
AWS
re:Invent

ARC214

Surviving success: COVID-19, Blackboard's black swan event

Gavin Llewellyn
Staff Software Engineer
Blackboard

Brian Carlson
Operational Excellence Pillar Lead
AWS

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“You may not be able to predict an event, but that does not mean you cannot be prepared for it.”

-unattributed

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Agenda

Blackboard

- Who is Blackboard?
- Move to the cloud
- Rapid evolution

Surviving success

- Blackboard in March
- Reactive to proactive
- Adapting to 90x



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Who is Blackboard?



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Blackboard is a leading EdTech company, serving higher education, K–12, business, and government clients in every region of the world

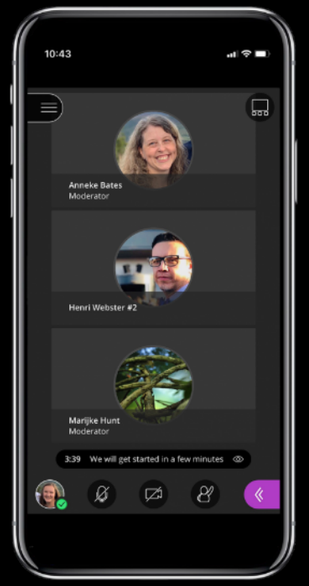
Blackboard connects a deep understanding of education with the power of technology to continuously push the boundaries of learning



Blackboard virtual classrooms

Learn

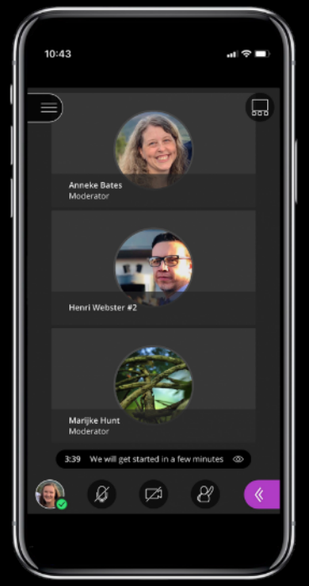




Blackboard virtual classrooms

Collaborate





Moving to the AWS Cloud



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Blackboard's move to AWS

Motivations

- Scale without capital expense
- Business agility
- Leveraging a **cloud provider** with **deep experience**

