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**MOSCONE WEST CENTER**

**SAN FRANCISCO, CA, USA**


# Enabling Best Practices For Design in Cloud

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# About Western Digital

- Western Digital is a data infrastructure company that provides hard-disk drives (HDDs), solid state drives (SSDs), fabrics, and storage platforms.
- Wherever you are, Western Digital is with you every step of the way. We are always at the cusp of innovation, pushing the boundaries of technology to make what you thought was once impossible, possible

Western Digital.

# Western Digital Case Study: 1 Million vCPU Cores

- The Challenge
  - Simulate More Elements for HDD Head Designs
  - Run at least 200K HPC Jobs per Hour
  - Insufficient Throughput with Existing On-Prem and Cloud Environments
  - Hit the limit at 80K CPU Cores in AWS Cloud
- The Solution
  - 1 Million vCPU Cores in AWS Cloud
  - 2.5 Million HPC Jobs in 8 Hours
  - 40K AWS EC2 Instances
  - Univa Grid Engine and AWS Batch for Workload Management
  - Spot Instances
  - Amazon S3 Storage

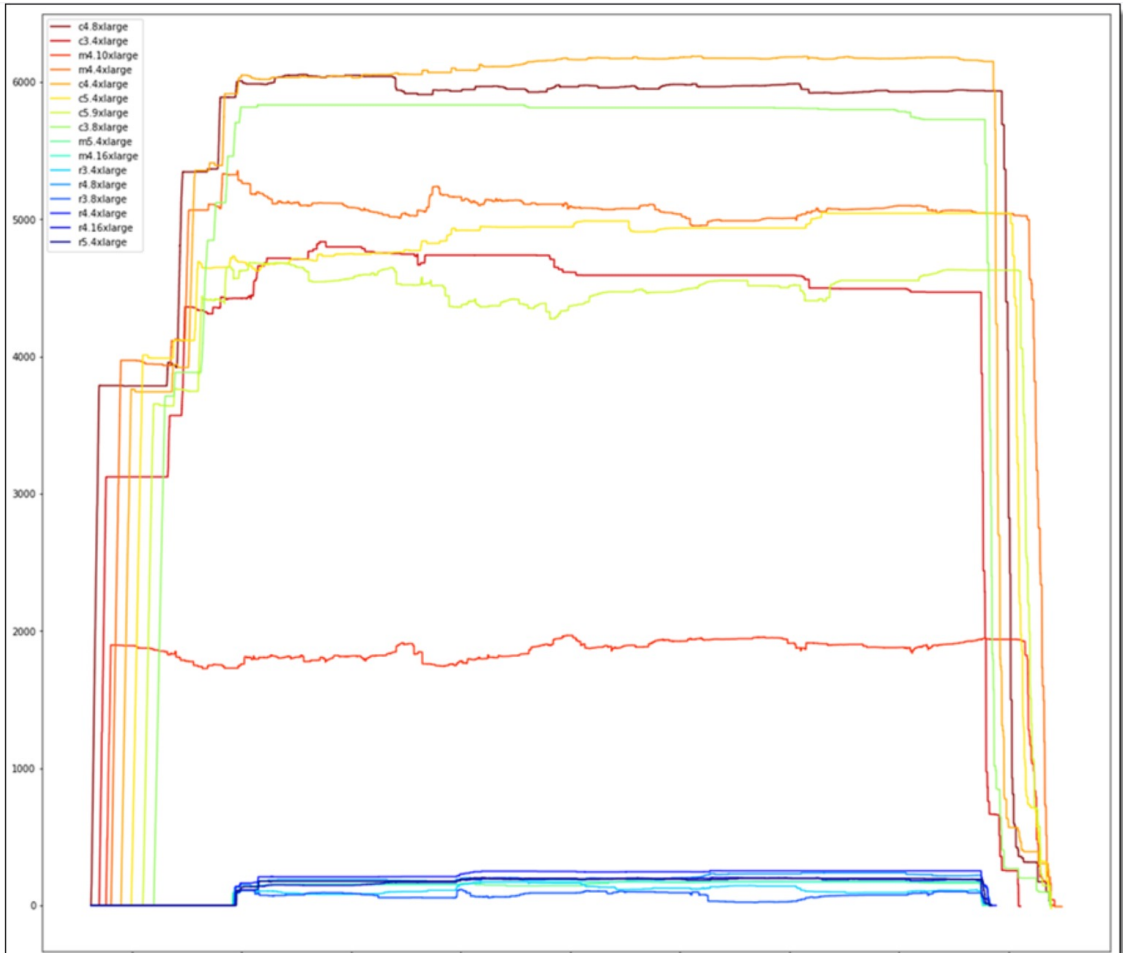

# Western Digital Case Study: 1 Million vCPU Cores

- The Details
  - Took 6 Weeks of Planning and Prep
  - Grew to 1 Million vCPU Cores in 1 Hour and 32 Minutes
  - Ran Full-Speed for 6 Hours
  - Each Task Ran for 2 to 3 Hours, Depending on Instance Type
  - HPC Tasks Checkpoint Themselves Every 15 Minutes to S3, In Case Instance Were Terminated
  - Used C, R and M-series AWS EC2 Instances
  - Spanned 6 Availability Zones in US East Region
  - During the 8-hour run, 1.5% of EC2 Instances were automatically replaced

# Western Digital Case Study: 1 Million vCPU Cores

- The Details
  - HPC Jobs Were Containerized
  - Too Fast for DNS, Used IP Address Instead to Dispatch Jobs to EC2 Instances
