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# **EVOLUTION OF THE BATTERY SYSTEMS REMOTE MONITORING WHAT'S NEXT?**



# ***WHAT IS MONITORING?***

*Remote monitoring* – follow up on battery life without human intervention



*What it comes down to in real life?*

*Measure:*

- *DC Voltage across battery terminals*
- *AC Voltage drop across battery terminals*
- *Temperature*



# WHY MONITORING?

## Battery life model



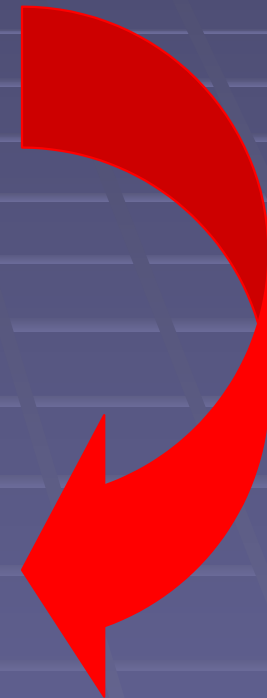
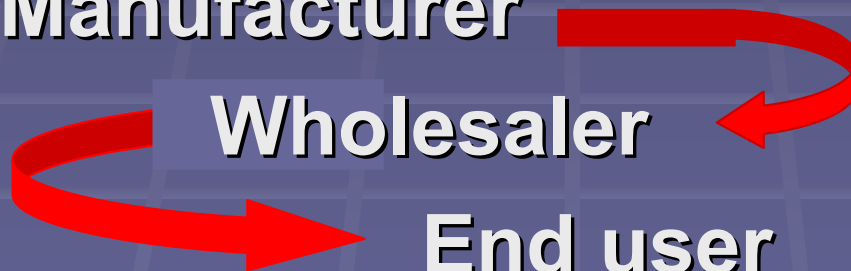
## Who is interested?



