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الراعـي الرسمـي

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Measurements in Leak Detection system

KOC Consumer Fuel Pipelines- Challenges

LDS monitored KOC Consumer Fuel Pipelines- Services

- Fuel Gas - Subiya PS, Doha PS, Al-Zour PS
  Shuaiba PS, Shuwaikh PS
  Shuaiba Industrial Area
- Gas Oil - Subiya PS, Doha PS
  Al-Zour PS
- LSFO - Subiya PS, Doha PS
  Al Zour PS
- Crude Oil - Subiya PS

LDS in KOC Consumer Fuel Lines Covers:

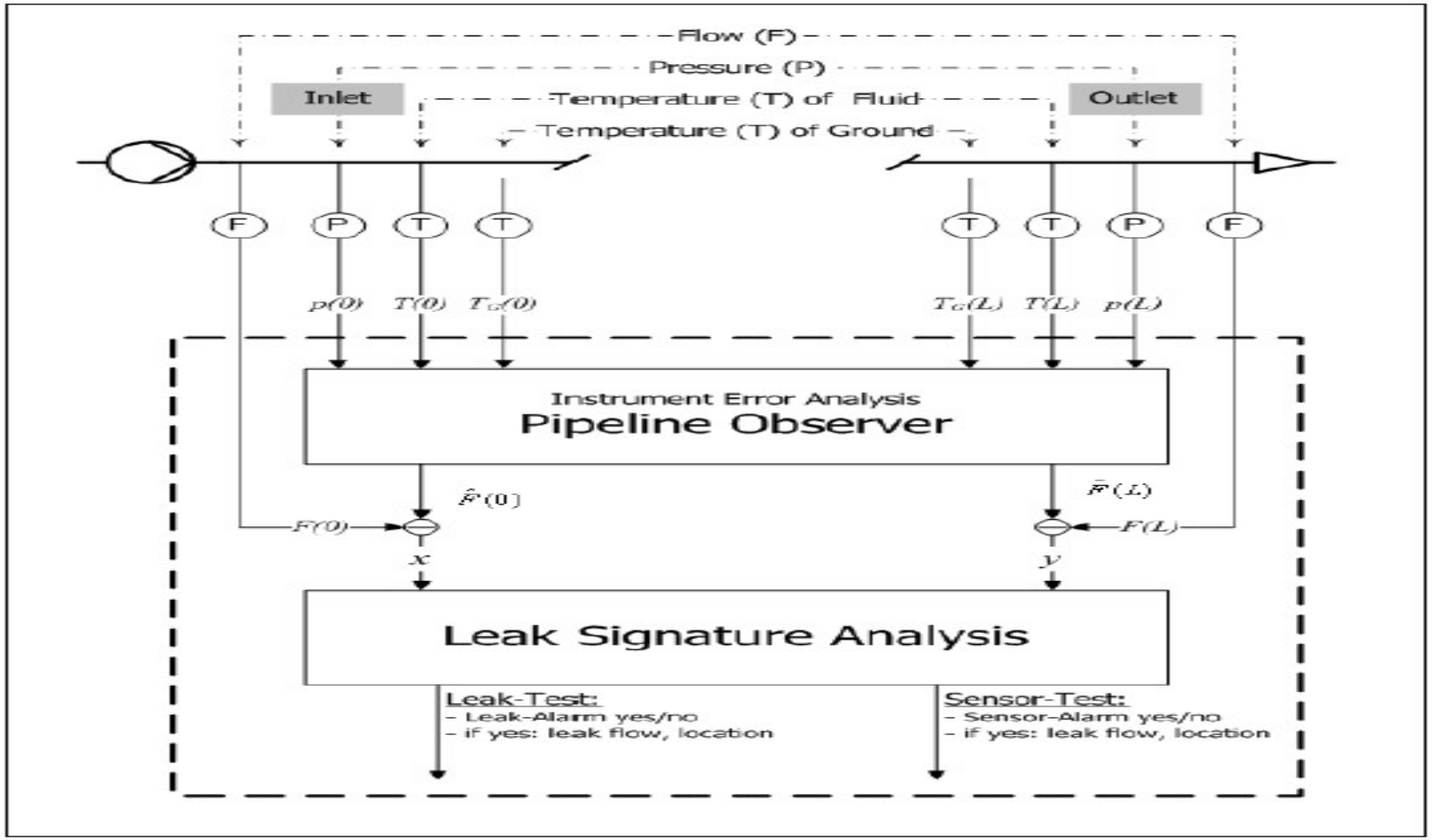
- Pipelines of Size 4” Up to 52”
- Pipeline sections of Length 6 KM Up to 120 KM
- Combined pipeline sections of 177 KM

