CHECK-IN
CLOUD BASICS FOR RESEARCH COMPUTING
THURSDAY, JANUARY 19 AT 10:00AM

https://colink.me/2gi/c19244821122151822

1. Open the CampusGroups app.
2. Select 'Princeton University'.
3. Click on QR Code scanner.
4. Scan this QR Code and you are checked-in!
CLOUD BASICS FOR RESEARCH COMPUTING

WINTERSESSION 2023

IRENE KOPALIANI, PHD, CISA, CISM, CDPSE
IK8@PRINCETON.EDU
AGENDA

- Types of Cloud
- Why use Cloud
- Public Cloud Adoption
- Pros/Cons of largest Hyperscale Providers
- Security Misconceptions
- Cloud Spend Waste
- Strategies for Cost Reduction
- Automation Example
- Resources – links to calculators

- Logging in
- Overview of the environment – dashboards, menus
- Creating Resource Groups & Tags
- Adding new services
- Creating Virtual Machines & Network Security Groups
- Storage Options
- Deleting Resource Groups
- Getting Help
CLOUD PREPONDERANCE

39% of organizations have a cloud-first policy.

41% say they weigh cloud and on-premises options equally before making decisions.

Only 20% of organizations still have an on-premises-first approach.
TYPES OF CLOUDS

- Private
- Public
- Multi Cloud
- Hybrid

Specialty Cloud

de facto standard

48%
31%
Reduced cost
Flexibility
Scalability
Built-in backup plan
Technology options
Collaboration
The diagram shows the distribution of cloud platform usage among different categories:

- **Azure**: 45% running significant workloads, 32% running some workloads, 12% experimenting, 6% plan to use.
- **AWS**: 46% running significant workloads, 30% running some workloads, 11% experimenting, 6% plan to use.
- **Google Cloud Platform**: 19% running significant workloads, 29% running some workloads, 22% experimenting, 10% plan to use.
- **Oracle Cloud Infrastructure**: 10% running significant workloads, 18% running some workloads, 16% experimenting, 12% plan to use.
- **IBM Cloud**: 8% running significant workloads, 16% running some workloads, 15% experimenting, 11% plan to use.
- **Alibaba Cloud**: 3% running significant workloads, 9% running some workloads, 13% experimenting, 10% plan to use.
- **Other**: 8% running significant workloads, 8% running some workloads, 12% experimenting, 5% plan to use.

The legend indicates:
- Blue: Running significant workloads
- Purple: Running some workloads
- Yellow: Experimenting
- Gray: Plan to use
AZURE

Pros
- New market leader
- Tight Microsoft products integration
- Built on the existing customer base

Cons
- Customer support issues
- Partner ecosystem
- Resource limitations
AWS

Pros
- Market leader for 10 years
- Massive Scope of operations
- Comprehensive Global Network

Cons
- Cost Structure
- Support Fees
- Overwhelming implementation choices
GCP

Pros

- Strong Offer in Container
- Specializes in High compute offerings
- Strong AI/ML capabilities

Cons

- Limited Offerings
- Limited Global Data Centers
- Secondary provider, not a strategic provider
SECURITY MISCONCEPTIONS
Troubling Statistics

- 75% Moving data to the cloud
- 1/2 Expect security breaches
- 57% Think security is cloud provider’s responsibility

Cloud Security Alliance – Cloud Migration Study
So, what happens when you move into a public cloud?
Who is Responsible?

Cloud **Customer** Responsibility
Data | Applications | Identity & Access Management

Cloud **Customer** Responsibility
Operating System | Firewall Configuration

Cloud **Customer** Responsibility
Network Traffic Protection | Data Encryption | Integrity

Cloud **Provider** Responsibility
Compute | Storage | Database | Networking

Shared Responsibility
MINIMIZING CLOUD SPEND WASTE
CLOUD SPEND WASTE

2018: $12.9 Billion
2019: $14 Billion
2020: $17.6 Billion
2021: $21 Billion
2022: $27.1 Billion
UNDERSTAND COST FACTORS

**Type:** Compute, Memory, General

**Size:** CPU/GPU and memory – i.e., large, x-large

**Purchasing Method:** On Demand, Reserved, Spot

**Region:** where instance will be launched

**Capacity:** Provisioned read/write

**Storage:** Including indices

**Services:** Such as Data transfer or streams

**Throughput:** Reserved provisioned throughput

**Type of Storage:** Amount of redundancy and accessibility speed

**Data Transfer:** In/out Frequency and number of requests

**Quantity:** Number of files storage units requested

**Region:** Where data storage is requested

**Requests:** Number of executions your function will perform

**Memory:** The amount of allocated memory per function

**Time:** Average execution time

**Region:** Where function will be launched

**Type:** Based on Database Transaction Units

**Size:** Based on the number of virtual cores

**License:** Open Source or Commercial

**Purchase Method:** (On Demand, Reserved, Spot)

**Hidden Costs**
<table>
<thead>
<tr>
<th>Strategies for Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RIGHT SIZE</strong></td>
</tr>
<tr>
<td>Right Size the machine for the job</td>
</tr>
<tr>
<td><strong>SPRAWL CONTROL</strong></td>
</tr>
<tr>
<td>Control sprawl of virtual machines</td>
</tr>
<tr>
<td><strong>SHUTDOWN SCHEDULE</strong></td>
</tr>
<tr>
<td>Control running hours for resources</td>
</tr>
<tr>
<td><strong>DISCOUNTS</strong></td>
</tr>
<tr>
<td>If discount available, use it!</td>
</tr>
<tr>
<td><strong>EXPIRATION DATE</strong></td>
</tr>
<tr>
<td>Monitor &amp; delete expired instances</td>
</tr>
<tr>
<td><strong>TAGS</strong></td>
</tr>
<tr>
<td>Keep track of resources with logical tags</td>
</tr>
</tbody>
</table>
Strategies for Cost Savings

**ORPHAN CHECK**
Check for orphaned storage and lingering snapshots

**LOGGING**
Log user activities for audit and cross reference

**ALERTS**
Alerts and alarms notify you of reaching budget constraints

**BUDGETS**
Utilize budgets that will ensure you won’t overspend

**LIFECYCLE MGMT**
Automatically move data to a less expensive storage or purge data

**AUTOMATE**
Use Templates to stand-up/bring down stacks
Automation Example

```json
{
  "Monday-Thursday":{
    "Start":"9",
    "Shutdown":"17"
  },
  "Friday":{
    "Start":"9",
    "Shutdown":"16"
  }
}
```
## Resources

<table>
<thead>
<tr>
<th>AWS</th>
<th>Azure</th>
<th>Google Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://aws.amazon.com/tco-calculator/">https://aws.amazon.com/tco-calculator/</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HANDS ON AZURE
• A free trial account can be obtained from Microsoft https://azure.microsoft.com/en-us/free/

• Search for “Azure” in the Service-now portal https://Princeton.service-now.com

- Logging in
- Overview of the environment – dashboards, menus
- Creating Resource Groups & Tags
- Adding new services
- Creating Virtual Machines & Network Security Groups
- Storage Options
- Deleting Resource Groups
- Getting Help

https://portal.azure.com