

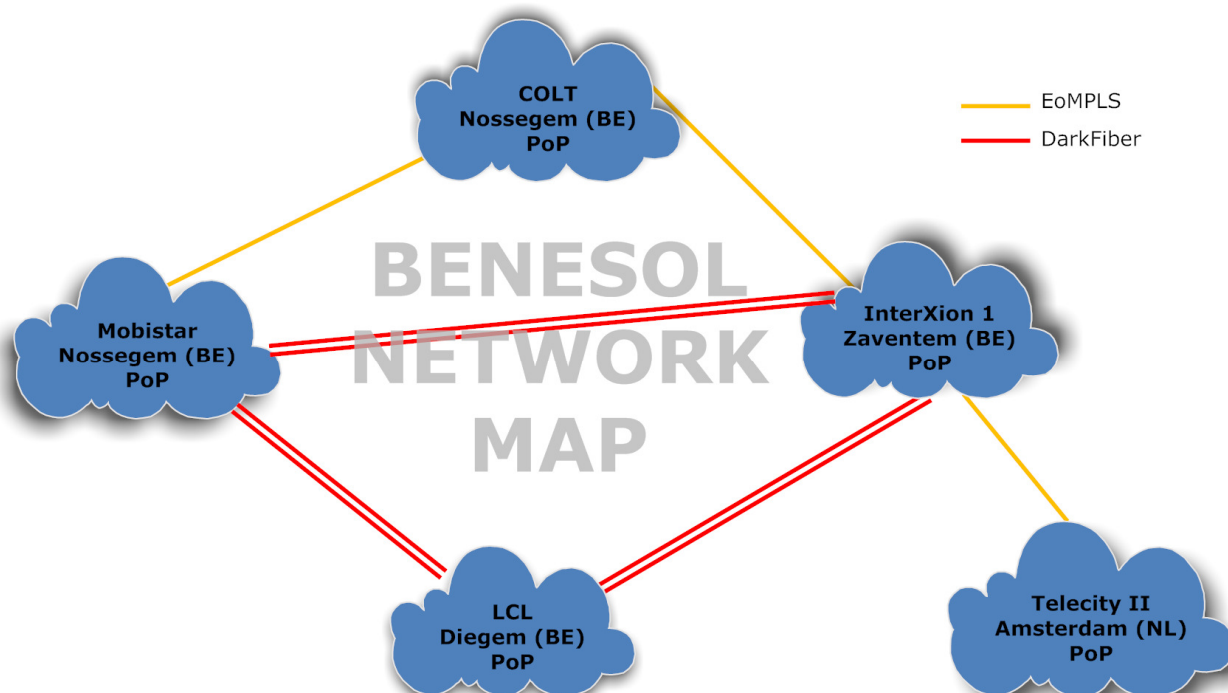
Network Center

Technical specifications

Belgian Network Solutions offers a fully redundant, multihomed network (AS 8368). Our network is fully Ethernet based and built with Cisco routers and switches in different locations (PoP's).

Belgian Network Solutions owns two superscript dark-fiber rings around Brussels, that links 3 datacenters (PoP) (LCL, InterXion and Mobistar). On this dark-fiber we use CWDM equipment to split into several channels, namely 1x10Gbit and 7x1Gbit. Furthermore Belgian Network Solutions has several connections to different carriers and a direct link between Brussels and Amsterdam each 1Gbit.

Network scheme:



On various locations, our network is connected to multiple Tier-1 carriers such as Level3, Tinet, Highwinds and Cogent Communications. With each of these carriers Benesol has a minimum of 1Gbit connection. In addition, we are directly connected to multiple peering exchanges, in Belgium and abroad and to content providers.

Network traffic is not manually routed or determined, except in case of a malfunction. We use BGP4 protocol and let it complete its work to choose the best route to every destination. For each customer we offer 2 network cables in a VRRP configuration to provide a redundant connection. In case of a failure of one of two routers, the connection will be taken over in about 3 seconds.

