



Emerging Technology Themes

September 2018

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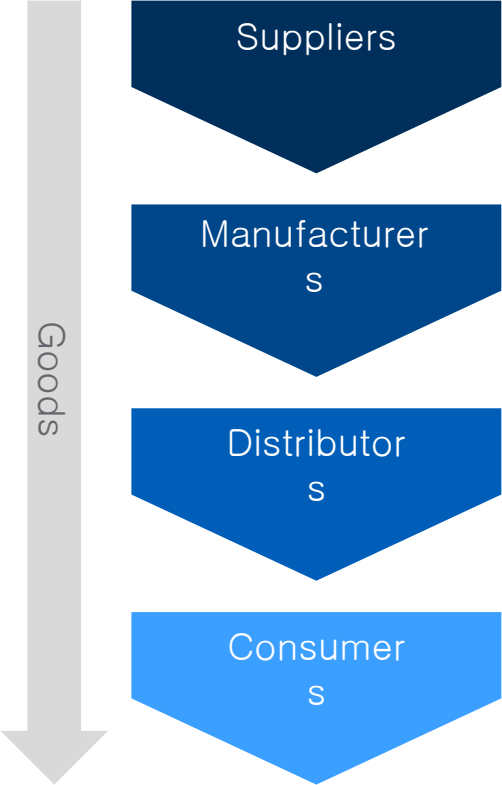
Topics

1. Blockchain – definition, practical examples, and some hypotheses
2. AI, Big Data, and IOT – definitions, ‘Yard of the Future,’ and Key Challenges & Enablers
3. Closing Thoughts



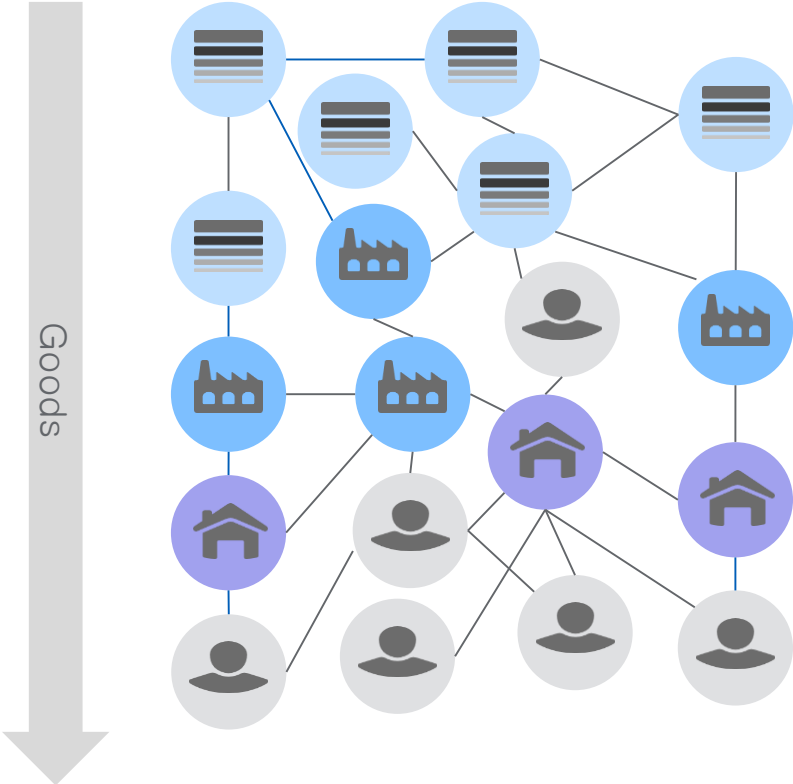
Supply chain evolving into value webs

Linear supply chains are evolving into...



