THE MERTON GROUP

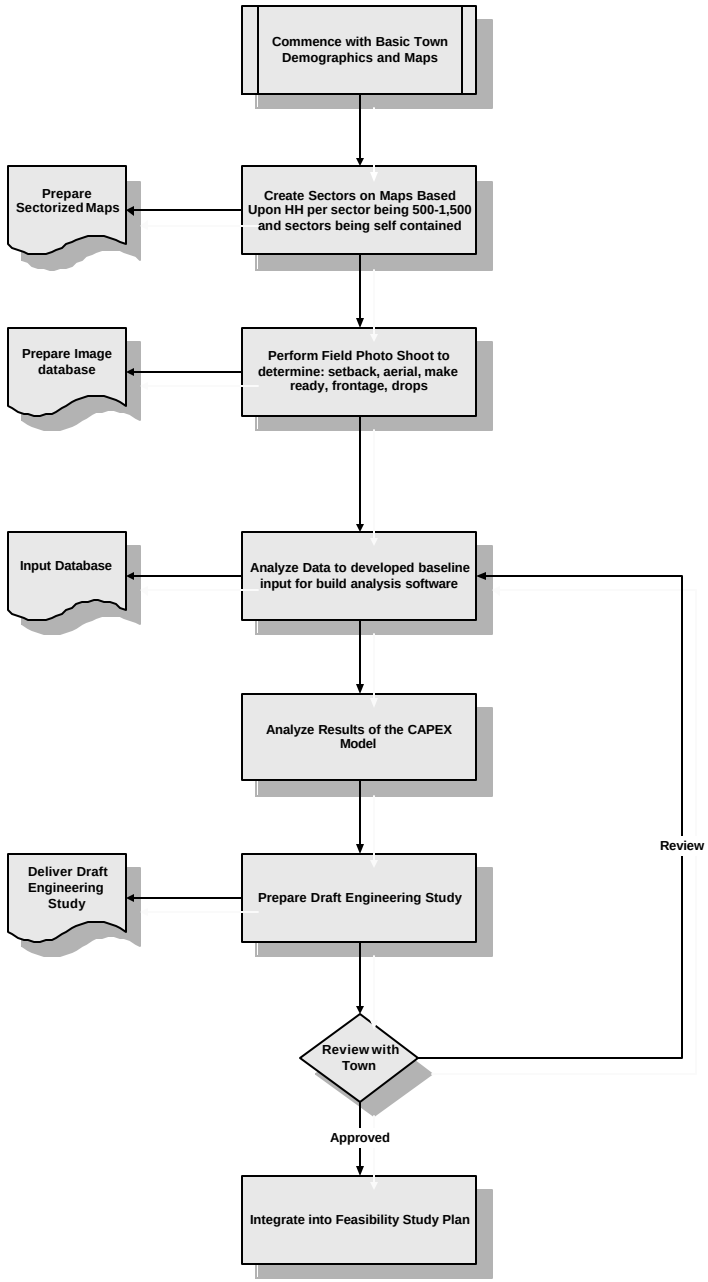
Municipal Broadband Networks

Infrastructure

Hooksett, NH

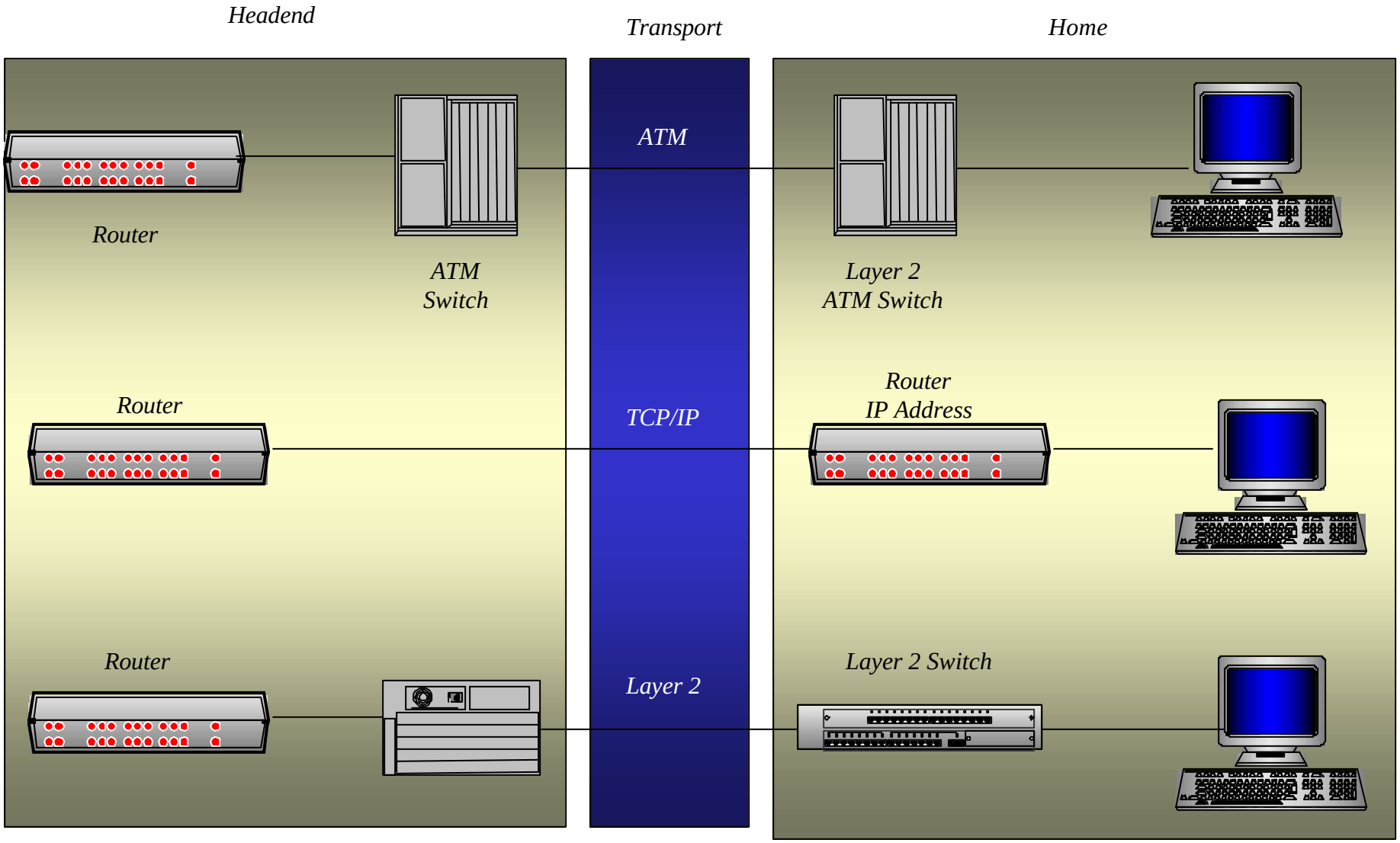
Methodology

Engineering Methodology

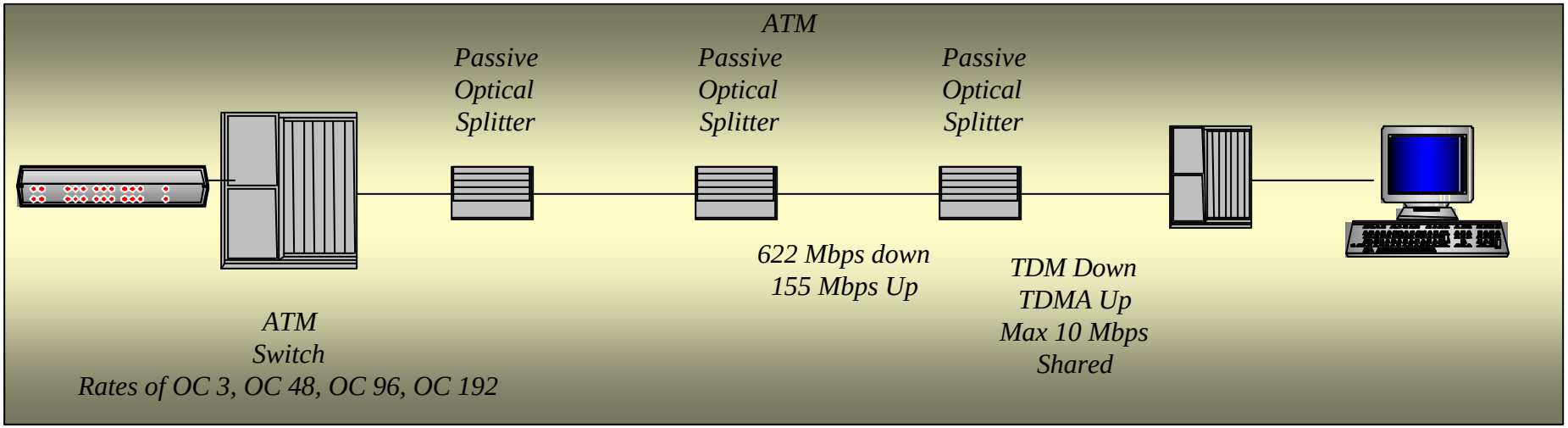


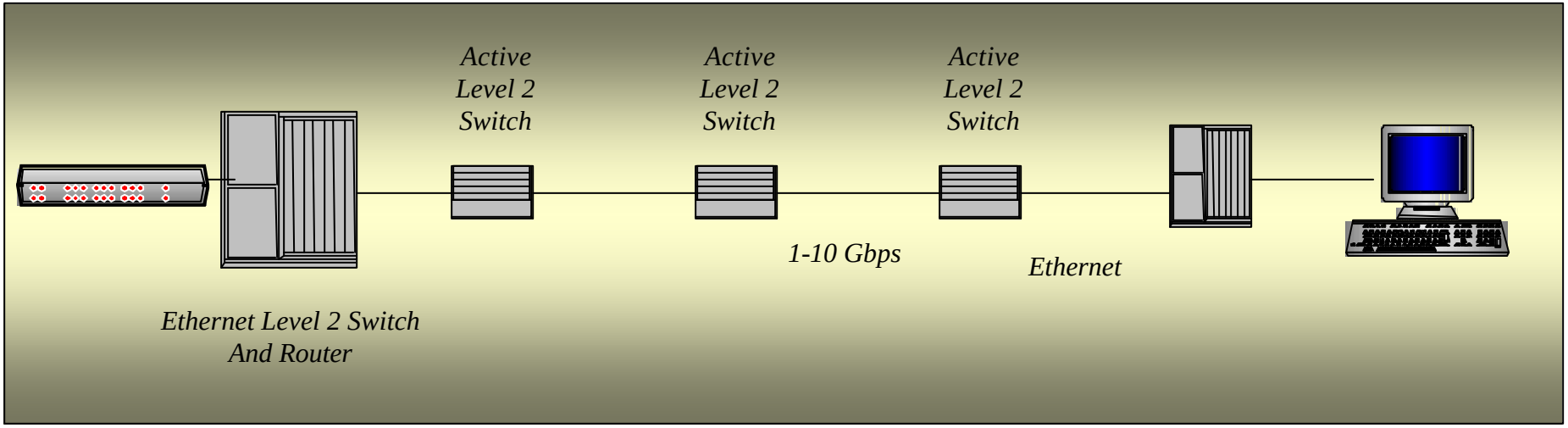
