

T4 Viewer Overview

*A graphical display tool to assist in the analysis of data
collected by the T4 Data Collector for OpenVMS*

T4 Viewer Version 1.6.1

1. The T4 Viewer

The T4 Viewer is a Windows based application for presenting graphical views of performance data contained in CSV files that have been collected from OpenVMS systems using the T4 data collector.

The program is self-contained and uses only code contained in the Microsoft .NET libraires. Whilst this imposes limitations in the performance and style of the charts possible, it does mean that there is no requirement for the licencing of additional software packages, nor any need to deliver additional libraries as part of the distribution. In this first release, the application is provided as a simple .exe file that can be copied to the required target system.

The key motivation behind its development was the desire to be able to handle multiple T4 files at the same time and easily compare and contrast views from different system classes of data and metrics.

To this end, the new T4 Viewer handles a wide range of files simultaneously, and from multiple systems and across multiple days. Whilst it can take some time to open large numbers of files, this is more than compensated for by the ease in which data comparisons can be performed. However, it should be noted that the program does not explicitly check for relationships between the files opened but errors will occur, or results could be widely misleading if inappropriate T4 files are opened in the same session. For consistency, the following guidelines should be followed:

- All files should all relate to the same cluster and should reflect the same time period (although adjustments will be made for small differences in start and end times).
- The files MUST have the same sample interval.

The following notes will help in getting to grips with the tool – but please read the limitations section at the end of this overview to understand some restrictions on use.

2. Key Concepts

2.1. Data Classes, Fields and Devices

T4 data headings are processed to allow data to be presented by “Data Class”, “Field” and, where appropriate, “Device”. It is no longer necessary to understand the names of the T4 fields and relate them – the pre-processing section of the viewer attempts this.

Classes

A “Class” is a high-level group of samples such as “IO”, Memory, “Process” or “State”.

- The “Class” is determined from the component of the T4 data heading inside the square brackets – although for some classes (Networking, host based mini-merge and others) it is not the entirety of the square-bracket component).
- “Class” elements are presented in “plain text” as far as possible. This is achieved by using lookup tables to translate the T4 data fields into the desired text. So, for example, fields listed as “MON.PAGE” in the T4 data will appear as “Paging” in the class lists in the display.
- The text describing each class is customizable.
- The lookup tables are easily extended to accommodate additional classes.

Fields

A “Field” is a metric within each class such as “CPU Busy”. “Direct I/O Rate”, “ProcCount” and is derived directly from the headings in the T4 data files.

- In most cases, the field is determined from the T4 heading element after the square brackets, ignoring any device name.
- If new fields are added to T4 datasets that the Viewer has not specifically been programmed to accommodate then these fields will still be handled correctly providing the entire field name follows the closing square bracket of the T4 heading.
- There are some T4 data classes where this rule is not followed (e.g. network related fields). The T4 Viewer has been specifically programmed to catch these and process field names correctly.

Devices (or Items)

The “Device” or “Items” elements are the device or item names appropriate to each Class (e.g. Disk, HBA, Interface). Note that for the network classes the T4 viewer has separate concepts for the actual network interfaces and the protocols.

General notes on Classes, Fields and Devices

- The last selected items from the “fields” and “Devices” lists for each class are remembered for the duration of the session.
- Architecturally, there is no limit to the number of “Fields” and “Devices” that can be selected for a single chart – however, care should be taken as it is easy to select too many items for the system to comfortably display due to CPU and Memory limitations. Processing large numbers of chart items is very resource intensive. Also remember that in a cluster, by default, each Field and Device combination will be charted for each node (so it may be worth filtering out inactive nodes).
- The Viewer may impose a “soft” limit on the number of fields selectable and the number of series charted based on PC specification. These limits can be adjusted or removed via the **Chart => Chart Items Limits** menu. Limits are not set for PCs exceeding the optimum specification (indicated below).

- Note that if the “soft” limit is overridden then the new value will be saved in the initialisation file (if the file is saved) and used in future analysis runs.
- A maximum of 2 Classes may be selected for simultaneous charting (but see the note later regarding multiple charts). Each class will be shown as a separate chart in the same window.

