What's New in Antelope 5.6

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Boulder Real Time Technologies

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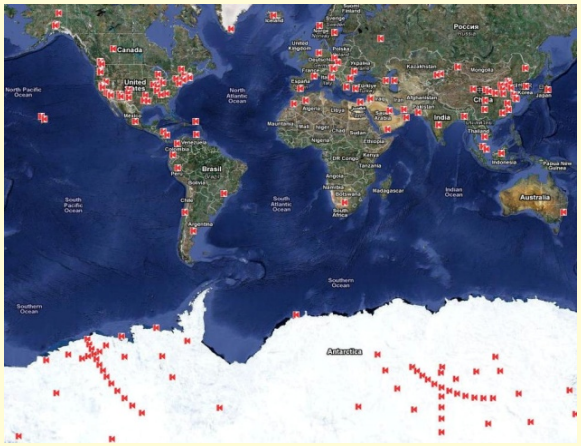
Introduction - KMI

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

Introduction – KMI Team

KINEMETRICS

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

QUANTERRA®

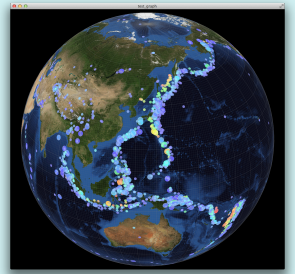
Designs High-End Digitizers

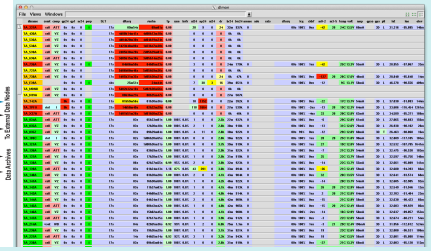
metrozet

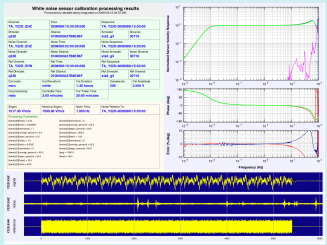
Designs High-End Sensors

BRTT

Antelope Software







Kinemetrics / BRTT
Comprehensive Hardware, Software, and Services

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

Kinemetrics Hardware Manufacturer
- World class Kinemetrics and Quanterra dataloggers
- World class Kinemetrics, Metrozet and Streckeisen sensors

BRTT Software Developer
- World class acquisition software for all Kinemetrics 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

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

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What's New In Antelope 5.6

- Qt and Python Graphics & Maps
- *orb2orb_pre*
- Contractors and Contracted Development
  - *dbmoment*
  - *db2stationxml*
- *dbe*
- Internationalization and Localization
- new *demo* database
- Bighorn

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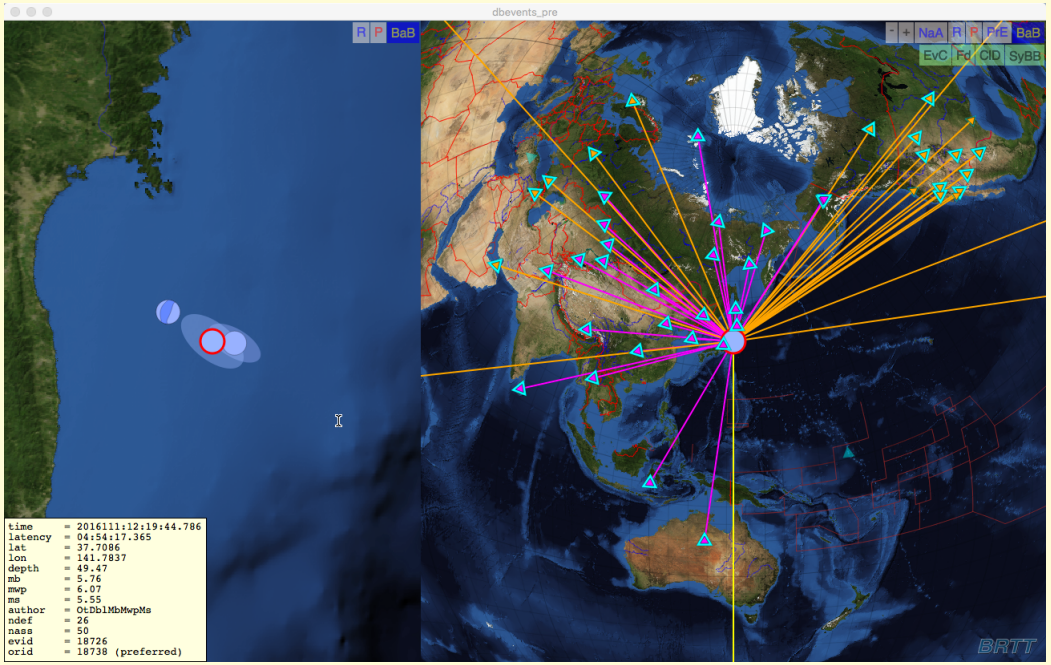
Python / Qt Graphics



- Modern Maps based on NASA Blue Marble
- Python hooks for developers
- Further detail in Danny Harvey's talk

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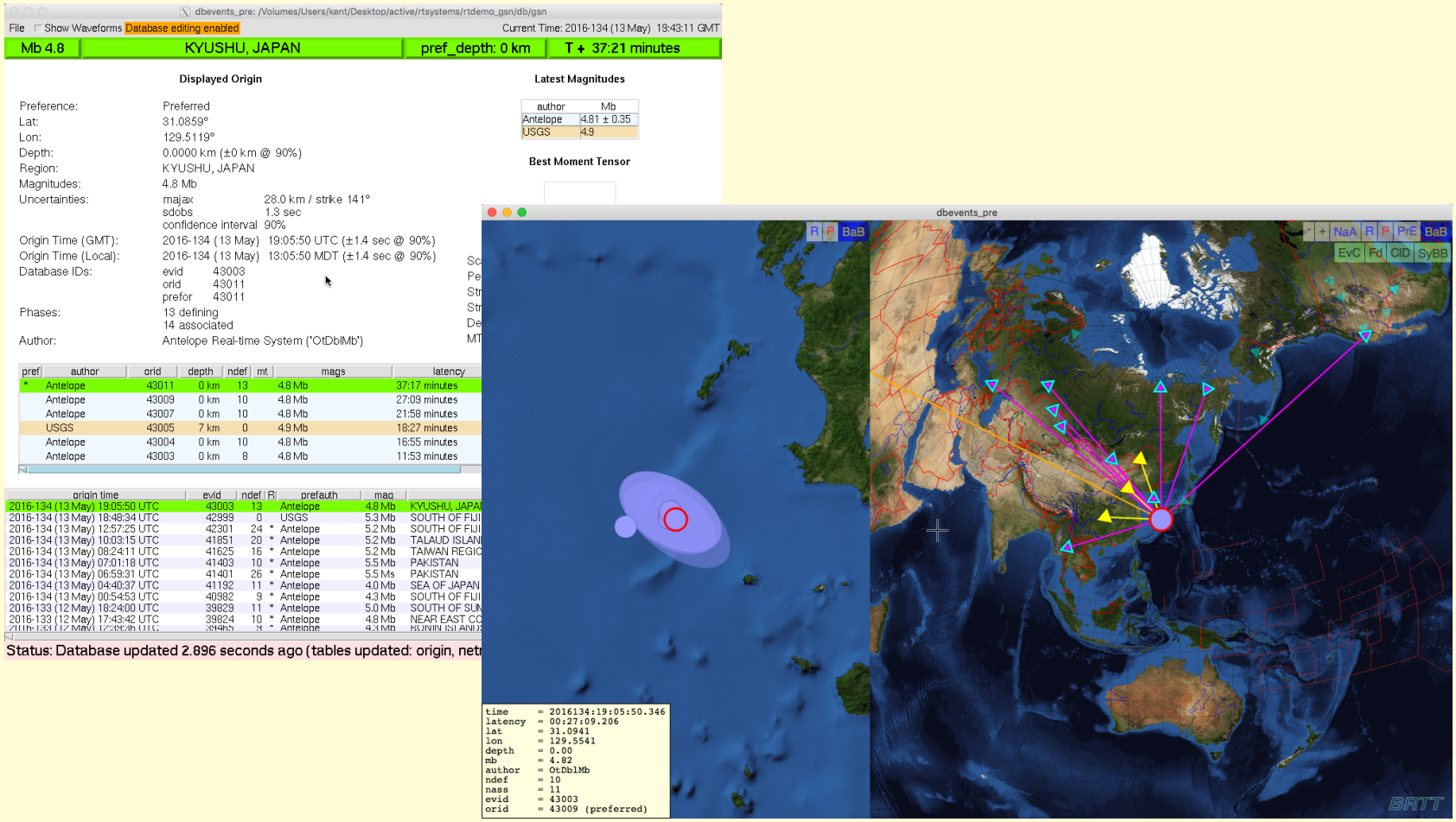
New Graphics in dbevents_pre



(old maps still available with –*noqt* option)

orb2orb_pre

- Design goals
  - Provide datalogger acquisition functionality like *q3302orb* and *altus2orb*
    1. Data ingestion and delivery
       - including repackaging / renaming
       - Point-Of-Contact (POC) call-in capability for dataloggers on dynamic IPs
       - Ultimately: failover support
    2. State-of-Health (SOH) monitoring
       - *dlmon* capabilities
    3. Command-and-control
       - *dlcmd* capabilities
  - Multithreading:
    - multiple *orb2orb* connections with one instance
    - connectivity from *M* source orbs to *N* destination orbs
  - Consolidate slew of related programs (*orb2orb*, *orbxchange*, *orbxthreads*, *orbclone*, etc.)
  - Preserve backwards-compatibility with old *orb2orb*

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orb2orb_pre: current version

- Basic data acquisition capabilities (*orb2orb*)
- many-to-many connections in one instance
  - Fully Multithreaded
- Basic *dlmon*-compatible SOH output
- Backwards compatibility with
  - Legacy command-line format
  - Legacy parameter-file format
  - [N.B. Not all parameters/options supported yet]
- Embedded in GSN *rtdemo*(1)

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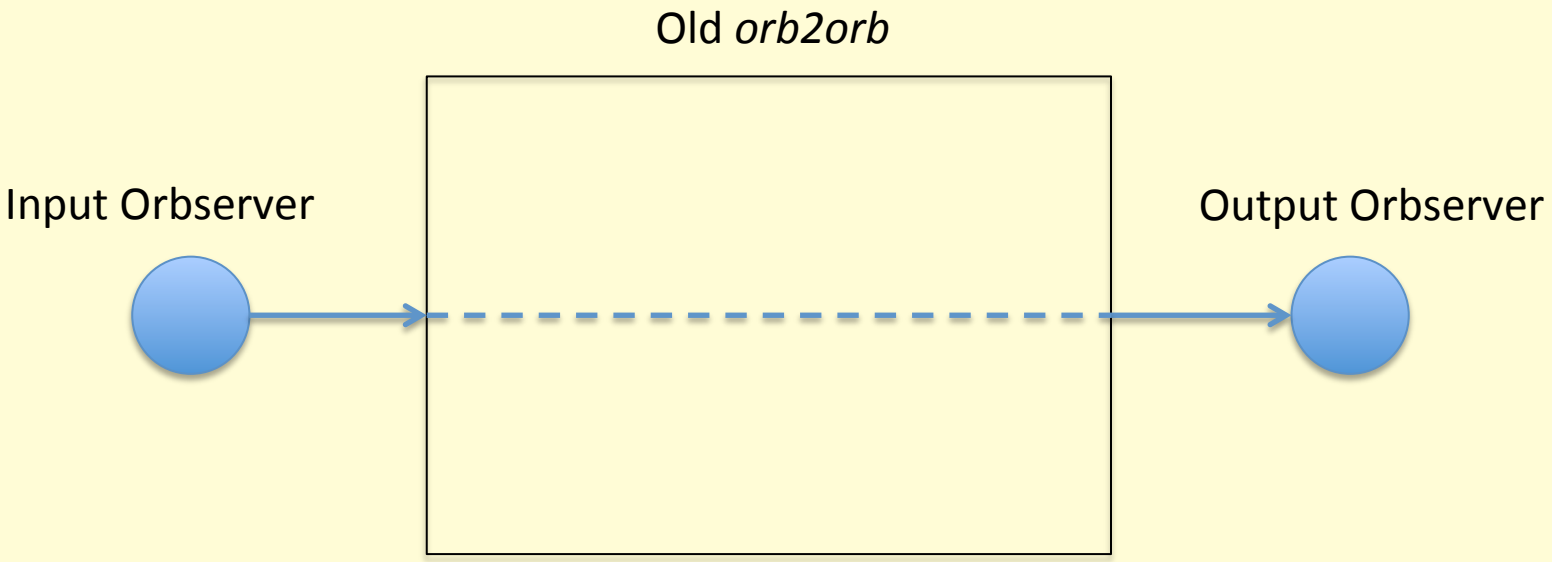
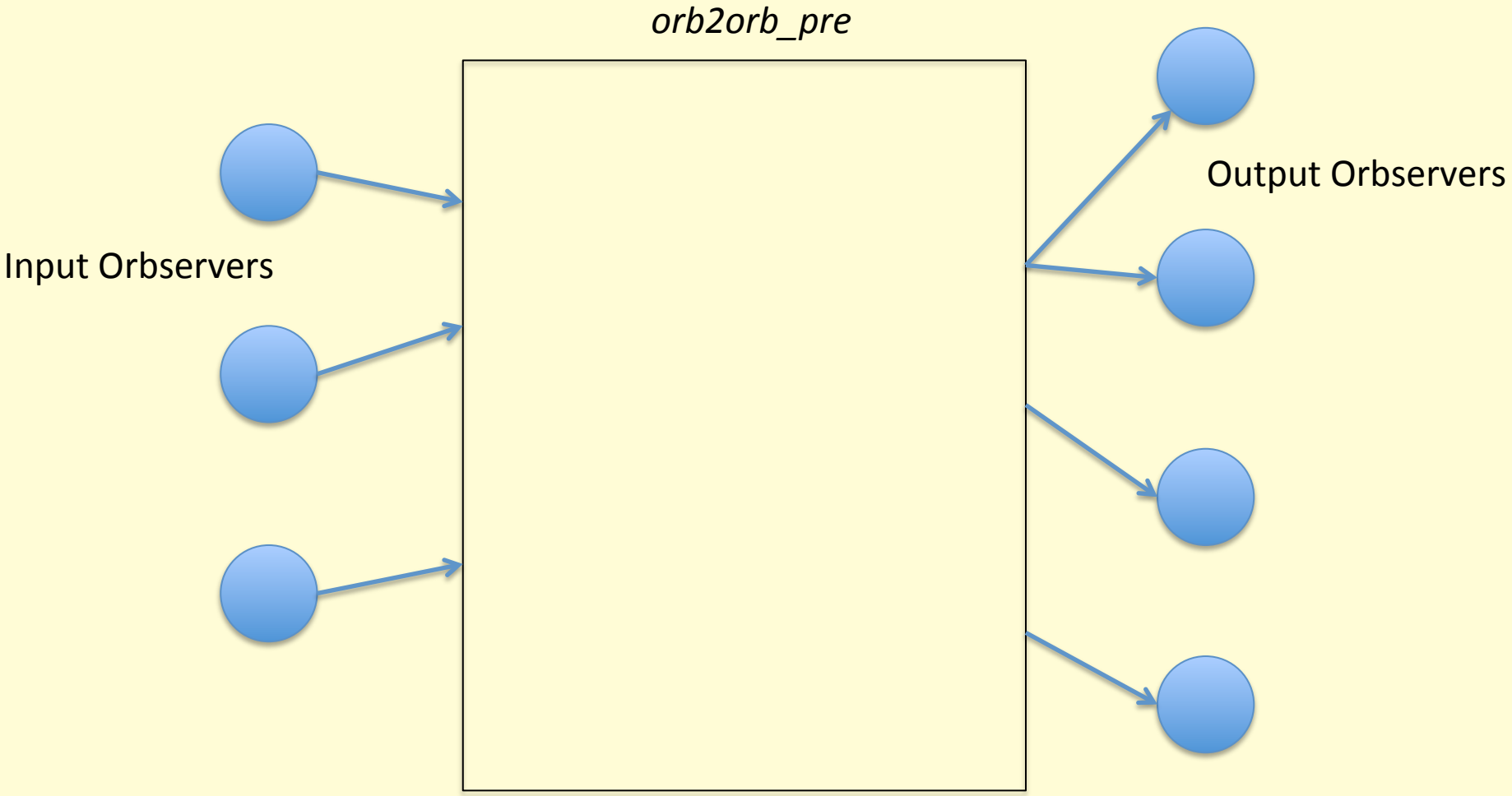
orb2orb: old architecture

