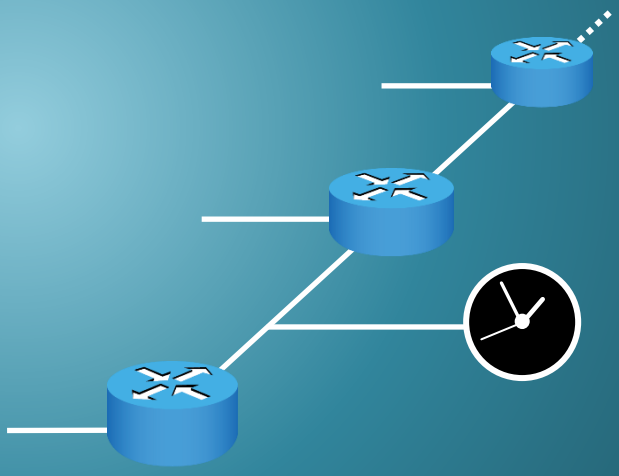
TEST GUIDE

This Test Guide shows how the Calnex Paragon-X can be used to prove IEEE 802.1AS (gPTP) supporting devices are compliant to OPEN Alliance TC11 2.5 Test Specifications, and provides procedures to measure timing accuracy

OPEN Alliance:

TC11 Time Sync Testing



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Contents

1. Hardware and Software Required

1.1. Paragon-X

Option 252	IEEE 1588v2 Peer-to-Peer: One-box BC, TC & OC Test	Included in Paragon-ONE *Automotive* bundle
Option 206	Phase and time measurement	
Option PFV	PTP Field Verifier	
Option 111	10GbE interface support (if DUT has 10G interface)	
Option 133	External 1pps/ToD/frequency converter accessory (if required to match DUT outputs)	
Software Version	X.10.40.*xx* and later	

1.2. Accessories

- SFP/SFP+/Modular devices as required[1]
- Cables as required

1.3. Reference Phase/Frequency Source

Option 132, Rubidium Interface (optional)

1.4. Reference Material

- OPEN TC11 Switch Semiconductor Test Specification
- IEEE Std 802.1AS Timing and Synchronization for Time-Sensitive Applications
- IEEE Std 1588™ -2008 IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems
- Tech Note: Cabling Considerations Document (Calnex Doc. No. CX5009)

[1] BASE-T1 interfaces are supported through modules or converter devices – contact Calnex for more information on recommended parts

2. Connecting Paragon-X to the Device-under-Test

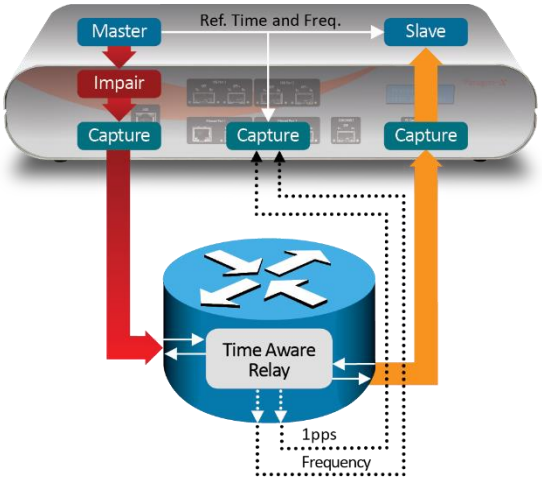
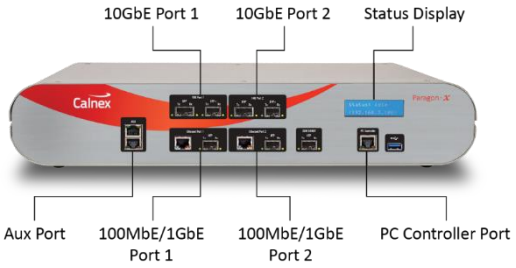


Figure 1. Paragon-X and DUT (e.g. Time Aware Relay)

Front Panel

- 100MbE Electrical or Optical (SGMII SFP)
- 1GbE Electrical or Optical (SFP)[2]
- 10GbE Optical (SFP+) – *with option 111 fitted*



Rear Panel

The Paragon-X accepts the following reference clocks which should be applied to one of the reference inputs on the back panel:

- 2.048/10MHz
- E1 (2.048Mb/s)
- DS1 (T1) (1.544Mb/s)

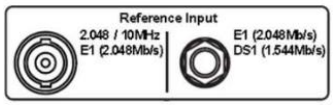


Figure 2. Reference Inputs

Connections

- Connect port 1 (master side of Paragon-X) to the DUT 'Slave' side.
- Connect port 2 (slave side of Paragon-X) to the DUT 'Master' side.
- Connect external reference e.g. 10MHz to Paragon-X ref input.
- If provisioned on the DUT, connect 1pps output from DUT to 1pps measurement port (Aux). Use converter accessory if required.
- If provisioned on the DUT, connect Freq e.g. E1 output from DUT to Freq measurement port at the rear of the Paragon-X.

[2] If using SFPs or SFP+s, both Port 1 and Port 2 optical transceivers must be inserted into Paragon-X.

3. How to use Paragon-X for TC11 2.5 Performance Tests

Test Set-up Steps:

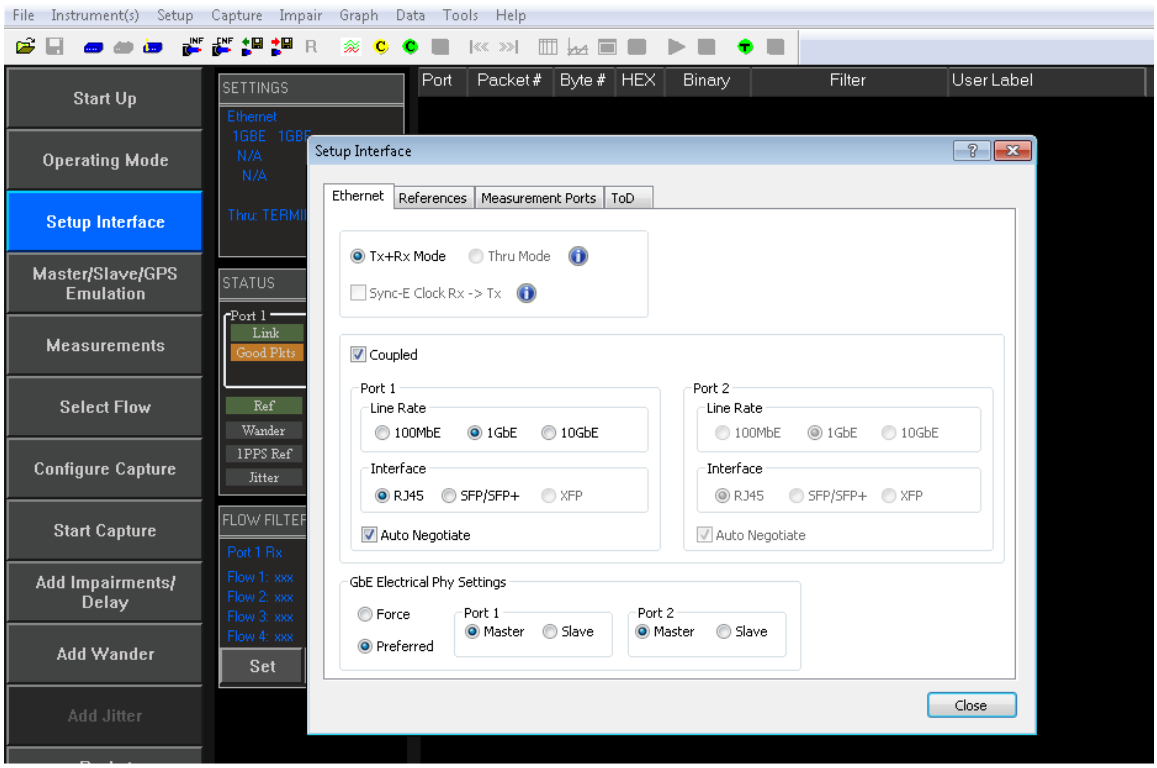
3.1 Connection to Paragon-X from GUI
3.2 Configuration of physical connections
3.3 Measurement Configuration
3.4 Preparing Master/Slave Emulation operation
3.5 Confirmation of PTP traffic on interfaces
3.6 Configuring capture filters and parameters
3.7 Making measurements

Paragon-X Connections

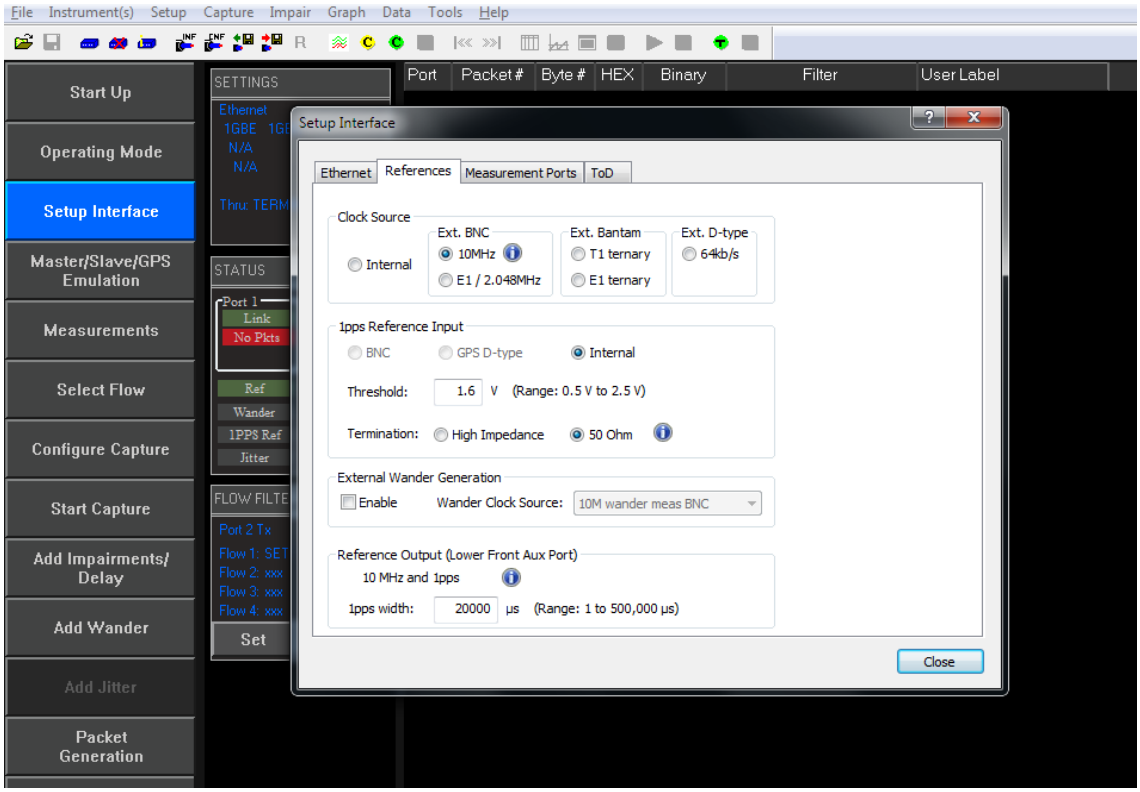
1. Verify physical connections have been completed per Section 2.
2. Start the Paragon-X GUI.
3. Select ***Start Up*** and ***Connect***.
4. Enter IP address of Paragon-X (displayed on Paragon-X status display).
5. See Paragon-X Getting Started Guide for more details.

