DOBLE PROTECTION TESTING

Digital Network Analyzer

DETECT AND ADDRESS ISSUES IN IEC 61850 NETWORK TRAFFIC



FEATURES AND BENEFITS

- Lightweight and compact for easy portability
- Multiple field and laboratory applications, inperson and remote use cases
- Software for detailed analysis of captured events and evaluation of network performance
- System event packet capture (PCAP) for analysis in a wide range of network analysis tools
- Numerous user-configurable views available for observing system status in real-time
- Fast setup and intuitive user experience

The Doble F6880 Digital Network Analyzer (DNA) reveals details that are essential to helping protection engineers and relay test technicians quickly resolve issues in IEC 61850 network traffic.

This compact and lightweight instrument is paired with powerful software that analyzes IED communications and provides diagnostic and analytical functionality in real time.

The DNA is a digital substation multimeter, capable of plotting IEC 61850 sampled values (SV) and GOOSE messages via real-time oscillography, phasor, and tabular data views.

It is also a system event recorder, capturing events via customizable triggers and producing analysis reports that allow the user to evaluate network performance and power system anomalies, like voltage sag, harmonic distortion, and underfrequency.

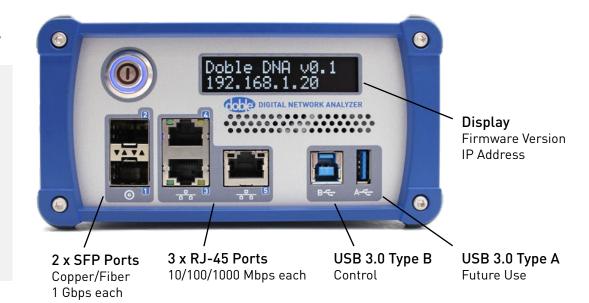
The F6880 compares SV and GOOSE information from SCL files with the present network traffic to identify system misconfiguration issues such as missing, duplicated, or unknown messages.

The DNA can even be left connected in the substation for extended periods, offering remote access and control.



CONNECT

Assign ports to process bus, station bus and control networks and save along with other setup configurations for sharing and future plug-andplay efficiency.



SUBSCRIBE

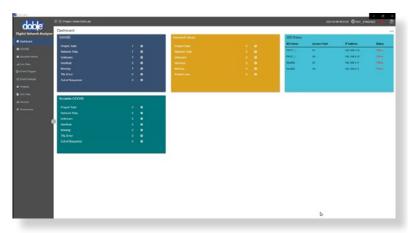
Import SCL files to find baseline IED parameters. Create up to 3 networks to filter SV and GOOSE from Process/Station buses. Synchronize with PTP grandmaster clocks to achieve sub-microsecond network time synchronization.

