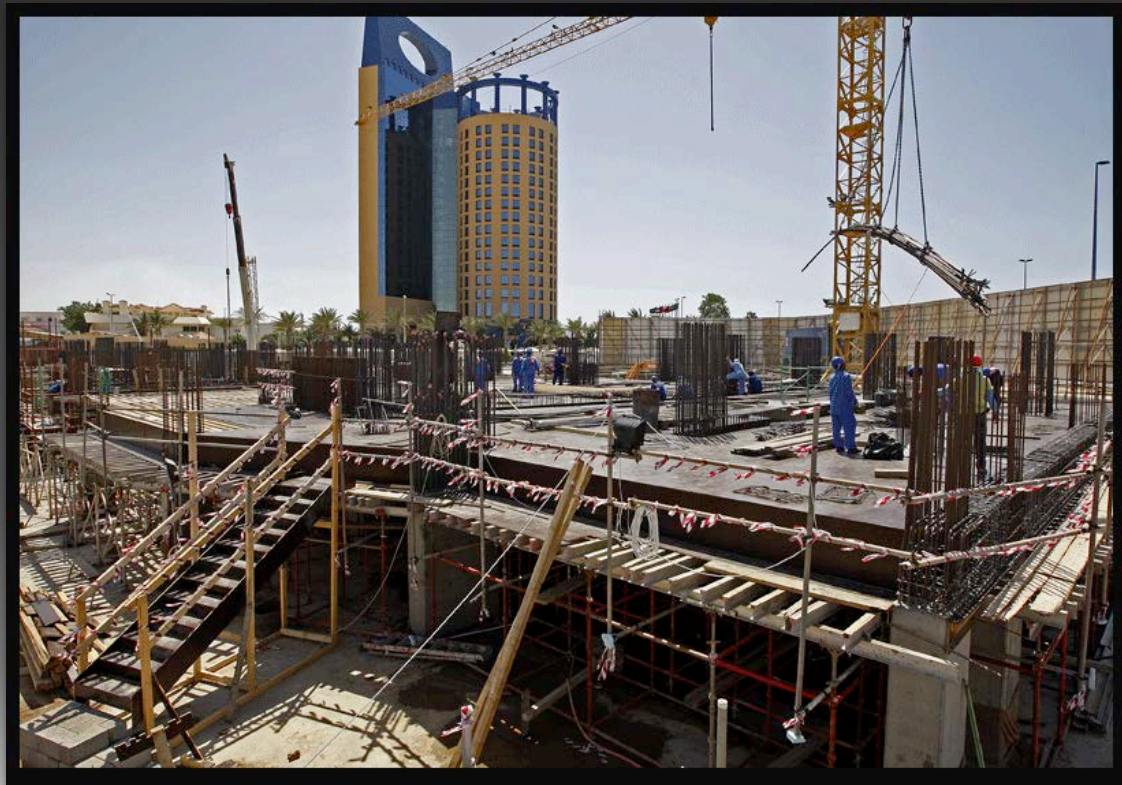


dbloc

work-in-progress prototype



Work-in-progress



Outline

- Short history
- Design goals
- Current prototype
- Demo
- Feedback welcome on where we're headed

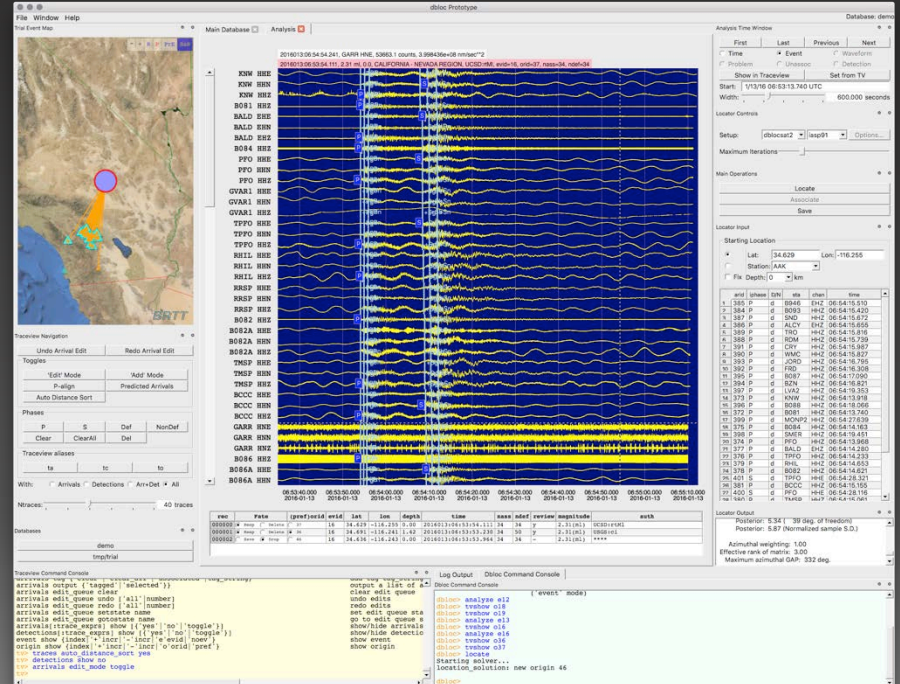
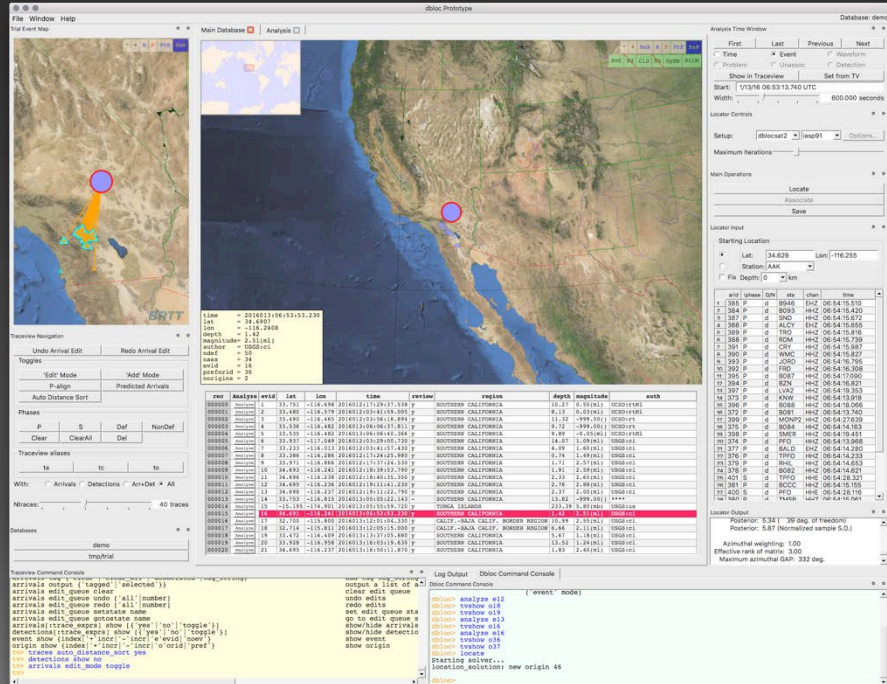
Short history of dbloc2 and dbloc

