



# DESCRIPTION OF SERVICES INTERNET FOR ENTERPRISES

Internet services for enterprises  
01.12.2018 / Version 3.18

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## 1 Introduction

Broadnet Internet is an internet access service for the corporate market, with transmission capacities from 1 Mbps up to 10 Gbps.

Broadnet Internet comes in 3 varieties:

1. Internet Managed: includes configuration, operation and monitoring of client-deployed router in addition to the internet access connection.
2. Internet access: Modem is included in delivery of Broadnet.
3. Internet access ADSL/VDSL; where the client can choose between a WiFi router with simple firewall, later named; router/IAD (IAD: Integrated access device) or alternative 2 above.

Broadnet Internet comes with alternative access types such as fiber, SHDSL, VDSL and ADSL, which contribute to cost-optimal solutions tailored to the company's needs in terms of capacity and traffic patterns. Options offered include IP addresses (fixed IP addresses are not available for WiFi router/option 3 above), redundancy and extended service.

Additional services such as web hosting, domain management, e-mail and DDoS protection can be found in separate service descriptions.

Broadnet also delivers internet Mobile Access with ICE as the mobile operator. This service is not described in this document. Description for this service can be found in a separate service description for Internet Mobile Access.

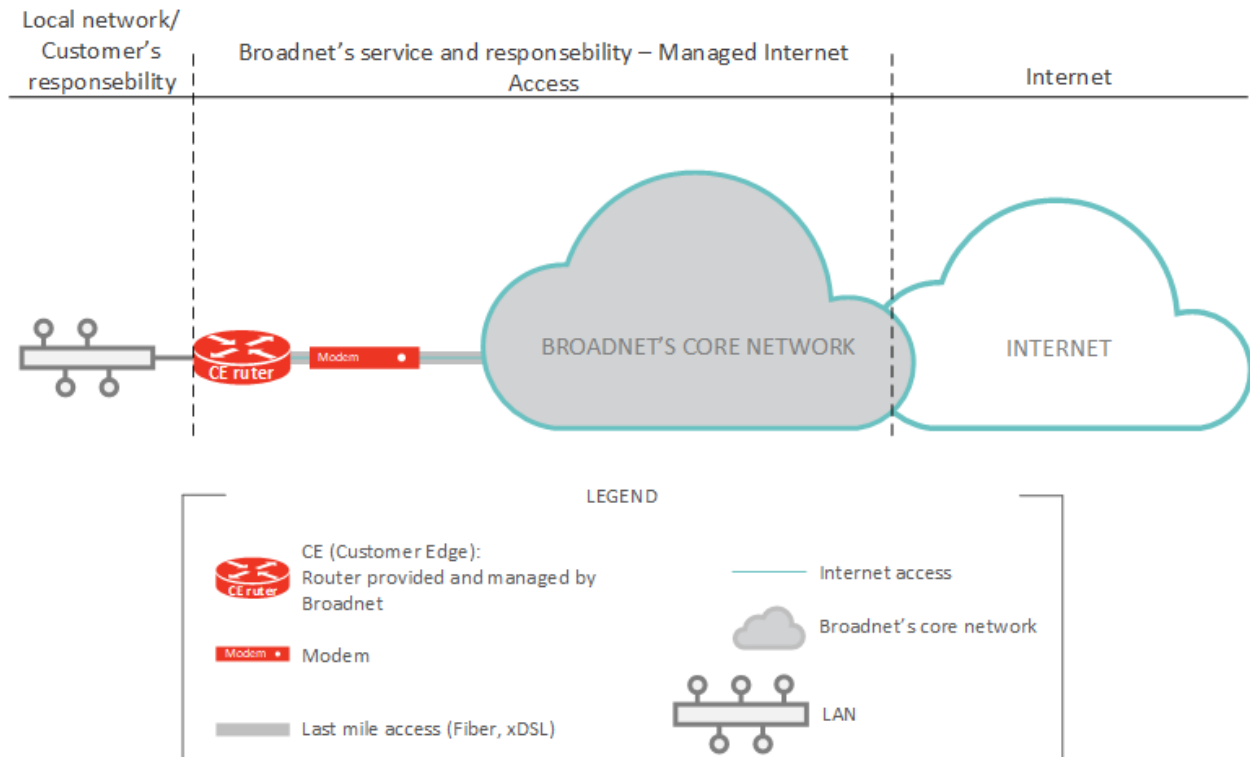
## 2 The services

Broadnet Internet consists of a logical Internet connection with a specified capacity supplied via an Ethernet interface. The capacity requirement will depend to a high degree on usage patterns, for example

