RFP No.: APSFL/CPE/14/13/2018, Dated 27/08/2018					
Empanelment of Vendors by APSFL for Procurement of Customer Premise Equipment (CPE)					
Corrigendum 02, Dt:30.09.2018					
Bidders may please note that this corrigendum document is part of this RFP. The items listed in the corrigendum will supersede the corresponding clauses in RFP					
S.No.	**Section**	**Clause**	**Brief Description of the clause**	**Page No**	**Revised clause**
1	1. Inviting Authority	1.1(7)	Last date and time for submission of proposal 28/09/2018 at 3:00 PM Date and time of opening of pre-qualification cum technical bids on e-procurement platform 28/09/2018 at 4:00 PM	7	Last date and time for submission of proposal 12/10/2018 at 3:00 PM Date and time of opening of pre-qualification cum technical bids on e-procurement platform 12/10/2018 at 4:00 PM
2	1. Inviting Authority	1.1(12)	Onsite warranty for a period of One (1) year for all equipment.	8	Clause Removed
3	3. Scope of Work	Sample acceptance & testing	New Clause	12	APSFL shall provide the box designs for all CPEs and adherence to these designs is mandatory to ensure uniformity.
4	4. Pre-Qualification Criteria	--	Pre-Qualification Criteria	14	Please refer Annexure A
5	5. Schedule of Requirement	--	Schedule of Requirement	16	Please refer Annexure B
6	6. Technical Bid Evaluation	--	Technical Bid evaluation.	17	Please refer Annexure C
7	7. Instructions to the Bidder	7.30(iv)	Replacement warranty for one (1) years and needs to maintain at least 10 % of SOR as spares (Percentage of spares mentioned is minimum and it have to be planned by Successful bidder to maintain SLAs)	26	Replacement warranty for one (1) years and needs to maintain at least 10 % of Supply made by vendor as spares (Percentage of spares mentioned is minimum and it have to be planned by Successful bidder to maintain SLAs)
8	7. Instructions to the Bidder	7.26	Empanelment Methodology	25	Provisions under G.O. M.S 22 will be applicable for this tender subject to bidders' fulfilling necessary pre-qualification criteria and other applicable sections of the RFP
9	8. Annexures	Annexure X	Technical Specifications	39	Please refer Annexure D

Annexure A: Pre-Qualification Criteria

SNo.	Pre-Qualification Criteria	Documentary Proof to be submitted
1	The Bidder/consortium members should be a Company registered in India under the Indian Companies Act 1956/2013 or a Registered Partnership Firm or a Sole Proprietary Firm or LLP. Foreign companies can be a consortium member provided they are manufacturer/OEM of the products being supplied and provided they partner with an Indian MSME, from whom they undertake to procure goods and services not less than 10 % of the order value.	● In case the Bidder is a Registered Company in India, they should produce the copy of the Certificate of Incorporation. ● In case the Bidder is Registered Partnership Company / Firm, they should produce the copy of Registered Partnership Deed. ● In case the Bidder is a Sole Proprietary Firm, they should produce the copy of valid Tax Registration Certificate(s) ● Registration certificate under equivalent law abroad for foreign company ● A notarized or registered agreement between the Consortium members mentioning the details of Lead member and other consortium members and outline the financial strengths, technical strengths and the role and responsibility of each of the members of the consortium.
2	The Bidder/ any consortium member should have 3 years of experience in manufacturing or supply of CPEs as on date of submission of RFP.	● Copy of Purchase Orders and client certificate should be submitted. ● In the case of authorized distributor/dealer, a Letter of Authorization from the OEM/manufacturer. ● In the case of OEM, the documentary proof for manufacturing the products.
3	The Bidder/consortium should have cumulative Annual Turnover of INR 100 Crores and above in last three audited financial years. In case of Consortium the prime bidder should contribute at least 50% of the turnover.	Copies of the Audited Balance sheets and Profit and Loss Accounts for the last two audited financial years (2015-16 , 2016-17 & 2017-18). Bidders can provide provisional balance sheet for FY-2017-18 in case audited balance sheet is not available.

4	Bidder/ Consortium (all partners) should have positive net worth for the last 2 audited financial years.	Certificate from the statutory auditor/practising Chartered Accountant for having positive net worth for the last 2 successive audited financial years (2016-17 & 2017-18) Bidders can provide provisional certificate for FY-2017-18 in case audited balance sheet is not available.
5	The Bidder/ Consortium should have valid GST registration in India	Certified copy of valid GST registration certificates issued by competent authority in India. In case of consortium, this is applicable for all Indian members.
6	The Bidder/ Consortium should not have been blacklisted by any Govt. or PSU in India as on the date of bid submission	Self-declaration by the bidder duly signed by the authorized signatory
7	Technical compliance for the minimum specifications provided in scope of work	● The bidder shall submit all the technical leaflets/technical literature/product certifications etc. to confirm the technical compliance. ● The OEM should submit the compliance confirmation for each parameter in their letterhead and also MAF. ● If there is any deviation, the deviation with justification should be spelt out.
8	The Bidder / Consortium should have supplied at least 10 lakh CPEs Cumulatively in last 3 FYs Globally.	Copies of Purchase Orders/Client Certificate should be submitted
9	Existing service centres of OEM/ Authorized Distributors or Dealers in Andhra Pradesh	Should have service centres in at least 3 locations in Andhra Pradesh or Undertaking to establish the same within the 90 days. Should have support centres in all the districts of Andhra Pradesh or Undertaking to establish the same within the 90 days. Self-certified declaration and address proof of support centres to be submitted.

Relaxations under G.O. MS 22 where applicable shall be allowed for this tender

Annexure B - Schedule of Requirement

S.No	Description	Unit of Measurement	Quantity
1	**Android TV OS** **IPTV Box with Accessories**	Nos	Upto 1,00,00,000
2	**GPON with WiFi and Accessories**	Nos	Upto 1,00,00,000
3	**Android TV OS** **Combo Box with Accessories**	Nos	Upto 1,00,00,000
4	**OLTs (8/16/48/96 port chassis)**	Ports	1 PON port per 100 ONTs / Combo boxes supplied

Details of accessories for each line item are as follows

S.No	Description	Accessories
1	Android TV OS IPTV Box	Bluetooth RCU, Power adapter with cable, HDMI & AV connectors, 1.5M Lan Cable, 2 Nos AAA batteries
2	GPON with WiFi	Power adapter with cable, 1.5M Lan Cable
3	Android TV OS Combo Box	Bluetooth RCU, Power adapter with cable, HDMI & AV connectors, 1.5M Lan Cable, 2 Nos AAA batteries

Note:

1. Combo & IPTV boxes will be procured in an "either-or" model with preference for combo boxes subject to prices discovered in this tender
2. Every 100 ONT or 100 Combo Boxes shall be supplied with one port of OLT which is interoperable with the ONTs being supplied and the existing ONTs/Combo Boxes in the APSFL Network. This OLT shall have interoperability with the APSFL BSS through its management system. OLTs shall be provided along with the necessary Element Management System which should be scalable for managing up to 10 million ONTs. The Management system should be web based and should expose REST API to integrate with BSS/OSS. The EMS shall be supplied along with the Server and software licences if any at no additional cost.
3. The OLT port capacity will be specified as 8/16/48/96 based on the consignment order placed. The OLT shall be provided along with ONT/COMBO Box as a part of sample testing.

