

Time Synchronization of Computer in secure manner while using Teleclock & NTP Services

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ABSTRACT

Time lost is never found again. If we talk about IT world, time is a critical component for each activity. And it should be synchronized with all computers. NPL provide a service for this purpose and it called Teleclock Service. The Teleclock Service is a cost-effective way of distribute uniform standard time for all computer. As there are several applications requiring accurate time up to a second. Teleclock provide service to set the real time clock of a computer and this service works over the telephone line. In this paper we provide detailed information about Teleclock and how to synchronize time in software applications which are running over the internet.

Keywords: Teleclock, NPL (National Physical Laboratory), NTP (Network Time Protocol), IST (Indian Standard Time)

1. INTRODUCTION

In various customer service organizations and public assistance centers, there is clearly variance in the time displayed, usually in seconds and minutes. The problem is because they all are not synchronized to one source clock. This difference in timings can cost people dearly. Time synchronization is emerging as a critical factor, especially in multi-city and multi-centre based operations, such as travelling, data exchange, ticketing long-distance telephone billing, and so on. To achieve this, NPL has recently made an important contribution with the development of a Teleclock, which will help the users to access IST data for updating the local clock of their devices like computer. User can get local time from any source but choice of source is depend upon various things like accuracy of time, Coverage range and cost.

Some online application needs a high rate of time accuracy like E-Procurement system in which there are various functions like bid in E-Tender, bid in auction, tender opening/closing time, pre bid query etc.

Telephone is omnipresent now days so it is good idea to use telephone service to get time or synchronize the time as it is low cost service. NPL provide IST time and transmit it in digital time data by using telephone line. NPL give name of this service as Teleclock service and this service can be accessed by using Teleclock Receiver.

2. EXISTING SCENARIO

As in our computer, there are two clocks. First is software clock and second is hardware clock. Software clock works when computer is in use for any purpose and on the other hand hardware clock works even computer is not in use (stop/shutdown). Hardware clock uses battery for keep running [2]. Software clock is not able to retain accurate time for long period because of interrupt request. The computers which are off for a long time there clock might be delay by huge duration. When the computer is start hardware clock set time of software clock automatically. Hardware clock uses crystal oscillator to maintain accurate time for long duration. Crystal oscillator time is effected by the temperature.

- Internet enable computers can easily synchronize there computer clock to internet standard time. Time protocol ,the Network Time Protocol(NTP), Daytime Protocol etc are protocol which are usually use in time synchronization with the internet time .NTP which is a standard protocol for time is the most popular protocol for time synchronization , NTP is build on the internet protocol (IP) and user datagram protocol (UDP)[4]. Now in present days many operation systems also have inbuilt NTP client software. This NTP client software always run silently as a background process

and get update from various time at a predefined time automatically or random time manually. The NTP client software receive response from various time servers and take averages of all received response time which are appear as accurate [1]. Some NTP client software work over SNTP(Simple Network Time Protocol) which get response on the basis of IP address of one time server and set receive time to computer. NTP protocols works on port no 123 and use UDP/IP as a data transfer protocol. the data is transmitted in the time format. NTP service for time synchronization is widely use over the public internet which is vulnerable to various attack that can alter the data or/and disturb the protocol.[5]

- GPS is another technique by which we can synchronize time. This technique is costly but provides accurate time.

In the paper we are going to discuss about a new technique which synchronize the time using telephone service using Teleclock device and NTP services in secure manner which is also inexpensive with great accuracy.

3. PROPOSED TECHNIQUE

Time synchronization play major role in various domains like broadcast service, transaction, attendance, telecom etc. NPL (National physical Laboratory) is responsible for maintaining IST (Indian Standard Time) in India [3]. So NPL has developed a system by which digital time can be transmitted over telephone line, that time can be accessed by a receiver called Teleclock and the used service called Teleclock service. As synchronizing time using telephone service can be accepted anywhere because this service is available in every institution. These days, computer has become necessity for each domain. Teleclock Receiver uses Teleclock service to synchronize IST time of computer. This is very inexpensive technique and by using it is easy to synchronize the computer clock. One of it great feature is that it has auto dialing functionality at predetermined time and also on command.

