International Telecommunication Union

COSITU

Software for the Calculation of Costs, Tariffs
and Rates for Telephone Services

Telecommunication Development Bureau

(2004 Edition)

SERVICE PACK 2

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1 Installing COSITU

1.1 Introduction

The COSITU program can be installed on any computer running one of the following operating systems:

a) Windows 98

b) Windows 98 SE

c) Windows ME

d) Windows NT

e) Windows 2000

f) Windows XP or any later version

Important Note – If you are running Windows 98 first edition, Internet Explorer 5.0 or a later version must be installed for you to be able to install COSITU.

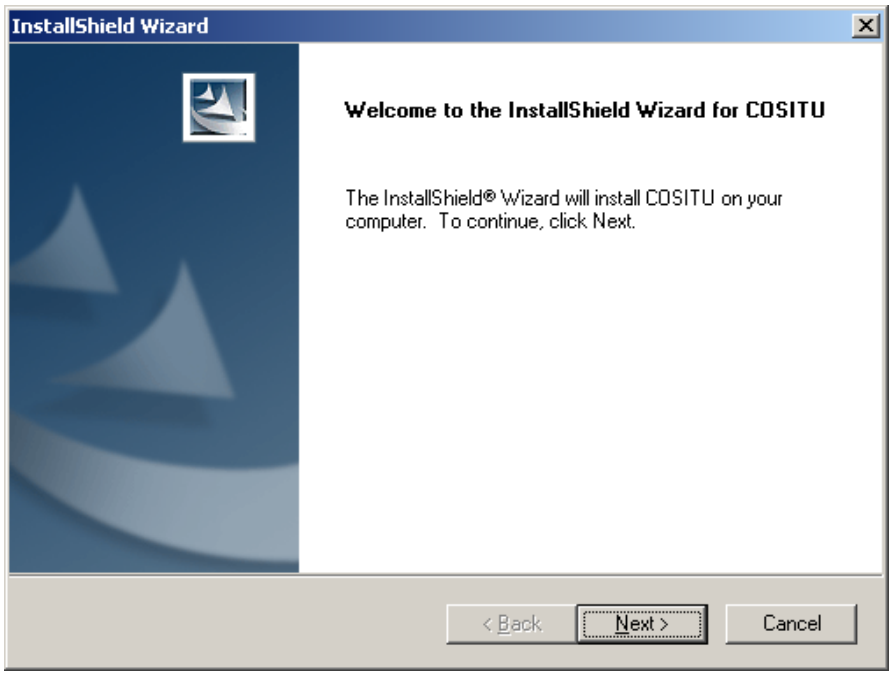
1.2 Installation Process

To install COSITU, proceed as follows:

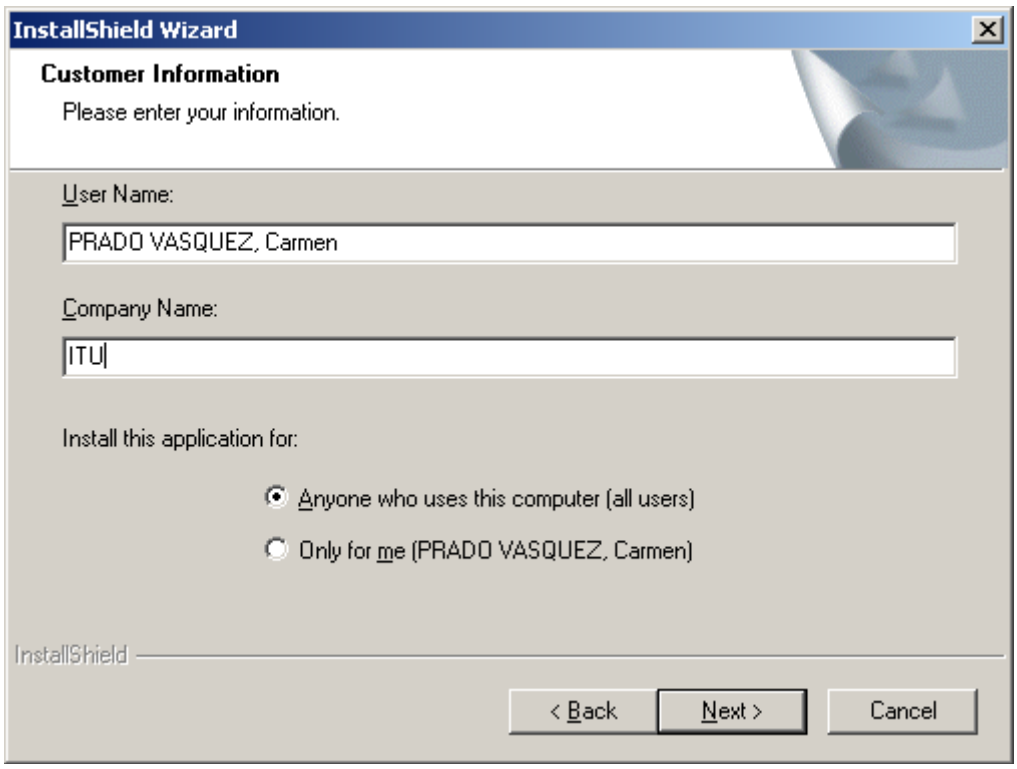
1 Insert the COSITU CD into the CD drive of your computer. The installation wizard should start automatically. If it does not, find the icon corresponding to your CD drive and double-click on it.

2 Double-click on the *Setup* icon.

3 The Installation program runs and pauses at the following screen:

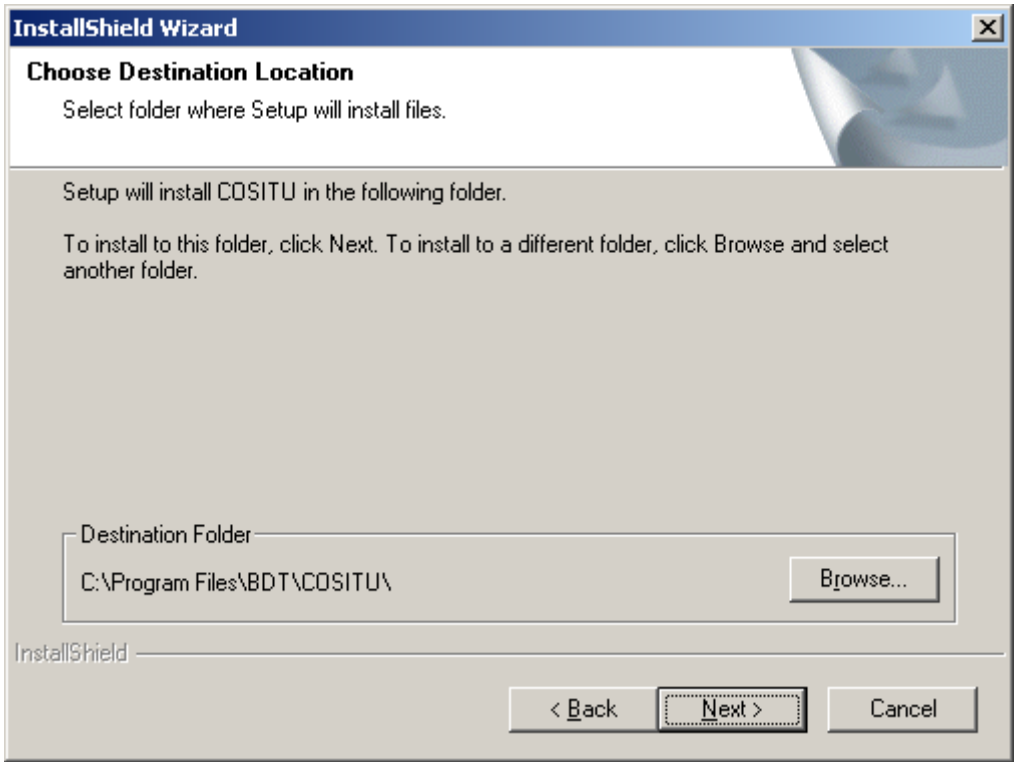


4) Specify your Name and Company in the following window:



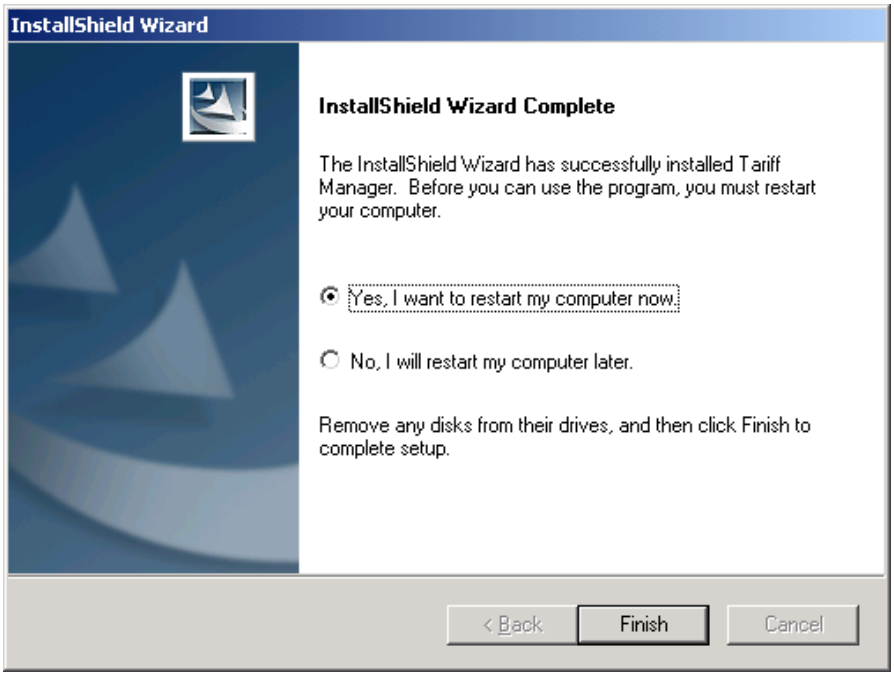
It is recommended to choose the first option.

5) Choose the destination folder for the COSITU program:



6) Proceed with installation by clicking the *Next* button.

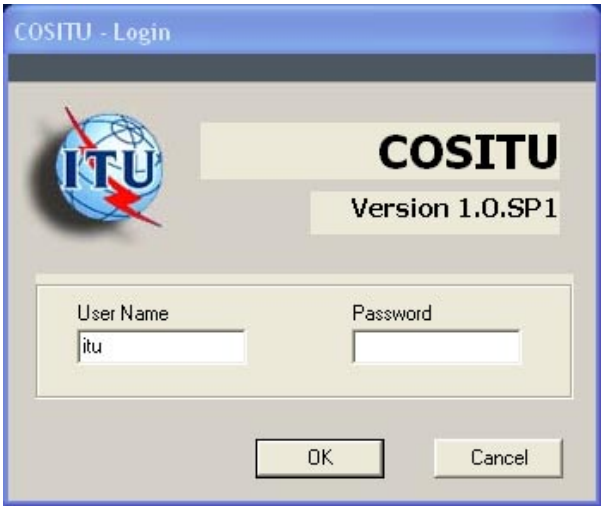
7) To complete installation, restart your computer when this screen appears:



8) After the computer has restarted, you can launch COSITU under *Start/Programs/COSITU*) or by double-clicking the COSITU icon on your desktop.

1.3 Starting COSITU

When starting COSITU, the following Login screen appears:



Enter the user name *ITU* and password *itu* the first time you log in.

This user name has Administrator rights and allows you to define other COSITU users.

2 Principal users of COSITU

COSITU is a tool for calculating costs, tariffs and rates for telephone services. It is also useful as a policy-making tool for regulators and public authorities in developing countries.

Independently of network configuration, COSITU can thus be used by various categories of fixed and mobile operators:

A: Vertical operators managing international and national traffic with complete geographical coverage

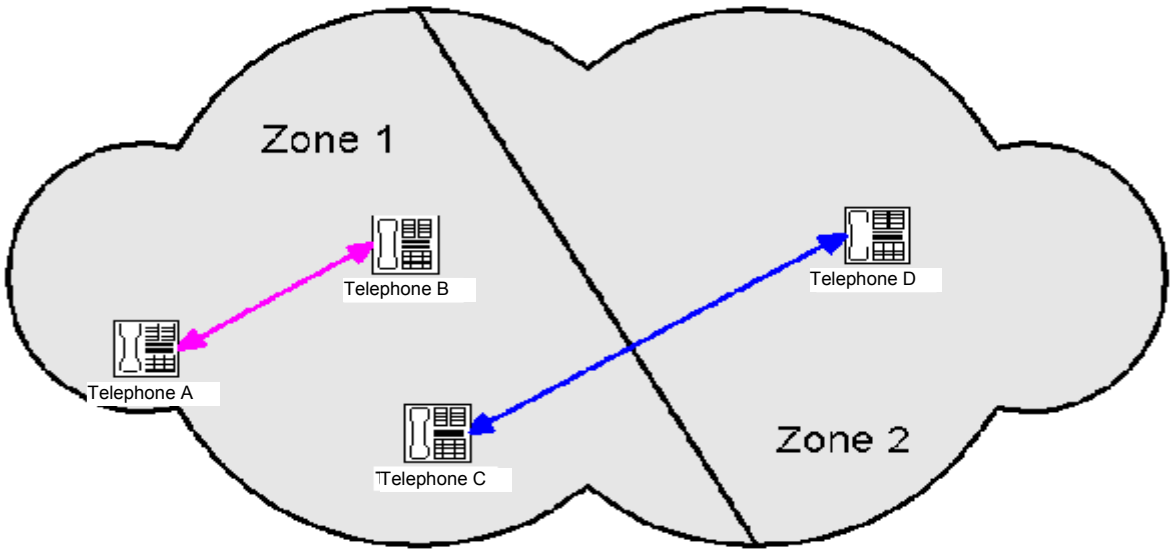
B: National operators with urban and interurban area coverage

C: National operators with urban area coverage only

3 Services for which COSITU can calculate costs

- Basic telephone service

National services



Urban traffic

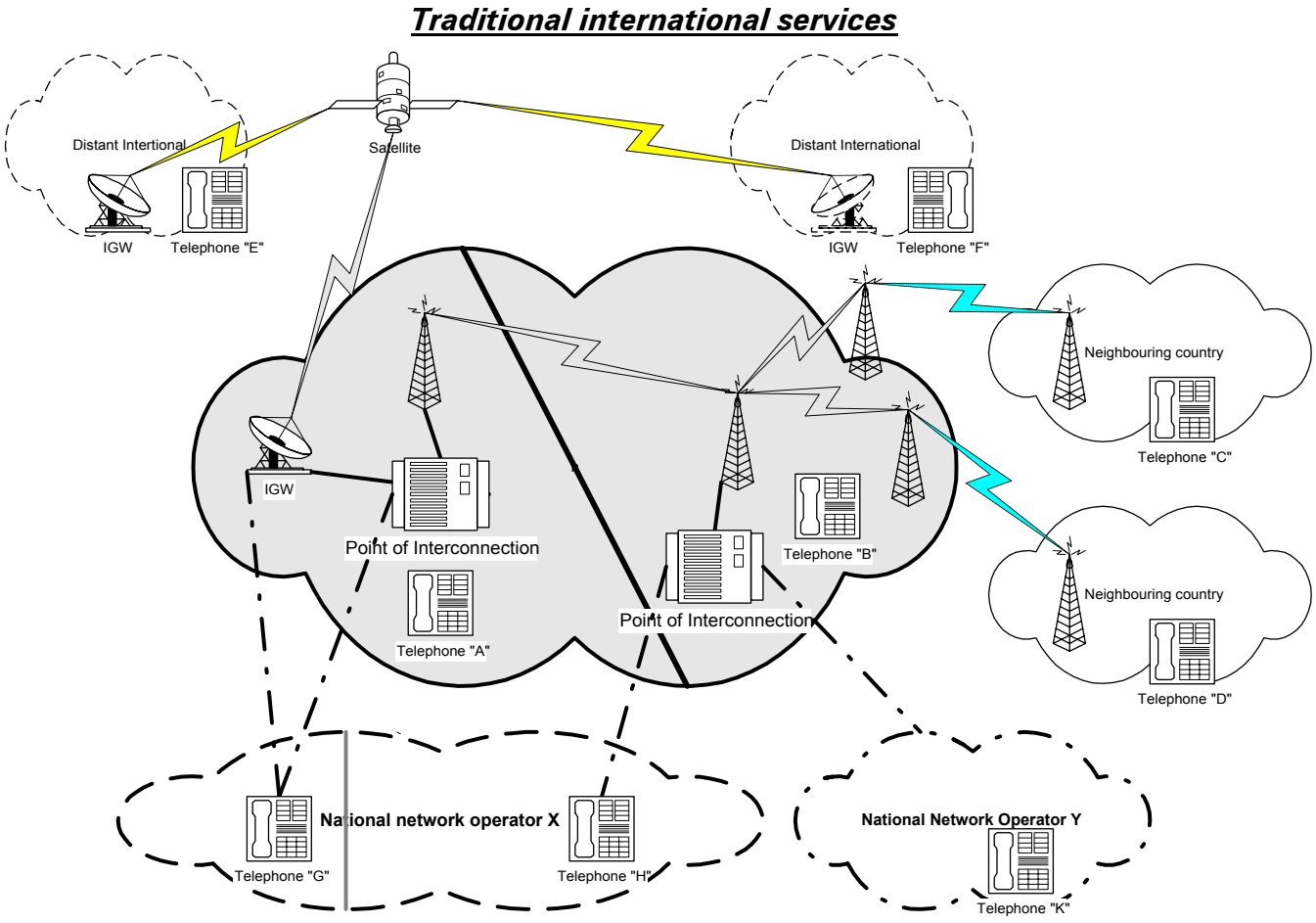
Traffic carried solely within the network of the operator for which calculations are being made, between users located in the same local tariff zone.

Example: in the illustration above, this might be between telephone A and telephone B.

Interurban traffic

Traffic carried solely within the network of the operator for which calculations are being made, between users located in different local tariff zones.

Example: in the illustration above, this might be between telephone C and telephone D.



Outgoing international traffic

A call from an end-user connected to the network of the operator using the international gateway to a correspondent located outside the national boundaries.

Example: in the illustration above, this might be a call from telephone A or B to telephone E or F.

Incoming international traffic

A call from a user located outside the national boundaries to an end-user connected to the network of the operator using the international gateway.

Example: from telephone E or F to telephone A or B.

Outgoing subregional traffic

A call from an end-user connected to the network of the operator using the international gateway to a correspondent located outside the national boundaries, in a country which can be accessed by the terrestrial media used for trunk calls.

Incoming subregional traffic

A call from a user located outside the national boundaries, in a country which can be accessed by terrestrial media used for trunk traffic, to an end-user connected to the network of the operator using the international gateway.

- **Transit services**

International to international traffic

A call between two non-subregional international correspondents via the international gateway of the operator for which calculations are being made.

Example: between telephone E and telephone F in the above illustration.

International to subregional traffic

A call from a non-subregional international correspondent to a subregional correspondent via the international gateway of the operator for which calculations are being made.

Example: from telephone E or F to telephone C or D.

Subregional to international traffic

A call from a subregional correspondent to a non-subregional international correspondent via the international gateway of the operator for which calculations are being made.

Example: from telephone C or D to telephone E or F.

Subregional to subregional traffic

A call between two subregional correspondents via the international gateway of the operator for which calculations are being made.

Example: between telephone C and telephone D.

- **Interconnection services**

International to national traffic

A call from an international correspondent to an operator without an international gateway located within the same political borders as the operator using the international gateway for which the calculations are made.

Example: from telephone E or F to telephone G, H or K.

National to international traffic

A call from an operator without an international gateway located within the same political borders as the operator using the international gateway for which the calculations are made, to an international correspondent.

Example: from telephone G, H or K to telephone C, D, E or F.

Outgoing national traffic

A call from an end-user of the network of the operator for which calculations are being made, to another operator located within the same political borders.

Example: from telephone A or B to telephone G, H or K.

Incoming national traffic, simple transit

A call originating in the network of another national operator, to an end-user located in the tariff zone of the point of interconnection and connected to the network of the operator for which calculations are being made.

Example: from telephone G to A, or from telephone K to B.

Incoming national traffic, double transit

A call originating in the network of another national operator, to an end-user located outside the tariff zone of the point of interconnection and connected to the network of the operator for which calculations are being made.

Example: from telephone G to B, or from telephone K to A.

National to national traffic

Transit communication between two national operators via the network of the operator for which calculations are being made.

Example: between telephone K and telephone G or H.

4 First steps in COSITU

4.1 Introduction

COSITU is a stand-alone[1] application using the Windows Graphical User Interface. Its goal is to compute cost-oriented tariffs for urban, interurban, international, subregional and interconnection communications at a country level, for a given year and a given operator.

4.2 Exchange rate in relation to the Special Drawing Right (SDR)

All costs are expressed in local currency, but the exchange rate with the Special Drawing Right (SDR) must be known in order to be able to benchmark the computed data with other operators in other countries. A link to the International Monetary Fund (IMF) is available on the COSITU website:

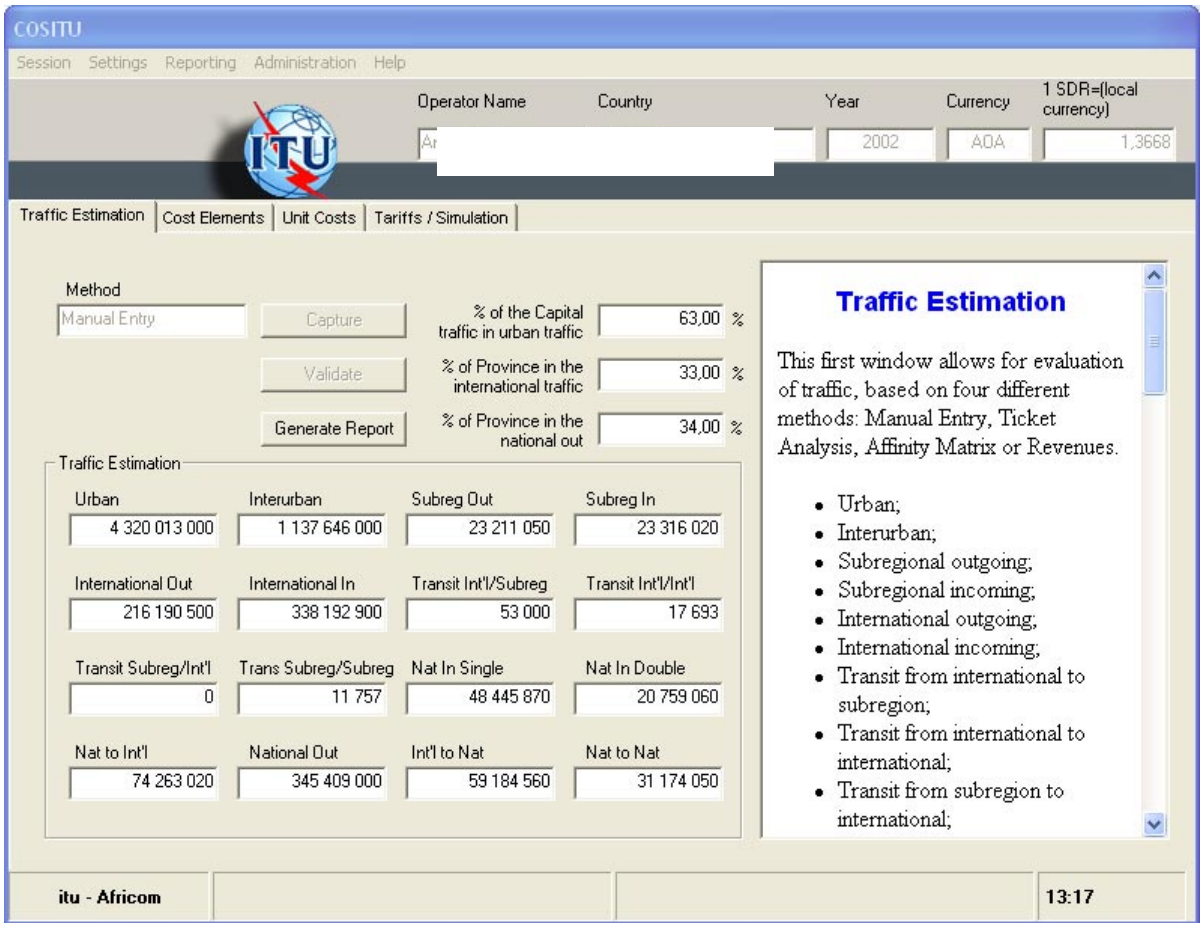
http://www.itu.int/ITU-D/finance/COSITU/

4.3 Starting the application

To start the application, you need to have a user name or login and a password assigned (see chapter 1.3). Logins and passwords are local variables that apply only to this application. They can be created, destroyed or modified by any user having *Administrative rights*.

Once the application has started up, it will take you directly to the last *Session* you have used. On the very first connection, you will be taken to a default session. You will be able to create a new session or import an existing one.

[1] It is a stand-alone application in the sense that it is able to run independently. However, a connection to the central server is provided in order to benchmark the data.



COSITU – Main window

The lower part of the window contains some general information such as:

- Current session (see chapter 5.1)
- Current time

5 The menus in COSITU

5.1 Session menu

5.1.1 Introduction

This application is session-based. This means that when the application is started, it automatically opens the last session opened by the logged-in user.

The session is a key concept for understanding how COSITU works. A session contains all of the context data, but also all data that have been entered by the user, and all results obtained on the basis of the data. The user does not need to save the data, since this is done automatically as data are entered or calculated.

To initiate a session, some data of a general type need to be entered, such as the name of the operator, the country, the year of evaluation, the annual mean of the exchange rate of the local currency with respect to the SDR[2] in the year in question, and the geographical correction coefficient (a utility is provided with the application for the purpose of calculating the latter). In addition to these data, the user will be asked to choose among the four methods available for evaluating traffic, and the two methods for evaluating costs.

