

Service Bulletin: Time Synchronization Considerations for the PeriCALM Tracings System – No. 2279

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The PeriCALM Tracings system acts as a central fetal monitoring system (and many other functions). The system depends on proper time synchronization between server(s) and client workstations, which is essential for the proper display of tracings and their associated information such as vital signs.

This service bulletin is issued as a reminder on the behavior, configuration and requirements for effective Time Synchronization operation of the PeriCALM Tracings system in hospital-networked environments.

Time Synchronization Fundamentals

PeriCALM Tracings collects data from fetal monitors using serial-to-ethernet devices. The full cycle of data acquisition is done in two stages: the synchronous and asynchronous stage.

The serial-to-ethernet “terminal server” collects the data from the monitor’s serial port and then transmits it to the “tracing collector” server. This data acquisition portion (monitor \leftrightarrow Serial-to-Ethernet \leftrightarrow Server) is synchronous (meaning very near real-time without caching). If the communication is interrupted at this stage for ~5 seconds, for example, that results in a loss of data of ~ 5 seconds. Fortunately, the low data rates and proven drivers produce a very reliable synchronous layer. Examples of failure in this layer are: terminal server hardware failure, cable disconnection or server/network failures.

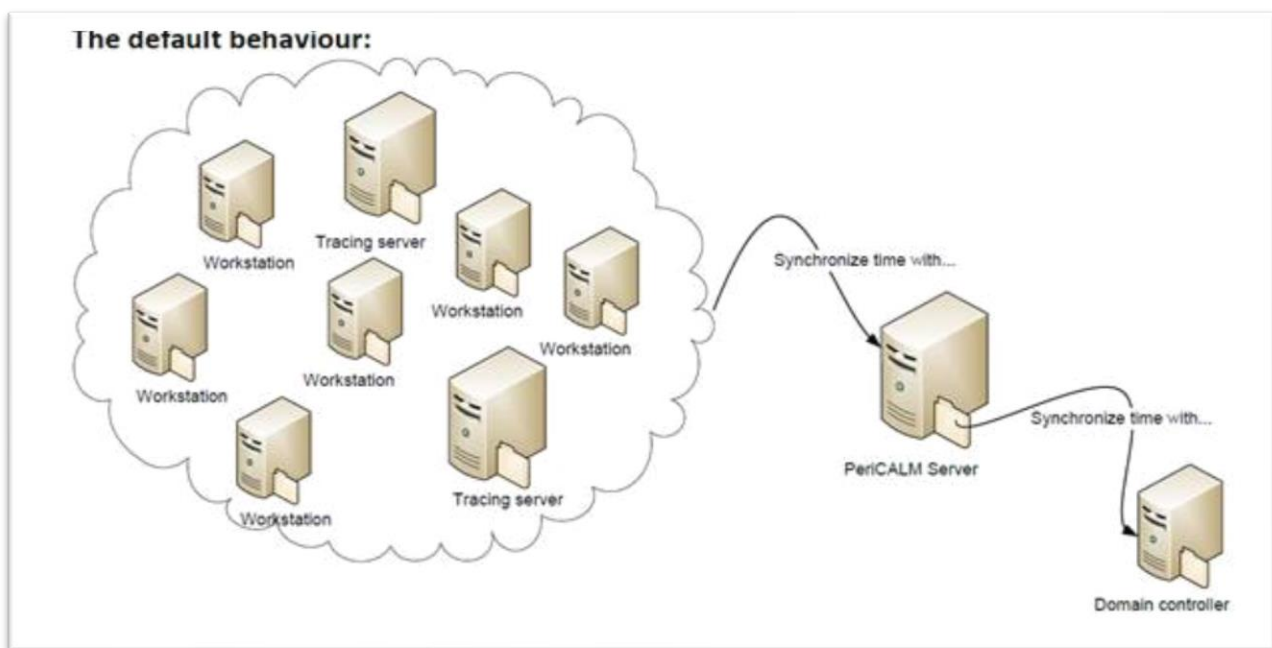
Once the data is collected on the “Tracing collector” server, it is time stamped with the current time on the server (e.g., at 10:22:24 the Uterine Activity (UA) reading was 126) and once time-stamped, it is broadcasted over the different networked computers that are part of the PeriCALM Tracing system. This broadcast stage is asynchronous because communication between server and client computers may vary or even be delayed, but whatever the delay, once the data arrives, the UA value illustrated above will still be displayed at 10:22:24 due to the original time-stamp.

