



# VALUE CREATION, SMART SYSTEM PARTITIONING & RAPID DEVELOPMENT OF IOT SYSTEMS

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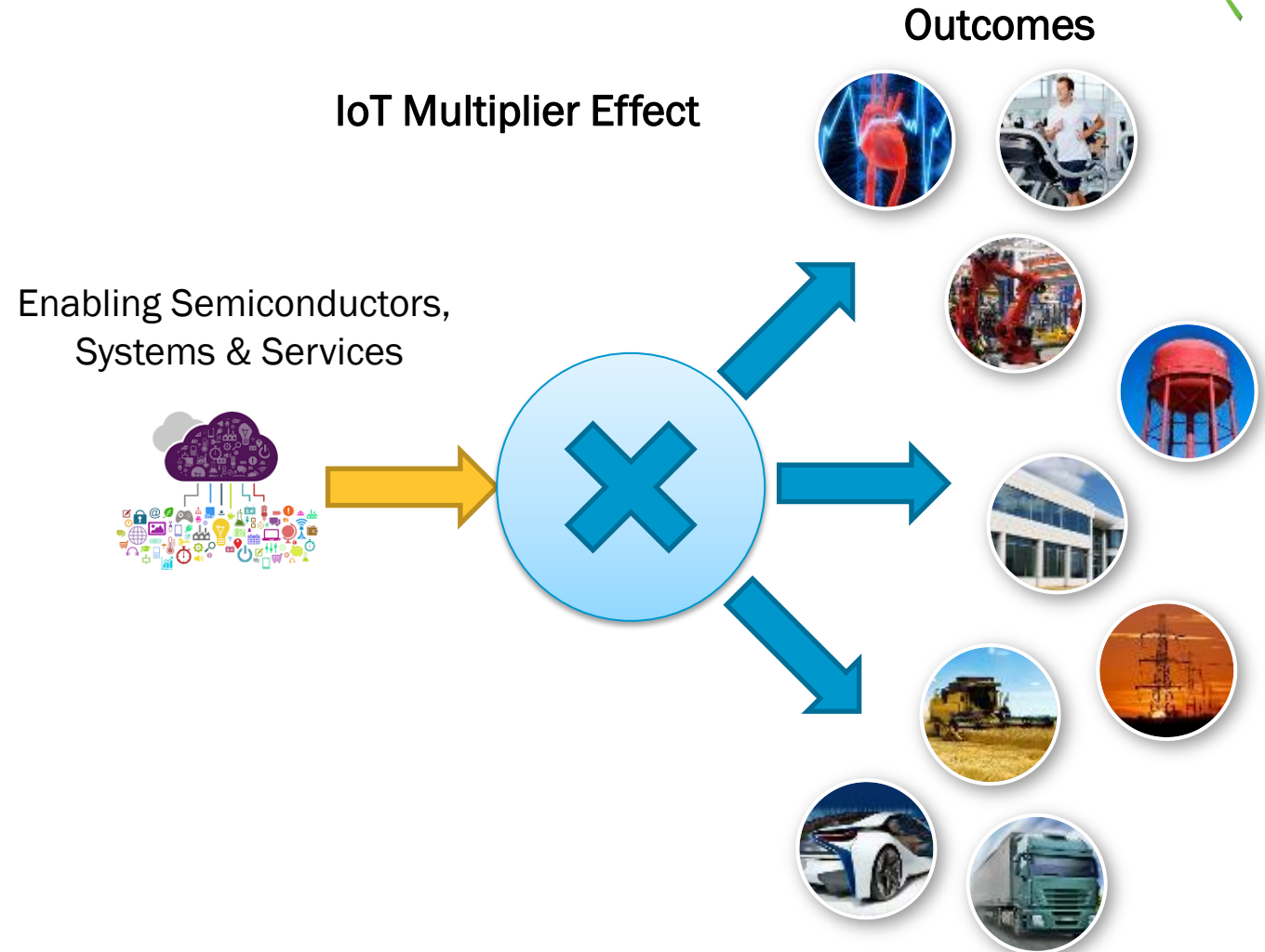
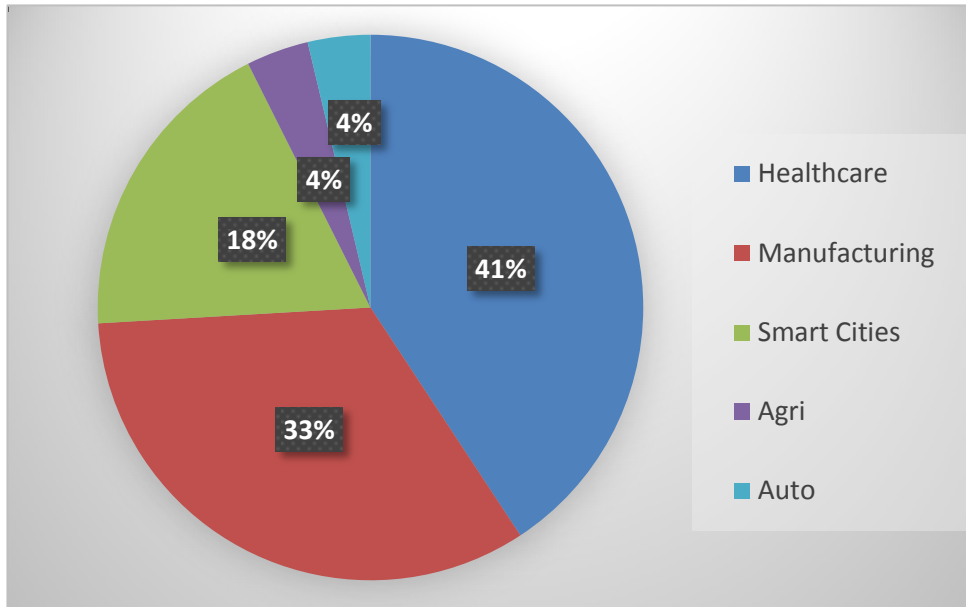
- Value Creation & Smart System Partitioning
  - IoT Multiplier Effect & Value Creation.
  - IoT Value Loops.
  - What does “Smart” Mean in the Context of IoT ?
  - Smart Partitioning - Examples.
- Rapid Development of IoT Systems

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# VALUE CREATION & SMART SYSTEM PARTITIONING

# THE IOT MULTIPLIER EFFECT AND VALUE CREATION

Total IoT Economic Value Impact in 2020  
Total \$2.7T (McKinsey) driven by  
Healthcare and Manufacturing