Annexure C: Technical Bid Evaluation

Submission of Samples and test acceptance certificate is a mandatory requirement for commercial bid opening consideration.

SNo	Technical Criteria	Documentary Proof to be submitted	Compliance	Max Marks
1.	Cumulative Annual Turnover 100 Crore in the last 2 audited financial yrs. (2015-16 & 2016-17)	Copies of the Audited Balance sheets and Profit and Loss account	(INR Crores) ≥ 100 & ≤ 150	**10**
			>150 & ≤ 200	**15**
			>200	**20**
2.	Positive net worth for the last 2 audited financial years.	Certificate from the statutory auditor for having positive net worth for the last 2 successive audited financial years (2015-16 & 2016-17)	100% for 2 Years	**10**
3	In-house engineering capability of the Lead Bidder	Self-Declaration of the Bidder stating the Size and experience of Engineering team. Previous Experience working with Android Developers/Google	Yes	10
4.	Technical compliance to Equipment specifications	The bidder shall submit all the technical leaflets/technical literature/product certifications etc. to confirm the technical compliance. The OEM should submit the compliance confirmation for each parameter for Equipment in letterhead. If there is any deviation, the deviation should be spelt out by the bidder in the OEM letterhead.	Mandatory Compliance. ▪ Compliance with RFP specifications – 15 ▪ **Testing and Compliance of samples devices** – 15 *Decision of technical committee shall be final in award of full marks.*	**30**
5.	The Bidder / Consortium should have supplied at least 10 lakh CPEs cumulatively in the last 3 FYs globally.	Copy of Purchase Orders / client certificate should be submitted. Proof of delivery/ client acceptance certificates are mandatory	**CPE quantity** (in Lakhs)	**Marks**
			≥ 10 & ≤ 20	15
			≥ 20 & ≤ 30	20
			> 30	25
6.	Capability to deliver 2 Lakh CPEs per month	Self-Declaration of the Bidder	Yes	5

Important Notes:

- Bidders should obtain **minimum 80 out of 100 marks** in the overall technical evaluation to qualify for opening of the Financial Bid.
- In case, none of the bidder achieves the min. qualifying marks, the Technical Evaluation Committee may revise the min. qualification marks as per the case in the interest of this RFP. The Technical Evaluation Committee's decision in this regard shall be final and binding on the Bidder.
- Bidders should submit necessary proofs towards experience claimed such as work orders / work completion certificates from clients/certificate from Auditors etc. as required by APSFL.
- APSFL may ask Bidder(s) for additional information to verify claims made in Bid documentation from already submitted Proposals at any point of time before announcement of final results.
- A Technical Committee will examine the Technical Bids against the Prequalification Criteria and Technical Criteria given in the Tender document and all other terms & conditions in the tender. The evaluation will be conducted based on the support documents submitted by the Bidders.
- Bidder should submit the interoperability test report with the existing APSFL systems and infrastructure before the opening of the financial bids. This is a critical part for obtaining test acceptance certificate from APSFL.

Annexure D –Technical Specifications

1.1 IPTV Box with Android TV OS

S.No	Description	Details
1	**Operating System**	AndroidTV OS 8.0 or later
2	**Form Factor**	Box
3	**SoC**	Approved Android TV SoC with GPU
4	**Memory (RAM)**	2GB, DDR3
5	**EMMC**	16 GB eMMC
6	**Video Decode**	VP9 Profile-2 up to 1080P@60fps H.265 HEVC MP-10@L4.1 up to 1080P@60fps H.264 AVC HP@L4.2 up to 1080P@30fps H.264 MVC up to 1080P@60fps MPEG-4 ASP@L5 up to 1080P@60fps(ISO-14496) WMV/VC-1 SP/MP/AP up to 1080P@60fps AVS-P16(AVS+) /AVS-P2 JiZhun Profile up to 1080P@60fps MPEG-2 MP/HL up to 1080P@60fps (ISO-13818) MPEG-1 MP/HL up to 1080P@60fps (ISO-11172) Real Video 8/9/10 up to 1080P@60fps
7	**Video Decode Licenses**	H.265 HEVC
8	**Video Encode**	H.264 1080P@30fps, VP 8
9	**Wi-Fi**	802.11b/g/n.
10	**Bluetooth**	BT 4.1 or Higher
11	**Ethernet**	RJ45, 10/100/1000MBase-T (support IPV4 & IPV6)
12	**USB**	1*USB 3.0 TypeA (HOST), 1*USB 2.0 TypeA (HOST)
13	**Security**	TEE, Widevine Level 1 (Support multicast), PlayReady 3.0
14	**HDMI**	1*HDMI, OUTPUT, HDMI 2.0b
15	**Composite A/V**	3 X RCA output cable(red/white/yellow)
16	**Audio**	SPDIF/HMDI/3.5mm TRRS, MP3, AAC, WMA, RM, FLC, Ogg
17	**Panel**	Front Panel: Green LED, Orange LED, Blue LED (Bluetooth) Rear /Side Panel: Power Switch, DC Jack, RJ45, TRRS, TF,HDMI, Micro USB, 2*USB Type-A, Reset Key.
18	**Other inputs**	Micro SD slot
19	**RCU**	Model # 1: BT with mic. Basic layout as per Android TV minimum requirements Model # 2 (Optional): BT with Mic and Speaker along with number pad, must support usage as cordless phone for voice with a key for off-hook indication for initiating outgoing call. Signalling messages and Voice Data should be extended to ATV and ONT for handling voice through BT RCU and vice versa.
20	**Other Note**	Device must support multicast as well as unicast services.

