Connection load balancing with mikrotik [workshop]

Mikrotik User Meeting Jakarta, 13 october 2016

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GLC Networks, Indonesia

Agenda

- Introduction
- The basics: connection and routing
- Load Balancing (LB) techniques (PCC)
- Some issues and recommendations
- Q & A

What is GLC?

- Garda Lintas Cakrawala (www.glcnetworks.com)
- An Indonesian company
- Located in Bandung
- Areas: Training, IT Consulting
- Mikrotik Certified Training Partner
- Mikrotik Certified Consultant
- Mikrotik distributor

Trainer Introduction

- Name: Achmad Mardiansyah
- Base: bandung, Indonesia
- Linux user since ’99
- Certified Trainer (MTCNA/RE/WE/UME/INE/TCE)
- Mikrotik Certified Consultant
- Work: Telco engineer, Sysadmin, PHP programmer, and Lecturer
- Personal website: http://achmad.glcnetworks.com
- More info: http://au.linkedin.com/in/achmadmardiansyah

About Telkom University

- Located in Bandung, Indonesia
- 7 Faculties, 27 schools
- Areas: Engineering, Communications, Computing, Bussiness and management, Arts
- 650+ Academic staff, 400+ Administration staff, 20000+ students
- An exchange program
- Runs mikrotik academy program

Mikrotik academy @ TEL-U

- Started in 2013
- Embedded into schools curricula
- 100% hands-on
- Get MTCNA certification

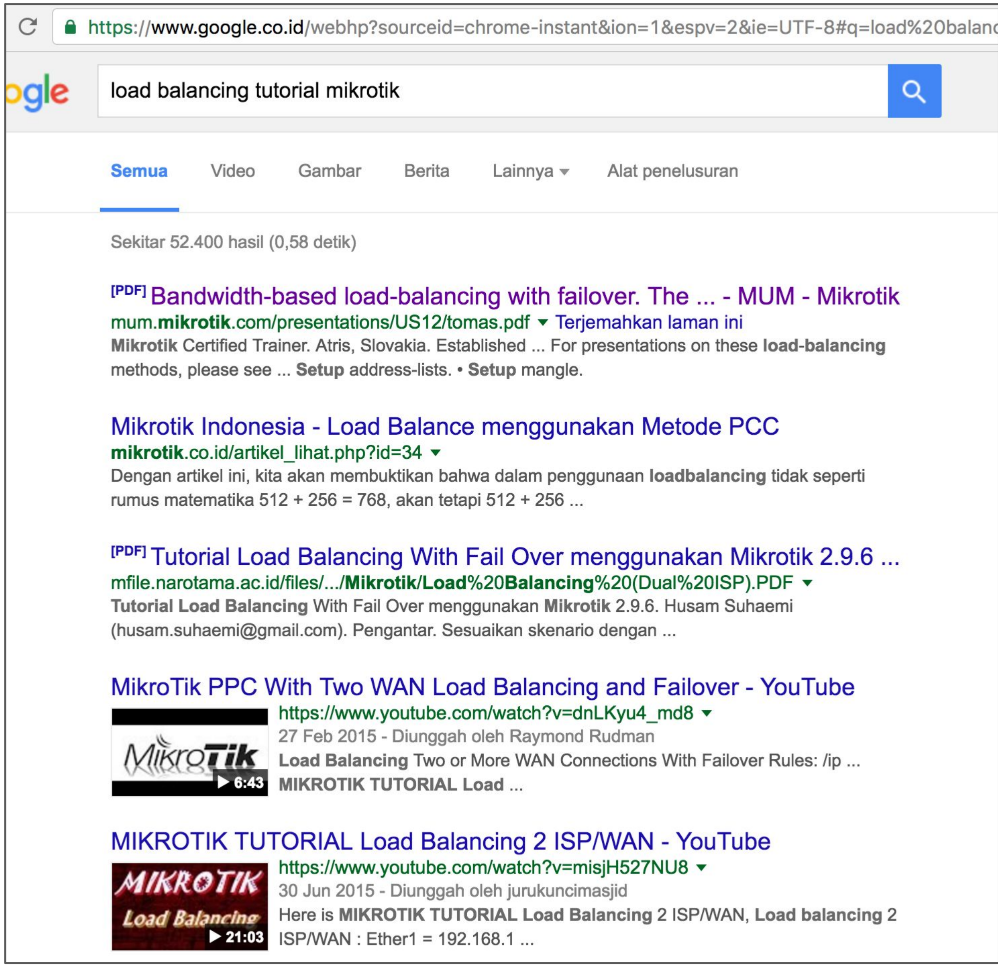
The basics: Connection and Routing

Why should i care?

- Lots of tutorials in internet!!!
- Tons of pages, tutorial, videos

Questions for reader:

- Do you really understand that?
- Did the writer understand that?
- Is it really works as expected?



https://www.google.co.id/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=load%20balanc

load balancing tutorial mikrotik

Sekitar 52.400 hasil (0,58 detik)

[PDF] Bandwidth-based load-balancing with failover. The ... - MUM - Mikrotik
mum.mikrotik.com/presentations/US12/tomas.pdf ▾ Terjemahkan laman ini
Mikrotik Certified Trainer. Atris, Slovakia. Established ... For presentations on these load-balancing methods, please see ... Setup address-lists. • Setup mangle.

Mikrotik Indonesia - Load Balance menggunakan Metode PCC
mikrotik.co.id/artikel_lihat.php?id=34 ▾
Dengan artikel ini, kita akan membuktikan bahwa dalam penggunaan loadbalancing tidak seperti rumus matematika 512 + 256 = 768, akan tetapi 512 + 256 ...

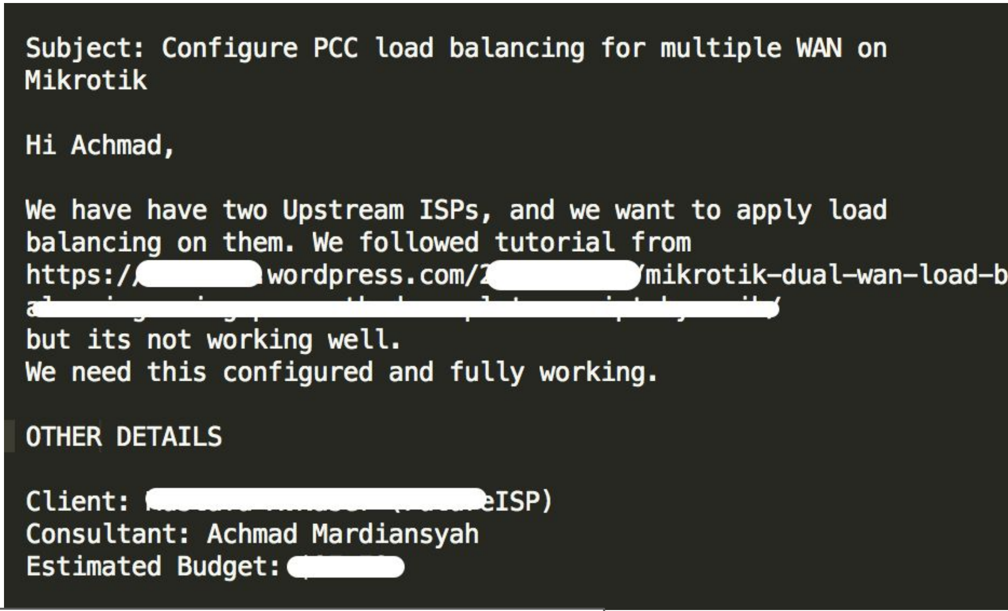
[PDF] Tutorial Load Balancing With Fail Over menggunakan Mikrotik 2.9.6 ...
mfile.narotama.ac.id/files/.../Mikrotik/Load%20Balancing%20(Dual%20ISP).PDF ▾
Tutorial Load Balancing With Fail Over menggunakan Mikrotik 2.9.6. Husam Suhaemi (husam.suhaemi@gmail.com). Pengantar. Sesuaikan skenario dengan ...

MikroTik PPC With Two WAN Load Balancing and Failover - YouTube
https://www.youtube.com/watch?v=dnLKyu4_md8 ▾
27 Feb 2015 - Diunggah oleh Raymond Rudman
Load Balancing Two or More WAN Connections With Failover Rules: /ip ... MIKROTIK TUTORIAL Load ...

MIKROTIK TUTORIAL Load Balancing 2 ISP/WAN - YouTube
https://www.youtube.com/watch?v=misjH527NU8 ▾
30 Jun 2015 - Diunggah oleh jurukuncimasjid
Here is MIKROTIK TUTORIAL Load Balancing 2 ISP/WAN, Load balancing 2 ISP/WAN : Ether1 = 192.168.1 ...

Are those webpages really works on you?

- Information overloaded… which one suits you?
- Perhaps they have different environment on their network
- You need to understand how it works...



