



Dr. Erick C. Jones, PhD, PE, CSSBB

University of Texas at Arlington

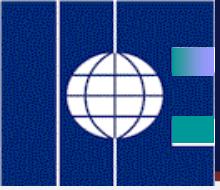
RFID & Auto-ID Deployment (RAID) Labs



420 Woolf Hall, Arlington, TX 76019
ecjones@uta.edu
817-272-7592

August 2nd, 2011





Presentation Outline

- Who We Are
- RFID Applications in Healthcare
- RFID Applications in Manufacturing
- RFID Applications in Logistics
- RFID in the Future
- Question

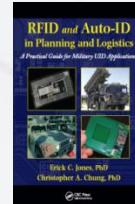
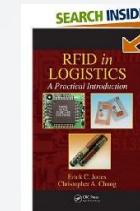




Presenters Background

RFID
EXPERTISE

- Industrial Experience (14 years)
 - Companies: UPS, Academy Sports, Tompkins Associates, Arthur Anderson, LLP
 - Positions: IE Specialist, IE Manager, Director of Engineering, Senior Consultant, Project Manager, Senior Manager
- National Recognition
 - Current RFID Certification Chair for International Supply Chain Educational Alliance
 - RFID Journal Live Best in Show Judge
 - Member of RFID National Certification Groups (GS1, EPC Global, AIM)
 - Former NSF I/UCRC Nebraska Site Director for Logistics
- Academia
 - Texas A&M (BS), University of Houston (MS, PhD)
 - Associate Professor - University of Texas at Arlington
 - Associate Professor - University of Nebraska-Lincoln
 - ABET Program Evaluator
 - Courses: RFID, Logistics Optimization Modeling, Six-Sigma Quality & Manufacturing
 - Research Areas: RFID and ADC Technologies, Supply Chain Procurement and Logistics
 - Former Chair for University of Nebraska's Black Belt Certification Program
 - Former Chair for University of Nebraska's Logistics Certification
 - Published 62 transcripts of which 22 were peer reviewed journals, 3 magazine publications (20 transcripts in print), 1 textbook chapter, **2 co-authored textbooks**, and 1 edited industry certification book and 40 conference and speaking transcripts.





Introduction to Radio Frequency Identification & Auto-Identification (RAID) Center

RAID





RAID Center Team

RAID EXPERTISE

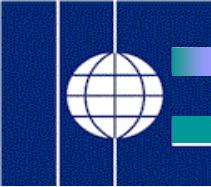
- Faculty
 - Dr. Erick C. Jones (Director)
 - Dr. Richard Billo
 - Dr. John Priest
- Post Docs/Graduate Students
 - Dr. Vettri Gnaneswaran – Post Doc Research Associate
 - Maurice Cavitt(MC)- PhD
 - Gowthaman Ananthakrishnan (GA)-PhD
- Undergraduates
 - As many as I can “afford”





- Mission:
 - *“Providing integrated solutions in logistics and other data driven environments through automatic data capture, real world prototypes, and analysis”*
(Room 411/413 WH-RFID Lab, 309-ERB-AutoID Lab)
- Objective:
 - *Attract Recognized Funding from notable federal agencies and nationally recognized organizations*
 - *Provide a research facility that inspires future STEM researchers from K-12 and undergraduate students*
 - *Attract national attention from academic rankings and research recognition*





Future NSF I/UCRC RAMHSES

RFID Expertise



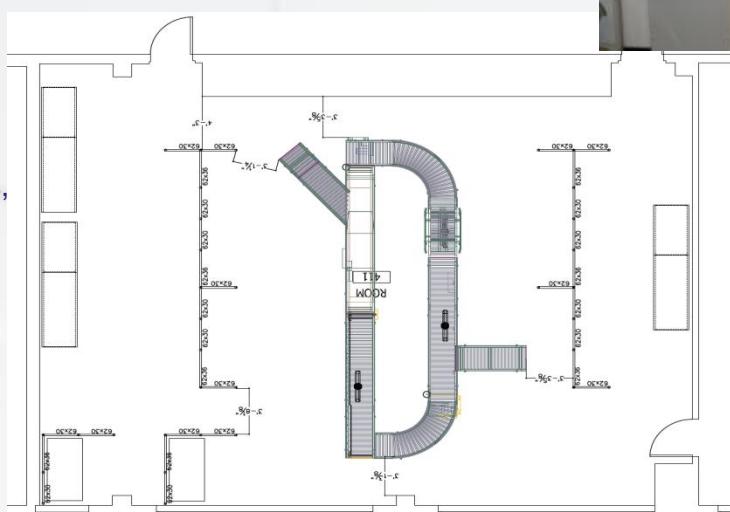
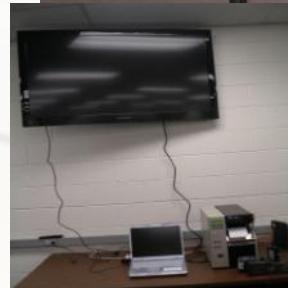
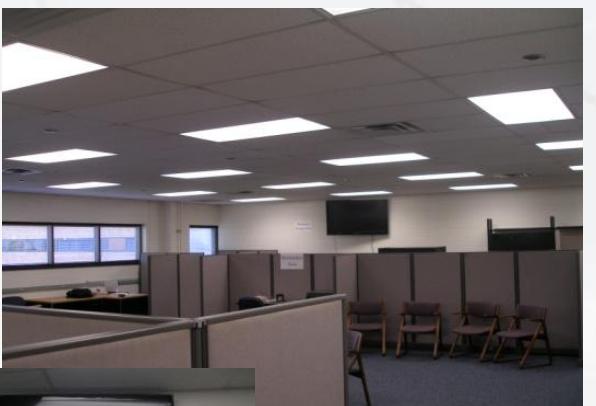
- National Science Foundation sponsored Industry/University Cooperative Research Center
- Create a new collaborative multi university research center in Radio Frequency Identification (RFID), Automatic Identification, Material Handling Systems Engineering, and Security (RAMHSES)
- **Need Local Industry Partners** – Let me know of interest
- *Importance*
 - Our Research is Based Upon solving Real-World Operational Problems that required Industry Buy in and investment

