# Building A Smarter Strategy For Alarms With Splunk Machine Learning Tookit!


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# Meet The Presenters

**TELUS - Manager, Technology Strategy**
(2015 – Present)
OSS/BSS & GIS – TELUS MBNE

**TELUS - Manager, Network Integrity**
(2010 – 2015)
Tier – III Network & Service Assurance

**Splunk> - Advisory Engineer**
(2016 - Present)
Customer Success Manager

**TELUS - Design Specialist, Network Integrity**
(2012 – 2016)
Network & Service Assurance
Splunk> Technical Champion

# TELUS At A Glance

TELUS
the future is friendly®

| | |
|---|---|
| Wireless Subs | **8.5 million** |
| LTE Penetration | **>85% of data traffic goes over LTE** |
| Smartphones | **82% penetration** |
| Canadian Population | **35+ million** |
| Area | **10M Km²** |
| Annual Revenue | **$12.5 billion** |
| Wireless Revenue | **$7 billion** |
| Wireless ARPU | **$63.74 CAD** |

TELUS is Canada's fastest-growing national telecommunications company, with $12.6 billion of annual revenue and 12.5 million subscriber connections. TELUS provides a wide range of communications products and services, including wireless, data, Internet protocol (IP), voice, television, entertainment and video, and is Canada's largest healthcare IT provider.




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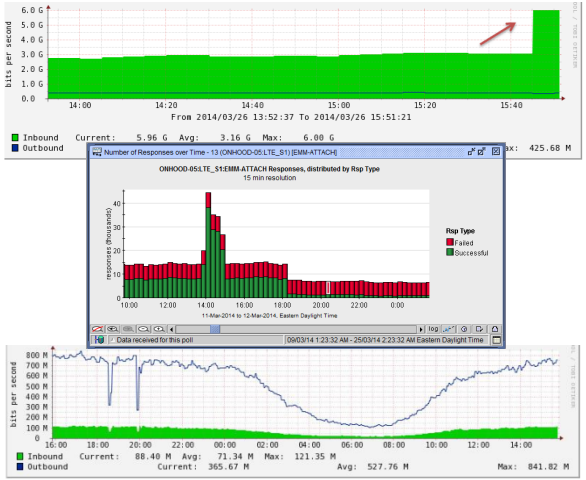
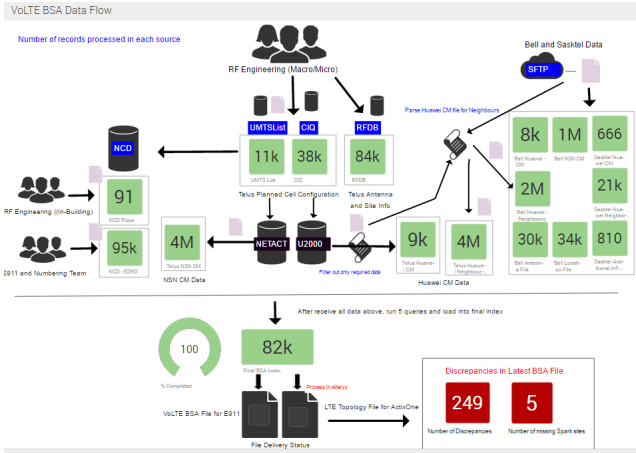
# An Ops Intel Journey…

