CA²

COMTRADE Archive/Analysis (CAA)

Version 3.3.5

User Guide

SOFTSTUF INC.

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Software Purpose

The COMTRADE Archive/Analysis (CAA) software has seven main operating modes, Move, MoveWW, MoveCN, MoveCD, MoveDD, Copy, and Analysis. The operating mode is determined by the command line parameters passed to the application.

Downloading and Installing CAA

1. To download and install the software go to www.wavewin.net
2. Click on the link that reads, "Wavewin Full Version".
3. Enter the username and password provided to you by Softstuf. The username and password are case sensitive.
4. Click on the software link that reads "COMTRADE Archive" to download the software.
5. When you download the software click on the show in folder option, this should display a zip file in your download's directory.
6. Create a folder off the root called C:\CAA, take the contents of the zip file and unzip them to this folder.

Configuring CAA

To configure CAA please see the CAA Interface User Guide. The settings which need to be set for each operating mode to successfully run are described in the operating mode section of this guide.

Running CAA

CAA is designed to run automatically as a Windows service application. We recommend using the AlwaysUp software to schedule CAA, but users can also use the Windows scheduler. To run CAA in one of its operating modes enter the operating mode name as a command line parameter. Examples of running CAA from the command prompt are shown below:

Run MoveCD operating mode:

```
C:\Softstuf>COMTRADEArchive.exe MoveCD
```

Run the MoveWW operating mode:

```
C:\Softstuf\COMTRADE Archive>COMTRADEArchive.exe MoveWW
```

Operating Modes

Move

The Move mode is used to create a folder hierarchy of COMTRADE records. The folder hierarchy created will be based on the month and year each record was created. Records created in the same month and year will be placed into the same sub-directory. For example, records created in January 2021 will be moved into a sub-directory named "2021-01". The input for this command is a diagnostic file containing a list of COMTRADE records. The folder hierarchy will be created under the path the records in the diagnostic file are stored. When the application is completed archiving the records, the filenames in the diagnostic file whose priority is greater than 0 will be updated to reflect their new location. If the priority is 0 the record will be archived but its entry in the diagnostic file will be removed. The input diagnostic file is required to have a priority column, the date field as the third column and the filename field as the last column.

Move Settings

- Input File - a diagnostic file containing a list of COMTRADE records

MoveWW

The MoveWW mode is used to read multiple diagnostic files containing lists of COMTRADE records and categorize the records as either events or non-events depending on values contained in the diagnostic files. Records categorized as events will be archived to an event folder and records that are categorized as non-events will be moved to a non-events folder. The archive format for event files is as follows:

- Sub-directory for the year the file was created.
- Sub-directory under the year for the substation the file originated from.
- Sub-directory under the station for the month the file was created.
- Sub-directory under the month indicating if the file was a system or an equipment event.

Non-Event files are not archived, they are just moved to the user specified non-events folder.

MoveWW Settings

- Input Path – directory where the diagnostic files are stored.
- Non-Event Path – directory where the records determined to be non-events will be stored.
- Event Path – directory where the records determined to be events will be stored.
- Log File Path – if set the directory where log files will be stored.

MoveWW Command Script

To determine how records are categorized users can create a "DME_Commands.INI" file which uses a proprietary scripting language to define what columns in the diagnostic files to evaluate and how to evaluate them. The format of the scripting language is explained below:

- The script contains four comma separated fields; the fields are:
  - DIG-File
    - This field is used to specify the diagnostic (DIG) file where the column name can be found, this field has three options (FAULT, PREFAULT, CHANNELS)
  - Column Name
    - This field specifies the column name within the DIG file, the name must be spelled correctly and must match the case of the column name in the DIG file. Users can also specify calculated columns which are columns that are not in the DIG files but can be calculated from columns within the files. Currently MoveWW only supports two calculated columns, Fault_3I0 and PreFault_3I0.
  - Command
    - This field specifies how the column name will be compared to the comparator value. The options for this field are

