THE MERTON GROUP

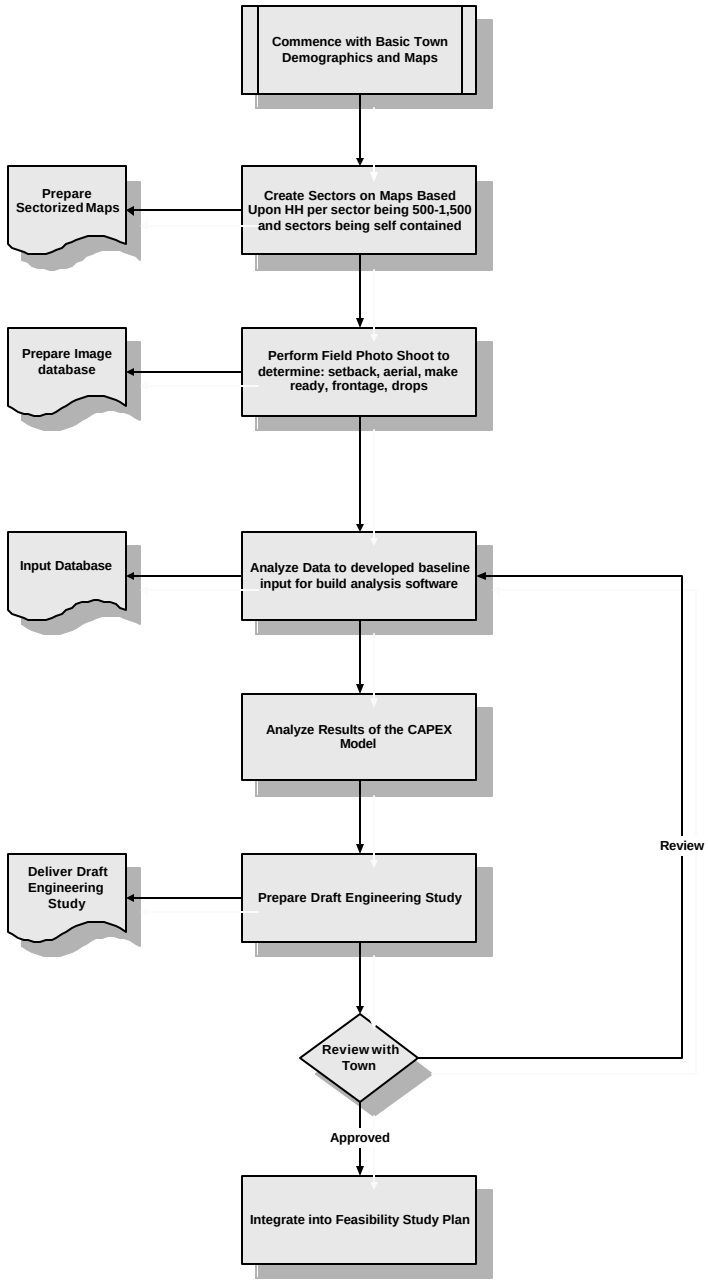
Municipal Broadband Networks

Infrastructure

Milford, NH

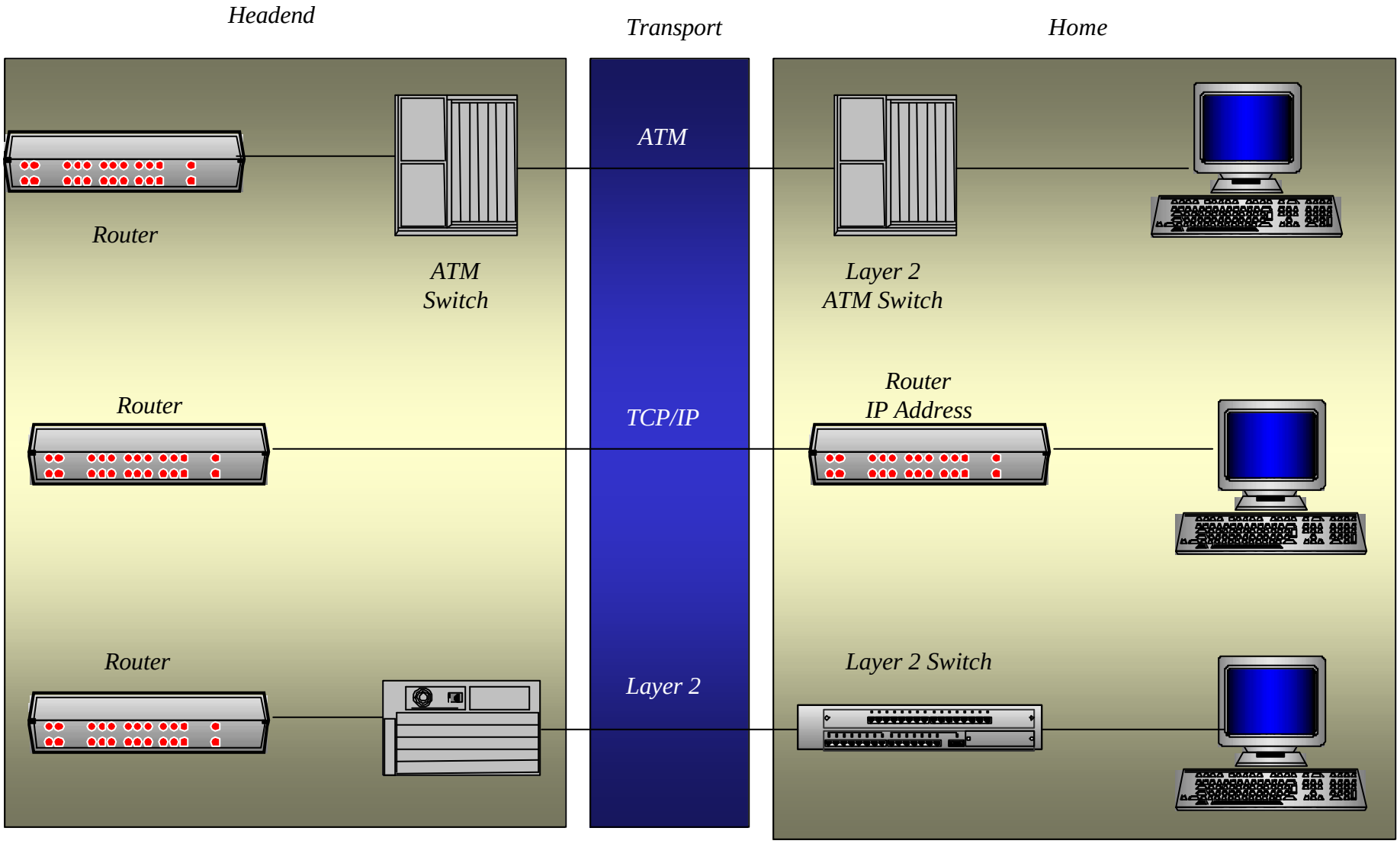
Methodology

Engineering Methodology

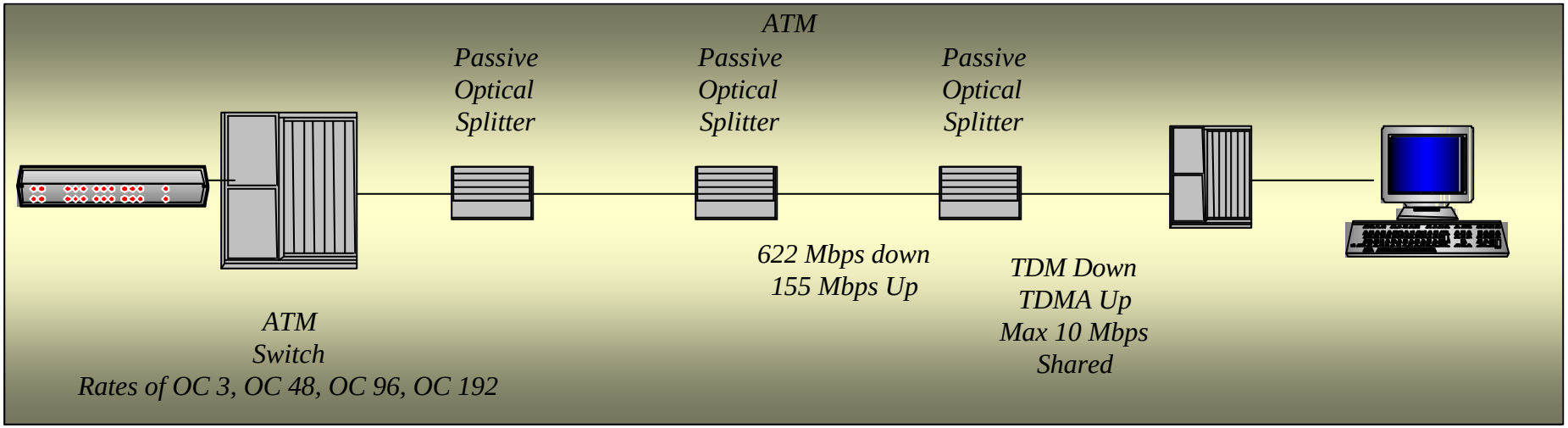


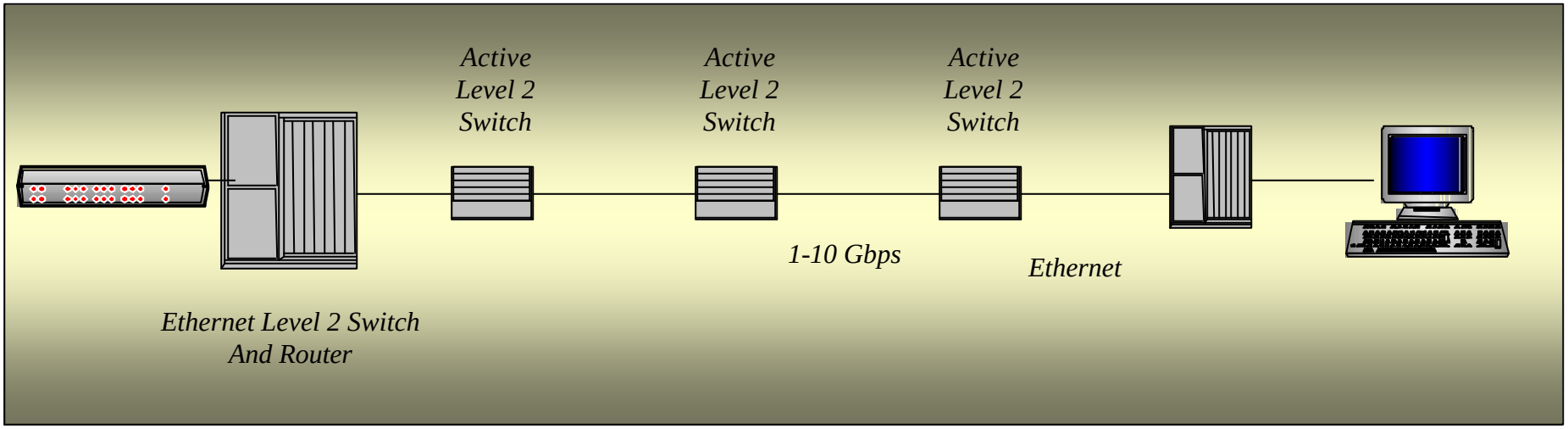
General Architecture

