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ORÁCULOS DISTRIBUIDOS EN LA BLOCKCHAIN

TESIS PARA OPTAR AL GRADO DE MAGÍSTER EN CIENCIAS MENCIÓN COMPUTACIÓN

MEMORIA PARA OPTAR AL GRADO DE INGENIERO CIVIL EN COMPUTACIÓN

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INTEGRANTE 1
INTEGRANTE2
INTEGRANTE3

SANTIAGO DE CHILE
MES AÑO

RESUMEN DE LA MEMORIA PARA OPTAR
AL TÍTULO DE
POR: FRANCISCO JAVIER ANDRÉS MONTOTO MONROY
FECHA: MES AÑO
PROF. GUÍA: ALEJANDRO HEVIA

ORÁCULOS DISTRIBUIDOS EN LA BLOCKCHAIN

Este es un resumen muy resumido

Una dedicatoria corta. Por ejemplo, A los creadores de U-Campus

Agradecimientos

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Chapter 1

Introduction

1.1. Gambling

Gambling is the activity of predicting events and placing a wager on the uncertain outcome of those events, with the intent of winning money or valuable goods. A wager can be put on many different events, in a casino we find randomizing devices as dices, roulette wheels, etc. which are used to get randomize events. In other establishments we can bet on sport events, such as a horse racing, football games, etc. or the minimum temperature in Santiago during this night. Its popularity and the big amounts of money at stake inevitably entails a lot of interest on this activities. Most of the time gambling is heavily regulated and taxed, also it is usual that lotteries are owned by the state.

Internet has been making cheaper to open and operate a casino, even without complying laws from any country. This and the massive internet use, has been moving the gambling industry online[14] [8]. The global Internet gambling market was estimated to be worth US$28.32 billion in 2012 and forecasted to rise to US$49.64 billion by 2017[7]. However, gambling not only takes place in casinos, lotteries or betting sites, it can also involve two or more individuals with no intermediaries. In Chile friends usually bet on their favorites football teams.

Nonetheless all the different ways for placing a bet, all of the mentioned share a common obstacle, participants are required to trust in the other parties to pay if they lose. Even if the bet takes place in a physical casino, where the law can enforce the bet, is not certain the casino will be able to pay after the resolution. We might not be aware of the fact, but every time we place a bet we are implicitly trusting in a third party, either the other player or the bet site. For physical casinos this is usually not a problem, as they are regulated by the law, any misconduct can get the casino to the justice and even get its license revoked. As there is a significant cost on starting a physical casino, them are also encouraged to keep a good reputation, in order to get customers.

Friends usually are trusted people, so trusting them when gambling might not be considered an issue. Also, probably the friendship is at risk if the bet is not paid. Other option is

to get a third friend to get the money until the bet result. Online casinos on the other hand are more problematic, there are many knowns scam schemes, as described by Griffiths[9]. And half of the players at this sites believe the providers are cheating on them[10]. Some of them are subject of government regulation and many have being in the business for several years, this kind of characteristics could help to indicate an online site is trustworthy.

What if you would like to gamble in a event that no gambling site offers nor any friend want to. Probably the internet would be the place to look for somebody willing to gamble on this event. However, how could you trust the potential person in order to bet with him?

1.2. Cryptocurrency

Digital currency refers to any currency stored and transferred electronically. A subset of the digital currencies is called virtual currencies: them are usually defined[1] as a « *unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community*».

Based on the interaction of the currency with currencies outside the community there are three types of virtual currencies: The ones with almost no interaction with the outside money, this is usually the case of video games, where its currency is only valuable within the game. A second type is where the currency can be purchased directly using other currency. Here, we observe an unidirectional flow. The third type is when the flow is bi directional, the users can sell and buy the currency. A cryptocurrency is a bi directional virtual currency, that uses cryptography for security and anti-counterfeiting measures. Virtual currencies are been historically linked to cryptography, the first known investigations [3] to establish a virtual currency where lead by David Chaum, an American cryptographer. However, despite his and others effort (e-gold[1], Ecash[4], DigiCash, LibertyReserve, among others), virtual currencies never where massively adopted.

