



# APA Group's PI System

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**APA Group**



# Introduction

- About APA Group
- APA Group's OSI PI Journey and Roadmap
- PI Implementations
  - Meter Data Management System – APA Grid
  - NIMDS – Networks Interval Meter Data System
  - Data Challenges
- Solution Overview
- Summary

# About APA Group

APA is Australia's largest gas infrastructure business

- **Gas transmission pipelines and storage**

- Owning and operating two-thirds\* of Australia's onshore transmission pipelines
- Interconnected pipeline networks
- Transporting approximately half the gas used domestically
- Underground and LNG gas storage

- **Gas distribution networks**

- Operating approximately a third\* of the nation's gas distribution networks
- Long-term agreement to operate Australian Gas Networks assets
- Own the Central Ranges (Tamworth) network
- Ownership interest in and operate the Allgas distribution network.

- **Other related energy infrastructure**

- Developed and acquired complementary energy infrastructure, including gas-fired and wind-driven electricity generation, gas processing and electricity transmission

\* By length

**ASX Top 50**

**\$9.8 B**

**MARKET CAP**  
AS AT 24 JUL 2015

**Moody's: Baa2**  
(outlook Stable)

**S&P: BBB**  
(outlook Stable)

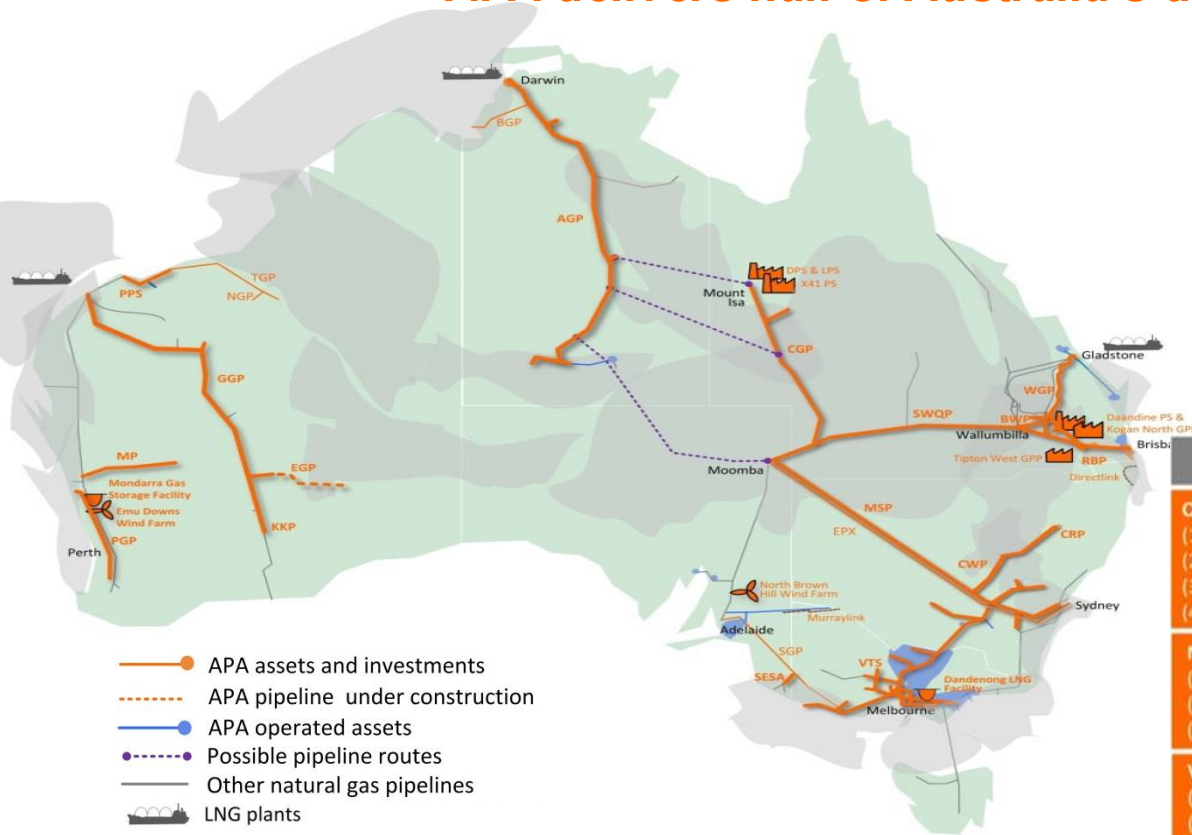
**CREDIT RATINGS**

**\$19 Billion Assets**

**Employees** More than 1,600

# APA asset and investment portfolio

*APA delivers half of Australia's domestic gas usage*



**Assets owned and/or operated**

## Gas transmission

14,744<sup>(1)</sup> km transmission pipelines  
Underground & LNG gas storage

## Gas distribution

27,100 km gas network pipelines  
1.3 million gas consumers

## Other energy infrastructure

585 MW power generation  
244 km HV electricity transmission  
Gas processing plants



## Energy Infrastructure

### Queensland

- (1) Roma Brisbane Pipeline
- (2) Carpentaria Gas Pipeline
- (3) Berwyndale Wallumbilla Pipeline
- (4) South West Queensland Pipeline

### New South Wales

- (5) Moomba Sydney Pipeline
- (6) Central West Pipeline
- (7) Central Ranges Pipeline

### Victoria

- (8) Victorian Transmission System
- (9) Dandenong LNG facility

### South Australia

- (10) SESA Pipeline

### Western Australia

- (11) Pilbara Pipeline System
- (12) Goldfields Gas Pipeline (88.2%)
- (13) Eastern Goldfields Pipeline (under construction)
- (14) Kalgoorlie Kambalda Pipeline
- (15) Mid West Pipeline (50%)
- (16) Parmelia Gas Pipeline
- (17) Mondarra Gas Storage Facility
- (18) Emu Downs wind farm