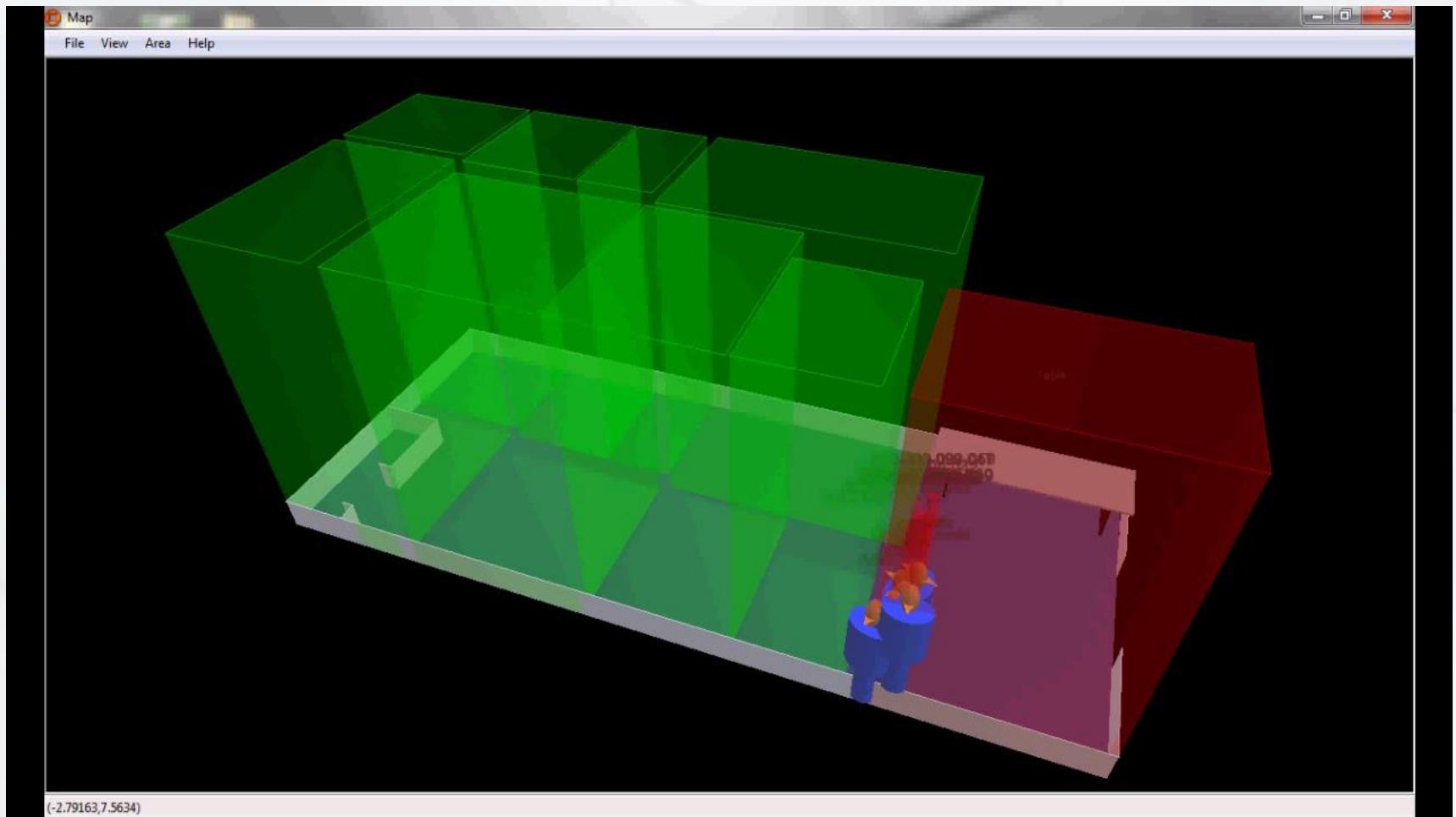




RAID Center RFID Facilities

RFID Expertise







Previous Projects

- **RFID and AutOID**
 - Integrating RFID into Healthcare Manufacturing Plant
 - Cost analysis for implementing RFID in Libraries
 - RFID impact on enforcing the use of collaborated tools at a defense manufacturer
 - Integration of RFID and GIS system for ticket/seat location
 - Applying RFID technology to sports timing in a marathon
 - RFID testing of consumables in NASA Space Center (ISS) storage containers
 - Integration of Animal ID into systems for Cattle Tracking
 - RFID in the Operating Room with surgical tags
 - RFID in Construction



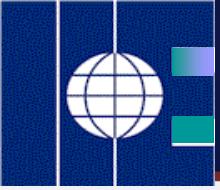


Previous Projects

RFID Expertise

- **RFID and Autoid**
 - RFID economics of automated checkout for retail companies
 - RFID for Roadside Safety
 - Imbedded RFID License Plates
 - Right of Way Underground and Above Ground RFID tags for property disputes
 - Automated sensing RFID systems for location of inventory for Astronauts on current and future missions
 - Evaluation of RFID for linear roadside assets
- **Procurement & Logistics**
 - Grain Terminal Supply Chain Network Analysis for reducing minimizing procured costs and auctioning effect of a Co-Op





Previous Projects

- **Procurement & Logistics**
 - Strategic Procurement Strategies for Centralized Procurement to reduce Obsolete Inventory for Large City Material Management Group
 - Predictive modeling of City's Materials Management Branch Commodities to Optimize Procurement Pricing
 - Evaluating plant transportation to prevent Plant closing
 - Attracting Foreign Manufacturer to move operations domestically
 - Supply Chain Network modeling for a city government
 - Strategic Information Technology Initiatives and Department Re-Alignment
- **Engineering Management**
 - Predicting Knowledge Worker Job Turnover





Current Projects

RFID and AutoID

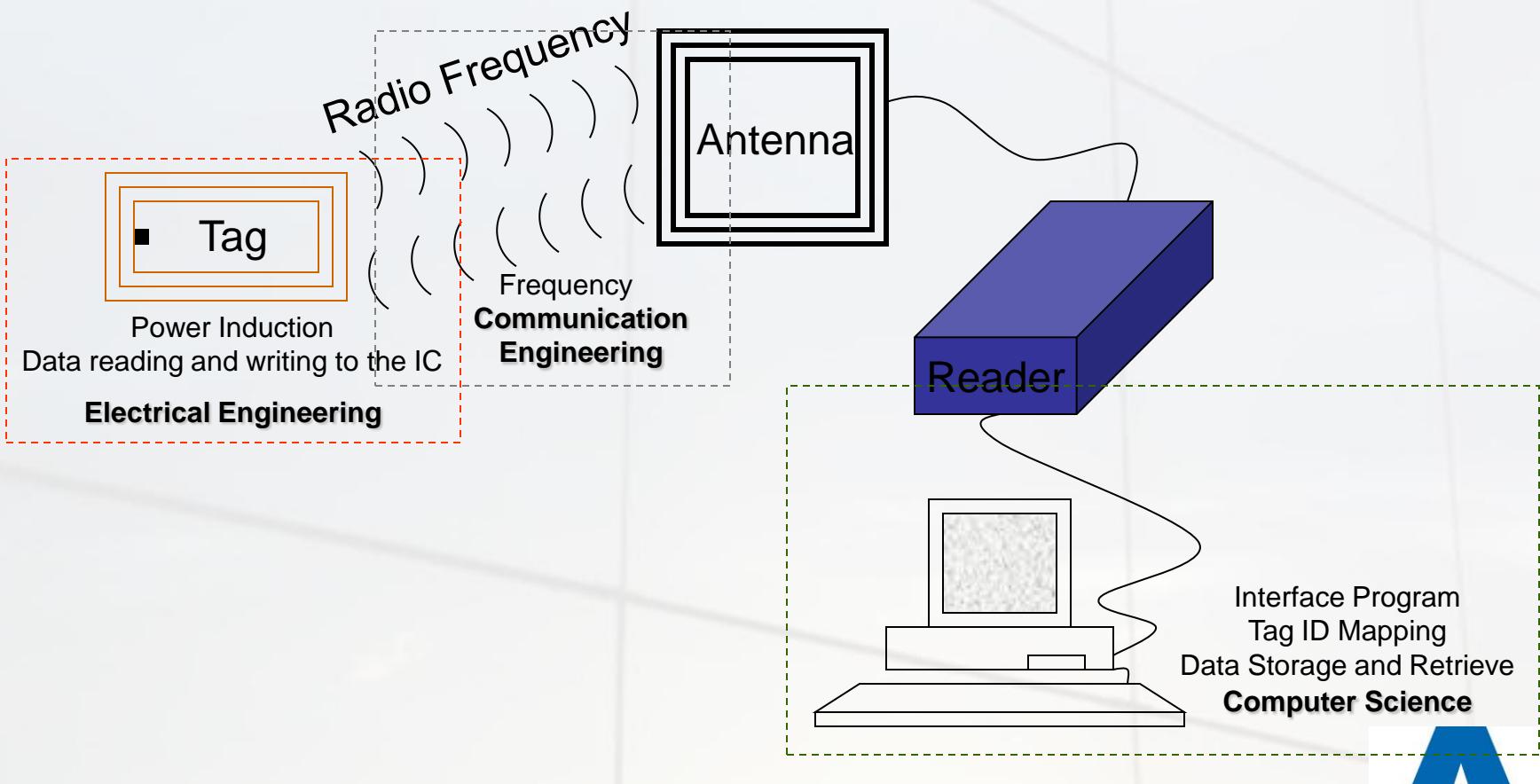
- Cost reduction of tags through micro manufacturing process design for Health Care Drug Delivery for dosage level samples and ingestible Bio enabled pills
- NASA Gen 2 RTLS
- RFID Reader for WMS direct to Cloud (CiC)
- International Research Experiences in Science for undergraduate students in Mexico
- I/UCRC Planning Research Center for Automatic Identification Technology