By late 2008, using a pseudonym, was released a short whitepaper[12] with yet another virtual currency protocol specification. A few months later, during 2009 its implementation was made available as open source code. The main difference with previous implementations was its lack of a central organization, this new coin was completely decentralized. The software started to being run by some early enthusiasts and Bitcoin gave the step from an idea to an usable coin. The first years was the coins were exchanged for free among the community users. However, at some point the community was big enough and its members started to give value to the coin, then the first exchanges from and to other coins started to take place. Bitcoin transitioned into a bi directional flow virtual coin.

Then the first online exchanges between bitcoin and other currencies started to appear, the coin started to gain traction as people outside the community were able to buy and sell coins. As the money became popular, the idea was taken and a whole generation of cryptocurrencies were born. Today the market capitalization of Bitcoin (this is, the amount of money times its value in USD) is over 25,000,000,000 USD.

[1]https://www.wired.com/2009/06/e-gold/

1.3. Gambling using Cryptocurrencies

With cryptocurrencies getting more and more popular, it was only a matter of time until the first sites started to offer started to offer some games of chance an act as online casinos. Where the only difference with a traditional online casino was the currency on which the bet takes place. However, as any other currency online casino, any player who decided to play here is at the mercy of the casino. If the casino does not want or does not have the means to pay, there is nothing the participant can do and its money is lose. More on online casinos at subsection 1.1. The problems described for online casinos using traditional currencies apply in the same way to the new ones.

After some time, people started to see some potential on cryptocurrencies to solve some of the trust issues related to gamble. In 2014 Andrychowicz et al. proposed a two party randomized gambling protocol. Players are not required to trust each other in order to gamble, so even if the loser does not behave correctly the honest player, can get its prize. The protocol is not a representation of a casino game, but effectively allows player to gamble on a random event. Also in 2014, a group of Bitcoin enthusiasts started Orisi[2], a distributed oracles system for cryptocurrency contracts. Orisi allows users to access data of the outside world from the blockchain, by using a distributed set of oracles. So instead of trusting in one instance to provide the data, the trust is placed in the majority of several different oracles. More recently, on early 2017, Winsome[3] was released. Advertised as a «*Provably Fair / Trustless Casino*», Winsome is an online casino where wager are placed in a public smart contract posted in the Ethereum's blockchain. So the contract, defining the game, is enforced by the Ethereum protocol. As May 2017, they do offer two casino games, blackjack and `Rouleth`, an online roulette.

Motivated to provide an option to gamble over real world events with untrusted peers. This work proposes a protocol to define the destination of an initial wage between the two player. The decision is taken by a set of oracles, which are being paid also inside the protocol to behave correctly.

1.4. Objectives

Design and implement a distributed protocol where real world observations can be used as blockchain transaction inputs.

1.4.1. Specific Objectives

1. Provide a protocol to make possible to gamble with untrusted peers over real world events.

[2]http://orisi.org
[3]https://www.winsome.io

2. Provide the correct economic incentives to the protocol participants to behave correctly, so everyone incentives are aligned.
3. Implement a proof of concept of the designed protocol.
4. Debate of implications and other applications for the designed protocol.

1.5. Methodology

The main phases of this work will be the following:

1. Extensive review of existing proposal and implementations to solve the proposed problem or similar ones. As cryptocurrencies are a recent investigation field, this review must cover literature as well as community gathering places, such as forums and specialized blogs, magazines, etc..
2. Analysis of current solutions to the problem and similar ones.
3. Design and implementation of a protocol to solve the problem. Implementation is considered very important as the current rate of change of cryptocurrencies is considerably fast, validating the protocol within a real implementation is critical.
4. Analysis of the economic incentives of the protocol participants, to ensure protocol viability.

