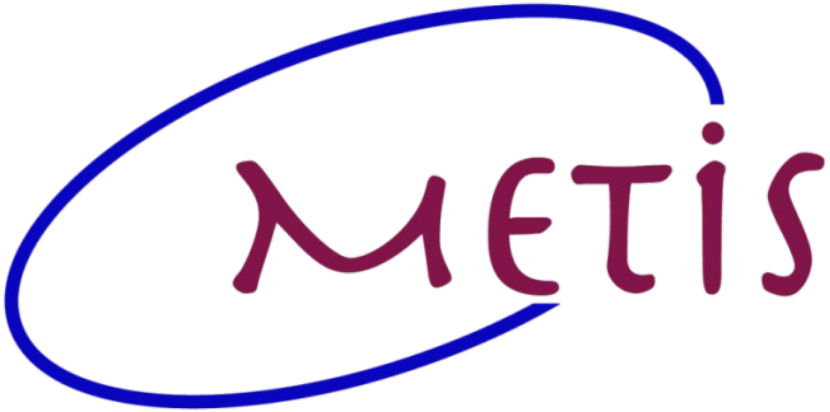

METIS SCAO HRTC Platform

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centra
center for astrophysics and gravitation

Science and Technology Facilities Council
UK Astronomy Technology Centre

Outline

- METIS SCAO HRTC performance requirements
- Hardware
- Performance evaluation
- Maintenance: Obsolescence

HRTC performance requirements

RTC = SRTC + HRTC (ESO ELT concept)
HRTC: **H**ard **R**eal-**T**ime **C**ore runs the wavefront control loop.

WFS ROI	192 x 186
WFS pupil size	93 x 93
#Subapertures	6785
WFS detector readout speed	1 kHz
RTC computation time limit	909 us
# actuators	5318

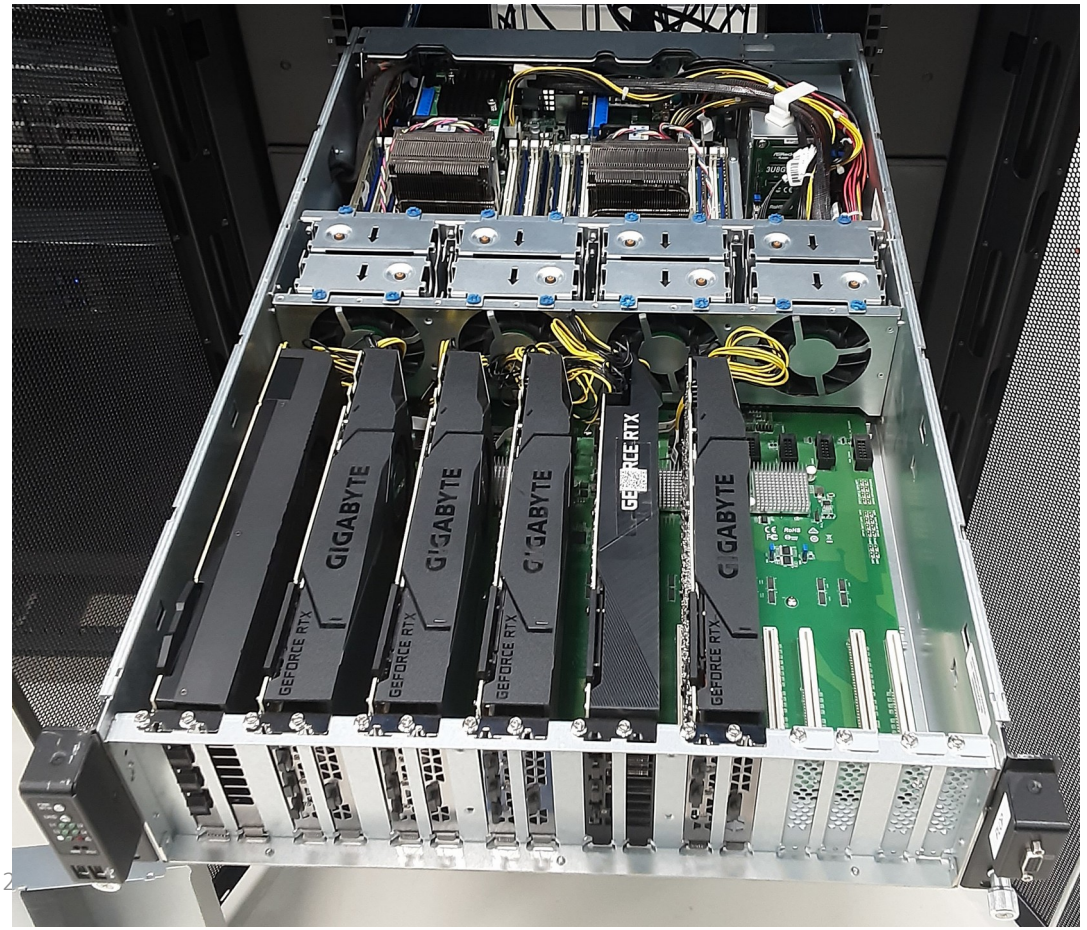
Computation demand	281 GFLOPS
Memory throughput demand	563 GByte/s

760 full CD-ROMs per second or 23 DDR4-3200 SDRAM memory channels!