- Surfing on the Internet
- Sending and receiving e-mail
- Connections to home-based offices and mobile users
- File transfers between the company and its partners
- Backup of the company's data using third party services
- High usage of cloud-based services (office365, Google etc.)
- Distributed applications
- Multimedia solutions such as sound, images/graphics, conference, file sharing and application sharing
- Requirements for performance when displaying file company's web pages

## 2.1 Internet Managed

Internet Managed is a managed end-to-end service where Broadnet supplies and operates routers installed at the client's facilities. Responsibility for service for the Internet Managed service extends from the LAN interface at the client's router and to Broadnet's interface with the Internet. Internal cabling towards the customers premises in the building is excluded from this responsibility. According to the Norwegian Ekom Act suppliers of ICT services can not own or operate infrastructure in private or public buildings. The owner of the building is responsible for operation and maintenance of this infrastructure.



### 2.1.1 Redundancy

Redundancy is a good option for solutions with high demands for uptime or which use the service for business-critical applications.

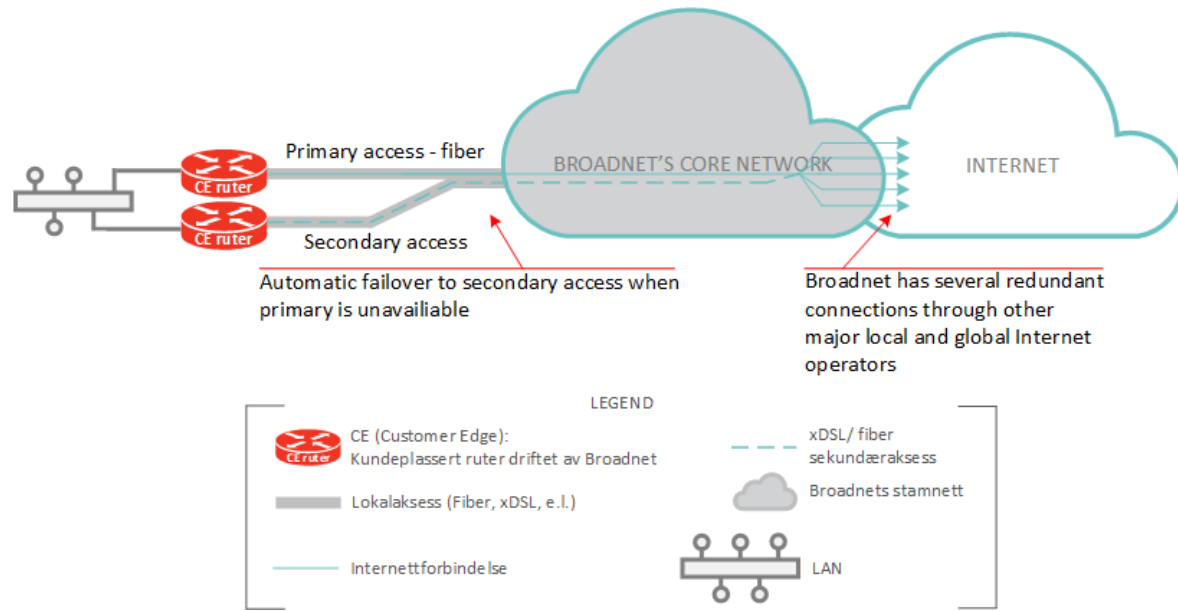
Broadnet offers several solutions to ensure that the company's internet connection is always up; access redundancy and access redundancy with alternative routings.

#### 2.1.1.1 Access redundancy

Broadnet delivers two internet connections that are connected to each one's router. In case of a break in the primary connection, traffic will automatically be diverted to the secondary connection, and back again when the primary connection is restored.

