VERTICA

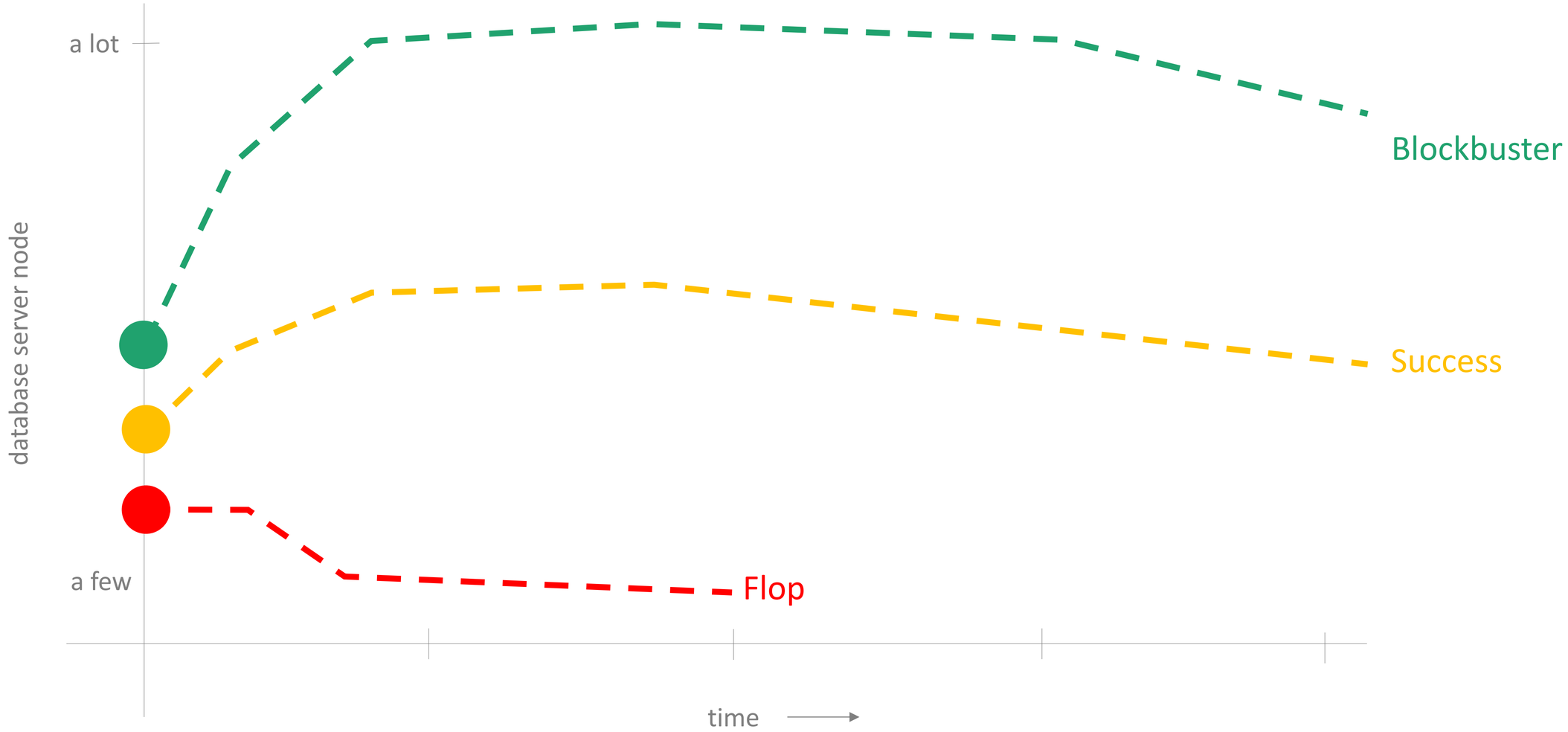
Vertica's Eon architecture

Separation of compute from storage

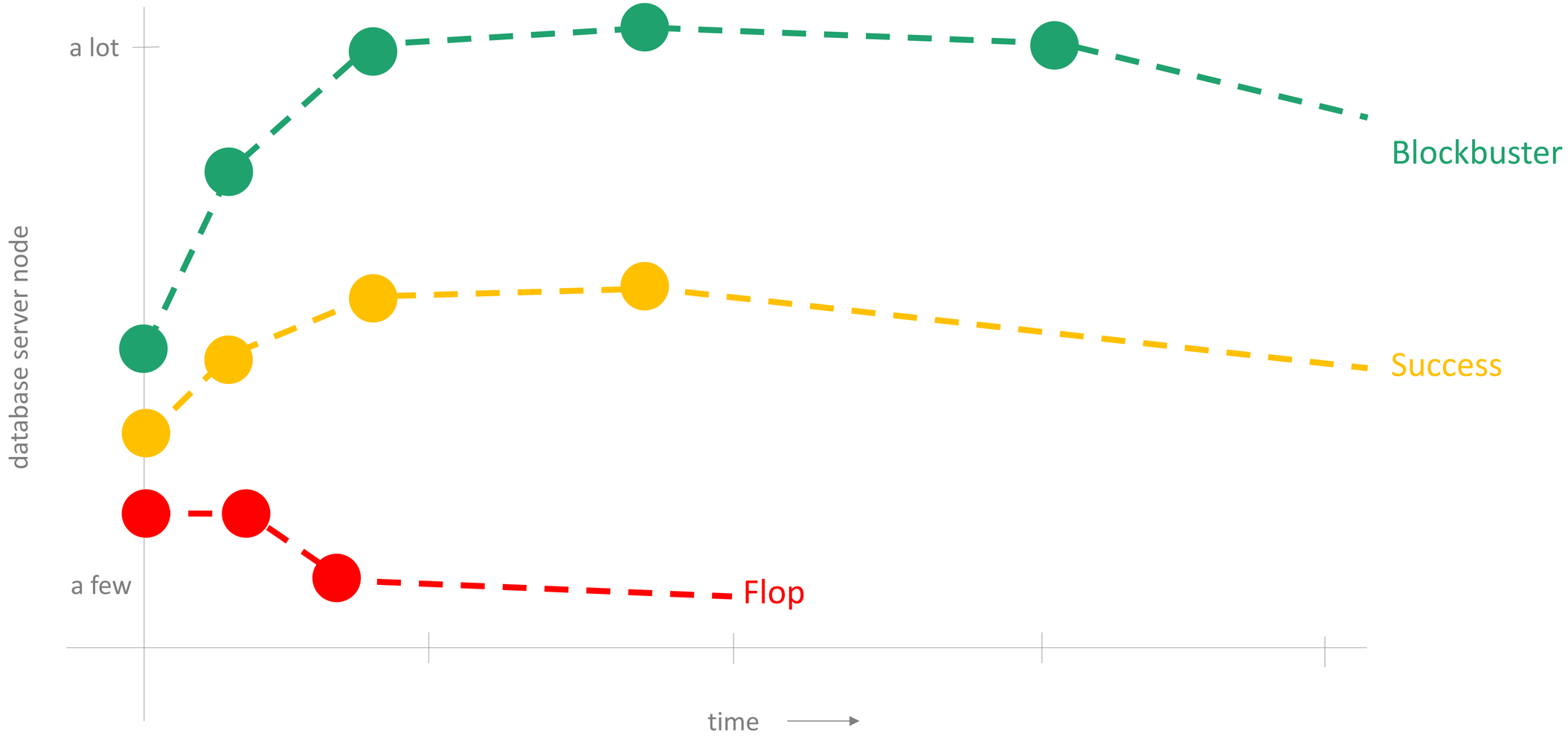
David Sprogis

MICRO FOCUS

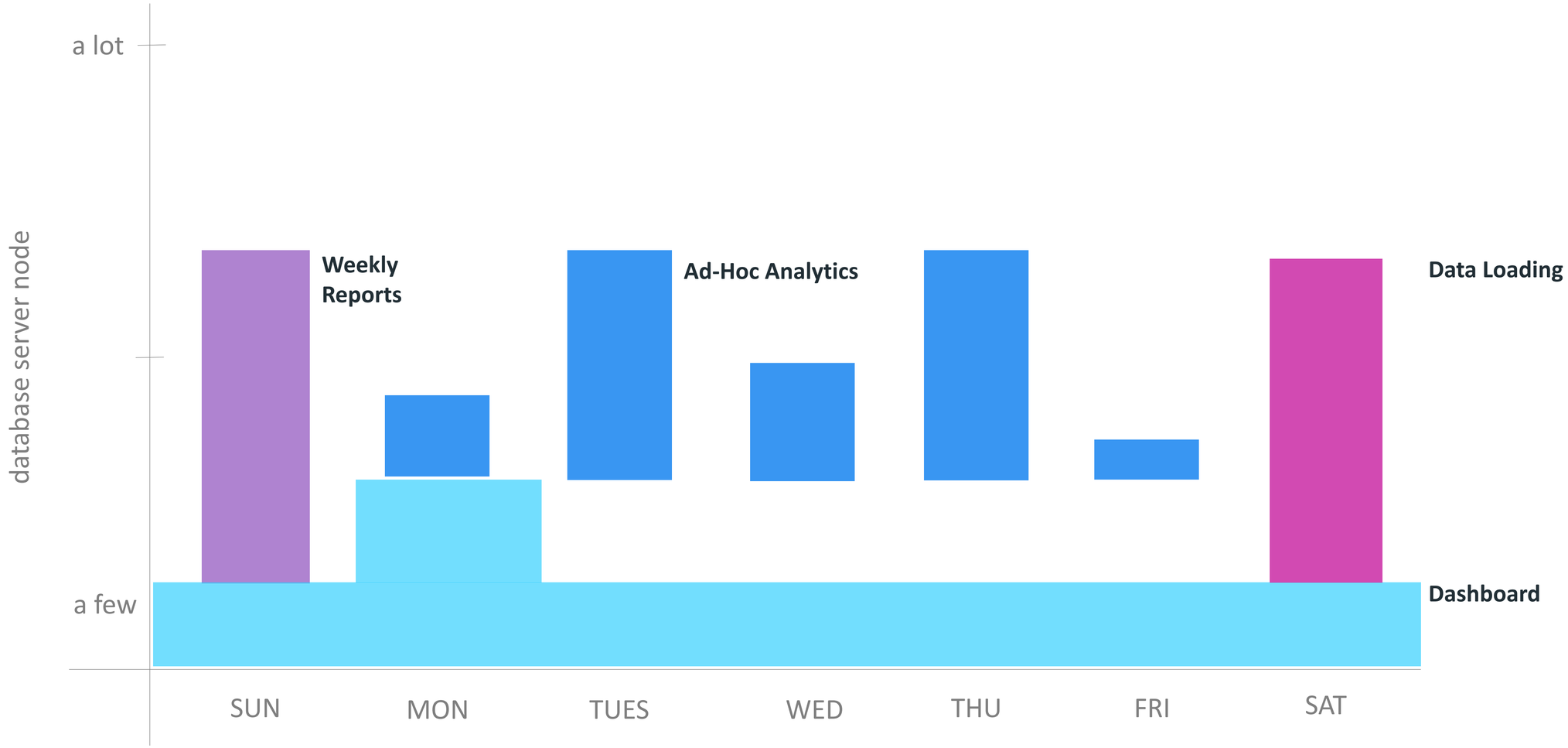
The struggle to size database infrastructure



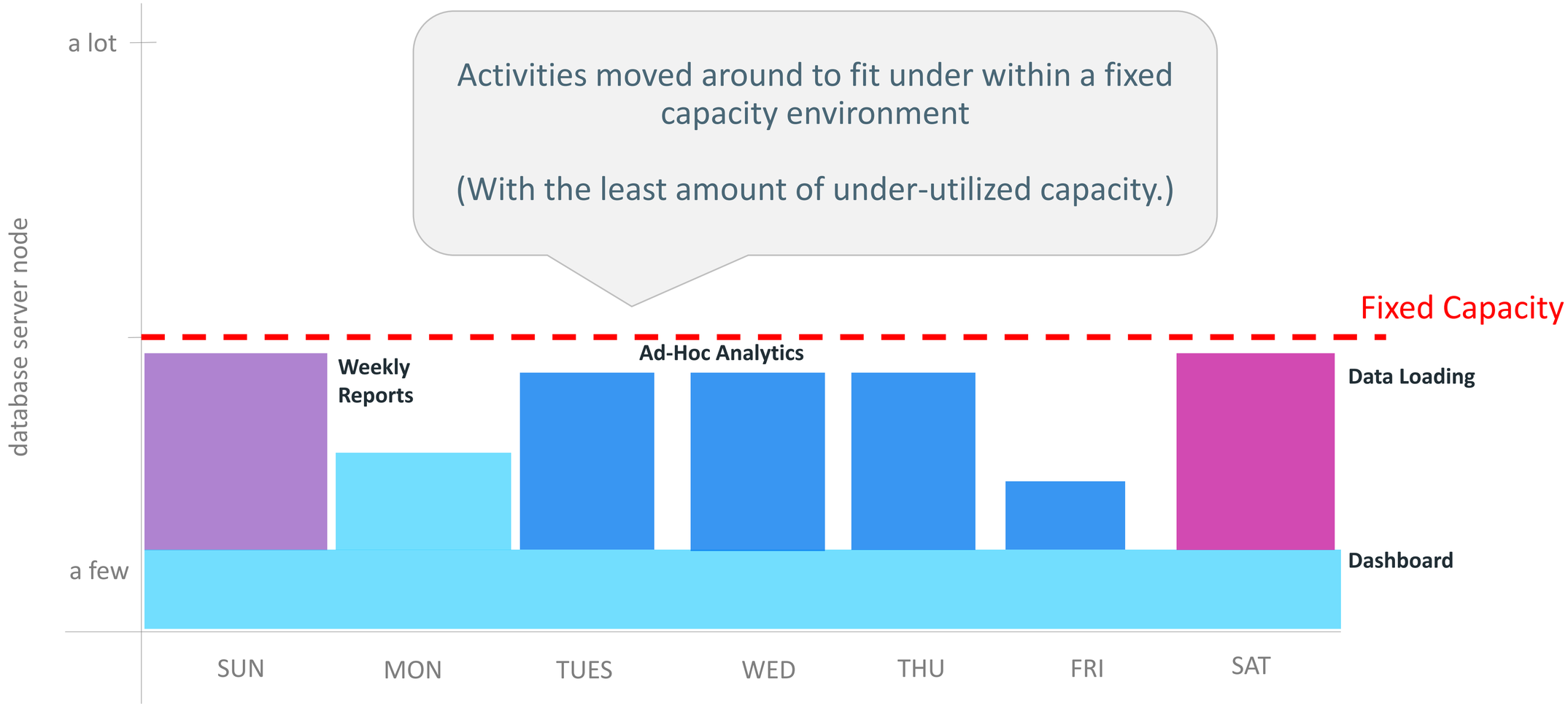
… then resize across a product lifecycle



