

Instrumenting C and Fortran Software with Kieker

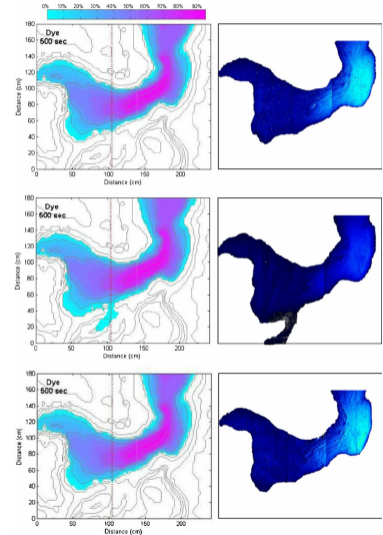
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Sub-Models of Earth-System Climate Models

- Ocean models
- Bio-geo-chemical models of the water column
- Land models
- River models
- Atmosphere models



Programming Languages

- Fortran (multiple variants)
- C and C++
- Python

Code Configuration

- Custom Perl script
- Custom Python script
- Makefile
- Configure scripts with project specific extensions

Build Tools

- Make, Cmake
- Custom Perl scripts
- Shell scripts
- Python programs

Compiler

- Preprocessors cpp, fpp
- GNU Compiler Collection gfortran, gcc
- Intel Fortran Compiler ifort

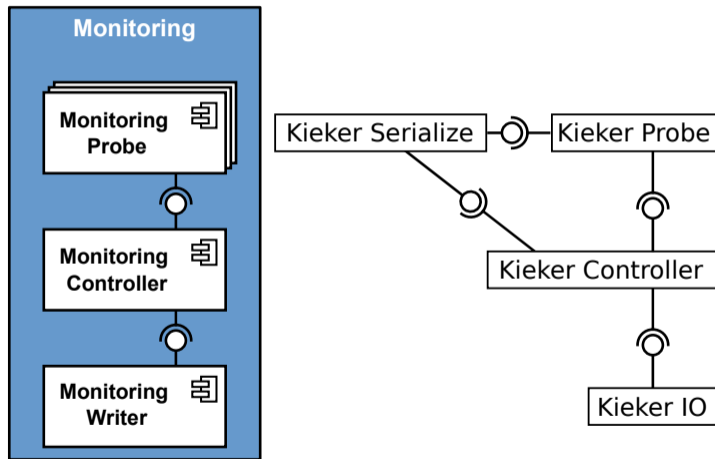
Instrumentation Functions

```
void __cyg_profile_func_enter (void *this_fn,  
                              void *call_site);  
void __cyg_profile_func_exit (void *this_fn,  
                              void *call_site);
```

Compiler Options

- `-finstrument-functions` activate feature
- `-finstrument-functions-exclude-file-list` exclude mechanism

See <https://gcc.gnu.org/onlinedocs/gcc/Instrumentation-Options.html>



Probes

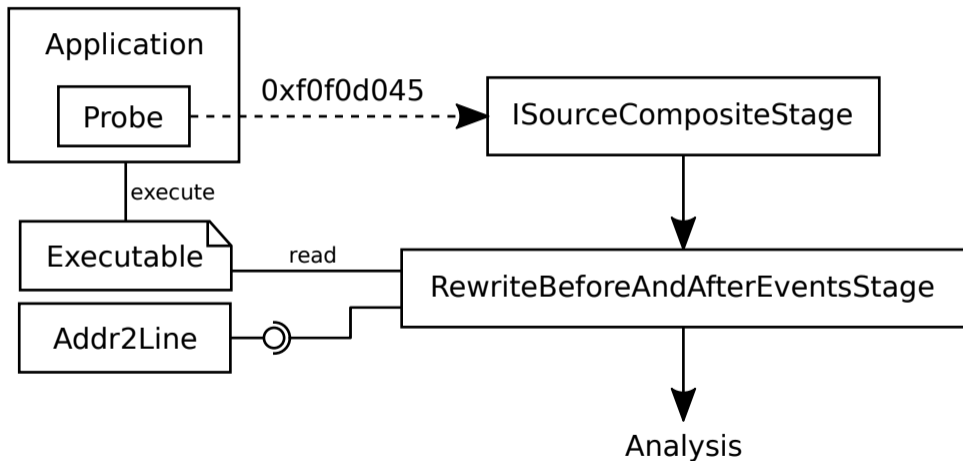
- Manual instrumentation
- Support for the GNU instrumentation feature
- *Probes for Aspect C++ (experimental)*

