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®

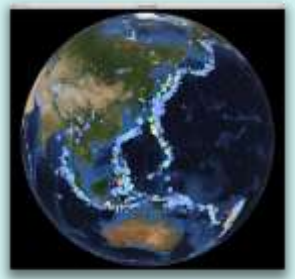
Designs High-End Digitizers

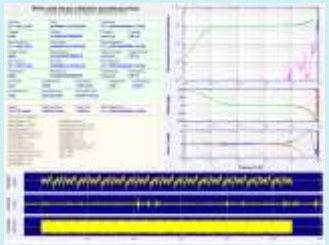
metrozet

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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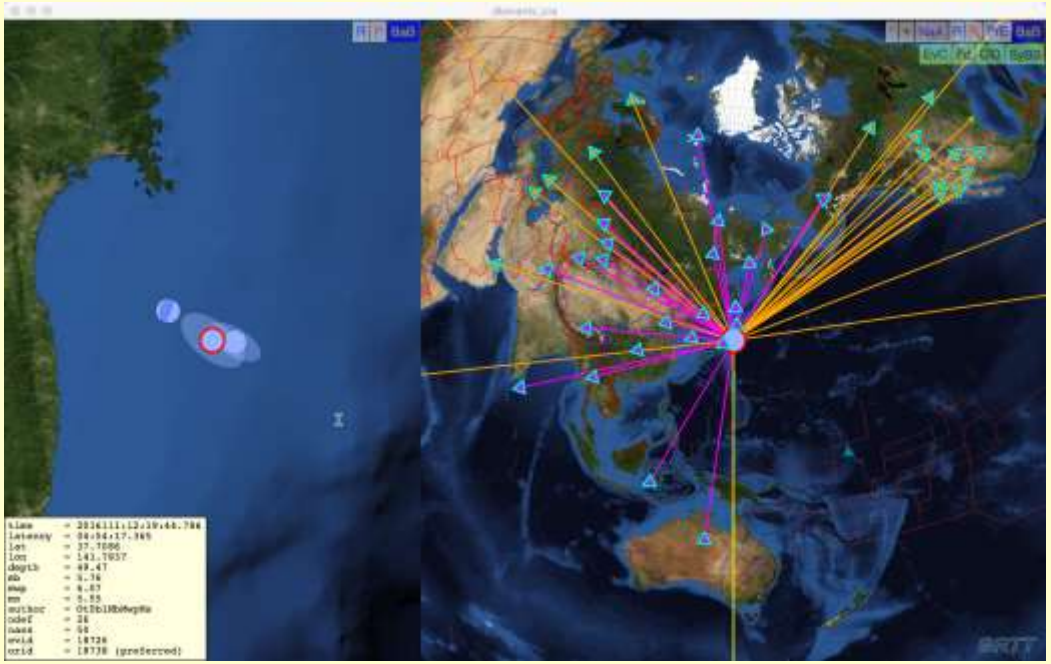
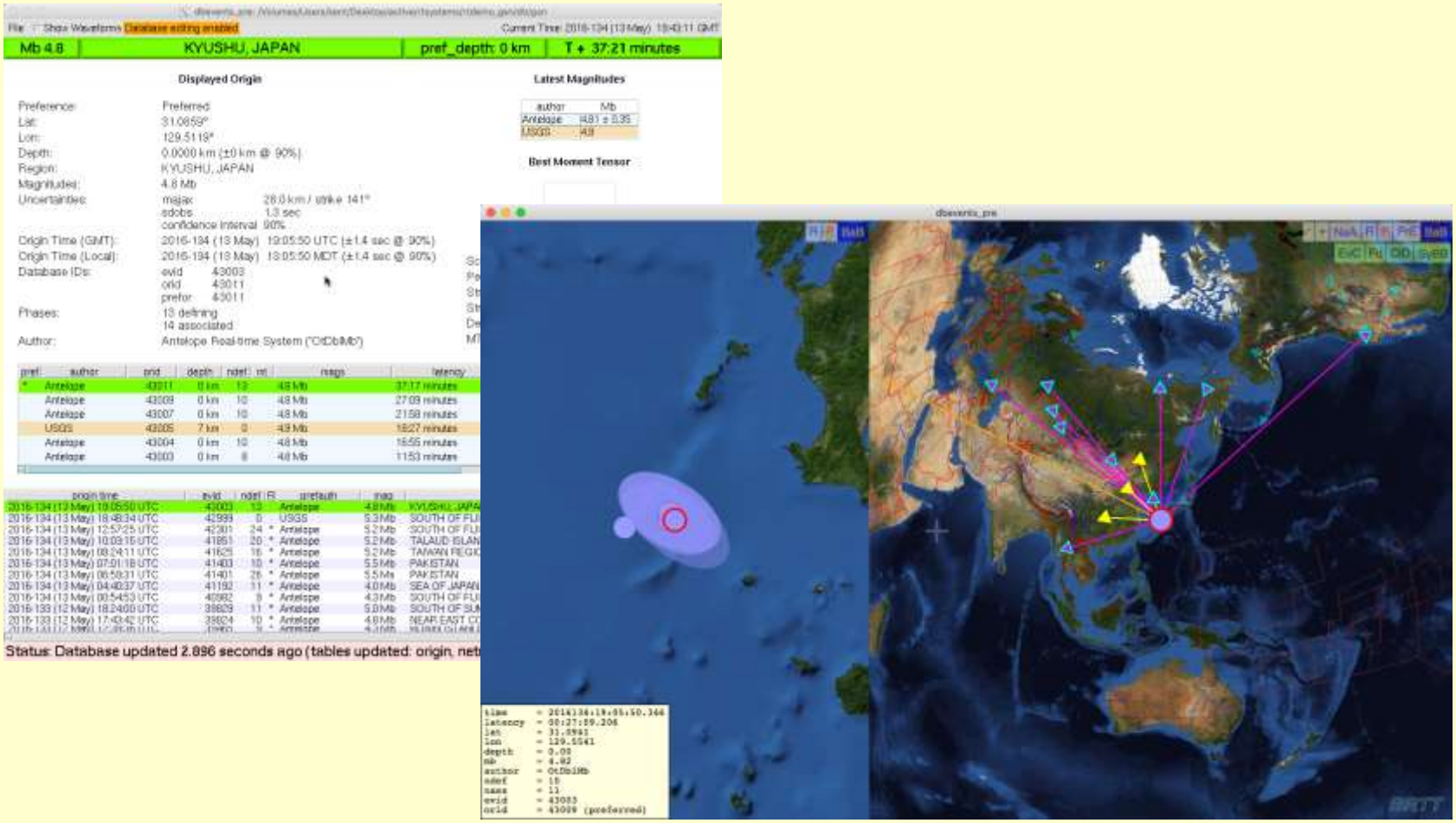
Python / Qt Graphics



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

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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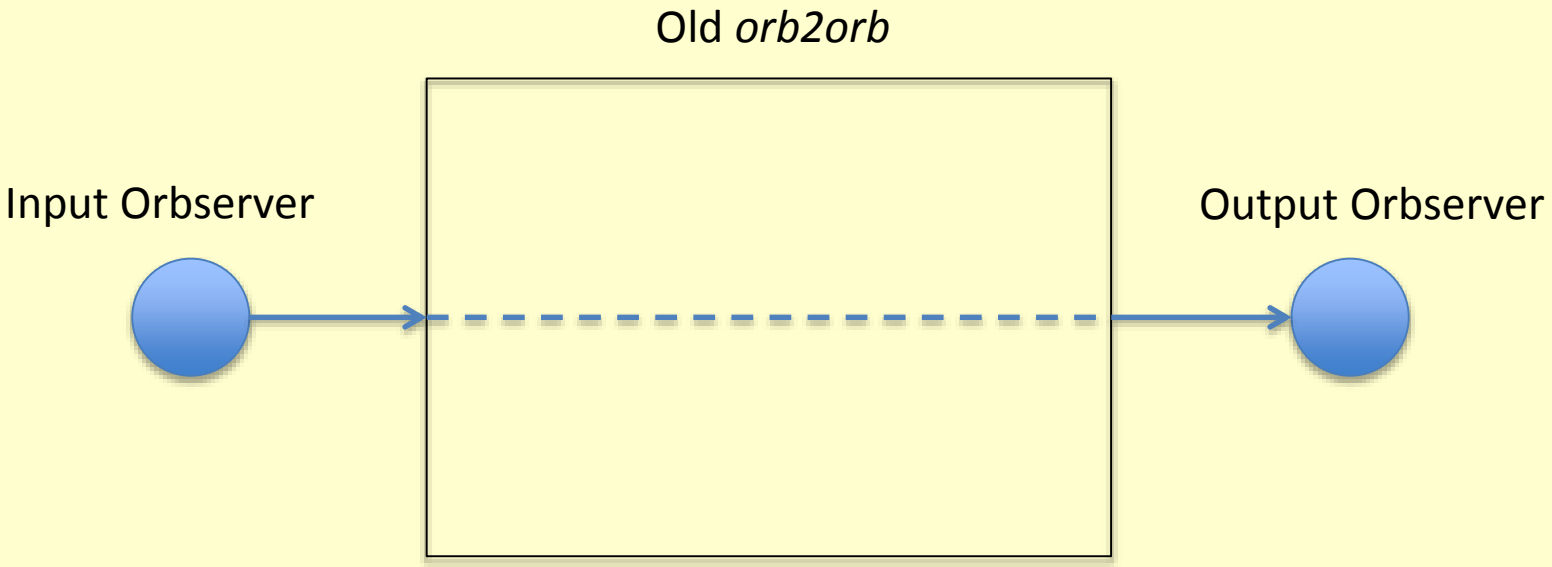
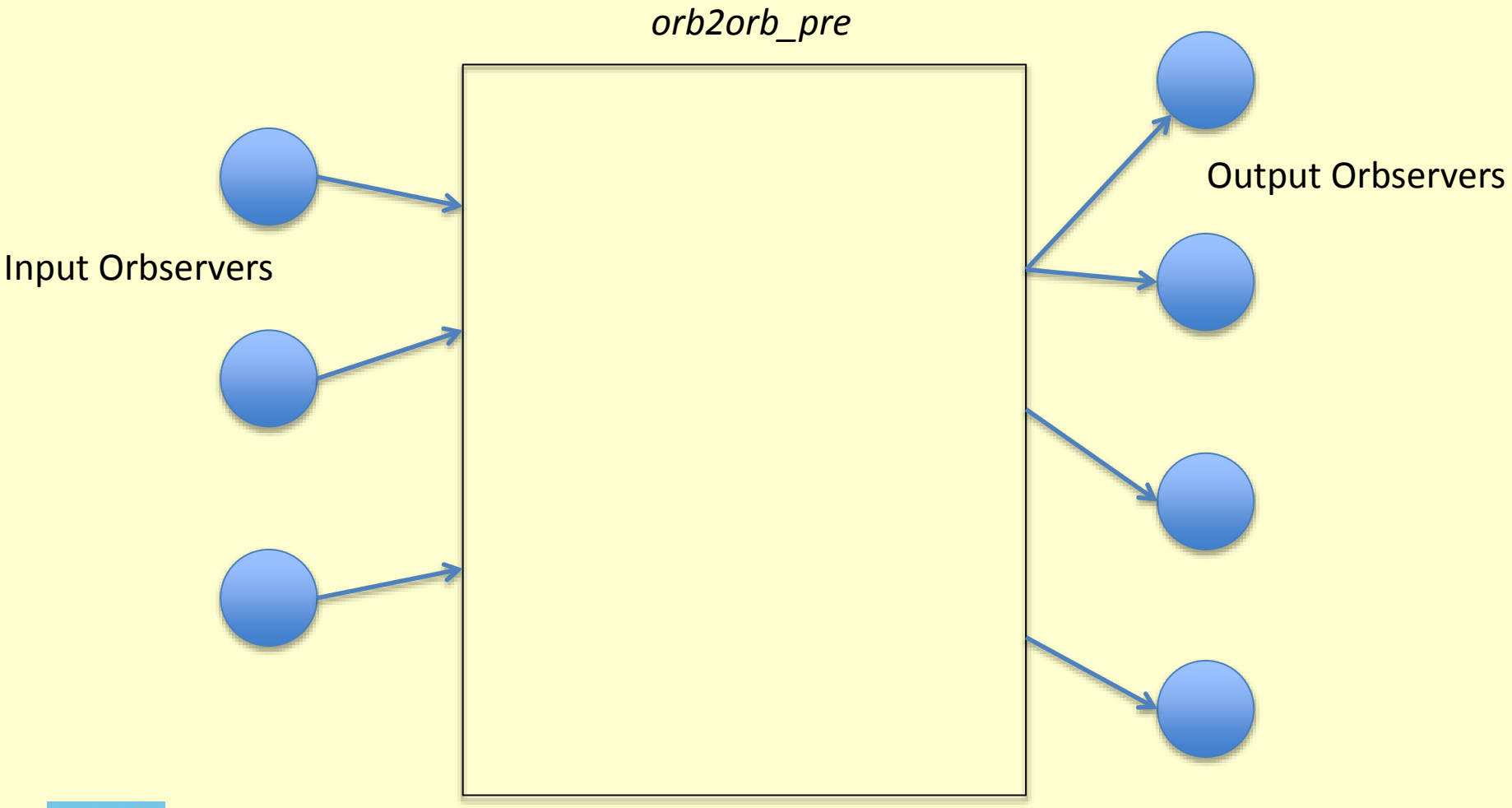
orb2orb: old architecture

