Interactive visualisation and fluent animation of meteorological data in an operational web application based on WMS

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What this presentation is about

• METFROG
  The weather visualisation system at the air traffic control in Germany: Deutsche Flugsicherung (DFS)

• Challenges and best practices handling web-based WMS clients with large amounts of data
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- IT solutions und services since 1995
- Core-Area
  - Visualisation of weather related data in 2D/3D
  - Broadcast Computer Graphic
  - Automated document generation
  - Meteorological workstations
  - Processing of meteorological and geographical data
Requirements for the development of METFROG

- Interactive, multi-layered meteorological workstation
- Browser-based application
- Smooth animation of meteorological data
- Based on open standards
- Completely configurable and extendable within browser
- Handling has to be very simple
Challenges in design and implementation

• Handling large amounts of data
• Handling time-variant, resolution dependant and multi-source data
• Achieving a high performance despite many separate layers
• Fluid animation of multiple WMS layers
Available data in METFROG [1/2]

- Geographical data
  - Air control zones
    - approach sectors, control sectors, etc.
  - Airport
    - runways, airport locations, etc.
- Background images
  - height map, HR satellite images, OpenStreetMap, etc.
- Ground-data
  - streets, city names, borders, rivers, etc.
- Etc.
Available data in METFROG [2/2]

- Time-variant meteorological data:
  - Raster based data
    - radar images
  - Modell output
    - wind: [resolution dependant, multi-source]
  - Vector based data
    - storm cell tracking and prediction
  - Point data
    - lightning, METAR: [resolution dependant]
  - Etc.
Challenges in visualising large amounts of data in a browser [1/3]

• METFROG provides ~80 WMS-Layers thereof ~20 time variant

• A typical map in METFROG consists of 10 to 20 WMS layers, visible at the same time
Challenges in visualising large amounts of data in a browser [2/3]

- Trade off between high server-load (single-tile) vs high client-load (tiled)
- One layer sends between 6 and 30 WMS requests for an update, depending on screen resolution and tile-size

- Typical amount of requests in METFROG...
  - … for a map @ 1280x1024: ~100 tiles (each 1024x1024px)
  - … for an animated frame @ 1280x1024: ~30 tiles (each 1024x1024px)
Challenges in visualising large amounts of data in a browser [3/3]

• Common pitfalls
  • Images in the browser cache are not instantly available
  • Many parallel requests to a server do not scale well
Approaches to optimise handling and animation

- Intensive use of caching
- Efficient request management and layer handling
- Using HTML5 features can vastly improve performance and memory footprint
Experiences using WMS for animating meteorological data

- Without optimisation an animation takes 1-5 seconds per frame
  - Animation is not usable at all

- With optimisation an animation can display up to 20 frames per second, even on low-end hardware
  - Animation runs very smooth
Demo
Thank you for your attention

For further Information please visit our website at http://www.askvisual.de or contact me via mail:

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