Understanding TOP Server Scan Rate Settings as They Affect Wonderware InTouch Applications

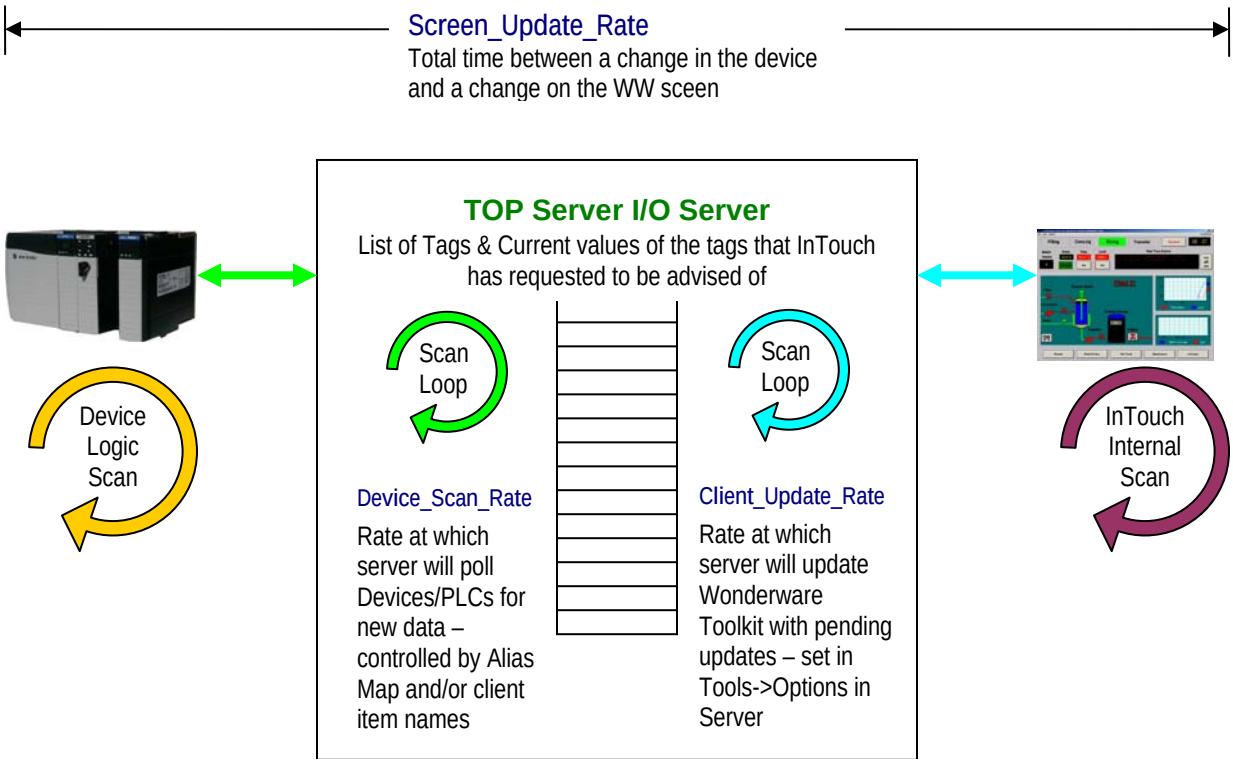
Introduction

The TOP Server has settings that can control the rate of PLC polling and the rate of tag updates in Wonderware InTouch Clients. The intent of this article is to help users understand how these Server settings control different operations and together work to control the flow of information from field devices to Wonderware InTouch client applications. Correctly setting these for your design will help to provide the optimum performance for your Automation System.