2.2. Handling of Shadow Sets

The application has a degree of “Shadow Set Awareness”.

As T4 has no mechanism for detailing the Shadow Set Configuration of the sampled system, the T4 Viewer features a capability to manually specify the members of the shadow sets on the system. If shadow set definitions are provided, then the “Shadow Set Class” will pull together all disk related fields for each shadow set across the cluster.

Shadow set processing is initiated during the file pre-processing sequence of the T4 Viewer – and continues as a background activity during initial chart processing.

Shadow set handling differs depending on whether disks are directly attached or entirely MSCP served:

- Full shadow set processing occurs for directly attached disks (e.g. Fibre Channel, CI, DSSI or Shared SCSI). For these classes of devices the processing is as follows. For each cluster node, the I/O rates, Transfer rates and Average I/O Sizes for all member devices will be combined (summed or averaged, as appropriate) to provide aggregate figures across the Shadow Set. This pulls together I/O data from the “comp”, “disk” and “fcm” T4 files. The viewer can then be used to chart either the aggregate figures for each Shadow Set or the individual metrics for each component device using the “Shadow Set” class.
- For fully MSCP Served disks there is no way to apportion the MSCP traffic to individual devices – nor indeed, to the actual I/O on the actual serving node, so it is not possible to produce aggregate figures. MSCP Served Disks can still be grouped and charted together – but the metrics will not be combined.
- For shadow sets where both direct paths and MSCP served paths exist, the pre-processing will be unable to determine what, if any, proportion of the workload is satisfied by MSCP servicing, so the aggregation data presented will ONLY be that from the direct paths. The user must determine the accuracy of this from prior knowledge of the system and careful examination of the data.

Once data has been loaded into the viewer it is not possible to retrospectively request processing, nor to change the Shadow Set definitions to be used – data must be reloaded to achieve this. In addition, data saved in a Binary File (see below) has already been processed against shadow set definitions, so it is not possible to change this.

The following notes apply to Shadow Set Handling:

- For full Shadow Set data to be computed, the T4 data sets must include the “comp”, “disk” and “fcm” files for each node.
- Shadow set definitions for processing can be defined either:
 - Simple matching rules, grouping disks based on simple disk name attributes, namely: First/Last Digits of the Volume Name or Allocation Class.
 - Custom rules where the members of each Shadow Set are identified explicitly. A simple menu interface allows the specification of the custom rules. Note that custom rule definitions are saved as simple text files.

- On completion of the pre-processing, a summary of shadow-set information derived from the data files will be presented. This provides a list of physical devices for each shadow set for on each node for which metrics are present in the T4 data files. This assist in establishing the accuracy of aggregated data. The summary will also indicate the following:
 - If there is a Shadow Set that does not appear in the data tables for any node, the message ***“Some shadow sets not mounted cluster-wide”*** will be displayed.
 - If any node is missing metrics for a physical device, then the message ***“Some disks not mounted cluster-wide – processed shadow data may not be complete”*** will be shown.
 - If there are 4 or more shadow sets for which only a single device can be found, then the message ***“A number of single member shadow sets found – shadow definitions may be incorrect”*** will result.
- To accommodate systems with dynamic shadow set membership, the Shadow Processing component allows the specification of 2 different Custom Shadow Set rules for a cluster. Unfortunately, at present there is no way for the viewer to automatically determine which ruleset to use, but a simple menu option allows you to switch between the rulesets. *(Note that work is in progress to provide an automated T4 extension that will allow this).*
- Shadow set pre-processing is turned off by default – but the user is prompted to specify whether Shadow Set processing is required after selecting to Open CSV files.
- Shadow set definitions can be created, edited or deleted via ***Preferences => Shadow Set Handling*** menu. They can also be listed and deleted via the ***Preferences => Customisation and Other Preferences*** menu.