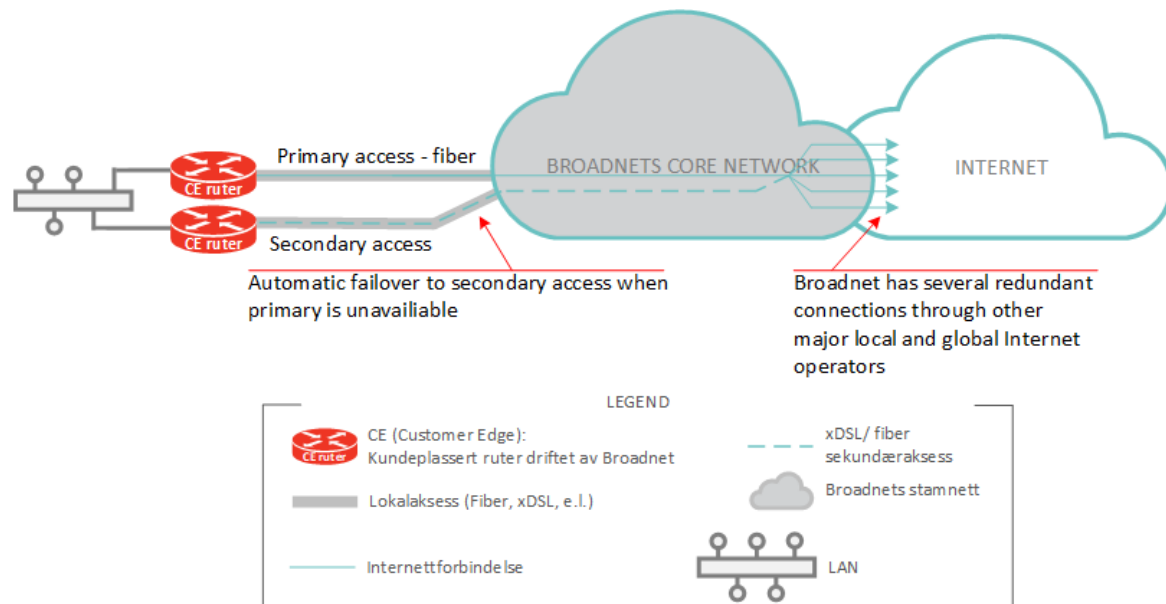
The two internet connections may have Fiber as primary connection and SHDSL/ADSL as secondary connection. Transition from primary to secondary router with associated access occurs automatically using HSRP, VRRP or BGP routing protocol.

This solution can be provided for speeds on the primary and secondary connection of up to 1 Gbps. If the secondary connection is delivered with xDSL, the maximum available speed may be selected.



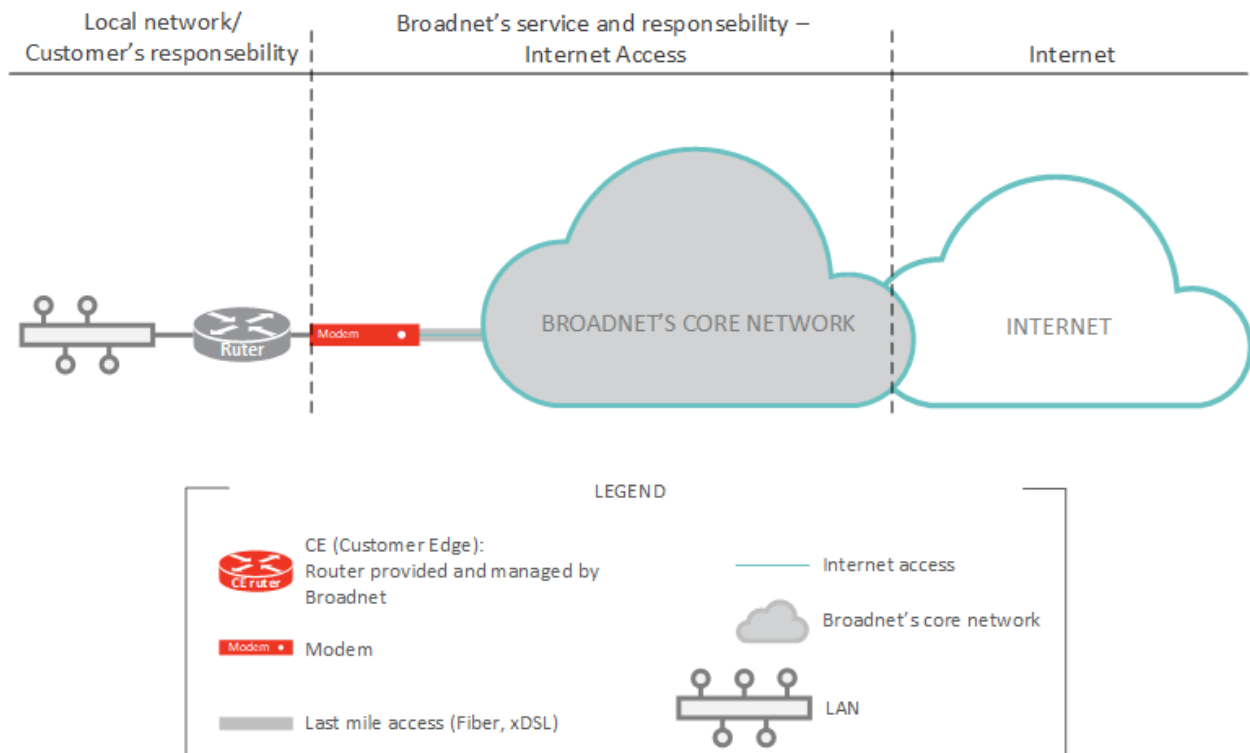
### 2.1.1.2 Access redundancy with alternative routings

