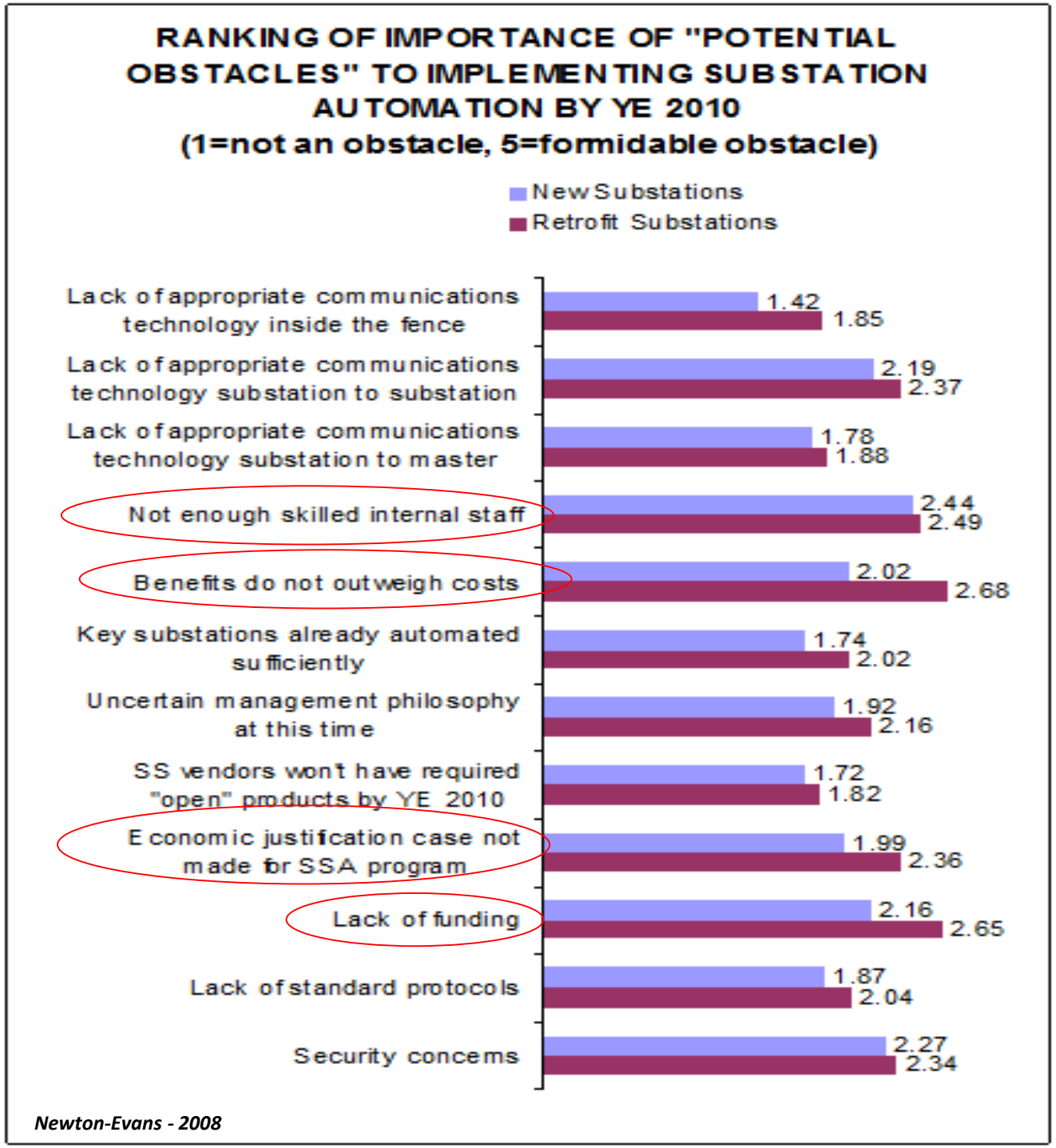
Small Web-Based SCADA

for the Utility Networks Cybersecurity Symposium
Fort Morgan, CO

by: Ray Wright, NovaTech Utility Products Manager

Topics to be Covered

- WEBserver SCADA Concept
- WEBserver SCADA Compared to Traditional SCADA
- Project Examples
  - City of Fort Morgan Online Demo
  - City of Seguin, TX