- Dan Quinlan and Luda Ratnikova designed initial dbloc2 in the 1990's for small regional networks
- From late 1990's to present, dbloc2/dbpick has worked well (dbpick even earlier)
- Mounting pressure from user community for modernization plus need to switch to modern toolkits for maintainability spurred rewrite
- New effort called 'dbloc' rather than objectionable 'dbloc3' -- history of original 'dbloc' lost to time, we're taking the name back
- Coding efforts begun Summer 2018
 - First glimpse at Victoria AUG 2018
 - First presentable early-prototype May 2019

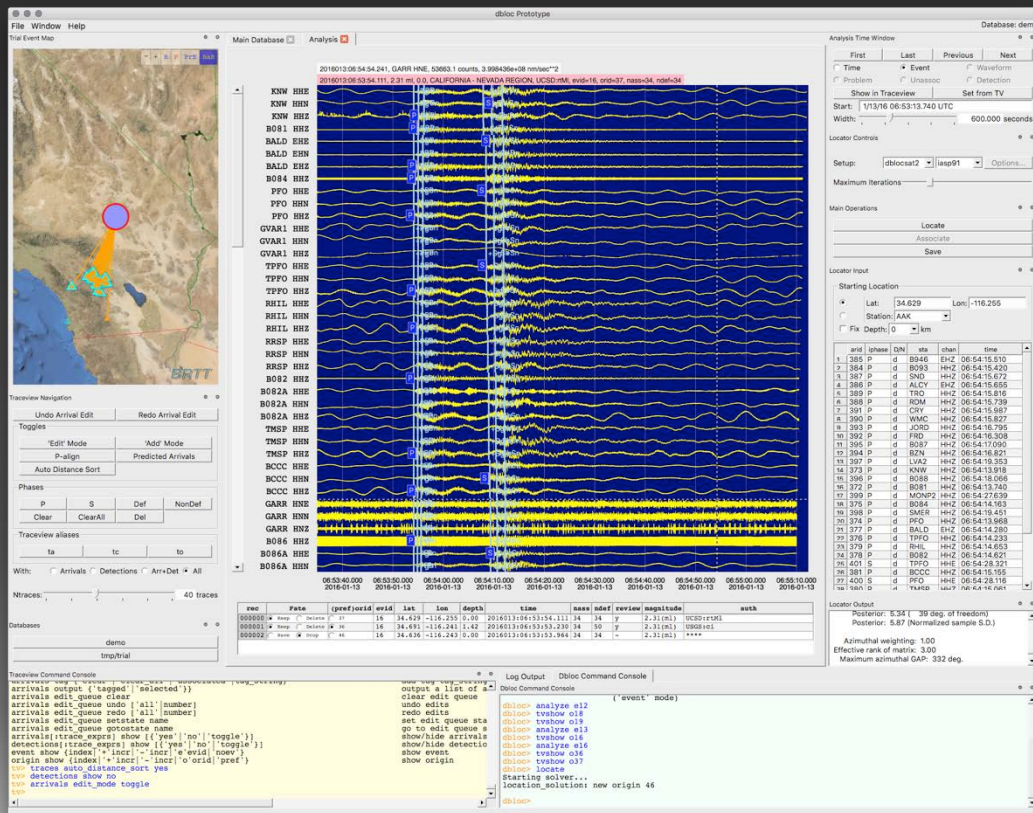
Design goals for dbloc

- Reestablish maintainability of software by switching to modern toolkits
- Support enterprise-scale network operations
- Continue supporting small-network operations
- Modernize user-interaction features and capabilities
- Retain main features of existing programs
- Integrate waveform-processing and earthquake-analysis components (dbloc2 vs dbpick) since that is now possible
- Integrate, modernize, and/or re-integrate myriad features such as magnitude calculation, moment tensors etc. to produce a unified analyst experience