Multi Disciplinary Approach

RFID Expertise

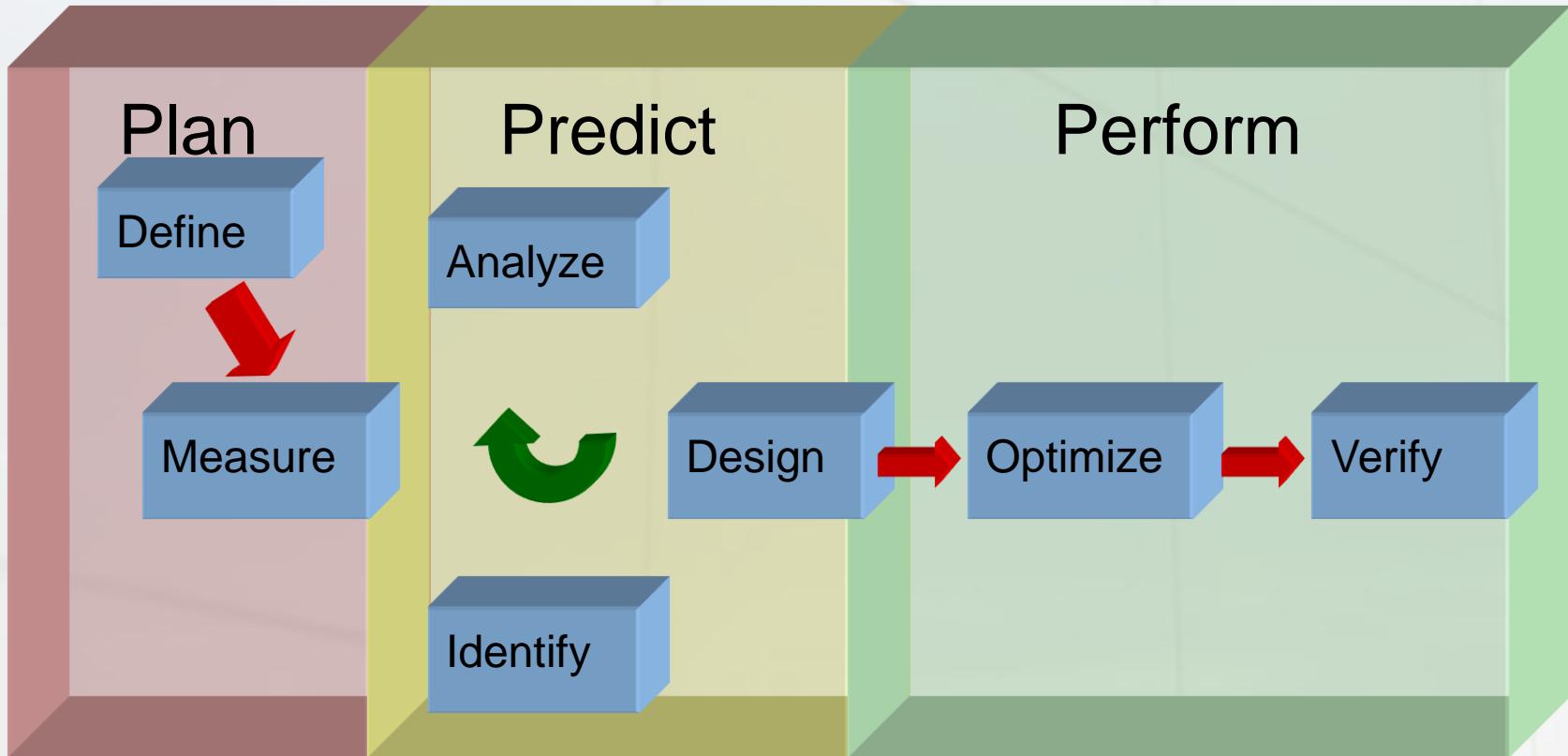
Industrial and Systems Engineering

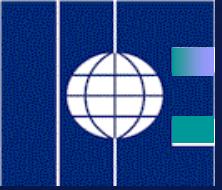




DFSS-R , Research Methodology

RAID Expertise



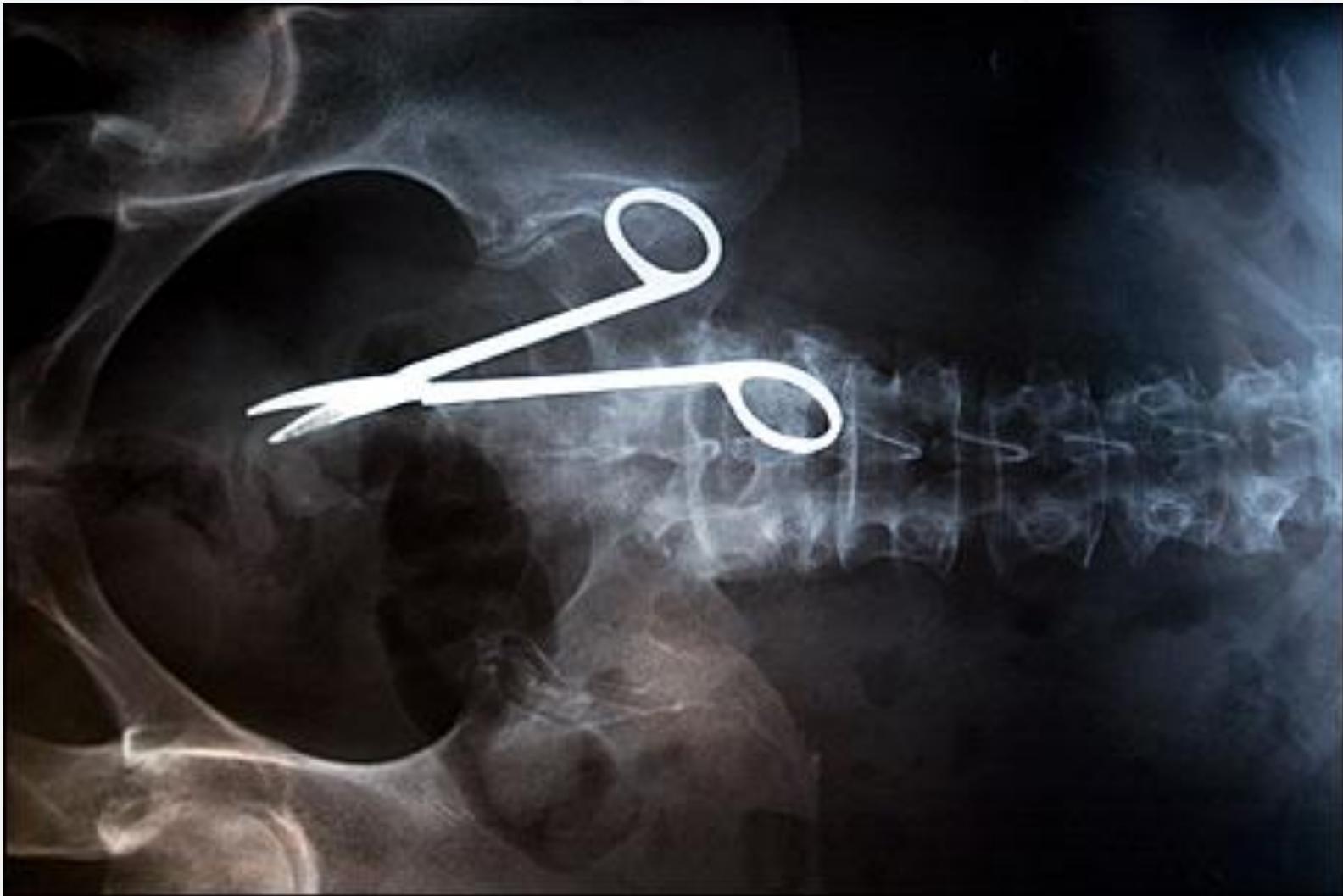


