



KINEMATRICS

Advancement through Innovation

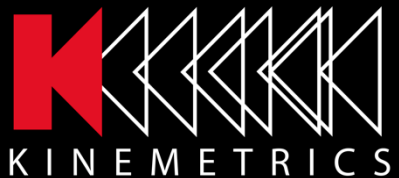
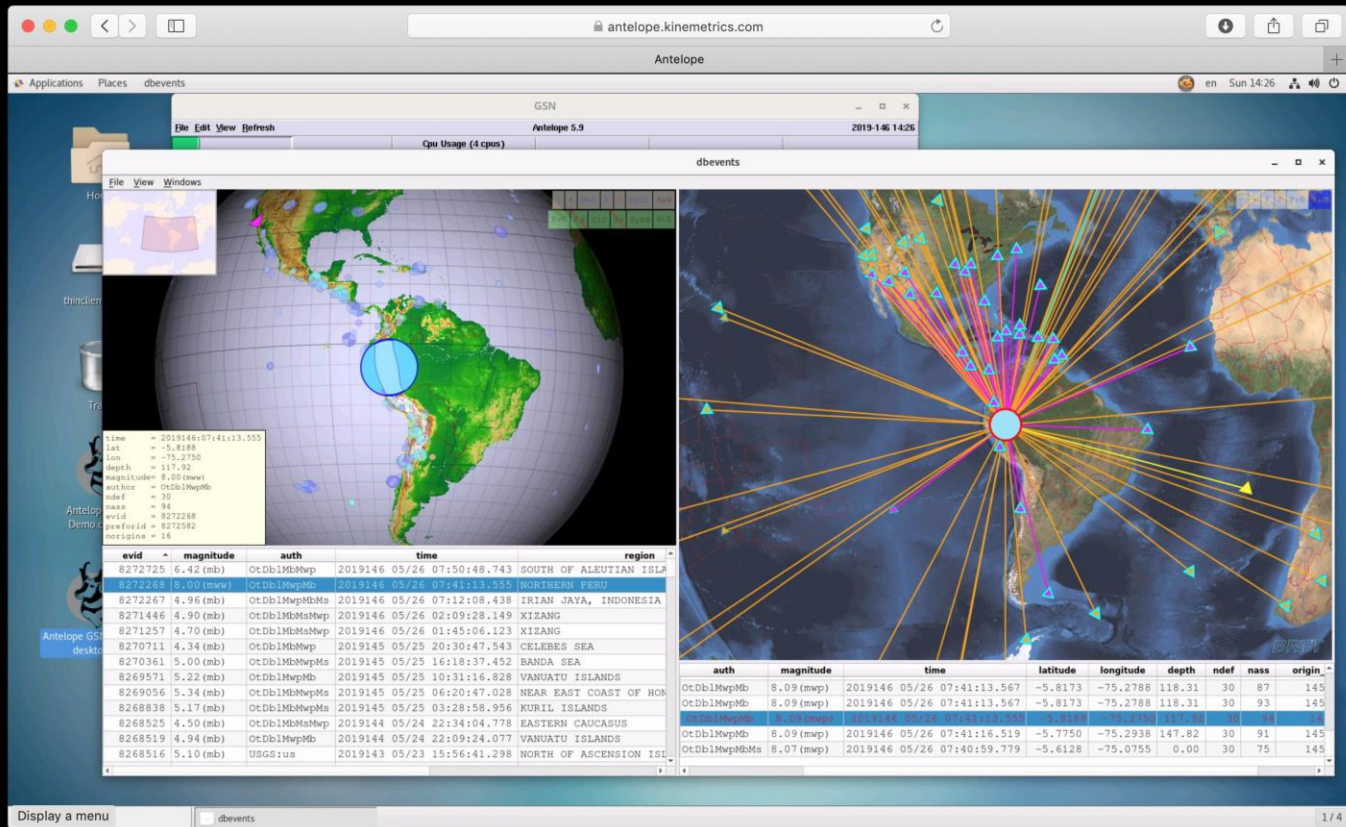
www.kinematics.com

First Experience with Antelope Cloud Processing

Sizing, Licensing, etc.

Stefan Radman, Kinematics

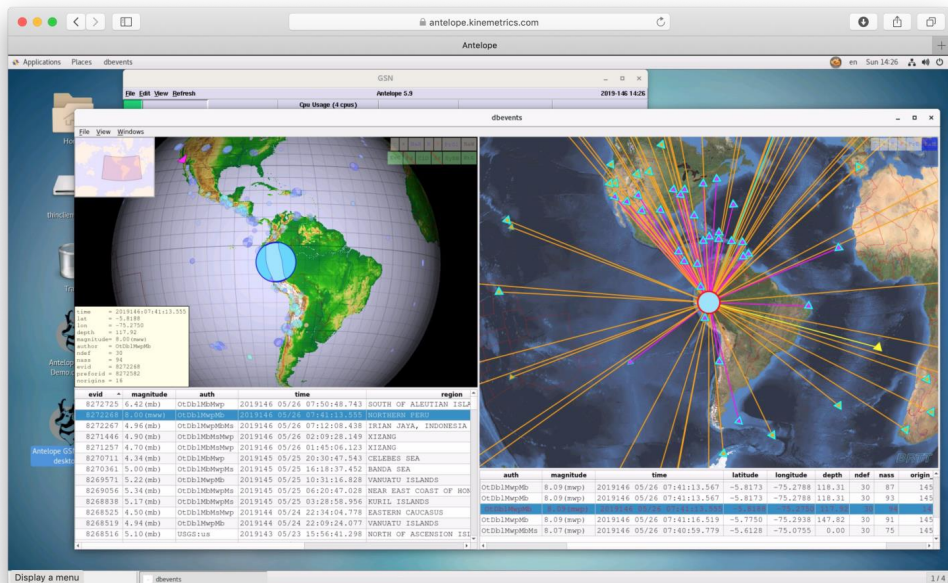
Antelope User Group, Taormina, Sicily, May 29, 2019



Advancement Through Innovation

Antelope Virtualization History

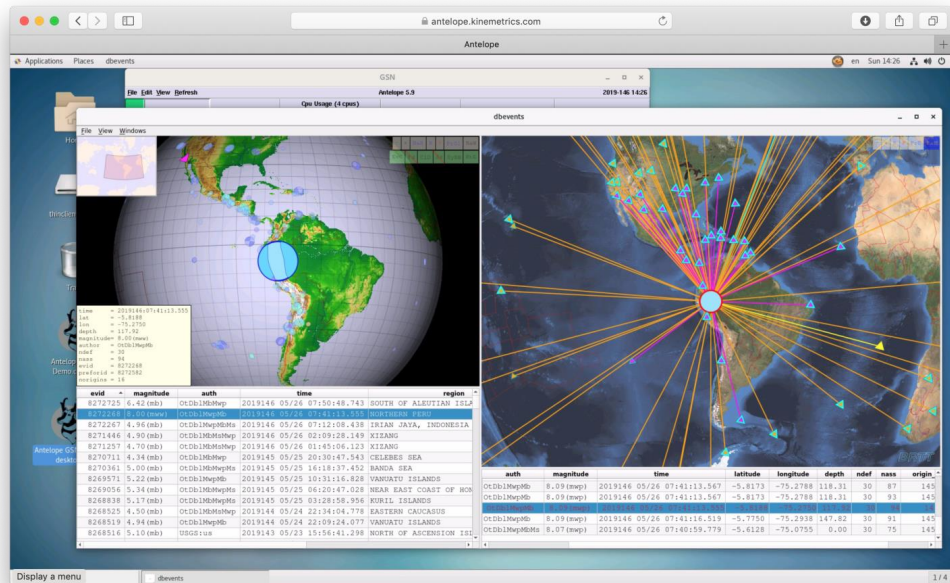
- Most new Antelope instances installed by Kinemetrics are virtual nowadays.
- Trend to virtualize existing installations.
- Primarily on shared private hardware.
- VMware vSphere most popular but others emerging (Proxmox, Nutanix, Xen, etc).
- Next logical step: Antelope in the Cloud



