

Case Study: The campus network as the “last mile” problem

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Case Study: HPC Researcher versus UCSD Campus Network

- Researcher reports of ongoing network performance problems between his campus lab and SDSC.
- Description of the response to the reported problem, the network environment involved, and the administrative domains.
- Description of the tests carried out and results
- Current thinking and recommendations
- Next Steps



Case Study Researcher

- Who: Shankar Subamaniam, PI
Bioinformatics and Cell Biology and Alliance
for Cell Signal Processing
- Joint appointment at SDSC and UCSD
- Funding sources and participants: NIH,
National Cancer Institute, Elli Lilly, The Merck
Genome Research Institute, Aventis
Pharmaceuticals,
Johnson and Johnson, Novartis Pharma AG



Problem Symptoms Reported

- General network slowness in accessing SDSC hosts from EBU 1 lab.
- Report occasions of 30 – 60 second character key input response
- Research staff located at SDSC do not see same problems.
- Hmmmm.....



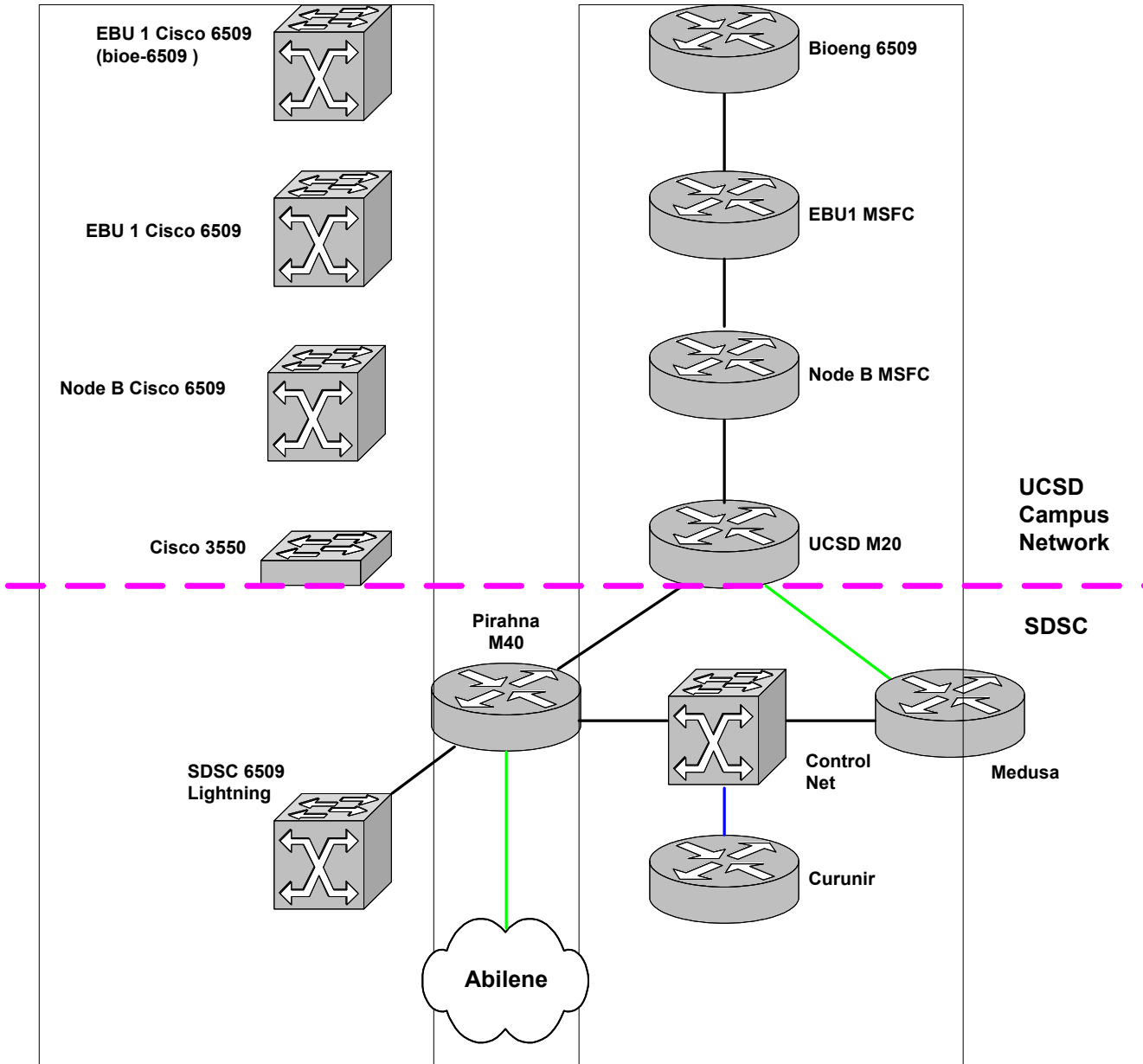
Additional Wrinkles

- Research staff reluctant to move to second newly constructed lab on campus because of poor network performance.
- New lab will have servers accessed over Abilene.
- Requesting private fiber paths from SDSC to both labs.

