Open. Together.
OCP NIC 3.0 Design and Implementation Experiences

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Agenda

OCP NIC 3.0 Design Specification Overview
Mechanical Design
Electrical Design
Thermal Considerations
Management
Firmware Design
OCP NIC 3.0 Design Specification

Third Generation of NIC specification
Defines two form factors: SFF and LFF
Supports up to 32 PCIe lanes
Primary and Secondary connectors
Covers single host, multi-root, and multi-host environments
DMTF standards based Manageability
Security considerations
Mechanical Design

Evolution of Server NICs

A variety of form factors are available today.
- PCIe NICs, NDC’s
- Mezzanine cards.
- OCP Mezz 2.0
- OCP NIC 3.0
OCP NIC 3.0 CARDS
Mechanical Design (cont’d)

- Bracket(s)
- I/O Types
- LEDs
- PCB (115mm x 76mm)
- Heatsink
- Mylar/Insulation (Backside of PCB)

Specifications
Mechanical Design (cont’d)

Mylar / Insulator (Backside of PCB)
Mechanical Design Experience

- PCB Form Factor
  - Easy to implement; Similar to PCIe NIC
- Bracket(s)
  - Good design but a ‘little’ challenging; Involve more parts; Hard to procure offshore parts.
  - Good to have different bracket options to choose from.
  - Challenging to add air vents some cases.
- Heatsink Design
  - More space than 2.0; Single height restriction makes life much easier 😊.
- Mylar/Insulator
  - Provides good insulation on back side;
Electrical Design

Typical Block Diagram of an OCP NIC 3.0

Specifications
Electrical Design - Experience

- Similar to PCIe NIC design with a few new signals.
- Pay attention to BIF and SLOT_ID signals.
- FRU Write Protection is a requirement.
- RBT signals timing (Spec is TBD)
  - Hard to meet max trace lengths (timing); Clock routing;
  - Will be difficult to meet timing for LFF’s.
- Bus isolation requirements on a few signals.
- Shift registers (New)
  - LED status; Board power and temperature status.
- New LED wavelengths requirements (Higher Vf !)
  - Difficult to place LEDs and not blocking airflow!
Thermal Design

- Challenging to meet “Typical Server Airflow” for high power cards
  - Stay under 200LFM for ~20W card.

***From OCP v0.85 Spec
Thermal Considerations (Simulation)

**OCP 3.0 Thermal Test Fixture**

*Figure 11B: Thermal Test Fixture Airflow Direction*

<table>
<thead>
<tr>
<th>Local inlet air temperature</th>
<th>Low</th>
<th>Typical</th>
<th>High</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°C (system inlet)</td>
<td>50°C</td>
<td>90°C</td>
<td>100°C</td>
<td>10°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local inlet air velocity</th>
<th>Low</th>
<th>Typical</th>
<th>High</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Dependent</td>
<td>50 LPM</td>
<td>100 LPM</td>
<td>200 LPM</td>
<td>System Dependent</td>
</tr>
</tbody>
</table>

**System Model**

Enclosure dimensions LxWxh = 328x128x40.6mm
Hot Asile/55C/60C/65C conditions

Air mover

OCP 3.0 thermal test fixture

4xRJ45s

**3D CAD Thermal Model from OCP Spec**

**Actual thermal model**
Thermal Considerations (Design)

- Definitely need vents on the bracket!
- Require adequate heatsink size.
- Thermal simulation a Must!
Management

Standards based manageability essential for interop
Management Type: Recommend RBT+MCTP
Sideband Interfaces: Support concurrency
Self-shutdown: Optional but important
FRU: dual-byte addressing not ubiquitous for small size FRU
Firmware Design Considerations

- Hardware Root of Trust (RoT)
- Secure boot
- Secure firmware loading
- Secure firmware update
- Encrypt sensitive NVRAM config data
- Built in recovery from HW/FW failures
Summary

OCP NIC 3.0 is good for the industry and enables one to move from proprietary form factors.

Broadcom is extending OCP NIC 3.0 from performance NICs to SmartNICs.

Broadcom’s Contributions to OCP NIC 3.0 Specification:
- Manageability, Security, Pin definitions, Electrical, Mechanical, Thermal and Labeling – base requirements.

Broadcom’s early adoption experience mostly positive.
Call to Action
Adopt OCP NIC 3.0 in server designs
Get NIC products recognized as OPC Inspired / OCP accepted
Work with community and share your experiences