

# Service Description

## Vodafone Switched Ethernet



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## Vodafone Switched Ethernet Service Description

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## 1. General Information

Vodafone will provide the Switched Ethernet service to the customer on the basis of the Vodafone MPLS backbone (MPLS = Multi Protocol Label Switching). The service provides the technical conditions at one site for an Ethernet connection to one or multiple other customer sites.

Vodafone reserves the right to change the technology and infrastructure used to provide the service provided that such changes do not conflict with the customer's legitimate interests. When such changes are implemented, e.g. due to new technical or regulatory requirements, the customer is bound to cooperate to an extent that is reasonable.

### 1.1. Network topologies

The following network topologies are optionally available:

The Switched Ethernet product facilitates E-Line, E-Access and E-LAN Ethernet connections (designations as per MEF).

Service frame size is oriented on the smallest frame size for the relevant access in the topology.

Service type (as per MEF)	Port-based (all-to-one bundling)	VLAN-based (service multiplexing bundling)
E-Line (Point-to-point EVC/UNI-to-UNI)	Ethernet Private Line (EPL see 1.1.1.1)	Ethernet Virtual Private Line (EVPL see 1.1.2)
E-access (UNIs-to-ENNI)	Ethernet Private Line Access (EPL see 1.1.3)	
E-LAN (Multipoint-to-multipoint EVC/UNIs-to-UNIs)	Ethernet Private LAN (EP LAN see 1.1.4)	
E Tree (Rooted multipoint EVC/UNI-to-UNI)	Ethernet Private Tree (EP Tree see 1.1.5)	

The customer site is connected to the Vodafone network access point via access lines. A prerequisite for access product availability is an established connection to the Vodafone MPLS backbone.

#### 1.1.1. Ethernet Private Line (EPL)

Point-to-point connection between two customer sites. EPL implementation involves a port at site A being connected to a port at site B in order to obtain a transparent Ethernet connection analogue to a leased line. There is no consultation on VLANs. The maximum bandwidth for this service is 4 Gbps.

This service cannot be implemented with Switched Ethernet VDSL Regio L2BSA access products. (See section 6).

#### 1.1.2. Ethernet Virtual Private Line (EVPL)

With EVPL, a VLAN at site A is connected to a VLAN at site B. One EVC is used at each spoke site. This option permits the creation of a hub & spoke VPN and use of the 'Service Multiplexing' and 'Bundling' options. The number of VLANs per EVC is restricted to 63.

To establish a hub & spoke VPN the hub site must have an access rate of at least 50 Mbps and EVPL is only possible in conjunction with the Switched Ethernet Basic or Switched Ethernet All Inclusive Fibre access products. Up to 200 spokes (EVCs) can be connected to one hub site. The minimum bandwidth at the hub site has to be at least equal to the sum of the bandwidths at the spoke sites.

The hub site's maximum bandwidth is 10 Gbps. The spoke sites can be connected with a maximum bandwidth of 4 Gbps.

#### 1.1.3. Access EPL

Point-to-point connection between a port-based customer site (UNI type) and customer's network interface device (ENNI type). Implementation involves a port at the customer site being connected to a port at the network interface device in order to achieve a transparent Ethernet connection analogue to a

leased line. The access EPL (port-based) is assigned to the ENNI's Ethernet interface using the S-VLAN-ID with an 0x8100 EtherType value.

The ENNI's minimum bandwidth is 1 Gbps and its maximum bandwidth is 10 Gbps. The UNI's maximum bandwidth is 4 Gbps.

The S-VLAN reduces the frame size by 4 bytes in conjunction with the various access products and services.

#### 1.1.4. Ethernet Private LAN (EP LAN)

Connection of a customer site to the Vodafone network. An any-to-any Ethernet VPN is realised by connecting a port at the customer site to the Vodafone transport network. There is no consultation on VLANs. The customer can use different VLANs without consulting Vodafone. The maximum bandwidth for this service is 10 Gbps. For reasons relating to security, a maximum of 256k can be used with multicast and broadcast frames.

#### 1.1.5. Ethernet Private Tree (EP Tree)

Connection of a customer site to the Vodafone network. An EP Tree is realised by connecting a port at the customer site to the Vodafone transport network. There is no consultation on VLANs. The customer can use different VLANs without consulting Vodafone. In the LAN the 'root' site can communicate with the 'leaf' sites and vice versa. Communication between the leaf sites is not possible. When using multiple roots, communication between the roots and each root with each leaf is possible, in the VPN.

Unlike EVPL, there is no dependency between the 'root' site and the sum of the bandwidths of all 'leaf' sites. To establish a hub & spoke VPN the hub site must have an access rate of at least 50 Mbps and EVPL is only possible in conjunction with the Switched Ethernet Basic or Switched Ethernet All Inclusive Fibre access products. The maximum bandwidth for this service is 10 Gbps. For reasons relating to security, a maximum of 256k is possible with multicast and broadcast frames.

This service is not available with the Switched Ethernet VDSL Regio L2BSA symmetrical or VDSL Regio L2BSA access products.

