



**TECHNISCHE
UNIVERSITÄT
DRESDEN**

Center for Information Services and High Performance Computing (ZIH)

Showing the Missing Middle

Enabling OpenACC Performance Analysis



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Center for Information Services &
High Performance Computing

Great for prototyping

Great for first steps on porting legacy codes

Great for “glue-code” in between

The Five Results of Programming



Compiler error

Program crashes

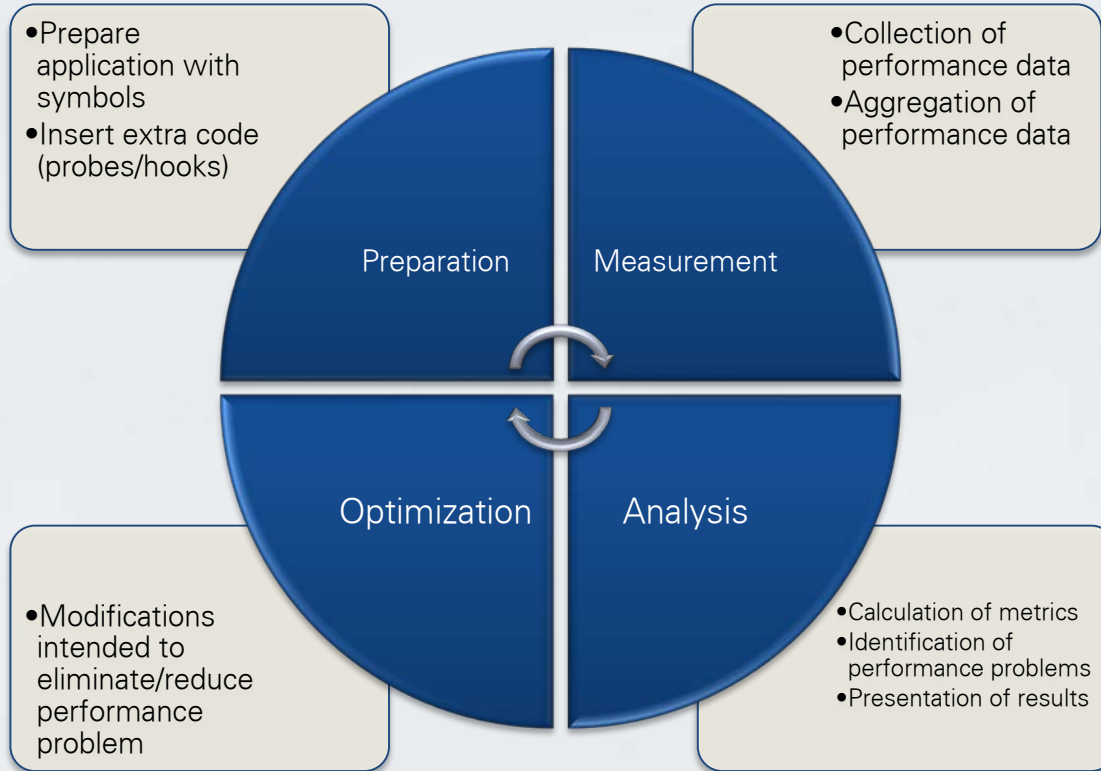
Program produces wrong results

Program runs very slow

Program runs fast and correct

Likelihood

Performance engineering workflow



Why a Standardized Profiling Interface?



Vendor tools not everything

HPC requires extreme scalability

Success of CUPTI a great example!

- CUDA Profiling Tools Interface now used by NVIDIA tools themselves
- Lively exchange with research tool community

Performance Tools Have You Covered



Level	Inter-Node Parallelism		Intra-Node Parallelism			Accelerator Offloading			
Method	native		Directive based		native	native		Directive based	
Paradigm	MPI	Open-SHMEM	OpenMP		Pthreads	CUDA	OpenCL	OpenACC	OpenMP Target
Tool Support	PMPI	PSHMEM	OPARI	OMPT	Custom Wrapping	CUPTI	Custom Wrapping	???	???



