

Amazon Web Services and Public Sector CIO Council

September 26, 2019 – Winnipeg, Manitoba

Attending for AWS:

Rejean Bourgault (Country Leader, Canada Public Sector) Nicole Foster (Public Policy) Rob Samuel (Security and Compliance) David Lurie (Business Development)

Agenda for today – Why are we here?

- Amazon's Culture of Innovation Implications for your organizations
- What value does Amazon Web Services (AWS) offer to government?
- What do jurisdictions need to know about AWS' future directions including technical innovation, infrastructure and security?
- How can AWS and PSCIOC build a collaborative pan-Canadian strategic relationship?
- Discussion and next steps

Amazon in Canada – More than 10,000 Full-Time Employees



 Winnipeg, MB (AWS Thinkbox)



Amazon's Culture of Innovation – Implications for your organizations

Understanding our Innovative Culture and Approach

CUSTOMER OBSESSION

ALWAYS WORK BACKWARDS FROM THE CUSTOMER



How do we organize for **innovation**?



Mechanisms

Encoded behaviors that facilitate innovative thinking.



Architecture

Structure that supports rapid growth and change.



Culture

Customer obsession, hire builders, let them build, support them with a belief system.



Organization

Small, empowered teams that own what they create.

Artifacts of the **Working Backwards** process

Press Release

Amazon Campus

Amazon com confidential

Amazon Campus Launches First Multi-Channel Student Store at the University of California Berkeley www.amazon.com/Campus & berkeley.amazon.com

SEATTLE-(BUSINESS WIRE) - August 31st, 2014 - Since returning to school for the Fall semester, Berk experienced a fresh take on the college bookstore as the new Berkeley Student Store opened at an on berkeley.amazon.com

The Amazon-run online Student Store brings Amazon's broad selection, low prices, and convenient sh of Berkeley's campus and offers a number of additional student-focused features. With the launch of students can now pay for any purchase on Amazon with their Cal1Card, buy course materials in any fo Learning Management System or directly on Amazon.com, pick up orders at convenient locations acro One-Day Shipping on textbooks sent to the campus area. Amazon Student members at Berkeley are e Shipping to campus on millions of additional products plus FREE Two-Day shipping on millions more.

"I've been an Amazon Student member for two years," explained Senior Aubrey Primason, "Getting the was huge. I've been ordering everything from Amazon since I got back to school. I may never have to

Students can access these campus-specific payment methods and shipping benefits, along with the fu textbooks - typically available only through the university's licensed bookseller - by activating the Berk experience when they visit berkeley.amazon.com, sign up for Amazon Student and select 'Berkeley' as to Amazon within the Berkeley Learning Management System.

In place of a traditional campus bookstore, Amazon has deployed Lockers across campus and built the a space that features a package pick up desk, technology showroom, and lounge area for students to in hatuaan elassas "Catting mutauthaalus was way assist this year. Instead of making the trin to the

FAQ

Q4: What do I get when Amazon is on my campus? Students get a number of benefits when Amazon is

the co-branded experience on Amazon, students receive Free One Day shipping on textbooks to campus

textbook selection, the ability to pay with their university ID card, and the ability to pick up Amazon.com

Q5: How do I activate the co-branded experience? Students at client universities will have four method

branded experience: 1) visiting the co-branded subdomain directly by typing the URL (berkeley.amazon.

clicking an external link, 2) joining the Amazon Student program and selecting their school, 3) shopping

their school's Learning Management System, 4) clicking on a Student Store merchandising placement or

customers have opted in, they will see a persistent co-branded toolbar on the top of the page whenever Customers can turn the experience off at any time by navigating to the 'Account Settings' menu in 'Your

Q6: What do I get if I sign up for Amazon Student when Amazon is on my campus? Amazon Student m the standard benefits of the program plus Free One Day shipping to the campus area on millions of top

benefits include Free Two-Day shipping on Prime eligible items, unlimited instant streaming of Prime Ins

access to the Kindle Owners' Lending Library. The cost of a Student membership will remain \$39/year.