		Device must conform to Android requirements as listed in Android CDD 8.1 (https://source.android.com/compatibility/android-cdd.pdf)
		Device must also conform to requirements listed in the Android TV Help Centre (ATV HC) which all eligible partner have access
		In the case of discrepancy, the CDD and ATV HC take precedence over the above listed requirements.
		The OS level access to hardware interface such as Bluetooth, IR should be provided.
		Build Tools and packages to develop and test custom made system applications along with a development version of the 10 no's ATV boxes with source or patches (changes to the open source code), and necessary tools to develop and test application shall be provided.
		Custom made SDK/library shall be made available with access and permission to achieve at least: i) Run default background service. ii) Will be able to give commands to system apps. iii) 3rd party can be started as standalone services. iv) Switch default hardware apps with custom app.
		The box must have DIAL protocol implemented
		ATV Box shall have software support to receive the raw SIP signalling messages and voice data from ONT over ETH interface and shall be able to convert them into BT formats compatible to RCU (Model # 2) and vice versa. SIP signalling and Voice Coding is still be part of ONT only.

1.2 GPON ONT Specifications

SNo	Parameter	Requirement/Standards
1	**GPON**	
1.1		Standard: ITU-T G984.1 /G984.2 /G984.3 /G984.4 /G984.5 /G988 (rev10-2012)
1.2		Encapsulation Method (GEM) supports Ethernet
1.3		Configurable AES (Downstream) and FEC (Downstream and Upstream)
1.4		Bitrates: 2488Gbps (Downstream) /1244Gbps (Upstream)
1.5		Receiver Sensitivity: -28 dBm
2	**WAN Uplink Interfaces**	G.984 GPON B+
3	**L2/L3 layer**	
3.1		VLAN-ID to GEM port-ID mapping (per WT-156): -N:1 VLAN , -1:1.
3.2		Transparent VLAN
3.3		Classification: DSCP/TOS, 802.1p TCI, VLAN-ID, MAC address;
3.4		Traffic Management: up to 8 queues per T-CONT in
3.5		Priority-controlled mode or up to 16 queues per T-CONT in
3.6		Rate-controlled scheduling mode;
3.7		802.1q VLAN processing: Q-in-Q, tagging, removing tag,
3.8		Replacing tag or transparent forwarding;
3.9		Routing: Network Access Translation (NAT) and Network
3.1		Access Port Translation (NAPT)
3.11		Firewall
3.12		VPN
3.13		DHCP Client and Server
3.14		PPPoE Client
3.15		Performance: 1000Mbps bidirectional
4	**IP-TV Support**	
4.1		IGMP v1/v2/v3 snooping and proxy
4.2		IGMP processing per VLAN ID to support group of channels
4.3		Interactive services (Video On Demand)
4.4		MLD v1/v2 snooping and proxy
4.5		IPTV prioritization using Quality of Service (QoS) using 802.1p
5	**VoIP specifications**	
5.1		Call control: SIPv1/v2.
5.2		T.38 Fax relay
5.3		Fax/Data bypass
5.4		Echo canceller (G.168)
5.5		Echo canceller length (32ms)
5.6		Jitter buffer
5.7		Caller ID, Call Waiting, Call Forwarding, Call Transfer, Three Way Calling/Conferencing, Distinctive Ringing
5.8		G.711 PCMU, G.711 PCMA, G.729AB, G.723.1, G.726
5.1		RTP/RTCP packet encapsulation

5.11		RFC 2833 Support
5.12		In-band signaling detection and generation (DTMF, call progress tones)
5.13		Automatic Tone generation (dial, busy, ring back, stutter, distinctive ring)
5.15		ONT shall have software support to send the raw SIP signalling messages (after SIP parsing) and voice data (after decoding) to ATV box over ETH interface and shall be able to receive signalling messages and voice data from ATV (after conversion into ETH packets from BT formats) and RCU (Model # 2) SIP signalling and Voice Coding shall be executed in ONT only.
6	**Features**	
6.1		ONT should support IPv4, IPv6 , Dual-stack (IPv4/IPv6).
6.2		ONT should support Dual-stack through IPoE termination.
6.3		ONT should be able to operate with some LAN ports in routed and some in bridge mode with IPv4/IPv6 dual stack support.
6.4		ONT should be able to handle multiple VLAN on WAN side with flexibility to map to LAN side ports.
6.5		ONT should support dot1q LAN encapsulation mode in WAN side.
6.6		ONT should be able to map Analog Voice port to any of the WAN side VLAN interface(FX port mapping to the non-default wan vlan/interface should be supported.
6.7		ONT should support configuring multiple Static Routes.
6.8		ONT should be able to share DNS information received via DHCP to LAN side.
6.9		ONT should be able to share SIP server information received via DHCP to LAN side.
6.10		ONT should support DHCPv4 ip-address assignment from local pool (Example pool 192.168.x.x) to devices in LAN.
6.11		DNS server info must propagate to devices via DHCPv4 OFFER MESSAGE from ONT to LAN clients.
6.12		ONT should be capable of sending periodic IPv6 RA messages.
6.13		ONT should support the delegated IPv6 Prefix assignment.
6.14		ONT should support NAT44 (translation of private-address to wan side IPv4 address).
6.15		ONT should have ability to set COS fields as 802.1p in tagged packets towards BNG.
6.16		ONT should have inbuilt GUI to handle OAM
6.17		ONT should have ability to set DSCP values.
6.18		ONT should support assignment of Static IPv6 address on WAN side(ability to configure IPv6 address, prefix length, Default IPv6 gateway address, primary & secondary IPv6 DNS server should be supported)
6.19		ONT should be able to send / transfer the voice call though the DIAL protocol to the STB
7	**POTS**	RJ-11 FXS port (Minimum 1 port)
8		**Ethernet & Wifi interfaces**
8.1	**LAN**	RJ-45 10/100/1000 BASE-T
8.2		Support auto-negotiation
8.3		Support auto MDI/MDIX
8.4	**Wifi**	802.11b/g/n 2:2 MIMO
		Authentication Security: WEP, WPA-PSK, WPA2, WPA2-PSK

		Encryption: WEP, AES, TKIP+AES
9	**Power Saving**	IEEE Energy Efficient Ethernet mode (EEE)
10	**Management Support**	
10.1		Web-based with GUI
10.2		Remote management over the OMCI, PLOAM
		OMCC versions: 0xA0 to 0xA3
10.3		The OLT shall not require the use of vendor-specific Managed Entities
		and the ONU shall not be forced to provide them.
10.4		OAM and TR-069, TR-104, TR-111, TR-142
10.5		Must expose all its interfaces via HTTP, REST API only when connected directly via USB or RJ45, and over Wi-Fi with password access, which is visible in a menu in the CPE. All messages (both send and receive) must be in JSON-LD format
10.6		CPE should provide an interface to publish VOIP status messages (Ex:
		VOIP Calls Status, CLIP, Ringing, etc.,)
11	**Firmware Upgrade**	
11.1		Software upgrades must be free of cost
11.2		Upgrades must be OTA and be notified to AP, and rolled out continuously
11.3		Vendor should provide OTA server and necessary software and hardware to optimally deliver OTA updates.
12	**Power Requirement**	Comply with CoC V3
13	**Power Supply**	150V to 250V AC 50Hz, Indian Socket Plug
14	**Environment**	-5ºC to +60ºC, 0 - 90% Relative Humidity

