

# “Zero Shell” Implementation Scenarios

**June 3 2011**

*By the time that this document was written, the latest ZS version was 1.0.14b*

In this Document you may find some of the Implemented but not thoroughly tested Scenarios.

There are no Configuration Screen Shots (Routing-Netbalancer, Bridging-QoS etc) / Captures, as these can be found on-line.

The CPU Overhead for the Scenarios may vary ... based on CPU of the ZS “box”, traffic, Total QoS Classification “rules”, type of and number of QoS Classification “Rules” etc.

**THIS IS NOT A TUTORIAL**, the scenarios are just WiFs (What If) and/or HOWTO meaning ... “food for thought”. Your best friend is always “try and error” ;-)

As a rule of thumb have always in mind that your implementation should be “KISS”ed (**Keep It Simple Stupid**) , redundant (Less SPOFs –Single Point Of failure- is a better and “cheaper” choice than “All in One Box”) and scalable.

In order to Implement any of the scenarios you don’t need in depth knowledge of Networking nor \*NIX (Thanks to Fulvio’s excellent work) BUT ... you must not be a complete “newbie” ... If you are (a novice-newbie) then first “do your homework” ☺

In the forthcoming scenarios I’ve used some low end hardware:

- ZS Boxes: AMD Athlon 64x2 3800+ with 1GB Ram and 4GB USB Flash cards (I’ve only changed partitions sizes based on some nice posts in the forum)
- Cisco Catalyst 3560 L2/3 Switch ... you may use another L2/3 Switch or a router
- Cisco 1800 Router
- A Low end 8 Port Gigabit Switch (Level one GSW-0807)
- aDSL Modem/Routers from various manufacturers

The network for which I’ve implemented the scenarios is a: 40 Work Stations, 11 aDSL (From 4 different ISPs) and the users are hungry for “surfing”, real time video, voice chat (Mostly Skype, but also MSN), gaming (They’re getting paid for that !!! ☺ ) and real time stocks “viewing”. No other ZS Services are used, except of Routing/Load Balancing, QoS and Bridging.

The ZeroShell versions used: 1.0.12b + athelings patch (for Implementing QoS AND Load balancing) and 1.0.14b

These were all the “facts”.

Happy reading

Regards, Steve.

# Scenario 1 (Sub Scenarios 1.1.0, 1.1.1 & 1.2)

## Sub Scenario 1.1.0

ZS Versions. A) 1.0.12b + athelings Patch B) 1.0.14.b

Needs:

- a) Redundancy ... if something goes wrong the services should continue to be serviced although there will be some degradation.
- b) The “VIP Customers” (Actually the board members 😊 ) and Services (Games) must have “VIP treatment” ... meaning there must be a router with 2 (At least) connections servicing ONLY them. In order to accomplish that, we’re using a Cisco 3560 that does PBR (Policy Based Routing) based on IP Ranges and protocols/ports.

Fact: Not all ADSL Links have the same Upload/Download Bandwidth

For Simplicity the Logical Network layout – Map, does not contain all the ISP Links. In reality the ZS box that does the Load balance, has 5x2 Ports NICs.

