

# 3D RFID

---

Artem Tkachenko  
Wirama



# Table of Contents

---

- Introduction to Wirama**
- Our goal
- Areas of interest
  - Asset tracking in large yards
  - Dock doors
  - Retail
- Current status and lessons learned
- Questions?

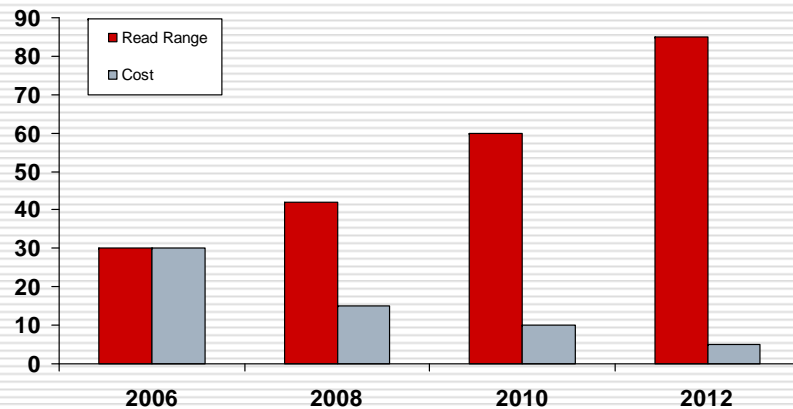
# Introduction

---

- ❑ Incorporated January 2006
- ❑ Team with entrepreneurial experience, engineering savvy, and intellectual horsepower
- ❑ Founders include UC Berkeley and UC Santa Barbara professors – highly cited experts in wireless communication and signal processing
- ❑ Received Series A funding in 2007
- ❑ 5 full/pending patents
- ❑ 4 full-time employees
- ❑ Office in Palo Alto, CA

# Introduction

---



- ❑ Cross reads become more problematic over time
- ❑ Reverse link becomes more challenging
- ❑ Semi-passive tags increase these problems

# Table of Contents

---

- Introduction to Wirama
- Our goal**
- Areas of interest
  - Asset tracking in large yards
  - Dock doors
  - Retail
- Current status and lessons learned
- Questions?

# Our Goal – Technology

---

- Transmitter beam forming
  - Increase reliability
- Receiver beam forming
  - Reduce cross reads, increase SNR, cancel interference
- **X,Y,Z locationing for all types of tags**
  - **Gives tag location and directionality, identify zones**
- Multipath/reflection cancellation
  - Improve location in harsh environments.
- Software Defined RFID Reader
  - Easily program Reader for any passive/semi-passive/active tag standard

# Our Goal – Sample use cases

---

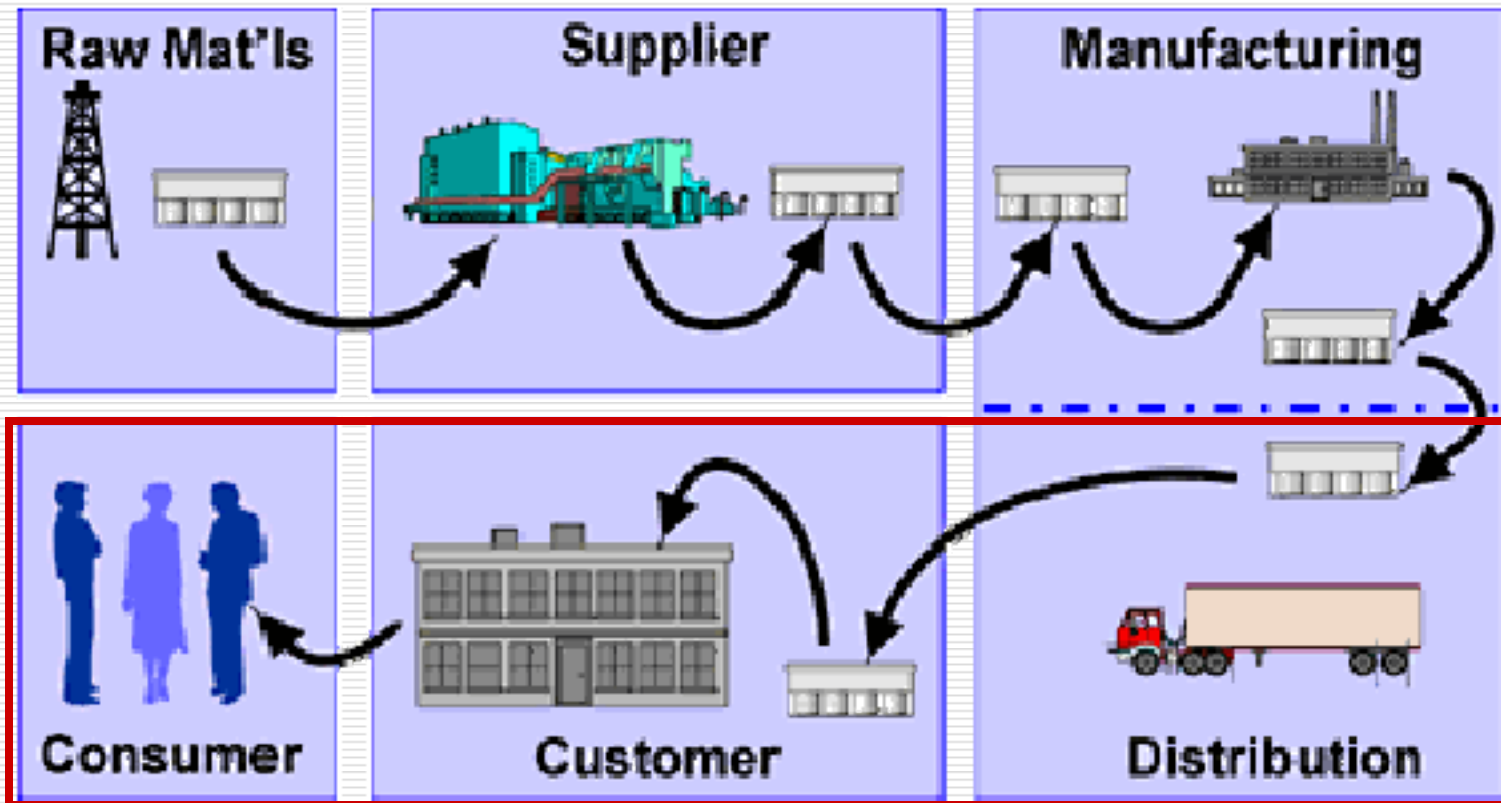
- Improve existing infrastructures
  - Accurate inventory cycle count
  - High volume dock door processing
  - Direction of arrival
- Enable new ones
  - Locate misplaced items and items of interest
  - Passive and semi-passive RTLS
  - Large yard asset tracing