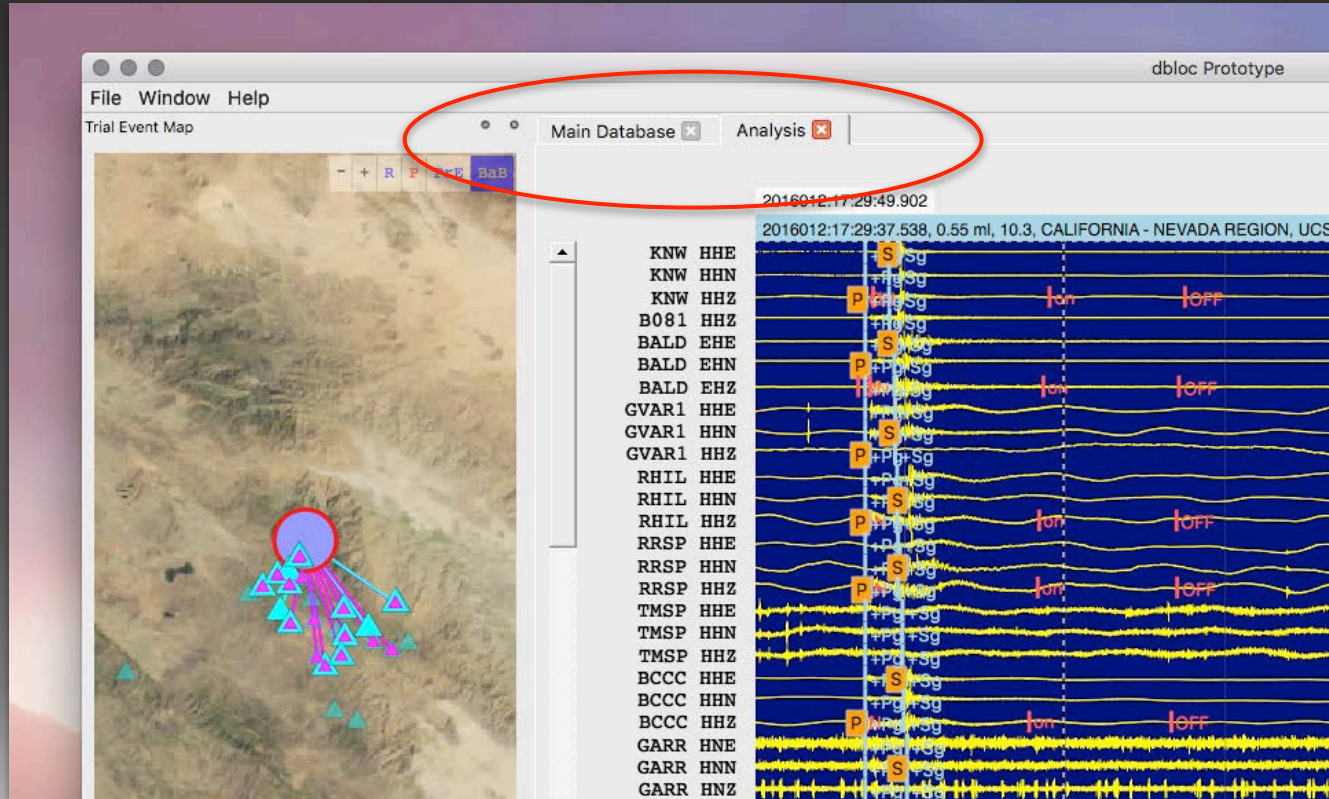
Current prototype -- overview



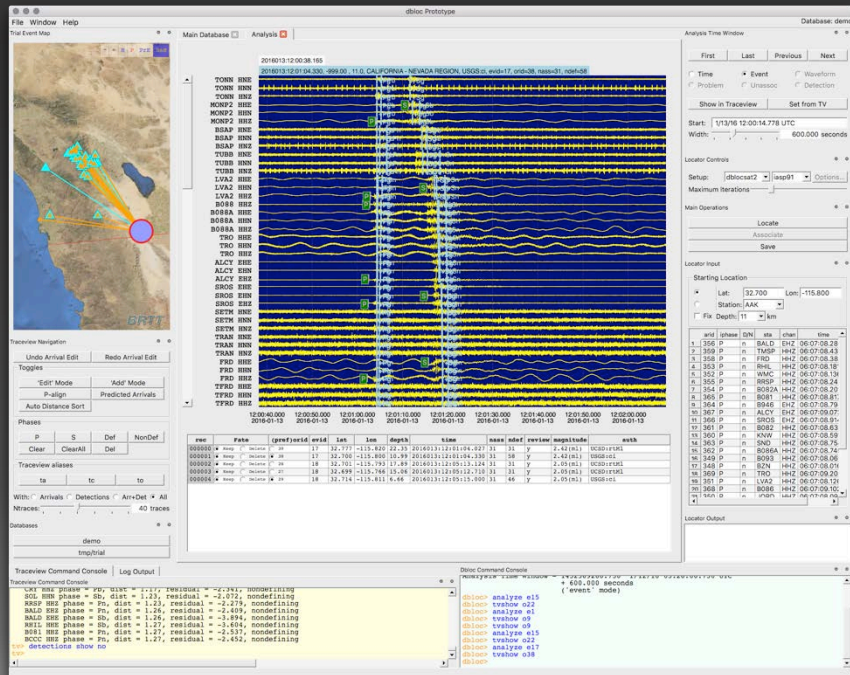
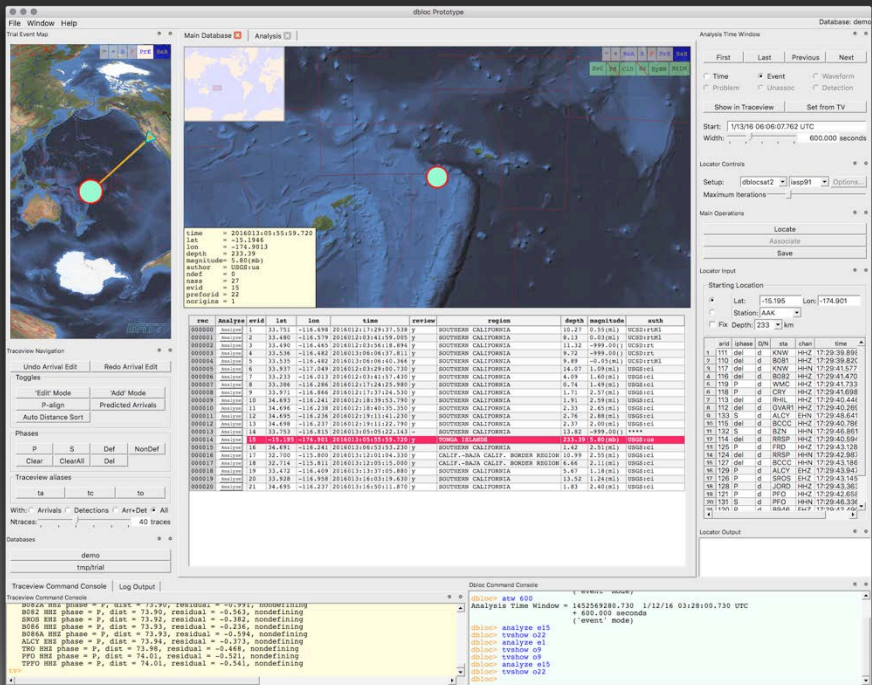
Major feature -- Full integration of waveform analysis via traceview



Major feature -- Tabbed panels for analyst tasks



Major feature -- Integrated maps



Major feature -- Built-in command consoles for command-driven interaction

```
Traceview Command Console
3087 HNZ phase = P, dist = 1.17, residual = -0.446, defining
3102 HNZ phase = P, dist = 1.17, residual = -0.351, defining
3121 HNZ phase = P, dist = 1.19, residual = -0.186, defining
3140 HNZ phase = P, dist = 1.29, residual = -0.464, defining
3159 HNZ phase = P, dist = 1.29, residual = -0.918, defining
3178 HNZ phase = P, dist = 1.30, residual = 0.124, defining
3197 HNZ phase = P, dist = 1.40, residual = -1.391, defining
3216 HNZ phase = P, dist = 1.74, residual = 1.750, defining
> arrivals tag clear
> arrivals tag associated
> arrivals tag D
> help
?
display help
echo With substitutions
make a command alias
remove a command alias
show all aliases
make a hot key assignment
remove a hot key assignment
show all hot key assignments
import commands
export commands
set display start time
set display time window duration
zoom display time window by factor so that time_anchor is in the same relative position
enable/disable display P-arrival alignment
enable/disable show display predicted arrivals
enable/disable batch mode
set maximum number of traces to display in the vertical window
set minimum vertical height of traces
fit traces to vertical window subject to maximum and minimum pixels
enable/disable show only traces with arrivals
enable/disable show only traces with detections
enable/disable show only traces with arrivals and/or detections
enable/disable automatic trace sorting by distance from event
set gains of all traces
select/delete traces whose labels match trace_exprs
configure traceview or trace objects
duplicate traces whose labels match trace_exprs
show/hide traces whose labels match trace_exprs
order and show traces whose labels match trace_exprs
zoom traces to first and last labels that match trace_exprs or to the specified indexes