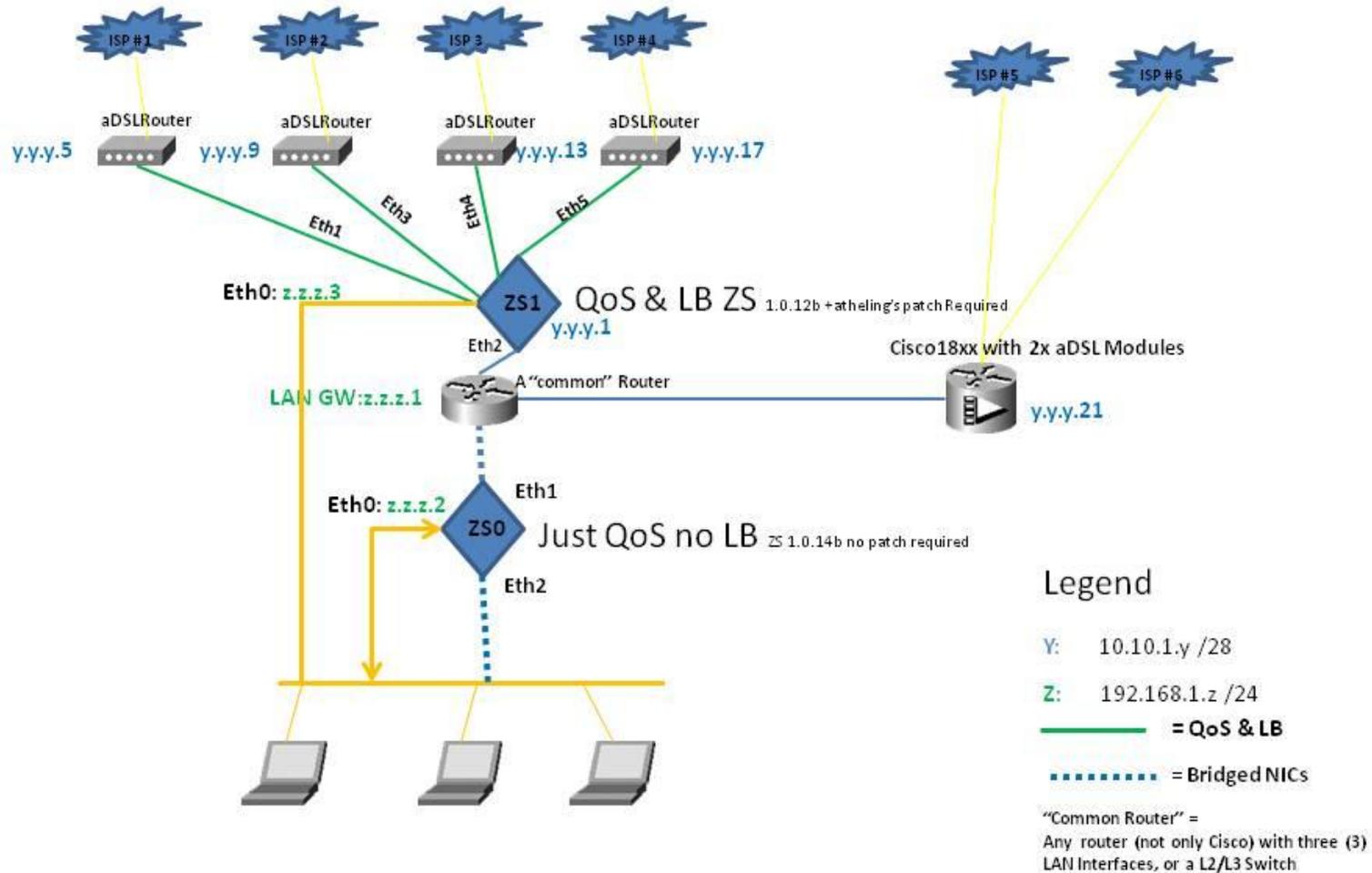
In the Network Diagram you will see that the First ZS Box works in Bridged mode QoS and it’s placed BEFORE the GW. Why?

- 1) We need our GW (Cisco 3560) to route the “priority” packets first. So according to our QoS Rules Configuration (Classifier) , the “VIP” IP Ranges and the “VIP” ports/protocols are “tagged” as Priority High (Class Manager, Class VIP) so they’re serviced/forwarded first .
- 2) We need to offload the Second ZS Box that already does a lot!!! Load Balancing AND QoS for 9 Uplinks!!! So, the 1<sup>st</sup> ZS Box does Prioritization for Outgoing Packets of Eth1 and also does traffic Shaping for “incoming” (For the LAN) packets ... actually the “LAN incoming packets” are outgoing packets for Eth2, I’m clarifying this for people not having big experience (But you should already know that QoS,/Traffic Shaping can be applied only to outgoing packets ... didn’t know that? DO YOUR HOMEWORK and then continue reading 😊)

Now, regarding the 2<sup>nd</sup> ZS Box, In order to do its duty, I had to use ZS 1.0.12b. atheling’s patch. The box is servicing as a Load balancer for Unequal “cost” – Bandwidth Lines, for that reason I also needed QoS and traffic Shaping. But, as you may observe from the Network map, I’m Traffic Shaping ONLY the outgoing packets TO the ISPs without applying QoS on the Eth2 (Facing the LAN). Traffic Shaping for incoming (for the LAN) packets, is done by the 1<sup>st</sup> box as mentioned above.