General Architecture

Ethernet Layer 2, 3 and ATM

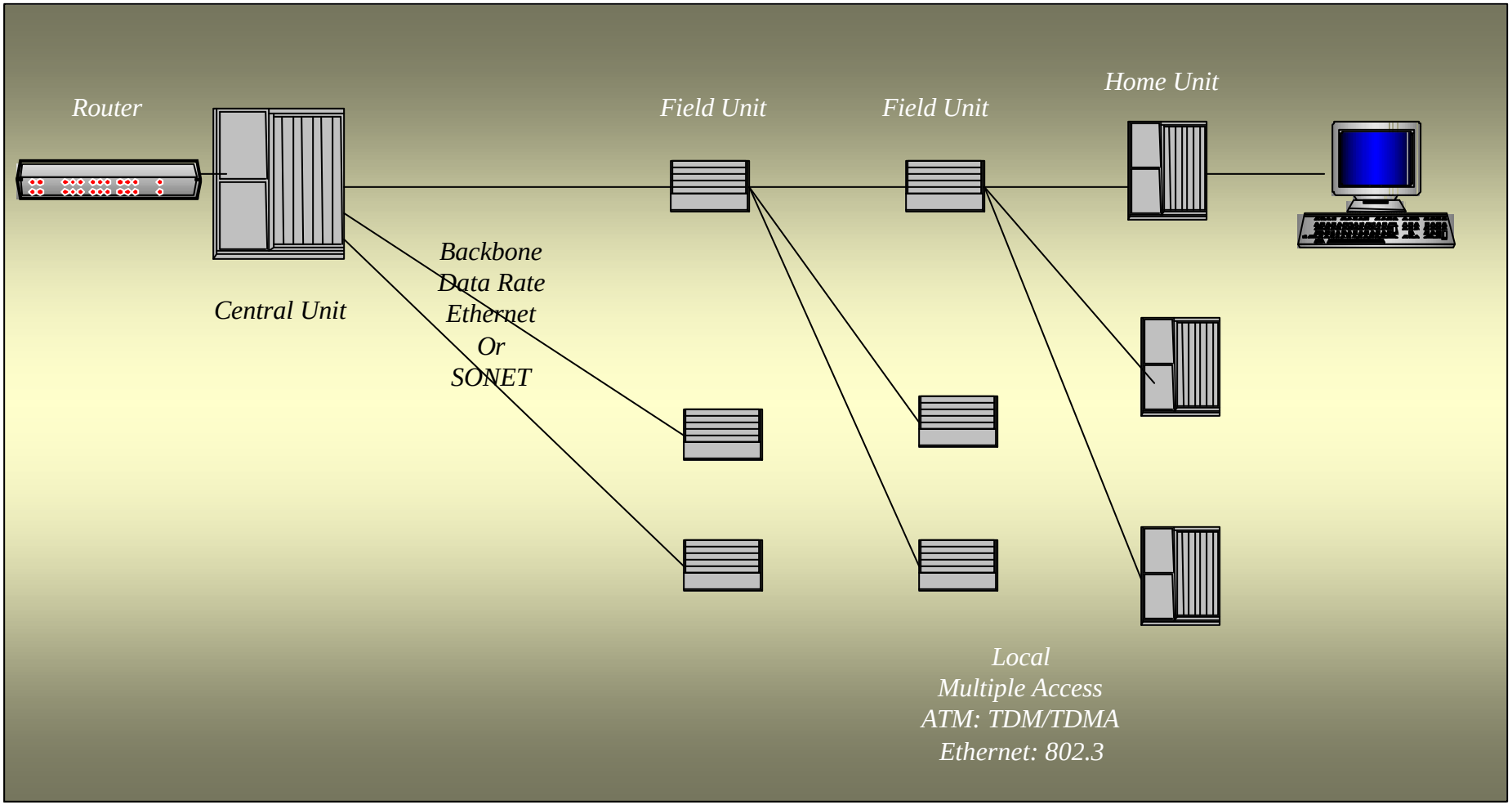


Fiber Rates ATM v GigE

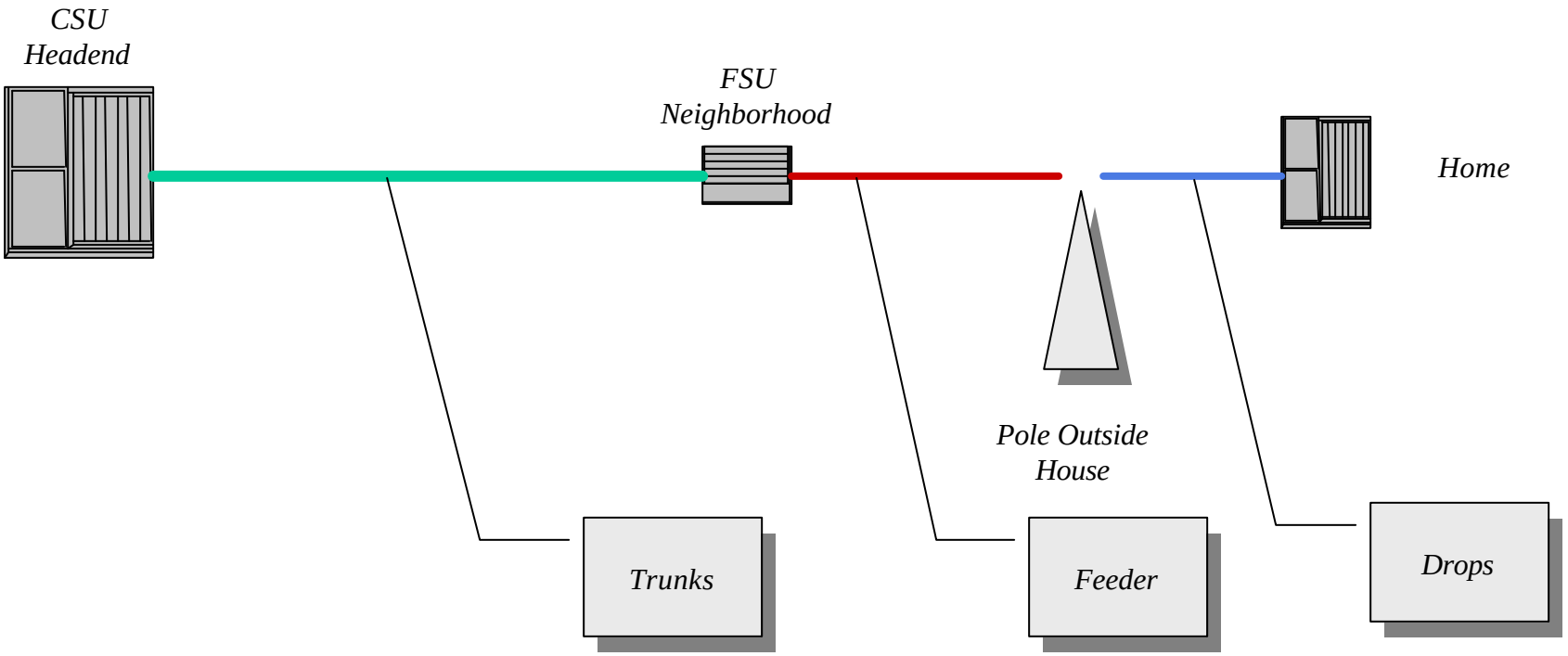




Basic Architecture

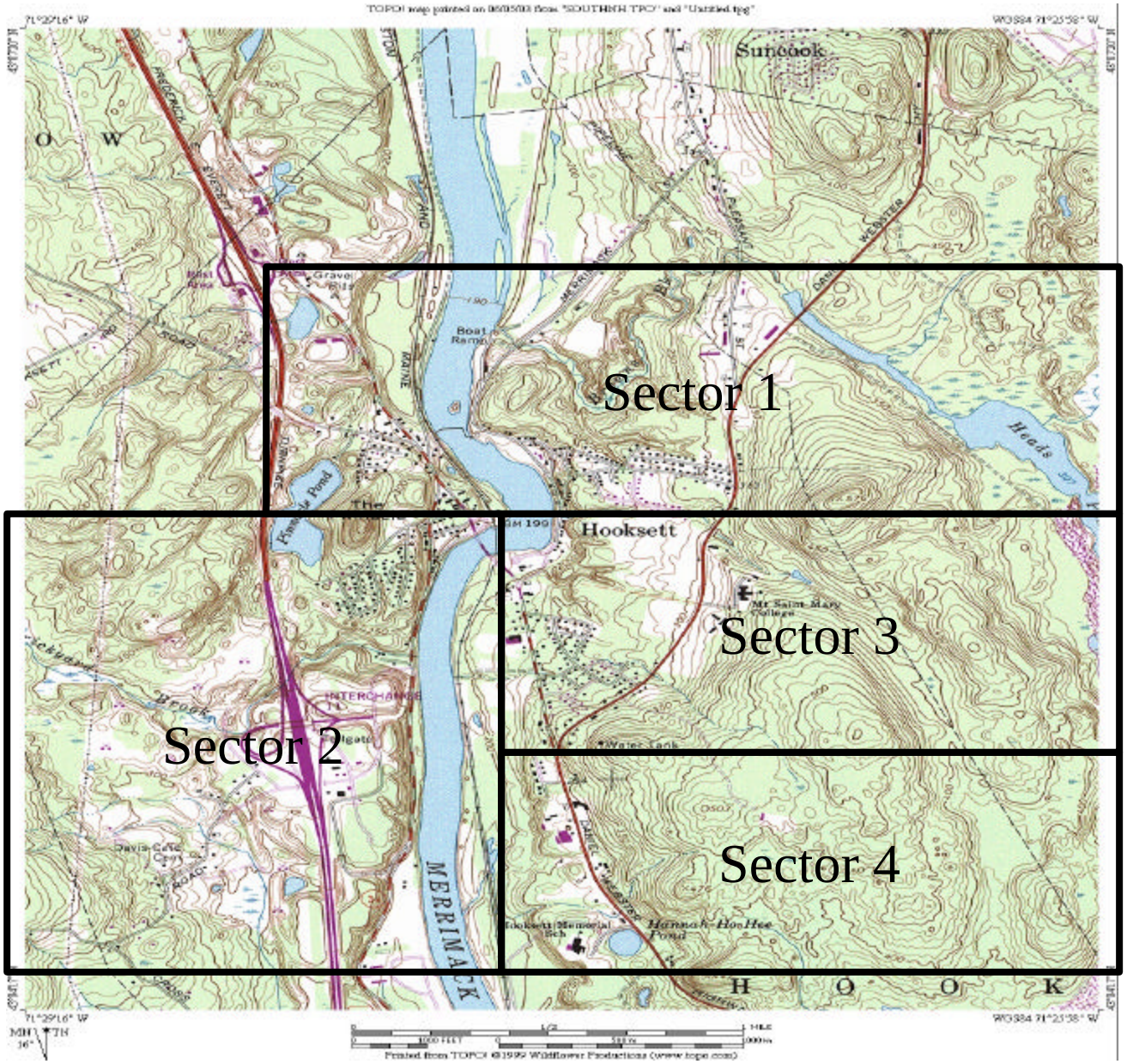


Generic Fiber Network Elements



Local Architecture

Hooksett, NH



Hooksett, NH Sectorization

Hooksett, NH

Sector	Population	Percent	Street Miles	Percent	HH/mi
1	829	20%	12	13%	70.89
2	332	8%	11	12%	30.72
3	912	22%	23	25%	40.55
4	2,074	50%	45	50%	46.08
5	-	0%	-	0%	
	4,147	100%	90	100%	

