Overview of IEEE 1451.1

for Distributed Measurement and Control Applications

Jeff Burch

Agilent Technologies

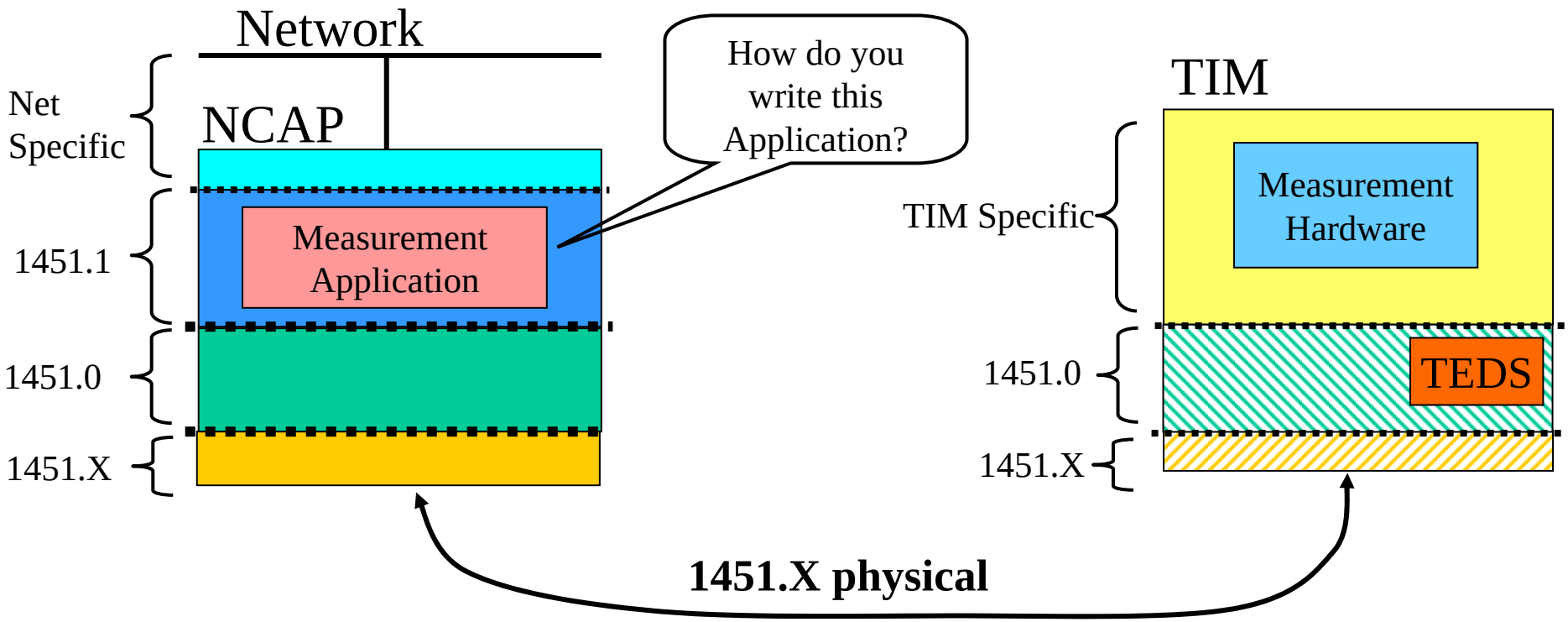
jeff_burch@agilent.com

Agilent Technologies

Agenda

- Context – Where does 1451.1 fit in?
- Goals / History
- Use in Agilent Remote RF Monitoring Products
- Key Architecture Features
- Meeting Application Requirements
- Next Steps

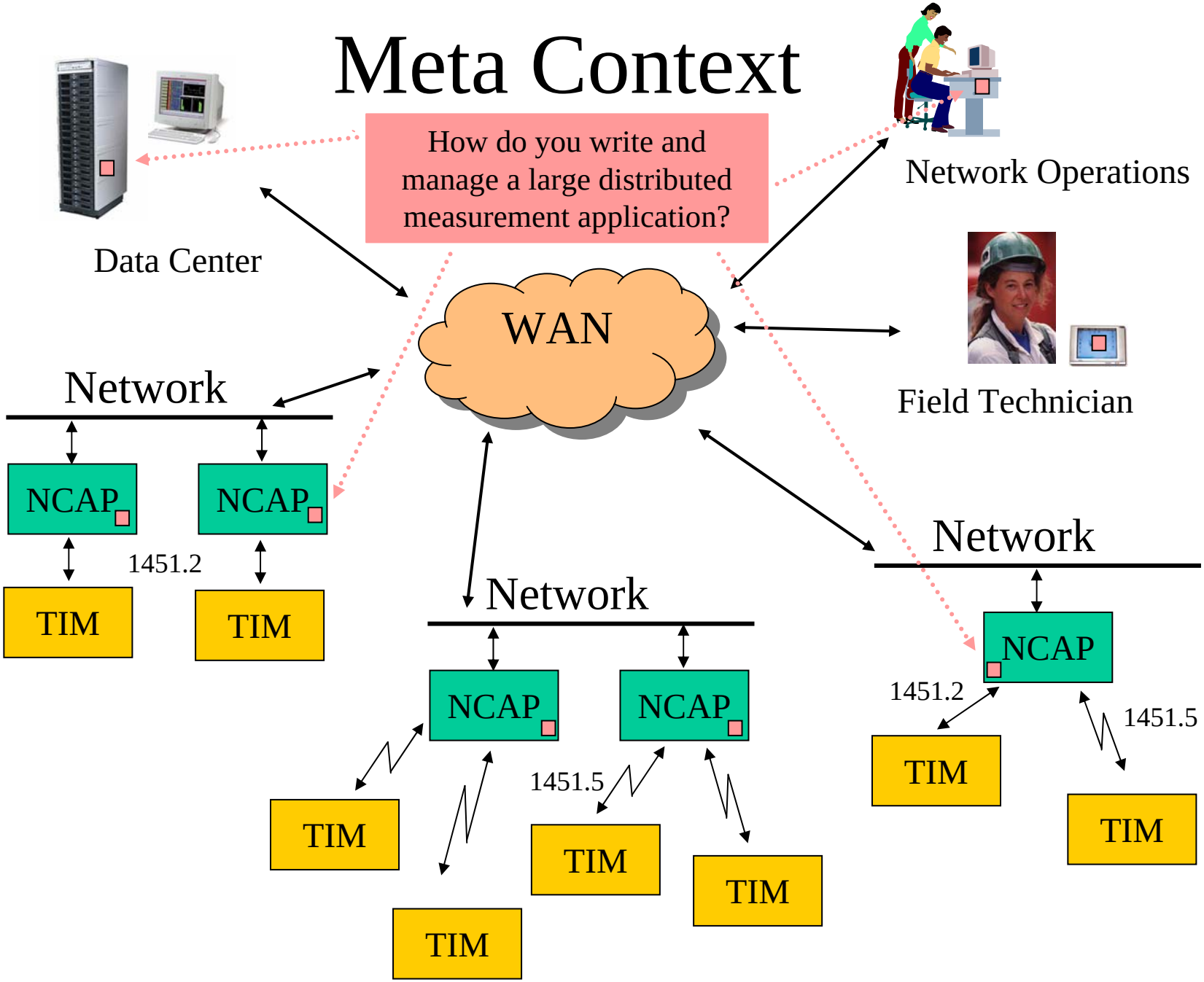
Context



The 1451.1 standard:

- Communication abstraction between NCAPs and higher level systems.
- Network independence / Language neutral.
- Measurement Data-flow processing
- Configuration and Management mechanisms

