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# Lockheed Martin's Journey to the Cloud

Jeff Morin, Lockheed Martin

Dan Zotter, Lockheed Martin

Session ID # 82404

# About the Speakers

## Jeff Morin

- Solution Architect, Lockheed Martin
- 30+ years experience with Lockheed Martin focused on manufacturing and IT.
- Avid snow skier

## Dan Zotter

- System Engineer, Lockheed Martin
- IT Professional with 30+ years experience managing internal business & operations systems, people and projects.
- Foodie

# Agenda

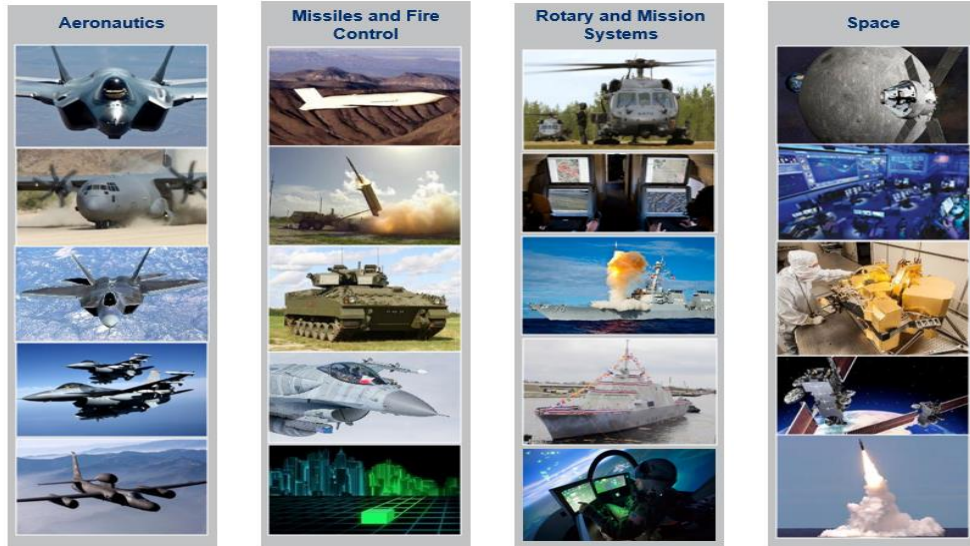
- About Lockheed Martin
- Cloud 101
- Lockheed Martin Cloud Experience and Plans
- Lessons Learned / Recommendations

# Lockheed Martin Corporation - Who Are We?



Your Mission is Ours.

Headquartered in Bethesda, Maryland, Lockheed Martin is a worldwide global security, aerospace and information technology company that is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services



LM International - Cross Business Capability Integration

**105,000**  
Employees



**54,000**  
Scientists and  
Engineers



**375+**  
Facilities  
Worldwide



Operating in over  
**54**  
Countries



With **7,500+**  
Employees

- **2018 Sales:** \$53.8 Billion
- **Backlog:** \$130.5 Billion
- **Stock Ticker Symbol**
  - LMT, on the New York Stock Exchange.
  - Ranked 59th on the 2018 *Fortune* 500 list industrial corporations

ASUG

# About SAP at Lockheed Martin

	Aeronautics	Rotary & Mission Systems	Missiles and Fire Control	Space	Enterprise Operations	International
Finance	✓	✓	✓	✓	✓	✓
Operations	✓	✓	✓	✓	✓	✓
Procurement	✓	✓	✓	✓	✓	✓
Analytics	✓	✓	✓	✓		✓
Learning	✓	✓	✓	✓	✓	✓

- 20+ Years experience with SAP applications
- Wide variety of SAP components deployed: ECC, S/4 (Central Finance), HANA, Portal, PI/XI, BW, GRC, IDM, BOBJ +
- Early HANA Adopter (2011)
- Deployment models: Primarily on premise with some SaaS and IaaS