3.1 How it works:-

According to Pranalee P.Thorat, In Teleclock service, the time data is transmitted through telephone line at a baud rate of 1200 bps. The baud rate is selected such that it can neither be too slow nor too fast to become more immune to noise. [3]. Five sets of data are sent in every second so that at the receiving end one has enough provision to confirm the correctness of the data. In five sets of data, each set having hour, minute, and second data [3].

“Signature-Character” is included in each set of data for confidently identification of data. The data travel in asynchronous mode and its identification may start at random point of data transmission. RS232 port is responsible for communication with the Modem. The data which are received through Modem is connected to telephone line.

Now in Teleclock receiver there is a crystal oscillator and also an up down switch on its external part. To obtain IST time from the NPL, Teleclock receiver dial a predefined Number (Given by NPL) at a pre-programmed time manually by using external switch up or automatically by using program. We can set autodialing time according to need. After receiving of IST time from the NPL, Teleclock disconnect the telephone automatically.

3.2 Process flow

In India NPL is responsible to maintain Indian Standard time (IST) throughout the country. The detail of process flow is described In Figure 1. To maintain accurate time in any enterprise, NPL is the most effective and trusted source to get IST time. NPL determine IST by using Atomic clock and broadcast to Teleclock devices by using Telephone line. As in enterprises organization there are lots of devices computer so it is not manageable to connect each computer to a Teleclock receiver. An enterprise organization uses a master server which directly connects to Teleclock receiver to store accurate IST time and distribute time to other peripheral devices like laptop, web server etc using network time protocol. An enterprise organization has a Teleclock receiver as discussed earlier Teleclock service work over the telephone line so both (NPL and organization) end have telephone which also have dedicated service at a predefined dialling number. As shown in Fig. 1 Teleclock receiver obtain IST time from NPL by auto dialling telephone at a predetermine time or it can obtain IST time manually by pressing external switch which dial telephone number instantly. Teleclock receiver received IST time in signal and converts it to desired time format by using electric methodology. Teleclock receiver is connected to device like server, laptop etc which must have either RS232 port or network port. To understand the received input from Teleclock receiver to device like laptop, master server etc. there must be an interface or program which understands the received input and to synchronize the real time clock of device clock which work over the operating system application. And the best suitable language for such type of application is Java because it have feature *write once run everywhere* or portability across OS platform. Now days usually devices have network port and these device easily connect to network using Ethernet cable. An enterprise organization has lots of devices, besides running this java application on each device it is wise to run this java application on a master server and distribute the IST time within organization by using NTP. So we can synchronize the time in other computer through NTP from the master server. By using the IP address of master server other computers time synchronization can be done easily.

