

# **UbuntuNet Alliance**

# Amazon Web Services (AWS)

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# Agenda

- High Performance Computing (HPC) on AWS
- Addressing Data Security and Compliance
- Moodle on AWS
- Q&A Session





# **High Performance Computing on AWS**

Innovating without infrastructure constraints

# HPC impacts your life every day





### What if you could escape the bounds of on-premises?



# Why HPC on AWS?

Virtually unlimited 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 options quickly iterate resource selection and ensure cost optimization







Faster time to results



# AWS HPC continues to be recognized by the HPC community





#### Key services that enable HPC on AWS



#### Run your HPC workloads with the price performance you expect and the security you demand



Broad HPC partner community



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# Delivering performance where it matters The only benchmark that matters is your application

U.S. Naval Research Lab scaled its tightly-coupled weather codes on EFA-enabled Intel instances, beating all its other platforms



# Relay Therapeutics Uses AWS Services to Accelerate Drug Discovery

#### Challenge

Relay Therapeutics wanted to make it easy for scientists to virtually screen billions of molecular compounds in a shorter time frame than the months required by onpremises IT environments. It also wanted to reduce the cost of compute resources.

#### Solution

Relay Therapeutics takes advantage of Amazon EC2 Spot Instances for costeffective compute capacity and AWS Batch to help scale CPUs for virtual screen analysis. Scientists can rapidly analyze molecular data by using Amazon Athena.

#### Benefits

- Analyzes 5 billion molecular compounds in 1 day
- Reduces compute resource costs by 50%
- Enables scientists to easily run complex analysis

Company: Relay Therapeutics Industry: Healthcare Country: United States Employees: 125

#### **About Relay Therapeutics**

Based in Massachusetts, Relay Therapeutics is committed to creating medicines that have a transformative impact on patients. The company combines unprecedented computational power with leading-edge experimental approaches across structural biology, biophysics, chemistry, and biology.

Sorting a table with billions of rows is not a trivial exercise. By using AWS technologies, we can deal with all that information efficiently, which helps us strive toward our ultimate goal—getting medicines to patients faster than we previously thought possible.

- Pat Walters, Senior Vice President of Computation, Relay Therapeutics

# Flexible compute options and purchase models optimize price performance

#### Flexible compute to maximize performance Flexible pricing models to optimize





#### **On-Demand**



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.









# Addressing Data Security and Compliance Sub-Sahara Africa

# Regulatory view and challenges

# Regional breakdown

- East, West and Southern Africa
- Varied Maturity of regulations/regulators
- FSI most active in leading regulations
- Regulatory Themes and Challenges
  - Data Residency, Sovereignty and Localisation(ambiguity in understanding differences)
  - Contractual obligations (exit clauses, vendor lock-in protection)
  - Critical Infrastructure / Resiliency starting to be a talking point



# **Regulatory Challenges**

- Hard Blockers Long term challenges
  - Data sovereignty and or localization absolute no cloud/outsourcing allowed
  - Regulatory regime and laws not in-place, missing or outstanding
    - Laws are written and tabled/signed without public consultation
    - Not aligned to AU/ITU declarations
    - Not aligned to International standards/best practices

# • Soft Blockers and issues – managed through engagement

- Data Residency and Localization
  - Ambiguity in regulations
  - Lack of education

• Arduous registration/notification processes for approval



# What is Data Residency, Sovereignty and Localization?



#### Data Residency

The requirement as to where all/some customer content be processed and stored in an IT system that remains within a specific locality's borders(geographical location)

#### Data Sovereignty



The control and governance over who can and cannot have legal access to data, its location and usage

#### **Data Localization**



The strictest version of data residency predicated on legal obligations. Requires that a copy of such data be held within the country's borders, usually to guarantee the relevant government access



# Traditional Shared Responsibility Model





# Extending model to address requirements



# **Compliance of the Cloud**

Certifications / Attestations		
C5	<b>V</b>	
Cyber Essentials Plus		
DoD SRG		
FedRAMP		
FIPS	<b>I</b>	
IRAP	<b>*</b>	
ISO 9001	$\bullet$	
ISO 27001		
ISO 27017		
ISO 27018		
K-ISMS	$\mathbf{v}$	
MTCS	<b>1</b>	
PCI DSS Level 1		
SEC Rule 17-a-4(f)		
SOC 1, SOC 2, SOC 3		

#### Laws / Regulations / Privacy

**E** 

gentina Data Privacy
SISPE
U Model Clauses
ERPA
SDPR
GLBA
IIPAA
IITECH
RS 1075
TAR
1y Number Act IK DPA - 1988
PAT/Section 508
Pata Protection Directive
rivacy Act [Australia]
rivacy Act [New Zealand]
DPA—2010 [Malaysia]
DPA—2012 [Singapore]
IPEDA [Canada]
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#### Alignments / Frameworks

CIS (Center for Internet Security)	
CJIS (US FBI)	
CSA (Cloud Security Alliance)	
ENS High	<b></b>
EU-US Privacy Shield	
FFIEC	
FISC	
FISMA	
G-Cloud	
GxP (US FDA CFR 21 Part 11) ICREA	
IT Grundschutz	<b>I</b>
MITA 3.0 (US Medicaid)	
MPAA	
NIST	
PHR	
Uptime Institute Tiers	
Cloud Security Principles	

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# **Compliance Attestation**



#### The AWS Artifact tool supports increased transparency

#### What is it?

A globally available, no-cost portal that provides on-demand access to AWS' most recent external security and compliance certifications.

