CPNP Project

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1. Wiring

Calculating the number of double outlets

There must be one double outlet per 10 m^2 of a room. In order to calculate the number of DOs we take the room's surface and divide it by 10m^2, to get a rough approximation of our needs:

$$Number\ of\ double\ outlets\ (n_{DO}) = \left[\frac{Room\ area}{10\ m^2}\right]$$

Example for Room no. 108 (office space):

$$Room\ 108\ area = 167\ m^2\ \Rightarrow\ Number\ of\ double\ outlets = \left[\frac{167\ m^2}{10\ m^2}\right]$$
$$=\ 17\ Double\ Outlets$$

Calculating the quantity of UTP cables

To determine the number of UTP cables required to cover the entire building, we must first identify the number of double outlets. Next, we measure the distance from each room to its corresponding distribution facility and calculate the average cable length within a room. Using this data, we can determine the cable length needed for each room with the following formula, including a 6-meter cable reserve:

$$L_{room} = 2 *\ n_{DO} * (D_{room-DF} + L_{room\ avg} + 6m)$$

Considering the different room sizes, we compute the cable lengths needed for two rooms in detail, then average these lengths to estimate the cable required for the other rooms based on their surface area.

1. **Big room: room no. 130 (office space)**

$$S_{130} = 249\ m^2;\ n_{DO} = \left[\frac{249\ m^2}{10\ m^2}\right] =\ 25\ Double\ Outlets;\ D_{room-DF} = 19;$$

$$L_{130} = 6 +\ 2 * (50 + 74 + 54 + 34 + 66 + 63 + 52 + 49 + 62 + 46 + 55 + 51 + 65$$
$$+ 54 + 40 + 45 +\ 40 + 36 + 52 + 49 + 69 + 55 + 48 + 69 + 44)$$
$$= 2650\ m\ of\ cable\ in\ room\ 130$$

$$n_{cables\ in} = 2 * n_{DO} = 2 * 25 = 50\ cables$$

$$avg_{130} = \left[\frac{L_{cables}}{n_{cables}}\right] = \left[\frac{2650\ m}{50}\right] = 53\ m\ length\ per\ cable$$

2. **Small room: room no. 179 (meeting room)**

$$S_{179} = 44\ m^2;\ n_{DO} = \left[\frac{44\ m^2}{10\ m^2}\right] =\ 5\ Double\ Outlets;\ D_{room-DF} = 9;$$

$$L_{179} = 6 + \ 2 \ * (30 + 36 + 24 + 20 + 22\ ) = 270\ m\ of\ \ cable\ in\ room\ 179$$

$$n_{cables} = 2 * n_{DO} = 2 * 5 = 10\ cables$$

$$avg_{179} = \left[\frac{L_{cables}}{n_{cables}}\right] = \left[\frac{270\ m}{10}\right] = 27\ m\ length\ per\ cable$$

Based on the two above examples, one for a large room and one for a small room, we can extrapolate for all the other rooms:

	Room no.	Surface	Double outlets	Room to DF distance	Room AVG distance	DF	No. of cables	Cable per room
Lounge & Storage	102	188	19	14	24	MDF	38	1672
Meeting Room	103	50	5	14	13	MDF	10	330
Meeting Room	104	44	5	9	12	MDF	10	270
Meeting Room	105	49	5	5	13	MDF	10	240
MDF	106	42	0	0	12	(MDF)	0	0
Office space	108	167	17	10	23	MDF	34	1326
Office space	109	292	30	10	30	MDF	60	2760
Presentation room	110	91	10	14	17	MDF	20	740
Meeting Room	111	16	2	15	7	MDF	4	112
Meeting Room	114	17	2	21	8	MDF	4	140
Kitchen	117	42	1	17	12	IDF1	2	70
Bathroom hallway	118	42	0	0	12		0	0
Bathroom	119	18	0	0	8		0	0
Bathroom	120	18	0	0	8		0	0
Office space	121	714	72	14	47	IDF2	144	9648
IDF2	123	42	0	0	12	(IDF2)	0	0
Meeting Room	124	49	5	5	13	IDF2	10	240
Meeting Room	125	44	5	8	12	IDF2	10	260
Meeting Room	126	50	5	12	13	IDF2	10	310
Kitchen	128	42	1	16	12	IDF2	2	68
Office space	129	179	18	19	24	IDF2	36	1764
Office space	130	249	25	19	28	IDF2	50	2650
Storage	131	27	3	17	9	IDF2	6	192
Meeting Room	132	17	2	24	8	IDF1	4	152
Meeting Room	133	17	2	30	8	IDF1	4	176
Meeting Room	134	17	2	33	8	IDF1	4	188
Kitchen	135	42	1	24	12	IDF1	2	84
Bathroom	137	18	0	0	8		0	0