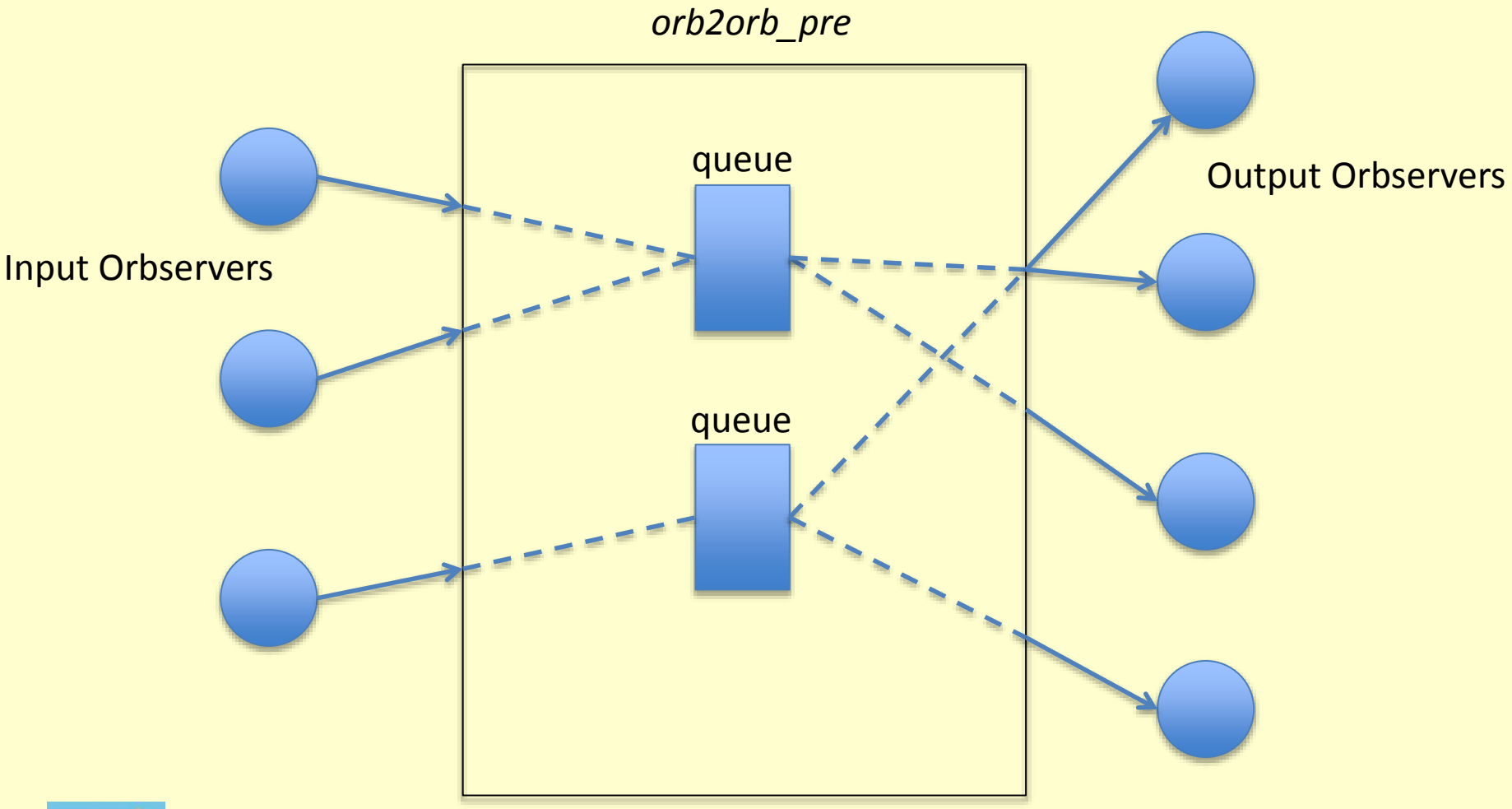


- Served well for many years
- Large networks might have hundreds of individual instances
- Manual configuration becomes burdensome
- Insufficiently supportive of direct data-acquisition role from dataloggers