## March, 2014




## Sept 2015


## July 2016



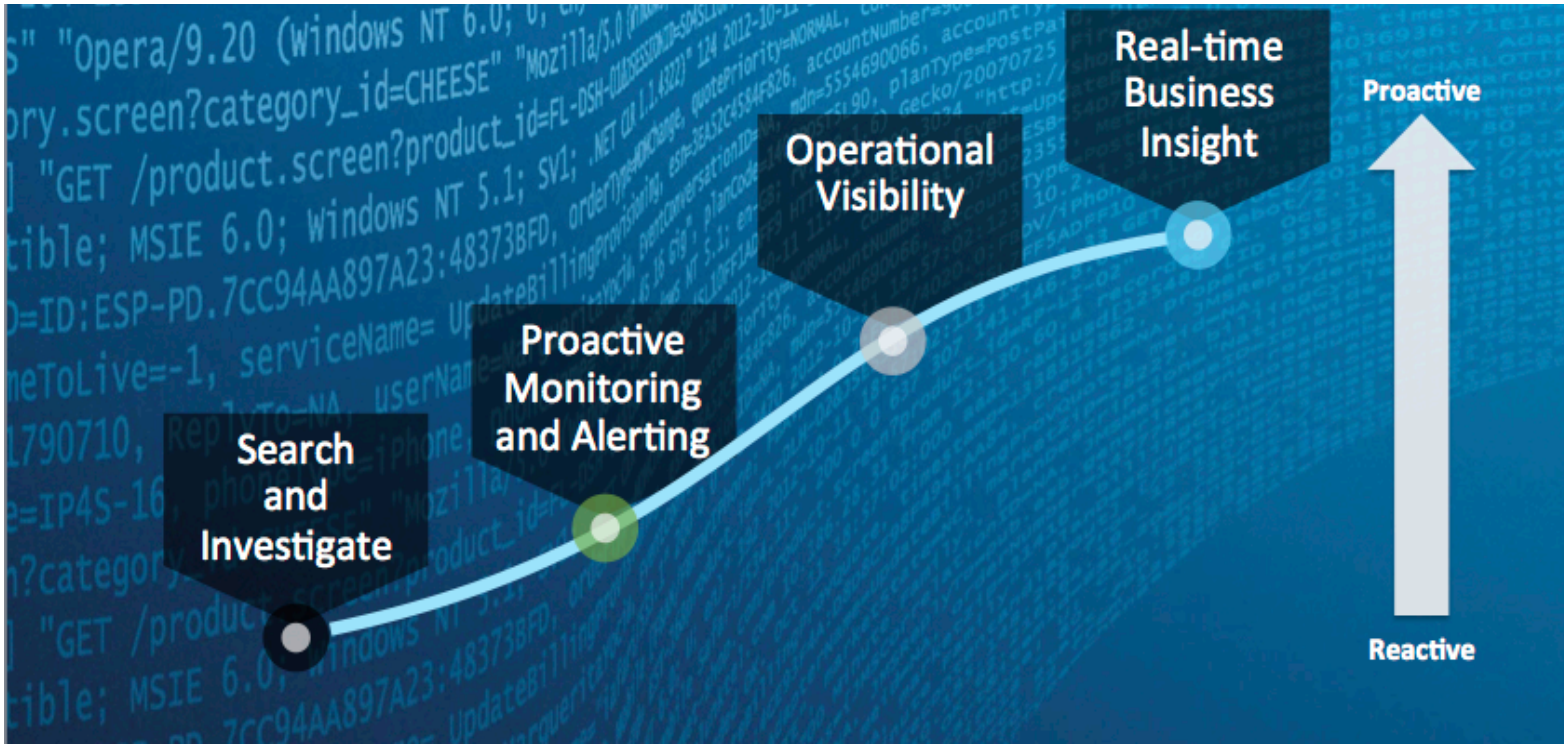

**Graph Wars**

**Enriched Viz**

**Glass Tables**

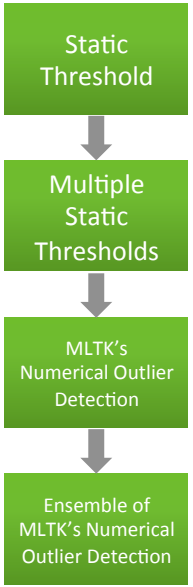
*Proactive Pursuit of OI4*

# Phases Of Operational Intelligence



# Quest for Operational & Business Intelligence

## Building Monitoring Tools Process




✗ Too restrictive for dynamically changing data

✗ Too many rules to be set for too many KPIs

✓ Catches most of outlier without knowing the data range

✗ Misses subtle outliers

✓ Catches subtle outliers too

## Machine Learning Workflow

1. **Get** data
2. **Split** data (set aside some to train the model, some to test its performance)
3. **Fit** the model on some of the data (training data)
4. **Apply** the model on data the model hasn't seen (test data)
5. **Evaluate** the performance of the model on the test data
6. **Adjust** the model based on sources of error
7. **Repeat** as needed until the margin of error is low enough

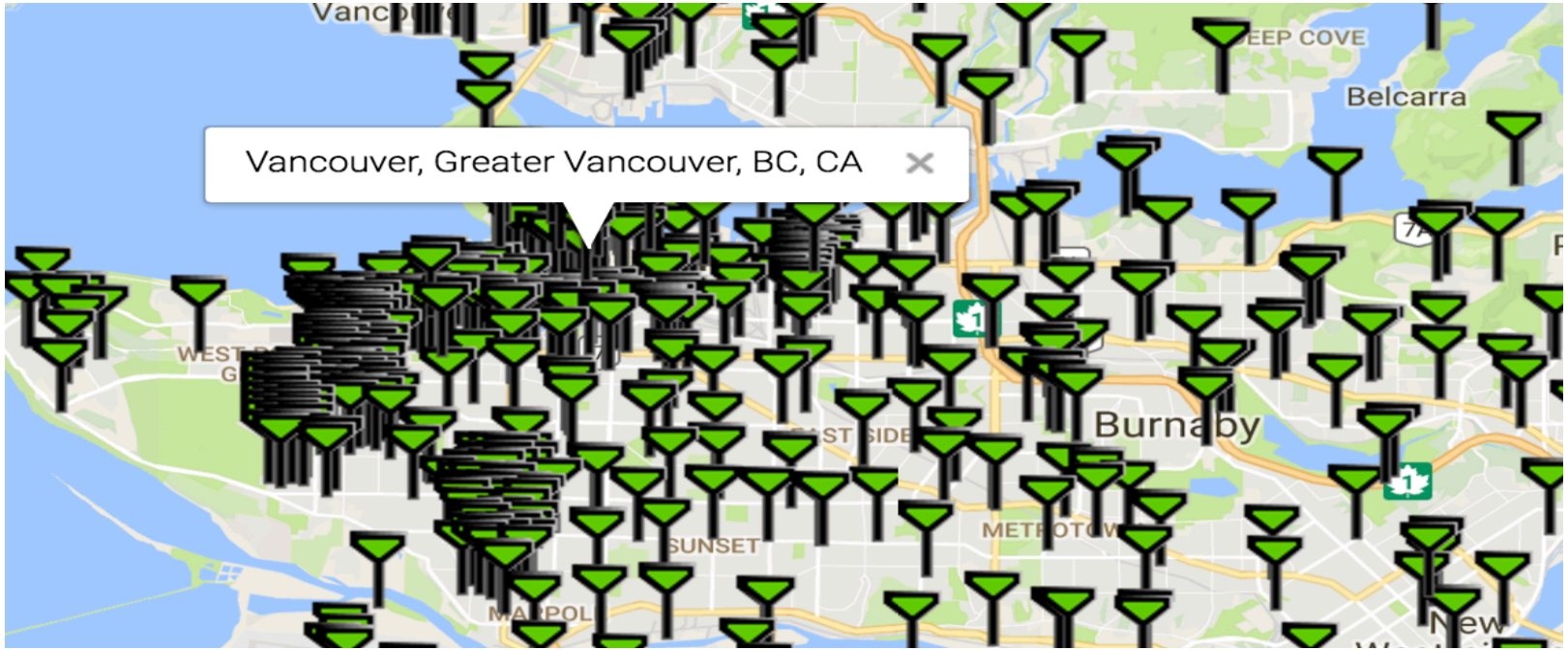
B U I L D

8. **Use** the model on real world business questions

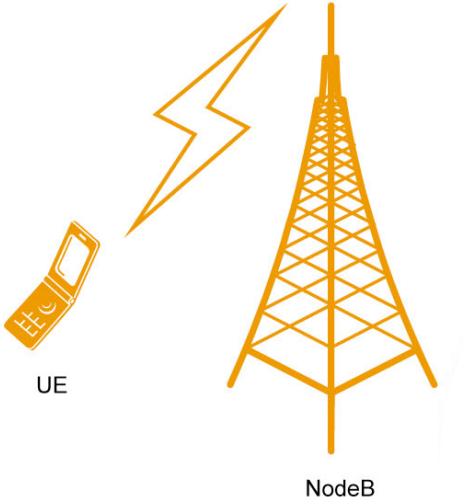
# Use Case #1:
# Wireless Network Operation Profiling

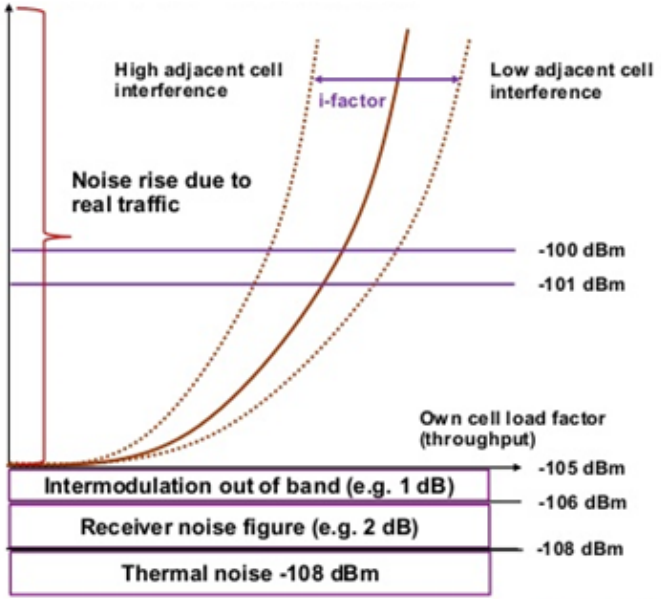
## “The Trick Is To See The Forest For The Trees“

