

Terapaths Installation

Background

This page documents the installation procedure at SLAC.

Unix accounts

No log in. No password.

```
[yee@terapaths home]$ sudo /usr/sbin/luseradd terapaths -u 30000 -g terapaths
```

Java

From: [here](#)

```
[yee@terapaths installation]$ sudo mkdir /usr/java
Password:
[yee@terapaths installation]$ sudo mv jdk1.5.0_13/ /usr/java/
```

SJSAS

From [here](#)

```
[terapaths@terapaths installation]$ sh sjsas_pe-8_2-linux.bin
sjsas_pe-8_2-linux.bin: sjsas_pe-8_2-linux.bin: cannot execute binary file
[terapaths@terapaths installation]$ chmod ugo+x sjsas_pe-8_2-linux.bin
```

The Sun Java System Application Server Platform Edition components will be installed in the following directory, which is referred to as the "Installation Directory". To use this directory, press only the Enter key. To use a different directory, type in the full path of the directory to use followed by pressing the Enter key.

```
Installation Directory [/home/terapaths/SUNWappserver] {"<" goes back, "!" exits}:
```

The directory "/home/terapaths/SUNWappserver" does not exist.

Do you want to create it now or choose another directory?

1. Create Directory
2. Choose New

```
Enter the number corresponding to your choice [1] {"<" goes back, "!" exits} 1
```

The Sun Java System Application Server requires a Java 2 SDK.

Please provide the path to a Java 2 SDK 1.4.1 or greater.

```
Recommended version is 1.4.2 or greater. [/usr/java/jdk1.5.0_13] {"<" goes back, "!" exits}
```

Supply the administrator user's password and override any of the other initial configuration settings as necessary.

```
Administrator User [admin] {"<" goes back, "!" exits}:
```

Administrator User's Password (8 chars minimum):

Re-enter Password:

Do you want to store administrator user name and password in user preference file [yes] {"<" goes back, "!" exits}? yes

```
Administration Port [4848] {"<" goes back, "!" exits}: 53470
```

```
HTTP Port [8080] {"<" goes back, "!" exits}: 40860
```

```
HTTPS Port [8181] {"<" goes back, "!" exits}: 48580
```

Please choose installation options.

```
Do you want to upgrade from previous Application Server version [no] {"<" goes back, "!" exits}?
```

Installation Successful.

Next Steps:

1. Access the About Application Server PE 8 welcome page at:
file:///home/terapaths/SUNWappserver/docs/about.html
2. Start the Application Server by executing:
/home/terapaths/SUNWappserver/bin/asadmin start-domain domain1
3. Start the Admin Console:
http://localhost:53470

Append to configuration file

/home/terapaths/SUNWAppserver/domains/domain1/config/server.policy

```
// TeraPaths-specific permissions

// Permission to NetworkDeviceController to create ClassLoaders for hardware drivers

grant codeBase "file:${com.sun.aas.instanceRoot}/generated/ejb/j2ee-modules/terapathsNetworkDeviceControllers/-"
{
    permission java.lang.RuntimePermission "createClassLoader";
};

grant codeBase "file:${com.sun.aas.instanceRoot}/applications/j2ee-modules/terapathsNetworkDeviceControllers/-"
{
    permission java.lang.RuntimePermission "createClassLoader";
};

// Permissions needed by WAN proxy server(s)

grant codeBase "file:${com.sun.aas.instanceRoot}/generated/ejb/j2ee-modules/terapathsESnetOSCARSProxy/-" {
    permission java.security.AllPermission;
    permission java.lang.RuntimePermission "getClassLoader";
    permission java.lang.RuntimePermission "createClassLoader";
    permission java.net.SocketPermission "*", "connect,accept,resolve";
    permission java.io.FilePermission "<>", "read,write,delete";
};

grant codeBase "file:${com.sun.aas.instanceRoot}/applications/j2ee-modules/terapathsESnetOSCARSProxy/-" {
    permission java.security.AllPermission;
    permission java.lang.RuntimePermission "getClassLoader";
    permission java.lang.RuntimePermission "createClassLoader";
    permission java.net.SocketPermission "*", "connect,accept,resolve";
    permission java.io.FilePermission "<>", "read,write,delete";
};
```

Change jvm settings, place within <java-config/> tag at end.

/home/terapaths/SUNWAppserver/domains/domain1/config/domain.xml

```
<!-- this is to prevent the java.lang.OutOfMemoryError: PermGen space during deployment-->
<jvm-options>-XX:MaxPermSize=256m</jvm-options>
<!-- -->
<!-- additional jvm options to fix file descriptor leak due to sockets not being closed (bug#:6321777) -->
<jvm-options>-server</jvm-options>
<jvm-options>-Dcom.sun.enterprise.web.connector.grizzly.useKeepAliveAlgorithm=true</jvm-options>
<jvm-options>-Dcom.sun.enterprise.web.connector.grizzly.socketSoTimeout=30000</jvm-options>
<jvm-options>-Dcom.sun.enterprise.web.connector.grizzly.maxKeepAliveRequests=250</jvm-options>
<jvm-options>-Dcom.sun.enterprise.server.ss.ASQuickStartup=false</jvm-options>
<!-- end of additional jvm options -->
```

Security Setup

Need keys etc.

```
[terapaths@terapaths ~]$ export PATH=$PATH:/usr/java/jdk1.5.0_13/bin/
```

```
[terapaths@terapaths ~]$ keytool -list -keystore /home/terapaths/SUNWappserver/domains/domain1/config/keystore.
jks
Enter keystore password:  changeit

Keystore type: jks
Keystore provider: SUN

Your keystore contains 1 entry

slas, Nov 8, 2007, keyEntry,
Certificate fingerprint (MD5): F1:C4:86:53:BD:35:41:33:CC:3B:41:32:A7:E2:6C:EE
```