Bathroom	138	20	0	0	8		0	0
Entertainment room	139	109	11	12	19	IDF1	22	814
IDF1	140	31	0	0	10	(IDF1)	0	0
Office space	141	201	21	2	25	IDF1	42	1386
Laboratory	142	53	6	5	13	IDF1	12	288
Laboratory	143	53	6	11	13	IDF1	12	360
Laboratory	144	53	6	17	13	IDF1	12	432
Meeting Room	146	17	2	9	8	IDF1	4	92
IDF3	147	41	0	0	12	(IDF3)	0	0
Meeting Room	148	44	5	2	12	IDF3	10	200
Meeting Room	149	49	5	5	13	IDF3	10	240
Meeting Room	150	44	5	9	12	IDF3	10	270
Meeting Room	151	50	5	12	13	IDF3	10	310
Kitchen	152	43	1	17	12	IDF3	2	70
Office space	153	594	60	2	43	IDF3	120	6120
Office space	154	228	23	9	27	IDF3	46	1932
Office space	155	263	27	2	29	IDF4	54	1998
Meeting Room	156	17	2	21	8	IDF3	4	140
Meeting Room	157	17	2	24	8	IDF3	4	152
Laboratory	158	53	6	27	13	IDF3	12	552
IDF4	159	31	0	0	10	(IDF4)	0	0
Laboratory	160	53	6	9	13	IDF4	12	336
Laboratory	161	53	6	14	13	IDF4	12	396
Kitchen	162	43	1	18	12	IDF4	2	72
Presentation room	163	91	10	21	17	IDF3	20	880
Storage	164	16	2	12	7	IDF4	4	100
Entertainment room	165	109	11	15	19	IDF4	22	880
Bathroom	166	20	0	0	8		0	0
Bathroom	167	18	0	0	8		0	0
Kitchen	168	43	1	24	12	IDF4	2	84
Bathroom	169	20	0	0	8		0	0

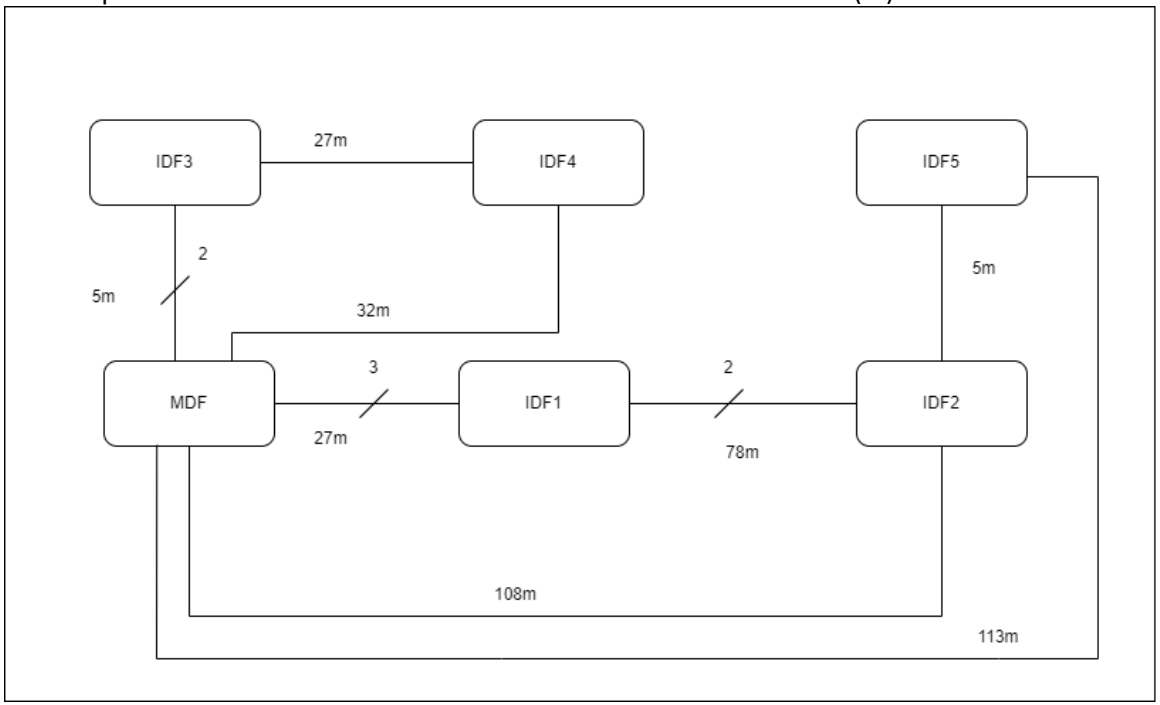
Bathroom	170	18	0	0	8		0	0
Meeting Room	171	17	2	29	8	IDF4	4	172
Meeting Room	172	17	2	39	8	IDF5	4	212
Meeting Room	173	14	2	41	7	IDF5	4	216
Storage	174	27	3	21	9	IDF5	6	216
Lounge & Storage	175	264	27	5	29	IDF5	54	2160
Office space first half	176	400	40	17	35	IDF4	80	4640
Office space second half	176	407	41	2	35	IDF5	82	3526
Kitchen	177	44	1	18	12	IDF5	2	72
Meeting Room	178	50	5	14	13	IDF5	10	330
Meeting Room	179	44	5	9	12	IDF5	10	270
Meeting Room	180	49	5	5	13	IDF5	10	240
Meeting Room	181	44	5	2	12	IDF5	10	200
IDF5	182	41	0	0	12	(IDF5)	0	0
Office space first half	184	250	25	17	28	IDF4	50	2550
Office space second half	184	248	25	22	28	IDF	50	2800

Total Double outlets:	655	Total UTP cable:	59100	Average per outlet	46
Total Number of cables:	1310	Total UTP 305 boxes:	214		

Rooms per DF			Double outlets per DF	Single outlets per DF
MDF	9	MDF	95	190
IDF1	11	IDF1	60	120
IDF2	8	IDF2	134	268

