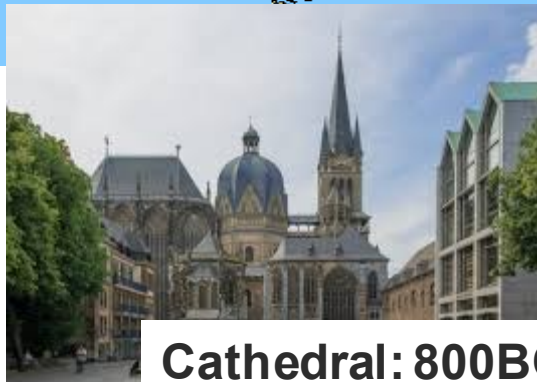
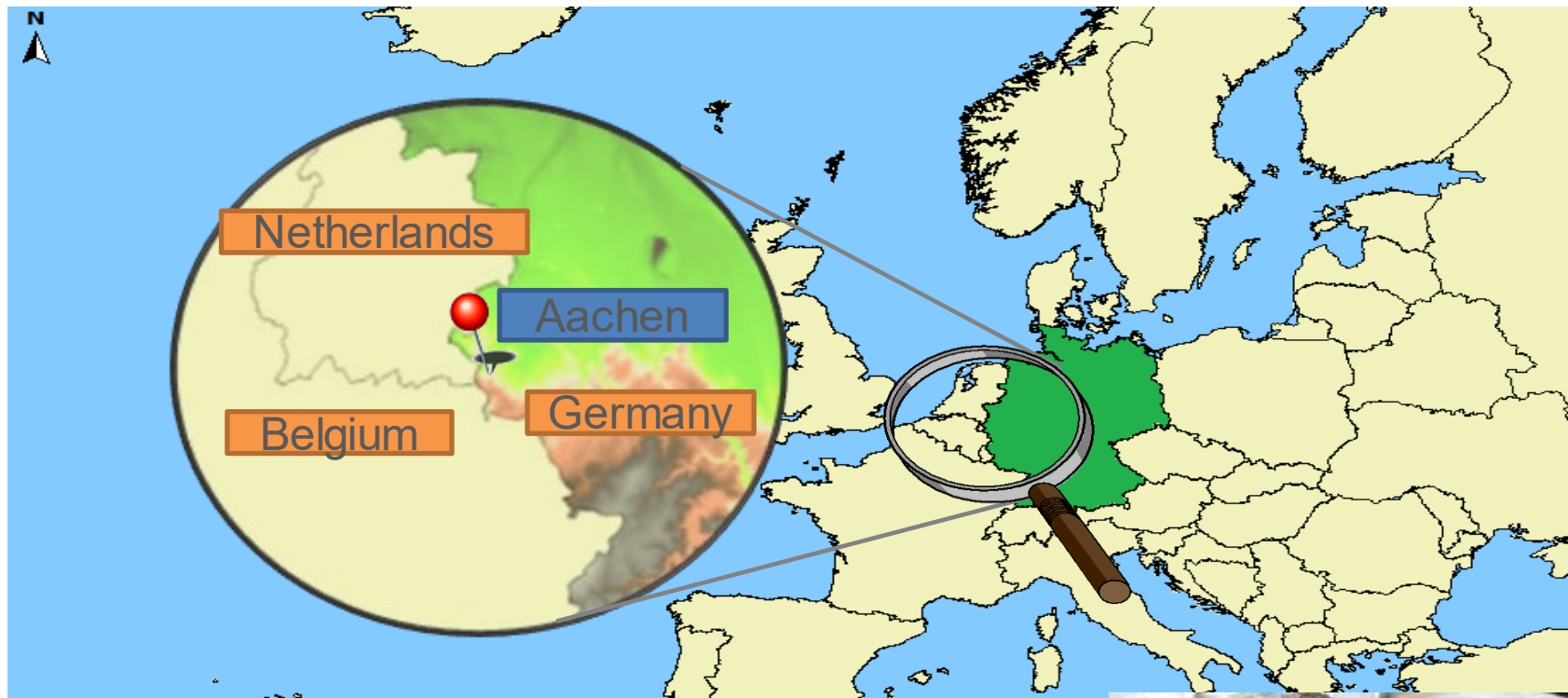


POP-Consulting at Hydrotec

Benedikt Rothe

POP Workshop



Cathedral: 800BC



Charlemagne



Printen



RWTH Aachen University

- Water management
- Flooding
- Sewage water
- Planning and consulting
- About 60 employees
- Civil engineers + Software development
- Simulation: Hydraulics, Hydrology
- Geographic Information Systems, Database, Web