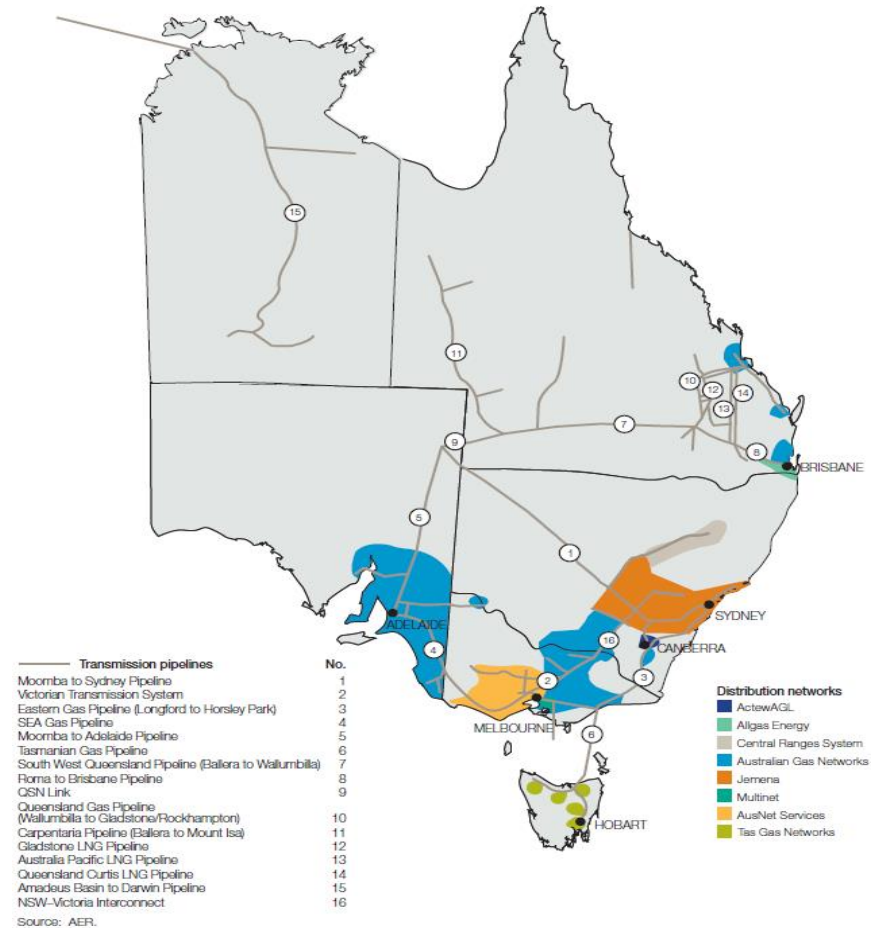
### Northern Territory

- (19) Amadeus Gas Pipeline

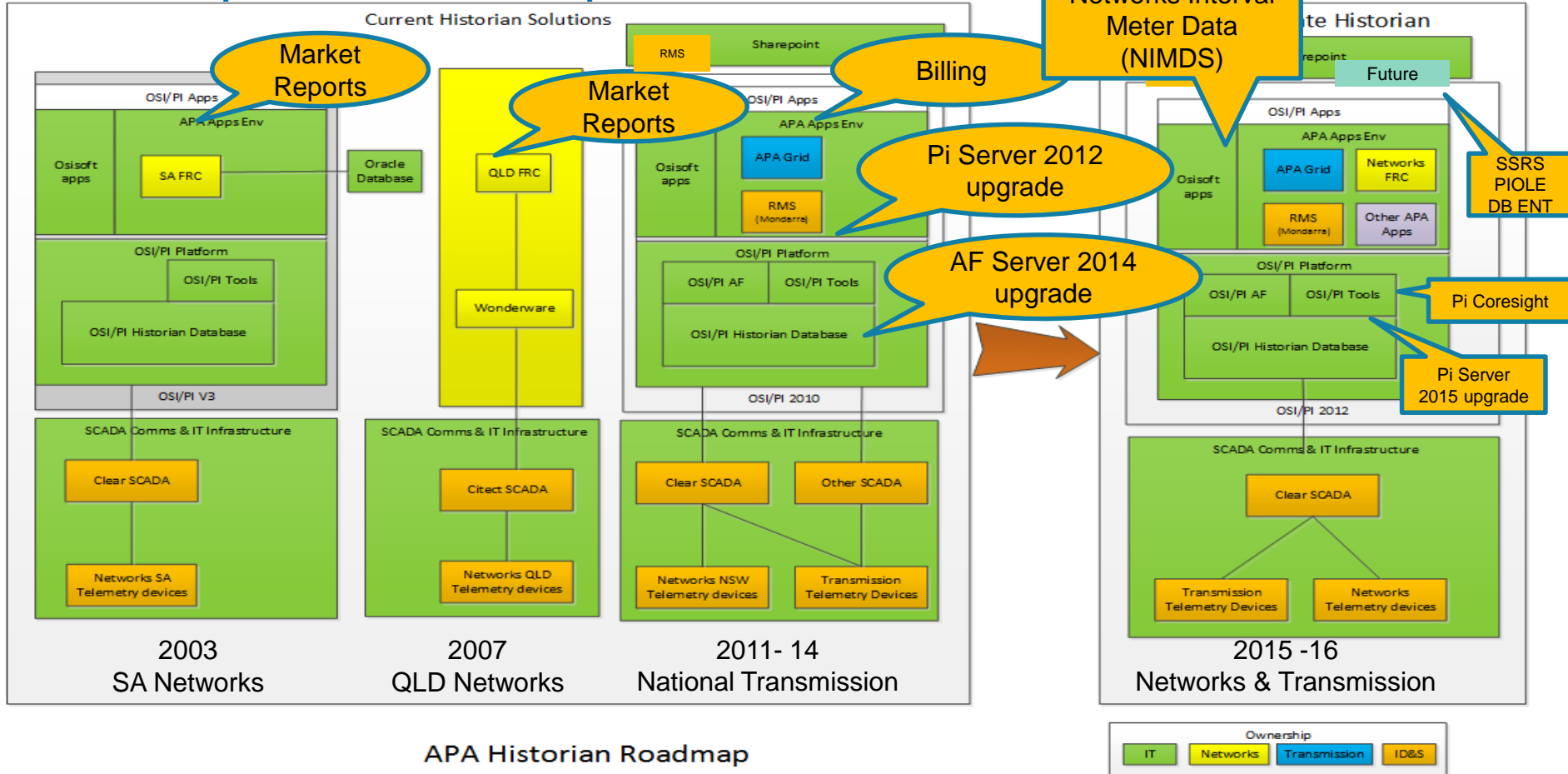
# Gas Networks Operations

- Delivering gas to domestic and commercial use customers
- Daily consumption reporting to regulators (AEMO) and retailers for high demand customers
- Require Daily/Hourly telemetered reads of high gas demand customers

Major gas pipelines—eastern Australia



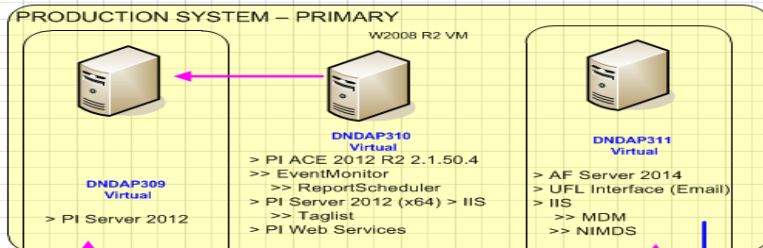
# APA Group's Historian Roadmap



APA Historian Roadmap

# System Architecture

Data Center 1



SCADA/Corp Presentation Zone (10.87.7)

