Improving SCADA Historical Data Collection and Reliability for Large Radio Telemetry Systems

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Water Jam 2011

McKIM&CREED

Overview

- Historical Data
  - How do we capture historical data?
  - Why do we need it?
- Loss of Data
  - What are the causes of gaps and unreliable data?
  - Why do large telemetry systems, in particular, pose a problem?
- What can be done?

Historical Data

How do we collect the data?

Why do we need historical data?

Collection of Historical Data

- Traditional Methods
  - Chart Recorders
  - Operator Logs
  - Alarm Printers

- SCADA (Supervisory Control and Data Acquisition)
  - Trends
  - Historical Databases

How do we use Historical Data?

- Reports
  - Compliance Reports
  - Operation Reports
  - Asset Management, Work Order Generation
- Postmortem Sequence of Events
- Modeling
- Power Management

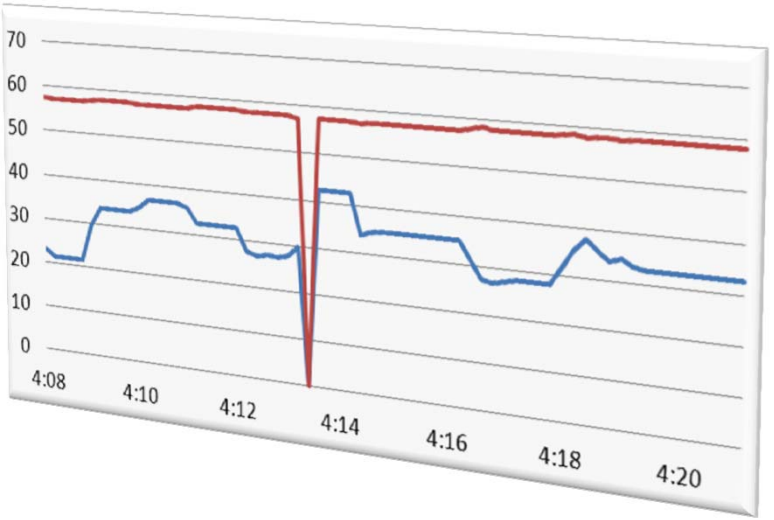
Loss of Data

What causes gaps and unreliable data?

How do large telemetry systems increase these problems?

Gaps in Data

- What causes gaps or holes in telemetry data?
  - Communication Failures
    - Radio hardware failures
    - Poor communication paths
    - Obstructions
    - Network management

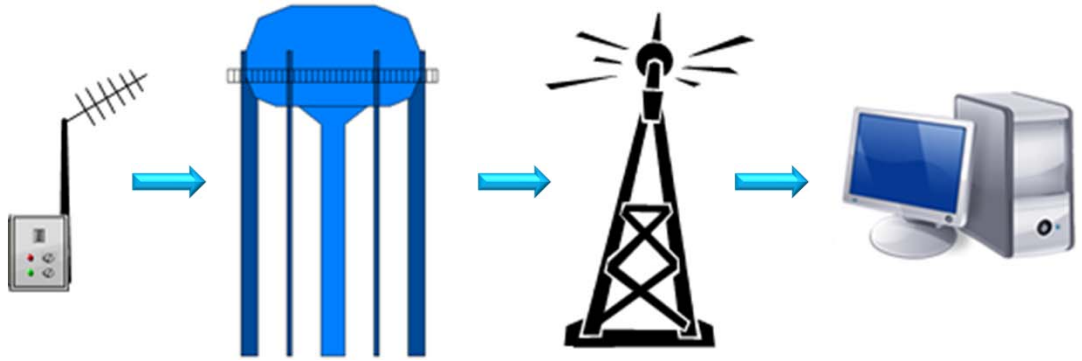


Gaps in Data

- What causes gaps or holes in telemetry data?
  - Polling Master Failures
    - Software
      - Computer crashes, freezes
      - Communication driver errors
    - Hardware
      - Hard drive
      - Modem/NIC
      - Local Area Network

Gaps in Data

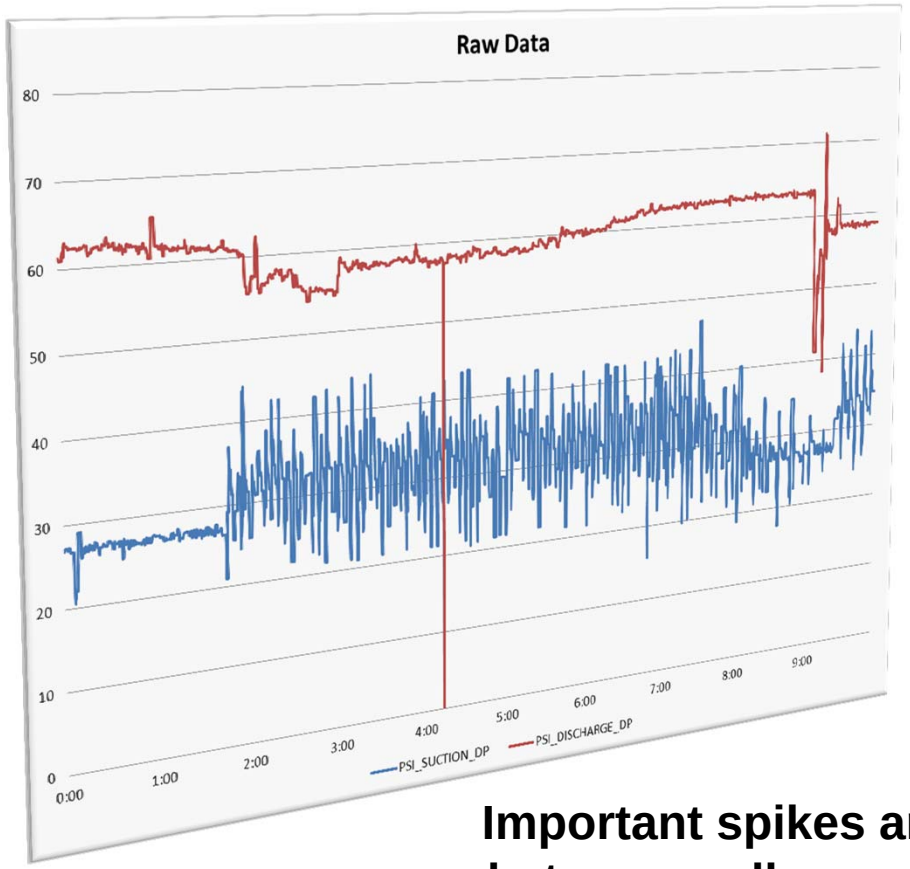
- There are multiple points of failure from RTU to HMI.

