Querying DCS Messages

DADDS Website Training

Microcom Design, Inc.

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Training Agenda

- Basic Topics
  - Dialog
  - Conditions
  - Operators
- Advanced Topics
  - Datetime Filter
  - ANY/ALL Filter
  - Nested Filter
- Saved Filters
  - View
  - Netlist
- ARM Messages
- Troubleshooting

Filter Dialog

- The filter dialog is used to query DADDS website message data, and contains the following controls to define specific message filters:
  - Apply Filter button to submit the query to the server and load the results.
  - Link to select ‘ANY’ (boolean OR) or ‘ALL’ (boolean AND) options for a filter condition.
  - Add new condition or sub-condition button (blue arrow icon, top left) used to add additional conditions.
  - Add new condition link provided to add additional main conditions to the filter.
- Open the dialog by clicking the ‘FILTER’ button located on the grid toolbar.
- Clear any applied filters by clicking the ‘CLEAR’ button on the grid toolbar.

Filter Conditions

- Conditions depend on the data set and are normally available for each field displayed in the grid being filtered
- Click the ‘CLICK HERE TO ADD A NEW CONDITION’ link, followed by the desired option from the resulting conditions list to add a new condition.
- One or more conditions can be defined in a filter to query data for a specific set of results.
- Multiple conditions further refine queries to return more precise data sets for use in troubleshooting and analysis.

Filter Type Operators

- Operators determined by the data type of field being queried:
- String Type
  - Starts With, Not Starts With, Contains, Does Not Contain, Is Equal To, Is Not Equal To
- Number Type
  - Is Equal To, Is Not Equal To, Is Between, Is Not Between, Is Greater Than, Is Less Than
- DateTime Type
  - Is Between, Is Equal To, Is Greater Than, Is Less Than
- Select List Type
  - Is Equal To, Is Not Equal To

Datetime Filters

- DateTime conditions allow users to create queries that restricts the resulting data to a defined time frame.
  - This can eliminate messages not required or desired to focus on the time surrounding a message, which makes debugging easier.
- The message carrier or message end time can be used to add a DateTime condition to the query.
  - End time has the best performance.
- Two ways to add a carrier or end time condition to the filter:
  - Default - Manual entry in Julian format (DD/YYY HH:MM:SS)
  - By Day - Automatically entry from date picker selections

Example - Datetime ‘Full’ Filter

- Create a message filter representing the statement below using the default (full) DateTime entry method:

  “Return messages with end times between 13:00z and 13:05z on February 1st 2024”

  - Browse to the messages tab, clear any existing filters, and open the filter dialog
  - Click the ‘Add New Condition’ link and select ‘End Time’ from the condition list
  - Enter the Julian DateTime ‘24/032 13:00:00’ in the left text box for lower limit.
  - Enter the Julian DateTime ’24/032 13:05:00’ in the right text box for upper limit.
  - Verify entries match Julian format exactly, and click the ‘Apply Filter’ button to submit the query

Example - Datetime ‘By Day’ Filter

- Create a message filter representing the statement below using the ‘by day’ DateTime method implemented with date picker controls:

“Return messages with end times between February 1st 2024 and February 3rd 2024”

- Browse to the messages tab, clear any existing filters, and open the filter dialog.
- Click the ‘Add New Condition’ link and select ‘End Time (By Day)’ from condition list.
- Click the left text box and select February 1st from the datepicker control to set the lower limit.
- Click the right text box and select February 3rd from the datepicker control to set the upper limit.
- Click ‘Apply Filter’ to submit the query. Selections are automatically entered in the fields.

ANY/ALL Operators

- Advanced feature used to create complex queries.
  - Default selection is ‘ALL’, and is used for majority of filters.
- Changed via the blue ‘ALL’ (or ‘ANY’) link to the right of the text ‘SELECT RECORDS WHERE’ at the top of the dialog window.
- Determines how boolean operators are applied to the filter condition when generating the query to the database
  - ‘ALL’ selection is analogous to the boolean ‘AND’ operator and returns data that meets all specified conditions in the query.

    ‘Return all messages found from platform X and channel Y and belonging to group USGS01’
  - ‘ANY’ selection is analogous to the boolean ‘OR’ operators and returns data that meets any specified condition in the query.