Value is based on the production of goods and services

Complex, dynamic, and connected value webs



Value is based on knowledge exchange that drives proactive production of goods and services



Connecting the Physical and the Digital

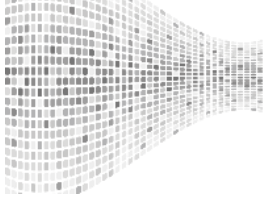
Blockchain establishes digital record of the physical operation that is tamper proof



2

PHYSICAL

Big data, analytics and visualization to store and compute data from 'things' in any format



3

DIGITAL

IoT is a giant network of connected "things" via sensors, cameras, and edge devices



1

4

Automation and Artificial intelligence ... translate algorithmic recommendations from from the digital world into automated movements in the physical world



Buzzwords defined



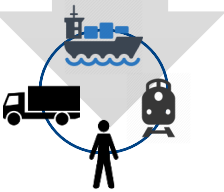
Internet of Things

- IoT is a giant network of connected "things"
- The technology connects people ↔ people, people ↔ things, and things ↔ things.
- Examples: Cameras, sensors, locomotives, containers, & the internet



Big Data & Machine Learning

- Big Data: collect & connect data from 'things' in any format
- ML: give machines access to data, train them, & then they teach themselves
- Examples: Sensor enabled assets, cameras monitoring yard, social media chatter



Artificial Intelligence → Automation & Efficiency

- AI: Machines carry out tasks in a manner that is 'smart'
- Smart behavior leads to efficient interaction between machines and people
- Example: efficient and just-in-time handoff of freight driving yard efficiencies



Blockchain

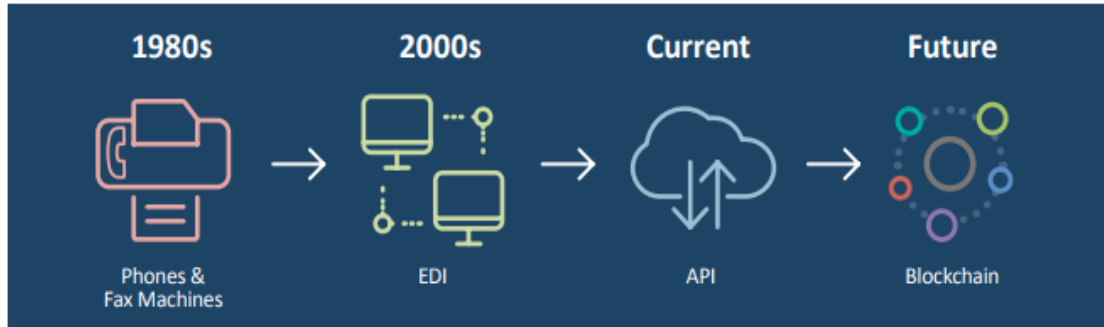


Blockchain



Blockchain Defined

A new B2B standard...



With traditional forms of point-to-point B2B, each party has its own view leading to exceptions and disputes

If *shared state visibility* truly existed, many of these exceptions and dispute situations would not arise in the first place – or would be remediated as they occur

- 1 *Blockchains use complex mathematical functions to create a **secure and definitive record** of who owns what, when... **without a central authority.***
 - 2 *Data is not stored in any one place, but across millions of computers.*
 - 3 *Information held on a blockchain exists as a shared — and **continually reconciled** — database.*
- This means that the information is truly public, easily traceable & verifiable, and difficult to hack.*



Real Blockchain Examples

Financial services

Challenge

- Inefficient financial system adding costs through fees and delays
- Antiquated paper based process dressed up in digital wrapper



Solution

- Entities that don't know each other can make transactions directly
- Ex: ripple (XRP) for int'l remittance
- **\$20B savings/ year** ... ↓ friction and costs between financial intermediaries

Global trade management

- Bureaucratic paperwork intensive process w/ many intermediaries
- 2x cost for processing, verifying & documenting vs. transport costs



- Digitize & automate paperwork filings for the import and export of goods
- Ex: Maersk / IBM BOL's and LOC's
- Allows end users to securely submit, stamp and approve docs across national / organizational boundaries

