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TRACK AND MANAGE **EVERYTHING**

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APR. 3-5, 2012 | WALT DISNEY WORLD SWAN AND DOLPHIN RESORT, ORLANDO, FLA

# Putting It Together: Architecture, Product Selection and IT Governance

Kenneth R. Traub, PhD

Ken Traub Consulting LLC

3 April 2012

# Outline for Today

- 11:30: RFID Visibility Data for Business Applications
  - What's the important data, and how do you use it?
- 12:15: RFID Data Capture Software
  - How do you collect the important data?
- Lunch
- 1:45 (now): Putting It Together: Architecture, Product Selection and IT Governance
  - How do you build a complete system for the enterprise?
- 2:30: RFID Tag-Data Standards
- 3:30: RFID Data-Capture Standards: LLRP and ALE



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# About the Speaker

- Independent Consultant
- Specializing in EPC/RFID Standards adoption
  - Software architecture for enterprises and solution providers
  - Educational programs on standards tailored to clients' needs
- Actively involved in GS1/EPC standards development
  - Member, GS1 Architecture Group
  - Editor, GS1 System Architecture
  - Editor, EPCIS and CBV specifications
  - Co-chair, Filtering & Collection (ALE) Working Group
  - Editor, EPC Tag Data Standard
  - Contributor to four other software specifications
- Consulting Instructor for Academia RFID



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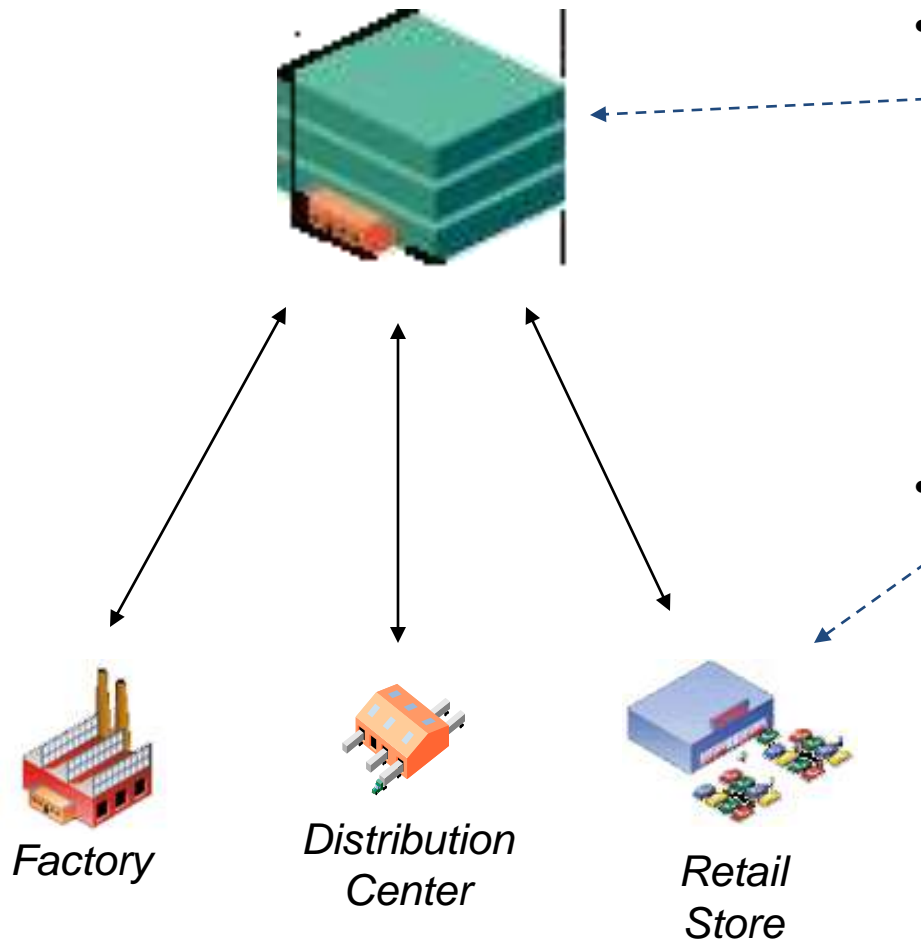
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# Visibility into the Physical World



- Business decisions are made here, in the company headquarters data center

- ...but there's an awful lot of important action **here**, in the real world.

➔ Unique identification and RFID technology can bring awareness of the physical world



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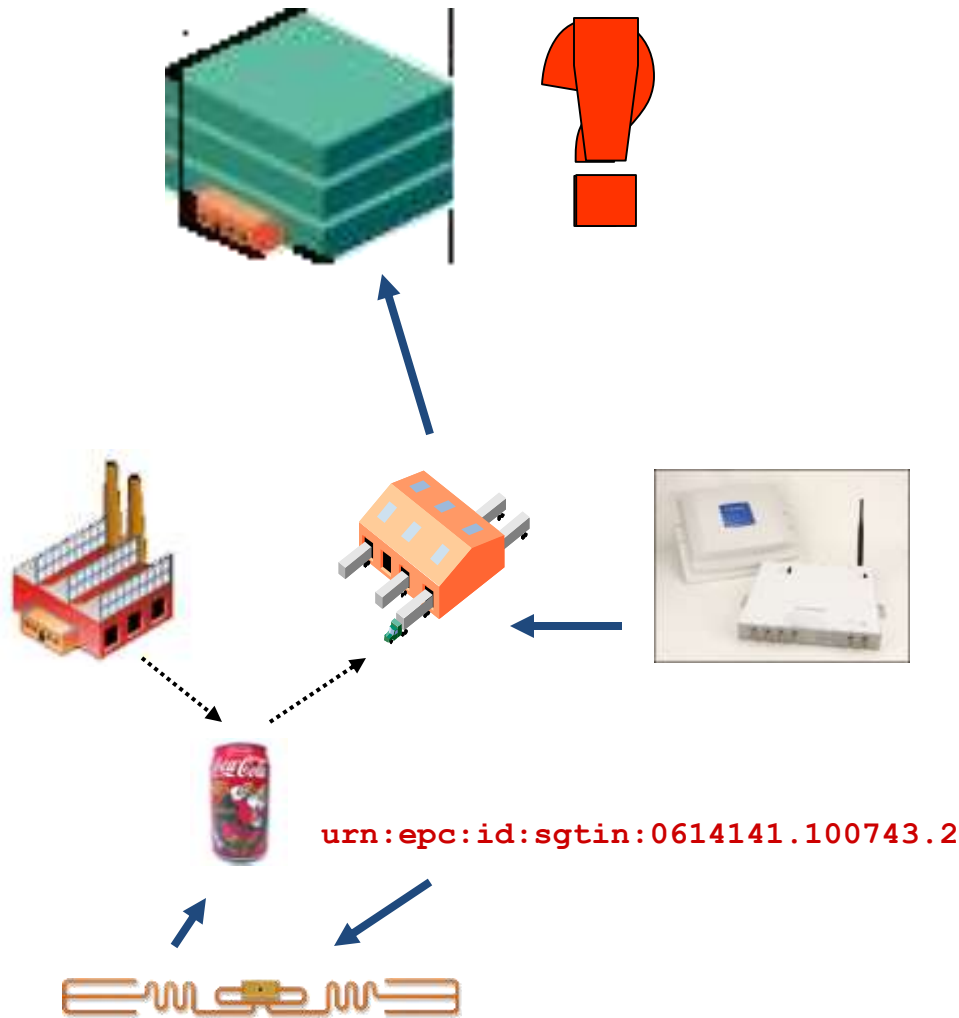
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# What do Unique Identification and RFID do?



