A practical introduction to programming the Cerebras CS-2 for HPC workloads

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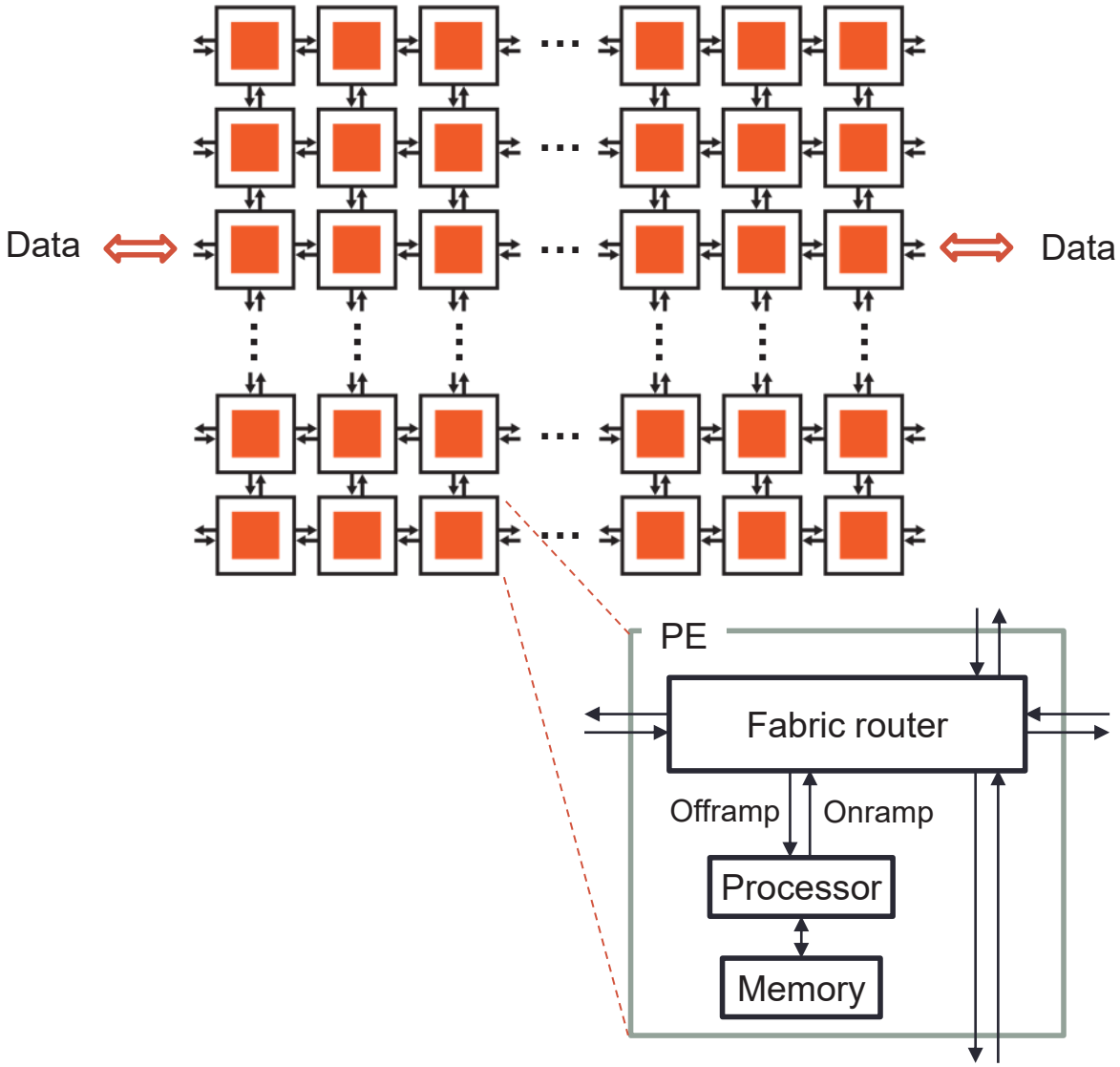
We hope you have enjoyed the tutorial….

- The Cerebras CS-2 is a powerful system with significant potential for HPC workloads
- We have seen that it is programmed using CSL, which is generally fairly similar to other languages but with some specifics for the architecture
- We have explored three hands-on activities and run these on a real CS-2 machine
  - And leveraged the simulator during development, which is standard practice on the CS-2



Taking things further

- We have covered the basics here which should be enough for you to understand programming of the machine for multi-PE codes
  - But by necessity we couldn't fit everything in, and there are other aspects you can now explore
- More advanced topics

- Sentinels
  - *Associates a task ID with routable colors for more routing flexibility*
- Switches
  - *Runtime control of routes*
- Filters
  - *Selectively consume wavelets*
- FIFOs
  - *Hardware queues for buffering*
  - *Connecting FIFOs to host-device communication for streaming*
- More advanced task handling
  - *For scheduling and managing tasks*
- Storage classes
  - *Making variables visible outside the PE*
- Modules
  - *For improved structuring of CSL codes*
- Map builtin
  - *For performing custom operations on DSDs*

Cerebras SDK libraries

- We explored the communications library, but there are others which you might find helpful

- Similarly to the communications library, these provide standard API function calls that you can leverage from your code

- Complex
  - *For working with complex numbers*
- Debug
  - *A tracing library for debugging CSL codes*
- Layout
  - *Access to information about where the PE is located on the WSE*
- Malloc
  - *Allocation for memory on the WSE*
- Math
  - *Standard math functions on the WSE*
- Random
  - *Random number generation*
- Tile_config
  - *Hardware configuration of the WSE*
- Time
  - *Timestamping on the WSE*

Example CSL programs are also available

Repository: https://github.com/Cerebras/csl-examples

- Introductory Tutorials
- GEMV
- GEMM
- Cholesky Decomposition
- 1D and 2D FFT
- 7-Point Stencil SpMV
- Power Method
- Conjugate Gradient
- Preconditioned Conjugate Gradient
- Finite Difference Stencil Computations
- Mandelbrot Set Generator
- Shift-Add Multiplication
- Hypersparse SpMV
- Histogram Computation

Materials and the CS-2 community

- All materials for this tutorial are open source and can be found at
  - https://github.com/EPCCed/cs2-sdk-training
- There is lots of documentation on the Cerebras website on CSL and the SDK
  - https://sdk.cerebras.net/csl
  - https://github.com/Cerebras/csl-examples
- There is a CS-2 developer community that you can join
  - Roughly monthly meetings
  - Forums: discourse.cerebras.net
- The SDK is free to download, meaning you can have a copy of the compiler and simulator on your own local machine

Going forwards…

- We are very happy to chat with you about your own codes on the CS-2 and offer any advice that we can here
- The visitor accounts will stay open on the EPCC CS-2, so you can continue to experiment with the codes and run on the machine
  - And remember you can install the SDK locally too
- There are also cloud CS-2s hosted by Cerebras