Add DOE Cert and ESnet

```
[terapaths@terapaths ~]$ keytool -import -noprompt -trustcacerts -alias DOECertAlias -file /home/terapaths
/installation/DOE-01.25.13.pem -keystore /home/terapaths/SUNWappserver/domains/domain1/config/cacerts.jks -
storepass changeit
Certificate was added to keystore
[terapaths@terapaths ~]$ keytool -import -noprompt -trustcacerts -alias ESnetAlias -file /home/terapaths
/installation/ESnet-10.26.22.pem -keystore /home/terapaths/SUNWappserver/domains/domain1/config/cacerts.jks -
storepass changeit
Certificate was added to keystore

[terapaths@terapaths config]$ pwd
/home/terapaths/SUNWappserver/domains/domain1/config
[terapaths@terapaths config]$ keytool -list -keystore /home/terapaths/SUNWappserver/domains/domain1/config
/cacerts.jks
Enter keystore password:  changeit

Keystore type: jks
Keystore provider: SUN

Your keystore contains 13 entries

verisignclg3, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): B1:47:BC:18:57:D1:18:A0:78:2D:EC:71:E8:2A:95:73
verisignclg2, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): DB:23:3D:F9:69:FA:4B:B9:95:80:44:73:5E:7D:41:83
esnetalias, Nov 9, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 32:AC:21:5D:DE:43:73:E9:3A:EE:90:BC:17:C4:8F:36
verisignclg1, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): 97:60:E8:57:5F:D3:50:47:E5:43:0C:94:36:8A:B0:62
verisignc2g3, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): F8:BE:C4:63:22:C9:A8:46:74:8B:B8:1D:1E:4A:2B:F6
verisignc2g2, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): 2D:BB:E5:25:D3:D1:65:82:3A:B7:0E:FA:E6:EB:E2:E1
verisignc2g1, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): B3:9C:25:B1:C3:2E:32:53:80:15:30:9D:4D:02:77:3E
doecertalias, Nov 9, 2007, trustedCertEntry,
Certificate fingerprint (MD5): F3:76:00:EC:D0:8E:DB:20:BC:2B:E0:06:60:24:C4:9F
verisignc3g3, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): CD:68:B6:A7:C7:C4:CE:75:E0:1D:4F:57:44:61:92:09
verisignc3g2, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): A2:33:9B:4C:74:78:73:D4:6C:E7:C1:F3:8D:CB:5C:E9
verisignc3g1, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): 10:FC:63:5D:F6:26:3E:0D:F3:25:BE:5F:79:CD:67:67
slas, Nov 8, 2007, trustedCertEntry,
Certificate fingerprint (MD5): F1:C4:86:53:BD:35:41:33:CC:3B:41:32:A7:E2:6C:EE
verisignseureserver, Apr 8, 2004, trustedCertEntry,
Certificate fingerprint (MD5): 74:7B:82:03:43:F0:00:9E:6B:B3:EC:47:BF:85:A5:93
```

Make sure server works properly:

```
[terapaths@terapaths bin]$ pwd
/home/terapaths/SUNWappserver/bin
[terapaths@terapaths bin]$ ./asadmin start-domain --debug=true domain1
Nov 9, 2007 5:36:27 PM com.sun.enterprise.util.ASenvPropertyReader setSystemProperties
SEVERE: property_reader.unknownHost
java.net.UnknownHostException: terapaths: terapaths
    at java.net.InetAddress.getLocalHost(InetAddress.java:1346)
    at com.sun.enterprise.util.net.NetUtils.getCanonicalHostName(NetUtils.java:66)
    at com.sun.enterprise.util.ASenvPropertyReader.setSystemProperties(ASenvPropertyReader.java:161)
    at com.sun.enterprise.cli.framework.CLIMain.invokeCommand(CLIMain.java:87)
    at com.sun.enterprise.cli.framework.CLIMain.main(CLIMain.java:46)
Starting Domain domain1, please wait.
Log redirected to /home/terapaths/SUNWappserver/domains/domain1/logs/server.log.
Domain domain1 failed to startup. Please check the server log for more details.
CLI156 Could not start the domain domain1.
```

Add local dns (no dns server is configured on these machines)

/etc/hosts

```
127.0.0.1      terapaths
192.124.59.130 terapaths
```

Fixes the startup problem:

```
[terapaths@terapaths bin]$ ./asadmin start-domain --debug=true domain1
Starting Domain domain1, please wait.
Log redirected to /home/terapaths/SUNWappserver/domains/domain1/logs/server.log.

Domain domain1 is ready to receive client requests. Additional services are being started in background.
```

Listening ports

```

yee@terapaths ~]$ netstat -nlp
(Not all processes could be identified, non-owned process info
will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)

```

| Proto | Recv-Q | Send-Q | Local Address | Foreign Address | State | PID/Program name |
|-------|--------|--------|-------------------------|-----------------|--------|------------------|
| tcp | 0 | 0 | 0.0.0.0:3306 | 0.0.0.0:* | LISTEN | - |
| tcp | 0 | 0 | 0.0.0.0:111 | 0.0.0.0:* | LISTEN | - |
| tcp | 0 | 0 | 0.0.0.0:9009 | 0.0.0.0:* | LISTEN | - |
| tcp | 0 | 0 | 0.0.0.0:946 | 0.0.0.0:* | LISTEN | - |
| tcp | 0 | 0 | 127.0.0.1:631 | 0.0.0.0:* | LISTEN | - |
| tcp | 0 | 0 | :::48580 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::3820 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::ffff:127.0.0.1:32876 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::8686 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::3920 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::3700 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::32884 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::32885 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::22 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::32887 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::40860 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::7676 | :::* | LISTEN | - |
| tcp | 0 | 0 | :::53470 | :::* | LISTEN | - |
| udp | 0 | 0 | 0.0.0.0:514 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:2055 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:940 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:943 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:7001 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:111 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:631 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 192.124.59.130:123 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 127.0.0.1:123 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | 0.0.0.0:123 | 0.0.0.0:* | - | - |
| udp | 0 | 0 | :::123 | :::* | - | - |

MySQL

download [server client libs](#)

```

[root@terapaths installation]# rpm -Uhv MySQL-*
error: Failed dependencies:
    MySQL conflicts with mysql-4.1.20-2.RHEL4.1.0.1.i386
[root@terapaths installation]# rpm -e mysql-4.1.20
error: Failed dependencies:
    libmysqlclient.so.14 is needed by (installed) cyrus-sasl-sql-2.1.19-14.i386
    libmysqlclient.so.14(libmysqlclient_14) is needed by (installed) cyrus-sasl-sql-2.1.19-14.i386
[root@terapaths installation]# rpm -Uhv MySQL-server-community-5.0.45-0.rhel4.x86_64.rpm
error: Failed dependencies:
    MySQL conflicts with mysql-4.1.20-2.RHEL4.1.0.1.i386
[root@terapaths installation]# rpm -e mysql-4.1.20
error: Failed dependencies:
    libmysqlclient.so.14 is needed by (installed) cyrus-sasl-sql-2.1.19-14.i386
    libmysqlclient.so.14(libmysqlclient_14) is needed by (installed) cyrus-sasl-sql-2.1.19-14.i386
[root@terapaths installation]# rpm -e cyrus-sasl-sql-2.1.19
[root@terapaths installation]# rpm -e mysql-4.1.20

```

Change users

```
[root@terapaths installation]# mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 3
Server version: 5.0.45-community MySQL Community Edition (GPL)
```

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

```
mysql> select User,Host from mysql.user
-> ;
```

| User | Host |
|------|-----------|
| root | 127.0.0.1 |
| root | localhost |
| root | terapaths |

3 rows in set (0.01 sec)

```
mysql> create database terapaths;
Query OK, 1 row affected (0.00 sec)
```

```
mysql> GRANT ALL PRIVILEGES ON terapaths.* TO 'terapaths'@'localhost' IDENTIFIED BY '*****';
Query OK, 0 rows affected (0.00 sec)
```

```
mysql> select User,Host from mysql.user
-> ;
```

| User | Host |
|-----------|-----------|
| root | 127.0.0.1 |
| root | localhost |
| terapaths | localhost |
| root | terapaths |