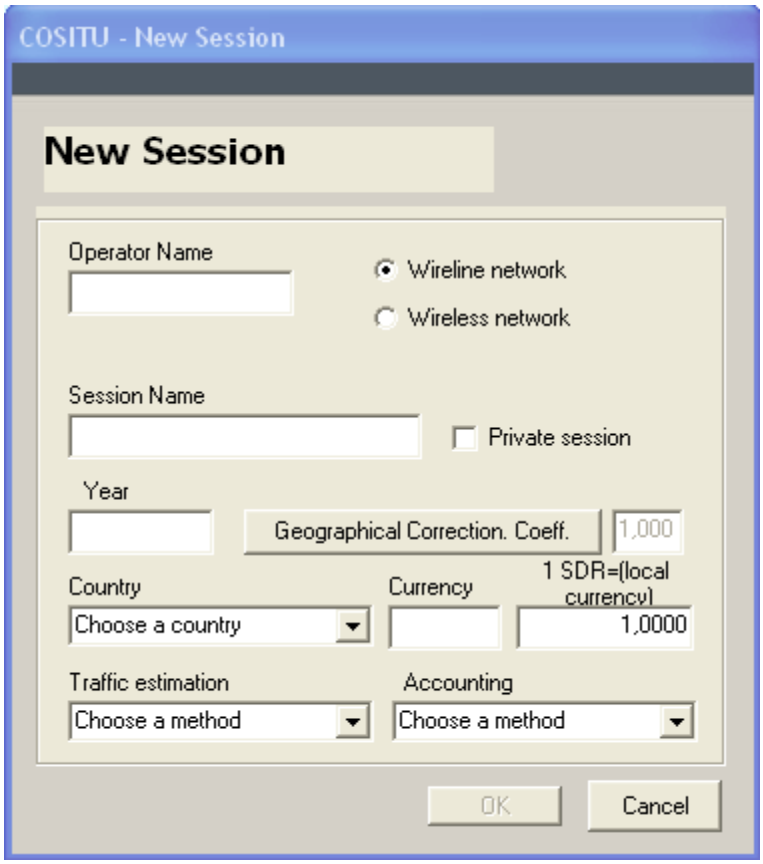
To change the method chosen, you can at any time select the menu *Session* and then the dialogue box *Settings*.

5.1.2 Managing sessions

- **New session**

To create a new session, select the menu *Session* and then *New* (or use the shortcut Ctrl+N) and then enter a name for the session and provide the other general data required. The application will then activate the new session automatically.

The following data are required when creating the new session:



Operator name:

The name of the operator using COSITU.

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[2] In the COSITU Website http://www.itu.int/ITU-D/Finance/COSITU/ there is a direct link to the International Monetary Fond (IMF) to obtain current and historical SDR exchange rates.

Session name:

The name by which this session will be referenced.

Wireline or GSM network indicator:

Indicates whether the operator for which calculations are being performed is a fixed or GSM (mobile) network operator.

Private session indicator:

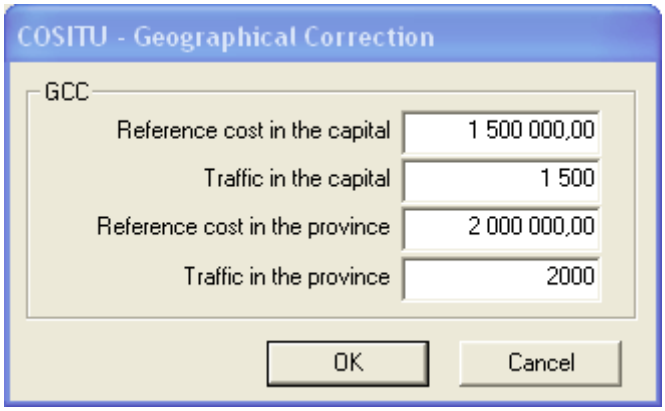
Sessions may be public or private. A public session may be viewed and edited by any user of the system. A private session can only be created by an authorized person, and no one else will be allowed to have access to it.

Year:

The year for which cost-oriented tariffs will be calculated.

Geographical correction coefficient (GCC):

The services for which geographical correction is applied are those which concern local provinces. The GCC can be calculated with the following tool:



If we take the following variables:

C_c is the reference cost in the capital

T_c is the traffic in the capital

C_p is the reference cost in the province

T_p is the traffic in the province

then GCC is calculated with the formula:

(Tc*Cp)/(Tp*Cc)

If the GCC is smaller than 1, the system automatically rounds it up to 1. If it is greater than 3, the system informs the user that the value is not likely to be correct. However, the user can keep the calculated value if he/she considers it to be correct.

NOTE – The internal traffic matrices of the various exchanges are used to calculate the total traffic volume for each exchange (local, transit, incoming, outgoing).

Country:

The country in which the operator is active and for which tariffs are calculated in this session.

Currency:

Local currency of the country. All amounts are entered in local currency except settlement rates relative to international traffic.

FX Rate vs. SDR:

Exchange rate of the local currency against the SDR. This rate is used when data are being exchanged with the ITU server as well as for the calculation of weighted average tariffs for international services. For more information, move the cursor over the "1 SDR" field and follow the instructions, or consult the COSITU website.

Traffic Estimation Method:

The user can choose between four different methods to determine traffic data. If the traffic is known, *Manual entry* must be chosen.

If the traffic has to be estimated, the choice is between

- Ticket analysis
- Affinity matrix
- Revenues

The estimation logic of these three methods is detailed in chapter 7.

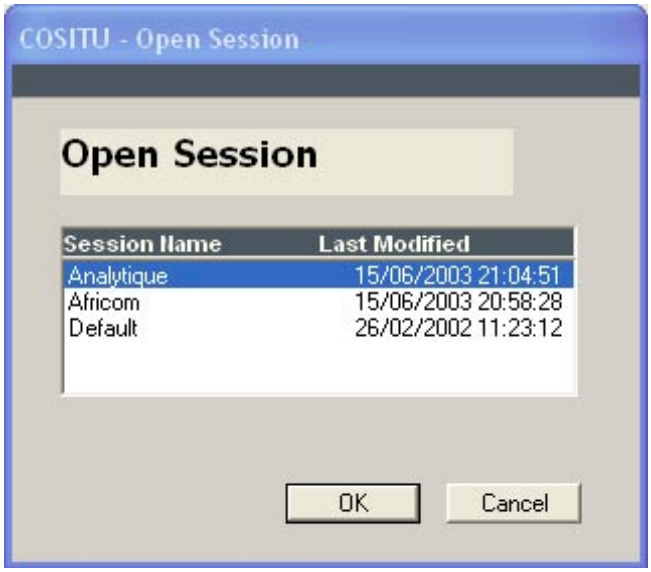
Accounting:

Here the user specifies whether cost data based on analytical accounting are available. If this is not the case, then general accounting data may be used. Once the method has been specified, the user will be guided through different steps requiring the entry of specific data.

Data from a medium-term business plan may, depending on the degree of detail, be used either in the *General accounting* mode or in the *Analytic accounting* mode, or in both, consecutively.

- **Open session**

This command is part of the *Session* menu and may be reached with the shortcut Ctrl+O. It allows the user to open one of the public sessions from a list. The administrator may also open private sessions.

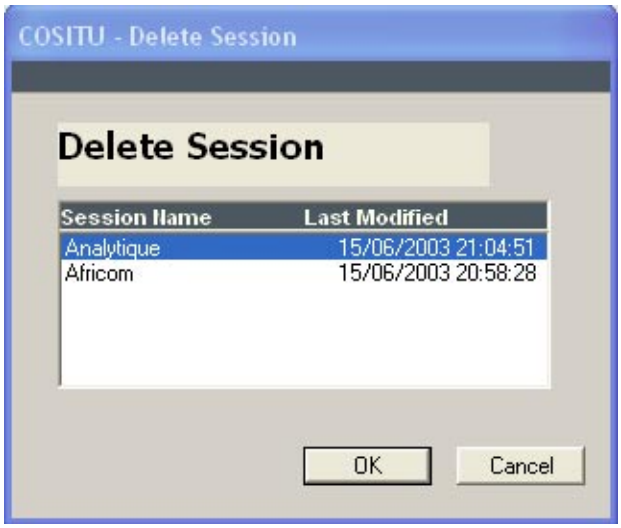


- **Save as Session**

This command is part of the *Session* menu and may be reached with the shortcut Ctrl+S. It allows the user to save the current session under a new name. All data that have been entered or calculated for the current session will be copied into the new session.

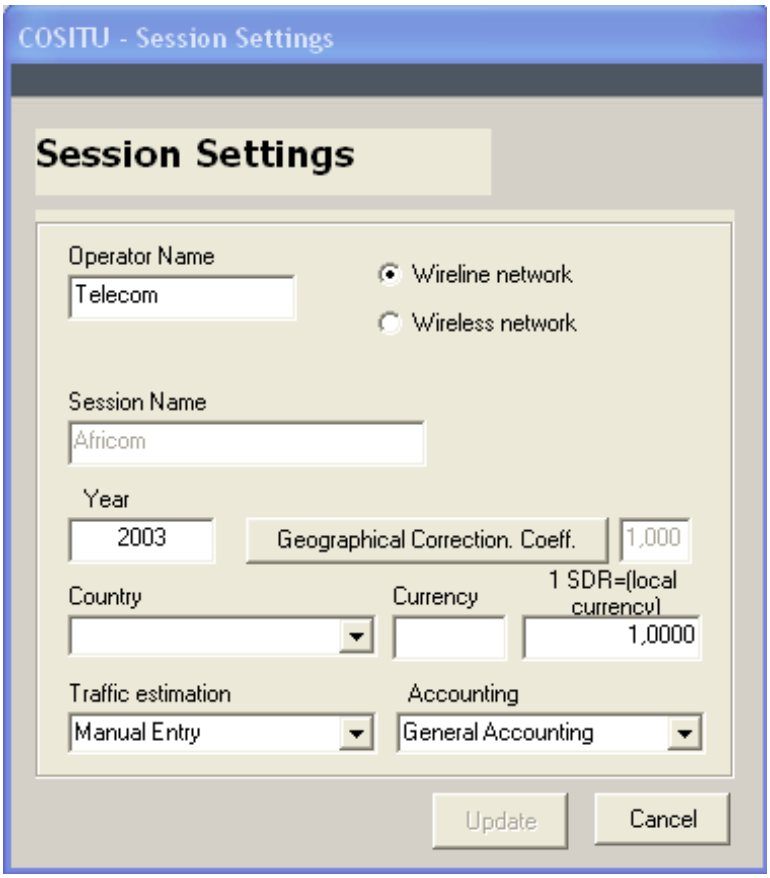
- **Delete**

This command deletes a session from the list of sessions that are available to the user. The *Default* session cannot be deleted.



- **Settings**

This command allows the user to modify session parameters, including the choice of method for estimating the traffic or costs.



5.1.3 Export-Import

This command is used to exporting and importing sessions.

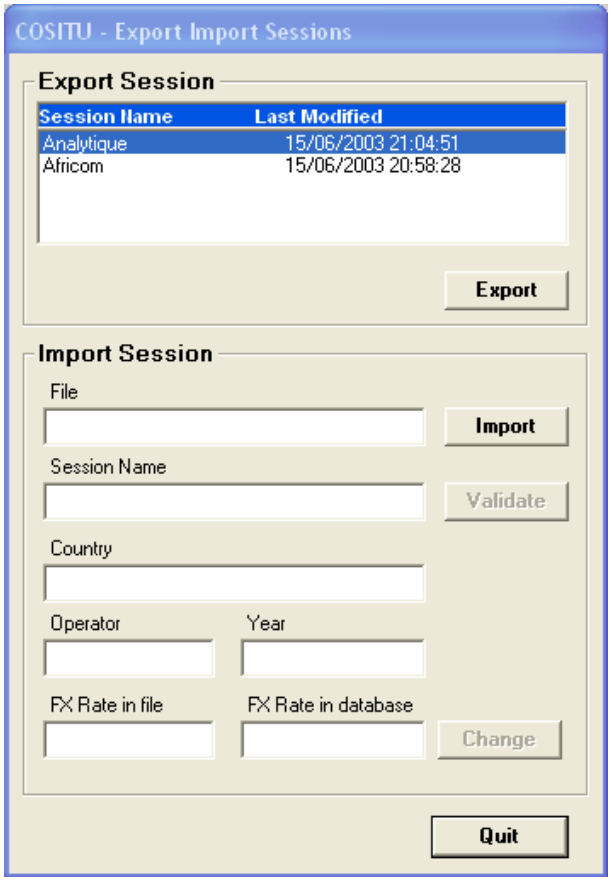
To export a session, the user must choose the session and for after pressing the *Export* button, specify the name of the file to which it should be stored.

To import a session, the user has to select the command *Import* and then specify the file by pressing the *Choose file* button. If the name of the session from file already exists in the database, the user must set a different name for the imported session.

If the FX Rate in the database is different than the FX Rate of the imported file, the button *Change* is enabled and it is allowed to import the value from the file to the database.

Once all the required information has been entered, the user is asked to confirm by clicking on the *Validate* button.

To exit from the export-import module, click on the *Quit* button.



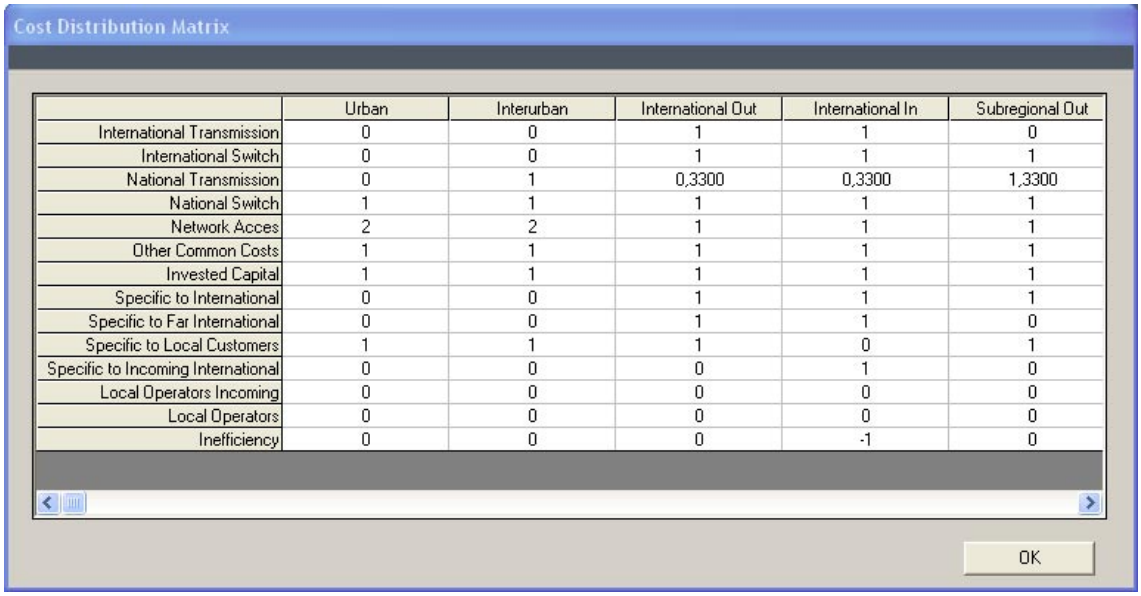
5.1.4 Exit

This command allows the user to quit COSITU.

5.2 Settings Menu

5.2.1 Cost Distribution Matrix

The Cost Distribution Matrix specifies the rules for allocating costs among the different services. This command displays the contents of the Cost Distribution Matrix.



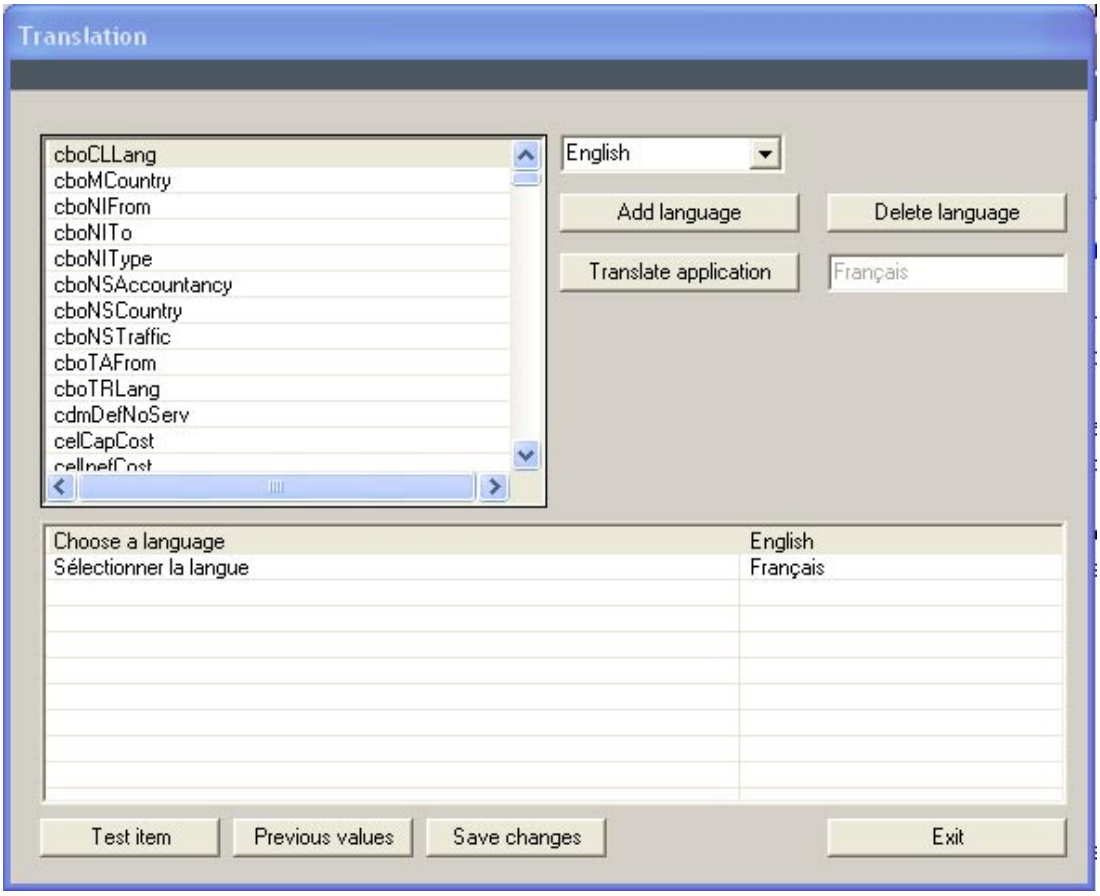
	Urban	Interurban	International Out	International In	Subregional Out
International Transmission	0	0	1	1	0
International Switch	0	0	1	1	1
National Transmission	0	1	0,3300	0,3300	1,3300
National Switch	1	1	1	1	1
Network Acces	2	2	1	1	1
Other Common Costs	1	1	1	1	1
Invested Capital	1	1	1	1	1
Specific to International	0	0	1	1	1
Specific to Far International	0	0	1	1	0
Specific to Local Customers	1	1	1	0	1
Specific to Incoming International	0	0	0	1	0
Local Operators Incoming	0	0	0	0	0
Local Operators	0	0	0	0	0
Inefficiency	0	0	0	-1	0

5.2.2 Change Language

This command allows users to change the language of the application. The user can choose from the languages available in the list. Once the language has been selected, the application is automatically translated.

5.2.3 Translation

The *Translation* command allows the management of translations for the application.



Add Language

The *Add Language* command allows users to add a new language in which the application can be translated. Translations can then be added to the application by the user.

NOTE – Adding a language and translating the labels available with this form will not automatically translate the help files.

Delete Language

The *Delete Language* command deletes the language itself and all its corresponding translations.

Translate Application

This command allows translation of the application to the language specified in the field at the top of the window; the read-only field indicates the current language.

Test Item

This command allows translations which have been entered to be tested before being saved. To use this command, select the translated item to be tested and activate the application in the area in which the item is used.

Previous Values

This command allows translation values entered to be replaced by stored values.

Save Changes

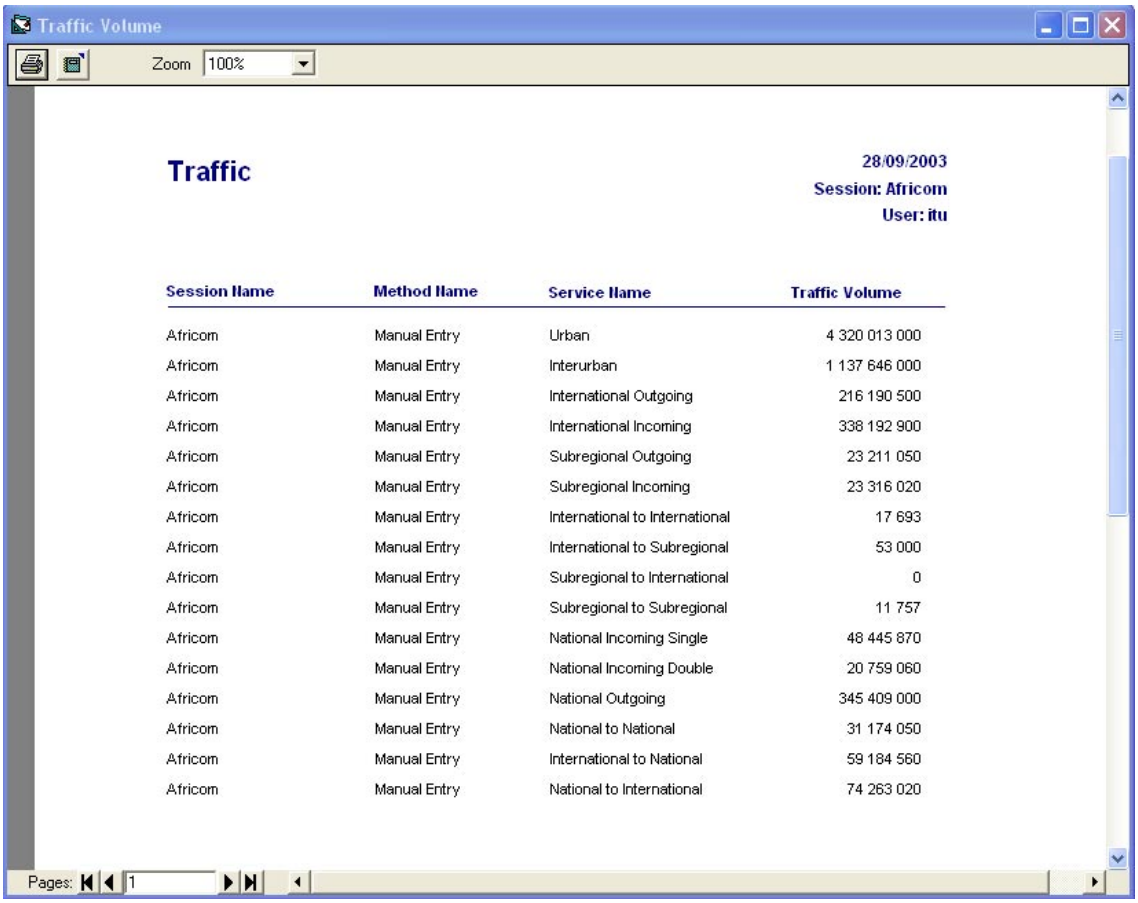
This command allows the newly entered translations to be stored in the database.

5.3 Reports Menu

The *Reports* Menu includes a set of reports that can be executed from the data stored in the database. The following reports are available in the application:

5.3.1 Results of the Traffic Estimation

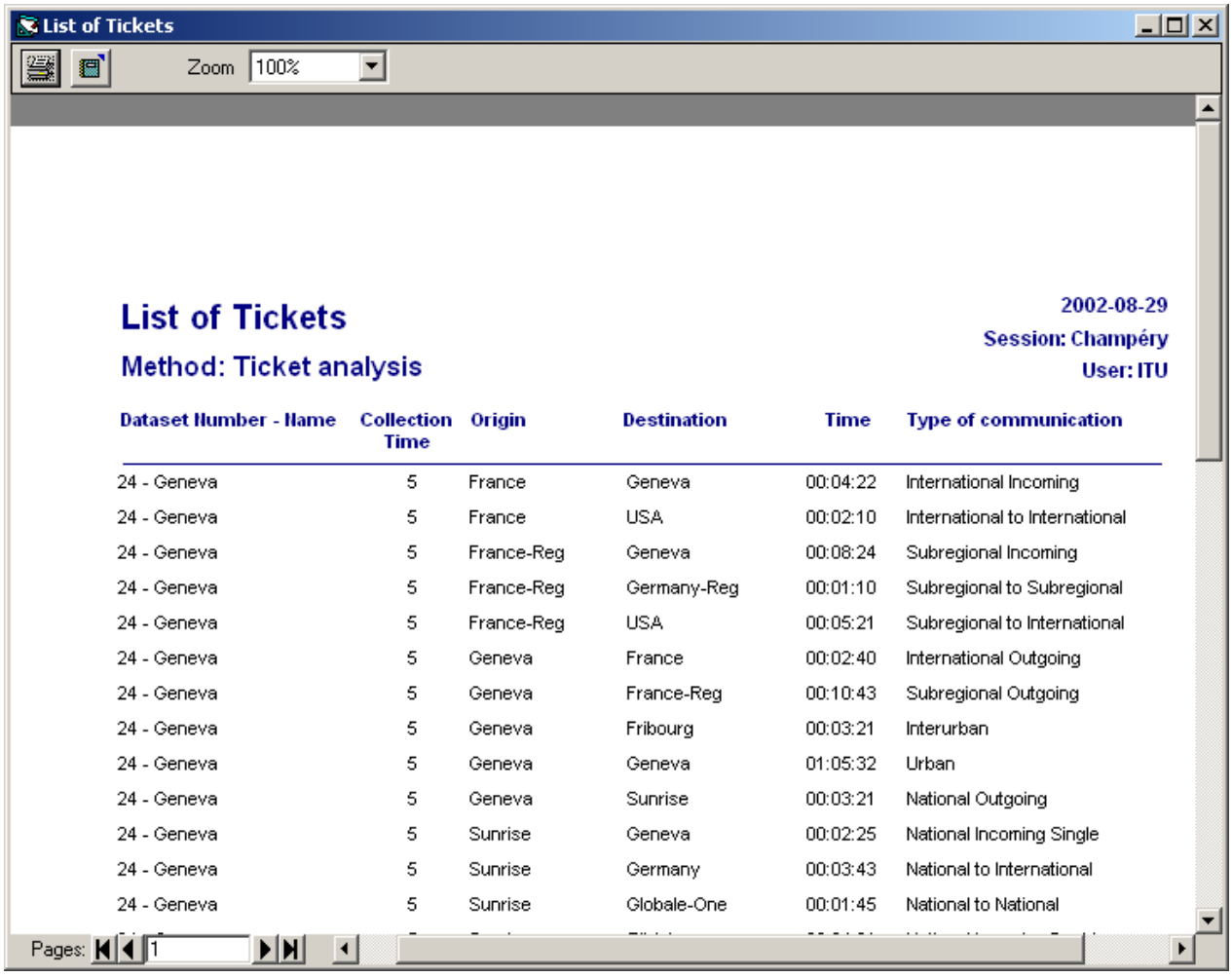
This report gives the traffic estimates for each service. The header shows the name of the session and the type of method used to arrive at the estimate. The estimates are for a full year and are given in minutes.



