

What's New in Antelope 5.9

Dr. Kent Lindquist
Boulder Real Time Technologies, Inc.

September 2019
Calgary, Canada



Thanks to our hosts!!

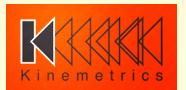


**Alberta
Energy
Regulator**

Virginia Stern

**Alberta Geological Survey /
Alberta Energy Regulator**

*Thanks on behalf of
BRTT and Kinemetrics*



Long Line of Successful European AUG Meetings



Slovenia 2018



Vienna 2017



Rome 2016



Baku 2014



Bucharest 2011

Udine 2015
Trieste 2012
Prague 2010
Vienna 2008
Trieste 2007
Ljubljana 2005
Trieste 2004
Rome 2000

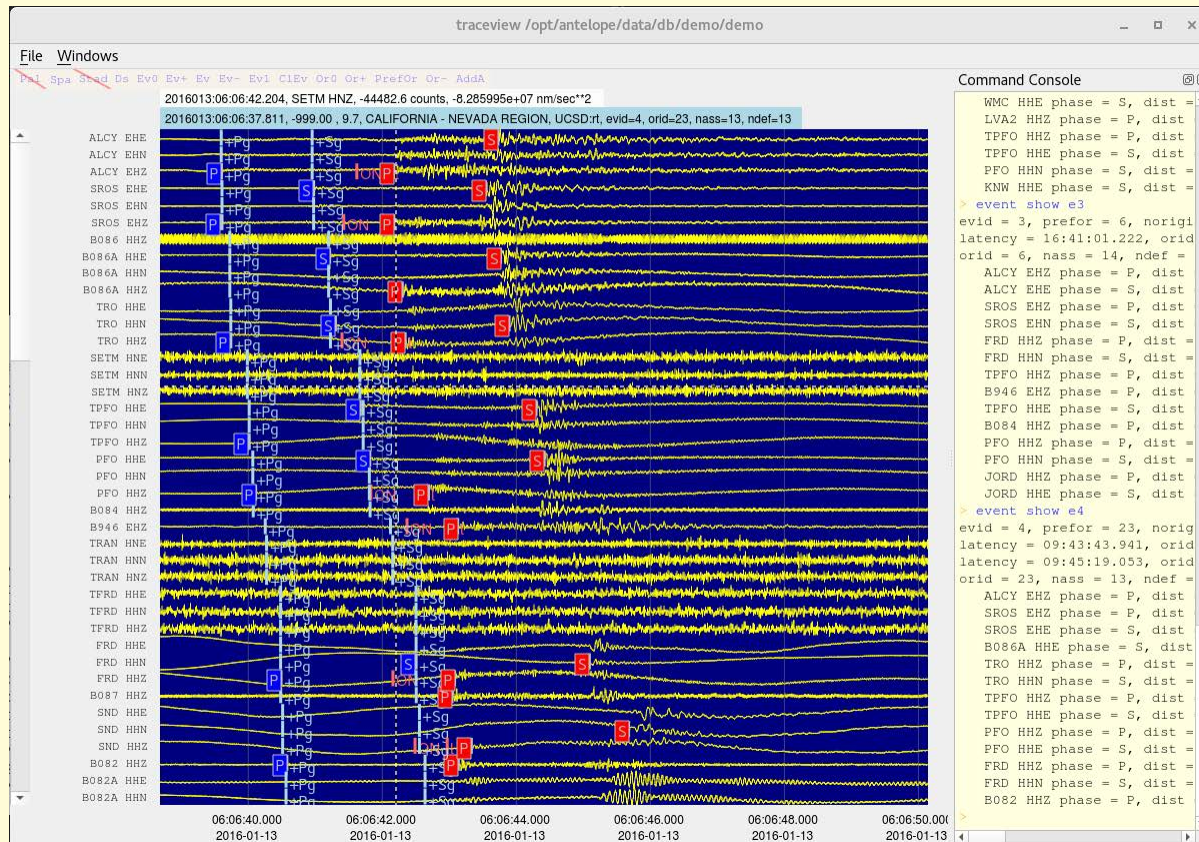


What's New In Antelope 5.9

- Major Advances
 - **traceview**(1)
 - **dbloc**(1) prototype
- Infrastructure
 - Operating System Support
 - Linux Installation
 - X11 on Mac OSX
 - **install_boot_scripts**(1) for **rtexec**(1), **amd**(1), **ald_proxy**(1)
 - *Interpreters – with MATLAB support for R2018a, R2018b, R2019a*
 - *Python 3*
 - **install_obspy**(1)
- Variety of noteworthy smaller improvements
 - Qt-based **inspect_snapshot**(1)
 - Qt-based **setup_site**(1)
 - Qt-based **antelope_update**(1)
 - Qt-based **rtdemo**(1)
 - **orb2orb**(1) match/reject expressions on output connections
 - Custom map lines and areas
 - **dbevents**(1) with *traceview* waveform display
- Coming year

traceview(1)

- Qt-based replacement for *dbpick*(1)

