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# Benchmarking Methodology

for the

## Telecoms Price Benchmarking Study

### for Arab Countries



Produced for the

**Telecommunications Regulatory Authority**  
**Kingdom of Bahrain, Chair of AREGNET**

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## A. Introduction

Teligen has produced a Price Benchmarking study commissioned by TRA Bahrain, Chair of AREGNET. This study covers four different types of telecoms services: PSTN, Mobile, Leased Line and Broadband. For each of these services a basket methodology is used for a comprehensive price comparison across countries.

The basket methodologies for PSTN, Mobile and Leased Lines are identical to those used by the OECD (Organisation of Economic Co-operation and Development) for their ongoing price benchmarking. Teligen is maintaining and developing these methodologies on behalf of the OECD, and is producing the quarterly results for the OECD countries.

For this study the OECD basket methodologies have been adapted slightly to the countries covered, as explained below. It is still possible to compare the results from this study with the OECD member country results.

The basket methodology for Broadband services is developed by Teligen, and used in various studies for clients and public bodies in Europe.

All baskets are available as products and/or services from Teligen on a general basis covering European and OECD countries.

In addition to these 4 baskets this study also covers a simpler call cost comparison for PSTN.

This document describes the methodologies and structures for the 4 baskets and the simple call cost comparison for PSTN.

### A.1. Background data

For this study the exchange rate data has been taken from the OANDA web service on [www.oanda.com](http://www.oanda.com). OANDA is a service that offers a comprehensive set of Internet-based currency tools, including an online currency converter - this enables easy conversion of currencies between most countries for specific dates, based on interbank market rates.

Data was taken on the 8 January 2008.

The Purchasing Power Parity (PPP) exchange rates are taken from the World Bank database of Comparative Price Levels (CPL) that uses data from 2005. This is the most recent CPL data from the World Bank that covers the majority of the countries in this study. The CPL is a correction factor for the market exchange rate to calculate current PPP rates.

For a few countries not listed in the World Bank database the CPL has been assumed to values close to comparable countries in the region. The values are shown in bold in the table below.

The VAT information is taken from a variety of sources in the Internet as there is no single consistent source for tax information. Some information is found on the Deloitte website [www.deloitte.com](http://www.deloitte.com).

	US\$	US\$ PPP	VAT %	CPL
Algeria	0.01497	0.02994	17.0%	<b>0.5</b>
Bahrain	2.65290	4.01955	0.0%	0.66
Comoros	0.00299	0.00525	0.0%	0.57
Djibouti	0.00580	0.01208	19.0%	0.48
Egypt	0.18310	0.65393	10.0%	0.28
Iraq	0.00084	0.00220	0.0%	0.38
Jordan	1.42210	2.63352	16.0%	0.54
Kuwait	3.66170	5.01603	0.0%	0.73
Lebanon	0.00067	0.00120	10.0%	0.56
Libya	0.83250	2.08125	0.0%	<b>0.4</b>
Mauritania	0.00406	0.01097	0.0%	0.37
Morocco	0.13040	0.23709	20.0%	0.55
Oman	2.60870	4.34783	0.0%	0.6
Palestine	0.26310	1.31550	0.0%	<b>0.2</b>
Qatar	0.27470	0.36627	0.0%	0.75
Saudi Arabia	0.26690	0.41703	0.0%	0.64
Somalia	1.00000	3.33333	0.0%	<b>0.3</b>
Sudan	0.50800	1.15455	10.0%	0.44
Syria	0.01993	0.05245	0.0%	0.38
Tunisia	0.83170	1.84822	18.0%	0.45
UAE	0.27220	0.36293	0.0%	<b>0.75</b>
Yemen	0.00505	0.01402	10.0%	0.36
UK	2.07190	1.75585	17.5%	1.18
USA	1.00000	1.00000	10.0%	1
France	1.47053	1.27872	19.6%	1.15

## A.2. Tariff data

The tariff data used in this study is researched by Teligen from Internet sources, mainly operator websites. As some of the services are only presented with a minimum of price information on the net, Teligen has sought further clarifications from the operators and the regulators. In some cases it has not been possible to establish enough price information to conclude the benchmarking for a service, and this will give a gap in the benchmarking results.