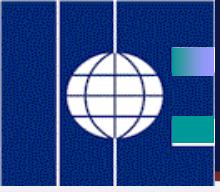
RFID in Healthcare



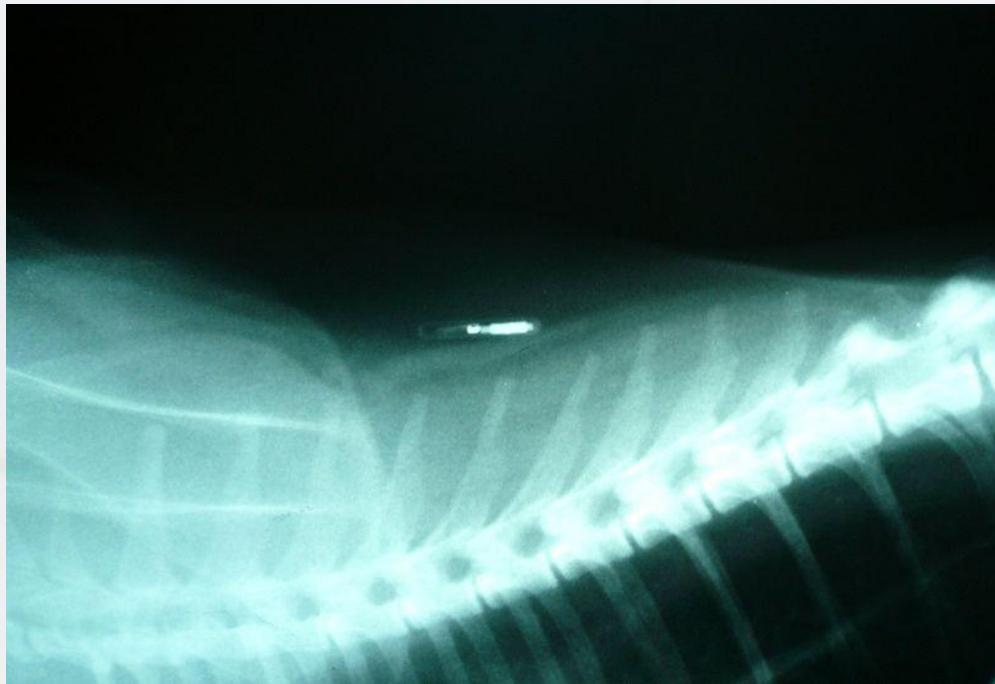
RAID







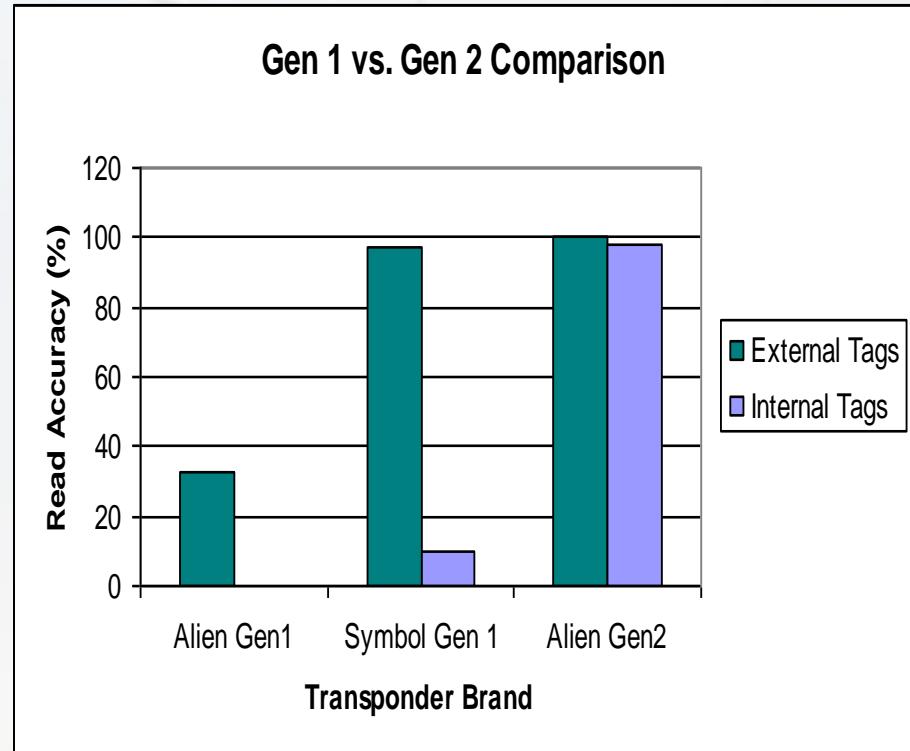
RFID Previous Microchip Research



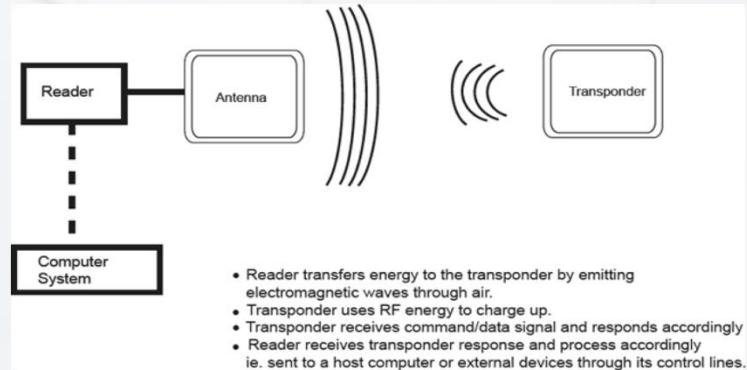
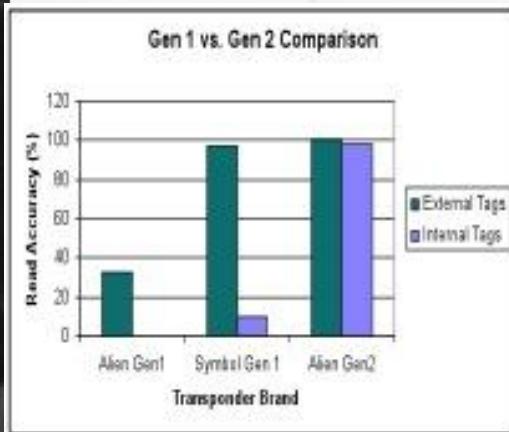


