

# **John Smith Home Network Proposal:**

JT

## **Executive Summary:**

The client (Mr. Smith) owns a single-story house in southern California that needs to be equipped with a fast and reliable network. The main objectives of this proposal are to provide the fastest home network connection design that can support reliable connectivity various areas of the residence and the specific equipment with regards to the data used in the network while implementing adequate security measures such as configured firewall is necessary as the client is away from the premises most of the time. There needs to be wired connection available for the Laptop, TV and Printer while the bedrooms, study/library room and living room need to have the wired connection capability. A laser color printer, Full HD TV and network related devices such as modem, router, switch, cabling and an AP also need to be purchased to support accessibility and fiber internet will be purchased to support the client's needs. Furthermore, the detailed software and applications necessary for entertainment purposes as well as GE business purposes need to be purchased. The cost of implementing the network including the 300ft of wired access using Cat6 unshielded twisted pair and maintaining the printer as well as the ongoing costs related to subscription-based apps is included in the end of the report as well.

## **Network Analysis:**

**Needs analysis:** The client needs a fast network that can support multiple full duplex connection of multiple devices as well as applications including fast printing, general business apps such as Dropbox, Microsoft 365, Adobe creative cloud to access all apps, zoom pro for unlimited business meetings, entertainment applications and devices such as Netflix and Roku and general web surfing apps such as google chrome, Firefox and safari for guests and mobile devices. Therefore the data rate needs to support real time video streaming for the TV such as Roku and Netflix. Which requires at least "25 Mbps" for HD content streaming on Netflix and "9 Mbps" on Roku. (Netflix, 2020) (Roku, 2020)

Since there can be at least 3 - 5 devices connected to the network simultaneously in case additional guests use the network, the suggested data rate for 4K video streaming needs to be at least "50 – 100 Mbps" to support the needs of the network. (Reisinger, 2020)

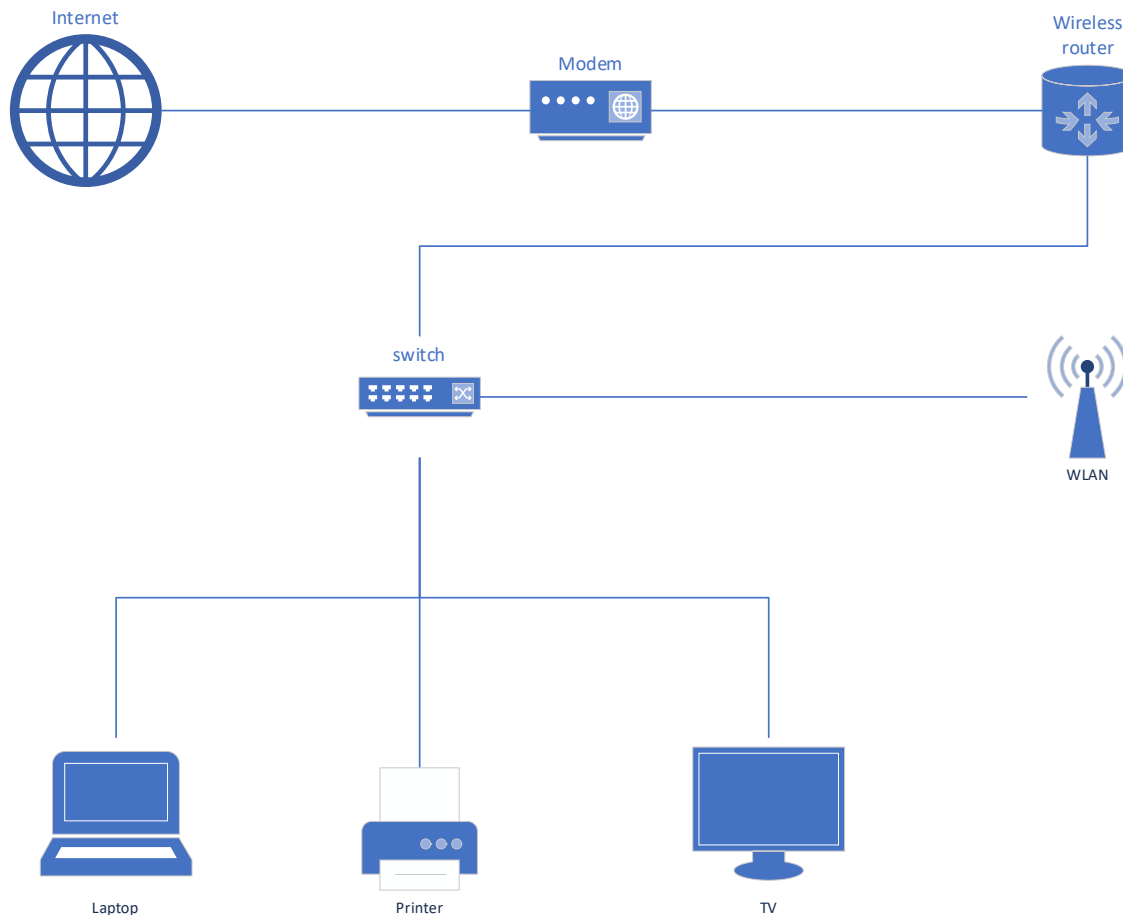
For the security purposes and optimal data rate a "point-to-point" connection is preferred for Mr. Smith. A fiber to home internet connection has a point-to-point circuit with a data rate of 1GB/s is the most suitable for the client as it can support fast connectivity and minimize network traffic while reducing the security risks due to being a point-to-point also a router with firewall capability is needed to provide an extra security layer as the client is traveling most of the time and is away from the premises. (FitzGerald et al., 2017, p. 274)