## 1.2. Ethernet Service Features

All Vodafone access products offer the following Ethernet and transparency features; restrictions may occur if a third party carrier is used.

The different types of traffic 'No VLAN tag' (only EPL, EPLAN, EP Tree), '1 VLAN tag' and '2 VLAN tags' are taken into account. Using VLAN tags reduces the MTU.

### 1.2.1. Point-to-point connection features

Switched Ethernet via EVPL supports various service features such as service multiplexing several EVCs to different remote sites on a UNI (User Network Interface) or bundling customer VLANs to an EVC.

With EPL/ Access EPL and EVPL any number of MAC addresses can be used.

### 1.2.2. Any-to-any connection features

MAC addresses are used for switching in the E-LAN service. Requirements and service scalability can differ considerably depending on what device the customer uses.

#### 1.2.2.1 E-LAN as router interconnect service

The router interconnect service provides the customer with maximum scalability. One MAC address is used for each router interface. It is important to remember that MAC addresses are necessary for virtual IP addresses (e.g. HSRP, VRRP). A maximum of 5 MAC addresses can be used with each connection and 255 with each customer VPN.

#### 1.2.2.2 E-LAN as switch interconnect service

If the customer does not use a router, a maximum of 64 MAC addresses can be used with each connection and 255 with each customer VPN.

## 1.3. Backbone parameters

The following typical average values are achieved in the Vodafone fixed network's backbone, based on measurements with a packet size of 200 bytes:



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One way – backbone parameter	Typical values
Frame loss	0.05 %
Delay	10 ms
Jitter	5 ms

## 1.4. Service termination

### 1.4.1. Network Interface Device (NID)

To provide Switched Ethernet an NID with Ethernet port is installed at the customer site (generally a table-top NID with a 230-volt alternating current connection). Optionally, an NID with 48-volt direct current can be requested. If the NID is to be integrated into a rack provided by the customer it must be requested separately.

Optionally, an NID with a second power supply unit can be requested. In this case, both power supply units have 230-volt alternating current or 48-volt direct current connections.

### 1.4.2. Transfer interfaces

Ethernet interfaces will be provided as customer interfaces.

The standard for all bandwidths up to 1000 Mbps is a 1000 Base T interface with auto negotiation and an RJ 45-type connector.

The standard for bandwidths of between 2 Gbps and 10 Gbps is a 10GBase LR interface without auto negotiation and an LC-type connector.

Depending on the selected access rate the following physical interface types are available:

Bandwidth	Interface	Connector type	Auto negotiation/duplex mode
2 - 10 Mbps	10 Base T	RJ45	off/full duplex
	100 Base T	RJ45	off/full duplex
	1000 Base T	RJ45	on
	1000 Base LX	LC	off
	1000 Base SX	LC	off
15 - 100 Mbps	100 Base T	RJ45	off/full duplex
	1000 Base T	RJ45	on
	1000 Base LX	LC	off
	1000 Base SX	LC	off
150 - 1000 Mbps	1000 Base T	RJ45	on
	1000 Base LX	LC	off
	1000 Base SX	LC	off

## 1.5. Additional services

Vodafone offers further additional services subject to agreement. Charges for usage, installation or modification, if such charges apply, are listed in the relevant effective price schedule.

### 1.5.1. Service classes (CoS)

Vodafone offers four classes of service, each with defined transmission and service quality parameters, for the transmission of customer data with Switched Ethernet products. The data are transmitted via the Vodafone backbone in accordance with the relevant service class.

Customers who subscribe to Vodafone CoS can assign their applications to the service classes of 'Premium', 'Enhanced', 'Standard' or 'Default'. They also have the options of layer 2 (p-Bit) or layer 3 (DSCP) marking.

CoS	p-Bit (layer 2)
Premium	5, 6, 7
Enhanced	4
Standard	3

CoS	p-Bit (layer 2)
Default	0, 1, 2

Service quality can only be guaranteed to the customer by Vodafone if the agreements reached between Vodafone and the customer regarding the assignment of defined data to Vodafone service classes are upheld.

Classification and mapping to the relevant CoS is also possible with MEF marking.

CoS	p-Bit (layer 2)	IP-precedence (layer 3)	DSCP (layer 3)
Premium	5 (6,7)	5	EF
Enhanced	3	3	Af31
Standard	1	1	Af11
Default	0 (2,4)	0	

If the traffic in the 'Premium' service class exceeds the reserved bandwidth, the data will be rejected, which can affect all applications assigned to this CoS.

Two different options are available. At the time of subscription to the service, the customer can specify the required CoS model: 'Leased Line Model' (single CoS EVC) or 'CoS Aware Model' (multi-CoS EVC).

#### 1.5.1.1 Leased Line Model (Single CoS EVC)

With leased line model the customer chooses a class of service for all data traffic (bandwidth per EVC). The maximum bandwidth for the class of service "Premium" is 4 Gbps.