Ethernet Layer 2, 3 and ATM

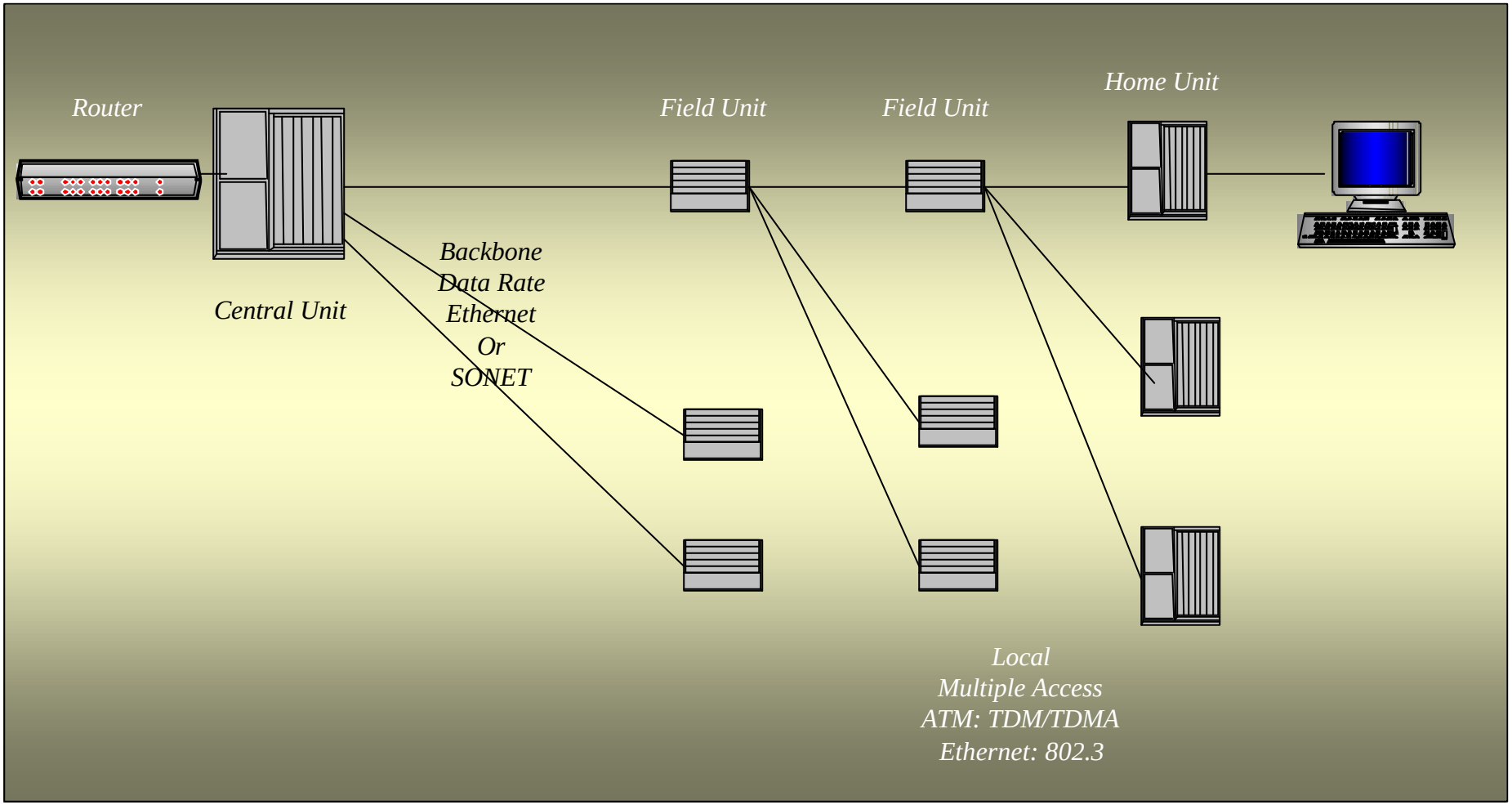


Fiber Rates ATM v GigE

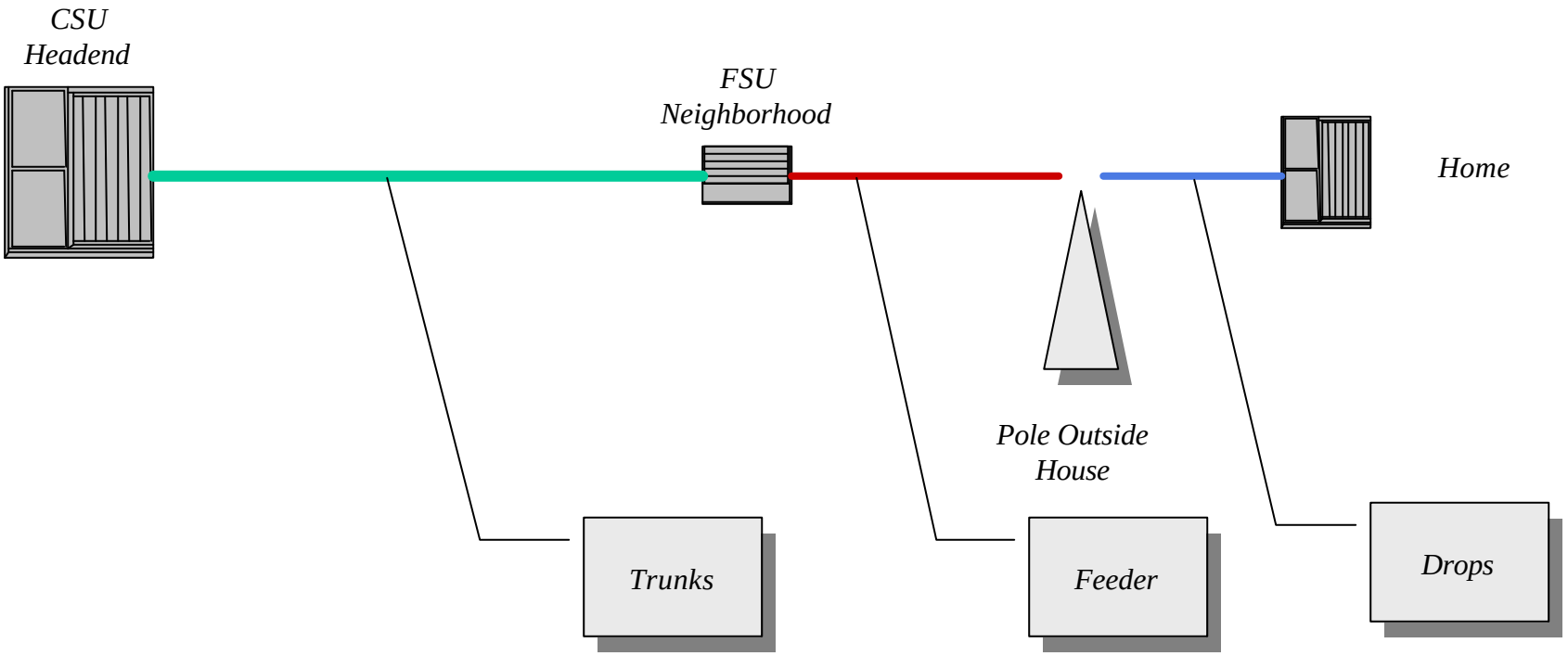




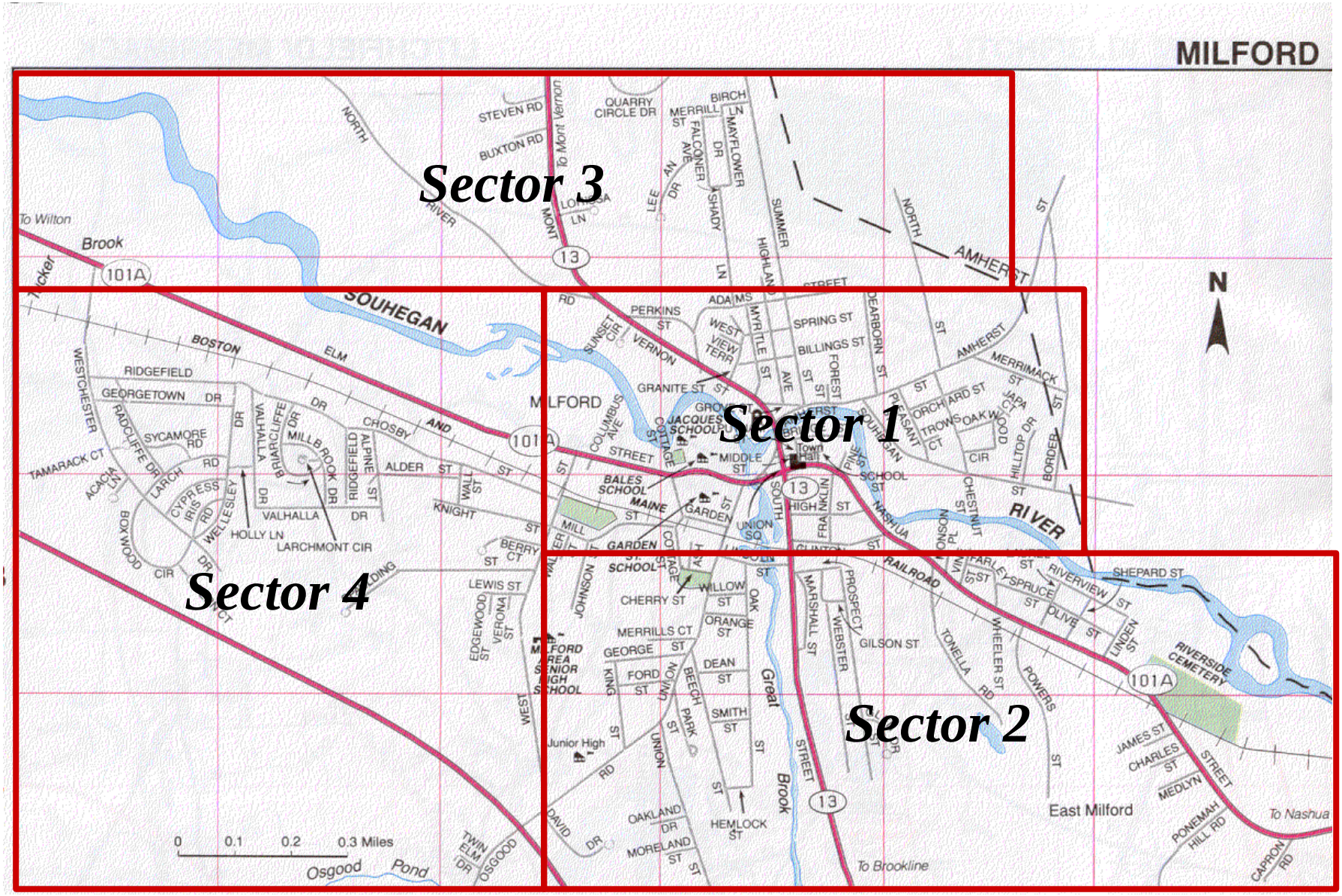
Basic Architecture



Generic Fiber Network Elements



Local Architecture



Milford, NH Sectorization

Sector	Population	Percent	Street Miles	Percent
1	2,080	40%	27	35%
2	780	15%	12	15%
3	1,560	30%	27	35%
4	780	15%	12	15%
5	-	0%	-	0%
6	-	0%	-	0%
7	-	0%	-	0%
8	-	0%	-	0%
	5,201	100%	77	100%

Total HH:	5,201
Total Miles Streets:	77

Milford, NH Set Back

Sector	Street Miles	Average Set Back	Weighted Average Setback
1	27	61	24
2	12	155	23
3	27	131	39
4	12	171	26
5	-		-
6	-		-
7	-		-
8	-	-	-
	77		
Total Average Set Back			112

Milford, NH Frontage

Sector	Street Miles	Average Frontage	Weighted Average Frontage
1	27	100	40
2	12	364	55
3	27	213	64
4	12	281	42
5	-		-
6	-		-
7	-		-
8	-	-	-