Manufacturer

Wholesaler

End user

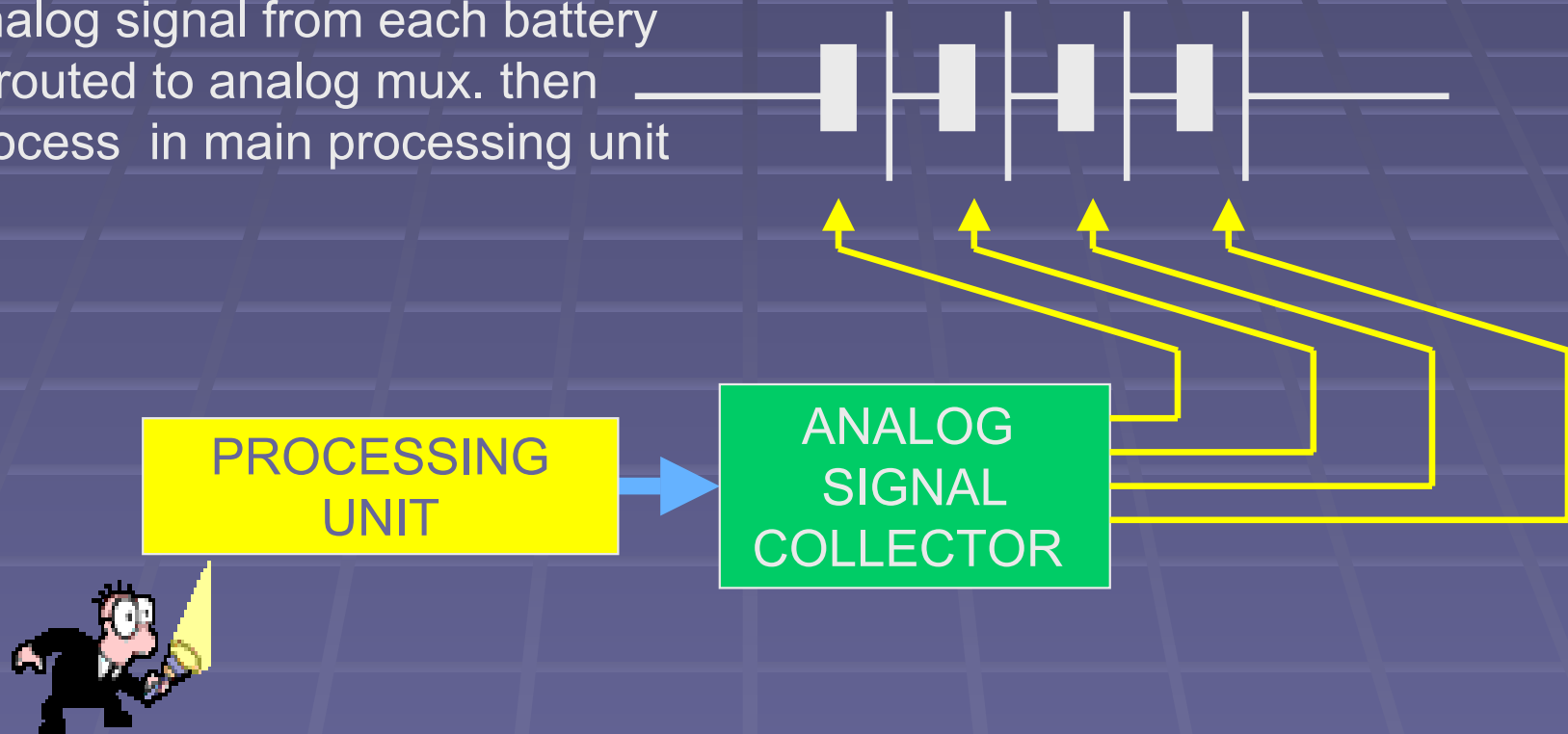




# System Architecture

## Historically oldest model - STAR

Analog signal from each battery is routed to analog mux. then process in main processing unit





## *System Architecture – cont.*

Issues associated with such topology:

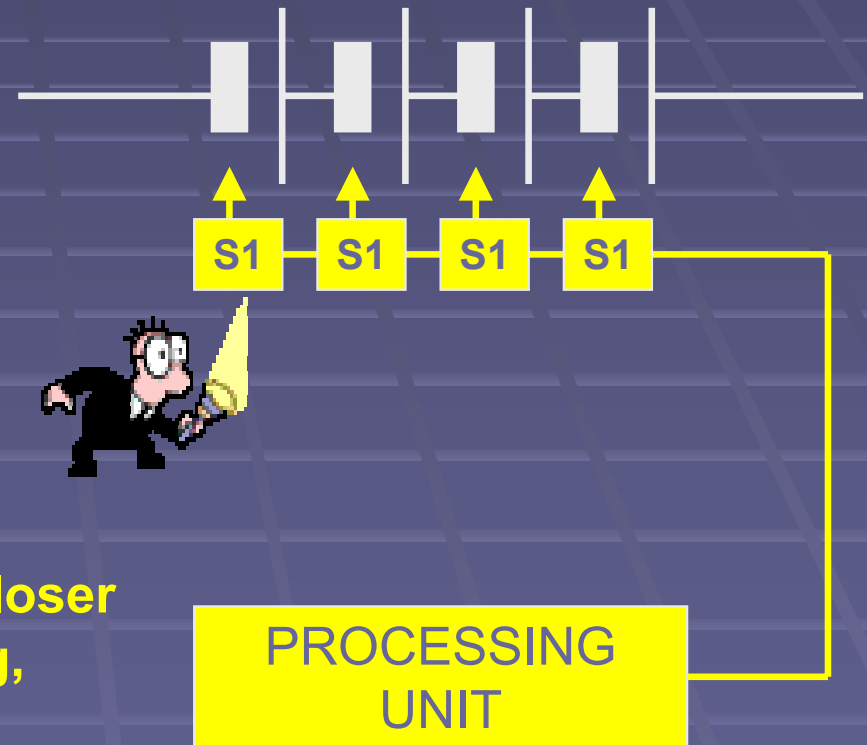
- ✓ Noise problem affecting analog signal,
- ✓ Difficult, sometime layout sensible cabling,
- ✓ High installation cost,
- ✓ High hardware cost causing:

System to be prohibitive for  
small battery count systems



## Daisy chain architecture

Analog signal is converted into the digital form by the sensor attached to the battery then transferred via daisy chain bus to the processor



**Notice:**  
Part of processing now moved closer to the battery (ADC, auto-ranging, averaging, etc.).



## *System Architecture – cont.*

### Advantages of such topology:

- ✓ Significantly lower installation cost,
- ✓ Simple cabling,
- ✓ Lower overall cost, in particularly for small battery systems, but:

Monitor still too costly for  
small battery count systems





## *System Architecture – cont.*

Historically, two companies provided monitoring systems with such architecture:

- Polytronic being first with its BMS line
- Enersafe followed suit with its LifeLink line

