

Peak Reliability Synchronphasor Program (PRSP)

NASPI

Data Quality Workshop

03-21-2016



PEAKRELIABILITY

assuring the wide area view

Peak Reliability Synchrophasor Program (PRSP)

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Background - WISP

WISP Statistics:

Number of TOs contributing data	17
Number PMUs reporting	239
Number of signals monitored Positive Sequence Voltage and Current	1219
Number of substations PMU data collected from	136
PMU reporting rate (samples/second)	30
Total data volume collected/month	~1TB/month per site
Data accuracy	NA
Data timeliness · Data on-time	85%
Network availability %	99.999%
Device data completeness monitoring? · % devices performing with acceptable quality	85%



Background - WISP

WISP Delivered:

- 481 phasor measurement units (PMUs)
- 69 phasor data concentrators (PDCs)
- Implemented a managed wide area network (WAN) across the Western United States to collect the critical synchrophasor measurements at to the RC.
- Re-designed and expanded the Control Rooms in Vancouver, WA and Loveland, CO to facilitate the introduction of new visualization applications.
- Designed and built two data centers in RCs at Vancouver, WA and Loveland, CO to house the applications and a significant Historical Data Archive for synchrophasor measurements.



Background - PRSP

Peak Reliability Synchrophasor Program (PRSP):

- A two year program to realize the benefits of the high fidelity, time-synchronized power system data;
- Total project budget of \$12.4M
- U.S. Department of Energy funding of \$6.4M
- Leverage the measurements and infrastructure deployed by the Western Interconnection Synchrophasor Program;
- High-level Schedule:
 - Delivery phase started October 1, 2014;
 - Program runs through September 30, 2016; and
 - The program closes by December 31, 2016.



PRSP SOLUTION ARCHITECTURE

- Tracking availability and accuracy are the two primary requirements of the system. To make the system a tool for improving both accuracy and availability, it must meet additional requirements.
- Receive the same data as the edge PDC, not receive the data downstream of the edge PDC
- Generate reports with availability and accuracy metrics
- Generate notifications based on metrics
- The system must be manageable by operations