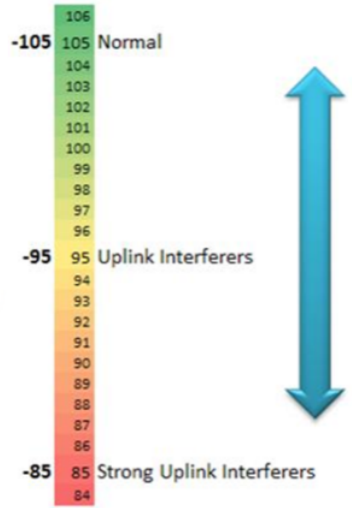
# Mobility 3GPP RAN KPI



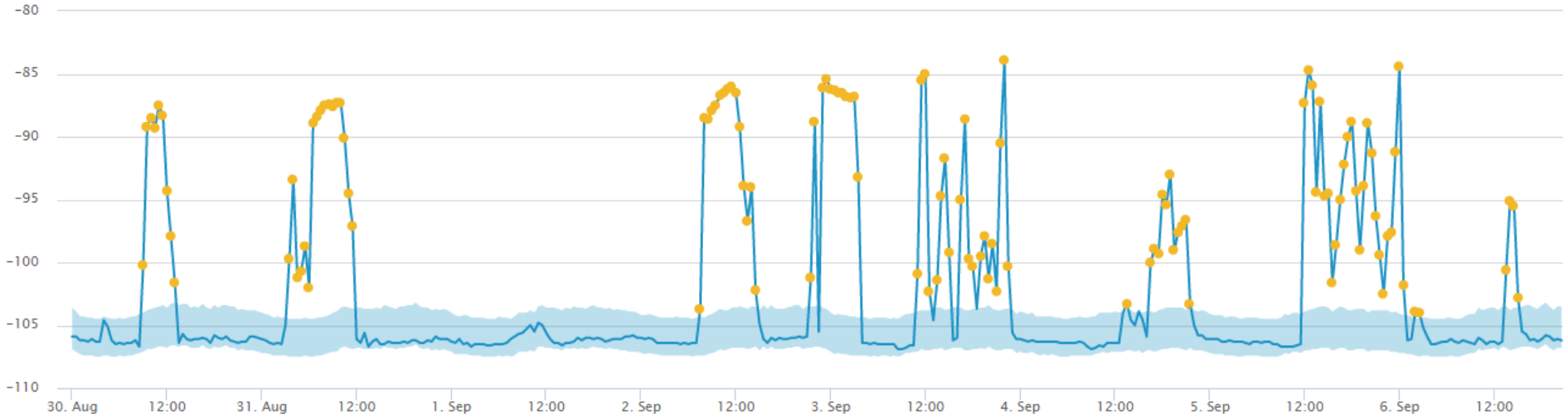
# Radio Access Network Interference



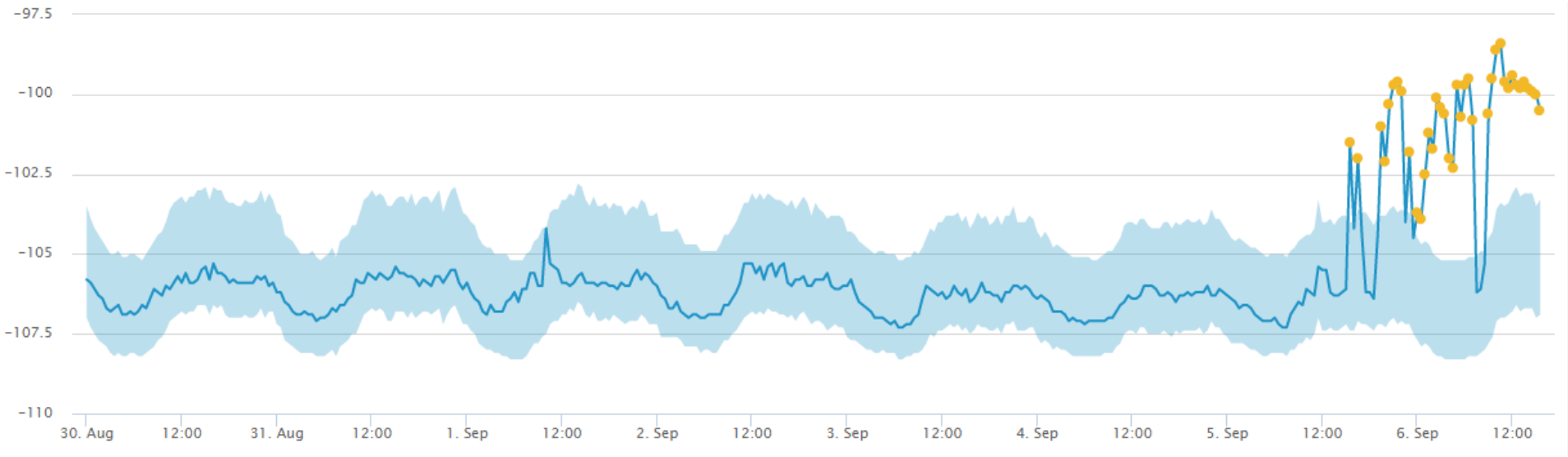



# Example #1



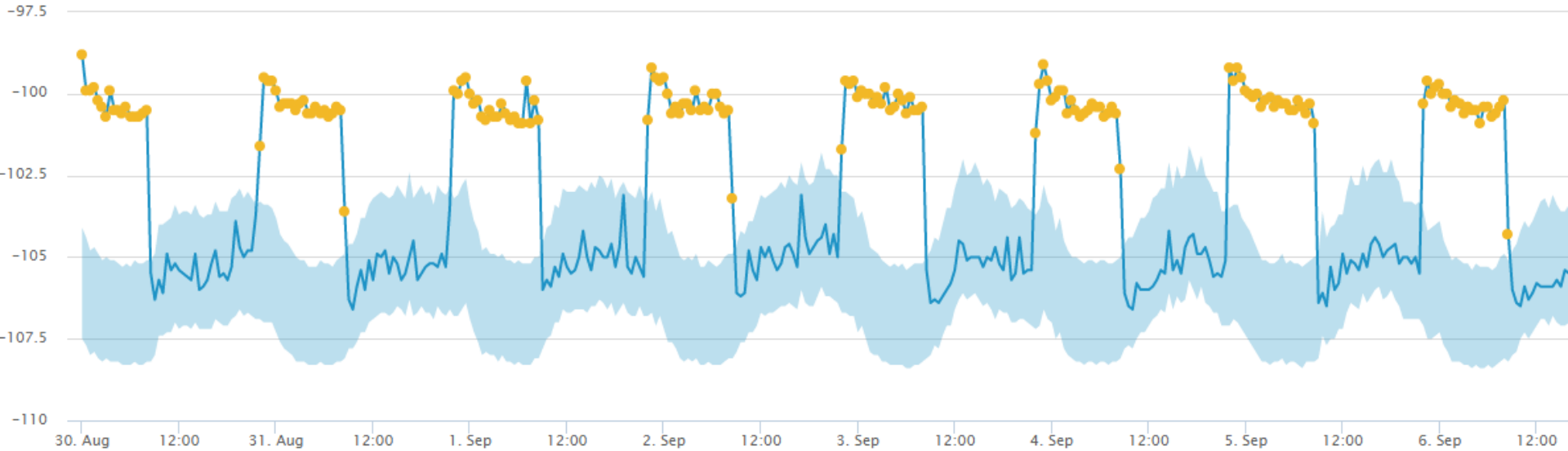

- Outlier detected for abnormal interference pattern.
- Not every cell has the same issue but many cell neighbors experience a similar pattern

