

The logo for Penguin Computing, featuring a stylized yellow swoosh that curves around the text.

**PENGUIN
COMPUTING**

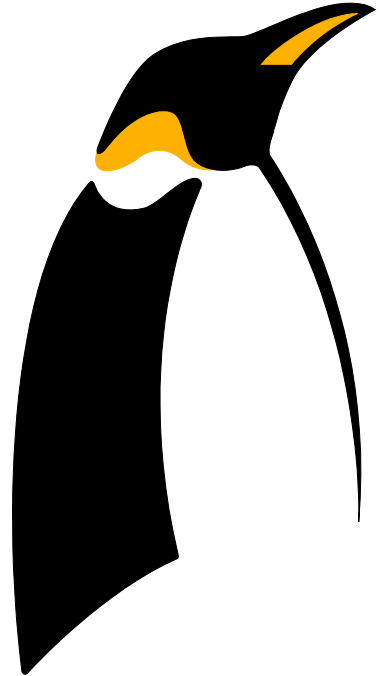
Lessons Learned on the Road to Tundra ES Hardware

Presentation by Phil Pokorny



Penguin Computing Introduction

- ▶ Founded in 1998
- ▶ \$90M revenue for 2015 (projected) 25%?? CAGR last 4 years
- ▶ Privately held
- ▶ Exclusive Linux focus
- ▶ Primary expertise in HPC and IP Datacenter deployments
- ▶ Individual servers to complete clusters and pre-racked deployments



Penguin and OCP

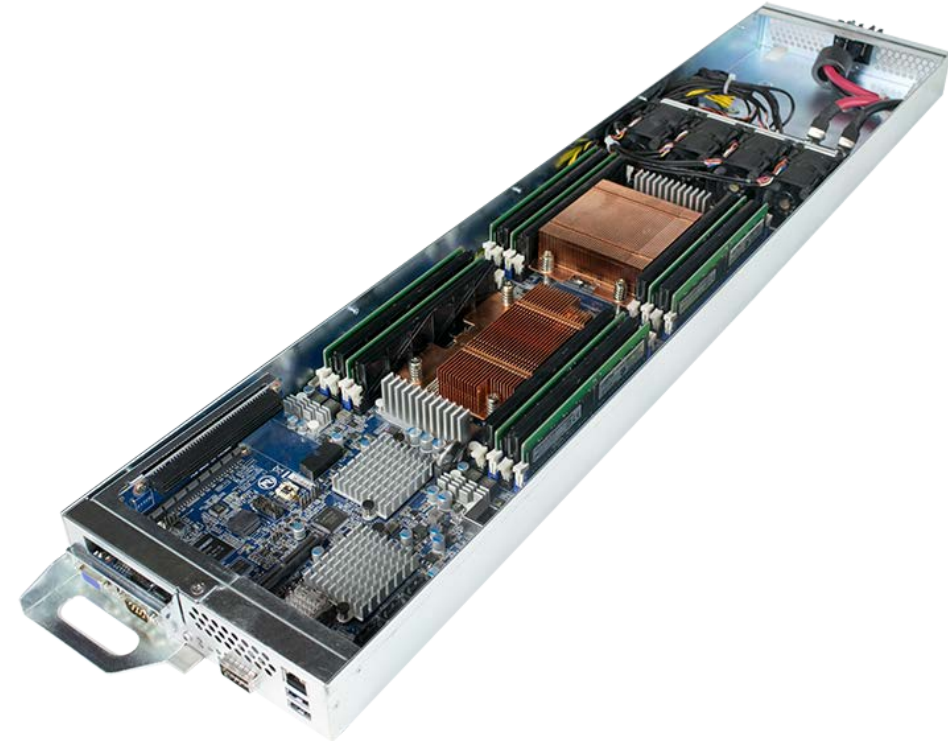
- ▶ Joined OPC in 2013
- ▶ OCP Solution Provider
- ▶ Enabled to sell "facebook" designs
- ▶ Developed 1-OU form factor



OPEN[™]
Compute Project
SOLUTION PROVIDER

Germ of an idea

- ▶ 12-V busbar is a radical change to server form factors
- ▶ Half-width boards from EIA 19in could be used in 3-wide shelf
- ▶ What specs for the sled?
- ▶ 173mm allows for the widest selection of motherboards
- ▶ mini-ITX (170x170) also fits
- ▶ Existing half width systems prove you can cool using 3 or 4 40mm fans



Refine the design

- ▶ How to guide the sled in a tray
- ▶ How to stack trays
- ▶ How to hold the sled into the tray



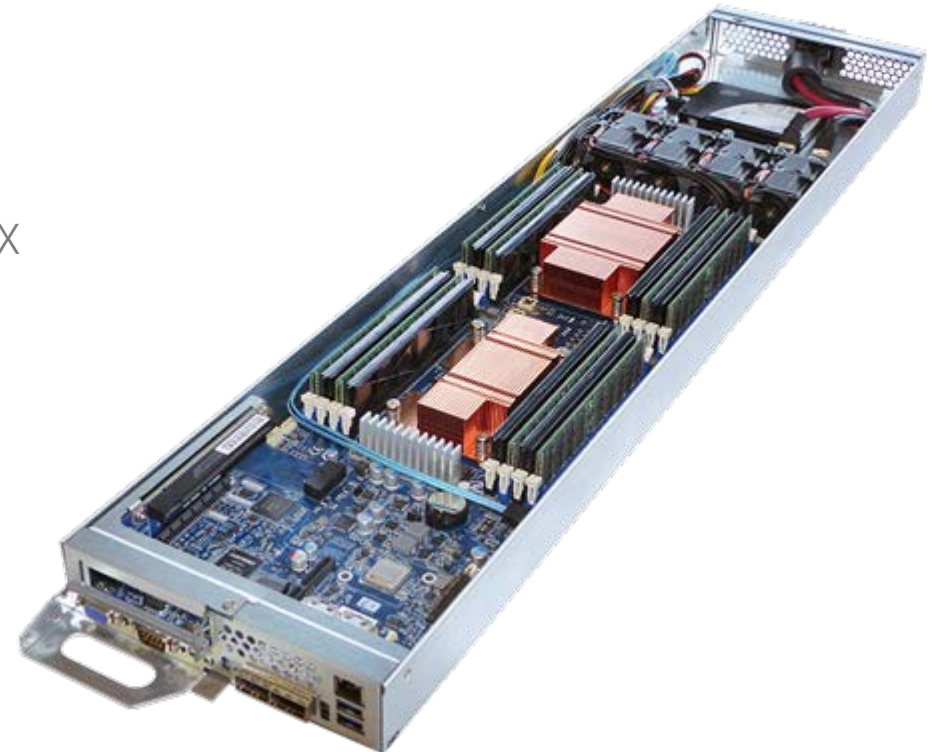
Prove the design

- ▶ Give it to multiple mfg to implement
 - ▶ AIC - Storage sled
 - ▶ Gigabyte



Prove the design (cont.)

- ▶ Implement multiple motherboards
 - ▶ Gigabyte boards -- Dual Intel Xeon, Dual Cavium ThunderX
 - ▶ Intel -- Dual Intel Xeon, Single Xeon Phi
 - ▶ Gigabyte – Storage
 - ▶ Intel -- Single socket E5-1600 v2



Supporting technologies

- ▶ Power shelf
 - ▶ up to 26.4kW (N+1)
- ▶ Liquid cooling
 - ▶ Chilled water door
 - ▶ Direct to CPU



Profit!

- ▶ Deploy internally in POD for revenue
- ▶ Win contracts
 - ▶ CTS-1 DoE NNSA program



A thick yellow swoosh graphic that starts on the left, curves upwards and then downwards, framing the text.

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Questions?