Total Average Frontage	201

Milford Aerial

Sector	Street Miles	Average Aerial	Weighted Average Aerial
1	27	100%	40%
2	12	100%	15%
3	27	53%	16%
4	12	76%	11%
5	-		0%
6	-		0%
7	-		0%
8	-	0%	0%

Total Average Aerial	82%

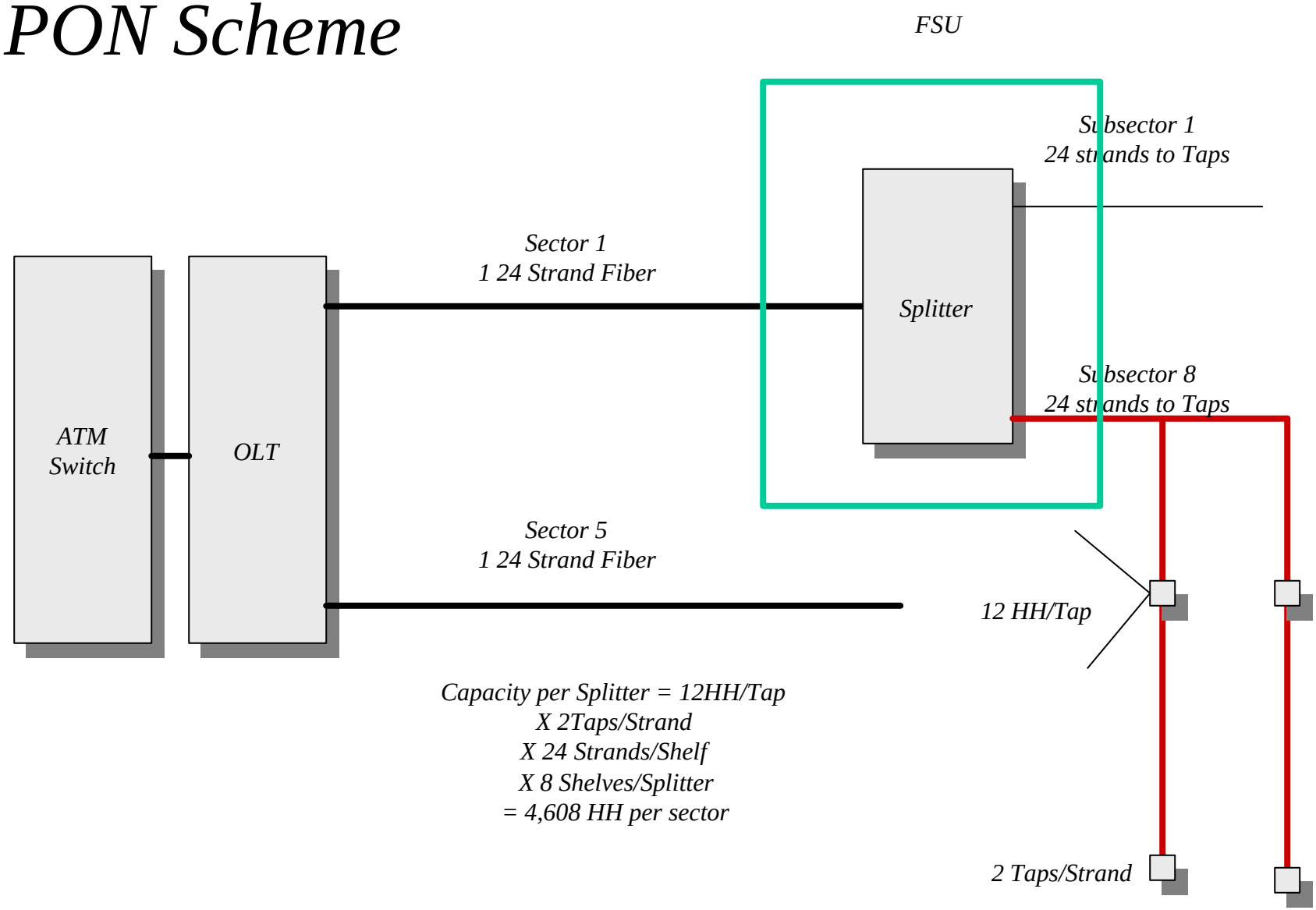
Milford, NH Make Ready

Sector	Street Miles	Average Make Ready	Weighted Make Ready
1	27	50%	20%
2	12	0%	0%
3	27	0%	0%
4	12	0%	0%
5	-		0%
6	-		0%
7	-		0%
8	-	0%	0%