pan traces to begin at first label that matches trace_exprs or to the specified indexes
stretch vertical heights of traces whose labels match trace_exprs
set foreground color of traces whose labels match trace_exprs
set background color of traces whose labels match trace_exprs
set linewidth of traces whose labels match trace_exprs
set filter of traces whose labels match trace_exprs
set units of traces whose labels match trace_exprs
set vertical scale factor of traces whose labels match trace_exprs
enable/disable arrivals edit mode
clear selected arrivals or enable/disable selected arrival
enable/disable interactive add arrivals mode
copy selected arrivals into clipboard or clear clipboard
paste arrivals in clipboard
set selected arrivals phase to phase string
add tag tag_string to selected arrivals or clear selected arrivals tags or clear all arrivals tags
output a list of arids and association status for tagged or selected arrivals
clear edit queue
undo edits
redo edits
set edit queue state
go to edit queue state
show/hide arrivals that match arrival_exprs
show/hide detections that match detection_exprs
show event
show origin
traces auto_distance_sort yes
> detections show no
> arrivals edit_mode toggle
>
```

```
Dbloc Command Console
dbloc> atw first
Analysis Time Window = 1452569280.730 1/12/16 03:28:00.730 UTC
+ 600.000 seconds
('event' mode)

dbloc> atw 600
Analysis Time Window = 1452569280.730 1/12/16 03:28:00.730 UTC
+ 600.000 seconds
('event' mode)

dbloc> analyze e12
dbloc> tvshow o18
dbloc> tvshow o19
dbloc> analyze e13
dbloc> tvshow o16
dbloc> analyze e16
dbloc> tvshow o36
dbloc> tvshow o37
dbloc> locate
Starting solver...
location_solution: new origin 46

dbloc> analyze e15
dbloc> tvshow o22
dbloc> tvshow o26
dbloc> locate
Starting solver...
location_solution: new origin 47

dbloc> locate
Starting solver...
location_solution: new origin 48

dbloc> atw next
Analysis Time Window = 1452667973.230 1/13/16 06:52:53.230 UTC
+ 600.000 seconds
('event' mode)

dbloc> window analysis
dbloc> tvshow o37
dbloc> locate
Starting solver...
location_solution: new origin 49

dbloc> atw next
Analysis Time Window = 1452686404.330 1/13/16 12:00:04.330 UTC
+ 600.000 seconds
('event' mode)

dbloc> window analysis
dbloc> |
```