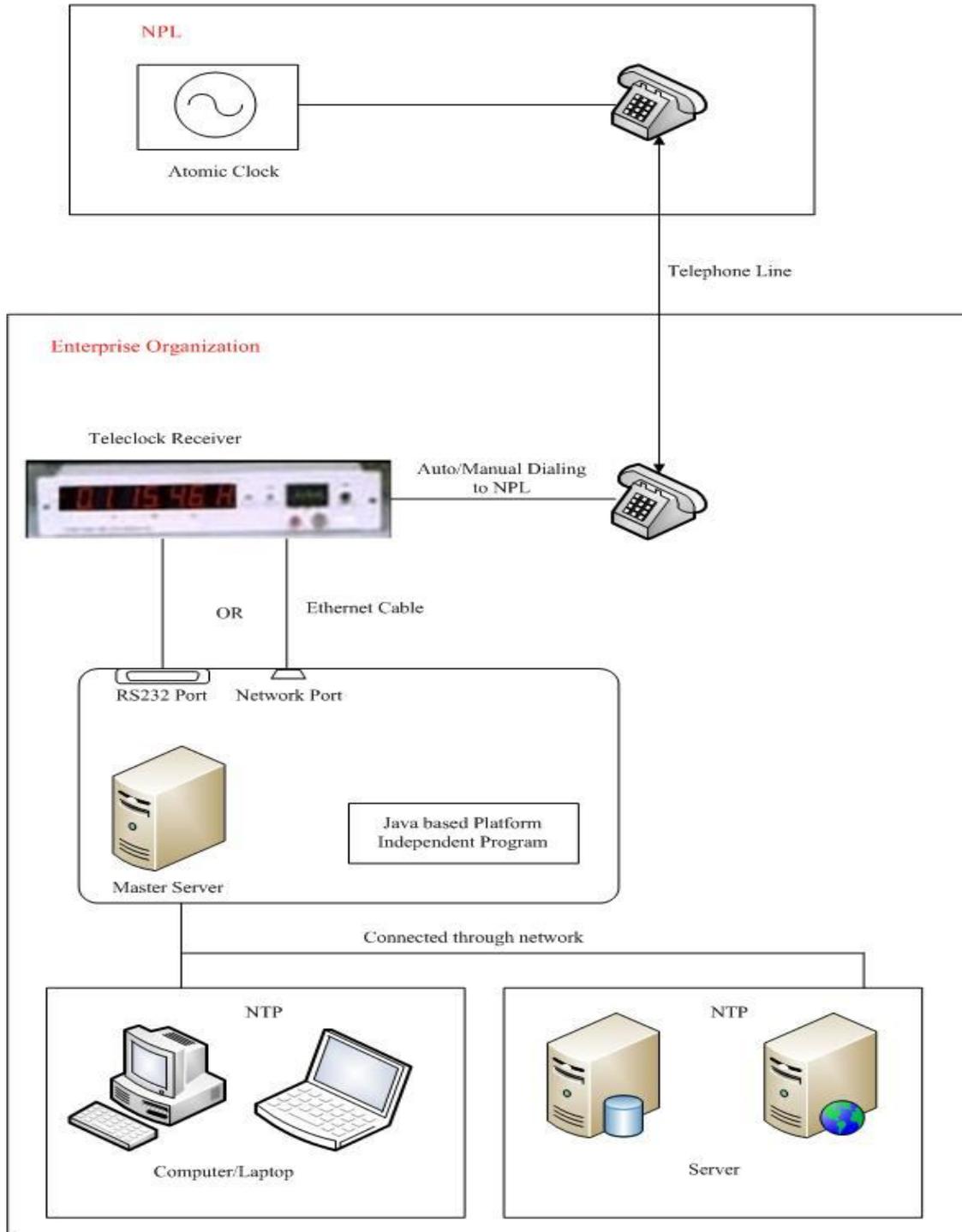


Figure 1 Time Synchronization using Teleclock and NTP Services in secure manner

3.3 How Teleclock synchronize IST time to System (Server/laptop) Clock?

1. Firstly Teleclock Receiver automatically or manually dial the NPL Number using telephone then it instantly get response as IST time from NPL Atomic clock through telephone line.
2. Teleclock receiver IST time will be transmitted to the master server either through RS 232 Port or Network port (Ethernet connection).
3. Now Java Based Application will receive the IST time, convert into required time format and synchronize the real time clock of master server.
4. Other devices which are in network can also be synchronized by using NTP, these devices can synchronize there time with master server by using static IP of master server.

