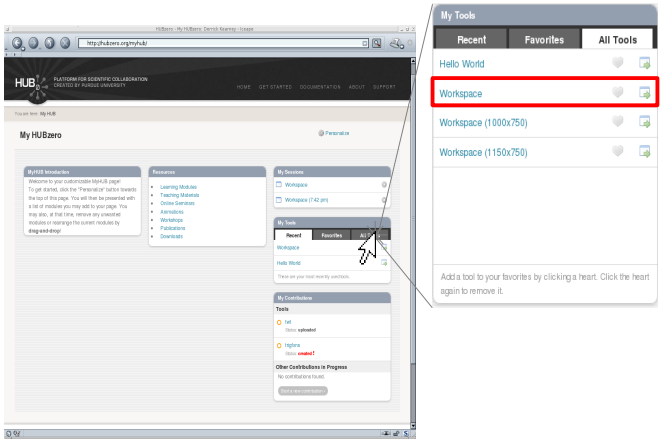
Automating Workspace Testing

Accessing a Workspace

User's Web Browser



HUBzero Infrastructure

Web Server

Middleware

Submit Proxy

Grid

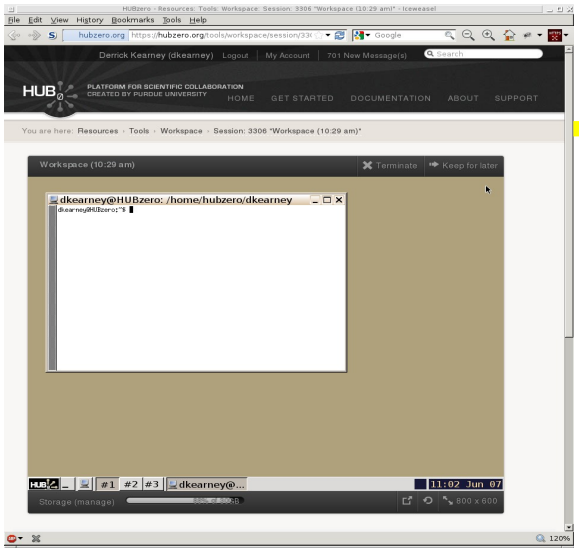
Tool Session Containers

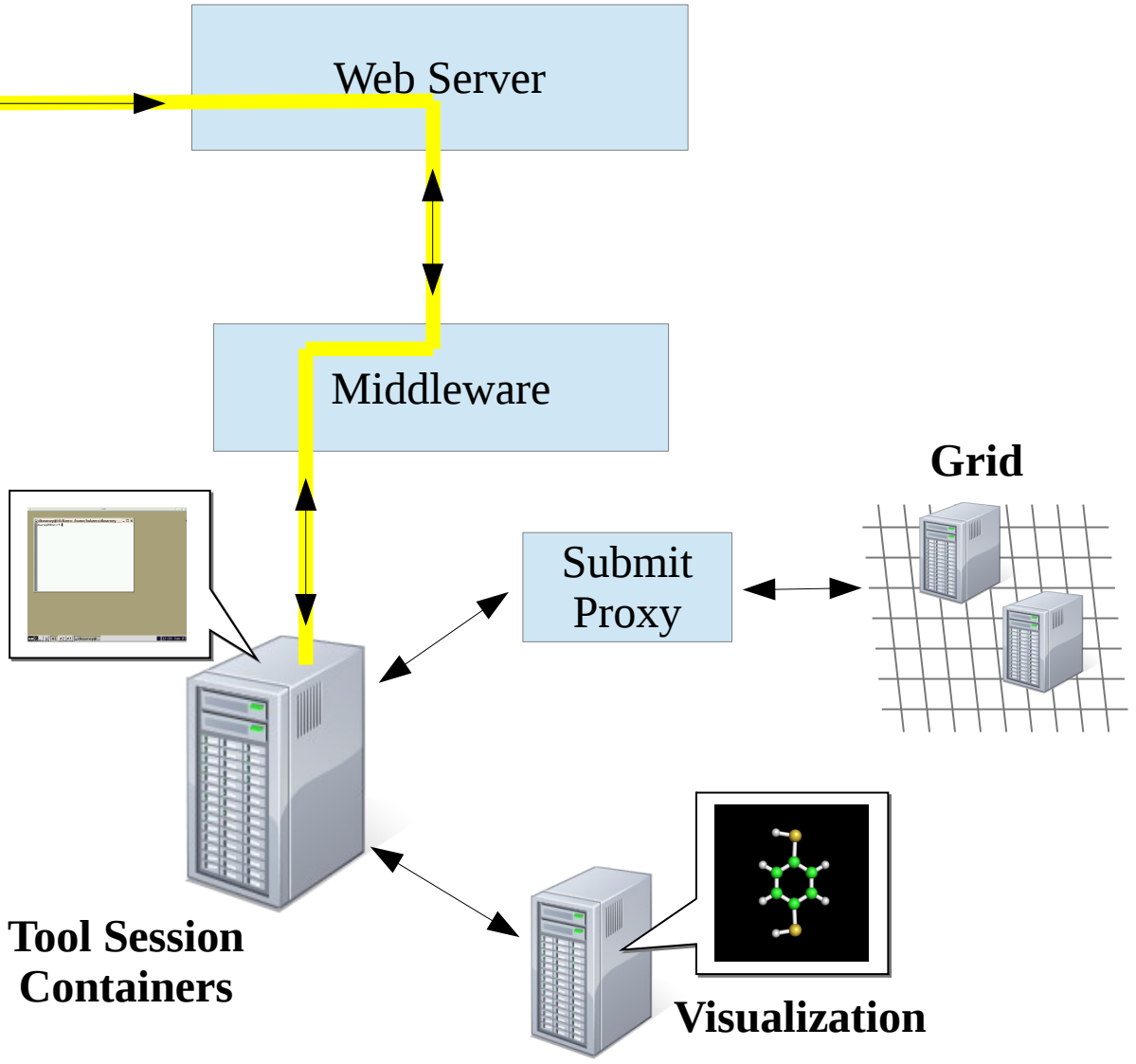
Visualization

Workspace via Website

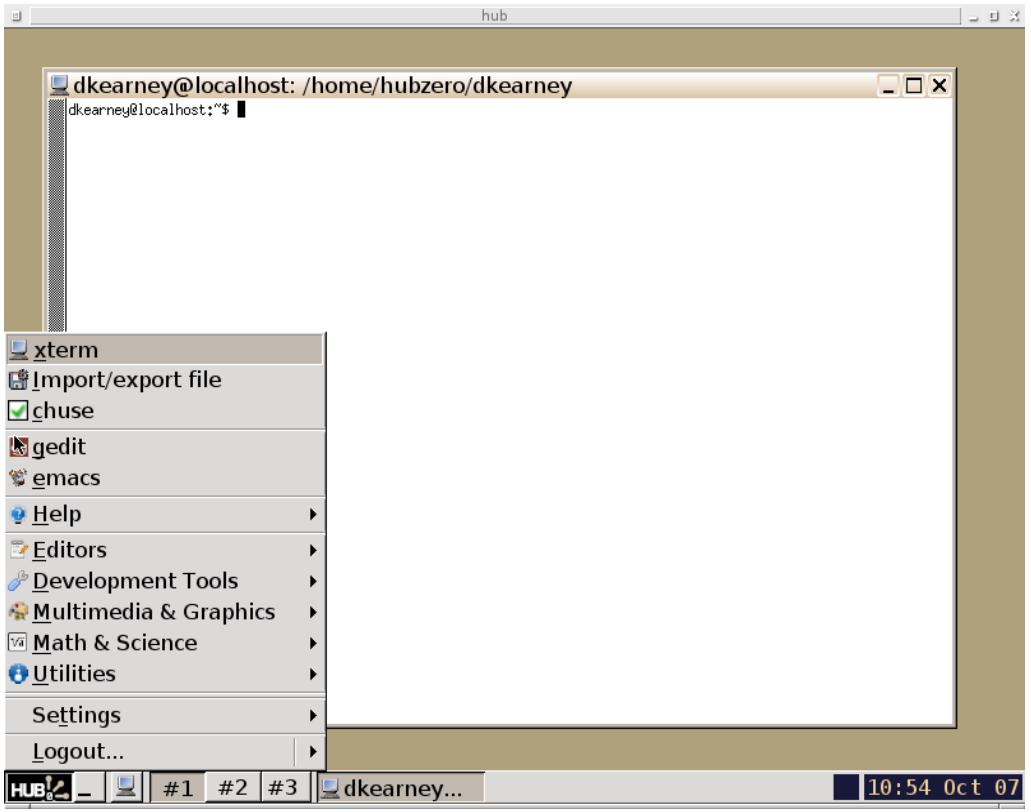
User's Web Browser

HUBzero Infrastructure





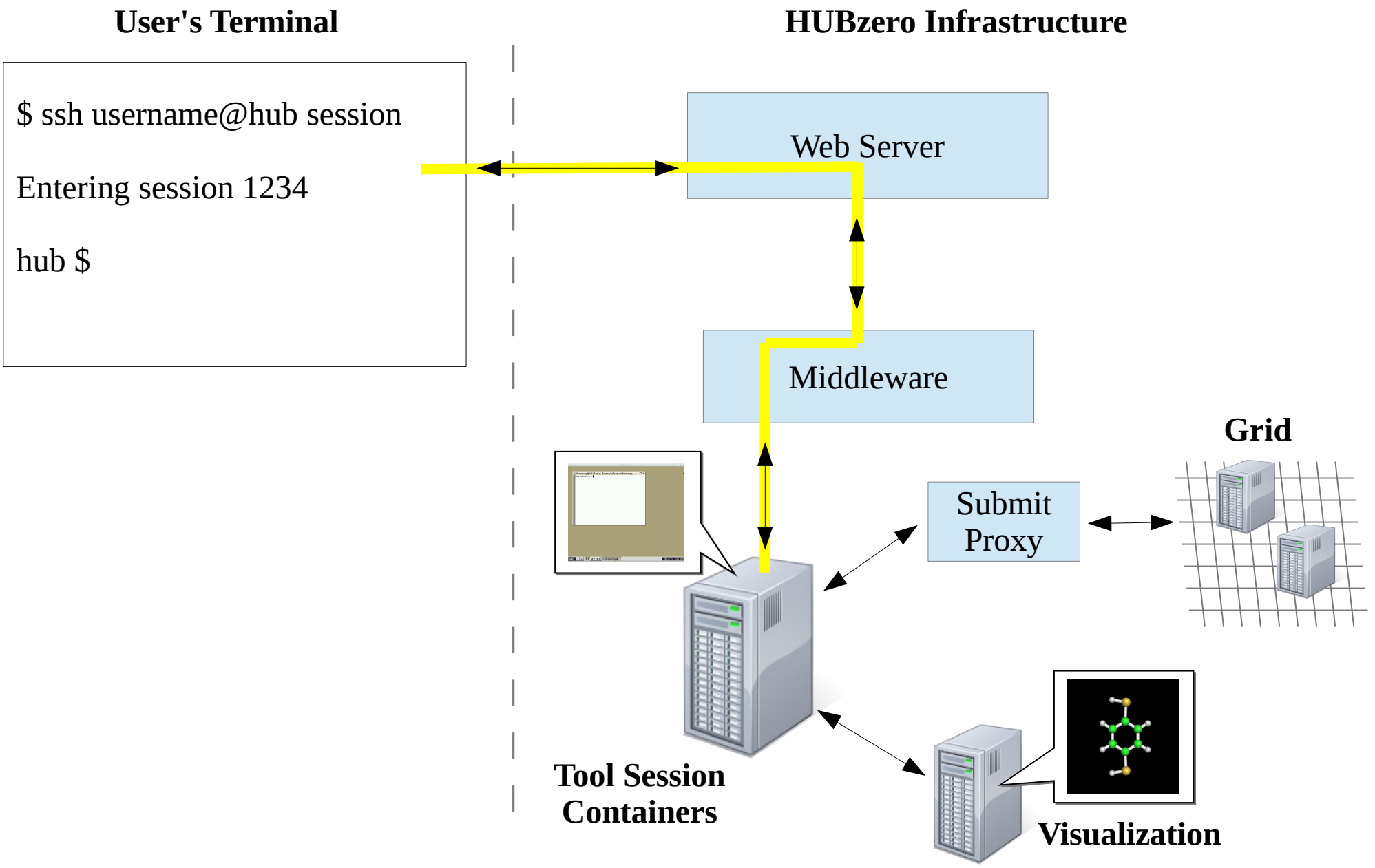
Using a Workspace