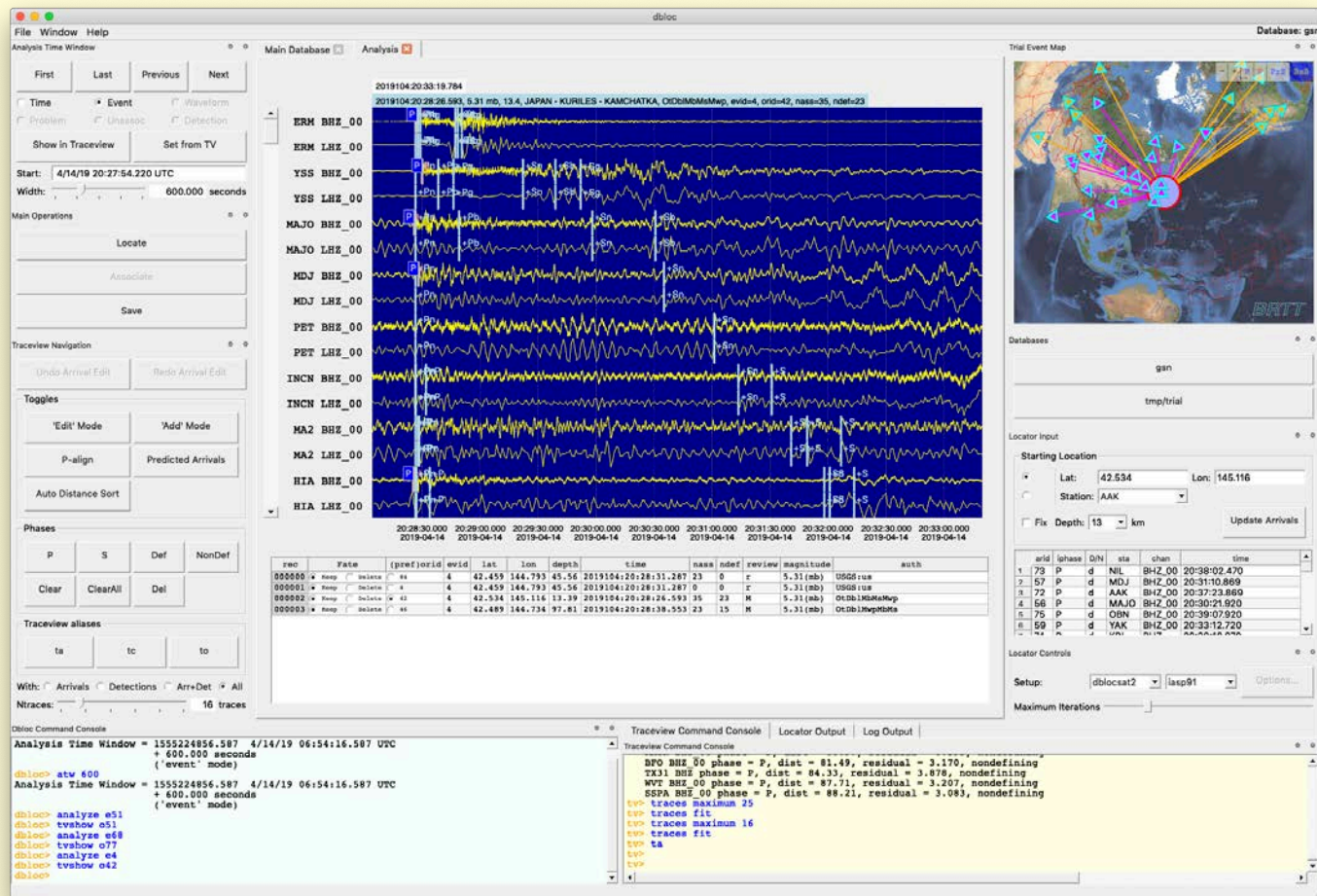


- More details in upcoming talks

dbloc(1)

- *dbloc2(1)* has outgrown its original design
- Part of *Qt* graphics Modernization initiative
- Initial design work courtesy of:
 - Taimi Mulder
 - Trilby Cox
- Will likely take several years to stabilize

dbloc(1) Prototype



- *More details in upcoming talk*

Operating-system Support

- *Antelope 5.9* is released on
 - *RedHat/CentOS 7.4*
 - *Mac OS X 10.13 (High Sierra)*
- *Antelope 5.9* is compiled with:
 - Linux:
 - *Clang 6.0.0* compiled on *CentOS Linux 7.4*
 - *GCC 7.2.0 gfortran* compiled on *CentOS Linux 7.4*
 - Darwin:
 - *Clang 5.0.0* compiled on *OSX 10.9.5*
 - *GCC 7.1.0 gfortran* compiled on *OSX 10.9.5*

Linux Installation

- We recommend installing most complete *Linux* Environment Group (feature set) available
- In *RHEL*:
 - “*Development and Creative Workstation*”
 - (Not “*Minimal Install*”)
- Missing dynamic libraries (*libXss.so*, *libnettle.so*, etc.) most common symptom of insufficient install
- Enterprise Class Software:
 - *Antelope* chosen to support mission
 - OS chosen to support *Antelope*
 - Hardware chosen to support OS
- (Recommendation would be different if we were tailoring for multi-purpose research environments instead of operational missions)
- The fix, per ***notes_linux_setup(5)***:
 - ***% yum groupinstall "Development and Creative Workstation"***

X11 Support on Macs

- Last *Xquartz* update October, 2016
 - “For OSX 10.6.3 or later” [not reassuring]
 - *<http://www.xquartz.org>*
- *X11*-forwarding of *Qt* apps on *OSX*
 - Constant battle
 - May disappear with *Qt5.12* / *Antelope 5.10*
- Several key apps left to port:
 - ***orbrtd, dbbuild, dlmon, rtm***

New *install_boot_scripts(1)*

- Script to install turnkey (startup-on-boot) mechanisms for
 - *rtexec(1)*
 - *amd(1)*
 - (Licensing daemon for serial #'s or dongles on *Linux*)
 - *ald_proxy(1)*
- One script can install all programs
 - *rtexec(1)* may require *amd(1)*
- Based on
 - *launchctl(1)*, *launchd(8)* (*OS X*)
 - *systemctl(1)*, *systemd(1)* (*Linux*)
- Replaces *install_turnkey_boot_script(8)*, *install_amd_daemon_script(8)*, *S99antelope(8)*, *S99amdd(8)*
- The *install_boot_scripts(1)* executable is now in *\$ANTELOPE/bin* directory
- All raw materials in *\$ANTELOPE/data/system*
- *Must be run as root, e.g. with sudo(8)* command
- Added Stefan Radman's suggestions for multi-system support

Antelope 5.9 Interpreters

- *Qt* -> *Qt5.11.0*
- *MATLAB* support:
 - *R2018a, R2018b, R2019a*
- *Perl*: Still *Perl 5.26.1*
- *TCL/Tk*: Same as previous few years
- *Python*: *Python3!*
 - *Python 3.6.5*



Antelope Port to Python 3

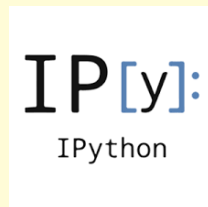
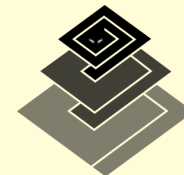
- The Port
 - Antelope use of *Python* is extensive—very complicated job
 - Initiated by Kent Lindquist and Danny Harvey June '17
 - Final big push by Rohan Ambli of Ambli, LLC
- Drivers
 - *Python* 2 End-Of-Life 2020
 - Availability of programming talent
 - Community interest in *ObsPy* (<http://www.obspy.org>)
 - Support for new capabilities e.g. FDSN Web Services
- Advances
 - *pip3* install of almost all modules
 - `/opt/antelope/python3.6.5/bin/pip3`
 - Pre-install of all modules needed by *ObsPy* as of April 2019
 - Updated *matplotlib*
 - Added *scipy*

matplotlib

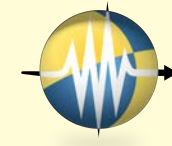


Antelope *Python* 3

- Pre-built *Python* interpreter
- Comprehensive *Antelope* APIs for data handling, analysis, sophisticated plotting
- More than 80 standard third-party modules pre-built and ready to go

