

Dual Pool Bandwidth part 1

Tests on Signalling

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Agenda

- **Difference between TE and DPB-TE**
- **Results on signalling tests**
- **To do**
- **Presentation on DPB-TE + Diffserv tests plan**
 - test plan
 - test bed
- **Other MPLS tests on Plage**
- **IETF work & Cisco last release**

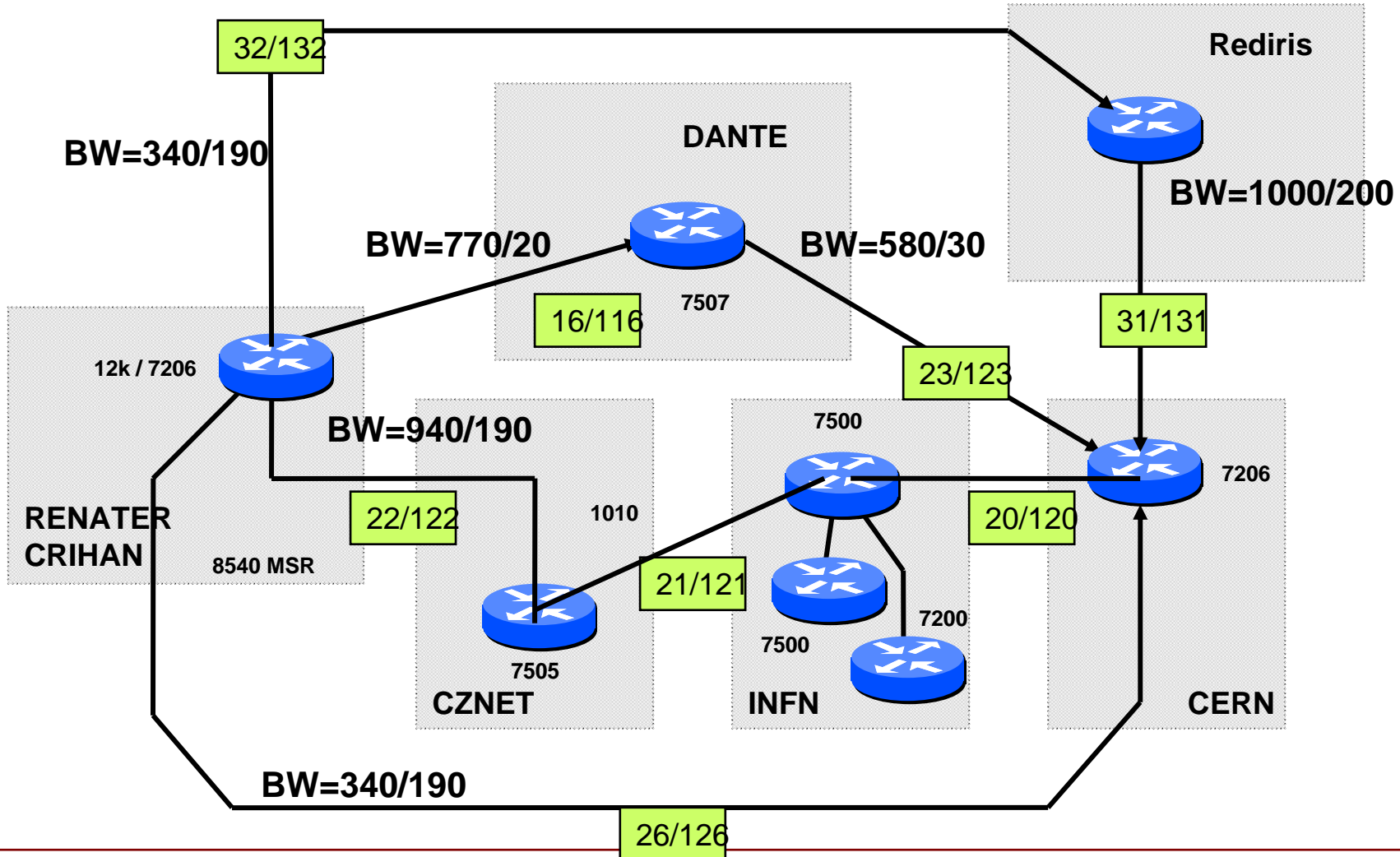
TE//DPB-TE

- **MPLS TE is about optimising the utilisation of installed resources. It can improve QOS by reducing or eliminating congestion bottlenecks.**
- **MPLS TE operates independently of Diffserv and performs admission control over “global” bandwidth pool for all COSs.**

