Real Impact of the Blockchain in Securing a ToIP Network

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ABSTRACT

Telephony over IP (ToIP) is a cost-saving communication technology based on voice over IP (VoIP) that enables enterprises to reduce communication fees. However, ToIP faces many security threats due to its IP-based nature. This work aims to improve ToIP security using cryptography and blockchain technology. The authors propose a secure approach to user registration, authentication, communication session establishment, and communication data storage. The proposed solution leverages blockchain technology to ensure the integrity, confidentiality, and availability of communication data. By implementing this solution, the researchers aim to enhance the security of ToIP networks and protect them from cyber threats. This approach provides a secure and reliable way to support ToIP services while preserving confidentiality and privacy.

KEYWORDS

Blockchain, Cryptography, Security, Telephony over IP (ToIP), Voice over IP (VoIP)

INTRODUCTION

Telephones are an important tool in the business world. It's the principal source of contact between enterprises and customers. Since its creation in 1876 by Alexander Graham Bell *(*https://www.history.com/this-day-in-history/alexander-graham-bell-patents-the-telephone*, 2022),* telephone use hasn't ceased to increase. So telephonic communication takes a great place in enterprise development, and then, country development. The report is that, with traditional telephony, we spend more and more on our telephonic communications. The table below, published in November 2021 in the annual activities report of RAECP (Regulatory Authority for Electronic Communications, posts and Press distribution) in Benin, presents mobile telephonic traffic evolution from 2019 to 2020 in Benin Republic.

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Table 1. Mobile telephonic traffic evolution from 2019 to 2020 (RAECP BENIN, 2021)

Designations	2019	2020	Tendencies
Intra network traffic (in minutes)	3 795 312 233	3 913 566 886	3,1%
National outgoing traffic (in minutes)	1 617 239 901	1 642 941 183	1,6%
National incoming traffic (in minutes)	1 661 100 686	1 659 876 456	- 0,1%

Source: (Operators Data, 2020)

In 2020 in Benin Republic, the intra network traffic was 3 913 566 886 minutes (or 234 814 013 160 FCFA for 1 franc/s); in other words, intra network voice traffic and national outcoming voice traffic have known respectively increasing of 3.1% and 1.6% of volume comparatively to 2019. Although considerable efforts are done in order to improve telephonic communication fees, the question remains: How can we reduce telephonic communication fees ?

The merger of IT and telephonic networks that has been done since 17 years has considerably upset the telephony world. With this merger, we talk of Telephony over IP which needs, before all, great skills in systems, networks and telecommunication fields. Voice over IP is a complex field comprising a lot of essential concepts to know, before installing your own telephone system based on a free telephone switchboard. VoIP is a technology continuously used by a large number of users and businesses to transmit voice communications and multimedia sessions over the IP protocol. *(Félix Meloche, 2016)*.

The American Center for Technological Innovation and the Brookings Institution have studied the use of free VoIP applications (whatsapp, messenger, etc.) and have found that the use of such applications adds 0.23% to national Gross National Product (GNP). Concerning Morocco, the American center assured that the non-use of VoIP applications (for around 11 months) caused the national economy to lose around 320 million dollars. *(Center for Technology Innovation for Brooking, 2016)*

As)any technology is not without drawbacks, VoIP encounters security networks problems. The goal of our study is to use blockchain technology to enhance security in VoIP networks. The major problems encountered in IP telephony include vulnerable authentication which leads to identity theft, listening to the network and therefore calls through applications such as wireshark and ettercap (violation of user privacy) which can lead to the modification and deliberate falsification of information displayed on caller ID systems. *(Félix Meloche, 2016)*

It is on this issue that we are working by strengthening security in an IP telephony network thanks to a revolutionary technology that is the blockchain.

OPERATION OF TOIP

Characteristics of ToIP

ToIP is a network based on VoIP technology and offers more advantages than Public Switched Telephone Network (PSTN):

Meaning

VoIP is a technique that allows communication by voice (or via multimedia streams: audio or video) on IP-compatible networks, whether private networks or the Internet, wired (cable/ADSL/optical) or not (satellite, Wi-Fi, GSM, UMTS or LTE). VoIP concerns the transmission of voice over an IP network. *(Félix Meloche, 2016)*

Figure 1 below shows us how this data transport works on IP protocol. Indeed, the first step consists in capturing the voice using a microphone, whether it is a telephone or a headset microphone

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