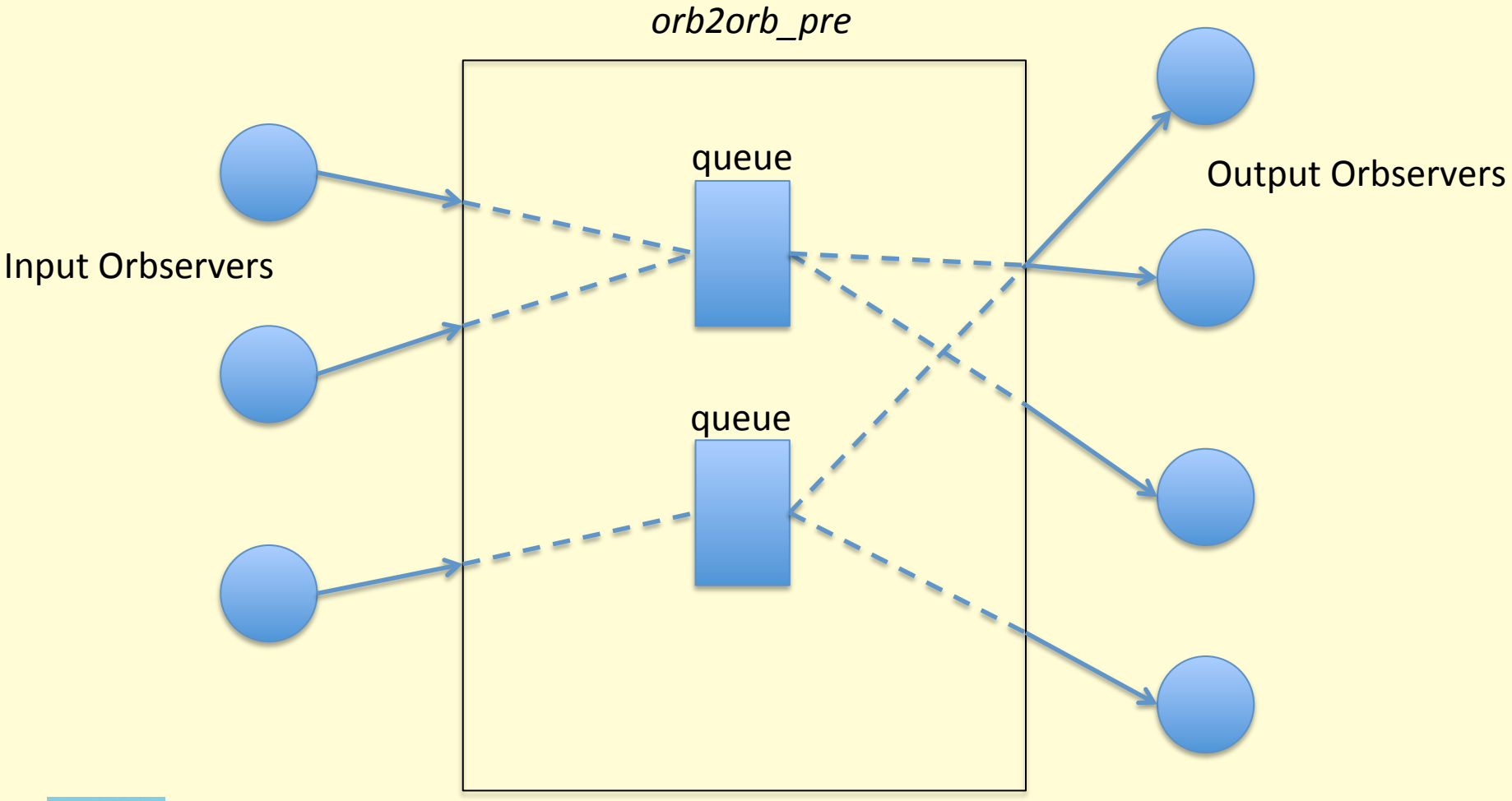


- Served well for many years
- Large networks might have hundreds of individual instances
- Manual configuration becomes burdensome
- Insufficiently supportive of direct data-acquisition role from dataloggers

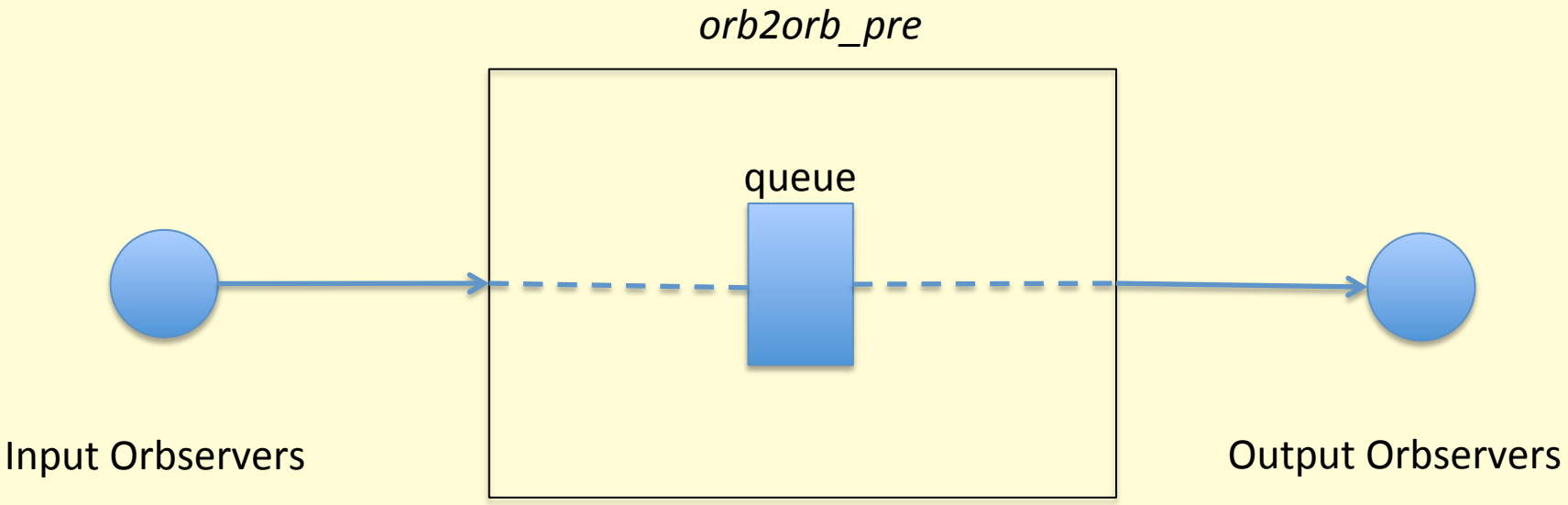
orb2orb_pre: new architecture



orb2orb_pre: new architecture

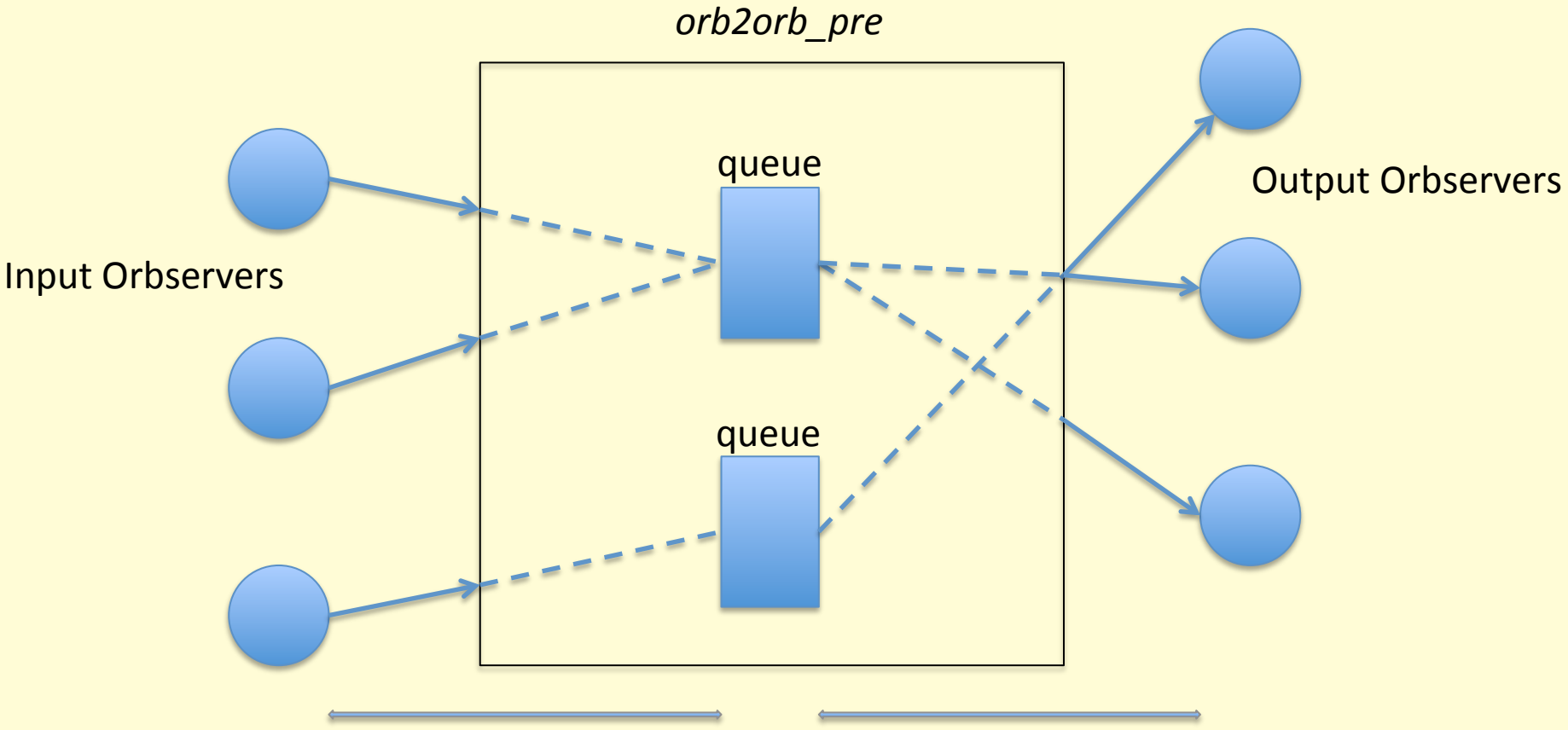


orb2orb_pre: new architecture

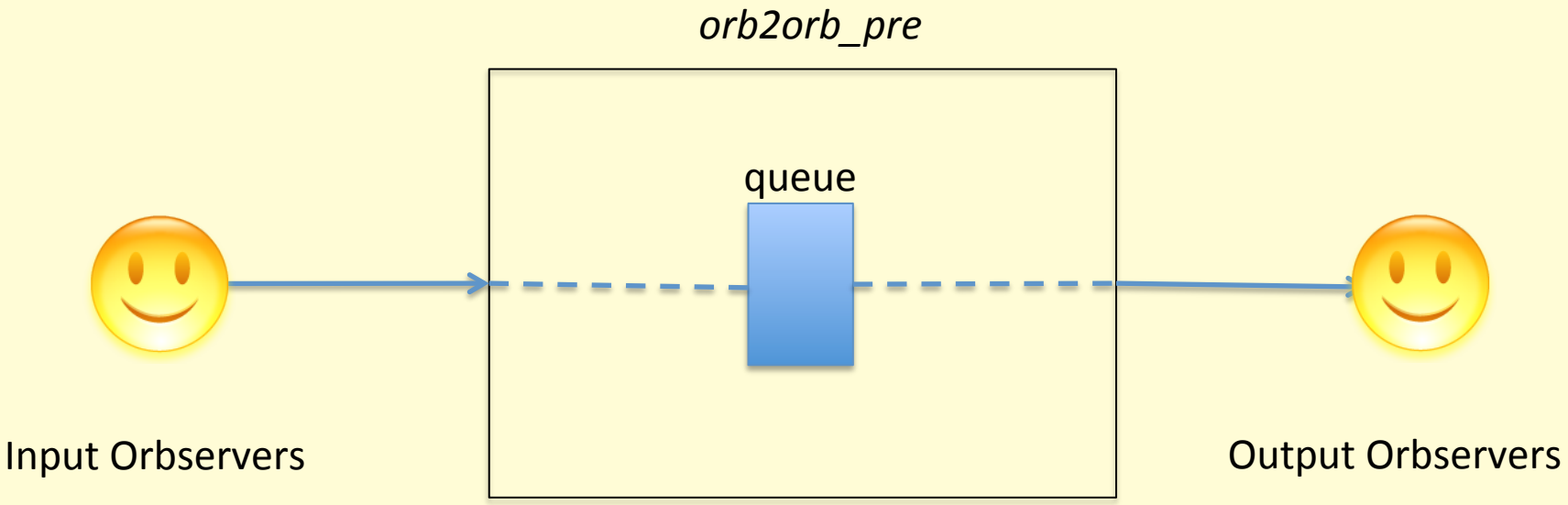


- Separate the connection into two parts:
  - The “read” half
  - The “write” half
- Configure each connection independently
- Add an internal *queue* to buffer data
- Allows you to acquire once, distribute to many destinations
- Allows you to fine-tune outputs
  - different match expressions to different outputs

