

## **SPECIFICATION OF SERVICE Tele2 xDSL Access Wholesale**

For the provision of xDSL Access the following line segments are required in the Tele2-network:

- a) Access Line
- b) Backbone Segment
- c) Interposition Trunk

The technical specifications of these line segments or, in general, of the TK-service xDSL Access are as follows:

### **1 ACCESS LINE**

Tele2 will provide to the RESELLER, within the framework of existing technical and operating possibilities, a connection to the transport network of Tele2 at requested locations for resale to Customers (End Customers) of the RESELLER. The location of a connection is specified by the indication of the exact address and the premises of the End Customer.

This connection links the transport network of Tele2 (Backbone) with the End Customer's location. The connection consists of a data line which is conducted from the port of the Tele2-DSL-Access-Multiplexer (DSLAV) to the Customer's location as well as the port of the Tele2-DSLAM which is connected to the Customer.

The data line is realized by means of a copper line, which is unbundled from the network of Telekom Austria, and transmission technologies such as ADSL and SHDSL as requested by the RESELLER which make a high-bit-rate use of the copper line possible.

#### **1.1 Unbundled Network Access**

Since the connection is realized by means of an unbundled copper dual wire the withdrawal of the existing access to the Ceding Operator as well as the switching of the line from the Ceding Operator to Tele2 by the Ceding Operator is a precondition for the establishment of a connection by Tele2. The withdrawal of the access to the Ceding Operator becomes effective only after the successful switching to Tele2. The switching of the line and the withdrawal may only be carried out upon the filling out and signing of the form for unbundling by the account holder.

#### **1.2 Physical interface**

The physical interface in the End Customer will be provided on the connection facility installed in the End Customer. Depending on the bandwidth the interface will be realized as indicated in Table 1 Physical Interfaces.

The establishment of an exact bandwidth via the unbundled copper line cannot be guaranteed by Tele2 in a particular case. The actually commissioned bandwidth shall be considered as "exact" bandwidth within an array of 0 to -15% in steps of 32 kbit/s. Commissioned bandwidths within an array of 1024 ...896 / 256...224 kbit/s (downstream / upstream) shall be considered as 1024 / 256 kbit/s.

#### **1.3 Access protocol**

The following encapsulations are alternatively available for access:

- RFC 2684 (formerly RFC 1483) - Multiprotocol Encapsulation over AAL5: LLC Encapsulation for Bridged Protocols (aal5snap bridged) – in the alternative IP Transfer PPPoE is used, whereby the required PPPoE Client is not part of the service!

- RFC 2364 - PPP over AAL5: LLC Encapsulated PPP (aal5snap ppp)

## 1.4 Access Bandwidth

Access Bandwidth refers to the bandwidth of the connection (e.g. 512 / 64 kbit/s), i.e. bandwidth of the transmission path from the port of the Tele2 DSLAM to the End Customer (e.g. 512 kbit/s) and bandwidth of the transmission path from the End Customer to the port of the DSLAM (e.g. 64 kbit/s).

The Access Bandwidths available for Access Lines are indicated in Table 1 Physical Interfaces.

| Bandbreite Downstream / Upstream | Interfacetyp | Stecker |
|----------------------------------|--------------|---------|
| • 512 / 512 kbit/s               | 100BaseT     | RJ45    |
| • 1024 / 512 kbit/s              | 100BaseT     | RJ45    |
| • 1024 / 1024 kbit/s             | 100BaseT     | RJ45    |
| • 2048 / 512 kbit/s              | 100BaseT     | RJ45    |
| • 2048 / 2048 kbit/s             | 100BaseT     | RJ45    |
| • 4096 / 512 kbit/s              | 100BaseT     | RJ45    |
| • 4096 / 4096 kbit/s             | 100BaseT     | RJ45    |
| • 6144 / 1024 kbit/s             | 100BaseT     | RJ45    |
| • 6144 / 6144 kbit/s             | 100BaseT     | RJ45    |
| • 8192 / 1024 kbit/s             | 100BaseT     | RJ45    |
| • 8192 / 8192 kbit/s             | 100BaseT     | RJ45    |

Table 1 Physical Interfaces Access Line

## 1.5 General Structural Prerequisites

The connection establishment requires an installation room or service room at the End Customer's location that is clean, dry, dust-free and sufficiently aired. The RESELLER shall provide for the observance of an operating temperature range from +5 ° to +40 °C at the End Customer's location and a relative humidity of 35% to 70% (non-condensing).