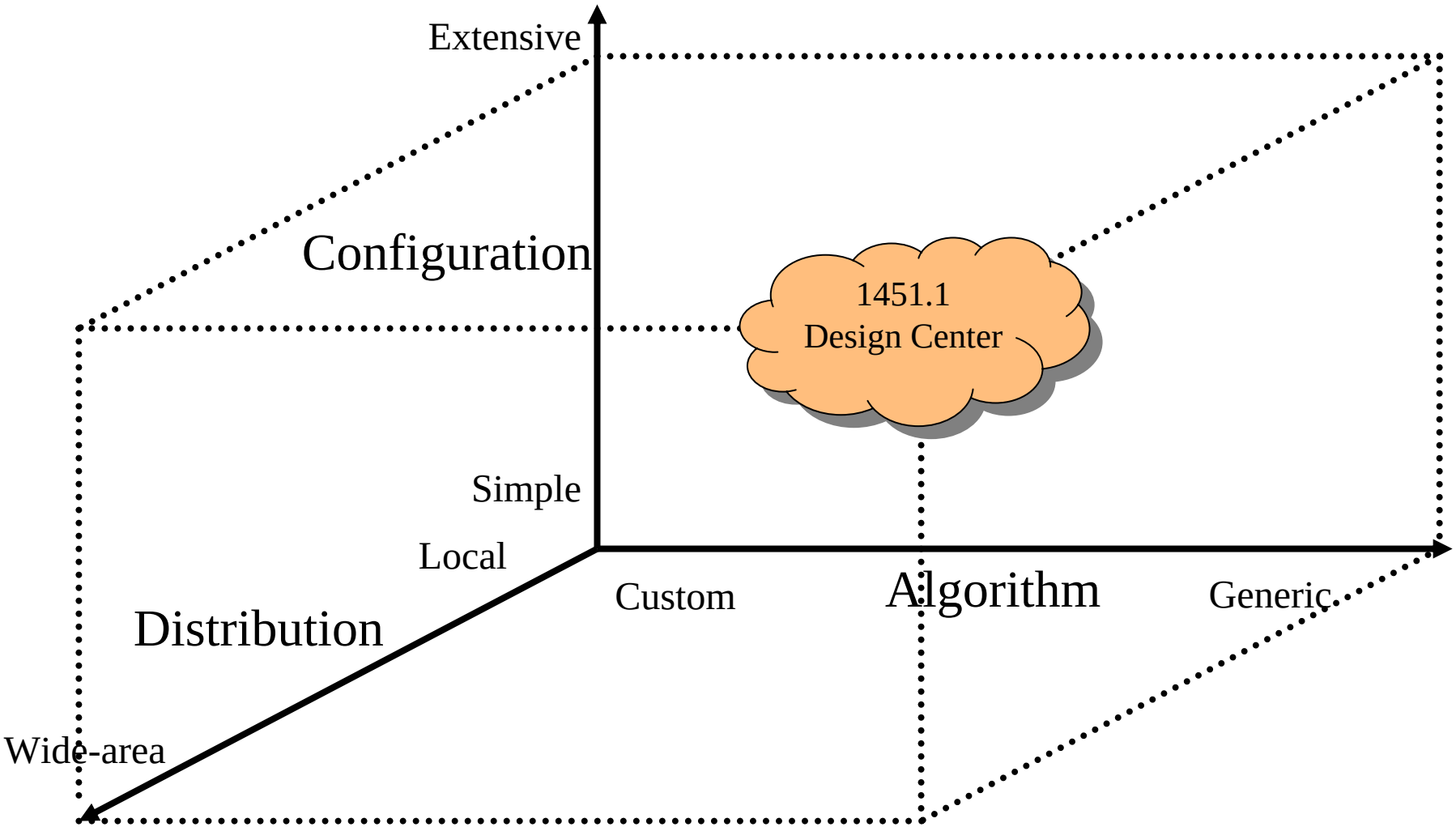
Meta Context



1451.1 Goals and History

- Provide a Programming Model for Distributed Measurement and Control Applications
- Interface with 1451.X Transducers
- Network Neutral
- Language Neutral
- Passed 1999
- Up for review this year

Software Design Dimensions



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Agilent Air Interface Remote Monitoring System
(E6476A, E6478A)

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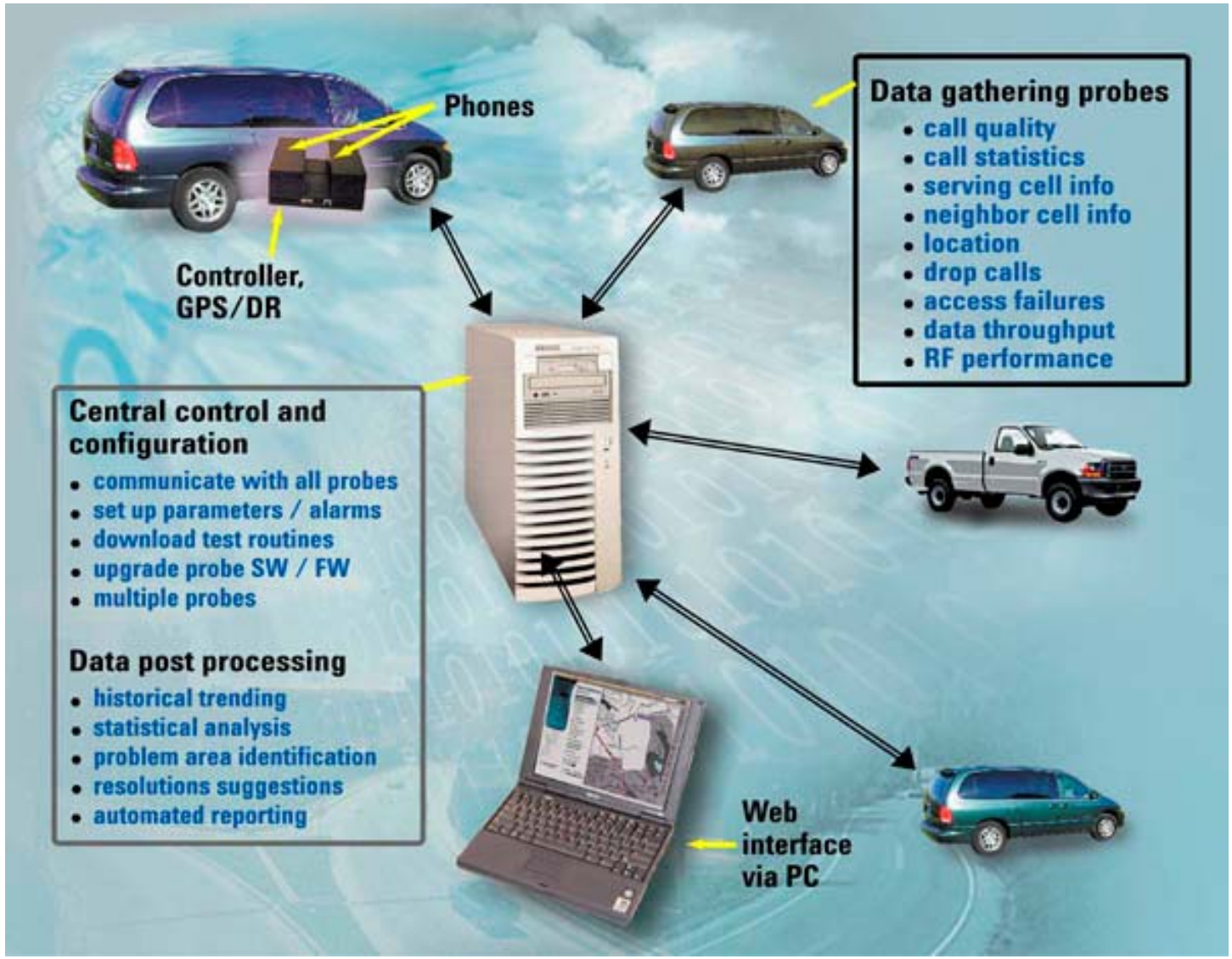

Agilent RMS | Air Interface | Chicago GSM Reference Market | GO

Air RMS Interface

- Map
- Alert
- Probe
- Market
- Reports
- Administration
- Help
- Logout

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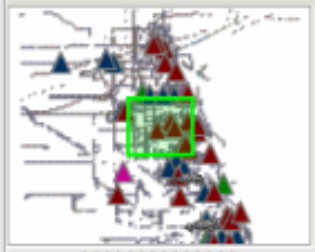
Chicago GSM Reference Market

Map | 800x600



- Base Stations
- Probes
- Alarms (Severity)
  - Critical
  - High
  - Low
  - Medium
  - Severe
- Signal Strength Full-M
  - -110.0 - -104.0
  - -104.0 - -100.0
  - -100.0 - -95.0
  - -95.0 - -85.0
  - -85.0 - -70.0
  - -70.0 - -60.0
  - -60.0 - -50.0
  - -50.0 - -40.0
  - -40.0 - 0.0

Dropped Call, Source: 034727029000090000000000000000000, Severity: Severe (8)