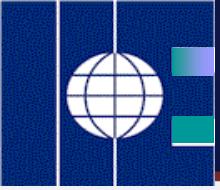
RFID Surgical Sponges

RAD Expertise



RFID Application in Operating Room





RFID Healthcare Applications

RFID Expertise

- RFID has been envisioned in Healthcare for
 - Patient Tracking
 - Personnel Tracking
 - Nurses
 - Surgeons
 - Inventory Tracking
 - Assets
 - IV Pumps
 - OR Sponge Tracking
 - Integration with Barcodes for
 - Electronic Medical Record Enablement
 - Current Research in Medical Error Reduction





Medical Error Background

RAID Expertise

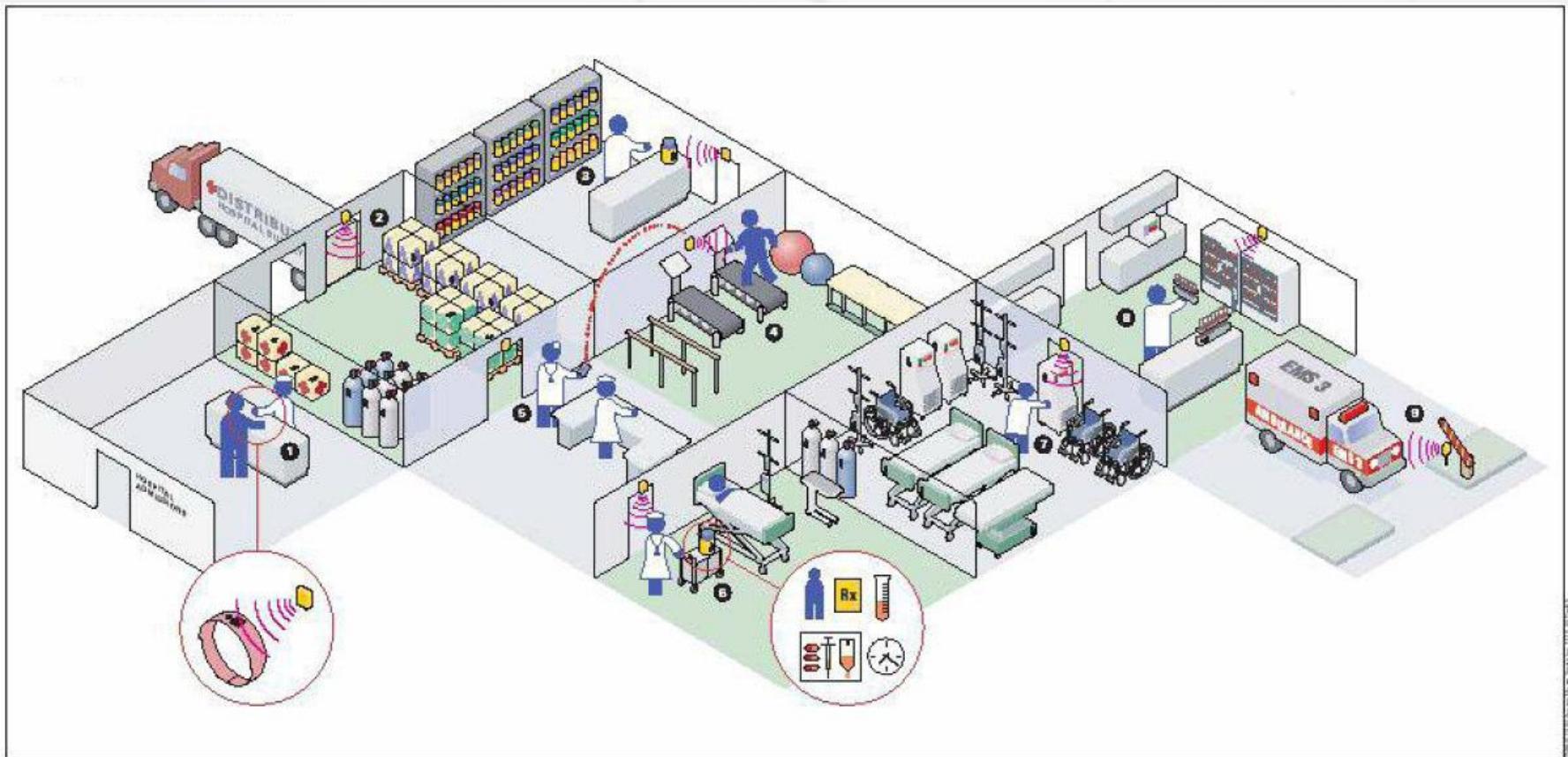
- The Institute of Medicine (IOM) estimates that medical errors cost the United States about \$37.6 billion each year.
- Hospital errors rank between the fifth and eighth leading causes of death, killing more Americans than breast cancer, traffic accidents or AIDS.
- A specific example is of this is when an infant is given the wrong dosage of pre-packaged medicine.
 - Recently there have been several instances where adult doses of heparin have caused premature infant deaths (Wolf, 2006).
- Eliminating this type of dosage error is the primary focus of this research.





RAD Expertise

Future Smart Hospitals



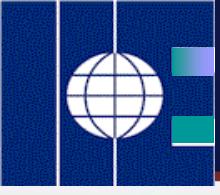


RFID Significance

RFID Expertise

Application	Benefits	Workflow
Medical equipment /instruments 1. Real time location 2. Boundary checking	a. Reduced time to find assets 1. Responsiveness 2. Idle time - staff waiting b. Increased utilization - Lower asset investment required 1. Reduced shrinkage/lost 2. Efficiency / process synchronization	a. Automatic routing for request for equipment b. Automatic notification / alerts / Interface with actuators (i.e Locks) c. Process triggers activation /expedition) by logic of asset moves
Pharmaceuticals Inventory 1. Pedigree	a. Safety b. Faster response to critical events	Automatic acquisition/ verification of product origin/history
Blood Product management	a. Safety b. Faster response to critical events	Automatic acquisition/ verification of product origin/history