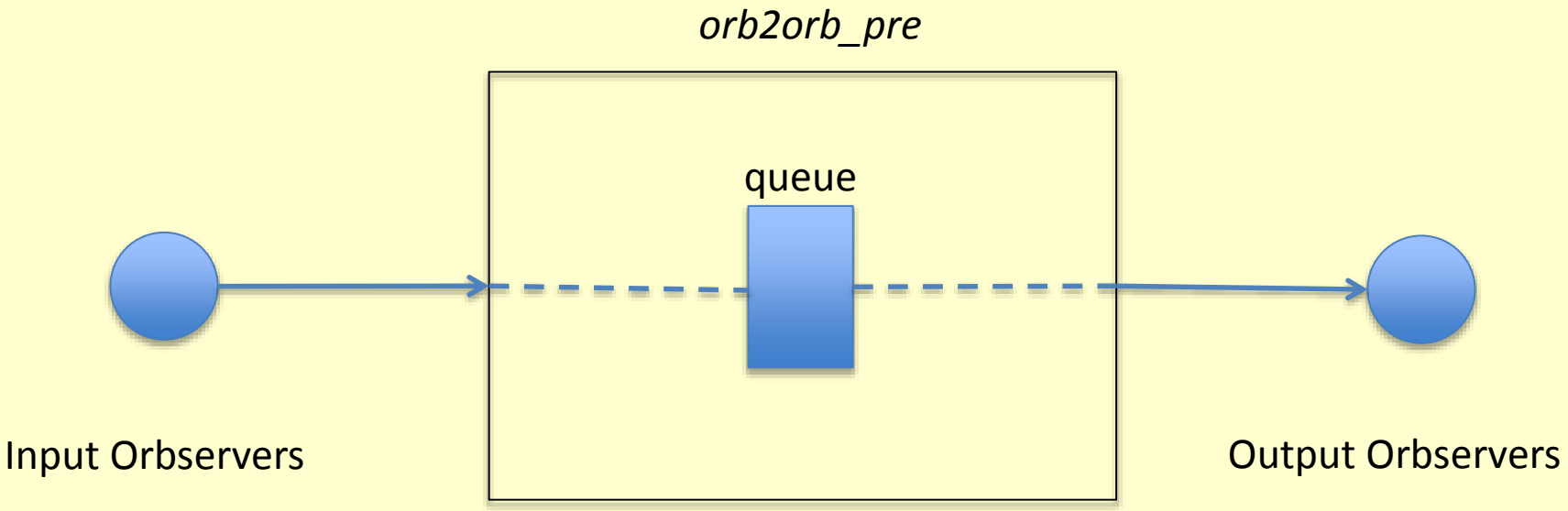
orb2orb_pre: new architecture



orb2orb_pre: new architecture

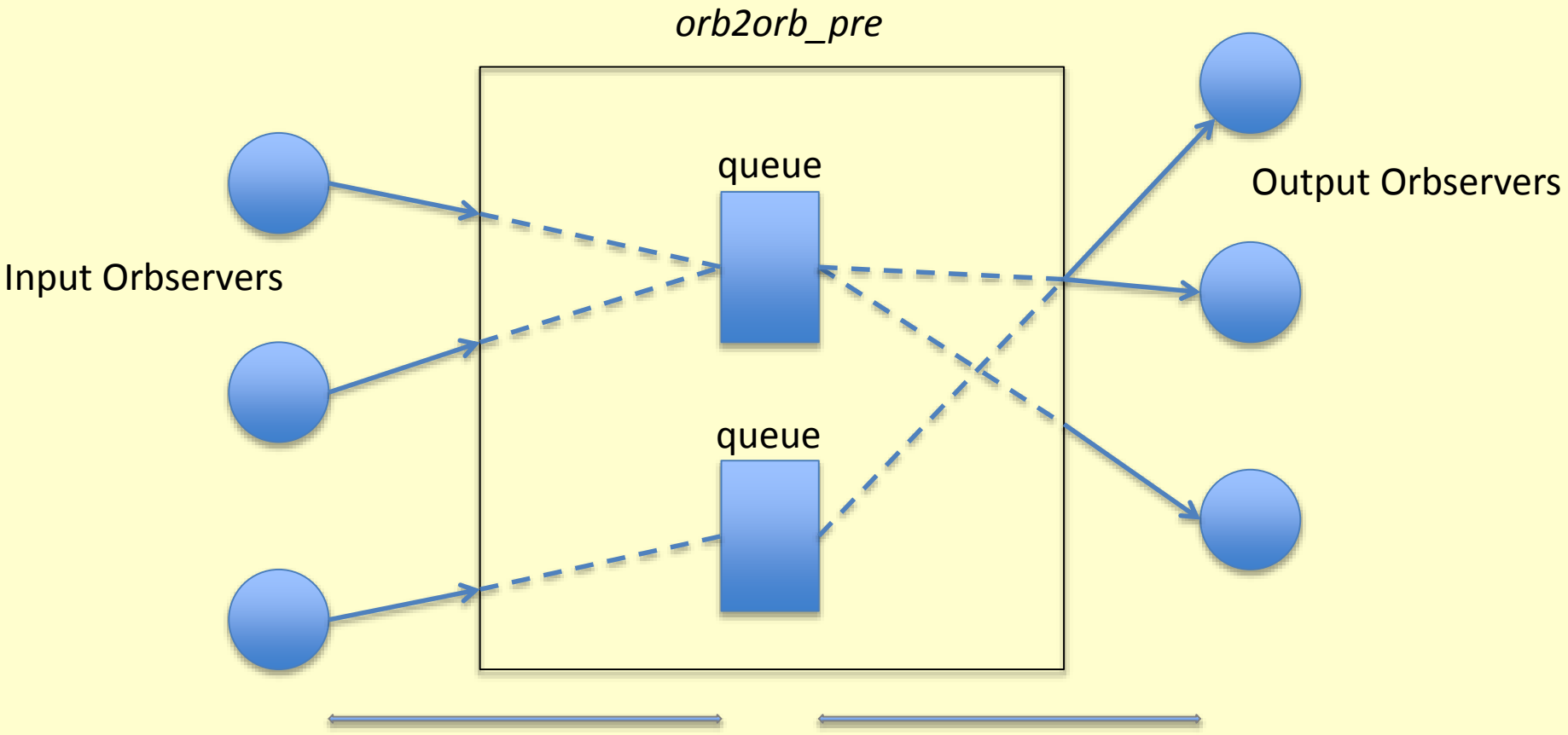


orb2orb_pre: new architecture

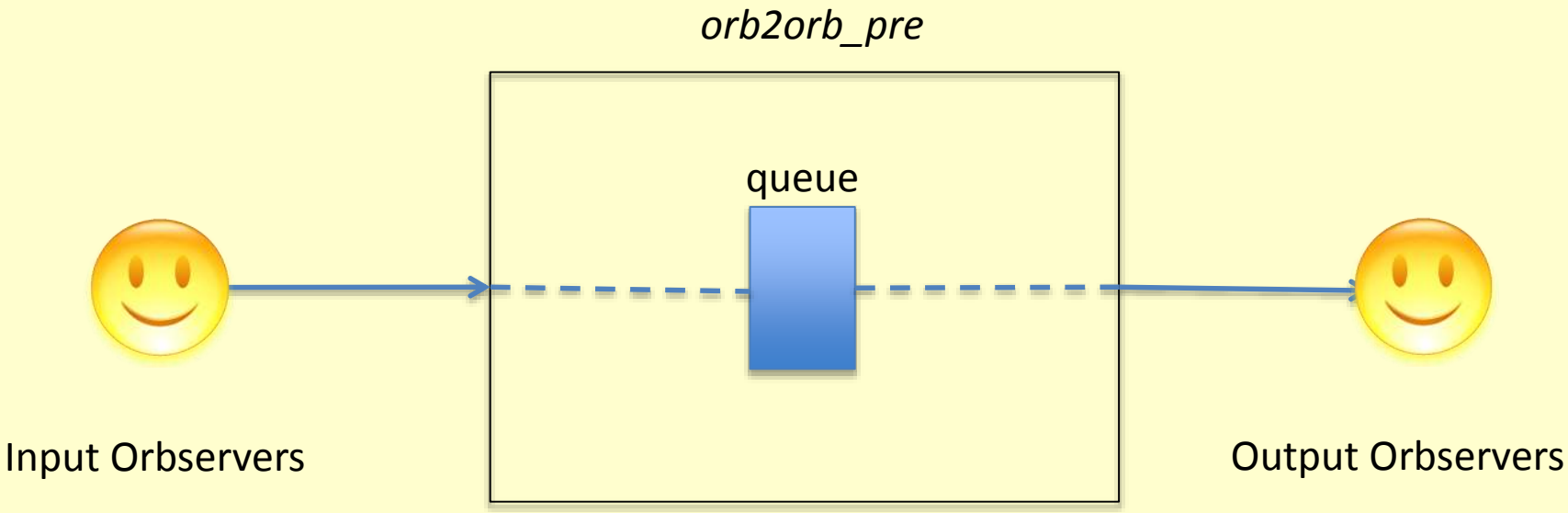


- Separate the connection into two parts:
  - The “read” half
  - The “write” half
- Configure each connection independently
- Add an internal *queue* to buffer data
- Allows you to acquire once, distribute to many destinations
- Allows you to fine-tune outputs
  - different match expressions to different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

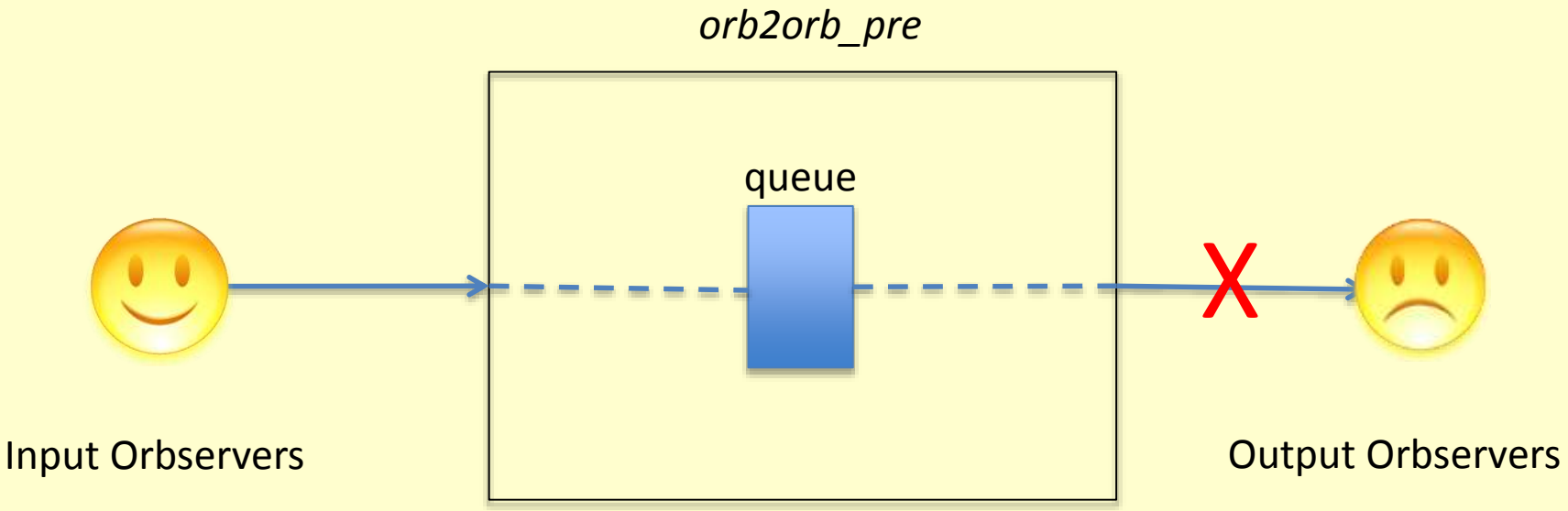
orb2orb_pre: new architecture



orb2orb_pre: new architecture



orb2orb_pre: new architecture



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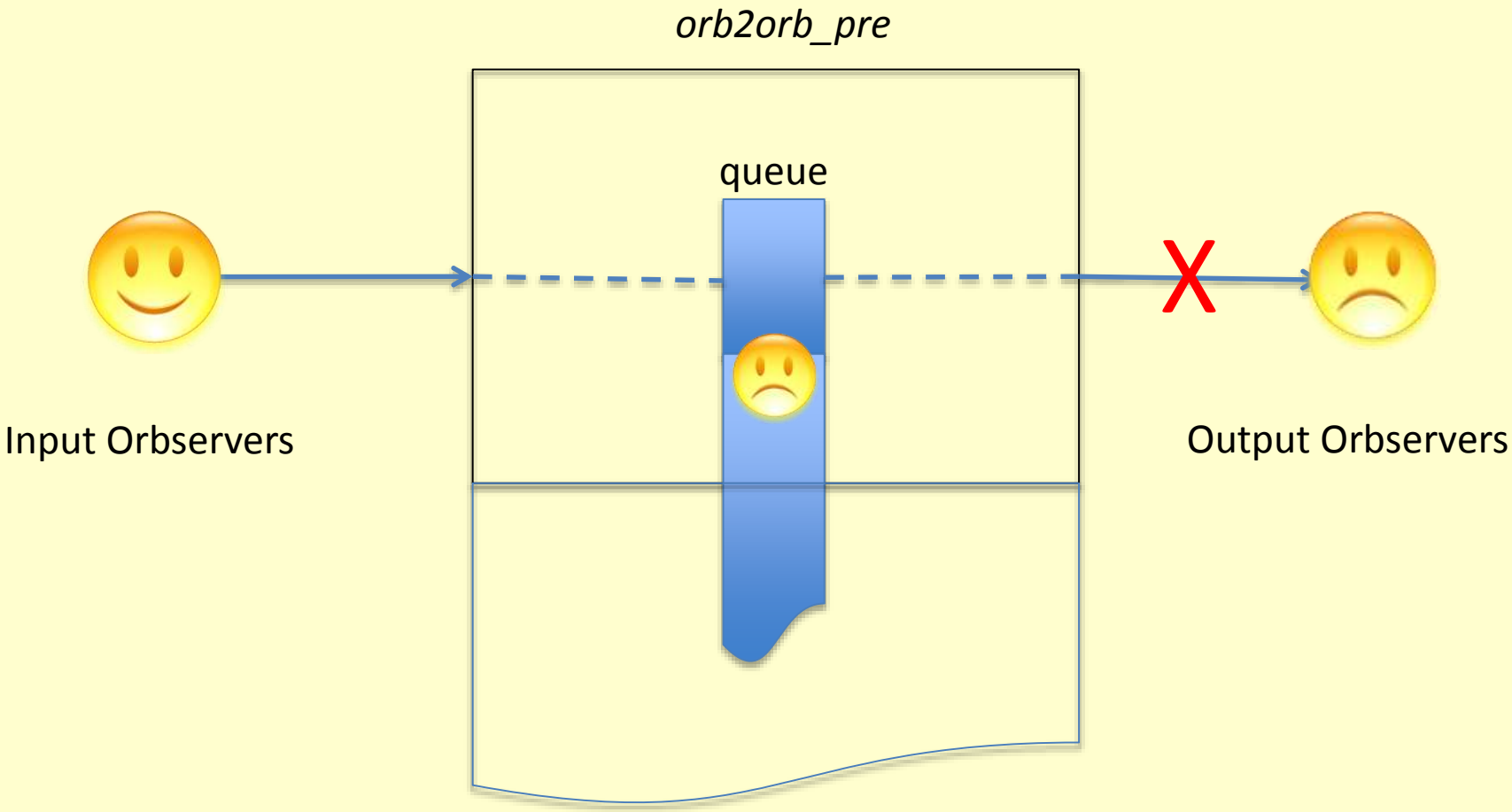

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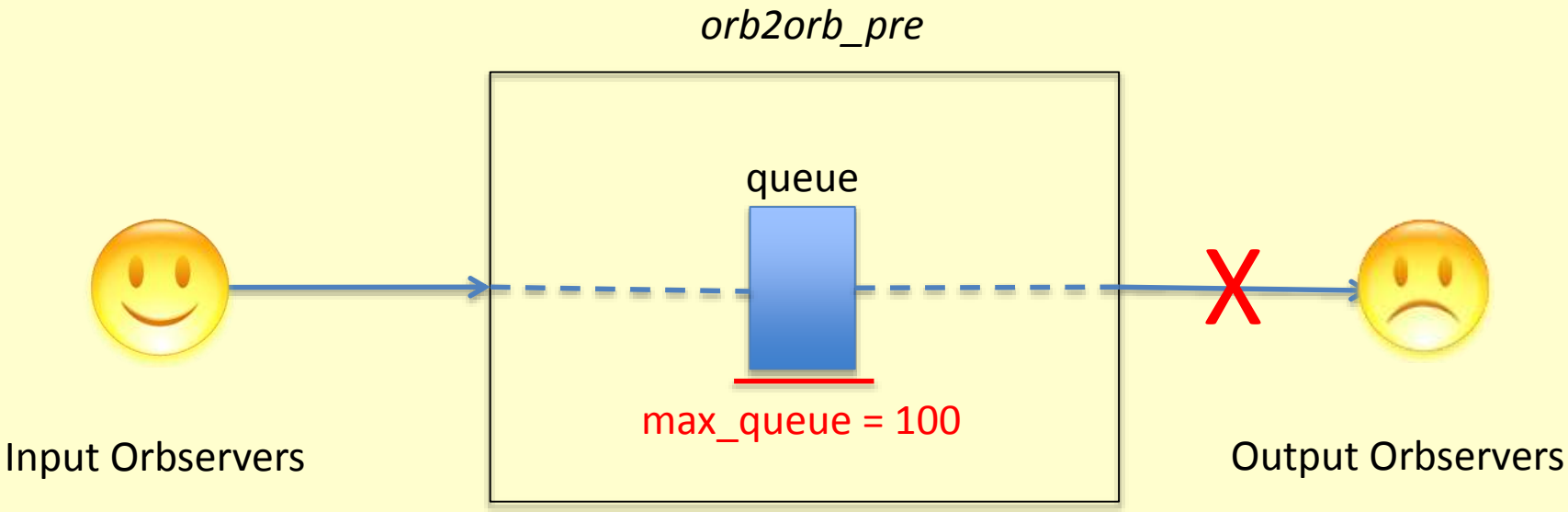