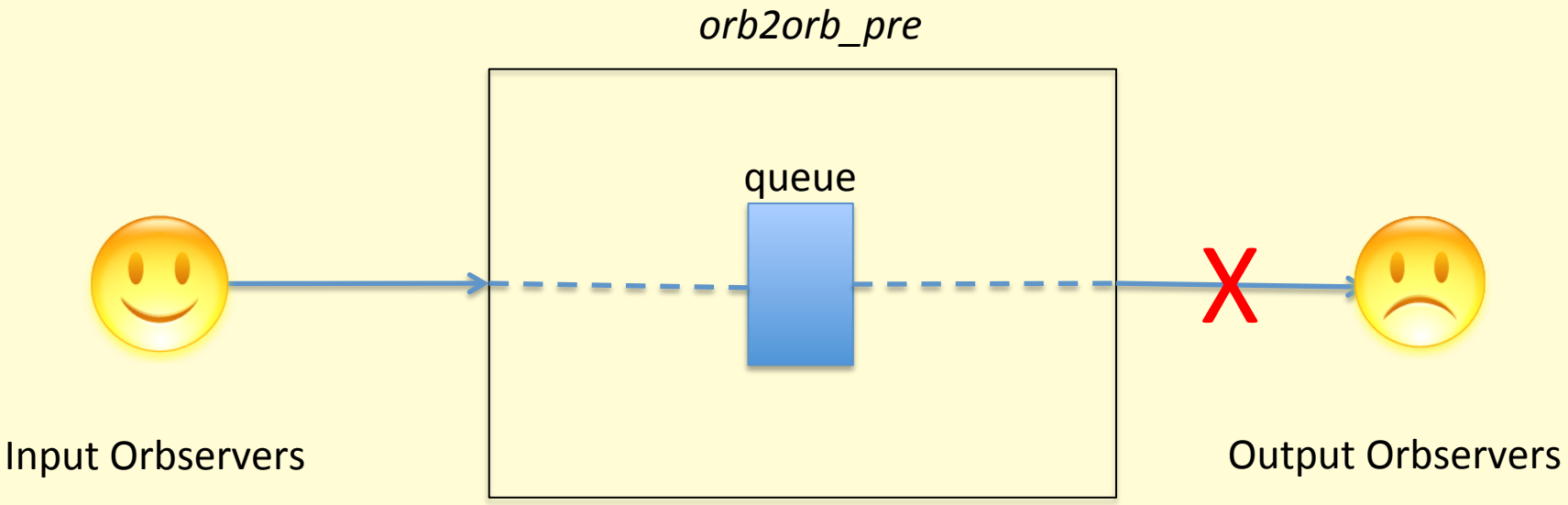
orb2orb_pre: new architecture



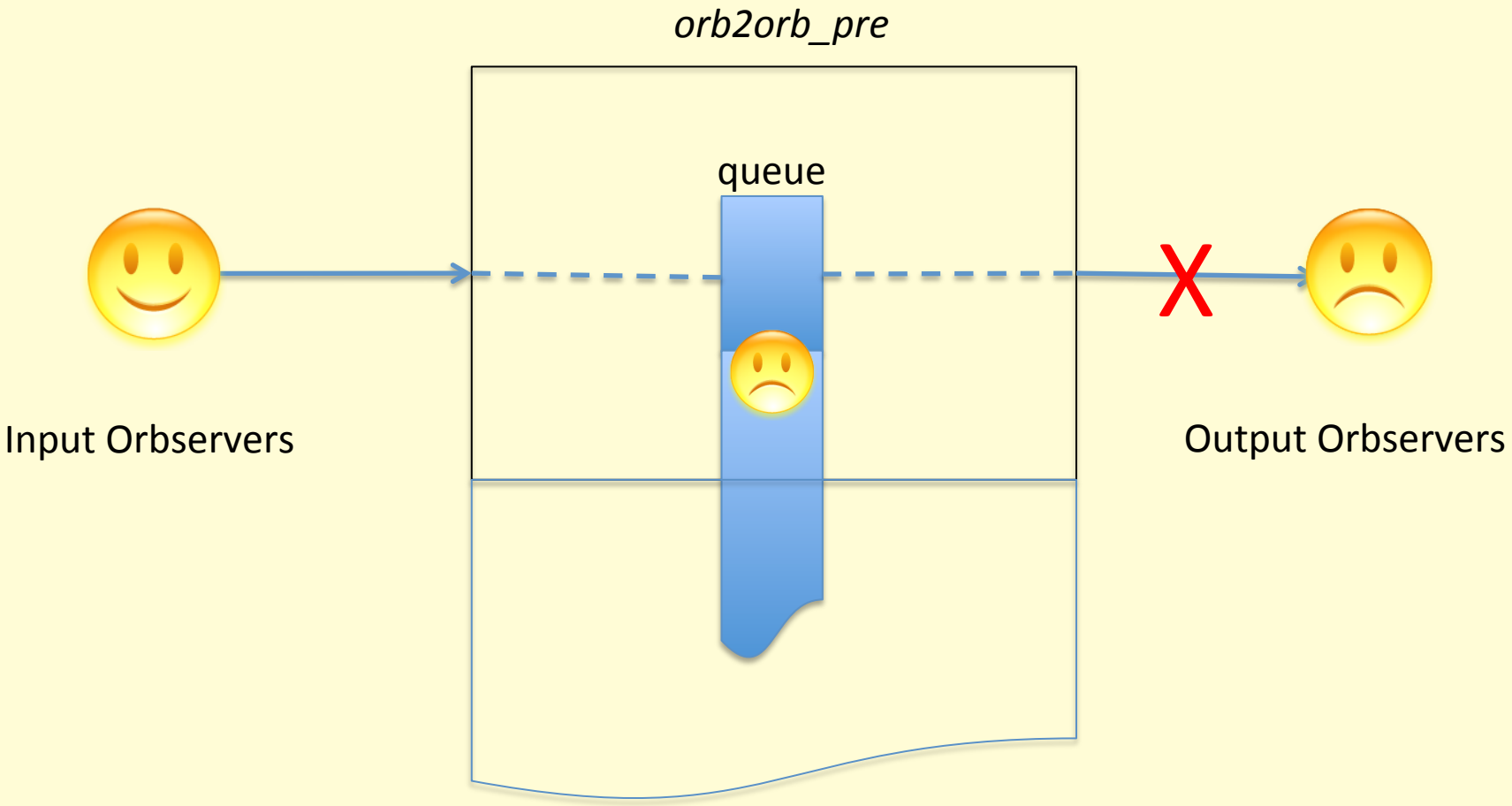
orb2orb_pre: new architecture



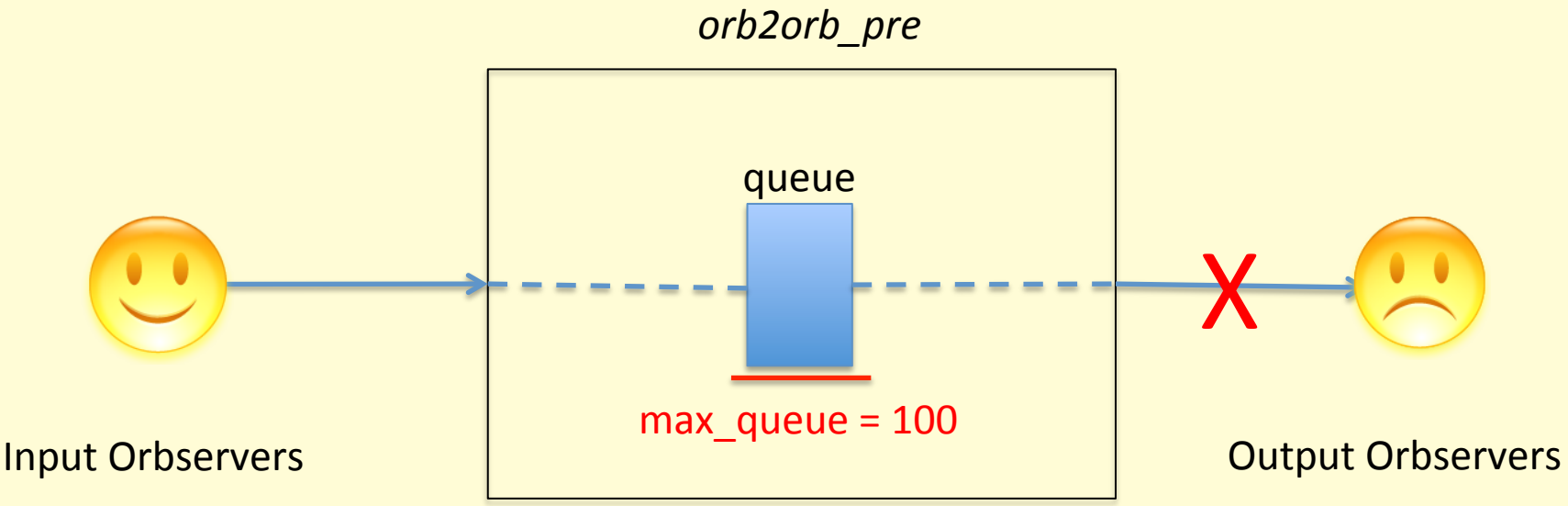
orb2orb_pre: new architecture



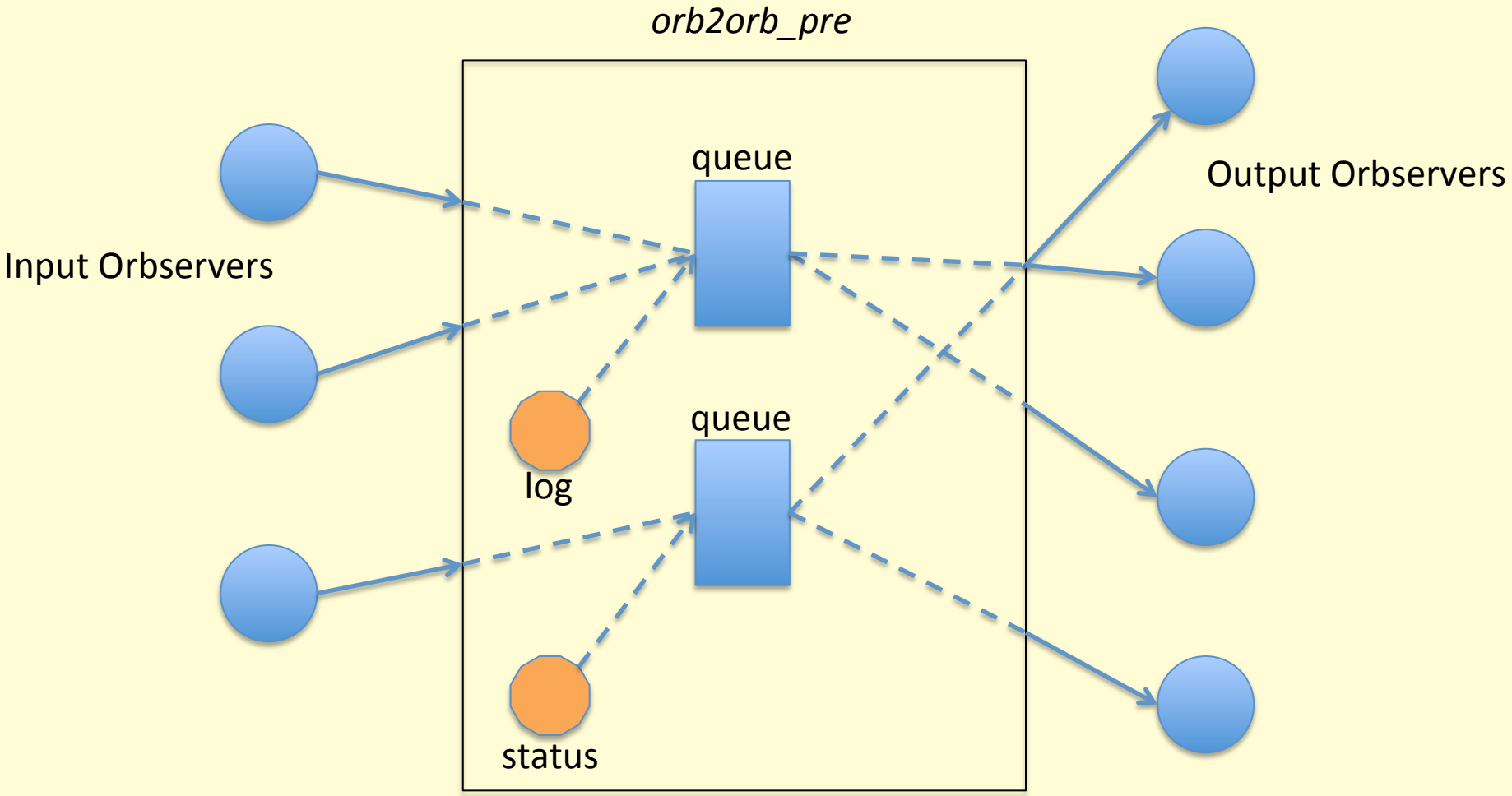
orb2orb_pre: new architecture



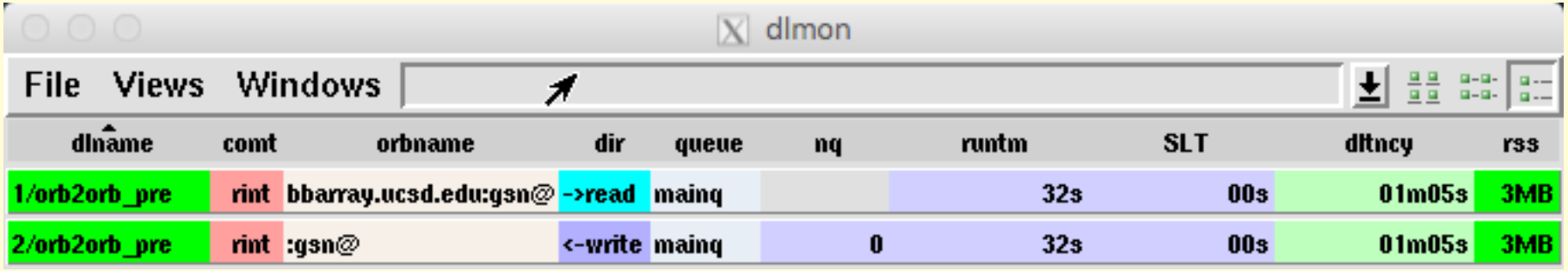
orb2orb_pre: new architecture



orb2orb_pre: new architecture



orb2orb_pre: dlmon output



"connection"

number of packets in queue

run time

Status Latency

Data Latency

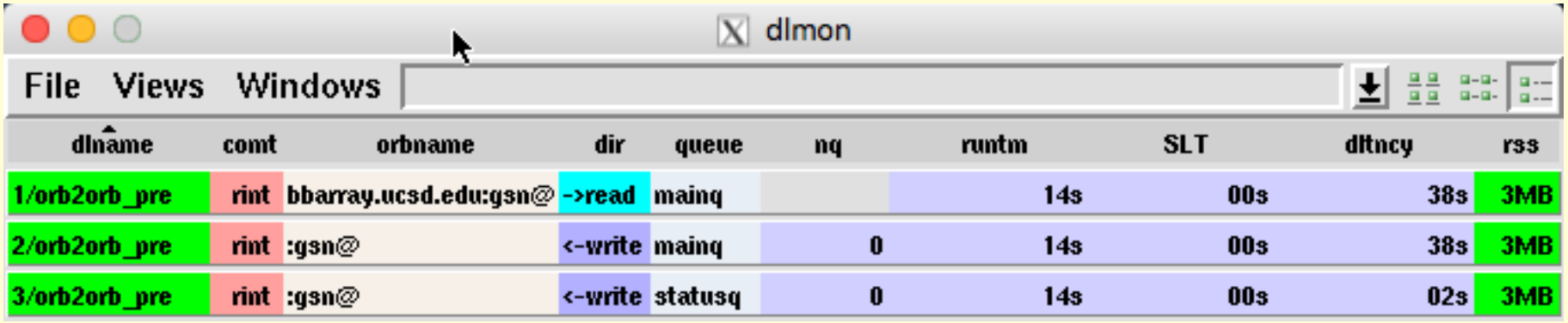
orb name

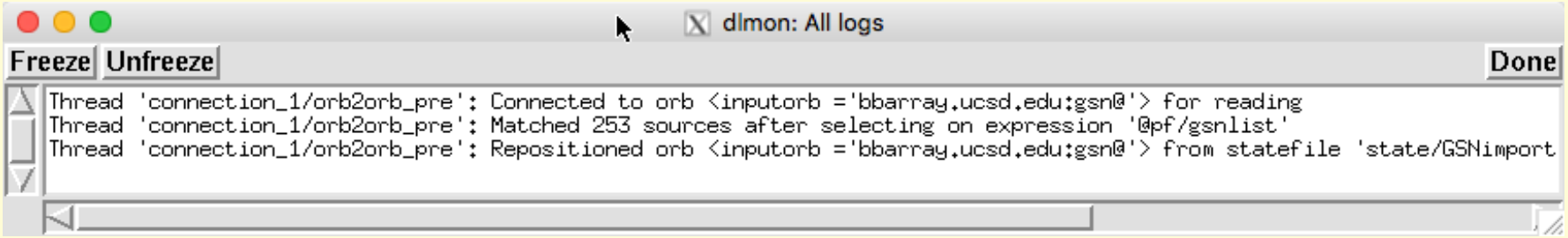
queue name

direction

Resident Set Size (memory)

orb2orb_pre: dlmon output





orb2orb_pre: command line

```
orb2orb_pre [-v]                                [CURRENT SYNTAX]
            [-p pf]
            [-S statefile]
            [-t targetname]
                    [[orbtag orbname] ...]

orb2orb_pre [-v]                                [LEGACY SYNTAX]
            [-m match]
            [-p pf]
            [-r reject]
            [-S statefile]
            [-t targetname]
                    orbin orbout [start-time [period|end-time]]
```

orb2orb_pre: command line

- Example from *rtdemo* GSN:

```
orb2orb_pre -v -S state/GSNimport  inputorb  bbarray.ucsd.edu:gsn  outputorb  :gsn
```

