# Meet Our Panel
## *Topic: Persistent Memory Software & Applications*

**Jeff Chang**
Moderator
AGIGA TECH

**Andy Rudoff**
PM SW Architect
intel

**Pratap Subrahmanyam**
Fellow
vmware

**Pradeep Balakrishnan**
VP SW Engineering
FORMULUS BLACK

**Gurmeet Goindi**
Master Product Manager
ORACLE

# Often Forgotten

**Andy Rudoff**
PM SW Architect
(intel)

- The Programming Model includes storage APIs



Use PM Like an SSD

Use PM Like an SSD (no page cache)

"DAX"

Optimized flush
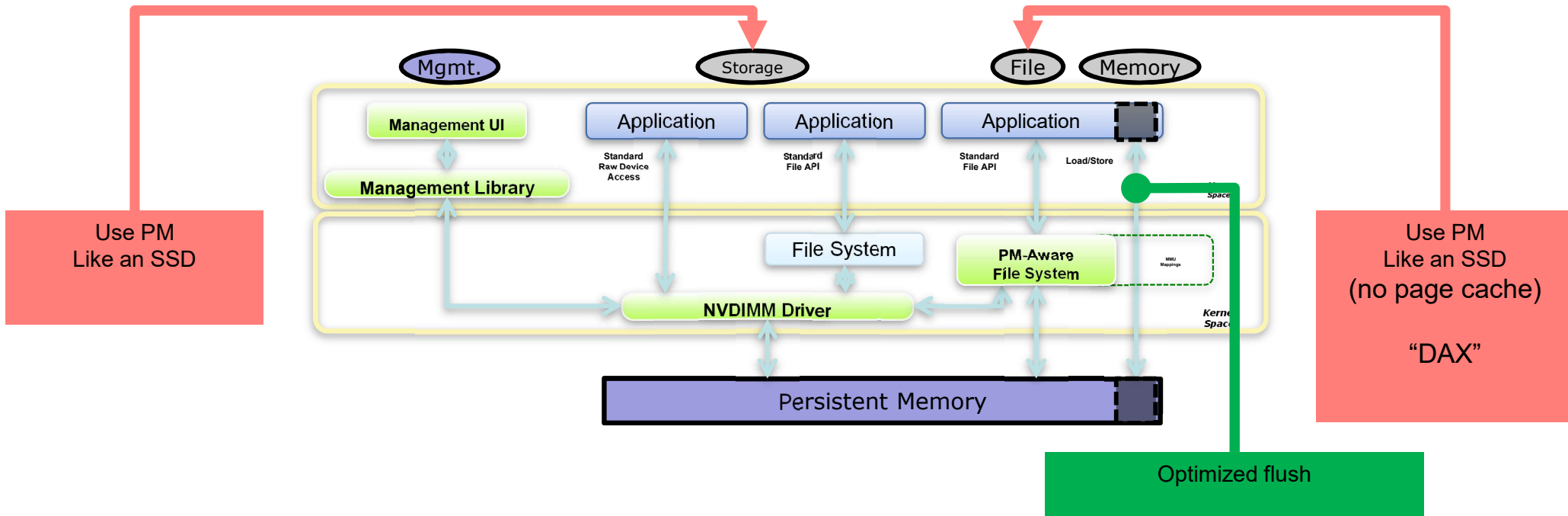
# Performance

**Pratap Subrahmanyam**
Fellow
**vm**ware®

## Memtier (rw=1:1, clients=1, threads=1, data size=1024)



Chart data labels:
- 71.490293
- 70.9739258
- 69.459043
- 68.9830023
- 58.8899707
- 58.2398047
- 58.3520313
- 44.6778906
- 36.658457
- 34.5463072
- 34.2918555
- 32.9825293
- 27.1019922
- 18.3175684
- 11.7958418 / 11.7953758
- 6.21651367
- 2.98945313

X-axis: 1, 4, 16, 64, 256, 1024

Legend: — C Redis SSD  — C Redis Pmem  — Go Redis

# Performance

**Pratap Subrahmanyam**
Fellow

Memtier (rw=1:1, clients=1, threads=1, data



— C Redis SSD　— C Redis Pmem　— Go Redis

FMS Persistent Memory Track Presented by:

# Using Memory as Storage Media

## Formulus Black

## Pradeep Balakrishnan

Who We Are

- We are a software startup HQ in Jersey City, NJ and team spread around US and India.