Newton-Evans - 2008

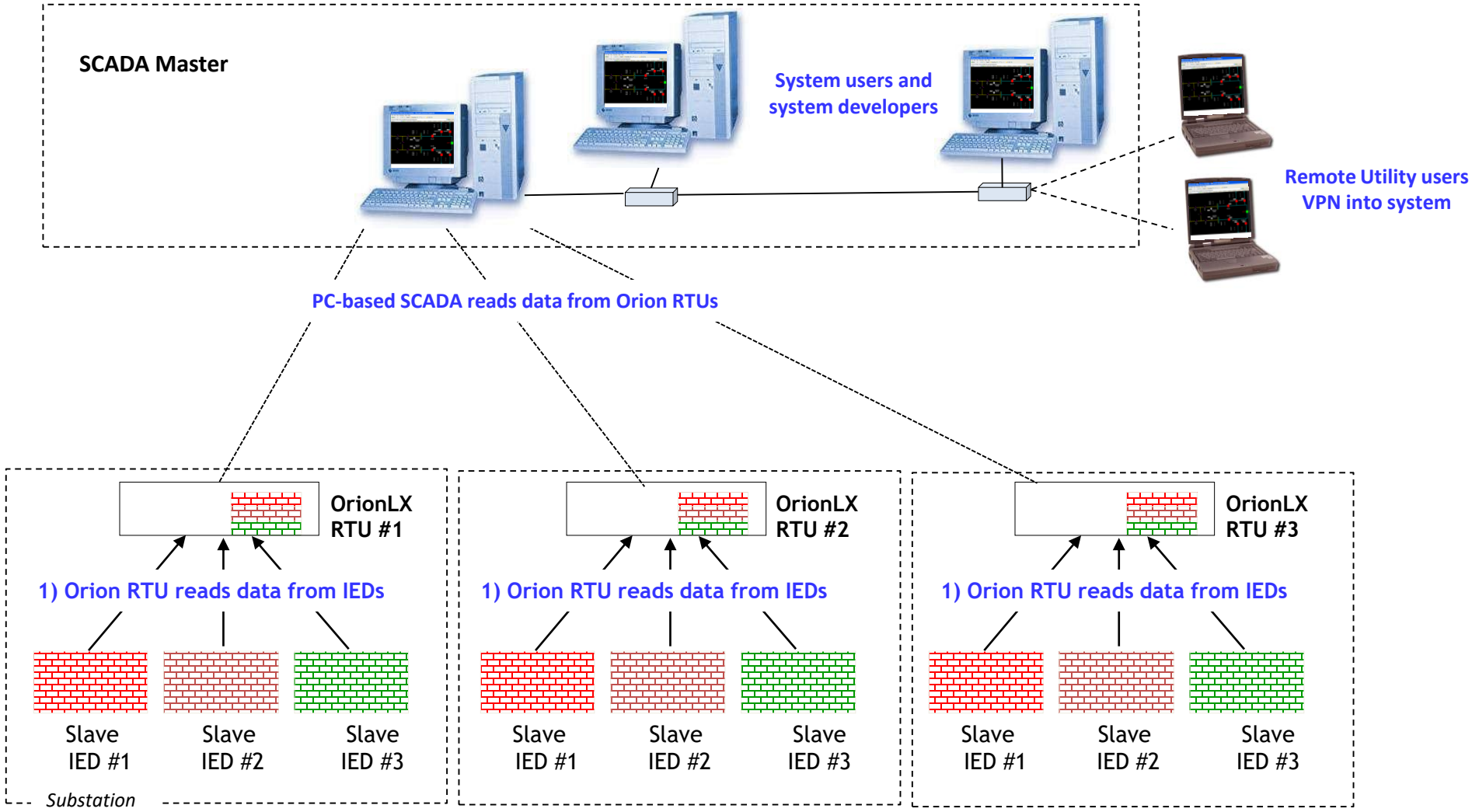
Drivers for simpler, lower cost SCADA

The Big Difference between Traditional SCADA and WEBserver SCADA

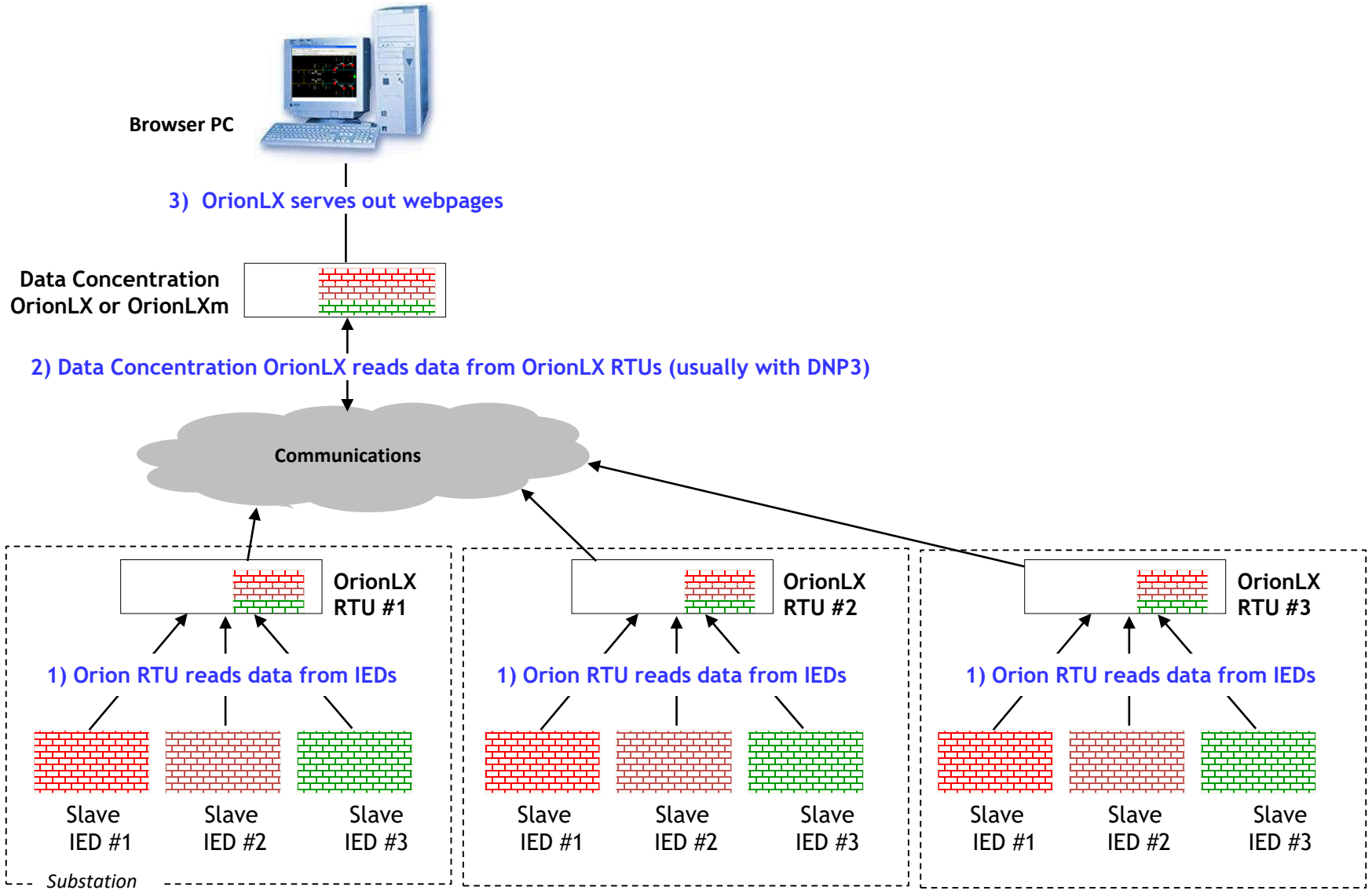
- *In traditional SCADA,* PCs and Servers contain all the software

- *In WEBserver SCADA,* the OrionLX Automation Platform contains all the software
- PCs only browse

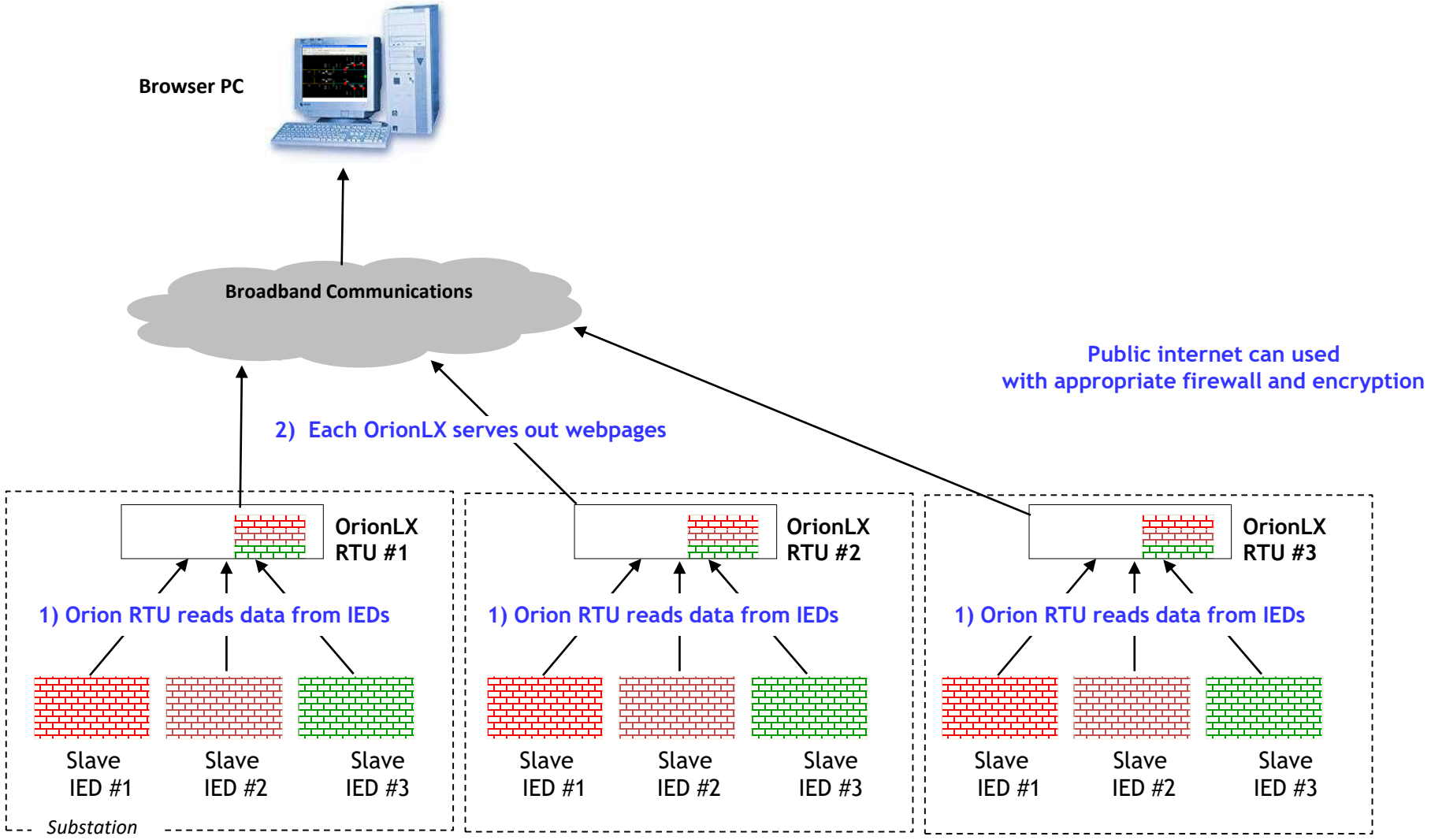
Traditional SCADA



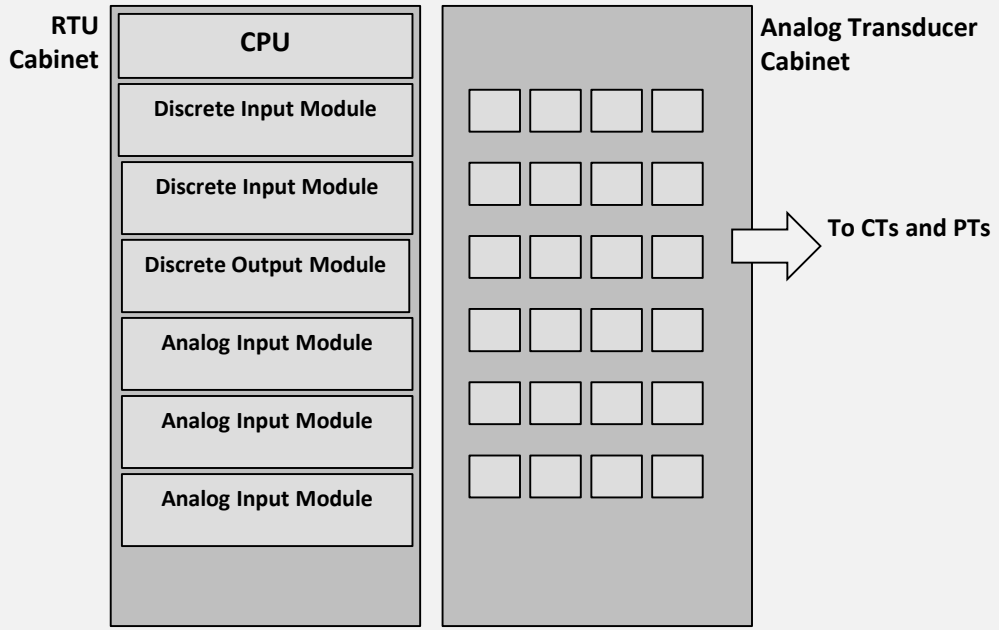
WEBserver SCADA



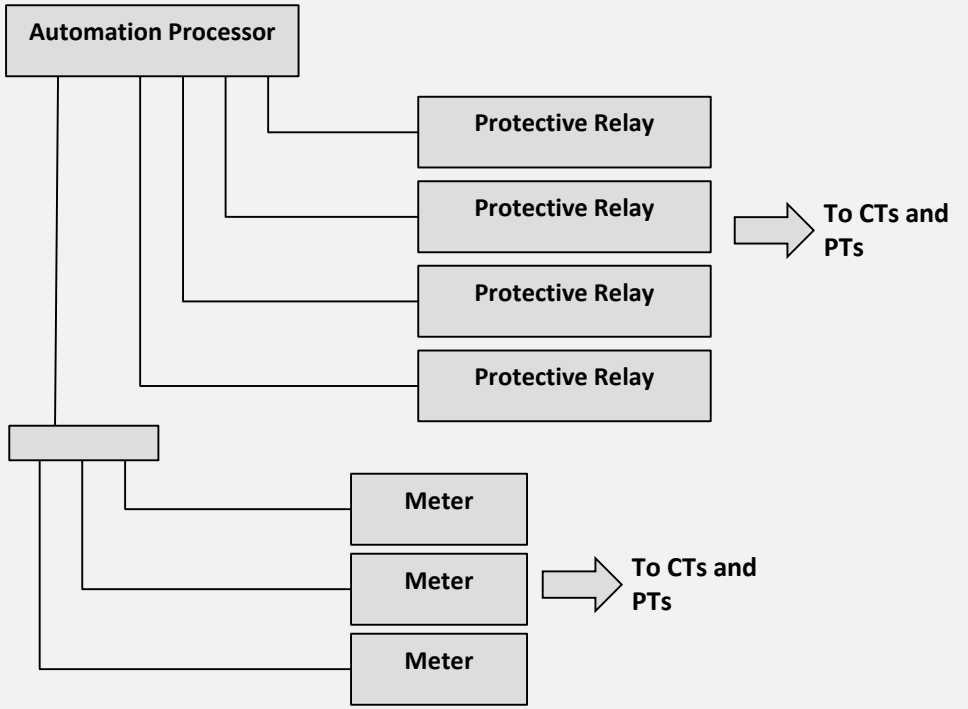
Distributed WEBserver SCADA



- **Traditional RTU**
  - Uses “hard-wired” I/O modules
  - Discrete I/O
    - Connected to breakers
    - Alarm contacts
  - Analog I/O
    - Connected to analog transducers