# Example #2



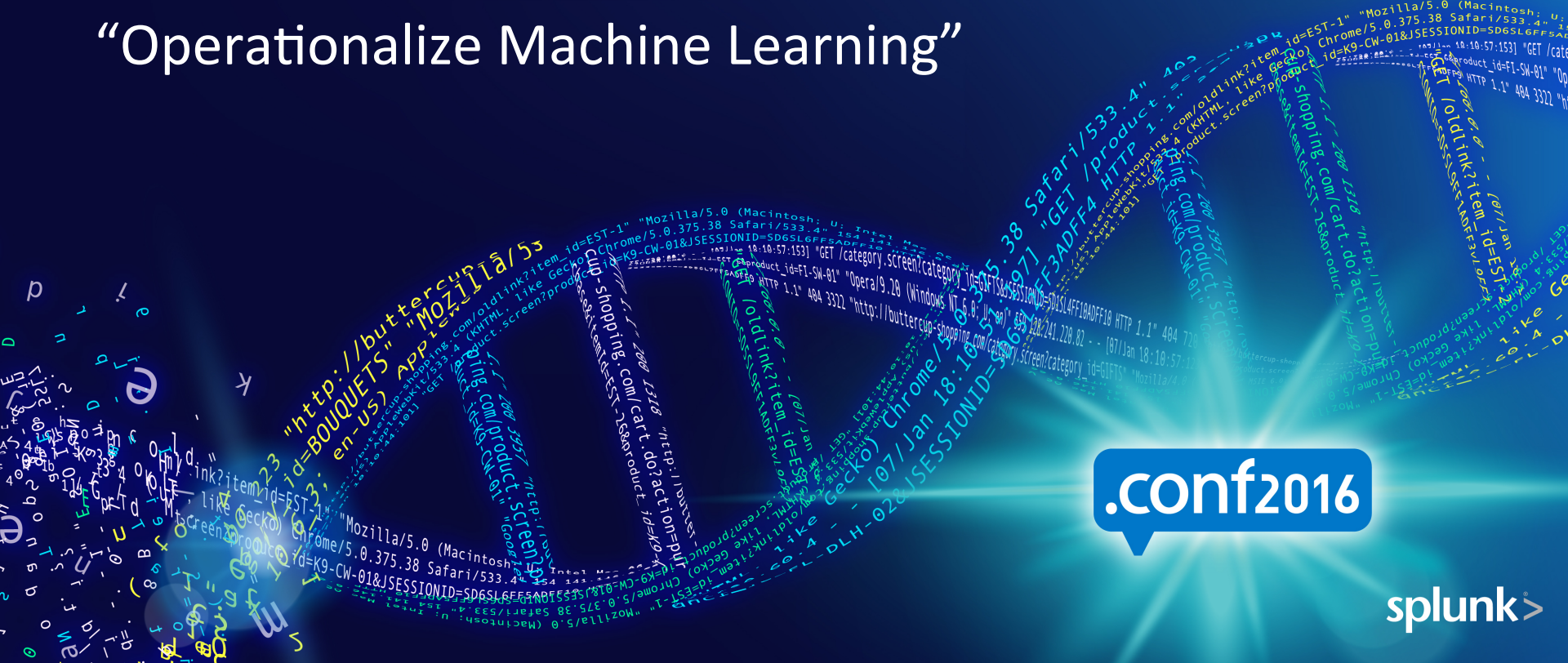

- Recent spike in interference alerts team members to begin investigations.
- MLTK assist the information overload problem through machine correlation vs manual correlation

# Example #3




- Outlier detected for potential faulty tower light
- The tower light turns on only at night and Nav Canada controls the blinking interval.

