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Contribution to Improving the Treatment of CDR in Development Countries

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ABSTRACT

Traffic is one of the most important values in the telecommunication's sector. Unfortunately, most of the part of that value is beyond the control of the International Telecommunication Union (ITU) and the countries in development while on its mastery depend the accuracy and the relevance of the sector development policies. Today, it is clear that States, through the regulatory bodies, are focused on the statements made by telecommunication operators to issue invoices at the end of each month. The regulator has no visibility on incoming calls or calls made by the rest of the world to a particular country. For better management of this situation, we propose through this article a control system for regulators to have visibility on the incoming traffic. The system allows then, the State to be able to collect its share that's paid by the foreign operators and not by the local one.

Keywords: *Call Details record (CDR), Pricing, Traffic, Visibility, Volumetry*.

1 INTRODUCTION

The world today has become a global village where exchanges have no borders. The Information and Communication Technologies (ICT) allow the convergence of Computers, Audiovisual, and Telecommunications [1], participating in the dynamics of an automatic information processing in real time. Each country receives a considerable number of traffic per day, week, month and year. In many countries, particularly countries in development, there are large emigrant populations, which contribute significantly, through remittances and phone calls to the turnover achieved by financial companies and Telecommunication operators. However, most of the countries do not properly collect royalties on international incoming traffic, as they do not have appropriate technical tools to control traffic and to face operator's statements. Controlling traffic is a source of revenue that will allow States/countries to finance structural projects in the field of Research, Education etc. The aim of our work is to provide a web platform that calculates for a given CDR, the number of calls, the number of seconds, the minutes and the billed or charged traffic. To do so, we will create accounts on an Asterisk [2] server and will use softphones to make calls in order to generate CDR. The other way is to test the platform using an already made CDR file (obtained from a real Telecommunication operator).

In the continuation of this paper, we will present in section 2, the context or research. In section 3, we will speak about regulation of telecommunications. As in point 4, we will speak about pricing in a convergent network of telecommunications. As in point 5, we present results resulting from simulation. Lastly, the sixth and last section will be booked with the conclusion and the prospects.

2 CONTEXT OF RESEARCH

2.1 Problem

In the world, the industry of Telecommunications is a key sector of many economies that's rapidly expanding. But the lack of control and mastery of

the volume of the international incoming traffic to a Telecommunication operator by the regulator as well as the high rate of fraudulent traffic, are a major lost for local industry actors. That situation is also true for States/countries. This fraudulent traffic benefits to individuals. International traffic control is part of the International Telecommunications Regulations (ITR) [3] clearly stating, "The sovereign right to regulate its telecommunications is fully recognized for each country." The control will allow States, via the regulators to know the total volume of the incoming and legally established operator's traffic.

2.2 Issues

Traditionally, the telephone traffic was exchanged between operators on a bilateral base defined according to the D-150 recommendation of the ITU-T [4]. The exchanged traffic had for origin the country of residence of the two operators (for the greater part in monopoly position of State) who established between them a distribution tax intended to pay for the use of their respective networks. This exchange was made via a center of transit after an agreement on the rates to be distributed between origin, transit and destination. In the 90s, the transit market has become very competitive and strategic and we have seen the abandonment of ITU rules for the adoption of the so-called "Hubbing" which consists in providing or ending complete traffic to third-party networks according to beforehand negotiated conditions. From a bilateral system defined by ITU with secure rules guaranteeing the exchange of international traffic between hundreds of operators, we moved to a system governed by the market of routing at a lower cost (Least Cost Routing) where the involved actors (several thousand of operators and intermediaries) are using every mean to capture the maximum possible traffic going to all destinations, optimizing the cost and routing at the expense of quality. This widespread practice of "Hubbing" led to the creation of an international stock market of traffic around a wholesale market. This market is dominated by a number of carriers that escapes to the control from governments, regulatory bodies and international organizations such as the ITU. Indeed, we notice that the volume of traffic received from developed countries is greater than the volume of traffic emitted by countries in development. Hence the interest to exploit the call detail records (CDR) [5] generated by the equipment of operators of Telecommunications.

Below is an excerpt from a CDR which provides information, on the caller, the called/callee and the call duration.

ORIG_CALLING_NUM	ORIG_CALLED_NUM	IN_TRUNK	OUT_TRUNK	DURATION
0022222301381	226341008801	43	5	22
00249188601083	221389654838	SDN_KOS	DK_CMSC0_1	10
002491878901081	221350054838	18	6	79
00249180901083	221300654838	13	4	58
00249184901282	221328054838	SDN_KOS	DK_CMSC0_1	131

Fig. 1. CDR example

3 REGULATION OF TELECOMMUNICATIONS

The sector of Telecommunications is regulated worldwide by the International Telecommunications Union (ITU). Taking into account the sovereignty and security of States, it is left to each country the latitude to regulate their telecommunications at their will. The interest for a sovereign country is indeed to achieve the control of the international incoming traffic by establishing the resources and data collection procedures. Telecommunications are a set of activities convenient to the analysis of economic and legal phenomenon of regulation. The regulation is a concept that was born at the end of the monopoly, according to the fact that originally, each country has an incumbent operator. With the opening/beginning of the competition, States have issued licenses to other alternative operators that have entered the sector. Thus, it was necessary to set up other texts/laws and regulations which allow all stakeholders (government, incumbent operators, new incomers, consumers...) to meet their interests. It is from there that was the regulation born.