## 1.6 Access Device

Tele2 shall install an Access Device (modem) at a suitable place in the installation room which is easily accessible for purposes of eliminating any failures.

The Access Device is a device with a plastic housing and has approximately the following dimensions: B 25 cm, D 22 cm, H 6 cm. The RESELLER shall not be entitled to the provision of an Access Device with special specifications.

The RESELLER shall ensure that the End Customer provides for the required current supply (230 VAC) for the Access Device. The length of the network cable is approximately 2 m. If the End Customer's location is situated in a lightning-prone area so that the installation of an overvoltage protection device to be provided by Tele2 and paid

for separately becomes necessary, the RESELLER shall provide that for purposes of overvoltage protection a potential equalization line as well as non-linear resistance arresters are installed in the network current supply by a licensed electro engineering firm at the End Customer's location. Tele2 shall not bear the costs accrued in this respect.

Tele2 shall be free to have the installation of the Access Device carried out by commissioned third parties.

Tele2 shall remain the owner of the provided Access Device.

Depending on the encapsulation selected according to point 1.3 the RESELLER shall be free to enter configuration files into the Access Device under his own responsibility. The additional functionalities made available by the entering to the RESELLER or the RESELLER's Customers (End Customers) are not to be considered as part of the Tele2-DSL Access service. In the case of any failures, caused by the entering or in the course of the entering of such configuration files, TELE2 will only make available the respective initial configuration, but Tele2 will not perform services to eliminate such failures.

Tele2 will not provide for the centrally archiving of any configuration files entered by the RESELLER.

The RESELLER shall not be entitled to the provision of an Access Device with special functions which are not covered by this service specification.

The Access Device will be integrated into the central Tele2 Management System over a separate virtual connection. This management will be performed out of a VPN and will thus not be accessible from a network outside this Management System. This, however, entails a restriction of accessibility of certain IP addresses which will then be routed over this virtual connection and configured on this virtual connection in the modem. Tele2 will reserve the private IP Address Block 172.31.0.0/16 for this purpose.

## **1.7 Network Terminating Point**

The Access Device forms the termination of the transmission way from the nearest DSLAM of the Tele2-Transport Network (Backbone), i.e. the Network Terminating Point (plug on the Access Device).

The Network Terminating Point determines the limit of both Tele2's on the one and the RESELLER's spheres of responsibility on the other hand. All network facilities operated by the Access Device on the network level and also the Access Device itself fall within Tele2's sphere of responsibility, excluding, however, the configuration files entered into the Access Device by the RESELLER and the functionalities resulting thereof (point 1.6). All other network facilities fall within the RESELLER's sphere of responsibility.

## **1.8 Installation**

The establishment of the connection will be performed according to the customary installation rules (standard installation). The cabling will accordingly be carried out "on the surface", whereby the RESELLER shall provide that in immediate proximity of the cabling there are no interfering and disturbing fields (transformer stations, wireless stations and the like).

Tele2 will provide cables with a length of up to 20 m. The RESELLER shall provide for the laying of the cables (commissioning of an electrician).

The RESELLER shall bear the costs for any protective measures necessary to prevent effects resulting from external voltage.

## 1.9 Terminal Device

The RESELLER shall connect the terminal device (NIC, hub, router, switch, ...) designed to be used by the End Customer via corresponding connecting cables to the connecting facility, thus providing access to the service. The terminal device itself including the connecting cable fall within the sphere of disposition and responsibility of the RESELLER.

The RESELLER shall be only be entitled to connect such terminal devices to the connecting facility which are suitable for the service Tele2 xDSL Access and which are compatible with the electrical and mechanical interface conditions indicated in point 1.10.

In the case of doubt the RESELLER shall obtain Tele2's consent.

## 1.10 Technical Specifications and Interfaces

Access bandwidth: 10 Mbit/s (10BaseT) in the connecting facility

Interfaces: IEEE802.3

## 2 Backbone (Transport network)

For the provision of xDSL Access a connection between two accesses shall be established within the Tele2-network by configuration of the Tele2-network nodes and Tele2-DSLAM. This enables the data transmission between these two accesses. The service provides cells through the Tele2-transport network which can be received with the call identifier (Virtual Path Identifier VPI, Virtual Channel Identifier VCI) of the connection at the interchanging point.

