1. **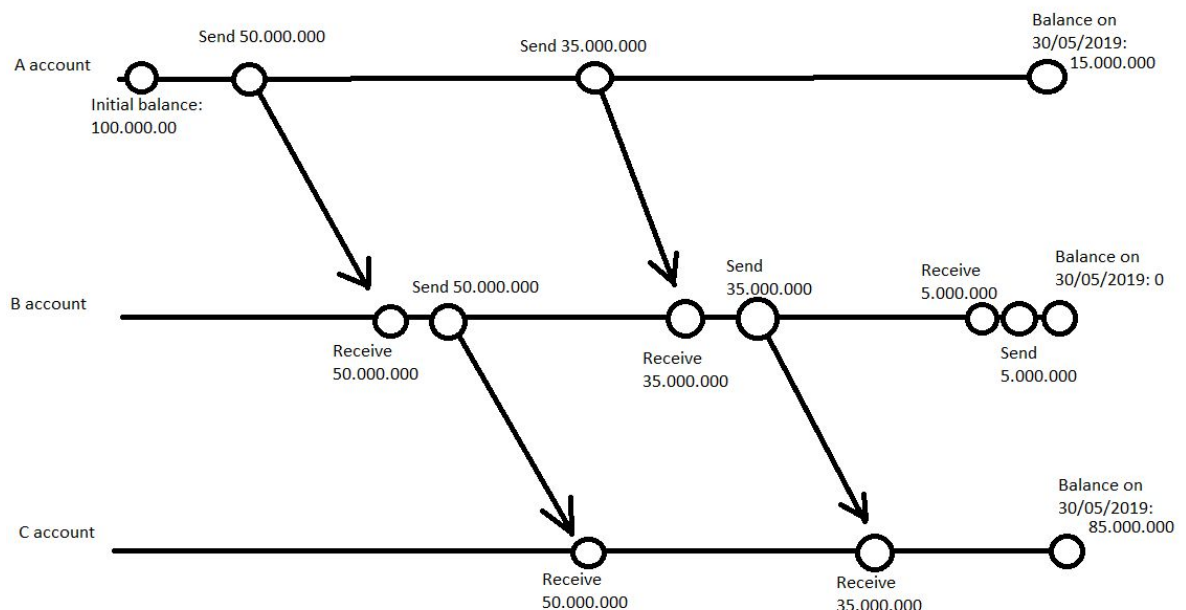From the information we have about the movements between bank accounts, represent these movements in the group by means of a chronogram, according to the process model and message passing events that we already know. Show the result to the teacher for review.**

2. **The teacher will extend the model of events already known and formalize the concepts of _consistent cut_ and _inconsistent cut_, included in the Notes of Topic 2 (Section 2.4.1). Identify examples of both types of cuts in your chronogram.**

When a cut occurs in a distributed system, as we studied in Part 1, the cut occurs on different times due to the time difference there is on each system due to the net latency.

As a consequence of this, we find two types of cuts: consistent and inconsistent cuts. Vector clocks can be used to determine whether a cut is consistent or not.

A cut is **inconsistent** when the process corresponding to the event of receiving the message has more information of the sender's logical clock than the sender. In other words, it is not possible to register a receive event when even the sending event has not occurred.

Instead, we consider a **consistent cut** if the sending of the message also belongs to the cut. It does not matter if the receiving of the message belongs or not to the cut once the sending is inside. In case it does, there would not be any cut because both events would be inside, so it means nothing to analyze this case. So, what we are going to find is that the cut leaves outside the receiving event. It is true that the communication is not going to be completed, but it does not matter because in the future it is going to be sent again.