- "orbtag" parameters label each actual orbname
  - just as in *q3302orb*, *altus2orb*

orb2orb_pre: parameter file

```
connections &Tbl{
        &Arr{
                read_from_orbtag        inputorb
        }
        &Arr{
                write_to_orbtag         outputorb
        }
}
```

orb2orb_pre: parameter file

```
connections &Tbl{
        &Arr{
                read_from_orbtag        inputorb
        }
        &Arr{
                write_to_orbtag         outputorb
        }
        &Arr{
                read_from_queue         statusq
                write_to_orbtag         outputorb
        }
}
```

orb2orb_pre: parameter file

```
connections_defaults &Arr{
        read &Arr{
                read_from_orbname
                read_from_orbtag
                write_to_queue          mainq
                starttime
                endtime
                too_old
                too_new
                check_unstuff           false
                suppress_unstuff_errors false
        }
        write &Arr{
                read_from_queue         mainq
                write_to_orbname
                write_to_orbtag
                max_queue               100
        }
        shared &Arr{
                name                    auto
                run                     true
                match
                reject
        }
}
```

orb2orb_pre: parameter file

```
connections_special &Arr{
        status_create &Arr{
                run                     true
                write_to_queue          statusq
        }
        log_create &Arr{
                run                     true
                write_to_queue          mainq
        }
}

time_intervals_sec &Arr{
        pfstatusreport                  2
        internal_timeout                1
        shutdown_grace_period           15
}
```

orb2orb_pre: planning for next year

- Time and Multiplex repackaging
- More status metrics (dataflow, rates, etc.)
- POC Capability
- Command-and-control (*dlcmd*)
- Duplicate packet rejection
- Additional legacy option & parameter support
- Failover to alternate input orbservers

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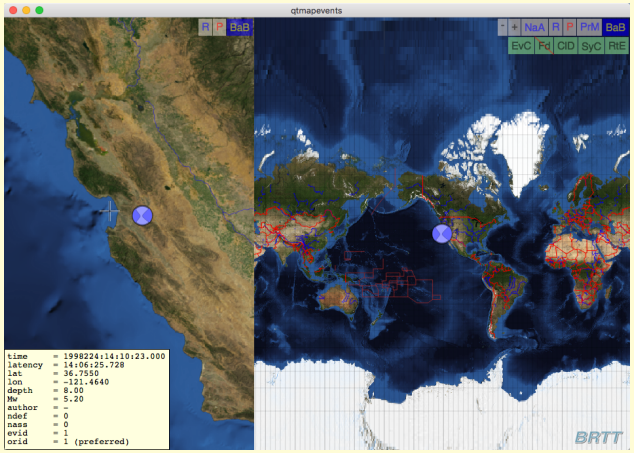
Contractors

- Continuing strategy of doing Antelope infrastructure development in-house and contracting externally for some well-defined applications and capabilities
- Juan Reyes, *Reyes' Code*
  - *dbmoment*
- Celso Reyes, *Celso Reyes Consulting*
  - *db2stationxml*

dbmoment

- Contributed-code wrapper around Dreger's regional moment-tensor code
- Further detail in Juan Reyes' talk
  - Focal Mechanism Framework in Antelope



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db2stationxml

- Station-metadata export capability from Datascope to FDSN StationXML format
- Further detail in Celso Reyes' talk

% ***db2stationxml -L network /opt/antelope/data/db/demo/demo***

```
<FDSNStationXML xmlns="http://www.fdsn.org/xml/station/1" schemaVersion="1.0" xsi:schemaLocation="http://www.fdsn.org/xml/station/1 http://www.fdsn.org/xml/station/fdsn-station-1.0.xsd"
xmlns:xsi="http://www.w3.org/2011/XMLSchema-instance" xmlns:css30="http://www.brtt.com/xml/station/css30" >
 <Source>ZZ</Source>
 <Sender>BRTT</Sender>
 <Module>db2stationxml</Module>
 <ModuleURI><!-- UNKNOWN --></ModuleURI>
 <Created>2016-05-13T19:29:38.17847</Created>
 <Network code="AZ" startDate="1970-01-01T00:00:00" endDate="2599-12-31T23:59:59" css30:netType="-" >
  <Description>Anza Real-Time Broadband Network</Description>
  <SelectedNumberStations>38</SelectedNumberStations>
 </Network>
 <Network code="PB" startDate="1970-01-01T00:00:00" endDate="2599-12-31T23:59:59" css30:netType="ww" >
  <Description>Plate Boundary Observatory Borehole Seismic Network</Description>
  <SelectedNumberStations>11</SelectedNumberStations>
 </Network>
 <Network code="YN" startDate="1970-01-01T00:00:00" endDate="2599-12-31T23:59:59" css30:netType="-" >
  <Description>San Jacinto Fault Zone (SJFZ)</Description>
  <SelectedNumberStations>4</SelectedNumberStations>
 </Network>
</FDSNStationXML>
%
```

dbe

- Complete rewrite of venerable database editor
- First version introduced last year as *dbe_pre*
- Original *dbe* is still available as *dbe_dep*(1)
- Very hard to rewrite to established standard
- A few features still missing
- Feedback welcome!!
  - Add and vote on feature requests:
  - https://brtt.zendesk.com/hc/en-us/community/topics/200361606-Feature-Requests-dbe
  - (also support@brtt.com, especially for bugs)

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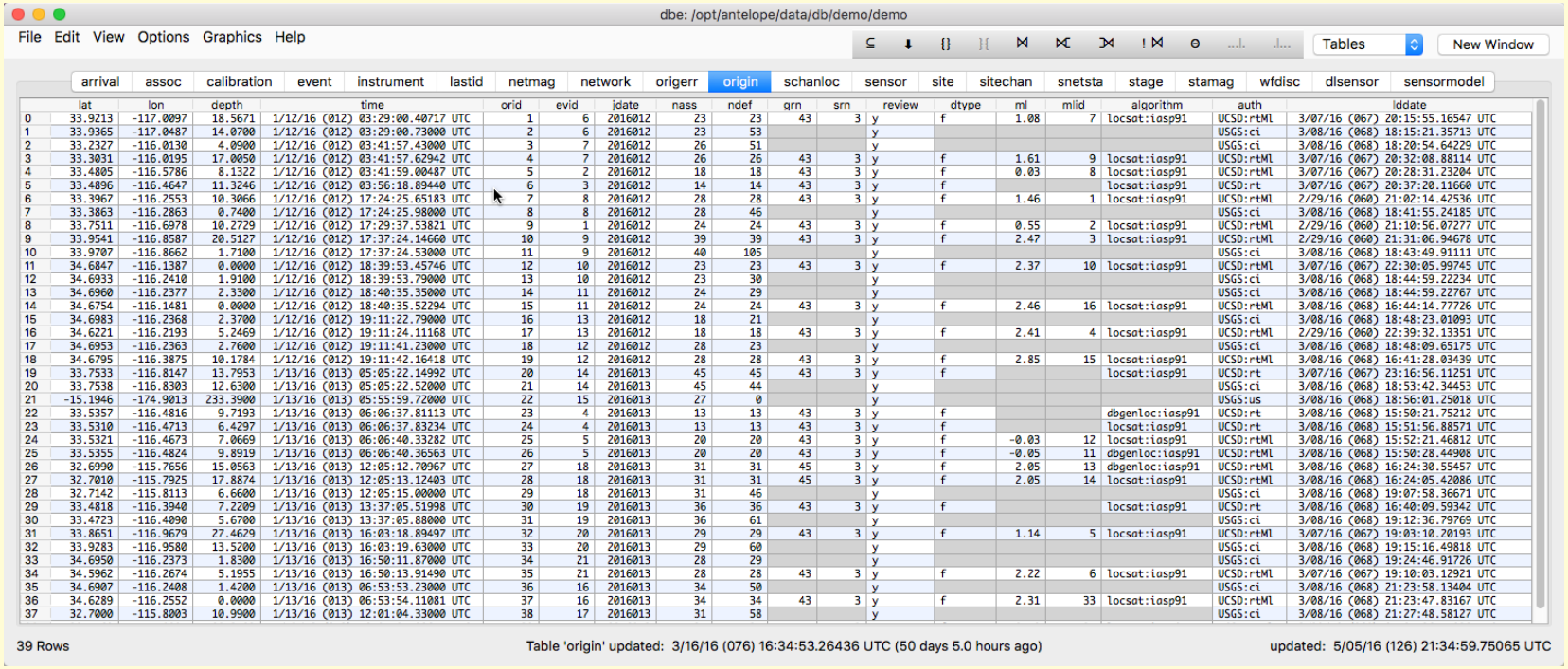
dbe



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1	33.9365	-117.0487	14.0700	1/12/16 (012) 03:29:00.73000 UTC	2	6	2016012	23	53			y					USGS:ci	3/08/16 (068) 18:15:21.35713 UTC
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3	33.3031	-116.0195	17.0050	1/12/16 (012) 03:41:57.62942 UTC	4	7	2016012	26	26	43	3	y	f	1.61	9	locsat:iasp91	UCSD:rtML	3/07/16 (067) 20:32:08.88114 UTC
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6	33.3967	-116.2553	10.3066	1/12/16 (012) 17:24:25.65183 UTC	7	8	2016012	28	28	43	3	y	f	1.46	1	locsat:iasp91	UCSD:rtML	2/29/16 (060) 21:02:14.42536 UTC
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13	34.6960	-116.2377	2.3300	1/12/16 (012) 18:40:35.35000 UTC	14	11	2016012	24	29			y					USGS:ci	3/08/16 (068) 18:44:59.22767 UTC
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25	33.5355	-116.4824	9.8919	1/13/16 (013) 06:06:40.36563 UTC	26	5	2016013	20	20	43	3	y	f	-0.05	11	dbgenloc:iasp91	UCSD:rtML	3/08/16 (068) 15:50:28.44908 UTC
26	32.6990	-115.7656	15.0563	1/13/16 (013) 12:05:12.70967 UTC	27	18	2016013	31	31	45	3	y	f	2.05	13	dbgenloc:iasp91	UCSD:rtML	3/08/16 (068) 16:24:30.55457 UTC
27	32.7010	-115.7925	17.8874	1/13/16 (013) 12:05:13.12403 UTC	28	18	2016013	31	31	45	3	y	f	2.05	14	locsat:iasp91	UCSD:rtML	3/08/16 (068) 16:24:05.42086 UTC
28	32.7142	-115.8113	6.6600	1/13/16 (013) 12:05:15.00000 UTC	29	18	2016013	31	46			y					USGS:ci	3/08/16 (068) 19:07:58.36671 UTC
29	33.4818	-116.3940	7.2209	1/13/16 (013) 13:37:05.51998 UTC	30	19	2016013	36	36	43	3	y	f			locsat:iasp91	UCSD:rt	3/08/16 (068) 16:40:09.59342 UTC
30	33.4723	-116.4090	5.6700	1/13/16 (013) 13:37:05.88000 UTC	31	19	2016013	36	61			y					USGS:ci	3/08/16 (068) 19:12:36.79769 UTC
31	33.8651	-116.9679	27.4629	1/13/16 (013) 16:03:18.89497 UTC	32	20	2016013	29	29	43	3	y	f	1.14	5	locsat:iasp91	UCSD:rtML	3/07/16 (067) 19:03:10.20193 UTC
32	33.9283	-116.9580	13.5200	1/13/16 (013) 16:03:19.63000 UTC	33	20	2016013	29	60			y					USGS:ci	3/08/16 (068) 19:15:16.49818 UTC
33	34.6950	-116.2373	1.8300	1/13/16 (013) 16:50:11.87000 UTC	34	21	2016013	28	29			y					USGS:ci	3/08/16 (068) 19:24:46.91726 UTC
34	34.5962	-116.2674	5.1955	1/13/16 (013) 16:50:13.91490 UTC	35	21	2016013	28	28	43	3	y	f	2.22	6	locsat:iasp91	UCSD:rtML	3/07/16 (067) 19:10:03.12921 UTC
35	34.6907	-116.2408	1.4200	1/13/16 (013) 16:53:53.23000 UTC	36	16	2016013	34	50			y					USGS:ci	3/08/16 (068) 21:23:58.13404 UTC
36	34.6289	-116.2552	0.0000	1/13/16 (013) 16:53:54.11081 UTC	37	16	2016013	34	34	43	3	y	f	2.31	33	locsat:iasp91	UCSD:rtML	3/08/16 (068) 21:23:47.83167 UTC
37	32.7000	-115.8003	10.9900	1/13/16 (013) 12:01:04.33000 UTC	38	17	2016013	31	58			y					USGS:ci	3/08/16 (068) 21:27:48.58127 UTC

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Kinemetrics

dbe: major new features

- All tables are in one window
  - New Windows available on request
- Modern interface
  - Cocoa substrate on Mac
    - *$ANTELOPE/bin/native/dbe*
    - (run *$ANTELOPE/bin/x11/dbe* over *ssh*)
- In-cell editing
- New mapping tools integrated into application
  - more sophistication to come here
- Internationalized (thanks to Translators!)
- Dynamic updating

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Kinemetrics

dbe: minor features

- Lots of tooltips
  - *dbhelp* info integrated into tables, fields tooltips
  - Full contents of each row
- Quick-access database-operations toolbar
- Context-sensitive (right click) find-forward, find-backward, subset
- Separate background colors for null and blank values