Configuration of Physical Connections

1. Select ***Setup Interface*** and select ***Line Rate*** to match system under test.

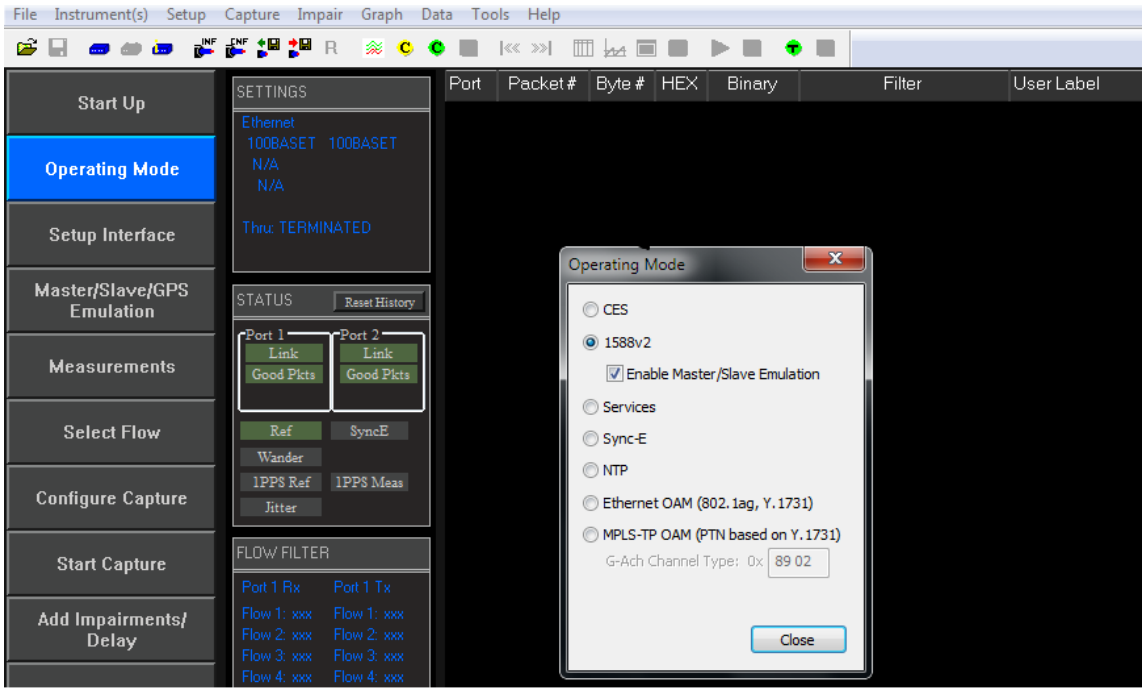


2. Select ***References*** tab to configure a stable reference for Paragon-X, set the ***Clock Source*** to ***External reference*** (10MHz or E1/2MHz). An external source is recommended. This should be the same external ref as used with the DUT.

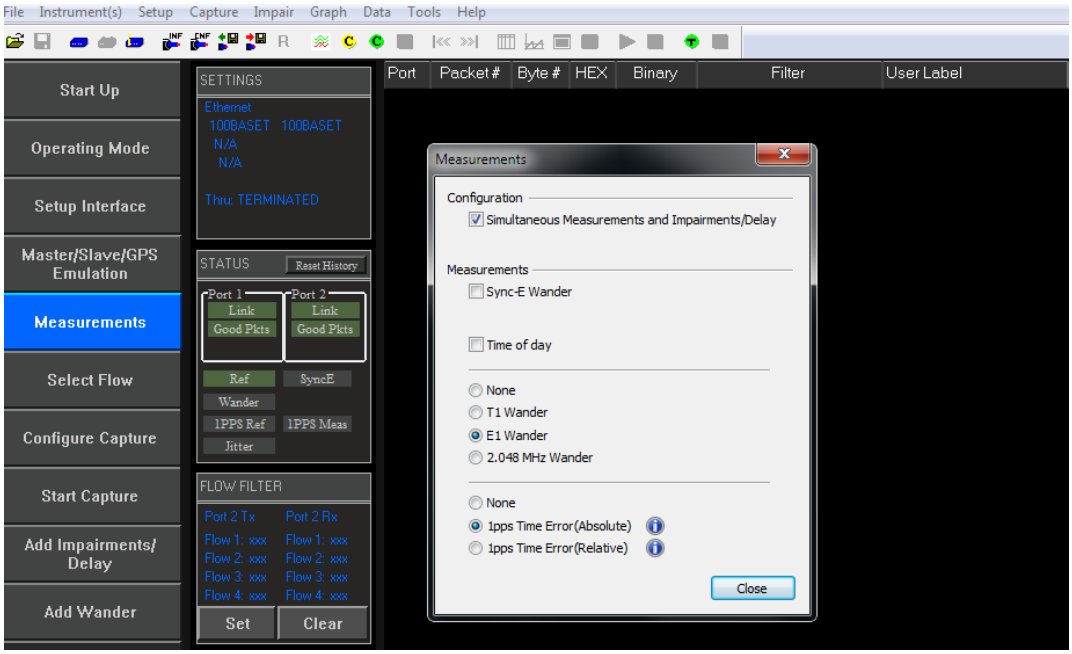


Measurement Configuration

1. Select ***Operating Mode > 1588v2,*** enable ***Enable Master/Slave Emulation*** then ***Close***.



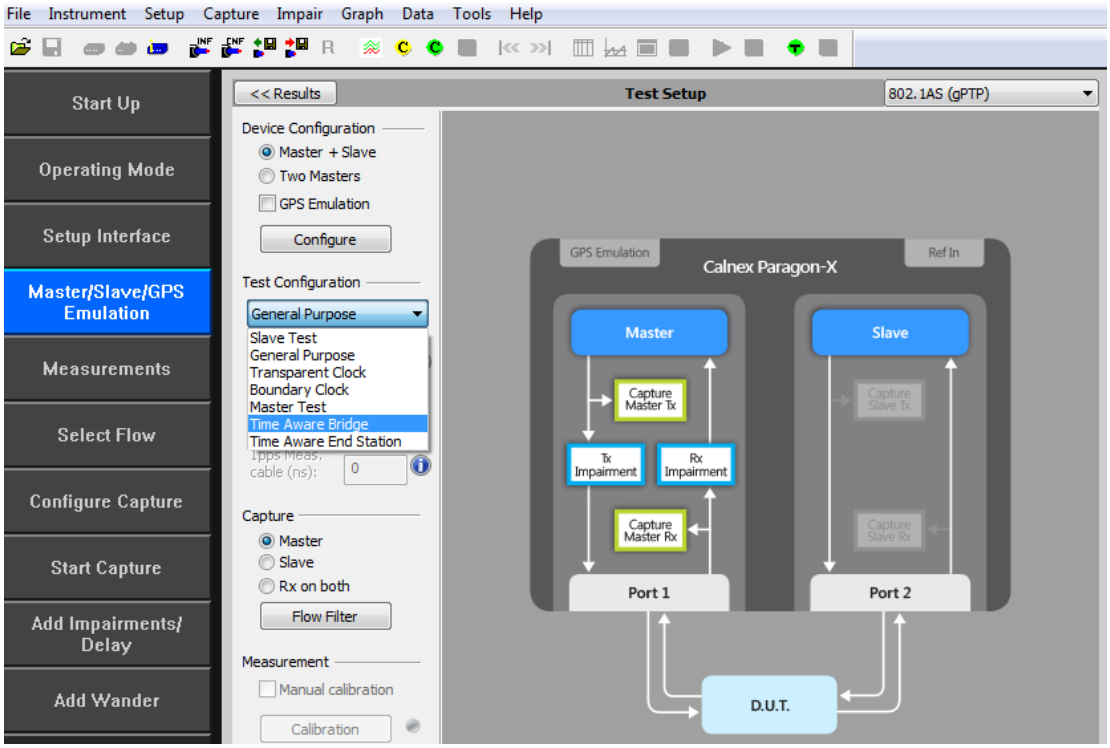
2. Select ***Measurements***, then any desired simultaneous measurements in addition to PTP based measurements, e.g. ***E1 Wander***, ***1pps Accuracy*** (if available from DUT).



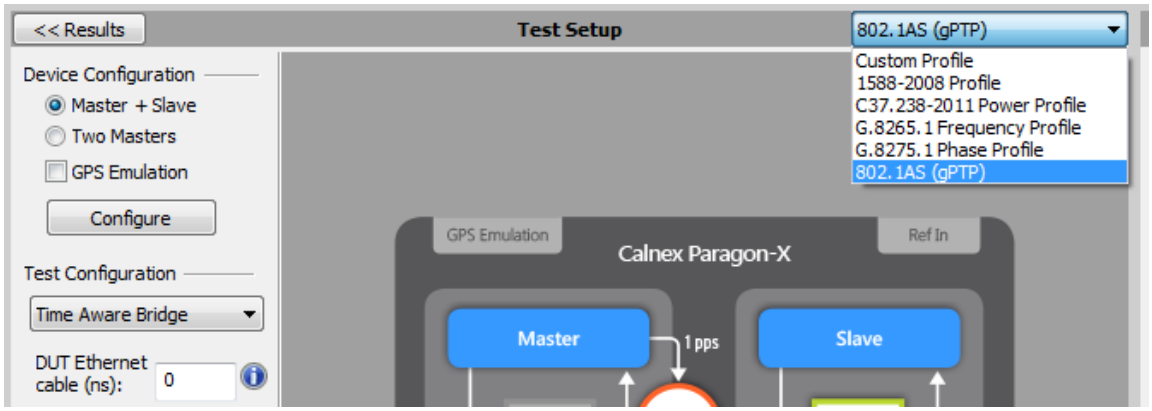
Prepare for Master/Slave Emulation

It is assumed that the 802.1AS/AS-REV profile will be predominantly used in testing and as a result testing will be carried out using L2 encapsulation in Multicast mode. The Master/Slave Emulation can be configured to use other profiles, e.g. Unicast UDP/IPV4 etc. However, it should be noted that these profiles will not conform to the 802.1AS/AS-REV standards.

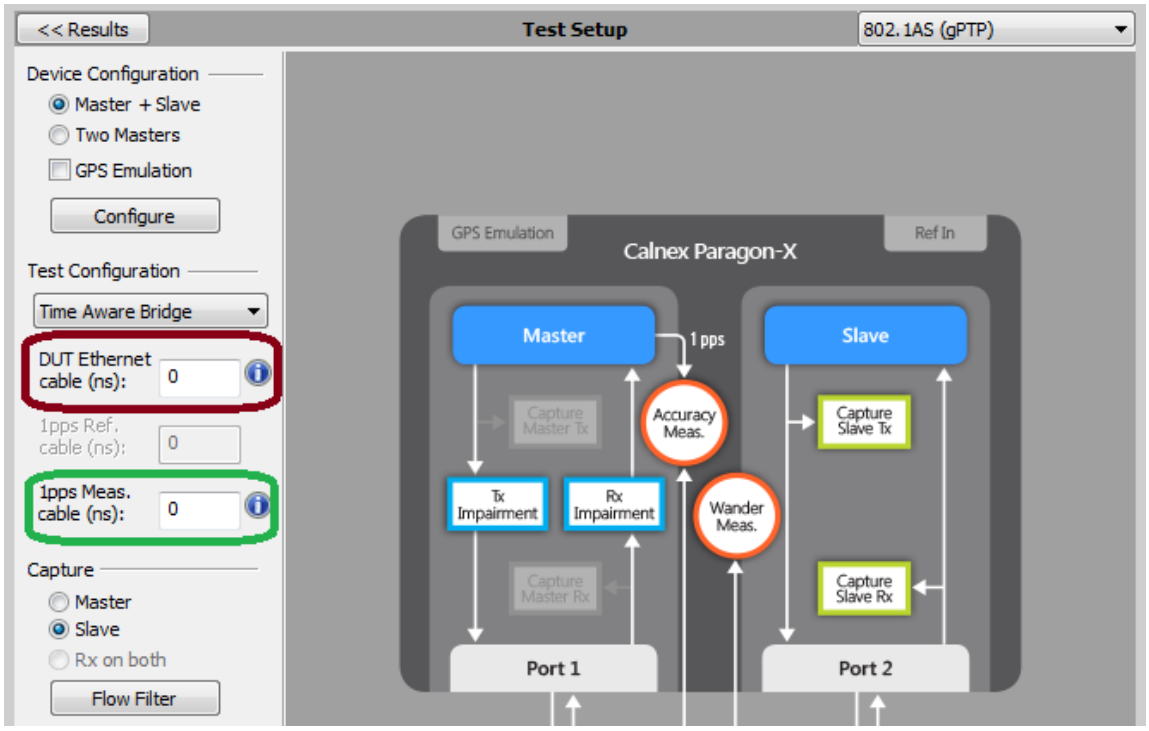
1. Select ***Master/Slave Emulation***. Choose ***Time Aware Bridge*** in the ***Test Configuration*** drop down menu.



