JAWS 2: Refactorization
Framework Design and Utilization
Overview

James C. Hu
Washington University in St. Louis
jxh@cs.wustl.edu
http://www.cs.wustl.edu/~jxh/

Advisor: Dr. Douglas C. Schmidt
Sponsors: Siemens SCR
Object Technologies International
Eastman Kodak, Rochester, N.Y.

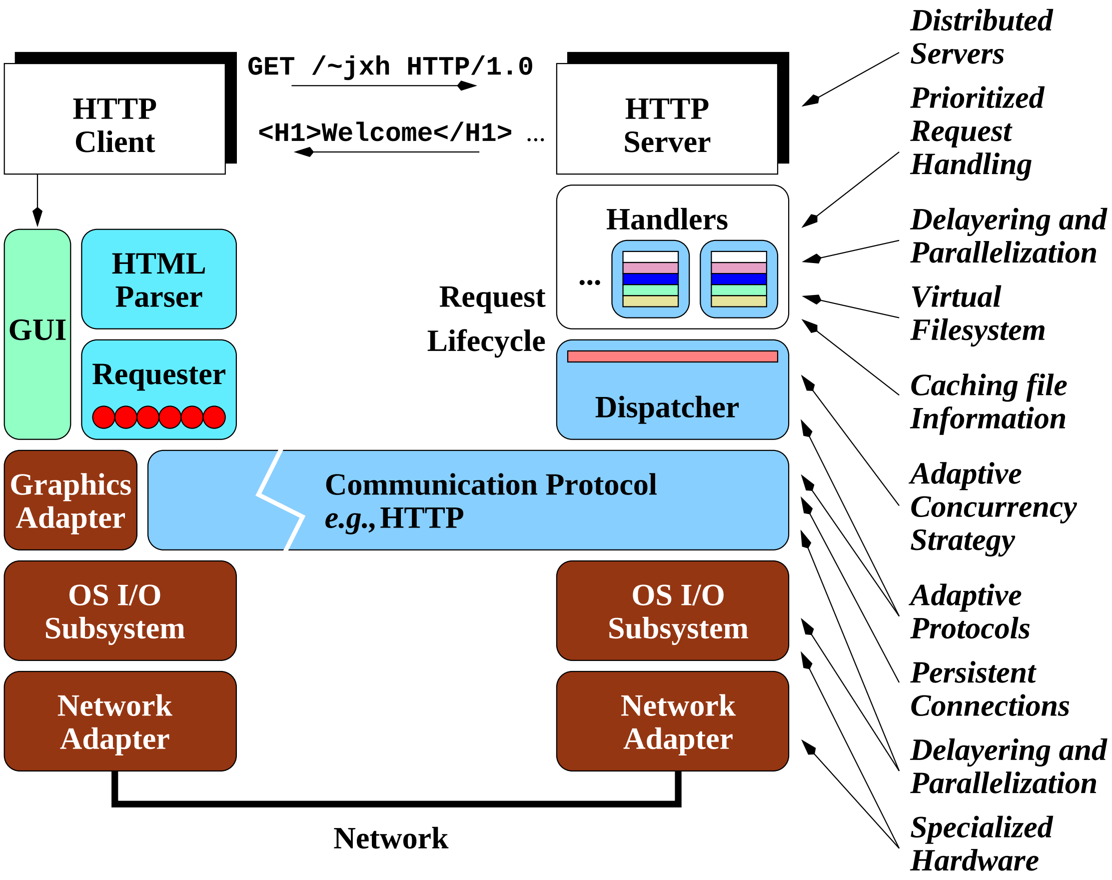
Overview

- Introduction
- JAWS 2
- Data Block
- Dispatch Policy
- IO Handler
- Protocol Pipeline Framework
- Utilization Rules
- Summary

