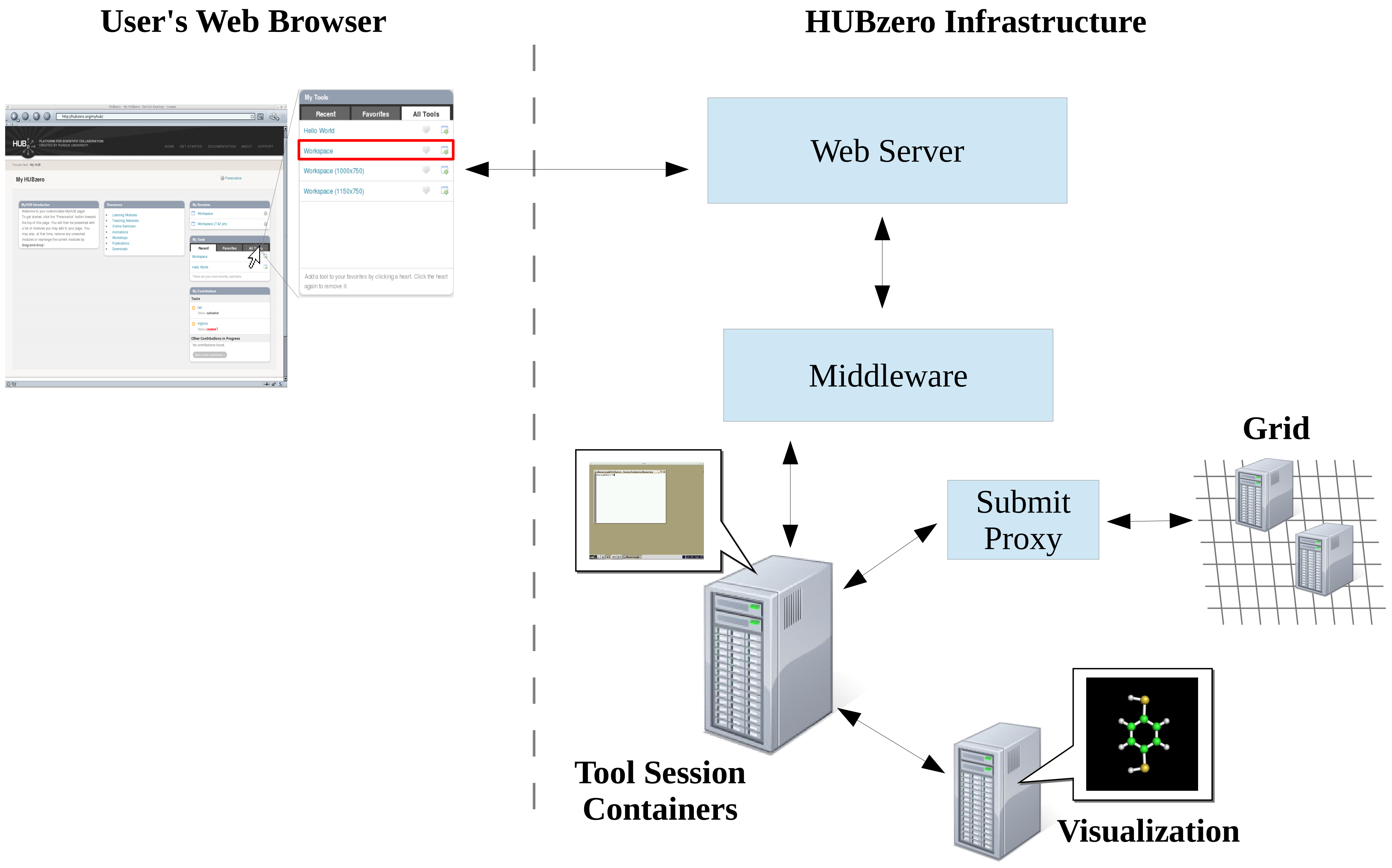
Automating Workspace Testing

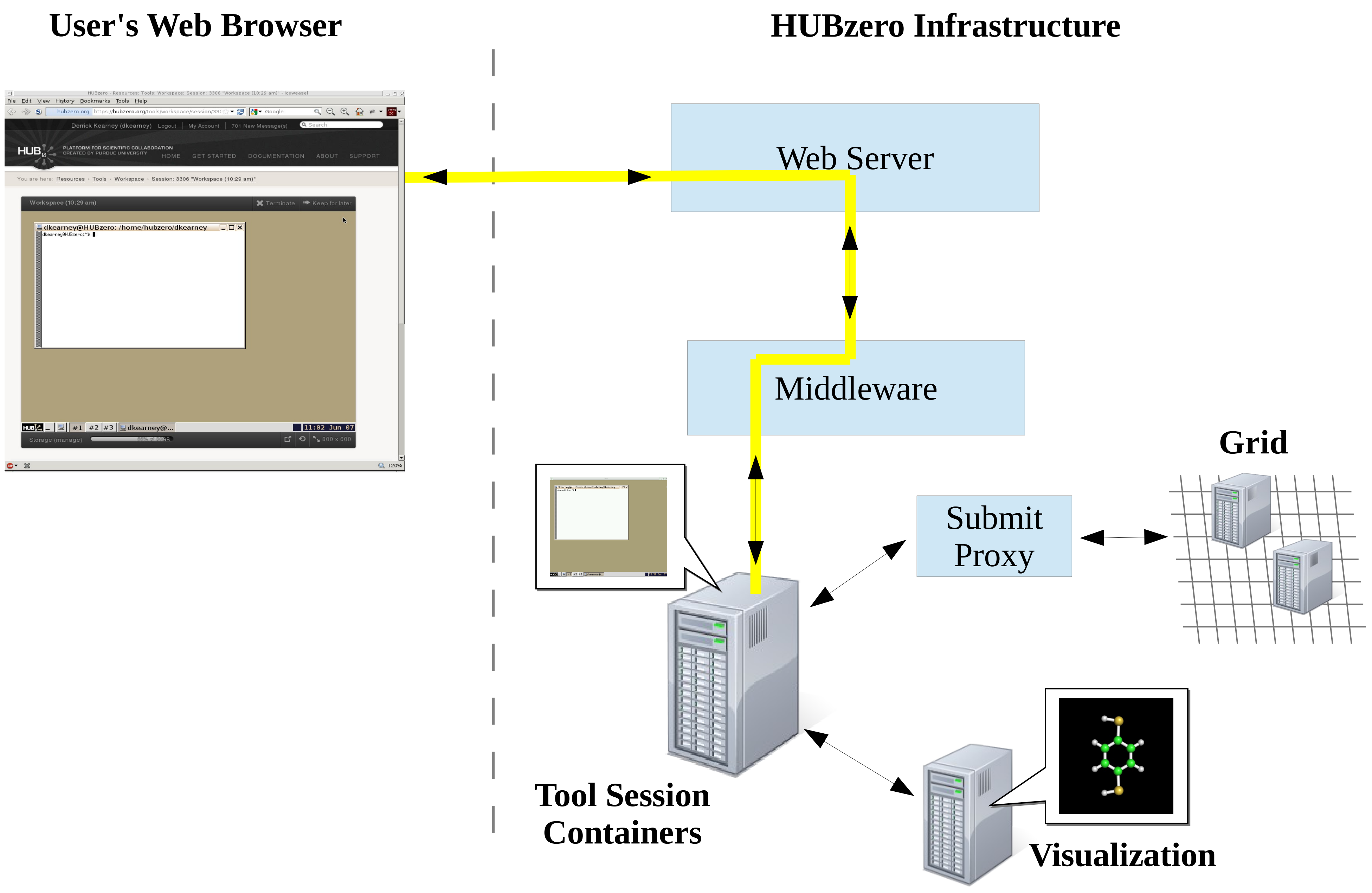
HUB Tool Developement

Accessing a Workspace

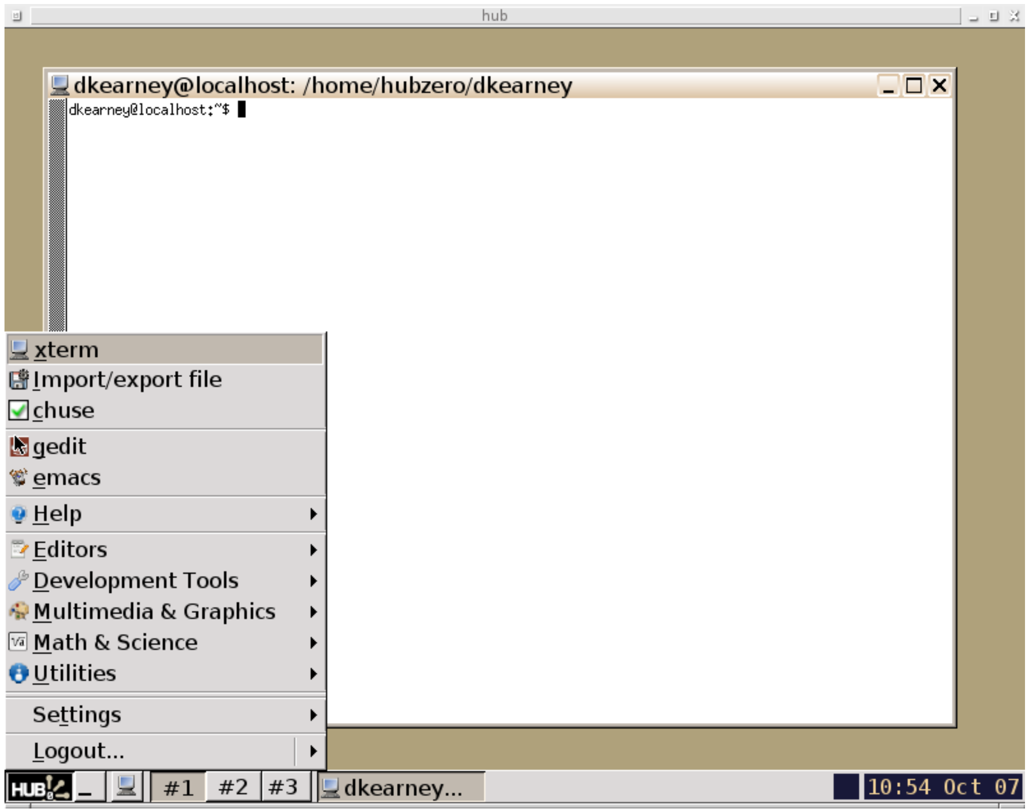


Add a tool to your favorites by clicking a heart. Click the heart again to remove it.