X: -87.652
Y: 41.942

1:21,999

One Inch = 0.347 Miles

0 1 2

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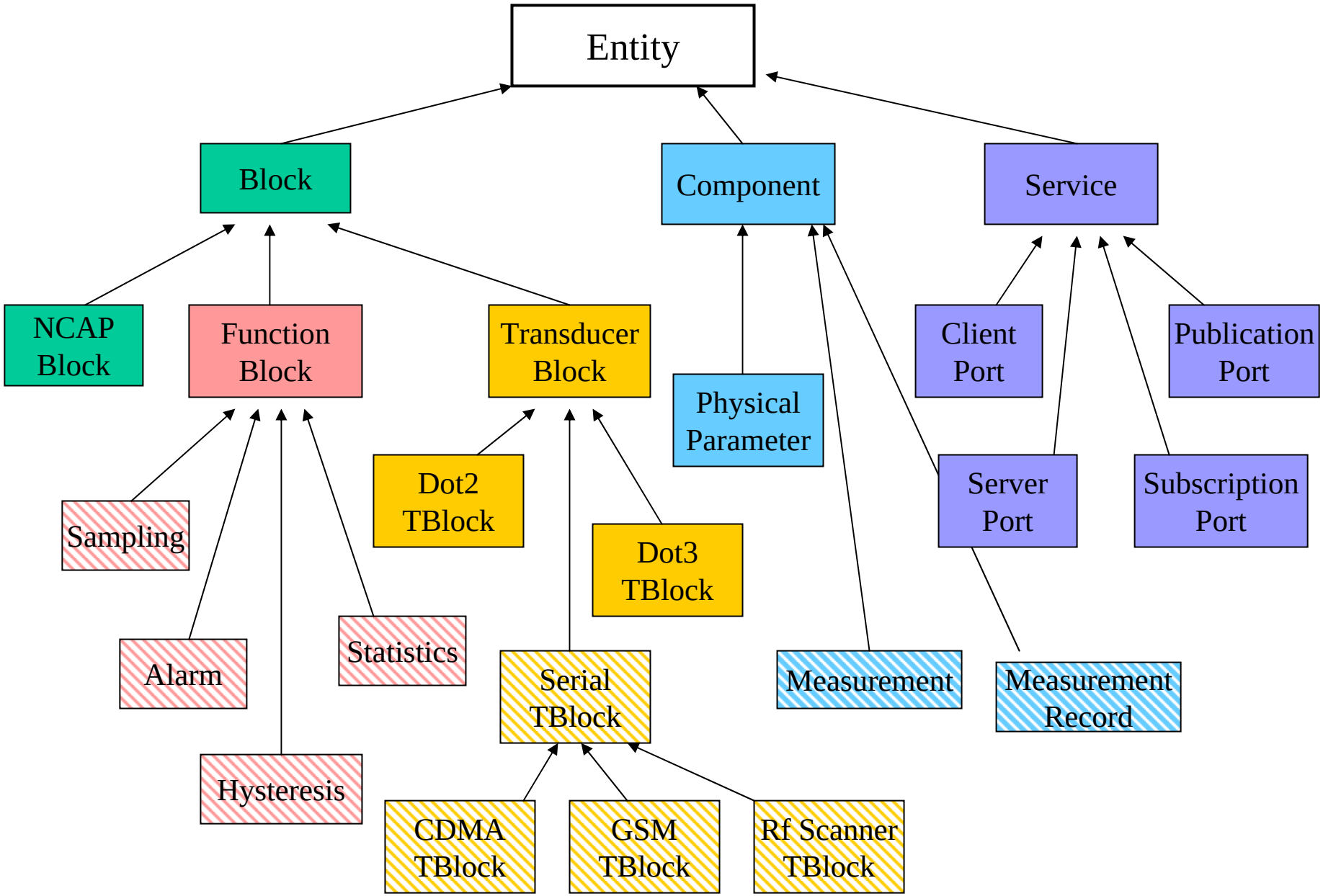
1451.1 Class Hierarchy



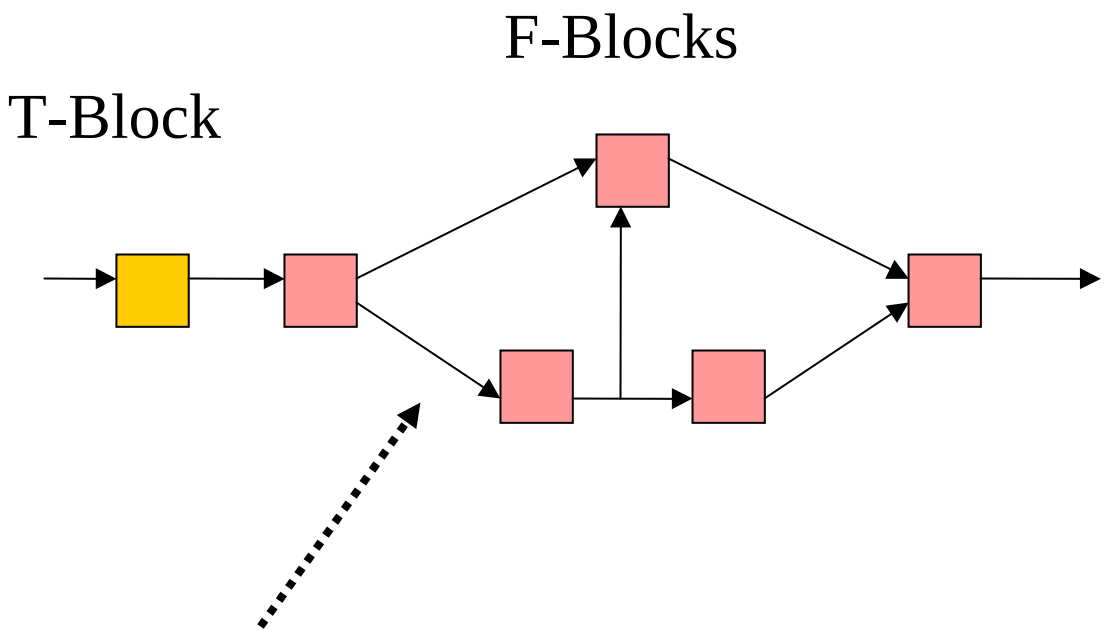
1451.1 Communication

- Client / Server style
  - Always One-to-One
  - Bi-directional information flow
  - Optional one-way
  - Synchronous and asynchronous forms

- Publish / Subscribe style
  - One-to-Many, may be One-to-One or One-to-All
  - Unidirectional information flow
  - Non-acknowledged

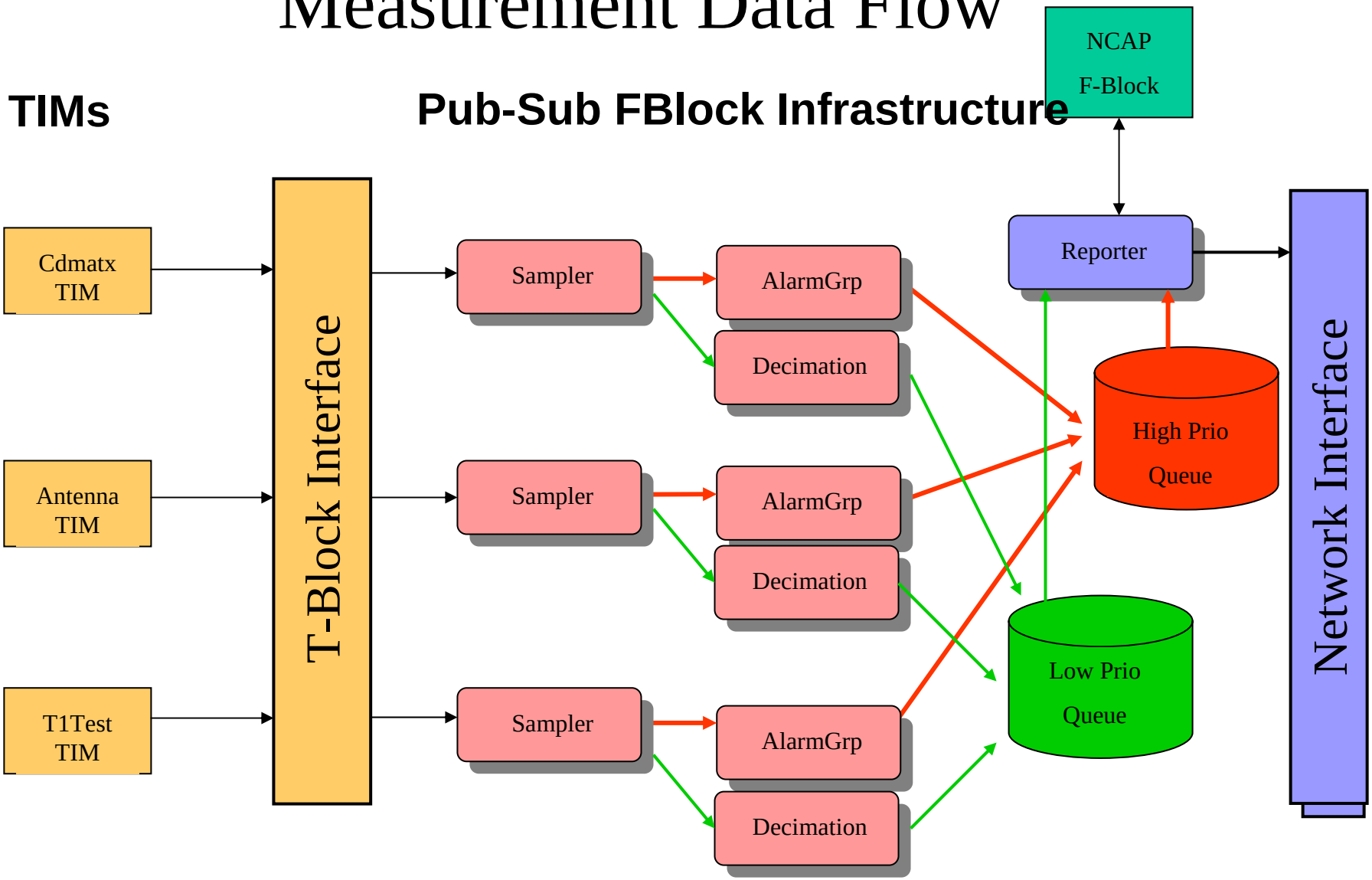
- Fully Symmetric Communication
  - NCAPs and higher-level server can be Client, Server, Publisher, and Subscriber simultaneously