Similar to the solution above, except that this solution has primary and secondary access with separate conduits between locations, where possible. The two internet connections must have have Fiber connections, both as a primary and secondary connection. The solution can be delivered with speeds on of up to 10 Gbps.



## 2.2 Internet access service

Internet access from Broadnet is supplied to the company via an Ethernet interface. Responsibility for the service is from the Ethernet interface at the Media converter or Modem supplied to Broadnet's interface with the Internet. Internal cabling towards the customers premises in the building is excluded from this responsibility. According to the Norwegian Ekom Act suppliers of ICT services cannot own or operate infrastructure in private or public buildings. The owner of the building is responsible for operation and maintenance of this infrastructure.



## 2.3 Comparison Internet services

Functionality	Internet managed	Internet access
Operation of router	Yes	No
DHCP	No (Can be delivered as an option up to 100 Mbps)	Option (1 dynamic address)
Status information (SNMP read)	Yes	No
Fixed IP-address (Fiber)	Yes	Standard (1 fixed IP address)
Fixed IP-address (SHDSL)	Yes	Option
Fixed IP-address (VDSL and ADSL)		Option (only supported on modem/bridge)
Redundancy (option)	Yes	No

Functionality	Internet managed	Internet access
Domain, e-mail and web hotel (option)	Yes	Yes
Defined Service Level Agreement	Yes	Yes
Cover	Norway	Norway

## 2.4 Included subscription services

- Media Converter for Fiber accesses up to 1Gbps, which provides Ethernet interface to the client (RJ-45 electric)
- Modem for xDSL accesses, which provides Ethernet interface to the client (RJ-45 electric) Clients can choose router/IAD upon delivery of VDSL access.
- Fixed IP address is assigned as standard for:
  - Internet access with Fiber connection
  - Internet Managed (all forms of access)
- Dynamic IP address is assigned as standard for:
  - Internet xDSL access.
    - Fixed IP address may be ordered as an add-on service. For VDSL/ADSL, a fixed IP address cannot be provided when ordering WiFi router.

## 2.5 Technical platform

Internet accesses from Broadnet are supplied via a modern MPLS core network of high capacity and back-up (double access) connections. This is to ensure best possible uptime and capacity.

The core network is connected to several central interconnection hubs for the exchange of Internet traffic. These include amongst others:

- NIX 1 and 2 (Norwegian Internet Exchange)
- Net node in Sweden
- DIX (Danish Internet Exchange)
- LINX (London Internet Exchange)

Further, Broadnet has several private interconnection agreements with national and international operators, as well as with major content suppliers, for example:





## 2.6 Packet volume

MTU (Maximum Transmission Unit) specifies how many bytes can be transferred in one IP-packet. MTU packet size for the Internet service in Broadnet net is 1,500 bytes.