Q7: Why aren't there any 'grab and go' items available for purchase at the Student Lounge? At launch

products to customers "on demand" at the Student Lounge because we do not have a Point of Sale syste

inventory for sale on site. However, we intend to offer this in the future for a small selection of top-selli

meantime, customers may order items displayed in the Lounge by using the bar code scan feature in the

Q8: Why is Free One Day shipping limited to campus addresses? Why don't I get Free One Day shipping

By working directly with a university, Amazon is able to reduce costs associated with shipping orders to to pass on to all students at the school via Free One Day shipping for textbooks, and to our Amazon Stud

Day shipping on millions of other eligible products. However, in order to provide these benefits at no ad

the geography in which we offer this benefit to those zip codes served from our on campus delivery stat

members always receive Free Two-Day shipping on Prime eligible items, to campus or most other addres

campus. On campus, all students will have access to an Amazon Student Lounge.

Amazon Campus

II: Student Customer FAQs

Amazon.com confidential

0 INBOX CODM: AMAZO TO: JOSH (2) YOUR PACKAGES ARE READY GET PICKUP CODE 0

Josh is at Amazon@ASUC Student Union picking up his textbooks. He opens his email notification and chooses to "Get Pickup Code".





(2) The link automatically opens the Amazon app where Josh sees that his order will be ready in 2 minutes and that he can add snacks to his order and pick them up instantly Anna, the backroom associate, gets a pick task for Josh's boxed textbooks and scans it into a locker



(H) Josh waits while his textbook and Cheetos are being prepared for pickup. Anna gets another pick task. She scans the Cheetos, bags them, and places them into the same locker as losh's box

(3) Josh gets hungry browsing all the great snacks available and decides to add a bag of Cheetos to his order

Visuals



A structure that allowed for 1 change/second

... in 2009



Amazon hires builders

... and lets them build

"2 Pizza" Team

Innovation has manifested itself in many domains...

At Amazon, we've been making investments in **Machine Learning** (ML) for the last 20 years...





















What value does AWS offer to government?

What is Cloud Computing?

- The secure, on-demand delivery of compute power, database, storage and other IT resources via public or private networks with zero upfront costs, no long-term contracts, and pay-as-you-go pricing
- Capacity that can grow or shrink rapidly to meet demand

What is Amazon Web Services?

- Amazon Web Services (AWS) provides a highly reliable, secure, scalable, low-cost IT infrastructure platform in the cloud that powers millions of active customers in 190 countries around the world
- Q2 2019 Earnings: USD\$8.4B, putting the company on a USD\$33B run rate

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

TODAY

5 benefits of <u>true</u> cloud computing







AWS Cloud features and capabilities: 165+ services to support any cloud workload



Amazon Connect is an easy to use, cloud-based contact centre solution that scales to support organizations of any size



Intuit



More Machine Learning happens on AWS than anywhere else: 10,000+ customers using application services, platforms, frameworks and infrastructure designed specifically for ML

AI Services



ML Frameworks + Infrastructure

FRAMEWORKS	INTERFACES	INFRASTRU	CTURE							
TensorFlow mxnet		Ĵ	Ē	Û	A Contraction of the second se	\bigcirc			575 575	
PYTÖRCH	K Keras	EC2 P3 & P3DN	EC2 G4 EC2 C5	FPGAS	DL CONTAINERS & AMIS	ELASTIC CONTAINER SERVICE	ELASTIC KUBERNETES SERVICE	GREENGRASS	ELASTIC INFERENCE	INFERENTIA

We are continuously innovating within the AWS Cloud

• Pace of innovation: In 2018, we released 1,957 significant products and features.



