



CEO of the Data Stack

Proactively Managing Data Service Delivery to the Business

Other White Papers available for download on www.bez.com:

Challenges of Workload Characterization in Parallel Processing Environments (Dr. Jeffrey P. Buzen and Dr. Boris E. Zibitsker)

Optimize Resources to meet Business Goals (Ptak, Noel & Associates)

Proactive Performance Management: Improving Data Service Delivery

BEZProphet Architecture

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Overview

The overall importance of the database to today's businesses cannot be overstated. But both data growth and more complex applications are increasing at an alarming rate, affecting the level of service provided by IT to the business and threatening to slow down future growth. And there's no end in sight. Actually, the overall rate of change required to support growth just keeps getting faster.

As the database manager, you are probably feeling pressure from all sides:

- The rate of change keeps accelerating
- Newer technologies add even more complexity to the database environment
- Resources are scarce and will continue to be so with little or no relief in sight
- Business managers, Application managers, IT managers and others look to you for non-stop, well performing database service delivery

As these issues continue to apply pressure to your already overtaxed DBAs, there is something that you are sure you don't need – another thing to do. *Even so, there are ways to proactively manage these, and other, database issues by choosing tools that can be automatically set to deliver the information you need when you need it.*

This paper describes an approach that will notify you of potential database performance breaches well in advance of them becoming a problem for database end-users; deeply analyze database activity and deliver the information in easy to read, customizable dashboards; and use powerful capabilities to predict, fully evaluate and compare various courses of corrective action from simple tuning efforts to detailed infrastructure plans. This approach allows you to choose the most effective solution, and subsequently verify if its implementation achieved the expected results.

Reacting to problems in the data stack is no longer a successful and sustainable strategy. You need to adopt a proactive approach that:

- Looks at service delivery – not in technical terms but in terms of delivering real service to business users (customers)
- Uses advanced analytics to enable high frequency planning cycles and prediction profiles
- Accommodates changes – Uses “what-if” for a proactive look at the future.

BEZProphet™ for Oracle® differs from traditional performance management tools in three important ways:

1. Hands Free “As-Is” Predictions™

“As-Is” predictions provide a 12 month performance roadmap of where application performance is heading. They are also referred to as “do nothing” predictions that produce a forecast based on no changes being made to the existing hardware configuration and assuming the application continues to grow in the manner it has been in the past.

2. Evaluating Alternatives with the Prediction Engine

The prediction engine supports a host of “what-if” scenarios in the areas of growth projections, hardware changes (server and storage), database design changes, workload elimination, server consolidations, and new application introductions

3. Automated Comparative Analysis

BEZProphet supports a number of comparison options to provide a clear picture of the changing trends and patterns within applications.

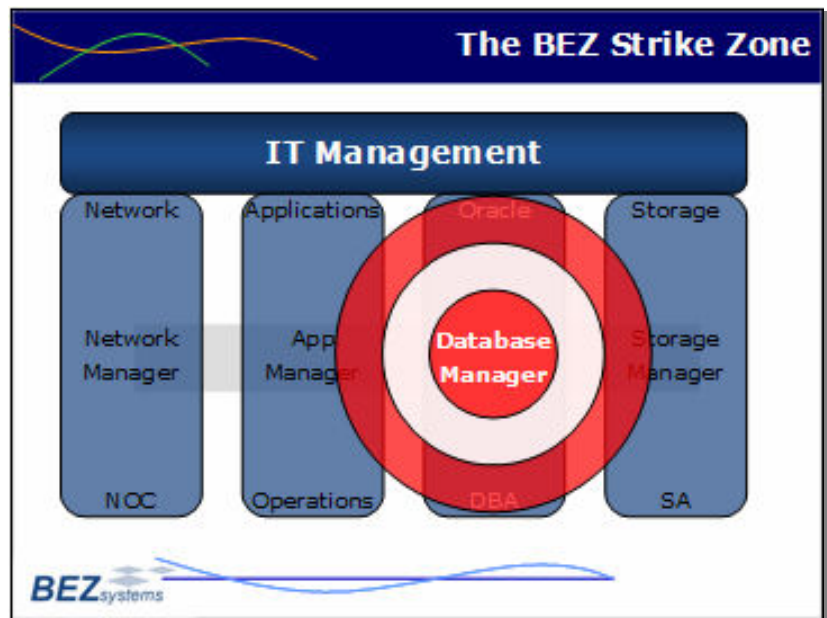
Introduction

It's not about the Technology – it's about the Business!

Enterprises spend a lot of money, time and effort to ensure that production applications and their underlying infrastructure deliver benefits that were promised or agreed upon. Two-thirds or more of an overall IT budget is typically spent on IT Operations. The operations staff, in turn, must maintain high availability and stability within the infrastructure while also providing an agile environment that allows the business to take advantage of new opportunities as they arise. While the demand for more IT agility and less IT inertia have grown during the past few years, the overall complexity of business processes have increased significantly. Businesses have become more and more dependent upon IT to help automate complex business processes that integrate them more fully with suppliers, partners, customers, and even members of the same organization. As businesses become more intertwined with their IT departments, decisions regarding changes and expansion of the infrastructure have a significant impact on a company's ability to adapt and compete. If done correctly, the IT architecture can both provide much needed stability and availability while ensuring that the infrastructure remains agile enough to respond quickly in a rapidly changing, increasingly database-centric business landscape. IT Operations is the central element to ensure that critical services are provided to maintain stability, maximize availability, and enhance agility. If IT is committed to operational superiority, then this will ensure continued business superiority.

