Is There a "Right" Charging Principle with the NGN Advent?

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Abstract: Historically, telecommunications services developed adding one network to another (voice and data networks), but Next Generation Networks (NGN) are developing as native multiservice networks. Main characteristics include: broadband capacity, IP protocol, ability to transmit voice, data and video, quality control, separation among different network layers. The fact to deliver with one only network different services such as voice and data, now treated in a very different way with respect to charging principles (interconnection for voice, peering for Internet exchanges), poses the problem of the charging model to adopt in the future. In the paper we will analyse pros and cons of the different charging principles, both at wholesale and retail level, from an economic perspective. The first conclusion is that there is no "magic solution", as any criteria has pros and cons, but that it appears more appropriate to leave operators to choose their retail models, once the wholesale criteria are settled. Then the paper concentrates on the different scenarios which can arise choosing different charging principles at wholesale level. Particular attention is given to the issues of quality safeguard and of recovering investments in innovative networks and services. On many aspects "intermediate" scenarios seem better to answer economic problems than the "pure" scenarios, (calling party network pays for all wholesale services, including Internet/data, or bill & keep for everything, including voice).

Key words: NGN, charging principles.

Historically telecommunications networks where built one after the other, adding data networks to the existing PSTN network. On the contrary, the new so-called Next Generation Networks (NGN) are developing as native multiservice networks. This category can include very different networks, based on different technologies, but their main common characteristics include: broadband transmission, with quality control (QoS) end-to-end; the ability to support voice, data and video services; the use of the IP protocol [1], the separation among different layers [2] and the adoption of open and standard interfaces.

[1] At least as a trend.

[2] Transport, service and network control.

The reasons to build new, more technologically developed, networks are, basically: the ability to supply new valuable services to end users (especially services that customers are willing to pay for and which can contrast the decrease of fixed voice revenues) and the opportunity to benefit from cost savings in the long run (especially real estate costs).

As every change, also the move towards NGN raises some points of attention, with particular reference to the issues of IP interconnection, interoperability among networks of different operators and architectural and network topology changes. In this paper we will focalise on the issue of how to charge interconnection among different networks in an IP environment.

Before entering into this issue, it can be useful to observe that the current regulatory framework is founded on the technology neutrality principle. Therefore we don't see general problems in the application of the current regulatory framework in the move towards next generation networks, even if, obviously, some modifications could be needed in the detailed resolutions [3]. The new framework under discussion [4] is in the same line of thought, even if some proposed novelties can have influence on the regulatory powers applicable also to NGN issues, with special reference to new National Regulatory Authorities and European Commission powers, the creation of a new European body of regulation [5], and the possibility to introduce the functional separation remedy.

Entering into our issue, the move towards NGN can pose problems of IP interconnection because, at the moment, two very different interconnection models are applied to the two main networks: the PSTN network for voice services and the Internet network for data services. As a matter of fact, voice interconnection is characterised by the payment of a price per minute of conversation and by well defined quality standards. On the contrary, the exchange on the Internet network is based on peering, which means that every undertaking bears entirely the costs necessary to reach a peering point and contributes only to the node's operating costs [6]. On the quality side, then, instead of defined quality standards, the best effort rule applies.

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[3] See, for instance, the modifications already included in the most recent Recommendation on Relevant Markets.

[4] EC proposal 13 November '07.

[5] BERT in the first reading of the European Parliament.

[6] In practice, peering system is a Bill & Keep formula with traffic symmetry clauses.

Obviously, if a new network is built, carrying all type of services, the need to choose a common rule arises.

In order to understand which is the most suitable rule for charging IP interconnection on NGNs, we need to enter a little bit into the different possible charging principles, both at retail and at wholesale level.

As for the retail side, we can choose among three different types of charging principles:

- Calling Party Pays (CPP), in which the calling party bears all the cost of the call (or of the message sending). It is the most common rule, currently applied for: calls for voice telephony on fixed networks, calls from mobile networks, SMS;
- Receiving Party Pays (RPP), where the receiving party bears the entire cost of the call (or of the message) since the originating point. It is now applied for toll free numbers;
- Both Party Pays (BPP), in which the cost of the call is shared between the caller and the callee. It is currently used for: shared paid calls, calls towards a mobile number abroad, mobile calls in the United States, Internet [7].

The 3-parties differentiation appears to be the most precise, even if some authors prefer to include BPP in a larger definition of RPP, as they basically show the same characteristics with regards to economic analysis [8].

