Driven by a need to scale efficiently
It takes a community working together

Scale is a big problem

The problem is bigger than just one company or individual

The world is waiting.
facebook’s scale

• 864 million daily active users on average for September 2014

• 703 million mobile daily active users on average for September 2014

• 1.35 billion monthly active users as of September 30, 2014

• 1.12 billion mobile monthly active users as of September 30, 2014

• Approximately 82.2% of our daily active users are outside the US and Canada
Complexity creates waste

Resiliency is better than redundancy

Good enough is not enough
Complete Datacenter ecosystem
Focus on Efficiency

Software  Server  Data center
Datacenter tools and workflow

Continual improvements
FBAR
Self Healing and Auto Remediation

- Retrieve list of outages
- Insert flows in Job Queue
- Calculate Remediation workflows

Remediation Plugin 1
- Remediation plugin 2
- Repair Machine
- Escalate to Humans
- Mark as Resolved
Cluster Planning and Datacenter maps
SORT / CI

Part Check-In

Inventory Transfer

Dashboards

Scan at Swap Time

Failure Analysis

Shopping Cart

SLA Tracking

PRN1-CART-007
Integrated Repairs Workflow

HDD Chain of Custody
- System of origin
- App Service –to-HDD Association
- Certification of Wipe

Spares Management
- Capture failed/new part SN
- Streamline Repairs
- Provide data for Analysis
- Eliminate Lost Parts
Original OCP designs

Software

Server & Storage

Datacenter

Cost

Energy Efficiency

38%

24%
Serviceability is a Must Have

- Influence server design to ensure best serviceability
- No tools needed to complete repairs
- Server must be front-of-rack serviceable
- Simplicity in design to allow for quick repairs
Windmill

Triplet rack

2012

Windmill tray
Winterfell

Singlet rack (OpenRack v1)
2013

Winterfell in tray
Open Vault

- Storage JBOD for Open Rack
- Fills the volume of the rack
### Six Standard Rack Configuration types

<table>
<thead>
<tr>
<th>Standard Systems</th>
<th>I Web</th>
<th>III Database</th>
<th>IV Hadoop</th>
<th>V Haystack</th>
<th>VI Feed</th>
<th>VII Cold Store</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>2 x E5-2680v2</td>
<td>2 x E5-2680v2</td>
<td>2 x E5-2680v2</td>
<td>1 x E5-2660v2</td>
<td>2 x E5-2660v2</td>
<td>2x E5-2660v2</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>32GB</td>
<td>144GB</td>
<td>64GB</td>
<td>96GB</td>
<td>144GB</td>
<td>144GB</td>
</tr>
<tr>
<td><strong>Disk</strong></td>
<td>Boot</td>
<td>High IOPS 3.2 TB Flash</td>
<td>High 15 x 4TB</td>
<td>High 30 x 4TB</td>
<td>Medium 2TB SATA</td>
<td>High 240 x 4TB SATA</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Web, Chat</td>
<td>Database</td>
<td>Hadoop</td>
<td>Photos, Video</td>
<td>Multifeed, Search, Ads</td>
<td>Cold Storage</td>
</tr>
</tbody>
</table>
Prineville, OR Data Center

Next update: 53 seconds

Power Usage Effectiveness (PUE) 1.06

Water Usage Effectiveness (WUE) 0.20

Humidity (Outdoors) 91% /100%

Temperature (Outdoors) 28° C /-2.2° F

Annualized Numbers — The chart above shows real-time PUE, WUE, temperature and humidity for Facebook’s Prineville data center. The numbers to the right are the Prineville data center trailing 12-month PUE and WUE as of the end of September 2013.

We are sharing dashboards that show real-time PUE (power usage effectiveness) and WUE (water usage effectiveness) at our data centers in Oregon and North Carolina. We’d previously been sharing PUE and WUE quarterly and are now increasing the frequency of that sharing through these dashboards.
Facebook Greenfield Datacenter

Our original Goal

- Design and build the most efficient datacenter eco-system possible

Current Sites:

- Prineville, OR
- Forest City, NC
- Luleå, Sweden
- Altoona, IA
Industry Standard

Open Compute Project
Typical Power

Utility Transformer
480/277 VAC
2% loss

AC/DC

DC/AC

ASTS/PDU

SERVER PS

Total loss up to server: 21% to 27%

Prineville Power

Utility Transformer
480/277 VAC
2% loss

Standby Generator

480/277VAC 99.99999% Availability

FB SERVER PS

48VDC DC UPS (Stand-by)

Total loss up to server: 7.5%
Battery Cabinet

- Custom **DC UPS**
- 56kW or 85kW
- 480VAC, 3-phase input
- 45 second back-up
- 20 sealed VRLA batteries
- Battery Validation System
- Six 48VDC Output
- Two 50A 48VDC aux outputs
Let’s wrap it up

Complexity creates waste

Resiliency is better than redundancy

Good enough is not enough
Engage!

http://www.opencompute.org