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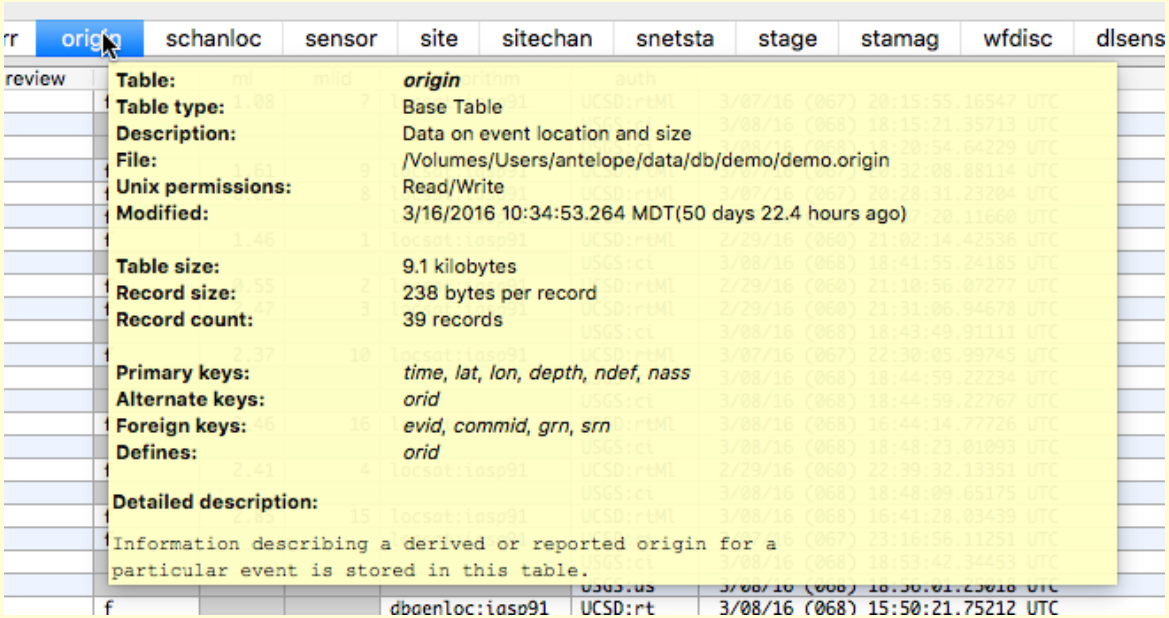
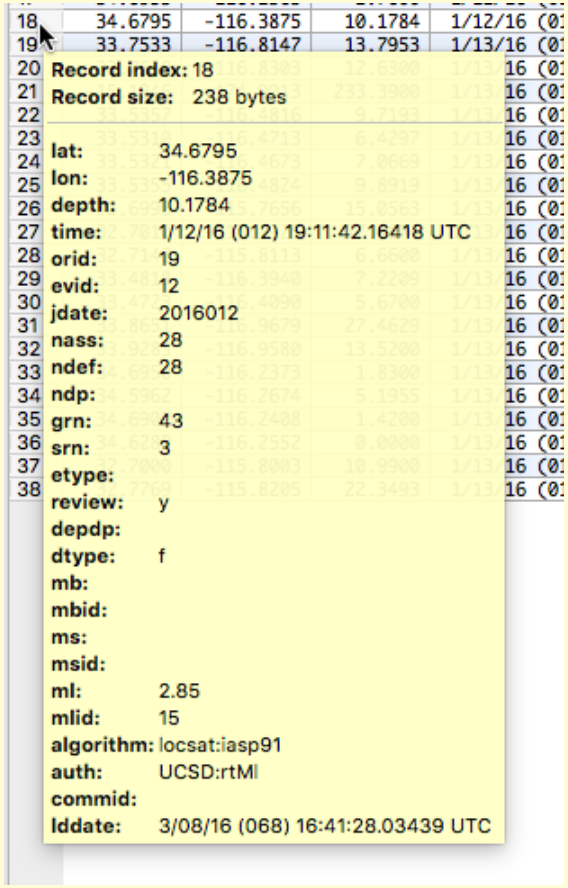
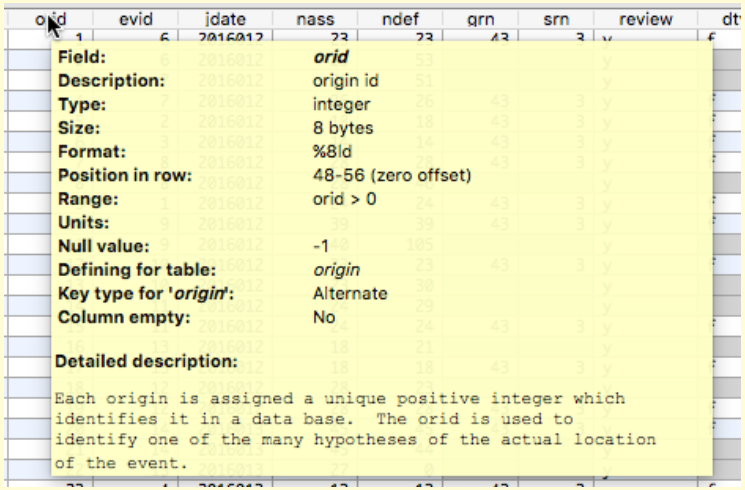
Kinemetrics

dbe: tooltips







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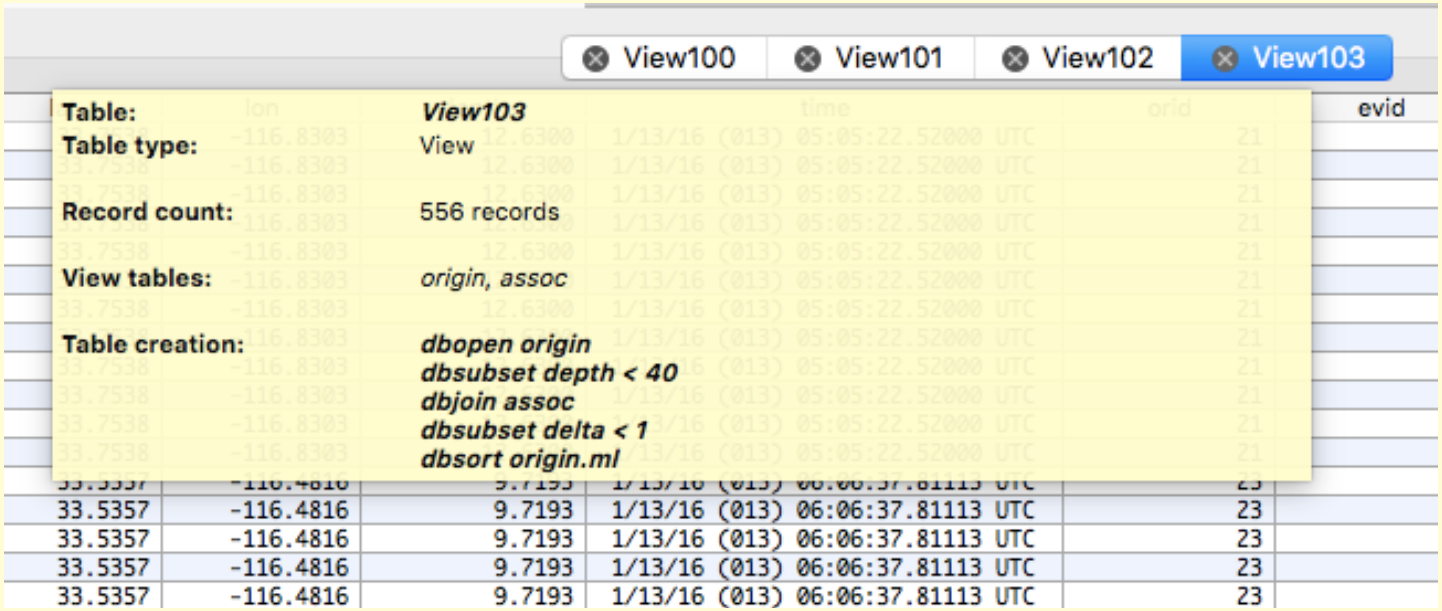
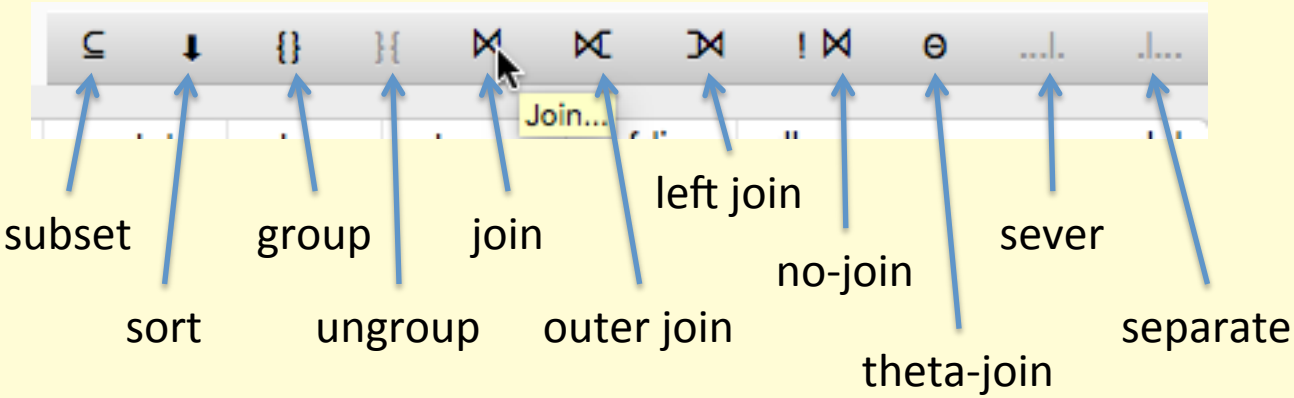
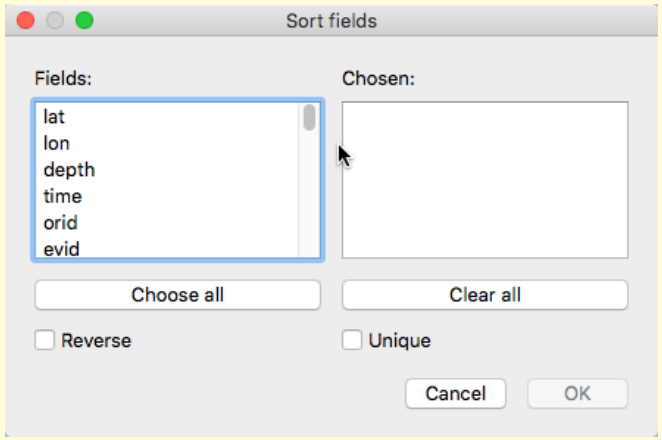
Kinemetrics