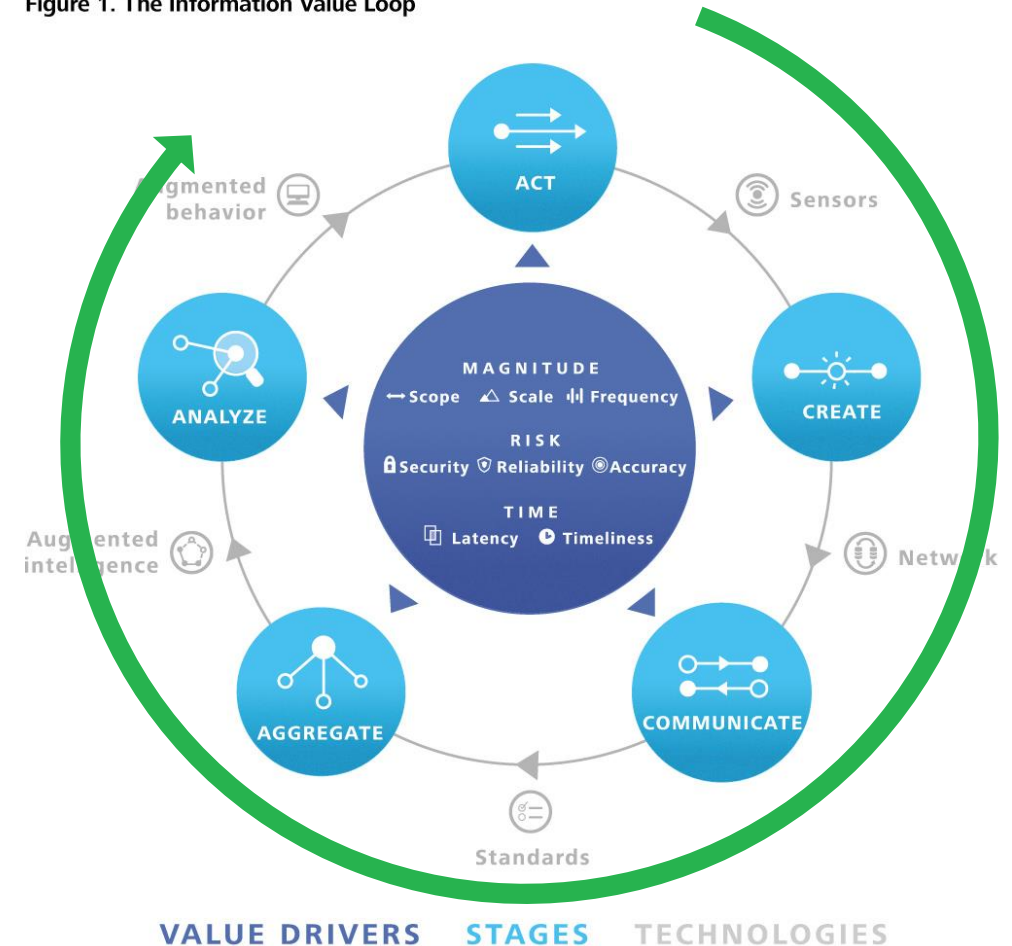


- **\$2.7T OpEx saved through instrumenting applications in Healthcare and Manufacturing.**
- **Substantial Growth Opportunities for the Enabling Supply Chain.**

# IOT VALUE LOOPS.

- How will this IoT Multiplier Effect be enabled ?
- By knowing when and how to change behaviour.
- Overall Solution Value comes from being able to modify behaviour to effect desired outcome.
  - Requires a loop to monitor and ultimately change the system behaviour.
- Before behaviour can be modified through action, the system must be analyzed so that the most appropriate action can be taken.

