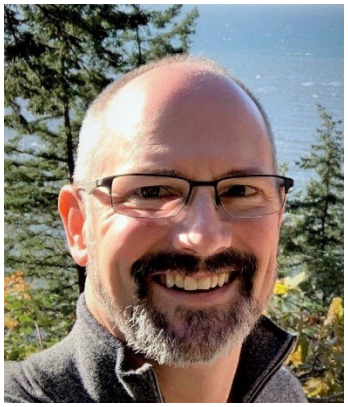
CALCE
CENTER FOR ADVANCED
LIFE CYCLE ENGINEERING

SMTA

NSF Workshop on Enterprise Network Models for Counterfeit Parts

Michael Ford
Aegis Software

Radu Diaconescu
SWIE.IO



David Mills
Alitheon

Cameron Shearon
Raytheon

Tracking and Traceability Session

Cameron Shearon Bio

Cameron Shearon is a Principal Materials Engineer with Raytheon's RMD Division. Prior to his current role he was the owner of Shearon-Consulting. Cameron is a co-chair of IPC 1782, and a SMTA Distinguished Speaker. Cameron has given invited speeches at many international events. He earned a BS and MS in Materials Science and Engineering from North Carolina State University. He obtained a Physics minor for his BS and a Solid State Science minor for his MS.

Cameron initiated and chaired the development of IPC 1782, a global component traceability standard that contains four traceability levels for materials and four independent traceability levels for the process that was completed in record time with the help of many outstanding contributors, IPC Staff support, and his leadership. As a result of his contribution to this standard, Cameron received a Committee Leadership Award from IPC at IPC APEX EXPO 2017.

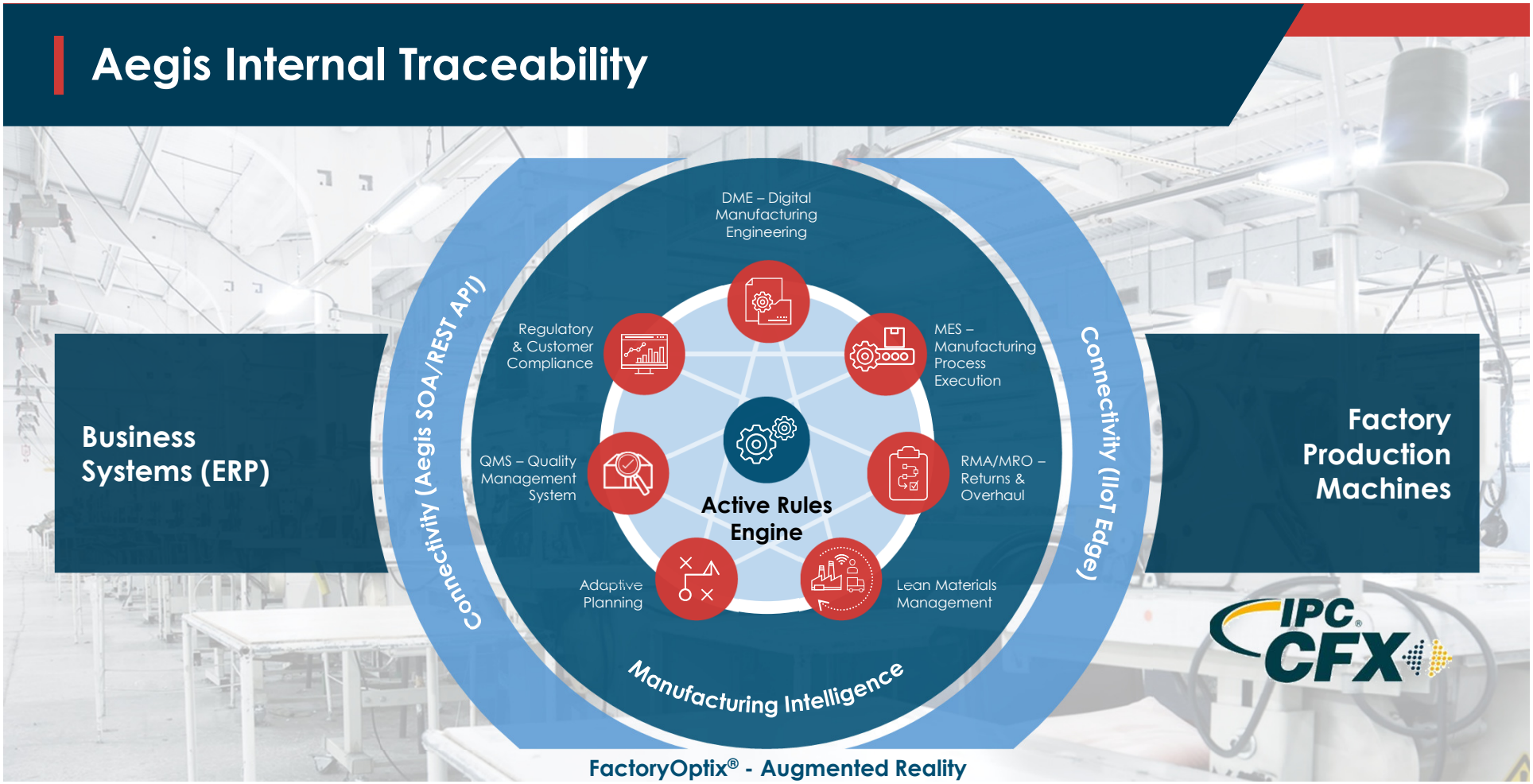
He has also worked as a Process Engineer in a Wafer Fab, Failure Analysis Engineer and Product Safety Engineer in an R&D Environment, a Lead Quality Engineer with AT&T's Global Supply Chain, and a Reliability Engineer with AT&T Labs.

