Global Technology Associates, Inc.

Internet Firewall Developer since 1994

Advanced Networking
Link Aggregation

Course # 3101

What does Link Aggregation do on GTA Firewalls?

- Binds or aggregates two or more Ethernet interfaces to act as one interface.
- Provides redundant Interfaces in the event of
  - NIC failure on firewall
  - Port failure on switch
  - Switch failure if multiple switches are used
  - Cable failure
- Provides Increased Through Put in some instances.
- Supported both IPv4 & IPv6 Addresses

What LAG does not do?

- Does not aggregate different Internet connections.
- Does not bridge the connections.

Link Aggregation
4 configurations

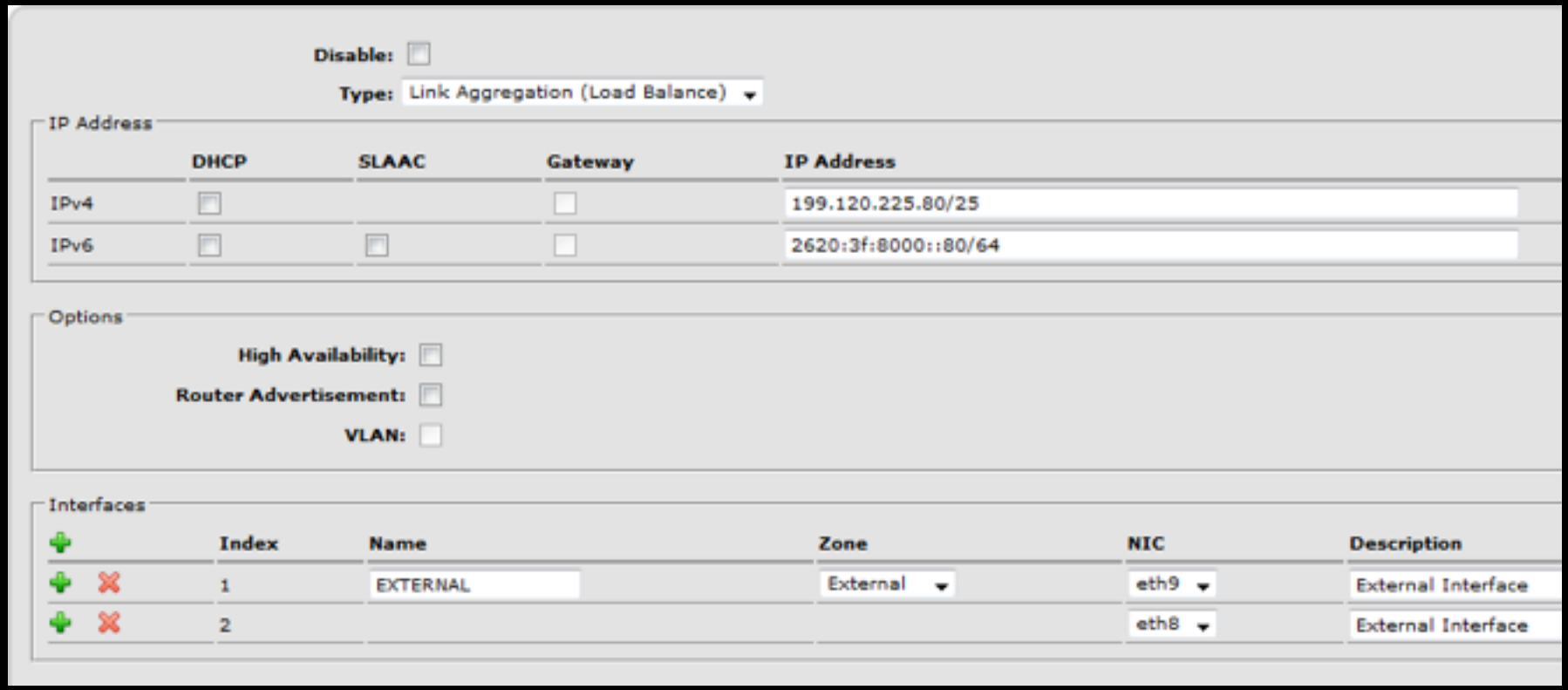
- LACP -Link Aggregation Control Protocol
- Fail over
- Load Balance
- Round Robin