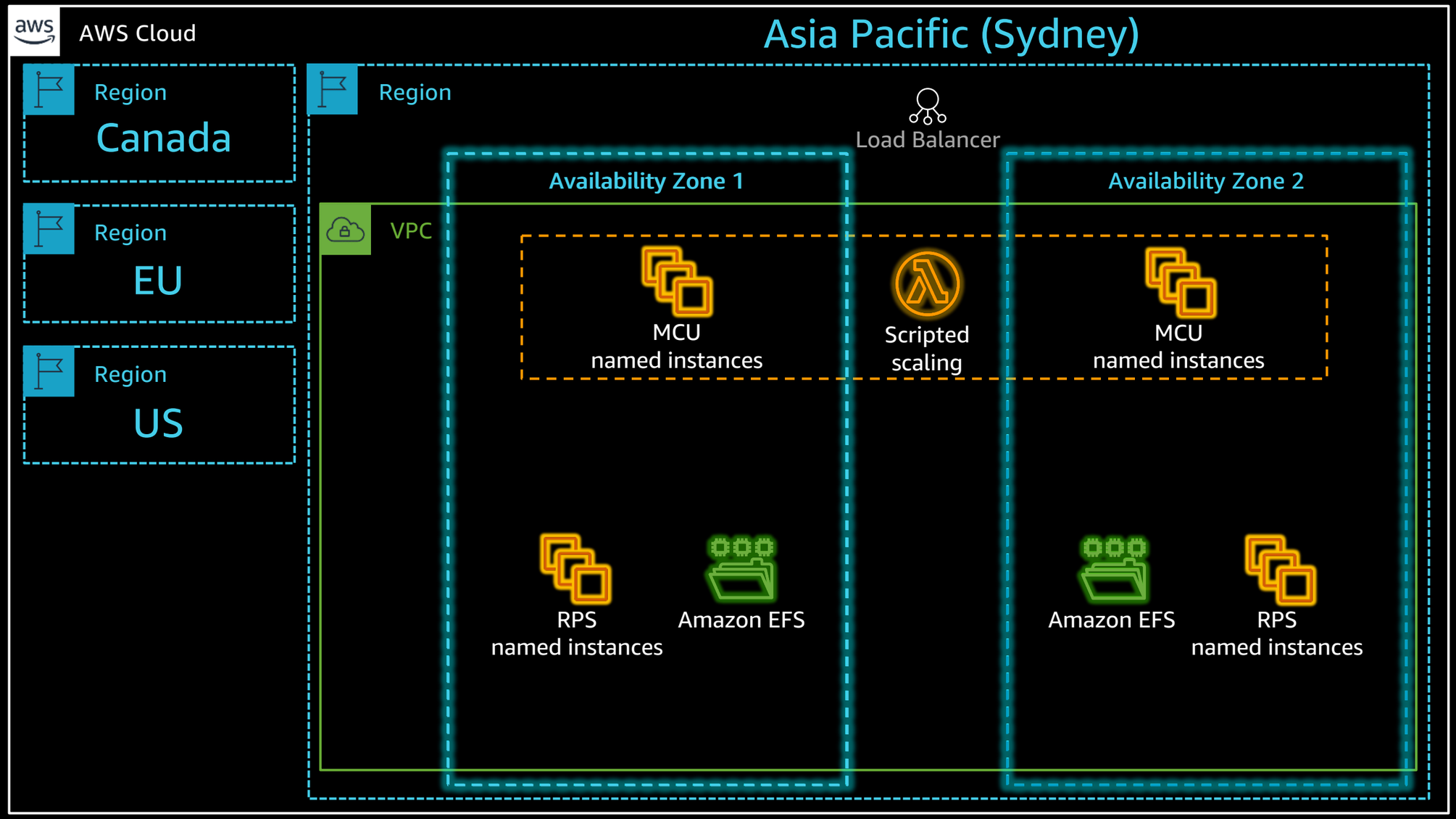
Initial architecture

- Multi-account
- Multi-AZ
- Native systems
- Amazon Elastic File System replacing NFS
- Four initial regions

Approach

- Focused resources
- Migration with **minimal disruption**

Collaborate architecture after migration



Rapid evolution on the AWS Cloud



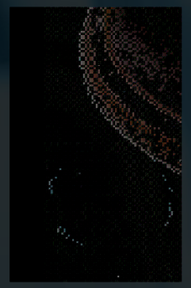
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Rapid iteration and large improvements

Media Conferencing Units

- Take advantage of the newest instance types
- Manage MCU instances with **Immutable** AMIs
- Configuration management for regional uniqueness
- Manage MCU capacity with AWS Auto Scaling