TE//DPB-TE

- **DPB-TE (Diffserv aware Traffic Engineering) is an extension of TE and is essentially a signalling feature. It allows constraint based routing of “Guaranteed Bandwidth” TE tunnels.**
- **DPB-TE ensures that GB-TE will follow a path across the backbone that has the needed BW. This needed BW is typically the bandwidth of a Diff-Serv queue dedicated to GB-TE Tunnels.**

DBP-TE Backbone



Results on signalling testing

- **Setup of Dynamics LSPs in Global pool and Sub pool.**
- **IGP flooding**
- **Constraint Based Routing & Admission Control**
- **Preemption among Tunnels**
- **Forwarding mechanisms.**

<http://www.crihan.fr/MPLS/dbp-test/pres/dbpte-results-draft-1.html>

Setup of Dynamics & Explicit LSPs in Global pool and Sub pool

- **Set-up time**
 - Node participating : CH, IT, Cselt, FR, ES, UK, CZ
 - **Dante Results**
 - » 20 Tunnels in 8s from the debugging monitoring tool => debug mpls tra tun state
 - **INFN Results**
 - » 20 tunnels in 20s from the log file, with 4 tunnels down (wrong explicit path)
 - **Cesnet Results**
 - » In a typical situation when a line or interface goes down, OSPF setup is responsible for about 85% of the total delay and LSP setup for the rest (typically 4-5 seconds for both dynamic and explicit LSPs).
- **Monitoring the background load**

IGP flooding

- **In DBP-TE, extended OSPF is modified and will also flood the BW for sub pool tunnels.**
- **Conditions for triggering a flow are the following :**
 - **Links changes => Result ok.**
 - » **Observation of a new opaque LSA after the modification of the Sub pool Bandwidth Reservation on an atm PVC.**
 - **Call set-up failures => Too difficult**
 - » **We haven't been able to produce the good conditions for observing a flooding.**
 - **Periodic flooding => ok**
 - » **mpls tra lin timers periodic <0 3600>**
 - **Subpool reservation thresholds => Result ok**

IGP flooding

- **Subpool reservation thresholds => Result ok**
 - **crihan-pe(config)# interface ATM1/0.6**
 - **crihan-pe(config-subif)#**
 - » **mpls traffic-eng flooding thresholds up 25 50 75 100**
 - **crihan-pe(config-subif)#**
 - » **mpls traffic-eng flooding thresholds down 99 75 50 25**
- **Results**
- **The flooding doesn't seem to act the same way when we increase and decrease the bandwidth on the tunnels. When we increase bandwidth on a tunnel the flooding starts immediately, it takes no more than one second, but when we decrease bw to cross a threshold it takes 1 minute or more for the flooding to occur.**

Constraint Based Routing & Admission Control



- **PCALC computation**
 - **Component which permits to calculate the best path for the LSPs across the backbone**
 - **Tests of computation for Global pool and Sub pool LSPs and interaction between the both pools.**
 - **Results : ok**
 - » **The different tests show that there is no possibility of confusion for reservation of GP and SP LSPs. We also verified that Global pool LSPs can book BW when the SP is full**
 - » **The main Pool takes into account the BW used by both the normal and the GB-TE tunnels, while the subpool only keeps track of the constraint for the SP tunnels.**