Master of Your Own Destiny or Architect of Your Own Demise

Everyone from the CIO, to business, applications, and storage managers, and even your own staff place both reasonable and unreasonable demands on you. The data is the focal point, and perhaps the pain point, of everyone in the enterprise. The data is of the utmost importance and you are the CEO of the Data Stack. After all, if the CIO has plans to shake up the IT department and run it as a business, he will most certainly do his part to make it succeed but he can't do your job. It will be left to you to figure out just how to proactively plan and manage seamless access to the data by those business groups that need it.



The pressure is on and much of it is on you. If your organization is like many of today's enterprises, then you are probably faced with one or more of the following issues:

Fast Growth

Growth in the database is faster than ever. Conventional wisdom states that companies that can execute better can compete better. Being able to execute better means servicing the growing needs of:

- Business Intelligence: Consumer data, customer data
- Operations: cost data inventory
- Finance: Billing data
- Web: products, credit cards
- Regulations: SOX,
- Sales: remote access by PDA or cell phone

Change and Complexity

Today's game is one of constant change. Historically, considerable care was taken to stabilize the database operating environment. Now, software and hardware infrastructure is considerably more complex and change has become almost constant. A sampling of these that you may be faced with includes:

- Rapid database growth
- New applications driven by business needs
- New hardware infrastructure driven by innovations and consolidation
- Trend to Oracle 10g, grid computing, and increased parallelism
- Server consolidation, standardization, or re-hosting
- Number of users growing rapidly

Personnel Shortages

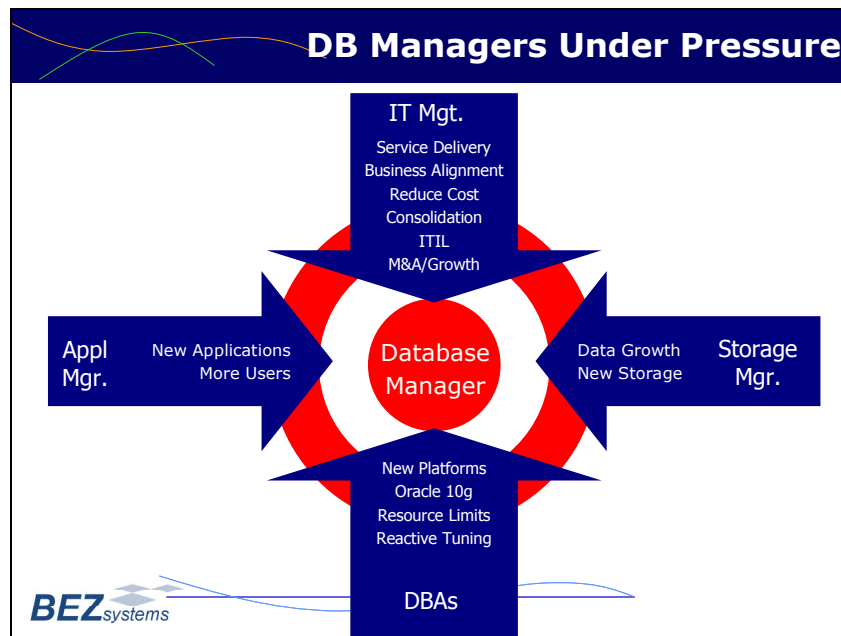
You've probably got too much to do with not enough resources to get it done. Even though we can see from Moore's Law that hardware costs are continually going down, the salaries of the people who maintain that hardware are not. In all probability, your staff is being asked to constantly react to problems while they try to offload as much as they can to outside service providers. They are looking to you for leadership and guidance through difficult times. To make matters worse, you probably don't get credit for fixing a problem. It's more likely that you are asked why you didn't know it was there in the first place!

Overall, you are stretched pretty thin. The real question is can you manage all of the competing priorities for your time and attention and transform your organization into one that is proactively managed and that is stable yet agile enough to respond to the constantly changing needs of the enterprise? As CEO of the Data Stack, you need to:

- Support business needs
- Manage growth
- Insulate change from the business
- Manage costs
- Make effective use of scarce human resources

There are currently available tools that purport to be solutions that address the issues outlined here, but the vast majority of them are reactive, infrastructure-centric packages that may help tune the database but they offer little or no help with service delivery.

These tools typically lack a forward-looking predictive component and thus, are restricted to a purely reactive approach. They are usually called into action when something has already gone wrong. They can identify when something happens, what it is, and how fast it can be fixed. But these tools are only good for reacting to problems; not avoiding or eliminating them all together. These tools don't manage service delivery – they manage technology.



DB Managers are under almost constant pressure from all sides.