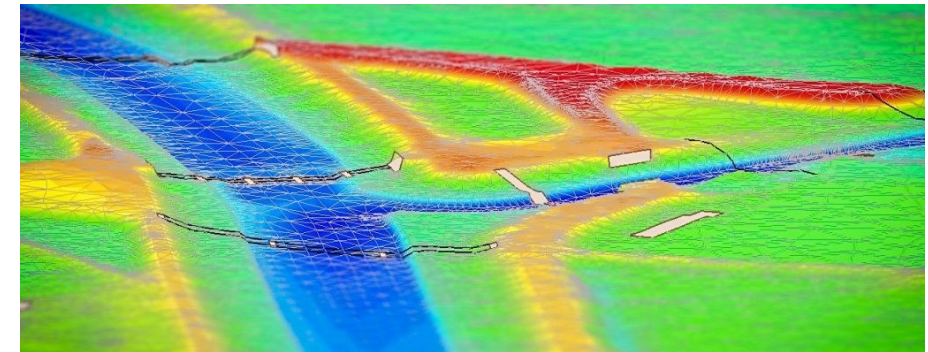
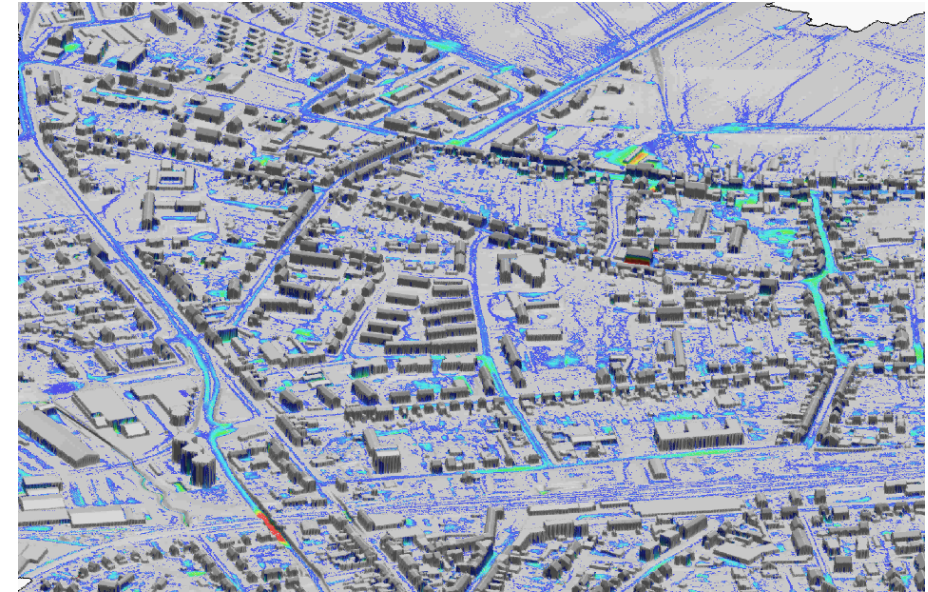
Our services:

Hydraulics and Hydrology	River Basin Management	Flood Protection & Warning	Software and Web development
			



Software products: Simulation of run-off and water-level

- HYDRO_AS-2D
- Input:
 - Ground elevation
 - Soil properties
 - Inflow, precipitation
- Output
 - Water level
 - Vectored velocity of flow
 - Timesteps
- Size of models:
 - Small: 10^5 nodes
 - Regular: $2 \cdot 10^6$ nodes
 - Big: 10^8 nodes
- Computation time: 30 minutes up to 2 weeks
- Kernel
 - Fortran
 - Windows, Linux



Our users: Water authorities, civil-engineering-offices of any size

- Water authorities
- Civil engineering company
 - Small model
 - Few occasional users in company
- Consulting engineering company (like Hydrotec)
 - Huge models
 - Users are modeling professionals
- Usage
 - Edit/create mesh and boundary conditions on Windows-Workstation
 - Computation on Windows- or Linux-Workstation
 - Process/present results on Windows-Workstation and in Web
- Samples
 - [River Erft](#)
 - [Urban Area Eppelborn \(Precipitation\)](#)

- Multithreading: Open MP
 - Intel
- GPU: Open ACC
 - Fortran extension - syntax like OpenMP
 - Conditional compilation -> One source for both flavors 😊
 - Experience: Less stable at different settings of customers (Code may not run on newest GPU...)
- For now, no MPI
 - User do not have access to Cluster machines
 - Avoid maintenance for additional code & software architecture
 - Lower priority than other topics ...

- ▶ Consulting by High Performance Computing group at IT-center: <https://www.itc.rwth-aachen.de>
- ▶ Fabian Orland and Julian Miller
- ▶ Results OpenMP
 - ▶ Memory Bound
 - ▶ Uncached IO
 - ▶ Enforce usage of SIMD
- ▶ Work was performed in Hydrotec office: One day/week for some month
- ▶ Great side-effects
 - ▶ Training/Advice on Intel-Tools
 - ▶ Sharing Profound understanding of Intel optimization and OpenMP
 - ▶ Support on OpenACC-problems: Profound understanding of OpenACC insides
 - ▶ Talks on algorithmic aspects
- ▶ Beyond specific advice on HYDRO_AS-2D → Increase general knowledge at Hydrotec
- ▶ Whish: Stay connected with High Performance Computing group at IT-center