The Global Language of Business

GS1 Industry & Standards Event 2017
09-13 October 2017 – Brussels, Belgium

Transforming business together

Session: GS1 Innovation: Blockchain, Consumer focused Internet of Things (C-IoT) & GS1 Standards

Time:08:30, Thursday, 12 October

Who may attend:Everyone!

Speaker(s): Kevin Stark & Gena Morgan, GS1 GO

Anti-trust caution

- GS1 operates under the GS1 anti-trust caution. Strict compliance with anti-trust laws is and always has been the policy of GS1.
- The best way to avoid problems is to remember that the purpose of the group is to enhance the ability of all industry members to compete more efficiently.
- This means:
  - **There shall be no discussion of prices, allocation of customers, or products, boycotts, refusals to deal, or market share.**
  - If any participant believes the group is drifting toward impermissible discussion, the topic shall be tabled until the opinion of counsel can be obtained.
- The full anti-trust caution is available via the link below, if you would like to read it in its entirety: http://www.gs1.org/gs1-anti-trust-caution.

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GS1 Standards Event App – How to get it

1. Get the App by searching your App store for "GS1 Global Events" (If you already have the Global App due to attendance at the Global Forum or Standards Event, you do not need to do this)

2. Once you have the Global App on your mobile device, type GS1IS17 in the search box. Please click the orange (+) to activate the event within your application.

3. Login with the email address you used to register for the event:

   Username: (your registered email)
   Password: 2017

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WiFi internet access

- Select “Crowne-Plaza-Free-Internet” and connect
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Agenda

- Who wants to be a Blockchain & Consumer-IoT expert?
- Introduction
- Breaking through with Blockchain
- Consumer IoT (C-IoT)
- Wrap-up

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Who wants to be a Blockchain & Consumer-IoT Expert?

- I could teach a master class on IoT…to my kids
- I have been tracking IoT a bit…what does it mean to GS1?
- I can barely spell IoT….I'm here to learn

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Who wants to be a Blockchain & Consumer-IoT Expert?

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Trust starts with Traceability

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Breaking Through With Blockchain

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Why is blockchain exciting? Data Sharing.

Much of the excitement about blockchain is actually excitement about the possibility of sharing data across company lines.

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What is blockchain?

The word "Blockchain" is used in a variety of ways:

- To refer to technologies that are, basically, "shared ledgers" of data
- As the name of algorithms that help achieve decentralized consensus
- To refer to a deployed shared ledger system: e.g. "the blockchain"
- A general purpose magic word

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What are the relevant parts of a public "blockchain"?

- **Blockchains are shared databases** of records that can never be changed afterwards
  - They commonly use "decentralised ledger technology"
- **They are decentralised and replicated**
  - No one organization controls governance of the data or the process of validation
  - They are not merely distributed…(more on this in a minute…)
- **They may have stored procedures** to enforce validation rules for data and for transactions
  - These are also known as "smart contracts" and are independently verifiable by any participant
  - It turns out that these may be important to supply chain implementations
- **They can support a crypto-currency**
  - This is the most widely used implementation of a blockchain today
  - This might be useful if database transactions involve payment, but isn't very relevant to our discussion today

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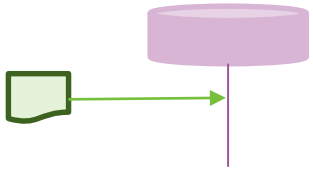
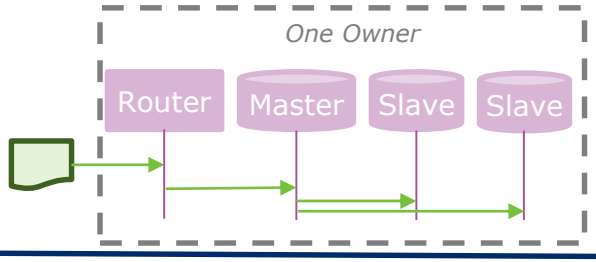
Centralized vs. Distributed vs. Decentralized.

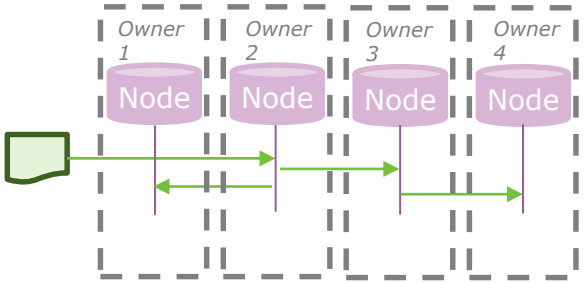
- **Centralized**
  - One database, one owner
  - Not resilient to organisational failure
  - Not resilient to technical failure



- **Distributed**
  - Many database copies, one owner
  - Resilient to technical failure
  - Not resilient to organisational failure



- **Decentralized**
  - Many database copies, many owners, no one "master"
  - Resilient to technical failure
  - Resilient to organizational failure



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Who needs a decentralised public blockchain?

