



# SCADA FEST

ORLANDO | 2026

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**VTscada**  
Trihedral  
A Delta Group Company



## SCADA Speed Run - Mastering Performance Optimization

Luc Ouellet

Regional Engineering Manager (Western Canada)

Blair Sooley

Regional Account Manager (TX/LA/NM/OK)



# HOW VTSCADA USES COMPUTER RESOURCES

RAM -> Select adequate amount for size of application

- Used to hold tags and variables
- Once VTScada has it, it keeps it

CPU -> Processor speed is more important than high core count

- Sequential operations limit number of threads and multicore utilization
- New tech CPUs perform the same actions in less operations
- OS handles thread assignment to cores

Hard Drive -> Select adequate amount for duration of storage

- Fast drives (SSD) are highly recommended
- Realtime Antivirus scanning kills performance

**FOUND OBJECT!** Configure Workstation Drivers to record CPU and RAM use



# POLL/SCAN RATES

HIGH CPU

Frequent scanning = more comms = more data analysis

Scan to capture the required changes. Group scan rates to minimize # of read blocks and poll time.

Example	High	Alarms – 2 Sec
	Medium	Status and controls – 4 Sec
	Low	Config Parameters – 30-60 Sec

Use Application Config variables and parm expressions to set group scan rates (default 1sec)

## Scanning priorities...

Identify Issues in a timely manner

Maintain operational intelligence

Update configuration parameters

**Easter Egg!** Report-by-exception protocols mitigate poll frequency concerns



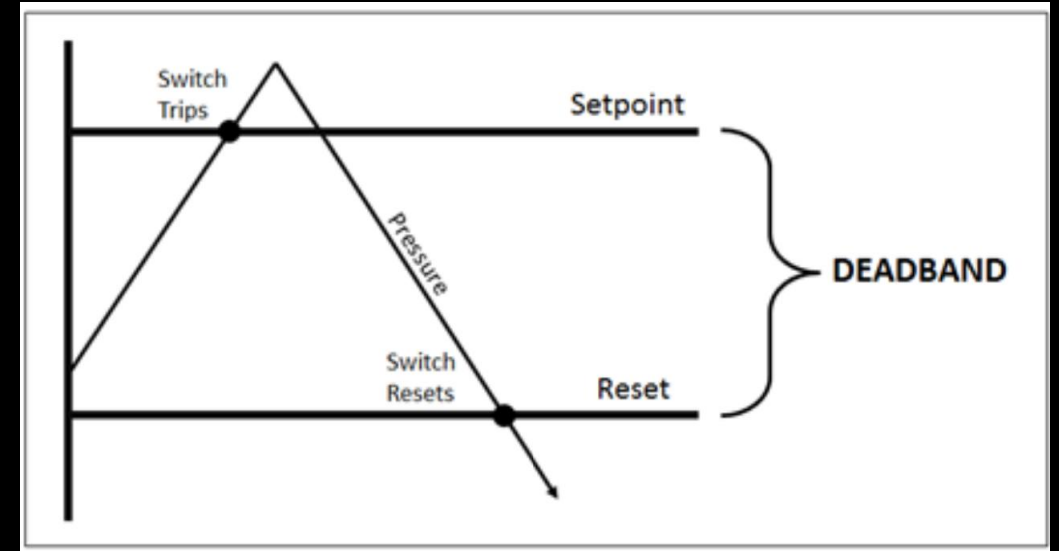
# READ ADDRESS DEADBAND

HIGH CPU  
HIGH NETWORK TRAFFIC

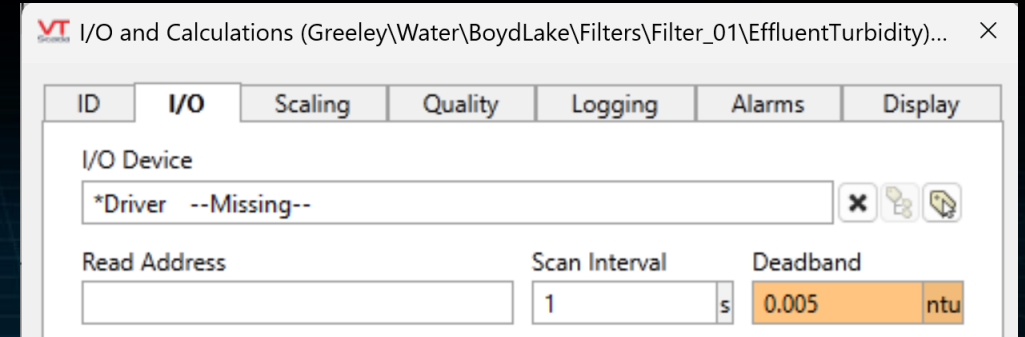
Excessive data VS discarding information

Data exceeding deadbands (default zero) is networked to all fully installed servers/workstations