Similarly, on the wholesale side we can identify three basic charging principles:

- Calling Party's Network Pays (CPNP), where the operator supplying the caller bears all the costs of transmitting the call (or the message sending) to the receiving party. If another network is involved, the same operator has to pay also for the transit service. It is the system used for: calls for voice telephony on fixed networks, calls from mobile networks, SMS;

[7] Some authors include a 4th type, the No Party Pay (NPP) charging principle, meaning that no customer is explicitely asked to pay for the service, as for the Internet network. The majority of authors, nevertheless, prefer not to differentiate this case, pointing on the fact that both the sender and the receiver of messages indirectly pay for the connection.

[8] This 2-parties differentiation is adopted also in the ERG (2007) document.

- Receiving Party's Network Pays (RPNP), in which it is the receiving network to bear the costs, including transit and collection. This is applied for toll free numbers and for the collection of calls in indirect access;
- Bill & Keep (B&K), where every network bears its own costs, as no payment is due for traffic exchange. This principle is basically applied on the Internet network.

Also on the wholesale side some authors don't distinguish among the three different charging principles, preferring to include RPNP in the CPNP category, pointing out the fact that in both cases it is the network operator which invoices the final customer to pay also on the wholesale side. In this perspective, we can distinguish between CPP and RPP (including BPP definition) on the retail side, and between CPNP/RPNP and B&K on the wholesale side.

In order to understand which charging principle can be most suitable in an NGN environment, we have firstly to analyse the impact of the main relevant economic problems on the different criteria. Main problems include: externalities and SPAM/SPIT, on the retail side, and termination monopoly and hot potato problem, on the wholesale one.

An externality arises when the consequences for welfare are not fully accounted in the price of a good, thus deriving a sub-optimal use of the resource. In telecommunications markets we can distinguish between network externalities and call externalities.

Network externalities arise because every new subscriber increases the value of the network for existing subscribers, but this value increase is generally not included in the price. This problem seems to be better addressed with CPP, as the penetration of the service (which means the subscription to the network) tend to be maximised when the user can benefit from the service without necessarily being called to pay for it (he pays only when he decides to communicate with someone, and not when others decide to communicate with him).

Call externalities, on the other hand, derives from the fact that often also the callee, and not only the caller, derives a utility from the call. If the cost is all charged to the caller (CPP criteria) this externality is not internalised in the price. From this perspective, a BPP system, in which both consumers pay for the call seems to best address the call externalities problem. But

some authors [9] have argued that things are more complicated than this, as the callee can be subject to two types of error:

- one type of error, for the callee, is to accept a call from which it would gain a zero or negative utility (e.g. advertising calls). This error is not so serious, as it can end the call when it realises that if would get no benefit from it, thus increasing also the caller utility [10];
- the other type of error for the callee is to refuse a call from which it would have gained a positive utility. This error is more problematic, as the refusal reduces the welfare of both consumers. Therefore, if the caller utility is sufficiently high, it can be efficient that the caller subsidises the callee paying its costs, thus encouraging it to answer.

In other words, when speaking about call externalities, it has to be considered that, not only the callee can derive a utility from the call, but also that the caller derives a utility from the callee answering its call, not merely from the fact of initiating the call. This means that if the price is set only at the call origination cost (as in the BPP system), this externality is not necessarily internalised. These considerations bring us to put a question mark on whether charging principle, among CPP or RPP/BPP, is better equipped to address the call externality problem.

Another economic problem affecting retail charging principles comes from the fact that some received calls or messages can result in a negative utility for the callee. It is often the case for messages (SPAM) or calls (SPIT) with advertising content. For these communications an RPP charging principle would be not equitable, as the user would be asked to pay for something disturbing it. In addition, the use of SPAM and SPIT would be incentivised, as the initiator would not pay (pure RPP) or pay only a portion (BPP) of the incurred costs, thus damaging the consumers' welfare. In this case, the consumer reaction would probably be not to answer to non identified calls, thus inefficiently reducing the total amount of calls in the market. With respect to this problem, therefore, the CPP criterion is much better than the RPP/BPP ones.

With regards to economic problems affecting wholesale charging principles, a first typical problem is the termination monopoly. This problem is typical of the CPNP charging principle, as the caller has no control on the

[9] See, for instance, the NGNuk (2007) report.