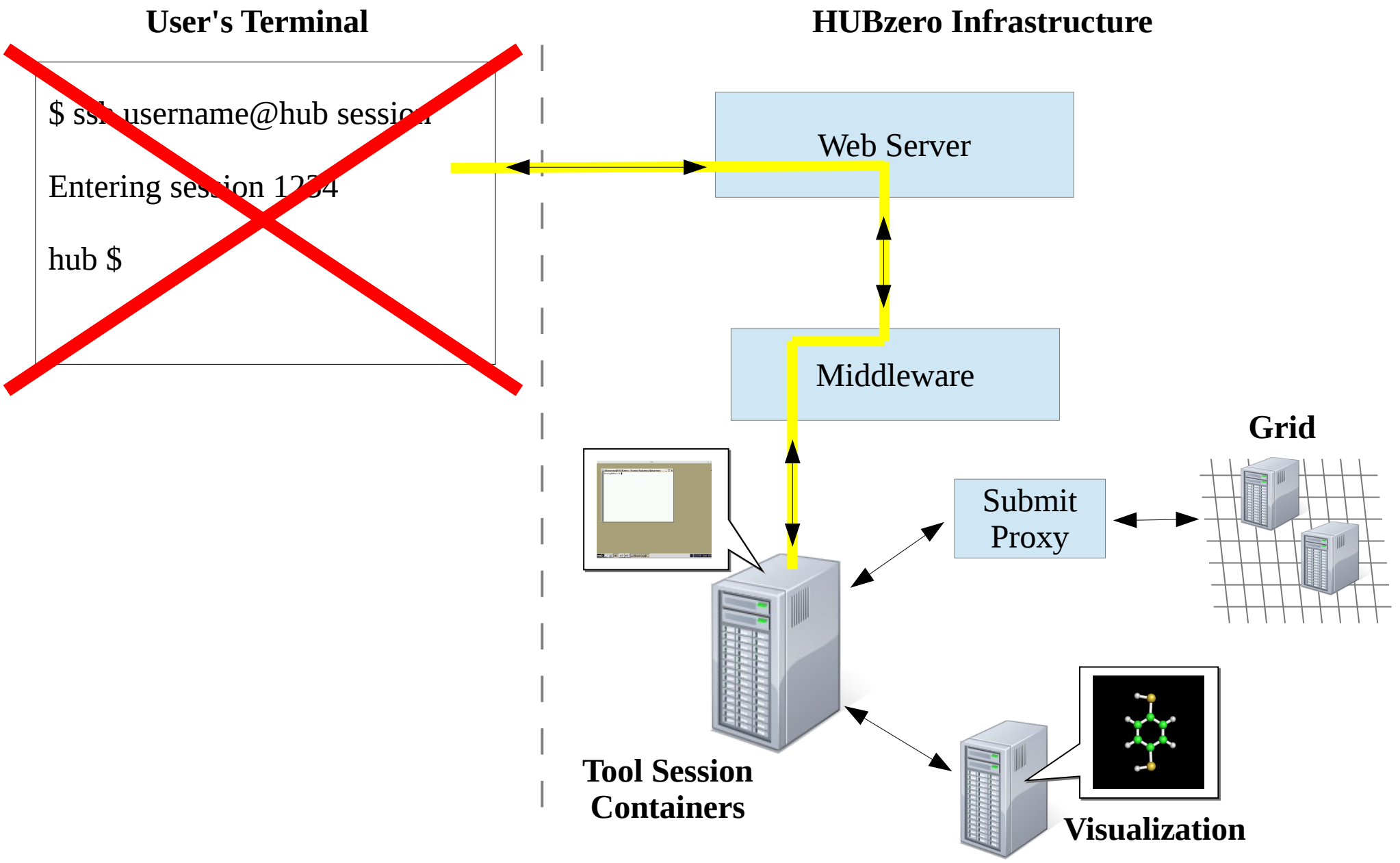
Development Tools Available
In Workspace:

* **Editors**: geany, emacs, vim
* **Debuggers**: gdb, ddd, valgrind
* **Compilers**: gcc, g++, gfortran
* **Interpreters**: wish, python, R, octave, irb, perl,

Workspace via VirtualSSH



Workspace via VirtualSSH



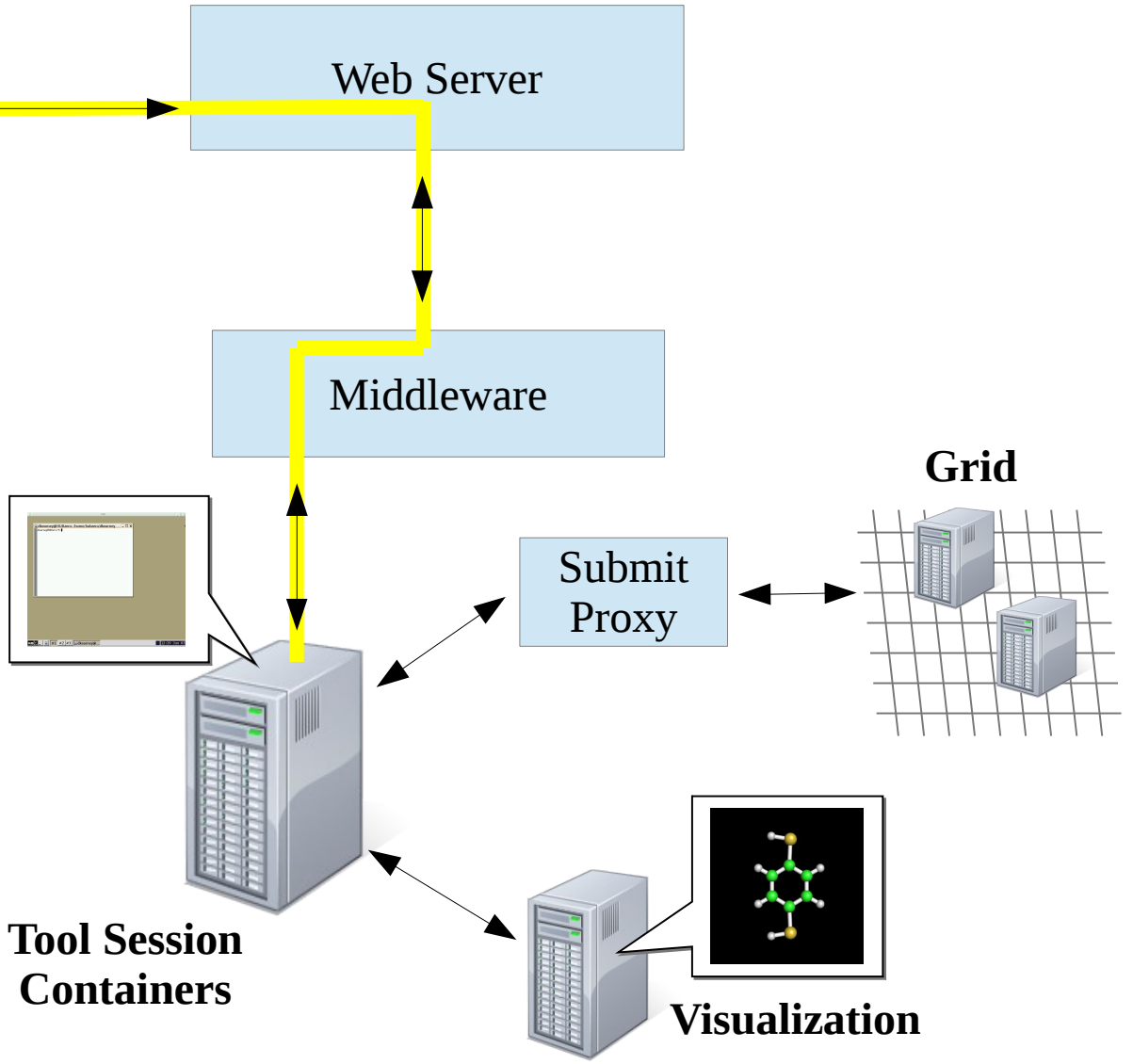
Workspace via HUBcheck

Python Script

```
from hubcheck import ToolSession

ts = ToolSession(host,user,passwd)

shell = ts.access()

out,status = shell.execute(' echo hi')
```