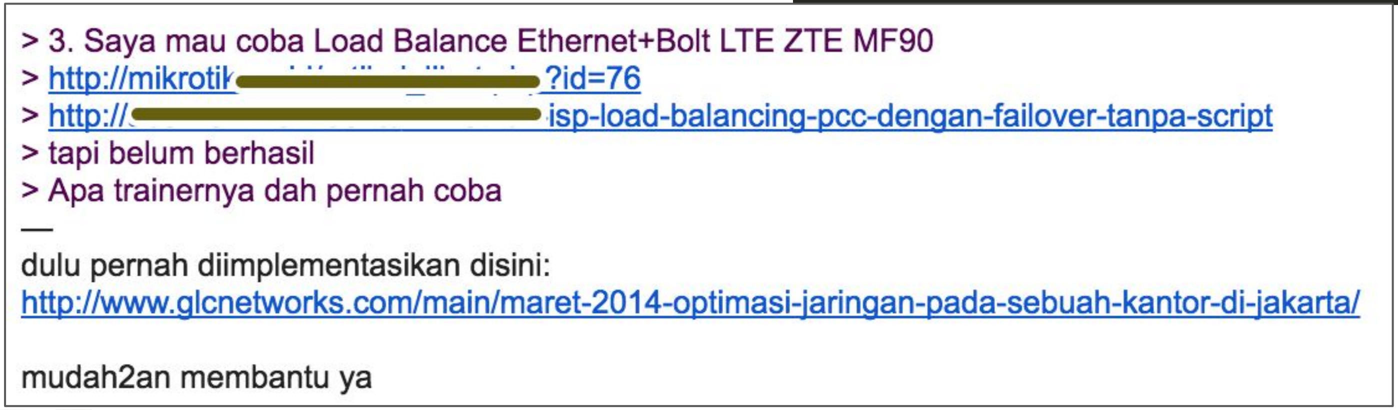
```
Subject: Configure PCC load balancing for multiple WAN on
Mikrotik

Hi Achmad,

We have have two Upstream ISPs, and we want to apply load
balancing on them. We followed tutorial from
https:/[redacted]wordpress.com/[redacted]/mikrotik-dual-wan-load-b
[redacted]
but its not working well.
We need this configured and fully working.

OTHER DETAILS

Client: [redacted]eISP)
Consultant: Achmad Mardiansyah
Estimated Budget: [redacted]
```



> 3. Saya mau coba Load Balance Ethernet+Bolt LTE ZTE MF90
> http://mikrotik[redacted]?id=76
> http://[redacted]isp-load-balancing-pcc-dengan-failover-tanpa-script
> tapi belum berhasil
> Apa trainernya dah pernah coba

—

dulu pernah diimplementasikan disini:
http://www.glcnetworks.com/main/maret-2014-optimasi-jaringan-pada-sebuah-kantor-di-jakarta/

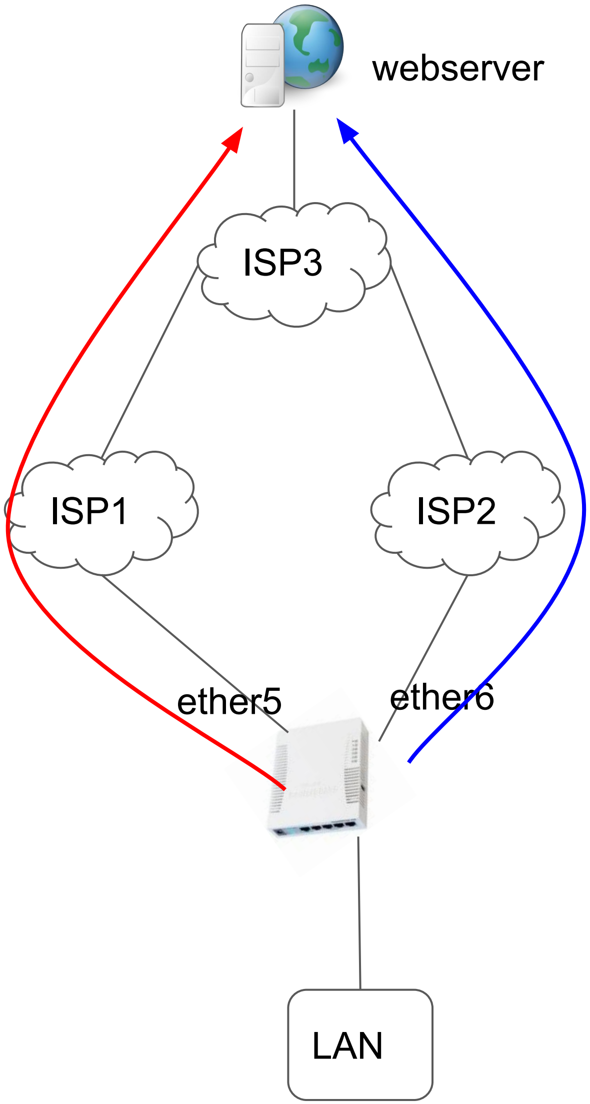
mudah2an membantu ya

What is (traffic) load balancing?

- Is a process to forward traffic on several links
- Applied on router
- != failover

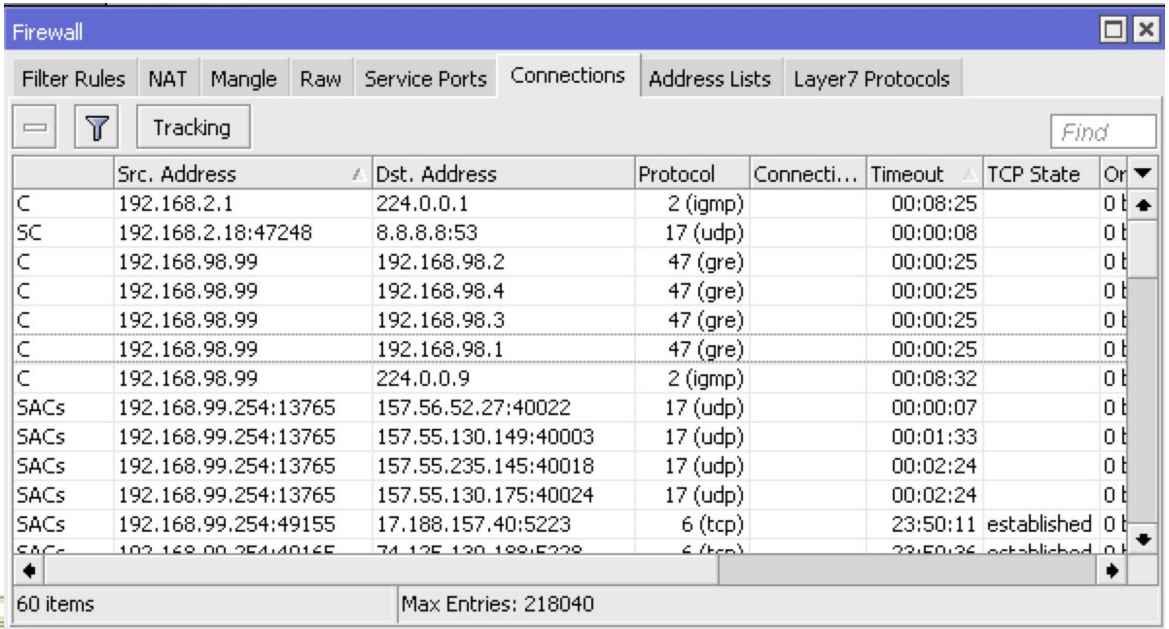
Benefits:

- Increase utilisation of upstream links



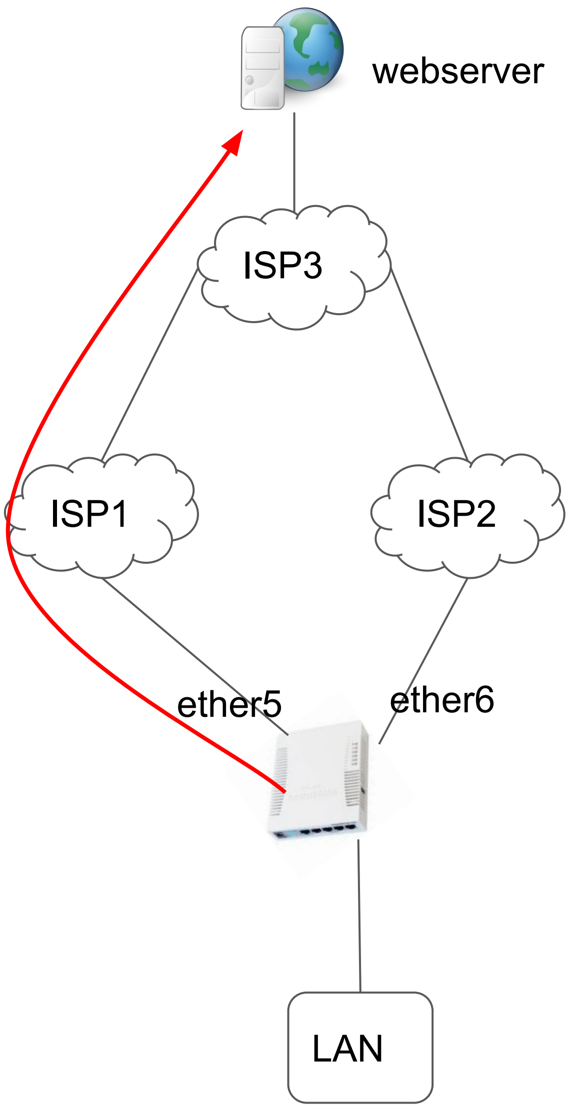
What is connection?

