# Connectivity Requirements

In the Learn on Demand platform the learner may connect to multiple components of an integrated platform from a single location, the Enlight LMS. From the Enlight LMS, the learner can be connected to a virtual classroom environment to participate in a class, and can also launch labs provided by the Lab on Demand cloud platform.

All of this is done through the learner's web browser and Lab on Demand supports a wide range of browsers to allow anyone to participate.

The Lab on Demand user interface is an HTML based application that wraps one of three virtual machine access controls. The control used depends on the type of browser, available browser add-ins and the style of lab being taken:

- The Virtual Machine Remote Control Active-X control which uses port 2179. This control has two types:
    - The Hyper-V Active-X VMRC (VMRDP over port 2179)
    - The Virtual Server Active-X VMRC (VMRDP over port 2179)
- The HyperVMRC control. The HyperVMRC control has three options:
    - HTLM5 (Websockets over port 443)
    - Flash (Websockets over port 80 & 843. *Port 843 is to connect to the Flash Websockets Policy Server)
    - Silverlight (HTML over port 443)
- The VMware Remote Console Plug-in (Port 902) *

All of the virtual machine access controls offer excellent performance, however, where a learners Internet connection has consistency/quality of service issues, the best performance will be achieved using the Active-X plug-ins.

The requirements to connect depend which of the Lab on Demand clients you choose to use, or can use, with your browser version. Each browser can support a different combination of clients. Use the table below to determine your requirements.

| Virtual Machine Client | Internet Explorer | | Firefox | | Chrome | | Safari | |
|---|---|---|---|---|---|---|---|---|
| | Version | Ports | Version | Ports | Version | Ports | Version | Ports |
| VMRC ActiveX* | 8+ | 2179 | NA | NA | NA | NA | NA | NA |
| Hyper-VMRC HTML5 | 10+ | 443 | 11+ | 443 | 16+ | 443 | 6+ | 443 |
| HyperVMRC Flash | Flash 11+ | 80 & 843 | Flash 11+ | 80 & 843 | Flash 11+ | 80 & 843 | Flash 11+ | 80 & 843 |
| HyperVMRC Silverlight | Silverlight 4+ | 80 | Silverlight 4+ | 80 | Silverlight 4+ | 80 | Silverlight 4+ | 80 |
| VMware Remote Console** | 6+ | 902 | 11+ | 902 | 16+ | 902 | NA | NA |

\* (Preferred client)
\*\* (Windows & Linux OS's only)

Each browser has a preferred virtual machine client order and will attempt to use its preferred client by default.

- Internet Explorer will use Active-X first, then HTML5 (IE 10 or higher), then Flash, then Silverlight.
- Chrome, Firefox and Safari will attempt to use HTML5 first, then Flash, then Silverlight.

You can switch between any available virtual machine client in the lab interface by clicking on the *Options* section and then selecting the desired client from the drop down list.

**Firewall Exception Rule Information**

For those that need to create a firewall exception rule to allow connectivity to the Lab on Demand servers the following information can be used to create a limited destination rule to only allow the above protocols and ports from your network to the Lab on Demand cloud.

- **Domain Names:** *.labondemand.com
- **IP Range:** 67.214.104.129/25

The Lab on Demand system is a cloud platform that automatically provisions and connects the learner with private sandboxed resources. There is no way to predict which IP address in the cloud the learner will connect to for the provisioning of their virtual machines. This is why we provide a "range" of IP addresses and only a second level domain name. See the below diagram and explanation of how the Learn on Demand platform connects and passes data.
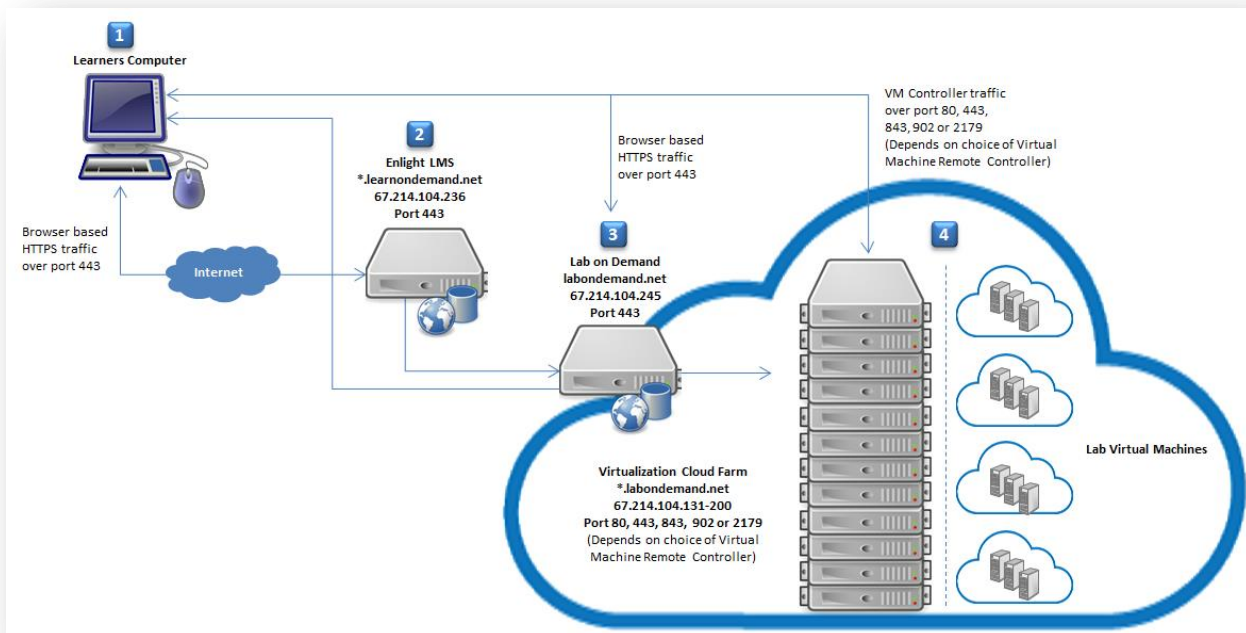


A. The learner [1] connects to the Enlight LMS [2] over HTTPS (port 443) and logs on to the platform.
B. The learner [1] clicks the "Launch" button in the LMS [2] to start a lab.
C. The LMS [2] connects to the Lab on Demand [3] platform and makes the learners lab request.
D. The Lab on Demand [3] platform scans the LoD resource cloud [4] using a proprietary algorithm and chooses the optimal resources to provision the learner's lab.
E. The LoD resource cloud [4] then provisions and starts the requested virtual machines in a private sandbox for the learner.
F. The learner's browser presents the Lab on Demand user interface using HTTPS connections to the Lab on Demand [3] platform and wrapping the selected Virtual Machine control interface connection to the LoD resource cloud [4]. The ports and destination will correspond to the selected virtual machine client and private sandbox lab location within the cloud.