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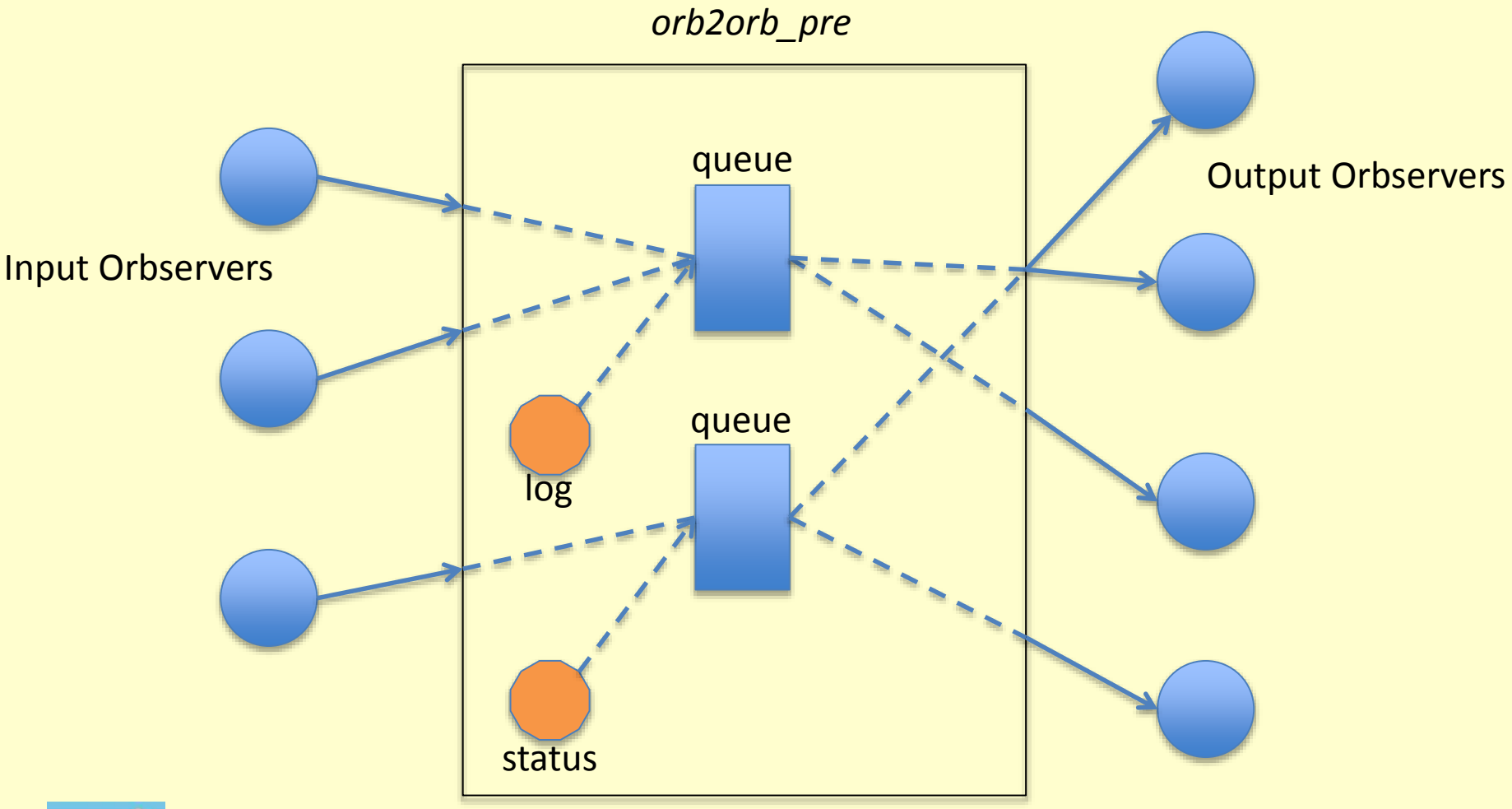
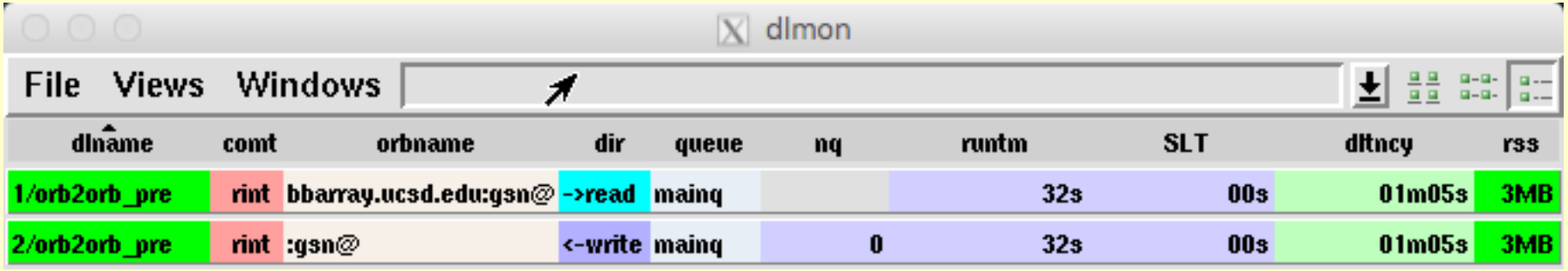


orb2orb_pre: dlmon output



"connection"