# Use Case #2:
# Outlier Detection On 3GPP Core KPI
## “Operationalize Machine Learning”



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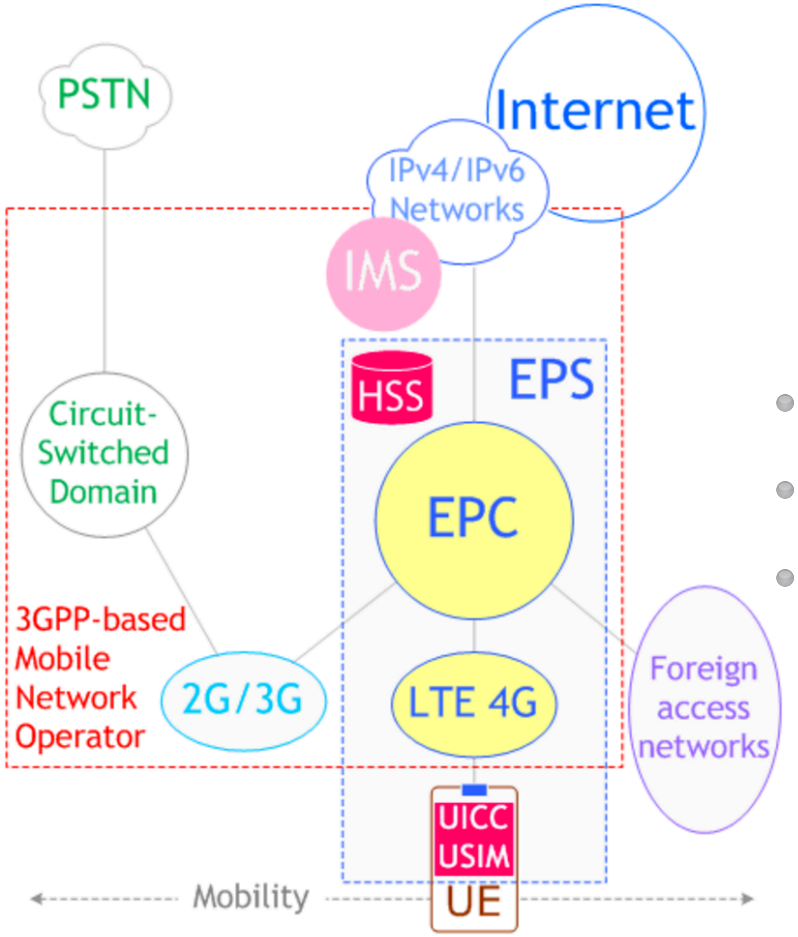
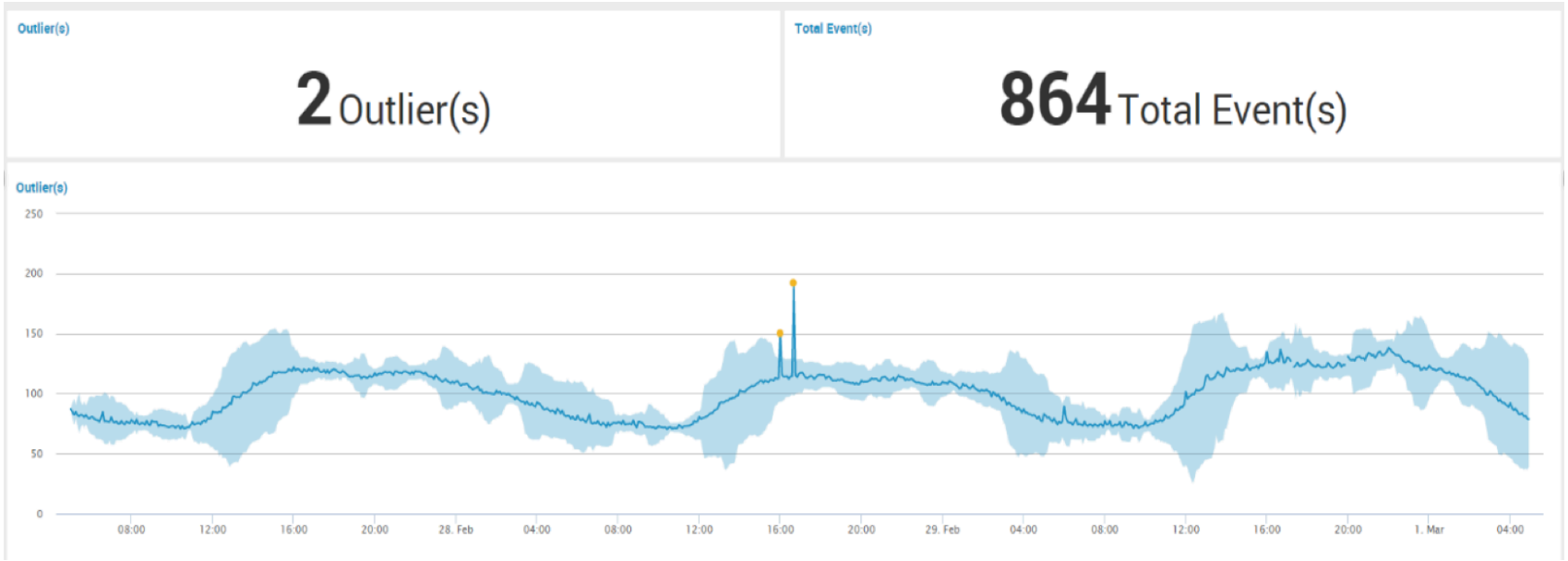


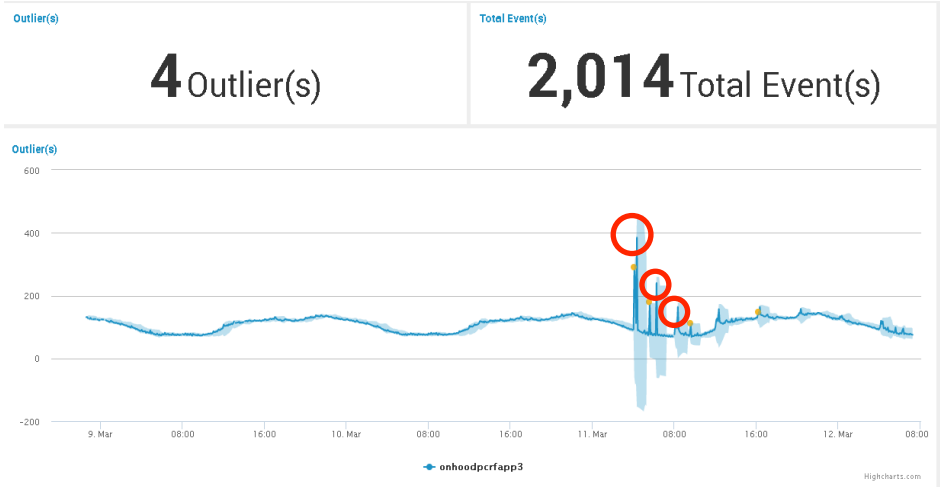

# Mobility 3GPP Core KPI

- Connection Details on 3GPP Core as KPI
- Real-time Network Behaviour
- Performance Degradation Monitoring