Antelope Cloud Processing

Motivations

- Reliable infrastructure
- Low TCO
- Availability
- Growing market

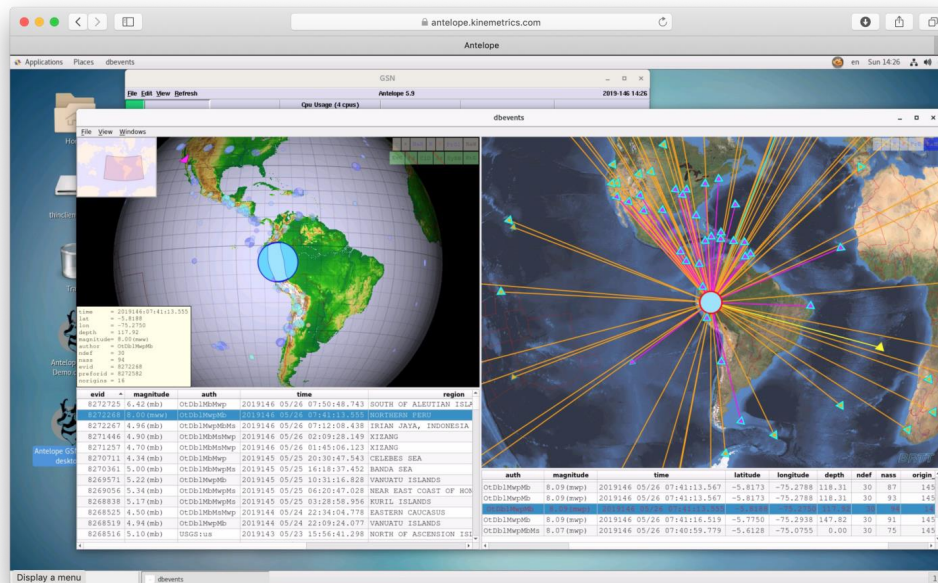


Antelope Cloud Demo

Objective

5

- Live demo
- Fully operational
- Real-time data processing
- Accessible from the Internet
- Low bandwidth requirement
- Secure



Antelope Cloud Demo

Virtual Hardware Specifications

- Amazon EC2
- Region: Oregon
- EC2 instance type: **m4.xlarge**
 - M4 = Intel Xeon E5
 - 4 vCPU, 16GB RAM
 - Balanced
- No traditional text or GUI console

```
smr — rt@antelope:~ — ssh rt@antelope.kinemetrics.com — 80x25
```

```
[ ||||| 50.6%] Tasks: 190, 636 thr; 2 running
[ ||||| 35.1%] Load average: 3.05 2.20 1.68
[ ||||| 48.4%] Uptime: 9 days, 08:18:08
[ ||||| 37.7%]
[ ||||| 9.17G/15.5G]
[ | 18.2M/4.00G]
```

| USER | PRI | NI | VIRT | RES | SHR | S | CPU% | MEM% | TIME+ | Command |
|-----------|-----|----|-------|-------|-------|---|------|------|----------|--------------|
| setrouble | 20 | 0 | 374M | 66328 | 11544 | S | 51.1 | 0.4 | 0:00.78 | /usr/bin/pyt |
| polkitd | 20 | 0 | 605M | 18068 | 4812 | S | 9.8 | 0.1 | 11:31.73 | /usr/lib/pol |
| rt | 20 | 0 | 8108M | 550M | 382M | S | 6.5 | 3.5 | 2:26.55 | /opt/antelop |
| rt | 20 | 0 | 3749M | 264M | 56964 | S | 5.9 | 1.7 | 4:08.64 | /usr/bin/gno |
| setrouble | 20 | 0 | 374M | 66328 | 11544 | S | 5.9 | 0.4 | 0:00.09 | /usr/bin/pyt |
| rt | 20 | 0 | 460M | 97592 | 6076 | S | 3.3 | 0.6 | 6h30:18 | /opt/antelop |
| rt | 20 | 0 | 119M | 2520 | 1496 | R | 3.3 | 0.0 | 0:00.47 | htop |
| dbus | 20 | 0 | 70076 | 3828 | 1888 | S | 2.6 | 0.0 | 6:12.60 | /usr/bin/dbu |
| root | 20 | 0 | 387M | 4564 | 3224 | S | 2.0 | 0.0 | 2:22.54 | /usr/libexec |
| rt | 20 | 0 | 412M | 112M | 7748 | S | 2.0 | 0.7 | 1h44:33 | /opt/antelop |
| root | 20 | 0 | 170M | 21792 | 5344 | S | 2.0 | 0.1 | 0:24.29 | /usr/sbin/xr |
| polkitd | 20 | 0 | 605M | 18068 | 4812 | S | 2.0 | 0.1 | 3:10.58 | /usr/lib/pol |
| rt | 20 | 0 | 273M | 13264 | 6736 | S | 2.0 | 0.1 | 1:02.86 | /opt/antelop |
| root | 20 | 0 | 387M | 4564 | 3224 | S | 1.3 | 0.0 | 1:22.79 | /usr/libexec |
| rt | 20 | 0 | 63804 | 5736 | 3528 | S | 1.3 | 0.0 | 1h29:16 | orb2ringserv |

```
b F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice -F8Nice +F9Kill F10
```