Constraint Based Routing & Admission Control

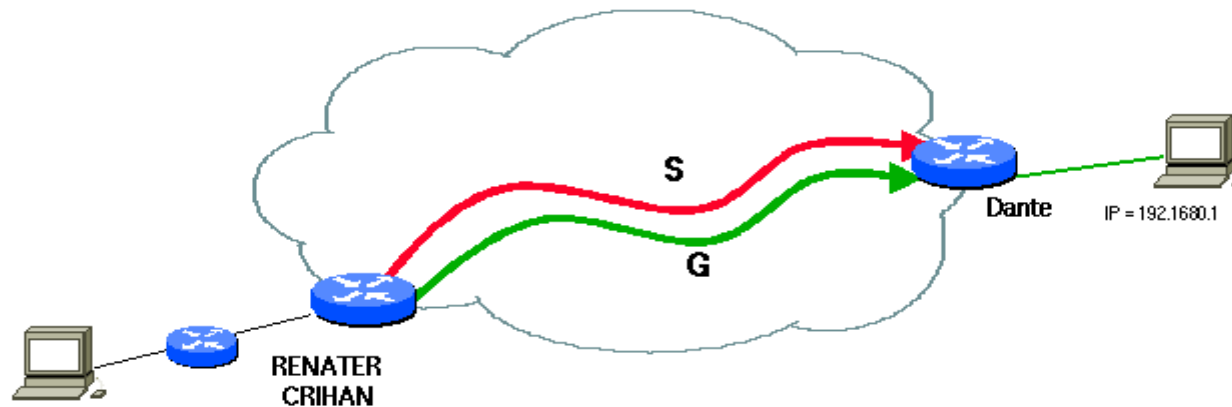


- **Call rejection**
 - » We'd like to observe messages carried by RSVP in case of a call failure.
 - » This test was not obvious and we didn't succeed in observing RSVP failure messages.
- **Affinity string**
 - Result ok (We focused on SP LSPs).
- **Preemption among tunnels**
 - Result ok
 - » The only parameters which is taken in account for preemption is the priority. The pool is not taken in account therefore, the only way to protect SP LSP from GP LSP is to configure the lowest value for the priority attribute on SP LSP.

Mapping traffic into GB and SP tunnels

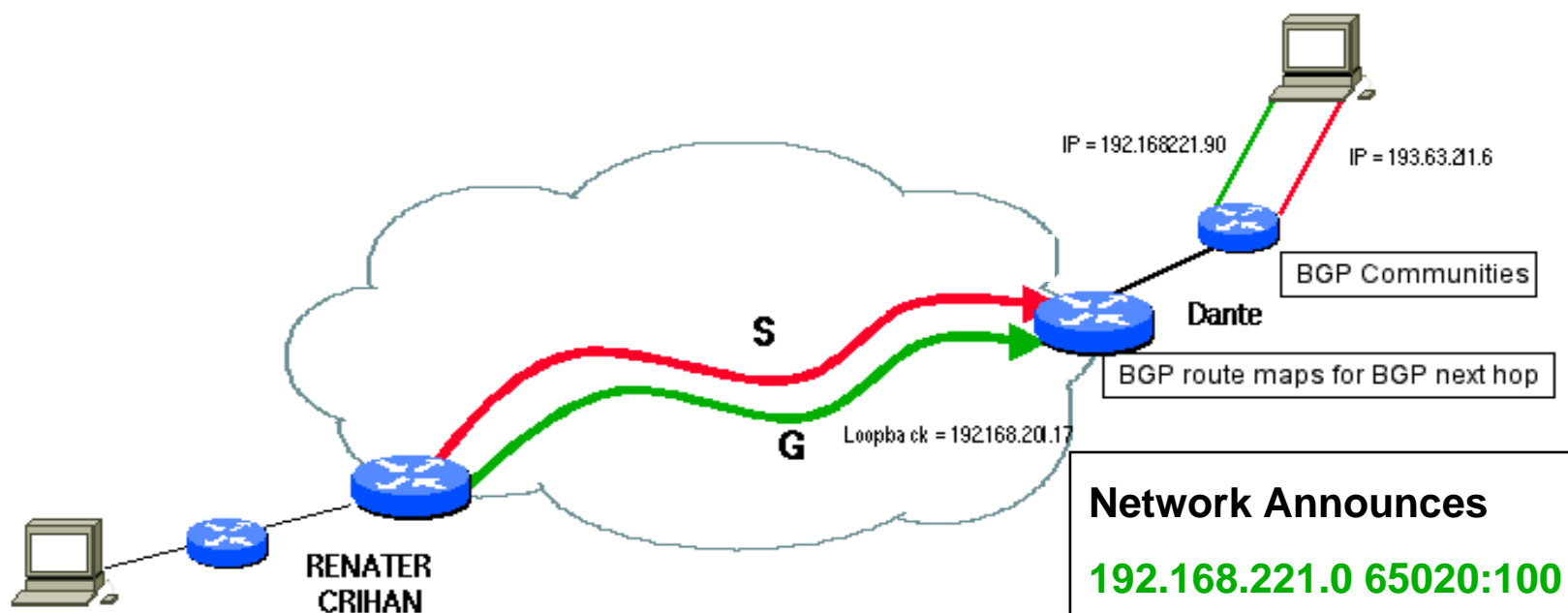
- **IGP can forward traffic over Global pool Tunnels.**
- **SP tunnels are created for providing guarantees to a specific subset of traffic. Thus, they can't be part of the IGP domain.**
- **For forwarding traffic through them we can use :**
 - **Static routes**
 - » Done .. ok
 - **BGP Next-hop**
 - » Under study