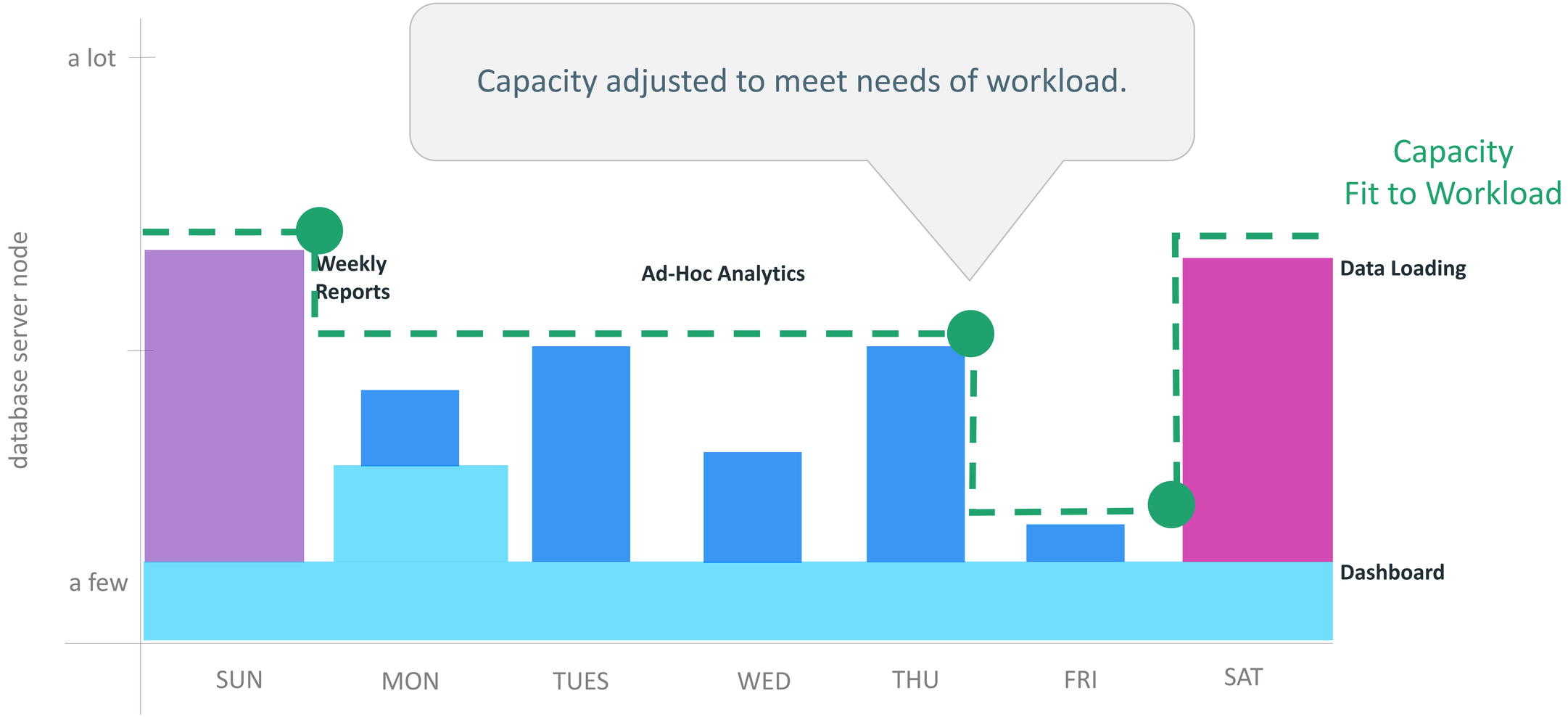
Not just gaming companies



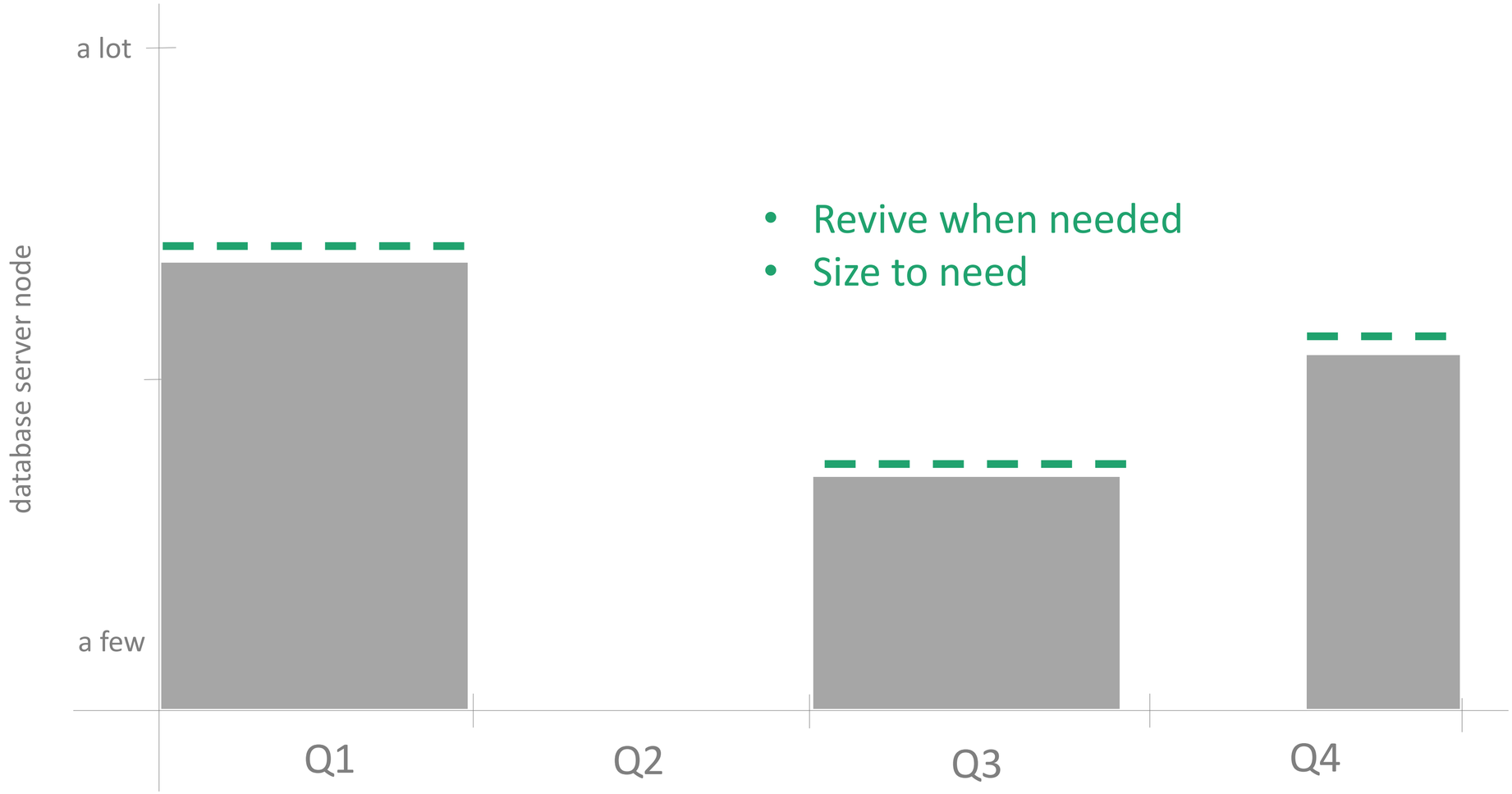
Adjusting workload to fit capacity



Eon mode lets you fit capacity to workload, scaling as needed



Hibernate between project phases

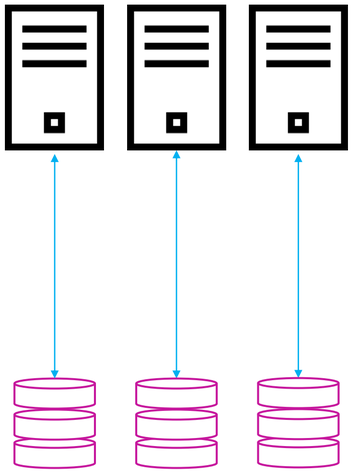


- Revive when needed
- Size to need

How does Eon work?

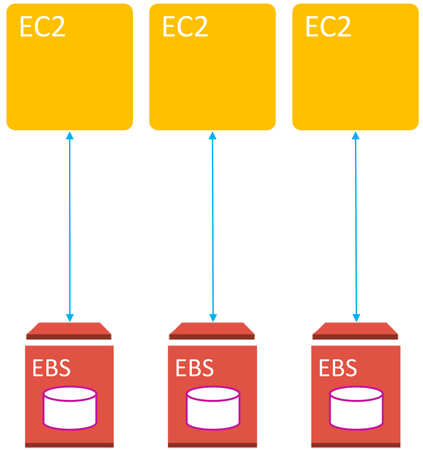
Growth and Extension of Vertica

Enterprise Mode Vertica On-Premises



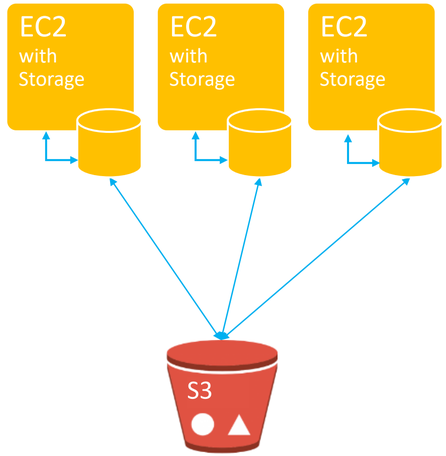
Fastest, open architecture, advanced analytics SQL database on commodity hardware.

Enterprise Mode Vertica AWS



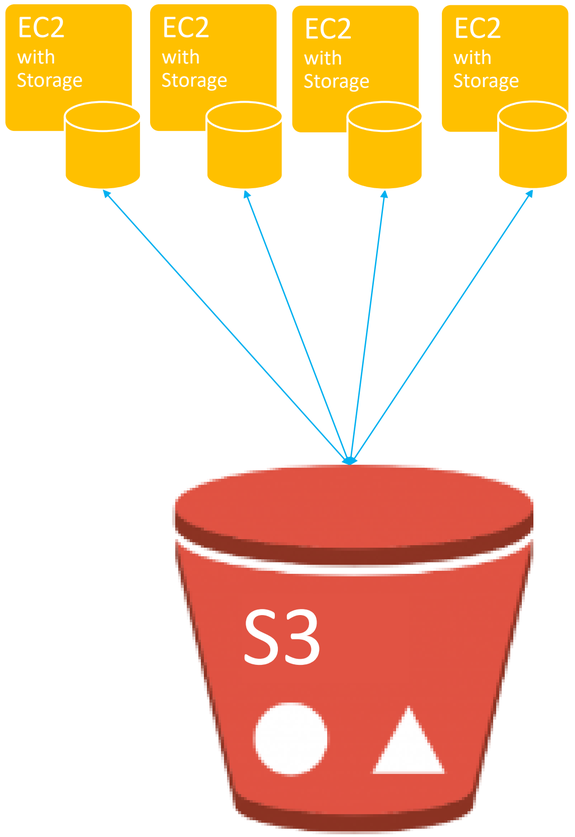
Fastest, open architecture, advanced analytics SQL database in the cloud.

Eon Mode Vertica AWS



Fastest, open architecture, advanced analytics SQL database capable of scaling quickly to keep pace with your changing workload.

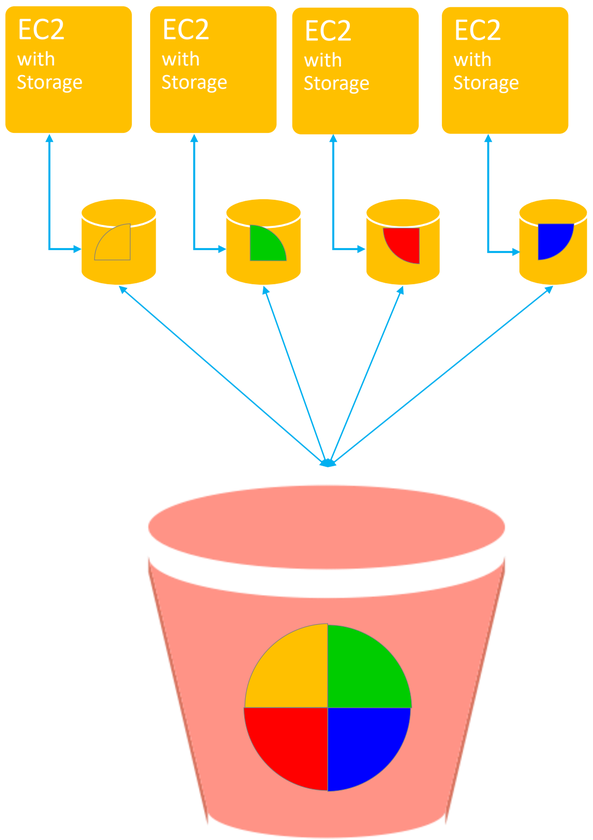
Simpler, Faster Provisioning



Getting started just got easier!

All you need are EC2 instances with storage and an S3 Bucket.

How does Eon Mode work?



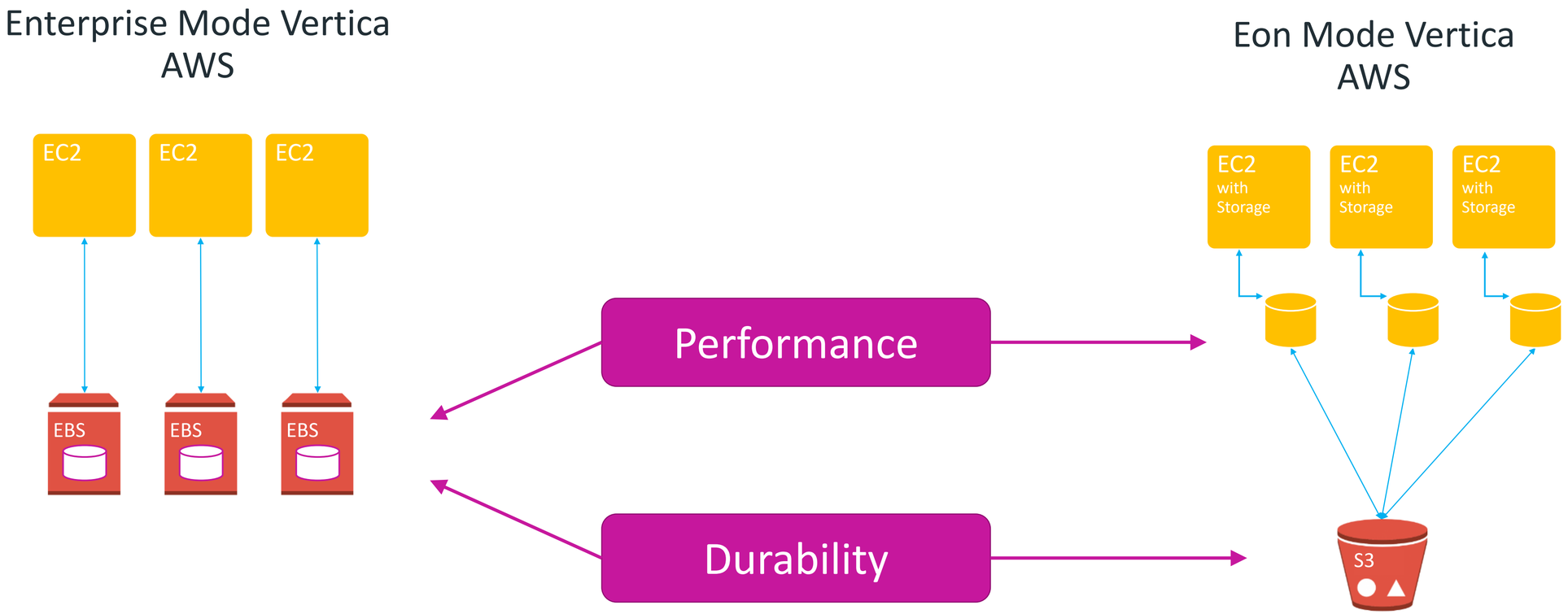
Nodes with instance storage are provisioned.

Each node caches a shard of the database from S3 into instance storage from which it can service queries with the blazing performance you expect from Vertica.

Collectively, this ephemeral instance storage layer is called the “depot” and remains consistent with the full database maintained in S3.

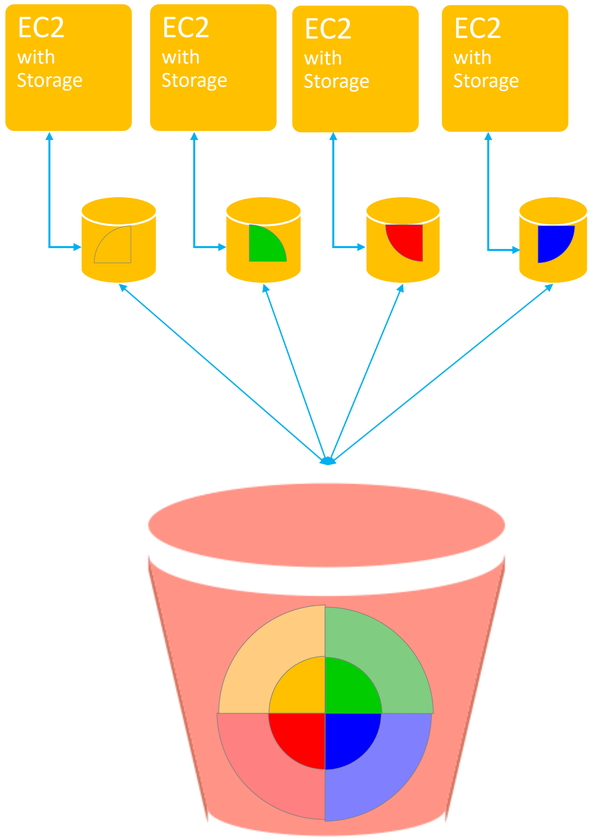
Your database is stored in S3 with 11 9’s of reliability.

Growth and Extension of Vertica



* Enterprise Mode or Eon Mode decided at the time the database is created

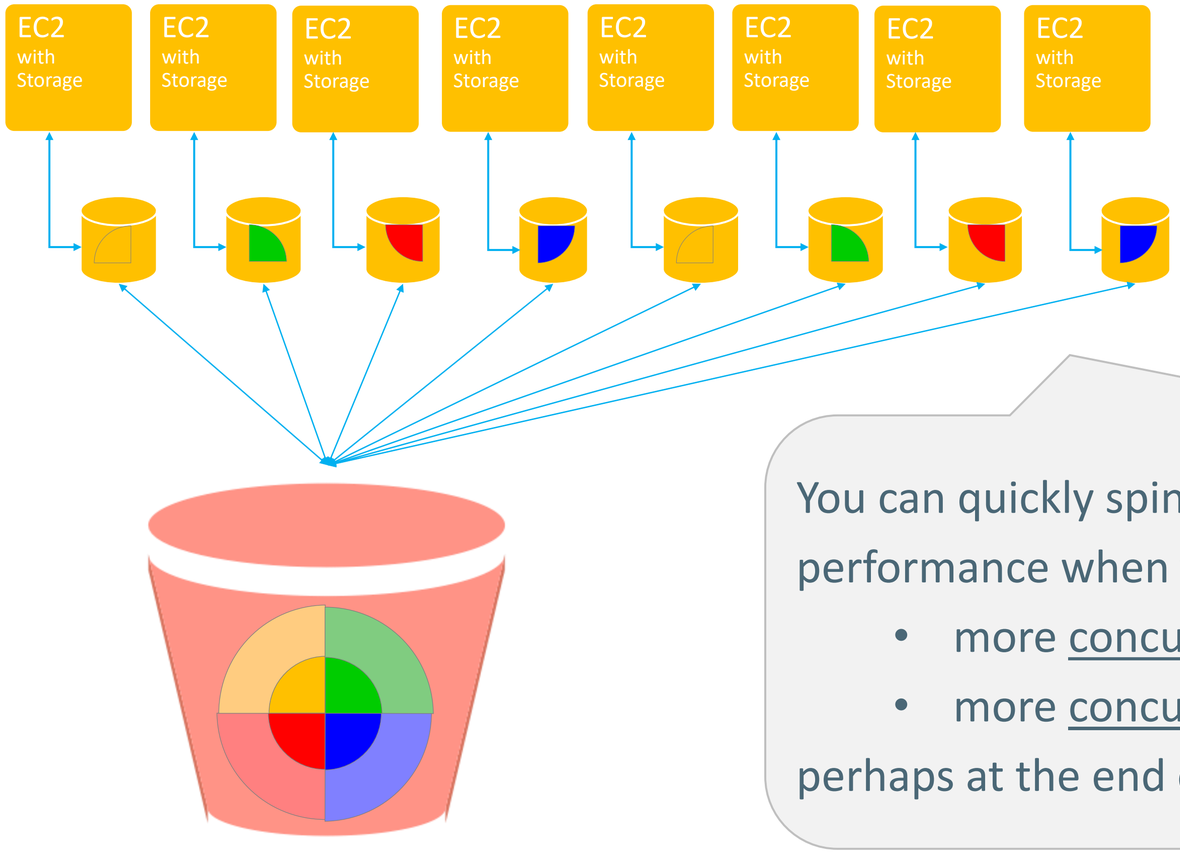
How does Eon Mode work?