Can be detrimental with lower bandwidth and/or cost-per-use networks



Source: <https://blog.ashcroft.com/deadband-pressure-switch>





# EXCESSIVE HISTORIAN LOGGING

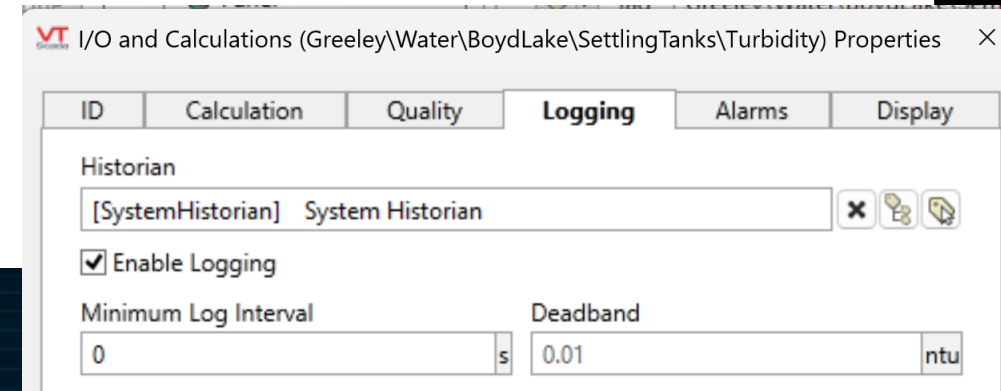
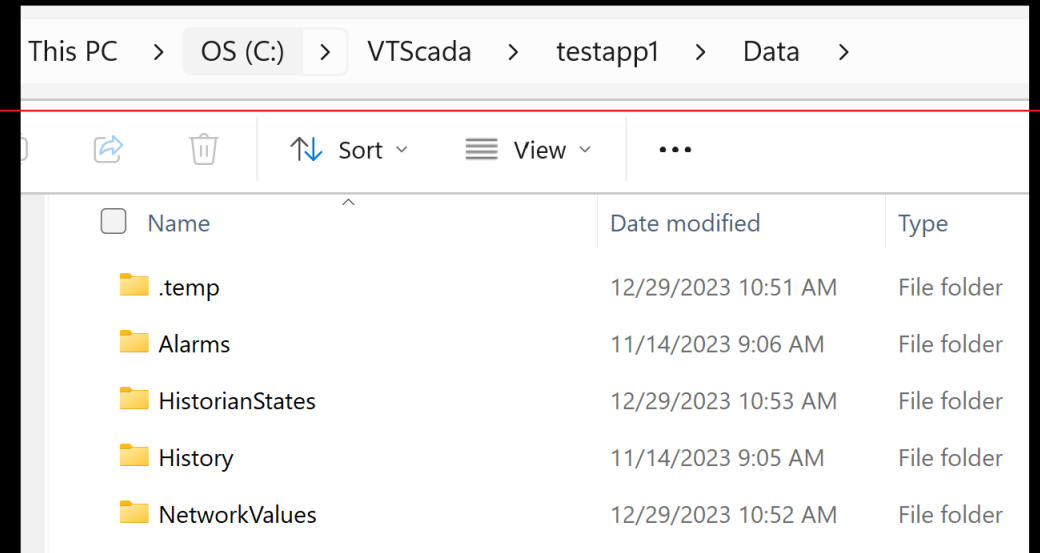
HIGH CPU  
HIGH DRIVE SPACE USAGE  
HIGH NETWORK TRAFFIC

## Driven by

- Small deadbands (default 0.25% full scale)
- Historizing tags unnecessarily (default ON)

Results in high drive use for excessive syncing between historians

Detrimental with lower bandwidth and/or cost-per-use networks



**1UP!** Always exclude the Data folder from Antivirus scanning



# HISTORIAN STORAGE PERIOD

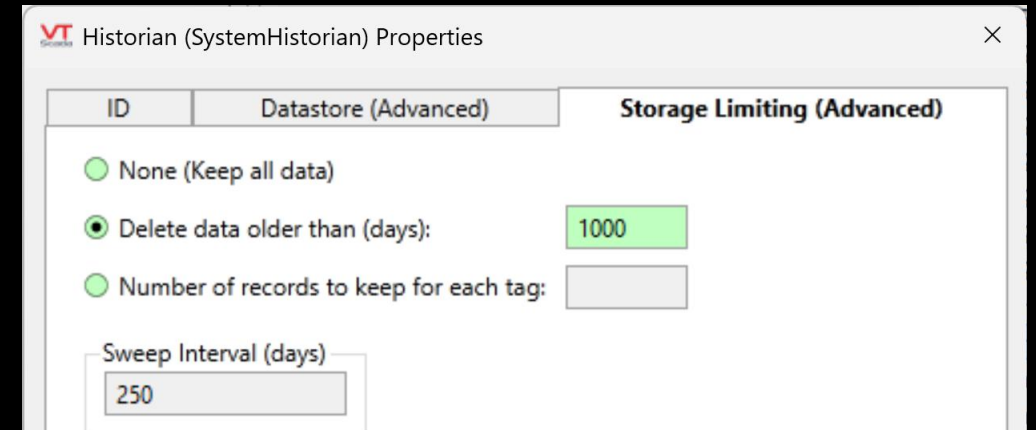
HIGH DRIVE SPACE USAGE

How long is retained history useful for

- Reports?
- Data analysis?
- Regulatory requirements?