New Noil	Second	Second	Section Section <t< th=""><th>Isolated Networks</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	Isolated Networks									
Name Name <th< th=""><th>Falling Notes <</th><th>FALMA NAME <t< th=""><th>Filing Not Not Not Not Not With W > 0 0</th></t<><th>Nore</th><th>Park 1</th><th>Parta</th><th>Part 3</th><th>Parts</th><th>Part 3</th><th></th><th>vee</th><th>GHGP bervet</th><th></th></th></th<>	Falling Notes <	FALMA NAME NAME <t< th=""><th>Filing Not Not Not Not Not With W > 0 0</th></t<> <th>Nore</th> <th>Park 1</th> <th>Parta</th> <th>Part 3</th> <th>Parts</th> <th>Part 3</th> <th></th> <th>vee</th> <th>GHGP bervet</th> <th></th>	Filing Not Not Not Not Not With W > 0 0	Nore	Park 1	Parta	Part 3	Parts	Part 3		vee	GHGP bervet	
Number Numer Numer Numer <td>No. 10. 30. 30. 30. 30. 30. 30. 30. 30. 30. 3</td> <td>NUM - N NUM - N <t< td=""><td>NUM - N NUM - N <t< td=""><td>Centille</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<></td></t<></td>	No. 10. 30. 30. 30. 30. 30. 30. 30. 30. 30. 3	NUM - N NUM - N <t< td=""><td>NUM - N NUM - N <t< td=""><td>Centille</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<></td></t<>	NUM - N NUM - N <t< td=""><td>Centille</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Centille									
Factor Factor<	Parter 1011 Difference for Difference	Parts: 101:00 10 have foresta None	Parts: 101:00 10 have foresta None		#Antonia	12	Terman .	1		1.	2461		Dett
Number O <td>Number O<td>Number O<td>Number O<td></td><td>10, 10, 9 . 1</td><td></td><td>200.200.000.0</td><td></td><td></td><td></td><td></td><td></td><td></td></td></td></td>	Number O <td>Number O<td>Number O<td></td><td>10, 10, 9 . 1</td><td></td><td>200.200.000.0</td><td></td><td></td><td></td><td></td><td></td><td></td></td></td>	Number O <td>Number O<td></td><td>10, 10, 9 . 1</td><td></td><td>200.200.000.0</td><td></td><td></td><td></td><td></td><td></td><td></td></td>	Number O <td></td> <td>10, 10, 9 . 1</td> <td></td> <td>200.200.000.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>		10, 10, 9 . 1		200.200.000.0						
Factor Name <	Factor Name <	Factor Name <	Factor Name <		Pages: 2712	COSE S Rame Corn	a fue						
False Not Not </td <td>False Non Non<!--</td--><td>PARM Non Non<td>PARM Non Non<td>Press las</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td></td></td>	False Non Non </td <td>PARM Non Non<td>PARM Non Non<td>Press las</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td></td>	PARM Non Non <td>PARM Non Non<td>Press las</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	PARM Non Non <td>Press las</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Press las									
Parter Ir 8 0001 Battle huma he	Partic 17 B 1000 * Ball House In O O O O P <	Parme tr 8 0001 Ball humbs · <td>Parme tr 8 0001 Ball humbs ·<td></td><td>Witness .</td><td></td><td>Second 1</td><td>-</td><td>Contra 1</td><td></td><td>1001</td><td></td><td></td></td>	Parme tr 8 0001 Ball humbs · <td></td> <td>Witness .</td> <td></td> <td>Second 1</td> <td>-</td> <td>Contra 1</td> <td></td> <td>1001</td> <td></td> <td></td>		Witness .		Second 1	-	Contra 1		1001		
2010 0	2010 0	No. No. <td>No. No. No.<td></td><td></td><td></td><td>a second</td><td></td><td></td><td></td><td></td><td></td><td></td></td>	No. No. <td></td> <td></td> <td></td> <td>a second</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>				a second						
Fallow Mode <	Fallow Mode <	Faller Mod. <	Faller Mod. <		Presser IV B	COSE Rate Pros	at Bar						
PAGES MAGE MAGE <t< td=""><td>PAGES MAGE <t< td=""><td>PAGES MAGE <t< td=""><td>PAGES MAGE <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<></td></t<></td></t<></td></t<>	PAGES MAGE MAGE <t< td=""><td>PAGES MAGE <t< td=""><td>PAGES MAGE <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<></td></t<></td></t<>	PAGES MAGE MAGE <t< td=""><td>PAGES MAGE <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<></td></t<>	PAGES MAGE MAGE <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>										
16. 16. 17. 17. 17. 17. 17. 17. 17. 17. 17. 17	16. 16. 17. 17. 17. 17. 17. 17. 17. 17. 17. 17	16. 16. 1. 17. 17. 17. 17. 17. 17. 17. 17. 17.	16. 16. 1. 17. 17. 17. 17. 17. 17. 17. 17. 17.	Billion .									* 8
					******		Bertrack.		Colorest .		2401		141
Reason of B 10000 B Aug (1-)-	Reason of B 00000 B Ann fr he	Managanan dar 18 Galologi 18 Managan dar San	Farmer of B 00000 B farm of the		10.101.5.5		255.255.255.0		1.1.1.1.1.1				
					Press 21 10	ICOSE B Anne IV IL							

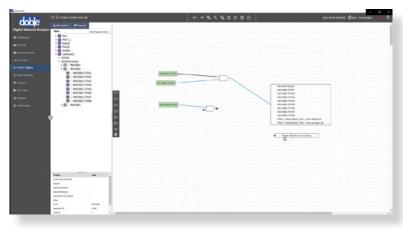
Assign ports to isolated networks to monitor multiple subnetworks simultaneously.

