



TRUSTWORTHY CYBER INFRASTRUCTURE FOR THE POWER GRID | TCIPG.ORG

BIG DATA IN POWER SYSTEMS

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KENTA KIRIHARA AND KEVIN LARSON

UNIVERSITY OF ILLINOIS

OUTLINE

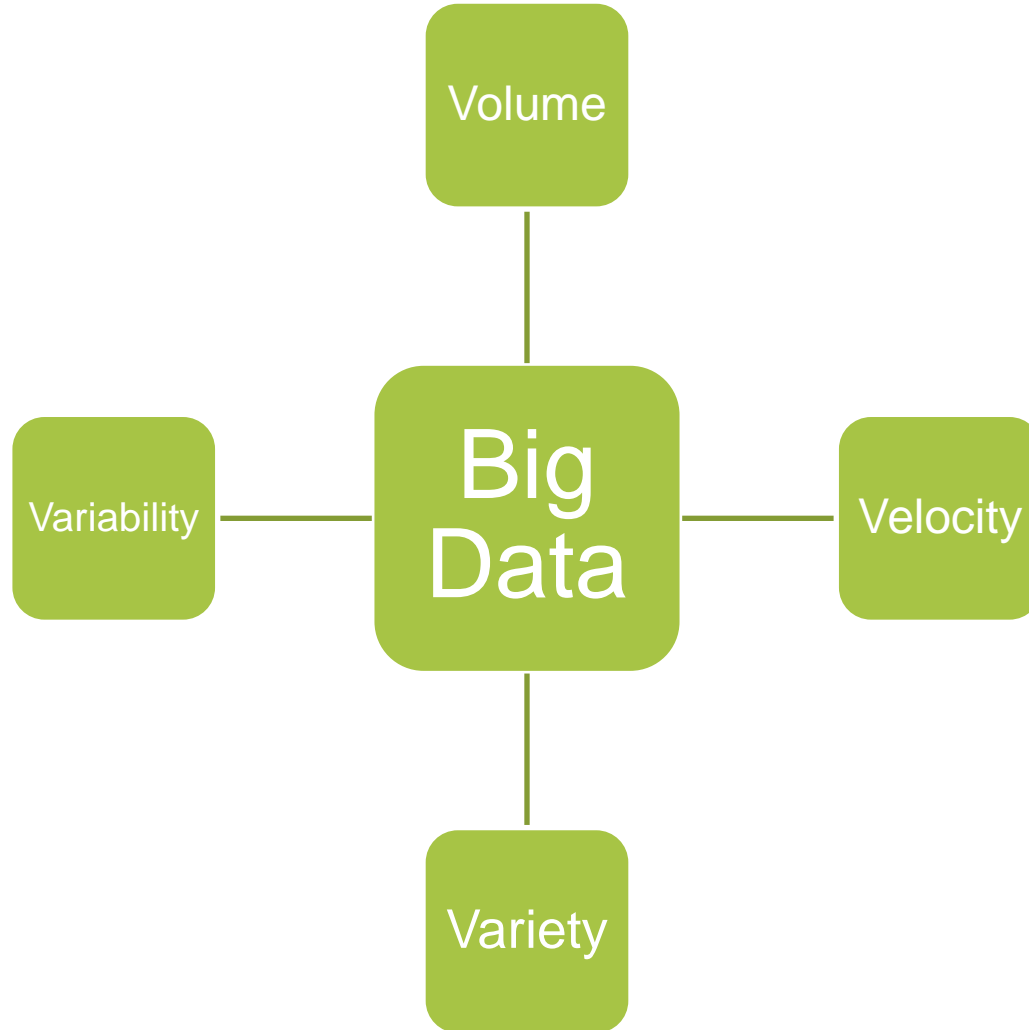
1. What is Big Data?
2. Companies working with Big Data
3. Examples of Big Data in Power System
4. Human Perception
5. Example Solutions in Power System
6. General Strategies/Solution
7. General Big Data Analysis
8. Challenges
9. Cloud Computing

WHAT IS BIG DATA?