Introduction

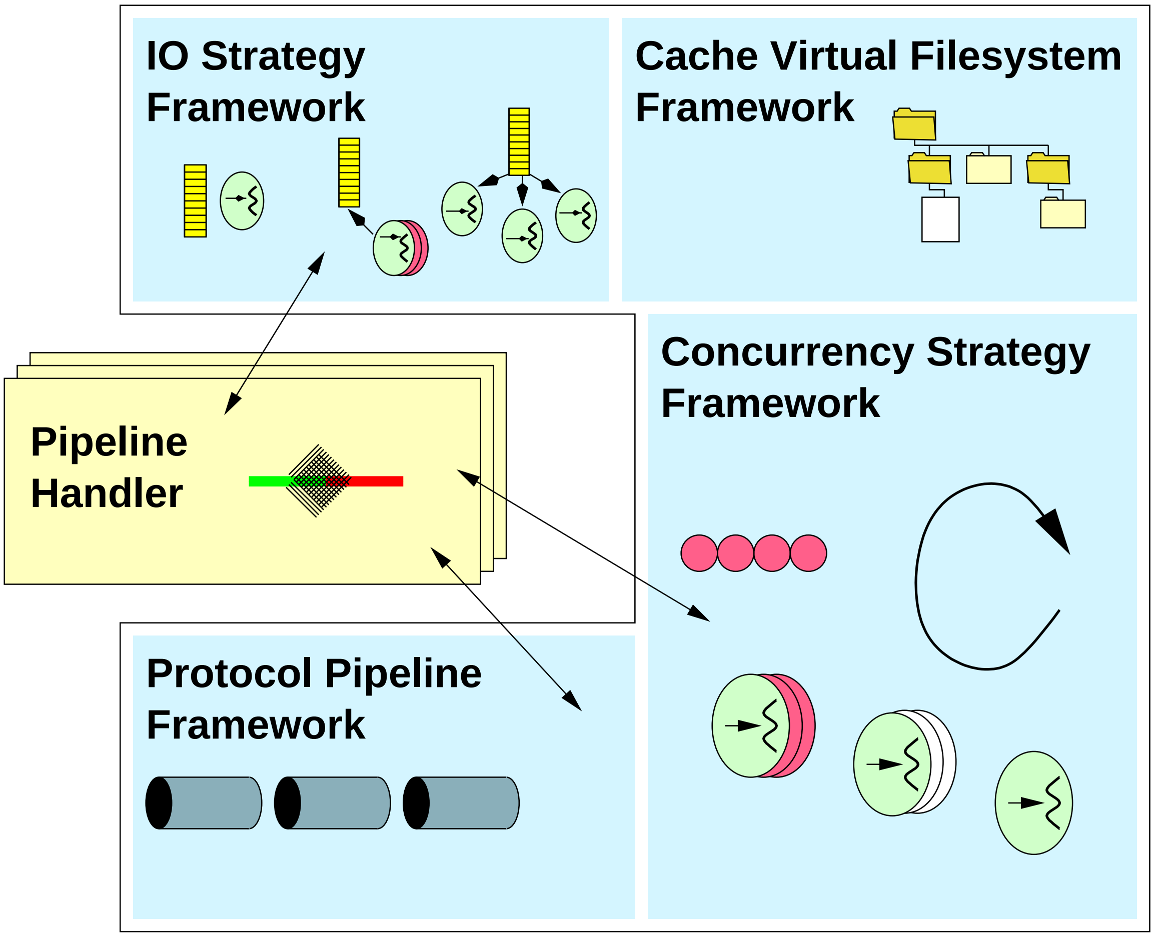
- Research question
  - *Identify techniques to develop Web systems that provide the best possible performance over high-speed networks.*
- Goals
  - *Alleviate "throughput preservation problem"*
  - *Create a framework to enable server developers to build high-performance Web systems by only implementing the protocol.*