[10] Also the call center operator doesn't gain any utility from keeping the call if it would end in no contracts signing.

network where the receiving party is connected, and therefore he has to pay whatever tariff is requested by the termination network. As a matter of fact, this circumstance gives a special monopoly power to the termination network, even in markets characterised by strong competition. The usual remedy to this problem, at least under the European legislation, is to fix the termination tariff by means of regulation, also for small, non SMP operators. But obviously this solution has positive transaction costs. On the contrary, the Bill & Keep charging principle doesn't show the problem of termination monopoly, as no charge is due for terminating calls. Obviously the costs to terminate a call continue to exist, and the operators should have to cover them with the price of calls charged to end user.

The other important economic problem on the wholesale side is the "hot potato" one. Unlike the termination monopoly one, this problem is typical of the B&K charging principle as, not having to pay termination costs, the originating operator has the incentive to release the call in a point as close as possible to the caller, in order to minimize its own network costs. This behaviour, then, maximises the costs of the termination network, which will have to charge them to its own customers. This circumstance shows two problems: firstly, customers have to pay [11] for calls that they have not requested and, secondly, if competition or demand characteristic don't allow to charge entirely these costs to final customers, this would result in the under-investment in the termination network.

To minimise this problem a typical remedy could be to require operators included in a B&K system to interconnect at a minimum number of points (PoI), thus reducing the transit on the terminating network. But this would imply to determine the topology of interconnection points, and sometimes brings to inefficiently duplicate some infrastructures. In any case this is a heavy solution, with positive transaction costs especially if determined by the regulator. On the other hand the CPNP system doesn't show this problem, as the originating operator has the incentive to minimise the termination costs, and therefore it has the convenience to use the termination network the minimum possible.

In conclusion, the positive (+) and negative (-) economic aspects of the different charging principles are synthesed in the following table.

[11] At least partially.

	Retail side		*Wholsale side*	
	CPP	RPP-BPP	CPNP-RPNP	B&K
Call Externalities	- / +	+ / -		
Network Externalities	+	-		
Consumers habit	+	-		
SPAM and SPIT	+	--		
Termination monopoly			-	+
Hot potato			+	-

From this table it emerges a general superiority of the CPP criteria at retail level, especially considering also the aspect of the consumers habit, which is obviously very important as it affects the size of the total demand [12]. On the contrary we observe a balance of positive and negative aspects at the wholesale level.

Before making some considerations on how to choose the most suitable charging principle it can be important to make some considerations on the relationship between retail and wholesale criteria. As a matter of fact, traditionally it has been said that a strict relationship between retail and wholesale criteria exists:

CPP <-> CPNP
RPP <-> RPNP
BPP <-> B&K

But, despite this typical belief, in literature strong relationships don't emerge, as different authors [13] have shown basically the following:

- B&K favours smaller or zero tariff per minute, higher installation costs and higher monthly charges;
- CPNP tends to preclude flat or semi-flat tariffs, but allows smaller monthly charges;
- offerings including minutes of traffic have high users' utilization, but slow penetration;
- in presence of a CPNP/CPP framework, we found less per capita use of the mobile service, but a quicker penetration.

In addition, we observe that many counterexamples exist on the market. Among others, we can cite the following:

[12] This superiority is shown also by other studies, analysing the main princples for tariff setting, with particular reference to benefits distribution, according to the principle that costs must be covered by beneficiaries, especially if externalities exist. See, for example, NGNuk, 2007.

[13] See, for example, MARCUS, 2006.

- in Italy, flat and semi-flat offers have existed since June 2000 [14], also in presence of CPNP on the wholesale side;
- the huge penetration of mobile telephony has stimulated the usage and semi-flat tariffs are now diffusing;
- also in a CPP system a monthly charge exists (for the access to the network) which, de facto, is paid also to have the possibility to receive calls (sort of BPP).

These considerations bring us to say that the relationship between retail and wholesale principles is less stringent than it appears at first sight. This means that, even if we have found some advantages in the CPP principle at retail level, we will not be compelled to adopt a CPNP one at wholesale level, but we have to carefully analyse pros and cons of the different solutions.

In practice, we advocate that, in principle, if an efficient model for wholesale charging is chosen, there is no need to impose rules at retail level (except, perhaps, some limits for Universal Service purposes). The main reason of this conclusion comes from the fact, that a wholesale rule is necessary in order to make the different networks communicate, but network operators of different sizes can have different incentives in choosing one system or the other. Therefore a regulatory "eye" on the choice is needed in order to facilitate or impose the agreement. On the contrary, the choice of the retail system can probably be left to operators, which have a common interest in maximising the consumer demand and use. Obviously regulation can always intervene in case of consumers' damage, but this is not likely to result from the mere choice of the retail charging principle.