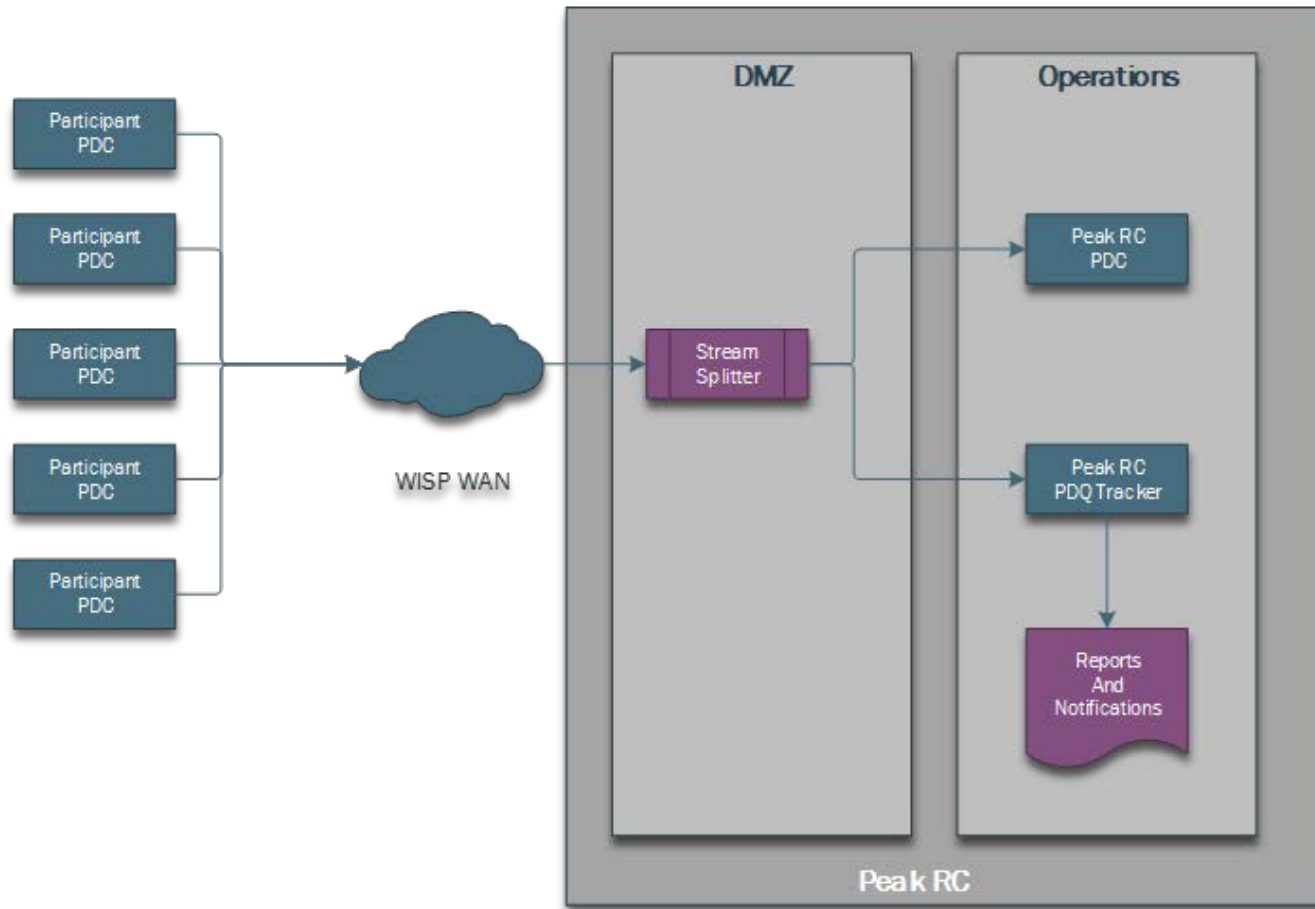


AVAILABILITY ARCHITECTURE

- Availability is measured as close to the source as possible, in this architecture the availability is measured at the output of the stream splitter. This means the availability measured is identical to the availability presented to the edge PDC. The purpose of this architecture is to report availability issues that are the result of either the WISP WAN, or the participant PDC. With this information policies and procedures at Peak RC are in place to notify and work with participants to resolve issues.
- Availability reports are generated weekly and shared monthly with the Peak RC Hosted Synchrophasor Performance and Data Quality (SPDQ) meeting. Reports are also posted on the Peak RC website and are available to all registered members