Although the architecture of both systems followed daisy chain approach, the concept of sensor operation and data transfer was completely different. Both systems, however, advanced technology step closer to **the next level.**





# *What it real monitoring?*

## *What is remote monitor again?*

*Device which Measure:*

- *- DC Voltage across battery terminals*
- *- AC Voltage drop across battery terminals*
- *- Temperature*

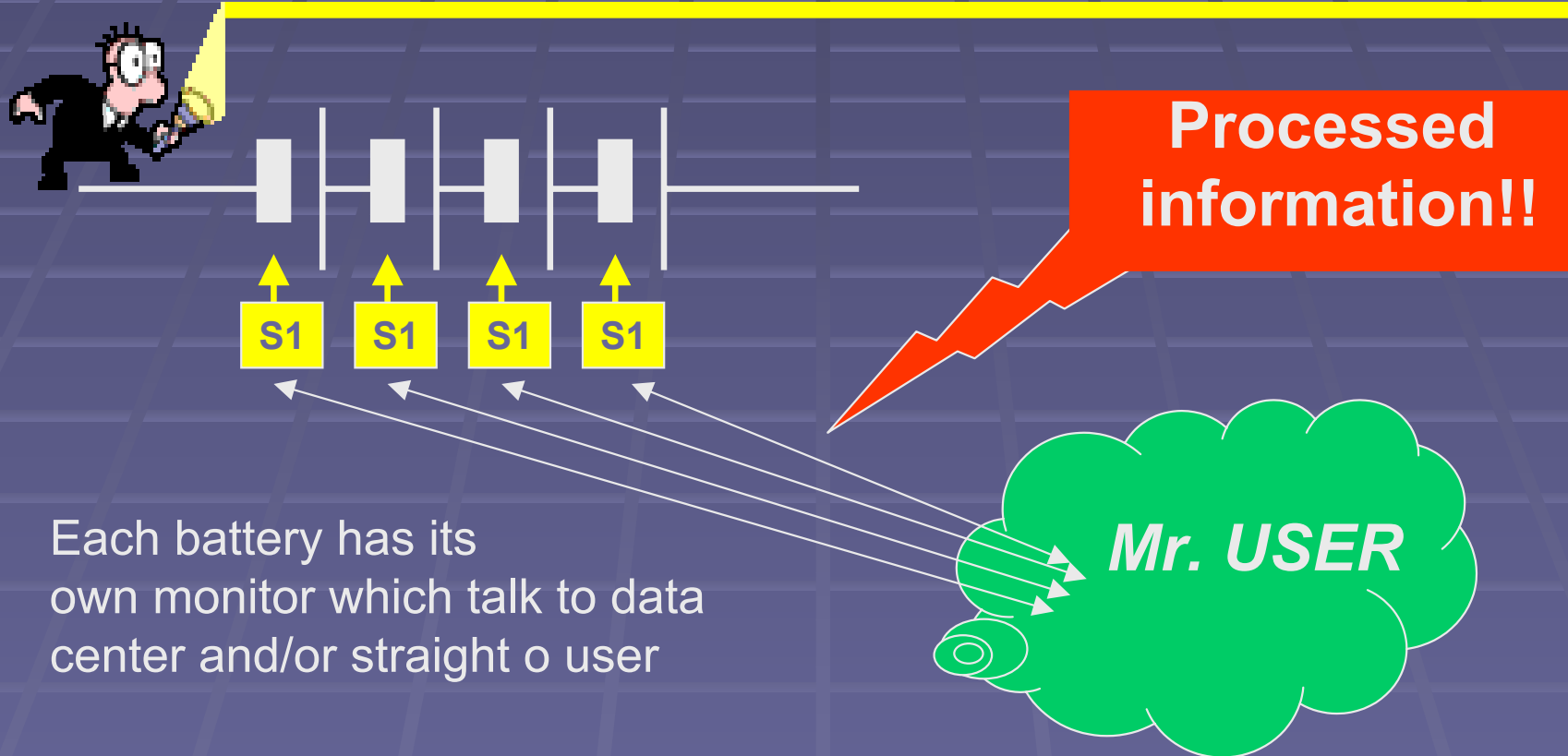
*Process it, then communicate results to the end user*