- **Systems that include many organisations that lack mutual trust in a central authority** may need *decentralisation*
  - When the system is used by competing parties that do not trust a central authority or lack trust in a single "trusted intermediary"

- **Systems that need to manage scenarios that depend on national sovereignty** may need *decentralisation*
  - Some nations will never trust a system exclusively domiciled in another country
  - It should be noted that many *distributed* databases are domiciled in multiple countries (Amazon Web Services and other platforms offer ample configuration options here)

- **Systems that need to ensure absolute continuity** may need *decentralisation*
  - Those that demand continued operation if any node's owner goes out of business
  - Ability for new nodes to join and pick up all previous data

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Decentralisation ensures a “single truth”.

- **A blockchain ensures that each node sees all transactions.**
  - This is not a familiar approach to data sharing across traditional supply chains.
  - It ensures that:
    - “I know”
    - “I know that you know”
    - “I know that you know that I know”

- **Blockchains help to avoid ambiguity in the ordering of events or transactions.**
  - The ordering and the processing (by consensus) ensures a single version of the truth….always
  - This is why blockchains are particularly interesting to financial systems
  - All nodes must be able to converge on a single truth
  - A single truth must be enabled despite a lack of mutual trust in a central party…and without any one node playing a distinguished role (there can be no single arbiter)

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What problem does blockchain technology solve?

Blockchain doesn’t solve a technology problem…

but it might solve a social problem.

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Attributes of a Blockchain.

Trusted

Shared

Tamper-Proof

Secure

Traceable

Public?

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But MY "single truth" can't be public!

- **Public blockchains, such as Bitcoin or Ethereum, are not fit for purpose for most Enterprise applications.**
  - Supply Chain parties have justifiable concerns about visibility of sensitive data.
  - Access control and permission are real concerns

- ***Enterprise Blockchains* are, by design, access-limited to known parties that are trusted.**
  - Enterprise blockchains implement a number of layers of authentication and authorisation control to ensure party trust.
  - While the term "enterprise blockchain" does not have the same definition as the term "permissioned blockchain", these terms are beginning to become colloquially equal.

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So, what is an enterprise blockchain good for?

- **A blockchain is just a database**…
  - It's a unique kind of database where:
    - You can't change data
    - You can't delete data
    - You can't query for data (at least in many implementations)
      - This means that the data set could get BIG…**really BIG**.

- When implemented to address business applications in the supply chain space, **an enterprise blockchain is generally an index that references off-chain data** (off-chain data can continue to be maintained in traditional data stores).
  - These can be EPCIS repositories
  - This might solve the problem of ledgers getting too large.
  - This also enables fast sharing of a common truth about events and contracts.

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So, what is an enterprise blockchain good for?

- **You can share data in an enterprise blockchain, specifically data that doesn't change.**
  - This means that **data that is familiar to supply chain business applications *could* be shared in an enterprise blockchain ledger** (like event data, transactional data, and even master data).
    - This may create very large blockchains of data.
  - But, this also means that **you can put pointers to (and hashes of) event and transaction data in an enterprise blockchain ledger!**
    - These pointers can refer to off-chain data and the hashes of that off-chain data can prove that the off-chain data wasn't tampered with.

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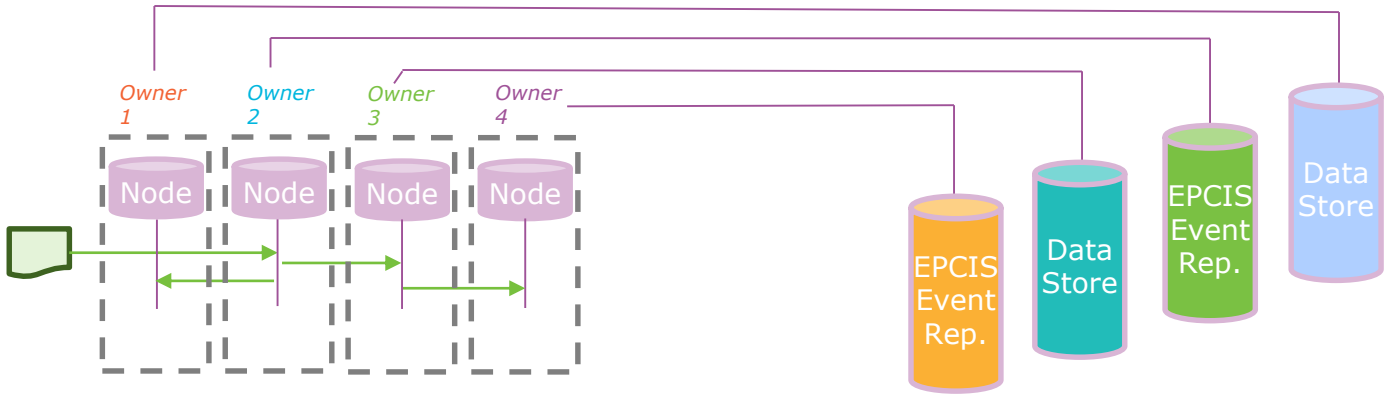
Blockchains and data stores working together.