# Table of Contents

---

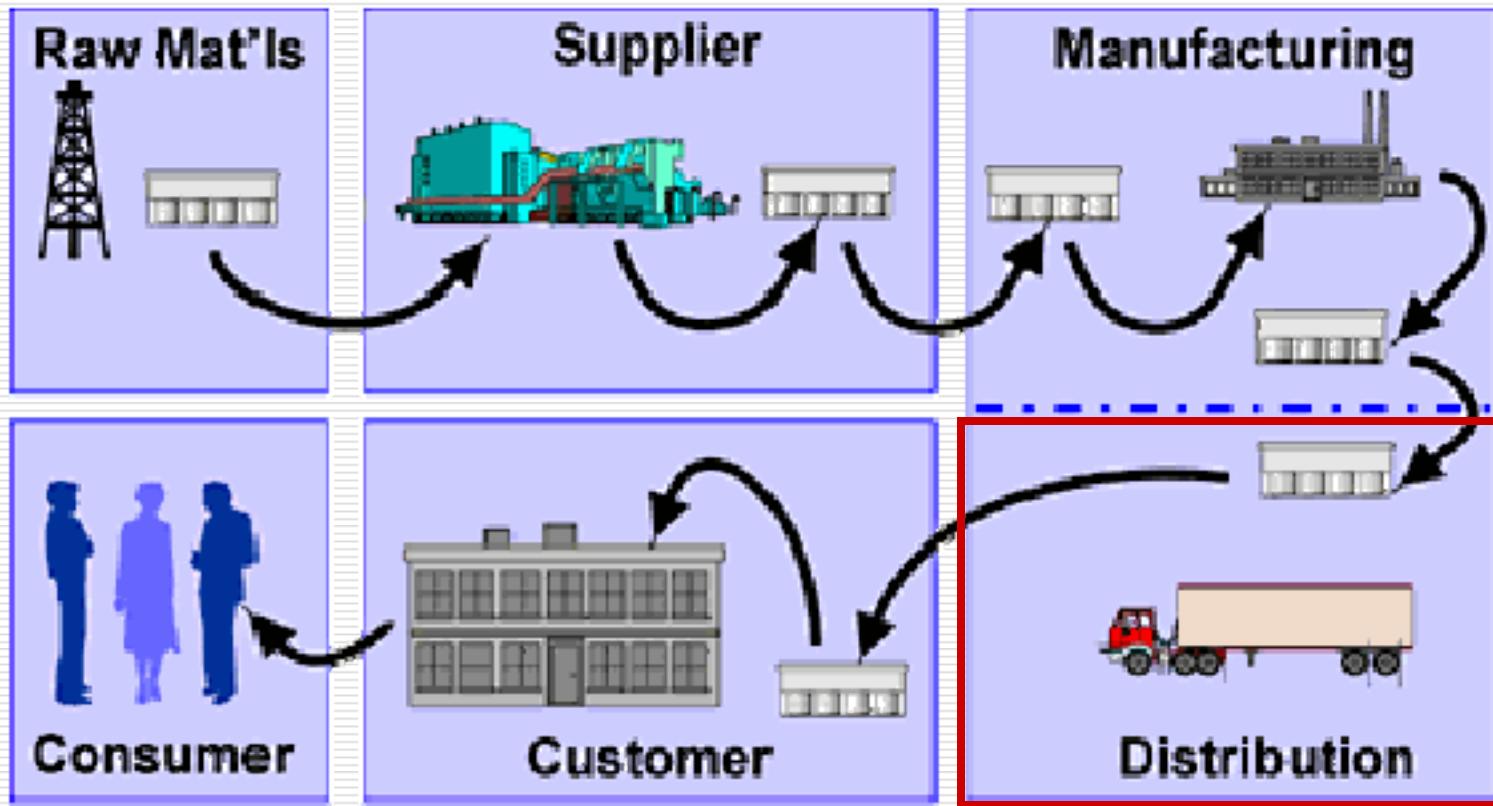
- Introduction to Wirama
- Our goal
- Areas of interest**
  - Asset tracking in large yards
  - Dock doors
  - Retail
- Current status and lessons learned
- Questions?