Figure 1. The Information Value Loop

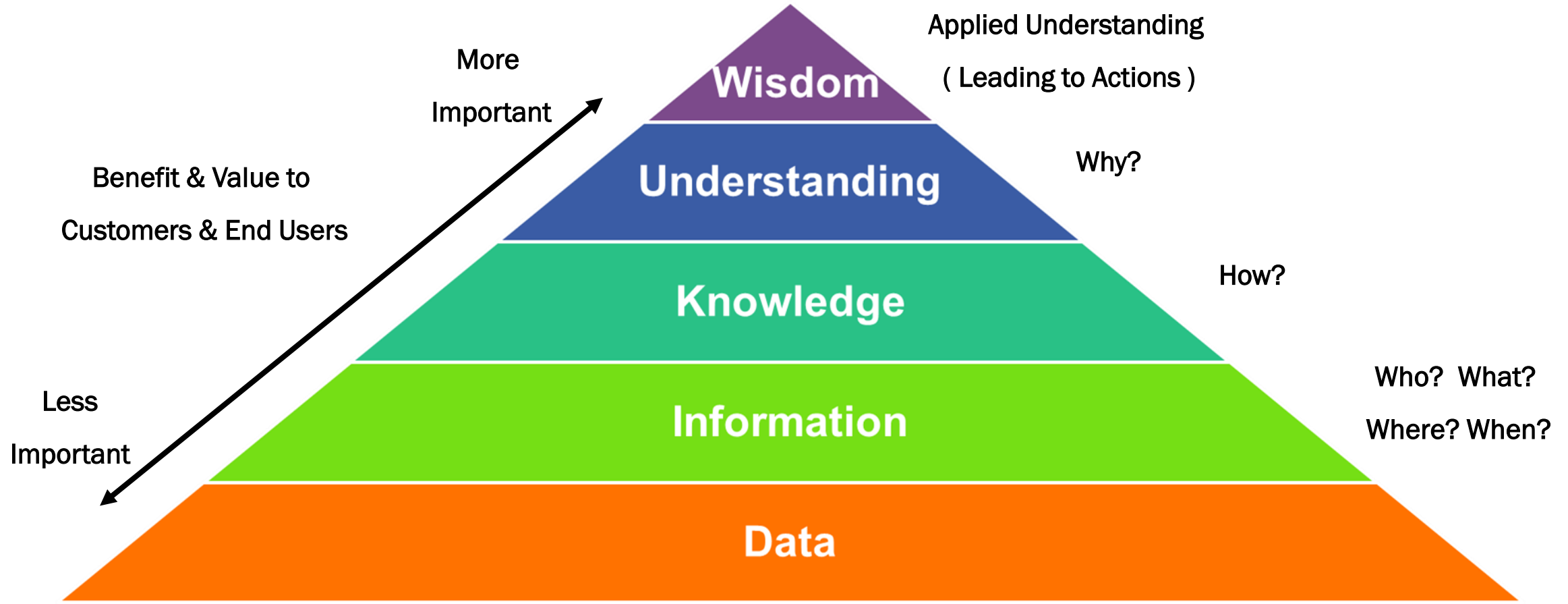


Graphic: Deloitte University Press | DUPress.com

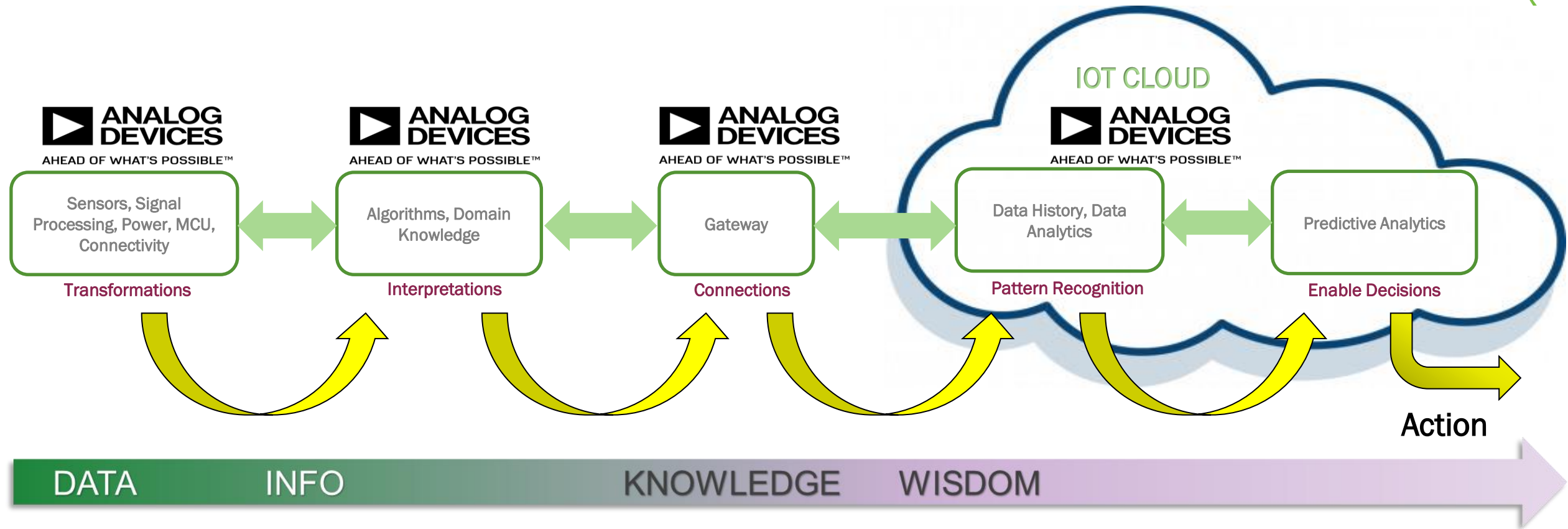
# DIK(U)W AND VALUE CREATION



- ▶ Through the journey around this Value Loop sensor data is transformed into progressively more meaningful and actionable information providing insights.



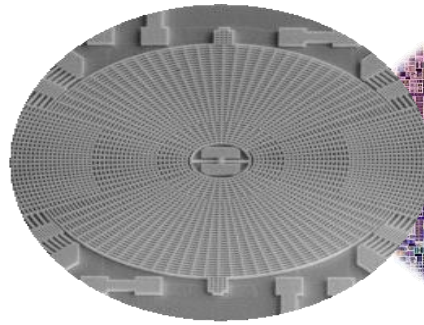
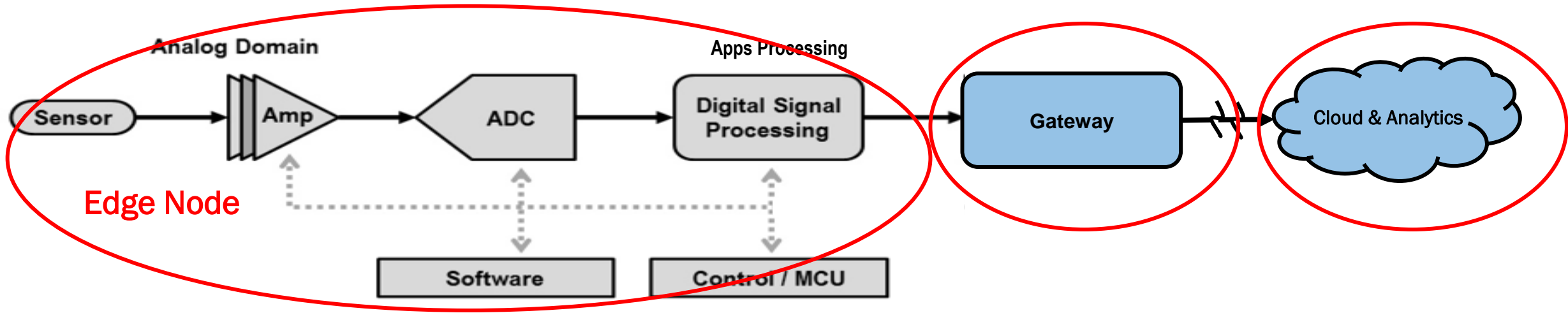
# IOT SIGNAL CHAIN – ENABLING DIKW VALUE CREATION



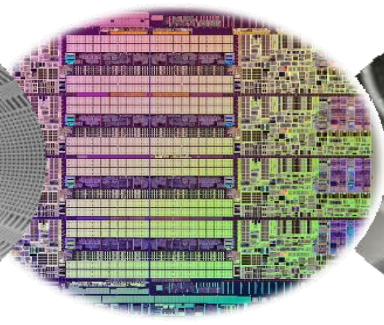
- ▶ IoT enables increasing automation of this DIKW process, thereby enabling more efficiencies.
- ▶ Every transformation step is a “SMART” step, it provides more valuable insights.
- ▶ Every “SMART” step is an opportunity to create & capture value.



