

# **Flecstan:**

## **FleCSI Static Analyzer**

### **Part II: Using Flecstan with flecsale-mm, FleCSI's Tutorial, and General C++ Codes**

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# Introduction

**Flecstan**, our **FleCSI Static Analyzer**, is ready for use.

We focus here on how to use the tool. Before beginning, a few remarks.

- Flecstan builds on the clang/llvm compiler technology). Under its hood is a full compiler. It ***runs from the command line, analyzes your code, and prints a report.***
- Input can be any of:
  - Direct-specified C++ compiler flags and source codes.  
**Good for:** **Simple C++ codes** (including non-FleCSI codes).
  - A .json format “compilation database” (easy to write).  
**Good for:** **FleCSI’s tutorial**, and direct C++ code compilation.
  - Output from a make VERBOSE=1 after using cmake.  
**Good for:** **flecsale-mm**, and similar cmake-built, FleCSI-based work.
- Input options as listed above can be combined arbitrarily in one analysis command.
- Output is highly customizable, via command-line options.

You can find flecstan in **flecsi/tools/flecstan/**.

# Goals, and Talk Outline

## Goals:

- Build in a **knowledge of FleCSI constructs**, so that we can detect certain things that the compiler cannot.
- **Analyze (mis)uses** of FleCSI constructs.
- Focus in particular on **FleCSI's macro interface** (e.g., its macros for task registration and execution).
- **Intercept clang++'s errors, warnings**, etc., and present the messages in a more readable format.
- Provide users with a **clear report** on what was found.

## Broad overview of this talk:

- Flecstan's output: **look & feel**
- Analyzing codes in **flecsale-mm**
- Analyzing **FleCSI's tutorial** examples
- Analyzing **plain old C++** codes
- List of **command-line options**

---

**Let's begin!**

# Look & Feel

## File:

```
// stub.cc
int main()
{
}
```

## Command:

flecstan stub.cc

## Output:

-----  
Command  
-----

Note:  
Queueing C++ file stub.cc.

-----  
Compilation  
-----

File:  
stub.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

-----  
Analysis  
-----

Synopsis:  
No errors or warnings were detected.

-----  
Summary  
-----

Note:  
FleCSI static analysis completed.

## Remarks:

Output is colored, and divided into “sections.”

- Section headers
- File names
- Report labels and Report text
- Notes
- Warnings
- Errors
- Debug information

Coloring is done with ANSI color escape codes, which are likely to work on most terminals.

Switch off coloring with the **-no-color** option.

# Analyzing flecsale-mm: Remarks

**The first big thing to realize:** flecsale-mm is a *set of codes*, not one code!

Flecstan analyzes *one code at a time!* As in, the code for one executable application. (This of course generally involves many C++ *source files*.)

Throw everything in flecsale-mm at the analyzer, and you'll probably get the moral equivalent of "multiply defined symbol" linkage errors, and probably *won't* get correct analysis.

Analogy: a linker links object files into *one* executable. Give it all the object files for a set of several executables, and you'll probably get multiply defined symbol errors.

**The second big thing to realize:** the analyzer must know *exactly how each C++ source file will be compiled*. (Compiler options etc.)

Compilations of complex FleCSI apps may involve *many compiler flags*.

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**Bottom line:** Some way, somehow, *flecstan must know precisely what clang++ commands are used, for every relevant C++ source file in exactly one app (say, hydro\_2d) .*

**Our Goal:** Make this as easy as possible for users. (90% there, **very usable right now.**)

# Analyzing flecsale-mm: Process

Get flecsale-mm from the repo, set your compiler to **clang++** (not g++), and proceed:

- `cd flecsale-mm`
- `mkdir build ; cd build`
- `cmake ..` *various cmake flags*

**Stop! Don't build anything quite yet!**

- Choose *one* app; say, **hydro\_2d**
- Try this: **`make VERBOSE=1 hydro_2d`**

If all is well, this make should produce output that includes lines like one or the other of these:

```
clang++ flags file.cc
```

```
cd dir && clang++ flags file.cc
```

**Verify that you see these.** Don't worry about other lines, and don't worry if clang++ is actually `/usr/bin/clang++` or another variation.

**Those lines provide sufficient information for flecstan to do its job.** Flecstan's *-make* input option extracts those lines (and ignores other lines), gets what it needs, and analyzes:

```
make clean  
make VERBOSE=1 hydro_2d  
| flecstan -make -
```

Here, - means standard input.

**Do this only from a clean build directory!**

If anything is already partially built, *make* probably won't produce everything flecstan needs.

# Output: hydro\_2d

-----  
Command  
-----

Note:  
Queueing make-verbose file <standard input>.