SCADA Firewall

DC2 SCADA Transit Zone

SCADA WAN

**PI**  
**PROD\_Collective**

SCADA Firewall

DC2 SCADA Transit Zone

**AF**  
**PROD\_Collective**

**PRODUCTION SYSTEM - SECONDARY**

W2008 R2 VM

**ADLAP310 Virtual**

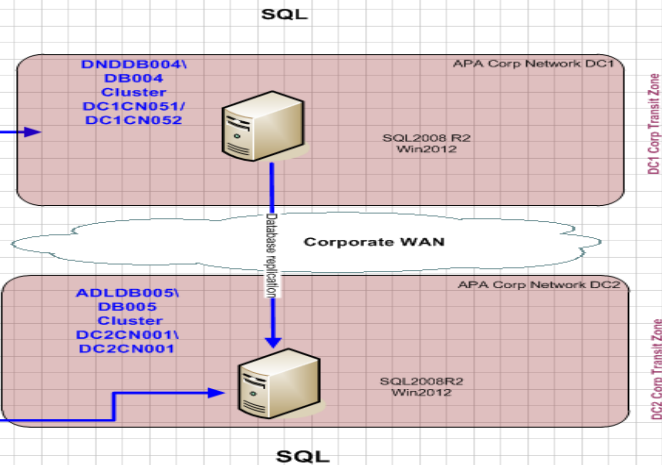
**ADLAP311 Virtual**

SQL



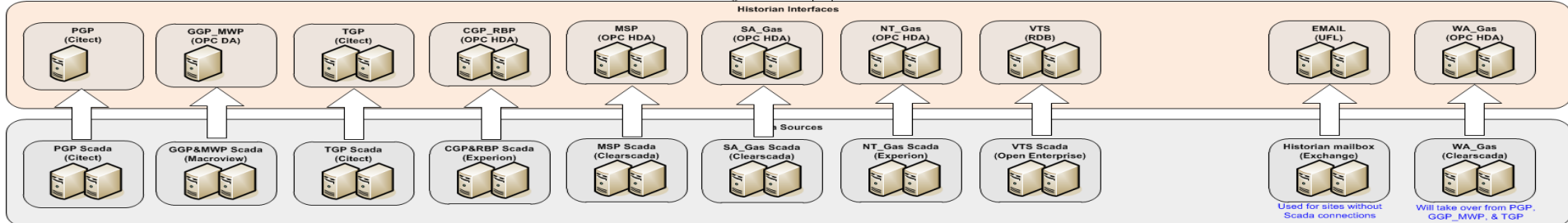
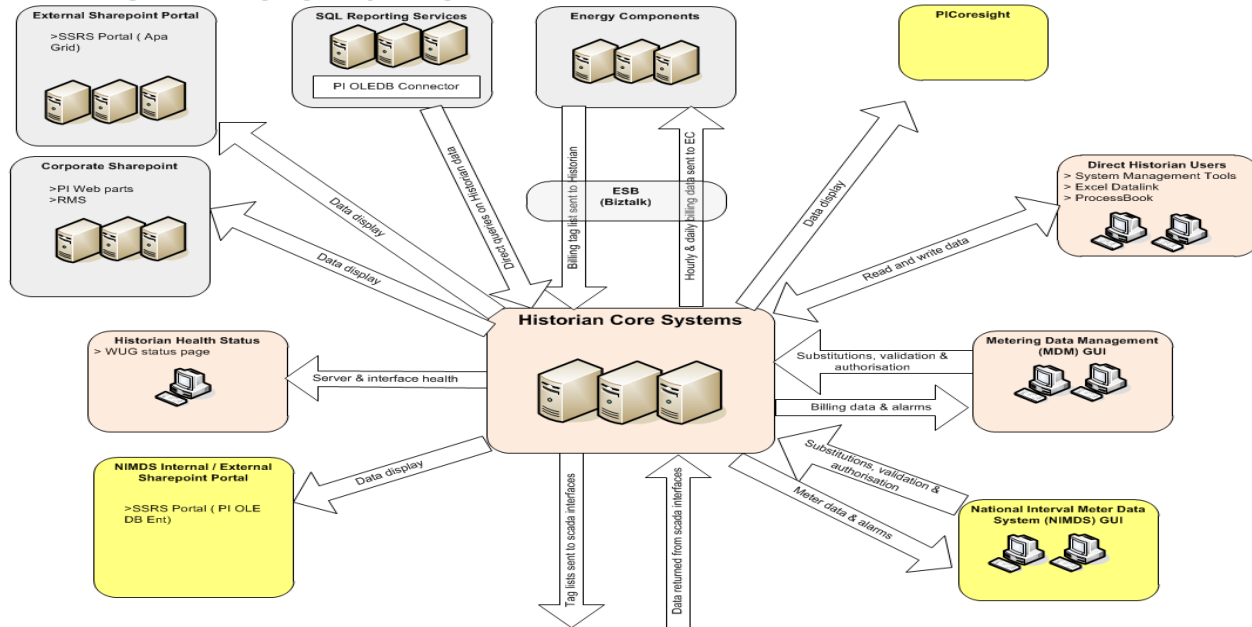
> PI Server 2012

Data Center 2



- 2 HA PI Servers
- 2 HA AF servers
- 2 PI ACE servers sharing the workload independently
- 2 Front end GUI servers on AF servers (MDM and NIMDS)
- 2 Clustered SQL servers, replicating across DC1 and DC2

# System Architecture

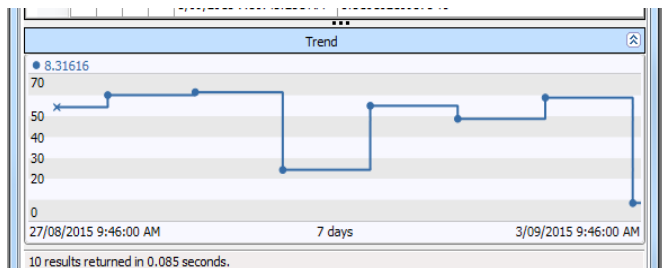




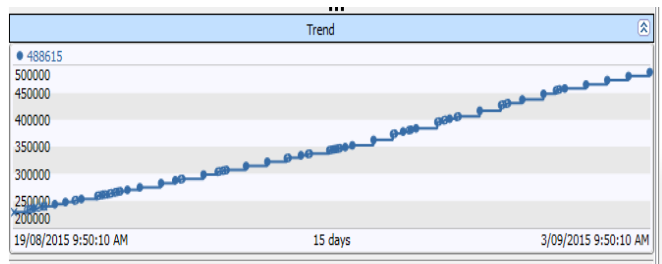
# Challenges for Gas Meters

1. Selecting correct end of gas day value for a Meter
  - Reporting to regulator and retailers
2. No End Gas day value available or data missing
  - Estimating
  - Substituting
3. What if the EOGD value is incorrect
  - Validation tests
  - Manual overrides

# Selecting Correct EOGD Value



## Step Change



## Accumulator Change

The screenshot shows the PI System Explorer interface for the BillingSystem. The left pane displays a tree view of elements, including RBP, Argyle, Braemar, and Station. The right pane shows the configuration for the "Energy Last Day" element, with tabs for General, Child Elements, Attributes, Ports, Analyses, and Version. The "Attributes" tab is selected, showing a table of attributes and their values.

Name	Value
ActualValueStrategy	OneStep
EstimateValueStrategy	Accumulator
RecordPoint	AccumulatorContinuous
ReportingPeriod	AccumulatorIndex
SourcePoint	DailyRecalculate
ValuePoint	Delta
	Disabled
	FirstStep
	FirstValue
	LastStep
	LastValue
	LastValueGasPeriod
	OneStep
	Standard
	StandardBackFill
	StandardContinuous
	UAFG

- Building Strategies using the PI SDK and PI ACE jobs, Eg One step , First step, Last Value
- Selecting strategies within the AF meter configuration

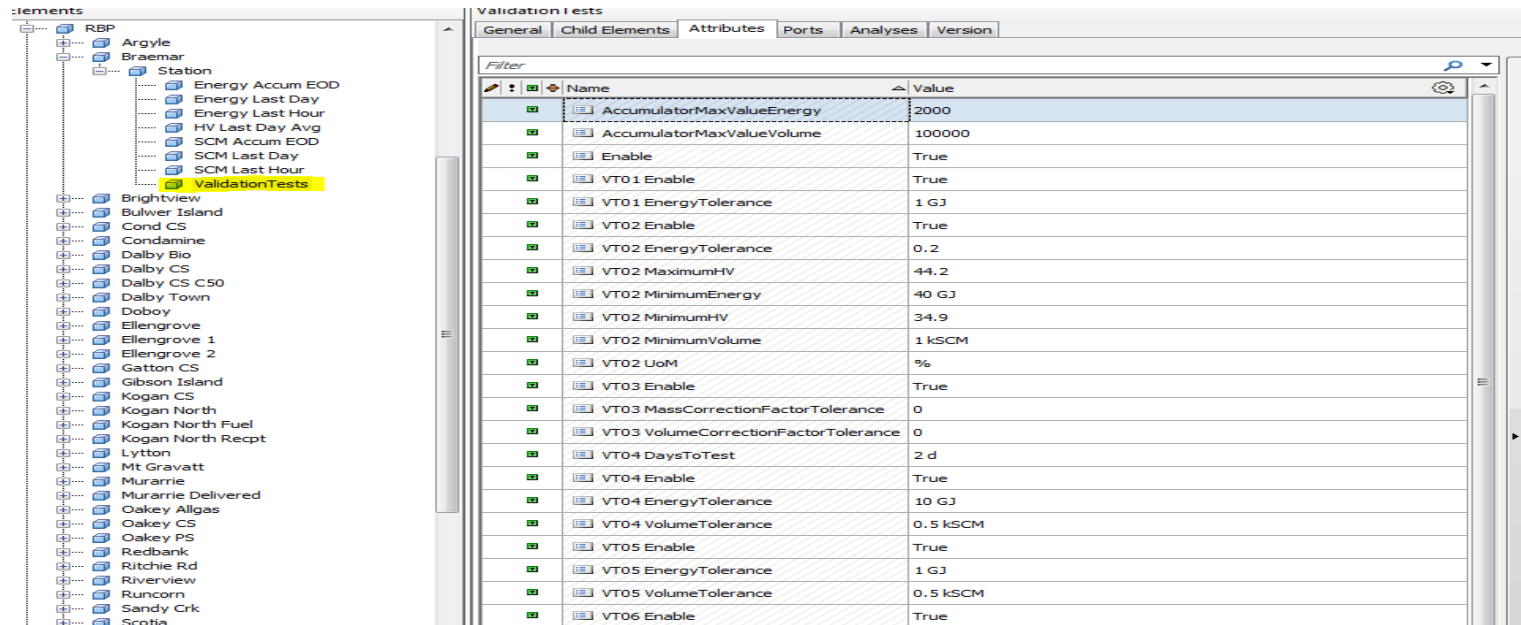
# Missing Data

The screenshot shows the PI System Explorer interface. On the left, a tree view displays the hierarchy: RBP > Argyle > Braemar > Station > Energy Last Day. The right pane shows the configuration for 'Energy Last Day' with tabs for General, Child Elements, Attributes, Ports, Analyses, and Version. The 'Attributes' tab is active, displaying a table of attributes and their values.