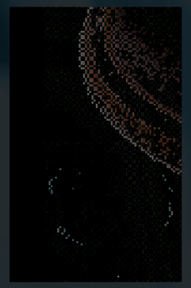




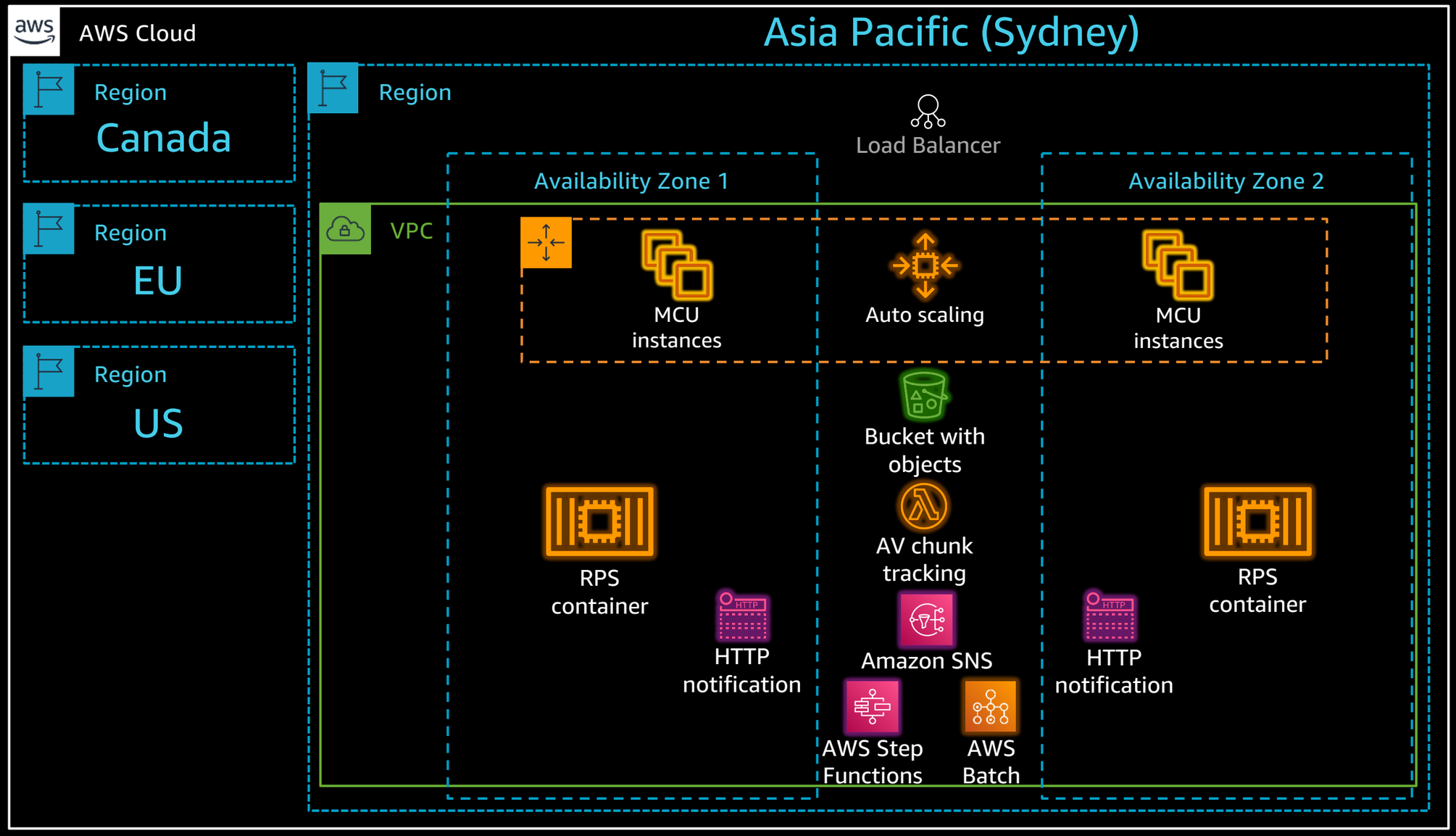
Rapid iteration and large improvements

Recording Processing System

- Serverless approach
- AWS Lambda
- AWS Batch
- Amazon
  Elastic Container Service
- Event based process using
  Amazon SNS
- Migration to Amazon S3



Collaborate architecture after evolution



Blackboard in March

Start of the new school year in the Southern Hemisphere



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“We must stop, contain, control, delay and reduce the impact of this virus at every opportunity.”

World Health Organization

March 7, 2020 statement

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Reactive

- **10x** increase in usage
- AWS IEM
- Hitting service limits
- Hitting API limits

Teams united and collaborated



Proactive

- Microservices – will they scale?
- VPC definition and subnet size
- Amazon RDS maxing out IOPS
- Redis concerns
- **50x**

“We are providing their classroom”