The tariff data is current as of January/February 2008, with a cut-off date at the end of February.

## B. Basket methodologies

The so called "Basket" approach relates to a theoretical shopping basket where one can assume that a shopping basket is filled with the same amounts of equivalent goods in different shops, and then the cost of the basket content is compared.

The objective of the basket approach is to create a like-for-like comparison between different providers of a service. However, for the results to be comparable the services included in the basket must be reasonably comparable.

For example, a telephony service is more or less the same thing in different countries and from different providers. But if one provider offers a service that has specific limitations, for example no access to international calls, this service will not be comparable with other services that allow international calls.

Great efforts are made to make sure that all the elements required by the basket definition are incorporated in each tariff entry. It is equally important that the calculations of the individual costs are true to the price structure of each tariff.

The “Basket Results” are created by applying the basket definition of individual calls and service parameters to the prices of each tariff. Fixed cost elements are simply calculated to the period of for example one year, while call and message elements may be significantly more complicated to calculate in a consistent manner across all tariffs. The number of calls of a given type (e.g. Local) is combined with the average duration of calls at different times of day and the distribution of the calls across the day and week to calculate the cost of such calls as defined by the basket.

These calculations produce an annual or monthly cost for each tariff element, and these costs are comparable across all tariffs. In the end the sum of the element costs for one tariff will produce the total cost of using the tariff. As all tariffs are calculated with the same set of rules, the results are also comparable.

The structure and metrics of the basket definition is critical to any comparison. If the traffic volumes and structure are too different from the real world situation the results may not be relevant for a meaningful comparison. The OECD has developed a comprehensive set of basket definitions for different types of services. These definitions are based on real traffic information from the majority of the OECD Member Countries around the world, and have produced a stable set of international benchmarking results for nearly two decades. Teligen has been instrumental in the development and implementation of these basket definitions, and is providing on-going updates to the OECD basket results.

The OECD baskets are produced specifically to facilitate meaningful international comparisons of prices. These baskets may not be directly comparable with the usage profiles experienced in any one country, and that is not the intention. More specific national usage profiles can be used for comparisons of prices seen from a national point of view, and may give different results.

## C. PSTN basket methodology

The OECD basket methodology for PSTN services is built up by the following elements:

Installation	Assuming that the average life of a PSTN connection is 5 years the installation elements consists of 1/5 of any one-off charges related to the connection of the service.
Rental	As the OECD basket results are calculated for one full year the rental element is made up of any line rental charges and other recurring charges, calculated up to the period of one year.
Fixed line calls	The fixed line call element covers all local and national fixed line calls. Instead of defining local calls as "local", the range of calls are distributed over 14 distinct distances ranging from 3 km up to 490 km. The local calling area is specified for each operator/country as covering all distances up to a certain radius. Regional and national calls will be distributed over the remaining distances according to the tariff definitions.
Calls to mobiles	Calls to mobiles are included for all major national networks. The call charges are weighted according to the best possible market share information available
International calls	International traffic include calls to all other countries covered by the study (all other OECD countries for the OECD baskets).

For fixed line calls and calls to mobiles a time of day-weighting with 6 specific time and day definitions are applied. Call charges for all of these 6 times are calculated separately and weighted.

For international calls a somewhat simpler Peak and Off-peak time definitions is used, with peak being the most expensive time of the week, and off-peak the cheapest time of the week.

The international call costs are also weighted according to the traffic volume on each route. In this study a simpler method is used due to lack of concise traffic information. Please see below.

The calculation of national calls is done as close to actual billing principles as possible, applying units, minimum charges, maximum charges and call set up charges as specified by the tariff.

There are five different basket definitions for PSTN:

- Low usage residential
- Medium usage residential
- High usage residential
- SoHo basket, single user business
- SME basket, multiple (30) user business

## C.1. Call volumes and proportions

The number of calls in each basket and the spread of calls by call type are shown in the two tables below. The volumes are given per user. This means that the Business SME basket will have 30 times this usage in total.

	Volumes	Call proportions		
	Total calls per month	Fixed line	Mobile	International
Residential Low	50	76.0%	19.0%	5.0%
Residential Medium	100	75.0%	23.0%	2.0%
Residential High	200	65.0%	31.0%	4.0%
Business Small	150	67.0%	29.0%	4.0%
Business SME	233	72.0%	20.0%	8.0%

## C.2. Time of day variation

The distribution of calls depending on time of day is divided into three parts: Fixed line calls, calls to mobile and international calls.

