



xPON Network Proposal to Kit Carson

Presented on
November 4, 2013

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1 Overview



This proposal is for Kit Carson to use EPON or GPON technology to complete its network which is currently under construction. It is premised on using the passive optics presently being deployed as the means of fiber transport and access, and thus focuses on the headend and hub capital equipment costs and residential equipment costs. The proposal identifies the equipment on a per-hub basis, including all substations in the project plan. Current Situation

KCEC is building an extensive fiber optic broadband network to provide triple-play services. The project spans densely populated to very rural areas with FTTx connections. The passive optics presently being deployed will support the use of either GPON or EPON technologies.

As the present provider of the passive optic network presently being deployed, CommScope is uniquely qualified to offer and implement a solution best suited to the current project and the data connection needs. Indeed, a CommScope EPON system is already installed and delivering high-speed data services at Kit Carson.

2 Solution

2.1 Objectives

- Provide high-speed, high-quality, symmetrical data services (up to 1Gbps) to Kit Carson Electric Coop members;
- Participate as a project team member to identify additional network switch and router equipment and equipment shelters as needed to complete the network, which are not part of this proposal.

2.2 Approach

CommScope's EPON equipment is presently providing data service to KCEC commercial members in the Los Cordovas service area. The ease of use of the equipment gave rise to the interest to continue using xPON equipment for other substation locations, both for commercial and residential customers. xPON equipment can reach coop members living up to 30km from a substation using normal techniques to reach 32 subscribers on a fiber from the substation hub. Residents that are outside these regions, as shown below in Fig. 1, can be reached using the same electronics, but using a reduced number of subscribers per fiber. For residents where the economics of reduced subscribers per fiber would be better served by building a separate hub, it is feasible and probably would not need more than one instance of a separate hub.

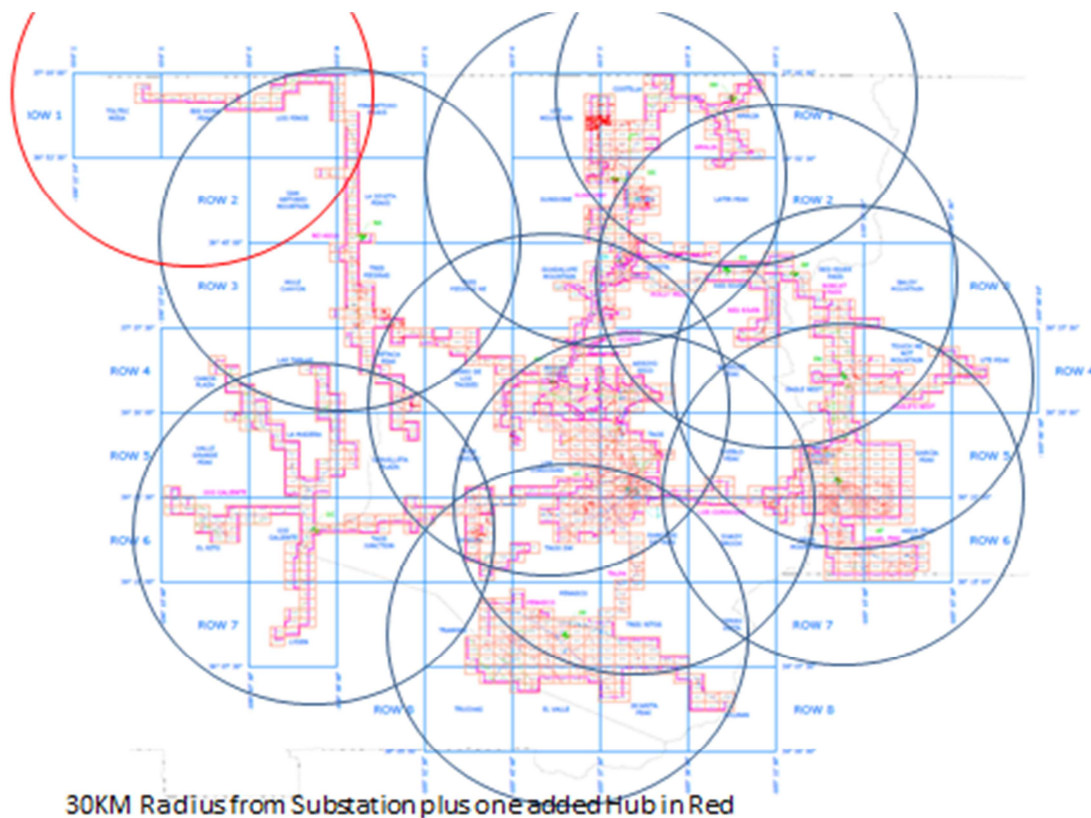


Figure 1. Kit Carson Serving Area

2.3 Technology

This proposal is based on either EPON or GPON technology, as each has been estimated. Although CommScope offers both EPON and GPON systems, we recommend EPON for many reasons that include:

- Our EPON system is already installed and successfully serving customers in Taos
- Quickest path to next-generation 10G PON speeds, (already being tested by major network operators).
- EPON's basis is in Ethernet (data networking technology) rather than GPON's ATM (Asynchronous Transfer Mode used by telephone operators)
- EPON is the technology of choice for cable operators globally, which provides economies of scale, standardization, and optimization for video services
- Independent 3rd party validation of interoperability via CableLabs
- No real advantages of either technology in terms of services supported, throughput speeds for the customer, market size, or other user experience metrics
- No fundamental differences between the technologies in network topology or engineering complexity

To summarize the technology preference, the user experience and network infrastructure are the same for both technologies. However, the edge goes to EPON because the cable industry is aggressively driving cutting-edge evolution and features, and EPON's data networking roots make it a high-performance, low-cost IP technology for tomorrow's network.

Additionally, the CommScope EPON system is the only product to have ever been certified as compliant with both CableLabs DPoE standards and US government JITC requirements. The CableLabs DPoE (DOCSIS Provisioning of EPON) certification requires performance for data throughput, automatic provisioning, and interoperability with other DPoE systems, as well as integration into a cable operator environment. Department of Defense JITC (Joint Interoperability Test Command) approval requires compliance with a rigorous set of data throughput assurance metrics plus very demanding security features.



2.4 Benefits

The primary benefit of using a xPON as the end-point technology on the KCEC Broadband Network is the ability to offer symmetrical, high data-rate services to customers who want premium multi-megabit bandwidth, rich Ethernet services with SLA-quality reliability, while making use of the existing fiber infrastructure to deliver those services.

- **SLA-Quality data services.** PON network customers can access up to 1Gbps symmetrical data services. Tiered data rate plans can be established for a variety of offerings, with the ability to guarantee minimum bandwidths up to 1Gbps, plus allowing burst rates up to a preset maximum. For example, one CommScope customer offers 3 service tiers:
 - 10Mbps symmetrical with bursts to 100Mbps
 - 20Mbps symmetrical with bursts to 250Mbps
 - 50Mbps symmetrical with to 1000Mbps
- **Custom data services.** For special-needs customers, such as Holy Cross Hospital with exceptional data requirements such as medical imaging, up to 1 Gbps services can be configured and guaranteed.
- **Another layer of future-proofing.** The forward-looking design of the current fiber plant based around a PON configuration allows this proposed overlay. The next generation of PON services, 10G PON, continues to extend the life and utility of the existing fiber plant. 10G PON will operate on the same fiber infrastructure being used and can overlay any technology currently used or planned for that infrastructure.
- **Triple-Play Plus.** The KCEC Broadband Network under construction is the ideal triple-play network for voice, video and data. It is ideally suited for residential service, relying on proven, cost-effective technology and equipment.
- **Network Simplicity.** xPON networks, in particular, EPON, transport data in a native Ethernet format, reducing the complexing of signal processing and enabling long distance transport and signal regeneration.

3 Implementation

3.1 Using Existing Passive Optics

The xPON network relies on the use of additional optical passives in place of active node devices. At the locations where nodes have been designed-in, eight distribution fibers feed the service area, made up of existing optical taps. For every 2 of these fibers, a passive optical combiner will be used to transport the signals back to the substation/hub. The additional Link Budget of xPON networks makes this possible.

3.2 Methodology

Each substation has as part of its design, the needed fibers to reach the service areas. By use of the additional optical passives as mentioned above, the total fiber count determines the number of xPON ports required. CommScope C9264 and C9016 chassis are selected for each substation/hub to provide the needed number of xPON ports. The C9016 chassis has a capacity to serve up to 512 passings. The C9264 has the capacity to serve up to 2048 passings, both using 32 ports per fiber. Some substations require one model or the other depending on the number of passings. The equipment racking requirements have been determined as well as the power requirements. Additionally, optical patch panels and splitters/combiners have been proposed, for which additional rack space is required. The racks and environmentally protected shelters for use at the substations are not included in the proposal, although such equipment may be available from CommScope. Also, the needed switches and routers, to interconnect the substations to the headend, are not provided, as they will be sourced by Fujitsu.

4 Costs

Costs for the KCEC solution are summarized below, with additional detail available in Appendix A. Since this proposal assumes use of the existing fiber infrastructure, only the incremental capital costs of the PON equipment is considered. (Note that NIDs are included for use at the side of the home of each subscriber. To date, 8,600 have already been delivered and may be used in the xPON project)

Please note that to accurately represent full equipment costs, the financial analysis throughout this proposal assumes that the EPON system currently in use has not been purchased.