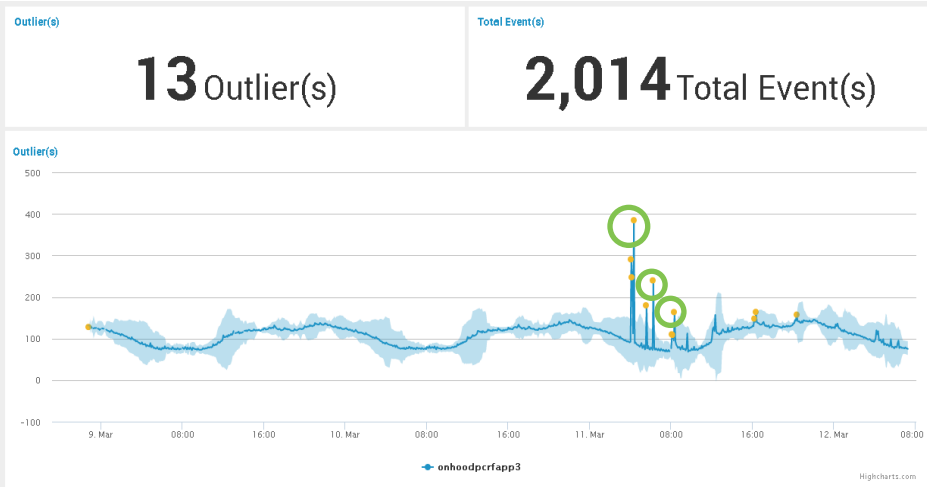
# Numerical Outlier Detection In Machine Learning Toolkit



# Iterating Over Different Threshold Methods




Standard Deviation




Absolute Median Deviation

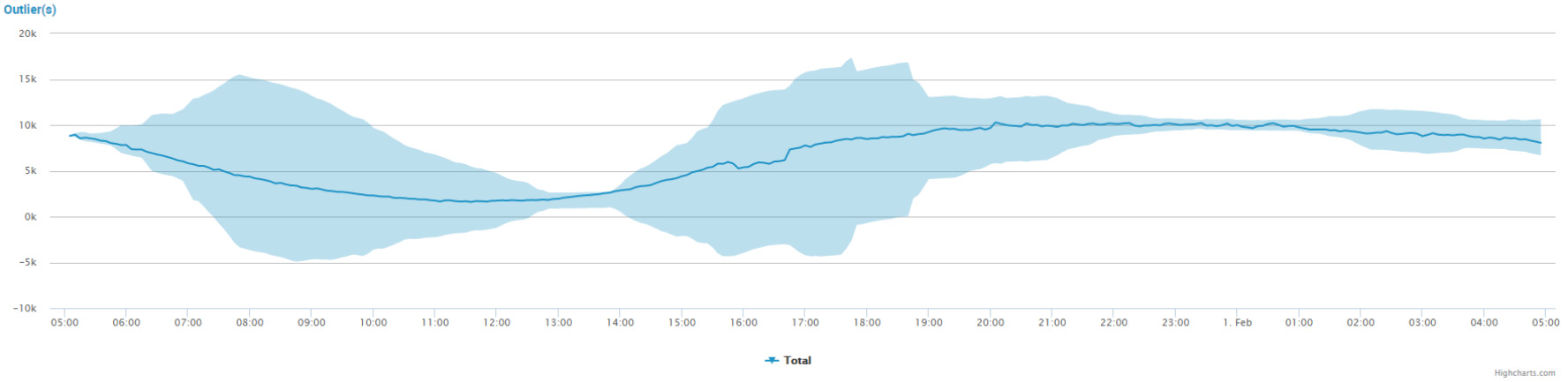
# Missed Outlier!

Outlier(s)

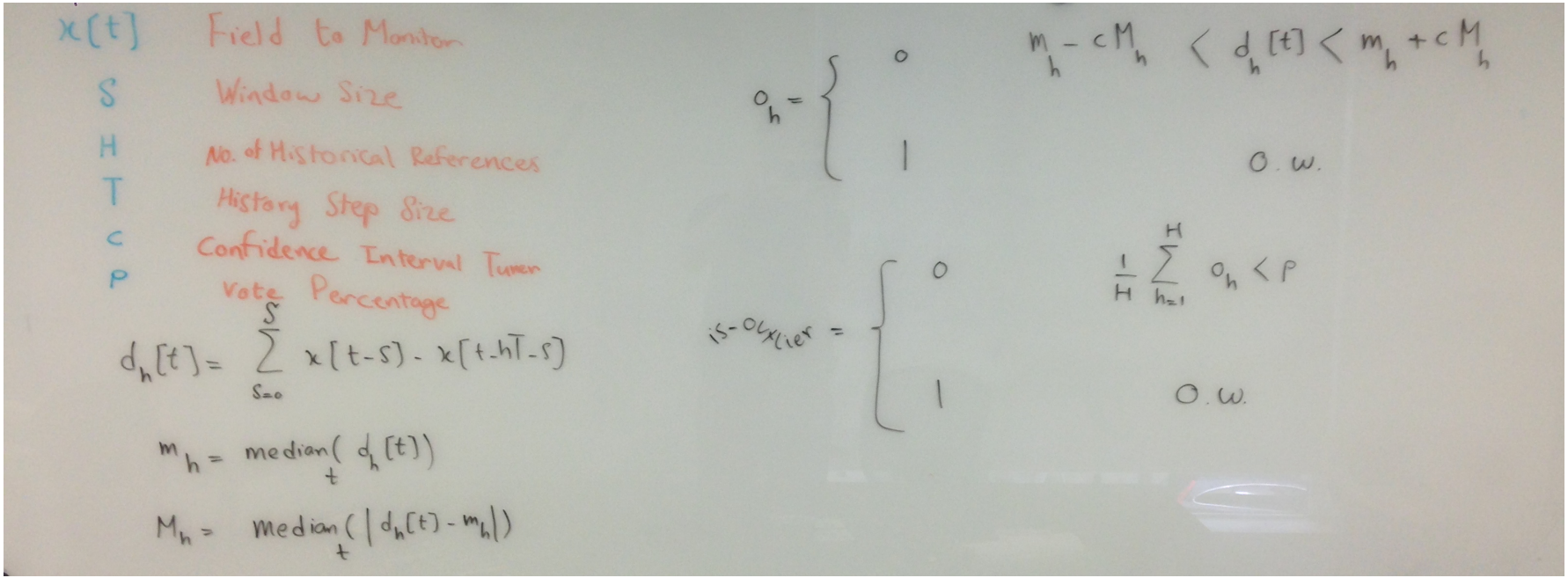
**0** Outlier(s)

Total Event(s)