- No Unique ID/RFID → No Visibility
- An ID (EPC or other) uniquely identifies the asset
- RFID Tag encodes the ID
- RFID Reader senses presence of asset (no human intervention)
- Information systems now have visibility data
- Business can take action



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# Typical Project Plan

- Get some tags and readers, do some lab experiments
- Decide what bit patterns to put in the tags
- Evaluate middleware, choose based on price and vendor tools claiming to simplify development
- Deploy hardware and software, try to integrate data into business applications
  
- Result: a system capable of doing exactly one thing, at high cost!



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# Why the Typical Path Fails

- Data capture tightly coupled to data use
  - Any change to capture infrastructure requires application rewrite
  - Any change to business applications requires reprogramming of capture logic
- Software architecture driven by product features
  - Vendor lock-in
- Bottoms-up design in limited context
  - Little carries over to next project
  - Every visibility project has high implementation and maintenance cost, long lead time
- Inevitable conclusion: RFID too expensive relative to benefits



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# Challenges

- IT + Physical World
  - Hardware cost in addition to software cost
  - Control plane in addition to data plane
  - IT organization + operations side (plant foremen, store managers, etc)
- Emerging Technology
  - Visibility data is different from other data
  - Technology is rapidly evolving: tags, readers, software
    - Better technology every two years or so
    - Deployment over long term → heterogeneous
  - Ever new business applications that exploit visibility data



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# Principles for Success

- Decouple data capture from data consumption
- Keep deployment options open via consistent data interfaces
- Establish an enterprise architecture



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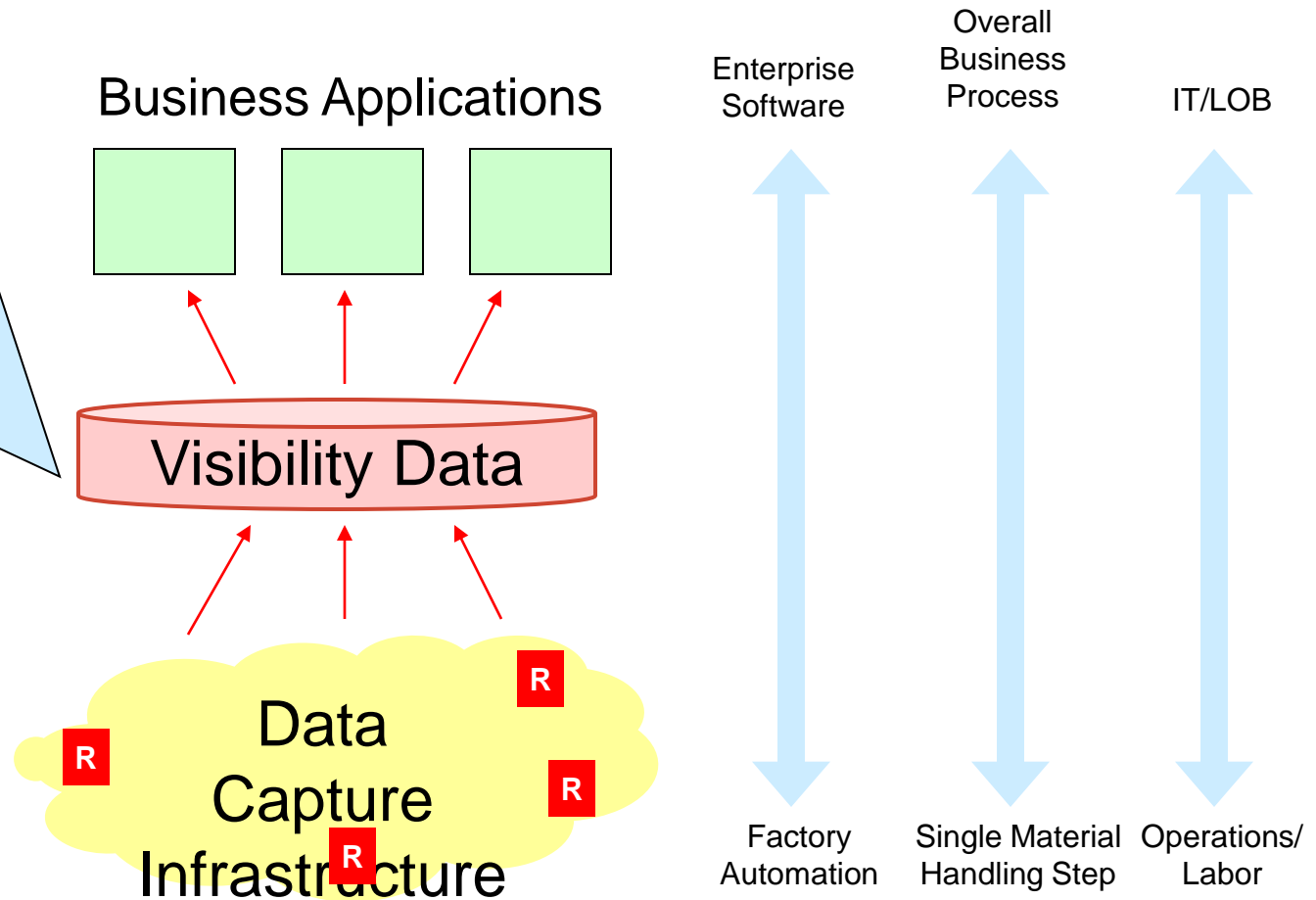
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# Visibility Architecture

Single Most Important Design Decision:  
**This Interface**

Key “hinge”  
between different  
worlds



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# Design Process

- Document the business process flows
- Break each process flow into a series of discrete business steps
- Model the completion of each step as a visibility event
  - Understand what information is needed from a business application's perspective
- Decide what data fields are to be included
  - If using EPCIS standard, start with data fields defined there
  - Choose which optional fields to include
  - Define extension fields if necessary
- Define the vocabularies that populate each field
  - A fixed list of identifiers with standardized meanings for things like business step and disposition – e.g., drawn from EPC Core Business Vocabulary
  - Rules of construction for user-created identifiers like read point and business location – e.g., according to EPC Tag Data Standard
  - Borrow from other verticals where semantics coincide exactly