RFID Healthcare Opportunities



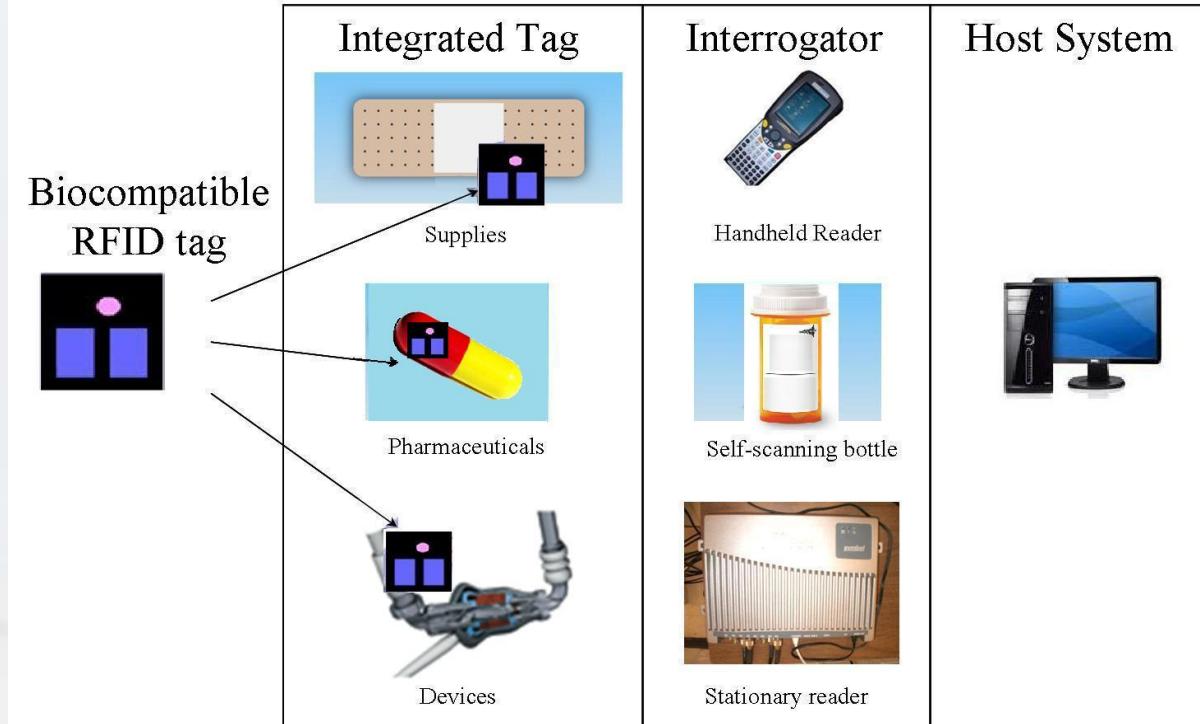
- Building from Previous Research in
 - Automation Initiative in Healthcare
 - Barcodes
 - An array of parallel, narrow, rectangular bars and spaces that represent a group of characters in a particular pattern.
 - A reader scans the barcode, decodes it, and transfers data to a host computer
 - Barcode Point of Care (BPOC)
 - Bar-code medication administration (BCMA) systems
 - Computerized Physician Order Entry (CPOE)
 - Medication Error Identification
 - Previous RFID research
 - Micro-Manufacturing RFID tags
 - Dosage level packaging
 - Surgical RFID sponges for ER
 - Biosensor RFID tags for ingestion confirmation





Envisioned Research Concept

RFID Expertise

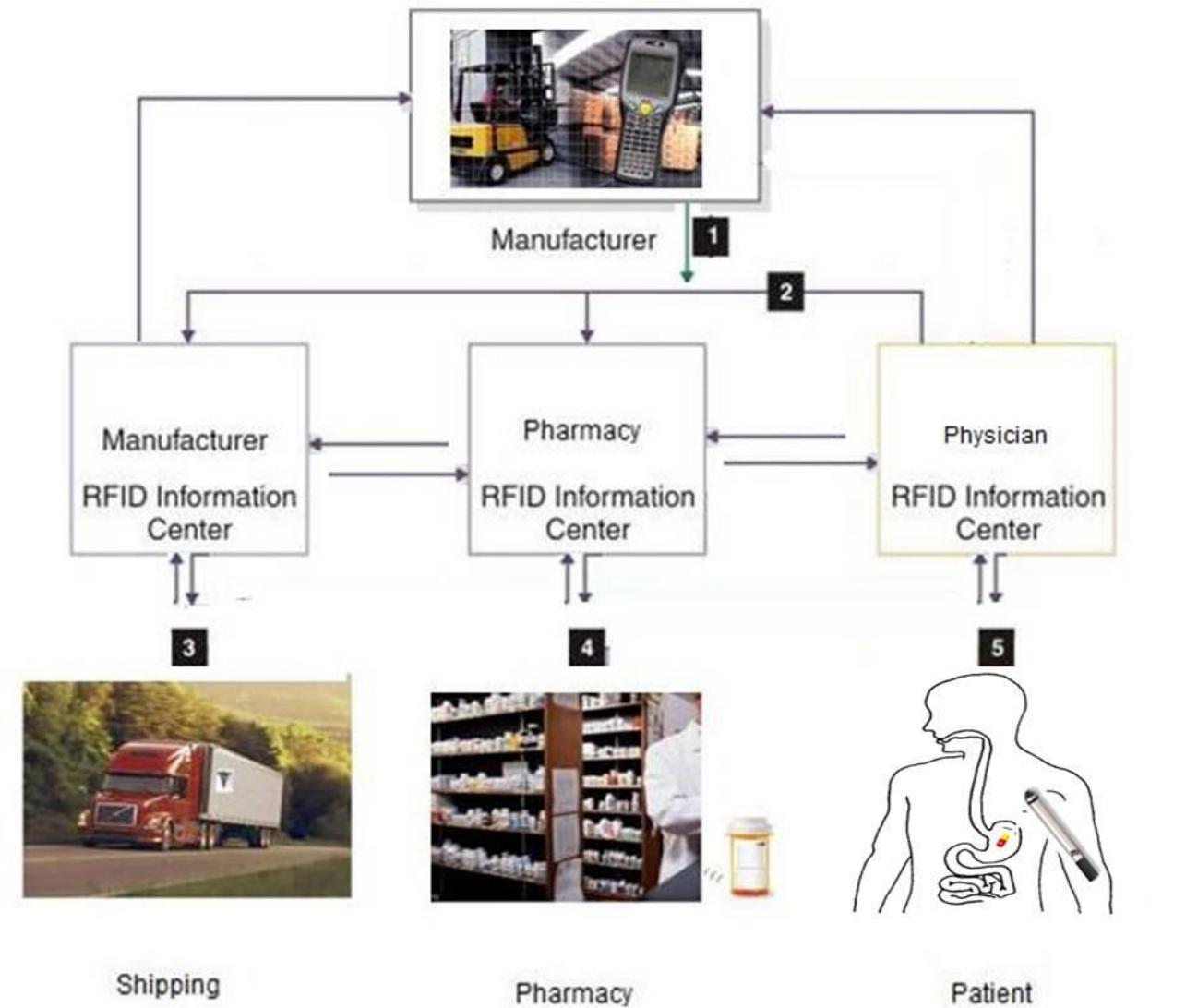


RFID embedded in Medical devices and on individual doses. (Jones, 2009)



