BRIEF UPDATE ON SPBM FIRST INTEROP
Ottawa: 2010/Oct

We tested 1 emulated version and two physical versions including H/W data paths and OA&M.

We tested against older (pre I2 merge/de-merge) draft:

draft-ashwood-isis-spb-00.txt

several format differences and Type values differ from latest:

draft-ietf-isis-ieee-aq-01.txt

So this is work in progress and additional interops will be scheduled as soon as we get -01 implementations … likely just before X-mas.

Peter Ashwood-Smith / Huawei Technologies Canada
Srikanth Keesara / Avaya

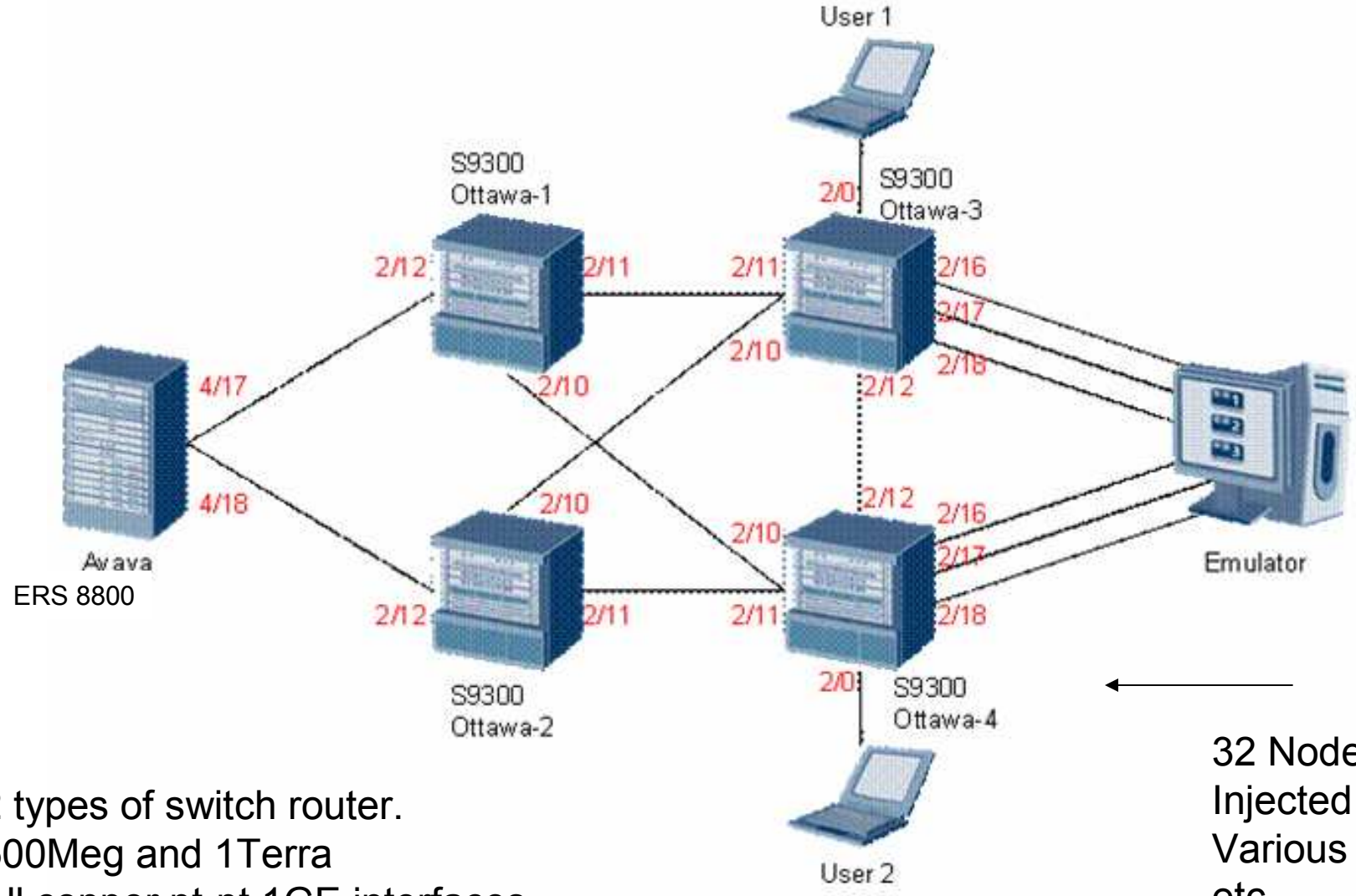
Credits

- Guoli Yin (Huawei)
- Xiaolan Zhou (Avaya)
- WuGuangrui (Huawei)
- Roger Lapuh (Avaya)
- Jon Vant Erve (Avaya)
- Zhouke (Huawei)
- Leifei (Huawei)
- ChangYue (Huawei)

Issues Encountered

- Protocol related - nothing significant however we expect when we do MCID and Digests in Hello's it will get a bit tricky.
- Issues – only real problem was mis-configuration of B-VIDs which caused adjacency to fail without enough feedback as to cause. Implementation issue.
- Mostly usability type work required but not things relevant to actual protocol.
- OA&M L2-Pings 'just worked' no issues.
- A few crashes here and there ;)
- Main issue is to now re-synch on the latest draft and up the scale of the network tests from 30 nodes to several hundred, add failure testing etc.

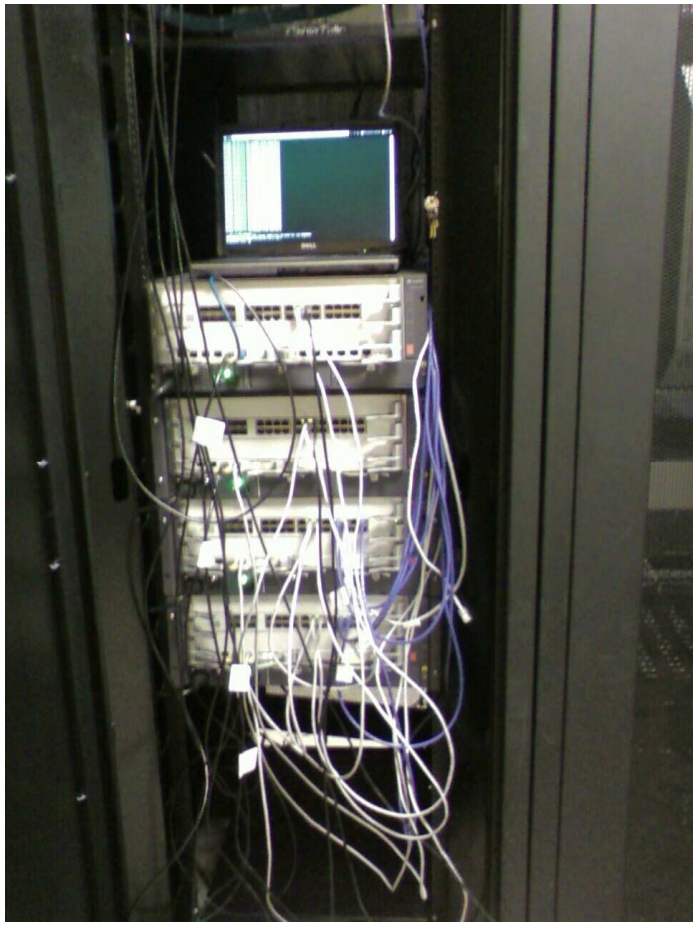
SPBM INTEROP TEST CONFIGURATION



2 types of switch router.
500Meg and 1Terra
All copper pt-pt 1GE interfaces.

