aws
FINANCIAL SERVICES
CLOUD SYMPOSIUM
MAY 4, 2021

aws FINANCIAL SERVICES
CLOUD SYMPOSIUM

FSI 102

# Morgan Stanley's journey to migrate its Equities Risk Workload to the AWS Cloud


**Vikas Chawla**

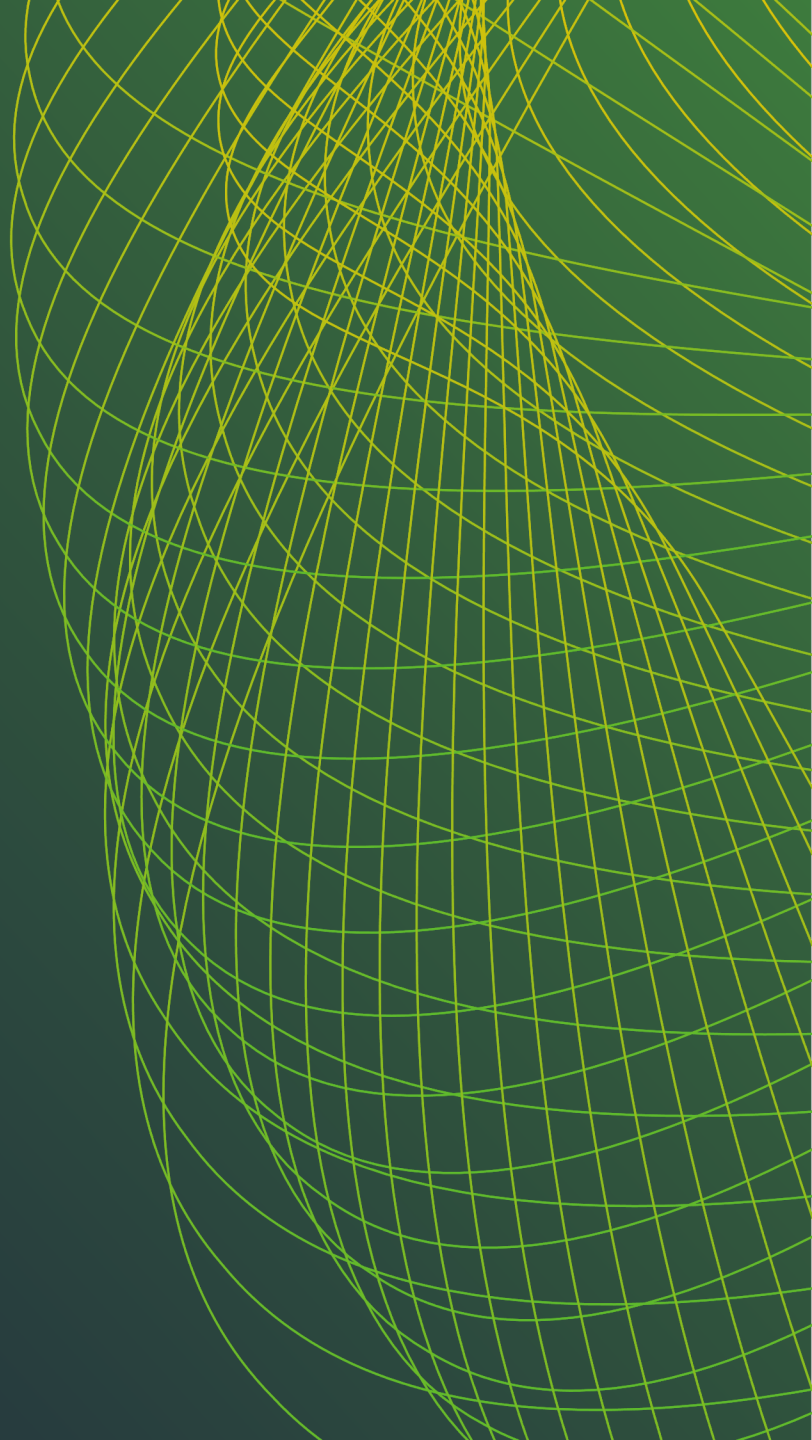
Executive Director

**Morgan Stanley | ENTERPRISE TECH & SERVICES**

**Anthony J. Galleno**

Principal Solutions Architect

**Amazon Web Services | Global Financial Services**

# Agenda

- Intro to High Performance Computing (HPC) on AWS
- Morgan Stanley's Equity Risk Grid Migration Journey
  - Fundamentals of HPC for Financial Services
  - Business Drivers for Equities Risk
  - Morgan Stanley's Key Cloud Principles
  - Equity Risk Architectural Overview
  - Lessons Learned
- FSI 102 Session Wrap-Up