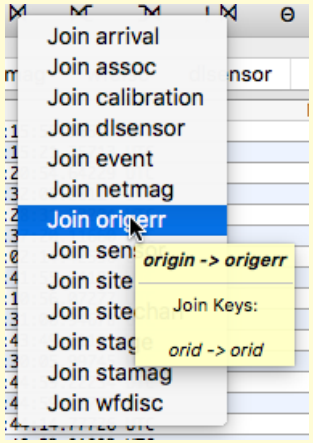
dbe: tooltips

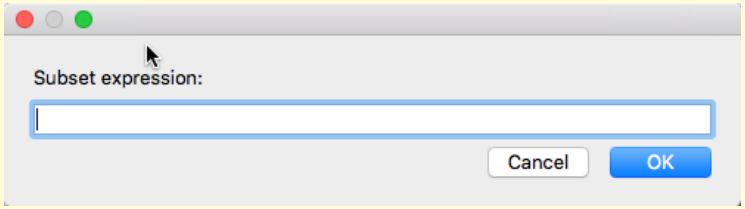


dbe: database operations toolbar



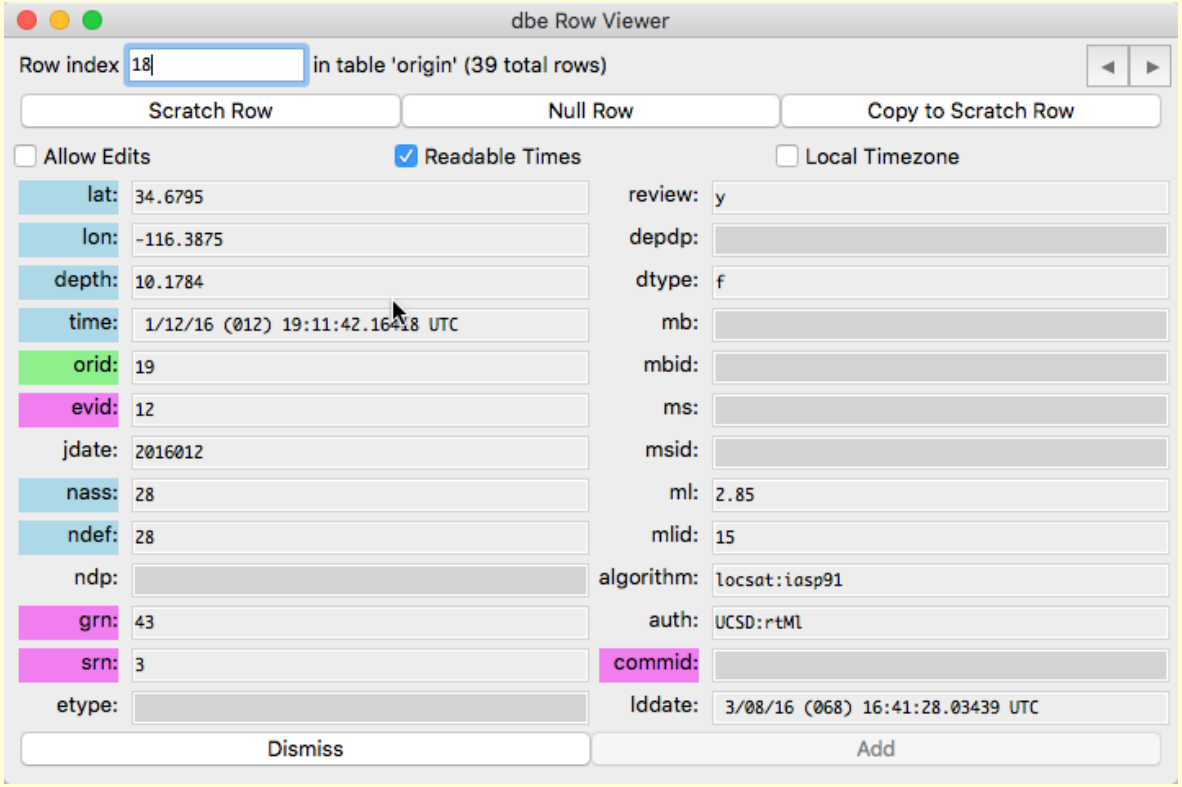




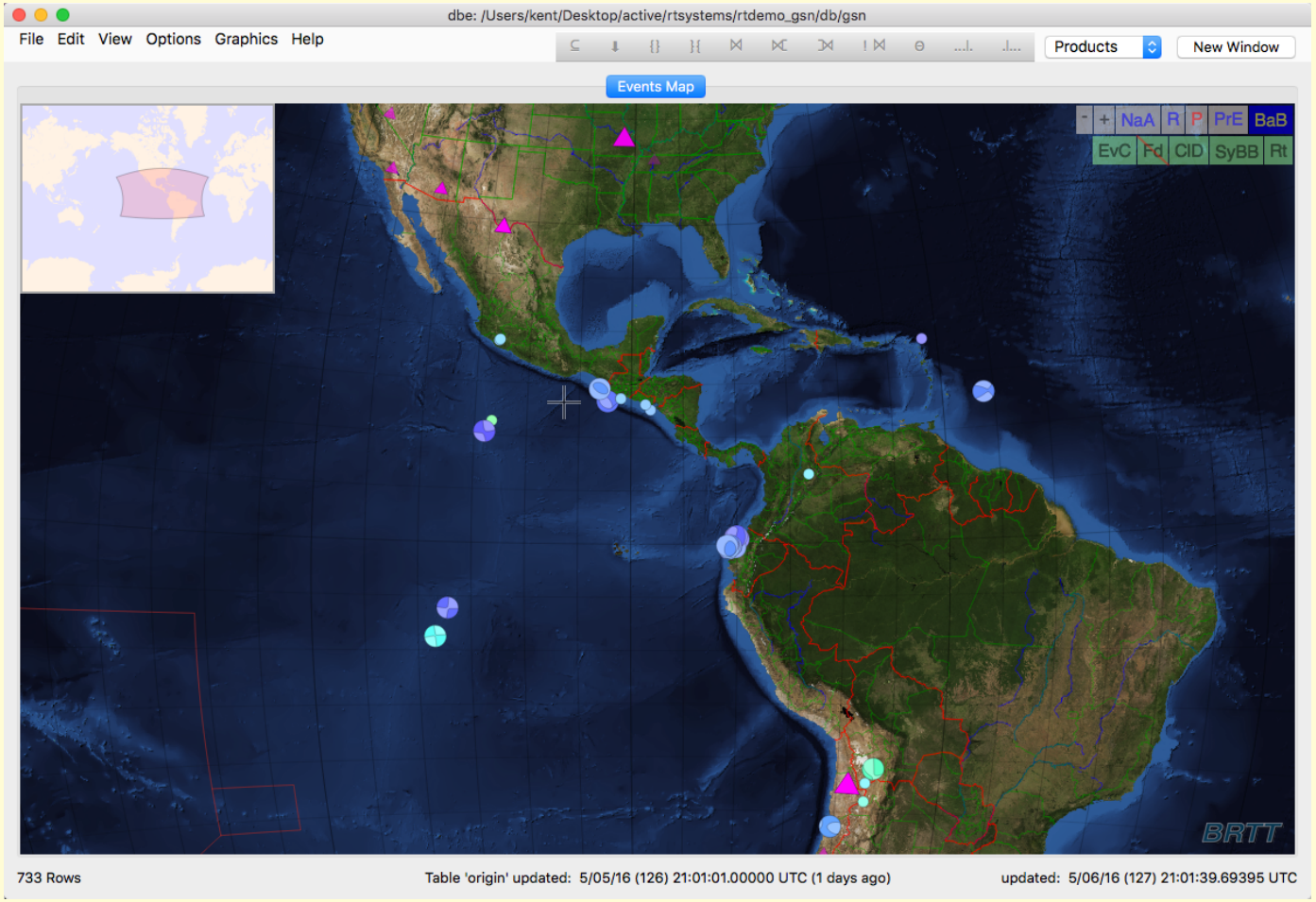


Danke: Stefan Radman

dbe: row viewer and editor



dbe: maps



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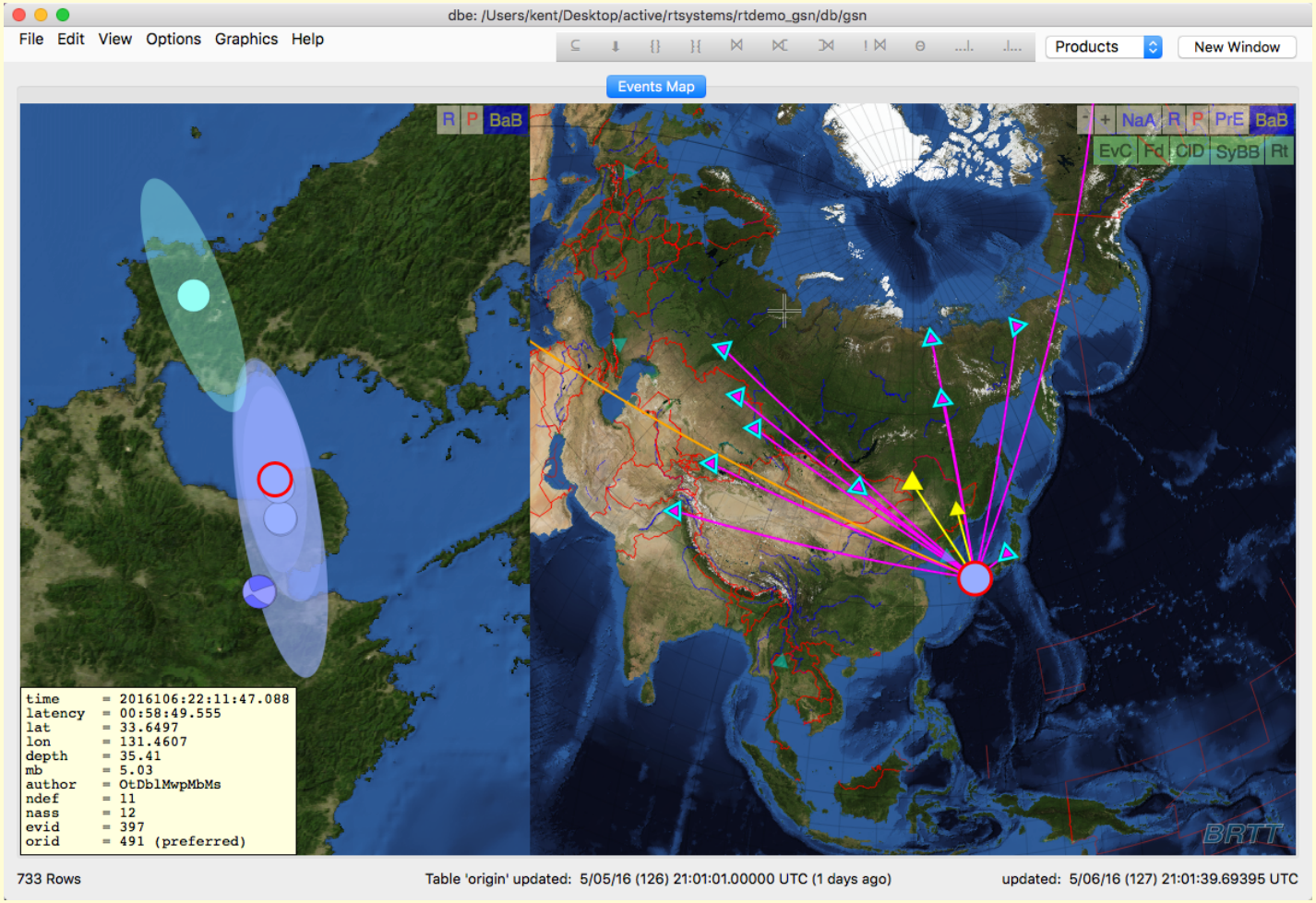
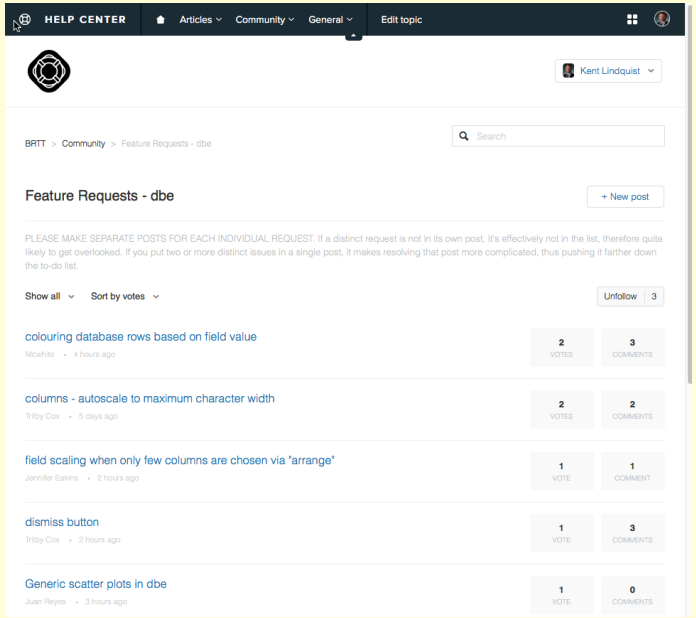
Kinemetrics

dbe: maps


dbe: /Users/kent/Desktop/active/rtsystems/rtdemo_gsn/db/gsn
File Edit View Options Graphics Help
Products
New Window
Events Map
R P BaB
+ NaA R P PrE BaB
EvC Fd CID SyBB Rt
time = 2016106:22:11:47.088
latency = 00:58:49.555
lat = 33.6497
lon = 131.4607
depth = 35.41
mb = 5.03
author = OtDblMwpMbMs
ndef = 11
nass = 12
evid = 397
orid = 491 (preferred)
BRTT
733 Rows
Table 'origin' updated: 5/05/16 (126) 21:01:01.00000 UTC (1 days ago)
updated: 5/06/16 (127) 21:01:39.69395 UTC

dbe: feedback welcome!

- Add and *vote on* feature requests:
- https://brtt.zendesk.com/hc/en-us/community/topics/200361606-Feature-Requests-dbe



- One Request per post!
- Each detail in its own post!
- Vote!

- (also support@brtt.com, especially for bugs)

Internationalization and Localization

- Internationalization "I18n"
  - The *capability* to support multiple languages; the software-development side of the problem
  - New library *libbqtr*(3) to support translating program controls
  - All Unicode-supported languages allowed
  - This is our first, basic foray – will require more investment if there is sustained interest

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Kinemetrics

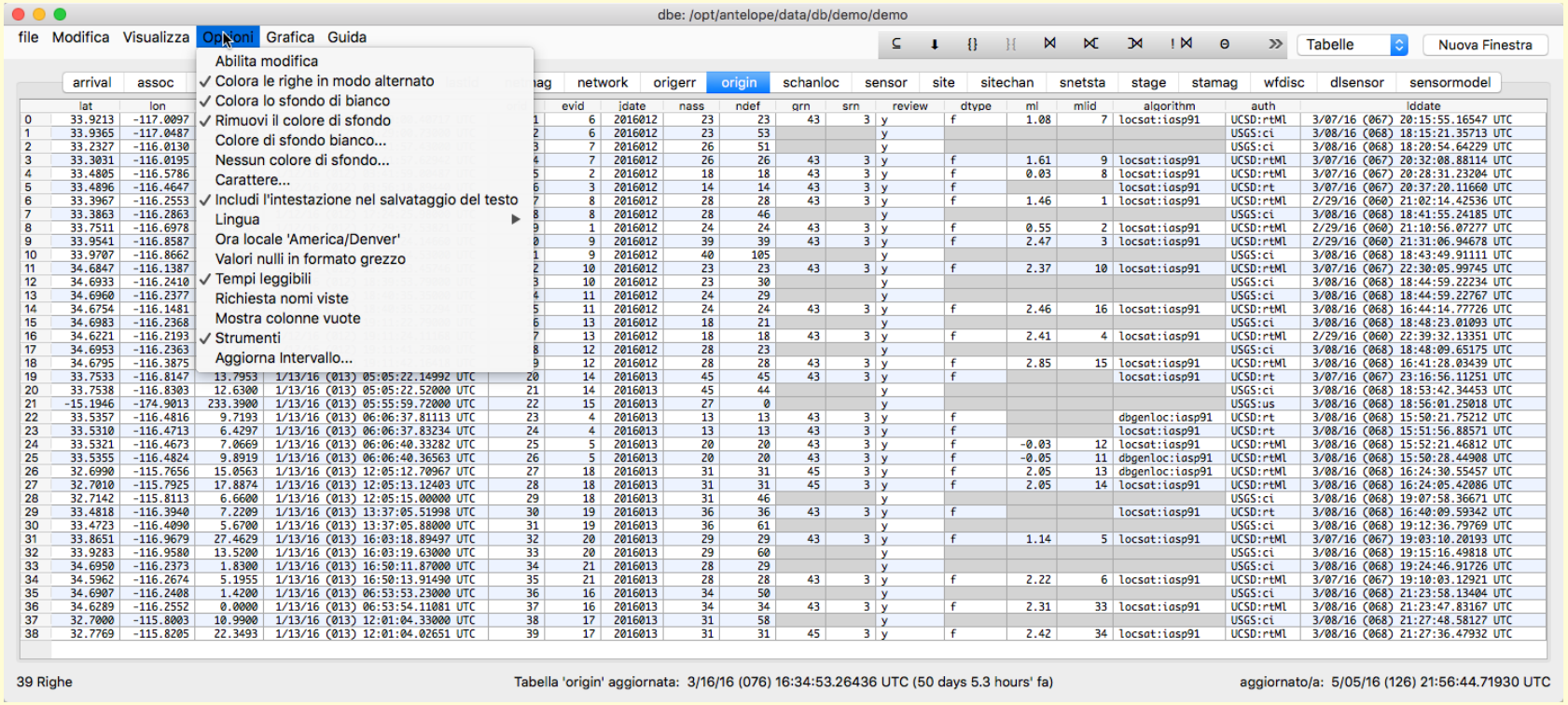
Internationalization and Localization

- Localization “l10n”
  - The *expression* into specific languages; the application-configuration side of the problem
  - New manpage *antelope_l10n*(5) on how to add a language
  - Languages may be added/changed by BRTT, by the AUG community, or privately
  - Can do most of the work in Microsoft Excel – use *ts2xlsx*(1) program