2. Select e.g. ***802.1AS (gPTP)*** profile from the Profile Configuration drop down menu.



3. Enter **DUT to Paragon-X Cable Delay**.
In order to correctly perform calculations, the delay caused by the cable that is used to connect the DUT output and Port 2 must be factored out. Values of 5ns per 1 metre of electrical cable and 4ns per 1 metre of optical cable can be expected.

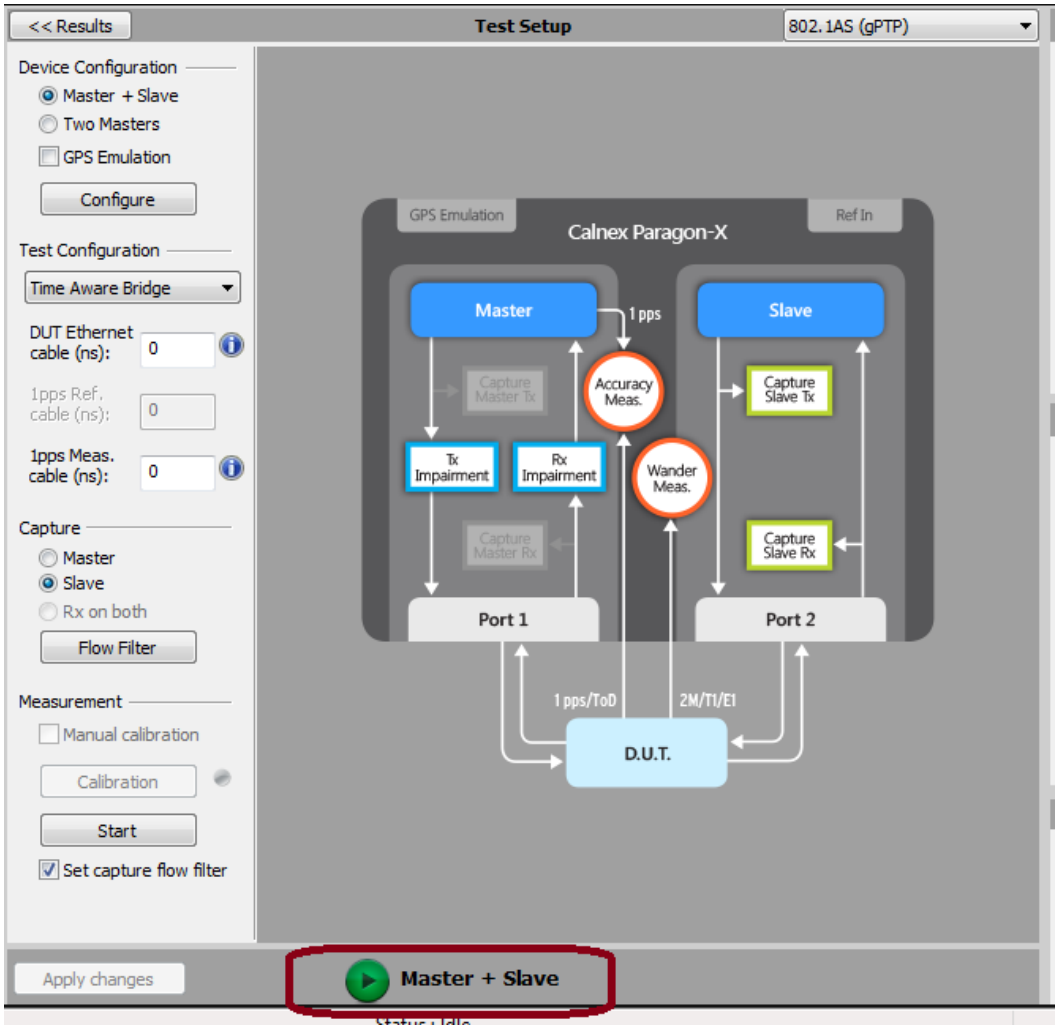


- If 1pps Time Error measurements are to be made, enter the 1pps Measurement Cable Delay

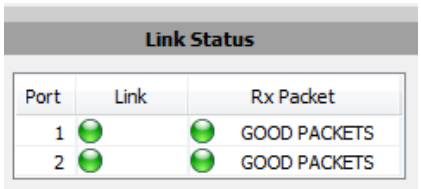
  Values of 5ns per 1 metre of cable can be expected. See the Calnex Tech Note: **Cabling Considerations Document** (Doc. No. CX5009) for more information.

Establish and Confirm Link between Paragon-X and DUT and make a Measurement

1. ***Start*** the Master/Slave emulation.

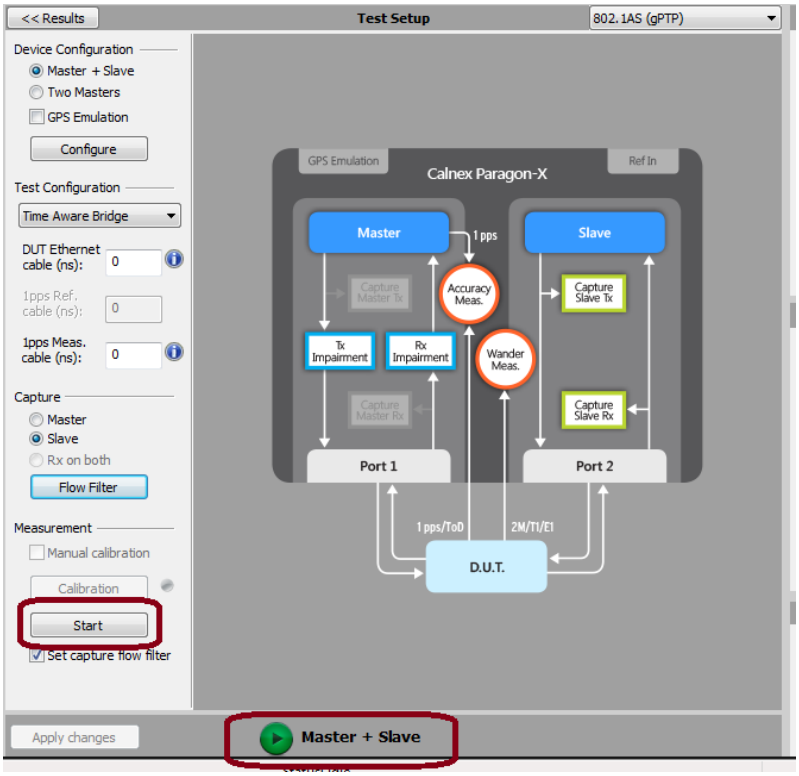


2. Check the link to make sure that the PTP packets are running without error. If working successfully both Link and Packet status should show green status.



Making Measurements

The test recommendations in this document detail measurements that should be carried out to verify performance as defined in OPEN TC11 2.5, as well as for further insight into device performance. Measurements are actioned using the ***Start*** measurement button and should be executed for the period as specified.

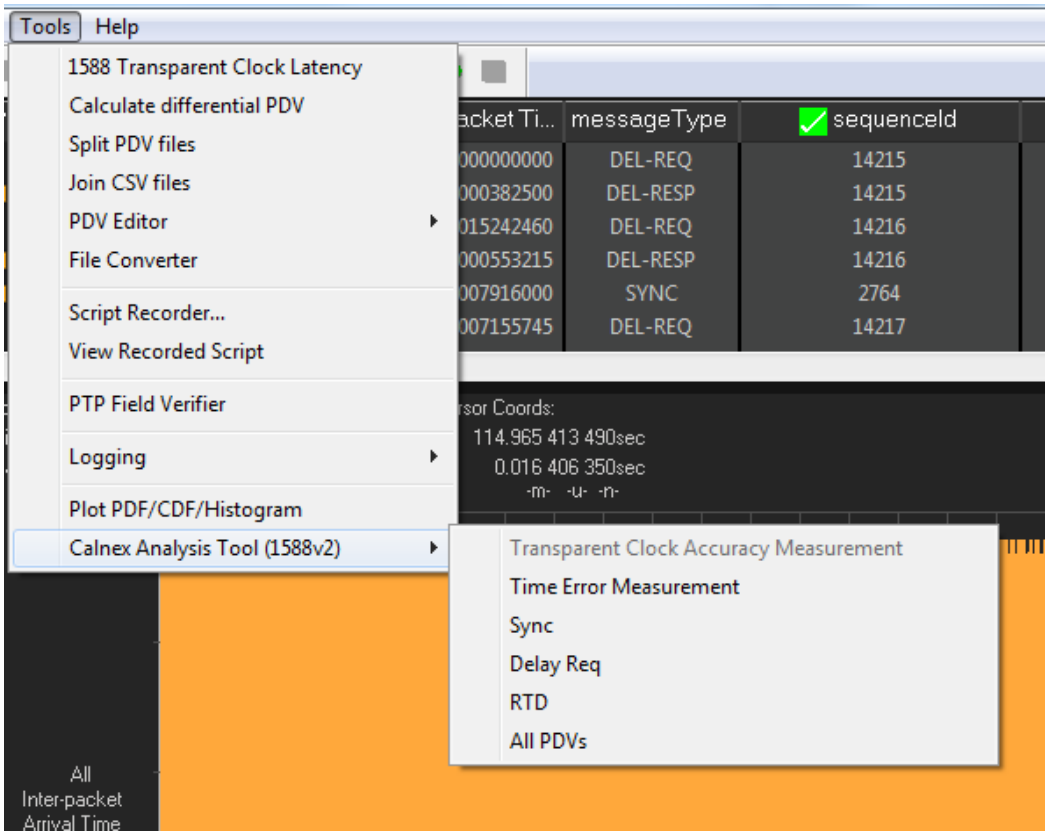


Wait for the DUT to lock to the Paragon-X emulated Master and stabilize before making any measurements**. Clock settling time is important**. Ask the vendor for advice for how long to wait or if it is possible to force a re-alignment. The wait time could be several minutes in some cases, dependent on the device under test.

If not possible to monitor this directly, using Paragon-X to view the 1pps output, if available, may provide an indication of the settling state of the DUT.