Session Name	Method Name	Service Name	Traffic Volume
Africom	Manual Entry	Urban	4 320 013 000
Africom	Manual Entry	Interurban	1 137 646 000
Africom	Manual Entry	International Outgoing	216 190 500
Africom	Manual Entry	International Incoming	338 192 900
Africom	Manual Entry	Subregional Outgoing	23 211 050
Africom	Manual Entry	Subregional Incoming	23 316 020
Africom	Manual Entry	International to International	17 693
Africom	Manual Entry	International to Subregional	53 000
Africom	Manual Entry	Subregional to International	0
Africom	Manual Entry	Subregional to Subregional	11 757
Africom	Manual Entry	National Incoming Single	48 445 870
Africom	Manual Entry	National Incoming Double	20 759 060
Africom	Manual Entry	National Outgoing	345 409 000
Africom	Manual Entry	National to National	31 174 050
Africom	Manual Entry	International to National	59 184 560
Africom	Manual Entry	National to International	74 263 020

5.3.2 List of Tickets

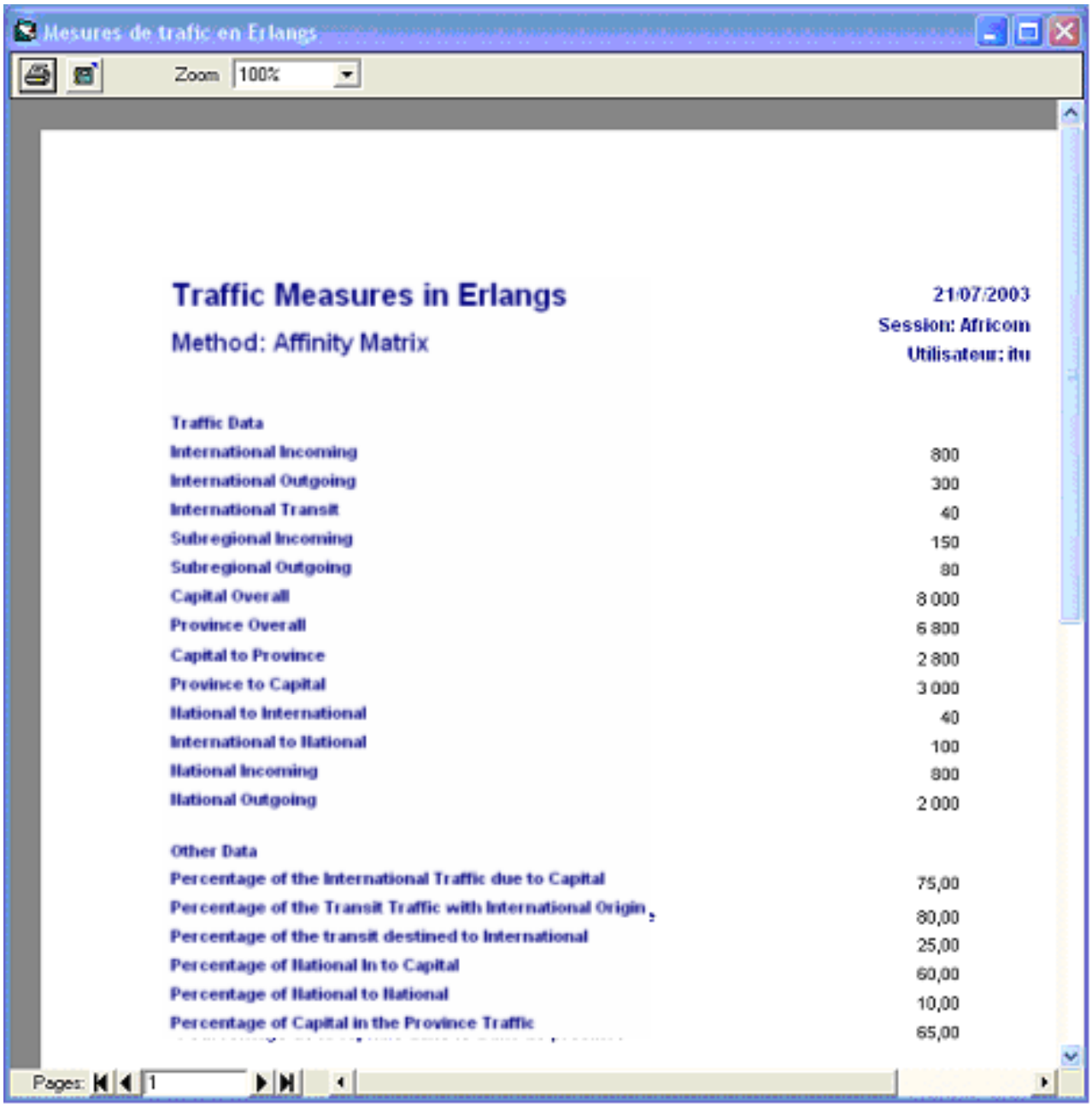
This report applies only to the *Ticket analysis* traffic estimation method. It is used to provide the following information for all tickets in the current session, for each set of data entered: the call origin and destination, the call duration and the type of call. The name of the place where data are collected, the number of days used, and the name of the dataset are also displayed. For more information, see the traffic estimation method in *Ticket analysis*.



Dataset Number - Name	Collection Time	Origin	Destination	Time	Type of communication
24 - Geneva	5	France	Geneva	00:04:22	International Incoming
24 - Geneva	5	France	USA	00:02:10	International to International
24 - Geneva	5	France-Reg	Geneva	00:08:24	Subregional Incoming
24 - Geneva	5	France-Reg	Germany-Reg	00:01:10	Subregional to Subregional
24 - Geneva	5	France-Reg	USA	00:05:21	Subregional to International
24 - Geneva	5	Geneva	France	00:02:40	International Outgoing
24 - Geneva	5	Geneva	France-Reg	00:10:43	Subregional Outgoing
24 - Geneva	5	Geneva	Fribourg	00:03:21	Interurban
24 - Geneva	5	Geneva	Geneva	01:05:32	Urban
24 - Geneva	5	Geneva	Sunrise	00:03:21	National Outgoing
24 - Geneva	5	Sunrise	Geneva	00:02:25	National Incoming Single
24 - Geneva	5	Sunrise	Germany	00:03:43	National to International
24 - Geneva	5	Sunrise	Globale-One	00:01:45	National to National

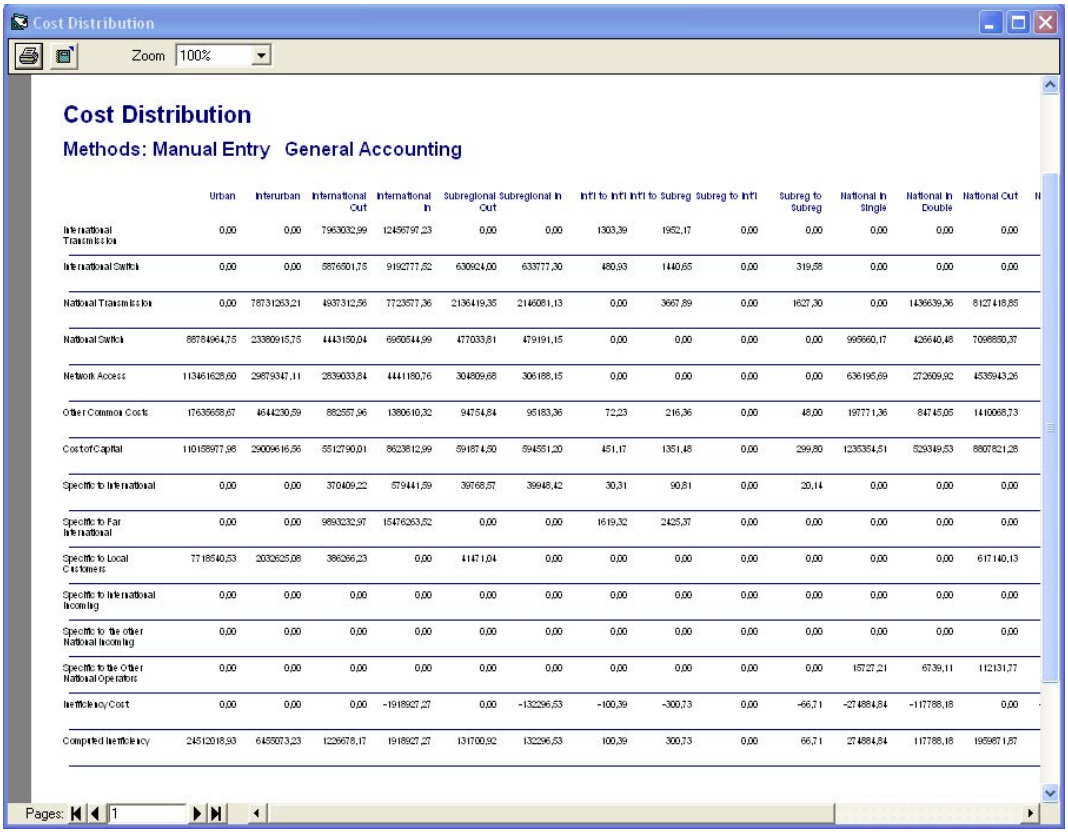
5.3.3 Traffic Measures in Erlangs

This report applies only to the *Affinity Matrix* method for estimating traffic. It gives the list of data entered by the user to estimate the traffic by that method. For more information, see the traffic estimation method in *Affinity Matrix*.



5.3.4 Cost Distribution

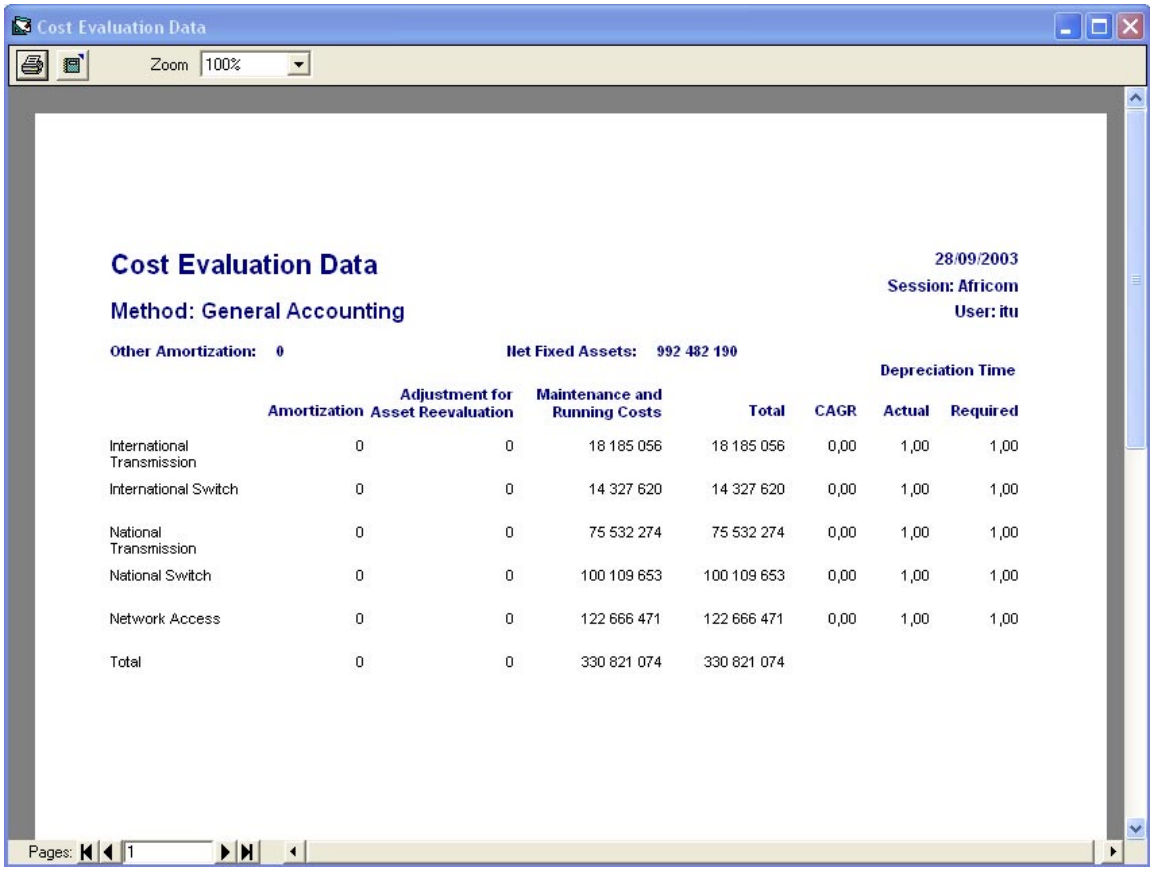
This report shows the distribution of the cost elements across the different services. They are shown in a matrix, in which the sum of any row gives the total cost for a segment of the network, and the sum of any column gives the total cost for a service.



	Urban	Interurban	International Out	International In	Subregional Out	Subregional In	Intl to Intl	Intl to Subreg	Subreg to Intl	Subreg to Subreg	National In Single	National In Double	National Out	N
International Transmission	0,00	0,00	7963032,99	12456797,23	0,00	0,00	1303,39	1952,17	0,00	0,00	0,00	0,00	0,00	
International Switch	0,00	0,00	5876501,75	9192777,52	630924,00	633777,30	480,93	1440,65	0,00	319,58	0,00	0,00	0,00	
National Transmission	0,00	78731263,21	4937312,56	7723577,36	2136419,35	2146081,13	0,00	3667,89	0,00	1627,30	0,00	1436639,36	8127418,85	
National Switch	88784964,75	23380915,75	4443150,04	6950544,99	477033,81	479191,15	0,00	0,00	0,00	0,00	999660,17	426640,48	7098850,37	
Network Access	113461628,60	29879347,11	2839033,84	4441180,76	304809,68	306188,15	0,00	0,00	0,00	0,00	636195,69	272609,92	4535943,26	
Other Common Costs	17635668,67	4644230,59	882557,96	1380610,32	94754,84	95183,36	72,23	216,36	0,00	48,00	19777,36	8474,05	1410068,73	
Cost of Capital	110158977,98	29009616,56	5512790,01	8623812,99	591874,50	594551,20	451,17	1351,48	0,00	299,80	1235354,51	529349,53	8807821,28	
Specific to International	0,00	0,00	370409,22	579441,59	39768,57	39948,42	30,31	90,81	0,00	20,14	0,00	0,00	0,00	
Specific to Far International	0,00	0,00	9893232,97	15476263,52	0,00	0,00	1619,32	2425,37	0,00	0,00	0,00	0,00	0,00	
Specific to Local Customers	7718540,53	2032625,08	386296,23	0,00	41471,04	0,00	0,00	0,00	0,00	0,00	0,00	0,00	617140,13	
Specific to International Incoming	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Specific to the other National Incoming	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Specific to the Other National Operators	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	15727,21	6739,11	112131,77	
Inefficiency Cost	0,00	0,00	0,00	-1918927,27	0,00	-132296,53	-100,39	-300,73	0,00	-66,71	-274884,84	-117788,18	0,00	
Computed Inefficiency	24512018,93	6459073,23	1226678,17	1918927,27	131700,92	132296,53	100,39	300,73	0,00	66,71	274884,84	117788,18	1959871,87	

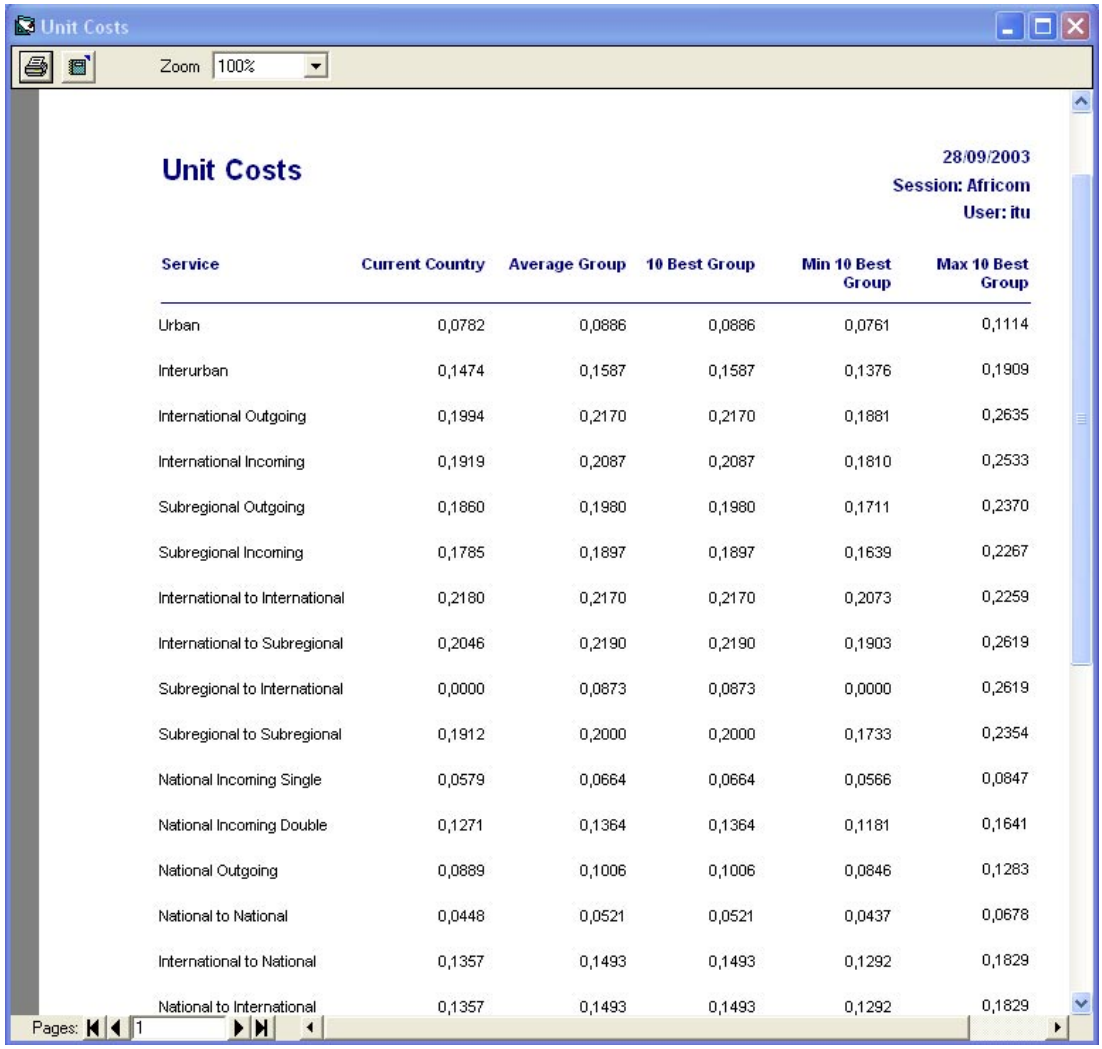
5.3.5 Cost Evaluation Data

This report shows all of the data needed to calculate costs: amortization by segment, adjustment for asset reevaluation, maintenance and running costs, amortization period (actual and desired) and net immobilization. The report allows the user to verify the data before proceeding with calculation.



5.3.6 Unit Costs

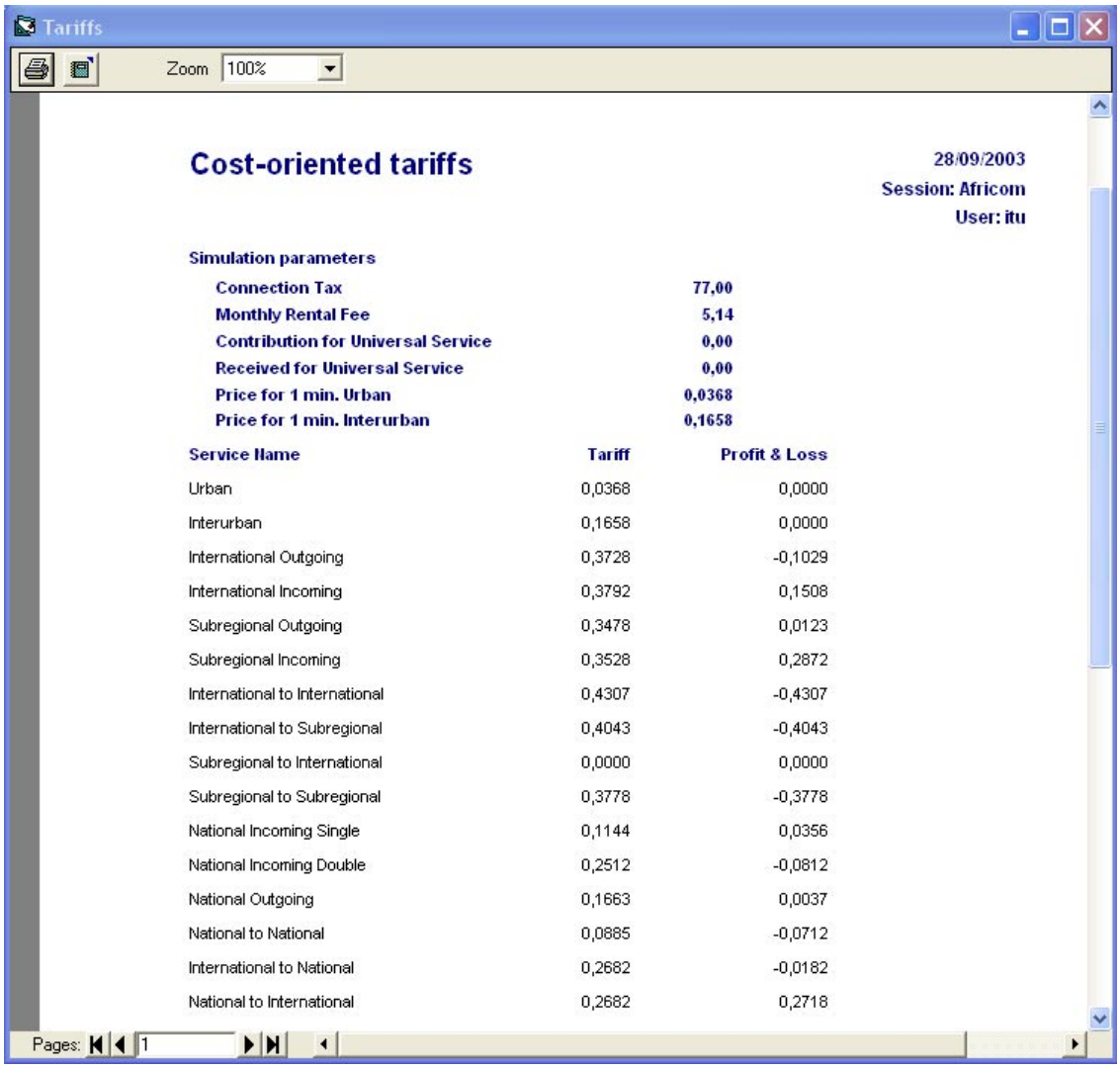
This reports displays the Unit Costs data as displayed under the *Unit Costs* tab.



Service	Current Country	Average Group	10 Best Group	Min 10 Best Group	Max 10 Best Group
Urban	0,0782	0,0886	0,0886	0,0761	0,1114
Interurban	0,1474	0,1587	0,1587	0,1376	0,1909
International Outgoing	0,1994	0,2170	0,2170	0,1881	0,2635
International Incoming	0,1919	0,2087	0,2087	0,1810	0,2533
Subregional Outgoing	0,1860	0,1980	0,1980	0,1711	0,2370
Subregional Incoming	0,1785	0,1897	0,1897	0,1639	0,2267
International to International	0,2180	0,2170	0,2170	0,2073	0,2259
International to Subregional	0,2046	0,2190	0,2190	0,1903	0,2619
Subregional to International	0,0000	0,0873	0,0873	0,0000	0,2619
Subregional to Subregional	0,1912	0,2000	0,2000	0,1733	0,2354
National Incoming Single	0,0579	0,0664	0,0664	0,0566	0,0847
National Incoming Double	0,1271	0,1364	0,1364	0,1181	0,1641
National Outgoing	0,0889	0,1006	0,1006	0,0846	0,1283
National to National	0,0448	0,0521	0,0521	0,0437	0,0678
International to National	0,1357	0,1493	0,1493	0,1292	0,1829
National to International	0,1357	0,1493	0,1493	0,1292	0,1829

5.3.7 Tariffs

This report displays computed tariffs, profit and loss and computation parameters.