Decomposing an Application as Cooperating Function-Blocks



Publish / Subscribe
Communication Mechanism between
Cooperating F-Blocks and T-Blocks

Measurement Data Flow



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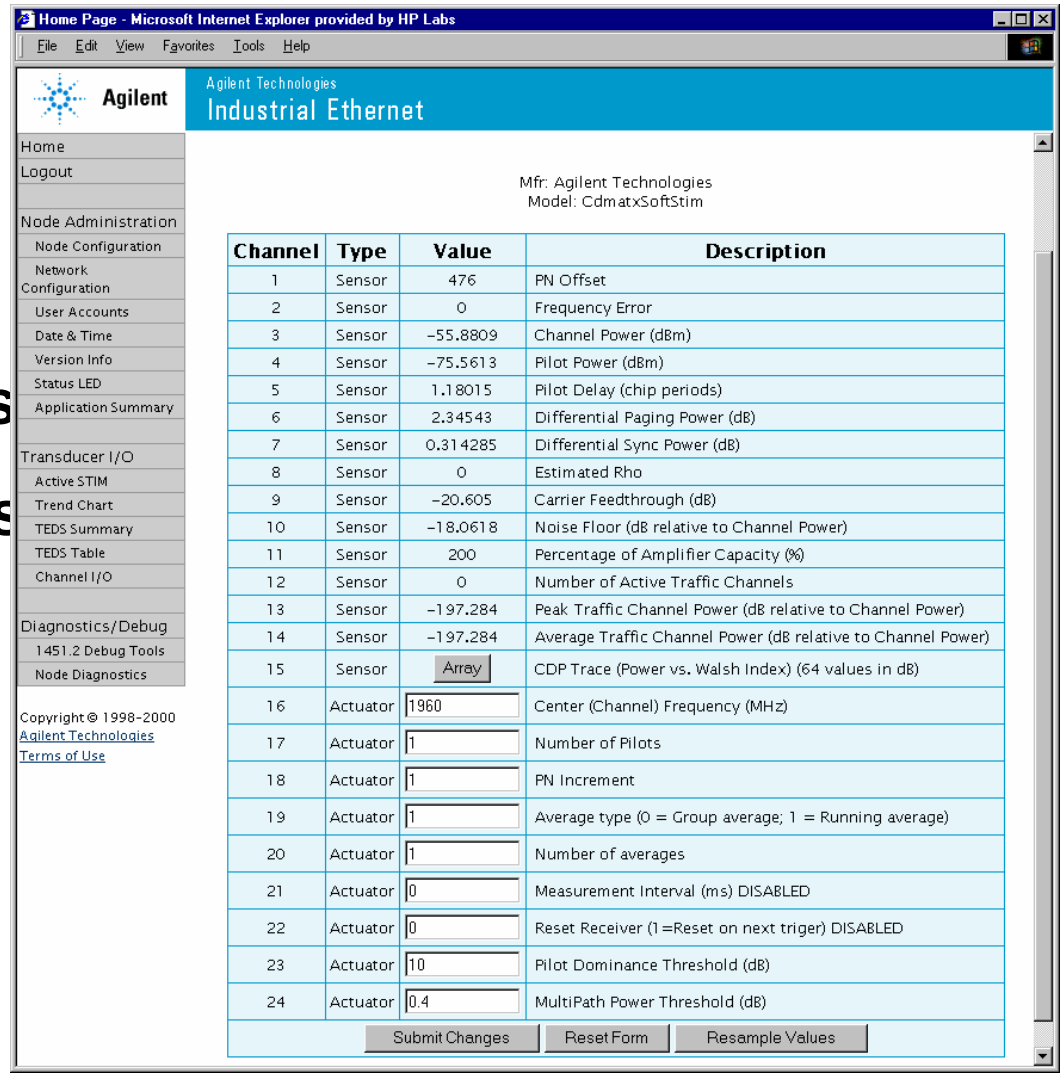
CDMA Analysis TIM

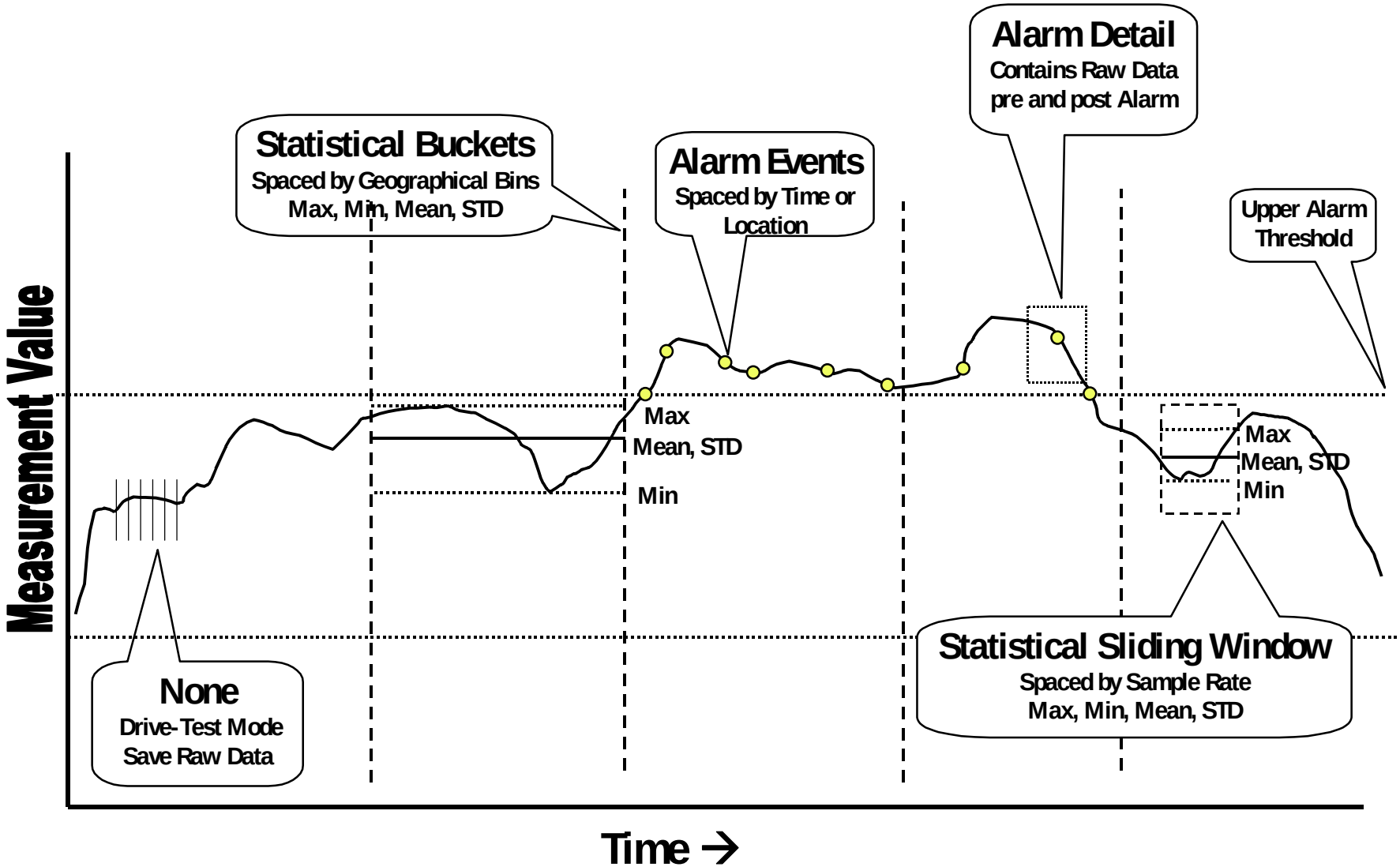
- **1451.2 Data Model**
- **TEDS**
- **24 data channels**
- **15 sensor channels**
- **9 actuator channels**