# Agenda

- About Lockheed Martin
- **Cloud 101**
- Lockheed Martin Cloud Experience and Plans
- Lessons Learned / Recommendations



# Cloud 101 – Cloud Computing Model

## *Essential Characteristics*



## *Service Models*



## *Deployment Models*



- Source - National Institute of Standards and Technology (NIST) Special Publication 800-145

# Cloud 101 – IaaS and some AWS Terms

Model	Description	Examples
<b>Infrastructure as a Service (IaaS)</b>	The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).	AWS EC2 Azure Rackspace NS2

Source - National Institute of Standards and Technology (NIST) Special Publication 800-145

- Network ➔ Virtual Private Cloud (VPC)
- Compute ➔ Elastic Compute Cloud (EC2), Amazon Machine Image (AMI)
- Storage ➔ Simple Storage Service (S3), Elastic Block Store (EBS), Elastic File System (EFS), Glacier
- Security ➔ Security Groups



# Cloud 101 - SAP's Cloud Strategy

## Software as a Service (SaaS)

- SAP has invested heavily in acquisitions and organic development
- SaaS applications include Concur, Success Factors, Fieldglass and S/4 HANA Cloud

## Platform as a Service (PaaS)

- SAP CloudPlatform (SCP) is a PAAS Offering
- SCP services include SAP Web IDE, Analytics, Blockchain and HANA Service
- SCP is a cloud provider agnostic - Available on AWS, Azure and Google Cloud Platform

## Infrastructure as a Service (IaaS)

- SAP supports their applications on 7 different IaaS providers (see note 1380564)
- SAP is not a IaaS provider, but SAP NS2 provides managed services in cloud IaaS environments

***SAP has embraced all cloud service models!***

# Agenda

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# Lockheed Martin Cloud Journey

