IP Fast Reroute Using Relaxed MRC*

Ole Kristoffer Apeland
Simula Research Laboratory
PB. 134, 1325 Lysaker, Norway
oleap@simula.no

Tarik Čičić
Department of Informatics, University of Oslo
PB. 1060 Blindern, 0316 Oslo, Norway
tarikc@ifi.uio.no

ABSTRACT

We demonstrate IP fast reroute using a recently proposed method called Relaxed Multiple Routing Configurations. The demo comprises a small network of Linux routers, where the effect of network failures can be observed on real-time applications with and without IP fast reroute in effect.

Categories and Subject Descriptors

C.4 [**Performance of Systems**]: Reliability, availability, and serviceability; D.4.5 [**Reilability**]: Fault tolerance.

General Terms

Performance, reliability, verification.

Keywords

IP fast reroute, multi-topology routing, fault tolerance, network protection.

1. DEMO OVERVIEW

The demo shows the effect of network failures on real-time applications with and without deploying IP fast reroute mechanisms. For best illustration we use video transmission showing that our IP fast reroute implementation eliminates frame freezing upon cable cut.

Routing protocols are known to converge slowly after topology changes or link or router failures. Intra-domain protocols in common use, such as OSPF, may need seconds to exchange new link state information and converge to a common view of the network. In this period, the lack of valid network routes will affect the data plane.

Recently, there has been much attention in the research community and the IETF on resolving these problems using *proactive, local* IP recovery. Several schemes, collectively called IP fast reroute by the IETF, have been proposed. Those mechanisms are able to recover packets during transient failures without global signaling. One of these mechanisms is Multiple Routing Configurations (MRC, [1]) which guarantees recovery from any single link or node failure.

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In order to better understand how MRC can be implemented in a real routing system, we have built a prototype based on the Quagga routing suite [2] and the native Linux forwarding. MRC is implemented in its recently introduced, more efficient, ("relaxed") version [3].

The demonstrator architecture consists of two main components; an extension to the routing protocol provided by Quagga, and an extension to the kernel forwarding procedure.

MRC functionality is added to Quagga using a two stage process. First, a backup configuration generator reads the network topology from Quagga's OSPF daemon, and produces the configurations that satisfy the formal requirements of the MRC model. Subsequently, a routing information mapping processor uses the backup configurations and the existing OSPF routing information to populate backup forwarding tables. This is done in order to avoid using certain links for forwarding recovered packets. One such table is constructed per backup configuration.

The forwarding engine is extended with a generic framework that manages core IP fast reroute functionality, and an implementation of MRC recovery mechanisms. The framework identifies packets originally assigned to failed interfaces, while the MRC mechanism determines the backup configuration for each packet. Packets assigned to the appropriate operative outgoing interface are in accordance to the MRC requirements, tagged with a predefined recovery configuration identifier. This enables routers further down the forwarding path to use the right backup forwarding table.

The demonstrator comprises four ASUS WL-500gp routers running the OpenWrt Linux distribution. They are arranged in a circular topology, connecting two laptops. A video is streamed from one laptop and displayed on the other. With MRC fast recovery enabled, removal of the link used for data forwarding does not affect the video transmission.

2. REFERENCES

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