ETSI adopted and published his contribution in early 2016, which established the fundamental foundation for his current work of developing a standard portfolio of very granular in situ custom probe level metrics, as well as, an expandable & extendable framework for those metrics along with an associated governance structure for the new global software defined telecommunications networks that can be used by Big Data groups among others to help make everyday decisions. Cameron is chairing the Multi-Standard Development Organization (SDO) metric effort for TM Forum and includes members from ETSI, NIST, and QuEST Forum. In addition, he chaired the NFV Metric Landscape effort for Quest Forum. Cameron has participated as a member in a multiple phase TM Catalyst project that has won several

awards (e.g.; Best Technical Contribution, Best In Show, etc.). The following is a link to Cameron's LinkedIn profile in case you are interested in more detail: https://www.linkedin.com/in/cameronshearon"

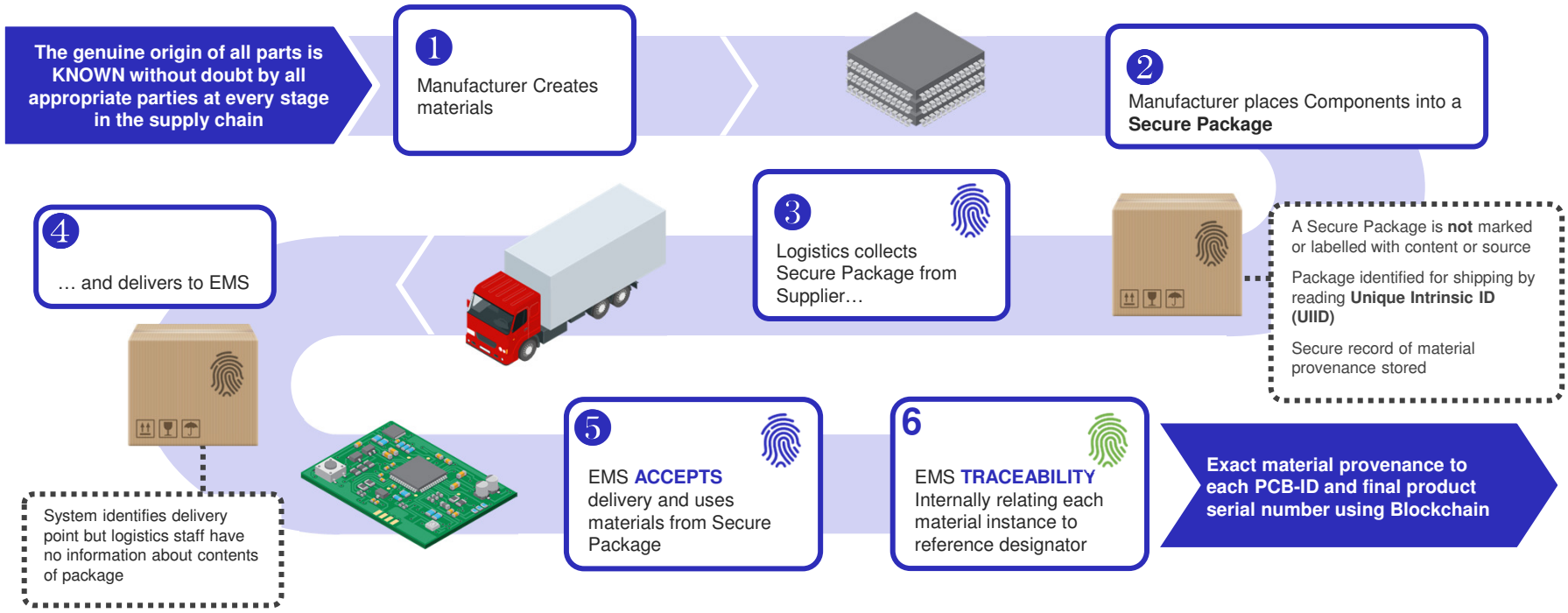
For further information about IPC 1782, go to the following location: http://www.ipc.org/TOC/IPC-1782.pdf

