REF TEK RTM2EW Client

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RTM2EW is an RTPD Client used to import MRF data into Earthworm.

Revision History:

Rev	Date	Reason for change	Pages
A	2106.11.08	Initial Release 1.0	All

Notation Conventions

The following notation conventions are used throughout REF TEK documentation:

Notation	Description
ASCII	Indicates the entry conforms to the American Standard Code for Information Interchange definition of character (text) information.
Binary	Indicates the entry is a raw, numeric value.
Hex	Indicates hexadecimal notation. This is used with both ASCII characters (0 – 9, A – F) and numeric values.
BCD	Indicates the entry is a numeric value where each four bits represents a decimal digit.
FPn	Indicates the entry is the ASCII representation of a floating-point number with n places following the decimal point.
<n>	Indicates a single 8-bit byte. When the contents are numeric, it indicates a hexadecimal numeric value; i.e. <84> represents hexadecimal 84 (132 decimal). When the contents are capital letters, it represents a named ASCII control character; i.e. <SP> represents a space character, <CR> represents a carriage return character and <LF> represents a line feed character.
MSB	Most Significant Byte of a multi-byte value.
MSbit	Most Significant Bit of a binary number.
LSB	Least Significant Byte of a multi-byte value.
LSbit	Least Significant Bit (bit 0) of a binary number.
YYYY	Year as a 4-digit number
DDD	Day of year
HH	Hour of day in 24-hour format
MM	Minutes of hour
SS	Seconds of minute
TTT	Thousandths of a second (milliseconds)
IIII	Unit ID number

n, nS	nano, nanoSecond; 10-9 = 0.000000001
u, uS	micro, microSecond; 10-6 = 0.000001
m, mS	milli, milliSecond; 10-3 = 0.001
K, KHz	Kilo, KiloHertz; 103 = 1,000
M, MHz	Mega, MegaHertz; 106 = 1,000,000
G, GHz	Giga, GigaHertz; 109 = 1,000,000,000
Kb, KB	Kilobit, KiloByte; 210 = 1,024
Mb, MB	Megabit, MegaByte; 220 = 1,048,576
Gb, GB	Gigabit, GigaByte; 230 = 1,073,741,824

REF TEK   Support and update notifications

As a valued user of REF TEK equipment we would like to provide the best support possible by keeping you up to date with our product updates.

If you would like to be notified of any REF TEK product updates please spend a couple of minutes to register with the REF TEK customer support team.

To register fill out our online registration form at http://support/reftek.com

Once we register your contact we will only send necessary notifications via email. The same notifications will be shown on our website's http://support.reftek.com notifications page

Support Email: reftek_support@trimble.com

Support Phone: 1-888-879-2207

Thanks,

Your REF TEK support team

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1 RTM2EW

1.1 Overview

RTM2EW is an Earthworm module for importing MRF data into Earthworm. It connects as a data client to RTPD to receive MRF packet data from REF TEK recorders and pass the data into Earthworm.

The **RTM2EW** module is a classic "data source" Earthworm module:
- o Has a "dot d" configuration file that follows the normal Earthworm syntax of configuration files
- o Connects to an Earthworm shared memory ring
- o Beats an alive heartbeat message
- o Sends status messages
- o Responds to Earthworm termination requests
- o Writes its data to an Earthworm ring in Tracebuf2 format.

RTM2EW requires that a proper RTPD configuration and a proper Earthworm configuration are already running. It is supported on Mac OS X, Linux, Solaris and Windows platforms. It is available for 32 or 64 bit systems.

1.2 RTM2EW Configuration

To run RTM2EW in Earthworm:

1. Add the **rtm2ew** process to the **startstop** configuration file specified for the OS being used.

   Note that every Earthworm module accepts the dot d file as the first and usually only argument in the command line;
   e.g. "rtm2ew rtm2ew.d" is an example for the Process line in the startstop file.

2. Edit the **rtm2ew.d** file (refer to an example file below) to specify the two ring Ids to write its data to.

   (a) Set *WaveRing* for Tracebuf2 packets.