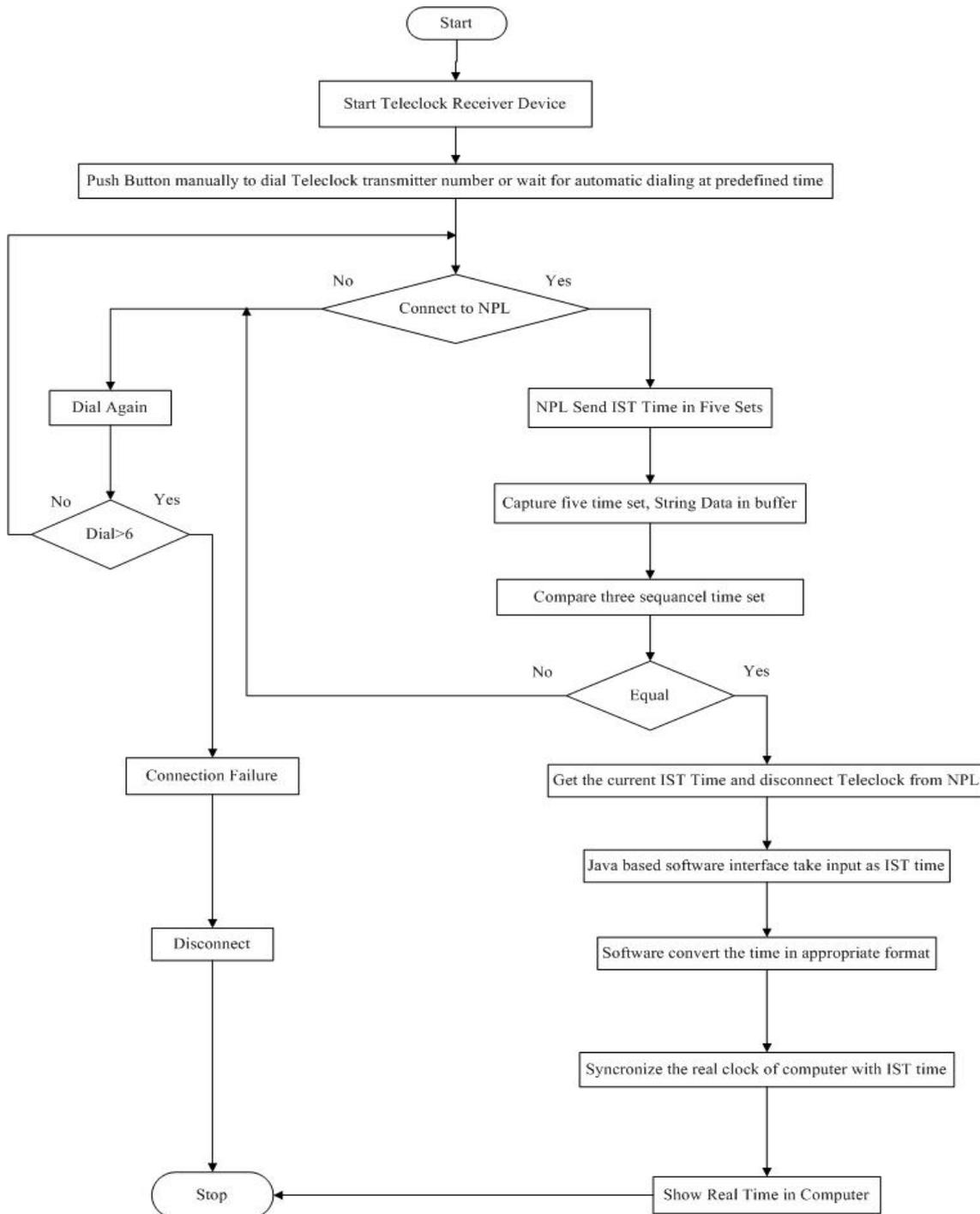


Figure 2 Flow chart for time synchronization using Teleclock

3.4 How Security can be achieve in Time synchronization while using Teleclock Service?

1. **Out of Service** - By any means (Hardware failure, power supply failure etc.) If Teleclock will go out of service so to identify this scenario quickly .We can make some database logical arrangement to overcome this critical issue. I proposed a solution for this scenario as to insert/update a Boolean status like true (Teleclock is working) or false (Teleclock is not working) in a specific time interval (10 second) into database .If any time status change true to false then database immediate trigger action like SMS alert on mobiles and alert on other devices . Due to this we got aware and we can recover from it soon.

2. **Making it Platform Independent** - The Application interface should be built in Java. As we know Java is Platform Independent language. So Application interface built in java can be easily run on any Operating System to synchronize the real time clock of computer.

3. **Cross Verification** - We can also maintain the logs of time synchronization for each server date wise so that it can

be verified anytime whether time was updated or not. So that if anyhow Teleclock stops for a while than we can also get know details from logs.

4. Upgrading Communication Channel for Teleclock service-In Tradition way Teleclock communicate with Server through RS232 port. But we can also transmit this data through Ethernet cable (network port). So that we can fetch the time using IP addresses also.

3.5 Why is it better?

- Teleclock receiver has a 1 ppm (parts per million) crystal clock it means for 7 days Teleclock receiver time does not differ by a second.
- Teleclock receiver has autodialing (by programmatically) or manual dialing facility to get time at predetermine time or random time.
- Teleclock receiver based on the Microcontroller system so that the system is reprogrammable.
- IST time is synchronized within a fraction of second by using Teleclock receiver.
- Teleclock receiver has battery for backup power supply.
- Teleclock receiver gets time from trusted source NPL.

4. CONCLUSION

In this paper, I provide detailed information regarding Teleclock with NPL to synchronize IST time to other devices using Application software. Also provide detailed description of time flow from NPL to computer clock and advance techniques which provide security in time synchronization process

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