KCEC Proposed Configuration - EPON		
HE/HUB OLTs and Optics – per passing	\$	36
ONU cost per subscriber	\$	175
HE/HUB OLTs and Optics – Total 26,800 Passings	\$	972,852
ONU cost, 20,000 subscribers	\$	3,501,800
Total Proposal	\$	4,474,652

Table 2. KCEC EPON Network Summary Costs.

KCEC Proposed Configuration - GPON		
HE/HUB OLTs and Optics – per passing	\$	37
ONU cost per subscriber	\$	180
HE/HUB OLTs and Optics – Total 26,800 Passings	\$	979,550
ONU cost, 20,000 subscribers	\$	3,605,000
Total Proposal	\$	4,584,550

Table 3. KCEC GPON Network Summary Costs.

5 Conclusion

This proposal outlines both EPON and GPON equipment alternatives for KCEC. It utilizes the fiber infrastructure under construction, with the changes to that network being removal of active field devices, being replaced by additional passive optics. Further analysis and detailed engineering are needed to provide individual substation shelter requirements, and hence to derive total capital equipment, installation labor, and operational expense. It is CommScope's intent that this proposal provides information sufficient to assist KCEC's decisions regarding a transition to an xPON network for the KCEC members.

Appendix A: Detail of KCEC xPON Network

COMMScope®

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Fax: 828-328-3400

					Hub Amelia		Hub Arroyo Hondo		Hub Sunshine		Hub Angel Fire		Hub Los Cordovas		Hub Ojo Galiente		Hub Eagle Nest		Hub Red River and BGP		Hub Talpa		Hub Penasco		Hub No Agua		Total Project
Item No.	Product	Product Description	Full Description	Unit Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	
			Number of Passings	75%	532		5826		1215		7455		6734		479		766		764		942		2026		66		
			Number of Active Drops/Subscribers(portion)	75%	397		4346		907		5561		5024		358		572		570		703		1512		50		26,806
Headend Equipment																											
20	760169755	BOS-SP-13002	HEADEND,SPLITTER,FBC,1X2,LGX MODULE,DUAL,SC/APC	\$ 96.75	3	\$ 290	69	\$ 6,676	9	\$ 871	87	\$ 8,417	101	\$ 9,772	6	\$ 581	10	\$ 968	10	\$ 968	12	\$ 1,161	24	\$ 2,322	1	\$ 97	\$ 32,121
21	760147454	RFE-SLC-IS-EMT-BK/4U-PNL	LGX Chassis for splitters	\$ 217.00	1	\$ 217	6	\$ 1,302	1	\$ 217	6	\$ 1,736	9	\$ 1,953	1	\$ 217	1	\$ 217	1	\$ 217	1	\$ 217	2	\$ 434	1	\$ 217	\$ 6,944
22	760147454	RFE-SLC-IS-EMT-BK/4U-PNL	Ready™ 4U Internal Sliding Shelf, black, for Patch Panel	\$ 216.85	1	\$ 217	4	\$ 867	4	\$ 867	9	\$ 1,952	17	\$ 3,686	2	\$ 434	2	\$ 434	2	\$ 434	2	\$ 434	4	\$ 867	1	\$ 217	\$ 10,409