# IOT SIGNAL CHAIN – PARTITIONING TRADEOFFS



sensing



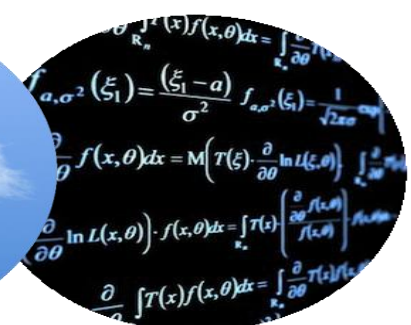
processing



comms



cloud



analytics

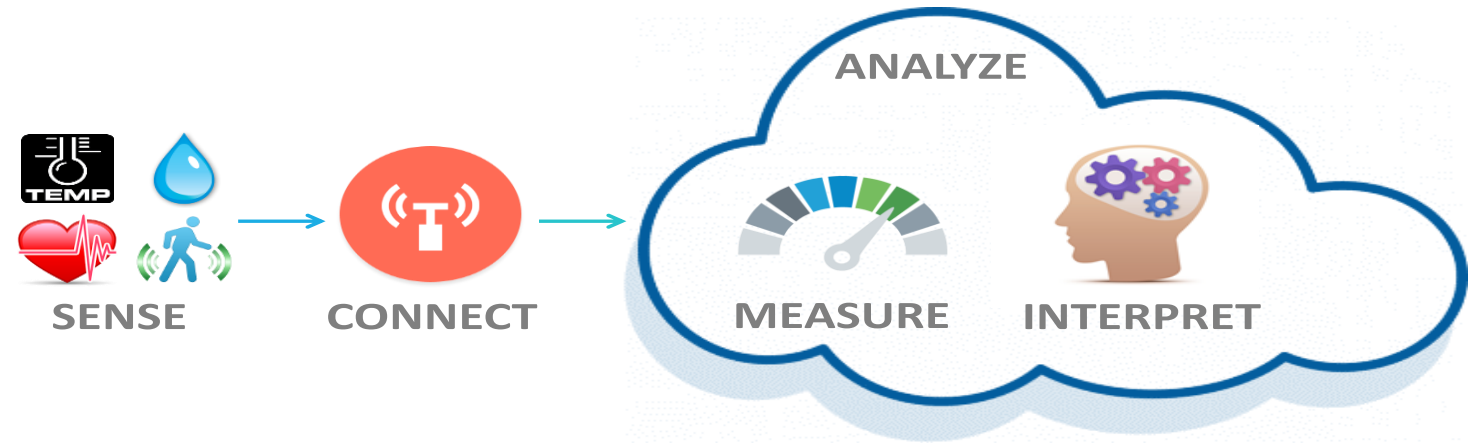


# SMART PARTITIONING - IOT EVOLVING TO MORE INTELLIGENCE AT THE NODE



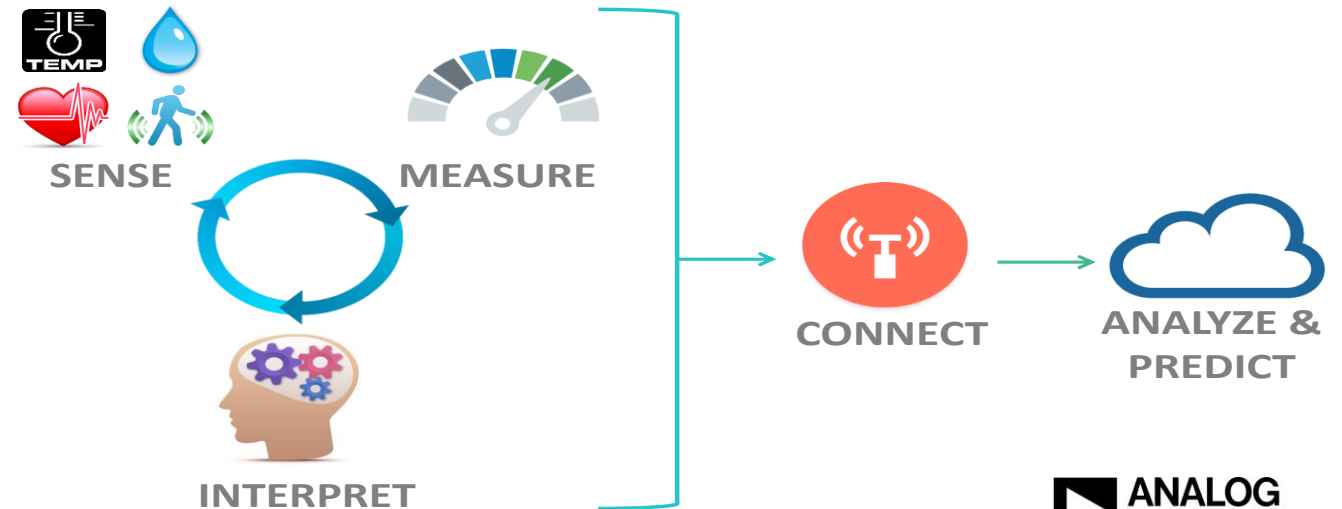
## TODAY

- Data stays data: never generate wisdom and knowledge at the node
  - Power hungry and bandwidth intensive to convert and send all data



## TOMORROW

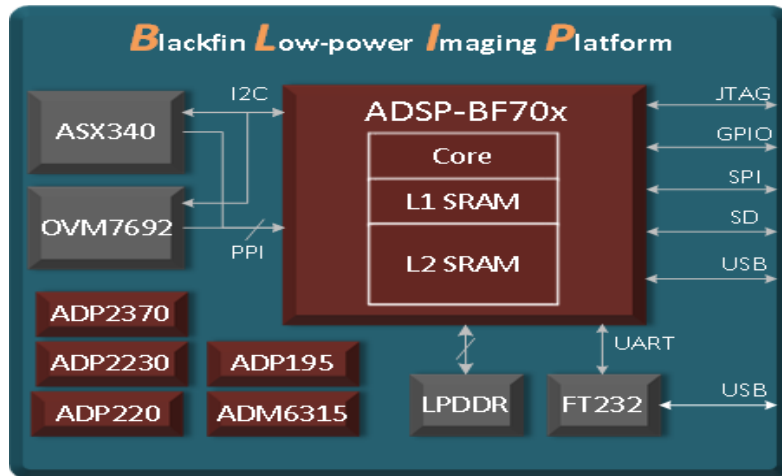
- Intelligent “Smart” Sensing: node turns data into information
  - Lowers overall power consumption, lowers latency, reduces bandwidth waste
  - Enables move from reactive IoT → predictive & real-time IoT
  - Important in Smart Healthcare, Smart City, and Smart Factory



# SMART PARTITIONING EXAMPLE – REMOTE OCCUPANCY SENSING



- Video-based Occupancy Sensing ( using BLIP – Blackfin Low Power Imaging Platform ).
  - Edge Based Video Analytics to detect the presence and behaviour of humans and vehicles.
  - Only the Occupancy Information is transmitted – Higher Value, Low Bandwidth.

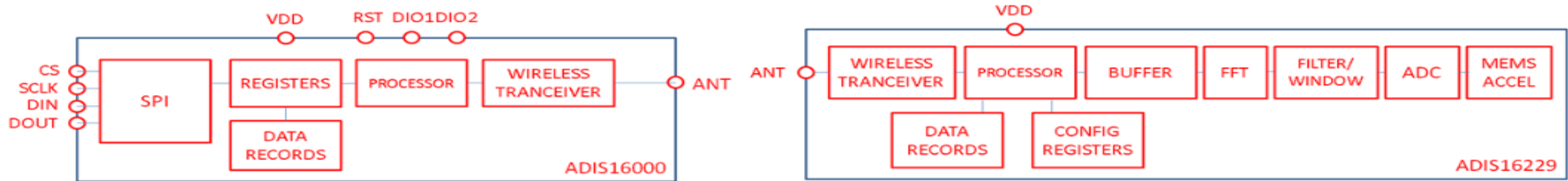


- ▶ “Smart Node” can significantly reduce the amount of data being transmitted.
- ▶ Only Send the insights that the Customer / End User cares about.