Total Average Make Ready	20%

PON Architecture

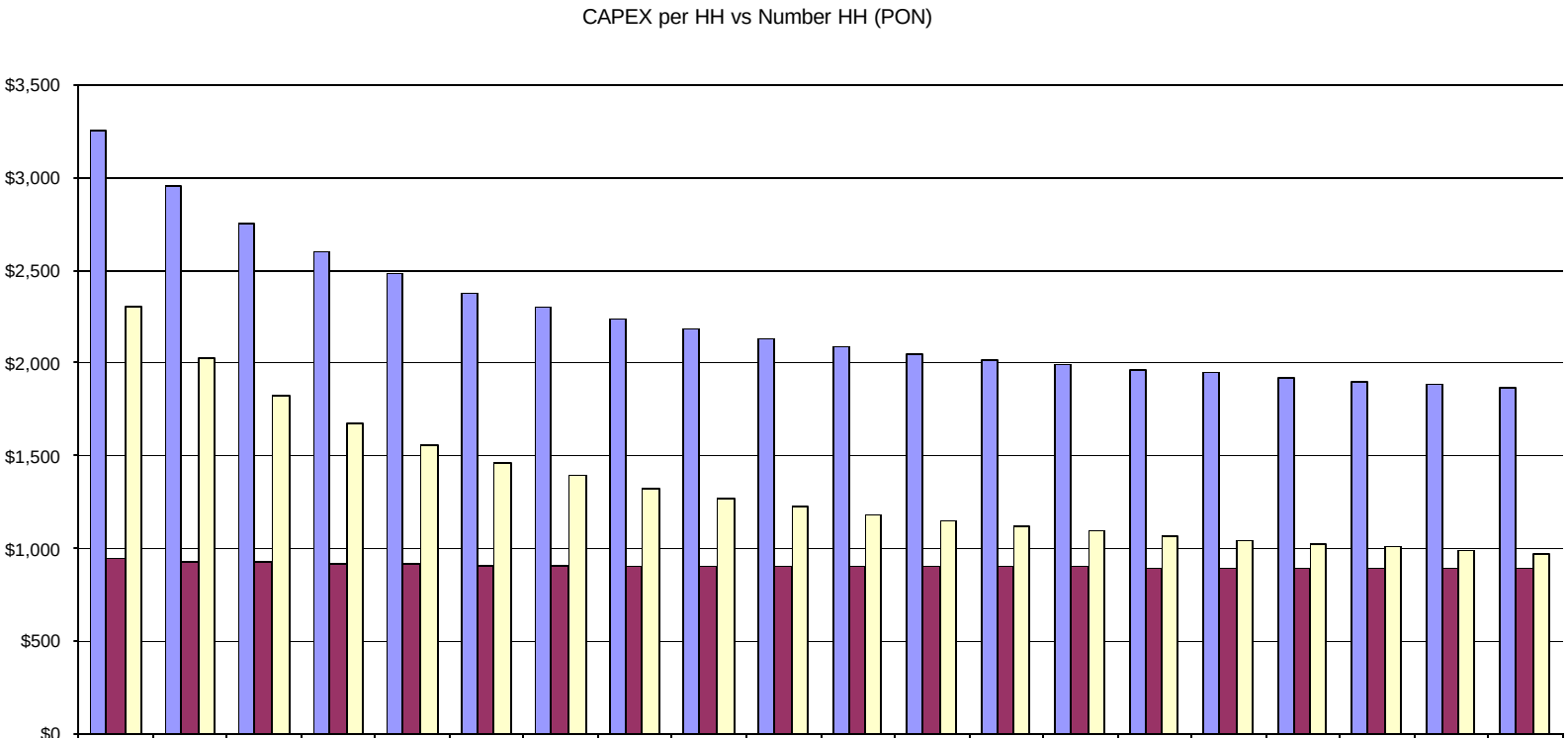
PON Scheme



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

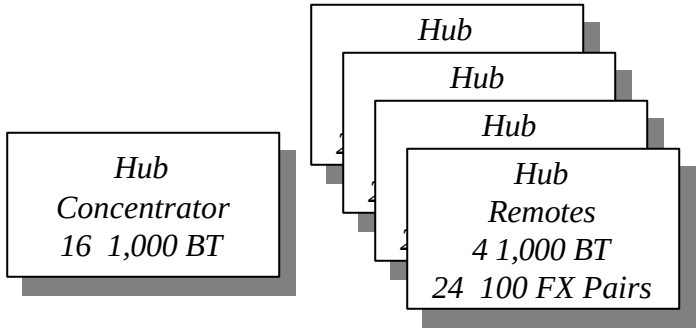
CAPEX PON

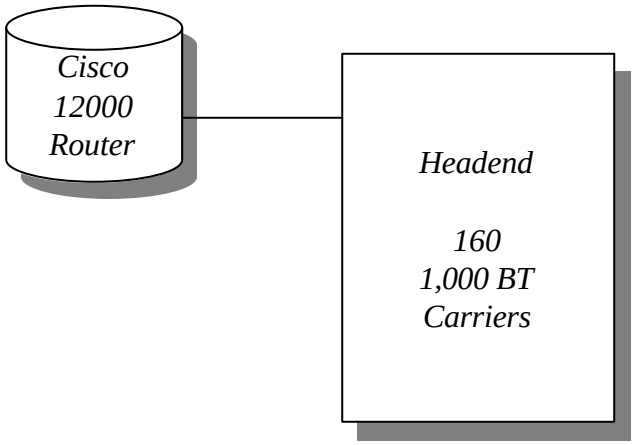


	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000	4,200	4,400	4,600	4,800
Total CAPEX	$3,254	$2,960	$2,755	$2,599	$2,478	$2,379	$2,300	$2,235	$2,180	$2,132	$2,089	$2,053	$2,021	$1,995	$1,968	$1,946	$1,925	$1,906	$1,889	$1,872
Electronics	$949	$934	$928	$923	$918	$912	$909	$907	$906	$905	$901	$901	$899	$900	$898	$898	$897	$897	$896	$894
Fiber	$2,305	$2,026	$1,826	$1,677	$1,560	$1,467	$1,391	$1,327	$1,273	$1,227	$1,187	$1,152	$1,122	$1,094	$1,070	$1,048	$1,028	$1,010	$993	$978