# Supply chain



***So many steps...so many inventories...so much time!***

# Asset tracking in large yards



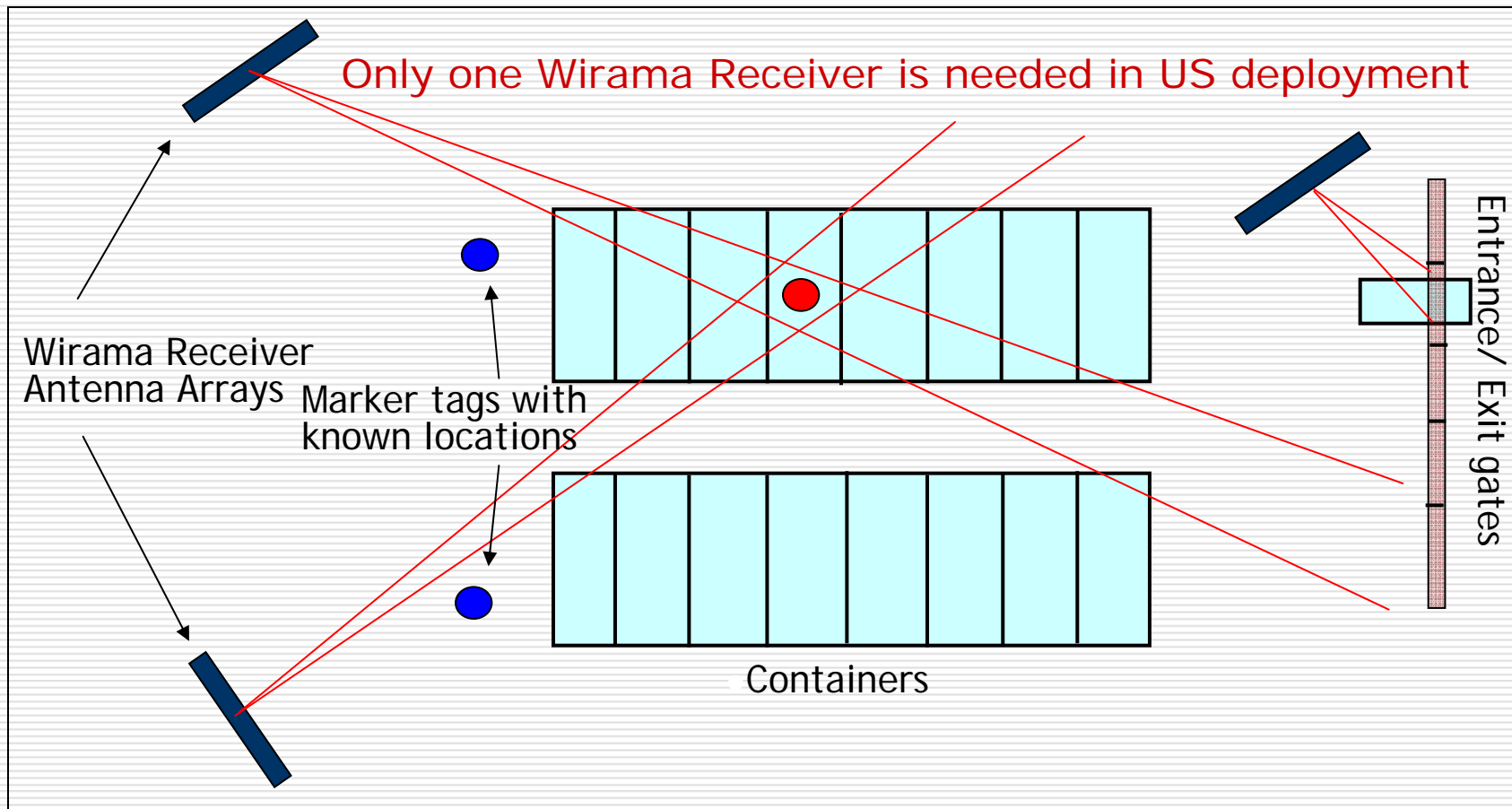
# Issues

---



- K-C: Up to 3 hours to find container of interest
- Lost time in yard check
- Inefficient yard utilization and use of equipment
- Shrinkage through spoilage and theft

