



SCHWEITZER
ENGINEERING
LABORATORIES

You Can't Manage What You Don't Monitor

SEL Integrated Systems and Information Management



Making Electric Power Safer, More Reliable, and More Economical®

Integrated Systems Efficiently, Securely Replace Dedicated SCADA, Metering and Equipment Monitoring Devices

- Calculations and Operator Interfaces Are Tailored to Meet the Needs of Operators, Protection Engineers, Asset Managers, Technicians etc.



SEL Information Management Saves Lives, Saves Money, and Saves Equipment

- Saving Lives and Equipment via Fewer Failures
 - ◆ Maintenance when needed as predicted by IEDs, fewer blackouts/failures, less expensive repairs
- Proactive Asset Management Improves Apparatus Health and Reduces Maintenance Costs
 - ◆ Better productivity, better maintenance scheduling, less maintenance effort
 - ◆ Savings Due to SEL Integrated System data quickly pays for the system



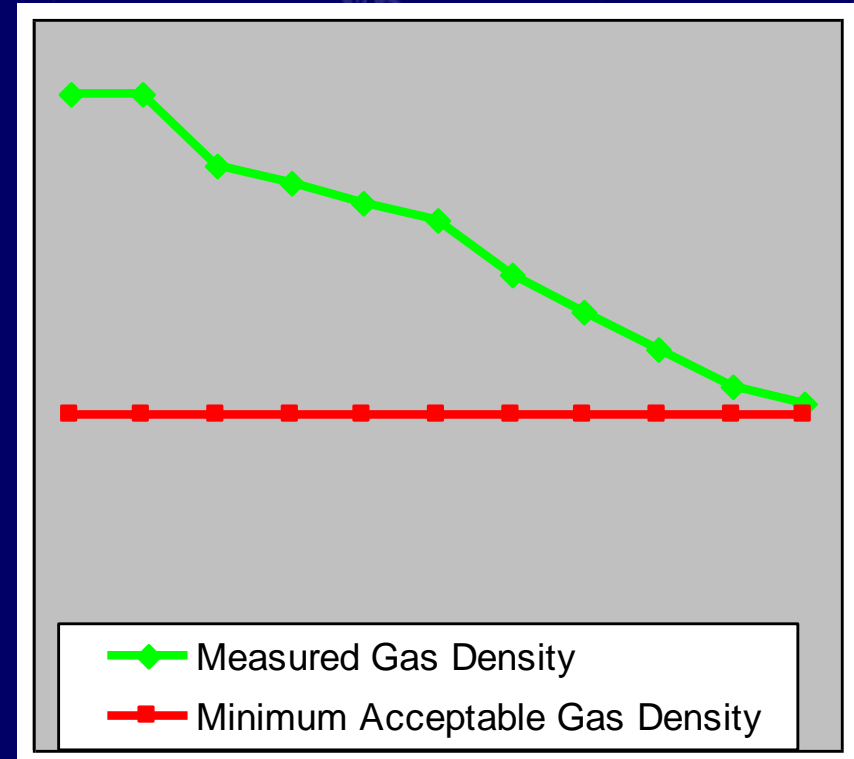
Integration of Dynamic I&C System Data Supports Automation and Information Management