Important notes and limitations of Shadow Set Handling

- **On large systems or those with complex Shadow Set naming, processing of this data can be resource intensive. For this reason, Shadow Set processing always runs in the background. Generation of charts can continue, but the user must be aware that Shadow Set related charts may be incomplete or inaccurate until Shadow Processing is complete.**
- **Background shadow set processing is multi-threaded (one thread per Cluster Node per Sample Day).**
- **At the completion of shadow set processing the current chart display will refresh. This will cause any time selection operations that are in progress to reset.**
- **As noted above, beware of the limitations of MSCP served Shadow Set processing.**

2.3. Data Granularity

The viewer has a concept of data granularity (essentially, averaging). If large amounts of data are selected for charting, then performance falls off very quickly. However, if the data is reduced first, then wide-ranging charts can be produced quickly allowing you to focus in on areas of interest with increased levels of detail.

By default, the Viewer selects the granularity automatically based on the samples to be displayed – as zoom levels or time selections are made then the granularity will recompute automatically. Note that automatic granularity for 3D charts is lower than that for 2D charts.

However, charts can be generated with selectable granularity:

- As noted, higher granularity charts require more processing and therefore take longer to render – and obviously, lower granularity will result in charts being drawn more quickly.
- If a specific granularity is selected from the pull-downs it will be used for all charts until Automatic granularity is reselected.

- Chart granularity is reported in the bottom right-hand corner of the chart. If there is no granularity reported then the chart is displaying native resolution.
- Granularity can be controlled using menu pull-downs – 3D Chart Granularity is controlled separately to standard chart granularity.
- As an alternative to “Simple” granularity, a “Rolling Average” can be used. In some cases this may offer a more representative smoothing of the data.

3. File Selection and Pre-Processing

3.1. File Selection

On selecting “Open” and “CSV Files” from the initial menu, the user is prompted for Shadow Set processing information (see below), after which a file selection dialogue appears.

This allows selection of either discrete files, multiple discrete files or entire folders. Note that the selection buttons may appear non-intuitive:

- “Open Path/Parent Folder” will use the folder path displayed in the text box at the top of the screen (Path:) and will open all .csv files discovered in that folder and any subfolders.
 - The “Total Files in Path” value indicates the approximate number of files located in the indicated folder tree.
- “Open Selected” will use any folders selected with tick boxes in the folder/file tree view on the left-hand side of the window AND any additional FILES OR FOLDERS selected in the right-hand file detail box.
 - File selections are cumulative.
 - The “Total Files Selected” value indicates the approximate number of files that will be opened.

When selecting files for processing, please consider the resources available in your PC. Whilst the tool will accommodate large data sets, the number of files that are being manipulated may be much larger than you think.

A T4 dataset for a single server can consist of between 1 and 12 files (typically between 6 and 10), depending on the classes and metrics selected for collection. If the analysis is for a 6-node cluster then a typical collection will result in between 36 and 60 files per day.

This should be within the capabilities of a modern system (including a typical business laptop) – but processing multiple sample days at the same time does require a more generously sized machine.

For initial analysis it is recommended that you attempt smaller groupings of files until you understand the capability of your PC to handle larger data sets.

On a final note, it is often easier to organise file datasets into discrete days before analysis to make file selection easier.

The pre-processor will attempt a rough estimate of the time required to process any Shadow Set data that is specified, and if the estimated time exceeds 1 hour then it will prompt for confirmation before continuing – with 4 options.

1. Continue as normal.
2. Continue, but don't process Shadow Set aggregate data.
3. Exit and return to file selection (allowing the re-selection of number of sample files).
4. Exit and return to main screen (allowing the re-specification of Shadow sets).

3.2. Pre-Processing

Files are pre-processed to build internal data structures to allow for efficient chart creation, but also to check for sample consistency. Checks are limited to the following:

- The “first” and “last” sample times are computed across all sample files.
- If necessary, zero samples will be added to data streams that are incomplete – therefore care must be taken when analysing time periods toward the beginning and end of the sample periods.