Enterprise Blockchain ledger

- Access and permission control layers
- Pointers to off-chain data and hashes of off-chain data
- Some relevant pieces of data needed for validation and business processes and smart contracts
- Identifiers based on GS1 keys (party, location, things, etc) – likely obfuscated
- Data stored in accordance with GS1 standard data structures

Off-chain resources

- Access and permission control layers
- Event, transaction and master data stored in accordance with GS1 standard data structures (such as EPCIS Event Data Repositories)
- Identifiers based on GS1 keys (party, location, things, etc)
- Other data resources that may be needed (documents, images, files, etc)

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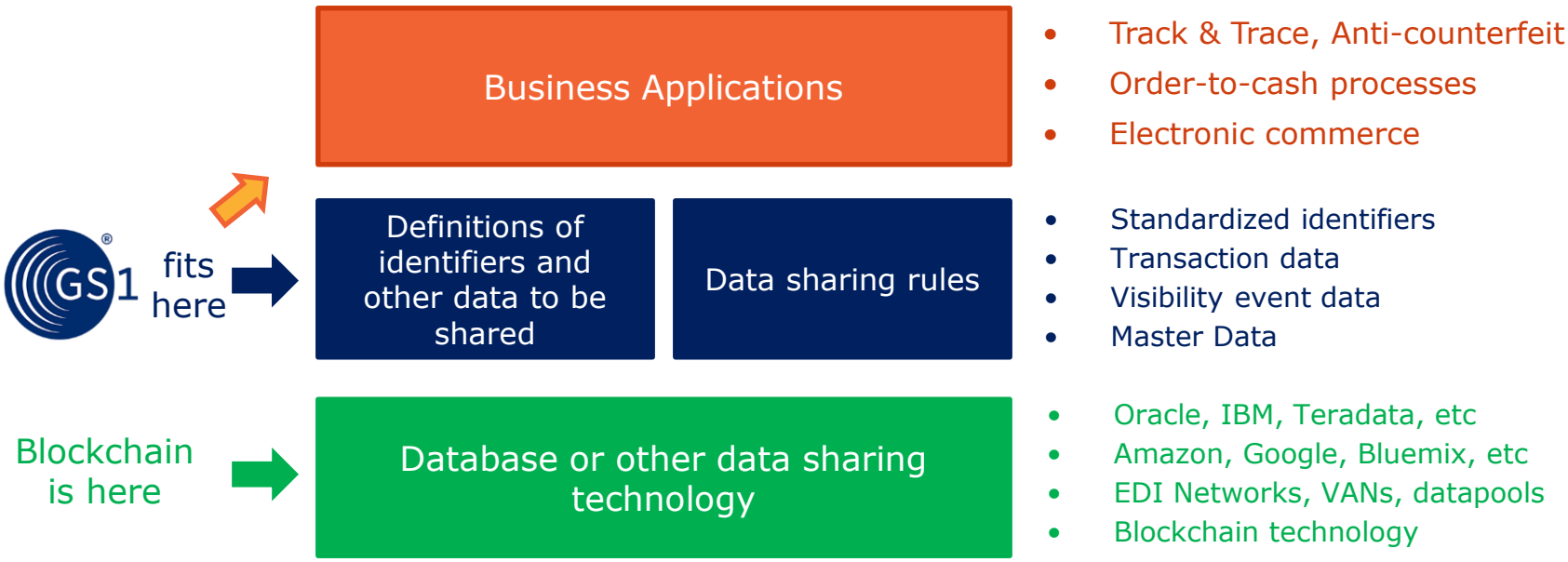
Where does GS1 fit…

and where does "blockchain" fit?



Blockchain is a shared, secure, distributed ledger;
GS1 facilitates standards for data and some business applications

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There’s no need to reinvent the wheel.

Work has been done to create a global language of identification and data sharing.

This work, and the rest of the GS1 system of standards, can be leveraged to accelerate startups and industry who wish to use blockchain technology to address business applications.

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Blockchain → Digital Transformation.

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Questions?

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Consumer-Focused Internet of Things

(C-IoT)

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How are different companies approaching IoT?