Workspace via Website



Using a Workspace

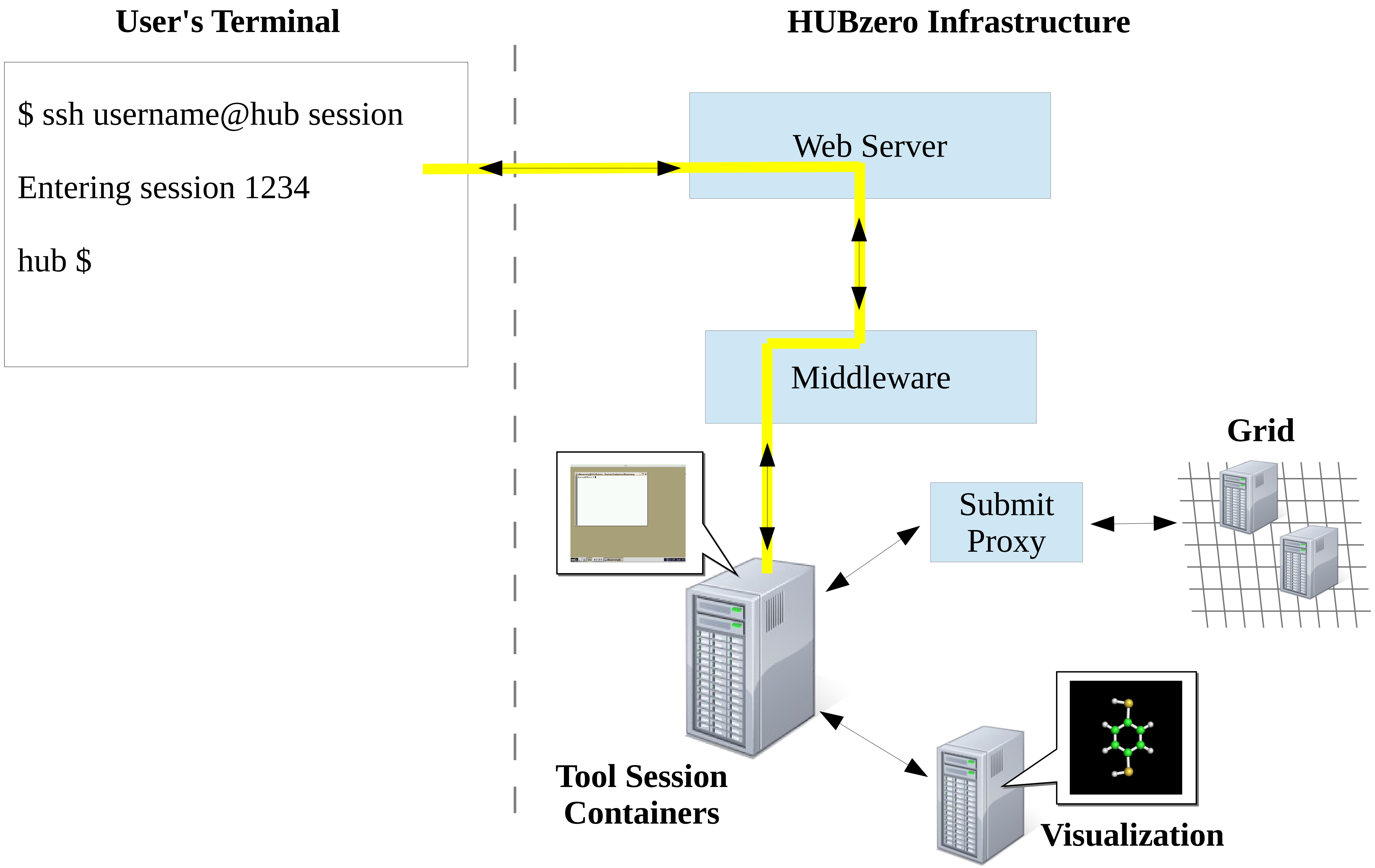


```
dkearney@localhost:~$ 
```

Development Tools Available
In Workspace:

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

Workspace via VirtualSSH

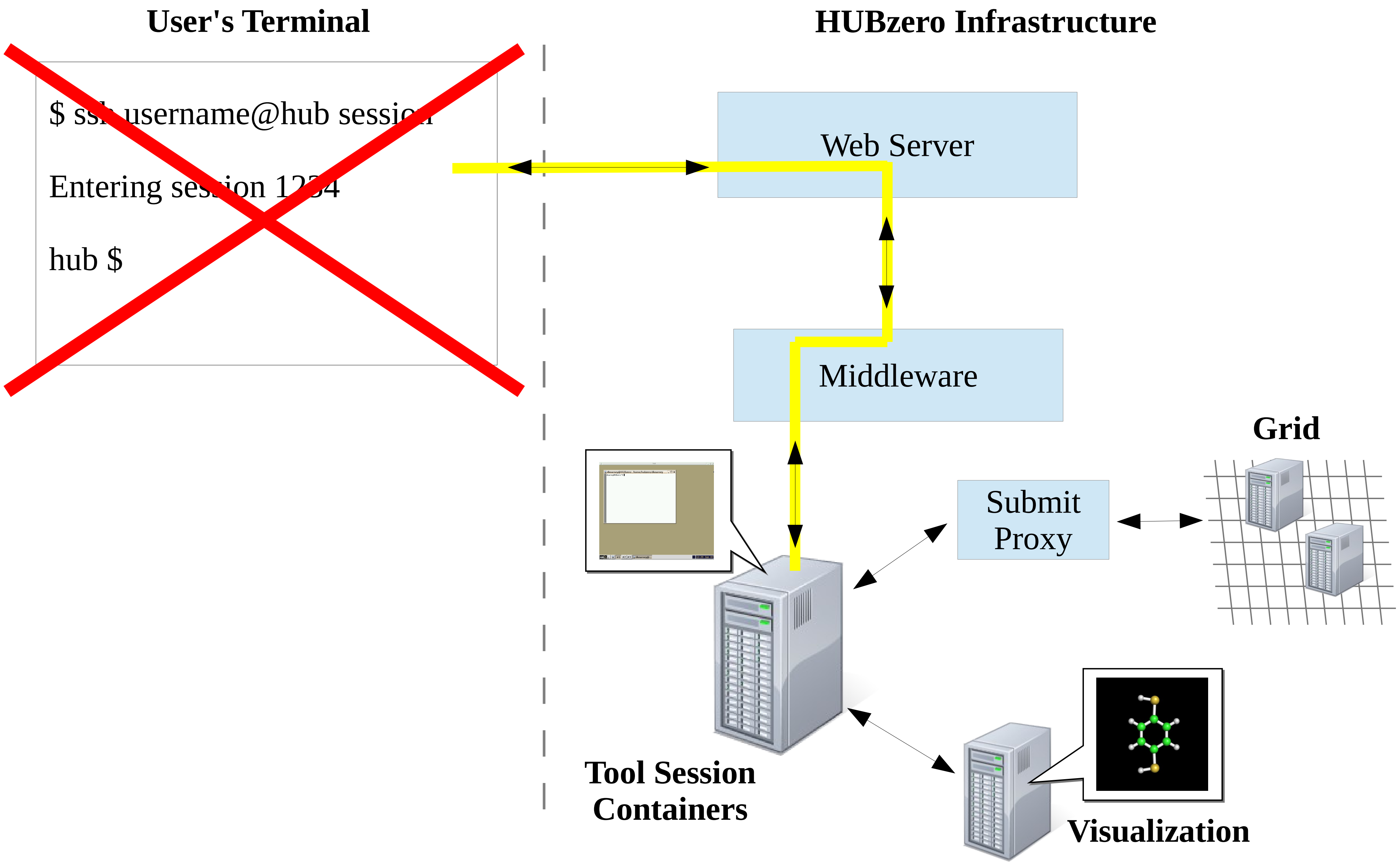


```
$ ssh username@hub session

Entering session 1234

hub $
```

Workspace via VirtualSSH



```
$ ssh username@hub session

Entering session 1234

hub $
```