- **“Smart” RTU**
  - Minimal, if any, hard-wired I/O
  - Most “I/O” accessed through IEDs



Traditional SCADA vs. Orion WEBserver SCADA

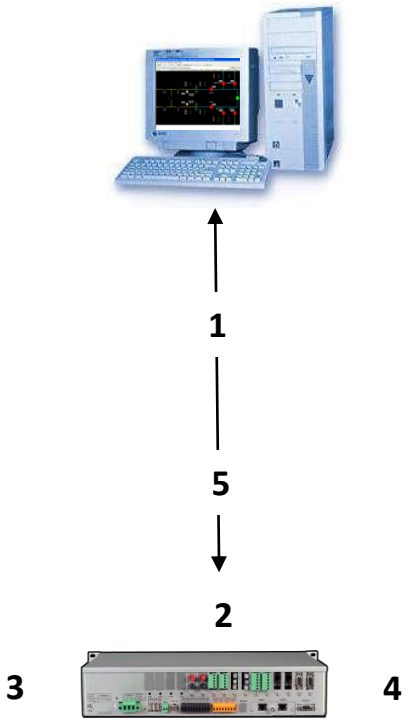
Challenges to "Traditional" SCADA	WEBserver Advantage
• Software Licensing Costs	• No Licensing Costs
• Support Costs	• No recurring support fees
• Need for Specialized Personnel who understand server and PC architecture	• "SCADA" maintained by same personnel that work on RTUs
• Life Expectancy – How long do PC-based operating systems and hardware ?	• Life expectancy of Orion • Orion has historically lasted far longer than PCs
	• Scalability

Key Features in OrionLX WEBserver SCADA

- System Overview screens
- “Real-time” visibility into substations
  - Breaker positions
  - Tap and regulator steps
  - Relay and Apparatus Alarms
  - Weather conditions
- Alarm Annunciation
- Sequence of Event records
- Remote control
  - Breakers
  - Regulators
  - Controllers
- Access to “non-operational data”
  - Protective relay fault records and oscillography
  - Apparatus health

Same as traditional SCADA plus more

How Can WEBserver SCADA be Made Secure?



1) Encryption

2) Firewall

3) Establish specific User “Privileges”

4) IP Address Lockout

5) Add another higher level of security with devices such as SNC Binary Armor®

Online Demonstration
City of Fort Morgan Colorado

OVERVIEW EAST EXCEL HENDERSON SOUTH WEST ALARMS TRENDING ADMIN

Alarms: 2 unacknowledged, 2 total.

SYSTEM TOTAL MW	34.55
SYSTEM TOTAL MVAR	10.04
SYSTEM TOTAL PF	0.96

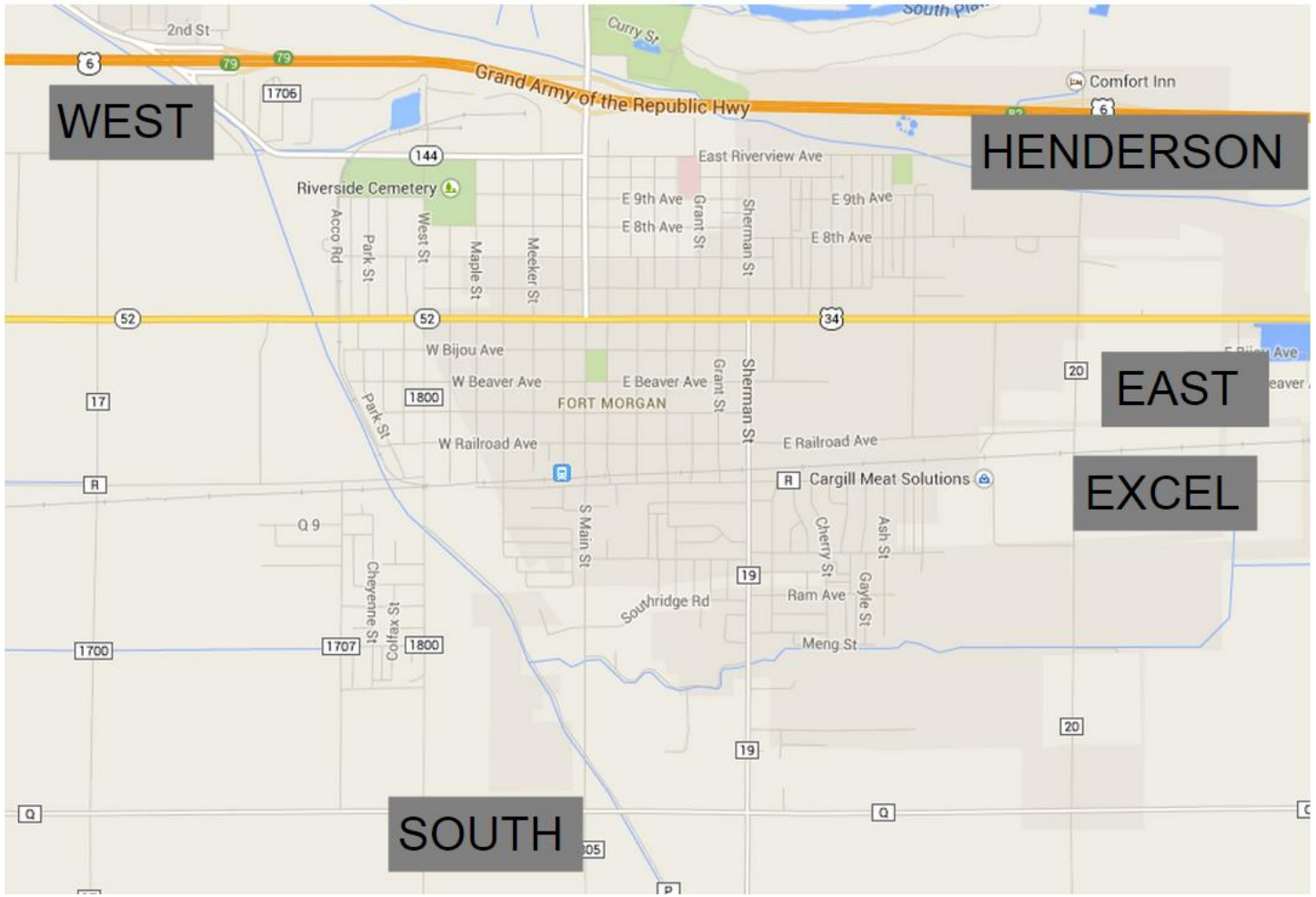
EAST MW	9.12
EAST MVAR	2.50
EAST PF	0.96

