Creative Disruption: Micro-Sensing Platform and Machine Learning

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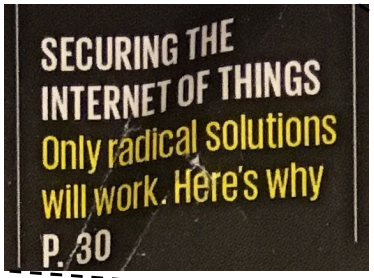
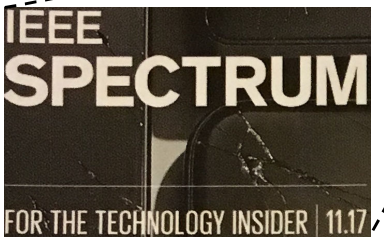
Vision: Trusted Data Born on the Blockchain

Blockchain allows sharing of data among multiple parties in a secure immutable distributed ledger. However, data flowing into the blockchain must be captured authentically at the data source. This calls for secure blockchain enabled sensors & devices at the point of data capture. We call it "data that is born on the blockchain via a complete smart microsensing platform." Imagine the possibilities that blockchain with tamper proof secure small computer systems embed into goods and processes can open up for agriculture, manufacturing, luxury goods, health care, and more!

- Make computing / sensing / storing / communicating ubiquitous!
- Enable a dramatic expansion of applications

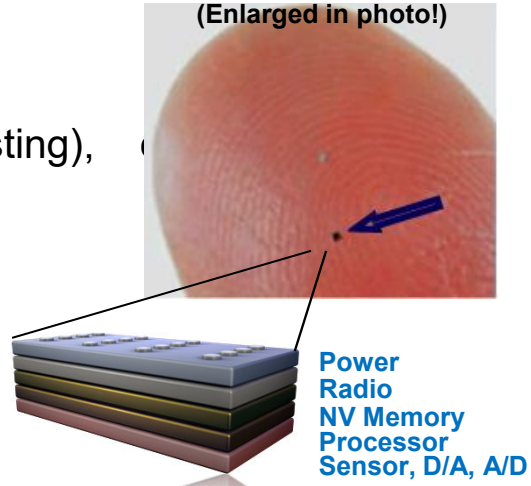


IEEE Spectrum, Nov. 2017 article stresses reconfigurability for security as a must have In IoT!



IEEE--423,000 members in over 160 countries, and its highly cited publications, conferences, technology standards, and professional and educational activities.

What differentiates IBM's micro-sensing platform?



- Smallest full computer system platform
  - Not just a processor, but also contains power supply (battery, energy harvesting), modules (Optical or RF), sensors (temperature, pH, etc.), memory (SRAM, Cache, NVSM), private keys, encryption engine, etc.
  - Allows for undetected attachment to physical items.
- Low cost (cents in high volume manufacturing)
  - Amortize the most advance wafer processing cost over more (i.e. smaller) chips, thereby decreasing each chip cost.
  - Use open architecture & standardize packaging platform to allow user add-on chips and sensors
- Highest security available
  - Tamperproof hardware, private keys, secure communication channel protocols, data encryption.
  - Ideal for attachment to physical items in such applications requiring authenticity, trusted data sources for such applications as Blockchain, smart & secure IoT, etc.
- In-field reconfigurability to accommodate adaptive and reusable missions and security updates/changes
  - Did we mention full computer, which is as configurable as a normal computer, allowing machine learning
  - A necessity for secure protocol updates!
- Low power (~ uW/MHz processor)
  - Allows for stand alone untethered application such as edge and mesh computing and reading & storing data when intermittently connected to the cloud, servers, etc.