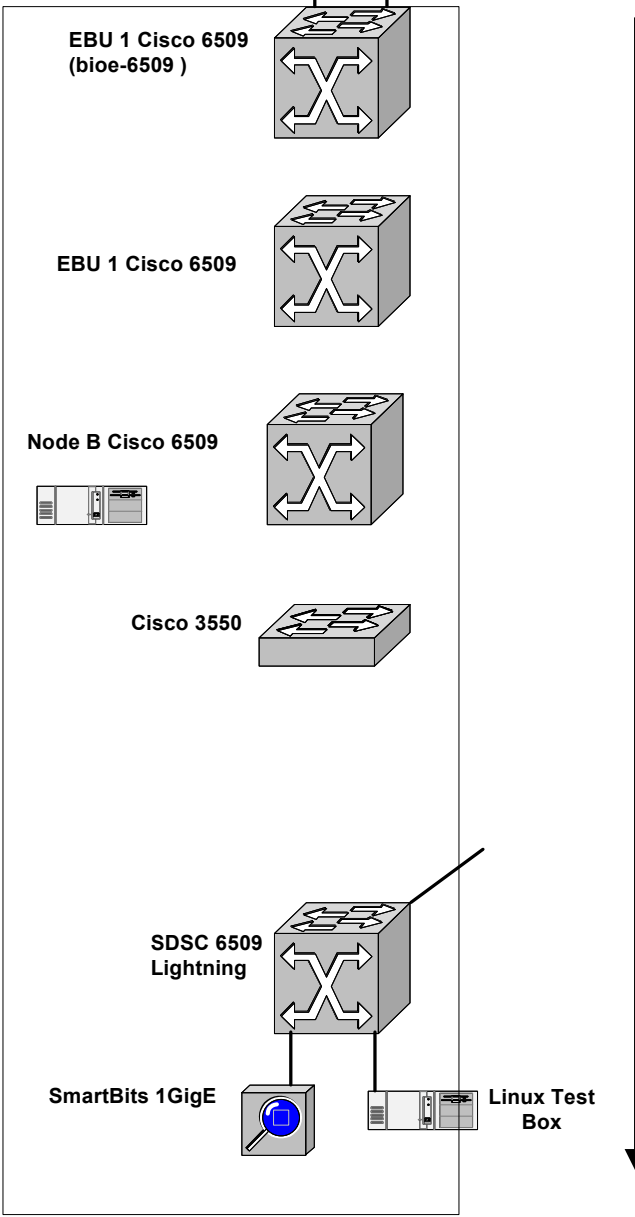


Layer 2 Path

Layer 3 Path



SmartBits 1GigE
Layer 2 Path
Linux test box



**210
Mbit/sec**

415 Mbit/sec



Test 1 Results Summary

- With gigabit layer 2, incur 10% loss at 60% offered load of varying frame size.
- Incur 30% loss at 70% offered load of varying frame sizes. Larger frames = lower loss.
- Iperf test results directional: 415 Mbit/sec to SDSC; 210 Mbit/sec from SDSC to EBU.



Consequences and Response to Test Results

- 10% > packet loss on shared campus pipe = poor performance on LAN and WAN.
- Potential consequences to performance across Abilene significant due to retransmissions that would occur.
- Campus administrative domains investigate their equipment and test within their buildings.
- What happened?



