Survey on VoIP call security perception during COVID-19 pandemic

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Abstract—The goal of this paper is to identify the most popular users' call security worries and users' perceptions about provided call security by popular VoIP-based applications during the COVID-19 pandemic. To accomplish this goal, we did a survey among different age categories in North Macedonia. In this paper, we describe how applications provide call security and we present and analyze the results of the survey.

Keywords—VoIP, security, COVID-19 pandemic

I. INTRODUCTION

Voice over Internet Protocol (VoIP) is a highly effective technology for enabling voice communications and media sessions over Internet Protocol (IP). VoIP offers significant cost savings over traditional landline service, long-distance phone calls become very inexpensive and that has attracted the most attention. Covid-19 has changed how we live, study, work and interact. Following the essential remote working protocols, there was a transition to work-from-home and the use of VoIP-based applications increased significantly.

In our paper, we describe how popular VoIP-based applications: Viber, Facebook Messenger, Discord, Whatsapp, Skype, Instagram, and Telegram provide call security. Our research focuses on the answers to the survey about call security perception from users of VoIP bases applications during the COVID-19 pandemic. We conclude that users consider that applications provide excellent and satisfactory call security and they are right.

II. CALL SECURITY

A. Call encryption

Analyzed applications ensure call security by providing end-to-end encryption (E2EE) or by using Transport Layer Security (TLS) protocol [1].

TLS provides encryption between users and service providers (applications), while E2EE provides encryption directly between users. E2EE ensures that only call parties can listen (and view), and nobody in between. We can conclude that applications that provide E2EE provide more privacy and security than applications that use only TLS.

B. Applications security

Viber [2], Whatsapp [3], FaceTime [4], and Telegram [5] provide end-to-end encrypted by default. Viber uses Salsa20 cipher [6] and other applications use AES-256 cipher [7].

Facebook Messenger [8], Instagram [9], and Skype [10] provide end-to-end encryption using AES-256 cipher, but not by default. To have end-to-end encrypted you have to use Secret Conversation on Facebook Messenger, End-to-end encrypted chat on Instagram, and Private Conversation on Skype.

Discord [11] does not provide end-to-end encryption.

C. Comparison

Viber, Whatsapp, FaceTime, and Telegram provide more secure and privacy calls than Facebook Messenger, Instagram, and Skype default conversations. All applications (can) provide more security and privacy than Discord.

Viber, Whatsapp, FaceTime, and Telegram provide excellent call security. Facebook Messenger, Instagram, and Skype by default provide satisfactory call security, but there is an option to have excellent call security. Discord provides only satisfactory call security.

III. METHODOLOGY

In our work, we surveyed 161 people in North Macedonia. We were distributing the survey through social media and analyzed applications, with our friends and family, and gathered the responses for about 1 week. Our survey was answered by 36% male respondents and 64% female respondents. Because of the distribution of the survey, most of the respondents 61.49% belong to the 18-24 age group, and other respondents belong to the other age groups with a representation of around 10%. Our survey was answered by students 63.35%, employees 22.36%, retirees 9.32%, and 4.97% not employed. The respondents were asked a different set of questions about their use of the applications and VoIP call security perception. The results of the survey are presented and discussed in the next section.

IV. RESULTS

We asked our respondents which applications they use most for calls and which applications they started using (more) during the COVID-19 pandemic. As we can see from
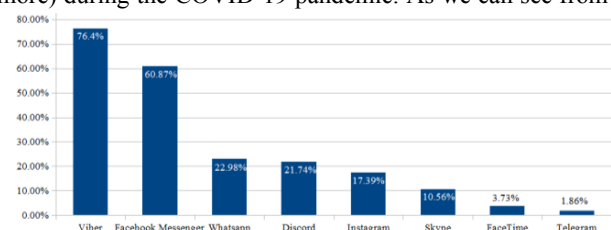

Fig.1 the most used applications for often calling are Viber and Facebook Messenger.

Fig. 1. Use of application for often calling

During the lockdown period in the 2020 year, we almost did not have live communication with family members, friends, and colleagues, though we live in the same city, and

we wanted to talk with them and see them, so we started using analyzed applications for local calls more. Also maybe because of that, our respondents use applications the most for local calls (77.5%), although VoIP at the beginning was the most used for international calls. The responses about which applications respondents started using (more) during the COVID-19 pandemic are shown in Fig.2.
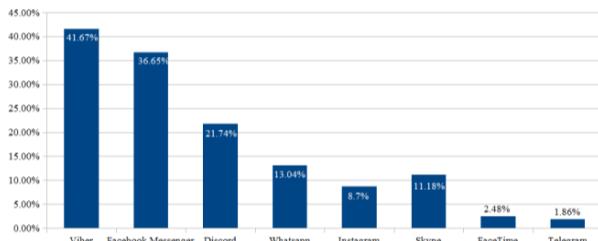

