Intergraph Smart® Cloud Services

Network Requirements

1. Definitions & Acronyms

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<tr>
<th>Item</th>
<th>Definition</th>
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<tr>
<td>DNS</td>
<td>Domain Name System</td>
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<tr>
<td>Gbps</td>
<td>Gigabits per second</td>
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<tr>
<td>HTTP</td>
<td>Hyper Text Transfer Protocol</td>
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<tr>
<td>HTTPS</td>
<td>Hyper Text Transfer Protocol Secure</td>
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<tr>
<td>ICMP</td>
<td>Internet Control Message Protocol</td>
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<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td>Kbps</td>
<td>Kilobits per second</td>
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<tr>
<td>Mbps</td>
<td>Megabits per second</td>
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<td>QOS</td>
<td>Quality of Service</td>
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<td>S3D</td>
<td>Smart3D</td>
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<td>SSL</td>
<td>Secure Sockets Layer</td>
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<td>TCP</td>
<td>Transmission Control Protocol</td>
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<tr>
<td>TCP/IP</td>
<td>Transmission Control Protocol/Internet Protocol</td>
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<td>UDP</td>
<td>User Datagram Protocol</td>
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2. Authorized User Connection to the Network

Most corporate office environments today support both wired and wireless (WiFi) user connectivity, depending on circumstances. The Cloud Environment, Cloud Services and PPM Software Products require a high-quality consistent connection and therefore it is recommended that Customer and/or its Authorized Users connect via a **wired 1 Gbps connection** into a switch to access the network.
It is advised that wireless connections be avoided where possible, as they may not be consistent and introduce a large amount of latency and jitter, even though their use may be initially successful.

3. Internet Bandwidth Requirements

Use of PPM Software Products and/or the Cloud Services is dependent upon a session established over the Internet from the Authorized User’s machine to the one of the Data Centers. This requires a high speed, high quality Internet connection at the Authorized User’s site.

Any PPM Software Products that involve either rendering or editing 3D content have the following bandwidth requirements:

- **Minimum Required Bandwidth**: 2 Mbps dedicated Internet bandwidth for each simultaneous Authorized User.
- **Recommended Bandwidth**: 5 Mbps dedicated Internet bandwidth for each simultaneous Authorized User.

For instance, this means that a site running ten simultaneous Smart 3D or HxGN SmartBuild clients would require a minimum of 2x10, or 20Mbps, connectivity to the Internet allocated to the application, above and beyond the usual bandwidth requirements at the site and 5x10, or 50Mbps for optimal performance.

For PPM Software Products that do not involve rendering or editing 3D content have the following bandwidth requirements:

- **Minimum Required Bandwidth**: 250 Kbps dedicated Internet bandwidth for each simultaneous Authorized User.
- **Recommended Bandwidth**: 400 Kbps dedicated Internet bandwidth for each simultaneous Authorized User.

It is recommended that the Authorized User site be served by a dedicated business grade ISP connection, sized using the parameters above.

Satellite connections are **not advisable**, as they introduce very large amounts of latency into the connection, increasing the round-trip time to unacceptable limits. Similar problems may be encountered with wireless point to point or microwave links, depending on the Customer Environment.

4. Network Latency Requirements

Network latency from the site location to the Data Center(s) is a critical factor in ensuring an optimal user experience with Cloud Services and the PPM Software Products.

Any PPM Software Products that involve either rendering or editing 3D or EcoSys content have the following latency requirements:

- **Maximum Required Latency**: < 150 milliseconds
- **Recommended Latency**: < 100 milliseconds
For PPM Software Products that do not involve rendering or editing 3D or EcoSys content have the following latency requirements:

**Maximum Required Latency:** < 300 milliseconds

**Recommended Latency:** < 250 milliseconds

Latency from a specific site/location can be evaluated by navigating to the following URLs via a web browser from the specific physical site in the applicable region:

- **EUROPE, MIDDLE EAST, INDIA & AFRICA:** [https://perfazeu.smartplantcloud.net/speedtest/](https://perfazeu.smartplantcloud.net/speedtest/)
- **UNITED STATES OF AMERICA & CANADA:** [https://perfazus.smartplantcloud.net/speedtest/](https://perfazus.smartplantcloud.net/speedtest/)
- **ASIA & PACIFIC REGION:** [https://perfazsea.smartplantcloud.net/speedtest/](https://perfazsea.smartplantcloud.net/speedtest/)

5. **Jitter and Packet Loss**

Network jitter is defined as the variation in network latency. All PPM Software Products delivered via Cloud Services have the following jitter requirements:

**Maximum Required Jitter:** < 50 milliseconds

**Recommended Jitter:** < 25 milliseconds

PPM recommends a maximum jitter of 30ms or less (variation in latency response times) if possible, although connections may be acceptable with larger variations. All PPM Software Products have the following packet loss requirements:

**Maximum Required Packet Loss:** < 0.3%

**Recommended Packet Loss:** < 0.1%

6. **Firewalls and Port Settings**

The site firewalls must allow ports 80/tcp (http) and 443/tcp (https), 443/udp at a minimum. Additional ports may be required for services including file import / export services, etc. All PPM Software Product session traffic is carried over HTTPS. It may also be useful to allow ports associated with the ICMP protocol to the Cloud Services proxy servers for troubleshooting purposes.

Please note that specific IP addresses may by subject to change at any time, but the DNS name will remain the same.

Cloud Services firewall rule requirements may change from time to time as a result of future service enhancements.
7. Domain Name Resolution

DNS servers must be set up and configured correctly at each site/location and all connections must use a DNS resolver of last resort that is located in the same country as the Authorized Users.

8. Quality of Service

Where possible it is recommended that the network should utilize a Quality of Service (QOS) policy to prioritize HTTPS traffic to the PPM Software Product proxy servers.

9. Web Proxy And Caching Services

Many corporate entities deploy web proxy solutions for http and https traffic for performance and security reasons.

As all Cloud Services connections are encapsulated and encrypted within a https connection, it is advised that all traffic to https://proxy.smartplantcloud.net be excluded from any category filtering, web caching, and security inspection in order to maximize performance.

PPM currently does not recommend SSL interception and decryption on a proxy server for Cloud Services.