The logo for matplotlib, featuring the word "matplotlib" in a blue sans-serif font, with a circular icon containing a stylized plot with multiple colored lines.The logo for NumPy, featuring a 3D grid of blue and yellow cubes to the left of the word "NumPy" in a blue serif font.The logo for SciPy, featuring a blue circular icon with a white stylized 'S' and a small star, followed by the word "SciPy" in a bold black sans-serif font.The logo for BRTT (Boulder Real Time Technologies, Inc.), featuring a stylized mountain range and the letters "BRTT" in a bold blue font.The logo for pillow, featuring a small icon of a pillow with a face and the word "pillow" in a light gray sans-serif font.The logo for scikit-learn, featuring a blue circle and an orange circle with the word "scikit-learn" in a black sans-serif font.The logo for IPython, featuring the text "IP[y]:" in a blue monospace font above the word "IPython" in a black sans-serif font.The logo for SQLAlchemy, featuring the word "SQLAlchemy" in a stylized black and red font.The logo for JEDI, featuring a black and white geometric design resembling a stylized 'X' or a four-pointed star, with the word "JEDI" in a black sans-serif font below it.The logo for Babel, featuring the word "Babel" in a stylized black font with a speech bubble-like shape, and the tagline "speaking your language" in a smaller black font below it.The logo for Pygments, featuring a green and yellow chevron icon followed by the word "Pygments" in a green sans-serif font.A black and white logo featuring a large curly brace on the left, a checkmark in the center, and another curly brace on the right.The logo for python pip, featuring the Python logo (two interlocking snakes) and the text "python pip" in a black sans-serif font.The logo for Zope, featuring a blue circular icon with a white 'Z' and the word "Zope" in a blue sans-serif font.The logo for Tornado, featuring a blue rectangular background with the word "Tornado" in a white sans-serif font.The logo for Flask, featuring a black silhouette of a flask and the word "Flask" in a black sans-serif font.The logo for Kinemetrics, featuring a stylized 'K' made of multiple parallel lines and the word "Kinemetrics" in a black sans-serif font.

install_obspsy(1)



ObsPy

A Python Framework for Seismology

- New contributed-code utility *install_obspsy(1)*
- All supporting *Python* modules already in *Antelope Python*
- N.B. Needs compilers for the *ObsPy* installer

```
[/opt/antelope][5.9] kent% install_obspsy
```

Collecting obspsy

Downloading

<https://files.pythonhosted.org/packages/b4/fa/87a6b3612d7060c585cb0aec518ede6a75fc5b002897d3991633d857fc19/obspsy-1.1.1.zip> (23.9MB)

```
100% |#####| 23.9MB 1.2MB/s
Requirement already satisfied: future>=0.12.4 in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (0.17.1)
Requirement already satisfied: numpy>=1.6.1 in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (1.16.2)
Requirement already satisfied: scipy>=0.9.0 in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (1.2.1)
Requirement already satisfied: matplotlib>=1.1.0 in ./python3.6.5/lib/python3.6/site-packages/matplotlib-3.0.3-py3.6-macosx-10.13-x86_64.egg (from obspsy) (3.0.3)
Requirement already satisfied: lxml in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (4.3.2)
Requirement already satisfied: setuptools in ./python3.6.5/lib/python3.6/site-packages/setuptools-39.2.0-py3.6.egg (from obspsy) (39.2.0)
Requirement already satisfied: sqlalchemy in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (1.3.1)
Requirement already satisfied: decorator in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (4.3.0)
Requirement already satisfied: requests in ./python3.6.5/lib/python3.6/site-packages (from obspsy) (2.18.4)
Requirement already satisfied: cyclr>=0.10 in ./python3.6.5/lib/python3.6/site-packages (from matplotlib>=1.1.0->obspsy) (0.10.0)
Requirement already satisfied: kiwisolver>=1.0.1 in ./python3.6.5/lib/python3.6/site-packages (from matplotlib>=1.1.0->obspsy) (1.0.1)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in ./python3.6.5/lib/python3.6/site-packages (from matplotlib>=1.1.0->obspsy) (2.2.0)
Requirement already satisfied: python-dateutil>=2.1 in ./python3.6.5/lib/python3.6/site-packages (from matplotlib>=1.1.0->obspsy) (2.6.1)
Requirement already satisfied: urllib3<1.23,>=1.21.1 in ./python3.6.5/lib/python3.6/site-packages (from requests->obspsy) (1.22)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in ./python3.6.5/lib/python3.6/site-packages (from requests->obspsy) (3.0.4)
Requirement already satisfied: certifi>=2017.4.17 in ./python3.6.5/lib/python3.6/site-packages (from requests->obspsy) (2018.4.16)
Requirement already satisfied: idna<2.7,>=2.5 in ./python3.6.5/lib/python3.6/site-packages (from requests->obspsy) (2.6)
Requirement already satisfied: six in ./python3.6.5/lib/python3.6/site-packages (from cyclr>=0.10->matplotlib>=1.1.0->obspsy) (1.11.0)
Building wheels for collected packages: obspsy
  Building wheel for obspsy (setup.py) ... done
Stored in directory: /Users/kent/Library/Caches/pip/wheels/11/d6/40/c448464ae42229b2f9fb46b71be0213e10e9628346b7f1198f
```

