# Infodraw MRS Video Time Delay Calculation

## Introduction

Media Relay System is a server-based infrastructure for sending live video, audio and location samples from a monitored location to a monitor client software via an MRS device client and an MRS server. The samples or frames are sent over the cellular and internet and arrive usually after a short time at the destination for user presentation. Sometimes the user is interested to check if the presentation time delay since capture is indeed as short as expected. The MRS transfers special numbers for calculating the delay between the time the frame was captured and the time it is displayed on the screen for the user. This calculation is performed a number of times each second and displayed in the monitor application window above the video.

## Local Timestamps

Local timestamps are a tool for relative time measurement in software. Using two timestamps, software can calculate the time between them with fractions of a second. The timestamps taken by components of the MRS are 64 bit numbers representing a number of microseconds since an undefined time. Every media frame, video and audio, is carried with the original captured timestamp. This timestamp is to be used later in the monitor client application to calculate the delay time.

## Time Servers

The time delay calculation is based on time servers and network time protocol (NTP). In short, time servers are servers that given a time request from any client, they respond very quickly with an accurate UTC time measurement that includes very tiny fractions of a second.

## Recording both local timestamp and accurate UTC time

The MRS devices and MRS Monitor Applications query the time servers regularly and keep a record of the latest UTC time together with the local timestamp taken at that time. The MRS device sends this record to the MRS Monitor through the server for the purpose of this delay calculation.

## Relative timestamp calculation

When the MRS Monitor has data on both local timestamp with captured UTC time and device timestamp with captured UTC time, it can calculate a relative timestamp that represents the relative difference in microseconds between the device timestamps and the monitor timestamps. This calculation starts with UTC time difference in microseconds calculation (device - local), adding the local timestamp and subtracting the device timestamp.

## Frame Delay Calculation

When a video frame is displayed on the monitor screen, another local timestamp is taken. Then the frame delay time is calculated by subtracting the sum of the original captured frame timestamp with the relative device timestamp from the new local timestamp.