Workspace via Automated SSH

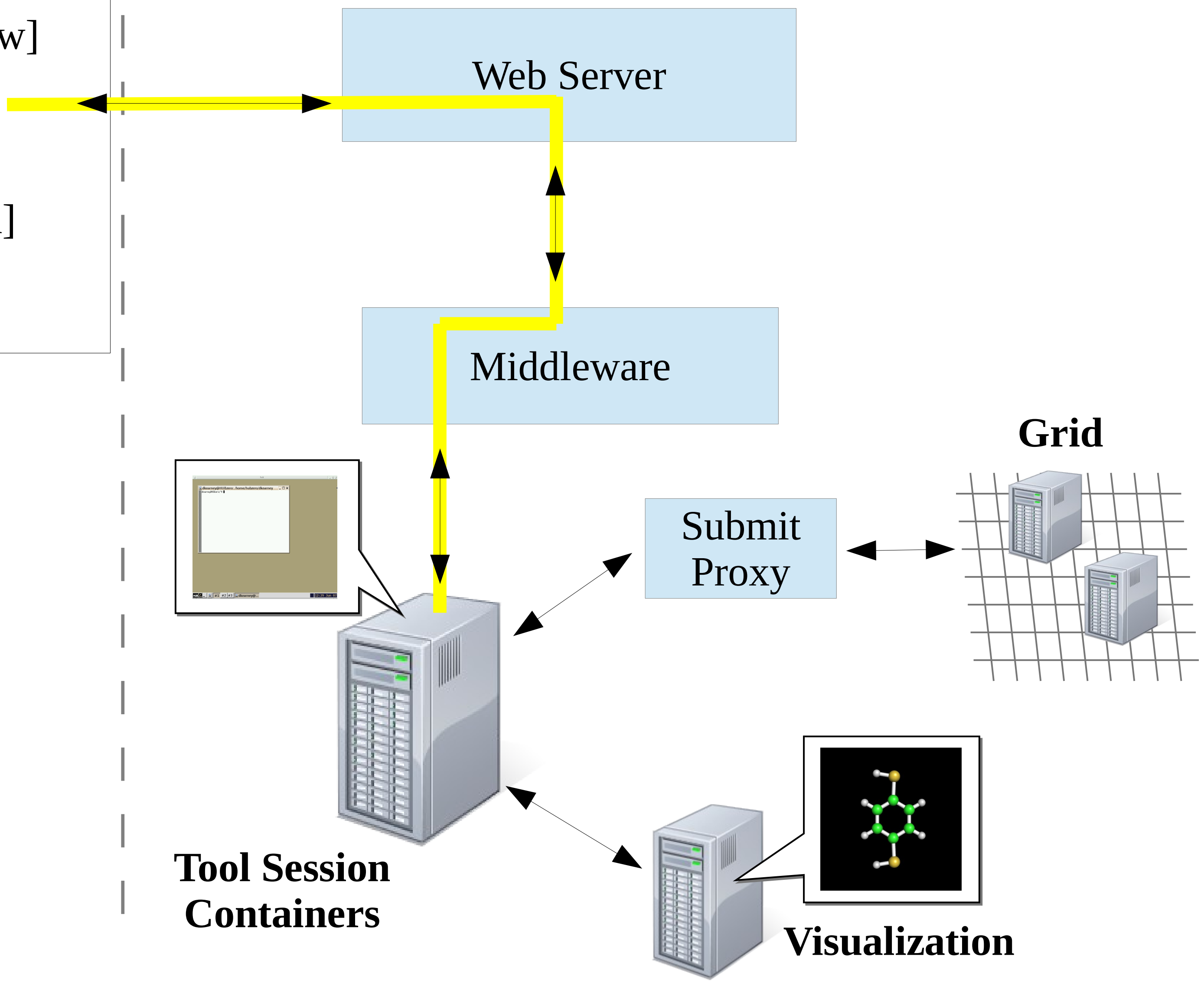
Expect/Tcl Script

```
set ws [hubcheck::workspace::new]

set snum [$ws enter]

set spawn_id [$ws cget spawn_id]
send “echo hi\r”
expect “hi”
```

HUBzero Infrastructure



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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Ported to Python, Perl, other languages

Expect Scripts Typically Have 3 Parts:

- Spawn the interactive program
- Expect phrase
- Send response

User's Terminal

```
$ passwd libes
Changing password for libes on thunder
New password:
Retype new password:
```

Expect Script

```
spawn passwd [lindex $argv 0]
set password [lindex $argv 1]
expect “password:”
send “$password\r”
expect “password:”
send “$password\r”
expect eof
```

Expect Example

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Expect Example

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send “$password\r”
expect “password:”
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Expect Example

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Expect Script

```
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expect “password:”
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send “$password\r”
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```

Expect Example

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Expect Scripts Typically Have 3 Parts:
- Spawn the interactive program
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User's Terminal

```
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New password:
Retype new password:
```

Expect Script

```
spawn passwd [lindex $argv 0]
set password [lindex $argv 1]
expect “password:”
send “$password\r”
expect “password:”
send “$password\r”
expect eof
```

hei: hubcheck Expect interface

hubcheck::hei::prompt $spawn_id

hubcheck::hei::parse_resources $spawn_id

hubcheck::hei::sshLogin $spawn_id $host $port $user $password $cmd

hubcheck::hei::sshLogout $spawn_id

hubcheck::hei::bashTurnOffHistory $spawn_id $prompt

hubcheck::hei::bashSourceSystemStartupFiles $spawn_id $prompt

hubcheck::hei::bashSetPrompt $spawn_id $prompt

hubcheck::hei::spawnBashLogin $prompt

hubcheck::hei::spawnBashLogout $spawn_id $bashpid

hubcheck::hei::bashLogin $spawn_id $prompt

hubcheck::hei::bashLogout $spawn_id

hubcheck workspace module

```
set ws [hubcheck::workspace::new]

cget
configure
enter
exit
importfile
exportfile
getSessionNumber
getenv
isInsideWorkspace
login
logout
start
stop
```

hubcheck + Expect

```
# create a new workspace command
set ws [hubcheck::workspace::new -username $username -password $password]

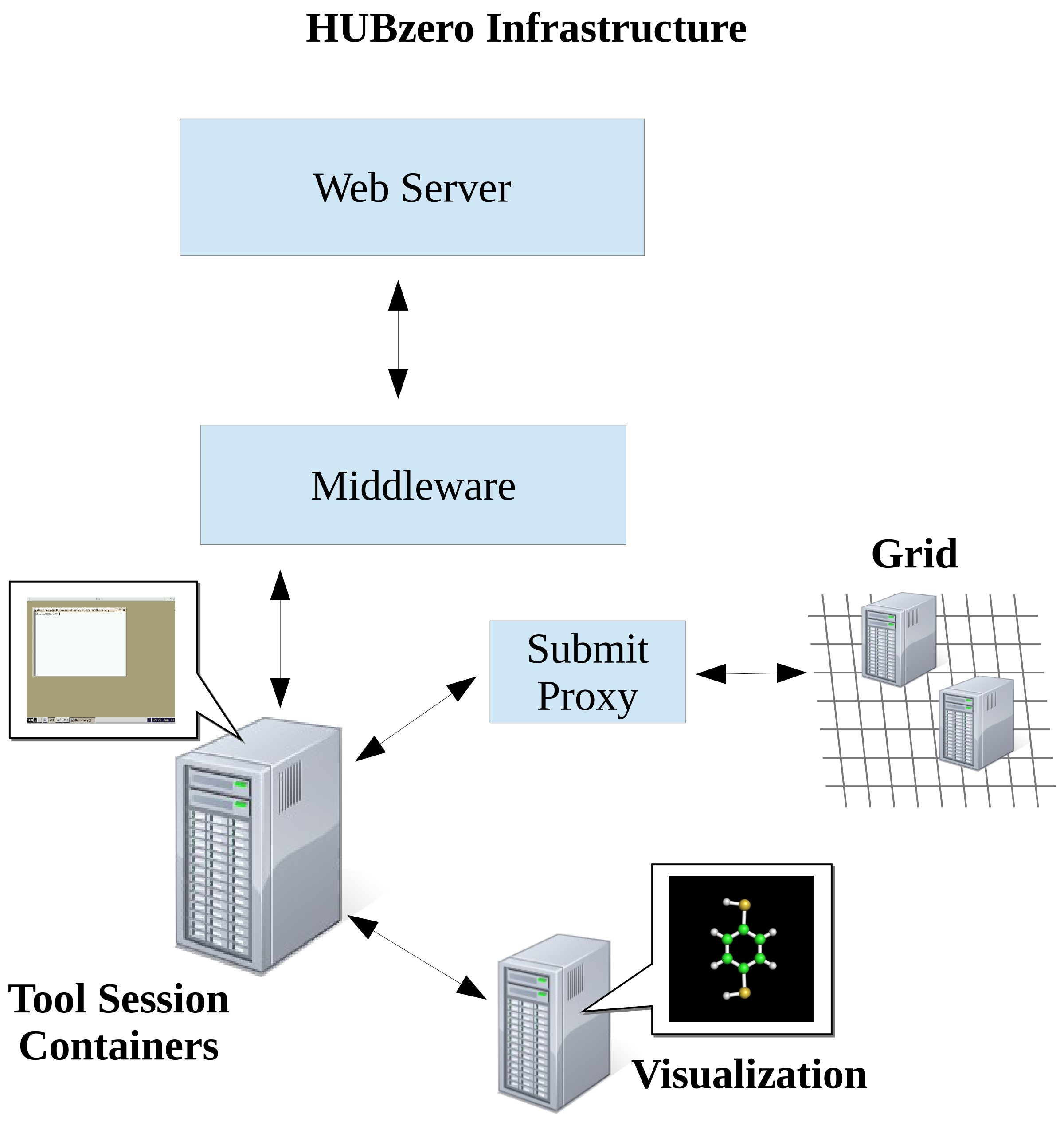
# enter into a workspace session as the user
set snum [$ws enter]
set spawn_id [$ws cget spawn_id]