A Typical Web System



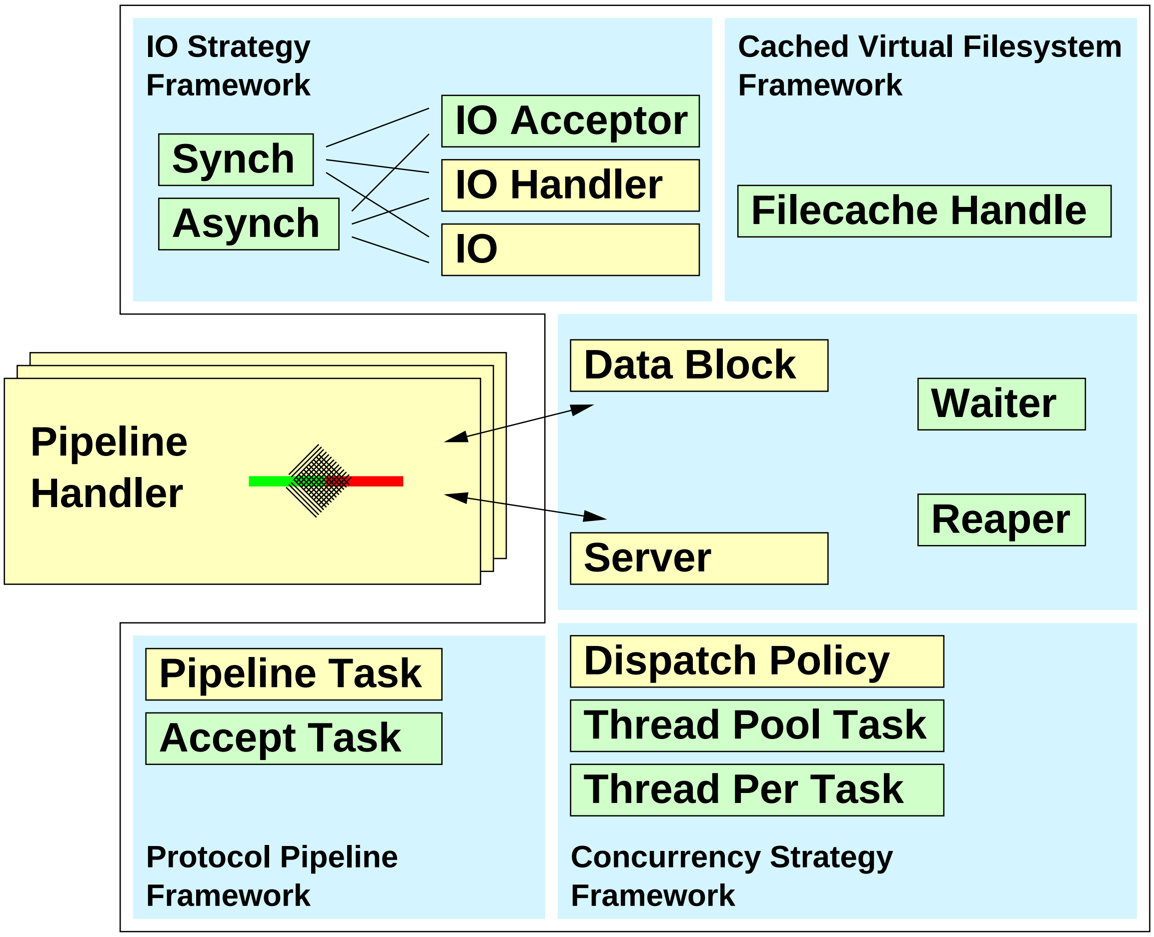
- Overview of Web system components
- Targets for optimizations

JAWS 2 Overview



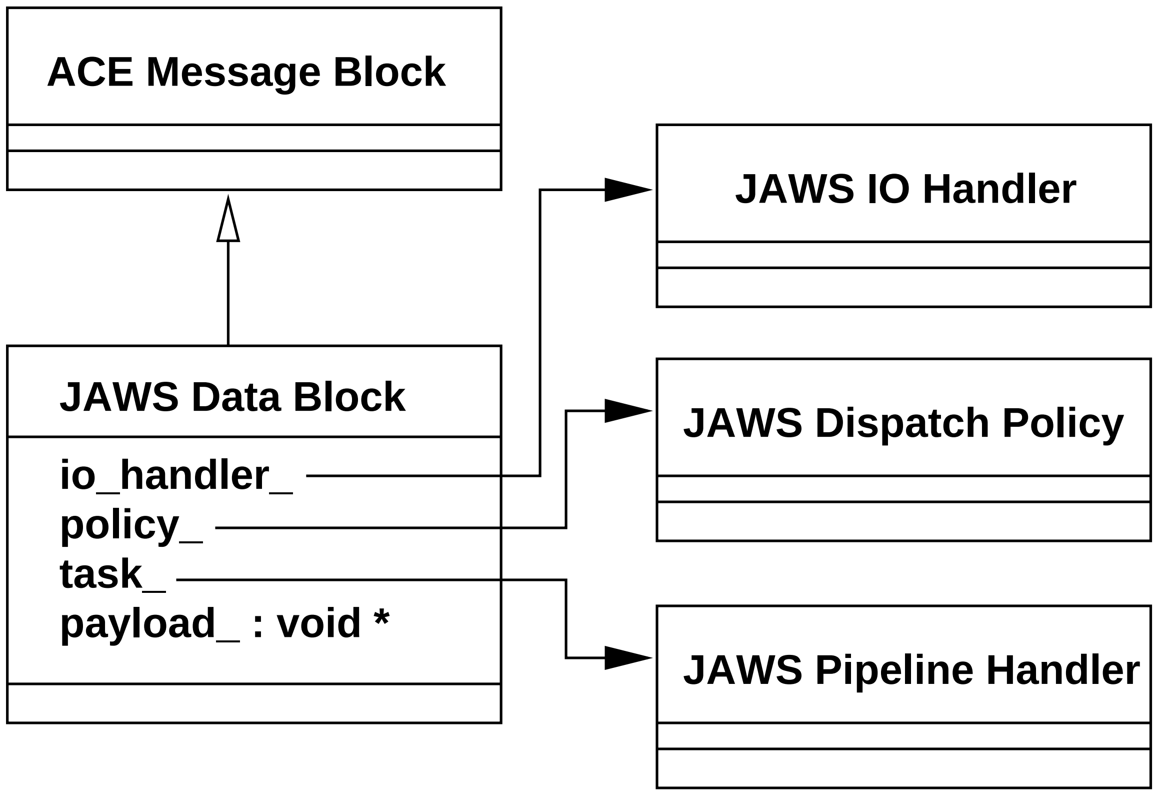
- Overview of JAWS top level components
- Allow different strategies to be tested independently and in concert.