number of packets in queue

run time

Status Latency

Data Latency

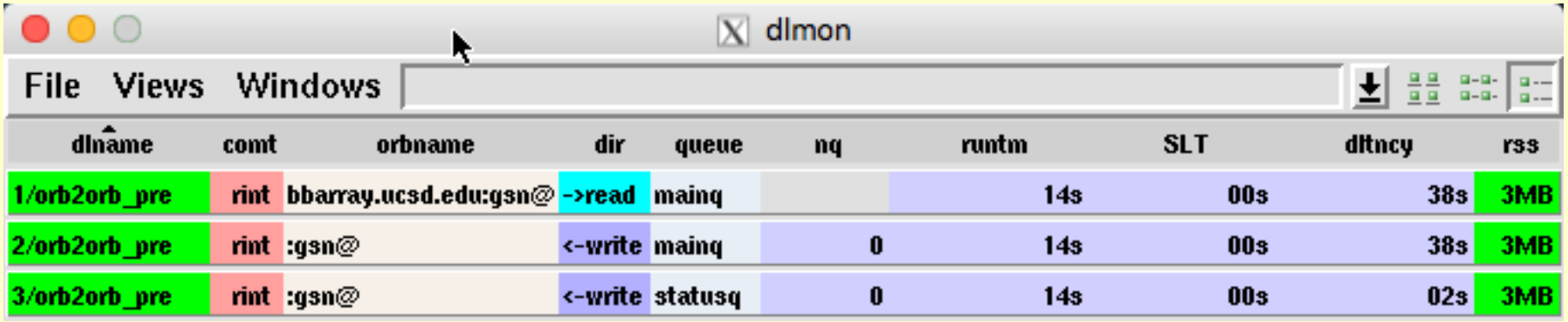
orb name

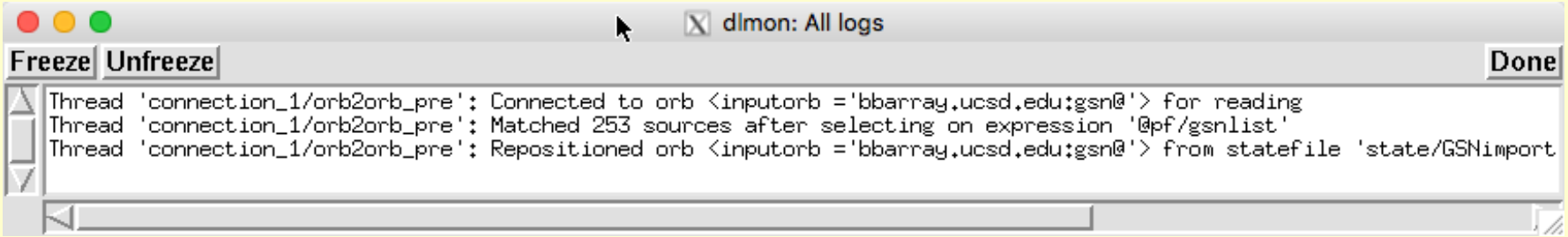
queue name

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

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

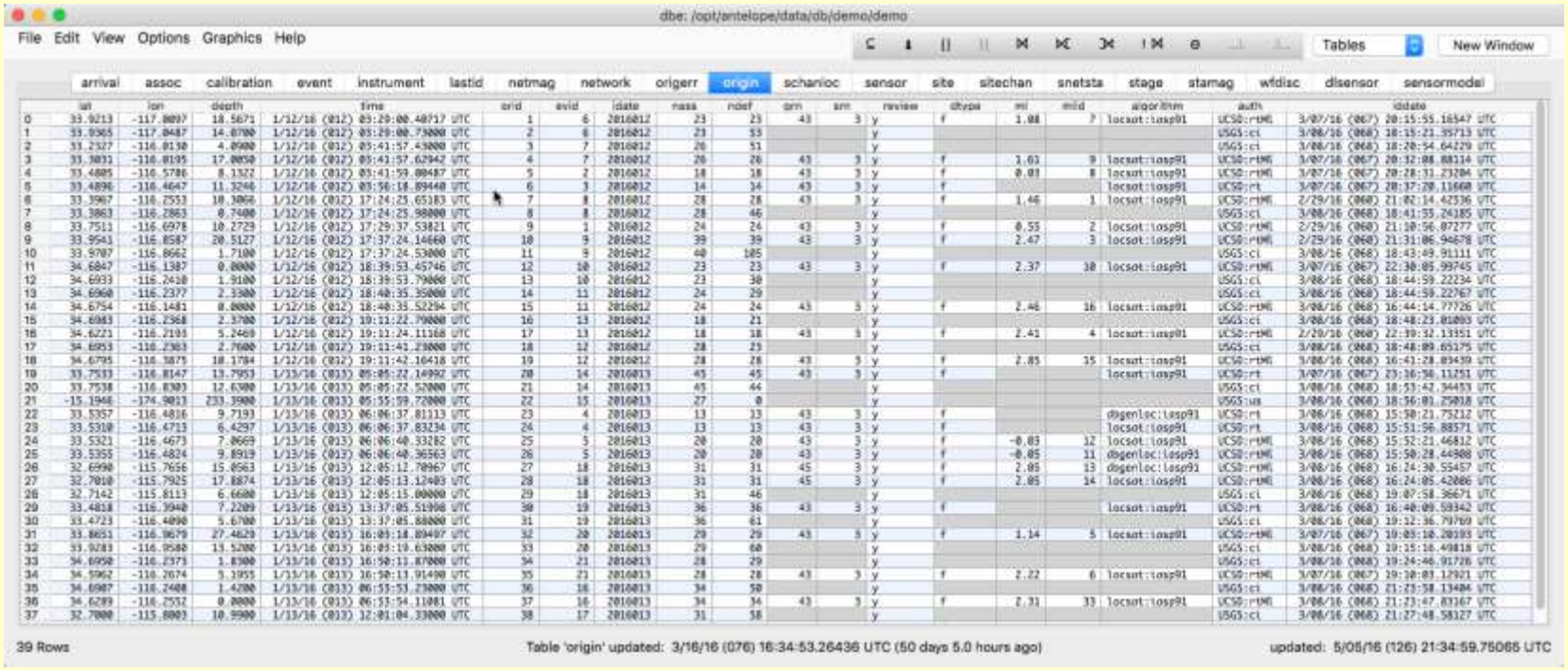
- Station-metadata export capability from Datascope to FDSN StationXML format
- Further detail in Celso Reyes' talk

```
% 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)

dbe



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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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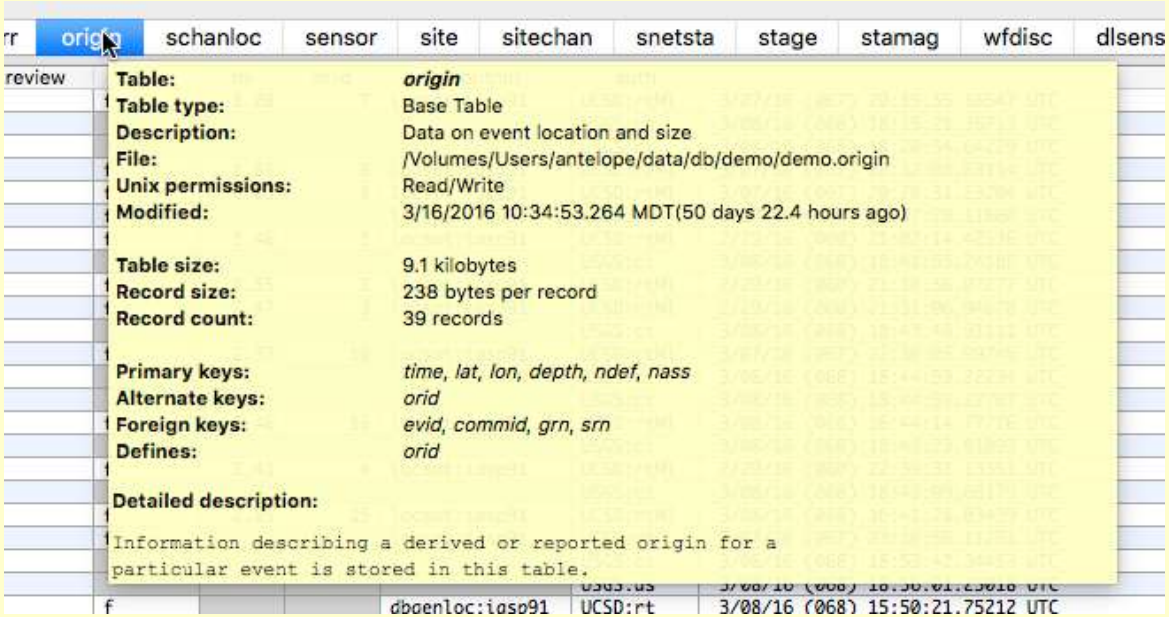
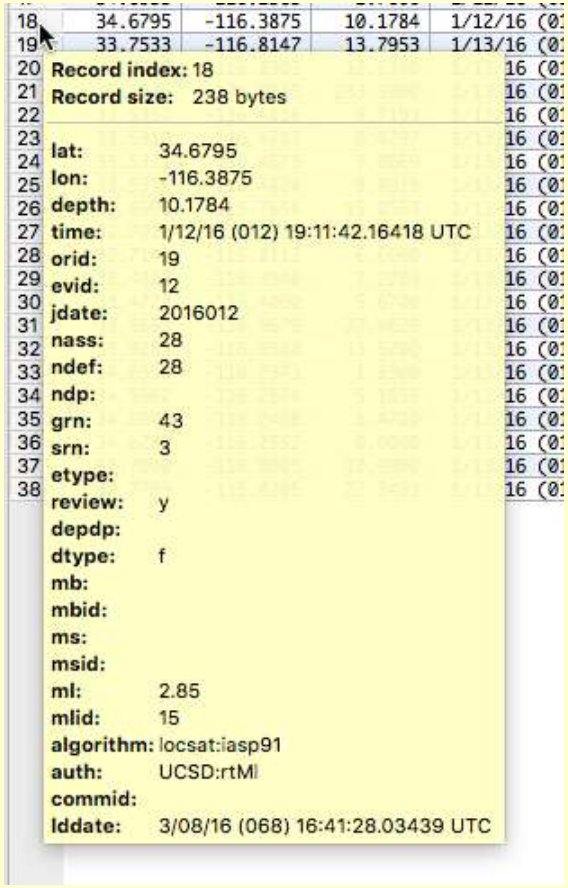
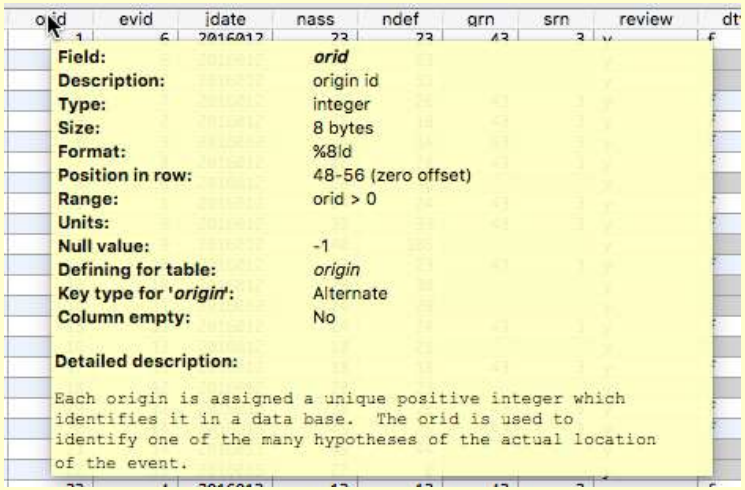
dbe: minor features

- 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

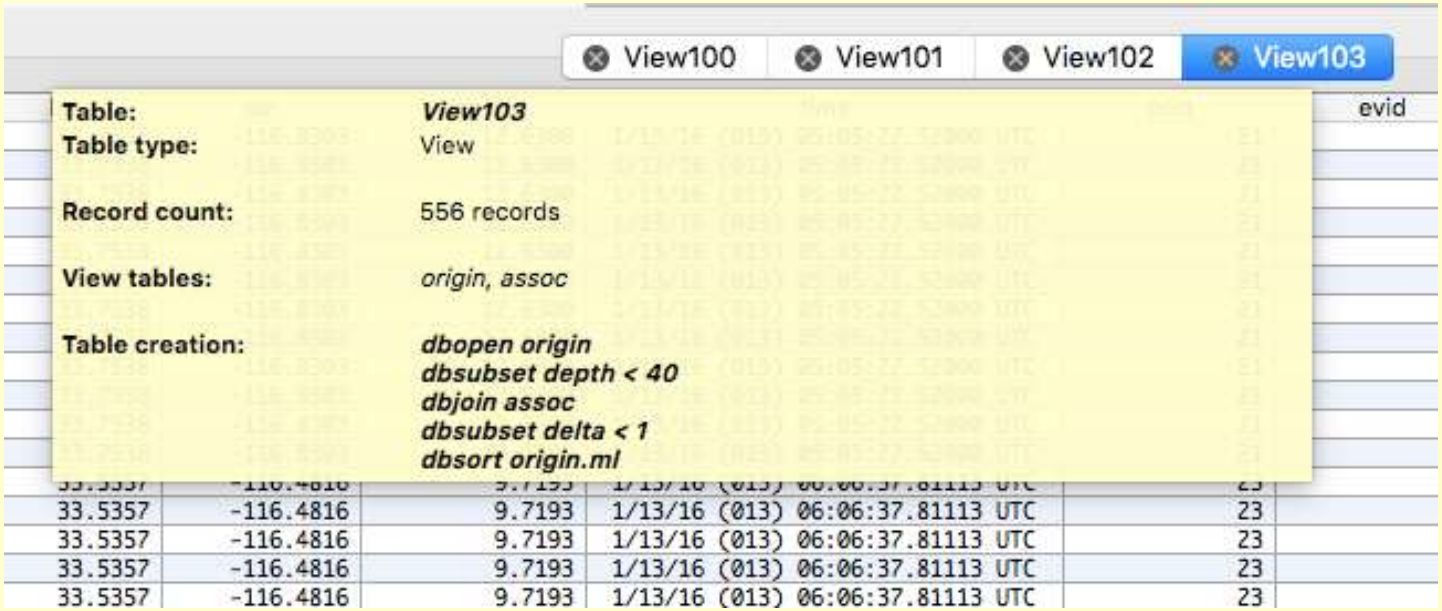