# send/expect commands inside workspace
#  … Expect code here ...
#

# logout of the workspace
$ws exit
hubcheck::workspace::delete ws
```

Testing in the Workspace

Debian Squeeze Packages
Container Setup
Network Firewall
Rappture Toolkit
Submit
Filexfer



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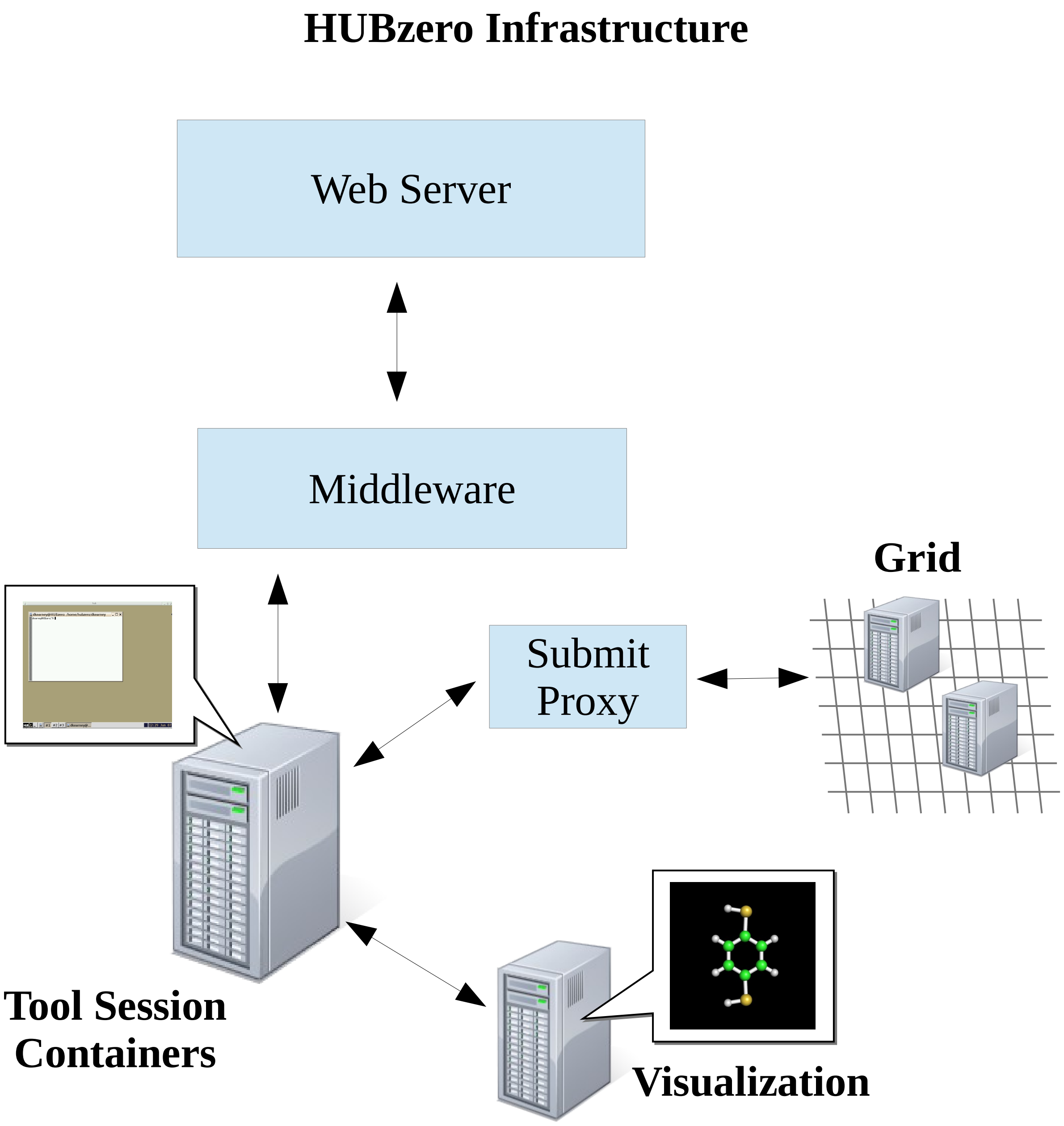
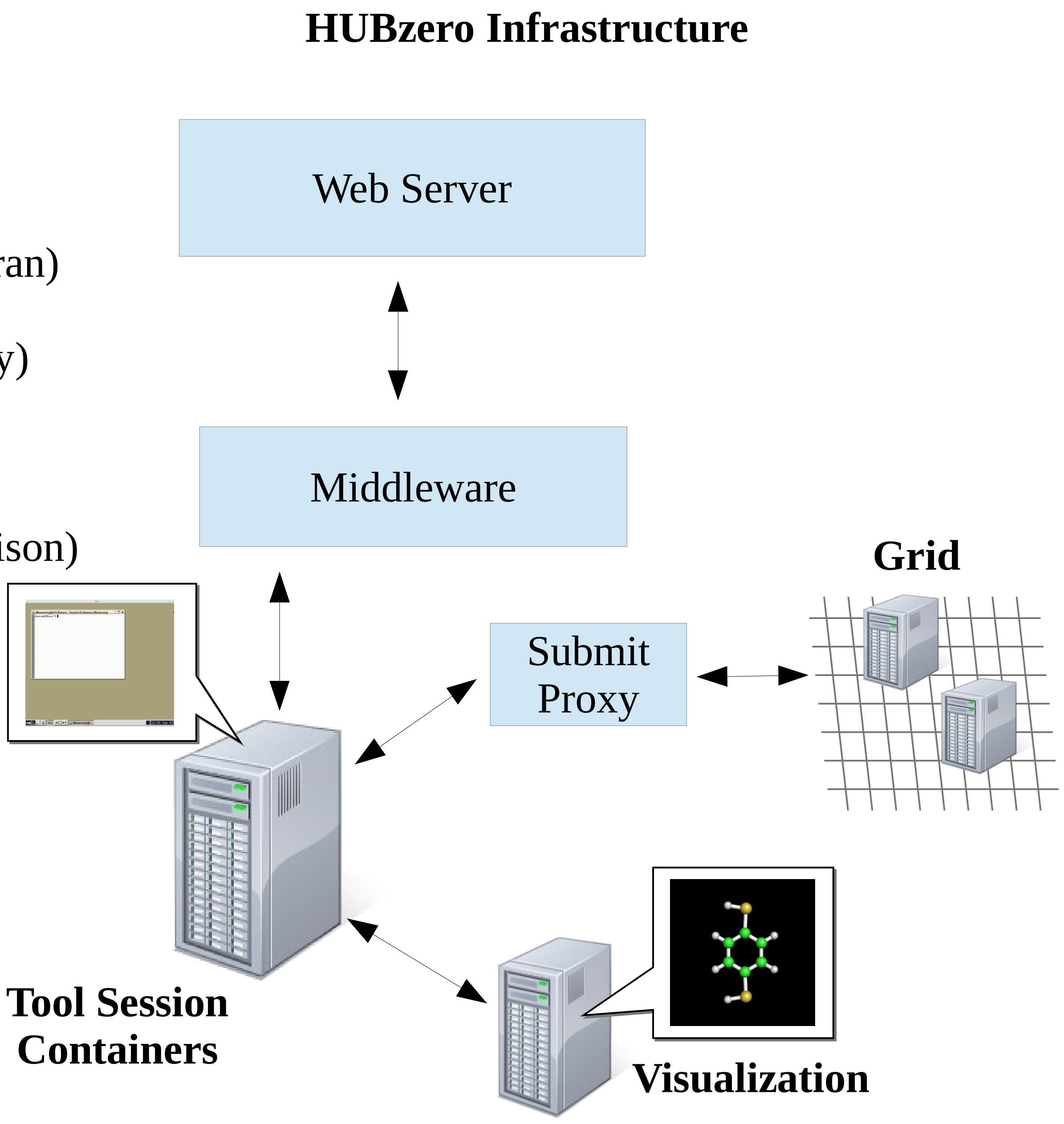


Testing Packages

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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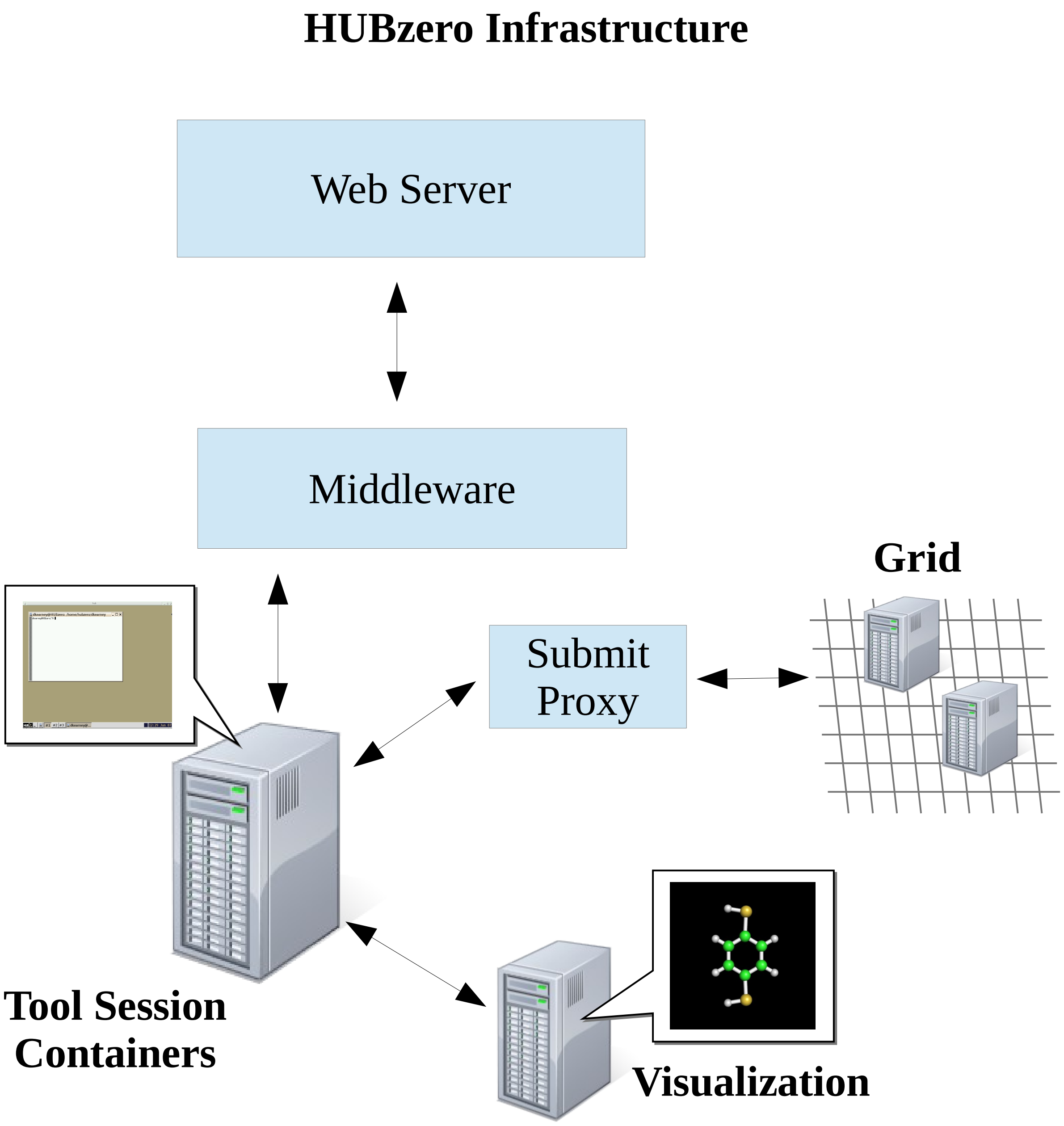