Mapping traffic into GB and SP tunnels



Static Route :
Ip route 192.168.0.1 255.255.255.255 Tunnel S

Mapping traffic into GB and SP tunnels



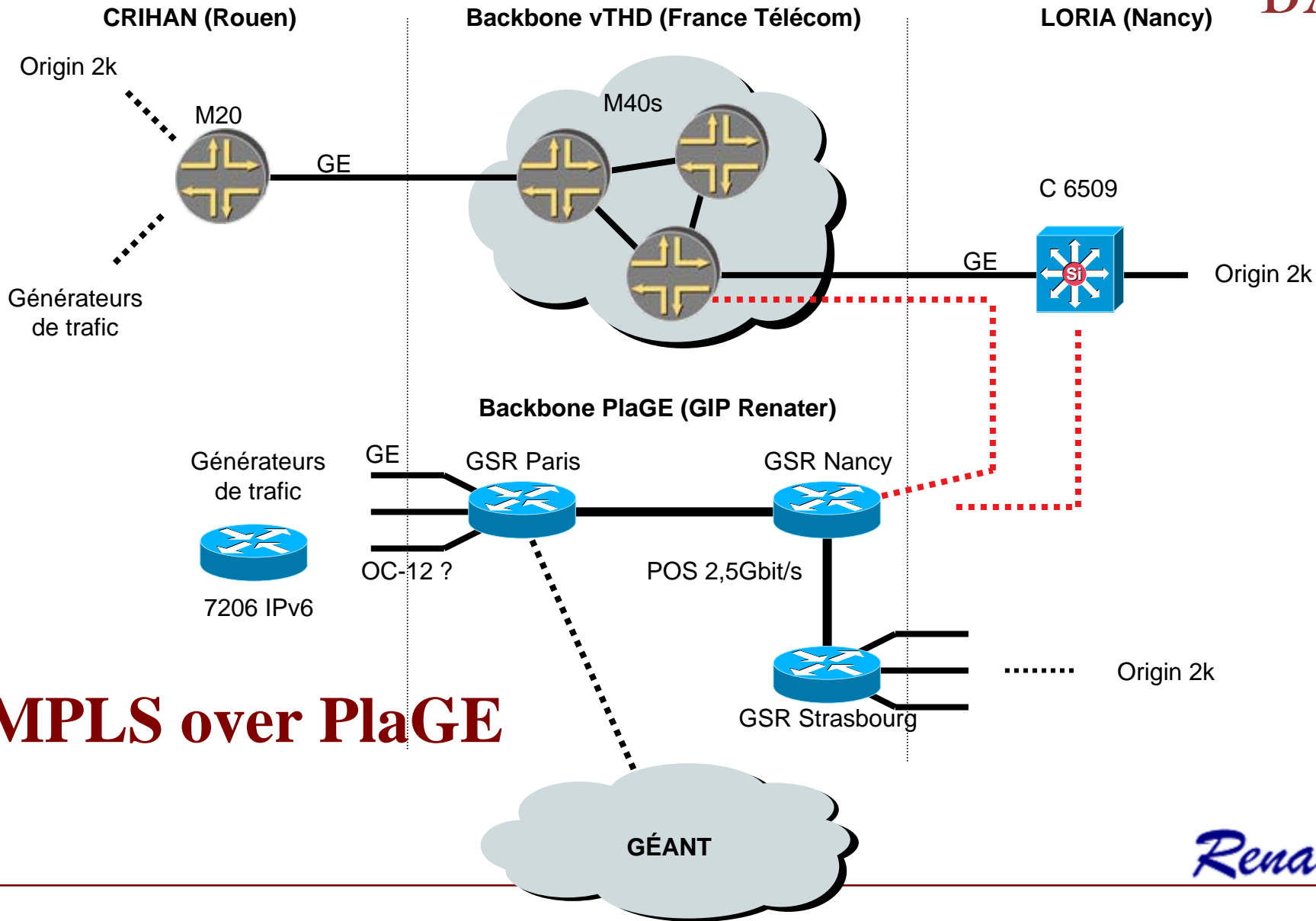
Ip route 192.168.201.18 255.255.255.255 Tunnel S
 Ip route 192.168.201.19 255.255.255.255 Tunnel G

