FINAL ACCEPTANCE TEST - FAT

General

1. For AGGN FAT, full functionality, redundancy and capacity must be established.

2. Latest at the time of the first FAT invitation the Contractor is obliged to present for validation to the Client the following documentation
 - training certificates for persons designated by the Client, namely for 10 persons (for "first level support and maintenance" related to the equipment supplied),

3. Before the invvatition according to 12.3. for the last FAT the Contractor must prepare and submit for validation to the Client technical documentation with detailed description of the system and all of its components and functionalities "as built"

4. For AAN FAT redundant active/active links must be established between all AAN devices and all AGGN devices and all ISPCN devices.

5. For FAT redundant connections between locations must be via redundant direct optical fiber links or redundant DWDM connections or leased 10GE service.

RUNE Rural Networks

AAN NUMBER:			

FAT	EXPECTED RESULT	YES/NO	REMARKS
Physical connectivity of OLT device with at least two active links to at least two AGGN devices in active/active mode to avoid single point of failure (dedicated optical fiber, 10GE service or DWDM system can be used on each of the separate links).	OLT device and AGGN active devices are connected to each other via at least two links and can establish protocol communication, where at least two AGGN devices (AGGN devices can be on a different geographical location if single location does not provide link redundancy) are connected to one OLT device to avoid single point of failure.		
Redundancy between OLT and AGGN must be provided without traffic interruption	Shutdown of any of the redundant links or failure of any of the redundant active equipment doesn't bring down the communication between OLT and AGGN device if at least one active link exists and at least one device on each side is in working condition - end customer doesn't have visible outage.		
ONT and OLT device must have their final configuration and full functionality to accept services from at least one of the ISPs.	FAT includes ISP connectivity and OLT and ONT device are ready to accept services from at least one of the available ISPs today; additionally, in each AAN one or more OLT devices are in working condition with at least 20 residential end customers and 5 SOHO end customers, where all end users have end to end service from ISP if required by end user. Additionally, at least 5 SOHO customers are conected using L2 and L3 services between 2 SOHO customers and Upstream ISP.		
Access equipment must support at least two basic wholesale models.	The following functionalities are supported, tested and confirmed: VULA (Virtual Unbundling Local Access) and BSA (BitStream Access), LLU (Local-Loop Unbundling) is not required, but considered a premuim. The test is performed according to the testing method the Supplier has proposed and the Client has aproved during the bidding process.		
Wholesale model related functionalities must be tested and confirmed.	The following functionalities are supported, tested and confirmed: VLAN - IEEE802.3Q with 4k VLAN-IDs; QinQ - IEEE802.3ad – 16K VLAN-IDs; Multicast services; PIM protocols PIM-SM, PIM-DM and PIMG-SSM; IGMPv2, IGMPv3, MLDv1, MLDv2, IGMP filtering; L2 MVR; Bandwidth control to inshore OTT services *; QoS and Traffic management. The test is performed according to the testing method the Supplier has proposed and the Client has aproved during the bidding process.		
Shaping and policing to limit bandwidth - queuing and policing on Ingres and Egress.	The following functionalities are supported, tested and confirmed: Upstream Traffic Management and Downstream Traffic Management. The test is performed according to the testing method the Supplier has proposed and the Client has aproved during the bidding process.		
Remote Packet Capture functionality established	The following functionalities are supported, tested and confirmed: Captures packet stream in real-time and redirects it to remote server running Wireshark application. The test is performed according to the testing method the Supplier has proposed and the Client has aproved during the bidding process.		
Video Channel Analyzer functionality established	The following functionalities are supported, tested and confirmed: Capture and Analyze MPEG Video on IP Multicast. The test is performed according to the testing method the Supplier has proposed and the Client has aproved during the bidding process.		

* https://networkengineering.stackexchange.com/questions/54421/how-isp-limits-subscriber-speed-on-gpon-ftth-gpon-architecture-technical-questi

Date

Signed by

RUNE   (NAME and SURNAME, SIGNATURE)

Technical Supervisor   (NAME and SURNAME, SIGNATURE)

Contractor   (NAME and SURNAME, SIGNATURE)

AGGN NUMBER:			