#### 1.5.1.2 CoS Aware Model (Multi-CoS EVC)

If the customer chooses the CoS aware mode, the bandwidth per EVC (Ethernet Virtual Connection) can be distributed across different classes of service. The following table applies to the distribution of bandwidth between the individual classes of service in CoS aware mode. The percentages distributed to the various classes may not exceed 100% of the access rate.

CoS Aware Model	Max. share of AR*	CIR	EIR
Premium	50%	10/20/30/40/50% of AR	0
Enhanced	100%	10/20/30/40/50/60/70/80/90/100% of AR	EIR = AR-CIR
Standard	100%	10/20/30/40/50/60/70/80/90/100% of AR	EIR = AR-CIR
Default	100%	0	AR

\*) AR=Access rate

### 1.5.2. Link loss forwarding

In point-to-point topologies such as EPL, EVPL and Access EPL the link loss forwarding feature is available if the customer has subscribed to the Performance Monitor service. When there is no input signal and/or the EVC fails, the relevant UNI will be deactivated. With EVPL the relevant UNIs at the spoke sites will be deactivated.

### 1.5.3. Network management / network monitoring

Vodafone offers the network management and monitoring tools of Performance Monitor and Supervise Management, as described in the Network Management / Network Monitoring section.



## 1.6. Duties of the customer to cooperate

### 1.6.1. General

The customer must meet all requirements in its sphere of responsibility to ensure the proper provision of services and inform Vodafone without delay of any changes to customer data that Vodafone has on record.

The customer must take all reasonable precautions to prevent unauthorised third parties from accessing Vodafone hardware and equipment.

### 1.6.2. Customer site and ENNI sites/ premises

The customer must provide Vodafone with suitable premises for the installation and set-up of the Vodafone equipment which is necessary for execution of the Agreement during the entire term of the Agreement. The customer must also provide all necessary ancillary services, particularly an adequate power supply, lighting and air-conditioning, as well as any necessary potential equalisation and earthing systems, at no charge.

The customer is responsible for the clear documentation of the demarcation point between the public switched telephone network and the in-house private network (location of the demarcation point, configuration of line parameters), and to make available at any time upon request. The minimum requirement in connection with the above documentation obligation is the provision of a postal address including house number if the demarcation point can be clearly identified in this way. If a building has several demarcation points it will be necessary to designate them clearly in such a way that differentiation between them is possible.

### 1.6.3. Physical access

The customer must grant Vodafone and/or service provider personnel with access to the equipment installed by Vodafone (on more than one occasion if necessary) to enable Vodafone to comply with its contractual obligations relating to customer access products maintenance and service restoration.

### 1.6.4. Installation of the Vodafone NID

Vodafone will install an NID and/or modem close to the transmission path's NID. It remains the property of Vodafone. The NID is used to connect customer LAN devices or switches.

If the NID is not in the vicinity of the router location requested by the customer, (access line length 3 metres), Vodafone can perform the necessary additional installation work by arrangement. This additional work will be invoiced on a time and material basis.

The NID is equipped with an Ethernet 10/100 /1000 base T (RJ-45) interface as standard. For 2000, 4000 and 10000 Mbps the NID is equipped with a 10G Base-LR (optical interface). It is necessary ensure that the maximum optical input at the transfer port is not exceeded. The bandwidth to be used between the Ethernet interface and the NID must be stated in the service request.

The NID's configuration settings may not be modified by the customer. Vodafone is responsible for 24h NID management.

## 2. Switched Ethernet Basic

### 2.1. Basic services

#### 2.1.1. Fixed line connection to the Vodafone MPLS backbone

Vodafone provides the necessary technology for access at your network nodes and handles the necessary administrative tasks. The connection from the customer's premises to the Vodafone network access point is established via access lines which can also be part of another carrier's network infrastructure.

#### 2.1.2. Access rates

The Ethernet services are provided with the following access rates in the Classic service level.

- 2, 4, 8, 10, 15, 20, 50, 100 and 150 Mbps
- 200, 300, 600, 1000, 2000, 4000 and 10000 Mbps

The access rates conform to the generally accepted, state of the art bandwidth designations. With Ethernet access lines the line designations (10 / 100 / 1000 / 10000 Mbps) refer directly to Layer 1 bandwidths.

With Switched Ethernet Basic, Vodafone provides the full access rate. The actual rate of data transmission depends on several factors (applications, frame size) and can deviate from the specified values.

The customer can select suitable access rates for each site.

### 2.1.3. Maximum Ethernet frame size

Frame sizes of up to 2000 bytes are possible with all Vodafone access technologies; if another carrier's wholesale product is used, deviations are possible. Depending on the access technology used and subject to a prior technical check and Vodafone's confirmation, Gigabit Ethernet with frame sizes up to 8996 bytes is possible.

Access	Rate	Frame size in bytes
2, 4, 8, 10, 20 Mbps	Ethernet leased line	1572
50 - 10000 Mbps	Ethernet leased line	1996

## 2.2. Service levels

All SLA parameters are set out in the Service Level Agreement.

