Ground-Motion Estimation:
Antelope tools and possibilities

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Dr. Kent Lindquist

Lindquist Consulting, Inc.

Goal

Understand the true 2D ground motion right after an earthquake

Ideal Solution: Measure It!

One station every 20 km

A Note on Terminology

- Nobody invented ground motion
- Earthquakes happen…
- …The ground shakes.
- Estimating:
  - Exactly how much…
  - Everywhere…
  - …is complicated.
- Generic term: Ground Motion Estimation (GME)
- Research field with Operational requirements

Ideal Solution: Measure It!

One station every 20 km

Antelope and Ground-Motion: Two Current Approaches

- The dbgme approach:
  - Entirely Antelope-based
- The ShakeMap™ approach:
  - U.S. Geological Survey ShakeMap™ code
  - Antelope processing substrate
  - Linkage code

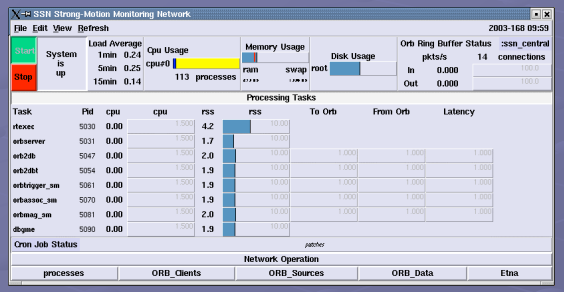
Current Users

- The dbgme approach:
  - SSN
- The ShakeMap™ approach
  - U. of Alaska, Fairbanks
  - U. of Nevada, Reno
  - Differing architectures
- And
  - ???
  - Others potentially interested

Tool sets

- The dbgme approach:
  - Dbwfmeas / orbwfmeas
  - Dbgme
  - Dbgme_show
- The ShakeMap™ approach
  - ShakeMap™ conglomerate calc/display software
  - Dbwfmeas, orbwfmeas or alternative (?)
  - Db2shakemap_xml
  - Make_shakemap_qtm
  - Shakemapgrid2cggrid
  - Shakemapxml2db
  - Other ad-hoc solutions?

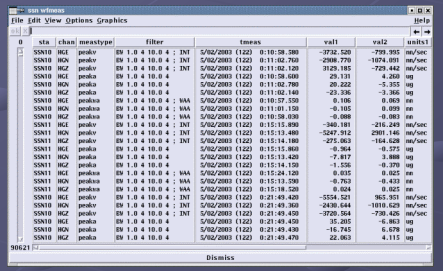
Dbgme
Real-time System Context



Orbserver

orbwfmeas

wfmgme table



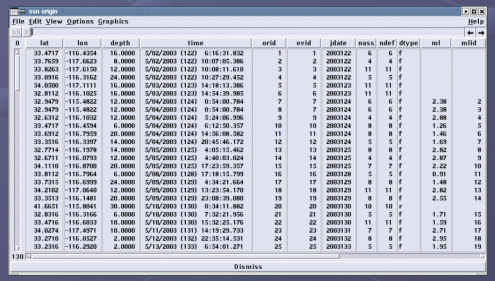
dbgme

orbdetect

orbtrigger

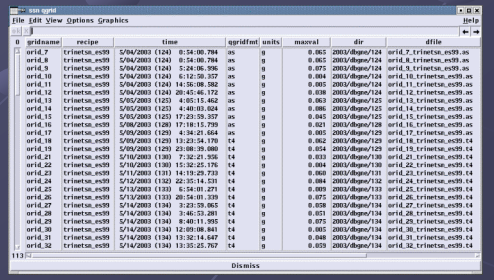
orbassoc

orbmag



origin table

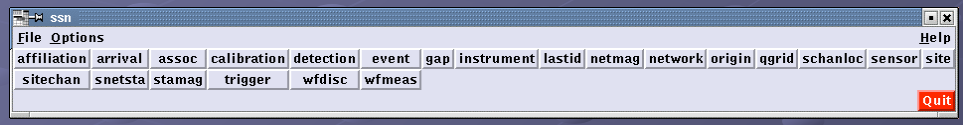
gme1.0: qgrid table



Dbgme structure

- One parameter file: recipes

dbgme



Dbview, parameter file

recipe1 recipe2 recipe3 trinetsm_es99

Delegate A | Delegate B | Trinetsm_es99

cggrid2db()

Delegates: C, Matlab, Shell

Strengths

- The dbgme approach:
  - Strong, clean architecture
  - Complete integration with Antelope
  - Complete separation of computation, presentation
  - Algorithmic extension mechanisms
- The ShakeMap™ approach
  - More sophisticated models
    - Extended source
    - Uncertainties
  - Scenario earthquakes
  - More web displays

Weaknesses

- The dbgme approach:
  - Not as much sophistication in existing delegates
  - Extension mechanism hasn't been used except by author
  - Not as many web tools have been written to date
- The ShakeMap™ approach
  - Complicated and expensive to configure and run
  - Computation and presentation are tangled
  - Linkages to Antelope are
    - limited
    - need work
    - Ugly problem

GME: What Next?

- Rewrite of dbgme ??
  - Danny Harvey's embedded-perl approach
  - Similar to new magnitude-computation
  - Flexible, user-controlled research and operations tool
- Links with new web tools ??
- Coordination with ShakeMap™ ??
  - Optional cast as slave to new dbgme; or
  - Re-engineer ShakeMap™ linkages independently
- Programming tasks:
  - Significant effort
  - Must be approached in architectural context
  - tractable
- Needs community support
- Feedback welcome!