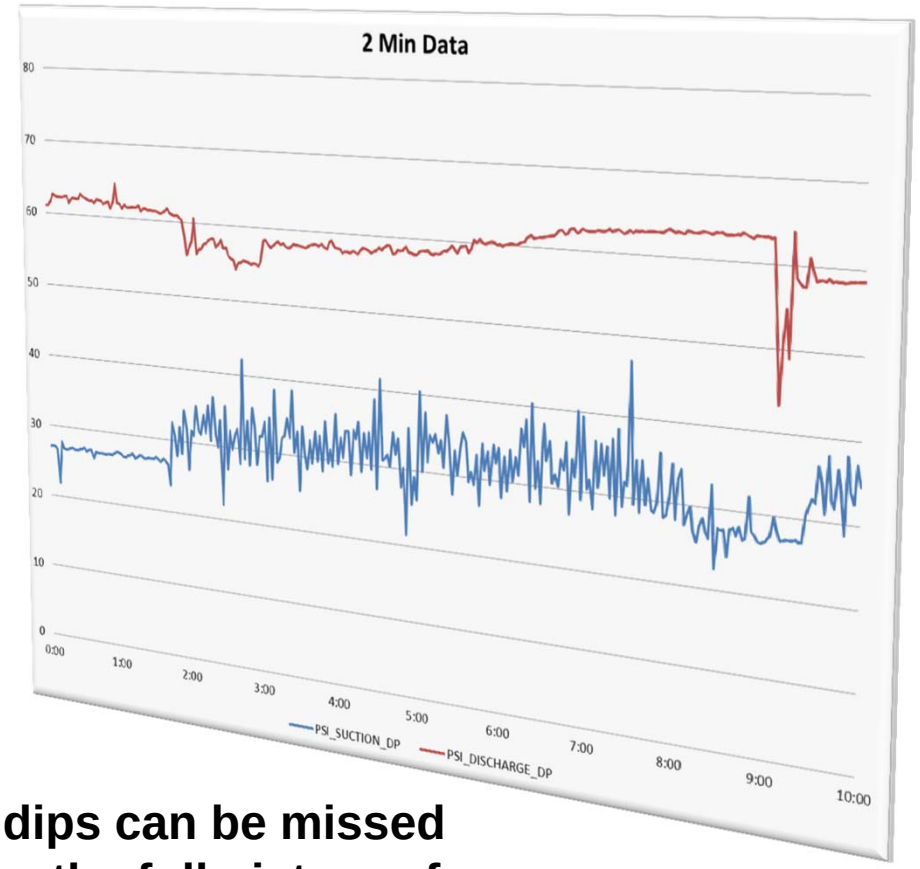


Unreliable Data

- What makes it unreliable?
  - Flat-lined and out-dated
  - The data is not updating in a timely fashion.
  - A quick rise or fall between poles or an unlatched alarm activating and clearing
- What causes unreliable data?
  - Slow polling times
  - Intermittent interference
  - Overloaded system