Amazon Cloud

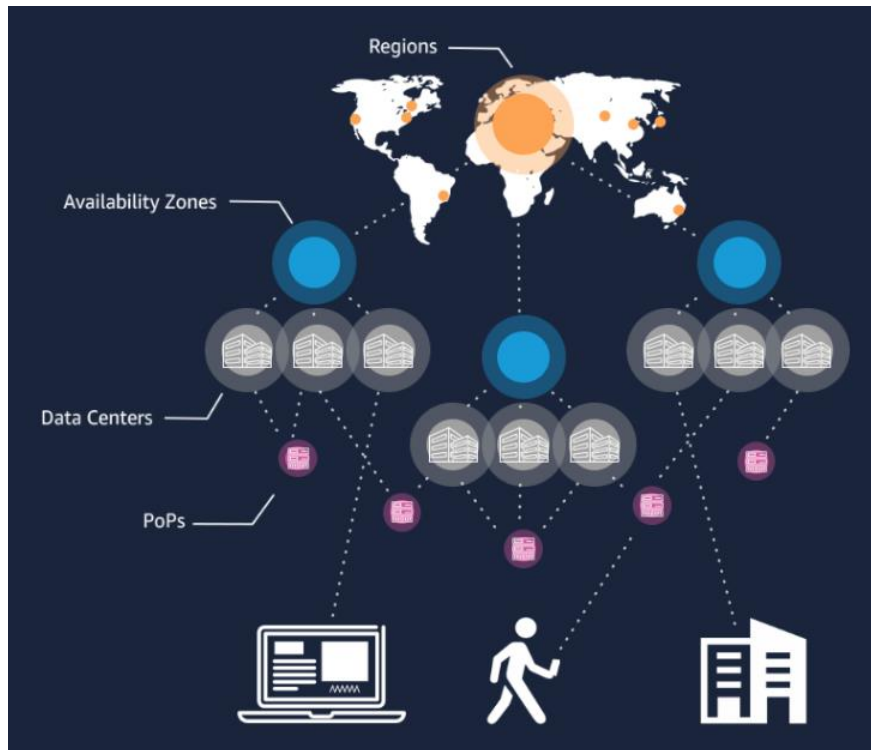
Overview & Glossary

- AWS = Amazon Web Services
- EC2 = Elastic Cloud 2
- Instance = Virtual Machine
- AMI = Amazon Machine Image
- HVM = Hardware Virtual Machine (Xen)
- Region = Geographical region
- Availability Zones = Datacenters

Amazon Virtualization is based on the Xen Hypervisor but recently moving to KVM



<https://www.infrastructure.aws>



Amazon Cloud

Overview & C

- AWS =
- EC2 = E
- Instance
- AMI = A
- HVM =
- Region
- Availab

Amazon Vi
based on t
recently m



aws

DISCOVER HOW WE DO IT

- Home
- Global Infrastructure
- Regions
- Availability Zones
- Points of Presence
- Network
- Custom Hardware
- Benefits

Share

Display a menu

Projection Type

structure.aws

Oregon

GovCloud (US-West)

N. California

Oregon
4 Availability Zones

Key

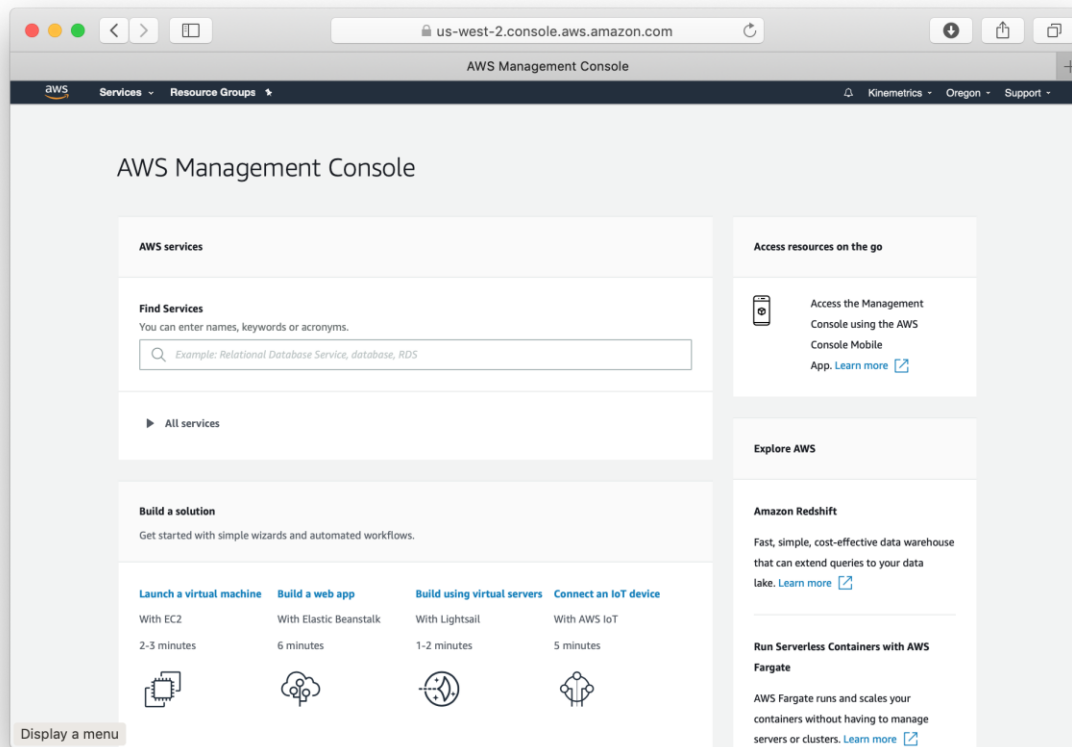
- Region
- Region (coming soon)
- AZ
- POP
- Network

AWS Management Console

Installation and Management

10

- Not a system console (terminal) in the common sense
- Web based
- Solution driven
- Wizards

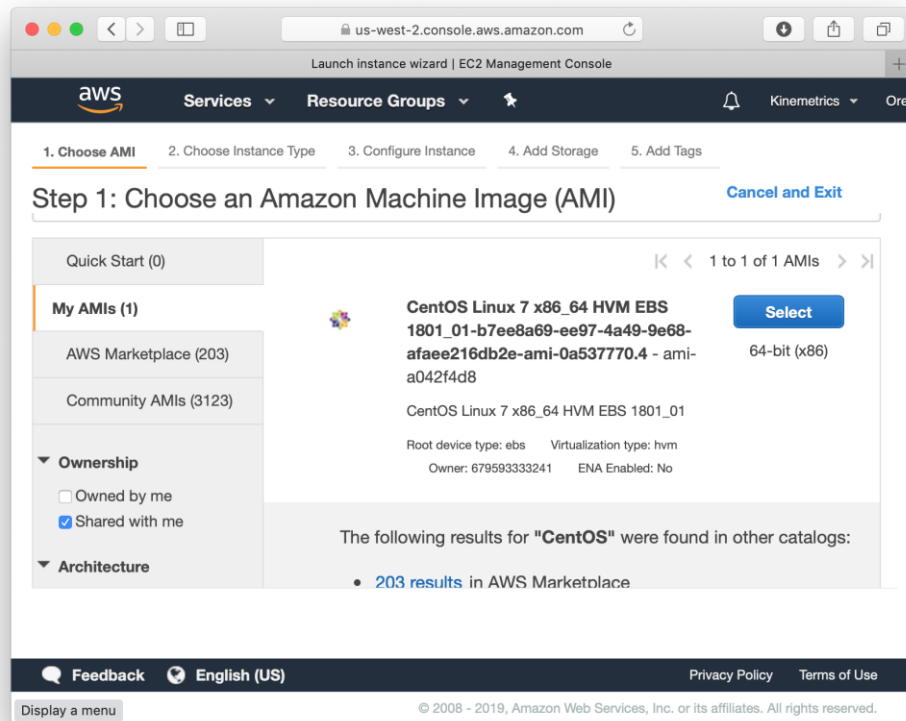


Installation

Operating System selection

11

- Virtual Machine Image
- Ready to start
- RHEL7 or CentOS7
- No traditional installation
- No console GUI or terminal



Installation

Instance Type selection

12

- Hundreds of instances types
- For different workloads in
- 5 Groups
 - General Purpose
 - Memory Optimized
 - Accelerated Computing
 - Storage Optimized
- Differ by
 - Processor type
 - # vCPUs
 - Memory
 - I/O bandwidth

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. [Learn more](#) about instance types and how they can meet your computing needs.