Since the living room, study room and the two bedrooms (Master and guest) need to have fast wired network connectivity two switches will be utilized, one included in the router and a second one to "strengthen the signals" and "prevent collisions" as there is 300ft of cabling required to cover the premises. Cat6 cables are needed for the wired connection of house as it provides fast and reliable connection while supporting future updates on the network speed up to 10 Gb/s. Other areas of the house such as dining room, kitchen and garage need to support wireless internet connection. (FitzGerald et al., 2017, p. 187)

Moreover, as for the devices and wireless connectivity Mr. Smith needs a networked color laser printer that is available on the network at all times. The living room needs to have a network connected high-definition flat panel LED TV and other areas of the house such as dining room, garage, kitchen need wireless internet access as well which is supported by a single access point that covers the entire premises.

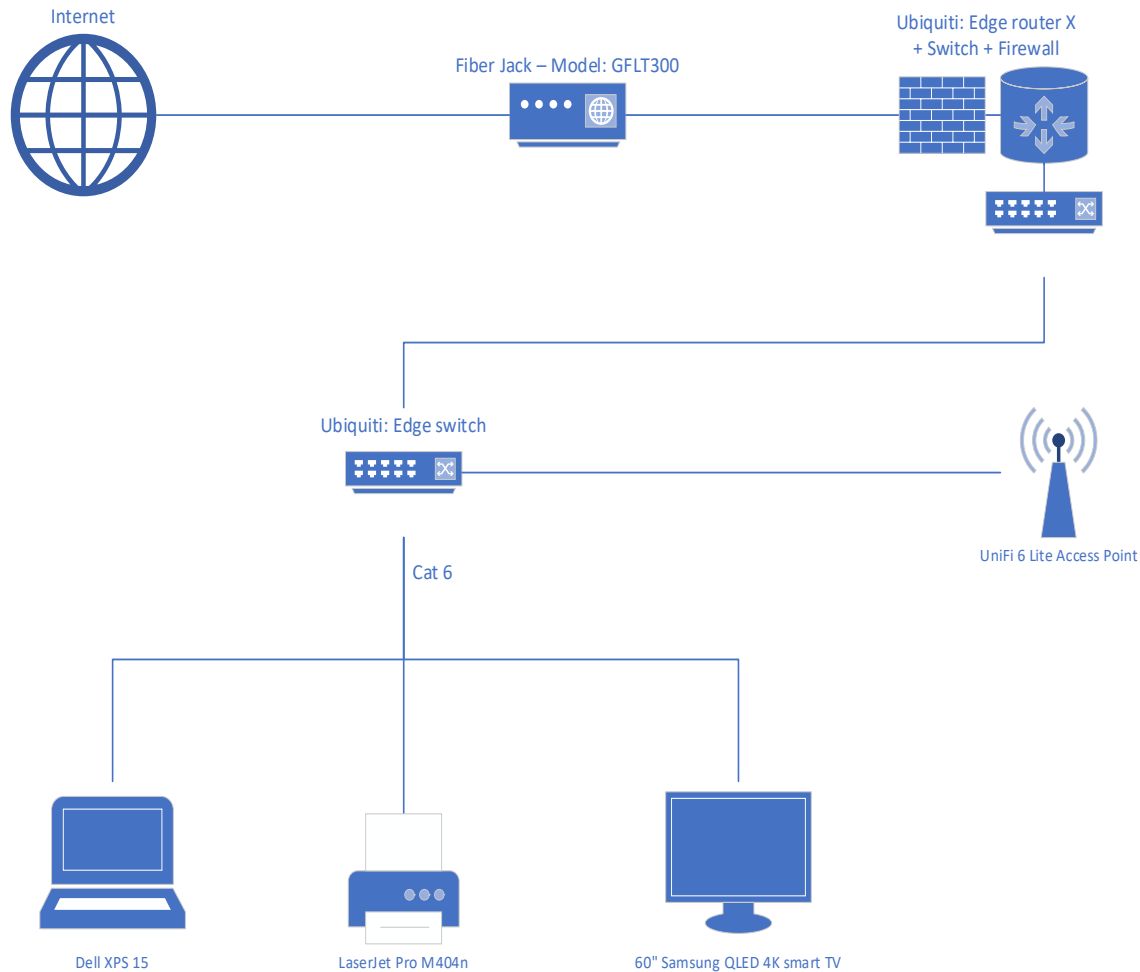
In order to satisfy the needs above the following equipment and application is needed,  
 Equipment: Optical network terminal, Router, Switch, Access point, Cat6 cable, laser printer, High-definition flat panel LED TV, Laptop. Applications: Windows 10, Dropbox, Microsoft office, Adobe creative cloud, Zoom pro, Netflix, Roku. Furthermore, the internet package of Google Fiber 1Gb/s will be needed to support the data rate for the above applications and equipment.