23	760147652	PNL-BK-006-AFA-SC06-GR	TeraSPEED® Angled SC, 6 Fiber, Ganged Green Adapter, Black Panel, Single Pack, Zirconia Sleeve	\$ 36.80	9	\$ 331	43	\$ 1,582	34	\$ 1,251	90	\$ 3,312	163	\$ 5,998	13	\$ 478	22	\$ 810	16	\$ 589	11	\$ 405	38	\$ 1,398	2	\$ 74	\$ 16,229
24	760148452	KIT-SW-96-SFS-4FD	Splice Waiet Kit, 96 Single Fusion Splices (1x6x16), 4U Shelf, 4 Fiber Drums	\$ 71.43	1	\$ 71	4	\$ 286	4	\$ 286	9	\$ 643	48	\$ 3,429	2	\$ 143	2	\$ 143	2	\$ 143	2	\$ 143	5	\$ 357	1	\$ 71	\$ 5,714
25	FEWSASA31	FEWSASA31-JXM005	TeraSPEED® SC APC to SC APC, Fiber Patch Cord, 3.0 mm Simplex, Riser	\$ 24.97	22	\$ 549	90	\$ 2,247	96	\$ 2,397	244	\$ 6,093	456	\$ 11,386	32	\$ 799	52	\$ 1,298	40	\$ 999	30	\$ 749	106	\$ 2,647	2	\$ 50	\$ 29,215
26	FEWSASA31	FEWSASA31-MXM015	TeraSPEED® SC APC to SC APC, Fiber Patch Cord, 3.0 mm Simplex, Riser	\$ 32.86	25	\$ 822	169	\$ 5,553	104	\$ 3,417	293	\$ 9,628	519	\$ 17,054	39	\$ 1,282	61	\$ 2,004	50	\$ 1,643	36	\$ 1,183	121	\$ 3,976	9	\$ 296	\$ 46,858
27	FBWSAUC11	FBWSAUC11-JXM001	TeraSPEED® SC APC to Unconnectorized, Fiber Pigtail, 0.9 mm Riser - SBI	\$ 14.19	47	\$ 667	259	\$ 3,675	200	\$ 2,838	537	\$ 7,620	975	\$ 13,835	71	\$ 1,007	113	\$ 1,603	90	\$ 1,277	66	\$ 937	227	\$ 3,221	11	\$ 156	\$ 36,837
EPON Headend Equipment																											
	760168955	CS264	CS264 EPON Chassis with Basic Configuration - 2 Switch & CPU Modules - 3 Fan Modules - 2 AC Power Supply Modules	\$ 17,295.89	0	\$ -	3	\$ 51,888	1	\$ 17,296	3	\$ 51,888	3	\$ 51,888	0	\$ -	0	\$ -	0	\$ -	0	\$ -	1	\$ 17,296	0	\$ -	\$ 190,255
36	760168997	LIM-2X	Line Interface Card(2 port 10GBase-X, XFP, Up to 2 Module)	\$ 1,150.68	0	\$ -	0	\$ -	1	\$ 1,151	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	\$ 1,152
37	760169003	LIM-4X	Line Interface Card(4 port 10GBase-X, XFP, Up to 2 Module) (XFP Transceivers not included)	\$ 1,996.93	0	\$ -	6	\$ 11,742	0	\$ -	6	\$ 11,742	6	\$ 11,742	0	\$ -	0	\$ -	0	\$ -	0	\$ -	2	\$ 3,914	0	\$ -	\$ 39,139
38	760172205	Blank CS264	Blank Panel for Line Card(PIU/UU) Slot	\$ 19.78	0	\$ -	6	\$ 119	3	\$ 59	2	\$ 40	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	2	\$ 40	0	\$ -	\$ 257
39	760169011	PIM-8E	EPON Interface Service Card, 8 EPON ports per Module	\$ 3,691.12	2	\$ 7,382	18	\$ 66,440	5	\$ 18,456	22	\$ 81,205	27	\$ 99,660	2	\$ 7,382	3	\$ 11,073	3	\$ 11,073	3	\$ 11,073	6	\$ 22,147	1	\$ 3,691	\$ 339,583