We need a volunteer!



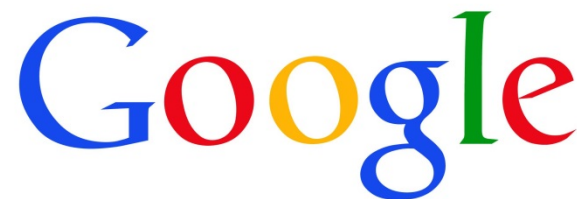
WHAT IS BIG DATA?



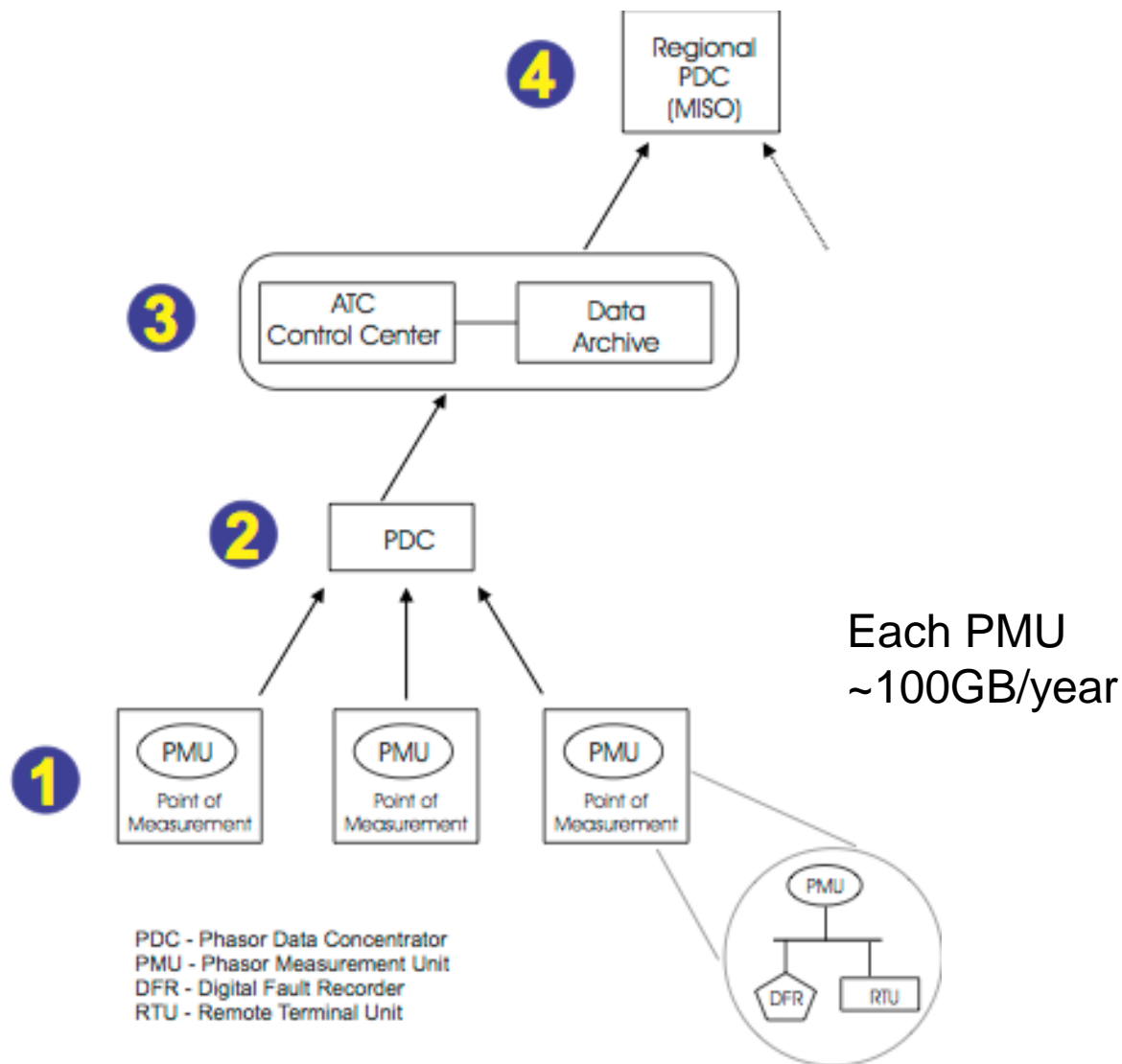


COMPANIES WORKING WITH BIG DATA