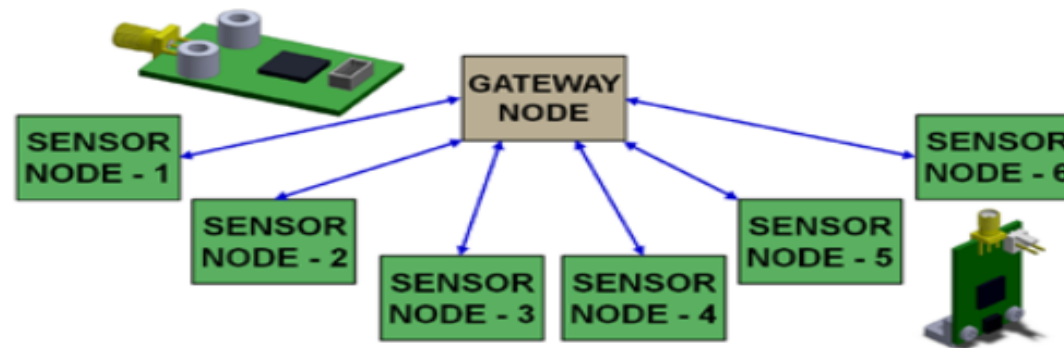
# HIGH ACCURACY VIBRATION SENSING



- Smarter Edge Nodes - Vibration Sensors with Build-in Analytics  
ADIS16000/ADIS16229 Remote Vibration Monitoring System



*MEMS-Based Sensor Node (ADIS16229) with 928 MHz RF Link to Gateway Controller (ADIS16000)*

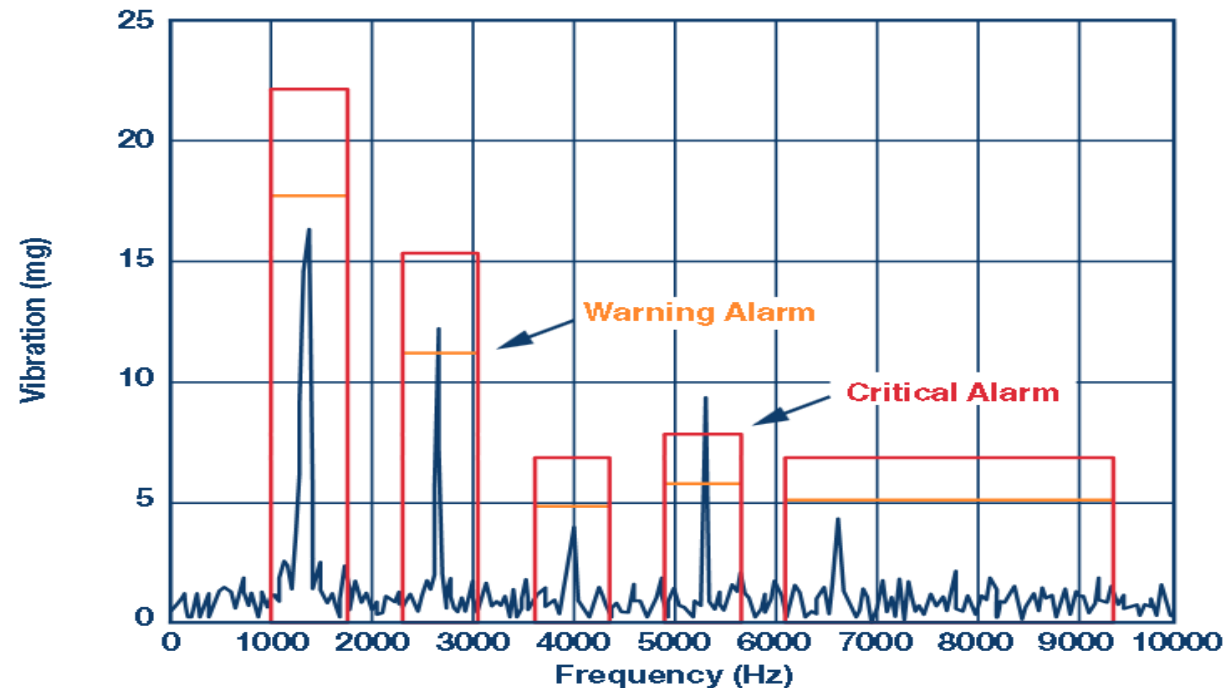


*Six Remote Sensor Nodes Autonomously Detect/Collect/Process Data and Wirelessly Transmit to a Central Controller Node.*

# HIGH ACCURACY VIBRATION SENSING



- Node-based Analytics – Real-time FFT Analysis to Identify Potential Failures
- In Addition to Vibration Data and Frequency Content, Alarms Can Be Generated



*Embedded FFT analysis with programmable filtering and tuning control.*

# VALUE CREATION & SMART SYSTEM PARTITIONING



- Realizing the promise of IoT will require solutions that can close Value Loops to efficiently modify System Behaviour.
- Automation of the Data-Information-Knowledge-Wisdom (DIKW) processes is key to understanding how to efficiently modify behaviour.
- Conventional wisdom today suggests that processing in IoT systems should be done in the cloud
  - Moving processing to the edge enables “smarter” sensors with insight extraction closer to the source.
- All of these systems must provide actionable insights to customers.
- We will now turn to how we can provide these insights to customers.

