SMF Link Costs over Time

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Supporters

- Tom Palkert – Luxtera
- Chris Bergey – Luxtera
- John Petrilla – Avago
- Kiyo Hiramoto – Oclaro
- Scott Sommers – Molex
- Mark Bugg – Molex
- Patrick Casher - Molex
- Tom Issenhuth – Microsoft
- Dave Warren – HP
- Kapil Shrikhande - Dell

SMF Link Costs over Time

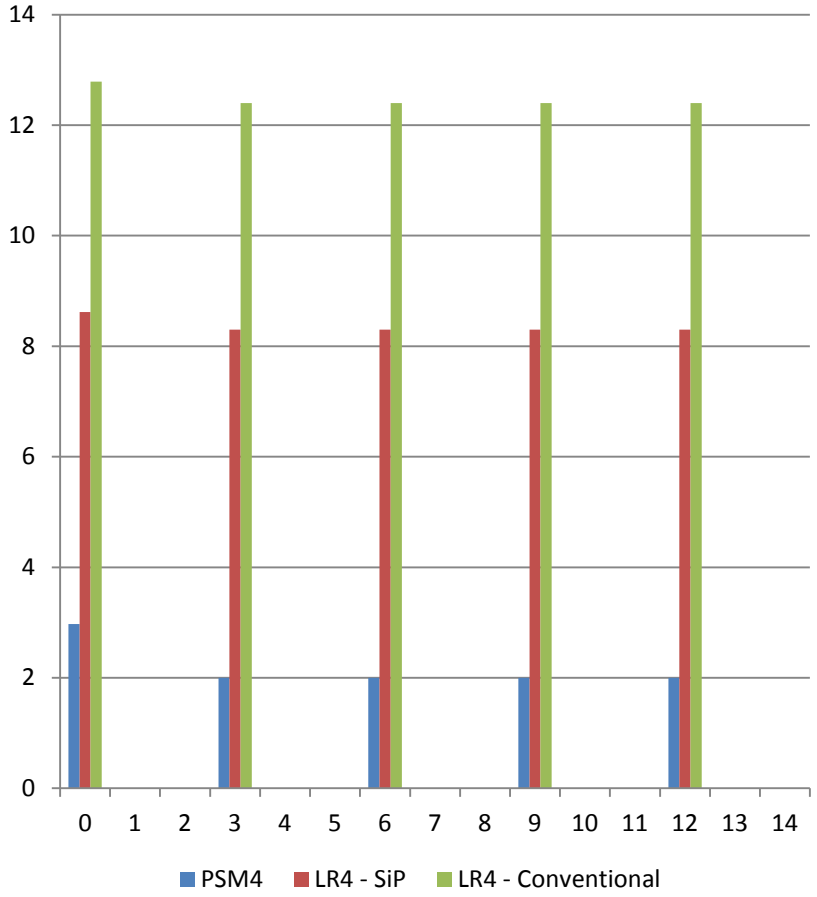
- Contemporary cost modeling assumes new fiber is used/consumed every time a module is installed.
- In reality fiber is used for much longer than modules.
  - SMF commonly deployed for 10+ years
  - Modules may be replaced/upgraded every 3-5 years
- A better way to model link costs:
  - Calculate the cost of *servicing* the fiber, using an NPV function.
    - 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