- When you access a server you will create a connection
- **Connection** is identified by a set of IP addresses (source and destination) and ports (source and destination)
- See connection tracking below



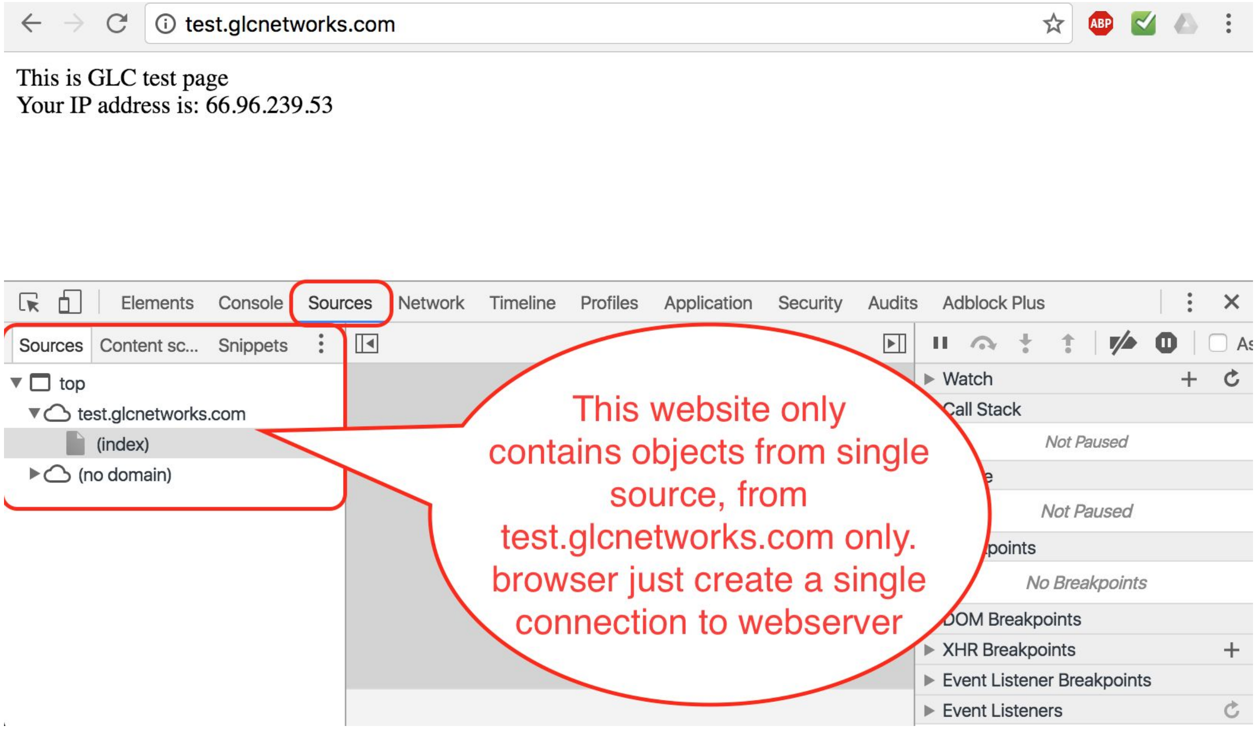
	Src. Address	Dst. Address	Protocol	Connecti...	Timeout	TCP State	Or
C	192.168.2.1	224.0.0.1	2 (igmp)		00:08:25		0 b
SC	192.168.2.18:47248	8.8.8.8:53	17 (udp)		00:00:08		0 b
C	192.168.98.99	192.168.98.2	47 (gre)		00:00:25		0 b
C	192.168.98.99	192.168.98.4	47 (gre)		00:00:25		0 b
C	192.168.98.99	192.168.98.3	47 (gre)		00:00:25		0 b
C	192.168.98.99	192.168.98.1	47 (gre)		00:00:25		0 b
C	192.168.98.99	224.0.0.9	2 (igmp)		00:08:32		0 b
SACs	192.168.99.254:13765	157.56.52.27:40022	17 (udp)		00:00:07		0 b
SACs	192.168.99.254:13765	157.55.130.149:40003	17 (udp)		00:01:33		0 b
SACs	192.168.99.254:13765	157.55.235.145:40018	17 (udp)		00:02:24		0 b
SACs	192.168.99.254:13765	157.55.130.175:40024	17 (udp)		00:02:24		0 b
SACs	192.168.99.254:49155	17.188.157.40:5223	6 (tcp)		23:50:11	established	0 b
SACs	192.168.99.254:49165	74.125.130.188:5228	6 (tcp)		23:59:36	established	0 b

60 items | Max Entries: 218040



Single connection to a website

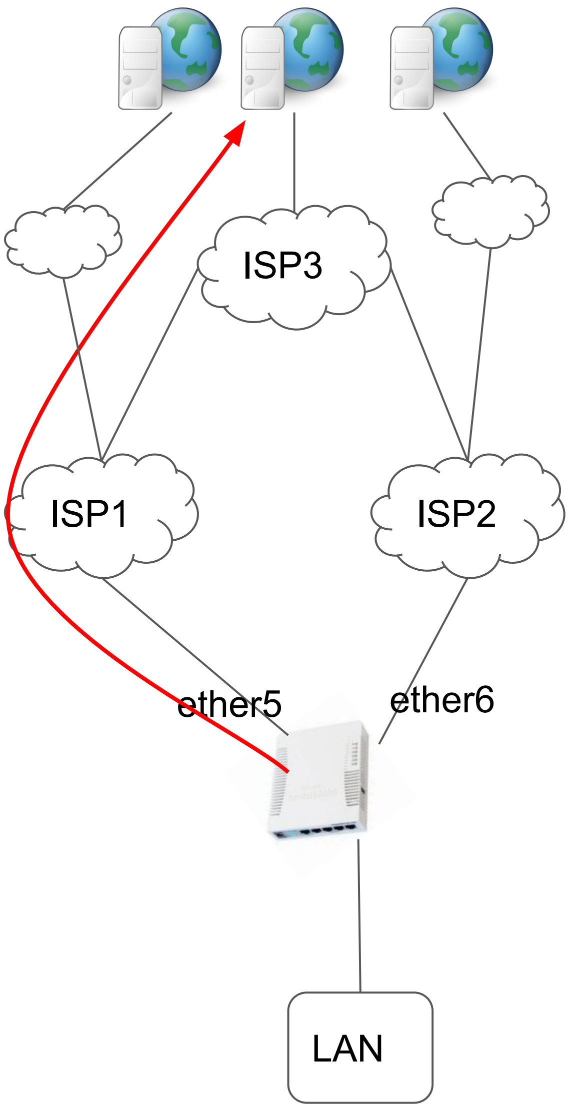
Website with single connection:
http://test.glcnetworks.com