Overview

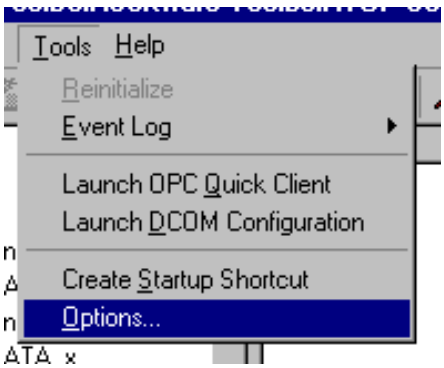
We will begin with an overview diagram and by defining terminology that helps in understanding the pieces of a total system discussed in this article. We encourage you to refer back to this drawing and introduction as you read this application note. Please pay particular attention to the meaning of the terms in blue bold text in the drawing.

System Overview – HMI to I/O Server to Device



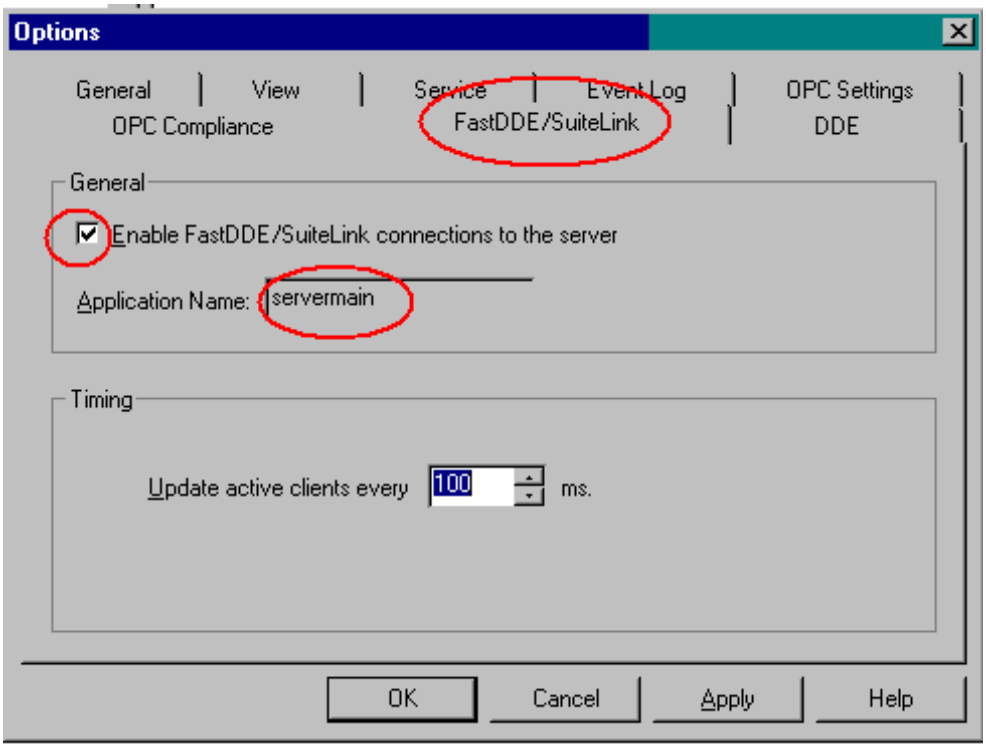
Note: simplifications have been made to this drawing for the sake of clarity about the key points we wish to make in this application note.

Setting Client_Update_Rate – how quickly we send data to Wonderware clients



The first of these settings we will discuss is the value we named Client_Update_Rate in the System Overview drawing. The Client_Update_Rate is set in the FastDDE/SuiteLink configuration in the TOP Server.

Open the TOP Server, go to the Tools menu and select "Options…" from the list. This selection will bring up the Options dialogue box with a number of tab choices. Select the FastDDE/SuiteLink tab. The circled items should be set the same as below.