A node may not store the entire shard in the depot.

When a new query can’t be satisfied by the depot, the node will run the query directly against S3 while updating the depot.

Rapid Scaling

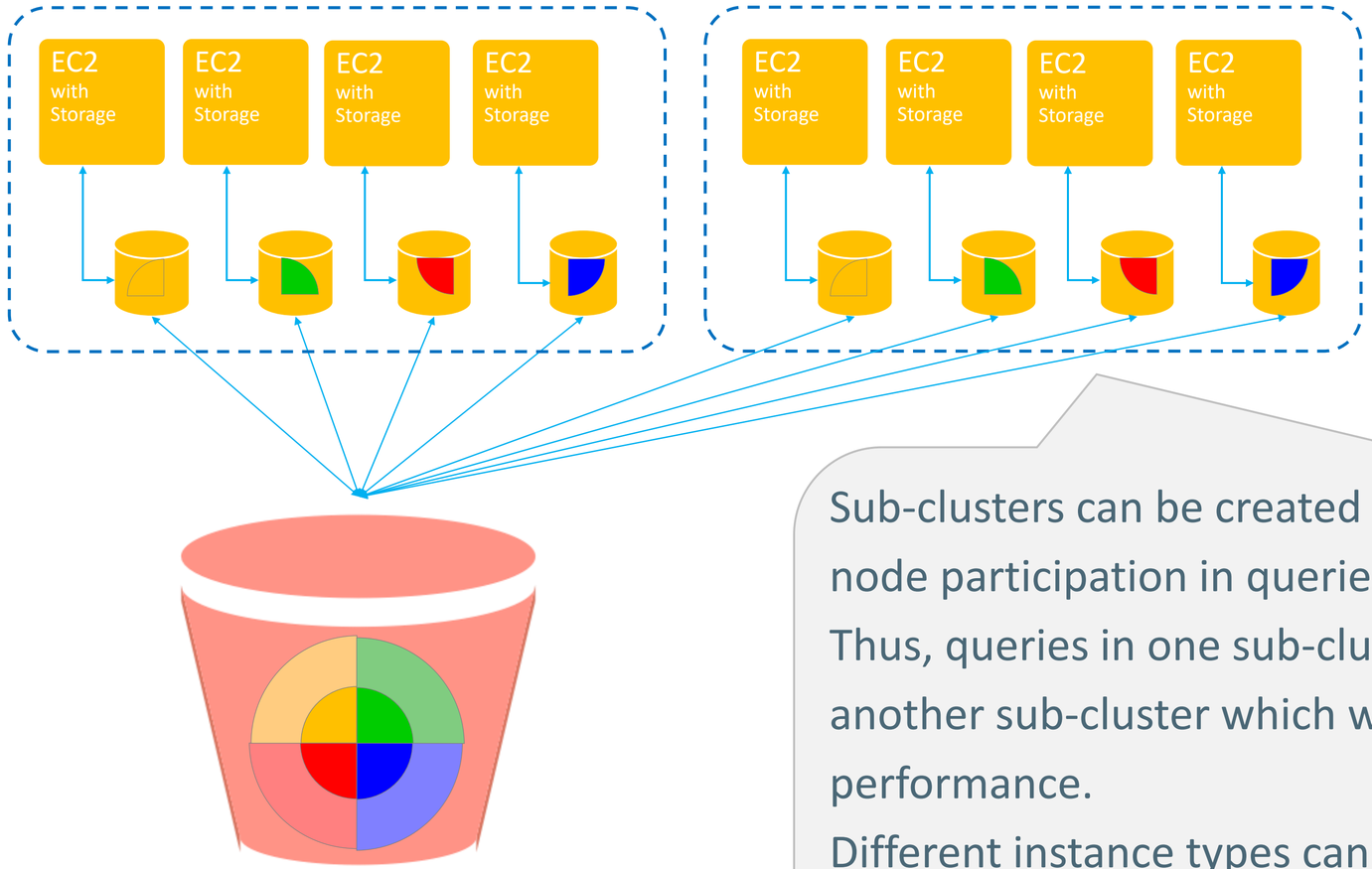


You can quickly spin-up additional nodes to maintain blazing fast performance when you need to run:

- more concurrent queries or
- more concurrent loads

perhaps at the end of a month or simply at the end of the day.

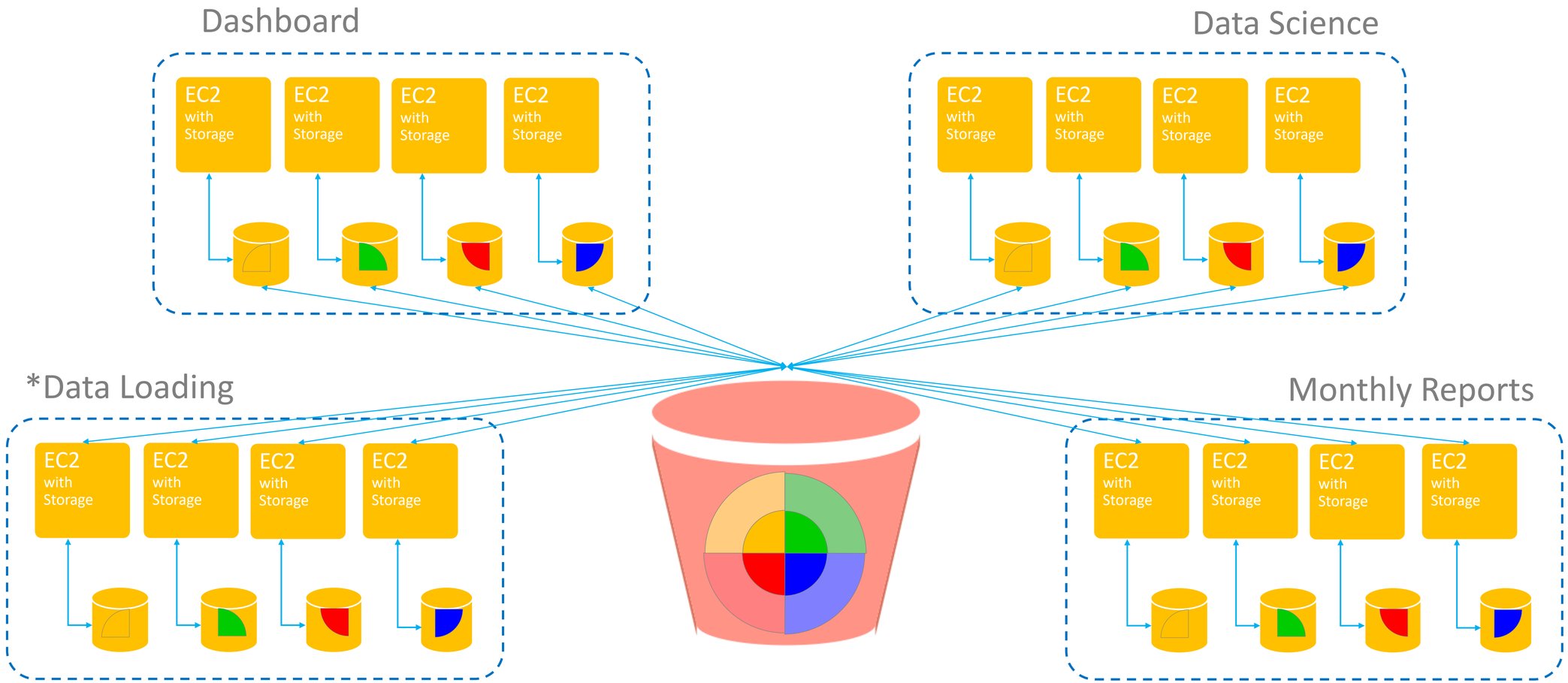
Isolate Workloads using Sub-clusters



Sub-clusters can be created using Fault Groups. Fault Groups isolate node participation in queries which, in turn, results in Depot isolation. Thus, queries in one sub-cluster will never evict files from the depot of another sub-cluster which would force an S3 fetch an reduce overall performance.

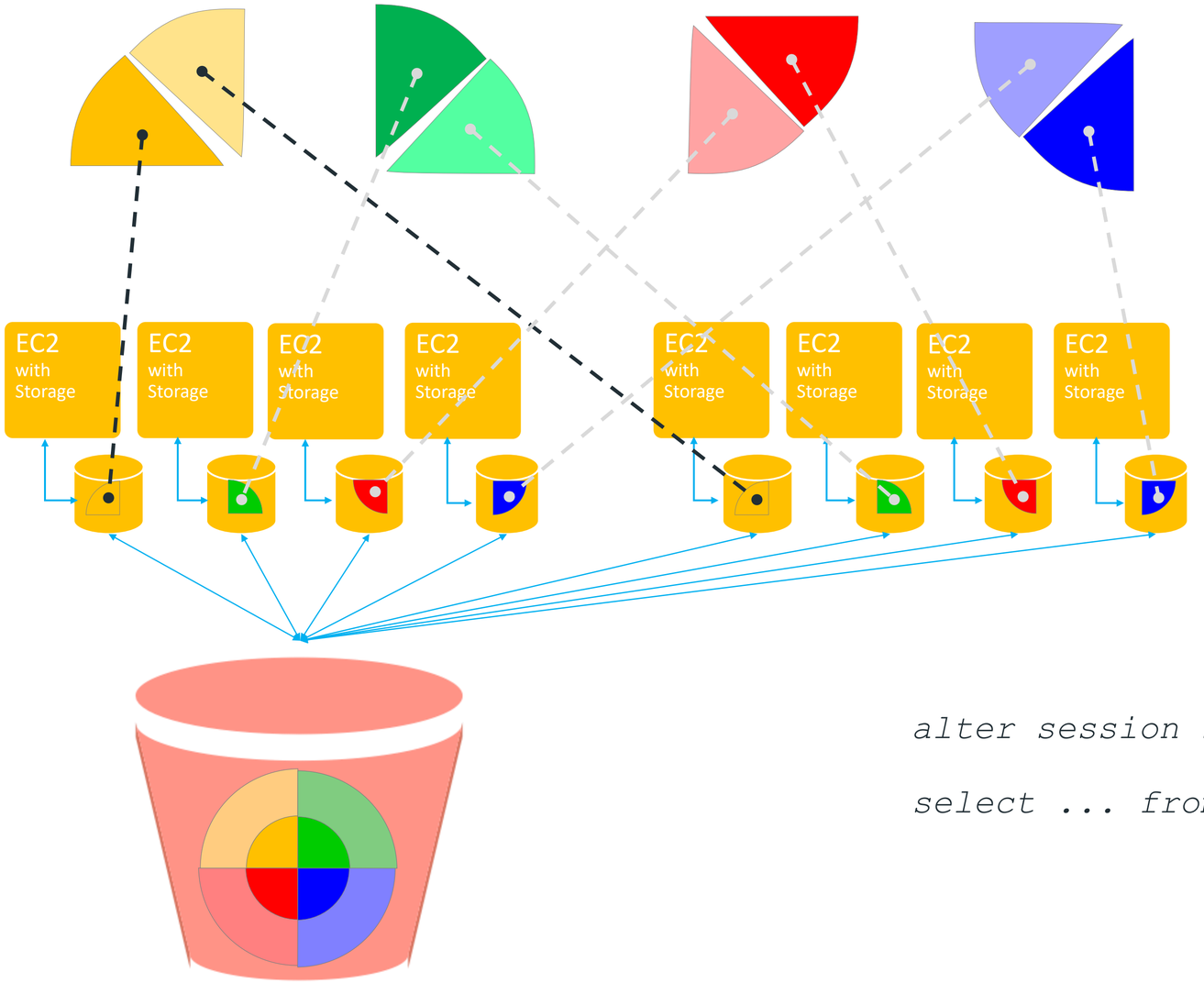
Different instance types can be used in different sub-clusters to better address specific activities of the sub-cluster.

Isolate Workloads using Sub-clusters



*Data Loading is an exception to workload isolation. All depots will be updated with most recent data files. We are planning a way to suppress peer-filling in this case.

Query Crunching for Increase Query Performance



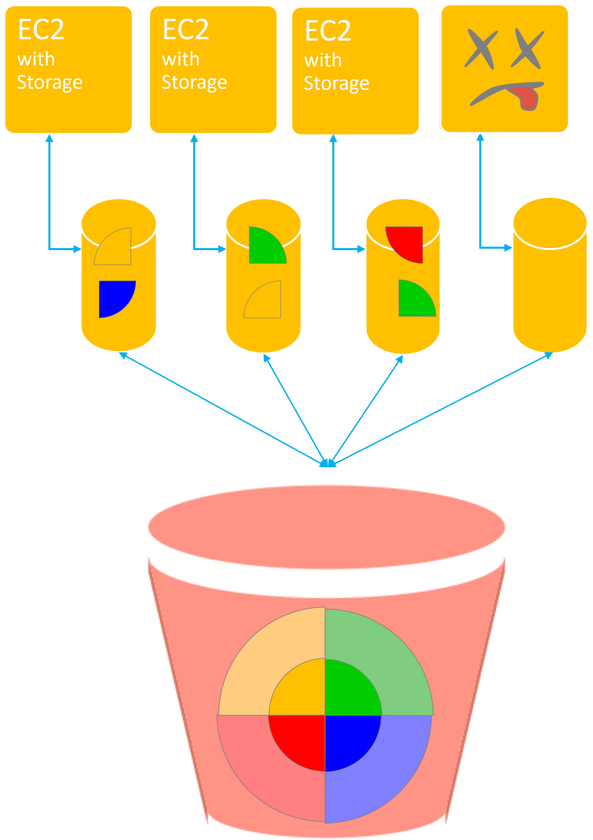
Divide compute across more nodes (shards) in order to increase query performance.

NOTATION

```
alter session set EnableElasticThroughputScaling = 0;

select ... from ... where ...
```

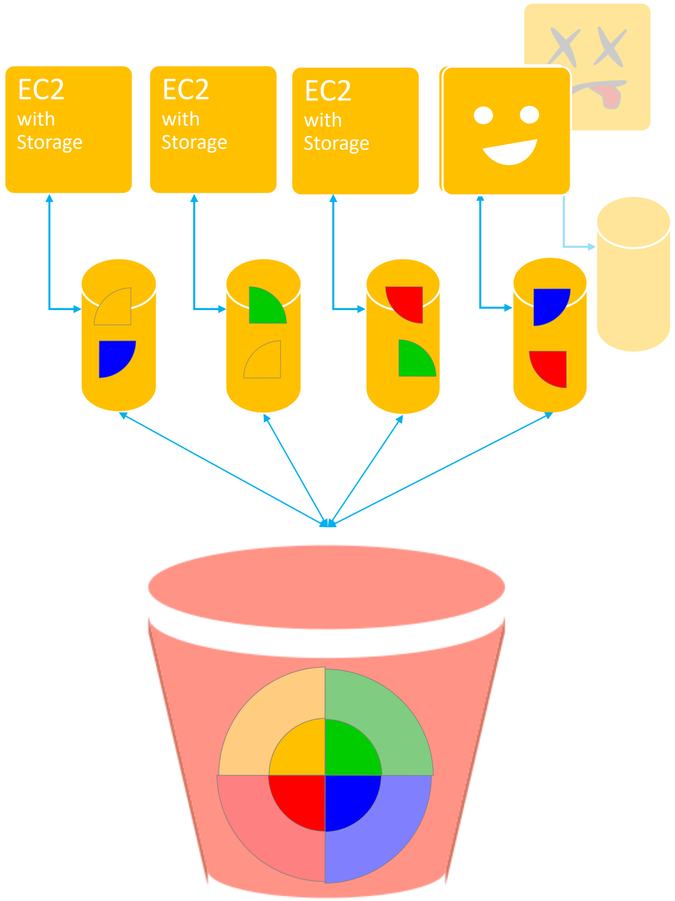
High Availability through Multiple Shards



Each node is responsible for a multiple shards so that when a node goes down, queries continue to be satisfied by alternate nodes responsible for the shard.

This is similar to K-Safety.