Requirements

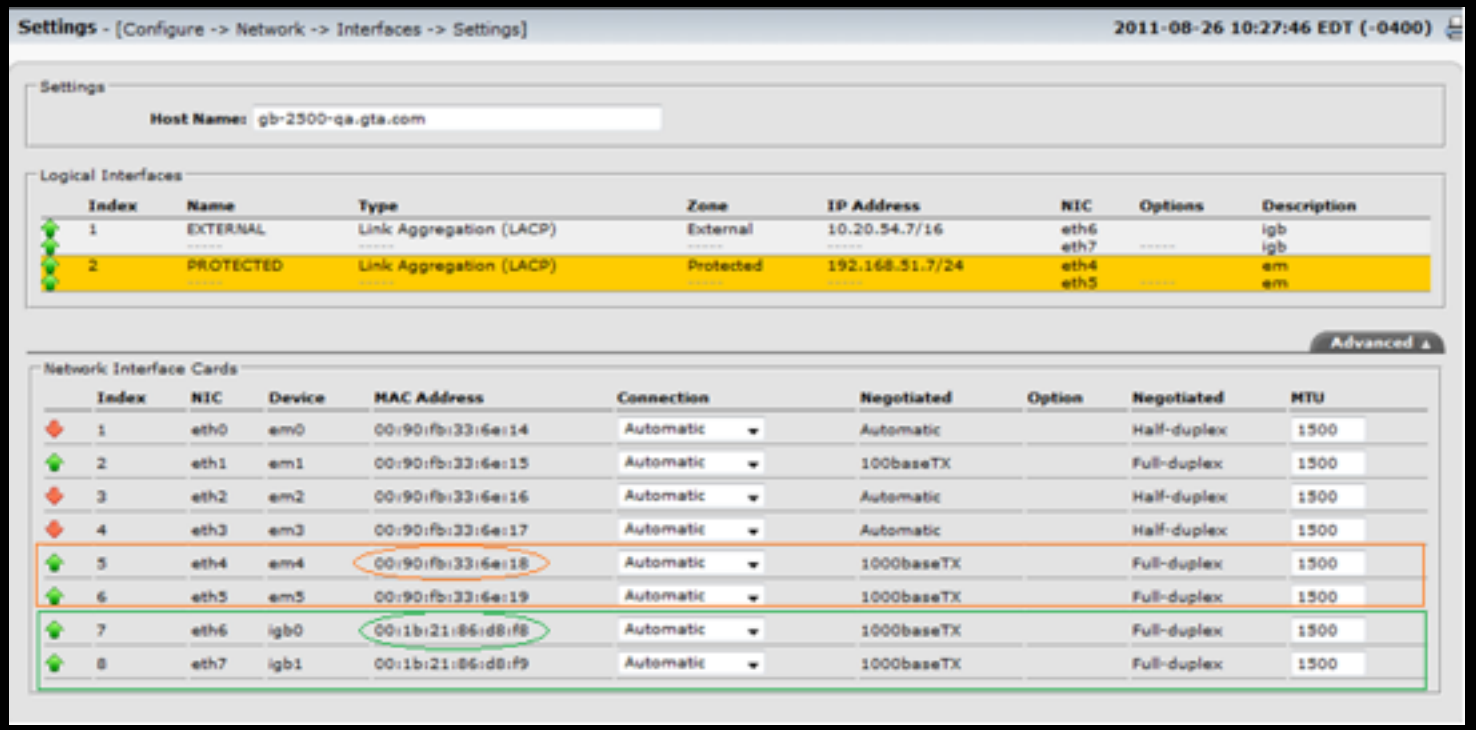
- GB-OS 5.2 or later
- LACP – Switch or Switches that support LACP
- 3 or more interfaces
- All GTA Firewalls support Link Aggregation