- Sample files representing vastly different time periods may result in errors being reported and some of the files being ignored.
- Warnings will be displayed during the file pre-processing phase if any of the data files have incomplete sample sets (except in the event that the only error requires small adjustments to start and end samples – in which case zero samples will be added automatically).
- If files are present with different sample intervals, then the pre-processing will fail with an error message.

4. The User Interface

The user interface is a standard Windows Forms application with the following key features.

4.1. A Standard Windows Menu Bar

This is fixed along the top of the screen. If your screen resolution is sufficiently wide, then the menu bar will contain a summary indication of the source data.

4.2. Status and Reporting Bar

This is fixed along the bottom of the screen containing some status and reporting information and some additional controls:

- At the left-hand end of the status and reporting bar is a simple coloured square. This square will be green except during chart generation when it will turn red. Note that generation of some charts can take a significant amount of time.
- There is a Chart Type pull-down menu that allows the selection of the chart display type.
- Status indicators show the numbers of series shown and the number of chart items selected.
- If files are selected that represent multiple days of data collection, then a selector will offer a choice of ways to present the separate days in the data.
- A checkbox indicating whether to show a computed “average” for the chart. Note that this is an overall average for the chart and may not be meaningful for charts with large numbers of series.
- An additional progress status bar is displayed in the bottom left-hand corner of the Chart when background shadow processing is in progress or when Binary File import is in progress.

4.3. Data Navigation

Lists of elements to assist in navigating the data are presented down the left-hand side of the main window. There may be two or three columns shown, depending on selection choices.

Data Classes

The left-hand column lists the available Data Classes (described above). A maximum of two Data Classes may be selected (but ONLY if “separate nodes” and “separate days” are not selected).

Fields and Devices Lists

The next column may be broken into 1, 2 or 3 separate lists, depending on the class of data selected.

- For simple data, the column will display the list of fields available for the selected data class.
- For data that has per-device or per-component data, then the bottom section of the column will list the available devices or components.
- For Shadowing data, the column may be broken into three sections. If **Show Component Disks** is selected from the **Shadow Sets** menu then the top section shows the available shadowing metrics, the middle section will show the available shadow sets and the bottom section the available volumes in the selected Shadow Sets.

Fields and Devices List for Second Class

The next column is the same as above, but reflects a second class, if selected. If only one class is selected this column is not shown.

Column sizes

The columns may be re-sized by dragging left or right whilst holding down the right mouse button on the appropriate column edge.

4.4. Legends

A chart Legend Box may be shown.

By default, this appears on the right-hand side of the screen with the chart area sized to accommodate it. The Legend Box may be moved by dragging from its title bar to any other area of the window, or by selecting its position from the **Chart => Legend** menu.

The Legend Box may be hidden by either pressing the close widget in the top right-hand corner, or from the **Chart => Legend** menu.

The Legend Box may be configured to show the Average and Maximum values of a series.

Clicking on an item in the Legend Box will cause the corresponding series on the Chart to highlight. Multiple series can be highlighted simultaneously.

Note that the size of the legend box will depend on the number of chart items shown. If the Legend Box cannot accommodate all of the chart items, then a scroll bar will automatically appear.

4.5. Main Chart Area

The Main Chart Area occupies most of the screen.

One or more separate charts may be shown, depending upon the menu and navigation selections – all charts will have the same chart type.

The time range shown on the chart can be “zoomed” by dragging the Blue Bars on the left and right of the chart (note that the left-hand bar may be obscured by the X Axis). It is also possible to select multiple focussed timeframes (a “list of times”) for analysis - as described below.

If multiple charts are shown, then the first chart will have the Blue Zoom bars and can be used for changing the time range. Note that all charts show the same time window.

Clicking on a series line will cause the corresponding Legend Item to highlight.

3D charts are also available, but it is recommended to reserve these for small data sets for performance reasons.

4.6. Time Selector Menu

If a list of times for analysis is selected (see below) then a “Time List” Grid will be shown. This can be moved to another location by dragging its menu bar.

Note that the only action possible in the Time List control is to select “Ignore Days”.

4.7. 3D Control Menu

If 3D Charts are selected, then a 3D Chart Control Menu is displayed. This can also be moved to another location by dragging its menu bar.