5.4 Administration Menu

The administration mode is used to locally create and manage user names (logins) and passwords (the login used to access the server cannot be managed at the client application level).

The "responsible" or supervisor role is used to manage private sessions.

5.4.1 Create a user name (login)

The *Create Login* command is used to define a new system user, with or without the rights of administrator or "responsible".

When defining a new user, the following information must be entered:

Login:

This option specifies the *Login* to be used by the new user.

Password:

This option specifies the *Password* to be used by the new user. The password must be entered twice in order to be validated.

Administrator:

The *Administrator* option is used to specify that the new user will be allowed to access the administrative tasks of the application. These administrative tasks are:

1) The translation function in the *Settings* menu
2) The administration menu

Responsible:

The *Responsible* option is used to specify that the user can create *Private* sessions. Private sessions are sessions that can only be managed and viewed by their creator.

5.4.2 Manage user accounts (logins)

The *Manage Login* command is used to edit or delete existing user logins.

Delete user name (login):

This command is used to delete a user login. It is not possible to delete the current (active) user.

Update Status:

This option is used to modify the status of a user by assigning or revoking *Administrator* or *Responsible* privileges.

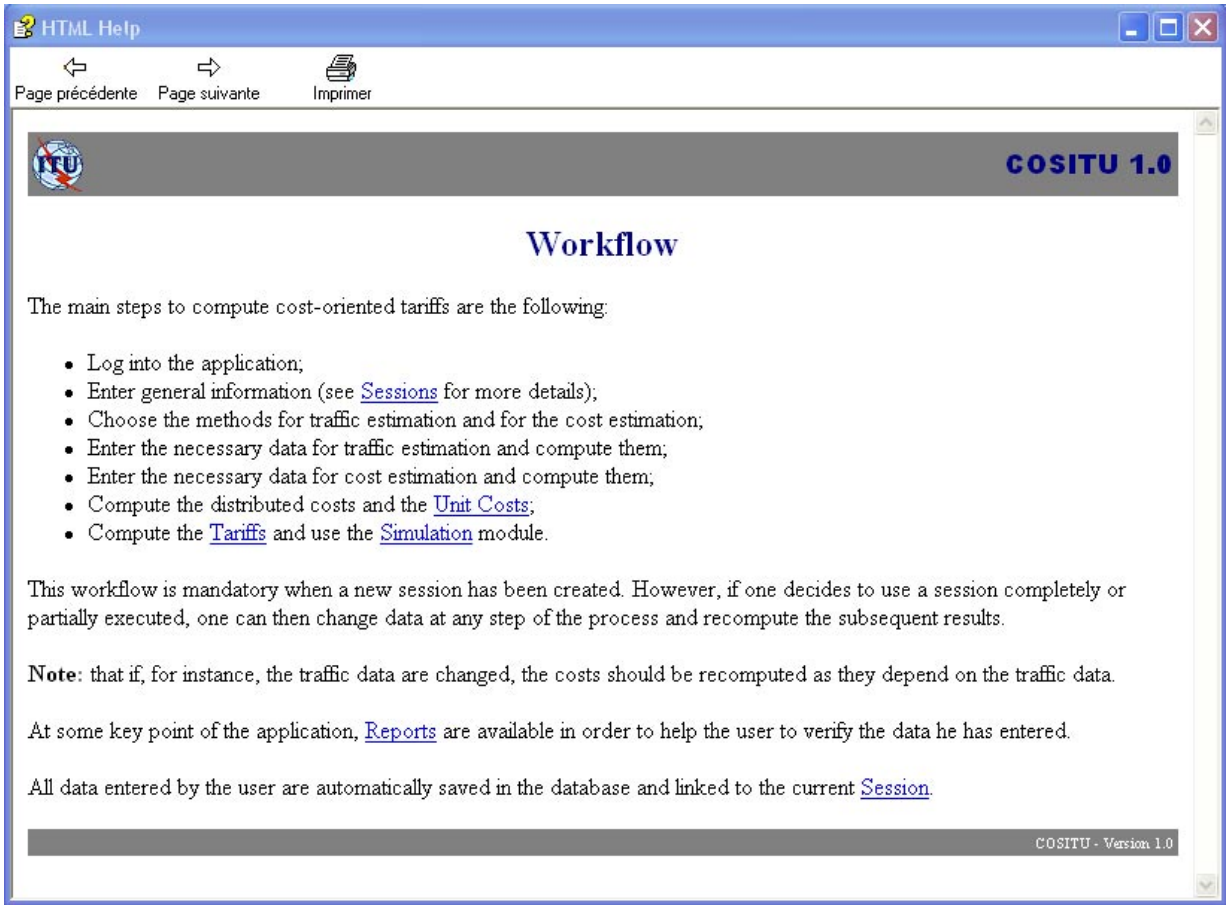
Update Password:

Any user password can be changed. To do this, you must type the new password twice, then click on *Update Password*.

5.5 Help Menu

5.5.1 COSITU Help

This Menu command calls up the Help window. This window can also be called up by pressing the F1 key from any screen or dialog box in the application.



From this page numerous helpful links are available.

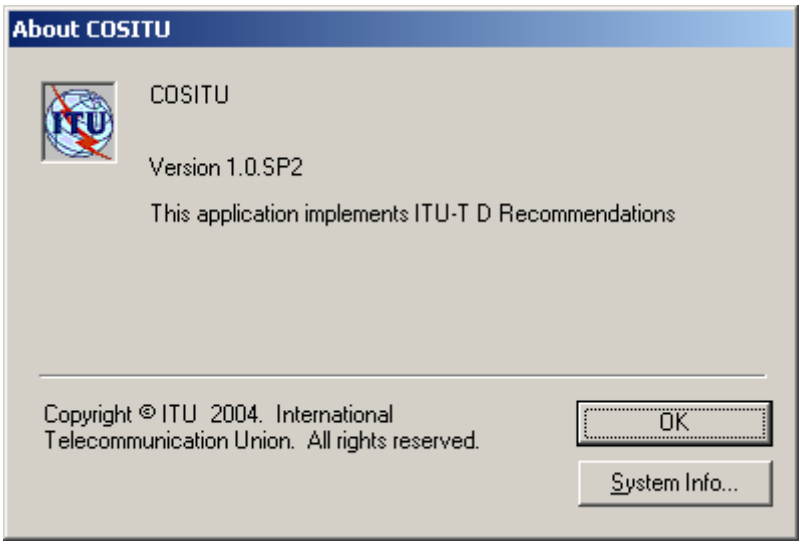
5.5.2 About COSITU

This window gives general information about the COSITU application such as:

– version number

– description

With this function, system information can also be obtained on the computer used.



6 Sequence to be followed

The main steps for computing cost-oriented tariffs are as follows:

- Connect to the application
- Input general information (see *Sessions* for more details)
- Select traffic evaluation and cost estimation methods
- Input necessary data for traffic estimation and compute
- Input necessary data for cost estimation and compute
- Compute allocated costs and unit costs
- Compute tariffs and use the simulation module

This sequence has to be followed when working on a new session. However, if a session that has already been fully or partially executed is used, the data can be altered at any level and all the subsequent processes re-executed.

NOTE – If, for example, the traffic data are modified, the costs will have to be recomputed since they depend on the traffic data.

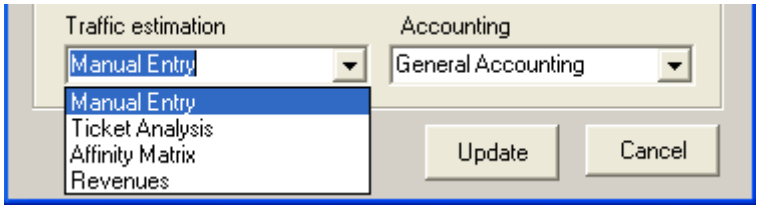
At key stages in the application, reports are available to help the user verify the input data entered.

Any input data entered by the user is automatically saved in the database and associated with the current session.

7 Traffic Estimation

7.1 General

The first step of the application is to estimate the traffic of all services for which COSITU calculates the costs by one of the four methods described above under the menu *Session* (manual entry, ticket analysis, affinity matrix and revenues). Each of those methods gives annual traffic volume in minutes.



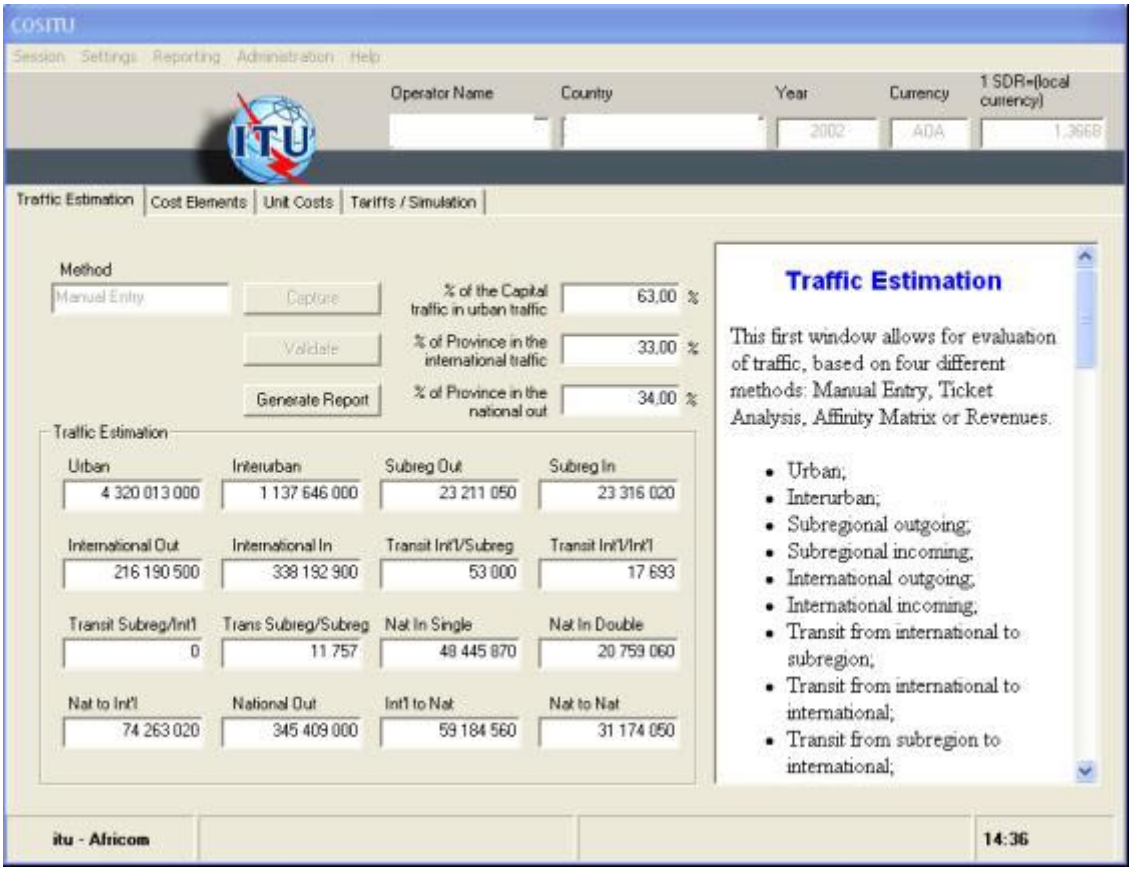
If the traffic data are known, they can be entered directly into the system using the **Manual Entry** method.

As these data are not always completely available, three methods for estimating the traffic are proposed:

- **Ticket Analysis**: this method consists of collecting call tickets in the Telephone Exchanges during a specific period of time. Based on these data, the annual traffic in minutes for each service can be derived.
- **Affinity Matrix**[3]: a traffic matrix in Erlangs may be used to determine coefficients of affinity which are then considered in relation to outgoing national traffic or outgoing international traffic.
- **Revenues**: based on the international outgoing traffic and the national outgoing traffic, which are usually known, and on the turnover for billed traffic, the turnover for domestic traffic can be determined, allowing the deduction of the urban and interurban traffic.

[3] The traffic matrix must include all measurements taken during periods of significant traffic, not just peak periods. Ideally, measurements should be taken around the clock over an entire week of normal operations.

The traffic evaluation window contains a number of different fields:



Method

This box shows the method previously chosen by the user.

If **Manual Entry** has been chosen, traffic data may be entered directly in the **Traffic Estimation** tab. In all other cases, these numbers will be calculated by the program and the user is not allowed to edit or modify them directly. Once a method has been chosen and traffic data has been calculated or entered directly, that method will be used in the subsequent steps (cost elements, unit costs, tariffs/simulations).

Capture

This button is used to start the evaluation method, except in the case of the manual entry method, in which case traffic estimates are entered manually.

Validate

This button is used to validate the estimate worked out with one of the three non-manual methods. Once the estimate has been validated, the program automatically goes into "Manual Entry" mode (this is the only method used in subsequent calculations) and copies the results obtained by another method. The user can then fill in any missing data items and make any changes desired to the traffic estimates.

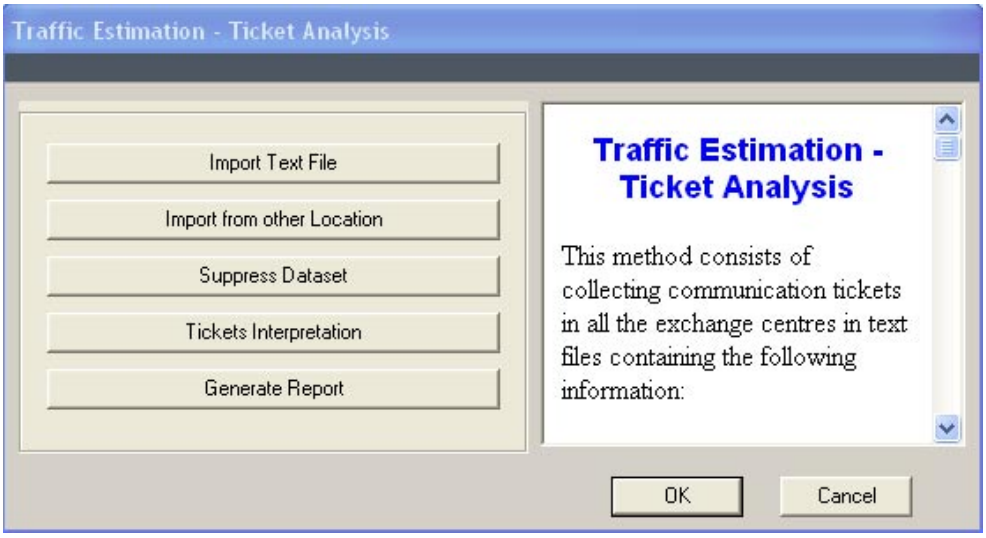
Generate report

This button is used to create a report on the results of the traffic evaluation in accordance with the method in question. The report may be viewed on the screen, printed or exported to a text file.

Percentages

These percentages must be filled in, as they are used for the following calculations.

7.2 Ticket Analysis



Traffic observation can be performed by recording call tickets over a specific period of time (usually a week). The call tickets must show the location of the calling party, the location of the called party and the duration of the call. The point-to-point matrix determined from these data is used as the basis for extrapolation.

7.2.1 File Format

The call tickets are stored in text files having the following format:

```
Localisation,duration (in days)
Origin_1,Destination_1,minutes:seconds
Origin_2,Destination_2,minutes:seconds
....
Origin_n,Destination_n,minutes:seconds
```

It is the responsibility of the user to provide files having the required format. This format must be passed to the technical teams that will be in charge of extracting the data in the telephone exchanges. This kind of file can easily be generated from a database or from a spreadsheet.

7.2.2 File Import

The ticket files are **imported** into the system using the *Import Text File* button. If the file cannot be imported due to a format error, an error message appears telling the user where the mistake is and asking him/her to correct it manually. Before importing the file, the user is required to assign a name to this dataset. A number is automatically assigned to the dataset by the system.

7.2.3 Missing Data

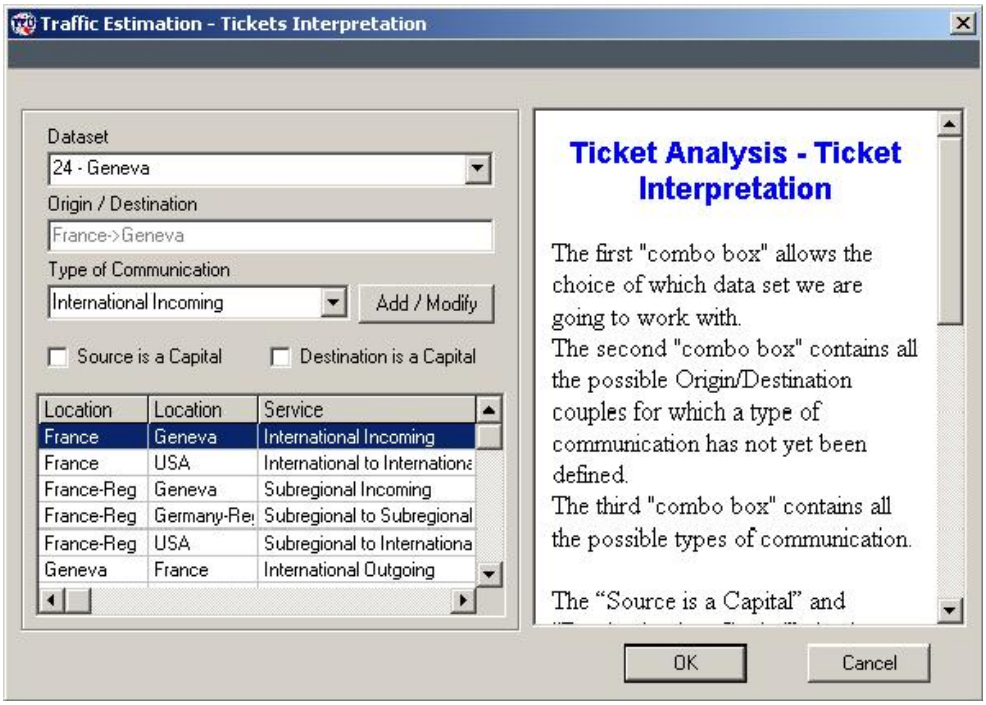
If, for any reason, data are missing for a given location, the user has the opportunity to copy data from another location that **he**/**she** considers similar. This operation can be performed with the button *Import from other Location*.

7.2.4 Dataset Suppression

With the button *Suppress Dataset*, the user has the possibility of deleting a previously entered dataset. It will not be taken into account in the traffic estimation. **A suppressed dataset cannot be recovered** (unless the corresponding text file is imported again).

7.2.5 Ticket Interpretation

This button starts a sub-window allowing the assignation of a type of communication for any combination of an Origin/Destination couple. This task has to be performed for each and every dataset. This sub-window is automatically started when a dataset has been imported.



The first "combo box" allows the dataset the user is going to work with to be selected. The second "combo box" contains all the possible Origin/Destination couples for which a type of communication has not yet been defined. The third "combo box" contains all the possible types of communication.

The **Source is a Capital** and **Destination is a Capital** check boxes allow for identifying whether the origin or the destination of the call is a capital.

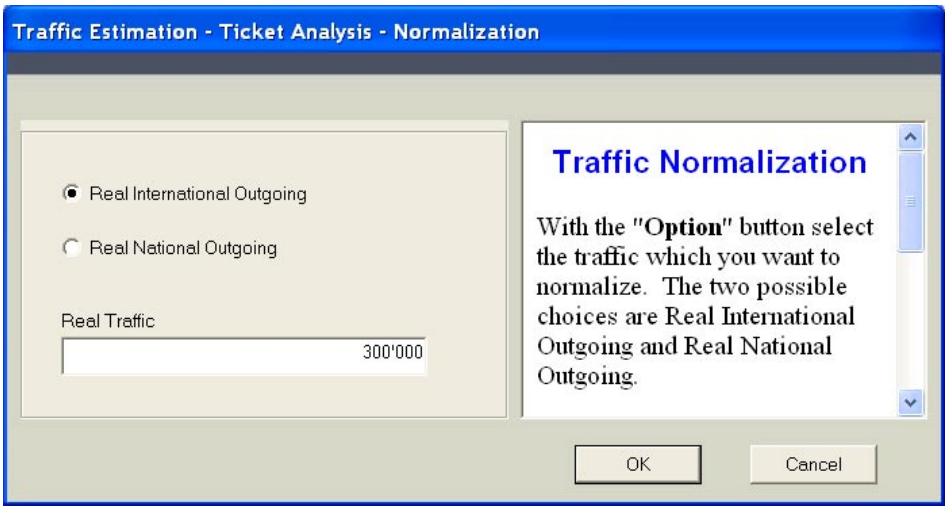
The *Add/Modify* button allows for assigning or modifying the selected communication type to the selected Origin/Destination couple. When pressed, the source location, destination location and service type will be displayed in the list of defined Origin/Destination couples.

The process is finished when no origin/destination couple is displayed in the second "combo box".

7.2.6 Normalization

Once the data have been entered, and all the possible Origin/Destination couples have been identified, the traffic must be normalized to actual International and National Outgoing Traffic.

The user must choose the traffic to be normalized and enter the corresponding value in *Actual traffic*. This value represents the value of annual traffic, in minutes, for the selected type of traffic.



Based on the number entered, all traffic will be computed, assuming there is proportionality between the numbers estimated by the method and the real traffic volume entered.

7.2.7 Generate Report

The system allows the creation of a report containing all the call tickets entered for the current session, arranged by dataset.

7.3 Affinity Matrix

If it is not feasible to observe the traffic by means of call tickets, a traffic matrix in Erlangs (as discussed in § 7.1 above) may be used to determine coefficients of affinity which are then considered in relation to outgoing national or international traffic.

The following data, as measured in the Telephone Exchanges, must be entered, in Erlangs:

Measured in the International Transit Centre:

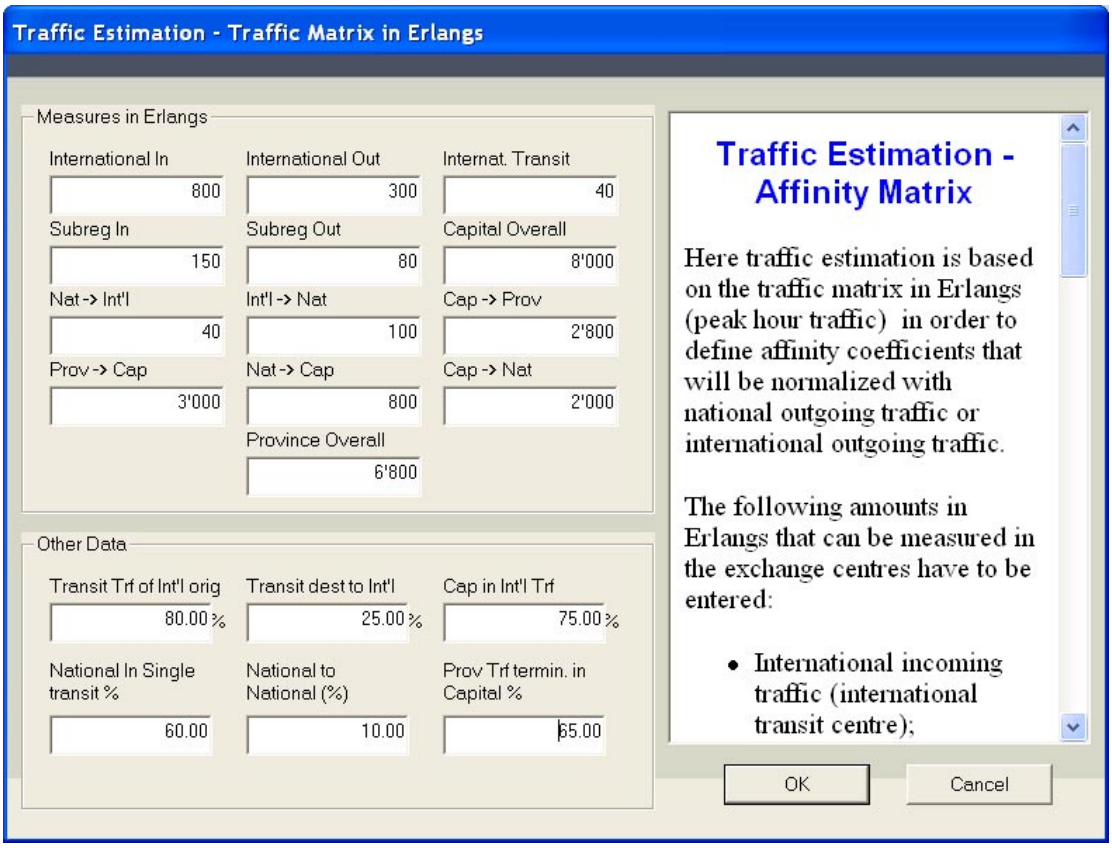
- International Incoming
- International Outgoing
- International Transit
- Subregional Incoming
- Subregional Outgoing
- National to International
- International to National

Measured in the Capital exchanges:

- Capital Overall (total traffic of customers from the capital: Number of lines used × average traffic per line)
- Capital to Province (traffic intensity in Erlangs from the capital to the province)
- Province to Capital (traffic intensity in Erlangs from the province to the capital)
- National to Capital (traffic intensity in Erlangs arriving at capital system from other national operators' networks)
- Capital to National (traffic intensity in Erlangs generated by capital area subscribers towards other local operators' subscribers)

Measured in the Province exchanges:

- Total province traffic intensity in Erlangs (total number of lines in the province multiplied by average traffic per line)



The data entered, combined with the additional percentages (in the lower half of the window), normalized to the volume of International or National Outgoing Traffic, allow the required traffic data to be calculated.

