

TECHNICAL SPECIFICATIONS

FOR MODERNIZATION OF THE LOCAL AREA NETWORK (LAN) IN CAHUL MAYORALTY

I. GOAL AND OBJECTIVES

These specifications outline the technical and quality conditions for the implementation of a structured cabling network (Local Area Network, hereinafter referred to as LAN) to provide integrated Internet and telecommunication services. The project aims to enhance communications and information flow, ensuring stable and secure connectivity within the Cahul Mayorality building, located at 6 Independence Square, Cahul, Republic of Moldova (hereinafter referred to as the Beneficiary).

An analysis of the current computer network infrastructure revealed that the existing LAN, which is over 15 years old, no longer meets today's technological requirements and standards. The network was implemented when connectivity and cybersecurity demands were simpler and less stringent. Significant advancements in information and communications technology, along with evolving operational requirements, have created a substantial gap between the existing network structure and the modern needs of the Cahul Mayorality.

The current network structure presents several features and issues:

- Routers, switches, and other network components are outdated and unable to deliver the required performance and functionality.
- The network is overloaded, lacking the capacity to meet the increasing demands for fast data transfer and simultaneous access to online resources.
- Security technologies from 15 years ago are ineffective against modern cyber threats and malware.
- The outdated network is difficult to scale or upgrade to meet future technological requirements.
- Outdated equipment and configurations complicate network administration and maintenance, making them complex and costly.

The main objective is to develop and implement a robust, secure, and scalable network infrastructure that ensures efficiency, productivity, and adaptability to emerging technologies. This involves installing modern network equipment capable of supporting high transmission speeds and advanced data security to protect the confidentiality and integrity of information.

The Local Area Network must be designed to be easily scalable, allowing for the integration of future technologies such as cloud computing and the Internet of Things (IoT). This will ensure the Mayorality remains at the forefront of technological innovations and continuously improves its ability to deliver quality services to citizens.

II. AREA OF APPLICATION

These specifications represent the minimum mandatory requirements for bidders. Bidders must also comply with the legislation of the Republic of Moldova, specific regulations, and standards in force at the time of the works. This includes adhering to the normative document NCM G.02.01:2017, "Electrical, Automation, Signalling, and Telecommunication Installations. Electronic Communication Networks (Systems), Automation and Signalling Installations for Buildings and Constructions. Basic Provisions for Design and Installation," which is the subject of these specifications.

III. GENERAL DESCRIPTION OF REQUIREMENTS

The cabling works will be carried out in the existing premises of the Cahul Mayorality building, specifically on levels 3 and 4. This involves re-wiring 34 rooms, including offices, conference rooms, and halls. The detailed list of premises where the data network configuration will be conducted is provided in Table 1 below.

Table no. 1 - Premises for performing structured cabling works								
	Premises	Type	Level	No. of RJ45 network ports	No. of double sockets in room	Number of phone sockets	Wi-Fi access ports (simple socket)	Single socket for printers on the hall bottom of the wall
1	Hall	Hall	Level 3	3	1		1	1
2	Office 301-A	Office	Level 3	2	1	1		
*	Office 301-B	Office	Level 3	2	1	1		
*	Office 301-C	Office	Level 3	2	1	1		
3	Office 304	Office	Level 3	2	1	1		
4	Office 306	Office	Level 3	2	1	1		
5	Office 308	Office	Level 3	2	1	1		
6	Anteroom	Office	Level 3	5	2	1		1
7	Mayor	Office	Level 3	2	1	1		
8	Office 311	Office	Level 3	2	1	1		
9	Office 312	Office	Level 3	2	1	1		
10	Office 314	Office	Level 3	2	1	1		
11	Office 315	Office	Level 3	2	1	1		
12	Office 316	Office	Level 3	2	1	1		
13	Office 318	Office	Level 3	2	1	1		
14	Office 313	Office	Level 3	4	2	1		
15	Office 319	Office	Level 3	2	1	2		
16	Office 320	Office	Level 3	2	1	1		
17	Office 324	Office	Level 3	2	1	1		
18	Office 325	Server Room	Level 3	-	-	1	-	
19	Office 310	Office	Level 3	2	1	1		
20	Office 322	Office	Level 3	2	1	1		
21	Hall	Hall	Level 4	3	1		1	1
22	Office 403	Office	Level 4	2	1	1		
23	Office 410	Office	Level 4	2	1	1		
24	Office 409	Office	Level 4	2	1	1		
25	Office 407	Office	Level 4	2	1	1		
26	Office 414	Office	Level 4	2	1	1		
27	Office 416	Office	Level 4	2	1	1		
28	Office 418	Office	Level 4	2	1	1		
29	Office 420	Office	Level 4	2	1	1		
30	Office 419	Office	Level 4	2	1	1		
31	Office 421	Office	Level 4	4	2	1		
32	Office 422	Office	Level 4	2	1	1		
				Total nr of ports 75	Total of double sockets 36 RJ45	Total phone sockets 33 RJ12		Total of single sockets 3 RJ45