You need to run the Data Stack like a business by adopting a proactive approach that allows you to provide a service that matches the needs of the business. This includes using tools and techniques, such as:

Analytics – enables more proactive, high frequency change cycles

Prediction – Proactively plans a course for near and far term

Notification and Communication – enables staff to avoid small problems before they become crisis situations and proactively address business needs

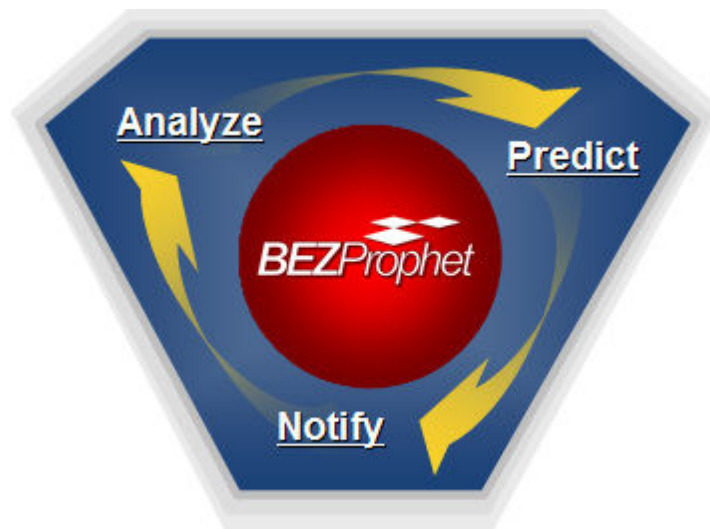
It also helps to automate as much as possible in all of these areas whether it be “set and forget” notification of potential performance breaches, automatic report generation based on a predefined report dashboard, or completely hands off “as-is”™ predictions regarding response time and throughput of significant workloads.

BEZProphet™ for Oracle®: Proactive Performance Management for the Data Stack

BEZProphet™ for Oracle® is an automated management solution enabling Database Managers, DBAs, and other IT professionals to deliver high performing, uninterrupted database services to the business at the lowest cost. It does this by analyzing, notifying and predicting resource consumption, performance and throughput by individual workload. BEZProphet was specifically designed to deliver much needed analysis and expert advice to you with minimal intervention.

BEZProphet automatically profiles complex database processing by workloads to understand data usage, resource consumption and workload response time and throughput. *BEZProphet* notifies you of current performance issues and provides a guided process to help identify, analyze and quickly resolve service-level issues. These profiles can then be directly input to *BEZProphet*'s prediction engine to understand how different changes will accommodate service delivery. *BEZProphet* arms you with the information needed to steer the direction of your efforts through powerful "what if" capabilities for near term performance improvements and longer term infrastructure changes.

Based on its core prediction technology, *BEZProphet* for Oracle combines performance management and capacity planning as core disciplines supporting the need to understand current and future data service delivery expectations for key lines-of-business. The *BEZProphet* prediction engine provides powerful capabilities that look ahead to identify performance bottlenecks or service delivery breaches on the horizon. This information provides users with enough time to properly plan and compare alternatives to find the most cost-effective remedy, whether it be implementing simple tuning recommendations or a major server upgrade.



BEZProphet is composed of three main integrated components: Analyze, Predict and Notify

BEZProphet empowers DBAs and their managers to proactively execute large and small changes, set realistic expectations, justify corrective actions and ensure the delivery of consistent, high-quality data service to the business at the lowest cost.

BEZProphet uses agentless data collection technology to provide hands-free "set and forget" monitoring to predict future Oracle response time and throughput levels without manual intervention. It automatically notifies you when a future threat materializes long before database users notice.

BEZProphet Analysis: Evaluating Alternatives

The *BEZProphet* Analyze component offers deep insight into the overall running of the database along with its corresponding software and hardware platforms. With *BEZProphet*, you can directly reveal and evaluate:

The impact of database and application growth

BEZProphet helps you understand the effects of increased user activity. For example, you may want to determine what performance changes should be expected as increased user activity continues into the future? This increase can either be specified as an increase in concurrent

users or an increase in transaction volume per user by workload. The change is specified as an expected percentage change in database activity per concurrent user over the measured period. You may also need to understand the effects of increased database size on workload performance. In this case, the change is specified as an expected percentage change in average I/O's processed per database request.

Database and SQL design recommendations





BEZProphet helps you determine if there are database design flaws or inefficient code that should be corrected. You can select New Index or New Materialized View recommendations for incorporation into a BEZProphet prediction. Advice is generated from two sources; direct BEZ analysis or integration with Oracle10g's SQL Access advisor. CPU and I/O savings per workload are derived for each recommendation.

Software parameters for improved efficiency

BEZProphet helps you evaluate whether there are database or application installation parameters that will help improve performance. You can specify the number and types of nodes to be evaluated in a RAC cluster migration. BEZProphet currently includes support for predictions to evaluate going from a standalone instance to a RAC cluster. You can also evaluate increasing a RAC installation by adding additional nodes including support for heterogeneous node types in a RAC cluster.