EXCEL MW	9.32
EXCEL MVAR	4.73
EXCEL PF	0.89

SOUTH MW	6.38
SOUTH MVAR	0.52
SOUTH PF	1.00

WEST MW	7.05
WEST MVAR	1.68
WEST PF	0.97

HENDERSON MW	2.68
HENDERSON MVAR	0.61
HENDERSON PF	0.97



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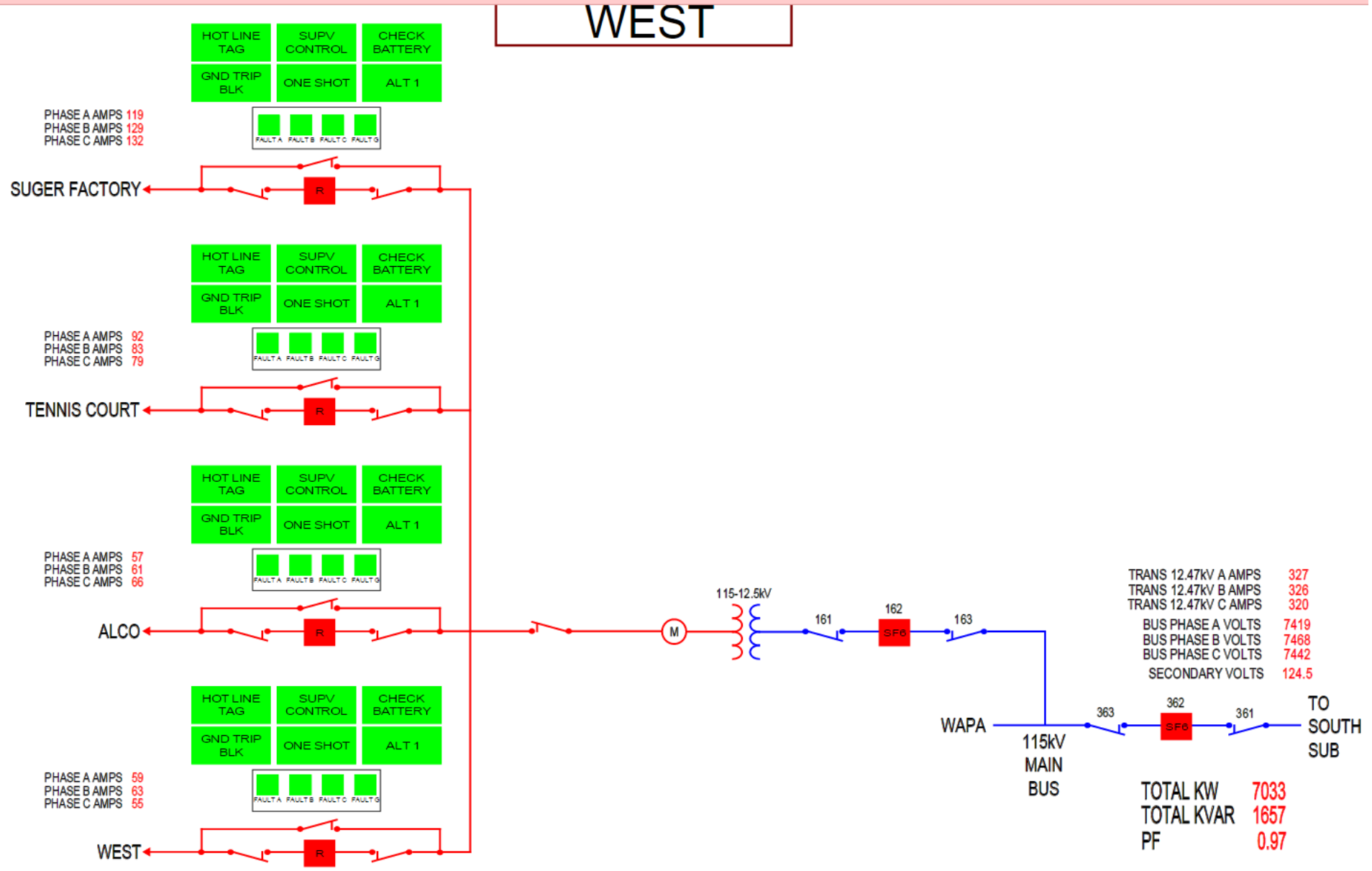
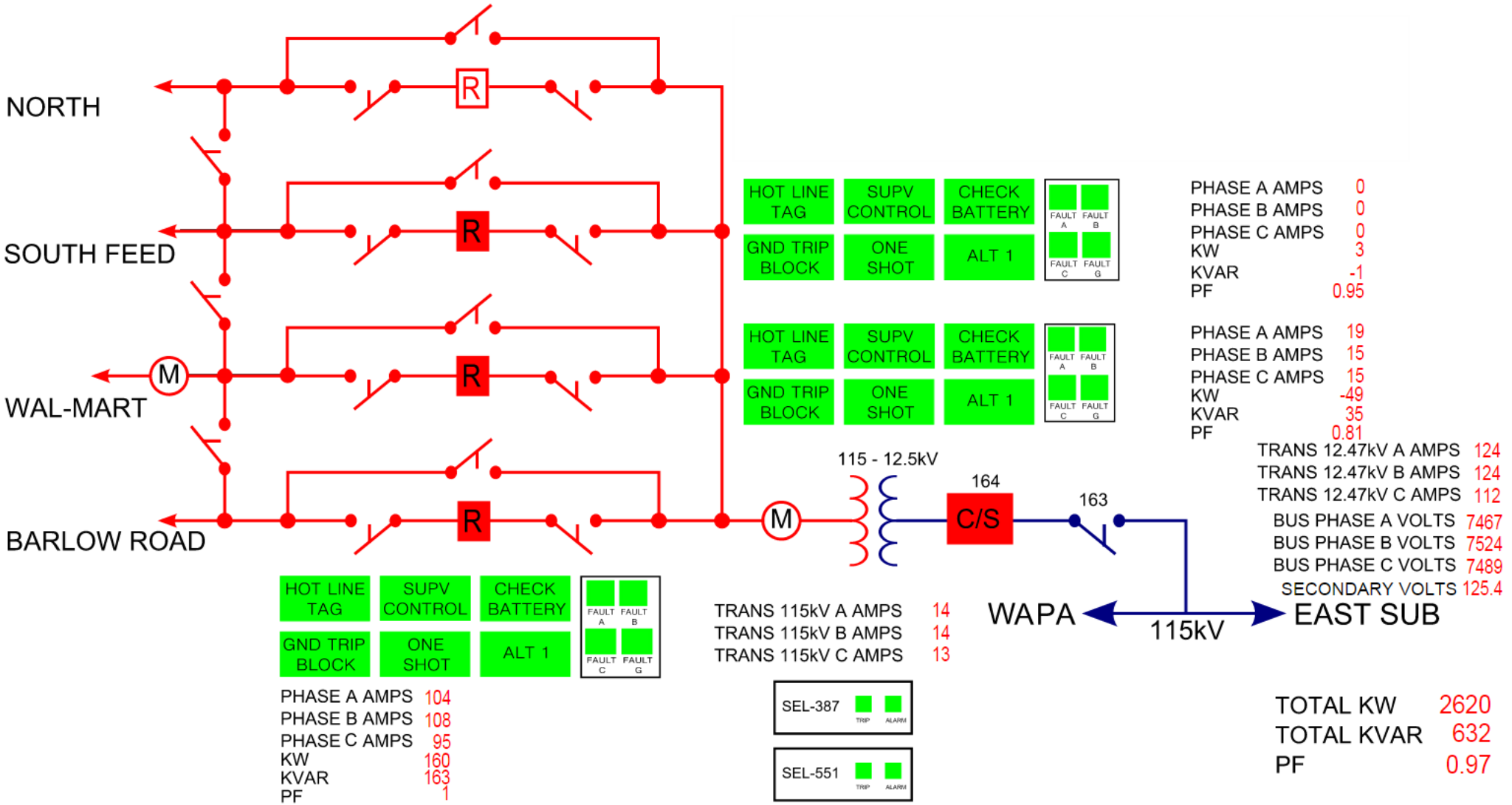
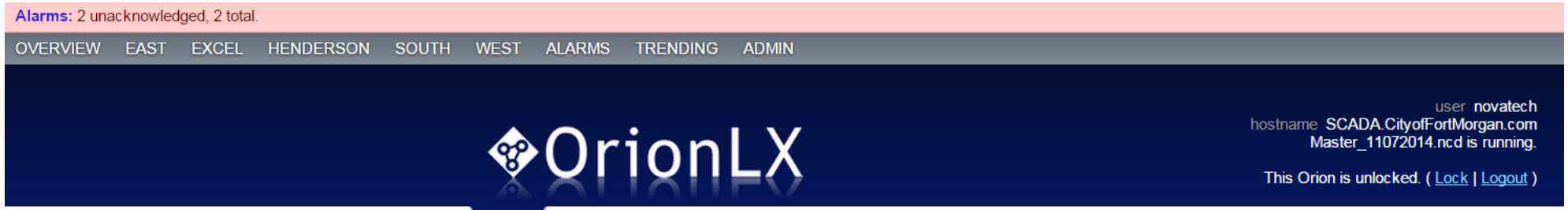
Alarms: 2 unacknowledged, 2 total.



Alarms: 2 unacknowledged, 2 total.

HENDERSON




Alarms: 2 unacknowledged, 2 total.
OVERVIEW EAST EXCEL HENDERSON SOUTH WEST ALARMS TRENDING ADMIN
OrionLX
user novatech
hostname SCADA.CityofFortMorgan.com
Master_11072014.ncd is running.
This Orion is unlocked. (Lock | Logout)
Home DataValues Devices Alarms Archive System Logs Files Settings Contact
System Summary
OrionLX Serial # 50101
OrionLX Distro Version 8.5-3
OrionLX Firmware Version 2.0.26
OrionLX Firmware Date 07/31/2014
Linux Version: 3.8.13.26-rt31-ge84bed2
OS Uptime: 78 days, 8 hours, 23 minutes, 45 seconds
Orion Process Uptime: 69 days, 7 hours, 26 minutes, 51 seconds
Active Configuration: Master_11072014.ncd
Date/Time Thu, 15 Jan 2015 20:56 MST
Hostname: SCADA.CityofFortMorgan.com
eth0 Address 10.20.51.10
User Links
East.svg
West.svg
South.svg
Excel.svg
Master.svg
Overview.svg
Henderson.svg
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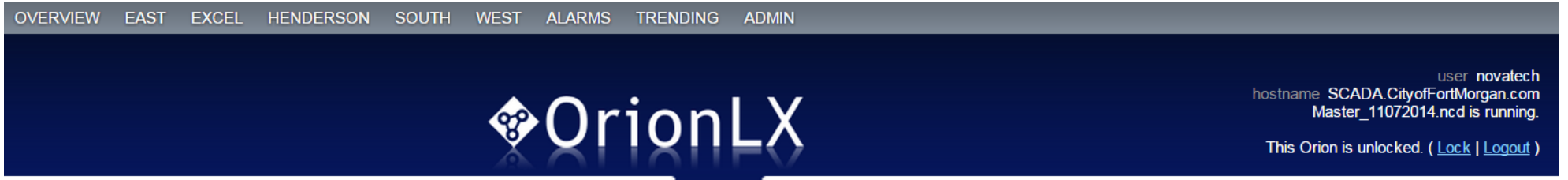
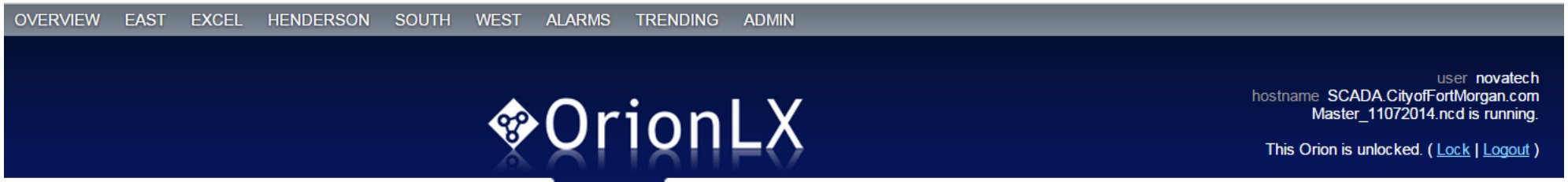


