

Oracle Real User Experience Insight: Implementation Case Study at Oracle

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EXECUTIVE OVERVIEW

Oracle Corporation's recent deployment of Real User Experience Insight has brought real-time, end-user performance analysis to some of its key customer-facing Web services. Initial installation of Real User Experience Insight in the Data Center was straight-forward and well documented. Initial configuration, which allowed basic reporting of the Web sites under the Real User Experience Insight system, was completed in about an hour. Within hours of installation, Real User Experience Insight quickly provided real-time identification of a client robbing performance issue on the Oracle Corporation website, and allowed for swift and effective counter measures.

INTRODUCTION

Real User Experience Insight is a sophisticated performance monitoring solution that provides full 360-degree visibility of every end-user's experience. Real User Experience Insight captures all transactions and replays customer's bottleneck experiences. This is like looking over the shoulder of your customer while performing online transactions! Real User Experience Insight is based on Network Protocol Analysis (NPA): an innovative, non-intrusive technology. It's an off-the-shelf solution. Configuration, implementation, and training can be performed in just two days.

This technical white paper highlights Oracle's first internal customer experience with the set up and configuration of the Real User Experience Insight solution for monitoring some of Oracle's premier external websites, including www.oracle.com, oraclepartnernetwork.oracle.com, and forums.oracle.com. The white paper also considers the high-level architecture against which the Real User Experience Insight solution is deployed, and discusses basic configuration challenges experienced while getting the solution online in the Data Center. Finally, it demonstrates that, with even very basic configurations, Real User Experience Insight can begin paying dividends almost the moment it is switched on.

BASIC SETUP AND CONFIGURATION

Real User Experience Insight Data Center deployment and initial configuration

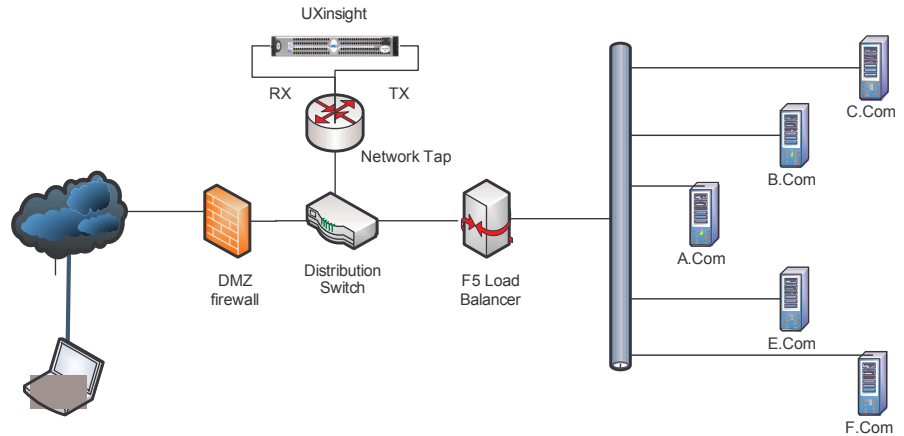
Installation of Real User Experience Insight within the Data Center is well documented in the *Real User Experience Insight Installation Guide*. For Oracle's installation, the Network team chose the network tap installation option over the use of a span (copy) port. This decision was driven by the fact that span ports are limited in number, and are reserved by the Networking team for network diagnostics and analysis. There are also security advantages to using a tap over a span port because a tap is read-only device. However, a span port configuration does have the advantage that it only requires the use of one network port on the Real User Experience Insight system, whereas a tap minimally requires two ports.

One minor network challenge encountered involved Oracle's need to use fiber-based NICs, instead of the standard copper NICs typically delivered with the hardware Real User Experience Insight was deployed to. Oracle encountered problems trying to bring Real User Experience Insight online with fiber cards NICs installed. Alert lights on the back of the system indicated hardware problems and network connectivity was not successful. In testing, removing the fiber cards and re-installing the copper cards cleared the errors. Eventually, the use of the documented "rescue interface" (a version 4.3 feature) was employed, and detailed diagnostics performed. It was determined that the fiber cards are difficult to "seat" in the PCI slots. However, through careful placement, the hardware errors were resolved, and the network service normalized.

Deployment architecture concept

To integrate with Oracle's deployment architecture, the Real User Experience Insight system was installed in front of the Load Balancing Router (LBR), instead of behind it (see Figure 1). A benefit of this deployment is a reduction in the number of network ports required for Receive (RX) and Transmit (TX) traffic to just two. Locating the device in front of the LBR greatly simplifies advanced configurations (such as IP filtering) because the back-end network and servers for the various websites are transparent to the Real User Experience Insight solution. Real User Experience Insight only needs to know about virtual IPs for the specific websites, and does not need to know anything about the application and hardware topology beyond the LBR. However, it may be desirable to monitor services behind the LBR individually, and to obtain data from each member of a clustered environment. In this case, Real User Experience Insight can be deployed in front of the back-end architecture, but behind an LBR. As a side note, Oracle is working on a second Real User Experience Insight deployment that will monitor the front- and back-end of a load balancer. This will provide the best of both worlds, and will be the topic of a future white paper.

