Isambard:
the world's first production Arm-based supercomputer

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Isambard PI

University of Bristol / GW4 Alliance

University of BRISTOL

http://gw4.ac.uk/isambard/

GW4

'Isambard' is a new UK Tier 2 HPC service from GW4

University of BRISTOL

UNIVERSITY OF BATH

UNIVERSITY OF EXETER

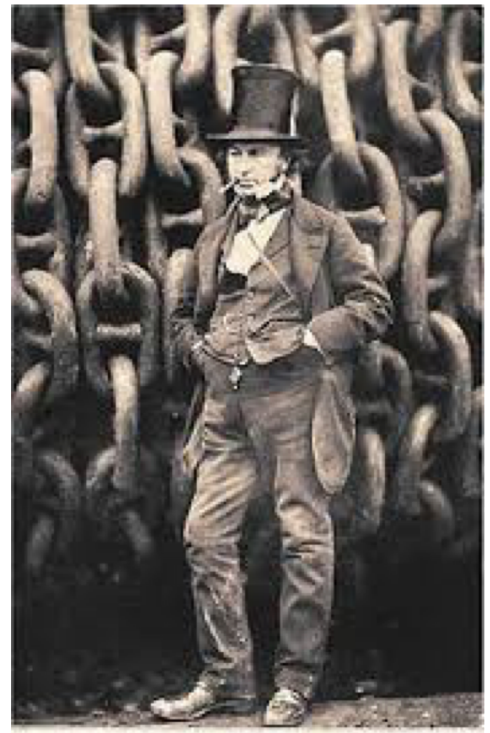
CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Met Office