Storage period usually closely correlates to drive usage

Set each historian's Storage Limiting (default none) carefully. Not recoverable once deleted.



**Hidden Item! Use multiple Historian tags to set different retention periods**



# ALARM TUNING

OPERATOR DISTRACTION  
HIGH DRIVE USE  
HIGH NETWORK TRAFFIC

Bad Actors Report is your friend. Use regularly!

Start with highest alarm counts. Check

- Priority. Is this even an alarm?
- Setpoint
- Alarm Deadband
- Delay
- Suppression. Unconsidered conditions

I/O and Calculations (Greeley\Water\WaterUsage\Zone\_Two) Properties

ID	Calculation	Quality	Logging	Alarms	Display
Alarm					
High High Alarm					
Alarm Settings					
Priority	None		Delay	0 s	
Setpoint	100		Deadband	0 GPM	
<input checked="" type="radio"/> Constant <input type="radio"/> Expression <input type="radio"/> Tag					

Description	Count	Percent	Type
Non-Potable Water Low Wetw	65	6.9 %	STATE
Alls Well With Riverview Telem	33	3.5 %	STATE
Trojan UV Low Flow Alarm	26	2.7 %	STATE
WW2 Stop Level Fouled	21	2.2 %	STATE
Pump 2 Starter Condition	17	1.8 %	STATE
Generator Fuel Status	15	1.6 %	STATE
Trojan UV Critical Alarm	15	1.6 %	STATE
Trojan UV Not Enough Channe	13	1.4 %	STATE



# ERROR REPORTS

OPERATOR DISTRACTION

Occur during tag initialization

- Attempts to read bad IO addresses
- Tag collisions due to duplication

Confusing if not corrected and create false impression that the application is broken.

VT Error Report

The following faults have been reported by VTScada

Metric	Value
<b>Tag Address Error</b>	
Driver Name	CL1
Address	Program:MainProgram.newtag
Error Code	1

[Help](#)

[Show Details](#) [Hide Details](#) [Copy](#) [Close](#)



# VERSION CONTROL REPOSITORY

LARGE CHANGESSET

Each change creates a new revision.

Revisions are incremental so cannot be removed manually.

Use Snapshot changeset for initial deployment to production environment. This will roll all version history into a single revision.

Workstations			
Workstation	Last Update	Current	
BLAIR-LAPTOP3	Fri Mar 27, 2026, 07:48:53.996	BLAIR-LAPTOP3-D20	
SINKLERBA	Tue Mar 10, 2026, 07:33:10.712	SINKLERBA-D10	
Version Log for BLAIR-LAPTOP3 (Total of 24 records in log)			
Version	Time Applied	User	
BLAIR-LAPTOP3-D20	Fri Mar 27, 2026 07:48:53.996	Application	SecurityManager: System up
BLAIR-LAPTOP3-D19	Tue Mar 10, 2026 15:05:03.971	demo	Switch to This Version [BLA
BLAIR-LAPTOP3-D18	Tue Mar 10, 2026 14:26:00.819	demo	Updating server list
BLAIR-LAPTOP3-D17	Tue Mar 10, 2026 14:25:29.262	demo	Tag modified: OPCUAC1
BLAIR-LAPTOP3-D16	Tue Mar 10, 2026 14:24:42.322	demo	Tag modified: OPCUAC1