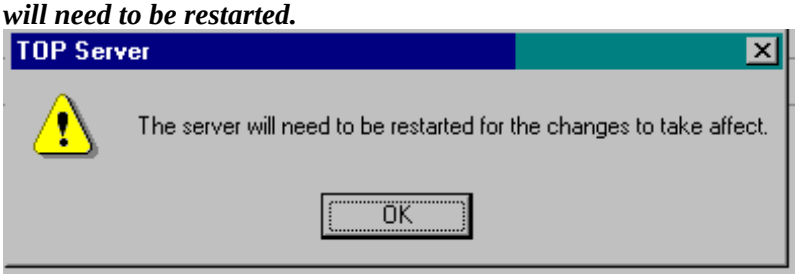
The settings on this tab control connections between TOP Server and the Wonderware Clients using FastDDE or Suitelink protocols.

- The Enabled check box turns on FastDDE or SuiteLink communications and the TOP Server.
- The Application name is the name used as the Application name when you configure your Access Name in Wonderware.
- The Timing section controls how often TOP Server sends pending tag updates to a Wonderware Client.

How these settings in the Timing section can impact total system performance as measured by Screen_Update_Rate in the System Overview warrants further discussion. The TOP server keeps a list of the tags/items that Intouch is requesting for update and constantly polls the Device at the Device_Scan_Rate and updates it's internal list. These are the "Active" tags in the server. The TOP server also keeps a scan list that checks for tags that have new values (called Pending Updates) that need to be passed to InTouch. A tag has a Pending Update if the read value has changed since the last client update was completed by the Server.

This setting defaults to 100 ms as shown in the dialog on the previous page. In the majority of situations this setting should be left at the default. It helps Wonderware from "slowing down" by providing smaller chucks of data at a time instead of sending a large number of tag updates to Wonderware all at the same time. Also, if there are only a few items that change but they change rapidly, by keeping this value low, we'll be able to pass the changes up to Wonderware quickly.

Note: If you do make changes to the settings on the FastDDE/Suitelink tab under Tools->Options, the TOP Server will need to be restarted.



The Screen_Update_Rate as measured from a Device to a Wonderware Client is also improved by keeping this rate set low.

Relation of Client_Update_Rate to Device_Scan_Rate – an example

For example, if there are 1000 active tags being read from the Server and these tags are scanned at 500ms from the Device, the Server may get updates back in time to update Wonderware before the server is through polling all 1000 tags. This happens because Device protocol specifics require us to break data requests into blocks – it's rare to find a list of user tags and a Device protocol that could read all 1000 items in a single request. Since the two scan loops are asynchronous, it's very possible that the Device Scan loop may be halfway through its reads when the Client Update Scan loop says it's time to update InTouch. That's OK. The Client Update Scan loop will update InTouch with whatever Pending Updates it sees in the list in the server.

One might assume that if you set the Device_Scan_Rate at 500ms, we're sure to get all the data that fast and see screen updates at 500ms. This would be a misunderstanding of the system because there are many other variables if you look at the System Overview. The Device Network or Device itself might not be able to keep up with the required update rate. Granted 500 ms is a long time, but there are some slow devices and networks we've seen in our experience.

In order to have the Screen_Update_Rate actually be the same as the Device_Scan_Rate, the time it takes to have the Device and Device Network respond too all requests in a single scan of the 1000 active tags would have to meet the following criteria:

In our example of 1000 tags with a 500 ms Device_Scan_Rate, 100ms Client_Update_Rate, the rate at which the Device and Device network can be polled for the 1000 tags would have to be at under 400 ms, realistically more since 400 ms gives no value to the Intouch_Internal_Scan_Rate. The value of InTouch_Internal_Scan_Rate is dependent on issues internal to your Wonderware project design, pc resources, and many other variables beyond the scope of our expertise and of this document.

The key is understanding that the total Screen_Update_Rate is a combination of all the system variables.

Physical Device/Network Update Rate – things that affect it and in turn affect Screen_Update_Rate

One key item that affects screen update rates is the rate at which the number of active tags can actually be retrieved from particular devices on particular networks.

One key item that affects screen update rates is the rate…the active tags can actually be retrieved from… devices on… networks. The amount of data flow that a particular network can handle is a major impact.