EPSRC

CRAY
THE SUPERCOMPUTER COMPANY

ARM



I.K.Brunel 1804-1859

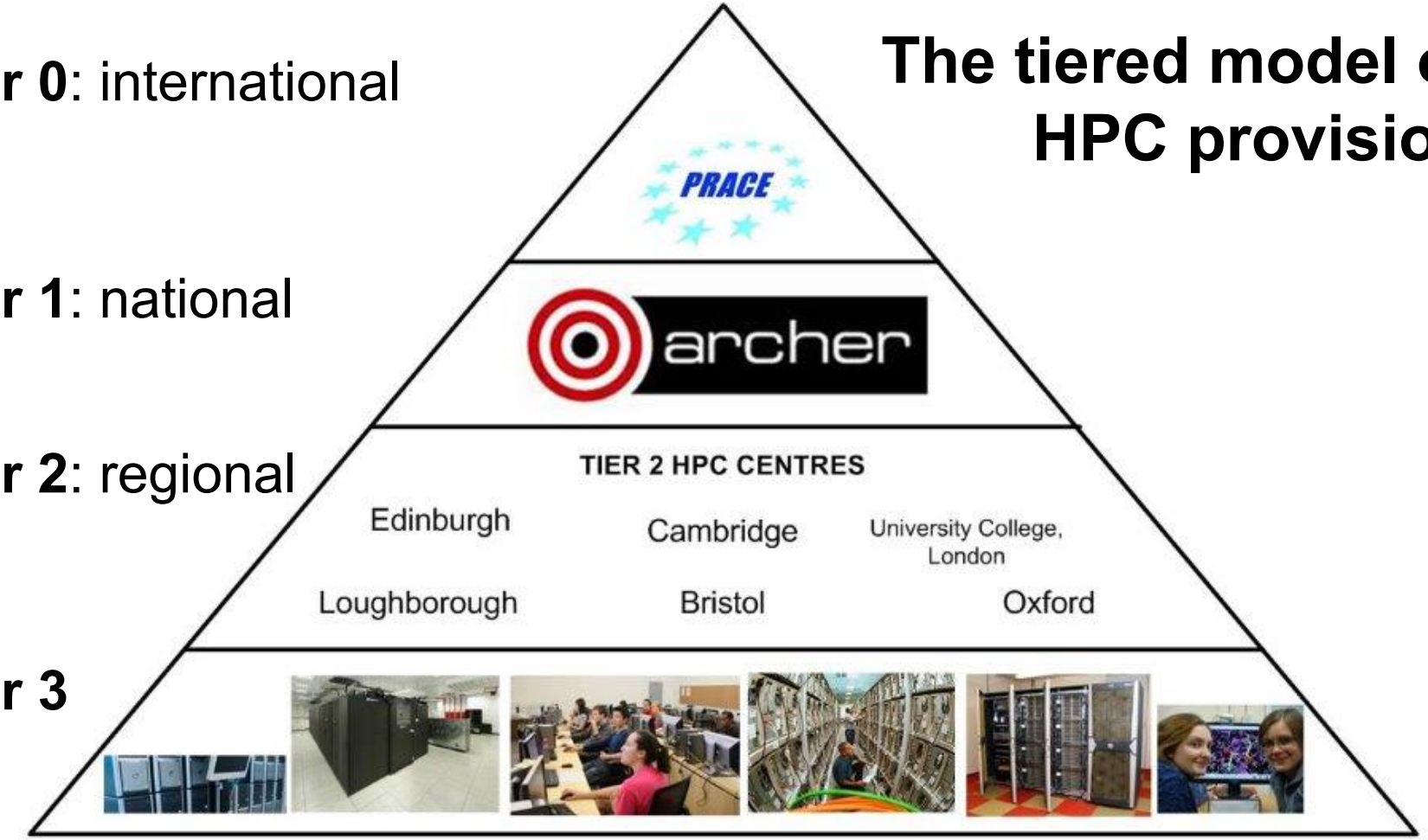
The tiered model of HPC provision

Tier 0: international

Tier 1: national

Tier 2: regional

Tier 3



Isambard system specification

- **10,000+** Armv8 cores
  - **Cavium ThunderX2 32core 2.1GHz**
- Cray XC50 Scout form factor
- High-speed **Aries** interconnect
- Cray HPC optimised software stack
- **Technology comparison:**
  - **x86, Xeon Phi, Pascal GPUs**
- Phase 1 installed March 2017
- Phase 2 (the Arm part) arrives July 2018
- £4.7m total project cost over 3 years

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Isambard's core mission: evaluating Arm for production HPC

Starting by optimizing the top 10 most heavily used codes on Archer

- **VASP**, **CASTEP**, **GROMACS**, **CP2K**, **UM**, HYDRA, **NAMD**, **Oasis**, **SBLI**, **NEMO**
- Note: 8 of these 10 codes are written in FORTRAN

Additional important codes for project partners:

- **OpenFOAM**, **OpenIFS**, WRF, CASINO, LAMMPS, …

RED = codes optimised at the first Isambard hackathon
BLUE = codes optimised at the second hackathon

Isambard progress to date

- 8 early access nodes delivered mid October 2017
- We've been able to compile and run most of the hackathon codes "out of the box"
- Been using Cray CCE, GNU and Arm Clang/Flang/LLVM toolchains
- Our systems were upgraded to B0 beta silicon in late Feb 2018, firmware updated at the same time
- Performance already looks very exciting
  - We released A1 single socket benchmark results at SC17
  - First dual socket B0 results released here at CUG 2018!

Exciting times ahead!

- Early results show **ThunderX2 performance is competitive with current high-end server CPUs,** while **performance per dollar is compelling**
- The full Isambard system is due to be installed in July 2018
- Aiming to be online and open for science by the end of the summer
- The signs are that Arm-based systems are real alternatives for HPC

For more information

- Bristol HPC group: https://uob-hpc.github.io/
- Isambard: http://gw4.ac.uk/isambard/
- Twitter: @simonmcs
- Full paper: **Comparative Benchmarking of the First Generation of HPC-Optimised Arm Processors on Isambard**
  S. McIntosh-Smith, J. Price, T. Deakin and A. Poenaru, CUG 2018, Stockholm