Figure 1: Deployment architecture.



The installation configuration chosen for this deployment was a default “Reporter” with a local Collector (Option #1 in the *Real User Experience Insight Installation Guide*).

First login

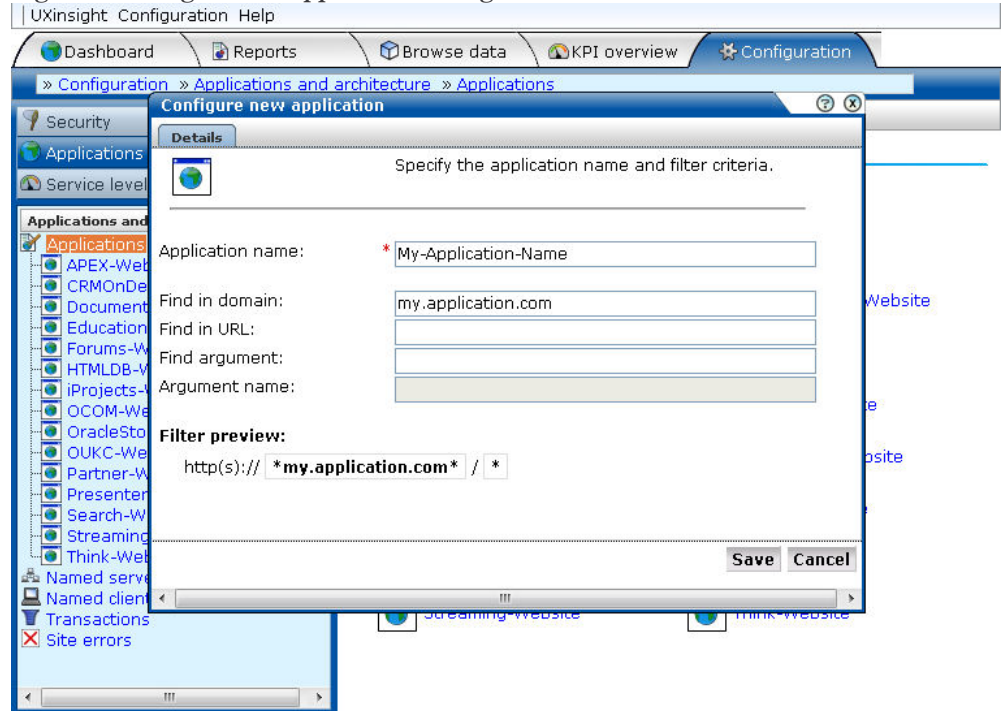
Initial login to the Real User Experience Insight system is via the “admin” account, as documented in the *Real User Experience Insight User Guide*. From a security perspective, it is important to change the default password as soon as the system is available on the network. Changing the default password is even more critical for installations placed within a DMZ where the risk of external network security breaches can be higher than that of Intranet-based deployments. The user interface and menu structures used to create additional user accounts and assign roles were simple and intuitive. In particular, Real User Experience Insight’s online help’s description of Roles, provided in a “context” format, is very accurate and straightforward.

