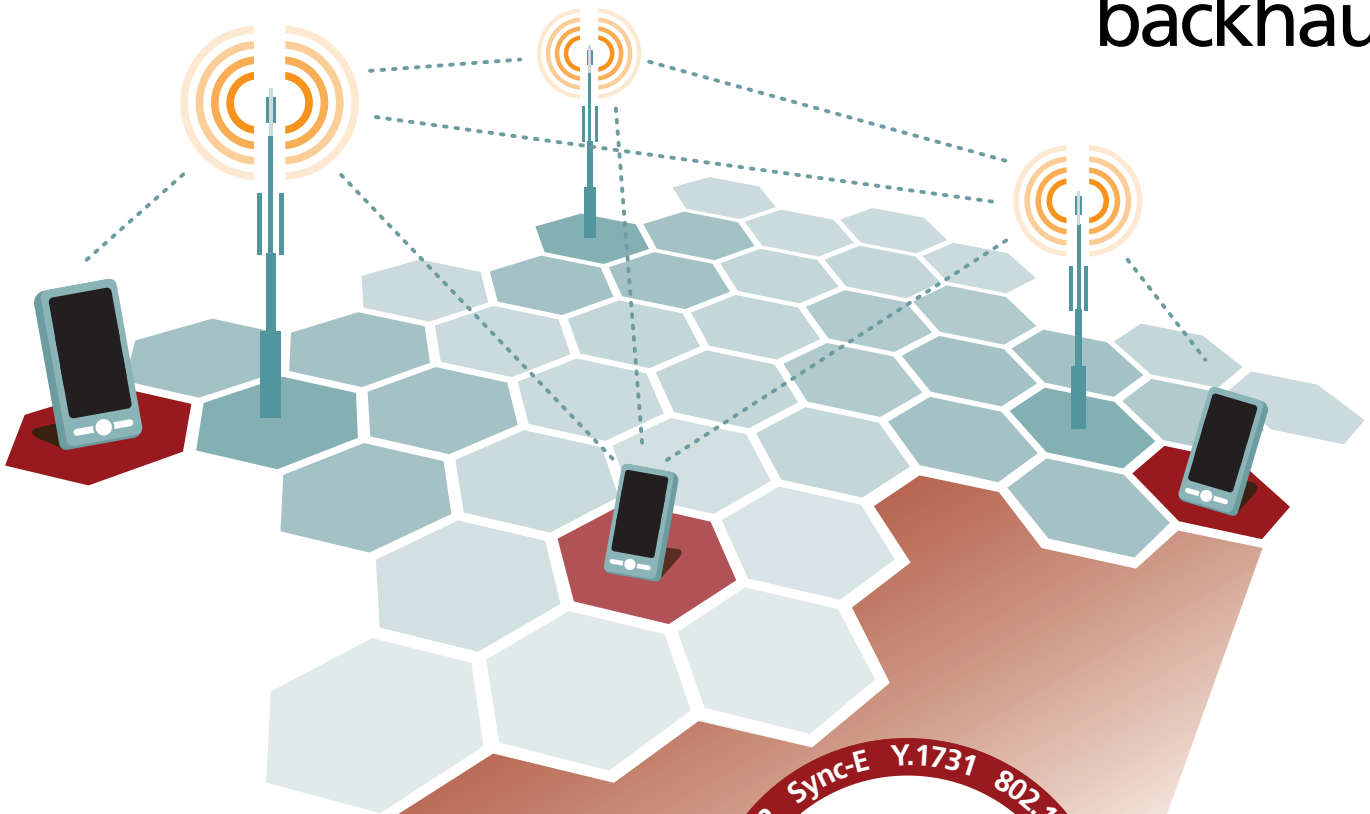


prove Ethernet OAM and Sync for Next-Gen mobile backhaul



If you need to deliver the performance and reliability of legacy networks for services like mobile backhaul, Video and VoIP, look no further than the Calnex Paragon platform. For Next-Gen technologies, the Calnex Paragon offers direct insight to actual device and service behavior, and the ability to generate a broad range of real-world disruption scenarios to validate the operation of your network devices.