Leveraging Latest IBM Technology for Future Scaling of Platform

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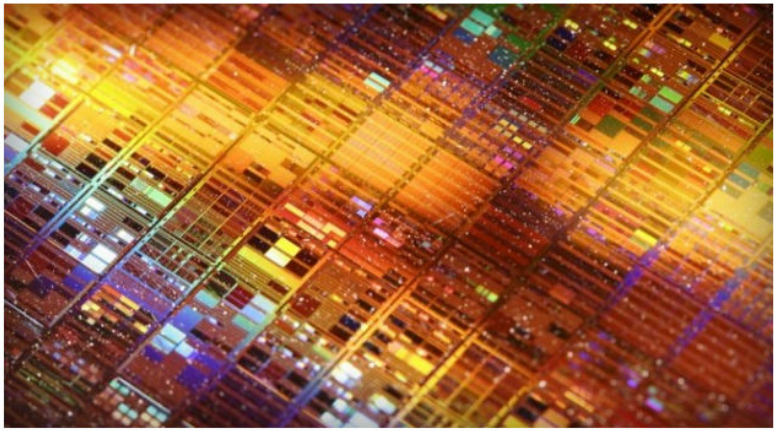
HOME › COMPUTING › IBM ANNOUNCES 5NM BREAKTHROUGH USING SILICON NANOSHEETS

IBM Announces 5nm Breakthrough Using Silicon Nanosheets

By Joel Hruska on June 6, 2017 at 8:45 am | 13 Comments

1.8K shares



IBM researchers announced a new manufacturing breakthrough yesterday that could clear the way to 5nm device scaling and the implementation of next-generation transistor design technologies. The company has used silicon nanosheets — sheets of 2D silicon stacked on top of one another — to assemble a test chip with 30 billion transistors, compared with a 7nm, 20-billion transistor chip the research team debuted several years ago.