Fig. 2.   Increased use of application during COVID-19 pandemic

We can see from Fig.2 that the most used applications Viber and Facebook Messenger have increased in usage for calling during the COVID-19 pandemic, but Skype, Discord, and Telegram have the largest increase. On the report of Viber in 2020 increase was 170% in all group-related activities, including chats, calls, and Communities [12]. As stated by Meta in February 2020 in Italy time in group calling increased by over 1,000% during the last month [13]. According to CNET in March 2020, 70% more people were participating in group video calls using Facebook Messenger, and the amount of time spent on those group video calls has doubled globally [14]. Many people started learning new languages during the COVID-19 pandemic, and the classes of a big part of the courses were conducted on Skype, maybe this is the reason of the large increase in use by our respondents has Skype with 105.87%. As claimed by CNET Skype saw a massive increase in usage as coronavirus spread, Microsoft said 40 million people are using Skype daily in March 2020, up 70% from February 2020 [15]. According to the Statista during the COVID-19 pandemic, there was an increase in playing games [16], and Discord can be described as a gaming social media application, so we can suppose that is the reason for a large increase in usage with 100%. The most important conclusion from Fig.2 is that all applications have an increase in usage for calling, and the respondents' reason for using the application is described below.

VoIP has become a widely used technology because it offers free calls. So we asked our respondents about the reasons Why they use these VoIP-based applications for calling? The most common reason for using applications is offered Free calls (77.9%). Also, the common reason is offered the Video call option (76.5%), accordingly most respondents make video calls, as we can see in Fig.3, and another not common reason is offered the Screen share option (22.1%).
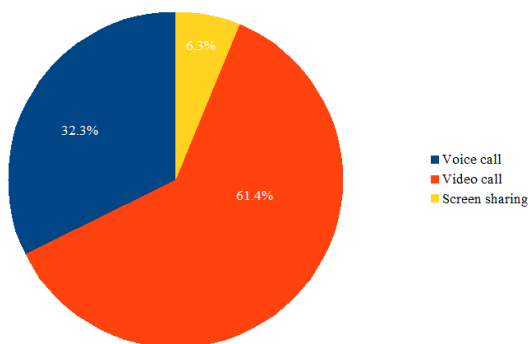

Fig. 3.   Respondent makes the most video call, voice call or screen sharing

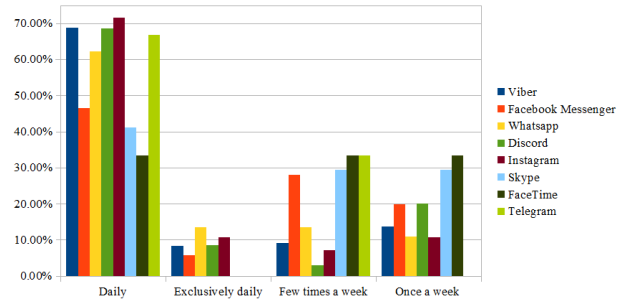Almost all respondents (99.38%) use their mobile phone

for VoIP calls, because it is always with them (99.38%) and it is practical for calls (89.44%).

Fig. 4.   Frequency of use of application for calls

We asked our respondents how often they use applications for calls during the COVID-19 pandemic and Fig.4 is a detailed view of their answers. We conclude that applications are used mostly daily by our respondents, but also they often use applications in general. Accordingly, respondents are concerned about call security. Also, we asked respondents about their most VoIP call duration during the COVID-19 pandemic. The most common call durations are less than 30 minutes (39.7%) and 30 minutes - 1 hour (36.8%). On the other hand, less represented are calls duration 1 hour - 2 hours (13.2%) and 2 (and more) hours (10.3%).
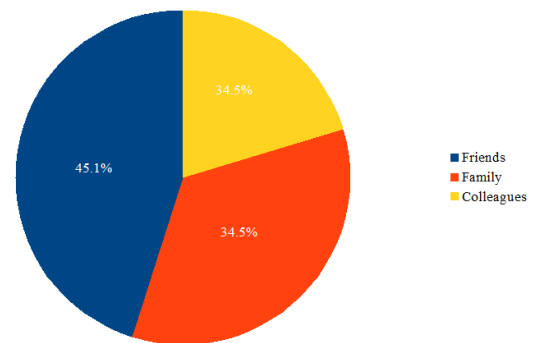

Fig. 5.   Respondent use applications the most for call with friends, family or colleagues

Our respondents were asked With whom they communicate the most (during the COVID-19 pandemic) through applications. We can conclude from Fig.5, that our respondents the most communicate with their friends, appropriately, they started to use applications more for a calls with their friends during the COVID-19 pandemic, as we can see from Fig.6. It is important to say that there is an increase in the use of applications to communicate with family and colleagues too.
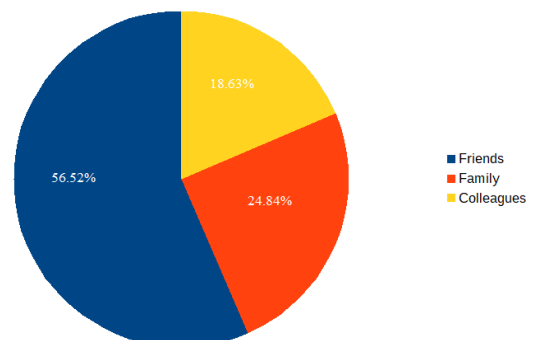
Fig. 6.   Respondents use applications the most for call with friends, family or colleagues during COVID-19 pandemic

Heretofore we presented our necessary general analysis of the use of popular VoIP-based applications. Next, we present the analysis of call security worries of respondents and a discussion of the reasons for those concerns, relying on a general analysis.

