Certified SysOps Administrator – Associate 2017

Exam

* Monitoring & Metrics – 15%
* High Availability – 15%
* Analysis – 15%
* Deployment & Provisioning – 15%
* Data Management – 12%
* Security – 15%
* Networking – 13%

**CloudWatch**

* Monitors your AWS resources and applications it runs on.
  + ELB, Route53, Autoscale, EBS Volumes, CloudFront, Storage Gateways, DynamoDB, Elasticache Nodes, RDS Instances, EMR, Redshift, SNS topics, SQS, Opsworks, Cloudwatch logs, and bill.
* Metrics are stored for 2 weeks. Can retrieve longer ones by GetMetric Statistics API.
* Custom Metrics can have a minimum of 1 minute intervals.
* If resources are terminated, data can be retrieved up to 2 weeks.
* EC2
  + CPU, Network, Disk, Status Check
  + Custom Metric needed for Harddisk utilization
  + **Default monitoring is 5 minutes or detailed can be enabled by 1 minute.**
  + System Status Checks (Checks underlying physical Host)
    - Check loss of network connectivity
    - Loss of system power
    - Software issues on the physical host.
    - Hardware issues on the physical host.
    - Best way to resolve is to stop and start the VM.
  + Instance Status Checks (Checks VM)
    - Failed system status checks
    - Misconfigured networking or startup configuration
    - Exhausted memory
    - Corrupted file system
    - Incompatible kernel
    - Best way to troubleshoot is by rebooting the instance and make modifications in your OS

Cloudwatch Lab:

yum install perl-Switch perl-DateTime perl-Sys-Syslog perl-LWP-Protocol-https -y

mkdir /CloudWatch

curl http://aws-cloudwatch.s3.amazonaws.com/downloads/CloudWatchMonitoringScripts-1.2.1.zip -O

unzip CloudWatchMonitoringScripts-1.2.1.zip

rm -rf CloudWatchMonitoringScripts-1.2.1.zip

cd aws-scripts-mon/

nano mon-put-instance-data.pl

./mon-put-instance-data.pl --mem-util --verify –verbose

./mon-put-instance-data.pl --mem-util --mem-used --mem-avail

Nano crontab

**EBS Monitoring**

* Throughput Optimized HDD (st1) – streaming workloads requiring consistent, fast throughput at a low price.
* Max volume size is 16 TiB
  + Go from 1GB to 4 GB to 500 GB.
  + 3 IOPS per GB
    - Can burst by using I/O Credits
    - (3000-1500) = may need to increase drive for me.
    - When more baseline performance I/O is required, it uses I/O credits in the credit balance to burst to the required performance level
    - Each volume receives an initial I/O credit balance of 5,400,000 I/O credits. Can sustain 3,000 IOPS for 30 minutes. If you don’t go over, you earn credits.
* Recommended to have SSD as the boot volume.
* **Pre-warming** – maximum performance is started at initialization. Only time this may be needed is for restoring from snapshots. Preliminary action takes times and can cause a significant increase in the latency of an I/O operation the first time each block is accessed.
* **Initialization** - avoid performance hit in production by reading from all of the blocks on your volume before you use it.
* **Volume Read Bytes/Volume Write Bytes –** information on the I/O operations in a specified period of time.
* **Volume Read Ops/Volume Write Ops –** total number of I/O operations in a specified period of time.
* **Volume Total Read Time/Volume Total Write Time –** total number of seconds spent by all operations that completed in a specified period of time.
* **Volume Idle Time –** total number of seconds in a specified period of time when no read or write operations were submitted.
* **Volume Queue Length –** read and write operation requests waiting to be completed in a specified period of time. (indicator of high IOPS)
* **Volume Thoughput Percentage –** Provisioned IOPS (SSD) only. Percentage of I/O operations per second (IOPS) delivered of the total IOPS provisioned for an Amazon EBS volume.
* **Volume Consumed Read Write Ops -** Provisioned IOPS (SSD) only. Total amount of read and write operations consumed in a specified period of time.