# Asset tracking in large yards



7/8/2008

3D RFID

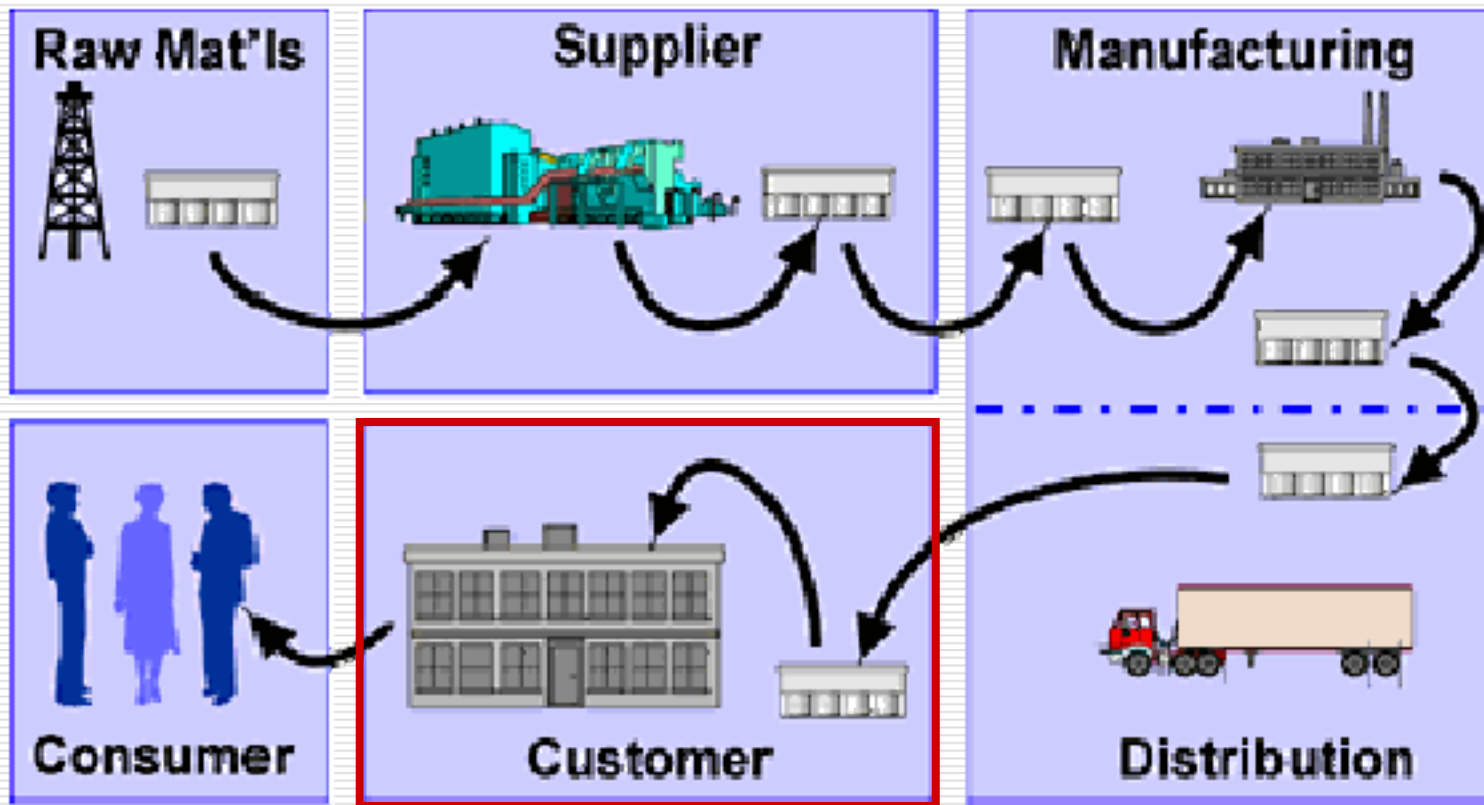


# Alternative solutions examples

---

- Ekahau RSS based active
  - Triangulated received signal strength
  - 3-4 antennas to locate a tag
  - \$40 per tag
- Aeroscout TDOA based active
  - Triangulated time difference of arrival
  - 3-4 antennas to locate a tag
  - \$40 per tag
- Pinc passive/GPS solution
  - Mobile interrogation unit
  - \$3 per tag
- Intellex semi-passive/GPS solution
  - Mobile interrogation unit
  - \$5 per tag

# Dock doors



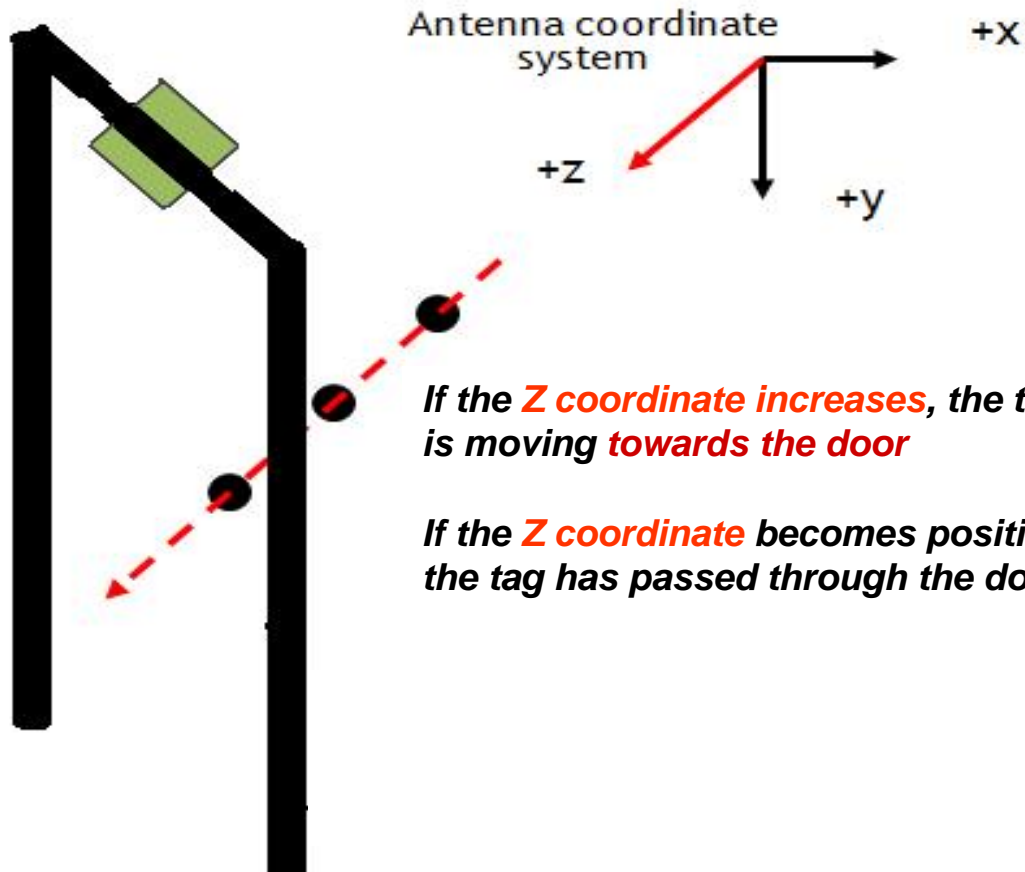
# Dock doors issues

---

- Current problem with the setup
  - Which dock door did the that tagged asset come through?
  - Was it coming in or out?
  - Was it even coming through the door?
- Problem with tags
  - They are becoming too good