Successfully built obspsy

Installing collected packages: obspsy

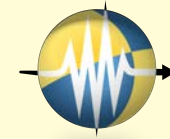
Successfully installed obspsy-1.1.1



ObsPy in Antelope

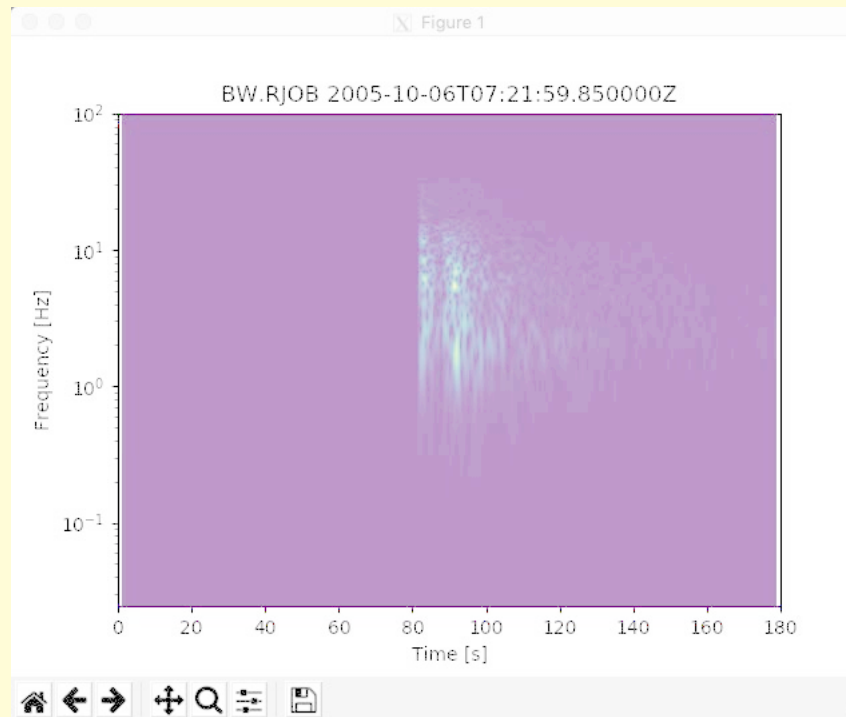
```
[nyas:/opt/antelope][5.9] kent% python  
Python 3.6.5 (default, Mar 22 2019, 21:04:14)  
[GCC 4.2.1 Compatible Clang 5.0.0 (trunk 306208)] on darwin  
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>> import obspy  
>>> st = obspy.read("https://examples.obspy.org/RJOB_061005_072159.ehz.new")  
>>> st.spectrogram(log=True, title='BW.RJOB ' + str(st[0].stats.starttime))
```



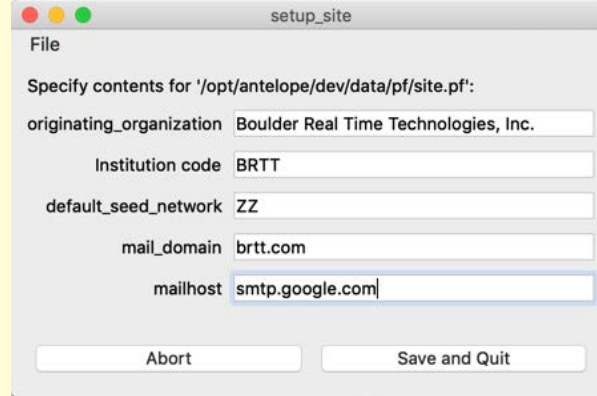
ObsPy

A Python Framework for Seismology



New *setup_site*(1)

- Straight replacement for old *setup_site*(1)
- Part of *Qt* modernization and installer modernization

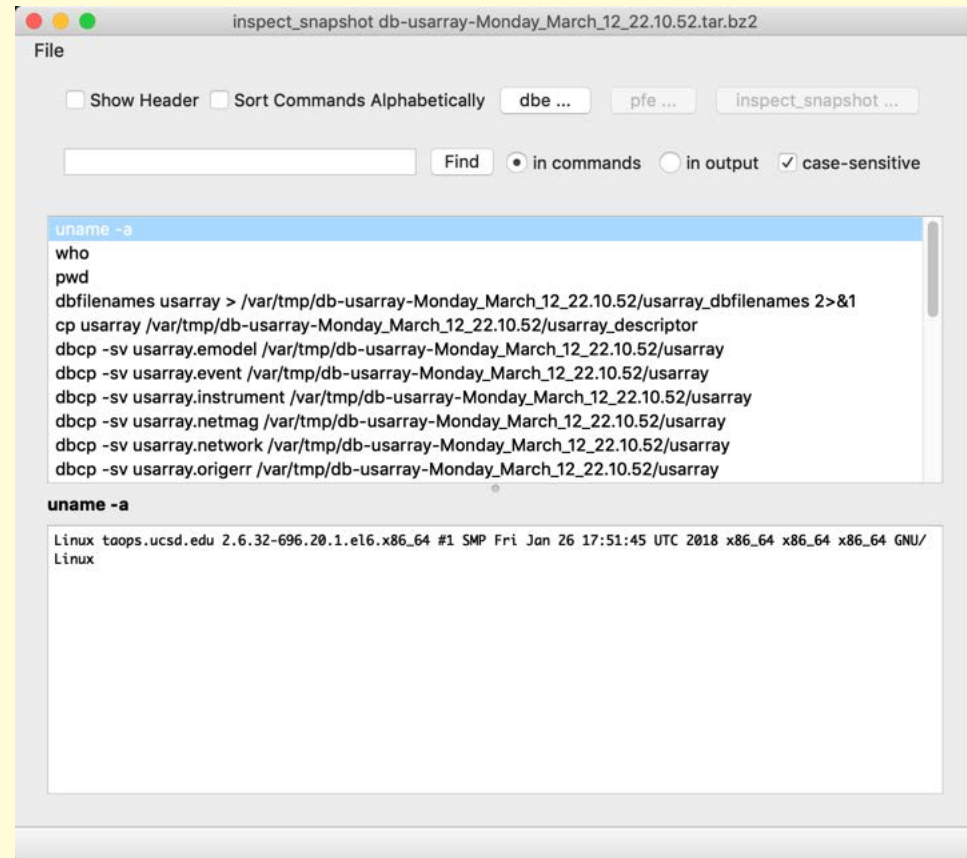


Written by:
Sue Simoncic
Pitch, Roll, & Yaw LLC

New *inspect_snapshot(1)*

% *inspect_snapshot* db-usarray-Monday_March_12_22.10.52.tar.bz2

- Various snapshot generators available:
 - *licsnapshot(1)*
 - *rtssnapshot(1)*
 - *dbsnapshot(1)*
 - *dbloc_snapshot(1)*
- Snapshots are frequently requested by support@brtt.com
- Feel free to look at these snapshots if so inclined -- perhaps you will see the problem quickly

