

Sigmafine underpinning Allocation Success within the World's largest LNG Company: Lesson Learned

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AGENDA

- Qatargas
- Product Allocation
- Sigmafine as Product Allocation
- Challenges & Lesson Learned
- Thanks
- Questions

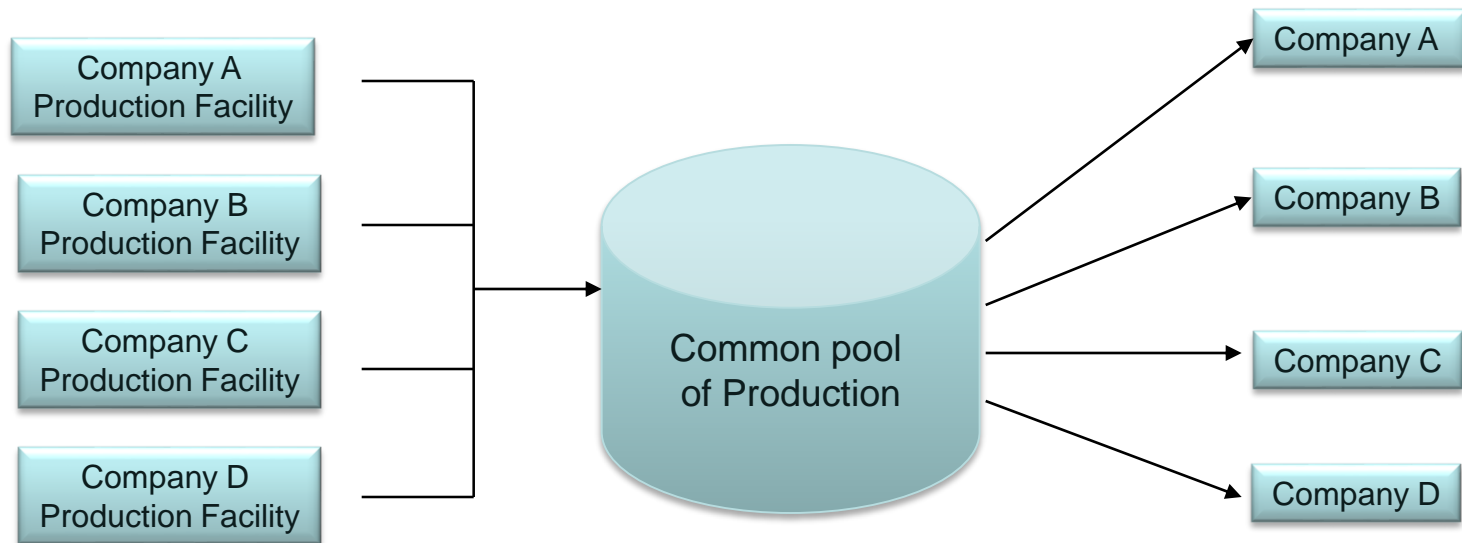
QATARGAS

- **Qatar.**
- **Natural Gas in Qatar.**
- **Ras Laffan**
- **Expansion.**
- **Common Facilities**
- **Agreements**
- **Traditional Production Allocation**
- **Process Plant - Product Allocation**
- **Qatargas Operating Company**

Product Allocation

Facts to bear in mind:

1. Actual production always differs from plan
2. Sales are never exactly equal to production



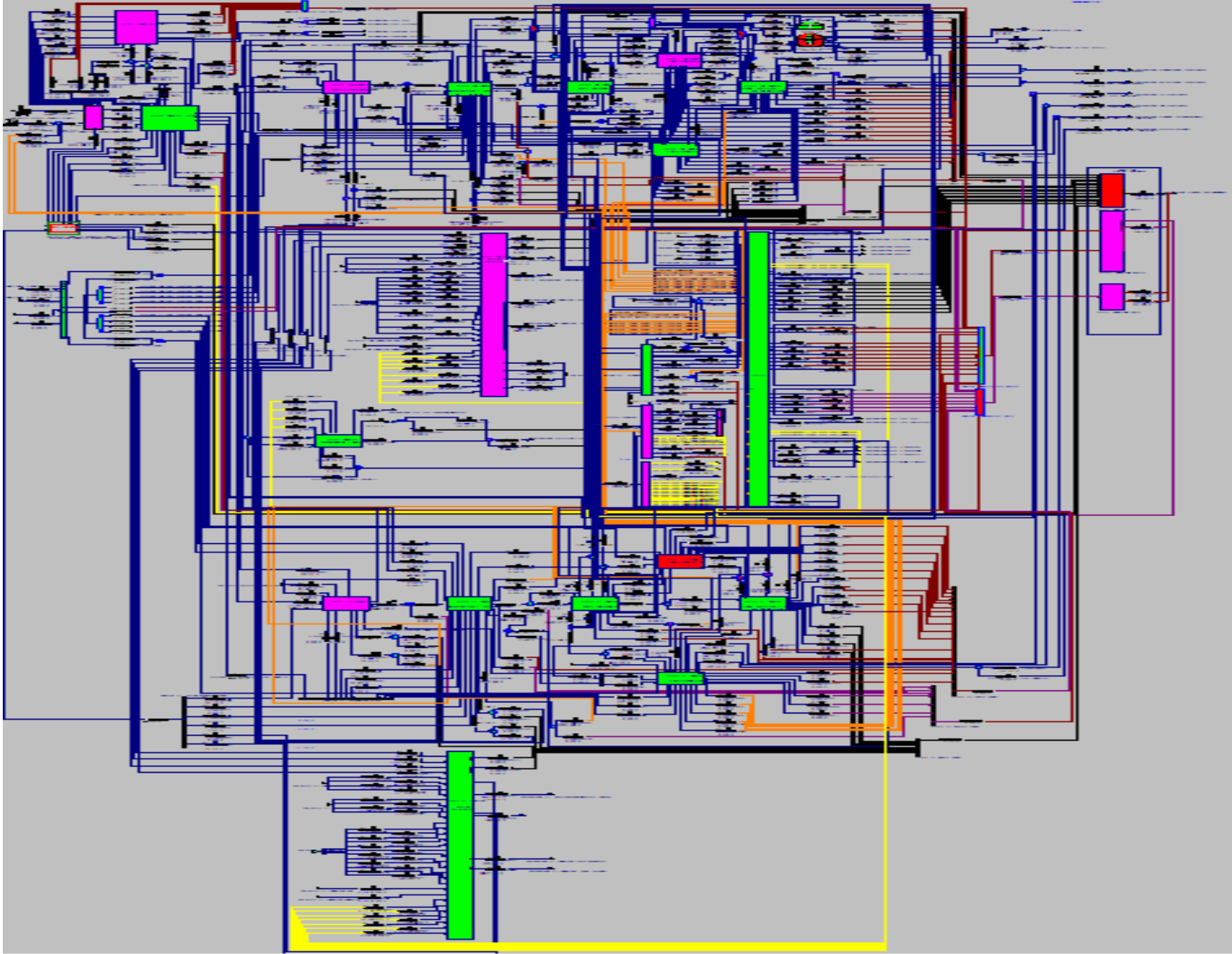
Product allocation is the equitable sharing of the synergy of being in business together as governed by contract

Product Allocation Facilitates

	Level 1	Level 2	Level 3	Common Cooling Water	Common Condensate Storage	Common LPG Storage	Common Sulphur	Common Lean LNG
LNG	Qatargas	QG 1	Train 1 to 3	✓	✓	✓	✓	✓
		QG 2	Train 4 & 5	✓	✓	✓	✓	✓
		QG 3 &4	Train 6 & 7	✓	✓	✓	✓	✓
	Rasgas	RG 1	Train 1 & 2	✓	✓	✓	✓	✓
		RG 2	Train 3 to 5	✓	✓	✓	✓	✓
		RG 3	Train 6 & 7	✓	✓	✓	✓	✓
Pipeline Gas	AKG	AKG 1		✓	✓	✓	✓	
		AKG 2		✓	✓	✓	✓	
	Dolphin			✓	✓	✓	✓	
	Barzan			✓	✓		✓	
GTL	Oryx			✓		✓		
	Pearly GTL			✓	✓			
Refinery	Laffan Refienry			✓		✓		

