



**Vodafone's response to
BEREC's Consultation on
Common Characteristics of Layer 2 Wholesale Access Products in
the European Union¹**

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Executive Summary

Vodafone welcomes the opportunity to respond to “BEREC’s Consultation on Common Characteristics of Layer 2 Wholesale Access Products in the European Union”.

BEREC’s consultation on what it refers to as Layer 2 Wholesale Access Product (WAP) with local points of handover (PoH) (also known as virtual unbundled local access (VULA)) and L2 WAP with PoH at higher levels in the network hierarchy, e.g. regional PoH (also known as enhanced bitstream) is a timely consultation as Member States are conducting reviews of markets 3a and 3b and defining appropriate remedies to foster competition.

Within the mix of access remedies, active wholesale access services on NGA will play a critical role in the years to come to address significant market power, especially where it is technically and/or economically infeasible to use passive access. While Vodafone owns significant fixed infrastructure (cable operators in Spain and Germany, FTTH networks in Spain, Portugal and Ireland, the former Cable and Wireless infrastructure in the UK), we are and will continue to remain a significant access seeker (we are the largest unbundler in Europe) to achieve national coverage across our 12 markets in the EU. We also require access to offer services to our business customers throughout Europe.

Greater harmonisation of technical and service characteristics of regulated products is necessary to achieve the ambitions of the Digital Single Market Strategy of a true single market and to enable pan-European operators to offer consistent customer experience for residential and business customers. At present the landscape remains fragmented: in some countries, such as Germany and Malta regulated L2 WAP has yet to be implemented although it has been mandated as a remedy for some time; BEREC’s benchmark show wide variations of the specifications of regulated L2 WAP amongst countries. A L2 WAP regulated product should enable operators to control and deliver the best possible customer experience and build innovative new services.

BEREC’s consultation is an important step to investigate the state of L2 WAP in a select number of countries. However we would urge BEREC to go beyond a mere benchmarking of technical characteristics and instead issue a **Best Practices Document** to foster harmonisation and guide NRAs in the development and improvement of L2 WAP. At the very least, BEREC should provide firmer guidance. While we broadly agree with the common characteristics identified by BEREC, more specific guidance should be developed and some important dimensions, such as Service Level Agreements and Guarantees (SLAs and SLGs), B2B interfaces and portal as well as pricing should be covered.

Drawing on our commercial needs, we have defined a set of requirements for L2 WAP to inform the debate. We believe that those requirements provide a solid foundation to ensure that L2 WAP enables access seekers to compete effectively, gives them control allows them to differentiate and innovate. This should be the overarching principle in the design of regulated L2 WAP.

This blueprint should also facilitate the timely introduction of regulated L2 WAP in countries where it is deemed a necessary regulatory remedy.



The role of L2 WAP to foster effective competition

In today's telecoms sector, fixed infrastructure is critical to enabling competition in fixed broadband services, IPTV, and services to business. Competition in mobile is also increasingly linked to competitive conditions in fixed through converged offers and the increased use of mobile data which requires high-bandwidth fibre backhaul.

With a presence in 12 Member States, a total of 124 million mobile and 11 million fixed private and business broadband customers, Vodafone is already the biggest pan-European telecoms operator and the third largest fixed broadband operator in Europe.

While Vodafone owns significant fixed infrastructure (cable operators in Spain and Germany, FTTH networks in Spain, Portugal and Ireland, the former Cable and Wireless infrastructure in the UK), we are and will continue to remain a significant access seeker (we are the largest unbundler in Europe) to achieve national coverage across our 12 markets in the EU. We also require access to offer services to our business customers throughout Europe.

Some form of active services on fixed NGA access will be required to address significant market power, especially where physical access is not technically and/or economically feasible and where infrastructure-based competition is infeasible.

In our response, we focus on the characteristics that a L2 WAP deemed necessary as a wholesale remedy by a NRA should present. Of course, these can serve as a basis for commercial offers. As NRAs throughout Europe grapple with the challenges of defining appropriate remedies, BEREC's initiative to look at L2 WAP with local PoH (also known as VULA) and L2 WAP with regional POH (also known as enhanced bitstream) is welcome. In fact, L2 WAP is one of the critical remedies that may be necessary to address competition problems in wholesale broadband markets.