The amount of data flow that a particular network can handle is a major impact. A 9600-baud serial connection won't allow as much as a 10mb Ethernet network. A 10mb Ethernet network won't allow as much data transfer as a 100mb network. Common sense, but we are often surprised at what is asked of a 9600 baud serial link at times.

The device's protocol and the actual information being requested have to make the best of the network being used. Some devices will allow the server to retrieve 1000 tags in 500ms or less on a serial network depending on what tags are being asked for in the case. Other devices won't be able to return 1000 tags on a 100mb network in 500ms due to specific device configurations.

When a Device System can't return the requested data under the Device_Scan_Rate time, lowering the Device_Scan_Rate will have no effect. Lowering the Client_Update_Rate in this situation is the only thing in the Server's control that can potentially increase the information flow to Wonderware but should be done with care so as not to overload the Wonderware system with update replies from the Server. This assumes all write optimization has already taken place (write optimization is outside the scope of this paper). There are also many other design options in specific cases that can improve communication of a system, but are outside this particular topic.

Device_Scan_Rate – How to set it in the TOP Server

Once the FastDDE or SuiteLink update rate is set, the actual rate the Server will scan active tags needs to be determined. There are a number of ways the Scan Rate can be set for active tags in the Server, whether they be tags pre-configured in the TOP server or those dynamically passed down from InTouch with a valid PLC address in the Item Name in a Tag Dictionary entry. We will look at both cases.

Tags Defined in the Server: When tags are actually created in the TOP Server, the Scan Rate can be set for individual tags at the time you enter them. The default setting for the Device_Scan_Rate (called DDE Scan Rate on the screen shown here) is 100ms. If none of the other methods discussed below are used to set the Scan Rate the default of 100 ms will be used.

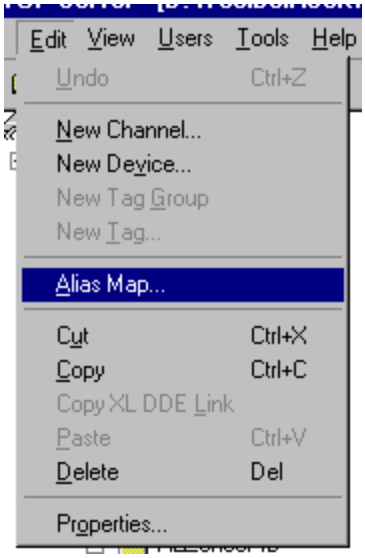
Tag Name	Address	Data Type	DDE Scan Rate
CnetLocalStatus	CNETLOCALSTATUS	Short	100
CnetRemote123	CNETREMOTE123	Short	100
CnetRemote456	CNETREMOTE456	Short	100

Important Note: when a tag address can be read as part of a block read the whole block will be scanned at the highest requested rate. For example, if 20 tags in the Server project can be read as a single block request of the Device and 19 of them are set to scan at 1000 ms, but one of them is set to scan at 100ms, all of them will be read from the device at 100ms.

Tags passed down via PLC Address in the Item Name Field in Tag Dictionary Entries (i.e. Dynamic tags): If you don't have tags in the server or don't want to define them in the server, but are adding them dynamically through the Wonderware Tag Database Item Name Field like is done with traditional I/O Servers used with InTouch, the Device_Scan_Rate will also default to 100ms unless you add the "@scan rateinms" to the end if the item name.

For example passing N7:0 in an Item Name would default the Device_Scan_Rate to 100ms, but if you put N7:0@1000 into the Item Name, Device_Scan_Rate will be set to1000ms instead for that item.

If the tags will be scanned at any rate other then 100ms it is generally simpler to use the DDE scan rate override value in the Alias map instead of adding @value to all your tags in Wonderware.