Ethernet OAM Performance Summary

- Prove Connectivity Fault Management (CFM) and Performance Monitoring (PM) for Y.1731, 802.1ag and 802.3ah
- Add latency, jitter, errors, dropped packets to prove OAM implementation
- Prove G.8031/2 protection
- Support for 1000s of MEGs

Sync-E Performance Summary

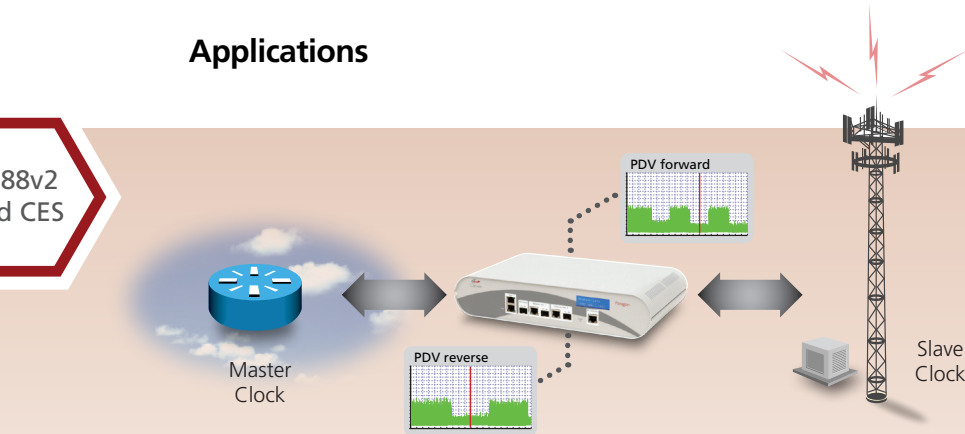
- Prove Sync-E Wander to G.8262
- MTIE/TDEV Pass/Fail evaluation
- 1 nanosecond accuracy
- ESMC (SSM) message testing and proving to G.8264

1588v2 and CES Performance Summary

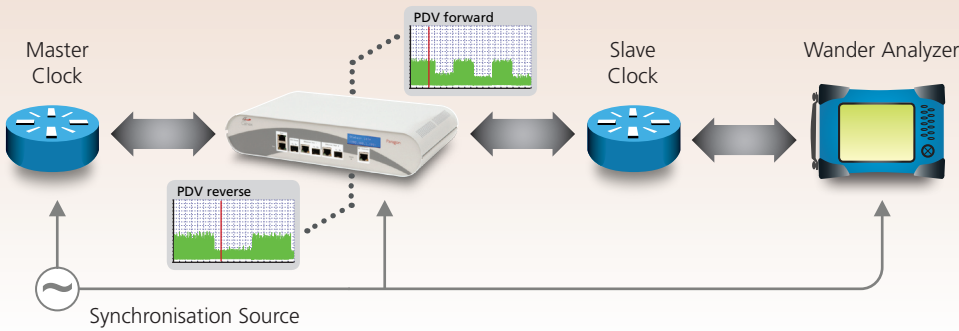
- Run G.8261 and MEF-18 test cases
- Extensive graphical analysis and troubleshooting
- Capture PDVs from REAL networks
- Replay REAL network PDVs in the lab
- Troubleshoot 1588v2 protocols and handshaking