Understanding Measurements

To analyse the results select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



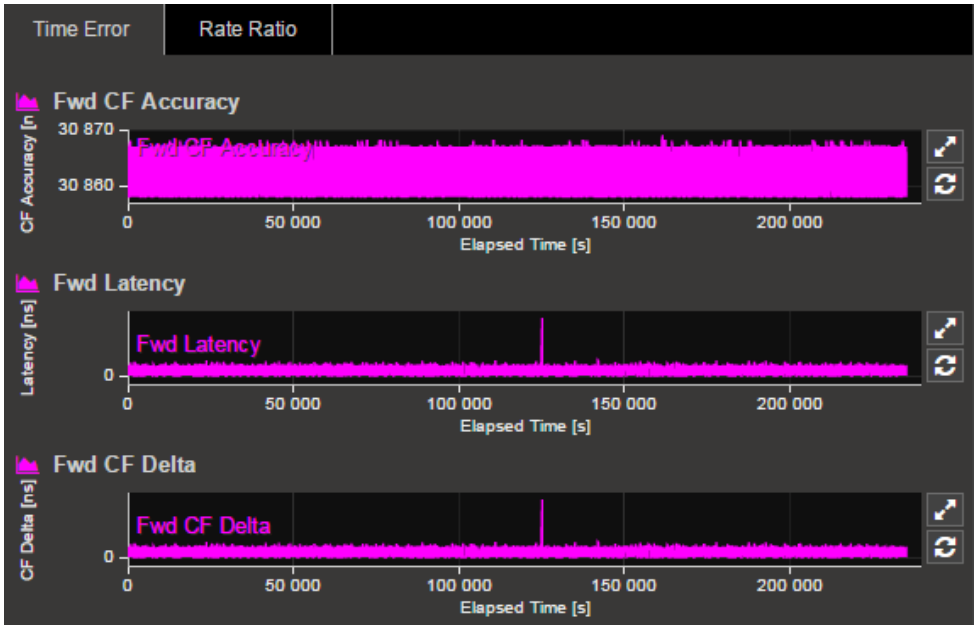
Calnex Analysis Tool (Time Error Measurement) Notes

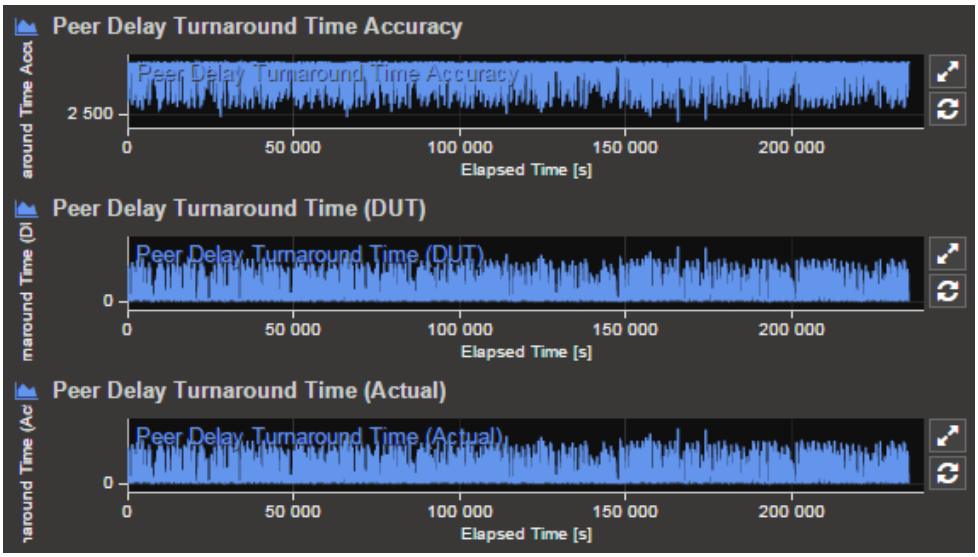
Time Aware Bridge measurements available with the CAT:

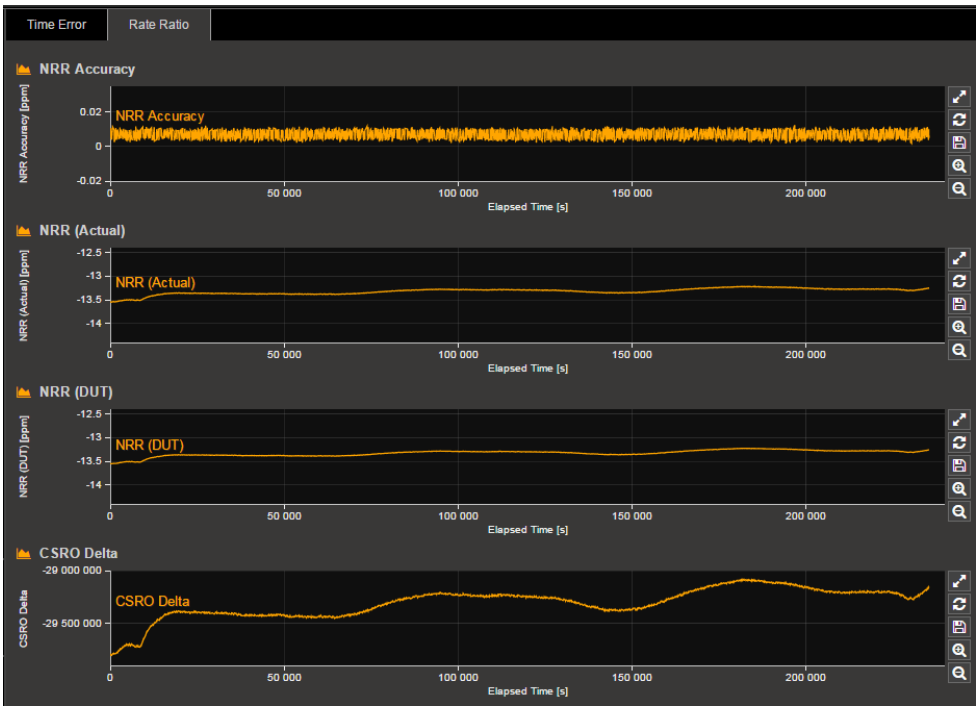
- **Time Error**
  - Forward Correction Field Accuracy (T1 Time Error)
  - Forward Latency
  - Forward Correction Field delta
- **Peer Delay**
  - Peer Delay Turnaround Time Accuracy
  - Peer Delay Turnaround Time (DUT)
  - Peer Delay Turn-Around Time (Actual)
- **Rate Ratio**
  - Neighbour Rate Ratio (NRR) Accuracy
  - Neighbour Rate Ratio (NRR) Actual
  - Neighbour Rate Ratio (NRR) DUT
  - CumulativeScaledRateOffset (CSRO) Delta

1pps versus PTP

It is important to prove performance via the egress PTP as this is the signal that is used downstream to recover the time. If provisioned, the 1pps output from the DUT should accurately reflect the performance of the timing being delivered by the egress PTP packet flow. Once in service, the performance can be monitored by this 1pps output so it is important to also prove it is an accurate reflection of performance on the line.


Time Error
Rate Ratio
Fwd CF Accuracy
CF Accuracy [n
30 870
30 860
Fwd CF Accuracy
0
50 000
100 000
150 000
200 000
Elapsed Time [s]
Fwd Latency
Latency [ns]
Fwd Latency
0
Fwd CF Delta
CF Delta [ns]
Fwd CF Delta


Peer Delay Turnaround Time Accuracy
2 500
Peer Delay Turnaround Time Accuracy
0
50 000
100 000
150 000
200 000
Elapsed Time [s]
Peer Delay Turnaround Time (DUT)
Peer Delay Turnaround Time (DUT)
Peer Delay Turnaround Time (Actual)
Peer Delay Turnaround Time (Actual)


Time Error
Rate Ratio
NRR Accuracy
NRR Accuracy [ppm]
0.02
-0.02
NRR Accuracy
Elapsed Time [s]
NRR (Actual)
NRR (Actual) [ppm]
-12.5
-13
-13.5
-14
NRR (Actual)
NRR (DUT)
NRR (DUT) [ppm]
NRR (DUT)
CSRO Delta
-29 000 000
-29 500 000
CSRO Delta

4. Testing OPEN TC11 2.5.1 (PTP_1_Step_Clock)

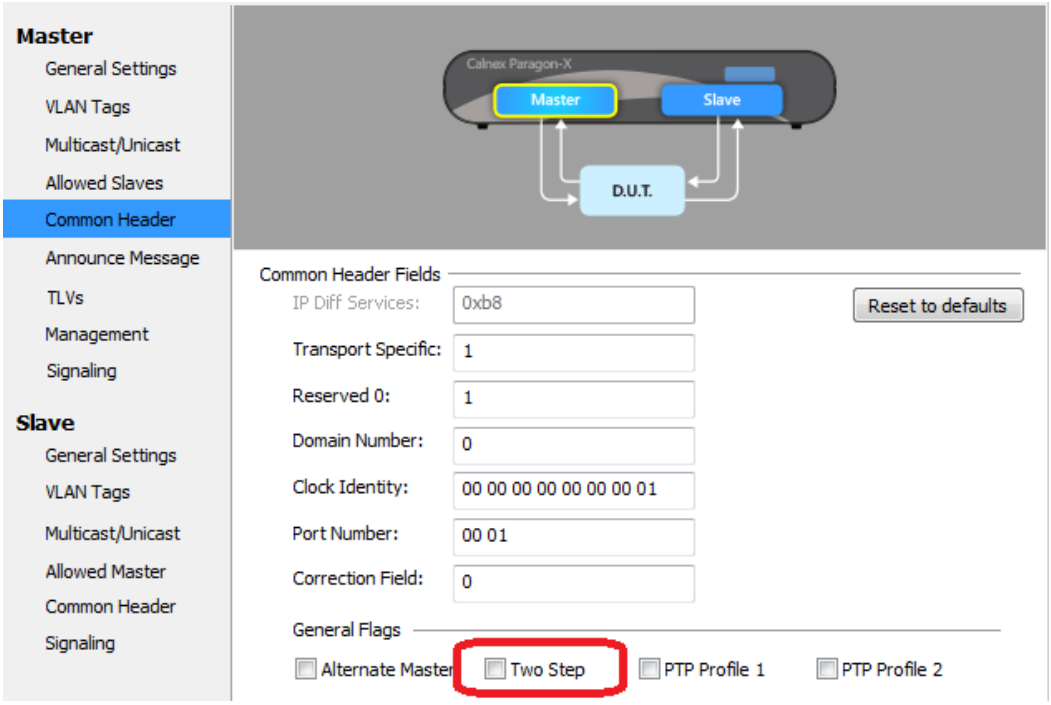
Test Background

Test ID:	TIME_001
Synopsis:	Checking 1-step frame forwarding mechanism including correct implementation of residence time measurement. The test station sends Sync frames to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionField of the Sync message is checked if the value correlates to the timestamp measurements of the test station.
Ext Req ID:	TIME-001 TIME-002 GEN_001
Reference:	IEEE Std 1588-2008
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration 1-Step forwarding and modification of Sync frames
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync frames to DUT ingress port and capture timestamp from test station 2. Receive Sync frame from DUT egress port and capture timestamp from test station 3. Read correctionField from received Sync frame 4. Verify that the FCS field of the forwarded Sync frame has been recalculated correctly 5. Reconfigure the port roles such that every port is tested at least one time as a PTP Master port and at least one time as PTP Slave port. 6. Repeat steps 1-5 until every port has been tested as PTP Master and Slave at least one time.
Pass criteria:	1. Value from correctionField needs to match the difference between the timestamp in the Sync frame and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error. 2. The FCS field of the forwarded Sync frame is correct
Notes:	NONE

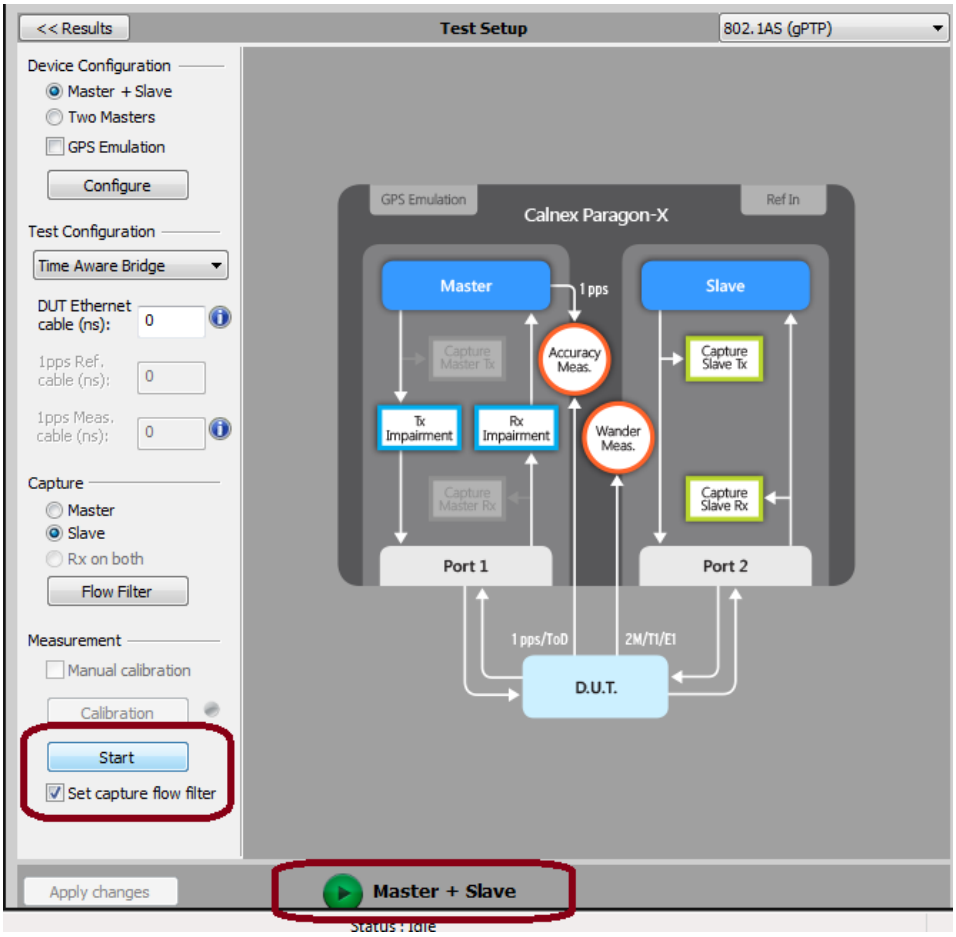
4.1 Measurement Process

1. Perform the **Master Slave Emulation Configuration** steps described in Section 3.

2. To enter 1-step mode, ensure the ***Two-Step*** flag setting in the ***Master Common Header*** is not selected.



3. With Master Slave Emulation mode running start a capture using the ***Start*** button in the Master/Slave Test Setup page.