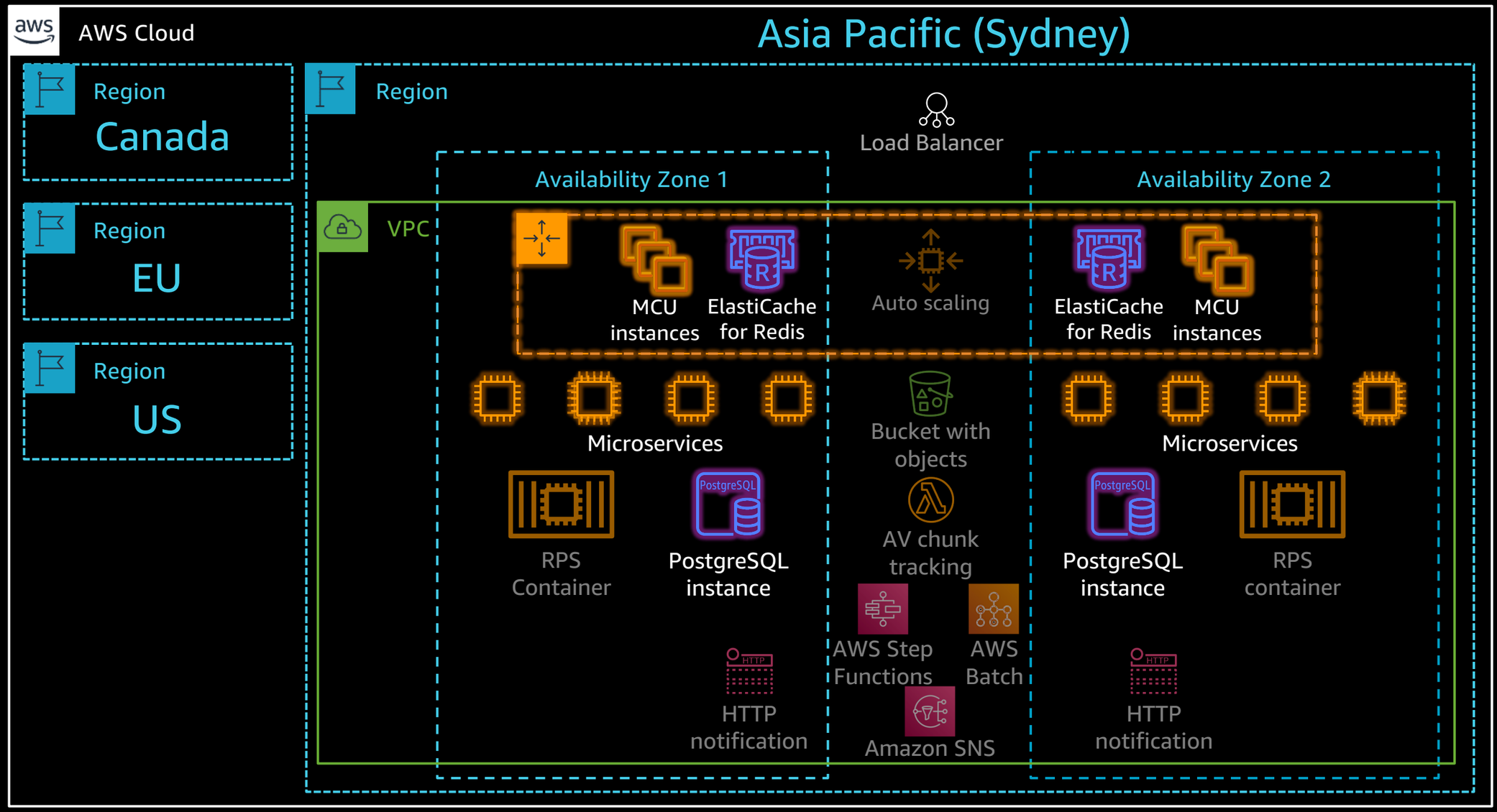


Feb March April May June

How to survive success

Challenge	Solution
Massive increase in utilization	People and architecture
What might break?	Monitoring to guide action Failure Mode analysis **Removing sources of failure**
Capacity	Limit increases Auto scaling Manual scaling Instance diversity Provisioned IOPS Cache

Collaborate architecture after the initial surge



Adapting to 90x Start of the new school year in the Northern Hemisphere

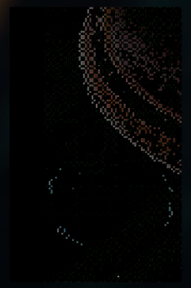


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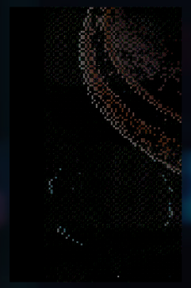
Supported, stable, and scaling

- ChatOps - chat based event notification, and collaboration
- Postgres RDS - Tuned Provisioned IOPS
- Redis - Clusters with sharding for horizontal scaling
- MCU - **Predictive** Auto scaling