-----  
Compilation  
-----

File:  
<standard input>

File:  
<standard input>: /home/staley/flecsale-mm/ristra/ristra/elements/elements.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
<standard input>: /home/staley/flecsale-mm/flecsi/flecsi/execution/mpi/runtime\_driver.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
<standard input>: /home/staley/flecsale-mm/flecsale/dummy/dummy.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
<standard input>: /home/staley/flecsale-mm/ristra/ristra/initialization/announce.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/flecsi/flecsi/execution/mpi/context\_policy.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/flecsi/flecsi/utils/debruijn.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/specializations/flecsi-sp/dummy/dummy.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/ristra/ristra/assertions/detail/dbc\_impl.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/apps/common/exceptions.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/apps/hydro/2d/inputs.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:  
 <standard input>: /home/staley/flecsale-mm/ristra/ristra/io/vtk.cc



Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:

<standard input>: /home/staley/flecsale-mm/flecsi/flecsi/utils/demangle.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:

<standard input>: /home/staley/flecsale-mm/apps/hydro/2d/driver.cc

Scanning for FleCSI macros...

Macro:

Name: flecsi\_register\_task

Args: initial\_conditions, flecsale::apps::hydro, loc, index|flecsi::leaf

File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h

Line: 419

Macro:

Name: flecsi\_register\_task

Args: initial\_conditions\_from\_file, flecsale::apps::hydro, loc, index|flecsi::leaf

File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h

Line: 420

Macro:

Name: flecsi\_register\_task

Args: evaluate\_time\_step, flecsale::apps::hydro, loc, index|flecsi::leaf

File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h

Line: 421

Macro:

Name: flecsi\_register\_task

Args: evaluate\_fluxes, flecsale::apps::hydro, loc, index|flecsi::leaf

File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h

Line: 422

Macro:

Name: flecsi\_register\_task

Args: apply\_update, flecsale::apps::hydro, loc, index|flecsi::leaf

File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h

Line: 423

Macro:

Name: flecsi\_register\_task  
Args: output, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h  
Line: 424

Macro:

Name: flecsi\_register\_task  
Args: print, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h  
Line: 425

Macro:

Name: flecsi\_register\_task  
Args: dump, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h  
Line: 426

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, int  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[14]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, long  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[15]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, short  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[16]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, unsigned  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[17]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, size\_t  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[18]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, float  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[19]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: min, double  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 83[20]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, int  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[14]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, long  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[15]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, short  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[16]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, unsigned  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[17]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, size\_t  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h

Line: 124[18]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, float  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[19]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, double  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 124[20]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, int  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[14]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, long  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[15]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, short  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[16]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, unsigned  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[17]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, size\_t  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[18]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, float  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[19]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, double  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 165[20]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, int  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[14]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, long  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[15]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, short  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[16]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, unsigned  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[17]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, size\_t  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[18]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, float  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h

Line: 206[19]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, double  
File: /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h  
Line: 206[20]

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, density, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 33

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, velocity, mesh\_t::vector\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 43

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, internal\_energy, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 53

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, pressure, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 63

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, temperature, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 73

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, sound\_speed, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 83

Macro:

```
Name: flecsi_register_field
Args: mesh_t, hydro, flux, flux_data_t, dense, 1, mesh_t::index_spaces_t::faces
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 95
```

Macro:

```
Name: flecsi_get_client_handle
Args: mesh_t, meshes, mesh0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 120
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, density, real_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 150
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, velocity, vector_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 152
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, internal_energy, real_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 154
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, pressure, real_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 157
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, temperature, real_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 158
```

Macro:

```
Name: flecsi_get_handle
Args: mesh, hydro, sound_speed, real_t, dense, 0
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
```

Line: 159

Macro:

Name: flecsi\_get\_handle  
Args: mesh, hydro, flux, flux\_data\_t, dense, 0  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 161

Macro:

Name: flecsi\_execute\_task  
Args: initial\_conditions\_from\_file, flecsale::apps::hydro, index, mesh, inputs\_t::eos, soln\_time, filename\_char, d, v, e, p, T, a  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 175

Macro:

Name: flecsi\_execute\_task  
Args: initial\_conditions, flecsale::apps::hydro, index, mesh, inputs\_t::eos, soln\_time, d, v, e, p, T, a  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 186

Macro:

Name: flecsi\_execute\_task  
Args: output, flecsale::apps::hydro, index, mesh, prefix\_char, postfix\_char, time\_cnt, soln\_time, d, v, e, p, T, a  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 212

Macro:

Name: flecsi\_execute\_task  
Args: print, flecsale::apps::hydro, index, mesh, name  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 228

Macro:

Name: flecsi\_execute\_reduction\_task  
Args: evaluate\_time\_step, flecsale::apps::hydro, index, min, double, mesh, d, v, e, p, T, a, inputs\_t::CFL, inputs\_t::final\_time-soln\_time  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 248

Macro:

Name: flecsi\_execute\_task  
Args: evaluate\_fluxes, flecsale::apps::hydro, index, mesh, d, v, e, p, T, a, F  
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h  
Line: 257