Reset All Counters

(1 of 1) << first < prev 1 next > last >>

Port #	Port Name	Device	Online	Polls	Responses	% Successful
24	East Slave	East Slave	1	2866872	2800833	97.69647894987988
25	Excel Slave	Excel Slave	1	2992353	2992161	99.99358364471037
26	Henderson Slave	Henderson Slave	1	2559921	2351605	91.86240512890828
27	South Slave	South Slave	1	2867217	2800200	97.66264639195428
28	West Slave	West Slave	1	2975466	2973668	99.93957249049392

(1 of 1) << first < prev 1 next > last >>



View tagging archive

Clear Input Override

Port #	Port Name	
20	NTP Kernel	inputs
21	Sensor Master	inputs
22	LED	
24	East Slave	inputs
25	Excel Slave	inputs
26	Henderson Slave	inputs
27	South Slave	inputs
28	West Slave	inputs
29	XML	inputs
30	AAR Slave	inputs
31	Email	
32	Text Generator	
124	Logic	inputs

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Clear Input Override

Toggle options

(1 of 3) << first < prev 1 2 3 next > last >>

Alias	Name	Type	Point #	Changes	Fails	Successes	Value	Percent FS	Status	Forced
	TRANS TAP @East Slave	AI	00000	3	584	222417	0.000	50.000000	Online	No
	12.47kV PHASE A VOLTS @East Slave	AI	00001	169770	584	392185	7564.000	5252.7777	Online	No
	12.47kV PHASE B VOLTS @East Slave	AI	00002	164909	584	387325	7606.000	5281.9444	Online	No
	12.47kV PHASE C VOLTS @East Slave	AI	00003	167820	584	390236	7578.000	5262.5000	Online	No
	TRANS 12.47kV A AMPS @East Slave	AI	00004	179155	584	401571	403.000	80.600000	Online	No
	TRANS 12.47kV B AMPS @East Slave	AI	00005	180122	584	402538	411.000	82.200000	Online	No
	TRANS 12.47kV C AMPS @East Slave	AI	00006	177716	584	400133	385.000	77.000000	Online	No
	TRANS PF @East Slave	AI	00007	85979	584	308393	964.000	98.199100	Online	No
	TOTAL KW @East Slave	AI	00008	198662	584	421077	8755.000	2076.6203	Online	No
	TOTAL KVAR @East Slave	AI	00009	197086	584	419501	2421.000	610.41666	Online	No
	TRANS 115kV A AMPS @East Slave	AI	00010	2876840	584	2878067	47.410	0.144690	Online	No
	TRANS 115kV B AMPS @East Slave	AI	00011	2881782	584	2882667	46.819	0.142884	Online	No
	TRANS 115kV C AMPS @East Slave	AI	00012	2801888	584	2802981	45.161	0.137826	Online	No
	SHERMAN PHASE A AMPS @East Slave	AI	00013	193974	584	416389	910.000	1.388571	Online	No
	SHERMAN PHASE B AMPS @East Slave	AI	00014	194301	584	416715	975.000	1.487755	Online	No
	SHERMAN PHASE C AMPS @East Slave	AI	00015	194047	584	416462	872.000	1.330587	Online	No
	SHERMAN PF @East Slave	AI	00022	197568	584	419983	5010.000	57.644007	Online	No
	SHERMAN KW @East Slave	AI	00023	16326	584	238740	6.000	50.008392	Online	No
	SHERMAN KVAR @East Slave	AI	00024	31612	584	254027	10.000	50.014496	Online	No
	LERRINO PHASE A AMPS @East Slave	AI	00025	197634	584	420050	2474.000	2.775093	Online	No

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Clear Input Override

Toggle options

(1 of 6) << first < prev 1 2 3 4 5 next > last >>

Alias	Name	Type	Point #	Changes	Fails	Successes	Value	Percent FS	Status	Forced
	12.47 PHASE A VOLTS @Excel Slave	AI	00000	2110334	189	2330067	7385.000	5128.4722	Online	No
	12.47 PHASE B VOLTS @Excel Slave	AI	00001	1851202	189	2068082	7366.000	5115.2777	Online	No
	12.47 PHASE C VOLTS @Excel Slave	AI	00002	1964536	189	2182587	7420.000	5152.7777	Online	No
	TRANS 12.47kV A AMPS @Excel Slave	AI	00003	1980329	189	2192228	483.000	96.600000	Online	No
	TRANS 12.47kV B AMPS @Excel Slave	AI	00004	1989559	189	2201873	505.000	101.00000	Online	No
	TRANS 12.47kV C AMPS @Excel Slave	AI	00005	1980779	189	2192614	500.000	100.00000	Online	No
	TRANS PF @Excel Slave	AI	00006	1248876	189	1460227	897.000	94.847424	Online	No
	TOTAL KW @Excel Slave	AI	00007	2744331	189	2945514	9863.000	2333.1018	Online	No
	TOTAL KVAR @Excel Slave	AI	00008	2629886	189	2831798	4856.000	1174.0740	Online	No
	TRANS 115kV A AMPS @Excel Slave	AI	00009	769016	189	786249	57.000	0.173956	Online	No
	TRANS 115kV B AMPS @Excel Slave	AI	00010	909176	189	919614	56.000	0.170904	Online	No
	TRANS 115kV C AMPS @Excel Slave	AI	00011	919054	189	928309	55.608	0.169707	Online	No
	XFMR PHASE A AMPS @Excel Slave	AI	00012	163922	189	363397	478.000	0.729381	Online	No
	XFMR PHASE B AMPS @Excel Slave	AI	00013	163739	189	363214	473.000	0.721752	Online	No
	XFMR PHASE C AMPS @Excel Slave	AI	00014	163662	189	363137	466.000	0.711070	Online	No
	XFMR PHASE A WATTS @Excel Slave	AI	00015	0	189	199476	0.000	0.000000	Online	No
	XFMR PHASE B WATTS @Excel Slave	AI	00016	0	189	199476	0.000	0.000000	Online	No
	XFMR PHASE C WATTS @Excel Slave	AI	00017	0	189	199476	0.000	0.000000	Online	No
	XFMR PHASE A VARS @Excel Slave	AI	00018	0	189	199476	0.000	0.000000	Online	No
	XFMR PHASE B VARS @Excel Slave	AI	00019	0	189	199476	0.000	0.000000	Online	No
	XFMR PHASE C VARS @Excel Slave	AI	00020	0	189	199476	0.000	0.000000	Online	No

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View Trending

Limit to 1000 most recent records | Custom filters

In this mode queries are performed only on the most recent 1000 records. This ensures queries are executed quickly while giving you access to only the most recent data.

