OCP 3 TALL FORM FACTOR PROPOSAL

Andrey Lashchuk, September 3rd 2020
1. Nvidia Networking has chosen OSFP as POR solution for Infiniband NDR 400Gb/s. The advantages of OSFP over QSFP112 or QSFP-DD are:
   - Thermal - larger thermal contact area and integrated fins in the backshell.
   - Signal integrity - based on our SI team study, OSFP shows better performance than currently available alternatives in the market.
2. In order to fit into PCIe CEM boundaries, OSFP-RHS cage modification is used. A cage with specific thermal solution was simulated in PCI CEM environment, successfully. Simulation in OCP 3.0 environment is yet to come.
3. Current OCP 3.0 rev 1.0 could not accommodate OSFP interface, as shown below:
DESIGN TARGETS

Listed below our targets for new form-factor design

1. Clean and simple design, straightforward approach.

2. Accommodate both OSFP and OSFP-RHS cages including thermal solution within minimal volume.

3. Provide sufficient thermal performance to operate under OCP 3.0 server system airflow capability, tiers.

4. Preserve as much as possible existing faceplate tooling, including sub-assembly.

5. Minimize the impact on running NICs mass production lines, assembly complexity and testing machinery.

6. System side - Enable easy support for all form factors in the same chassis, with minimal adaptations.

7. System side - Keep stacking options in 1U/2U envelopes.

8. The design changes shall be applicable to LFF as well.
TALL SMALL FORM FACTOR

TSFF - Supports OSFP-RHS cage with PCIe CEM heat-sink

- Straight forward approach - extending current design.
- Ejector latch faceplate taken as a case study since it is the most restrictive design.
- Cage heat-sink (above) is given for representation purpose only.

Flat back-shell module, riding heat-sink (RHS) assembled on the cage
EXTRA TALL SMALL FORM FACTOR

ETSFF - Supports OSFP cage, could accommodate finned back-shell module

- Straight forward approach - extending current design.
- Ejector latch faceplate taken as a case study since it is the most restrictive design.
CHASSIS APERTURE

Adjustments required in chassis aperture

- Same chassis could accommodate all form factors using interposer inserts.
- Ejector latch faceplate taken as a case study; the concept applicable for all faceplate flavors.
KEY DIMENSIONS CHANGES SUMMARY

List of main dimensional deviations from ‘standard height’ form factor

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>TSFF (S+3)</th>
<th>ETSFF (S+5.7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10.13</td>
<td>13.13</td>
<td>15.83</td>
</tr>
<tr>
<td>B</td>
<td>11.5</td>
<td>14.5</td>
<td>17.2</td>
</tr>
<tr>
<td>C</td>
<td>15.1</td>
<td>18.1</td>
<td>20.8</td>
</tr>
<tr>
<td>D</td>
<td>12.81</td>
<td>16.01</td>
<td>18.51</td>
</tr>
<tr>
<td>E</td>
<td>16.1</td>
<td>19.1</td>
<td>21.8</td>
</tr>
</tbody>
</table>

• Given dimensions are also valid for Large Form Factor
• Internal faceplate dimensions were omitted, shall be updated in manufacturing drawing

Figure 27: SFF Keep Out Zone – Side View

Figure 49: SFF Baseboard Chassis CTF Dimensions (Rear View)
In purpose of simplicity, the side EMI finger was kept the same. The gap increased as shown below. Is this a significant change? Guidance from system manufacturers is required.
SUMMARY

1. Clean and simple design, straight forward approach. - Done

2. Accommodate both OSFP and OSFP-RHS cages including thermal solution within minimal volume. - Done

3. Provide sufficient thermal performance to operate under OCP 3.0 server system airflow capability, tiers. - TBD

4. EMI performance evaluation of TSFF and ETSFF is required, in case of marginal results the side EMI spring could be extended. - TBD

5. Preserve as much as possible existing faceplate tooling, including sub-assembly. - Done

6. Minimize the impact on running NICs mass production lines, assembly complexity and testing machinery. - Done

7. System side - Enable easy support for all form factors in the same chassis, with minimal adaptations. - TBD, Feedback from system level manufacturers is required.

8. System side - Keep stacking options in 1U/2U envelopes. - TBD, Feedback from system level manufacturers is required.

9. The design changes shall be applicable to LFF as well. - Done

10. In case of proposal/s acceptance, Nvidia Networking will take care of drawings and prototypes manufacturing.
UPDATE #1
Andrey Lashchuk, October 7th 2020
PROPOSAL UPDATE

During last month we did a development effort with DellEMC. As a result the proposed heights were adjusted, to provide better 1U stacking capability, as shown below:

- **Tall Small Form Factor:**
  - 13.13 mm
  - 14.50 mm
  - Adjusted to 17.80 mm
  - Reduction: -0.3 mm

- **Extra Tall Small Form Factor:**
  - 15.83 mm
  - 17.20 mm
  - Adjusted to 20.10 mm
  - Reduction: -0.7 mm
Stack options in 1U envelope

<table>
<thead>
<tr>
<th></th>
<th>PCIe CEM</th>
<th>H15.1</th>
<th>H17.8</th>
<th>H20.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIe CEM</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H15.1</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td>H17.8</td>
<td>X</td>
<td>V</td>
<td>V</td>
<td>X</td>
</tr>
<tr>
<td>H20.1</td>
<td>X</td>
<td>V</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
1U STACK CHECK CONT.

OCP 3.0 H17.8mm

OCP 3.0 H15.1mm

OCP 3.0 H20.1mm

OCP 3.0 H17.8mm
Given dimensions are also valid for Large Form Factor

Internal faceplate dimensions were omitted, shall be updated in manufacturing drawing.

Figure 27: SFF Keep Out Zone – Side View

Figure 49: SFF Baseboard Chassis CTF Dimensions (Rear View)
<table>
<thead>
<tr>
<th>Type</th>
<th>H17.8 PROS</th>
<th>H17.8 CONS</th>
<th>H20.1 PROS</th>
<th>H20.1 CONS</th>
<th>HDHP PROS</th>
<th>HDHP CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal</td>
<td>Improved thermal performance compared with</td>
<td>Smaller thermal envelope volume than H20.1</td>
<td>Provides the largest volume for thermal solution, compared to all other FF</td>
<td>Effective perforation in fully populated faceplate, quad RJ-45 and quad SFP</td>
<td>Restricting thermal solution for the ports, compared to H17.8 and H20.1 due to jog and ejector features</td>
<td></td>
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<tr>
<td></td>
<td>H15.1. For both ASIC and ports.</td>
<td></td>
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<td></td>
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<tr>
<td>Mechanical</td>
<td>Enable usage of OSFP-RHS</td>
<td>No PCIe CEM card stack option in 1U</td>
<td>1U stack option with H15.1, no volume above is ‘wasted’</td>
<td>No 1U stack option with PCIe CEM and H17.8</td>
<td>Horizontal stack in 2U chassis</td>
<td>Restricting connector height</td>
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<tr>
<td></td>
<td>1U Stack option with H15.1 and H17.8</td>
<td>Enable use of ‘full’ OSFP interface</td>
<td></td>
<td></td>
<td>1U Stack option with HDHP or H17.8</td>
<td></td>
</tr>
<tr>
<td>Operative</td>
<td>Design extension of H15.1 bracket, no significant cost addition</td>
<td>Design extension of H15.1 bracket, no significant cost addition</td>
<td></td>
<td></td>
<td>Higher cost due to complexity and larger BOM</td>
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</tr>
</tbody>
</table>

- Quantified data shall be presented during TechWeek session. Simulations are still in progress.