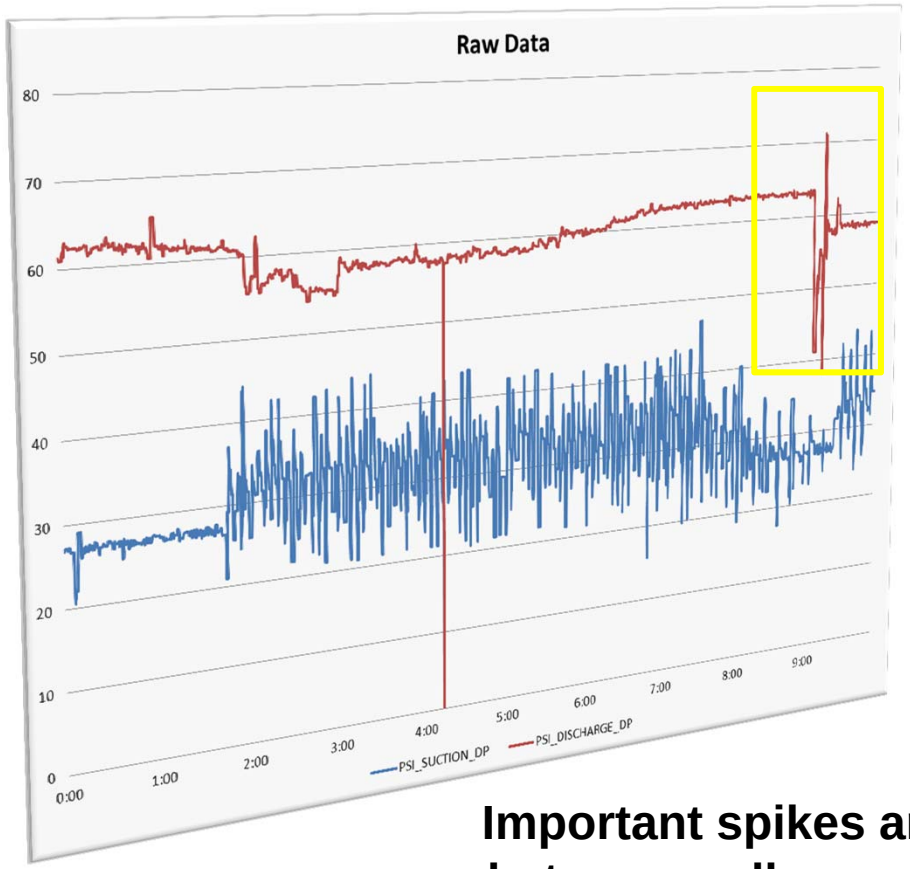
Unreliable Data

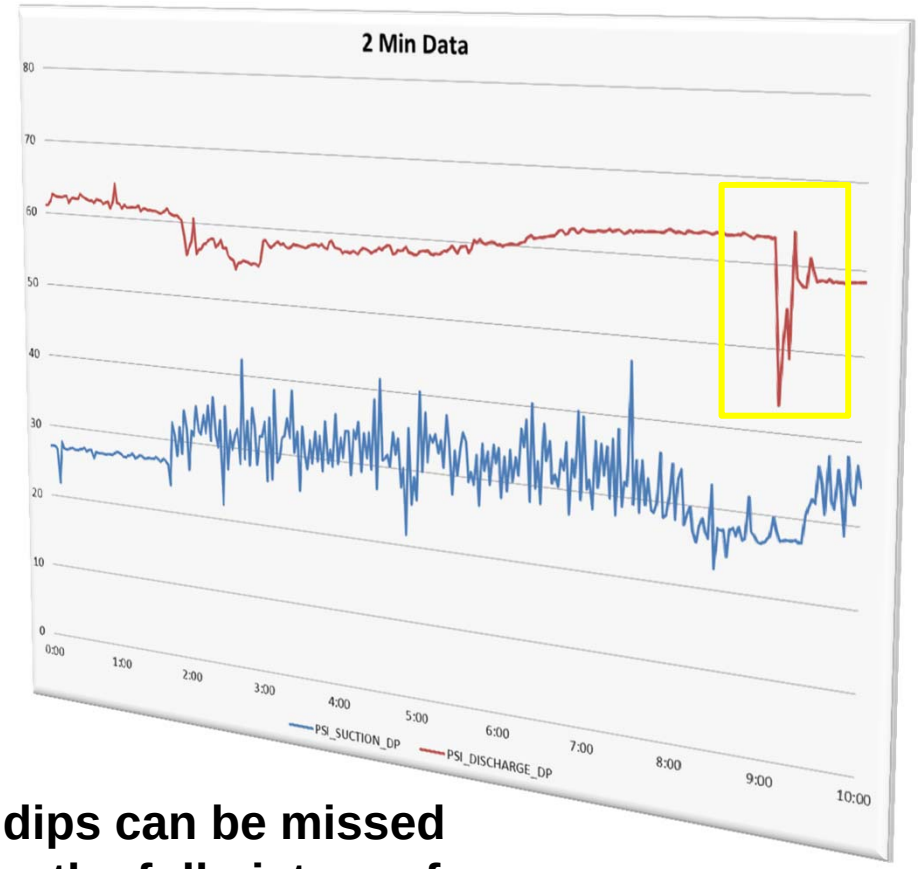




Important spikes and dips can be missed between polls masking the full picture of what is happening at the remote station.

Unreliable Data



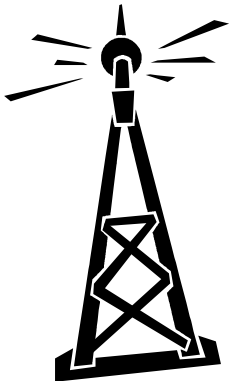


Important spikes and dips can be missed between polls masking the full picture of what is happening at the remote station.

What can be done?

What can be done?

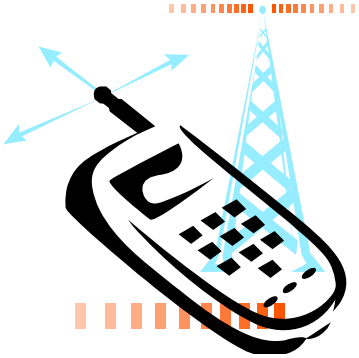
- Improvements to Infrastructure
  - Better radio paths



    - Evaluate your current paths by performing path studies. Using these results, considerations for improving the existing infrastructure, such as adjusting antenna alignment and taller towers, can be explored.
  - Leverage city/county owned assets
    - Examine utilization of existing assets
    - Consider joint ventures with other utilities to help minimize the cost of new infrastructure

What can be done?