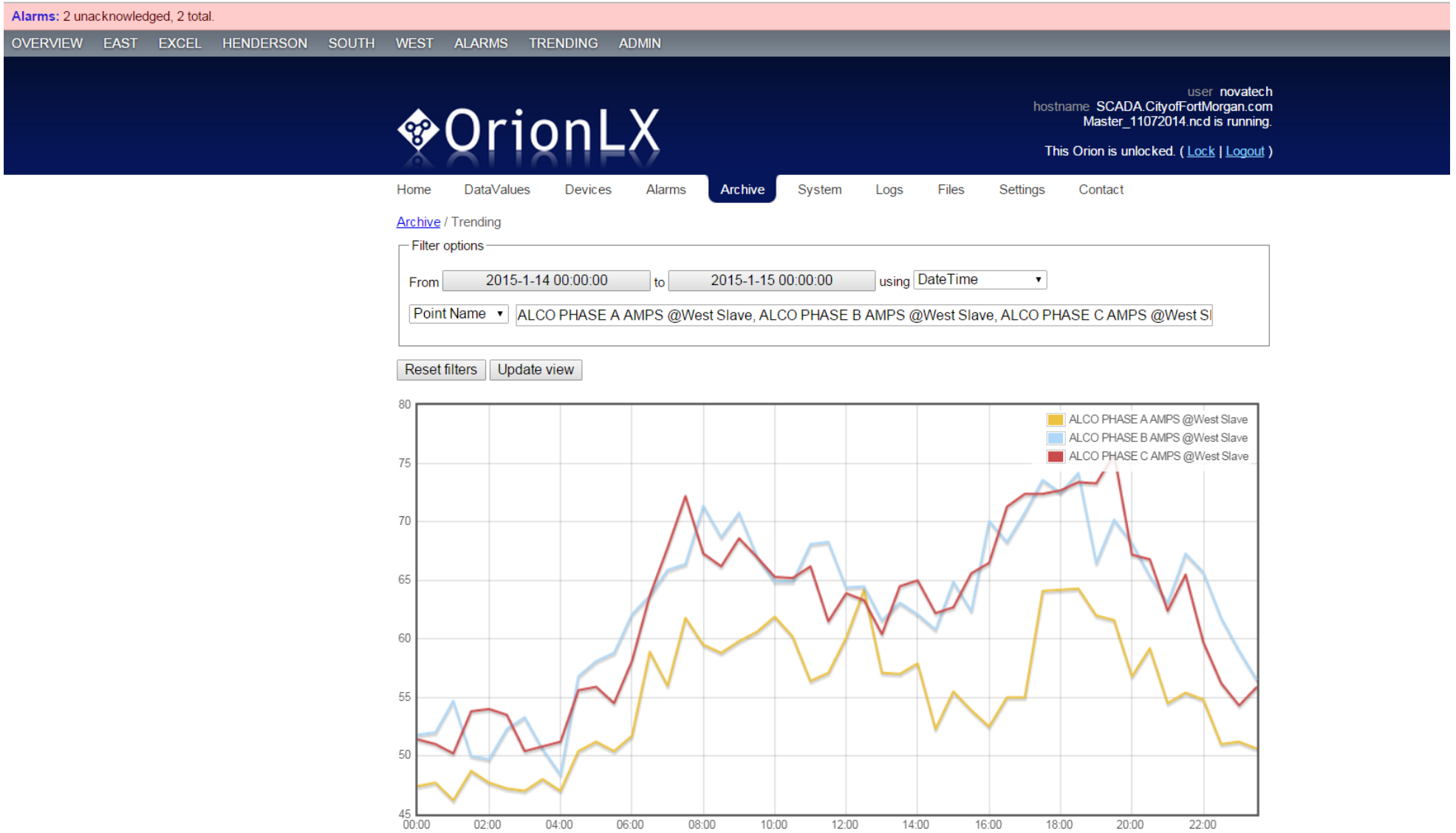
Reset filters | Update view

(25 of 40) << first < prev 20 21 22 23 24 25 26 27 28 29 next > last >> Rows per page: 25

ID	DateTime	Device DateTime	Point Name	Alias	Value	Online	DTime
51173194	2015-01-15 19:00:00.256-07	2015-01-15 19:00:00.127-07	SYSTEM PF TOTAL @Logic		0.962342	online	no
51173193	2015-01-15 19:00:00.256-07	2015-01-15 19:00:00.127-07	SYSTEM MW TOTAL @Logic		35.262976	online	no
51173192	2015-01-15 19:00:00.256-07	2015-01-15 19:00:00.126-07	SYSTEM MVAR TOTAL @Logic		9.96108	online	no
51173188	2015-01-15 19:00:00.256-07	2015-01-15 18:59:54.14-07	WEST PHASE C AMPS @West Slave		56.8	online	no
51173093	2015-01-15 19:00:00.256-07	2015-01-15 18:59:57.877-07	NORTH PHASE A AMPS @East Slave		72.5	online	no
51173189	2015-01-15 19:00:00.256-07	2015-01-15 18:59:58.296-07	SF PHASE A AMPS @West Slave		127.1	online	no
51173185	2015-01-15 19:00:00.256-07	2015-01-15 18:59:54.14-07	ALCO PHASE C AMPS @West Slave		71	online	no
51173186	2015-01-15 19:00:00.256-07	2015-01-15 18:59:54.14-07	WEST PHASE A AMPS @West Slave		55.3	online	no
51173094	2015-01-15 19:00:00.256-07	2015-01-15 18:59:57.877-07	NORTH PHASE B AMPS @East Slave		73.9	online	no
51173187	2015-01-15 19:00:00.256-07	2015-01-15 18:59:54.14-07	WEST PHASE B AMPS @West Slave		62.8	online	no
51173190	2015-01-15 19:00:00.256-07	2015-01-15 18:59:58.296-07	SF PHASE B AMPS @West Slave		137.6	online	no

https://10.20.51.10/Archive/yui-dt0-sort1-ascending

Trending Example



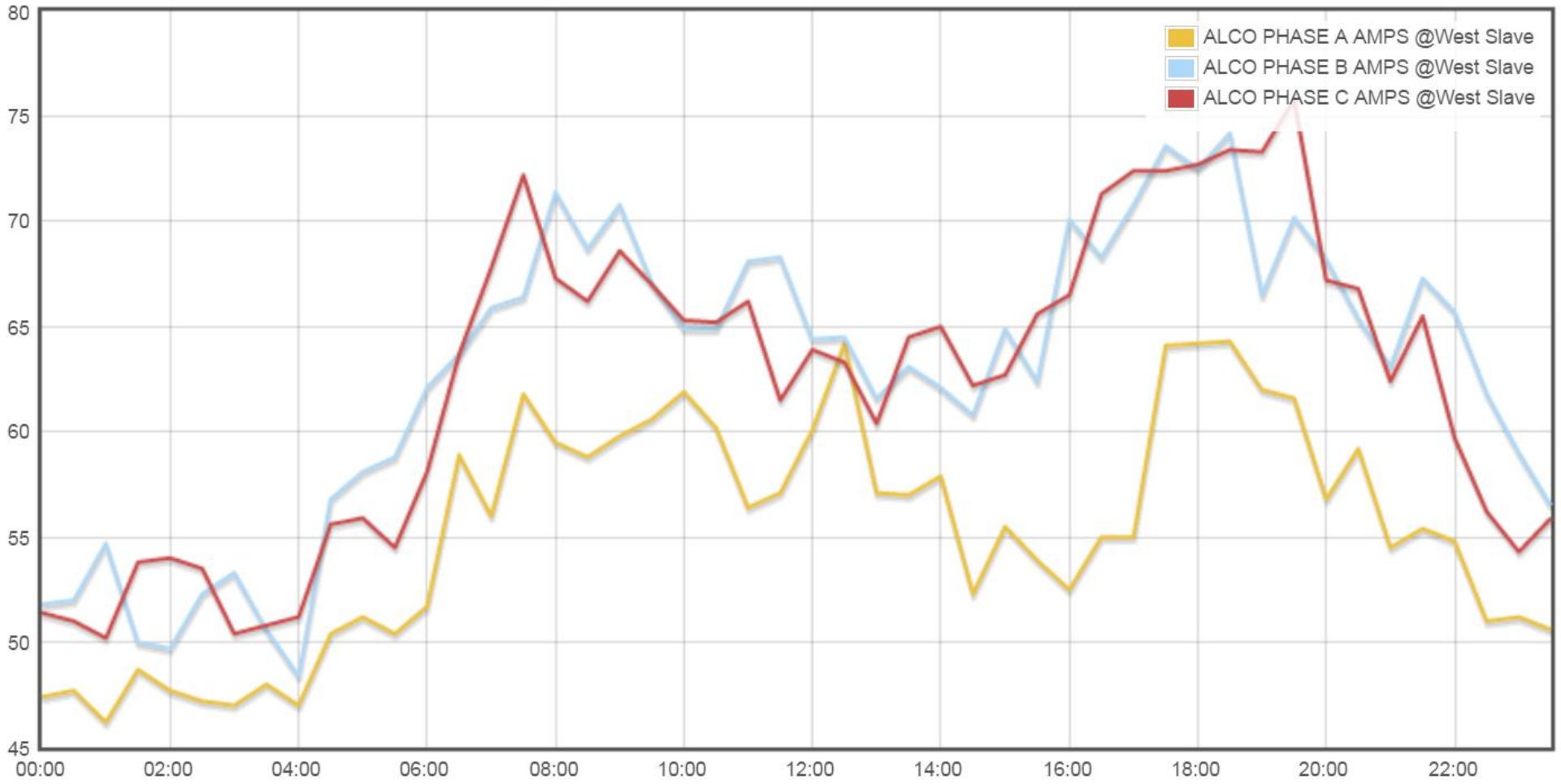
Trending Example (Cont.)

