RUNE PROJECT CALL

REQUEST FOR INFORMATION AND EXPRESSIONS OF INTEREST

September 2017

1 ABOUT "RUNE" PROJECT

1.1 WHAT IS "RUNE"

RUNE project aims at deploying a Greenfield cross-border wholesale broadband network targeting underserved areas in Slovenia and Croatia. The infrastructure will provide several residents and small-businesses with a gigabit Next Generation Access (NGA) broadband infrastructure. The project includes a Fiber to the Home (FTTH) component and will offer wholesale services only, on an active layer open access basis, to other service providers. The infrastructure deployment will leverage, to the maximum possible, the reuse of existing infrastructure and the most efficient technologies and cost reduction measures.

The proposed network will cover a number of villages in Slovenia, and clusters of villages in Primorsko-Goranska and Istarska counties (Croatia), targeting a rural area of 344,900 potential network points, all of which are currently not covered by a fibre NGA network.

Area	Area (km^2)	Number of villages	Households on white areas	Length of county and local roads
Slovenia	8.000	3.585	235.000	3.585.000
Croatia (PGŽ and Istarska counties)	5.320	1.127	109.000	1.127.000
TOTAL Rune	13.320	4.712	344.900	4.712.000

Final numbers might change, definitive number will be stated in the RFQ document.

For the purpose of this document open access network (OAN) is defined as network where the access to the active network services is granted to any provider under the same fair and transparent conditions.

RUNE will act as a wholesale only active layer infrastructure operator, offering high capacity bitstream (VULA type) service to service providers.

- **Layer 2 transparent networks**, where content providers provide the connectivity and services connected with their date streams. The line terminal at the end user's premises is provided by RUNE. The demarcation point (the User-To-Network Interface, UNI) is one or more 1GE and/or 10GE ethernet interface at the user premises;
- **Layer 3 networks**, where besides the services described in the previous point RUNE also ensures the connectivity layer, providing DHCP, security, traffic policing and other possible basic network services. The line terminal at the end user's premises is provided by RUNE. The demarcation point (the User-To-Network Interface, UNI) is one or more 1GE and/or 10GE ethernet interface at the user premises.

All services will be offered at national level access (redundant), and with wire-speed capacities (zero oversubscription) both on aggregation and access level.

1.2 GENERAL INFORMATION

The word "RUNE" in this document refers to all legal entities acting with the goal to reach "RUNE" project targets by using "RUNE" project funds. At the moment of issuing this RFI, it refers to RUNE-SI d.o.o., a Slovenian company, and RUNE-ADRIA d.o.o., a Croatian company.

The subject of this Call for expressions of interest are:

- Design and construction of the passive layer of the future network
- Active network layer systems.

The goal of the RFI and the following process is to define the RFQ content until 15.11.2017.

A separate RFI for the materials, needed for the passive network, will be published. RUNE will contract type, quality, prices and other economic conditions for the materials. This will be bought by the chosen contractors for the »Design and construction of the passive layer« directly from the chosen supplier, and sold to RUNE once built-in.

A more detailed description of the foreseen procurement processes is provided in Chapter 3.

This RFI is aimed to the widest possible stakeholder audience. In this phase, we would like to have as many contributions as possible, at list from the following groups:

- Service providers, willing to offer their services, to express their expectations in terms of technical requirements and services that should be offered over the RUNE's network;
- Infrastructure providers, willing to sell/rent their excess/free existent infrastructure, to be re-used for the new infrastructure deployment;
- Suppliers of materials, needed to build the network (a parallel RFI will be issued for the materials);
- Suppliers/integrators of active layer solutions, that can be used to offer infrastructural network services;
- Building companies/groups of building companies/engineering companies, willing to undertake the building of the pasive network infrastructure;
- Any other subject, not specified in the previous lines.

As a first step, respondents are required to submit their expressions of interest via email to goran.zivec@ruralnetwork.eu and sasa.ukic@ruralnetwork.eu , not later than 30.9.2017!