IDF3	11	IDF3	124	248
IDF4	10	IDF4	121	242
IDF5	10	IDF5	96	192

Fiber optics: 6 cables on each connection 628 (m)



As such, by adding all of the extrapolated obtained results together we obtain:

$$L_{total} = \mathbf{59100\ m}\ of\ UTP\ cable\ for\ the\ entire\ building$$

Calculating the number of UTP boxes

In order to calculate the number of boxes needed we must consider that: UTP cable boxes contain 305m of cable per box and we must leave a 10% margin of cable boxes.

$$n_{boxes} = 110\% * \left[\frac{L_{total}}{305\ m}\right] = 110\% * \left[\frac{59100m}{305\ m}\right] = 110\% * 194 = \ 214\ UTP\ boxes$$

Calculating the quantity of Fiber Optic

The quantity of Fiber Optic cables is calculated by adding 6 m of cable reserve each. Since we have 6 distribution facilities and a total of 12 cables we have a total quantity of fiber optic wire of:

$$L_{FO} = (5 * 2 + 27\ +\ 32\ +\ 113\ +\ 5 + 27 * 3 + 78 * 2 + 108) + 6 * 16$$
$$= 628m\ of\ FO\ cable$$

2. VLANs and IP address assignment

1	VLAN_MANAGEMENT	192.168.10.x	192.168.10.1
2	VOICE_VLAN	192.168.20.x	192.168.20.1
3	VOICE_VLAN2	192.168.30.x	192.168.30.1
4	WLAN1	192.168.40.x	192.168.40.1
5	WLAN2	192.168.50.x	192.168.50.1
6	WLAN3	192.168.60.x	192.168.60.1
7	WLAN4	192.168.70.x	192.168.70.1
8	WLAN5	192.168.80.x	192.168.80.1
9	VLAN_ALPHA	192.168.90.x	192.168.90.1
10	VLAN_BETA	192.168.100.x	192.168.100.1
11	VLAN_GAMMA	192.168.110.x	192.168.110.1
12	VLAN_DELTA	192.168.120.x	192.168.120.1
13	VLAN_EPSILON	192.168.130.x	192.168.130.1
14	VLAN_ZETA	192.168.140.x	192.168.140.1
15	VLAN_ETA	192.168.150.x	192.168.150.1
16	VLAN_THETA	192.168.160.x	192.168.160.1
17	VLAN_IOTA	192.168.170.x	192.168.170.1
18	VLAN_KAPPA	192.168.180.x	192.168.180.1
19	VLAN_LAMBDA	192.168.190.x	192.168.190.1
20	VLAN_MU	192.168.200.x	192.168.200.1
21	VLAN_NU	192.168.210.x	192.168.210.1
22	VLAN_XI	192.168.220.x	192.168.220.1
23	VLAN_OMICRON	192.168.230.x	192.168.230.1
24	VLAN_PI	192.168.240.x	192.168.240.1
25	VLAN_SIGMA	192.168.250.x	192.168.250.1

3. Equipment

L2/L3 modular switches and FO modules

a. Cisco C9300X-48HX

The Cisco C9300X-48HX switch is designed to deliver high performance and robust security for modern network demands. This switch offers a comprehensive suite of security features that ensure the integrity of both hardware and software, as well as the protection of all data traversing the switch. The C9300X-48HX model is equipped with 48 ports of 10 Gigabit Ethernet (10GE) and 8 ports of 25 Gigabit Ethernet (25GE) non-blocking, providing flexible connectivity options for a variety of network requirements. It supports advanced network automation, simplified operations, and secure end-to-end connectivity, making it an ideal choice for enterprise and campus networks. In addition, because of its fiber optics uplinks, it can also act as an FO module. Unit price: $23,000.

b. Juniper EX4650-48Y

The Juniper EX4650-48Y switch is engineered to provide high performance and advanced security features essential for modern networking environments. This switch ensures the integrity of both hardware and software, as well as the protection of all data passing through the system. The EX4650-48Y model comes equipped with 48 ports of 25 Gigabit Ethernet (25GE) and 8 ports of 100 Gigabit Ethernet (100GE) non-blocking, offering versatile connectivity options to meet a variety of network demands. This switch supports advanced features such as automation, simplified management, and secure, end-to-end connectivity, making it an excellent choice for data centers and enterprise networks. In addition, because of its fiber optics uplinks, it can also act as an FO module. Unit price: $15,600.

Conclusion: While both the Cisco C9300X-48HX and Juniper EX4650-48Y offer robust performance and advanced security features, the Cisco C9300X-48HX stands out due to its versatile port options, 24/7 support possibilities and high levels of reliability, often associated with Cisco devices. As such, our choice for the current project will be the Cisco C9300X-48HX.