In its Explanatory Note on relevant markets, the Commission identified a number of characteristics that a L2 WAP should meet in order to be considered as a remedy for the wholesale local access market (Market 3a), those are:²

- Actual location of the point of handover at the local level;
- Topology and transmission features which should enable a generic access service providing a service agnostic transmission capacity uncontended in practice, i.e. with guaranteed bandwidth; and
- Degree of network flexibility to enable service differentiation.

To put it simply a L2 WAP with a local PoH should give access seekers the same level of control and flexibility that LLU offers. Mimicking the benefits of physical unbundling, including the economics, should remain the guiding principle for the technical design and pricing structure of L2 WAP.

From a commercial stand point the most important characteristics of L2 WAP in order to foster competition are:

- Ethernet presentation with local handover, including with grouping of some central offices
- Access to the maximum bandwidth possible with transmission uncontended in practice via defined Committed Information Rate with no restrictions of services (voice, data, IPTV, etc) giving the access seeker the ability to control the customer experience and differentiate with innovative new services
- Multicast capability to enable efficient provision of video services such as IPTV
- Appropriate VLAN configuration and freedom for access seekers to vary QoS parameters
- Ability for access seekers to differentiate how services are delivered to customers with wires-only option for access seekers to provide own branded & integrated NTE/modem/ONT and router CPE

² Commission Staff Working Document, Explanatory Note, Commission Recommendation on Relevant Markets, SWD(2014) 298, 9 October 2014, p41.



L2 WAP should be provided on an equivalence of inputs basis, the surest way to ensure non-discrimination and complemented by a robust set of SLAs and SLGs meeting users' needs.

Another critical element for effective competition is pricing. Pricing should enable economic replicability and where there is limited scope for competing investment in infrastructure, the preference is for L2 WAP to be cost oriented whilst ensuring full economical replicability based on effective retail prices. This is necessary to avoid excess profits while ensuring an adequate risk adjusted return on investment and enabling downstream competition. There should be full transparency of all pricing components. Regardless of the pricing principle, the pricing structure should be as close as possible to physical unbundling: there should be no speed related price differential unless justified by cost differences. Traffic related charges should be avoided. Finally product design and hand-over choices should be closely scrutinized by regulators to prevent regulated operators from loading cost onto access seekers, especially during the transition to NGA.

Requirements for best-in-class L2 WAP

In its review of L2 WAP of selected European countries, BEREC identifies a number of common characteristics, as reproduced below.

| |
|---|
| <p>Common characteristics of L2 WAP with local PoH</p> <ol style="list-style-type: none">1. (Technology): The L2 WAP is based on Ethernet.2. (Availability): The L2 WAP is (or will be) available at least in NGA rollout areas.3. (CPE/Modem): ANOs can use and configure their own CPE/modems at least in case of FTTC/B.4. (Bandwidth): ANOs have the possibility to control the speed of their services within the limit(s) of the bandwidth profile(s) of the subscriber access line.5. (Quality of Service): The L2 WAP provides at least ostensibly uncontended bandwidth or a bandwidth with a defined QoS.6. (Traffic Prioritisation): The L2 WAP supports different traffic priorities.7. (Number of VLANs): The L2 WAP provides several VLANs per end user unless additional wholesale products are available.8. (Customer Identification): The L2 WAP enables ANOs to identify their end users.9. (Security): The L2 WAP enables ANOs to apply security measures. <p>Common characteristics of L2 WAP with regional PoH</p> <p>Same as the common characteristics of L2 WAP with local PoH (see above) with the exception of common characteristics 5 and 7.</p> |
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Source: BEREC's Consultation on Common Characteristics of Layer 2 Wholesale Access Products in the European Union, page 4.

While BEREC has correctly identified the main common technical characteristics for L2 WAP, **the report could be improved in three important respects**. First, the report should ideally cover the situation in all EU member states and not be limited to the current ten countries³.

Second, some important other dimensions constitutive of a fit-for-purpose L2 WAP are missing, this includes in particular, B2B interfaces, SLAs and SLGs, and pricing.

Third, the report is not ambitious enough in that it merely undertakes a cross-country comparison of L2 WAP but does not define best practices or attempt to critically compare product characteristics against their intended purpose to promote competition, give control and enable service differentiation.

³ The countries are: Austria, Belgium, Denmark, France, Greece, Italy, Spain, United Kingdom where the imposed L2 WAP is available as well as Germany and the Netherlands, where a regulated L2 WAP is not yet available.