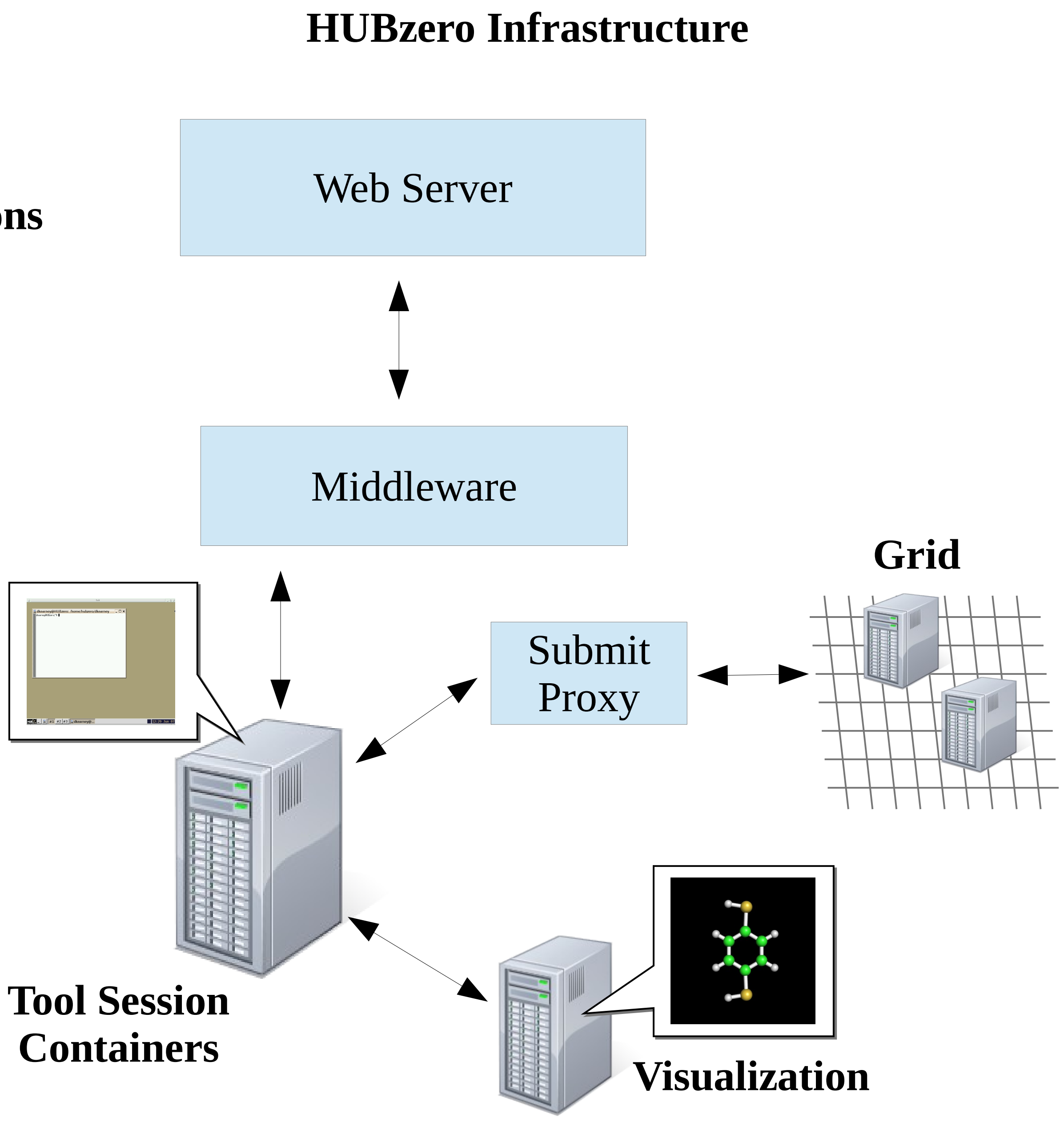


Testing Container Setup

Check file locations and permissions

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



Testing in the Workspace

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Container Setup
Network Firewall
Rappture Toolkit
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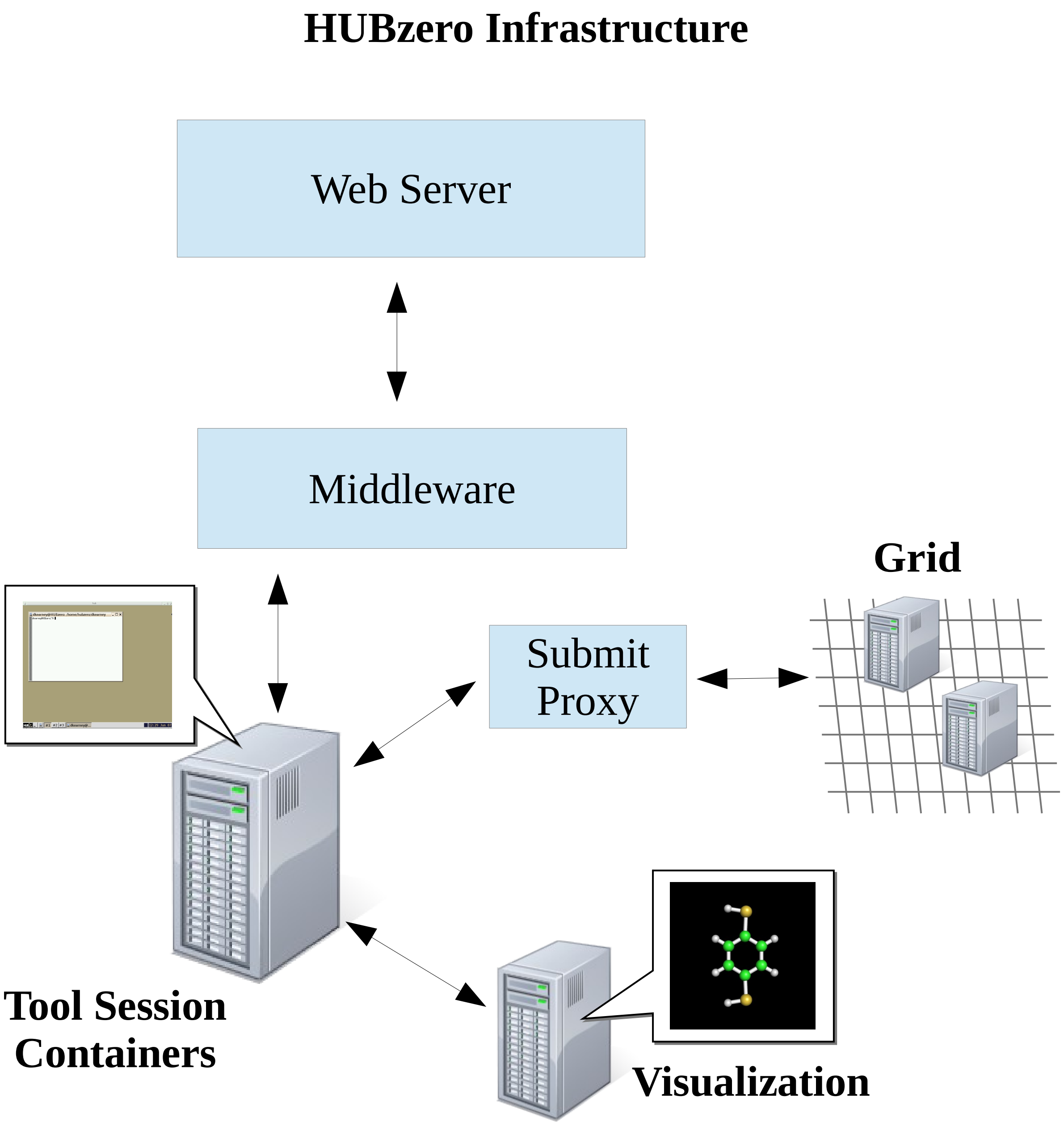
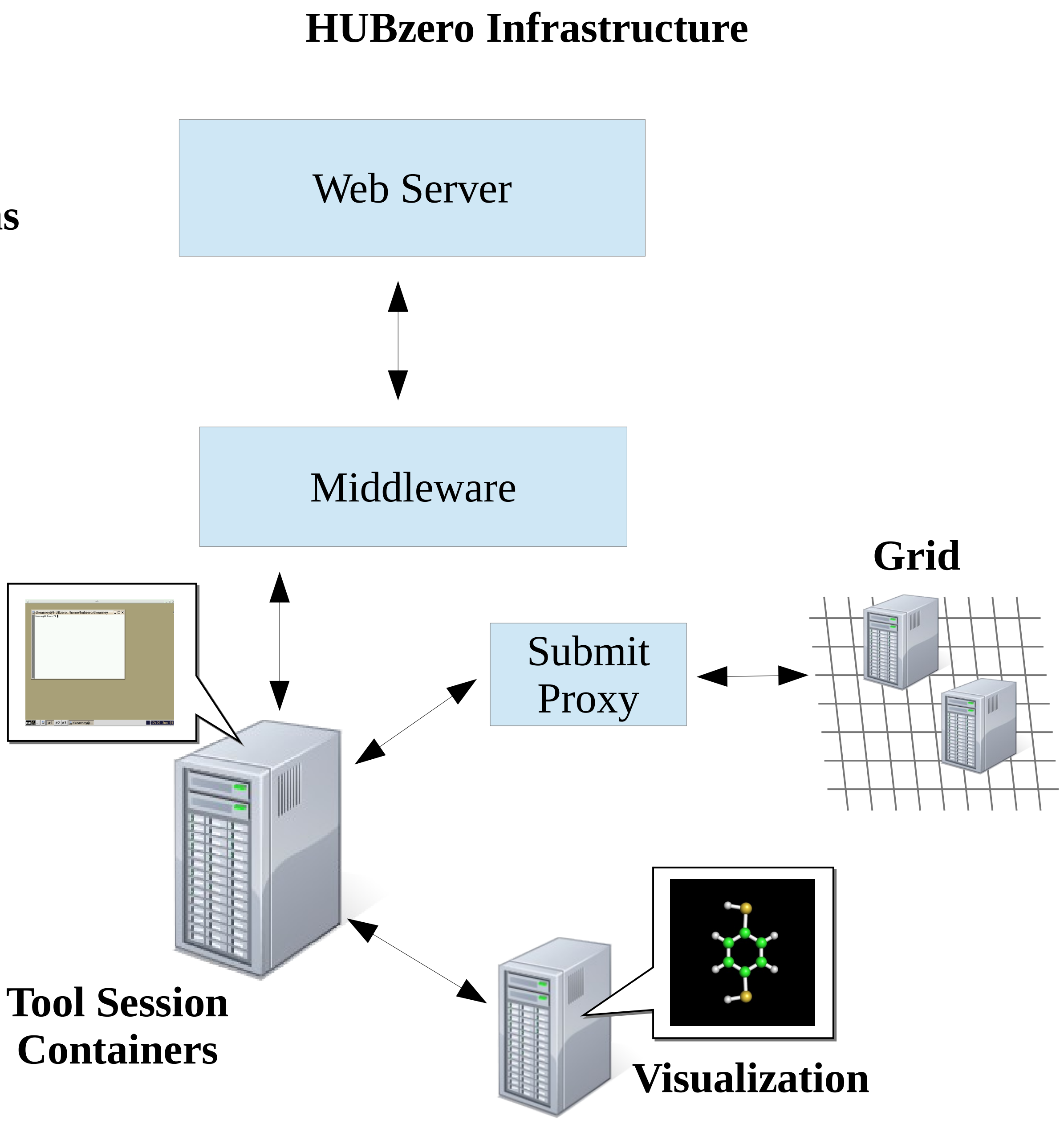
Filexfer