Total HH:	4,147
Total Miles Streets:	90

Hooksett, NH Set Back

Sector	Street Miles	Average Set Back	Weighted Average Setback
1	12	131	26
2	11	175	14
3	23	163	36
4	45	212	106
5	-		-
	90		
Total Average Set Back			182

Hooksett, NH Frontage

Sector	Street Miles	Average Frontage	Weighted Average Frontage	Total Frontage	Percent Frontage
1	12	189	38	156,664	16%
2	11	200	16	66,352	7%
3	23	229	50	208,878	22%
4	45	252	126	521,950	55%
5	-		-		
Total Average Frontage			230	953,844	100%

Hooksett Aerial

Sector	Street Miles	Average Aerial	Weighted Average Aerial
1	12	100%	20%
2	11	75%	6%
3	23	100%	22%
4	45	34%	17%
5	-		0%
Total Average Aerial			65%

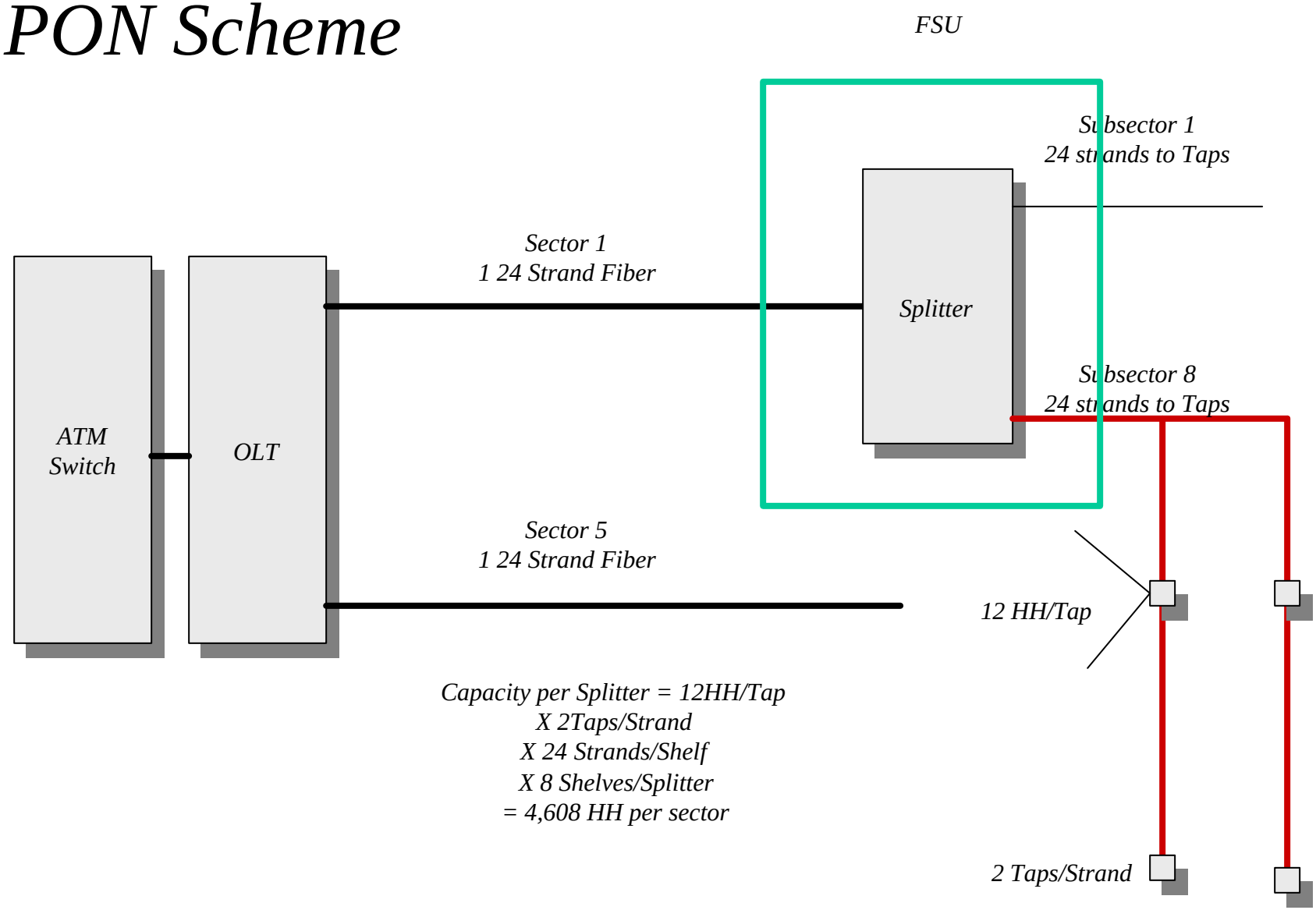
Hooksett, NH Make Ready

Sector	Street Miles	Average Make Ready	Weighted Make Ready
1	12	30%	6%
2	11	0%	0%
3	23	0%	0%
4	45	3%	2%
5	-		0%