Configure a Link Aggregation

- [Network -> Interfaces -> Settings]
- Select an Interface and set type to the LAG required.
- Click plus to add additional interfaces



LAG Properties



- Once an Interface is added to a LAG it is treated as a single interface
- Primary Interface or port is interface in index 1 of the LAG interface.
- MAC address – LAG interface assume the MAC address of the NIC in the primary index.
  - Example above the there are two LAGG's
    - Eth4 & eth5 MAC 00:90:fb:33:6e:18 (EM4 & EM5)
    - Eth6 & eth7 mac 00:1b:21:86:d8:f8 (IGB0 & IGB1)

LACP

- LACP will negotiate a set of links between the firewall and a peer.
- Each LAG is composed of one or more links set to the same speed and duplex.
- Packets will be balanced across all active ports
- Current Implementation does not allow administrative variables to be set
  - Always uses Active Mode
  - 0x8000 as system and port priorities.

Peer Switch Using LACP

Logical Interfaces

Index	Name	Type	Zone	IP Address	NIC	Options	Description
1	EXTERNAL	Link Aggregation (LACP)	External	10.20.54.7/16	eth6 eth7		igb igb
2	PROTECTED	Link Aggregation (LACP)	Protected	192.168.51.7/24	eth4 eth5		em em

Eth4 & eth5 MAC 00:90:fb:33:6e:18 (EM4 & EM5)
Eth6 & eth7 MAC 00:1b:21:86:d8:f8 (IGB0 & IGB1)

LACP Status Overview

This page shows the status of your LACP groups.

Aggregation Information

Aggregation Group	Partner MAC Address	Local Ports Aggregated	Seconds Since Last Change
19	00-90-fb-33-6e-18	23,24	908

LACP Status Overview

This page shows the status of your LACP groups.

Aggregation Information

Aggregation Group	Partner MAC Address	Local Ports Aggregated	Seconds Since Last Change
23	00-1b-21-86-d8-f8	23,24	949

Fail Over

- Sends and receives traffic only through primary port
- If primary port fails or connection is broken the second interface takes over the connections

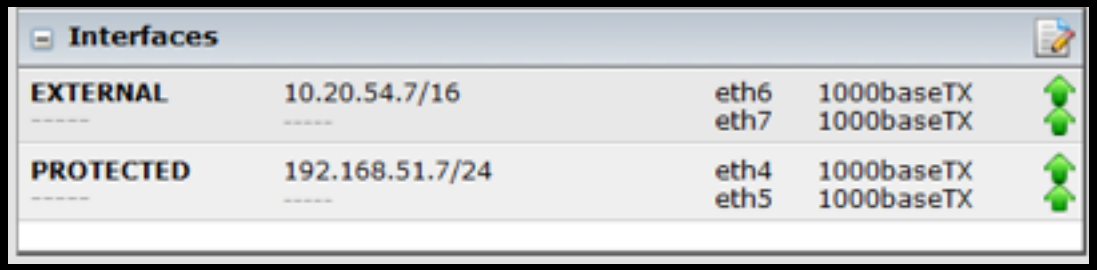
Round Robin

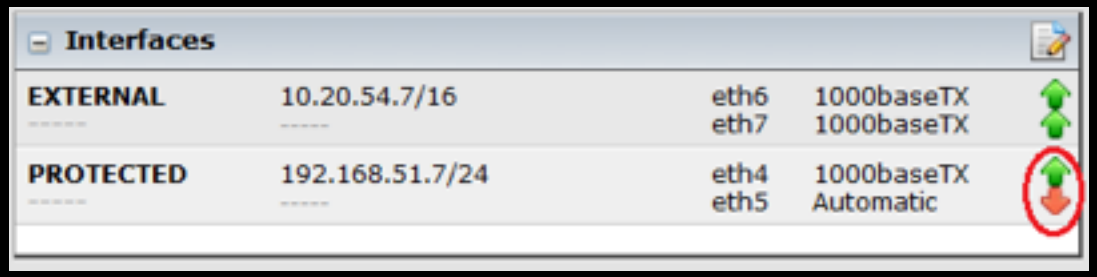
- Basic algorithm where outbound packets are distributed using a round robin approach
- Accepts packets on all configured ports that are up.