Major feature -- Multi-window design with detachable docking widgets

The image displays the dbloc Prototype software interface, which is designed for multi-window operation with detachable docking widgets. A red circle highlights the 'File', 'Window', and 'Help' menu bar, with a red arrow pointing to the 'Window' menu. The 'Window' menu is open, showing a list of dockable widgets that can be managed, including:

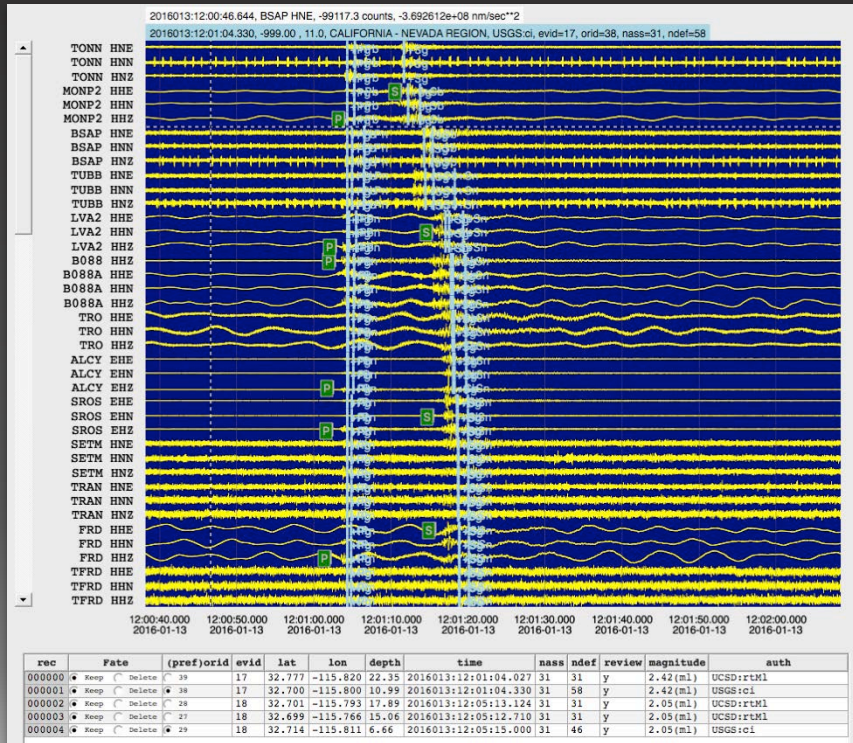
- ✓ Main Database
- ✓ Analysis
- ✓ Mags
- ✓ Test
- ✓ Analysis Time Window
- ✓ Databases
- ✓ Dbloc Command Console
- ✓ Locator Controls
- ✓ Locator Output
- ✓ Log Output
- ✓ Main Operations
- ✓ Locator Input
- ✓ Trial Event Map
- ✓ Traceview Command Console
- ✓ Traceview Navigation

The main interface area is divided into several panels:

- Trial Event Map:** A map showing the location of the trial event, with a red circle highlighting the event location.
- Main Database:** A panel displaying a list of stations and their associated data.
- Analysis:** A panel displaying a list of analysis results, including station names, event times, and magnitudes.
- Locator Controls:** A panel for controlling the locator, including buttons for 'First', 'Last', 'Previous', 'Next', 'Time', 'Event', 'Waveform', 'Problem', 'Unassign', 'Detection', 'Show in Traceview', and 'Set from TV'.
- Locator Output:** A panel displaying the output of the locator, including station names, event times, and magnitudes.
- Locator Input:** A panel for inputting location data, including fields for 'Starting Location', 'Station', 'Lat', 'Lon', 'Fix Depth', and 'km'.
- Traceview Command Console:** A panel for entering commands to interact with the traceview.
- Traceview Navigation:** A panel for navigating through the traceview, including buttons for 'Undo Arrival Edit', 'Redo Arrival Edit', 'Edit Mode', 'Add Mode', 'P-align', 'Predicted Arrivals', 'Auto Distance Sort', and 'Phases'.

The interface also includes a 'Trial Event Map' showing a map of the trial area, a 'Main Database' table with columns for 'rec', 'date', 'eventid', 'evid', 'lat', 'lon', 'depth', 'time', 'mag', 'ndet', 'review', 'magnitude', and 'auth', and a 'Locator Controls' panel with buttons for 'First', 'Last', 'Previous', 'Next', 'Time', 'Event', 'Waveform', 'Problem', 'Unassign', 'Detection', 'Show in Traceview', and 'Set from TV'.