- What We Do

  - Our software, Forsa, enables memory to be easily and efficiently used as a high-performance storage media. Forsa can be used to power the most demanding application workloads and for developers seeking to minimize latency, maximize throughput, and scale without performance loss
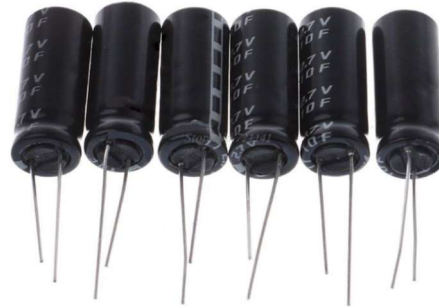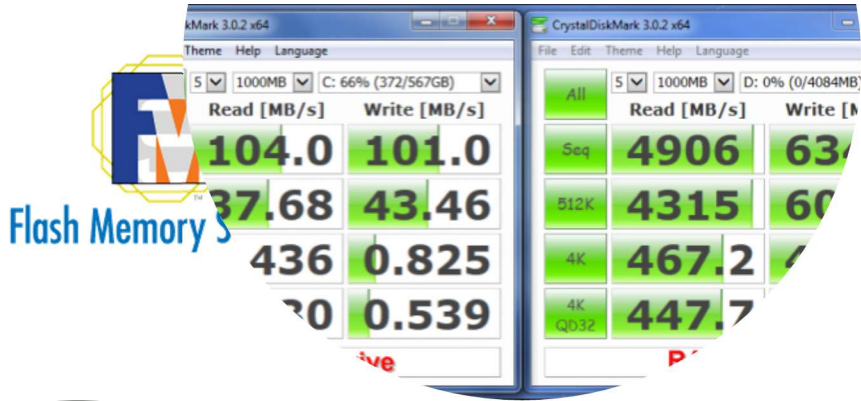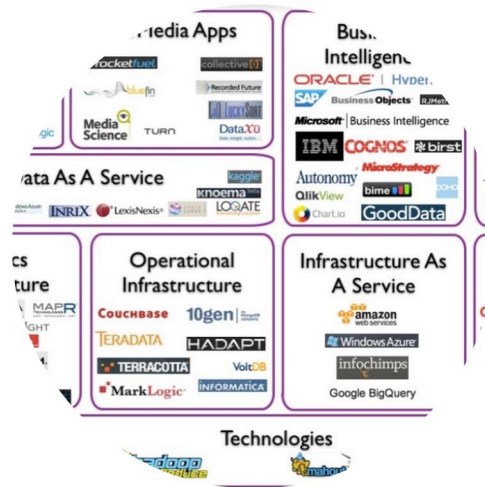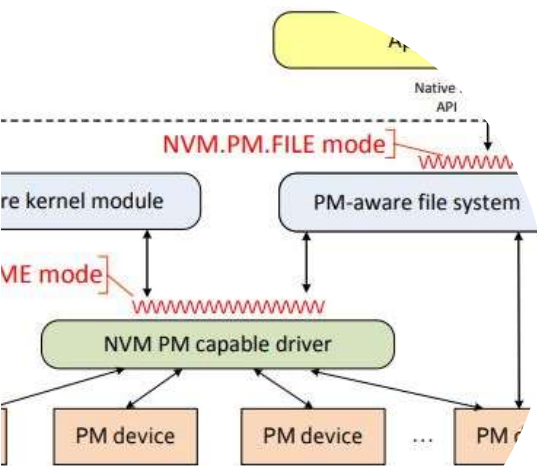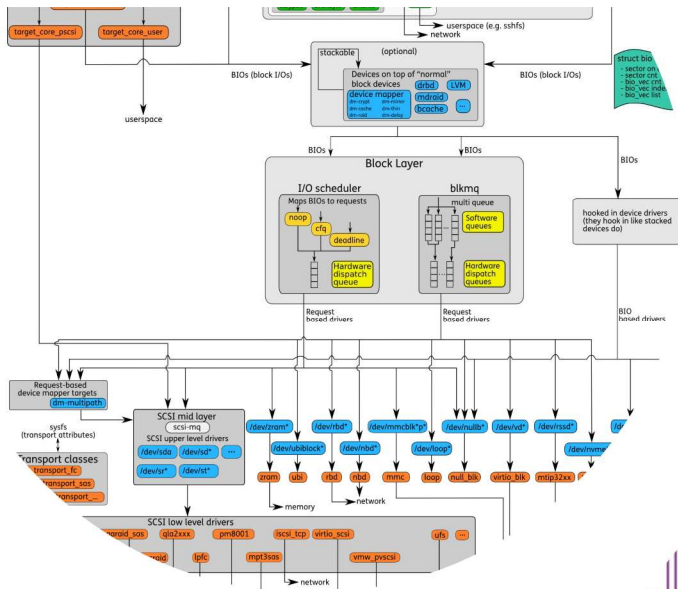
# Few Questions

What comes in your mind when we say using memory as storage?

Yes, you need hardware support…

DRAM, NvDIMM, or something else sitting in the memory channel or something with memory interfaces.