test.glcnetworks.com

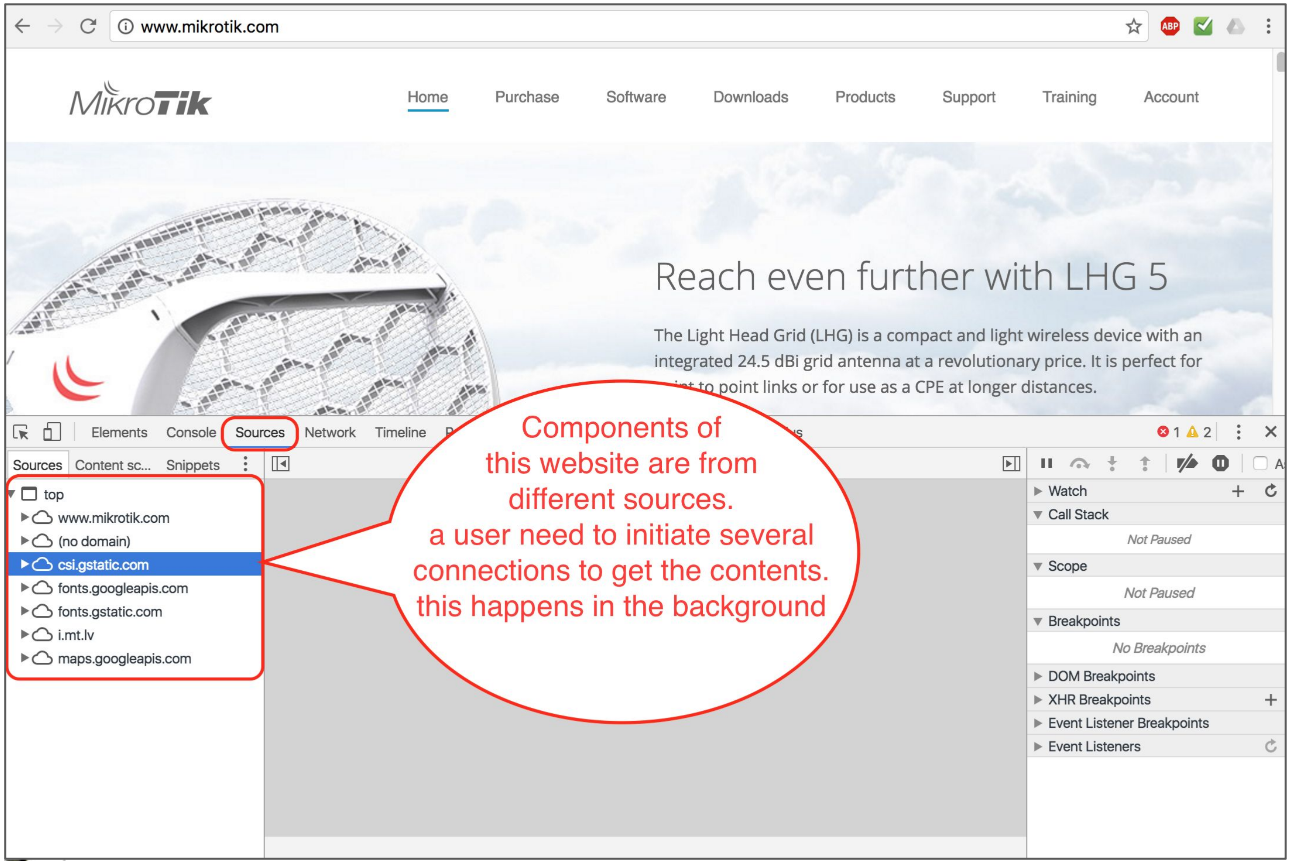
This is GLC test page
Your IP address is: 66.96.239.53

This website only contains objects from single source, from test.glcnetworks.com only. browser just create a single connection to webserver



Website with multiple objects

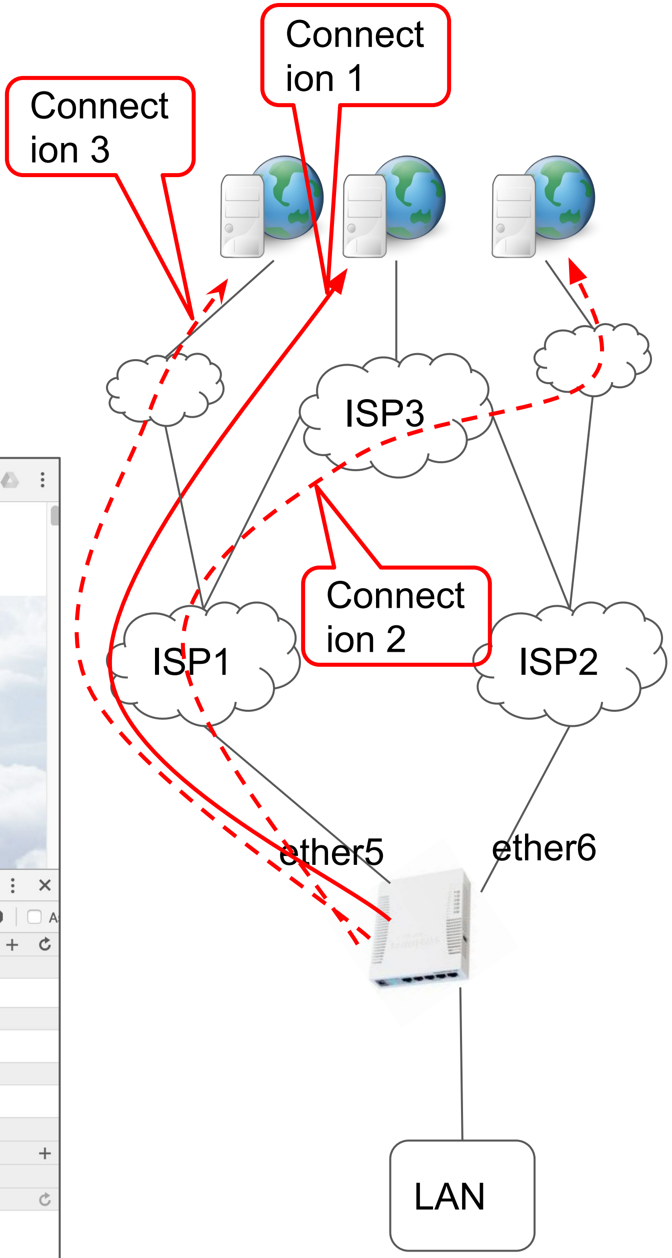
- Client will open multiple connections to get website components



Reach even further with LHG 5

The Light Head Grid (LHG) is a compact and light wireless device with an integrated 24.5 dBi grid antenna at a revolutionary price. It is perfect for ...int to point links or for use as a CPE at longer distances.

Components of this website are from different sources.
a user need to initiate several connections to get the contents.
this happens in the background



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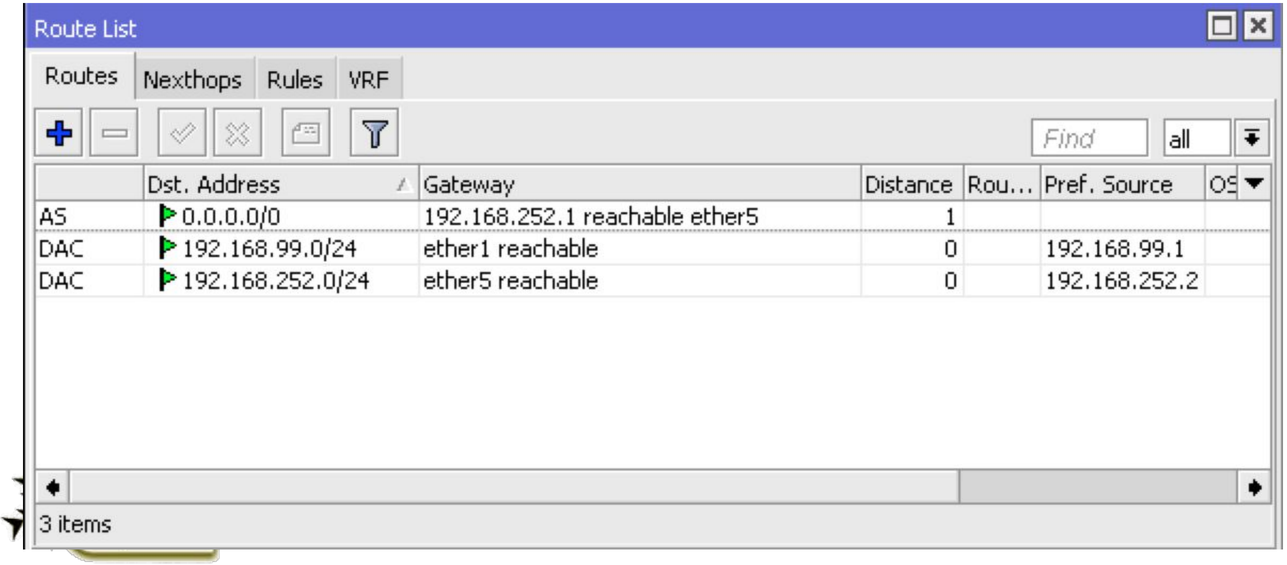
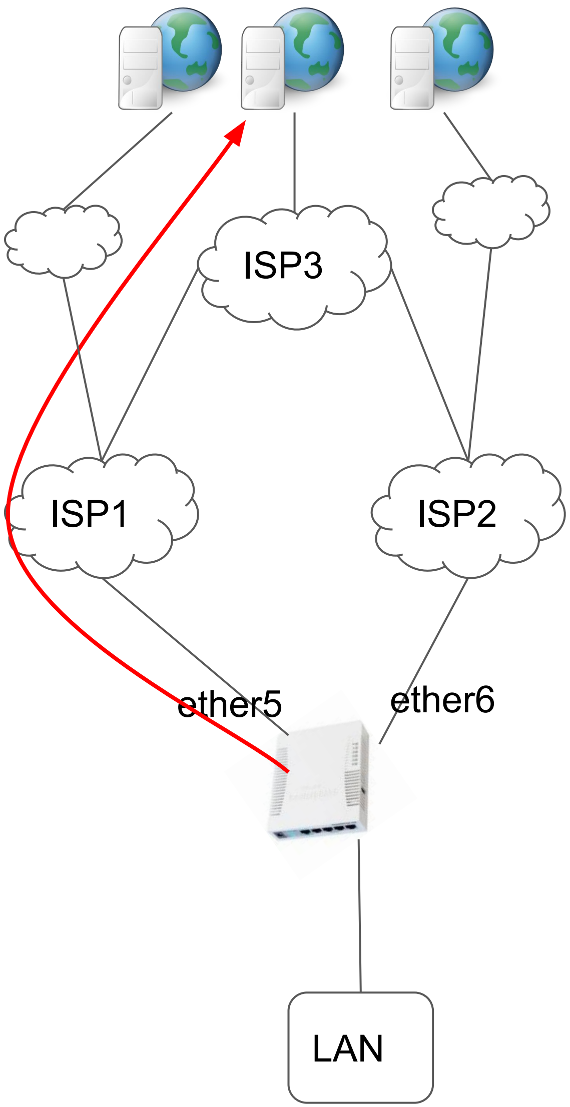
Routing and Forwarding