Name	Value
ActualValueStrategy	OneStep
EstimateValueStrategy	PreviousPeriod
RecordPoint	Constant Disabled
ReportingPeriod	Nomination PreviousDay
SourcePoint	PreviousPeriod PreviousWeek
ValuePoint	Zero 82657380859375

- Building Estimation Strategies using the PI SDK and PI ACE jobs, Eg Previous Period , Previous Day
- Selecting Estimation strategies within the AF meter configuration

# Invalid Data



The screenshot displays the 'Validation Tests' configuration window in the OSIsoft PI SDK. The left pane shows a hierarchical tree of elements, with 'ValidationTests' selected. The right pane shows a table of validation tests, with columns for 'Name' and 'Value'.

Name	Value
AccumulatorMaxValueEnergy	2000
AccumulatorMaxValueVolume	100000
Enable	True
VT01 Enable	True
VT01 EnergyTolerance	1 GJ
VT02 Enable	True
VT02 EnergyTolerance	0.2
VT02 MaximumHV	44.2
VT02 MinimumEnergy	40 GJ
VT02 MinimumHV	34.9
VT02 MinimumVolume	1 kSCM
VT02 UoM	%
VT03 Enable	True
VT03 MassCorrectionFactorTolerance	0
VT03 VolumeCorrectionFactorTolerance	0
VT04 DaysToTest	2 d
VT04 Enable	True
VT04 EnergyTolerance	10 GJ
VT04 VolumeTolerance	0.5 kSCM
VT05 Enable	True
VT05 EnergyTolerance	1 GJ
VT05 VolumeTolerance	0.5 kSCM
VT06 Enable	True

- Building Validation tests using the PI SDK and PI ACE jobs, Switch Validations on/off within AF
- Providing a Front end GUI for controllers to Acknowledge validation failures, override and correct data

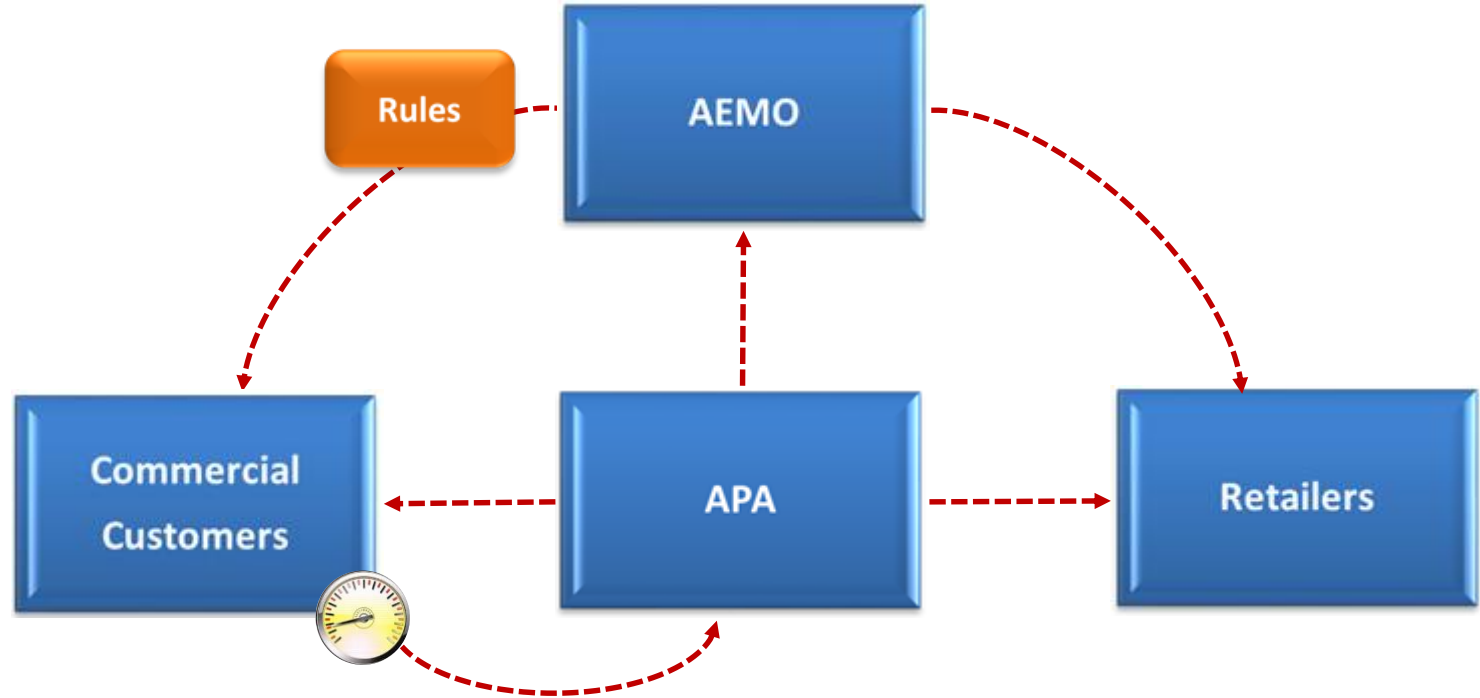
# 3-Point Auditing System

1. Source Point Tag
  - Unchanged Raw Data
2. Audited Value Value Point Tag (AVVP)
  - Value selected to be reported
  - Edited data
  - eg NTY.GT.BGP.WOT.GC.HV Last Day Avg.AVVP
3. Audited Value Record Point Tag (AVRP)
  - Audit trail of who changed what and when
  - eg NTY.GT.BGP.WOT.GC.HV Last Day Avg.AVRP

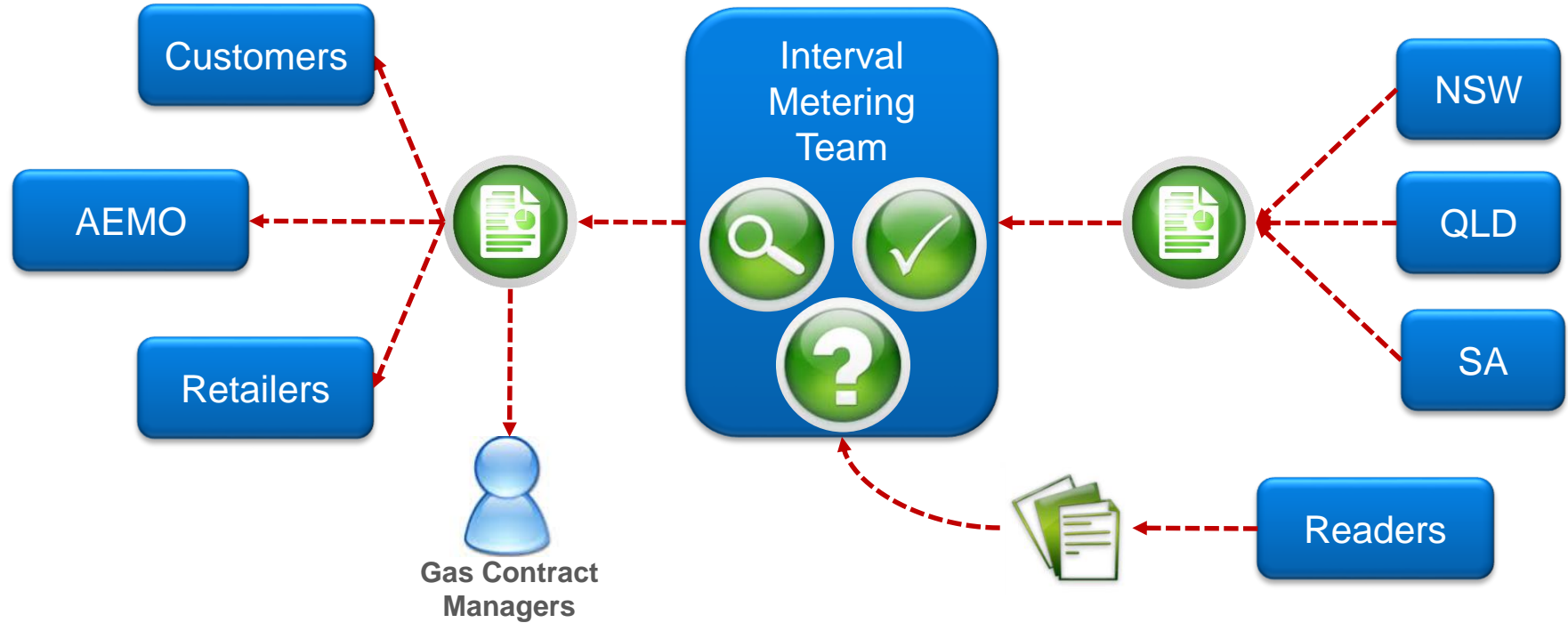
Value	Event Time
2015-08-26 07:32:18,37,2015-08-25 22:30:00,S,-,Reason Code: Other. Comment: test,PIPELINETRUST\thegia,	26/08/2015 8:00:00 AM