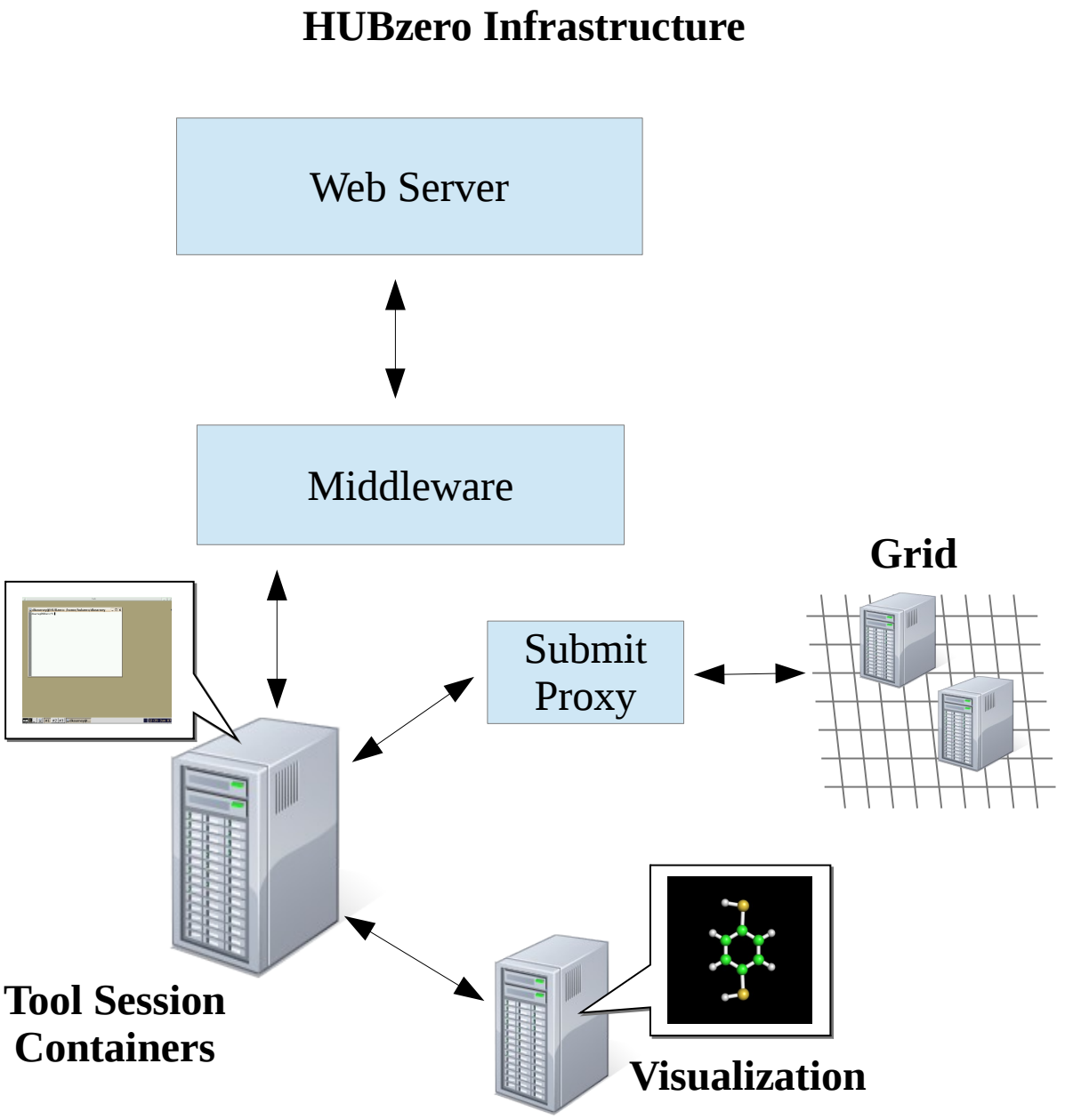
Expect-like interface for running commands

HUBzero Infrastructure



Testing in the Workspace

Debian Squeeze Packages
Container Setup
Network Firewall
Rappture Toolkit
Filexfer
Submit



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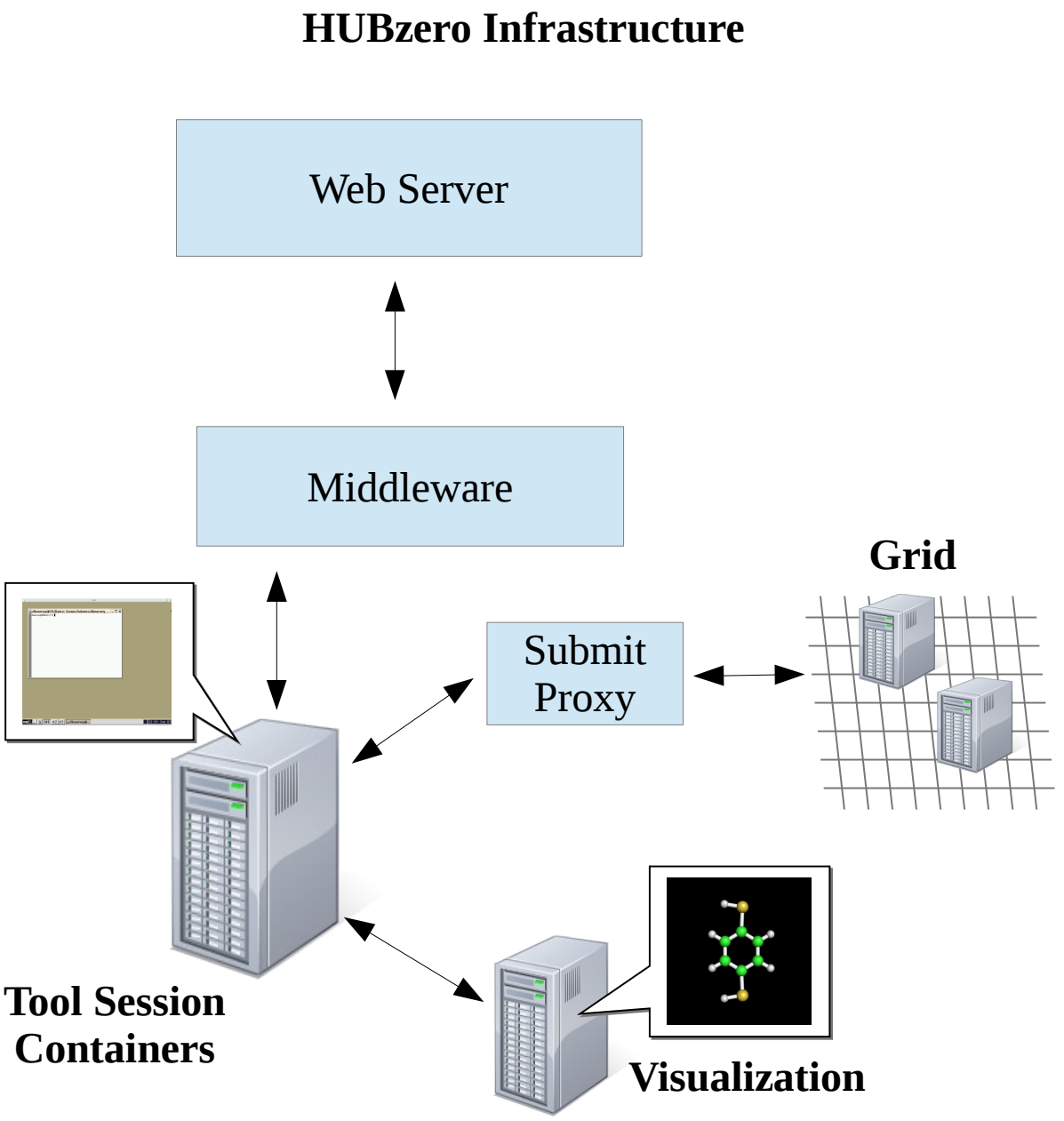
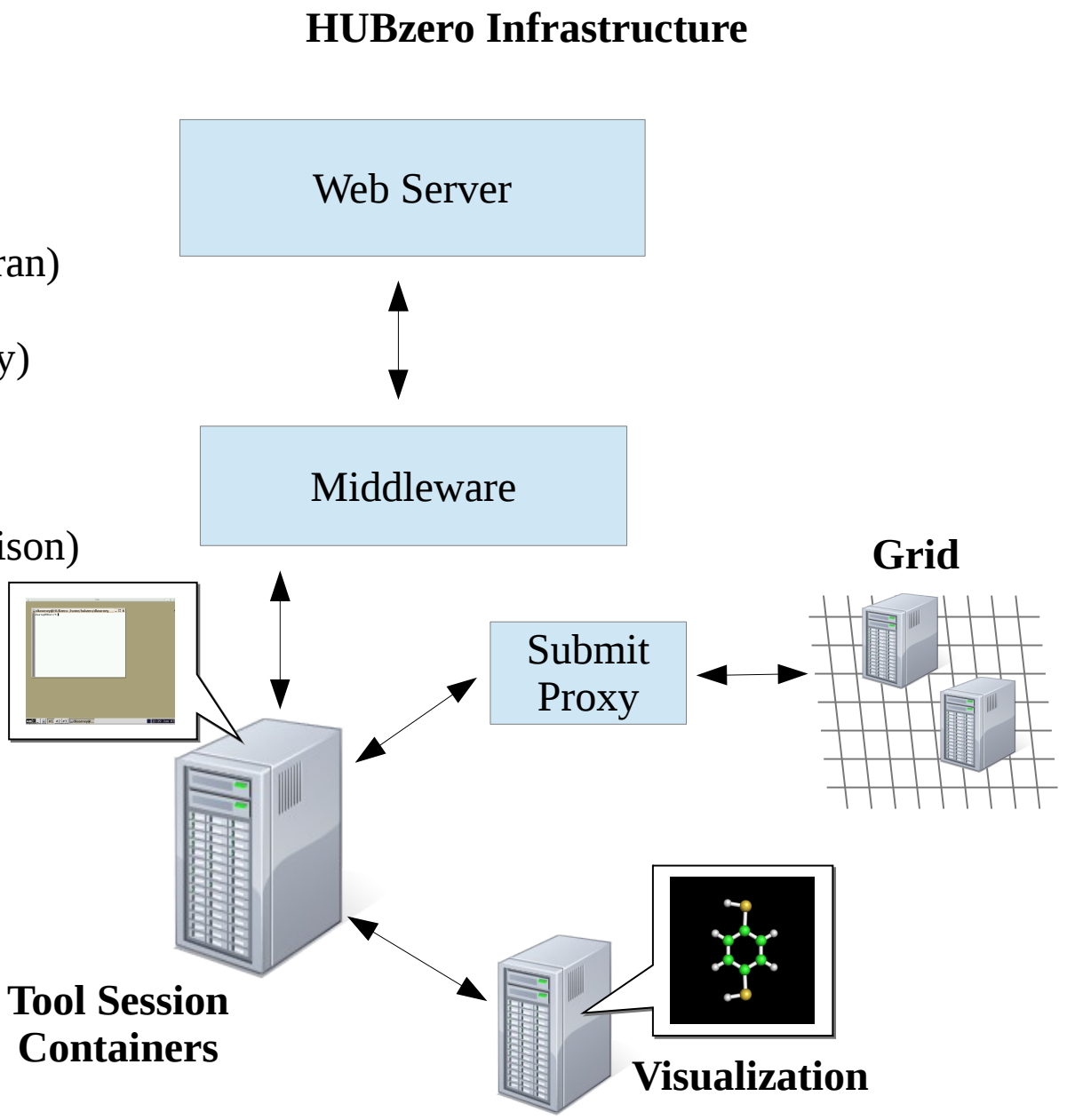