Filter by: All instance types | Current generation | Show/Hide Columns

Currently selected: m4.xlarge (13 ECUs, 4 vCPUs, 2.4 GHz, Intel Xeon E5-2676v3, 16 GiB memory, EBS only)

| | Family | Type | vCPUs | Clock Speed | Memory (GiB) | Network Performance |
|--------------------------|-----------------|--------------------------------|-------|-------------|--------------|---------------------|
| <input type="checkbox"/> | General purpose | t2.nano | 1 | 2.4 GHz | 0.5 | Low to Moderate |
| <input type="checkbox"/> | General purpose | t2.micro Free tier eligible | 1 | 2.5 GHz | 1 | Low to Moderate |
| <input type="checkbox"/> | General purpose | t2.small | 1 | 2.5 GHz | 2 | Low to Moderate |
| <input type="checkbox"/> | General purpose | t2.medium | 2 | 2.3 GHz | 4 | Low to Moderate |
| <input type="checkbox"/> | General purpose | t2.large | 2 | 2.3 GHz | 8 | Low to Moderate |

Cancel Previous Review and Launch Next: Configure Instance Details

Display a menu | English (US) | © 2008 - 2019, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use

Installation

Instance Type selection

- M4 = Balanced performance
- Up to 64 vCPU & 256G Mem
- Similar to proven hardware used by Kinometrics
- Reasonable pricing

General Purpose

| | | | | | | | |
|----|----|-----|----|----|-----|----|--|
| A1 | T3 | T3a | T2 | M5 | M5a | M4 | |
|----|----|-----|----|----|-----|----|--|

M4 instances provide a balance of compute, memory, and network resources, and it is a good choice for many applications.

Features:

- 2.3 GHz Intel Xeon® E5-2686 v4 (Broadwell) processors or 2.4 GHz Intel Xeon® E5-2676 v3 (Haswell) processors
- EBS-optimized by default at no additional cost
- Support for Enhanced Networking
- Balance of compute, memory, and network resources

| Model | vCPU* | Mem (GiB) | Storage | Dedicated EBS Bandwidth (Mbps) | Network Performance |
|-------------|-------|-----------|----------|--------------------------------|---------------------|
| m4.large | 2 | 8 | EBS-only | 450 | Moderate |
| m4.xlarge | 4 | 16 | EBS-only | 750 | High |
| m4.2xlarge | 8 | 32 | EBS-only | 1,000 | High |
| m4.4xlarge | 16 | 64 | EBS-only | 2,000 | High |
| m4.10xlarge | 40 | 160 | EBS-only | 4,000 | 10 Gigabit |
| m4.16xlarge | 64 | 256 | EBS-only | 10,000 | 25 Gigabit |

Installation

Instance Type selection

- M4 = Balanced performance
- Up to 64 vCPU & 256G Mem
- Similar to proven hardware used by Kinemetrics
- Reasonable pricing

General Purpose



AWS Management Console

Instances

The screenshot displays the AWS Management Console interface for EC2 instances. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information. The left sidebar lists navigation options such as 'EC2 Dashboard', 'Events', 'Tags', 'Reports', 'Limits', 'INSTANCES', 'Instances', 'Launch Templates', 'Spot Requests', 'Reserved Instances', 'Dedicated Hosts', 'Scheduled Instances', 'Capacity Reservations', 'IMAGES', 'AMIs', and 'Bundle Tasks'. The main content area features a 'Launch Instance' button, a search filter, and a table of instances. The table has columns for Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, and Public DNS (IPv4). One instance, 'Antelope Demo', is shown with ID 'i-09358a6b8e...', type 'm4.xlarge', in 'us-west-2c' availability zone, and state 'running'. Below the table, the details for the selected instance are shown, including its ID 'i-09358a6b8ed0d7d19', name 'Antelope Demo', and Elastic IP '54.70.42.80'. The 'Description' tab is active, showing the instance ID and Public DNS (IPv4) 'ec2-54-70-42-80.us-west-2.compute.amazonaws.com'. The footer contains a language selector set to 'English (US)', copyright information '© 2008 - 2019, Amazon Web Services, Inc. or its affiliates. All rights reserved.', and links for 'Privacy Policy' and 'Terms of Use'.

| Name | Instance ID | Instance Type | Availability Zone | Instance State | Status Checks | Alarm Status | Public DNS (IPv4) |
|---------------|-----------------|---------------|-------------------|----------------|-------------------|--------------|--------------------------|
| Antelope Demo | i-09358a6b8e... | m4.xlarge | us-west-2c | running | 2/2 checks passed | None | ec2-54-70-42-80.us-we... |

Instance: **i-09358a6b8ed0d7d19 (Antelope Demo)** Elastic IP: 54.70.42.80

Description | Status Checks | Monitoring | Tags | Usage Instructions

Instance ID: i-09358a6b8ed0d7d19 | Public DNS (IPv4): ec2-54-70-42-80.us-west-2.compute.amazonaws.com

AWS Management Console

Elastic IP

The screenshot shows the AWS Management Console interface for Elastic IPs. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and a search icon. The main header indicates 'Elastic IPs | EC2 Management Console'. On the left, a sidebar lists navigation options like 'EC2 Dashboard', 'Events', 'Tags', 'Reports', 'Limits', 'INSTANCES', and 'IMAGES'. The main content area features a table of Elastic IPs and a detailed view for the selected 'Antelope' instance.

| Name | Elastic IP | Allocation ID | Instance | Private IP address | Scope | Association ID |
|----------|-------------|----------------------------|---------------------|--------------------|-------|----------------------------|
| Antelope | 54.70.42.80 | eipalloc-0f7dcb95b60650cda | i-09358a6b8ed0d7d19 | 172.31.3.58 | vpc | eipassoc-06f92f3b4d052b5a5 |

Address: 54.70.42.80

Description | **Tags**

| | | | |
|-----------------------------|----------------------------|--------------------------------|---|
| Elastic IP | 54.70.42.80 | Allocation ID | eipalloc-0f7dcb95b60650cda |
| Address Pool | amazon | Instance | i-09358a6b8ed0d7d19 |
| Private IP address | 172.31.3.58 | Scope | vpc |
| Association ID | eipassoc-06f92f3b4d052b5a5 | Public DNS | ec2-54-70-42-80.us-west-2.compute.amazonaws.com |
| Network interface ID | eni-0f15e1745f0a8103a | Network interface owner | 494951114966 |

AWS Management Console

Elastic IP

17

- Private IP = configured on VM
- Elastic IP = Assigned Public IP
- Needed for Antelope IP license
- One Elastic IP / Instance = included
- No need for ald_proxy