- Addition of Time
Allows Trending and
Integrating

Gas Pressure: 85 psi

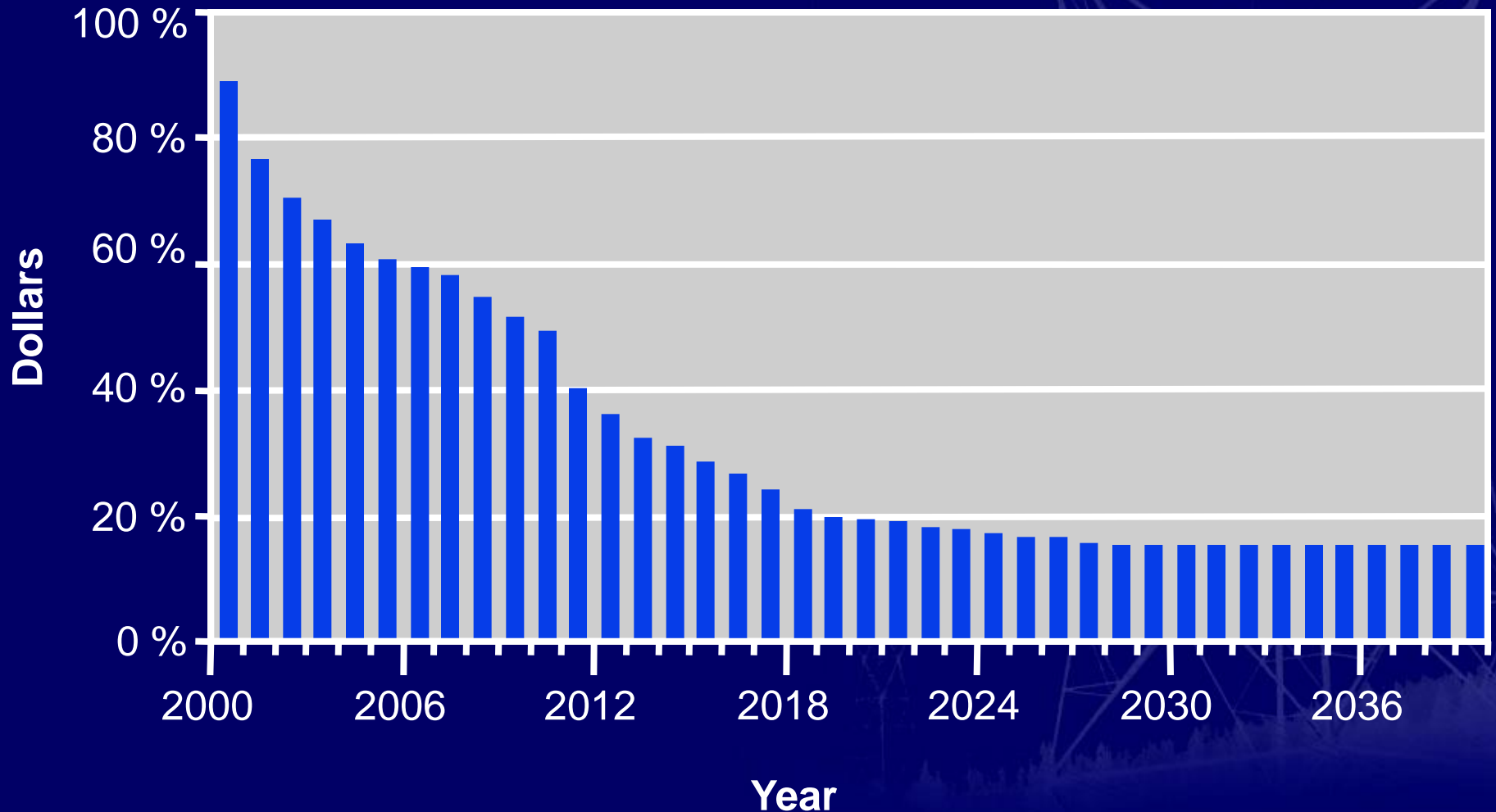
Gas Temperature: 20°C

Instantaneous
Measurements



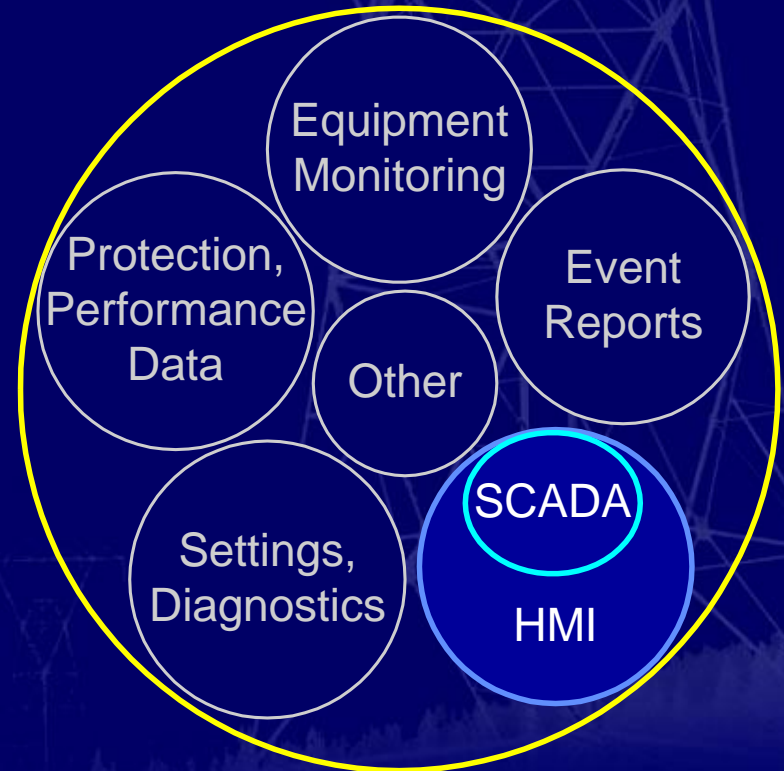
Trend

Duke Power Actual and Projected Reduction in O&M Costs Due to Intelligent Management

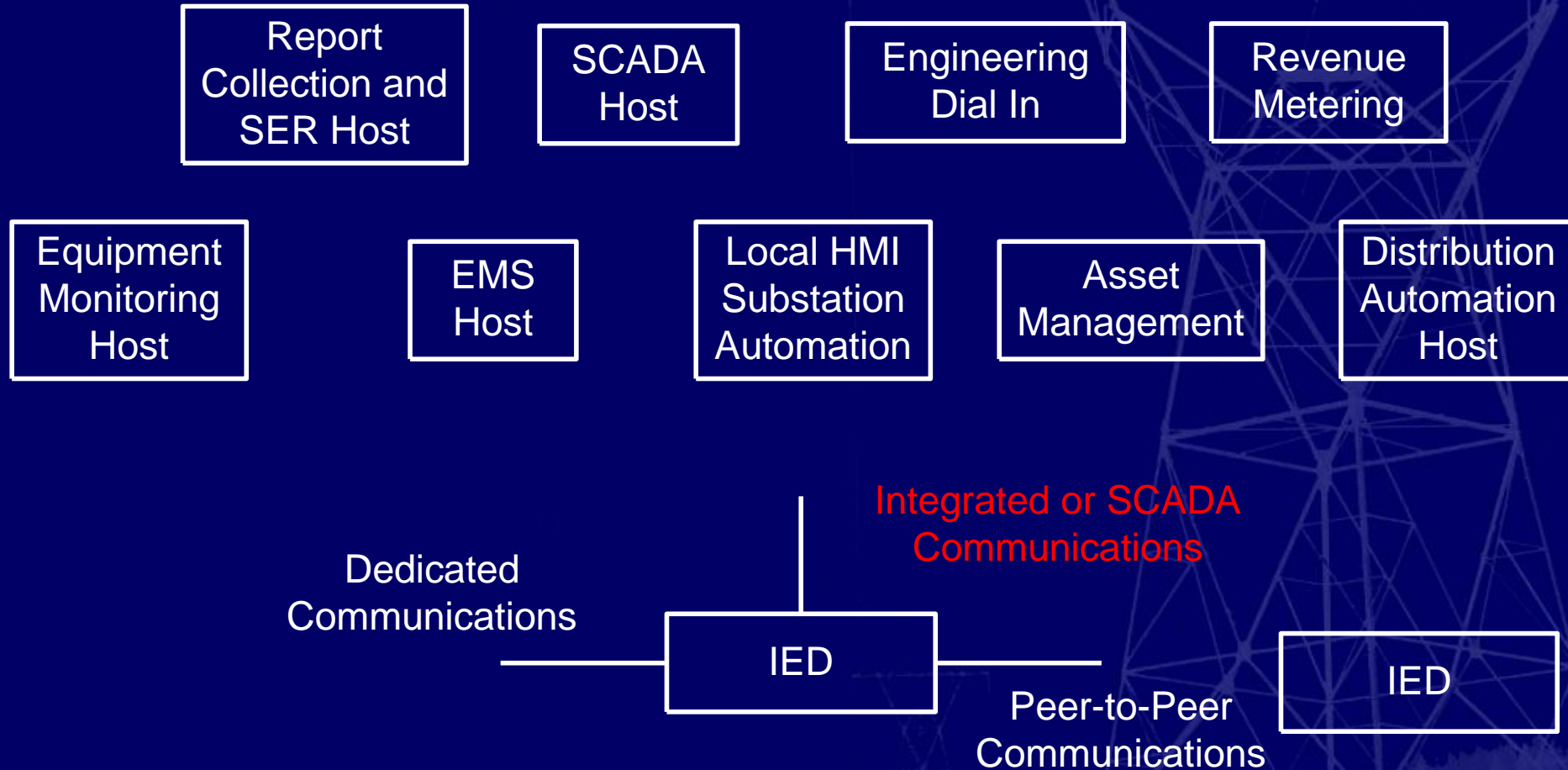


SCADA Practices Strand Asset Management Data

- SCADA Protocols Serve SCADA Data Needs Only and Only Serve One Client
 - ◆ SCADA protocols used at the IED level collect a small subset of available data
 - ◆ No reports, settings, historical references, diagnostics, equipment monitoring, performance measures