PREPARING FOR BASIC CAPTURE AND ANALYSIS

Configuring an application

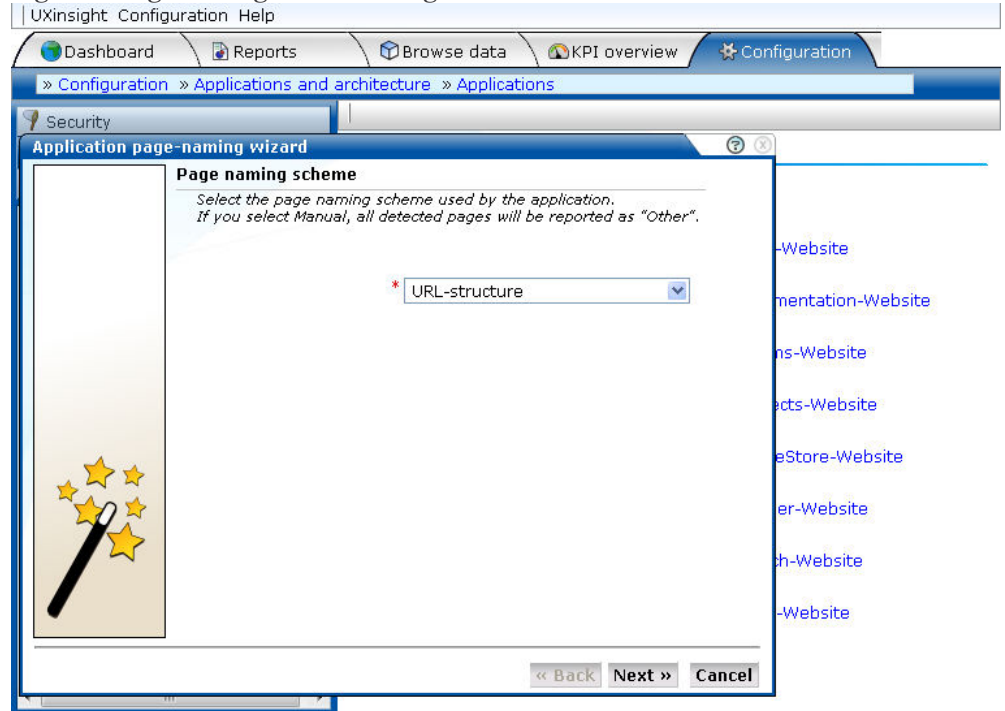
Real User Experience Insight begins data collection as soon as it is connected to the network. However, depending on the number of distinct websites sharing the subnet, the packet capture or amount of traffic being captured may require some configuration in order to simplify data browsing and analysis. As a simple first step, select the **Configuration > Applications and architecture** menu option, click **Applications**, and then select **New Application** to open the Configure new application dialog box (Figure 2).

Figure 2: Configure new application dialog box.



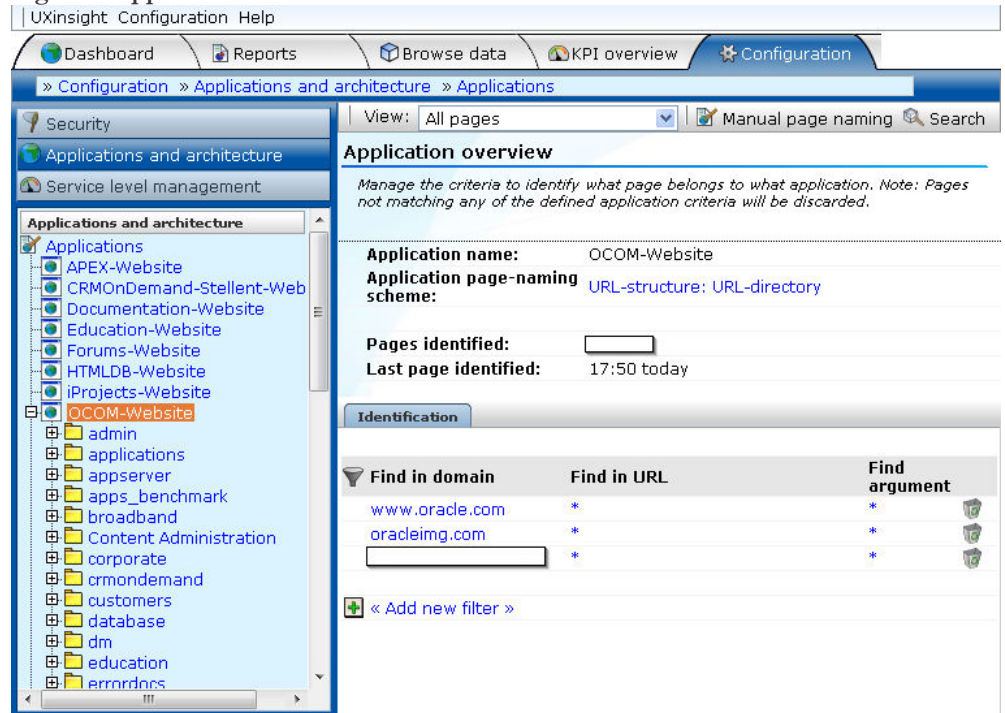
Specify an application name for a logical service, being careful not to use spaces or special characters. A hyphen works well for bridging a space in the name. Specify a domain within the Find in domain field, and to create an Application in its simplest form, simply click **Save**. In the next dialog box (Figure 3), select the option URL-Structure. This will create and gather the captured statistics based on the URL naming structure.

Figure 3: Page naming scheme dialog box.



Once again, this is a simple configuration and there are additional options for creating more sophisticated URL structures. This selection worked very well for our initial configurations, and provided useful data for analysis within minutes (see www.oracle.com in Figure 4). Note that you should select the application name carefully because it cannot be changed afterwards without losing data and any associated reporting metrics.