### Logical Network Diagram



Wired connection should be available for the TV, Printer and Laptop that is made available through separate ports on a switch that is connected to one of the switch ports of the router. There is an AP available to cover the entire premises. The network also has a star topology to allow simultaneous transferring of the data between devices and the network with minimal risk of collusion. (FitzGerald et al., 2017, p. 187)

## 1. Technology design



**Internet:** In order to deliver the optimal data rate and throughput for the network requirements Google Fiber 1GB internet will be used.

**modem:** An optical network terminal “Google Fiber jack (GFLT300)” which converts gigabit symmetric fiber optic signals to gigabit Ethernet. Since the proximity of the service provider is within 10 miles of the client’s residence the model GFLT300 using passive optical network is chosen which does not require being connected to an electrical outlet and can reduce the electricity use as the client is away from the premises most of the time. (Google Fiber Help)

**router:** Ubiquiti EdgeRouter Lite (ERLite-3) has a throughput of 1 million packets/ second for 64 bytes packets. it includes 3 Gigabit ports to support different data rates for wired connection of the TV, Printer and laptop. The one of the ports will be connected to an external switch that supports wired connection for the Printer as well as wired connection into Study room, Living room and the master bedroom. Furthermore, a firewall will be installed on the router to provide additional security as the client is travelling most of the time and is away from the premises. (Ubiquiti, 2020)

**Firewall:** The firmware on the EdgeRouter is downloaded from Ubiquiti's website and provides the capability of setting up a firewall with manually created rules or automatically created rules using Basic Setup wizard of the router. The router's firewall will be set to reject incoming packets from non-existing connection "invalid" during the time that client is away on "WAN\_IN" which checks for invalid traffic that is passed through the router on either WAN or LAN side. (Ubiquiti support, 2020)

**Switch:** Linksys SE3005 contains 5-port Gigabit Ethernet switches has the plug and play capability and will be connected to the router to support extra wired connections to other devices as well as to the Study/Library room, Living room, guest room and master bedroom. (Linksys, 2020)

**AP:** Ubiquiti's UniFi 6 Lite Access Point is powered with 802.3af PoE will be used as the premises has only one story therefor this access point is able to cover all the areas of the house. Considering there are few devices transferring data at a single point of time with the exception of guest devices, the access point will be configured to use 5Ghz band with a radio rate of 1.2 Gbps for optimal speed performance. (Ubiquiti, 2020)

**Laptop:** Dell XPS 15 Touchscreen Laptop with 10th Generation Intel Core i7 processor; it also has a 4K Ultra HD (3840 x 2160) display and a 1.0 TB SSD (Costco, 2020).