In summary:

- Ethernet based
- Fully redundant network
- State-of-the-art materials: Cisco Systems 7600 Series
- Transit Providers: in various PoP's
- Local and international Internet Exchanges
- Carrier neutral
- Internal 10GigE ready network
- Redundant gigabit uplinks for each customer
- Possibility for IPv6 addresses without tunnels

Network facility

Transit providers

Belgian Network Solutions is third-party independent as a result of which only **TIER-1 carriers** process all data traffic:

ASN	Transit Provider	Speed
174	Cogent Communications	1000 Mbit
3356	Level3 Communications	2000 Mbit
3257	Tinet	1000 Mbit
12989	Highwinds Network Group	1000 Mbit

Local and international internet exchanges

An Internet Exchange is the infrastructure in which different parties interconnect and exchange traffic at national or international level. An Internet Exchange connects major ISP's, and sometimes research networks, webhosters and similar companies. When you peer with two or more parties, it is usually beneficial to connect once to the shared infrastructure of the Internet Exchange rather separately to each party.

Internet Exchanges		
Macro	Internet Exchange	Speed
AMS-IX	Amsterdam Internet Exchange	1000 Mbit
FreeBIX	Free Belgian Internet Exchange	1000 Mbit

PoP faciliteiten



InterXion Brussels
Wezembeekstraat 2, 1930 Zaventem
Belgium



Mobistar Brussels
Leuvensesteenweg 641, 1930 Nossegem
Belgium

LCL Brussels
Kouterveldstraat 13, 1831 Diegem
Belgium



Level3 Brussels
Leon Grosjeanlaan 2, 1140 Brussels
Belgium



Telecity 2 Amsterdam
Kuiperbergweg 13, 1101AE Amsterdam
The Netherlands



Colt Nossegem
Mercuriusstraat 30
1930 Zaventem
Belgium

Peering

Belgian Network Solutions endorse delivering quality, redundant and dedicated services to his customers. We believe that a peering agreement is healthy for both parties to improve the service provided. Therefore, Belgian Network Solutions has an open peering policy.

Because of our quality certificates we ask all our peering partners to our peer agreement to sign. This agreement is not legally binding, but merely an acknowledgment that both networks are properly maintained. It is not required to sign our peering agreement. When a peering partner peering requires an agreement or a confidentiality agreement, we will sign a mutual agreement.

Peering policy

Belgian Network Solutions has an open peering policy and will start a session if the partner meets all the requirements. Below are our main points where our peering partners to comply.

1. Backbone capacity	2. MD5 wachtwoord
The peering partner shall have a fully redundant network, all inter-hub connections need to have a minimum capacity of 1Gbit available.	All BGP sessions are protected with an MD5 password.
The minimum capacity to start a eBGP session on an Internet Exchanges is 100Mbit.	If the infrastructure or policies of the peering partner do not allow MD5 passwords, Belgian Network Solutions can grant a derogation.
3. Internet Routing Registry	4. Network Operations Center
All prefixes and AS numbers must be recorded in a database such as RIPE or RADB IRR.	The network must have a Network Operations Center that has 24/7 availability service.

Restrictions:

- Peering agreements with indirect or direct customers
- Peering agreements with ex-clients, up to 1 years after the expiry of the contract

Peering documents

All agreements with Belgian Network Solutions are prepared in English and under no circumstances be translated.

The technology behind the Belgian Network Solutions Network

TCP / IP

Since the revolution of the Internet has taken place, the Internet Protocol (TCP/IP) is established as the dominant protocol in data communications. TCP/IP and related technologies for packet switched networks such as Ethernet and Multi-Protocol Label Switching (MPLS) took the place of traditional network technologies.

CWDM - Layer 1

Belgian Network Solutions has an extensive fiber optic network based on CWDM technology. The cubes are based on rack mountable WDM-MODULAR SHELL, which has two modules. Each module has a connector type (for SDH, SONET, ATM or Ethernet) that can perform CWDM.

Cube Optics provides a range of network solutions (Mux, De-Mux, OADM) for point-to-point and fiber rings. All solutions are compatible with the ITU G.694.2, NEBS L3, Telcordia GR1221 and GR1209 standards.

MPLS - Layer 2

MPLS is a standard, future-proof technology. It offers companies and Internet Service Providers the opportunity to all business applications over a network to transport. Based on MPLS sets the IP routing protocol dynamically branded (labeled) paths over the IP network.