Consumer Transparency

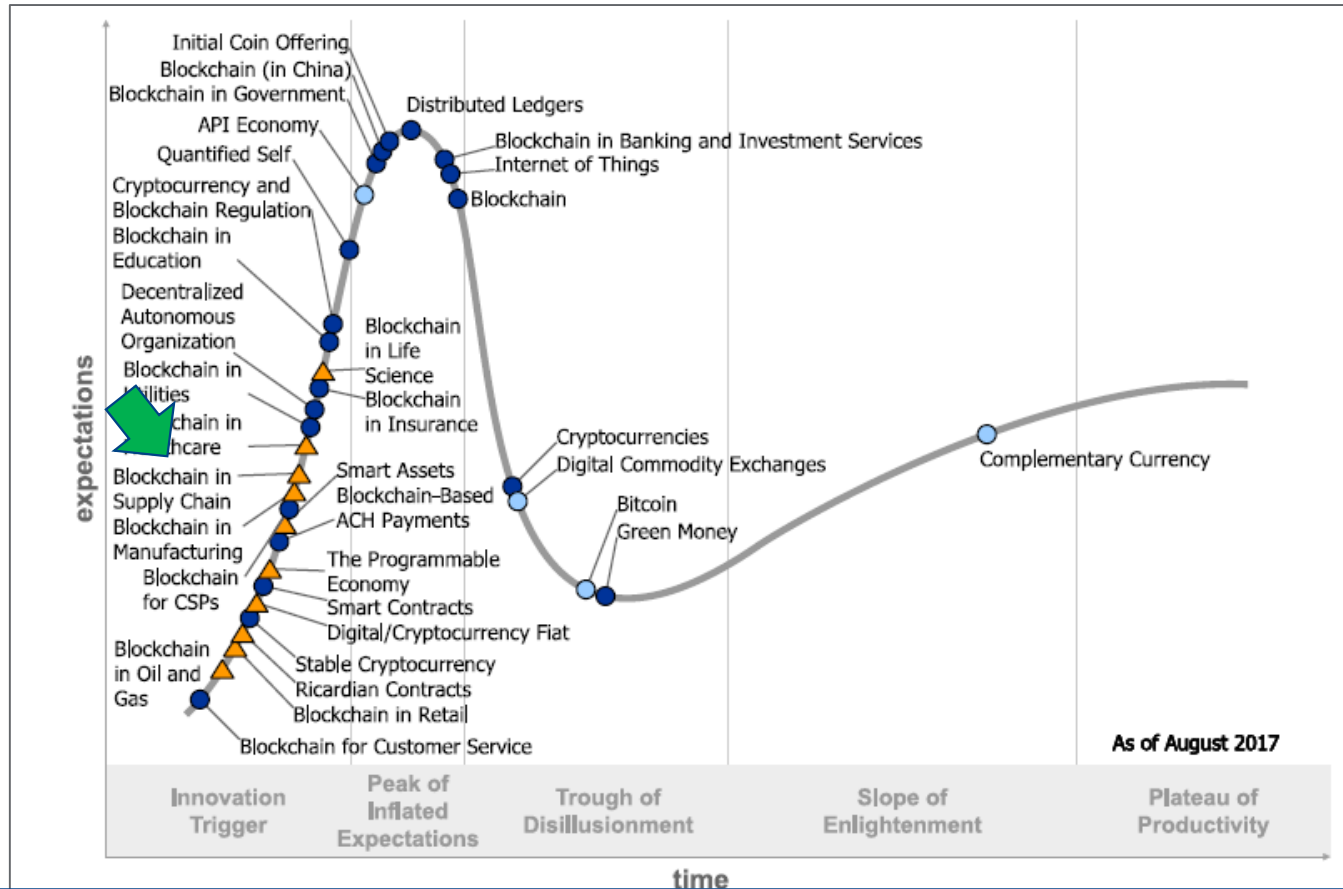
- Source of goods becoming more important to consumers ...
- ... very challenging to verify
- Ex: Conflict-free diamonds; Organic / cage-free foods



- Global, digital ledger that tracks assets across their lifecycle
- Collects ownership, history, and defining characteristics
- 'Digital thumbprint' for authenticity



Supply Chain & Blockchain ... what is the current status?