## 2.7 Interface for responsibility – Client connection point

Broadnet is responsible for operating the service to and with the media converter or modem/WiFi router supplied by Broadnet. The WiFi functionality is excluded from this. Broadnet is not responsible for network elements in the client's network or internal cabling at the client. Modems that are configured as a WiFi router/IAD from Broadnet have built-in firewall functionality, and have the possibility of opening to internal services. The end-user is responsible for ensuring that exposed services are responsibly secured.

The WiFi router/IAD that can be ordered for VDSL and ADSL supports WiFi functionality, but the client is responsible for its configuration/set-up and maintenance.

The client has the option to use and adapt:

- SSID
- WPA key
- WIFI Channel
- LAN network default is 192.168.20.0/24. default gw is 192.168.20.1.
- Port forwarding
- USB port
- Internet filter (parental control)
- Access for a user to change passwords for ACL

Use of this functionality is implemented at the client's own risk and is not supported by Broadnet. Reversal to Broadnet's default settings can be performed by pressing the reset button.

The default SSID and WPA key is enclosed in the shipment from Broadnet.

## 2.8 xDSL (ADSL, VDSL, SHDSL) Cover check

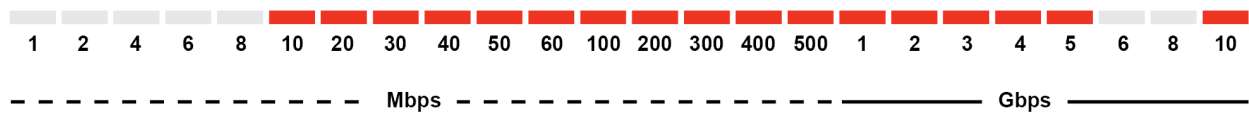
Prior to placing an order for Broadnet Internet for SHDSL, ADSL and VDSL a check will be carried out to determine the infrastructure in the telecom network up to a defined geographic location. The resources check will provide the answers to what access types and capacities are available. Available capacity will depend on the distance to the current central where Customer copper line are hooked on.

The quality of the copper line is affected by factors outside Broadnet control, and perceived access capacity will vary as a result of this. Due to this - capacity-indication at time of order should be considered as maximum capacity.

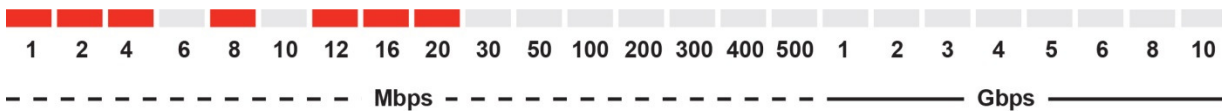
## 2.9 Access types and speeds

Broadnet Internet can be supplied with alternative access types such as Fiber, SHDSL, ADSL and VDSL. The table below shows a more detailed specification:

### 2.9.1 Internet Fiber (symmetric speeds, same up- and downloading speed)

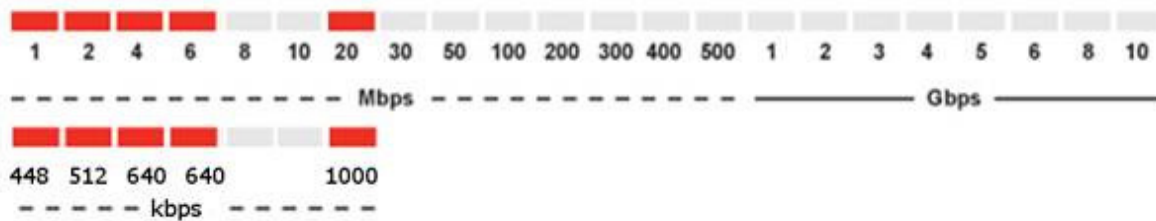


### 2.9.2 Internet SHDSL (symmetric speeds, equal up- and downloading)

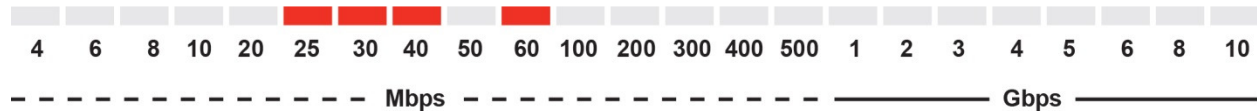


Internet SHDSL 12 Mbps can provide a maximum speed up to 11.6 Mbps.