- LENGTH – checks whether the value in the column name is longer than a certain length, this is normally used to check if a column name contains anything or is blank.
- GT – greater then
- GTE – greater than or equal to
- LT – less then
- LTE – less than or equal to
- ABNORMAL – checks if the value in the column name is ABNORMAL or NORMAL. This is only used for column names which can be NORMAL or ABNORMAL, if this command is selected the comparator value is not used and must be set to 0.
  - o Comparator
    - This field is compared to the column name field using the command specified in the command field. This field can specify a number or another column name from within the DIG file.
- Boolean Logic - The script uses basic Boolean ORs and ANDs to determine the category (event or non-event) of records. The Boolean logic the script uses is explained below:
  - o AND
    - To create an AND statement simply enter multiple column names, commands, and comparators on the same line by separating them with pipes.
    - Example script line –
      FAULT,V2-SEQ|I2-SEQ,ABNORMAL|ABNORMAL,0|0
    - The line above defines the following Boolean statement –
      IF column V2-SEQ in the FAULT DIG is ABNORMAL AND column I2-SEQ in the FAULT DIG is ABNORMAL
  - o OR
    - Individual lines will be ORed together
    - Example script lines –
      FAULT,V2-SEQ|I2-SEQ,ABNORMAL|ABNORMAL,0|0
      FAULT,Fault_3I0,GT,PreFault_3I0
      CHANNEL,Triggers,GT,0
    - The script above defines the following Boolean statement –
      IF (column V2-SEQ in the FAULT DIG is ABNORMAL AND column I2-SEQ in the FAULT DIG is ABNORMAL) OR (column Fault_3I0 in the FAULT DIG is greater than column PreFault_3I0 in the FAULT DIG) OR (column triggers in the CHANNEL DIG is greater than 0)
  - o AND multiple ORs
    - To end multiple OR statements surround lines with parentheses.
    - Example script lines –

```
(
FAULT,Brk1,LENGTH,0
FAULT,Brk2,LENGTH,0
)
(
FAULT,Eve1,LENGTH,0
FAULT,Eve2,LENGTH,0
)
```

- The script above defines the following Boolean statement –
  IF (column Brk1 in the FAULT DIG has length greater than 0 OR column Brk2 in the FAULT DIG has length greater than 0) AND (column Eve1 in the FAULT DIG has length greater than 0 OR column Eve2 in the FAULT DIG has length greater than 0)

Example of a full DME_Command.INI script file

(
FAULT,Brk1,LENGTH,0
FAULT,Brk2,LENGTH,0
)
(
FAULT,Eve1,LENGTH,0
FAULT,Eve2,LENGTH,0
)
FAULT,V2-SEQ|I2-SEQ,ABNORMAL|ABNORMAL,0|0
FAULT,Fault_3I0,GT,PreFault_3I0
CHANNEL,Triggers,GT,0
PREFAULT,V2-SEQ,ABNORMAL,0
PREFAULT,I2-SEQ,ABNORMAL,0

Boolean statement created from script:

IF

(

((column Brk1 in the FAULT DIG has length greater than 0 OR column Brk2 in the FAULT DIG has length greater than 0) AND

(column Eve1 in the FAULT DIG has length greater than 0 OR column Eve2 has length greater than 0)) OR

(column V2-SEQ in the FAULT DIG is ABNORMAL AND column I2-SEQ in the FAULT DIG is ABNORMAL) OR

column Fault_3I0 in the FAULT DIG is greater than column PreFault_3I0 in the FAULT DIG OR

column trigger in the CHANNEL DIG is greater than 0 OR

prefault column V2-SEQ in the PREFAULT DIG is ABNORMAL OR

prefault column I2-SEQ in the PREFAULT DIG is ABNORMAL

)

      Then Event

ELSE

      Then Non-Event

MoveCN

The MoveCN mode is used to archive files. Files will only be archived if they are COMNAME compliant or have a TXT extension. The files will be archived based on the year and month they were created, the content of specific filename fields, and the file extension if the file is a TXT file. For each file moved the process will be as follows.

- Under the destination path specified by the user a sub-directory will be created for the year the file was created in.
- In that sub-directory an additional sub-directory will be created for the month the file was created in.
- Any non-text files that contain fault information will be archived here.
- Files that do not contain fault information will be moved to an additional sub-directory titled "No_Trip".
- All txt files will be moved to an additional sub-directory titled "TXT".

To determine which non-TXT files, contain fault information the CAA application uses a setting tilted Triggers. For information on CAA settings please see the CAA Interface Guide. The Triggers setting contains a list of filename fields that indicate a file has no fault information.

Examples of how different files will be archived are listed below.

- For an archived non-txt file created in June 2021 which contains fault information the final destination path would be "destinationPath\2021\2021-06".

- For an archived non-txt file created in June 2021 which does not contain fault information the final destination path would be "destinationPath\2021\2021-06\No_Trip".

- For an archived txt-file created in June 2021 the final destination path would be "destinationPath\2021\2021-06\TXT"

The MoveCN command can be set to create logs detailing any files that cannot be moved or any exceptions that occur during file archiving. To activate log creation, enter a valid directory name in the Log File Path setting. All logs created will be moved to this directory.

MoveCN Settings

- Input Path – directory where the files to be archived are stored.
- Output Path – destination directory where the files will be archived.
- Log File Path – if set the directory where log files will be stored.
- Triggers – a list of filename fields which indicate if a record contains event information.

MoveCD

The MoveCD command is used to archive event and log files. Files will only be archived if they are in the COMNAME format. The files will be archived based on if they are an event file or a log file, the year the file was created, the substation in which the file originated from, the month the file was created, and for event files also the contents of specific fields in the filename.