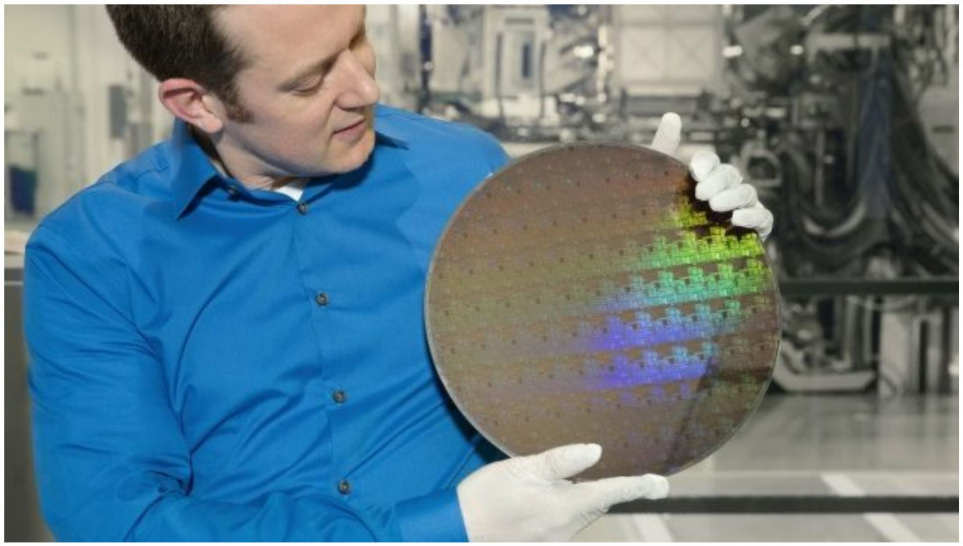
THE VERGE

TECH \ IBM

circuit breaker

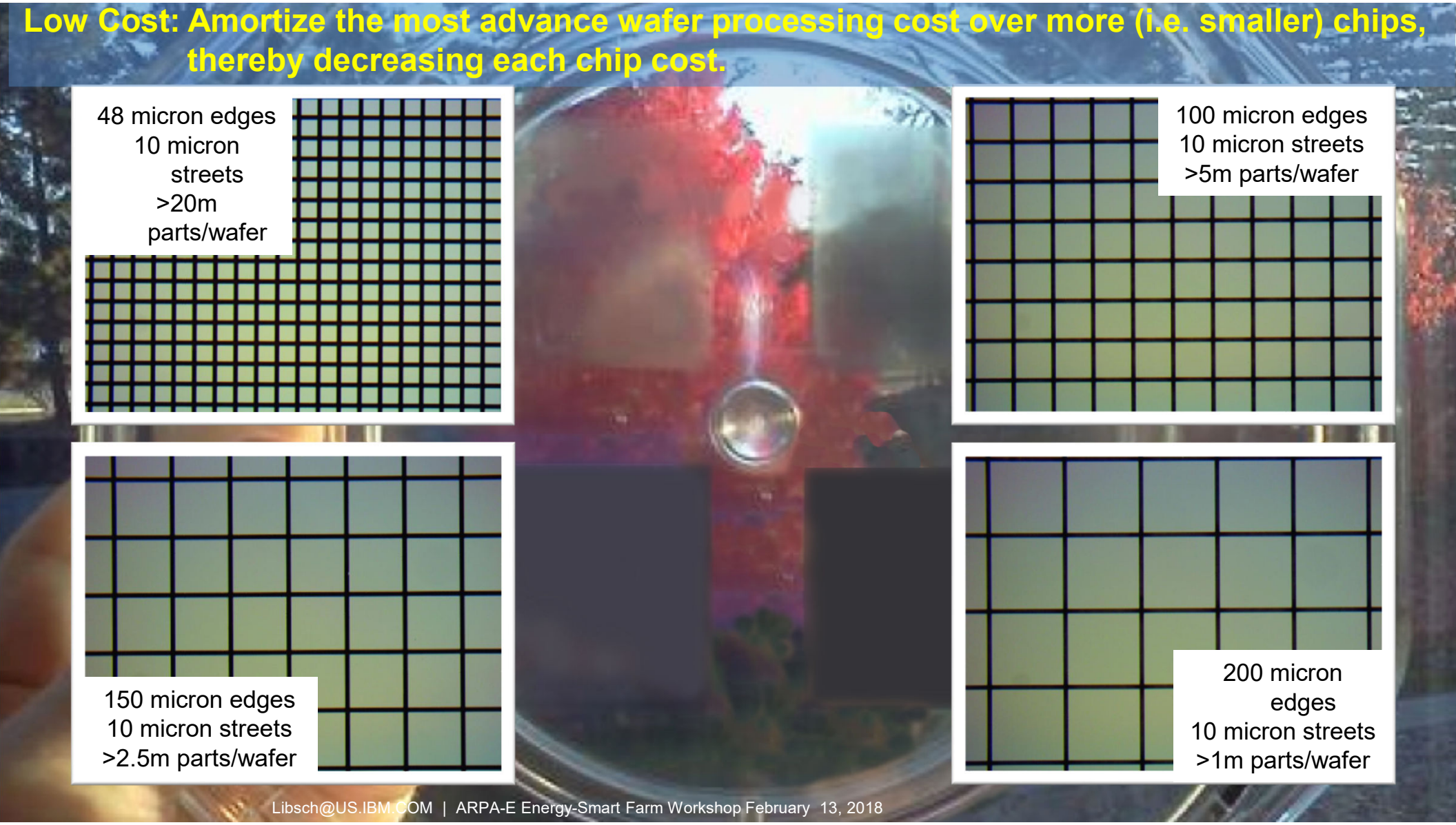
IBM's 5nm chip could quadruple battery life

By Paul Miller | @futurepaul | Jun 5, 2017, 12:04pm EDT



IBM Research scientist Nicolas Loubet holds a wafer of chips with 5nm silicon nanosheet transistors manufactured using an industry-first process that can deliver 40 percent performance enhancement at fixed power, or 75 percent power savings at matched performance. (Credit: Connie Zhou)

Low Cost: Amortize the most advance wafer processing cost over more (i.e. smaller) chips, thereby decreasing each chip cost.