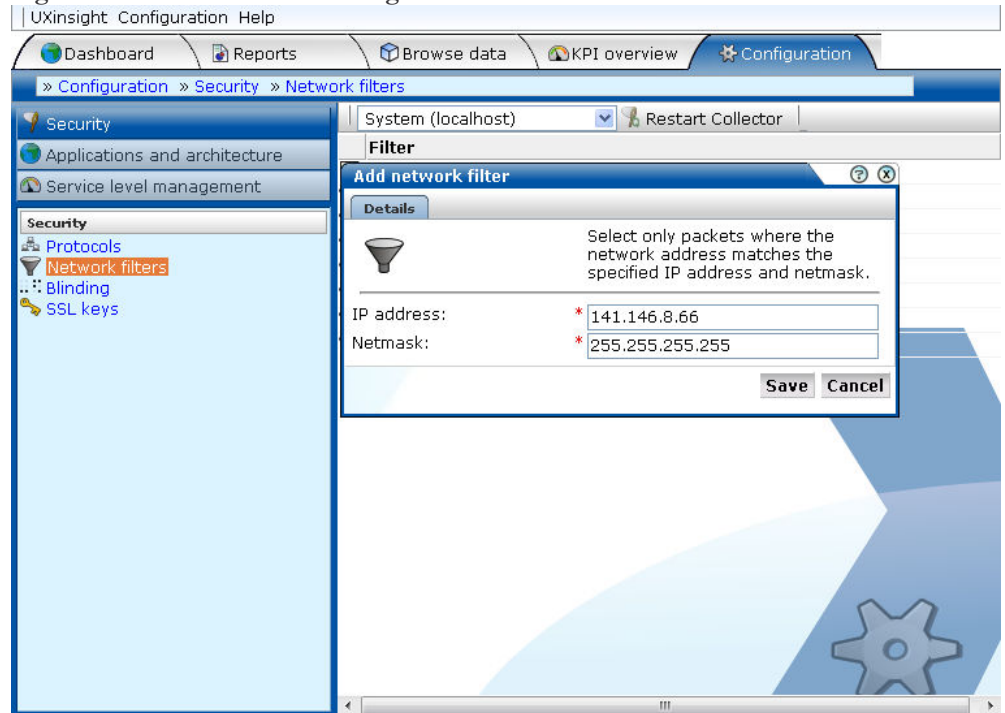
Figure 4: application overview.



Establishing a simple IP filter

The network on which Oracle's installation of Real User Experience Insight resides is heavily shared by many dissimilar applications. Hence, network filtering proved a very useful feature in reducing the overall amount of traffic sampling, load, and noise exposed to the Collector. Without IP filtering (or traffic limiting discussed later), Real User Experience Insight captures every single packet. To reduce the collection and analysis of traffic to a single IP, for example, simply specify the IP address of that domain in the Add Network filter dialog box (Figure 5) under the **Configuration > Security > Network filters** menu option.

Figure 5: Add network filter dialog box.

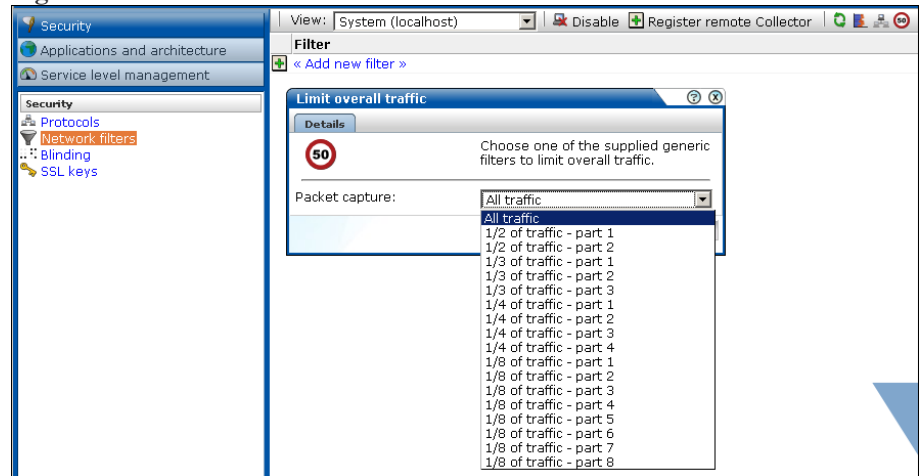


In addition, add the appropriate subnet mask (note that Real User Experience Insight checks that a filtered IP is valid, and will not allow a filter to be created that does not match an address located on the target network). In the example shown in Figure 5, we have explicitly targeted the IP address of www.oracle.com (141.146.8.66) as one of our filters. Because the IP address is specified, no further masking is required. Finally, we simply use subnet mask 255.255.255.255.