1.3 Combo Box with Android TV OS

SNo	Description	Details
1	**Operating System**	AndroidTV OS 8.0 or later
2	**Form Factor**	Box
3	**SoC**	Approved Android TV SoC with GPU
4	**Memory(RAM)**	2GB, DDR3
5	**EMMC**	16 GB eMMC
6	**Video Decode**	VP9 Profile-2 up to 1080P@60fps H.265 HEVC MP-10@L4.1 up to 1080P@60fps H.264 AVC HP@L4.2 up to 1080P@30fps H.264 MVC up to 1080P@60fps MPEG-4 ASP@L5 upto 1080P@60fps(ISO-14496) WMV/VC-1 SP/MP/AP up to 1080P@60fps AVS-P16(AVS+) /AVS-P2 JiZhunProfile up to 1080P@60fps MPEG-2 MP/HL up to 1080P@60fps (ISO-13818) MPEG-1 MP/HL up to 1080P@60fps (ISO-11172) Real Video 8/9/10 up to 1080P@60fps
7	**Video Decode Licenses**	H.265 HEVC
8	**Video Encode**	H.264 1080P@30fps. VP 8
9	**Wi-Fi**	802.11b/g/n
10	**Bluetooth**	BT 4.1 or Higher
11	**Ethernet**	2* RJ45, 10/100 MBase-T (support IPV4 & IPV6)
12	**USB**	1*USB 3.0 Type A (HOST), 1*USB 2.0 Type A (HOST)
13	**Security**	TEE, Widevine Level 1 (Support multicast), PlayReady 3.0
14	**HDMI**	1*HDMI, OUTPUT, HDMI 2.0b
15	**Composite A/V**	3 X RCA output cable(red/white/yellow)
16	**Audio**	SPDIF/HMDI/3.5mm TRRS, MP3, AAC, WMA, RM, FLC, Ogg
17	**Panel**	Front Panel: Green LED, Orange LED, Blue LED (Bluetooth) Rear/Side Panel: Power Switch, DC Jack, RJ45, TRRS, TF,HDMI, Micro USB, 2*USB Type-A, Reset Key.
18	**Other inputs**	Micro SD slot
19	**RCU**	Model # 1: BT with mic. Basic layout as per Android TV minimum requirements Model # 2 (Optional): BT with Mic and Speaker along with number pad, must support usage as cordless phone for voice with a key for off-hook indication for initiating outgoing call. Signalling messages and Voice

		Data should be extended to ATV and ONT for handling voice through BT RCU and vice versa.
20	**Voice**	RJ11 FXS port
21	**GPON**	GPON features should be as per the GPON ONT Specifications in Section 2 above
22	**Service Requirements**	Device must support multicast as well as unicast services.
		Device must conform to Android requirements as listed in Android CDD 8.1 (https://source.android.com/compatibility/android-cdd.pdf)
		Device must also conform to requirements listed in the Android TV Help Centre (ATV HC) which all eligible partner have access
		In the case of discrepancy, the CDD and ATV HC take precedence over the above listed requirements.
		The OS level access to hardware interface such as Bluetooth, IR should be provided.
		Build Tools and packages to develop and test custom made system applications along with a development version of the 10 no's ATV boxes with source or patches (changes to the open source code), and necessary tools to develop and test application shall be provided.
		Custom made SDK/library shall be made available with access and permission to achieve at least: i) Run default background service. ii) Will be able to give commands to system apps. iii) 3rd party can be started as standalone services. iv) Switch default hardware apps with custom app.
		The box must have DIAL protocol implemented
		ATV Box shall have software support to receive the raw SIP signalling messages and voice data from ONT over ETH interface and shall be able to convert them into BT formats compatible to RCU (Model # 2) and vice versa. SIP signalling and Voice Coding is still be part of ONT only.

1.4 Specifications for the OLT

As part of the contract, bidder has to supply the OLTs also along with GPON/Combo boxes. For every 100 GPON/Combo boxes, one PON port needs to be provided. The exact type of OLT and quantities of each type will be specified at the time of ordering the boxes.

1.4.1 OLT – 8 Port

SNo	Technical Specifications
1	Generic Requirements
	The FTTx solution should be based on GPON, XG-PON1 / Point-to-Point Active Ethernet.
2	Service Interfaces
	GPON, 2.5G downstream, 1.25G upstream.
	The equipment must be able to operate at the physical distance of 20 km and above (between OLT and ONU/ONT) without any additional amplification required.
	The OLT should support 1310 and 1490 nm wavelengths
	No. Of Subscribers per GPON port minimum is 128 (Splitting ratio 1:128)
	The system shall be support multiple GbE / 10xGbE network connections.
	The FTTx platform shall be modular, with minimum of 40Gbps switching capacity.
	The Interfaces for the offered FTTx systems shall be of “plug in type (PIU) SFP modules”
	The offered OLTs/MDUs/HGWs shall be inter-operable with any third party ONTs as per the OMCI standards and must at least be certified by the Broadband Forum BBF.247. Inter-operability tests shall be done with different vendors
3	Network management
	Unified Network Management system (NMS) shall be offered.
	The required NMS in addition to management of network elements shall be incorporated optionally with special network planning and management tools for managing all connections through the FTTx network and modelling, planning and span design for FTTx networks etc.
	Bidder shall offer Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.
4	FTTx SYSTEM GENERAL REQUIREMENTS
	Compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO 9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.
	The IGMP forwarding capabilities on OLT should be no less than 2000pps,
	The equipment shall support IPv4 and IPV6.
	The equipment shall support Multicast IPv4 & IPv6 and MLD Version1 & 2
	The equipment shall detect the optical power transmission of every ONT, once that it detects some problems in the status of the optical transmission power. The system shall disable the defective ONT automatically in order to guarantee the normally use of the others.
5	The following VLAN Operations need to be supported:
	Mapping of subscriber VLAN to a common service VLAN
	Translate/re-write subscribers VLAN ID to another VLAN ID