In the following part of the paper we will concentrate, then, only on the choice of the wholesale charging principle in the move towards an NGN, analysing firstly the "pure" scenarios (CPNP [15] and B&K) and then a number of intermediate solutions, trying to minimise some economic problems of the "pure" ones.

As we have said before, building an NGN means to progressively migrate services, already vehiculated with different technologies and charging models, on an only IP-based network. This means to choose the wholesale

14 "Teleconomy" offer.

15 In its broad definition, including also RPNP.

charging model which will prevail when such a migration will be completed, thus opening the way to different possible scenarios.

The first of the "pure" scenarios is represented by the choice to make interconnection paid also on IP networks. In practice, this would mean to pay – at least at wholesale level – also for data exchanged on the Internet network.

"Pure" scenarios – Pay interconnection also with IP networks

pros	*cons*
- simplicity on the retail side (CPP very accepted) - maintain the equilibrium of traditional interconnection - normally, the subject with the highest benefit is the one who pays - no problems with Spit and Spam - guarantee to recover the investments in new networks	- need to choose the measure unit for payment – not trivial problem, minutes of use are no more an appropriate measure unit (with data transmission it would mean to pay more for worse quality). (*) - regulation should continue to deal with the problem of termination monopoly - it implies to eliminate the current peering system, i.e. to impose a payment for what has been exchanged for free till now: difficult to accept without a quality improvement expressly required

(*) If the bandwidth is low, it takes more time to deliver a data package. Therefore, if a “per minute” price is set, a communication would cost more if the bandwidth is low, e.g. if the quality is scarce.

This solution tends to be quite favourable to the incumbent, which continues to maintain its lead in interconnection revenues, while it is less favourable for alternative operators, especially for the smaller ones.

Trying to make an evaluation, we found little acceptable to impose a payment on what has always been exchanged for free (Internet), with the risk of arbitrages and possible delays in the complete migration towards the new networks, thus increasing the overall costs of the system. In addition we have to consider that NRAs want to simplify the market and that there is a trend towards a general decrease of termination tariffs.

In conclusion, we think that this solution is not likely to prevail, even if some elements of this solution can be kept in the "intermediate" scenarios.

The other "pure" scenario, on the contrary, forsees the application of a pure B&K model, with every operator bearing its own network costs, also for voice services (and data, video, etc.).

"Pure" scenarios – pure B&K

pros	*cons*
- simplicity on the wholesale side - in its "pure" version it eliminates almost completely the need for economic regulation of interconnection (it eliminates the termination monopoly) - "natural" solution, given the trend towards the decrease of termination tariffs through time - well accepted by Authorities and new entrant operators (but much more by ISPs and small operators) - eliminates the problem to determine the measure unit	- the ability to recover the investments in new networks is subject only to the possibility to charge end users for them - the "hot potato" problem is maximised (relevant for most capillary operators) - necessary to think carefully about the retail charging criteria to use: the most natural criteria (*) is BPP/RPP, which poses relevant problems for users - in presence of a pure B&K system, it can be natural to apply it also to mobile interconnection, with a very strong impact on revenues
- breaks the equilibrium of traditional interconnection but: . avoids litigation on economics . solves the problem of asymmetric termination (current opportunity for larger new entrant operators)	

(*) Even if not the only possibility.

This scenario has very strong positive outcomes, but the "hot potato" problems can be very serious, at the point to put a disincentive on the realisation of large Next Generation Networks.

In addition, we observe that it is generally not favourable for incumbents but, at the meantime, it can be not favourable also for competitive larger network operators, especially when asymmetric termination is applied. Therefore, probably intermediate solutions offer best perspectives for all types of operators, except the smaller ones, which will generally prefer a pure B&K solution.

After having given a look at pros and cons of the "pure" solutions, we have then tried to understand if it is possible to find intermediate scenarios minimising the negative outcomes of both. A first, immediate, intermediate scenario is represented by the possibility to adopt different systems for different network typologies/services.

Intermediate scenarios – different systems for different network typologies

pros	*cons*
- it is the solution currently applied: paid interconnection on the PSTN network and B&K system (peering) on the Internet network - therefore it is the simplest solution to implement	- but it is a short run solution if the new network will substitute completely the previous ones (*) - even in the short run, problems arise in presence of services which can be provided on both networks (e.g. VoIP service), thus opening arbitrage opportunities

(*) In practice, the parallel application of the two systems could be maintained for a longer time, by applying interconnection tariffs only at universal service.