The following service levels are available for Switched Ethernet Basic: Classic, Classic Express, Classic Plus, Classic Premium and Classic Premium Advanced. The backup link bandwidth may not be higher than the primary link bandwidth.

### 2.2.1. Classic service level

Switched Ethernet Basic is provided with the Classic service level as standard. Access product availability with the Classic SL is 99%. Time back to service is 12 hours. In the event of cable damage, the time back to service is 24 hours.

### 2.2.2. Classic Express service level

In the Classic Express service level, Vodafone provides the customer with a faster time back to service of 8 hours.

### 2.2.3. Classic Plus service level

In this service level another link with the same access rate is connected to the NID and configured. The backup bandwidth can be implemented as Switched Ethernet Basic.

Service frame size is oriented on the smallest frame size for the relevant access in the topology.

### Backup bandwidths with Switched Ethernet Basic access products

Redundant connections are available with the relevant backup bandwidths for the following access rates:

Access rate	Back-up bandwidth
150 Mbps	150 Mbps
200 Mbps	200 Mbps
300 Mbps	300 Mbps
600 Mbps	600 Mbps
1 Gbps	1 Gbps
2 Gbps	2 Gbps
4 Gbps	4 Gbps
10 Gbps	10 Gbps

Communication and backup services are restricted to the backup link in case that the primary link fails. The redundancy mechanism is managed by



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Vodafone. The additional (backup) link is connected to the same PoP as the primary link (disjunct routing).

Access product availability with the Classic Plus SL is 99.5%. In this case, original state is restored (problem-free operation of both accesses) within 12 hours.

If both links fail, at least one must be restored to service again within 8 hours.

### 2.2.4. Classic Premium service level

In the Classic Premium service level, Vodafone provides the customer with enhanced availability. This involves the installation of an additional Switched Ethernet access product at the customer site, subject to a prior check.

In the case of point-to-point connectivity (EPL, EVPL and E-Access) the same SLA must apply to both sites unless EVPL or Access EPL topologies are used. Spoke sites that are set up with a Classic Premium SLA can terminate on the same NNI or hub with the Classic SL.

If the connection is via a carrier, this carrier's access links can be realised via a building feed with an NID at the customer site. Two Vodafone terminals are then installed behind the carrier's NID. Optionally and subject to an extra charge the customer can request a premium wholesale product (higher network availability) with a different line routing and implement it.

If different carriers are used line routing may deviate and two separate NIDs may be necessary.

#### Backup bandwidths with Switched Ethernet Basic access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
2 Mbps	2 Mbps
4 Mbps	2, 4 Mbps
8 Mbps	2, 4 or 8 Mbps
10 Mbps	2, 4, 8 or 10 Mbps
20 Mbps	2, 4, 8, 10, 15 or 20 Mbps
50 Mbps	8, 4, 10, 20 or 50 Mbps
100 Mbps	10, 15, 20, 50 or 100 Mbps
150 Mbps	15, 20, 50, 100 or 150 Mbps
200 Mbps	20, 50, 100, 150 or 200 Mbps
300 Mbps	50, 100, 150, 200 or 300 Mbps
600 Mbps	100, 150, 200, 300 or 600 Mbps
1 Gbps	100, 150, 200, 300, 600 Mbps or 1 Gbps
2 Gbps	200, 300, 600, 1000 or 2000 Mbps
4 Gbps	600, 1000, 2000 or 4000 Mbps
10 Gbps	1000, 2000, 4000 or 10000 Mbps

#### Backup bandwidths with Switched Ethernet Basic WLL access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
2 Mbps	2 Mbps
4 Mbps	2, 4 Mbps
8 Mbps	2, 4 or 8 Mbps
10 Mbps	2, 4, 8 or 10 Mbps
20 Mbps	2, 4, 8, 10, 15 or 20 Mbps
50 Mbps	8, 10, 15, 20 or 50 Mbps

Access rate	Back-up bandwidth
100 Mbps	10, 15, 20, 50 or 100 Mbps
150 Mbps	15, 20, 50, 100 or 150 Mbps
200 Mbps	20, 50, 100, 150 or 200 Mbps
300 Mbps	50, 100, 150, 200 or 300 Mbps
600 Mbps	100, 150, 200 or 300
1 Gbps	100, 150, 200 or 300

#### Backup bandwidths with Switched Ethernet VDSL Regio L2BSA symmetrical access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
10 Mbps	10 Mbps
20 Mbps	10 or 20 Mbps
50 Mbps	10 or 20 Mbps
100 Mbps	10 or 20 Mbps
150 Mbps	20 Mbps
200 Mbps	20 Mbps

#### Backup bandwidths with Switched Ethernet VDSL Regio L2BSA access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
20 Mbps	16/2 Mbps
50 Mbps	16/2, 25/5 or 50/10 Mbps
100 Mbps	16/2, 25/5, 50/10 or 100/40 Mbps
150 Mbps	16/2, 25/5, 50/10 or 100/40 Mbps
200 Mbps	25/5, 50/10 or 100/40 Mbps
300 Mbps	50/10, 100/40 or 250/40 Mbps
600 Mbps	100/40 or 250/40 Mbps
1 Gbps	100/40 or 250/40 Mbps

During regular operation both access links can be actively used. During backup, communication is restricted to back-up bandwidth. The customer is required to implement any necessary load sharing and redundancy mechanisms.