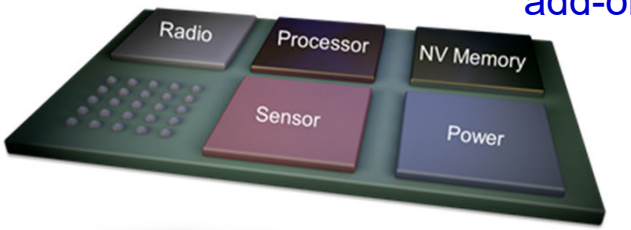


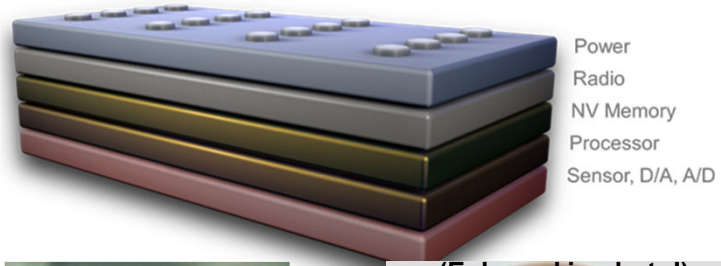
Ultra-compact Platform Requires More Than Just a Small CPU

Heterogeneous Chip Technology Selection: → Standardized Packaging Platform

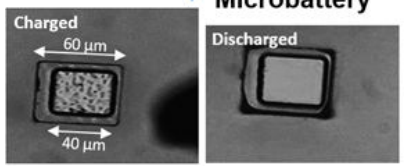
-- Lowest power and cost
-- Smallest size, best performance

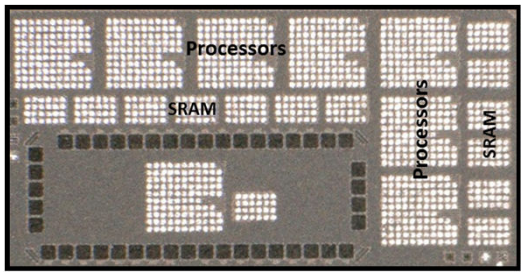
-- Lowest power and cost
-- Smallest size, best performance
-- Allows end-use customization and user add-on chips



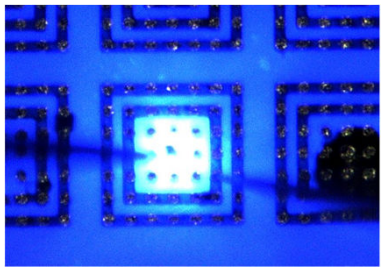


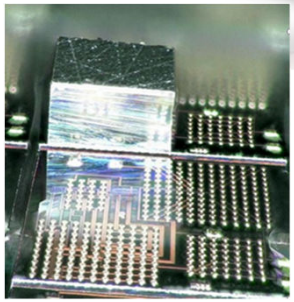
Microbattery

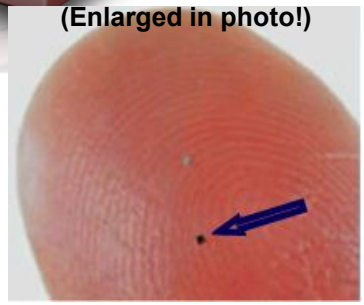




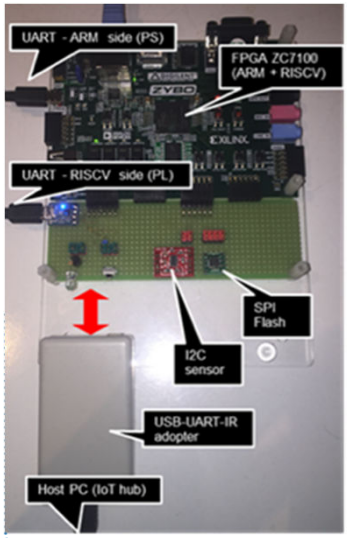
Communications
Micro LED







IBM Smart & Secure Microsensing Platform* Road Map



- FPGA Emulation
- GUI

2016

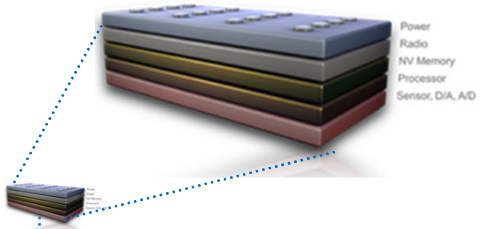
- Mechanical 2.5D

2017

- 2.5D build
- "Controlled" lab reader
- End-to-End Design with Blockchain & Secure Protocols
- GUI

- 2.5D build
- Hand-held reader
- GUI

2018



- 3D build
- Hand-held reader
- ….