Expected Outcomes

RFID Expertise

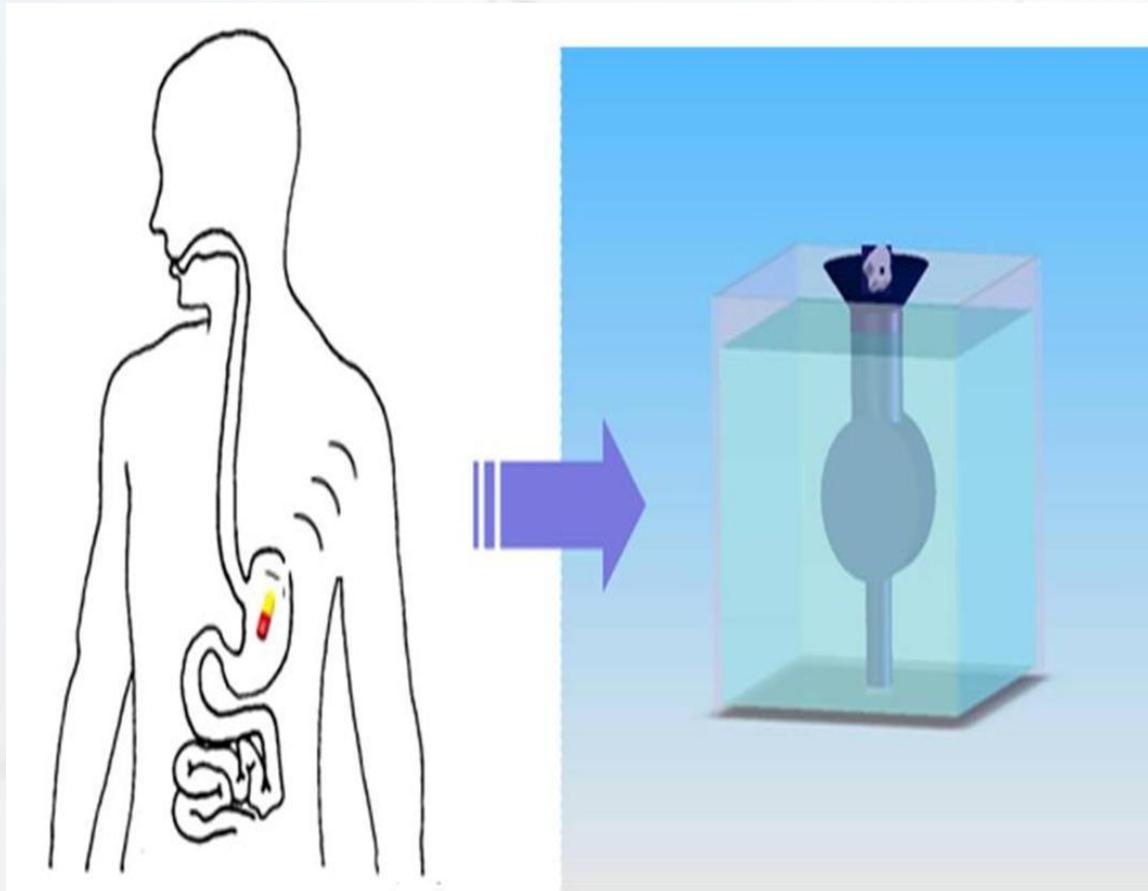


The future of integration of RFID technologies in hospitals. (Jones, 2009)



Drug Confirmation System

RFID Expertise



In-Vivo Capsulation of Biodecomposable RFID tag

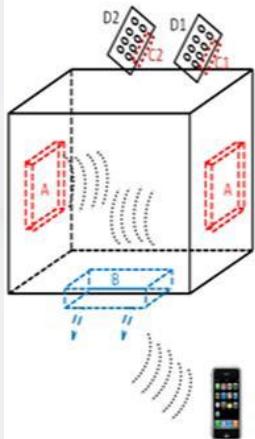




Drug Confirmation Concept

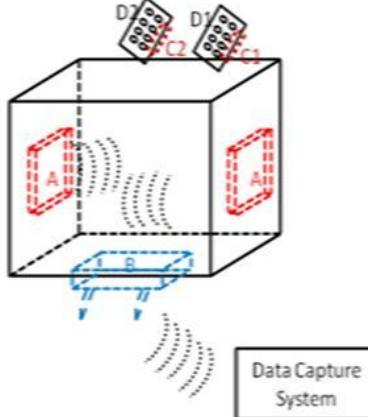
RFID EXPERTISE

I-Phone Reader Confirmation



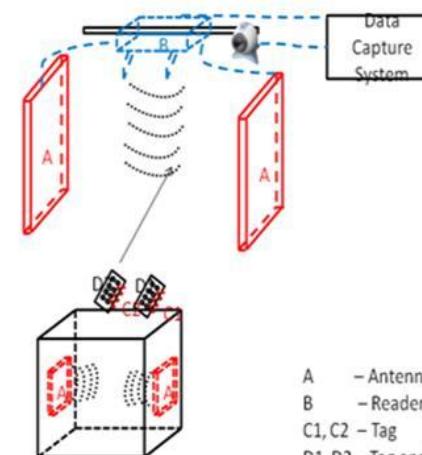
A – Antenna
B – Reader
C1, C2 – Tag
D1, D2 – Tag enabled Medicine Packaging

RFID Trash Can Confirmation Concept



A – Antenna
B – Reader
C1, C2 – Tag
D1, D2 – Tag enabled Medicine Packaging

RFID OCR Camera Confirmation



A – Antenna
B – Reader
C1, C2 – Tag
D1, D2 – Tag enabled Medicine Packaging

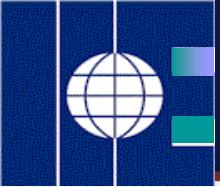




Drug Confirmation System

RAID EXPERTS

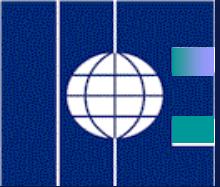




Neonatal Intensive Care Unit

RFID Expertise



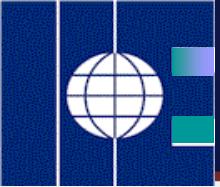


RFID in Manufacturing



RAID

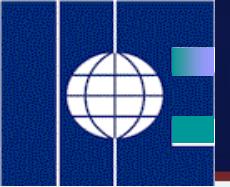




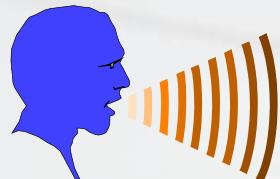
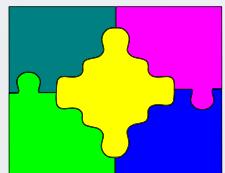
RFID in Manufacturing

- RFID has been envisioned in Manufacturing for
 - Personnel Tracking
 - BOM Tracking and Matching
 - Lights Out Facilities
 - AS/RS Usage
 - Conveyor Control and Movement
 - Enabling Operations
 - Lean/KANBAN And Triggers





5S - Workplace Organization



- First S: Sort (Organization)

Distinguish between what is needed and not needed.

- Second S: Stabilize (Orderliness)

A place for everything and everything in its place.

- Third S: Shine (Cleanliness)

Cleaning and looking for ways to keep it clean.

Cleaning is inspecting!

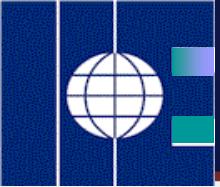
- Fourth S: Standardize (Promote Adherence)

Share established standards and make standards obvious.