# NIMDS

# Full Retail Contestability

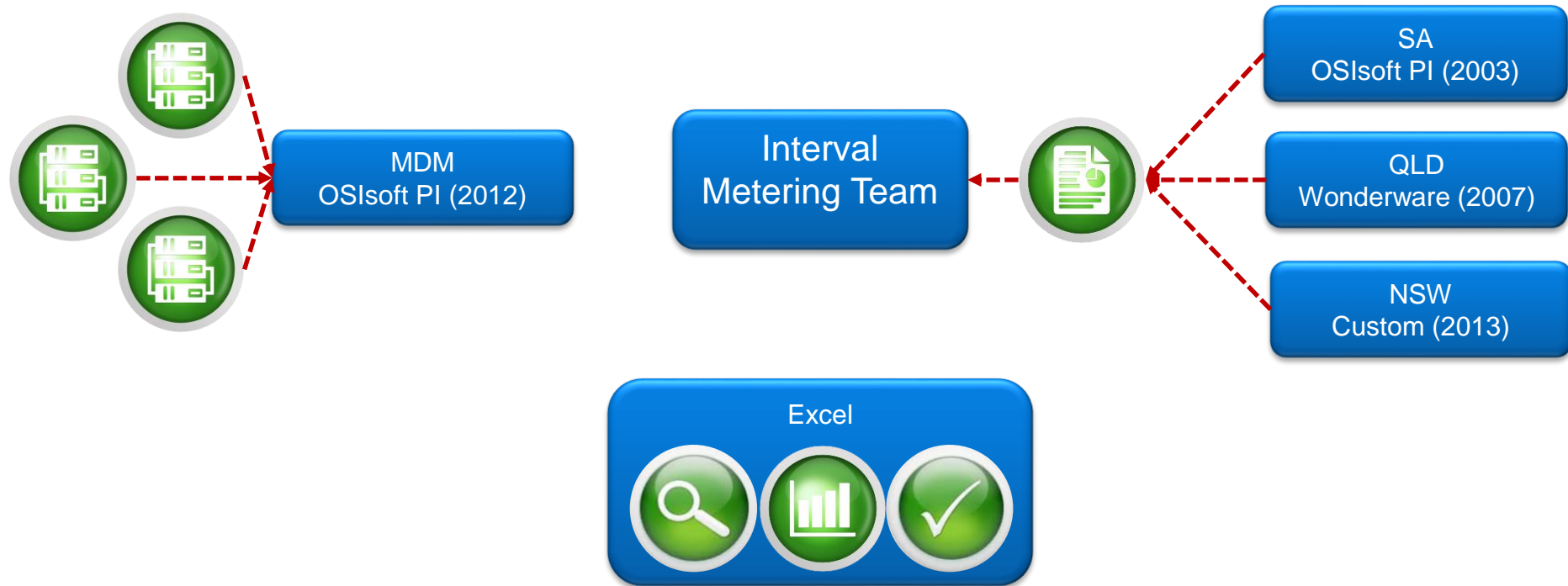


# Managing FRC Data

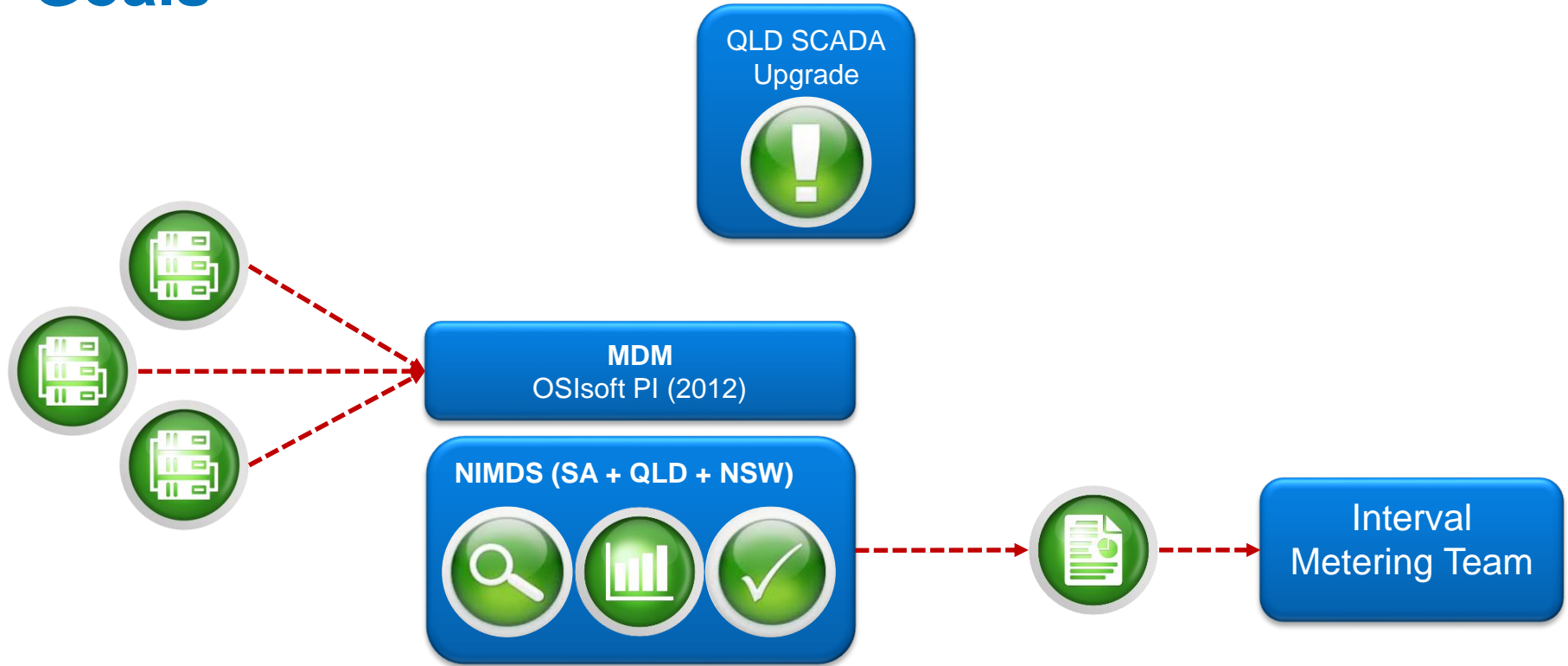




# Current State



# Goals

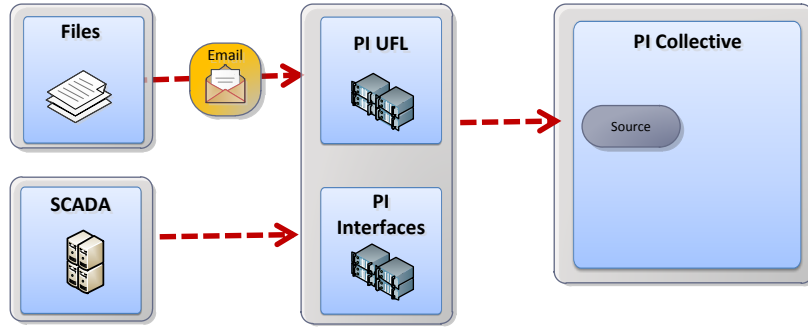


# High-Level Requirements

- Real-time and file-based data collection
- Selection of data events
- Implement FRC estimation 'rules'
- Data validation
- System health
- Reporting & data delivery
- Data management interface
- Support EOM Reconciliation process