   (b) Set the *MyModuleId* parameter to reflect the MOD_RTM2EW module Id. This should also be set in the **earthworm.d** parameter file.

   (c) Set the *Server* parameter to reflect the IP and port of the RTPD server.

3. Edit the **rtm2ew.scnl** file to specify the DAS/stream/channel mapping to SCNL (Station Channel Network Location) names for identifying the Tracebuf2 packets. (See example rtm2ew.scnl file below.)

4. If you monitor your Earthworm modules using **statmgr**, then set the **rtm2ew.desc** file as described in the example below and add this to the **statmgr.d** list of modules to monitor.

1.3   Basic Earthworm Setup

An example **rtm2ew.d** file is shown below (comments are denoted by a # symbol before the comment):

```
MyModuleId        MOD_RTM2EW          # module id for this process

WaveRing          WAVE_RING           # output ring for TRACEBUF messages

HeartBeatInterval 30            # seconds between heartbeats
```

If you have selected a WaveRing to output TRACEBUF2 messages, then it is necessary to define a mapping between the digitizer, stream, channel information that is contained in each packet to the station, channel, net, and pin number that is required by the TRACEBUF2 messages. There is no standard way to do this in vanilla Earthworm, therefore import_rtp defines yet another parameter file. If you don't specify this file, then import_rtp issues a warning message on startup and then generates its own names. Station name is the unit id, and channel name is built up from the stream and channel values in the DT header (stream:chan), the network name is set to "RT", and the pin number is set to -1.

```
SCNLFile    rtm2ew.scnl
```

PLEASE READ THIS SECTION BEFORE SETTING SendUnknownChan

The program has two modes of operation:

1.   Track only the data for channels listed in the SCNLFile

2.   Track all channels for which data is received.

Mode 1

Under Mode 1, memory will be allocated to track the channels when the SCNL file is read. Once the channel list is read from the file, no further data allocation, or list sorting will be done, but data from all channels that are NOT IN THE SCNL LIST, will be dropped.

Mode 1 essentially requires the operator to predefine all of the desired channels in the SCNLList, but is very stable.

Mode 2

Under mode 2, memory will be allocated to track any channels that are encountered by the module. Each time a new channel is encountered, it will be added to the list, and the list will be resorted. Channel list allocation is done in blocks, and it is possible that if a new channel was added to the input stream while the program was running, that it could require the program to:
   o   Allocate a new large block of memory
   o   Copy the list from one memory block to another
   o   Free an old block of memory

o   Resort the list

All of the above can happen before any other packets could be processed. This may add another degree of volatility to the program.

Mode 2 is more flexible, but has more volatility.

```
SendUnknownChan    0
```

DropPacketsOutOfOrder

Set a flag to control whether out-of-chronological-order packets will be ignored or not. Standard Earthworm modules may misbehave if they see out-of-order data (especially wave_serverV). Winston waveserver can handle out-of-order data.

Default: DropPacketsOutOfOrder 1

```
DropPacketsOutOfOrder 1
```

DropPacketsWithDecompressionErrors

Set a flag to control whether packets with decompression errors will be dropped (not sent).

Default: DropPacketsWithDecompressionErrors 1

```
DropPacketsWithDecompressionErrors 1
```

AcceptableSampleRates

The program will attempt to determine the nominal sample rate for each channel. The channel rate will only be set if it matches a valid sample rate as specified in the config file. So if **RTM2EW** starts up, and the first 3 packets it sees from a channel have respective rates of 125.0, 40.0, 40.0 it will set the sample rate to 40.0.

Default: AcceptableSampleRates 40.0 80.0 100.0 200.0

```
AcceptableSampleRates 10 40 80 100 200 250 500
```

SendTimeTearPackets

RTM2EW observes the start-time of the packets coming from the REF TEK data stream. If there is a gap between the "estimated" end of the previous packet, and the start of the current packet, then some sort of time tear occurred. It is not certain where the time-tear occurred and if any data is corrupted. Theoretically, the data in the previous packet could be invalid, the data in the current packet could be invalid, or both, or neither. Because packets may be quite long (8+ seconds), you may wish to risk validity of some data in order to have access to all of the data in the packet. The default behavior is to SEND the packets around a time

tear. Set to 0 to NOT SEND the packet after a time tear. The packet previous to the time tear is ALWAYS SENT.