In Vodafone's view, this is a missed opportunity to provide guidance and foster greater harmonisation. There is significant scope for improvement in regulated L2 WAP across Europe. Examples of issues faced by Vodafone and the business impact are set out in the tables below.

| Critical Technical Characteristic | Example of Limitation | Example of Business Impact |
|-----------------------------------|---|---|
| Availability | <ul style="list-style-type: none"> No regulated L2 WAP available in Germany and Malta, although it has been mandated. Germany L2 WAP availability 7 years behind UK | <ul style="list-style-type: none"> Constrained to IP bitstream in some markets hence no scope to differentiate |
| Interconnect | <ul style="list-style-type: none"> Spain L2 Ethernet NNI only at regional handover locations, not local Interconnect at NNI is only 1 Gbit/s in Italy | <ul style="list-style-type: none"> No ability to use own backhaul network assets N*1 Gbit/s option improves capacity management flexibility & effectiveness |
| Multicast | <ul style="list-style-type: none"> No multicast in Spain or Germany No differentiated multicast in the Netherlands | <ul style="list-style-type: none"> Drives need to install equipment (capex, space, power) in COs to convert backhaul multicast to unicast for access node |
| Control of CPE | <ul style="list-style-type: none"> Country specific requirements, test plans & certification (Belgium, Germany, UK) | <ul style="list-style-type: none"> Duplicated testing of some capabilities (could make more efficient use of standards-based certification) |
| QoS / Contention | <ul style="list-style-type: none"> UK only offers simplistic drop priority, not multiple QoS classes - not compliant with either global (BBF) or UK standards (NICC) | <ul style="list-style-type: none"> Limits ability to use NGA for business services |

Source: Vodafone Group

| Critical Process Characteristic | Example of Limitation | Example of Business Impact |
|---------------------------------|---|--|
| SLAs/SLGs | <ul style="list-style-type: none"> Wide variability across markets in terms of SLAs and SLGs (e.g. target of 5 working days for provisioning bitstream in Ireland vs 21 in the Czech Republic. Poor and not publicly reported wholesale performance generally SLAs for initial L2WAP offer in Germany according to draft reference offer worse than in current LLU offer. | <ul style="list-style-type: none"> Inconsistent or lowest common denominator capabilities offered to customers |
| Provisioning | <ul style="list-style-type: none"> In Greece, customer identification only communicated via DHCP after implementation | <ul style="list-style-type: none"> More timely notification of DSLAM/port ID could facilitate zero-touch provisioning |
| Assurance | <ul style="list-style-type: none"> ANO can only undertake L1 testing the systems stack in Italy, not L2 | <ul style="list-style-type: none"> Takes longer to diagnose root cause of faults and fix them thus increasing |



| | | |
|--------------|---|---|
| | | operational costs and reducing customer satisfaction |
| B2B / Portal | <ul style="list-style-type: none"> In Italy the web portal is sometimes unavailable for a few days | <ul style="list-style-type: none"> Unable to send orders or check progress |

Source: Vodafone Group

There are significant benefits to be achieved through greater upward harmonisation, they include:

- Increased competition/switching and consumer welfare with fit-for purpose wholesale services
- Consistent end-user experience, for both business and residential customers
- Harmonised wholesale products leading to :
 - Reduced product development complexity
 - Faster time to market (design/test once, deploy "many")
 - Ability to leverage economies of scale
- Reduced vendor equipment cost
- Wholesale service consistency facilitates:
 - Cross-border expansion
 - Intra-market choice of wholesalers without interoperability risks

To assist NRAs and BEREC, Vodafone has sought to define the generic technical requirements that a best in class L2 WAP should met for effective competition. They have been considered from a commercial standpoint and are set out in the table below along with the rationale. Detailed technical requirements can be found in the Annex.

Vodafone is, of course, mindful that in designing and harmonising regulated L2 WAP, it is necessary to weigh up the relative cost and benefits, and take into account market demand for the L2 WAP and specific functionalities. This is an important exercise as is the definition of technical requirements.