**Scenario 1.1.0 Logical Network Topology – Map:**

# Scenario 1.1.0



**Now, if you ask me:** Was this the best implementation you could do?

**The answer is:** It was the best for the time. A better one would be the one with 3 or 4 ZS Boxes (For redundancy + Less CPU Power/Box) where the “first layer Load balance” would be done by the catalyst 3560 (Without any prioritization or/and QoS).

**But, If you ask me:** Was this the simplest implementation you could do?

**The answer is:** No, there is a simpler (According to the needs) ... that is the upcoming scenario 1.2

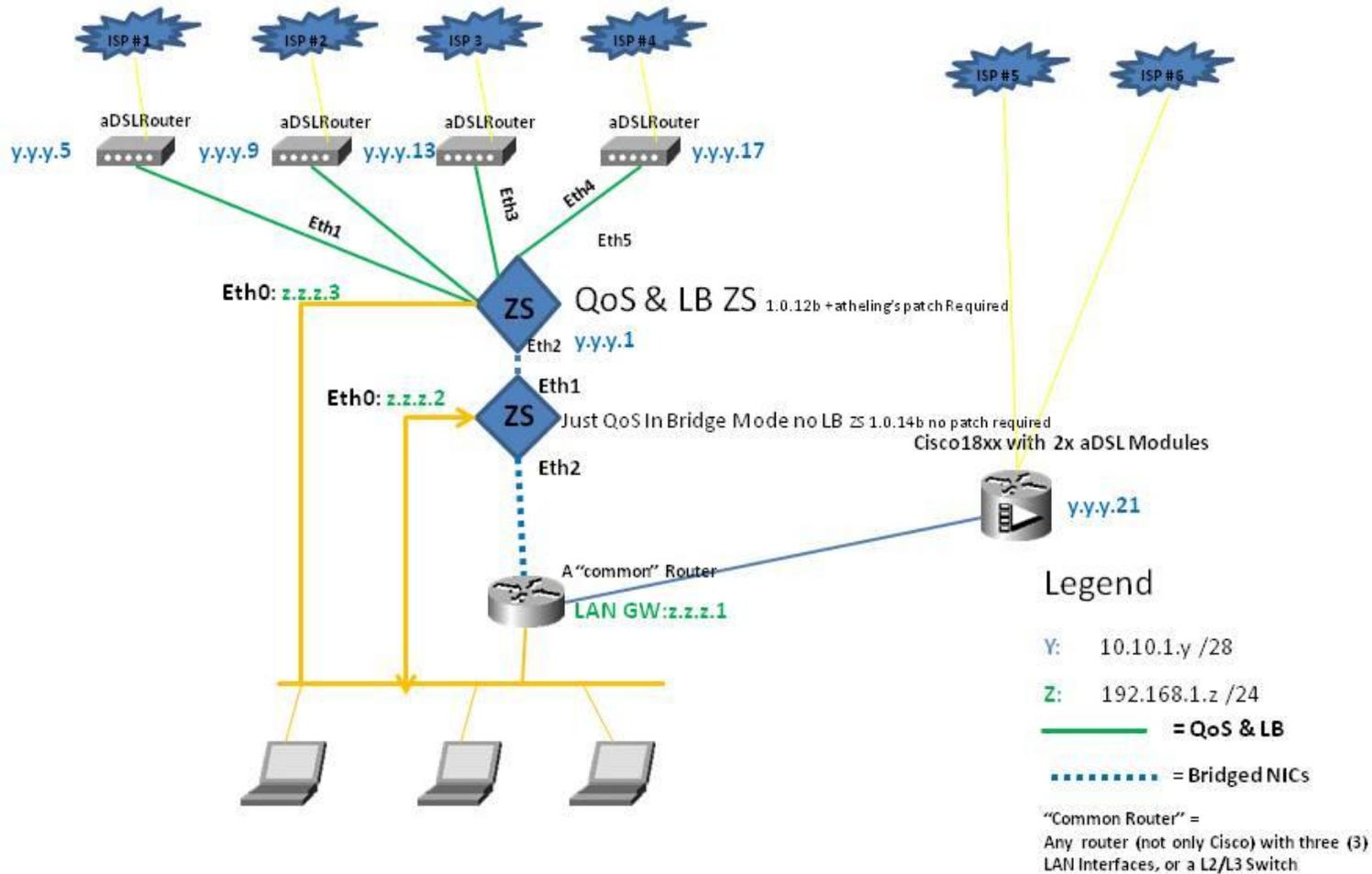
**If you ask:** Is it right to put the QoS ZS Box (ZS0) “before” or after the GW?