Aegis Internal Traceability



The Story So Far…

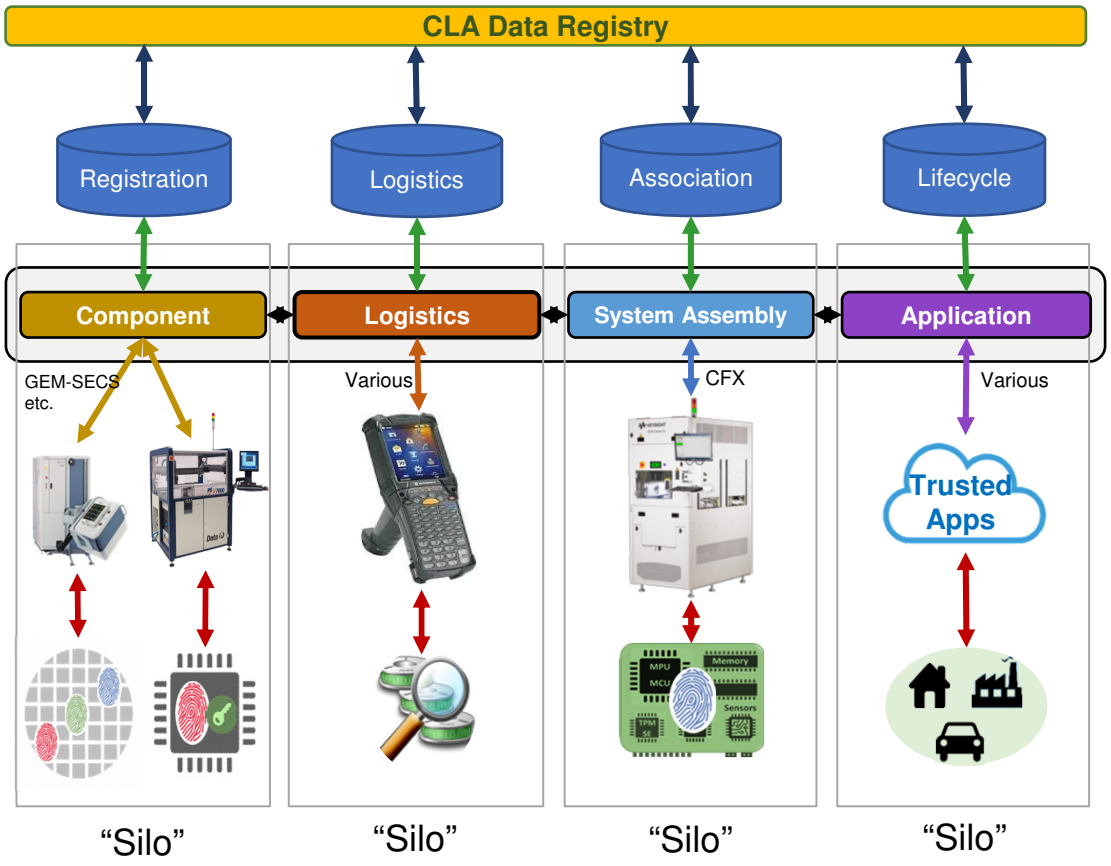
The Secure Supply Chain (IPC-1782A Standard)