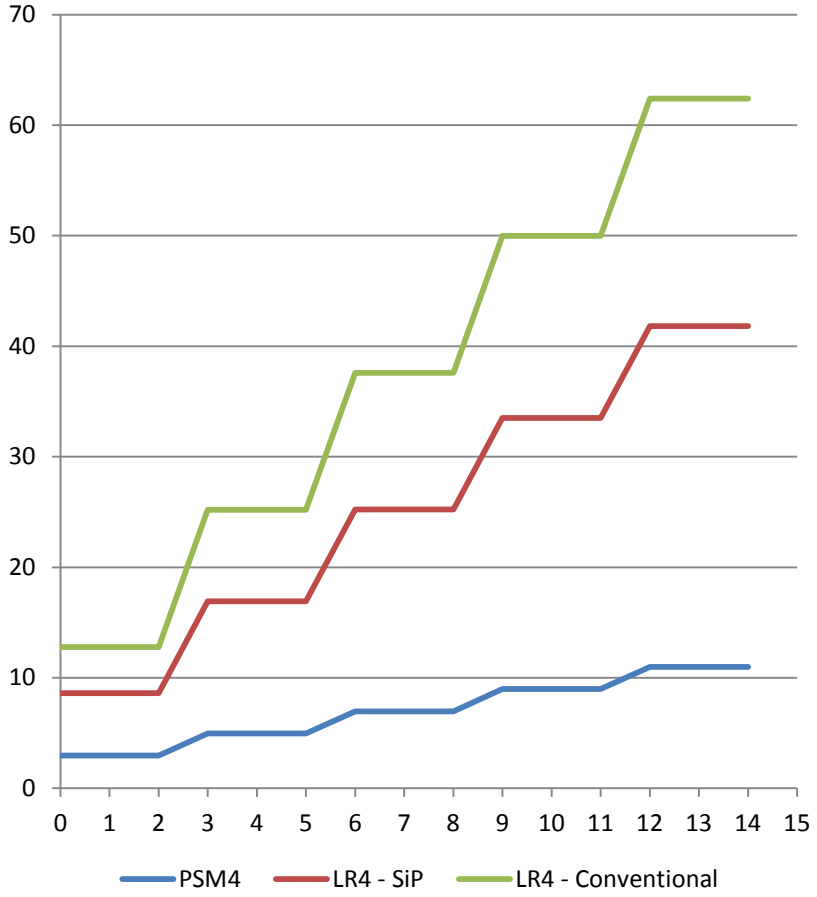
- Looks at 150m link lengths
  - Cost centroid for 500m application space
- Assumes the same module cost for each successive replacement
  - Ie, Cost/Gbps reduces commensurate with rate increases
- Assumes all solutions are at high volume production
  - May not always be the case, since volume can be a strong function of cost
- Shows 7, 10, & 15 year fiber lifetimes
  - 8 Fiber and 12 Fiber PSM configurations