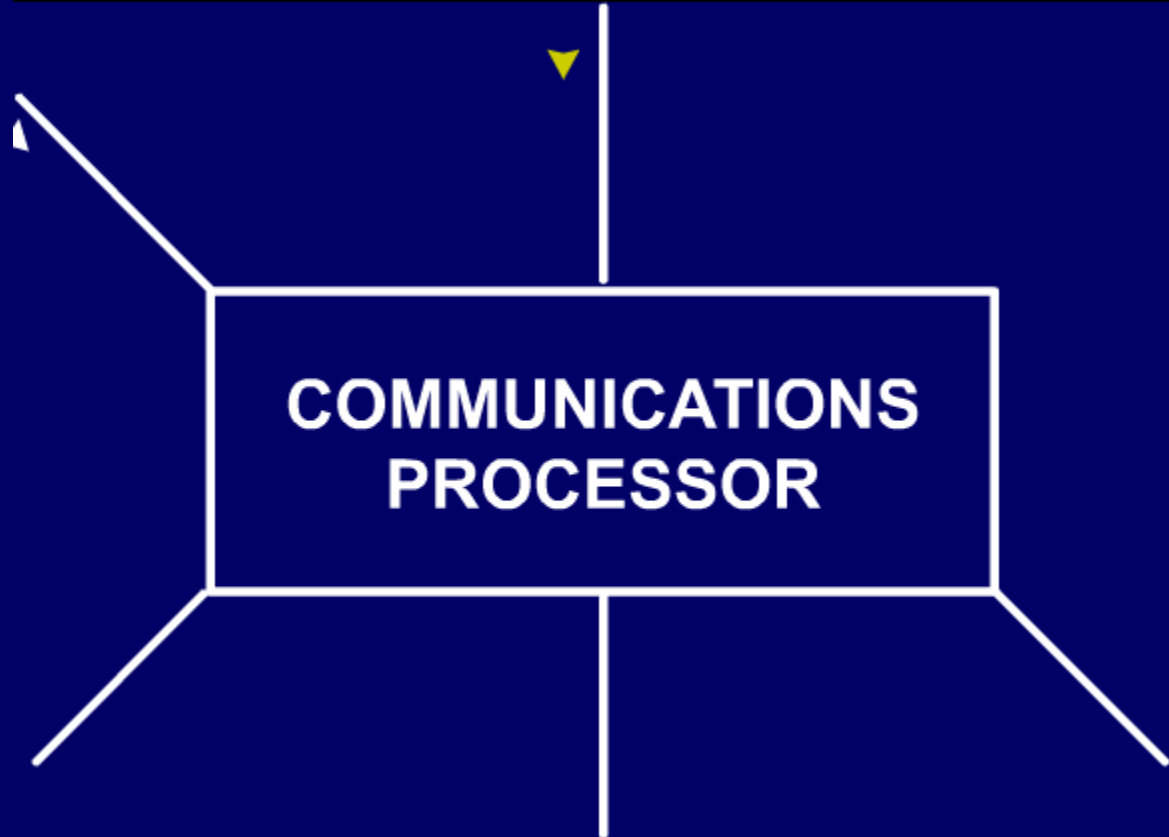


It All Starts With the IED Connections



Where RTU and SCADA Methodology Cannot do the Job, SEL Can

- SEL-2032 Designed to Serve Many Clients Separately – SCADA, PI, EMS, Engineering
 - ◆ All data types are collected, stored and sent to many connections



Where SCADA Practices Strand Asset Management Data, SEL Rescues the Data



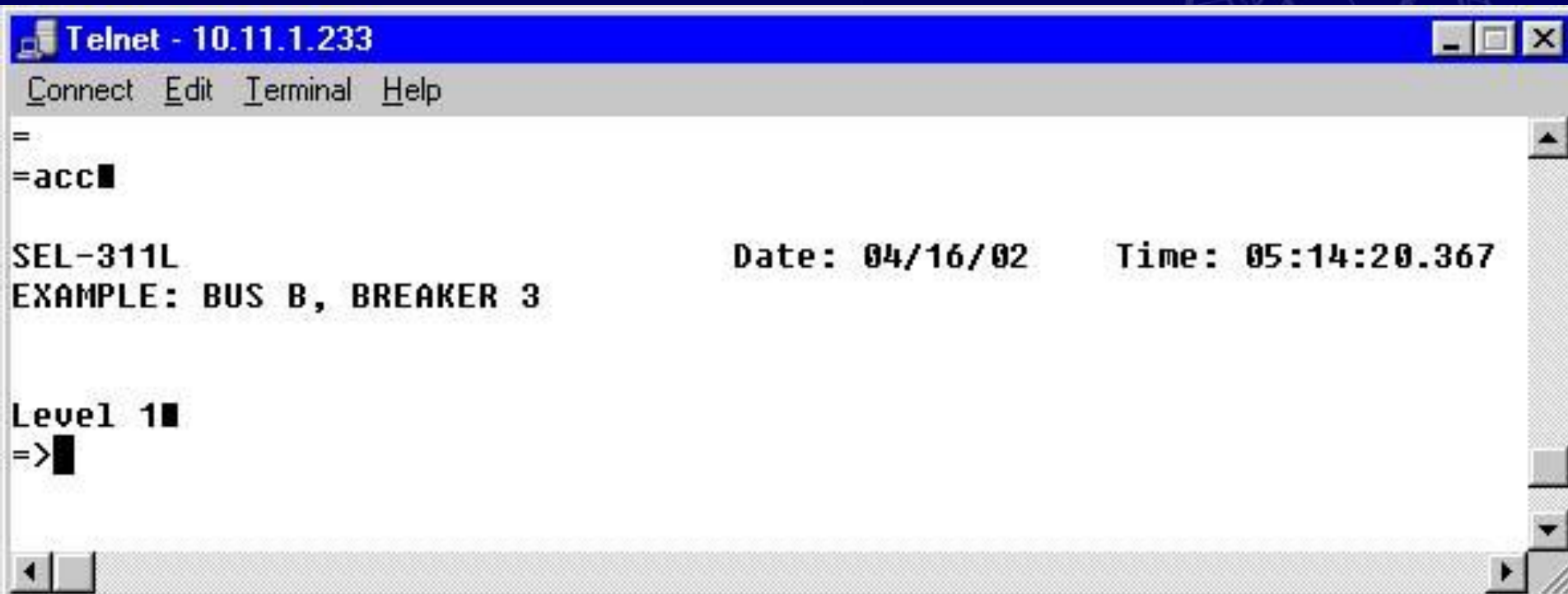
- Talk to Virtually any IED via Native Protocol
 - ◆ Created by vendors to access all IED data for test, commissioning, engineering access etc.
- Integrate Devices Designed for Manual Data Retrieval via Laptop and Software
 - ◆ Equipment monitors, weather station etc.

Engineers and Technicians Need to Directly Retrieve and Receive IED Data



What Does SEL Offer?

- Direct Access to Equipment Diagnostic Data in SEL and Other IEDs
 - ◆ Breaker, transformer, generator, motor etc.
 - ◆ Serial or Ethernet



The screenshot shows a Telnet session with the title bar 'Telnet - 10.11.1.233'. The menu bar includes 'Connect', 'Edit', 'Terminal', and 'Help'. The terminal content displays the command '=acc' followed by a cursor. Below this, the text 'SEL-311L' and 'EXAMPLE: BUS B, BREAKER 3' are shown. On the right side, the date 'Date: 04/16/02' and time 'Time: 05:14:20.367' are displayed. At the bottom left, 'Level 1' and '=>' are visible. The terminal window has standard scrollbars and window controls.

```
Telnet - 10.11.1.233
Connect Edit Terminal Help
=
=acc█

SEL-311L                                Date: 04/16/02    Time: 05:14:20.367
EXAMPLE: BUS B, BREAKER 3

Level 1█
=>█
```



Ethernet Transceiver Makes Create Web Pages at Each Device

SEL-2890 Ethernet Transceiver - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Size Print

Address <http://10.11.1.233/>



- Access
 - Login
 - Logout
- Metering
- Events
- Status
- Reports
- Settings
- SEL
- Visit

SEL-311L Date: 04/16/02 Time: 05:03:38.992

EXAMPLE: BUS B, BREAKER 3

	Max	Date	Time	Min	Date	Time
IA (A)	997.0	05/07/01	06:14:35.442	96.0	05/09/01	13:30:43.263
IB (A)	998.0	05/07/01	06:14:35.442	99.0	09/07/01	23:03:20.889
IC (A)	4994.0	12/24/01	21:35:27.174	100.0	09/07/01	23:03:21.060
IP (A)	RESET			RESET		
IG (A)	4580.0	12/24/01	21:35:27.174	132.0	05/07/01	06:42:46.395
VA (kV)	RESET			RESET		
VB (kV)	RESET			RESET		
VC (kV)	RESET			RESET		
VS (kV)	RESET			RESET		
MW3P	RESET			RESET		
MVAR3P	RESET			RESET		
LAST RESET 05/03/01 08:35:48.735						

Done Local intranet

Also... Unsolicited email of Reports Go Direct to Experts

Breaker 865, SEL-421

New Memo Delete Move To Folder... Forward Reply Reply With History

Subject: Breaker 865, SEL-421

Relay 1 Date: 10/29/2001 Time: 15:42:22.850
 Station A Serial Number: 2001242085

Event: AG T Location: 50.42 Time Source: OTHER
 Event Number: 10344 Shot 1P: 0 Shot 3P: 0 Freq: 60.00 Group: 1
 Targets: INST_ZONE_1 A-PHASE GROUND
 Breaker 1: OPEN Trip Time: 15:42:22.850
 Breaker 2: OPEN Trip Time: 15:42:22.850

PreFault:	IA	IB	IC	IG	3I2	VA	VB	VC	V1mem
MAG(A/kV)	248	251	248	3	2	134.001	134.049	134.140	134.062
ANG(DEG)	-0.3	-120.0	119.7	-95.9	142.9	0.0	-120.0	120.0	0.0