7.4 Revenues

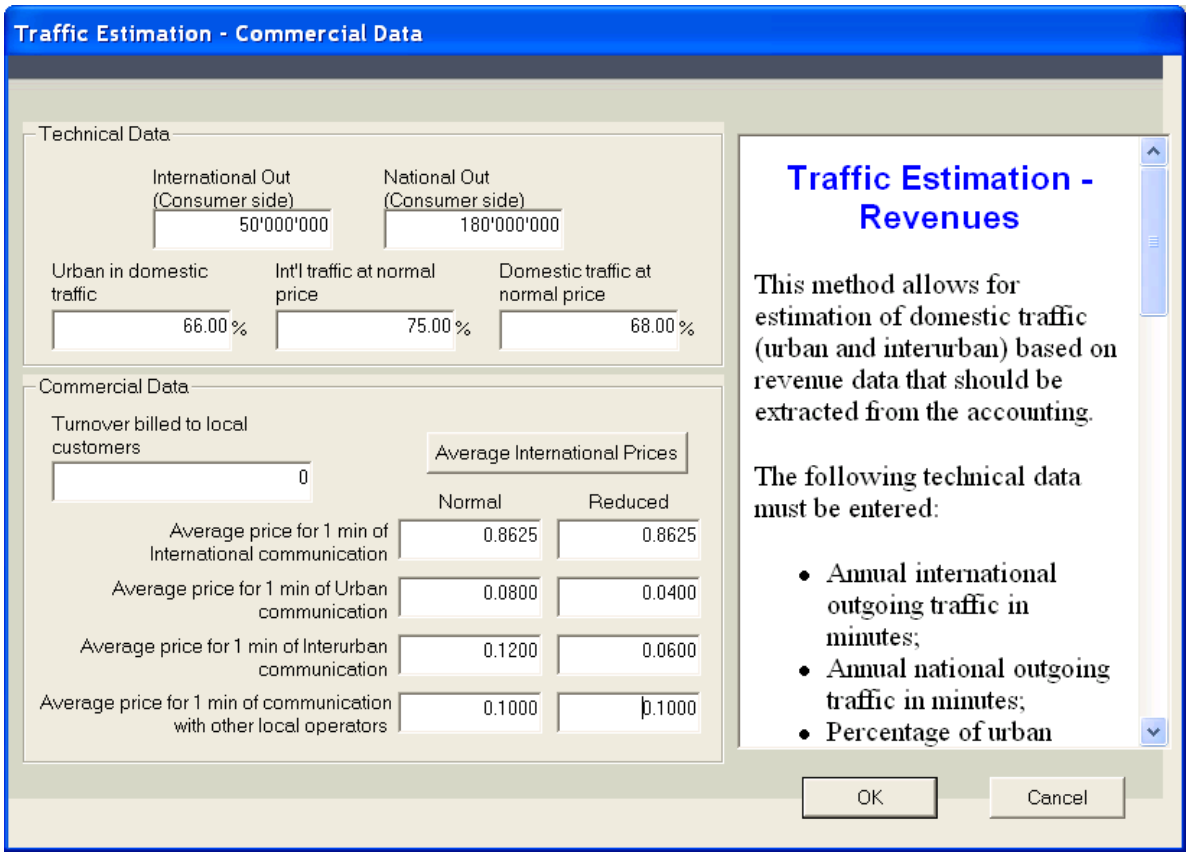
This method makes it possible to estimate the domestic traffic (urban and interurban) on the basis of revenue data provided by the accounting system.

If the international traffic and the interconnection traffic are known in minutes, it is also possible to take advantage of the fact that the turnover for billed traffic includes revenue from the following sources: domestic traffic, outgoing international traffic (including subregional outgoing traffic) and outgoing national traffic.

If the average price per minute and the volume of outgoing traffic are known, the turnover for domestic traffic can be determined.

The analysis of the matrix of national traffic and internal telephone exchange traffic allows the distribution of domestic traffic between local (urban) traffic and trunk (interurban) traffic, to be determined.

All the data are entered in the following window:



- **Technical data**

International outgoing (from client's point of view): the volume of outgoing traffic is supposed to be measured on a monthly basis for the purposes of traffic accounting. If these data are not available, observation during a week of typical operations can be used to derive the necessary data.

National outgoing (from client's point of view): The volume of outgoing traffic to other local operators is supposed to be measured on a monthly basis for the purposes of traffic accounting.

Proportion of urban traffic in domestic traffic: Electronic switchboards make it possible to perform a detailed analysis of affinities between locations in the territory. Where this is not the case, the values needed to calculate this parameter may be estimated using the following procedure:

a) measure the outgoing traffic in Erlangs that is generated by the subscribers of each switchboard in the territory;

b) subtract external outgoing traffic (international + subregional) to obtain domestic traffic;

c) determine urban traffic for each switchboard by adding local traffic to random measurements of traffic going to other switchboards in the same city; the required proportion is then given by the formula C/B.

Percentage of international traffic at normal price: The model only considers normal prices (daytime) and reduced prices (night). If there are more than TWO price levels, it is possible to produce a two-level equivalent by taking the mean of the various billing levels, weighted to the traffic in Erlangs.

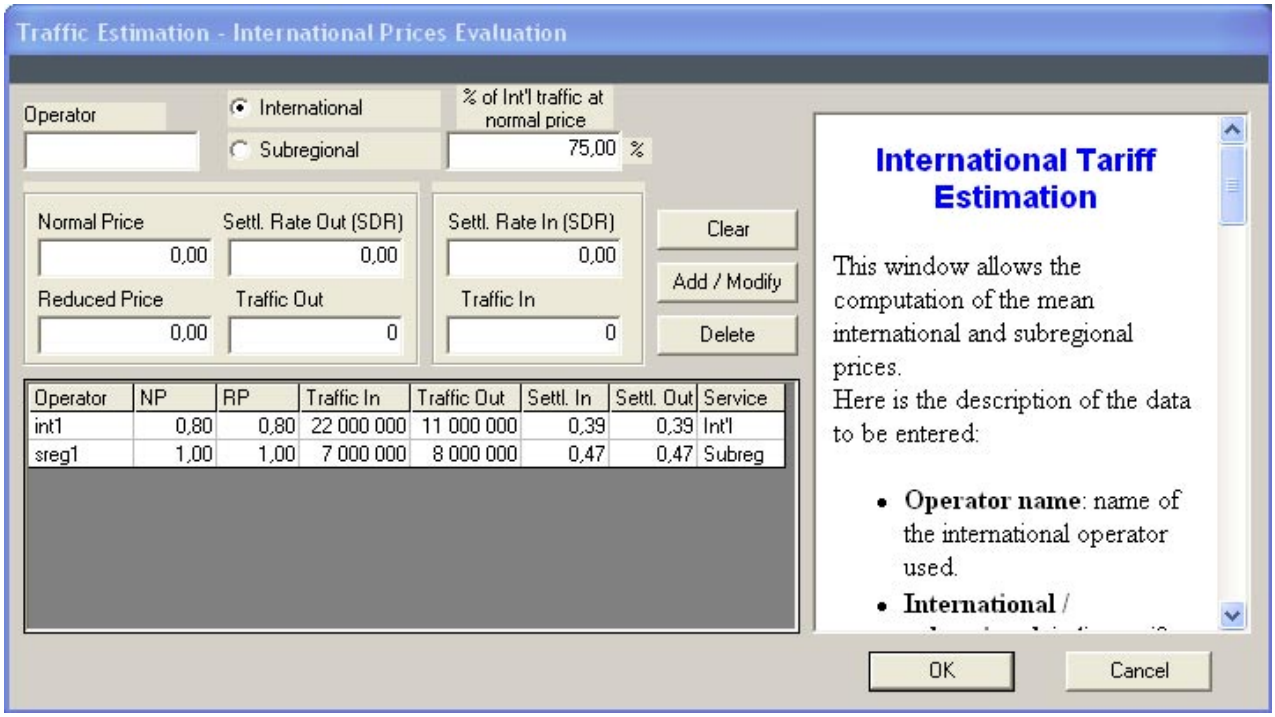
Percentage of domestic traffic at normal price: This percentage relates normal to reduced price domestic traffic. If there are more than TWO levels, it is possible to produce a two-level equivalent by taking the mean of the various billing levels, weighted to the traffic in Erlangs.

- **Commercial data**

The average prices (normal and reduced tariffs) must be known for the international (including the subregional), the urban, the interurban and the interconnection traffic. The urban and interurban tariffs are usually known.

The expression of the urban tariff per minute in local currency may, however, require some intervention at the telephone exchange level with a view to determining, for a data observation period, the total amount and the duration of the corresponding urban communications.

The international average prices may be a bit more difficult to determine, which is why a dedicated tool, activated by the *Average International Prices* button, is available in the system. It requires, for each international relation, the entering of the annual traffic (incoming and outgoing), the settlement rate (incoming and outgoing) in SDR as well as the current normal and reduced prices in local currency for the outgoing traffic.



Description of data to be entered:

Operator: Name of the international operator in question

International/subregional: Indicates whether the values in question concern international or subregional traffic

Percentage of international traffic at normal price: The model considers only normal (daytime) and reduced (night) prices.

This percentage gives the breakdown of normal and reduced for outgoing international traffic. So a figure of 40% means that 40% of outgoing international traffic is billed at the normal price, while 60% is at the reduced price.

If there are more than TWO price levels, it is possible to produce a two-level equivalent by taking the mean of the various billing levels, weighted to the traffic in Erlangs.

Normal price (in local currency): The price (not including VAT) that is billed to the subscriber for one minute of communication with the designated international operator, during the normal-price calling period.

Reduced price (in local currency): The price (not including VAT) that is billed to the subscriber for one minute of communication with the designated international operator, during the reduced-price calling period.

Incoming forwarded traffic: Annual figure, in minutes

Outgoing forwarded traffic: Annual figure, in minutes

Incoming settlement rate (in SDR): The settlement share charged for forwarding one minute of the other operator's traffic for termination on my network. **Enter the total amount for one year, in SDR**.

Outgoing settlement rate (in SDR): The settlement share charged for forwarding one minute of my traffic for termination on the other network.

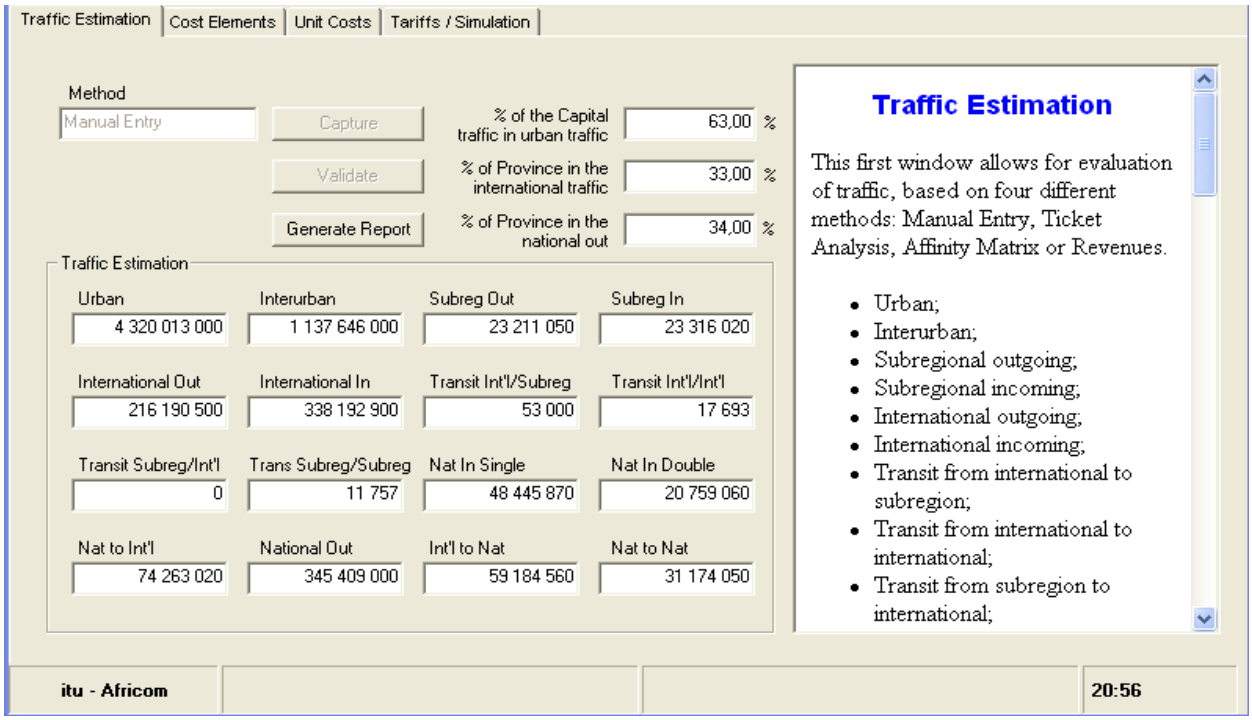
NOTE – If both a subregional and an international link exist with one and the same country, enter the country twice, giving the subregional and international data for forwarded traffic in each case.

7.5 Validation

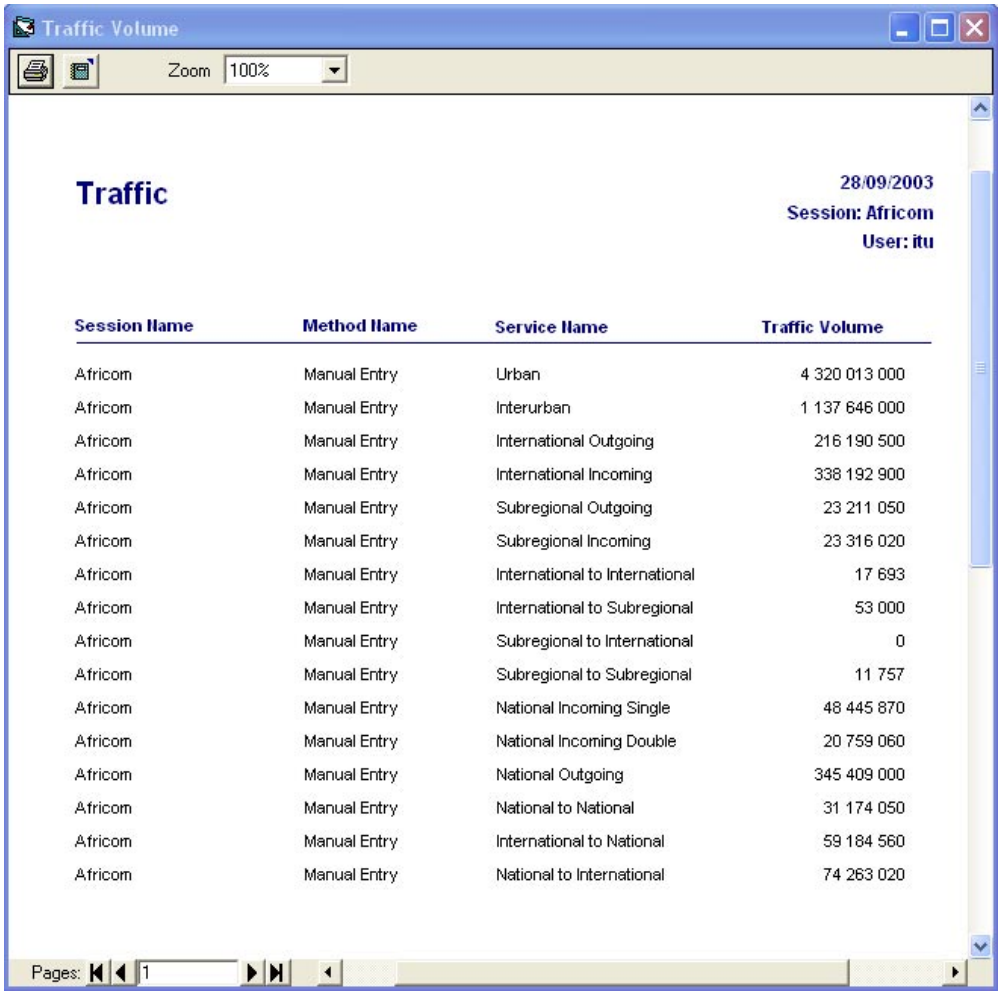
Once the traffic has been partially or fully estimated through one of the three methods mentioned above, the *Validate* button automatically sets the application to the *Manual Entry* mode. At this moment the results obtained from the estimation method are automatically copied. The user then has the possibility of manually entering missing data or modifying the existing data.

Additional data must now be entered. These will be used at a later stage by other processes:

- Percentage of urban traffic in capital out of total urban traffic
- Percentage of the province in international traffic (proportion of international and subregional traffic coming into/going out of the province)
- Percentage of the province in national outgoing traffic (national outgoing traffic originating elsewhere than in the interconnection zone/total national outgoing traffic)



A report containing all the traffic data can be generated. It can be seen on-screen, printed or exported to a text file:

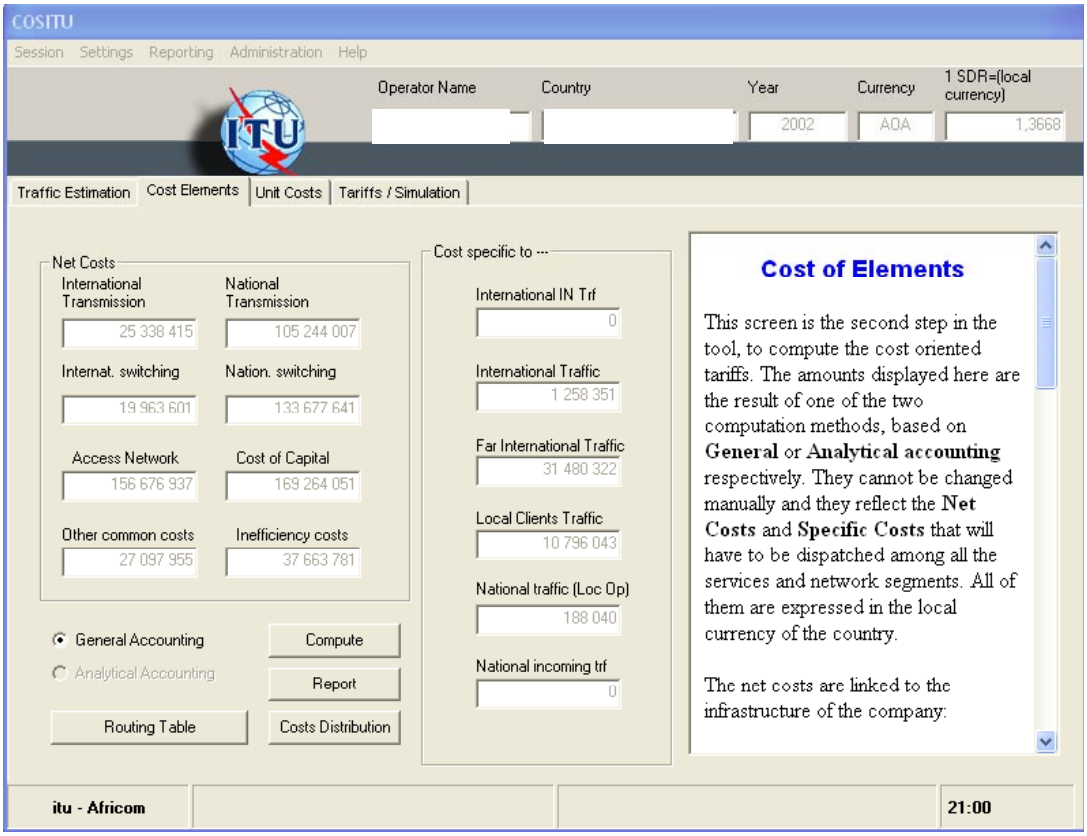


Session Name	Method Name	Service Name	Traffic Volume
Africom	Manual Entry	Urban	4 320 013 000
Africom	Manual Entry	Interurban	1 137 646 000
Africom	Manual Entry	International Outgoing	216 190 500
Africom	Manual Entry	International Incoming	338 192 900
Africom	Manual Entry	Subregional Outgoing	23 211 050
Africom	Manual Entry	Subregional Incoming	23 316 020
Africom	Manual Entry	International to International	17 693
Africom	Manual Entry	International to Subregional	53 000
Africom	Manual Entry	Subregional to International	0
Africom	Manual Entry	Subregional to Subregional	11 757
Africom	Manual Entry	National Incoming Single	48 445 870
Africom	Manual Entry	National Incoming Double	20 759 060
Africom	Manual Entry	National Outgoing	345 409 000
Africom	Manual Entry	National to National	31 174 050
Africom	Manual Entry	International to National	59 184 560
Africom	Manual Entry	National to International	74 263 020

8 Cost Evaluation

The second step of the application consists of evaluating all the costs related to the telephone services.

Depending on the accounting data available, two possible methods may be chosen: a cost evaluation based on analytical accounting or a cost evaluation based on general accounting. This choice has to be made when a session is created, but can be changed using the *Settings* tool in the *Session* menu.



After choosing the method, the user must click on **Compute** to start.

The **Report** button generates a report on the results of the evaluation. If both methods are used in succession, the report will contain both sets of results.

The **Routing table** button displays the matrix used for the distribution of costs between services and network segments.

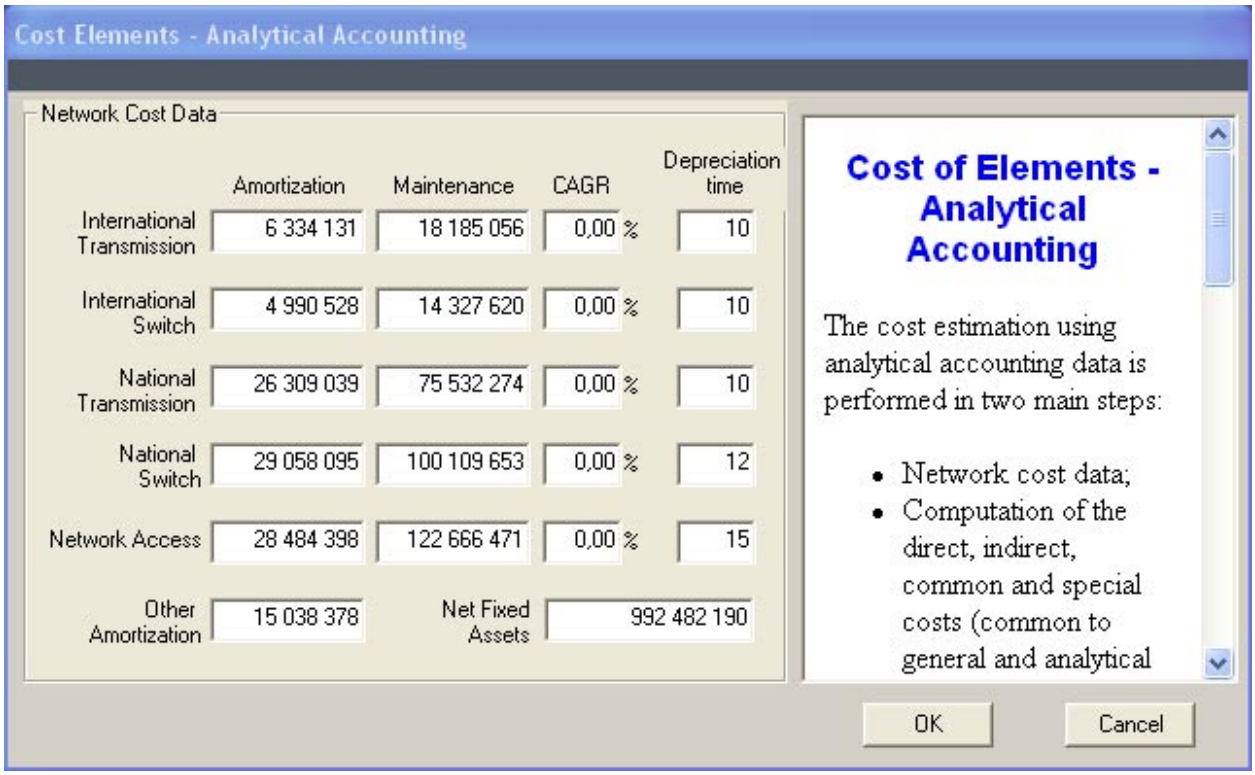
The results of this cost distribution may be displayed by clicking on **Costs distribution**. This matrix of costs forms the input for the next stage, the **calculation of unit costs**.

8.1 Analytical Accounting

Estimation of costs using analytical accounting data is carried out in two distinct steps:

– provision of detailed network cost data;

– calculation of direct, indirect, common and special costs (this step is the same in both methods, based on analytic or general accounting): see § 8.3 for a description of this step.



To calculate network costs, the following data (extracted from the analytic accounting system) must be entered for each network element (international transmission, international switching, national transmission, national switching, access network):

– amortization

– amortization period

– running and maintenance costs

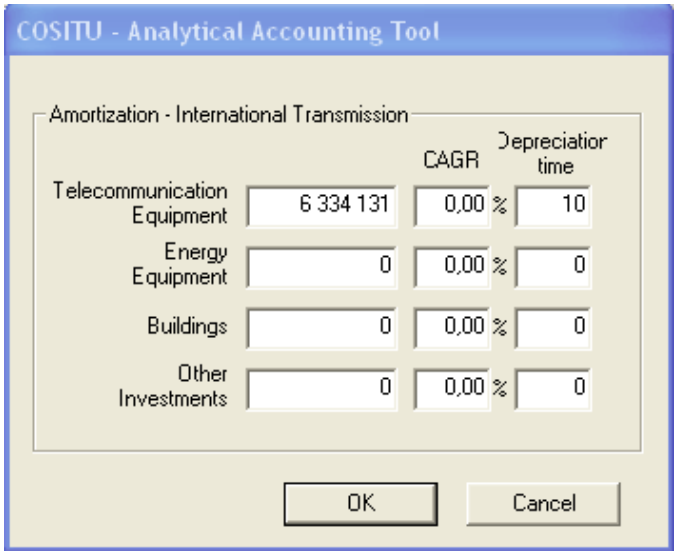
– mean annual growth rate

These data may be entered globally for each network segment, or they may be detailed (telephone systems, power supply systems, buildings, other capital investments) in a separate window, which can be opened by double-clicking in any blank box or by pressing F4.