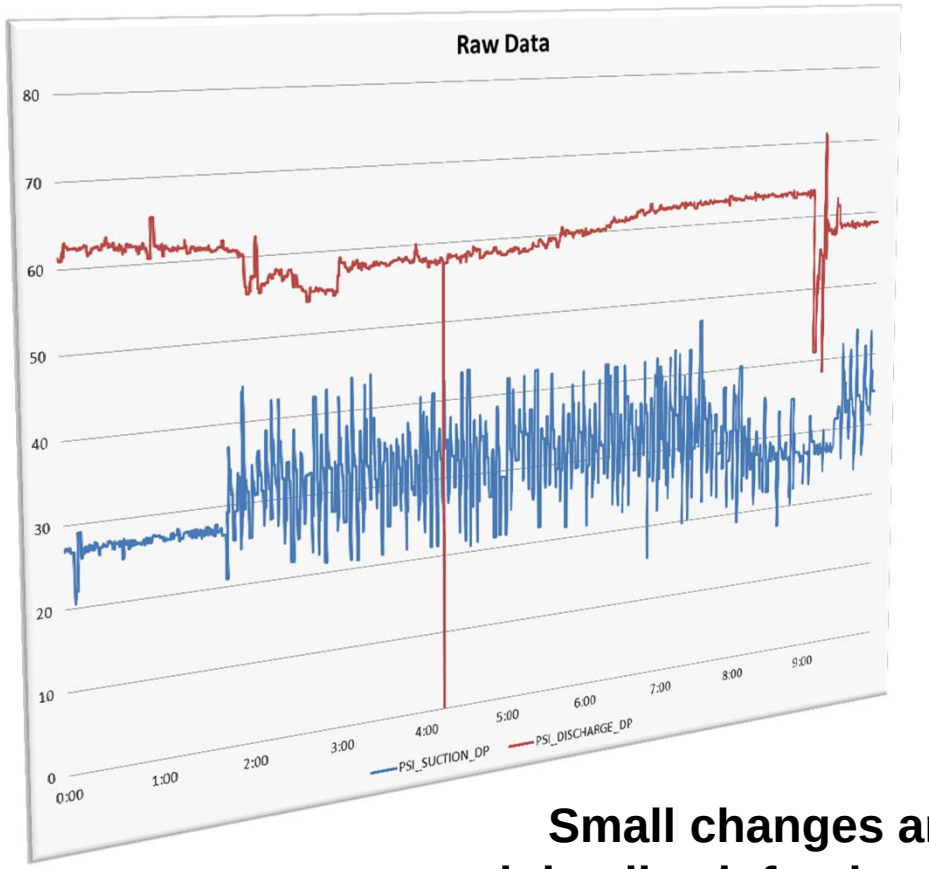
- Improvements to Infrastructure
  - Service Providers
    - These include broadband, DSL, cellular based wireless, or even a dial-up phone line
    - An alternative to upgrading and maintaining infrastructure.
      - Can be a more cost-effective solution
    - Hard to reach remote stations
    - Temporary, short-term fixes

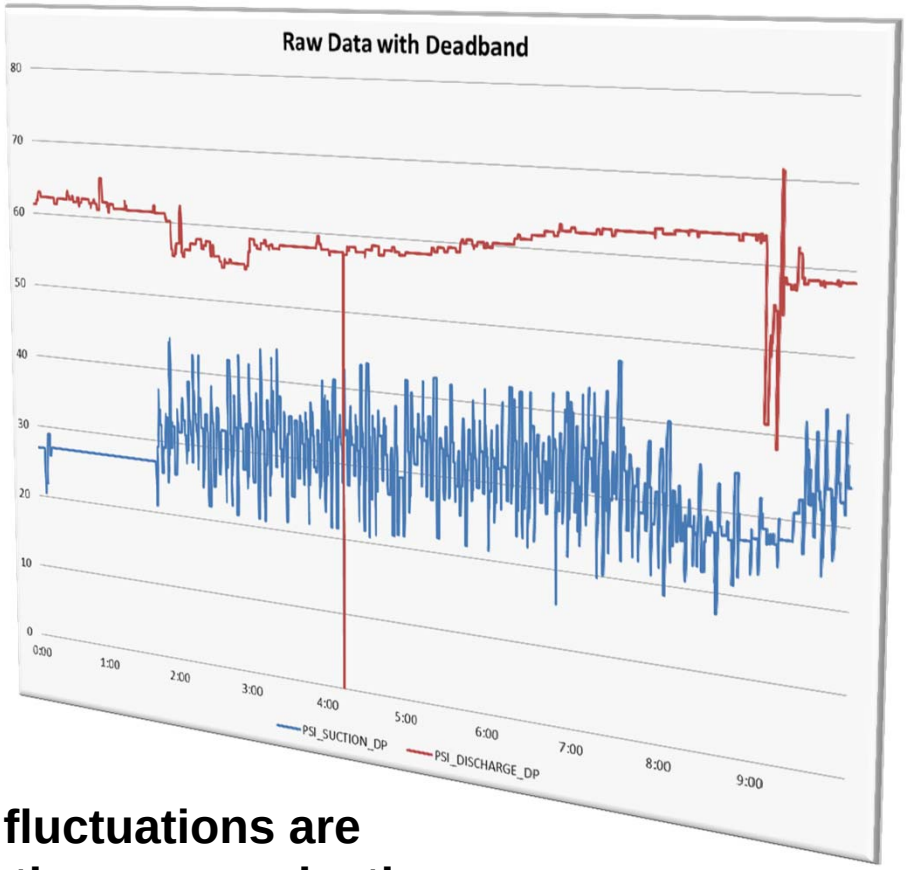


What can be done?

- Changes to polling
  - Clustering remotes with multiple polling masters and data concentrators
  - Report by Exception
    - Use of dead bands and change of state triggers
    - Only new/changed data
  - Unsolicited Response
    - Important data is not missed between slow polls