Internationalization and Localization: Caveats

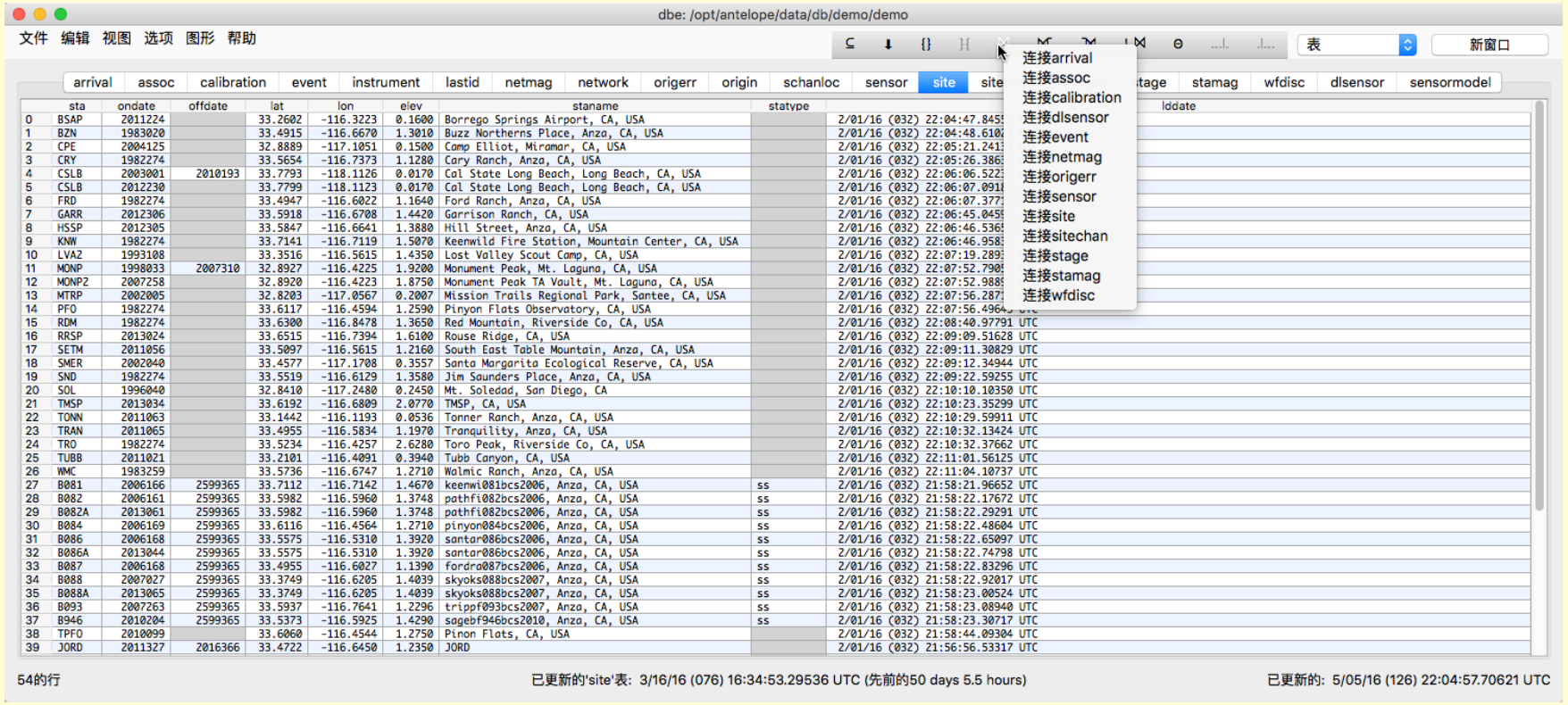
- All support requests must be in English
- This includes screen-dumps
  - *Command-E* or *Ctrl-E* shortcut to switch to English
- We do not translate, and do not foresee translating, database content, table names, schema descriptions etc.

dbe: Italian



Grazie: Alessandra Papparelli

dbe: Chinese



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0	BSAP	2011224		33.2602	-116.3223	0.1600	Borrego Springs Airport, CA, USA		2/01/16 (032) 22:04:47.845
1	BZN	1983020		33.4915	-116.6670	1.3010	Buzz Northerns Place, Anza, CA, USA		2/01/16 (032) 22:04:48.610
2	CPE	2004125		32.8889	-117.1051	0.1500	Camp Elliot, Miramar, CA, USA		2/01/16 (032) 22:05:21.241
3	CRY	1982274		33.5654	-116.7373	1.1280	Cary Ranch, Anza, CA, USA		2/01/16 (032) 22:05:26.386
4	CSLB	2003001	2010193	33.7793	-118.1126	0.0170	Cal State Long Beach, Long Beach, CA, USA		2/01/16 (032) 22:06:06.522
5	CSLB	2012230		33.7799	-118.1123	0.0170	Cal State Long Beach, Long Beach, CA, USA		2/01/16 (032) 22:06:07.091
6	FRD	1982274		33.4947	-116.6022	1.1640	Ford Ranch, Anza, CA, USA		2/01/16 (032) 22:06:07.377
7	GARR	2012306		33.5918	-116.6708	1.4420	Garrison Ranch, CA, USA		2/01/16 (032) 22:06:45.045
8	HSSP	2012305		33.5847	-116.6641	1.3880	Hill Street, Anza, CA, USA		2/01/16 (032) 22:06:46.536
9	KNW	1982274		33.7141	-116.7119	1.5070	Keenwild Fire Station, Mountain Center, CA, USA		2/01/16 (032) 22:06:46.958
10	LVA2	1993108		33.3516	-116.5615	1.4350	Lost Valley Scout Camp, CA, USA		2/01/16 (032) 22:07:19.289
11	MONP	1998033	2007310	32.8927	-116.4225	1.9200	Monument Peak, Mt. Laguna, CA, USA		2/01/16 (032) 22:07:52.790
12	MONP2	2007258		32.8920	-116.4223	1.8750	Monument Peak TA Vault, Mt. Laguna, CA, USA		2/01/16 (032) 22:07:52.988
13	MTRP	2002005		32.8203	-117.0567	0.2007	Mission Trails Regional Park, Santee, CA, USA		2/01/16 (032) 22:07:56.287
14	PFO	1982274		33.6117	-116.4594	1.2590	Pinyon Flats Observatory, CA, USA		2/01/16 (032) 22:07:56.496
15	RDM	1982274		33.6300	-116.8478	1.3650	Red Mountain, Riverside Co, CA, USA		2/01/16 (032) 22:08:40.97791 UTC
16	RRSP	2013024		33.6515	-116.7394	1.6100	Rouse Ridge, CA, USA		2/01/16 (032) 22:09:09.51628 UTC
17	SETM	2011056		33.5097	-116.5615	1.2160	South East Table Mountain, Anza, CA, USA		2/01/16 (032) 22:09:11.30829 UTC
18	SMER	2002040		33.4577	-117.1708	0.3557	Santa Margarita Ecological Reserve, CA, USA		2/01/16 (032) 22:09:12.34944 UTC
19	SND	1982274		33.5519	-116.6129	1.3580	Jim Saunders Place, Anza, CA, USA		2/01/16 (032) 22:09:22.59255 UTC
20	SOL	1996040		32.8410	-117.2480	0.2450	Mt. Soledad, San Diego, CA		2/01/16 (032) 22:10:10.10350 UTC
21	TMSP	2013034		33.6192	-116.6809	2.0770	TMSP, CA, USA		2/01/16 (032) 22:10:23.35299 UTC
22	TONN	2011063		33.1442	-116.1193	0.0536	Tonner Ranch, Anza, CA, USA		2/01/16 (032) 22:10:29.59911 UTC
23	TRAN	2011065		33.4955	-116.5834	1.1970	Tranquility, Anza, CA, USA		2/01/16 (032) 22:10:32.13424 UTC
24	TRO	1982274		33.5234	-116.4257	2.6280	Toro Peak, Riverside Co, CA, USA		2/01/16 (032) 22:10:32.37662 UTC
25	TUBB	2011021		33.2101	-116.4091	0.3940	Tubb Canyon, CA, USA		2/01/16 (032) 22:11:01.56125 UTC
26	WMC	1983259		33.5736	-116.6747	1.2710	Walmic Ranch, Anza, CA, USA		2/01/16 (032) 22:11:04.10737 UTC
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28	B082	2006161	2599365	33.5982	-116.5960	1.3748	pathfi082bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.17672 UTC
29	B082A	2013061	2599365	33.5982	-116.5960	1.3748	pathfi082bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.29291 UTC
30	B084	2006169	2599365	33.6116	-116.4564	1.2710	pinyon084bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.48604 UTC
31	B086	2006168	2599365	33.5575	-116.5310	1.3920	santar086bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.65097 UTC
32	B086A	2013044	2599365	33.5575	-116.5310	1.3920	santar086bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.74798 UTC
33	B087	2006168	2599365	33.4955	-116.6027	1.1390	fordra087bcs2006, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.83296 UTC
34	B088	2007027	2599365	33.3749	-116.6205	1.4039	skyoks088bcs2007, Anza, CA, USA	ss	2/01/16 (032) 21:58:22.92017 UTC
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36	B093	2007263	2599365	33.5937	-116.7641	1.2296	trippf093bcs2007, Anza, CA, USA	ss	2/01/16 (032) 21:58:23.08940 UTC
37	B946	2010204	2599365	33.5373	-116.5925	1.4290	sagebf946bcs2010, Anza, CA, USA	ss	2/01/16 (032) 21:58:23.30717 UTC
38	TPFO	2010099		33.6060	-116.4544	1.2750	Pinon Flats, CA, USA		2/01/16 (032) 21:58:44.09304 UTC
39	JORD	2011327	2016366	33.4722	-116.6450	1.2350	JORD		2/01/16 (032) 21:56:56.53317 UTC

谢谢: Margaret Chen

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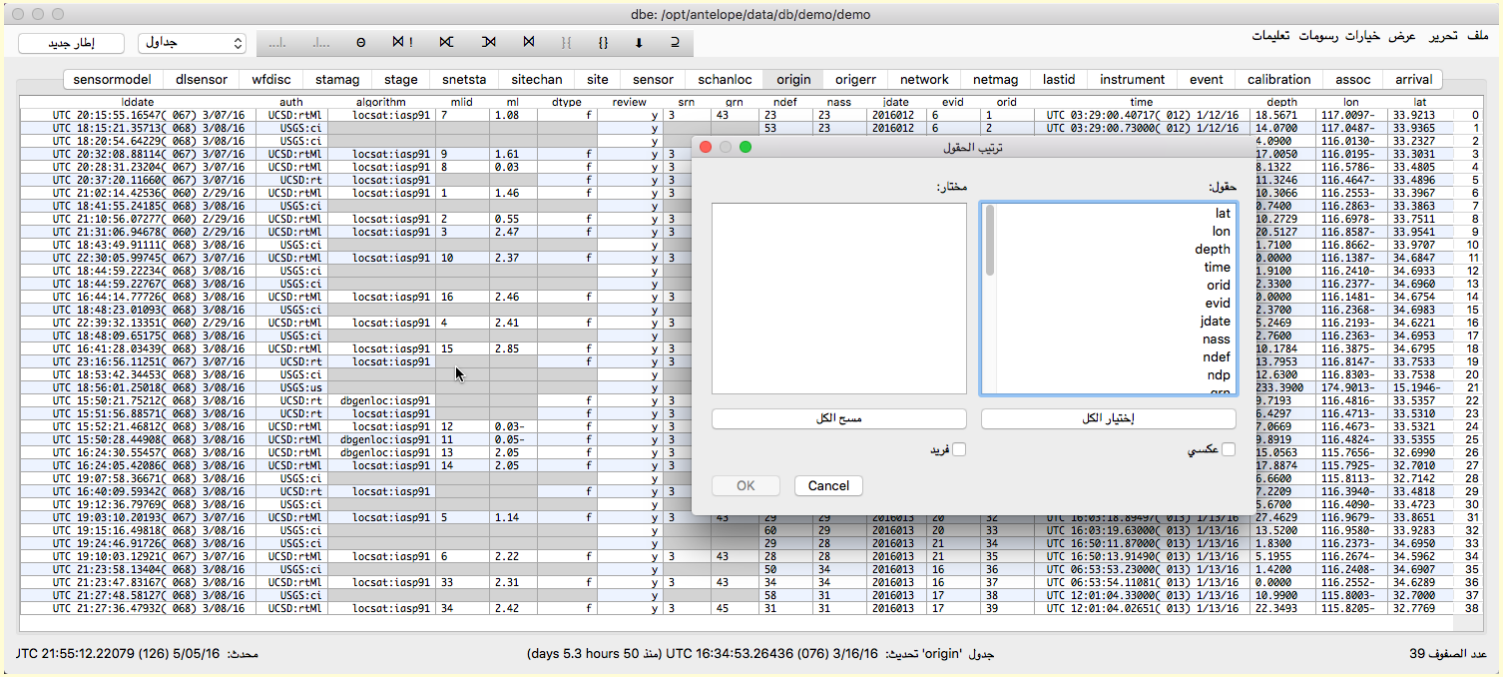
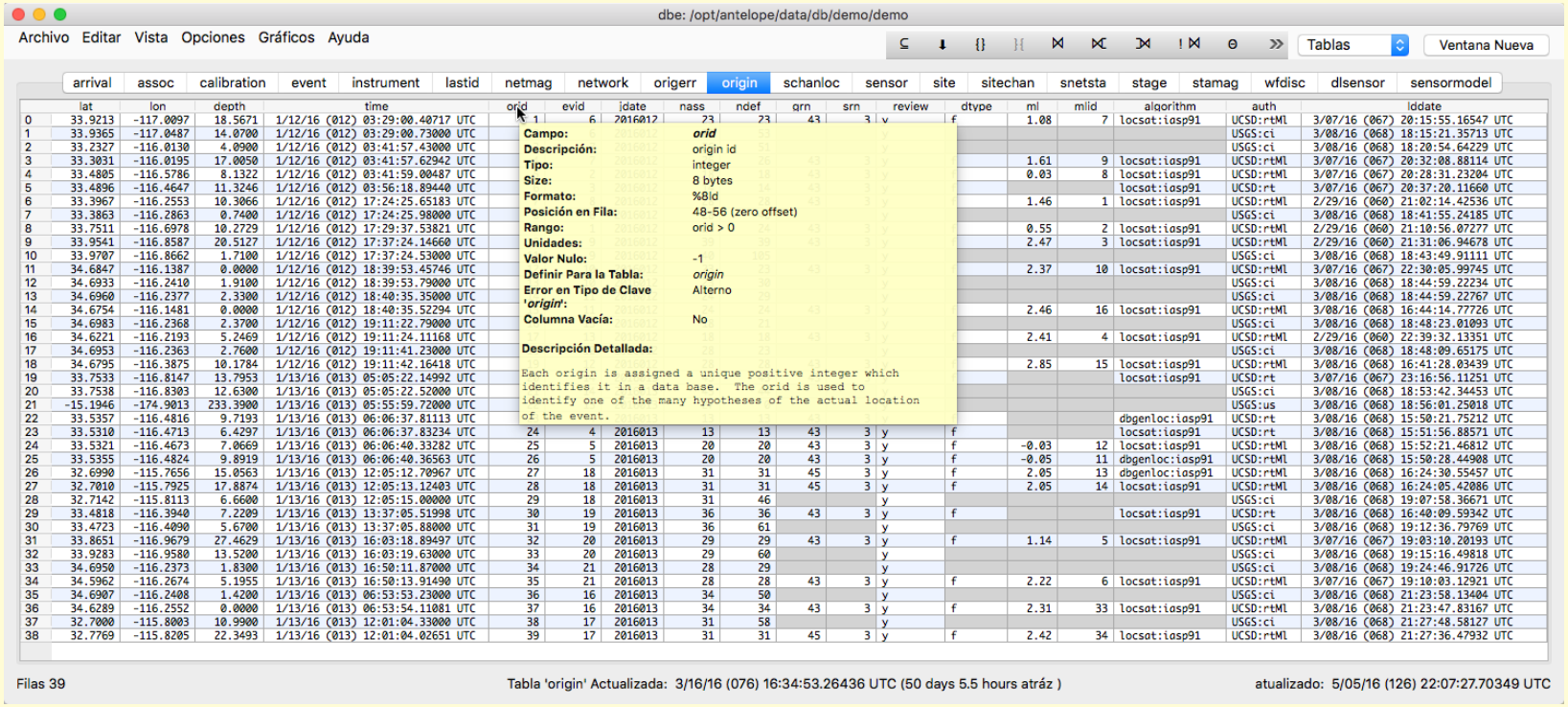
Kinemetrics

dbe: Arabic



Toufik Allili :شكرا

dbe: Español



Gracias: Juan Reyes

Internationalization and Localization: ***Special Offer***

- If you'd like *dbe* controls in your language, we'll give you a *Microsoft Excel* spreadsheet at this meeting (about 170 strings to translate), you translate it, we'll put your language in the next Antelope 5.6 patch