Load Balance

- Similar to Cisco Fast Ethernet Channel (FEC)
- Configuration where firewall does not negotiate the aggregation
- Accepts inbound packets on all configured and up interfaces.
- Balance the packets passing outbound through the firewall interface over the ports configured and up in the LAG.
- Algorithm for this includes in the calculation
  - Source IP
  - Destination IP

Overview Display





A Green up arrow indicates an interface is physically connected.
A Red Down Arrow indicates the interface is not connected.

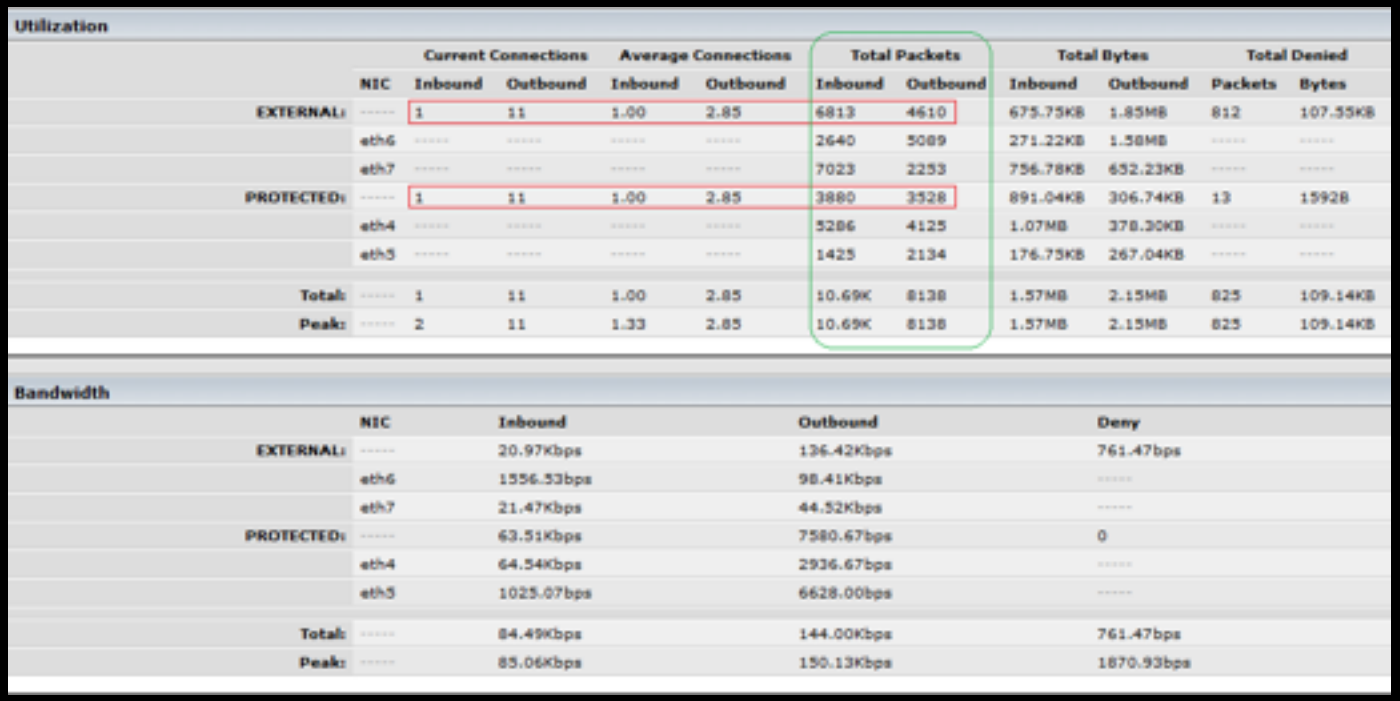
Log

Oct 14 13:32:40 pri=4 msg="alarm: Interface PROTECTED (eth4) down”