- Under the destination path specified by the user a sub-directory will be created called "Events" if the file is an event file, or "Logs" if the file is a log file.
- In the "Events" or "Logs" subdirectory an additional subdirectory will be created for the year the file was created in.
- In the year subdirectory an additional subdirectory will be created for the substation in which the file originated from.
- In the substation directory an additional subdirectory will be created for the month the file was created in.
- For event files only, in the month subdirectory an additional subdirectory will be created titled "No_Trip" for event files which do not contain fault information.

To determine which event files, contain fault information the MoveCD command uses the Triggers setting described under the MoveCN command.

The MoveCD command can be set to create logs detailing the files moved, the files' final location, and the time of the move by using the Log File Path setting. To activate log creation, enter a valid directory name in the Log File Path setting. All logs created will be moved to this directory.

MoveCD Setting

- Input Path – directory where the files to be archived are stored.
- Output Path – destination directory where the files will be archived.
- Log File Path – if set the directory where log files will be stored.
- Triggers – a list of filename fields which indicate if a record contains event information.
- Exclude Path: the directory where all excluded files will be moved to.
- Exclude: only applies to filenames in the COMNAME format, enter the value in the fifth COMNAME field to exclude from archiving.

MoveDD

The MoveDD command is used to categorize and archive transient waveform files as either events or non-events. This command uses hard-wired logic to determine if a file is either an event or an non-event. If the file is determined to contain event information then it is archived to an event folder specified by the user in the following way:

- Sub-directory for the year the file was created.
- Sub-directory under the year for the substation the file originated from.
- Sub-directory under the station for the month the file was created.
- Sub-directory under the month indicating if the file was a system or an equipment event.

Files determined to contain no event information are categorized as non-events are moved to an non-events folder specified by the user. The MoveDD command can be set to create logs detailing the files moved, the files' final location, and the time of the move by using the Log File Path setting. To activate log creation, enter a valid directory name in the Log File Path setting. All logs created will be moved to this directory.

MoveDD Settings

- Input Path – directory where the diagnostic files are stored.
- Non-Event Path – directory where the records determined to be non-events will be stored.
- Event Path – directory where the records determined to be events will be stored.
- Log File Path – if set the directory where log files will be stored.

Analysis

The Analysis command is used to read DIG files produced by Wavewin Process and automatically create Event and Data Quality reports based on the data stored in the DIG files. This is the only command which does not archive, move, or copy any files. This command is solely used to automatically analyze DIG files. CFA can create either text file or PDF file reports. The reports that can be created are broken down into three categories:

- Event Reports
  - Event reports are created when an event, single-ended event, or double-ended event is detected.
    - Single ended event reports are created when over current or under voltage conditions are detected but no remote station, device, or line can be found. Users have the option to supervise the issuing of single ended reports with a breaker operation. If the user chooses to supervise with a breaker a single-ended report will only be issued if over current or under voltage conditions are accompanied by a breaker operation.
    - Double ended even reports are created when over current or under voltage conditions are detected and a remote station, device, or line can be found. Just like the single-ended events users can supervise the issuing of double ended events with a breaker operation.
    - Event reports are created when at least one breaker and one digital event occurs within the same line group and there is no over current or under voltage condition present, this type of report will not include a fault location.
- Polarity Data Quality Reports
  - Polarity Data Quality reports are created when a polarity or imbalance condition is detected on either the current or voltage channels.
- Pegged Channel Data Quality Reports
  - Pegged Channel Data Quality reports are created when a pegged channel condition is detected on either the current or voltage channels.

Analysis Settings

- Input Directory – the directory the DIG files are stored in.
- Output Directory – the directory the report files will be saved to.
- Log Directory – the directory where log files will be saved to. Logs are used to detail the steps that CFA takes while analyzing files, as well as any exceptions caught during analysis. The logs are essential to debugging potential issues which may occur.
- Voltage Dip (Percent) – if the measured voltage dip is not higher than the number entered than no fault location will be calculated.

- Report Type – the type of reports CFA will create, this field can either be TXT for text file reports or PDF for pdf file reports. The default is set to TXT.
- Supervise with Breaker – this field can be set to TRUE or FALSE and indicates whether a single-ended event or double-ended event will be supervised with a breaker operation.
- Delete Non-Event – this field can be set to TRUE or FALSE and indicates whether files in which an event or a data quality issue cannot be found are to be deleted. If the field is set to TRUE any files that do not contain events or data quality issues will be deleted.