We are going to make two cuts in the chronogram, the green one means consistent and the red one inconsistent:
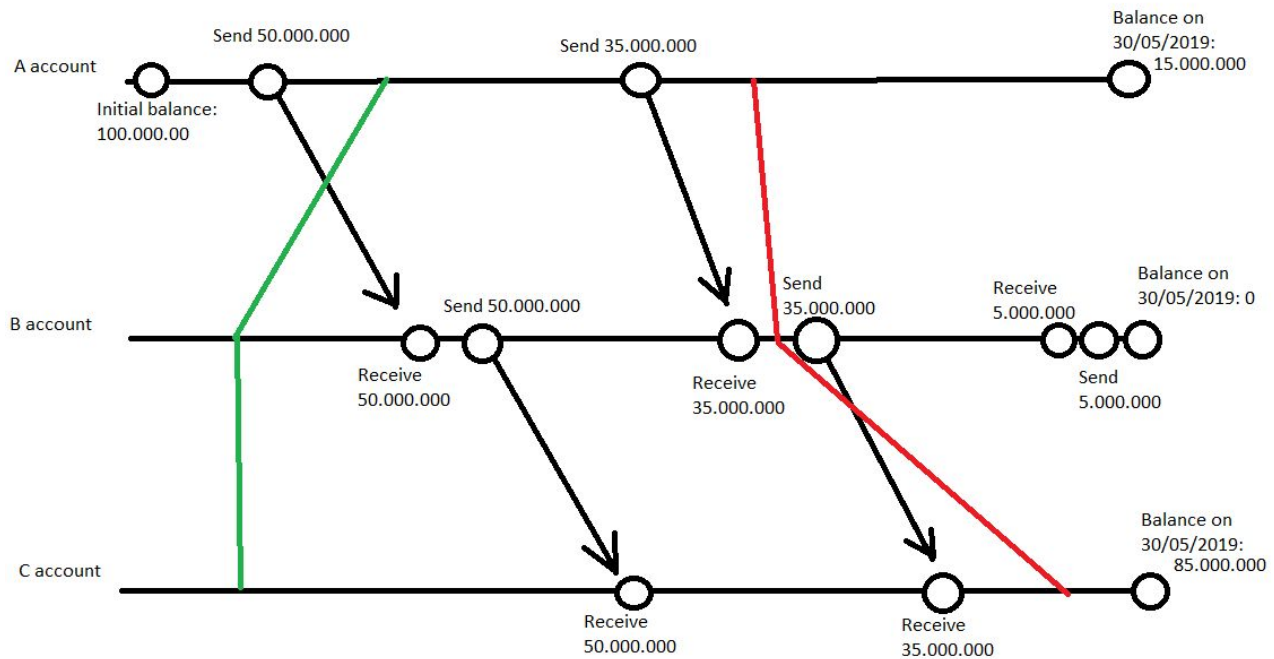
3. **In class we will discuss a formal method, based on vector clocks, to automatically verify the consistency of the cuts (Section 2.4.2 of the Notes). Now you are in a position to explain why the statement of accounts presented is inconsistent and how the construction company and politicians may have taken advantage of it. The activity is evaluated in a subsequent test.**

