

# To Decide or Not to Decide? That is the Decision May 16, 2012

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**DAX**  
TECHNOLOGIES

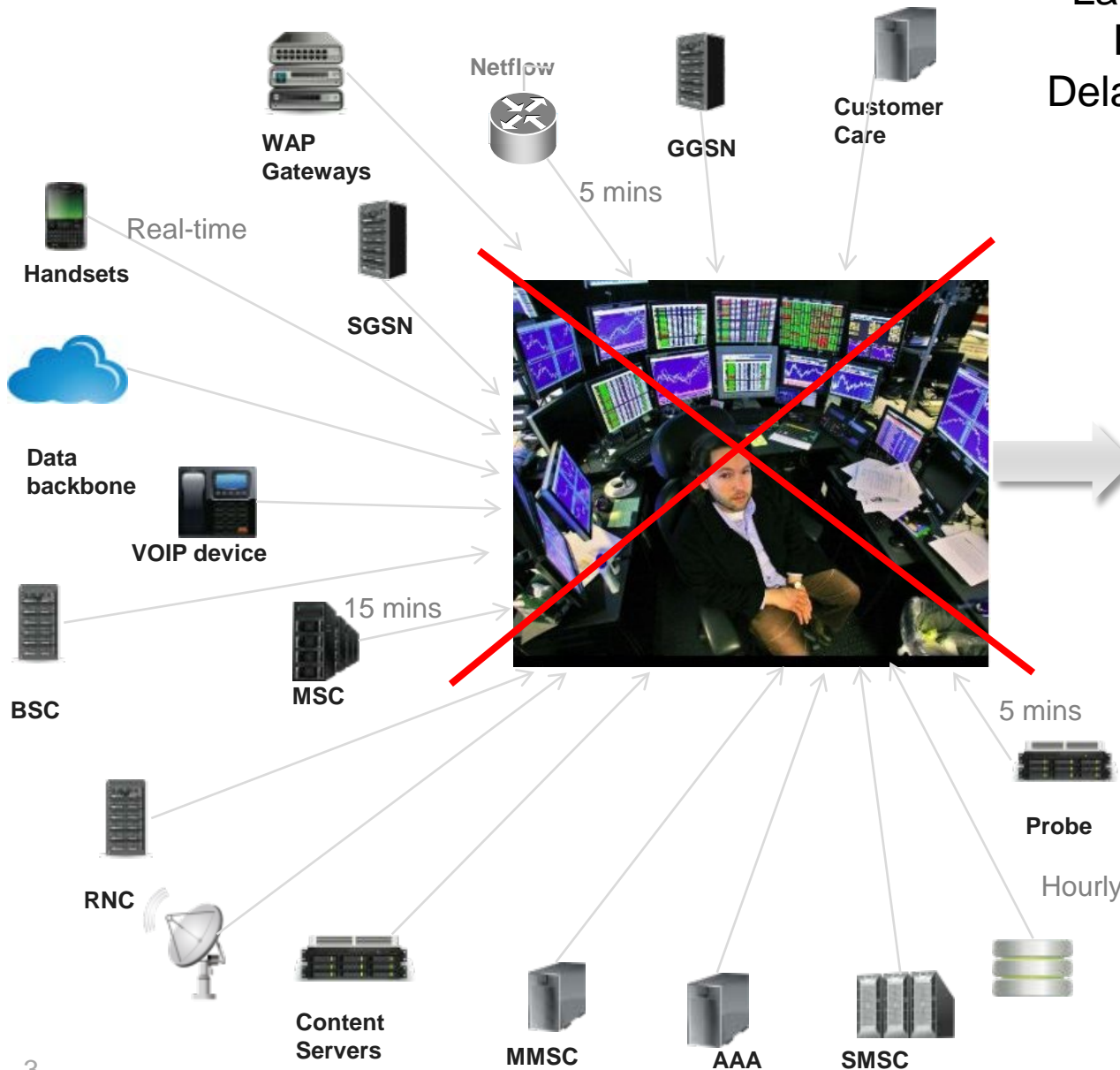


## Agenda

- **Plethora of Data Multiple Sources**
  - Incomplete
  - Delayed/Partial
- **Temporal Importance**
- **Decision Costs**
- **Completeness of Data as Data Itself**
- **Human Factors**



