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Ampere eMAG™ Processor  
Optimized for the Cloud

Kumar Sankaran

Vice President, Software & Platforms, Ampere

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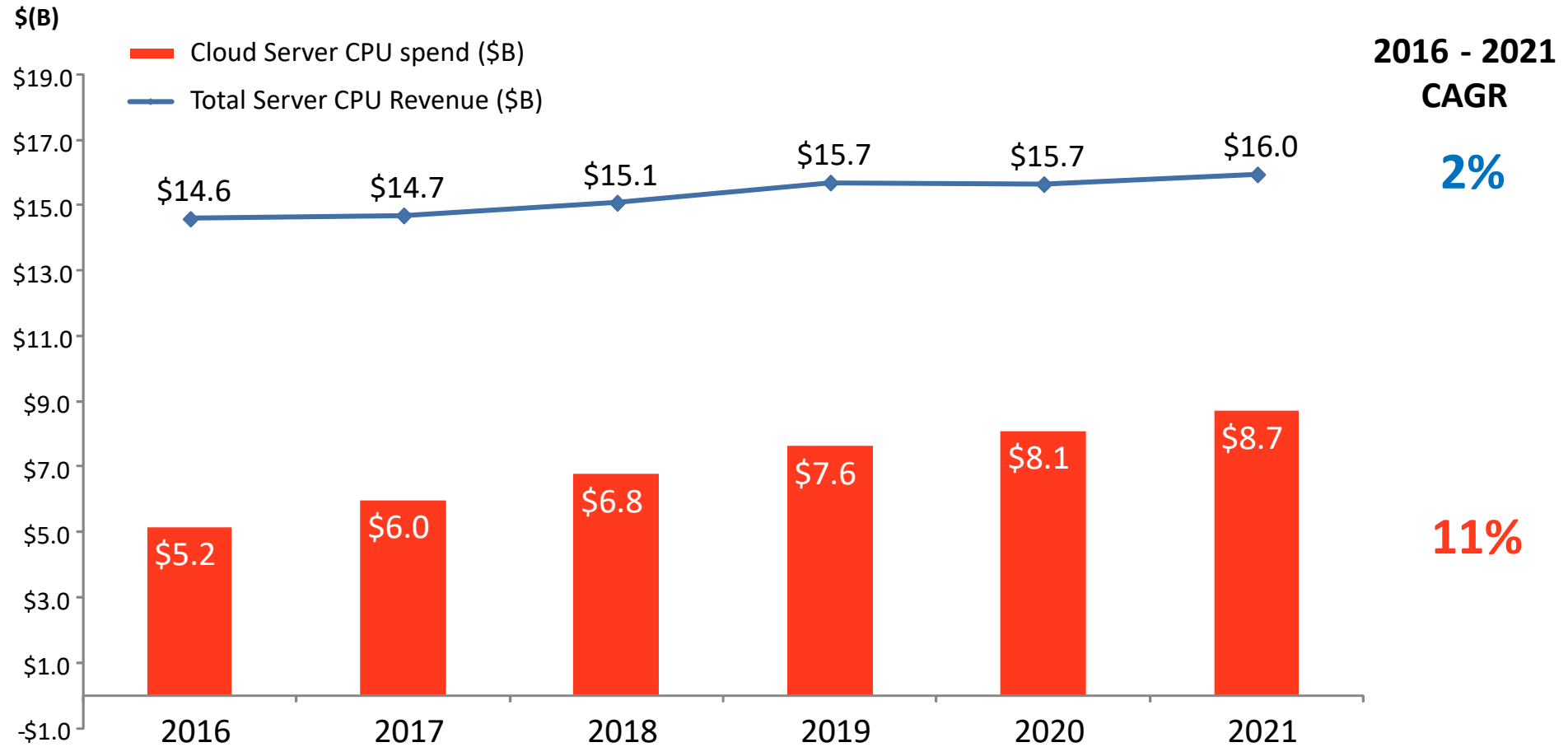




# Ampere eMAG™ Processor Optimized for the Cloud

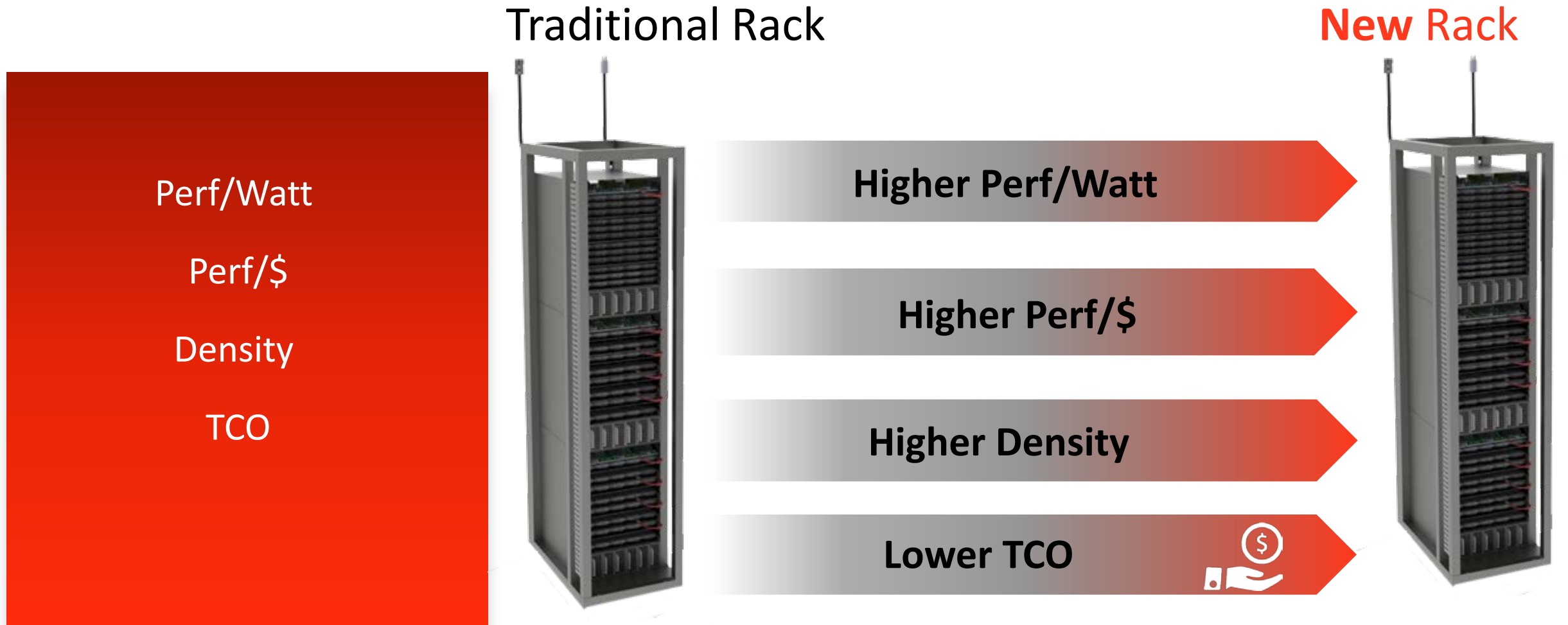
March 20, 2018

# Ampere: Targeting the Cloud Processor Market



The Cloud processor market is growing at 11% CAGR from 2017 to 2021 and reaching \$8B by 2021  
Cloud accounts for over 50% of the overall server revenue by 2021

# Cloud Performance Metrics



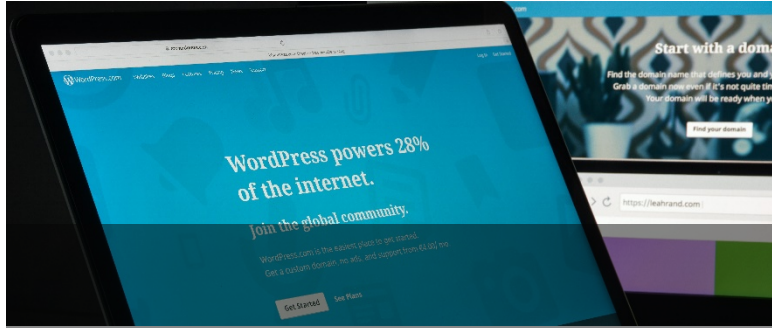
Rack Level TCO savings is one of the primary factors to transition to an alternate rack/server architecture

# Ampere eMAG Target Market Segments

## Web Tier

## Big Data, Data Analytics Data Management

## IT Apps/Storage



Web Servers/Proxy Servers →  
Apache, NGINX, HAProxy

Web Apps/Hosting → Drupal,  
WordPress, Rails

Hadoop, MapReduce, Search,  
Apache Storm, Kafka,  
Apache SPARK

Databases → Memcached,  
Redis, Cassandra, MongoDB,  
Postgres, MySQL

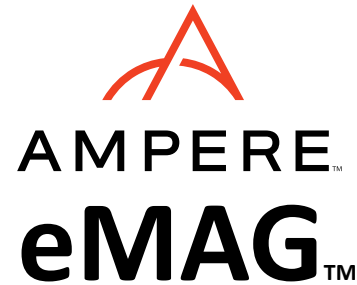
Cold/Warm Storage → CEPH,  
GlusterFS, Openstack Swift,  
Cinder

Enterprise Storage

Networking

Security

# Current Ampere™ eMAG™ Product Overview



## 1 High Performance Custom Cores

- > 32 Ampere designed ARMv8 64-bit cores up to 3.3GHz with Turbo
- > ARMv8 Architectural Licensee - ARM SBSA/SBBR standards compliant

## 2 Leading Memory Capacity and Bandwidth

- > 8x DDR4-2667 memory channels
- > 33% higher capacity and bandwidth versus competition

## 3 Connectivity and Enterprise class RAS

- > Large number of high bandwidth IO – 42 lanes of PCIe Gen 3
- > End-End enterprise server class RAS

## 4 Optimized for data centers

- > Over 40% higher Perf/Watt and over 90% higher Perf/\$ versus competition

## 5 Mature Fabrication Technology

- > Mature 16 FF+ TSMC process node

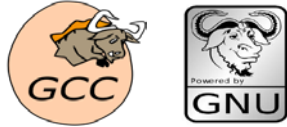
## 6 Leading OEM Partnerships and Tier 1 Customer Engagements

- > Partnered with leading ODM/OEM with worldwide presence for platform designs
- > Multiple Tier 1 customer engagements



# Ampere™ eMAG™ Software Ecosystem

## Tools/BIOS/BMC



Open Source GCC 6.x/7.x



LLVM >= v3.9  
Latest version v5.0



## OS



Open Source Linux  
Latest Kernel v4.14



RedHat  
RHEL7.3 (Kernel 4.5)  
RHEL7.4 (Kernel 4.11)



CentOS 7.3 (Kernel 4.5)  
CentOS7.4 (Kernel 4.11)



Ubuntu 16.04 LTS  
(Kernel 4.10)



SLES 15 (Kernel 4.12)



Oracle Linux 7.4  
(Kernel 4.14)

## Virtualization/Java



Open Source GCC 6.x/7.x



Open Source GCC 6.x/7.x



Open Source GCC 6.x/7.x



Open Source GCC 6.x/7.x

# Cloud Workloads on Ampere eMAG

Web Tier, Big Data, Data Analytics & Storage

## Web Apps/Hosting



## Web Server/Proxy



## Languages



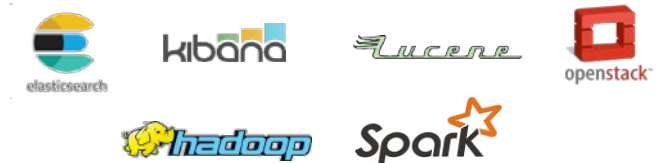
## Web Caching



## Database



## Cloud/Big Data/Data Analytics



Cloud Workloads on  
**eMAG**

## Storage



# Ampere eMAG Lenovo Evaluation Platform



eMAG Lenovo Server Top View

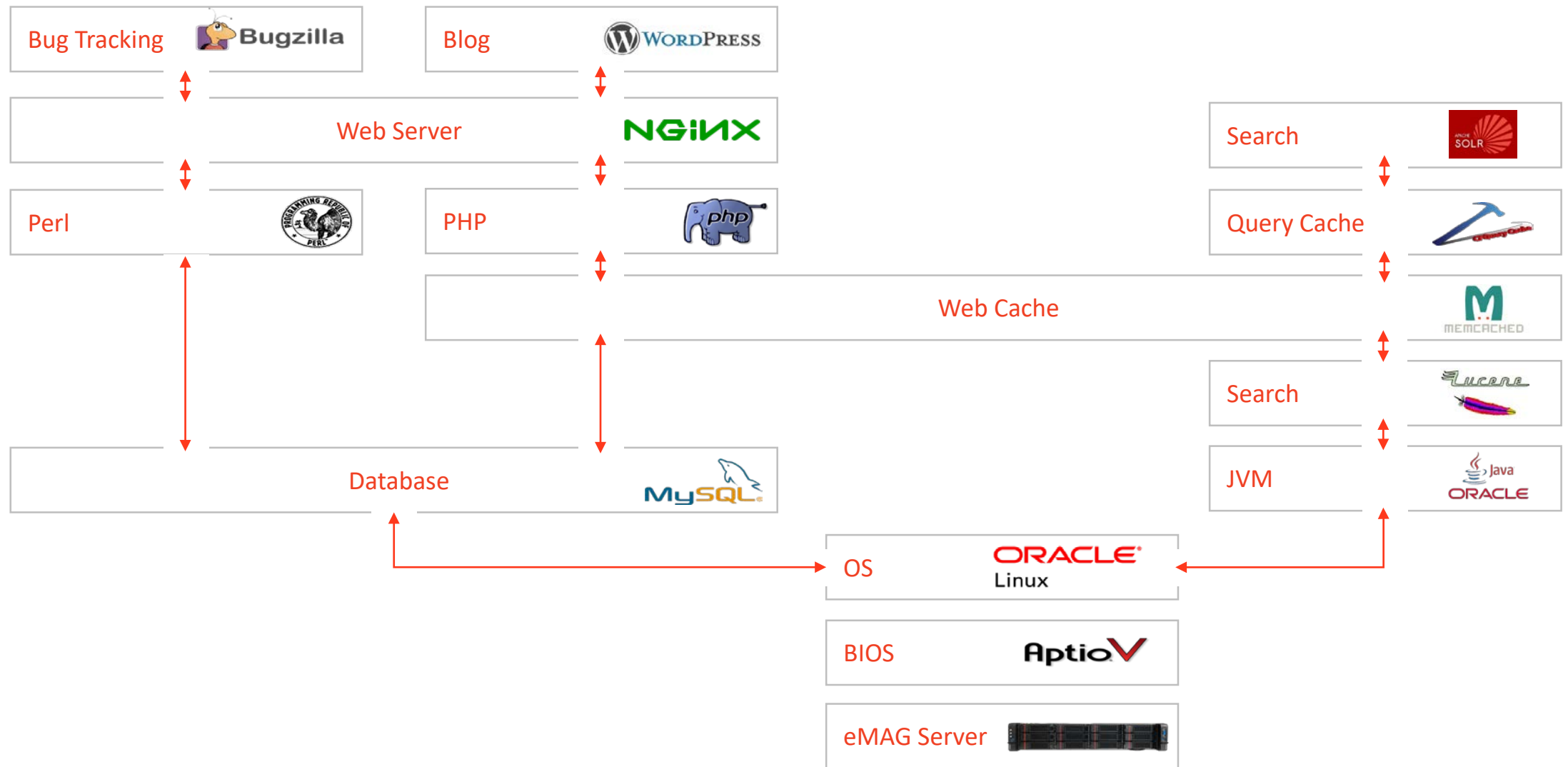


eMAG Lenovo Server Front View

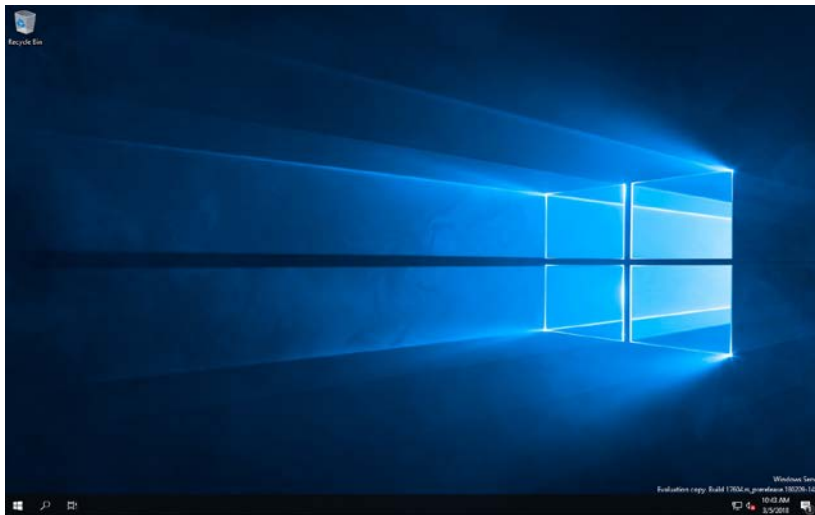
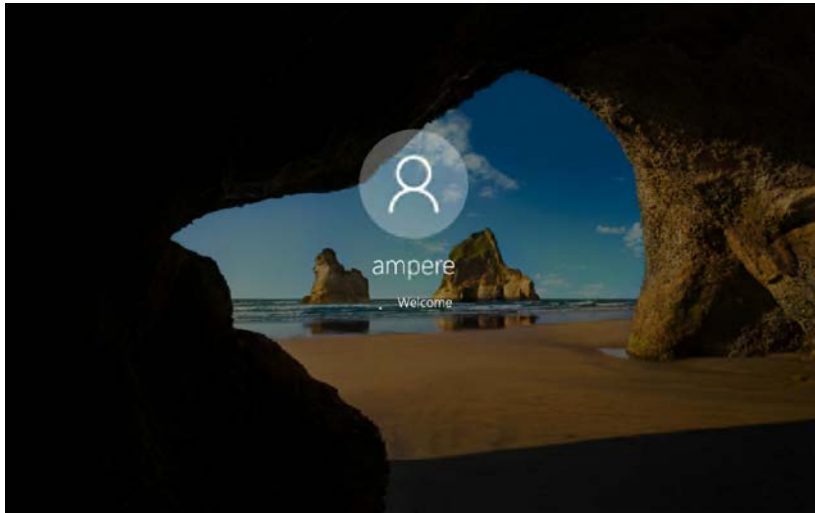


eMAG Lenovo Server Rear View

# Web Apps Software Stack on Oracle Linux and MySQL



# Microsoft Windows Server on Ampere eMag



A screenshot of the Windows Settings application, specifically the 'About' page. The window title is 'Settings' and the page title is 'About'. The 'Device specifications' section lists the following information:

Device specifications	Value
Device name	WIN-ARM64-DEMO
Processor	Ampere(TM) eMAG 3.00 GHz
Installed RAM	256 GB (256 GB usable)
Device ID	1027767E-2B6E-43D1-8860-0A6A15B1EA25
Product ID	00351-00000-00000-AA232
System type	64-bit operating system, ARM-based processor
Pen and touch	No pen or touch input is available for this display

The 'Windows specifications' section lists the following information:

Windows specifications	Value
Edition	Windows Server
Version	1709
Installed on	2/22/2018
OS build	17604.1000

The taskbar at the bottom shows the Start button, search, task view, and settings icons. The system tray in the bottom-right corner displays the time '11:01 AM' and date '3/5/2018'. The text 'Windows Server' and 'v. Build 17604.rs\_prerelease.180209-1422' is visible in the bottom-right corner.



# Ampere eMAG Value Proposition with Cassandra

Rack Level Performance vs. Intel Xeon Silver 4110 and Gold 6130

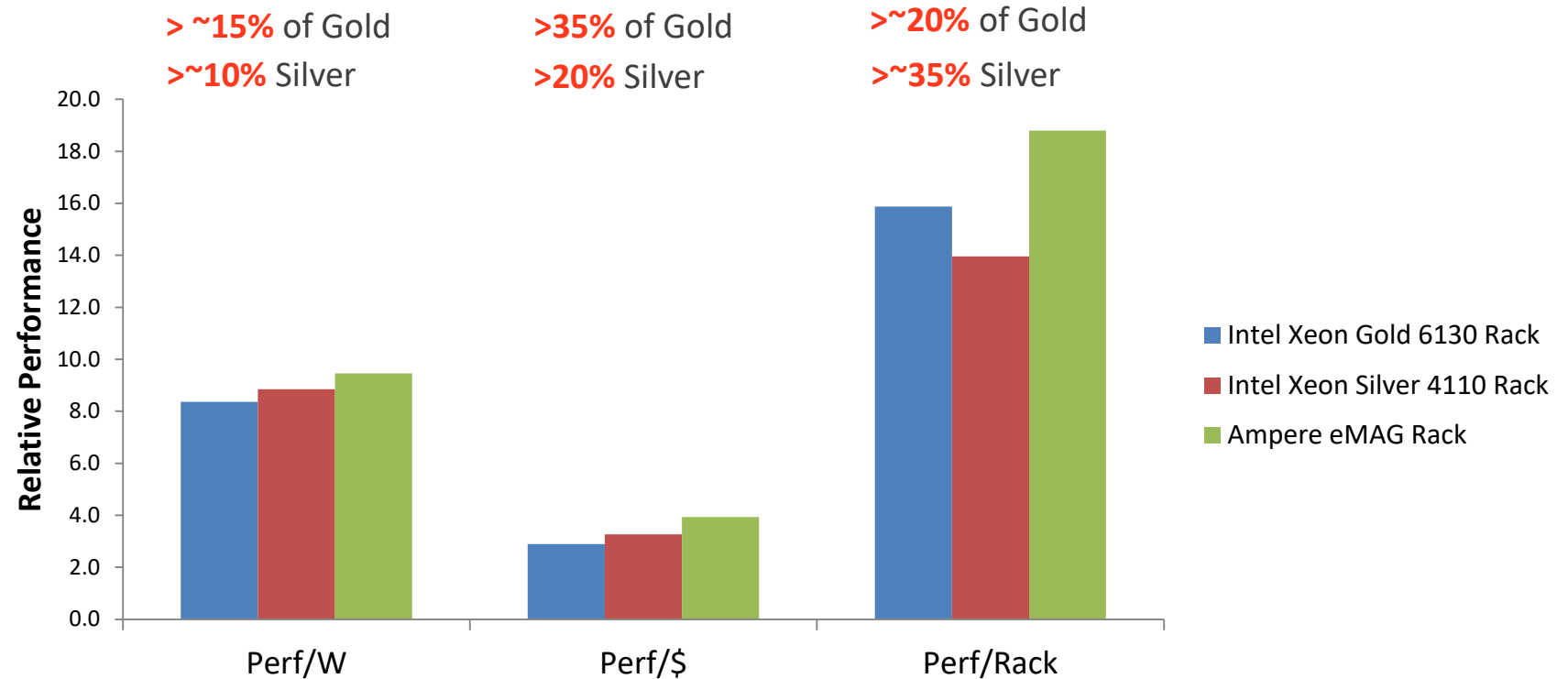


## 42U Rack

42U rack with  
40 1U servers

### Server Config

- 384GB Memory
- 8x SSD storage
- 1x 2x10GE networking



Perf/Watt

eMAG is ~15% higher than Gold and ~10% higher than Silver at the rack level

Perf/\$

eMAG is over 35% higher than Gold and over 20% higher than Silver at the rack level

Perf/Rack

eMAG has ~20% higher than Gold and ~35% higher than Silver

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Thank you.





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