- Industrial IoT – Industry 4.0
  - GE & Siemens developing the "Smart Factory"
- IoT in healthcare and retail
  - Beacons, RFID, tracking the consumer shopping journey / the patient journey
- Plus…
  - Smart Homes
  - Smart Cities
  - Smart Grid / Smart Infrastructure
  - Connected Cars (Smart Autonomous Transportation)
  - Smart Farming

So where does Consumer-focused IoT fit?

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GS1 “Consumer IoT” Innovation Initiative

Consumers are changing the ways in which they interact with retailers, brands and products—both in the physical world and online.

IoT platforms are at the center of this change—helping consumers integrate products and devices into their daily lives.

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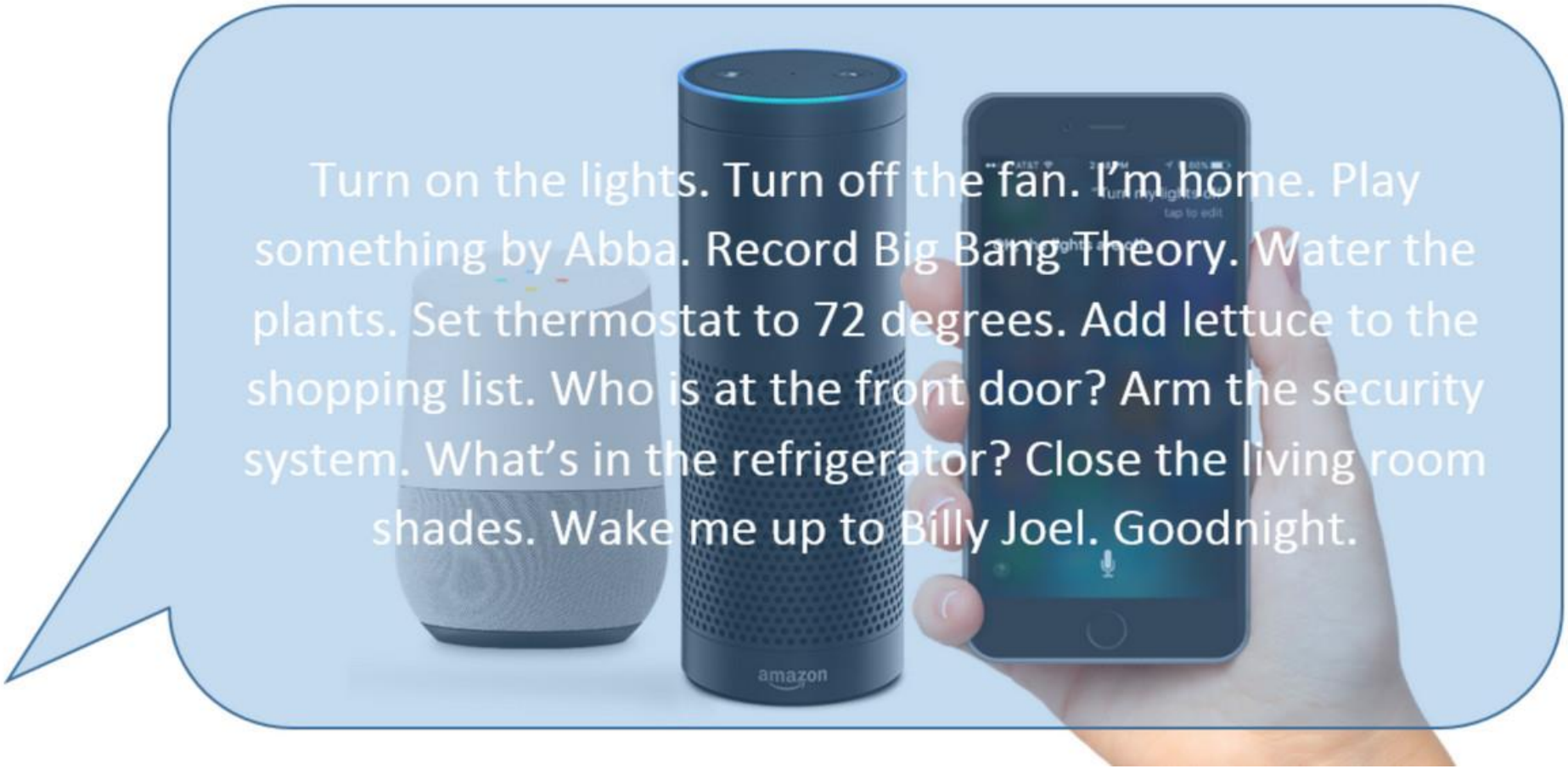

https://www.cepro.com/article/ces_2017_voice_control_smart_home_google_nest_thread_weave_iot_alexa

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C-IoT applications for consumers can help a mother manage her infant's nutrition needs…

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…and help the business traveler track their luggage

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Smart Luggage Use Case Example (part 2)