    ‘Return all messages found from platform X or channel Y or belonging to group USGS01

Example – ANY/ALL Filter

- The following example demonstrates how to use nested filters with the ‘ANY/ALL’ (OR/AND) operators to create a query that represents the statement below by changing how individual filter conditions are linked together in the overall query

“Return all messages on channel 183 and have an ARM code ‘G’ or ‘?’ ”

- Browse to messages tab, clear filters, and open the filter dialog.
- Click the ‘Add New Condition’ link and select ‘Channel’ from the list of conditions. Enter 183 in the condition text box.
- Click ‘Add New Condition’ button and then ‘Open New Bracket’ to add new condition set. Default option is ‘Any’ (boolean OR).
- In new bracket, change default condition to ‘ARM’ and select ‘Good Msg (G)’ from the ARM values list.
- Click the ‘Add New Condition’ button for the ARM condition and select ‘Add New Condition After Current’ from the list to add a second condition to the ‘Any’ bracket.
- Change new ‘Any’ bracket condition to ‘ARM’ and select ‘Parity Msg (?) from the ARM values list.
- Click the ‘Apply Filter’ button to apply the filter to message data.

Nested Filters

- Nested filters are an advanced filtering technique that allows for the creation of complex, multi-part message data queries.
- They involve one or more main conditions, each with one or more sub-conditions.
  - Allows main conditions to have different sub-sets of data in the query.
- While use of nested filters is uncommon, they can be valuable in certain situations.
  - Queries containing multiple platforms and their corresponding time windows.
  - Queries for platform messages on multiple channels.

Example – Nested Filter

- Browse to messages tab, clear filters, and open the filter dialog.
- Click the ‘ADD NEW CONDITION’ link and select ‘Address’ from the list of conditions and enter <> in the textbox.
- Click the arrow icon next to the address condition and select ‘ADD SUB CONDITION’. Set Any/All type to ‘ALL OF THE FOLLOWING APPLY’ (boolean AND).
- In the sub-condition, change the parameter from address to ‘SATELLITE ID’ and select ‘GOES-16’ (GOES East) from the select list.
- Click the arrow icon next to the satellite condition and select ‘ADD NEW CONDITION’ and change the parameter from address to ‘ARM’ and select ‘PARITY ERROR (?)’ from the select list
- Click the arrow icon next to the address condition and select ‘ADD NEW CONDITION’ and enter the same DCP address in the text box.
- Click the arrow icon next to the new address condition and select ‘ADD SUB CONDITION’. Set Any/All type to ‘ALL OF THE FOLLOWING APPLY’ (boolean AND).
- In the sub-condition, change the parameter from address to ‘SATELLITE ID’ and select ‘GOES-18’ (GOES West) from the select list.
- Click the arrow icon next to the new satellite condition and select ‘ADD NEW CONDITION’ and change the parameter from address to ‘ARM’ and select ‘GOOD MSG (G)’ from the select list.
- Submit the query and review the results.

Stored Filters Overview

- Message and other filters can be saved in the database and are linked to the user account responsible for its creation.
  - Once a filter has been saved, it is referred to as a ‘view’ within the DADDS website terminology.
  - Prevents frequently used filters from having to be re-created every time a user wishes to filter for a specific set of data.
- View controls are next to ‘NETLISTS & VIEWS’ label at top left corner of enabled grids.
  - Select List – Load
  - Folder Button – Save
  - Trash Button - Delete

Creating Stored Filters

- The first step in creating a view is to create and apply the desired filter to the grid data.
- Once the filter has been applied, click the ‘Folder’ icon to open the save dialog where the view is given a name.
- On the dialog, enter the desired view name in the text box and click the ‘Add View’ button.
- If successful, the page will re-load, and the new view will be available in the select list control.

Loading Stored Filters

- Views are applied to message data using the ‘NETLISTS & VIEWS’ select list.
- Click the list to expand views and select the desired option.
- Load action will close the select list and apply the filter defined in the view to the message data.
- Select list containing user’s views can have two view types:
  - [FILTER] - Standard message filter.
  - [NETLIST] - Custom message filter (address & time only).

Removing Stored Filters

- Views are that are no longer needed can be easily removed from the account.
- To remove a view it must first be applied to the data by selecting the desired option from the list of views.
- After loading, click the trash icon to remove the view from the user account.
- If successful, the page will refresh with the filter cleared and the view removed from the select list.

