# FAUST

## A Framework for Adaptive Ubiquitous Scalable Tasks

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April 28th 2009

FAUST

A Framework for Adaptive Ubiquitous Scalable Tasks

# APPLICATION LEVEL SCHEDULING

- Why is application level scheduling important?
  - Different applications may have different runtime characteristics - system level scheduling usually does not take this into account
  - New scheduling approaches and algorithms can easily be tested without having them deployed system-wide
  - Multiple distributed resources without a cross-system meta-scheduler can be utilized effectively
  - Can help to optimize the overall time to completion of an application (e.g EKNF, BigJob, Glide-In... [find more/better examples])

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## KEY DESIGN OBJECTIVES

- Create a portable programming *framework* with a SAGA-like interface that can be used to schedule, manage and monitor jobs and resources programatically
- Provide a transparent mechanism to collect, interpret and store system performance data
- Expose low-level system and scheduling details *only* if desired / requested by the application programmer
- Provide a plug-in mechanism that allows the replacement of scheduling algorithms - no hard-wiring

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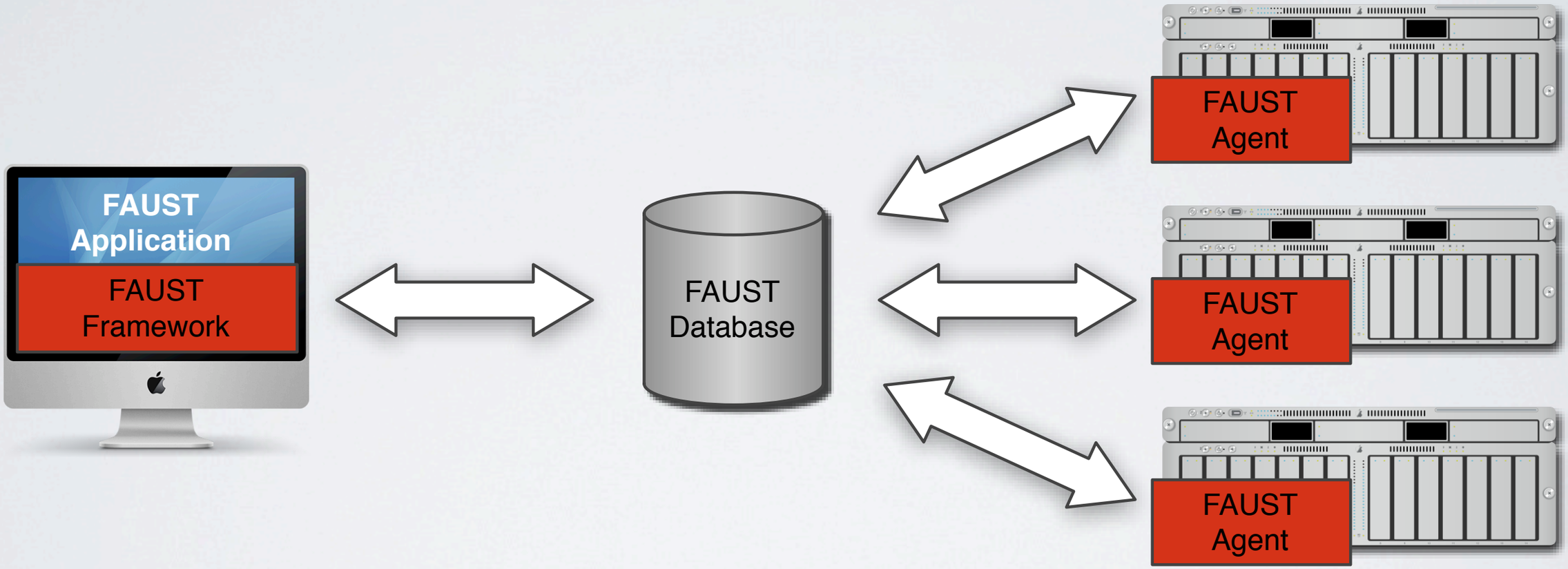
# ARCHITECTURE OVERVIEW



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## STATUS QUO

- Framework / Agent interaction protocol is implemented and works pretty stable with local and remote systems (GRAM hosts)
- Agents are capable of executing arbitrary shell commands on host machines and write the results back to the database
- Version 0.1 of the resource API is defined, implemented and ready to be used
- Beta testers needed!

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## TODO ITEMS

- Get more input and use-case scenarios from people who want to use FAUST in their projects
- Compile a list of resource_description to resource_monitor attribute mappings and implement them
- Implement basic job submission functionality so people can start using FAUST in their projects, even if the scheduling component is not in place yet
- Update website, documentation, etc...