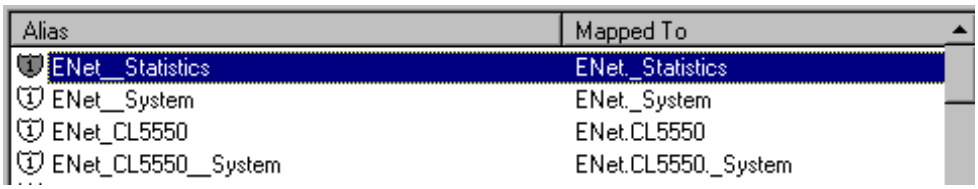


Setting Device_Scan_Rate through the DDE Scan Rate Override in the TOP Server Alias Map

An easy way to modify the Scan rate when using the TOP Server with Wonderware Clients is to do it through the Alias map. This is done by going to the Edit menu and selecting "Alias Map." The Alias map is a key feature of the Server. The TOP Server's Aliases are the Topic Name that you use

when setting up your Access Name in InTouch.

If you have created Channels and Devices in the TOP Server project, you will find that the Server has created default Aliases for you. These defaults are based on the Channel + Device path structure, you see on the screen with an underscore "_" character between the Channel and Device names. Some examples are shown below.



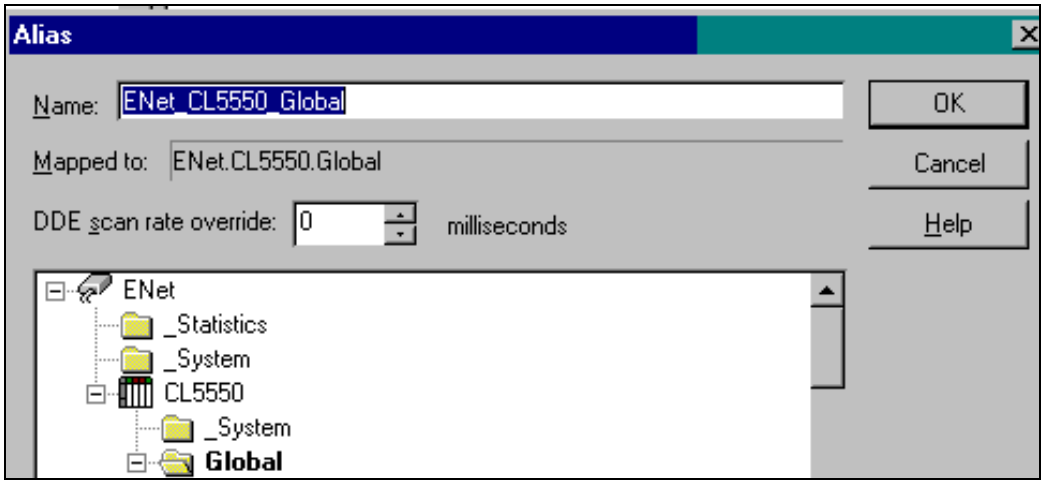
If you are using both Wonderware and a separate OPC client connected to the TOP server simultaneously, using Aliases can help you to maintain common path names to your tags in all your client applications.

You can also change these default names to something shorter or add an additional Alias to the same Channel and Device. This can give you the ability to scan information at different rates from the same Device. For those of you used to the concept of Topics, this means we can have more than 1 Topic per Device with the TOP Server. In fact we encourage it as a way to optimize your total system performance. In some cases this can allow data to be scanned faster for a small number of critical tags that could not be updated as quickly if all the tags were scanned at the higher rate.

The Alias map also allows Wonderware Clients access to specialized tags in the server that control channel and device properties as well as report communications errors. To learn more about the powerful system tags, lookup the topic "System Tags" in the TOP Server Help file. You can get a quick look at the tags too by opening the TOP Server Quick Client from Tools->Launch OPC Quick Client from the TOP Server menu.

When you want to change the Scan Rate using the Alias map you simply select the particular Alias name with the mouse and double click.