32 Nodes
Injected
Various ISIDs
etc.

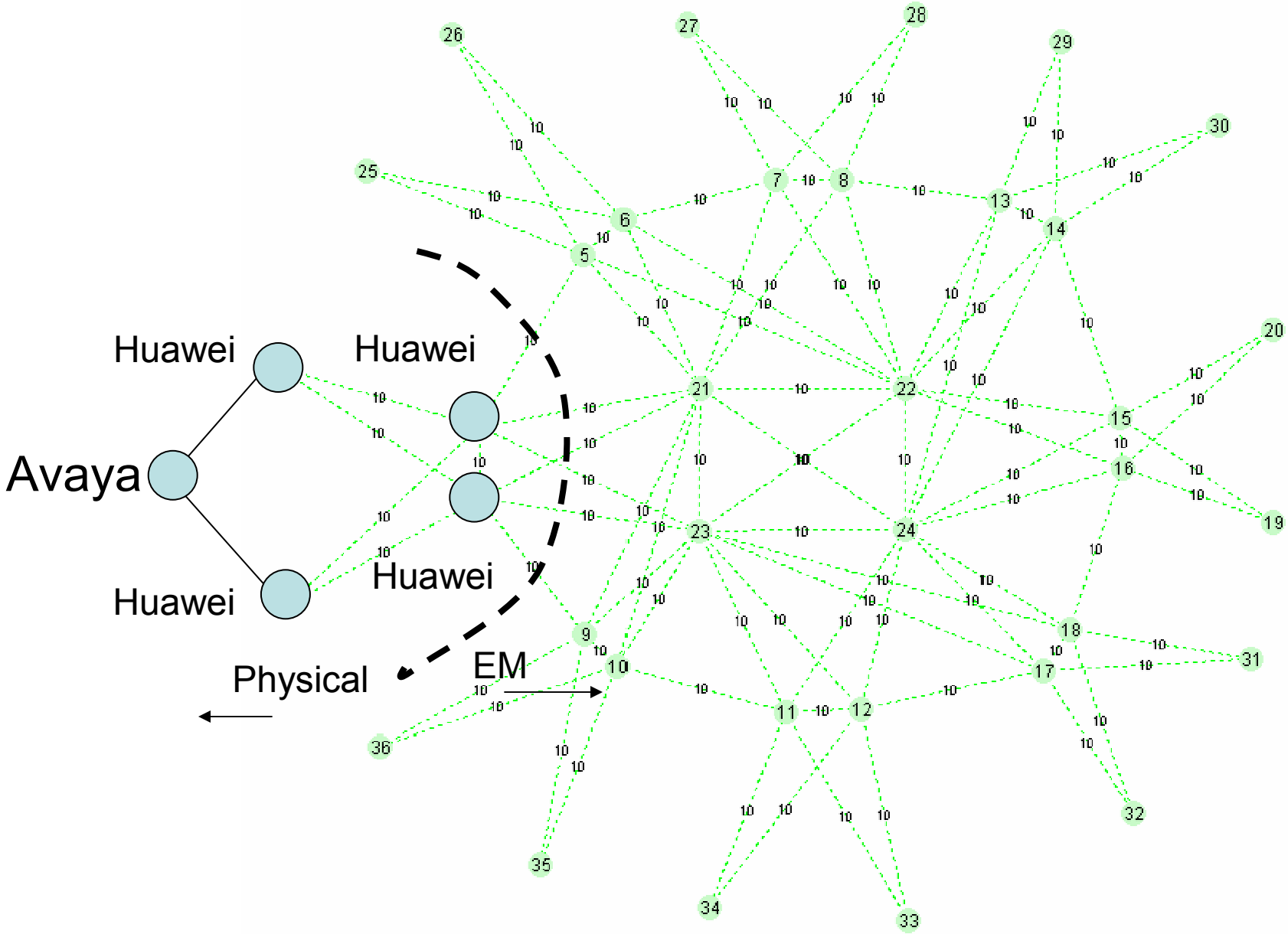
4 Huawei X S9303's
1 x Avaya ERS 8800
32 x Quagga IS-IS instances on Linux