Hardware configuration optimization

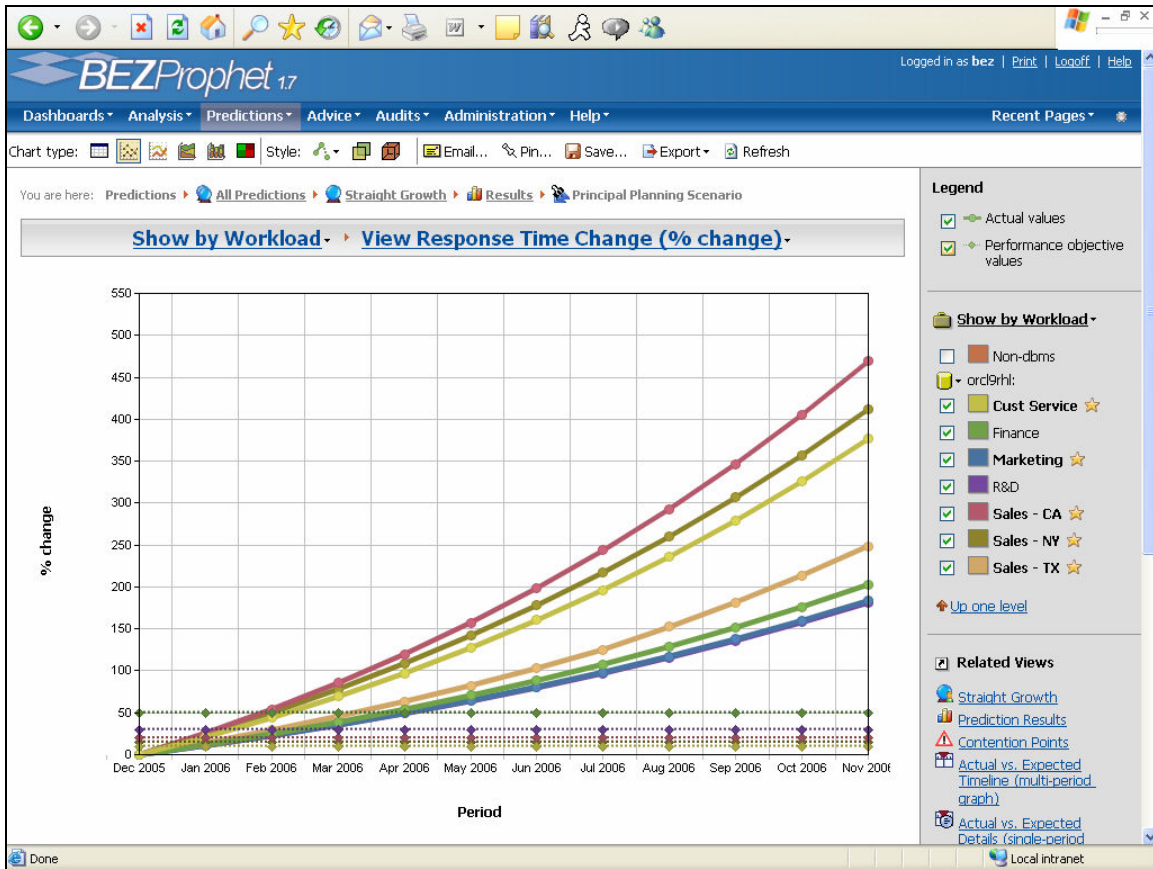
BEZProphet can help you evaluate hardware changes that can be implemented to alleviate poor performance. You can specify changes to any component of the physical hardware configuration that makes up the backend "data access" tier:

-  Server Configuration
-  Interconnect Bandwidth
-  Storage Array Configuration
-  Physical Disk Properties

BEZProphet also offers "In-Box" capacity optimization recommendations that are provided for each prediction where at least one performance objective will be violated. Support for Server and Workload Consolidation or Elimination scenarios is also a standard feature.

BEZProphet uses two different methods to analyze and evaluate alternatives:

1. User Specified Changes: In this method, you provide all of the details of the change to be evaluated. For example, you may want to evaluate a 43% increase in transaction volume over the next 12 months.