Total Average Make Ready	8%

PON Architecture

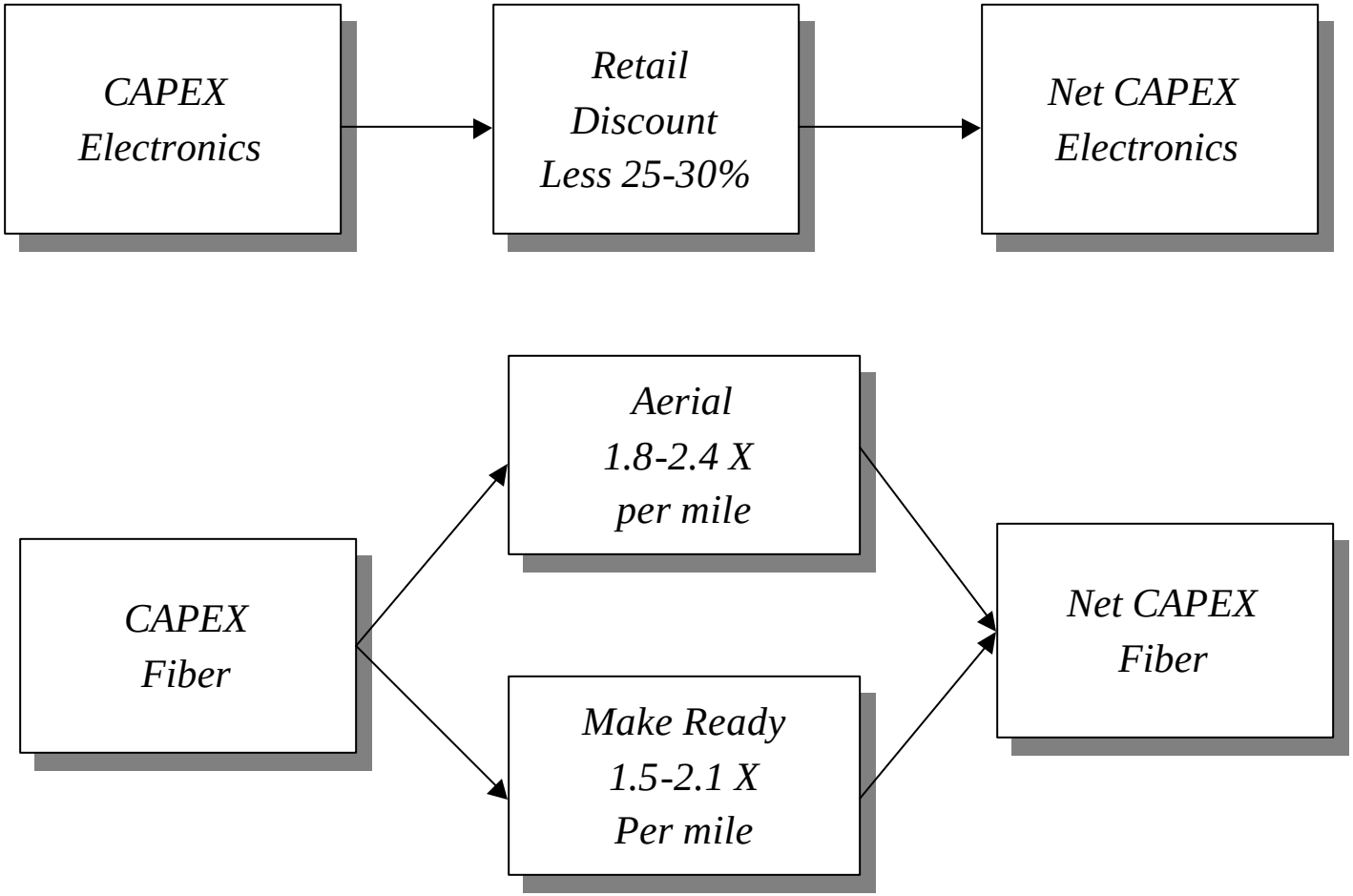
PON Scheme



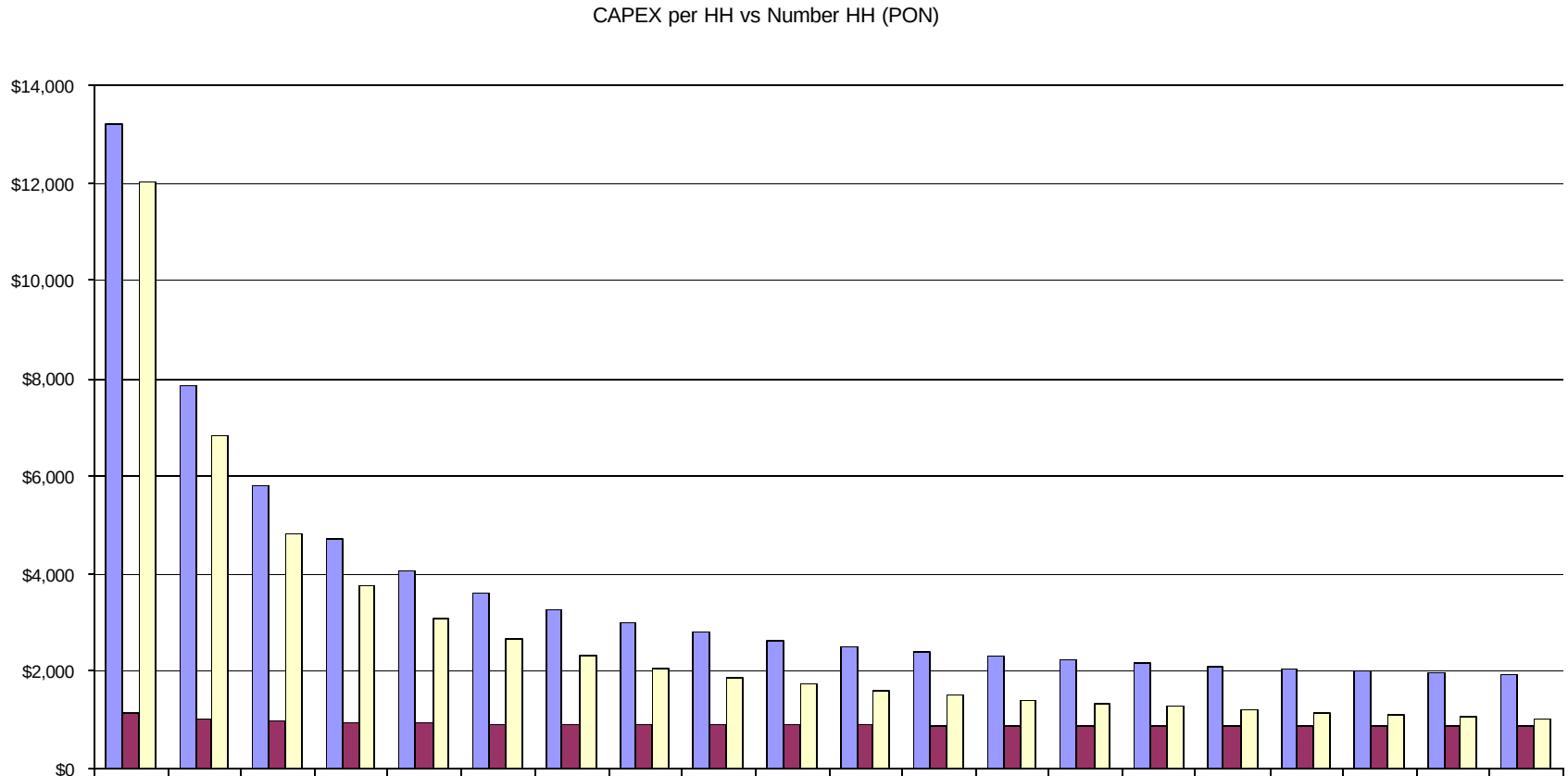
PON Cost Analysis

Unit	*Fixed*	*Variable*	*Capacity*	*Example for 1,000 HH*	*Per HH CAPEX*
EUU, End User Unit		$1,067	1 per user	$1,067,000	$1,067
Taps		$558	12 users per Tap	$46,500	$47
Splitter	$7,000	$1,380	8 spliter draws pre cabinet, 576 HH per splitter draw, maxium of 4,608 HH per Splitter cabinet. Typically 5 sectors so 5 splitters	$41,900	$42
ATM Switch	$40,000	$4,000	Max capacity 15 OC-3 Cards, incrementyal cost per OC-3 Card, user has 2 Mbps at 5% utilization is 100 Kbps per user.	$44,000	$44
OLT PON Card		$6,000	Maximum 18 Cards per shelf, capacity of 64 users per card	$93,750	$94
OLT Rack		$10,000	Maximun of 3 Shelves per rack. 3,456 HH per Rack	$10,000	$10
Number HH				1,000	
Total				$1,303,150	
Total per HH				$1,303	$1,303
Total Fiber Miles		$25,000	In town of 80 miles with 70% coverage	$1,400,000	$1,400
Drop Cost		$300		300,000	$300
Total per HH with Fiber					$3,003