1,957

AWS Global Infrastructure



Key features of AWS infrastructure – globally and in Canada



- 1. Each **AWS Region** provides full redundancy and connectivity to the network. Unlike other cloud providers, who define a region as a single data center, at AWS Regions consist of multiple Availability Zones (AZ), each of which is a fully isolated partition of the AWS infrastructure.
- 2. Each Availability Zone (AZ) consists of one or more highly available state of the art data centers. Each DC has redundant power, networking, and connectivity, housed in separate facilities, on isolated fault lines, flood plains, networks, and electrical grids to substantially reduce the chance of simultaneous failure.
- 3. AZs give customers the ability to operate production applications and databases that are more highly available, fault tolerant, and scalable than would be possible from a single DC. Each AZ can be multiple DCs, and at full scale can be hundreds of thousands of servers. They are fully isolated partitions of the AWS Global Infrastructure. AZs are physically separated by a meaningful distance, many kilometers, from any other AZ, although all are within 100 km of each other.
- 4. All AZs are interconnected with high-bandwidth, low-latency networking, over fully redundant, dedicated metro fiber providing high-throughput, low-latency networking between AZs. The network performance is sufficient to accomplish synchronous replication between AZs. AWS Availability Zones are also powerful tools for helping build highly available applications. If an application is partitioned across AZs, companies are better isolated and protected from issues such as lightning strikes, tornadoes, earthquakes and more.

Virtual Tour of a AWS Data Center: https://aws.amazon.com/compliance/data-center/

Added value in the AWS Cloud – services, people, software, solutions, training and partners

- All models of cloud computing (IaaS, PaaS, SaaS) and Managed Services) much more than "just compute and storage"
- AWS Solution Architects, Professional Services, Enterprise Support and Managed Services Well Architected Reviews and Cloud Adoption Framework etc.
- AWS Marketplace digital catalog with thousands of software listings from independent software vendors that make it easy to find, test, buy, and deploy software in the cloud... including public sector solutions!
 - 1280+ ISVs, 4200+ product listings, 160,000 active customers, 481M EC2 hours deployed per month procure new (billed through AWS account) or BYOL
- AWS Solutions help customers solve common problems and build faster using the AWS platform. All AWS Solutions are vetted by AWS architects and are
 designed to be operationally effective, reliable, secure, and cost effective. Every AWS Solution comes with detailed architecture, a deployment guide, and
 instructions for both automated and manual deployment: https://aws.amazon.com/solutions/. You pay only for the resources used, not for the solution itself
- Education & Training wide range of public events and training opportunities
 - AWS Public Sector Summits (Ottawa, Washington DC and other global cities) plus many local events
 - Coming up: Toronto Summit (Oct 3), Quebec City (Oct 8), Calgary (Oct 22) Victoria (Nov 5), Montreal (Nov 6), re:Invent (Las Vegas, Dec 2-6), Ottawa Summit (May 2020)
 - AWS YouTube channel where we share all Summit and re:Invent session videos: <u>https://www.youtube.com/user/AmazonWebServices</u>
 - Hundreds of free, self-paced digital courses on AWS fundamentals: <u>https://www.aws.training/LearningLibrary?&search=&tab=digital_courses</u>
 - AWS Innovate online conference: https://aws.amazon.com/events/aws-innovate/machine-learning/
 - 20+ sessions over 6 tracks all focused on Machine Learning and Artificial Intelligence
 - Classroom training: Role based paths (Architect, Developer and Operations), Solutions paths (Machine Learning and Storage), Specialty paths (Big Data, Advanced Networking and Security): <u>https://aws.amazon.com/training/learning-paths/?nav=tc&loc=5</u>
 - Specialized programs aligned with government "Cloud First" strategy: GovExecEd, DigiGov, AWS Academy, AWS Educate etc.
 - AWS Podcast, webinars, blogs, guides, quickstarts, tools, templates etc.
- Documentation detailed technical documentation, SDKs, toolkits, use cases, scenarios, user guides, developer guides, tutorials, and API references.
- AWS Partner Network global program for technology (ISV) and consulting businesses which leverage AWS to build solutions and services for customers

AWS innovation and economies of scale = lower prices for our customers



Infrastructure Innovation Community Global Footprint

New Features New Services

We pass the savings along to our customers in the form of low prices and continuous reductions

74 price reductions to date – continuously lowering prices for customers is in our DNA

AWS pricing and licensing model

AWS offers you a pay-as-you-go approach for pricing. With AWS you pay only for the individual services you need, for as long as you use them, and without requiring long-term contracts or complex licensing.

AWS pricing is similar to how you pay for utilities like water and electricity. You only pay for the services you consume, and once you stop using them, there are no additional costs or termination fees.