Netlist Filters Overview

- A netlist filter is a type of message data filter created from a standard CSV file, an LRGS netlist file or a platform filter.
- LRGS Files (.nl)
  - Used by an LRGS client to determine what platforms it needs to retrieve data for.
  - Many users already have LRGS .nl files that define only the platforms for their organization.
- CSV Files (.csv)
  - Comma Separated Value; An additional file format for users not familiar with LRGS netlist files.
  - Contains a comma separated string of platform addresses to be included in the website netlist filter.
- They contain two query parameters
  - One or more platform addresses.
  - Look back period to limit results.
- Stored in the database for future use, and accessed using existing message view controls.

Creating Netlist Filters

- Perform the following steps to create a netlist view from a CSV or LRGS netlist file:
  - Open the netlist view dialog window by clicking the ‘Netlist’ button on the messages or platforms tabs.
  - Enter a name for the netlist view.
  - Select the ‘CSV’ or ‘LRGS’ option in the ‘Type’ options group depending on what file type is being used.
  - Select look-back period using the ‘Range’ select list.
  - Click the ‘Select’ button to open the file browser, and select the CSV or LRGS file to be uploaded.
  - Click the ‘Add’ button to submit and save the netlist view.

Creating Netlist Filters

- Perform the following steps to create a netlist view from a platform filter:
  - Create a filter with conditions such as group codes or individual platform addresses on the platforms tab.
  - Open the netlist view dialog window by clicking the ‘Netlist’ button on the platforms tab.
  - Select the ‘Filter’ option from the ‘Type’ options group.
  - Select a look back period using the ‘Range’ select list.
  - Click the ‘Add’ button to submit and save the netlist view.

Loading Netlist Filters

- Netlist views are handled as a custom message data filter on the messages tab and grid.
- Loaded into the ‘Netlists & Views’ select list located on the messages tab and have the format:
  - Header text ‘[NETLIST]’ before the friendly name.
  - Footer text specifying the range, for example ‘[3HOUR]’.
- To load a netlist, select the desired option from the drop down list.
- The website will submit a query to the database and apply the netlist view to the message data.

ARM Messages

- Informational messages are generated when DADDS detects problems with a platform's message reception.
- They are phony messages generated and disseminated by DADDS to alert users to potential problems with a platform.
- Within the website, informational messages are identified by the abnormal response message, or 'ARM' code, and can have the following values:
  - 'W' character for messages received on the wrong channel.
  - 'T' / 'U' characters for messages received with timing errors.
  - 'A' / 'B' / 'I' characters for messages received with address errors.
  - 'M' character for messages that were not received at all.
  - 'G' character for messages received with no errors (actual message).
  - '?' character for messages received with parity errors (actual message).

Address ARM Messages

- There are three types of address informational messages generated by DADDS:
  - Bad Address Errors (B)
  - Invalid Address Errors (I)
  - Correctable Address Errors (A)
- Bad address messages have the ARM character ‘B’ and are generated when an invalid DCP address is received that cannot be corrected.
- Invalid address messages have the ARM character ‘I’ and are generated when a received DCP address not present in the DADDS database.
- Correctable address messages have the ARM character ‘A’ and are generated when a transmission is received with an invalid DCP address that can be corrected via the BCH code.

Timing ARM Messages

- There are two types of timing informational messages generated by DADDS:
  - Message Timing Errors
  - Unexpected Message Errors
- Timing messages have the ARM character ‘T’ and are generated when a message is not received entirely within its window.
- Unexpected messages have the ARM character ‘U’ and are generated when a message is received completely out of its window.
- Timing messages normally indicate problems with a platform’s transmit configuration, GPS synchronization or radio hardware.

Missing ARM Messages

- Missing informational messages are generated by DADDS when an transmission is not received within 2 minutes of its expected time window.
- They are generated for 48 hours after the last successful reception of a platform's message to notify users of the problem.
- After 48 hours, the platform is marked as inactive and missing messages are no longer generated by DADDS.
- For a missing message to be generated, the expected message must be completely missing.
- Messages received completely outside of their window, or received on a wrong channel will not trigger a missing message to be generated.