### Fixed line time of day variation

	WD 11:00	WD 15:00	WD 20:00	WD 03:00	WE1 11:00	WE2 15:00
Residential Low	30.2%	28.1%	23.6%	0.9%	8.2%	9.0%
Residential Medium	27.5%	28.0%	23.0%	2.0%	8.0%	11.5%
Residential High	30.0%	29.2%	23.8%	1.1%	7.3%	8.6%
Business Small	39.5%	39.3%	7.5%	3.6%	5.5%	4.6%
Business SME	40.2%	40.5%	6.5%	3.4%	4.7%	4.7%

### Call to mobile time of day variation

	WD 11:00	WD 15:00	WD 20:00	WD 03:00	WE1 11:00	WE2 15:00
Residential Low	28.6%	28.6%	20.5%	0.6%	10.1%	11.6%
Residential Medium	29.1%	30.5%	20.5%	0.7%	8.5%	10.7%
Residential High	30.0%	30.4%	20.0%	0.6%	8.5%	10.5%
Business Small	39.5%	39.5%	4.5%	0.3%	9.0%	7.2%
Business SME	44.0%	42.0%	1.2%	0.1%	6.3%	6.4%

### International time of day variation

	Peak	Off-peak
Residential Low	33.0%	67.0%
Residential Medium	33.0%	67.0%
Residential High	33.0%	67.0%
Business Small	80.0%	20.0%
Business SME	80.0%	20.0%

*Note: WD is Weekday, WE1 is the day before the holiday, and WE2 is the holiday. The definitions for WE1 and WE2 are used instead of the original Saturday and Sunday defined in the OECD basket definitions.*

### C.3. Distance variation for fixed line calls

The distribution of national fixed line calls is related to distance, with defined km distances. 14 discrete distances from 3 to 490 km are used. The following rules apply:

- Tariffs will be assigned to the sum of call proportions related to the distances they cover. For example: A local tariff covering 0 to 20 km will attract the call proportions assigned to the distances of 3, 7, 12 and 17 km.
- Proportions for distances that reach beyond the country borders will be assigned to the highest national tariff.
- The percentages listed in this table will add up to 100%, and refer to the number of national fixed line calls in the basket.

#### Fixed line distance variation

	3	7	12	17	22	27	40	75	110	135	175	250	350	490
Residential Low	62.0%	14.5%	5.2%	3.1%	1.6%	2.1%	2.1%	2.1%	1.2%	1.0%	0.8%	0.8%	0.6%	2.9%
Residential Medium	56.7%	13.3%	4.7%	2.8%	1.4%	3.2%	3.2%	3.2%	1.9%	1.6%	1.3%	1.3%	1.0%	4.4%
Residential High	63.0%	14.7%	5.2%	3.1%	1.6%	1.9%	1.9%	1.9%	1.1%	0.9%	0.7%	0.7%	0.6%	2.7%
Business Small	55.5%	13.0%	4.6%	2.9%	1.5%	3.3%	3.3%	3.3%	2.0%	1.7%	1.4%	1.4%	1.1%	5.0%
Business SME	57.2%	13.4%	4.9%	3.0%	1.5%	3.0%	3.0%	3.0%	1.8%	1.5%	1.2%	1.2%	0.9%	4.4%

## C.4. Call durations

Call durations for fixed line calls are assigned based on a Time of day / distance matrix, with distances defined below and above the average size of local calling areas. Call durations for mobile and international calls are assigned based on time of day only.