Gartner's Blockchain "Hype Cycle"

- Phase 1 (through 2021): Irrational exuberance & few high-profile successes
- Phase 2 (2022 through 2026): Larger focused investments & many successful models
- Phase 3 (2027 through 2030): Large-scale global economic value-add

Business partner onboarding challenges will halt 90% of supply chain blockchain initiatives through 2020 – Gartner

Blockchain in Supply Chain ... potential & exciting uses



1. **Freight Tracking**: offers greater visibility into supply chain transactions through shared visibility, interoperability and immutability



2. **Bill of Lading**: paperless BoL using blockchain eliminates potential tampering and instances where cargo lands ahead of the documentation



3. **Freight Settlement**: enables companies to transact, resolve disputes and settle more efficiently than current practice



4. **No-show containers**: use crypto deposit to curtail the \$23B booking shortfall... driven by customers that book a shipping slot but do not turn up with the cargo.

Blockchain in early stages of technology and business use case maturity ... many challenges to adoption at scale

Blockchain in Supply Chain ... our views

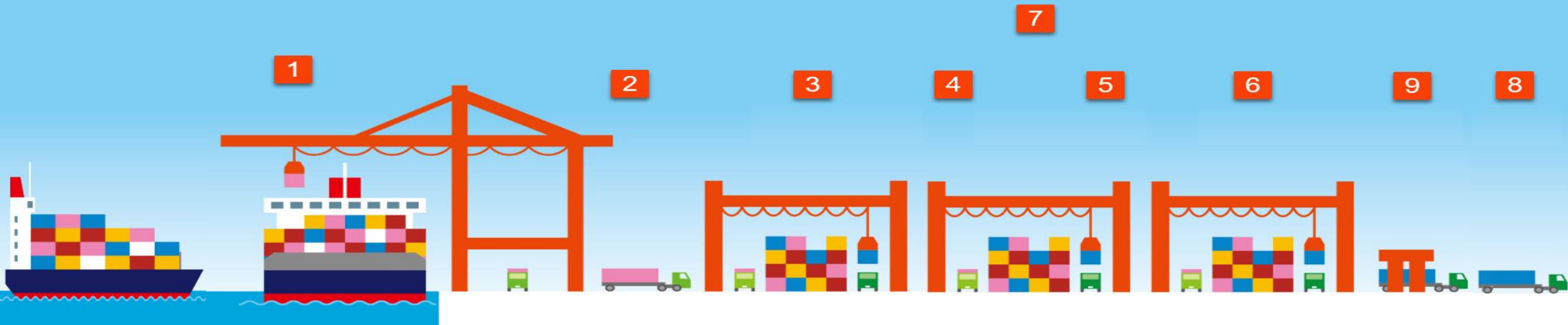
1. Blockchain isn't as powerful or beneficial without **mass adoption and interoperability**
2. There are **many challenges** to mass adoption ...
 - Standardization is needed ... architecture, controls, platform providers.
 - Multiple Supply Chain stakeholders, including governments.
 - Lacking a single “inciting force” ... what is THE problem to solve.
3. We predict that blockchain in supply chain will continue with financial / visibility oriented use-cases through 2021. Blockchain associated with the physical movement of goods will take much longer. **Mass adoption is likely a ways out (years).**
4. Our Blockchain strategy is:
 - **Influence standardization** through consortium participation (BiTA)
 - **Pilot** financial & visibility related use-cases, as they align to our product offerings
 - Remain **flexible on blockchain partners** ... until standards are set and until a true “BaaS provider” emerges, with proven **scaled capabilities**.