MONITOR

Select individual GOOSE and SV control blocks to analyze. The DNA can sample and display 16 sampled values streams simultaneously.



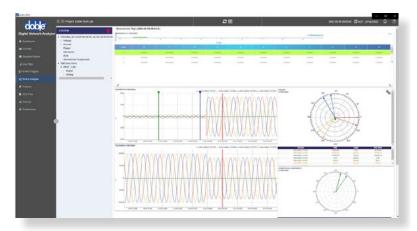
The Dashboard combines a high-level aggregate view with quick navigation to present key information about the networks being monitored.



Set DNA triggers to record data prior to and following events. The captured data is scanned to produce an Event Analysis Report.

CAPTURE

Create custom event trigger configurations that combine any number of Boolean logic gates with comparators that measure SV quantities and data attribute values in GOOSE packets. Capture all network information for a set duration.



Configure the Live Data screen with oscillography, metering, and/or tabular UI elements to display live GOOSE and SV being polled from the network.

alalar				200-01 DIAL DIAL DIAL DIAL DIAL DIAL DIAL DIAL
	Audt Events			
	2.000070.000 here. 5			
	Exectine -	I Max	The Bacque Constant of the State of the State of The	Security
	20240000 M-636	Ministra	Sacharo Hwani, Kangari AP. Peru and guardine microardi. Claring Biol. 102 (2013), 2012;2012;2012; - and-Paris J. M. (2016) (Editorial-line: Claring-Linear (2014), 2013;103: 2013);2013;2013 (adurbar), Sara K. P. Perl-and T. Rado (2016), 2013;2013;2013 (adurbar), Sara K. (2016), 2013;2013;2012;2013;2013;2014);2014 (3durbar), 2014;2014;2013;2013;2013;2013;2013;2014);2014 (3durbar), 2014;2014;2014;2014;2014;2014;2014;2014;	ng.
	2022-00-08 16:45:36	Byones .	DNA application contesties is removed when 158, 506-510	Medium
	2022-00-04 44,28-45	Unan	DNA application interest delates support	Medium
	2022-05-04 44 (0.43)	1.hum	Only apply and initial drive how data to the party	Medium
	2022-02-08 16:21.92	Unin	DNA application defend device - 102 108.1.2.12	Medure
		Namon	Instation reference all analysis of environment and purposes in the contractic Contract Biological Devices (Contraction), State 1, 155, 155, 155, 155, 155, 155, 155,	~
	3022-00-08 14 19:09	Restarts	DNA application converted to tensile-disclor (FIZ 107.5.10	Mellan
	2022/00/08 94/94/90	User	Dish application analysis auto percent device - 192, 1983, 10	Lee
	202010-08 10:07:07	P1P	PIPatrix cargeto NULSING	ngt
	2012-02-08 10.07.09	User	DNP-application disatilities are connect service - 100, 7580,7 210	Lee
	3033-00-09 43-02-07	172	PTP-sine margarin IV%C_SOCCERE	styp.
	222103-88 (0.02-69	User	D&Auguitation enabled auto connect device - 90, 988,7,212	Lee
	2022-00-08 13:01.41	Unan	DNA application doubled auto-somett sevice - 192 558.3:10	Line
	2022-00-08 (0.00.47	112	PTP status sharped in NOT_STIND KD	rsp.
	2022-00-09 43.60-14	PTP	PTP-violan dramped to DRIABLED	Algh
	20206 04 0-4648	Network	Installan mekola dragod schollbas zerligsscher Hollandbillen Bass (2016): 2016 (2016): 2016 (2016): 2016 UBH-schollbas (2016): 2016 (2016): 2016): 2016 Schollbas (2016): 2016 (2016): 2016): 2016 (2016): 2016): 2016): 2016 (2016): 2016): 2016): 2016 (2016): 20	i Haji
	2022-00-08 (00.45	Reserved.	DisAugulturius committee to remain alwine 198, 995,518	Median
	3020-05-08 45-07-07	112	PTP status margart to MCP, 97M/2400	Hup .
	3022-03-08 13-07.98	PP	PTPstatus manaed to DtIAML00	Hum
	2020-00-08 10-07-08	Uner	DM-appliation initiated durifocard refresh	Mediati
	Appropriate third-page	(her)	DNA application initiated destinant referral	Mailure

DNA system logs provide timestamped evidence of configuration changes, system events, and general information such as PTP synchronization times.