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## ONLINE RESOURCES

- API documentation:
  http://macpro01.cct.lsu.edu/~oweidner/FAUST/

- SVN repository:
  https://svn.cct.lsu.edu/repos/saga-projects/applications/FAUST

- My email address: oweidner @ cct.lsu.edu

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# API EXAMPLES

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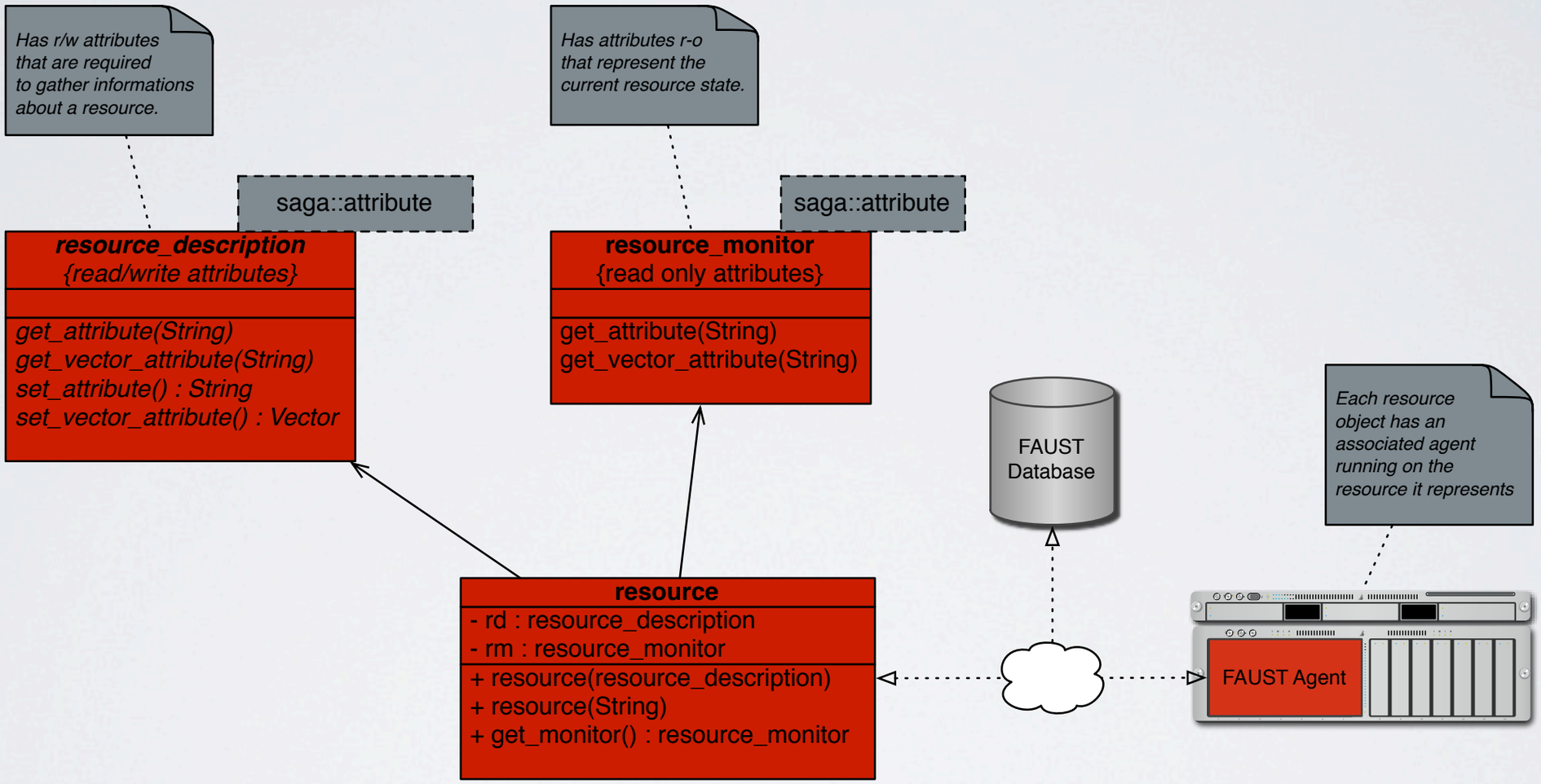
# RESOURCES: OVERVIEW



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## RESOURCES: API EXAMPLE 1

```
// FAUST API EXAMPLE 1
// Creating a resource from a resource description and
// instantiate a resource monitor instance.


faust::resource_description queenbeeRD;

queenbeeRD.set_attribute("identifier", "queenbee.loni.org");
queenbeeRD.set_attribute("faust_agent_submit_url", "gram://qb1.loni.org/jobmanager-fork");
queenbeeRD.set_attribute("faust_agent_binary_path", "/work/oweidner/FAUST/agent/faust_agent");
queenbeeRD.set_attribute("saga_root_path", "/work/oweidner/megajobs");

dir_ids.push_back("my_work_dir");
dir_path.push_back("/home/");
dir_dev_space_total_cmd.push_back ("echo \"scale=0; `df . | awk '/\\// {print $2}'` * 512/1024/1024\" | bc");
dir_dev_space_used_cmd.push_back  ("echo \"scale=0; `df . | awk '/\\// {print $3}'` * 512/1024/1024\" | bc");

queenbeeRD.set_vector_attribute("dir_id", dir_ids);
queenbeeRD.set_vector_attribute("dir_path", dir_path);
queenbeeRD.set_vector_attribute("dir_dev_space_total_cmd", dir_dev_space_total_cmd);
queenbeeRD.set_vector_attribute("dir_dev_space_used_cmd", dir_dev_space_used_cmd);

faust::resource queenbee (queenbeeRD, false); // create a resource instance (launches faust agent)
faust::resource_monitor queenbeeMON = queenbee.get_monitor();

std::vector<std::string> attribs = queenbeeMON.list_attributes();
std::vector<std::string>::const_iterator it;
for(it = attribs.begin(); it != attribs.end(); ++it)
{
  std::cout << (*it) << ": " << queenbeeMON.get_attribute(*it) << std::endl;
}
```