Firewall

a. PA-7080 Firewall (with PA-7000-DPC-A and PA-7000-100G-NPC-A cards to full configuration)

The PA-7080 Firewall, equipped with PA-7000-DPC-A and PA-7000-100G-NPC-A cards for a fully configured setup, offers advanced threat prevention features such as WildFire cloud-based malware analysis and sophisticated URL filtering. It delivers robust protection against even the most advanced cyber threats. This firewall supports up to 200 Gbps of firewall throughput and up to 100 Gbps of threat prevention throughput, making it highly scalable for large enterprise networks. Its multi-layer security features, including IPS, antivirus, and application control, ensure comprehensive defense against a wide array of threats. Built-in redundancy features such as dual power supplies and hot-swappable fans guarantee high availability and minimal downtime. The PA-7080 is easily managed through the Palo Alto Networks Panorama management platform, providing centralized control over all network

devices. It can be deployed as a traditional hardware appliance or as a virtualized instance in cloud or virtual environments. The unit price is $594,000.

b. Cisco Firepower 9300 SM-56 X 3

The Cisco Firepower 9300 Firewall, equipped with 3xSM-56 modules, provides advanced threat detection and prevention capabilities, including intrusion prevention, malware protection, and URL filtering. It supports up to 60 Gbps of threat inspection throughput and up to 100 Gbps of firewall throughput, ensuring high scalability and performance for large enterprise networks. The Cisco Firepower 9300 includes advanced security features such as SSL decryption and inspection, advanced malware protection, and file analysis, ensuring comprehensive protection against a wide range of cyber threats. Built-in redundancy features, such as dual power supplies and hot-swappable fans, ensure high availability and minimal downtime. The Cisco Firepower 9300 can be easily managed using the Cisco Firepower Management Center, providing centralized control over all network devices. It can be deployed as a traditional hardware appliance or as a virtualized instance in cloud or virtual environments. The unit price is $535,000.

Conclusion: We have chosen the PA-7080 firewall because it offers maximum throughput, enabling us to manage a single firewall for the entire building. While both options are modular, the Palo Alto Networks model provides greater extensibility, allowing for future expansion.

WLESS APs

a. Cisco Catalyst CW9166D1-MR

The Cisco Catalyst CW9166D1-MR is a high-performance wireless access point designed to deliver secure, reliable, and high-speed wireless connectivity. It supports 802.11ax and has Wi-Fi 6 technology support, Multigigabit Ethernet and PoE, while having a 7.78 Gbps max throughput, thus offering improved performance, higher capacity, and better coverage. The CW9166D1-MR features advanced security protocols to protect network integrity and user data. It is ideal for dense deployment scenarios, providing robust support for a large number of concurrent users and devices. Unit price: $1890

b. Ubiquiti U6 Enterprise

The Ubiquiti U6 Enterprise is a versatile wireless access point designed for both performance and ease of use. It supports 802.11ax and has Wi-Fi 6 technology support, PoE, Multigigabit Ethernet and a max throughput of 4.8 Gbps, thus ensuring high-speed connectivity and increased capacity for modern network demands. The U6 Enterprise is equipped with advanced features like seamless roaming, robust security, and simplified management through the UniFi Network Controller. It is well-suited for a variety of deployment scenarios, from small businesses to large enterprise environments. Unit price: $280

Conclusion: While both Aps provide Wi-Fi 6 technology and support multi-gigabit Ethernet, the Cisco AP does support a higher max throughput (7.78 Gbps, as opposed with the 4.8 Gbps

on the Ubiquiti AP). However, due to the significant difference in price between the 2 we have chosen to go with the Ubiquiti U6 Enterprise AP for our Wi-Fi needs.

WLESS AP controllers

a. Cisco Catalyst 9800-80-k9

The Cisco Catalyst 9800-80-K9 is a high-performance wireless LAN controller tailored for large enterprise environments. It supports up to 6000 Aps, up to 64,000 clients and has 80 Gbps throughput. The Catalyst 9800-80-K9 is highly scalable, capable of supporting thousands of access points and clients, making it ideal for complex, large-scale deployments. What is to note here is that it does not support Ubiquiti APs. Unit price: $30,000.

b. Ubiquiti Dream machine Special edition

The Ubiquiti Dream Machine Special Edition is a versatile and cost-effective wireless LAN controller designed for ease of use. It supports more than 100 UniFi devices and more than 1000 client devies, supports PoE and PoE+, has 3.5 Gbps routing and includes full UniFi application suite support. The Dream Machine Special Edition supports seamless integration with Ubiquiti access points, offering optimal performance and centralized management through the UniFi Network Controller. It includes robust security features and an intuitive user interface, making network management straightforward and efficient. Unit price: $500.

Conclusion: Because we have already chosen to go with Ubiquiti APs due to their low cost compared to the Cisco ones, we will also go with a Ubiquiti AP controller, which also has a signifcantly lower cost than its Cisco counterpart, while also being, in essence a software program deployed on a machine inside the rack, for ease of use and access.

IP Phone

a. Cisco IP Phone 8811

The Cisco IP Phone 8811 features a high-resolution, backlit display that simplifies access to call information and applications. It supports wideband audio and video, ensuring exceptional voice and video clarity. With the capability to handle multiple calls at once, it supports up to five lines and five programmable line keys. The phone includes a built-in Gigabit Ethernet switch for seamless network connectivity and supports Power over Ethernet (PoE), removing the need for separate power supplies. Security is robust, with secure voice communication, device authentication, and encryption to safeguard data. Additionally, the phone supports third-party applications, offering a versatile solution that can be integrated into various business processes and workflows. Unit price: $400.

b. Yealink VP59

The Yealink VP59 IP phone features a large 8-inch color touch screen display, offering easy access to call information and applications. It supports up to 16 SIP accounts and includes built-in Wi-Fi and Bluetooth, allowing users to manage multiple lines and calls simultaneously and connect effortlessly to wireless headsets. Powered by a robust 2.4GHz quad-core

processor, the phone ensures fast and efficient performance. It includes security features such as secure voice communication, device authentication, and encryption to protect data. The VP59 also supports video conferencing with an integrated 1080p HD camera and H.264 video codec. It can be easily deployed and managed using Yealink's management platform, offering centralized control over the entire network of devices. Unit price: $566.