Macro:



```
Name: flecsi_execute_task
Args: apply_update, flecsale::apps::hydro, index, mesh,inputs_t::eos,time_step,F,d,v,e,p,T,a
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 264
```

Macro:

```
Name: flecsi_execute_task
Args: output, flecsale::apps::hydro, index, mesh,prefix_char,postfix_char,time_cnt,soln_time,d,v,e,p,T,a
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 308
```

Macro:

```
Name: flecsi_execute_task
Args: dump, flecsale::apps::hydro, index, mesh,time_cnt,soln_time,d,v,e,p,name
File: /home/staley/flecsale-mm/apps/hydro/2d/./driver.h
Line: 345
```

Visiting the C++ abstract syntax tree...

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 419)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 420)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 421)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 422)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 423)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
Matches macro: flecsi_register_task (file /home/staley/flecsale-mm/apps/hydro/2d/./tasks.h, line 424)
```

Link:

```
Function call: flecsi::execution::task_interface_u::register_task
```

Matches macro: flecsi\_register\_task (file /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h, line 425)

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task

Matches macro: flecsi\_register\_task (file /home/staley/flecsale-mm/apps/hydro/2d/../tasks.h, line 426)

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[14])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[15])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[16])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[17])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[18])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[19])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 83[20])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[14])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[15])

Link:

Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation

Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[16])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[17])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[18])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[19])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 124[20])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[14])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[15])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[16])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[17])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[18])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[19])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 165[20])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[14])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[15])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[16])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[17])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[18])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[19])

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_reduction\_operation  
Matches macro: flecsi\_register\_reduction\_operation (file /home/staley/flecsale-mm/flecsi/flecsi/execution/reduction.h, line 206[20])

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 33)

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 43)

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 53)

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 63)

Link:

Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 73)

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 83)

Link:  
Function call: flecsi::data::field\_interface\_u::register\_field  
Matches macro: flecsi\_register\_field (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 95)

Link:  
Function call: flecsi::data::data\_client\_interface\_u::get\_client\_handle  
Matches macro: flecsi\_get\_client\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 120)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 150)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 152)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 154)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 157)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 158)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 159)

Link:  
Function call: flecsi::data::field\_interface\_u::get\_handle  
Matches macro: flecsi\_get\_handle (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 161)

Link:  
Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 175)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 186)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 212)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 228)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_reduction\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 248)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 257)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 264)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 308)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsale-mm/apps/hydro/2d/./driver.h, line 345)

File:

<standard input>: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.cc

Scanning for FleCSI macros...

Macro:

Name: flecsi\_register\_mpi\_task

Args: partition\_mesh, flecsi\_sp::burton

File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h

Line: 2532

Macro:

Name: flecsi\_register\_task  
Args: initialize\_mesh, flecsi\_sp::burton, loc, index|flecsi::leaf  
File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h  
Line: 2533

Macro:

Name: flecsi\_register\_data\_client  
Args: burton\_mesh\_t, meshes, mesh0  
File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h  
Line: 2540

Macro:

Name: flecsi\_execute\_mpi\_task  
Args: partition\_mesh, flecsi\_sp::burton, mesh\_filename,max\_entries  
File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.cc  
Line: 72

Macro:

Name: flecsi\_get\_client\_handle  
Args: flecsi\_sp::burton::burton\_mesh\_t, meshes, mesh0  
File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.cc  
Line: 102

Macro:

Name: flecsi\_execute\_task  
Args: initialize\_mesh, flecsi\_sp::burton, index, mesh\_handle,mesh\_filename  
File: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.cc  
Line: 104

Visiting the C++ abstract syntax tree...

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task  
Matches macro: flecsi\_register\_mpi\_task (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h, line 2532)

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task  
Matches macro: flecsi\_register\_task (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h, line 2533)

Link:

Function call: flecsi::data::data\_client\_interface\_u::register\_data\_client  
Matches macro: flecsi\_register\_data\_client (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton\_specialization\_init.h, line 2540)

Link:

```
Function call: flecsi::execution::task_interface_u::execute_task
Matches macro: flecsi_execute_mpi_task (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton_specialization_init.cc, line 72)
```

```
Link:
Function call: flecsi::data::data_client_interface_u::get_client_handle
Matches macro: flecsi_get_client_handle (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton_specialization_init.cc, line 102)
```

```
Link:
Function call: flecsi::execution::task_interface_u::execute_task
Matches macro: flecsi_execute_task (file /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton_specialization_init.cc, line 104)
```

```
File:
<standard input>: /home/staley/flecsale-mm/flecsi/flecsi/execution/mpi/runtime_main.cc
```

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

```
File:
<standard input>: /home/staley/flecsale-mm/specializations/flecsi-sp/burton/burton_types.cc
```

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

```
File:
<standard input>: /home/staley/flecsale-mm/flecsi/flecsi/data/internal_client.cc
```

Scanning for FleCSI macros...