	VLAN switching
	Mapping of the subscriber traffic based on the IEEE 802.1p priority tagging to a specific VLAN.
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q tagging to a specific VLAN
6	Subscriber Access methods supported
	DHCP, DHCP option 82/60/43/37/18, Static IP, PPPoE
	Shall support multiple service delivery of data, voice and video.
	Shall support IP policing at the network and subscriber end.
	Shall support Ethernet 802.1p and IP TOS bit prioritization.
	The OLTs shall be able to support mobile traffic backhauling.
	Support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 pulse per second (1PPS), and time of day (TOD) interfaces. supports synchronous Ethernet (SyncE) and IEEE-1588 functionalities and Shall act as the source for network clocking for TDM, SDH and SONET, SyncE, and GPS interfaces. In addition to the timing services
	The Equipment must support IP Multicasting to cater for interactive services such as broadcast IPTV, distance learning, etc. The detail implementation of multicasting mechanism must be explained.
	Static routing and Dynamic routing
7	QoS Features supported
	Trusted connectivity where the QoS setting / traffic prioritization configured by customer can be preserved.
	Un-trusted connectivity where the QoS setting / traffic prioritization configured by customer can be overwritten by the Equipment.
	The detail Downstream and Upstream QoS and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction. A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.
	Management System shall support bandwidth provisioning starting from 64 kbps granularity.
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface. The detail implementation and capability of DBA mechanism should be explained in detail.
	The offered NG-PON equipment shall support a complete T-Cont type (Type 1, 2, 3, 4, and 5) according to ITU-T G.983.4. The bidder shall explain the T-Cont types supported and typical usage of each of it respectively.
	Shall support basic OAM features such as loop back, remote diagnostic, CC and Link Trace complies with IEEE 802.1ag.
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose. The bidder shall explain the port-mirroring function mechanism in detail.
8	ITU-T / IEEE RELATED SPAECIFICATIONS
	Shall comply to ITU-T/IEEE recommendations.
	ITU-T G.652: Characteristics of a single-mode optical fiber and cable.
	ITU-T G.757: Characteristics of a Bending Loss Insensitive Single Mode Optical Fiber and Cable for the Access Network
	ITU-T G.703: Physical/electrical characteristics of hierarchical digital interface.
	ITU-T G.704: Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 Kbit/s hierarchical levels.
	ITU-T G.823: The control of jitter and wander within digital networks which are based on the 2048 Kbit/s hierarchy.

	ITU-T G.983.4: A broadband optical access system with increased service capability using dynamic bandwidth assignment.
	ITU-T G.984.1: GPON General Characteristics.
	ITU-T G.984.2: GPON Physical Media Dependent (PMD) layer specification.
	ITU-T G.984.3: GPON Transmission convergence layer specification.
	ITU-T G.984.4: GPON ONT management and control interface specification.
	ITU-T G.987.1: XG-PON, General requirements.
	ITU-T G.987.2: XG-PON, Physical media dependent (PMD) layer specification.
	ITU-T G.987.3: XG-PON, Transmission convergence (TC) specifications
	ITU-T G.988: XG-PON, ONU management and control interface (OMCI) specification
	ITU-T G.698.3: Seeded WDM-PON
	ITU-T G.8261: Timing and Synchronization aspects in packet networks.
	ITU-T G.8262: Timing characteristics of synchronous Ethernet equipment slave lock.
	IEEE 802.1ad Provider Bridges
	IEEE 802.1ag Ethernet OAM
	IEEE 802.1D Spanning Tree Protocol
	IEEE 802.1p VLAN prioritization
	IEEE 802.1Q VLAN tagging
	IEEE 802.1w Rapid Spanning Tree Protocol of at least 8 ports, based on port-based, address-based, and round robin
	IEEE 802.1p VLAN prioritization.
	IEEE 802.1Q VLAN tagging.
	IEEE 802.3 10 Mbps Ethernet
	IEEE 802.3u 100 Mbps Fast Ethernet
	IEEE 802.3ad Ethernet Link Aggregation
	IEEE 802.3ae 10 Gigabit Ethernet
	IEEE 802.3z Gigabit Ethernet
	IEEE 802.3x Flow Control
	IETF RFC 2131: DHCP
	IETF RFC 2132: DHCP Options and BOOTP Tenderer Extensions
	IETF RFC 2236: Internet Group Management Protocol, Version 2.
	IETF RFC 2933: Internet Group Management Protocol Management Information Base
	IETF RFC 3046: DHCP Relay Agent Info Option (Option 82)
	IETF RFC 3376: Internet Group Management Protocol, Version 3
	Any other standards inter-related with all the above Specifications and any other standards deemed necessary by the bidder.
9	OLT Hardware features
	The OLT shall be rack mountable and meet ETSI standards for indoor equipment requirement.
	The OLT shall be designed to Operate at 210- 250 V ac Dual Redundant Power supplies Operating temp 0 to 65 centigrade
	Fan is required for cooling the OLT to force airflow.
	The OLT shall provide one craft port for local configuration access.
	The OLT shall support one 10/100M Ethernet port for linking with EMS.
	The equipment must support a minimum splitting ratio of 32 splits or more.
10	Physical interfaces supported/loaded
	Supporting Ethernet interfaces towards the FTTx network is the mandatory requirement.
	The offered OLT should support 4 GPON interfaces, 4 x 1G SFP interfaces ,4 x 10 G SFP+ interfaces

	The offered OLT should be expandable to support additional 4 x GPON interfaces.

1.4.2 OLT – 16 Port

SNo.	Technical Specifications
1	Generic Requirements
	The FTTx solution should be based on GPON, XG-PON1 / Point-to-Point Active Ethernet.
2	Service Interfaces
	GPON, 2.5G downstream, 1.25G upstream.
	The equipment must be able to operate at the physical distance of 20 km and above (between OLT and ONU/ONT) without any additional amplification required.
	The OLT should support 1310 and 1490 nm wavelengths
	No. Of Subscribers per GPON port minimum is 128 (Splitting ratio 1:128)
	The FTTx platform shall be with complete non-blocking architecture
	The system shall be support 8*GbE / 10xGbE network connections.
	The FTTx platform shall be modular, with minimum of 40Gbps switching capacity.
	The Interfaces for the offered FTTx systems shall be of “plug in type (PIU) SFP modules”
	The offered OLTs/MDUs/HGWs shall be inter-operable with any third party ONTs as per the OMCI standards and must at least be certified by the Broadband Forum BBF.247. Inter-operability tests shall be done with different vendors
3	Network management
	Unified Network Management system (NMS) shall be offered.
	The required NMS in addition to management of network elements shall be incorporated optionally with special network planning and management tools for managing all connections through the FTTx network and modelling, planning and span design for FTTx networks etc.
	Bidder shall offer Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.
4	FTTx SYSTEM GENERAL REQUIREMENTS
	compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO 9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.
	The IGMP forwarding capabilities on OLT should be no less than 2000pps.
	The equipment shall support IPv4 and IPV6.
	The equipment shall support Multicast IPv4 & IPv6 and MLD Version1 & 2
	The equipment shall detect the optical power transmission of every ONT, once that it detects some problems in the status of the optical transmission power. The system shall disable the defective ONT automatically in order to guarantee the normally use of the others.
5	The following VLAN Operations need to be supported:
	Mapping of subscriber VLAN to a common service VLAN
	Translate/re-write subscribers VLAN ID to another VLAN ID
	VLAN switching
	Mapping of the subscriber traffic based on the IEEE 802.1p priority tagging to a specific VLAN.
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q