The screenshot displays the AWS Management Console interface for an Elastic IP. The left sidebar shows navigation options like 'EC2 Dashboard', 'Events', 'Tags', 'Reports', 'Limits', 'INSTANCES', 'IMAGES', and 'Bundle Tasks'. The main content area shows the 'Allocate new address' button and a table of Elastic IP addresses. The selected instance 'Antelope' has an Elastic IP of 54.70.42.80. Below the table, the 'Address' is 54.70.42.80, and the 'Description' tab is active, showing details for the Elastic IP, Address Pool, Private IP address, Association ID, and Network interface ID.

| Name | Elastic IP | Allocation ID | Instance |
|----------|-------------|----------------------------|------------|
| Antelope | 54.70.42.80 | eipalloc-0f7dcb95b60650cda | i-09358a6b |

Address: 54.70.42.80

Description | Tags

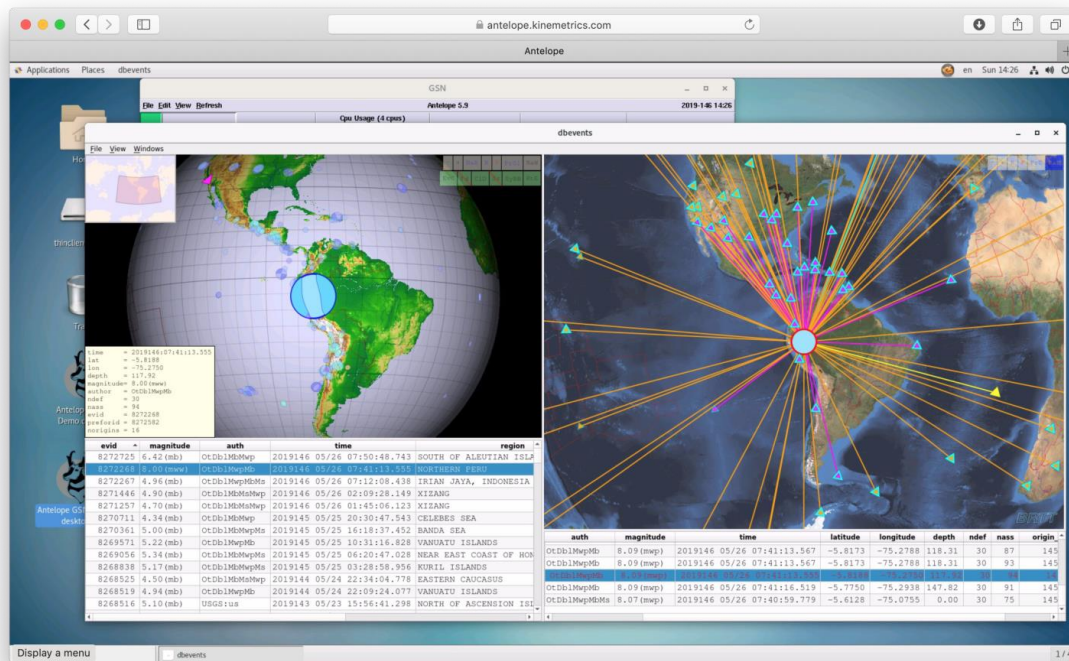
| | |
|-----------------------------|----------------------------|
| Elastic IP | 54.70.42.80 |
| Address Pool | amazon |
| Private IP address | 172.31.3.58 |
| Association ID | eipassoc-06f92f3b4d052b5a5 |
| Network interface ID | eni-0f15e1745f0a8103a |

Antelope Cloud Demo

Antelope Real-time Systems

18

- Started June 21, 2018
- Installed Antelope 5.8
 - GSN Demo
 - ANZA Demo
- Running automatically
- Daily reports
 - rtsys
 - rtreport
- Upgraded to 5.9 last week



Antelope Cloud Demo

Remote Access

- Remote desktop (RDP protocol)
- Based on xrdp from EPEL7
- Clients for Windows, Mac & Linux
- HTTP frontend Guacamole
- Official Kinemetrics DNS name
- Only using HTTPS
- Official certificate from DigiCert

19

The image shows a browser window at antelope.kinemetrics.com. The main content area is a teal background with a "Display a menu" button at the bottom left. A small dialog box titled "Just connecting" is overlaid on the teal background, showing a progress indicator and fields for "Session" (rt), "Username" (rt), and "Password" (masked). Below the teal area, a certificate validation message is displayed: "Certificate Standard" logo, "antelope.kinemetrics.com", "Issued by: DigiCert SHA2 Secure Se...", "Expires: Thursday, April 15, 2021 at...", and a green checkmark with the text "This certificate is valid". To the right, a smaller browser window shows the login form with the Kinemetrics logo, "ANTELOPE DEMO", a text input for "rt", a password input (masked with dots), and a "Login" button. A "0.9.13 incubating" status indicator is visible in the bottom right corner of the login window.

Antelope Cloud Demo

Guacamole

20

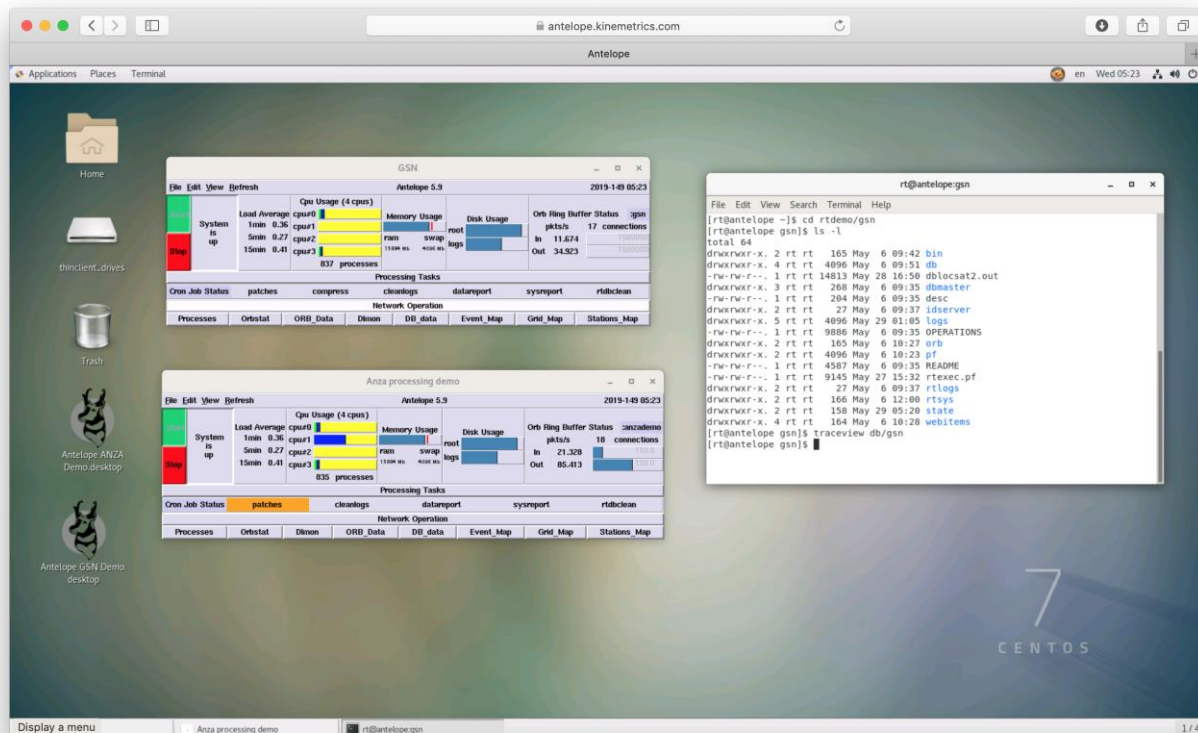
- Apache Guacamole
- Clientless remote desktop gateway
- HTML5 web application
- Support for VNC, RDP and SSH