**The answer is:** According to our needs, this is right, but you can put it “after” the GW. As a matter of fact, if you read Fulvio’s Documents and/or Forum posts, you will see that the “recommended “place for the QoS ZS box is “after” the GW. There is no “correct or wrong” approach; it depends of your needs. There are almost always more than one solution in Networking ... and that’s “one of the “beauties” ☺

Now, take a look of the Logical Network Layout – Map for the “second approach”, just a Map, no words to write.

**Scenario 1.1.1 Logical Network Topology – Map:**

# Scenario1.1.1



## Sub Scenario 1.2

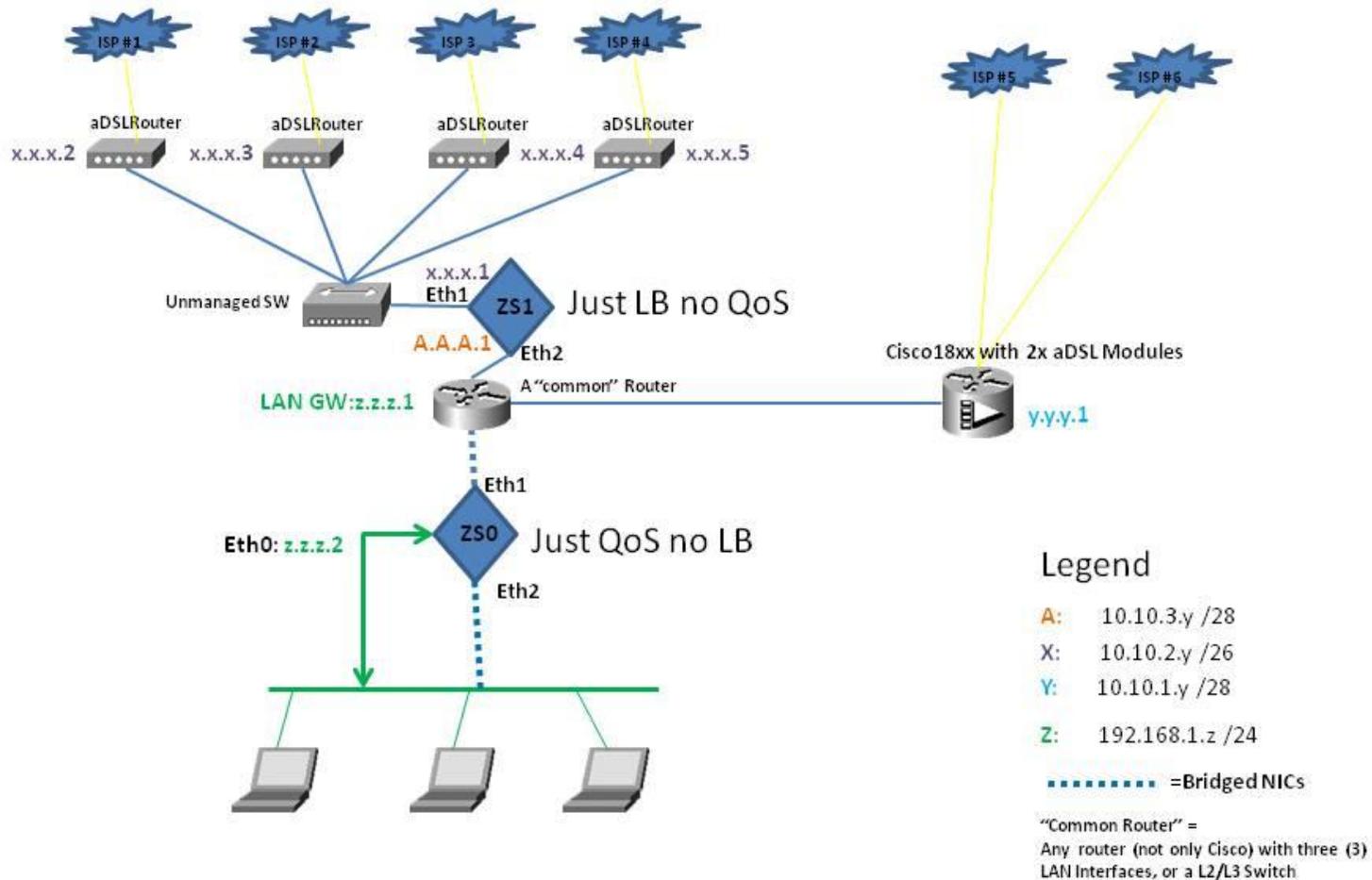
The needs for scenario 1.2 are exactly the same as scenario 1.1, but we needed to “calm down” the 2<sup>nd</sup> (ZS1) ZS box (It had some CPU peaks up to 82% => lag everywhere ☹ ) plus a “key factor#1” (The uploading Bandwidth) seems that can be manipulated easy and the “key factor#2” (Downloading Bandwidth) doesn’t seem to work bad (There are no Bottlenecks on the uplinks/Downlinks nor Skype / MSN Voice-Video Drops, despite the huge amount of P2P downloading. Well, when P2P goes beyond 60Mb there are CPU peaks of up to 82% as I said before). Our first concern was the CPU Power of the 2<sup>nd</sup> (ZS1) ZS Box, the second concern was the unequal “cost” – Bandwidth between the many ISP Links, and the third concern was the Uploading bandwidth -> “will there be enough bandwidth for Voice/Video Chat or the P2P will eat up everything”?

Regarding the first concern, we gave up QoS-Traffic Shaping the Outgoing TO the ISPs packets on the 2<sup>nd</sup> (ZS1) ZS Box. Regarding the second concern, we did some upgrades and all the ISP Links are almost equal and there are no bottlenecks (OK we are lucky for the bottlenecks), regarding the third concern, the answer was pretty easy ... Traffic shape (Limit) the Outgoing P2P to an amount of less or equal than 1/6 of the total outgoing bandwidth of all the connections (Sorry for being rude to the “community” of P2Ps ☹ ) !!! Some of our Uplinks are 512Kb and some 763Kb+. We gave a max of 800Kb to P2P and ... now we’re sure that there will no bottlenecks in any of the uplinks. So, now the 1<sup>st</sup> (ZS0) ZS box is “the traffic shaper” and QoS – Prioritization and the 2<sup>nd</sup> ZS box is just a Load balancer.

By removing the QoS-Traffic Shaping on the 1<sup>st</sup> (ZS0) ZS Box we’ve manage to “calm down” the CPU. We’ve also removed 4 of the 5 Dual Port NICs, introduced a low level Lan Switch to the topology and all the ISP modem/routers on the same IP Segment. Have a look at the Logical Network Topology – Map for this scenario, it’s almost the same as scenario 0, different colors on the links between ZS2 and the ISPs + a Low budget Unmanaged LAN Switch. For this Scenario we don’t actually need atheling’s patch, but we left the ZS Version unattached (1.0.12b with patch)

**Scenario 1.2 Logical Network Topology – Map:**

# The "Easy Going" - Scenario 1.2



**Now, If you ask me:** Is there an even better (but not simple) implementation?

**The answer is:** There is always a better one 😊, almost the “ultimate” (According to the needs) ... that is the upcoming scenario 2, but not in this document ... stay tuned.

Thanks for reading

Regards

Steve

P.S: This is a draft Document, written in hurry. A reader with basic networking knowledge (Basic IP, Subneting and routing Knowledge) or a pre-CCNA or CCNA Certified Engineer should have no problems understanding the Logical Network Layouts (Are you a CCNP, CCIE, JNCP engineer? Then you’ve ... already set up your ZS Boxes and you’re just curious 😊 seeing what others do ...). A reader knowing only to Configure IP Address on A windows box with a subnet of /24 -> 255.255.255.0 ... should first do his homework