Leak Detection system: Methods

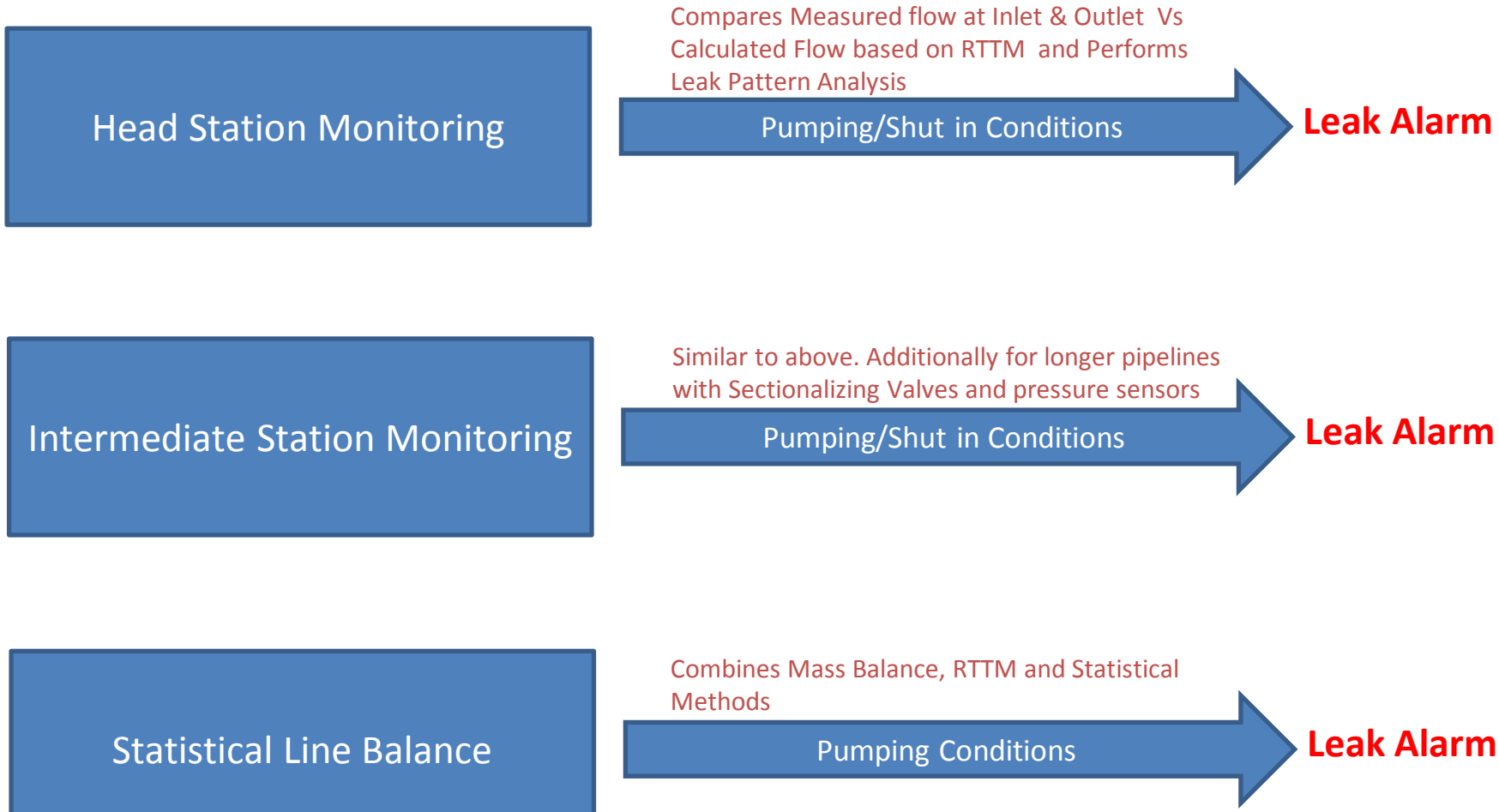
- Non Continuous:
  - Routine Inspections
  - Intelligent Pigging