# More important…

- Software stack should be reconsidered
  - Programming models
  - Application APIs
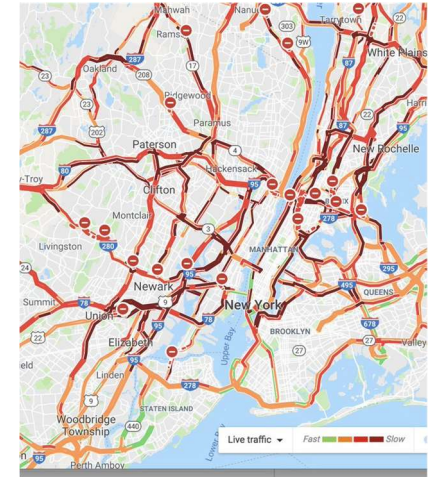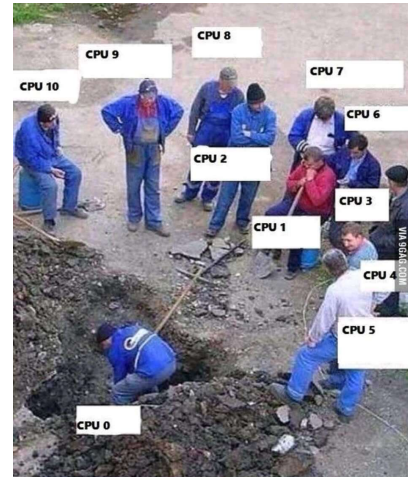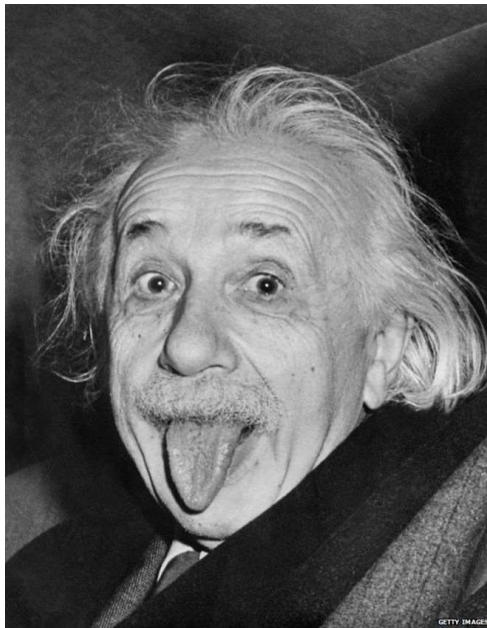  - Operating System IO path
  - Virtualization stack

- Using memory as storage media is not as simple as what we used to think about…

# Use it correct and efficient



- Thinking from CPUs instead of peripheral device
- Thinking from memory management more than IO
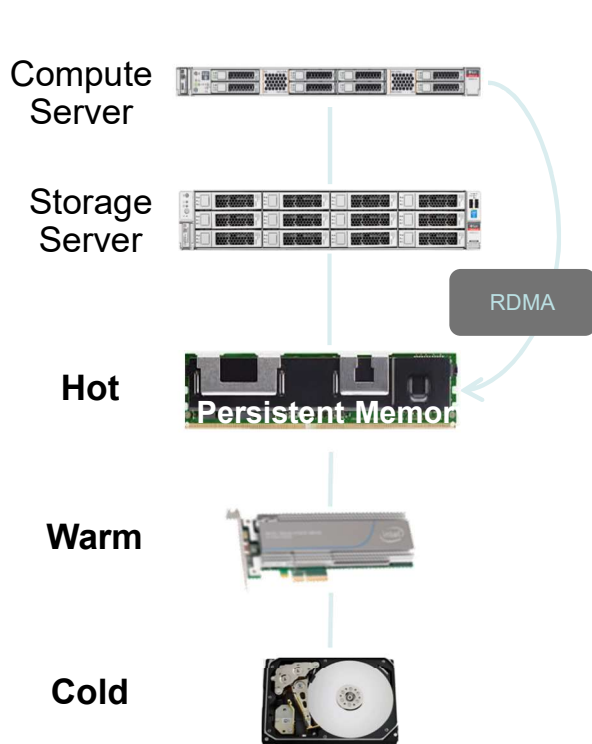- Till the end it is the story about *Time* and *Space*

# Persistent Memory in Oracle Exadata

## Gurmeet Goindi

## Master Product Manager, Exadata

# Preview: **Oracle Exadata – Persistent Memory Accelerator for** OLTP

Compute Server

Storage Server

RDMA

**Hot**
Persistent Memor

**Warm**

**Cold**

- Exadata Storage Servers will add Persistent Memory Accelerator in front of Flash memory

- **RDMA** bypasses the software stack, giving 10X faster access **latency** to remote Persistent Memory

- Persistent Memory mirrored across storage servers for fault-tolerance

- Persistent Memory used as a **shared cache** effectively increases its capacity 10x vs using it directly as expensive storage

- Log Writes will use RDMA to achieve super fast commits

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