- A process to forward a packet from input interface to output interface, based on information on routing table.
- As we use private IP address, there will be a NAT process before sending out to exit interface
- To check our public IP address, go to http://test.glcnetworks.com



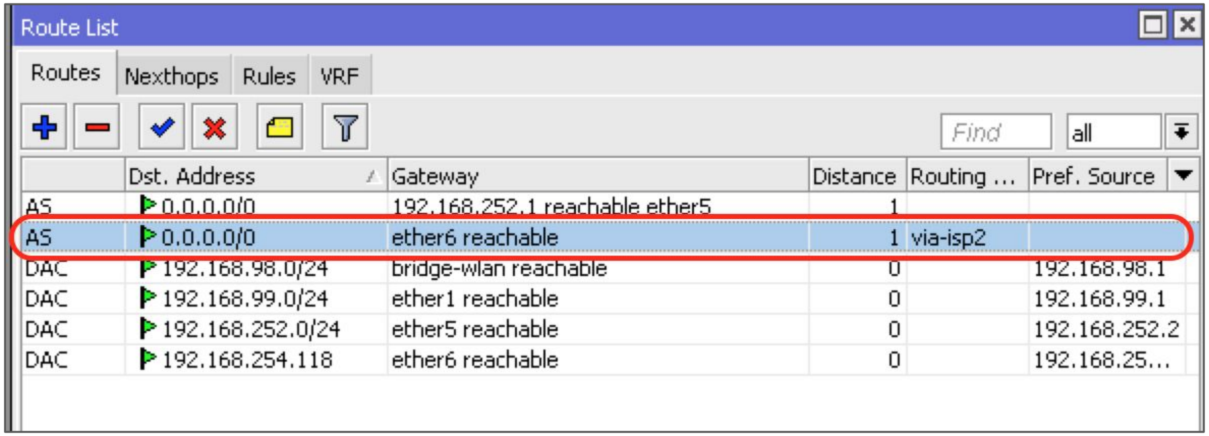
	Dst. Address	Gateway	Distance	Rou...	Pref. Source	OS
AS	0.0.0.0/0	192.168.252.1 reachable ether5	1			
DAC	192.168.99.0/24	ether1 reachable	0		192.168.99.1	
DAC	192.168.252.0/24	ether5 reachable	0		192.168.252.2	

3 items

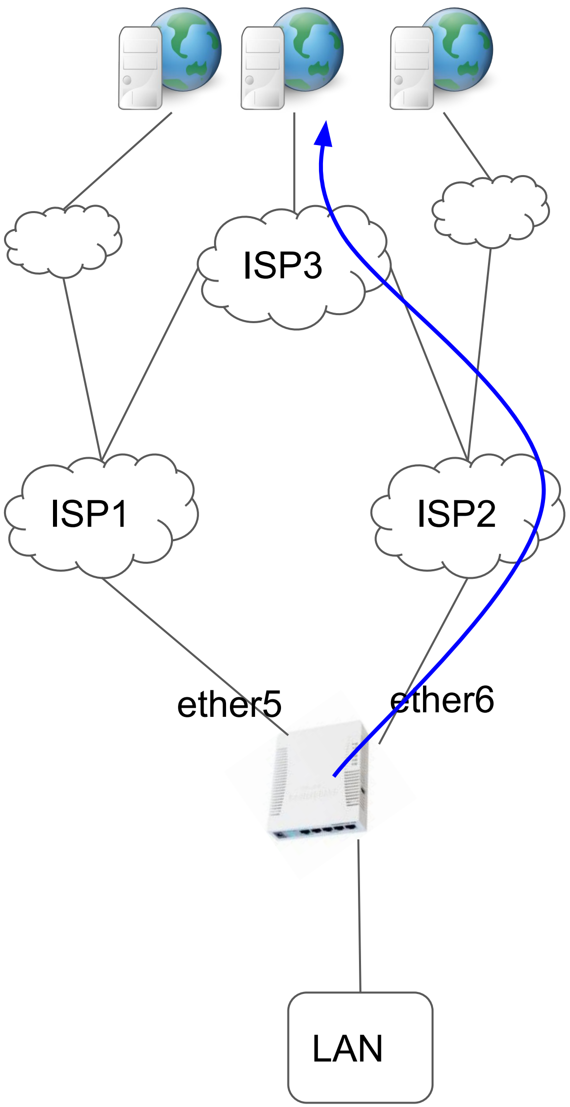


Adjust routing (mangle: mark-routing)

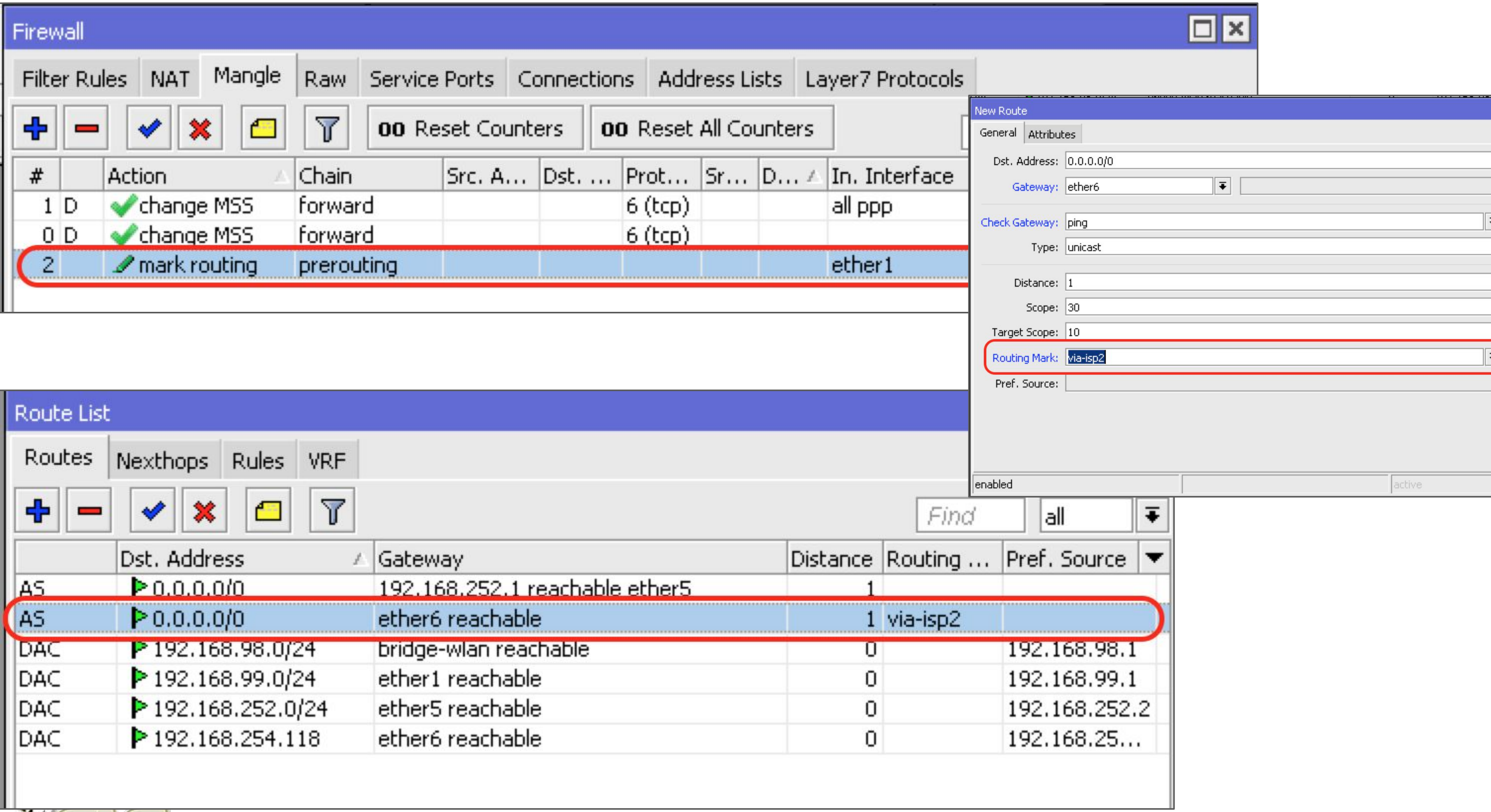
- Process to mark a packet to for routing purpose
- Steps:
  - Create firewall mangle with action mark-routing
  - Create routing entry with defined-mark
  - Create NAT rule if we use private IP address
- To check our public IP address, go to http://test.glcnetworks.com