The routers in the network recognize these labels and separate the traffic from each other. Also based on these labels a priority is given to the traffic, so transmission and reception is regulated.

Ethernet - Layer 2

Ethernet technology has been used successfully for many years "Local Area Network (LAN). In recent years Ethernet technology is attractive to apply in the form of "Wide Area Network (WAN). Belgian Network Solutions allows multiple locations in the form of a Virtual Private Network (VPN) or point-to-point link to link. This creates in effect a large Local Area Network (LAN) based on IEEE 802.3. The Ethernet technology also allows a fast and reliable connection to the internet.

Ethernet is the most used technology for local area networks (LAN) and is divided into the following types:

- 10 Mbit/s Ethernet (10Base-T)
- 100 Mbit/s Fast Ethernet (100Base-T)
- 1 Gbit/s Gigabit Ethernet (1000Base-LX/-X)

BGP - Layer 3

The Belgian Network Solutions IP services are based on the main routing protocol, BGP4. This protocol is in practice a route table that tracks IP networks or 'prefixes', this indicates the network reachability among autonomous systems (AS). By using BGP and have at least two connections to the Internet, we can dynamically determine which traffic goes to which connection. The automatic routing decisions (calculation) are based on network policies or rules. This means we will use the full bandwidth and still the shortest and fastest route to any chosen location. This allows us to perform maintenance works without any impact on our customers.

Communities

By using BGP communities Belgian Network Solutions provides a complete control over the routing properties. It enables to apply "traffic engineering" on incoming and outgoing traffic.

Incoming communities

These communities are passed to the prefixes and identify the origin of the prefix. Based on a certain community the route may or may not be preferred to manipulate the outgoing traffic.

8368:1***	Prefix-type tagging
8368:1001	Belgian Network Solutions own prefixes
8368:1002	Routes received from transit customers
8368:1003	Routes received from peering partners
8368:1004	Routes received from a transit provider
8368:2***	Internet Exchange tagging
8368:2001	Routes received at BNIX
8368:2002	Routes received at AMS-IX
8368:2003	Routes received at FreeBIX
8368:3***	Private peer tagging
8368:3001	Routes received from eXpress
8368:3002	Routes received from Earthlink Inc.
8368:4***	Transit tagging
8368:4001	Routes received from Cogent Communications
8368:4002	Routes received from Level3
8368:4003	Routes received from Tinet
8368:5***	City tagging
8368:5001	Routes received in Brussels
8368:5002	Routes received in Amsterdam
8368:6***	Country tagging
8368:6001	Routes received in Belgium
8368:6002	Routes received in The Netherlands

Outgoing communities

When announcing your prefixes you can use the following communities to adjust various BGP features.

8368:1**	Local-preference manipulation
8368:101	Lower your local-preference by 100
8368:102	Raise your local-preference by 100
8368:6**	Export manipulation
8368:601	Do not export to anyone
8368:602	Do not export to transits
8368:603	Do not export to peers
8368:604	Do not export to customers
8368:666	Nullroute (discard) traffic

Default local-preference values

All prefixes have a default local-preference value that ensures that the optimal routing is chosen to reach the destination. The following table shows these values.

Localpref	Origin	Value
100	Transit	Standard
200	Transit	Prefix
100	Peering	Standard
200	Peering	Prefix
900	Customer	Minimal
1000	Customer	Standard
1100	Customer	Prefix

Nullroute / DDoS protection

When a server or CIDR in your network receives a DDoS attack, it is possible to get the appropriate prefix to advertise with a 8368:666 community. We will nullroute all traffic to the prefix and so your routers / server are not overloaded with excess traffic.

The nullroute community also activates an alarm in our Network Operations Center so we can assist you in investigating the origin.

The hardware infrastructure

Cisco Systems is the leader and pioneer in Gigabit and 10Gigabit Ethernet (10GigE) routing and switching. The Cisco 7600-S routers offer the best resistance, stability and line-rate performance. Also, the Cisco 7600-S has a full IP / MPLS, layer2 and layer3 routing technology.



Patented multi-processor design.

- Possibility to 288 Gigabit ports or 24 10GigE ports.
- The self-designed RSP720-3CXL
 - nonblocking
 - line-rate forwarding.
- Private Cisco IOS software © for LAN, MAN and WAN