The data relating to *Other Amortization* and *Total Net Fixed Assets* can be entered directly in the blank.

- Amortization amounts for all segments

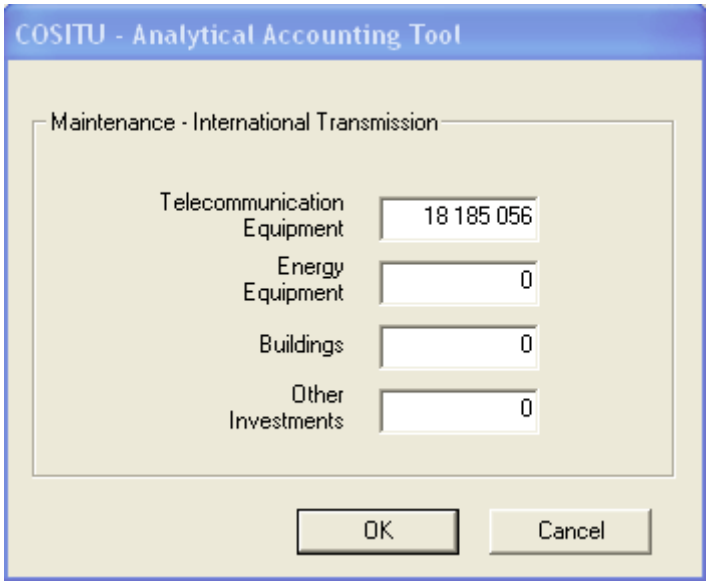
  Double clicking on any field in the *Amortization* column will activate a detail sub-window that allows the amount to be entered (Amortization, Compound Annual Growth Rate (CAGR) and Amortization Period) for each category defined in the analytical accounting.



At this point the following data must be entered: annual amortization of equipment (telecommunications, energy and environment), buildings and miscellaneous investments.

- **Running and maintenance costs for each segment**

  Double-clicking on any blank in the *Maintenance* column opens a window for entering detailed annual running and maintenance costs for each network segment.



- **Compound Annual Growth Rate of the prices (CAGR) for each segment**

  The CAGR of prices in a given segment can be calculated as the weighted mean of the CAGR of the various segment components (telecommunication equipment, energy and environment equipment, buildings and miscellaneous investments)

- **Amortization duration for each segment**

  The amortization period calculated for each network segment will be a weighted average of the amortization periods of the elements from which it is composed.

- **Amortization for other fixed assets**

  In general this is equal to the purchase price divided by the length of the lifetime. If the accounting system does not support such a category, this figure may be estimated by taking the overall figure and subtracting that for the network components.

- **Total of net fixed assets**

  The historical value of acquisitions having a lifetime of more than one year, after deduction of the cumulative amount of amortization applied.

The data entered here, together with the data provided in *Other Costs* (see § 8.3), allow all the costs to be determined for the segments and the network.

8.2 General Accounting

Estimation of costs using general accounting data is carried out in two distinct steps:

– calculation of net costs;

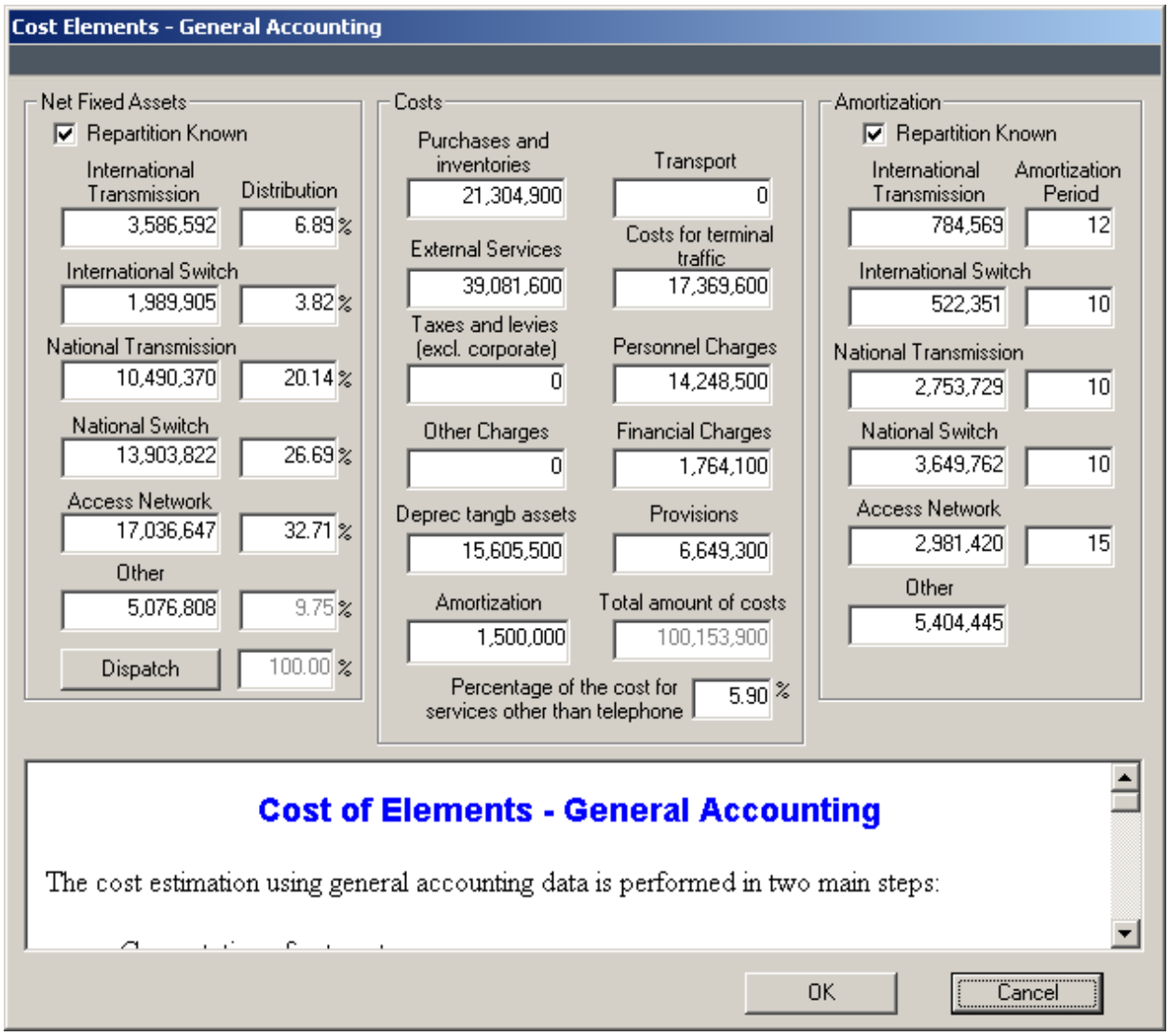
– calculation of direct, indirect, common and special costs (this step is the same in both methods and is discussed in § 8.3).

If cost information is available only from general accounting data, a good knowledge of the network's cost structure may allow the carrying out of an initial allocation of overall amortization and operating charges to the network's various network segments. The segments considered are international transmission, international switching, national transmission, national switching and the access network. Other investments that cannot be classified in one of these segments are added.

The cost structure is indicated by the relative value of net fixed assets for each segment of the network, in proportion to the total net fixed assets.

It frequently happens that this information cannot be drawn directly from the subaccounts in the general accounting data. In this case, a more detailed analysis may be necessary (often requiring inspection in the field): for example, the separation of fixed assets for international and national switching, the allocation of fixed assets in technical buildings to the various segments, the allocation of fixed assets in electrical power equipment to the various segments, etc.

To calculate **Net Costs**, the user must provide three sets of data: net fixed assets, costs, and amortization.



- **Net fixed assets**

The user must enter the size of the net fixed assets in local currency, broken down by network element: international transmission, international switching, national transmission, national switching, access network and others.

If the distribution of net fixed assets is known, the **Repartition Known** box should be checked, and the user should then enter the figures accordingly. The percentage distributions will be calculated automatically.

If one of those percentages is changed manually, the distribution can be re-balanced by clicking on **Dispatch** without changing the overall total.

If the distribution is not known, uncheck the **Repartition Known** box, enter the overall total for net fixed assets, download the distribution by clicking on **Get repartition** and use that to break down the total amount.

Clicking on **Get repartition** will open a connection to a server providing a data distribution corresponding to the weighted mean of the distributions of those countries that are in the chosen group.

NOTE – If it is business accounting that is used, some network components may have a net fixed asset value that does not reflect the actual functioning thereof.

For example, suppose international transmission has been completely amortized. In this case it would be necessary to estimate the actual replacement cost of that component. Let us say that *K* is the cost, and *D* is the amortization period.

Then the following assumptions are used:

1) Net fixed asset value = *K*/2

2) Amortization = *K*/*D*

3) Total value of accounting amortization is adjusted accordingly.

- **Costs**

This is where the cost data extracted from general accounting are entered. The general accounting data provide subaccounts of charges. The following subaccounts must be identified:

- *Purchases and variations in stock:* Purchases of material; purchases of raw materials and associated supplies; purchases of stocks of raw materials and associated supplies; purchases of packaging; other purchases; variations in stocks of material; variations in stocks of raw materials and associated supplies; variations in stocks of other supplies.
- *Transport:* Transport for purchases of non-fixed assets; transport for sales; transport for third parties; transport of staff; mail and other transport charges.
- *External services:* Subcontracting; rental, leasing and associated charges; payments on leases and similar agreements; maintenance, upkeep and repair; insurance premiums; studies; research and documentation; advertising; publications; public relations; telecommunication charges; bank charges; intermediaries' and consultants' honoraria; staff training charges; royalties in respect of patents, licences and computer software, and similar charges; sundry subscriptions and financial assistance; payments to outside personnel; other outside charges.
- *Expenses for terminal traffic:* Payments made to other operators (national or international) for settlement charges, excluding transit charges.
- *Taxes and duties (other than corporate taxes):* Direct taxes; indirect taxes; registration fees; tax penalties and fines; other taxes and levies.

- *Other charges:* Losses on accounts receivable from customers and other debtors; share of earnings on joint ventures; cancelled share of earnings in respect of partial execution of agreements covering several fiscal years; accounting values of current transfers of fixed investments; sundry charges.

- *Personnel charges:* Direct remuneration paid to personnel; lump-sum indemnities paid to personnel; social charges; remuneration and social charges of individual operators; remuneration transferred to outside personnel; other social charges.

- *Financial and similar charges:* Interest paid on loans; interest on leases and similar agreements; discounts granted; other interest (advances received and creditor deposits, blocked current accounts, interest on commercial and sundry debts); discounted commercial paper; exchange losses; losses on transfers of securities; losses on financial risks; financial provisioning charges (given that financial charges are a component of the cost of capital, they must be clearly identified so as to prevent any double counting).

- *Amortization:* Operating amortization; financial amortization (e.g. premium on redemption of securities).

  NOTE – Amortizations are dealt with in the section entitled "Amortizations", and distributed in accordance with the distribution grid defined in "Net fixed assets", after subtraction of the non-telephone portion.

- *Provisions:* Operating provisions, financial provisions.

- *Percentage of non-telephone charges:* The charges described above may not be generated solely by the telephone service. In this case, non-telephone charges must be individually identified and deducted. This is generally a straightforward procedure in low teledensity networks. However, if difficulties should arise in this regard, a cost deduction factor can be reckoned on the basis of the proportion of non-telephone revenues (this approximation assumes that prices are cost-oriented).

- **Amortization**

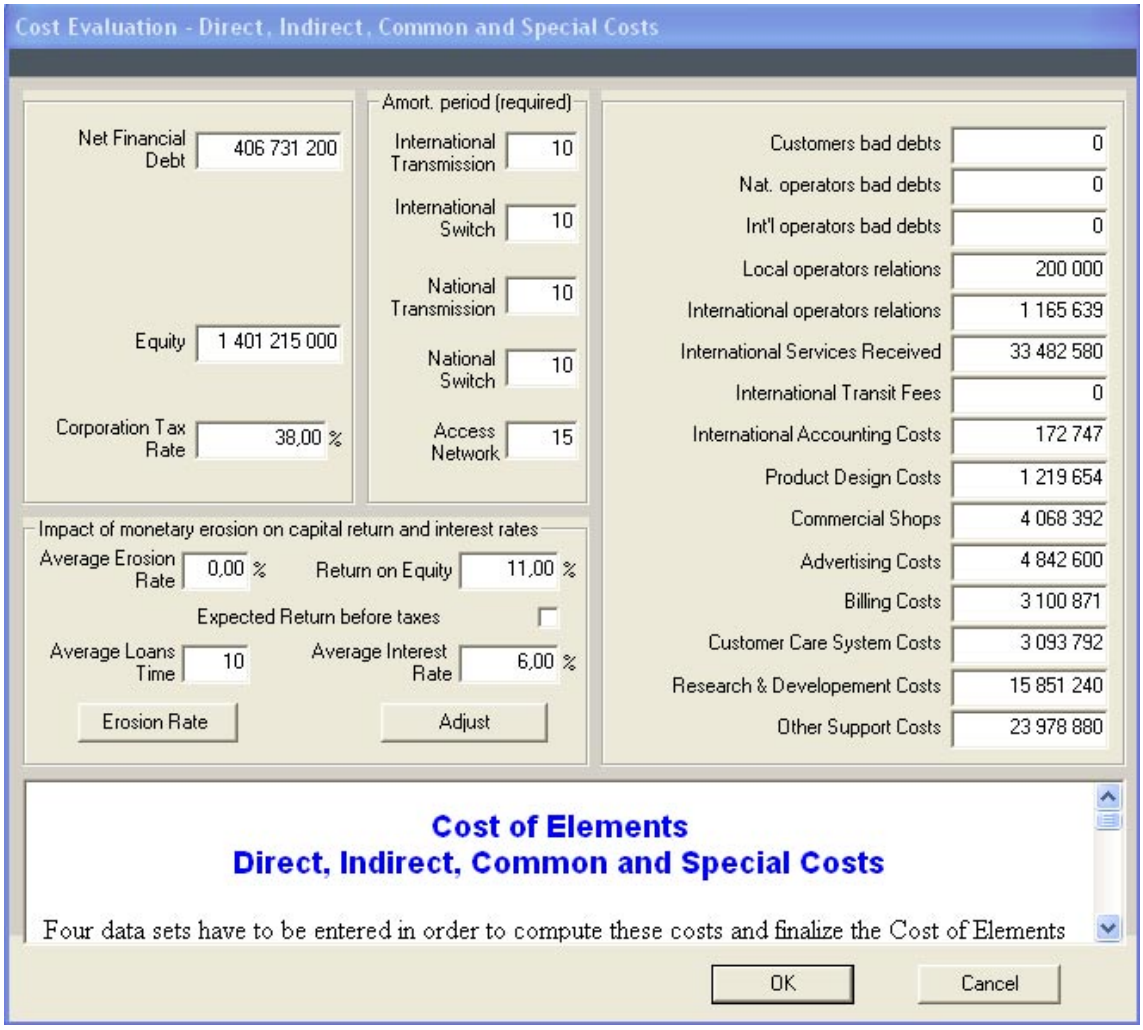
This concerns the amortization period. The overall total will already have been entered in the previous section.

The button marked **Distribute** (which is visible as long as the **Distribution known** box is unchecked) is used to break down amortization into the various elements, using the distribution grid defined in **Net fixed assets**, corrected by the appropriate amortization durations of the various components (for more information, hold the cursor over one of the amortization blanks and press F1).

It is possible to manually change the amortization duration and value for any element.

8.3 Other Costs

Once the direct costs have been estimated through the analytical or general accounting, the costs mentioned in the window below must be integrated in the model.



These are the direct and indirect costs, amortization durations, common and special costs, and the impact of monetary erosion. All of these amounts must be given in local currency.

8.3.1 Direct and Indirect Costs

Net Financial Debt

Net financial debt is used in calculating the cost of capital. For tariff purposes, its value cannot be lower than zero.

Net financial debt equals long-term bank and financial debts plus short-term funds (discount etc.) minus financial investments minus available assets (cash, bank).

Equity

Equity registered in the company's accounts. For tariff purposes, this is composed of those equity resources which the corporate owners have used to acquire some of the corporation8's assets. This figure cannot be negative.

Equity = subscribed capital + reserves + retained earnings.

Corporate income tax

According to fiscal law, the State claims a part of the income as taxes. This tax is not a cost, strictly speaking. Nonetheless, it must ultimately be taken into account in determining the tariff base for services.

8.3.2 Amortization Period (required and actual)

The accounting amortization period may not correspond to the reality in cases where, for example, rapid technological change leads to accelerated obsoleteness of the equipment used in non-manufacturing countries. For purposes of tariff calculation, the operator can simulate a more appropriate amortization period without affecting the accounts. This adjustment will result in:

- Appropriately adjusted annual amortization values
- Corrected net fixed assets

The result of this adjustment may be viewed in the window *Costs results* (adjustment for asset reevaluation).

8.3.3 Common and Special Costs (calculation and allocation)

Bad debts – subscribers

This is the provision for estimated bad debts held by subscribers.

NOTE – These provisions are "reversible", so it is recommended that, for the purpose of tariff calculation, they not be considered as costs unless the following conditions have been met:

a) the provision has become irreversible (i.e. collection has become impossible);

b) the operation is not specific to a given year but spread over a sufficiently long period; and

c) there exists an accepted national practice for handling with such provisions.

Bad debts – national operators

This is the provision for estimated bad debts held by local operators, for local calls only.

Bad debts – international operators

This is the provision for estimated bad international debts, for external incoming calls only.

Costs related to local-operator relations

These are the costs of those activities that are associated exclusively with relations with the other national operators. They are supported by national traffic. The cost of interconnection link-ups to the POI, whether as a charge or in the form of amortization, is also recognized here.

The costs associated with national-to-national traffic offered by other operators is not included.

Costs of international-operator relations

These are the costs of those activities that are associated exclusively with promoting international traffic, recovering outstanding international account balances, etc. They are supported by external traffic (international and subregional).

Costs of international services received

Costs linked to services received from international third parties such as Intelsat, Rascom, contractors providing submarine cabling maintenance, access rights, etc.

International Transit Fees

Costs linked to international services received from international suppliers of transit services, not including any payments for outgoing international terminal traffic.

International Accounting Costs

Amount of costs linked to international accounting. These are separated in order to be able to allocate them to international communications only.

Product Design Costs

Costs generated by commercial studies of products that the operator offers or will offer to its customers. These costs are exclusively supported by the national customers.

Commercial Shops

Amount of costs linked to commercial agencies (amortization and operating costs). These costs are distributed entirely among the customers of the operator for which the calculation is being effected.

Advertising Costs

If advertising costs are to be distrubuted to all services offered, enter the amount here. If this is not the case, this field is set at "zero", and the amount allocated to advertising added to *Commercial Agency costs*.

Billing Costs

Amount of billing costs (including amortization) and customer relation costs specific only to communications of local origin.

Commercial Information System Costs

Amortization and operation costs linked to the commercial information system. These are exclusively supported by local customers.

Research and Development Costs (network planning and engineering)

These functional support costs should be allocated to the infrastructure of the technical network. They are therefore distributed among all services that use the network. The distribution to the network segments is made according to their cost structure, unless a more precise allocation method is possible.

Other Support Costs

General support costs identified among common costs. These are allocated to all services according to the actual traffic in minutes, unless another, more precise allocation method, is available.

For tariff purposes, every attempt must be made to minimize common costs by identifying indirect costs that can be attributed to service groups.

For example: a management information system (MIS) can be charged to payroll, accounting and invoicing. The "invoicing portion" can be estimated as a function of the resources/units allocated during peak periods.

8.3.4 Impact of monetary erosion on return on capital and interest rate

Average Interest Rate

The average rate of interest can be calculated by taking the average of interest rates for ongoing loans, weighted by the loan amounts.

For tariff purposes, it is preferable to use the evolution of the money rate on the international market in the telecommunication sector, and to take into account the risk factor for the given country.

Return on Capital

The after-tax **return on capital** can be calculated on the basis of net earnings, using the following relationship:

$$\sigma = \frac{B}{E}$$

Where

B is the net profit and

E is the equity

It is recommended to use the evolution of the rate of return on capital on the international market in the telecommunication sector, and to take into account the risk factor for the given country.

The capital asset pricing model (CAPM) also gives an indication of how the minimum equity earnings may be determined for a given market.

If the expected return specified by the user does not include taxes and duties, the check box *Expected Return Before Taxes* must be checked, in order to take taxes into account at a subsequent stage in the computations.

Impact of Monetary Erosion

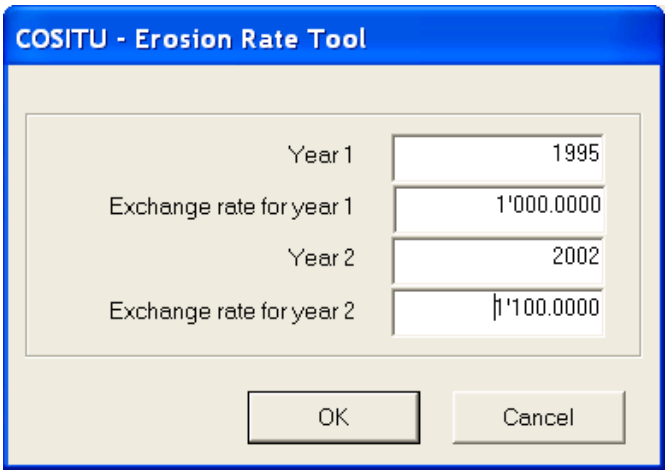
Costs are expressed in the national currency in company accounts. This currency may fluctuate with respect to the Special Drawing Rights (SDR), depending on economic conditions. The monetary erosion factor reflects the loss of purchasing power of the national currency with respect to the SDR.

If the operator's purchasing conditions dictate that international transactions be oriented towards a well-defined strong currency, the monetary erosion rate should be calculated with respect to that currency.

If loans are taken out in currencies with their own interest rates and the national currency undergoes major changes with respect to the SDR, the average interest rate used in calculating costs needs to be adjusted accordingly. The same applies to the return on capital if it is referred to international markets. In summary, it means that an inflation risk factor on the cost of capital must be applied.

Entering the amount of monetary erosion and the average duration of the loans will allow the impact on the return on capital and the average interest rate to be computed (click the *Adjust* button). These adjusted values are then available for the purpose of further calculations, but it is also possible to change them if better estimates can be obtained with a more detailed analysis of the data.

COSITU has a specific feature designed to calculate the erosion rate. For a more precise calculation, independently of COSITU, more detailed historical data are required.



8.3.5 Cost of Capital

The **Net Financial Debt**, the **Equity**, the **Tax Rate** and the **Expected Return on Capital** will be used for the computation of the **Capital Cost**. When the **Expected Return on Capital** has been adjusted (see chapter 8.3.4), this new value is automatically taken into account.

8.3.6 Method of Allocating Common and Special Costs

All the costs specified in the *Common and Special Costs* part can be allocated very precisely to one or several services:

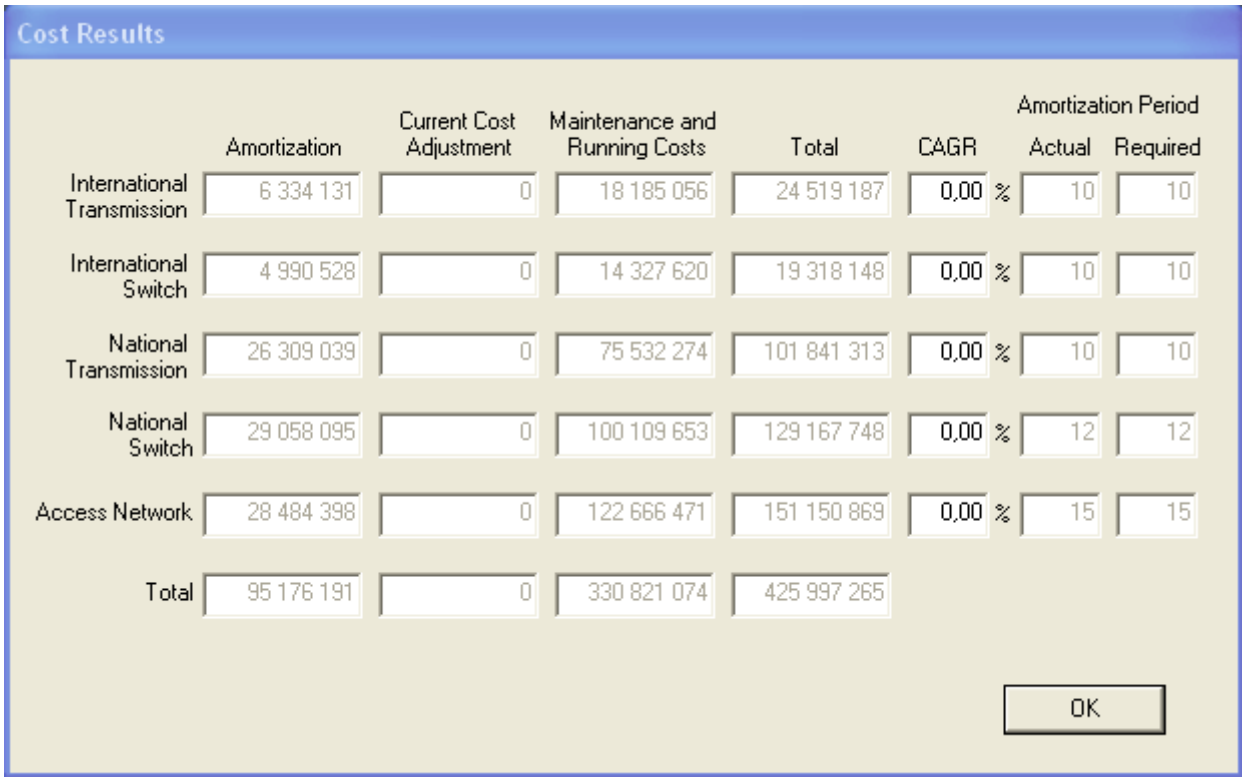
- The provision for debts is specific to Local Customers
- The provision for local operators debts is specific to Local Incoming Traffic
- The provision for international operators debts is specific to International Incoming
- The costs for local operator relations are specific to Local Operators
- The costs for international operator relations are specific to Distant International
- The costs for International Services received are specific to Distant International
- The fees paid for International Transit are specific to International
- The International Accounting Costs are specific to International
- The Product Design costs are specific to the Local Customers
- The Commercial Shops costs are specific to the Local Customers

- The Advertising costs are added to the Other Common Costs
- The Billing costs are specific to the Local Customers
- The Commercial Information System costs are specific to the Local Customers
- The Research and Development costs are allocated over all the network elements
- The Other Support Costs are added to the Common costs.

