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Experiments on Splitting User Interface and Data Handling in Diana

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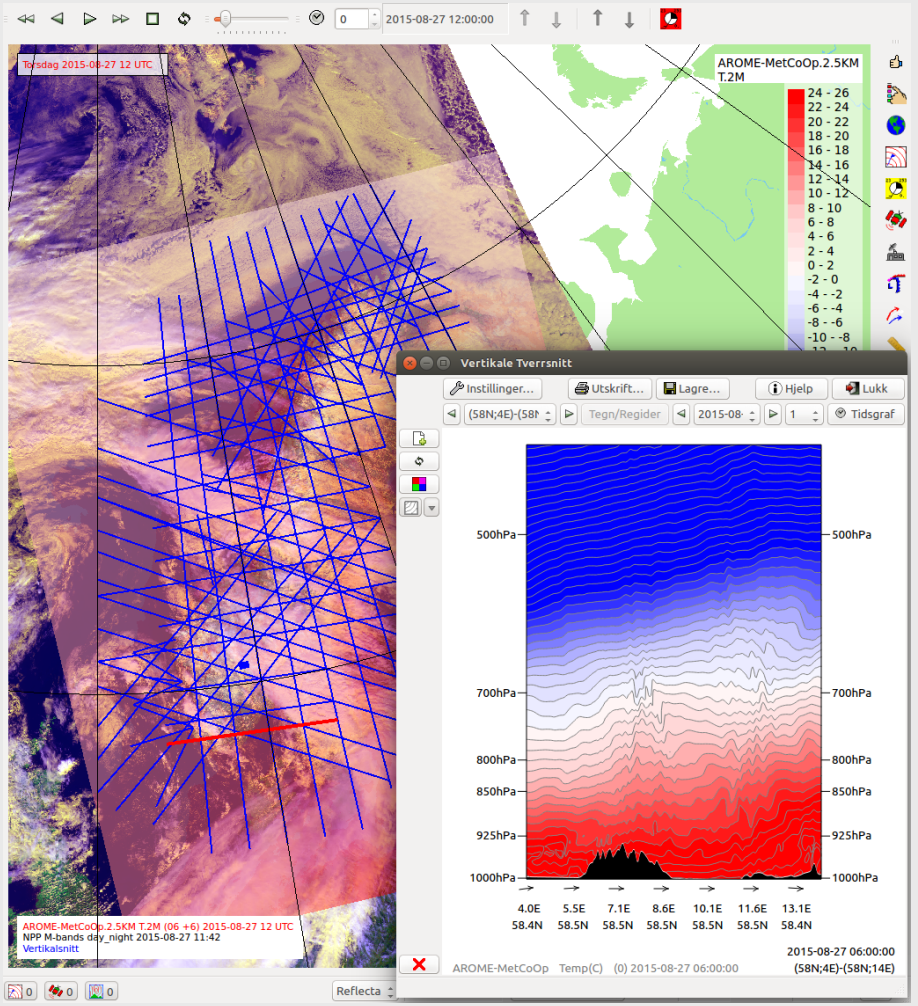
Digital Analysis

- meteorological workstation software
  - MET Norway, SMHI, …
  - forecasters + researchers
  - GUI and batch versions
  - perl interface
- implemented using C++ + Qt
- open source: github.com/metno/diana
- connected to other forecaster applications via network protocol
  - ted, modfly, mimage, …



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Handling huge model outputs

- model size is continuously increasing
- forecasters cannot wait
  - pilots or journalists want answers now
  - efficiency has to increase
  - waiting is boring and annoying

Today, everything is remote

- complete diana application runs remotely on dedicated servers
  - VirtualGL + ssh
  - slow startup, big latency for GUI elements
  - difficult integration (sound, printers, “disk”)
  - everything breaks when the ssh tunnel breaks
  - it can hang because of network, io, bug