The screenshot shows a web browser window titled 'Antelope' at the URL 'antelope.kinometrics.com'. The browser displays a 'Remote Desktop HD' interface. On the left, there is a sidebar with two main sections: 'Clipboard' and 'Input method'. The 'Clipboard' section contains a text box with the text 'This is text on the clipboard for copy & paste!'. The 'Input method' section has three radio button options: 'None' (selected), 'Text input', and 'On-screen keyboard'. Below these options is a small image of a keyboard. The main area of the browser shows a remote desktop view of a CentOS server. The desktop background features a large number '7' and the word 'CENTOS'. Several windows are open on the desktop, including a terminal window titled 'rt@antelope:gsn' showing system logs, and a network status window titled '2019-10-05:37' displaying disk usage and network statistics.

Antelope Cloud Demo

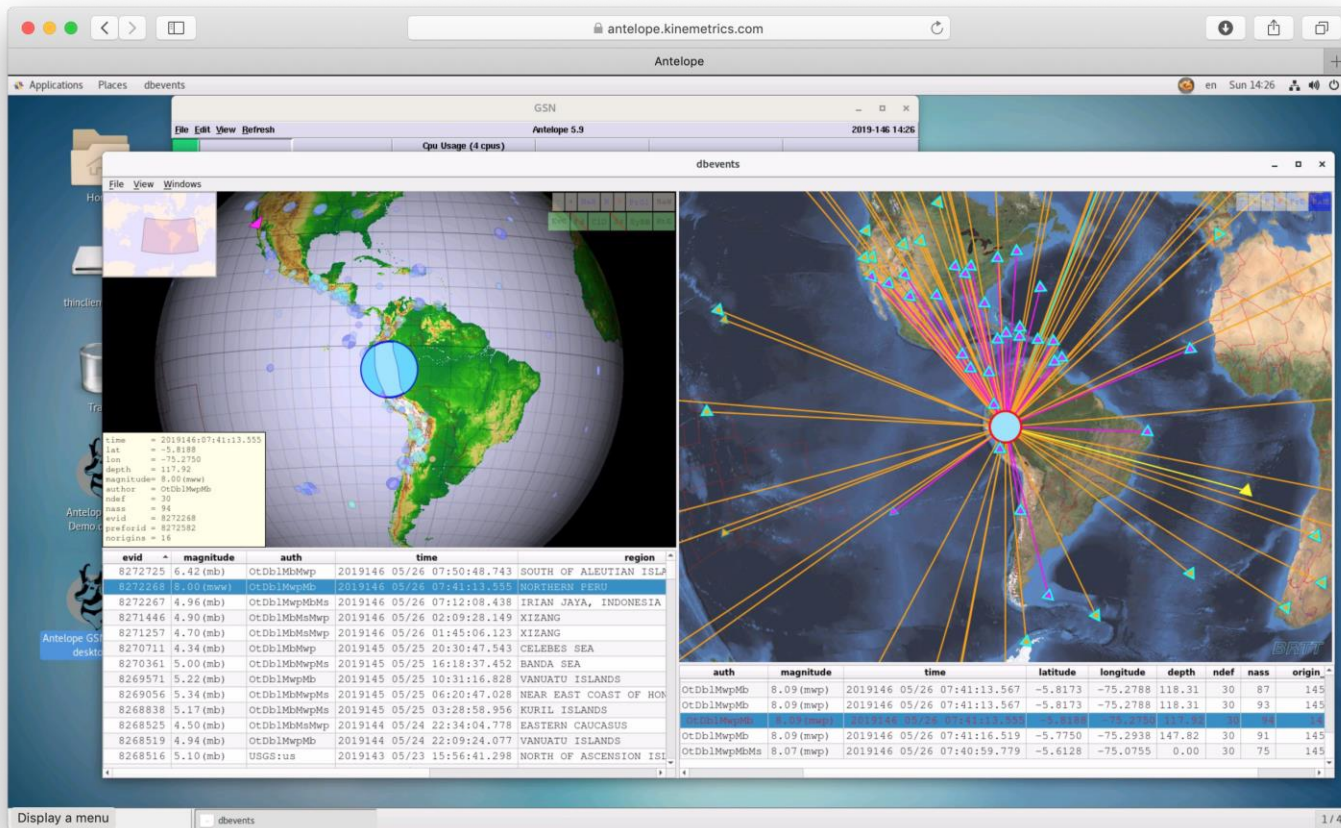
Virtual Desktop

- GNOME Desktop
- Custom Icons



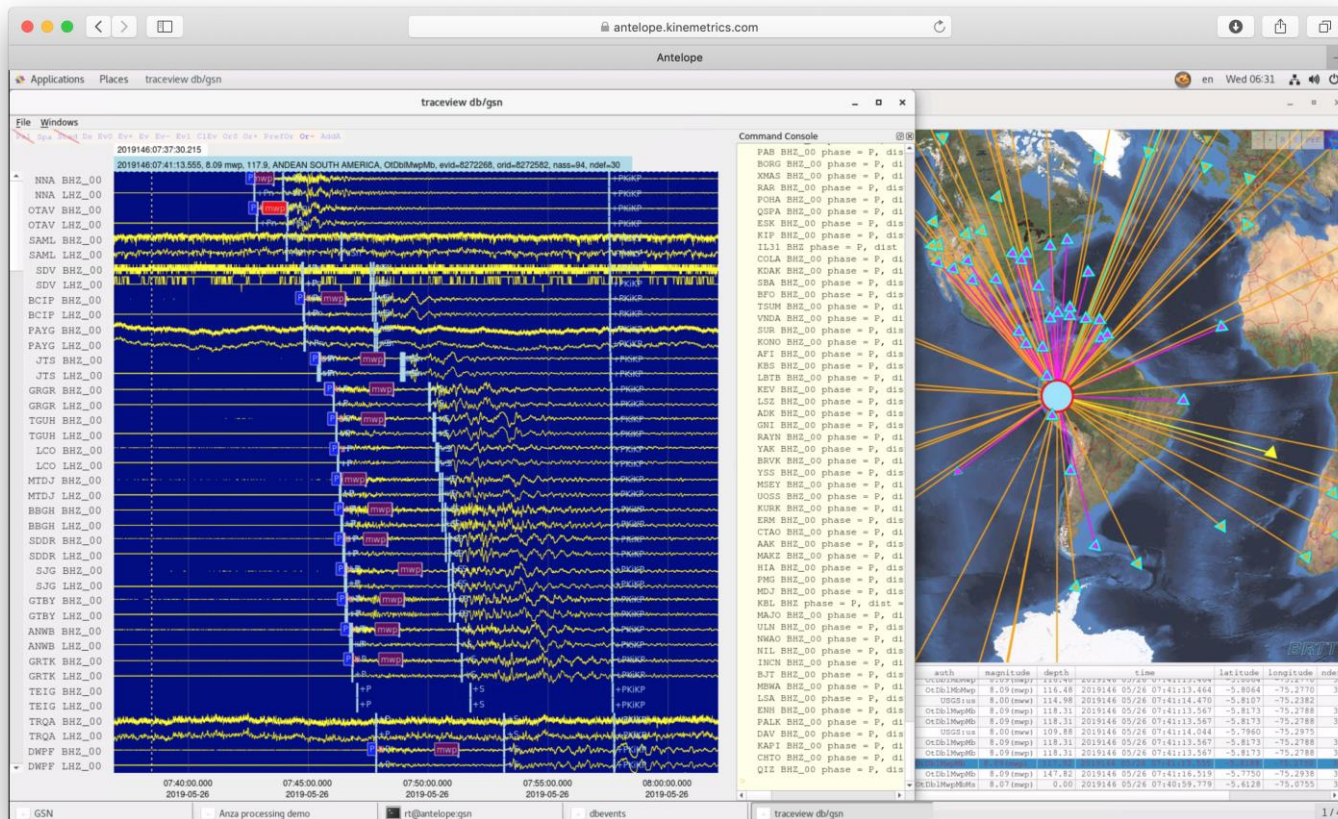
Antelope Cloud Demo

Automatic processing



Antelope Cloud Demo

Automatic processing



Cost control

Planning

- Simple Monthly Calculator
- Estimate for operational cost
- On-demand pricing
- Reserved instances

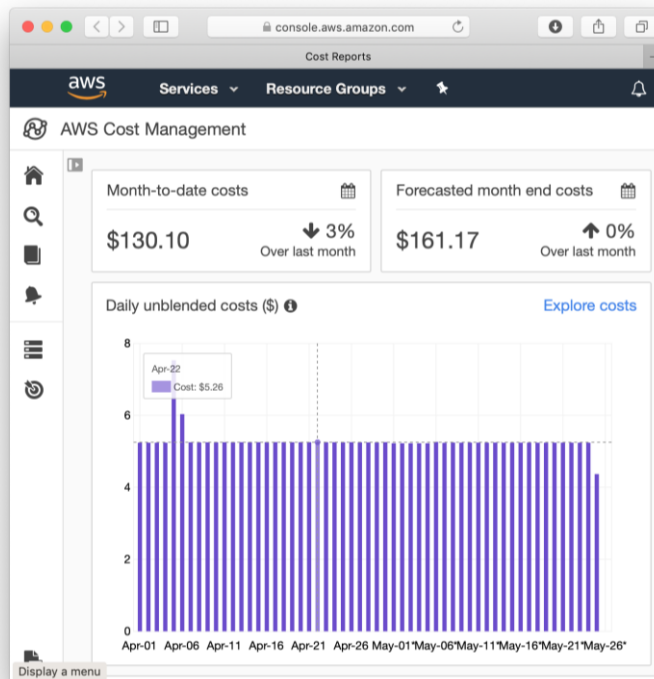