Collection limiting

There are limits to the amount of traffic the Real User Experience Insight Collector can scan. Our 4.3 version was limited to 5 million page views per day, or 50 million hits per day. It is possible to have these limits raised to a maximum 10 million page views per day. There are license (cost) implications for raising this limit. Therefore, please contact Support if an increase is required. As of version 4.4, this limit no longer applies. Hence, from this point on, processing capacity is the only limit within the system, and is solely related to hardware specifications. Another option to protect system resources is to change the overall sampling percentage rate performed by the Collector (Figure 6). Sample percentages range from All traffic (that is, 100%) to 1/8th sampling. Note that sampling traffic will also reduce the 'totals' you see in reports and data analysis. However, data sampling does not greatly affect percentages and equation numbers in reports and data analysis.

Figure 6: Limit Overall traffic.



RAPID VALUE GAINED FROM REAL USER EXPERIENCE INSIGHT

Case 1: the case of the heavy hitter

One of the constant challenges of running a website on the World Wide Web is the fact that services are exposed to potential abuse by anyone in the world. Aggressive crawlers are one example of abuse that webmasters must defend against in order to preserve bandwidth for live customer requests. The first step in the defense strategy is to identify and understand which crawlers are abusing a service. One simple way to do this with Real User Experience Insight is to identify your top consumers based on their IP addresses. By grouping the number of hits received from a given IP address over a period of time, and then reviewing this data in an ordered list from highest to lowest hits-per-IP, we can quickly identify a website's highest hitters over time.

Not long after Real User Experience Insight was deployed, we witnessed in our Oracle Enterprise Manager Dashboards that the Cache Hit Ratio for WWW was becoming significantly lower over an extended period of time. At the same time, we also saw that these cache's network throughputs were becoming significantly higher. Historically, this pattern suggested us to the possibility that the website was under the influence of a very aggressive Web crawler, or even some sort of targeted malicious attack.

However, the really interesting part to all of this is that, before Real User Experience Insight, we had no real-time way of determining if overall site traffic performance was being impacted under such scenarios. Neither could we tell much about the potential offending client IP and agent in real-time. Pre-Real User Experience Insight, we relied on mined data that took up 24 hours to be available. In 24 hours, the event was likely to be long over, except for the most aggressive abusers. If the aggressive crawl situation was especially desperate, then custom Perl-based scripts were executed against the webserver logs to unearth some real-time data. This process was painstaking when performed across a clustered environment.

In addition, it was also dangerous because the combination of the increased load (from the aggressive clients) coupled with the additional overhead of the Perl script analysis could actually make the performance situation worse; the old adage that the cure being worse than the disease comes to mind.

With Real User Experience Insight, we very quickly established that end-user performance was being affected by the change recognized in the cache behavior, and identified an offending client IP and agent type they we could associate with the higher load on the cache. At this point, taking action to deny traffic from that IP until issues with that customer could be resolved happened very quickly, and the performance bottleneck was resolved. Figure 7 shows the page performance trend before and after the corrective action.

Figure 7: Page performance before and after corrective.

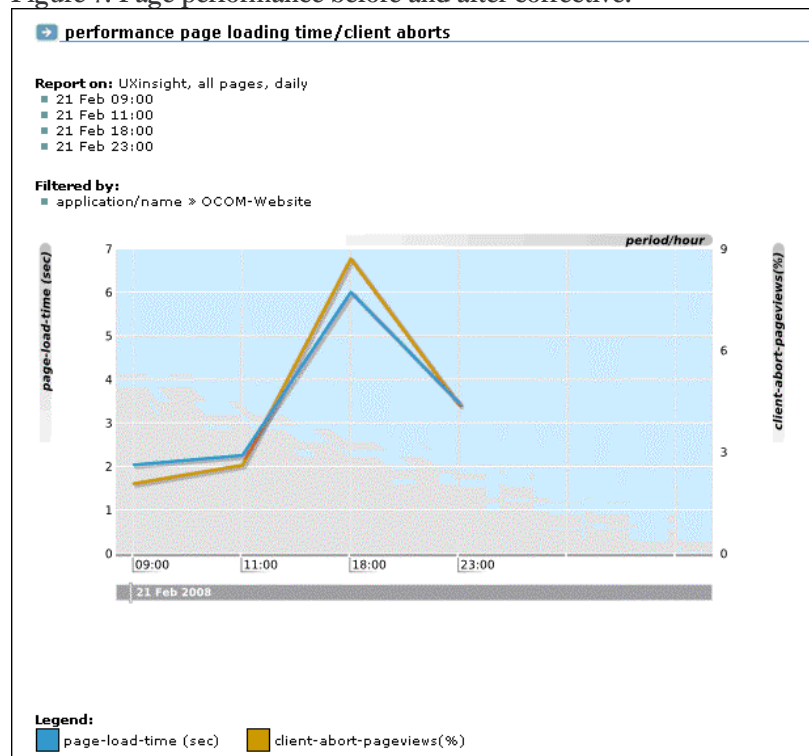
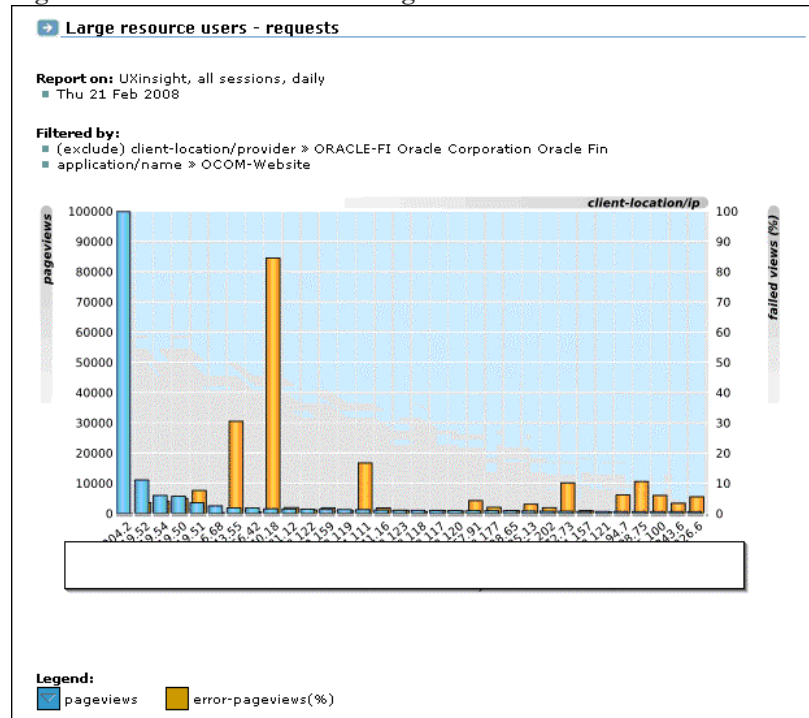