Testing Packages

119 Debian Squeeze Packages

- Compilers (gcc, g++, javac, gfortran)
- Debuggers (gdb, valgrind)
- Interpreters (python, perl, tcl, ruby)
- Build tools (make, autoconf)
- Editors (gedit, vim, emacs)
- Utilities (zip, tar, ssh, rsync)
- Window Managers (icewm, ratpoison)
- Development tools



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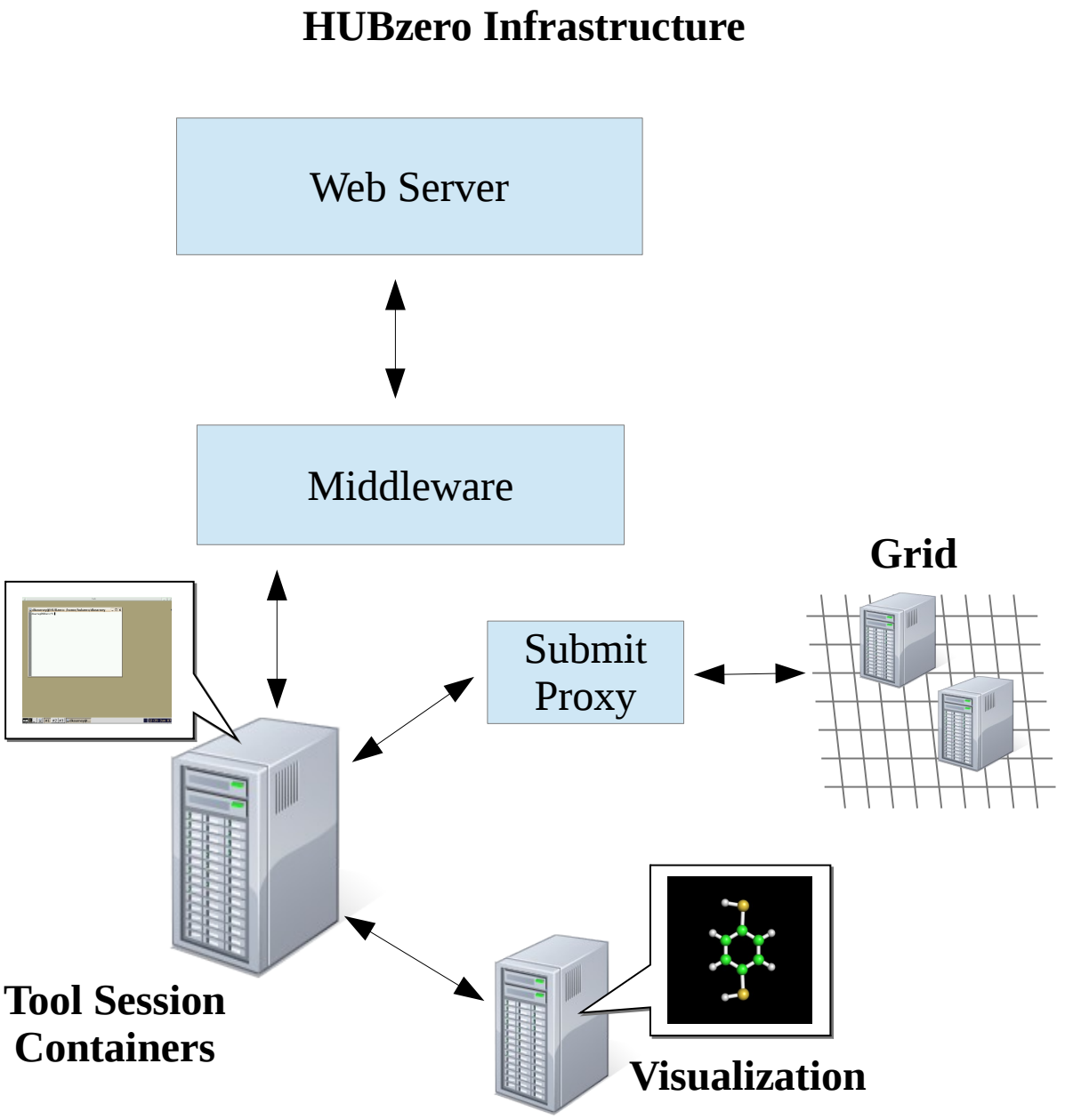
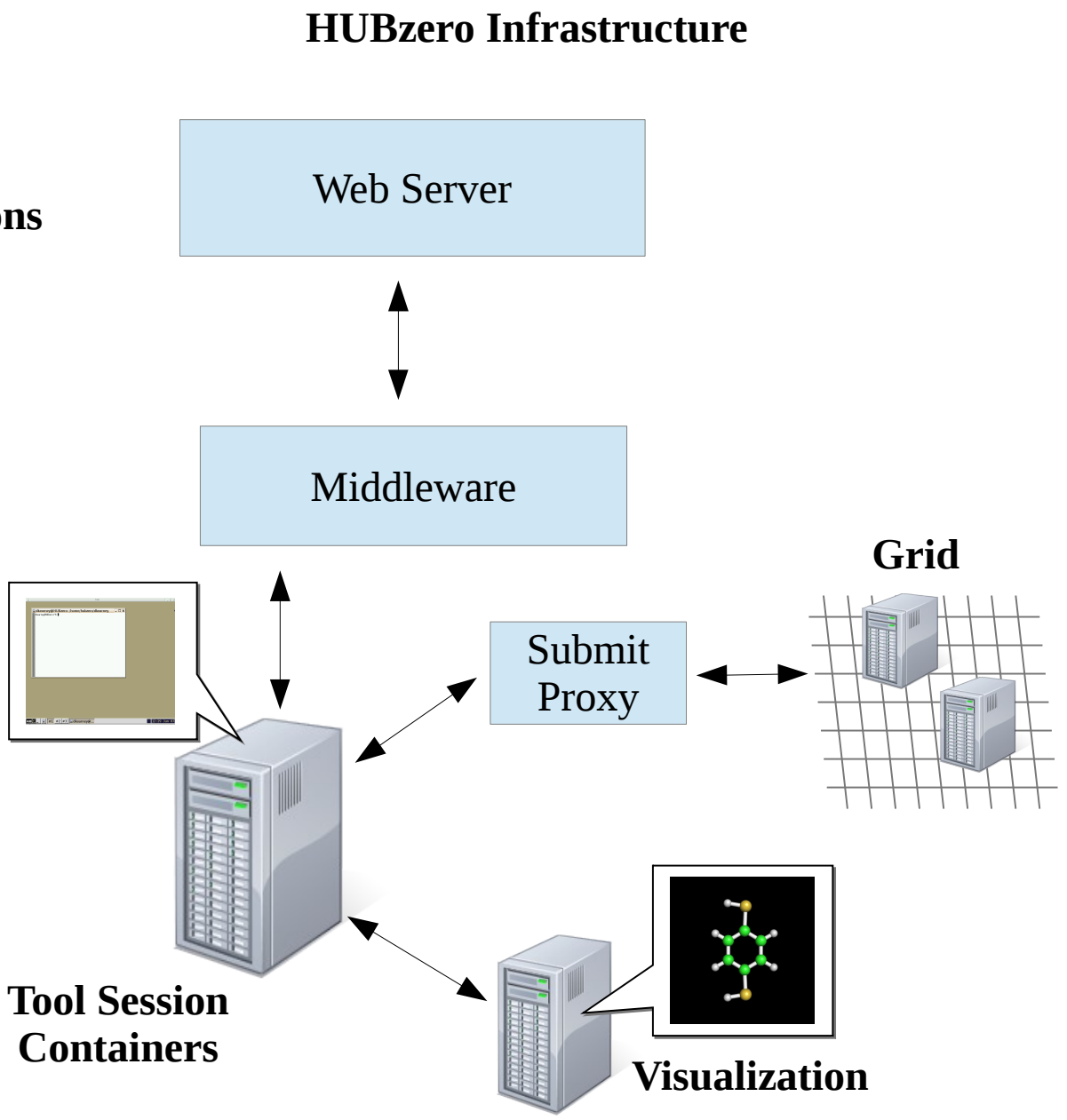


Testing Container Setup

Check file locations and permissions

- filexfer, importfile, exportfile
- clientaction
- pixelflip
- mergeauth
- startxvnc
- xsetroot
- icewm, icewm-captive, ratpoison
- invoke_app
- Testing for old installations