Mid Infrared ELT Imager and Spectrograph

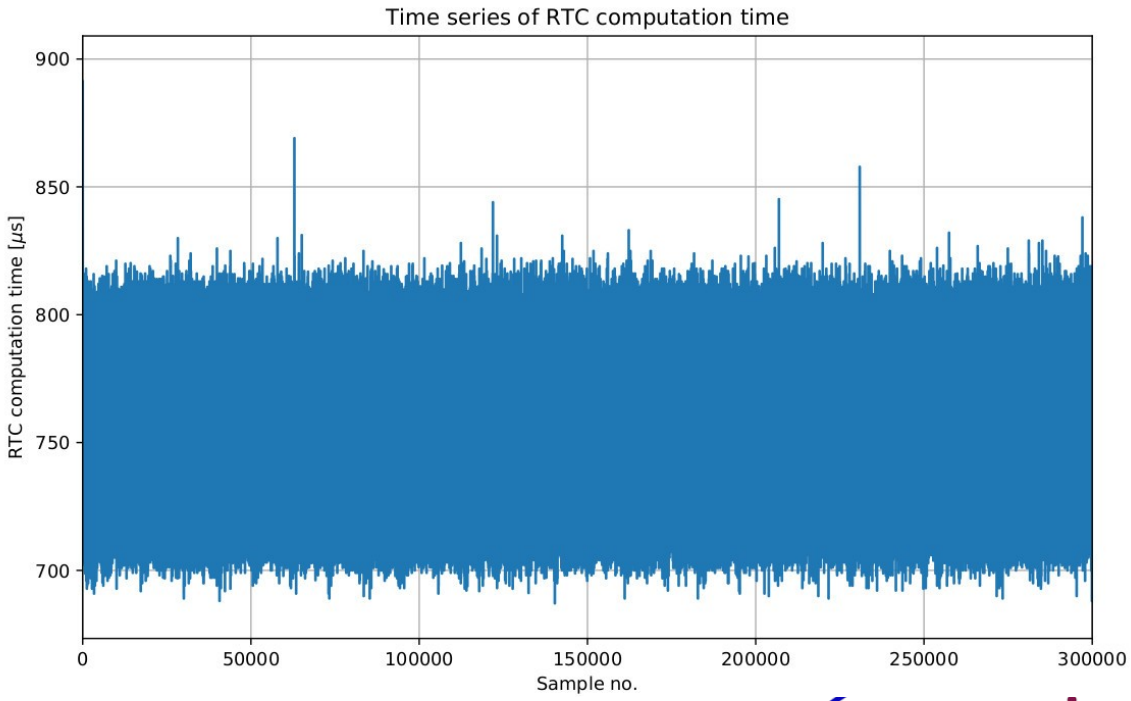
HRTC hardware

- GPU server for prototyping:
  ASRock 3U8G+
- 6x GeForce RTX 2080 Ti
  - Measured GPU-GPU memory speed: 519 Gbyte/s
- CPU:
  2x Xeon E5-2687W v4 @3GHz
- RAM: 128 Gbyte DDR4-2400
- Total cost: ~15 k€



Performance evaluation

- Performance test setup similar to HRTC installation at ELT.
- **RTC computation time**: time elapsed between the first WFS data received at HRTC and the last command data transmitted by the HRTC.
- Statistics: mean: 726 µs, median: 739 µs, std dev: 32 µs, 99.99% percentil: 825 µs
- HRTC is below its RTC computation time limit of 909 µs.



Maintenance: Obsolescence

- HRTC spare parts needs to be available until METIS decommissioning – at minimum until 2038.
- Difficult to predict availability of Nvidia GPUs in 18 years from now.
- Our mitigations:

Using long-term GPU features	Only stable API routines shall be used like e.g. memory copy or MVM.
GPU market competition	Nvidia, AMD, Intel
Spares in stock	Simple but expensive. Open question: only GPUs or whole GPU rack server in stock?

EOF

```
$ cat << EOF > /dev/audience
Thank you for your attention!
Any questions?
EOF
```