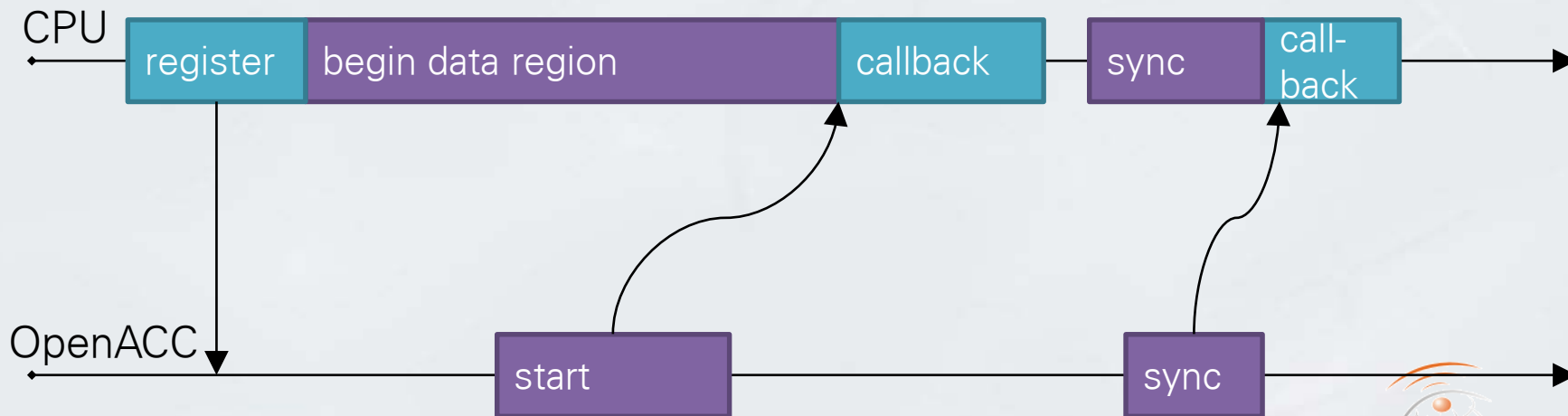
Profile Based

- PGI prof
- Craypat

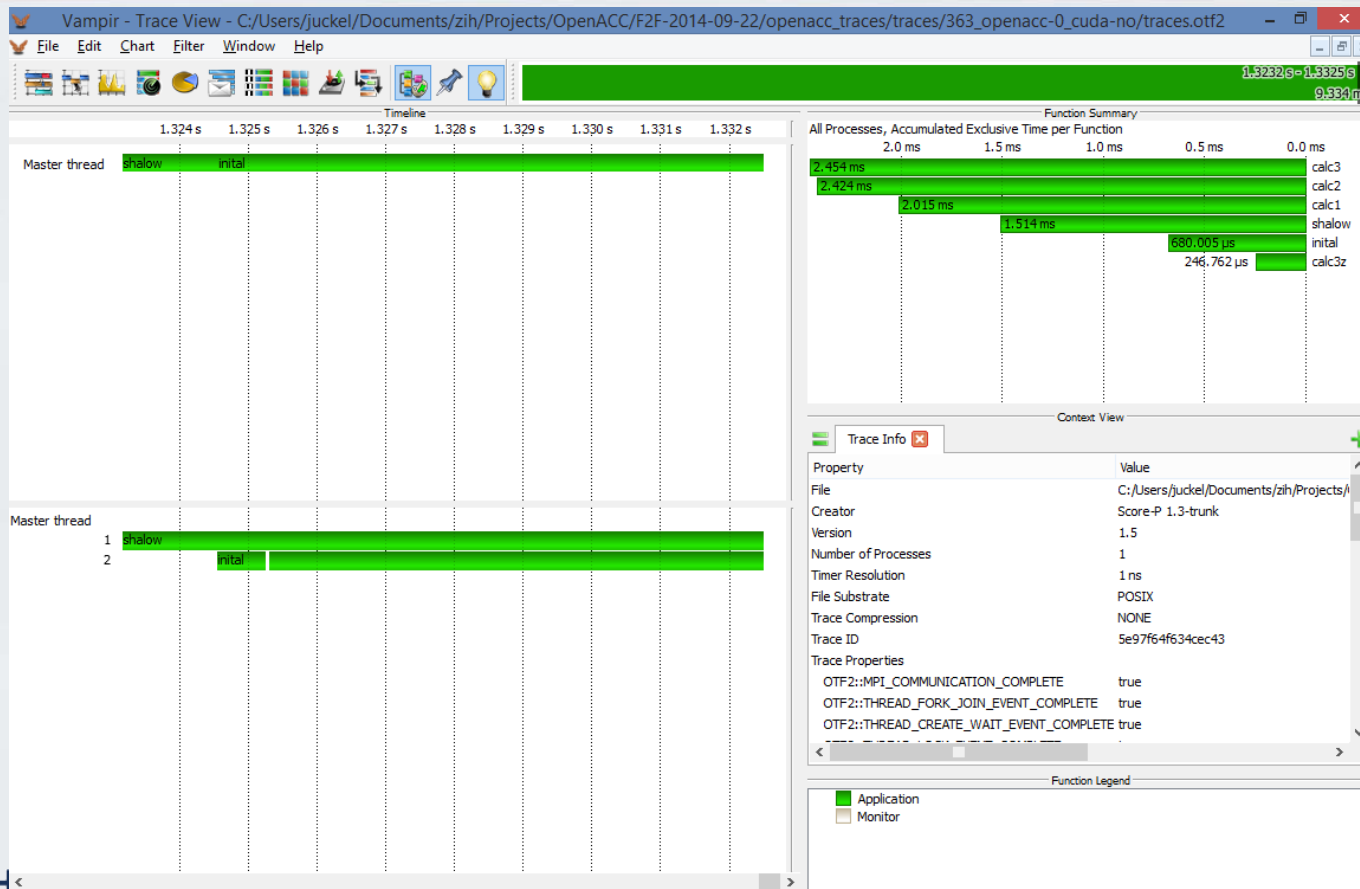
How about timelines?