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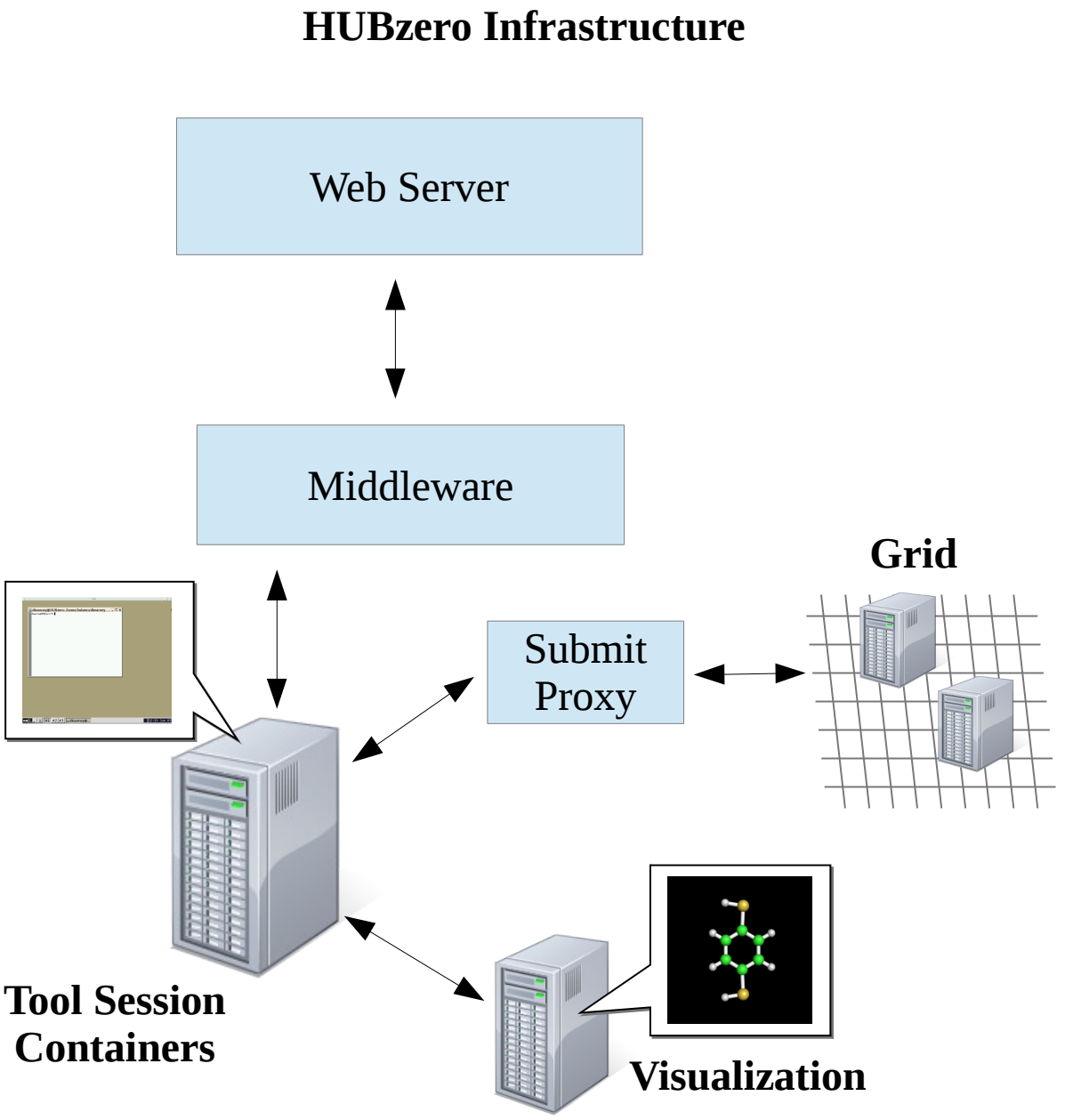
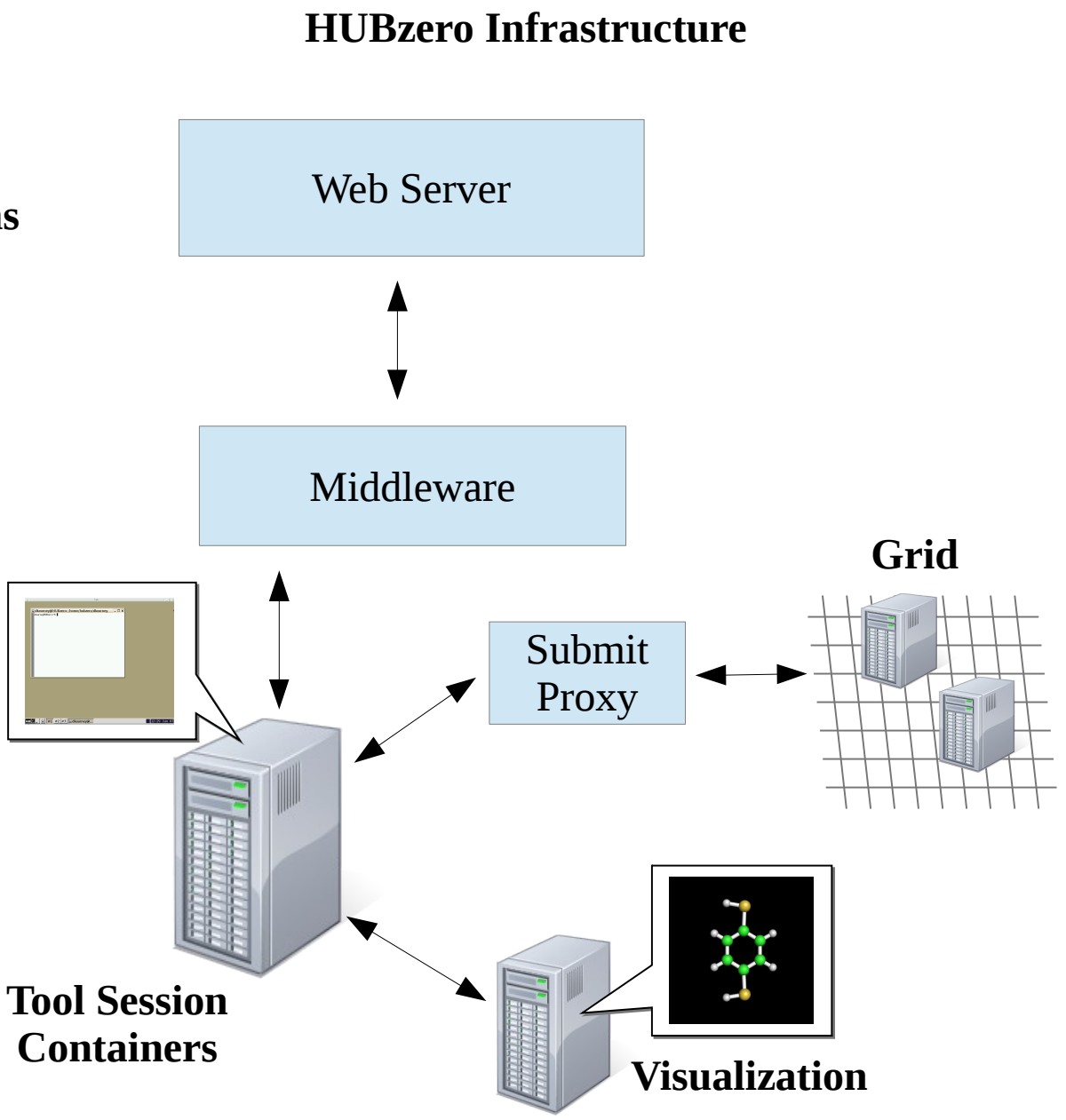


Testing Container Network Firewall

3 User Configurations, 30 locations

- Hub's website port 80 and 443
- Rappture website
- Google
- Campus ssh ports
- Hub nameservers
- OpenDNS nameservers
- Google nameservers
- License servers
- Visualization servers