3.1 Position of authorities of regulation

ITU D156 recommendation [4] considers that the networks in developing countries are beneficial externalities offered to users of networks in developed countries. An increasingly marked imbalance is noticed between the situation in developed countries and the situation in developing countries. This imbalance is especially actual in the field of the economic growth and in the field of technology progress. That's why, the ITU exhorts developing countries to ask for a network externality bonus that is an additional element but not a cost element. It is just a bonus paid on the distribution tax of the international traffic of network operators in developed countries. Thus, international and national institutions of regulation are favorable to all the initiatives organized to fight frauds. With the control, the State is going to gain

more money on VAT (Value Added Tax) compared to what it perceived from operators unreliable statements.

3.2 Legal legitimacy for a State to control incoming traffic

The first legal argument on the control of incoming calls holds a general principle of international law which states that: "States are free to organize sovereignly Telecommunications on their own territory as they wish in order to fit and submit to the law of their choice, to the legal traditions of the country, to the dominant political doctrine or to the national economic development requirements." [6]. This principle which underlies the sovereign right of the State to intervene in the control of the incoming traffic is due to the fact that Telecommunications regulation was eminently technical and protector of the interests of operators who exercised under a regime of State monopoly. This regulation faded to make way for the Telecommunications law (or right) whose the purpose is to seek a balance between the requirements of the proper functioning of the market and the necessity of the presence of the State. This right is based on three layers of rules governing the Telecommunication's sector:

- The main principles such as the guarantee of secrecy of private correspondences which supply all the material (subject);
- A set of measures defining the regime of the access to markets, Telecommunications activities (networks and services), interconnection, consumer protection, competition (price regulation) between actors;
- Technical rules for the use of the frequency spectrum or the evaluation of equipment... This shows that the control of traffic and pricing pull their substance from the material of the three layers so indicated and that its object can not break these rules.

4 PRICING IN A CONVERGENT NETWORK OF TELECOMMUNICATIONS

Pricing is the mechanism by which a service determines the amount of the minimal counterparty amount of the due for a service provided or to offer. In the area of pricing, countries are sovereign. No rules of the World Trade Organization (WTO), any international agreement, no community legal act of the West African Economic and Monetary Union (UEMOA) or no rules of the Economic Commission of the States of the West Africa (ECOWAS) can oppose it. No regulations or no international convention impose on States any rules to match to practice pricing of international calls which are of three types: voice, data and video routed to a convergent network of Telecommunications [7]. In the few countries that do traffic control, the focus is mainly placed on voice traffic while the volume of data traffic is increasing compared to the voice traffic. The purpose is to have a perfect control of the pricing process of the share of the State on the incoming international traffic, following the following phases:

- CDR collection
- CDR processing
- Calculation of charged traffic (share of the State).

The exercise is to confirm or to refute the results (minutes) from the CDR by demonstrating it in an objective and rigorous way of processing. At this level, the processing focuses mainly on the voice traffic and actual calls with durations. The volumetry on CDR is obtained, based on the number of calls, by adding the number of seconds and the number of minutes. The share of the State will be equal to the number of minutes multiplied by a ratio. For example a State may decide to take off 25 AFC Francs (African Financial Communities: an African currency) per minute on each direct, transit or bypassing incoming call. The main part is that, the call must be an international forwarded call to a third party country and recorded on a CDR that can serve validly as a proof [8].

5 SIMULATION

The aim is to make a simplified and detailed CDR processing tool for operators of Telecommunications. To do so, we have used technologies such as HTML5 / CSS3 and PHP through a web platform or interface [9]. The platform uses a PHP script that processes the submitted information and returns the results to the user. So we will need a web server with a PHP interpreter. The platform takes as input a CDR file in Comma Separated Value (CSV) format and the output after processing is displayed on the web interface. The form that is responsible for input data collection is as follows:

```
<form method="post" action="test.php" >
 <table width="400px" class="offree">
 <tr>
  <td valign="top" class="offree_td">
   <label for="diametre" class="required"> Veuillez donner l'emplacement du fichier
                                          <span class="required_star"> * </span></label>
  </td>
  <td valign="top" class="offree_td">
   <input type="text" name="fichier"  maxlength="90" style="width:293px" required autofocus>
  </td>
 </tr>
 <br />
 <tr>
  <td colspan="2" style="text-align:right"  class="offree_td">
   <input type="submit" value="Voir les details">
  </td>
 </tr>
 </table>
</form>
```

Fig. 2. Information collection form HTML code

The user is prompted for the location of the CDR file.