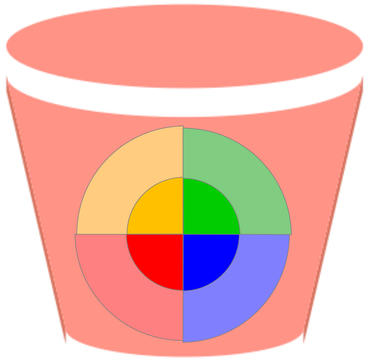
Rapid Node Recovery



A failed node can be restored or quickly replaced with a new node.

The new node starts up quickly by filling its cache from peer nodes or directly from S3. Performance is maintained because table locks are not required.

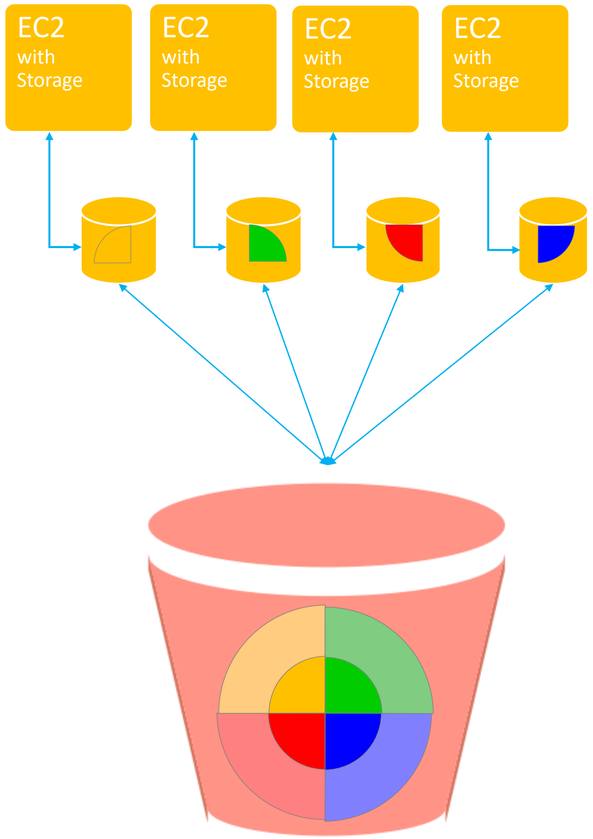
Hibernating



Spin down your entire cluster to save money if your system or project goes dormant or you want to use your Vertica license on other data.

Simply spin it back up when you need it again.

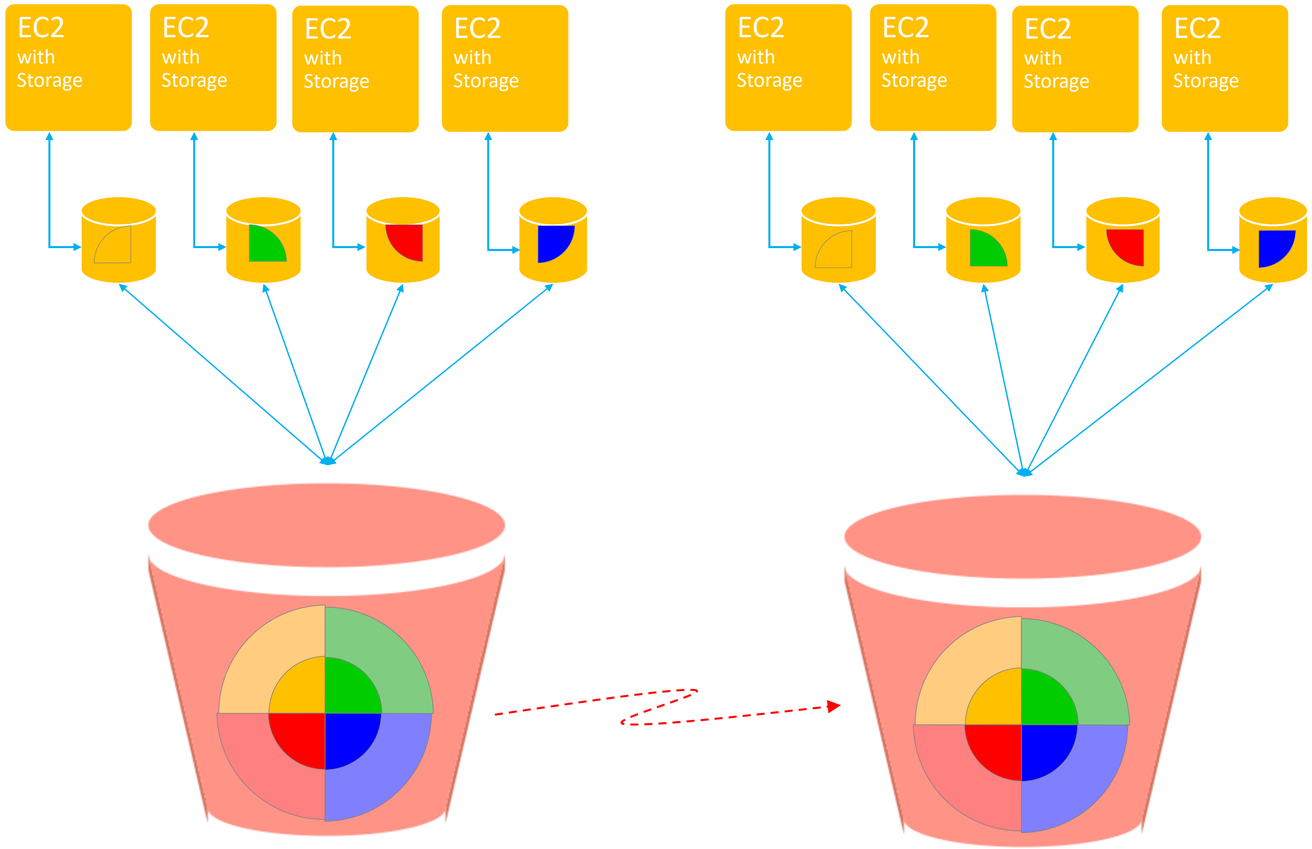
Revive Database



When you are ready to restore your database, simply:

1. Provision a new cluster and
2. Use revive_db to bring the database out of hibernation.

Replication through S3 Snapshots

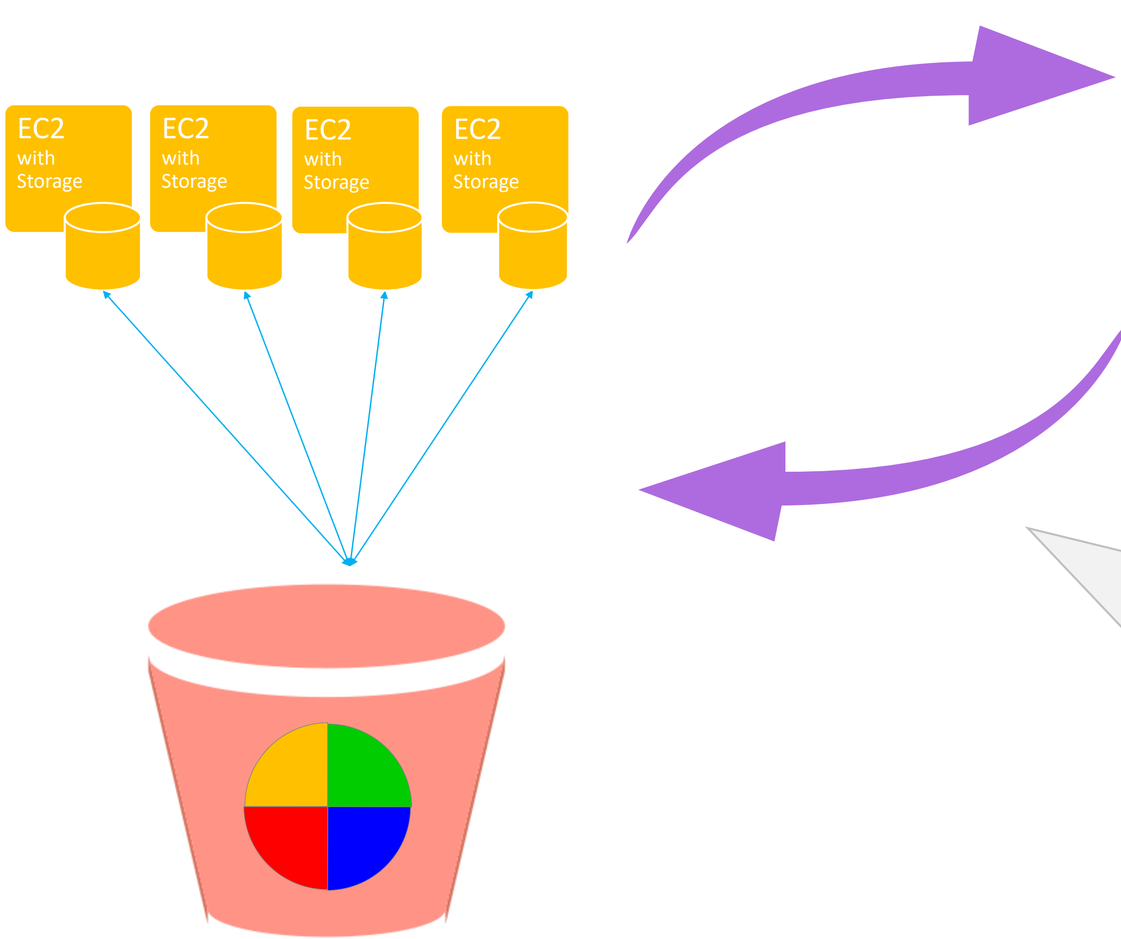


Snapshot your S3 database for replicas on-demand.

For example, dedicate a cluster to service another geographical region or cost center.

“Revive” a replica by simply adding nodes.

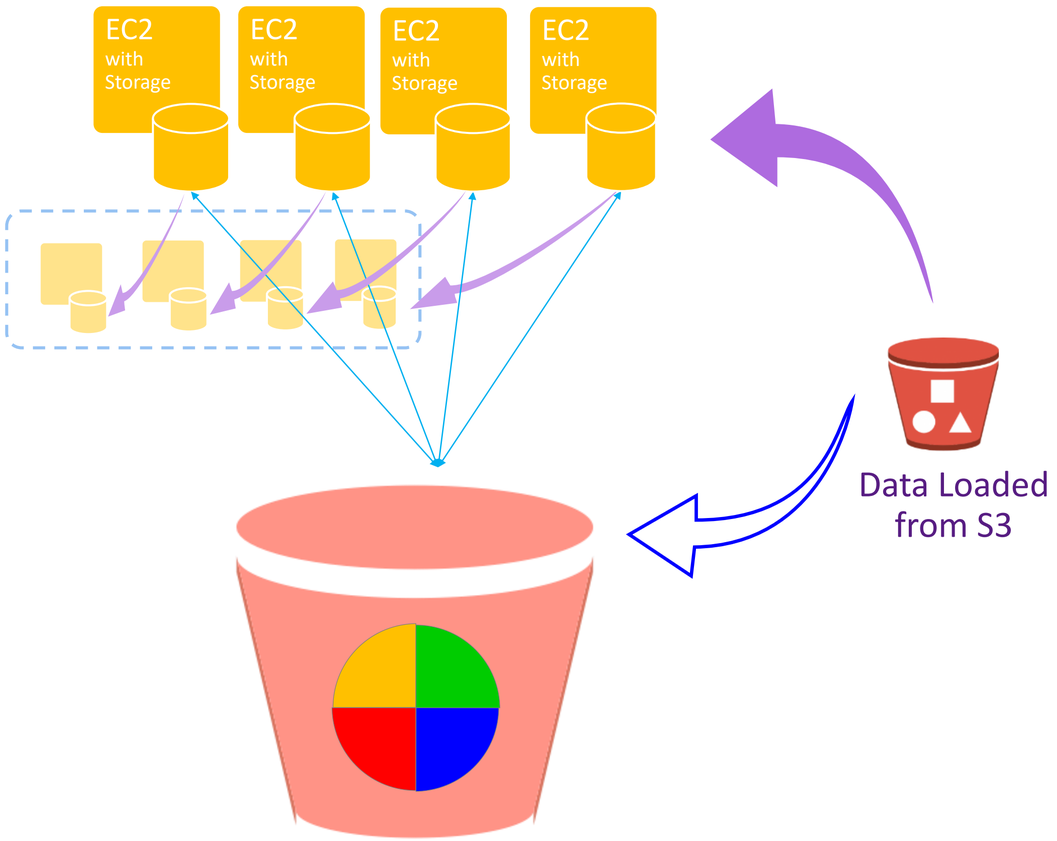
Vertica Backup and Restore (“VBR”) to S3



VBR for EON will operate much like “Back-up to S3” currently available in Enterprise Mode

- Backup entire DB (Full & Incremental)
- Restore entire DB
- Backup selected Objects
- Restore selected Objects

Loading Data, through Depot and Direct Writes to S3

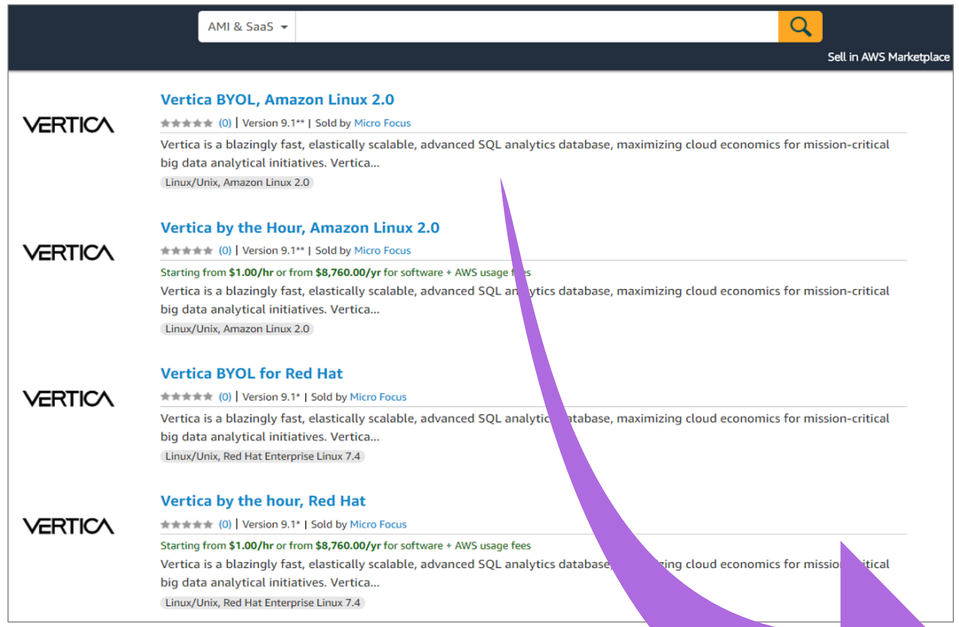


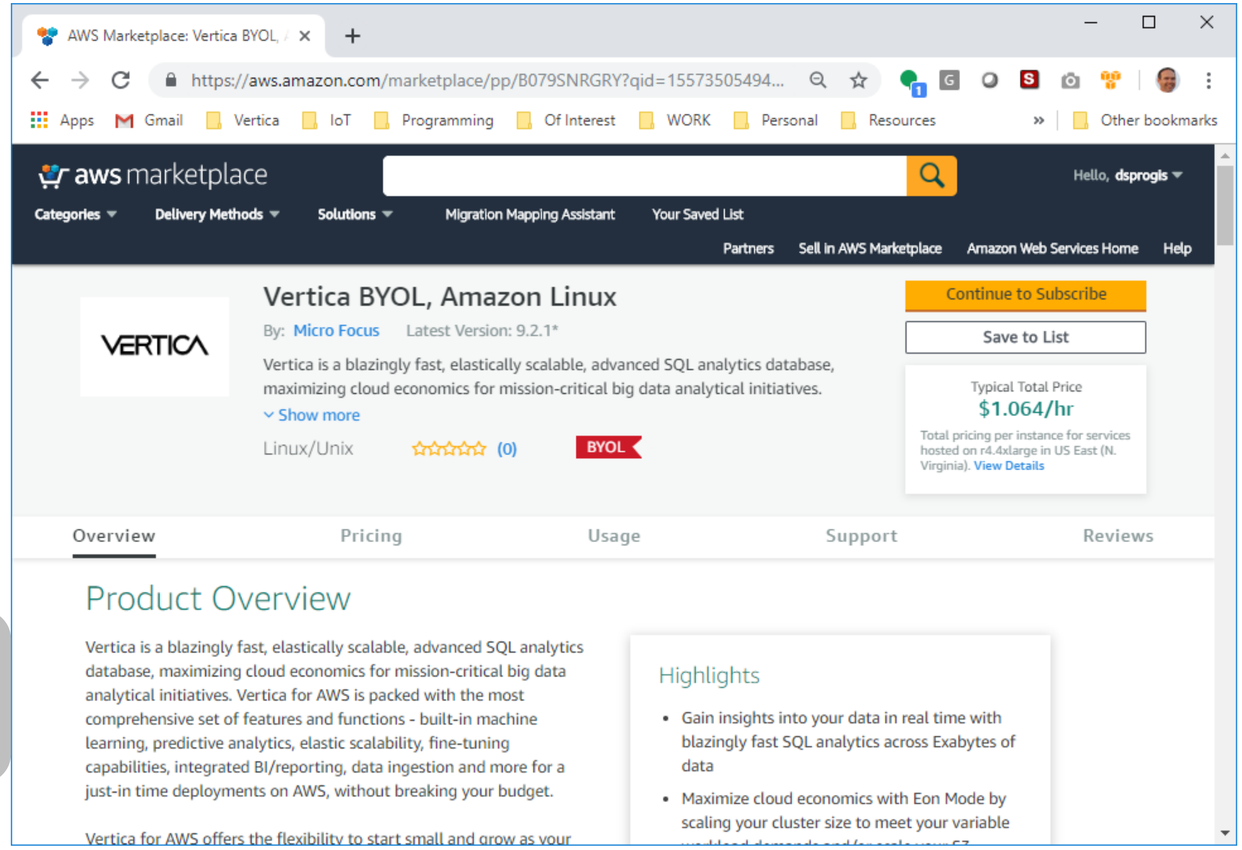
Data can be loaded into Vertica Eon through the Depot or directly to S3