Oct 14 13:33:52 pri=5 msg="alarm: Interface PROTECTED (eth4) up"

Monitoring

[Monitor -> Activity -> Network -> Statistics]



Utilization

		Current Connections		Average Connections		Total Packets		Total Bytes		Total Denied	
	NIC	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Packets	Bytes
EXTERNAL:	-----	1	11	1.00	2.85	6813	4610	675.75KB	1.85MB	812	107.55KB
	eth6	-----	-----	-----	-----	2640	5089	271.22KB	1.58MB	-----	-----
	eth7	-----	-----	-----	-----	7023	2253	756.78KB	652.23KB	-----	-----
PROTECTED:	-----	1	11	1.00	2.85	3880	3528	891.04KB	306.74KB	13	15928
	eth4	-----	-----	-----	-----	5286	4125	1.07MB	378.30KB	-----	-----
	eth5	-----	-----	-----	-----	1425	2134	176.75KB	267.04KB	-----	-----
Total:	-----	1	11	1.00	2.85	10.69K	8138	1.57MB	2.15MB	825	109.14KB
Peak:	-----	2	11	1.33	2.85	10.69K	8138	1.57MB	2.15MB	825	109.14KB

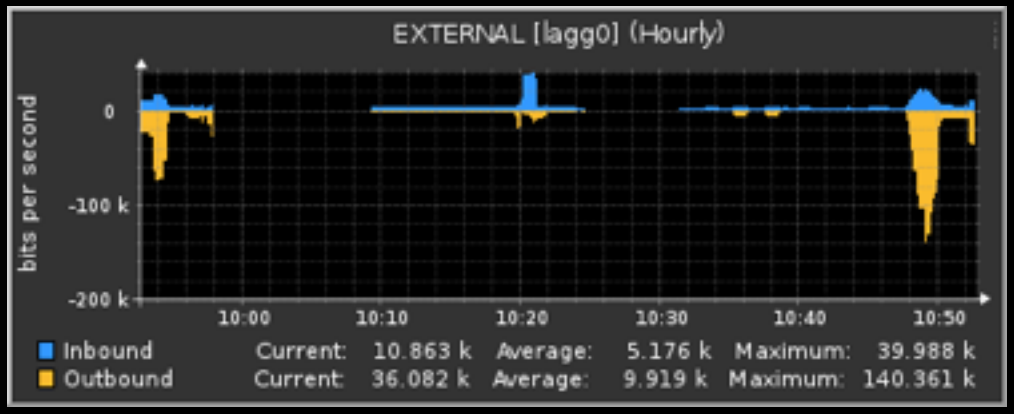
Bandwidth

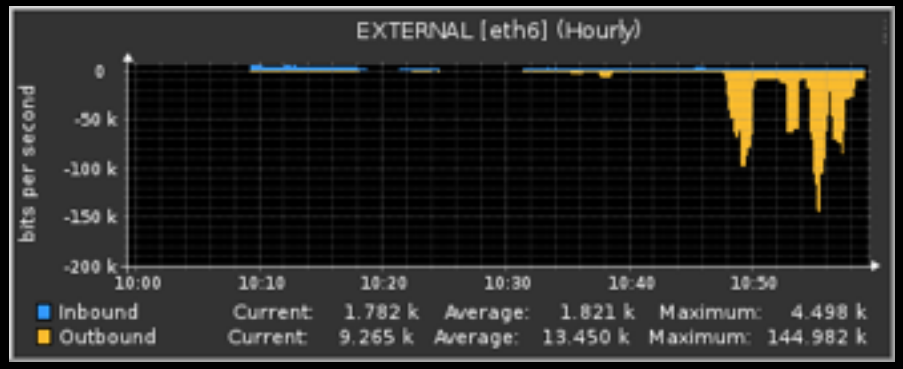
	NIC	Inbound	Outbound	Deny
EXTERNAL:	-----	20.97Kbps	136.42Kbps	761.47bps
	eth6	1556.53bps	98.41Kbps	-----
	eth7	21.47Kbps	44.52Kbps	-----
PROTECTED:	-----	63.51Kbps	7580.67bps	0
	eth4	64.54Kbps	2936.67bps	-----
	eth5	1025.07bps	6628.00bps	-----
Total:	-----	84.49Kbps	144.00Kbps	761.47bps
Peak:	-----	85.06Kbps	150.13Kbps	1870.93bps