The screenshot displays the Amazon Simple Monthly Calculator interface. On the left, there are navigation tabs for various AWS services: Amazon EC2, Amazon S3, Amazon SQS, Amazon CloudFront, Amazon SimpleDB, Amazon VPC, Amazon ElastiCache, Amazon IAM, Amazon RDS, Amazon Premium Support, and AWS Import/Export. The main configuration area is set to 'United States' and includes sections for Amazon EC2 On-Demand Instances (2 Linux/Ubuntu instances), Amazon EC2 Reserved Instances, Amazon EBS Volumes (4 GB-months), Elastic IP (1), Amazon EC2 Bandwidth (Data Transfer In/Out), and Elastic Load Balancing (1). On the right, the 'Estimate of Your Monthly Bill' is shown as a pie chart and a table. The table lists the following items and costs:

| Service | Cost |
|---|--------------------|
| Amazon EC2 Service (US Region) | \$ 218.40 |
| Amazon EC2 Service (Europe Region) | \$ 232.74 |
| Amazon S3 Service (US Region) | \$ 296.64 |
| Amazon S3 Service (Europe Region) | \$ 207.76 |
| Amazon VPC Service | \$ 190.80 |
| Amazon SimpleDB Service (US Region) | \$ 42.75 |
| Amazon SimpleDB Service (Europe Region) | \$ 44.76 |
| Total Monthly Payment: | \$ 1,279.80 |

Cost control

Operational costs

- AWS Cost Explorer
- Current cost
- Monthly/Daily cost
- History
- Trend/Forecast

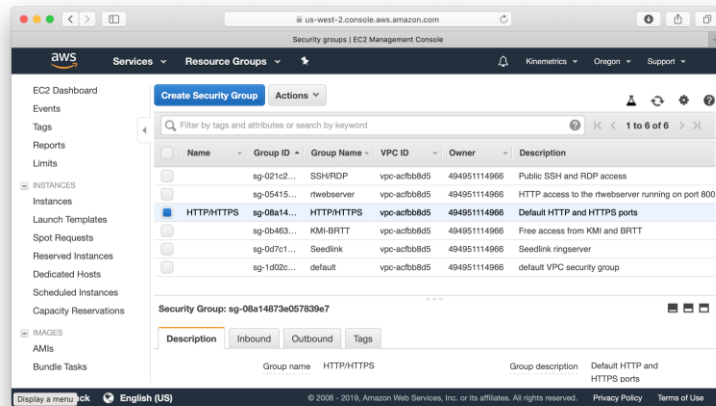
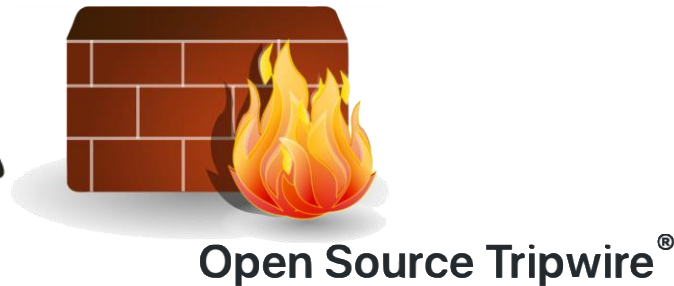