Network Announces
 192.168.221.0 65020:100
 193.63.211.0 65020:200

De2 modifies the nexthop
 with route-map and community-list
 65020:100 NH 192.168.201.18
 65020:200 NH 192.168.201.19

To do

- **Forwarding mechanisms**
 - (mapping traffic in LSPs)
- **Resilience**
 - Backup LSPs
 - Nodes failures



MPLS over PlaGE

MPLS over Plage: DPB-TE&Diffserv

- **DPB-TE provides signalling for the CoS and ensures that the traffic directed onto the GB tunnel is less than the capacity of the tunnel.**
- **Diffserv provides QoS and ensures that BW is set aside on each link in the network.**
- **Conditioning at the edge**
 - **No overbooking of the GB tunnel**
 - sum of sold GB services $\leq G$
 - **Per-Link DiffServ Policy**
 - PQ policed at 20% of Physical BW
 - CBQ with 100% of Physical BW
 - **Per-Link RSVP BW**
 - X = 100% of Physical BW
 - Z = 20% of Physical BW
 - **Per-Cust Edge-Condition**
 - In Contract: marked GB-DSCP-in
 - In excess: dropped
 - **GBTE tunnels with Setup/Hold Priority = 0**
 - regular tunnels with > 0
 - **The PQ is only used by packets riding the GBTE tunnels**