JAWS 2 Overview



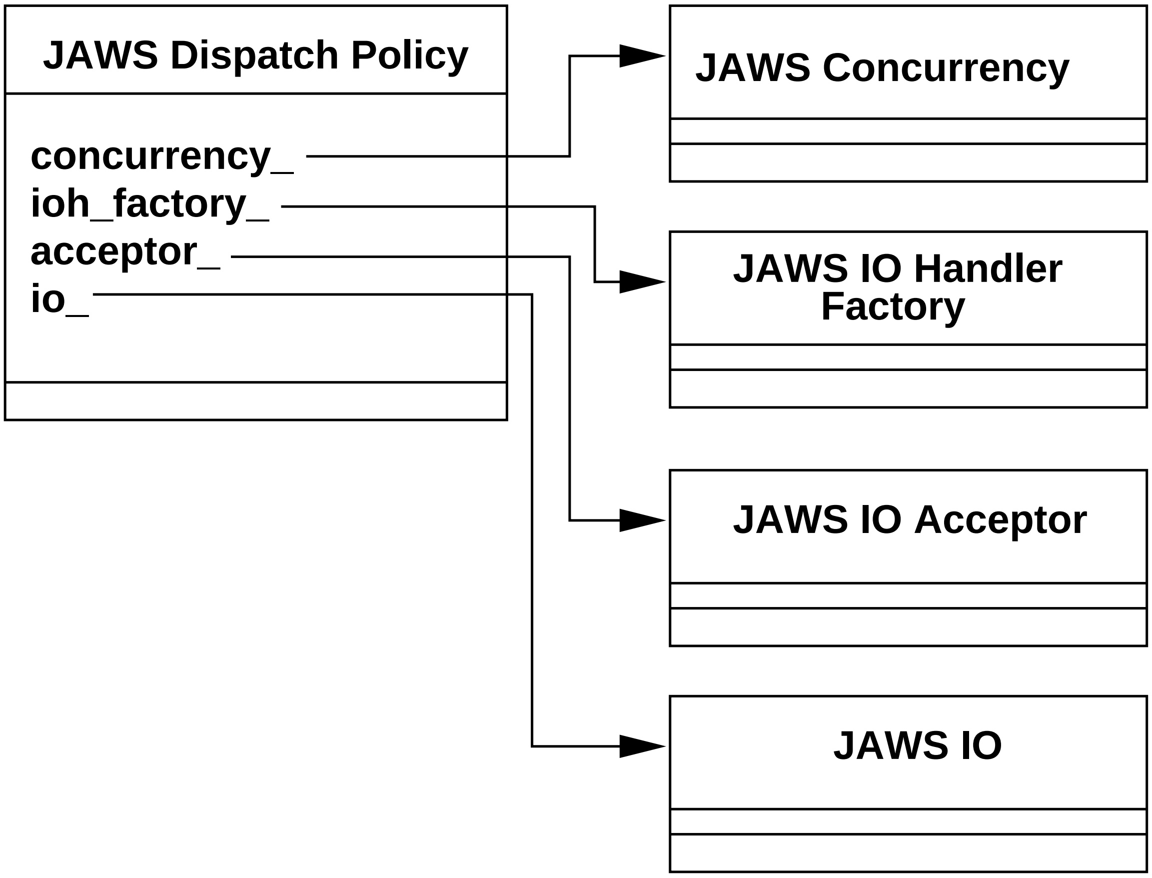
- Overview of JAWS inner components
- Illustration of framework use