# Walkthrough

# Component Overview



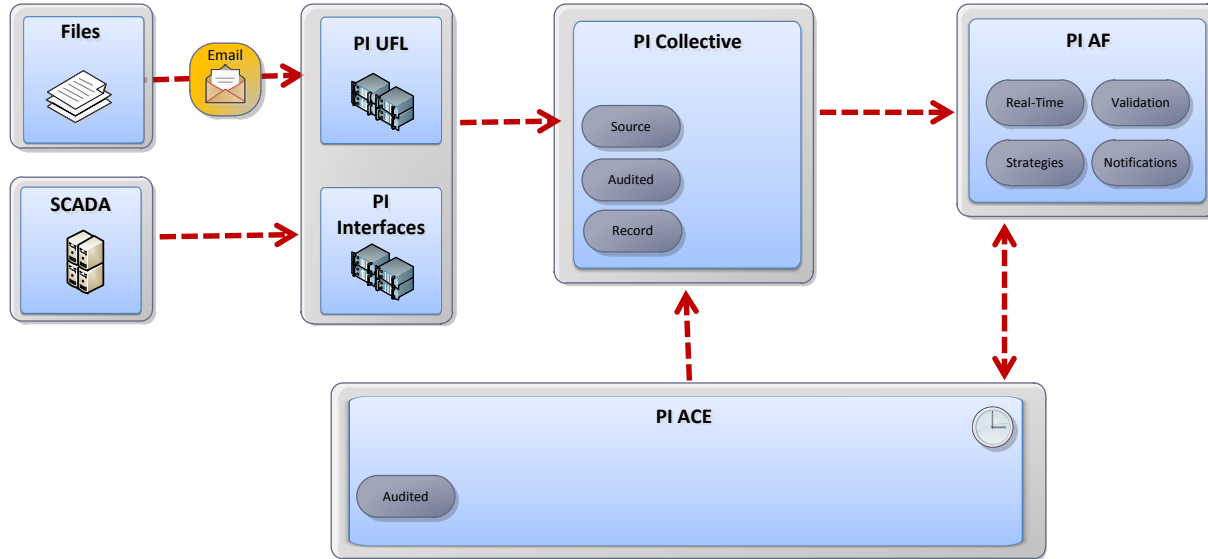
# AF Contains the Blueprint for Data Processing

The screenshot displays the AF (Advanced Function) interface. On the left, a tree view under 'Elements' shows a hierarchy: RBP (Argyle, Braemar, Station). The 'Station' element is expanded, showing sub-elements: Energy Accum EOD, Energy Last Day, Energy Last Hour, HV Last Day Avg, SCM Accum EOD, SCM Last Day, SCM Last Hour, and ValidationTests. Below this, other elements like Brightview, Bulwer Island, Cond CS, Condamine, Dalby Bio, Dalby CS, Dalby CS C50, Dalby Town, and Doboy are listed.

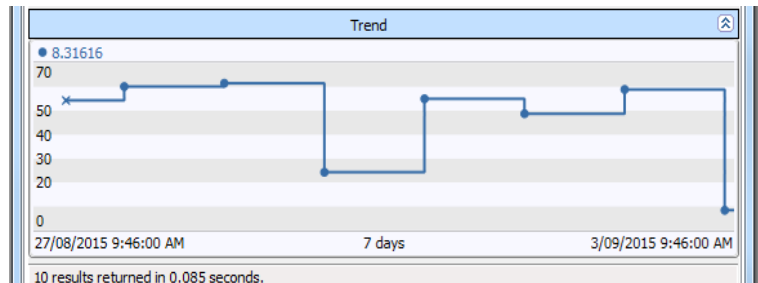
The right pane shows the 'Energy Last Day' element selected. It has tabs for General, Child Elements, Attributes, Ports, Analyses, and Version. The 'Attributes' tab is active, showing a table with columns 'Name' and 'Value'. A search filter is present above the table. The table lists several attributes, with 'ActualValueStrategy' selected, showing a dropdown menu with options: OneStep, Accumulator, AccumulatorContinuous, AccumulatorIndex, DailyRecalculate, Delta, Disabled, FirstStep, FirstValue, LastStep, LastValue, LastValueGasPeriod, Standard, StandardBackFill, StandardContinuous, and UAFG.

Name	Value
ActualValueStrategy	OneStep
EstimateValueStrategy	Accumulator
RecordPoint	AccumulatorContinuous
ReportingPeriod	AccumulatorIndex
SourcePoint	DailyRecalculate
ValuePoint	Delta

# Component Overview



# Value Strategy Example



What gas period is the value in?

Do we already have a value/should we update?

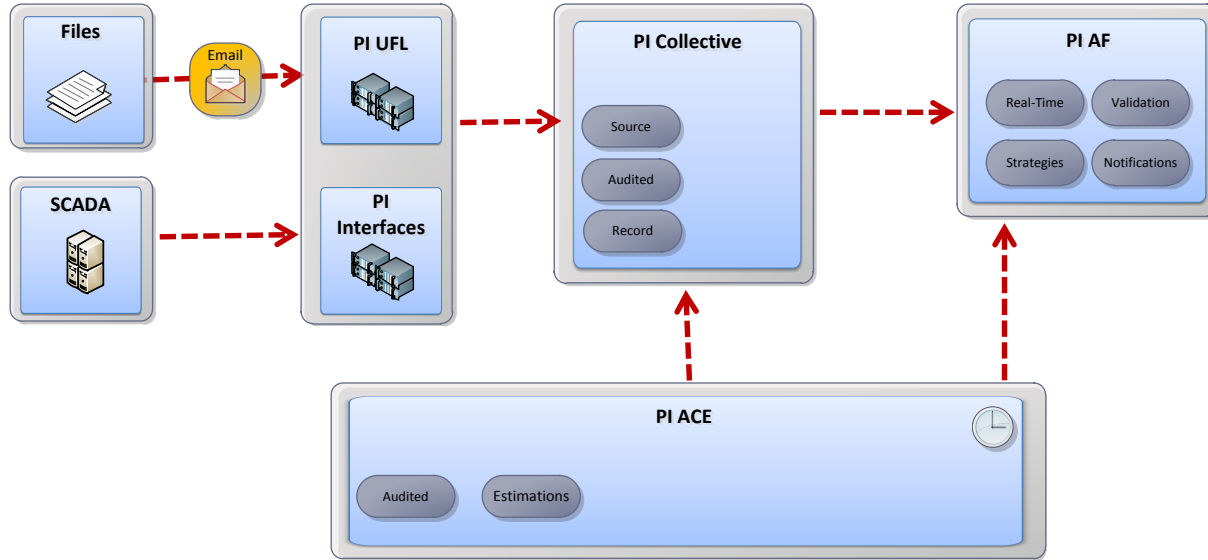
Fetch all values within a 'window' around the gas period

Starting from the first value  
(and only looking at 'good' and >0)

Find first value different than the preceding one



# Component Overview



# Estimation Strategy Example

Is it x minutes past the gas period?

Do we have a value for the period?

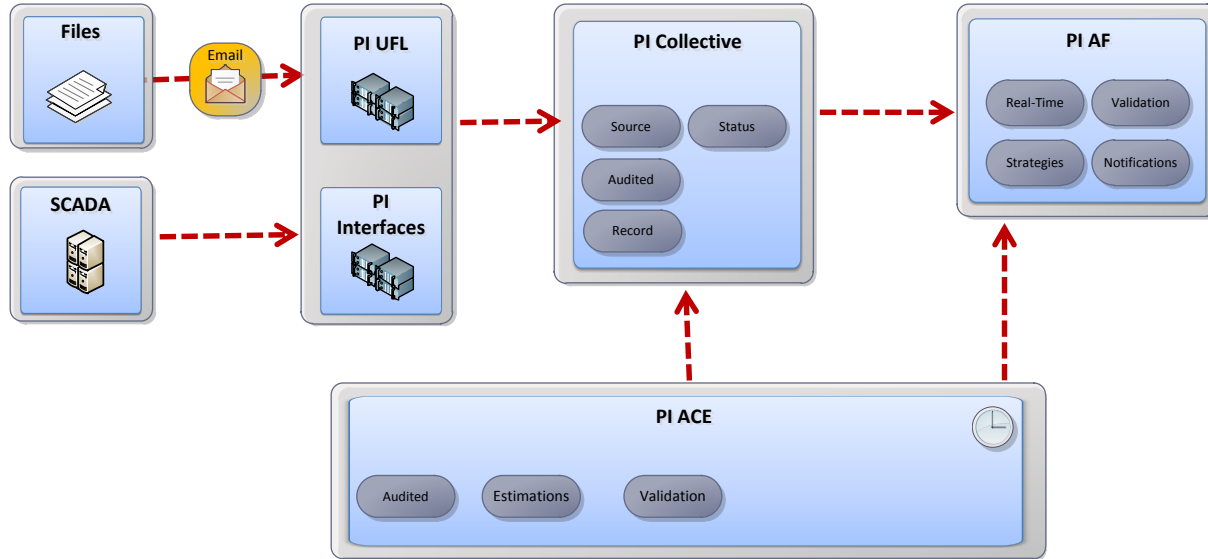
If not, provide a value using the method configured in AF