5. General Notes On Usage

5.1. Customisations

The **Preferences => Customisation and other preferences** menu allows the customisation of a wide variety of attributes of the tool, including font sizes and colours. It also permits remapping of Class names, definition of Chart Units and the specification of start-up behaviour.

One key item is the specification of the “Base Folder” where new subfolders will be created for saving customisation files. There may be 3 such folders:

- T4_Recipes
- T4_ShadowSetRules
- Logs

By default, the “Base Folder” will be the users “Documents” folder.

An initialisation file (“t4viewer.ini”) will also be saved in your “Documents” folder. This contains:

- The location of the “Base Folder”.
- All customisations from the “Preferences and Customisation” menu.
- Preferred file formats.
- The most recent Items and Devices selection for each Class of data.
- The most recent Shadow Set ruleset used.
- Various positional attributes from your last Chart.
- **Note that the initialisation file is only saved if:**
 - You exit the T4Viewer using the **File => Exit and Save** button
 - You use the “Save” button on the **Preferences => Customisation and other preferences** menu.

On launch, the T4 Viewer will check for the existence of the Base Folder and if it cannot be found (or is not readable) then the user will be prompted to specify it. Note that after specifying the “Base Folder” (even if you decide to leave it as your “Documents” folder) you must perform an action that results in the saving of the initialisation file – otherwise on next invocation the T4 Viewer will prompt for the location.

5.2. Chart Headings

For a single class of selected data, the chart heading will reflect the Class of data selected and up to 3 specific fields that have been charted. If more than 3 fields are selected, then the heading will simply state “multiple items”. If multiple classes are selected, then the chart heading will simply state “Multi-Class Chart” and additional information will be provided underneath the X-axis.

Sub-headings will also indicate whether data is stacked and / or whether days are overlayed.

5.3. Chart Styles

A variety of chart styles are available – including line and area styles, and overlayed and stacked styles. If a stacked style is selected, then this is noted in the heading of the chart.

Charts can be annotated to display a line showing the “overall average”. For a stacked chart, this is the average of all stacked items. For a non-stacked chart it is the average of the highest values.

As noted above, the chart legend can also optionally display the series maximum and average – which may be more meaningful than the overall average, especially for complex data sets.

3D charts are also offered – although performance is poor except for small numbers of charted items.

5.4. Y-Axis Control

By default, the chart Y-axis automatically adjusts to reflect the data contained in the chart, but it can be adjusted to show additional detail by dragging the baseline or the pale green bar at the top of the charts. The Y-axis can also be locked to allow easier comparison of different data sets.

It is also possible to ask the viewer to scale the Y-axis based on system capabilities. If “System Max” is selected, then the y-axis scale will be adjusted based on the individual CPU core counts or the amount of memory contained in the system. Note that for clustered systems these computations are system specific (i.e. clusters with dissimilar CPU counts and memory capacities across the nodes will be treated correctly).

Where multiple charts are displayed it is possible to lock the chart Y-axis relative to each other (Cross-Lock) to allow more meaningful comparison. If Cross-Lock is not selected, then the Y-axis of each chart will adjust to the data in that chart or the “System Max” setting.

Y-axis units are shown for up to 2 different selected items. If 3 or more items with different units are selected, then only the first 2 will be shown.

Note that the Units that are shown can be modified in the ***Preferences => Customisation and other preferences*** menu.

5.5. Saving Charts

Charts can be saved in a variety of image formats (jpg, bmp, gif, png or tiff). The ***Preferences => Save Options*** menu allows you to select the default format.

Charts can be printed directly from the screen.

Note that printed and saved charts may not have the full legend.

5.6. Showing Multiple Charts

The application allows the display of multiple chart views in the same window for 3 different scenarios:

- It can optionally (via menu selection) show a separate chart for each node in a cluster.
- It can optionally (via menu selection) show a separate chart for each day in the sample period.
- It will always show a separate chart when 2 classes of data are selected.
- Note that these separate chart views are mutually exclusive.