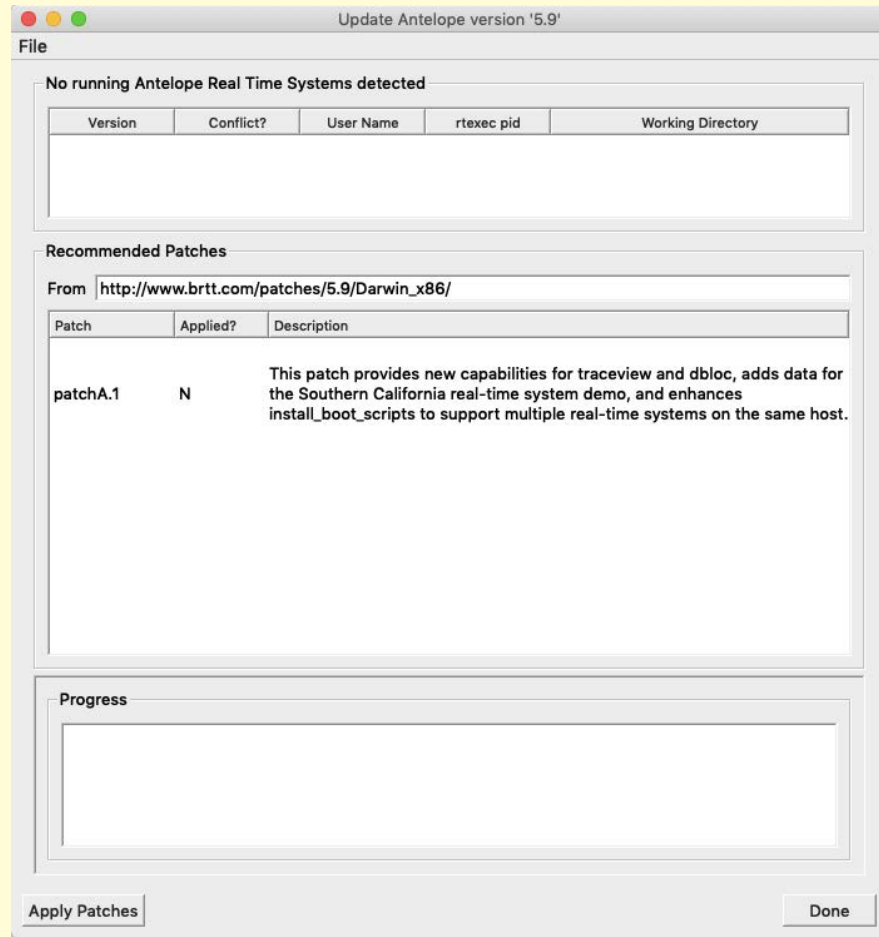


The screenshot shows a window titled "inspect_snapshot db-usarray-Monday_March_12_22.10.52.tar.bz2". The interface includes a "File" menu, checkboxes for "Show Header" and "Sort Commands Alphabetically", and buttons for "dbe ...", "pfe ...", and "inspect_snapshot ...". A search bar with a "Find" button and radio buttons for "in commands", "in output", and a checked "case-sensitive" checkbox is present. The main text area displays the output of a command: "uname -a", which returns system information including the kernel version (2.6.32-696.20.1.el6.x86_64) and architecture (x86_64). Below this, the output of "dbfileNames usarray" is shown, listing various database files and their locations in the temporary directory.

Written by:
Sue Simoncic
Pitch, Roll, & Yaw LLC

New *antelope_update*(1)

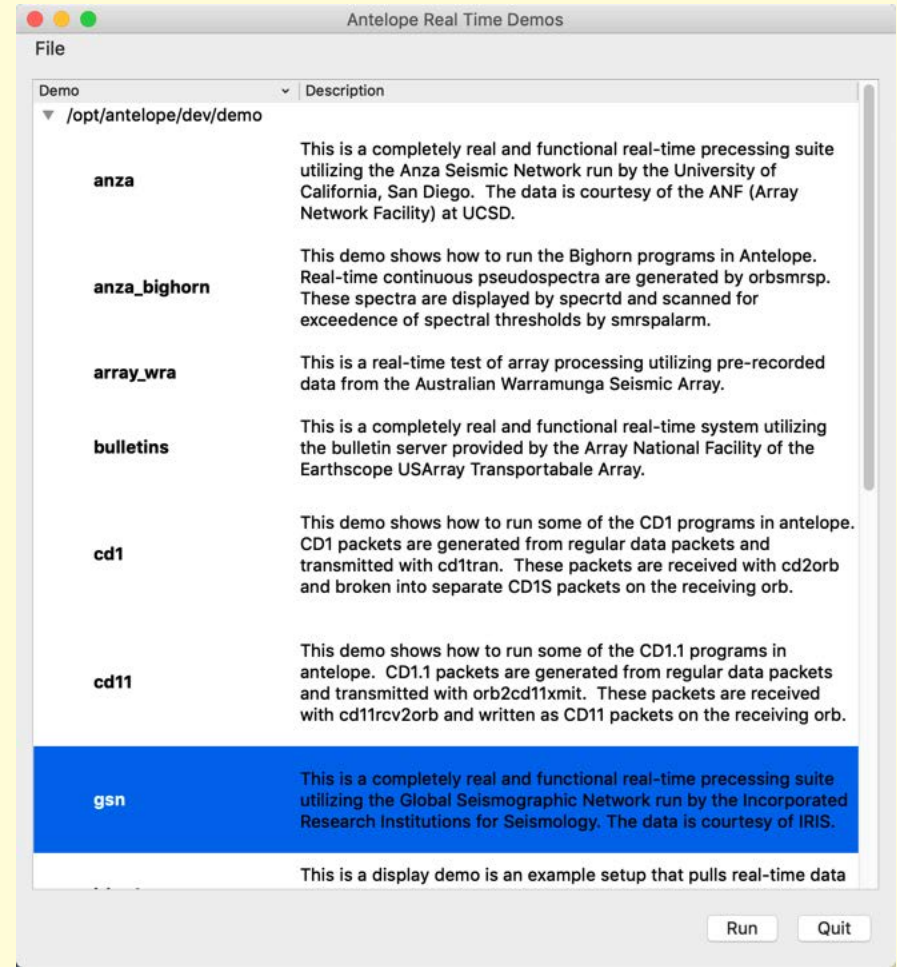
- Modern Qt interface
- Auto-detection of running real-time systems under updating version
- Override capability for updating running systems (not recommended)