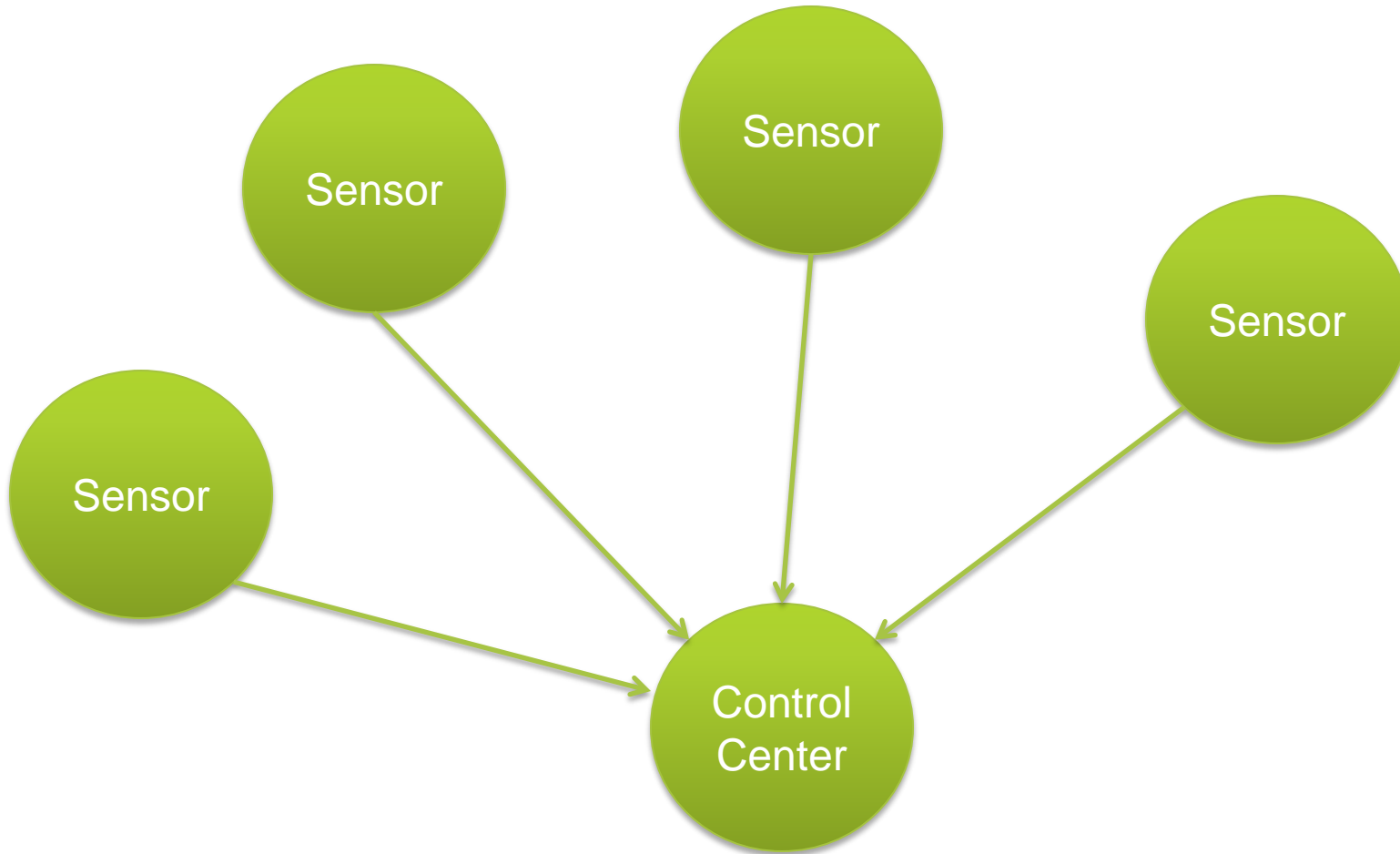
1. IBM
2. HP
3. EMC
4. Teradata
5. Oracle
6. SAP
7. Microsoft
8. Amazon
9. Vmware
10. Google