- Continuous:
  - External type:- Acoustic Systems, Fiber Optic Cables, Video Monitoring…
  - Internal type: Mass Balance, Pressure Point Analysis, Statistical Systems, Real Time Transient Model…

Measurements in Leak Detection system- RTTM Typical Block Diagram



Measurements in Leak Detection system- Software Modules

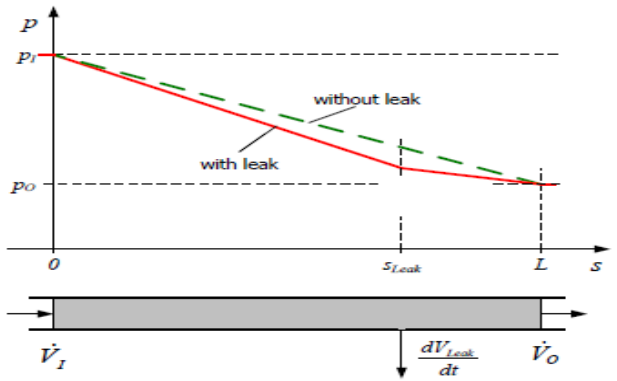


Measurements in Leak Detection system- Software Modules...

Leak Location

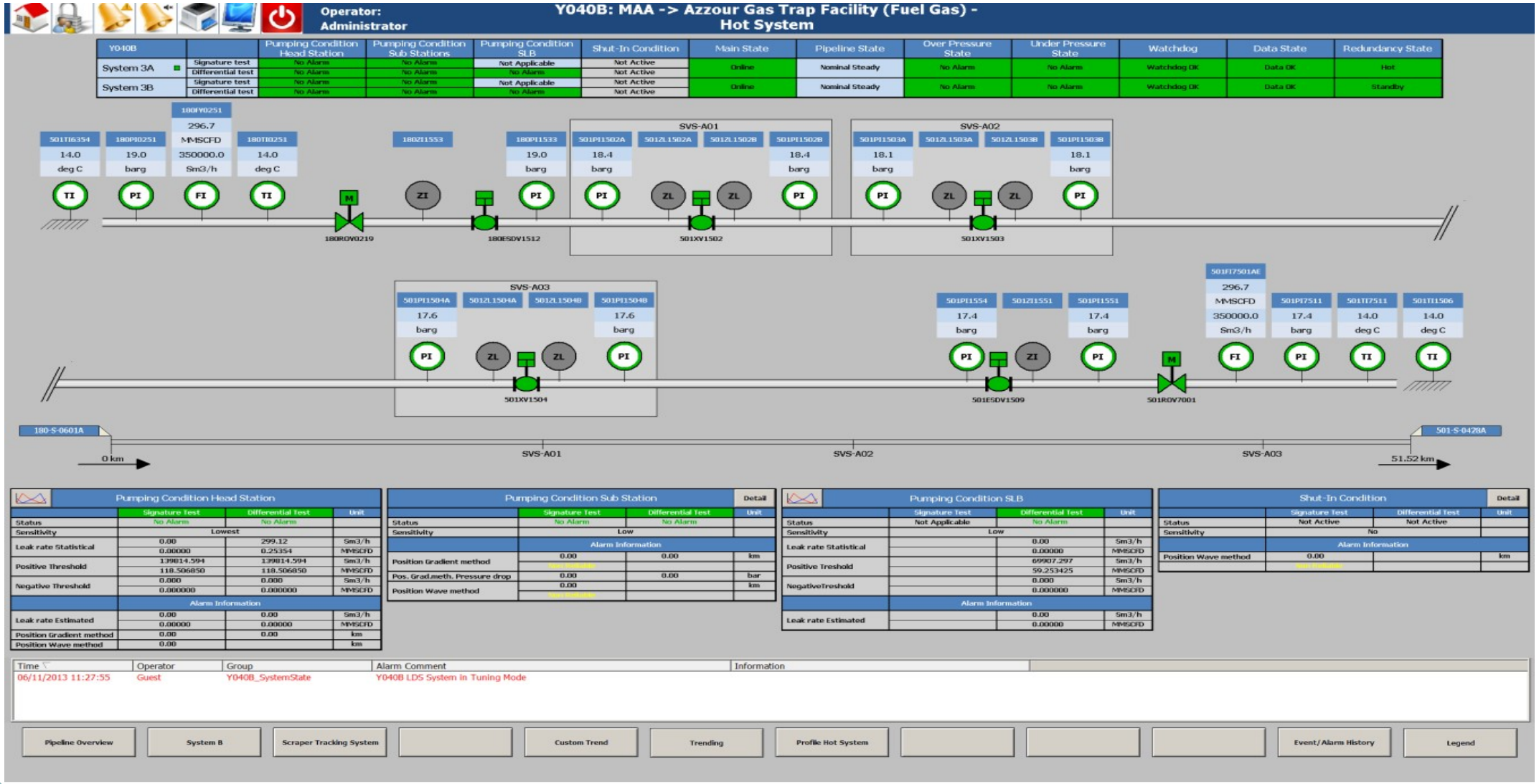