Depot	Direct to S3
Immediately available for queries	Not constrained by Depot size
Option to share with peer nodes in same subcluster and/or other subclusters	No contention for Depot space

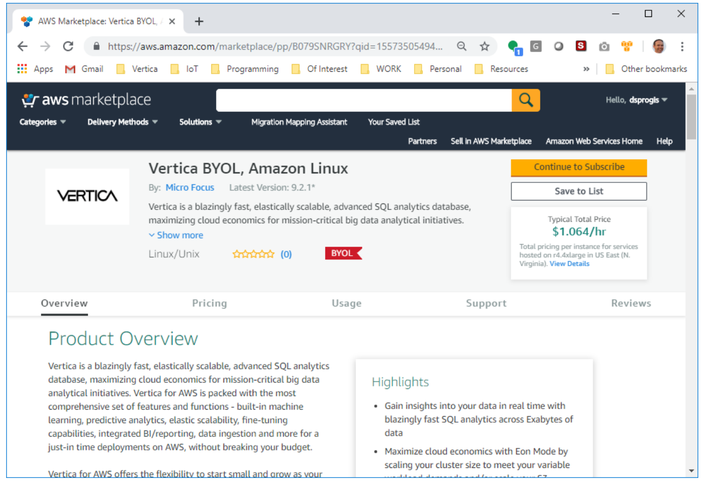
Getting Started

Search for “Vertica” in AWS Marketplace (http://aws.amazon.com/marketplace)

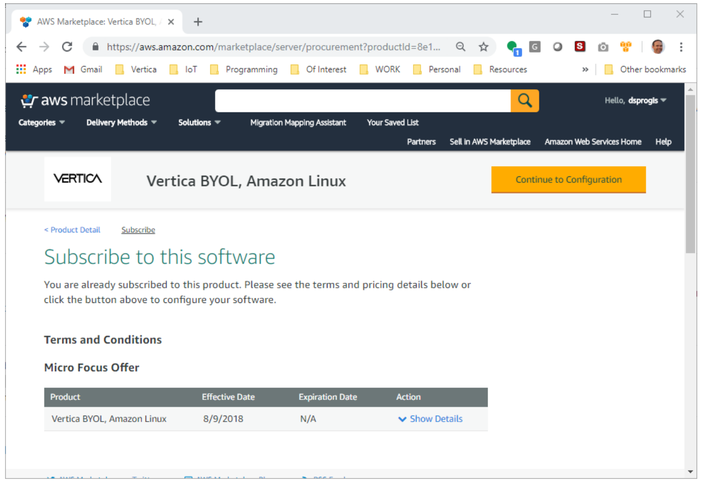




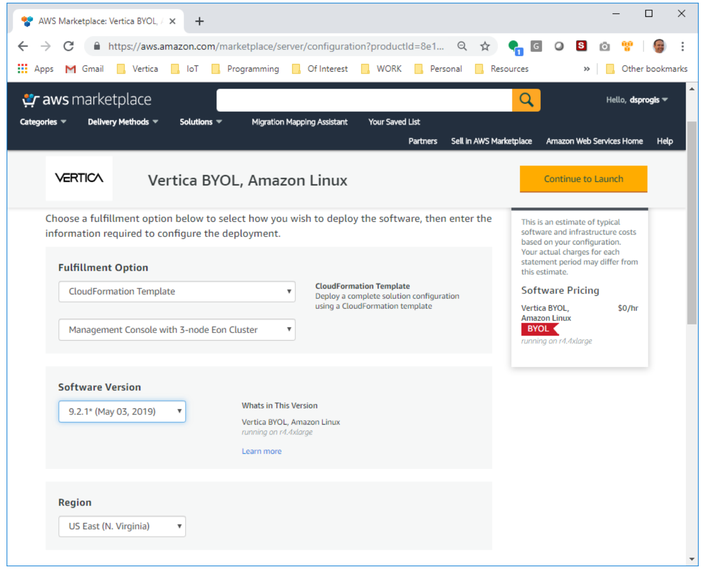
Click “Vertica BYOL, Amazon Linux”
Which provides Community Edition Vertica free



Click “Continue to Subscribe”



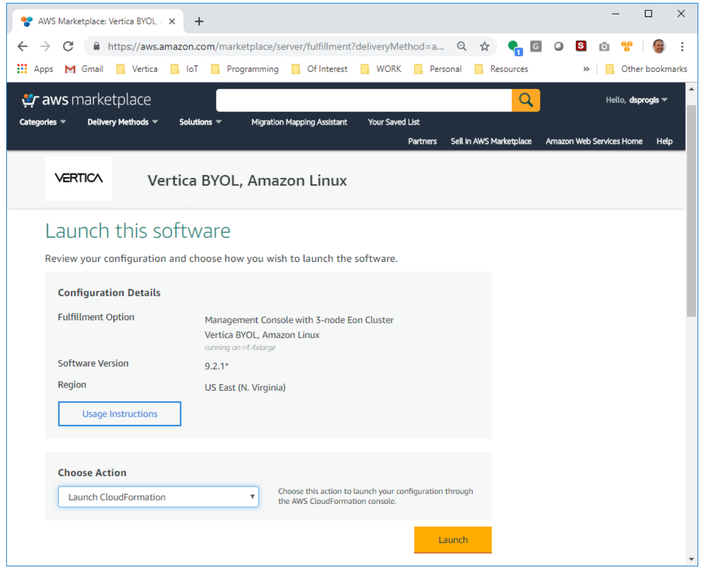
Click “Continue to Configuration”



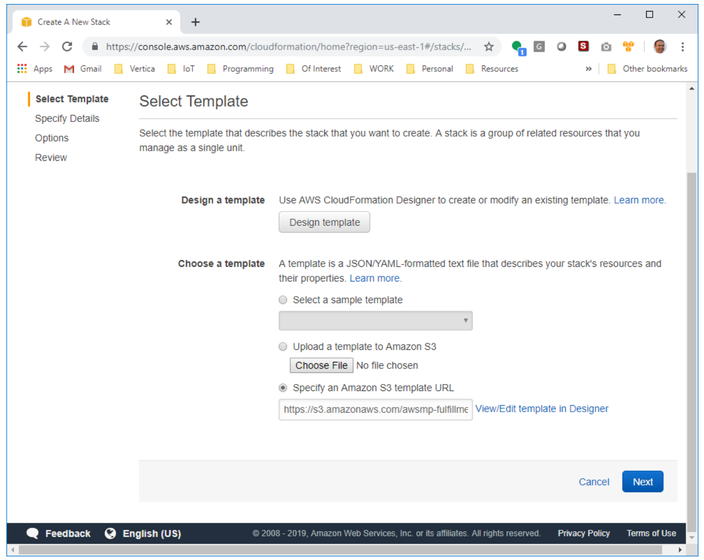
- Select “CloudFormation Template”
- Select “Management Console with 3-node Eon Cluster”
- Select desired Version
- Select desired Region
- Click “Continue to Launch”

VERTICA

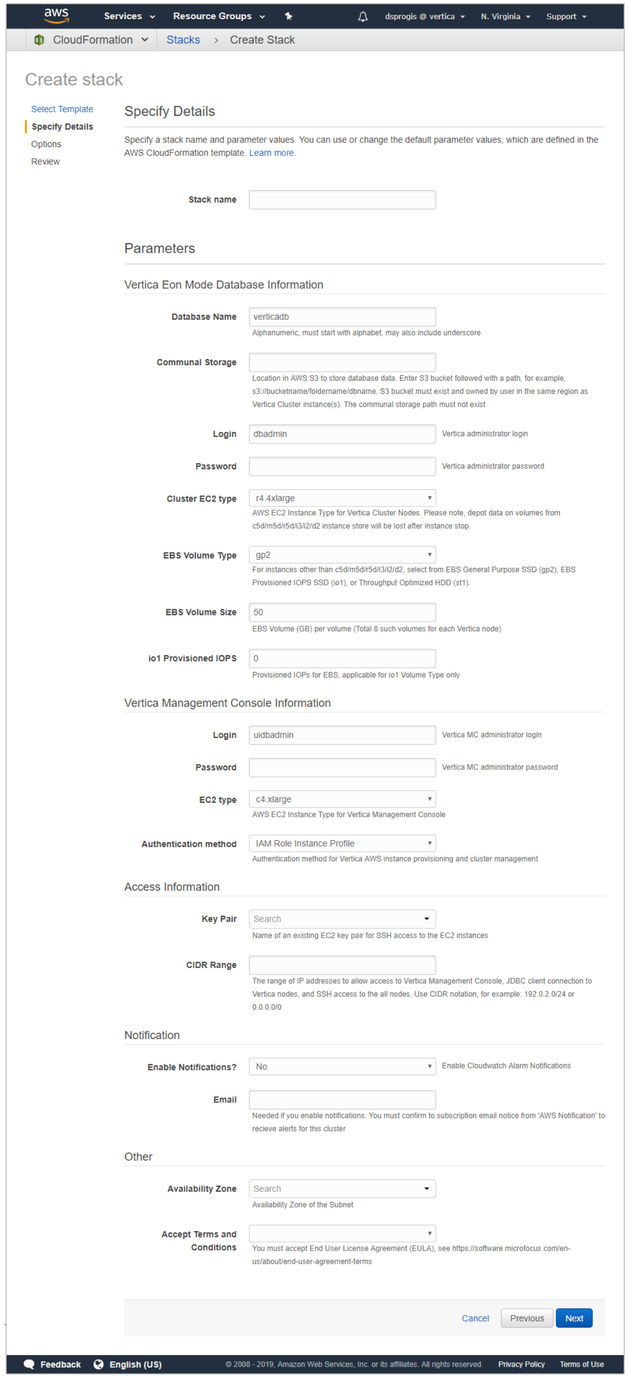
MICRO FOCUS



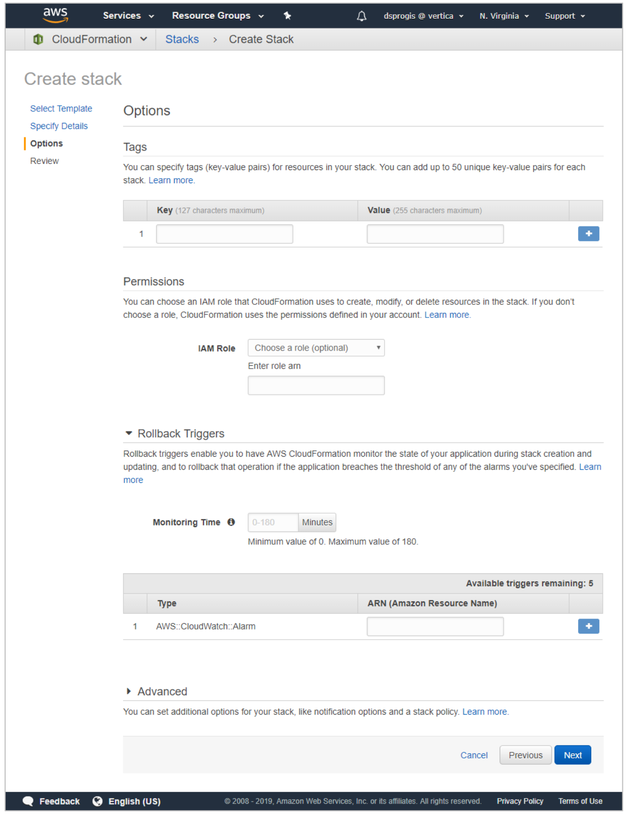
- Select “Launch CloudFormation”
- Click “Launch”



- Click “Next”



- Enter new name for CloudFormation Stack
- Enter new name storage path in existing bucket
- Enter new database password
- Enter new Management Console password
- Select Key Pair
- Enter CIDR Range
- Select Availability Zone
- Accept Terms and Conditions
- Click “Next”


aws
Services
Resource Groups
dsprogis @ vertica
N. Virginia
Support
CloudFormation
Stacks
Create Stack
Create stack
Select Template
Specify Details
Options
Review
Options
Tags
You can specify tags (key-value pairs) for resources in your stack. You can add up to 50 unique key-value pairs for each stack. Learn more.
Key (127 characters maximum)
Value (255 characters maximum)
1
Permissions
You can choose an IAM role that CloudFormation uses to create, modify, or delete resources in the stack. If you don't choose a role, CloudFormation uses the permissions defined in your account. Learn more.
IAM Role
Choose a role (optional)
Enter role arn
Rollback Triggers
Rollback triggers enable you to have AWS CloudFormation monitor the state of your application during stack creation and updating, and to rollback that operation if the application breaches the threshold of any of the alarms you've specified. Learn more
Monitoring Time
0-180
Minutes
Minimum value of 0. Maximum value of 180.
Available triggers remaining: 5
Type
ARN (Amazon Resource Name)
1
AWS::CloudWatch::Alarm
Advanced
You can set additional options for your stack, like notification options and a stack policy. Learn more.
Cancel
Previous
Next
Feedback
English (US)
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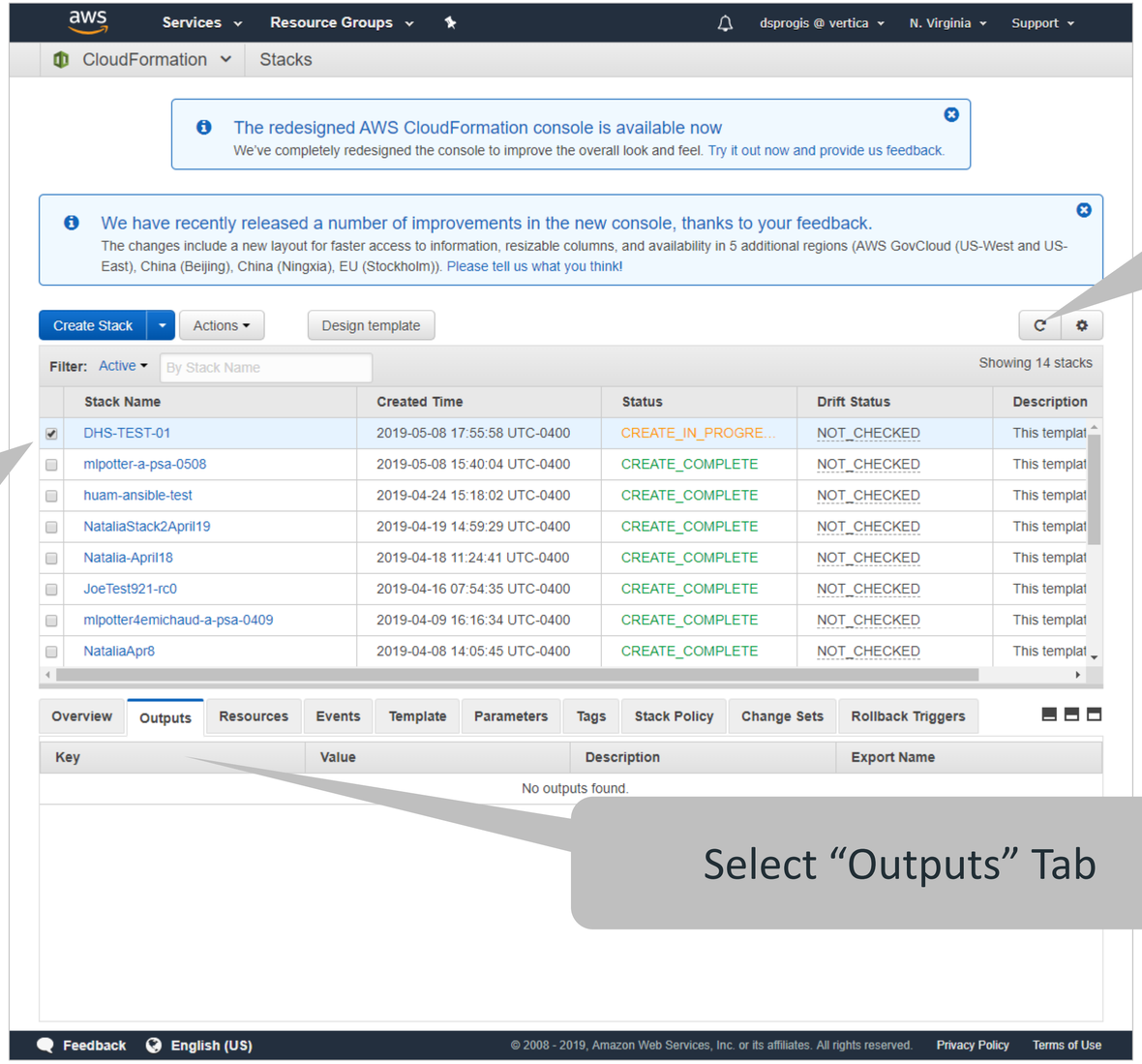
Privacy Policy
Terms of Use

- Click “Next”

- Review Selections

- Click “I acknowledge …”

- Click “Create”