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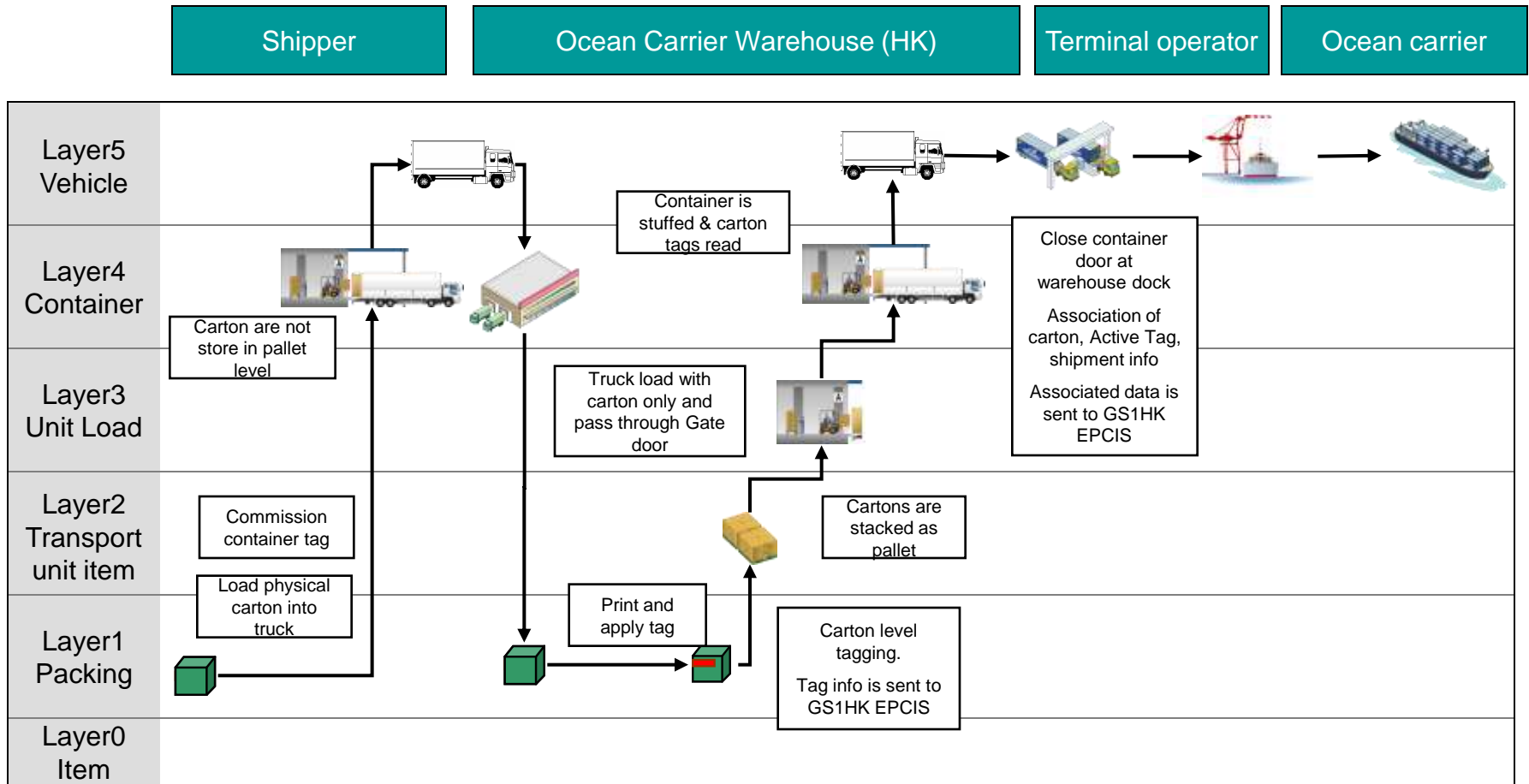
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# Process Flow Example (1 of 3)



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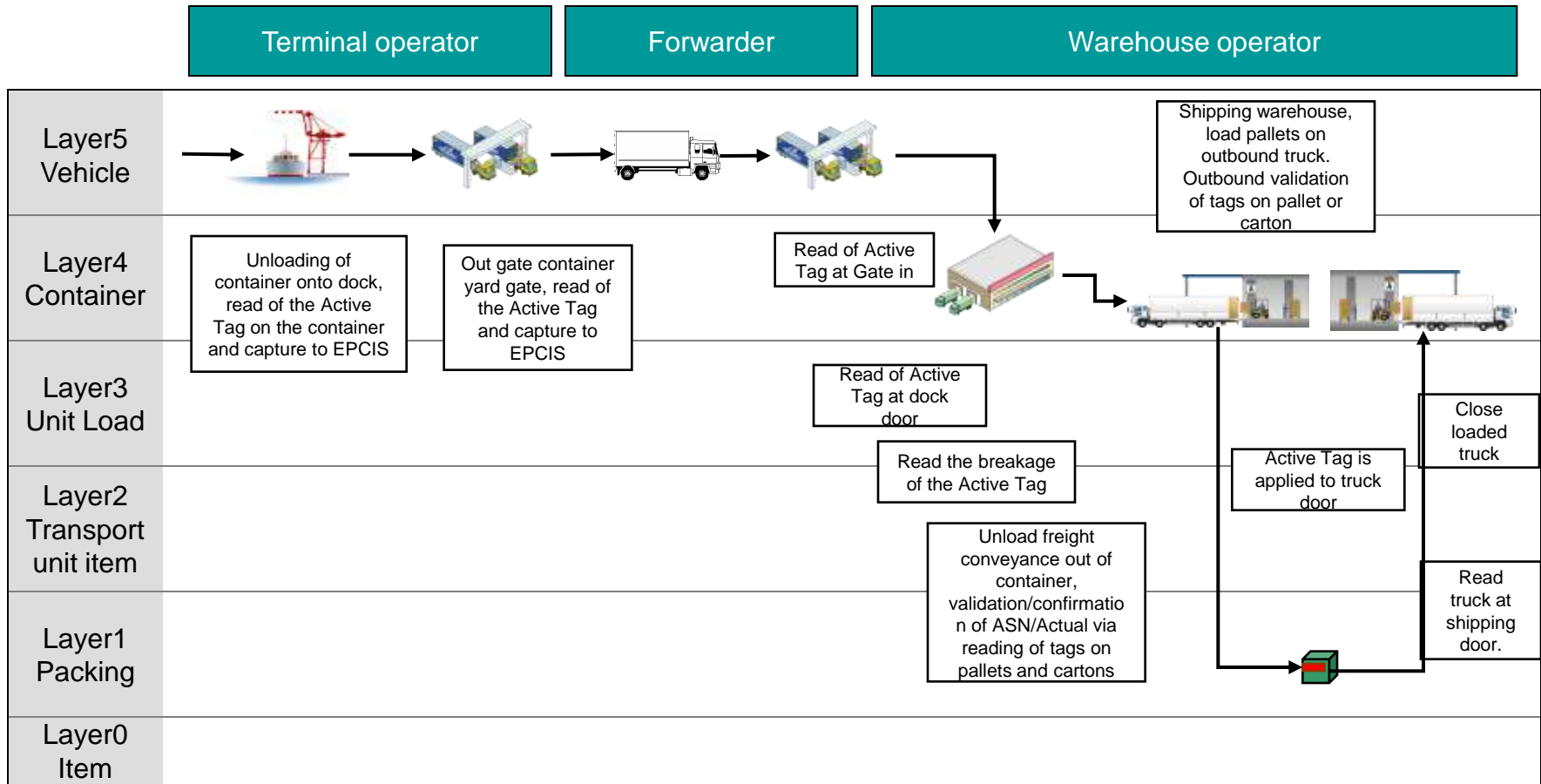
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# Process Flow Example (2 of 3)



