Summary

Wrap-up discussions

RTC Workshop, ESO Dec 4-5, 2012

- Latency & Jitter should be quantified to include in errror budgets – especially when windshake and seeing not benign
- GPU Direct. Now available. DMA from reserved memory on interface board to GPU.. Mediated by GPU
- Hard real time ~5% of RTC software – remainder is calibration, optimization, configuration control

- Phase screen generator: Mersenne Twister
- FRIM – 1 simplified PCG iteration in hard real time, with 3 iterations off critical path for next 'warm start'
- Portability is more valuable than peak speed
- New DM electronics from CILAS with high density and low power and latency

- "Photo-accoustic" guide star for Imaging in skin (scattering medium)!
- COTS "not necessarily trouble free" – system lifetime is an issue. Custom electronics can be superior for life cycle cost and maintainability
- Kermode FPGA board can do 128^2 FFT in 1 microsecond. Useful for FD-PCG?
- FreeBSD Unix can have lower worst-case interrupt latency latency than VxWorks

- SABRE.. Spline based aberration reconstruction) local splines on triangular mesh. Computationally efficient and parellizable
- CuReD   Fast SCAO computaton. Excellent Registration tool for WFS vs actuators.

- Fast and Furious.. Focal plane images, no WFS. Iterative Linear approximation, relies on pupil symmetry and phase diversity.
  - O(N log N) -- low dynamic range, monochromatic
- Kaczmarz for MCAO   - 3 steps – phase on WFSs, tomography, DM fitting
- Wavelet Regularization – promising speed and accuracy   - CG mode.

- Wind River (VxWorks vendor) now owned by Intel. Have discontinued Real Time Linux.

- Hyperthreading does not evenly distribute work among CPUs in RT systems.

- Reconstructing Pyramid data -- convert to SH-equivalent with sparse convolution followed by CuRed. 500 us for 200^2 SCAO. $O(N\sqrt{N})$ <1% Flops of MVM.

Algorithms

- Dense MVM will work well on multiple GPUs, but can matrix be updated quickly enough to track seeing and sodium?

- Intel Xeon Phi asserted to be better for sparse matrix operations.

- Simplex 2D B-splines, parallizable with communication to neighbours.

- Canary
  - Correlation tracking.. When updating reference images, adjust reference vector with correlation of old vs new reference images - clean switchover
- SPARTA ..for Sphere. FPGA provides 80 us latency dominated by Lo-order WFS on CPU.
  - Hard RTC is smallest % code, but large effort to code & debug

- Adaptive Vibration cancellation - proposed add-on to Sparta – expected to recover 96% of losses from 18 and 48 Hz vibrations

Most Important Slide

- Should we do this workshop again?

- Where should we do it?

- When should we do it?