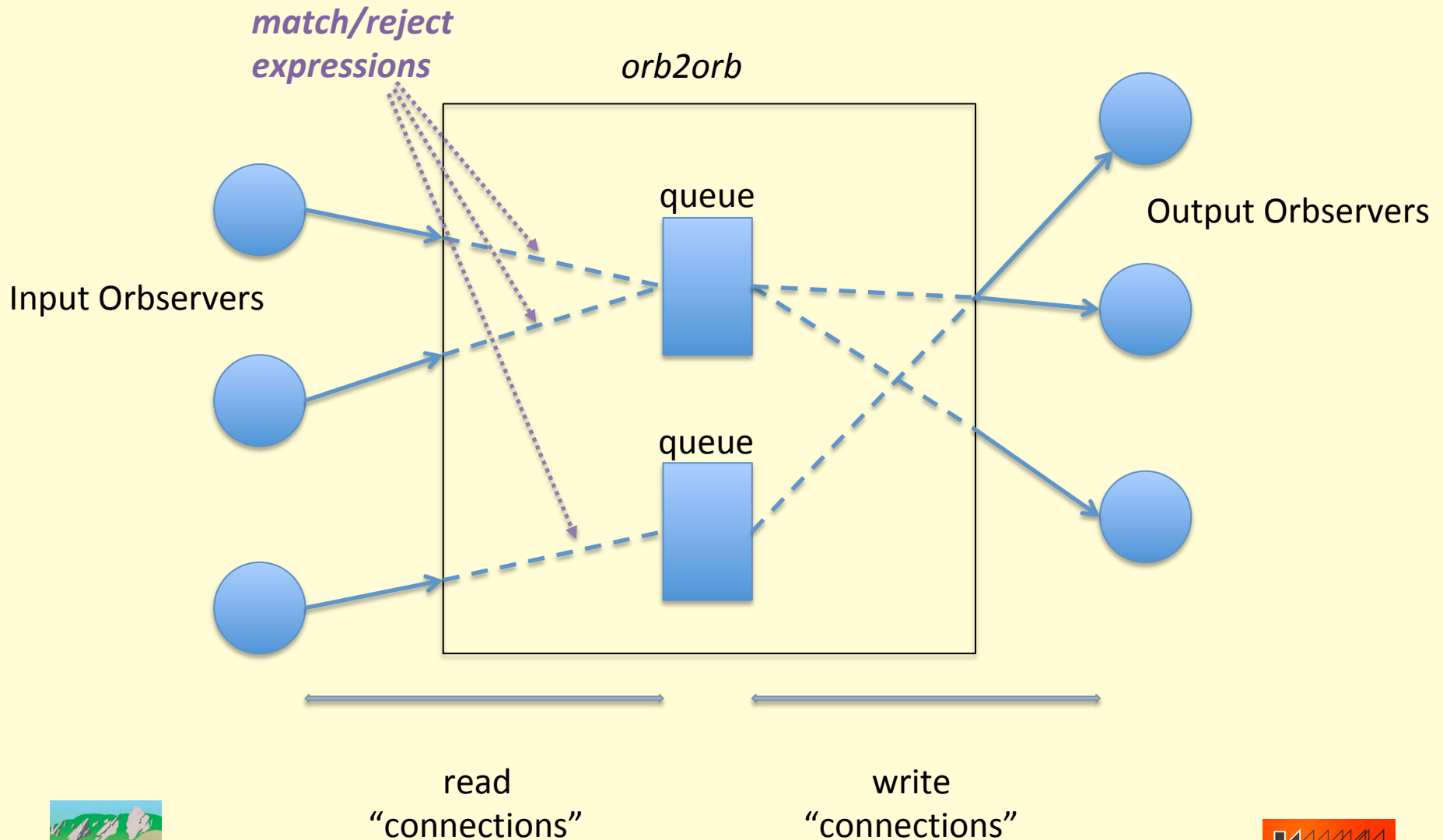
New *rtdemo*(1)

- Command-line version works same as before:
`% rtdemo gsn`
- New Qt-based graphical version:
`% rtdemo`

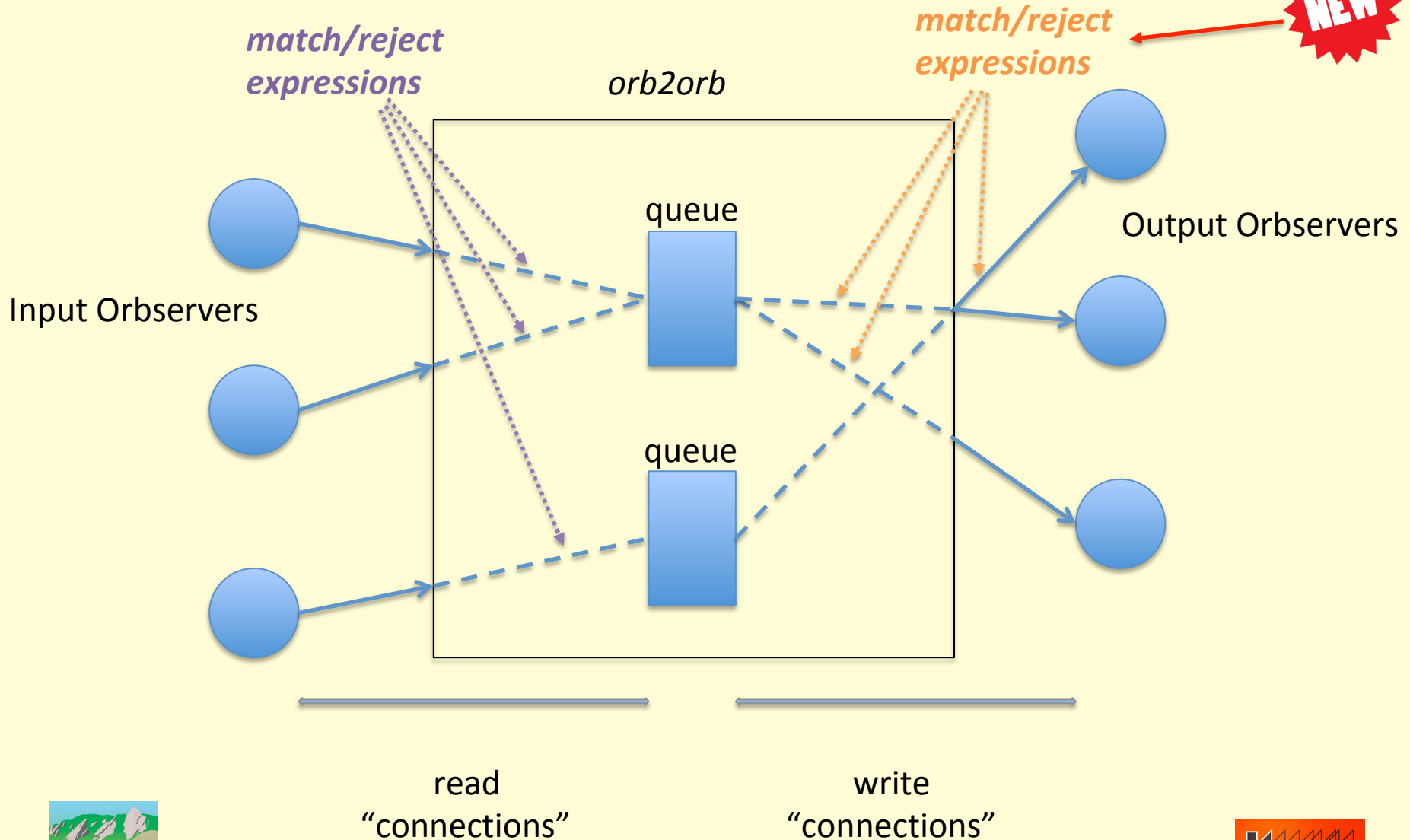
Written by:
Sue Simoncic
Pitch, Roll, & Yaw LLC