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Kinemetrics

new demo database

- Original demo database was showing it's age
  - No event table
  - Limited station metadata
  - Old-format *lddates* in places
  - many other anachronisms
- New demo database courtesy UCSD / Jennifer Eakins
  - 20 events from Anza network, Southern California
  - Segmented waveform data
  - Full station metadata

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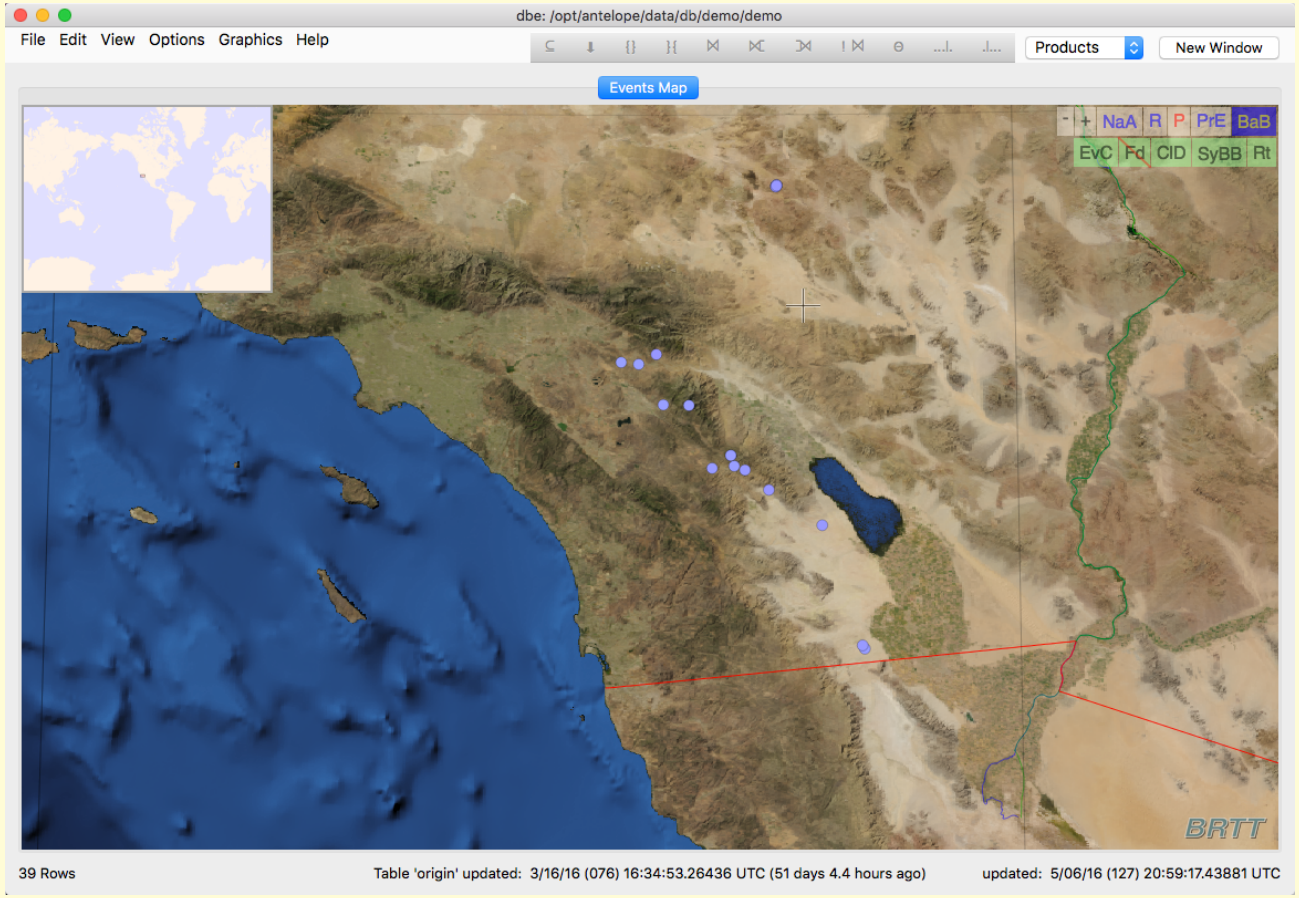
Kinemetrics

new demo database

/opt/antelope/data/db/demo/demo



Bighorn

Bighorn

is now delivered at no additional cost with Antelope 5.6!

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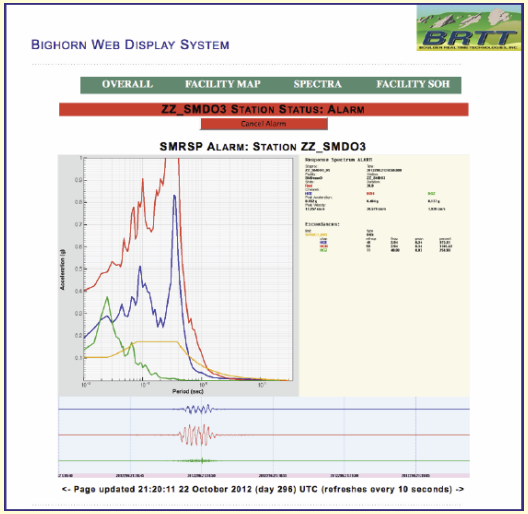
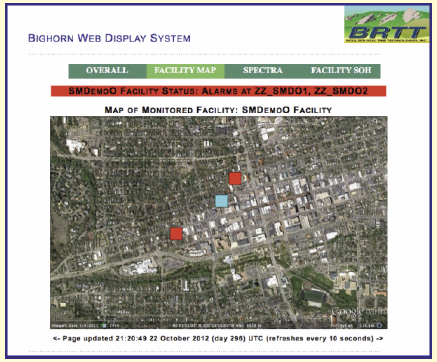
Kinemetrics

Bighorn

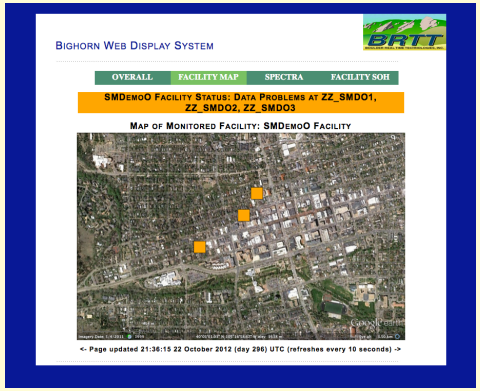
Main Features

- ***Now-casting*** of wavefield spectral content
- Real-time, continuous response spectra exceedence
- Immediate results tailored for response team
- Automatic alarms against engineered criteria (Structural Health Monitoring)
- ***Independent of Earthquake Location***
  - No need to wait for location
  - Applicable for non-earthquake sources
  - Very close to Earthquake Early Warning
- Quantitative, ***critical decision support***





Facility Monitoring



Bundled into Antelope 5.6

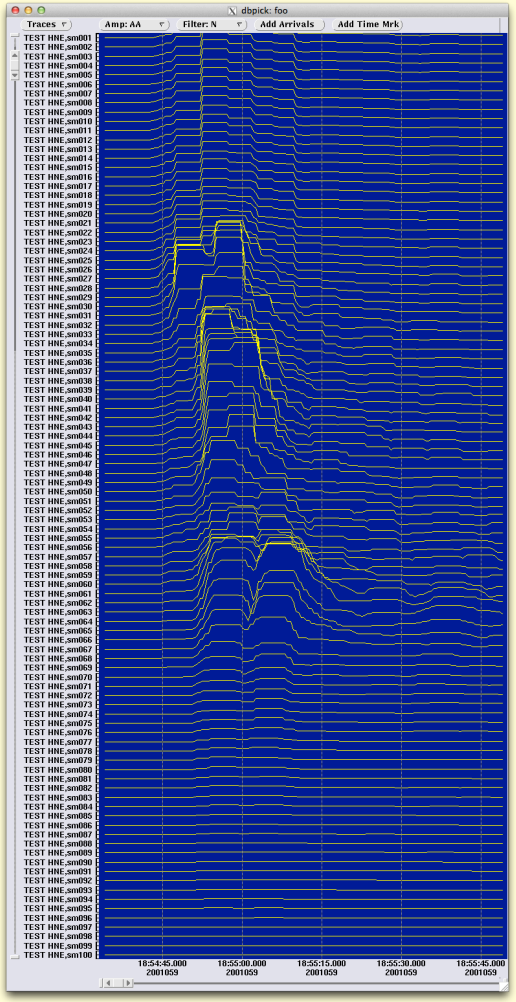
State-of-Health Monitoring

BRTT BOULDER REAL TIME TECHNOLOGIES, INC.

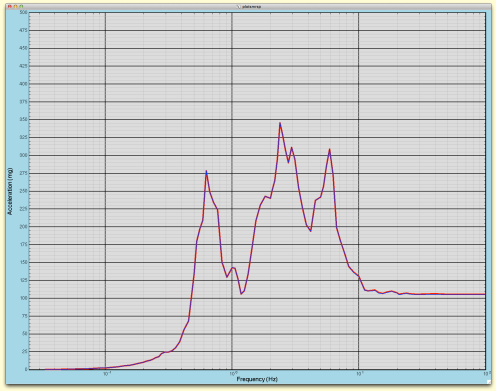
Kinemetrics

Bighorn

Multiple
Time-domain filters
Of incoming wavefield

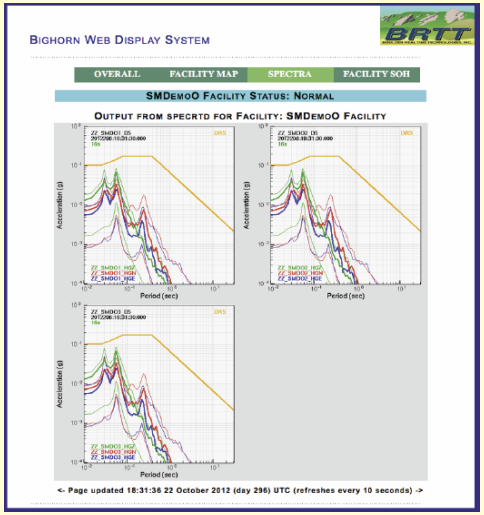


- Method vetted by Nuclear Regulatory Commission
- Faithful translation from
  - After-the-fact event-based review; to
  - Streaming, real-time, continuous now-casting



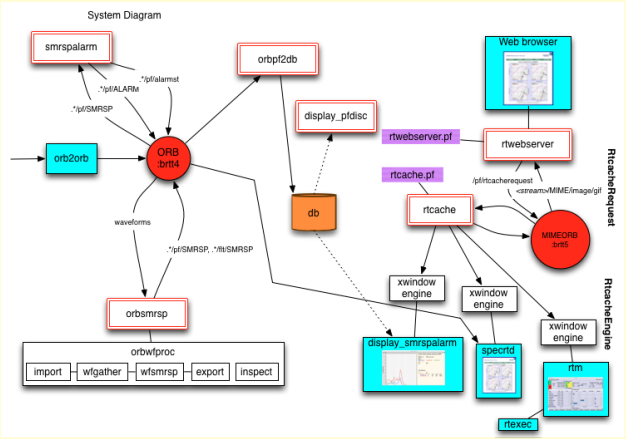
Blue: Traditional post-processing
Red: Streaming real-time processing
(or vice versa…)

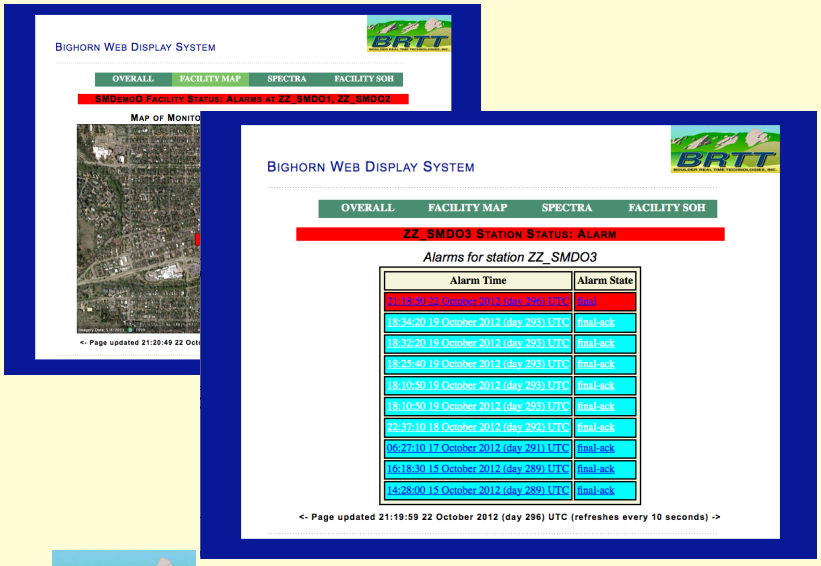
-> Synthesize
Real-time
Spectral
Calculations

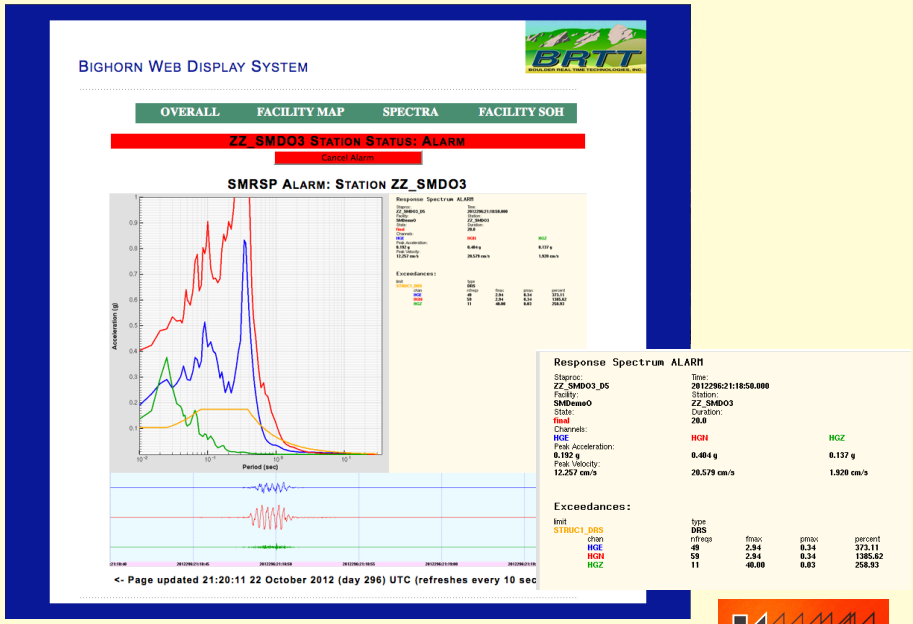


Bighorn

- Alarms based on exceedence of Operating Basis Earthquake (OBE)
- Building-block nature of Antelope/Bighorn system and open-architecture APIs allow construction of wide variety of systems for Structural-Health Nowcasting, Earthquake Early Warning, and Post-Earthquake Response (e.g. Critical Facility alert / Alarm Acknowledgment system)







Future: Antelope 5.7 (May 2017)

- Feature-completeness and promotion of *orb2orb_pre* (datalogger-acquisition compliance: expanded SOH reporting, data repackaging/renaming capability, POC processing dlcmd compatibility)
- Continued campaign to modernize graphics and rewrite applications
- Feedback and requests?

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Thank You!

Questions?

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