- Craypat
- Score-P or similar needed at very large scale

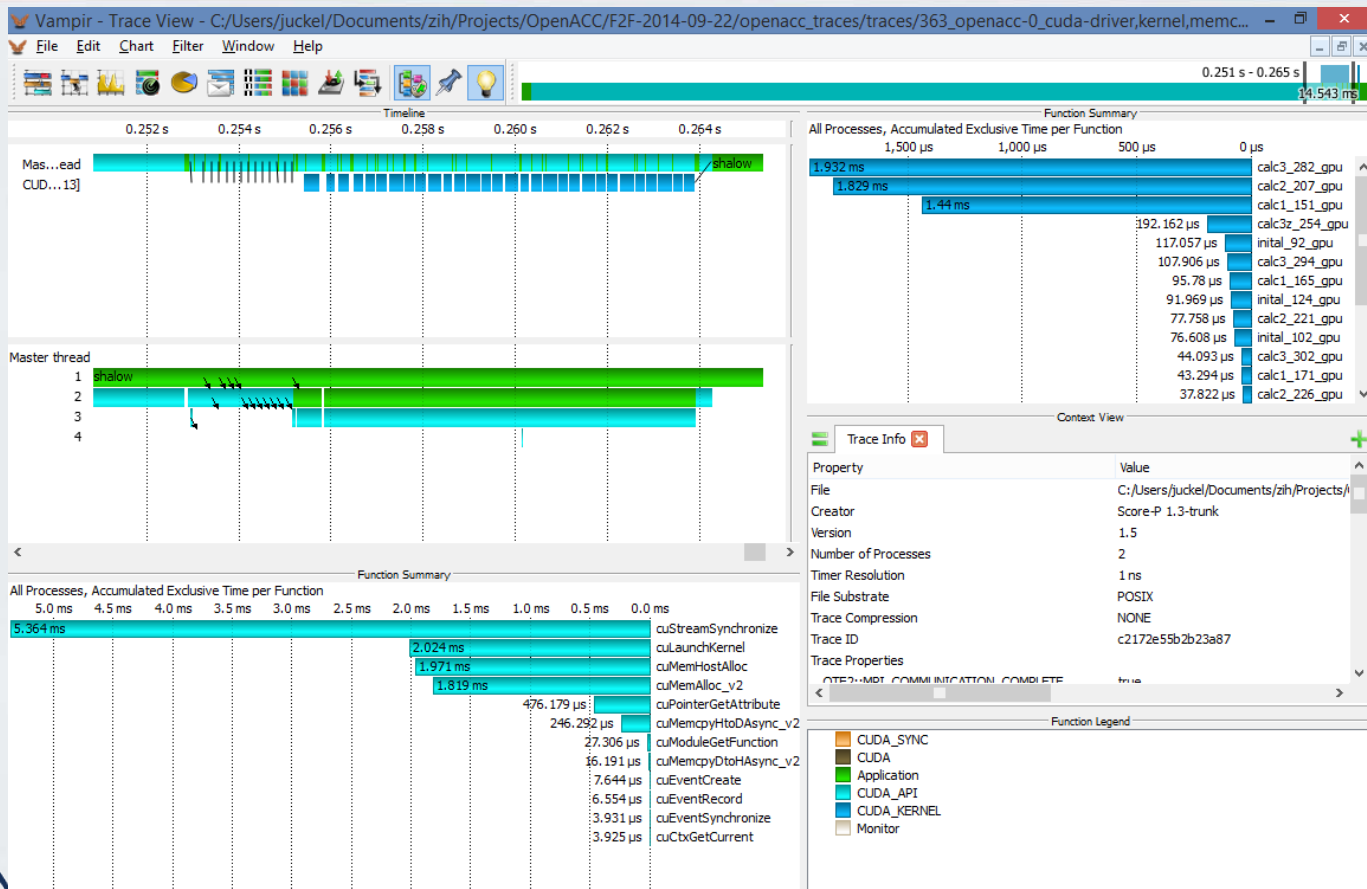
- See Technical Report TR 14-2
- Performance monitor registers callbacks with OpenACC runtime
- Tool will be invoked by runtime to do handle the events