AVAILABILITY ARCHITECTURE

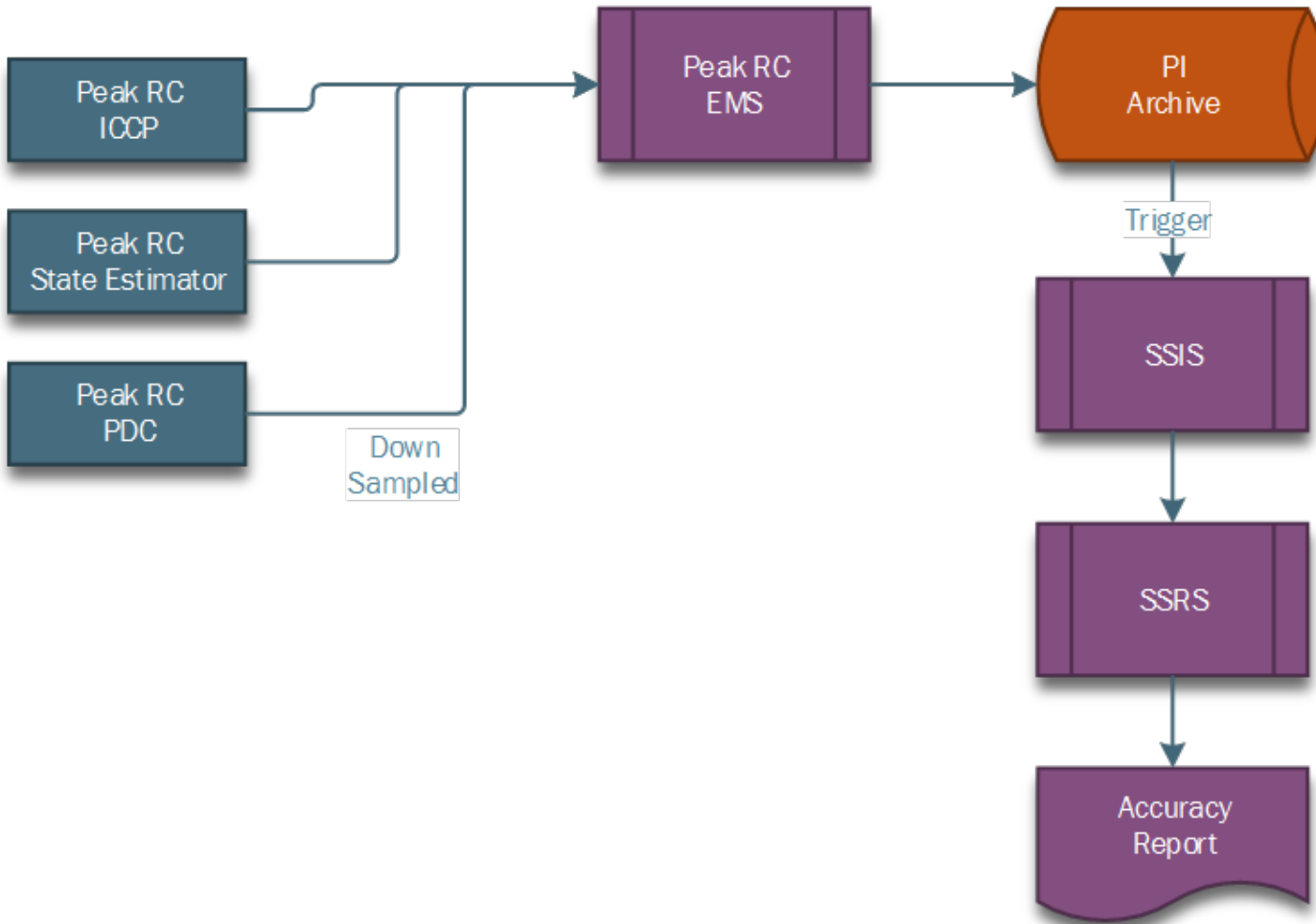


ACCURACY ARCHITECTURE

- Peak RC receives SCADA data from participants over ICCP. This ICCP data is sent to the Peak RC EMS system. Peak RC receives PMU data from participants over the WISP WAN into the Peak RC edge PDC. The edge PDC sends down sampled (1 sample per second) PMU data to the Peak RC EMS system. All the data from the Peak RC EMS system is archived in an OSISoft PI archive. Peak RC also sends state estimator calculated values to the Peak RC EMS system. To check PMU data for accuracy the following procedure is used:
 - An ICCP value or a state estimated calculated value is archived in PI
 - The appearance of this new value in PI triggers a process
 - The triggered process retrieves 20 of the down sampled PMU data values previous to the time date of the arrival of the ICCP or SE value
 - The median of the 20 down sampled values is compared to the ICCP or SE value
 - The results of the comparison are stored in PI
 - A daily report is generated using the comparison results stored in PI



ACCURACY ARCHITECTURE



PDQTracker Completeness Report

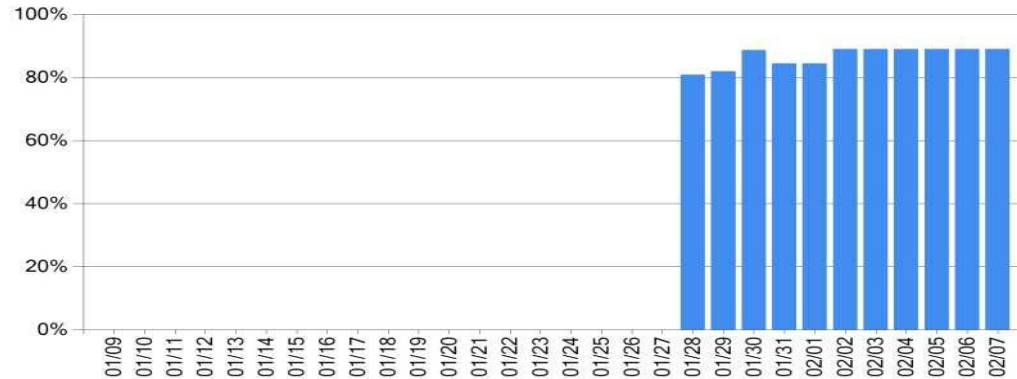
Peak Reliability

Sunday, February 07, 2016

5-day Device Data Completeness

	02/03	02/04	02/05	02/06	02/07
L4: Good	183	181	187	187	187
L3: Fair	30	32	26	26	26
L2: Poor	24	24	24	24	24
L1: Offline	0	0	0	0	0
L0: Failed	2	2	2	2	2
Total	239	239	239	239	239

Percent of Devices with Acceptable Quality (30 days)



Definitions

Level 4: Good - Devices which are reporting as expected, with a completeness of at least 99% on the report date.