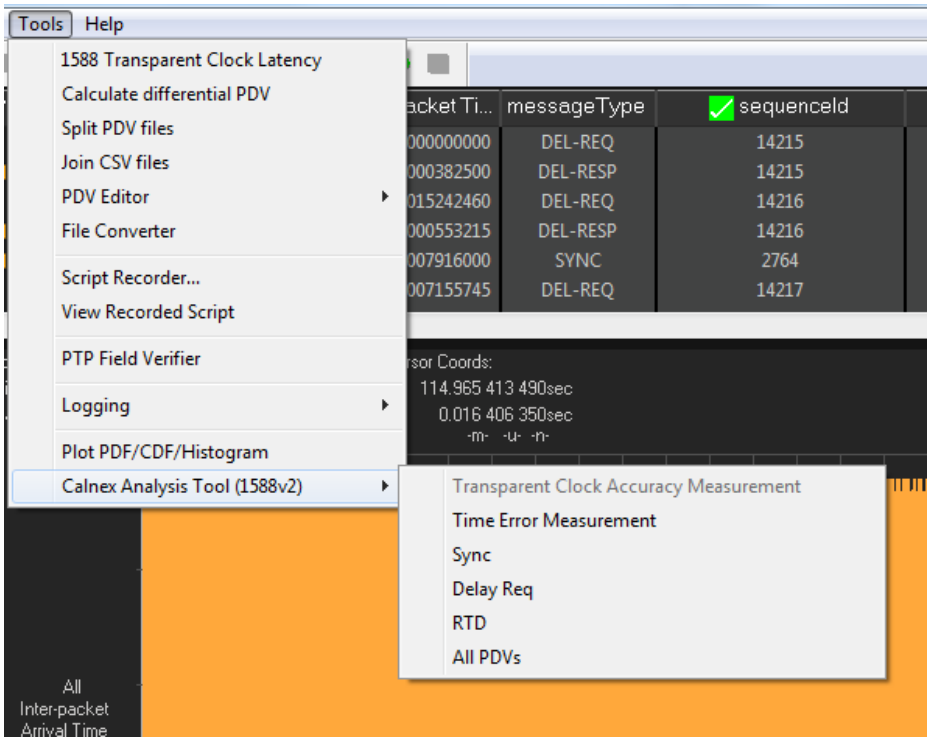


4. Allow the capture to run for the desired period. Then use the ***Stop Capture*** button to stop the capture.

   Time error results can be viewed live during capture or after capture has been stopped.

4.2 Time Error Results

1. Select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



The ***Calnex Analysis Tool*** will launch and display the ***Time Error*** metrics tab.

For PTP based data this will include the metrics ***T1 Time Error, Fwd Latency*** and ***Fwd CF Delta***. Individual graphs can be displayed by clicking on the icon highlighted in the display below.

This will display a single graph view, including additional statistics on the chosen measurement.

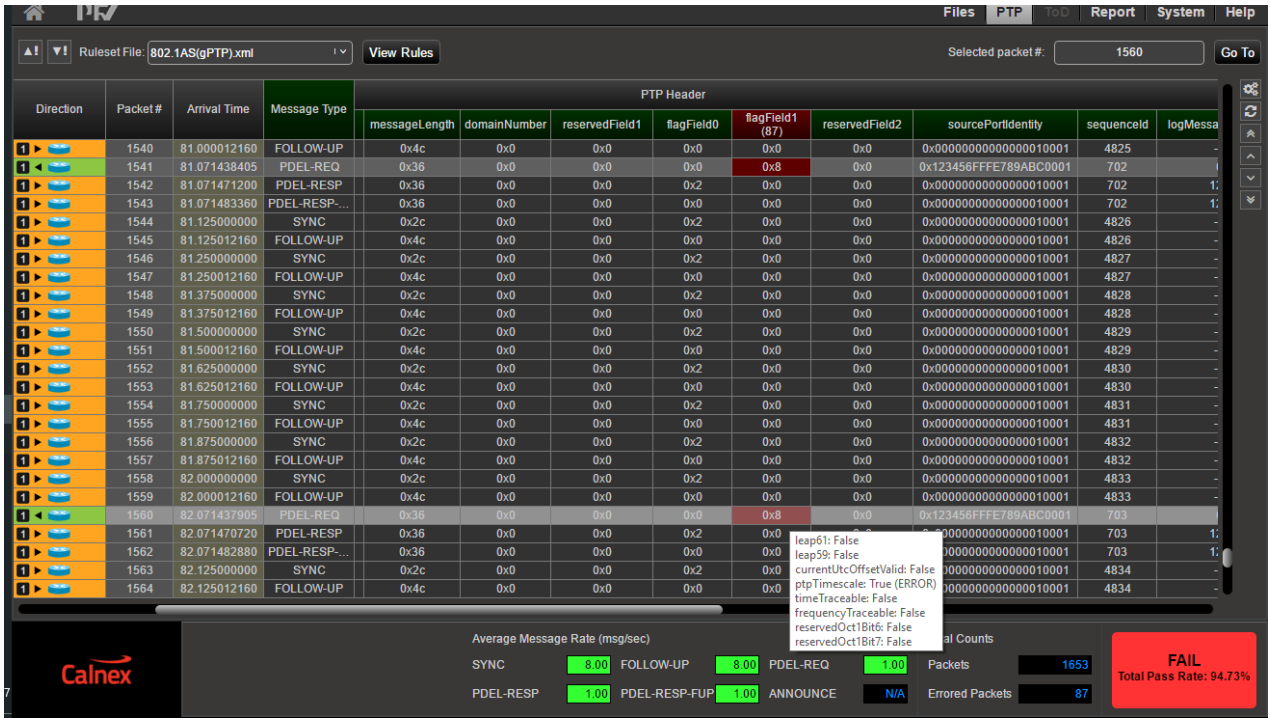
To return to the multi-graph display, click on the same icon in the single graph display.

3. T1 Time Error should be selected, and the limit set to 80ns (0.08us) as per the test specification.

- check for PASS/FAIL versus limite. If the result is a pass then the status in the **Mask Status** block in the top right of the CAT will indicate Pass. Failure will be indicated in Fail.

4.3 PTP Profile conformance and FCS Results

1. Once data has been captured, launch PFV from ***Tools > PTP Field Verifier***
2. Once launched, if not already selected, choose ***IEEE 802.1AS*** from the dropdown list
3. Areas of non-conformance will automatically be highlighted in red, with details of the failure provided via hover-over.



4. To verify that FCS has been recalculated correctly, look for sequence ID errors highlighted in PFV. PTP packets with FCS error will not be passed to PFV, resulting in a sequence ID error, and jump in displayed interpacket gap. **For compliance there must be no FCS errors.**

4.4 Verifying each port of DUT

• The above steps should be repeated for each applicable port on the DUT so that they are each tested as both Master and Slave at least once.

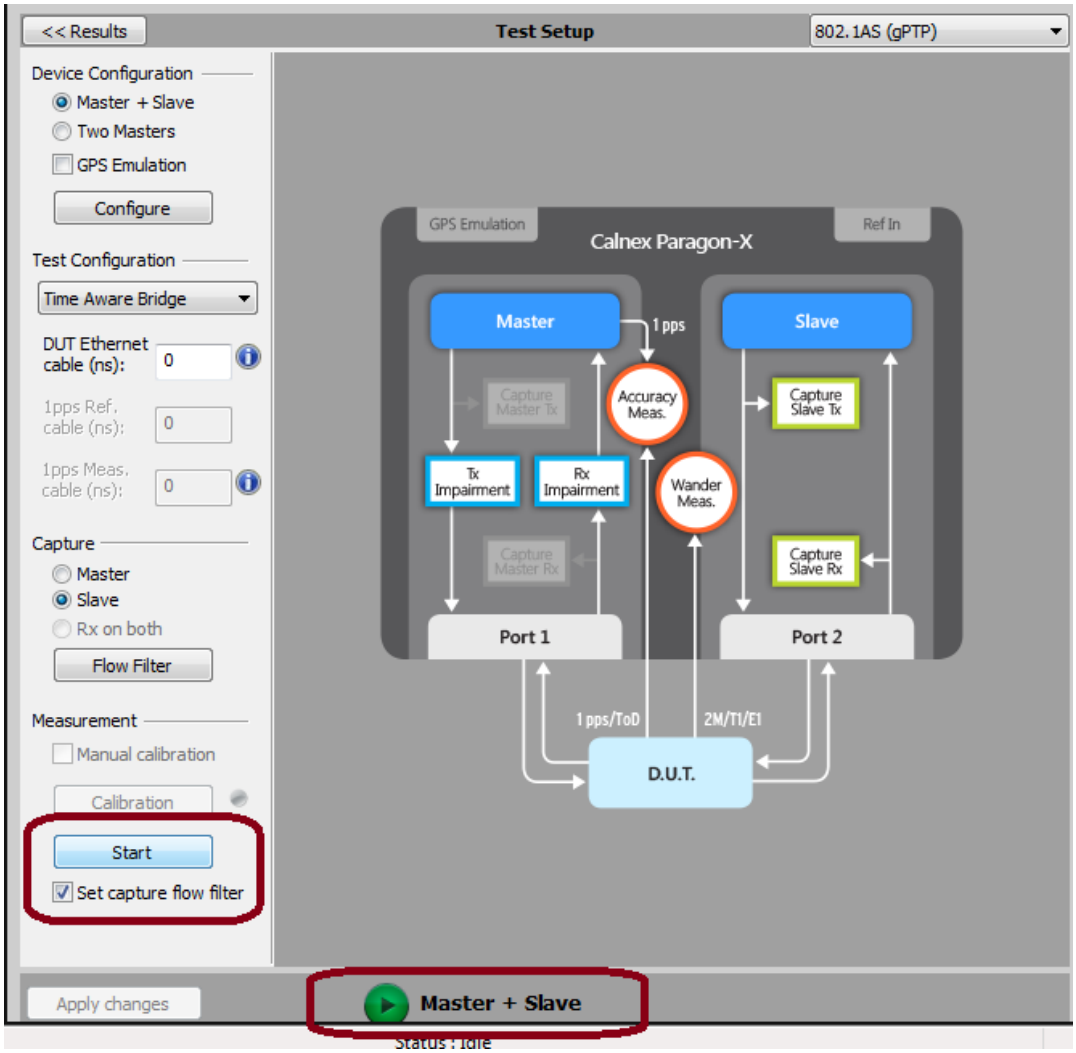
5. Testing OPEN TC11 2.5.2 (PTP_2_Step_Clock)