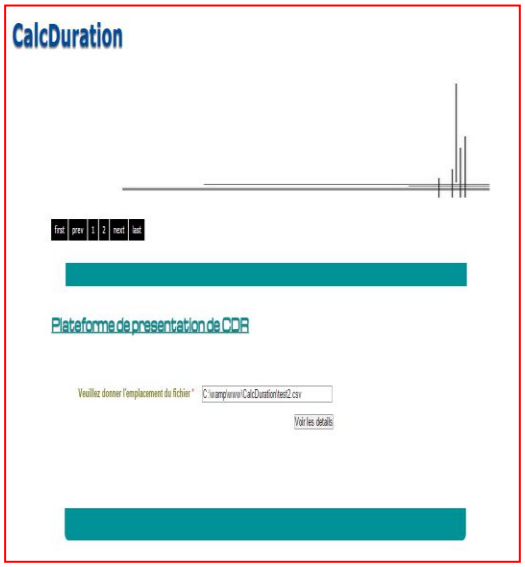

Fig. 3. CDR file import

Clicking on the "Voir les details" button, after submitting a 5 records file, the system returns the following results:

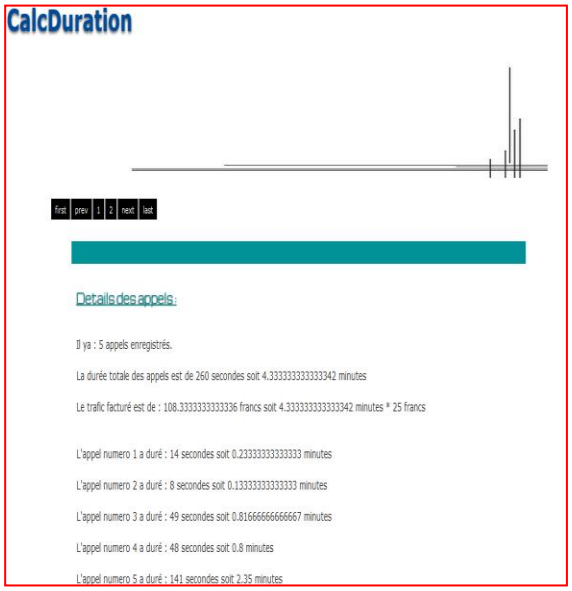

Fig. 4. Results

108.33 AFC Francs (African Financial Communities: an African currency) represents the amount obtained by accumulation of all of the call durations.

5.1 Description

The script collects the information submitted by the user from the CDR file and returns the results. Among the expected results, there are: the number of calls, the global duration of all the calls in seconds and minutes, and the billed or charged traffic before displaying the duration of each call in seconds and minutes.

5.2 Comments

Given that each line of the input file corresponds to a call, the number of calls can be known through the "count()" function, which receives an array as a parameter to return its size. The durations of the calls are listed in the CDR file at the fifth column, which is the fourth column in the array. So, to make the accumulation of the durations of all calls, we used a "while" loop adding each fourth column value to the next and so on. The result of the accumulation is converted in minutes (from seconds).

A ratio of 25 AFC Francs (African Financial Communities: an African currency) is applied to the result of the obtained accumulation to calculate the invoiced traffic from a CDR. To browse the entire file and view the details of each call, we used the "for" and the "while" loops. But before using that loops, we have put a conditional structure ("if") to check if the specified CSV (Comma Separated Value) file exists.

The following script enables the CDR processing:

```php
<?php
$emp=$_POST['fichier'];
$fichier = $emp;
$contenu_array = file($fichier);
echo "Il ya : ".count($contenu_array)." appels enregistres.";

echo "<br />\n";
echo "<br />\n";
echo "<br />\n";
$row = 1;
if (($info = fopen($fichier, "r")) !== FALSE) {
    while (($data = fgetcsv($info, 1000, ",")) !== FALSE) {
        $num = count($data);
        echo " L'appel numero $row a dure : ";
        $row++;
       for ($c=0; $c < 1; $c+=1) {
           echo $data[4]." secondes soit ".$data[4]*0.0166666666666667."
            echo "<br />\n";

            echo "<br />\n";

       }

    }
    fclose($handle);

}

?>
```

Fig. 5. Script processing

6 CONCLUSION AND PERSPECTIVES

The proposed CDR processing system will allow the State to dissuade swindlers (operators). Also, the State will no longer relied solely on the data reported by operators but on the actual data generated by the CDR. Thus, the State will generate more revenues to finance various projects in the field of Education, Health, Research, etc. Finally, the regulator will be able to manage potential disputes opposing operators relying on CDR as evidence. Given the number of CDR and the size of each, the regulatory body can use big data for better organization of the information collected from the operators. This will ensure a sustainable and secure storage.

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