JAWS Data Block



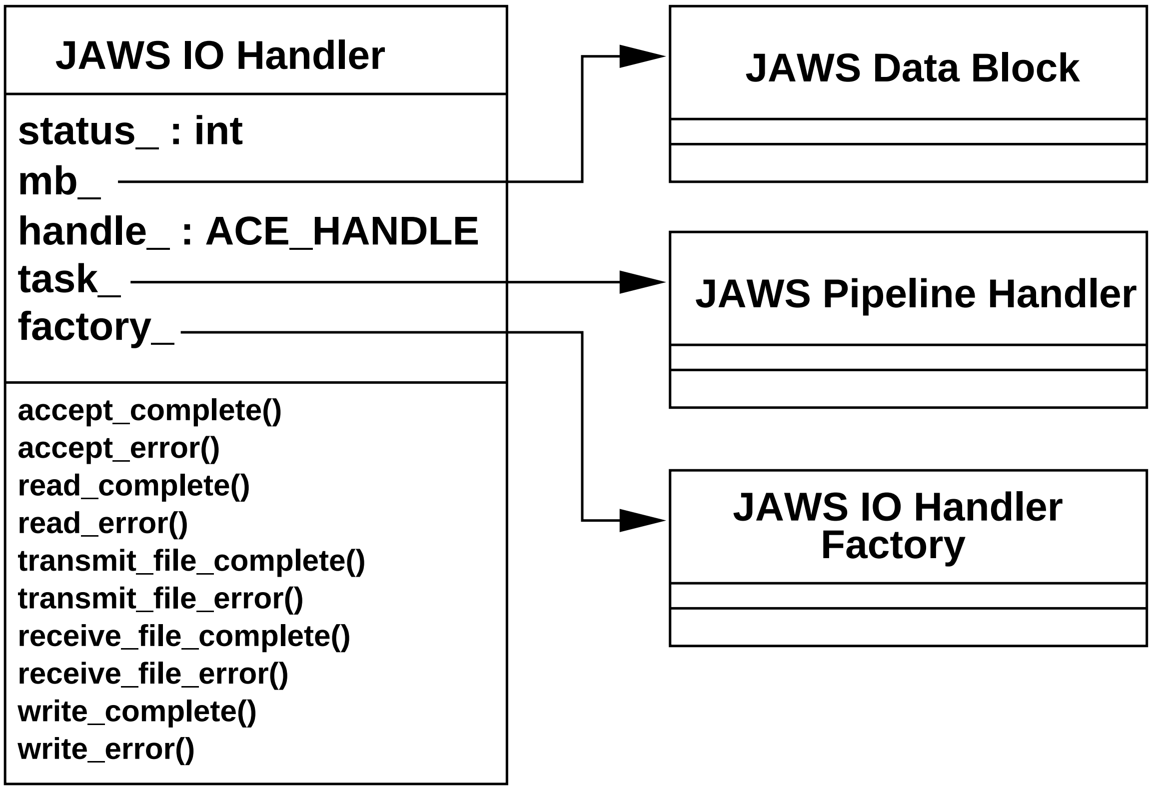
- Maintains server state
- Enables communication

JAWS Dispatch Policy



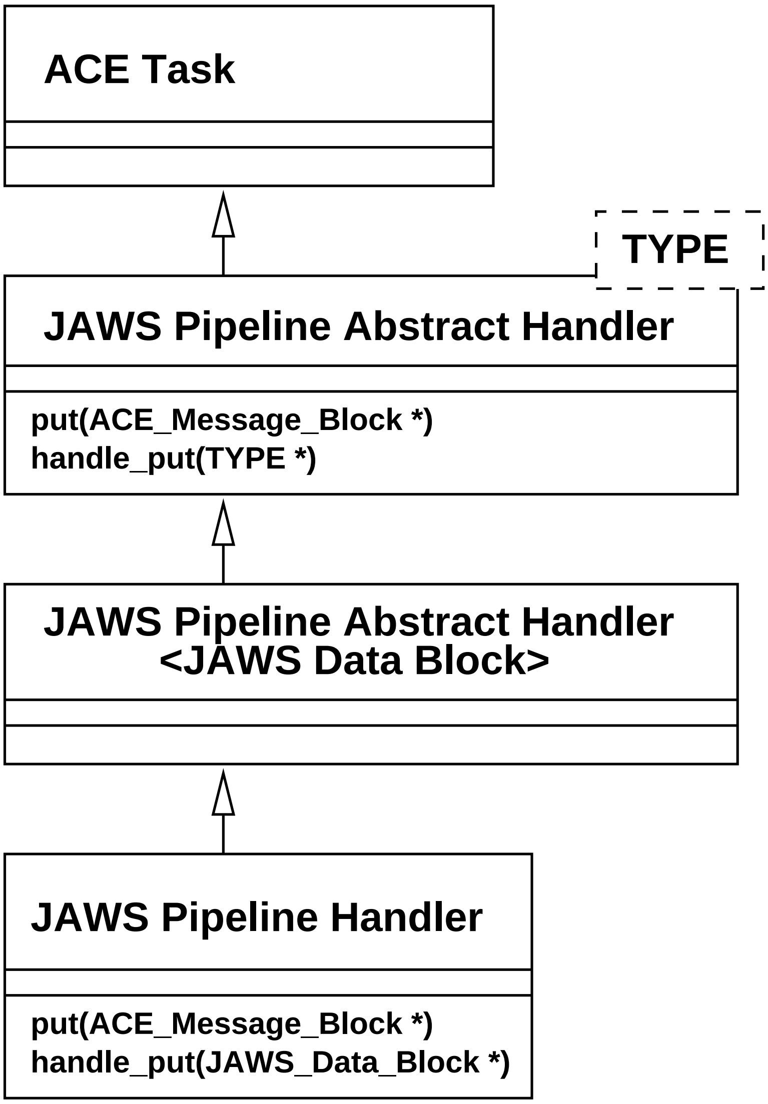
- Server decision maker
- Enables dynamic server behavior