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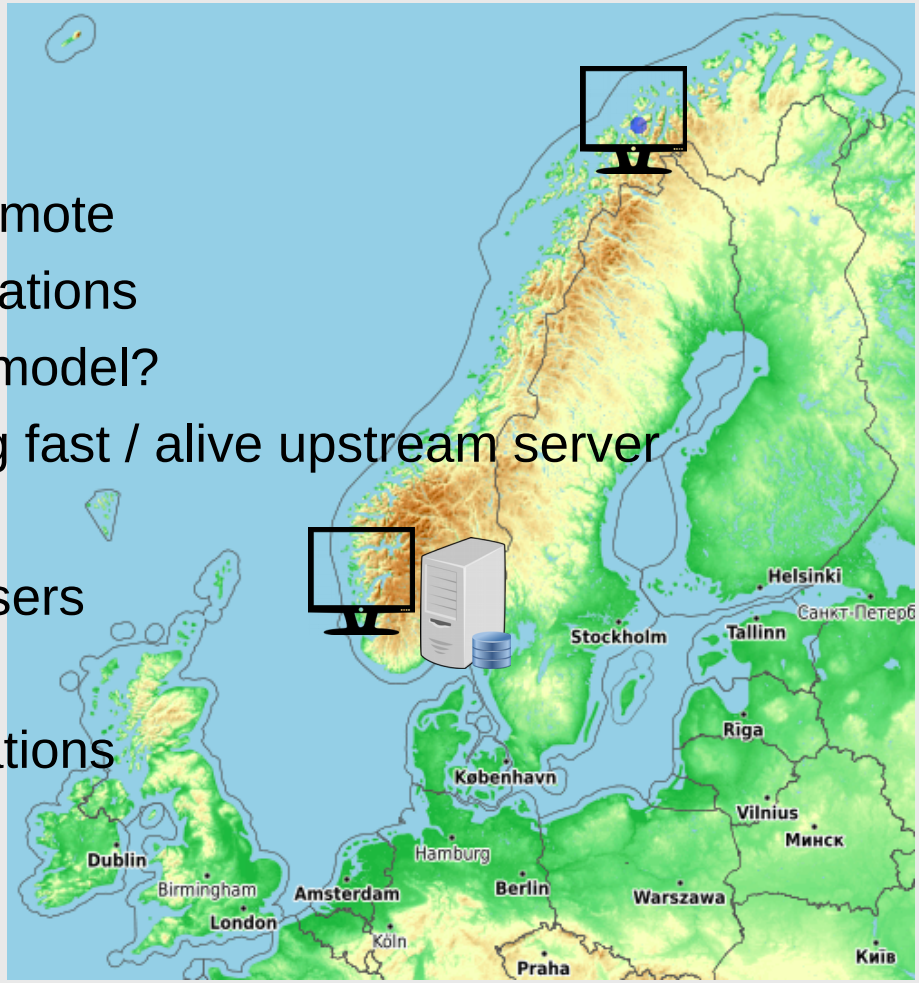
Partly local, partly remote?

- idea: split
  - GUI local
  - data servers (possibly) remote
- many possible server configurations
  - several servers, one per model?
  - caching proxies, selecting fast / alive upstream server
  - …
- one server handles multiple users
  - better caching
  - fewer reprojection calculations
  - …



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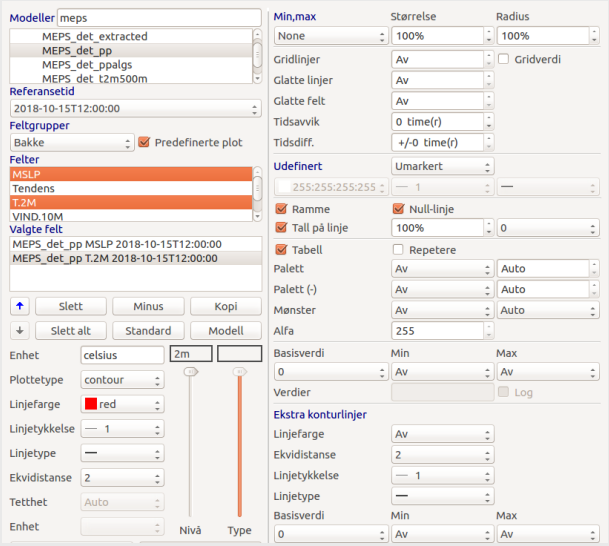
Why not WMS / WPS / …?

- typical use
  - either **known** model + reference time + field + style
  - or **step by step** model, reference time, field, style
- WMS: huge capabilities document
  - 50 models
  - each has 20 reference times
  - each has 50 fields
  - (each field has 50 style options)
  - 50000 layers
  - how often to reload?
- WPS: maybe, later
- possibility for WMS/WPS frontends
- evolution not revolution, for now
  - stay close to current implementation for the experiment



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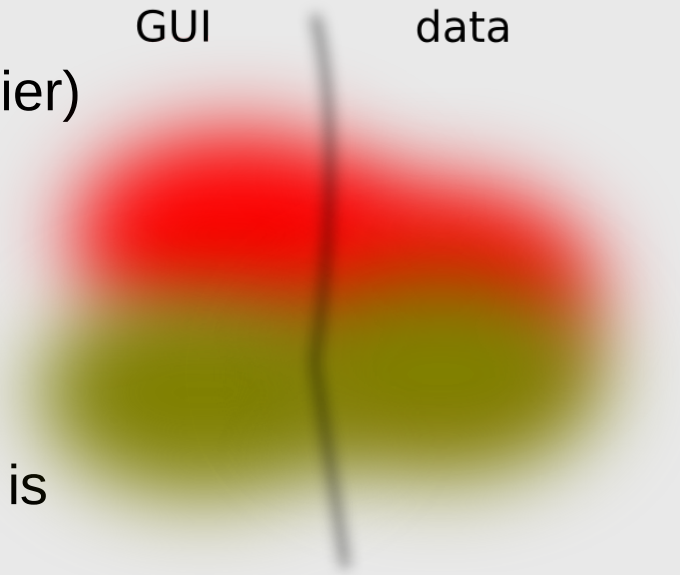
All beginnings are difficult

- Diana is not “new” (born 1999 or earlier)
- lots of good stuff
- lots of mixed responsibilities
- lots of preparations before starting splitting-ui-and-data experiment
  - even if the experiment fails, this is good