Design Detail Modifications



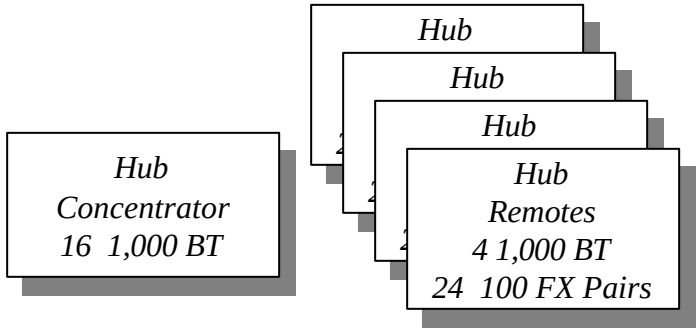
CAPEX PON

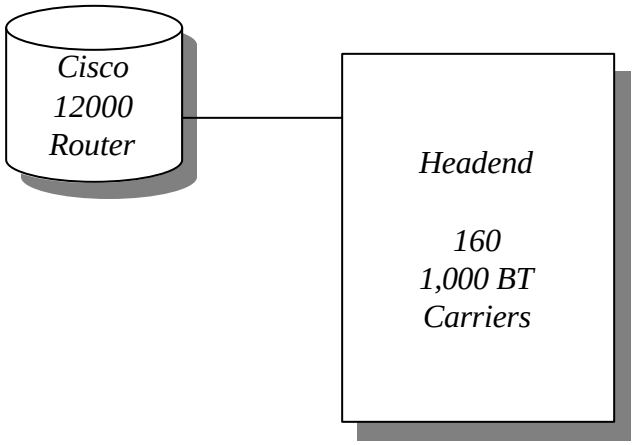


	250	450	650	850	1,050	1,250	1,450	1,650	1,850	2,050	2,250	2,450	2,650	2,850	3,050	3,250	3,450	3,650	3,850	4,050
Total CAPEX	$13,195	$7,852	$5,804	$4,720	$4,049	$3,593	$3,261	$3,011	$2,815	$2,657	$2,525	$2,417	$2,326	$2,247	$2,178	$2,116	$2,063	$2,017	$1,975	$1,936
Electronics	$1,165	$1,028	$983	$959	$944	$935	$926	$921	$916	$913	$908	$906	$905	$904	$902	$900	$899	$900	$899	$898
Fiber	$12,031	$6,824	$4,821	$3,761	$3,104	$2,658	$2,335	$2,090	$1,898	$1,744	$1,617	$1,510	$1,420	$1,343	$1,275	$1,216	$1,164	$1,117	$1,076	$1,038