**Volume Status:**

* + **OK –** Normal (Volume performance is as expected)
  + **Warning –** Degraded (Volume performance is below expectations). Severely Degraded (Volume performance is well below expectations)
  + **Impaired –** Stalled (Volume performance is severely impacted). Not Available (Unable to determine I/O performance because I/O is disabled)
  + **Insufficient-data**

**Modifying EBS Volumes:**

* Can increase a size or change type and adjust the IOPS on the fly without detaching. Same for detaching.
* **Steps:**
  + Issue the modification command (Console or command line)
  + Monitor the progress of the modification
  + Extend files system to take advantage of the increased storage capacity.

**Monitoring RDS:**

* Metrics:
  + BinLogDiskUsage
  + CPUUtilization
  + **DatabaseConnections**
  + **DiskQueueDepth -** # of read/write I/O to access your RDS instance.
  + FreeableMemory
  + **FreeStorageSpace**
  + **ReplicaLag (Seconds) – lag between RDS instance and read replica’s**
  + SwapUsage
  + ReadIOPS
  + **WriteIOPS**
  + **ReadLatency**
  + **WriteLatency**
  + ReadThroughput
  + WriteTrhoughput
  + NetworkReceiveThroughput
  + NetworkTransmitThroughput
* Events:
  + Creates an SNS topic to send notifications out to.

**Monitoring ELB:**

* Is monitored every 60 seconds if traffic is coming into it. Otherwise, it won’t be reported.
* Metrics:
  + HealthyHostCount
  + UnHealthyHostCount
  + RequestCount
  + Latency
  + HTTPCode\_ELB\_4XX
  + HTTPCode\_ELB\_5XX
  + HTTPCode\_Backend\_2XX
  + HTTPCode\_Backend\_3XX
  + HTTPCode\_Backend\_4XX
  + HTTPCode\_Backend\_5XX
  + BackendConnectionErrors
  + **SurgeQueueLength –** count of total # of requests that are pending submission to a registered instance
  + **Spillovercount –** count of total number of requests that were rejected due to the queue being full.

**Monitoring Elastiche:**

* CPU utilization
  + Memcached
    - Multi-threaded
    - Can handle loads of up to 90%. If it exceeds 90% add more nodes to the cluster
  + Redis
    - Not multi-threaded. To determine the point in which to scale, take 90 and divide by the number of cores
    - Threshold for CPU Utilization (90/4)
* **Swap Usage** – amount of disk storage space reserved on disk if your computer runs out of ram. Size of swap file – the size of the RAM.
  + Memcached
    - Should be around 0 most of the time and not exceed 50Mb
    - If it exceeds 50 Mb you should increase the memcached\_connections\_overhead parameter.
    - **Memcached\_connections\_overhead** – defines that amount of memory to be reserved for memcached connections and other miscellaneous overhead.
  + Redis
    - No SwapUsage metric, instead just uses reserved-memory.
* **Evictions** – occurs when a new item is added and an old item must be removed due to lack of free space in the system.
  + Memcached
    - Can either scale up – increase memory on nodes
    - Scale out – add more nodes
  + Redis
    - Can only scale out – add read replicas
* Concurrent Connections
  + Memcached
    - No recommended setting
    - Set an alarm on the number of concurrent connections
    - Number of concurrent connections can either mean a large traffic spike or the application is not releasing connections as it should be.
  + Redis
    - No recommended setting
    - Set an alarm on the number of concurrent connections
    - Number of concurrent connections can either mean a large traffic spike or the application is not releasing connections as it should be.

**Centralized Monitoring:**

* Enterprises install Zennos, Nimsoft, Splunk, IBM, HP Operations on a centralized server that installs an agent on there.
* Security groups can span multiple AZ’s.
* Basic monitoring is going to use ICMP. Could be SQL (1433) or MySQL (3306)
* Ping is a 2 way street.