JAWS IO Handler



- Maintains protocol and IO state
- Callback driven

Protocol Pipeline Framework



- Provides an abstraction to easily extend JAWS
- Linked list of tasks

Protocol Pipeline FURs

Framework Utilization Rules

1. Inherit from and extend JAWS_Pipeline_Handler.

2. Extract Dispatch_Policy and IO_Handler.

3. Check IO_Handler status after every IO request.

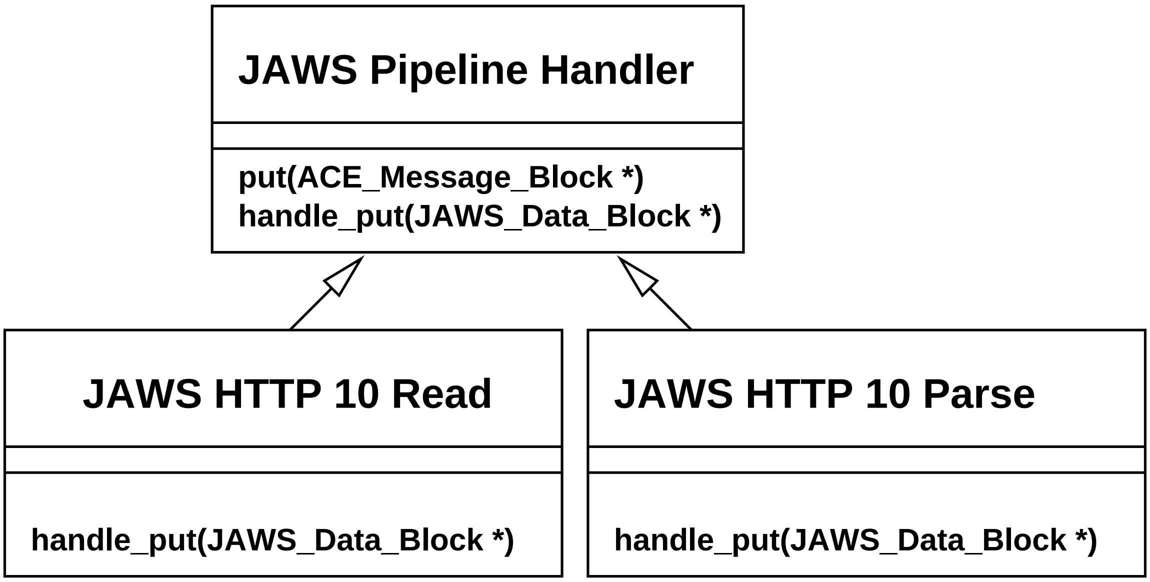
4. Return -1, 0, 1, or 2.