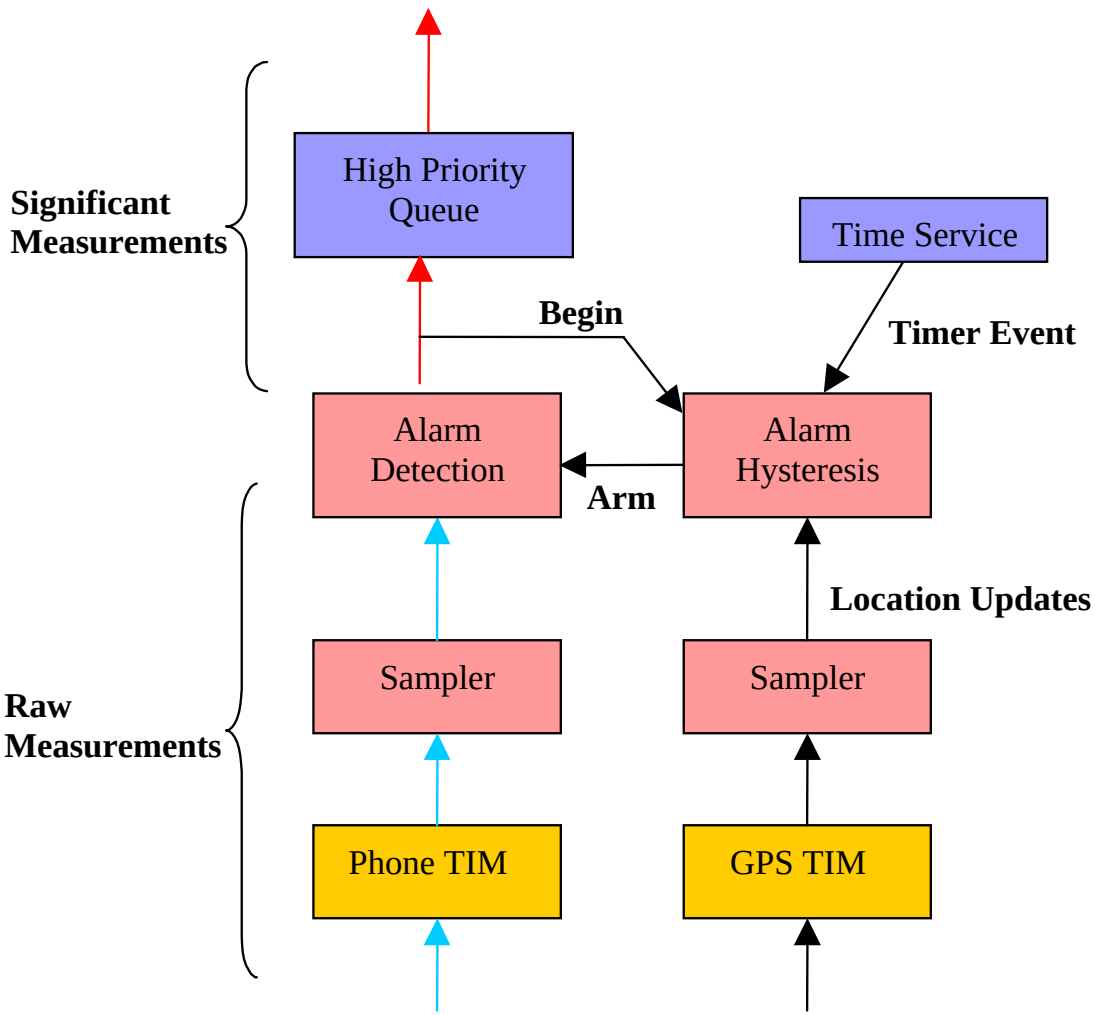
Channel	Type	Value	Description
1	Sensor	476	PN Offset
2	Sensor	0	Frequency Error
3	Sensor	-55.8809	Channel Power (dBm)
4	Sensor	-75.5613	Pilot Power (dBm)
5	Sensor	1.18015	Pilot Delay (chip periods)
6	Sensor	2.34543	Differential Paging Power (dB)
7	Sensor	0.314285	Differential Sync Power (dB)
8	Sensor	0	Estimated Rho
9	Sensor	-20.605	Carrier Feedthrough (dB)
10	Sensor	-18.0618	Noise Floor (dB relative to Channel Power)
11	Sensor	200	Percentage of Amplifier Capacity (%)
12	Sensor	0	Number of Active Traffic Channels
13	Sensor	-197.284	Peak Traffic Channel Power (dB relative to Channel Power)
14	Sensor	-197.284	Average Traffic Channel Power (dB relative to Channel Power)
15	Sensor	Array	CDP Trace (Power vs. Walsh Index) (64 values in dB)
16	Actuator	1960	Center (Channel) Frequency (MHz)
17	Actuator	1	Number of Pilots
18	Actuator	1	PN Increment
19	Actuator	1	Average type (0 = Group average; 1 = Running average)
20	Actuator	1	Number of averages
21	Actuator	0	Measurement Interval (ms) DISABLED
22	Actuator	0	Reset Receiver (1=Reset on next triger) DISABLED
23	Actuator	10	Pilot Dominance Threshold (dB)
24	Actuator	0.4	MultiPath Power Threshold (dB)

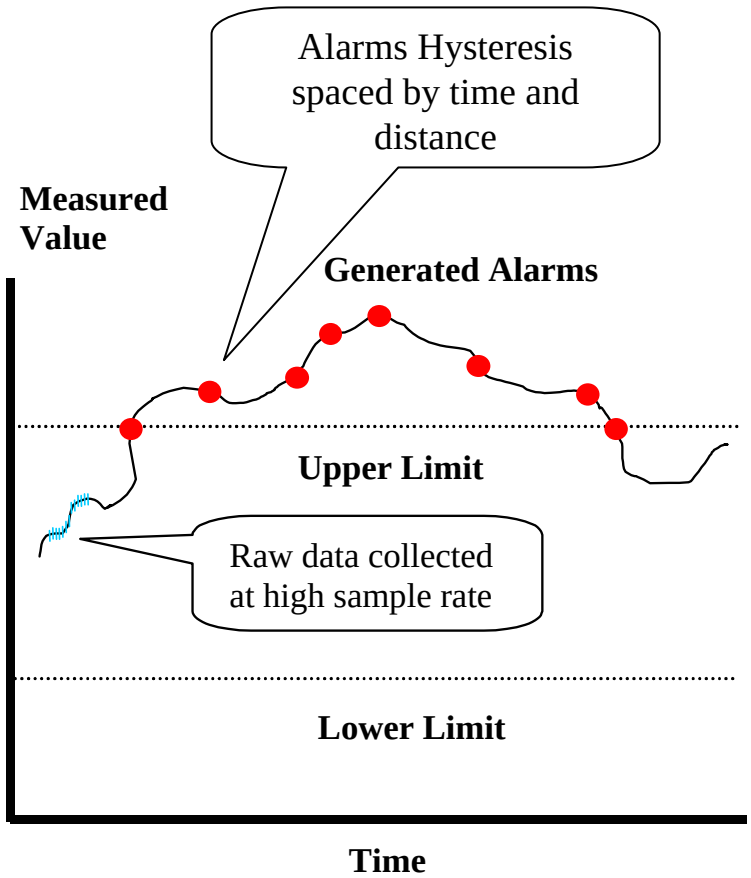
Using Cellular Networks to telemetry Measurement Results