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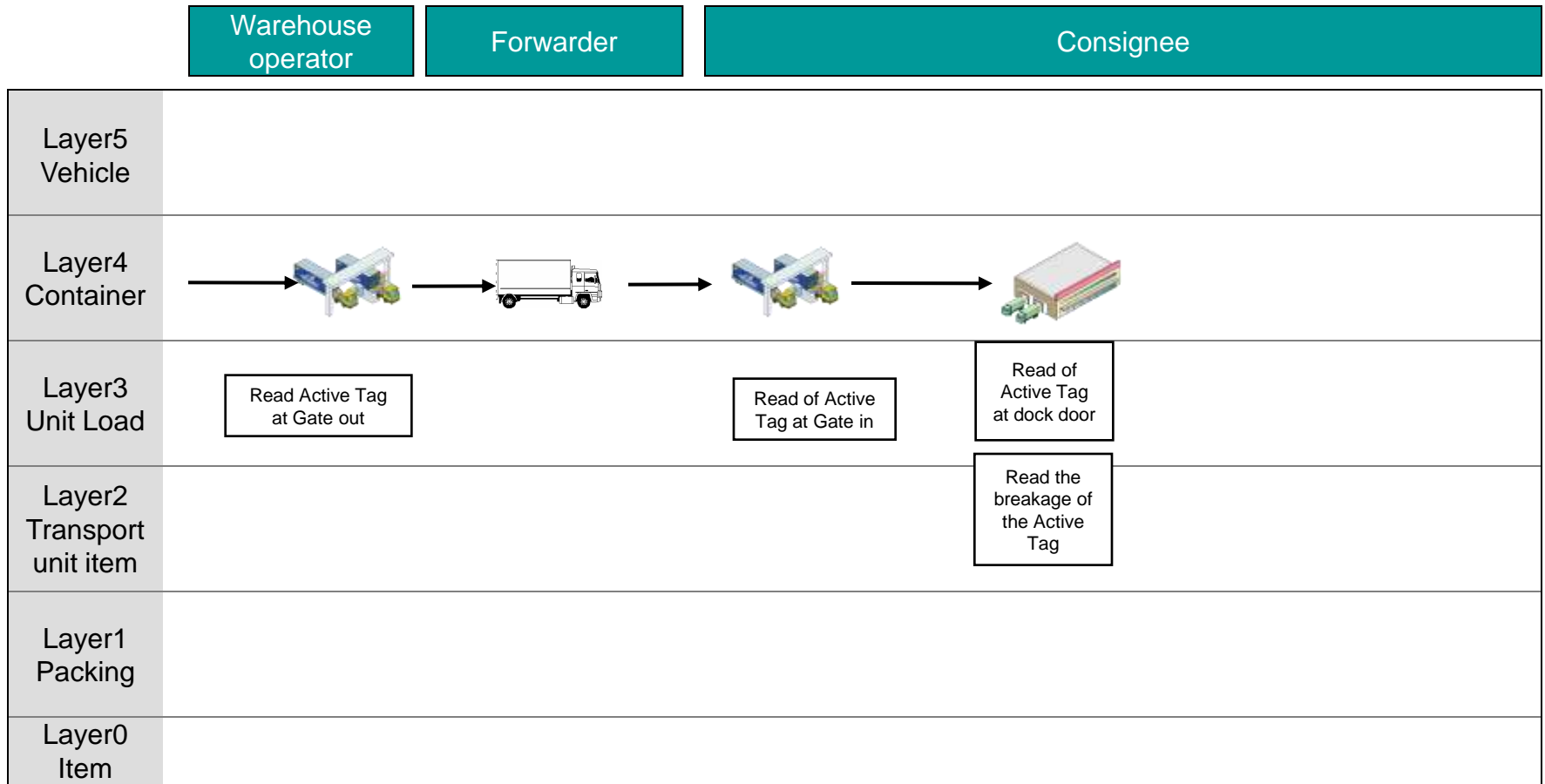
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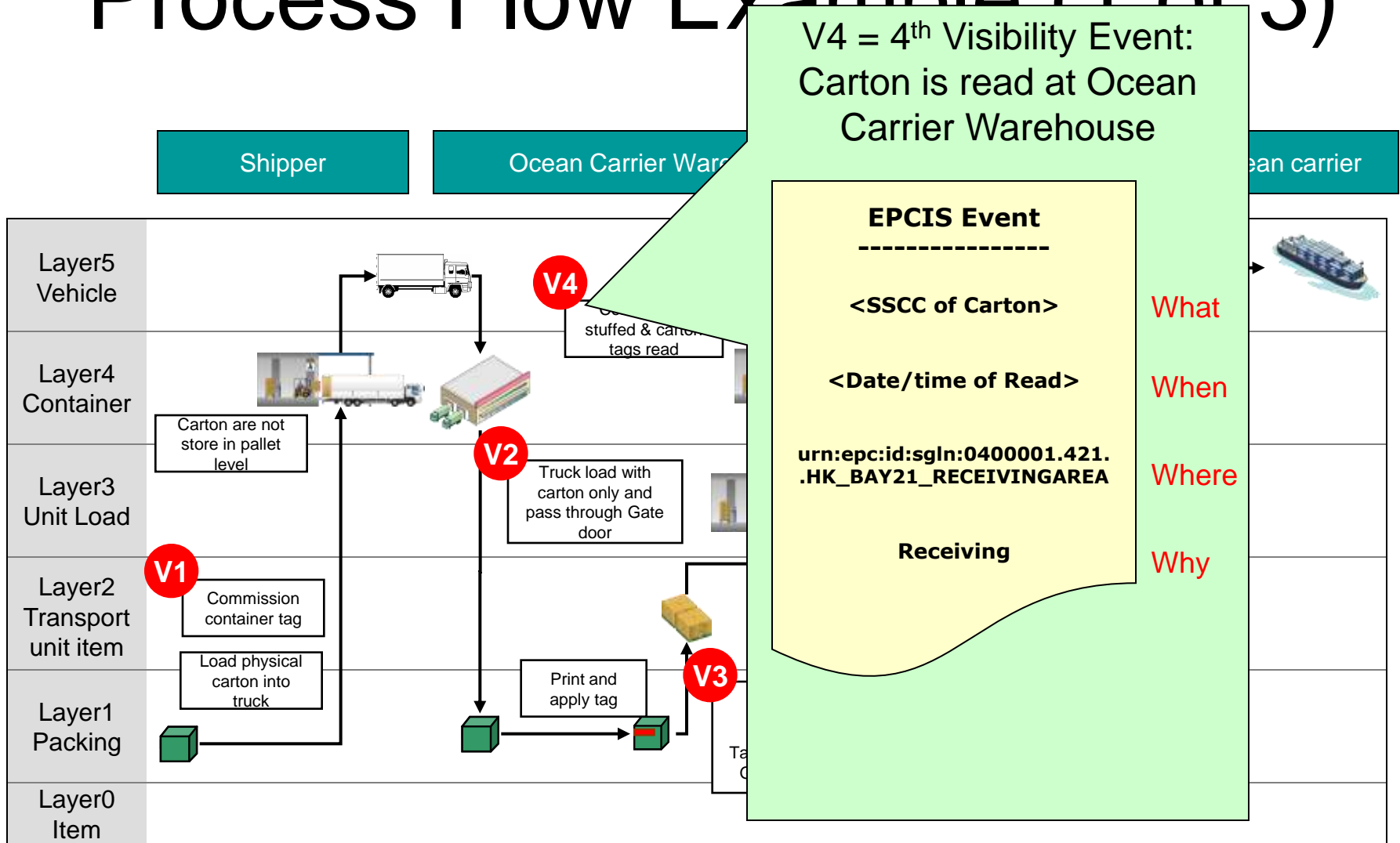
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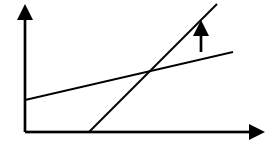
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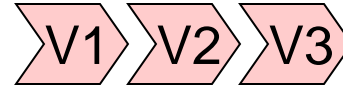
# Design Artifacts – Visibility Data