	tagging to a specific VLAN
6	Subscriber Access methods supported
	DHCP, DHCP option 82/60/43/37/18, Static IP, PPPoE
	Shall support multiple service delivery of data, voice and video.
	Shall support IP policing at the network and subscriber end.
	shall support Ethernet 802.1p and IP TOS bit prioritization.
	The OLTs shall be able to support mobile traffic backhauling.
	support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 pulse per second (1PPS), and time of day (TOD) interfaces. supports synchronous Ethernet (SyncE) and IEEE-1588 functionalities and Shall act as the source for network clocking for TDM, SDH and SONET, SyncE, and GPS interfaces. In addition to the timing services
	The Equipment must support IP Multicasting to cater for interactive services such as broadcast IPTV, distance learning, etc. The detail implementation of multicasting mechanism must be explained.
	Static routing and Dynamic routing
7	QoS Features supported
	Trusted connectivity where the QoS setting / traffic prioritization configured by customer can be preserved.
	Un-trusted connectivity where the QoS setting / traffic prioritization configured by customer can be overwritten by the Equipment.
	The detail Downstream and Upstream QoS and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction. A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.
	Management System shall support bandwidth provisioning starting from 64 kbps granularity.
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface. The detail implementation and capability of DBA mechanism should be explained in detail.
	The offered NG-PON equipment shall support a complete T-Cont type (Type 1, 2, 3, 4, and 5) according to ITU-T G.983.4. The bidder shall explain the T-Cont types supported and typical usage of each of it respectively.
	Shall support basic OAM features such as loop back, remote diagnostic, CC and Link Trace complies with IEEE 802.1ag.
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose. The bidder shall explain the port-mirroring function mechanism in detail.
8	ITU-T / IEEE RELATED SPAECIFICATIONS
	Shall comply to ITU-T/IEEE recommendations.
	ITU-T G.652: Characteristics of a single-mode optical fiber and cable.
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	ITU-T G.983.4: A broadband optical access system with increased service capability using dynamic bandwidth assignment.
	ITU-T G.984.1: GPON General Characteristics.
	ITU-T G.984.2: GPON Physical Media Dependent (PMD) layer specification.
	ITU-T G.984.3: GPON Transmission convergence layer specification.
	ITU-T G.984.4: GPON ONT management and control interface specification.
	ITU-T G.987.1: XG-PON, General requirements.
	ITU-T G.987.2: XG-PON, Physical media dependent (PMD) layer specification.
	ITU-T G.987.3: XG-PON, Transmission convergence (TC) specifications
	ITU-T G.988: XG-PON, ONU management and control interface (OMCI) specification

	ITU-T G.698.3: Seeded WDM-PON
	ITU-T G.8261: Timing and Synchronization aspects in packet networks.
	ITU-T G.8262: Timing characteristics of synchronous Ethernet equipment slave lock.
	IEEE 802.1ad Provider Bridges
	IEEE 802.1ag Ethernet OAM
	IEEE 802.1D Spanning Tree Protocol
	IEEE 802.1p VLAN prioritization
	IEEE 802.1Q VLAN tagging
	IEEE 802.1w Rapid Spanning Tree Protocol of at least 8 ports, based on port-based, address-based, and round robin or ERPS shall be supported.
	IEEE 802.1p VLAN prioritization.
	IEEE 802.1Q VLAN tagging.
	IEEE 802.3 10 Mbps Ethernet
	IEEE 802.3u 100 Mbps Fast Ethernet
	IEEE 802.3ad Ethernet Link Aggregation
	IEEE 802.3ae 10 Gigabit Ethernet
	IEEE 802.3z Gigabit Ethernet
	IEEE 802.3x Flow Control
	IETF RFC 2131: DHCP
	IETF RFC 2132: DHCP Options and BOOTP Tenderer Extensions
	IETF RFC 2236: Internet Group Management Protocol, Version 2.
	IETF RFC 2933: Internet Group Management Protocol Management Information Base
	IETF RFC 3046: DHCP Relay Agent Info Option (Option 82)
	IETF RFC 3376: Internet Group Management Protocol, Version 3
	Any other standards inter-related with all the above Specifications and any other standards deemed necessary by the bidder.
9	OLT Hardware features
	The OLT shall be rack mountable and meet ETSI standards for indoor equipment requirement.
	The OLT shall be designed to Operate at 210- 250 V ac Dual Redundant Power supplies Operating temp 0 to 65 centigrade
	Fan is required for cooling the OLT to force airflow.
	The OLT shall provide one craft port for local configuration access.
	The OLT shall support one 10/100M Ethernet port for linking with EMS.
	The equipment must support a minimum splitting ratio of 32 splits or more.
10	Physical interfaces supported/loaded
	Supporting Ethernet interfaces towards the FTTx network is the mandatory requirement.
	The offered OLT should support 16 GPON interfaces, 8 x 1/10G SFP+ interfaces for uplink
	The offered OLT should be expandable to support additional 4 x GPON interfaces.

1.4.3 OLT- 48 Port Chassis

SNo	Description	Details
1	Modular GPON OLT	Modular GPON OLT
		Backplane physical bandwidth 2.5Gbps per PON port
		Active Ethernet 1GbE/10GE shall support for uplink interfacing;
		19" mountable Chassis
		Required interface/ Ports:
		32 PON ports 48 PON ports
		4 * 10 Gbe XFP/SFP+
		The OLT should support 1310 and 1490 nm wavelengths No. Of Subscribers per GPON port minimum is 128 (Splitting ratio 1:128) The system shall be support multiple GbE / 10xGbE network connections.
		Warranty is 5 years from the date of commissioning
		Necessary license for GPON NMS
	GPON (ITU-T G.984.4) and Security	Downstream/Upstream bit rate: 2,488/1,244 Gbps, Advanced Encryption Standard (AES), Forward Error Correction (FEC), Maximum Differential Distance: 20 km.
	L2 layer	Services: 1:1, N:1 (TR-156i3), VLAN-ID conversion to GEM port-ID, Transparent: Add/change S-TAG and C-TAG, Load balancing LACP, Priority bits (p-bits) included in changes, Performance: GPON full wire speed
	Synchronism	SYNC-E, IEEE1588v2/PTP
	IPTV features	IGMPv2/v3 snooping with proxy reporting, multicast, IPTV streams forwarding: 1024.
	Management	- Local management by HTTP Web Browser - Remote using SNMTP and HTTP protocols. - CPE remote management over OMCI G.984.4 channel.
	Interoperability	OLT family system NMS assure layer 2 and layer 3 interoperability with the transport segment of the network, according to Rec BBF TR-156/247. NMS/EMS should support existing BSS/OSS solution with rest API interface. Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.
	Environment	Compliant with partly temperature - controlled locations recommendation as stated by ETSI ETS 300 019-1-3 Class 3.2 -5oC to +45oC, 0 - 95% of Relative Humidity range. Note: The specifications mentioned are minimum desired specification. Vendor can quote higher specifications.
	EMC	Compliant with at ETSI EN 300 386 recommendation / or equivalent IEC/EN standards
	Scalability	OLT equipment family system NMS are reliable modular Optical Line Termination (OLT) equipment specially devoted for fiber network infrastructures either Point-to-Point (P2P), Active Ethernet (AE) or Point-to-Multipoint (P2MP) FTTx Gigabit Passive Optical Network (GPON) architectures as well as assuring next generation PON technologies as XGPON-1 and NGPON2 (TWDM PON)
2	FTTx SYSTEM GENERAL REQUIREMENTS	

	Compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO 9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.
	The IGMP forwarding capabilities on OLT should be no less than 2000pps,
	The equipment shall support IPv4 and IPV6.
	The equipment shall support Multicast IPv4 & IPv6 and MLD Version1 & 2
	The equipment shall detect the optical power transmission of every ONT, once that it detects some problems in the status of the optical transmission power. The system shall disable the defective ONT automatically in order to guarantee the normally use of the others.
3	The following VLAN Operations need to be supported:
	Mapping of subscriber VLAN to a common service VLAN
	Translate/re-write subscribers VLAN ID to another VLAN ID
	VLAN switching
	Mapping of the subscriber traffic based on the IEEE 802.1p priority tagging to a specific VLAN.
	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN
	Mapping of the subscriber traffic based on the combination of IEEE 802.1p and 802.1Q tagging to a specific VLAN
4	Subscriber Access methods supported
	DHCP, DHCP option 82/60/43/37/18, Static IP, PPPoE
	Shall support multiple service delivery of data, voice and video.
	Shall support IP policing at the network and subscriber end.
	Shall support Ethernet 802.1p and IP TOS bit prioritization.
	The OLTs shall be able to support mobile traffic backhauling.
	support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 pulse per second (1PPS), and time of day (TOD) interfaces. supports synchronous Ethernet (SyncE) and IEEE-1588 functionalities and Shall act as the source for network clocking for TDM, SDH and SONET, SyncE, and GPS interfaces. In addition to the timing services
	The Equipment must support IP Multicasting to cater for interactive services such as broadcast IPTV, distance learning, etc. The detail implementation of multicasting mechanism must be explained.
	Static routing and Dynamic routing
5	QoS Features supported
	Trusted connectivity where the QoS setting / traffic prioritization configured by customer can be preserved.
	Un-trusted connectivity where the QoS setting / traffic prioritization configured by customer can be overwritten by the Equipment.
	The detail Downstream and Upstream QoS and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction. A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.
	Management System shall support bandwidth provisioning starting from 64 kbps

	granularity.
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface. The detail implementation and capability of DBA mechanism should be explained in detail.
	The offered NG-PON equipment shall support a complete T-Cont type (Type 1, 2, 3, 4, and 5) according to ITU-T G.983.4. The bidder shall explain the T-Cont types supported and typical usage of each of it respectively.
	Shall support basic OAM features such as loop back, remote diagnostic, CC and Link Trace complies with IEEE 802.1ag.
	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose. The bidder shall explain the port-mirroring function mechanism in detail.
6	ITU-T / IEEE RELATED SPAECIFICATIONS
	Shall comply to ITU-T/IEEE recommendations.
	ITU-T G.652: Characteristics of a single-mode optical fiber and cable.
	ITU-T G.757: Characteristics of a Bending Loss Insensitive Single Mode Optical Fiber and Cable for the Access Network
	ITU-T G.823: The control of jitter and wander within digital networks which are based on the 2048 Kbit/s hierarchy.
	ITU-T G.983.4: A broadband optical access system with increased service capability using dynamic bandwidth assignment.
	ITU-T G.984.1: GPON General Characteristics.
	ITU-T G.984.2: GPON Physical Media Dependent (PMD) layer specification.
	ITU-T G.984.3: GPON Transmission convergence layer specification.
	ITU-T G.984.4: GPON ONT management and control interface specification.
	ITU-T G.987.1: XG-PON, General requirements.
	ITU-T G.987.2: XG-PON, Physical media dependent (PMD) layer specification.
	ITU-T G.987.3: XG-PON, Transmission convergence (TC) specifications
	ITU-T G.988: XG-PON, ONU management and control interface (OMCI) specification
	ITU-T G.698.3: Seeded WDM-PON
	ITU-T G.8261: Timing and Synchronization aspects in packet networks.
	ITU-T G.8262: Timing characteristics of synchronous Ethernet equipment slave lock.
	IEEE 802.1ad Provider Bridges
	IEEE 802.1ag Ethernet OAM
	IEEE 802.1D Spanning Tree Protocol
	IEEE 802.1p VLAN prioritization
	IEEE 802.1Q VLAN tagging
	IEEE 802.1w Rapid Spanning Tree Protocol of at least 8 ports, based on port-based, address-based, and round robin
	IEEE 802.1p VLAN prioritization.
	IEEE 802.1Q VLAN tagging.
	IEEE 802.3 10 Mbps Ethernet
	IEEE 802.3u 100 Mbps Fast Ethernet
	IEEE 802.3ad Ethernet Link Aggregation
	IEEE 802.3ae 10 Gigabit Ethernet

	IEEE 802.3z Gigabit Ethernet
	IEEE 802.3x Flow Control
	IETF RFC 2131: DHCP
	IETF RFC 2132: DHCP Options and BOOTP Tenderer Extensions
	IETF RFC 2236: Internet Group Management Protocol, Version 2.
	IETF RFC 2933: Internet Group Management Protocol Management Information Base
	IETF RFC 3046: DHCP Relay Agent Info Option (Option 82)
	IETF RFC 3376: Internet Group Management Protocol, Version 3
	Any other standards inter-related with all the above Specifications and any other standards deemed necessary by the bidder.
7	OLT Hardware features
	The OLT shall be rack mountable and meet ETSI standards for indoor equipment requirement.
	The OLT shall be designed to Operate at 210- 250 V ac Dual Redundant Power supplies Operating temp 0 to 55 centigrade
	Fan is required for cooling the OLT to force airflow.
	The OLT shall provide one craft port for local configuration access.
	The OLT shall support one 10/100M Ethernet port for linking with EMS.
	The equipment must support a minimum splitting ratio of 32 splits or more.