Access product availability with the Classic Premium service level is 99.9%. In this case, the original state is restored (problem-free operation of both connections) within 12 hours.

If both access links fail, at least one must be restored to service again within 4 hours.

### 2.2.5. Classic Premium Advanced service level

In the Classic Premium Advanced service level Vodafone provides enhanced availability to the customer via a second, node and edge disjoint building feed at the customer site up to two different Vodafone points of service (different VF network segments). Both links terminate at an own NID.

All 4 components are essential prerequisites for the provision of this service level.





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## Backup bandwidths with Switched Ethernet Basic access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
2 Mbps	2 Mbps
4 Mbps	2, 4 Mbps
10 Mbps	2, 4, 8 or 10 Mbps
20 Mbps	2, 4, 8, 10, 15 or 20 Mbps
50 Mbps	8, 4, 10, 20 or 50 Mbps
100 Mbps	10, 15, 20, 50 or 100 Mbps
150 Mbps	15, 20, 50, 100 or 150 Mbps
200 Mbps	20, 50, 100, 150 or 200 Mbps
300 Mbps	50, 100, 150, 200 or 300 Mbps
600 Mbps	100, 150, 200, 300 or 600 Mbps
1 Gbps	100, 150, 200, 300, 600 Mbps or 1 Gbps

During regular operation both access links can be actively used. During back-up, communication is restricted to back-up bandwidth. The customer is required to implement any necessary load sharing and redundancy mechanisms.

Access product availability with the Classic Premium Advanced service level is 99.99%. In this case, the original state is restored (problem-free operation of both connections) within 12 hours.

If both access links fail, at least one must be restored to service again within 2 hours.

### 3. Switched Ethernet Basic - WLL

#### 3.1. Basic services

##### 3.1.1. WLL connection to the Vodafone MPLS backbone

Vodafone Wireless Local Loop (Vodafone WLL) offers an access option to the Vodafone backbone via which further data services can be provided. Access via Ethernet WLL is only available in certain areas. Vodafone will inform the customer of these by request.

The necessary hardware components for the provision of the service will be provided by Vodafone, as a rule on the roof of the customer's premises, consisting of an antenna, the outdoor unit (ODU), the cabling and the indoor unit (IDU) close to the Vodafone access device (router or switch).

Structural alterations are not included in the scope of the Vodafone WLL service and are charged additionally in a separate offer.

Further hardware and installation components may be required for antenna structures, and additional work may be necessary which is charged on a time and material basis.

Preconditions for the contract to be effective are:

- a legally valid licence agreement (Schedule 1),
- a positive line of sight (LoS) test,
- the allocation of wireless frequencies by the Federal Network Agency,
- compliance with structural and lightning protection requirements.

##### 3.1.2. Access rates

The Ethernet services are provided with the following access rates in the Classic service level.

- 2, 4, 8, 10, 15, 20, 50, 100, 150, 200 and 300 Mbps
- The available bandwidth is dependent on several technical factors and will be disclosed to the customer after the line of sight test.

With Switched Ethernet -WLL Vodafone provides the full access rate. The actual rate of data transmission depends on several factors (applications, frame size) and can deviate from the specified values.

#### 3.1.3. Maximum Ethernet frame size

For connections under the 'Basic – WLL' tariff with access rates of up to 300 Mbps the maximum frame size is 1996 bytes.

Access	Rate	Frame size in bytes
2 - 300 Mbps	WLL	1996

#### 3.2. Service levels

All SLA parameters are set out in the Service Level Agreement.

The Classic service levels is available for Switched Ethernet Basic - WLL. The service level and the provisioning dates for WLL connectivity are subject to the following limitations:

Compliance with the agreed service restoration timeframes/ deadlines cannot be guaranteed if the following events occur:

- Storm
- Ice
- Icy ladders/climbing equipment
- Thunderstorms

The same applies if work has commenced, but to continue work would entail additional risks due to an adverse event occurring (e.g. sudden change in the weather). Work may only be performed at night if:

- the access routes and the place where the work is to be performed are adequately illuminated.
- Ladders with climbing protection or back protection may only be climbed in the dark if they are illuminated by a stationary lighting rig without glare or shadow.

A delay caused by one of the foregoing limitations does not represent a default in performance or a breach of the service level agreement as defined in the Service Description.

##### 3.2.1. Classic service level

Switched Ethernet Basic -WLL is provided with the Classic service level as standard. Access product availability with the 'Classic' service level is 99.0%. Time back to service is 12 hours. In the event of cable damage, the time back to service is 24 hours.