- Description of business process flow, application goals



- Process flow diagrams

- Visibility event generation spots identified



- Design for data dimensions

- What:

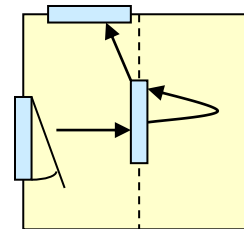
- What assets/products/objects are identified? What data carriers?
- What kind of identifiers for each?
- Allocation rules



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- Where:

- What locations need identification? How granular?
- What kind of location identifiers?
- Allocation rules



- Why:

- How to describe each event from perspective of consuming application?
- What vocabulary elements are used?
- How to identify any related business transactions

**shipping  
receiving**

...

- Visibility data matrix (next slide)



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# Visibility Data Matrix

|                    | Event 1       | Event 2                        | Event 3        | Event 4                        |
|--------------------|---------------|--------------------------------|----------------|--------------------------------|
|                    | Tag cases     | Pack cases<br>→ pallet         | Tag pallet     | Ship pallet                    |
| <b>EventType</b>   | Object        | Aggregation                    | Object         | Aggregation                    |
| <b>Action</b>      | ADD           | ADD                            | ADD            | OBSERVE                        |
| <b>EPCs</b>        | SGTIN of case | SGTIN of cases, pallet<br>SSCC | Pallet SSCC    | SGTIN of cases, pallet<br>SSCC |
| <b>Read Point</b>  | DC 1 tag line | DC 1 pack line                 | DC 1 pack line | DC 1 dock door                 |
| <b>Biz Loc</b>     | DC 1          | DC 1                           | DC 1           | [null]                         |
| <b>Biz Step</b>    | Commission    | Packing                        | Commission     | Shipping                       |
| <b>Biz Xaction</b> |               |                                |                | PO #                           |

What

Where

Why



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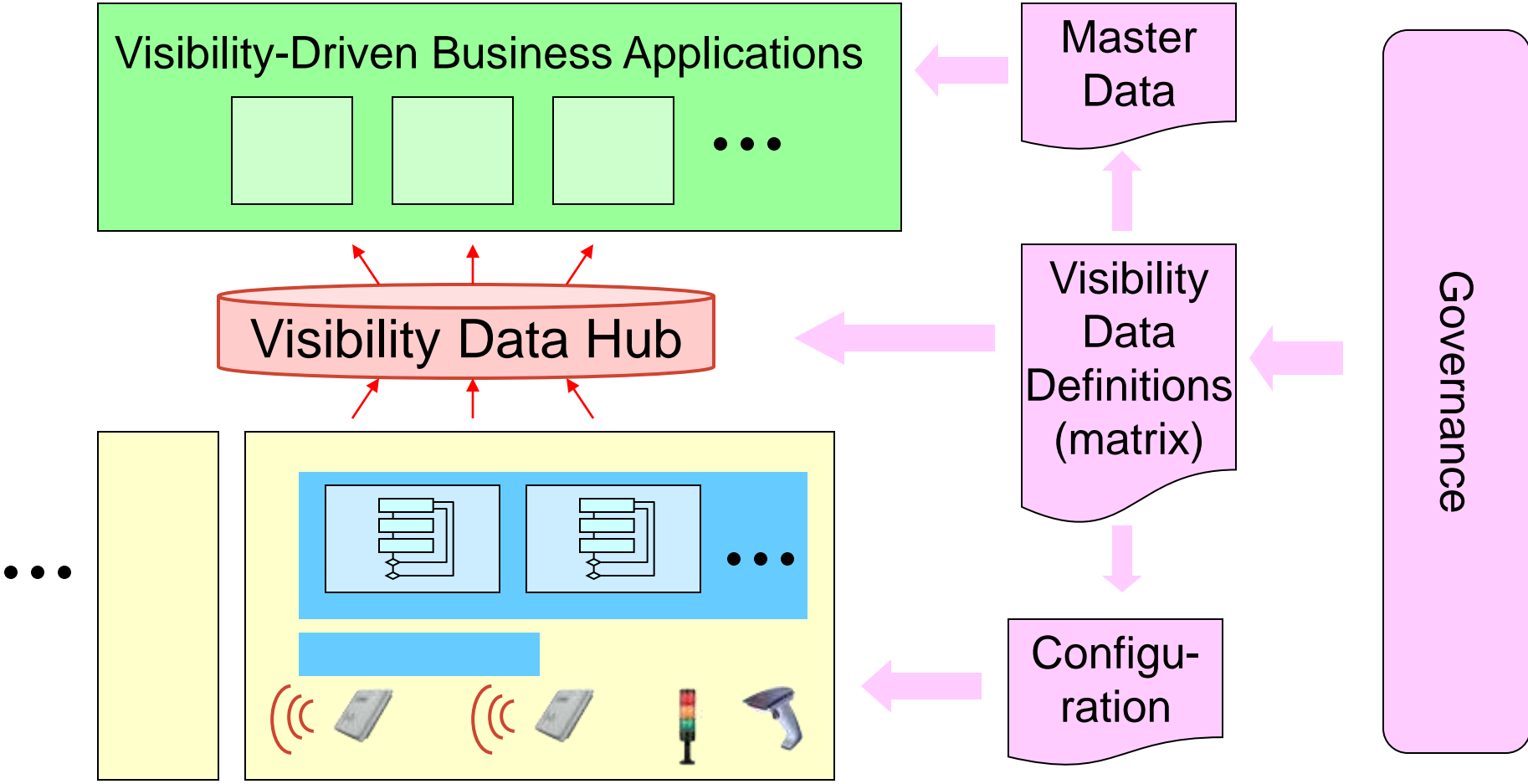
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# Focus on Data Interfaces – Maximum Flexibility