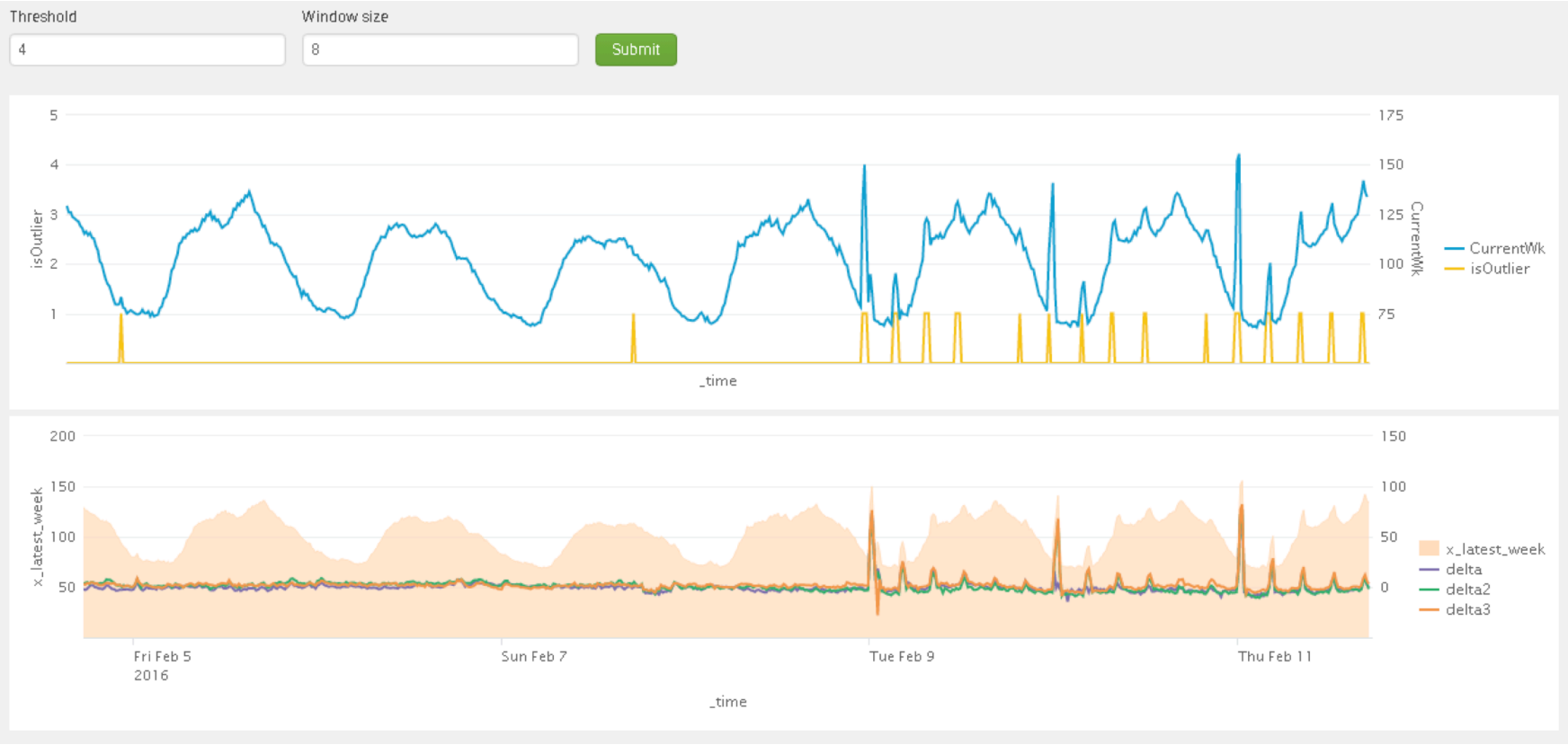
**288** Total Event(s)