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

FINANCIAL SERVICES
CLOUD SYMPOSIUM

# Introduction to HPC and Compute on the AWS Cloud

# Why run HPC on AWS?

Extensive infrastructure enabling scaling and agility not attainable on-premises

Instant access to latest technologies with no lengthy procurement cycles or big capital investments

Flexible configuration of options quickly iterate on resource selection and ensure cost optimization

© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Broadest and deepest compute options

## Categories

General purpose

Burstable

Compute intensive

Memory intensive

Storage (High I/O)

Dense storage

GPU compute

Graphics intensive

HPC

## Capabilities

Choice of processor
(AWS, Intel, AMD, and ARM – AWS Graviton)

Fast processors
(up to 4.5 GHz)

High memory footprint
(up to 24 TiB)

Object, Block, File and Instance storage
(S3, EBS, EFS, and FSx for Lustre)

Accelerated computing
(ASIC, GPUs and FPGA)

Enhanced Networking and EFA
(up to 400 Gbps)

## Pricing Options

*On-Demand Instances*

Pay for compute capacity by the second with no long-term commitments.

*Savings Plan & Reserved Instances*

Make a commitment and to save up to 72% off compute.

*Spot Instances*

Spare EC2 capacity at savings of up to 90% off On-Demand prices.

375+ Instance types for virtually every workload and business need



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Spot Fundamentals

## Spot infrastructure

Is **same** as On-Demand and RIs

**Up to 90% off**

## Spot pricing

Smooth, infrequent changes no spikes, more predictable

## Interruptions

Happen when On-Demand Instances needs capacity

## Diversify

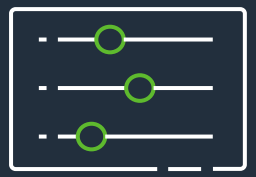
Choose different instance types, size and AZ in a single fleet



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

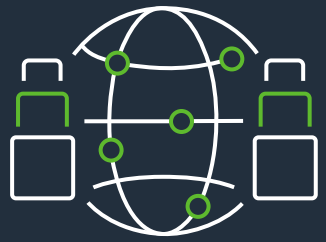
# Flexibility is key to successful EC2 Spot adoption

**Instance flexible**



**Time flexible**

**Region flexible**



Flexibility allows you access to the most Spot capacity to minimize interruption

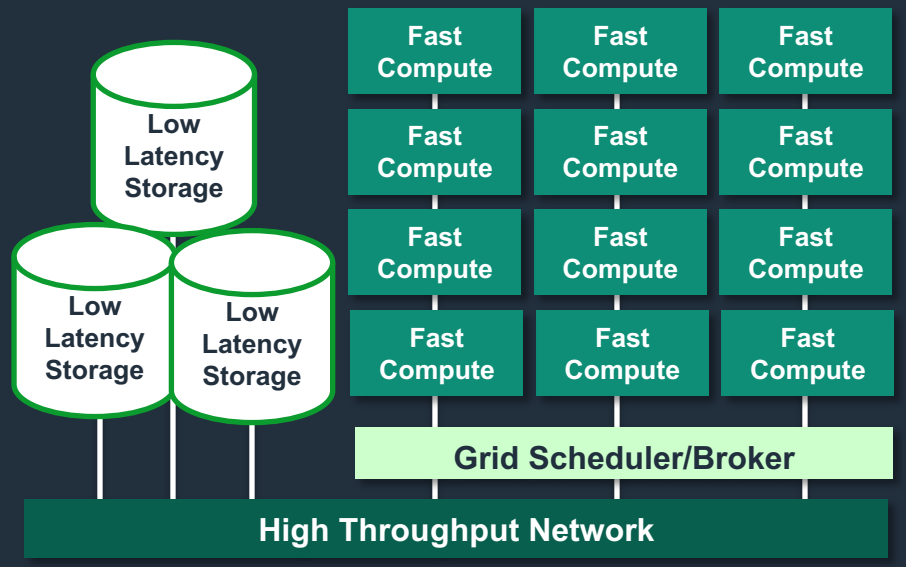


© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

FINANCIAL SERVICES
CLOUD SYMPOSIUM

# Morgan Stanley's Equity Risk Grid Migration Journey

# HPC Fundamentals for Financial Services




- Fast Compute
- High throughput networks
- Low latency storage
- Grid Scheduler/Broker
- Multi layered Caching



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Business Drivers for Equity Risk

- Value at Risk ( VaR)
- Large Variable Workload
- Variable start time but fixed end time
- Managing SLA and Capacity in times of volatility
- New Risk models based on market conditions
- New Business Capability



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Key Architecture Principles Leveraged - Cloud Native Approach

- Refactor the application to be cloud native

- Use Cloud native technology for all the components

- All infrastructure instantiation (Landing Zone, IAM, Guardrails, etc.) via Infrastructure as Code (IaC)