Visibility Data Capture (1 or more sites)

# Principles for Success

- Decouple data capture from data consumption
- Keep deployment options open via consistent data interfaces
- Establish an enterprise architecture



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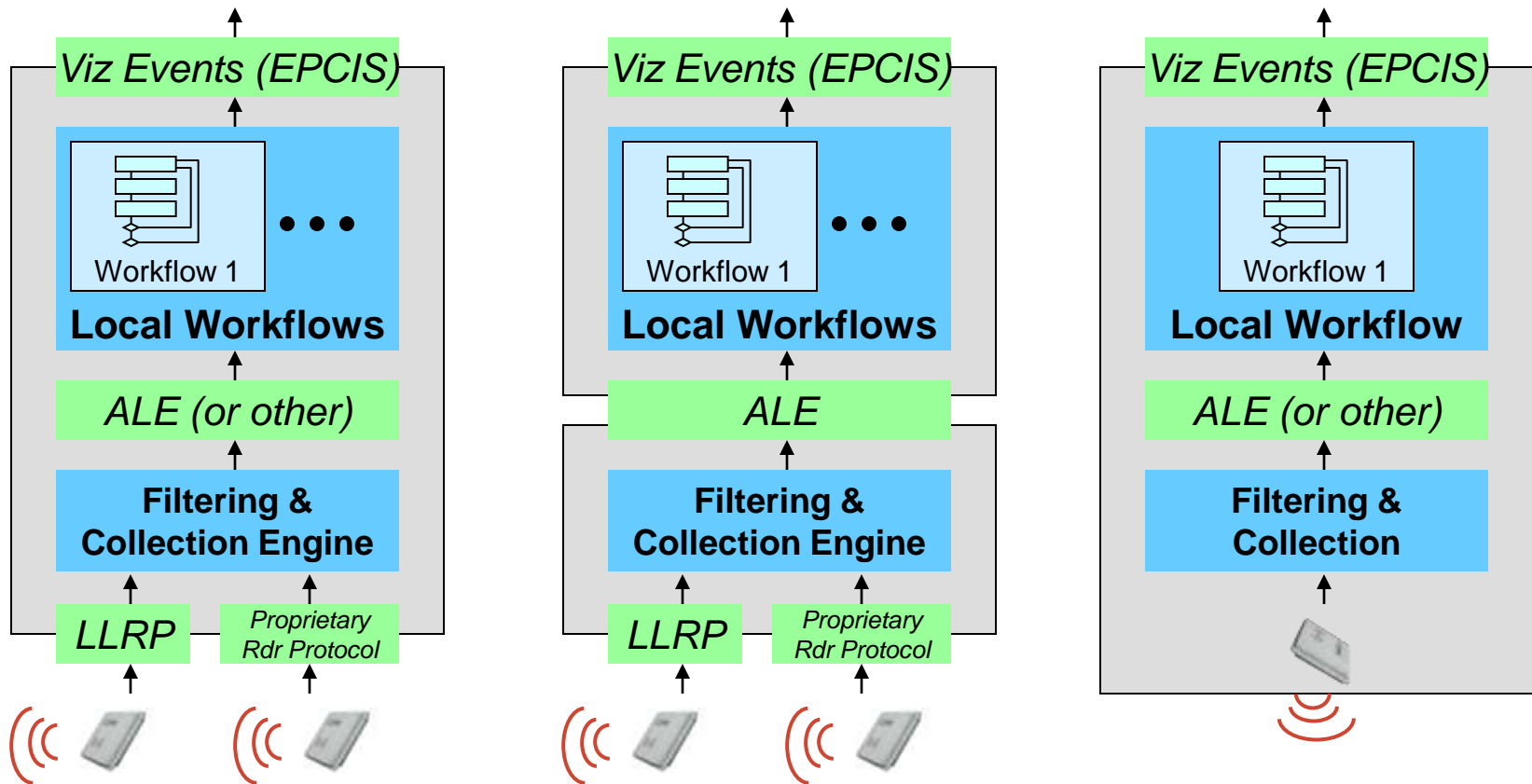
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# Deployment Options – Data Capture