  - Open-Source and Home-Grown Tools
  - No Commercial Software Licenses Required
  - Used Ansible for Configuration Management
  - Used AWS Cloud Formation for Infrastructure Provisioning
  - Jobs Ran For 8 Hours and Cost $137,307 ($17,164 per hour)

# Western Digital Case Study: 1 Million vCPU Cores

# Western Digital Case Study: 1 Million vCPU Cores

- The Benefits:
  - Shrank 20 Days of Work in 8 Hours
  - Faster Time-to-Market
  - Ran 2.5 Million Tasks, using 1 million vCPUs, in only 8 hours
  - Cost Savings of 50% vs On-Prem
  - Agility: Would Take At Least 180 Days to Implement On-Prem
  - Extreme Scale, Power and Agility!!!

# Best Practices and Recommendations

- Cloud Strategy
  - Define Business Drivers
  - Consider Pay-per-use EDA Licenses
  - Evaluate Public Cloud Providers
  - Migration Approach
    - Lift and Shift
    - Re-Platform
  - Success Criteria

# Best Practices and Recommendations

- Modern and Resilient Design Cloud Platform
  - Components:
    - Blueprint and Code: Think before you build and translate design to code
    - Resilient Architecture: Auto-Recover when stressed by load or component failure
    - Observability and monitoring: Find what happened and why
- Auto-Scaling Infrastructure Framework
  - Grow and Shrink resources automatically
  - Configuration Management
  - Use of Cloud Agnostic Tools

# Best Practices and Recommendations

- Cloud Optimization
  - Right-Sizing
  - Cost Models:
    - On-Demand: Expensive but stable
    - Reserved or savings plans: Inexpensive vs on-demand but less flexible with fixed pricing
    - Spot: Can cost up to 90% less vs on-demand but can be unreliable
  - Cost Optimization Tools
  - Benefits:
    - Visibility
    - Reduce unnecessary costs
    - Boost Utilization