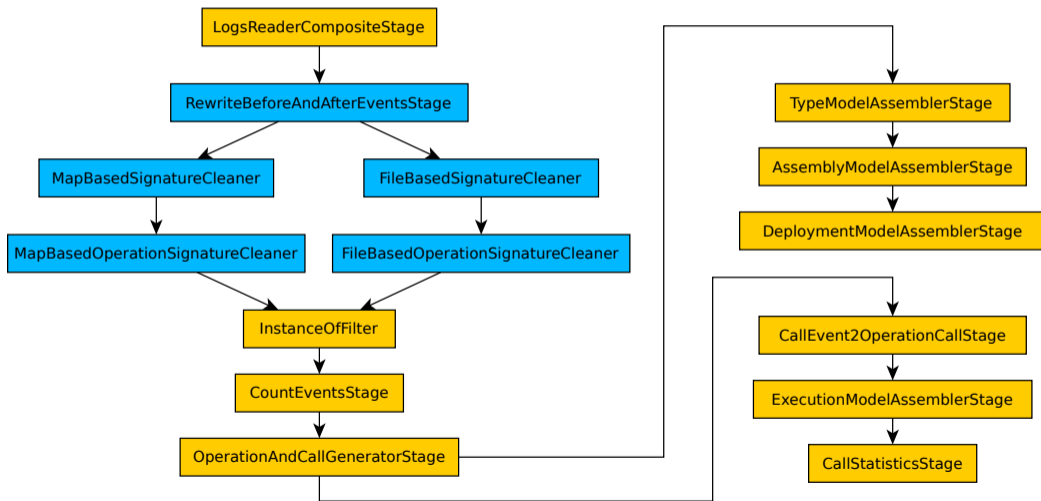
Kieker Event Types

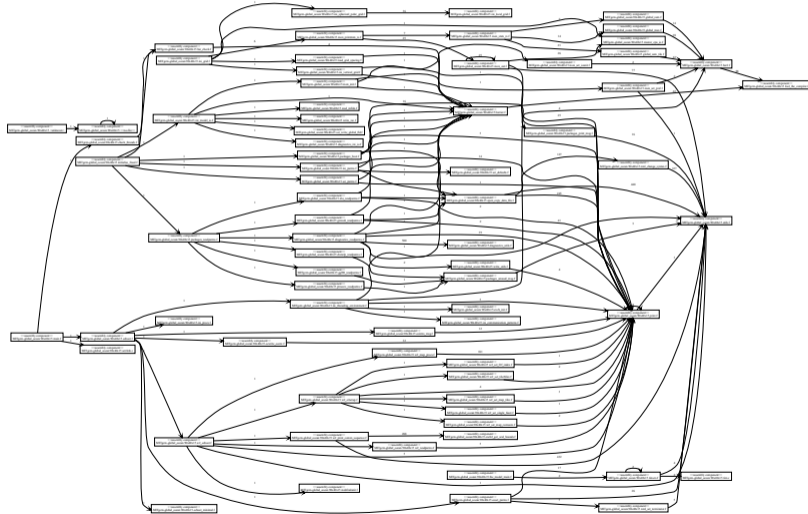
- All, generated with the IRL compiler
- Used BeforeOperationEvent, AfterOperationEvent, TraceMetadata

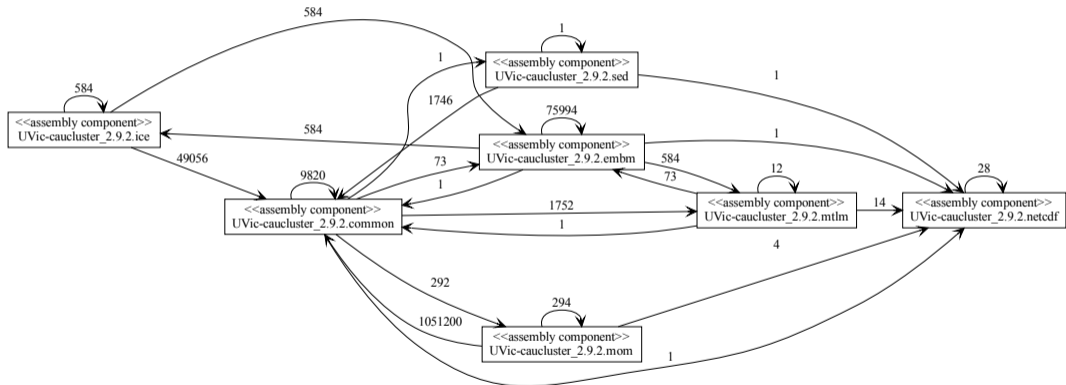
Writer support

- TCP writer with two options as environment setting
 - KIEKER_HOSTNAME
 - KIEKER_PORT









Summary

- Probes for all GNU Compiler Collection languages
- Name resolving on analysis side
- Provides basic parts of the Kieker architecture for TCP
- Shown its application with two ESCMs

Outlook

- Measuring the performance impact of the C implementation
- Evaluation of compatible optimization options
- Implementation of function name resolution on monitoring side

Next Steps

- Measuring the performance impact of the C implementation
- Evaluation of compatible optimization options
- Implement tests with cmocka

Where to find

- Instrumentation <https://github.com/kieker-monitoring/kieker-lang-pack-c.git>
- OceanDSL-Tools <https://git.se.informatik.uni-kiel.de/oceandsl/oceandsl-tools>