In the short run, during the migration phase, this system can be convenient for the sake of simplicity, but certainly it cannot be promoted at regime when the network will become an only one.

The version of this scenario by which different services (e.g. voice and data) are treated differently also when transmitted on the same network is also quite complicated, as it implies being able to recognise the nature of the data packages transmitted on the unique IP network. In practice, this would really be possible only if different quality requisites are asked for different services (e.g. specific quality parameters for voice and video services, best effort for data) [16], but this case is included in the third intermediate scenario that we will examine soon.

The second intermediate scenarios we have considered, foresees the application of a B&K system with symmetry clauses. In practice, it is the scenario, de facto, applied in peering contracts even if we have to consider that two types of asymmetry can arise:

- traffic asymmetry, that arises when the operator A has to terminate much more traffic coming from the operator B than the traffic that it delivers to it;
- asymmetry of geographic presence, that arises when one operator is much more spread on the territory, thus having to bear much more costs to terminate calls coming from other operators.

Asymmetry is a problem as it puts a disincentive to invest in network update, therefore it can be opportune to correct the problem with ad hoc clauses. Typically the two types of asymmetries are corrected with one or more of the following clauses included in the basic B&K contract:

- symmetric traffic is exchanged for free, while exceeding traffic must be paied;
- a minimum number of Points of Interconnection (PoI) is necessary in order to be included in the B&K system, otherwise a price is due for traffic exchange.

Intermediate scenarios – B&K with symmetry clauses

pros	*cons*
- the "hot potato" problem is minimised	- necessary to fix the price (value and measure unit) - for the 2nd type of asymmetry, problem to determine the correct number of PoIs to which applying the B&K criteria (heavy regulatory intervention)

16 If the distinction is made only conventionally opportunistic behaviours are likely to emerge.

This scenario is quite practical, but maintains some serious negative outcomes of the "pure" B&K system. Looking at practical implications, we could argue that the traffic asymmetry problem is less relevant and can be skipped [17], in order to avoid the problem of choosing the measure unit to apply at the excess traffic exchanged. But it can be important to 'sterilise' the geographic problem in order to maintain investment incentives (the "hot potato" problem penalises the operators investing more), even if this implies a regulatory intervention. In conclusion, this scenario can easily be applied, as it is already applied for peering, but it is not easy to determine the "right" number of PoIs, which, on one hand, has to maintain the incentive to invest in the new network but, on the other hand, doesn't have to require to inefficiently duplicate networks (thus putting at risk competition and creating an unnecessary disturbance to citizens lives [18]).

The last intermediate scenario we have considered is represented by the chance to apply B&K for best effort and premium tariffs for better quality levels. This means that, until a certain quality level (typically best effort) a B&K system is applied, while for higher required quality levels a price is due for traffic exchange. In practice, it is necessary to define a number of Class of Service (CoS), grouping different levels of quality, in order to apply the different prices [19].

Intermediate scenarios – B&K for best effort and premium tariffs for better quality

pros	*cons*
- in general: it minimises the problems of "pure" solutions - in particular: it stimulates the incentive to invest in network quality (with pure B&K, risk of alignement to *best effort* quality) - very acceptable scenario from the point of view of both equity and current regulation - compatible with every charging principle applied at retail level (it is a mix of B&K, for minimum quality, and CPNP, for higher classes of service) - it doesn't eliminate automatically the need for regulation, but it minimises its impacts (e.g. the termination monopoly remains only for higher quality, therefore it doesn't include Universal Service obligations, and it favours agreements between operators) - making network developments pay, it addresses the problem of "net neutrality" (higher parity with economic operators of the IT world)	- it has no specific disadvantages, except the one to define appropriately the classes of service - it maintains the disadvantages of the "pure" solutions that compose this intermediate one, even if minimising them

17 We are speaking only of the exchange of termination traffic.

18 Think of the need to dig city streets (or even buildings) more than one time.

19 It is difficult to imagine a continuous quality differentiation.

This solution appears to solve many more problems than it leaves unresolved. In particular, it seems to address in a quite balanced way both the problem of network investment incentive and the one to maintain a lively competition, as operators can choose their most suitable quality level, with a minimum level (the best effort one) which doesn't imply any wholesale payment.

The only specific problem remains, then, to appropriately determine the number of CoS, which will determine the level of different prices applicable. Obviously the problem to choose the measure unit to which the price will be applied also remains.