Product Allocation General Principal

- Allocation mechanisms should honour agreements and contracts.
- Allocation should be unbiased and fair
- Basis should be mass / energy balance
- Sum of allocated volumes should always be equivalent to the sum of the actual volumes produced
- Rules applied should be workable, consistent, fair and auditable
- As far as possible used the best available numbers.



Sigmafine as Product Allocation Tool

- Provide data for allocation with reduced or eliminated errors.
 - Provide Mass, Volume and Component balance as necessary.
 - Perform reliable calculation for Unavailability of Data or Data redundancy.
 - Reconciled Data are easy to access and auditable.
 - Control on correction of Data.
 - Unit wise Balance.
 - Flare Calculations.
 - Boil of gas and Fuel Gas Calculation.
 - Royalty Related Data calculation
 - Automatic interaction with other applications such as LIMS, DCS.
 - Inventory calculations for shared facilities tanks.
 - Inventory Calculations within plant i.e. LPG Bullets etc.
 - Availability of data on required UOM.
-

Sigmafine as Product Allocation Tool

- Provide consistent and accurate data for Financial & Share holder reporting.
- Identify process losses, faulty measurements, Verify custody transfer meters
- Reduce time for analyzing the data
- Monitoring yields, Inter Venture supplies.
- Monitoring specific energy consumption.
- Distribution of utilities.
- Easy setting up for long term balance.

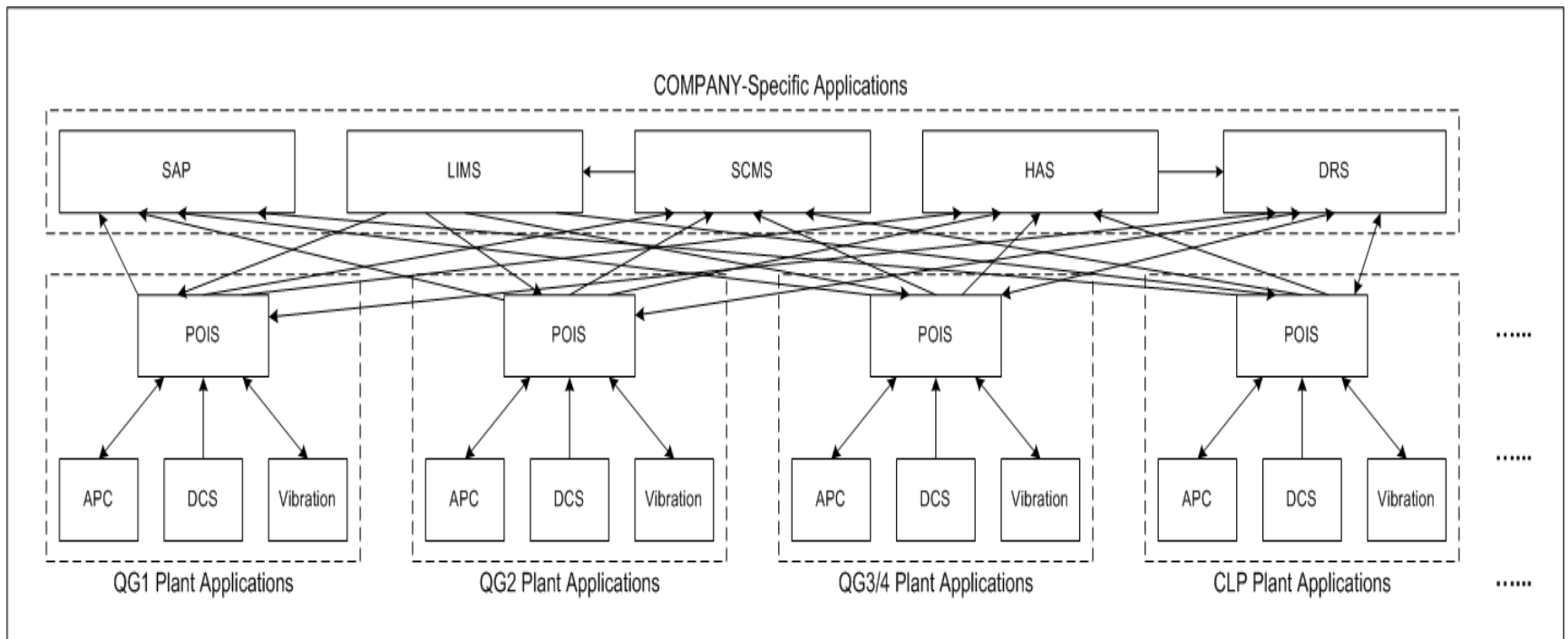
Data Reconciliation is art and achieved through Sigmafine to make production allocation Fair, Accurate and auditable However to reach their wasn't so easy and pass through many challenges.