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



Testing in the Workspace

Debian Squeeze Packages
Container Setup
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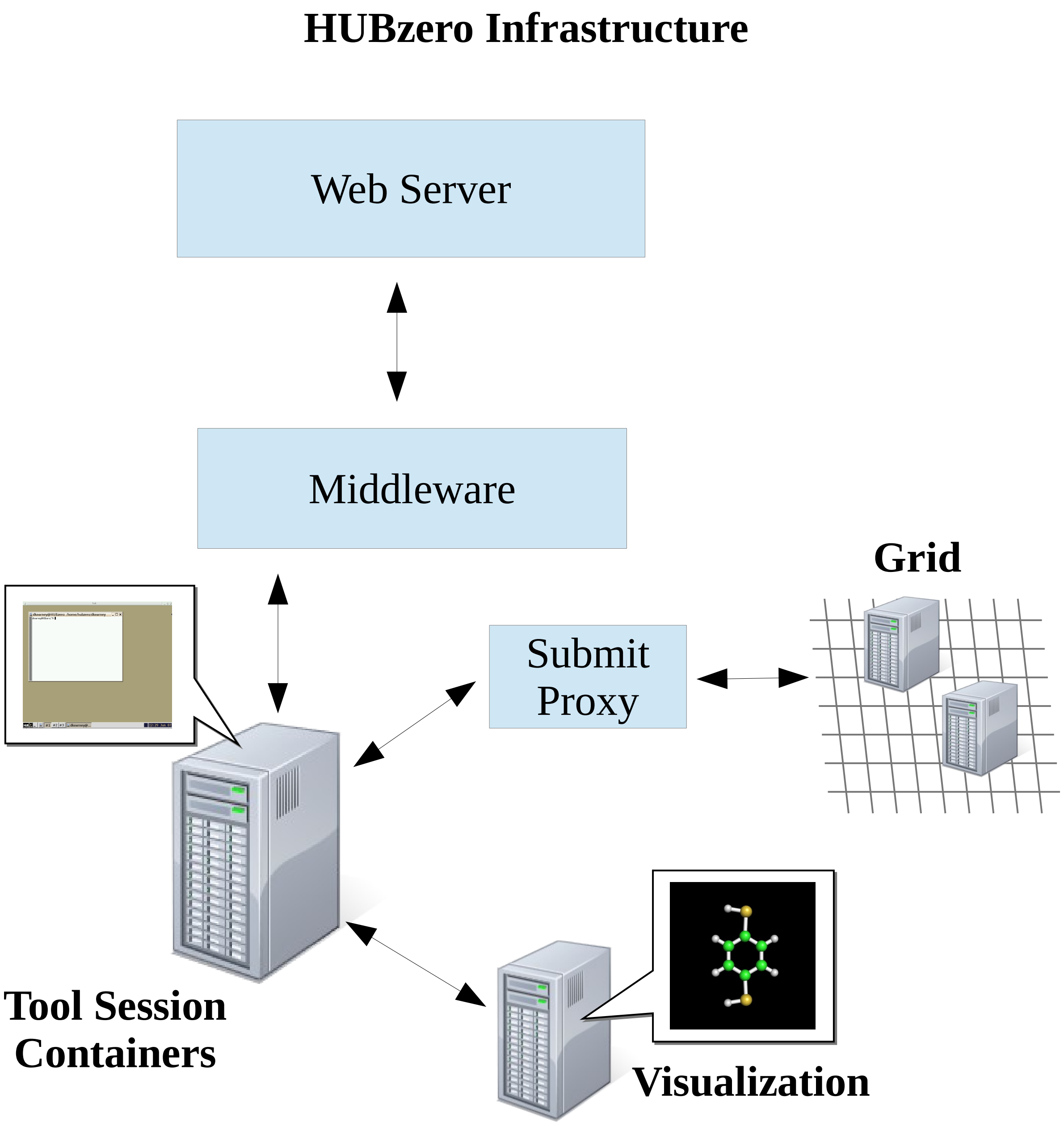
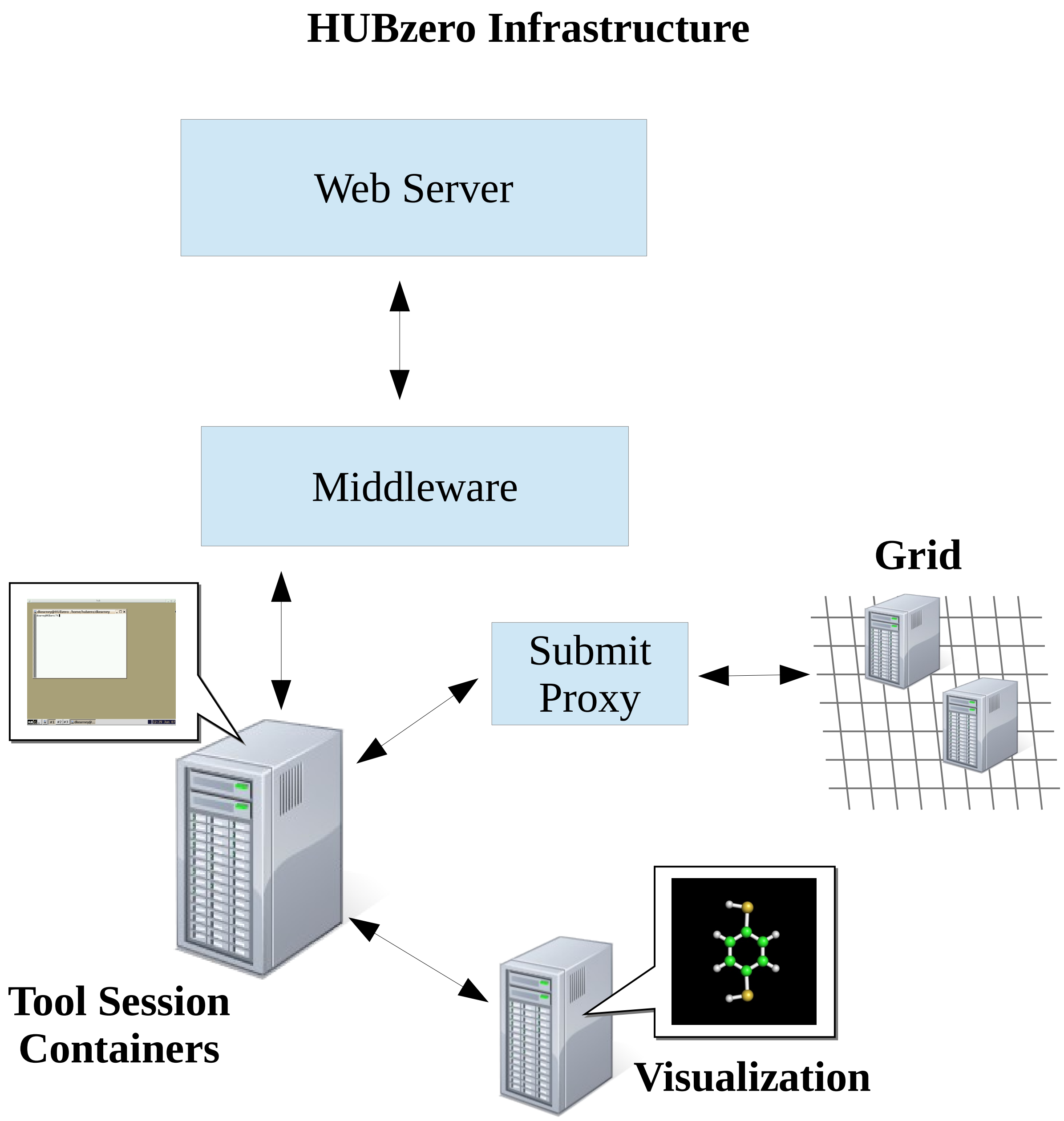
Rappture Toolkit
Submit
Filexfer



Testing Rappture Toolkit

Rappture Toolkit
- Rappture Installation
- Examples Run
- Visualization Servers



Testing in the Workspace

Debian Squeeze Packages
Container Setup
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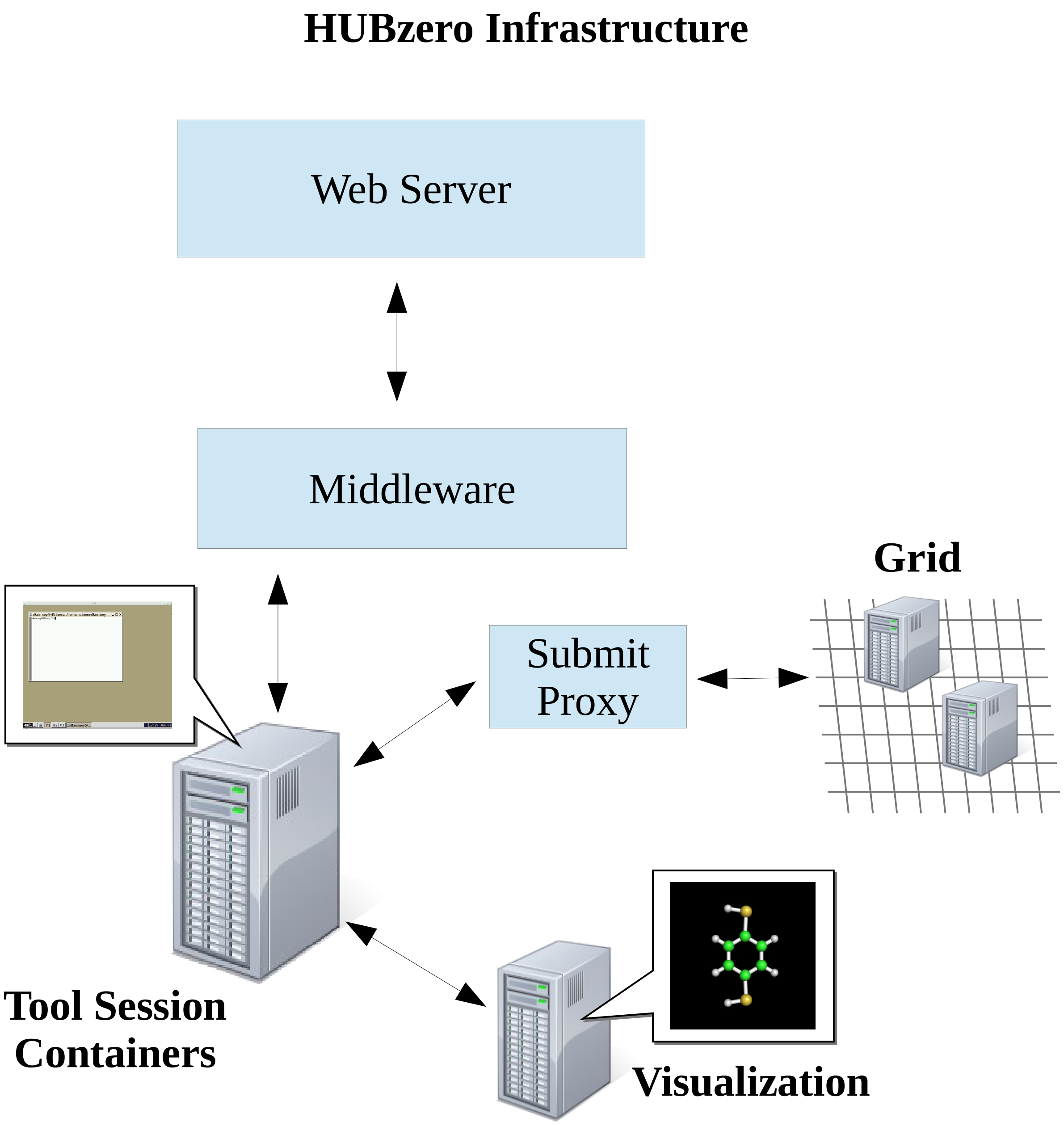