SYNCHROPHASORS



SMART METERS/AMI

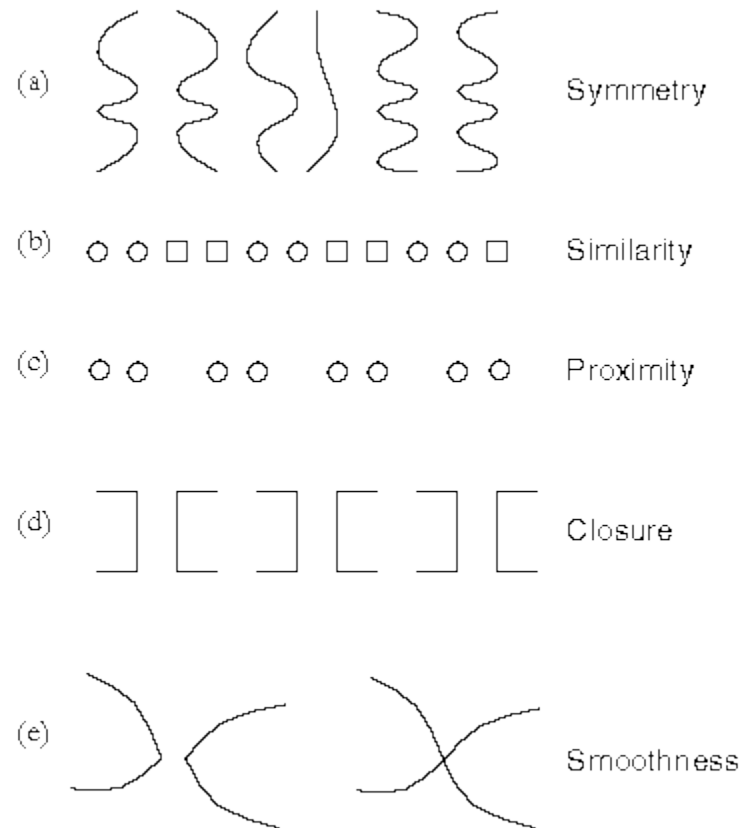


HUMAN PERCEPTION: THE LIMITING REAGENT

**“The Magical Number
Seven, Plus or Minus
Two: Some Limits on Our
Capacity for Processing
Information”**

Information from Big Data
Analytics should aim to take
information to this level.