Gradient Intersection Method

Wave Propagation Method



$$\hat{s}_{Leak} = \frac{1}{2} \cdot \left(L - c \cdot \Delta t \right)$$

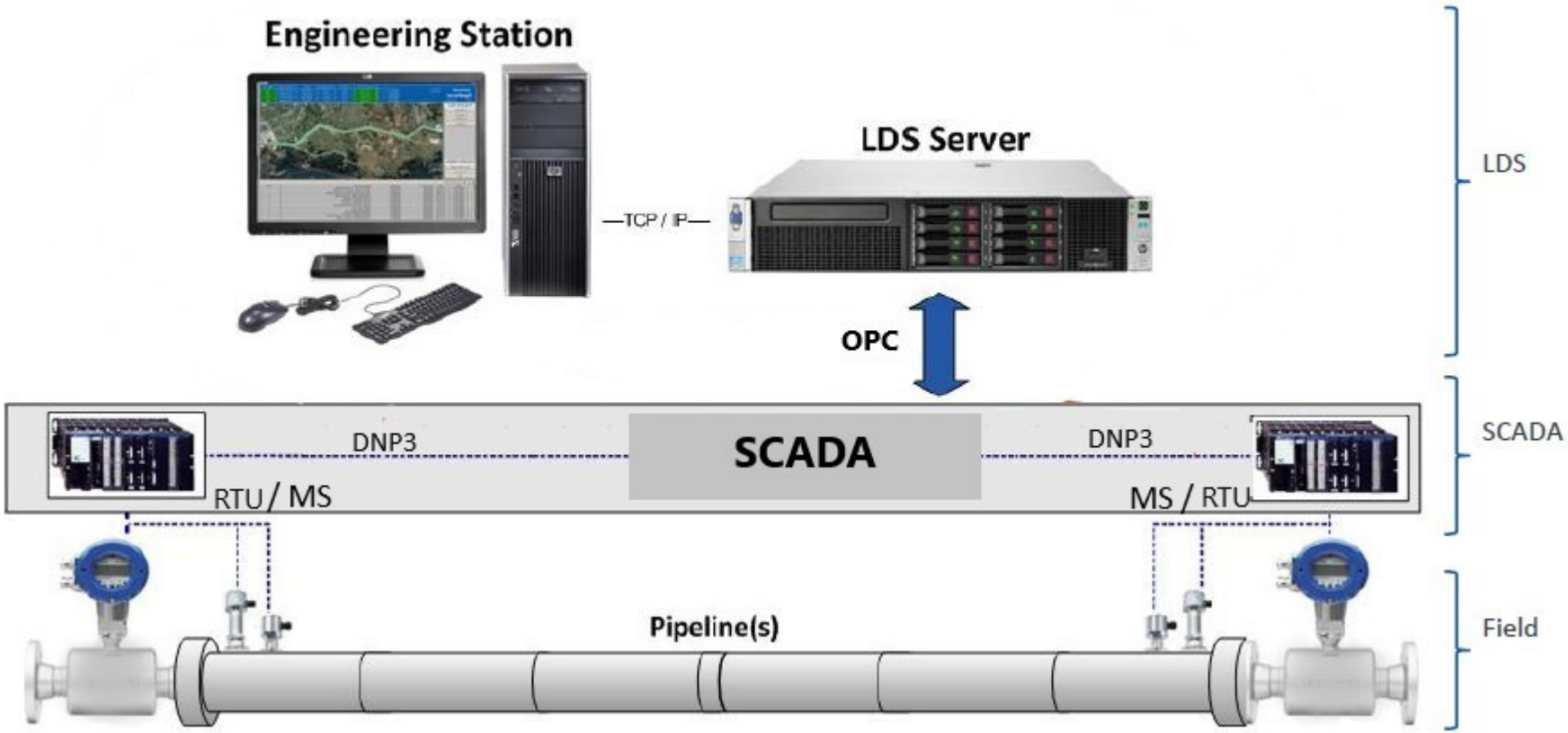
Measurements in Leak Detection system- Typical Dashboard



