Best Practices:

Maximize Exceed onDemand Performance

OpenText Exceed onDemand
Managed Application Access Solutions for Enterprise

OpenText Connectivity Solutions Group
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Abstract

Exceed onDemand® is the most powerful and complete remote X Window application access solution on the market. Designed for Microsoft Windows, Linux, UNIX and Mac OS X desktop users, it is built on a sophisticated architecture that gives it the power, flexibility, and security to meet business needs.

This whitepaper is an Exceed onDemand guide for improving performance. It also provides tips to help users maximize the benefit of the product. It will be beneficial for readers to also review the Architecture Whitepaper for information on the how the solution works and be familiar with some of the terminologies used throughout this whitepaper.
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A Multi-Tier Solution

Exceed onDemand is a multi-tier solution that includes Server and Client components. Users can use Exceed onDemand to access X applications on an application server. As the most flexible solution on the market, Exceed onDemand offers two types of connectivity: two-tiered and three-tiered.

Two-tiered environment

In a two-tiered environment the X application resides on the same physical machine as the Exceed Connection Server (ECS). This will result in better performance for the simple reason that there is one less network connection. There are no security concerns between the X application and the Exceed onDemand proxy as they reside on the same system.

![Diagram of two-tiered environment](image)

*Figure 1. Two-tiered environment. The X applications reside on the ECS machine.*
Three-tiered environment

In a three-tiered environment the X applications will not necessarily reside on the Exceed Connection Server. Performance may be subject to the quality of the network connection between application server and the Exceed Connection Server.

Figure 2. Three-tiered environment
Architecting Exceed onDemand Infrastructure

No two business environments are identical, but many do share similar characteristics, such as the type of business applications deployed, the strategic distribution of application servers, the density of the user population, the relative distance between the user population and application servers, etc. These characteristics have definitive impacts on the IT infrastructure, which will ultimately shape the business environment.

There is one simple but fundamental rule that serves as the design guide for all scenarios described above: the Rule of Proximity. One of the strengths of the OpenText Exceed onDemand is the highly compressible and ultra-high performance Thin X Protocol (TXP). Results from an in-house analysis has shown that the amount of network traffic generated by Exceed onDemand is less than 1 percent that of a traditional X server. TXP is one of the main reasons why Exceed onDemand has such exceptional performance over limited bandwidth connections, which is commonly associated with increased geographical distance. TXP can effectively eliminate geographical barriers.

However, TXP can only be used to reduce network traffic between client PCs and Exceed Connection Servers; the communication between the Server and X applications is still handled by the traditional X11 protocol, which performs well only in a local area network environments.

Because of the dependence of the X11 protocol, and the protocol's lackluster performance over any network connection other than LAN, it is imperative that when considering the placement of the Exceed Connection Server, you must ensure that the network connection between the application server and the Exceed Connection Server is both high-speed and low-latency. In other words, Exceed Connection Server and the application server must be in close network proximity in order to maximize the efficiency of the solution.

For more information on server deployment strategy, please refer to Best Practices: Exceed onDemand Deployment Scenarios.
Improving 2D Drawing Performance

Performance adjustments are made and contained in the respective configuration (.cfg) file and are edited through the Xconfig Manager. Exceed onDemand ships with Xconfig profiles with default settings. These settings will delivery good performance for a broad range of X Window applications.

All of the performance enhancing options are located under the Performance tab, and options are grouped into six categories. Use the Xconfig Manager to open a Xconfig profile, then go to the Performance tab.

The image below shows the typical settings found in the default Xconfig profile.

![Xconfig Profile](image)

*Figure 3. These are optimal settings for most X applications*
**Drawing**

There are several options in the Drawing section. They will be explained in the upcoming section.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exact Zero Width Lines</td>
<td>Disabled</td>
<td>Most applications do not use this option. When redrawing two lines or segments together, it has to be drawn exactly within one pixel at the end of the line.</td>
</tr>
<tr>
<td>Draft mode</td>
<td>Enabled</td>
<td>This option improves performance, but results in a slightly but generally unnoticeable reduction in drawing accuracy.</td>
</tr>
<tr>
<td>Batch Requests</td>
<td>Enabled</td>
<td>When doing repeated drawings, we batch the requests and send several commands at once.</td>
</tr>
<tr>
<td>Limit Window Exposures</td>
<td>Enabled</td>
<td>Saves an image of each top-level window to avoid sending extra traffic when windows are moved. This results in reduced bandwidth and improved performance.</td>
</tr>
<tr>
<td>Backing Store</td>
<td>Always</td>
<td>When a window is created, it will always create a backing store. This can reduce network traffic and improve speed refresh.</td>
</tr>
<tr>
<td>Save Unders</td>
<td>Disabled</td>
<td>Improves Windows drawing speed and memory usage.</td>
</tr>
</tbody>
</table>
Image Caching

Large images can take a long time to transfer from the Proxy to the Client. Exceed onDemand can persistently cache large images in the local storage to save bandwidth and improve performance. Users can also define the image size threshold and the maximum storage size for the image cache. However, like all caching mechanism, it is subjected to diminishing return on performance if the cache size is too big. In which case it means system may spend more time going through and compare cached contents than to just simply download the content from the host. So, be mindful when lower the image size threshold or increasing the disk space limit value.

Font Caching

The concept of font caching is similar to image caching. Since all fonts are located on Exceed Connection Server and it is the Client that has to display the text on the screen, the fonts have to be transferred from the Server to the Client, and this process can be time-consuming and repetitive. Font caching can help. Caching is a mechanism that temporarily stores frequently accessed information in a location that is easier and faster to access than the original storage place. With font caching turned on, the Exceed onDemand Client caches all requested fonts consistently in the local storage. The Exceed onDemand Proxy first consults the Client’s font cache content before sending the font over the network. This mechanism ensures maximum efficiency and reduces redundant network traffic. Users can further specify the maximum number of fonts that can be stored in the cache directory.

Fast and Slow Connections

Exceed onDemand is designed to run on all types of network connections, especially remote connections such as WAN and the Internet, where the connection speed varies widely, from a dial-up modem connection at 33.6 kbps to a DSL/cable connection that can be as fast as 20 mbps. Exceed onDemand automatically tests the connection speed when an X session is launched. Based on the results of the test, Exceed onDemand decides if the Exceed onDemand Proxy should be optimized for “fast” or “slow” connections. This selection dictates the level of compression as well as the allowed number of window exposure events.
Compression

Exceed onDemand uses Thin X Protocol (TXP) to handle the communication between the
Exceed onDemand Client and the Exceed Connection Server. This physical connection is usually slower
because it is more likely for the Exceed onDemand Client to be running in a remote location, connecting
to an Exceed Connection Server over dial-up or broadband connections. One of the characteristics
of TXP is its ability to compress data so fewer bytes will have to travel over the network. The compression
ratio is controlled by the Exceed onDemand Proxy, but users can override it under certain conditions. If
the network connection is fast, the Proxy will default the compression setting to “large data only,” which
means that only images and font data will be compressed. TXP commands will not be compressed. Users
can override this setting by selecting either “none” or “all data”. The “none” setting benefits users on a
very fast network; one that is so fast that any performance benefit gained by decreasing the number of
bytes transferred is offset by the time Exceed onDemand takes to compress and decompress data.
However, users will observe little bandwidth reduction with this setting. “All data” compression, as the
name implies, compresses all data. The bandwidth usage is at the minimum.

Users cannot adjust the compression setting if the connection speed is slow, in which case “all data”
compression is selected by Exceed onDemand.

Image Quality

The default setting for the Image Quality is Highest.

When set to highest this ensures that Exceed onDemand uses lossless (zlib) compression algorithm to
compress images. The other settings use lossy (JPEG) compression. In some cases, using lossy (JPEG)
compression will yield better performance because the algorithm can better reduce the size of complex and colorful images. However, in certain cases, such as displaying Cadence Virtuoso
application, where the screen is mostly composed of lines of fewer colors, zlib compression algorithm can actually do a better job in keeping the down the amount of graphic data transfer.
**Shadow Window**

Shadow window creates a buffer on the Exceed onDemand Server machine, allowing drawing requests to be handled by the Exceed onDemand Proxy instead of the Client. Some X applications will benefit tremendously by this feature because of the extensive drawing requests that they make, which impose heavy bandwidth demands and impede performance. When used properly, bandwidth consumption and performance can be greatly improved.

After running the application for the first time, look in the ewebhost log for an entry that resembles the following:

```
WM_NAME=<some value>
```

You may then enable the Shadow Window checkbox and insert this information under the “Window Name:” box.

**OpenGL**

OpenGL is the premier environment for developing portable, interactive 2-D and 3-D graphic applications. Exceed onDemand has harnessed the power of OpenGL, and supports OpenGL applications such as scientific and data analysis, geographic mapping, content creation, CAD, CAM, and CAE.

The unique design of Exceed onDemand allows the Proxy to delegate OpenGL rendering tasks to the Exceed onDemand Client, thus relieving the Proxy of the heavy computational tasks. As a result, the Proxy can simultaneously handle a larger number of OpenGL applications.

*Figure 4. Exceed onDemand can display X applications with OpenGL API implementation*
Desktop-side Rendering

In a normal X server environment, the 3D rendering is done on the client PC. This means that all the OpenGL commands and data are sent across the network which can result in slower performance depending upon the quality of the network, the video card as well as the X application doing the rendering. This will also require a high-end video card on the individual client workstations.

Server-side Rendering

Exceed Connection Server has the option, Server-Side Rendering which instructs the Server to render the OpenGL application on the Connection Server, instead of having the client perform this task. Configuring this is a two-step process. On the UNIX box, you will need to run the script ssrconfig which is found in the `<eod install dir>/bin`.

It seems counter-intuitive but you should respond "No" to the three options presented during configuration.

Restrict local X server access to vglusers group (recommended)?
Restrict framebuffer device access to vglusers group (recommended)?
Disable XTEST extension (recommended)?

You will then need to restart the X server on the console. The second step is configuring the Client.

![Figure 5. OpenGL Setting page in Xstart With Server-Side Rendering enabled](image-url)
When this option is enabled, in Xstart Settings under the OpenGL tab, the OpenGL application is drawn on the Server to the local video card and then a 2D image is sent to the client.

Figure 6 Server-side Rendering

The benefits of this option are that it greatly reduces the amount of resources that the Exceed onDemand client uses to render the 3D image. It cuts down on the amount of bandwidth that is used because the Exceed Connection server is sending an image instead of all the information to the client to build the image. If the application requires a high end video card to do the rendering then only the Exceed Connection Server needs the video card instead of having to have an expensive video card for each client that is connecting to the Exceed Connection Server and running the 3D application. This option does add extra load to the Exceed Connection Server when it is enabled.

One thing worth noting is that not all OpenGL applications will benefit from Server Side Rendering. Applications, such as glxgears or glxspheres, that use Display Lists will not show any noticeable performance gain when objects are rendered on the server side. Instead, try using the OpenGL applications that your business or workflow demands to test the Server Side Rendering feature. Alternatively, a benchmarking software, called SpecViewPerf, can also be used to show the performance improvement offered by Server Side Rendering.
Conclusion

Exceed onDemand is an extremely flexible product that is ideal for today’s enterprise. It is the leading managed application access solution for enterprises worldwide. It offers a long list of configurable options to allow users to fine tune it performance. This document provides a concise overview of those features so advanced users can adjust them to suit the demands of their specific needs.

When it comes to OpenGL applications, Exceed onDemand offers out-of-the-box support for OpenGL while leveraging the existing graphics hardware on users desktop. To further accelerate the 3D performance of complex CAD/CAM applications, Exceed onDemand also offers the unique Server Side Rendering capability. By utilizing a powerful and cost-effective graphic resource pool available to the Exceed Connection Server, company can enjoy high-performing OpenGL rendering while lowering the cost of ownership by removing the requirement for high-end video cards on all desktop systems.
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