4 rows in set (0.00 sec)

```
mysql>
```

Database creation

Create the terapaths MySQL database by running terapaths-create-1.2.0.sql.

```
[root@terapaths dist]# pwd
/home/terapaths/installation/dist
[root@terapaths dist]# mysql < terapaths-create-1.2.0.sql

[terapaths@terapaths ~]$ mysql -u terapaths -p -D terapaths
Enter password:
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 5.0.45-community MySQL Community Edition (GPL)

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql> show tables;
+-----+
| Tables_in_terapaths |
+-----+
| WANServiceURL       |
| bandwidthClasses    |
| diffServClasses     |
| hosts               |
| remoteLANServiceURL |
| reservations        |
| routerDrivers       |
| routerManagers      |
| routers             |
| routes              |
| systemMessages      |
| terapathsDatabaseInfo |
| users               |
| virtualRouterMembers |
| virtualRouters      |
+-----+
15 rows in set (0.01 sec)
```

Edit terapaths-populate-1.2.0.sql to match your network host information and run it to populate the database.

```
--
-- Populate the TeraPaths database for the TeraPaths UMich-side secure testbed
-- MySQL server on tera01.ultralight.org (192.84.86.25)
-- Database structure version 1.2.0
-- 01/23/07
--

USE terapaths;

--
-- database settings
--
INSERT INTO terapathsDatabaseInfo (
    version,
    creationTimeStamp,
    serverIpAddress,
    serverName,
    siteName
) VALUES (
    "1.2.0",
    NOW(),
    "192.124.59.130",
    "terapaths.slac.stanford.edu",
    "SLAC"
```



```

);

--
-- drivers for communication between instance and router
INSERT INTO routerDrivers (
    name,
    driverInfo
) VALUES (
    "DUMMY_DRIVER",
    "hardware,DUMMY,type,DUMMY,os,DUMMY,comm_protocol,DUMMY"
);

INSERT INTO routerDrivers (
    name,
    driverInfo
) VALUES (
    "CISCO_WS-C6509_IOS_TELNET",
    "hardware,CISCO,type,WS-6509,os,IOS,comm_protocol,TELNET"
);

INSERT INTO routerDrivers (
    name,
    driverInfo
) VALUES (
    "CISCO_WS-C6509_IOS_SSH",
    "hardware,CISCO,type,WS-6509,os,IOS,comm_protocol,SSH"
);

SELECT @driver := LAST_INSERT_ID();

--
-- terapath instance, and endpoint to communicate to
--
INSERT INTO routerManagers (
    ipAddress,
    name,
    wsdlURL,
    interface,
    managerDir
) VALUES (
    "192.124.59.130",
    "terapaths01.slac.stanford.edu",
    "http://192.124.59.130:48580/terapathsNetworkDeviceControllers/tpsNDC",
    "GigabitEthernet3/33",
    "/home/terapaths/routerConfig"
);

SELECT @edgeManager := LAST_INSERT_ID();

SELECT @borderManager := @edgeManager;

--
-- routers
--
INSERT INTO routers (
    ipAddress,
    name,
    routerInfo,
    driverParameters,
    driverId,
    managingNodeId,
    position
) VALUES (
    "192.124.59.129",
    "tera",
    "hardware,CISCO,type,WS-6509,os,IOS12.2(18)SXD1",
    "system_prompt,tera,terapaths,XXXXXXX,entry_pass,XXXXXXX,enable_pass,XXXXXXX,policy_name_root,QoS_nile",
    @driver,
    @edgeManager,
    "edge"

```

```

);

SELECT @edge := LAST_INSERT_ID();
SELECT @border := @edge;

INSERT INTO virtualRouters (
    name
) VALUES (
    "tera (physical-edge)"
);

SELECT @vedge := LAST_INSERT_ID();

INSERT INTO virtualRouters (
    name
) VALUES (
    "nile (physical-border)"
);

SELECT @vborder := LAST_INSERT_ID();

INSERT INTO virtualRouterMembers (
    virtualRouterId,
    routerId
) VALUES
    (@vedge,@edge),
    (@vborder,@border);

INSERT INTO routes (
    edge,
    border
) VALUES (
    @vedge,
    @vborder
);

SELECT @route := LAST_INSERT_ID();

--
-- worker nodes
---
INSERT INTO hosts (
    ipAddress,
    name,
    route,
    interface
) VALUES
    ("192.124.59.200", "node00.slac.stanford.edu", @route, "GigabitEthernet3/4"),
    ("192.124.59.201", "node01.slac.stanford.edu", @route, "GigabitEthernet3/5"),
    ("192.124.59.202", "node02.slac.stanford.edu", @route, "GigabitEthernet3/6"),
    ("192.124.59.203", "node03.slac.stanford.edu", @route, "GigabitEthernet3/7"),
    ("192.124.59.204", "node04.slac.stanford.edu", @route, "GigabitEthernet3/8"),
    ("192.124.59.205", "node05.slac.stanford.edu", @route, "GigabitEthernet3/9"),
    ("192.124.59.206", "node06.slac.stanford.edu", @route, "GigabitEthernet3/10"),
    ("192.124.59.207", "node07.slac.stanford.edu", @route, "GigabitEthernet3/11"),
    ("192.124.59.208", "node08.slac.stanford.edu", @route, "GigabitEthernet3/12");

INSERT INTO remoteLANServiceURL (
    ipAddress,
    mask,
    maskedIpAddress,
    prefix,
    wsdlURL,
    preference
) VALUES
    ("198.124.220.0", "255.255.255.0", ipAddr2dec("198.124.220.0")&ipAddr2dec("255.255.255.0"), 24,
    "http://198.124.220.9:48588/terapathsRemoteTPsListeners/tpsRTPsL"
    , 0);

INSERT INTO WANServiceURL (
    ipAddress,

```

```

        mask,
        maskedIpAddress,
        prefix,
        wsdlURL,
        preference
    ) VALUES
        ('198.124.220.0', '255.255.255.0', ipAddr2dec('198.124.220.0')&ipAddr2dec('255.255.255.0'), 24, 'OSCARS',
https://oscars.es.net/axis2/services/OSCARS", 0);

INSERT INTO diffServClasses (
    name,
    dscp,
    aggregateBandwidth,
    configured,
    active
) VALUES
    ('BE',0,0,0,0),
    ('CS01',1,0,0,0),
    ('CS02',2,0,0,0),
    ('CS03',3,0,0,0),
    ('CS04',4,0,0,0),
    ('CS05',5,0,0,0),
    ('CS06',6,0,0,0),
    ('CS07',7,0,0,0),
    ('CS1',8,0,0,0),
    ('CS11',9,0,0,0),
    ('AF11',10,0,0,0),
    ('CS13',11,0,0,0),
    ('AF12',12,0,0,0),
    ('CS15',13,0,0,0),
    ('AF13',14,0,0,0),
    ('CS17',15,0,0,0),
    ('CS2',16,0,0,0),
    ('CS21',17,0,0,0),
    ('AF21',18,0,0,0),
    ('CS23',19,0,0,0),
    ('AF22',20,0,0,0),
    ('CS25',21,0,0,0),
    ('AF23',22,0,0,0),
    ('CS27',23,0,0,0),
    ('CS3',24,0,0,0),
    ('CS31',25,0,0,0),
    ('AF31',26,0,0,0),
    ('CS33',27,0,0,0),
    ('AF32',28,0,0,0),
    ('CS35',29,0,0,0),
    ('AF33',30,0,0,0),
    ('CS37',31,0,0,0),
    ('CS4',32,0,0,0),
    ('CS41',33,0,0,0),
    ('AF41',34,0,0,0),
    ('CS43',35,0,0,0),
    ('AF42',36,0,0,0),
    ('CS45',37,0,0,0),
    ('AF43',38,0,0,0),
    ('CS47',39,0,0,0),
    ('CS5',40,0,0,0),
    ('CS51',41,0,0,0),
    ('CS52',42,0,0,0),
    ('CS53',43,0,0,0),
    ('CS54',44,0,0,0),
    ('CS55',45,0,0,0),
    ('EF',46,0,0,0),
    ('CS57',47,0,0,0),
    ('CS6',48,0,0,0),
    ('CS61',49,0,0,0),
    ('CS62',50,0,0,0),
    ('CS63',51,0,0,0),
    ('CS64',52,0,0,0),
    ('CS65',53,0,0,0),
    ('CS66',54,0,0,0),