### Fixed line call duration (minutes)

	Local (below 26 km)						National (above 26 km)					
	WD 11:00	WD 15:00	WD 20:00	WD 03:00	WE1 11:00	WE2 15:00	WD 11:00	WD 15:00	WD 20:00	WD 03:00	WE1 11:00	WE2 15:00
Residential Low	3.7	3.7	4.7	4.7	4.5	4.5	4.4	4.4	7.0	7.0	6.6	6.6
Residential Medium	3.7	3.7	4.7	4.7	4.5	4.5	4.4	4.4	7.0	7.0	6.6	6.6
Residential High	3.7	3.7	4.7	4.7	4.5	4.5	4.4	4.4	7.0	7.0	6.6	6.6
Business Small	1.9	1.9	2.1	2.1	2.3	2.3	2.2	2.2	3.0	3.0	3.1	3.1
Business SME	1.9	1.9	2.1	2.1	2.3	2.3	2.2	2.2	3.0	3.0	3.1	3.1

### Call to mobile duration (minutes)

	WD 11:00	WD 15:00	WD 20:00	WD 03:00	WE1 11:00	WE2 15:00
Residential Low	1.8	1.8	2.1	2.1	1.9	1.9
Residential Medium	1.8	1.8	2.1	2.1	1.9	1.9
Residential High	1.8	1.8	2.1	2.1	1.9	1.9
Business Small	1.6	1.6	1.7	1.7	1.7	1.7
Business SME	1.6	1.6	1.7	1.7	1.7	1.7

### International call duration (minutes)

	Peak	Off-peak
Residential Low	5.5	7.2
Residential Medium	5.5	7.2
Residential High	5.5	7.2
Business Small	2.9	3.9
Business SME	2.9	3.9

*Note: All durations are given in minutes and fractions of minutes, i.e. 7.2 minutes equals 7 minutes 12 seconds.*

## C.5. Other OECD basket rules

- Only incumbent operators are covered.
- Nonrecurring charges are covered using the simple average of the charge for a new installation of a service, and the charge for taking over an existing installation.
- Nonrecurring charges are distributed over 5 years, except where the installation is a tradable asset (Japan) where the charge is distributed over 20 years.
- All call costs are calculated as actual call costs as opposed to average, i.e. the real cost of a call with full unit charges is used.
- Calls to mobile use a weighted average charge for calls to all national mobile networks, based on a subscriber number weight.<sup>1</sup>
- International calls to other OECD countries are included, with call charges weighted according to actual traffic volumes. This means that those destinations with most traffic will carry most weight.
- For international call charges the highest charge is used for peak time, and the lowest is used for off-peak time.
- For each operator a relevant number of tariff packages shall be included. Combinations of packages are allowed. Certain discount packages with “selective discounts” are not included for technical reasons.
- Note: Selective discounts mean discounts to a chosen set of numbers or destinations. Since no general algorithms exist to determine the number of calls to such destinations, such discount schemes cannot be included in the baskets.
- The 3 residential baskets and the “Small” business basket all include 1 line and 1 user. The “SME” business basket includes 30 lines and 30 users. This means that all relevant costs per line are multiplied with the number of lines (and users), i.e. 30.
- Results are presented in US\$ per year, excluding VAT for Business baskets and including VAT for Residential baskets.

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<sup>1</sup> For the OECD countries Teligen has used subscriber numbers from the Informa Mobile Subscriber database for the distribution of prices for calls to mobile.

### C.6. Modifications for Arab baskets

In the Price Benchmarking Study for Arab Countries some minor modifications have been made to the OECD baskets listed above:

- The definition of Weekend is changed to cover the weekly holiday regardless of day. The “Saturday is changed to mean the day before the weekly holiday. See note below tables in section C.2 above
- As the subscriber numbers for mobile operators in the Arab countries are not known at this stage, the prices for calls to each network are equally distributed. The effect is minimal as the prices are normally quite close, and the distribution is still within reason.
- Due to the lack of traffic data for the international weighting an approximate method has been used. The traffic volumes are distributed according to the table below:

From	To	N. Africa	ME West	ME East	E. Africa	Europe	N. America	Asia
North Africa	5	30%	10%	10%	10%	20%	10%	10%
ME West	4	10%	35%	10%	5%	20%	15%	5%
ME East	8	10%	10%	35%	5%	5%	15%	20%
East Africa	5	10%	10%	20%	30%	10%	10%	10%

The countries covered under each category are:

North Africa	Algeria	Libya	Mauritania	Morocco	Tunisia			
ME West	Jordan	Lebanon	Palestine	Syria				
ME East	Bahrain	Iraq	Kuwait	Oman	Qatar	Saudi	UAE	Yemen
East Africa	Comoros	Djibouti	Egypt	Somalia	Sudan			
Europe	France	UK	Spain					
N. America	USA							
Asia	India	Phillipines	Japan	Australia				

The weight for each destination country is taken from the table above, and divided with the number of other countries in the relevant category. For example:

A call from Algeria to Egypt will have a weight of  $10\% / 5 = 2\%$ .

A call from Jordan to Lebanon will have a weight of  $35\% / 3 = 11.67\%$

In total all weights will add up to 100%.

## D. Mobile Basket Methodology

Mobile services offer a slightly different set of challenges than for fixed line services. Because of this the OECD has defined a separate basket methodology for mobile. It is built with these elements:

Installation	Assuming that the average life of a mobile connection is 3 years the installation elements consists of 1/3 of any one-off charges related to the connection of the service.
Rental	As the OECD basket results are calculated for one full year the rental element is made up of any monthly charges for service provision and options taken with the tariff, calculated up to the period of one year.
Fixed line calls	The fixed line call element covers local and national fixed line calls.
On-net calls	On-net calls to same network
Off-net calls	Off-net calls to other networks. When charges distinguish between networks the weighted average using market share is used.
Voicemail retrieval	Voicemail retrieval is included, and that also implicates any recurring charges for the provision of basic voicemail service.
SMS	SMS to own network and other networks
MMS	MMS to own network and other networks
Allowances	Allowances defined as minutes, messages or monetary value are included, along with definitions of the application of allowances to specific types of calls.

Call charges are split into Day, Evening and Weekend times. For messages only peak and off-peak definitions are used.

The calculation of allowances is a particularly complicated part of this basket. Several levels of allowances are possible, and the implementation of such calculations can make a significant difference. Teligen has worked with several operators to ensure that the implementation is as close to real billing as possible.

There are 3 mobile basket definitions:

- Low usage basket (for pre- and post-paid)
- Medium usage basket (post-paid)
- High usage basket (post-paid)

The OECD basket definitions contain the following metrics:

“Old” baskets refer to the baskets before the last revision in 2006.

## D.1. Call and message volumes

Volumes of calls and messages are given per year

Volume	Voice	SMS	MMS
Low usage	360	396	8
Medium usage	780	600	8
High usage	1680	660	12

## D.2. Time of day variation

The distribution of calls over time of day is given as a percentage of the number of voice calls.

ToD	Peak	Off-peak	Weekend
Low usage	48.00%	25.00%	27.00%
Medium usage	50.00%	24.00%	26.00%
High usage	60.00%	19.00%	21.00%

## D.3. Call and message destinations

The distribution of calls and messages over different (types of) destinations are given as a percentage of the total number of calls and messages.

Destinations	Local	National	Mobile On-net	Mobile Off-net	Voice mail	SMS On-net	SMS Off-net
Low usage	15.00%	7.00%	48.00%	22.00%	8.00%	65.00%	35.00%
Medium usage	14.00%	7.00%	48.00%	24.00%	7.00%	65.00%	35.00%
High usage	13.00%	7.00%	47.00%	26.00%	7.00%	65.00%	35.00%

## D.4. Call durations

The call durations are given for each type of call (Fixed corresponds to both local and national fixed line calls)

Durations	Fixed	Mobile On	Mobile Off	Voicemail
Low usage	1.5	1.6	1.4	0.8
Medium usage	1.8	1.9	1.7	0.8
High usage	1.7	1.9	1.8	0.8

*Note: All durations are given in minutes and fractions of minutes, i.e. 1.4 minutes equal 1 minute 24 seconds.*

## D.5. Other basket rules

- Two largest operators are covered for each country, based on subscriber numbers. The operators covered should between them have at least 50% of the market share.
- Tariffs shall be typical 2G services with the main focus on voice.
- A range of relevant tariffs are covered, allowing the lowest cost tariff to be selected for each operator. The relevance of tariffs are judged from the apparent target customer group, and some basic criteria like:
  - No selective discounts (i.e. discounts to selected numbers)
  - Single user tariff only
  - No tariffs clearly beneficial for traffic volumes outside the scope of the OECD baskets
- Nonrecurring charges are distributed over 3 years
- All call costs are calculated as actual call costs as opposed to average, i.e. the real cost of a call with full unit charges is used.
- Off-net M2M charges are weighted according to subscriber numbers for each country, where relevant for the pricing of calls.<sup>2</sup>
- The value of call and message allowances included in the tariff will be deducted from the usage element of the basket, up to the value of actual usage.
- Results are presented in US\$ per year, including VAT.

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<sup>2</sup> For the OECD countries Teligen has used subscriber numbers from the Informa Mobile Subscriber database for the distribution of prices for calls to mobile.

### D.6. Modifications for Arab baskets

In the Price Benchmarking Study for Arab Countries some minor modifications have been made:

- An International element is included, based on the same principles as with PSTN.
- Due to the lack of traffic data for the international weighting an approximate method has been used. The traffic volumes are distributed according to the table below:

From	To	N. Africa	ME West	ME East	E. Africa	Europe	N. America	Asia
North Africa	5	30%	10%	10%	10%	20%	10%	10%
ME West	4	10%	35%	10%	5%	20%	15%	5%
ME East	8	10%	10%	35%	5%	5%	15%	20%
East Africa	5	10%	10%	20%	30%	10%	10%	10%

The countries covered under each category are:

North Africa	Algeria	Libya	Mauritania	Morocco	Tunisia			
ME West	Jordan	Lebanon	Palestine	Syria				
ME East	Bahrain	Iraq	Kuwait	Oman	Qatar	Saudi	UAE	Yemen
East Africa	Comoros	Djibouti	Egypt	Somalia	Sudan			
Europe	France	UK	Spain					
N. America	USA							
Asia	India	Phillipines	Japan	Australia				

The weight for each destination country is taken from the table above, and divided with the number of other countries in the relevant category. For example:

A call from Algeria to Egypt will have a weight of  $10\% / 5 = 2\%$ .

A call from Jordan to Lebanon will have a weight of  $35\% / 3 = 11.67\%$

In total all weights will add up to 100%.

## E. Leased Line basket methodology

The OECD basket for Leased Lines is based on a relatively simple structure that calculates the average cost of a circuit of varying length, for 3 specific bitrates:

- 64 kb/s
- 2 Mb/s
- 34 Mb/s

The basic definition will follow these rules:

### E.1. Circuit numbers and weights

The basket results will represent the price of 1 circuit weighted over the distances covered.

	<b>circuits</b>	<b>2 km</b>	<b>20 km</b>	<b>50 km</b>	<b>100 km</b>	<b>200 km</b>	<b>500 km</b>
OECD basket	1	35%	20%	15%	20%	5%	5%

The 2 km distance is considered a local circuit between two customer premises. Other distances are considered regional or long distance circuits between customer premises.

### E.2. Circuit bitrates

The basket data covers the following bitrates:

- 64 kb/s
- 2 Mb/s
- 34 Mb/s \*

*Note: Where 34 Mb/s is not offered, and 45 Mb/s is used instead, a conversion factor of  $34 / 45 = 0.75$  will be used on the price.*

### E.3. Other basket rules

- The basket shall include transparent end-to-end leased lines from the incumbent operators. Virtual circuits can be included in cases where traditional leased circuits do not exist any more; xDSL services, however, fall outside the scope of the basket.
- Non-recurring charges (installation) are excluded from the basket. Only annual rental charges are included.
- Circuits above 2 km shall include two 2 km local tail circuits within the defined distance. This means that, for example, a 50 km circuit will have 2 local tail circuits of 2 km, and a main circuit of 46 km. Some operators include the local tail circuits in the total price, some do not.
- Circuits are assumed to be within or out of the major city in the country. This means that the 2 km circuit is a local circuit within the major city, and the rest of the distances will have one end in the major city, and the other end outside.

- Where the distance exceeds the possible distance for a country, the highest available price is used for that distance. This means that even when a circuit length would go beyond the borders of a country, this circuit is included in the basket, using the price of the longest possible circuit.<sup>3</sup>
- Results are presented in US\$ per year, excluding VAT.

#### **E.4. Modifications for Arab baskets**

In the Price Benchmarking Study for Arab Countries a minor modification has been made to the leased line basket:

- Where tariffs are available the additional bitrates of 256 kb/s and 155 Mb/s will be included in the results.