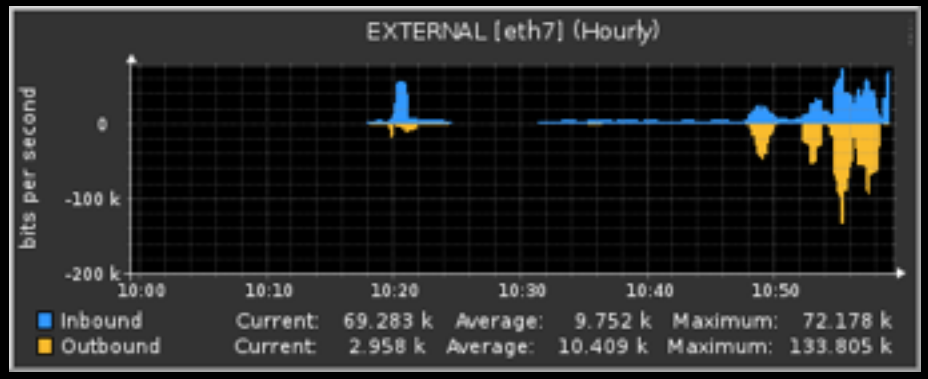
- Connections will show only on lagg interface name.
- Individual totals will display

Monitoring

[Monitor -> Reporting -> Historical Statistics -> Bandwidth]