ANALYZE

Observe network traffic and apply deep mathematical analysis of analog quantities and network performance. Quickly navigate to lists that isolate the information. See instances of corrupted GOOSE and SV streams.

MANAGE

Save work in sharable .dna project files. Export events in PCAP and/ or COMTRADE for sharing with other network/power-analysis tools. DNAs maintain security with encrypted PC communications, deny-by-default on all ports, and checksum validations on updates.

FUNCTIONAL SPECIFICATIONS

10	INCTIONAL SPE	CITICATIONS
IEC 61850	(all editions and an noted)	nendments, unless otherwise
	IEC 61850-6 IEC 61850-8-1 IEC 61850-9-2 IEC 61869-9	(SCL files) (GOOSE over Ethernet) (SV over Ethernet) (Digital interface for instrument transformers)
	IEC 61850-90-5	(Routable GOOSE)
Industry Guidelines		ideline for Digital Interface to ormers Using IEC 61850-9-2
Time Synchronization	Simple Network Tir	on Time Protocol), with support 9-3:2016 111
Dashboard	stream identificat SV lost packet(s) in GOOSE packets Ou	Jnknown GOOSE/R-GOOSE/SV tion
Live Data	16 SV streams 128 GOOSE messag	ges
Event Triggers	functionality, with t record up to — 3 SV streams, trig Symmetrica RMS/peak-t Phase Frequency ROCOF 10 GOOSE messa	l Components
Event Analysis	event information 1 PCAP file genera R-GOOSE stream COMTRADE file gen C37.111-2013 Packet Variation De SV stream	ted per each SV, GOOSE, and nerated according to IEEE elay (or "Jitter") Analysis of each lysis (requires SV streams with at
Data Visualization	SV Analog Scope SV Phasor Diagram Symmetrical Comp GOOSE Digital Scop GOOSE Tabular Gra	oonents De

GENERAL SPECIFICATIONS

Memory	240 GB Non-volatile memory (SSD)
Cyber Security	Access supervision and logging TLS Encrypted Control Bus Full Network Isolation
OLED Display	IP Address of Control Bus Firmware Version
Software	Windows PC application
Firmware	Package upgrade via PC application
Dimensions	Length: 8 in (20.32 cm) Width: 5.5 in (13.97 cm) Height: 3 in (7.62 cm) Weight: 3 lb (1.36 kg)
Power	12 V DC (back of device) 2 A
Power Connector	DC Barrel Jack, center pin positive Ø 2.5 × 5.5 × 9 mm Ø 0.098 × 0.217 × 0.35 in
Certifications	ROHS FCC Class A CE IEC 60529 IP2X CFR 47 FCC Part 15 Subpart B Class A (EMI Emissions) EN 61326-1:2013 (EMI Emissions) IEC 61010-1:2010 (EMI Emissions)
Operating Temperature	32° to 131° F (0° to 55° C)
Storage Temperature	-4° to 176° F (-20° to 80° C)
Includes	 1 x F6880 Digital Network Analyzer 1 x Power supply 1 x Power cable 1 x Cat6 cable 1 x USB flash drive [2 Gb] 1 x USB-A to USB-B cable 2 x SFP transceivers (1000BASE-T) 1 x Hard shell case with form cut foam interior padding 1 x F6880 User Manual (software based) 10 x Software user seats
The performance of	

The performance of the recording system is largely dependent on the simultaneous use and the combination of: the number and types of monitored signals; the number of signals used for online visualizations; the number and types of visualizations; and the number and types of recording triggers used. The numbers stated here are typical and should provide satisfactory performance. If these numbers are exceeded, possible degraded performance can be expected.



Specifications are subject to change without notice. Doble is an ISO 9001 & ISO/IEC 17025 & 17034 Certified Company. Doble is an ESCO Technologies Company. PUBLISHED: MAY, 2024



Doble Engineering

Worldwide Headquarters 123 Felton Street, Marlborough, MA 01752 USA tel +1 617 926 4900 | fax +1 617 926 0528 www.doble.com