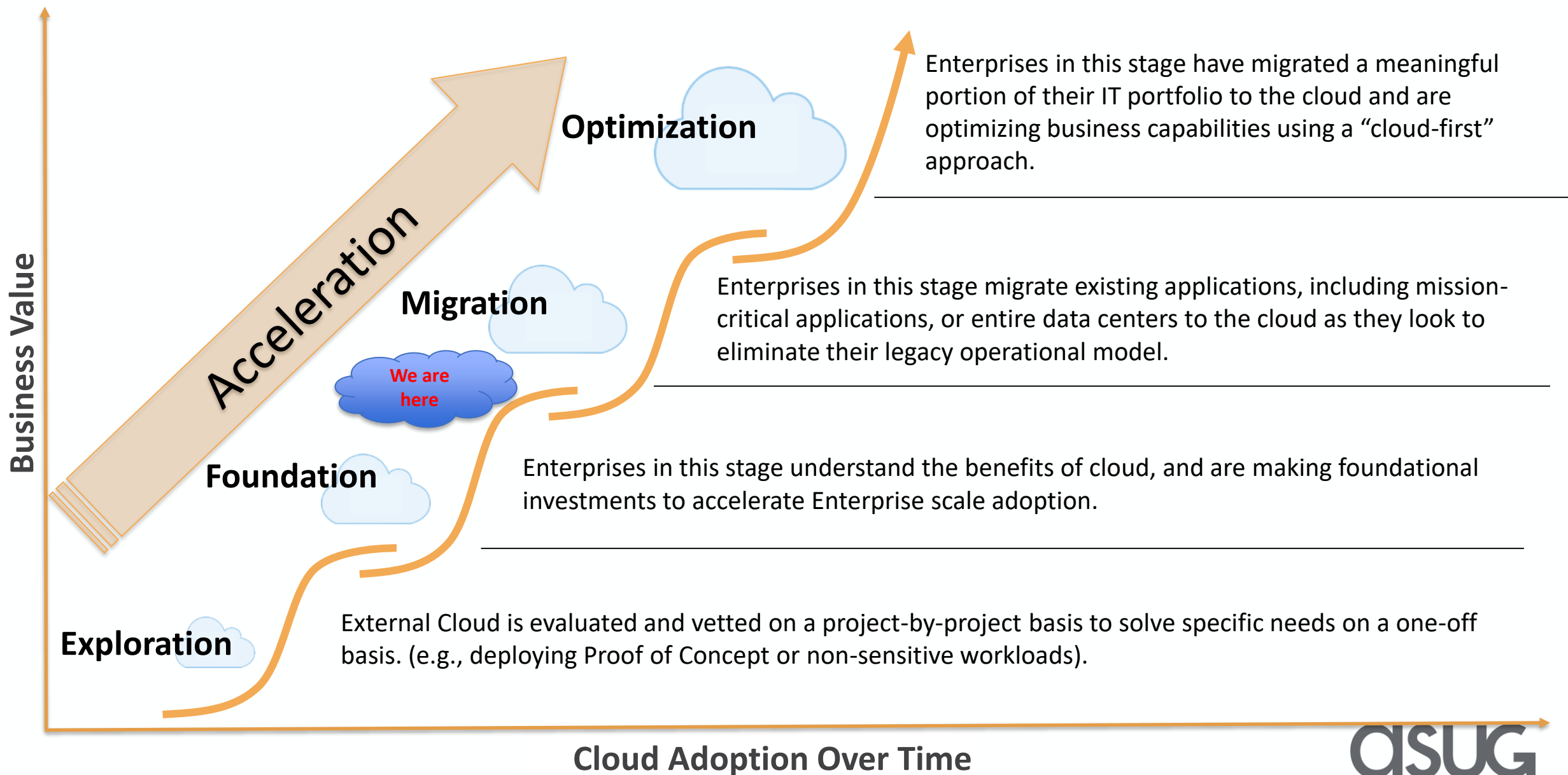
## Background

- As a U.S. defense contractor, IT security is paramount!
- Lockheed Martin historically has hosted most applications including SAP on premise
- Have adopted SaaS for less critical applications (SuccessFactors and Concur)
- Formed an enterprise cloud acceleration team to facilitate cloud adoption across Lockheed Martin
- Established a Lockheed Martin SAP Center of Expertise(COE) cloud team January 2018

## Currently

- Lockheed Martin SAP COE team has established Virtual Private Cloud's (VPC) in AWS U.S.-EAST and GovCloud for workloads involving sensitive and non-sensitive data
  - Deployed various SAP systems to AWS U.S.-EAST
  - Deployed 10+ ABAP with HANA SAP multi-tier landscapes to AWS GovCloud
  - Working to develop best practices and procedures for cloud hosting
- Hope to use cloud to augment on-premise capacity for workloads involving sensitive data

# Lockheed Martin Cloud Journey – Stages of Adoption



# Lockheed Martin Experience – SAP Cloud Team

- Team Mission Objectives
  - Establish a Lockheed Martin SAP environment in AWS Gov Cloud West
  - Develop architectures and processes to deploy SAP applications in AWS Gov Cloud
  - Move existing workloads off premise to AWS Gov Cloud
  - Fulfill new requests for SAP systems in AWS Gov Cloud
- Team Formed in January 2018
  - SAP Solution Architect
  - SAP Systems Architect
  - SAP Corporate Information Security
  - SAP Basis Analyst Architect
  - SAP Basis Analyst – On Premise
  - Database Admin – HANA
  - Database Admin – Oracle
  - Cloud Systems Architect
  - Cloud Systems Engineer

## Lockheed Martin Cloud Experience – AWS Public Cloud

- AWS Public Cloud – U.S. East
  - Basis New Hire Training Environment
- SAP Cloud Appliance Library (SAP CAL)
  - S/4 HANA 1610, 1709, 1809
  - Enterprise Threat Detection (ETD)
  - SAP Landscape Management (LaMa)