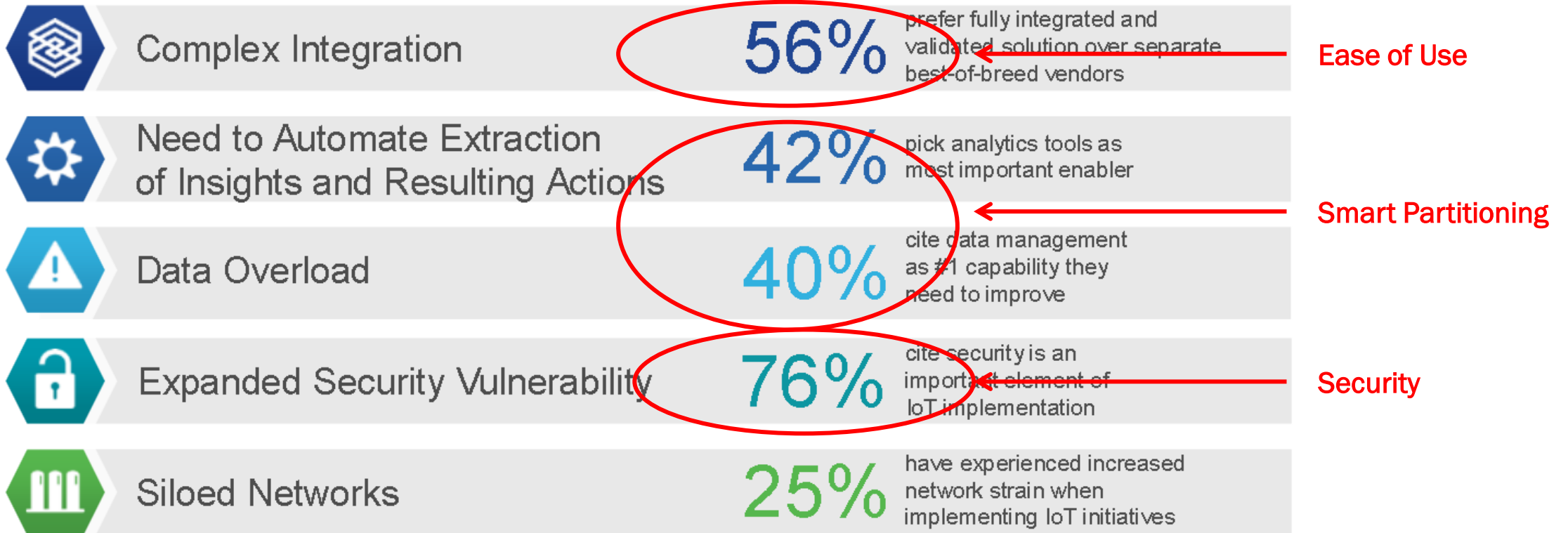
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# RAPID DEVELOPMENT OF IOT SYSTEMS

# ADDRESSING THE TOP OBSTACLES TO IOT ADOPTION



## Top Obstacles to IoT Adoption & Digital Transformation



Sources: Cisco IoT Purchase Process Global Study January 2015,  
Forrester Research study commissioned by Cisco November 2014,  
IDC Futurescape: Worldwide IoT Predictions Dec 3, 2014



# IOT SECURITY CONTROLS



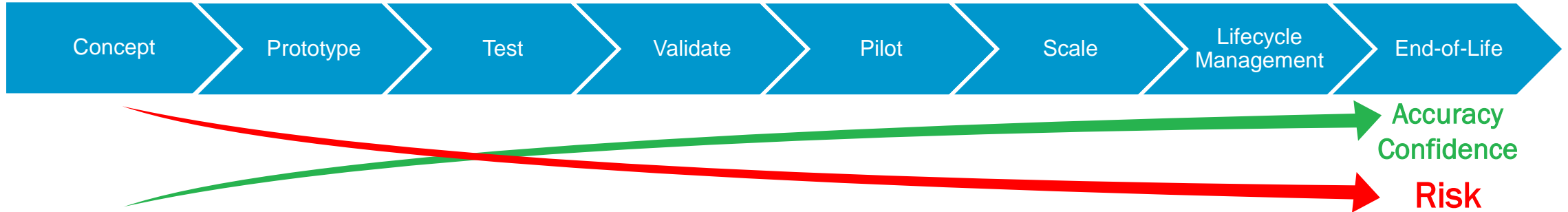
Initial Deployment	Authentication	Communications Channel	Access Control	Software Management	Storage	Supply Chain
Tamper and Side Channel Protection	Secure and Mutually Authenticated Channel	Message Authentication	Authentication, Privacy, and Access Management	Secure Coding Practices	Memory Protection	Authorized Distribution Channels
Identity and Root of Trust	Credential and Privilege Management	Timestamping	Key and Certificate Management	Virtualization	Key Protection	Track and Trace
Trusted Processor and Execution	Remote Monitoring	Physical Layer	Scan Chain and Failure Analysis	Software Containers	Data Masking and Loss Prevention	Spare and Maintenance Supply Continuity
Local and Remote Provisioning	Secure Boot	Entropy and Encryption	Log/SIEM and Digital Forensics	Predictable Holistic Behavior Environment		Counterfeiting, Trojans, IP Piracy, and Overbuilding
	Software Attestation	Interface Security and Firewalls	Intrusion and Anomaly Detection	Revision Control Odometer and EOL		
	Direct Anonymous Attestation			Verification and Obfuscation		
	Signatures and Certificates			Updates and Patches		
	Device/Network Analysis and Threat Intelligence Exchange					

- A variety of Controls and Countermeasures are needed in IoT Systems.
- Goal: Increase the attack cost to unprofitable levels.