dbe: tooltips



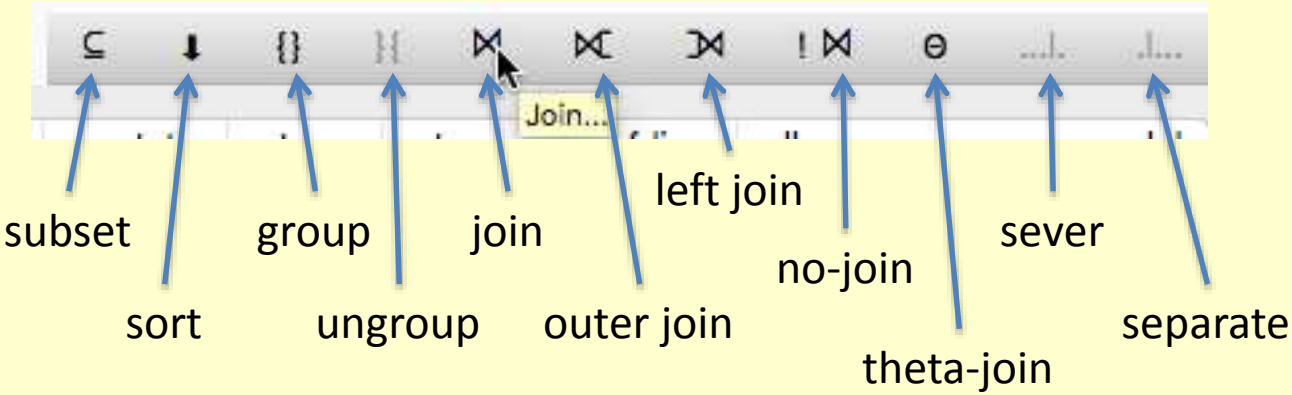


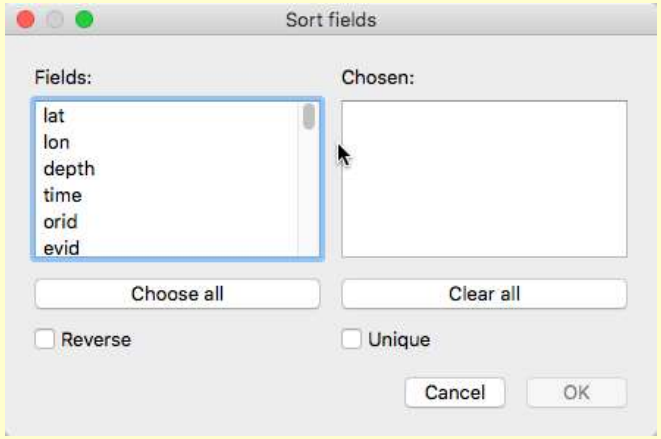


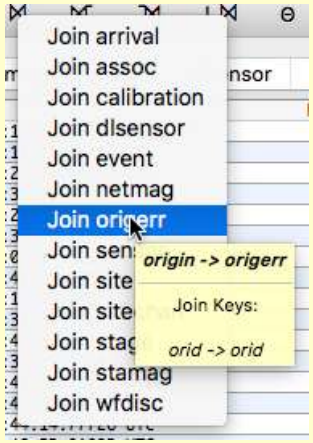
dbe: tooltips

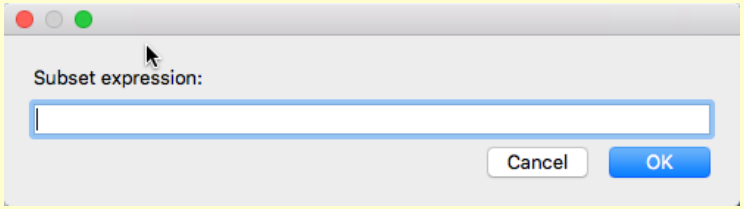


dbe: database operations toolbar



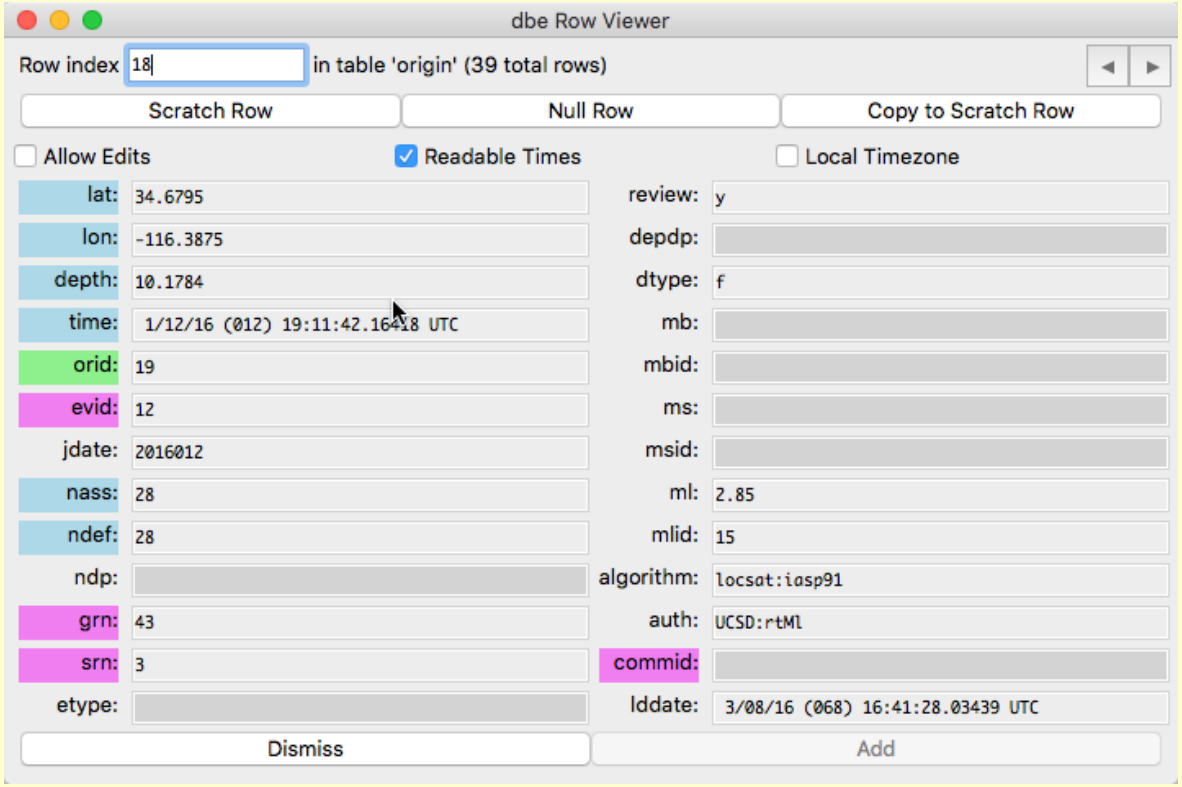




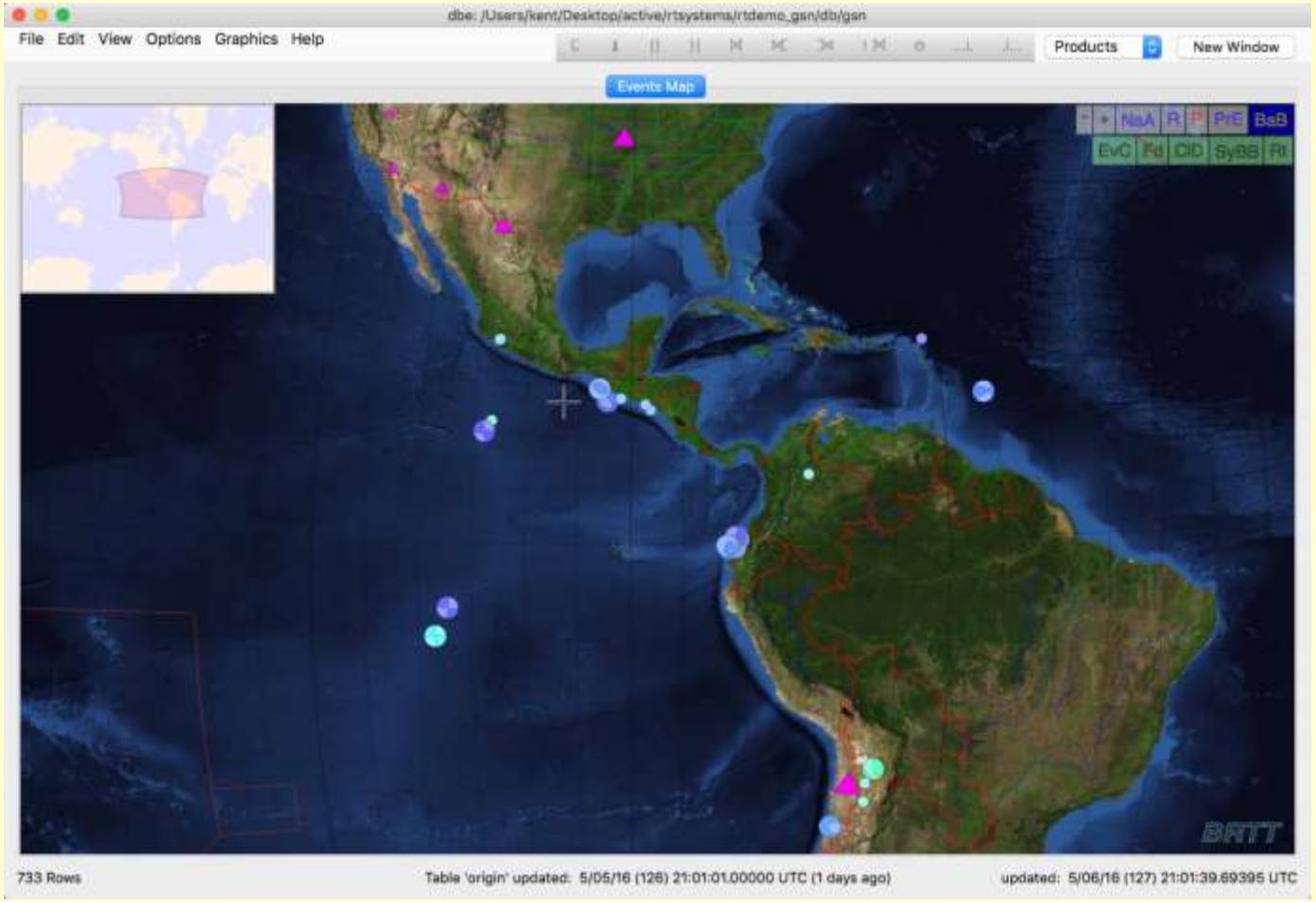


Danke: Stefan Radman

dbe: row viewer and editor



dbe: maps



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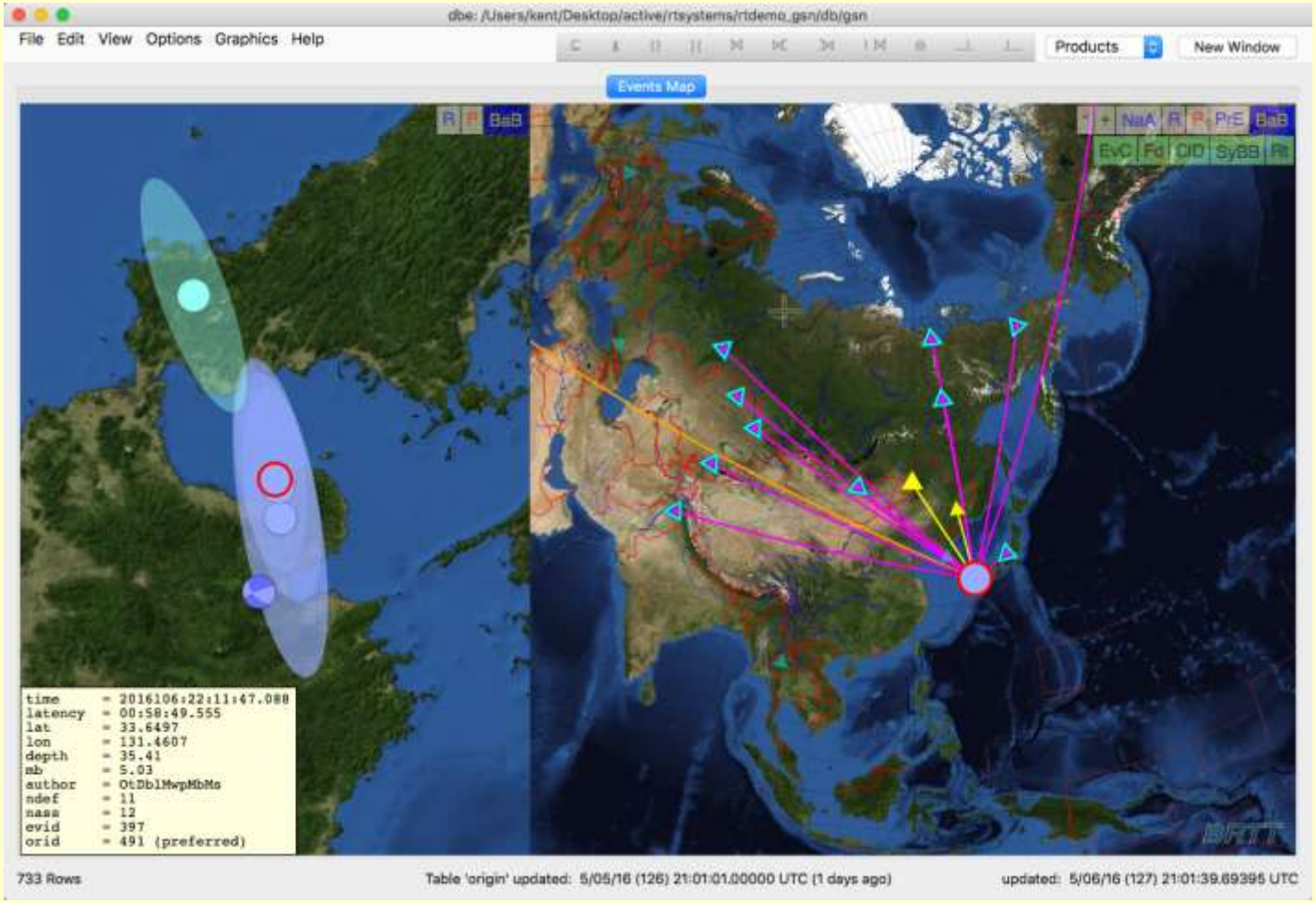
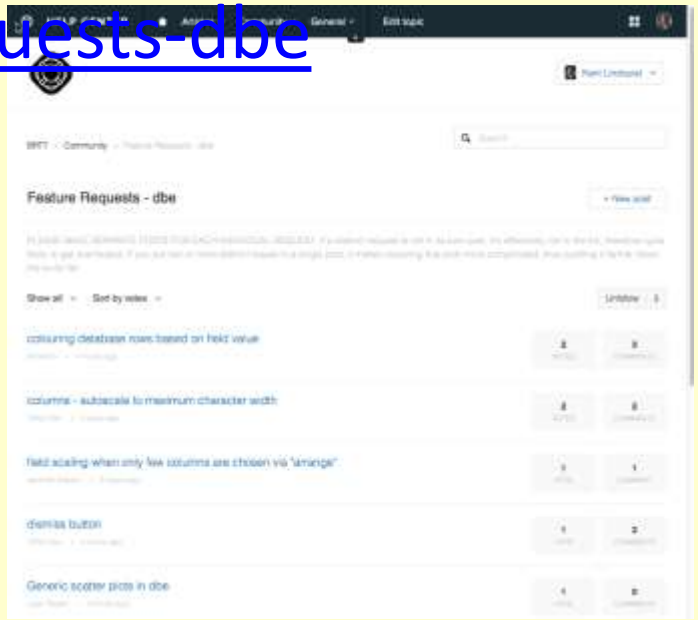
dbe: maps


dbe: /Users/kent/Desktop/active/rtsystems/rtdemo_gsn/db/gsn
File Edit View Options Graphics Help
Products
New Window
Events Map
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)
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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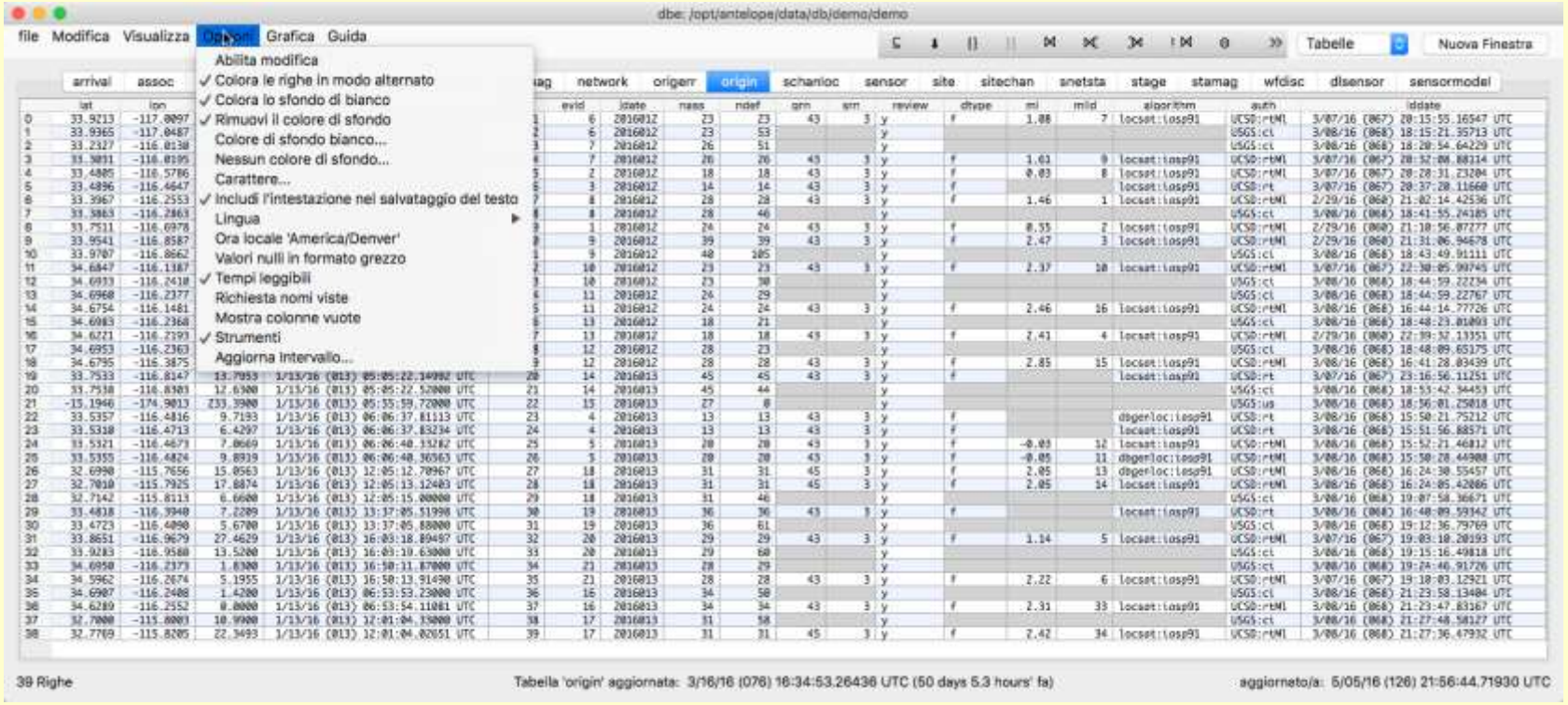
Internationalization and Localization