## **F. Broadband benchmarking methodology**

Broadband services have not been covered by the general OECD baskets, even though the OECD has benchmarked broadband prices for a while. However, Teligen has developed a structure for comparing broadband prices, and this has been adopted by various bodies like the European Commission and various regulatory bodies in Europe. The basic methodology is described below.

There is unfortunately little information available on the detailed consumption of traffic within broadband services. However, it has become clear that the price structure used for such services lends itself to misinterpretation of benchmarking results, and that further non-price information will have to be included in the results.

In general there is a wide range of offerings for broadband, with speeds from 128 kb/s up towards 20 Mb/s. When looking for the cheapest available service the low speed offerings will inevitably appear as the best choice. On the other hand, these services will not necessarily fulfil the requirements for high speed access to the Internet. An alternative is to compare the price per Mb/s, i.e. using prices normalised to the same speed. This will however favour the higher speeds, as the price per speed unit tends to go down with increasing speed.

As both of these methods have their weaknesses, but in the opposite direction, a combination of the two may appear sensible. But as there is no clear mathematical relationship between the two methods the assessment will have to be done manually, reviewing the two sets of results together.

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<sup>3</sup> If a small country in principle only allows circuits up to for example 50 km within its borders, the weights and calculations for longer circuits will still be used as if circuits up to 500 km were possible. The price for the longest zone given in the tariff will be used for those excessive distances. In most cases this will not have an impact as the circuits in small countries do not normally have a distance element (i.e. per km charge) in the pricing.

## F.1. Broadband methodology

The broadband benchmarking methodology contains these elements:

Installation	A 3 year lifetime of service is assumed, dividing all one off installation and modem costs <sup>4</sup> by 3. Charges related to the provision of the physical line are not included.
Rental	The sum of the monthly service cost and any option charges related to for example modem. Charges related to the provision of the physical line are not included.
Usage limitations	Indication of time limit or volume limit if applicable. There will also be a text description of what the consequence of breaking the limit will be.
Usage cost	If usage beyond the time or volume limit results in further charges per minute, hour or MByte, such charges will be included in the overall cost calculation as "Usage"
Maximum usage cost	Some tariffs that apply usage charges may also have a maximum usage cost per billing period.
Speed	The up- and down-load bitrates.
Email addresses	Number of email addresses included in basic service
Web space	Amount of web space included in basic service
Contract duration	Minimum duration of contract (in months)

The non-charge elements of the methodology are used for assessment of the service suitability and perceived value.

The costs may be calculated in one of two ways:

- Actual cost of installation, rental and usage based on a specific usage profile.
- The cost of installation, rental and usage, normalised to for example 1 Mb/s speed, based on a specific usage profile.

The usage profiles are selectable, and can be changed. Default profiles contain the following elements:

Basket #	Hours per month	Minutes per session	GB per month	% day	% evening	% weekend	Years
1	10	20	1	25%	50%	25%	3
2	15	20	2	25%	50%	25%	3
3	30	30	5	25%	50%	25%	3
4	50	30	5	25%	50%	25%	3
5	75	60	10	25%	50%	25%	3
6	100	60	20	25%	50%	25%	3

The basket calculation can also be limited to a subset of the packages selected by speed range, for example below 1 Mb/s, 1 – 4 Mb/s, 4 – 10 Mb/s and above 10 Mb/s.

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<sup>4</sup> Modem cost may be included in the basic installation cost, or specified separately. If specified separately it is added to the installation cost.

## G. Call cost methodology

Beyond the basket analysis required in this study there is also a requirement for calculating the cost of actual 3 minute calls to different destinations.

	Peak	Off-peak
Local 3 minute call	√	√
National 3 minute call	√	√
International 3 minute call to USA	√	√

The calculation of a call shall be as close as possible to the real billing principles, and may include:

Call set up	A charge raised at the beginning of the call
Unit	A fixed price unit that is applied with different durations for different types of calls. The unit is the minimum billing amount.
Per second	Charging per second based on a price normally given per minute.
Per minute	Charging in whole minute units with a price given per minute. A variant is charging per half or quarter minute.
Minimum	A minimum charge used if the total cost of the call is less than the minimum
Maximum	A maximum charge used instead of actual cost if the call cost goes beyond the maximum value.
Initial period	The first period of the call, often specified as the first minute. This period has a specific charge that may be different from the rest of the call