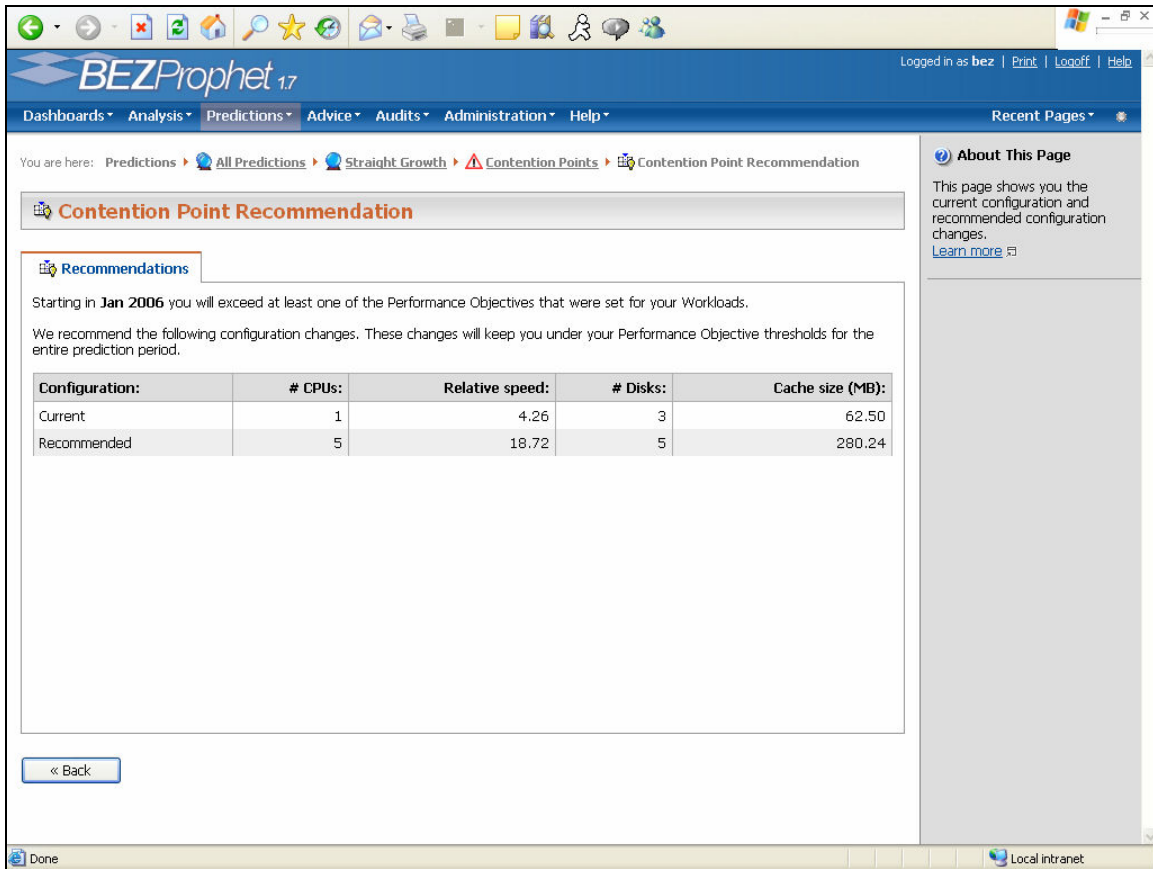


BEZProphet Prediction results showing response time change resulting from an increase in transaction volume by workload over the next 12 months

User specified change support includes:

- User activity volume changes
- Database size changes
- Number of nodes to be evaluated in a RAC cluster migration
- In-Box server and storage configuration changes
- Server and Storage configuration swapouts
- Workloads to consolidate or eliminate

2. Advice Integration: Through integration with 3rd party products, advice lists are generated and you can select entries from the advice list for incorporation in a BEZProphet Prediction Scenario. BEZProphet automatically converts advice recommendations into modified workload profiles that include CPU, I/O, Memory and Interconnect impacts at the workload level.



BEZProphet Capacity Optimization Advice recommendation showing the current and proposed configuration changes

Advice integration support currently exists for Oracle 10g SQL Access Advisor and evaluates the impact of:

- New Index Candidates
- New Materialized View Candidates

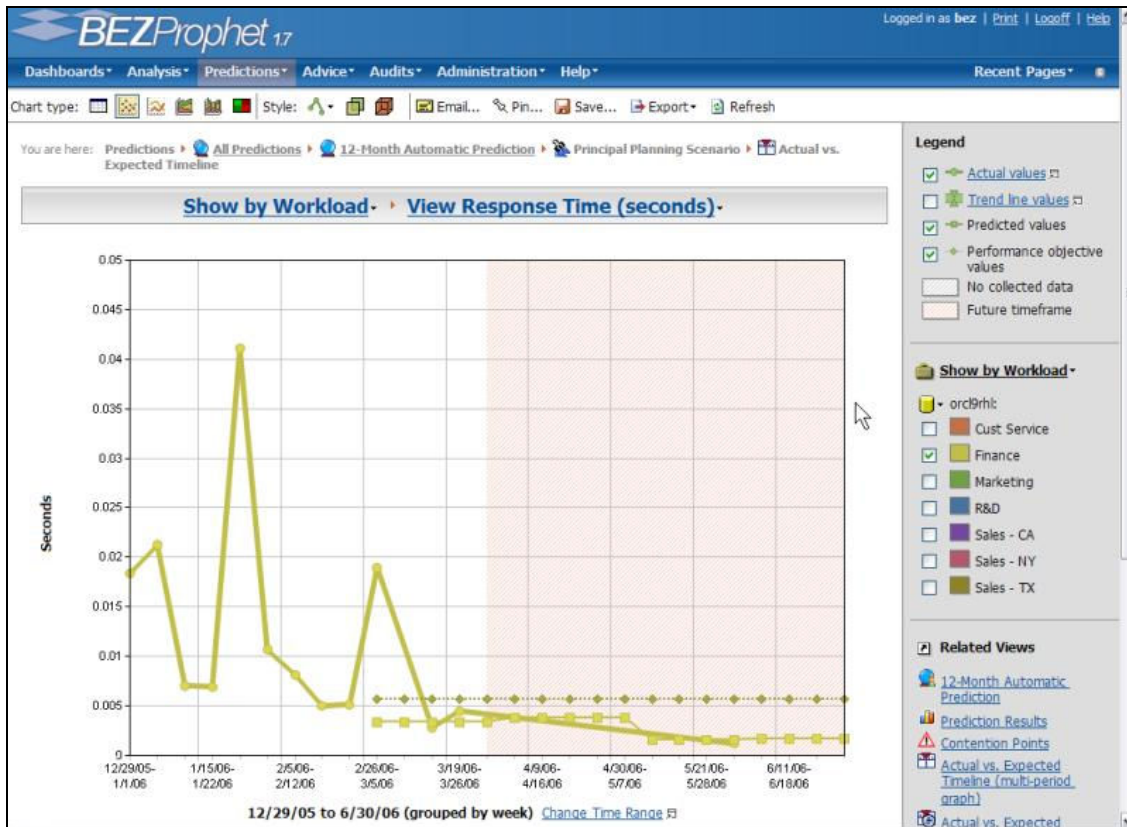
BEZProphet Prediction: Proactively Planning an Optimal Database Path

BEZProphet empowers DBAs and their managers to proactively execute large and small changes, set realistic expectations, justify corrective actions and ensure the delivery of consistent, high-quality data service to the business at the lowest cost.

