Open. Together.
Open Rack Battery Back up Roadmap

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Purpose:
Accommodating transitions for AC outages to generator and back.

Current ORv2 BBU

- Main AC
- BBU
- Generator AC
- 12V Load
Current ORv2 BBU

- 52 x 18650 Power Type Li-Ion Cells – 13S4P
- 90s discharge @ 3600W Max
- 5A CC-CV charge
- 52 - 33.6 VDC voltage range
- 444 x 62x 160mm (LxWxH)
Current ORv2 BBU - Limitations

- Discharge time is fixed and too short for other use cases
- Lack of control over charge after an outage
- Charge as a result of self-discharge is too frequent
- Elevated Battery temperature in the Data Center
POWER LOSS SIREN

A mechanism to broadcast AC power outage to affected servers within a rack.
Power Loss Siren Flow

1. AC Outage
2. PSU Sensor Triggered
3. GPIO Signal Sent to RSW
4. TOR notifies all hosts within the rack
Discharge limitation

V2 BBU - 90s Discharge

Power Loss Siren
Lack of charge control

- Breaker trip at DC
- Generator overload
- Power Capping → Capping services

Outage
Thermal limitations

- Cold aisle temp 18-35C
- Hot aisle temp > 45C

Elevated BBU temp in the Summer and for high power racks.
New BBU Design

- 84 x 18650 Cells – 14S6P
- 450s discharge @ 3300W Max
- 1A - 5A CC-CV charge
- 57.4 - 36.4 VDC voltage range
- 568 x 62x 160mm (LxWxH)
- Improved cell chemistry
New BBU discharge times

Comparison with V2

- High Power Compute Rack: 600 sec
- UDB Rack: 1050 sec

Voltage vs. Time

- ORV2
- Next Gen

Comparison with V2

- 3300W
- 2200W
- 1500W
New BBU Design

- Reduced BMS Components
- High side I sensing for Charge
- Blackbox functionality
- Adaptive charger
Variable Charger

- Reduced charge voltage for new batteries
- Reduced charge current based on discharged energy
  - Energy counting by the PSU or BBU
- Charge Delay
  - Staggering charge sequence across DC for all BBUs
Thermal improvements

Addition of Fan power by PSU and controlled by the BBU

Airflow Consumption

- 3.5 CFM per unit -> 21 CFM per rack
- Typical airflow -> 900~1100 CFM per rack
System Improvements

Extend emergency runtime
- Reduce diesel power generation
- Graceful shut down in DR scenarios

Enable peak shaving
- Increase rack power max limit
V2 Battery Backup

**Diagram:**
- AC 277VAC
- BBU 52VDC
- AC/DC
- Bulk Cap 450VDC
- DC/DC
- PSU
- Load
Next gen Battery Backup

AC 277VAC

AC/DC

Bulk Cap 450VDC

DC/DC

PSU

Load

BBU 56-57.4VDC

Discharger

Charger

AC 277VAC
New BBU Shelf

- Standalone BBU Shelf
- 40U Height
- 8 x V2 BBU or Vx BBU
- OpenBMC com-controller
New BBU Shelf

Energy Available:
• W/ V2 module: 2.9 KWh
• W/ new module: 4.8 KWh

GPU Rack Example:
> 20 minutes of discharge for a GPU rack
Call to Action

Specification submission to OCP, Q3 2019

Project Wiki with latest specification:
https://www.opencompute.org/wiki/Open_Rack/SpecsAndDesigns
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