# ACCELERATING CUSTOMER DEVELOPMENT - CHALLENGES



## Product Development & Lifecycle Phases.

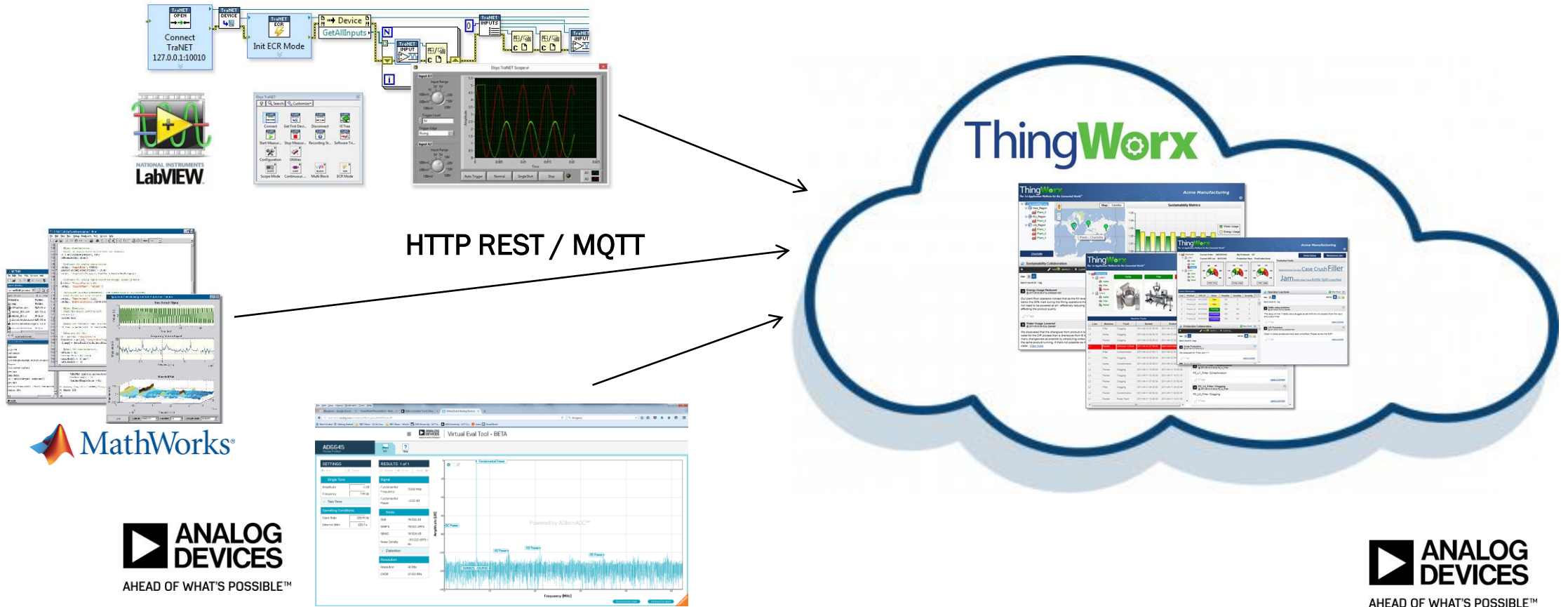


- Customers want a seamless progression from Product Concept to Scale & Beyond.
  - Focus on their Value, not making our (vendor) solutions work.
  - Becoming System Integrators.
  - Minimize Risk – especially at Transitions.
  - Maximize Reuse from Prototype to Production and between different developments.
  - Significantly Improve Time to Prototype / MVP & Scale.
    - Tools must be easy to use & enable end-product to be easy to use.

# CUSTOMER CONCEPT DEVELOPMENT



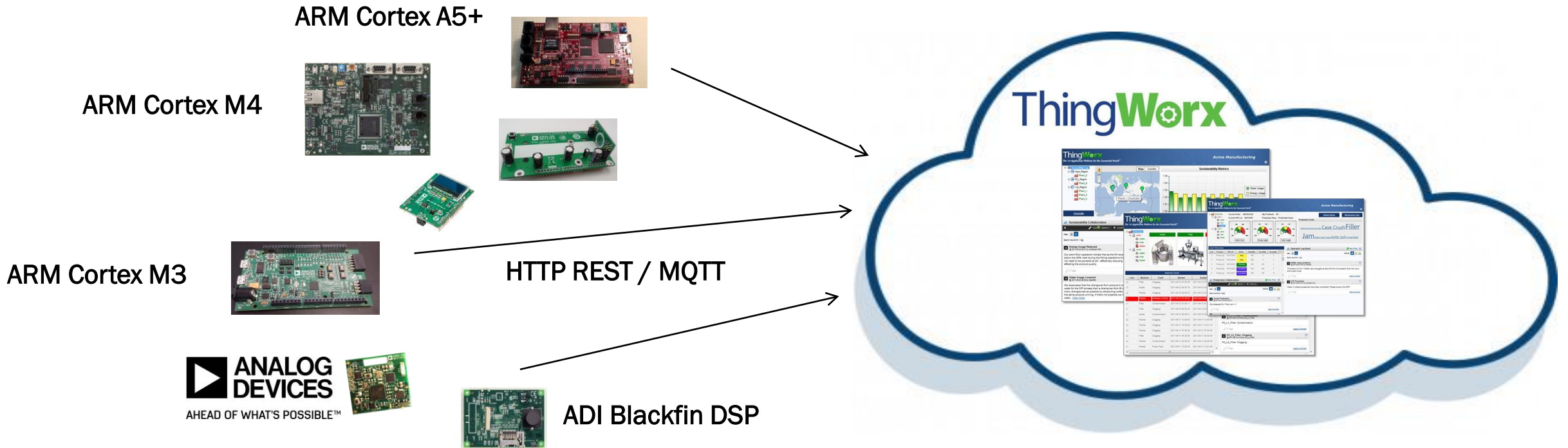
Concept Development: Edge Simulation Tools & ThingWorx Cloud Platform



# CUSTOMER PROTOTYPE DEVELOPMENT.



## Prototype Development: Edge Development Kits & ThingWorx Cloud Platform

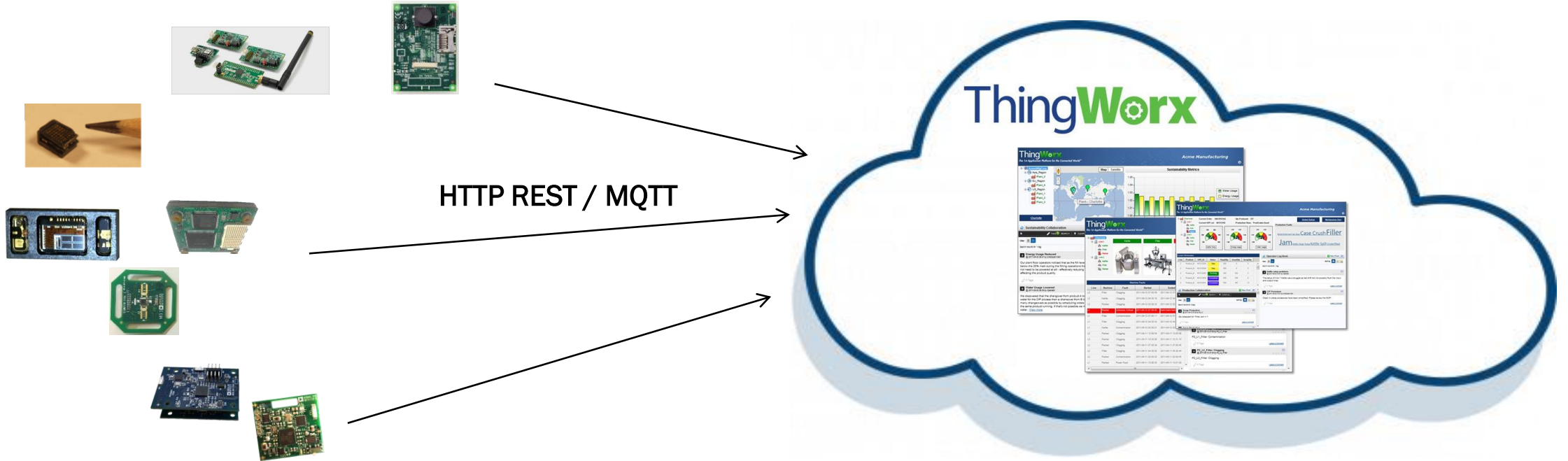


Range of Different Edge Processors / Communications Kits with Sensor Shields

# PILOT DEVELOPMENT AND PRODUCTION SCALE.



Pilot Development and Production Scaling: Edge Modules / Custom Design & ThingWorx Cloud Platform