Antelope Cloud Processing

Security

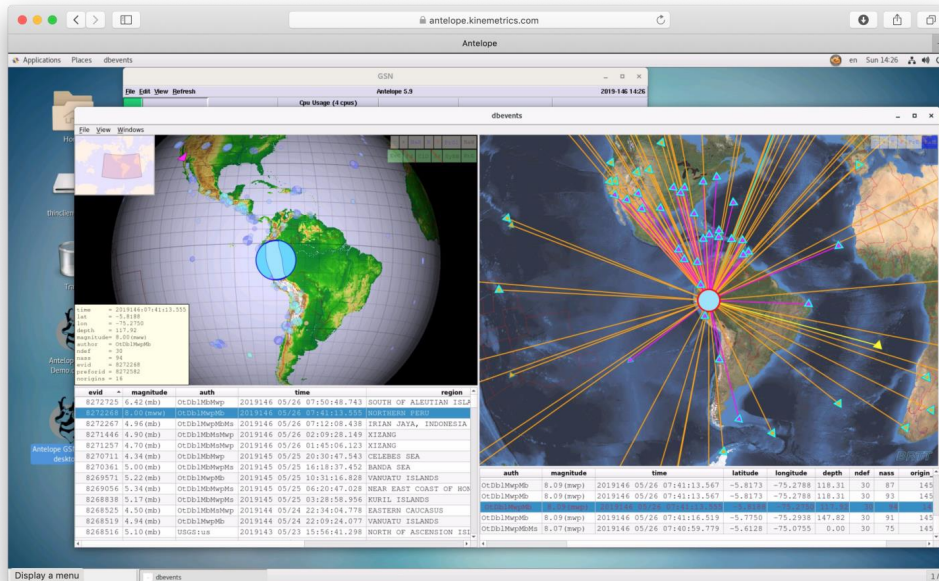
26

- AWS security measures
- EC2 Security Groups
- Linux firewalld
- SELinux (Security Enhanced Linux)
- Secure SSL configuration
- Software updates!
- Open Source Tripwire®
- Monitoring (Zabbix)
- SSH Public Key Authentication



Antelope Cloud Processing Challenges

- Credit Card required
- Cost control
- Network bandwidth
- Resource hungry GUI
- Traditional storage model
- Remote access integration
- Security



```
[smr:~ smr$ ssh root@antelope.kinematics.com
Last failed login: Sun May 26 12:22:58 UTC 2019 from 218.92.0.209 on ssh:notty
There were 91256 failed login attempts since the last successful login.
Last login: Mon May 20 11:31:36 2019 from 213-225-1-165.nat.highway.a1.net
[root@antelope ~]#
```

Antelope Cloud Processing Questions

The screenshot shows the Antelope software interface in a browser window. The main view is a globe with several seismic event locations marked by red dots and pink lines. A terminal window is open in the foreground, displaying the ASCII art 'ANTHELOPE' and the command prompt 'rt@antelope:~\$'. Below the terminal, a data table lists seismic events with columns for event ID, magnitude, author, time, region, latitude, longitude, depth, ndof, name, and other details.

| rec | evid | magnitude | auth | time | region | latitude | longitude | depth | ndof | name | oid | latency | auth | magnitude | depth | time | latitude | longitude | ndof |
|--------|---------|-----------|---------------|----------------------------|----------------------------------|----------|-----------|--------|------|------|---------|---------------|---------------|-------------|--------|----------------------------|----------|-----------|------|
| 000990 | 8274174 | 5.10 (mb) | USGS/us | 2019148 05/26 14:33:15.136 | SANTA CRUZ ISLANDS | -10.2844 | 165.4122 | 38.57 | 0 | 0 | 8272537 | 12:35 minutes | OKDb/MapMq | 8.09 (mags) | 116.48 | 2019148 05/26 07:41:13.464 | -5.8044 | -75.2770 | 30 |
| 000991 | 8274430 | 5.10 (mb) | USGS/us | 2019148 05/26 14:33:15.017 | SANTA CRUZ ISLANDS | -10.2853 | 165.4069 | 37.44 | 0 | 0 | 8272540 | 17:41 minutes | OKDb/MapMq | 8.09 (mags) | 116.48 | 2019148 05/26 07:41:13.464 | -5.8044 | -75.2770 | 30 |
| 000989 | 8272725 | 6.42 (mb) | OKDb/MapMq | 2019148 05/26 07:15:48.743 | SOUTH OF ALBATROSS ISLANDS | 46.4180 | 177.2173 | 434.40 | 8 | 8 | 8272548 | 18:16 minutes | USGS/us | 8.00 (mww) | 114.98 | 2019148 05/26 07:41:14.470 | -5.8107 | -75.2982 | 0 |
| 000997 | 8272267 | 4.58 (mb) | OKDb/MapMqMta | 2019148 05/26 07:12:08.438 | IRIAN JAYA, INDONESIA | -4.2393 | 139.2784 | 78.04 | 9 | 9 | 8272550 | 22:48 minutes | OKDb/MapMq | 8.09 (mags) | 118.31 | 2019148 05/26 07:41:13.567 | -5.8173 | -75.2788 | 30 |
| 000996 | 8271446 | 4.90 (mb) | OKDb/MapMqMta | 2019148 05/26 02:09:28.149 | KIANGSANG | 30.3389 | 87.4823 | 4.11 | 11 | 13 | 8272556 | 23:56 minutes | OKDb/MapMq | 8.09 (mags) | 118.31 | 2019148 05/26 07:41:13.567 | -5.8173 | -75.2788 | 30 |
| 000985 | 8271217 | 4.70 (mb) | OKDb/MapMqMta | 2019148 05/26 01:49:04.123 | YILGANG | 30.0388 | 88.0738 | 71.19 | 8 | 10 | 8272558 | 34:14 minutes | USGS/us | 8.00 (mww) | 109.88 | 2019148 05/26 07:41:14.044 | -5.7960 | -75.3975 | 30 |
| 000984 | 8270711 | 4.34 (mb) | OKDb/MapMq | 2019145 05/25 20:30:47.543 | CELEBES SEA | 2.8087 | 122.5819 | 359.74 | 10 | 10 | 8272560 | 38:12 minutes | OKDb/MapMq | 8.09 (mags) | 118.31 | 2019148 05/26 07:41:13.567 | -5.8173 | -75.2788 | 30 |
| 000983 | 8270761 | 5.00 (mb) | OKDb/MapMqMta | 2019145 05/25 16:18:37.452 | BANDA SEA | -8.3912 | 128.9585 | 74.20 | 16 | 16 | 8272574 | 53:18 minutes | OKDb/MapMq | 8.09 (mags) | 118.31 | 2019148 05/26 07:41:13.567 | -5.8173 | -75.2788 | 30 |
| 000982 | 8269971 | 5.22 (mb) | OKDb/MapMqMta | 2019145 05/25 10:31:16.828 | VANUATU ISLANDS | -18.8140 | 159.0836 | 205.24 | 25 | 35 | 8272585 | 1:19 hours | OKDb/MapMq | 8.07 (mags) | 147.82 | 2019148 05/26 07:41:16.519 | -5.7750 | -75.2938 | 30 |
| 000981 | 8269356 | 5.34 (mb) | OKDb/MapMqMta | 2019145 05/25 06:12:47.028 | NEAR EAST COAST OF HONSHU, JAPAN | 35.1495 | 140.1994 | 37.07 | 28 | 38 | 8272585 | 1:14 hours | OKDb/MapMqMta | 8.07 (mags) | 0.00 | 2019148 05/26 07:40:59.779 | -5.8128 | -75.0755 | 30 |

Antelope Cloud Demo

Links and References

- Antelope Cloud Demo <https://antelope.kinematics.com>
- Amazon Web Services (AWS) <https://aws.amazon.com>
- xrdp <http://www.xrdp.org>
- Apache Guacamole <http://guacamole.apache.org>
- Zabbix <https://www.zabbix.com>
- Open Source Tripwire <https://github.com/Tripwire/tripwire-open-source>