40			EPON SFP Transceiver Module (8 modules per one PIU-8E)Extended Range 30km	\$ 188.34	2	\$ 377	115	\$ 21,659	8	\$ 1,507	101	\$ 19,022	33	\$ 6,215	8	\$ 1,507	11	\$ 2,072	11	\$ 2,072	14	\$ 2,637	24	\$ 4,520	2	\$ 377	\$ 61,964
41	460140106	PIM-8E SFP	EPON SFP Transceiver Module (8 modules per one PIU-8E)	\$ 159.53	14	\$ 2,233	22	\$ 3,510	26	\$ 4,148	73	\$ 11,646	171	\$ 27,280	4	\$ 638	8	\$ 1,276	8	\$ 1,276	9	\$ 1,436	24	\$ 3,829	0	\$ -	\$ 57,271
	760169063	C-4016	CS016 EPON Complete System Set with AC power -Chassis -SCM EPON with 2x10G ports(SFP+) and 4x1G ports(SFP) Uplink Ports -Fan -2 AC PSMs	\$ 5,171.61	1	\$ 5,172	0	\$ -	0	\$ -	0	\$ -	1	\$ 5,172	1	\$ 5,172	2	\$ 10,343	2	\$ 10,343	2	\$ 10,343	0	\$ -	1	\$ 5,172	\$ 51,716
43	760172213	Blank 9016	Blank Panel for Line Card(PIU) Slot	\$ 19.78	0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	1	\$ 20	0	\$ -	1	\$ 20	1	\$ 20	1	\$ 20	0	\$ -	1	\$ 20	\$ 99
44	PON-EMS-10	PON-EMS-10	EMS for the CS264 and the C8016, up to 50 OLTs	\$ 30,100.00	share	\$ 1,309	share	\$ 3,926	share	\$ 1,309	share	\$ 3,926	share	\$ 5,235	share	\$ 1,309	share	\$ 2,617	share	\$ 2,617	share	\$ 2,617	share	\$ 1,309	share	\$ 1,309	\$ 27,483
45	PRD-00ASFPFSR-10G	PRD-00ASFPFSR-10G	Accessory, SFP+ module, 10 GE, Fiber, SR	\$ 258.00	2	\$ 516	15	\$ 3,870	3	\$ 774	18	\$ 4,644	20	\$ 5,160	1	\$ 258	4	\$ 1,032	4	\$ 1,032	2	\$ 516	5	\$ 1,290	2	\$ 516	\$ 19,608
Subscriber Access																											
107	1360411	BP-ND-2000	ENCLOSURE, MICRONODE, OUTDOOR	\$ 31.65	397	\$ 12,644	4,346	\$ 138,420	907	\$ 28,888	5,561	\$ 177,118	5,024	\$ 160,014	358	\$ 11,402	572	\$ 18,218	570	\$ 18,155	703	\$ 22,391	1,512	\$ 48,157	50	\$ 1,593	\$ 637,000
EPON ONT																											
115	760168914	CS-8004W	4GE EPON ONT (SC/APC, 20Km Fiber Optic Module) including Power Adaptor	\$ 136.74	397	\$ 54,286	4,346	\$ 594,272	907	\$ 124,023	5,561	\$ 760,411	5,024	\$ 686,982	358	\$ 48,953	572	\$ 78,215	570	\$ 77,942	703	\$ 96,128	1,512	\$ 206,751	50	\$ 6,837	\$ 2,734,800
121	760180083	BOS-FAWSAUC01-JXM001	FIBER PIGTAIL, SC/APC, 900UM, SINGLE MODE TIGHT BUFFERED FIBER, 1 METER	\$ 6.50	397	\$ 2,581	4,346	\$ 28,249	907	\$ 5,896	5,561	\$ 36,147	5,024	\$ 32,656	358	\$ 2,327	572	\$ 3,718	570	\$ 3,705	703	\$ 4,570	1,512	\$ 9,828	50	\$ 325	\$ 130,000
TOTALS						\$ 89,664		\$ 946,283		\$ 215,650		\$ 1,197,188		\$ 1,159,137		\$ 83,888		\$ 136,062		\$ 134,504		\$ 156,959		\$ 334,303		\$ 21,016	\$ 4,474,652
Cost per pass						\$ 168.54		\$ 162.42		\$ 177.49		\$ 160.59		\$ 172.13		\$ 175.13		\$ 177.63		\$ 176.05		\$ 166.62		\$ 165.01		\$ 318.42	