Fault:

	1669	251	247	1644	1637	111.984	138.054	138.141	132.054
MAG(A/kV)	1669	251	247	1644	1637	111.984	138.054	138.141	132.054
ANG(DEG)	-79.4	-120.0	119.7	-87.9	-88.0	0.0	-120.0	120.0	-0.1

	L	C	R		L	C	R
	B	B	B	R	B	B	B
	O	A	A	O	O	A	A
	K	D	D	K	K	D	D
	A	A	A	A	B	B	B
	0	1	1	0	0	0	0
	0	1	1	0	0	0	0

MB:8->1 RMBA TMBA RMBB TMBB

	00000000	00000000	00000000	00000000
TRIG	00000000	00000000	00000000	00000000
TRIP	00000000	00000000	00000000	00000000


=>

FTP Access to Serial Devices From Any Vendor



ftp://rack2.selinc.com/DD15_TYPE__WEATHER__ENTER__to/USER.TXT - Microsoft Internet Explorer















File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit

Address  ftp://rack2.selinc.com/DD15_TYPE__WEATHER__ENTER__to/USER.TXT

Favorites X

 Add...  Organize...

-  Channels
-  Links
-  Media
-  MSN
-  Radio Station Guide
-  Web Events
-  MSN.com
-  DMSI Design Mainten...
-  National Grid Group
-  Alaska Airlines - Milea...
-  - IEC - CEI - Internati...
-  Airline tickets, hotels, ...
-  Yahoo! Search Options
-  Telemetric Wireless R...

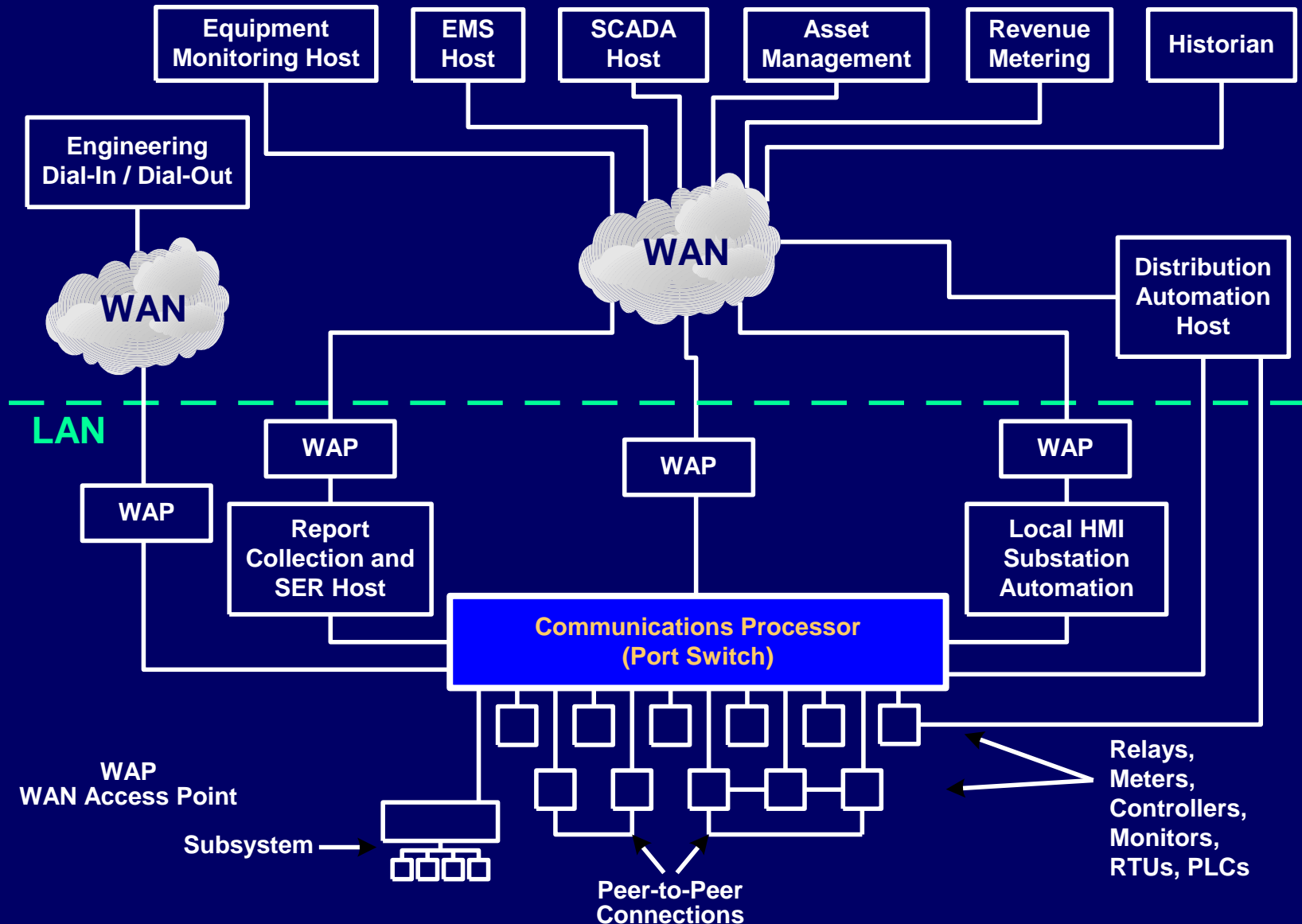
Port 15, Data Region USER Data

TEMP_IN = 72.50 TEMP_OUT = 70.40 WIND_SP = 6 WIND_DIR = 338
BAR_RD = 27.46 HUM_IN = 33 HUM_OUT = 46 RAIN_RD = 0.91
SCRATCH1 = 91 SCRATCH2 = 91

Example of Weather Station on
Roof of 2390

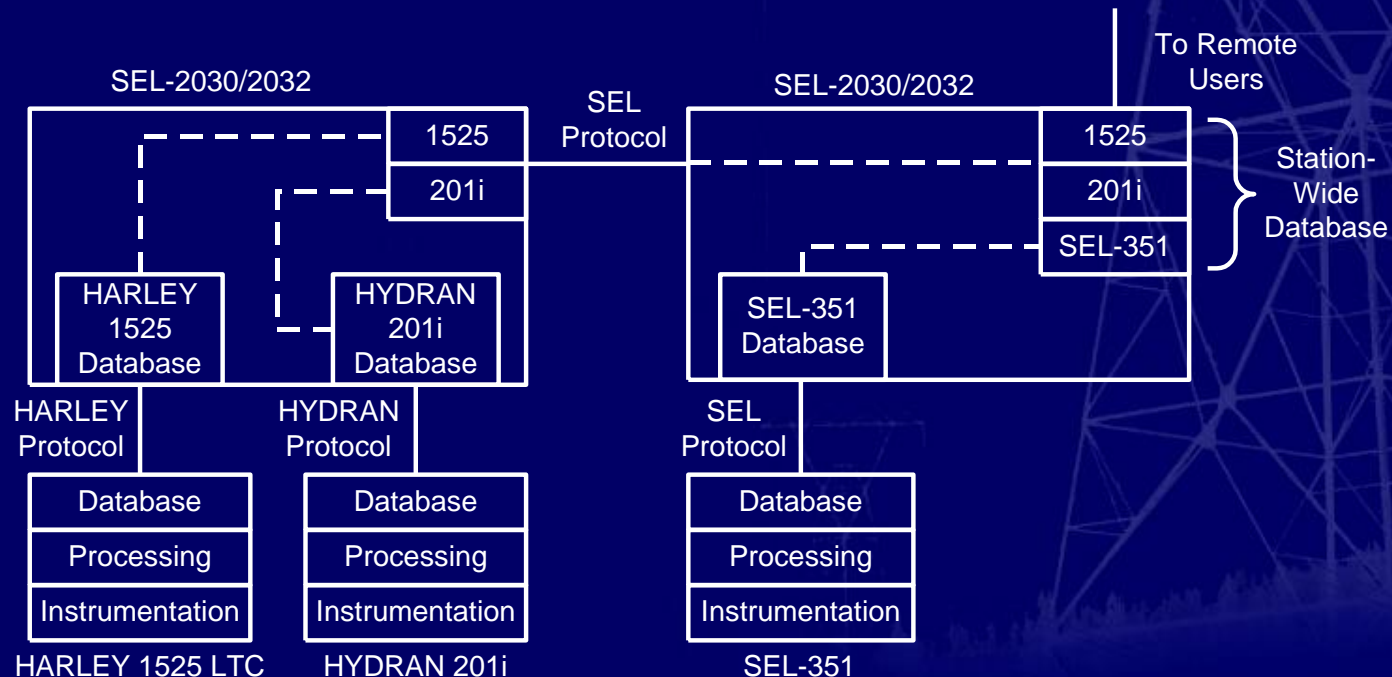
Innovative Communication Paths and Protocols