5.7. Focussing on Specific Time Periods

The data time period(s) can be focussed and refined in 3 different ways:

- Multi-day analysis can be shown either as
 - Under the **Chart** menu, Separate Charts for each day can be selected (as mentioned above (“Separate Day”).
 - In single chart or multi-class charts, selection buttons along the bottom of the chart window allow selection of additional views as follows:
 - A single continuous chart (“All Days”).
 - A single chart with the days overlayed (“Overlay Days”).
 - A day-by-day view with navigation between days (“Single Day”).
 - A simple zoom facility allows charts to be focussed on a small period of samples. Zooming is achieved by dragging the mouse over the chart whilst holding down the left mouse button.
 - During the zoom operation, the zoomed area is highlighted by a box to illustrate the time period to be zoomed.
 - Once a chart is zoomed, a “Zoom Adjust” box appears at the bottom of the screen showing the current Zoom start and end times below sliders which allow the beginning and end of the Zoomed range to be moved.
 - The zoom can be reset completely either from the context menu that appears when the right mouse button is clicked over the chart or from the **Reset All Zoom Settings** button located in the bottom right-hand corner of the chart window.
 - In multi-chart views (Separate Days, Separate Nodes) – zooming can be performed from any chart, and the zoom window will be duplicated in all of the charts.
 - A complex zoom facility (Zoom List or Time Frames List) allows the selection of multiple timeframes – so a single chart could be selected to show, for example, start-of-day processing, peak-daytime processing and end-of-day processing.
 - If the **Multiple Timeframes** button in the bottom right of the display is clicked, then a “prototype” timeframe appears - the start and end times of this frame can be dragged to the required times (actual times are shown in the grid). Additional “prototype” frames can then be added to achieve the desired ranges. Each range is colour coded. A detailed grid window also appears showing the detail of the Timeframe ranges.
- Once all required frames are added, the “Draw” button can be pressed to show the chosen time periods.

Multi-timeframe processing has the following characteristics:

- There is no architectural limit on the number of timeframes.
- For multi-day samples, timeframes may be specified to **Ignore date**. In this case, the timeframes specified will be repeated for each day in the sample. **Ignore date** is the default for multi-day samples.
- If multi timeframes are selected in a multi-day single chart view, then the frame movement is restricted within the bounds of the second sample day – so an attempt to drag a frame start or end outside of the current day boundary will cause an error message to display.
- If the frame sides are dragged together (resulting in a zero-length frame) that frame will be deleted. Note that later frames will be redrawn with the default colour scheme.
- Once the new charts have been drawn it is not possible to change the frames except by clearing or resetting the times. The **Clear** button removes all time entries and

shows a new initial “prototype” timeframe whilst the **Reset Zoom** button removes all zoomed frames and closes the Time Frames list window.

- It is also possible to hide the detailed frames list allowing the graph area to be decluttered. **Show List** redisplay it.
- In a multi-chart view, all charts will be computed with the same timeframes. Timeframe creation can be performed in any chart, and the templates will be repeated in each chart.
- Selected multi-timeframes are retained across multi-day views if the **Ignore Date** selector is checked. If **Ignore Date** is cleared, selections are cleared if the multi-day view is changed.
- Selected multi-timeframes are retained across class and item selections, and across node view changes.

Note that the time selector controls function best in the single chart view. It is recommended that zoom selections are made in single chart view and then the desired multi-chart view is selected.

5.8. Binary Files

The pre-processed data can be saved as a “binary” file. Note that there is limited benefit to this except where complex Shadow Set processing has been performed, where the processed shadow data is saved alongside the other samples, removing the need to process shadow sets on re-load.

Note that any complex Shadow Set definitions relevant to the saved data are saved with it. This is critical to ensure correct interpretation of the data on re-load.

Note also that you cannot re-save a Binary file (but there is nothing to be gained from doing so).

5.9. “Recipes” - Saving Views and Selections

The application provides a mechanism to save “recipes”. A recipe is a combination of Class Selections and Timeframe windows that can be saved to disk and then re-used during a future analysis exercise.