Challenges

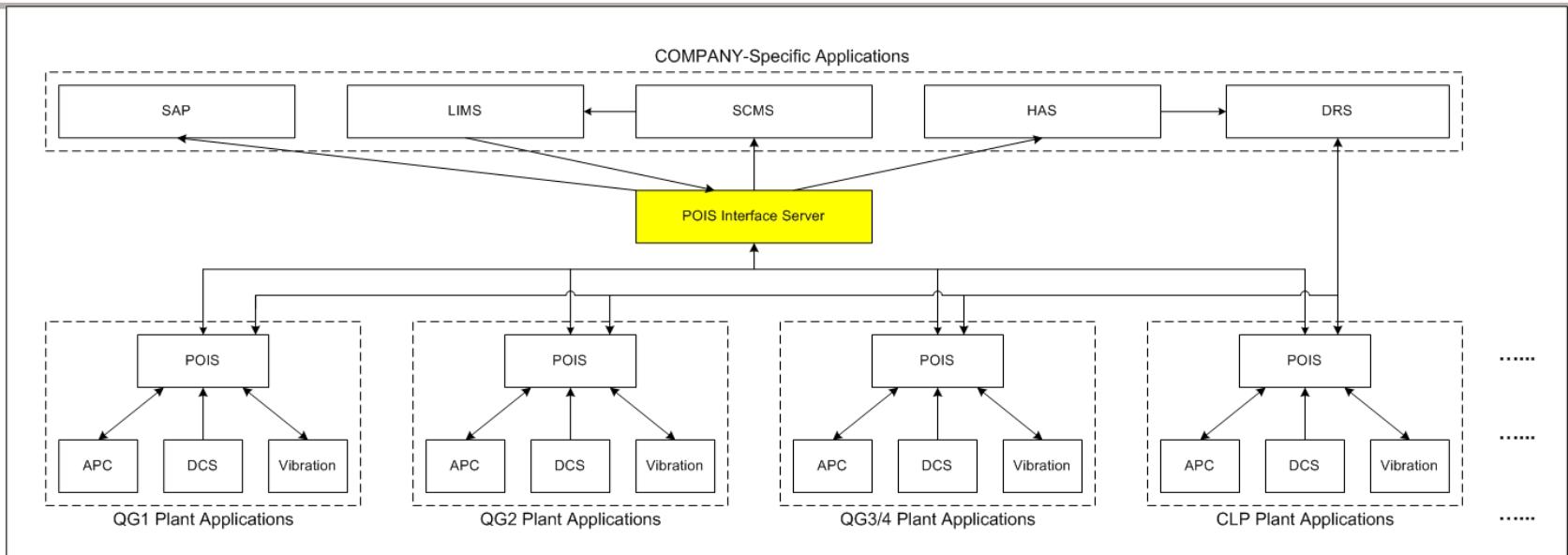
- Integration of POISS server.
- Use laboratory analysis for the Mass/Energy Balance.
- Supply of reconciled values to the down stream business automatically.
- Writing to POISS through Sigmafine directly for other than mass UOM.
- PI to PI interface time stamp issue.
- Flare Calculation with many un measured flows.
- Energy Balance issue due to limited energy measurement points.
- Tank Reconciliation Concerns