Integrate Data With Applications



Integrated Systems Efficiently Collect and Calculate Information

- IEDs and Communications Processors Perform Data Acquisition and Processing
- Communications Processors Share Data With Local and Remote Data Users



Integration of Equipment Diagnostic Data in SEL IEDs

Breaker, Transformer, Generator, Motor, etc

% Wear X:	7	100% Wear X	NO
% Wear Y:	7	100% Wear Y	NO
% Wear Z:	7	100% Wear Z	NO

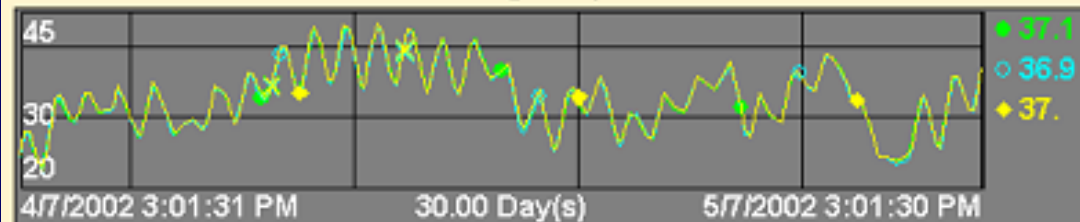
4 MWH OUT BP

558 MWH IN

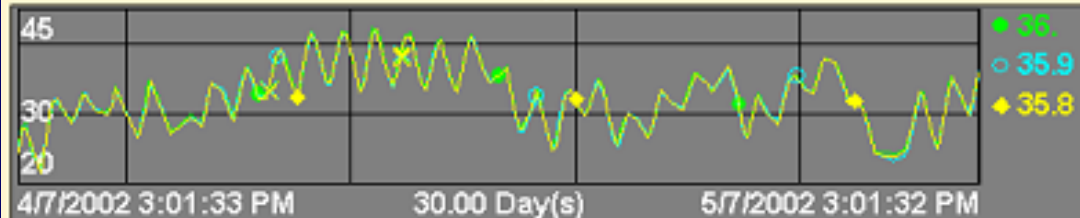
32767 MVARH OUT

653 MVARH IN

Winding Temperature



Oil Temperature



Integration of Other Equipment Monitors

Dissolved gas analyzers, load tap changers, breaker monitors



Integration of Other Important Devices

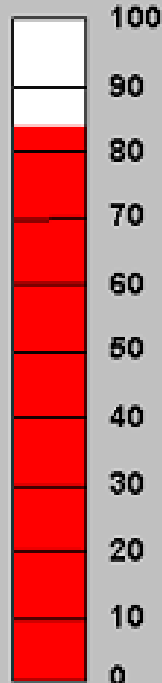
Clocks, weather stations, battery systems

ALBEMARLE WEATHER

Interior Temp

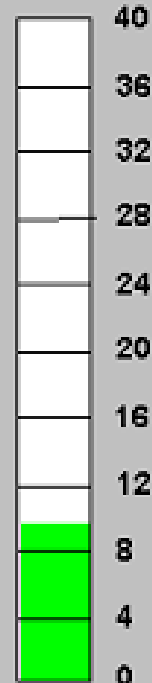


Exterior Temp



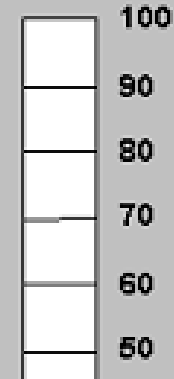
84.50 F

Rain



9.80 IN

Interior Humidity



35.00 %



Substation Automation

Control, alarm, notification, swap-over
etc.

Albemarle Active Alarm Display

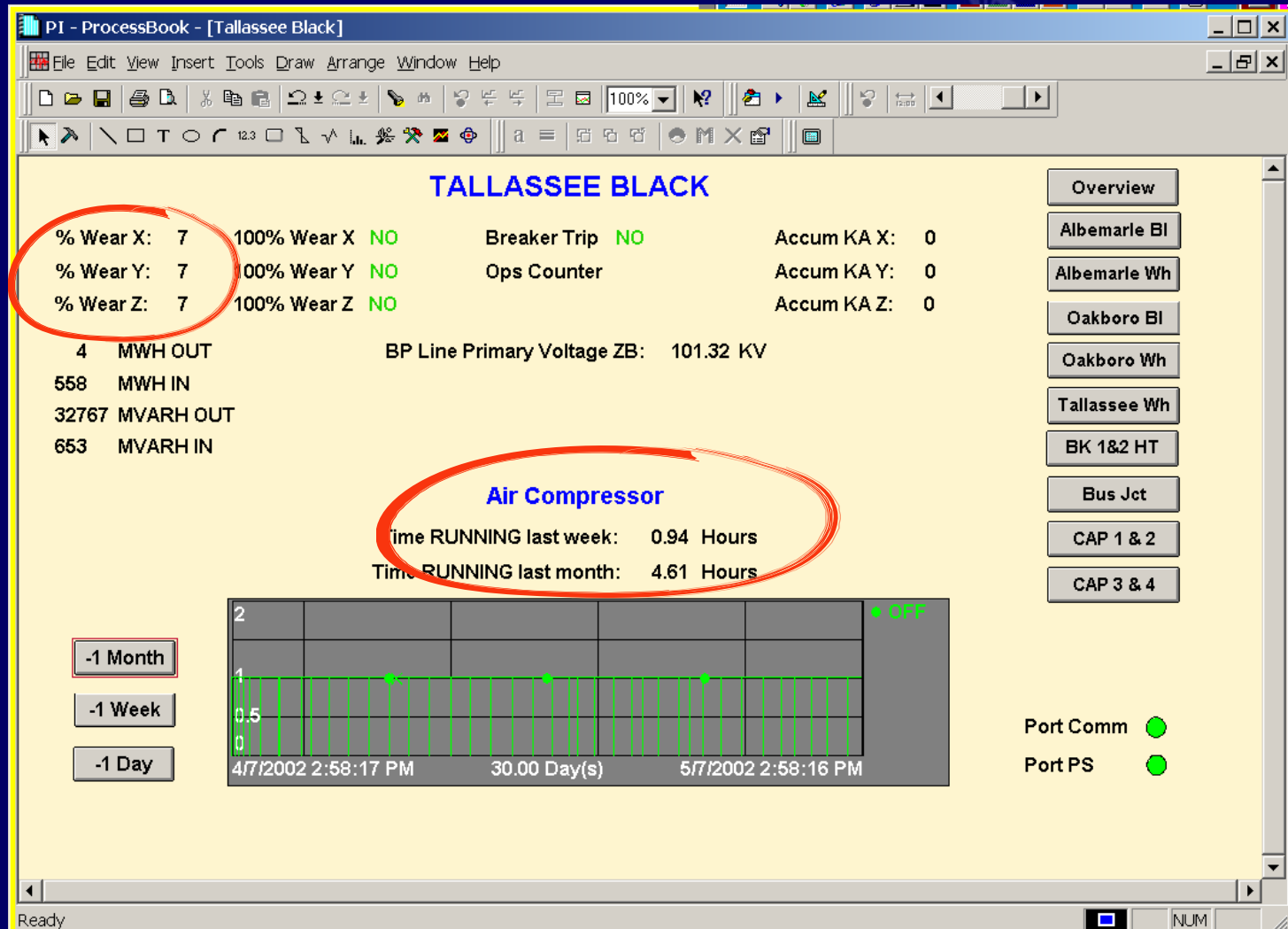
Id	State	Cmt	Name
40	ACK	Oakboro_Black Air Compressor Run Status	SEL2030_2_2_20TAR_IN201
40	ACK	Oakboro_Black Low Air Alarm	SEL2030_2_2_20TAR_SV7T

Alarm Elements For Alarm Group: Oakboro_Black - Items: 56

This window will close automatically after fifteen minutes.

