



Das Deutsche
Klimarechenzentrum (DKRZ)

German Climate
Computing Center

Hamburg, Germany

Deutsches Klimarechenzentrum (DKRZ)

Provides the German climate research community with compute, storage, and support

- Operated as a non-profit limited company since 1987
- Share holders
 - Max Planck Society, City of Hamburg, 2 others
- About 120 employees
- CEO Thomas Ludwig also professor at Universität Hamburg
 - Focus on high performance storage

38 Years of Computer and Storage Systems (1987-2026)



1985: Control Data
Cyber-205

- 1 processor
- 0.2 Gigaflops
- 0.03 Gigabyte memory



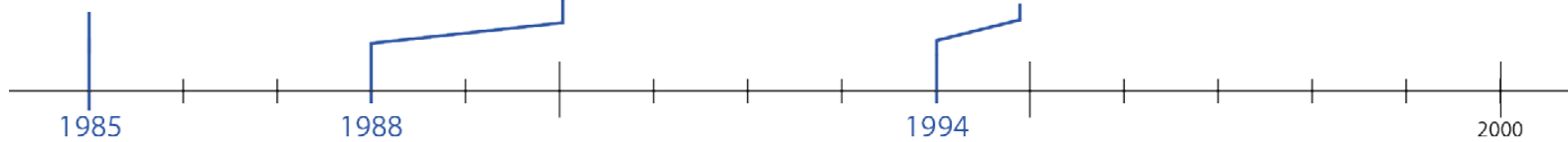
1988: Cray 25

- 4 processors
- 2 Gigaflops
- 1 Gigabyte memory



1994: Cray C-916
„Sea“

- 16 processors
- 16 Gigaflops
- 2 Gigabyte memory
- 128 Gigabyte disc space
- 10 Terabyte tape archive



2002: NEC SX-6
„Hurrikan“

- 192 processors
- 1.5 Teraflops
- 1.5 Terabyte memory
- 60 Terabyte disc space
- 3.4 Petabyte tape archive



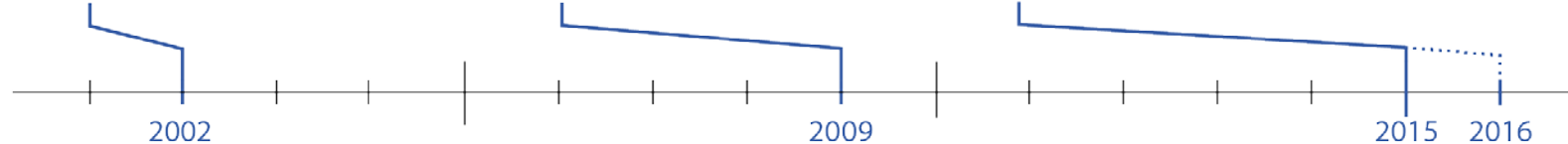
2009: IBM Power6
„Blizzard“

- 8500 processors
- 158 Teraflops
- 20 Terabyte memory
- 6 Petabyte disc space
- 60 Petabyte tape archive



2015/16: bullx B700 DLC
„Mistral“

- **>100,000 processor cores**
- **3.6 Petaflops**
- **240 Terabyte memory**
- **54 Petabyte disk space**
- **up to 500 Petabyte tape archive**
120 PetaByte are used



Performance Improvement with last Procurements

- NEC -> IBM [2009]: around 100x
- IBM -> Mistral (Bull) [2015]: around 25x
- Mistral -> Levante (Bull) [2022]: around 3.5x
- Levante -> next generation (Bull) [2028]: around 1x

Reasons

- Stalling miniaturization
 - Transistor size close to physical limits
 - Hardly any progress in speed and energy efficiency
- Rising inflation
 - Around 20% in 6 years and no compensation for DKRZ
- Rising prices with AI hype
 - AI gold rush pushes hardware prices
- If you want more compute power, raise investment
 - Difficult for non-profit research organizations

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Reasons until 2022 and after

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Alternatives

- Explore new ways
 - Use machine learning with scientific knowledge gaining
 - Look for new hardware like e.g. quantum computers

To be discussed now...