AWS Pricing Concepts

- Each AWS service is priced separately and transparently
- Pay-as-you-go pricing with monthly billing (credit card or invoice)
- Automatically benefit from Free Tier
- Save when you reserve capacity available for 6 services
- Pay less by using more volume discounts
- Our cost estimation and TCO calculators help you understand cost before you spend
- AWS Solution Architects will help you estimate your cost and optimize your solution
- AWS provides budgeting, tagging and financial monitoring capability as well as proactive alerts, guidance and recommendations
- Buy new 3rd party software licenses through AWS Marketplace or BYOL

EC2 Pricing Models







Implications for government – drivers for cloud adoption

- No upfront expense or financial commitment, no long-term contractual commitment, no punitive audits
- Get modern technology immediately and stay up to date no outdated solutions or hardware
- Try before you buy, learn quickly, and walk away if appropriate avoid buying shelfware
- Obtain access to both tools and services to implement
- Build using micro-services model, limit technical debt, change incrementally, retain ability to pivot
- Scale up and down as needed to meet service demand no delay, no outages
- Realize impact on business process not just short-term cost-savings greater innovation, improved citizen services, increased security
- Benefit from pricing flexibility and ability to turn services off





Reduce overall infrastructure costs



Quick, easy refresh & update



Focus scarce workforce on high-value tasks



Operational resilience





What does government need to know about AWS' future directions including technical innovation, infrastructure and security?

Technical roadmap

- Culture of Innovation: Everything we do starts with our customers and works back from there. 90-95% of our roadmap is driven by feedback from our customers please provide input to help us keep improving the AWS Cloud!
- Reviewing technical roadmap: We are happy to review our 3- and 12-month roadmap with customers under NDA
- Infrastructure in Canada:
 - In December 2016, we launched the AWS Canada (Central) Region in Montreal
 - We continue to expand the number of services offered in the Canada region: https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/. Since our first Public Sector Summit in October, we've increased the number of services available in our Canada region by more than 20%
 - Recent service launches include:
 - VMWare Cloud on AWS: Integrated cloud offering to seamlessly migrate and extend on-premises VMware vSpherebased environments to the AWS Cloud
 - Amazon Sagemaker: Fully managed machine learning service to quickly and easily build and train ML models, and then directly deploy them into a production-ready hosted environment no expertise required
 - Amazon Comprehend: Natural language processing service that uses machine learning to find insights and relationships in text
 - We've also continued to roll out language support for services. For example, Amazon Transcribe is now available in Canadian French.
 - You can expect that we will continue to add services in the AWS Canada (Central) Region

Security is our highest priority











Designed for Security

Constantly Monitored

Highly Automated Highly Available Highly Accredited



Advantages of cloud security







Visibility

Automation

Scale



Security in the cloud is a shared responsibility... and shared responsibility is not static!



Security IN the Cloud

Customers/partners assume responsibility and management of the guest operating system (including updates and security patches), other associated application software, configuration of the AWS-provided security group firewalls, and other security, change management, and logging features

Security OF the Cloud

AWS operates, manages, and controls the infrastructure components, from the host operating system and virtualization layer down to the physical security of the facilities in which the services operate

Infrastructure Services



Container Services

Customer Data							
Clie Dat	nt Side Data Encryption & a Integrity Authentication	Network Traffic Protection Encryption / Integrity / Identity			8 -	Cust	
Optional – Opaque Data: 0s and 1s (In Transit and At Rest)							
Platform & Application Management							
Operating System & Network Configuration							
AV	Foundation Services	Storage	Databases	Networking		AV	
VS xoints	AWS Global Infrastructure	Regions	Availability Zones	Edge Location	8	N N	

Abstracted Services



Role of compliance and 3rd party auditors

- Vendor claims alone are not enough
- Testing, auditing and certification by multiple teams of 3rd party professionals provides needed validation
- Far more numerous and rigorous processes than those of any government agency or enterprise
- AWS is architected for government security requirements

Example:





AWS foundational and layered security services

<u>ک</u>

Amazon

Cloud

Directory

E

AWS

Directory

Service



AWS AWS Security Organizations Hub



AWS Control Tower



AWS





Advisor



AWS Resource Amazon VPC Direct Access manager PrivateLink Connect

Protect



Amazon Amazon GuardDuty Macie



Amazon AWS Inspector Security Hub



Amazon AWS Step **CloudWatch Functions**



AWS Systems AWS Manager



AWS **OpsWorks**



AWS





AWS Config AWS Service Catalog



AWS Systems AWS Well-Manager Architected Tool



IAM



Amazon KMS Cognito



Manager



Amazon Personal Health Route 53 Dashboard



Improving data security with the cloud – customer perspectives

Based on our experience, I believe that we can be even more secure in the AWS cloud than in our own datacenters.

"

Tom Soderstrom Chief Technology Officer



You should probably start engaging with the idea that the cloud can be considerably more secure than the private cloud or your own data centre, and start engaging with the risks that are building in the spaces where you haven't moved to the cloud yet.

> Dave Rogers Chief Technology Officer

Ministry of JUSTICE

Success factors for managing in the cloud

- Get cloud procurement right This is critical, because if the procurement is not approached correctly, the benefits of using the cloud can be negated completely
- Include <u>all</u> the key elements of a successful cloud journey to build a solid foundation



- Emphasize training events/digital/classroom/certification paths
- Remove barriers, reward innovation, emphasize continuous discovery and learning

AWS Cloud Adoption Framework



- Well-Architected Review
- Programs: DigiGov
- Recommended Reading





How can AWS and PSCIOC build a collaborative pan-Canadian strategic relationship?

Canadian organizations from every industry – including public sector – use AWS today



These public sector organizations use AWS today and have agreed to be public references



Public Sector success story: Municipal Property Assessment Corporation – Valuation Engine

AWS has had a transformational effect on our business, enabling us to serve our business clients better and faster than we ever have before.

Nicole McNeill, Chief Financial Officer



MPAC is the largest assessment jurisdiction in North America, responsible for accurately assessing and classifying more than five million properties in Ontario.

- Public sector organization evaluates 5M+ properties across
 Ontario for use in assessing \$30B+ in property taxes
- Formerly 95% "keep the lights on" and 5% innovation
- Migrated off traditional IT architecture to AWS for greater speed and agility
- Main valuation engine now runs 5,000% faster at 1/10th the cost of previous architecture
- Developers release new features every one to two weeks instead of every three to six months as in the past
- Started with a purchasing card, at a spend of \$50-100/month

Public Sector success story: Financial Industry Regulatory Authority – Daily Petabyte-Scale Analysis on Trading Data

For our market surveillance systems, we are looking at about 40% (savings with AWS), but the real benefits are the business benefits. We can do things we physically weren't able to do before, and that is priceless.

Steve Randich, Chief Information Officer

FINRA is the largest independent regulatory authority in the United States. It is based in Washington, D.C.

- Wanted a platform to provide greater speed and scalability for analyzing petabyte-scale data
- Migrating mission-critical operations to AWS
- Can provide analysts with real-time access to 75 billion records collected daily
- Can move faster, more efficiently in serving core business processes
- Estimated savings of \$10-20M annually by using AWS



Trends in adopting AWS Cloud – Where are organizations starting?



Other key starting points



at $1/10^{\text{th}}$ the cost



VMware Cloud on AWS

Windows Server sur AWS

Des capacités de calcul flexibles et évolutives pour les applications Microsoft Gérez et sécurisez facilement vos charges de travail Windows

And all other Microsoft workloads



The AWS business relationship model is flexible, depending on the priorities of our customers

- There are multiple paths for the public sector to buy AWS cloud
 - <u>Direct</u>
 - AWS Customer Agreement or Enterprise Agreement
 - Indirect through AWS partners
 - Resell or RFP (solution-based) or Framework or Managed Services
- Successful approaches typically separate infrastructure from services/labour to maximize choice



Examples:

- UK G-Cloud (direct)
- Singapore GovTech (direct)
- Australia Digital Transformation Agency Whole of Government Agreement (direct)

- Shared Services Canada
 - Unclassified (indirect)
 - Protected B (direct)

The AWS enterprise engagement model is well-established and our team is growing



Current Team

- Focused on 4 main verticals: Government (Federal, Provincial & Municipal Government), Education, Healthcare and Not-for-Profit Organizations
- Dedicated resources for each vertical
- Based in 5 cities across 3 provinces (Vancouver, Toronto, Ottawa, Montreal, Quebec City)
- Updates for 2020

When we think about collaboration, what does "great" look like?