# DRIVER ERRORS

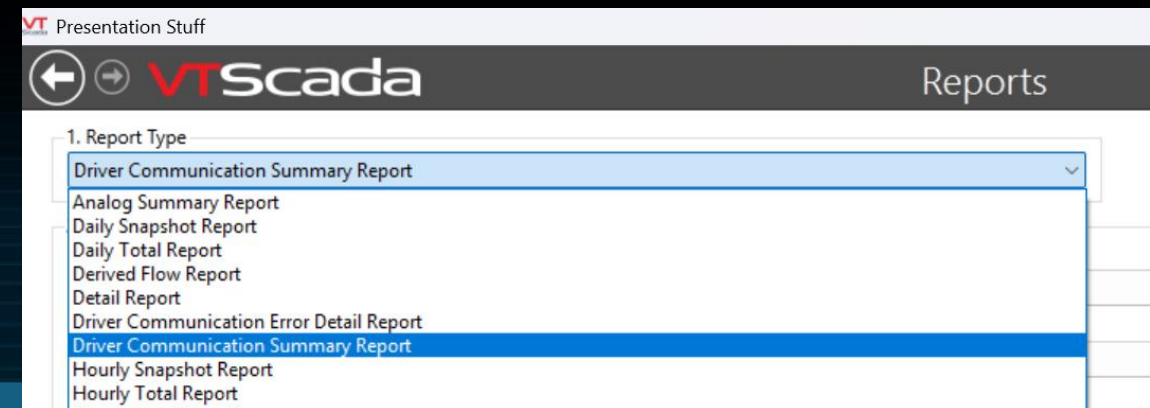
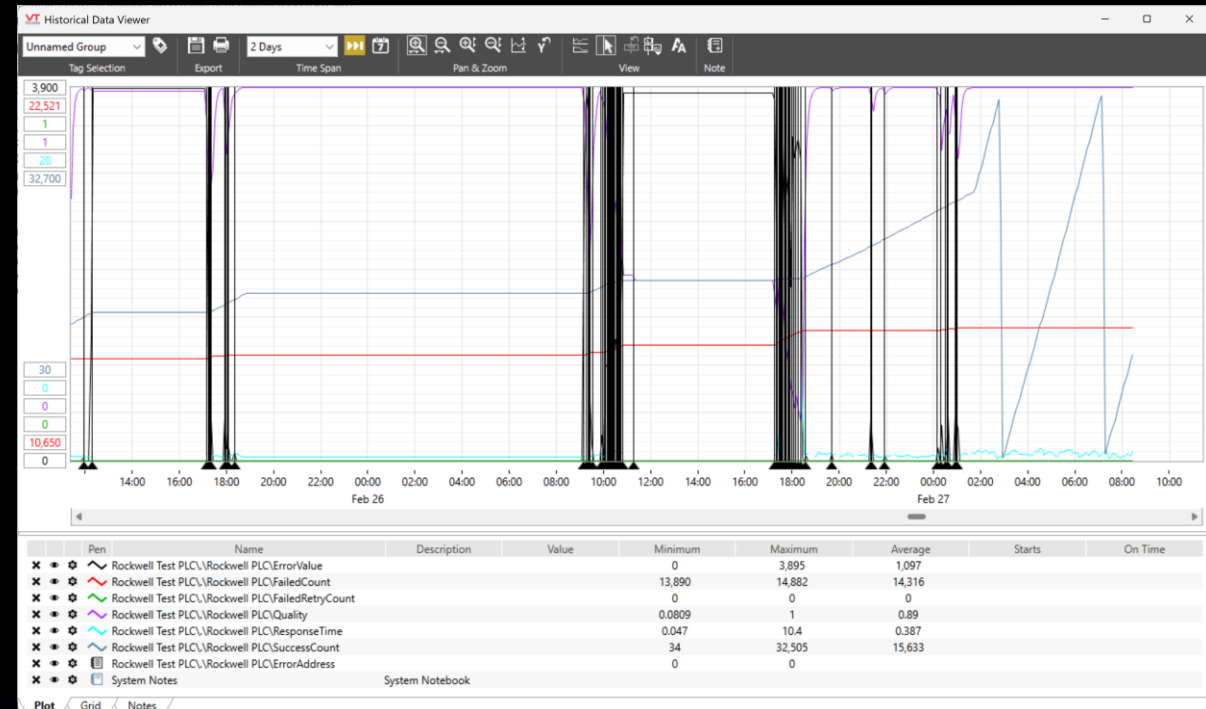
DEGRADES SCAN RATE  
COMMS ALARMS

Use the analysis tools

- Create driver tag plots of associated groups of drivers
- Use Comm Summary and Comm Error

Use On Delay in alarms conditions to eliminate noise from expected infrastructure interruptions