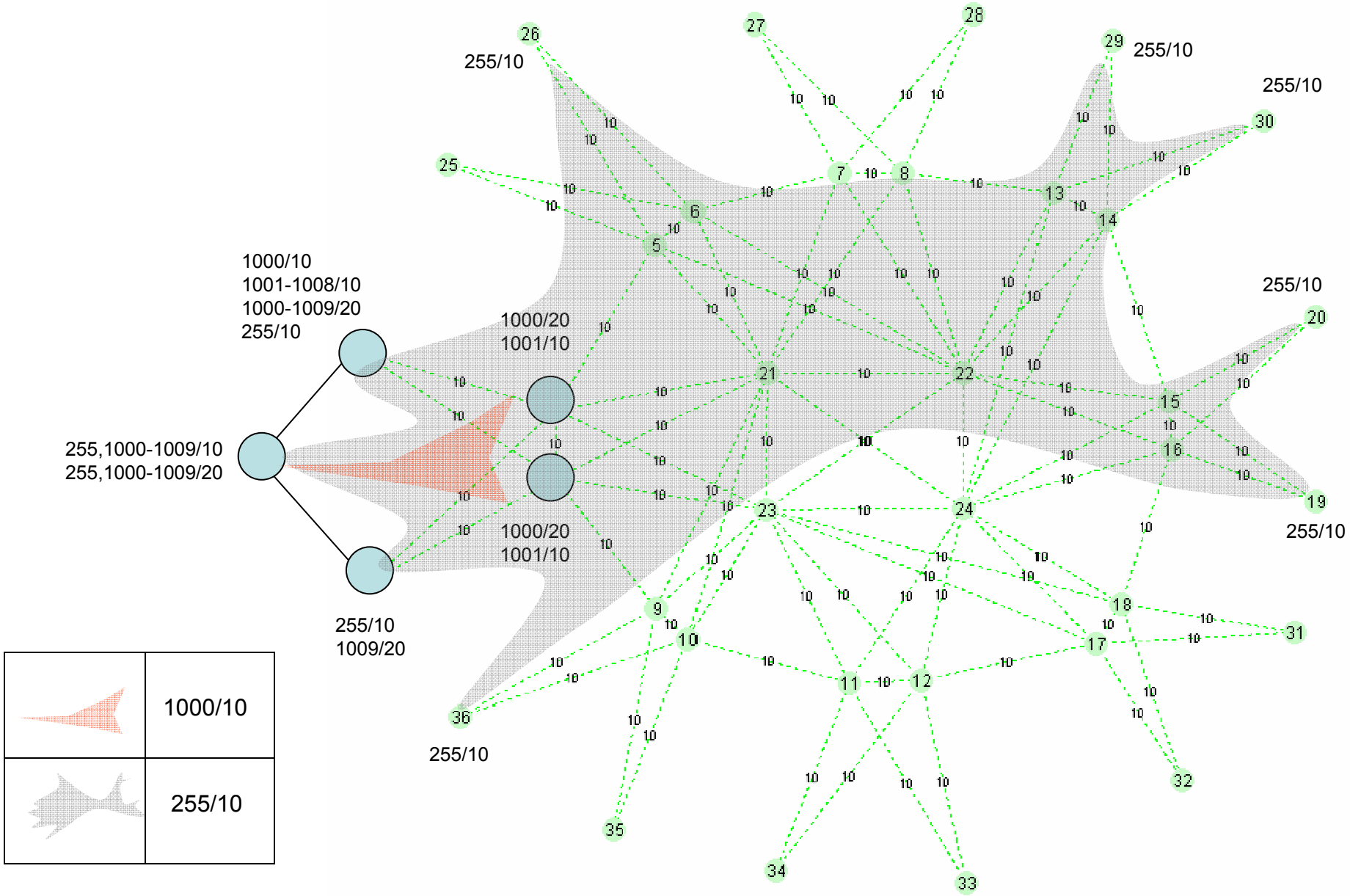
Huawei 4x S9303 + PC Laptop Hosts

Avaya ERS 8800

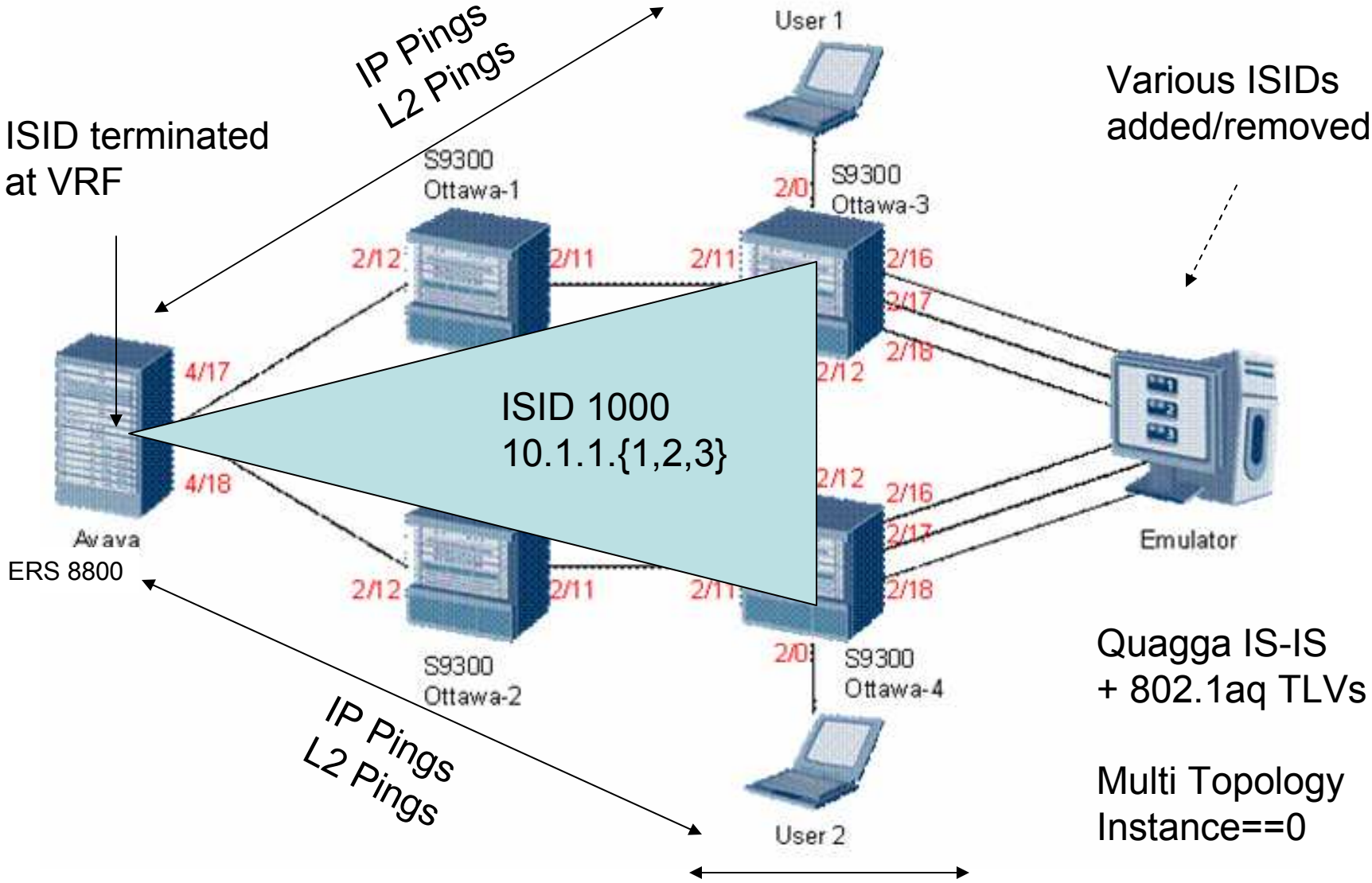
Emulated & Physical Topology



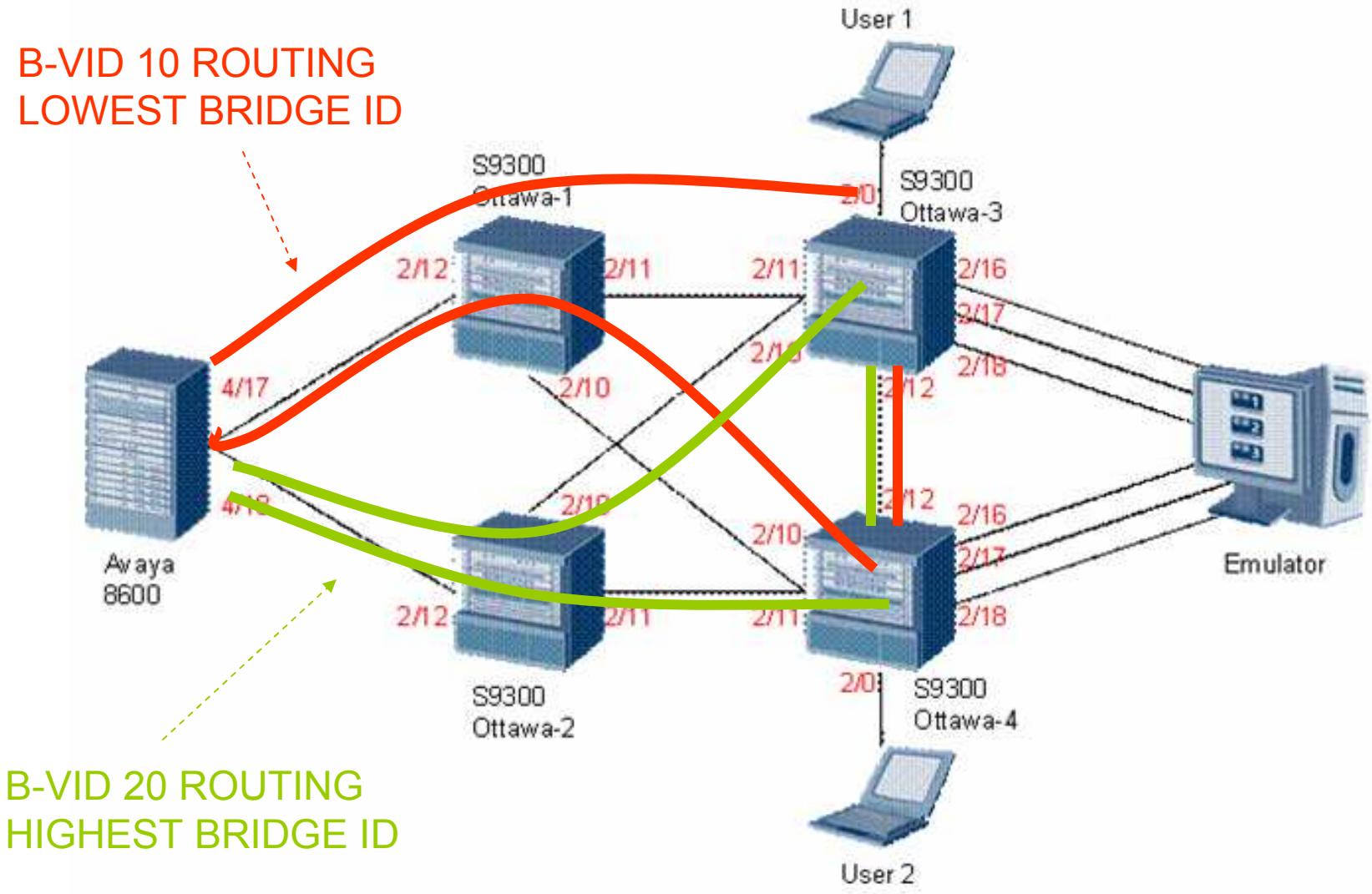
ISID/B-VID distribution



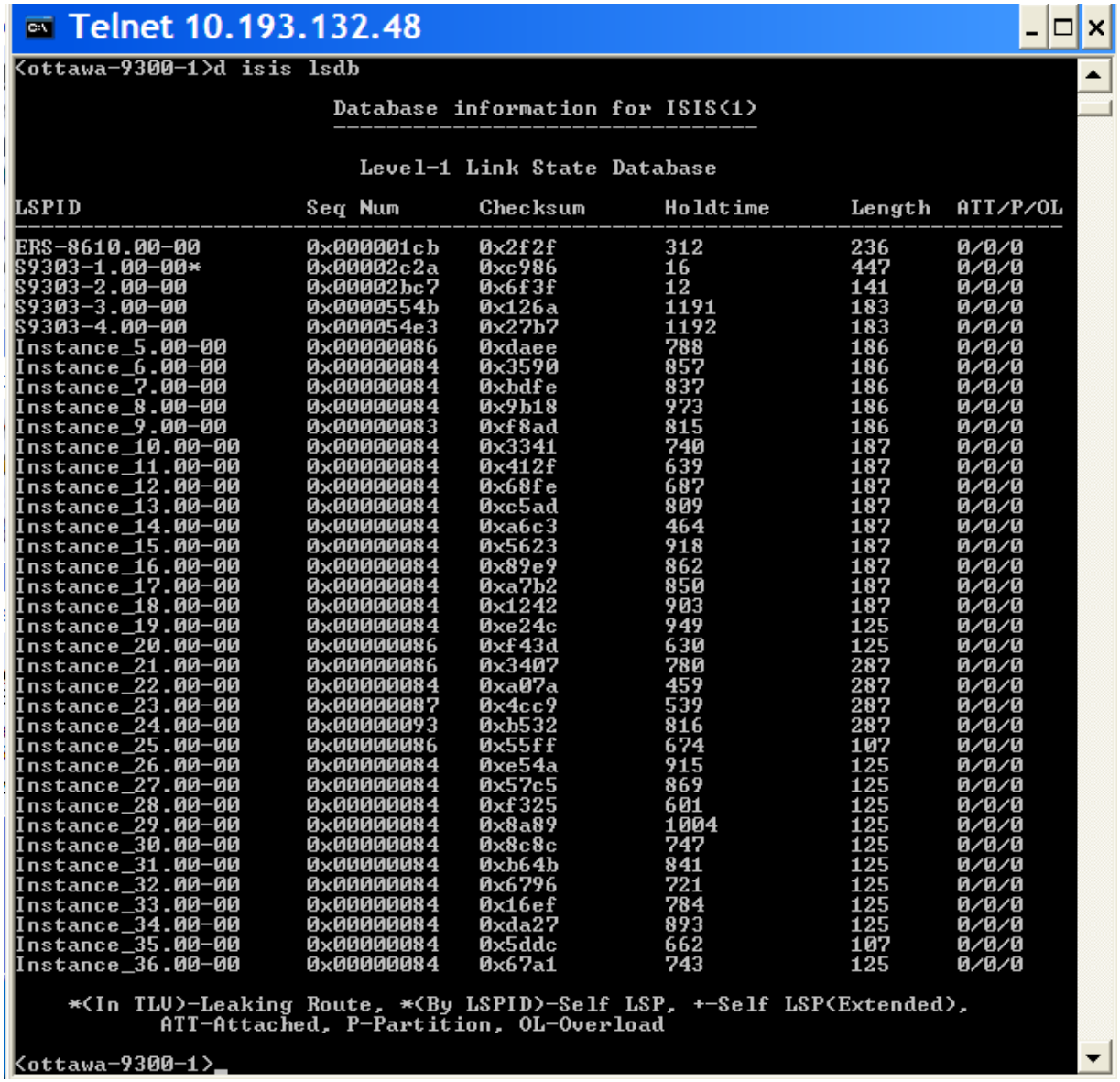
SPBM INTEROP TEST CONFIGURATION



SPBM WITH 2 ECT PATHS ON B-VID 10 & 20



LINK STATE DATABASE 37 NODES – 1xAvaya, 4xHuawei, 32xEm



802.1aq data in LSDB detail (Avaya switch)

Level-1LspID: 00e0.7b82.9fdf.00-00 SeqNum:
0x000000e7 Lifetime: 1005
Chksum: 0xb517 PDU Length: 228
Host_name: ERS-8610
Attributes: IS-Type 1
TLV:1Area Addresses: 1
22.3344

TLV:3End System Neighbors:
Metric: 0
00e07b829fdf (ERS)

TLV:22Extended IS reachability:
Adjacencies: 2
TE Neighbors: 2
4455.6677.0002.00 (<NULL>) Metric:10
SPBM Sub TLV:
Instance: 0
Attr: 0
Metric: 10

SPB link metric

4455.6677.0001.00 (<NULL>) Metric:10
SPBM Sub TLV:
Instance: 0
Attr: 0
Metric: 10

NLPID

TLV:129Protocol Supported: SPBM

MT-ID

TLV:180SPBM INSTANCE:
Instance: 0
Attr: 32768
OUI: 01-00-02

SPSourceID

TLV:183ISID:
Instance: 0
Metric: 0
B-MAC: 00-e0-7b-82-9f-df
BVID:10
Number of ISID's:10
1000(Both),1001(Both),1002(Both),
1003(Both),1004(Both),1005(Both),
1006(Both),1007(Both)
1008(Both),1009(Both)