# Plethora of Available Data



Large Quantity of Data  
Different "Chunks"  
Delayed/Incomplete Data

**Business Intelligence**  
Correlation  
Aggregation  
Integration

**Actionable Item(s)**

- **Benefits of Acting in Real-Time**
  - **Pro-active: Resolve issue before customer is impacted (or notices impact)**
  - **Reactive: Restore service minimizing MTTR**
- **Cost of Acting**
  - **Cost of Labor**
  - **If it's not broke – don't break it**
  - **Human Life (Tactical Environment)**
- **Deciding on Incomplete Data?**

# Probabilistic View – Fault or Performance?

Milki Rado - Fault Manager - GIS Map Show banner

Fault Manager Configuration Administration Logout

**Severity Filter**

**Events list**

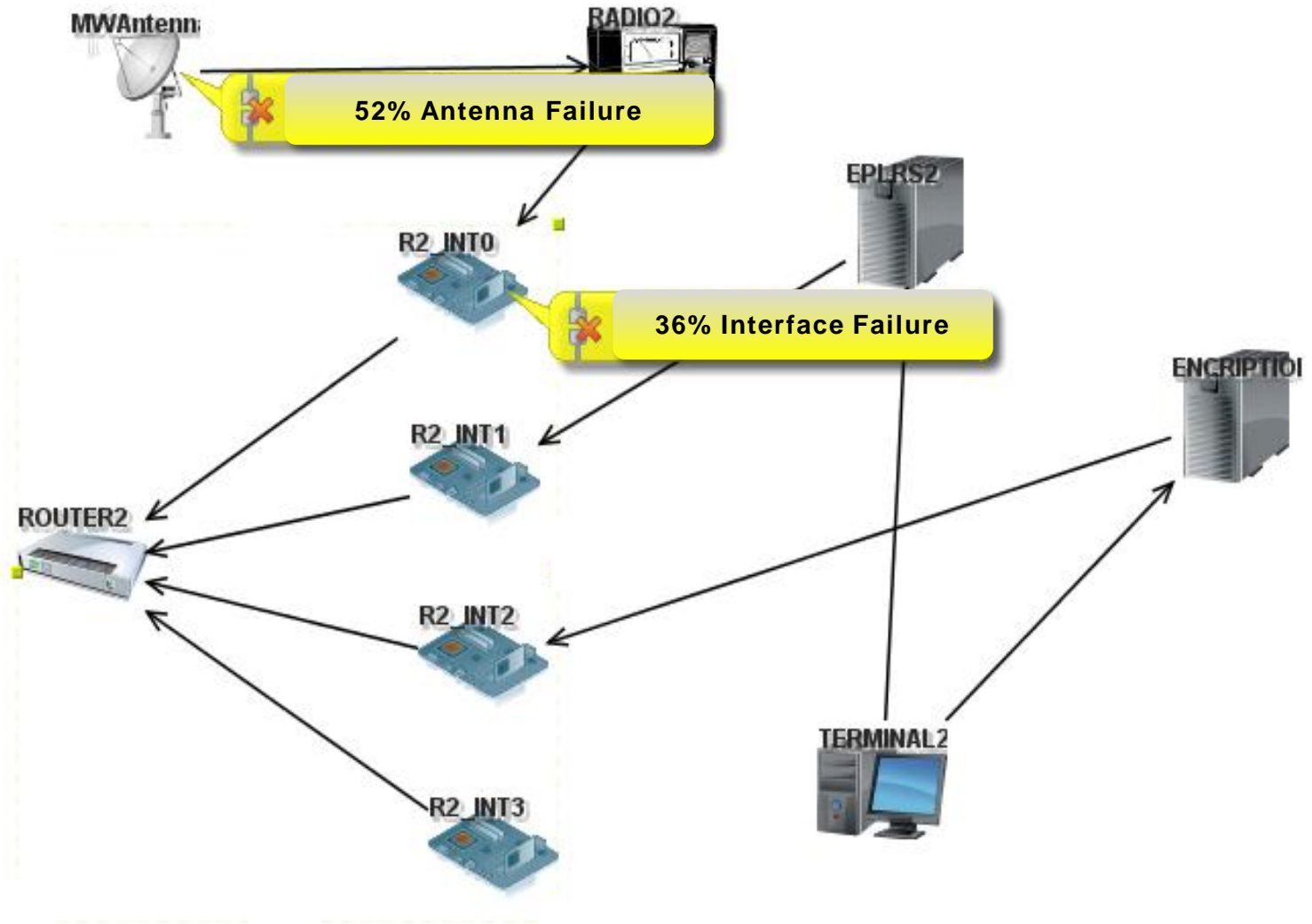
- Alarm, Minor, 03/20/2008 10:27:47  
(3) High Packet Loss detected
- Alarm, Critical, 03/20/2008 10:27:47  
(1) Link Failure
- Alarm, Critical, 03/20/2008 10:27:47  
(3) Link Failure
- Alarm, Minor, 03/20/2008 10:27:47  
(1) Link Congested