Before the commencement of the works, the Contractor will identify the optimal locations and routes for data cable routing, based on the proposed materials and execution techniques listed in Table 2 - LAN Equipment and Materials. This will be done without requiring additional quantities of works and equipment.

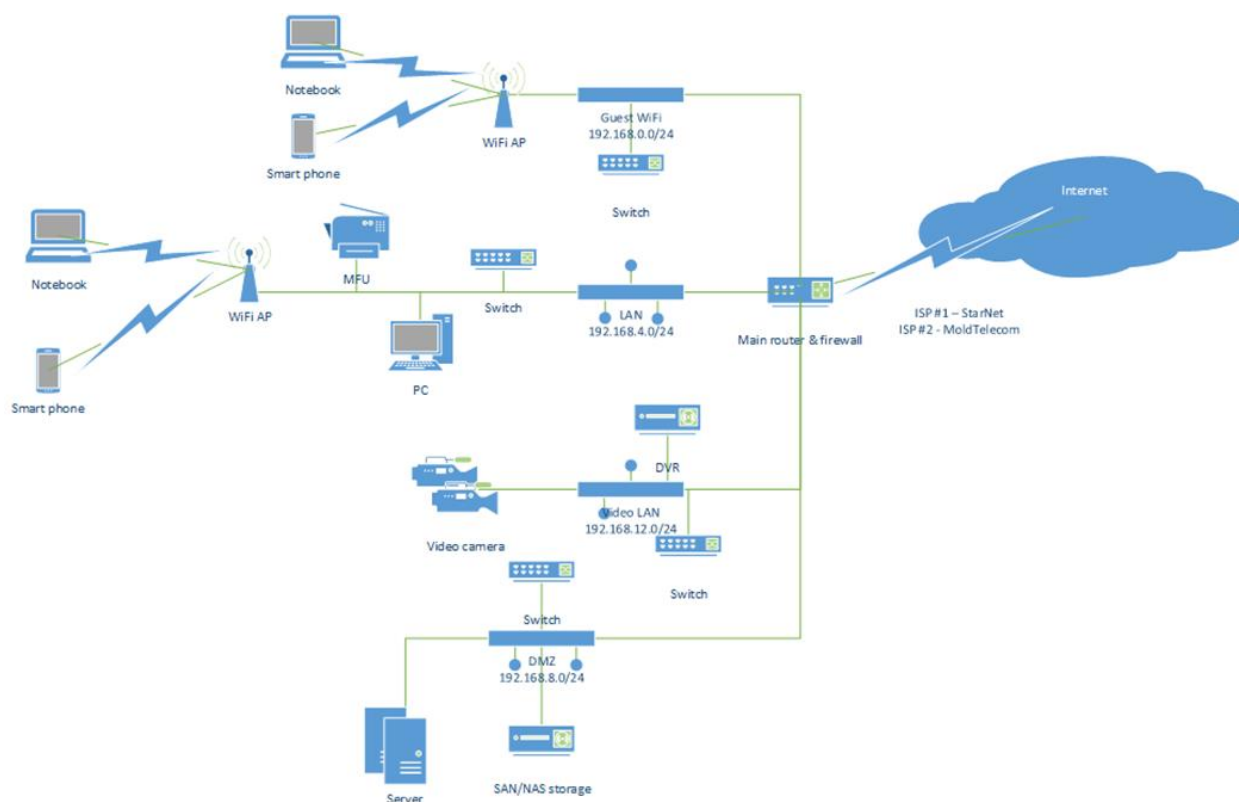
The Contractor will also design and execute the necessary electrical installation works to supply the data network. These designs must be submitted to the Beneficiary for approval.