Conclusion: While the Yealink VP59 offers superior performance and more advanced features, we opted for the Cisco phone due to its cost-effectiveness and ample functionality (PoE, security, switching) suitable for our office building needs.

UPS

a. APC Smart-UPS SRT 3000VA RM 230V SRT3000RMXLI

The APC Smart-UPS SRT 3000VA RM 230V (SRT3000RMXLI) is a high-performance uninterruptible power supply (UPS) designed for critical applications in server rooms and data centers. It provides 3000VA/2700W of power capacity and operates at 230V, ensuring reliable power backup and protection against power disturbances. This rack-mountable unit features double-conversion online technology, offering consistent and clean power output. Key features include an intuitive LCD interface, hot-swappable batteries, and network management capabilities for remote monitoring and management. Unit price: $4800.

b. CyberPoker PR5000LCDRTXL5U Smart App Sinewave

The CyberPower PR5000LCDRTXL5U Smart App Sinewave is a high-capacity uninterruptible power supply (UPS) designed to provide reliable power backup for mission-critical systems. It delivers 5000VA/4500W of power and features true sine wave output, ensuring clean and consistent power for sensitive electronics. This rack/tower convertible unit includes an intuitive LCD control panel for easy monitoring and management. Unit price: $3800.

Conclusion: While the CyberPower PR5000LCDRTXL5U Smart App Sinewave offers a higher power capacity at 5000VA/4500W, the APC Smart-UPS SRT 3000VA RM 230V (SRT3000RMXLI) is the preferred choice despite its higher cost. The APC model excels with its double-conversion online technology, ensuring the cleanest and most reliable power output. It also features hot-swappable batteries, an intuitive LCD interface, and advanced network management capabilities, thus making it the preferred choice.

Cooling

a. Carrier 42QHG012D8S

The Carrier 42QHG012D8S air conditioner is a high-performance unit designed for efficient and quiet operation. With a cooling capacity of 12,000 BTU, it is well-suited for maintaining comfortable temperatures in various environments. The unit features advanced inverter technology, which ensures precise and efficient temperature control, similar to Daikin's inverter compressors. Additionally, the Carrier model boasts high SEER ratings, translating to significant energy savings. Its noise-reducing design makes it an excellent choice for a peaceful indoor environment. Unit price: $600.

b. Daikin Comfora SB.FTXP35N9/RXP35

The Daikin Comfora SB.FTXP35N9/RXP35 air conditioner offers a cooling capacity of 12,000 BTU, making it a robust solution for effective climate control. It stands out with its high energy efficiency, achieving up to A++ ratings in both cooling and heating modes. The unit uses R-32 refrigerant, which is more environmentally friendly and energy-efficient compared to the more common R-410A. In terms of sound levels, the Daikin Comfora excels with a silent mode operating at just 20 dBA for cooling and 21 dBA for heating, and a high mode at 43 dBA for cooling and 40 dBA for heating, ensuring a quiet and comfortable indoor atmosphere. Unit price: $900.

Conclusion: While both the Carrier 42QHG012D8S and the Daikin Comfora SB.FTXP35N9/RXP35 offer impressive features and performance, the Daikin Comfora edges out as the preferred choice. Its superior energy efficiency with up to A++ ratings, environmentally friendly R-32 refrigerant, and exceptionally low noise levels in both cooling and heating modes make it the more advantageous option.

4. Environment

MDF

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
	Organizer orizontal				

	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
	Controller Wireless	Ubiquiti Dream machine Special edition		50	170
	Firewall	Palo Alto PA-7080	590Gbps firewall throughput	2500	8530
5	UPS1	APC SUA5000RMI5U	Smart-UPS, 5000VA/4000W, line-interactive	4000	430
5	UPS2	APC SUA5000RMI5U	Smart-UPS, 5000VA/4000W, line-interactive	4000	430
25				**5238**	**18720**
			Putere disponibila in UPS	**8000**	

			Consum electric AC	Racire AC
AC 1	Daikin Comfora SB.FTXP35N9/RXP35		4000	12000
AC 2	Daikin Comfora SB.FTXP35N9/RXP35		4000	12000

		Total	**8000**	**24000**

Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	190	
Nr prize disponibil in PP UTP in acest rack	96	**Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.**

IDF1

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
	Controller Wireless	Ubiquiti Dream machine Special edition	50AP/1000useri	50	170
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
14				**2066**	**7743**
			Putere disponibila in UPS	**2700**	
				Consum electric AC	Racire AC

AC 1	Daikin Comfora SB.FTXP35N9/RXP35		4000	12000

	Total	**4000**	**12000**

Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	120
Nr prize disponibil in PP UTP in acest rack	144

Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.