#### 3.3. Duty of the customer to cooperate (WLL)

##### 3.3.1. General information

Prerequisites for the installation and operation of the WLL system by Vodafone are that all requirements under proprietary law being complied with, building and lightning protection requirements being met, and technical requirements (e.g. cabling capability between IDU and ODU) being in place prior to installation. Otherwise all costs incurred will be charged to the customer.

The necessary structural measures will be agreed between the customer and Vodafone during a site inspection. For this purpose the customer must provide Vodafone with the name of an authorised contact person.

If, in certain cases, additional installation work is necessary, Vodafone will notify the customer and provide a quotation.

The customer is responsible for the provision of an adequate power supply around the ODU and the IDU.



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### 3.3.2. Licence agreement

Before requesting WLL connectivity the customer is required to present a signed licence agreement (see Schedule 1). This document forms part of the contract.

### 3.3.3. Building cabling

The customer is responsible for the cabling between ODU and IDU.

## 4. Switched Ethernet All Inclusive - Fibre

### 4.1. Basic services

#### 4.1.1. Fixed line connection to the Vodafone MPLS backbone

Vodafone provides the necessary technology for access at your network nodes and handles the necessary administrative tasks. Switched Ethernet All Inclusive Fibre includes the necessary access lines and is only available in certain areas such as, for example, business parks. Vodafone will inform the customer of these by request.

#### 4.1.2. Access rates

The Ethernet services are provided with the following access rates via copper twisted pair cables. 50, 100, 150, 200, 300, 600, 1000 Mbps. The access rates conform to the generally accepted, state of the art bandwidth designations.

With Switched Ethernet All Inclusive Fibre, Vodafone provides the full access rate. The actual rate of data transmission depends on several factors (applications, frame size) and can deviate from the specified values.

#### 4.1.3. Maximum Ethernet frame size

For connections under the 'All Inclusive Fibre' tariff the maximum frame size is 8996 bytes.

Access	Rate	Frame size in bytes
50 - 10000 Mbps	Vodafone Fibre	8996

### 4.2. Service level

The following service levels are available for Switched Ethernet All Inclusive Fibre: Classic, Classic Express, Classic Premium and Classic Premium Advanced. The backup link bandwidth may not be higher than the primary link bandwidth.

#### 4.2.1. Classic service level

Switched Ethernet All Inclusive Fibre is provided with the Classic service level as standard. Access product availability with the 'Classic' service level is 99.0%. Time back to service is 12 hours. In the event of cable damage, the time back to service is 24 hours.

#### 4.2.2. Classic Express service level

In the Classic Express service level, Vodafone provides the customer with a faster time back to service of 8 hours.

#### 4.2.3. Classic Premium service level

In the Classic Premium service level, Vodafone provides the customer with enhanced availability. This involves the installation of an additional Switched Ethernet access product the customer site, subject to prior check.

If the connection is via a carrier, this carrier's access links can be realised via a building feed with an NID at the customer site. Two Vodafone terminals are then installed behind the carrier's NID.

Optionally and subject to an extra charge the customer can request a premium wholesale product (higher network availability) with a different line routing and implement it.

If different carriers are used deviating line routing is possible and two separate NIDs may be necessary.

#### Backup bandwidths with Switched Ethernet Basic access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
50 Mbps	8, 4, 10, 20 or 50 Mbps
100 Mbps	10, 15, 20, 50 or 100 Mbps
150 Mbps	15, 20, 50, 100 or 150 Mbps
200 Mbps	20, 50, 100, 150 or 200 Mbps
300 Mbps	50, 100, 150, 200 or 300 Mbps
600 Mbps	100, 150, 200, 300 or 600 Mbps
1 Gbps	100, 150, 200, 300, 600 Mbps or 1 Gbps

#### Backup bandwidths with Switched Ethernet Basic - WLL access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
50 Mbps	8, 4, 10, 20 or 50 Mbps
100 Mbps	10, 15, 20, 50 or 100 Mbps
150 Mbps	15, 20, 50, 100 or 150 Mbps
200 Mbps	20, 50, 100, 150 or 200 Mbps
300 Mbps	50, 100, 150, 200 or 300 Mbps
600 Mbps	100, 150, 200 or 300 Mbps
1 Gbps	100, 150, 200 or 300 Mbps

#### Backup bandwidths with Switched Ethernet VDSL Regio L2BSA symmetrical

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
50 Mbps	10 or 20 Mbps
100 Mbps	10 or 20 Mbps
150 Mbps	20 Mbps
200 Mbps	20 Mbps

#### Backup bandwidths with Switched Ethernet VDSL Regio L2BSA access products

Redundant connections with the relevant backup bandwidths are available for the following access rates:

Access rate	Back-up bandwidth
50 Mbps	16/2, 25/5 or 50/10 Mbps
100 Mbps	16/2, 25/5, 50/10 or 100/40 Mbps
150 Mbps	16/2, 25/5, 50/10 or 100/40 Mbps
200 Mbps	25/5, 50/10 or 100/40 Mbps
300 Mbps	50/10, 100/40 or 250/40 Mbps
600 Mbps	100/40 or 250/40 Mbps
1 Gbps	100/40 or 250/40 Mbps

During regular operation both access links can be actively used. During back-up, communication is restricted to back-up bandwidth. The customer is





required to implement any necessary load sharing and redundancy mechanisms.