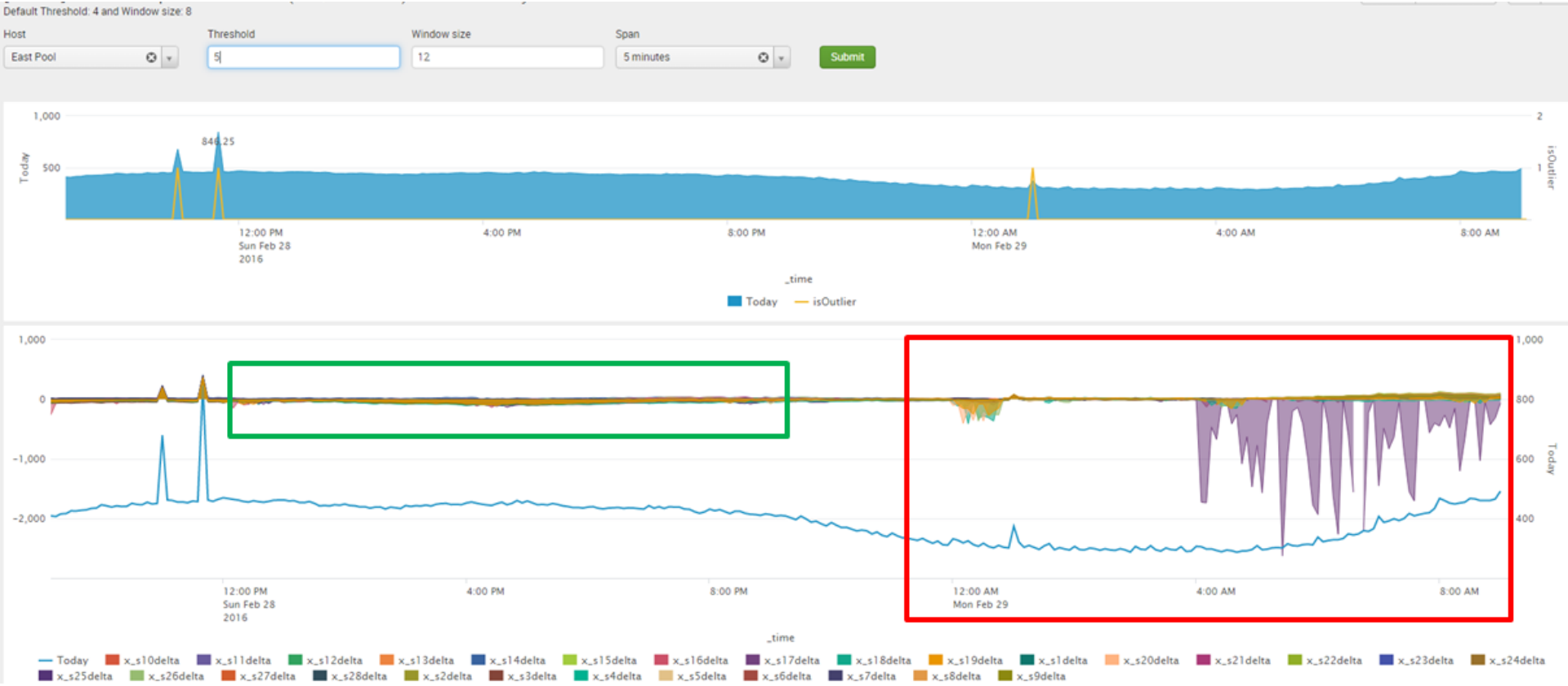
# Customized Outlier Detection



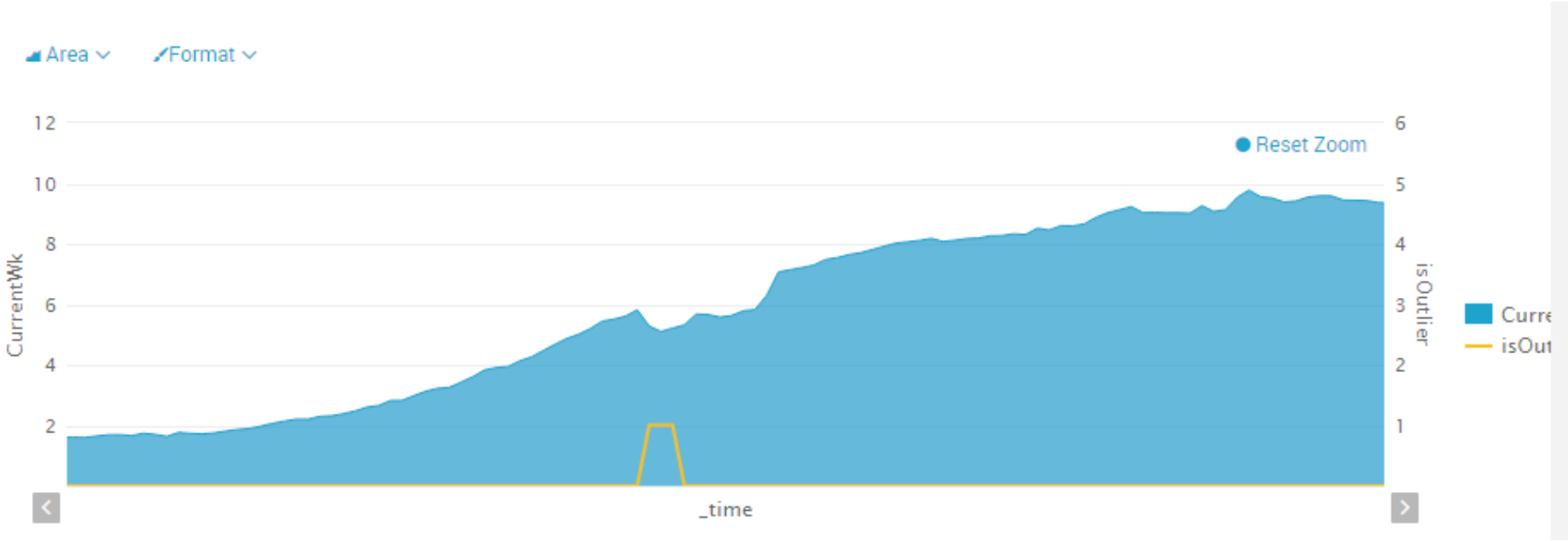
# Evaluate!



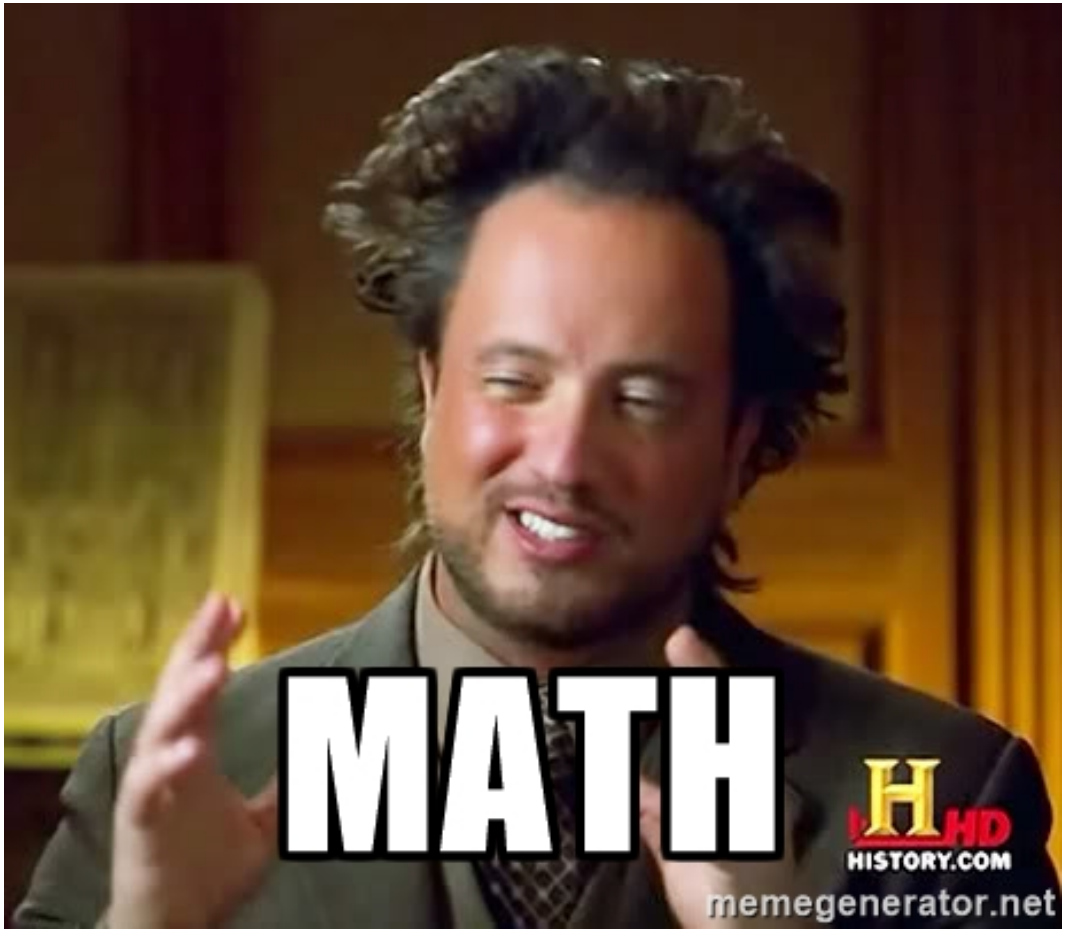
# Current Vs Historic And Delta Calculation



# DETECTED!



# Conclusion
## “Feed the Models!”



# Conclusion

- Future of IT -> Leveraging Machine Learning
- Machine Learning Toolkit (MLTK) Helped:
  - Modelling Complex System's Behaviour
  - Right Algorithm
  - Custom Visualization
  - Quick Validation
  - Generating SPL
- OI4

# THANK YOU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