A simple and efficient 0(50msec) resilience technology for IPTV

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Fast convergence (FC)

- The routing protocol detects the failure and computes an alternate path around the failure
- The simplest and cheapest design/operational approach for a SP is to have such behaviors optimized by default in the software and hardware implementations and applicable to all its services

FC for any service

- FC is appliable to IGP-destined unicast routes
  - [nanog 25]
- FC is applicable to BGP-destined unicast routes for both intra and inter-AS failures
  - [nanog 40]
- FC is applicable for PIM SSM multicast trees
  - Most IPTV deployments occurred in Europe and were based on FC applied to IGP/PIM

IPTV is different… The 50msec myth.

- VoIP was also claimed to require 50msec before it got deployed
  - Reality check after several years of deployment indicate an order of magnitude larger
- IPTV has successfully been deployed for several years with FC
  - It is unfortunately not widely known
- A 50msec loss may generate as much artifact as a 300msec loss
  - <test example to be shown>
- Obviously, if the application architecture is un-optimized, it could result into a tighter-than-normally-required requirement on the network.
  - Fix the application design or increase complexity/cost of the network?
  - Leverage FEC technology or temporal redundancy
- Remember to weight complexity/cost versus frequency
  - MTBF for an IPTV branch between an eye ball and a server is > 100 hours based on 5-years-old data. More recent data indicate longer MTBF's.
  - Simple PIM make-before-break would increase MTBF by 2
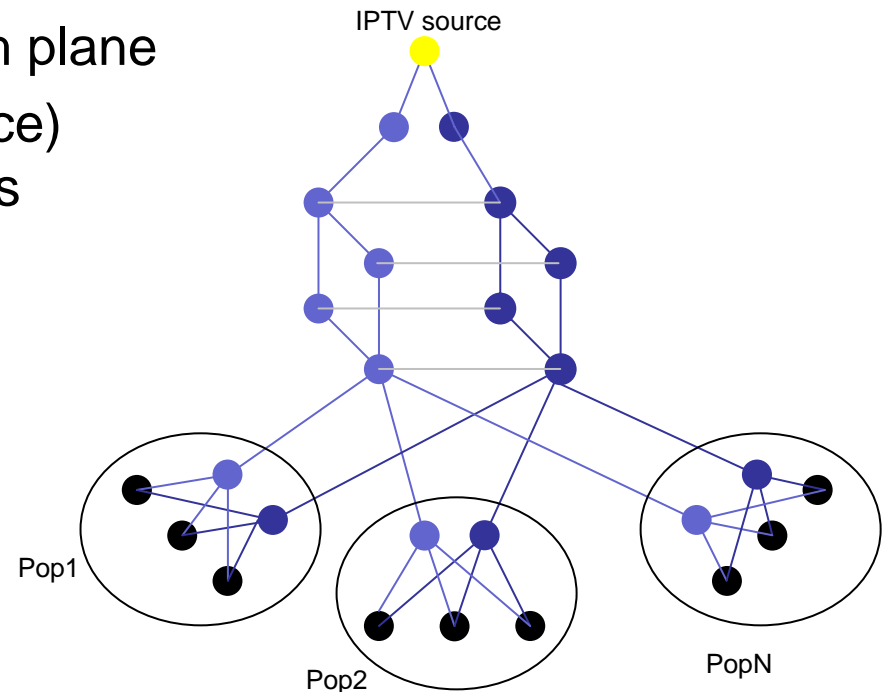
MoFRR

- Still, if one really wants the 50msec myth, one should consider MoFRR

- A pragmatic (based on real knowledge on how a networks are designed), cheap and simple approach to provide <50msec and even zero-loss behavior for IPTV

MoFRR

- Deliver two disjoint branches of the same IPTV PIM SSM tree to the same PE
- <50msec: the PE locally switch to the backup branch upon detecting a failure on the primary branch
  - IPTV Inter-packet Gap is 0(1msec). Upon not receiving any packet from the primary branch for 50msec, switch-over to the backup feed
- Hitless: the PE uses the two branches to repair losses and present lossless data to its IGMP neighbors
 - Leverage RTP sequences to repair losses

Two-Plane Network Design

- Many SP networks apply the Two-Plane Design
  - two symetric backbone planes (blue and red)
  - interconnected by grey links with large metrics to ensure that a flow entering the red plane goes all the way to its exit via the red plane
  - pop's are dual-homed to each plane
  - important content (IPTV source) is dual-homed to both planes

IPTV source

Pop1

Pop2

PopN

Two-Plane Network Design

- An IPTV SSM Tree for a premium channel is densely covering the two-plane design

- From a capacity planning viewpoint, all Blue and Red routers in a PoP are or must be assumed to be connected to the tree