Applications

1588v2 and CES

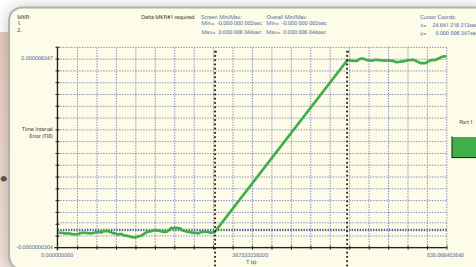
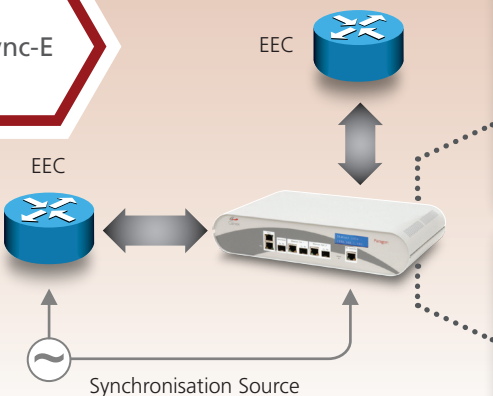


Capture 1588v2 packets and PDVs from real networks and perform detailed performance analysis and troubleshooting.

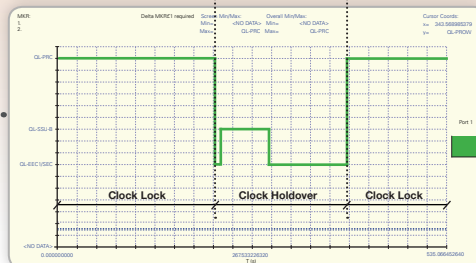


Captured PDVs can then be replayed in the lab to test systems under real network conditions.

Sync-E



Measure Sync-E Wander to ITU-T G.8262.



Test ESMC (SSM) to ITU-T G.8264.

Ethernet OAM

Port	Packet #	Arrival Time	Eth Dst	Eth Src	OAM Type	MEP ID	RDI	Period	fps	TransID/SeqNum	TxFcI	TxFcB
	0	0.000000000	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	24	38482382	1838290	
	1	1.000022315	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	25	38482382	1838290	
	2	2.000044640	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	26	38482382	1838290	
	3	2.040043850	10:11:12:13:14:15	01:11:21:31:41:51	LBR	-	-	-	1181	-	-	-
	4	2.080043060	01:11:21:31:41:51	10:11:12:13:14:15	LBR	-	-	-	1181	-	-	-
	5	3.000069860	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	27	38482382	1838290	
	6	4.000092860	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	28	38482382	1838290	
	7	5.000111660	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	29	38482382	1838290	
	8	6.000133915	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	30	38482382	1838290	
	9	7.000156235	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	31	38482382	1838290	
	10	8.000178545	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	32	38482382	1838290	
	11	8.040177355	10:11:12:13:14:15	01:11:21:31:41:51	LBM	-	-	-	1182	-	-	-
	12	8.08009380	01:11:21:31:41:51	10:11:12:13:14:15	LBR	-	-	-	1182	-	-	-
	13	9.080176965	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	33	38482382	1838290	
	14	10.000231305	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	34	38482382	1838290	
	15	11.000245535	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	1	1s	35	38482382	1838290	
	16	12.000267815	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	36	38482382	1838290	
	17	13.000290135	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	37	38482382	1838290	
	18	14.000312450	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	38	38482382	1838290	
	19	14.040311660	10:11:12:13:14:15	01:11:21:31:41:51	LBM	-	-	-	1183	-	-	-
	20	14.080310870	01:11:21:31:41:51	10:11:12:13:14:15	LBR	-	-	-	1183	-	-	-
	21	15.000334770	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	39	38482382	1838290	
	22	16.000357080	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	40	38482382	1838290	
	23	17.000379400	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	41	38482382	1838290	
	24	18.000401715	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	42	38482382	1838290	
	25	19.000424035	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	43	38482382	1838290	
	26	20.000446355	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	44	38482382	1838290	
	27	20.040445565	10:11:12:13:14:15	01:11:21:31:41:51	LBM	-	-	-	1184	-	-	-
	28	20.080444775	01:11:21:31:41:51	10:11:12:13:14:15	LBR	-	-	-	1184	-	-	-
	29	21.000468675	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	45	38482382	1838290	
	30	22.000490990	10:11:12:13:14:15	01:11:21:31:41:51	CCM	323	0	1s	46	38482382	1838290	

Capture and analyze OAM messages and flows. Introduce controlled impairments to stress-test OAM.

