

SMF Link Costs over Time

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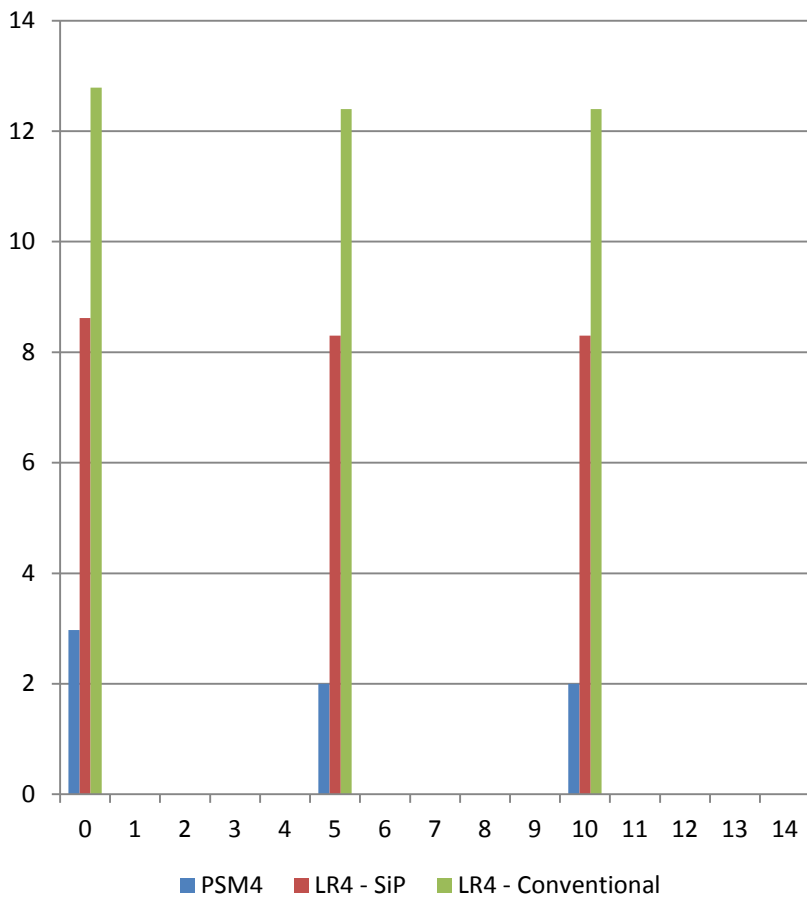
- Contemporary cost modeling assumes new fiber is used/consumed every time a module is installed.
- In reality fiber is used for much longer than modules.
 - SMF commonly deployed for 10-20 years
 - Modules may be replaced/upgraded every 3-5 years
- A better way to model link costs:
 - Calculate the cost of servicing the fiber
 - By looking at the full life cycle of the fiber, and the multitude of modules which will service it
- Hypothesis: It is better to put your value in your longest lived assets, while reducing the costs of your shortest lived assets.