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FAT	EXPECTED RESULT	YES/NO	REMARKS
Physical connectivity of at least two redundant AGGN devices with at least two active links to other AGGN devices inside AGGN location in active/active mode to avoid single point of failure (dedicated cable, optical fiber, 10GE service or DWDM system can be used on each of the separate links)	AGGN devices in each AGGN location are connected to each other via at least two active links and can establish protocol communication to avoid single point of failure.		
Physical connectivity of at least two redundant AGGN devices with at least two active links to any OLT device in active/active mode to avoid single point of failure (dedicated cable, optical fiber, 10GE service or DWDM system can be used on each of the separate links)	Each OLT device and each AGGN active device in its corresponding AGGN location are connected via at least two links and can establish protocol communication, where at least two AGGN devices (AGGN devices can be on different geographical location in case redundant links can not be establised over same AGGN location) are connected to one OLT device to avoid single point of failure		
Physical connectivity of at least two redundant AGGN devices with at least two active links to two different ISPCN device in remote ISPCN location in active/active mode to avoid single point of failure (dedicated cable, optical fiber, 10GE service or DWDM system can be used on each of the separate links)	At least two AGGN devices in each AGGN location are connected to at least two ISPCN devices in its related ISPCN location via at least two active links and can establish protocol communication to avoid single point of failure		
Redundancy between OLT and AGGN must be provided without traffice interruption	Shutdown of any of the redundant links or failure of any of the redundant active equipment does not bring down the communication between OLT and AGGN device if at least one active link exists and at least one device on each side is in working condition - End customer doesn't have visible outage		
Redundancy between AGGN and ISPCN must be provided without traffice interruption	Shutdown of any of the redundant links or failure of any of the redundand active equipment in AGGN and ISPCN does not bring down the communication between AGGN and ISPCN if at least on active link exists between them and at least one device on each side is in working condition - End customer doesn't have visible outage		
AGGN devices must have their final configuration and full functionality to accept services from all of the today known ISPs in Slovenia and Croatia	FAT includes ISP connectivity and AGGN devices must be ready to accept services from at all available ISPs today in Slovenia and Croatia, where each of these ISPs has a known definition of connectivity type (in Slovenia: TS, T2, A1, Telemach; in Croatia HT and A1)		
AGGN devices must have their final configuration and full functionality for required protocols	The following protocos are running between AGGN device and ISPCN device: one of the IGP protocols selected by the vendor, MPLS, FRR, all L2 (EVPN) and L3 MPLS services including NG-MVPN. All vendor-specific protocols specified in the High level design are operative.		
Connectivity between AAN and AGGN must be implemented with a final capacity planned for RUNE project	Connectivity between OLT and AGGN is at least 2x 10GE and each 10GE over a separate active link		
Connectivity between AGGN and ISPCN must be implemented with a final capacity planned for RUNE project	Connectivity between AGGN and ISPCN is at least 8x 100GE, where half of the capacity is over one of the active DWDM links and the other half of the capacity is over second active DWDM link (in case of more than two DWDM links distribute the load accordingly)		

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RUNE (NAME and SURNAME, SIGNATURE)

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Contractor (NAME and SURNAME, SIGNATURE)

ISPCN NUMBER:

FAT	EXPECTED RESULT	YES/NO	REMARKS
Physical connectivity of at least two redundant ISPCN devices with at least two active links to at least two AGGN devices inside each AGGN location in active/active mode to avoid single point of failure (dedicated cable, optical fiber, 10GE service or DWDM system can be used on each of the separate links)	At least two ISPCN devices in each ISPCN location are connected to at least two AGGN devices in each AGGN location via at least two active links in active/active mode of operation and can establish protocol communication to avoid single point of failure		
Physical connectivity of at least two redundant ISPCN devices with at least two active links to at least two ISPCN devices inside each other remote ISPCN location in active/active mode to avoid single point of failure (dedicated cable, optical fiber, 10GE service or DWDM system can be used on each of the separate links)	At least two ISPCN devices in each ISPCN location are connected to at least two ISPCN devices in each remote ISPCN location via at least two active links in active/active mode of operation and can establish protocol communication to avoid single point of failure		
Redundancy between AGGN and ISPCN must be provided without traffic interruption	Shutdown of any of the redundant links or failure of any of the redundant active equipment in AGGN and ISPCN does not bring down the communication between AGGN and ISPCN if at least one active link exists between them and at least one device on each side is in working condition - End customer doesn't have visible outage		
Redundancy between ISPCN locations must be provided without traffic interruption	Shutdown of any of the redundant links between any two ISPCN locations or failure of any of the redundand active equipment in any ISPCN location does not bring down the communication between devices in different ISPCN locations if at least one active link exists and at least one device on each side is in working condition - End customer doesn't have visible outage		
ISPCN devices must have their final configuration and full functionality to accept services from all of the today known ISPs in Slovenia and Croatia	FAT includes ISP connectivity and ISPCN devices are ready to accept services from all available ISPs today in Slovenia and Croatia, where each of these ISPs has a known definition of connectivity type (in Slovenia: TS, T2, A1, Telemach; in Croatia HT and A1)		
ISPCN devices must have their final configuration and full functionality to provide connectivity between AGGN locations and between ISPCN locations for required protocols	The following protocos are running between AGGN device and ISPCN device: one of the IGP protocols selected by the vendor, MPLS, FRR, all L2 (EVPN) and L3 MPLS services including NG-MVPN; Multitenant L3 and L2 services are implemented with HA functionality; all vendor-specific protocols specified in the High level design are operative.		
Connectivity between AGGN and ISPCN must be implemented with a final capacity planned for RUNE project	Connectivity between AGGN and ISPCN is at least 8x 100GE, where half of the capacity is over one of the active DWDM links and the other half of the capacity is over second active DWDM link (in case of more than two DWDM links distribute the load accordingly)		
Connectivity between ISPCN locations in Slovenia and Croatia must be implemented with a final capacity planned for RUNE project	Connectivity between any two ISPCN locations is at least 4x 100GE on each link, where two links go out of each ISPCN toward neighbopring ISPCN locations and full capacity of 8x 100GE is used on these two links combined (in case of more than two DWDM links distribute the load accordingly)		