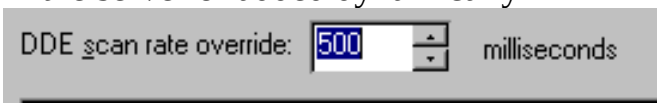
The Alias map dialogue opens where you can change the Alias (aka Topic) name. It also shows where this Alias points to in the Channel + Device tree. Hint: you can also use Ctrl-C on the keyboard to copy this name then paste it in the topic field in the Wonderware Access name with Ctrl-V.



You will notice that the DDE scan rate override defaults to 0. As long as this is 0 the individual DDE scan rate set on the tag either by default (100ms) or through the @scanrate modifier in the ItemName field in Intouch or through the Tag dialog in the TOP server will be used.

The DDE Scan Rate Override value set on the Alias Map works for DDE, FastDDE and SuiteLink – it has no bearing on OPC connections. It overrides the tag level default if you have tags in your TOP Server project or if you add them dynamically.

The DDE Scan Rate Override value works for DDE, FastDDE and SuiteLink with tags in the server or added dynamically

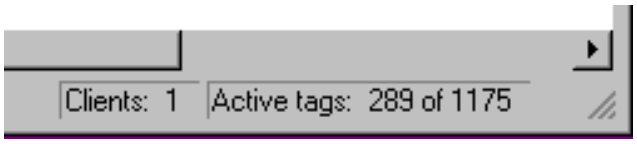


It is important to understand that this is the fastest the Device will be scanned. If the Device System is unable to return the requested information in the set-time the Server will begin a new request for the active tags as soon as the last request is finished. Once data is being requested as fast as it can be returned lowering the DDE Scan Rate Override won't impact the actual Device_Scan_Rate .

Monitoring Active Tag counts in the TOP server

Once you have your project configured, your FastDDE/SuiteLink update rate set and your Device Scan Rate set you can connect to the TOP Server with your Wonderware Client as you would any other Wonderware I/O driver through the Access name and Tag Database in Wonderware. (See our separate application note on this subject as well as our online video).

The number of active tags in the TOP Server at any given time can be seen in the Server at the bottom, right corner. The number of active Wonderware Clients only shows one for any number of Clients because the Wonderware toolkit doesn't pass information on # of connected clients back to the server, however, the active tag count can be very helpful.



Depending on the Wonderware project configuration more tags can be requesting information then are being viewed by clients. When these tags are being read for historical data collection or alarming this makes sense.

> Care needs to be taken when developing your Wonderware project to make sure other tags are not being requested or written to when it is not necessary

Care needs to be taken when developing your Wonderware project to make sure other tags are not being requested or written to when it is not necessary to read or write from them. This can often cause reduced project performance that could otherwise be experienced. For example, if you set your windows in Wonderware to overlay instead of replace when a user switches from one window to another, and you have hundreds of possible windows, then over time you could actually see the Active tag count go up in the TOP server but never go down because the windows in InTouch are actually never being closed and thus the items are never removed from the list of tags the Server needs to advise Intouch of.

Summary

In summary, there are 2 key parameters one can adjust in the TOP server that can impact how quickly it scans Devices for data and how quickly it updates the InTouch client.

1. Device_Scan_Rate – set as "DDE Scan Rate" through one of the following
    a. Defaulting to 100ms
    b. @scanrate modifier passed in the Item Name from InTouch with the PLC address to be read
    c. Modifying the DDE Scan rate in a tag defined in the TOP Server
    d. Or Overriding all of the above through the Alias Map in the TOP Server

2. Client_Update_Rate – set from Tools→Options, FastDDE/Suitelink tab in the TOP server – should only be changed with caution and full understanding of the system wide impact modifying this parameter can have.

There are cases where modifying either of these parameters will not speed up the total Screen_Update_Rate because the limiting factor is the Device/Device network scan rate. In those cases, system design choices will have to be made to adjust for those limiting factors.