Filter options

From 2015-1-14 00:00:00 to 2015-1-15 00:00:00 using DateTime

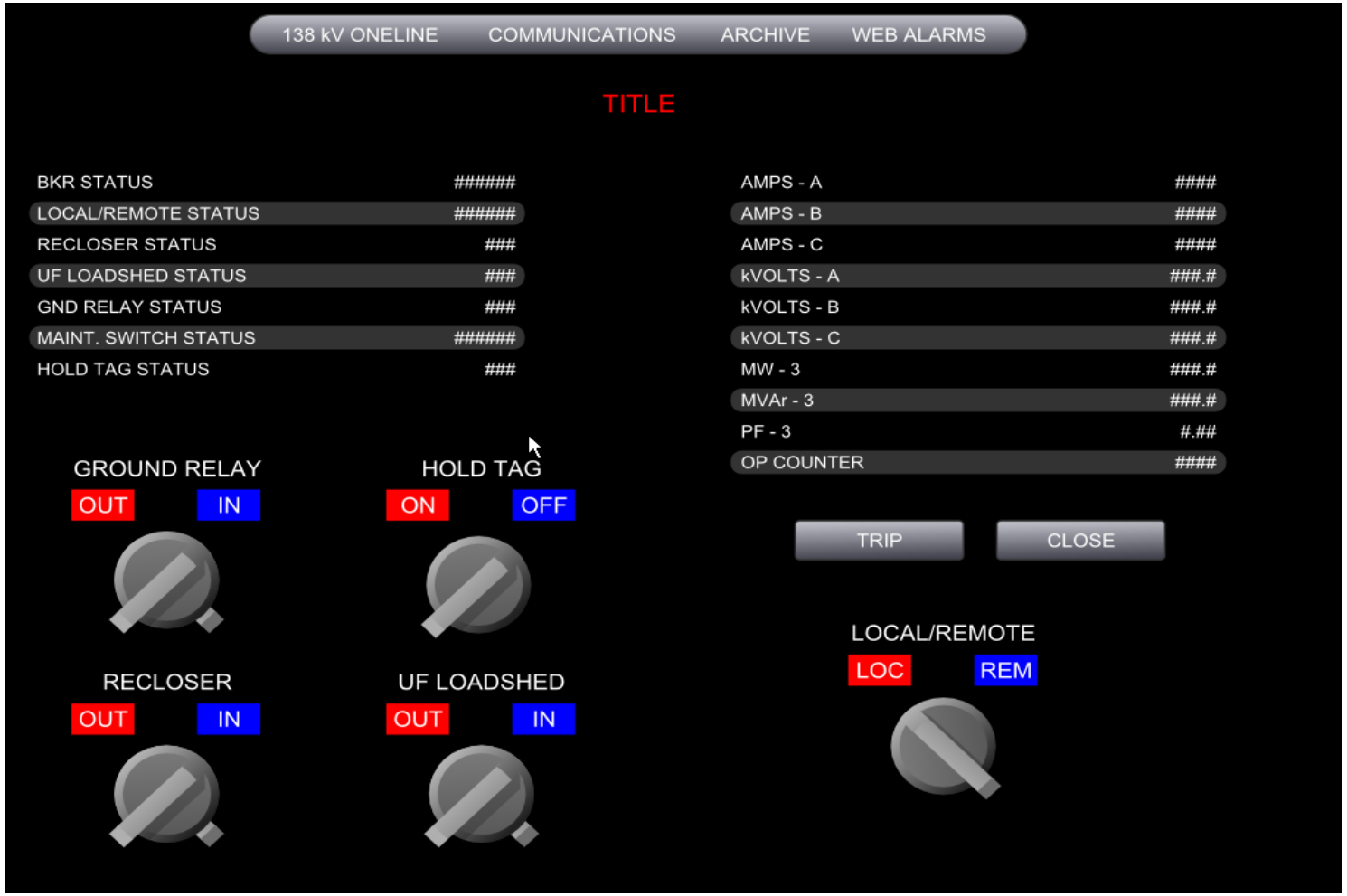
Point Name ALCO PHASE A AMPS @West Slave, ALCO PHASE B AMPS @West Slave, ALCO PHASE C AMPS @West Sl