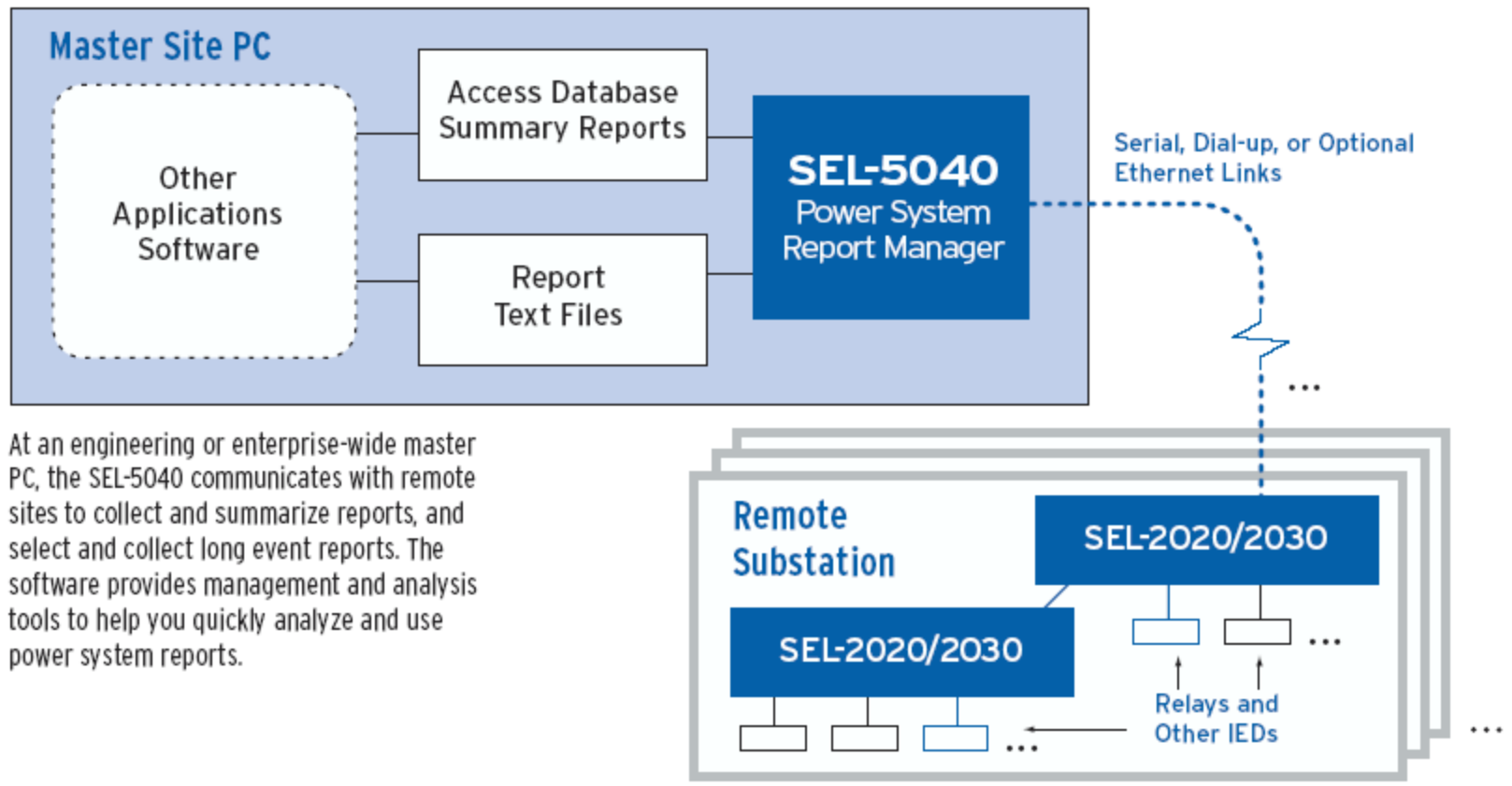
Device	Equipment	Element	Description
SEL351-6	Oakboro_Black	IN101	Breaker Open
SEL351-6	Oakboro_Black	IN103	Local Close Block
SEL351-6	Oakboro_Black	IN201	Air Compressor Run Status
SEL321-1	Oakboro_Black	IN4	Carrier Blocking Signal
SEL321-1	Oakboro_Black	IN5	85VCO Carrier Pilot Scheme Blocked
SEL321-1	Oakboro_Black	IN6	RFL Power Supply Failure
SEL321-1	Oakboro_Black	IN7	RFL Transmit Failure
SEL351-6	Oakboro_Black	INST	LED - 50KYZG OR 67KYZG Trip
SEL321-1	Oakboro_Black	INST	LED - 21L1G1 or 50KYZG Trip
SEL351-6	Oakboro_Black	LOP	Loss of Potential
SEL351-6	Oakboro_Black	LT1	79VCO Reclosing Blocked
SEL351-6	Oakboro_Black	LT2	79VCO Reclosing Blocked