**TV:** 60" class Q60T QLED 4K UHD HDR Smart TV (2020), This TV supports wired and wireless connection to the ethernet which for our purposes we will use the wired connection. (Samsung, 1)

**Printer:** HP LaserJet Pro M404n printer supports Gigabit Ethernet network will be connected to the switch via Cat6 cables and will be available on the home network at all times. (Hp,1)

**Cable:** 328ft 100m augmented Cat6A Unshielded Twisted Pair 10GbE Cable. Allows Gigabit connection between devices and future data rate updates up to 10 GB/s will be supported using the same cable without the need for replacement. Furthermore, since the cable is used indoors there is no need for a shielded type as there is a low risk of cable damage and other issues that might arise. Furthermore, it takes "1-2 hours" to install the cabling with appropriate ports. (Fixr, 2020)

**Cost Assessment:** Described below.

The average cost of network installation with CAT-6 cabling and up to "8 connection" is \$3,800.00 Dollars with average labor costs of "\$50 to \$60 per hour" also considering an "average

of 30 to 40 hours for 2,000 feet of cabling” it is estimated that 300 feet of cabling should take between “5-6 hours” of labor plus 3 hours for installing and testing the network devices. Estimated installation time for Mr. Smith’s network including hardwiring, configuration (ports, firewall etc.) and testing is 9 hours of labor. (Fixr, 2020)

Considering the amount of travel by the client, it is estimated that with moderate use of the printer the cartridges have to be replaced at most once every year. Other costs to be considered include the fixed one-time charges for hardware devices, internet subscription fees and periodic general business software/application fees. Furthermore, as the Laptop is already purchased by the client, its cost is not included in the cost assessment below.

Hardware/Installation	Price	Period	
Fiber Jack GFLT300	\$ -	N/A	
EdgeRouter Lite	\$ 129.00	one time	
Linksys SE3005 5-Port Gigabit Ethernet Switch	\$ 24.99	one time	
UniFi 6 Lite Access Point	\$ 99.00	one time	
50" Class Q60T QLED 4K UHD HDR Smart TV (2020)	\$ 499.99	one time	
HP LaserJet Pro M404n	\$ 269.99	one time	
50" Class Q60T QLED 4K UHD HDR Smart TV (2020)	\$ 87.51	one time	
Roku Premier (For HD streaming)	\$ 24.99	one time	
Network installation(55/hours) - 9 hours	\$ 495.00	per hour	
<b>Total Fixed cost(Initial)</b>	<b>\$ 1,630.47</b>		
<b>Software/Apps</b>			
Microsoft 365 Apps for enterprise	\$ 12.00	per month	
Dropbox	\$ 9.99	per month	
Adobe creative cloud	\$ 39.99	per month	
Zoom Pro	\$ 149.90	per year	
Netflix HD available	\$ 13.99	per month	
<b>Estimate total monthly cost</b>	<b>\$ 88.46</b>		
	<b>2020</b>	<b>2021</b>	<b>2022</b>
Google Fiber 1Gb	\$ 840.00	\$ 840.00	\$ 840.00
Printer cartrige replacement	\$ 408.99	\$ 408.99	\$ 408.99
Microsoft 365 Apps for enterprise	\$ 144.00	\$ 144.00	\$ 144.00
Dropbox	\$ 119.88	\$ 119.88	\$ 119.88
Adobe creative cloud	\$ 479.88	\$ 479.88	\$ 479.88
Zoom Pro	\$ 1,798.80	\$ 1,798.80	\$ 1,798.80
Netflix HD available	\$ 167.88	\$ 167.88	\$ 167.88
Roku Premier (For HD streaming)	\$ 299.88	0.00	0.00
EdgeRouter Lite	\$ 129.00	0.00	0.00
Linksys SE3005 5-Port Gigabit Ethernet Switch	\$ 24.99	0.00	0.00
UniFi 6 Lite Access Point	\$ 99.00	0.00	0.00
50" Class Q60T QLED 4K UHD HDR Smart TV (2020)	\$ 499.99	0.00	0.00
HP LaserJet Pro M404n	\$ 269.99	0.00	0.00
50" Class Q60T QLED 4K UHD HDR Smart TV (2020)	\$ 87.51	0.00	0.00
Roku Premier (For HD streaming)	\$ 24.99	0.00	0.00
Cabling installation(Labor/2hours)	\$ 495.00	0.00	0.00
<b>Estimate total annual cost(Ongoing)</b>	<b>\$ 5,889.78</b>	<b>\$ 3,959.43</b>	<b>\$ 3,959.43</b>

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