This price list and product availability are preliminary and subject to change. All sales not constitute an offer. A binding agreement shall be formed when CommScope accepts your purchase order by issuing a purchase order acknowledgement.

Figure 2. Kit Carson EPON BOM.



1100 CommScope Place SE
Hickory, NC 28603
Tel.: 828-324-2200
Fax: 828-328-3400

				Hub Amelia		Hub Arroyo Honda		Hub Sunshine		Hub Angel Fire		Hub Los Cordovas		Hub Ojo Galiente		Hub Eagle Nest		Hub Red River and BGP		Hub Talpa		Hub Penasco		Hub No Agua		Total Project	
Item No.	Product	Product Description	Full Description	Unit Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty	Extended Cost	Qty		Extended Cost
				Number of Passings	532		5026		1215		7455		6734		479		766		764		942		2026		66		26,805
				Number of Active Drops/Subscribers(portion)	397		4346		907		5561		5024		358		572		570		703		1512		50		20,000
Headend Equipment																											
20	760169755	BOS-SP-13002	HEADEND,SPLITTER,FBC,1X2,LGXMODULE,DUAL,SC/APC	\$ 96.75	3	\$ 290	69	\$ 6,676	9	\$ 871	87	\$ 8,417	101	\$ 9,772	6	\$ 581	10	\$ 968	10	\$ 968	12	\$ 1,161	24	\$ 2,322	1	\$ 97	\$ 32,121
21	760147454	RFE-SLC-IS-EMT-BK/4U-PNL	LGX Chassis for splitters	\$ 217.00	1	\$ 217	6	\$ 1,302	1	\$ 217	8	\$ 1,736	9	\$ 1,953	1	\$ 217	1	\$ 217	1	\$ 217	1	\$ 217	2	\$ 434	1	\$ 217	\$ 6,944
22	760147454	RFE-SLC-IS-EMT-BK/4U-PNL	Ready™ 4U Internal Sliding Shelf, black, for Patch Panel	\$ 216.85	1	\$ 217	4	\$ 867	4	\$ 867	9	\$ 1,952	17	\$ 3,686	2	\$ 434	2	\$ 434	2	\$ 434	2	\$ 434	4	\$ 867	1	\$ 217	\$ 10,404
23	760147652	PNL-BK-006-AFA-SC06-GR	TeraSPEED® Angled SC, 6 Fiber, Ganged Green Adapter, Black Panel, Single Pack, Zirconia Sleeve	\$ 36.80	9	\$ 331	43	\$ 1,582	34	\$ 1,251	90	\$ 3,312	163	\$ 5,998	13	\$ 478	22	\$ 810	16	\$ 589	11	\$ 405	38	\$ 1,398	2	\$ 74	\$ 16,229
24	760148452	KIT-SW-96-SFS-4FD	Splice Wallet Kit, 96 Single Fusion Splices (1x6x16), 4U Shelf, 4 Fiber Drums	\$ 71.43	1	\$ 71	4	\$ 286	4	\$ 286	9	\$ 643	48	\$ 3,429	2	\$ 143	2	\$ 143	2	\$ 143	2	\$ 143	5	\$ 357	1	\$ 71	\$ 5,714
25	FEWSASA31	FEWSASA31-JXM005	TeraSPEED® SC APC to SC APC, Fiber Patch Cord, 3.0 mm Simplex, Riser	\$ 24.97	22	\$ 549	90	\$ 2,247	96	\$ 2,397	244	\$ 6,093	456	\$ 11,386	32	\$ 799	52	\$ 1,298	40	\$ 999	30	\$ 749	106	\$ 2,647	2	\$ 50	\$ 29,215
26	FEWSASA31	FEWSASA31-MXM015	TeraSPEED® SC APC to SC APC, Fiber Patch Cord, 3.0 mm Simplex, Riser	\$ 32.86	25	\$ 822	169	\$ 5,553	104	\$ 3,417	293	\$ 9,628	519	\$ 17,054	39	\$ 1,282	61	\$ 2,004	50	\$ 1,643	36	\$ 1,183	121	\$ 3,976	9	\$ 296	\$ 46,858
27	FBWSAUC11	FBWSAUC11-JXM001	TeraSPEED® SC APC to Unconnectorized, Fiber Pigtail, 0.9 mm Riser - SBI	\$ 14.19	47	\$ 667	259	\$ 3,675	200	\$ 2,838	537	\$ 7,620	975	\$ 13,835	71	\$ 1,007	113	\$ 1,603	90	\$ 1,277	66	\$ 937	227	\$ 3,221	11	\$ 156	\$ 36,837
EPON Headend Equipment																											
33	760171439	C9264	C9264 GPON Chassis with Basic Configuration - 2 Switch & CPU Modules - 3 Fan Modules - 2 AC Power Supply Modules	\$ 17,295.89	0	\$ -	3	\$ 51,888	1	\$ 17,296	3	\$ 51,888	3	\$ 51,888	0	\$ -	0	\$ -	0	\$ -	0	\$ -	1	\$ 17,296	0	\$ -	\$ 190,255
36	760168997	UM-2X	Line Interface Card(2 port 10GBase-X, XFP, Up to 2 Module)	\$ 1,150.68	0	\$ -	0	\$ -	1	\$ 1,151	0	\$ -	3	\$ 3,452	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	\$ 4,607
37	760169003	UM-4X	Line Interface Card(4 port 10GBase-X, XFP, Up to 2 Module) (XFP Transceivers not included)	\$ 1,956.93	0	\$ -	6	\$ 11,742	0	\$ -	6	\$ 11,742	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	2	\$ 3,914	0	\$ -	\$ 27,397