### 2.9.3 Internet ADSL (asymmetric speeds – up and downloading)



### 2.9.4 Internet VDSL (asymmetric speeds – up and downloading)



The following table lists the expected speeds for the various internet VDSL products:

Product name	Experienced speed
Internet VDSL 60/15 (oa)	35-60 down / 5-15 up
Internet VDSL 40/10 (oa)	20-40 down / 2-10 up
Internet VDSL 25/5 (oa)	15-25 down / 0,2-5 up
Internet VDSL 40/10 (ws)	25-60 down / 5-15 up
Internet VDSL 30/10 (ws)	20-35 down / 2-10 up
Internet VDSL 25/5 (ws)	12-25 down / 0,2-5 up

### 2.9.5 Internet Asymmetric Fiber (asymmetric speeds – up and downloading)

Internet Asymmetric Fiber (asymmetric speeds, up and downloading) may be delivered in certain locations. Please contact Broadnets sales representative for more information.

## 2.10 Physical interface for Internet access

### 2.10.1 Fiber access to the Internet

Fiber access is supplied as standard with a media converter that converts from optical to electrical interface against the client’s local network (LAN). The media converter supports 10/100/1000 Mbps (auto-negotiation) speeds to LAN. The client does not have to relate to a “correct” optical interface (An optical interface can be supplied on request).

### 2.10.2 Termination point in building

The NTP is the physical point of hand-over appointed by Broadnet, usually located on the outside of or immediately inside the exterior wall at the installation address. The service includes as a maximum 15 meter of cabling to the NTP. If an NTP has already been installed at the delivery address, this will be used. The costs regarding cabling between the NTP and the Customer’s own equipment are not included in the service. This service can be ordered as internal cabling from Broadnet.

### 2.10.3 SHDSL, VDSL and ADSL access to the Internet



SHDSL access comes with a modem and Ethernet interface to the client's local network (LAN). The modem supports 10/100 Mbps (auto-negotiation) speeds to LAN. This also applies to ADSL and VDSL, where the client chooses modem/bridge.

ADSL and VDSL provided with WiFi router/IAD, has Ethernet interface with the client's local network (LAN). WiFi router/IAD supports 10/100 Mbps (auto-negotiation) speeds to LAN. IAD also has support for WiFi functionality and has a simple firewall.

The pairing between Modem and LAN is performed using TP cable (Twisted Pair) and is connected with a RJ45 connector. The interface is used for connection of the end-user's equipment (switch, router, firewall or similar).

## 2.11 ADSL/VDSL without landline telephony on the same line

The term shared access is used when the end user has a telephone in addition to the Internet connection. The cost of line rental is in such case split between the voice telephony and the Internet service.

If the end user does not have voice telephony or the end user must for other reasons have his Internet service supplied via a dedicated copper pair, Broadnet ADSL offers voice telephony as an additional service. Dedicated access requires that a wire pair is available.

## 2.12 Equipment delivered with the Service

Service	Client equipment	Access speeds up to	Lan interface
Internet access, Fiber	Media converter	1 Gbps	Ethernet
Internet access, ADSL	Modem	20 Mbps	Ethernet
Internet access, VDSL	IAD/modem	60 Mbps	Ethernet
Internet Fiber Managed	Cisco 892f switch	50 Mbps	Ethernet
Internet Fiber Managed	Cisco ME3400 switch	1 Gbps	Ethernet
Internet DSL Managed	Modem and Cisco 881 router	20 Mbps	Ethernet

Some devices may emit unpleasant fan noise and are not suitable for office environments. Broadnet recommends placing equipment in a secured computer room with adequate cooling.

- Temperature: 0 to +50°C
- Relative humidity: 5 to 95%

## 2.13 Limitations and recommendations

Connection to an xDSL modem using a HUB is not permitted. In the case of a connection of a switch to an xDSL modem, there is a limit of up to 20 MAC (Medium Access Control) addresses per access line. Broadnet reserves the right to filter the number of MAC addresses per access line.

There is a limit of one (1) physical switch per xDSL modem and we recommend a router in front. An end user who requires a double access solution must clarify this in detail and in advance with Broadnet.

All systems with public IP addresses are as standard visible to Internet users and are therefore vulnerable to malicious attempts by third parties to gain unauthorized access. We therefore strongly advise that a firewall or router with firewall functionality is used in order to limit the exposure to hacking while at the same time permitting access to defined internal services.

