

Lambdas and Your Campus BoF: Some Introductory Comments

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Thanks For Joining Us Today for This BoF!

- Let's begin by going around the room, and having everyone briefly **introduce themselves**. Please give **your name**, and **the name of the institution you're with**.
- I'd also encourage you to **sign in on the sheet that's going around** (be sure to indicate if you'd like to be added to a "Lambdas and Your Campus" mailing list).
- I'll then show a few introductory slides to get things started
- Finally we'll open things up for the rest of this session's time slot so that attendees can share what they're thinking about when it comes to lambdas and your campuses.

Why Is Joe Leading This BoF?

- At the Fall 2005 (Philadelphia) I2 Member Meeting I presented a talk entitled, “Thinking About Lambda Based Network Architectures and Your Applications,”
<http://www.uoregon.edu/~joe/lambdas/lambdas.ppt> (or .pdf)
- I’m active with a number of I2 working groups or activities which are interested in network architecture issues and security issues.
- Lambdas are coming, and we believe there’s interest in discussing how they will impact your campuses (e.g., see Kevin Miller’s excellent talk “Using Lambdas Without Bypass” from earlier this morning).
- Campus-level issues, in particular, were intended to be a special subject focus for this meeting.
- No one else volunteered to do this BoF, so you get me. :-)
- In any event, let’s dive in...

The New Network Connection Paradigm

- **Old** connection model: **packet based** OC12, Gig, OC48, or 10Gig
- **New** standard connection package: **two** connections --
 - one **10gig packet** connection, but ALSO
 - one **10gig lambda** connection
- **The fundamental question: How will Internet2 connectors and campuses integrate those new lambda based connections with their local networks?**
- Will those using lambdas simply bypass the normal campus infrastructure? Will lambdas tightly integrate with the campus infrastructure?
- What's the role of regionals or gigapops in facilitating lambdas for their members?
- **How you decide to use lambdas, and how you think about lambdas, potentially drives a lot of other questions...**₄

Lambdas and Security Considerations

- Are there security considerations associated with bringing lambdas to your campus? For example, will the availability of lambdas introduce new security risks, or will lambdas perhaps act to reduce or eliminate some security risks?
- While HOW YOU USE lambdas may drive part of the answer to that question, how you THINK about lambdas may also be important:

“Lambdas will blow right past our border firewall, and we also won’t be able to passively monitor traffic over that channel!”

VS.

“Lambdas are point-to-point ‘virtual wires,’ and as a closed network with a small number of interconnected hosts, such a network will inherently have far fewer security risks!”

Scheduling Access to Constrained Lambda Resources

- Another example of how lambdas differ from traditional packet-based connections is the need to consider scheduling and prioritization of use.
- That is, if only a single lambda is available, will it be used in a static fashion, or in a more dynamic way? Who will determine what user or application has priority access? Potential models:
 - First come, first serve use without any prior reservation?
 - Ad-hoc negotiation with IT technical or managerial staff?
 - Priority reservation system, with key users having the right to “bump” or “pre-empt” lower priority user reservation?
 - An institutional “lambda allocation committee?”
- In deciding on a solution, remember that you may/will ALSO need to simultaneously schedule access on the other end of the pipe. This will get harder as the # of sites and the number of users increases...

Are There Emerging Situations Where Campuses May Have Specific Lambda-Related Requirements?

- Packet-based traffic may still be the primary production campus and IT focus (particularly given that connectors are looking at getting a 10gig packet-based connection as part of the new Internet2 connection model), but lambda-based requirements should also be on the planning radar.
- The classic examples for lambdas have all traditionally been research-related projects, but your campus may also have requirements for lambdas for more mundane (but still very important)!
- Let's quickly consider just a couple of examples...

Example #1: DR/BCP

- Consider campus disaster recovery (DR) and business continuity planning (BCP) requirements where you might have large SAN or NAS disk farms at a location on campus that's continually replicated/synchronized at one (or more) remote "hot backup" locations. Some associated lambda-favorable characteristics:
 - this is a mission critical application (so \$\$\$ may be available)
 - filer synchronization has persistent and predictable long term point-to-point flows (nice property for lambda based networks!)
 - interfiler traffic may need to be isolated (it may be unencrypted)
 - routine interfiler synchronization traffic bandwidth may be large
 - recovery bandwidth requirements may be larger still
 - substantial geographical separation may be desired (e.g., more distance than you can get from just a state or regional network)
 - Backup channels should avoid common points of failure

Example #2: Dealing with DDoS Attacks

- Another situation where campuses might be interested in lambdas would be if they're experiencing problems with distributed denial of service (DDoS) attacks.
- DDoS attacks can easily run multiple Gbps
- DDoS attacks may last for minutes, hours, days, or longer.
- Currently many sites attempt to mitigate DDoS attacks by announcing specific blackhole routes as far upstream as possible. While that may protect campus links from that attack traffic, it limits the ability of targeted sites to track/analyze the attack traffic.
- Would dynamic waves represent an alternative way of handling that DDoS traffic, offloading and protecting an institution's primary packet-based connectivity while also facilitating delivery of that attack traffic (with customer permission) to local or remote network analysts for scrutiny and backtracking purposes?

Campus Interest in Lambdas and Upstream Architectures

- The last issue I'll raise this morning is the question of how campus interest in lambdas impacts upstream architectures and business relationships...
- This is not a new issue. For example, thinking about some other technologies:
 - IP multicast: if a campus wanted to do IP multicast, upstreams needed to play
 - IPv6: if a campus wanted to do IPv6, upstreams needed to play
 - jumbo frames: if a campus wanted to do jumbo frames, upstreams needed to play
- Are we facing the same sort of issues when it comes to lambdas? If so, are the regional optical networks and the campuses ready?
- With that, I'll throw this BoF open to y'all... do any of those issues resonate for you? How are you planning to address them¹⁰?