

# Einstein's Time Dilation concept proved false by Time Sharing methods

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## Abstract

A recent 3D computer simulation demonstrated that two inertial reference frames (IRFs) show the same count of time units by employing various methods of time sharing. This article explains those methods, the underlying concepts, and the conclusions on the common nature of time across IRFs. Multiple clocks of two different IRFs can be made to mark and count the same time units, concluding that measuring time across different IRFs is technically possible and it proves that Einstein's Special Relativity theory is wrong in its claims about a dilation of time in frames which are equivalent to each other. The Einsteinian relativistic application of the Lorentz time transformations is hence proved wrong and useless.

## 1. Key concepts

### 1.1. Event:

In this article, as well as in the other documents of the Neo-Classical Theory of Relativity (NCTR), we consider the word "event" with its meaning given by the current dictionaries:

*Event = Something that happens at a given place and time.*

We have to stress the importance of the words "*something*" and "*happens*" in the definition of an event, as they refer to all aspects of a part of the physical reality which is under observation. Therefore we reject the relativistic definition of an event as only a "*place and time*" reduced to a point of coordinates (x,y,z,t) in an abstract 4D spacetime, as we consider that such a relativistic definition is overly simplistic.

For "*something that happens*" to be observed, the physical aspects of an object need to exhibit a **change**, in such a way that an observer can **compare** those aspects (between his/her successive observations) and can decide whether the change happened or not.

Therefore, in this context we will use the word "change" with the meaning of "indication of an event".

### 1.2. Clock:

In order to perform multiple observations on the physical reality, and to make comparisons among them, an observer needs a way to identify them and distinguish each of them from the others.

A clock is a reoccurring change which is counted and compared to other changes observed, and which is independent from those other changes observed. Thus each observation can be assigned to a unique count.

### 1.3. Time:

The process of counting the reoccurring change of a clock, and also of comparing that count to other changes, is what gives an observer the sense of time.

Time is an aspect of reality and a fundamental concept of Physics which cannot be defined without appealing to other fundamental concepts such as space, matter, fields, and motion. However, the human perceptions and experiences indicate that time is distinct in its properties and different from the other fundamental concepts, in particular distinct from the concept of space.

#### **1.4. Rigid objects:**

In this paper we consider all the material objects involved here to be macroscopic, composed by a great number of particles which are arranged in shapes which ideally do not change during the experiments.

The hypothesis of FitzGerald and Lorentz about the length contraction of such objects is not considered here, however it is under our research and it will be discussed amply in the next articles describing the determinations of a common time and an absolute reference frame (ARF) for all the inertial reference frames (IRFs). The inertial motions of the objects are considered here to happen in free empty space.

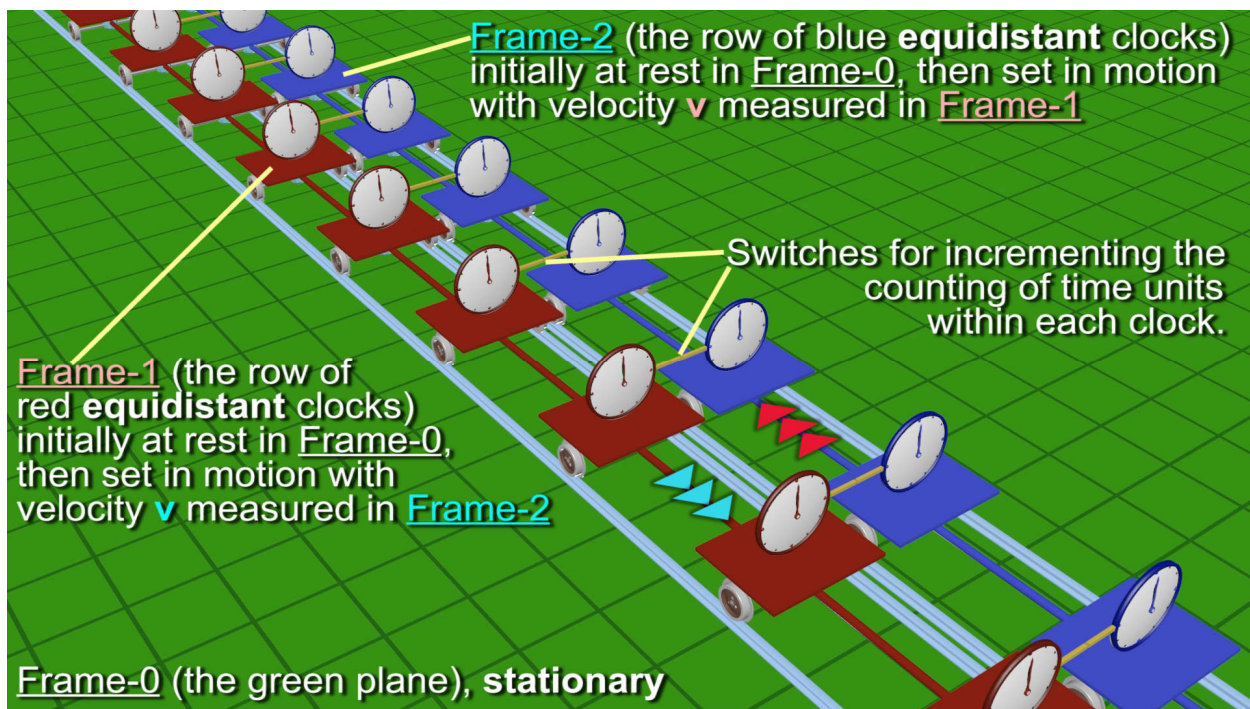
## **2. Methods of time sharing between inertial reference frames**

### ***2.1. Longitudinal methods of time sharing:***

The longitudinal methods involve the use of devices placed along the line of motion (the line described by the respective coordinate origins of two reference frames which move inertially, uniformly and linearly away from each other, or towards each other). The video of the 3D simulation of the methods described in this section can be seen at <https://youtu.be/oK0XpKKnLkw> or in other research websites.