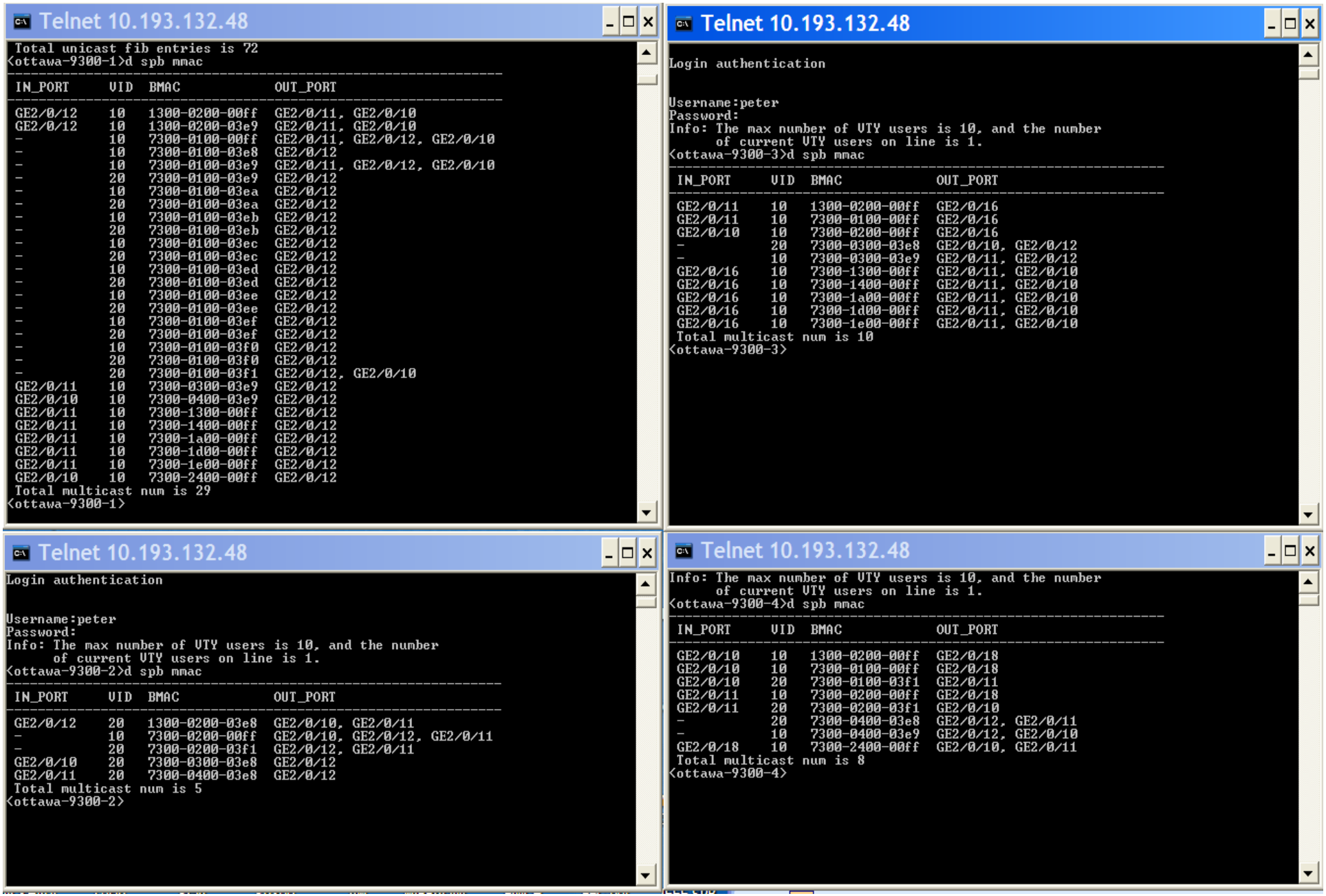
UNICAST FIB – AVAYA SWITCH

```
show isis spbm unicast-fib


================================================================================
                          SPBM UNICAST FIB ENTRY INFO
================================================================================
DESTINATION        BVLAN  SYSID           HOST-NAME         OUTGOING     COST
ADDRESS                                                     INTERFACE
--------------------------------------------------------------------------------
44:55:66:77:00:01  10     4455.6677.0001   NULL              4/17         10
44:55:66:77:00:01  20     4455.6677.0001   NULL              4/17         10
44:55:66:77:00:02  10     4455.6677.0002   NULL              4/18         10
44:55:66:77:00:02  20     4455.6677.0002   NULL              4/18         10
44:55:66:77:00:03  10     4455.6677.0003   NULL              4/17         20
44:55:66:77:00:03  20     4455.6677.0003   NULL              4/18         20
44:55:66:77:00:04  10     4455.6677.0004   NULL              4/17         20
44:55:66:77:00:04  20     4455.6677.0004   NULL              4/18         20
44:55:66:77:00:05  10     4455.6677.0005   Instance_5        4/17         30
44:55:66:77:00:05  20     4455.6677.0005   Instance_5        4/18         30
44:55:66:77:00:06  10     4455.6677.0006   Instance_6        4/17         40
…….
44:55:66:77:00:1a  20     4455.6677.001a   Instance_26       4/18         40
44:55:66:77:00:1b  10     4455.6677.001b   Instance_27       4/17         50
44:55:66:77:00:1b  20     4455.6677.001b   Instance_27       4/18         50
44:55:66:77:00:1c  10     4455.6677.001c   Instance_28       4/17         50
44:55:66:77:00:1c  20     4455.6677.001c   Instance_28       4/18         50
44:55:66:77:00:1d  10     4455.6677.001d   Instance_29       4/17         60
44:55:66:77:00:1d  20     4455.6677.001d   Instance_29       4/18         60
44:55:66:77:00:1e  10     4455.6677.001e   Instance_30       4/17         60
44:55:66:77:00:1e  20     4455.6677.001e   Instance_30       4/18         60
44:55:66:77:00:1f  10     4455.6677.001f   Instance_31       4/17         50
44:55:66:77:00:1f  20     4455.6677.001f   Instance_31       4/18         50
44:55:66:77:00:20  10     4455.6677.0020   Instance_32       4/17         50
44:55:66:77:00:20  20     4455.6677.0020   Instance_32       4/18         50
44:55:66:77:00:21  10     4455.6677.0021   Instance_33       4/17         50
44:55:66:77:00:21  20     4455.6677.0021   Instance_33       4/18         50
44:55:66:77:00:22  10     4455.6677.0022   Instance_34       4/17         50
44:55:66:77:00:22  20     4455.6677.0022   Instance_34       4/18         50
44:55:66:77:00:23  10     4455.6677.0023   Instance_35       4/17         40
44:55:66:77:00:23  20     4455.6677.0023   Instance_35       4/18         40
44:55:66:77:00:24  10     4455.6677.0024   Instance_36       4/17         40
44:55:66:77:00:24  20     4455.6677.0024   Instance_36       4/18         40

--------------------------------------------------------------------------------
 Total number of SPBM UNICAST FIB entries 72
--------------------------------------------------------------------------------
```