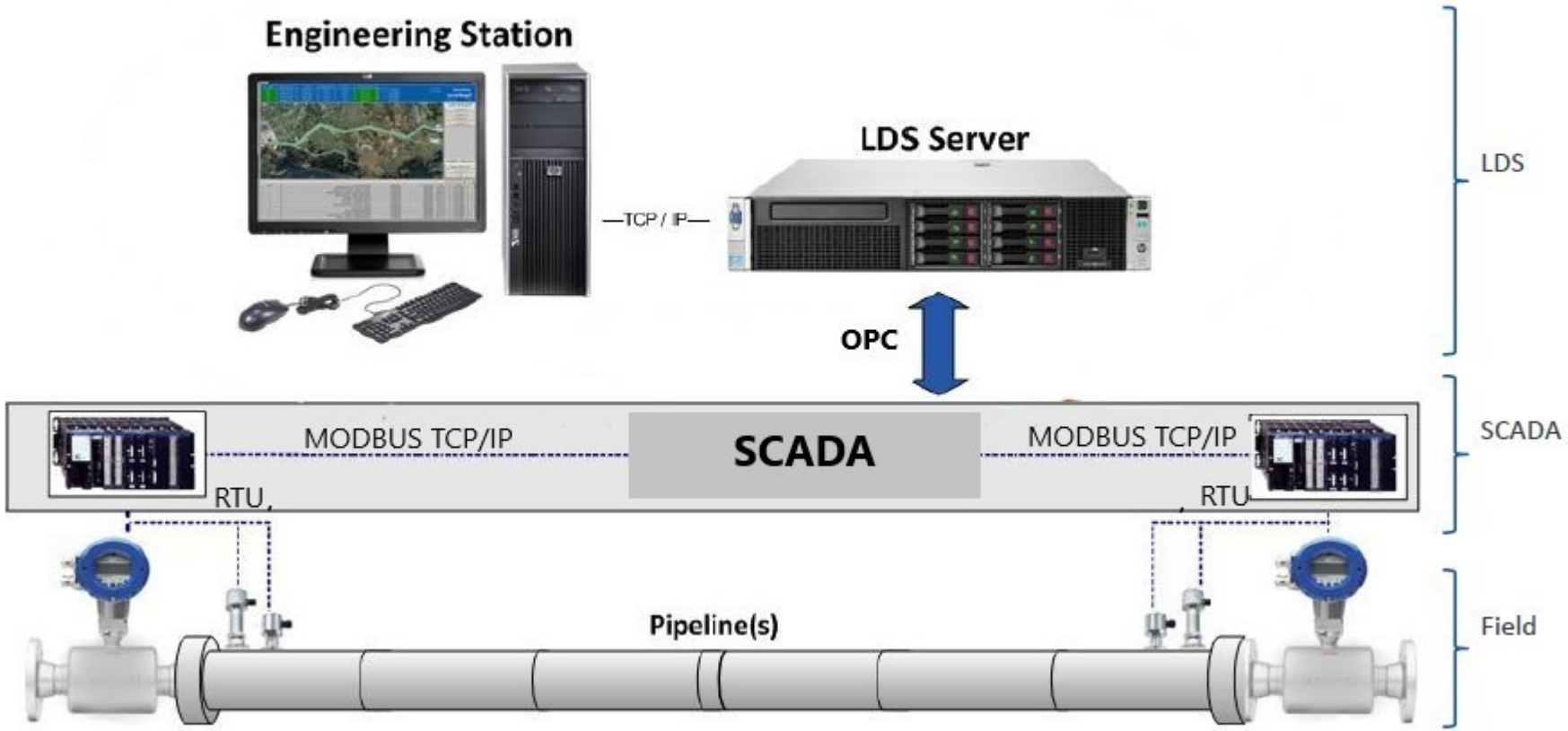
Measurements in Leak Detection system- Performance Criteria as per API 1155 for 40” Fuel Gas Line

	Steady state	Transient state**
Sensitivity		
Minimum detectable leak rate	1%	2%
Response time for 100% leak rate	≤ 1 min	≤ 1 min
Response time for 10% leak rate	≤ 4 min	≤ 5 min
Response time for 5% leak rate	≤ 8 min	≤ 11 min
Response time for 1% leak rate	≤ 12 min	N.A.
Reliability		
Incorrect leak alarm declaration rate (overall)	≤ 1 / year	≤ 2 / year
Robustness		
Loss of functionality due to instrument outages	see below*	
Loss of function due to pump state changes	none	
Loss of function due to valve state changes	none	
Loss of sensitivity due to pump state changes	none**	
Loss of sensitivity due to valve state changes	none**	
Start-up stabilization period	none**	
Accuracy		
Leak localisation for 100% leak	≤ 1%	
Leak localisation for 10% leak	≤ 2%	
Leak localisation for 5% leak	≤ 3%	≤ 5%
Leak localisation for 1% leak	≤ 5%	N.A.
Leak Rate error	≤ 1%	≤ 1%