Grouping

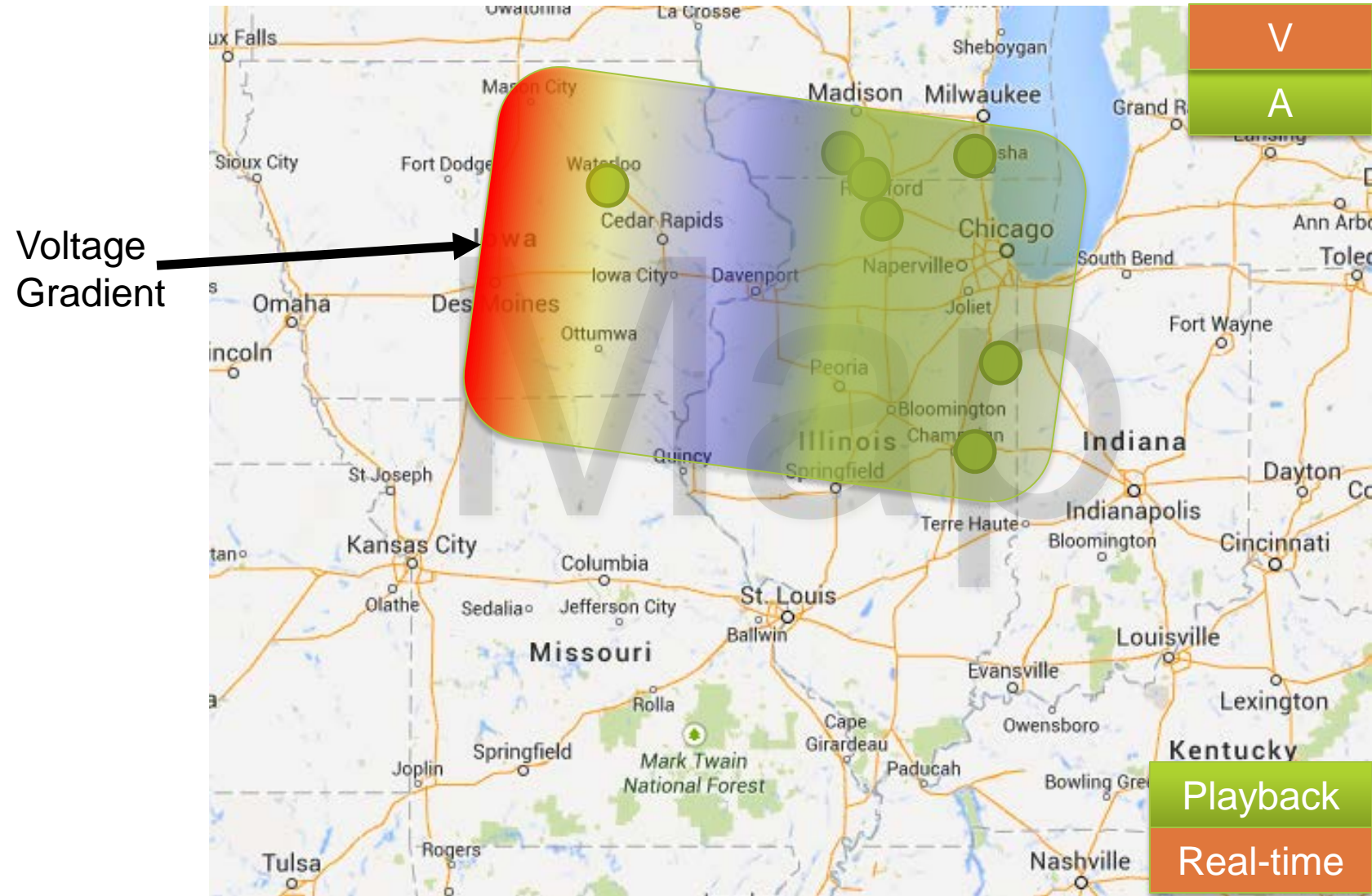


GOAL OF BIG DATA

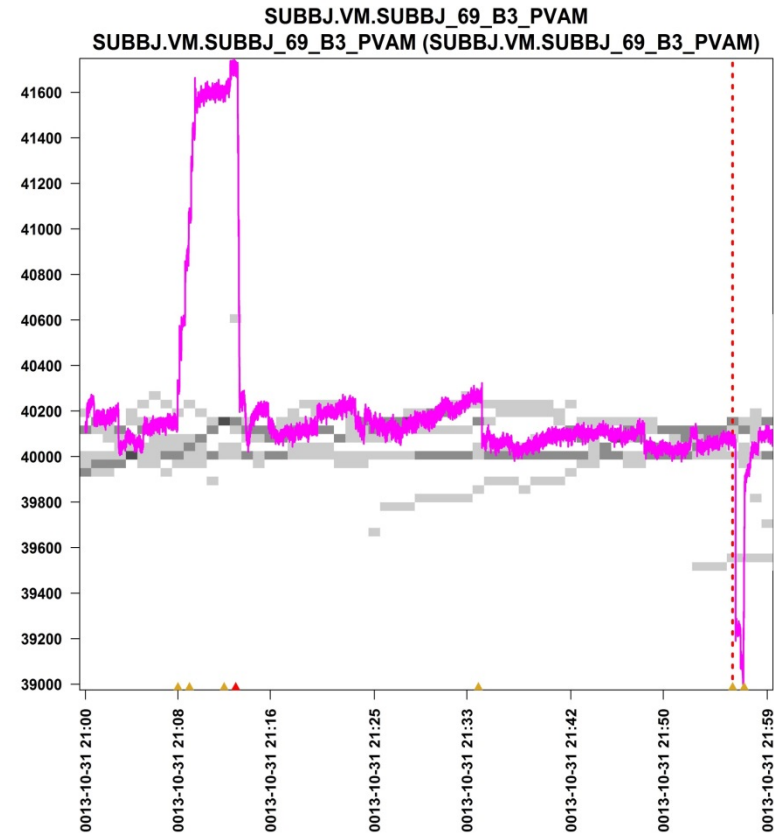
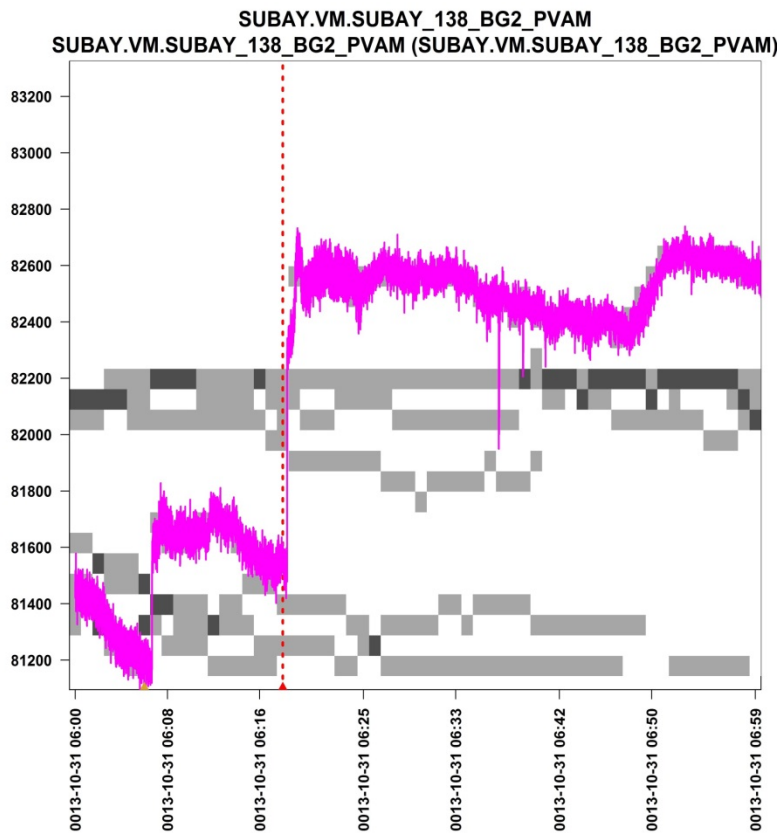
Take **complex** information.....

Then present it in a way that can be **understood!**

EXAMPLE SOLUTION #1: VISUALIZATION



EXAMPLE SOLUTION #2: EVENT DETECTION



Atypical Events Captured: double capacitor bank switching (left) and tap changer switching (right)

HANDLING BIG DATA

- Making sense requires computation – often lots of it.
- How to organize and distribute that computation is still a challenging subject
- Hadoop
 - Open source implementation of MapReduce
 - Lots of research

HADOOP

How do we break data into pieces and send them to computers?

Map – filtering and sorting

Reduce – summary operation

Example – word count

Maps – sort clusters of words

Recudes – count instances of words

HADOOP 1.X

1. Generated MR Job 1
 - 50 Map Tasks
 - 20 Reduce Tasks
2. 1's Output + Generated MR Jobs 2
 - 12 Maps
 - 3 reducers

Pig Tasks

HIVE Tasks

Custom Map Reduce Jobs

Hadoop
Resource ManagerComp
1Comp
2

⋮

Comp
n

YARN