Timeline depending on resources and End-use case

2019

*Machine Learning / Analytics capable at the edge (on platform) and/or in the cloud – End-use case determined.

Leverage Open Source: The Linux Foundation Hyperledger Project (i.e. Blockchain)

- Members
  - Launched with 30 members
    - 13 Premier including IBM
  - Currently: 200+ members so far
- Chairs
  - Chris Ferris (IBM)* elected to chair the Technical Steering Committee
  - Blythe Masters (DAH) elected to chair Hyperledger Board

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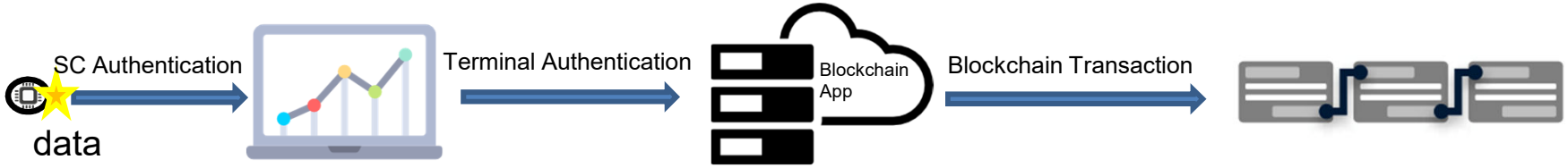
* As of 12 Sep 2016

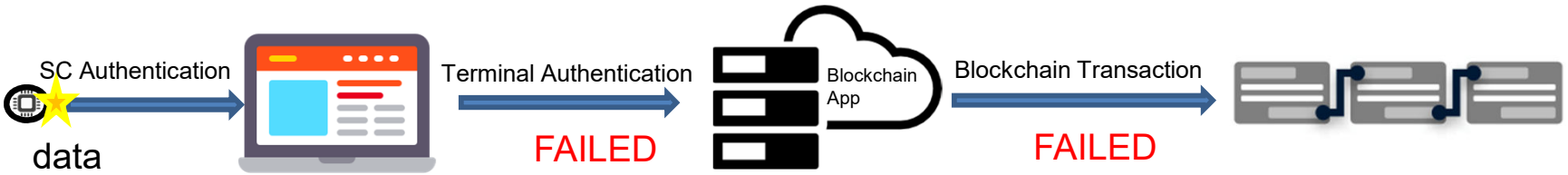
End-to-End Solution: IBM Small computer used as a trusted data source interacting with cloud containing IBM blockchain via an authorized terminal



Authorized computer

- Only after terminal and platform (such as blockchain) is authenticated, then IBMSC encrypts and sends the data!