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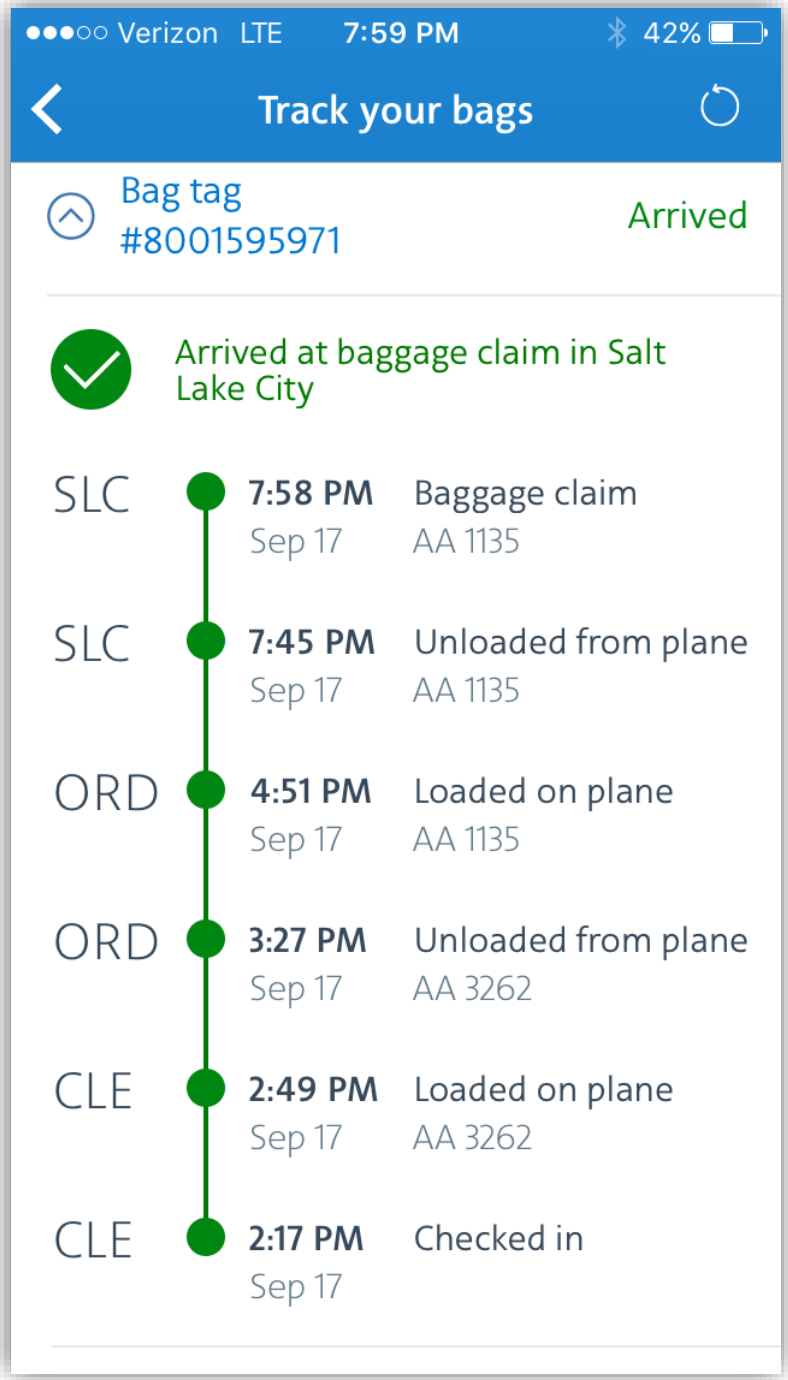
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Track your bags
Bag tag #8001595971
Arrived
Arrived at baggage claim in Salt Lake City
SLC 7:58 PM Sep 17 Baggage claim AA 1135
SLC 7:45 PM Sep 17 Unloaded from plane AA 1135
ORD 4:51 PM Sep 17 Loaded on plane AA 1135
ORD 3:27 PM Sep 17 Unloaded from plane AA 3262
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CLE 2:17 PM Sep 17 Checked in

IoT at the Consumer Electronics Show 2017

IoT was everywhere and was mostly underwhelming. It felt like "corporate imagination" (usually an oxymoron) run amok. Clearly a bunch of CEO's are asking "what's our IoT strategy" with predictably obvious, boring, and poor answers. Worse, there are competing standards so the stuff doesn't interoperate. Fix this folks.

- **Mark Hatch, reacting to CES 2017**

www.linkedin.com/pulse/final-ces-musings-mark-hatch

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Consumer IoT (C-IoT) – where does GS1 fit?

Leveraging our portfolio and our strength in building communities, GS1 is working to bring the C-IoT architecture for globally unique identification to life.

So what is our plan to do this?