1.4.4 OLT- 96 Port Chassis

SNo	Description	Details
1	Modular GPON OLT	Modular GPON OLT
		Backplane physical bandwidth 2.5Gbps per PON port
		Active Ethernet 1GbE/10GE shall support for uplink interfacing;
		19" mountable Chassis
		Required interface/ Ports:
		80 PON ports 96 PON ports
		8 * 10 Gbe XFP/SFP+
		The OLT should support 1310 and 1490 nm wavelengths No. Of Subscribers per GPON port minimum is 128 (Splitting ratio 1:128) The system shall be support multiple GbE / 10xGbE network connections.
		Warranty is 5 years from the date of commissioning
		Necessary license for GPON NMS
	GPON (ITU-T G.984.4) and Security	Downstream/Upstream bit rate: 2,488/1,244 Gbps, Advanced Encryption Standard (AES), Forward Error Correction (FEC), Maximum Differential Distance: 20 km.
	L2 layer	Services: 1:1, N:1 (TR-156i3), VLAN-ID conversion to GEM port-ID, Transparent: Add/change S-TAG and C-TAG, Load balancing LACP, Priority bits (p-bits) included in changes, Performance: GPON full wire speed
	Synchronism	SYNC-E, IEEE1588v2/PTP
	IPTV features	IGMPv2/v3 snooping with proxy reporting, multicast, IPTV streams forwarding: 1024.
	Management	- Local management by HTTP Web Browser - Remote using SNMTP and HTTP protocols. - CPE remote management over OMCI G.984.4 channel.
	Interoperability	OLT family system NMS assure layer 2 and layer 3 interoperability with the transport segment of the network, according to Rec BBF TR-156/247. NMS/EMS should support existing BSS/OSS solution with rest API interface. Network Management System for the offered equipment to provide the capabilities for configuration, operation, monitoring, remote monitoring, fault localization, and data storage.
	Environment	Compliant with partly temperature - controlled locations recommendation as stated by ETSI ETS 300 019-1-3 Class 3.2 -5oC to +45oC, 0 - 95% of Relative Humidity range. Note: The specifications mentioned are minimum desired specification. Vendor can quote higher specifications.
	EMC	Compliant with at ETSI EN 300 386 recommendation / or equivalent IEC/EN standards
	Scalability	OLT equipment family system NMS are reliable modular Optical Line Termination (OLT) equipment specially devoted for fiber network infrastructures either Point-to-Point (P2P), Active Ethernet (AE) or Point-to-Multipoint (P2MP) FTTx Gigabit Passive Optical Network (GPON) architectures as well as assuring next generation PON technologies as XGPON-1 and NGPON2 (TWDM PON)
2	FTTx SYSTEM GENERAL REQUIREMENTS	

	Compliant to the relevant ISO/ETSI industry quality standards (e.g. ISO 9000/9001), defining the quality system requirements for the design, development, production, delivery, installation and maintenance of product and services.
	The offered equipment shall be able to inter-work with the other user end equipment supplied by other vendors as per ITU-T specifications.
	The offered equipment shall support single fiber operation on standard SMF G.652, G.655 & G.657.
	The IGMP forwarding capabilities on OLT should be no less than 2000pps,
	The equipment shall support IPv4 and IPV6.
	The equipment shall support Multicast IPv4 & IPv6 and MLD Version1 & 2
	The equipment shall detect the optical power transmission of every ONT, once that it detects some problems in the status of the optical transmission power. The system shall disable the defective ONT automatically in order to guarantee the normally use of the others.
3	The following VLAN Operations need to be supported:
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	VLAN switching
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	Mapping of the subscriber traffic based on the IEEE 802.1Q VLAN ID to a specific VLAN
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4	Subscriber Access methods supported
	DHCP, DHCP option 82/60/43/37/18, Static IP, PPPoE
	Shall support multiple service delivery of data, voice and video.
	Shall support IP policing at the network and subscriber end.
	Shall support Ethernet 802.1p and IP TOS bit prioritization.
	The OLTs shall be able to support mobile traffic backhauling.
	support for the Building Integrated Timing Supply (BITS), 10 MHz, 1 pulse per second (1PPS), and time of day (TOD) interfaces. supports synchronous Ethernet (SyncE) and IEEE-1588 functionalities and Shall act as the source for network clocking for TDM, SDH and SONET, SyncE, and GPS interfaces. In addition to the timing services
	The Equipment must support IP Multicasting to cater for interactive services such as broadcast IPTV, distance learning, etc. The detail implementation of multicasting mechanism must be explained.
	Static routing and Dynamic routing
5	QoS Features supported
	Trusted connectivity where the QoS setting / traffic prioritization configured by customer can be preserved.
	Un-trusted connectivity where the QoS setting / traffic prioritization configured by customer can be overwritten by the Equipment.
	The detail Downstream and Upstream QoS and traffic prioritization mechanism supported inclusive of the hardware queue available for each direction. A minimum of 8 hardware queues should be supported at both directions. The OLT should implement some queuing mechanism to manage the hardware queue such as SP, WRR, etc.
	Management System shall support bandwidth provisioning starting from 64 kbps

	granularity.
	Shall support Dynamic Bandwidth Allocation (DBA) mechanism to allow optimum bandwidth utilization on each PON interface. The detail implementation and capability of DBA mechanism should be explained in detail.
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	Shall support port-mirroring function for trouble shooting, monitoring, and tracing purpose. The bidder shall explain the port-mirroring function mechanism in detail.
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	IEEE 802.1w Rapid Spanning Tree Protocol of at least 8 ports, based on port-based, address-based, and round robin
	IEEE 802.1p VLAN prioritization.
	IEEE 802.1Q VLAN tagging.
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	IEEE 802.3u 100 Mbps Fast Ethernet
	IEEE 802.3ad Ethernet Link Aggregation
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	IETF RFC 3046: DHCP Relay Agent Info Option (Option 82)
	IETF RFC 3376: Internet Group Management Protocol, Version 3
	Any other standards inter-related with all the above Specifications and any other standards deemed necessary by the bidder.
7	OLT Hardware features
	The OLT shall be rack mountable and meet ETSI standards for indoor equipment requirement.
	The OLT shall be designed to Operate at 210- 250 V ac Dual Redundant Power supplies Operating temp 0 to 55 centigrade
	Fan is required for cooling the OLT to force airflow.
	The OLT shall provide one craft port for local configuration access.
	The OLT shall support one 10/100M Ethernet port for linking with EMS.
	The equipment must support a minimum splitting ratio of 32 splits or more.