Access product availability with the Classic Premium service level is 99.9%. In this case, the original state is restored (problem-free operation of both connections) within 12 hours.

If both access links fail, at least one must be restored to service again within 4 hours.

## 5. Switched Ethernet VDSL Regio L2BSA symmetrical

### 5.1. Basic services

#### 5.1.1. General information

With Switched Ethernet VDSL Regio L2BSA symmetrical Vodafone provides the customer with access to Ethernet services. Access is via an upstream supplier's VDSL connection.

VDSLs are only provided in certain regions. Vodafone will inform the customer of these by request.

If several DSLs are provided within an in-house network or via an access line, simultaneous use can lead to reciprocal interference and service interruptions.

If access line interference escalates, it can in exceptional cases be impossible to maintain the service.

The escalation of interference can occur, in particular, as a result of an upstream supplier switching third party DSLs to neighbouring cable pairs. Vodafone has no influence over this.

In such cases, if it is technically feasible, the customer can request the provision of a lower bandwidth. If the service cannot be provided permanently as a result of circumstances over which Vodafone has no control, both parties to the contract have the special right to terminate Switched Ethernet VDSL Regio L2BSA symmetrical at the affected site.

In some cases, DSL access cannot be provided if there is no suitable cable (copper twisted pair).

#### 5.1.2. Access rates

Connections are provided with the following maximum symmetrical access rates:

Access rate	Downstream	Upstream
10 Mbps	10 Mbps	10 Mbps
20 Mbps	20 Mbps	20 Mbps

With Switched Ethernet VDSL Regio L2BSA symmetrical, Vodafone provides the full access rate. The actual rate of data transmission and performance values depends on several factors (applications, frame size, the physical characteristics of the access line) and can deviate from the specified values.

If connection access rates are below those defined this is deemed to be a service interruption and the provisions of 7.2 apply.

#### 5.1.3. Maximum Ethernet frame size

For connections under the 'VDSL Regio L2BSA symmetrical' tariff of up to 20 Mbps the maximum frame size is 1572 bytes.

Access	Rate	Frame size in bytes
10 - 20 Mbps	VDSL L2BSA	1572

### 5.2. Service level

The following service levels are available for Switched Ethernet VDSL Regio L2BSA symmetrical: Classic and Classic Express.

#### 5.2.1. Classic service level

Switched Ethernet VDSL Regio L2BSA symmetrical is provided with the Classic service level as standard. Access product availability with the Classic service level is 99.0%. Time back to service is 12 hours. In the event of cable damage, the time back to service is 24 hours.

#### 5.2.2. Classic Express service level

In the Classic Express service level, Vodafone provides the customer with a faster time back to service of 8 hours.

## 6. Switched Ethernet VDSL Regio L2BSA

### 6.1. General information

With Switched Ethernet VDSL Regio L2BSA Vodafone provides the customer with access to Ethernet services. Access is via an upstream supplier's VDSL connection.

VDSLs are only provided in certain regions. Vodafone will inform the customer of these by request.

If several DSLs are provided within an in-house network or via an access line, simultaneous use can lead to reciprocal interference and service interruptions.

If access line interference escalates, it can in exceptional cases be impossible to maintain the service.

The escalation of interference can occur, in particular, as a result of an upstream supplier switching third party DSLs to neighbouring cable pairs. Vodafone has no influence over this.

In such cases, if it is technically feasible, the customer can request the provision of a lower bandwidth. If the service cannot be provided permanently because of circumstances over which Vodafone has no control, both parties to the contract have the special right to terminate Switched Ethernet VDSL Regio L2BSA at the affected site.

In some cases, DSL access cannot be provided if there is no suitable cable (copper twisted pair).

#### 6.1.1. Access rates

Access to the customer VPN is provided at the following maximum asymmetrical access rates in the Classic service level:

Commercial bandwidth	Synchronisation bandwidth downstream	Synchronisation bandwidth upstream
VDSL 16/2 Mbps	Up to 16 Mbps	Up to 2.8 Mbps
VDSL 25/5 Mbps	Up to 25 Mbps	Up to 5 Mbps
VDSL 50/10 Mbps	Up to 50 Mbps	Up to 10 Mbps
VDSL 100/40 Mbps	Up to 100 Mbps	Up to 40 Mbps
VDSL 250/40 Mbps	Up to 250 Mbps	Up to 40 Mbps

The actual rate of data transmission and performance values depends on several factors (applications, frame size, the physical characteristics of the access line) and can deviate from the specified values.

Longer access lines require a lower synchronisation bandwidth for stable connections, and this also improves data transmissions.

The physical characteristics of the access lines can fluctuate during operation, which can result in synchronisation impairments.

If the access rates fall below the defined maximum rate for QoS/CIR this is deemed to be a service interruption and the provisions of 8.2 apply.