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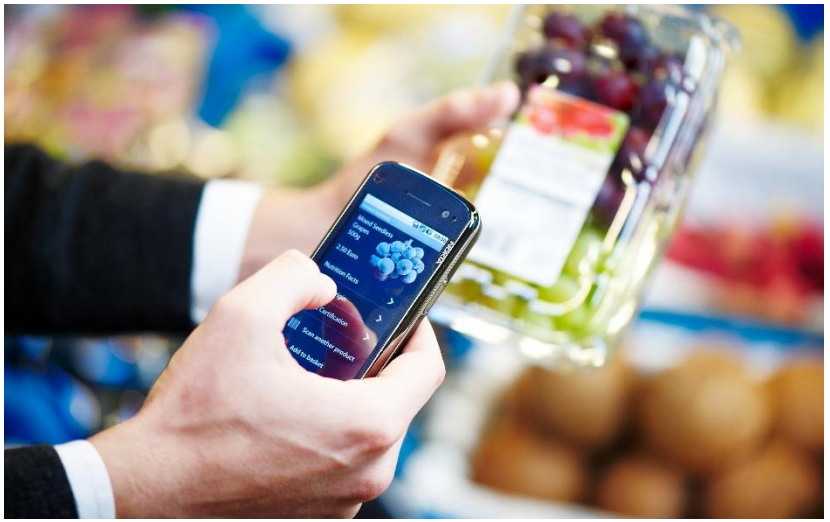
C-IoT – what is the work ahead?

Architecture Development

Benchmark our Architecture with other IoT systems to identify gaps

Identity of Everything



Leverage our expertise in Identification and explore Identity Management on a broad scale

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C-IoT – what is the work ahead?

Collaborate with End Users

Coordinate participation from Industry to solve real IoT problems

Align with Adjacent Activities

Connect C-IoT work with Traceability and other relevant initiatives

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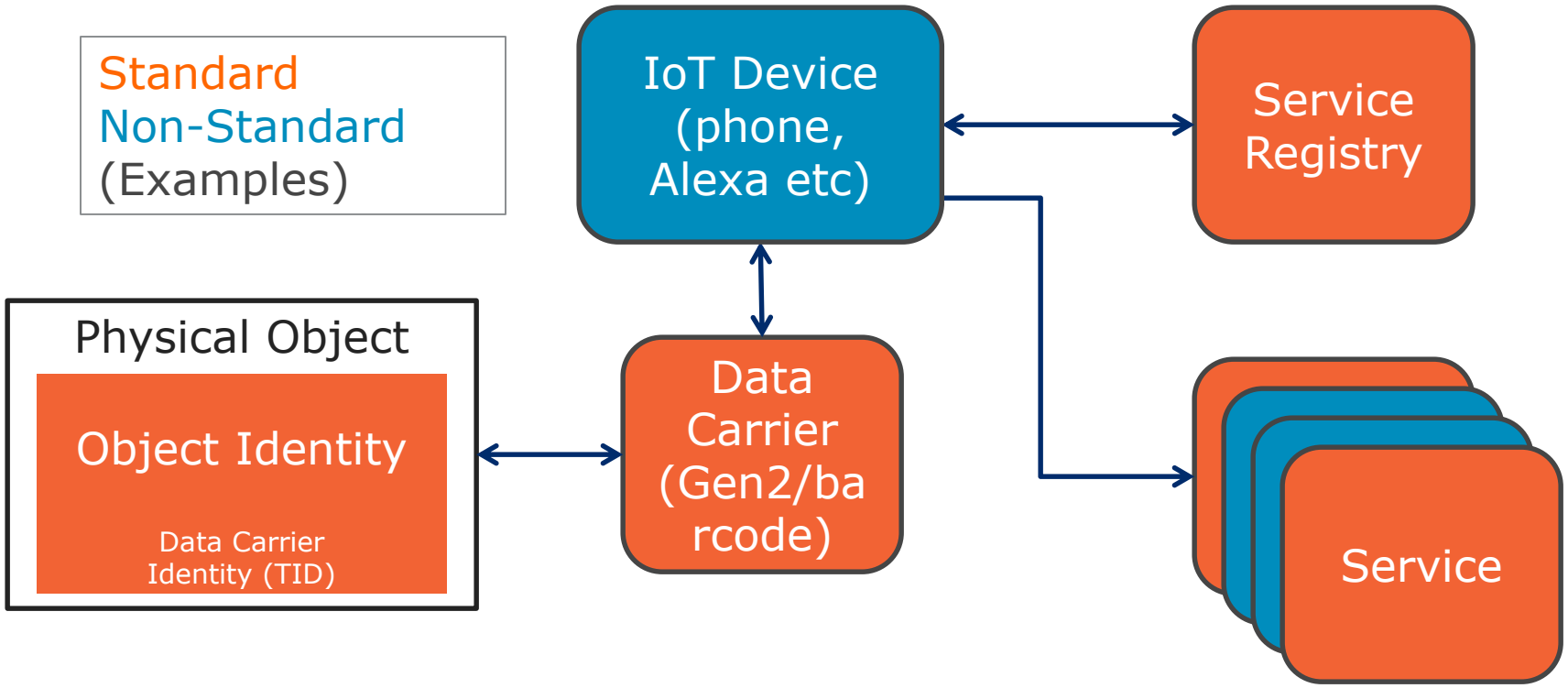
Simplified C-IoT Architecture