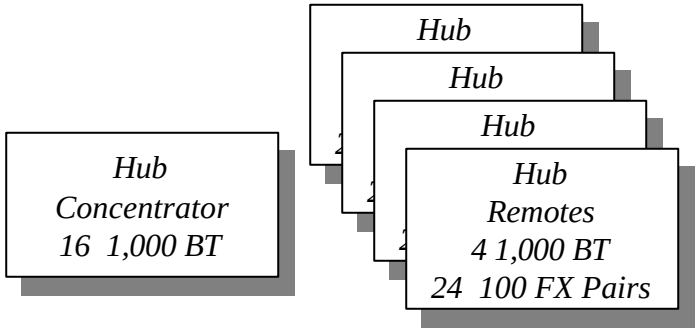
GigE Architecture

Design Issues

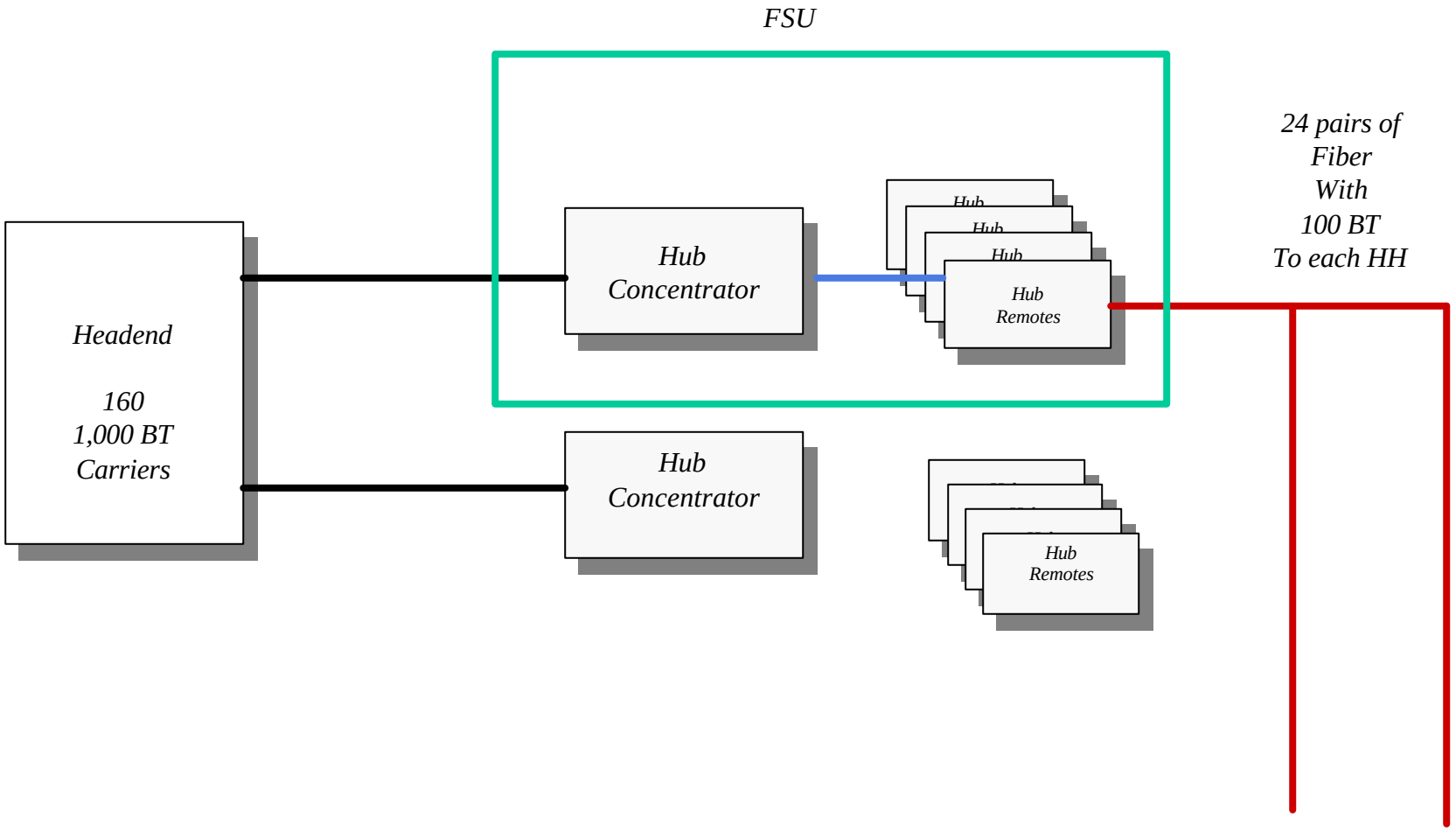




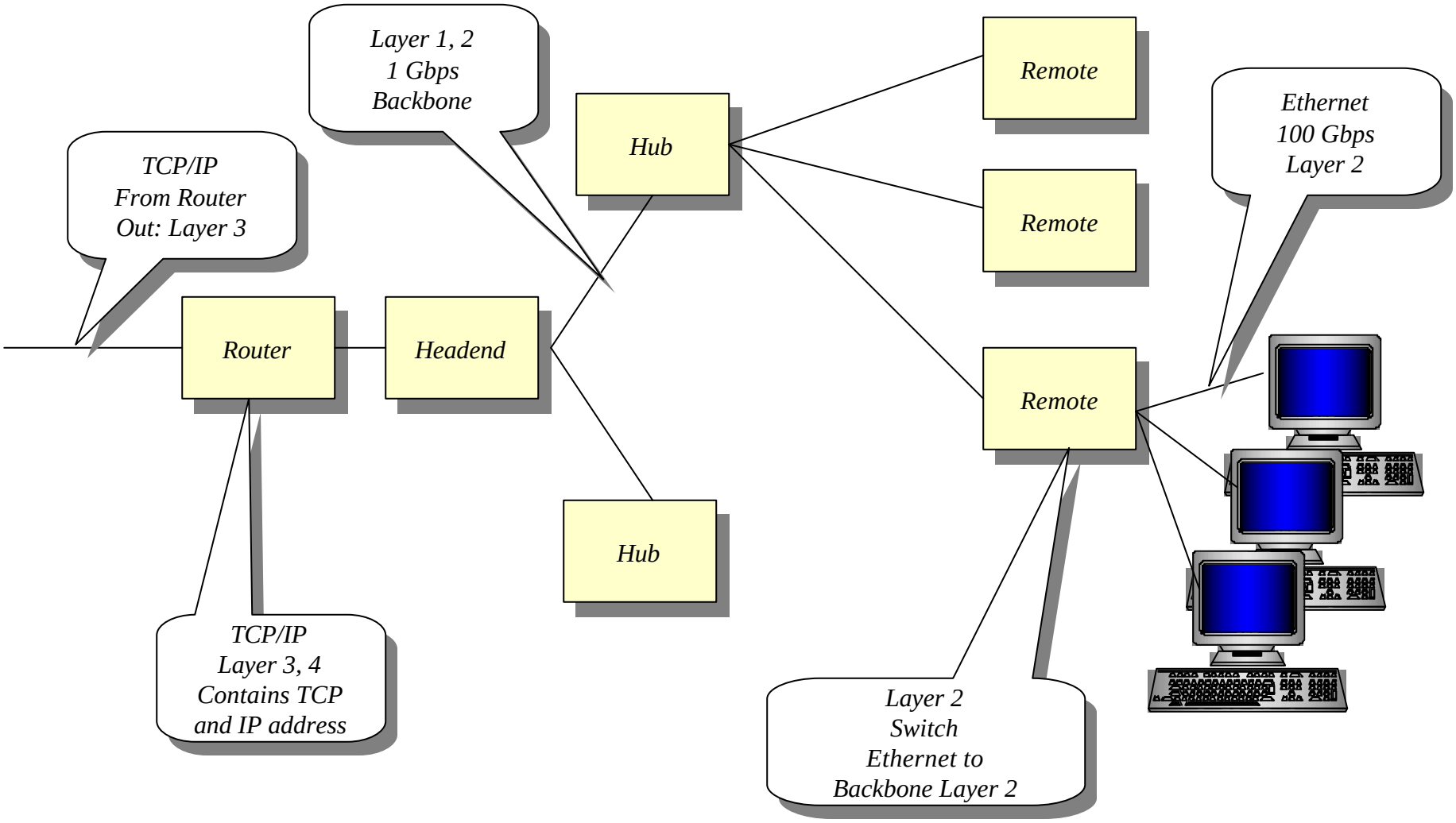
If low load per HH, then can set 15 HH 317 Per 410, and one 1 Gbps from 410 Back to 3700, with 1 Gbps on in and 1 Gbps on out.