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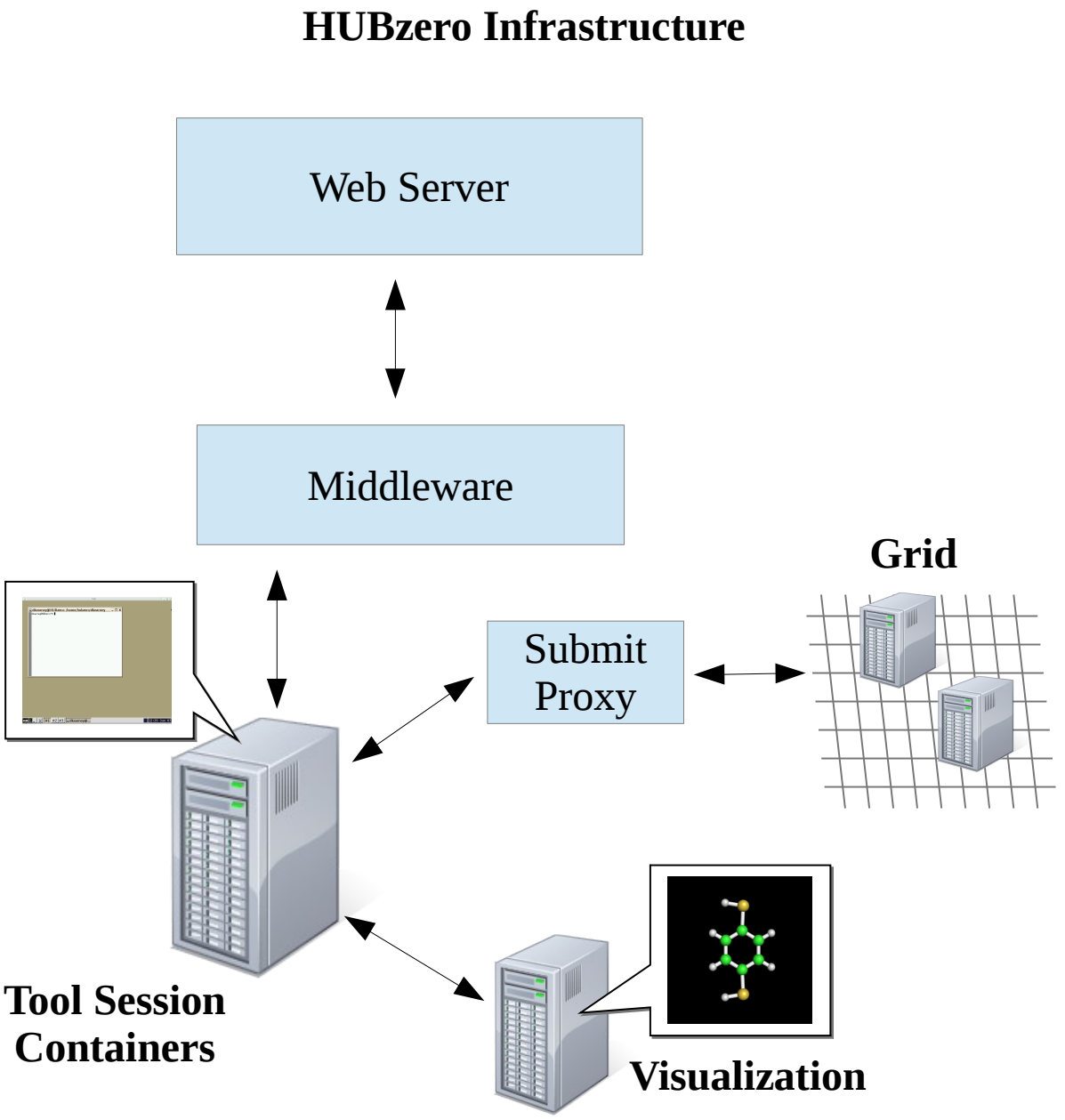
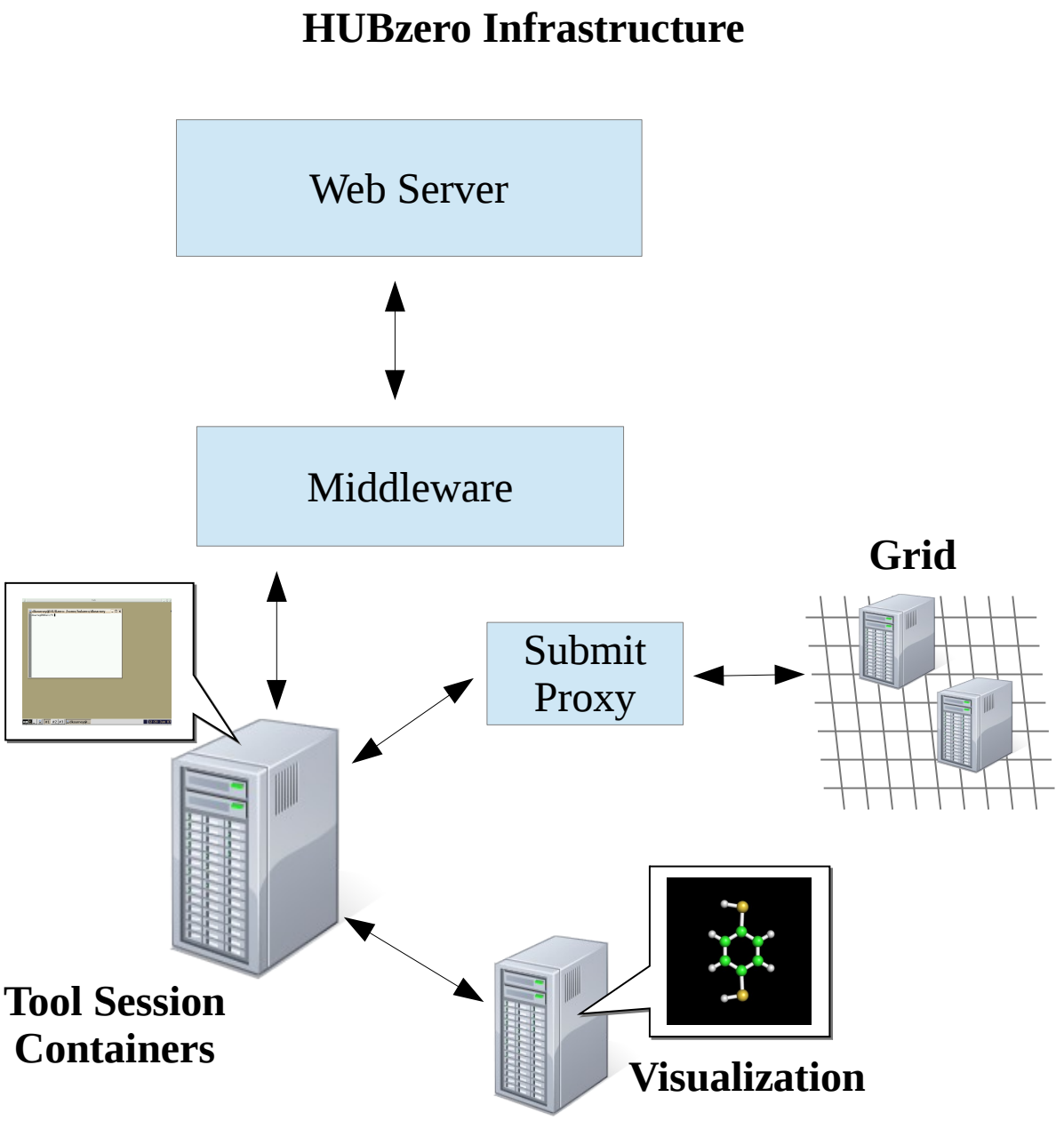


Testing Rappture Toolkit

Rappture Toolkit

- Rappture Installation
- Examples Run
- Visualization Servers



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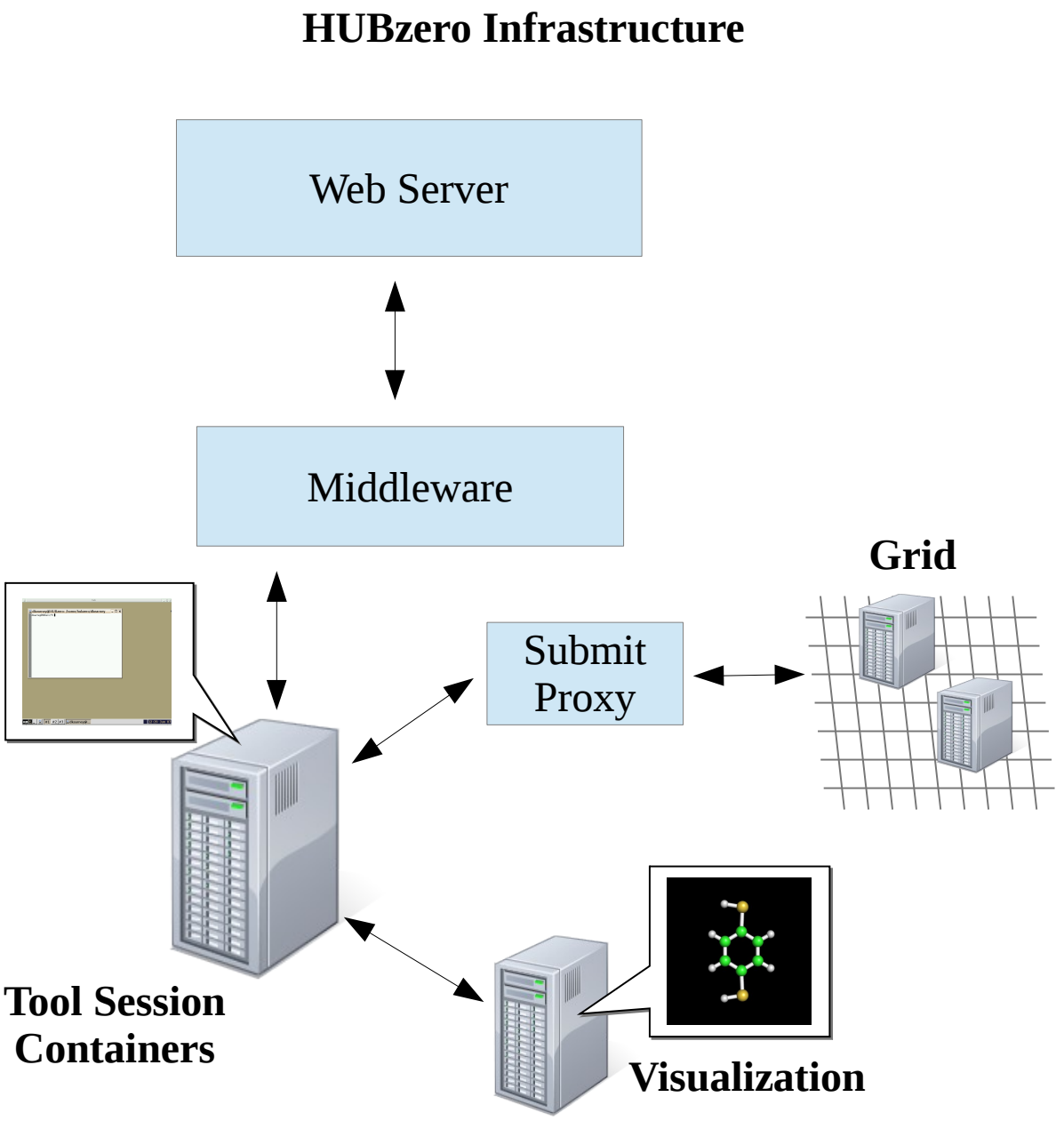
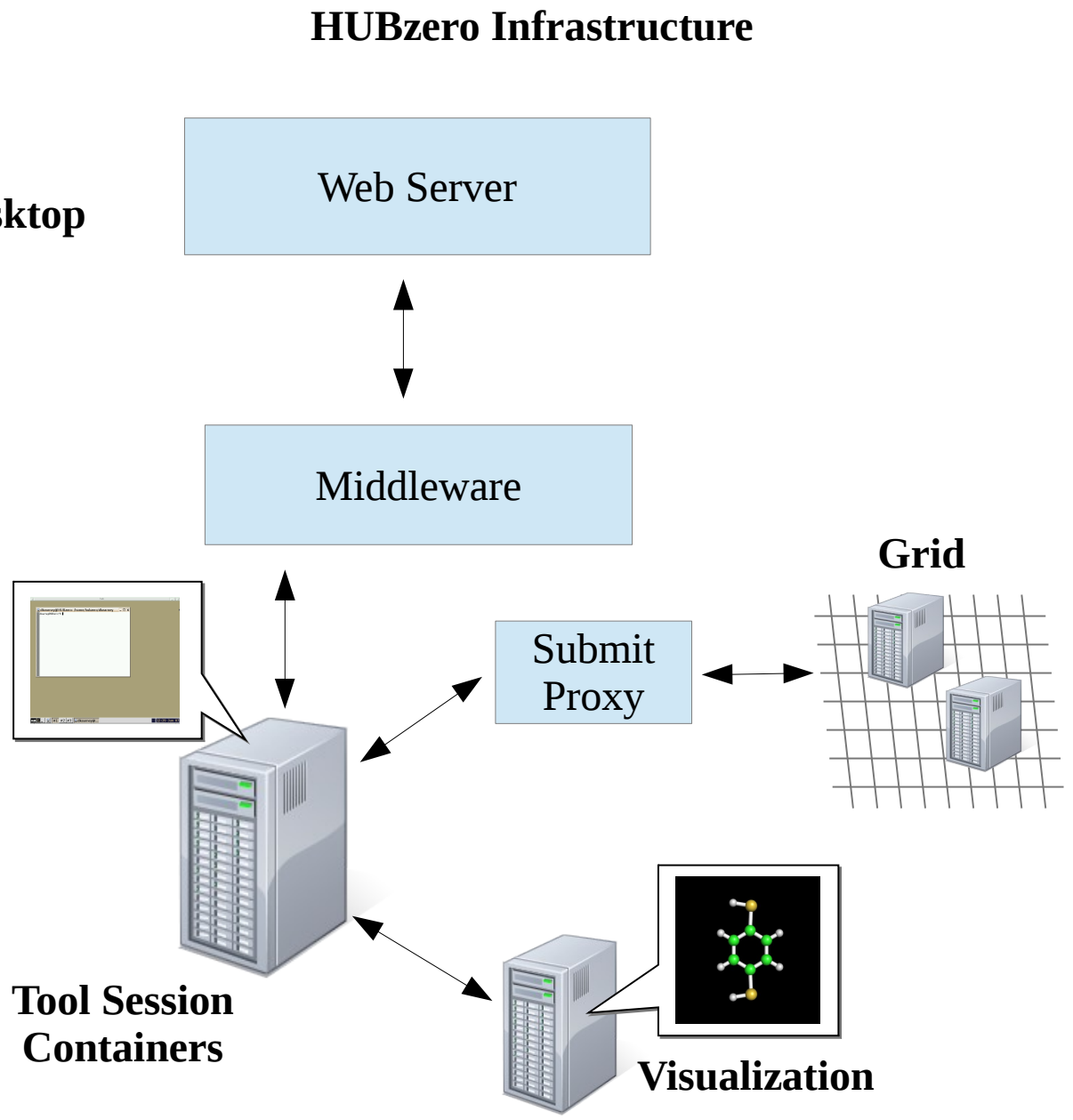