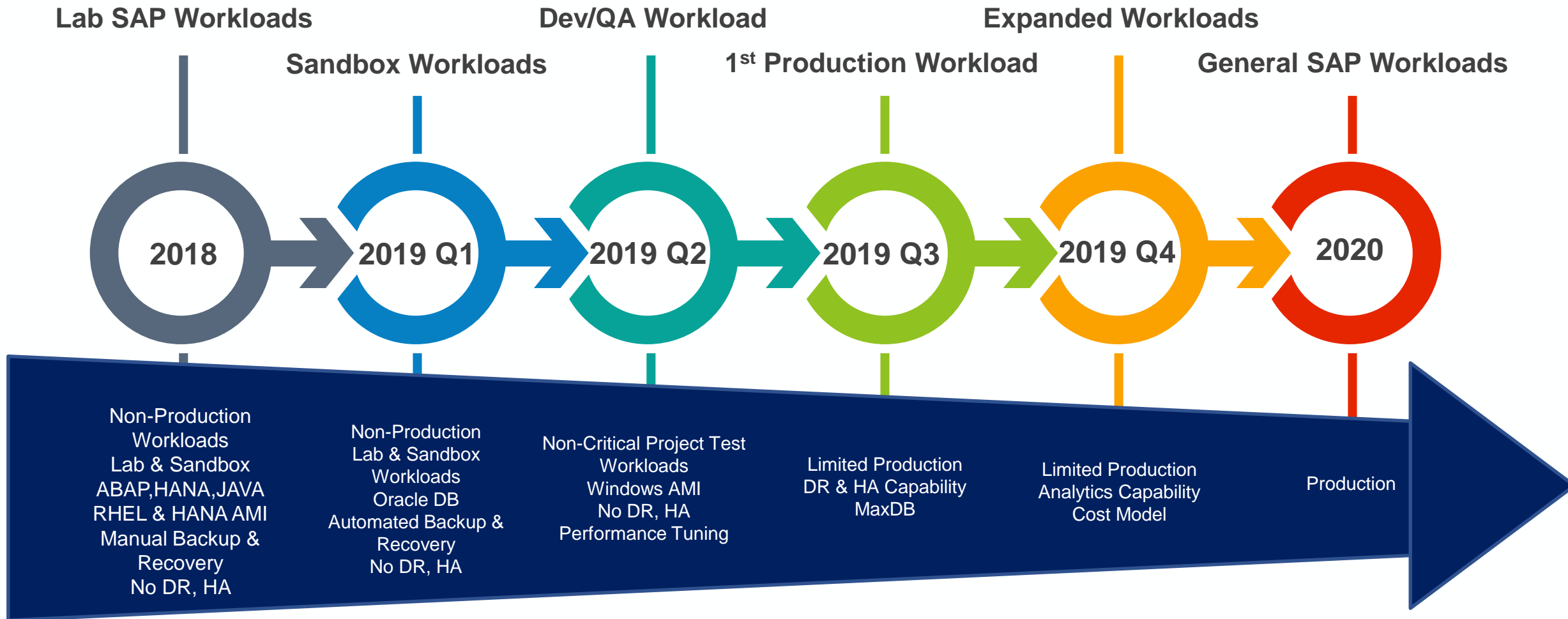


# Lockheed Martin Cloud Experience – AWS Gov Cloud West

- Non-Production VPC
  - 4 Tier, 5 System CHARM Test System
  - HANA Cockpit 2.0 Test System
  - SAP ETD Test System
  - S/4 HANA Central Code Check System
  - cFIN 1809 Proof of Concept System including SLT & SLD Environments
  - SAP Enable Now Proof of Concept Environment
  - Solution Manager Sandbox on RHEL 7.x & on HANA
  - SAP Net Weaver 7.5 Portal Sandbox Environment
  - Celonis Sandbox & Training System
- Production VPC
  - Currently being built out
  - First Production System 4 Tier Solution Manager Environment (3Q2019)