Technical Requirements for Ethernet L2 WAP

Network architecture and VLAN configuration

| | |
|------|---|
| What | <ul style="list-style-type: none"> Support for S-Tagged UNI with a VLAN per service at the residential customer UNI Support for S-Tagged or Port Based UNI for business customer UNI Support for S-Tagged or S+C Tagged on the same NNI Minimum of 4 VLANS per residential customer with support for the same set of VLAN IDs on all UNI Full flexibility for the ANO to define the ranges and policy for VLAN allocation on the UNI and NNI Access to an N:1 VLAN for multicasting Unicast services can be identified uniquely using only VLAN IDs (not MAC address) VLAN per customer at NNI and UNI for business customers |
| Why | <ul style="list-style-type: none"> VLAN configuration is important as it enables ANOs to create virtual pipes in their network at the Ethernet protocol level for the different services offered to end-users. The key for consumer VLAN configuration is mass scalability for triple-play services using the same "cookie cutter" VLAN configuration for all end-users' CPE. This facilitates simplification and hence cost control for service provisioning. For business customers, additional flexibility is required so that they can self-provision any |



adjustments to the number of service VLANs on their L2 Ethernet connection without necessitating additional provisioning activity (and costs) from the L2 WAP network provider.

Network interconnect location options

What

- Ethernet Interconnect at CO Level
- Parent-Child CO aggregation hand-over option and the possibility to request lower level hand-over at a street cabinet
- Choice of 1G or 10G interface at the discretion of the ANO and resilient handover options (inc. n*1G & n*10G)

Why

- Ethernet is the technology of choice
- Interconnect at the CO or equivalent maximises the potential for infrastructure competition and synergies between different services (mobile, business) that can make use of backhaul
- Depending on the economic conditions some aggregation of COs as done in the UK (Parent-Child) may be appropriate and should therefore be an option
- Conversely, where economically and technically feasible, there could be an option to hand over at a lower level than the CO (e.g. cabinet in an FTTC scenario). This would enable a pricing structure closer to physical unbundling with two main elements: (a) the L2 WAP with handover at the cabinet, a line dependent element; and (b) backhaul between the cabinet and the CO, a fixed cost, which could be self-provided or offered as dark fibre for instance
- Robust interconnect for handover is critical, it should be offered at 1G and 10G with resilient options
- The Access Node in the street cabinet or CO is the first point of aggregation in the broadband network. Backhaul dimensioning and resilience from this point has a profound impact on customer experience (degree of contention for the shared bandwidth) and cost. Hence it is a key factor in enabling differentiated retail services to offer consumers price/performance options.

User equipment options – CPE/modem choice

What

- Wires-only option for ANO to provide own branded & integrated NTE/modem/ONT + router CPE
- CPE interoperability requirements follow BBF standards and certification approach
- CPE interoperability test/validation environment to facilitate expanded "white list" of approved CPE

Why

- A wires-only option is necessary to avoid giving the network provider of the L2 WAP an unfair advantage (because otherwise the ANO would need to provide an additional box). It gives competitive parity as the CPE has proven to be a key domain for service differentiation and branding. This should also apply to FTTH technology.
- Customers are increasingly concerned about aesthetics, power consumption and home networking functionality. No single vendor's portfolio spans all functionality and price/performance options. Hence enabling the ANO to use their own branded CPE that integrates the WAN interface facilitates a single-box, lower power consumption solution. A range of price/performance (and even colour) options can then be offered. BBF standards and interoperability certification work has already enabled such a "wires-only" model for VDSL in some markets (e.g. the UK). Other NGA technologies can leverage the same approach.

Bandwidth, traffic prioritisations and QoS

What

- Bandwidth profile available up to the maximum speed achievable by the DSL physical layer transmission system (including rate-adaptive systems)
- Ability to request new bandwidth profiles for FTTH transmission systems
- Choice of bandwidth profiles at least equal to those used by the L2 WAP Network Provider for their own retail services with the ability to request additional bandwidth profiles
- Minimum of 4 levels of traffic prioritisation based on p-bits
- Minimum quantified guaranteed throughput rates for upstream and downstream traffic (CIR from UNI to NNI) for over-booked and uncontended services
- QoS SLA targets for each VLAN from UNI to NNI, defined by Frame Loss Rate, Frame Delay and Frame