Write the estimate to the audited value

Record the method in the audit record

23/08/2015 1:00:00 PM	2015-08-23 03:20:12,107,2015-08-23 02:00:00,E,Unreconciled,Previous Value [3600],,
23/08/2015 12:00:00 PM	2015-08-23 22:30:11,96,2015-08-23 02:00:00,E,Unreconciled,Hourly ReEstimate,,

# Component Overview

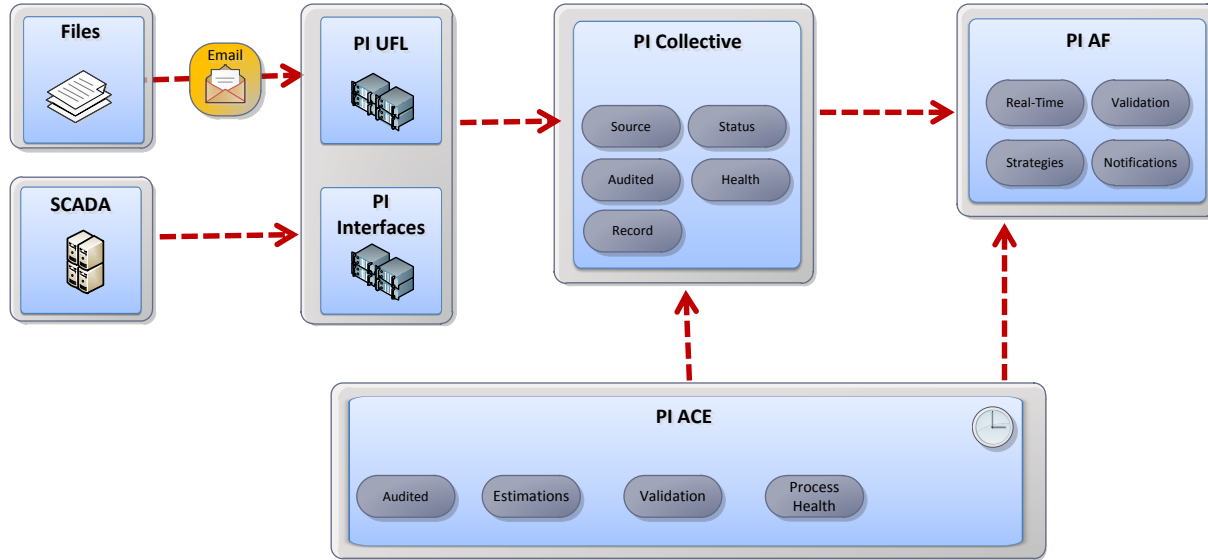


# Validation Structure

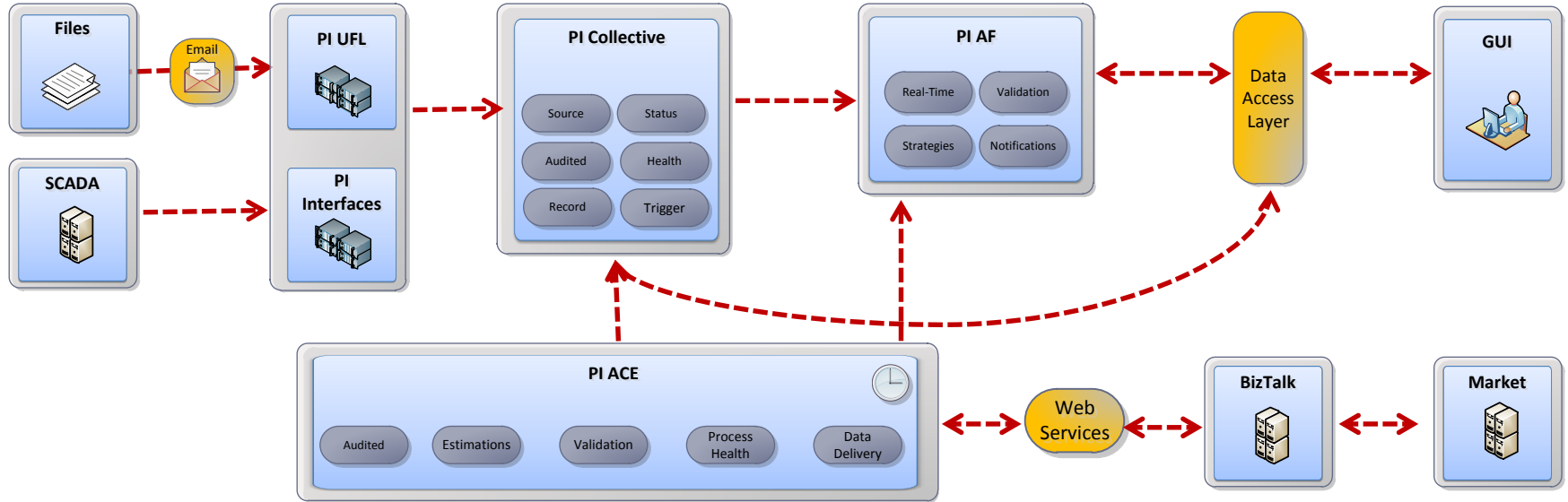
The screenshot displays the OSIsoft Validation Tests interface. On the left, a tree view shows the project structure, with 'ValidationTests' highlighted. On the right, a table lists various validation test parameters and their values. A callout box provides a detailed view of the VT05 parameters.

Name	Value
AccumulatorMaxValueEnergy	2000
AccumulatorMaxValueVolume	100000
Enable	True
VT01 Enable	True
VT01 EnergyTolerance	1 GJ
VT02 Enable	True
VT02 EnergyTolerance	0.2
<b>VT05 Enable</b>	<b>True</b>
<b>VT05 EnergyTolerance</b>	<b>1 GJ</b>
<b>VT05 VolumeTolerance</b>	<b>0.5 kSCM</b>
VT03 Enable	True
VT03 MassCorrectionFactorTolerance	0
VT03 VolumeCorrectionFactorTolerance	0
VT04 DaysToTest	2 d
VT04 Enable	True
VT04 EnergyTolerance	10 GJ
VT04 VolumeTolerance	0.5 kSCM
VT05 Enable	True
VT05 EnergyTolerance	1 GJ
VT05 VolumeTolerance	0.5 kSCM
VT06 Enable	True

# Component Overview



# Component Overview



[Overview](#)[Operational  
Dashboard](#)[Site Detail](#)[Reports](#)[Reconciliations](#)[Bulk Data  
Processing](#)[Manual Meter  
Entering](#)[Configuration](#)[System  
Administration](#)[Help](#)[Log Out](#)Network: Gas Day:  11 days with outstanding VT Errors - Beginning Date: 20-Aug-2015 - [Click to Expand](#)

## Network Validation - For Date: 30-Aug-2015

	Commissioned	Actual Sites	Estimate Sites	Substitute Sites
MIRNs	6	0	6	0
Gates	4	0	4	0
Totals	10	0	10	0

[See all Site Validation Errors](#)

## HV Zone Values and Status:

HV Zone ID	HV Zone Name	Value	Status
211	Brisbane	37.19	Actual
254	Gladstone	37.47	Actual
222	Ipswich	37.46	Actual
233	Lockyer Valley	37.47	Estimated
107	Mt Gravatt	37.20	Estimated
244	Rockhampton	37.48	Estimated

