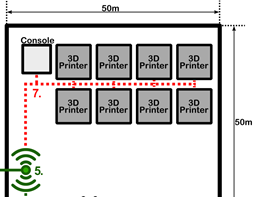
Point 7

# Problem

Point 7 manages the link of the 3D printers to the business network (Connection Point 5). The network will be expected to manage initially 8 printers producing 25 models a day with the capacity for suitable expansion. The network must provide access for 2 technical staff members manning the warehouse. The diagram below illustrates the 3D printers with a management console connecting via wireless.



# Considerations and Assumptions

The majority of 3D printers and technologies connect via USB or Wi-Fi.

Printers on the network will occupy more network resources whilst transferring data from the network to the printer. The average 3D print time for a model is roughly between 3 and 4 hours based on typical large model sizes of 200x200x150mm. The connection between the network and printer only need be maintained whilst transmitting data. Business will use commercial size printers supporting models print sizes between 200x200x150mm (large) and 50x50x20mm

3D model data sizes are determined by size and detail.

# Potential Solutions

**Wired Solutions**

**Wireless Solutions**

* Possible
  + Wireless router
  + USB network Hub
  + Wireless network Hub
  + USB multiport switch - <http://www.staples.com/ConnectPRO-8-Port-KVM-Switch-With-USB-VGA/product_IM1TC5782>
  + Wired/Wireless repeater
  + Automatic printer switch
    - <https://www.iogear.com/usb-switch.htm>
    - <http://www.amazon.co.uk/s/?ie=UTF8&keywords=printers+cables&tag=mh0a9-21&index=electronics&hvadid=3174907226&hvqmt=p&hvbmt=bp&hvdev=c&ref=pd_sl_797tdv5nbk_p>
* Proposed
  + Solution 1
    - USB Network Hub
  + Solution 2
    - Automatic printer switch
  + All Solutions
    - No repeater. (repeaters used for cleansing and extending signal further than 100m) Warehouse is 50x50m.
    - Ethernet over USB - <https://en.wikipedia.org/wiki/Ethernet_over_USB>
* Ethernet Hub vs Network switch
  + <http://www.ebay.co.uk/gds/Ethernet-Hubs-Vs-Network-Switches-/10000000177629216/g.html>
* Wired vs Wireless:
  + <http://smallbusiness.chron.com/explanation-wireless-vs-wired-printers-58672.html>

**What is it connection point needed for?**

This point manages the connection and network of the 3D Printers to the business network.

**What features should the hardware have?**

* USB hub will need an independent power supply (self-powered) so that the number of downstream ports is not limited to just 4. <https://en.wikipedia.org/wiki/USB_hub>
  + Bus-powered
  + Self-powered
  + Dynamic powered

**Assumptions**

* Cat5 Ethernet cable will be used to link connection point 7 and 5.
* Printer network will access LAN only. No need for internet connection.

**Constraints**

* The majority of FDM and SLA printers that I viewed where USB and Wi-Fi connected. Printer network specific hubs and switches have been developed other the years although 3D printer networks are still fairly new and not as common yet.
* Traditional network switches use Ethernet connectivity. Standard Ethernet switches come with 18-24 ports. Standard USB hub comes with 4-7.
* The network hub will need to be self-powered i.e its own power source opposed to powering by USB. If the hub is powered by USB then the amount of ports available downstream is a maximum of 4 where as if the hub had its own power source it is not limited
* In order to achieve USB2.0 or 3.0 data rates all connections from the USB device (printer) to the computer must be of the same USB version.

**Thoughts:**

Original idea was that all printers would be connected via USB network hub - <http://www.maplin.co.uk/c/computing-and-office/pc-device-connectivity/usb-hubs-and-switches?page=1&sort=&productsPerPage>. After researching printer networks I have come across USB networking switches originally designed for printer networks - <http://content.webcollage.net/apps/cs/mini-site/iogear/module/iogear/wcpc/1342558353799?channel-product-id=GUB431&enable-reporting=true&report-once=retailer-direct-product-button-click&showtabs=&suppress-site-prefs=&wc-target=&from-pp> and high speed USB cable - <http://www.amazon.co.uk/s/?ie=UTF8&keywords=printers+cables&tag=mh0a9-21&index=electronics&hvadid=3174907226&hvqmt=p&hvbmt=bp&hvdev=c&ref=pd_sl_797tdv5nbk_p> . Still investigating the benefits of this hardware opposed to a standard USB hub, its compatibility with other components and potential for network development.

Disadvantages of Wireless network.

Wi-Fi Router

3D Printer

3D Printer

3D Printer

3D Printer

3D Printer

3D Printer

3D Printer

3D Printer

USB Hub

Console