- Design the solution with emphasis on Security, Scalability and Reliability

- Design a blueprint which can be reused for similar applications

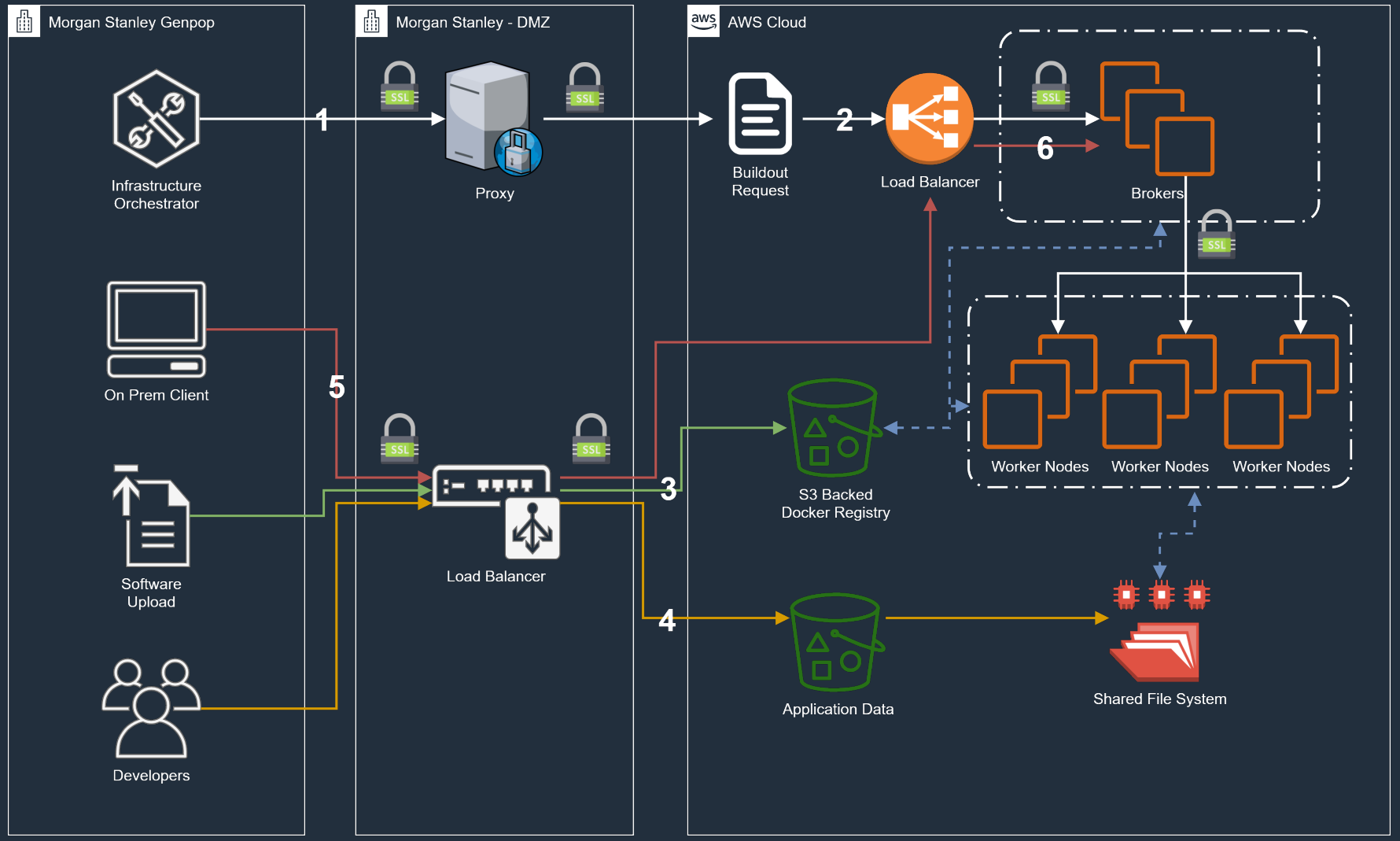
© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Key Architecture Principles Leveraged – Immutable Architecture

- Leverage EC2 Spot to optimize cost
- Re-create the entire compute environment weekly to ensure hygiene and repeatability
- Enforce SDLC and deploy code in multiple environments to maximize uptime
- Use Agile Iterative Strategy for incremental improvements
- Stability trumps agility

© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Equity Risk On Native EC2 - High-Level Architecture






© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

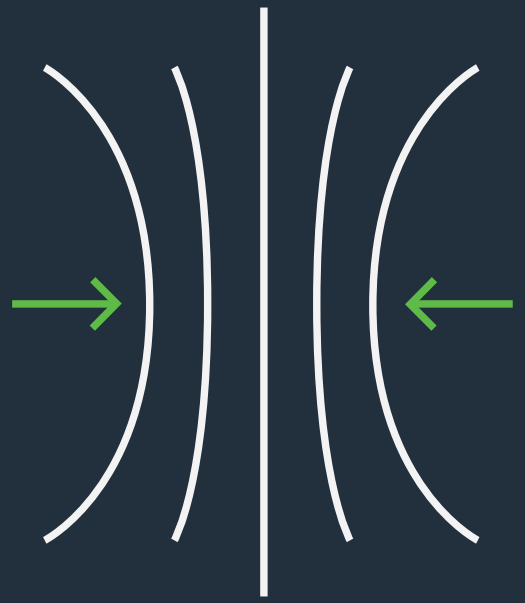
# Key Lessons Learned

- Scaling at MS level is non-trivial
- Dynamic nature of the cloud creates unexpected challenges
- Second Region took longer than expected
- Do not underestimate the time to implement security properly
- Fail Fast and change course rapidly
- Work closely with the AWS account team to solve the problems and influence the product roadmap



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Building for diversity and resilience



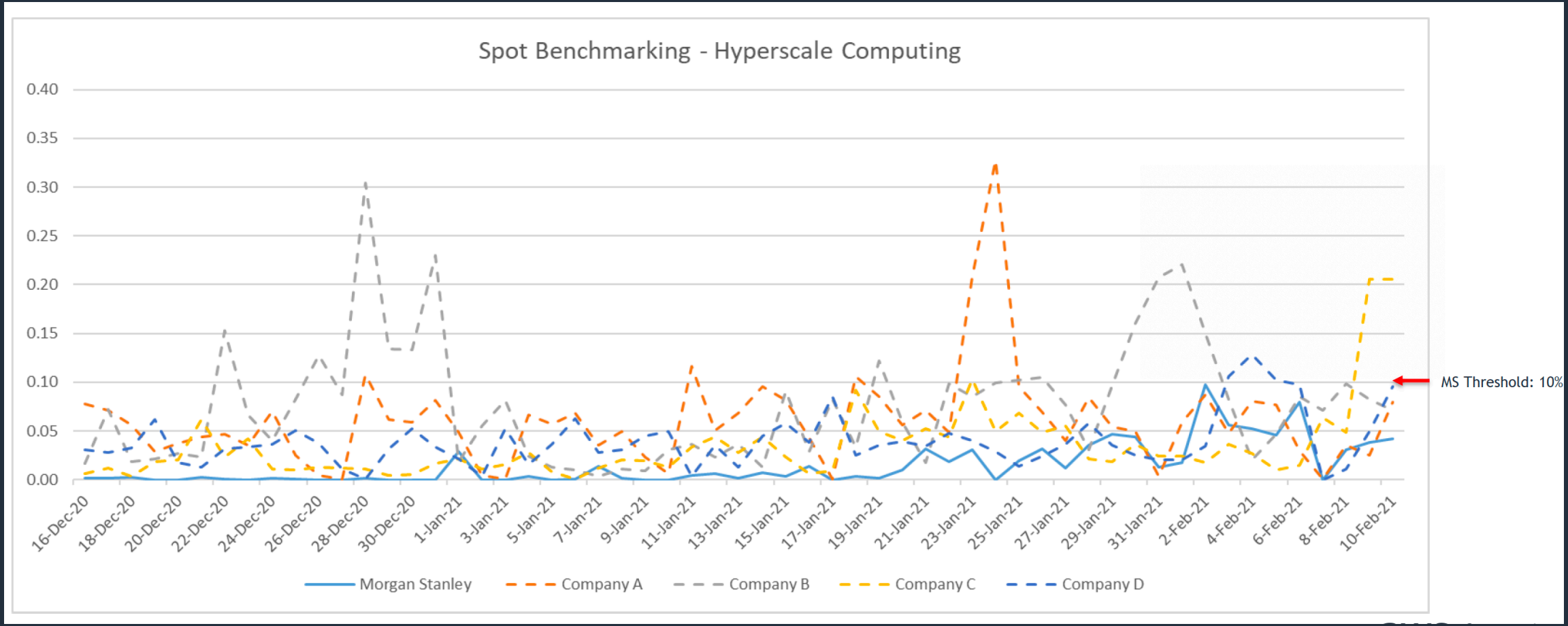
- Architecting to handle spot interruption
- Deploying across all the AZ’s
- Instance Diversity - Multiple instance types and chip families
- Choosing a Spot allocation strategy to minimize interruptions - Capacity-optimized allocation
- Deploying across multiple regions
- Eliminating Single Points of Failure



© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

# Handling Spot interruptions through instance diversification

Morgan Stanley have established themselves as one of the top AWS FSI Customers adopting our Spot best practices, in successfully implemented their instance diversification strategy.






© 2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.

FINANCIAL SERVICES
CLOUD SYMPOSIUM

# Thank you!

aws

FINANCIAL SERVICES
CLOUD SYMPOSIUM

# Please complete the session survey