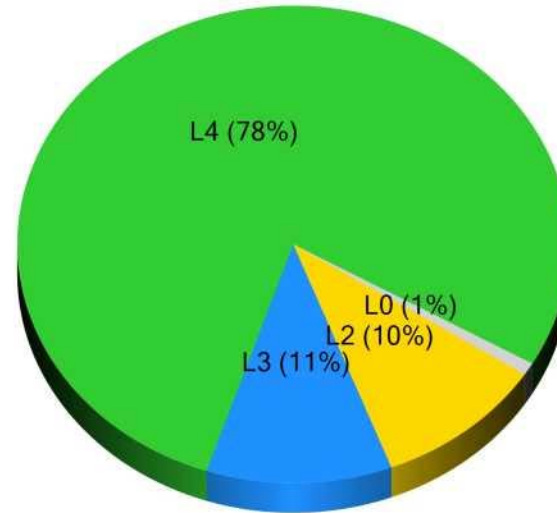
Level 3: Fair - Devices with a completeness of at least 90% on the report date.



Sunday, February 07, 2016

Data Completeness Breakdown

Level 4	187
Level 3	26
Level 2	24
Level 1	0
Level 0	2



Definitions

- Level 4: Good - Devices which are reporting as expected, with a completeness of at least 99% on the report date.
 - Level 3: Fair - Devices with a completeness of at least 90% on the report date.
 - Level 2: Poor - Devices which reported on the report date, but had completeness below 90%.
 - Level 1: Offline - Devices which did not report on the report date, but have reported at some time during the 30 days prior to the report date.
 - Level 0: Failed - Devices which have not reported during the 30 days prior to the report date.
- Completeness: Percentage of measurements received over total measurements expected, per device.

Acceptable Quality: Devices which are in Level 4 or Level 3.

Name		Completeness	Data Errors	Time Errors
W000XXXXXX	01	0%	0	0
W000XXXXXXXX	_01	0%	0	0
Level 2				
Name		Completeness	Data Errors	Time Errors
W000XXXXXX_	01	49.95%	2,589,168	2,589,168
W000XXXXXX	01	65.92%	1,761,157	1,761,157
W000XXXXXX	01	57.49%	2,198,403	2,198,403
W000XXXXXX	01	44.3%	188	2,371
W000XXXXXX	01	65.31%	854,348	1,503,508
W000XXXXXX	01	69.62%	1,790,050	1,790,032
W000XXXXXX	01	69.62%	3,324	188
W000XXXXXX	01	69.62%	1,804,534	1,804,534
W000XXXXXX	01	69.62%	188	2,938
W000XXXXXX	01	69.62%	194	3,969
W000XXXXXX	01	69.62%	195	3,092
W000XXXXXX	01	69.62%	575	188
W000XXXXXX	01	65.27%	1,804,534	1,804,534
W000XXXXXX	01	69.62%	1,804,534	1,804,534
W000XXXXXX	01	69.62%	1,790,257	1,790,210
W000XXXXXX	01	69.62%	1,673	5,269
W000XXXXXX	01	69.62%	188	3,253
W000XXXXXX	01	69.62%	191	2,810
W000XXXXXX	01	69.62%	188	3,810

CLASSIFICATION: PUBLIC



PMU Accuracy Report

02/04/2016 12:00:00 AM To 02/05/2016 12:00:00 AM

Exp. DS: 86400

Exp. ICCP: 8640

Exp. SE: 1440

Angle Thresh: 5 deg

Mag. Thresh: 1.0 %

Freq. Thresh: 0.005 Hz

MW Thresh: 1.0 %

Area	Nom Volt	Name	Type	DS Count	ICCP Count	Dev Calcs	Accuracy	Quality Accuracy
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _DSN_ 1500 PMU FRQ	FRQ	68639	4095	4095	80.26	100.00
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1500 PMU KVA	KVA	82655	1441	1441	100.00	99.98
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1500 PMU KVM	KVM	82863	2827	2826	100.00	100.00
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _DSN_ 1500 PMU FRQ	FRQ	72022	4095	4095	80.46	100.00
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1500 PMU FRQ	FRQ	72023	4095	4095	80.31	100.00
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1500 PMU KVA	KVA	82615	1441	1441	100.00	99.98
AESC	500	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1500 PMU KVM	KVM	82837	2911	2911	100.00	100.00
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _DSN_ 1240 PMU FRQ	FRQ	69865	4095	4095	80.78	100.00
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU KVA	KVA	82602	1441	1441	100.00	99.98
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU KVM	KVM	82811	3768	3767	100.00	100.00
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU FRQ	FRQ	3	4095	0	0.00	0.00
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU KVA	KVA	82601	1441	1441	100.00	99.98
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU FRQ	FRQ	69628	4095	4095	80.56	100.00
AESC	240	SUBSTN LANGRIDGE 11 UNIDN _SEAL_ 1240 PMU FRQ	FRQ	69542	4095	4095	80.80	100.00