IBM Small computer interacting with IBM blockchain via an unauthorized terminal



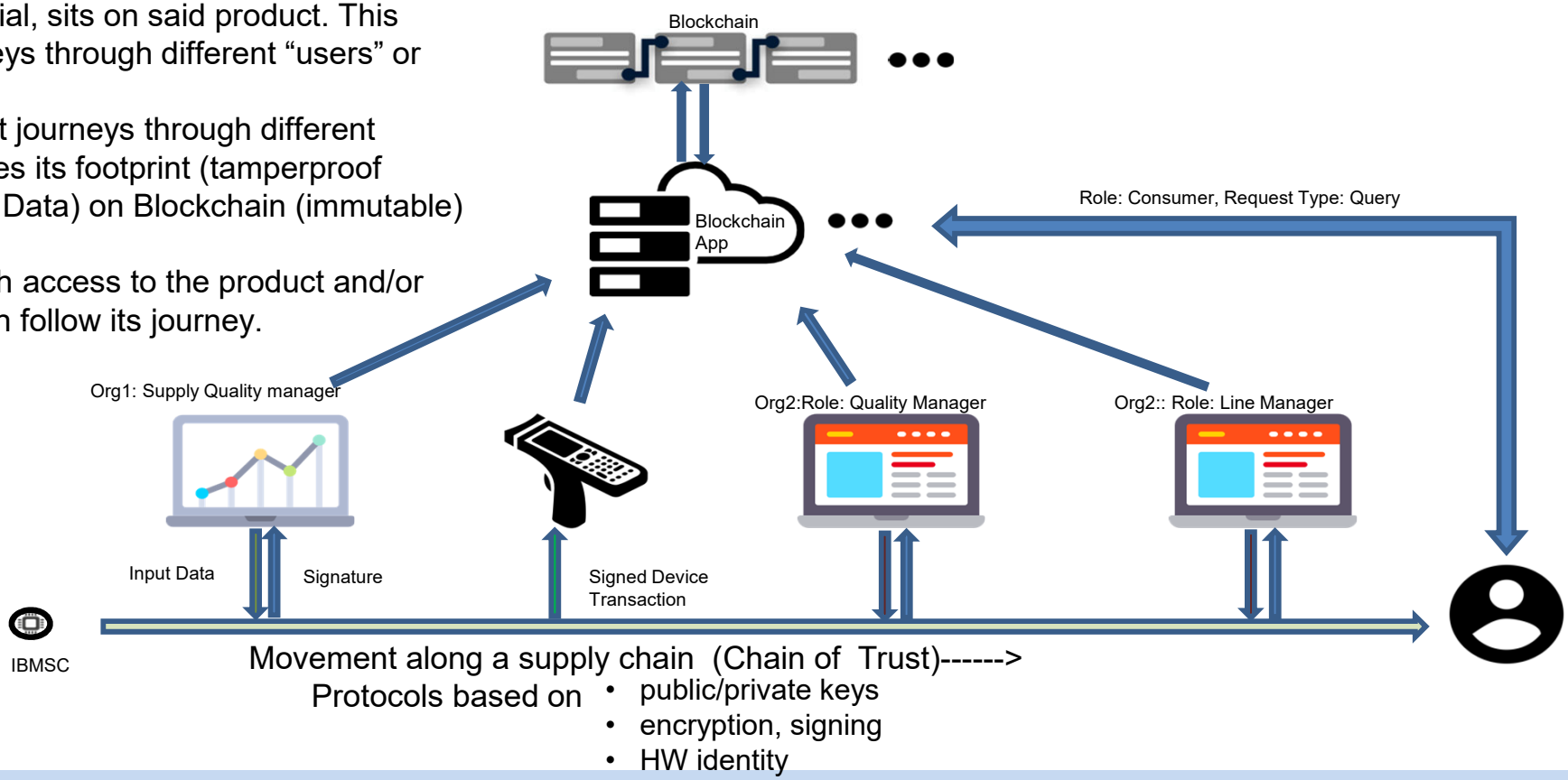
Unauthorized computer

IBMSC is a flexible computer system at the edge that can connect securely to private servers, cloud and run applications such as initiating transactions on blockchain, etc.