Figure 8 shows the report that provided the IP of the offending client (masked her for anonymity). However, the impact in the number of hits/IP is easily identifiable on the left-hand side of the chart. The offender had outpaced the next highest client by 90,000 hits for that period of the day.

Figure 8: Identification of offending client.



Case 2: the case of the choking pipe

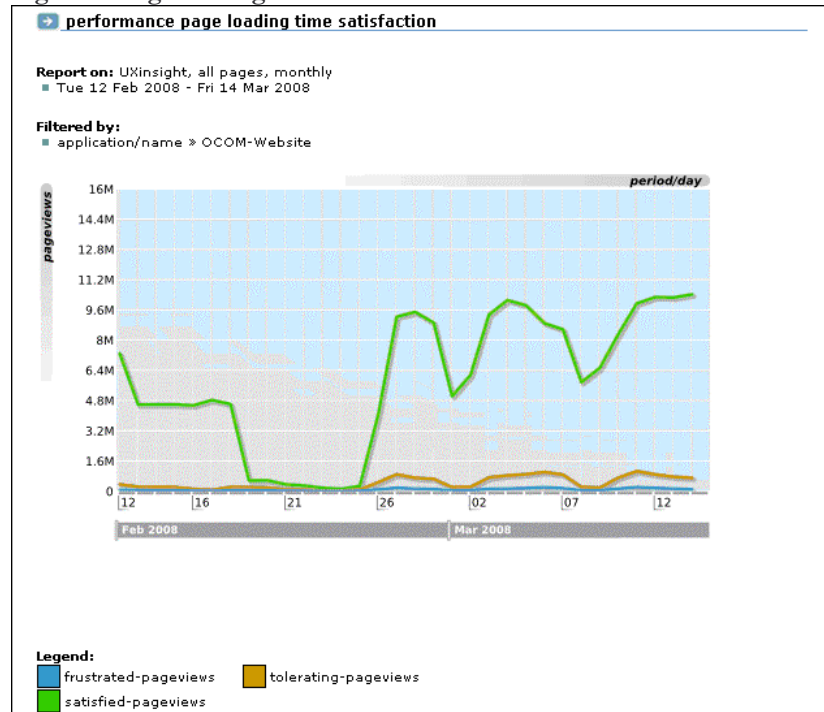
The load dynamics on the networks of small and large businesses can change quickly and dramatically. If these changes are significant enough, and occur without the knowledge of downstream application owners whose success depends on sufficient bandwidth upstream needed deliver services to the end-users, then puzzling performance issues can result. The case of the choking pipe illustrates Real User Experience Insight adding value through clear reporting in the management of www.oracle.com.

To start at the end, the final analysis of this case lead to the realization that one of the corporate ISP gateways was being saturated during certain peak periods of Oracle's business day. The saturation was due to some new services having been moved into the external gateway used by www.oracle.com. These new services were very network bandwidth intensive. Additionally, miscalculations in network provisioning meant there was not enough peak bandwidth to support all of the network requirements of the downstream applications. The analysis tools used to discover this problem included Real User Experience Insight, server metrics from Oracle Enterprise Manager Resource monitoring, and customer feedback. They eventually culminated in finding upstream saturation based on network reports and diagnostics.