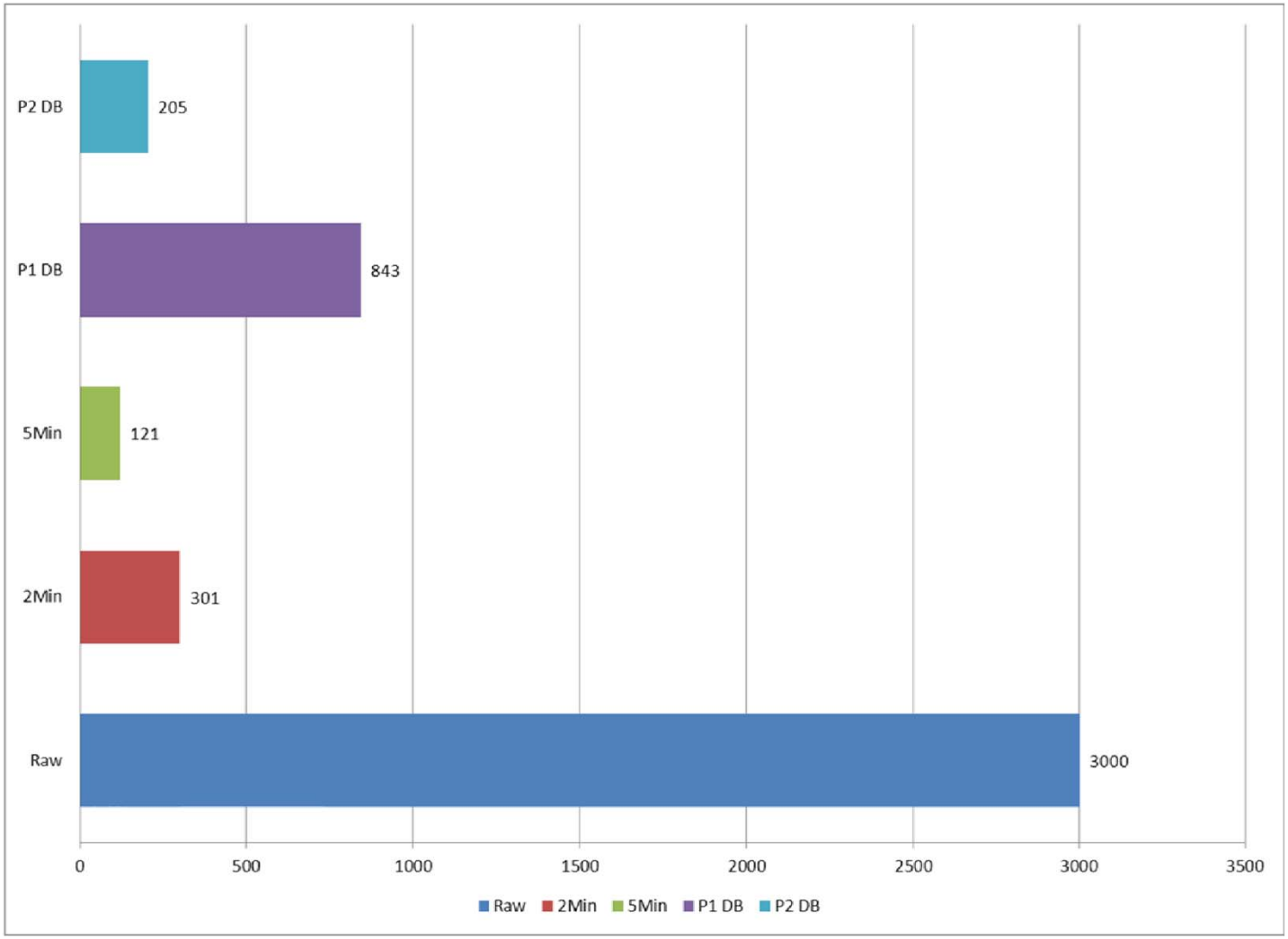
What can be done?





Small changes and fluctuations are minimalized; freeing up the communication for the more meaningful data.

What can be done?