Solutions

- Integration of POISS server.
- Use laboratory analysis for the Mass/Energy Balance.
- Supply of reconciled values to the down stream business automatically



Solutions

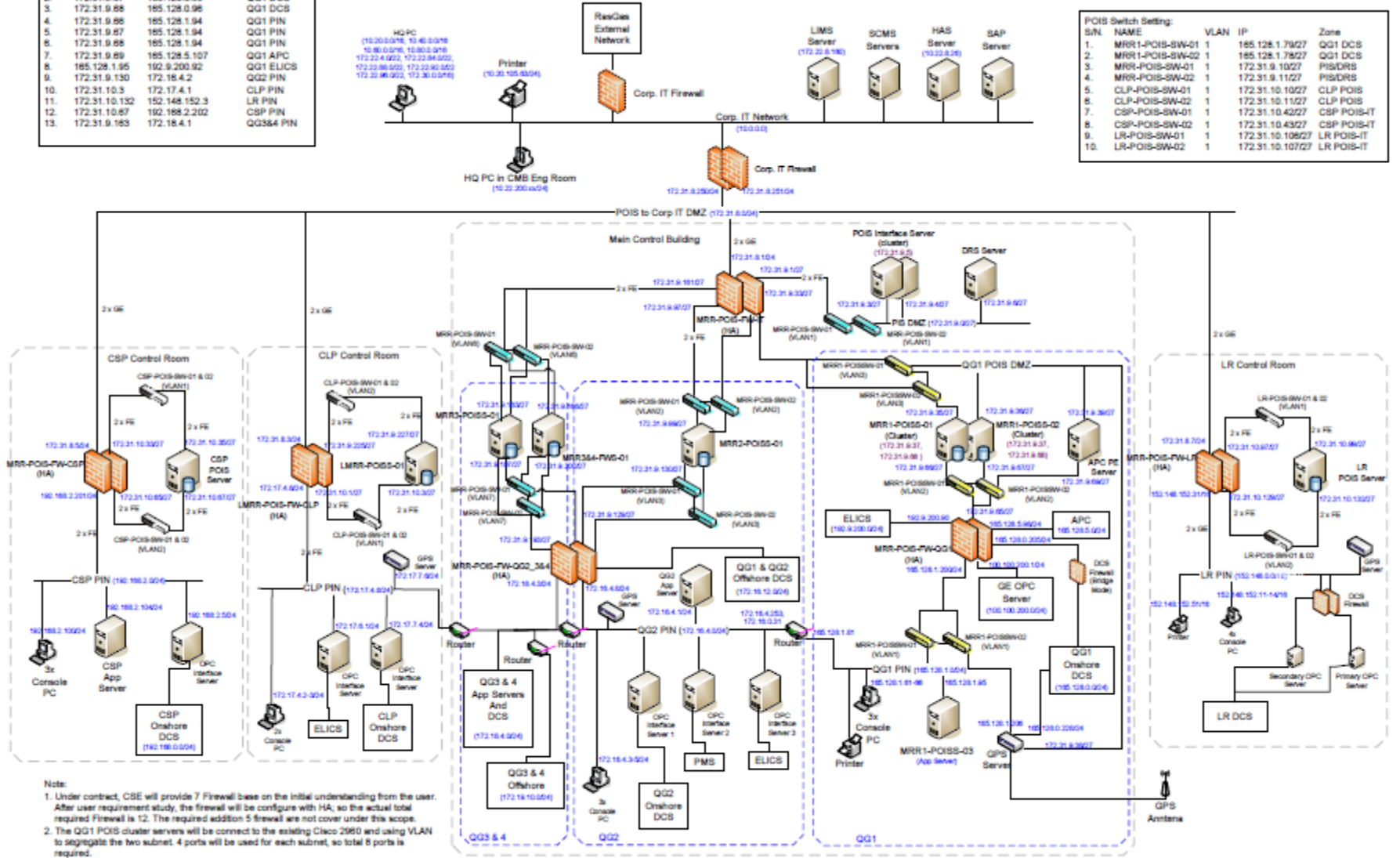


- Integrate POISs of QG1, QG2, QG3&4, CLLNG, CSP, Laffan Refinery and form a common POIS network.
- Interface common POIS network with DRS,HAS and SCMS.
- Interface LIMS with POIS.
- Interface POIS network with QG Corporate IT network.
- Interface with POISS of other companies i.e. Rasgas.

Qatar Gas POIS Network Diagram v2.3 (Dated 05 July 10)

NAT Setting:			
S/N	Original IP	Translated IP	Zone
1.	172.31.9.86	185.128.0.96	QG1 DCS
2.	172.31.9.87	185.128.0.96	QG1 DCS
3.	172.31.9.88	185.128.0.96	QG1 DCS
4.	172.31.9.88	185.128.1.94	QG1 PIN
5.	172.31.9.87	185.128.1.94	QG1 PIN
6.	172.31.9.88	185.128.1.94	QG1 PIN
7.	172.31.9.89	185.128.5.107	QG1 APC
8.	185.128.1.95	185.200.92	QG1 ELICS
9.	172.31.9.130	172.18.4.2	QG2 PIN
10.	172.31.10.3	172.17.4.1	CLP PIN
11.	172.31.10.132	152.148.152.3	LR PIN
12.	172.31.10.87	162.188.2.202	CSP PIN
13.	172.31.9.163	172.18.4.1	QG5&4 PIN