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RUNE   (NAME and SURNAME, SIGNATURE)

Technical Supervisor   (NAME and SURNAME, SIGNATURE)

Contractor   (NAME and SURNAME, SIGNATURE)

DWDM (side A - side B)			

FAT	EXPECTED RESULT	YES/NO	REMARKS
Physical connectivity of at least two redundant DWDM links between each AGGN location and corresponding ISPCN location in active/active mode to avoid single point of failure	At least two ISPCN devices in each ISPCN location are connected to at least two AGGN devices in each AGGN location via at least two active links in active/active mode of operation and can establish protocol communication to avoid single point of failure		
Physical connectivity of at least two redundant DWDM links between each two ISPCN locations, where ISPCN locations can be in a ring or a point-to-point topology in active/active mode to avoid single point of failure	At least two ISPCN devices in each ISPCN location are connected to at least two ISPCN devices in each remote ISPCN location via at least two active links in active/active mode of operation and can establish protocol communication to avoid single point of failure		
Redundancy between AGGN and ISPCN must be provided without traffic interruption	Shutdown of any of the redundant links or failure of any of the redundant active equipment in AGGN and ISPCN does not bring down the communication between AGGN and ISPCN if at least one active link exists between them and at least one device on each side is in working condition - End customer doesn't have visible outage		
Redundancy between ISPCN locations must be provided without traffic interruption	Shutdown of any of the redundant links between any two ISPCN locations or failure of any of the redundant active equipment in any ISPCN location does not bring down the communication between devices in different ISPCN locations if at least one active link exists and at least one device on each side is in working condition - End customer doesn't have visible outage		
ISPCN devices must have their final configuration and full functionality to accept services from all of the today known ISPs in Slovenia and Croatia	FAT includes ISP connectivity and ISPCN devices are ready to accept services from all available ISPs today in Slovenia and Croatia; additionally all ISP connections present at time of FAT must be in working condition and accepting end user traffic		
ISPCN devices must have their final configuration and full functionality to provide connectivity between AGGN locations and between ISPCN locations for required protocols	The following protocols are running between AGGN device and ISPCN device: one of the IGP protocols selected by the vendor, MPLS, FRR, all L2 (EVPN) and L3 MPLS services including NG-MVPN; Multitenant L3 and L2 services are implemented with HA functionality.		
Connectivity between AGGN and ISPCN must be implemented with a final capacity planned for RUNE project	Connectivity between AGGN and ISPCN is at least 8x 100GE, where half of the capacity is over one of the active DWDM links and the other half of the capacity is over second active DWDM link (in case of more than two DWDM links distribute the load accordingly)		
Connectivity between ISPCN locations in Slovenia and Croatia must be implemented with a final capacity planned for RUNE project	Connectivity between any two ISPCN locations is at least 4x 100GE on each link, where two links go out of each ISPCN toward neighbopring ISPCN locations and full capacity of 8x 100GE is used on these two links combined (in case of more than two DWDM links distribute the load accordingly)		

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Contractor   (NAME and SURNAME, SIGNATURE)