BEZProphet allows DB managers to continuously and proactively manage performance. It forecasts performance, resource utilization, response time and throughput, at an application or workload level, to understand when service levels will be exceeded and response time and throughput levels will degrade to stunt business growth potential. Using advanced analytical closed-loop modeling, BEZProphet helps you anticipate problems (“As-Is”™ Predictions), explore and evaluate alternatives quickly (“What-If” Analysis), and then measure actual vs. predicted results (Ongoing Validation) in order to identify new problems and proactively fix them.

BEZProphet “As-Is” Predictions

By utilizing the automated "As-Is" Prediction feature of BEZProphet, you can generate predictions of workload performance and system behavior as a function of growth and planned database tuning and hardware upgrade events, define these predictions as a baseline, and then constantly monitor actual performance against predicted (expected) performance. When variations are encountered, powerful analysis features let you drill down in context to rapidly determine the root cause, and determine which workloads are most heavily impacted.

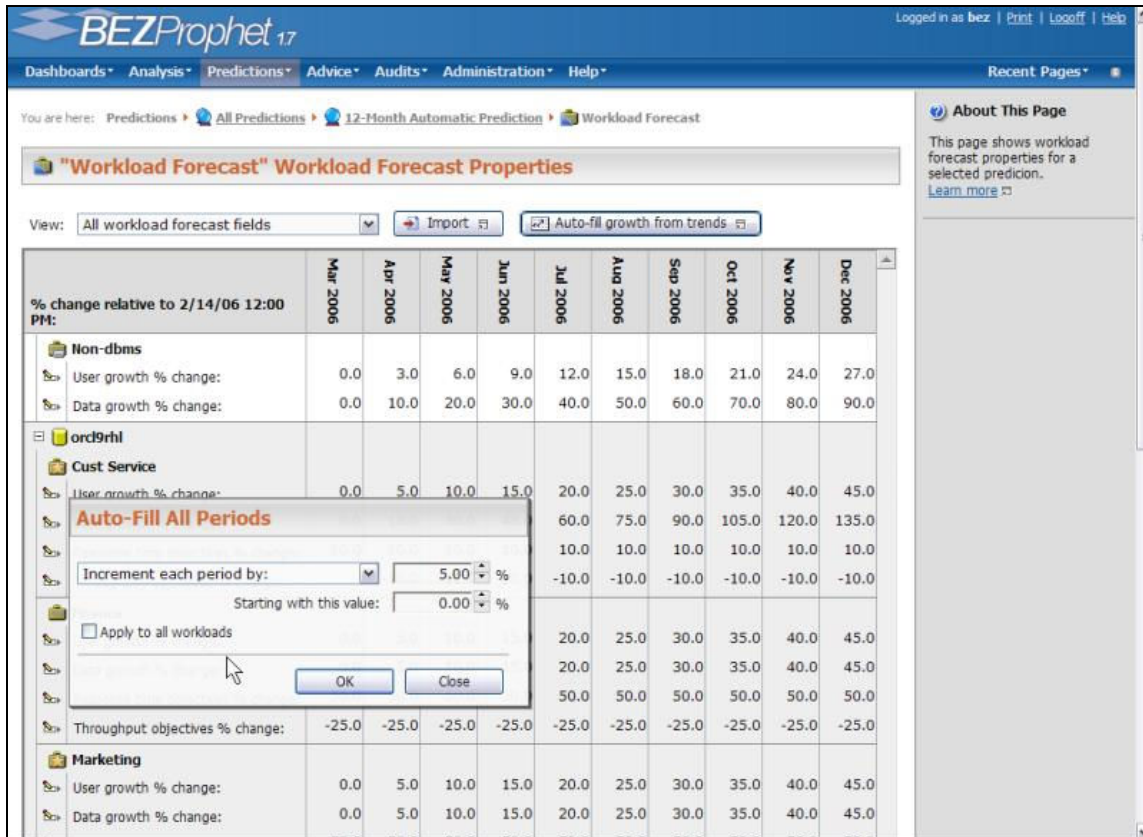


BEZProphet “As-Is” predictions provide valuable information for comparing actual to predicted performance

BEZ Prophet “What-If” Analysis

BEZProphet's powerful prediction engine can analyze performance data, and using a sophisticated analytical modeling engine developed and perfected over 20 years of practical application in complex computing environments. With BEZProphet you can accurately predict the impact of expected workload growth based on user-supplied forecast data and user activity growth rates combined with various modeled change events.

BEZProphet's prediction capabilities can be used to accurately evaluate, compare and justify the most effective change by quantifying immediate and future impact of proposed hardware changes, database design modifications, or workload and server consolidations.