Major feature -- Clear primacy of “Analysis Time Window” concept



Analysis Time Window

First Last Previous Next

☐ Time ☒ Event ☐ Waveform
☐ Problem ☐ Unassoc ☐ Detection

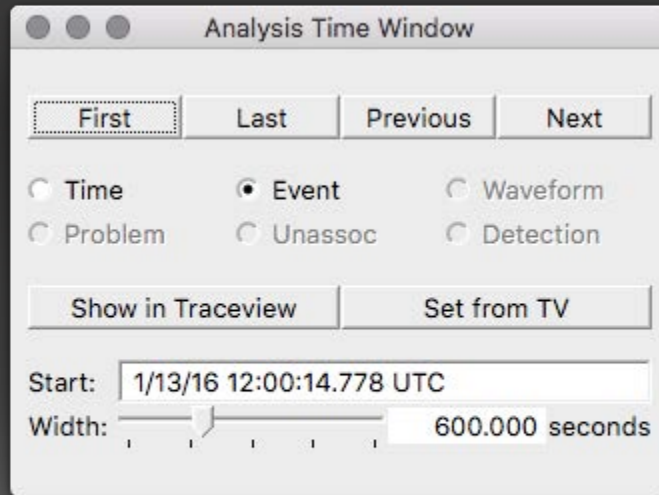
Show in Traceview Set from TV

Start: 1/13/16 12:00:14.778 UTC

Width: 600.000 seconds

Minor feature -- Multiple hop modes (time-based, event-based, etc.) to advance

Analysis Time Window



Minor feature -- Built in widgets to show log and locator output

```
Log Output

dbloc: Focusing to first Analysis Time Window
dbloc: Analysis Time Window changed: now 1/12/16 03:28:00.730 UTC + 600.000 seconds
dbloc: Found 1 events in main database for time window 1/12/16 03:28:00.730 UTC + 600.000 seconds
dbloc: Rebuilding trial database 'tmp/trial' with 1 events
dbloc: Analysis Time Window unchanged: still 1/12/16 03:28:00.730 UTC + 600.000 seconds
dbloc: Analysis Time Window changed: now 1/12/16 19:11:01.688 UTC + 600.000 seconds
dbloc: Found 2 events in main database for time window 1/12/16 19:11:01.688 UTC + 600.000 seconds
dbloc: Rebuilding trial database 'tmp/trial' with 2 events
dbloc: Analysis Time Window changed: now 1/12/16 19:10:43.087 UTC + 600.000 seconds
dbloc: Found 2 events in main database for time window 1/12/16 19:10:43.087 UTC + 600.000 seconds
dbloc: Rebuilding trial database 'tmp/trial' with 2 events
dbloc: Analysis Time Window changed: now 1/13/16 06:53:13.740 UTC + 600.000 seconds
dbloc: Found 1 events in main database for time window 1/13/16 06:53:13.740 UTC + 600.000 seconds
dbloc: Rebuilding trial database 'tmp/trial' with 1 events
dbloc: Locating event
dbloc: Starting dblocsat2
dblocsat2: File /opt/antelope/5.9/data/tables/dblocsat/iasp91.LQ will not open!
dblocsat2: File /opt/antelope/5.9/data/tables/dblocsat/iasp91.LR will not open!
dblocsat2: File /opt/antelope/5.9/data/tables/dblocsat/iasp91.Rg will not open!
dblocsat2: File /opt/antelope/5.9/data/tables/dblocsat/iasp91.SS will not open!
dblocsat2: Warning locate_event: No observations to process
dblocsat2: Starting solver...
dblocsat2: location_solution: new origin 46
dbloc: Assigning orid 46 to existing evid 16
dbloc: can't stats tmp/trial.mt
dbloc: No such file or directory
dbloc: dbloc: can't stats tmp/trial.wfmeas
dbloc: No such file or directory
```

```
Locator Output

B082 P t 0.88 1.03 -0.15 -1.47 1.08
TFPO S t 14.58 15.05 -0.47 -4.67 1.04
BCCC P t 1.41 1.30 0.12 1.18 1.10
PFO S t 14.38 14.88 -0.51 -5.06 1.04
TMSP P t 1.32 1.12 0.20 1.97 1.08
BALD S t 15.14 14.95 0.19 1.86 1.04
B086 P t 1.52 1.54 -0.02 -0.16 1.10
KNW S t 14.91 13.62 1.29 12.95 1.00
B086A P t 1.48 1.54 -0.06 -0.60 1.10
B086A S t 17.27 17.05 0.22 2.17 1.10
BCCC S t 16.00 16.62 -0.63 -6.25 1.10