orb2orb(1) enhancement



orb2orb(1) enhancement



Custom map lines and areas

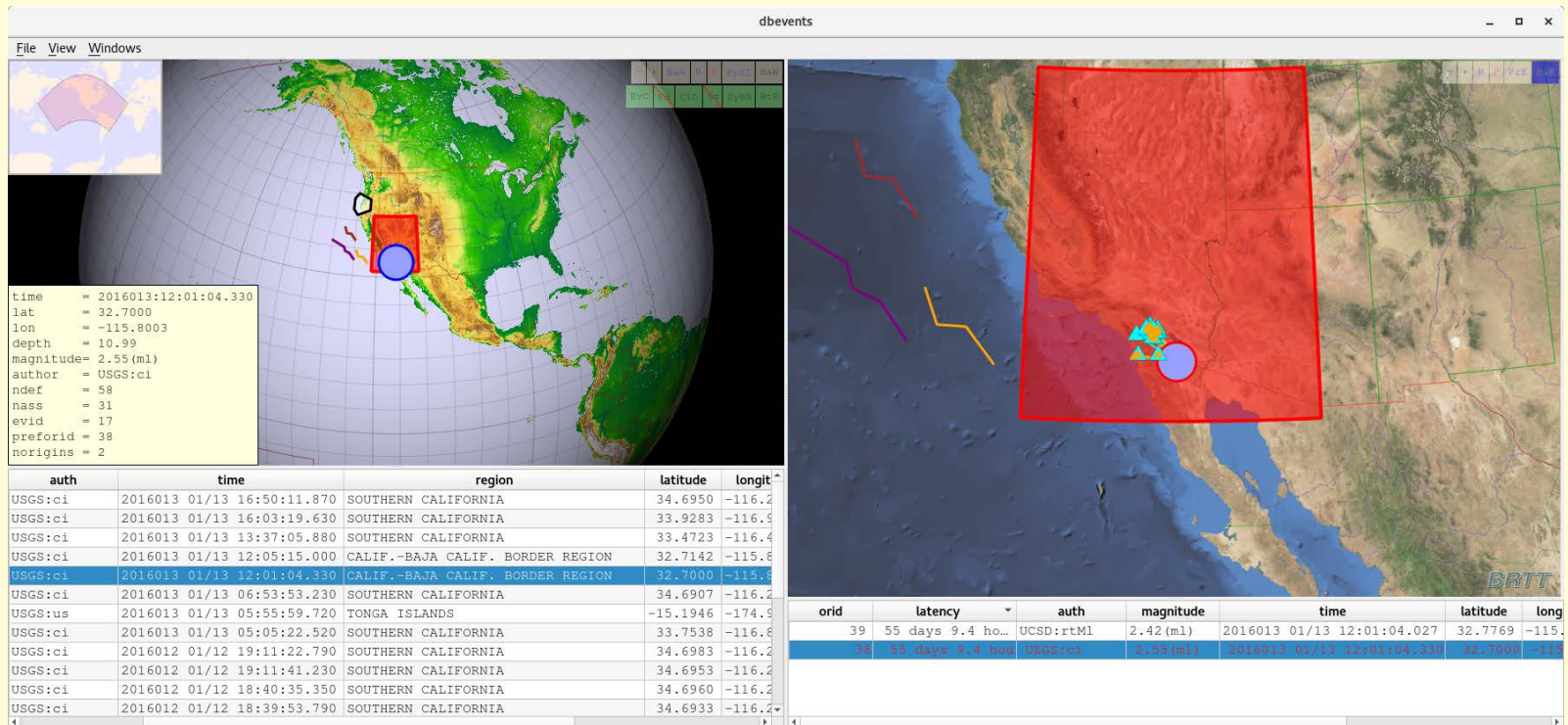
- New parameter-file *map_features.pf*
- Add your own lines
- Add your own areas
- Currently supported in ***dbevents***(1) and ***dbloc***(1)
- Straightforward text format – could create from *KML* etc.