Furthermore, the Contractor will provide the Beneficiary with the project documentation and work schedule for coordination and approval before starting the works. This is to ensure that the Beneficiary has sufficient time to relocate equipment within the premises between the completion of the works and the transition to the new Local Area Network.

Connection Type:

1. **Vertical Connection (Backbone Connections)** – using a high-speed backbone connection between building floors. These connections should link the technical floor, where the main equipment is located, to the other floors. To connect switching and routing equipment on each floor, the Contractor should use Category 6 or higher Ethernet cables. In computer networks, the backbone is the main channel for interconnecting and transferring data between different network segments. It provides high throughput, robust security, and reliability, which are essential for overall network performance. The backbone is crucial for scalability and efficient management of large-scale data traffic.
2. **Horizontal Connection.** To connect the offices on each floor, Ethernet cables of minimum Category 6 must be used. These cables should be routed from the floor patch panels to each office.

Network architecture:



1. Technical Floor (3rd floor):

- This floor will host the main equipment, including the server, main router, core switch, and floor-level switches. It will serve as the central node for the entire network.
- From the central node, cables (using CAT 6 or newer) will connect to the floor patch panels.

2. Floor-Level Switches:

- Considering that each floor has multiple offices with more than 15 double sockets, it is recommended to install a manageable switch. This allows separation of different departments and offices, surveillance systems, guest Wi-Fi, and the creation of a DMZ for mayoralty servers and Network Attached Storage.
- Every switch and patch panel must have enough ports to support the number of devices on the floor, plus additional ports for future expansion. A switch and patch panel with at least 48 ports would be sufficient, depending on the number of users on each floor.
- It is proposed to use PoE-enabled (Power over Ethernet) switches to power devices such as IP phones or surveillance cameras if required in the future.
- The connection between the router, core switch, and floor-level switches should be made using optical cables with 10 GB transceivers.

The proposed solution must adhere to the following specifications:

- It should be open and hardware reconfigurable as needed, facilitating data transfer rates of at least 1Gbps full duplex over copper environments.
- The network infrastructure must support data transfer in accordance with IEEE 802.3-2022 over Ethernet protocol.
- Network cabling will be carefully routed, either through cable ducts on walls/ceilings or, at wall joist junctions, via patch panels and sockets, ensuring appropriate protection.
- Terminal sockets and network equipment connections should utilize UTP CAT 6 or higher cables.
- Data cables must be UL certified, offering fire resistance and immunity to electromagnetic interference (**submission of technical data sheets is required along with offers**).

IV. MINIMUM TECHNICAL REQUIREMENTS

1. Materials and Works

Cable Duct Specifications. To ensure the protection and organization of UTP cables from patch panels to distribution racks and up to user data sockets, cable duct sections will be provided as follows:

- Metal cable ducts will be utilized for vertical cable distribution within the building.
- Metal cable ducts will be employed for horizontal cable distribution, positioned either on ceilings or at wall-beam junctions (as per the project design to be developed by the Contractor and approved by the Beneficiary) in public access areas such as access stairs, hallways, and One Stop Shop areas. Any deviations from the planned route will be subject to agreement with the Beneficiary.
- PVC cable ducts will be deployed in office and conference room areas. These ducts will extend downward from the metal cable duct on corridor ceilings or at wall-beam junctions (according to the project design to be developed by the Contractor and accepted by the Beneficiary) via PVC cable ducts to the data sockets. Additionally, horizontal cable ducts will be available where applicable.
- Cable routing through walls will be facilitated using PVC tubing, sized to accommodate a maximum occupancy rate of 80%.
- The cable duct occupancy will not exceed 80% of its total capacity, accommodating all potential cable variants (UTP, telephony, fiber optic, etc.).
- Connection curtains and transitions from higher capacity PVC cable ducts to lower capacity ducts will be incorporated as needed, ensuring seamless integration with the design of Mayoralty.
- Within PVC cable ducts, a minimum reserve of 300 mm of UTP cable will be retained at the end adjacent to the network socket, allowing for future resizing requirements.
- A 500 mm long sectioned cover will be installed on the section of the cable duct near the mains socket, facilitating easy access to the cable reserve for reinsertion purposes as needed.

UTP CAT 6 Cable (or a higher category) Installation:

- Each data socket port will be linked to a port in the patch panels within the distribution racks via a CAT 6 AWG24 UTP cable, ensuring optimal connectivity with 4 pairs.

Labelling Procedure:

- Labels will be affixed at every level of the building.
- Labels will be placed at both ends of the cable route and every 6000 mm horizontally. The initial labelling will occur at 3000 mm from the vertical column.
- Labels will consist of a route identification code, the format of which will be mutually agreed upon by the tenderer and the beneficiary.

UTP Cable Specifications:

- The UTP cable must be constructed of solid copper (Cu) with a gauge of AWG 24.
- Each pair of wires within the cable shall be insulated and marked according to industry standards, with colour coding as follows: blue + blue-white, orange + orange-white, green + green-white, brown + brown-white.
- The cable shall be visibly marked at least once every 1000 mm with the following information: Clearly identifying the manufacturer, the type of cable, confirmation of compliance with UL or ETL standards, compliance with CMR (riser-rated) or CSR (plenum-rated) standards, marking the length of the cable in meters.

Network Sockets Specifications:

Network sockets will meet at least the CAT 6 standard and will feature two fully equipped RJ45 modules.

Design and features:

- Sockets will be designed for wall mounting.
- Female RJ45 connectors will be utilized.
- Termination will be accomplished using 110/Krone (Punch Tool Crimping) method.
- EIA/TIA 568 A/B compliance and labelling.
- Sockets will have a solid build with screw-on covers, no clamps, and will be securely fastened to the wall using a minimum of two dowels.
- White sockets, simple and fully fitted, will be used for connecting access points, mounted on the wall next to the access point.

Each RJ45 module in the network outlet will be connected via a CAT 6 UTP cable (4 pairs) terminated in a patch panel in the distribution racks. Patch cords will be utilized to connect to the active equipment installed in the distribution racks.

The distribution of sockets per room will be determined through mutual agreement between the Contractor and the Beneficiary during the project implementation.

Data sockets will be clearly marked with cable route notation and socket code for easy identification.

Rack Specifications:

- All racks will be 19" profile width, 9U size, constructed of steel, with dimensions of 600mm x 600mm, demountable.
- Each rack will feature a cable organization and guiding system. Side walls, back wall, and top cover will be constructed of a minimum of 1mm thick, galvanized, painted sheet metal.
- Steel side walls will be easily removable and lockable with locks.
- All racks will have a 4mm thick, removable, tinted, tempered glass front door with locks and extendable handle. The door should be able to open from either the left or right side (interchangeable hinges).
- Each rack will support a minimum load of 100kg.
- Special metal slots in the top and bottom of the rack to provide access for cables.
- Wall mounting with a minimum of four (4) points.

Racks will include rack-mountable power protection multiple outlet (PDUs), mounting kit, grounding kit. Four mounting tracks for equipment, two at the front and two at the rear, with adjustable distance between them. Rails will be marked with 1U unit indicators.

Minimum IP20 protection and CE certification will be ensured. Warranty for a minimum of 24 months.