	Dst. Address	Gateway	Distance	Routing ...	Pref. Source
AS	0.0.0.0/0	192.168.252.1 reachable ether5	1		
AS	0.0.0.0/0	ether6 reachable	1	via-isp2	
DAC	192.168.98.0/24	bridge-wlan reachable	0		192.168.98.1
DAC	192.168.99.0/24	ether1 reachable	0		192.168.99.1
DAC	192.168.252.0/24	ether5 reachable	0		192.168.252.2
DAC	192.168.254.118	ether6 reachable	0		192.168.25...



Forward traffic via ISP2 using mangle

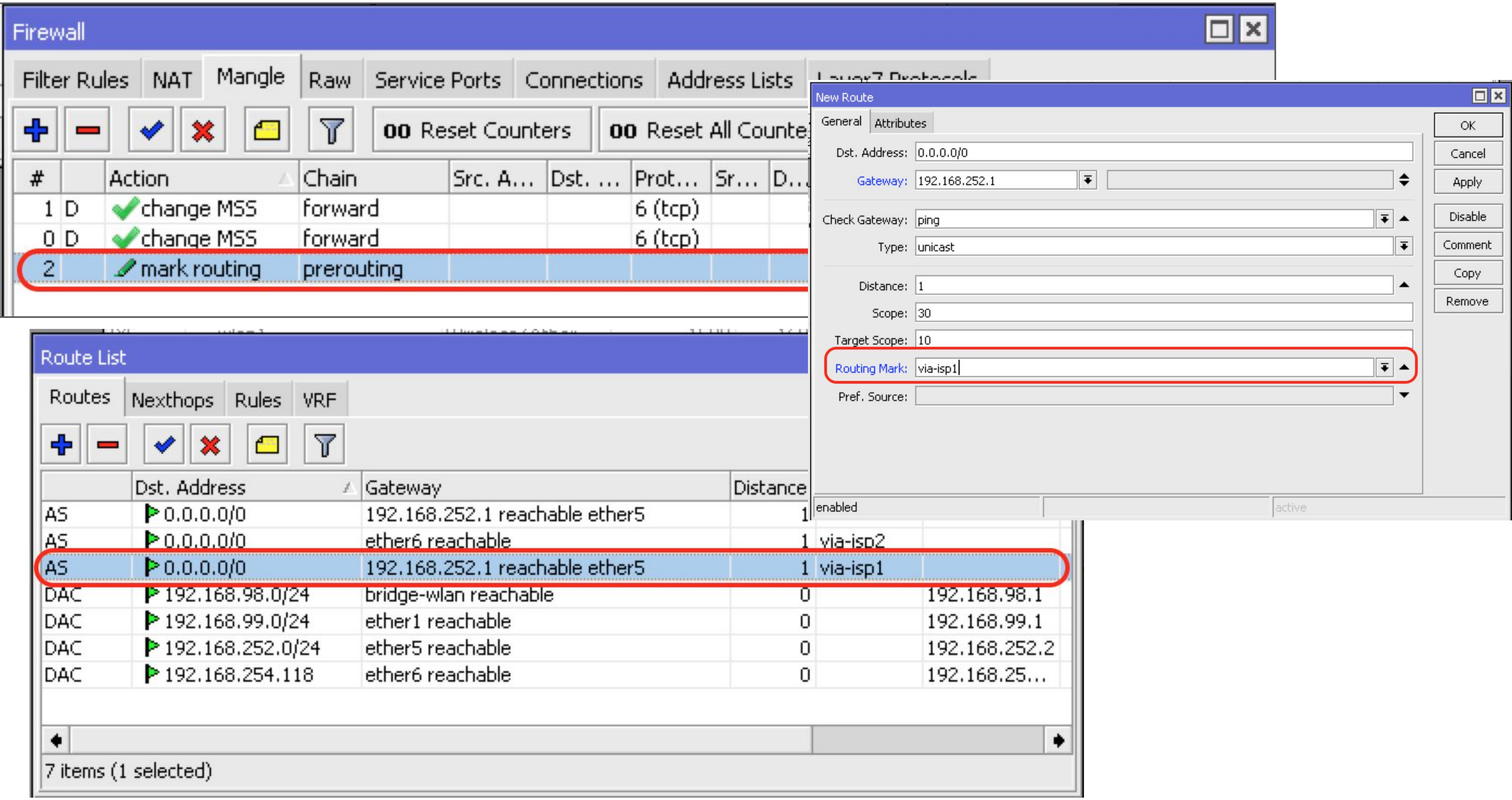


#		Action	Chain	Src. A...	Dst. ...	Prot...	Sr...	D...	In. Interface
1	D	change MSS	forward			6 (tcp)			all ppp
0	D	change MSS	forward			6 (tcp)			
2		mark routing	prerouting						ether1

Dst. Address: 0.0.0.0/0
Gateway: ether6
Check Gateway: ping
Type: unicast
Distance: 1
Scope: 30
Target Scope: 10
Routing Mark: via-isp2
Pref. Source:

	Dst. Address	Gateway	Distance	Routing ...	Pref. Source
AS	0.0.0.0/0	192.168.252.1 reachable ether5	1		
AS	0.0.0.0/0	ether6 reachable	1	via-isp2	
DAC	192.168.98.0/24	bridge-wlan reachable	0		192.168.98.1
DAC	192.168.99.0/24	ether1 reachable	0		192.168.99.1
DAC	192.168.252.0/24	ether5 reachable	0		192.168.252.2
DAC	192.168.254.118	ether6 reachable	0		192.168.25...

Forward traffic via ISP1 using mangle



#		Action	Chain	Src. A...	Dst. ...	Prot...	Sr...	D...
1	D	✓ change MSS	forward			6 (tcp)		
0	D	✓ change MSS	forward			6 (tcp)		
2		mark routing	prerouting					

Dst. Address: 0.0.0.0/0

Gateway: 192.168.252.1

Check Gateway: ping

Type: unicast

Distance: 1

Scope: 30

Target Scope: 10

Routing Mark: via-isp1

Pref. Source:

enabled | | active

	Dst. Address	Gateway	Distance		
AS	0.0.0.0/0	192.168.252.1 reachable ether5	1		
AS	0.0.0.0/0	ether6 reachable	1	via-isp2	
AS	0.0.0.0/0	192.168.252.1 reachable ether5	1	via-isp1	
DAC	192.168.98.0/24	bridge-wlan reachable	0		192.168.98.1
DAC	192.168.99.0/24	ether1 reachable	0		192.168.99.1
DAC	192.168.252.0/24	ether5 reachable	0		192.168.252.2
DAC	192.168.254.118	ether6 reachable	0		192.168.25...