23.433009077420344, 39.364013671875

Name	System	Parent	Latitude	Longitude	Elevation	Type	Class	Severity	Status
SW3	S8 - Dax Net...	BUMPER-A-3	BUMPER-A-3	NaN	NaN		Cisco Switch	Switch	Information

Search - (1) Details Links Other NEs Filtered NEs Event List Simulator

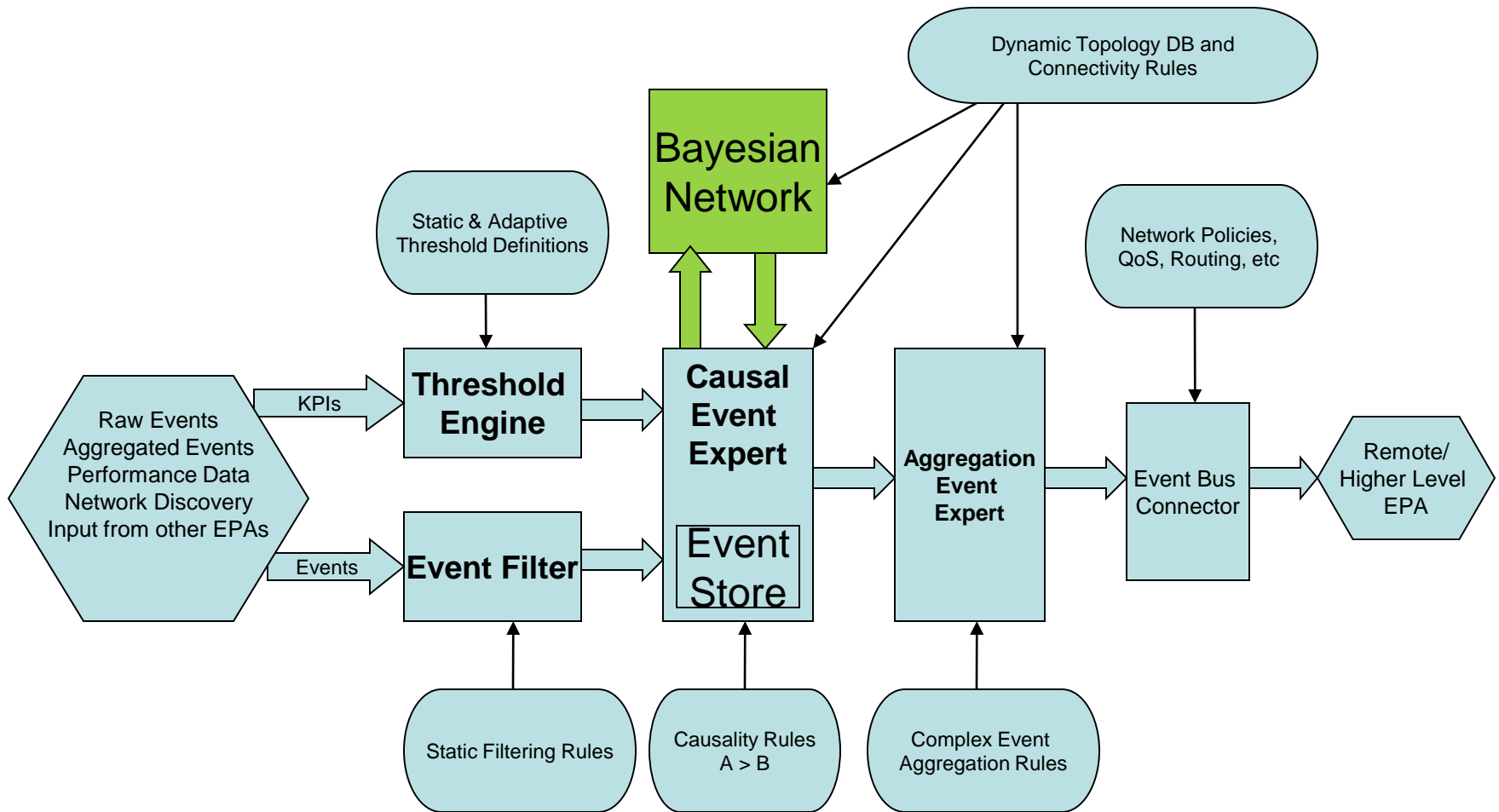
# Probabilistic View Fault



# Analyzing Incomplete Data




- **Hybrid approach that combines *abductive* reasoning and probabilistic *inferencing* techniques**
- ***Abductive* reasoning can be used to generate hypotheses about events**
  - However incomplete data may result in insufficient information being available for the abduction process to arrive at a conclusion
- **Probabilistic *inferencing* using Bayesian networks provides a powerful tool for distributed inferencing**
  - A Bayesian network is a directed acyclic graph (DAG) comprised of nodes and arcs
  - Nodes represent random variables and directed arcs between pairs of nodes represent dependencies between the random variables.

# Adding Probabilistic Determination





## Wireless Operator Example

Potential Issues				
	Description	Score	Count	Rate It
1	Over 99% of calls are 1x on cell: SW:Paris, No:33, Face:0	75%	119	
2	Sessions with no user traffic	15%	13	
3	Data Sessions terminated with MIP re-registration interval exceeded	6%	3	

- Rule Result(s) Self Score based on Probability
- Able to drill down on Rule Results to see how probability was derived
- “Crowd-Sourcing” by Allowing Rating Rule Results

# How Complete is the Data?

How Long Ago  
Complete Set of  
Data Received

What % of Data  
Available in  
Current Interval

Period  
Between 2/1/2011 and 2/7/2011

Customer Id  
2050637997

Go

Last Data Received	Delay (Min)	% Reported