The client is strongly advised to ensure that he is protected against unauthorized access to the network by external third parties, by for example installing a firewall. The client is also strongly advised to secure himself against Malware (Malicious Software), which is a type of "parasite" that can carry with it viruses, worms, Trojan horses, spyware and adware.

Modems that are configured as a WiFi router/IAD from Broadnet have built-in firewall and WiFi functionality. The end-user is responsible for ensuring that exposed services are responsibly secured and for configuration/set-up and maintenance of the WiFi functionality. Refer to Chapter 2.7 for further information about this.

## 3 Technical Quality

Broadnet supplies the services with an agreed Service Time and an agreed Service Guarantee. The different Service Time and Service Guarantee options are described in the Service Quality Agreement.

### 3.1 Service time

Service time specified is the time period that Broadnet perform fault-finding on the service. The Customer can choose Basic, Extended or Continual service time. If fault-finding is required beyond the agreed service time, this must be ordered in each individual case which will incur an associated charge for callout and for the work performed. Broadnet cannot guarantee that this type of fault-finding can actually be carried out.

### 3.2 Service Guarantee

Service Guarantee specifies quality parameters for the service through different Service Guarantee levels. Service Guarantee 1 is set as standard if an active choice is not made. If a higher level of Service Guarantee is required, this may be selected in the order process. For Internet ADSL, VDSL and SHDSL; Service Guarantee 1 is currently the highest available Service Guarantee.

## 4 Price

### 4.1 Price structure

The service is priced with a start-up price and a monthly price. Start up prices of the service depends on the agreement length and the service type. Additional prices, i.e. internal cabling, relocation and other work in the customer premises, is not included in start-up price. Broadnet have different solutions for internal cabling available as an option.

## 5 Additional services

In addition to Internet access Broadnet also offers relevant services that meet with the majority of the company's communication requirements.

### 5.1 Fixed IP addresses

Broadnet can allocate fixed IP addresses against an additional fee. Due to a serious shortage of IP version 4 addresses, a well-founded application must be submitted by the client and the application is subject to approval cf. the [RIPE](#) Guidelines.

Product	Net bits	Subnet mask	Addresses available to the client	Notes/comments
128 Fixed IP addresses	/25	255.255.255.128	125	Requires RIPE application
64 Fixed IP addresses	/26	255.255.255.192	61	Requires RIPE application
32 Fixed IP addresses	/27	255.255.255.224	29	Requires RIPE application
16 Fixed IP addresses	/28	255.255.255.240	13	Requires RIPE application
8 Fixed IP addresses	/29	255.255.255.248	5	
4 Fixed IP addresses	/30	255.255.255.252	1	

Addresses available to the client:

For each IP address block (/xx) 3 IP addresses are reserved for the specific purposes:

1. Net address
2. Default Gateway address
3. Broadcast address

Example:

On ordering the product 8 Fixed-IP-addresses (/29 nett) 5 Fixed IP addresses are "supplied" at the local network interface and will be available to the client.

On ordering Fixed IP addresses information relating to the addresses and how to configure these will be supplied. This will typically be done a few weeks prior to the actual access being supplied and activated. The client will thus have sufficient time to plan his usage of the IP addresses and to configure hosts where necessary.

If the company requires more than 13 Fixed IP addresses an application must be submitted to Broadnet. Application form can be obtained through Broadnets Sales Contact.

### 5.1.1 Allocation of IP addresses on an Internet Fiber access:

- Broadnet assigns as standard one fixed IP address included in the access price.
- For an additional price, /29 or /28 networks are allocated without requiring an approved RIPE application
- /27 and larger address blocks are allocated at an additional cost if approved RIPE application
- Broadnet can allocate 1. Dynamic IP address at an additional cost

### 5.1.2 Allocation of IP addresses on an Internet xDSL access:

- Dynamic IP address comes as standard on Internet xDSL accesses.
- For an additional price, /30, /29 or /28 networks are allocated without requiring an approved RIPE application
- /27 and larger address blocks are allocated at an additional cost if approved RIPE application

### 5.1.3 Connecting of router to accesses

For the allocation of more than 32 fixed IP addresses (/27 network), there is a requirement that the router is connected to access. As a solution, Broadnet can deliver the Internet Managed service. Alternatively, the client themselves must connect and operate the router to access.