Test Background

Test ID:	TIME_002
Synopsis:	Checking 2-step frame forwarding mechanism including correct implementation of residence time measurement. The test station sends Sync and Follow_Up frames to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionField of the Follow_Up message is checked for correlation to the timestamp measurements of the test station.
Ext Req ID:	TIME-002 TIME-005
Reference:	IEEE Std 1588-2008 IEEE Std 802.1AS-2011
Classifier:	MUST
Test Setup:	Time Synchronization 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Ports are configured for 2-Step forwarding and modification of Sync and Follow_Up frames - Basic TSN Application on Host Controller that handles 2-step operation for Sync forwarding, supports the timestamp mechanism of the DUT and generates Follow_Up frames with the correctionField containing the residence time
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync and Follow_Up frames to DUT ingress port and capture timestamp of Sync frame from test station 2. Receive Sync and Follow_Up frame from DUT egress port and capture timestamp of Sync frame from test station 3. Read correctionField from received Follow_Up frame 4. Reconfigure the port roles such that every port is tested at least one time as a PTP Master port and at least one time as PTP Slave port. 5. Repeat steps 1-4 until every port has been tested as PTP Master and Slave at least one time.
Pass criteria:	1. The value of the correctionField matches the difference between the timestamp in the Sync packet and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error.
Notes:	NONE

5.1 Measurement Process

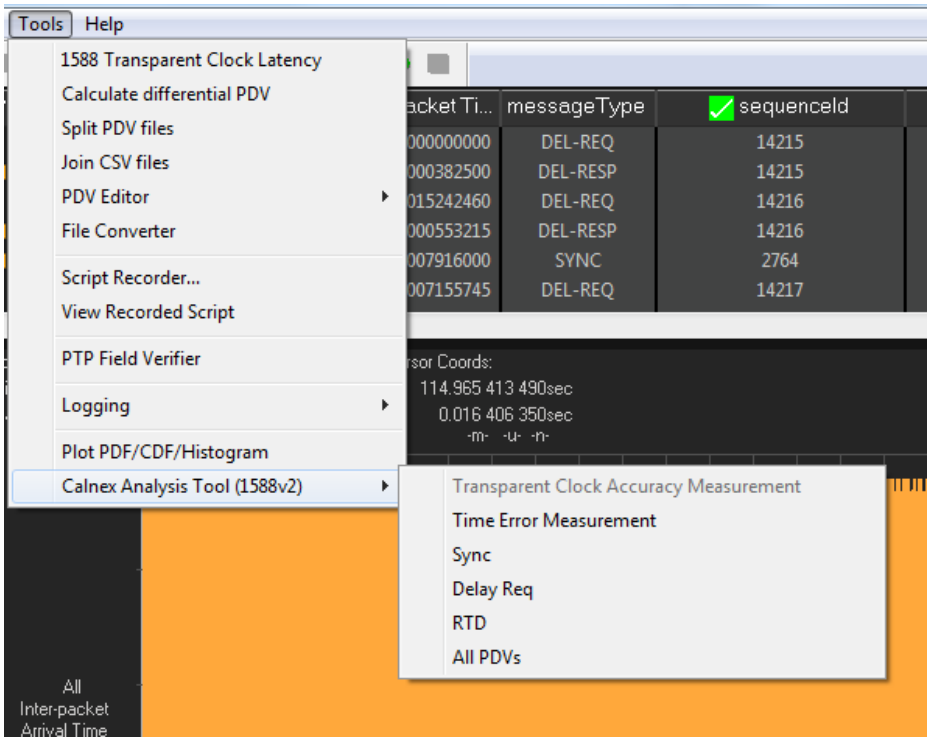
1. Perform the **Master Slave Emulation Configuration** steps described in Section 3.
2. Ensure the ***Two-Step*** flag setting in the ***Master Common Header*** is selected.
3. With Master Slave Emulation mode running start a capture using the ***Start*** button in the Master/Slave Test Setup page.



4. Allow the capture to run for the desired period. Then use the ***Stop Capture*** button to stop the capture. Time error results can be viewed live during capture or after capture has been stopped.

5.2 Time Error Results

1. Select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



The ***Calnex Analysis Tool*** will launch and display the ***Time Error*** metrics tab.

For PTP based data this will include the metrics ***T1 Time Error, Fwd Latency*** and ***Fwd CF Delta***. Individual graphs can be displayed by clicking on the icon highlighted in the display below.

This will display a single graph view, including additional statistics on the chosen measurement.

To return to the multi-graph display, click on the same icon in the single graph display.

4. T1 Time Error should be selected, and the limit set to 80ns (0.08us) as per the test specification.

- check for PASS/FAIL versus limite. If the result is a pass then the status in the **Mask Status** block in the top right of the CAT will indicate Pass. Failure will be indicated in Fail.

5.3 Verifying each port of DUT

- The above steps should be repeated for each applicable port on the DUT so that they are each tested as both Master and Slave at least once.

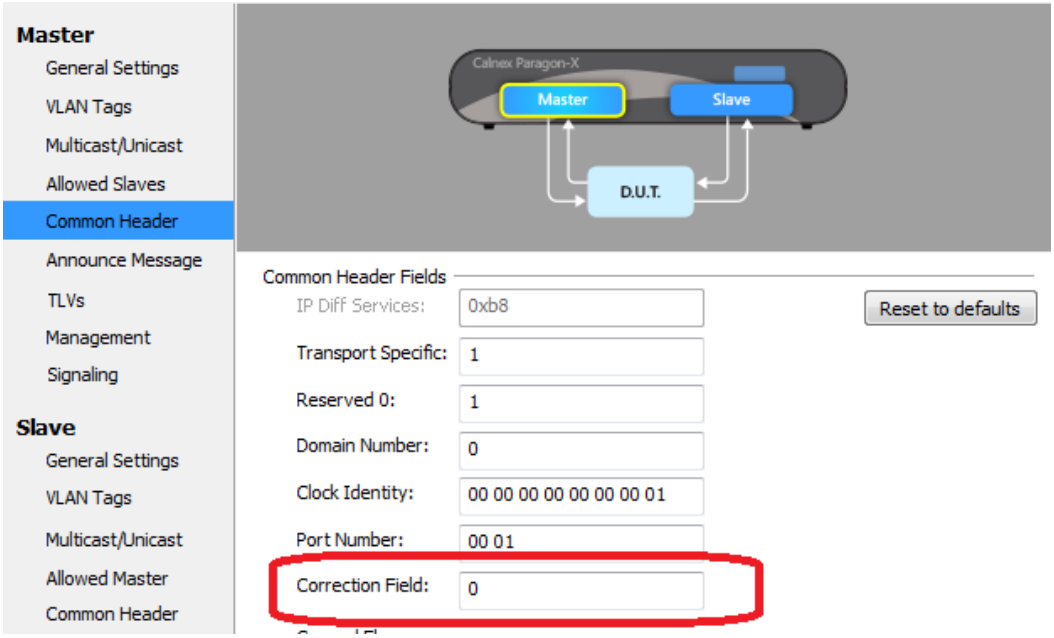
6. Testing OPEN TC11 2.5.3 (PTP_1_Step_Clock_Specific_MAC_Header)

Test Background

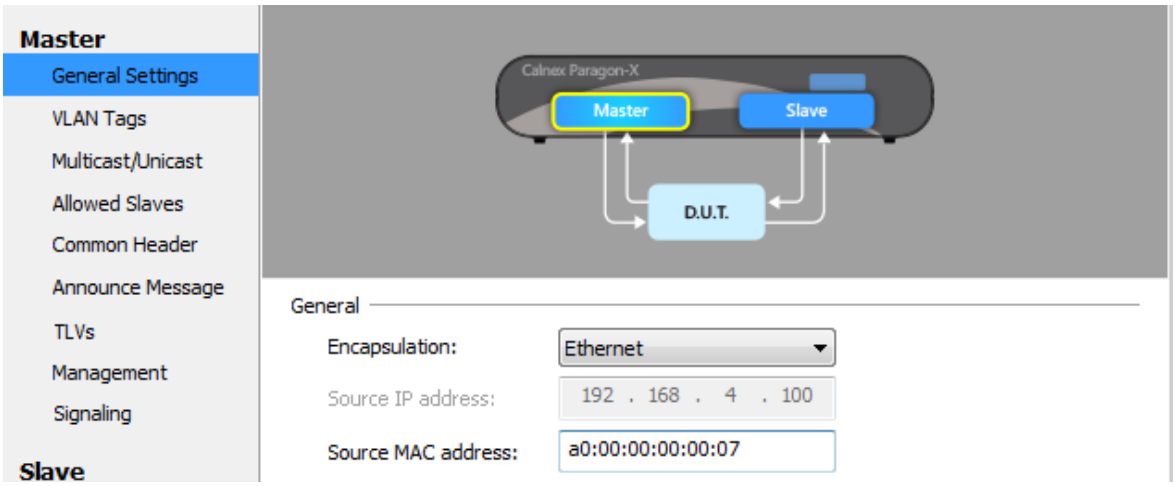
Test ID:	TIME_003
Synopsis:	Checking 1-step frame forwarding mechanism with specific MAC-Header. The test station sends Sync frames with specific MAC-Header to the PTP Slave Port and receives frames on all PTP Master Ports of the DUT. The correctionField of the Sync message is checked if the value is getting updated.
Ext Req ID:	TIME-003
Reference:	IEEE Std 1588-2008
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step-Clock, Time Synchronization 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Configuration 1-Step forwarding and modification of Sync frames - Configuration for non-standard MAC address and VLAN ID of Sync frames
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send Sync frames with specific MAC address and VLAN ID to DUT with the value of correctionField set to 0 2. Check if these frames are forwarded to configured port and that the value of correctionField is changed 3. Repeat step 1 and 2 with two step Sync and Follow_Up frames and check if the value of correctionField of Follow_Up is changed
Pass criteria:	1.. Value of Sync's correctionField is changed 2. Value of Follow_Up's correctionField is changed
Notes:	NONE

6.1 Measurement Process

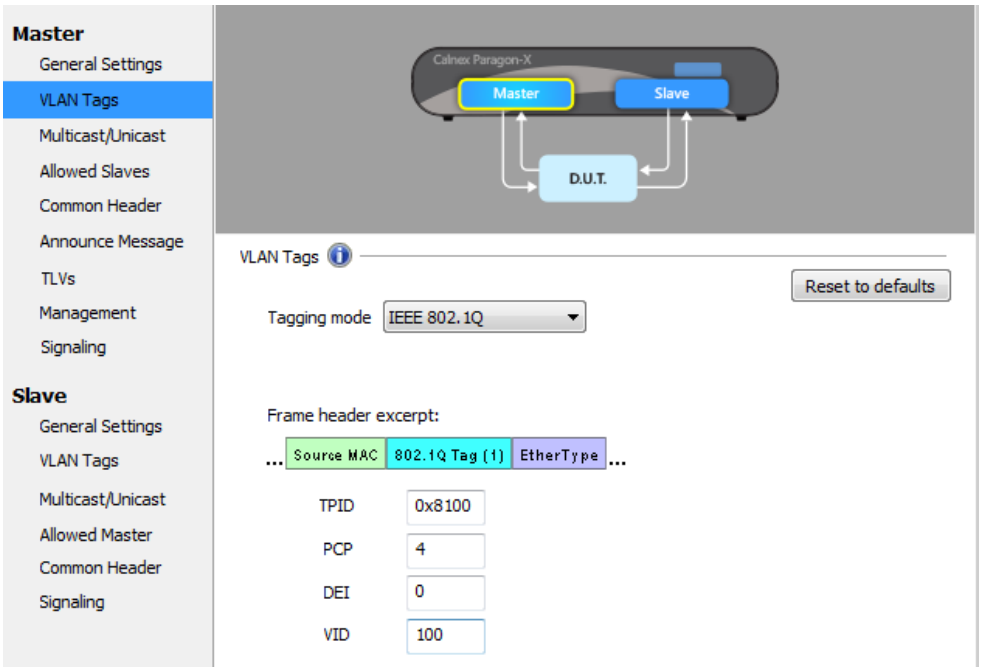
1. Perform the **Master Slave Emulation Configuration** steps described in Section 3.
2. Ensure the ***Two-Step*** flag setting in the ***Master Common Header*** is not selected.
3. Ensure the CorrectionField value is set to zero