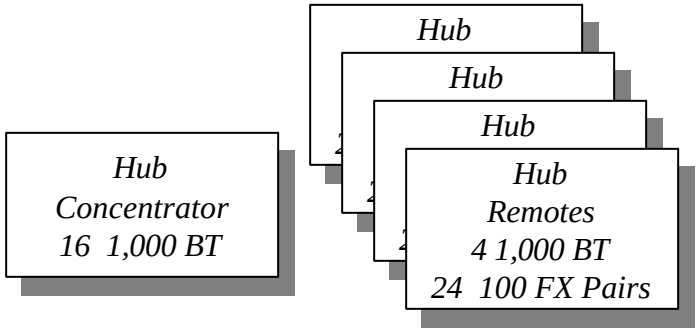
GigE Architecture

Design Issues

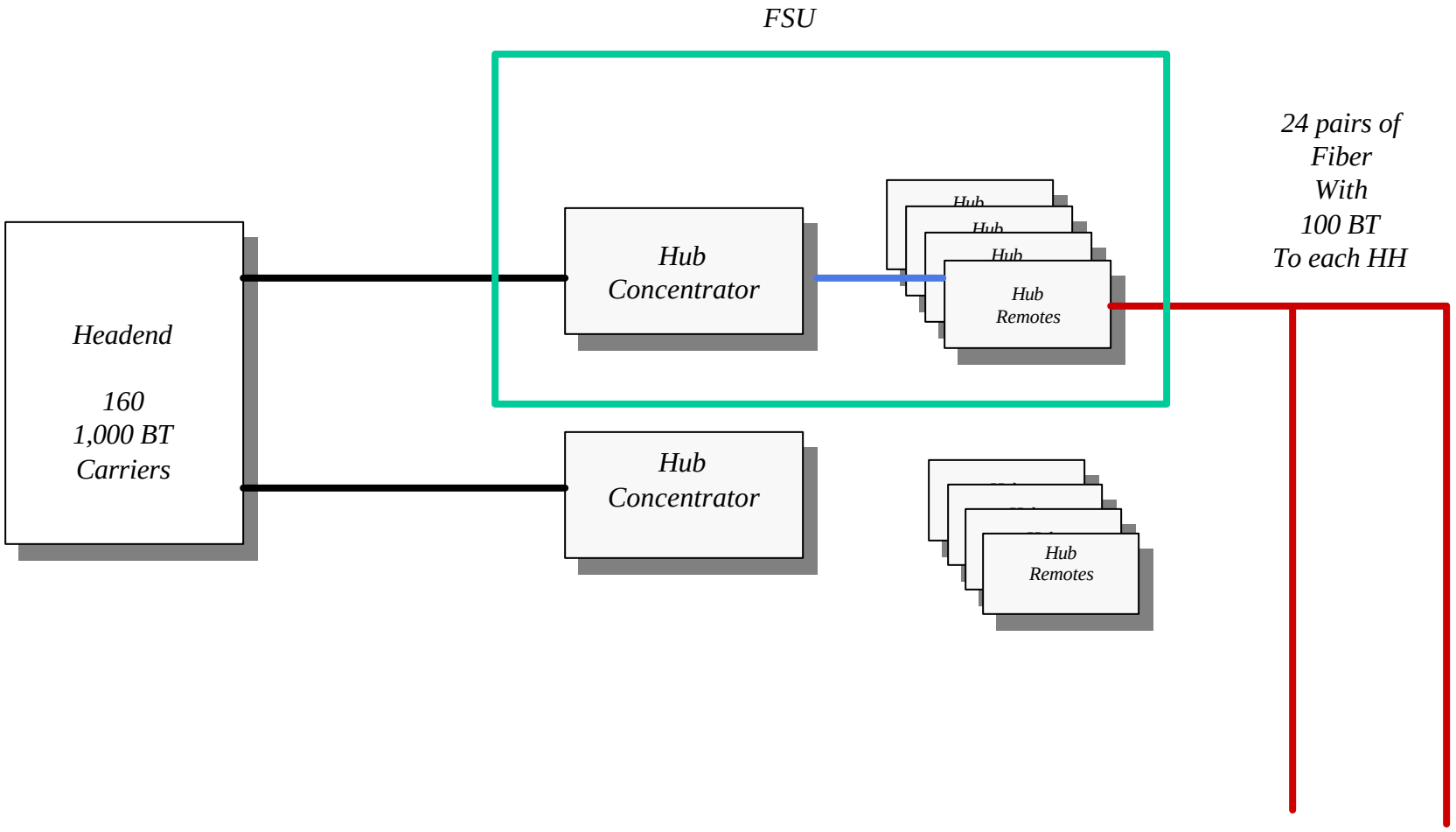




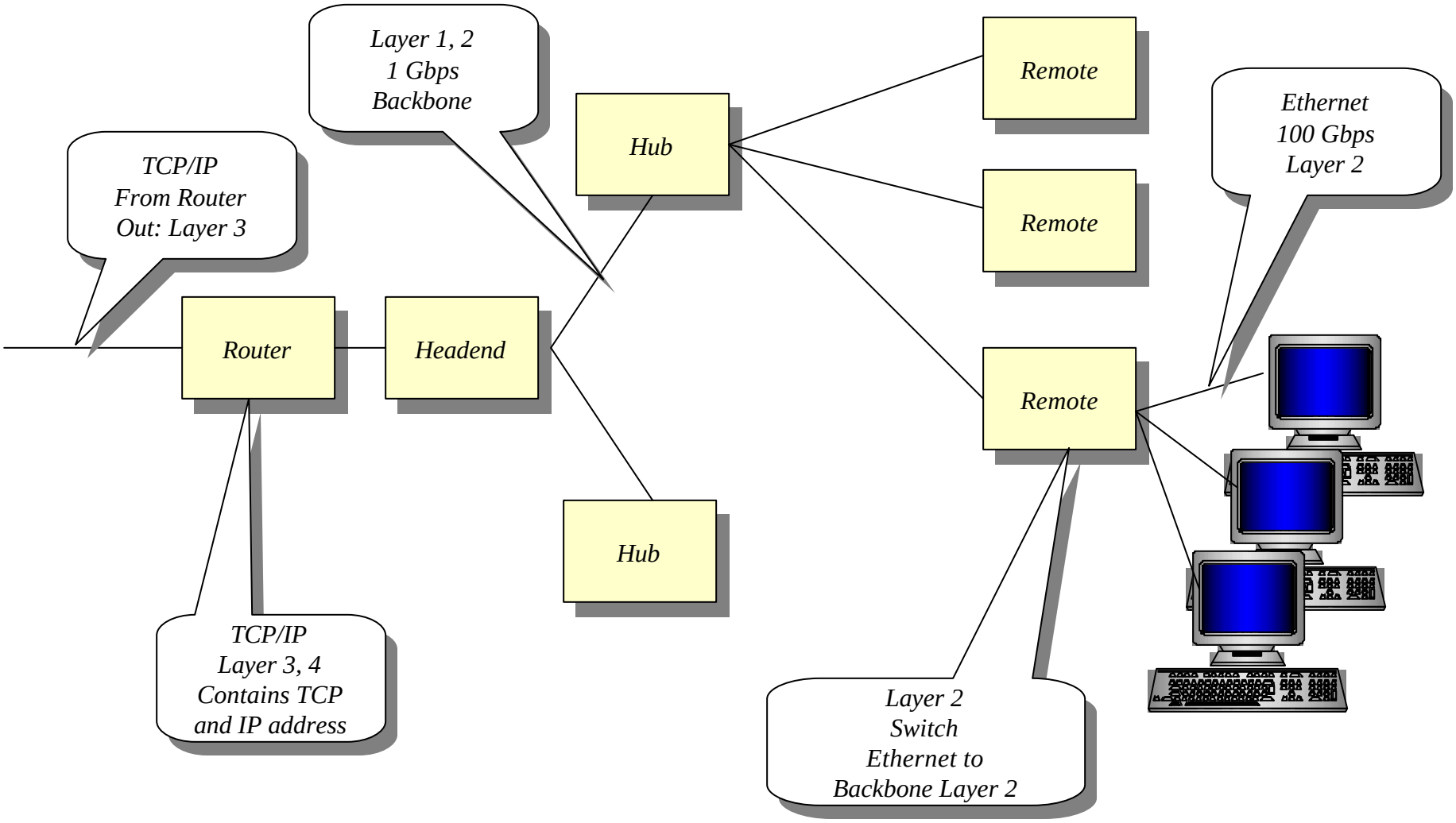
If low load per HH, then can set 15 HH 317 Per 410, and one 1 Gbps from 410 Back to 3700, with 1 Gbps on in and 1 Gbps on out.