Three Year Module Turnover

Costs Per Year

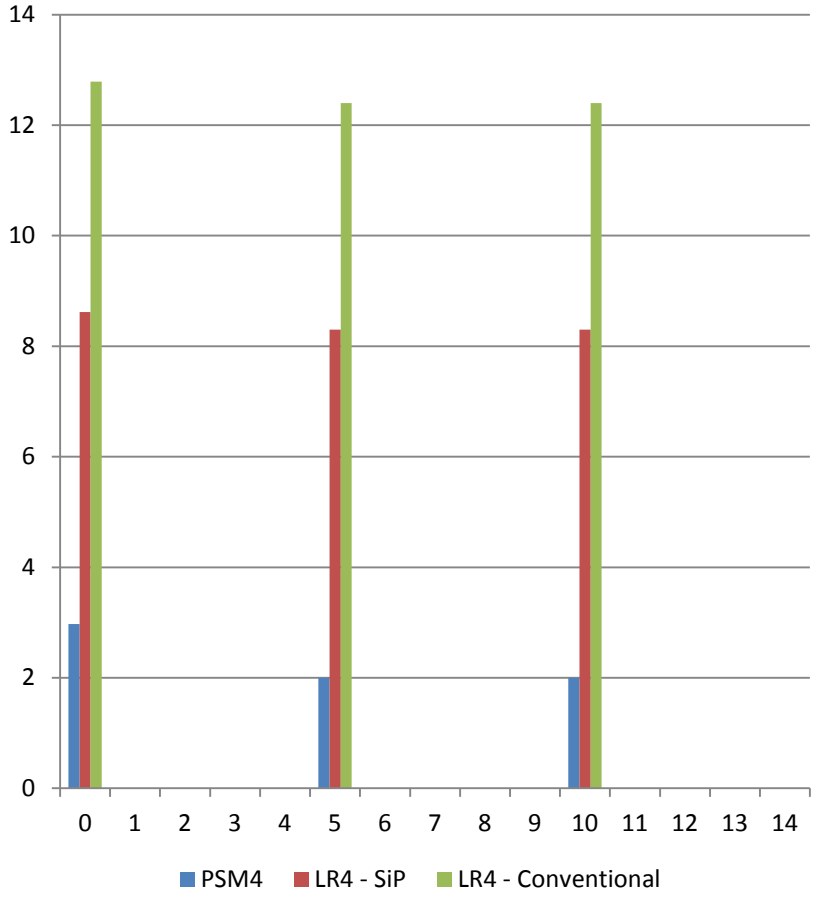


Cumulative Costs

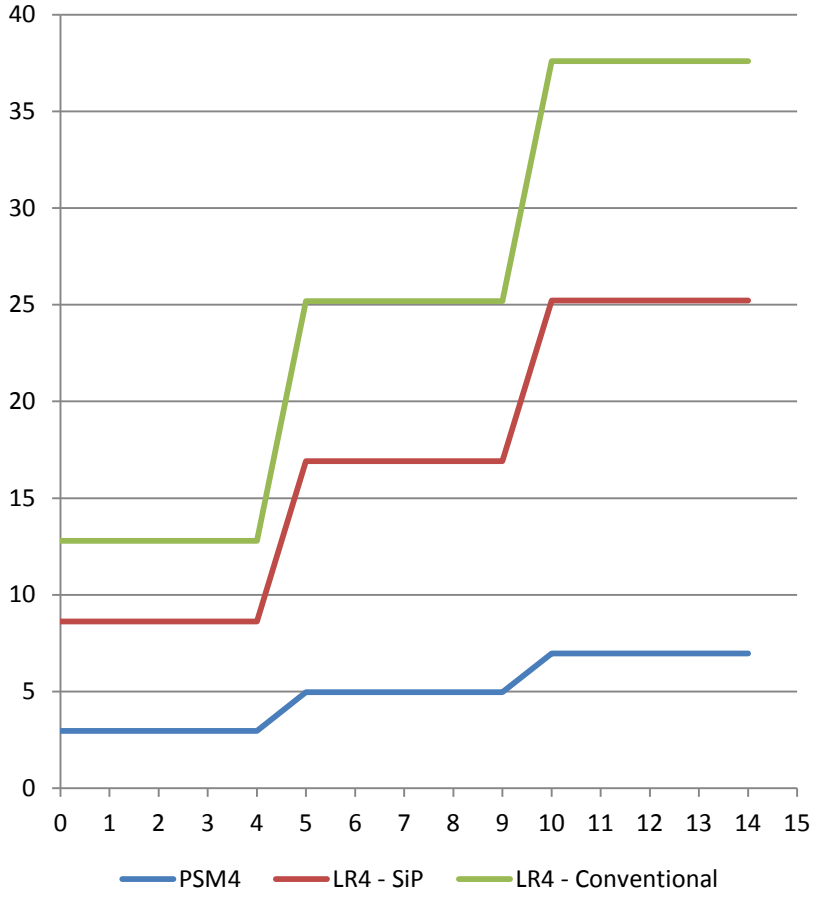


Five Year Module Turnover

Costs Per Year



Cumulative Costs



Net Present *Cost* – 8 Fiber Configuration

- To compare them in contemporary cost terms, an NPV analysis is done (using a 10% discount rate)

7 Year Fiber Life	5 Year Module Life	Ratio vs. PSM4	3 Year Module Life	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**
10 Year Fiber Life	**5 Year Module Life**	**Ratio vs. PSM4**	**3 Year Module Life**	**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**
15 Year Fiber Life	**5 Year Module Life**	**Ratio vs. PSM4**	**3 Year Module Life**	**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**

Net Present *Cost* – 12 Fiber Configuration

- To compare them in contemporary cost terms, an NPV analysis is done (using a 10% discount rate)

7 Year Fiber Life	5 Year Module Life	Ratio vs. PSM4	3 Year Module Life	Ratio vs. PSM4
PSM4	4.1		5.4	
LR4-SiP	12.5	**3.0**	17.8	**3.3**
LR4-Conventional	18.6	**4.5**	26.5	**4.9**
10 Year Fiber Life	**5 Year Module Life**	**Ratio vs. PSM4**	**3 Year Module Life**	**Ratio vs. PSM4**
PSM4	4.1		6.2	
LR4-SiP	12.5	**3.0**	21.0	**3.4**
LR4-Conventional	18.6	**4.5**	31.2	**5.1**
15 Year Fiber Life	**5 Year Module Life**	**Ratio vs. PSM4**	**3 Year Module Life**	**Ratio vs. PSM4**
PSM4	4.8		6.7	
LR4-SiP	15.4	**3.2**	23	**3.5**
LR4-Conventional	23	**4.8**	35	**5.2**

Comparison and Conclusions

	Contemporary Cost Model† - 8f/12f	NPV with 5 year refresh rate (10 year fiber life) – 8f/12f	NPV with 3 year refresh rate (10 year fiber life) – 8f/12f
LR4-SiP/PSM4	2.9/2.8	3.3/3.0	3.6/3.4
LR4-Conventional/PSM4	4.3/4.0	4.9/4.5	5.3/5.1

- Looking at the total cost to service SMF fiber, the real costs (as measured as a ratio to PSM4) of LR4 are approximately 10-25% higher.
- PSM4 solutions put the most value in the datacenter infrastructure, while reducing the costs of the consumables.

† *from welch_01_0513_optx.pdf*