Miracle happens

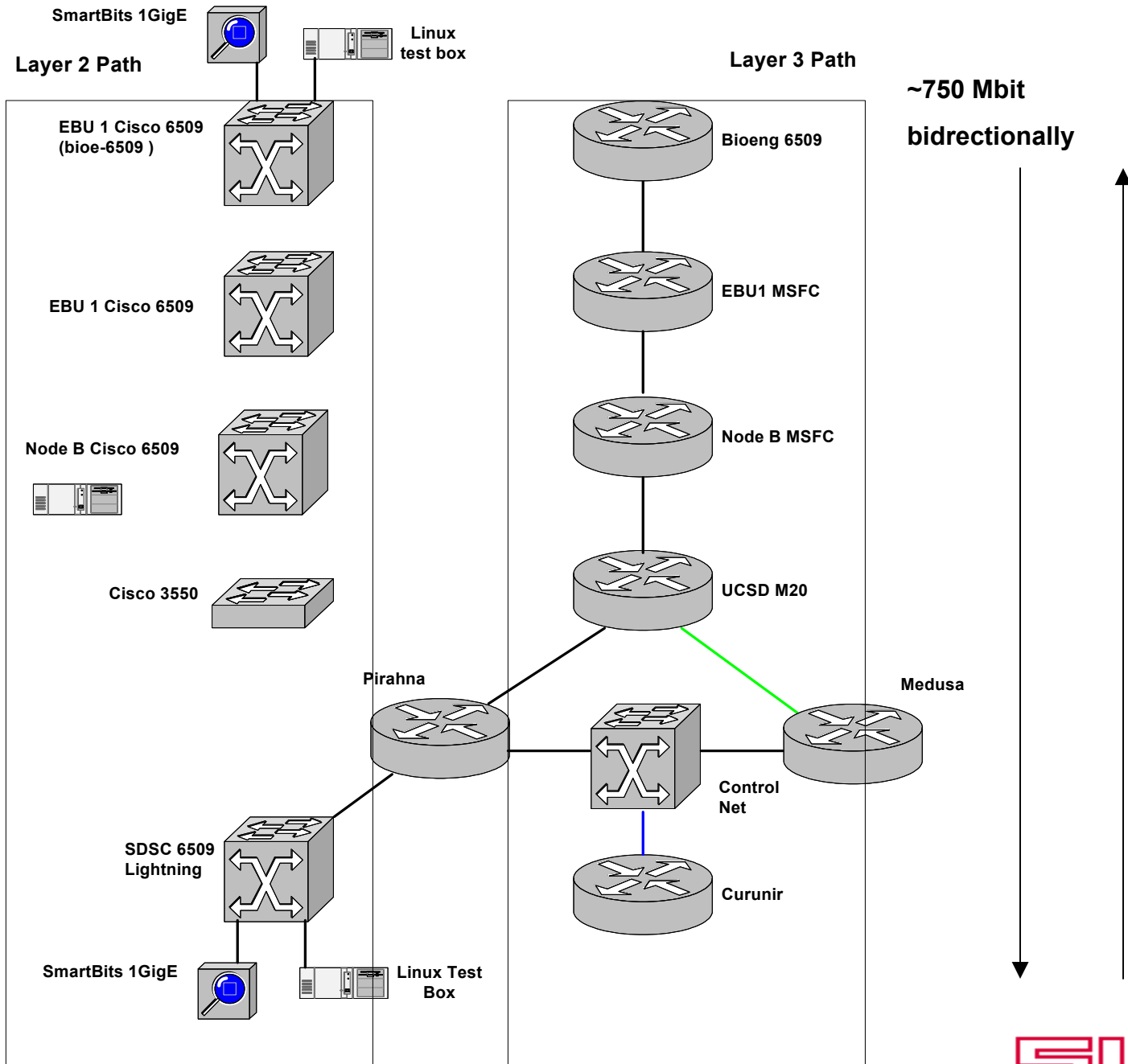
- Campus departments report that problem cannot be reproduced or it has cleared under test.



Retest

- Layer 2 test near capacity of \$39
SysKonnnect NIC ~735 Mbit
- Layer 3 test also near capacity of NIC
- Symmetrical





Campus Path Alternatives for Research Labs

- Private fiber path
 - Pros: Predictable performance and reduce admin domains
 - Cons: Does not scale in campus environment
- Shared campus/divisional/department backbone
 - Pros: lowest cost; meets connectivity needs
 - Cons: performance may not meet needs of HPC researchers
- Distinct VLAN for researcher/lab
 - Pros: can shape bandwidth easier and reduce administrative domain overhead. Can scale.
 - Cons: still using shared campus pipe



Next Steps

- Permanently Instrument each network segment to measure relative segment performance. (DONE)
- Continuously monitor network path to/from lab lab in cooperation with pertinent departments.
- Evaluation various E2E tools.



Conclusions

- If you don't test you don't know what performance is or what performance can be.
- Research universities have a number of administrative domains with a primary focus on connectivity. High performance is secondary.
- Resulting network architectures not always optimal.
- Common access to a common measurement platform leads to cooperation when you actually need it.