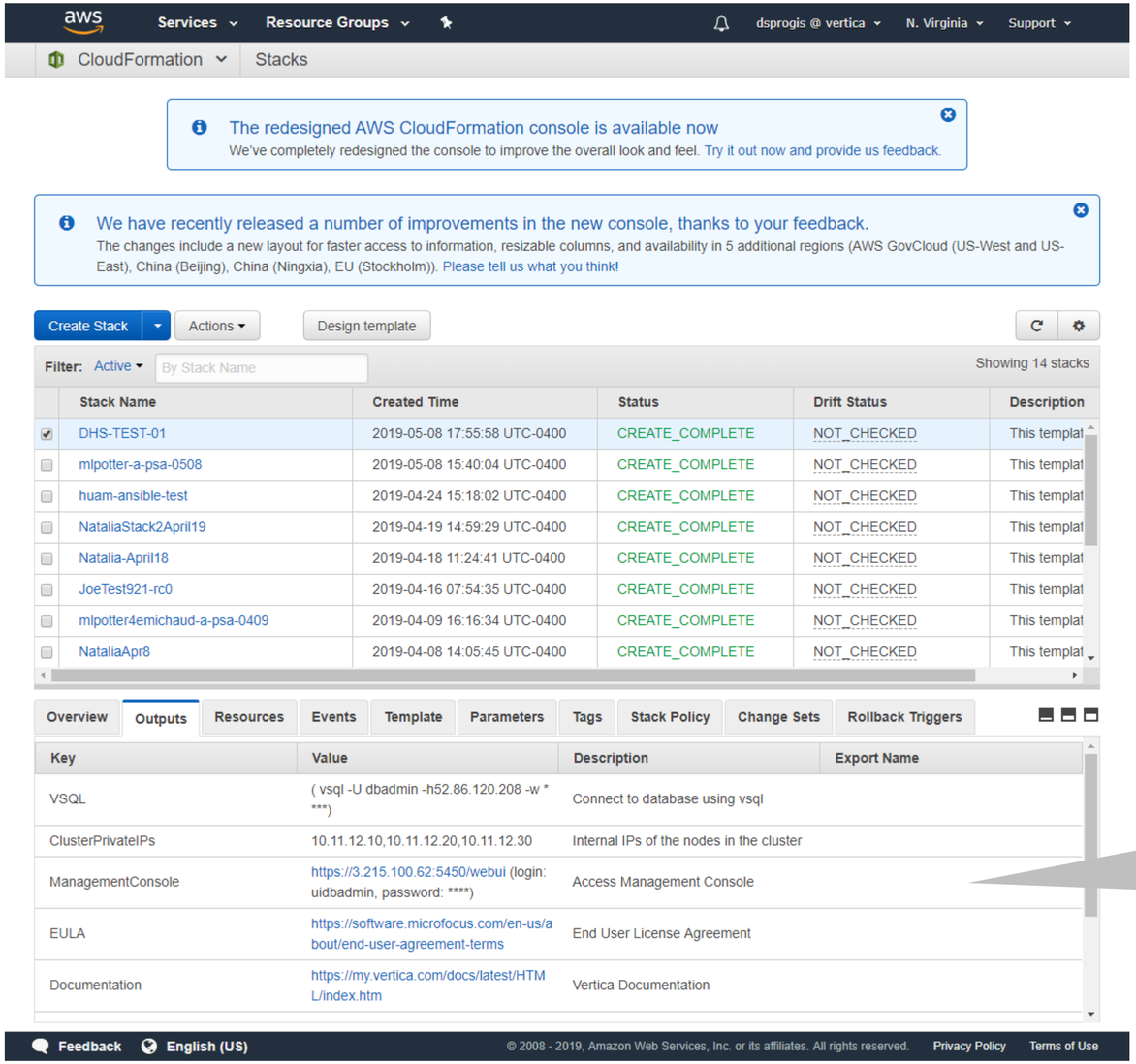


Select your Stack

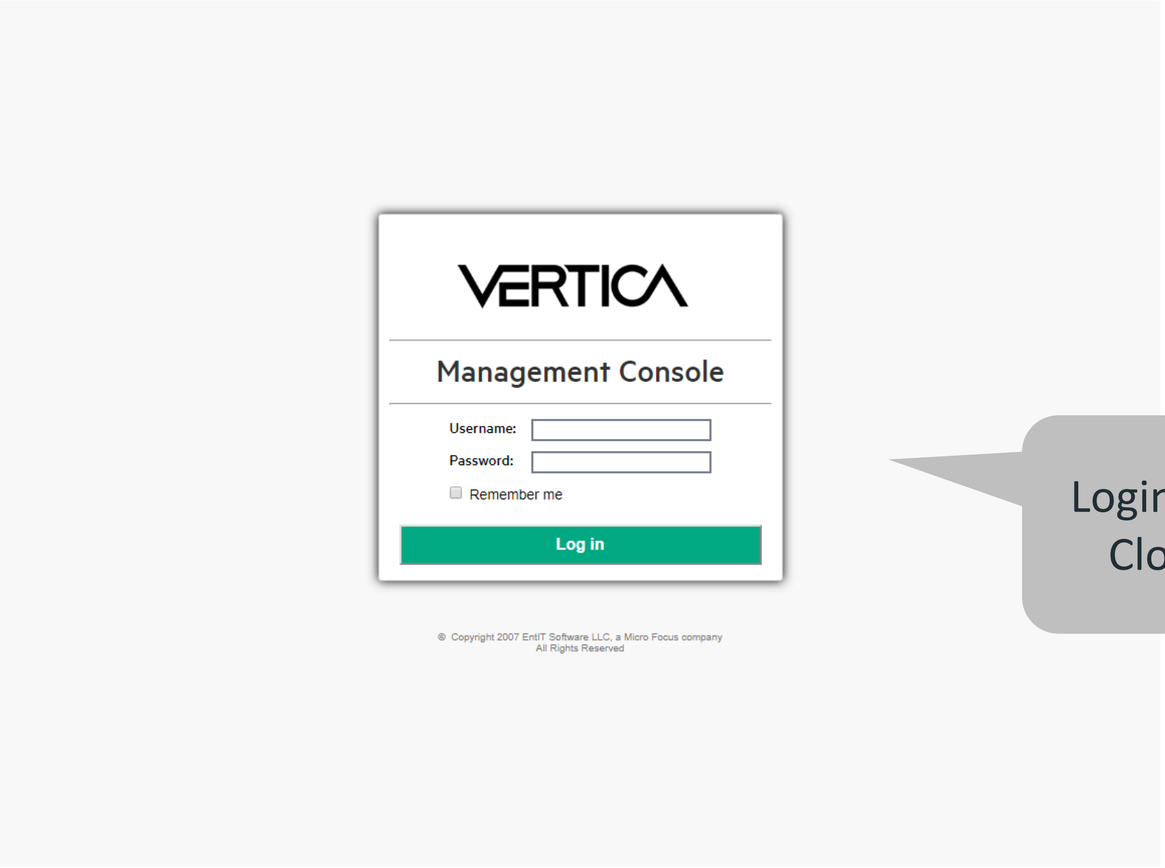
Click Refresh Button

Select “Outputs” Tab

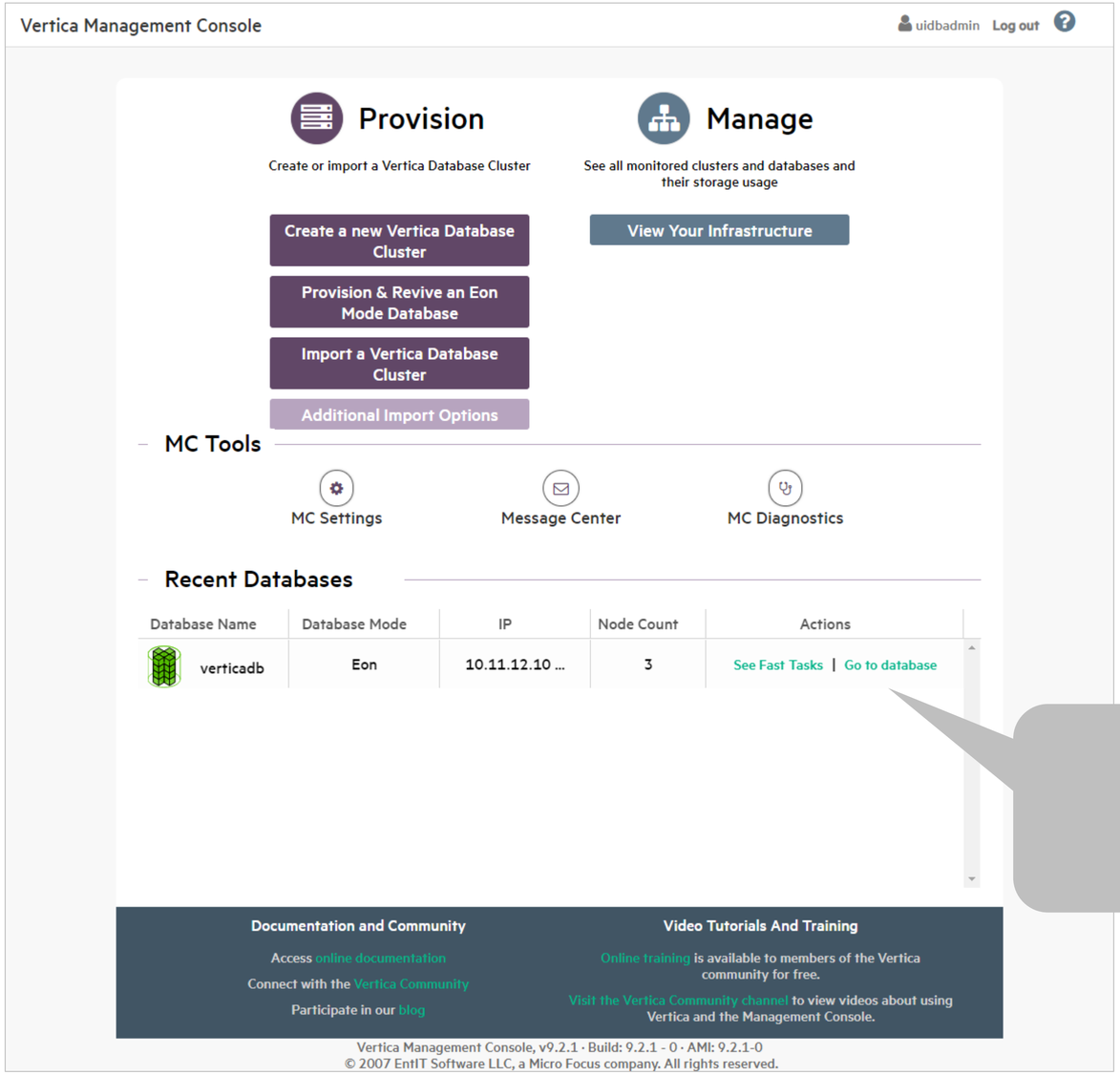
Observe connection options



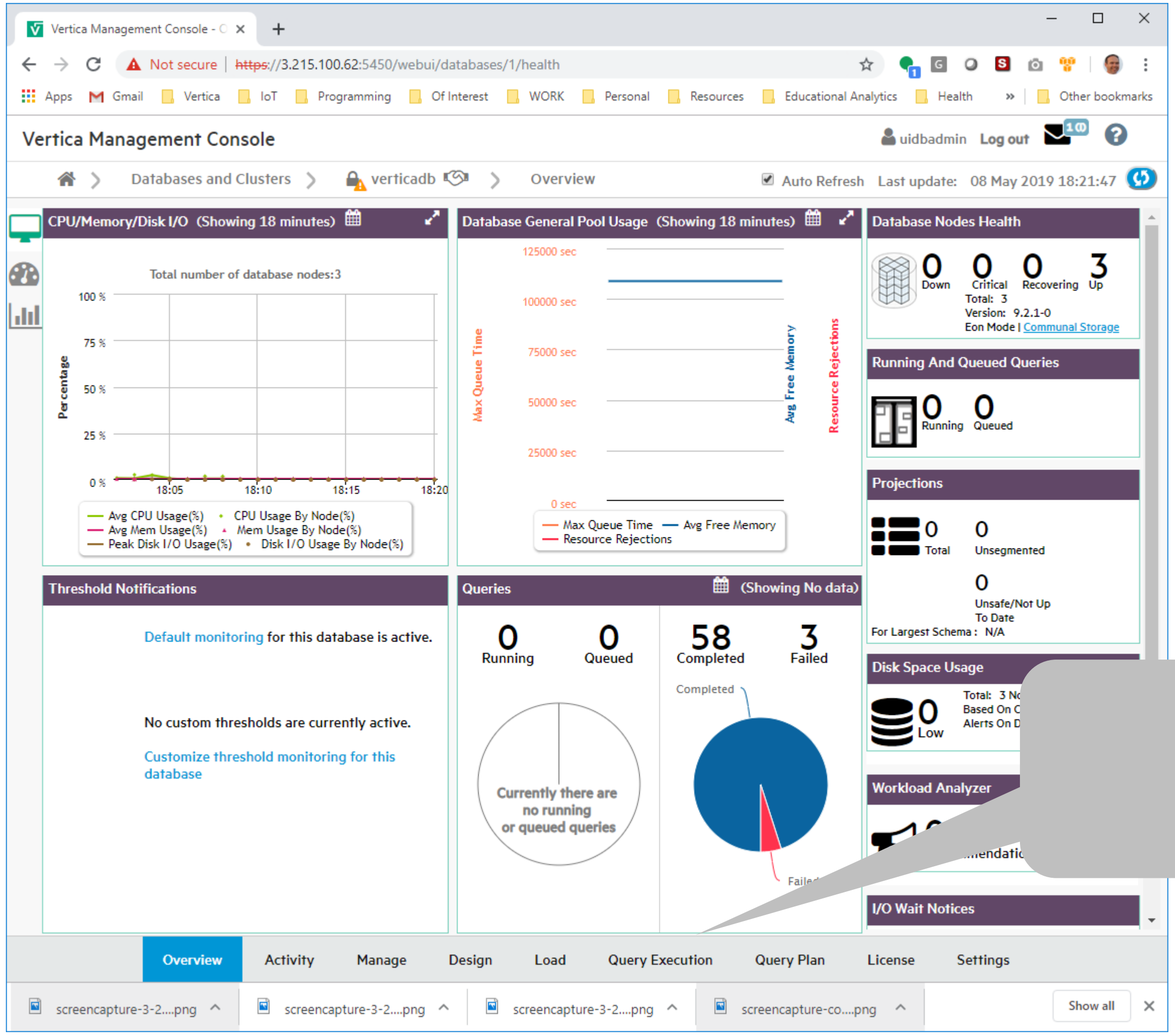
Click link to Management Console



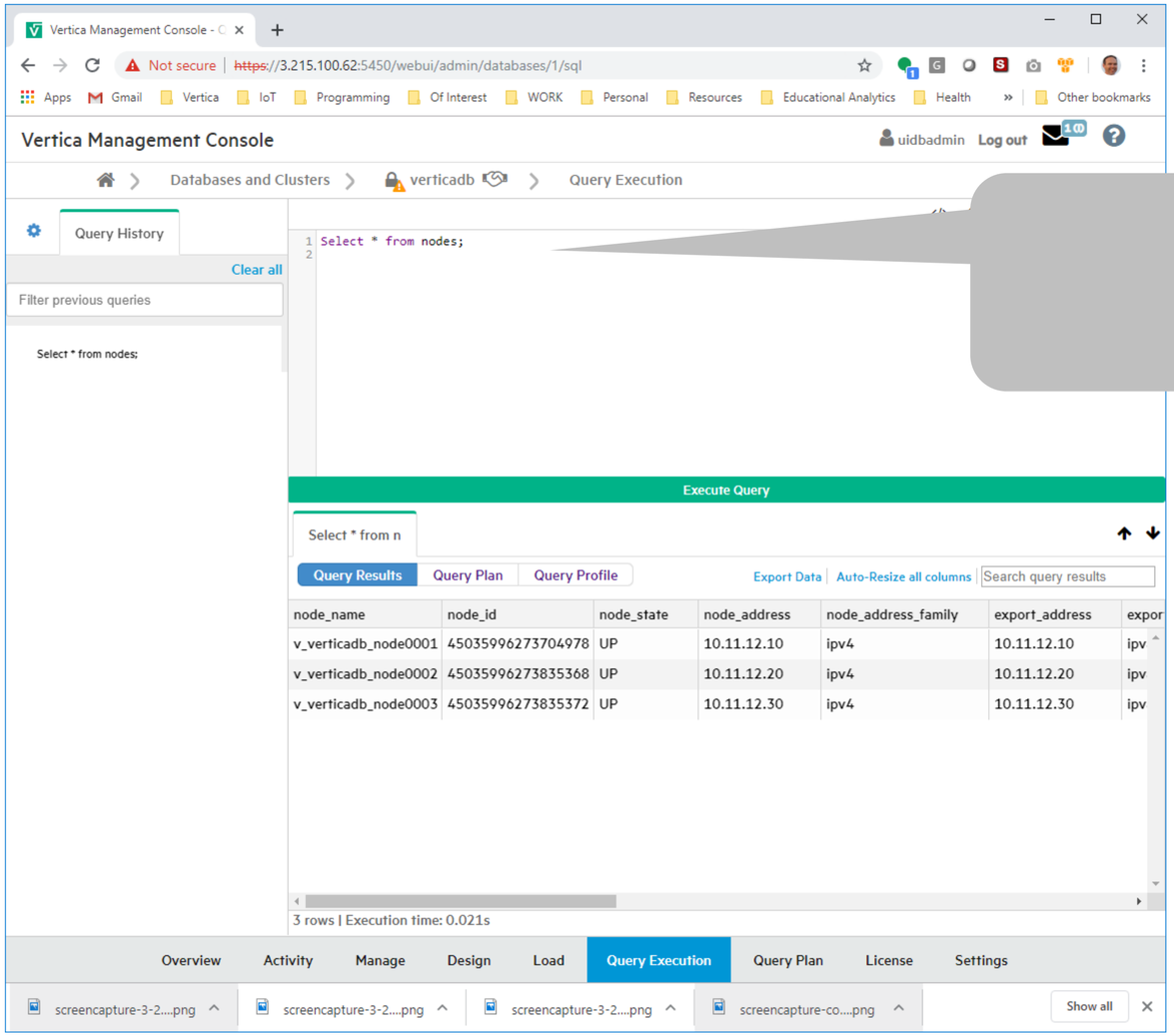
Login using credentials specified in CloudFormation Stack creation