5. Use JAWS_Data_Block::payload() to communicate with next pipeline task.

6. If returning 2, check the payload.

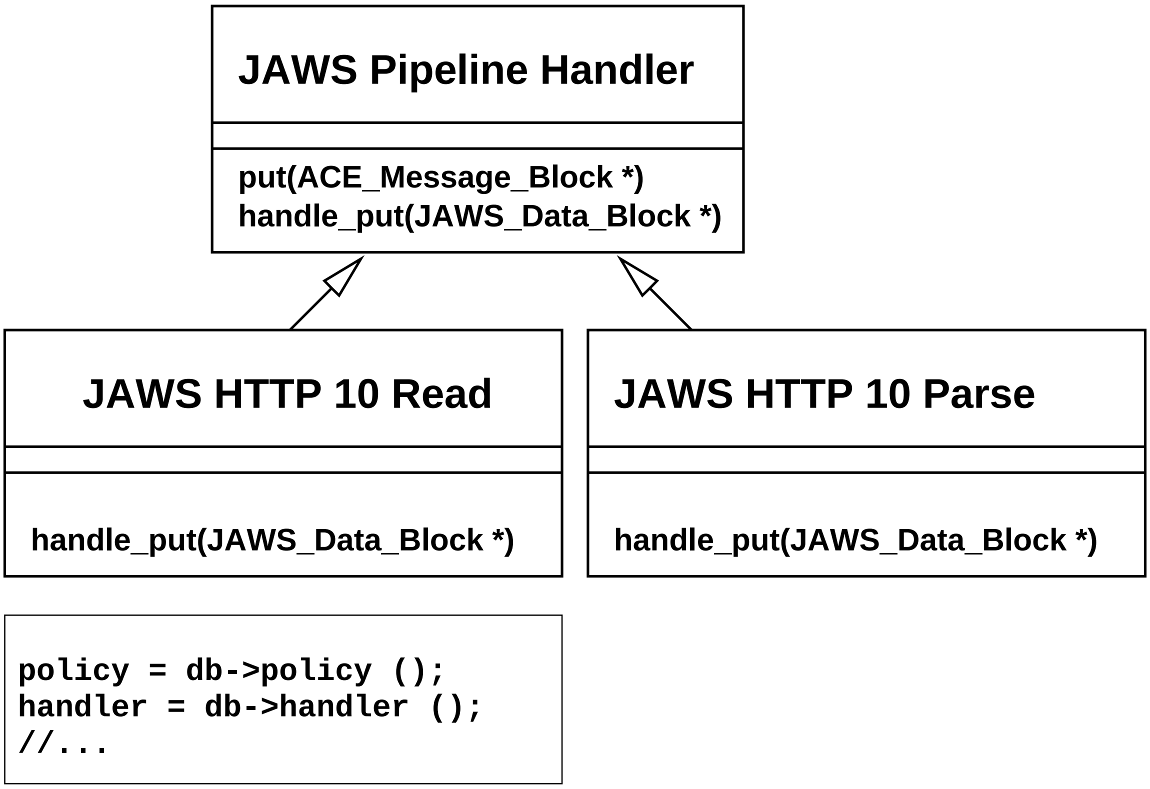
Protocol Pipeline FUR #1

Inherit from and extend JAWS_Pipeline_Handler.



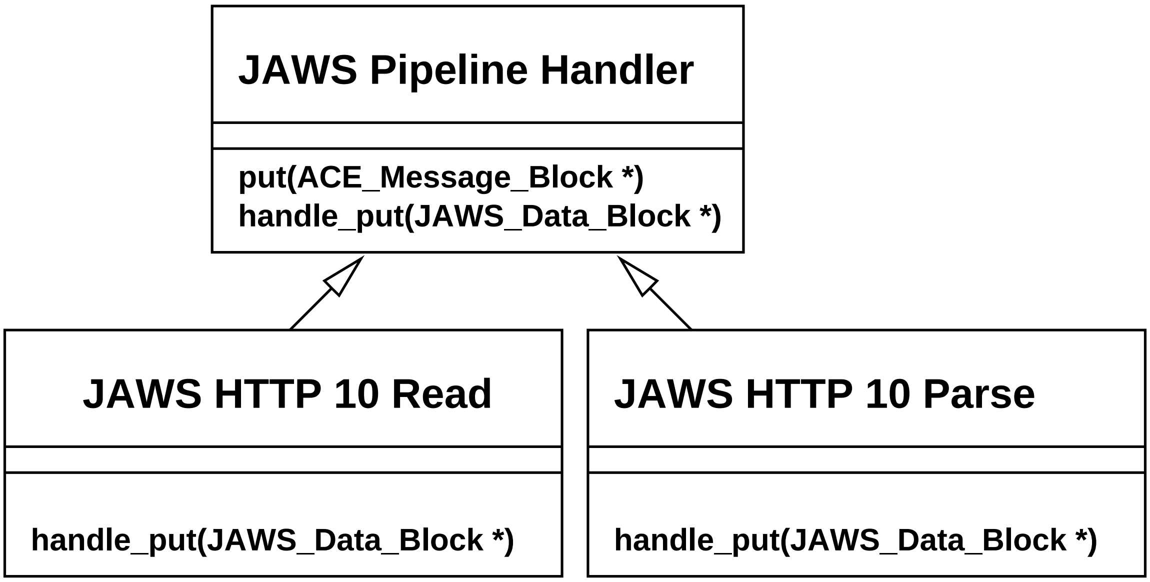
Protocol Pipeline FUR #2

Extract Dispatch_Policy and IO_Handler.