```

```

("CS67",55,0,0,0),
("CS7",56,0,0,0),
("CS71",57,0,0,0),
("CS72",58,0,0,0),
("CS73",59,0,0,0),
("CS74",60,0,0,0),
("CS75",61,0,0,0),
("CS76",62,0,0,0),
("CS77",63,0,0,0);

--Simple partitioning of bandwidth for testbed's 1 Gbit connection
UPDATE diffServClasses SET aggregateBandwidth= 15000000, configured=1 WHERE name="CS1";
UPDATE diffServClasses SET aggregateBandwidth= 20000000, configured=1 WHERE name="AF11";
UPDATE diffServClasses SET aggregateBandwidth= 40000000, configured=1 WHERE name="CS2";
UPDATE diffServClasses SET aggregateBandwidth= 50000000, configured=1 WHERE name="AF21";
UPDATE diffServClasses SET aggregateBandwidth= 75000000, configured=1 WHERE name="AF31";
UPDATE diffServClasses SET aggregateBandwidth=100000000, configured=1 WHERE name="AF41";
UPDATE diffServClasses SET aggregateBandwidth=150000000, configured=1 WHERE name="CS47";
UPDATE diffServClasses SET aggregateBandwidth=200000000, configured=1 WHERE name="EF";
UPDATE diffServClasses SET aggregateBandwidth=250000000, configured=1 WHERE name="CS7";

INSERT INTO bandwidthClasses (
    name,
    diffServClassId,
    bandwidth,
    type,
    configured,
    active
) VALUES
("CS1_1",(SELECT id FROM diffServClasses WHERE name="CS1"), 5000000,"shared",1,0),
("CS1_2",(SELECT id FROM diffServClasses WHERE name="CS1"), 5000000,"shared",1,0),
("CS1_3",(SELECT id FROM diffServClasses WHERE name="CS1"), 5000000,"shared",1,0),
("AF11_1",(SELECT id FROM diffServClasses WHERE name="AF11"),10000000,"shared",1,0),
("AF11_2",(SELECT id FROM diffServClasses WHERE name="AF11"),10000000,"shared",1,0),
("CS2_1",(SELECT id FROM diffServClasses WHERE name="CS2"), 20000000,"shared",1,0),
("CS2_2",(SELECT id FROM diffServClasses WHERE name="CS2"), 20000000,"shared",1,0),
("AF21",(SELECT id FROM diffServClasses WHERE name="AF21"), 50000000,"static",1,0),
("AF31",(SELECT id FROM diffServClasses WHERE name="AF31"), 75000000,"static",1,0),
("AF41",(SELECT id FROM diffServClasses WHERE name="AF41"), 100000000,"static",1,0),
("CS47",(SELECT id FROM diffServClasses WHERE name="CS47"), 150000000,"static",1,0),
("EF",(SELECT id FROM diffServClasses WHERE name="EF"), 200000000,"static",1,0),
("CS7",(SELECT id FROM diffServClasses WHERE name="CS7"), 250000000,"static",1,0);

--Default user

INSERT INTO users (
    userName,
    passWord,
    type
) VALUES
('terapaths',PASSWORD('*****'),'standard');
```

```
[terapaths@terapaths dist]$ mysql -u terapaths -D terapaths -p < terapaths-end2end-SLACside-secure-1.2.0.sql
Enter password:
@driver := LAST_INSERT_ID()
3
@edgeManager := LAST_INSERT_ID()
1
@borderManager := @edgeManager
1
@edge := LAST_INSERT_ID()
1
@border := @edge
1
@vedge := LAST_INSERT_ID()
1
@vborder := LAST_INSERT_ID()
2
@route := LAST_INSERT_ID()
1
```

Manually edit database entries for passwords etc:

```
mysql> UPDATE routers SET driverParameters='system_prompt,<prompt>,user_name,<terapaths>,entry_pass,<loginpass>,
enable_pass,<enable_pass>,policy_name_root,QoS_slac';
```

Edit terapaths.properties to contain the database info and service module URLs for each host at which one or more terapaths modules will be deployed.

```
[yee@terapaths dist]$ cat terapaths.properties
#####
# Change this file to match your host information #
#####
#
driver.for.host.terapaths = com.mysql.jdbc.Driver
db.for.host.terapaths = jdbc:mysql://localhost/terapaths?user=terapaths&password=*****
pws.for.host.terapaths = https://localhost:40860/terapathsPublicWebServices/tpsPWS
iws.for.host.terapaths = https://localhost:40860/terapathsInternalWebServices/tpsIWS
OSCARS.for.host.terapaths = https://localhost:40860/terapathsESnetOSCARSProxy/ESnetOSCARSProxy

#####
# Add other hosts here by specifying same five #
# values as above for each host #
#####
```

Edit proxy.properties to match your WAN provider accounts (currently only ESnet/OSCARS is supported)

N/A

Edit terapathsWebInterfaceDefaults to contain the defaults of your choice for the web interface.

Copy the file to the /home/terapaths directory of the host where terapathsWebInterface will be deployed.
The defaults can be changed at any time, even when the service is running.
This file overrides the build-in defaults.

```
[yee@terapaths dist]$ cat terapathsWebInterfaceDefaults
#####
# Defaults for the web interface #
# This file must be in the      #
# /home/terapaths directory    #
# ORDER IS IMPORTANT!!!        #
#####
# default web interace value

# 1. source IP address
192.124.59.200
# 2. destination IP address
# 198.124.220.134
192.124.59.204
# 3. source low port #
10000
# 4. source high port #
10000
# 5. destination low port #
10000
# 6. destination high port #
10000
# 7. protocol
tcp
# 8. reservation direction
bidirectional
# 9. time span for schedule
day
```

```
[terapaths@terapaths dist]$ pwd
/home/terapaths/installation/dist
[terapaths@terapaths dist]$ cp terapathsWebInterfaceDefaults /home/terapaths/
```

Edit autodeploy-hosts to describe which modules to deploy at which hosts.

```
[yee@terapaths dist]$ cat autodeploy-hosts
#####
# user@host_to_deploy:path_of_autodeploy_dir war1 war2 ... warN #
#####

#terapaths@localhost:/home/terapaths/SUNWappserver/domains/domain2/autodeploy/ terapathsWebInterface.war
terapaths@localhost:/home/terapaths/SUNWappserver/domains/domain1/autodeploy/ terapathsWebInterface.war
terapathsInternalWebServices.war terapathsPublicWebServices.war terapathsESnetOSCARSPProxy.war
terapathsRemoteTPsListeners.war terapathsNetworkDeviceControllers.war
terapaths@localhost:/home/terapaths/SUNWappserver/domains/domain1/autodeploy/ terapathsNetworkDeviceControllers.
war
```

Run the 'terapaths-deploy' script.

