Meet Aquasar:

A first a kind hot-water cooled supercomputer
Aquasar was born from a process of innovation and...
... because Mother Nature and clients demanded it.

- **FINANCIAL:** Rising global energy costs/ Shrinking IT budgets / IT capability does not align with business plan

- **OPERATIONAL:** Proliferation of IT technology in the data center, the Age of Cloud Computing is growing

- **ENVIRONMENTAL:** Large carbon footprint and poor corporate image on energy consumption are of growing concerns
Where does all the energy go?

ICT industries consume 2% world wide energy supply

Brouillard, APC, 2006
Aquasar Timeline

2007
IBM scientists develop concept of a zero emission data center

2008
The concept is unveiled for the first time at Cebit in Hannover, Germany, to positive reviews

2009
ETH and IBM announce plans to build Aquasar, a water cooled supercomputer and directly repurpose excess heat for the university’s buildings

2010
Aquasar comes to life for the first time in front of dozens of reporters at ETH
First Aquasar Prototype

- Reduced cooling energy with 60°C water cooling
- Reuse waste 60°C heat for remote heating
- Built using standard IBM Blades
Water-Cooled IBM BladeCenter HS22

Credit: IBM Research – Zurich
What’s next?

Today’s Microchips

**Cables:** The cores are placed next to each other and communicate via interconnected cables.

**Cores:** this design consumes a lot of energy and heat.
What’s next?

Tomorrow’s 3D Microchips: Less Energy, Less Heat

**Cores:** the cores are no longer side by side, but stacked vertically

**Channels:** as thin as a human hair, the channels fill with the coolant liquid and traverse the 3D chip to maintain an operating temperature
Summary

- Chip cooling technology needs to be combined with current computers in a more intelligent way

- Centralized computing more efficient and emission free

- Concept can scale to large data centers

- Aquasar Live:
  - Reduce emission by 85% through heat re-use on ETH campus
  - Save 40% of energy and through reuse reduce energy costs by more than 2x
  - ROI in 18 months

- Solution for Climate and Energy Grid Challenges