This is the chronogram with the vector clocks on it.
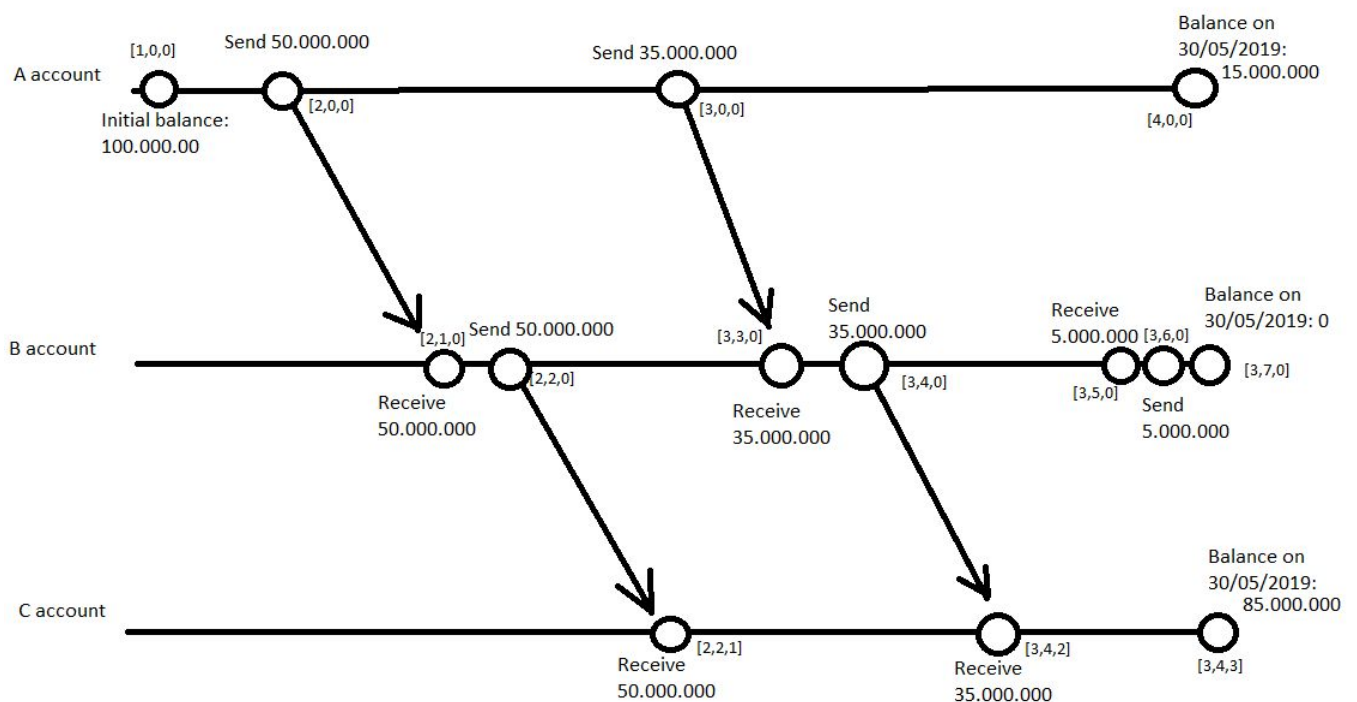
Now, we can explain how the company stole money from the foundation. Here's a graph that will help us to explain and understand the problem:
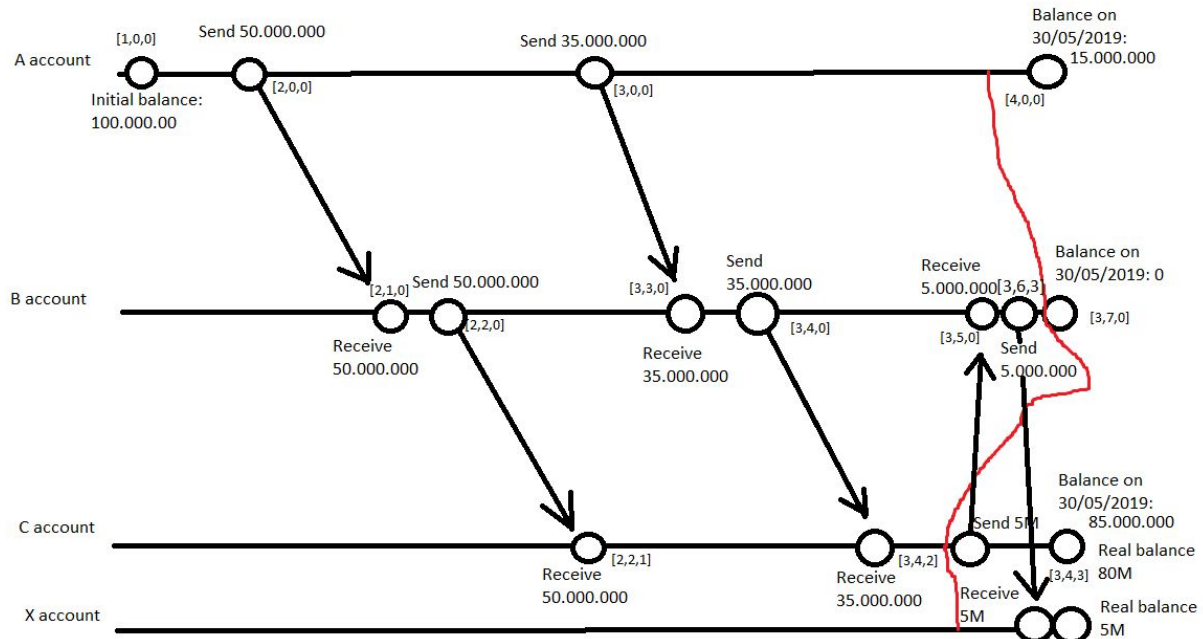
First, we have to point out that the statement of the balance on the C account was 85M is not totally true. This is because the company did take a snapshot of the global state in a manner that the last movement of the C account was not shown. This last movement consisted of sending 5M to the B account. This reception was indeed included on the snapshot, as well as the sending of those 5m to the X account.

Now, if we analyse this cut, using the vector clocks we can create the next matrix in order to analyse the consistency:

Va	3	0	0
Vb	3	6	3
Vc	3	4	2

As we can see, the cut is inconsistent because the third element in the Vb vector (3) is greater than the third element in the Vc vector (2) and it should be equal or lesser.