Environments

```
[terapaths@terapaths dist]$ ./terapaths-deploy
If ssh keys are not set up for remote deploy hosts, you will be prompted for your password multiple times.

Environment variable JAVA_HOME is not set.
```

```
[root@terapaths ~]# cat /etc/profile.d/java.sh
export JAVA_HOME=/usr/java/jdk1.5.0_13/
export PATH=$PATH:$JAVA_HOME/bin
[terapaths@terapaths yee]$ env | grep JAVA
JAVA_HOME=/usr/java/jdk1.5.0_13/
```

Keys (no password on terapaths local user account)

```
[terapaths@terapaths dist]$ ssh-keygen -t dsa
Generating public/private dsa key pair.
Enter file in which to save the key (/home/terapaths/.ssh/id_dsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/terapaths/.ssh/id_dsa.
Your public key has been saved in /home/terapaths/.ssh/id_dsa.pub.
The key fingerprint is:
cc:f0:46:d8:55:1d:36:5b:fe:f5:b9:9f:d1:89:3b:50 terapaths@terapaths
[terapaths@terapaths dist]$ cp ~/.ssh/id
id_dsa id_dsa.pub id_rsa.pub identity.pub
[terapaths@terapaths dist]$ cp ~/.ssh/id_dsa.pub ~/.ssh/authorized_keys2
[terapaths@terapaths dist]$ ls -lah ~/.ssh/.public/authorized_keys2
-rw-rw-r-- 1 terapaths terapaths 609 Nov 12 11:42 /home/terapaths/.ssh/.public/authorized_keys2
[terapaths@terapaths dist]$ chmod go-rwx ~/.ssh/authorized_keys2
[terapaths@terapaths dist]$ ls -lah ~/.ssh/.public/authorized_keys2
-rw----- 1 terapaths terapaths 609 Nov 12 11:42 /home/terapaths/.ssh/.public/authorized_keys2
```

```
[terapaths@terapaths yee]$
[terapaths@terapaths yee]$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/terapaths/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/terapaths/.ssh/id_rsa.
Your public key has been saved in /home/terapaths/.ssh/id_rsa.pub.
The key fingerprint is:
cd:74:d1:37:b0:0c:a5:1a:6f:c7:e4:62:40:ea:12:3b terapaths@terapaths
[terapaths@terapaths yee]$
[terapaths@terapaths yee]$
[terapaths@terapaths yee]$ cat /home/terapaths/.ssh/id_rsa.pub > /home/terapaths/.ssh/authorized_keys
```

Check Service

```
http://192.124.59.130:53470
```

Log into the SJSAS server and determine that under the task bar, we have

Applications->Web Applications

and that it shows the terapaths* applications

| Application | Description |
|------------------------------|--|
| terapathsWebInterface | Web frontend to terapaths |
| terapathsInternalWebServices | |
| terapathsPublicWebServices | |
| terapathsESnetOSCARSProxy | Interaction with OSCARS |
| terapathsRemoteTPsListeners | Interaction with other terapaths instances |

Web Interface

Located at

<http://192.124.59.130:40860/terapathsWebInterface>

You can log in using accounts that have been setup in the MySQL table 'users'; if you can't log on, that's because you don't have an account in the database.

```
mysql> select * from users;
+-----+-----+-----+-----+-----+
| id | userName | passWord | type | info |
+-----+-----+-----+-----+-----+
| 1 | terapaths | ***** | standard | NULL |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

In the above case, you can see that there is only one terapaths user. The passWord is stored from the function `password()`.

Logging in will show some IP addresses and a table at the bottom of green boxes. This is the reservation table. Click once on a box to select the appropriate time and bandwidth allocation requested. Click again somewhere else to select the end time.

This will then take you to a confirmation page where the details can be finalised.

Schedules

Schedules are created on the web interface and stored in the table `reservations`:

```
mysql> select * from reservations;
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
| id | relatedReservationIds | startTime | duration | protocol | direction |
bandwidthClassName | bandwidth | timeout | userName | who | srcIp | srcPortMin |
srcPortMax | destIp | destPortMin | destPortMax | status |
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
| SLAC-1194994094410 | NULL | 1194993900000 | 36000 | tcp | unidirectional |
AF41 | 100000000 | 1195029900000 | terapaths | terapaths | 192.124.59.200 | 10000 |
10000 | 192.124.59.204 | 10000 | 10000 | active |
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Here we see one active reservation. `status=temporary` reservations may appear that reflect in transient reservations that are being created.

Router configs

Routers are intrinsically defined in the table under `routers`:


```
mysql> select * from routers;
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
+
| id | ipAddress      | name | routerInfo
driverParameters
| driverId | basicConfiguration | managingNodeId | bottleneckBandwidth | position |
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
+
| 1 | 192.124.59.129 | tera | hardware,CISCO,type,WS-6509,os,IOS12.2(18)SXD1 | system_prompt,sw-iepm-10g,
user_name,*****,entry_pass,*****,enable_pass,*****,policy_name_root,QoS_slac | 3 |
NULL | 1 | NULL | edge |
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
+
1 row in set (0.00 sec)
```

The driverParameters defines the expect script info for logging into the router. the values comes as key-value pairs.

The driverId field determines the driver to use to communication to by Terapaths. It references an index value in the routerDrivers table:

```
mysql> describe routerDrivers;
+-----+-----+-----+-----+-----+-----+
| Field      | Type                | Null | Key | Default | Extra          |
+-----+-----+-----+-----+-----+-----+
| id         | bigint(20) unsigned | NO   | PRI | NULL    | auto_increment |
| name       | varchar(50)         | YES  | UNI | NULL    |                |
| driverInfo | text                | YES  |     | NULL    |                |
| javaClassFile | varchar(255)       | YES  |     | NULL    |                |
| javaClassName | varchar(255)       | YES  |     | NULL    |                |
| javaClass   | longblob            | YES  |     | NULL    |                |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.01 sec)
```

note that contains the java byte code in the 3 last fields.

```
mysql> select id,name,driverInfo from routerDrivers;
+-----+-----+-----+-----+-----+
| id | name                | driverInfo
+-----+-----+-----+-----+-----+
| 1 | DUMMY_DRIVER        | hardware,DUMMY,type,DUMMY,os,DUMMY,comm_protocol,DUMMY |
| 2 | CISCO_WS-C6509_IOS_TELNET | hardware,CISCO,type,WS-6509,os,IOS,comm_protocol,TELNET |
| 3 | CISCO_WS-C6509_IOS_SSH  | hardware,CISCO,type,WS-6509,os,IOS,comm_protocol,SSH   |
+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

show's the info for 3 drivers. Note that in the above router, we had id ref of 3 - which refers to the SSH driver.

Adding in External Services