8.3.7 Compound Annual Growth Rate

This window is automatically displayed when all the cost data have been entered and the *Direct, Indirect, Common and Special Costs* window has been validated.

The Compound Annual Growth Rate (CAGR) that represents the growth (positive or negative) of prices for the equipment of the service concerned must be entered here. It will have a direct impact on the Adjustment to Current Costs.

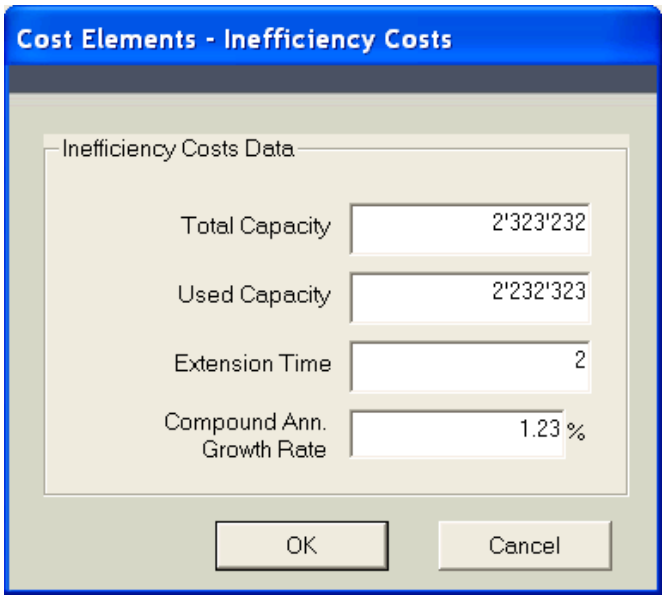


8.3.8 Inefficiency Costs

Once all data have been entered, click on "OK". A window will then open asking the user to enter the data needed to calculate the inefficiency costs.

As regards mobile GSM networks, COSITU has an additional module that makes it possible to calculate an estimate, at the level of base station controller (BSC), of the potential traffic that results from the allocation of frequency channels of base stations compared with the flow of real traffic via the BSCs. The Total Capacity is computed as the division of the potential traffic by the average traffic by user. The Used Capacity is computed as the actual traffic divided by the average traffic by user (see § 14 for more details).

Thus, operators need to verify that their unused capacity is not the result of inefficient resource management. For this, they need to determine that all of the available capacity is utilized within a timeframe that is in line with satisfactory resupply conditions.



Total capacity: Installed capacity, given as the number of subscriber units available (fixed networks), including those which are not in use.

Used capacity: Number of subscriber units in use (fixed networks).

Extension time: In practice, this will be equal to one year plus the weighted mean of non-controllable delays which affected the three last major projects.

Compound growth rate of inventory: Inventory change during the year in question, divided by the preceding year-end inventory.

Once this information has been provided, the cost element calculation stage is finished.

9 Cost of Services – Unit Costs

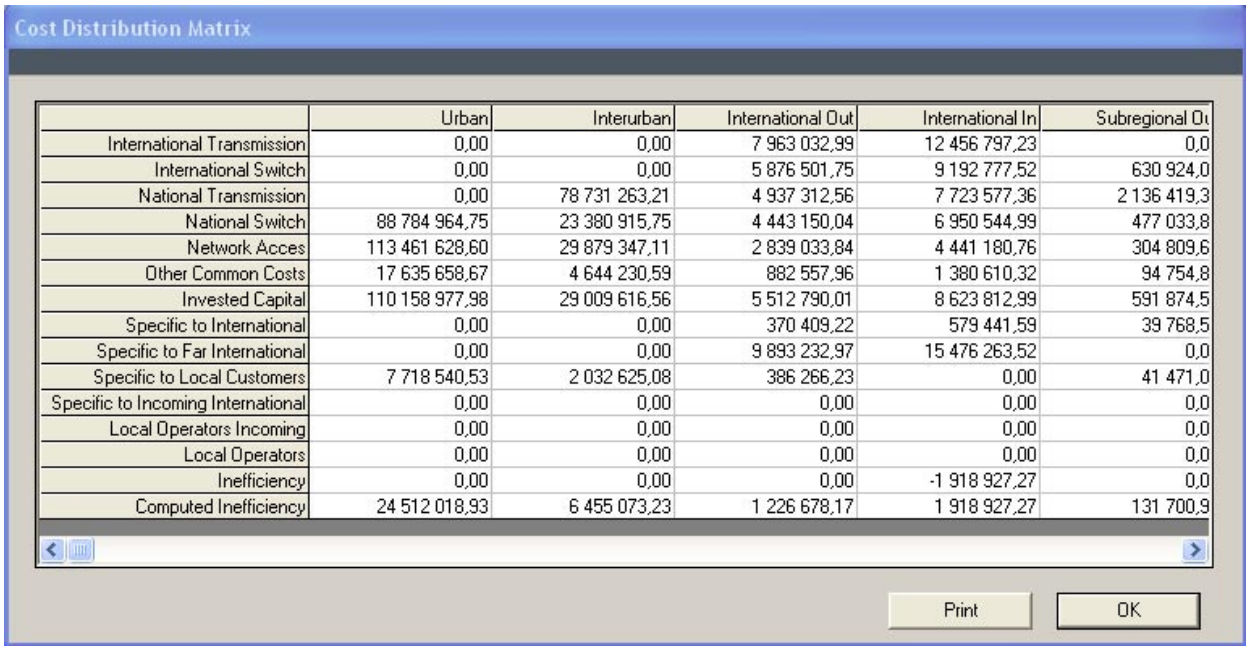
9.1 Cost of Services

The unit costs obtained differ from tariffs as they do not include any components specific to tax policy or to State policies with respect to universal service obligations. They cannot be directly compared to actual tariffs.

Nevertheless, these costs are the basis for all further calculations that will eventually lead to the determination of tariffs that are cost-oriented and tariffs that are cost-based.

They are computed by the distribution of the costs determined in the *Cost of Elements* step over all the services. This distribution is based on a matrix that allows the right cost to be allocated to the corresponding services.

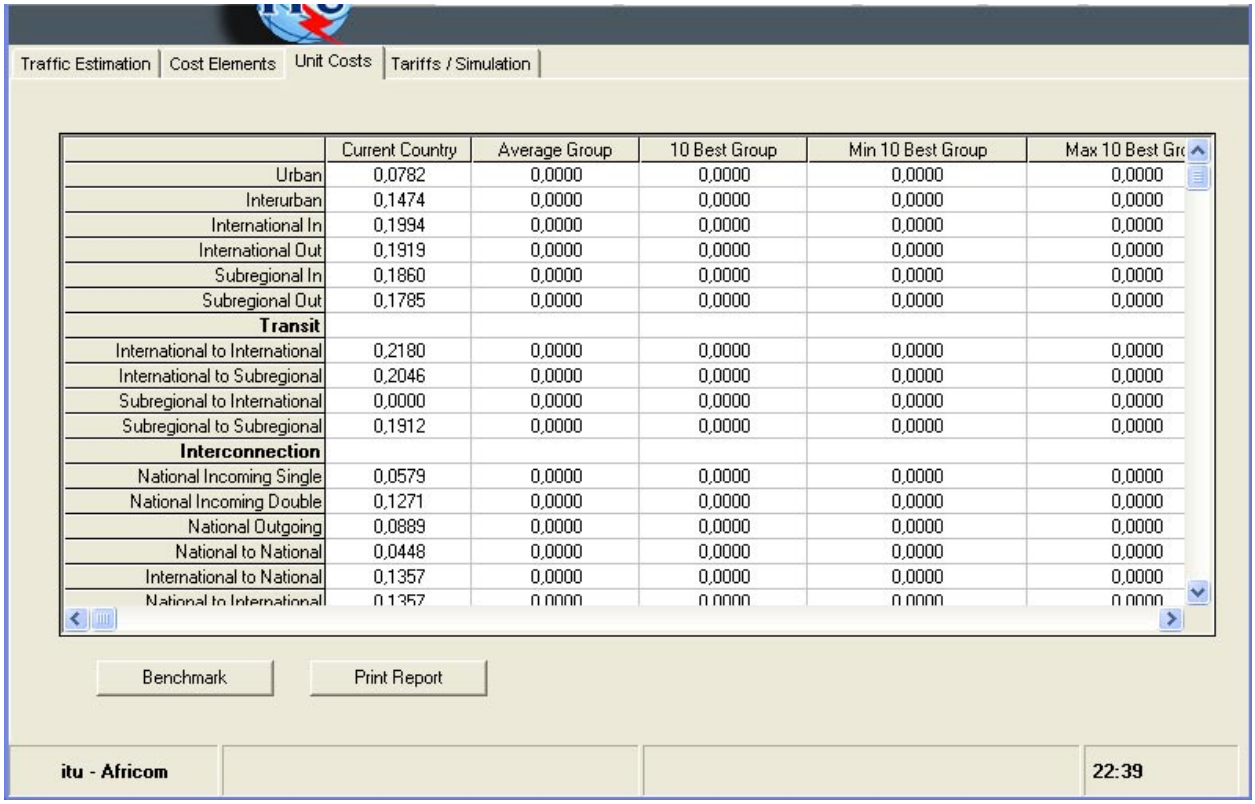
The result of this distribution may be viewed by clicking on **Distribution of costs**. The cost matrix will be the input for the next stage: **calculating the unit costs**.



	Urban	Interurban	International Out	International In	Subregional Ou
International Transmission	0,00	0,00	7 963 032,99	12 456 797,23	0,0
International Switch	0,00	0,00	5 876 501,75	9 192 777,52	630 924,0
National Transmission	0,00	78 731 263,21	4 937 312,56	7 723 577,36	2 136 419,3
National Switch	88 784 964,75	23 380 915,75	4 443 150,04	6 950 544,99	477 033,8
Network Acces	113 461 628,60	29 879 347,11	2 839 033,84	4 441 180,76	304 809,6
Other Common Costs	17 635 658,67	4 644 230,59	882 557,96	1 380 610,32	94 754,8
Invested Capital	110 158 977,98	29 009 616,56	5 512 790,01	8 623 812,99	591 874,5
Specific to International	0,00	0,00	370 409,22	579 441,59	39 768,5
Specific to Far International	0,00	0,00	9 893 232,97	15 476 263,52	0,0
Specific to Local Customers	7 718 540,53	2 032 625,08	386 266,23	0,00	41 471,0
Specific to Incoming International	0,00	0,00	0,00	0,00	0,0
Local Operators Incoming	0,00	0,00	0,00	0,00	0,0
Local Operators	0,00	0,00	0,00	0,00	0,0
Inefficiency	0,00	0,00	0,00	-1 918 927,27	0,0
Computed Inefficiency	24 512 018,93	6 455 073,23	1 226 678,17	1 918 927,27	131 700,9

9.2 Unit Costs

The costs of the services calculated at the preceding stage are weighted by the traffic (equivalent traffic for lines 1, 2, 3, 4, 5 and 7 in the above-mentioned matrix, and real traffic for all the other segments).



	Current Country	Average Group	10 Best Group	Min 10 Best Group	Max 10 Best Gr
Urban	0,0782	0,0000	0,0000	0,0000	0,0000
Interurban	0,1474	0,0000	0,0000	0,0000	0,0000
International In	0,1994	0,0000	0,0000	0,0000	0,0000
International Out	0,1919	0,0000	0,0000	0,0000	0,0000
Subregional In	0,1860	0,0000	0,0000	0,0000	0,0000
Subregional Out	0,1785	0,0000	0,0000	0,0000	0,0000
Transit					
International to International	0,2180	0,0000	0,0000	0,0000	0,0000
International to Subregional	0,2046	0,0000	0,0000	0,0000	0,0000
Subregional to International	0,0000	0,0000	0,0000	0,0000	0,0000
Subregional to Subregional	0,1912	0,0000	0,0000	0,0000	0,0000
Interconnection					
National Incoming Single	0,0579	0,0000	0,0000	0,0000	0,0000
National Incoming Double	0,1271	0,0000	0,0000	0,0000	0,0000
National Outgoing	0,0889	0,0000	0,0000	0,0000	0,0000
National to National	0,0448	0,0000	0,0000	0,0000	0,0000
International to National	0,1357	0,0000	0,0000	0,0000	0,0000
National to International	0,1357	0,0000	0,0000	0,0000	0,0000

Telephone Service Costs: With costs being allocated to services as indicated above, the unit cost for each service is defined as being equal to the total cost of the service divided by its actual traffic.

Interconnection Service Costs: With costs being allocated to services as indicated above, the unit cost for each service is defined as being equal to the total cost of the service divided by its actual traffic.

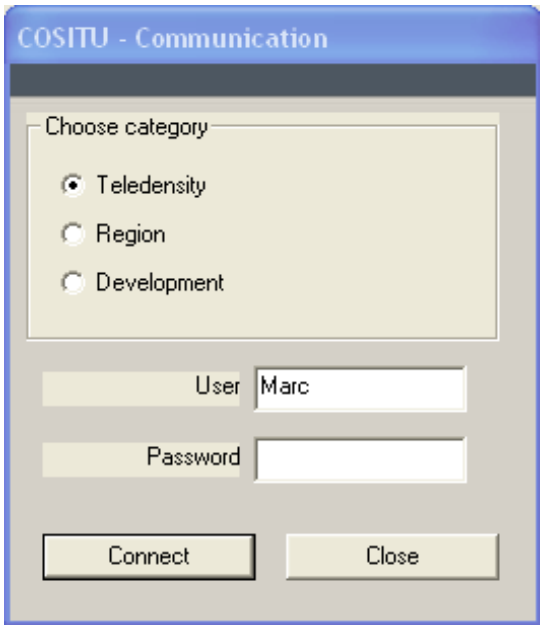
Network Component Costs: The unit cost of each network segment is determined by dividing the consolidated value for the segment by the traffic.

9.3 Comparison with other operators

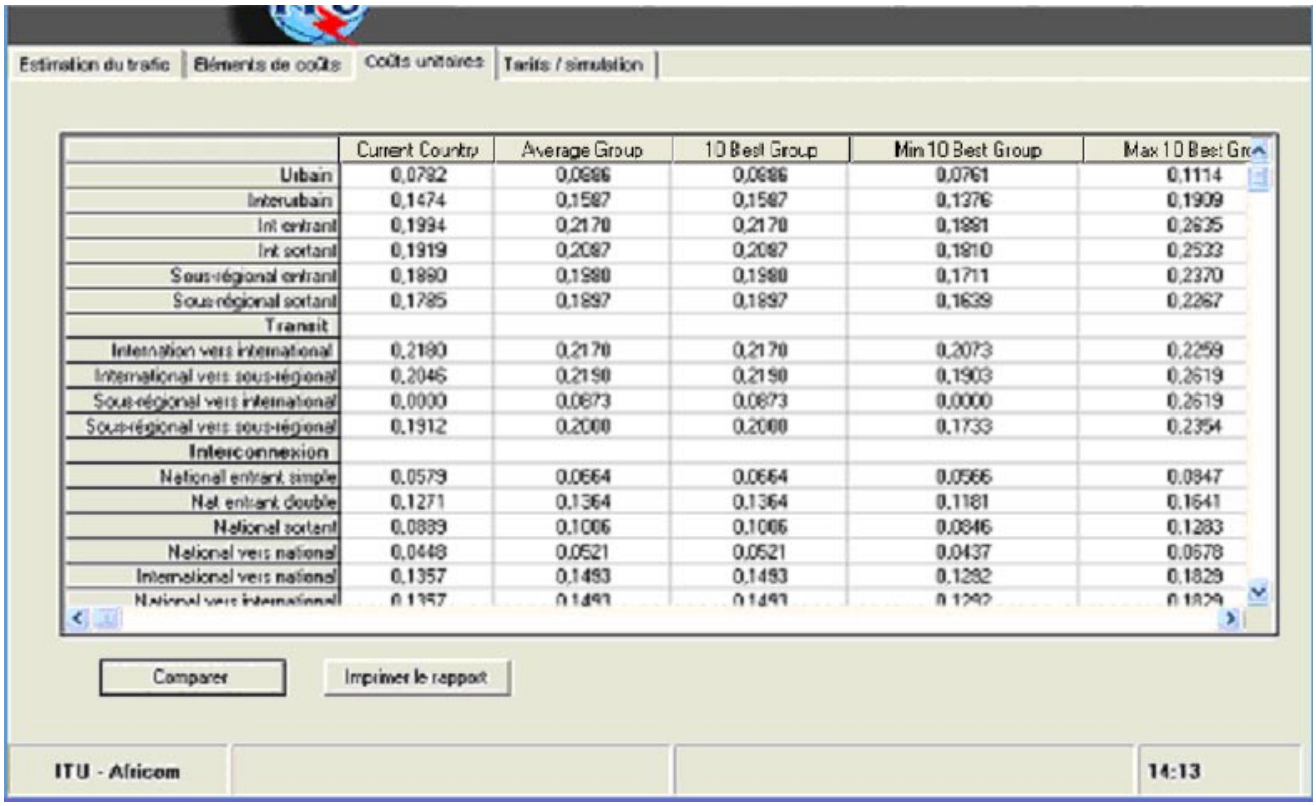
Once the results have been calculated, they can be benchmarked with comparable results for other operators in comparable countries. These countries must belong to the same group as the present country in terms of Teledensity, Region or Development level.

To obtain these data, a connection with a server must be established, and a user name (login) and a password obtained (go to the COSITU website and find the link "Ask for a password").

NOTE – Only regulators and telecommunication network operators that have purchased the software will have access to the COSITU server.



For the selected group, the benchmark data will be the average unit cost per service, the average unit cost per service for the 10 best of the group, the minimum unit cost per service for the 10 best of the group and the maximum unit cost per service for the 10 best of the group.



10 Determination of cost-oriented tariffs

This is the last step in the application.

Before proceeding to calculate cost-oriented tariffs, comparing them with real life and calculating the losses or profits for each service, some other data need to be supplied:

- Current prices (*Current prices* button)

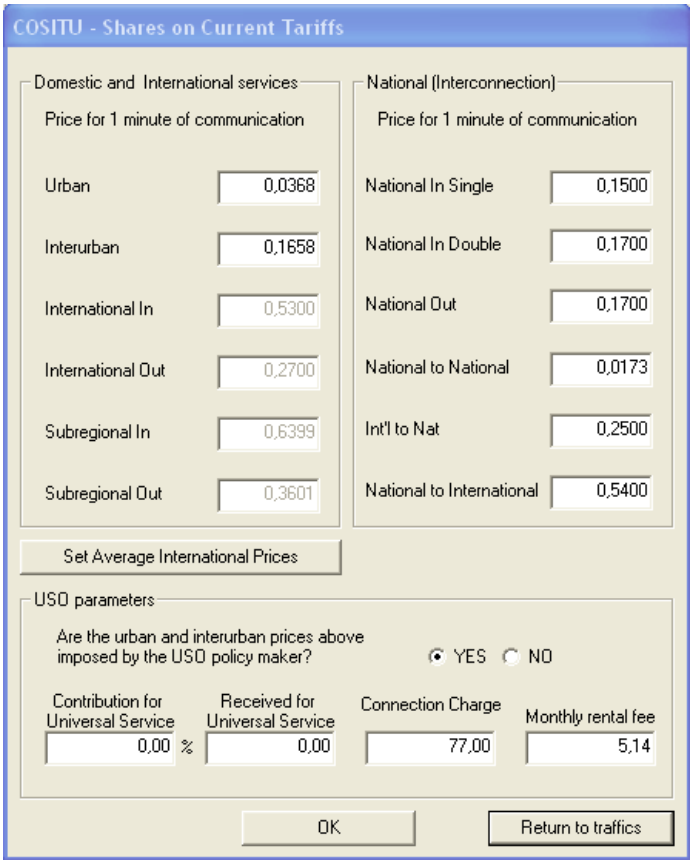
- The percentage of sales that is made up of universal service, the funding received for universal service, the connection charge and the monthly subscription charge

- It must also be indicated whether the urban and interurban prices charged are imposed by a public authority (on the other hand, the access deficit is not taken into account unless the authorities oblige the domestic services to operate below cost)

10.1 Current Prices

In order to compare the cost-oriented tariffs with reality, and to compute the access deficit and profit or loss for each service, the current prices for all traffic must be entered.

In the "Tariffs/simulation" tab, and with current prices still undefined for the session, click on *Current prices* to bring up the following window.



Current prices for domestic services and for services received from other local operators must be entered at this point, as must the information on the universal service obligation.

10.1.1 Domestic and international service

- **Overall average price for one minute of urban communication (before VAT)**

In general, if Dmean is the mean duration of an urban call, in minutes, TB is the basic charge unit and T is the length of the basic charge period, the mean price is given by the following formula:

Mean price = TB × [1+integer(Dmean/T)]/Dmean

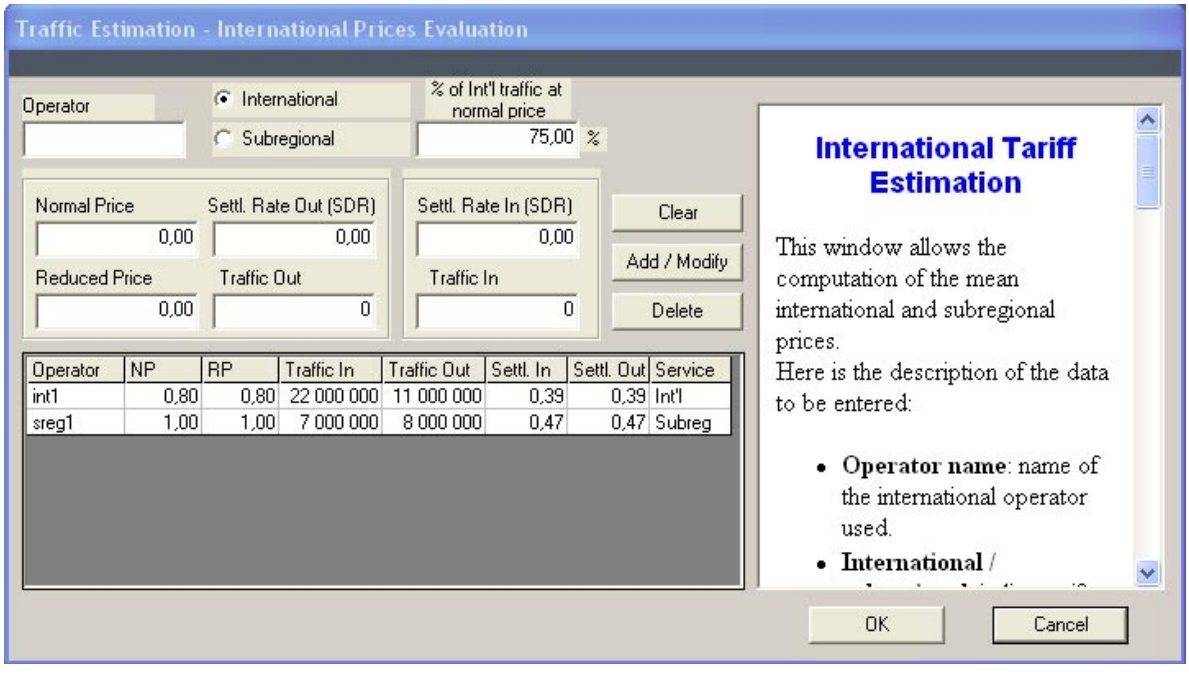
However, with additional information it may be possible to calculate the mean price to a greater degree of precision.

- **Overall average price for one minute of interurban communication (before VAT)**

If there are several different rates for interurban calls, the mean price for a minute of interurban calling will be the mean of the various rates, weighted by the corresponding volume of traffic.

- **Overall average price for one minute of international and subregional communication**

Average prices for the International Incoming, the International Outgoing, the Subregional Incoming and the Subregional Outgoing must be computed. A dedicated tool launched by the button labelled *Average Int'l Prices* allows this to be performed very easily.



Description of data to be entered:

Operator: name of the international operator in question

International/subregional: indicates whether the values in question concern international or subregional traffic

Percentage of international traffic at normal price: some operators have a multi-tiered rate structure. This model considers only normal (daytime) and reduced (night) prices.

This percentage gives the breakdown of normal and reduced price for outgoing international traffic. So a figure of 40% means that 40% of outgoing international traffic is billed at the normal price, while 60% is at the reduced price.

If there are more than two price levels, it is possible to produce a two-level equivalent by taking the mean of the various billing levels, weighted to the traffic in Erlangs. In any case, it is necessary to track all traffic through each exchange, twenty-four hours a day for a full week. For international traffic, measurements are taken at the international transit exchanges with hourly cumulative totals. Manual integration of the resulting curve will give the area corresponding to normal-rate and reduced-rate periods.

Normal price (in local currency): the price (not including VAT) that is billed to the subscriber for one minute of communication with the designated international operator, during the normal-price calling period.