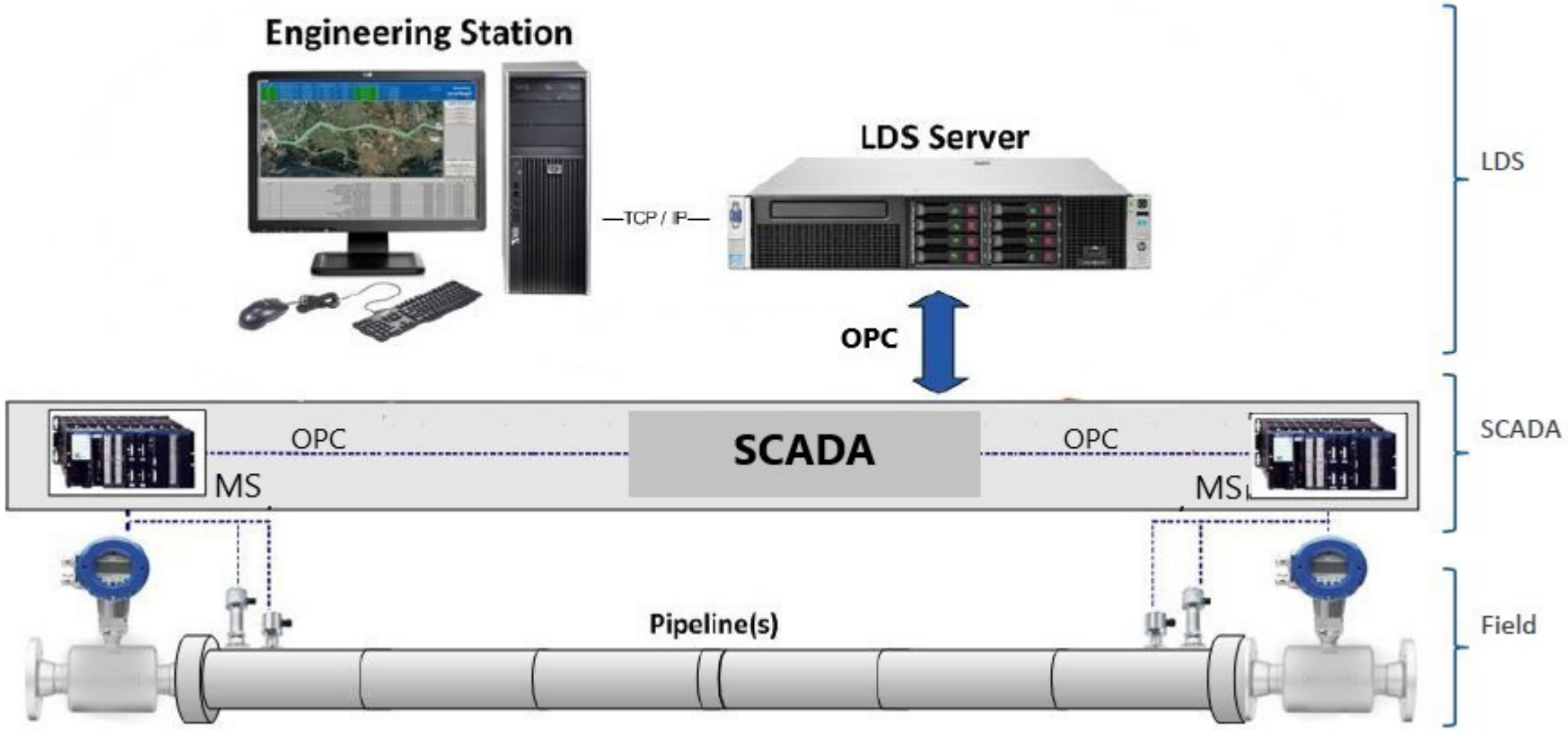
Measurements in Leak Detection system- Data Transfer Issues



Measurements in Leak Detection system- Modified RTU Communication



Measurements in Leak Detection system- Modified Metering Skid Communication



Measurements in Leak Detection system- Tuning Phase Issues

- Mandatory Tuning while pipeline is in operation
- Require to be Tuned for all Flow profiles
- Involves Multiple stake holders and their requirements
- Practically difficult to achieve

Measurements in Leak Detection system- Operational Issues

- Generate false alarms if operating in a flow region which has not been tuned
- Operating in lower flow rates may generate false alarms
- Process upsets and subsequent transients in upstream/down stream facilities
- Well trained operator is required to identify false alarms

THANK YOU