Prove and troubleshoot OAM more rapidly and more thoroughly than using a traffic generator alone.



Traffic Generator

Traffic Generator

Specifications

1588v2 (option 201) and CES (option 202)

Packet Sync Rates Protocols	1588v2 Any packet rate IEEE-1588 (2008)	CES T1, E1, T3, E3 or Any SAToP, CESoPSN, TDMoIP
Header Capture and Alarms	MessageType, TransportSpecific, VersionPTP, MessageLength, DomainNo, Flags, CorrectionField, SourcePortIdentity, SequenceID (errors highlighted), ControlField, LogMessageInterval, OriginTimestamp	L,R,M,FRG, Length and Sequence # (errors highlighted) L,R,M Alarm Injection
Graphs Displayed	Inter-packet (SYNC, DEL_REQ, DEL_RESP, pDELAY_REQ, pDELAY_RESP, FOLLOW-UP, ALL) Sync PDV (Master-to-Slave PDV), Delay_Req PDV (Slave-to-Master PDV), Slave Clock Wander (T3), Follow-up PDV, Delay_Resp PDV, PDelay_Req PDV, PDelay_Resp PDV, Asymmetry variation, RTD variation <i>Include or exclude Correction Factor in PDV calculation</i>	TIE vs Nominal, TIE vs Measured Average, Delay vs Packet #, Inter-packet Time (vs Time and vs Packet #)
Test Cases Supported	G.8261 (Test Cases 1 – 17) and MEF-18	
PDV Editor Suite	Edit any PDV file from the Graphs Profile Edits: Extract, Repeat, Copy, Paste (Replace or Insert) Modulate, Scale (%), Banding (Deplete or Concentrate) Adjust Delay Floor	
Measurement Accuracy	5ns	

Sync-E (option 203)

Wander Measurement MTIE/TDEV Analysis	ITU-T G.8262 – Wander Generation, Wander Transfer, Wander Tolerance, Phase Transient Built-in software with ITU-T masks and Pass/Fail indication	
Sync-E Master	Accuracy traceable to Reference source used (refer Reference Clocks)	
Measurement Accuracy	1ns	
ESMC (SSM) Features to G.8264, G.781, etc	Decode ESMC messages to ITU-T G.8264 and plot Quality Level (QL) changes graphically (bi-directional) QLs: PRS, PRC, INV3, SSU-A/TNC, INV5, INV6, ST2, SSU-B, INV9, EEC2/ST3, EEC1/SEC, SMC, ST3E, PROV, STU/UKN, DNU/DUS Overwrite ESMC Message to change QL status Support for ESMC Decode and Sync-E in 1588 mode (for concurrent Sync-E and 1588v2 implementations) Integrated decode using industry-standard tool, Wireshark	
ESMC Generation	Generate ESMC (SSM) packets per ITU-T G.8264 QLs: PRS, PRC, INV3, SSU-A/TNC, INV5, INV6, ST2, SSU-B, INV9, EEC2/ST3, EEC1/SEC, SMC, ST3E, PROV, STU/UKN, DNU/DUS Generate ESMC Messages, change QL value and measure impact on Wander	

Ethernet OAM (option 301)