| Delay Variation measures | |
|---|---|
| Why | <ul style="list-style-type: none">• Control by the ANO of those parameters is critical to emulate physical unbundling and enable service differentiation. The maximum bandwidth that the line can support should be available. To maximise the scope for service differentiation, an ANO should have the option to request bandwidth profiles beyond those offered by the retail arm of the network provider, where technically possible.• To enable service differentiation, the L2 WAP should provide low/uncontended bandwidth options (with SLAs on minimum throughput). This enables the setting of alternative options for differentiated service experience, e.g. for multiple voice lines for business customers or video services for consumers.• Traffic prioritisation gives flexibility to the ANO in the design of services and the management of the bandwidth. At least 4 levels are required to align with common practice and with BBF global standards in this area (TR-178).• Enabling the ANO to determine the combination of maximum bandwidth, minimum assured throughput rate along with leveraging multi-level QoS scheduling has a profound impact on the ability to offer differentiated services. This is also necessary for the L2 WAP capability to emulate the degrees of freedom available with physical unbundling. It enables solutions to be optimised for different use-cases such as video streaming, business services and mobile backhaul. |
| Multicast | |
| What | <ul style="list-style-type: none">• Multicast Frame replication functionality for Local and Regional handovers on dedicated N:1 VLAN• IGMPv3 snooping for end-user access control of multicast in accordance with BBF TR-101 (& MLDv2 for IPv6) |
| Why | <ul style="list-style-type: none">• Multicast functionality is critical to enable competition and service differentiation. It is the most efficient means of delivering video services because it sends a single copy of the multimedia stream towards the end users by enabling the ANO to inject a single stream of traffic at the point of interconnect. With unicast it would not be economical to offer broadcast IPTV.• A multicast capability on L2 WAP avoids the alternative network operator having to either incur unnecessary backhaul bandwidth costs or the capex (plus space & power) associated with adding an extra box to convert multicast to unicast at the NNI (i.e. a box at the PoH in the CO). This has a profound effect on the cost-base of the network architecture and hence these avoidable costs have knock-on implications for retail service pricing to consumers. |
| Security & End-User Identification | |
| What | <ul style="list-style-type: none">• Customer Identification by Access Node and physical port identifiers (which may then be communicated via DHCP option 82 or PPPoE IA) - VLAN identifiers are an alternative only in situations where they provide unique customer identification co-ordinates.• MAC address anti-spoofing - duplicate MAC address detection and rejection of traffic from duplicate MAC address sources⁴• Control and policing of IGMP rate for N:1 VLANs• Rate limit Layer 2 broadcast |
| Why | <ul style="list-style-type: none">• It is obviously critical for alternative network operators to be able to identify their end users' traffic at the aggregated L2 WAP NNI PoH. The aforementioned options have long been standardised by the BBF and are well supported by equipment and systems vendors.• By definition, L2 WAP shares network infrastructure and IT systems between multiple alternative network operators. Their traffic must be isolated from each other via L2 virtual connections and other |

⁴ This may necessitate an agreed process to make sure that moving a CPE within the network does not result in loss of service e.g. when a customer moves house and takes their CPE (and hence its MAC address) with them - preferably without imposing a limit on the number of MAC addresses an end user may utilise without agreeing any such limits with the Access Seeker.



best practice security measures to prevent malicious or accidental disruption to their competitors' services.

- The network design should also follow best practice to ensure that no individual user can detrimentally impact the traffic of other end-users (i.e. denial of service) either via malicious or accidental misconfiguration activities. The functionality to provide such security capabilities is standardised in the nodal (equipment) requirements that have been globally standardised (TR-178).
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In addition to these technical requirements, there are other service requirements which, in Vodafone's experience are critical for ensuring effective competition. They relate mostly to elements affecting the customer / supplier relationship, such as B2B interfaces, provisioning and assurance processes as well as SLAs and SLGs. Those are critical elements when dealing with a supplier with significant market power that is also competitor at the retail level as vertical integration provides the incentive and ability to discriminate. In fact, history shows that this is where non-price discriminatory practices are mostly likely to take place, e.g. the 2013 antitrust case against Telecom Italia.

Other service requirements

B2B & portal interfaces

What

- Automation of all key process interactions between VULA Network Provider and ANO via B2B and portal interface options
- SLA on systems availability and response time

Why

- B2B and portal interfaces are essential to any customer / supplier relationship even more so when dealing with a supplier who is vertically integrated and a competitor at the retail level as vertical integration provides an incentive and ability to discriminate.
- Automation and SLAs on the associated key processes have a major impact on the customer experience during the provisioning and assurance/fault-finding process i.e. it affects timeliness and accuracy of status updates and the cycle time of the entire process (compared to more manual approaches).
- Beyond performance (which should be underpinned by SLAs), such automation also impacts the costs of delivery of these processes.