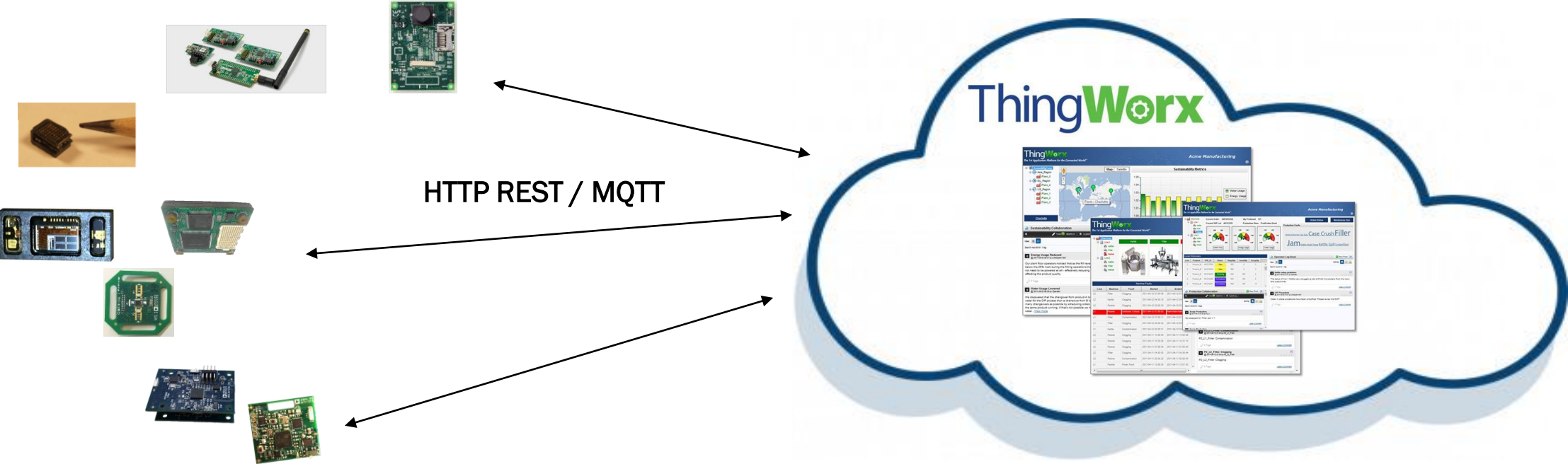




# LIFECYCLE MANAGEMENT & END-OF-LIFE



Lifecycle Management & End-of-Life: Device Management, Feature updates, Over-the-Air Updates, Dunning.

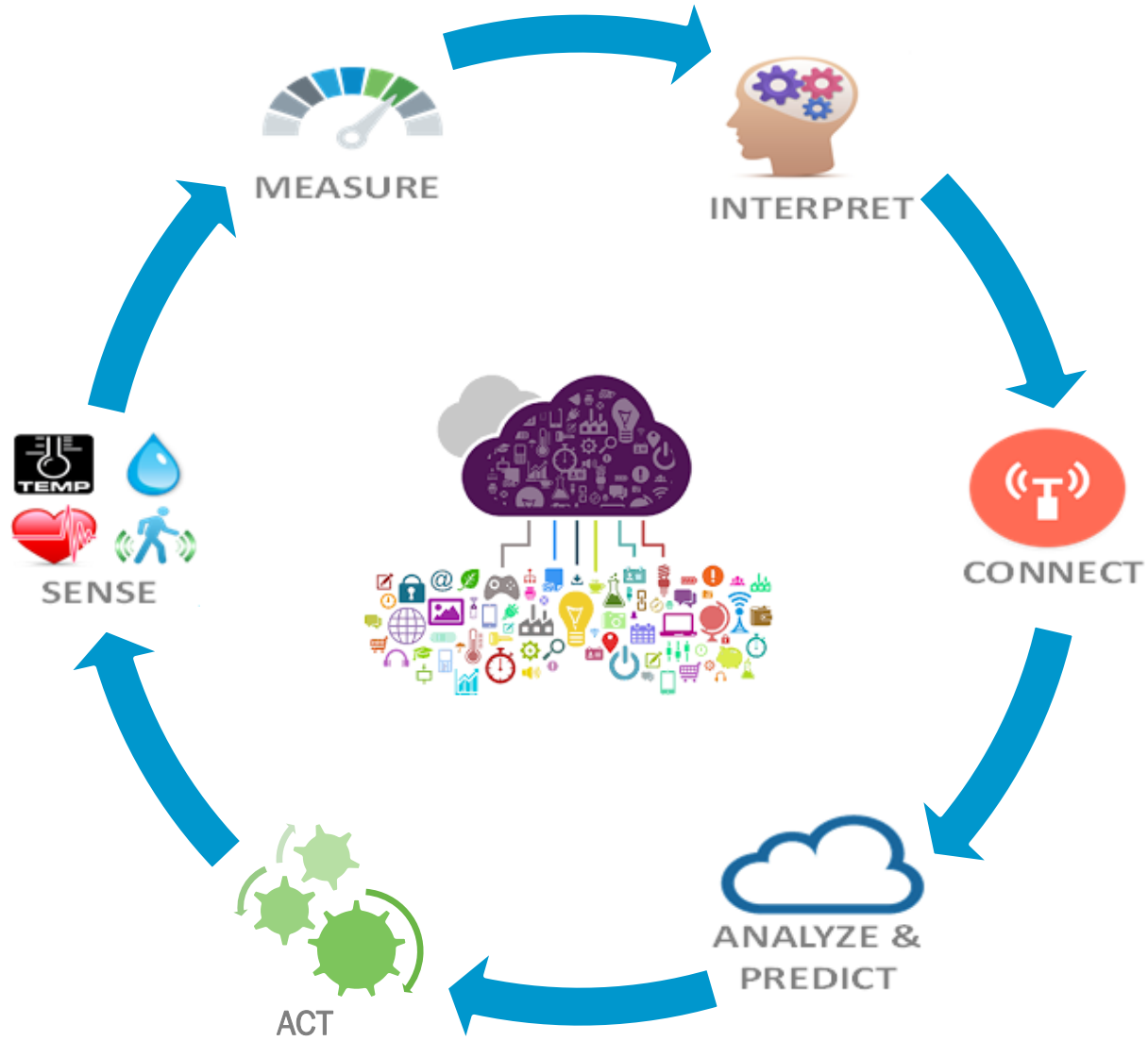


# IOT & ENABLING THE INFORMATION JOURNEY



Enhanced Edge Sensing & Measurement Capability

Security



Accelerating Customer IoT Development

Algorithms / Analytics / Machine Learning



The image features several colorful geometric shapes, primarily triangles and lines, scattered across the background. A large, multi-colored triangular shape is prominent on the right side, composed of various shades of blue, green, yellow, orange, pink, and purple. Several thin, colored lines (blue, pink, green, orange) radiate from the center of the text area. The text 'LIVE WORX 16' is the central focus, with 'LIVE' in a thin, outlined font and 'WORX 16' in a bold, solid black font. A small 'TM' trademark symbol is positioned to the upper right of the '16'.

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