The rack must accommodate optical fibre, telephone, and UTP cables for future patch panel resizing or fibre splicing, with a provision of at least 30 cm per wire.

All equipment and materials will be installed in compliance with the manufacturers' specifications.

Submission of a technical data sheet is required with the offer.

V. THE CONTRACTOR'S RESPONSIBILITIES FOR LAN INSTALLATION

The Contractor shall carry out at a minimum the following works related to the LAN installation:

- a) Development of the technical documentation to implement the Local Area Network, following the site visit to the Cahul Mayoralty. The technical documentation will be endorsed by the Beneficiary prior commencing the works by the Contractor.
- b) The gradual decommissioning of the replaced cables currently serving the Cahul Mayoralty premises will be carried out in the presence of the Beneficiary.
- c) Installation of cables, cabinets, racks, network sockets, cable ducts, patch panels, data connections and other necessary equipment in Cahul Mayoralty premises, according to the technical documentation elaborated as per point a) above.
- d) Installation of network sockets compliant with the UTP CAT 6 standard, along with identification and labelling of routes. All UTP routes will be labelled, and data sockets will be marked with the patch panel sequence number for easy identification.
- e) Positioning of the cable duct on the walls or at the junction of the wall with the beam, routing the solid copper CAT 6 UTP cable between the network outlets and the distribution racks, which will be installed on the walls.
- f) Implementation of the electrical grid, where necessary, with the subsequent presentation to the Beneficiary of the electrical grid layout diagram.
- g) Testing and certification of the network will be performed to ensure proper functionality and compliance with standards.
- h) Disposal of resulting waste and transportation to a suitable collection point will be carried out by the Contractor.

1. Site Visit

Prior to submitting their offers, interested Offerors will have the opportunity to visit the premises of Cahul Mayoralty. This visit aims to familiarize them with any unforeseen architectural details that may influence the development of their proposals. The site visit organization will be facilitated by the EU4Moldova: Focal Regions Programme.

In their proposals, Offerors must include all necessary elements to execute the required work, such as screw dowels, jointing elements, bends, and any other accessories essential for building a structured network.

The offer price should also include the cost of labour, any unforeseen materials required for installation, and services for design, labelling, testing, certification, and commissioning.

The offer must also include any potential masonry repairs resulting from wall penetrations.

2. Testing and Certification

The circuits will be checked with specialized equipment for continuity and the sequence of plugs and pairs. Parameters such as NEXT, FEXT, wire mappings, bandwidth, impedance, length attenuation, and electrical resistance for each route between the installed sockets and patch panels in the distribution racks will be measured. Test results obtained using equipment certified for CAT 6 networks with full-duplex Gigabit data transmission will be provided. The measured parameters shall comply with the ANSI/TIA-568-E standard.

Circuit Certificate Bulletins will be issued and submitted once the cable route installation is complete.

3. Documentation

Upon acceptance of the works, the following documents will be handed over to the Beneficiary in both electronic and paper formats:

- Technical Memo.
- Technical documentation relating to the works performed, final version. Technical documentation must include the wiring plan with the connection diagram, the measurements made and the conformity reports, the correlation tables relating to the connections.
- Equipment location plans (network sockets, distribution racks, patch panels, ODFs).
- Labelling plans, wiring and connections logs, crimping correspondence.
- Legend detailing all symbols used in documentation.

VI. REGULATORY BASIS AND REFERENCE STANDARDS

All designed and executed works for LAN deployment shall comply with at least the following Standards and Protocols:

- NCM G.02.01:2017 "Electrical, automation, signalling and telecommunication installations. Electronic communication networks (systems), automation and signalling installations for buildings and constructions. Basic provisions for design and installation".
- NCM C.01.12:2018 "Civil buildings. Public buildings and constructions";
- ISO/IEC 11801-1:2020 „Information technology — Generic cabling for customer premises — Part 1: General requirements“.
- ISO/IEC/IEEE 8802-3:2021/Amd 14:2022(en) Telecommunications and exchange between information technology systems — Requirements for local and metropolitan area networks.
- IEEE 802.3-2022 (IEEE Standard for Ethernet).

In the execution of the works, the provisions of the following normative and legal acts shall be respected, including but not limited to:

- Law no. 422 of 22 December 2006 on General Product Safety.
- Law no. 186 of 10 July 2008 on Safety and Health at Work.
- Law no. 107 of 27 May 2016 on the Electricity.
- Law no. 267 of 9 November 1994 on Fire Safety.
- Law no. 271 of 9 November 1994 on Civil Protection.
- Law no. 1515 of 16 June 1993 on the Protection of the Environment.
- Law no. 86 of 29 May 2014 on the Environmental Impact Assessment.
- Government Decision no. 906 of 16 December 2020 on the approval of minimum safety and health requirements related to the use by workers of personal protective equipment at work.
- Government Decision no. 918 of 18 November 2013 on minimum requirements for safety and health signs at work.
- Government Decision no. 847 of 07-12-2022 approving the General Rules of Fire Protection in the Republic of Moldova.
- Government Decision no. 505 of 15-07-2020 approving the Regulation on export and import of hazardous chemicals.

Compliance with the requirements of occupational health and safety legislation and specific regulatory documents does not relieve legal entities and individuals from liability for failure to provide for and ensure any other labour safety measures appropriate to the specific conditions in which the work required by these specifications is performed.

The Contractor must follow national safety requirements alongside the specific instructions in force. Electrical installation work must adhere to regulations for building electrical systems. The work should comply with technical regulations throughout the contract. After checks, power will be restored following health and safety rules.

The Contractor is fully responsible for the work quality and compliance with regulations, including conducting tests and measurements.

Machinery and equipment used must meet noise level requirements and provide protection against noise and vibration.

All obligations relating to labour protection and insurance against damage, injury or accident are the Contractor's responsibility.

VII. MONITORING OF WORK EXECUTION AND FINAL ACCEPTANCE

The cabling works will be monitored by designated responsible persons from the Cahul Mayoralty. Quantitative and qualitative acceptance of the executed works will be carried out by an acceptance committee through direct examination of the work quantity, measurement, and analysis of quality documents such as quality certificates and compliance of materials. The committee will also compare the executed works with the provided list.

If deficiencies are found during the acceptance process, the Contractor must promptly remedy them at their own expense without any additional cost to the contracted value.

Technical solutions for the contracted work that do not meet the quality standards specified in the technical regulations and standards will not be accepted as changes.

The acceptance committee will verify and confirm the quantity and quality of the works, documenting their findings in the acceptance minutes upon completion of the works.

Table 2 - LAN Equipment and Materials			
Item No	Minimum technical requirements	Unit	Qty.
1.	Network Equipment		
1.1	Main Router <ul style="list-style-type: none"> - form-factor: 1 or 2U for rack 19" - minimum 4x 100/1000MB ports Ethernet - minimum 4x SFP+ 10Gbps port - Routing - Packet filter support up to L7 (firewall) - VPN protocols support: L2TP, IPSEC - DNS server - DHCP server & DHCP proxy - NTP client/server - Wi-Fi CAP server 	Pcs.	1
1.2	Wall Mounted Cabinet Rack 19" - 6U-9U <ul style="list-style-type: none"> - tempered glass front door - metal rear door and removable sides - fan included 	Pcs.	2
1.3	Telecom Cabinet Rack 19" - 42U-48U <ul style="list-style-type: none"> - min 800*1000*2000 - tempered glass front door - metal rear door and removable sides - fan module, 4 x fans for 1000mm Depth included - 2x 1U Fixed Shelf For Deep included - 1x Power distribution unit (PDU), 8 Schuko sockets, 1U, 16A 	Pcs.	1
1.4	Switch x48ports + (floor level switch) <ul style="list-style-type: none"> - form-factor: 1/2U for rack 19" - min 1x SFP+ 10GBS Port - PoE-out support for min 4x ports - 48x 100/1000MB ports Ethernet 	Pcs.	2