The connection will be established as Soft Permanent Virtual Channel SPVC and as Point-to-Point Connection for bi-directional communication between the port of the DSLAM and the port of the network node.

### 2.1 Bandwidth of the connection

This parameter has to be determined for each connection. The price for a connection is determined inter alia by the height of the bandwidth of the connection. The indicated bandwidths are to be regarded as user data including ATM Header.

### 2.2 Service category of the connection

This parameter basically corresponds to the traffic categories described in Traffic Management 4.0.

The following two service categories are offered:

- ABR for a high-quality data service with respect to critical data services – this category is obligatory for the first connection via an access as described under point 2.2.
- UBR for a Best Effort Data Service without any guarantee of bandwidth – this category is available for the second connection via an access as described under point 2.2<sup>1</sup>.

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<sup>1</sup> This second connection to the remote management (fault management, download of configuration files) of the Access Device may be used by the Customer depending on the encapsulation selected under point 1.3.

## 2.3 Pre-defined Connections

Bandwidth and service category of the connection are relevant for subscription and invoicing. According to UNI4.0/TM4.0 a whole range of parameters are required to characterize an ATM connection. The following lines will explain the determination of the essential ATM-parameters.

Based on Table 1 Physical Interfaces and the Access Bandwidths<sup>2</sup> indicated there the following formula may be derived for service category ABR in respect of down- and upstream:

- PeakCellRatePCR[kbit/s] = Access Bandwidth [kbit/s]
- Minimum CellRateMCR [kbit/s] =  $\frac{\text{Access Bandwidth [kbit/s]}}{\text{overbooking factor}}$

The parameters UBR and MCR are not required for the service category UBR.

The guaranteed bandwidth (resulting from the **overbooking factor**) may initially be selected by the RESELLER and thus determines the guaranteed bandwidth of the first obligatory connection, however, there is no guaranteed bandwidth with respect to the second additional optional connection over one access as described in point 2.2.

## 2.4 Length of the Connection

The third price-determining factor of a connection apart from bandwidth and service category depends on the geographic position of both connections (port of DSLAM and port of the network node) of the connection to each other. Two categories have to be differed:

- Regional – the connection is located within one federal province from a network topological point of view<sup>3</sup>

National – the connection extends over several federal provinces from a network topological point of view

In case there are several potential Interconnection Points the selection of the actual Interconnection Point per connection is free.

## 3 IP - Interposition trunk

Tele2 shall provide interposition trunks to the RESELLER by which (for the operation of xDSL-broadband-connections) the connection between Tele2-transport-network (backbone) and Network Interconnection Point is set up.

In the case of the IP-Interposition Trunk version a VPDN connection (L2TP tunnel) from the Tele2-Access Server to the home gateway of the RESELLER is set up on the basis of the dialing-in domain of the RESELLER. There, the user is authenticated at the home gateway of the RESELLER either directly or by means of an individual authentication-server (Radius, Tacas Plus). After the authentication the corresponding PPP-connection is established at the home gateway. The allotment of the respective parameters such as e.g. IP-addresses is effected by the home gateway of the RESELLER.

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<sup>2</sup> The calculation of PCR and MCR is not influenced by the actually commissioned access bandwidth.

<sup>3</sup> From a network topological point of view province of Vienna means Greater Vienna. The network topological view of federal provinces basically complies with the political borders, exceptions merely exist at frontiers between the federal provinces.

### 3.1 Homegateway

The home gateway is a router, located at the RESELLER's site, which forms the end of the VPDN tunnel (L2TP). An integration of the homegateway-router-connection into the security devices of the Customer. is recommended by Tele2.

#### 3.1.1 Homegateway Performance

Tele2 recommends to use Cisco routers as homegateways. IOS 12 will be required as IOS software version for L2TP. Cisco IP-Plus SW will be required for the dialing into the corporate networks (VPDN Support).

#### 3.1.2 Installation and Maintenance: Customer AAA-Server and Homegateway

The installation and maintenance of the Customer-AAA-Server and homegateways are not included in the service. The Customer, however, shall have the possibility to have the installation and maintenance of the homegateway implemented in the form of the Tele2-service TopNet. This optional service is restricted to routers of the manufacturer Cisco.