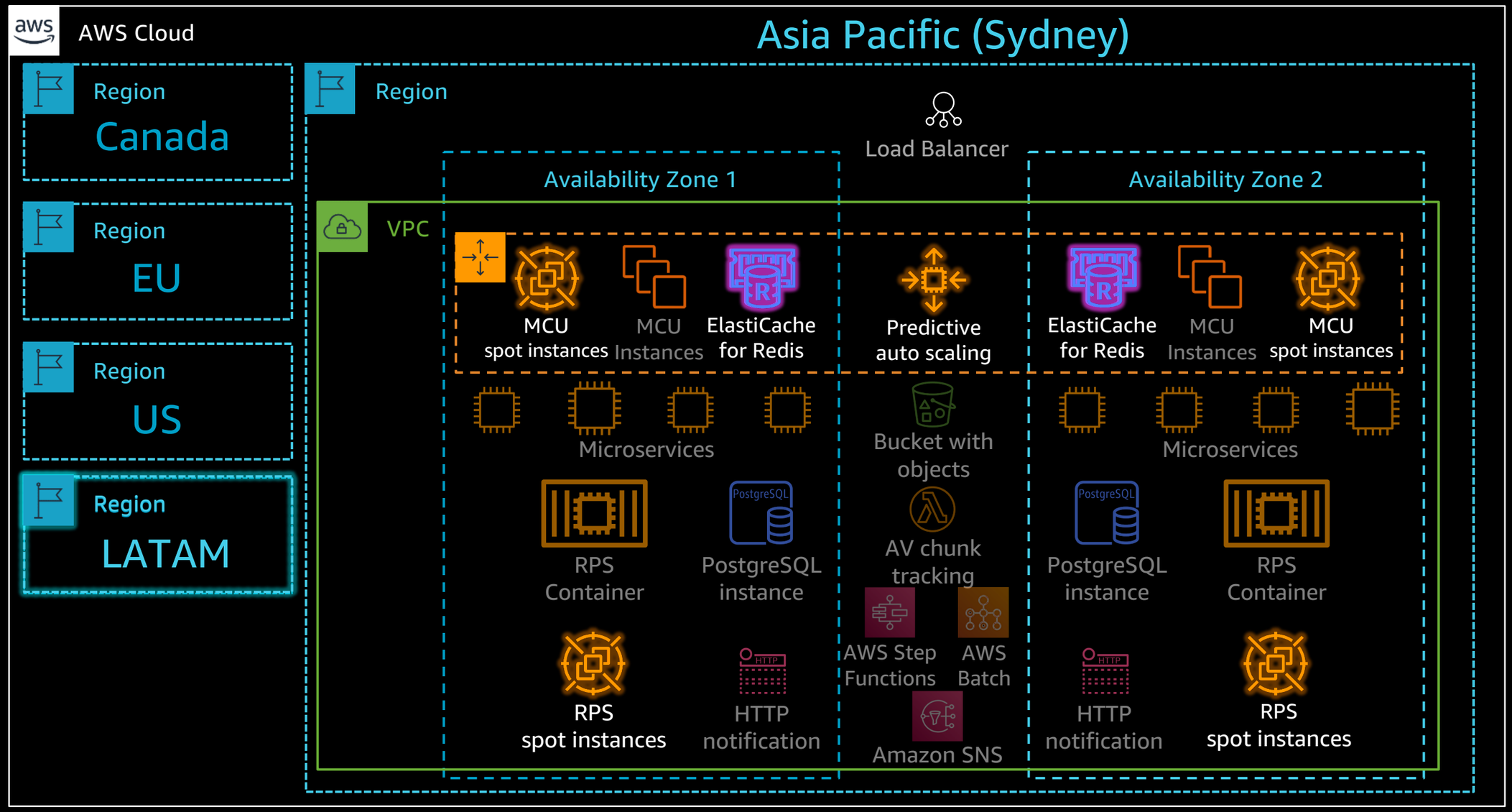


Cost Optimization

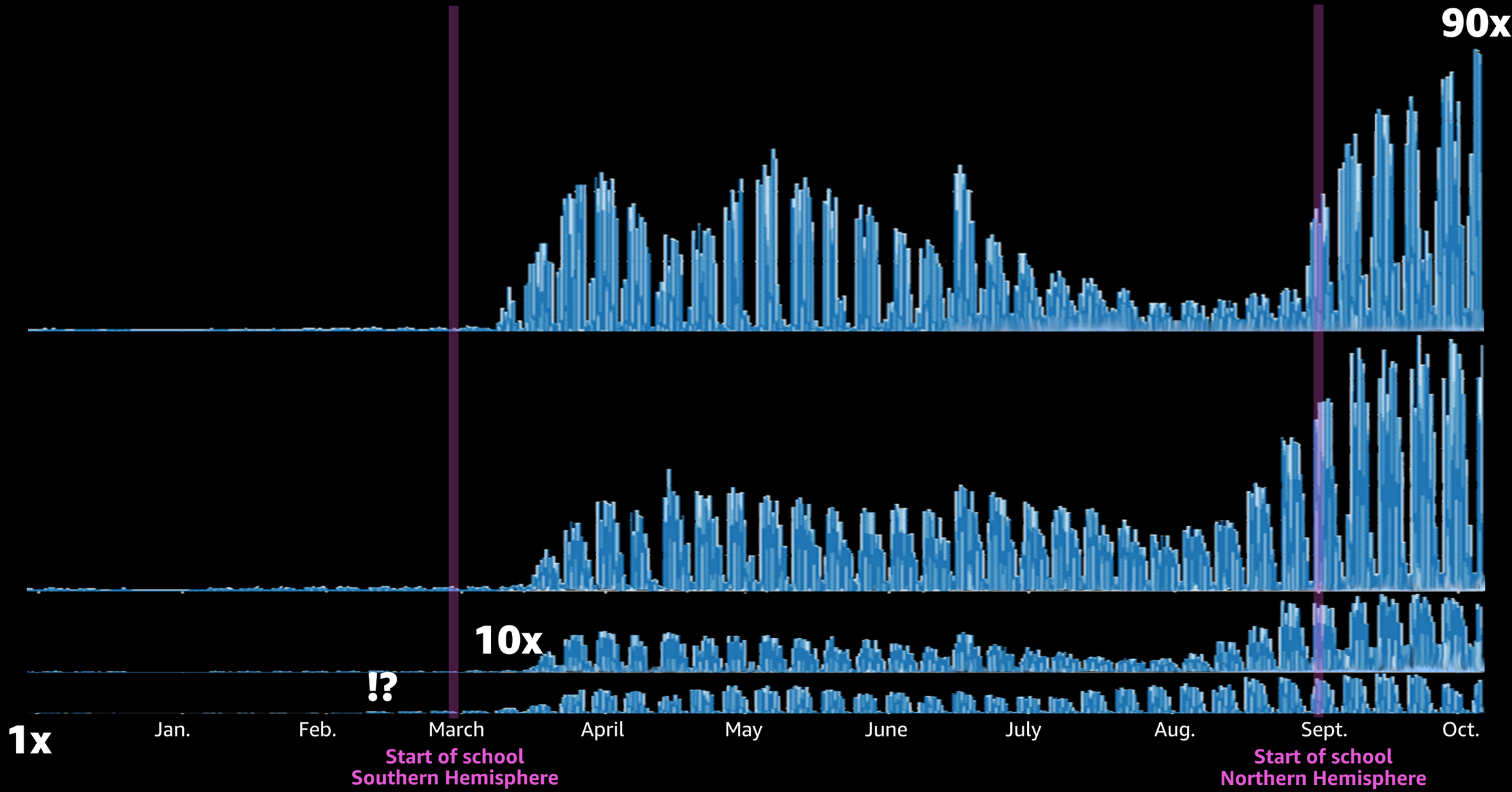
- **Instance Type Diversity**
  - Largely homogeneous
- **Experimenting with MCU on spot instances**
  - Stateless/Fault tolerant system
  - Negligible effect as they are migrated to an active MCU



Collaborate architecture after the calm

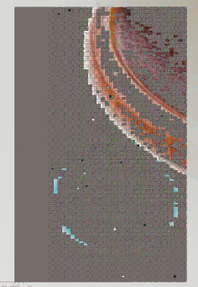


The effect of COVID-19 on online education



Celebration?

What’s next?



Relaxation?

Architecture resources

AWS Well-Architected Framework

The official best practices for Architecting in the AWS Cloud

aws.amazon.com/architecture/well-architected

AWS Well-Architected Labs

Hands-on labs to help you learn, measure, and build using architectural best practices

wellarchitectedlabs.com

AWS Architecture Center

Official AWS repository for all Architecture resources

aws.amazon.com/architecture

AWS Solutions Library

Vetted reference implementations and well-architected patterns

aws.amazon.com/solutions

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