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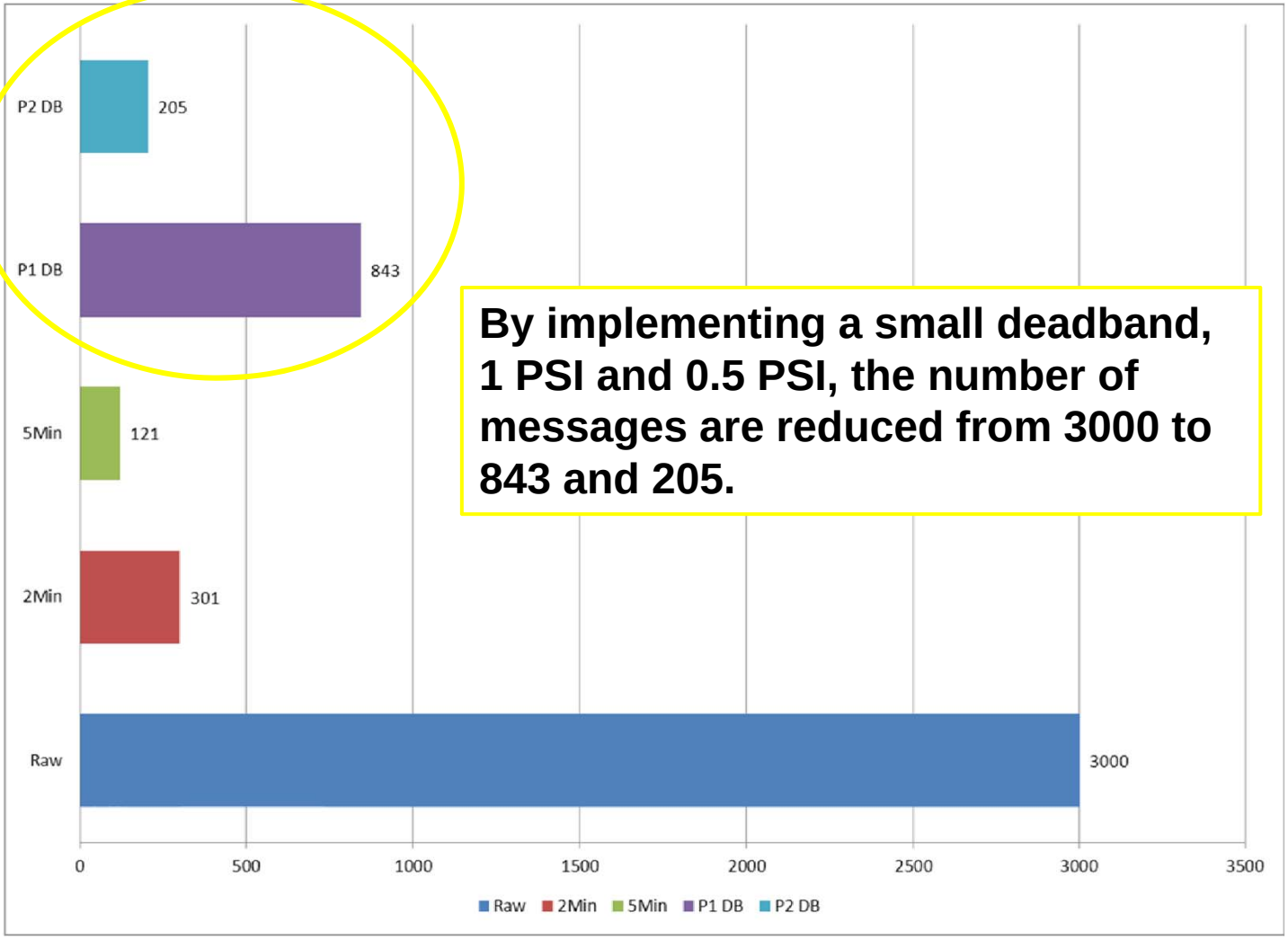
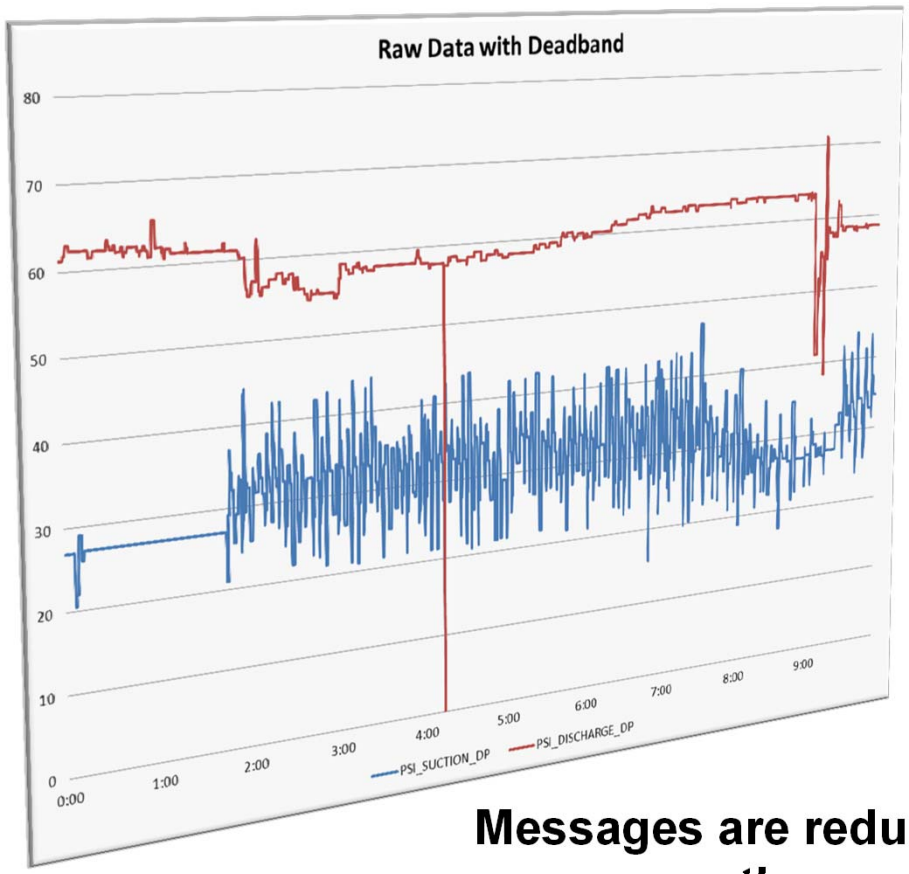
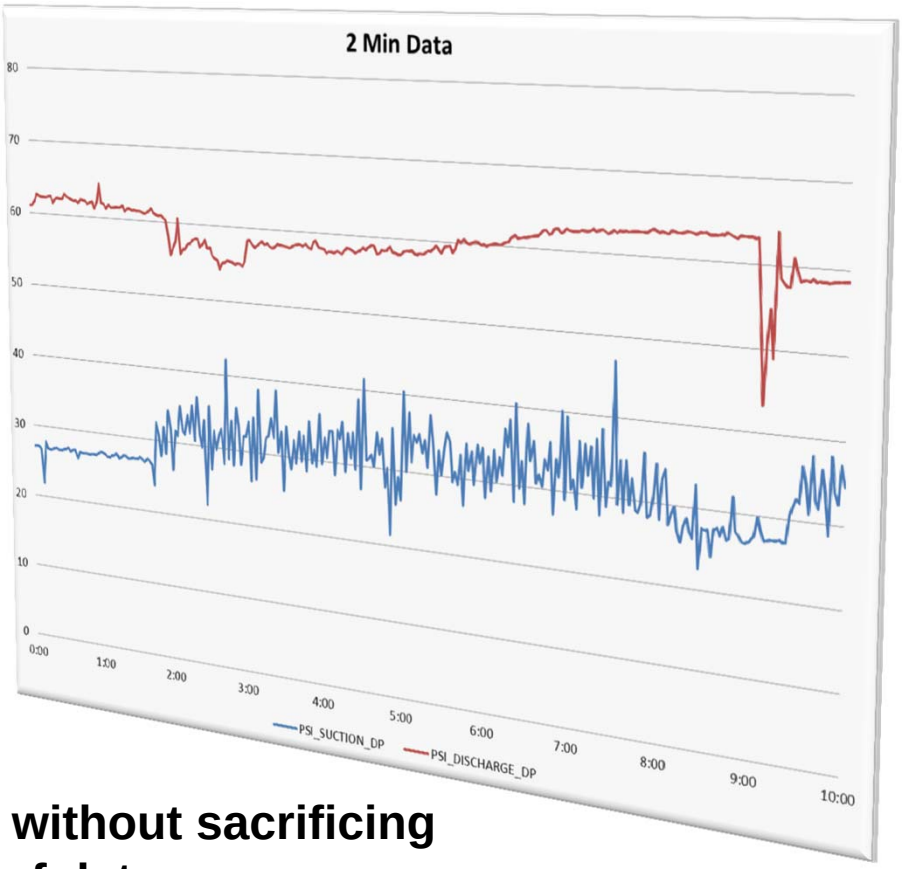


By implementing a small deadband, 1 PSI and 0.5 PSI, the number of messages are reduced from 3000 to 843 and 205.