AI, Big data and IOT



Today's Port Ecosystem



1 Inbound Container Volumes
Planning in Silos due to lack of collaboration

2 Horizontal Transport Route Optimization
Complex route optimization

3 Yard Inventory and Inspections
Labor intensive exception handling activity

4 Container Handling Equipment
Operations and APM Gap

5 Equipment and Yard Operations
Simple housekeeping and rehandles

6 Yard Bottlenecks
Demand/Supply unpredictability

7 Yard Capacity Management
Capacity tracking is a dynamic and complex

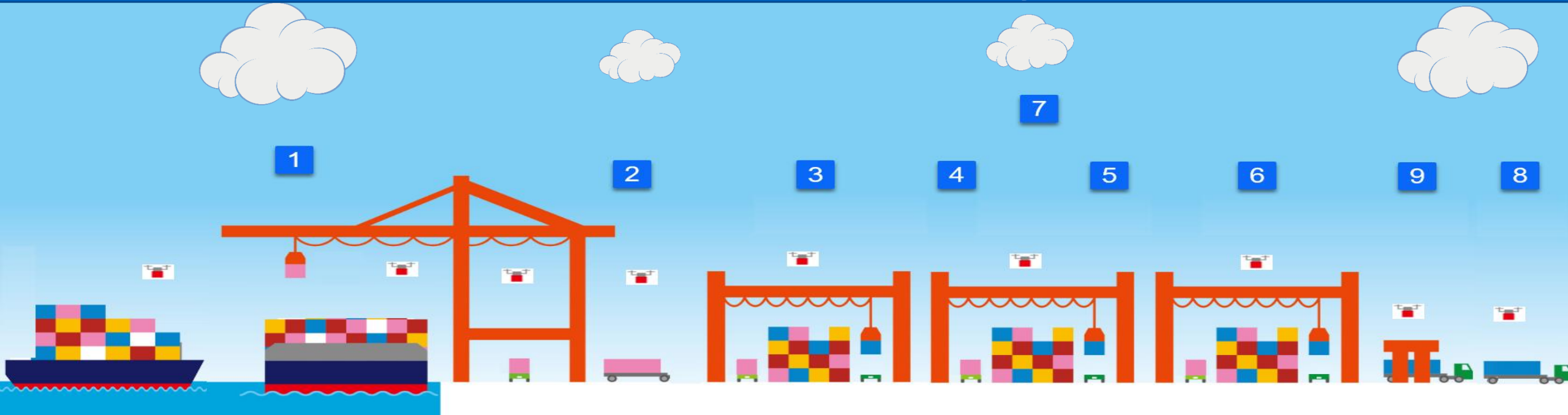
8 Container Delivery
Information gaps and inconsistent lead times

9 Gate Bottlenecks
Lack of pre-advised information and uncertainty



Siloes, On premise technology, Predictability

The Future's Port Ecosystem



Big Data

- 1** Inbound Container Volumes
Shared visibility and planning across ports

Machine Learning

- 2** Horizontal Route Optimization
Pattern recognition, adaptive algorithms

Artificial Intelligence

- 3** Yard Inventory & Inspections
Video recognition, automated yard processes
- 4** Container Handling Equipment
AI cranes with adaptive algorithms
- 5** Equipment & Yard Operations
Human like thinking/automation
- 6** Yard Bottlenecks
Real time simulations, evaluations

Internet of Things

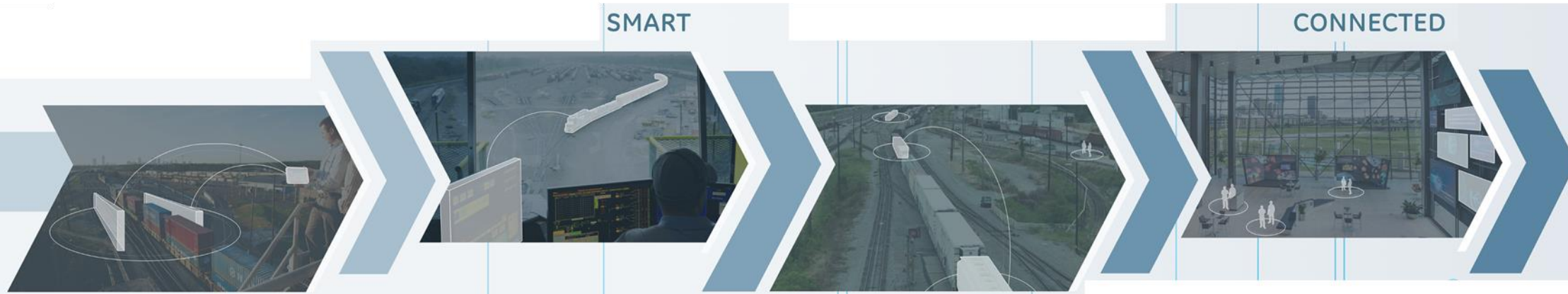
- 7** Capacity Management
IOT devices to track cargo
- 8** Container Delivery
Connectivity across systems & stakeholders
- 9** Gate Bottlenecks
Smart cities connectivity across multiple ecosystems