Adopted by US DoD 2021

Component-Level Authentication

Components of IPC-1783



Secure Registry:

- Association hierarchy
- Private data with verifiable credentials
- Blockchain of indexes

Secure Registry Protocol:

- Submit & query data / potentially CFX

Connects & mediates the verification of IDs

MES Access Protocol:

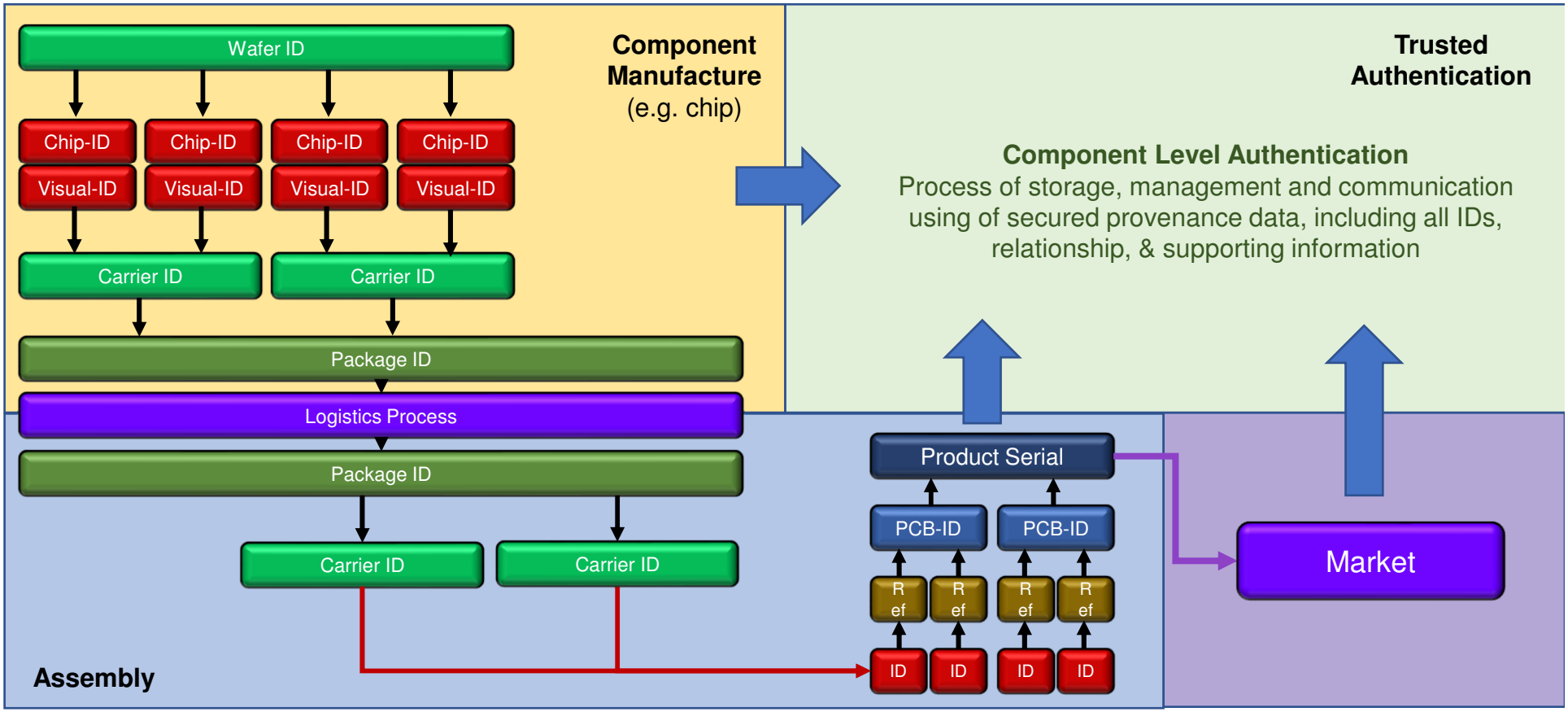
- Submit & query data
- Protocol varies between silos

