Scalable platform for geophysical data analysis and visualisation
Why?

Leveraging data interoperability to enable online interactive processing platforms

Data availability
- Data initiatives
- Interoperable services

Natural progression
- Applications and toolkits
- Algorithms availability and integration
Feature richness vs Usability

• Hand-crafting control files and inputs
• Setting the environment
• Compiling codes
• And then...

$WIGLAF_MPIEXEC -np $WIGLAF_NP $WIGLAF_BIN/lsqmod -f0 ${wdir}/priormod.bin -f1 ${wdir}/observed.bin -f2 ${wdir}/priormod.bin -f3 ${wdir}/Lpi.bin -f4 ${wdir}/Cdi.bin -f5 ${wdir}/weights.bin -f6 ${wdir}/lsqmod.bin -tao_type ntr -tao_gatol 25.0 -tao_grtol 0.1 -tao_stepTol 0.01 -tao_max_it 10 -tao_view -malloc_dump

Don’t we all hate doing this?
Geophysical Processing Toolkit

Our candidate

- Data-intensive processing
- Compute-intensive processing
- Multi-dimensional data sets that benefit from interactive visualisations
- Routinely performed survey processing
- Costly commercial options
Geophysical Processing Toolkit

Remote detection and measurement of the electrical conductivity structure of the subsurface:

- Green- or brown-fields exploration for minerals
- Groundwater detection
- Environmental
- Geo-technical applications

Spatially and temporally dense AEM data sets:

- Ranging from 1000 km to tens of thousands of km
- Sounding stations are taken every 0.2 seconds
- About 30-50 measurements taken at each site

Which translates to:

- Millions of individual stations of data, with tens of millions of measurements

*through geophysical inversion for conductivity-depth information*
Capabilities

Browser-based
Desktop- or Cloud-hosted
Interactive visual analytics tools
Signal processing
Integrated inversion codes

See our demo →
Researcher-focused interactivity

• Multi-view interactive dashboards
• Interactive data visualisations
• Integration with signal processing codes
• Integration with forward modelling and inversion codes
• Complete scientific workflows:
  • Data processing / filtering / optimisation
  • Data QA/QC
  • Modelling, geophysical inversions
Toolkit architecture

Cloud-hosted user application
Cloud data storage
Multiple processing workers deployed in a variety of environments
Another Case Study:
Data Mosaic
Same framework, different skin
Data Mosaic

- One month sprint
- Python code, taken as is, packaged in a container:
  - Easily updatable / re-deployable
- Simpler server-side rendered visualisations
- Angular-based client application
- Cloud-hosted (storage/compute)
Where to next

Data integration
- Missing data
- Converters and optimisers
- Development of a new NetCDF metadata standard for geophysical applications

Scientific application store
- Publications and versioning of algorithms/modules
- Workflows integration
- Python notebooks, R, etc.
- Payment system / billing
Where to next

Platform-level interoperability

Deployment options — from desktop to the Cloud
Scalable on-demand deployments
Software Development Kits (SDKs) and Application Programming Interfaces (APIs) for future extensions
Online processing platform concept
Thank you

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