> Sigmat: 5.341 NSDD: 5.866 dLat: -0.039 dLon: 0.005 dZ: 0.000
> True Cond. Num.: 9.58 Effective Cond. Num.: 9.58

Location ran for 10 iterations ... Converged!

=====

Final location estimate (+/- S.D.):
Latitude: 34.636 deg. N +/- 0.403 km.
Longitude: 116.243 deg. W +/- 0.754 km.
Depth: 0.000 km. +/- 0.000 km.
Relative O.T.: -19.776 sec. +/- 0.067 sec.
Absolute O.T.: -19.776 sec. +/- 0.067 sec.

Confidence region at 0.90 level:
Semi-major axis: 9.3 km. +/- 0.08 deg.
Semi-minor axis: 4.0 km. +/- 0.04 deg.
Major-axis strike: 107.7 deg. clockwise from North
Depth error: 0.0 km.
Orig. time error: 0.6 sec.

Standard errors (sigma):
Prior: 2.40 ( 8 deg. of freedom)
Posterior: 5.34 ( 39 deg. of freedom)
Posterior: 5.87 (Normalized sample S.D.)

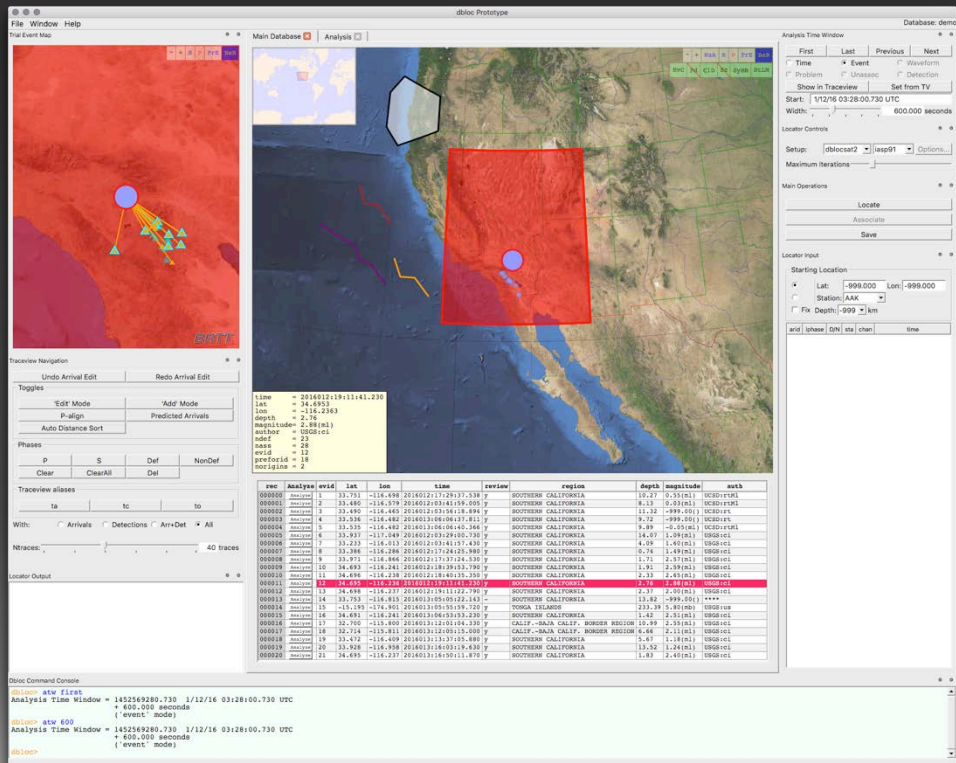
Azimuthal weighting: 1.00
Effective rank of matrix: 3.00
Maximum azimuthal GAP: 332 deg.

=====

Data Residuals Distance Azimuth Data
Ariv ID Statn Phase Type at True Normalized (deg.) (deg.) Import Err
=====
373 KNW P t d 0.631 6.315 1.000 202.94 0.054 0
402 KNW S t d 1.298 12.980 1.000 202.94 0.214 0
372 B081 P t d 0.392 3.917 1.003 202.98 0.054 0
375 B084 P t d 0.145 1.452 1.039 189.83 0.062 0
374 PFO P t d -0.055 -0.547 1.040 189.97 0.061 0
400 PFO S t d -0.502 -5.016 1.040 189.97 0.244 0
377 BALD P t d 0.220 2.196 1.040 203.50 0.057 0
403 BALD S t d 0.189 1.888 1.040 203.50 0.224 0
376 TFPO P t d 0.114 1.139 1.045 189.69 0.063 0
401 TFPO S t d -0.463 -4.631 1.045 189.69 0.251 0
379 RHIL P t d 0.265 2.648 1.057 204.56 0.066 0
378 B082 P t d -0.148 -1.481 1.078 195.81 0.034 0
380 TMSP P t d 0.198 1.964 1.079 199.73 0.038 0
381 BCCC P t d 0.117 1.165 1.095 205.58 0.075 0
404 BCCC S t d -0.623 -6.226 1.095 205.56 0.271 0
383 B086 P t d -0.017 -0.168 1.104 192.54 0.044 0
382 B086A P t d -0.060 -0.603 1.104 192.54 0.044 0
405 B086A S t d 0.221 2.208 1.104 192.54 0.198 0
390 WMC P t d 0.250 2.496 1.121 198.70 0.035 0
389 TRO P t d 0.063 0.632 1.123 187.78 0.080 0
388 RDM P t d 0.099 0.994 1.123 206.82 0.086 0
387 SNO P t d -0.022 -0.223 1.126 195.87 0.034 0
384 B093 P t d -0.290 -2.900 1.128 202.62 0.051 0
385 B946 P t d -0.377 -3.768 1.136 194.84 0.036 0
386 ALCY P t d -0.415 -4.150 1.144 189.45 0.065 0
391 CRY P t d -0.061 -0.605 1.146 201.05 0.043 0
395 B087 P t d 0.416 4.161 1.179 194.73 0.035 0
392 FRD P t d -0.381 -3.809 1.179 194.70 0.036 0
394 BZN P t d -0.222 -2.215 1.197 197.17 0.033 0
393 JORD P t d -0.497 -4.974 1.210 196.07 0.034 0
396 B088 P t d -0.946 -9.458 1.299 194.03 0.038 0
397 LVA2 P t d 0.105 1.048 1.311 191.70 0.050 0
398 SMER P t d -1.434 -14.339 1.407 213.37 0.167 0
399 MONPZ P t d 1.790 17.896 1.750 184.93 0.124 0
=====

= 0, No problem, normal interpolation
```