The following is a high-level sequence of events. During the middle of February 2008, we began noticing higher service loads on various layers of the www.oracle.com hardware and software components, but did not understand why.

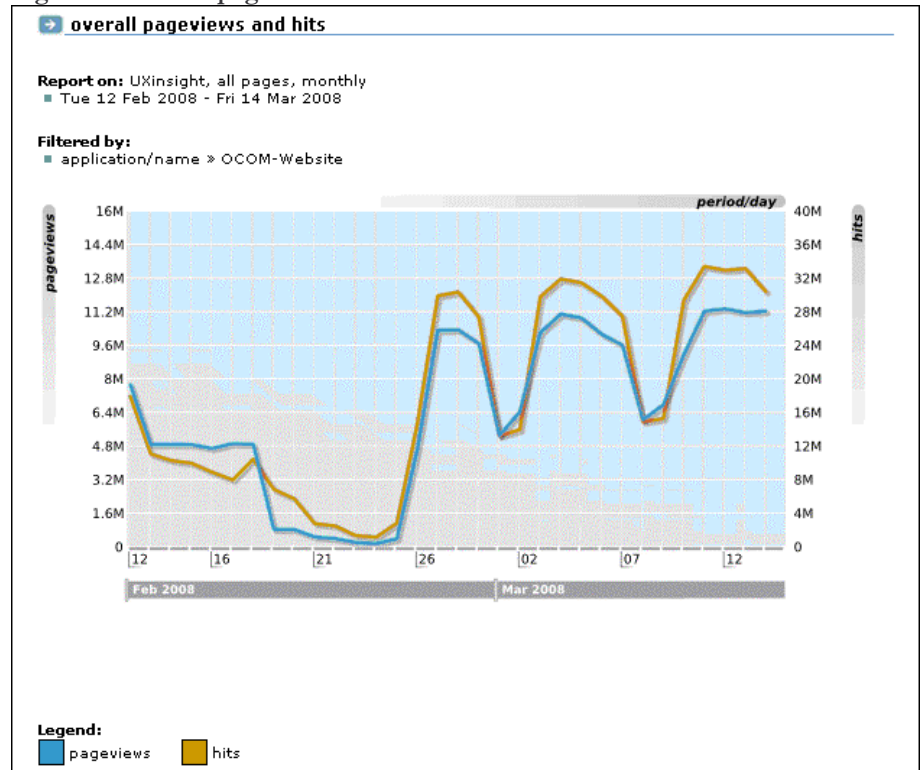
At the same time, we had received reports from some users concerning a problem with intermittent reductions in page rendering performance. We turned to our recent deployment of Real User Experience Insight, and discovered that it supported some of the end-users' performance claims (Real User Experience Insight can provide reports and alerts automatically so that performance problems can be discovered well before end-user reports ever surface. However, it was still early in the Real User Experience Insight deployment cycle and we did not yet have these alert features active.) Page loading time satisfaction (configured at 4 seconds) was severely depressed over several days (see Figure 9) dropping radically in the middle of February.

Figure 9: Page loading time satisfaction.



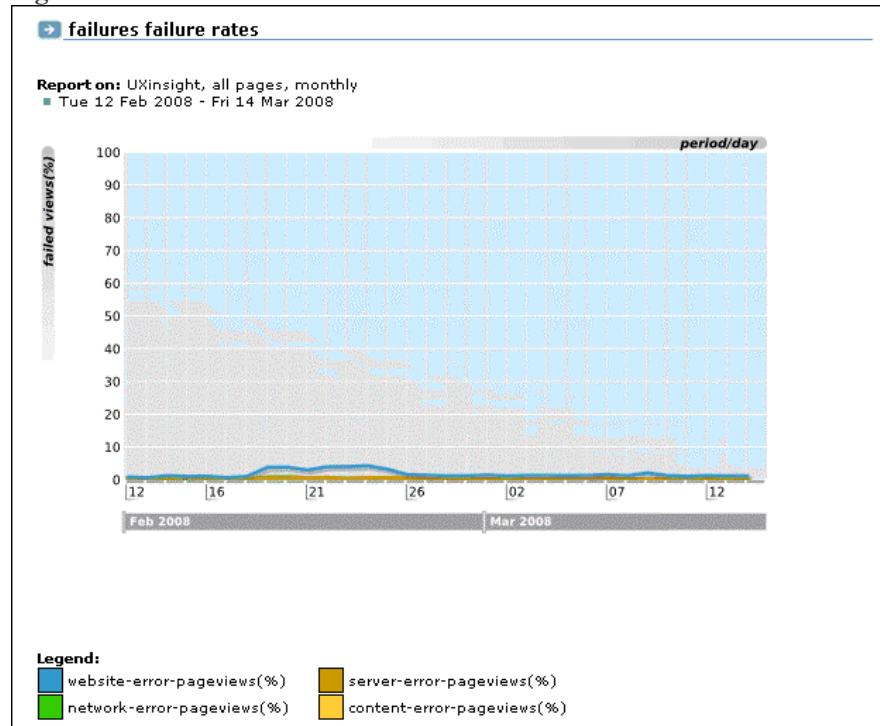
Further analysis showed overall site traffic activity was moving with the exact same depressed trend as Satisfied Page Views. That is, downward (see Figure 10). We needed to understand why we were taking less traffic but expending more server resources at the same time.