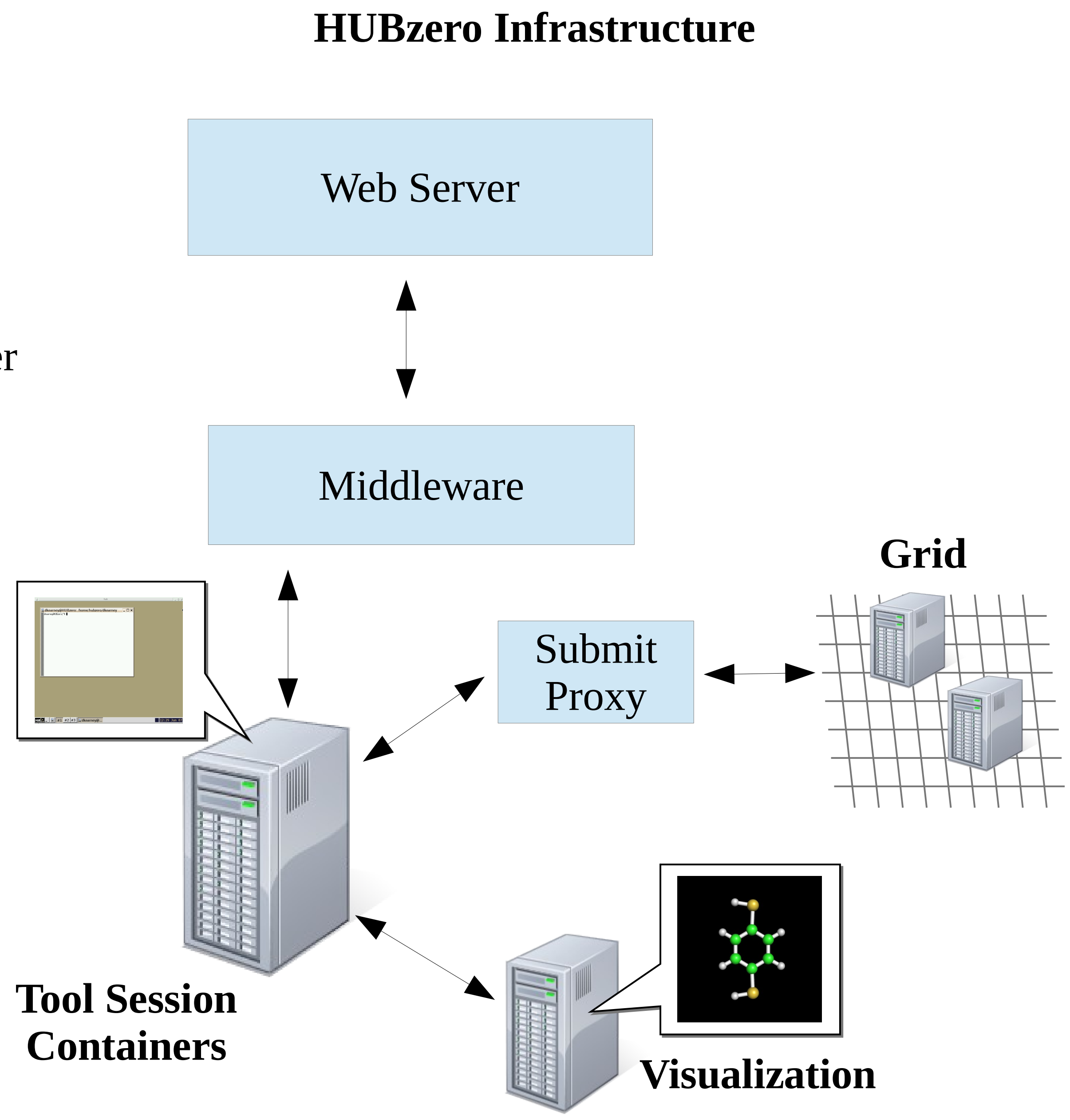
Rappture Toolkit
Submit
Filexfer



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



Testing in the Workspace

Debian Squeeze Packages
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Rappture Toolkit
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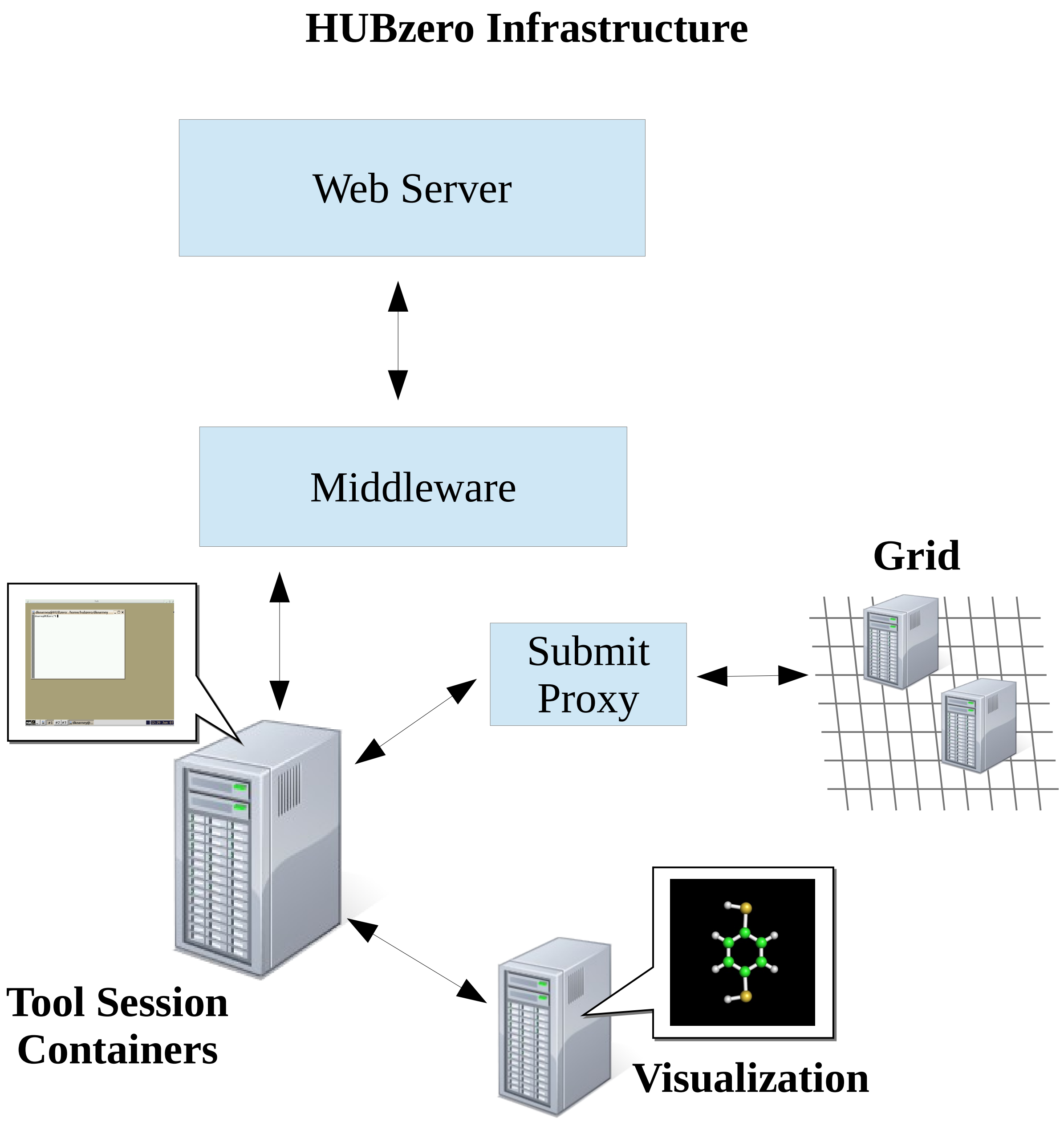
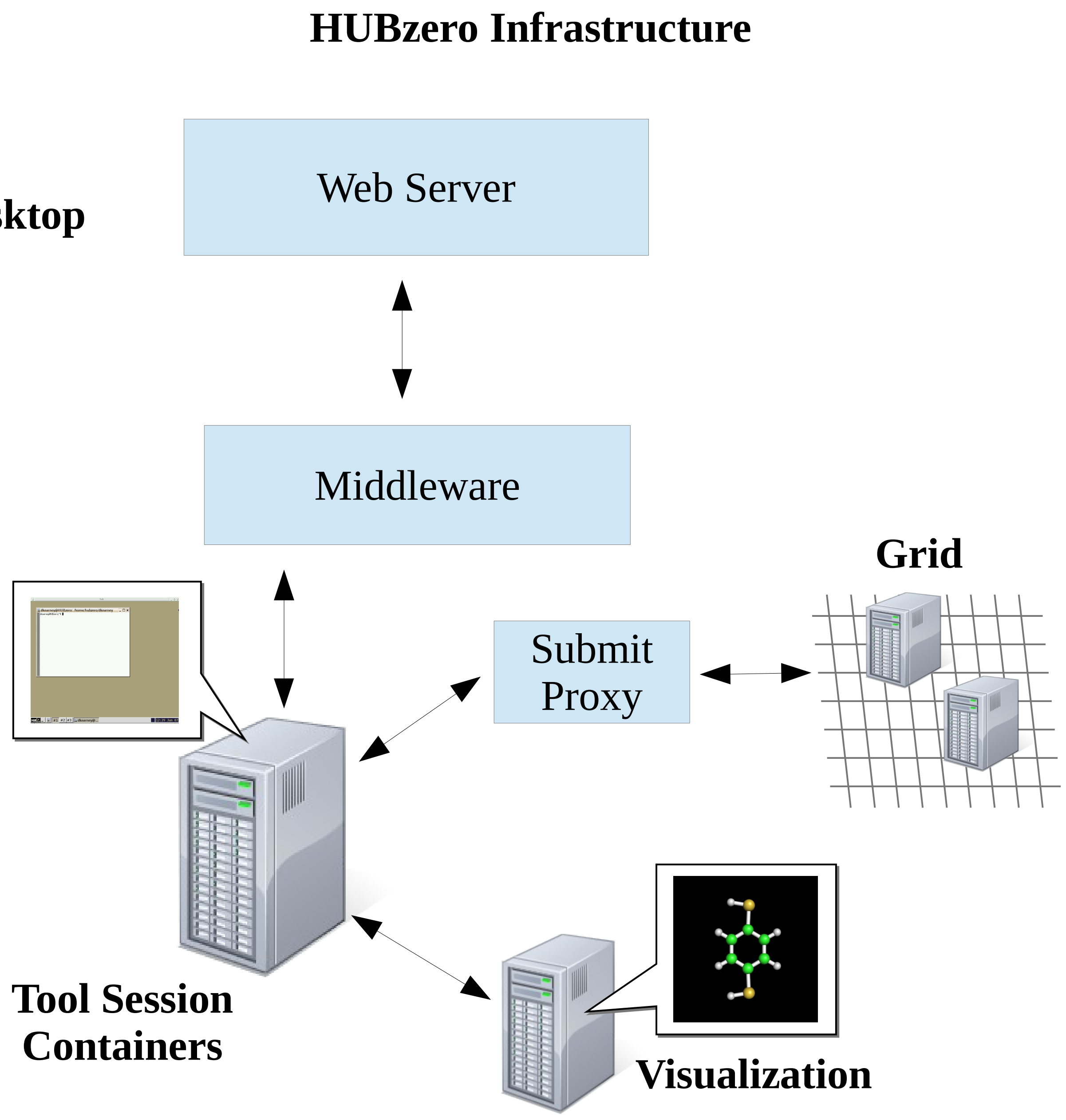


Testing Filexfer

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



Testing in the Workspace