Click “Go to database”



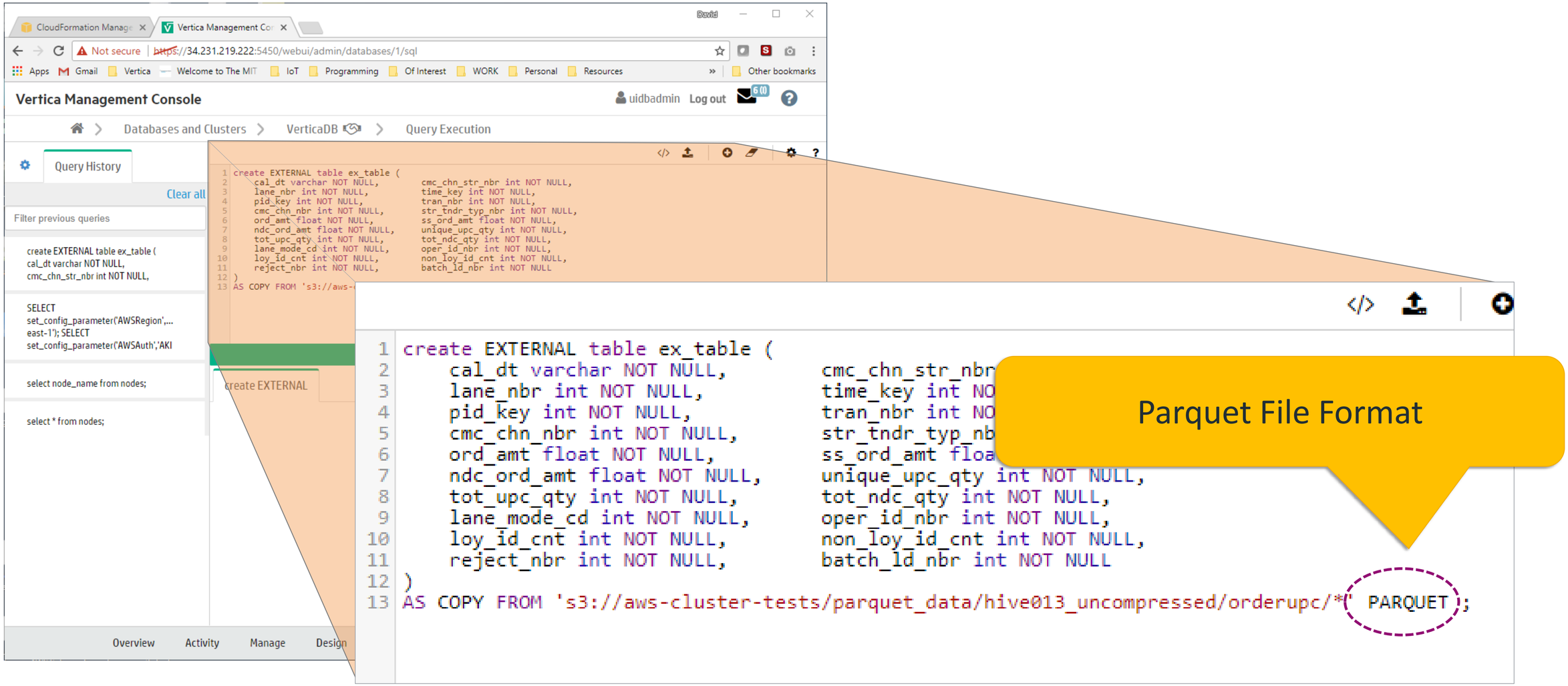
Click “Query Execution”



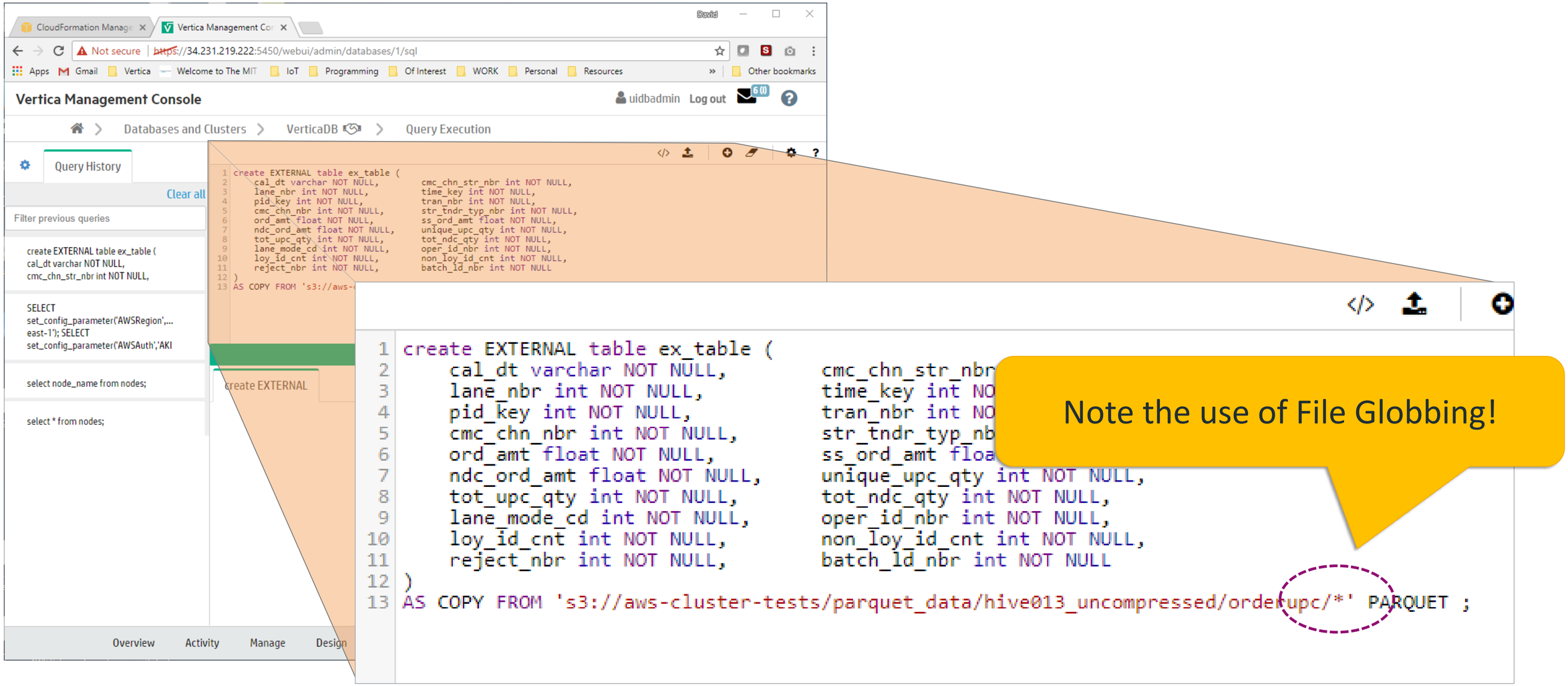
Try entering SQL

External Tables

Create External Table of Parquet Data on S3



Create External Table of Parquet Data on S3



3.5 GBytes of Parquet Data

```
create EXTERNAL table ex_table (
  cal_dt varchar NOT NULL,                  cmc_chn_str_nbr int NOT NULL,
  lane_nbr int NOT NULL,                     time_key int NOT NULL,
  pid_key int NOT NULL,                      tran_nbr int NOT NULL,
  cmc_chn_nbr int NOT NULL,                  str_tndr_typ_nbr int NOT NULL,
  ord_amt float NOT NULL,                    ss_ord_amt float NOT NULL,
  ndc_ord_amt float NOT NULL,                unique_upc_qty int NOT NULL,
  tot_upc_qty int NOT NULL,                  tot_ndc_qty int NOT NULL,
  lane_mode_cd int NOT NULL,                 oper_id_nbr int NOT NULL,
  loy_id_cnt int NOT NULL,                   non_loy_id_cnt int NOT NULL,
  reject_nbr int NOT NULL,                   batch_id_nbr int NOT NULL )
  AS COPY FROM 's3://dsprogis/data/orderupc/*' PARQUET ;
```

Fetch 10,000 rows

```
select * from ex_table;
```

How long did it take?

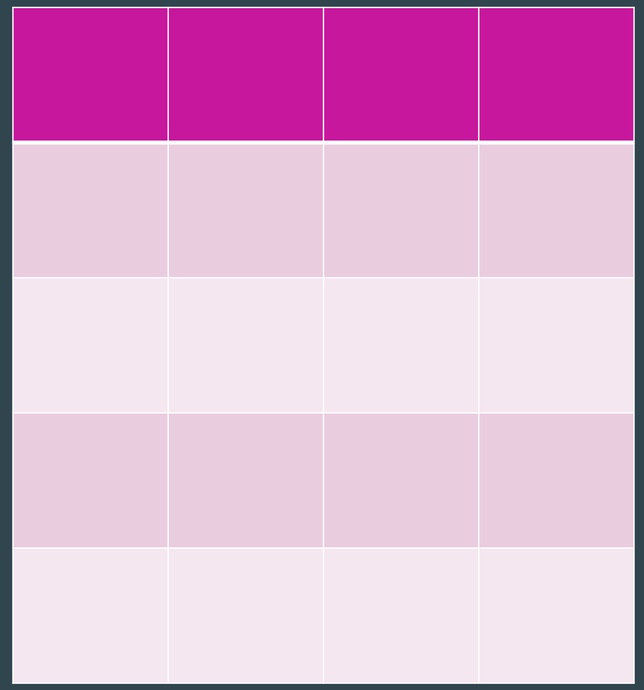
“ You mean I can query across more than one external file?! ”

“ You mean I can query across more than one external file?! ”

Actually, file globbing means more …

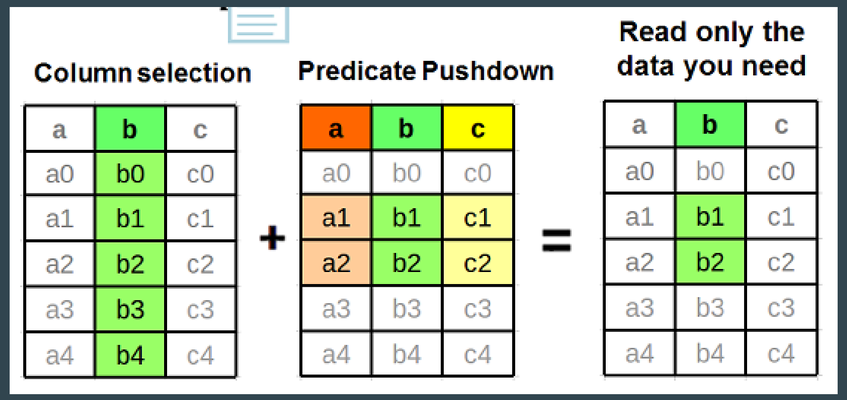
It means your external table is a “live table”:

```
12 )
13 AS COPY FROM 's3://aws-cluster-tests/parquet_data/hive013_uncompressed/orderupc/*' PARQUET ;
```



Vertica improves query performance of Parquet & Orc, through

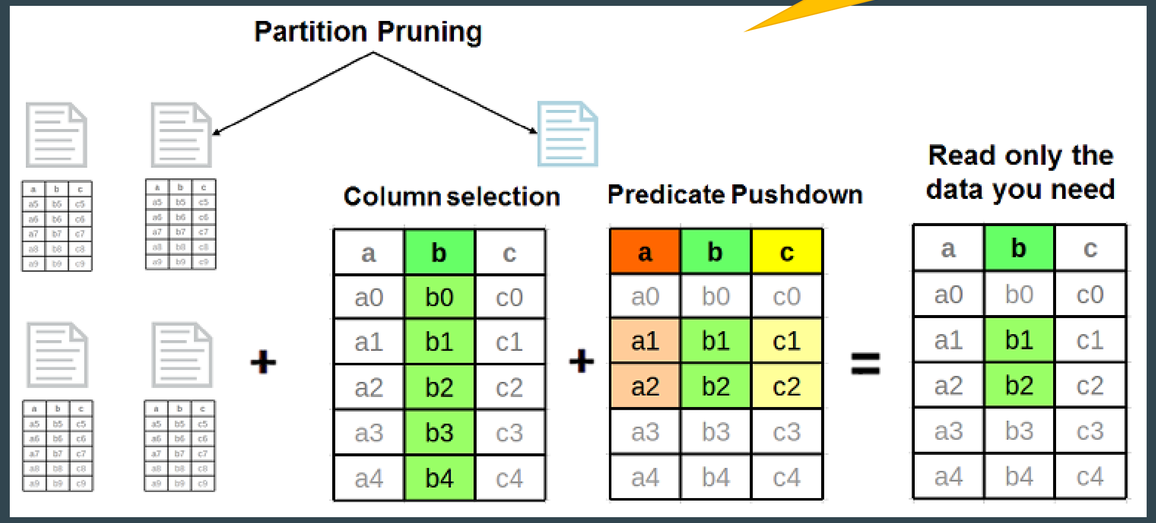
- column selection,
- predicate pushdown



Parquet & Orc plus File Globbing

- column selection,
- predicate pushdown, and
- partition pruning.

File globbing adds the potential for Partition Pruning

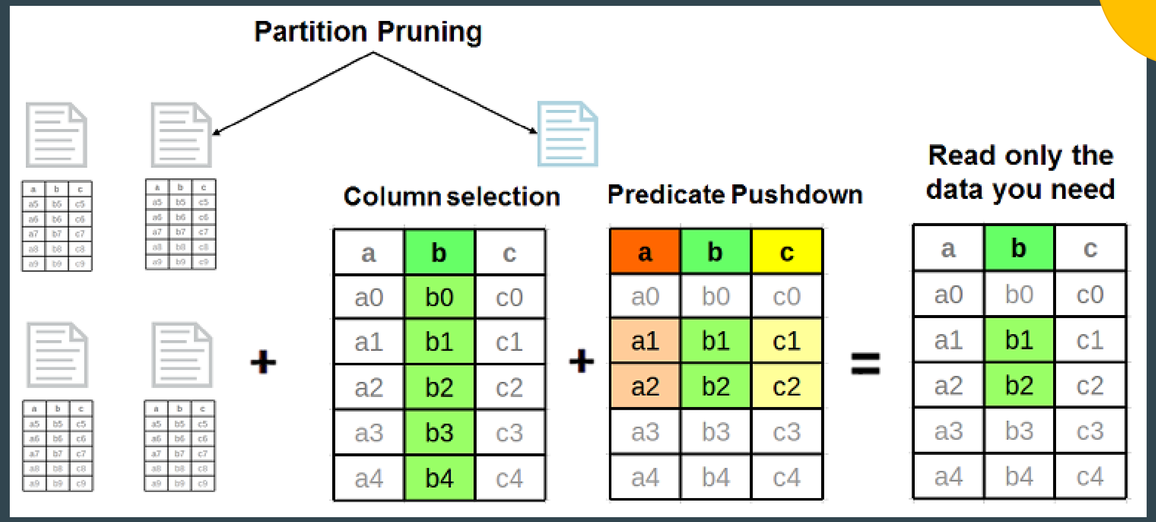


Parquet & Orc plus File Globbing

- column selection,
- predicate pushdown, and
- partition pruning.

If your file naming convention includes:
"…/part_col=value/…"

Then Vertica will process
"… where part_col = value …"
by reading only the files that match.