# Dock door directionality

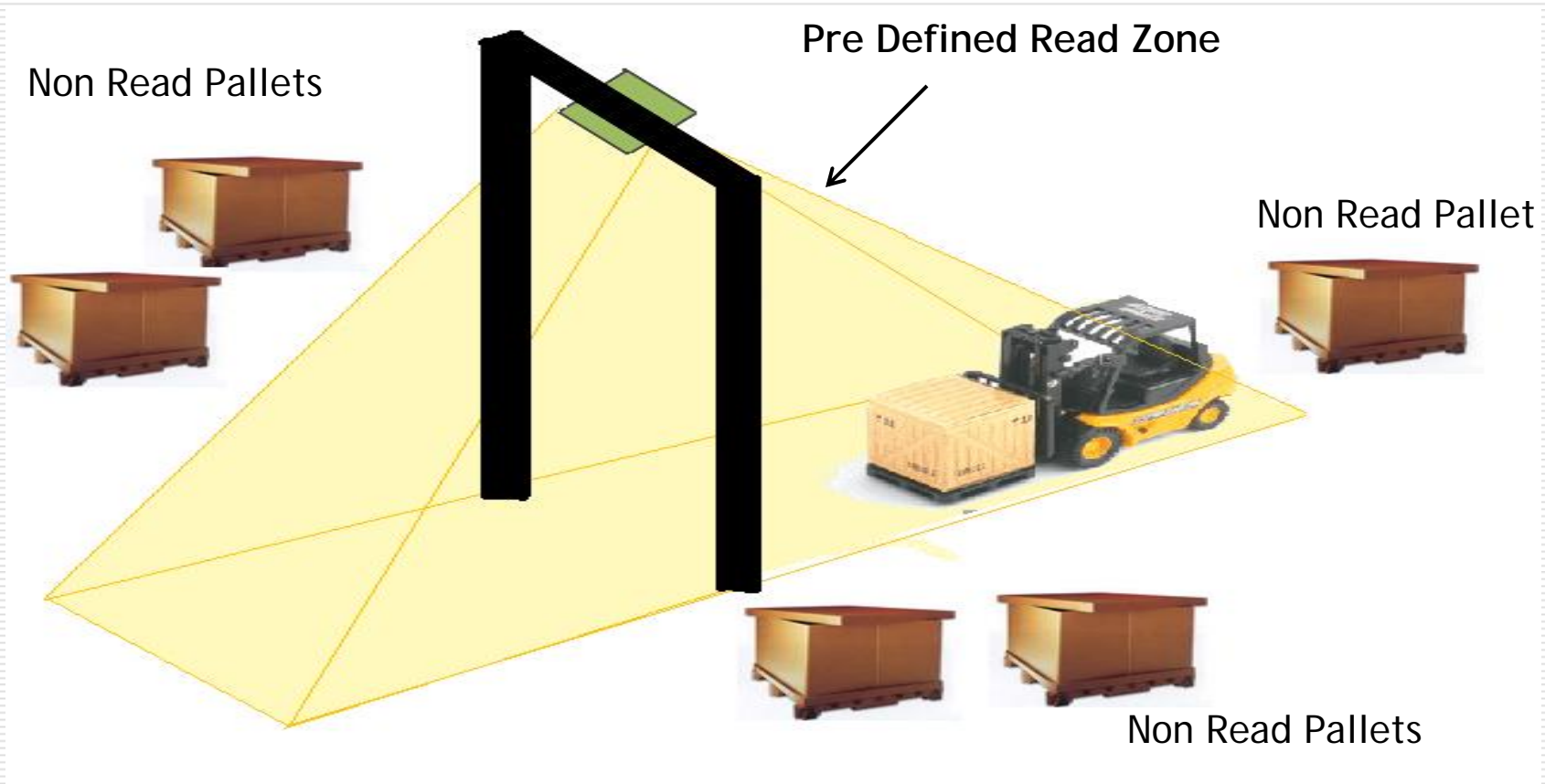
Wirama  
Locating Reader



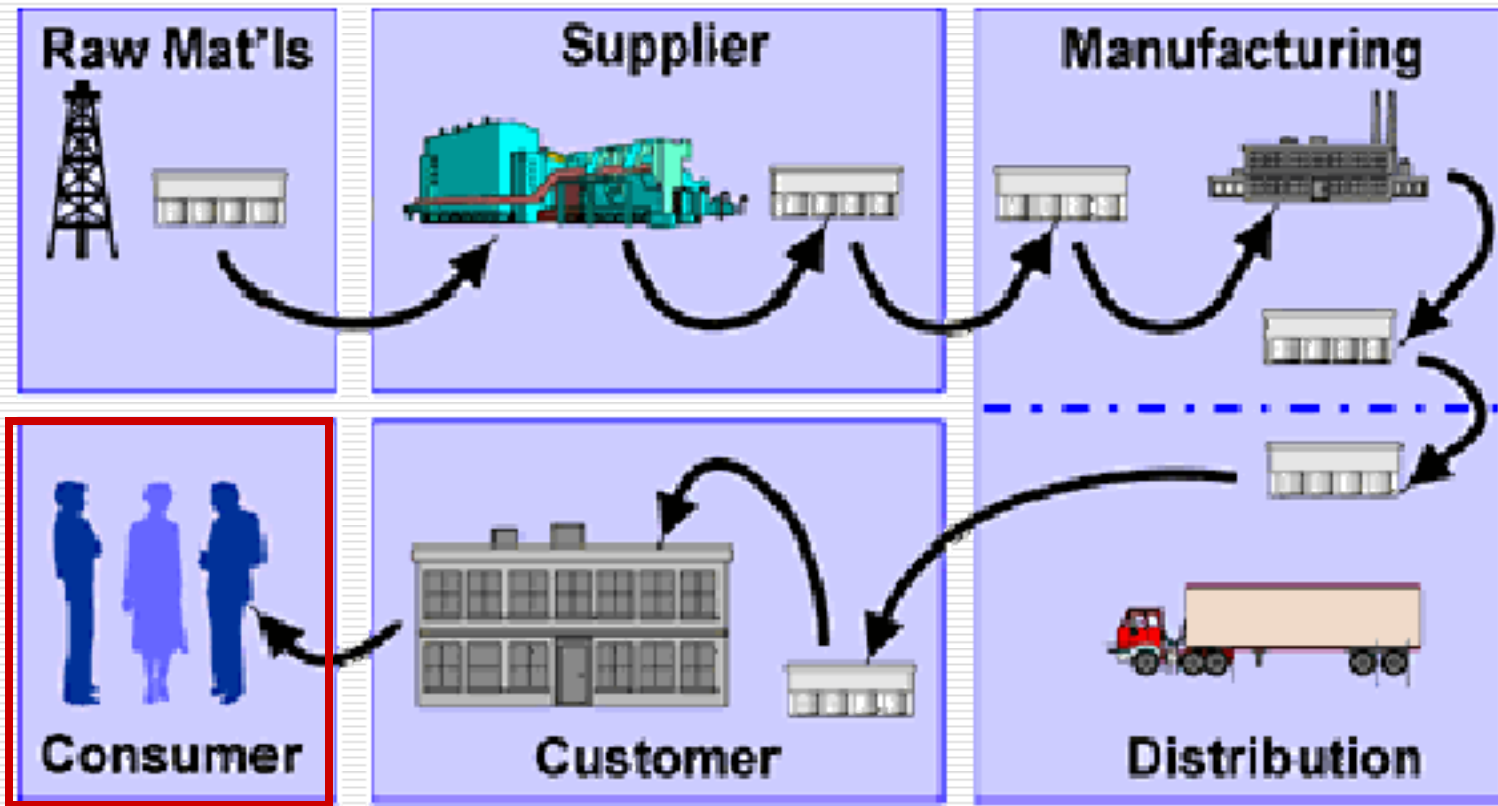
*If the **Z coordinate** increases, the tag is moving **towards the door***