*What would be next step?*

**Distribute system smartness even further**  
**- to each individual/group of batteries !!!**





# Trend indicators ?



FACTSTAR



SSM



Micro-Guard



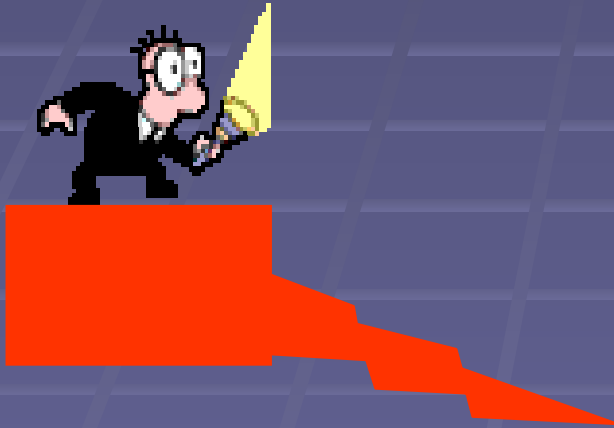


Communication is the key!!

**Key word - communication !!!**

- ✓ Between batteries
- ✓ Between batteries and user

**Future is in wireless !!!**



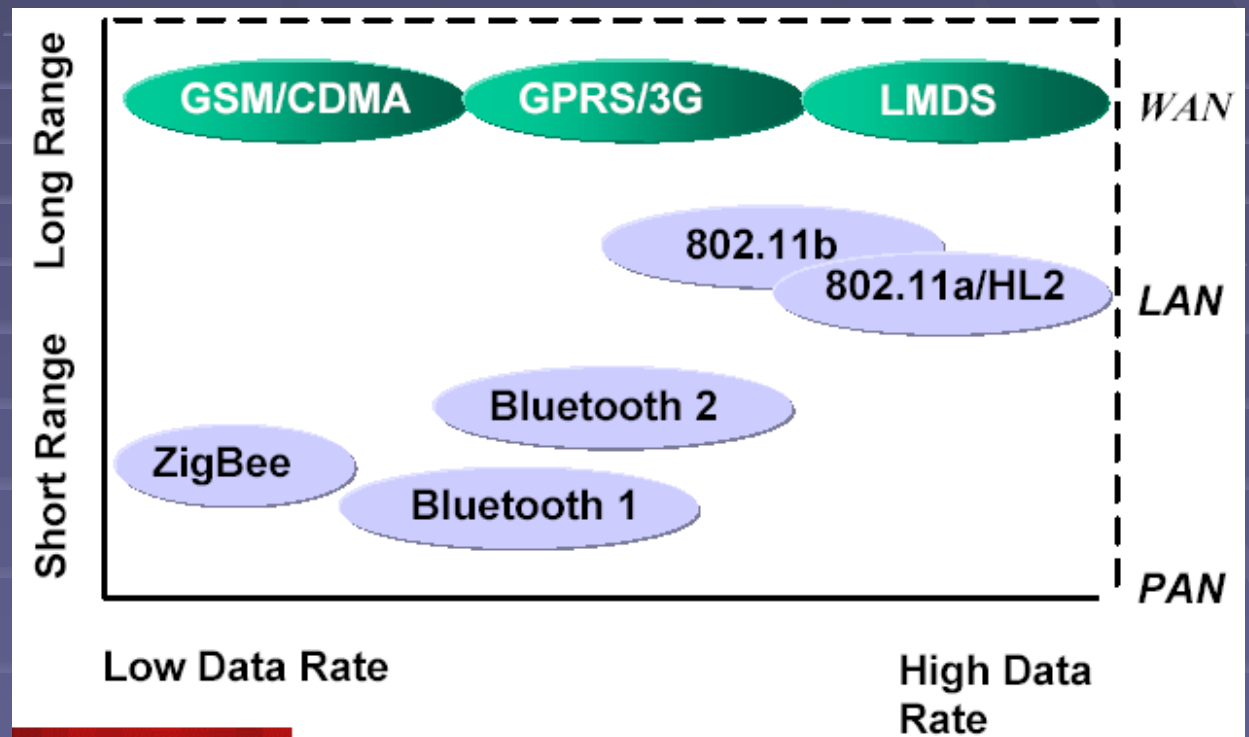
*No installation (almost)  
Simple networking  
Continuation of current technology*



# Key word – wireless !!!

Technology is there !

What's available ?





# How about economics?

Bluetooth good and proven technology but :

- cost prohibitive
- low nodes count
- transmission overkill

**ZigBee seems to be most promising:**



- large number of nodes
- reasonable speed
- high nodes count
- good transmission rate

**Technology is there – but  
he needs support !!!**