Our respondents were asked:

- For what type of communication are you most worried about the security of the conversation?

- For what type of call are you most worried about the security of the conversation?

- What level of security do you think the applications provide?
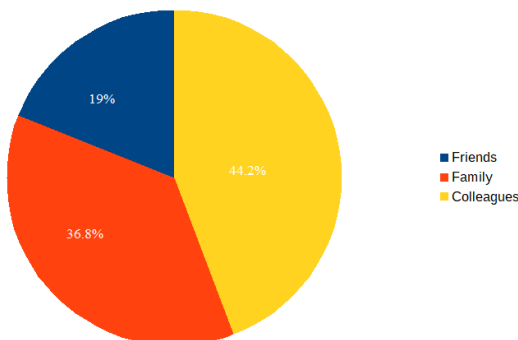

Fig. 7.   Respondent is most worried about call security with colleagues, family or friends

We can conclude from Fig.7 that our respondents are the most worried about call security with colleagues, although they communicate the most with their friends, as we concluded before. This may be due to that they may be talking with colleagues about work or they maybe work from home.
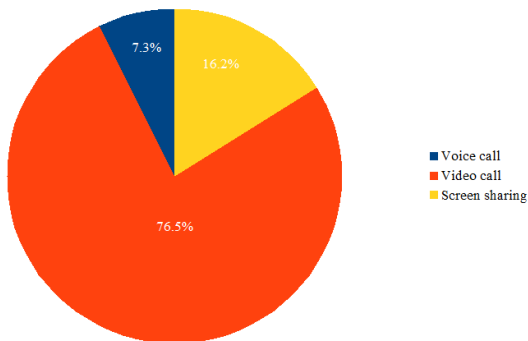

Fig. 8.   Respondent is most worried about video call security, voice call security or screen sharing security

According to Fig.8 we conclude that the most common concern is video call security.

For video calls and screen sharing calls, we have a causal-consequential relationship between the use of the call type and concern about that call security type, for voice calls, there is no dependence between the use of voice call and concern about voice call security. All respondents that mostly make video calls and screen sharing calls are the most worried about video call security and screen sharing call security. Out of all respondents that mostly make voice calls, 47.1% are worried the most about video call security, 30.3%

are worried the most about screen share call security, and only 22.6% are worried the most about voice call security.
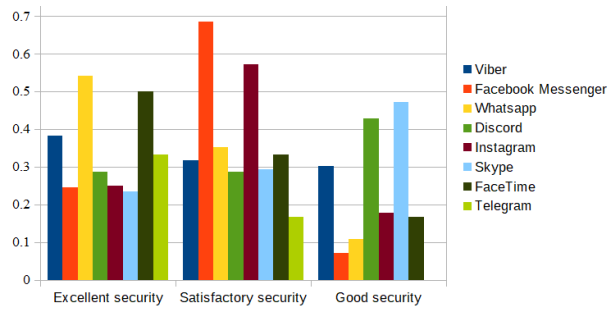

Fig. 9.   Respondent's opinion about call security level

From Fig.9 we can conclude that our respondents consider that Excellent security is provided the most from Whatsapp, FaceTime, Viber, and Telegram. Satisfactory security they think is provided by Facebook Messenger and Instagram and Good security is provided the most by Discord and Skype.

According to the conclusions that we made in Section II about provided call security by applications, we can say that our respondents are right about provided security by Viber, Whatsapp, FaceTime, Telegram, Facebook Messenger, and Instagram, but they are not right about provided security by Discord and Skype. Discord provides Satisfactory call security, Skype provides Satisfactory call security by default, but there is an option to have Excellent call security.

CONCLUSION

In our work, we describe how popular VoIP-based applications: Viber, Facebook Messenger, Discord, Whatsapp, Skype, Instagram, and Telegram provide call security. Viber, Whatsapp, FaceTime, and Telegram provide excellent call security. Facebook Messenger, Instagram, and Skype by default provide satisfactory call security, but there is an option to have excellent call security. Discord provides only satisfactory call security.

We did a survey among 161 people in North Macedonia about their use of applications during the COVID-19 pandemic, their call security worries, and their call security perception. We concluded that the respondents started use more applications during the COVID-19 pandemic. The most of respondents use applications daily, accordingly, they are concerned about call security. Respondents use applications the most for calls with friends, but they are the most worried about call security with friends. Most of the respondents use applications for video calls and they are most worried about video call security. Opinion of our respondents about provided call security is correct for Viber, Whatsapp, FaceTime, Telegram, Facebook Messenger, and Instagram, but it is not correct for Discord and Skype.

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