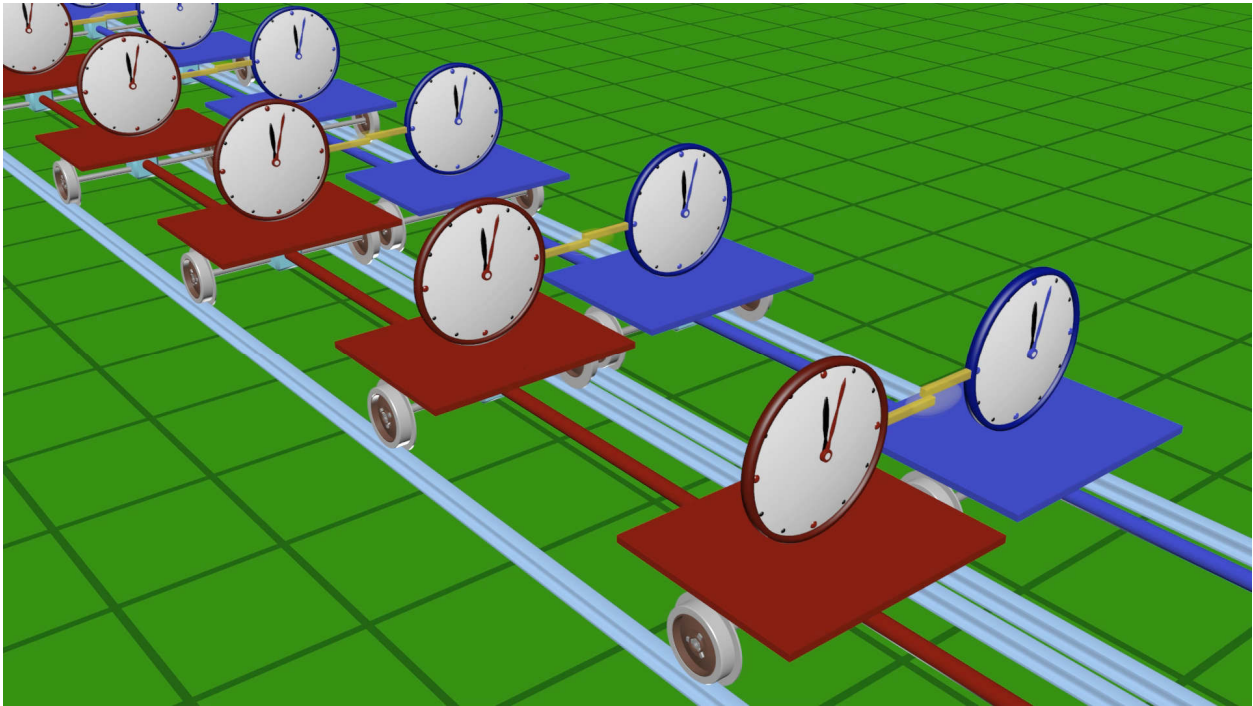
#### **2.1.0. Ideal endless rows of equidistant clocks (arrays of clocks):**

In the general case, each frame uses a very long row (array) of identical equidistant clocks, as in Fig. 1:



**Fig. 1 - Each frame uses a long row of equidistant clocks passing by the row of clocks of the other frame. At each meeting of any two clocks, both clocks increment their respective time counts.**

The time interval between two consecutive meetings (of a frame's clock with respectively two consecutive clocks of the other frame) will be the common unit of time used in both frames, and each such meeting of clocks will mark (increment) the time count of both clocks which meet.



**Fig. 2 - The time showed by all the clocks is the same, because each meeting of any two clocks is an event which marks the time unit-interval common to both frames.**

By definition, the measure of time is given by comparisons between changes (as indications of events). A clock is a device which counts the manifestations of a recurring identical change (named also period, or rate), to provide such a count to an observer for comparison to other changes which he/she observes.

In this time sharing method, the clocks do not have an internal period. Their period is provided by recurring identical **external** changes: the meetings of each clock of a frame with the next clocks of the other frame.

As the distances between the consecutive clocks of each frame have the same value **d**, and as each frame sees the other frame move with a constant velocity **v**, the period **T** of all clocks in both frames will be the same:

$$\mathbf{T = d / v} \quad (1)$$

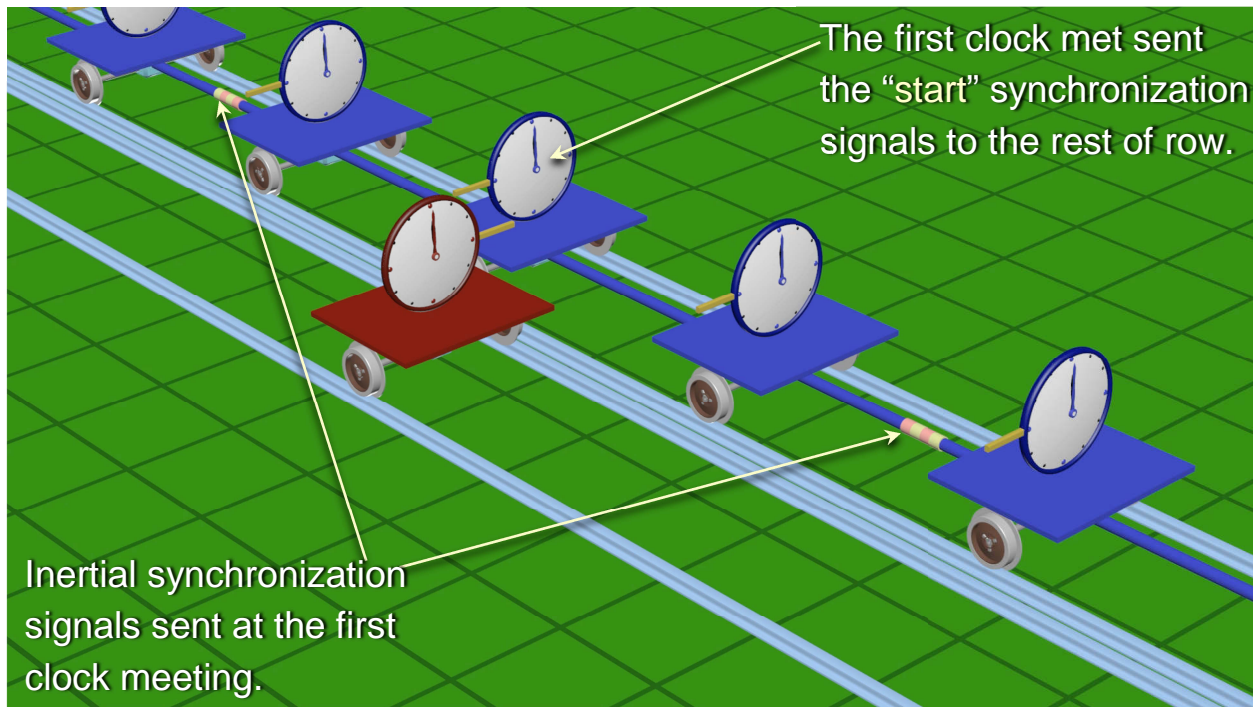
Thus Frame-1 can use exactly the same time unit as Frame-2, and therefore we can affirm the obvious:

**Time is the same in both inertial reference frames.**

However, a legitimate question might be raised: can we simplify the device structures used in this method? Can we use fewer clocks? The answer to these questions is “Yes”, and we will show here how we can simplify the method.

### **2.1.1. Ideal endless row of equidistant clocks in one frame and singular clock in the other frame:**

In this method we reduce the number of clocks of Frame-1 to only one clock. The clocks in Frame-2 will be in the same ideal arrangement of an endless row, as in Fig. 3.



**Fig. 3 - The "start" synchronization signals sent to the rest of the row at the first clocks meeting.**

The first two meetings of Frame-1's clock with two clocks of Frame-2 require those two clocks to send synchronization signals to all the other clocks of Frame-2. (We recommend the use of an inertial method of synchronization, as described in the documents of NCTR and its related 3D video simulations [2][3].)

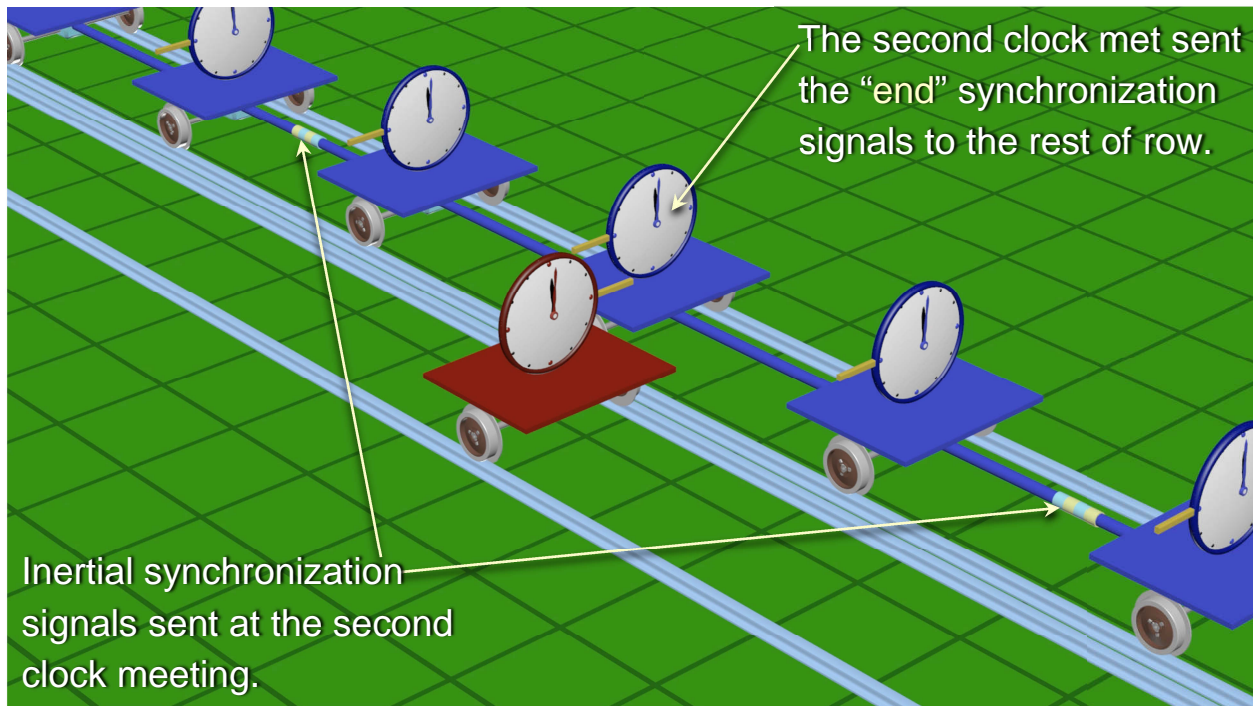
Such signals are needed because not all the clocks of Frame-2 will encounter the only clock of Frame-1. Those clocks which do not meet the only clock of Frame-1 will need to obtain the time unit separately, as indicated to them by the first two clocks of Frame-2 which will have met the clock of Frame-1:

- The first clock of Frame-2 which is met by the clock of Frame-1 will send a "**start of time-unit**" synchronization signal to all the rest of the clocks in Frame-2, as in Fig. 3.
- The second clock of Frame-2 which is met by the clock of Frame-1 will send an "**end of time-unit**" synchronization signal to all the rest of the clocks in Frame-2, as in Fig. 4.

That means that all the clocks in Frame-2 should use an **auxiliary independent period** (i.e. an auxiliary independent clock), to record and compare it with the time difference between the two synchronization signals which they receive.

After the first two meetings with the clock of Frame-1, all clocks in Frame-2 are ready to use the time unit common to both frames, independently from the next meetings with the only clock of Frame-1. Those clocks of Frame-2 which will meet the clock of Frame-1 can keep incrementing their count at each meeting event. Afterwards they will keep using the external time unit obtained (and recorded) by receiving the initial synchronization signals.

The only clock of Frame-1 will increment its count at each meeting with the next clocks of Frame-2, and will establish its rate (in common with the clocks of Frame-2) to be the time interval between any two such consecutive meetings.



**Fig. 4 - The “end” synchronization signals sent to the rest of the row at the second clocks meeting.**

(This method, containing one clock in Frame-1 and a row of clocks in Frame-2 is noted in the above mentioned 3D computer simulation as “Version 1”.)

### **2.1.2. One clock in one frame and a couple of clocks in the other frame:**

This method, noted as “Version 2” in the 3D simulation, furthers the simplification even more. We will reduce the number of clocks of Frame-1 to only one clock, and the number of clocks of Frame-2 to only two clocks.

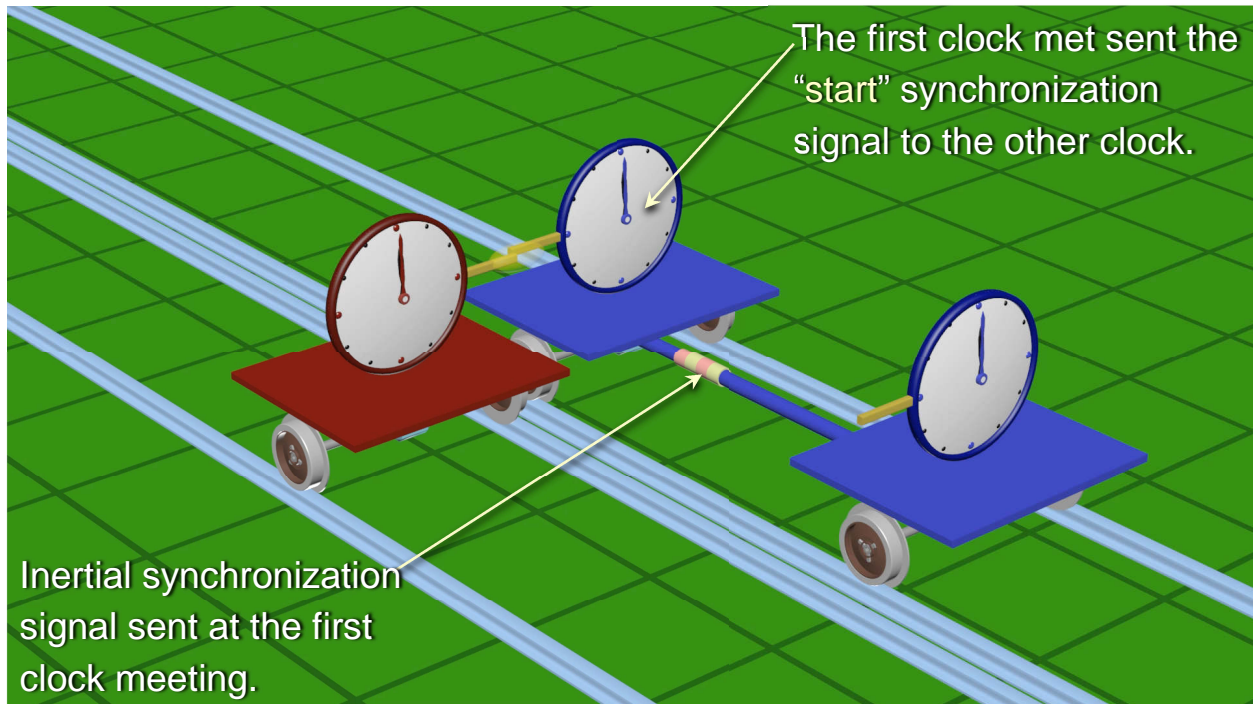
All clocks of both frames (in total just three clocks) will need to have an **auxiliary period internal** to their own frame, and synchronized across the same frame respectively. In this version, what we see as one clock is actually a device composed by two clocks:

- one **auxiliary internal clock** synchronized to the other auxiliary clocks within the same frame.
- one **main external clock** which establishes its period through its interactions (meetings) with the clocks in the other frame. That period will be **common** to both frames.

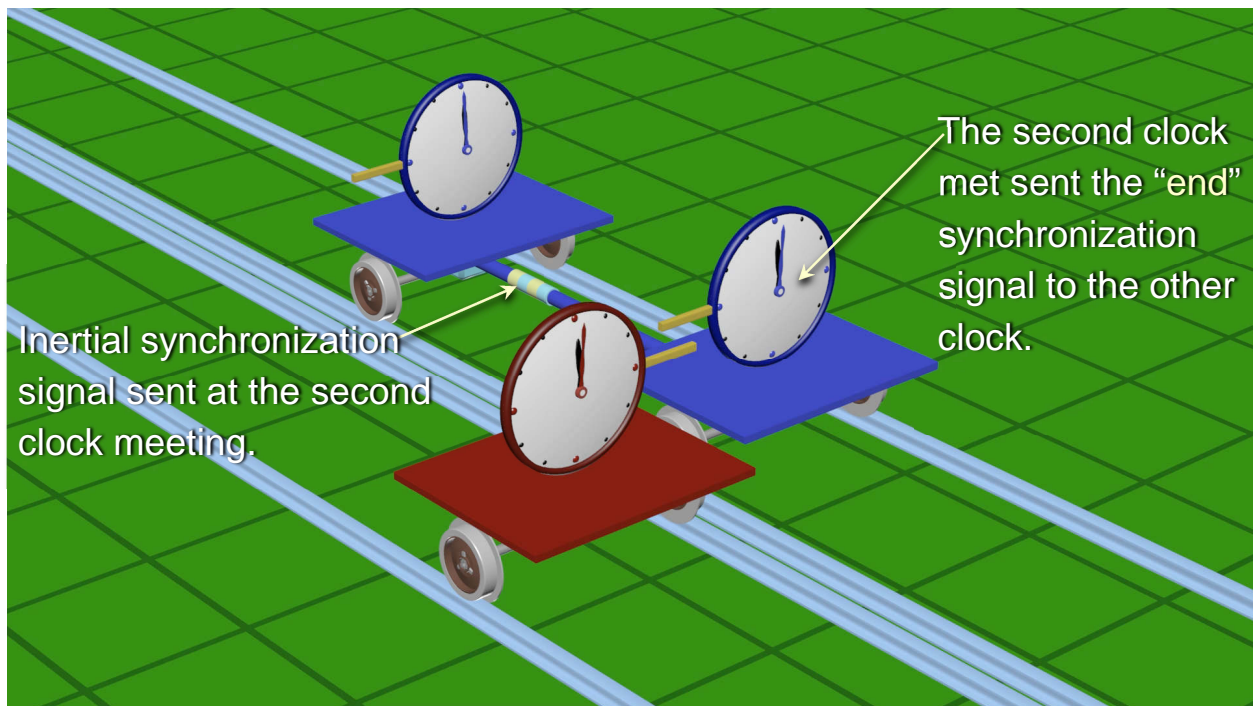
(For simplicity, the animations of the 3D simulation show only the external clocks.)

As their encounter with the only clock of Frame-1 is separate, the clocks of Frame-2 need to exchange **internal synchronization signals** respectively at each of their two meetings with the clock of Frame-1. Again, we recommend the use of an inertial method of synchronization, as in Fig.5 and Fig. 6.

After the two meetings have occurred, the external clocks in Frame-2 will keep using the external period (common with Frame-1), as it was calculated by their auxiliary clocks using the time difference between the synchronization signals.



**Fig. 5 - The "start" synchronization signal sent to the other clock at the first clocks meeting.**



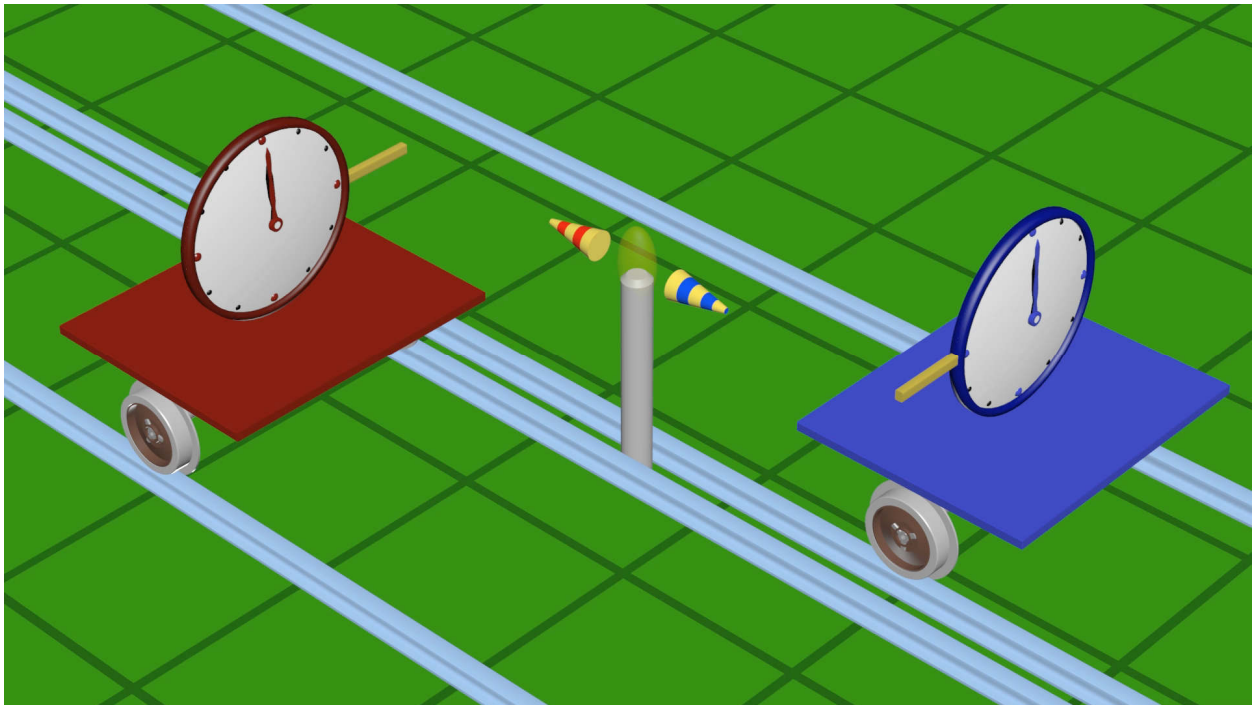
**Fig. 6 - The "end" synchronization signal sent to the other clock at the second clocks meeting.**

The only one external clock in Frame-1 will also keep using the external period (common with Frame-2) after the two meetings, as that period would be calculated by its auxiliary clock using the time difference between the meetings.

### 2.1.3. One clock in one frame and another clock in the other frame:

This method, noted as “Version 3” in the 3D simulation, is the simplest method in this category, as it requires each frame to carry only one external clock. However each such external clock needs to be accompanied by an auxiliary clock which will calculate the external period (common to both frames).

The start of the external period coincides with the start of the motion of both frames. Such a start needs to be triggered simultaneously by two signals sent in opposite direction, as in Fig. 7.



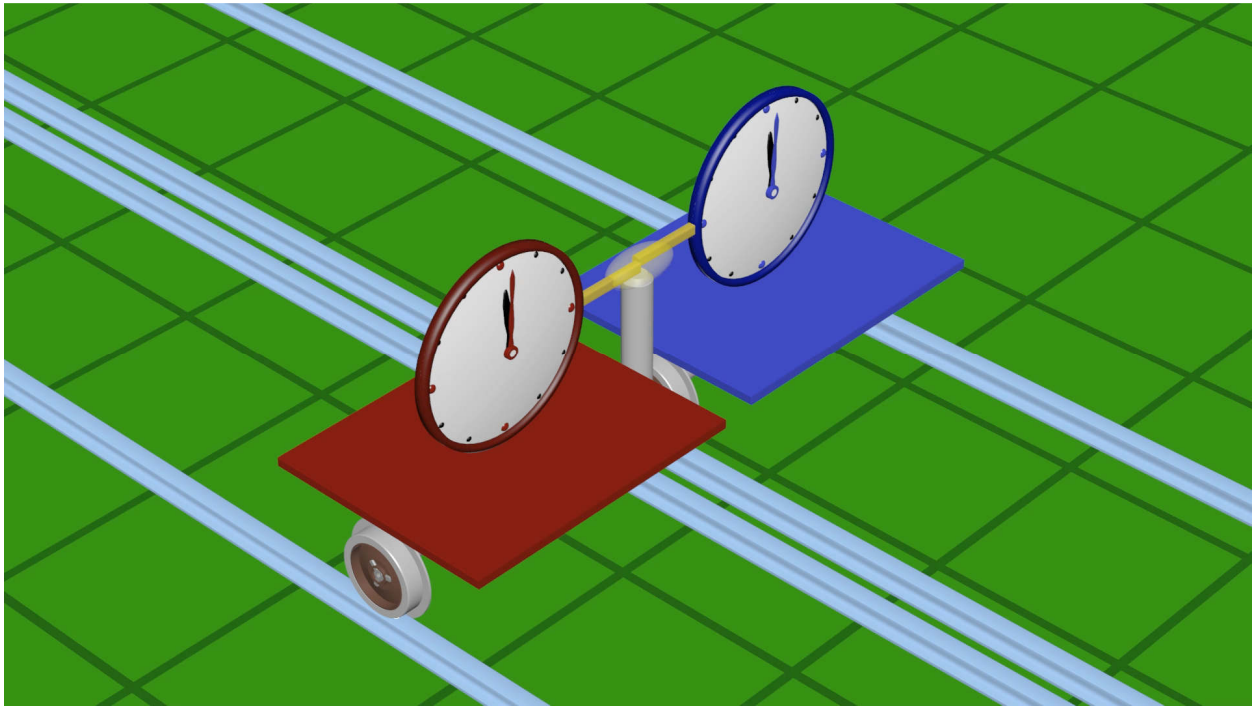
**Fig. 7 - The inertial signals sent respectively to each clock will set their respective frames in motion and will mark the start of the external time period (common to both clocks).**

[As before, we recommend the use of an inertial method of signaling (versus an electromagnetic wave or light signaling method), because the inertial method is carried along with the frame which uses it. In contrast, an electromagnetic (EM) wave/light synchronization is not suitable because the motion of light is independent from the motion of the inertial frame. Hence, the aberration of light, and/or time delays might occur in either direction in which a light signal would be sent.]

- The start of the motion marks the beginning of the external period (common to both frames).
- The meeting of the external clocks marks the end of the external common period, as in Fig. 8, which means both clocks will count that first passage of the external period, as a time unit.

The **auxiliary clocks** in each frame respectively will record the external period and will repeat it further.

This method can also be used to show a symmetrical **clocks paradox** of Einstein's special relativity theory (STR): the Lorentz transformations for the times of the external clocks of Frame-1 and Frame-2 are in contradiction at the meeting moment. For more details we will create soon a 3D simulation and a separate document dedicated to the clocks paradox of Einstein's STR.

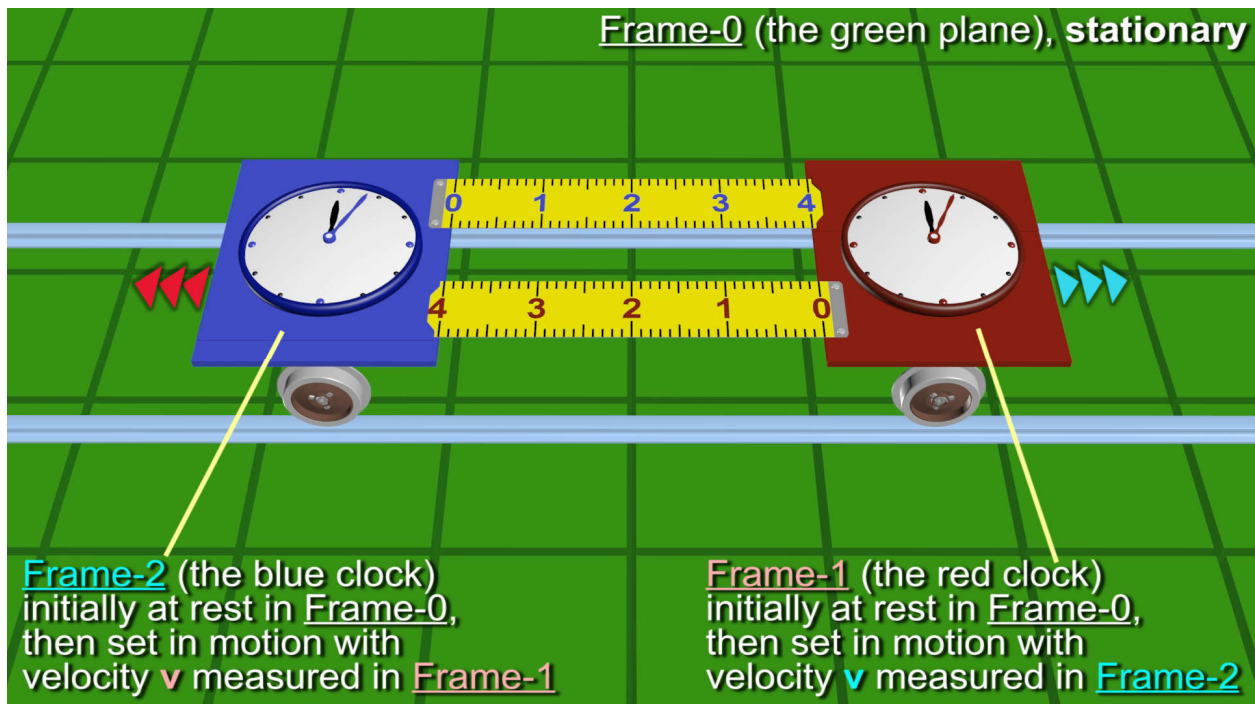


**Fig. 8** - The only one meeting of the external clocks marks the end of the external common period, and also that period is counted once as a time unit, for the first indication of both clocks.

#### **2.1.4. Using the mutual inertial velocity. The double measuring tape method.**

This method, noted as “Version 4” in the 3D computer simulation, is using the mutual inertial velocity  $v$  to indicate the common time to each of the both frames involved.

Each inertial frame has a separate measuring tape attached to it, respectively in such a way that the other frame observes its own position on that respective tape, as in Fig. 9:



**Fig. 9** - Each clock counts the length units travelled by itself on the tape attached to the other clock.



As the measuring tapes are ideal and identical, each frame observes on the measuring tape the same number  $N$  of length units traveled by itself, while the other frame has travelled the same number  $N$  of length units. In other words:

- The change in the length of the travelled distance is common to both frames.

Also, we remark that:

- The moments which mark the observation of the start of each new length unit (e.g. meter) are common to both frames.

Therefore, the counting of each length unit travelled is common to both frames, and each new count can mark a time unit common to both frames.

Thus we find out a general conclusion for any theory (e.g. Galilean relativity; or, Einsteinian relativity) which considers an identical mutual velocity  $\mathbf{v}$  measured from within both inertial reference frames:

The mutual inertial velocity  $\mathbf{v}$  secures a common space and a common time for both systems.

Hence we can think that a constant velocity is actually by itself a representation of a clock.

Such a conclusion is likely to be different in the case in which the Lorentz-FitzGerald length contraction is considered **and** an Absolute Reference Frame (ARF) is adopted by convention.

In such a case, the presence of ARF will imply different lengths of the measuring tapes for each frame, depending on the different velocities  $\mathbf{v}_1$  and  $\mathbf{v}_2$  which the frames respectively have relative to the ARF.

[The fact that Einstein's STR does not recognize an ARF makes it automatically consider both frames as equivalent, hence the length contraction seen from each frame has the same value, therefore paradoxically in STR it has no effect on the common time measured by this method (!)]

Our research is currently evaluating such a case in which the length contraction and an ARF are involved, in a physical context similar to that of the Lorentz Ether Theory, with the preoccupation on the physical meaning of different measurements of time in different inertial frames, using this time sharing method.

Without detailing our preliminary calculations here, we can anticipate that a common time **convention** can still be made between the frames, in such a way that the same count can be marked by both clocks, upon readings of different lengths on the measuring tapes.

### **2.1.5 Notes:**

A.) In all the methods mentioned above, Frame-1 and Frame-2 are initially at rest in a Frame-0 (the green plane in the video). Both Frame-1 and Frame-2 are set in motion **equally** from the Frame-0.

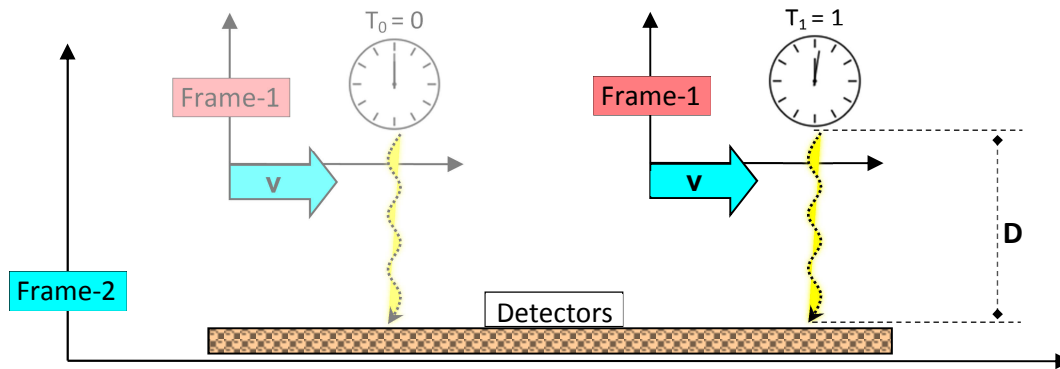
B.) The accelerations applied to Frame-1 and Frame-2 are **equal** and **simultaneous**. The magnitude and the time of acceleration from  $\mathbf{0}$  to  $\mathbf{v}$  does not affect the outcome of the technique in the general version (with two rows of multiple clocks) and in version 4. For the versions 1, 2 and 3, a mix of acceleration and deceleration can give the same period of time as if the distance between the first two meetings would have been travelled at a constant velocity  $\mathbf{v}$ .

C.) After the mutual velocity  $\mathbf{v}$  is obtained, Frame-0 becomes irrelevant. What matters is how Frame-1 and Frame-2 mark their common events using the same (common) time values based on their common external period of time.

D.) All the techniques here did not consider the effect of the Lorentz-FitzGerald length contraction. Such an effect would not affect the outcome of the techniques, for a theory such as STR which deems the two frames in motion as being equivalent - they see each other with the same length contraction factor. On the contrary, in our future research we will treat this subject by a theory similar to the Lorentz Ether Theory (LET), to consider the length contraction effects relative to an Absolute Reference Frame - such as the very frame for which Maxwell's equations for electromagnetic fields were written.

## 2.2. Transversal methods of time sharing

A transversal method implies the use of signals sent between frames on a direction perpendicular to the direction of motion. The signals can be either inertial objects or electromagnetic signals [2].



**Fig. 10 - Transferring the time unit from Frame-1 to Frame-2 by sending successive signals on a direction transversal to the direction of motion.**

As showed in Fig. 10, Frame-1 sends a signal at  $\mathbf{T}_0=0$  by its own clock, and another signal at  $\mathbf{T}_1=1$  when the count of its own clock is incremented (i.e. when its own time unit has just passed). Thus we can write for Frame-1:

$$\Delta\mathbf{T} = \mathbf{T}_1 - \mathbf{T}_0 = 1 \quad (2)$$

In Frame-2, a row of detectors will receive the signals coming from Frame-1.

If the signals have the velocity  $\mathbf{c}_m$  measured in the Frame-2, then the distance  $\mathbf{D}$  between the clock and the detectors will be covered in the time interval  $\Delta\mathbf{t}' = \mathbf{D} / \mathbf{c}_m$  as measured in Frame-2.

If a clock of Frame-2 would be close to the clock of Frame-1 at the moment of the emission of the first signal, it would mark its time as  $\mathbf{T}_0'$ .

Similarly, another clock of Frame-2 could mark the moment of the emission of the second signal as  $\mathbf{T}_1'$ .

The difference  $\Delta\mathbf{T}' = \mathbf{T}_1' - \mathbf{T}_0'$  would indicate for the Frame-2 what is the time interval used in Frame-1 as a time unit.

The first signal would reach the detector of Frame-2 at:

$$\mathbf{T}_{D0}' = \mathbf{T}_0' + \Delta\mathbf{t}' ,$$

and the second signal at:

$$\mathbf{T}_{D1}' = \mathbf{T}_1' + \Delta\mathbf{t}' \quad (3)$$

The time interval between those two moments of detection will be the same as the time interval between the moments of emission (as if they were measured directly and locally in Frame-2):

$$\Delta T_D' = T_{D1}' - T_{D0}' = T_1' - T_0' \quad (4)$$

Thus  $\Delta T_D'$  will indicate within Frame-2 the time unit of Frame-1.

### Notes:

N1.) - The time unit shared by Frame-1 and captured by Frame-2 does not depend on the velocity  $\mathbf{v}$  between frames, as the delays  $\Delta t'$  caused by the transversal components (of the velocity of the signals) will be eliminated upon subtracting the equations (3) from each other.

N2.) - It is important to notice that we cannot simply write  $\Delta T_D' = T_1 - T_0$ , because we do not know if the physical processes used to measure time are manifesting identically in both Frame-1 and Frame-2, and if they are affected by quantities non-invariant with the velocity  $\mathbf{v}$ , such as a possible FitzGerald-Lorentz length contraction).

Even if the fundamental physical processes used by the clocks of the two frames are manifesting identically, the respective clocks of the frames might use different numbers of cycles (of those fundamental processes) to compose their time units (relative to each frame).

In other words the purpose of this technique is only to “transport” the time unit from Frame-2 to Frame-1. Then the comparison between the time units of the two frames is left to be implemented in Frame-1.

N3.) - This method can also be applied viceversa: from Frame-1 to Frame-2.

By using bidirectionally this method, two inertial frames can establish a common time for practical purposes such as navigation and communication.

## 3. Conclusions

If a certain point of an inertial frame A is passing by a certain point of another inertial frame B, the achievement of the minimum distance between the two points is a unique event common to both frames. Any methods which employ the counting, comparison and ordering of such common events between the two frames, will put in evidence a common time of the two frames.

By generalizing the methods presented here, the changes which give us the meaning of time can be observed in common by any two different frames. The common observations lead us to the conclusion that time can be measured in common by all the inertial reference frames, and that Einstein's concept of time dilation in his Special Relativity theory is illogical, unfounded scientifically, incorrect conceptually, and misleading - against any practical purposes of synchronization.

## References

[1] Albert Einstein - "On the Electrodynamics of Moving Bodies" (June 30, 1905).

[2] Valentin Danci - "The Neo-Classical Theory of Relativity" (2<sup>nd</sup> edition, November 2013).

[3] Valentin Danci - "Einstein's variable speed of light and his enforced wrong synchronization method" (October 2015).