System Elements GigE



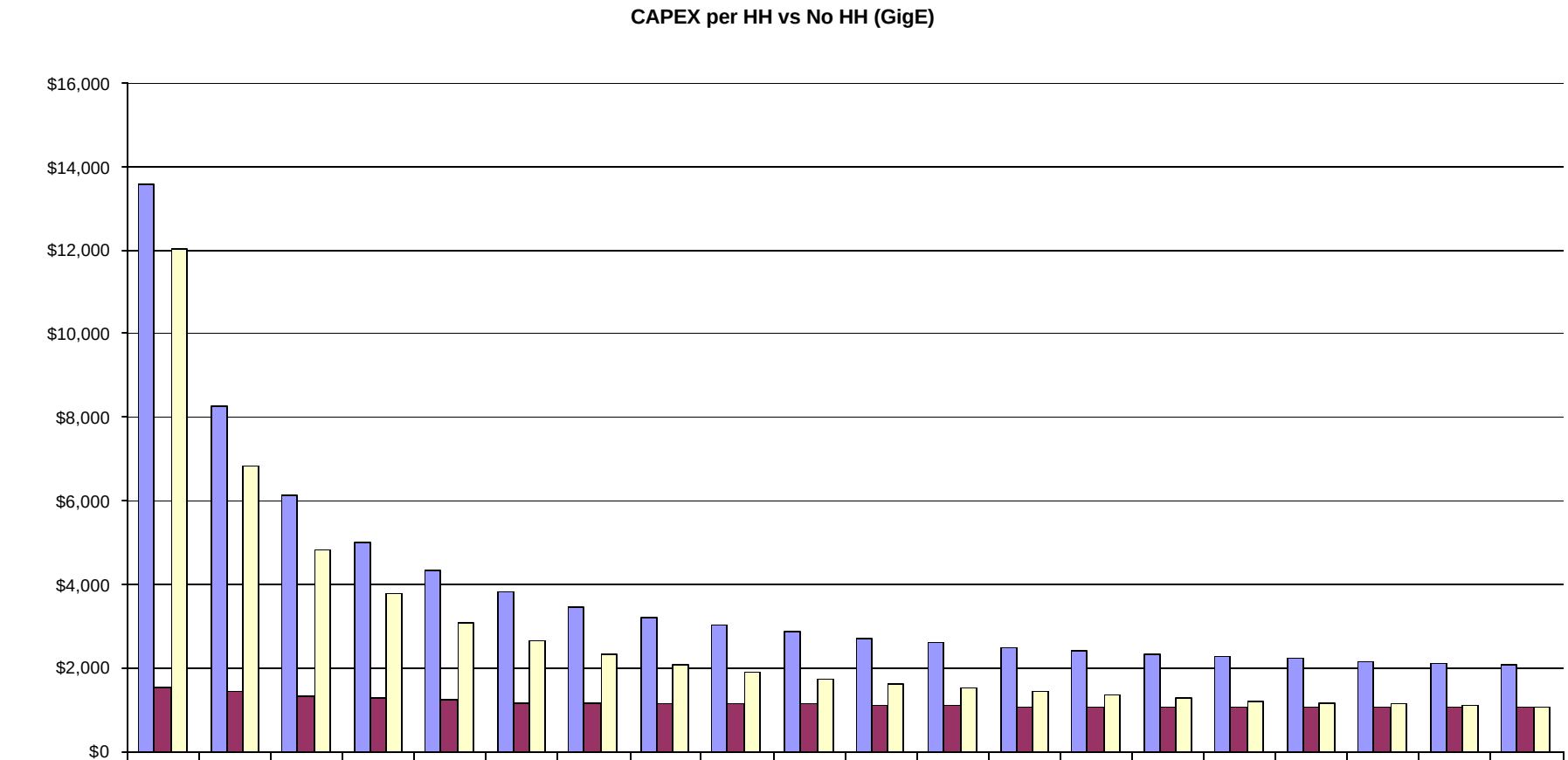
GigE Architecture



CAPEX GigE

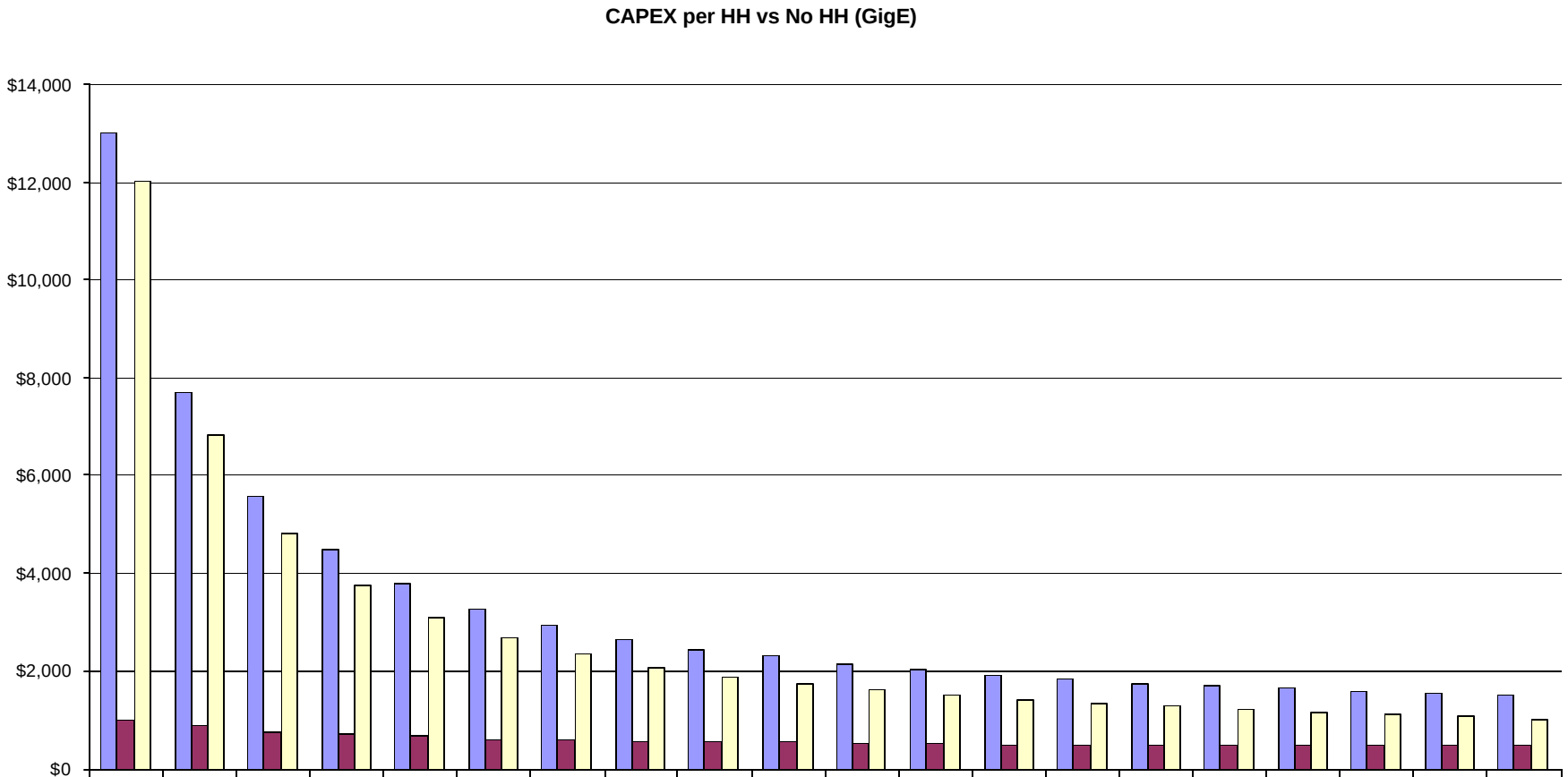
Unit	*Fixed*	*Variable*	*Capacity*	*Example for 1,000 HH*	*Per HH CAPEX*
EUU, End User Unit		$1,165	1 per user	$1,165,000	$1,165
Remote		$7,695	Supports 4 1 Gbps BT and 24 100 Mbps port pairs with 10 km range	$320,625	$321
Concentrator		$6,995	Supports 16 1 Gbps BT connections at 10 km range	$34,975	$35
Headend	$190,000	$12,000	Supports 160 1 Gbps BT connections	$202,000	$202
Number HH				1,000	
Total				$1,722,600	
Total per HH				$1,723	$1,723
Total Fiber Miles		$25,000	In town of 80 miles with 70% coverage	$1,400,000	$1,400
Drop Cost		$300		300,000	$300
Total per HH with Fiber					$3,423

CAPEX per HH GigE



	250	450	650	850	1,050	1,250	1,450	1,650	1,850	2,050	2,250	2,450	2,650	2,850	3,050	3,250	3,450	3,650	3,850	4,050
Total CAPEX	$13,569	$8,265	$6,147	$5,036	$4,348	$3,824	$3,488	$3,214	$3,020	$2,861	$2,715	$2,609	$2,481	$2,402	$2,326	$2,267	$2,214	$2,161	$2,119	$2,081
Electronics	$1,539	$1,441	$1,326	$1,275	$1,243	$1,166	$1,154	$1,124	$1,122	$1,117	$1,099	$1,099	$1,061	$1,059	$1,051	$1,050	$1,050	$1,044	$1,043	$1,043
Fiber	$12,031	$6,824	$4,821	$3,761	$3,104	$2,658	$2,335	$2,090	$1,898	$1,744	$1,617	$1,510	$1,420	$1,343	$1,275	$1,216	$1,164	$1,117	$1,076	$1,038

CAPEX GigE LITE



	250	450	650	850	1,050	1,250	1,450	1,650	1,850	2,050	2,250	2,450	2,650	2,850	3,050	3,250	3,450	3,650	3,850	4,050
Total CAPEX	$13,009	$7,705	$5,587	$4,476	$3,788	$3,264	$2,928	$2,654	$2,460	$2,301	$2,155	$2,049	$1,921	$1,842	$1,766	$1,707	$1,654	$1,601	$1,559	$1,521
Electronics	$979	$881	$766	$715	$683	$606	$594	$564	$562	$557	$539	$539	$501	$499	$491	$490	$490	$484	$483	$483
Fiber	$12,031	$6,824	$4,821	$3,761	$3,104	$2,658	$2,335	$2,090	$1,898	$1,744	$1,617	$1,510	$1,420	$1,343	$1,275	$1,216	$1,164	$1,117	$1,076	$1,038