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Bluetooth with my New Heart Rate Monitor (HRM)

Inclusive Discovery – HRM advertises. Phone hears and scans for other services.

Ownership, Security, and Privacy -- User selects devices on phone and pairs – two devices authenticate and then exchange encryption data. This is stored persistently.

Modular and Open Data Model -- The phone knows automatically about the HRM service and also about the battery service. They are standard services and can interface to your preferred fitness App or with the app provided by the manufacture.

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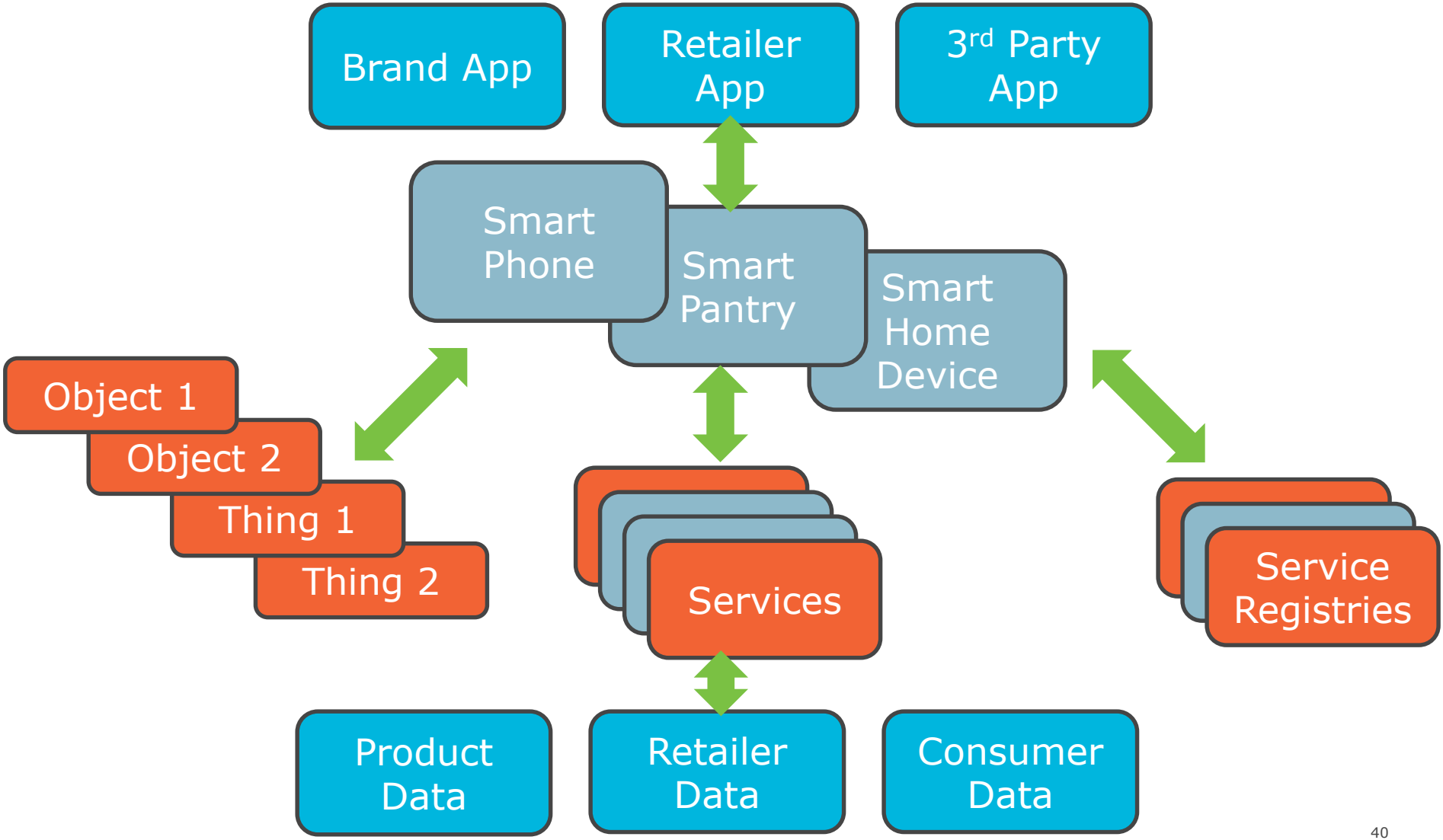
Q: How does this scale? A: pretty fast…



Big questions…

- What role does “Identity” play?
- Who owns the data (MY data)?
  - Privacy
  - Choice
  - Right to be “forgotten”
  - What does ownership even mean anymore?
- How can we make this simple to set up?
- How do these services work if your product is not “smart” (your smart pantry tracks inventory of serialized GTIN baby formula containers)
- How can we make this open, modular, inclusive, and data carrier agnostic?