- Timeframes should be specified as “ignore date” for recipes to be effective.
- There is no limitation on the recipe being used on the same cluster or nodes.
- Fields that are recorded in the recipe and not present in any future data set will be ignored.
- Recipes can be created and recalled from the **Recipes** toolbar menu.
- Recipes can be listed and deleted via the **Preferences => Customisation and Other Preferences** menu.

5.10. Selecting Nodes for Inclusion/Exclusion

The **Nodes** pull-down menu allows the deselection/reselection of cluster nodes for inclusion in the charts. By default, all nodes are charted.

5.11. Raw Data Views

You can list the files that have been opened for processing. In the case of a Binary file, the name of the Binary file will be displayed followed by the component files that were used in creating the binary.

You can view the raw data in tabular form. Note that the Raw Data view presents exactly the data as retrieved from the T4 CSV files – there is no processing of headers into Classes and Fields.

5.12. System Configuration View

You can view the system configuration summary as contained in the T4 files.

5.13. Managing Shadow Set Definitions and Recipes

Shadow Set Definitions and Recipes are saved as simple text files. By default, these will be stored in folders under your “Documents” folder – but the ***Preferences => Customisation and other preferences*** menu allows the specification of the “Base Folder” where these subfolders will be created.

Shadow Set Definitions and Recipes are over-written when new definitions are stored with the same name.

The existing Shadow Set and Recipe names are listed in the ***Preferences => Customisation and other preferences*** menu. A context menu on each list offers:

- ***Delete*** – removes the selected Shadow Set Definition or Recipe.
- ***Clear*** – removes ALL Shadow Set Definitions or Recipes.

Note that neither operation can be undone.

6. Current Limitations

The following limitations currently exist in the tool.

6.1. Times

Times are always shown in 24-hour format irrespective of the settings for time in the local PC. However, date settings DO conform to local settings.

6.2. Large data sets

As mentioned, care must be taken when selecting data across multiple fields and multiple devices as it is easy to exceed the resource and processing capabilities of the PC. The “Automatic Granularity” and the item selection limit features are designed to alleviate this, but the user must be aware that processing may be slow on an under-configured PC.

6.3. Data Analysis Periods

The pre-processing element of the tool will attempt to zero-fill gaps in data samples, but the current version is not designed to handle disjointed, non-contiguous days. Also, problems may arise when performing cluster analysis where some cluster nodes have missing data at the start of the analysis period. For this reason, it is recommended to perform analysis against consecutive day samples only and ensure that all cluster nodes have samples available for all days.

6.4. Data Sample Time Intervals

All data capture times are truncated to the sample interval.

Because of the way that T4 data captures work it is possible for sample times to “walk” through a sample period and on excessively big systems it is conceivable that the actual sample times may drift relative to each other. In extreme cases this may result in miss-matching data when data is compared from two different T4 data files (i.e. a sample from one file may actually relate to a sample one either side of the other file). Note that this is only likely to be an issue when using the Shadow Set Processing capabilities – as this pulls data from multiple files. In other cases, data from different files is always presented in different charts.

6.5. Shadow Set Processing

Full Shadow Set processing is limited to directly connected disks. T4 data does not contain sufficient information to accurately apportion MSCP served traffic with the originating shadow set. For disks where the only communication path is the MSCP served path, this means that no data aggregation will occur; for disks with both direct and MSCP served paths, the pre-processor will assume that all traffic is satisfied by direct paths (as again, there is no way to apportion the I/O otherwise).

Systems with Dynamic Shadow Sets (i.e. where volumes are dropped for backup or other purposes) have limited support.

- 1) If volumes are simply dropped for backup, then it is recommended to ignore this and simply be aware of the periods when backup is occurring.
- 2) For more complex scenarios, where volumes may be members of different shadow sets at different times, then the tool currently supports a maximum of 2 different shadow set configurations. However, it is not possible to automatically determine exactly which shadow set is active at any point in time. The tool therefore pre-processes both sets of shadow data and allows the switching between the shadowing configurations via a simple menu option.