# RESOURCES: API EXAMPLE 2

```
// FAUST API EXAMPLE 2
// Reconnecting to a persistent resource agent and
// retrieving the original resource description.

// SCOPE 1
{
  faust::resource queenbee (queenbeeRD, true);

  // instance gets destroyed here but the agent lives
  // on since the persistency flag is set!
}

// SCOPE 2
{
  // use the resource “identifier” string to reconnect
  // to an existing resource agent
  faust::resource queenbee (“queenbee.loni.org”);

  faust::resource_description queenbeeRD = queenbee.get_description();
  std::vector<std::string> attribs = queenbee.list_attributes();
  std::vector<std::string>::const_iterator it;
  for(it = attribs.begin(); it != attribs.end(); ++it)
  {
    std::cout << (*it) << “: “ << queenbeeRD.get_attribute(*it) << std::endl;
  }
}
```

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## LIVE DEMO

```
10:31:58 FAUST faust::resource (localhost) [INFO] Checking faust::resource_description for completeness. SUCCESS
10:31:59 FAUST faust::resource (localhost) [INFO] Creating advert endpoint 'advert://macpro01.cct.lsu.edu:5432//FAUST/
10:31:59 FAUST faust::resource (localhost) [INFO] Populating advert endpoint 'advert://macpro01.cct.lsu.edu:5432//FAUST/
10:31:59 FAUST faust::resource (localhost) [INFO] Trying to launch agent 042b4002-4592-4c9c-a526-d1c2c6e8fcb4 via
10:32:1 FAUST faust::resource (localhost) [INFO] Sending command 'PING' to faust_agent instance. SUCCESS Waiting for
10:32:1 FAUST faust::resource (localhost) [INFO] Starting service thread. SUCCESS
10:32:1 FAUST faust::resource (localhost) [INFO] Re-connecting to advert endpoint advert://macpro01.cct.lsu.edu:5432//

10:32:2 FAUST faust::resource (localhost) [INFO] Sending command 'PING' to faust_agent instance. SUCCESS Waiting for
10:32:2 FAUST faust::resource (localhost) [INFO] Retrieving resource description for localhost. SUCCESS
10:32:2 FAUST faust::resource (localhost) [INFO] Starting service thread. SUCCESS

10:32:2 FAUST faust::resource (localhost) [INFO] Setting persistentcy for endpoint 'localhost' to false. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Sending command 'TERMINATE' to faust_agent instance. SUCCESS Waiting
10:32:3 FAUST faust::resource (localhost) [INFO] Removing advert endpoint ''. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Shutting down service thread. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Shutting down service thread. SUCCESS

10:32:3 FAUST faust::resource (localhost) [INFO] Checking faust::resource_description for completeness. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Creating advert endpoint 'advert://macpro01.cct.lsu.edu:5432//FAUST/
                                                 RESOURCES/localhost/'. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Populating advert endpoint 'advert://macpro01.cct.lsu.edu:5432//FAUST/
                                                 RESOURCES/localhost/'. SUCCESS
10:32:3 FAUST faust::resource (localhost) [INFO] Trying to launch agent dbf7bd51-6192-483c-bf2f-cf5276bca22c via
                                                 fork://localhost/. SUCCESS
10:32:5 FAUST faust::resource (localhost) [INFO] Sending command 'PING' to faust_agent instance. SUCCESS Waiting for
                                                 acknowledgement SUCCESS
10:32:5 FAUST faust::resource (localhost) [INFO] Starting service thread. SUCCESS
10:32:5 FAUST faust::resource (localhost) [INFO] Re-connecting to advert endpoint advert://macpro01.cct.lsu.edu:5432//
                                                 FAUST/RESOURCES/localhost/.
```

# INSTALLATION

- FAUST uses CMake and builds on all UNIX/Linux/MacOS X platforms
- Requirements: Boost 1.35+, CMake 2.6.2+ and SAGA 1.2.1+
- Checkout FAUST source code from: https://svn.cct.lsu.edu/repos/saga-projects/applications/FAUST
- Build and Install

```
$ export BOOST_ROOT=<path_to_your_boost_installation>

$ cmake -DSAGA_ROOT=<path_to_your_saga_installation> -DCMAKE_PREFIX=<install_dir> .

$ make
$ make install
```

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# THANKS

## Any Questions / Suggestions ?