## HVzone Validation Errors

HV Zone ID	HV Zone Name	Value	Original Value	Validation Message
107	Mt Gravatt	37.1959953308105	N/A	HVT_ActualHV

## Report Status:

File Name	Status	Delivery Status	ACK Status	Comments
DailyExtract	Pending	-	-	
DailyUpdateExtract	Pending	-	-	

## Sites exceeding MDQ and MHQ:

MIRN	Customer Name	Site Name	Contracted MDQ	MDQ Value	Contracted MHQ	MHQ Value	Max Daily	Max Hourly Meter Capacity
No results returned								

Network Interval Metering Data System - NIMDS

System Environment: DEV

Current User: ###

OverviewOperational DashboardSite DetailReportsReconciliationsBulk Data ProcessingManual Meter EnteringConfigurationSystem AdministrationHelpLog Out

Network: QLD.AustralianGasNetworkFilter: All SitesChermside-Rode Rdor SearchGas Day: 30-Aug-2015Go

Site Daily Values - For date: 30-Aug-2015

SCADA Type	Run 1	Run 2	Station	Quality	UOM
ACM Last Day	0.202	N/A	N/A	Actual	ksm3
SCM Last Day	2.136	N/A	2.136	Estimated	ksm3
Energy Last Day	N/A	N/A	79.497650136	Estimated	GJ
HV Last Day Average	N/A	N/A	37.218001	Actual	MJ/m3
PCF Last Day Average	N/A	N/A	10.764	Actual	N/A
Update SCM Last Day	N/A	N/A		N/A	N/A
Update Energy Last Day	N/A	N/A		N/A	N/A
Active Run	False	False	N/A	N/A	N/A

Site Visits and Activity

Timestamp

No results returned

Comment

26-08-2015 8:00:00 AM	218.275906254	Estimated	5.853	Estimated	Previous Value [86400]
27-08-2015 8:00:00 AM	218.275906254	Estimated	5.94	Estimated	Previous Value [86400]
28-08-2015 8:00:00 AM	218.275906254	Substituted	5.94	Substituted	ConfiguredToSubstitute
29-08-2015 8:00:00 AM	189.720930906	Estimated	5.094	Estimated	Previous Value [86400]
30-08-2015 8:00:00 AM	79.497650136	Estimated	2.136	Estimated	Previous Value [86400]
31-08-2015 8:00:00 AM	117.656507164	Estimated	3.164	Estimated	Previous Value [86400]

Hourly Values

Trend Hourly Values vs STLW

Audit Log

ACM Index Values

Acknowledge

Save



# Network Interval Metering Data System - NIMDS

System Environment: **DEV**

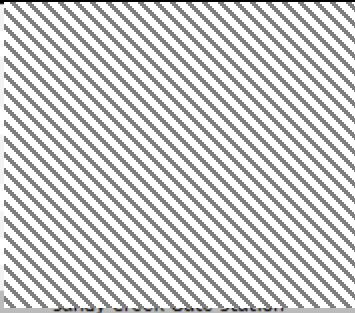
Current User: ###

[Overview](#)
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[Reports](#)
[Reconciliations](#)
[Bulk Data Processing](#)
[Manual Meter Entering](#)
[Configuration](#)
[System Administration](#)
[Help](#)
[Log Out](#)

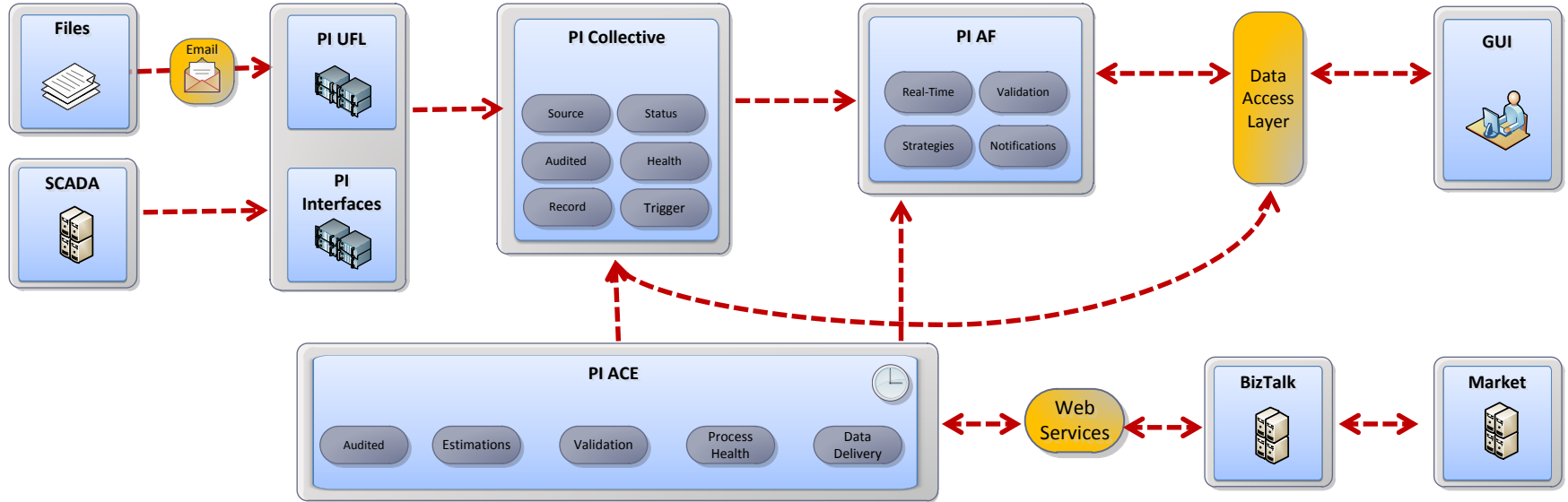
Network:

Filter:

Selected Gas Month:

MIRN	Site Name	Customer Name	Reconciled Status	Meter Head Index	ACM Accumulator	Percentage Difference	Comments from Manual Meter Reads
5420098926	Brisbane-Albert St		Unreconciled	?	?	?	Textbox
5420100586	Brisbane-Eagle St		Unreconciled	?	?	?	Textbox
5420100205	Brisbane-George St-2A		Unreconciled	?	?	?	Textbox
5420000001	Chermside-Rode Rd		Unreconciled	?	245889	?	Textbox
5420096135	Fortitude Valley-Wickham Tce		Unreconciled	?	?	?	Textbox
5420000024	Virginia-Ferric St		Unreconciled	?	257609.992676	?	Textbox
40000017PC	Gladstone-GS		Unreconciled	N/A	0	N/A	Textbox
40000018PC	Rockhampton-GS-North		Unreconciled	N/A	5374050	N/A	Textbox
40000019PC	Rockhampton-GS-South		Unreconciled	N/A	90736.001587	N/A	Textbox
40000023PC	Sandy Creek-GS		Unreconciled	N/A	N/A	N/A	Textbox

# Component Overview



# Summary

NIMDS will deliver a single, national platform that will bring efficiency and standardization to interval metering data management.

## BUSINESS CHALLENGES

- A. Provide a single application able to support the requirements of all states
- B. Maximise the value of investment in existing systems
- C. Retire legacy FRC systems
- D. Reduce dependency on spreadsheets

## SOLUTION

- A. Follow the technical approach developed in previous MDM system built on OSIsoft PI
- B. PI ACE managing data processing, PI AF providing structure and configuration instructions
- C. User interface developed in .NET using PI SDK

## RESULTS AND BENEFITS

- A. Single scalable FRC application will transform and bring great efficiency to the interval metering business process
- B. Legacy systems will be retired

# Contact Information

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Partner  
Green Technology Services



# Questions

Please wait for the  
**microphone** before asking  
your questions



State your  
**name & company**

# Please don't forget to...

Complete the Survey  
for this session



The **Power of Data**

DECISION READY IN REAL-TIME

## Evaluation Form (Seminar Location - Date)

Name: \_\_\_\_\_ Company: \_\_\_\_\_

Email: \_\_\_\_\_

### Quality and content of the presentations

Poor Good Excellent N/A

Welcome	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Journey To Real-Time Operational Intelligence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Power of Connection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tank Level Management System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unleash your Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information on the Spot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wrap-up/Seminar Conclusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Quality and organization of the seminar

Choice of date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time allowed for lunch/breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Choice of presentations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Break and time allowed for the presentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado