Delta Open Rack & Power Solution

Delta PSBG, IDC LOB
2014 Jan, Richard. Chan

Smarter & Greener
V1 Open Rack General Specification

- Dual Inputs –277Vac + 48Vdc
- Two Different types of PDU (AC + DC)
- 3 Power Zones; 3 pairs Bus for each Zone
- Each Power Zone = 4.2KW
- Use 21 pcs 700W PSU for total power
- Total Power = 12KW
- 15U space for server/ storage devices
- 9U space for PSU
- Bus Bar Max. continuous current = 408A
- Max. current for the Clip is 80A.
  (20% derating)
A. **DC G-PDU**: 3 main 48Vdc outputs + extra aux DC outputs

B. **Dual input server rack**: contain 1 AC and 1DC PDUs and 3 Power Zones (4.2KW each zone); 3 pairs Bus bar for each Zone;

C. **Power shelf**: Total 3 shelves; 7 PSU (6+1; 700W each PSU) per shelf, 4.2KW per zone, total 21 power supply to provide 12KW power

D. **AC G-PDU**: 277Vac input; 3 main AC outputs with single phase 277Vac to power shelf

E. **Monitoring device (Bloodhound)**: collecting power status to central control
Dual input (277Vac +48Vdc) dual Input PSU

- 277Vac +48Vdc Input
- 12.5V/ 700W;450W
- Efficiency > 94%

99% x 94% = 93%
85KW DC UPS & Venus AC/DC PDU

Rectifier  Rectifier  Rectifier  Controller

Battery

AC & DC PDU

Provide the Power to IT switch and Server node @ AC outage

DC Backup System
Dual Inputs – 208/230Vac + 208/ 230Vac
- Dual AC PDU
- 3 Power Zones; 3 pairs Bus for each Zone
- Each Power Zone = 4.2KW
- Use 18pcs 2.1W PSU for total power
- Total Power = 12KW
- 15U space for server/ storage devices
- 9U space for PSU
- Bus Bar Max. continuous current = 408A
- Max. current for the Clip is 80A. (20% derating)
208V/230V Stingray Rack

A. **AC M- PDU**: 208Vac input; 3 main AC outputs; total 2 per rack

B. **Dual AC input server rack**: contain 2 AC PDUs and 3 power zones; 3 pairs of bus bars

C. **Power shelf**: Total 3 shelves per rack, max with 6 pcs 2.1KW PSU (3+3); max power is 6.3KW per zone, 15KW per rack total

D. **Power adapter box**: 50W power adapter to provide DC power to monitoring device

E. **Monitoring device (Bloodhound)**: collecting power status to central control
Dual AC Feed Power Architecture

93% \times 99% \times 94% = 86.5%
Dual AC Feed Power

- Main AC-DC PSU work on redundant status at normal condition.
- Standard design
- AC backup system may be needed
Power shelf block diagram

DELTA POWER SHELF

- PSU3_B
- PSU2_B
- PSU1_B
- PSU3_A
- PSU2_A
- PSU1_A

- DC+
- DC-
- Alert signal

- L2(+)
- N2(-)
- PE
- L1(+)
- N1(-)
- PE
- HVDC I/P
Rear View of Power Shelf

- Fuses for input 2
- Fuses for input 1
- LED for 12V output
- RJ45 connector
- Input 2 connector
- Input 1 connector
- Output Bus Bar

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Dual AC input & 2 Power Zone Openrack

- All systems shall be electrically and mechanically compatible with the Open Compute Open Rack Standard.

- Highest economical physical density scalable to 12KW per rack.

- Diverse parallel AC power inputs per cabinet
  - United States 208Vac three phase input power solution.
  - UK / International 415/240Vac three phase power solution
**Rackspace Open Rack**

**A. 208Vac/230Vac dual AC input server rack:** Contain 1 power shelf with dual AC input cables; 42U total height.

**B. Power Shelf:** 1 shelf per rack, containing 6 pcs 2.4KW PSU (N+1); can support total 12KW power; additional aux AC connectors are available.

**C. Switch Tray:** Assembly in the middle of the rack, right on top of the power shelf. RMC feature also available.

**D. AC input cables:** 2 cables connected directly to the power shelf, supporting either 208Vac/230Vac input voltages.

**E. RMC:** Rack Power Shelf Remote monitor / Control device.
Power Architecture

480Vac 3 phase or 380Vac 3 phase

AC Power train

208vac/230vac single phase

Server PSU

AC/DC

DC/DC

420V

PDU

12V Load

99% x 94% = 93%

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Power Shelf Size:
W: 482.6 mm
H: 117 mm
D: 600 mm

PSU x 6
RMC
482.6 mm
Power Shelf I/P & O/P Device

- DC 12V O/P Bus Bar Set (3 sets)
- AC O/P 1 For SW
- Breaker for AC O/P 1
- AC I/P 1 Terminal
- AC I/P 2 Terminal
- Breaker for AC O/P 2
- AC O/P 2 For ATS I/P 2
Power Shelf Block Diagram

INPUT A
Δ: 208Vac
Y: 415Vac/240Vac

O/P: 12.5V/1000A, 12.5KW

INPUT B
Δ: 208Vac
Y: 415Vac/240Vac
General Specification (Higher Power Demand Rack)

- Dual AC Inputs – 208/230 Vac
- Two AC PDU
- 4 Power Zones; 3 pairs Bus for each Zone
- Each Power Zone = 6 KW
- Use 12 pcs 2.4W PSU for total power
- Total Power = 24 KW
- 36U space for server/ storage/ switch devices
- Bus Bar Max. continuous current = 408 A
- Max. current for the Clip is 80 A (20% derating)
Fidelity Open Rack General Specification

- Dual AC Inputs – 3 phase 208/230Vac
- Two AC PDU
- 2 Power Zones; 3 pairs Bus for each Zone
  - Each Power Zone = 7.5KW
- Use 12 pcs 2.5KW PSU for total power
- Total Power = 15KW maximum
- 36U space for server/ storage/ switch devices
- Bus Bar Max. continuous current = 408A
- Redundancy Power Shelf

Dimensions:
- W: 600 mm
- D: 2220 mm
- D: 1067 mm²
Fidelity Open Rack

A. **Open Rack Bus Bar Assemble Set:** Contain 6 pairs Bus Bar connect the power between power shelves and server nodes.

B. **Power Shelf:** 2 shelves per rack, containing 6 pcs 2.4KW PSU (N+N); can support total 7.2KW power per shelf; total 14.4W for whole rack

C. **AC PDU:** Installing at the back of the power shelf. Each PDU has 2 AC output to top/bottom power shelf

D. **RMC:** Rack Power Shelf Remote monitor / Control device.
Rack Layout

500A (7.5KW)

500A (7.5KW)

Total Rack Height: 2220 mm

Power Shelf A, 2.5 OU
Power Shelf B, 2.5 OU

Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU
Server / Knox, 2 OU

Total Internal Space: 41 OU

500A (7.5KW)
Output Bus Bar Connection

Upper side vertical Bus Bar

Down side vertical Bus Bar

Busbar connection between shelf and Rack
Output Bus Bar Connection

Input Plugs

AC PDU #1

AC PDU #2
Power shelf’s block diagram

Top side O/P: 12.5V/600A, 7.5KW

Bottom side O/P: 12.5V/600A, 7.5KW

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Rack Configuration and Monitoring – RMC (Remote Monitoring Controller)
**Interface:**
- Gigabit Ethernet (RJ45)
- USB, support OTG function (Micro-USB)
- RS-232_COM0 + CAN_0 (RJ45)
- RS-232_COM1 + CAN_1 (RJ45)
- Reset Button
- LED indicator (Red and Green light)
Power Shelf Communication Architecture

Main Function - Monitor/ report each PSU I/P & O/P Voltage, current, Power
- Monitor/ report overall Power shelf I/P & O/P Power
- PSU failure alerting mechanism
- PSU Remote ON/ OFF control, available max. Power …etc.

Each PSU communicates with RMC through I2C.
PSU can provide the information such as Input voltage/ current/ power, Output voltage/ current/ power and PSU fault condition.
RMC to consolidate all the PSU information then provide to monitoring system by SNMP.
V2 Open Rack External Physical Size

- Height: 2210mm
- Width: 1067mm
- Depth: 600mm

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# V2 Open Rack Internal Space Configuration

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Q’ty</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>1 OU</td>
<td>3</td>
<td>3 OU</td>
</tr>
<tr>
<td>Server / Knox</td>
<td>2 OU</td>
<td>16</td>
<td>32 OU</td>
</tr>
<tr>
<td>Power Shelf</td>
<td>3 OU</td>
<td>2</td>
<td>6 OU</td>
</tr>
<tr>
<td><strong>Total Internal Space</strong></td>
<td></td>
<td></td>
<td><strong>41 OU</strong></td>
</tr>
</tbody>
</table>

- **Switch**: 3 OU
- **Server / Knox**: 32 OU
- **Power Shelf**: 6 OU
- **Total Internal Space**: 41 OU
AC & DC PDU in Rack

AC PDU

DC PDU

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<table>
<thead>
<tr>
<th>Items</th>
<th>Open Rack V1</th>
<th>Open Rack V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack External Height</td>
<td>2100 mm</td>
<td>2210 mm</td>
</tr>
<tr>
<td>Internal Total Space</td>
<td>41 OU</td>
<td>41 OU</td>
</tr>
<tr>
<td>Server / Knox Space</td>
<td>30 OU</td>
<td>32 OU</td>
</tr>
<tr>
<td>Switch Space</td>
<td>2 OU</td>
<td>3 OU</td>
</tr>
<tr>
<td>Power Zone Q’ty</td>
<td>3 zones</td>
<td>2 zones</td>
</tr>
<tr>
<td>Power Shelf Q’ty</td>
<td>3 Sets / 9 OU</td>
<td>2 Sets / 6 OU</td>
</tr>
<tr>
<td>DC Bus Bar Q’ty</td>
<td>3 sets</td>
<td>1 or 3 sets</td>
</tr>
<tr>
<td>PDU Location</td>
<td>Side of rack</td>
<td>Top of rack</td>
</tr>
</tbody>
</table>
Facebook V2 Open Rack Features
China Scorpio Open rack 2.0 Outlook
Based on China Scorpio standard, there are 2 type racks “42U” & “46U” below:

<table>
<thead>
<tr>
<th>Item</th>
<th>42U</th>
<th>46U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Height</td>
<td>2100 mm</td>
<td>2300 mm</td>
</tr>
<tr>
<td>Switch Tray</td>
<td>3 U</td>
<td>3 U</td>
</tr>
<tr>
<td>Server space</td>
<td>36 U</td>
<td>40 U</td>
</tr>
<tr>
<td>Power Shelf</td>
<td>3 U</td>
<td>3 U</td>
</tr>
<tr>
<td>Fay Tray Q’ty</td>
<td>9 sets</td>
<td>10 sets</td>
</tr>
</tbody>
</table>

Special Note: For China scorpion, 1U = 46.5 mm.
Internal Space Configuration

Total: 46 U

Max. Power Demand = 12KW

Total: 42 U
Rack Internal Space Placement

- Fan Tray
- Back Plane Module
- DC Bus Bar
- Server
  - Width: 536 mm
  - Depth: 850 mm
- Pitch: 34 mm
- Cable Zone
  - Width: 538 mm
Hot Pluggable Fan Tray

Each “Fan Tray” with 3 sets “Fan Module” (14 cm size fan)
Both “Fan Tray” and “Fan Module” are hot pluggable.
Scorpio V2 Open Rack Features
# Major Differences on Scorpio 2.0 VS Open Rack V2

<table>
<thead>
<tr>
<th>Items</th>
<th>Scorpion 2.0</th>
<th>Open Rack V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack External Height</td>
<td>2100 / 2300 mm</td>
<td>2210 mm</td>
</tr>
<tr>
<td>Rack External Depth</td>
<td>1200 mm</td>
<td>1067 mm</td>
</tr>
<tr>
<td>Rack External/Internal Width</td>
<td>600/ 540mm</td>
<td>600/ 540mm</td>
</tr>
<tr>
<td>1 U size</td>
<td>46.5 mm</td>
<td>48.0 mm</td>
</tr>
<tr>
<td>Internal Total Space</td>
<td>42 / 46 U</td>
<td>41 OU</td>
</tr>
<tr>
<td>Switch Tray size / Q’ty</td>
<td>1 U / 3 sets</td>
<td>1U / 3 sets</td>
</tr>
<tr>
<td>Server Size / Q’ty</td>
<td>1 U / 36 or 40 sets</td>
<td>2 OU / 16 sets</td>
</tr>
<tr>
<td>Cooling</td>
<td>System Fan Tray</td>
<td>Fan in Server</td>
</tr>
<tr>
<td>Power Zone Q’ty</td>
<td>1 zones</td>
<td>2 zones</td>
</tr>
<tr>
<td>Power Shelf Q’ty</td>
<td>1 Sets / 3 U</td>
<td>2 Sets / 6 OU</td>
</tr>
<tr>
<td>Bus Bar Q’ty / Location</td>
<td>1 sets / Left Size</td>
<td>1 set / Center</td>
</tr>
<tr>
<td>AC / DC PDU</td>
<td>Without any PDU</td>
<td>With AC / DC PDU</td>
</tr>
</tbody>
</table>

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Thank you