*If the **Z coordinate** becomes positive, the tag has passed through the door*

# Eliminate dock door cross reads



# Retail



# Issues

---

- ❑ 50% of retail store labor time used searching for items
- ❑ 20% of customers claim they cannot find a desired in stock item
- ❑ 25%+ profit dollars lost to shrinkage
  - Customer theft
  - Employer theft
  - Administrative errors
- ❑ Inefficient restocking process

# Location enabled inventory

**Ceiling-Mounted Reader**

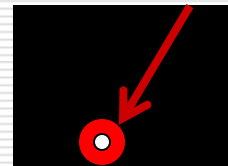
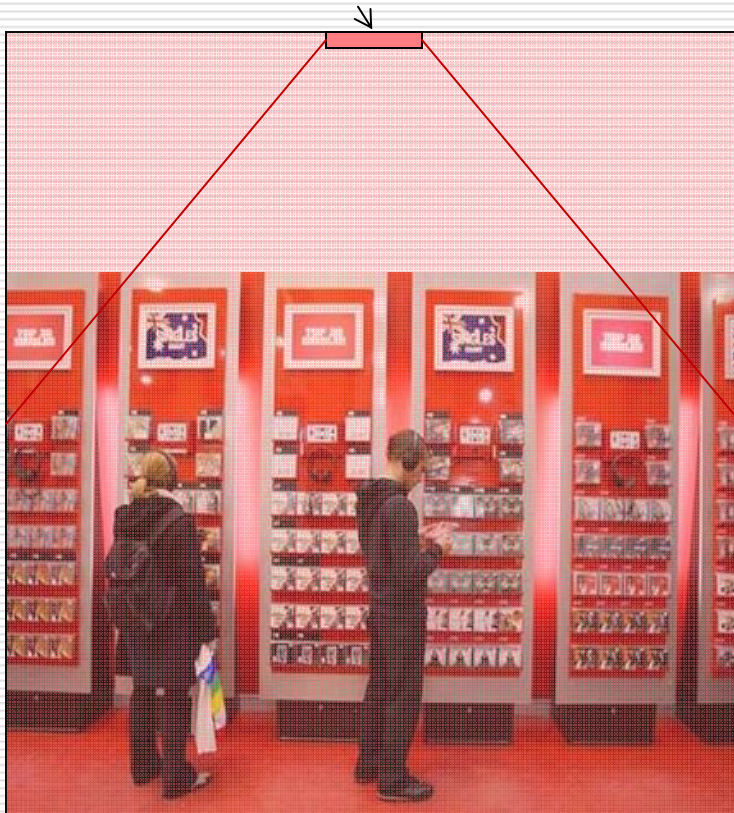


**Cart-Mounted Reader**

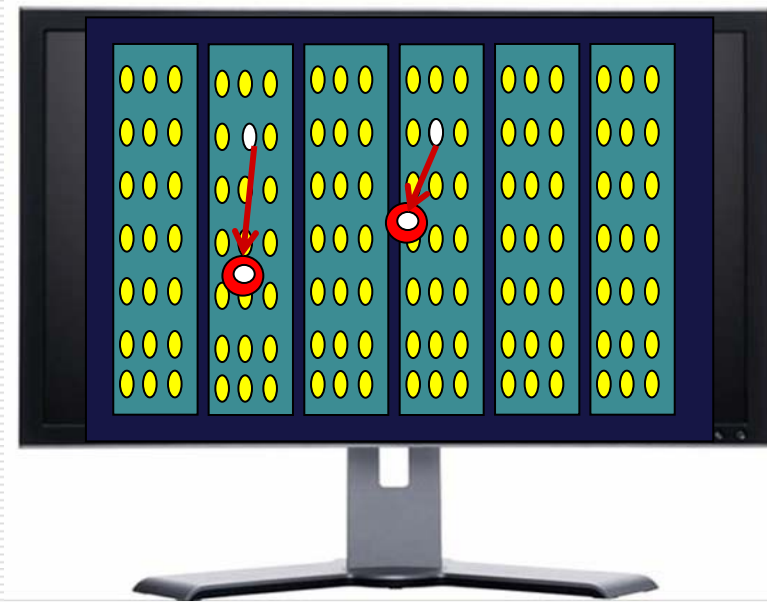
- Accurate inventory cycle count
  - Cross reads elimination
  - Assets tracked to dock door to back room shelves to store shelves
- Improved customer satisfaction