## 5.2 DHCP/NAT

DHCP/NAT can be supplied as an additional service to the Internet Managed service. It will not be possible to order multiple IP addresses in combination with the DHCP/NAT service.

DHCP/NAT for Internet Managed is available up to and including 100 Mbps. The additional service comes with fixed layout (RFC 1918) and standard configuration is as follows: 192.168.0.0/24 - alternatively the following can be selected: 10.240.10/24.

Set-up for DHCP/NAT:
.1 is router (gw)
.2-99 reserved fixed allocation
.100-250 is DHCP assigned

Set-up for DHCP/NAT:
Does not support inbound port-networking
DNS ☑ 193.75.75.75 and 193.75.75.193

## 6 Attachment A – Abbreviations and definitions

Abbreviation / definition	Explanation
ADSL	<u>Asymmetric Digital Subscriber Line</u>
DHCP	<u>Dynamic Host Configuration Protocol</u> Automatic allocation of IP address and other IP configuration to PCs and other network centers.
DNS	<u>Domain Name Service (Server or System)</u> An Internal service that converts domain names to IP addresses. Instead of having to remember complicated number-based IP addresses, DNS servers are used. These can be compared to a virtual telephone directory with an alphabetic overview of all registered domain names (for example Broadnet.no) and their accompanying IP addresses.
IP	<u>Internet Protocol</u> Network protocol developed for that which is now the Internet (therefore the name), but is now by far the most utilized protocol for routed networks.
ISP	<u>Internet Service Provider</u> A supplier of Internet access and Internet services.
kbps	<u>kilobit per second</u>
MAC	<u>Media Access Control</u> The unique hardware ID number.
Mbps	<u>Megabit per second</u>
MPLS	<u>Multi Protocol Label Switching</u> A network protocol that permits the transport of several separate networks on the same lines and network components. Separation can be compared with VLAN, but MPLS provides amongst other advantages better opportunities to improved to route traffic via redundant transmission routes. Broadnet uses MPLS in its basic network to combine separation of the individual client’s network while at the same time providing redundancy.
MTU	<u>Maximum Transmission Unit</u> The largest volume of data or packet size that can be transmitted in a single frame over the physical network.
NOC	<u>Network Operation Center</u> Broadnet has 24-hour year-round staffing and monitors the network infrastructure and services from NOC.
PHP	<u>PHP: Hypertext Preprocessor</u> PHP is a programming language that is mainly used to develop dynamic web pages
POP3	<u>Post Office Protocol version 3</u>



Abbreviation / definition	Explanation
	A standard Internet protocol used to download e-mail from a remote e-mail server via a TCP IP link.
RIPE	<u>Réseaux IP Européens (Network Coordination Center)</u> An independent organization that manages, distributes and registers public Internet addresses.
SHDSL	<u>Symmetric Digital Subscriber Line</u>
SLA	<u>Service Level Agreement</u> A document that describes the quality (i.e. level and standard) and service level (i.e. scheduled availability for services supplied to the client).
SMTP	<u>Simple Mail Transfer Protocol</u> Is a protocol for sending e-mail messages between e-mail servers. The majority of e-mail systems that can send e-mail via the Internet use SMTP to send messages between servers.
SNMP	<u>Simple Network Management Protocol</u> Is a protocol used in IP based networks to administer and monitor computers and network equipment.
Spam	<u>English: Spam.</u> Undesirable /unwanted advertising on the Internet, often sent per e-mail.
URL	<u>Uniform Resource Locator</u> This is a description of how documents and other resources on the Internet are addressed. As an example a home page on the Internet is addressed as follows: http://www.broadnet.no. This URL is composed of the prefix http://, which means that the address is to a page on a World Wide Web server, while broadnet.no is the domain name of the web server. The name can be supplemented with a registry name and file name. Other types of URL may for example start with file:// (a file that is stored locally), ftp:// (FTP server), and so forth – depending on what types/classes of resources you wish to gain access to.
VRRP	<u>Virtual Router Redundancy Protocol</u> is a networkprotocol which provides automatic allocation of available IP-router.
WWW	<u>World Wide Web</u>