IDF2

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					

1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
25				**4032**	**15146**
			Putere disponibila in UPS	**5400**	
				Consum electric AC	Racire AC
	AC 1	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000
	AC 2	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000

		Total	**1460**	**20000**
Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	268			
Nr prize disponibil in PP UTP in acest rack	288	**Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.**		

IDF3

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290

1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
25				**4032**	**15146**
			Putere disponibila in UPS	**5400**	
				Consum electric AC	Racire AC
	AC 1	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000
	AC 2	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000
			Total	**1460**	**20000**

Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	248

Nr prize disponibil in PP UTP in acest rack	288	**Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.**

IDF4

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				

1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
2	UPS1	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	2700	703
25				**4032**	**15146**
			Putere disponibila in UPS	**5400**	

			Consum electric AC	Racire AC
AC 1	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000
AC 2	Daikin Nepura Perfera FTXTM30S+RXTM30A		730	10000
		Total	**1460**	**20000**

Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	242
Nr prize disponibil in PP UTP in acest rack	288

Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.

IDF5

Spatiu ocupat in U	Denumire/ tip echipament	Model	Scurta descriere/ nr porturi	Putere electrica necesara W	Caldura disipata BTU
1	Patch Panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	0	0
1	Organizer orizontal				
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
1	Organizer orizontal				
1	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0
1					
1	Switch L2	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M)	672	2290
	Organizer orizontal				
	Patch Pannel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	0	0

5	UPS1	APC SUA5000RMI5U	Smart-UPS, 5000VA/4000W, line-interactive	4000	430
5	UPS2	APC SUA5000RMI5U	Smart-UPS, 5000VA/4000W, line-interactive	4000	430
24				**2688**	**10020**
			Putere disponibila in UPS	**8000**	

			Consum electric AC	Racire AC
AC 1	Daikin Comfora SB.FTXP35N9/RXP35		4000	12000
AC 2	Daikin Comfora SB.FTXP35N9/RXP35		4000	12000
		Total	**8000**	**24000**

Nr prize simple de conectat la acest DF, valoarea se ia din etapa 2	192
Nr prize disponibil in PP UTP in acest rack	192

Formula se modifica daca utilizati PP cu alt numar de prize, 24, 48 etc.

5. Active equipment list

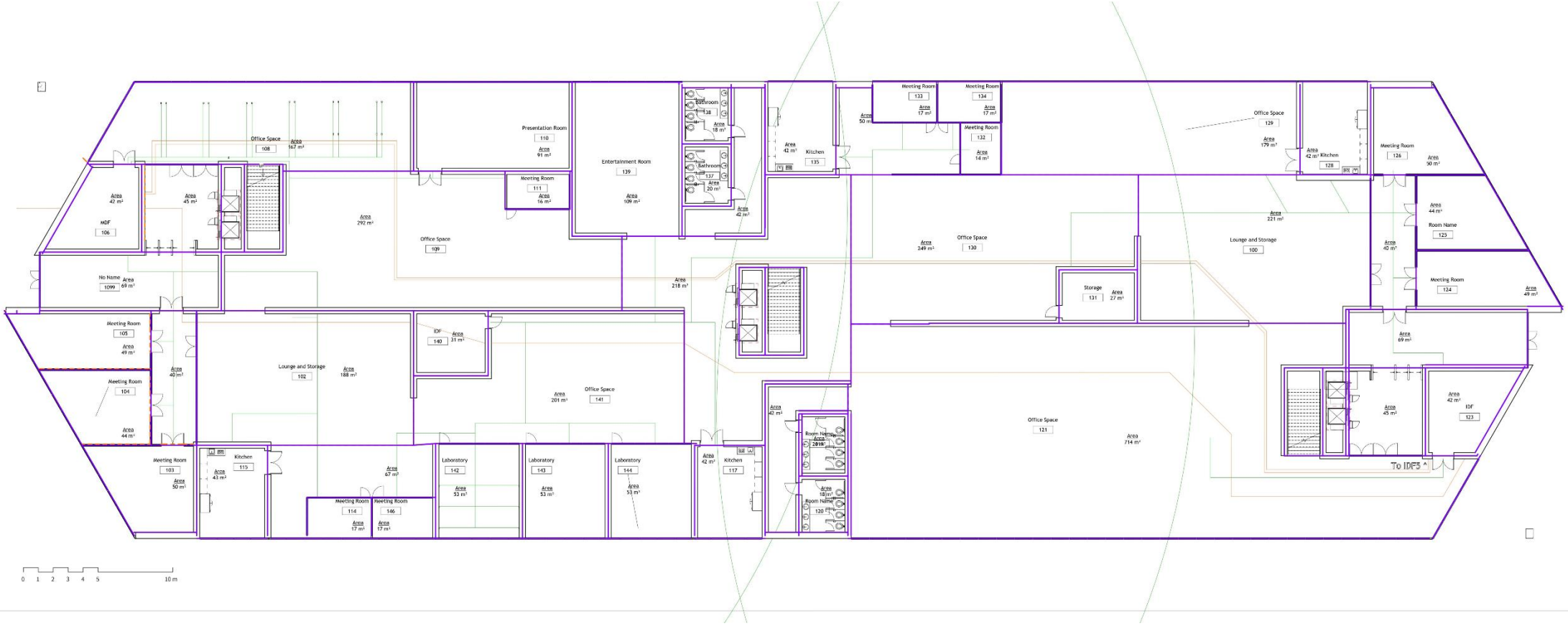
Type	Model name	Characteristics	Price	Quantity	Value
Chasis	Cisco Catalyst 9606R	6-slot chassis. Two middle slots (slots 3 and 4) are dedicated for supervisors only, and they work in Stateful Synchronization (SSO) mode. The top and bottom two slots are for line cards.	$8,068.00	4	$ 32,272
Power supply	C9600-PWR-2KWAC	Power supply output - 100 to 120 VAC operation -> 12V output — 1050W 200 to 240 VAC operation -> 12V output — 2000W 683 BTU per hour	$ 2,739	29	$79,431
L2/L3 switch + FO module	Cisco C9300X-48HX	48 port UPOE+, 48x 10G (10G/5G/2.5G/1G/100M); 4 FO ports for uplinks	$ 22,675.99	29	$ 657,604
Firewall	Palo Alto PA-7080	590Gbps firewall throughput	$ 594,000	1	$ 594,000
WLAN AP	Ubiquiti U6 Enterprise	4.8 Gbps max throughput; 802.11ax support; Wi-fi6 - 6Hz; 1x 2.5 GbE; PoE; Works with software-based controller (UniFi Network Controller)	$280	60	$16,800
AP Controller	Ubiquiti Dream machine Special edition	1000+ PoE and PoE+; 3.5 Gbps routing; Includes full UniFi application suite for device management; 100+ UniFi devices; 1000+ client devices, 50AP/1000useri	$ 500	2	$ 1,000
IP Phones	Cisco 8811	Voice Mail, Caller ID, Call Waiting, Call Transfer, Call Hold, Message Waiting Capability	$ 400	50	$ 20,000
UPS1	APC SUA5000RMI5U	Smart-UPS, 5000VA/4000W, line-interactive	$ 4,990	4	$ 19,960
UPS2	APC SRT3000RMXLI	Smart-UPS On-Line, 3kVA	$ 2,209	7	$ 15,463
Cooling1	Daikin Comfora SB.FTXP35N9/RXP35	BTU 12000, AC consumption 4000	$ 958	5	$ 4,790
Cooling2	Daikin Nepura Perfera FTXTM30S+RXTM30A	BTU 10000, AC consumption 730	$ 1,902	6	$ 11,412