Therefore, the clock time on the tracing collector server is the most important followed by the main server clock and that of all the client stations. This seemingly obvious time synchronization requirement is one of the more important validation steps that are part of the system installation procedures at each customer network.

Historically, maintaining time synchronization in a Windows environment was not as precise. Some newer Windows operating systems do provide more accurate time synchronization, but the w32time

service available in the versions of Windows currently supported by PeriCALM do not guarantee time synchronization at the level of accuracy required for reliable system operation. This prompted PeriGen to create a built-in time synchronization agent/service that will force a network time synchronization between all clients and servers to the main server every minute to minimize the risk of clock drift. In turn, the PeriCALM Tracings main server will synchronize to the hospital known-good time server (typically the domain controller) or other depending on customer network design.

The next section provides some recommended guidelines and considerations for time synchronization with the PeriCALM Tracings system.



Safety Measures

Considering the connectivity requirements of modern IT systems, vendors like PeriGen need to adapt to interconnected and dependent computing resources which, in this case, is the dependency on time synchronization from a network resource (domain controller or another designated server).

As mentioned in the previous section, the built-in time synchronization service performs a sync every 60 seconds. If the server time is wrong for any reason, the time on the client will be set to that wrong time. The same can happen if the synchronization agent cannot perform its job thus accumulating the natural computer clock drift which over time can be multiple seconds of minutes.

For these infrequent cases, the PeriCALM Tracings system has a protection mechanism to avoid the display of delayed or wrongly timed data to clinicians. The reasoning behind this protection mechanism

is that it is better to show “nothing” then to show “wrong” data and thereby directing clinicians to the source device (the fetal monitor) for the tracing data.

When the system detects a deviation of 30 seconds or more between client and server, the client application will error out and close (and log an error in the event log).

Note that clients perform communication to the server over UDP port 123. Administrators must ensure that UDP port 123 is open and not blocked by firewalls or other.

Optional: To override the default time synchronization target server (utilizing the PeriCALM main server host name specified by LMSPSBroker registry key), PeriGen may add a String type Timeserver to the registry, and specify the specific time server host name.

GUIDE: If/When this is observed, please call the PeriGen 24/7 support line or advise the hospital IT staff providing they are familiar with this mechanism.

Virtual Servers

Virtual Servers are probably the most popular server deployment technology in a hospital setting and PeriCALM Tracings is supported on virtual infrastructures such as VMware and Hyper-V. That said, there is a potential conflict in time synchronization technologies when it comes to PeriCALM Tracings.

All virtual servers come with a feature that allows time synchronization between the Host server (the physical server hosting more than one virtual machine) and the guest VM. When enabled, if the time on the host is changed, for example, to 15:28:45, the time on the guest will change to that time as well. This function will conflict with the built-in PeriCALM Tracing time synchronization that synchronizes with the domain controller.

Although the VM host server could be synchronizing with the same “known-good” time server as the PeriCALM Tracings time sync agent, the two synchronization processes may cause an undesirable jitter effect which could affect the precision and continuity of near real-time data.

GUIDE: It is therefore required that all VM host to guest time synchronization agents be disabled.

GUIDE: Avoid using VM Snapshots on a PeriCALM Server as it may lead to improper time-stamping during the snapshot process.

Configuration

PeriGen staff is responsible for the installation of PeriCALM Tracings servers including the configuration of the Time Synchronization service. The client software installer includes the time synchronization service and is typically deployed by the customer IT staff (either interactively or via server-side push technologies such as SCCM).

GUIDE: The client software must be installed with administrative rights to ensure the proper installation and registration of different services or components (which include the time synchronization service).

Client-Side Synchronization: With the “CALM Time Synchronization Service” installed, the service synchronizes the workstation clock to the main PeriCALM Tracing Server (or overridden different time server). The sync is done every 60 seconds over NTP.

Server-Side Synchronization: With the “CALM Time Synchronization Service” installed, the service overrides the standard W32Time service and synchronizes the server clock to the “time server” which by default is the Domain Controller (or another designated server). The sync is done every 60 seconds over NTP.

GUIDE: Time synchronization is validated by PeriGen staff as part of system installation.

1. If the client application closes unexpectedly or prompts an error message about time synchronization, this is probably by design according the “safety measure” section above:
 - a. Ensure that all the configuration settings mentioned above are adhered to
 - b. Try to restart the CALM Time Sync service or restarting the PC
2. If the problems persist, please call the PeriGen support at support@perigen.com to resolve these issues.