Troubleshooting

- Where is my platform's message data?
- Why am I receiving missing messages?
- Why am I experiencing poor reception?
- Am I being 'stepped on' by another platform?
- What do the informational messages being received along with message data mean?

Troubleshooting

- Message filters and netlist views are powerful tools for troubleshooting problems with message reception.
- This section will detail how to use filters to obtain specific sets of DCS data for review.
- Analysis of message timing and other parameters in the filter results provides clues into the cause of the reception issues, and what actions to take to resolve the problem.
- In addition, message data and informational messages from a platform provide clues, and are important to consider when debugging a problem.

Query Platform Messages

- The first step to take when troubleshooting missing data is to create a message data filter for the problem platform.
- Login to a DADDS website and open the messages filter dialog:
  - Add a new ‘ADDRESS’ condition to the filter and select the ‘STARTS WITH’ (default) or ‘EQUAL TO’ operator.
  - Enter the problem platform’s DCP address in the condition text box.
  - Add a second ‘END TIME (BY DAY)’ condition and select the ‘GREATER THAN’ operator.
  - Select the day prior to the last time the message was received and apply the filter.
- Save the filter as a view for quick re-call while debugging.
- If desired, export the filter results to an excel file for offline analysis of the data using Microsoft Excel or other software capable of reading XLS formatted files.

Analyze Platform Messages

- Review the messages leading up to the last received message from the platform.
  - Are there any informational or missing messages?
  - Are there any indicators in the actual data of transmissions leading up to the outage?
  - Does the message quality (performance) change leading up to the last received message?
- Query all 4 DCS websites to determine if reception issue is specific to a DADDS processing strand.
  - Real-time servers associated with DCS1-4 are re-booted periodically, during which time no messages will appear from that server on its website.
  - It is possible for messages to be received at Wallops but not NSOF, and visa-versa.

Analyze ARM Messages

- Are any informational messages present in the platform query results?
- If so, what are they and when were they received?
  - Timing ARM messages indicate the platform is having problems transmitting on schedule.
  - Wrong channel ARM message indicates a configuration or transmitter issue.
  - Address ARM messages indicate possible configuration, platforms registration or interference issues.
  - Missing ARM messages indicate reception gaps and possible interference with the platform's transmissions.

Analyze Message Data

- Depending on the transmit or message data format, some clues may be found in the message data.
- The first character of CS2 messages corresponds to platform GPS time synchronization events.
  - b (pseudo-binary) or “ (ASCII) character indicates that a GPS synchronization occurred prior to the message’s transmit time.
  - ‘ (pseudo-binary) or space (ASCII) character indicates that no GPS synchronization has occurred.
  - Missing GPS synchronizations along with timing informational messages prior to an outage points to GPS issues (drifting transmissions).
  - Check the platform’s GPS hardware and antenna.
- Message data (ASCII or decoded) may include battery voltage readings depending on the platform configuration.
  - Decreasing battery voltage readings prior to an outage points to battery and/or charging issues.

Analyze Message Performance

- Signal strength, frequency deviation, message quality, phase noise and parity errors provide insight into a platform's health.
- High frequency deviation can indicate transmitter hardware problems.
- Low signal strength, message quality and/or high phase noise normally indicate RFI or antenna issues.
- Did the performance decrease leading up to the outage occur gradually or suddenly?
  - Sudden decrease followed by an outage indicates a site issue, such as a misaligned antenna or dead transmitter.
  - Does it follow the diurnal with good message reception during the day and poor or missing messages overnight?
  - Gradual or periodic decrease prior to the outage points to local RFI or DCP interference due to timing issues.

Analyze Platform Channel

- To debug possible interference from other DCPs, a query on the platform channel is helpful
- Create a message data filter on the channel the platform is transmitting on.
- Add a few ‘END TIME BETWEEN’ conditions with time ranges starting few minutes before and after the expected transmission for a few hours prior to the outage.
- Look at the transmissions occurring immediately before and after the platform’s window:
  - Is there another message overlapping the window in any of the time ranges?
  - Are there timing/channel informational messages from other platforms, or does a neighboring transmission moving very close to the window?
  - If so, it is possible your platform is being ‘stepped on’ by another transmission.
  - Contact DCS support for help in resolving the DCP interference.