Protocol Pipeline FUR #3

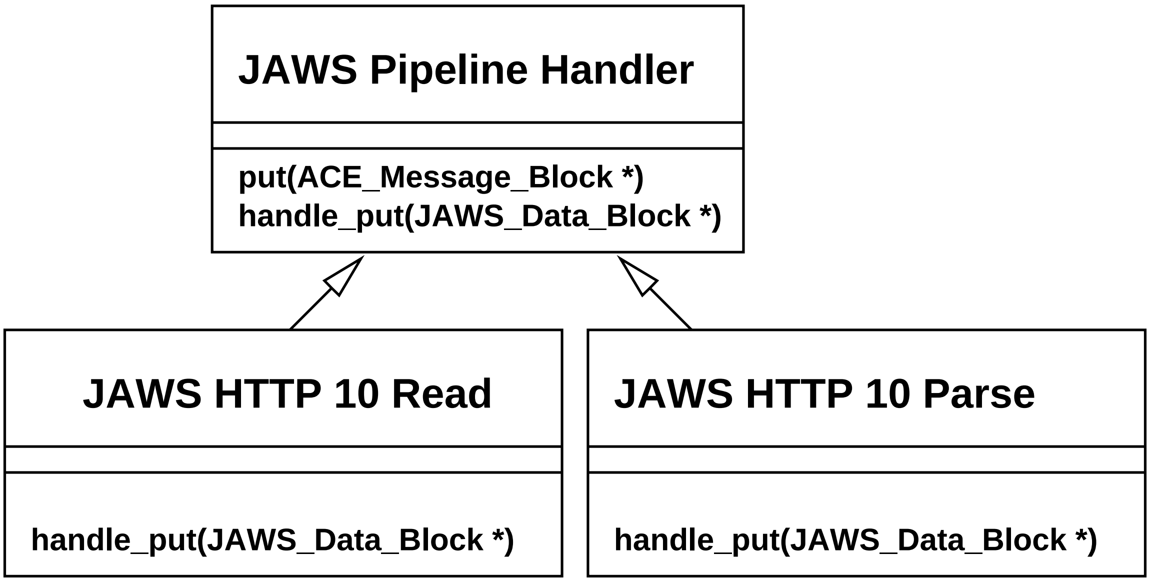
Check IO_Handler status after every IO request.




```
policy = db->policy ();
handler = db->handler ();
io = policy->io ();
size = db->size ();
io->read (handler,db,size);
switch (handler->status ()) {
//...
```

Protocol Pipeline FUR #4

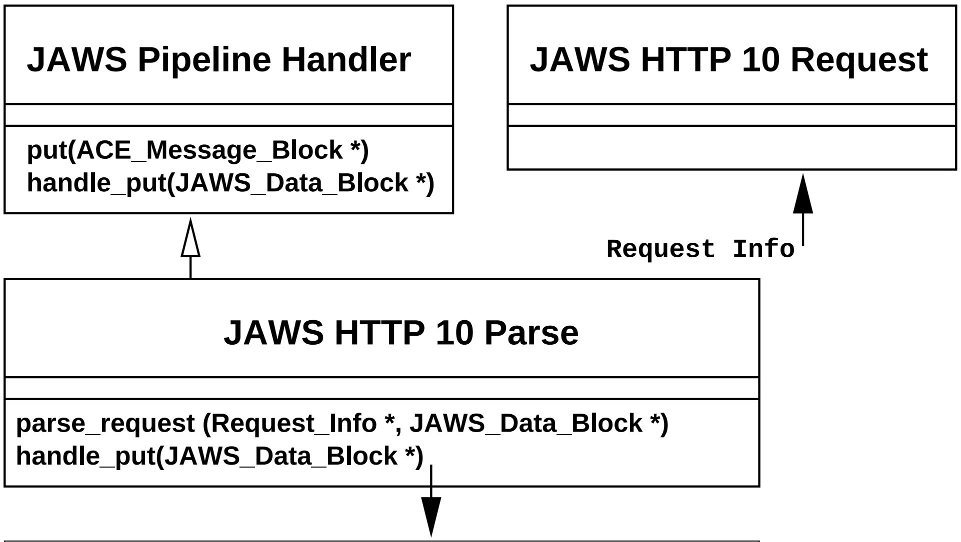
Return -1, 0, 1, or 2.




```
policy = db->policy ();
handler = db->handler ();
io = policy->io ();
size = db->size ();
io->read (handler,db,size);
switch (handler->status ()) {
case OK: return 0;
case IDLE: return 1;
default: return -1;
}
```

Protocol Pipeline FURs #5 and #6

Use JAWS_Data_Block::payload() to communicate with next pipeline task.
If returning 2, check the payload.




```
policy = db->policy ();
handler = db->handler ();
io = policy->io ();
info = db->payload ();
if (info == 0) {
  info = new Request_Info;
  db->payload (info);
}
while (this->parse_request (info,db) == 0) {
  if (db->full ()) {
    info->status (TOO_FULL);
    break;
  }
  io->read (handler,db,db->remaining_size ());
  switch (handler->status ()) {
  case OK: continue;
  case IDLE: return 2;
  default: return -1;
  }
}
return 0;
```

Summary

- JAWS is a framework for building flexible and adaptive Web servers.
- Enables prototyping and measuring different Web server optimization strategies.
- Previous versions of JAWS has performed as well or has outperformed top selling commercial Web servers.
- JAWS is currently being retooled and refactored.
- Developing FURs to document how to use the framework, and perhaps automate rule adherence.