SMF Link Costs over Time

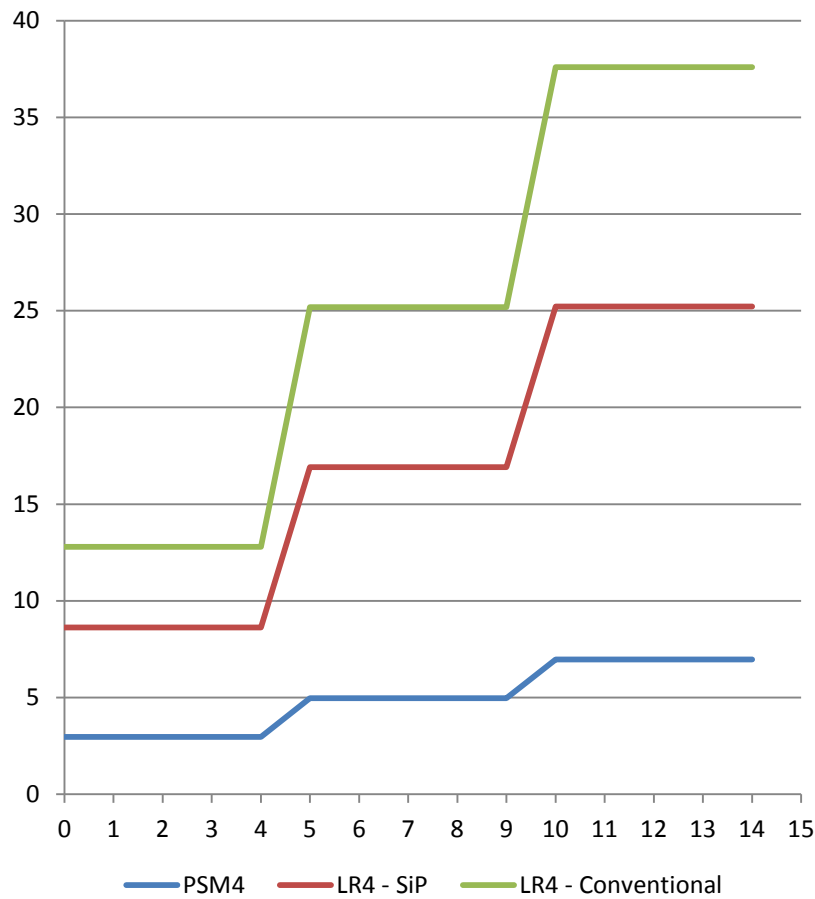
- Looks at 150m link lengths
 - Cost centroid for 500m application space
- Assumes the same module cost for each successive replacement
 - I.e., Cost/Gbps reduces commensurate with rate increases
- Assumes all solutions are at high volume production
 - May not always be the case, since volume can be a strong function of cost