Testing Filexfer

Transfer file between hub and desktop

- Filexfer Installation
- Filexfer GUI
- exportfile: hub to desktop
- importfile: desktop to hub
- Requires Selenium and Expect



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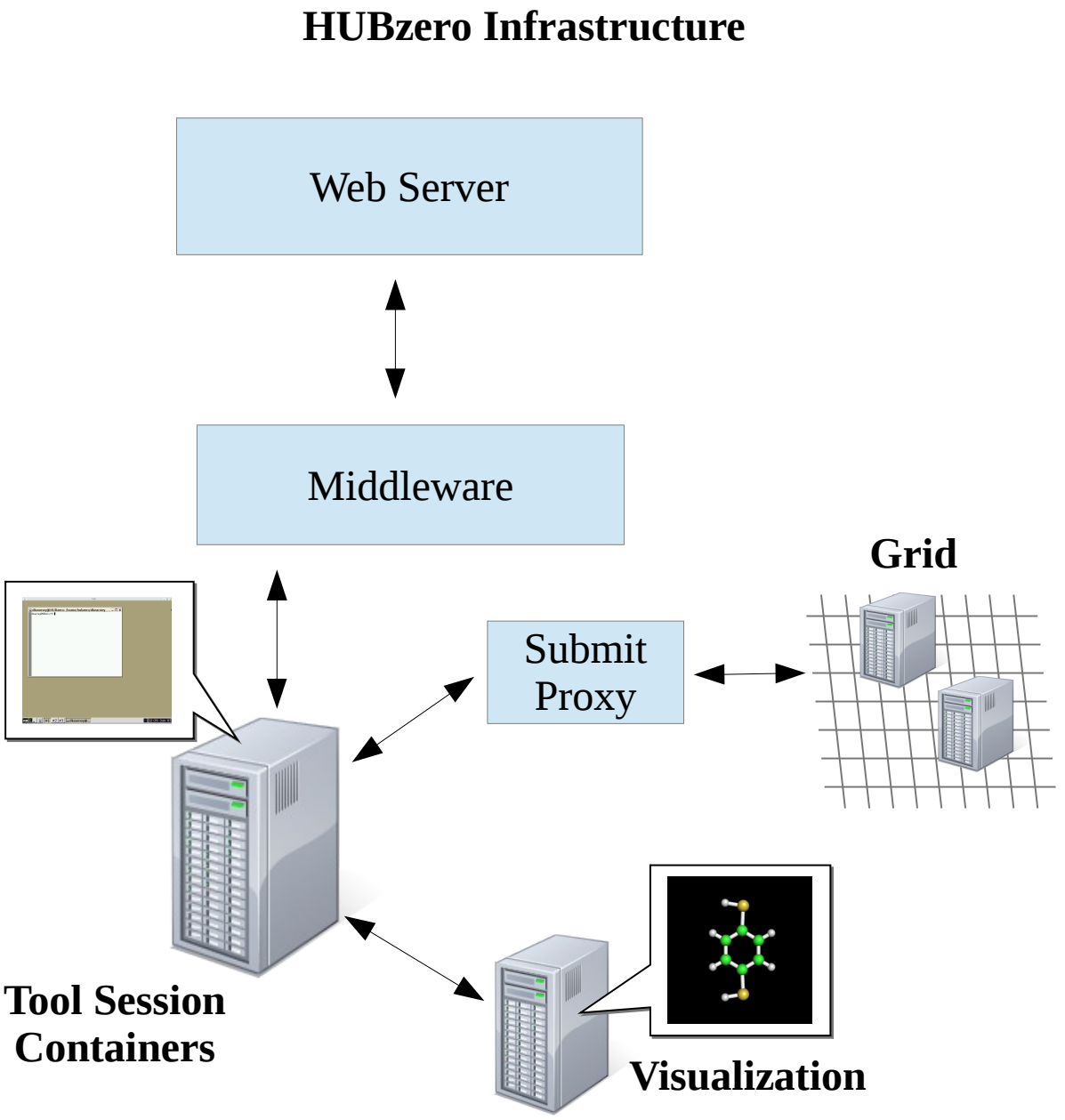
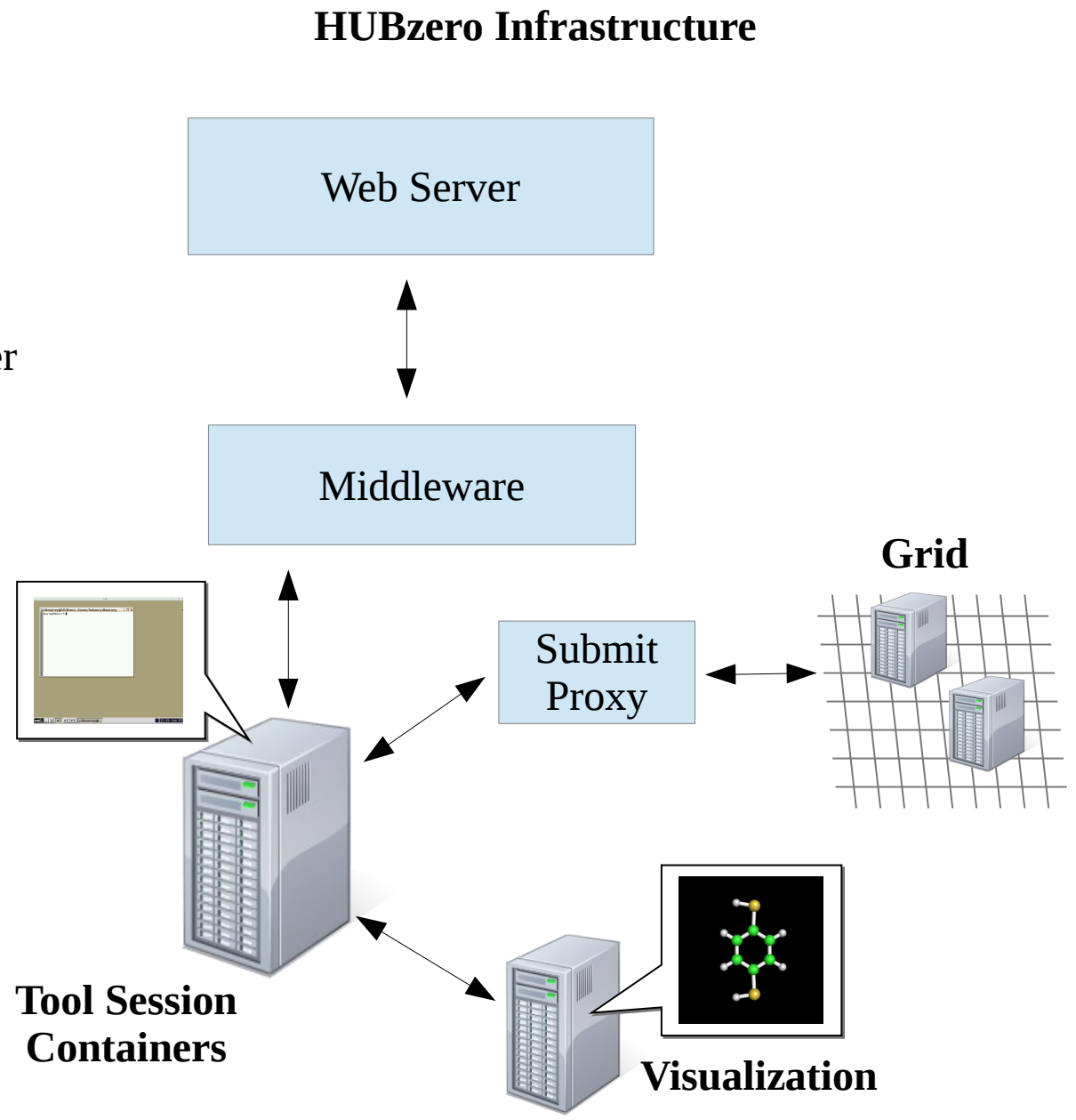


Testing Submit

Job submission to the Grid

- Submit Installation
- Submit job as registered user
- Submit job as submit enabled user
- Submit locally vs to the Grid
- Collecting metrics from Submit



Writing Tests for the Workspace

 # we would like to run a command like this in the workspace to test Submit
$ submit -p @@vth=0:0.2:5 -p @@cap=10pf,100pf,1uf sim.exe @:indeck

About the command:

- Submits 78 jobs.
- Substitutes values for @@vth and @@cap into @:indeck file
  @@vth goes from 0 to 5 in steps of 0.2 (26 values).
  @@cap takes on 3 values, 10pf, 100pf, 1uf.