- 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

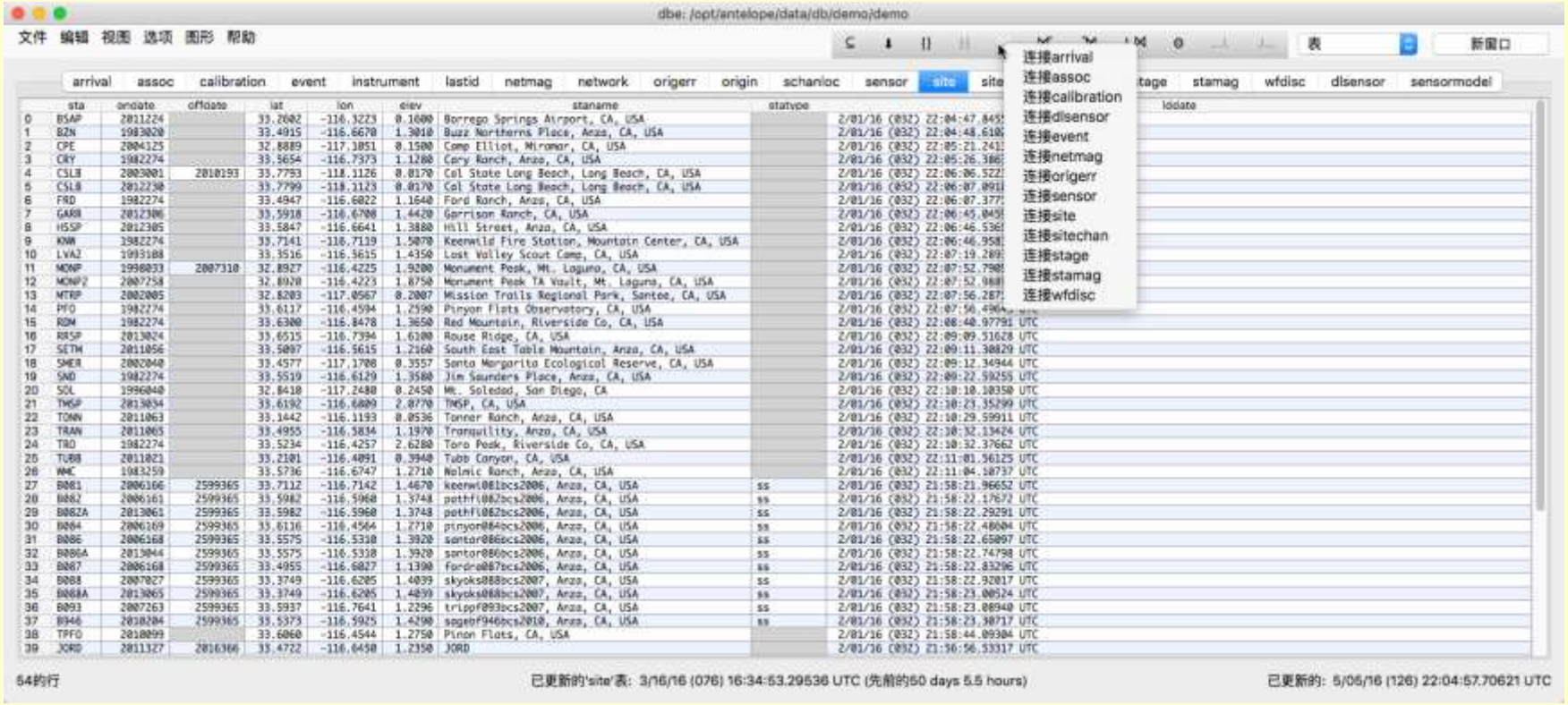
- All support requests must be in English
- This includes screen-dumps
  - *Command-E* or *Ctrl-E* shortcut to switch to English
- We do not translate, and do not foresee translating, database content, table names, schema descriptions etc.

dbe: Italian



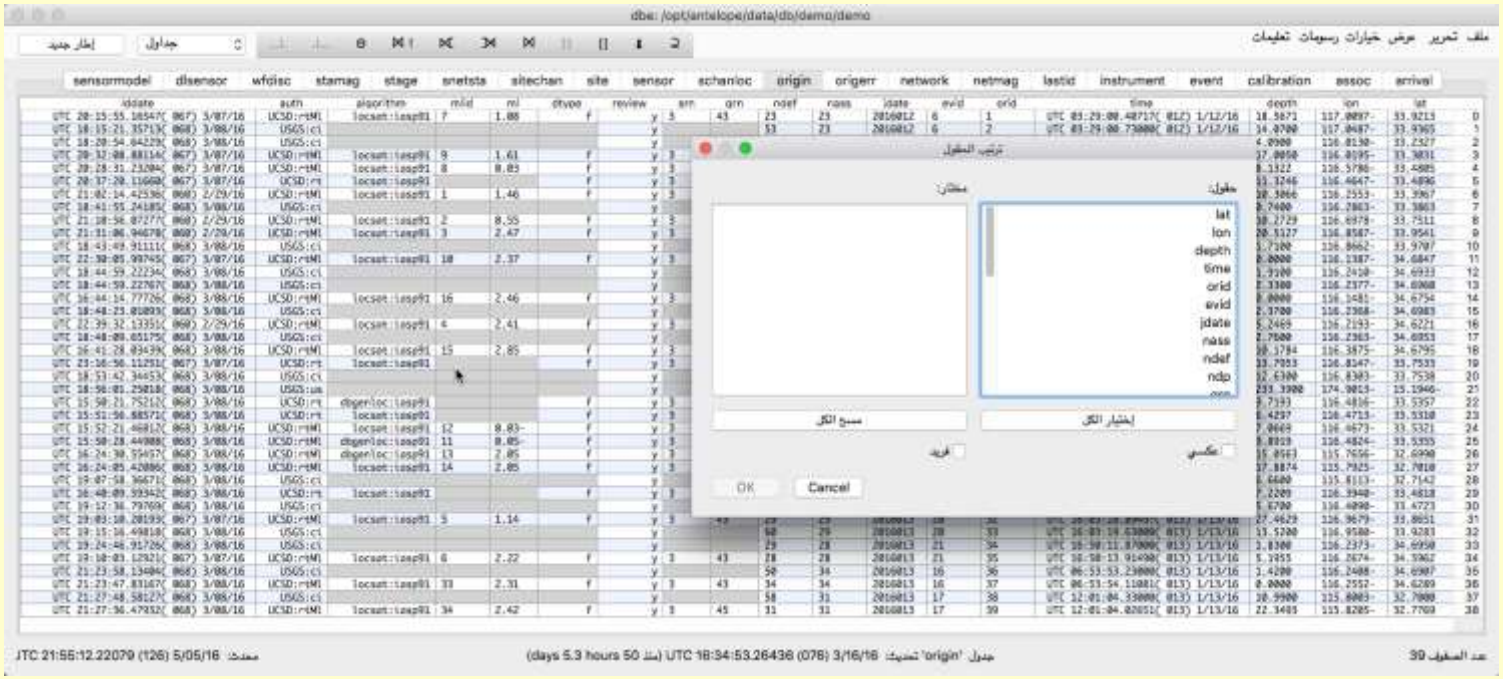
Grazie: Alessandra Papparelli

dbe: Chinese



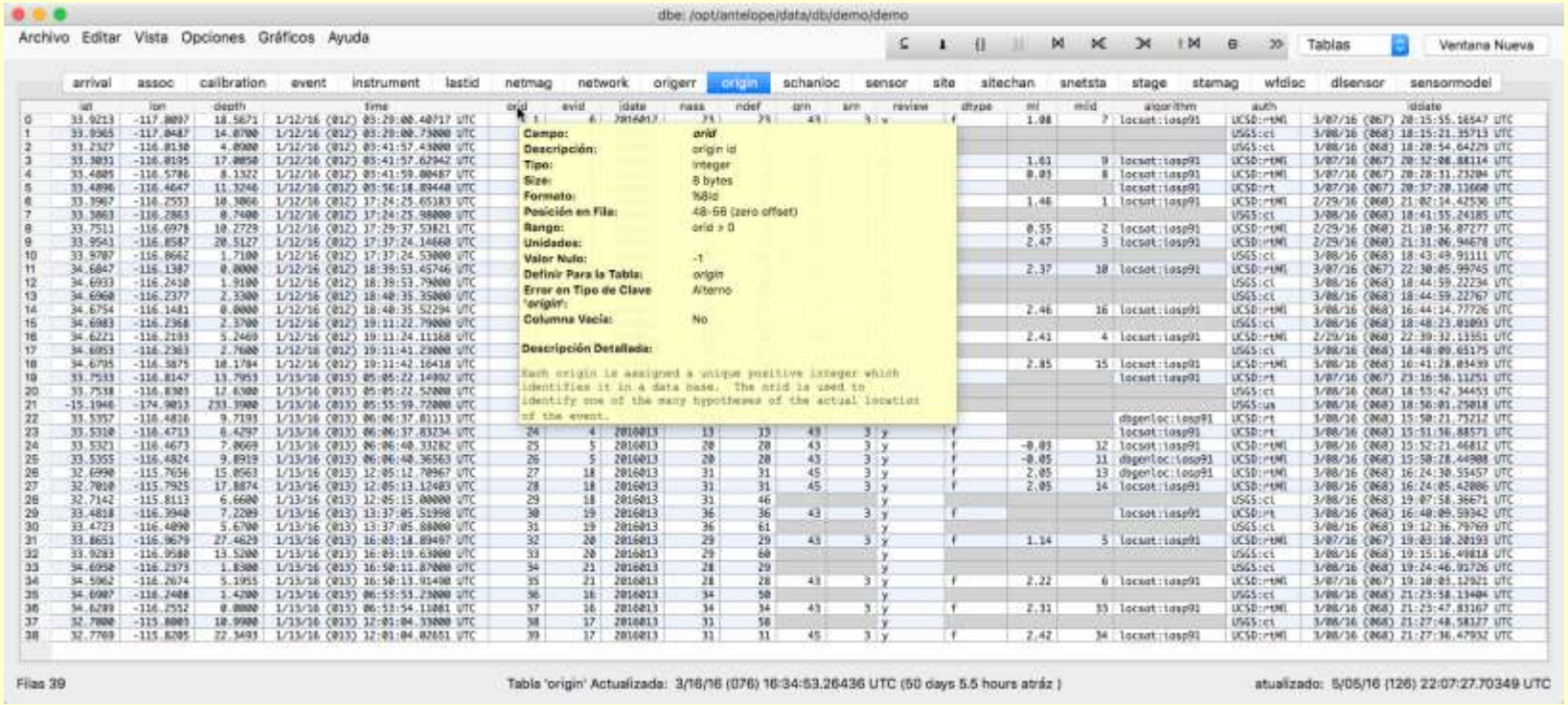
谢谢: Margaret Chen

dbe: Arabic



شكرا: Toufik Allili

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

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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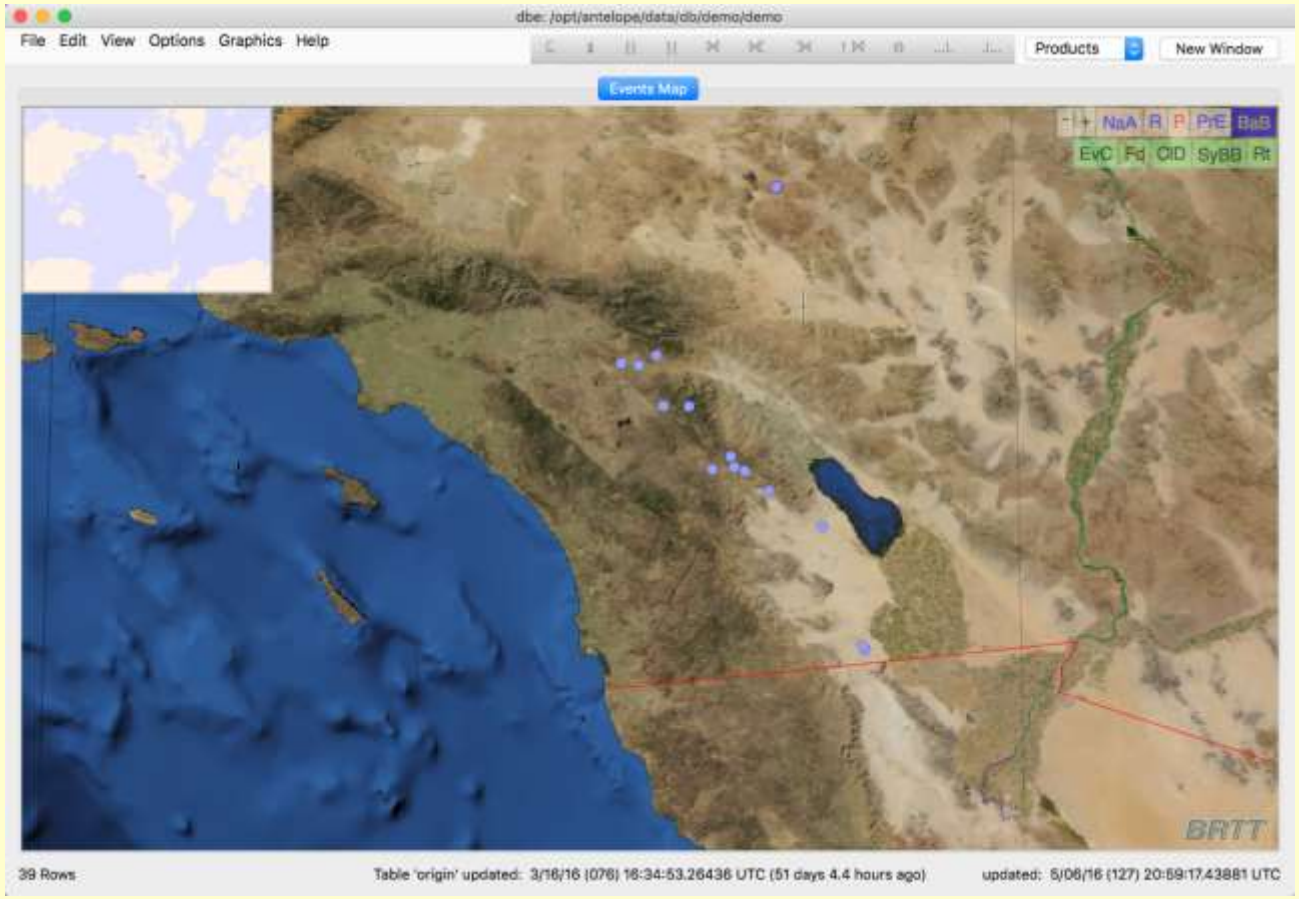
new demo database

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



Bighorn

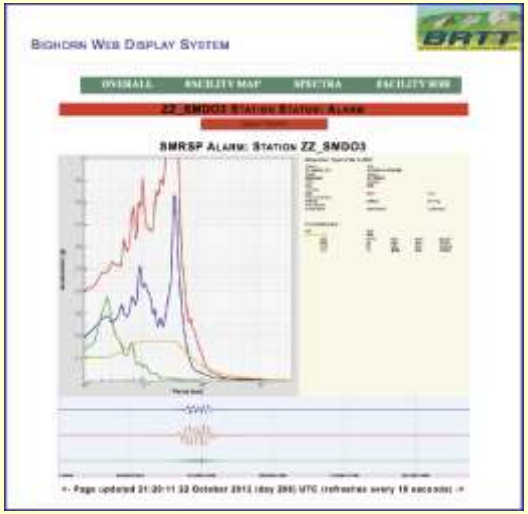
Bighorn

is now delivered at no additional cost with Antelope 5.6!