38	760172205	Blank 9264	Blank Panel for Line Card(PRI/ILI) Slot	\$ 19.78	0	\$ -	6	\$ 119	3	\$ 59	2	\$ 40	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	2	\$ 40	0	\$ -	\$ 257
39	760171454	PIM-8G	GPON Interface Service Card, 8 GPON ports per module	\$ 3,780.99	2	\$ 7,562	18	\$ 68,058	5	\$ 18,905	22	\$ 83,182	27	\$ 102,087	2	\$ 7,562	3	\$ 11,343	3	\$ 11,343	3	\$ 11,343	6	\$ 22,686	1	\$ 3,781	\$ 347,851
40		PIM-8G SFP 30KM	GPON SFP Transceiver Module (8 modules per one PIU-8E)Extended Range 30km	\$ 188.34	2	\$ 377	115	\$ 21,659	8	\$ 1,507	101	\$ 19,022	33	\$ 6,215	8	\$ 1,507	11	\$ 2,072	11	\$ 2,072	14	\$ 2,637	24	\$ 4,520	2	\$ 377	\$ 61,964
41	460140114	PIM-8G SFP	GPON SFP Transceiver Module (up to 8 modules per one PIU-8E)	\$ 159.53	14	\$ 2,233	22	\$ 3,510	26	\$ 4,148	73	\$ 11,646	171	\$ 27,280	4	\$ 638	8	\$ 1,276	8	\$ 1,276	9	\$ 1,436	24	\$ 3,829	0	\$ -	\$ 57,271
42	760171447	C-9016	C9016 GPON Chassis equipped with: - Switching & Control Module with 2x10G ports(SFP+) and - 4x1G ports(SFP) Uplink Ports - 2 AC Power Supply (SFP, SFP+ Transceivers not included)	\$ 5,171.61	1	\$ 5,172	0	\$ -	0	\$ -	0	\$ -	2	\$ 10,343	1	\$ 5,172	2	\$ 10,343	2	\$ 10,343	2	\$ 10,343	0	\$ -	1	\$ 5,172	\$ 56,888
43	760172213	Blank 9016	Blank Panel for Line Card(PRI) Slot	\$ 19.78	0	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	0	\$ -	1	\$ 20	1	\$ 20	1	\$ 20	0	\$ -	1	\$ 20	\$ 79
44	PON-EMS-10	PON-EMS-10	EMS for the C9264 and the C9016, up to 50 OLTs	\$ 30,100.00	share	\$ 1,309	share	\$ 3,926	share	\$ 1,309	share	\$ 3,926	share	\$ 6,543	share	\$ 1,309	share	\$ 2,617	share	\$ 2,617	share	\$ 2,617	share	\$ 1,309	share	\$ 1,309	\$ 28,791
45	PRD-00ASFPSR-10G	PRD-00ASFPSR-10G	Accessory, SFP+ module, 10GE, Fiber, SR	\$ 258.00	2	\$ 516	15	\$ 3,870	3	\$ 774	18	\$ 4,644	21	\$ 5,418	1	\$ 258	4	\$ 1,032	4	\$ 1,032	2	\$ 516	5	\$ 1,290	2	\$ 516	\$ 19,866
Subscriber Access																											
107	1360411	BP NID 2000	ENCLOSURE, MICRONODE, OUTDOOR	\$ 31.85	397	\$ 12,644	4,346	\$ 138,420	907	\$ 28,888	5,561	\$ 177,118	5,024	\$ 160,014	358	\$ 11,402	672	\$ 18,218	570	\$ 18,156	703	\$ 22,391	1,512	\$ 48,157	60	\$ 1,503	\$ 637,000
EPON ONT																											
115		CS-9004A	4GE GPON ONT (SC/APC, 20Km Fiber Optic Module) including Power Adaptor	\$ 141.90	397	\$ 56,334	4,346	\$ 616,697	907	\$ 128,703	5,561	\$ 789,106	5,024	\$ 712,906	358	\$ 50,800	572	\$ 81,167	570	\$ 80,883	703	\$ 99,756	1,512	\$ 214,553	50	\$ 7,095	\$ 2,838,000
121	760180083	BOS-FAWSAUC01-JXM001	FIBER PIGTAIL, SC/APC, 900UM, SINGLE MODE TIGHT BUFFERED FIBER, 1 METER	\$ 6.50	397	\$ 2,581	4,346	\$ 28,249	907	\$ 5,896	5,561	\$ 36,147	5,024	\$ 32,656	358	\$ 2,327	572	\$ 3,718	570	\$ 3,705	703	\$ 4,570	1,512	\$ 9,828	50	\$ 325	\$ 130,000
TOTALS						\$ 91,892	\$ 970,326	\$ 220,779	\$ 1,227,859	\$ 1,185,916	\$ 85,915	\$ 139,283	\$ 137,715	\$ 160,856	\$ 342,644	\$ 21,364	\$ 4,584,550										
Cost per pass						\$ 172.73	\$ 166.55	\$ 181.71	\$ 164.70	\$ 176.11	\$ 179.36	\$ 181.83	\$ 180.25	\$ 170.76	\$ 169.12	\$ 323.69											
This price list and product availability are preliminary and subject to change. All sales and charges are subject to CommScope's standard terms and conditions. This price list does not constitute an offer. A binding agreement shall be formed when CommScope accepts your purchase order by issuing a purchase order acknowledgement.						\$ 180.25																					