Reset filters | Update view

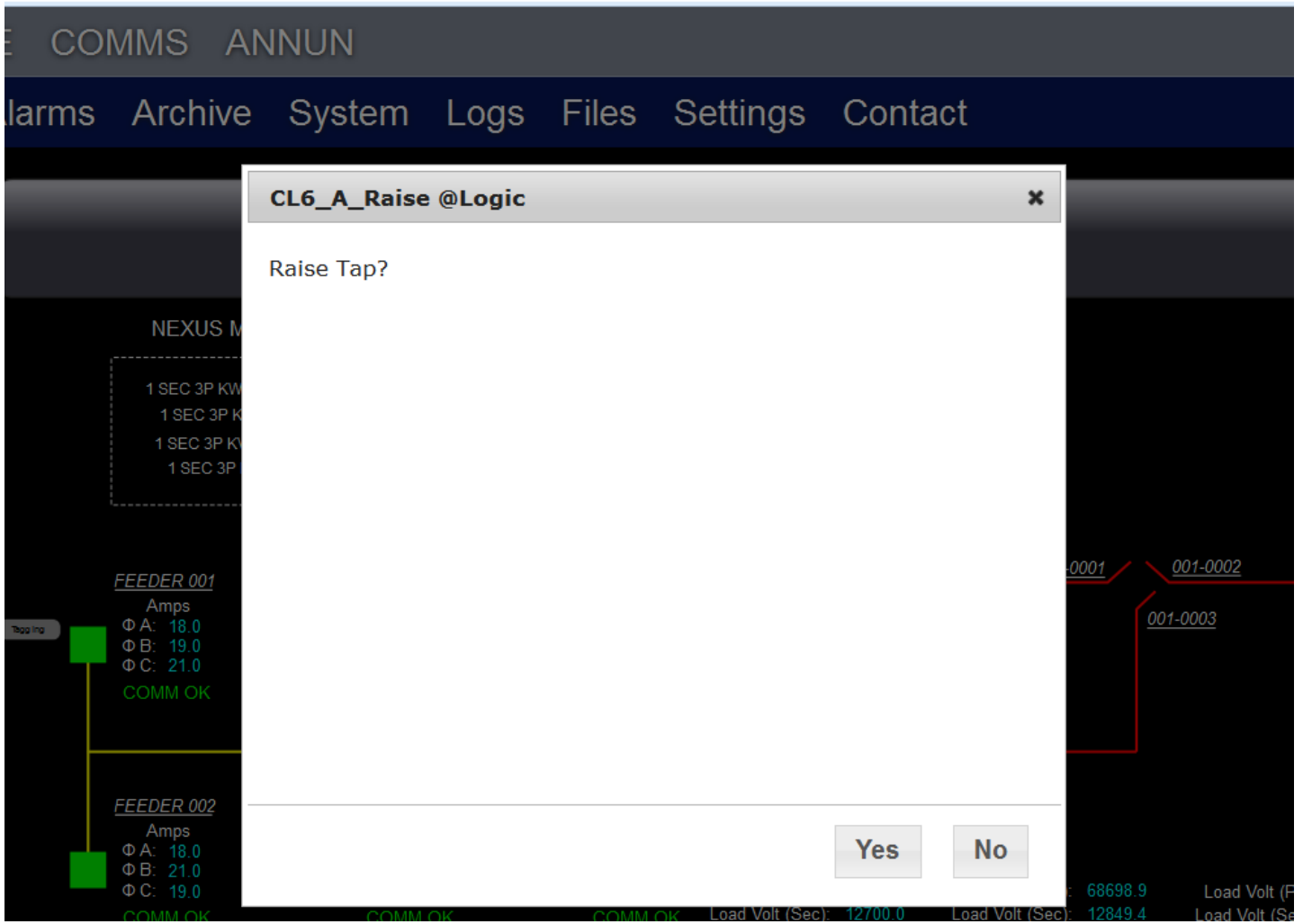


Adding Controls to Webpages

Tucson Electric Power - Breaker Control Web Page



Control Dialog Box

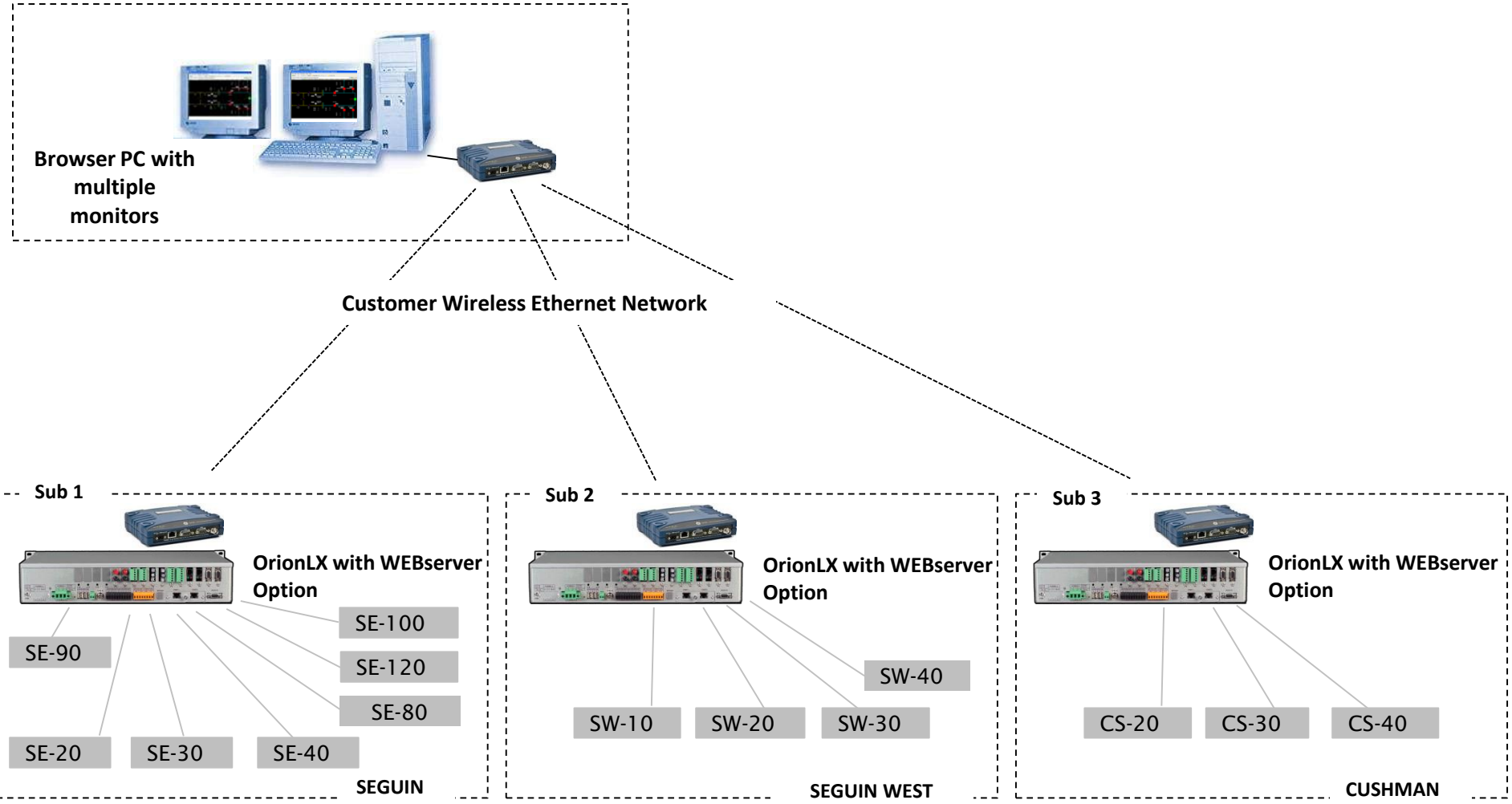


CITY OF SEGUIN Texas

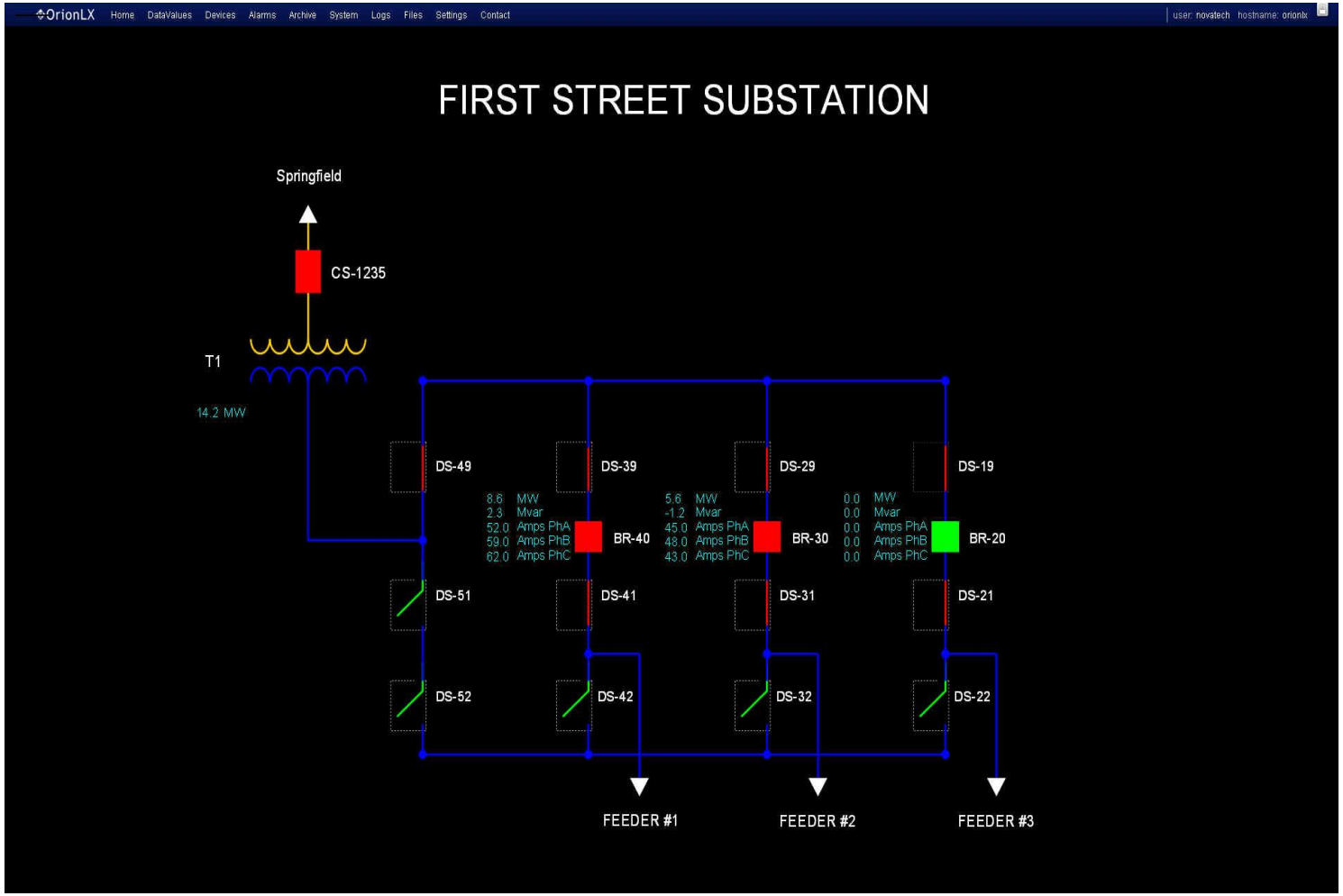
WEB Based SCADA at City of Seguin, TX

by
William Bissette
Director of Utilities
City of Seguin, TX

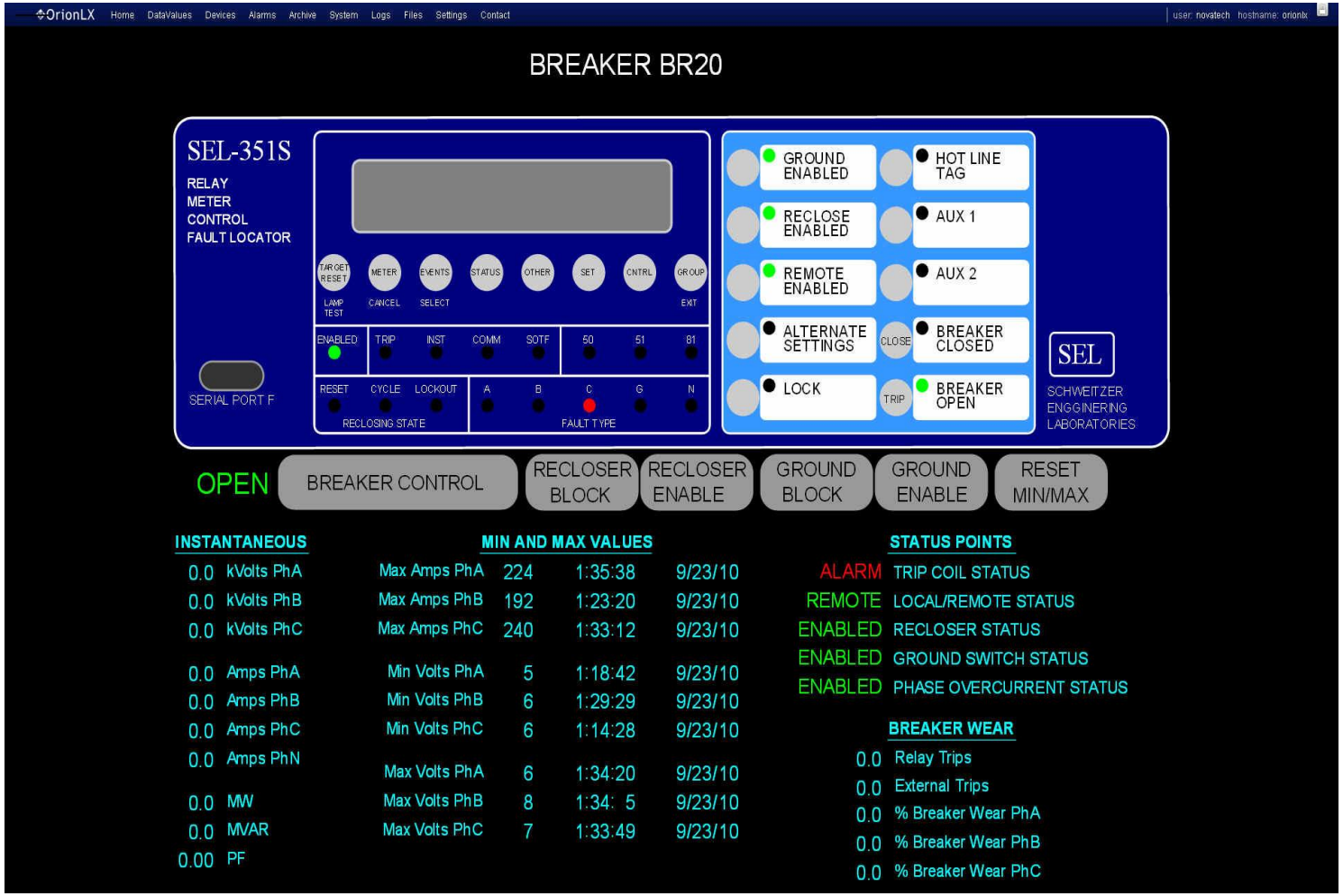
City of Seguin SCADA Topology



City of Seguin, TX - Substation One-Line Diagram



City of Seguin, TX - Relay Screen



How Does City of Seguin Use Their New SCADA System?

- The SCADA System has eliminated the need to drive to the substation during a power outage, which shortens the outage time for the customer.
- Allows the City to monitor the power factor on individual circuits, and then adjust the capacitance of the system without having to depend upon other companies.
- We are able to monitor and capture events such as low voltage or high voltage at the bus, this helps when trouble shooting customer complaints.
- History of events can be accumulated such as: breaker trips, breaker lock outs, reclosers blocked or enabled, low voltage events, high voltage events, and maximum amperage for each circuit.
- It allows the dispatcher to determine at a glance the position of the breaker being opened or closed and the position of the load and line side knife blade switches.

- The SCADA System is only as good as your IEDs (recloser controllers, relays, meters, etc.) You need to consider the information you desire to accumulate when you purchase the relays.

- Consider training time for new dispatchers to learn not only the SCADA, but also the system routing and switching possibilities. This helps the dispatcher understand their role when using the SCADA System.

- Consider the equipment the dispatcher will be using to view the SCADA System. Seguin went with dual 21”monitors at each of the two work stations. After working with the system, an additional and/or larger monitor would have allowed for better viewing of all of the different systems the dispatcher works with.

Questions?

Thank you