6. Material list

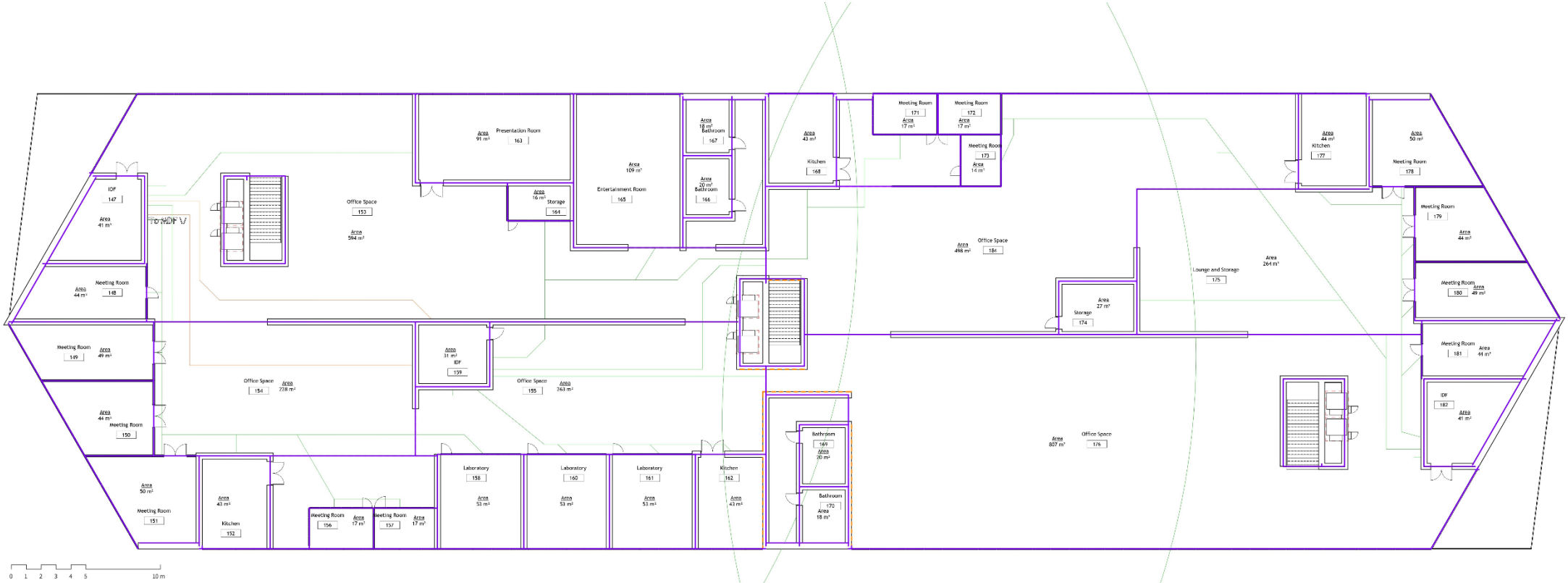
Type	Model name	Characteristics	Price	Quantity	Value
Outlets	BNPUHIU Ethernet Wall Plate - 2 Port Cat 6 Wall Plate with RJ45 Network Female to Female	Keystone Compatible with Cat 7/6/5/5e Ethernet Devices	$ 8	655	$ 5,240
UTP cable	Cablu Negru UTP CAT6 Super Plat, 5m	Cat6 UTP cable enhances the performance for transmission of high speed data, digital and analogue voice, and video (RGB). It features 4-pair Unshielded Twisted Pair cable which ensures performance with high speed Gigabit Ethernet.	$ 1.31	1310	$ 1,716
FO cable	High Quality and Cost-effective 9/125µm Single Mode Bend Insensitive Fiber Optic Cable	LC UPC to SC UPC, 2.0mm, 1m	$ 5.71	628	$ 3,585.88
Patch panel UTP	NewYork Cables B07Y3TJSB9	Cat6a 48 Port 10 GBit/s	$ 65.99	29	$ 1,913.71
Patch panel FO	FHU 96 Fibers OS2 Single Mode	48 x LC UPC Duplex	$ 94.29	6	$ 565.74
Patch cords UTP	VALUE 21.99.1566	Cat6, 5m	$ 2.60	1,392	$ 3,619
Patch cords FO	Emtex patchcord FO SC/PC – LC/PC	MM OM4 50/125 manta LSZH 3.0mm, duplex 2m	$ 4.45	116	$ 516.2
Horizontal organizer	SmartRack 1U Horizontal Cable Manager - Finger duct with cover	1U 19-inch Horizontal Cable Manager -finger duct with cover	$68	35	$2,380
Rack	Rack HYPERLINE 26U 600x800	26U Floor Server Rack, Disassembled, 600x800, glass front door, removable side panels, metal back panel, floor support kit	$ 336	6	$ 2,016