Figure 3. Kit Carson GPON BOM

					Hub Amalia				Hub Arroyo Hondo				Hub Sunshine				Hub Angel Fire				Hub Los Cordovas		
Product Description	Full Description	Power	Equip RU	Spacer RU	Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU
Additional Equipment																							
C-9264	C9264 xPON Chassis with Basic Configuration - 2 Switch & CPU Modules - 3 Fan Modules - 2 AC Power Supply Modules	800	8	0	0	0	0		3	2400	24		1	800	8		3	2400	24		3	2400	24
C-9016	C9016 xPON Complete System Set with AC power -Chassis -SCM EPON with 2x10G ports(SFP+) and 4x1G ports(SFP) Uplink Ports -Fan -2 AC PSMs	160	2	0	1	160	2		0	0	0		0	0	0		0	0	0		2	320	4
RFE-SLC-IS-EMT-BK/4U-PNL	LGX Chassis	0	4	0	2	0	8		10	0	40		5	0	20		17	0	68		26	0	104
Totals						160	10			2400	64			800	28			2400	92			2720	132

					Hub Ojo Caliente				Hub Eagle Nest				Hub Red River and BCP				Hub Talpa				Hub Penasco				Hub No Agua		
Product Description	Full Description	Power	Equip RU	Spacer RU	Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU		Quantity	Power	RU
Additional Equipment																											
C-9264	C9264 xPON Chassis with Basic Configuration - 2 Switch & CPU Modules - 3 Fan Modules - 2 AC Power Supply Modules	800	8	0	0	0	0		0	0	0		0	0	0		0	0	0		1	800	8		0	0	0
C-9016	C9016 xPON Complete System Set with AC power -Chassis -SCM EPON with 2x10G ports(SFP+) and 4x1G ports(SFP) Uplink Ports -Fan -2 AC PSMs	160	2	0	1	160	2		2	320	4		2	320	4		2	320	4		0	0	0		1	160	2
RFE-SLC-IS-EMT-BK/4U-PNL	LGX Chassis	0	4	0	3	0	12		3	0	12		3	0	12		3	0	12		6	0	24		2	0	8

Figure 4 Hub Power and Rack Unit

Appendix B: xPON Equipment

Optical Line Terminal (OLT) provide the system connection between the backbone network and the optical distribution network (ODN). The OLT is the aggregation point of the EPON system, collecting information to/from a number of ONUs and sending it to/from the backbone network.

CommScope offers three options:



C9264

- Up to 64 PONs



C9016

- Up to 16 PONs



C9500

- 1G & 10G Platform
- Up to 80 PONs

EPON ONUs - Overview

CS-8001A



- 1 x 10/100/1000Base-Tx Port
- MDI/MDIX Auto-Negotiation

CS-8004A



- 4 x 10/100/1000Base-Tx Ports
- MDI/MDIX Auto-Negotiation

CS-6204W



- 4 x 10/100/1000Base-Tx Ports
- 2 x FXS ports for VoIP
- IEEE 802.11b/g/n WiFi

Appendix C: Disclaimer

This proposal does not constitute an acceptance of KCEC requirements or terms and conditions (including general and/or special terms and conditions) and will be subject to CommScope's standard terms and conditions (as attached, subject to modification by CommScope) or a contract to be mutually negotiated between the parties upon CommScope being selected by KCEC as a supplier. Any changes, additions or deletions to the products, services, quantities, revenue commitments, or term of the proposed arrangement may result in changes to the rates, discounts, credits or other terms contained in this proposal. This proposal does not constitute an acceptance of KCEC requirements or terms and conditions, notwithstanding any provisions to the contrary stated in KCEC RFP or other document. Any future contract is contingent upon the parties entering a written agreement signed by authorized representatives of both parties and which sets forth the applicable prices, terms and conditions relating to specified CommScope products and services. Such contract will be the sole agreement between the parties and will supersede all prior agreements, proposals, representations, statements or understandings, whether written or oral, between the parties relating to the subject matter of such contract. Unless otherwise specified in writing by CommScope, this proposal shall expire in 6 months.

Each party may withdraw from discussions relating to this proposal at any time without liability or further obligation to the other party. Submission of this proposal does not obligate either party to enter a contract of any kind, create legal obligations on the part of either party or obligate either party to pay expenses

incurred by the other party. This proposal contains proprietary and confidential CommScope information that: KCEC is required to maintain as confidential, KCEC may use only to evaluate a possible business arrangement with CommScope, and KCEC may not disclose to any third party without the advance written consent of CommScope, and a CommScope approved written Non-Disclosure Agreement (NDA).

KCEC acknowledges that the information included in the proposal may be subject to U.S. Export Regulations and KCEC while using the information provided KCEC will comply with (a) all applicable U.S. Export Regulations and (b) any applicable foreign law, rule, or regulation. For purposes of this section, U.S. Export Regulations include, but are not limited to, the U.S. Export Administration Act, the International Emergency Economic Powers Act, the Trading With the Enemy Act, the Arms Export Control Act, and any rules or regulations issued thereunder including, without limitation, the regulations of the U.S. Department of the Treasury's Office of Foreign Assets Control ("OFAC"), 31 C.F.R. Parts 500 to 597; the U.S. Export Administration Regulations, 15 C.F.R. Parts 730 to 774. administered by U.S. Department of Commerce's Bureau of Industry and Security ("BIS"); and the U.S. International Traffic In Arms Regulations, 22 C.F.R. Parts 120 to 130, administered by the U.S. Department of State's Directorate of Defense Trade Controls. Without limiting the generality of the foregoing, KCEC will not, transfer, directly or indirectly, any part of the information provided to North Korea, Cuba, Iran, Sudan, Syria or any other country subject to embargo or sanction by OFAC, to any national thereof, or to any person or entity on OFAC's Specially Designated Nationals List.