MPLS over PlaGE: DPB-TE&Diffserv test plan

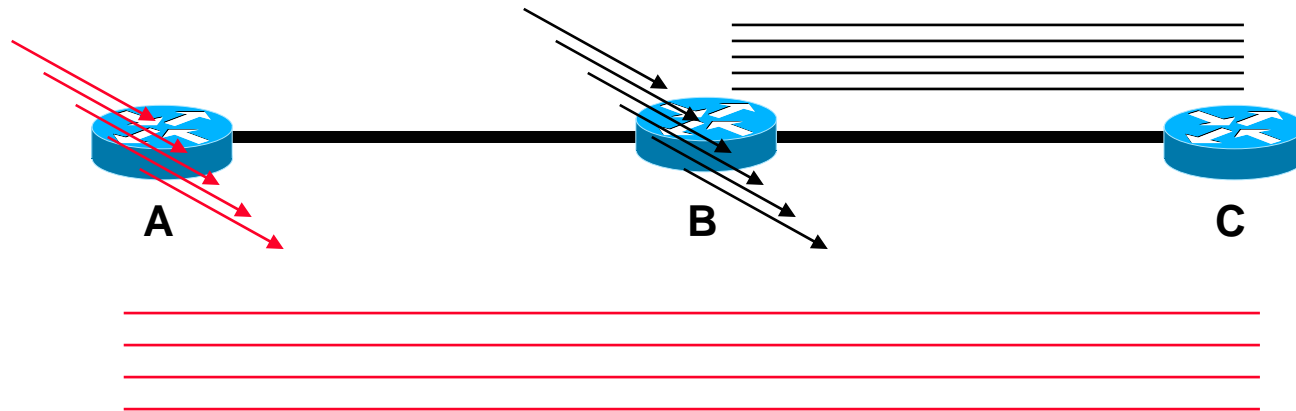
- **Test 1**
 - **Checking of queuing mechanisms (Deficit Round Robin on the 12k) & matching criteria (based on the MPLS exp field) in the EFT image**
 - » Configuration of CAR for conditioning
 - » Matching criteria => We'll verify that traffic is injected in the proper queue.
 - » We could get also indication of delay and jitter distribution
- **Setup**
 - » For this test, two tunnels Global and Subpool Tunnel between A and C through B are created. MDRR is activated on the POS interfaces towards the core.
 - » 1 Queue corresponds to the SP tunnel (20% of the link BW)
 - » 1 Queue corresponds to the GB tunnel (80% of the link BW)

MPLS over PlaGE

DPB&Diffserv test plan

- **Test 2 Aggregation**
 - **Verify that individual flow throughput is not affected by DS aggregation**
 - **Verify if the number of hops affects :**
 - » **Packet loss, Delay distribution, jitter distribution ..**
- **Setup**
 - **three routers: A, B, C**
 - **5,10,30 GP tunnels between A and B at 40 Mbit/s**
 - **5,10,30 SP tunnels between A, B and C at 40 Mbit/s**
 - » **Queuing and CAR to be configured on A and B.**

Test 2 Aggregation



**We don't want to see packet lost on SP tunnels.
We expect throughput for each given LSP.**

MPLS over PlaGE

DPB&Diffserv test plan

- **Test 3 Aggregation**
 - Same test but with PQ
- **Test 4**
 - **VBR-like service ?**
 - » **Conforming packets are marked with CAR at the edge.**
 - » **Non-conforming packets are marked with a different color instead of being dropped.**
 - » **RED is activated on all SP queues.**