System Elements GigE



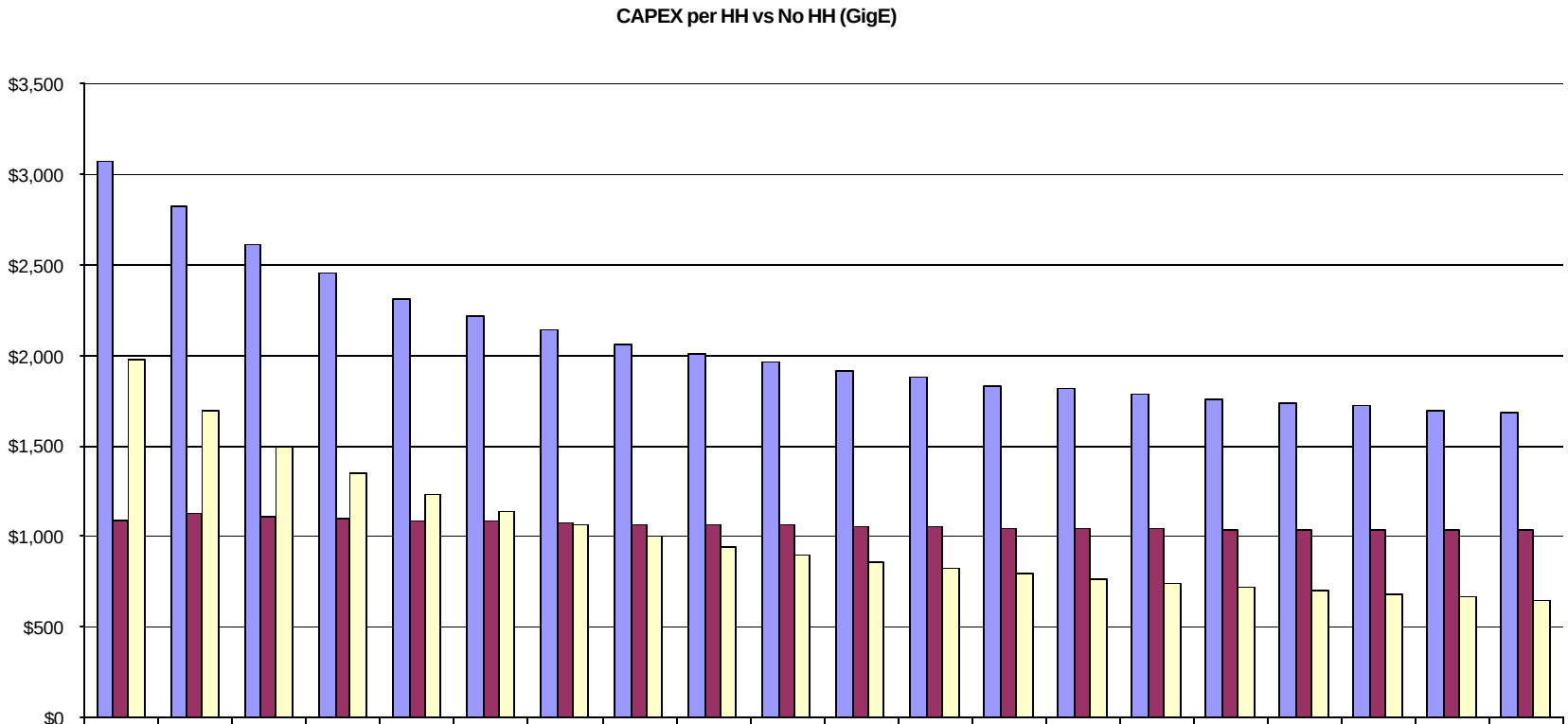
GigE Architecture



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



	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000	4,200	4,400	4,600	4,800
Total CAPEX	$3,073	$2,824	$2,612	$2,453	$2,317	$2,220	$2,140	$2,064	$2,009	$1,961	$1,913	$1,877	$1,837	$1,811	$1,786	$1,758	$1,739	$1,721	$1,699	$1,685
Electronics	$1,096	$1,126	$1,114	$1,104	$1,086	$1,081	$1,077	$1,066	$1,064	$1,062	$1,054	$1,053	$1,044	$1,045	$1,045	$1,038	$1,040	$1,040	$1,034	$1,035
Fiber	$1,977	$1,698	$1,498	$1,348	$1,232	$1,139	$1,062	$999	$945	$899	$859	$824	$793	$766	$741	$719	$699	$681	$665	$649