Can be turned off for driver types

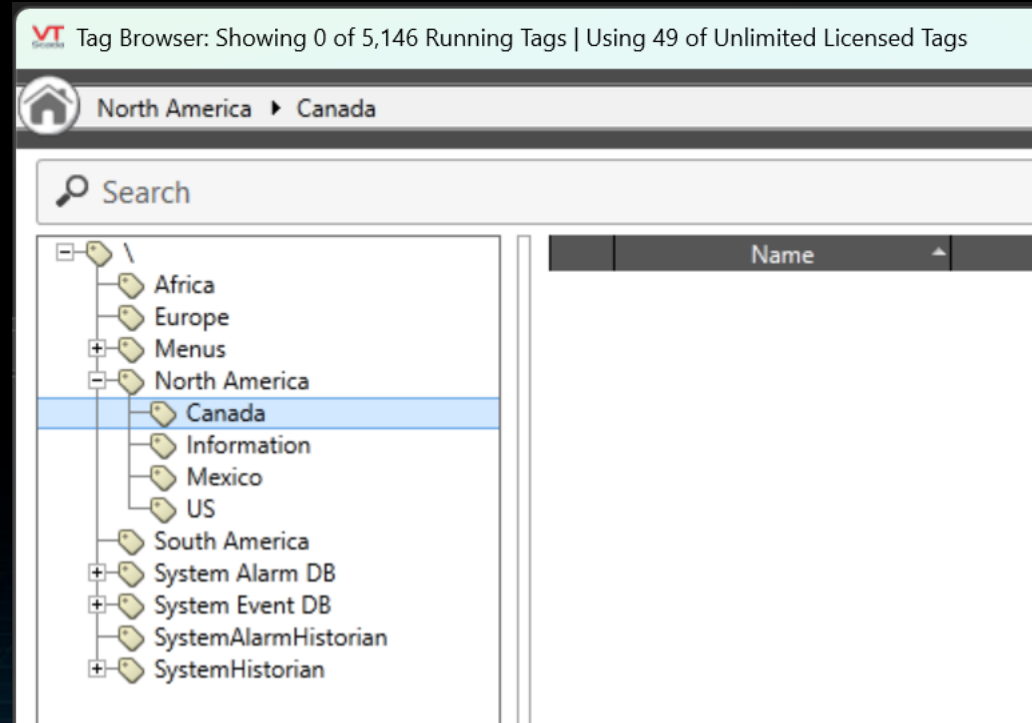




# Tag Architecture

HIGH CPU  
LOSS OF COMMS

Consider the ramifications of changing certain tag parameters

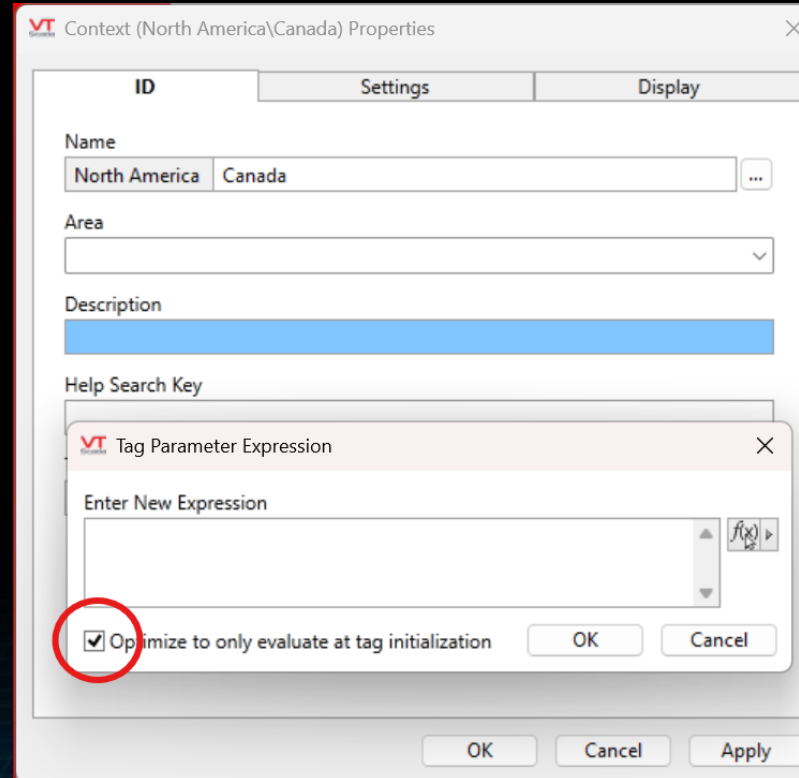




# Tag Architecture

HIGH CPU  
INCREASED RAM

## Misuse of Non-optimized Parameter Expressions





# GRAPHICS OVERLOAD

HIGH CPU  
SLOW LOADING  
SLOW PAGE REFRESH

Too many widgets on a page

Excessively nested widgets

Dynamic lists with large numbers of tags

Dynamic lists with improper filters (Use scoping)