MPLS over PlaGE

Interoperability between vendors

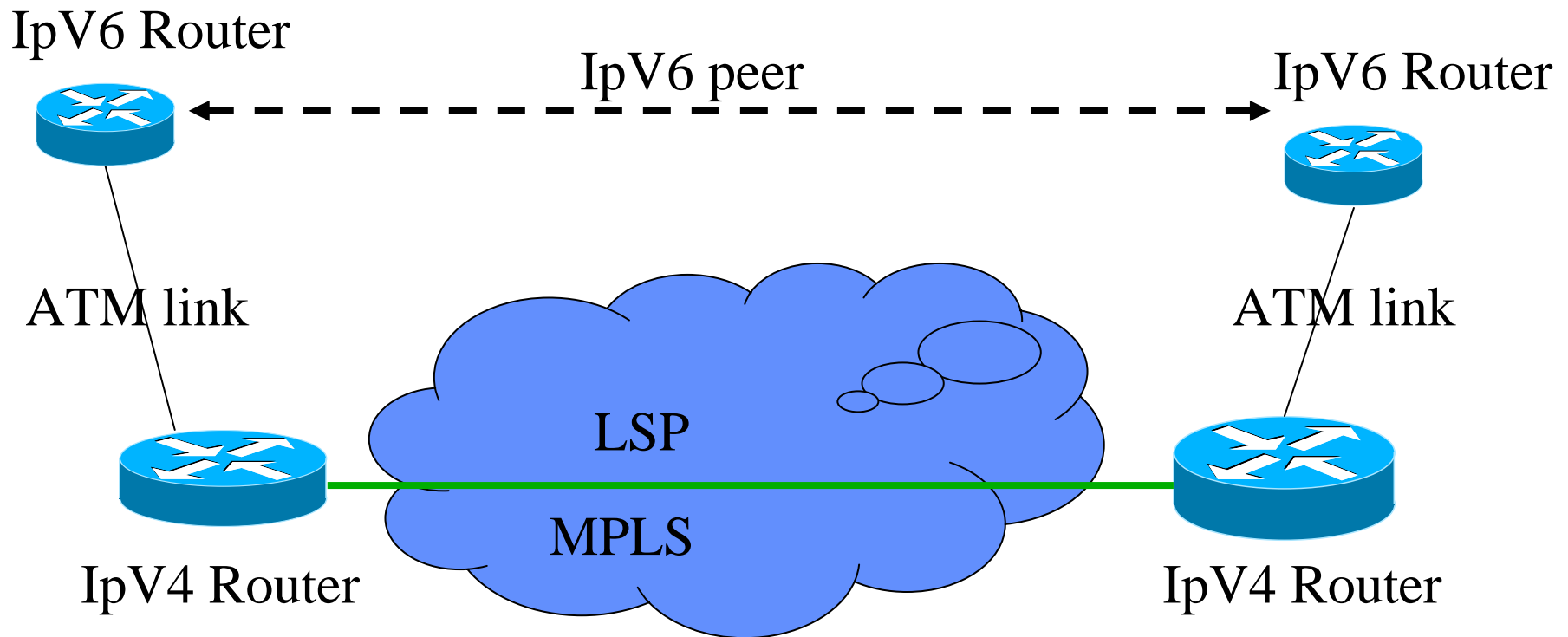
- **Juniper and Cisco**
 - » Simple TE
 - » Juniper's CCC and Cisco's ATOM technologies

MPLS over PlaGE: IpV6 network

- **Performance of IpV6 over a fast core network**
- **IpV6 and MPLS compatibility**
 - Ccc and atom test
 - « native » IpV6 over MPLS transport (Beta IOS version Q1)

MPLS over PlaGE

Why using AAL5 over MPLS ?



Other experiments

- **VPN across AS with the European test bed and ..PlaGE and .. => April/May**
- **Resiliency (Protection of LSPs)**
- **Monitoring tools**
- **RSVP across Multi AS.**

France Telecom / Renater experiments : VTHD \leftrightarrow PlaGE

- This connection will be use for testing:
 - L2VPN (service proposed by France Telecom)
 - End to end services through two differents networks
 - How can we do that ?
 - What kind of technologies will be used ?
 - RSVP across AS
 - L2VPN ?

IETF work and Cisco last release

- **IETF**
- **Requirements for Support of Diff-Serv-aware MPLS Traffic Engineering**
 - <http://search.ietf.org/internet-drafts/draft-ietf-mpls-diff-te-reqts-00.txt>
- **Extensions to RSVP-TE and CR-LDP for support of Diff-Serv-aware MPLS Traffic Engineering**
 - <http://search.ietf.org/internet-drafts/draft-ietf-mpls-diff-te-ext-00.txt>
- **Extensions to OSPF for Support of Diff-Serv-aware MPLS Traffic Engineering**
 - <http://search.ietf.org/internet-drafts/draft-lefaucheur-diff-te-ospf-00.txt>
- **Cisco release**
 - **Commercial software is available since the end of December for configuring a 12k as a PE (12.0.11ST1) on Engine 0 ATM and/or Engine 2 OC48 POS**
 - » <http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120st/120st11/index.htm>
 - » http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120st/120st11/ds_te.htm