MULTICAST FIBS – AVAYA SWITCH

```
show isis spbm multicast-fib
================================================================================
MCAST DA           ISID   BVLAN  SYSID               HOST-NAME         OUTGO
--------------------------------------------------------------------------------
13:00:02:00:00:ff  255    10     00e0.7b82.9fdf      ERS-8610          4/18,4/17
13:00:02:00:03:e8  1000   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:e9  1001   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ea  1002   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:eb  1003   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ec  1004   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ed  1005   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ee  1006   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ef  1007   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:f0  1008   10     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:e8  1000   20     00e0.7b82.9fdf      ERS-8610          4/18
13:00:02:00:03:e9  1001   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ea  1002   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:eb  1003   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ec  1004   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ed  1005   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ee  1006   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:ef  1007   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:f0  1008   20     00e0.7b82.9fdf      ERS-8610          4/17
13:00:02:00:03:f1  1009   20     00e0.7b82.9fdf      ERS-8610          4/18,4/17
73:00:01:00:00:ff  255    10     4455.6677.0001      S9303-1           4/18
73:00:01:00:03:e8  1000   10     4455.6677.0001      S9303-1
73:00:01:00:03:e9  1001   10     4455.6677.0001      S9303-1
……..
73:00:01:00:03:f0  1008   20     4455.6677.0001      S9303-1
73:00:01:00:03:f1  1009   20     4455.6677.0001      S9303-1
73:00:02:00:00:ff  255    10     4455.6677.0002      S9303-2           4/17
73:00:02:00:03:f1  1009   20     4455.6677.0002      S9303-2
73:00:03:00:03:e9  1001   10     4455.6677.0003      S9303-3
73:00:03:00:03:e8  1000   20     4455.6677.0003      S9303-3
73:00:04:00:03:e9  1001   10     4455.6677.0004      S9303-4
73:00:04:00:03:e8  1000   20     4455.6677.0004      S9303-4
73:00:13:00:00:ff  255    10     4455.6677.0013      Instance_19
73:00:14:00:00:ff  255    10     4455.6677.0014      Instance_20
73:00:1a:00:00:ff  255    10     4455.6677.001a      Instance_26
73:00:1d:00:00:ff  255    10     4455.6677.001d      Instance_29
73:00:1e:00:00:ff  255    10     4455.6677.001e      Instance_30
73:00:24:00:00:ff  255    10     4455.6677.0024      Instance_36

--------------------------------------------------------------------------------
 Total number of SPBM MULTICAST FIB entries 51
--------------------------------------------------------------------------------
```

SOME OF THE MULTICAST FIBS HUAWEI SWITCHES.



Telnet 10.193.132.48

```
 Total unicast fib entries is 72
<ottawa-9300-1>d spb mmac
-------------------------------------------------------------------
 IN_PORT      VID  BMAC            OUT_PORT
-------------------------------------------------------------------
 GE2/0/12     10   1300-0200-00ff  GE2/0/11, GE2/0/10
 GE2/0/12     10   1300-0200-03e9  GE2/0/11, GE2/0/10
 -            10   7300-0100-00ff  GE2/0/11, GE2/0/12, GE2/0/10
 -            10   7300-0100-03e8  GE2/0/12
 -            10   7300-0100-03e9  GE2/0/11, GE2/0/12, GE2/0/10
 -            20   7300-0100-03e9  GE2/0/12
 -            10   7300-0100-03ea  GE2/0/12
 -            20   7300-0100-03ea  GE2/0/12
 -            10   7300-0100-03eb  GE2/0/12
 -            20   7300-0100-03eb  GE2/0/12
 -            10   7300-0100-03ec  GE2/0/12
 -            20   7300-0100-03ec  GE2/0/12
 -            10   7300-0100-03ed  GE2/0/12
 -            20   7300-0100-03ed  GE2/0/12
 -            10   7300-0100-03ee  GE2/0/12
 -            20   7300-0100-03ee  GE2/0/12
 -            10   7300-0100-03ef  GE2/0/12
 -            20   7300-0100-03ef  GE2/0/12
 -            10   7300-0100-03f0  GE2/0/12
 -            20   7300-0100-03f0  GE2/0/12
 -            20   7300-0100-03f1  GE2/0/12, GE2/0/10
 GE2/0/11     10   7300-0300-03e9  GE2/0/12
 GE2/0/10     10   7300-0400-03e9  GE2/0/12
 GE2/0/11     10   7300-1300-00ff  GE2/0/12
 GE2/0/11     10   7300-1400-00ff  GE2/0/12
 GE2/0/11     10   7300-1a00-00ff  GE2/0/12
 GE2/0/11     10   7300-1d00-00ff  GE2/0/12
 GE2/0/11     10   7300-1e00-00ff  GE2/0/12
 GE2/0/10     10   7300-2400-00ff  GE2/0/12
 Total multicast num is 29
<ottawa-9300-1>
```

Telnet 10.193.132.48

```
Login authentication


Username:peter
Password:
Info: The max number of VTY users is 10, and the number
      of current VTY users on line is 1.
<ottawa-9300-3>d spb mmac
-------------------------------------------------------------------
 IN_PORT      VID  BMAC            OUT_PORT
-------------------------------------------------------------------
 GE2/0/11     10   1300-0200-00ff  GE2/0/16
 GE2/0/11     10   7300-0100-00ff  GE2/0/16
 GE2/0/10     10   7300-0200-00ff  GE2/0/16
 -            20   7300-0300-03e8  GE2/0/10, GE2/0/12
 -            10   7300-0300-03e9  GE2/0/11, GE2/0/12
 GE2/0/16     10   7300-1300-00ff  GE2/0/11, GE2/0/10
 GE2/0/16     10   7300-1400-00ff  GE2/0/11, GE2/0/10
 GE2/0/16     10   7300-1a00-00ff  GE2/0/11, GE2/0/10
 GE2/0/16     10   7300-1d00-00ff  GE2/0/11, GE2/0/10
 GE2/0/16     10   7300-1e00-00ff  GE2/0/11, GE2/0/10
 Total multicast num is 10
<ottawa-9300-3>
```

Telnet 10.193.132.48

```
Login authentication


Username:peter
Password:
Info: The max number of VTY users is 10, and the number
      of current VTY users on line is 1.
<ottawa-9300-2>d spb mmac
-------------------------------------------------------------------
 IN_PORT      VID  BMAC            OUT_PORT
-------------------------------------------------------------------
 GE2/0/12     20   1300-0200-03e8  GE2/0/10, GE2/0/11
 -            10   7300-0200-00ff  GE2/0/10, GE2/0/12, GE2/0/11
 -            20   7300-0200-03f1  GE2/0/12, GE2/0/11
 GE2/0/10     20   7300-0300-03e8  GE2/0/12
 GE2/0/11     20   7300-0400-03e8  GE2/0/12
 Total multicast num is 5
<ottawa-9300-2>
```

Telnet 10.193.132.48

```
Info: The max number of VTY users is 10, and the number
      of current VTY users on line is 1.
<ottawa-9300-4>d spb mmac
-------------------------------------------------------------------
 IN_PORT      VID  BMAC            OUT_PORT
-------------------------------------------------------------------
 GE2/0/10     10   1300-0200-00ff  GE2/0/18
 GE2/0/10     10   7300-0100-00ff  GE2/0/18
 GE2/0/10     20   7300-0100-03f1  GE2/0/11
 GE2/0/11     10   7300-0200-00ff  GE2/0/18
 GE2/0/11     20   7300-0200-03f1  GE2/0/10
 -            20   7300-0400-03e8  GE2/0/12, GE2/0/11
 -            10   7300-0400-03e9  GE2/0/12, GE2/0/10
 GE2/0/18     10   7300-2400-00ff  GE2/0/10, GE2/0/11
 Total multicast num is 8
<ottawa-9300-4>
```