What can be done?



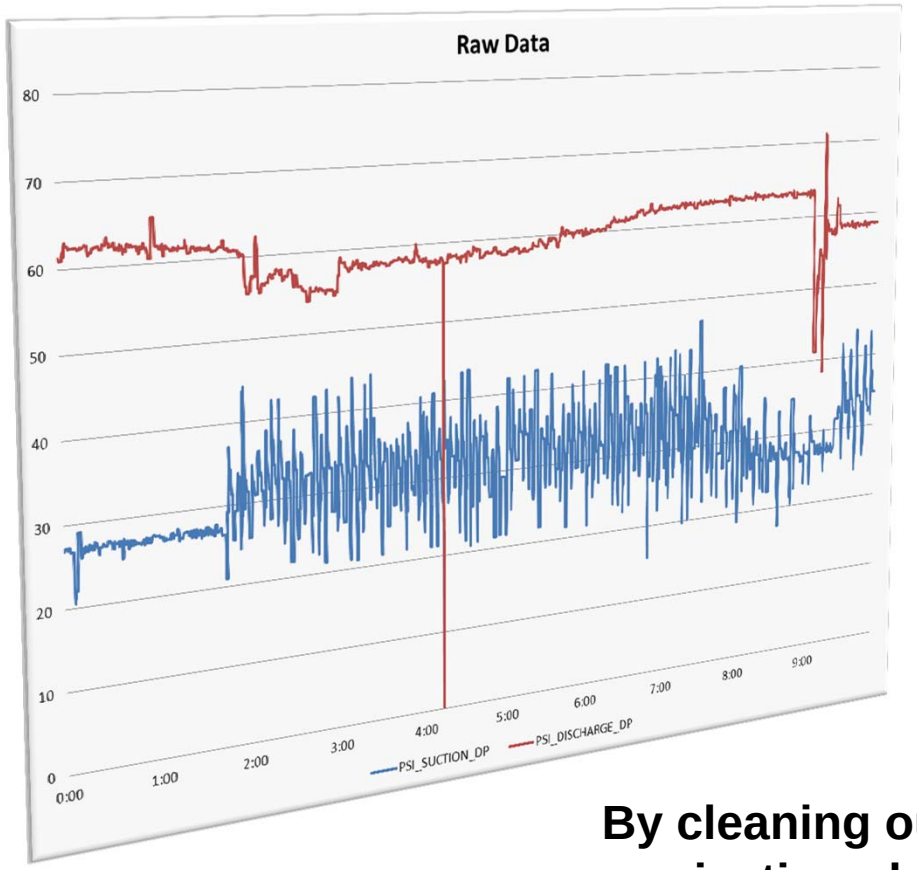


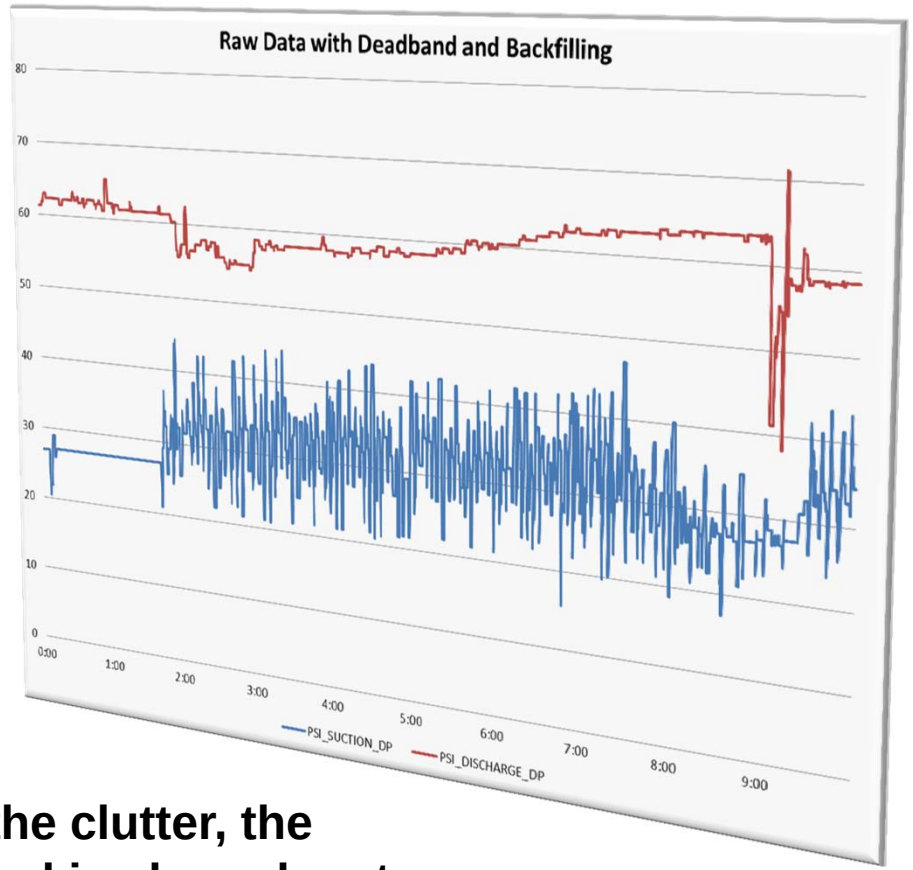
Messages are reduced without sacrificing the quality of data.