HMI Operator Displays Made Better With Apparatus Health Information

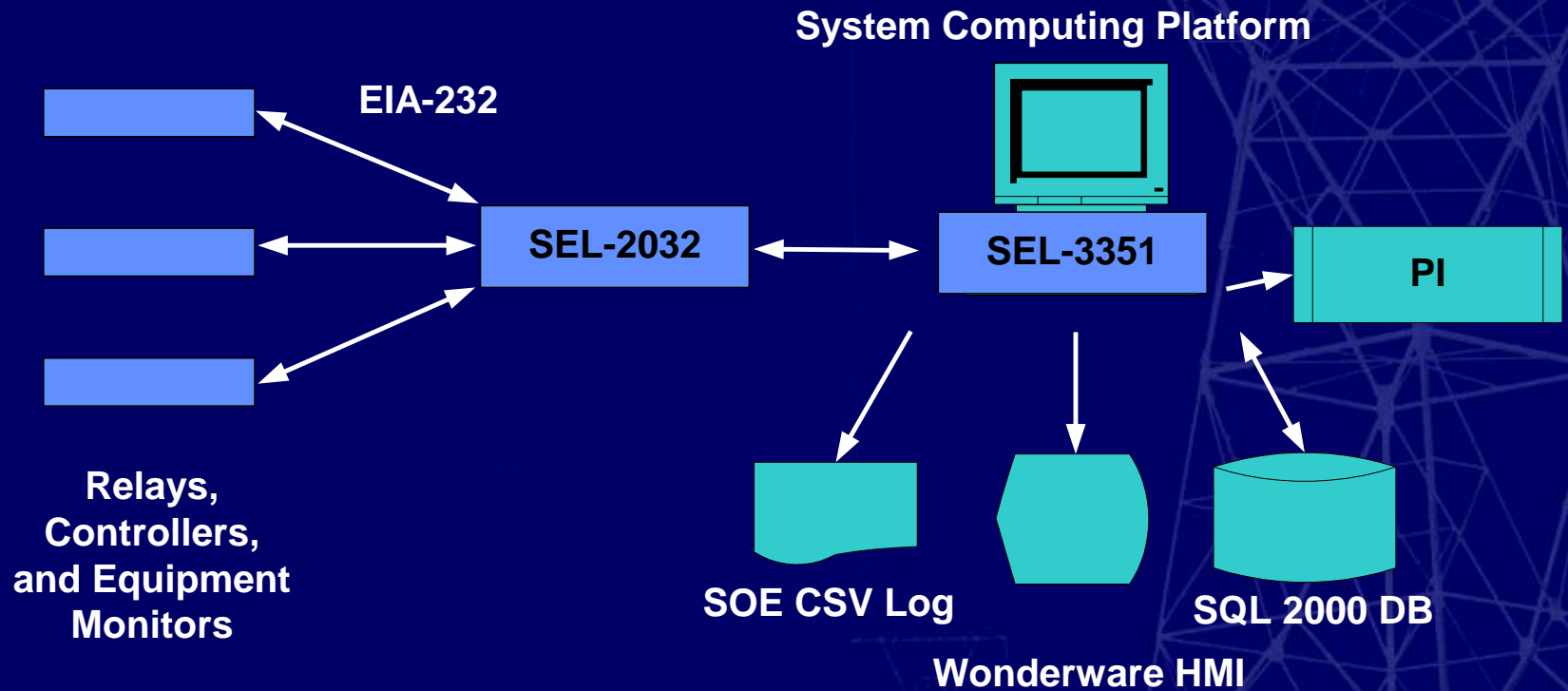


Automatic Event Collection Software and Web Viewer

Master Enterprise SEL-5040 Application Summary



Substation Wide Database to Store and Forward Data for all Purposes Including Asset Management



SEL-3300 Series Computing Platform and SEL-3021 Serial Encryption Transceiver










Connections to Common Database Interfaces

DDE and OPC












Station Wide Sequence of Events, SER

Viewer relates time stamped data to user-friendly states and descriptions

	10/22/2002 17:51:41.156	fgh	Compressc
	10/22/2002 17:51:41.156	fgh	Low Opera
	10/22/2002 17:53:13.041	fgh	Compressc
	10/22/2002 17:53:13.041	fgh	Low Opera
	10/22/2002 17:53:32.413	fgh	Overcurre
	10/22/2002 17:53:32.413	fgh	Breaker St
	10/22/2002 17:53:32.417	fgh	Overcurre
	10/22/2002 18:02:36.746	fgh	Compressc
	10/22/2002 18:02:36.746	fgh	Low Opera

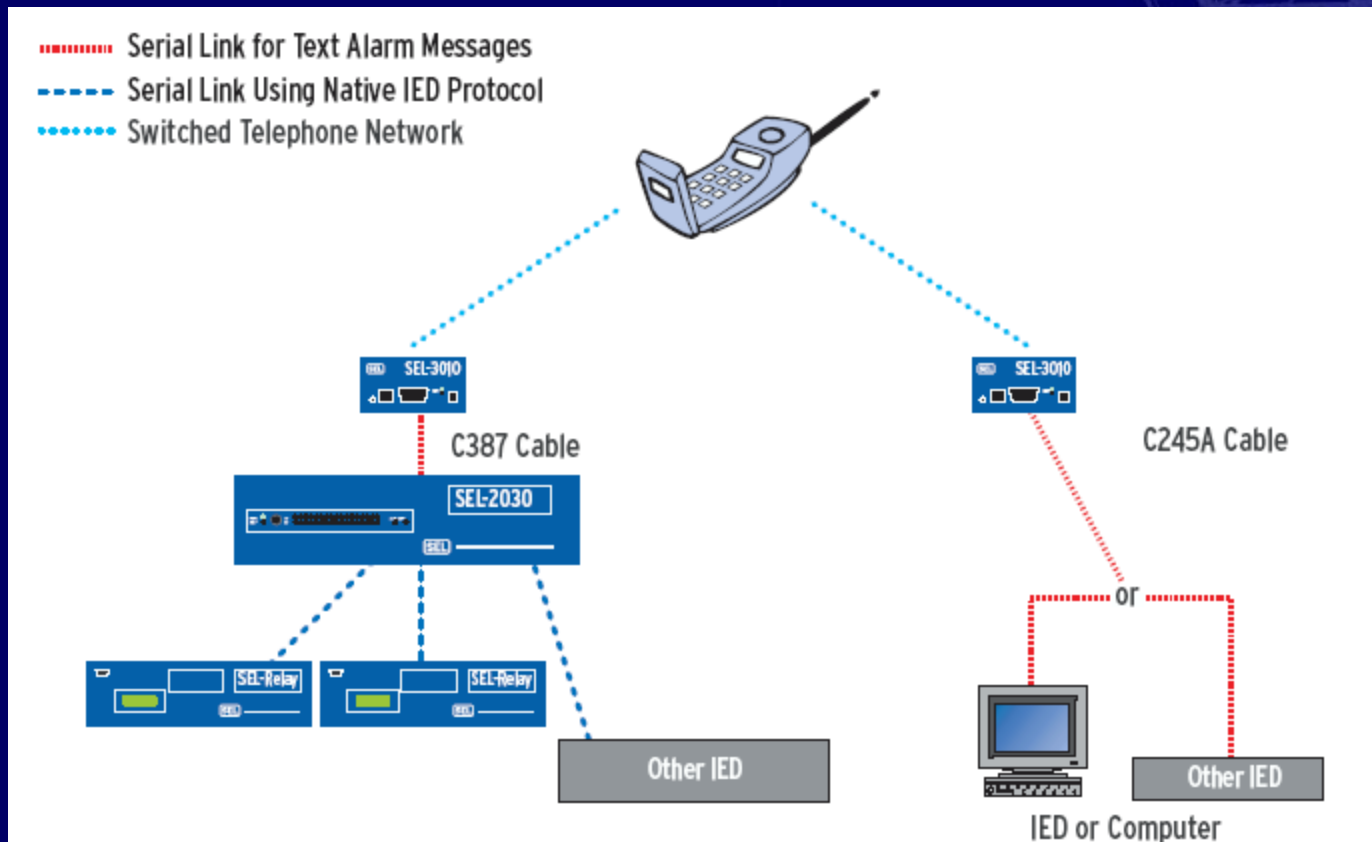
Absolute Time

	-01:51.257	fgh	Compressc
	-01:51.257	fgh	Low Opera
	-19.372	fgh	Compressc
	-19.372	fgh	Low Opera
	00.000	fgh	Overcurre
	10/22/2002 17:53:32.413	fgh	Breaker St
	00.004	fgh	Overcurre
	09:04.333	fgh	Compressc
	09:04.333	fgh	Low Opera