  26 x 3 = 78 jobs total.

- indeck is treated as a template
  values are substituted in place of @@vth and @@cap in that file.

  Example indeck:

  [inputs]
  C = @@cap
  Vin = @@vth

Converting VirtualSSH to HUBcheck

ssh [flags] [user@]hostname [command]

Virtual SSH related flags

-t Force pseudo-tty allocation

Virtual SSH Commands

session create [*session_title*]	create a new session
session start	start and enter a new session
session [*session_number*] [*command*]	access session
session list	list user's existing sessions
session stop *session_number*	stop the specified session
session help	print session help message

VirtualSSH → ToolSession

Using VirtualSSH you would type...

ssh [flags] [user@]hostname [command]

Virtual SSH related flags

-t Force pseudo-tty allocation

Virtual SSH Commands

session create [*session_title*]

session start

session [*session_number*] [*command*]

session list

session stop *session_number*

session help

In HUBcheck you would type...

ts = ToolSession(...)

ToolSession Object Methods

create(*title*=None)

start()

access(*snum*=None,*command*=None)

list()

stop(*session_number*)

help()

VirtualSSH - Create Session

Using VirtualSSH you would type...

ssh -t user@hostname session create

ssh -t user@hostname session create mytitle

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

(stdin,stdout,stderr) = ts.create()

(stdin,stdout,stderr) = ts.create('mytitle')
```

VirtualSSH - Start Session

Using VirtualSSH you would type...

ssh -t user@hostname session start

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

shell = ts.start()
```

VirtualSSH - Access Session

Using VirtualSSH you would type...

```
ssh -t user@hostname session

ssh -t user@hostname session 40032

ssh -t user@hostname session “echo hi”

ssh -t user@hostname session 40032 “echo hi”
```

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

shell = ts.access()

shell = ts.access(session_number=40032)

(in,out,err) = ts.access(command='echo hi')

(in,out,err) = ts.access(40032,'echo hi')
```

VirtualSSH - List Session

Using VirtualSSH you would type...

ssh -t user@hostname session list

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

(stdin,stdout,stderr) = ts.list()
print stdout.read(1024)
```

VirtualSSH - Stop Session

Using VirtualSSH you would type...

```
ssh -t user@hostname session stop 40032
```

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

(stdin,stdout,stderr) = ts.stop(40032)
print stdout.read(1024)
```

VirtualSSH – Session Help

Using VirtualSSH you would type...

ssh -t user@hostname session help

In HUBcheck you would type...

```
ts = ToolSession(hostname,
        username = username,
        password = password)

(stdin,stdout,stderr) = ts.help()
print stdout.read(1024)
```

ToolSession → ToolSessionShell

ts = ToolSession(hostname, username = username, password = password)

shell = ts.access()

Provides an Expect-like interface for running shell commands

ToolSessionShell Methods

shell.send(command)

shell.expect(patterns=[],flags=0)

shell.execute(commands)

Examples

shell.send('echo hi')

ToolSession → ToolSessionShell

ts = ToolSession(hostname, username = username, password = password)

shell = ts.access()

Provides an Expect-like interface for running shell commands

ToolSessionShell Methods

shell.send(command)

shell.expect(patterns=[],flags=0)

shell.execute(commands)

Examples

```
shell.send('echo hi')
shell.expect(['(\w+)'])
output = shell.match.groups()[0]
```

Expect Basics

Written by Don Libes in early 1990's

Core is written in C
Language bindings for Tcl
Ported to Python, Perl, other languages

Expect Scripts Typically Have 3 Parts:

- Spawn the interactive program
- Expect phrase
- Send response

Expect Example

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Expect Scripts Typically Have 3 Parts:

- Spawn the interactive program
- Expect phrase
- Send response

User's Terminal	Expect Script
$ passwd libes	spawn passwd [lindex $argv 0]
Changing password for libes on thunder	set password [lindex $argv 1]
New password:	expect “password:”
Retype new password:	send “$password\r”
	expect “password:”
	send “$password\r”
	expect eof

Expect Example

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	expect eof

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$ passwd libes	set password [lindex $argv 1]
Changing password for libes on thunder	expect “password:”
New password:	send “$password\r”
Retype new password:	expect “password:”
	send “$password\r”
	expect eof

Examples – Execute Command

```
ts = ToolSession(hostname, username = username, password = password)
shell = ts.access()

command = 'submit --local echo hi'
output, error_code = shell.execute(command)
print output                # hi
print error_code            # 0
```

Expect-like interface simplified using the *Execute Pattern*:

- **Send** *text*
- **Expect** sent *text*
- **Wait** for command to complete
- **Capture** command output
- **Capture** command exit status

Examples – Transferring Files

```
from hubcheck import SFTPClient, ToolSession

ts = ToolSession(hostname, username = username, password = password)

shell = ts.access()

shell.execute('cd $SESSIONDIR')
sessiondir,error_code = shell.execute('pwd')

shell.importfile('./sim1.py', '../examples/sim1.py', mode=0o700)
```

Examples – Transferring Files

```
from hubcheck import SFTPClient, ToolSession

ts = ToolSession(hostname, username = username, password = password)
sftp = SFTPClient(hostname, username = username, password = password)
shell = ts.access()

shell.execute('cd $SESSIONDIR')
sessiondir,error_code = shell.execute('pwd')

sftp.chdir(sessiondir)
sftp.put('../examples/sim1.py', './sim1.py')
sftp.chmod('./sim1.py', 0700)
```

Examples – Writing Files

```
from hubcheck import SFTPClient, ToolSession

ts = ToolSession(hostname, username = username, password = password)

shell = ts.access()

shell.execute('cd $SESSIONDIR')
sessiondir,error_code = shell.execute('pwd')


exe_path = './sim1.py'
indeckfn = 'indeck.template'
indeck_template = '[inputs]\nC = @@C\n'

shell.importfile(indeck_template,indeckfn,mode=0o600,is_data=True)



command = 'submit --local -p @@C=10e-12,100e-12 %s --inputdeck @:%s'  \
                    % (exe_path,indeckfn)
command += ' 0</dev/null'
output,error_code = self.ws.execute(command)
```

Examples – Writing Files

```
from hubcheck import SFTPClient, ToolSession

ts = ToolSession(hostname, username = username, password = password)
sftp = SFTPClient(hostname, username = username, password = password)
shell = ts.access()

shell.execute('cd $SESSIONDIR')
sessiondir,error_code = shell.execute('pwd')
sftp.chdir(sessiondir)

exe_path = './sim1.py'
indeckfn = 'indeck.template'
indeck_template = '[inputs]\nC = @@C\n'

f = sftp.open(indeckfn,mode='w')
f.write(indeck_template)
f.close()

command = 'submit --local -p @@C=10e-12,100e-12 %s --inputdeck @:%s'  \
                    % (exe_path,indeckfn)
command += ' 0</dev/null'
output,error_code = self.ws.execute(command)
```

Using HUBcheck to Write Tests

```
import hubcheck
import os

class container_firewall_registered_user(hubcheck.TestCase):

    def setUp():
        …

    def test_basic_connections():
        …

    def tearDown():
        …
```

Writing Tests – setUp Fixture

```
def setUp(self):

    self.remove_files = []
    self.ws = None

    # get user account info
    hubname = self.testdata.find_url_for('https')
    self.username,self.userpass = self.testdata.find_account_for('registeredworkspace')

    cm = hubcheck.ContainerManager()
    self.ws = cm.access(hubname, self.username, self.userpass)

    # copy the checknet executable to the session directory
    self.ws.execute('cd $SESSIONDIR')
    sessiondir,es = self.ws.execute('pwd')

    self.exe_fn = 'checknet.py'
    local_exe_path = os.path.join(hubcheck.config.macros_dir,self.exe_fn)
    self.exe_path = os.path.join(sessiondir,self.exe_fn)
    self.remove_files.append(self.exe_path)

    self.ws.importfile(local_exe_path,self.exe_path,mode=0o700)
```

Writing Tests – Test Method

```
def test_basic_connections(self):
    """
    login to a tool session container and check basic network firewall
    settings for a registered user in no network affecting groups.
    """

    conns = [
    #  (desc,              uri,                                port,  expected_result)
       ('rappture',        'rappture.org',                      80,  True),
       ('ecn_systems',     'shay.ecn.purdue.edu',               22,   False),
       ('google_https',    'google.com',                       443,  False),
       ('octave_ftp',      'ftp.octave.org',                    21,  False),
       ('localhost',       'localhost',                         80,  False),
       ('ecn_matlab',      'matlab-license.ecn.purdue.edu', 1703, False),
    ]

    results = ''
    for (desc,uri,port,eresult) in conns:
        results += self._run_checknet(desc,uri,port,eresult)

    self.assertTrue(results == '', results.strip())
```

Writing Tests – Test Method

```
def _run_checknet(self,desc,uri,port,eresult):

    command = '%s --protocol tcp4 %s %s' % (self.exe_path,uri,port)
    self.logger.debug('command = "%s"' % (command))
    aresult,es = self.ws.execute(command)

    if aresult == 'True':
        aresult = True
    else:
        aresult = False

    results = ''
    if eresult != aresult:
        results = '\n%s connection %s:%s received %s, expected %s' \
                % (desc,uri,port,aresult,eresult)

    return results
```

Writing Tests – tearDown Fixture

```
def tearDown(self):

    # remove the executable from the workspace
    for fname in self.remove_files:
        self.ws.execute('rm -f %s' % (fname))

    # get out of the workspace
    # shut down the ssh connection
    if self.ws is not None:
        self.ws.close()
```