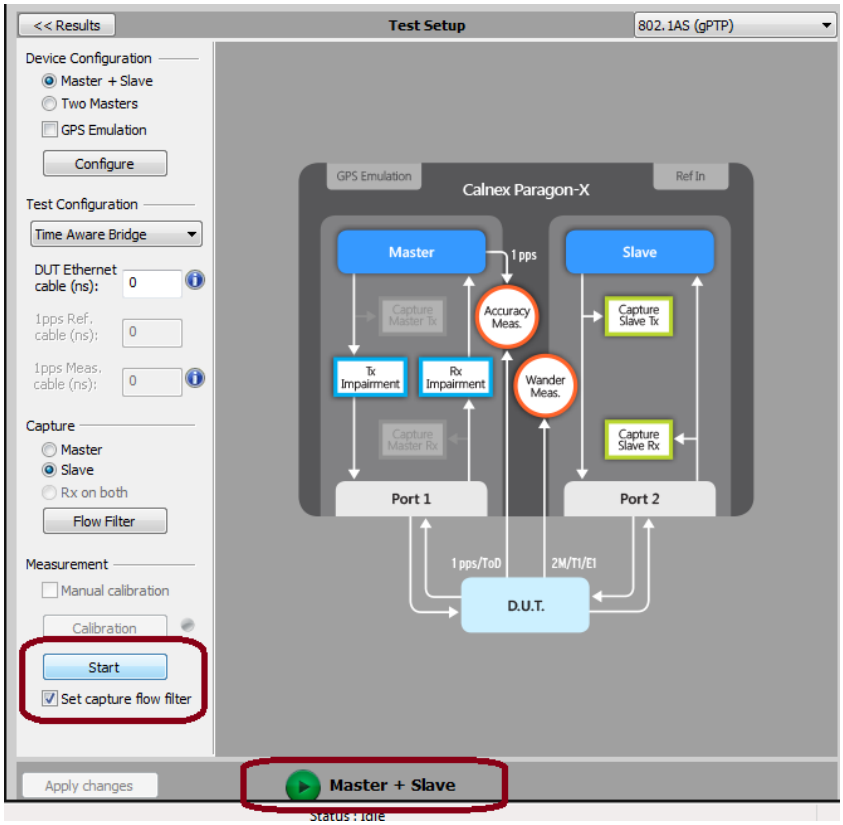
4. Ensure the desired **specific MAC address** has been set in ***Master: General Settings***



5. Ensure the desired **specific VLAN ID** has been set in ***Master: VLAN tags***



6. With Master Slave Emulation mode running start a capture using the ***Start*** button in the Master/Slave Test Setup page.

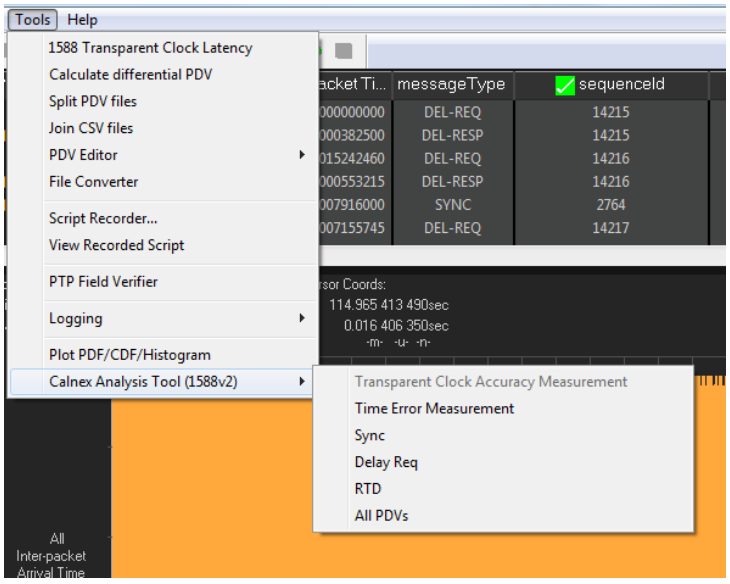


7. Allow the capture to run for the desired period. Then use the ***Stop Capture*** button to stop the capture.

   Time error results can be viewed live during capture or after capture has been stopped.

6.2 Time Error Results

1. Select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



The ***Calnex Analysis Tool*** will launch and display the ***Time Error*** metrics tab.

For PTP based data this will include the metrics ***T1 Time Error, Fwd Latency*** and ***Fwd CF Delta***. Individual graphs can be displayed by clicking on the icon highlighted in the display below.

This will display a single graph view, including additional statistics on the chosen measurement. To return to the multi-graph display, click on the same icon in the single graph display.

6 Fwd CF Delta should be selected, **and confirmed as non-zero** to show compliance to the test.

6.3 Verifying in 2-step Mode

The above steps should be repeated, ensuring the ***Two-Step*** flag setting in the ***Master Common Header*** is selected.

7. Testing OPEN TC11 2.5.4 (PTP_1_Step_and_2_Step_Clock_simultaneously)

Test Background

Test ID:	TIME_004
Synopsis:	Checking 1-step and 2-step frame forwarding mechanism including correct implementation of residence time measurements in parallel. The test station sends Sync frames to the related 1-step PTP Slave Port and receives frames on all other related 1-step PTP Master Ports of the DUT. In parallel, the test station sends Sync and Follow_Up frames to the related 2-step PTP Slave Port and receives frames on all other related 2-step PTP Master Ports of the DUT. The corresponding timestamps of the test station are recorded. The correctionFields of the Sync resp. Follow_Up messages are checked for correlation to the timestamp measurements of the test station.
Ext Req ID:	TIME-004
Reference:	IEEE Std 1588-2008 IEEE Std 802.1AS-2011
Classifier:	MUST
Test Setup:	Time Synchronization 1-Step and 2-Step-Clock
DUT Configuration:	- Standard Configuration for switching & forwarding (see Appendix B) - Selected ports are configured for 1-Step forwarding and modification of Sync frames - Selected ports are configured for 2-Step forwarding and modification of Sync and Follow_Up frames - Basic TSN Application for 2-step operation on Host Controller that handles Sync forwarding, supports the timestamp mechanism of the DUT and generates Follow_Up frames with the correctionField containing the residence time
Prerequisites:	1. Link up and stable between test station and DUT ports 2. Switch configured
Test procedure:	1. Send 1588 Sync frames within one time domain and 802.1AS Sync and Follow_Up frames in another time domain to related ingress ports and start capture 2. Receive 1588 Sync and respectively 802.1AS Sync and Follow_Up frames respectively from egress port and capture receive time of Sync frames 3. Read correctionField from received 1588 Sync frames and 802.1AS Follow_Up frames respectively
Pass criteria:	1. The value of the correctionField matches the difference between the timestamp in the Sync packet and the timestamp of receiving the packet on the tester, minus cable lengths and tester innacuracies, to within ±80ns error.
Notes:	NONE

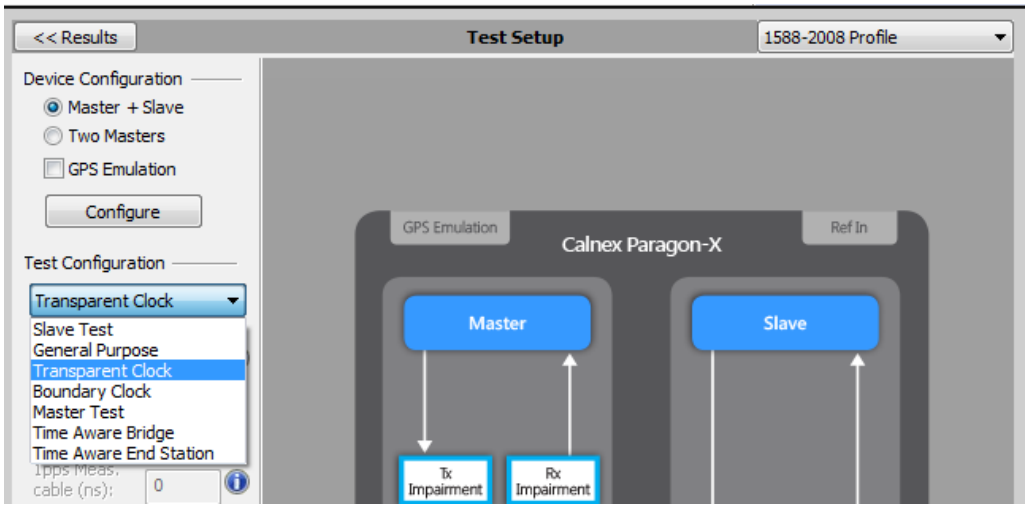
Test Methodology

The test procedure should allow validation of performance of device CorrectionField adjustments when the device is configured to support both 1588 1-Step and 802.1AS 2-Step operation. To allow the measurement accuracy required to verify +/-80ns device performance, it is recommended to test each output port sequentially.

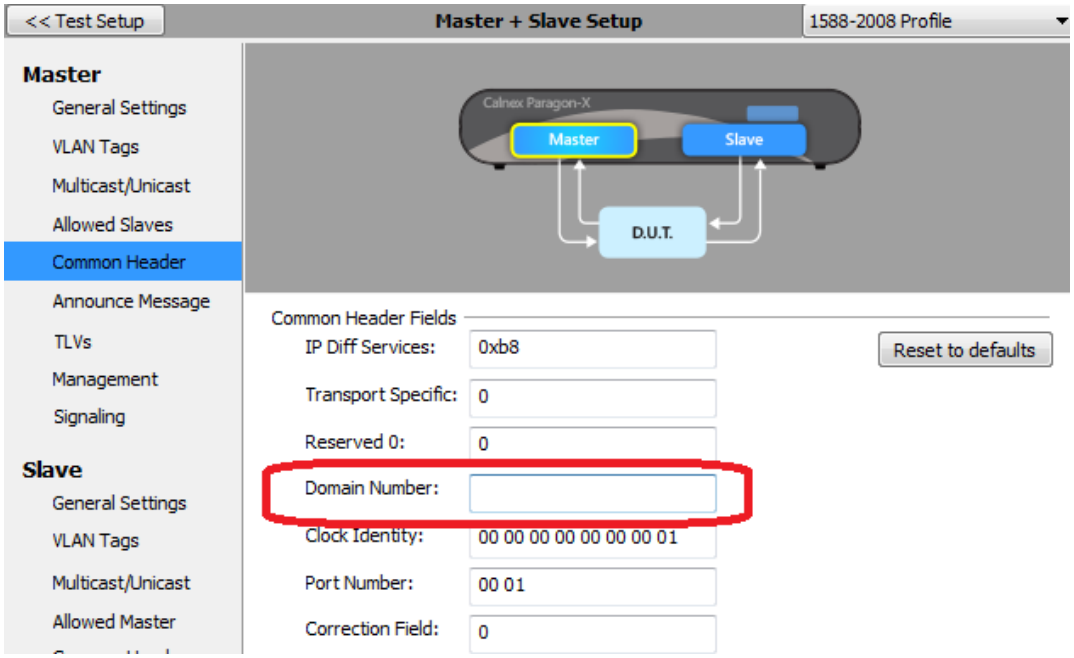
Testing 1588 1-step master ports should be performed with this configuration in the test device Master (reference), and testing of 802.1AS 2-step master ports should be performed with the equivalent setting in the test device Master (reference).
If both formats of PTP input are required for the device under test to provide 1588 and 802.1AS outputs, then any appropriate master device may be used to provide input for the Profile type not being actively tested.