7. Drawings

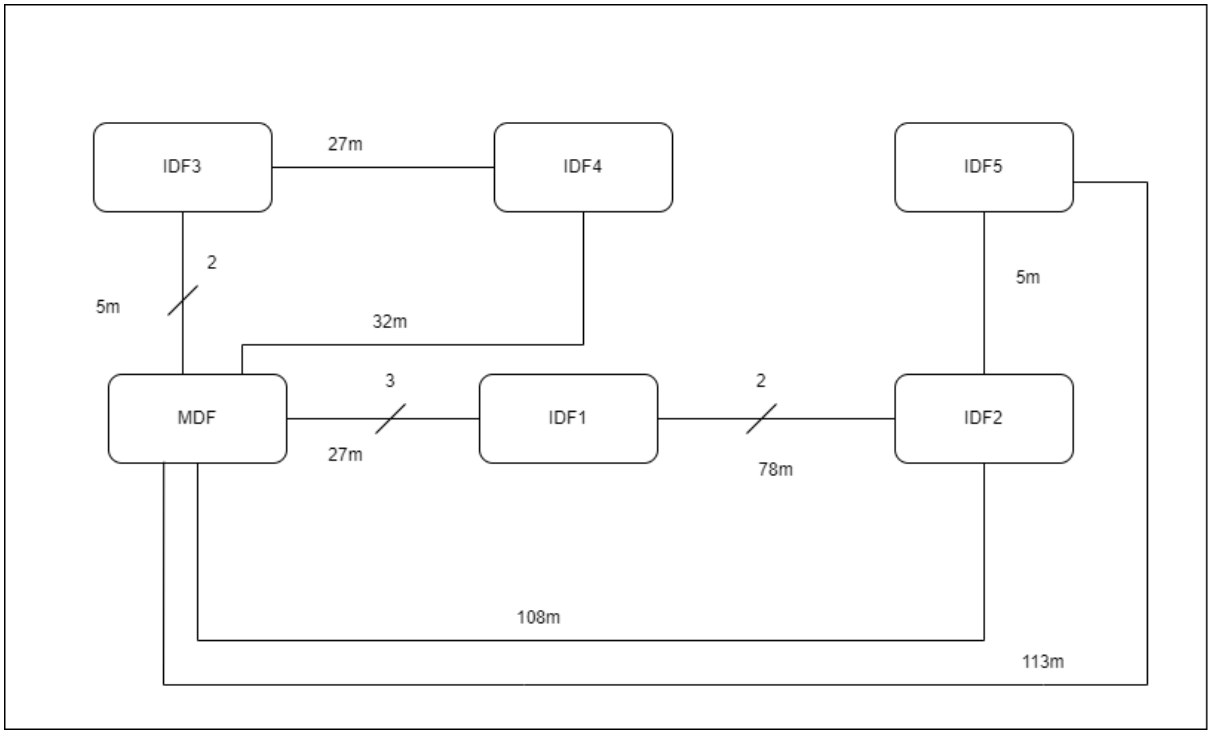
Ground floor drawing with cables and fiber



First floor drawing with cables and fiber



FO Cable layout



8. References

Layer 2/3 switches + FO modules
Cisco C9300X-48HX
Juniper EX4650-48Y

Firewall:
Palo Alto PA-7080 Firewall
Cisco Firepower 9300

WLAN APs
Cisco Catalyst CW9166D1-MR
Ubiquiti U6 Enterprise

WLAN AP controllers
Cisco Catalyst 9800-80-k9
Ubiquiti Dream machine Special edition

IP phones:

Cisco IP Phone 8811
Yealink VP59

UPS
APC SRT3000RMXLI
CyberPoker PR5000LCDRTXL5U Smart App Sinewave

Cooling
Carrier 42QHG012D8S
Daikin Comfora SB.FTXP35N9/RXP35