Example Report Files

Event Text/PDF File Report

```
171009,082539402292,-5,NineRivers,DFR,THREE-PHS,Line 58,WW_Event_Re
File Edit Format View Help
Wavewin Automatic Event Report

> Event Summary General Information
Station:             NineRivers
Device:              -
Equipment:           Line 58
Fault Date:          10/09/2017
Fault Time:          08:25:39.435625
Fault Type:          ABCN
Fault Magnitude:     7019.062
Fault Duration:      2.875
Voltage Dip (%):     43.52
Remote Station:
Remote Device:       -
Remote Equipment:

> Location Report
Line Length:         36.460
Z1 (Ohms):           28.551 @ 75.607
Z0 (Ohms):           81.517 @ 72.810
SE Radial:           -
SE Reactance:        -
MultiPhase:          -
ThreePhase:          8.039
DE Sequence:         -

> Pre-Event Phase Values
Pre-Event V2 (Volts):  321.194
Pre-Event I2 (Amps):   0.246
```

Wavewin Automatic Event Report

> Event Summary General Information
Station: NineRivers
Device: -
Equipment: Line 58
Fault Date: 10/09/2017
Fault Time: 08:25:39.435625
Fault Type: ABCN
Fault Magnitude: 7019.062
Fault Duration: 2.875
Voltage Dip (%): 43.52
Remote Station:
Remote Device: -
Remote Equipment:

> Location Report
Line Length: 36.460 miles
Z1 (Ohms): 28.551 @ 75.607
Z0 (Ohms): 81.517 @ 72.810
SE Radial: -
SE Reactance: -
MultiPhase: -
ThreePhase: 8.039
DE Sequence: -

Data Quality Polarity Text/PDF Report File

```
Wavewin Automatic Data Quality Report

General Information
Station:          Station1
Device:           -
Equipment:        Line1
Date:             8/4/2020
Time:             2:11:45 PM
Event Type:       Current Polarity

Voltage Measurements
V2 (Volts):       10115.161
VA (Volts):       102467.024 @ 0
VB (Volts):       86847.379 @ -115.428
VC (Volts):       104717.843 @ 128.846

Current Measurements
I2 (Amps):        4856.451
IA (Amps):        6542.254 @ -62.584
IB (Amps):        8916.857 @ -16.129
IC (Amps):        6024.114 @ -143.796
```

Wavewin Automatic Data Quality Report

> General Information
Station: Station1
Device: -
Equipment: Line1
Date: 8/4/2020
Time: 2:11:45 PM
Event Type: Current Polarity

> Voltage Measurements
Event V2 (Volts): 10115.161
Event VA (Volts): 102467.024 @ 0
Event VB (Volts): 86847.379 @ -115.428
Event VC (Volts): 104717.843 @ 128.846

> Current Measurements
Event I2 (Volts): 4856.451
Event IA (Amps): 6542.254 @ -62.584
Event IB (Amps): 8916.857 @ -16.129
Event IC (Amps): 6024.114 @ -143.796
Event IN (Amps): 182.438 @ 2.237

Data Quality Pegged Channel Text/PDF Report File

```
Wavewin Automatic Data Quality Report

General Information
Station:          Station1
Device:           -
Equipment:        Line1
Date:             11/30/2022
Time:             9:50:55 PM
Event Type:       Pegged Channel

Voltage Measurements
Pegged Channels:  VA, VB, VC
VA (Volts):       32768 @ 0
VB (Volts):       32768 @ 0
VC (Volts):       32768 @ 0

Current Measurements
Pegged Channels:  IA, IB, IC, IN
IA (Amps):        32768 @ 0
IB (Amps):        32768 @ 0
IC (Amps):        32768 @ 0
```

Wavewin Automatic Data Quality Report

> General Information
Station: Station1
Device: -
Equipment: Line1
Date: 11/30/2020
Time: 9:50:55 PM
Event Type: Pegged Channel

> Voltage Measurements
Pegged Channels: VA, VB, VC
VA (Volts): 32768 @ 0
VB (Volts): 32768 @ 0
VC (Volts): 32768 @ 0

> Current Measurements
Pegged Channels: IA, IB, IC, IN
Event IA (Amps): 32768 @ 0
Event IB (Amps): 32768 @ 0
Event IC (Amps): 32768 @ 0
Event IN (Amps): 32768 @ 0

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Copy

The copy command is used to copy files from an input directory to an output directory. Copy does not archive files it simply copies them from one directory to another. Users can choose whether to copy files from sub-directories stored under the input directory or not. The copy command remembers the maximum file time it has copied and only copies files with times greater than the previous maximum. This prevents the same files from being copied multiple times.

Copy Settings

1. Input Directory: the directory where the files to be copied are stored.
2. Output Directory: the directory where files will be copied to.
3. Search Sub-Directories: if set to TRUE then files in sub-directories stored under the input directory will be copied to the output directory. If set to false then files in sub-directories under the input directory will not be copied.