# Lockheed Martin -SAP Cloud Capabilities Roadmap

Progression to Maturity Over 2019



# Agenda

- About Lockheed Martin
- Cloud 101
- Lockheed Martin Cloud Experience and Plans
- **Lessons Learned / Recommendations**

# Lessons Learned and Recommendations

## Getting up to Speed

- Align SAP cloud vision with any existing cloud initiatives in your company
  - Seek to maximize re-use of company specific OS images & OS/DB scanning approach
  - Ideally leverage existing network connection from on-prem to cloud provider
  - Take advantage of lessons learned from deploying non-SAP workloads to the cloud
- Read up on cloud providers documentation especially SAP related
  - AWS probably most advanced for SAP IaaS
  - Began working with SAP in 2008 with production deployments of HANA available in 2014
  - See <https://aws.amazon.com/sap/whitepapers/> for a list of SAP related whitepapers from AWS
- Read the SAP notes related to running SAP applications in public cloud
  - Start with 1380654 - SAP support in public cloud environments
  - For each cloud public IaaS cloud provider supported SAP has specific notes on support requirements, supported applications, and supported instance types.
- Use SAP CAL to get some basic cloud experience
- Investigate free tier cloud services from AWS, Azure or Google for personal learning

# Lessons Learned and Recommendations

## General

- Be realistic about cloud capabilities (don't drink too much Kool-Aid!) and your companies readiness for cloud adoption
- Develop a plan to get from proof of concept to production in the cloud
  - Need to understand roles and responsibilities. Who will provision and patch instances?
  - Need to define future operating model in the cloud
- Be sure to understand different billing options (on-demand versus reserved) and impact on costs based on usage
  - Lower hourly rate for reserved instances, but no savings for shutting down instances
  - Cloud is not always cheaper than on-premise resources
- Need to determine network security model and governance
  - Role of VPC versus security groups
- Need to ensure adequate bandwidth and redundancy in place from on-prem to cloud
- Think about how to facilitate automation of application and DB software installation
  - Standardize on system numbers, host naming etc.
  - AWS allows for rapid provisioning of virtual machines, but application s/w needs to be installed
- Need to define HA/DR and backup/restore strategy in the cloud

# Lessons Learned and Recommendations

## Specific

- AWS does not patch operating systems for provisioned instances
  - Customer needs to take care of this
  - Lockheed Martin approach for patching needs to take into account the instance needs to be up during patching window
- Oracle supports running 11g R2 and 12c R1 only on Oracle Linux 6.4 or higher on AWS (see note 2358420)
  - Similar restriction on Azure for Linux OS(see note 2039619)
- Oracle database for SAP applications is not supported on AWS Relational Database Service (RDS) (see note 2358420)
- Not all AWS services available in all regions e.g. EFS (elastic file system service) was not initially available in AWS GovCloud
- EFS is good for sharing global file system directories (like /sapmnt or /usr/sap/trans),
  - Work around is deploy a NFS server
  - EFS should not be used for DB data or log files



# Lessons Learned and Recommendations

## Specific

- AWS announced the availability of 6, 9, and 12 TB instances for Fall 2018
  - Bare metal, but integrated into the AWS control panel
  - Current max virtualized EC2 size is 4 TB (x1e.32xlarge)
- Use Cloud Formation Template (CFT) to automate provisioning of EC2 instances
  - Have been able to automate HANA DB installation
  - SAP application is still a manual installation
- Hope to utilize security groups in AWS to improve network security
- AWS on-demand capacity not always available
  - We have had trouble on occasion provisioning EC2 instances due to insufficient capacity in AWS Gov Cloud West
  - Highlights the need to use reserved instances for a specific availability zone to ensure capacity in DR region

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# Presentation Materials

Access the slides from 2019 ASUG Annual Conference here:

<http://info.asug.com/2019-ac-slides>

# Q&A

For questions after this session, contact us at

[Jeff.morin@lmco.com](mailto:Jeff.morin@lmco.com)

[dan.zotter@lmco.com](mailto:dan.zotter@lmco.com)

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