmanagement.earthweb.com/career/article.php/11067_3699216_3

intelligence, or learning opportunities. Considered specialized and skilled manpower, database administration engineers are also difficult to find or replace.

For many organizations, fluctuating human resource expenses in addition to capital expenditures and depreciation costs, is a less appealing option compared to paying a predictable monthly or annual database management fee to a trusted Managed Hosting service provider. A typical comprehensive database administration package (covering DB design/implementation, maintenance, and monitoring) averages only about $4,000 per year.

# Choosing a Database Administration Services Provider

Choosing a database administration services provider can be a daunting task. There are a few guidelines you can adhere to in order to choose the right provider that fits your organization's budget and requirements.

### Proven Track Record

A proven track record is one of the most important aspects when choosing a database administration services provider. You want a provider that can deliver what you need, when you need it, and without any excuses. The provider should have a proven track record in designing, installing, managing and supporting a server environment involving thousands of servers and multiple locations on a global scale.

### Team of Certified Database Experts

The ideal provider must also have a team of certified and experienced systems administrators, systems engineers, and operations support staff. Expertise should include qualifications by Microsoft Certified Database Administrators (MCDBA), Microsoft Certified Technology Specialists (MCTS) and Microsoft Certified Information Technology Professionals (MCITP).

### Solid Database Infrastructure

A solid database infrastructure includes everything from the application code itself, the data storage, the servers, and the network. The ideal database management provider must be able to demonstrate sufficient capacity in all these areas to meet the customer's needs.[6] Being able to seamlessly address accumulation of data, changing business demands, and high availability should be the minimum that a reliable database infrastructure has to offer.

### Experience With Large-Scale Databases and Applications

The ideal database administration service provider must have not only the infrastructure but also the experience to serve various types of large-scale enterprises that operate on a global scale. The service provider must clearly demonstrate its capacity to run backup

---

[6] Database Infrastructure Performance Challenges, Meta Group, June 2004, http://eval.symantec.com/mktginfo/enterprise/white_papers/ent-whitepaper_metagroup_database_infrastructure_performance_challenges_06-2004.en-us.pdf

systems, recovery processes, and disaster recovery planning and execution for large-scale requirements and potential catastrophes.

## PEER 1's Database Administration Services Benefits

PEER 1's Database Administration services will save you time, money, and help you avoid crippling database crashes. Customers rely on the expertise and experience of the PEER 1 database administration team. PEER 1 Database Administration services allow you to purchase different levels of proactive services according to your specific needs. The three key areas of database administration are covered by PEER 1 standard packages including design and implementation, maintenance, and monitoring

Database administration services require highly specialized skills. Database administrators are among the highest paid IT professionals. In today's struggling economy, costs versus benefits are important in helping an organization make an informed decision on who should provide database services. In some cases, a full-time database administrator can become an expensive employee, often sitting idle when databases are running smoothly. However, not having a database administrator maintain and monitor your databases could cost you thousands, if not millions in lost revenue. The invaluable expertise and experience of the PEER 1 database administration team is a critical component to helping PEER 1 customers achieve their goals and reach higher levels of success.

The three key areas of database administration covered by PEER 1 include design and implementation, maintenance, and monitoring. A database without proper design and maintenance does not perform well. When PEER 1 manages your database, you get professional assistance in creating your tables, indexes, queries, and overall database schema. PEER 1 also designs a maintenance plan that includes automated backups and scheduling of non-automated tasks. For organizations that already have a database running, PEER 1 creates a maintenance plan to help monitor and fine-tune the existing database for peak performance.

The top five benefits of outsourcing your database administration services to PEER 1 include:

1. **Troubleshooting** – Database administration service engineers troubleshoot connectivity issues with your server, database, and any PEER 1 network issues over TCP/IP protocol.
2. **Performance Tuning** – Receive recommendations for improving database performance including rewriting queries and tweaking system parameters, thereby reducing potential bottlenecks that could slow or crash your database.
3. **Full Statistics** – Get full reports on physical disk I/O statistics, query execution time, CPU and memory usage, table locking statistics, and query cache hits.
4. **Full Database Recovery** – Get full database backups and recovery via a local or remote backup or take advantage of our Enterprise level Tivoli backup solution.

5. **Overall Health Check** – Receive quarterly reviews on how your database is doing including performance, maintenance, and suggestions on how to keep your database running in peak condition.

PEER 1's Database Administration services, offered in different levels of proactive packages or packages customized to your specific needs, save you time and money, and guarantee your business data is readily available and running efficiently.

## About PEER 1

Based in Vancouver, BC, PEER 1 is a global leader in Managed, Dedicated, and Co-location Hosting. PEER 1 provides services through its SuperNetwork$^{TM}$ in 15 data centers and 17 PoPs across North America and Europe. PEER 1's network infrastructure and experience in the hosting industry account for its solid strength in delivering high quality Managed Hosting services. Prices are competitive as compared to other providers in the Managed Hosting space. The company has a 24x7x365 support staff and offers a multitude of solutions that enhance the performance, experience, and overall customer satisfaction.

## Why PEER 1

PEER 1 provides services to over 10,000 customers worldwide and has the infrastructure, resources, and support available to see customer requests to completion. As an IT solutions provider, PEER 1 has backup technology for redundant data across multiple continents for superior business continuity. PEER 1's Database Administration services gives customers the option to choose services based on specific needs, budget, and requirements. And as a professional company dedicated to hosting thousands of servers, PEER 1 provides Ad-hoc services for customizing plans for your business.

## Contact PEER 1 Today

To learn more about PEER 1 Database Administration services and Managed Hosting solutions, visit http://www.peer1.com or call 1.877.504.0091 today.