Capture and Decode	Packet Number, Arrival Time, Ethernet Destination Address, Ethernet Source Address OAM Message Type, MEP ID, RDI, Period fps. TransID, TxFCf, RxFCf, TxFCb. Tx Timestamp(f), Rx Timestamp(f), Tx Timestamp(b), Rx Timestamp(b), Maintenance Domain Length, Maintenance Domain Name, Short MA Name Format, Short MA Name Length, Short MA Name, Time To Live, Origin MAC, Target MAC, Relay Action, OUI, TLV Offset, TLVs
Round-trip Delay	Based on DMM/DMR messages. Displayed in table and graph. MEF and ITU-T delay methods supported
View Filtering	MAC addresses and OAM Message types
Standards Supported	ITU-T Y.1731, IEEE 802.1ag, IEEE 802.3ah, ITU-T G.8031, ITU-T G.8032
Message Filters for Corruption and Delay	CCM, LBM, LBR, LTM, LTR, AIS, LCK, TST, APS, MCC, LMM, LMR, 1DM, DMM, DMR, EXM, EXR, VSM, VSR Any combination of above messages. CCM at 1s and 3.33ms both supported
Impairments and Delay	Lost, Misordered, Repeated, Errored, AIS/LCK/RDI Generation, Fixed Delay, Variable Delay
Header Overwrite	Ethernet Header or OAM Header – overwrite any bit (first 128 bytes) with Hex or Binary value or Invert
Multi-MEG Mode	Capture information for 1000s of MEGs including Eth Dest, Eth Src, SVID, CVID, MEL, MEP ID, OAM Message Count, AIS, RDI, CCM, CCM fps, etc

General Product Specifications

Physical Interfaces	Ethernet 100M Electrical 1G Electrical (optional), 1G Optical (optional) - SFP 10G Optical (optional) – XFP or SFP+	SDH/Sonet (optional) 155M, 622M, 2.5G, 10G (Optical – SFP, SFP+ and XFP)
Reference Clocks	Lock internal timing reference to external reference. Reference Lock soft LED indication External reference inputs: 2.048MHz, 10 MHz; T1 BITS clock; E1 MTS Internal reference Stratum-3, + 4.6 ppm Sync-E RX clock as reference for TX	
PC Control Interface	Any standard PC or laptop running Windows XP or Vista. RJ45 LAN connection to Instrument	
TCP/IP Settings	TCP Port and IP Address settable	
Automatic flow-selection in multi-flow environment	Automatic detection of OAM (MEGs), 1588v2, CES and other flows and filter setup using FlowWizard Filter: (1 to 64 bytes): Setup messages for capture and replay Select OAM type within a MEG flow Select 1588v2 Message type(s) or groups Integrated decode using industry-standard tool, Wireshark	
Packet Capture	Capture complete packet and display contents. The filters can specify the packet types to be captured	
Graph manipulation	Zoom in (X and Y), Zoom out (X and Y), Marker 1, Marker 2, Min/Max display in nanoseconds	
Items below are independently settable in Forward and Reverse directions		
Impairments – Delay		
Fixed Delay	6µs to 10s	
Variable Delays	All modes: (a) Gaussian, Gamma (b) User Defined – stored PDV profiles or captures from networks 1588v2 and CES modes: (c) G.8261 and MEF-18 Test Cases (d) Sawtooth – Systematic, Beating (F) and Beating (S) (e) Step Function (f) Latency Ramp	
1588v2 Delays applied to:	Packet Sending Time, Correction Field or Both	
Impairments - Corruption		
Control	Misordered, Lost, Repeated or Errored Packets	
	Single, Burst (1 to 10000), Duration (0.1s to 10s), Rate (0.00001% to 99.99999%), Ratio (1E-7 to 9E-1) or Constant	
Overwrite Header	Any 4 bytes with any value in first 128 bytes	
Switch Simulation	Independently set (a) Latency (b) Buffer Depth (1byte to 256k bytes) (c) Bandwidth (0% to 100%)	
Remote control	Scripting via TCL	

Calnex Solutions provides in-line test solutions for the emerging Packet Transport and Carrier Ethernet network technologies, and is a leader in enabling deployment of NGN technologies such as 1588v2, Sync-E, CES, Ethernet OAM and MPLS-TP.

For more information on the Calnex Paragon platform, and to take advantage of Calnex's extensive experience in Packet Sync and OAM testing technologies, contact Calnex Solutions today:

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 email: info@calnexsol.com

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