7.1 Measurement Process – 1588 Sync Validation

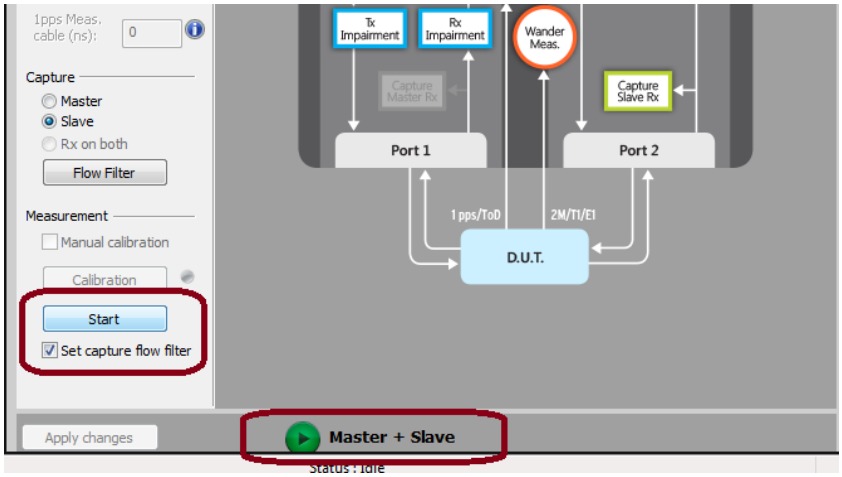
1. Perform the **Master Slave Emulation Configuration** steps described in Section 3, Ensuring Paragon Port 1 (Master) is connected to a DUT port configured as 1588 Slave, and Paragon Port 2 (Slave) is connected to a DUT port configured as 1588 Master
2. Select ***1588-2008*** from the ***Profile Selector*** Drop-down menu, and confirm all other settings are as required to allow connection to DUT.
3. Change ***Test Configuration*** to ***Transparent Clock***



4. If an 802.1AS 2-step Master will also be used in the testbed, ensure time domain has a different value.



5. With Master Slave Emulation mode running start a capture using the ***Start*** button in the Master/Slave Test Setup page.

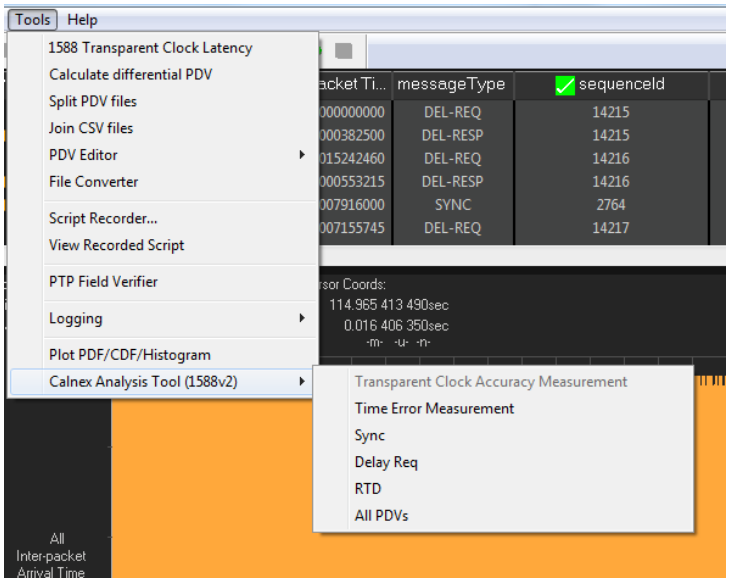


6. Allow the capture to run for the desired period. Then use the ***Stop Capture*** button to stop the capture.

   Time error results can be viewed live during capture or after capture has been stopped.

7.2 Time Error Results

1. Select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



The ***Calnex Analysis Tool*** will launch and display the ***Time Error*** metrics tab.

For PTP based data this will include the metrics ***T1 Time Error, Fwd Latency*** and ***Fwd CF Delta***. Individual graphs can be displayed by clicking on the icon highlighted in the display below.

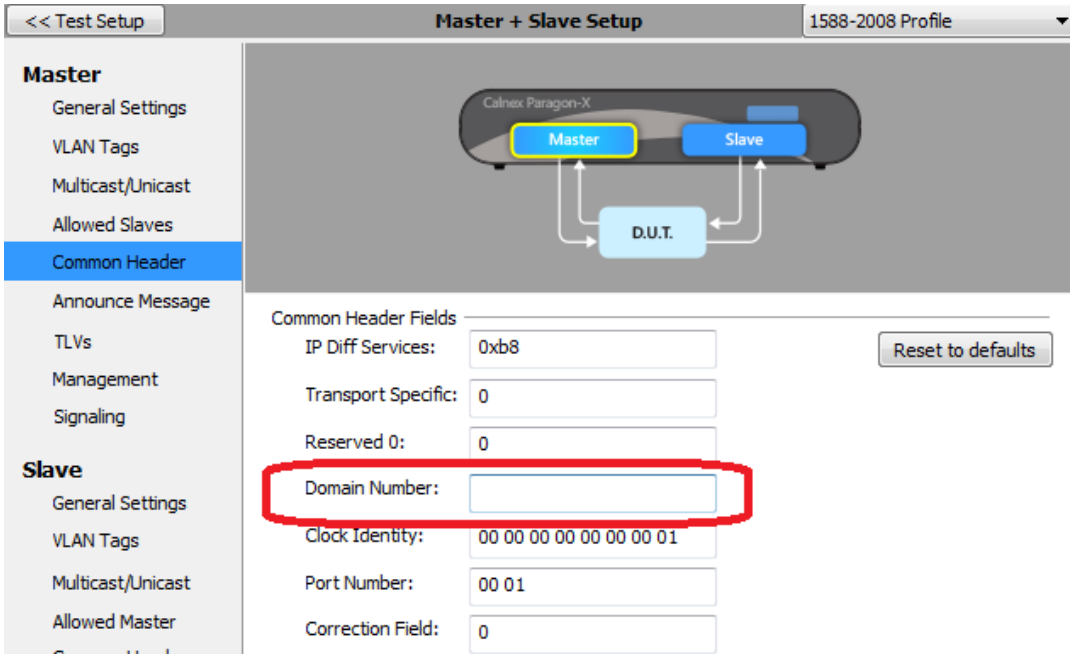
This will display a single graph view, including additional statistics on the chosen measurement. To return to the multi-graph display, click on the same icon in the single graph display.

5. T1 Time Error should be selected, and the limit set to 80ns (0.08us) as per the test specification.

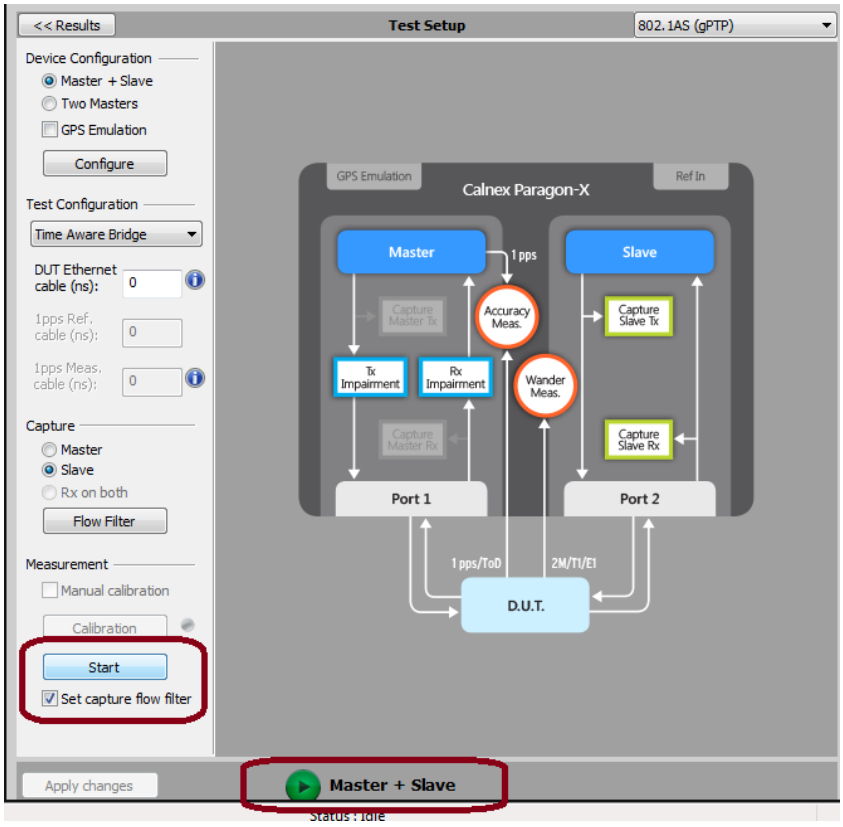
- check for PASS/FAIL versus limite. If the result is a pass then the status in the **Mask Status** block in the top right of the CAT will indicate Pass. Failure will be indicated in Fail.
- This can be repeated sequentially, connecting Paragon Port 2 (Slave) to all ports acting as 1588 1-step Master.

7.3 Measurement Process – 802.1AS 2-Step Validation

1. Perform the **Master Slave Emulation Configuration** steps described in Section 3, Ensuring Paragon Port 1 (Master) is connected to a DUT port configured as 802.1AS Slave, and Paragon Port 2 (Slave) is connected to a DUT port configured as 802.1AS Master
2. Ensure ***802.1AS*** is selected from the ***Profile Selector*** Drop-down menu, and confirm all other settings are as required to allow connection to DUT. Ensure ***Two-Step*** flag is set in ***Master: Common Header***
3. Ensure ***Test Configuration*** is ***Time-Aware Bridge***
4. If a 1588 1-step Master will also be used in the testbed, ensure time domain has a different value.



5. With Master Slave Emulation mode running start a capture using the ***Start*** button in the Master/Slave Test Setup page.

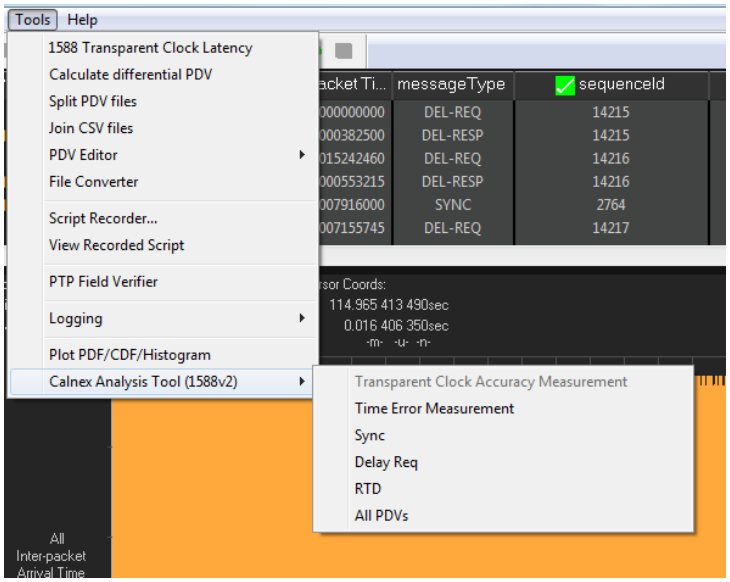


6. Allow the capture to run for the desired period. Then use the ***Stop Capture*** button to stop the capture.

   Time error results can be viewed live during capture or after capture has been stopped.

7.4 Time Error Results

1. Select ***Tools*** > ***Calnex Analysis Tool (1588v2) and Time Error Measurement*** tool.



The ***Calnex Analysis Tool*** will launch and display the ***Time Error*** metrics tab.

For PTP based data this will include the metrics ***T1 Time Error, Fwd Latency*** and ***Fwd CF Delta***. Individual graphs can be displayed by clicking on the icon highlighted in the display below.

This will display a single graph view, including additional statistics on the chosen measurement. To return to the multi-graph display, click on the same icon in the single graph display.

6. T1 Time Error should be selected, and the limit set to 80ns (0.08us) as per the test specification.

- check for PASS/FAIL versus limite. If the result is a pass then the status in the **Mask Status** block in the top right of the CAT will indicate Pass. Failure will be indicated in Fail.
- This can be repeated sequentially, connecting Paragon Port 2 (Slave) to all ports acting as 802.1AS 2-step Master.

Calnex Solutions Ltd
Oracle Campus
Linlithgow
West Lothian EH49 7LR
United Kingdom

tel: +44 (0) 1506 671 416
email: info@calnexsol.com

calnexsol.com

CX5031 August 2019