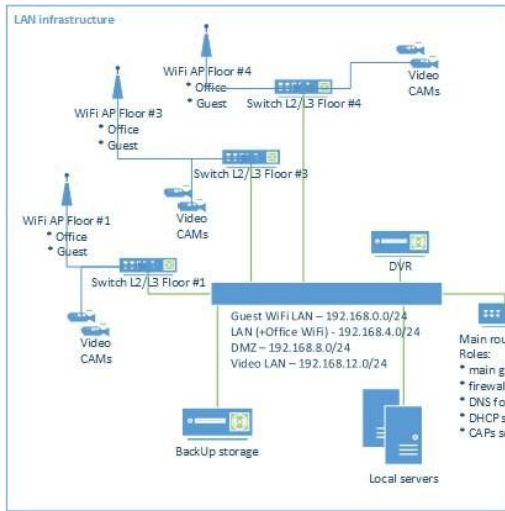
	- L2 management port support		
1.5	Switch x12ports+ (core level switch) - form-factor: 1/2U for rack 19" - L2 management port support - min 4x SFP+ 10GBs ports - min 8x 100/1000MB ports Ethernet	Pcs	1
1.6	WIFI Access Point - In-door whole mount - min 1 Ethernet 100/1000 Mbps with PoE-IN - other ports (optional) - dual channel 2.4G & 5G support 802.11b/g/n, other (optional)(Wi-Fi 6) - supporting centralized management (e.g. CAP, etc.)	Pcs.	6
1.7	Smart UPS (Uninterruptible Power Supply) - Form factor UPS - Rackmount 2-4U - 19" rackmount Output Power Capacity - min 3.0 kVA - min 2x active PSU-IN - min 8 Power-Out slots	Pcs.	1
2.	Cables, sockets, PDU and other materials		
2.1	Twisted Pair Cable/UTP/CAT6/4x2 (for computer network)	m.	3300
2.2	Twisted Pair Cable /UTP/CAT6/2x2 (for telephone network)	m.	1500
2.3	Cable duct /PVC/16x16 wall/unperforated	m.	190
2.4	Cable duct/PVC/25x25 wall/unperforated	m.	270
2.5	Connector - Ethernet/RJ- 45/CAT6/8p8c (for computer network)	Pcs.	330
2.6	Connector - Ethernet/RJ- 12/CAT6/6p4c (for telephone network)	Pcs.	130
2.7	Simple extension cable /5 sockets with switch – 1.5 m	Pcs.	2
2.8	Fixing materials - Dowel/Plastic/SM/6x60 with screw	Pcs.	700
2.9	Fixing materials - Staple/plastic/5 mm	Pcs.	200
2.10	Gutter cable duct IEK 50 x 100 x 3000 mm perforated, chrome, metal	m.	200
2.11	RJ45 data socket (single), Cat 6	Pcs.	3
2.12	RJ45 data socket (dual), Cat 6	Pcs.	36
2.13	RJ12 data socket for phone network	Pcs.	33
2.14	19" Patch-panel 1-2U 48 ports RJ 45	Pcs.	3
2.15	19" Patch-panel 1-2U 48 ports RJ 12	Pcs.	3
2.16	19" 1-2 U cable organizer	Pcs.	6
2.17	Patch Cord (1 spare) 1m.	Pcs.	5
2.18	Transceiver module 10 GB	Pcs.	4
Minimum 2 years warranty for all equipment			

VIII. FINAL RESULT

At the end of the implementation, the new LAN structure should enable the Mayorality to seamlessly interconnect with e-Government services and with the MCloud Platform¹. Additionally, the new network infrastructure should provide the capability to connect to two Internet Services Providers, ensuring a stable and uninterrupted connection.

The diagram below illustrates the desired configuration.

¹ <https://stisc.gov.md/ro/content/mcloud>



ISP #1
ISP #2

IPSec tunnel