```
mysql> select * from routerManagers;
+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
+-----+
| id | ipAddress      | name                               | interface |
+-----+-----+-----+-----+-----+
| 1 | 192.124.59.130 | terapaths01.slac.stanford.edu | https://192.124.59.130:48580 |
/terapathsNetworkDeviceControllers/tpsNDC | GigabitEthernet3/33 | /home/terapaths/routerConfig |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

```
mysql> select * from remoteLANServiceURL;
+-----+-----+-----+-----+-----+
+-----+-----+-----+-----+-----+
| ipAddress      | mask      | maskedIpAddress | prefix | preference |
+-----+-----+-----+-----+-----+
| 198.124.220.0 | 255.255.255.0 | 3330071552 | 24 | http://198.124.220.9:48588 |
/terapathsRemoteTPsListeners/tpsRTPsL | 0 |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Router Configuration

Certain rules need to be put in place on the router:

```
swh-iepm-10g(config)#mls qos
swh-iepm-10g(config)#$onform-action set-dscp-transmit 26 exceed-action drop
swh-iepm-10g(config)#$onform-action set-dscp-transmit 18 exceed-action drop
swh-iepm-10g(config)#$onform-action set-dscp-transmit 10 exceed-action drop
swh-iepm-10g(config)#$conform-action set-dscp-transmit 46 exceed-action drop
swh-iepm-10g(config)#$action set-dscp-transmit 34 exceed-action drop
swh-iepm-10g(config)#$action set-dscp-transmit 39 exceed-action drop
swh-iepm-10g(config)#$ conform-action set-dscp-transmit 56 exceed-action drop
swh-iepm-10g(config)#$nform-action set-dscp-transmit 8 exceed-action drop
swh-iepm-10g(config)#$nform-action set-dscp-transmit 16 exceed-action drop
swh-iepm-10g(config)#
swh-iepm-10g(config)#
swh-iepm-10g(config)#
swh-iepm-10g(config)#class-map match-all CS1_out
swh-iepm-10g(config-cmap)# match access-group name CS1_out
swh-iepm-10g(config-cmap)#class-map match-all CS2_out
swh-iepm-10g(config-cmap)# match access-group name CS2_out
swh-iepm-10g(config-cmap)#class-map match-all CS7_out
swh-iepm-10g(config-cmap)# match access-group name CS7_out
swh-iepm-10g(config-cmap)#class-map match-all CS47_out
swh-iepm-10g(config-cmap)# match access-group name CS47_out
swh-iepm-10g(config-cmap)#class-map match-all EF_out
swh-iepm-10g(config-cmap)# match access-group name EF_out
swh-iepm-10g(config-cmap)#class-map match-all AF41_out
swh-iepm-10g(config-cmap)# match access-group name AF41_out
swh-iepm-10g(config-cmap)#class-map match-all AF31_out
swh-iepm-10g(config-cmap)# match access-group name AF31_out
```

```
swh-iepm-10g(config-cmap)#class-map match-all AF21_out
swh-iepm-10g(config-cmap)# match access-group name AF21_out
swh-iepm-10g(config-cmap)#class-map match-all AF11_out
swh-iepm-10g(config-cmap)# match access-group name AF11_out
swh-iepm-10g(config-cmap)#
swh-iepm-10g(config-cmap)#class-map match-all CS47_in
swh-iepm-10g(config-cmap)# match access-group name CS47_in
swh-iepm-10g(config-cmap)#class-map match-all AF41_in
swh-iepm-10g(config-cmap)# match access-group name AF41_in
swh-iepm-10g(config-cmap)#class-map match-all EF_in
swh-iepm-10g(config-cmap)# match access-group name EF_in
swh-iepm-10g(config-cmap)#class-map match-all AF21_in
swh-iepm-10g(config-cmap)# match access-group name AF21_in
swh-iepm-10g(config-cmap)#class-map match-all AF31_in
swh-iepm-10g(config-cmap)# match access-group name AF31_in
swh-iepm-10g(config-cmap)#class-map match-all AF11_in
swh-iepm-10g(config-cmap)# match access-group name AF11_in
swh-iepm-10g(config-cmap)#class-map match-all CS1_in
swh-iepm-10g(config-cmap)# match access-group name CS1_in
swh-iepm-10g(config-cmap)#class-map match-all CS2_in
swh-iepm-10g(config-cmap)# match access-group name CS2_in
swh-iepm-10g(config-cmap)#class-map match-all CS7_in
swh-iepm-10g(config-cmap)# match access-group name CS7_in
swh-iepm-10g(config-cmap)#
swh-iepm-10g(config-cmap)#
swh-iepm-10g(config-cmap)#policy-map QoS_r2_out
swh-iepm-10g(config-pmap)# class EF_out
swh-iepm-10g(config-pmap-c)#
swh-iepm-10g(config-pmap-c)# class CS2_out
swh-iepm-10g(config-pmap-c)# police aggregate CS2_CAP
swh-iepm-10g(config-pmap-c)# $action set-dscp-transmit 16 exceed-action drop
swh-iepm-10g(config-pmap-c)# class AF11_out
swh-iepm-10g(config-pmap-c)# police aggregate AF11_CAP
swh-iepm-10g(config-pmap-c)# $action set-dscp-transmit 10 exceed-action drop
swh-iepm-10g(config-pmap-c)# class AF21_out
swh-iepm-10g(config-pmap-c)# police aggregate AF21_CAP
swh-iepm-10g(config-pmap-c)# class AF31_out
swh-iepm-10g(config-pmap-c)# police aggregate AF31_CAP
swh-iepm-10g(config-pmap-c)# class AF41_out
swh-iepm-10g(config-pmap-c)# police aggregate AF41_CAP
swh-iepm-10g(config-pmap-c)# class CS1_out
swh-iepm-10g(config-pmap-c)# police aggregate CS1_CAP
swh-iepm-10g(config-pmap-c)# $tion set-dscp-transmit 8 exceed-action drop
swh-iepm-10g(config-pmap-c)# class CS47_out
swh-iepm-10g(config-pmap-c)# police aggregate CS47_CAP
swh-iepm-10g(config-pmap-c)# class CS7_out
swh-iepm-10g(config-pmap-c)# police aggregate CS7_CAP
swh-iepm-10g(config-pmap-c)#
swh-iepm-10g(config-pmap-c)#policy-map QoS_r2_in
swh-iepm-10g(config-pmap)# class EF_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class CS2_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class AF11_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class AF21_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class AF31_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class AF41_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class CS47_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class CS7_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)# class CS1_in
swh-iepm-10g(config-pmap-c)# trust dscp
swh-iepm-10g(config-pmap-c)#ip access-list extended AF11_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF11_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF21_in
```