**Organizations & Consolidated Billing:**

* **AWS Organizations** – account management service that enables you to consolidate multiple AWS accounts into an organization that you create and centrally manage.
* **Consolidated Billing** - Link Paying account to all other accounts.
  + Limit of 20 linked accounts for consolidated billing
  + Linked accounts are all independent
  + Paying account is independent and can’t access resources
  + Volume pricing discounts
  + Billing alerts are included for all linked accounts if enabled on paying account
  + Cloud trail has to be enabled per account
  + Can consolidate logs on S3 from cloud trail
  + Unused reserved instances for EC2 are applied across the group.
* Billing alarms – helps monitor your account to see when charges reach a certain value.

EC2 Cost Optimization

* Heavy Utilization
* Medium Utilization
* Reserved
* Spot
* On-Demand
* Rule out wrong answers and then choose the best out of the last two.

**Elasticity and Scalability**

* **Elasticity –** allows you to stretch out and retract back your infrastructure, based on your demand. Used for a short period of time.
  + **EC2 –** increase # of EC2 instances based on autoscaling
  + **DynamoDB –** Increase additional IOPS for additional spikes in traffic
  + **RDS –** Not very elastic. Can’t scale based on demand
* **Scalability –** build out infrastructure to meet long term demands. Used for longer time periods.
  + **EC2 –** Increase instance size as required
  + **DyanmoDB –** Unlimited amount of storage
  + **RDS –** increase instance size.

**Scale Up or Scale Out?**

* Scale Up – increase resources or size of EC2 instances (bottle neck)
* Scale Out – add more EC2 instances with autoscaling (not enough resources)
* NAT – Network Address Translation

**RDS Multi-AZ Failover:**

* MySQL, Oracle, PostgreSQL use synchronous physical replication on multi-AZ on the standby machine to keep it up to date.
* SQL Server uses synchronous logical replication in multi-AZ which would be mirroring technology
* DNS failover which is essentially the IP address resolve.
* Advantages:
  + HA
  + With the Same region
  + Backups are taken from secondary which avoids I/O suspension
  + Restores are taken from secondary which avoids I/O suspension
  + Can force failover by console or RebootDB Instances API call
  + Read replica’s is used to scale
  + Multi-AZ Failover is not a scaling solution.

**RDS Read Replicas:**

* **Read replicas** – read only copies of your database. Gives you the function to scale out beyond capacity constraints for single DB instance.
  + Can be created by Console or CreateDBInstanceReadReplica API
  + Asynchronously synced.
  + Can have up to 5 Read replicas per primary DB.
  + Supported by MySQL 5.6 (NOT 5.1 or 5.5) and PostgreSQL
  + InnoDB is only supported by AWS for MySQL engine. Can also use MyISAM
  + If multi-az is not enabled, snapshot will be of your primary DB and can cause brief I/O suspensions for around 1 minute
  + If Multi-AZ is enabled, snapshot will be of your secondary database and you will not experience any performances hits on your primary database.
  + When a new read replica is created, you will be able to connect to it using a new end point DNS address.
  + Can promote read replica’s by it’s own standalone but it will break the replication link
  + Read replicas can be in different regions but only for MySQL.
  + Read replica’s can be build of Multi-AZ databases but read replica’s can’t be multi-az currently.
  + Can have read replica’s of read replicas but only for MySQL. Increases latency. Replicates to top tier and then to bottom tier.
  + DB snapshots and automated backups can’t be taken of read replica’s.
  + REPLICA LAG is the key metric.
  + In order to enable read replica, automated backups must be on.
  + Use case:
    - Scaling beyond computer or I/O capacity of a single DB instance. Excess read traffic can be directed to one or more read replicas.
    - Serving read traffic while the source DB instance is unavailable.
    - Business reporting or data warehouse running queries against the read-replica versus the primary DB instance.

Bastion Hosts with Route 53 and 2 public Subnets.

**Troubleshooting Autoscaling:**

* Look for the following:
  + Associated key pair does not exist
  + Security group does not exist
  + Autoscaling config is not working correctly
  + Autoscaling group not found
  + Instance type specified is not supported in the AZ
  + AZ is no longer supported
  + Invalid EBS device mapping
  + Autoscaling service is not enabled on your account
  + Attempting to attach and EBS block device to an instance-store AMI