7 items (1 selected)

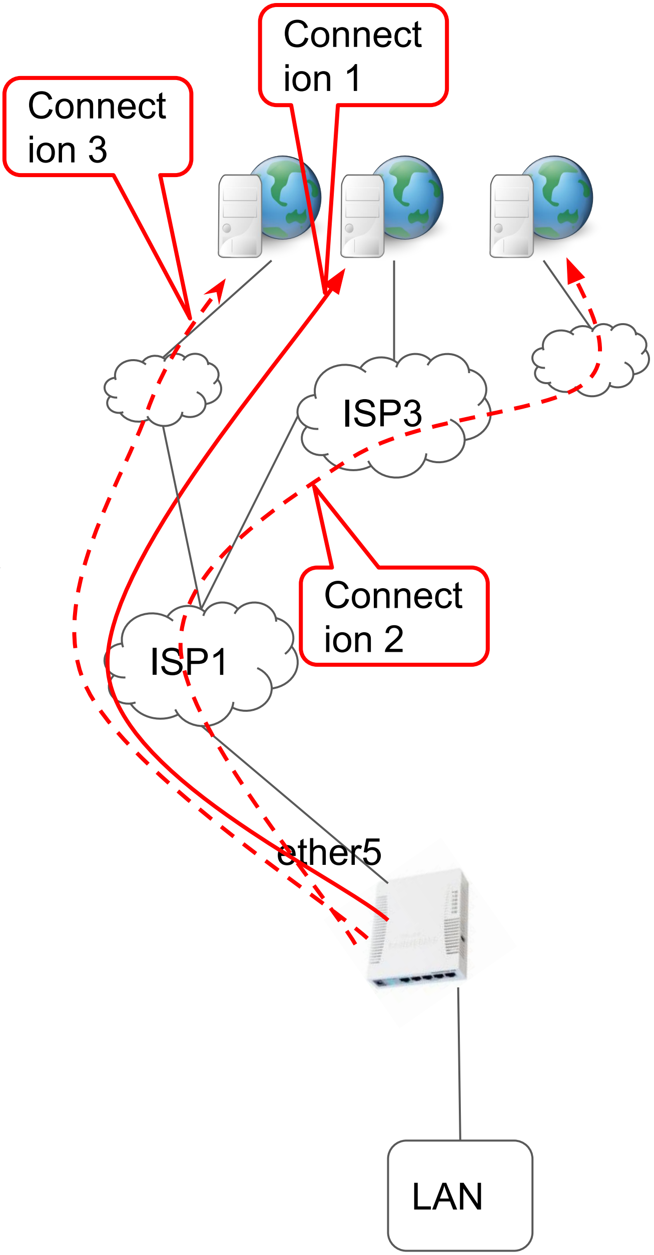
Load Balancing techniques

Load balancing techniques

Method	**Per-connection**	**per-packet**
Firewall marking	**YES**	**YES**
ECMP	**YES**	NO
PCC	**YES**	NO
Nth	**YES**	**YES**
Bonding	NO	**YES**
OSPF	**YES**	NO
BGP	**YES**	NO

How PCC works?

- PCC = Per Connection Classifier
- PCC can identify the connection and mark them for further processing
- Example: a client opens a multi-object website via single ISP. both addresses (src-address and dst-address) are used to identify connection
- PCC can identify each connection made from client

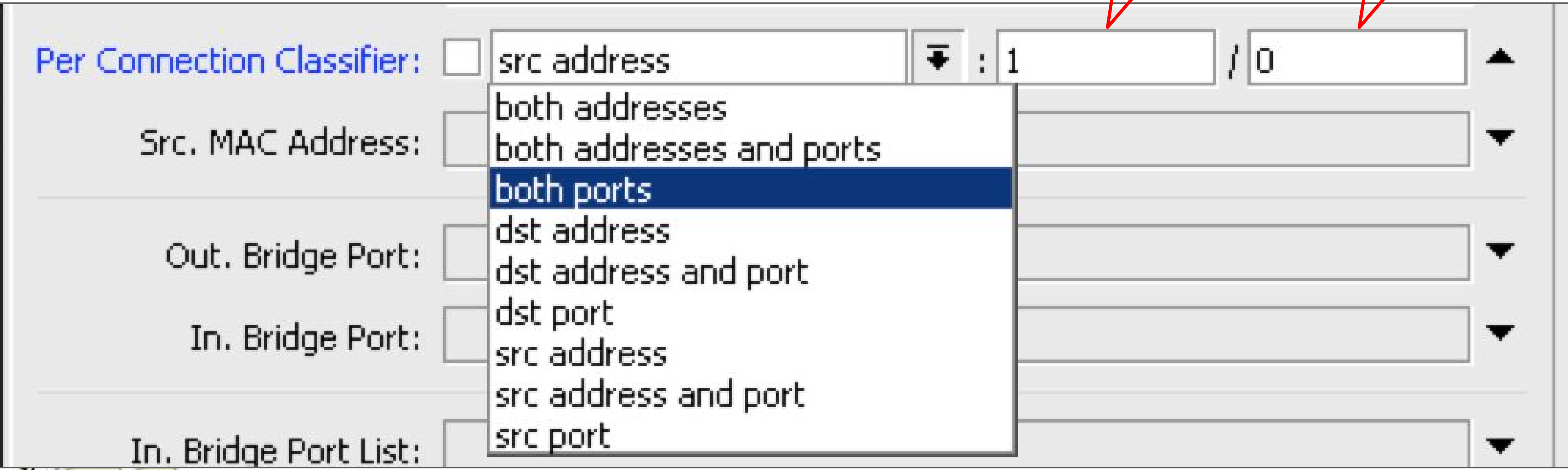


Applying PCC

- You need to understand the concept of connection
- Applied on firewall mangle
- Need to define classifier. Can be based on:
    - Source or destination address only
    - Both addresses
    - Etc
- Define connection number and total connection