```

swh-iepm-10g(config-ext-nacl)#ip access-list extended AF21_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF31_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF31_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF41_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended AF41_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS1_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS1_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS2_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS2_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS47_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS47_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS7_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended CS7_out
swh-iepm-10g(config-ext-nacl)#ip access-list extended EF_in
swh-iepm-10g(config-ext-nacl)#ip access-list extended EF_out
swh-iepm-10g(config-ext-nacl)#
swh-iepm-10g(config-ext-nacl)#
swh-iepm-10g(config-ext-nacl)#int gi5/2
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#servi
swh-iepm-10g(config-if)#service-policy in
swh-iepm-10g(config-if)#service-policy input ?
    WORD    policy-map name

swh-iepm-10g(config-if)#service-policy ?
    history  Keep history of QoS metrics
    input    Assign policy-map to the input of an interface
    output   Assign policy-map to the output of an interface

swh-iepm-10g(config-if)#int vlan59
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#service-policy input QoS_r2_out
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#
swh-iepm-10g(config-if)#mls qo
swh-iepm-10g(config-if)#mls qos ?
    bridged      bridged keyword
    dscp-mutation mutation keyword
    exp-mutation exp mutation keyword
    loopback     loopback cable between LAN and WAN port
    mpls         mpls keyword

swh-iepm-10g(config-if)#mls qos br
swh-iepm-10g(config-if)#mls qos bridged ?
    <cr>

swh-iepm-10g(config-if)#mls qos bridged

```

WAN Configuration

```
mysql> update remoteLANServiceURL set wsdlURL='http://198.124.220.9:8080/terapathsRemoteTPsListeners/tpsRTPsL'
where ipAddress='198.124.220.0';
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from remoteLANServiceURL;
+-----+-----+-----+-----+
| ipAddress      | mask      | maskedIpAddress | prefix |
wsdlURL                                     | preference |
+-----+-----+-----+-----+
| 198.124.220.0 | 255.255.255.0 | 3330071552 | 24 | http://198.124.220.9:8080
/terapathsRemoteTPsListeners/tpsRTPsL | 0 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Now enter an IP address in the reservation form with destination 198.124.220.134.

Quick validation on the reservations table:

```
mysql> select * from reservations;
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| id          | relatedReservationIds | startTime | duration | protocol |
direction    | bandwidthClassName | bandwidth | timeout   | userName | who   | srcIp   |
srcPortMin | srcPortMax | destIp      | destPortMin | destPortMax | status |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| SLAC-1195067218060 | OSCARS,ERROR-NULL_RESPONSE&ERROR-NULL_RESPONSE | 1195070400000 | 3600 | tcp |
bidirectional | AF21 | 50000000 | 1195074000000 | terapaths | terapaths | 192.124.59.200 |
10000 | 10000 | 198.124.220.134 | 10000 | 10000 | pending |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Note the OSCARS instance has thrown an error here; but this version of terapaths (due to debugging etc) accepted the end-to-end reservation.

Configuring Destination Subnets

Two tables must be configured, `remoteLANServiceURL` handles the mapping of endpoint subnets to the terapaths service endpoint. `WANServiceURL` handles the WAN service to communicate to for the subnets defined.

```
mysql> select * from remoteLANServiceURL;
+-----+-----+-----+-----+
| ipAddress      | mask          | maskedIpAddress | prefix |
wsdlURL                                     | preference |
+-----+-----+-----+-----+
| 198.124.220.0 | 255.255.255.0 | 3330071552 | 24 | http://198.124.220.9:8080
/terapathsRemoteTPsListeners/tpsRTPsL | 0 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql> select * from WANServiceURL;
+-----+-----+-----+-----+
| ipAddress      | mask          | maskedIpAddress | prefix | wsdlURL
| preference |
+-----+-----+-----+-----+
| 198.124.220.0 | 255.255.255.0 | 3330071552 | 24 | OSCARS,https://oscars.es.net/axis2/services/OSCARS
| 0 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Getting the DOE Certificate

Use firefox.

- Request a new certificate
- add the certificate to your browser by going to <http://pk11.doe grids.org/ca>: Go to 'Retrieval' -> 'Import CA Certificate Chain' -> 'Import the CA certificate chain into your browser' -> 'Submit'
- when you get an email back from the DOE, click on the link to retrieve your certificate; scroll to the bottom and click on 'import your certificate'
- in firefox preferences 'advanced' -> 'encryption' -> 'view certificates'

Select your certificate and click on 'backup'

save the file as p12 format and enter your password that you used on the DOE Cert form.

Setting up certificates for OSCARS

Create a directory for where the certs will be kept. We need to use keytool to copy the DOE cert into the keystore, and then make an useable alias for the cert. This alias will then be used in the 2 property files for Terapaths.

Get the repo (you could create this manually, but i got it from Dimitri)

```
[terapaths@terapaths ~]$ pwd
/home/terapaths/repo
[terapaths@terapaths ~]$ unzip repo.zip
Archive:  repo.zip
  creating: repo/
  inflating: repo/axis2.xml
  inflating: repo/jetty-6.1.5.jar
  inflating: repo/log4j.properties
  creating: repo/modules/
  inflating: repo/modules/rampart-1.3.mar
  inflating: repo/sec-client.jks      (need to add own cert)
  inflating: repo/sec-client.properties
  creating: repo/services/
  inflating: repo/ssl-keystore.jks    (used for contacting oscars server - does not need to be changed)
```

currently, the password that we put into the keystore must be kept in the sec-client.jks file.

/home/terapaths/repo/sec-client.jks

```
org.apache.ws.security.crypto.provider=org.apache.ws.security.components.crypto.Merlin
org.apache.ws.security.crypto.merlin.keystore.type=jks
org.apache.ws.security.crypto.merlin.keystore.password=password
org.apache.ws.security.crypto.merlin.file=sec-client.jks
net.es.oscars.client.security.PWCallback.keypass=<somepassword>
```

We now want to import our certificate that we got from the DOE and saved as a .p12 file in firefox into the keystore sec-client.jks. Note that the default password used here for the keystore is 'password'.

```
[terapaths@terapaths repo]$ /usr/java/jdk1.5.0_13/bin/java -cp /home/terapaths/repo/jetty-6.1.5.jar org.mortbay.
jetty.security.PKCS12Import <p12 certificate file> sec-client.jks
Enter input keystore passphrase: <DOE Password>
Enter output keystore passphrase: password
Alias 0: yee-ting li 940780's id
Adding key for alias yee-ting li 940780's id
```

Just to check the contents of the sec-client.jks store:

```
[terapaths@terapaths repo]$ keytool -list -keystore sec-client.jks
Enter keystore password: password

Keystore type: jks
Keystore provider: SUN

Your keystore contains 9 entries

jra3, Sep 13, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 61:02:09:AC:22:A0:6A:B5:AB:BA:FA:1F:60:B2:6E:FD
ca, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): CA:0A:6D:E3:A4:9F:E8:55:98:0A:F8:10:66:35:40:C6
alice, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 57:CE:81:F1:03:C4:2C:F7:5B:1A:DE:AC:43:64:0A:84
esnetroot, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): 25:85:99:E6:D4:49:F6:F2:85:AB:B0:69:37:B9:47:B8
bob, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 89:3E:86:D2:4F:9C:E7:39:B6:71:8A:EF:00:C5:89:DC
root, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): 0C:0D:00:27:BF:4B:32:63:40:A8:B2:03:96:4B:58:14
dcsca, Mar 29, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 92:21:D8:26:10:73:0A:CE:36:56:7D:F8:6C:65:9E:C6
yee-ting li 940780's id, Nov 15, 2007, keyEntry,
Certificate fingerprint (MD5): 43:F7:AD:B1:1B:76:3B:EB:95:8B:CE:C2:78:AB:AD:D8
doegridsca, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): B3:76:40:75:F6:C4:BF:AF:82:CA:9A:D5:1D:FC:00:97
```

The second to last entry show the newly inserted certificate.