1. *Middleware Software (on PC)*  
 2. *Middleware “Appliance”*

3. *“Unbundled” Middleware*  
 4. *Reader Array (e.g., Mojix®)*

5. *“Smart” Reader*



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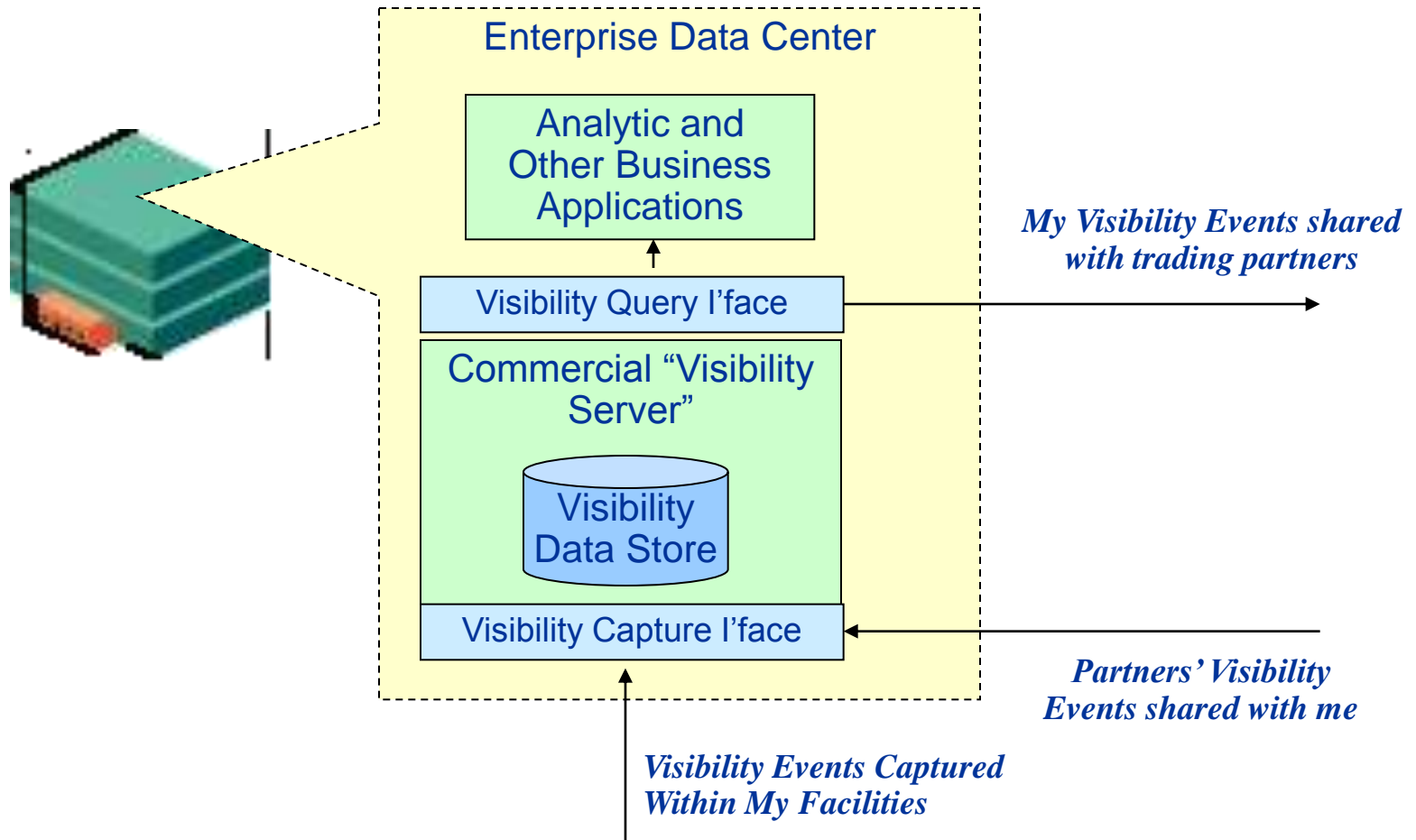
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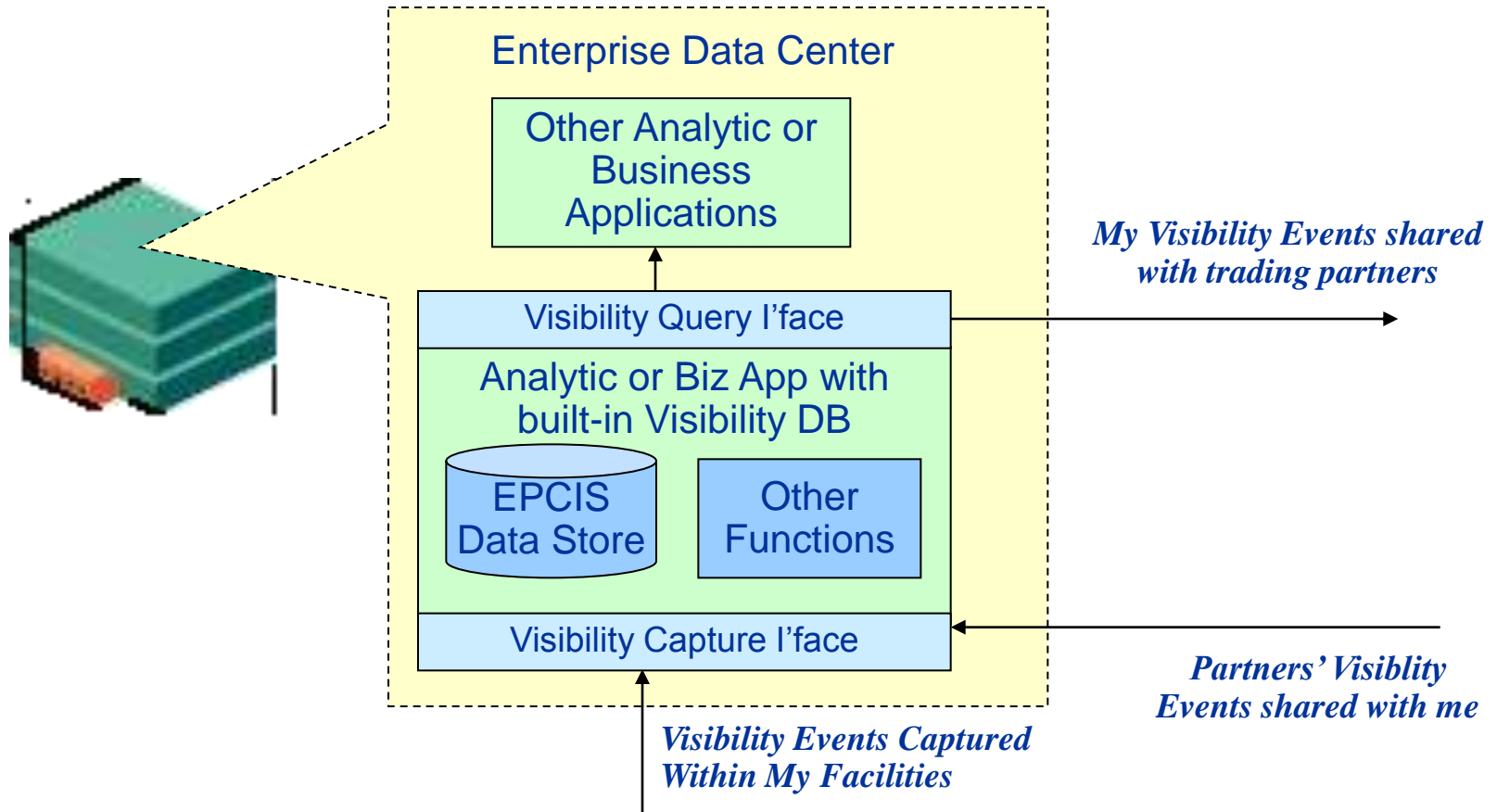
# Deployment Options – Enterprise Side



- Option 1: Dedicated “Visibility Data Server”