## • Information on AWS policies, processes, and controls

- **Documentation** of controls relevant to specific AWS services
- Validation that AWS controls are operating effectively

#### How does it work?

Customers can review reports, align AWS controls to their own control frameworks, and use the reports to verify that AWS controls are operating effectively.

#### **Global Certifications & Attestations**





#### AWS Global Infrastructure – Resiliency built-in 26 geographical regions, 84 Availability zones, 310+ POPs, 16 Local Zones

#### Region & Number of Availability Zones (AZs)

Europe

Frankfurt (3), Paris (3), <u>Ireland (3), Stock</u>holm (3),

London (3), Milan (3)

Middle East

Bahrain (3)

**Asia Pacific** 

GovCloud (US) US-East (3), US-West (3)

**US West** Oregon (4) Northern California (3)

**US East** N. Virginia (6), Ohio (3)

Canada Central (2)

South America São Paulo (3)

Africa Cape Town (3) **China** Beijing (2), Ningxia (3)

Hong Kong (3)

Singapore (3), Sydney (3), Tokyo (4), Osaka-Local (1)\* Seoul (3), Mumbai (3),

#### Announced Regions

Three Regions and 9 AZs in Indonesia, Japan, and Spain





# AWS Region design

AWS Regions are comprised of multiple Availability Zones (AZs) for high availability, high scalability, and high fault tolerance. Applications and data are replicated in real time and consistent in the different AZs.





# Meet the highest standard of data security



Meet data residency requirements Choose an AWS Region and AWS will not replicate it elsewhere unless you choose to do so



Encryption at scale with keys managed by our AWS Key Management Service (KMS) or managing your own encryption keys with AWS CloudHSM using FIPS 140-2 Level 3 validated HSMs



Comply with local data privacy laws by controlling who can access content, its lifecycle, and disposal



Access services and tools that enable you to build compliant infrastructure on top of AWS



# Education for regulators is key



# Using Encryption On AWSUbiquitousAWS KMSHigh<br/>StandardsImage: Colspan="2">Optimized of the second o



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A Region is a physical location in the world where we have multiple Availability Zones.



Availability Zones consist of one or more discrete data centers, each with redundant power, networking, and connectivity, housed in separate facilities.

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#### Security & Compliance requirements can be divided in 4 main categories: AWS offerings cover everything required to build and operate secure environments



#### Contract compliance

- Non-disclosure agreement (NDA) usual starting basis
- AWS Customer Agreement (CA) and AWS Service Level Agreements (SLA) provide foundational layer
- AWS Enterprise Agreement (EA)
- The EA links to our online Service Terms, which include a GDPR compatible Data Processing Agreement (DPA) and the Supplementary Addendum to the AWS GDPR Fata Processing Addendum
- AWS Financial & Insurance Services Addendum (FISA) provides necessary provisions to cover regulatory requirements of regulated banks and insurances



#### OF the cloud compliance

- AWS Compliance Programs and 3rd party attestations review & continious monitoring
- (Customer's) own control framework mapped to AWS controls
- Compliance briefing conducteded
- CSP-/ Vendor due diligence
  conducted and documented
- Internal audit (IT) involved & further potential need for audit evaluated



#### IN the cloud compliance

- Cloud review and approval process
  defined and enabled
- Core infrastructure enabled and landing zone implemented
- Cloud project roadmap defined, specified, and initiated
- AWS Well-Architected Framework
  Reviews performed
- Support and reviews with AWS experts conducted (e.g. Compliance Specialists, Security Solutions Architects, and Security Assurance professionals)



#### Other compliance topics

- Strategy definition and documentation
- Training
- Risk & materiality assessments
- Change management
- Maturity of control framework
- Regulatory notification/ approval processes
- BCM plan and Exit Strategy

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Enterprise Support





# Moodle on AWS

# Institutions want to move faster



Old World: Infrastructure adapted in WEEKS/MONTHS





Add new dev environment Add new prod environment Add new environment in Ohio Add 1,000 servers Remove 1,000 servers Deploy 1 PB data warehouse Shut down 1 PB data warehouse



A new level of agility transforms IT's ability to support student success



# Challenges for Moodle On-Premise



- Usage of LMS such as Moodle is seasonal and will normally peaked at events such as student registrations, online learnings and online exams
- Most learning institutions are experiencing challenges with their on-premise LMS:
  - Current On-Premise Infrastructure failed miserably to cope with the surge of demand with online learning
  - Expensive Up-front Investment on hardware and customer don't know how much to invest
  - Aging Hardware leading to reliability issues
  - Lack of IT staffs to support with the sudden surge of demand



# Why Customers are running Moodle on AWS



- Proven Technology AWS has the most proven operational & security cloud platform
- Highly Scalable Scale to meet the different demands of business users
- **Highly Available** Able to provide high availability of systems that is able to withstand various failure situations
- Highly Secure Highly Proven security platform with sophisticated security defense controls to protect business privacy requirements
- Low TCO Variable expense without capital upfront, Pay for What You Need



# **Reference Architecture** This reference architecture simplifies the complexity of deploying a scalable and highly available Moodle site on AWS.

#### **Moodle Hosting**

How to run Moodle on AWS

Moodle is a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments.. This reference architecture simplifies the complexity of deploying a scalable and highly available Moodle site on AWS.



#### **AWS Reference Architectures**

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# Moodle Demo



# Questions

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