Bitcoin is the first fully distributed cryptocurrency made publicly available, it was proposed in 2008 by Satoshi Nakamoto (a pseudonym) [12]. The same author shared as open source code a implementation of the protocol in January 2009. And the protocol has being running since then.

Nevertheless, Bitcoin is not the first idea of electronic cash. The idea of electronic cash has been present within the cryptographic community since at least 1983, when Chaum [3] proposed a system for anonymous payments. And the attempts kept going for other three decades, hundreds of paper have been published with improvements of e-cash schemes[2]. So, why is Bitcoin so popular and achieved the notority that three decades of academic research on the field could not achieve?

Barber et al.[2] suggest a few key points to explain why was Bitcoin the first electronic currency to take off.

1. No central point of trust. Bitcoin is a fully distributed system, there are no trusted entities in the system. The only asumption is that the majority of the network participants are honests. Every previous proposal had a central trusted entity for critical tasks, as preventing double spending and coin issuance.
2. Predictable money supply. The money supply is minted at a defined and transparent rate, defined from the begining of the protocol.
3. Transaction irreversibility. Bitcoin transactions quickly become irreversible. This is a big difference with credit cards, where chargebacks has been using largely to commit frauds.

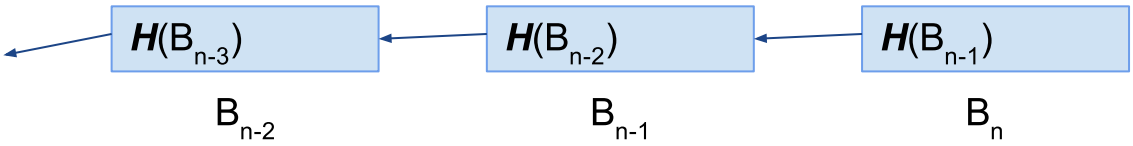

Figure 1.1: Blocks linked to each other in the blockchain

Bitcoin has not stopped to gain massive popularity and attention from the press. Mainly because its market capitalization (over USD 36000000000), and some illegal activities it has been using to as ransom to retrieve victim's data encrypted for malicious software, or as exchange medium in one of the most famous online black market, closed in 2013 by the FBI.

The main technical advance in Bitcoin is its database, the `blockchain`[5][13]. The blockchain is a distributed database formed by an always growing list of blocks, where each block contains the data to be stored, a timestamp and a link to a previous block. Its fully distributed nature allows bitcoin to lack a central authority.

1.5.1. Blockchain

The blockchain works as the bitcoin's ledger, it keeps record of all transactions and coin generation that had ever taken place in the protocol. It is completely distributed and public, anybody can participate in the protocol and get a copy of it. This makes simple to prevent double spending and be sure the received coins are valid, as anybody can examine where each coin came from.

As any other distributed system, the blockchain must resolve the consesus problem [6]. Get all the participants to agree on the data. This is a fundamental problem to any distributed system. In the the blockchain anybody with an internet connection can be part of the protocol, so solving this problem is quite challenging. Some authors argue the blockchain is the first practical solution to the Byzantine Consensus problem [11] [15].

The blockchain does not introduce a new primitive or idea to solve all of the mentioned problems, it does use existing tools in an innovative way to. To keep a consistent history the blocks are linked using the hash of the previous block, this prevents tamper on past data.

As it is public, every transaction can be verified by any protocol par

The blockchain is a chain of blocks were each of them keeps a link to the previou also fully distributed. In bitcoin

Chapter 2

Previous Work

2.1. Orisi

Orisi is a distributed system for bitcoin smart contracts that relies in multiple oracles to bring information from outside of the blockchain. It works over bitcoin by using multisig address

2.2. Winsome

2.3. Initiative for Cryptocurrencies and Contracts (IC3)

Chapter 3

Primero

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Chapter 4

Segundo

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Figure 4.1: Logo de la Facultad

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Table 4.1: Tabla 1

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