# Deployment Options – Enterprise Side



- Option 2: Visibility data hub is part of another product; e.g., an ERP system



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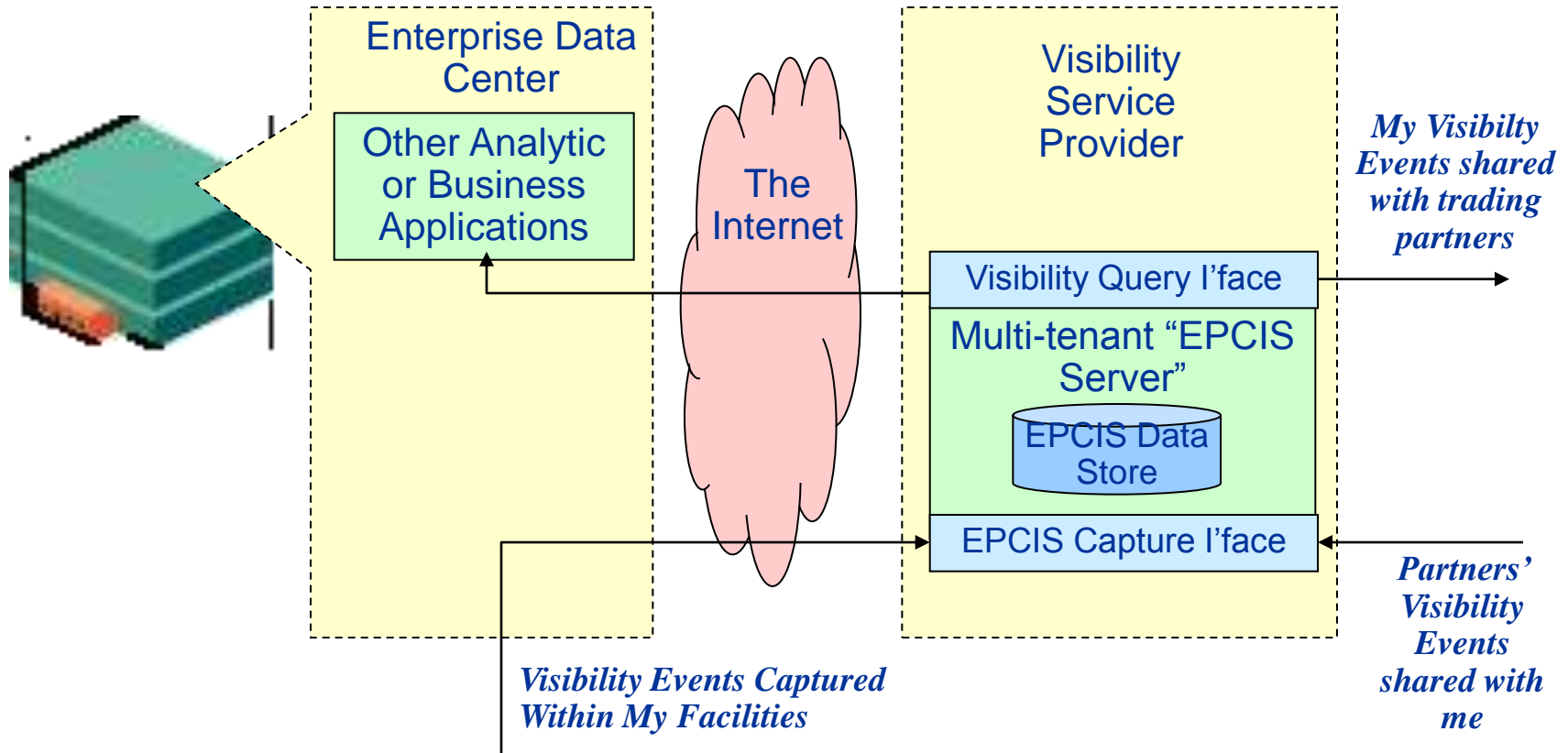
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# Deployment Options – Enterprise Side



- Option 3: Outsourced / Managed Service



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# Keeping Deployment Options Open

- Standardize the data across the enterprise
  - Build upon industry standards; e.g. EPCIS
- Establish data architecture and key software interfaces independent of vendor offerings
- Drive data definitions centrally
- Choose products wisely, but plan for change
  - Best in class at time of deployment
  - Constantly improving technology → heterogeneity over time
  - Fundamental architecture stays invariant



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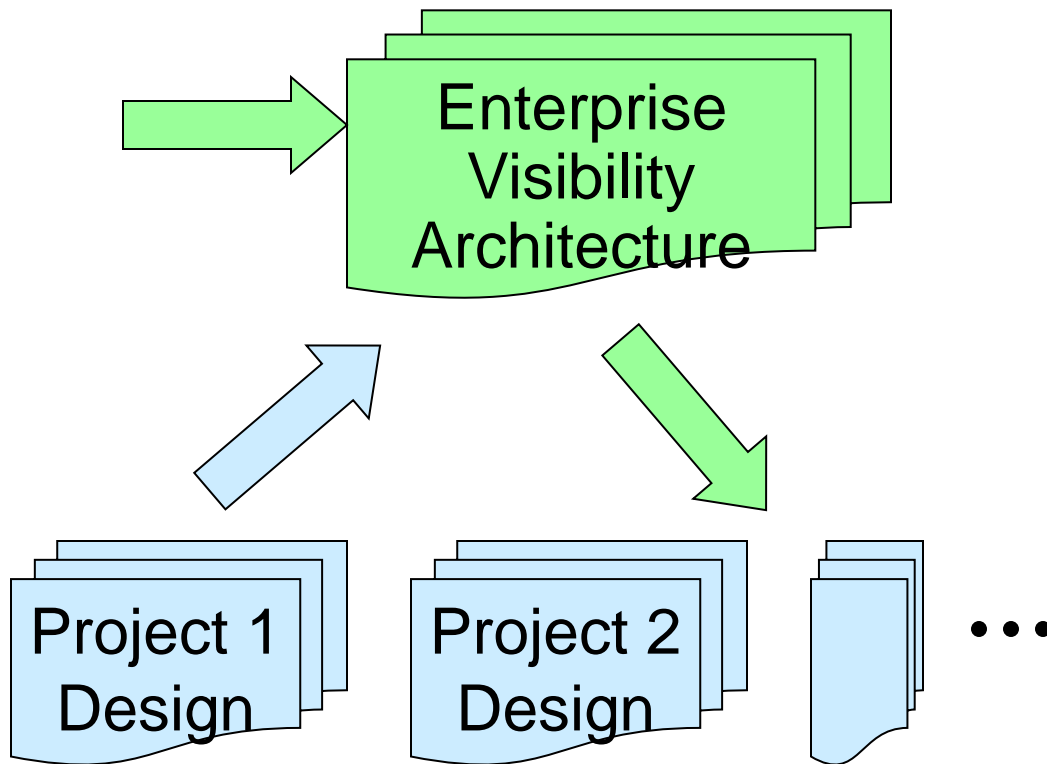
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# Role of Enterprise Architecture



- No enterprise architecture → each project is an island
- Each project informs enterprise architecture
- Enterprise architecture drives consistency across future projects, saves time
- Capacity to effect enterprise-wide change



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# Enterprise Architecture Ingredients

|                        | Project Plan  | Enterprise Architecture   |
|------------------------|---|---|
| Biz Process            | Use cases, flow diagrams, etc                       | Templates for biz process analysis  |
| Visibility Data Design | Visibility data matrix                              | Design rules, catalog of recurring process steps  |
| Identifier selection   | Specific choices: GTIN, GLN, etc                    | Allocation rules, process to request new identifier   |
| External data exchange | Specific partner data design, comm endpoints        | Organizational practice: security, validation, testing  |
| Internal data capture  | Specific process step workflows, deployment choices | Deployment blueprints for recurring capture scenarios, organizational practice for mgmt of infrastructure |



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# Summary

- Recipe for failure: build project bottoms-up from tags and readers
  - Does one thing only, at high cost; can't evolve
  - Unfortunate conclusion: RFID not worth it
- Principles for success:
  - Decouple data capture from data consumption
  - Keep deployment options open via consistent data interfaces
  - Establish an enterprise architecture
- Result:
  - Avoid vendor lock-in
  - Data reusable for new business applications
  - Flexibility to adopt ever-improving technology
  - Costs decline, results improve as learning curve is ascended



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