Device Access Protocol:

- Read immutable ID (fingerprint)
  - Chip / Device for electronic IDs in semi-conductors
  - Visual feature recognition for others
  - Others as technologies develop

Component-Level Authentication

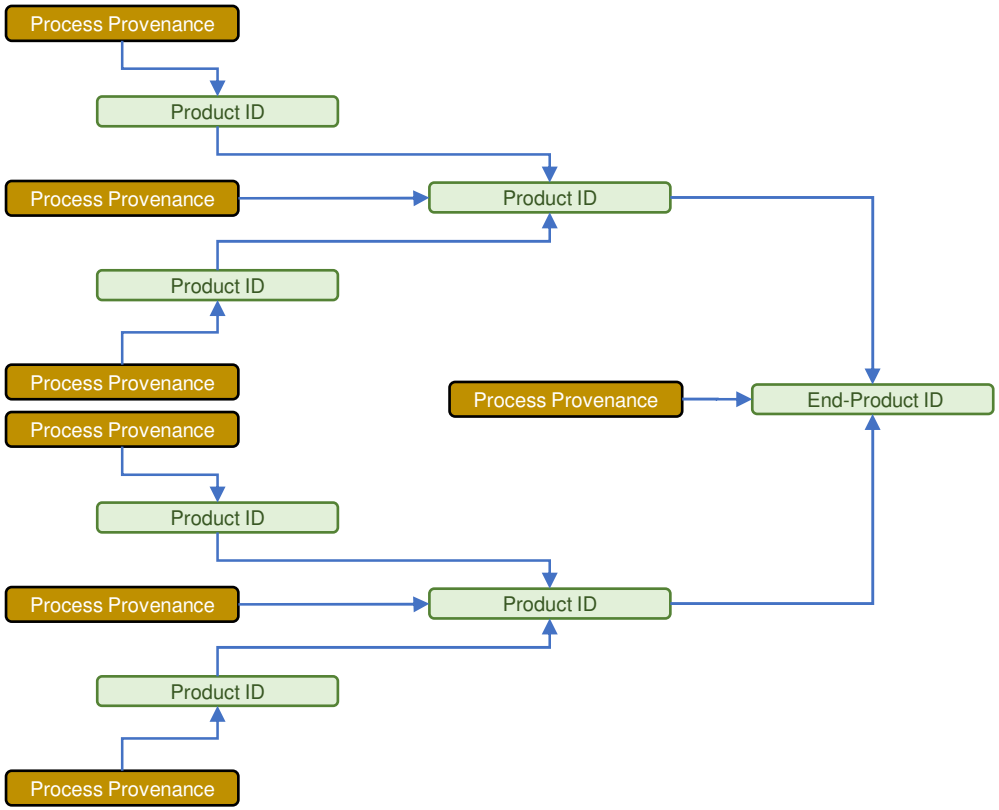
Product Provenance With Immutable IDs (Digital Fingerprints)



Provenance, a Dual Perspective

CLA Provenance Components:

- *Product ID Provenance:*
  - Tree of inheritance and association of all applicable material and assembly IDs to the end product
- *Process Provenance:*
  - Proof that specific actions have been taken, and data recorded, as applicable to each in each silo, without loss of privacy



Privacy Concerns

"A Person Walks Into A Bar…."