AVAYA SWITCH – LOCAL AND REMOTE LEARNED INFO

Local
Computed

Remote

```
show vlan info fdb-entry 1001
********************************************************************************
Command Execution Time: WED OCT 27 11:37:41 2010 UTC
********************************************************************************

================================================================================
                                  Vlan Fdb
================================================================================
VLAN            MAC                                          QOS    SMLT
ID   STATUS     ADDRESS            INTERFACE        MONITOR LEVEL  REMOTE
--------------------------------------------------------------------------------
1001 learned    00:21:70:b8:18:ed  I-SID-1001       false   1      false
1001 self       00:e0:7b:82:9e:01  Port-cpp         false   1      false

2 out of 85 entries in all fdb(s) displayed.

show vlan info remote-mac-table 1001
********************************************************************************
Command Execution Time: WED OCT 27 11:37:47 2010 UTC
********************************************************************************

================================================================================================================
                                  Vlan Remote Mac Table
================================================================================================================
VLAN STATUS  MAC-ADDRESS        DEST-MAC           BVLAN DEST-SYSNAME      PORTS    SMLTREMOTE
----------------------------------------------------------------------------------------------------------------
1001 learned 00:21:70:b8:18:ed  44:55:66:77:00:03  10                      4/17     false

----------------------------------------------------------------------------------------------------------------
 Total number of VLAN Remote MAC entries 1
```

*PC MAC: 00:21:70:b8:18:ed

L2 Pinging Node 3 to Node 1 – Through the Avaya switch (from Huawei to Huawei)

```
[ottawa-9300-3]cfm enable
[ottawa-9300-3]cfm md md1 level 6
[ottawa-9300-3]ma ma1
[ottawa-9300-3-md-md1-ma-ma1]map vlan 20
[ottawa-9300-3-md-md1-ma-ma1]mep mep-id 1 vlan
[ottawa-9300-3-md-md1-ma-ma1]

ping mac-8021ag mac 4455-6677-0001

Pinging 4455-6677-0001 with 144 bytes of data:
Reply from 4455-6677-0001: bytes = 144, time = 5ms
Reply from 4455-6677-0001: bytes = 144, time = 10ms
Reply from 4455-6677-0001: bytes = 144, time = 5ms
Reply from 4455-6677-0001: bytes = 144, time = 9ms
Reply from 4455-6677-0001: bytes = 144, time = 6ms
```

L2 Pinging: Avaya, Huawei, Huawei & return)

```
# l2ping 20.44:55:66:77:00:03

 Please wait for l2ping to complete or press any key to abort

----44:55:66:77:00:03 L2 PING Statistics----  0(68) bytes of data
1 packets transmitted, 1 packets received,   0.00% packet loss
  round-trip (us) min/max/ave/stdv =  8157/8157/8157.00/ 0.00

# l2ping 20.44:55:66:77:00:01 burst-count 100

 Please wait for l2ping to complete or press any key to abort

----44:55:66:77:00:01 L2 PING Statistics----  0(68) bytes of data
100 packets transmitted, 100 packets received,   0.00% packet loss
  round-trip (us) min/max/ave/stdv =  2742/1029707/120981.07/
   9223372039002259 4.56
```

L3 Pinging: Avaya VRF->ISID 1001 -> PC host

```
ping 10.1.1.2 vrf 1001 -s
PING 10.1.1.2: 56 data bytes
64 bytes from 10.1.1.2: icmp_seq=0. time=1.225 ms
64 bytes from 10.1.1.2: icmp_seq=1. time=0.965 ms
64 bytes from 10.1.1.2: icmp_seq=2. time=0.962 ms
64 bytes from 10.1.1.2: icmp_seq=3. time=0.960 ms
64 bytes from 10.1.1.2: icmp_seq=4. time=0.961 ms
64 bytes from 10.1.1.2: icmp_seq=5. time=0.960 ms
…..
64 bytes from 10.1.1.2: icmp_seq=13. time=0.962 ms
64 bytes from 10.1.1.2: icmp_seq=14. time=0.979 ms
64 bytes from 10.1.1.2: icmp_seq=15. time=0.959 ms
64 bytes from 10.1.1.2: icmp_seq=16. time=0.959 ms
64 bytes from 10.1.1.2: icmp_seq=17. time=0.959 ms
64 bytes from 10.1.1.2: icmp_seq=18. time=0.954 ms
64 bytes from 10.1.1.2: icmp_seq=19. time=0.946 ms
64 bytes from 10.1.1.2: icmp_seq=20. time=0.955 ms
64 bytes from 10.1.1.2: icmp_seq=21. time=0.944 ms
64 bytes from 10.1.1.2: icmp_seq=22. time=0.947 ms
64 bytes from 10.1.1.2: icmp_seq=23. time=0.948 ms
64 bytes from 10.1.1.2: icmp_seq=24. time=0.949 ms
64 bytes from 10.1.1.2: icmp_seq=25. time=0.948 ms
64 bytes from 10.1.1.2: icmp_seq=26. time=0.947 ms
----10.1.1.2 PING Statistics----
27 packets transmitted, 27 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 0.944/0.967/1.225
```