Note that this created an alias 'yee-ting li 940780's id' (note that double space). We don't want to use this because the username is not very useable. So we will clone the id:

```
[terapaths@terapaths repo]$ keytool -keyclone -alias "yee-ting li 940780's id" -dest ytl -keystore sec-client.
jks
Enter keystore password: password
Enter key password for <ytl>
(RETURN if same as for <yee-ting li 940780's id>)<DOE PASSWORD>
```

```
[terapaths@terapaths repo]$ keytool -list -keystore sec-client.jks
Enter keystore password: password

Keystore type: jks
Keystore provider: SUN

Your keystore contains 10 entries

jra3, Sep 13, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 61:02:09:AC:22:A0:6A:B5:AB:BA:FA:1F:60:B2:6E:FD
ytl, Nov 15, 2007, keyEntry,
Certificate fingerprint (MD5): 43:F7:AD:B1:1B:76:3B:EB:95:8B:CE:C2:78:AB:AD:D8
ca, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): CA:0A:6D:E3:A4:9F:E8:55:98:0A:F8:10:66:35:40:C6
alice, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 57:CE:81:F1:03:C4:2C:F7:5B:1A:DE:AC:43:64:0A:84
bob, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 89:3E:86:D2:4F:9C:E7:39:B6:71:8A:EF:00:C5:89:DC
esnetroot, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): 25:85:99:E6:D4:49:F6:F2:85:AB:B0:69:37:B9:47:B8
root, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): 0C:0D:00:27:BF:4B:32:63:40:A8:B2:03:96:4B:58:14
dcsca, Mar 29, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 92:21:D8:26:10:73:0A:CE:36:56:7D:F8:6C:65:9E:C6
yee-ting li 940780's id, Nov 15, 2007, keyEntry,
Certificate fingerprint (MD5): 43:F7:AD:B1:1B:76:3B:EB:95:8B:CE:C2:78:AB:AD:D8
doegridsca, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): B3:76:40:75:F6:C4:BF:AF:82:CA:9A:D5:1D:FC:00:97
```

The cloned cert is 2nd from top. Now lets remove the original certificate (as we have no use for it)

```
[terapaths@terapaths repo]$ keytool -delete -alias "yee-ting li 940780's id" -keystore sec-client.jks
Enter keystore password: password
[terapaths@terapaths repo]$ keytool -list -keystore sec-client.jks
Enter keystore password: password

Keystore type: jks
Keystore provider: SUN

Your keystore contains 9 entries

jra3, Sep 13, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 61:02:09:AC:22:A0:6A:B5:AB:BA:FA:1F:60:B2:6E:FD
ytl, Nov 15, 2007, keyEntry,
Certificate fingerprint (MD5): 43:F7:AD:B1:1B:76:3B:EB:95:8B:CE:C2:78:AB:AD:D8
ca, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): CA:0A:6D:E3:A4:9F:E8:55:98:0A:F8:10:66:35:40:C6
alice, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 57:CE:81:F1:03:C4:2C:F7:5B:1A:DE:AC:43:64:0A:84
esnetroot, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): 25:85:99:E6:D4:49:F6:F2:85:AB:B0:69:37:B9:47:B8
bob, Jun 4, 2005, keyEntry,
Certificate fingerprint (MD5): 89:3E:86:D2:4F:9C:E7:39:B6:71:8A:EF:00:C5:89:DC
root, Jun 4, 2005, trustedCertEntry,
Certificate fingerprint (MD5): 0C:0D:00:27:BF:4B:32:63:40:A8:B2:03:96:4B:58:14
dcsca, Mar 29, 2007, trustedCertEntry,
Certificate fingerprint (MD5): 92:21:D8:26:10:73:0A:CE:36:56:7D:F8:6C:65:9E:C6
doegridsca, Oct 23, 2006, trustedCertEntry,
Certificate fingerprint (MD5): B3:76:40:75:F6:C4:BF:AF:82:CA:9A:D5:1D:FC:00:97
```

Setup Terapaths to use keystores

Now we have setup the keystores. We now need to assign them to the relevant terapaths modules. There are two files, `proxy.properties` which should contain the keystore alias (ytl in the case above) to use to communicate with OSCARS, and `axis2.xml` - ditto.

Set up an alias on the terapaths OSCARS proxy.properties file that refers to the relevant keystore certificate.

/home/terapaths/SUNWAppserver/domains/domain1/applications/j2ee-modules/terapathsOSCARSProxy/WEB-INF/classes/tps/proxy.properties

```
# Proxy server properties file
enabled.for.service.OSCARS = YES
#url.for.service.OSCARS = https://ndb3-blmt.abilene.ucaid.edu:8443/axis2/services/OSCARS
url.for.service.OSCARS = https://198.128.3.10/axis2/services/OSCARS
repo.for.service.OSCARS = /home/terapaths/repo
user.for.service.OSCARS = ytl
burstLimit.for.service.OSCARS = 10000
```

Note that because we do not have a dns server, we have to substitute `oscars.es.net` for it's IP address.

Edit `axis2.xml` and add user alias into the file...

/home/terapaths/repo/axis2.xml

```
<parameter name="OutflowSecurity">
  <action>
    <items>Timestamp Signature</items>
    <user>ytl</user>
  ...
```

Server configuration

Application Server -> JVM Settings -> Path settings
add to 'Classpath Prefix' '/home/terapaths/repo'

Application Server -> JVM Settings -> JVM Options
click 'Add JVM Option'
add to the empty field '-Daxis2.xml=/home/terapaths/repo/axis2.xml'

Troubleshooting

Module Permissions

We upgraded to a version of the new OSCARS proxy, however, we must also change the `server.policy` file to allow the server to execute the code:

/home/terapaths/SUNWappserver/domains/domain1/config/server.policy

```
grant codeBase "file:${com.sun.aas.instanceRoot}/generated/ejb/j2ee-modules/terapathsOSCARSProxy/-" {
permission java.security.AllPermission;
permission java.lang.RuntimePermission "getClassLoader";
permission java.lang.RuntimePermission "createClassLoader";
permission java.net.SocketPermission "*", "connect,accept,resolve";
permission java.io.FilePermission "<>", "read,write,delete";
};

grant codeBase "file:${com.sun.aas.instanceRoot}/applications/j2ee-modules/terapathsOSCARSProxy/-" {
permission java.security.AllPermission;
permission java.lang.RuntimePermission "getClassLoader";
permission java.lang.RuntimePermission "createClassLoader";
permission java.net.SocketPermission "*", "connect,accept,resolve";
permission java.io.FilePermission "<>", "read,write,delete";
};
```

Starting/Stopping the Server

In order to pick up new policies and configuration files outside of the webapps, you must restart the server:

```
[terapaths@terapaths j2ee-modules]$ /home/terapaths/SUNWappserver/bin/asadmin stop-domain
Domain domain1 stopped.
```

Deploying new modules

Log into the admin web page and click 'undeploy' under 'Applications'-'>'Web Applications' for the module that that you want to upgrade. Then it's a simple task of copying the war into the autodeploy directory.

```
[terapaths@terapaths installation]$ cp terapathsOSCARSProxy.war /home/terapaths/SUNWappserver/domains/domain1
/autodeploy/
```

You do not need to restart the service