BEZProphet's prediction capabilities can be used to accurately quantify current and future impact of change events within your database environment

Multiple hardware upgrade options can be quickly and accurately compared, including scale-out to a grid or cluster configuration, CPU or disk subsystem upgrades, or platform switches. This enables you to make informed decisions about performance assurance, and provides rapid, accurate, and very cost-effective risk mitigation. Multiple alternatives can be quickly evaluated relative to one another, and the most efficient resolution strategy can be chosen in advance of approaching problems.

BEZProphet's database tuning and capacity planning recommendations, including creation of new indexes or materialized views, can be fed directly into BEZProphet predictions to determine - *proactively and non-invasively* - what impact they will have on all database workloads.

The screenshot shows the BEZProphet 17 web interface. The main content area is titled '"12-Month Automatic Prediction" Prediction Properties'. It features a table with columns for months from Mar 2006 to Feb 2007. The table lists several prediction scenarios: 'Workload Forecast', 'Principal Planning Scenario', 'c_name Index', and 'Scale out CPUs'. Each scenario has a row of circles representing its inclusion status for each month. A legend below the table explains the circle colors: black for 'Always included', blue for 'Included in period', and white for 'Not included in period'. A warning message at the bottom of the table area says 'You must click Save for your changes to be saved.' The right sidebar contains sections for 'Related Views', 'Related Tasks', 'Favorites', and 'About This Page'.

BEZProphet Index recommendations can be evaluated to help determine their impact on all database workloads

BEZProphet Notification: Proactively Delivering Information to You

BEZProphet notification features provide more than just an occasional alert. This is really one of the ways that BEZProphet delivers meaningful data to you without having to go hunt for it. And it allows you to share this information with other interested parties to be sure that the problems can be fixed before they cause a crisis.

BEZProphet provides automated notification, via e-mail, of any alerts generated by the three audit classes supported within the product:

- Abnormal Trends
- Performance Objective Breaches
- Actual vs. Expected Variations

In order to reduce the risk of "false alarms," all auditors are user-configurable to ensure that alerts are generated accurately and in a timely manner.

Abnormal Trend Isolation

The Abnormal Trends auditor analyzes each workload's actual and expected performance and resource utilization, using statistical process control filters to separate actual trends from background noise and reports on variations in workload response time, throughput, or CPU utilization.

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Dashboards* Analysis* Predictions* Advice* Audits* Administration* Help* Recent Pages*

You are here: Audits > All Auditors > Abnormal Trend Auditors > "rhlmv svr" Abnormal Trends Auditor

"rhlmv svr" Abnormal Trends Auditor

General Auditor Schedule Exception History Recent Audit Notifications

Exception date:	Workload name:	Database:	Metric:	Actual value:	Threshold value:
12/27/05 1:00 PM	Sales - TX	orc9rhj	Throughput (requests/second)	6.56	5.694
12/28/05 9:00 AM	Sales - TX	orc9rhj	CPU utilization (%)	15.031	14.4975
12/29/05 11:00 AM	R&D	orc9rhj	CPU utilization (%)	13.0152	11.8425
12/29/05 11:00 AM	R&D	orc9rhj	Throughput (requests/second)	4.8772	4.5441
1/6/06 6:00 AM	Finance	orc9rhj	CPU utilization (%)	2.1501	4.5609
1/6/06 6:00 AM	Marketing	orc9rhj	Throughput (requests/second)	9.7509	8.3372
1/6/06 8:00 AM	Marketing	orc9rhj	Throughput (requests/second)	8.4764	6.3354
1/6/06 12:00 PM	Finance	orc9rhj	CPU utilization (%)	2.1414	2.1896
1/6/06 12:00 PM	Sales - NY	orc9rhj	CPU utilization (%)	12.6112	11.4658
1/6/06 5:00 PM	Finance	orc9rhj	CPU utilization (%)	1.9842	2.4377
1/6/06 5:00 PM	Marketing	orc9rhj	Throughput (requests/second)	7.4636	5.6997
1/6/06 8:00 PM	Marketing	orc9rhj	Throughput (requests/second)	7.4952	6.328
1/7/06 5:00 AM	Marketing	orc9rhj	Throughput (requests/second)	3.5694	2.7079
1/7/06 12:00 PM	Marketing	orc9rhj	Throughput (requests/second)	10.2272	6.6407
1/7/06 8:00 PM	Marketing	orc9rhj	Throughput (requests/second)	9.9015	8.3112

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Related Tasks

- Remove Abnormal Trends Auditor
- All Audit Notifications

About This Page

From the General tab you can view and change the response time, throughput, and CPU utilization thresholds for the selected abnormal trend auditor. From the Auditor Schedule tab you can edit the schedule. From the Exception History tab you can view the list of exceptions that have occurred regarding the selected auditor. From the Recent Audit Notifications tab you can view the details of the alerts that have occurred regarding this auditor. [Learn more](#)

BEZProphet Abnormal Trends Auditor showing specific performance breaches by workload

Performance Objective Breaches

This auditor monitors each workload's response time and throughput and projects pending breaches of service objectives based on predicted growth and system load. For example, if you have specified that you wish to maintain response time for a certain workload within a certain range of tolerance over time, the Performance Objective monitor will alert you if the BEZProphet prediction engine anticipates a near-term breach.