Parquet & Orc on S3

File Globbing & Partition Pruning

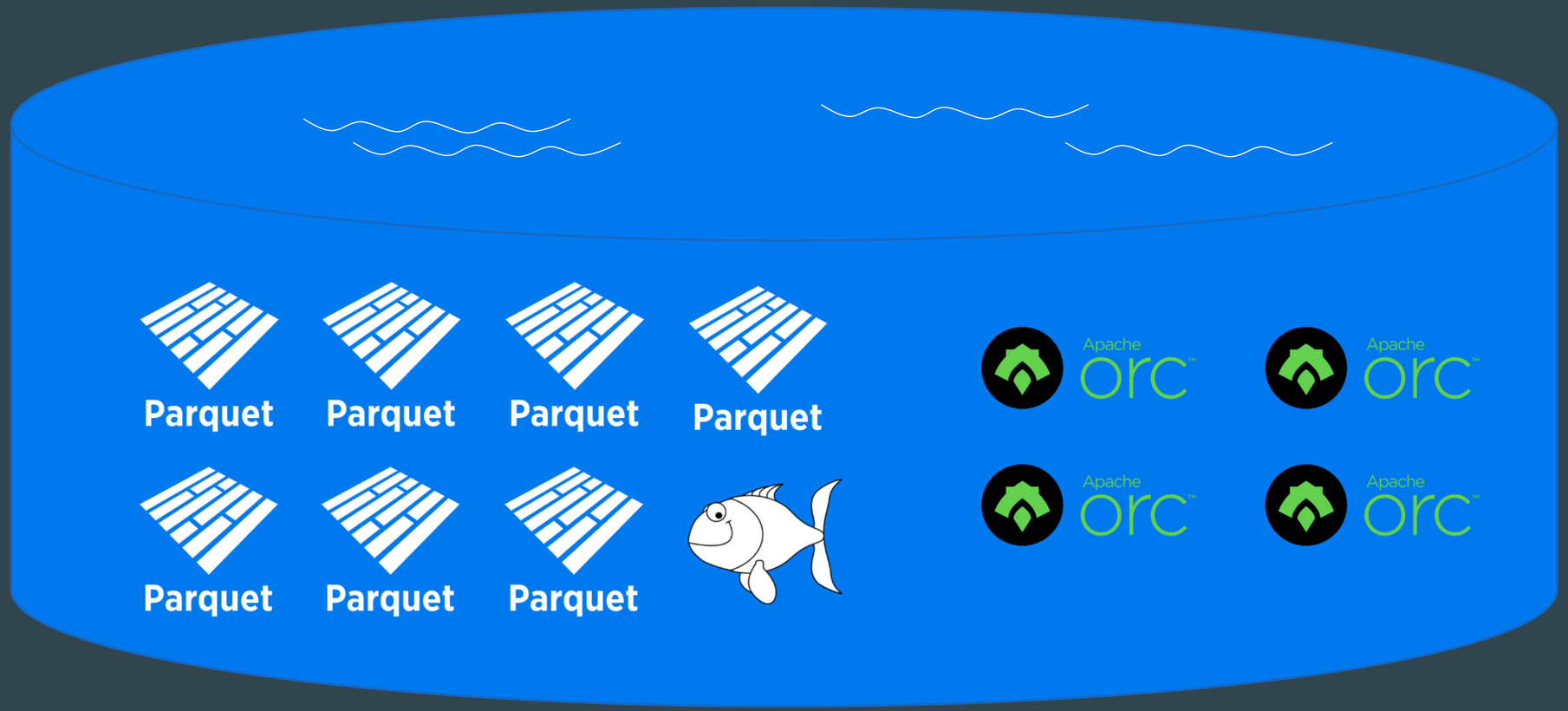
Column Selection & Predicate Push-down

UDFS File Read Improvements

So what?

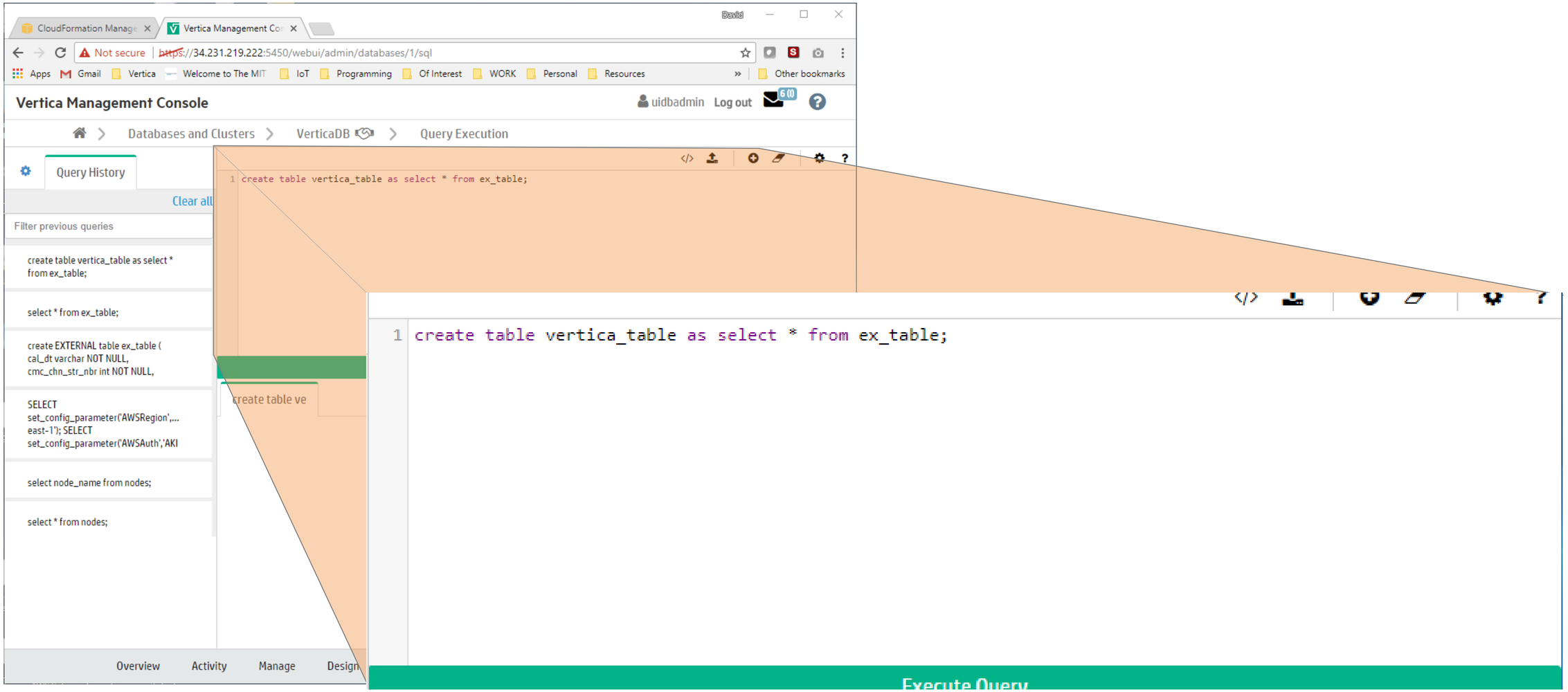
S3 Data Lake Formats?

Performant because they are columnar.
Efficient because they are compressed.



Compare External to Internal Tables

For Best Performance, Load the Data into Vertica.



Copy external table to internal table

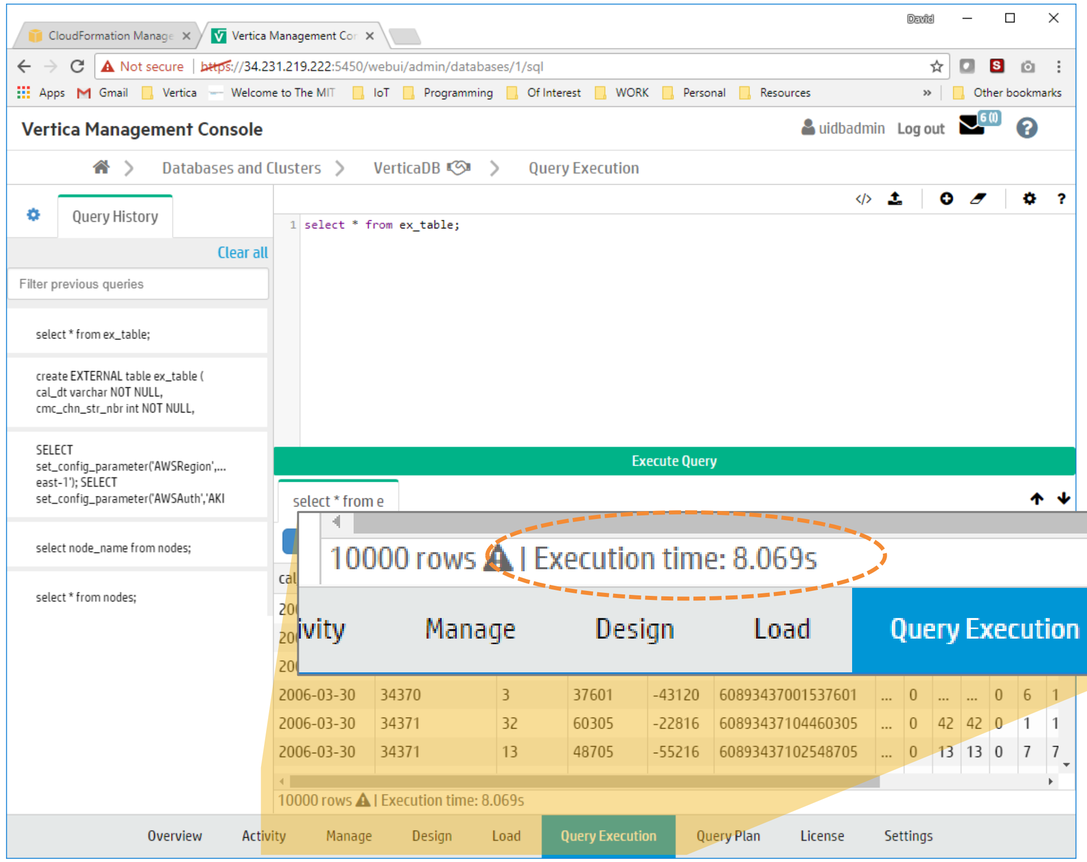
```
create table in_table as select * from ex_table;
```

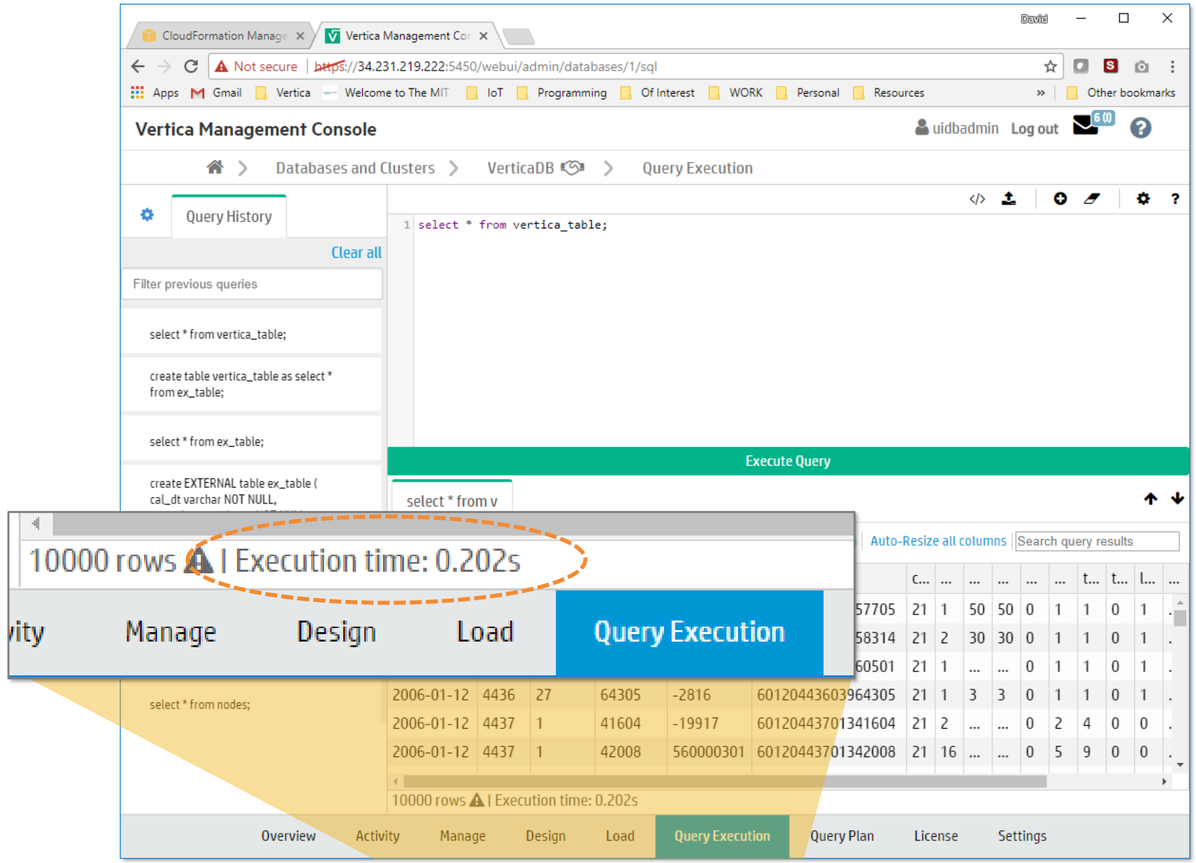
Fetch 10,000 rows

```
select * from in_table;
```

How long did it take?

External Table Query of Parquet Data on S3 vs Internal





40X faster

(Improvements will vary based on many factors.)

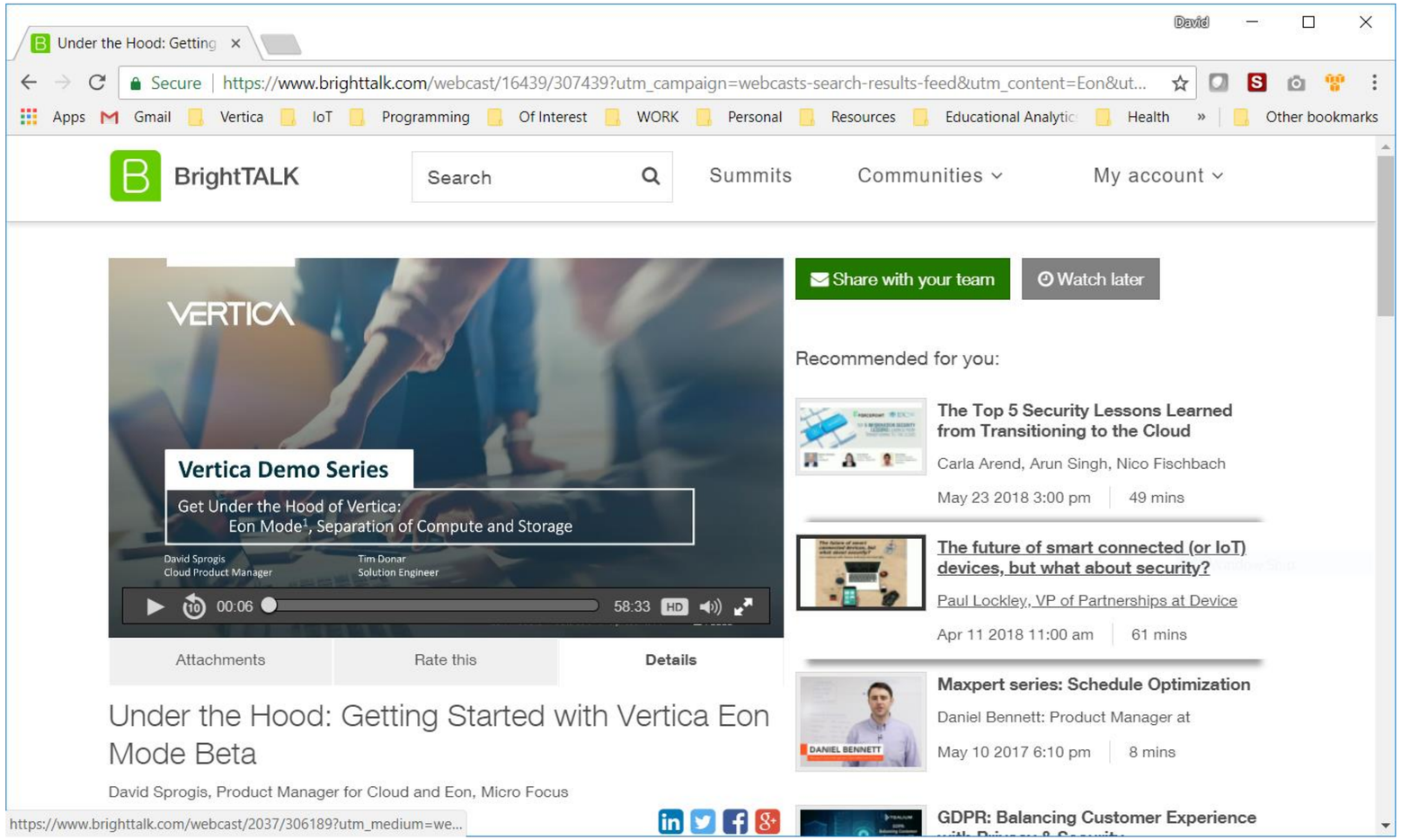
More Learning

Other things to test

- Scaling Cluster (in Video, next slide)
- Hibernating (in Video, next slide)
- Creating Subcluster (example ahead)

Workshop/Tutorial

https://www.brighttalk.com/webcast/16439/307439



* Slightly out-of-date instructions, contact David Sprogis for latest

Example Subcluster

- Sample Subcluster Setup
- ALTER DATABASE VerticaDB DROP ALL FAULT GROUP;
- create fault group "mysubcluster01";
- ALTER FAULT GROUP "mysubcluster01" ADD NODE v_verticadb_node0001;
- ALTER FAULT GROUP "mysubcluster01" ADD NODE v_verticadb_node0003;
- ALTER FAULT GROUP "mysubcluster01" ADD NODE v_verticadb_node0005;
- create fault group "mysubcluster02";
- ALTER FAULT GROUP "mysubcluster02" ADD NODE v_verticadb_node0002;
- create fault group "mysubcluster03";
- ALTER FAULT GROUP "mysubcluster03" ADD NODE v_verticadb_node0004;
-

- select parent_name,member_name from fault_groups where parent_name like 'subcluster%' order by parent_name,member_name;

VERTICA

Last Slide

Thank you

MICRO FOCUS