```
Macro:
Name: flecsi_register_data_client
Args: global_data_client_t, global_client, global_client
File: /home/staley/flecsale-mm/flecsi/flecsi/data/internal_client.cc
Line: 21
```

```
Macro:
Name: flecsi_register_data_client
Args: color_data_client_t, color_client, color_client
File: /home/staley/flecsale-mm/flecsi/flecsi/data/internal_client.cc
Line: 22
```

Visiting the C++ abstract syntax tree...

Link:



Function call: flecsi::data::data\_client\_interface\_u::register\_data\_client  
Matches macro: flecsi\_register\_data\_client (file /home/staley/flecsale-mm/flecsi/flecsi/data/internal\_client.cc, line 21)

Link:

Function call: flecsi::data::data\_client\_interface\_u::register\_data\_client  
Matches macro: flecsi\_register\_data\_client (file /home/staley/flecsale-mm/flecsi/flecsi/data/internal\_client.cc, line 22)

-----  
Analysis  
-----

Synopsis:

No errors or warnings were detected.

-----  
Summary  
-----

Note:

FleCSI static analysis completed.

# Output: hydro\_2d, Again

Let's shorten the earlier long-winded output. Add these flecstan options: **-file-short** (shorten the printing of file names), **-file-strip** (strip directories from printed file names) **-no-scanning** (suppress messages about scanning for macros) **-no-visiting** (suppress messages about visiting the abstract syntax tree) **-no-link** (suppress printing of AST/macro links).

But let's add **-column** (print column numbers).

-----  
Command  
-----

Note:  
Queueing make-verbose file <standard input>.

-----  
Compilation  
-----

elements.cc

runtime\_driver.cc

dummy.cc

announce.cc

context\_policy.cc

debruijn.cc

dummy.cc

dbc\_impl.cc

exceptions.cc

inputs.cc

vtk.cc

demangle.cc

driver.cc

Macro:

```
Name: flecsi_register_task
Args: initial_conditions, flecsale::apps::hydro, loc, index|flecsi::leaf
File: tasks.h
Line: 419
Column: 1
```

Macro:

```
Name: flecsi_register_task
Args: initial_conditions_from_file, flecsale::apps::hydro, loc, index|flecsi::leaf
File: tasks.h
Line: 420
Column: 1
```

Macro:

```
Name: flecsi_register_task
Args: evaluate_time_step, flecsale::apps::hydro, loc, index|flecsi::leaf
File: tasks.h
Line: 421
Column: 1
```

Macro:

```
Name: flecsi_register_task
Args: evaluate_fluxes, flecsale::apps::hydro, loc, index|flecsi::leaf
File: tasks.h
Line: 422
Column: 1
```

Macro:

```
Name: flecsi_register_task
Args: apply_update, flecsale::apps::hydro, loc, index|flecsi::leaf
File: tasks.h
Line: 423
Column: 1
```

Macro:  
Name: flecsi\_register\_task  
Args: output, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: tasks.h  
Line: 424  
Column: 1

Macro:  
Name: flecsi\_register\_task  
Args: print, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: tasks.h  
Line: 425  
Column: 1

Macro:  
Name: flecsi\_register\_task  
Args: dump, flecsale::apps::hydro, loc, index|flecsi::leaf  
File: tasks.h  
Line: 426  
Column: 1

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, int  
File: reduction.h  
Line: 83[14]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, long  
File: reduction.h  
Line: 83[15]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, short  
File: reduction.h  
Line: 83[16]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation

Args: min, unsigned  
File: reduction.h  
Line: 83[17]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, size\_t  
File: reduction.h  
Line: 83[18]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, float  
File: reduction.h  
Line: 83[19]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: min, double  
File: reduction.h  
Line: 83[20]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: max, int  
File: reduction.h  
Line: 124[14]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: max, long  
File: reduction.h  
Line: 124[15]  
Column: 1[3]

Macro:  
Name: flecsi\_register\_reduction\_operation  
Args: max, short  
File: reduction.h  
Line: 124[16]

Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, unsigned  
File: reduction.h  
Line: 124[17]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, size\_t  
File: reduction.h  
Line: 124[18]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, float  
File: reduction.h  
Line: 124[19]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: max, double  
File: reduction.h  
Line: 124[20]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, int  
File: reduction.h  
Line: 165[14]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, long  
File: reduction.h  
Line: 165[15]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, short  
File: reduction.h  
Line: 165[16]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, unsigned  
File: reduction.h  
Line: 165[17]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, size\_t  
File: reduction.h  
Line: 165[18]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, float  
File: reduction.h  
Line: 165[19]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: sum, double  
File: reduction.h  
Line: 165[20]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, int  
File: reduction.h  
Line: 206[14]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, long  
File: reduction.h

Line: 206[15]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, short  
File: reduction.h  
Line: 206[16]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, unsigned  
File: reduction.h  
Line: 206[17]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, size\_t  
File: reduction.h  
Line: 206[18]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, float  
File: reduction.h  
Line: 206[19]  
Column: 1[3]

Macro:

Name: flecsi\_register\_reduction\_operation  
Args: product, double  
File: reduction.h  
Line: 206[20]  
Column: 1[3]

Macro:

Name: flecsi\_register\_field  
Args: mesh\_t, hydro, density, mesh\_t::real\_t, dense, 1, mesh\_t::index\_spaces\_t::cells  
File: driver.h  
Line: 33  
Column: 1



