

# Blockchain and the causal tree of reference

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A partial translation of:

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In a previous article, *Philosophy of Blockchain Technology - Ontologies*, (Sfetcu 2019) I talked about applying Paul Ricœur's narrative theory in developing an ontology of blockchain technology. In this section I intend to highlight the idea of an analogy between blockchain technology and the causal theories of reference. To the extent that further deepening of this idea will prove viable, I will try to develop a theory based on this analogy.

Blockchain (The Economist 2015) (Morris 2016) (Popper 2017) is a constantly growing block chain (Brito and Castillo 2016) (Trottier [2013] 2018) that contains records called blocks, which communicate with each other through messages. (The Economist 2015) We can consider a *block* as a certain *sentence*. The sentence is taken into consideration only if it includes the reference, as in a blockchain a block must contain the transaction data. Each block/sentence contains a timestamp and transaction data. The *transaction data* can be considered here as analogous to the *reference*, which links a

name to an object. Just as in a blockchain a transaction is *initiated* by a *miner* and the causal chain starts from him, in a causal theory there is an *initiator* who gives the name and establishes the reference between name and object in a process (initial *baptism*).

Blockchain is designed as "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way," (Iansiti and Lakhani 2017) using a peer-to-peer network. The *transaction* is the initial naming (*baptism*, according to Kripke), (Kripke 1980) and the *peer-to-peer network* represents the *bilateral communication* system between two *nodes* in the blockchain respectively two *users* of a community. After *recording the data (accepting the reference)*, the data/reference in a given block/sentence cannot be modified retroactively without changing all the data/reference in all the blocks/sentences included in that chain, which requires the consent of the network (of the chain nodes; of users in the case of causal theory). Unlike the blockchain, where the block communication is made only between two nodes, and thus a chronological chain is formed, in the case of a community reference communication can be done from one user to several users simultaneously, which can then forward the reference, so here we can actually talk about a tree system, a **causal reference tree**. In the blockchain, at the same time as the data transmission, other additional information can be transmitted, but the acceptance is done only for the transaction data, the additional information gives details about the transactions but does not count on the acceptance. In this potential causal theory, additional information (descriptions) can be transmitted simultaneously with the reference, but they are not taken into account when accepting the reference by the other users. From this point of view, such a theory of a causal reference tree rather accepts the idea of Saul Kripke, (Kripke 1980) that in a causal theory the descriptions do not matter. If the descriptions are intended to be included in the causal reference tree and some of these descriptions are modified, disappear or added over time, a temporary marking system can be imagined recording the changes. An idea would be, according to Tom Gruber in the paper *On the design principles of the ontologies used for knowledge exchange*,

(Gruber 2008) the descriptions can be assimilated to the ontology as a technical term in the field of computer science: an ontology is a description (as a formal specification of a program) of the concepts and relationships that may exist formally for an agent or a community of agents. This definition is compatible with the use of ontology as a set of conceptual definitions, but more generally. And it is a different meaning of the word than its use in philosophy.

Such a causal theory thus becomes, like blockchain, a secure, distributed system with a high tolerance for errors. (Raval 2016)

Each acceptor of a reference thus memorizes the connection between the name and the object, and optionally the other additional information (descriptions, attributes). The causal tree is propagated only by the users who have accepted the reference (acceptors), and they in turn can forward the reference to other members of the community in subsequent discussions, which can become acceptors when they accept the reference.

Each node/member of a community can initiate a new transaction/can name an object through an initial baptism, which is the starting point of a new chain/tree insofar as it is accepted by other nodes/members.

Communities that include the causal tree of reference may be open (may include new members accepting the established reference), closed (the reference is transmitted only between current members of the community - in the case of esoteric groups, for example, or of references considered secret), or permeable, where the reference is transmitted outside the community only under special conditions.

If one of the nodes/members has, for the accepted name, another reference, or modifies (intentionally or not) the accepted reference for that name, a new branch is formed for the new reference, but not in the same plane as the accepted reference. with the consent of the other users. This is the case of a *change of reference* in causal theories. This leads to a **three-dimensional causal tree**

**of reference**, and the new branch is the initial baptism for the new reference. If this new reference is accepted by other members, it is transmitted causally through the newly formed two-dimensional tree, parallel to the already existing dimensional tree from which it came off.

For several two-dimensional trees that are part of a three-dimensional tree, the most-developed two-dimensional tree becomes the main two-dimensional tree of the three-dimensional tree (the case of a name referring to a famous person). The other two-dimensional component trees become secondary trees.

Such a theory can be interpreted as a result of syntactic notation in a reference field, based on the narrative theory developed by Paul Ricœur in *Time and Narrative*. (Ricoeur 1988) For Paul Ricœur, there is an order and a structure of history transmitted through the narration of history, otherwise history would be unintelligible. But the events and facts of this narrated history disrupt the dominant order and rearrange it. Ricœur examined a number of different forms of extended discourse, starting with metaphorical discourse. Narrative discourse is one of the forms investigated by Ricœur, (Pellauer and Dauenhauer 2002) configuring heterogeneous concepts that identify actions at a time when one thing happens not only after something else, but also because of something else from a story or history that can be followed. It reshapes physical events as narrative events, which make sense because they tell what is happening in a story or history. Narrations are always a synthesis of the heterogeneous concepts that shape the episodes of the story.

In *Time and Narrative*, Ricœur stressed the importance of the idea of a narrative identity. (Ricoeur 1988) Ricœur's argument regarding individualization continues through a succession of stages. He starts from the philosophy of language and from the problem of identifying the reference to people as individuals themselves, not just things. This leads to the consideration of the speaking subject as an agent, passing through the semantics of the action Ricœur had learned from analytical philosophy.

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