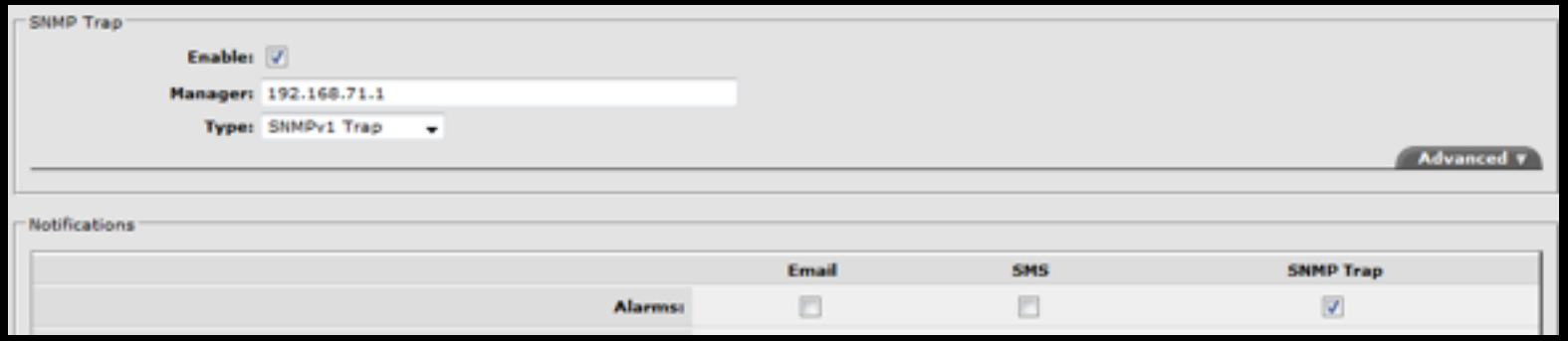






- Lagg0 is eht6 and eth7

Notification of Link Down

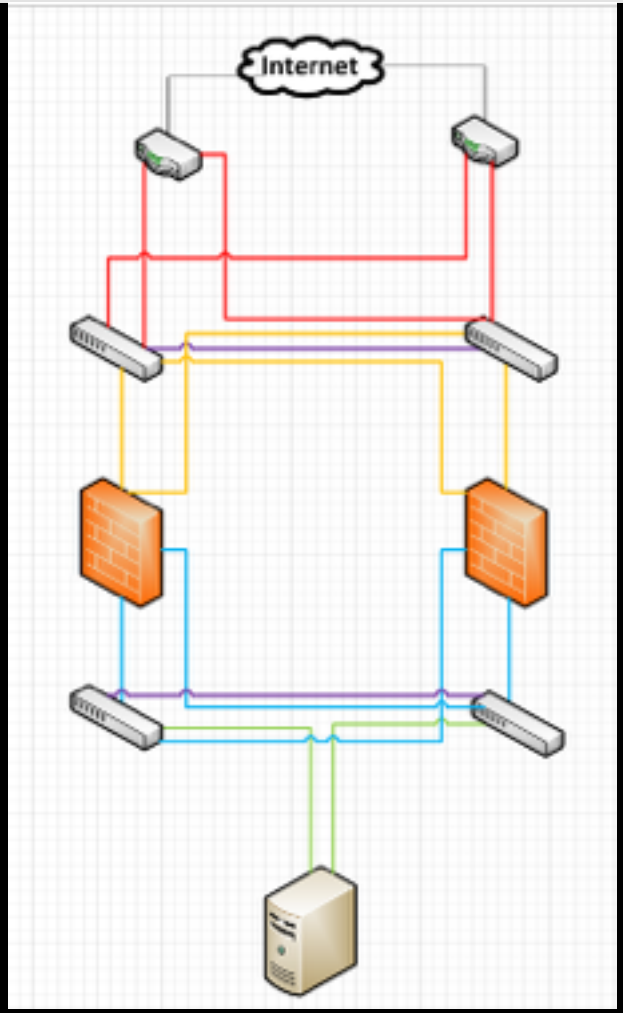


- SNMP Trap is sent if Alarms notifications is enabled and SNMP Trap Manager is configured in [Configure -> System -> Notifications] section. The Firewall will send on both up and down events.
- Log Messages –
  - Interface Down - Oct 20 13:38:51 pri=4 msg="alarm: Interface PROTECTED (eth0) down“
  - Interface Up - Oct 20 13:39:03 pri=5 msg="alarm: Interface PROTECTED (eth0) up"

HA Link Aggregation

Logical Interfaces

	Index	Name	Type	Zone	IP Address	NIC	Options
	1	EXTERNAL	Link Aggregation (LACP)	External	10.20.60.1/16	eth1 eth3	High Availability
		HA-EXTERNAL	-----	-----	10.20.60.3/16	-----	-----
	2	PROTECTED	Link Aggregation (LACP)	Protected	192.168.60.1/24	eth0 eth2	High Availability
		HA-PROTECTED	-----	-----	192.168.60.3/24	-----	-----



FAQ

- Can I use LAG with VLAN's?
  - No, currently VLAN's are not supported on LAG interfaces.
- Is LAG useful if the firewall has only 3 interfaces?
  - Load balancing will have little effect. However, interface fail over will be useful in some instances.
- Can I use LAG with DHCP?
  - Yes, LAG interfaces using DHCP is supported.
- Can I bridge LAG interfaces?
  - No, bridging and LAG are not supported..
- Can I use LAG with PPP?
  - No, you cannot use PPP interface with LAG

If you require additional assistance or have additional questions please contact GTA Technical Support.

- Email: support @gta.com
- Support Line Phone: 1.407.482.6925
- Normal Hours – 0830-1900 EST U.S.
- Free User Support – http://forum.gta.com

References

- GTA Online Documentation - http://www.gta.com/support/documents
- FreeBSD LAG Information - http://www.freebsd.org/doc/en/books/handbook/network-aggregation.html