6.6. Operational Issues / Known Problems

The T4 viewer is unresponsive when trying to abort or cancel during file pre-processing.

Similarly, background Shadow Set processing can only be cancelled by exiting the tool.

For charts showing large value data samples (i.e. where a sample is greater than 300000000) the graphics for time selection do not operate correctly due to limitations of the charting libraries.

Specifically:

- During simple time zoom the zoom illustration box does not show.
- For multi-frames the frame backgrounds are not coloured.

7. System Requirements

Ideally, the viewer requires a system with the following optimum specification:

- Windows 10
- 8 GB Memory
- Quad Core CPU at 2.8 GHz

It has been tested successfully on the following minimum configuration:

- Windows 8 64-Bit
- 4 GB Memory
- 2 Core CPU at 2.2 GHz

Notes:

1. A 64-bit Processor and 64-bit O/S are required.
2. The minimum configuration will limit the number of items that can be charted.
3. The system must be running .NET framework 4.5 or later (available as a download from Microsoft for older operating systems).

8. Release History

Version Number	Approximate Date	Summary of changes
1.0.2	26 th Feb 2021	Initial Release.
1.0.3	1 st Mar 2021	Fixed issue opening multiple files representing the same sample day.
1.0.4	15 th Mar 2021	Time and Date format dependencies removed. Time Format now read from systems active time format. Improved consistency and performance of time ranges and time zooming. Added automatic granularity. Minor improvements to error handling. Fixed bugs in multi-timeframe handling. Fixed issues with Legend location.
1.5	12 th Apr 2021	<p>New/Changed Items:</p> <p>Allow processing of individual T4 files that span multiple days. Added "List of Files" to raw data view. Added a "Shadow Member Mount Summary" option to report whether disks are locally or remotely mounted. Automatically restrict series generation based on PC performance. Ability to delete Shadow Set Definitions and Recipes. Node selection is now a top Menu pull-down. Added Shadowing and System Configuration data to saved Binary Files to allow proper shadow reporting and chart scaling. Improved .ini file handling – some new items missing from old .ini files will automatically be added. Time range zooming is now more intuitive. Multi-time range plots now have coloured backgrounds.</p> <p>Bugfixes:</p> <p>Fix source data label not displaying correct. Fixed problem where files were sometimes incorrectly reported with missing samples. Fix inconsistencies with Single Day view. Fixed numerous problems with Binary File handling, including:</p> <ul style="list-style-type: none"> • Out of memory exception when saving. • Out of memory exception when reading. • Improper handling of shadow sets on reload. • No import of system configuration. • Correct behaviour when moving a saved binary file to a PC using a different Time format. <p>Fixed an issue where defining and saving new shadow set definitions was causing an exception. Fixed several issues with Y Axis (zooming and charting multiple items). Fixed problem with incorrect calculation of rolling averages. Fixed a start-up crash caused by incorrect .ini file data. Various label changes for clarity.</p>

1.6	11 th May 2021	<p>New/Changed Items:</p> <p>Improved zoom handling – zoom frames are repeated in multi-chart selections.</p> <p>Bugfixes:</p> <p>Fixed an issue where the “Max Number of Items to Chart” is incorrectly sized on start-up.</p> <p>Fix handling of dates that use separators other than “/” (e.g. “.” as used in German date formats).</p> <p>Fixed problem where Quitting from “Preferences and Other Customisations sometimes results in an exception.</p>
1.6.1	25 th May 2021	<p>Bugfixes:</p> <p>Fixed an issue where loading data from the T4 CSV files is scaled incorrectly on system a where the local number format uses a comma “,” as the decimal separator.</p> <p>Fixed an issue where an exception occurs when drawing zoom windows on charts with large value data samples (>300000000). Note that in this situation the Time Zoom illustration box does not show.</p> <p>Fixed an issue where some network fields were being incorrectly tagged with a unit type of %.</p> <p>Fixed an issue where dragging the Y Axis top and bottom markers to adjust the Y Axis range also initiated time zooming.</p>