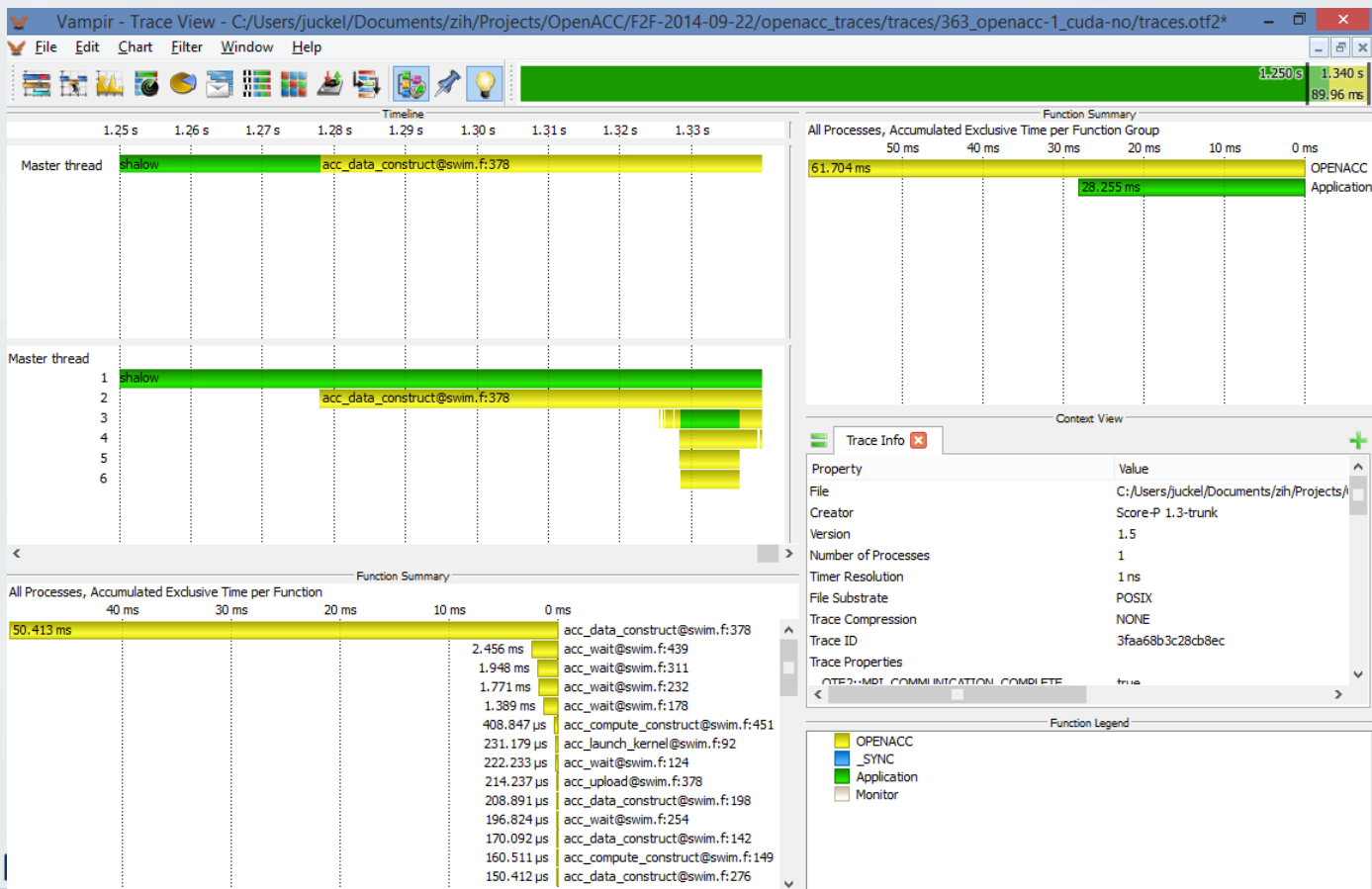
Starting Point – Watching an Application



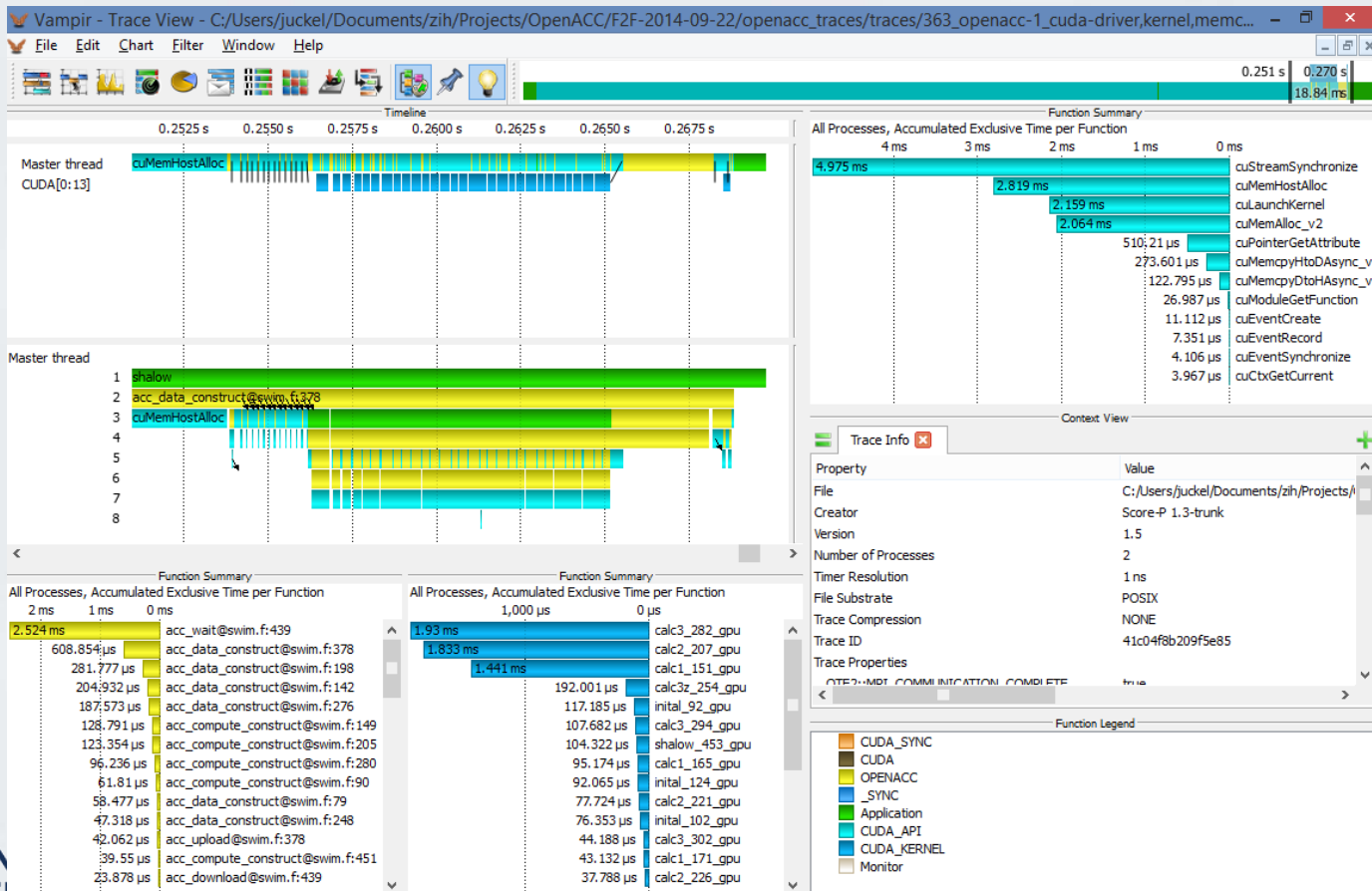
Adding Low Level Accelerator Activity



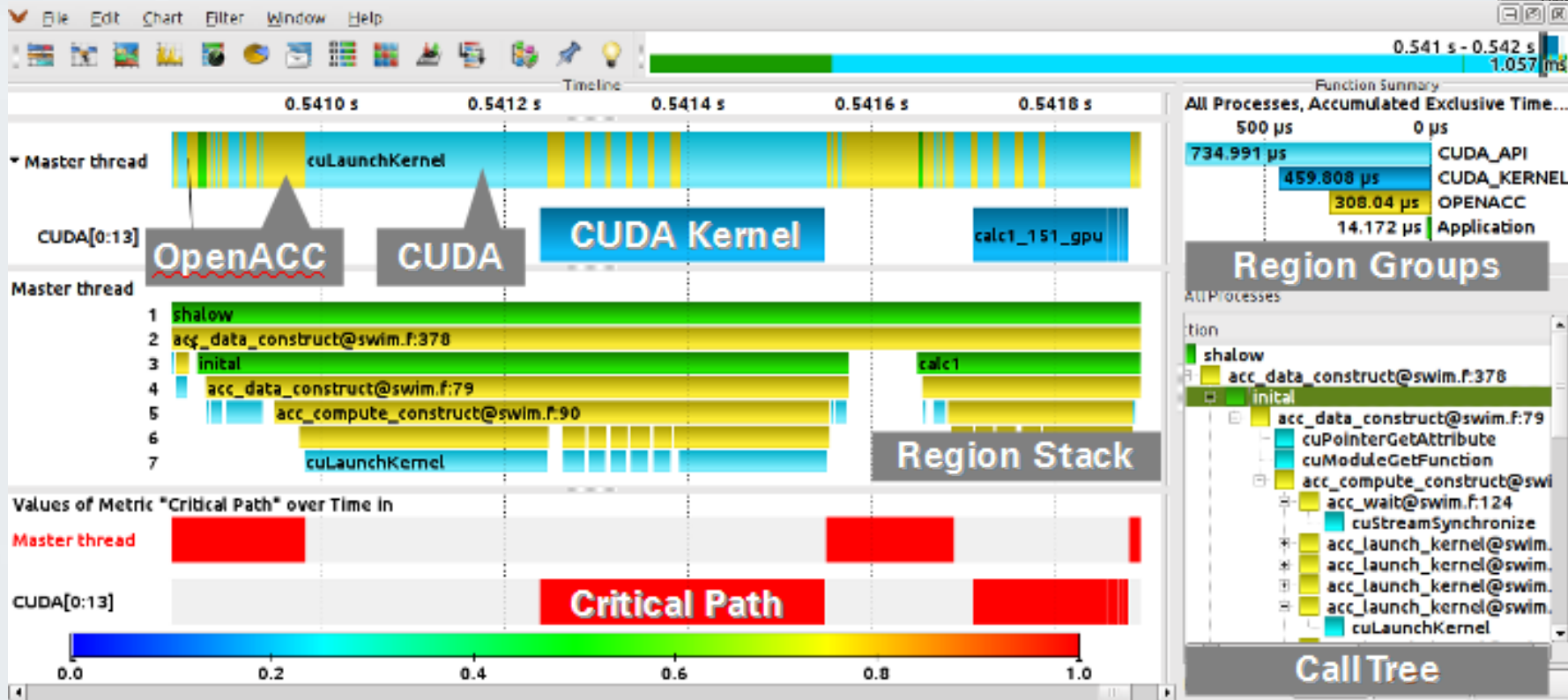
Using PGI's OpenACC Tool Interface Implementation



Putting it all together



What You See Explained



If you cannot see it,

you will never know it.

you will never understand it.

you will never improve it.