The provision and maintenance of the AAA-Server shall be excluded from this regulation.

#### 3.1.3 Technical Specification and Interface at the Tele2 Customer's location

TCP/IP: Internet Protocol pursuant to STD 5, Transmission Control Protocol pursuant to STD 7,  
 User Datagram Protocol pursuant to STD 6,  
 Tunneling Protocol: RFC 2661 Layer Two Tunneling Protocol "L2TP".

#### 3.1.4 Physical Interface

The physical interface at the location of the RESELLER will be made available at the Access Device installed at the location of the RESELLER. Depending on the bandwidth the interface will be set up as indicated in the following table:

| bandwidth                     | type of interface | plug      |
|-------------------------------|-------------------|-----------|
| • 34 Mbit/s (E3)              | G.703             | BNC 75Ohm |
| • 155 Mbit/s, optical (STM-1) | G.957             | FC/PC SM  |
| • 100 Mbit/s, electrical      | 100BaseT          | RJ45      |
| • 1 Gbit/s, optical           | 1000BaseT         | FC/PC SM  |

Table 2 Physical Interfaces Interconnecting Point

#### 3.1.5 Transfer Bandwidth

Transfer Bandwidth means bandwidth of the connection (e.g. 155 Mbit/s), i.e. the bandwidth of the transmission way from the port of the Tele2-network node to the Network Interconnecting Point at the RESELLER's location.

The possible interconnection bandwidths are indicated in Table 2 Physical Interfaces Interconnecting Point.

## 4 Technical Specifications of Tele2 xDSL Access Wholesale Overview

| ADSL Bandwidths   | SHDSL Bandwidths  |
|---|---|
| <ul style="list-style-type: none"> <li>• <b>1024 kb</b> downstream / 512 kb upstream</li> <li>• <b>2048 kb</b> downstream / 512 kb upstream</li> <li>• <b>4096 kb</b> downstream / 512 kb upstream</li> <li>• <b>6144 kb</b> downstream / 1024 kb upstream</li> <li>• <b>8192 kb</b> downstream / 1024 kb upstream</li> </ul> | <ul style="list-style-type: none"> <li>• <b>512 kbit/s</b> symmetrisch</li> <li>• <b>1024 kbit/s</b> symmetrisch</li> <li>• <b>2048 kbit/s</b> symmetrisch</li> <li>• <b>4096 kbit/s</b> symmetrisch</li> <li>• <b>6144 kbit/s</b> symmetrisch</li> <li>• <b>8192 kbit/s</b> symmetrisch</li> </ul> |
| <b>Bandwidths at the Interconnection Point</b>  |   |
| <ul style="list-style-type: none"> <li>• <b>E3 (34Mb) /STM-1 (155Mb)</b></li> <li>• <b>Fast Ethernet (100Mbit/s)</b></li> </ul>   |   |
| <b>Encapsulation of data via ATM</b>  |   |
| <ul style="list-style-type: none"> <li>• <b>Bridging</b> (RFC 2684) for terminals with bridging functionality "Bridges" or alternatively</li> <li>• <b>PPPoA</b> (RFC 2364) for terminals with routing functionality "Router"</li> </ul>  |   |
| <b>ATM Class of Service (CoS) per virtual connection of an End Customer</b>   |   |
| <ul style="list-style-type: none"> <li>• Guaranteed data rate and burst data rate with best effort à CoS: <b>ABR</b> or additionally</li> <li>• best effort data rate à CoS: <b>UBR</b> for a 2nd virtual connection</li> </ul>   |   |
| <b>Fault reporting to TELE2 Service Line</b>  |   |
| <ul style="list-style-type: none"> <li>• <b>Mo-So, 00:00-24:00 o'clock</b></li> </ul>   |   |
| <b>Trouble-shooting at the location of the End Customers</b>  |   |
| <ul style="list-style-type: none"> <li>• <b>on working days Mo-Fr, 07:00 a.m. - 06:00 p.m.</b> or alternatively</li> <li>• <b>Mo-So, 00:00-24:00 o'clock</b></li> </ul>   |   |
| <b>Trouble-shooting at unbundling sites, ATM backbone, Interconnection Point(s)</b>   |   |
| <ul style="list-style-type: none"> <li>• <b>Mo-So, 00:00-24:00 o'clock</b></li> </ul>   |   |

## 5 Networktopology of the service