The expression of interest, signed by the legal representative , should contain at list:

- Full name and a short description of the entity, expressing the interest to participate in the process of definition of contents for the RFQ;
- Name, mail and phone contact of the person in charge for the cooperation with RUNE;
- Possible/desired fields of cooperation;

- All information obtained during the process will be kept as internal, and not shared to third parties;
- Explicit declaration that cooperation in this phase does not represent any legally binding obligation to any part, that participation in the RFI process does not imply any advantage in the following phases, and that all parties involve cover its own expenses that arise from the cooperation, unless a separate agreement

All further correspondence with respect to this call for expressions of interest should be communicated to:

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E-mail:	sasa.ukic@ruralnetwork.eu

19th of September, 2017

RUNE-SI d.o.o.
Goran Živec

RUNE-SI TELEKOMUNIKACIJSKA INFRASTRUKTURA d.o.o.

RUNE-ADRIA d.o.o.
Saša Ukić

RUNE-ADRIA TELEKOMUNIKACIJSKA INFRASTRUKTURA d.o.o. Opatija

2 PURPOSE AND ROLE OF "RUNE" PROCUREMENT POLICY AND PROCEDURES

2.1 PURPOSE OF PROCUREMENT POLICY AND PROCEDURES

The purpose of the policy is to ensure in all of "RUNE" procurement activities:

- consistency across the project;
- compliance with legislation and key directions given by the international procurement standard ISO 10845;
- to ensure openness and transparency of decision-making;
- to define the best possible market conditions for all the supplies and services that will be required in the project

2.2 OBJECTIVE

The aim of this policy is to ensure that "RUNE" procurement policies are efficient, clearly defined, deliver value for money and do so in accordance with best practices given by international procurement standard ISO 10845.

2.3 SCOPE

The policy covers all activities related to purchasing of goods and services by all "RUNE" Staff across all business units.

2.4 POLICY STATEMENT

"RUNE" is committed to ensuring its purchasing practices are sustainable, efficient and deliver value for money, whilst encouraging a competitive environment amongst its suppliers and ensuring a safe working environment for its staff and contractors. "RUNE" purchasing practices will be based on the following principles:

- **Value for Money:** Obtain the best quality and value for the price and that the qualitative system requirements meets "RUNE" criteria regarding the policy, performance, risk and costs constraints.
- **Open and Fair Competition:** Treat all current and prospective suppliers and vendors fairly in an open and transparent manner without any bias or the perception of bias.
- **Accountability:** Provide clear lines of responsibility and requirements for compliance with best practice guidelines.
- **Risk Management**: Include management strategies to identify, minimize and control risk associated with different stages of the procurement process and to enhance council's capability to prevent, withstand and recover from interruption to the supply of goods, services and works.
- **Probity and Transparency**: Demonstrate the highest levels of integrity consistent with the "RUNE" project interests. Ensuring fairness and impartiality towards suppliers; consistency and transparency in the competitive process; and providing security and confidentiality for the commercial interests of existing and potential suppliers.

2.5 RELATED RULES

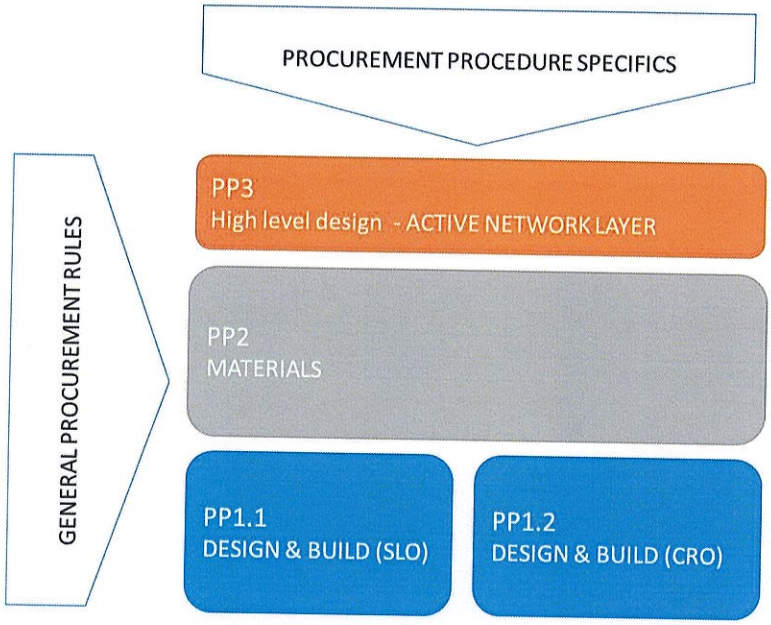
International procurement standard ISO 10845

3 PROCUREMENT PHASES AND DOCUMENTS

3.1 GENERAL DESCRIPTION OF PROCUREMENT PHASES AND PROCEDURES

The procurement will be held separately for each of the 3 procurement phases as shown in the picture below.

Picture: Overview of project procurement procedures



PP1.1 and PP1.2 procedures are aimed at the design and construction of the passive layer of the future network. Both contain designing and building of the infrastructure and include all permission gathering, in a way to reduce the operative risk deriving from the differences between the plan and the effective situation on the field.

PP1.1 and PP1.2 correspond geographically to Slovenia and Croatia part of the RUNE planned territory. Each of those will be furtherly divided (currently three sub-phases in Slovenia and two sub-phases in Croatia are foreseen) in more phases, to aid smooth execution.

With PP2 RUNE (subject of a separate, parallel RFI) intends to choose the most appropriate materials (only certified materials can be built-in) and contract the project price with the supplier. The materials will be bought from the Contractors of PP1.1 and PP1.2 and sold to the investor once properly built in the project.

A successive **open competitive negotiation procedure** will be used to select the best offer in all 3 procurement processes. All details will be defined in the RFQ.
Tenderers will submit tender offers in response to an RFQ, published by RUNE. RUNE will evaluate the offers and determine who may enter into competitive negotiations, as per ISO 10845-1.
When using the competitive negotiation, RUNE will negotiate with responsive and qualified tenderers, procedures through one or more rounds of competitive

negotiations, based on their rankings or other number of tender-evaluation points, until remaining tenderers are invited to submit final offers.

Tenderers will be informed of the competitive negotiation process and notified of the evaluation criteria and associated weightings in the tender data. All criteria will be defined in the process of preparation of the RFQ.

Orientative tender values:

CAPEX	
Administrative costs and cost of project documentation before construction	4,000,000
Construction permits and authorizations	1,400,000
Civil works (digging, laying pipes, manholes, etc.)	135,000,000
Base cost (primary distribution)	85,000,000
Base cost (secondary distribution)	50,000,000
Passive infrastructure installation (cabling, splicing, measurements, etc)	23,000,000
Cost of acquisition and/or setting up locations for network's primary nodes	250,000
Cost of materials and passive equipment	37,000,000
Cost of active equipment	14,000,000
Surveying and recording of the works for public utility cadastre	3,000,000
TOTAL CAPEX (euros)	217,650,000

3.2 PROCUREMENT PROCEDURE 1: DESIGN&BUILD PHASE (PP1)

3.2.1 INDICATIVE SCOPE OF WORK

RUNE will tender the building of the passive layer of the network on a "design and build" basis. There will be two separate procedures, one for Slovenian part and one for Croatian part of the passive infrastructure, to reflect differences on the legal obligations and requirements, related to the building phase.
Tables with indicative number of residential (household) network points to be built are attached at the end of this document. Beside those, a consistent number of companies, public bodies and other network points are present in the project area, and will have to be built.

The network will be built upon the following restraints/specifications

- The topology must concentrate on as few active points as possible, to contain CAPEX and OPEX. Space is an issue, and so is energy consumption, cooling, uninterrupted power supply and physical security;
- The topology of the active network must be thought in a way that new network parts can be added without the need to redesign the whole concept. In the

final stage, the solution must enable multiple rings, connecting each access node with two or more aggregation nodes.

Please see also chapter 3.4 for additional info about the overall requirements.

The work of this PP will comprise as follows:

Activity	Description	Remarks
NETWORK PLANNING	Passive network layer design, obtaining all necessary permissions.	• Network design of the aggregation and primary access network (feeder lines, distribution nodes, distribution network to splice box level) • Secondary access network design • Two public tenders divided into geographical units – individual tender for each country.
CONSTRUCTION WORKS	Digging, duct installation, cable blowing, aerial cable installation, installation of distribution cabinets, as-built documentation making, and all other services associated with construction and documentation, geodetic surveying of executed work and inscription of the infrastructure in the public registers	• Building of aggregation and primary access network passive infrastructure. • Maximum possible use of existing infrastructure, if convenient. • Two public tenders divided into geographical units – individual tender for each country. • Tender is based on turnkey model. • Monthly invoicing on executed works.
ON-SITE ASSEMBLY	Construction of distribution network from distribution node to end customer along with in house network installation (installation and connection of splice boxes, optical cable installation, installation and connection of ODF-s, ONT installation, optical line measurement, as-built	• Secondary access network building. • In house network installation (at the end customer expense). • Selected construction companies buy materials from contracted vendors and sell it as installed to RUNE, handling fee in amount of maximum 1,5% from material cost is accepted.

	documentation, obtaining all necessary permissions, geodetic surveying of executed work and inscription of the infrastructure in the public registers, and all other administrative tasks)	• Monthly invoicing of executed works per connected end user. • Two public tenders divided into geographical units – individual tender for each. • Tender is based on turnkey model.

3.2.2 SUBMISSION DATA

Participants are invited to submit as much material they feel necessary in this phase of the RFI. More stringent rules may be set in the following steps.

3.2.3 LIST OF RETURNABLE DOCUMENTS

For this phase, form is not mandatory, to stimulate as many stakeholders as possible to participate in the RFI process. More stringent rules may be set in the following steps.

3.2.4 RETURNABLE SCHEDULES

For this phase, returnable schedules are not set, to stimulate as many stakeholders as possible to participate in the RFI process. More stringent rules may be set in the following steps.

3.3 PROCUREMENT PROCEDURE 2: SUPPLY OF MATERIALS (PP2)

Will be part of a separate RFI and RFQ, included here for consistency. Potential suppliers are asked free to anticipate their interest.

3.4 PROCUREMENT PROCEDURE 3: SUPPLY OF ACTIVE NETWORK LAYER (PP3)

3.4.1. INDICATIVE SCOPE OF WORK

The network will be built upon the following restraints/specifications

- The topology must concentrate on as few active points as possible, to contain CAPEX and OPEX. Space is an issue, and so is energy consumption, cooling, uninterrupted power supply and physical security;
- The topology of the active network must be thought in a way that new network parts can be added without the need to redesign the whole concept. In the final stage, the solution must enable multiple rings, connecting each access node with two or more aggregation nodes;
- A specific request in terms of active equipment is to give the possibility to offer VLAN in VLAN (or Q in Q or VLAN trunks) to the users;
- AC 220V is available at all active points, solution must provide UPS with at list 12 hours autonomy for the installed communication equipment;
- A "pay as you grow" solution is requested;
- A temperature hardened equipment is preferred at the active access nodes, in a way to avoid the need for power supply to cooling systems in case of power failure.

The number of active users (for calculation purposes) is planned at 200.000, approximately 130.000 in Slovenia and 70.000 in Croatia (address list with geolocational data for each address is attached to this document).

Extensions of the network (possibility to add aggregation nodes) to nearby areas need to be foreseen. Redundancy between the active distribution nodes has to be planned (at least two connections from each active aggregation node, to two active aggregation nodes, using LAG or other mechanism), but can be fully implemented only after the initial phases due to the current topology of the network.

The overall solution comprises:

- Two redundant ISP connection nodes (ISPCN) one in Slovenia, one in Croatia;
- One aggregation network, connecting the ISPCNs to the active access nodes. Some connections are done through leased fibre/capacity over existent infrastructure;
- Several active access nodes (AAN);
- An optical network termination at the user premises.

RUNE will act as a wholesale only infrastructure operator, offering high capacity bitstream (VULA type) service to service providers.

Required services:

- Layer 2 transparent bitstream must be possible throughout the network (with network segmentation at aggregation level);
- Higher layer services (IP-MPLS or similar) must be possible throughout the network;
- IP layer services must be built in (IPv4 and IPv6).

3.4.2 Technical solution for the access network

GPON active equipment with multilayer splitting to a maximum ratio of 1:128 (1:64 accepted). A wire-speed connectivity between AANs and the aggregation network is a must. This means that the sum of nominal capacity of all access ports of an AAN must be provided also towards the aggregation nodes (Non-blocking hardware design, except malfunctions). Active distribution nodes are less than 80 km from the aggregation nodes.

The solution must foresee the possibility to be upgraded to 10G PON and WDM PON at the AAN.
The scheme of active components of the network from content source to the end user is attached at the end of this document.

Supported protocols
- Zero bandwidth impact during switch fail over;
- In Service Software Upgrades (ISSU)
- IP service-aware architecture to ensure optimal bandwidth efficiency and guaranteed instant channel changes;
- Software that enables IMS integration and expands existing IP service-aware features such as IGMP multicasting, VLAN tagging and stacking, and security features
- Security and service segmentations features:
    - DHCP snoop/proxy
    - IP Source Guard/Source verify
    - PPPOEiA and PPPOE profiles
    - MAC Forced Forwarding
        - to ensure DHCP/PPP and MAC/ARP table integrity and avoid IP/MAC and gateway spoofing
    - IGMP V2 and V3
    - IGMP snoop/proxy
    - MVR (Multicast Vlan Registration) to optimize IPTV delivery
    - IPv4 and IPv6 Access Control Lists
- 2.5 Gbps / 1.25 Gbps PON downstream/upstream speeds as minimum per each access port, ITU-T G.984 compliant, including G.984.7, BBF 247.certified;
- at list 10% user ports must be 10G PON (NG-PON2 recommended, XGS-PON minimum);
- at list 10% user ports must be 1GE and/or 10GE symmetrical lines, MEF certified;
- Wire-speed uplink interface from OLT to aggregation nodes;
- Voice services with SIP or H.248 signaling;
- Video services via IPTV;
- Dynamic Bandwidth Allocation (DBA) and HQoS;
- 128-BIT Advanced Encryption Standard (AES);
- VLAN in VLAN (or Q-Q or VLAN trunking);
- IP-MPLS (can be done with different active equipment at user side.
- G.8032V2 Ring support to facilitate ring topologies of the access nodes
- LAG (active-active/active-standby) support on the access node in case of P2P connection

Optical power calculation
Optical power budget is to be calculated as ~0.4 dB/km @ 1310nm, split (N*3.5 dB for a split of 2N) & other losses (connectors, insertion losses,etc...).

Inputs for power calculation of the access network :
- Quality of used optical components (uniform distribution, low insertion loss)

- Use of connectorised (type 0.5 dB loss) connections
- Use of class C+ laser interfaces or stronger (32 dB optical power budget) in the access network
- Multi stage splitting (typical 1:4 followed by 1:16)
- A 15km cable (fibre ITU-T G.657A1 or better) length limit is imposed for the construction of the primary passive access network. Maximum 2km of secondary (last mile) line is to be calculated.

3.4.3 Network management/provisioning

All necessary equipment must be offered, to ensure reliable and possibly automatic provisioning.
The proposed equipment shall be ready to support migration to SDN/NFV. Ideally with native Netconf/Yang implementation and Open Flow support for future ASN/NFV to eliminate a proxy/middleware layer.
Native Netconf/Yang shall cover both provisioning and alarm/messaging.
The operating system of the OLT shall be of modular nature, and identical across the proposed OLT systems. In Service Software Upgrade is desired.
Please highlight the supported/tested SDN platforms and embedded support tools (MPEG analyzer, Wireshark, Python diagnostics scripts,...)

Management system should support well-documented northbound interface API's. Preferred via the industry standard REST/JSON.
The Network Management system should support:

- Network and Service configuration when the product is both online & offline including device pre-configuration
- Software upgrades
- Status requests and command automation
- Statistics and performance data collection
- Alarm and event collection

A CRM or other platform must be offered for user management (order processing, trouble ticket solution and similar).
Suggestions, proposals and proactive behavior from the offerer is welcome in the FRI phase.

3.4.4 Active equipment at the aggregation point

Carrier grade aggregation switches (MEF certified), supporting multiple 10G Ethernet connections with link trunking / bonding capacity, with IP-MPLS functionality, with the possibility of direct use of WDM SFP+ interfaced, with all necessary interfaces must be the building block of the aggregation network.

3.4.5 Active equipment at the distribution sites

One or more OLTs with wire-speed upstream capacity (equal to the sum of nominal capacity of all installed ports, upgradeable to the sum of capacity of all potential access ports). Small formfactor OLT's, with a modular, redundant architecture and temperature hardened are desired to meet our space requirements/constrains. Temperature hardened reduces the requirement of air conditioning/cooling in remote POPs.

The number of GPON ports will grow with the network. At list 8 port GPON blades should be offered. Upstream interfaces should be included in the offer. User side GPON interfaces must be SFP type (removable), and should be quoted per unit. Minimum order quantity and delivery times must be expressed.

3.4.6 Equipment at the passive distribution aggregation node (PAN)

No active parts are meant to be present in the street cabinets. Only the connectorized (LC/APC) first or second level splitters are to be installed there. Splitters must be included in the offer (price per unit). Minimum order quantity and delivery times must be expressed.

3.4.7 User side active equipment

ONT should have at least 2 x 1GE ethernet ports, ideally 4 x 1 GE (at least 1x10GE, 1x1GE for 10G PON users, at least 1x10GE, 1x1GE for 10GE symmetrical line users).
ONTs shall support 'any service any port' supporting data/voice and video services on all ports, to allow for a flexible service delivery architecture.
Please provide a list of additional services like embedded IOT interfaces, options for temperature hardened ONT units.
Please quote price per unit and a planned price erosion for next 7 years period.

3.4.8 Energy efficiency

Please, include in the offer the calculations of the energy needs for all equipment (content source, main aggregation, etc...)
The offer for active equipment should be for all the needed components to allow RUNE to become a network infrastructure provider including the necessary PSUs and 12 hours UPS for access and aggregation nodes.
The offer for active equipment should be for all the needed components to allow RUNE to become a network infrastructure provider including the necessary PSUs and 12 hours UPS.

3.4.9 SUBMISSION DATA

Participants are invited to submit as much material they feel necessary in this phase of the RFI. More stringent rules may be set in the following steps.

3.4.10 LIST OF RETURNABLE DOCUMENTS

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3.4.11 RETURNABLE SCHEDULES

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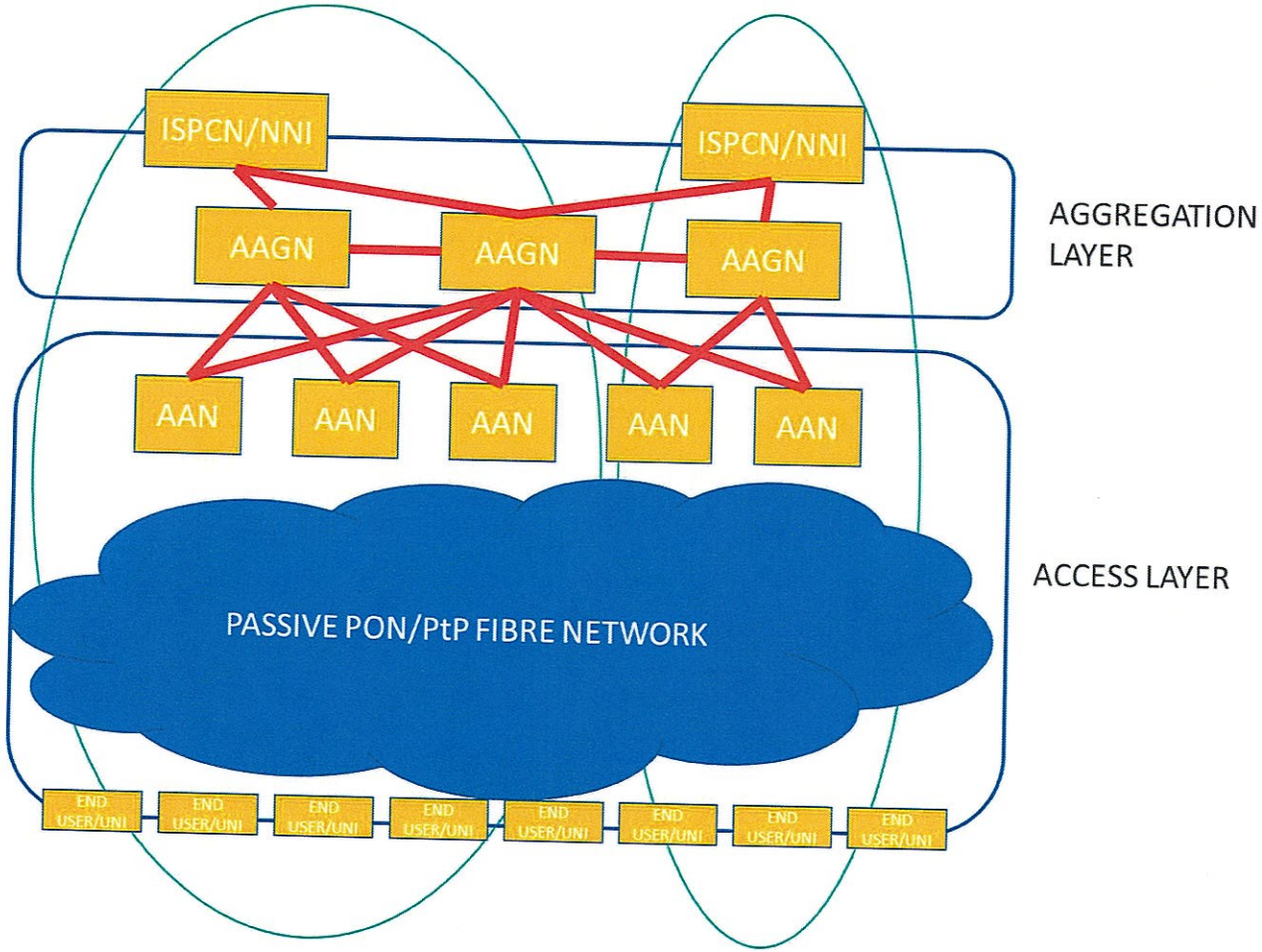
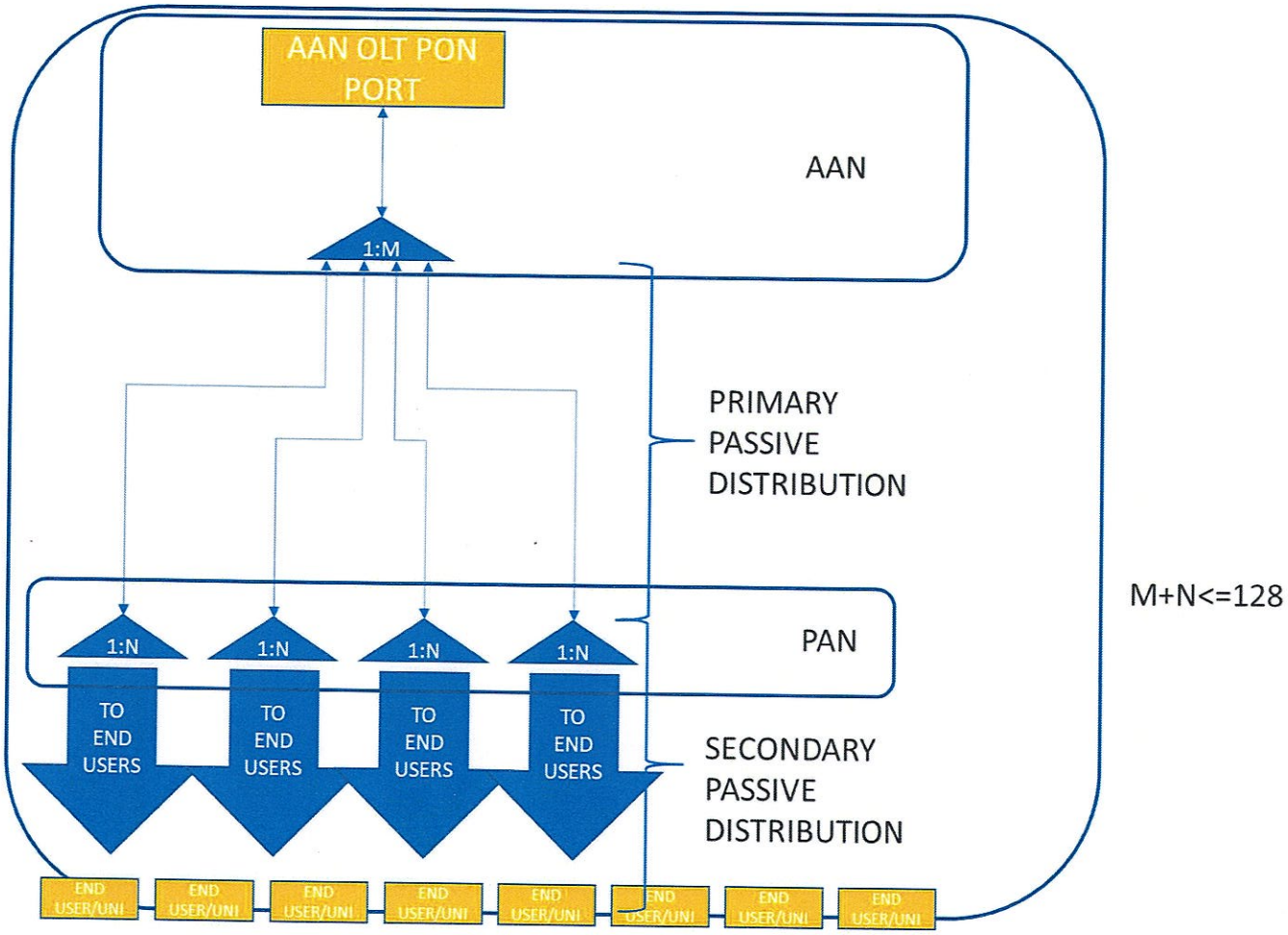
4 RUNE NETWORK SCHEMES

4.1.1 GENERAL SCHEME



4.1.2 ACCESS NETWORK SCHEME



5 RUNE – TABLES (attached as a separate excel table, please see both sheets, RUNE-SI and RUNE-ADRIA)