What can be done?

- Backfilling lost data
  - Custom Programming
  - Change of Protocol – DNP3
    - Time-stamped data
    - Report by Exception
    - Unsolicited Response
    - Event-based queuing of data

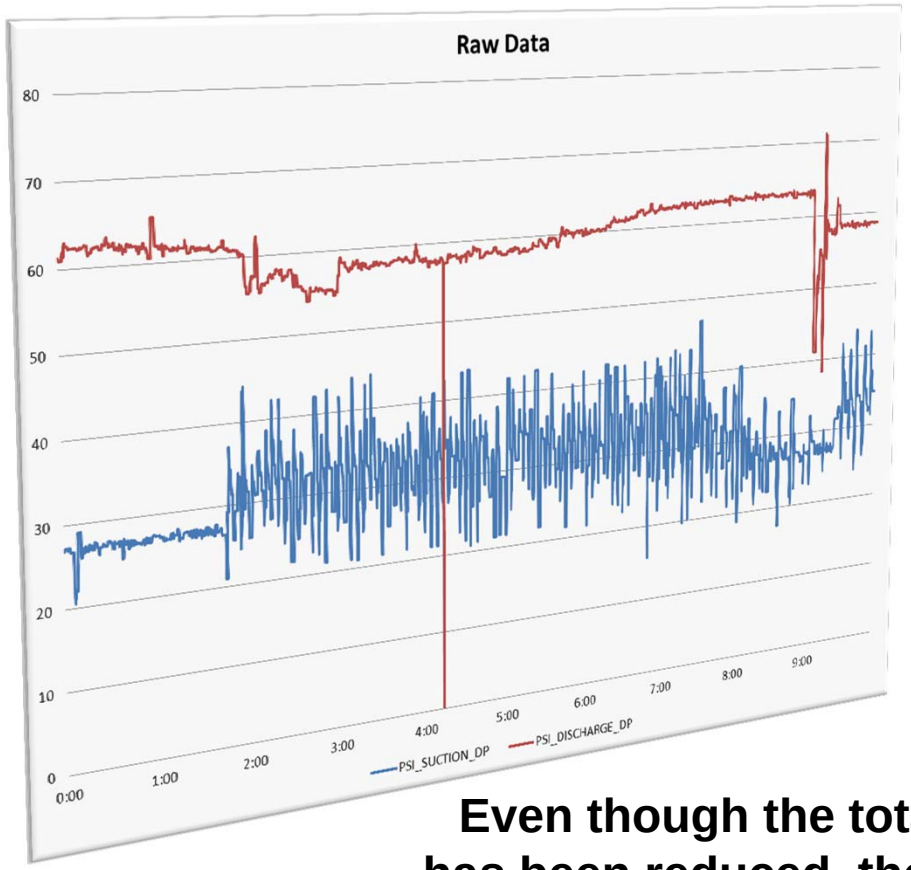
What can be done?

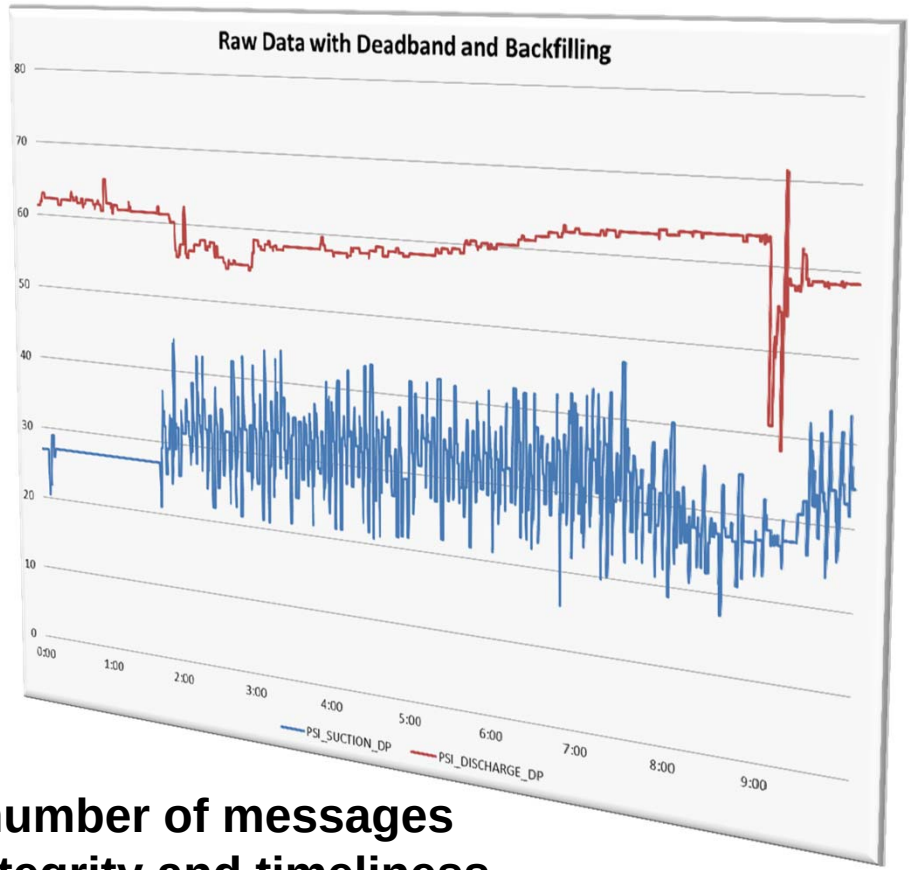




By cleaning out the clutter, the communication channel is cleared up to allow quicker poll times and backfilling.

What can be done?





Even though the total number of messages has been reduced, the integrity and timeliness of the data has not been compromised.

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Questions?

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