Excessive number of trends in pages

**HACK! ISA101 standard provides direction on concise, uncluttered graphic design**



# TAG CONSIDERATIONS

HIGH CPU

Rate of Change – Refresh Interval

Totalizer - Update Interval

OPC clients

- Small Deadbands
- Only use “Force Asynchronous Refresh” when necessary

Avoid Publishing all tags in Large Systems



# SCRIPTING CONSIDERATIONS

HIGH CPU  
HIGH NETWORK TRAFFIC

Caution with Networked Values

Continuously monitor the CPU usage

Test your changes at scale



# ACCOMMODATING FOR LARGE SYSTEMS

Load Distribution

Dedicated Thin client Servers

Dedicated reporting servers

Dedicated Operator Stations

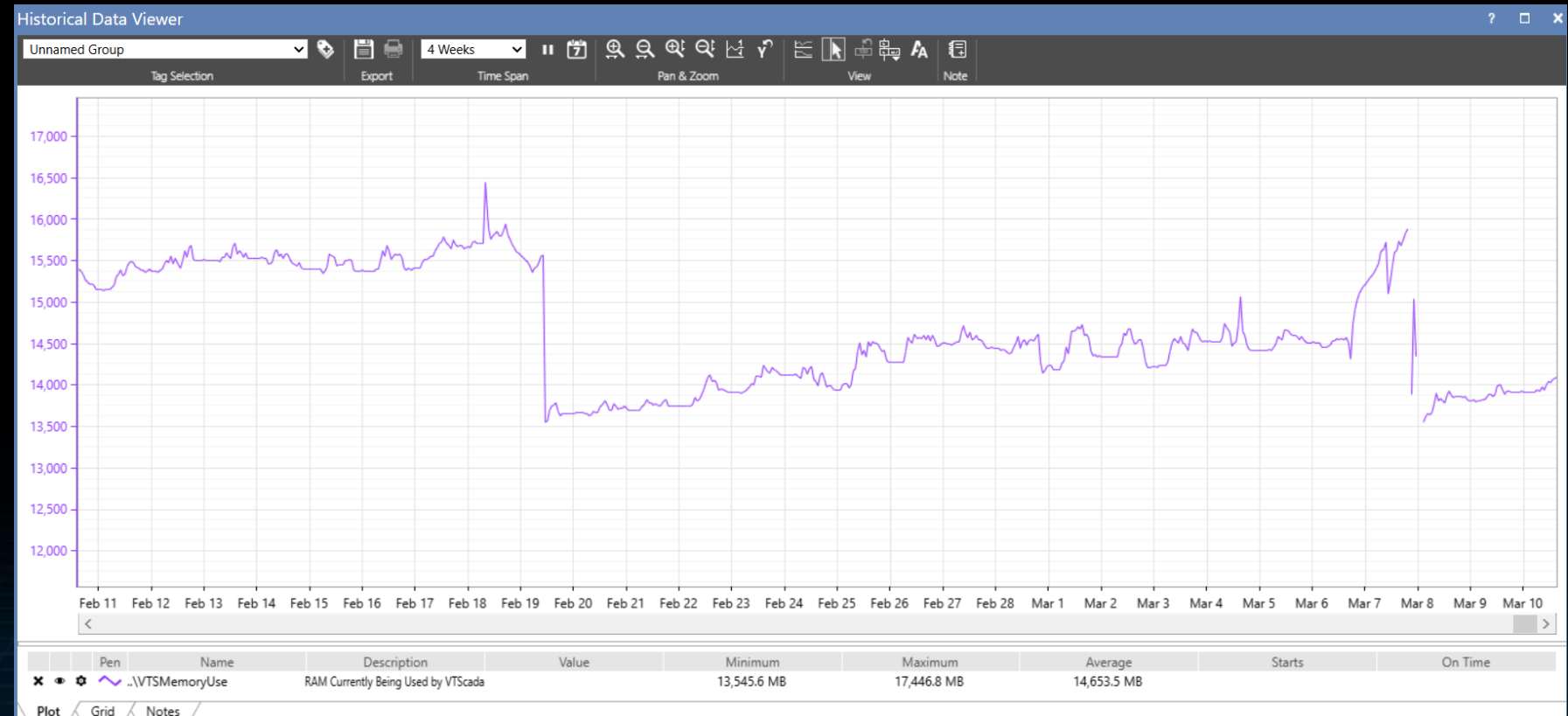
Use Start Tag Conditions to limit tags started on individual computers



# TRACK AND MONITOR WORKSTATION STATS

## Use Workstation Drivers to Monitor

- CPU Load
- RAM Usage
- Free Disk Space





# USING DEBUGGING TOOLS

## 1-Profiler

VT Profiler

Profiler: ⏪ ⏩ ⏴ ⏵ ⏶ ⏷ ⏸ ⏹ ⏺

Running Profile		Statistics		Messages	
Duration	--:--:--	Statement Count	591	Status	Idle
Last Profile		Normal Pending	5		
Start Time	22:58:49.966	Timers Pending	139		
Stop Time	22:58:53.365	Priority Pending	0		
Duration	00:00:03.399	Scheduler Lock	690.15 (20.30%)		