```
submit -p @@vth=0:0.2:5 -p @@cap=10pf,100pf,1uf sim.exe @:indeck
```

Submit 78 jobs.

@@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
```

Virtual SSH

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

Virtual SSH → ToolSession

ssh [flags] [user@]hostname [command]	**ts = ToolSession(...)**
Virtual SSH related flags	
-t Force pseudo-tty allocation	
Virtual SSH Commands	**ToolSession Object Methods**
session create [*session_title*]	**create**(*title*=None)
session start	**start**()
session [*session_number*] [*command*]	**access**(*snum*=None,*command*=None)
session list	**list**()
session stop *session_number*	**stop**(*session_number*)
session help	**help**()

Virtual SSH - Create Session

```
ssh -t user@hostname session create

ssh -t user@hostname session create mytitle
```

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

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

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

Virtual SSH - Start Session

```
ssh -t user@hostname session start
```

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

shell = ts.start()
```

Virtual SSH - Access Session

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

ssh -t user@hostname session	shell = ts.access()
ssh -t user@hostname session 40032	shell = ts.access(session_number=40032)
ssh -t user@hostname session “echo hi”	(in,out,err) = ts.access(command='echo hi')
ssh -t user@hostname session 40032 “echo hi”	(in,out,err) = ts.access(40032,'echo hi')

Virtual SSH - List Session

```
ssh -t user@hostname session list
```

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

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

Virtual SSH - Stop Session

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

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

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

Virtual SSH – Session Help

```
ssh -t user@hostname session help
```

```
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()
```

ToolSessionShell Methods	**Examples**
shell.send(command)	shell.send('echo hi')
shell.expect(patterns=[],flags=0)	
shell.execute(commands)	

ToolSession → ToolSessionShell

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

shell = ts.access()
```

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]
```

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
```

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)
```

Writing 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 – 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()
```

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 – 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())
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