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Dashboards* Analysis* Predictions* Advice* Audits* Administration* Help* Recent Pages*

You are here: Audits > All Auditors > Performance Objective Auditors > "rhvm svr" Performance Objectives Auditor

"rhvm svr" Performance Objectives Auditor

General Auditor Schedule Exception History Recent Audit Notifications

Exception date:	Workload name:	Database:	Metric:	Violation period:	Contention point:	Goal:	Projected value:	Deviation (%):
1/25/06 2:00 PM	Cust Service	orc9rhj	Response time (seconds)	2/25/06	CPU	0.4136	0.4543	9.83%
1/25/06 2:00 PM	R&D	orc9rhj	Response time (seconds)	3/25/06	CPU	0.0652	0.0652	0.01%
1/25/06 2:00 PM	Sales - NY	orc9rhj	Response time (seconds)	2/25/06	CPU	0.0557	0.061	9.58%
1/25/06 2:00 PM	Sales - TX	orc9rhj	Response time (seconds)	2/25/06	CPU	0.0569	0.0582	2.28%
1/26/06 2:00 PM	Sales - NY	orc9rhj	Response time (seconds)	2/26/06	CPU	0.0401	0.0436	8.76%
1/26/06 2:00 PM	Sales - TX	orc9rhj	Response time (seconds)	2/26/06	CPU	0.0401	0.0408	1.64%
1/27/06 2:00 PM	Sales - CA	orc9rhj	Response time (seconds)	2/27/06	CPU	0.3013	0.3122	3.62%
1/27/06 2:00 PM	Sales - NY	orc9rhj	Response time (seconds)	2/27/06	CPU	0.0428	0.0462	8.12%
1/27/06 2:00 PM	Sales - TX	orc9rhj	Response time (seconds)	2/27/06	CPU	0.044	0.0443	0.69%
1/30/06 2:00 PM	Cust Service	orc9rhj	Response time (seconds)	2/28/06	CPU	0.0549	0.0586	6.83%
1/30/06 2:00 PM	Sales - NY	orc9rhj	Response time (seconds)	2/28/06	CPU	0.0325	0.034	4.67%

Related Tasks
[Remove Performance Objectives Auditor](#)
[All Audit Notifications](#)

About This Page
 From here you can view and change the properties of the selected prediction performance objectives auditor. Select the Auditor Schedule tab to edit the schedule. Select the Exception History tab to view the list of exceptions that have occurred. Select Recent Audit Notifications to view the details of the alerts regarding this monitor. [Learn more](#)

The BEZProphet Performance Objective Auditor projects pending breaches of service objectives based on predicted growth and system load

Actual vs. Expected Variations

This auditor will alert you if your workloads actual response times or throughput deviate by more than a fixed percentage from a previously defined baseline prediction.

You are here: Audits > All Auditors > Actual vs. Expected Auditors > "rhlmv svr" Actual vs. Expected Auditor

"rhlmv svr" Actual vs. Expected Auditor

General Auditor Schedule Exception History Recent Audit Notifications

Exception date:	Workload name:	Database:	Metric:	Violation period:	Actual value:	Expected value:
3/15/06 11:00 AM	Finance	orcl9rh	Response time (seconds)	Nov 2005	0.0055	0.0036
3/22/06 3:00 PM	Finance	orcl9rh	Throughput (requests/second)	Dec 2005	18.8717	63.3247

Page 1 of 1 Refresh Pin... Export All

Remove All

Save Cancel Reset

Related Tasks

- Remove Actual vs. Expected Auditor
- All Audit Notifications

About This Page

From here you can view and change the properties of the selected prediction results auditor. Select the Auditor Schedule tab to edit the schedule. Select the Exception History tab to view the list of exceptions that have occurred. Select Recent Audit Notifications to view the details of alerts regarding this auditor. [Learn more](#)

The BEZProphet Actual vs. Expected Auditor shows any significant deviation by workload and specific metric

Summary

Today's business landscape requires a proactive response to almost continuous change. The database, while historically very important, has become the primary focal point for new applications, increased business intelligence and heavy increases in overall user activity. If business is going to respond quickly to changes in the market place and remain competitive, it is no longer practical to react to problems as they occur. DB managers and their staff need to implement a more proactive database performance management methodology to better align themselves with business goals while providing an agile database environment to take advantage of new opportunities.

BEZProphet for Oracle provides a comprehensive proactive performance management solution to this growing issue. With BEZProphet, you can answer these and other important questions:

- What is the overall quality of service I am currently providing?
- What does my service delivery profile look like for the next 6 to 12 months?
- How can I proactively accommodate an almost constant rate of change?
- What is the best scenario for maximizing service delivery and minimizing cost?

About BEZ Systems

Since 1993, BEZ Systems has been offering innovative Proactive Performance Management (PPM) solutions that provide a line-of-business view of application resource utilization for today and tomorrow. These solutions allow enterprises to accurately profile application performance, compare 'change and growth' alternatives, and forecast future requirements. Future performance predictions are an invaluable component of verifying that business objectives and performance goals can be met, thereby minimizing any shortfalls in service. With over 100 person years of experience, BEZ also offers "best-practice" professional services to help companies quickly implement PPM solutions for immediate results.

For more information, please contact:

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