Counts	Total Time	Self Time	Avg Time	Stalled Time	Module Name	Code ID
7252	126.57	7.04	0.02	0.00	Script Threads	Script Threads
875	4.50	4.50	0.01	0.00	DrawTitle (DrawTitle)	Source Debugger\.sync\Profiler.SRC\Profiler\DrawGridList\DrawTitle\DrawTitle 00013-00000
875	1.29	1.29	0.00	0.00	Sizer (Sizer)	GridList.SRC\GridList\Display\TitleRow\OneTitle\Sizer Sizer 00003-00000
875	3.26	3.26	0.00	0.00	Sizer (Sizer)	GridList.SRC\GridList\Display\TitleRow\OneTitle\Sizer Sizer 00000-00000
149	1.71	1.71	0.01	0.00	ToolBar (Main)	ToolBar.src\ToolBar\Main 00000-00000
127	11.22	11.22	0.09	0.00	AppWrapper (Main)	Source Debugger\.sync\AppSession.SRC\AppSession\AppWrapper Main 00005-00000
127	25.86	25.86	0.20	0.00	AppWrapper (Main)	Source Debugger\.sync\AppSession.SRC\AppSession\AppWrapper Main 00004-00000
125	1.96	1.96	0.02	0.00	ToolBar (Main)	ToolBar.src\ToolBar\Main 00001-00000
96	1.52	1.52	0.02	0.00	DrawRow (DrawRow)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\DrawRow\DrawRow 00005-00000
87	1.35	1.35	0.02	0.00	DrawRow (DrawRow)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\DrawRow\DrawRow 00004-00000
50	0.58	0.20	0.01	0.00	ProcessSerialisationQ (ProcessSQ)	ProcessSQ.SRC\ProcessSerialisationQ\ProcessSQ 00000-00000
49	0.47	0.47	0.01	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00002-00000
49	2.18	2.18	0.04	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00003-00000
42	2.62	2.62	0.06	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00003-00000
42	0.45	0.45	0.01	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00002-00000
32	2.48	0.02	0.08	0.00	ProcessSerialisationQ (ProcessSQ)	ProcessSQ.SRC\ProcessSerialisationQ\ProcessSQ 00001-00000
27	0.30	0.30	0.01	0.00	InfoBox (InfoBox)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\InfoBox 00005-00000
27	0.44	0.44	0.02	0.00	InfoBox (InfoBox)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\InfoBox 00008-00000
27	0.08	0.08	0.00	0.00	InfoBox (InfoBox)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\InfoBox 00006-00000
27	0.14	0.14	0.01	0.00	InfoBox (InfoBox)	Source Debugger\.sync\Profiler.SRC\Profiler\InfoBox\InfoBox 00007-00000
20	2.06	0.60	0.10	0.00	BroadcastManager (AutoFlush)	VTS\.sync\HistorianTag.SRC\HistorianTag\BroadcastManager AutoFlush 00000-00000
19	1.75	0.41	0.09	0.00	IO (IOMain)	VTS\.sync\IO.SRC\IO\IOMain 00009-00000
14	1.23	1.23	0.09	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00003-00000
14	0.30	0.30	0.02	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00002-00000
14	0.31	0.31	0.02	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00002-00000
14	1.32	1.32	0.09	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00003-00000
14	1.00	1.00	0.07	0.00	ShowIcon (Show)	VTS\.sync\TitleBar.SRC\TitleBar\TitleBarMain\ShowIcon Show 00003-00000



# USING DEBUGGING TOOLS

## 2-Num Instances

VT Modules

Modules: 66041 modules loaded, 46346 instances

# Instances	Module	Source File
5132	MenuItemTag	C:\VTScada\VTS\sync\MenuItemTag.SRC
5126	MenuItemTag	C:\VTScada\VTS\sync\MenuItemTag.SRC
5126	MenuItemTag	C:\VTScada\VTS\sync\MenuItemTag.SRC
5120	MenuItemTag	C:\VTScada\VTS\sync\MenuItemTag.SRC
5114	MenuItemTag	C:\VTScada\VTS\sync\MenuItemTag.SRC
557	DummySimulation	C:\VTScada\VTS\sync\DigitalStatus.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
557	DummySimulation	C:\VTScada\VTS\sync\DigitalStatus.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
557	DummySimulation	C:\VTScada\VTS\sync\DigitalStatus.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
557	DummySimulation	C:\VTScada\VTS\sync\DigitalStatus.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
557	DummySimulation	C:\VTScada\VTS\sync\DigitalStatus.SRC
557	DigitalStatus	C:\VTScada\VTS\sync\TagTypeHandler.SRC
445	Watcher	C:\VTScada\SecurityManager.SRC
439	GetPhrase	C:\VTScada\GetPhrase.SRC
350	PersistWorker	C:\VTScada\TagCache.SRC
291	SubscriptionWatcher	C:\VTScada\Publisher.SRC
250	AlarmPoint	C:\VTScada\VTS\sync\TagTypeHandler.SRC
250	AlarmPoint	C:\VTScada\VTS\sync\TagTypeHandler.SRC
250	AlarmPoint	C:\VTScada\VTS\sync\TagTypeHandler.SRC
250	AlarmPoint	C:\VTScada\VTS\sync\TagTypeHandler.SRC
250	AlarmPoint	C:\VTScada\VTS\sync\TagTypeHandler.SRC
231	IsCrossSession	C:\VTScada\SecurityManager.SRC
214	SecurityCheck	C:\VTScada\SecurityManager.SRC
208	Cell	C:\VTScada\GridList.SRC
206	IsActive	C:\VTScada\LayerModule.SRC
187	TagCache	C:\VTScada\TagCache.SRC
149	DummySimulation	C:\VTScada\VTS\sync\AnalogStatus.SRC
149	DummySimulation	C:\VTScada\VTS\sync\AnalogStatus.SRC