Verifiable Credentials Principle:

- Person approaches the entrance, can I be granted access?
  - I don't want to share any personal data (age etc.)
  - My personal data is securely stored in a private database
- A "verifiable credential" is a question that can be asked:
  - Is this person aged 18 or over?
  - Is this person COVID-safe?
  - Is this person Scottish, Irish or Welsh?
- The potential answers are:
  - "Yes", or "No"

The person gains entry, ***without disclosing any private data***

- In the commercial world, no NDA or contract required

Different places, different cases…

Process Provenance Authentication

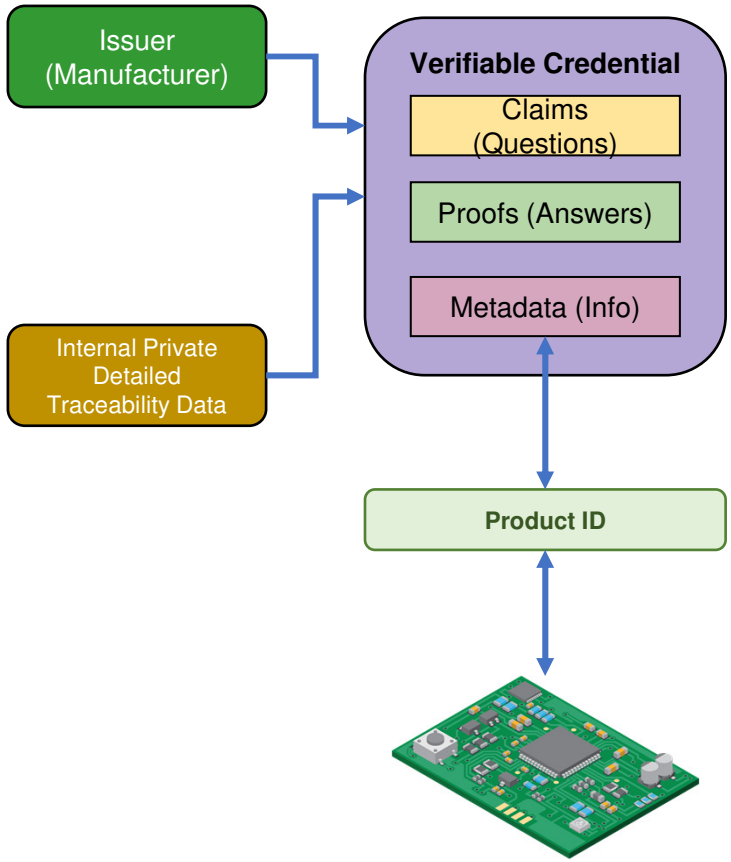
Verifiable Credentials:

- Confirmation of actions, without disclosure of detail
- A digital certificate that assesses the validity of the Claims
- Only the validity of the Claim is disclosed to the “questioning” party

CLA Use-Case Example:

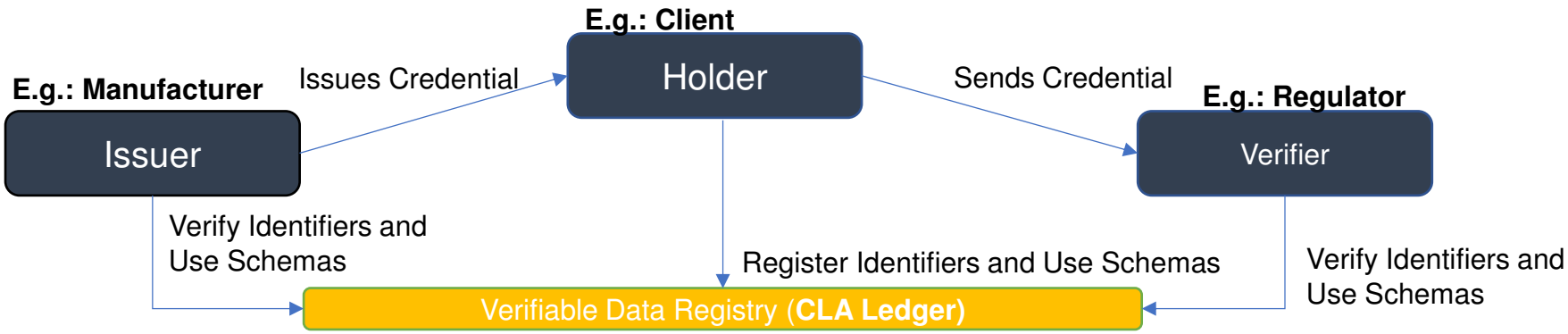
- A requirement for process provenance within silos for exiting products
- The manufacturer declares where a batch of products was made:
  - *“Made in the USA”*
- The questioning party asks *“Were the products made in the USA?”*
- The response is *“Yes”* or *“No”*
- Evaluated without disclosing the actual location