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

State-of-Health Monitoring

Bundled into Antelope 5.6

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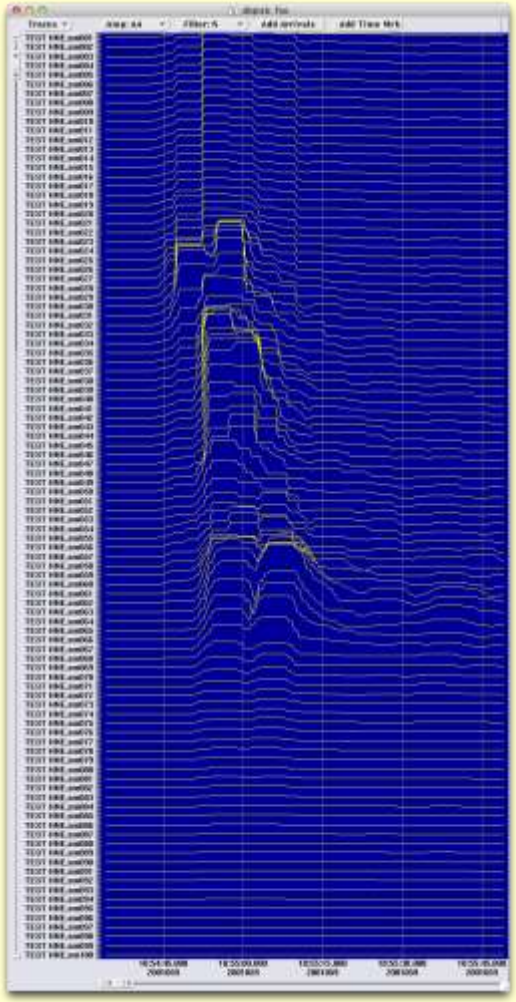
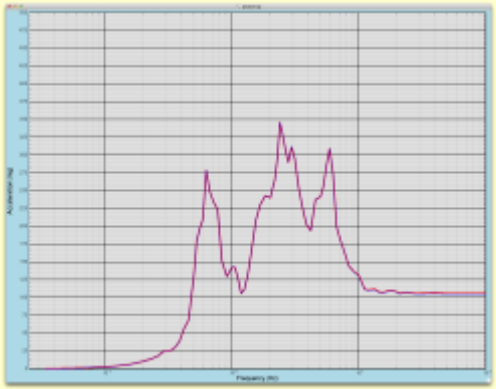
Bighorn

Multiple
Time-domain filters
Of incoming wavefield

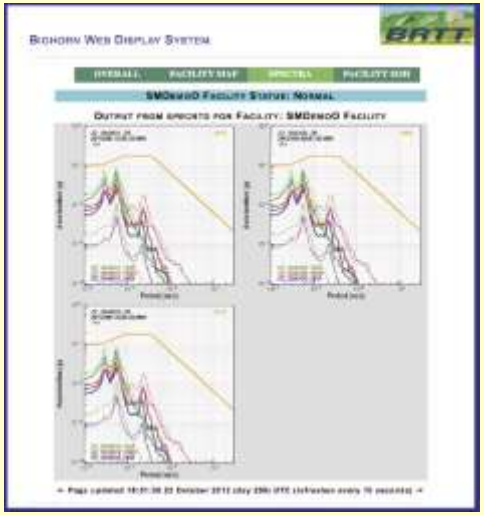


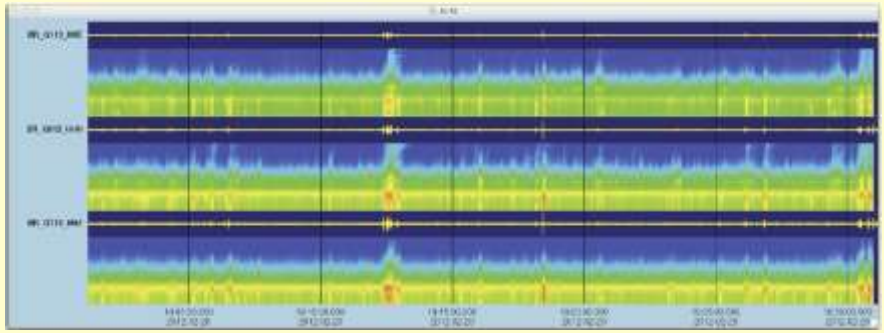
- Method vetted by Nuclear Regulatory Commission
- Faithful translation from
  - After-the-fact event-based review; to
  - Streaming, real-time, continuous now-casting



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

-> Synthesize
Real-time
Spectral
Calculations





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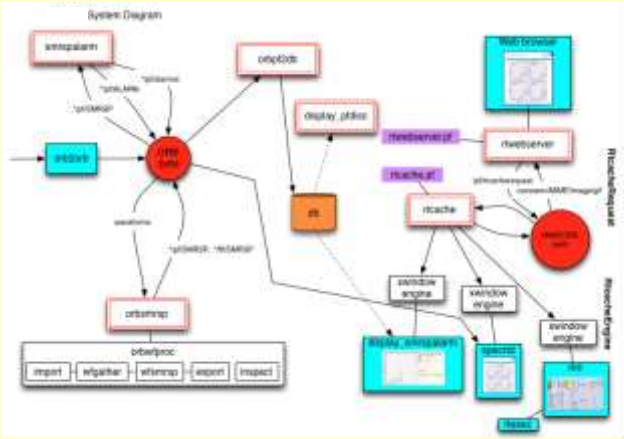
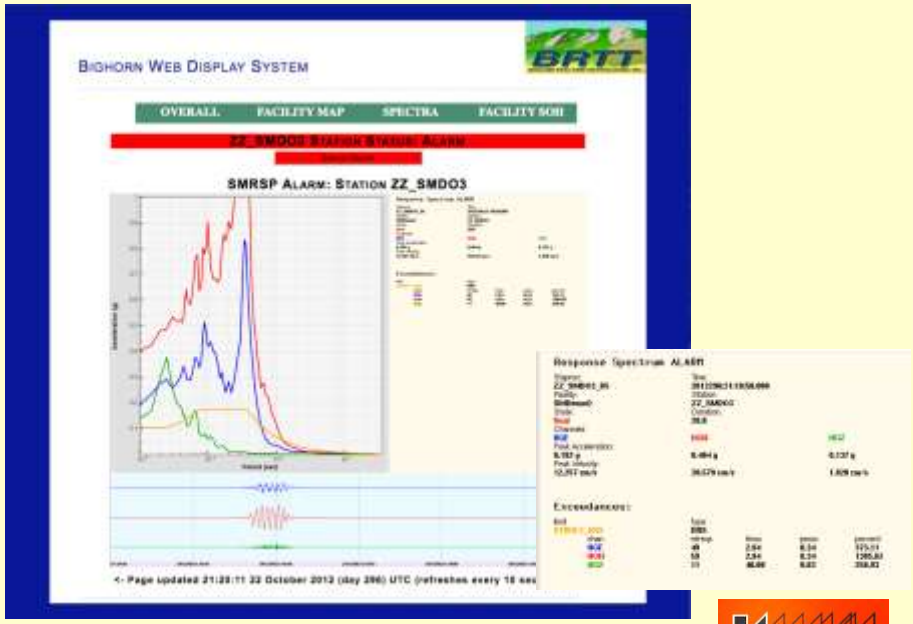
Bighorn

- 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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