Figure 10: Overall pageviews and hits.



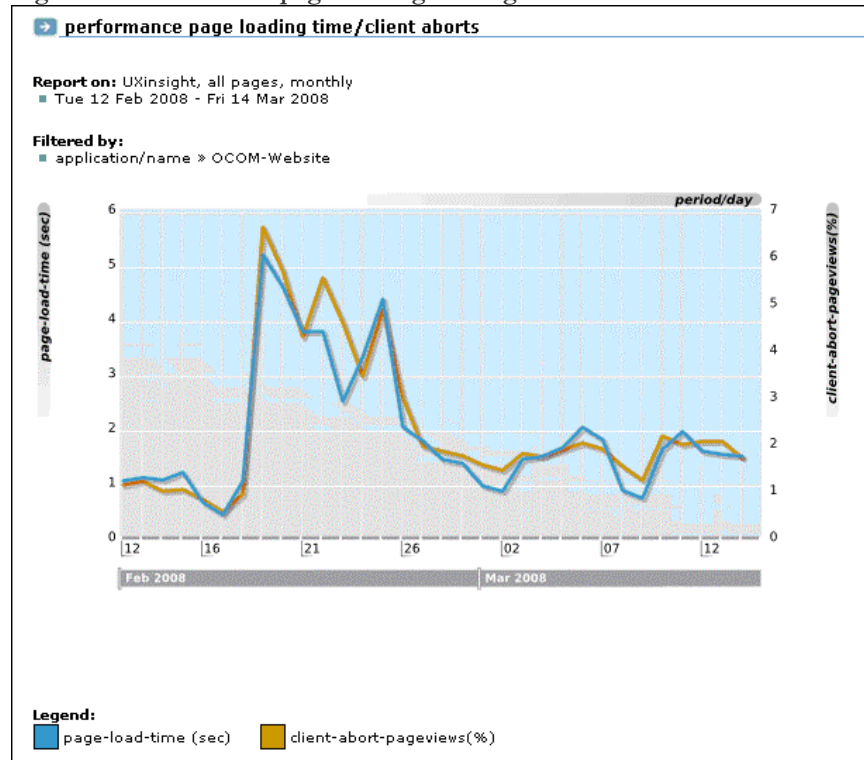
Interestingly enough, the increase in server loads, coupled with the traffic decrease and the drop in the Satisfaction Load Times, did not correspond with an associated trend in overall content or service errors to the end user which is what we would expect to see (Figure 11). We began to look at the problem differently and speculated that a drop in traffic and page response times, coupled with increased server loads, could be due to constant packet reprocessing and content re-requests from end-users never receiving content based on upstream networking problems.

Figure 11: Failure rates.



A few simple traces and ping diagnostics from external resources confirmed our suspicions. The Network team was contacted and network monitoring reports confirmed that during certain hours of the day, and certain days of the week, the external gateway used by www.oracle.com was being saturated. As mentioned earlier, it was then recognized by the Network team that several migrations of externally facing services that shared the network with www.oracle.com had saturated the internet uplink. Remedial steps were immediately taken to re-balance networks loads. The re-balance was done in a phased approach, and it is interesting to see the effects of this captured by Real User Experience Insight as evident in the Performance Page Load Time report shown in Figure 12. This same report also captures the associated decrease in client aborts trending with the decrease in page load times demonstrating an overall better experience for the end-user.

Figure 12: Performance page loading time against client aborts.



CONCLUSION

We have demonstrated that Real User Experience Insight can provide a powerful, real-time, 360 degree view of critical Web services. It can help to quickly identify serious threats against end-users' experiences of a website.

In the first case study, we saw Real User Experience Insight identifying external pressures directly affecting the web site's infrastructure resources. In the second case, we witnessed Real User Experience Insight identify issues, not directly related to the web site's infrastructure, but with the upstream network resources. This is truly a 360-degree view that's obtainable within days and hours of installing and configuring the device.

Real User Experience Insight is now a staple of the management of www.oracle.com and has replaced all other legacy end-user reporting mechanisms.



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