# USING DEBUGGING TOOLS

## 3-Execution History

Execution History:

Filter Options

Update Filter

Number of Entries: 10,000

Show

- All History
- <No Module Selected>
- <No Object Selected>

Thread: All Threads

Hide this Debugger Thread

Scroll List by Thread:

Entry	Time	Module Name	State	Statement #	Thread Name	Thread ID
289	23:01:46.945	PageFinder	Idle	1	DisplayManager	40612
290	23:01:46.945	PageFinder	Idle	0	DisplayManager	40612
291	23:01:46.945	Graphics	Main	8	DisplayManager	40612
292	23:01:46.945	DrawLevel	Main	7	DisplayManager	40612
293	23:01:46.945	DrawLevel	Main	6	DisplayManager	40612
294	23:01:46.945	DrawLevel	Main	7	DisplayManager	40612
295	23:01:46.945	DrawLevel	Main	6	DisplayManager	40612
296	23:01:46.945	PageListShow	Main	4	DisplayManager	40612
297	23:01:46.944	PageFinder	Idle	1	DisplayManager	32928
298	23:01:46.944	PageFinder	Idle	0	DisplayManager	32928
299	23:01:46.944	Graphics	Main	8	DisplayManager	32928
300	23:01:46.944	PageListShow	Main	4	DisplayManager	32928
301	23:01:46.944	PageFinder	Idle	1	DisplayManager	7820
302	23:01:46.944	PageFinder	Idle	0	DisplayManager	7820
303	23:01:46.944	Graphics	Main	8	DisplayManager	7820
304	23:01:46.944	PageListShow	Main	4	DisplayManager	7820
305	23:01:46.943	PageFinder	Idle	1	DisplayManager	30012
306	23:01:46.943	PageFinder	Idle	0	DisplayManager	30012
307	23:01:46.943	Graphics	Main	8	DisplayManager	30012
308	23:01:46.943	PageListShow	Main	4	DisplayManager	30012
309	23:01:46.941	PageFinder	Idle	1	DisplayManager	41560
310	23:01:46.941	PageFinder	Idle	0	DisplayManager	41560
311	23:01:46.941	Graphics	Main	8	DisplayManager	41560
312	23:01:46.941	PageListShow	Main	4	DisplayManager	41560
313	23:01:46.941	DrawAppListItem	Main	51	Application Manager	28840
314	23:01:46.941	DrawAppListItem	Main	51	Application Manager	28840
315	23:01:46.941	DrawAppListItem	Main	51	Application Manager	28840
316	23:01:46.941	DrawAppListItem	Main	51	Application Manager	28840





# USING DEBUGGING TOOLS

## 5-RPC Diagnostics

The screenshot displays the 'VT RPC Diagnostics' application. A central window titled 'Inter-machine sockets' lists several machines with their status and queue lengths:

Machine	Type	Queue length	Status
Machine: OUELLETLC/ 10.11.5.19	Local	0	Green
Machine: BACKUP/	Remote	3	Red
Machine: PUMP1SERVER1/	Remote	0	Red
Machine: PUMP1SERVER2/	Remote	0	Red
Machine: SQLHISTORIANSERVER/	Remote	0	Red
Machine: RADML16/	Remote	0	Red

The background shows a log of events with columns for Time, Direction, IP, Application, Service/Machine, and Data/Parameters. The 'Data/Parameters' column contains a repeating message: 'Discarded 1 messages (Q flush)'. The time range shown is from 13:45:23.412 to 13:45:25.880.



# SUMMARY



1-Plan Ahead



2-Anticipate the scale of your changes



3-Continuous performance monitoring while building



4-Monitor and deal with issues in the production environment as they occur



# Thank you for attending this session!

- Fill out the 2-question feedback survey via the App! *Ukova*
- Especially if you need a Continuing Education Credit or Professional Development Hours certificate.
- Don't have the app, fill out the paper form included in your conference kit and hand into Natasha.

SAVE THE DATE FOR SCADAFEST 2027!  
MARCH 8-12, 2027 | ORLANDO, FL