Default: SendTimeTearPackets 1

```
SendTimeTearPackets 1
```

Give the fully qualified host name, or the IP address of the server in the usual decimal dot notation, followed by the port number for the RTP service. If you are running this on the same computer as the RTP server, then specify "localhost" as the host name.

```
Server            10.8.122.150 2543
```

The API allows you to request data from a single, specific, DAS or from all DAS(es). There is no provision in the API for requesting data from a subset of the available digitizers. If you want data from a single DAS, give its unit id here, otherwise enter 0 to select all digitizers.

```
DASid             B215
```

The MRF packet delivery from RTPD is last in first out, and then backfilling will take place. Because Earthworm modules like data to be in proper time order, the **RTM2EW** module needs to cache packets when a gap occurs due to a dropped packet or network outage. **RTM2EW** will cache packets for a given time, defined by MaxGapLatency in milliseconds, and then release the most recent data if the gap is not back filled in that time. The example below shows a 5 second gap allowance for the MRF data.

```
MaxGapLatency     5.0
```

```
# Debugging
# DebugLevel 2
```

Note: Parameters that are preceded with # are not applied.

1.4   Example rtm2ew.desc

EW DESCRIPTOR FILE For Earthworm statgmr monitoring:

modName   rtm2ew

modId   MOD_RTM2EW

instId   INST_MENLO

tsec: 60 page: 0 mail: 10

Uncomment the "restartMe" line to enable automatic restart of this process by statmgr/startstop. statmgr will issue a TYPE_RESTART message for this process_id if it declares the patient dead.

restartMe

err: 1 nerr: 1 tsec: 0 page: 0 mail: 20

text: "RTP server OK."

err: 2 nerr: 1 tsec: 0 page: 0 mail: 20

text: "RTP server not responding."

err: 3 nerr: 1 tsec: 0 page: 0 mail: 20

text: "no data from RTP server."

err: 4 nerr: 1 tsec: 0 page: 0 mail: 20

text: "Error during channel lookup"

err: 5 nerr: 1 tsec: 0 page: 0 mail: 20

text: "Internal pointer error."

err: 6 nerr: 1 tsec: 0 page: 0 mail: 20

text: "Unexpected error."

err: 7 nerr: 1 tsec: 0 page: 0 mail: 20

text: "Invalid tracebuf message detected."

1.5 Example reftek.scnl file

This file defines the mapping between the unit, stream, and channel entries which are in the MRF data packet headers and the station, channel, net, location, pin number parameters which are required by the TracePacket format. This file is referred to by the **rtm2ew.d** file by the *SCNLFile* argument.

> **Note: Stream number here is the one-based value that is used by people, not the zero-based value that is actually in the headers. The format of the reftek.scnl file is shown below in a table for clarity, but any white space characters should be used between each field.**

Loc (Location Number) used to uniquely identify each channels trace packet.
Any positive integer value. No duplicates allowed.

Pinno (Pin Number) - This was originally used to define the Pin Number. In the new version of rtm2ew (Version 1.5 and later), this is the number of MRF packets to combine into one Earthworm packet.

A. Pin Number (Prior to Version 1.5)
       Any positive integer value. No duplicate Pinno.

B. Number of MRF packets to combine (Version 1.5 and later)
       Must start with '+' followed by an integer value - e.g. +5

DAS			Trace Packet						
#Unit ID	Stream	Chan	Station	Chan	Net	Loc	Pinno	Samp Rate
B215	1	1	PS1	BHZ	XR	1	+5	200
B215	1	2	PS1	BHN	XR	2	+5	200
B215	1	3	PS1	BHE	XR	3	+5	200

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