# Track movement of valuable items

Wirama Reader



Items moves or disappears



# Table of Contents

---

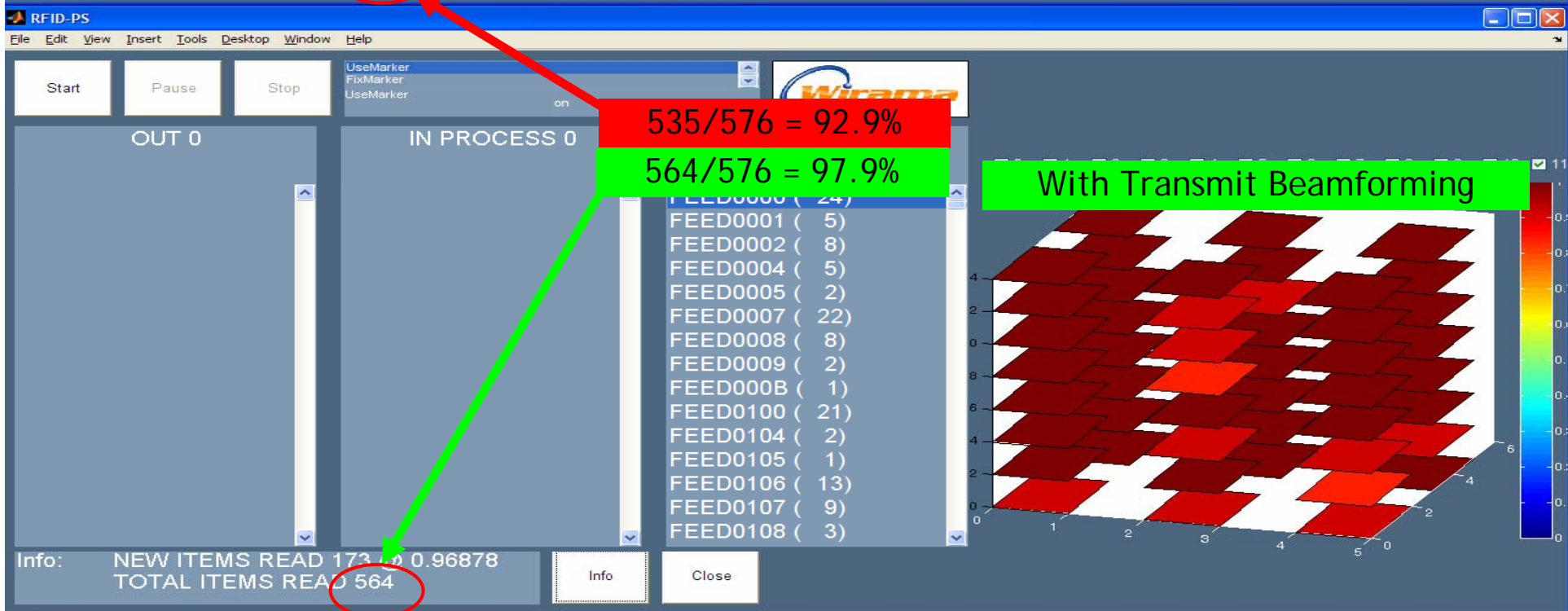
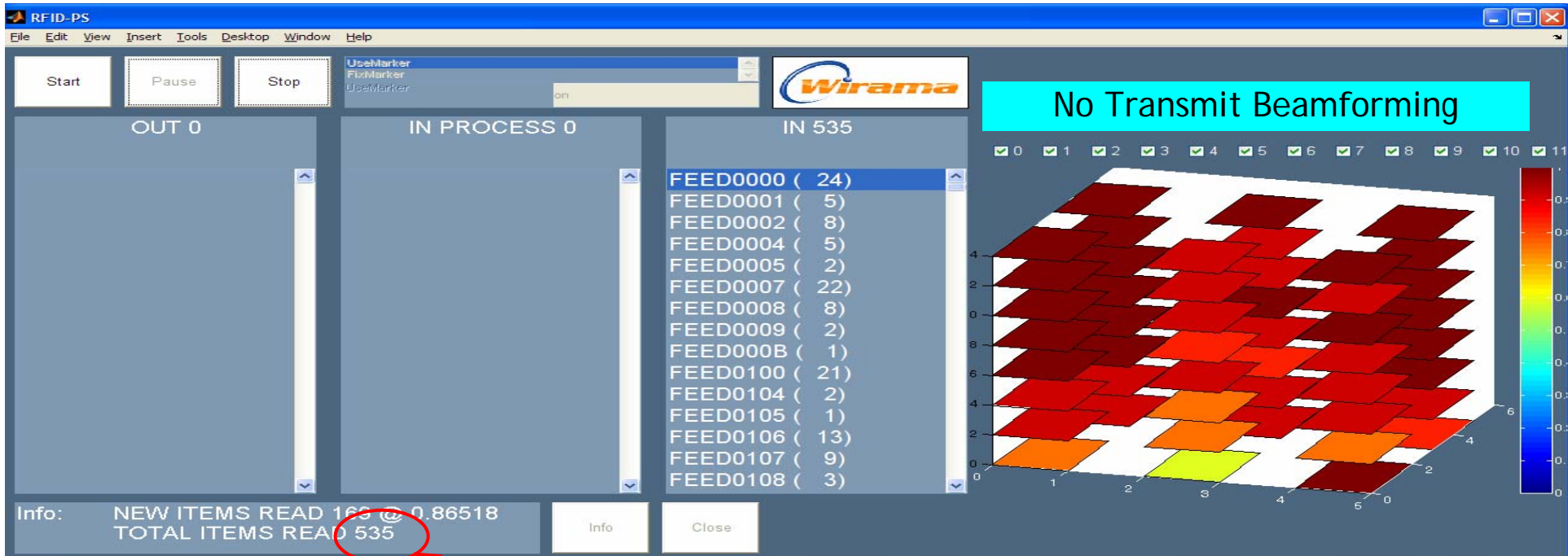
- Introduction to Wirama
- Our goal
- Areas of interest
  - Asset tracking in large yards
  - Dock doors
  - Retail
- Current status and lessons learned
- Questions?