Total connection

Connection identifier

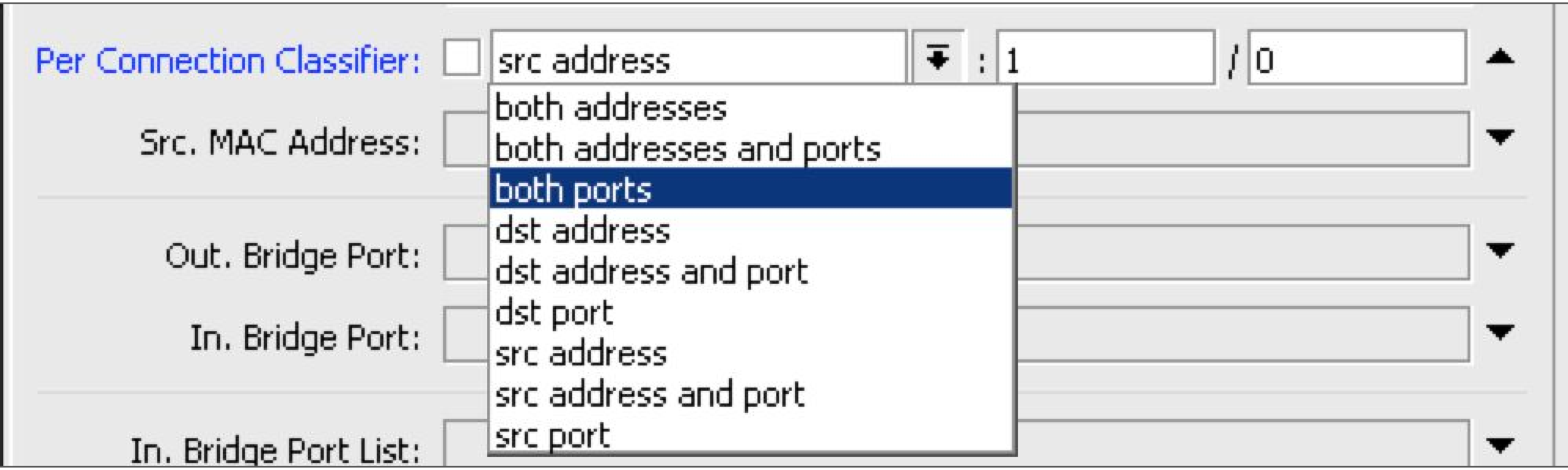


Per Connection Classifier: □ src address : 1 / 0

www.glcnetworks.com

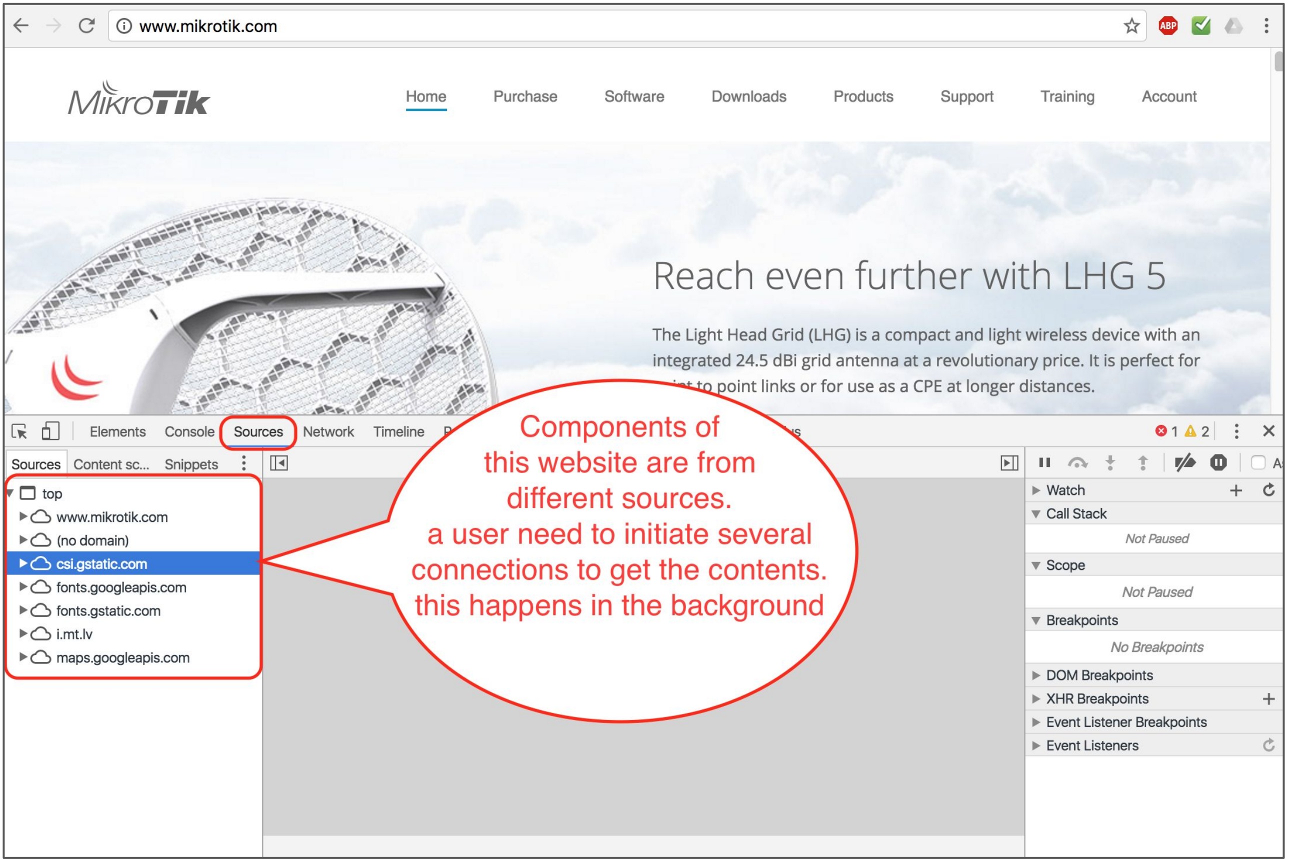
Lets play with PCC classifier...

- Apply different classifier and check the result



Per Connection Classifier: □ src address : 1 / 0

Website with multiple objects, LB with classifier: both address



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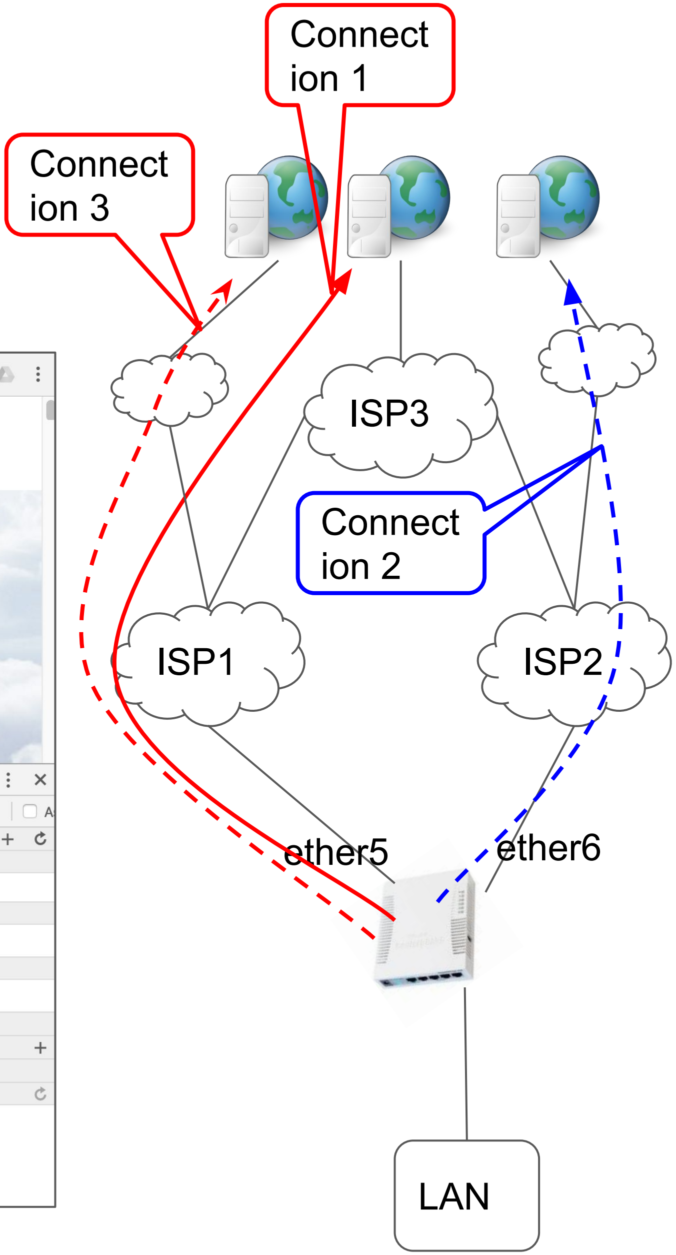


Some issues & recommendations

Some issues & recommendations

Issues:

- **Beware of NATed connection** -> webserver will see inbound connection from 2 ip public addresses -> page will not displayed correctly (as it is considered illegal session)
- **Beware of NATed connection** -> webserver will see inbound connection from 2 ip public addresses -> banking / https pages will not allow you to access their website

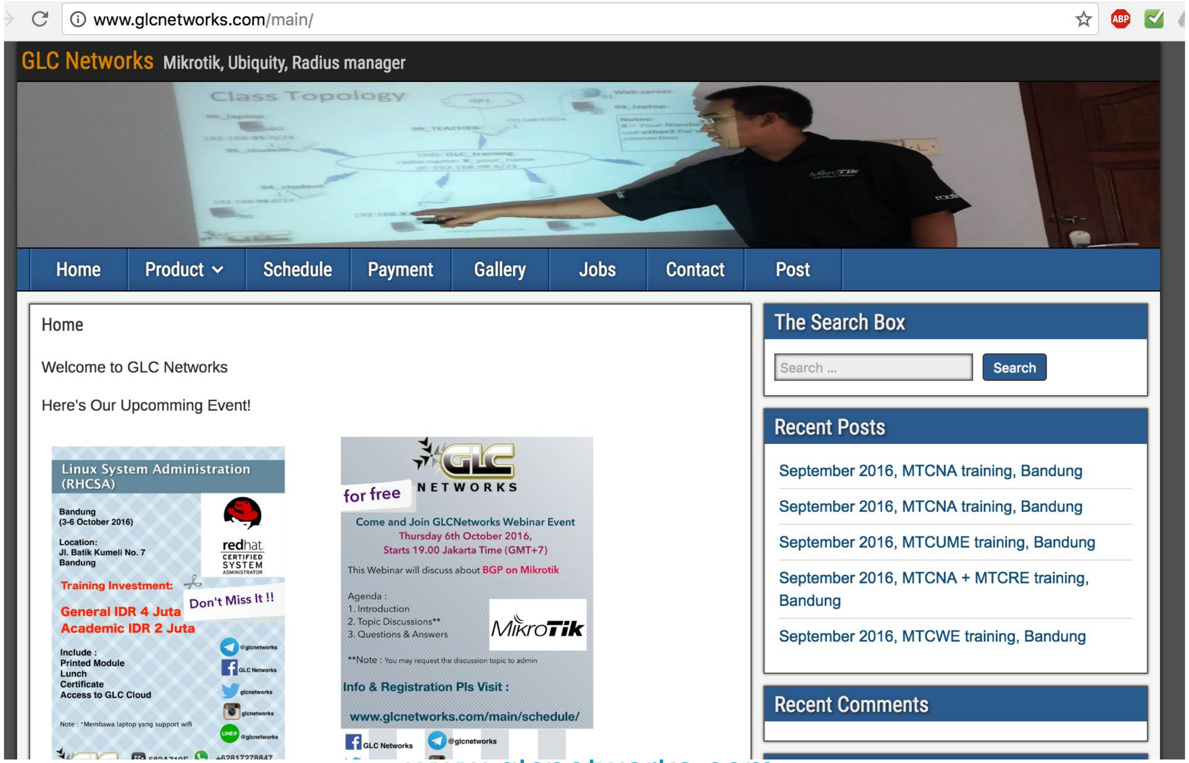
Recommendations

- **If you use NAT**, Better to use classifier based on **source IP address** only -> will give client consistent path to the destination
- **Avoid NAT if possible** -> using public IP address end-to-end -> use BGP -> better performance

QA

Some info

- Hope you are more curious now
- These materials are part of Mikrotik Certified Traffic Control Engineer (MTCTCE) course
- If you are interested, you can sign up to our website



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Thursday 6th October 2016,
Starts 19.00 Jakarta Time (GMT+7)

This Webinar will discuss about BGP on Mikrotik

Agenda :
1. Introduction
2. Topic Discussions**
3. Questions & Answers

**Note : You may request the discussion topic to admin

Info & Registration Pls Visit :

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