DC Switch Network

- Fabric for networking scalability 40G to 100G
- Connects compute, storage and switches

SMF deployed in the data center

- Lower fiber cost than MM
- Duplex SMF less fiber than parallel
- SMF future proof to higher data-rates
- Depreciated over many upgrade cycles
100G Optics CWDM4

- 100G CWDM4-MSA
  - QSFP-28 form-factor
  - Single-mode duplex fiber

- CWDM4-OCP:
  - Relaxed specification for DCs
  - Reduced temperature range
  - Reduced link budget

<table>
<thead>
<tr>
<th></th>
<th>CWDM4-OCP Relaxed Specification</th>
<th>CWDM4 MSA Base Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach</td>
<td>500 m</td>
<td>2000 m</td>
</tr>
<tr>
<td>Link loss</td>
<td>3.5 dB</td>
<td>5 dB</td>
</tr>
<tr>
<td>Operating Case</td>
<td>15-55 deg C</td>
<td>0-70 deg C</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OCP Networking Group Submission

- Open sourcing specification through OCP
- Commercially available optical transceivers
And, it’s REAL!
And, it’s REAL!
100G CWDM4 Production Readiness Challenge

- Product Fit
- Design Verification
- Qualification
- Production Test
- Ability to Scale Manufacturing
Production Readiness Tests Examples

- PCBA failure (System Level Traffic Test)
- SMSR, mode broadening (Power Temp Cycle)
Quality Control Plan and Executions

• Develop consolidated Quality Control Plan and Execute
  • Flexibility on the long term reliability and deployment schedule
  • Synchronization between Suppliers’ Product Quality Plan and our QCP
  • FIT/DPPM predication and co-assessment on the early failure modes
  • Development extra screen process at production to ensure the quality
  • ORT (on-going Reliability Test) in place
GR468 and CpK Control process in place

Solid Test process to keep no factory escape / ORT

IQC/OQC on items / Traceability

RMA/FA Event

TAT Requirement

Risk Assessment
Networking Ecosystem

All components are commercially available and work together
100G Networking Ecosystem

- Commercially available CWDM4-OCP optical transceivers include:

<table>
<thead>
<tr>
<th>Optical Transceiver Manufacturers</th>
<th>CWDM4-OCP Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorchip</td>
<td>C100 Q005 CWDM4 02B</td>
</tr>
<tr>
<td>Finisar</td>
<td>FTLC1152RGPL6</td>
</tr>
</tbody>
</table>

- Ecosystem of switch equipment

<table>
<thead>
<tr>
<th>Compatible Switches</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edgecore Networks</td>
<td>Wedge100-32X</td>
</tr>
<tr>
<td>Celestica</td>
<td>D8020 (Backpack 100G)</td>
</tr>
</tbody>
</table>
What’s Next?

- 400G switch interconnects beyond 2020
  - New optics technology 400G-FR4 using PAM4
  - QSFP-DD form factor
Conclusion

100G is deployed and in production
Sharing with the community via OCP

400G and QSFPDD in the future