Thank you!

Discussion, questions, next steps...



Additional slides that may be of interest





Enterprise Content Management on AWS – 4 ISV examples plus Marketplace

Box & AWS

Build and Deploy Content-Centric Business Apps with Box and AWS

https://aws.amazon.com/featured-partners/box/ https://www.box.com/industries/government

REFERENCE DEPLOYMENT

Alfresco Content Services on AWS

Enterprise content management in the AWS Cloud

View deployment guide

https://aws.amazon.com/quickstart/architecture/alfresco-contentservices/ https://www.alfresco.com/ecm-software/aws

Laserfiche

Home / Product Tour / Cloud Content Management

https://www.laserfiche.com/products/laserfiche-cloud/



https://newgensoft.com/reinvent/cloud/ https://newgensoft.com/industries/government/ https://aws.amazon.com/marketplace/pp/B00FJCNXIA?qid=15 68218286532&sr=0-1&ref =srh res product title

💐 aws n	narketplace				enterprise	e content management	Q
Categories 🔻	Delivery Methods 🔻	Solut	ions 🔻	Migration Ma	Migration Mapping Assistant Your Saved List		
			Categories			enterprise content management (88 results) showing 1 - 10	1 2
https://aws.	.amazon.com/ma	rketp	lace/sear	ch/result	s?x=0&v	=0&searchTerms=enterprise+content+management	

AWS provides two standalone blockchain services that address customer need for either a ledger with centralized trust or to run transactions with decentralized trust.

 Amazon Quantum Ledger Database is a fully managed ledger database that provides a transparent, immutable, and cryptographically verifiable transaction log owned by a central trusted authority. Amazon QLDB tracks each and every application data change and maintains a complete and verifiable history of changes over time

	Cryptographically		
Immutable	verifiable	Highly scalable	Easy to use
Maintains a sequenced record of all changes to your data, which cannot be deleted or modified; you have the ability to query and analyze the full history	Uses cryptography to generate a secure output file of your data's history	Executes 2–3X as many transactions as ledgers in common blockchain frameworks	Easy to use, letting you use familiar database capabilities like SQL APIs for querying the data

 Amazon Managed Blockchain is a fully managed service that makes it easy to create and manage scalable blockchain networks using the popular open source frameworks Hyperledger Fabric and Ethereum

(Fully managed	Choice of Hyperledger Fabric or Ethereum	Scalable and secure	Improves reliability
Quickly create blockchain networks that span multiple AWS accounts. Easily add or remove members and monitor the network	Choose the right framework for your needs, whether you are building a permissioned or public network	Easily scale your blockchain network as the usage grows. Also, Managed Blockchain secures your network certificates with KMS	Managed Blockchain improves the reliability of the "ordering service," by replacing the default technology with QLDB. This improves durability.

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases by varying combinations of CPU, memory, storage, and networking capacity

Categories	Capabilities	Options	<u>Choice</u>	
General purpose	Choice of processor (AWS, Intel, AMD)			
Burstable	Fast processors (up to 4.0 GHz)	Amazon Elastic Block Store	183	
Compute	📮 🛛 High memory footprint 🧃	Elastic Graphics	Instance types	
Intensive	(up to 12 TiB)	Elastic Inference	for virtually	
Memory intensive	Instance storage (HDD and NVMe)		every workload and business need	
Storage (High I/O)	Accelerated computing (GPUs and FPGA)		Application server	
Dense storage	Networking		 ✓ Web server ✓ Database server 	
GPU compute	(up to 100 Gbps)		✓ Game server	
Graphics	Bare Metal		 ✓ Media server 	
intensive	Sizo		 ✓ Catalog server ✓ File server 	
	(Nano to 32xlarge)		 ✓ File server ✓ Computing server 	
			✓ Proxy server	



Ama on Clinstances