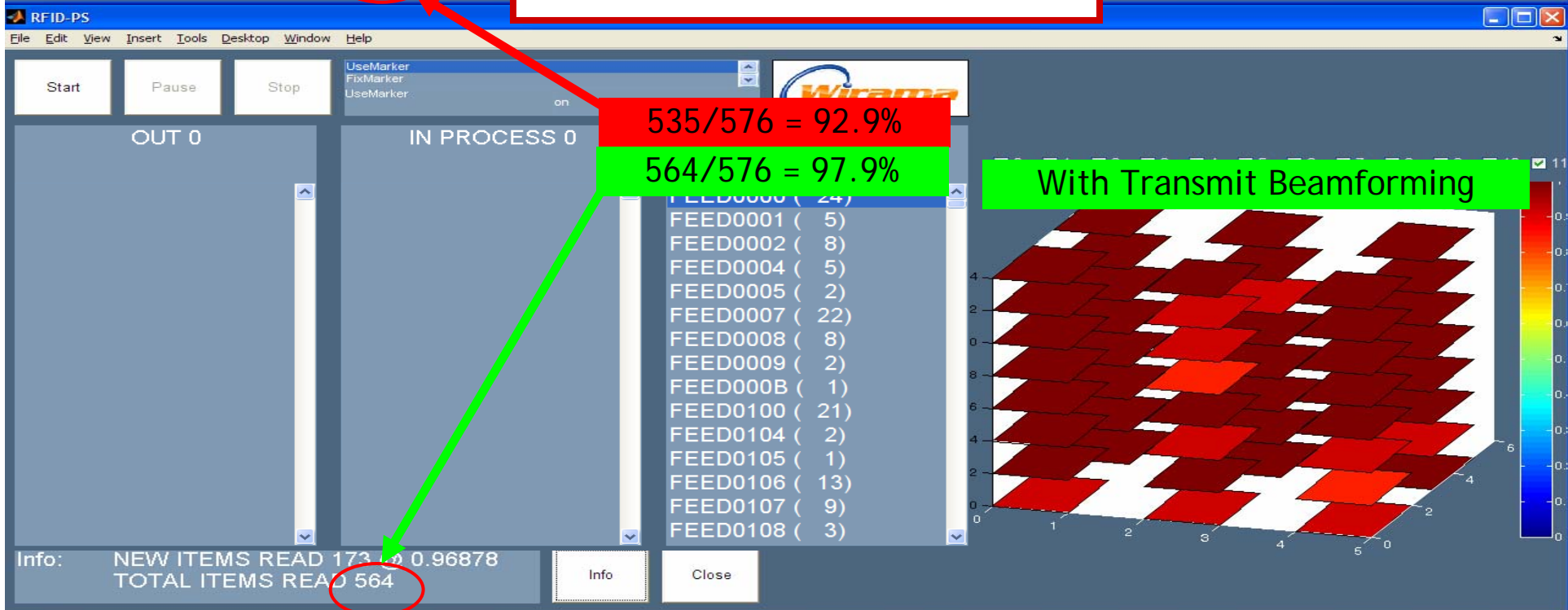
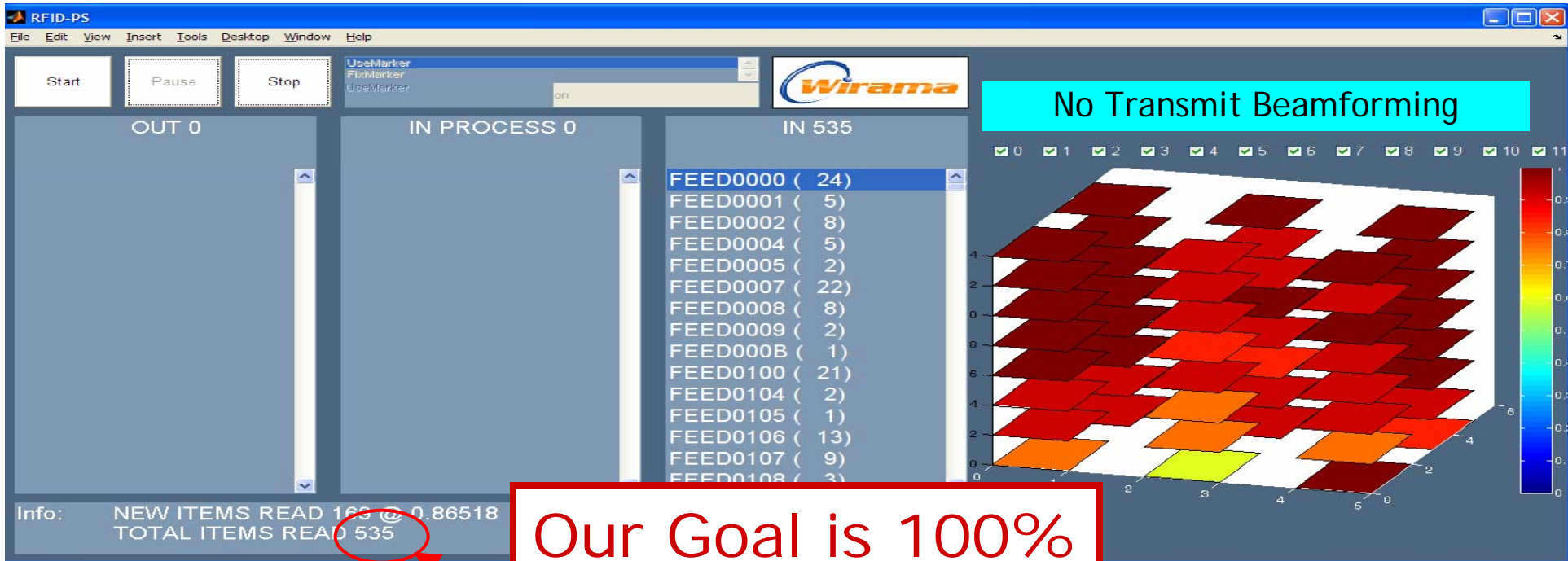
# Current status

---

- ❑ Beta product available today
- ❑ Integrated phased array antenna
- ❑ Software defined reader with current support of Gen 2 passive and semi-passive tags
- ❑ 30'+ read range with passive 100'+ read range with semi-passive
- ❑ 1000+ tags per second in a dock door setup
- ❑ 6'' accuracy per 10' of distance
- ❑ Tx and Rx beam forming with all the benefits
- ❑ Two configurations: mobile, battery powered; fixed, multi antenna
- ❑ Bluetooth, serial port communication interface







# Table of Contents

---

- Introduction to Wirama
- Our goal
- Areas of interest
  - Asset tracking in large yards
  - Dock doors
  - Retail
- Current status and lessons learned
- Questions?**