Minor feature -- Specification of custom shade areas, linear features via map_features.pf



```

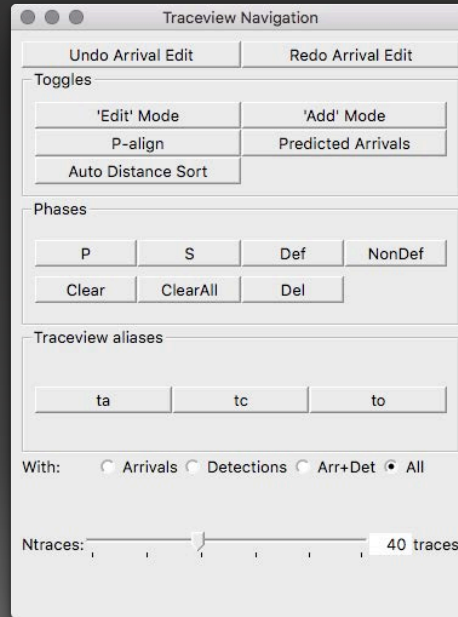
dbloc_linear_features user(
  testfeature1 user(
    naps tlib(
      devents.events
      devents.event
      devents.origins
      dloc.nairnd.events
      dloc.triald.event
    )
    color.outline purple
    linewidth 3
    lonlat_points.sequence tlib(
      -126 35
      -126 34
      -127 34.5
      -127.5 35
      -127.5 34.5
    )
  )
  testfeature2 user(
    naps tlib(
      devents.events
      devents.event
      devents.origins
      dloc.nairnd.events
      dloc.triald.event
    )
    color.outline orange
    linewidth 3
    lonlat_points.sequence tlib(
      -122 35.5
      -122.5 35
      -123 35.5
      -124 35.5
      -124.5 34.5
    )
  )
  testfeature3 user(
    naps tlib(
      devents.events
      devents.event
      devents.origins
      dloc.nairnd.events
      dloc.triald.event
    )
    color.outline brown
    linewidth 3
    lonlat_points.sequence tlib(
      -125 35.5
      -125.5 37
      -126 37.5
      -127 37.5
      -127.5 36.5
    )
  )
)

dbloc_area_features user(
  testfeature1 user(
    naps tlib(
      devents.events
      devents.event
      devents.origins
      dloc.nairnd.events
      dloc.triald.event
    )
    color.outline red
    color.fill #80808000
    linewidth 4
    lonlat_points.sequence tlib(
      -124 35
      -124 41
      -111 41
      -111 35
      -123 35
    )
  )
  testfeature2 user(
    naps tlib(
      devents.events
      devents.event
      devents.origins
      dloc.nairnd.events
      dloc.triald.event
    )
    color.outline black
    color.fill #80808000
    linewidth 2
    lonlat_points.sequence tlib(
      -126 42
      -126 44
      -125 44
      -122 44
      -122 42
      -125 42
      -126 42
    )
  )
)

dbloc_revision_time 1555703800

```

Minor feature -- Built-in Smartpick-style traceview control buttons



Minor feature -- Spreadsheet table for list of arrivals going into the location

Locator Input

Starting Location

☒ Lat: 34.691 Lon: -116.241

☐ Station: AAK

☐ Fix Depth: 1 km

	arid	iphas	D/N	sta	chan	time
1	393	P	d	JORD	HHZ	06:54:16.795
2	392	P	d	FRD	HHZ	06:54:16.308
3	395	P	d	B087	HHZ	06:54:17.090
4	394	P	d	BZN	HHZ	06:54:16.821
5	397	P	d	LVA2	HHZ	06:54:19.353
6	396	P	d	B088	HHZ	06:54:18.066
7	399	P	d	MONP2	HHZ	06:54:27.639
8	377	P	d	BALD	EHZ	06:54:14.280
9	398	P	d	SMER	HHZ	06:54:19.451
10	376	P	d	TPFO	HHZ	06:54:14.233
11	385	P	d	B946	EHZ	06:54:15.510
12	379	P	d	RHIL	HHZ	06:54:14.653
13	384	P	d	B093	HHZ	06:54:15.420
14	378	P	d	B082	HHZ	06:54:14.621
15	381	P	d	BCCC	HHZ	06:54:15.155
16	387	P	d	SND	HHZ	06:54:15.672
17	380	P	d	TMSP	HHZ	06:54:15.061
18	386	P	d	ALCY	EHZ	06:54:15.655
19	383	P	d	B086	HHZ	06:54:15.260
20	389	P	d	TRO	HHZ	06:54:15.816
21	382	P	d	B086A	HHZ	06:54:15.217
22	388	P	d	RDM	HHZ	06:54:15.739
23	391	P	d	CRY	HHZ	06:54:15.987
24	390	P	d	WMC	HHZ	06:54:15.827
25	373	P	d	KNW	HHZ	06:54:13.918
26	372	P	d	B081	HHZ	06:54:13.740
27	375	P	d	B084	HHZ	06:54:14.163
28	374	P	d	PFO	HHZ	06:54:13.968
29	401	S	d	TPFO	HHE	06:54:28.321
30	400	S	d	PFO	HHE	06:54:28.116
31	403	S	d	BALD	EHE	06:54:28.878
32	402	S	d	KNW	HHN	06:54:28.651
33	405	S	d	B086A	HHE	06:54:31.006
34	404	S	d	BCCC	HHN	06:54:29.738

I could go on for
days...
Demonstration!

Thank you -- Questions?

Feedback:
support@brtt.com