#### 6.1.2. Transfer interfaces deviating from 1.4.2

Ethernet interfaces will be provided to the customer.

The standard for all bandwidths is a 1000 Base T interface with auto negotiation and an RJ 45-type connector.

Depending on the selected access rate the following physical interface types are available:



# Vodafone Switched Ethernet Service Description

Access rate	Interface	Connector type	Auto negotiation/duplex mode
16/2 Mbps 100/40 Mbps	100 Base T 1000 Base T 1000 Base LX 1000 Base SX	RJ45 RJ45 LC LC	off/full duplex on off off
250/40 Mbps	1000 Base T 1000 Base LX 1000 Base SX	RJ45 LC LC	on off off

### 6.1.3. Maximum Ethernet frame size

For connections under the 'VDSL Regio L2BSA' tariff of up to 250 Mbps downstream and 40 Mbps upstream the maximum frame size is 1572 bytes.

Access	Rate	MTU in bytes
Up to 250 Mbps downstream	VDSL L2BSA	1572

### 6.1.4. Service Classes (CoS)

Only 'Leased Line Model' (Single-CoS EVC) is available for Switched Ethernet VDSL Regio.

Commercial bandwidth Downstream/upstream	Max. bandwidth for QoS/CIR Downstream/upstream
VDSL 16/2 Mbps	10.9/0.7 Mbps
VDSL 25/5 Mbps	16.7/1.6 Mbps
VDSL 50/10 Mbps	27.9/2.7 Mbps
VDSL 100/40 Mbps	55.5/21.3 Mbps
VDSL 250/40 Mbps	185.8/21.3 Mbps

## 6.2. Service level

The following service levels are available for Switched Ethernet VDSL Regio L2BSA: Classic and Classic Express.

### 6.2.1. Classic service level

Switched Ethernet VDSL Regio L2BSA is provided with the Classic service level as standard. Access product availability with the Classic service level is 99.0%. Time back to service is 12 hours. In the event of cable damage, the time back to service is 24 hours.

### 6.2.2. Classic Express service level

In the Classic Express service level, Vodafone provides the customer with a faster time back to service of 8 hours.

## 7. Network Management / Network Monitoring Portals

### 7.1. Performance Monitor

#### 7.1.1. General information

Subject to separate agreement, Vodafone provides the customer's technical administrator with access to the Performance Monitor. This web-based monitor can be used by the customer to retrieve usage statistics online and to implement availability checks at individual sites.

The statistics which can be made available depend on the type and technical implementation of connections.

Vodafone enables the customer to monitor (measure) CoS compliance between individual connections.

#### 7.1.2. Access

The technical administrator receives a user ID and a password from Vodafone for access to the Performance Monitor.

Access is subject to the technical administrator using a current web browser.

#### 7.1.3. Invoicing

The usage statistics which can be retrieved by the customer can deviate from the invoice billing data, particularly since management traffic is not billed to the customer.

#### 7.1.4. Service level

In the event of a service interruption, the Vodafone Performance Monitor service will be restored by the next working day (Monday to Friday) at the latest.

## 7.2. Supervise Management

Subject to agreement and a separate charge, Vodafone provides the Supervise Management service to the customer for the active supervision of the Switched Ethernet sites.

The service informs the customer's technical contact about the non-availability of the Vodafone-operated NIDs by e-mail and opens a trouble ticket to initiate the service restoration process.

For technical reasons (query intervals / multi-system query) the data displayed/ e-mail information may deviate from real service availability. Therefore, the service may not be used as proof of services not rendered.

The customer undertakes to ensure that all Vodafone-operated NIDs, which it has purchased to operate the Supervise Management service, remain permanently switched on and connected to the Vodafone MPLS network. Service interruptions caused by the customer will be billed to the customer.

## 8. Training on central services

Vodafone provides training relating to the functions and operation of the central Vodafone services Web Ticket and Performance Monitor, either on a remote basis or at the customer's premises.

The customer is required to provide a PC on which the access certificates can be installed.

## 9. EasyTicket

### 9.1. General information

Vodafone provides the Easy Ticket online service tool to all enterprise customers.

Easy Ticket can be accessed from the public internet via the URL [www.vodafone.de/1234](http://www.vodafone.de/1234).

With Easy Ticket the customer can create, process and close web-based incident tickets. After validation/ login, all products (access products/services) and reported service restrictions are shown to the user. Easy Ticket can be used without time or location restrictions on any device with internet access. Customers can find further information about Easy Ticket and the user manual here: <https://www.vodafone.de/business/hilfe-support/easy-ticket.html>

### 9.2. Access

#### Login (without user credentials)

Easy Ticket can be accessed by unregistered users.

For data protection purposes, two of three entries must be made during login.

When the entered data has been validated, all products (access products/services) for the validated customer number are shown to the customer.

#### Expert Login (with user credentials)

Registration is necessary for expert login. In this case the user is registered as administrator or power user. Administrators can set up, edit or delete other user.