Reduced price (in local currency): the price (not including VAT) that is billed to the subscriber for one minute of communication with the designated international operator, during the reduced-price calling period.

Incoming forwarded traffic: annual figure, in minutes

Outgoing forwarded traffic: annual figure, in minutes

Incoming settlement rate (in SDR): the settlement share charged for forwarding one minute of the other operator's traffic for termination on my network. Enter the total amount for one year, in SDR.

Outgoing settlement rate (in SDR): the settlement share charged for forwarding one minute of my traffic for termination on the other network.

NOTE – If both a subregional and an international link exists with one and the same country, enter the country twice, giving the subregional and international data for forwarded traffic in each case.

10.1.2 Services provided to and received from other national operators

- **Share for one minute of incoming single-transit national communication**

Interconnection rate which the operator for which calculations are being made charges for every minute of incoming communication from national operators terminating in the call area of the POI.

- **Share per minute of incoming dual-transit national communication**

Interconnection rate which the operator for which calculations are being made charges for every minute of incoming communication from national operators terminating outside the call area of the POI.

- **Overall mean price per minute of outgoing national communication (excludes VAT)**

The figures shown here are "endogenous" rates, i.e. the shares retained by the operator for which calculations are being made; in other words they represent the weighted mean value of pre-VAT rates paid by customers when calling customers of other national operators, minus the weighted mean value of the interconnection rates.

If there are several different rates for national interconnection, the mean price per minute for an outgoing national call will be the mean of the various rates, weighted by the corresponding volume of traffic.

- **National to national transit rate**

This is the amount which the operator for which calculations are being made effectively retains as its share for a switched transit service to interconnect two national operators.

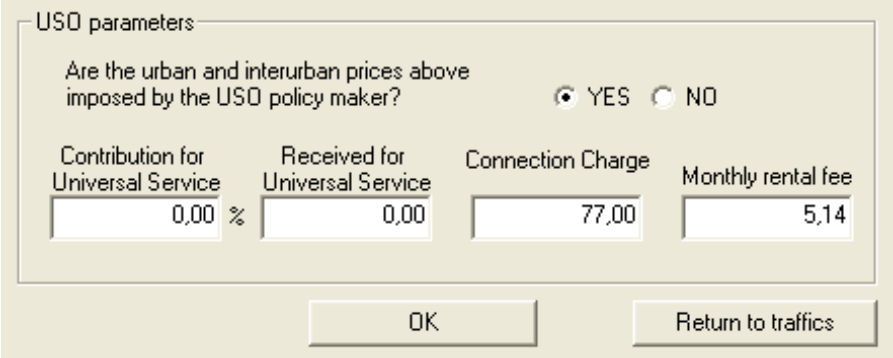
- **Share per minute of international to national communication**

The figures shown here are intrinsic rates, i.e. the shares retained by the operator for which calculations are being made. They are determined by calculating the weighted mean value of settlement shares collected by international operators when they call customers of other national operators, minus the weighted mean value of the interconnection rates.

- **Share per minute of national to international communication**

This value represents the share retained by the international gateway operator (for which calculation is being made) per minute of traffic from subscribers of national operators towards international (including subregional) operators.

10.1.3 USO parameters



Click on "Yes" to have access deficit sharing included in the calculation of rates. Click on "No" to have cost-based rates.

- **Urban and interurban rates set by policy-maker**

Indicate whether urban and interurban rates are set by the policy-maker or regulatory authority.

- **Contribution for universal service**

In certain cases the state collects a percentage of sales in order to fund the costs arising from the universal service obligation (USO). If it is desired not to take this into account in setting rates, the percentage should be made zero.

- **Amount received for universal service**

The amount which the operator receives to cover the costs arising from universal service obligations assigned by the public authorities.

This amount is subtracted from the access deficit.

- **Connection charge**

Mean amount paid by a subscriber for the right to a telephone line. It excludes any security deposit that may be required.

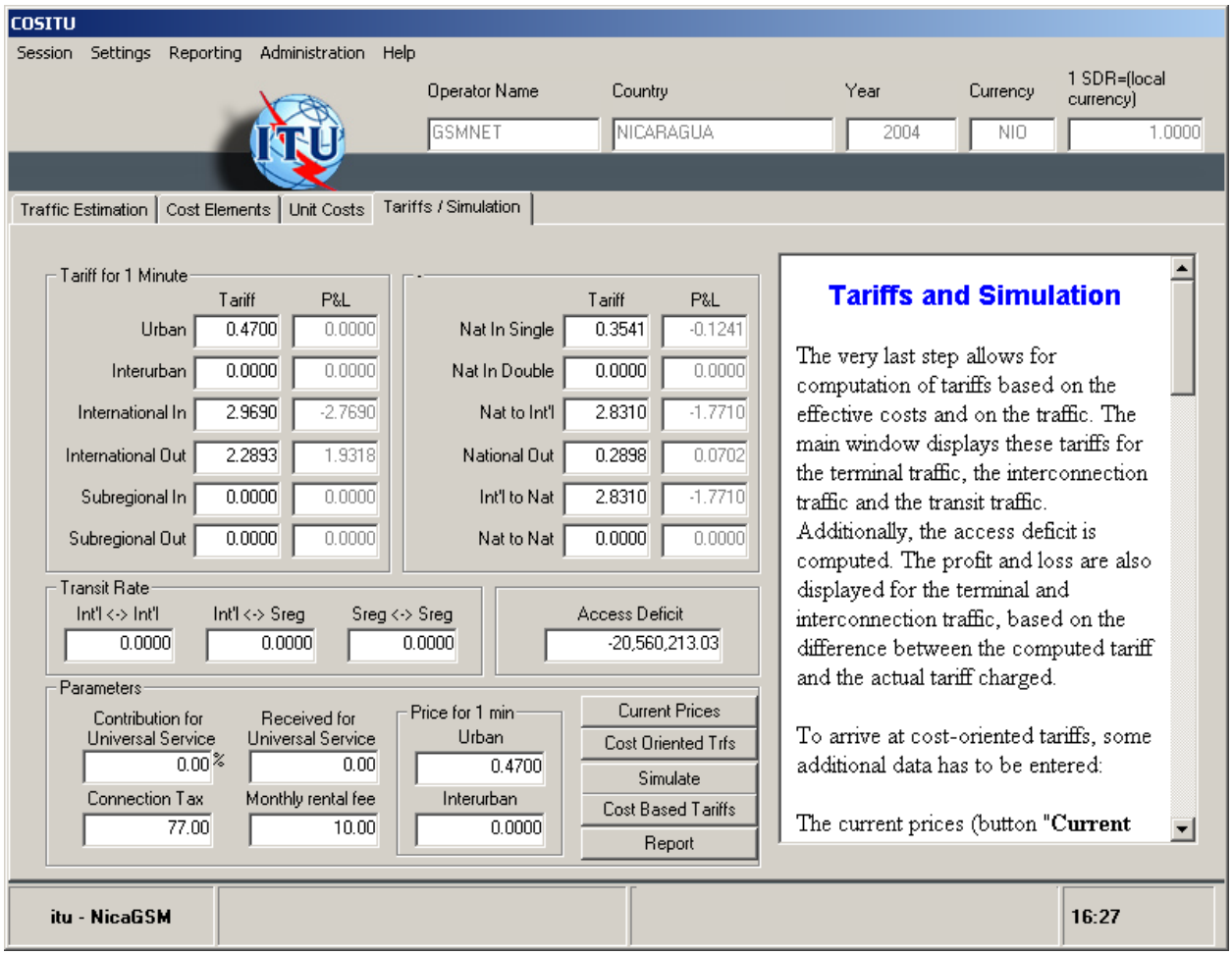
If there are several categories of subscribers, there may be several different connection charges on the market. It is the weighted mean value which should be calculated and entered in COSITU.

- **Monthly rental fee**

This is the monthly fee which subscribers are required to pay, independently of their telephone usage. If the state accepts, this parameter can play an important role in finding balanced telephone rates.

If there are different subscriber fees for different categories of customers, the weighted mean value should be used.

10.2 Cost-oriented tariffs

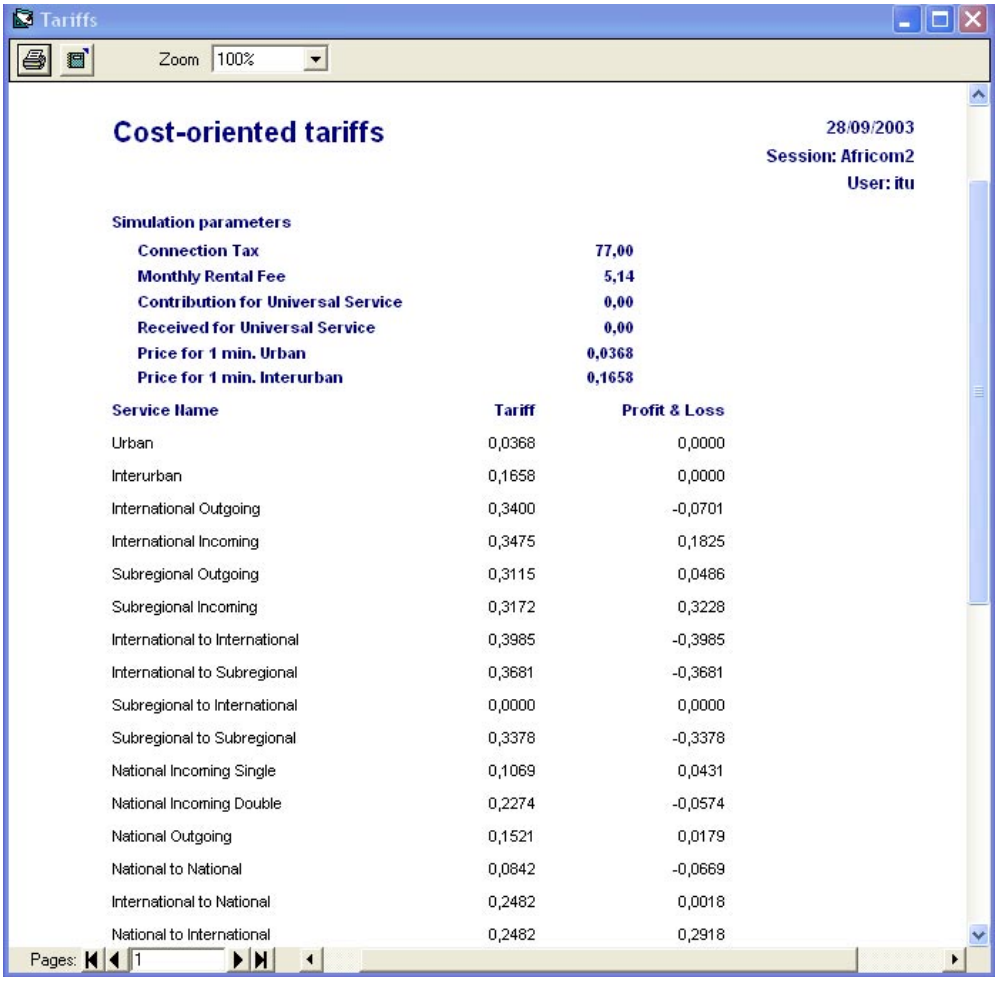


Based on the Unit Costs, cost-oriented tariffs are computed taking into account the Universal Services Obligations, tax on profits, the payment received (connection charge and monthly fees) and the access deficit.

However, the access deficit is not taken into account unless the public authorities have imposed below-cost prices for domestic services.

The button *Cost Oriented Trfs* is used to calculate **cost-oriented tariffs**.

Click on *Report* to generate a report on the tariffs oriented towards the costs that have been calculated.



The tariffs calculated at this stage are not balanced, in that they reflect the public policy decision which keeps prices of urban and interurban services below costs. Nonetheless, these tariffs are oriented towards costs.

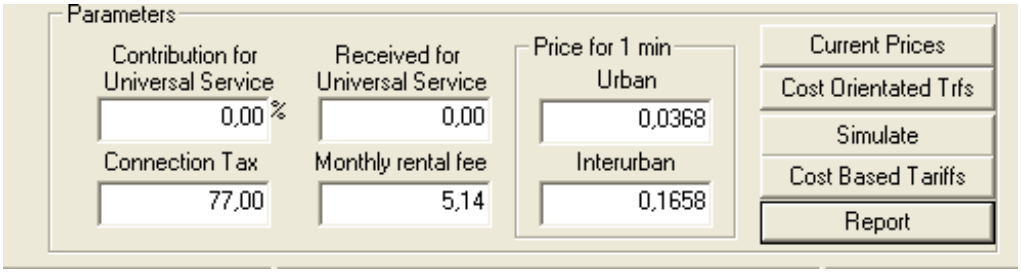
The **access deficit** and **losses and profits** for terminal and interconnection traffic are calculated on the basis of the difference between the calculated tariffs and the price actually charged at the current time.

11 Simulations for universal service obligation

The *Simulate* button is used to project the impact that a different urban or interurban tariff would have on the other tariffs. Tariffs are calculated in the same way as in the preceding section, except that the values for urban and interurban are forced to user-assigned values.

The simulation function can also be used to examine the effect on tariffs of adjusting any of the following parameters:

- Percentage of **universal service obligation**
- Amount received for **universal service**
- Price per minute of urban communication
- Price per minute of interurban communication
- Connection charge
- Monthly rental
- **Access deficit** (this value cannot be changed, but it is recalculated whenever any of the preceding parameters is modified)



Click on *Simulate* to recalculate tariffs and the access deficit on the basis of the new parameter values.

12 Determination of cost-based tariffs

Clicking on *Cost Based Tariffs* causes the program to adjust the price for urban and interurban communication so as to obtain a zero access deficit. (Nothing changes if the deficit is already zero.)

This function is used to rebalance tariffs.

Tariff rebalancing involves modifying the domestic rates until a zero access deficit is obtained; so it involves theoretical tariffs that are **cost-based**. In real life this would involve a gradual adjustment, typically one spread over several years, in order to make the most of the efficiency benefits that are the result of"price demand elasticity" and maximize the economies of scale that can be obtained thanks to the natural growth in the volume of traffic at constant tariffs.

The **report** that is generated will show cost-based or cost-oriented tariffs, depending on whether the access deficit is zero or non-zero.

13 Interpretation of results

All of the results obtained by this model will be "endogenous" tariffs pre-tax. They do not take into account either the interconnection charges paid to other local operators or the settlement fee paid to international operators (for outgoing international communications).

In order to determine the tariffs that would apply to users, "exogenous" charges must be added to the tariffs that the model has worked out.

13.1 Examples of how to determine tariffs for domestic services

Urban call, price per minute

The model is based on the assumption of a single urban rate. If there are in fact several rates, the result obtained should be understood to represent their weighted mean value.

Interurban call, price per minute

The model is based on the assumption of a single interurban rate. If there are in fact several rates, the result obtained should be understood to represent their weighted mean value.

Outgoing international call, price per minute

The result obtained will correspond to the mean share that is retained by the operator for which calculations are being made, for one minute of an outgoing international call. For the tariff as it will be applied to the customer for a given destination, the mean value of the outgoing settlement rates that will apply to the call must be added to that result.

Outgoing subregional call, price per minute

To obtain the tariff applicable to the final customer for a given subregional destination, the mean value of the settlement rates to this destination must be added to the result worked out by the model.

Outgoing national call, price per minute

The result obtained must be increased by the mean value of the share paid to other local operators for terminating this type of traffic in their network.

13.2 Examples of how to determine tariffs for services destined for other national operators (interconnection)

National to international call, price per minute

To obtain the tariff applicable to the national operator that submits the traffic for a given destination, the mean value of the settlement rates to this destination must be added to the result worked out by the model.

Incoming national simple transit call, price per minute

The tariffs worked out by the model are applicable to local operators directly.

Incoming national double transit call, price per minute

The tariffs worked out by the model are applicable to local operators directly.

National to national call, price per minute

The result obtained must be increased by the mean value of the share paid to other local operators for terminating this type of traffic in their network.

13.3 Examples of how to determine tariffs for services to international operators (termination rates)

International to national call, price per minute

The result obtained must be increased by the mean value of the share paid to other local operators for terminating this type of traffic in their network.

Incoming international call, price per minute

The model is based on the assumption of a single international incoming tariff. If there are in fact several tariffs depending on the origin, the result obtained should be understood to represent their weighted mean value.

Incoming subregional call, price per minute

The model is based on the assumption of a single subregional incoming tariff. If there are in fact several tariffs depending on the origin, the result obtained should be understood to represent their weighted mean value.

International to international call, price per minute

The model is based on the assumption of a single international to international transit tariff. If there are in fact several tariffs depending on the origin and destination, the result obtained should be understood to represent their weighted mean value.

International to subregional call, price per minute

The model is based on the assumption of a single international to subregional transit tariff. If there are in fact several tariffs depending on the origin and destination, the result obtained should be understood to represent their weighted mean value.

Subregional to international call, price per minute

The model is based on the assumption of a single subregional to international transit tariff. If there are in fact several tariffs depending on the origin and destination, the result obtained should be understood to represent their weighted mean value.

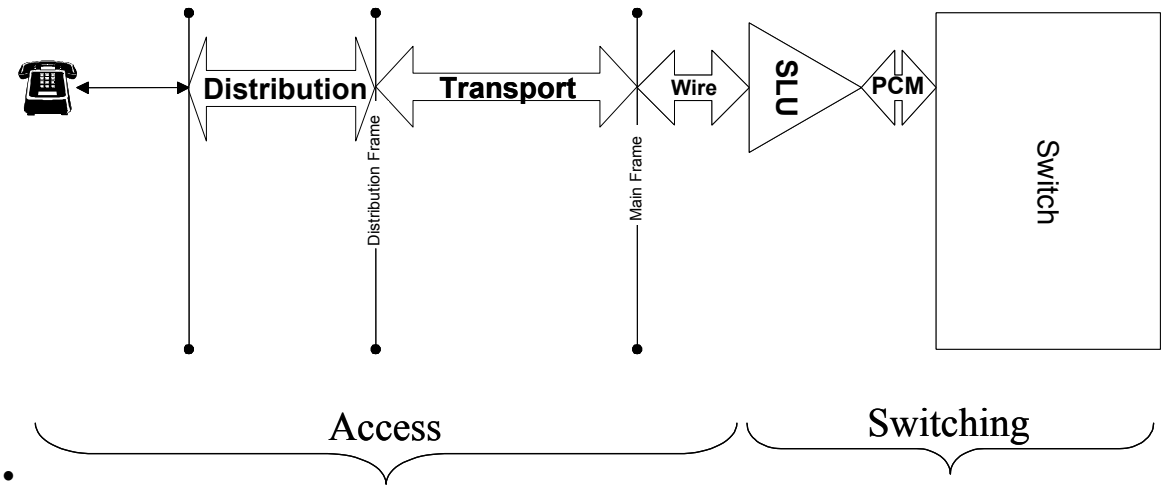
Subregional to subregional call, price per minute

The model is based on the assumption of a single subregional to subregional transit tariff. If there are in fact several tariffs depending on the origin and destination, the result obtained should be understood to represent their weighted mean value.

14 Applying COSITU to mobile networks

14.1 Similarities in fixed/mobile network architecture

- Fixed network



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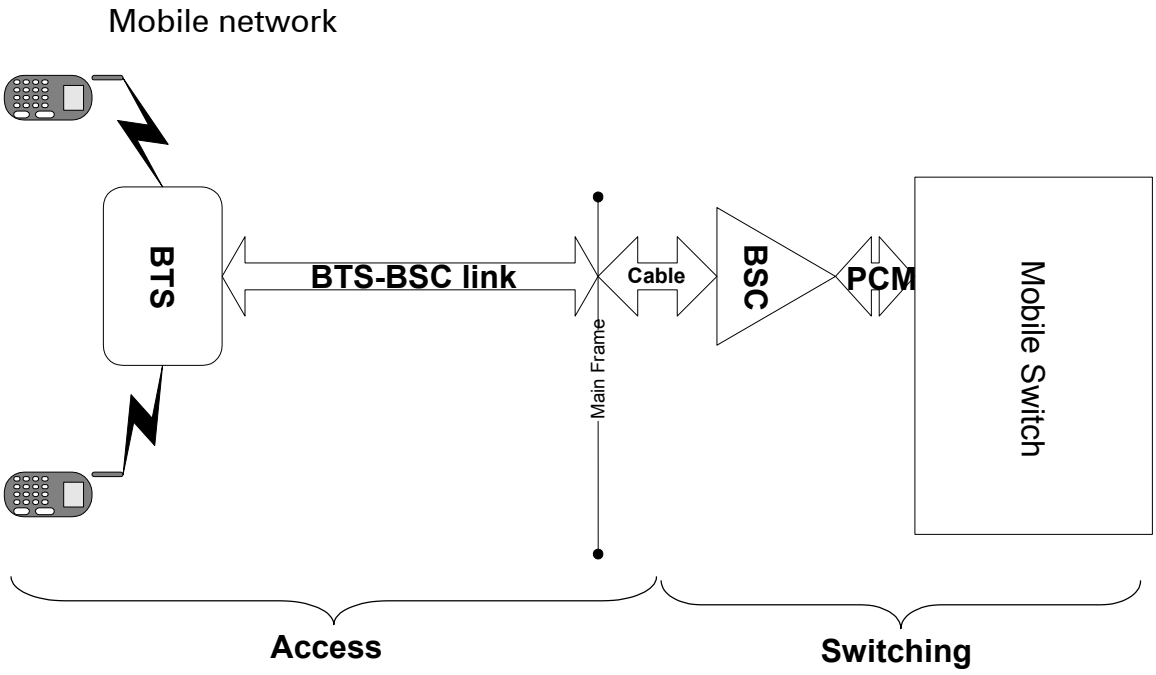


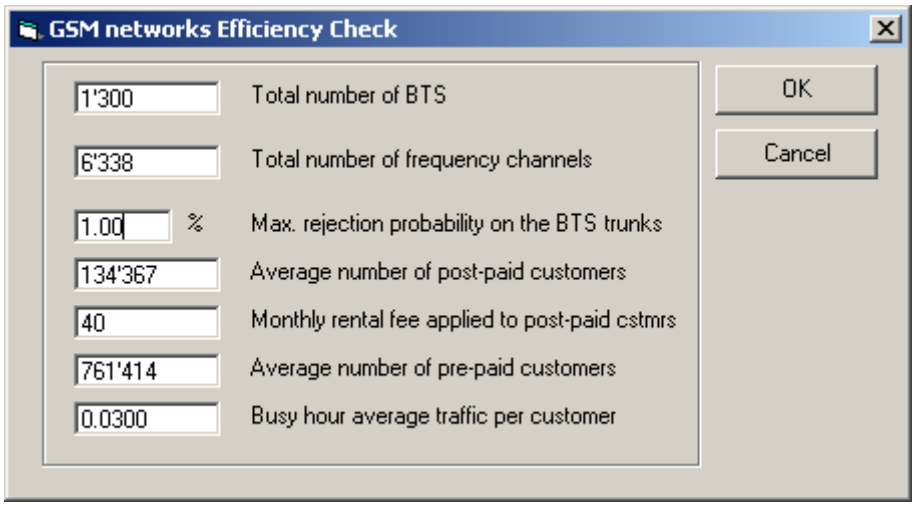
14.2 Calculating the cost of inefficiency for a mobile network

For **GSM mobile networks**, COSITU has an additional feature that takes into account the following:

- Mobile capacity and growth:
  - Base station controller (BSC) access capacity
  - Capacity utilized
  - Base transceiver station (BTS) traffic growth and its connection to growth in capacity utilized
- Determination of monthly subscriber fee taking into account the size of prepaid services
- Relationship between number of mobile subscribers and capacity of access network is a function of the traffic
- Therefore, knowing the actual current number of subscribers and their actual traffic, and making certain assumptions about the quality of service, it is possible to determine the equivalent network capacity, in terms of traffic and number of subscribers
- Data on actual number of subscribers and equivalent capacity may be introduced[4] into COSITU to calculate network efficiency.

[4] The values displayed may be modified manually for calculation but the modifications are not memorized because the values will be systematically recalculated on the basis of information introduced in the window below ("GSM networks Efficiency Checks").

The following utility comes up automatically if the network for which calculation is being done is a GSM mobile network.



Total number of BTSs

In these networks, BTSs are the terminals for one or more carrier frequency channels. Each carrier frequency can carry up to eight separate telephone calls at the same time.

The better these capacities are utilized, the better the network efficiency, in terms of resource expenditure.

Number of frequency channels

The number of channels effectively utilized between the BTS unit and the BSC unit for a given mobile network. The frequency channels reserved by the operator and not at all installed in the network are not taken into account either in terms of quantity or in terms of cost, in particular for the calculation of interconnection or termination rates.

Maximum probability of rejection

As a criterion for quality of service, this parameter, if fixed by the regulatory authorities (in the context of determining interconnection and termination rates, at least) can have a significant impact on the dimensioning of BTSs, in particular.

In order to avoid excessive complexity, COSITU approximates this constraint with reference to a medium BTS having a capacity, in terms of simultaneous communication circuits, of:

Mean capacity = (number of frequency channels used × 8)/Total number of BTSs

NOTE – If the operator possesses detailed information on the individual BTSs, it is possible to evaluate the efficiency of utilization of each BTS in the network in addition to overall performance, by taking the mean value, weighted by the number of communication circuits.

Number of subscribers with invoice billing

The number of customers having a permanent subscription contract with the mobile telephone service provider. Unlike other types of customer, they pay a periodic subscription fee.

Monthly subscription fee (MSF) of customers with invoice billing

If mobile service subscribers with invoice billing fall into several categories with different MSFs, the weighted mean value should be entered here.

Annual average number of prepaid customers

The number of customers having an occasional use arrangement with the mobile telephony service provider. Unlike other types of customer, they purchase prepaid cards (which are frequently reusable) and are thus not subject to either the monthly subscription fee or the invoicing process.

Average per-subscriber traffic

Mean number of traffic hours charged per customer during hours of heavy traffic, in Erlangs.