Overcoming Communication Bandwidth Limitations

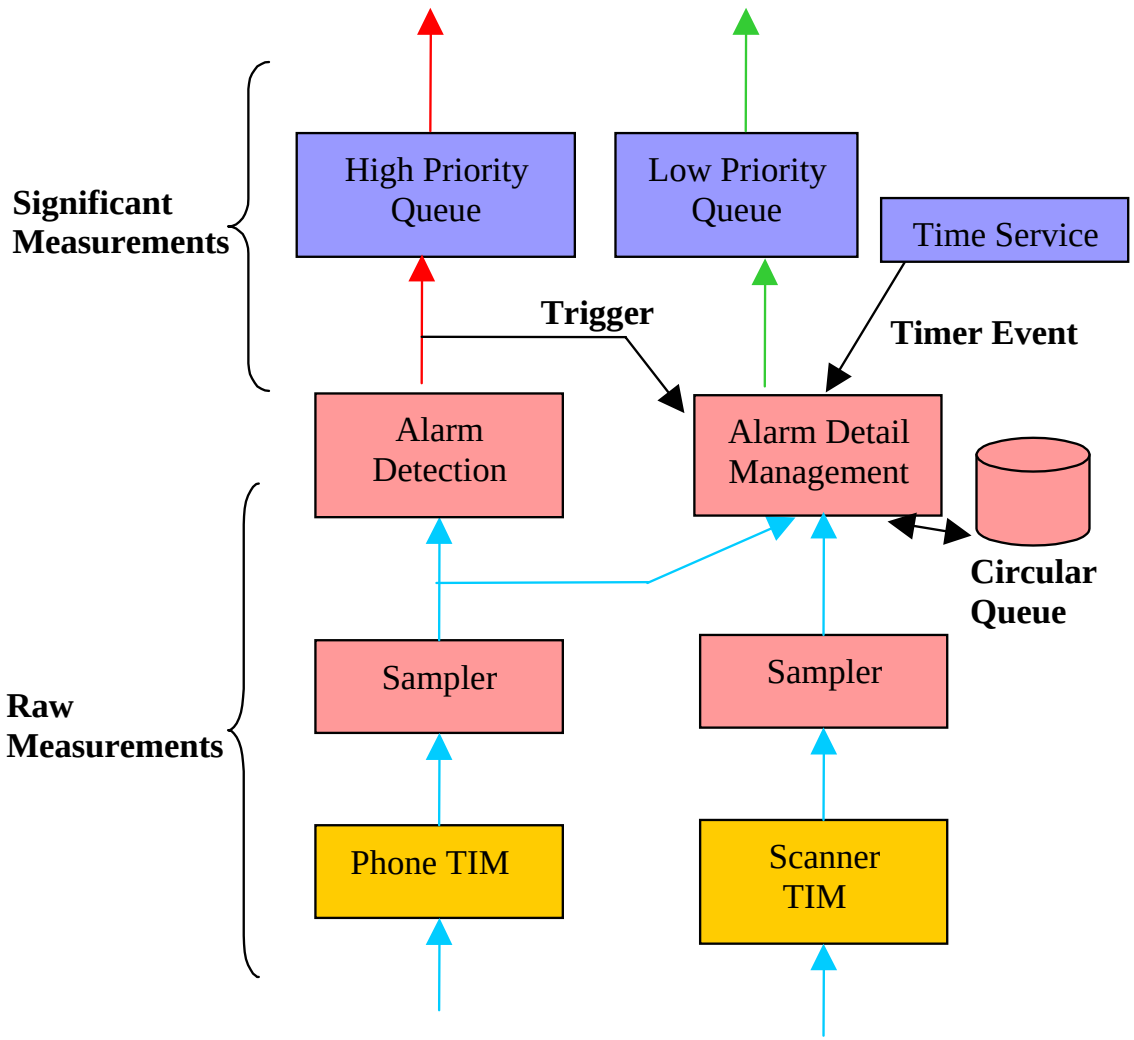


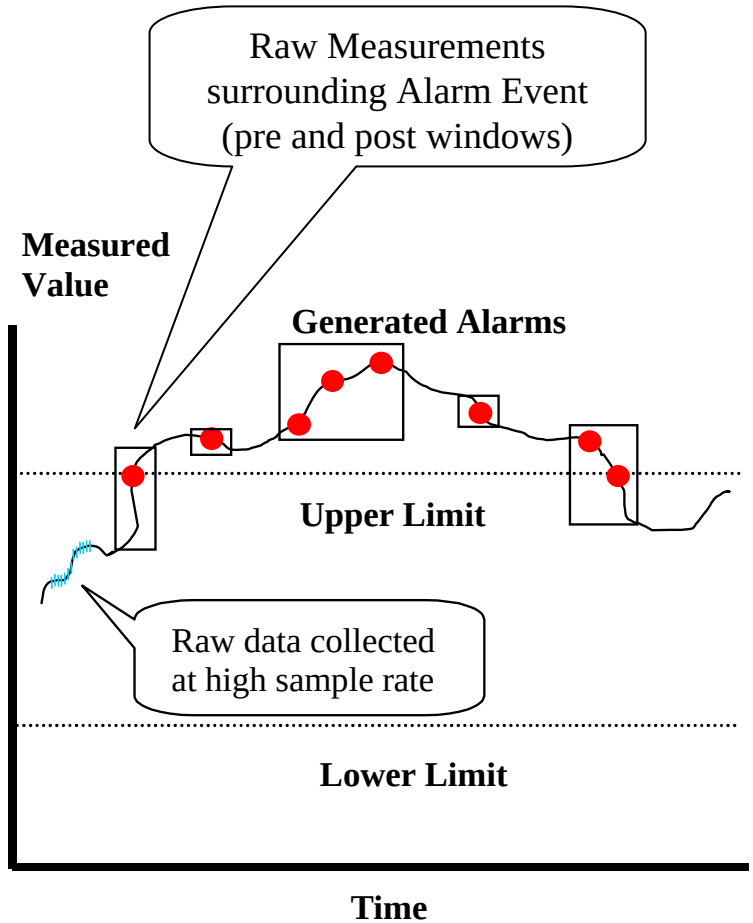
Alarm Hysteresis



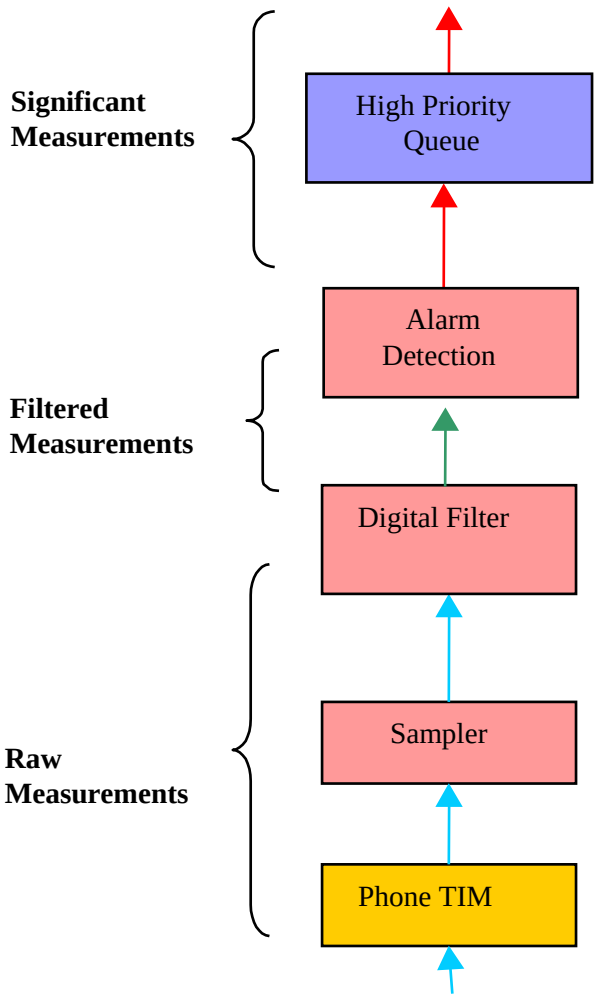


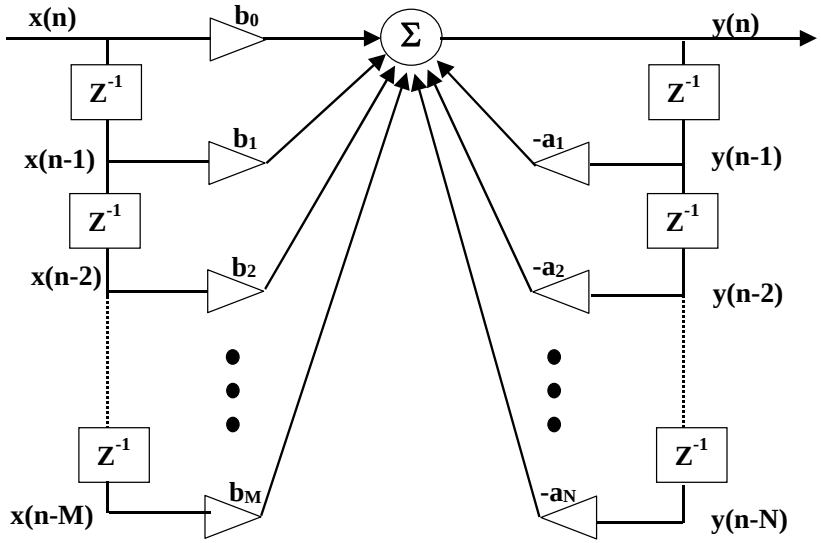
Alarm Context

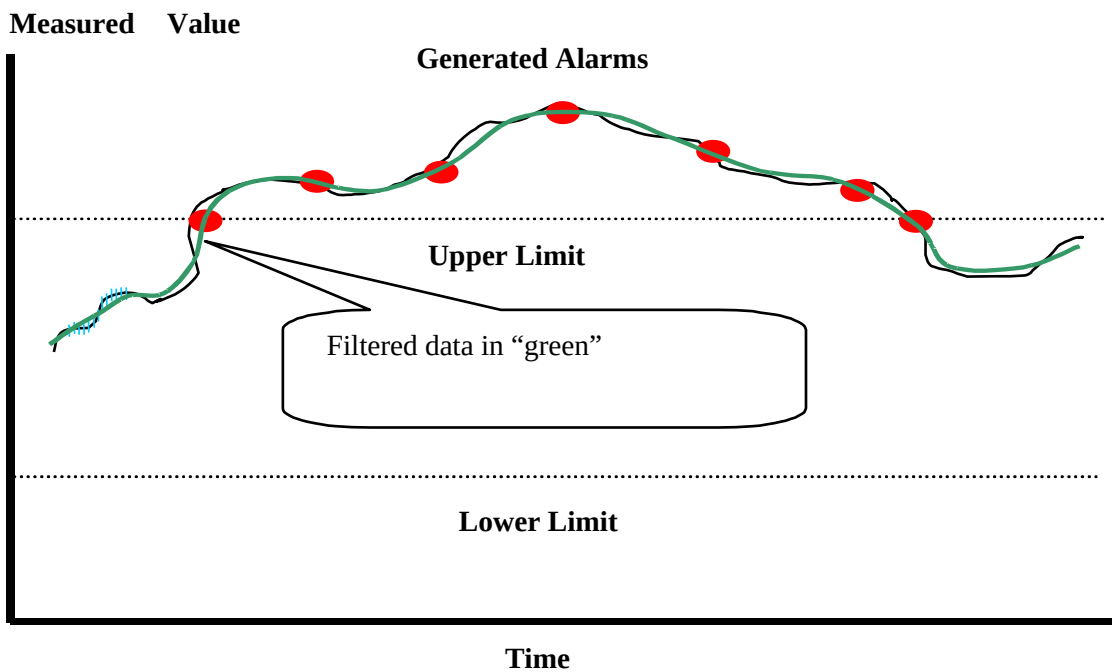




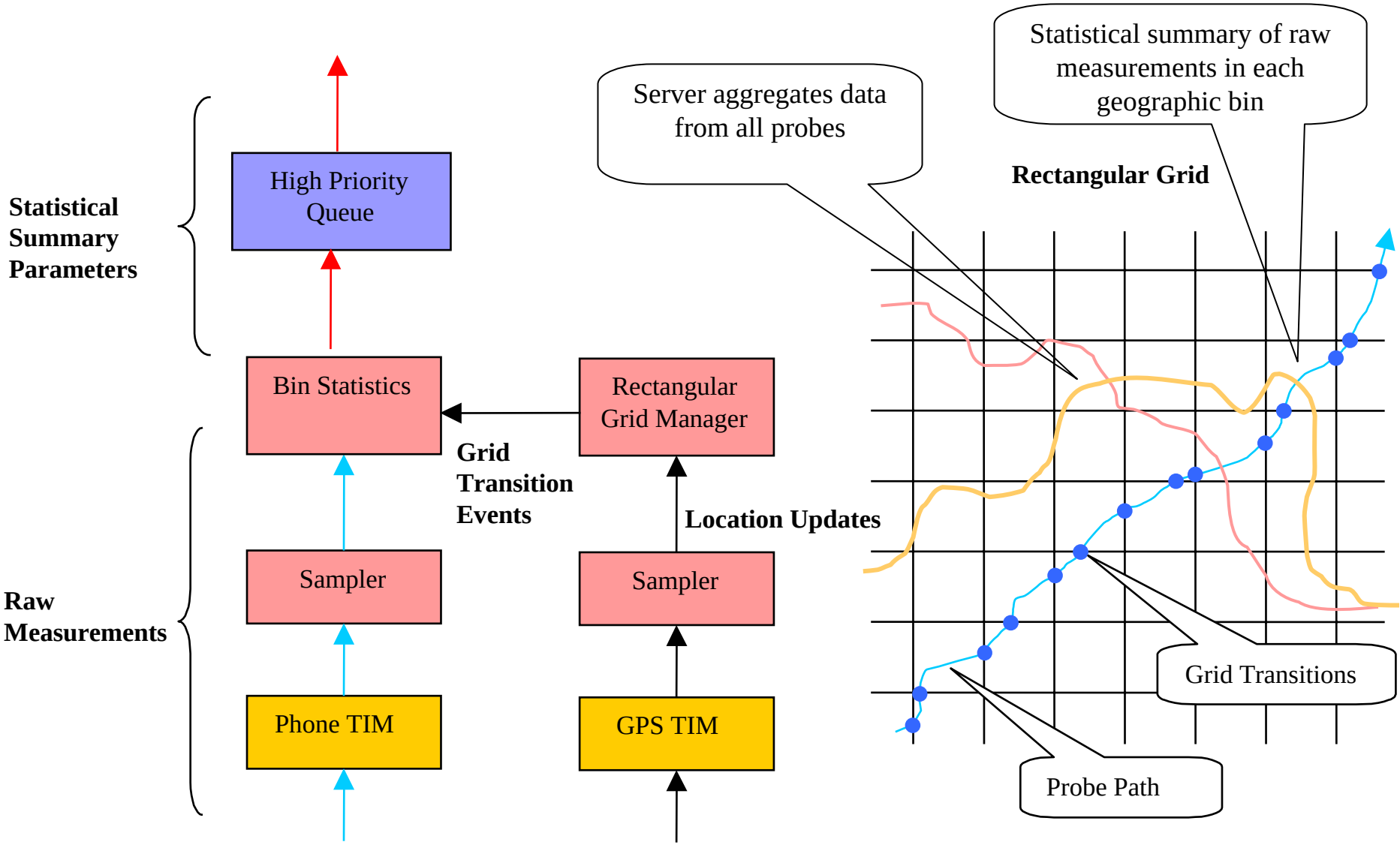
Digital Filtering

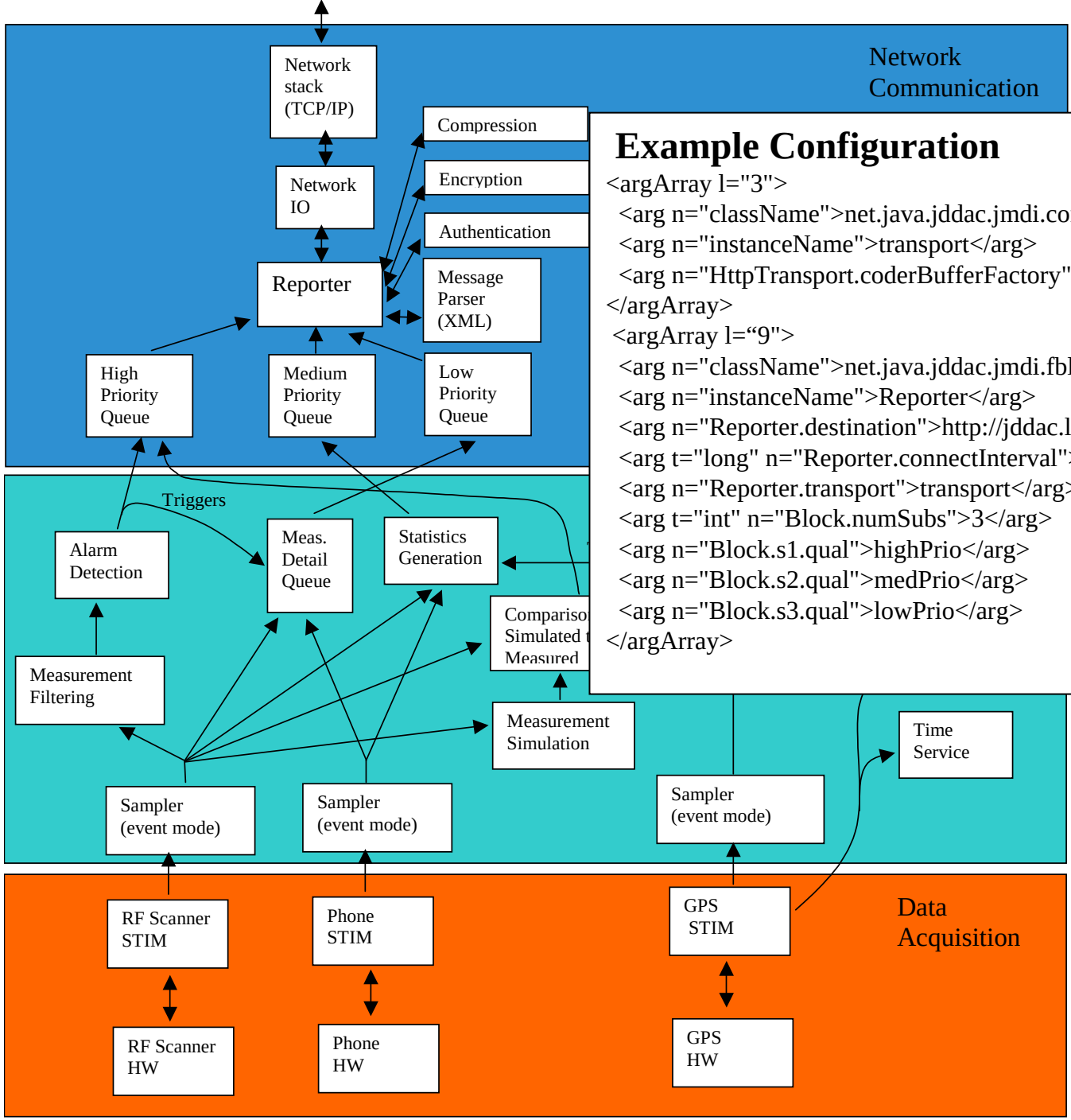






Statistical Binning





Example Configuration

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  <arg n="instanceName">transport</arg>