Custom map lines and areas

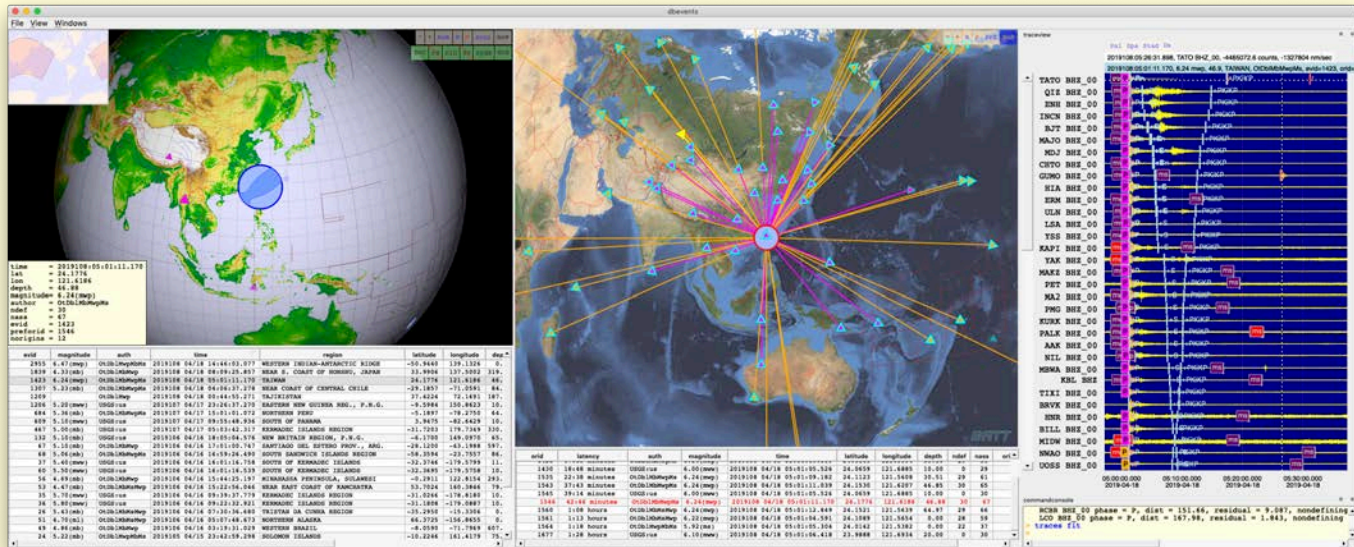
```
map_linear_features &Arr{
  testlinefeature &Arr{
    maps &Tbl{
      dbevents_events
      dbevents_event
      dbevents_origins
      dbloc_maindb_events
      dbloc_trialdb_event
    }
    color_outline  purple
    linewidth      3
    lonlat_points_sequence &Tbl{
      -125  33
      -126  34
      -127  34.3
      -127.3 35
      -130  36
    }
  }
}
```

```
map_area_features &Arr{
  testareafeature &Arr{
    maps &Tbl{
      dbevents_events
      dbevents_event
      dbevents_origins
      dbloc_maindb_events
      dbloc_trialdb_event
    }
    color_outline  red
    color_fill     \#88ff0000
    linewidth      4
    lonlat_points_sequence &Tbl{
      -121  31
      -121  41
      -111  41
      -111  31
      -121  31
    }
  }
}
```


Custom map lines and areas



dbevents(1) with traceview



- *traceview* display in **dbevents(1)**
- Replaces separate launch of **dbpick(1)**
- **BQTraceview(3)** plus *Python* widget wrapper underneath
- Right-click launch of external commands (from *dbevents.pf*) re-instated

Plans for Coming Development Year

- FDSN Web Services support
 - in progress
 - More detail in upcoming talk
- *Qt 5.12 (Long-term release)*
- Operationalizing ***dbloc***
- ***orbrrtd*** in *Qt*
- Further:
 - *Comments ?*
 - *Suggestions ?*
 - *Requests ?*



Thank You!

Questions?

Introduction - KMI

Kinemetrics, Inc.

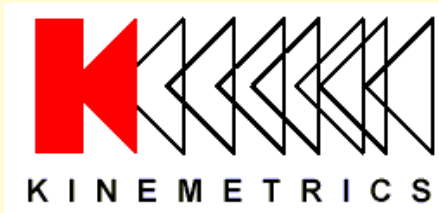
- Founded in 1969
- OYO Corp owned in 1991
- ISO9001 since 1999
- \$35M FY2012 revenue (mostly international)



HQ's in Pasadena CA with
Sales and Project offices in
Switzerland & Abu Dhabi

A screenshot of the Kinemetrics website homepage. The browser address bar shows 'www.kinemetrics.com/p-163-Home.aspx'. The main header features a large image of a person in a blue jacket working inside a large circular hole in the ground, with the Kinemetrics logo overlaid. Below the header is a navigation menu with links: About Us, Products, Solutions, Projects, News, Downloads, and Contact. The main content area is divided into two columns. The left column contains three sections: 'NEW KINEMETRICS WEBSITES: Kinemetrics has launched 3 new websites', 'MSNBC: EARTHSCOPE: Humankind's largest and most ambitious scientific project', and 'Quanterra Q330S+ Seismic System' with an image of the device. The right column features a large heading 'The Innovative World Leader In Earthquake Monitoring', a subheading 'Developer of Technologies, Products and Solutions to Advance How People Live and Work', and a section 'For forty years, Kinemetrics has been creating products for:' followed by a bulleted list: 'Seismic networks', 'Comprehensive environmental monitoring systems', and 'Strong motion and weak motion instrumentation'. Below this is a section 'Project solutions for' with a bulleted list: 'Structural health monitoring (bridges, dams, buildings)' and 'Seismic arrays'.

Introduction – KMI Team



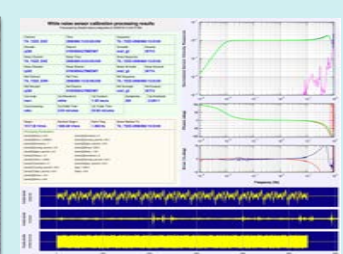
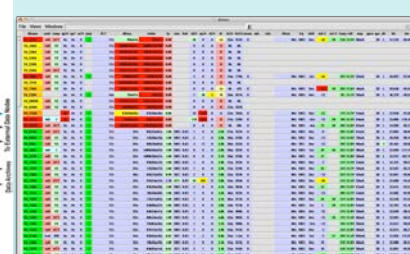
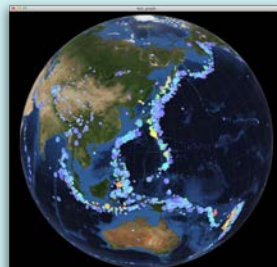
Designs and manufactures sensors and digitizers – Provides complete systems design, installation and operations



Designs High-End Digitizers



Designs High-End Sensors



Kinematics / BRTT

Comprehensive Hardware, Software, and Services

Kinematics Systems Solutions

- Turnkey complete systems including enterprise-class computing centers and full communications

Kinematics Hardware Manufacturer

- World class Kinematics and Quanterra dataloggers
- World class Kinematics, Metrozet and Streckeisen sensors

BRTT Software Developer

- World class acquisition software for all Kinematics hardware products
- Proven track record for large networks with difficult remote deployments (USArray)
- World class, comprehensive automated and interactive seismic processing software
- Data neutral architecture for support of non-seismic environmental monitoring networks
- Extraordinary Command & Control capabilities with SOH displaying

Kinematics Services

- Complete systems procurement, installation and training including all aspects of both hardware and software
- Network operations