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Questions?

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Where can I learn more?

https://www.gs1.org/standards/internet-of-things

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The Global Language of Business

GS1 recommends use of existing data standards in enterprise blockchain implementations

Early adopters should leverage GS1's proven, standardised data structures

The recent excitement around blockchain has renewed industry interest about the business value of data sharing, transparency, visibility and trust. Blockchains are shared databases (or indexes) of information about transactions and events. Storing traceability or event data about your supply chain or about your products, assets, services or "things" in a shared database is not a new concept. In fact, entire industries have been sharing such data with each other for years. Blockchain's promise is to do this more efficiently with the network enabling cross-party trust relationships in new ways. Some even call it the Trust Protocol.

GS1's portfolio includes a set of foundational standards that can be used to structure data that is to be stored in (or referenced by) blockchains. Industry leaders have an opportunity to avoid divergence of internal systems and data formats and to accelerate their adoption of blockchain technologies for enterprise by leveraging the **GS1 and ISO open standards EPCIS and CBV**, which are global multi-sector standards that enable the exchange of traceability data and serial-level (or item-level) track-and-trace.

Microsoft

"Leveraging existing GS1 standards to structure event information will enable blockchain-based supply chain implementations to be more interoperable and will simplify the capture and description of events that are written against smart contracts."

Yorke Rhodes
Global Blockchain Business Strategist

Practical enterprise blockchain implementations are starting to leverage these standards. Dr. Bill Hardgrave of Auburn University explains, "We are looking at blockchain as a flexible and secure solution, and we believe that we can work together to adapt GS1's EPCIS data standards to leverage blockchain as a medium and accelerate our work." Indeed, enterprise implementations can be built around blockchain-based indexes of information that refer to data in more traditional off-chain data stores. Such an approach can enable your business to instantly rely on a common single version of the truth about supply chain and logistics events, while creating migration paths to a future that increases trust between parties and significantly reduces data duplication and reconciliation.

Perhaps, the most exciting part of blockchain is the idea that there is a way to share data across corporate boundaries with a high degree of rigour and confidence of its veracity. For many, that's a game-changing notion...and it's an idea that needs to be explored with urgency.

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The Global Language of Business

GS1 "Consumer IoT" Innovation Initiative

Consumers are changing the ways in which they interact with retailers, brands and products—both in the physical world and online. They increasingly demand that their shopping experiences be relevant, timely, personal, secure and seamless. More and more, these interactions occur with, and between, smart-connected devices.

Behind this change is the Internet of Things (IoT). As a key market disruptor, the IoT will have a profound impact on GS1 stakeholders across industries and around the world. It is important that GS1 continues to serve its stakeholders in a way that preserves global standards and benefits people and companies today—and prepares them for tomorrow. At the same time, GS1 intends to lead this space by developing an inclusive architecture that aims to be **the global language of business, people—and things.**

The emergence of Consumer IoT

We are moving into the age of the Consumer Internet of Things (C-IoT). One can easily imagine a future in which a consumer's pantry alerts Amazon Alexa to order more baby formula, using a small camera, RFID tag or a WiFi-enabled scale. Once the item is ordered, the parent would be able to track the shipment and confirm the product's authenticity—directly with the manufacturer—upon delivery. If a problem arises, they could request a replacement by simply asking Alexa. The new product would be fulfilled through an Uber delivery service or a robot/drone.

Though the IoT has traditionally been leveraged within the B2B space, it is already prevalent across retail channels and we expect healthcare and other industries to follow suit. Today, the IoT is driven by the needs of—and interactions with—everyday people. In retail, for example, the pen-and-paper shopping list is no longer necessary because we can "talk" to objects that order products for us and arrange for their delivery. In healthcare, IoT devices can tell us to see a doctor before we even know we need to.

"As the Internet of Things grows we need an agreement on system architecture and open standards. If leaders don't think this through, and don't create a framework for it to succeed, there's a real chance that the full potential of the Internet of Things could be compromised".

Sanjay Sarma
Chairman, GS1 Innovation Network
Professor, VP for Open Learning, MIT

Life in the future of Consumer IoT

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Thank you!

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