2/7/2011 7:00:00 PM	43	32%

## Customer Technology Usage and Quality Rating

MSISDN	Category	Technology	Customer Sessions	Customer Quality Rating (Avg)
205063799797	Text Message	3G	2	5.00
	Voice	3G	9	4.96

## Customer Device Usage and Quality Rating

Manufacturer	Model	Category	Technology	Customer Sessions	Device Type	QoE
Nokia	N8	Voice	3G	9		4.36
			2G	0		4.45
		Text Message	3G	2		5.00
			2G	0		5.00
		Data	2G	0		3.95
			3G	0		3.89

## Customer Information

MSISDN	First Name	Last Name	Street Address	City	State	Group	Type	Subtype	Customer Segment	Use
205063799797	Dovie	Mannino	235 Seventh Ave.	San Clemente	WA	Residential	Individual			

## Customer Service Analysis

Based on data collected last 7 days.

No Service Quality Issues Detected.

## Recommendations

Based on data collected last 7 days.

Dispatch

Create Ticket

## Customer Voice KQIs

Metric	Value	Quintile
Voice Calls per Day	2.25	5th
Average Minutes of Use per Day	40.30	5th
Average Call Setup Time (sec)	4.11	3rd
Average Call Length (min)	17.91	5th
Abnormal Terminated Calls	0.00%	5th

## 2G Voice

Metric	Value	Quintile
Voice Calls per Day	NA	
Average Minutes of Use per Day	NA	
Average Call Setup Time (sec)	NA	
Average Call Length (min)	NA	
Abnormal Terminated Calls	NA	

## 3G Voice

Metric	Value	Quintile
Voice Calls per Day	2.25	5th
Average Minutes of Use per Day	40.30	5th
Average Call Setup Time (sec)	4.11	3rd
Average Call Length (min)	17.91	5th
Abnormal Terminated Calls	0.00%	5th

## Customer Cell Usage and Quality Rating

Site Name	Cell	Technology	Category	Customer Sessions	Cell Quality Rating (Avg)
Wellsville 21031-49022 (U.S. 91)	CELL 10171	3G	Voice	4	4.4
			Text Message	1	5.0

## Conclusions

**A Good Decision is based on knowledge and not on numbers**  
**Plato**