Interconnected Cloud Systems, Reliable, Autonomous, Data Driven

The Future's Port Ecosystem

Everything is...

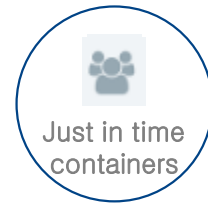
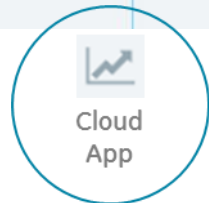
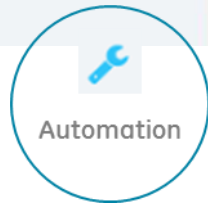
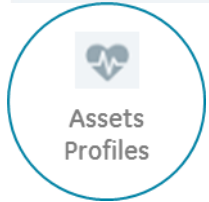
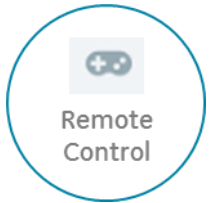


VISIBLE

SMART

AUTONOMOUS

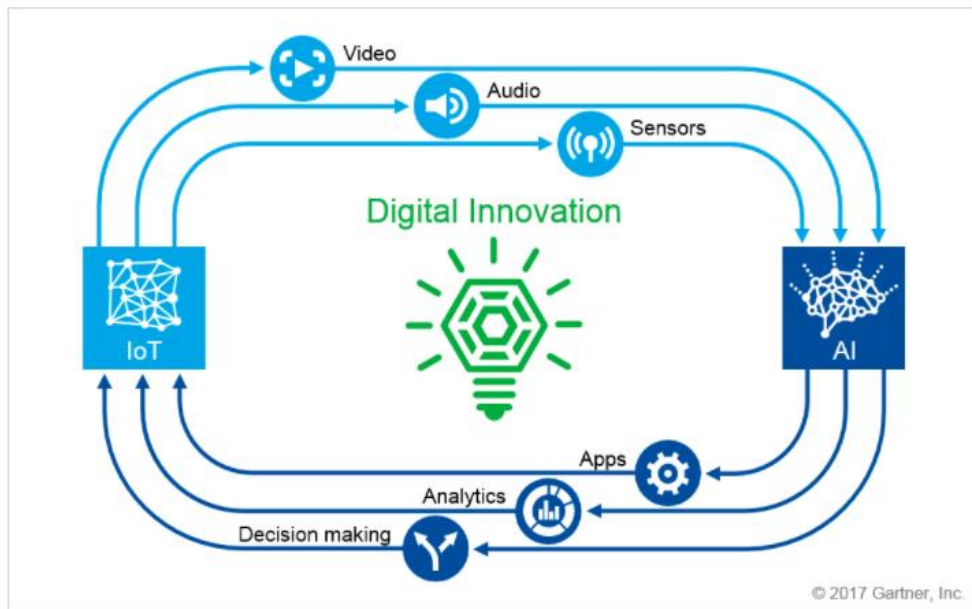
CONNECTED



Closing thoughts



- The Supply Chain's global and stakeholder breadth presents a great opportunity for **digital outcomes** ...
- ... the associated **disaggregation** also presents challenges to **adoption**. Governments / central authorities will need to play a critical role.
- Standardization & collaboration are both key enablers and potential blockers to supply chain digitization.
- Sharing data \neq sharing competitive advantage.
- Cloud is an integral part of big data and automation ... trust in technology.
- Technology without a clear problem to solve is just an interesting science experiment.



Source: Gartner (June 2017)