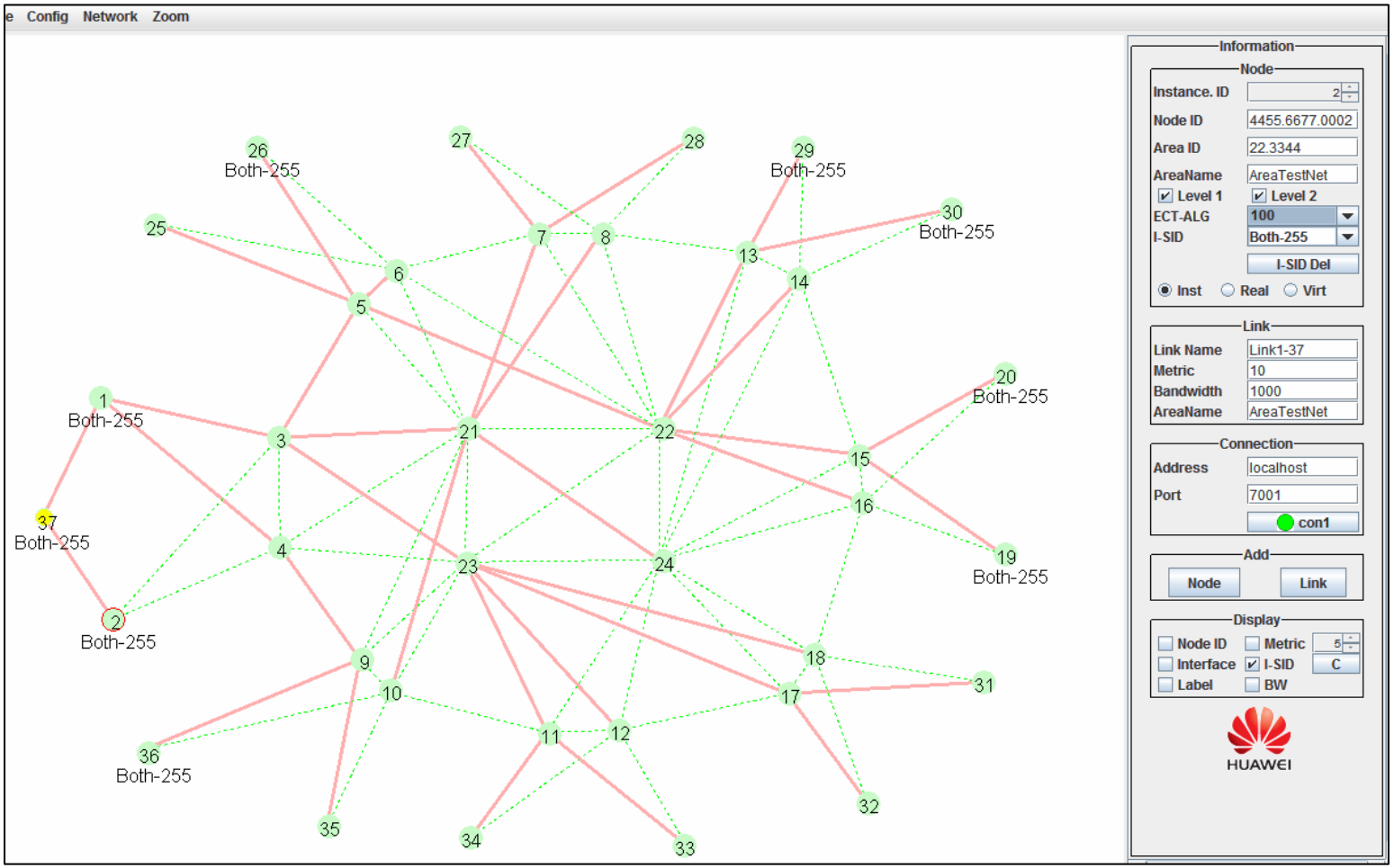
← 1st learn

← Moved PC multiple times .. to different attachment points (losses not shown this trace)

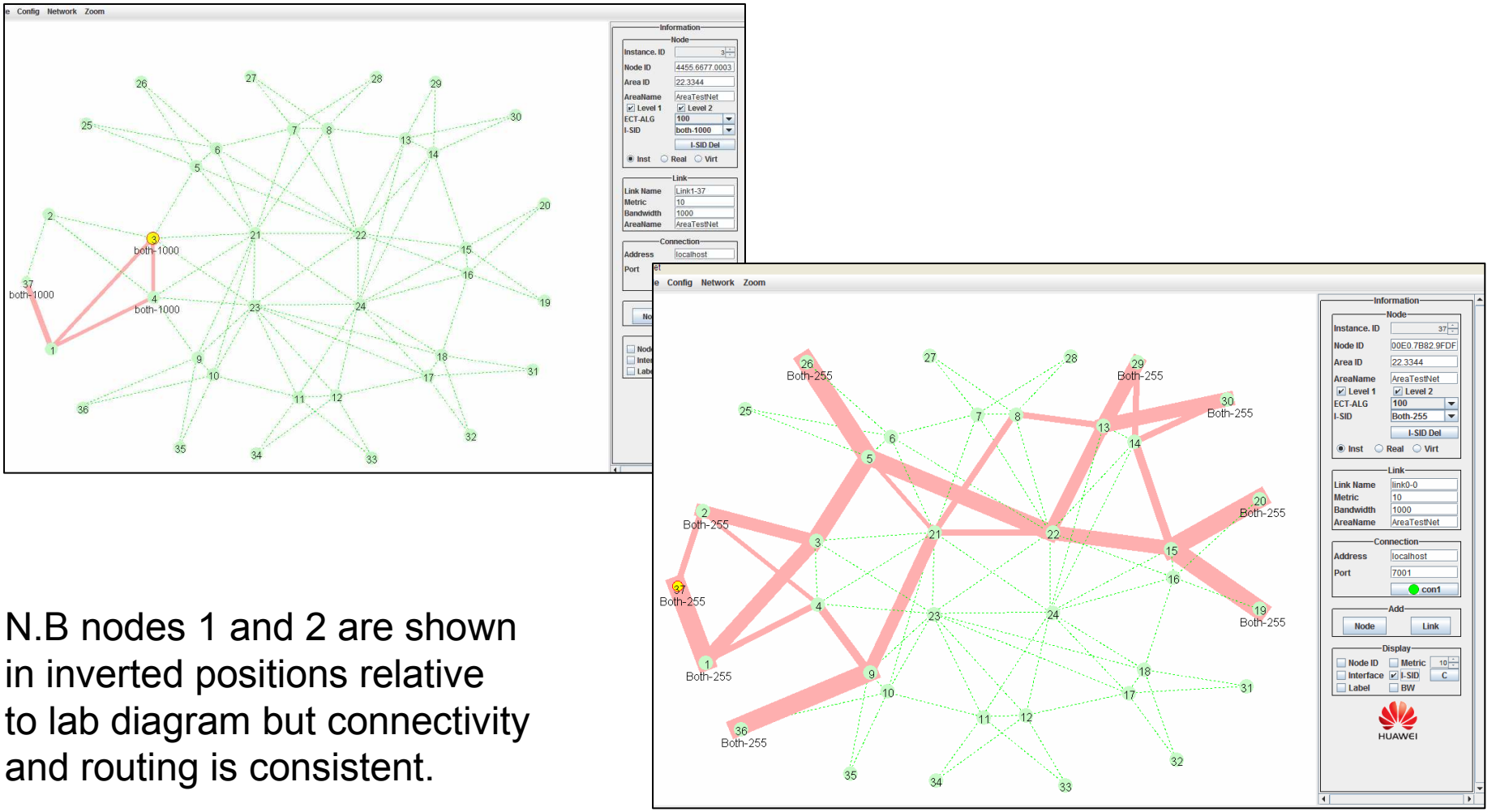
Avaya – show computed SPF from self/B-VID 10

```
show isis spbm unicast-tree 10
********************************************************************************
Command Execution Time: WED OCT 27 11:35:33 2010 UTC
********************************************************************************
Node:4455.6677.0002.00 -> ROOT
Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0015.00 (Instance_21) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0018.00 (Instance_24) -> Node:4455.6677.0015.00 (Instance_21) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0017.00 (Instance_23) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0016.00 (Instance_22) -> Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.000f.00 (Instance_15) -> Node:4455.6677.0016.00 (Instance_22) -> Node:4455.6677.0005.00 (Instance_5) ->
      Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0014.00 (Instance_20) -> Node:4455.6677.000f.00 (Instance_15) -> Node:4455.6677.0016.00 (Instance_22) ->
      Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0010.00 (Instance_16) -> Node:4455.6677.0016.00 (Instance_22) -> Node:4455.6677.0005.00 (Instance_5) ->
      Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.0013.00 (Instance_19) -> Node:4455.6677.000f.00 (Instance_15) -> Node:4455.6677.0016.00 (Instance_22) ->
      Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
……..
Node:4455.6677.001b.00 (Instance_27) -> Node:4455.6677.0007.00 (Instance_7) -> Node:4455.6677.0015.00 (Instance_21) ->
      Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.001c.00 (Instance_28) -> Node:4455.6677.0007.00 (Instance_7) -> Node:4455.6677.0015.00 (Instance_21) ->
      Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.001d.00 (Instance_29) -> Node:4455.6677.000d.00 (Instance_13) -> Node:4455.6677.0016.00 (Instance_22) ->
      Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
Node:4455.6677.001e.00 (Instance_30) -> Node:4455.6677.000d.00 (Instance_13) -> Node:4455.6677.0016.00 (Instance_22) ->
      Node:4455.6677.0005.00 (Instance_5) -> Node:4455.6677.0003.00 -> Node:4455.6677.0001.00 -> ROOT
```

Engineering tool predicted SPF tree B-VID 10 from Avaya ERS 8800 to all other nodes - same as: “show isis spbm unicast-tree 10” on previous slide



Engineering tool predicted active topologies for <ISID 255, B-VID10> and <ISID 1000, B-VID 10>



N.B nodes 1 and 2 are shown in inverted positions relative to lab diagram but connectivity and routing is consistent.