```
Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, velocity, mesh_t::vector_t, dense, 1, mesh_t::index_spaces_t::cells
  File: driver.h
  Line: 43
  Column: 1

Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, internal_energy, mesh_t::real_t, dense, 1, mesh_t::index_spaces_t::cells
  File: driver.h
  Line: 53
  Column: 1

Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, pressure, mesh_t::real_t, dense, 1, mesh_t::index_spaces_t::cells
  File: driver.h
  Line: 63
  Column: 1

Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, temperature, mesh_t::real_t, dense, 1, mesh_t::index_spaces_t::cells
  File: driver.h
  Line: 73
  Column: 1

Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, sound_speed, mesh_t::real_t, dense, 1, mesh_t::index_spaces_t::cells
  File: driver.h
  Line: 83
  Column: 1

Macro:
  Name: flecsi_register_field
  Args: mesh_t, hydro, flux, flux_data_t, dense, 1, mesh_t::index_spaces_t::faces
  File: driver.h
  Line: 95
  Column: 1

Macro:
  Name: flecsi_get_client_handle
  Args: mesh_t, meshes, mesh0
```

```
File: driver.h  
Line: 120  
Column: 15
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, density, real_t, dense, 0  
File: driver.h  
Line: 150  
Column: 13
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, velocity, vector_t, dense, 0  
File: driver.h  
Line: 152  
Column: 13
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, internal_energy, real_t, dense, 0  
File: driver.h  
Line: 154  
Column: 13
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, pressure, real_t, dense, 0  
File: driver.h  
Line: 157  
Column: 13
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, temperature, real_t, dense, 0  
File: driver.h  
Line: 158  
Column: 13
```

Macro:

```
Name: flecsi_get_handle  
Args: mesh, hydro, sound_speed, real_t, dense, 0  
File: driver.h  
Line: 159  
Column: 13
```

Macro:

Name: flecsi\_get\_handle  
Args: mesh, hydro, flux, flux\_data\_t, dense, 0  
File: driver.h  
Line: 161  
Column: 12

Macro:

Name: flecsi\_execute\_task  
Args: initial\_conditions\_from\_file, flecsale::apps::hydro, index, mesh,inputs\_t::eos,soln\_time,filename\_char,d,v,e,p,T,a  
File: driver.h  
Line: 175  
Column: 5

Macro:

Name: flecsi\_execute\_task  
Args: initial\_conditions, flecsale::apps::hydro, index, mesh,inputs\_t::eos,soln\_time,d,v,e,p,T,a  
File: driver.h  
Line: 186  
Column: 5

Macro:

Name: flecsi\_execute\_task  
Args: output, flecsale::apps::hydro, index, mesh,prefix\_char,postfix\_char,time\_cnt,soln\_time,d,v,e,p,T,a  
File: driver.h  
Line: 212  
Column: 5

Macro:

Name: flecsi\_execute\_task  
Args: print, flecsale::apps::hydro, index, mesh,name  
File: driver.h  
Line: 228  
Column: 12

Macro:

Name: flecsi\_execute\_reduction\_task  
Args: evaluate\_time\_step, flecsale::apps::hydro, index, min, double, mesh,d,v,e,p,T,a,inputs\_t::CFL,inputs\_t::final\_time-soln\_time  
File: driver.h  
Line: 248  
Column: 36

Macro:

Name: flecsi\_execute\_task

```
Args: evaluate_fluxes, flecsale::apps::hydro, index, mesh,d,v,e,p,T,a,F
File: driver.h
Line: 257
Column: 5
```

Macro:

```
Name: flecsi_execute_task
Args: apply_update, flecsale::apps::hydro, index, mesh,inputs_t::eos,time_step,F,d,v,e,p,T,a
File: driver.h
Line: 264
Column: 5
```

Macro:

```
Name: flecsi_execute_task
Args: output, flecsale::apps::hydro, index, mesh,prefix_char,postfix_char,time_cnt,soln_time,d,v,e,p,T,a
File: driver.h
Line: 308
Column: 7
```

Macro:

```
Name: flecsi_execute_task
Args: dump, flecsale::apps::hydro, index, mesh,time_cnt,soln_time,d,v,e,p,name
File: driver.h
Line: 345
Column: 5
```

## burton\_specialization\_init.cc

Macro:

```
Name: flecsi_register_mpi_task
Args: partition_mesh, flecsi_sp::burton
File: burton_specialization_init.h
Line: 2532
Column: 1
```

Macro:

```
Name: flecsi_register_task
Args: initialize_mesh, flecsi_sp::burton, loc, index|flecsi::leaf
File: burton_specialization_init.h
Line: 2533
Column: 1
```

Macro:

```
Name: flecsi_register_data_client
Args: burton_mesh_t, meshes, mesh0
```

```
File: burton_specialization_init.h
Line: 2540
Column: 1
```

Macro:

```
Name: flecsi_execute_mpi_task
Args: partition_mesh, flecsi_sp::burton, mesh_filename,max_entries
File: burton_specialization_init.cc
Line: 72
Column: 3
```

Macro:

```
Name: flecsi_get_client_handle
Args: flecsi_sp::burton::burton_mesh_t, meshes, mesh0
File: burton_specialization_init.cc
Line: 102
Column: 22
```

Macro:

```
Name: flecsi_execute_task
Args: initialize_mesh, flecsi_sp::burton, index, mesh_handle,mesh_filename
File: burton_specialization_init.cc
Line: 104
Column: 3
```

runtime\_main.cc

burton\_types.cc

internal\_client.cc

Macro:

```
Name: flecsi_register_data_client
Args: global_data_client_t, global_client, global_client
File: internal_client.cc
Line: 21
Column: 1
```

Macro:

```
Name: flecsi_register_data_client
Args: color_data_client_t, color_client, color_client
File: internal_client.cc
Line: 22
Column: 1
```

-----  
Analysis  
-----

Synopsis:  
No errors or warnings were detected.

-----  
Summary  
-----

Note:  
FleCSI static analysis completed.

# Output: hydro\_2d, Once More

Let's shorten the output further. To the previous options, add two more: **-no-macro** (suppress printing of macros that were found), and **-short** (general short-form output; **-file-short** as given earlier only shortened file name printing).

```
Command...  
Queueing make-verbose file <standard input>.
```

```
Compilation...  
elements.cc  
runtime_driver.cc  
dummy.cc  
announce.cc  
context_policy.cc  
debruijn.cc  
dummy.cc  
dbc_impl.cc  
exceptions.cc  
inputs.cc  
vtk.cc  
demangle.cc  
driver.cc  
burton_specialization_init.cc  
runtime_main.cc  
burton_types.cc  
internal_client.cc
```

```
Analysis...  
No errors or warnings were detected.
```

```
Summary...  
FleCSI static analysis completed.
```

As you can see, the default very-verbose printing can be reduced to less than one page! (Had there been errors or warnings in the analyzed code, they'd still have been printed.)

# Analyzing FleCSI's Tutorial Codes

**The Good:** FleCSI's tutorial examples come with a pre-written specialization layer, making the tutorial's user codes, themselves, be short, simple, and to-the-point.

**The Bad:** In terms of code analysis, the above fact complicates matters. Proper analysis requires *exact* knowledge of how *every* involved source file is compiled.

**The Ugly:** At the moment, therefore, complete analysis of a tutorial code requires that we do some things by hand. (Assuming that the tutorial scheme is kept as-is, we'll work on ways to make this process simpler.)

## **Solution:**

Tutorial-wise, two processes are involved:

**1.** When you build FleCSI, it creates (among other things) a library, `libFleCSI-Tut.so`, for the tutorial specialization. The library is presently built from three source files: **`control.cc`**, **`coloring.cc`**, **`control_points.cc`**. *We must determine how the build system compiles those files.*

**2.** A specific tutorial example is built by running the `flecsit` python script thus: `flecsit compile <tutorial-file.cc>`. Ultimately, `flecsit` compiles the given file in a particular way, then links with `libFleCSI-Tut.so`. *We must determine how `flecsit` compiles `<tutorial-file.cc>`.*



# Tutorial Analysis (continued)

My solution (**yep, this needs simplification**) was to first capture the output from making FleCSI:

```
cd ~/flecsi
mkdir build
cd build
cmake .. -foo -bar -etc
make >& make.out
```

Then, I grep'd the output in order to find those three tutorial specialization source files:

```
grep specialization make.out | grep 'control\.cc$'
grep specialization make.out | grep 'coloring\.cc$'
grep specialization make.out | grep 'control_points\.cc$'
```

The initial greps were to ensure that we only got the specialization/ material. (There's another control.cc elsewhere in FleCSI.)

Finally, the above provided three quite long clang++ commands:

```
/usr/local/bin/clang++ -lots -of -flags /blah/blah/specialization/control/control.cc
/usr/local/bin/clang++ -lots -of -flags /blah/blah/specialization/mesh/coloring.cc
/usr/local/bin/clang++ -lots -of -flags /blah/blah/specialization/mesh/control_points.cc
```

If these had had something like “cd /some/directory &&” at the beginning of those lines, we'd need to make a note of each /some/directory.

# Tutorial Analysis (continued)

Next, I inspected the flecsit script and determined what clang++ command it creates when you flecsit compile something. For the file, let's use **index-space.cc** from 03-index-spaces/.

Finally, I cobbled together all of the above information and created a .json-format file like this:

```
[
  {
    "directory" : ".",    <== or whatever directory was in a cd
    "command"   : "/usr/local/bin/clang++ -flags -from -make /full/path/to/control.cc",
    "file"      : "/full/path/to/control.cc"
  },
  {
    "directory" : ".",
    "command"   : "/usr/local/bin/clang++ -flags -from -make /full/path/to/coloring.cc",
    "file"      : "/full/path/to/coloring.cc"
  },
  {
    "directory" : ".",
    "command"   : "/usr/local/bin/clang++ -flags -from -make /full/path/to/control_points.cc",
    "file"      : "/full/path/to/control_points.cc"
  },
  {
    "directory" : ".",
    "command"   : "/usr/local/bin/clang++ -flags -from -flecsit /full/path/to/index-spaces.cc",
    "file"      : "/full/path/to/index-spaces.cc"
  }
]
```

This can be ingested by flecstan, with a command like:

**flecstan -json index-spaces.json**

Ideally, our build system could create these .json files for you.

# Tutorial Analysis: Output

-----  
Command  
-----

Note:  
Queueing JSON file index-spaces.json.

-----  
Compilation  
-----

File:  
index-spaces.json

File:  
index-spaces.json: /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc

Scanning for FleCSI macros...

Macro:  
Name: flecsi\_register\_data\_client  
Args: mesh\_t, clients, mesh  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/mesh.h  
Line: 71

Macro:  
Name: flecsi\_register\_task  
Args: simple, example, loc, index  
File: /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc  
Line: 54

Macro:  
Name: flecsi\_get\_client\_handle  
Args: mesh\_t, clients, mesh  
File: /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc  
Line: 66

Macro:  
Name: flecsi\_execute\_task  
Args: simple, example, index, m

File: /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc  
Line: 70

Visiting the C++ abstract syntax tree...

Link:

Function call: flecsi::data::data\_client\_interface\_u::register\_data\_client  
Matches macro: flecsi\_register\_data\_client (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/mesh.h, line 71)

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task  
Matches macro: flecsi\_register\_task (file /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc, line 54)

Link:

Function call: flecsi::data::data\_client\_interface\_u::get\_client\_handle  
Matches macro: flecsi\_get\_client\_handle (file /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc, line 66)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task  
Matches macro: flecsi\_execute\_task (file /home/staley/flecsi/flecsi-tutorial/03-index-spaces/index-spaces.cc, line 70)

File:

index-spaces.json: /home/staley/flecsi/flecsi-tutorial/specialization/control/control.cc

Scanning for FleCSI macros...

Visiting the C++ abstract syntax tree...

File:

index-spaces.json: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/coloring.cc

Scanning for FleCSI macros...

Macro:

Name: flecsi\_register\_mpi\_task  
Args: add\_colorings, flecsi::tutorial  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/coloring.h  
Line: 29

Visiting the C++ abstract syntax tree...

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task  
Matches macro: flecsi\_register\_mpi\_task (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/coloring.h, line 29)

File:  
index-spaces.json: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc

Scanning for FleCSI macros...

Macro:  
Name: flecsi\_register\_mpi\_task  
Args: add\_colorings, flecsi::tutorial  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/coloring.h  
Line: 29

Macro:  
Name: flecsi\_register\_data\_client  
Args: mesh\_t, clients, mesh  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/mesh.h  
Line: 71

Macro:  
Name: flecsi\_register\_task  
Args: initialize\_mesh, flecsi::tutorial, loc, index  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/tasks.h  
Line: 78

Macro:  
Name: flecsi\_execute\_mpi\_task  
Args: add\_colorings, flecsi::tutorial, map  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc  
Line: 36

Macro:  
Name: flecsi\_get\_client\_handle  
Args: mesh\_t, clients, mesh  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc  
Line: 77

Macro:  
Name: flecsi\_execute\_task  
Args: initialize\_mesh, flecsi::tutorial, index, mh  
File: /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc  
Line: 78

Visiting the C++ abstract syntax tree...

Link:  
Function call: flecsi::execution::task\_interface\_u::register\_task

Matches macro: flecsi\_register\_mpi\_task (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/coloring.h, line 29)

Link:

Function call: flecsi::data::data\_client\_interface\_u::register\_data\_client

Matches macro: flecsi\_register\_data\_client (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/mesh.h, line 71)

Link:

Function call: flecsi::execution::task\_interface\_u::register\_task

Matches macro: flecsi\_register\_task (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/tasks.h, line 78)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_mpi\_task (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc, line 36)

Link:

Function call: flecsi::data::data\_client\_interface\_u::get\_client\_handle

Matches macro: flecsi\_get\_client\_handle (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc, line 77)

Link:

Function call: flecsi::execution::task\_interface\_u::execute\_task

Matches macro: flecsi\_execute\_task (file /home/staley/flecsi/flecsi-tutorial/specialization/mesh/control\_points.cc, line 78)

-----  
Analysis  
-----

Synopsis:

No errors or warnings were detected.

-----  
Summary  
-----

Note:

FleCSI static analysis completed.

# Direct C++ Files

Flecstan is **designed to analyze FleCSI codes**, particularly in regards to their use of FleCSI's macro interface.

However, **you can run it on general C++ codes**, even though it won't find and report on any FleCSI constructs in non-FleCSI codes.

Why would you do this?

Well, many people find C++ compiler diagnostics to be cluttered, confusing, and convoluted.

Flecstan still **intercepts compiler diagnostics**, and **reformats** them into its own form.

You may find that form to be clearer.

Let's look at a simple example.

# Direct C++ File: Example

## C++ File:

```
// example-1.cc
#include <iostream>

void foo(int i)
{
    // Warning: parameter i is unused
}

int main()
{
    int i = 12345;
    foo(i);

    // Error: we accidentally write j, not i...
    std::cout << j << std::endl;
}
```

## Clang++ Command:

```
clang++ -Wunused-parameter example-1.cc
```

## Clang++ Output:

```
example-1.cc:4:14: warning: unused parameter 'i' [-Wunused-parameter]
void foo(int i)
           ^
example-1.cc:15:17: error: use of undeclared identifier 'j'
    std::cout << j << std::endl;
                  ^
1 warning and 1 error generated.
```

## Remark:

Those diagnostics are rather short and clear.

In this example, flecstan's reformatted diagnostics won't necessarily be better. They will, as we'll see, be somewhat more verbose.

Our point at the moment is simply to illustrate how flecstan reformats and colorizes compiler diagnostics.



# Direct C++ File: Example

## C++ File (again):

```
// example-1.cc
#include <iostream>

void foo(int i)
{
    // Warning: parameter i is unused
}

int main()
{
    int i = 12345;
    foo(i);

    // Error: we accidentally write j, not i...
    std::cout << j << std::endl;
}
```

## Flecstan Command:

```
flecstan -flags -Wunused-parameter example-1.cc
```

## Flecstan Output:

```
-----
Command
-----

Note:
    Found flag -Wunused-parameter.

Note:
    Setting C++ flags to -Wunused-parameter.

Note:
```

```
Queueing C++ file example-1.cc.

-----
Compilation
-----

File:
    example-1.cc

Scanning for FleCSI macros...

Warning:
    Clang++ reports a warning:
        unused parameter 'i'
    File: example-1.cc
    Line: 4

Error:
    Clang++ reports an error:
        use of undeclared identifier 'j'
    File: example-1.cc
    Line: 15

Visiting the C++ abstract syntax tree...

-----
Analysis
-----

Synopsis:
    1 error
    1 warning

-----
Summary
-----

Warning:
    FleCSI static analysis may be incomplete; errors occurred.
```

# Flecstan's Command-Line Options

## Informational

- [-]version
- [-]help

## Format: general

- [-]long
- [-]short

## Format: visual

- [-]print
- [-][no-]color[s]
- [-][no-]formfeed[s]

## Format: files

- [-]file-long
- [-]file-medium
- [-]file-short
- [-]file-full
- [-]file-strip

## Format: color markup

- [-]markup-ansi
- [-]markup-html
- [-]markup-rst
- [-]markup-tex
- [-]markup-tex-listing

## Content: combos

- [-]quiet
- [-]verbose

## Content: sections

- [-][no-]section-command
- [-][no-]section-compilation
- [-][no-]section-analysis
- [-][no-]section-summary

## Content: general

- [-][no-]title[s]
- [-][no-]file[s]
- [-][no-]report[s]
- [-][no-]scan[ning]
- [-][no-]macro[s]
- [-][no-]visit[ing]
- [-][no-]link[s]
- [-][no-]column[s]

## Content: diagnostics

- [-][no-]note[s]
- [-][no-]warning[s]
- [-][no-]error[s]

## Content: auxiliary

- [-][no-]trace[s]
- [-][no-]ccdetail[s]

## Content: debugging

- [-]debug

## Direct compilation

- [-]dir[ectory]
- [-]folder
- [-]clang[++]
- [-]flag[s]
- [-]cc
- [-]cpp
- [-]cxx
- [-]c++
- [-]C

## Files: input

- [-]make
- [-]json
- [-]yaml

## Files: output

- [-]yout