Five Year Module Turnover

Costs Per Year

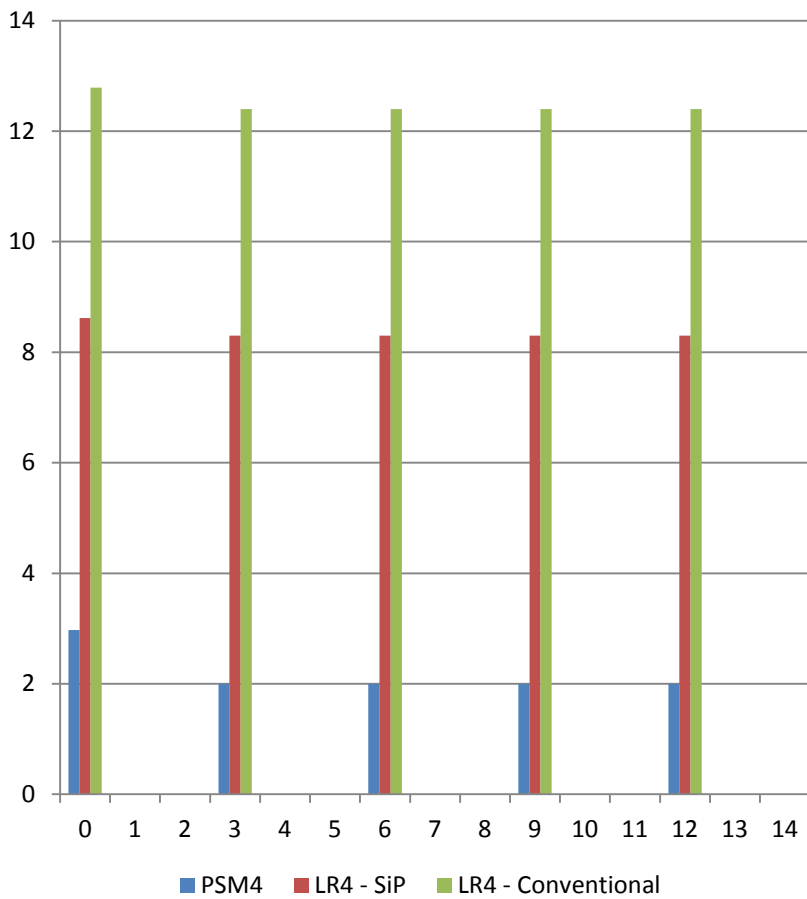


Cumulative Costs

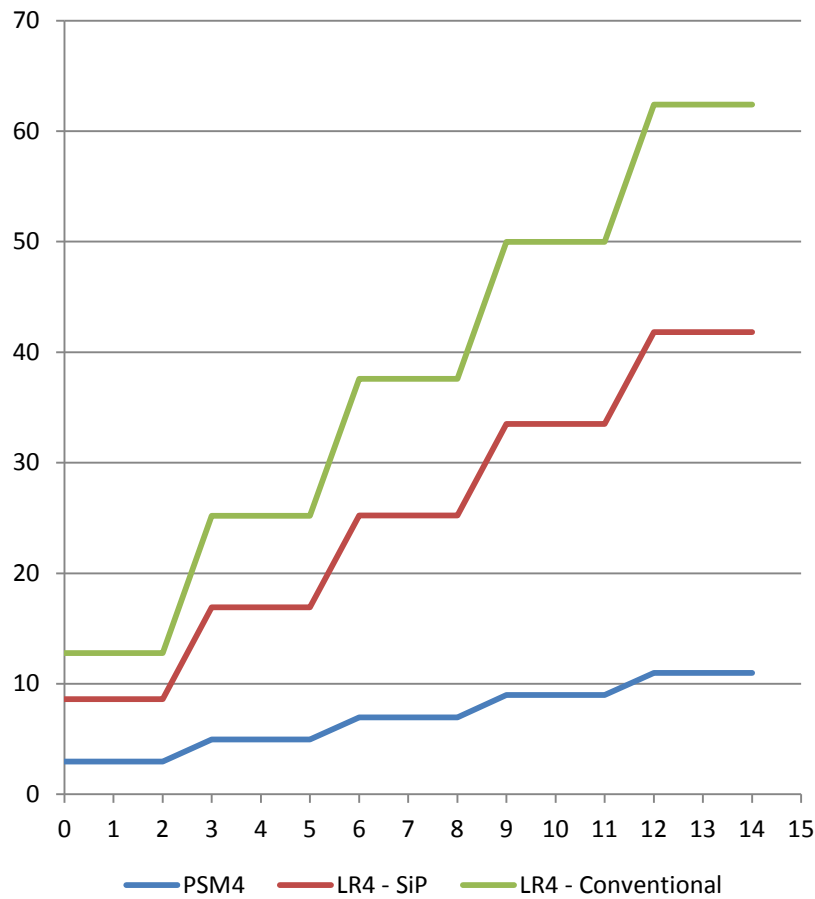


Three Year Module Turnover

Costs Per Year



Cumulative Costs



Net Present Cost

- Assuming a five year module refresh over 15 years, LR4 links cost 3.6x and 5.4x more than PSM4 links
- Assuming a three year module refresh over 15 years, LR4 links cost 3.8x and 5.6x more than PSM4 links
- To compare them in contemporary cost terms, an NPV analysis is done (using a 10% discount rate)

	5 Year Refresh	Ratio vs. PSM4	3 Year Refresh	Ratio vs. PSM4
PSM4	4.5		6.5	
LR4-SiP	15.4	3.4	23	3.6
LR4-Conventional	23	5.1	35	5.4

Comparison and Conclusions

	Contemporary Cost Model [†]	NPV with 5 year refresh rate	NPV with 3 year refresh rate
LR4-SiP/PSM4	2.9	3.4	3.6
LR4-Conventional/PSM4	4.3	5.1	5.4

- Looking at the total cost to service SMF fiber, the real costs (as measured as a ratio to PSM4) of LR4 are approximately 25% higher.
- PSM4 solutions put the most value in the datacenter infrastructure, while reducing the costs of the consumables.

† from welch_01_0513_optx.pdf

Seven and Ten Year View

10 Year Fiber Life	5 Year Refresh	Ratio vs. PSM4	3 Year Refresh	Ratio vs. PSM4
PSM4	3.8		5.9	
LR4-SiP	12.5	3.3	21.0	3.6
LR4-Conventional	18.6	4.9	31.2	5.3

7 Year Fiber Life	5 Year Refresh	Ratio vs. PSM4	3 Year Refresh	Ratio vs. PSM4
PSM4	3.8		5.1	
LR4-SiP	12.5	3.3	17.8	3.5
LR4-Conventional	18.6	4.9	26.5	5.2