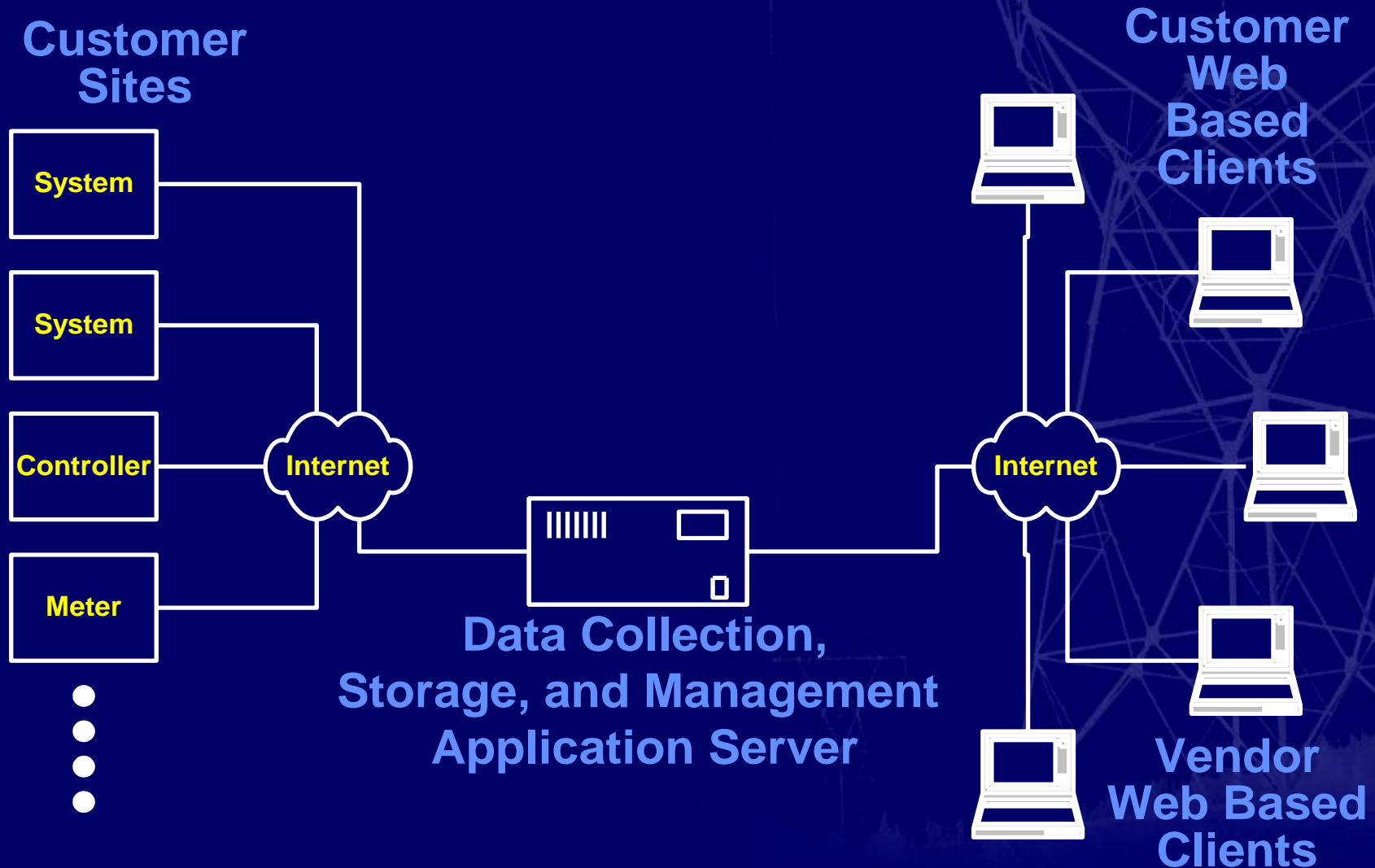
Relative Time

Annunciation and Alarming Immediate and Direct to Those who can fix the Problems

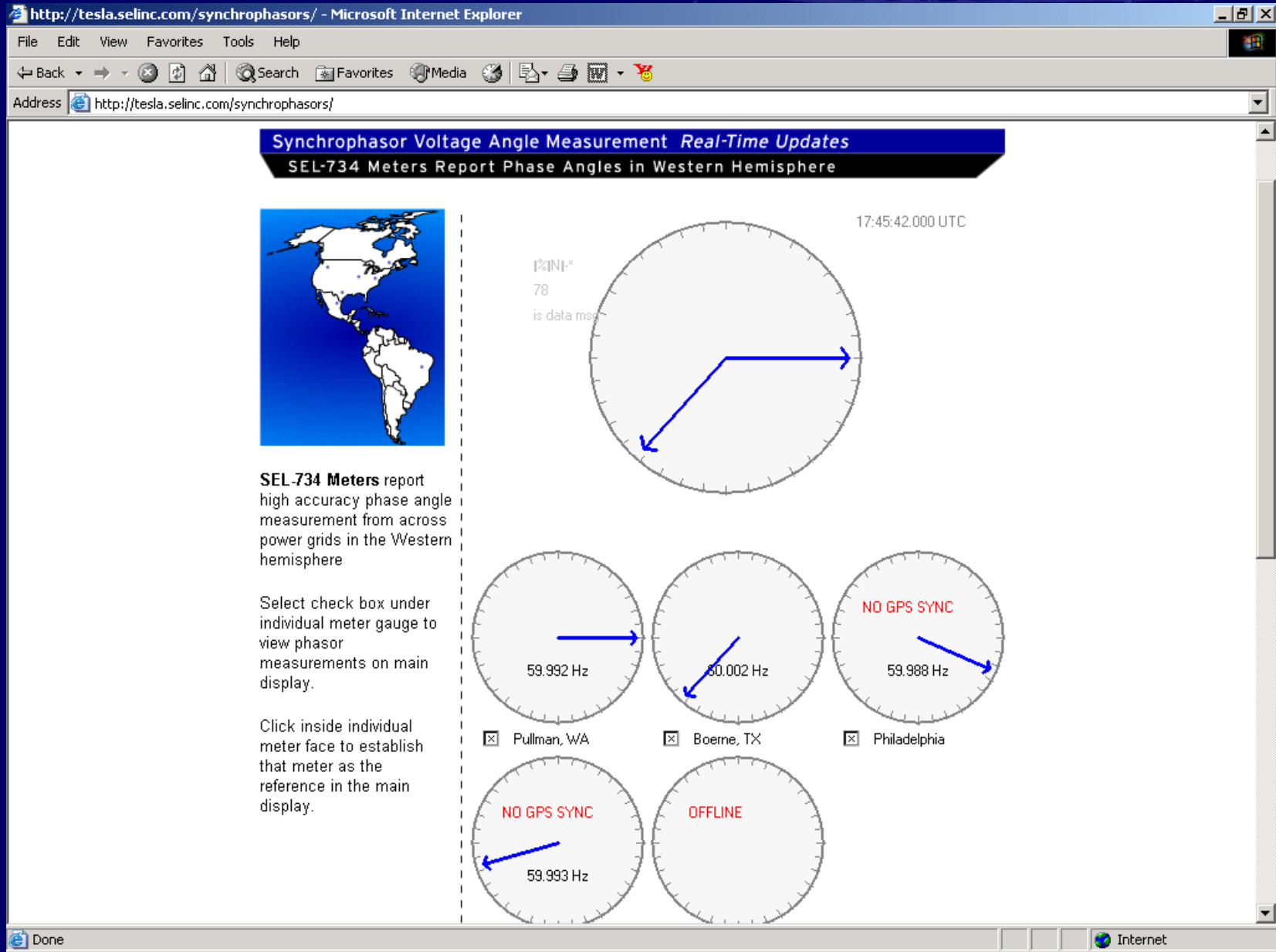
Event Messenger Voice Messages



Remote Monitoring and Data Storage



Data Available Via Web Browser



Engineering Design, Installation, and Support

Remote Monitoring, SEL-7000, Control
House, Tailored Design



What's Different With SEL Integrated Power System Data?

- Monitor Asset ROI
- Monitor and Understand Apparatus Health
- Perform Fact Based Risk Assessment
- Schedule Periodic Equipment Exercise to Avoid, Predictive Maintenance
- Provide Migration Path to Future Technologies

What's the Benefit of Using an SEL Integrated System?

- Increased Device and System Productivity
- Reduced Expenses, Lower Total Ownership Cost
- Justified, Defendable Business Planning Based on Actual Power System Data
- Increased Health, Availability, Reliability, Revenue, Performance
- Documented Resolutions to NERC/FERC Recommendations