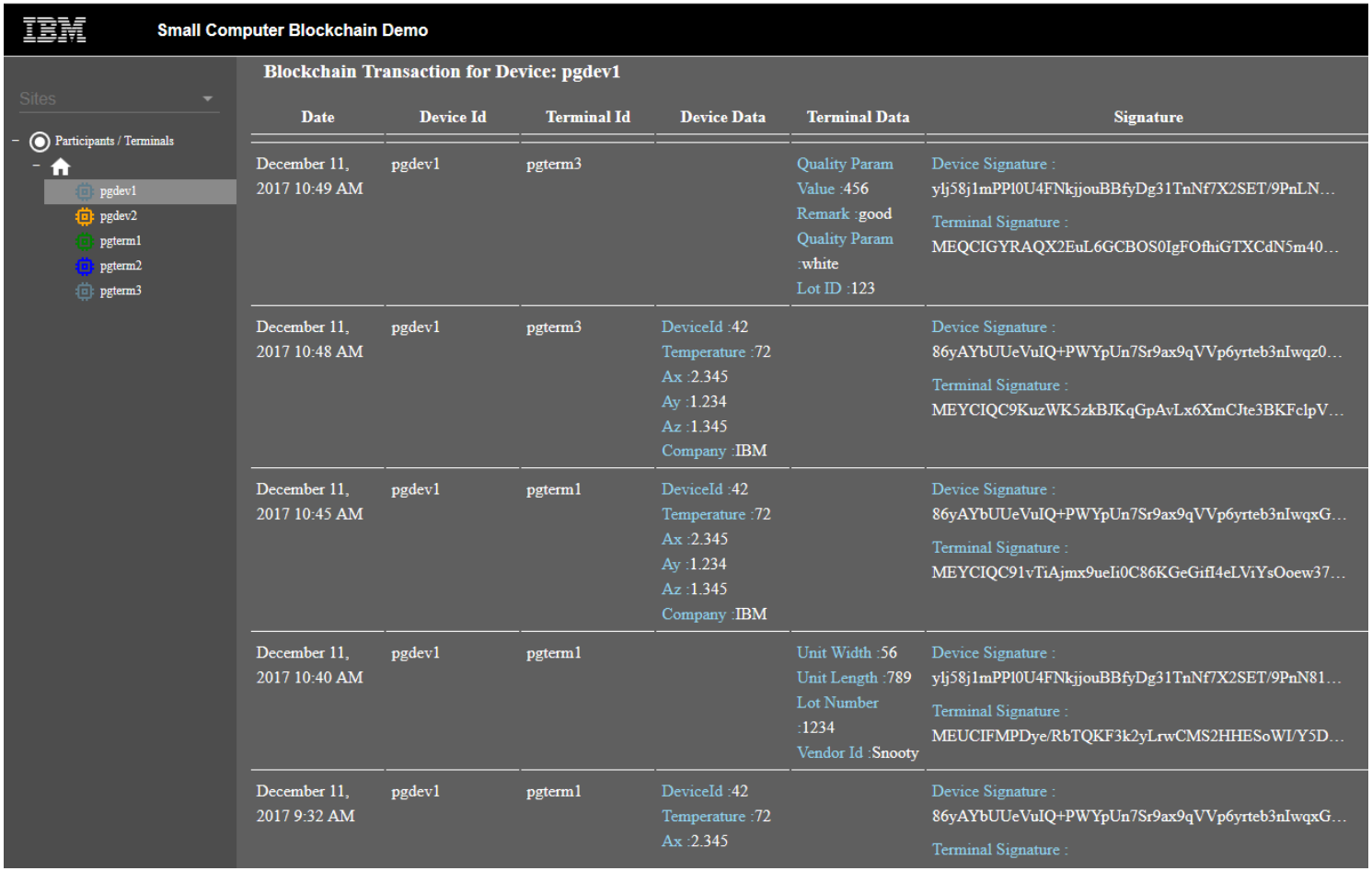
Blockchain Demo:

A complete turn-key solution concept that should be an end-to-end data taking design from a component (a smart and secure IoT data taking device platform) to a trusted many peer digital ledger (like IBM's Hyperledger fabric).

- **The demo can be summarized as:**
  - A hardware “wallet” (IBMSC) is owned by a product/material, sits on said product. This product journeys through different “users” or ”owners”.
  - As the product journeys through different “users” it leaves its footprint (tamperproof signature and Data) on Blockchain (immutable) (via readers).
  - Any “user” with access to the product and/or blockchain can follow its journey.



Example: IBM Blockchain Entry



In Summary

Impose IBM's microsensing platform size and computational capabilities to impose trust at the edge of Blockchain.

IBMSC + Blockchain provides trustable end-to-end validation, tracking and provenance with

- Guaranteed un-tampered (product) state information using tamper-proof data source hardware and protocol
- Automated, trusted, verified and authentic invocation of transactions, with no user involvement
- Tamper-proof immutable, permissioned data platform with flexible smart contracts, analytics, etc.

Let us know your use-case and see what we can do together!

Thank You!

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