IPTV source

Pop1

Pop2

PopN
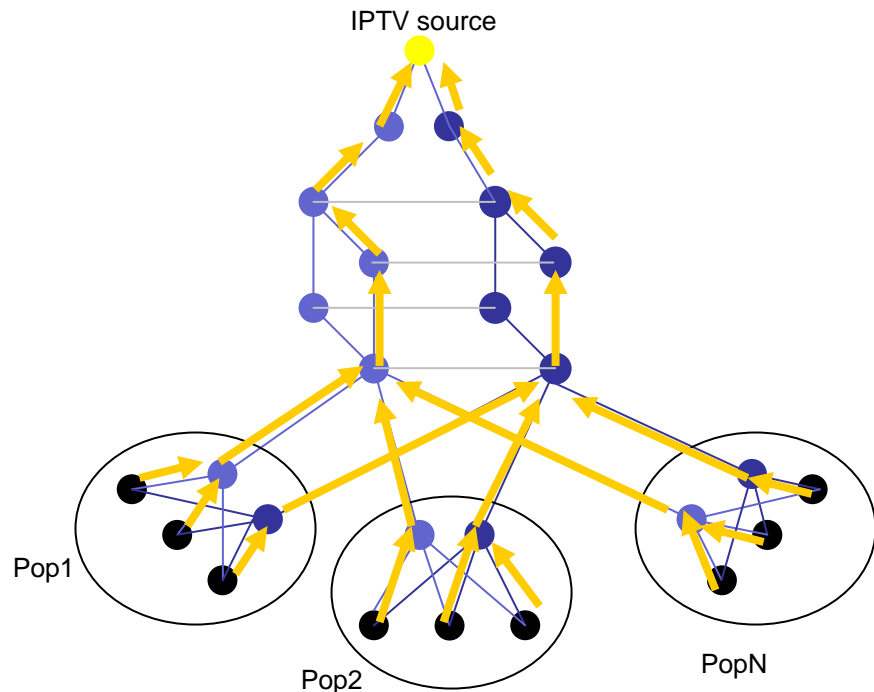
MoFRR PIM Enhancement

- Send an additional join to an ECMP neighbor to the source

- Simple
  - requires no protocol modification
  - requires no new inter-operability testing

MoFRR Applied to Two-Plane Network Design

- MoFRR only needs to be deployed on PE's (!)
- Does not create any additional capacity demand (!)
- Disjointness does not need to be created by explicit routing techniques. This is a native property of the design (!)
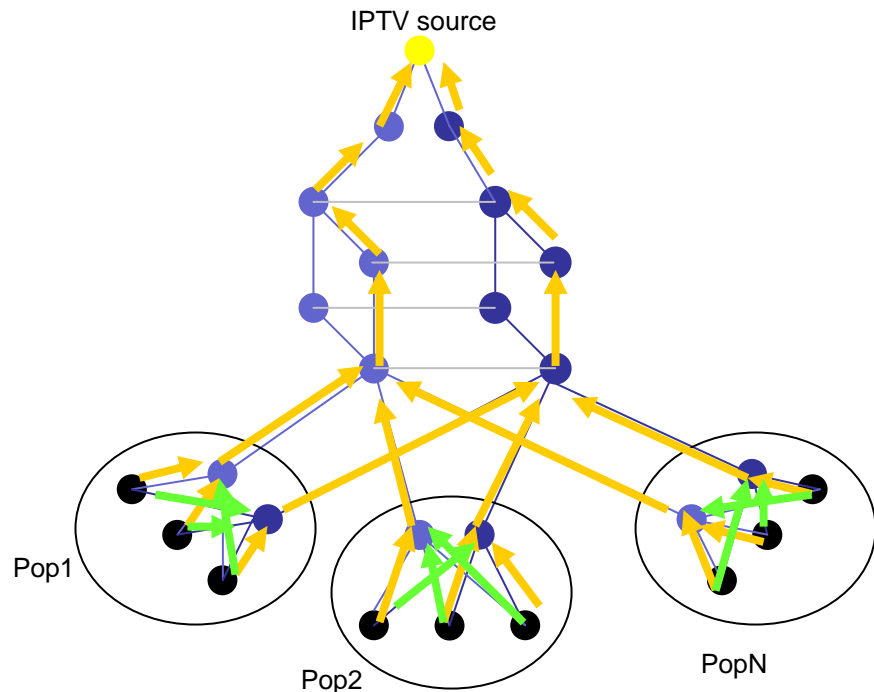
MoFRR 50msec Switch-Over

- IPTV Inter-packet Gap is 0(1msec).

- Monitor SSM (S, G) counter and if no packet received within 50msec switch onto the backup branch

- Feasibility, Scaling and Performance (TBD)

MoFRR Zero-Loss

- IPTV flows to use RTP
- MoFRR PE device to repair any loss thanks to RTP sequence match on the disjoint branch
- Feasibility, Scaling and Performance (TBD)

MoFRR and MPLS Transport

- MoFRR is as applicable to MLDP as to PIM

Conclusion

- FC is simple and applies to all services
  - IPTV is also one of these services
- MoFRR is a pragmatic, cheap and simple approach to support 50msec for IPTV, if the myth prevails.