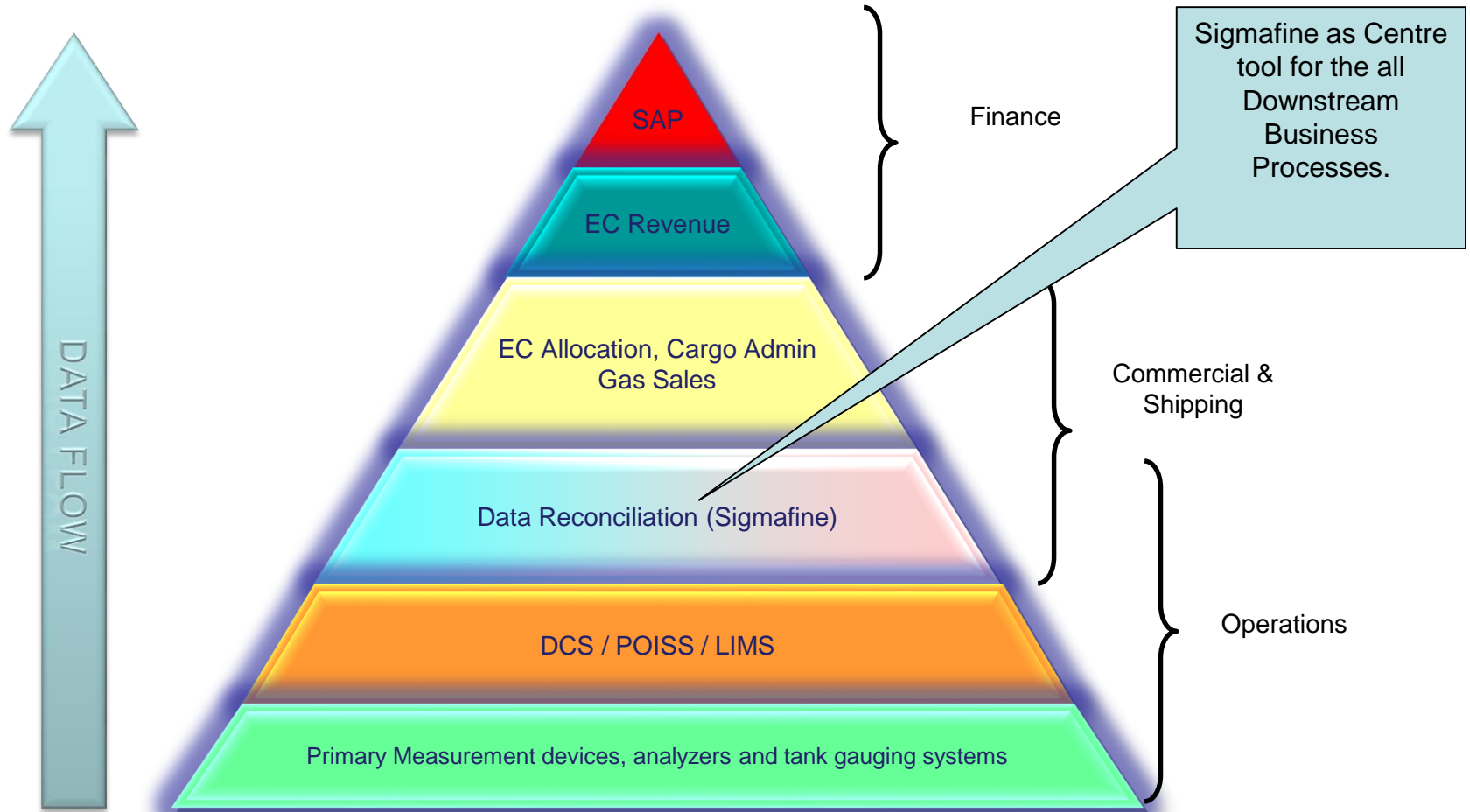
POIS Switch Setting:				
S/N	NAME	VLAN	IP	Zone
1.	MRR1-POIS-SW-01	1	185.128.1.78027	QG1 DCS
2.	MRR1-POIS-SW-02	1	185.128.1.78027	QG1 DCS
3.	MRR1-POIS-SW-01	1	172.31.9.10227	PIS/DRS
4.	MRR1-POIS-SW-02	1	172.31.9.10227	PIS/DRS
5.	CLP-POIS-SW-01	1	172.31.10.11027	CLP POIS
6.	CLP-POIS-SW-02	1	172.31.10.11027	CLP POIS
7.	CSP-POIS-SW-01	1	172.31.10.43227	CSP POIS-IT
8.	CSP-POIS-SW-02	1	172.31.10.43227	CSP POIS-IT
9.	LR-POIS-SW-01	1	172.31.10.10827	LR POIS-IT
10.	LR-POIS-SW-02	1	172.31.10.10727	LR POIS-IT



- Note:**
- Under contract, CSE will provide 7 Firewall base on the initial understanding from the user. After user requirement study, the firewall will be configure with HA, so the actual total required Firewall is 12. The required addition 5 firewall are not cover under this scope.
 - The QG1 POIS cluster subnet will be connect to the existing Cisco 2960 and using VLAN to segregate the two subnet. 4 ports will be used for each subnet, so total 8 ports is required.
 - The Corp IT is using x HA firewall, as such user requested to set up the DMZ firewall in CMB to be HA.
 - The redundant switches for MRR-POIS-SW-01 and MRR1-POIS-SW-01 are not included in the main contract and also the switches for CLP, CSP and Laffen POIS.

QG POIS Network Diagram with FW v2.3.vsd

Solutions



Solutions

- Writing to POISS through Sigmafine directly for other than mass UOM.

Issue been resolved by in house developed add inn for Process Book.



Challenges

- **PI to PI interface time stamp issue.**
 - Solved by in house developed macro to synchronize the daily data.
- **Flare Calculation with many un measured flows.**
 - Solved by using valve tables in Sigmafine to estimate the flow based on Valve opening.
- **Energy Balance issue due to limited energy measurement points.**
 - Solved by separating out Mass Balance and used Sigmafine balance rule for the Energy balance.
- **Tank Reconciliation Concerns.**
 - Solved by adjusting tolerances on the tank less than rundown meters.

Thank you...

**Thank you for being part of our success
now and in the future...**