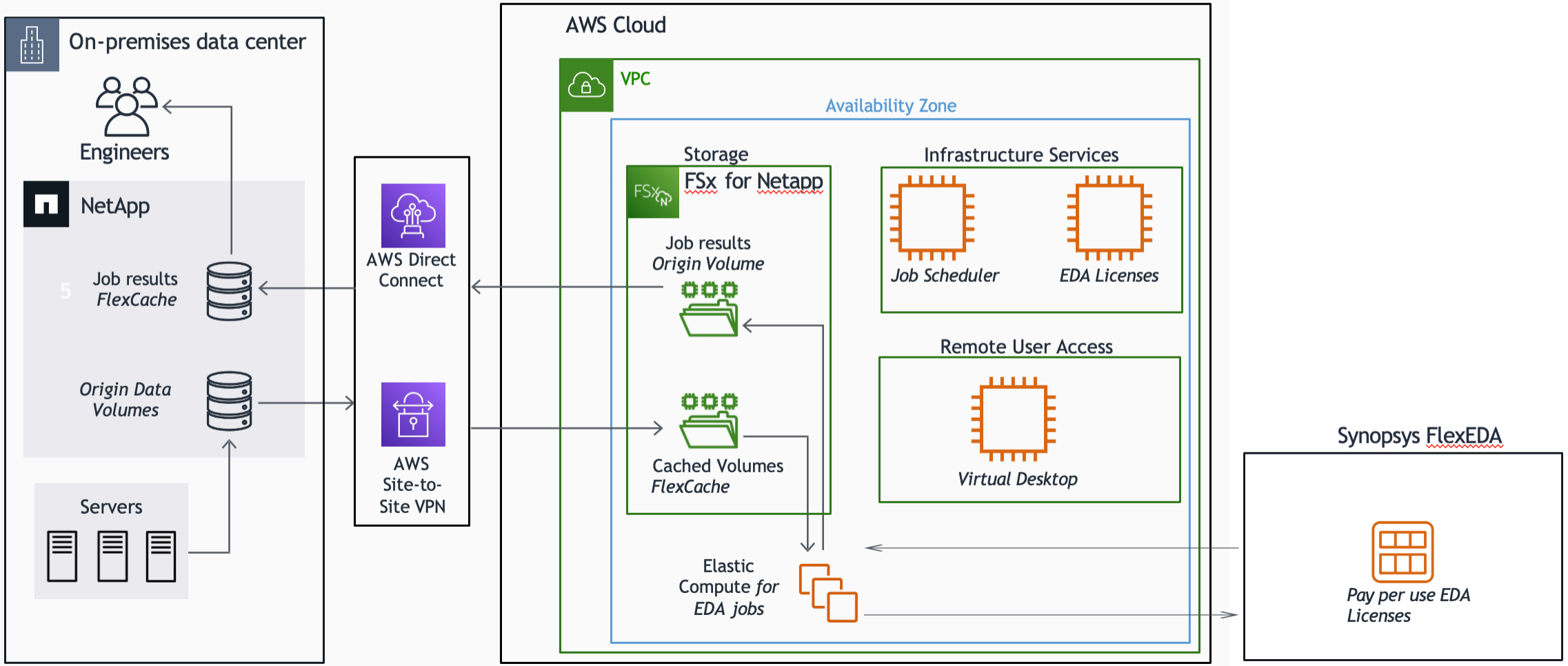
# Best Practices and Recommendations

- True Total Cost of Ownership
  - Calculate On-Prem Costs Before Migrating
  - Estimate Cost of Cloud Solution
  - Consider Intangible Cloud Benefits: Agility and Elasticity
  - Cloud Computing is not inherently cheaper than an on-premise model
  - Cloud adoption is rarely about pure cost savings
- Remote Data Caching Solution
  - Near instance access to remote data
  - Reduced storage costs
  - Multi-Cloud Flexibility

# Chip Design on a Hybrid Cloud

## Cloud-bursting with bidirectional caching of data

Pay as you go SAS Solution for EDA Licenses



# Summary

- Comprehensive Cloud Strategy
  - What business outcomes are you expecting?
  - Design for speed and business value
  - Full Workload Testing
- Crawl, Walk, Run
  - Identify and Plan
  - Design, Automate, Implement and Test
  - Adopt and Transition
- Accelerate Business Value
  - Drive Financial Accountability and Visibility
  - Optimize Cloud Usage and Cost Efficiency

# Thank you!

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