Applicable Verifiable Credentials are defined and listed in IPC 1783 standard



The Enabler

A decentralized public utility for asset self sovereign identity



CLA Ledger Network purposes:

- Ensures self-sovereignty of assets
- Establishes a Web of Trust interconnecting all Identity Owners and the assets they control
- Ensures openness and Interoperability of solutions
- Maintains accountability
- A unique source of truth not under central control

ID System Integration


```
{
  “ICboard-Factory”: [
    {
      "partName": "ICboard",
      "serialNumber": "T1000",
      "countryCode": "UK"
    },
    {
      "partName": "ICboard",
      "serialNumber": "T1001",
      "countryCode": "DE"
    },
    {
      "partName": "ICboard",
      "serialNumber": "T1002",
      "countryCode": "FR"
    },
    {
      "partName": "ICboard",
      "serialNumber": "T1003",
      "countryCode": "JP"
    },
    {
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      "serialNumber": "T1004",
      "countryCode": "US"
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    },
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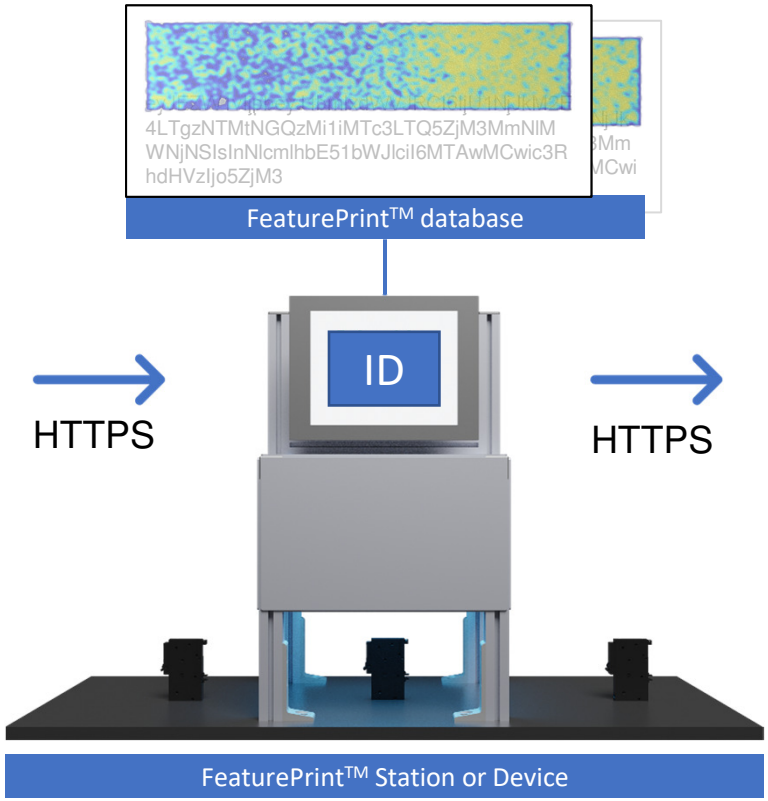


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{
  “ICboard-Field”: [
    {
      "eventType": "AUTH",
      "eventTime": "2021-03-18T02:32:40Z",
      "part": {
        "name": "ICboard",
        "serialNumber": "T1000",
        "countryCode": "UK"
      },
      "box": {
        "countryCode": "UK"
      },
      "user": {
        "location": "UK",
        "stationName": "P"
      }
    },
    {
      "eventType": "AUTH",
      "eventTime": "2021-04-10T04:56:40Z",
      "part": {
        "name": "ICboard",
        "serialNumber": "T1001",
        "countryCode": "DE"
      },
      "box": {
        "countryCode": "DE"
      },
      "user": {
        "location": "DE",
        "stationName": "T"
      }
    },
```

Example part and data flow