We have tried to give an example of the methodology which could be chosen in order to determine the CoS, making three different hypotheses which simplify more and more the number of quality parameters and, in the end, the number of prices applied. Obviously this is a theoretical exercise, the application of which would require the interaction of operators, looking for the most important technical and marketing aspects of the services to be supplied.

Segmentation hypothesis

Main quality parameters	*Hypothesis 1*	*Hypothesis 2*	*Hypothesis 3*
Bandwidth	≤ 2 Mbps	≤ 2 Mbps	≤ 2 Mbps
	>2 & ≤8 Mbps	>2 & ≤20 Mbps	>2 & ≤20 Mbps
	>8 & ≤20 Mbps		
	>20 Mbps	>20 Mbps	>20 Mbps
Priority level	Normal	Normal	Normal
	High	High	High
Geographic presence	< 30 PoI	< 30 PoI	< 30 PoI
	≥30 & ≤70 PoI	≥30 PoI	≥30 PoI
	> 70 PoI		
Interoperability level	Minimum	Minimum	-
	Higher	Higher	-

In the hypothesis 1, the application of four segmentations for the quality parameter of bandwidth, two priority levels, three segmentations for geographic presence and two interoperability levels, arrives to identifiy 48 combinations, to which adding the best effort level to treat under a Bill & Keep system. Similarly, the hypothesis 2 shows 24 combinations of quality levels, and the hypothesis 3 determines 12 combinations.

The CoS determined, then, are quite a lot, but it is not necessary to apply a different price to every CoS, as it can be argued that services with a superior characteristic on one quality parameter and an inferior characteristic on another quality parameter are perceived has having the same quality.

Therefore, even if theoretically a price could be associated at each combination, in practice it can be more convenient to set a price for a group of combinations.

In our exercise we have chosen the following methodology:
- the highest relevance of a quality parameter is reflected in the number of adopted segmentations,
- at every segmentation a score is given corresponding to their quality rank (e.g. B4 [20]=4, P1 [21]=1…),
- at the combinations with the same average score the same tariff level is attributed. We have chosen not to normalise the results, in order to give more emphasis to the importance of the criteria with more segmentations.

Attribution of tariff levels in the hypothesis 3

combinations	*bandwidth*	*priority*	*geographic presence*	*price*
1	*Best effort*			B&K
2	B1	P1	G1	P1
3	B1	P1	G2	P2
4	B1	P2	G1	P2
5	B1	P2	G2	P3
6	B2	P1	G1	P2
7	B2	P1	G2	P3
8	B2	P2	G1	P3
9	B2	P2	G2	P4
10	B3	P1	G1	P3
11	B3	P1	G2	P4
12	B3	P2	G1	P4
13	B3	P2	G2	P5

From the table above it appears that, in the 3rd hypothesis (12 combinations+best effort) 5 tariff levels were identified. The same exercise of attribution of tariff levels in the hypothesis 2 (24 combinations+best effort) brought to 6 tariff levels, and in the hypothesis 1 (49 combinations+best effort) brought to 8 tariff levels. Obviously more complex ways to determine the number of tariff levels starting from the different combinations can be adopted.

In conclusion, this last scenario, applying Bill & Keep for best effort quality and premium tariffs for better quality levels, is probably the best

[20] 4th segementation of the bandwidth (B) criteria.

[21] 1st segementation of the priority (P) level criteria.

compromise among the needs of regulatory simplification and an adequate investment incentive.

This scenario appears reasonable and acceptable at regulatory level, and it can meet the interests of all operators, especially those with own infrastructures. On one side, many small operators are quite well served with a best effort quality level, and then they are able to improve their interconnection imbalance with the incumbent with the migration to a B&K system. On the other hand, the larger operators (incumbent and competing ones), which pay more attention to the quality issues, can see their higher quality recognised in the prices determined for the highest CoS.

In addition, this scenario leaves large flexibility margins at retail level, in order to be able to apply, for every service, the best tariff package, which generally will be the one that makes the main beneficiary pay the larger part of the service.

In comparison with the scenario differentiating the charging criteria among vehiculated services (B&K for data, paid interconnection for voice), it is more practical, as it differentiates among well defined parameters, and not on the basis of services which can be provided to the final user with very different quality levels (think about the actual supply of voice service on the PSTN network and on the Internet network).

Obviously infrastructured operators [22] of different sizes can have different views on the relative importance of quality criteria but, as the underlying idea can be shared by all of them, probably an open discussion among different operators, in the presence of the regulator, can bring a more practical and less controversial solution for the market.

[22] Pure Service Provider will always prefer a pure Bill & Keep system.

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