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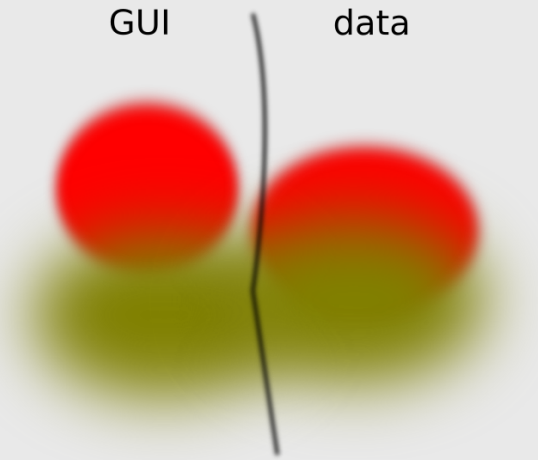
Experiments so far



- restricted to model data (FIELD)
- one client, multiple servers
  - serving data or images
- fetching data / images in multiple threads
- some challenges
  - requirements: “as now or similar in every detail”
  - lack of tests
  - multi-threading problems
- based on GRPC – simple, but not good for our purpose

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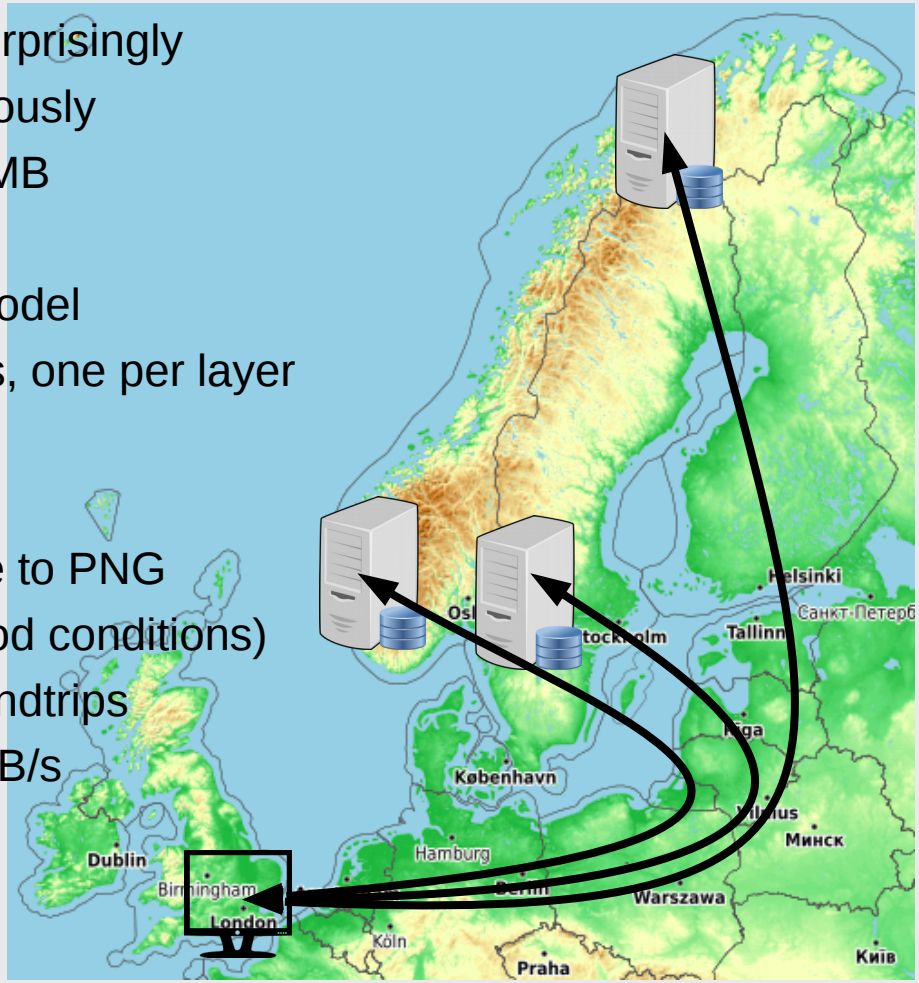
Preliminary results

- it works, somehow and sometimes, surprisingly
- display size is also increasing continuously
  - 2kx2k pixel ARGB32 image = 16MB
    - 0.16s on a 100MB/s network
  - might be smaller or larger than model
  - 1 field might need several images, one per layer
  - 1 field needs data only once
- some things are slow
  - 30ms or more to compress image to PNG
  - 24ms latency Oslo – Tromsø (good conditions)
  - must fetch in parallel, without roundtrips
- very slow but still functional over 200kB/s
  VPN – WLAN – Oslo – Tromsø – Oslo



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Side effects & future

- possibility for different clients
  - WMS server might use diana data servers as backend
  - lightweight client might offer a simplified user interface
- possibility for different servers
  - servers in multiple data centers
  - servers coming and going
    - serve from data center until model results are copied, then switch to “local” server
  - servers in other languages than C++
  - servers doing some processing
- diana application does not die if the network is slow or broken
- need to solve some issues before testing
- need to evaluate possible optimisations