  <arg n="HttpTransport.coderBufferFactory">coderBufferFactory</arg>
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  <arg n="Reporter.destination">http://jddac.labs.agilent.com/server/probe</arg>
  <arg t="long" n="Reporter.connectInterval">10</arg>
  <arg n="Reporter.transport">transport</arg>
  <arg t="int" n="Block.numSubs">3</arg>
  <arg n="Block.s1.qual">highPrio</arg>
  <arg n="Block.s2.qual">medPrio</arg>
  <arg n="Block.s3.qual">lowPrio</arg>
</argArray>
```

>150 Instances

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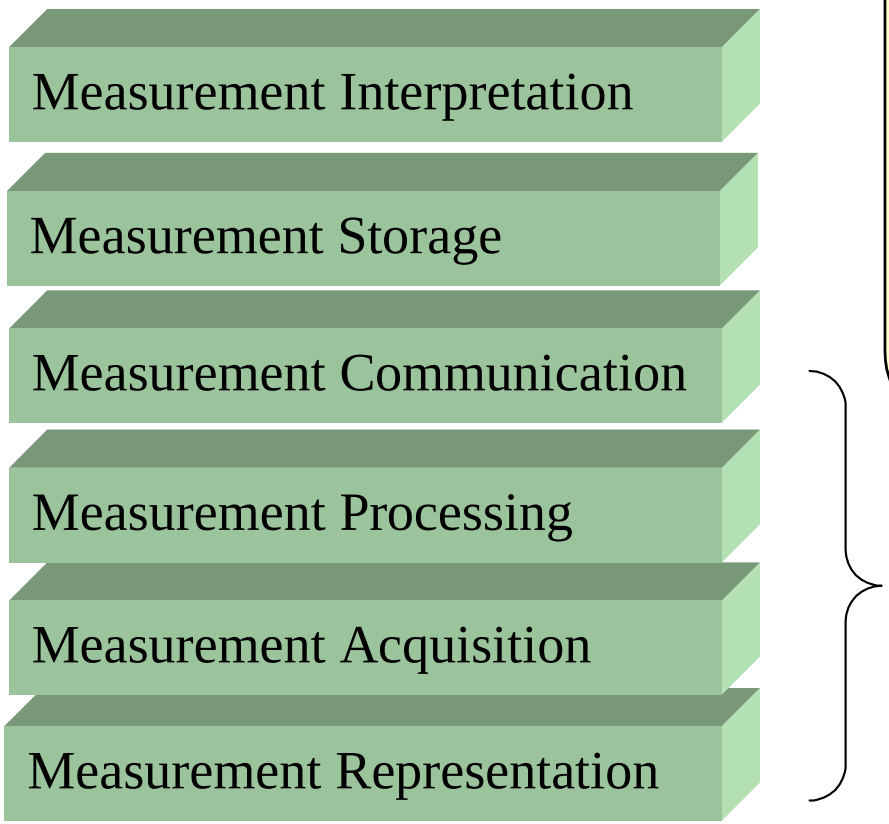
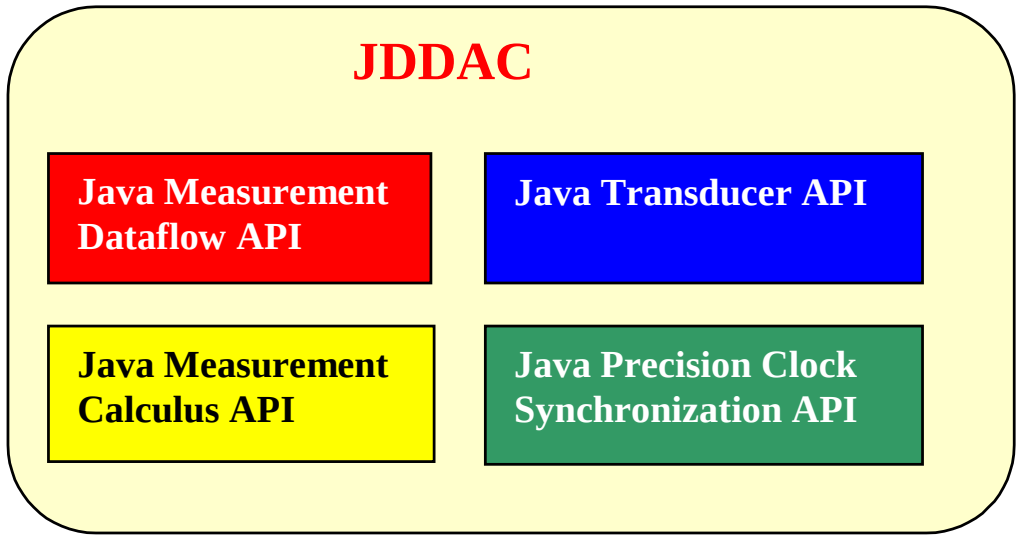
Next Steps

- Complete 1451.0
- Revise 1451.1 to take advantage of 1451.0
- Simplify 1451.1 based on practical experience from real applications
- Re-ballot 1451.1 next year
- Open Source Java implementation available now: http://community.java.net/jddac/

Java Distributed Data Acquisition and Control
See us at JavaOne in San Fransisco!





http://community.java.net/jddac/