Provisioning process

What

- Clear processes for provision and handling of errors or changes
- Individual customer order progress reported regularly during all phases of provisioning
- All key customer provide status milestones automatically notified via B2B interface and portal
- Interconnect planned for growth, minimal upgrade impact on live traffic
- Planning information on NGA rollout/coverage (by VULA Network Provider) provided on a timely and regular basis
- Ability to select and configure DSL line profiles/parameters and DLM stability thresholds
- Option to self-provide the fibre drop within multi-tenancy buildings for FTTH

Why

- Robust and comprehensive provisioning processes are essential to any customer / supplier relationship even more so when dealing with a supplier who is vertically integrated (as above).
 - Clear and timely build plans are essential for the alternative network operator to be able to plan their own geographic expansion of service availability spanning activities ranging from capacity planning/NNI establishment through to local marketing.
 - The ability for an alternative network operator to self-provide the final fibre drop within an MTU or to leverage their own DLM system facilitates process optimisation, cost control and differentiation. Hence it leads to a wider choice of differentiated service experience for end-users.
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Assure process

What

- Automated capability for confirming actual configuration of provisioned parameters (line profile, VLAN configuration etc.) and performance measures
- Diagnostic capability for L1 and L2 testing (including loopbacks) for analysis of end user connections and for interconnects
- Access and management to end user CPE from the alternative network operator network via industry standards based in-band methods
- All key customer repair status milestones automatically notified via B2B interface and portal

Why

- Robust and comprehensive assure process are essential to any customer / supplier relationship even more so when dealing with a supplier who is vertically integrated (as above).
- The aforementioned capabilities enable the alternative network operator to be more responsive to end-users thus improving customer satisfaction in dealing with provisioning failures and faults.
- It is also of benefit to the L2 WAP network provider since the alternative network operators are effectively acting as an outsourced 1st line assurance team, taking on many of the test and diagnostics functions themselves.

SLA/SLGs

What

- SLAs & SLGs should be defined for each of the main elements of the life cycle of services including at least, Ordering, Provisioning, Service Availability & Fault Restoration
- SLAs & SLGs should be defined for the electronic platform used to interface with the Network Provider, including availability and response times.
- SLAs should be aligned with end-user requirements
- SLGs should be high enough to incentivise compliance with the SLAs by the Network Provider, preferably with no penalty caps and with a right to claim for additional losses above the level of SLGs
- SLAs & SLGs should apply per fault/event/line/circuit - not in aggregate for average performance
- Payment of penalties should be pro-active /automatic – The ANO should not have to measure it or ask for it
- The VULA Network Provider should provide reports on actual performance against SLAs – ANOs should have a right to challenge reported performance with contrary evidence
- NRAs should collate and publish incumbent service performance
- SLAs & SLGs should be tightly worded with limited carve-out conditions, clearly identify exceptions, limited opportunities for stop-the-clock, outage time for electronic platforms and other multiple feed-back loops

Why

- Robust and comprehensive SLA and SLGs are essential to any customer / supplier relationship even more so when dealing with a supplier who is vertically integrated (as above).
- They are an integral part of the service description to enable a level playing field. It gives predictability to ANOs of provisioning and fault restoration time and to incentivise the Network Provider to meet set timelines.
- To a large extent end user experience is dependent on wholesale performance.

Pricing

What

- Pricing should enable economic replicability. Where there is limited scope for competing investment in infrastructure, preference is for L2 WAP to be cost oriented whilst ensuring full economical replicability based on effective retail prices.

Why

- Where the prospects of infrastructure based competition are limited, this is necessary to avoid excess profits while ensuring a fair risk adjusted return on efficient investment and enabling downstream competition.
- There should be full transparency of all pricing components.
- The price structure should be as closed as possible to physical unbundling to foster price and service



differentiation, i.e. one non-speed dependent rate unless objectively justified by cost differences
Traffic related charges should be avoided. Product design and hand-over choice should be closely scrutinized by regulators to prevent regulated operators from loading cost onto access seekers, especially during the transition to NGA.

- One-off charges, Port hand-over charges (GigE) and other ancillary charges should be tightly regulated. They are important cost categories for which there are competitive pressures.
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Annex

Vodafone L2 WAP Requirements

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