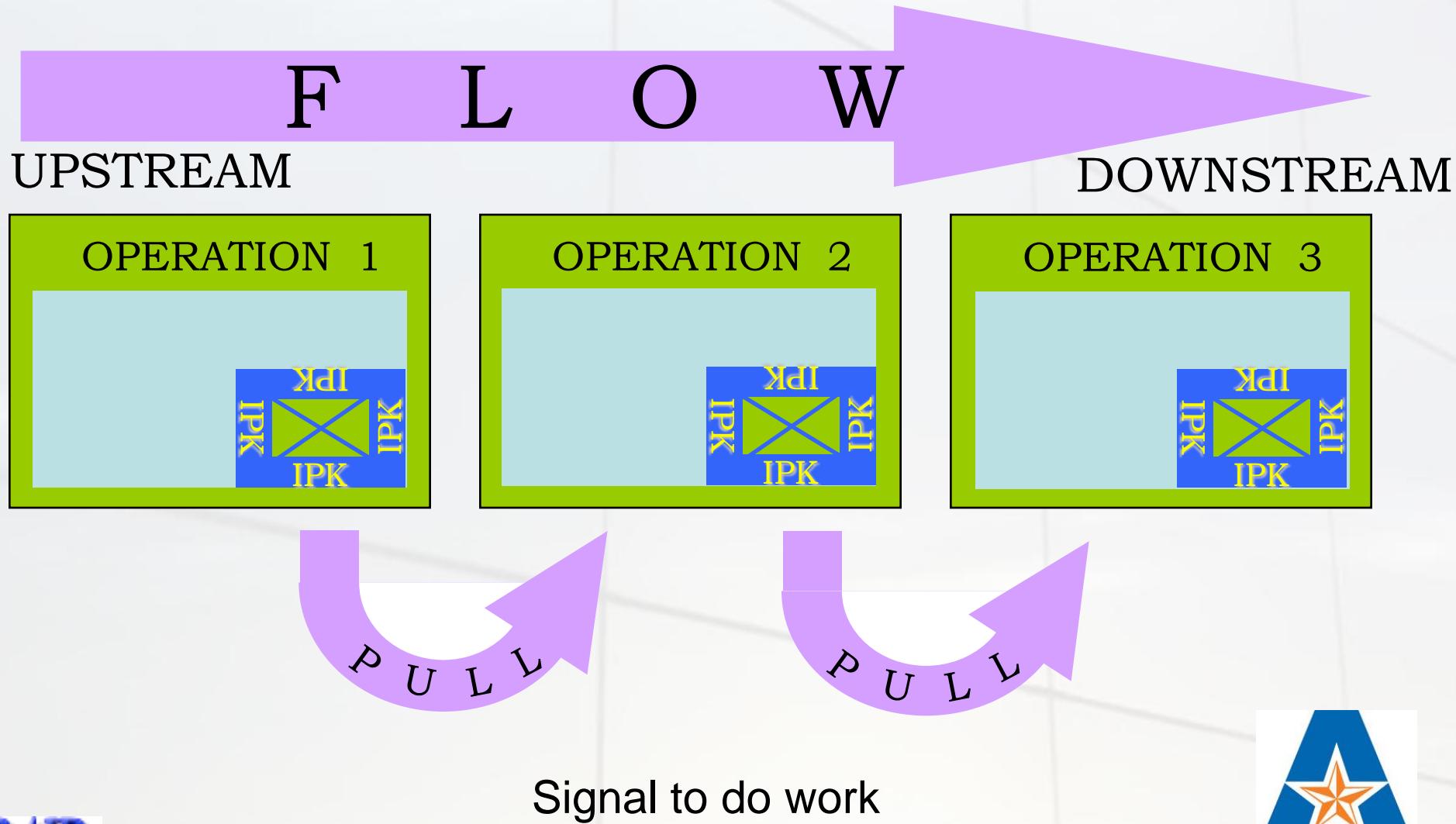
- Fifth S: Sustain (Self-Discipline)

Stick to the rules and maintain the first four S's.



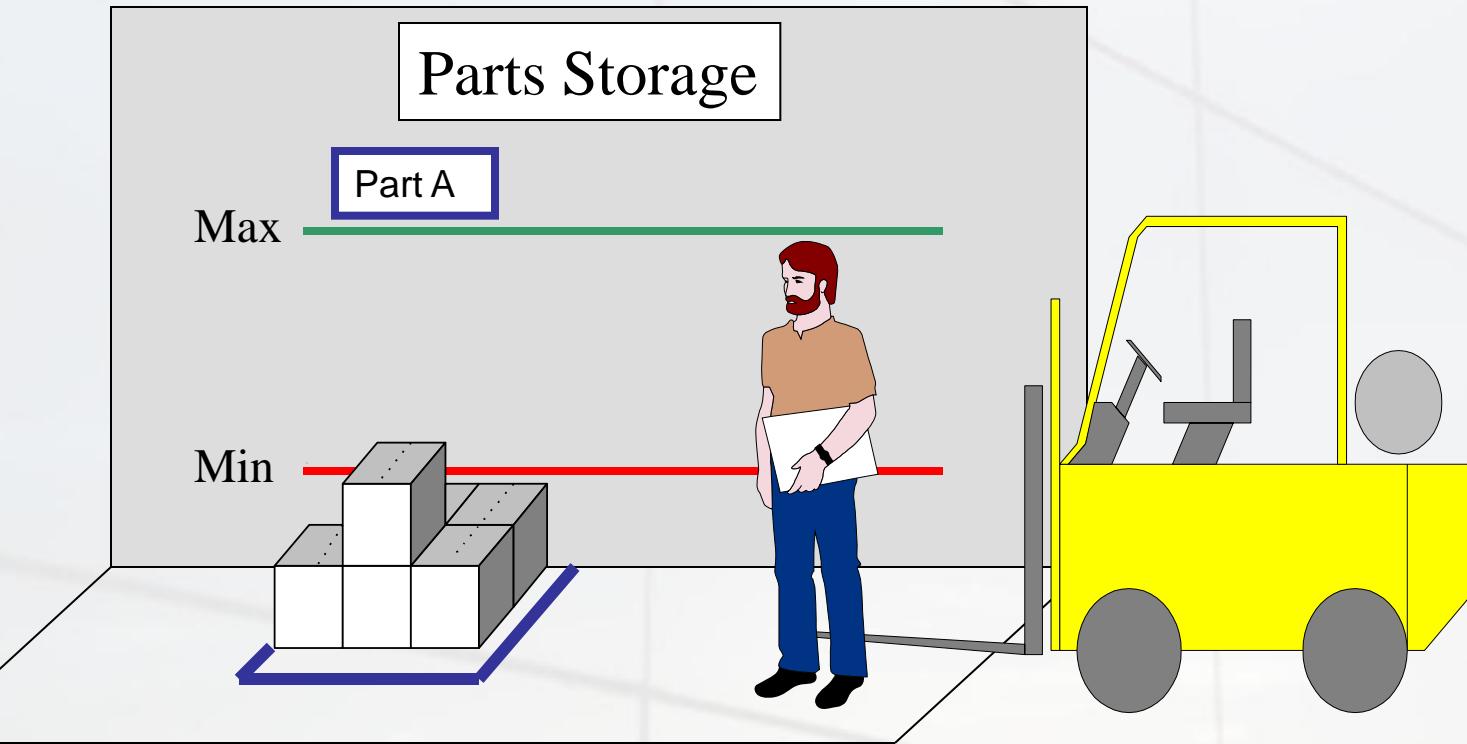


In-Process Kanban





Enhancing Visual Control with Automation (RFID)

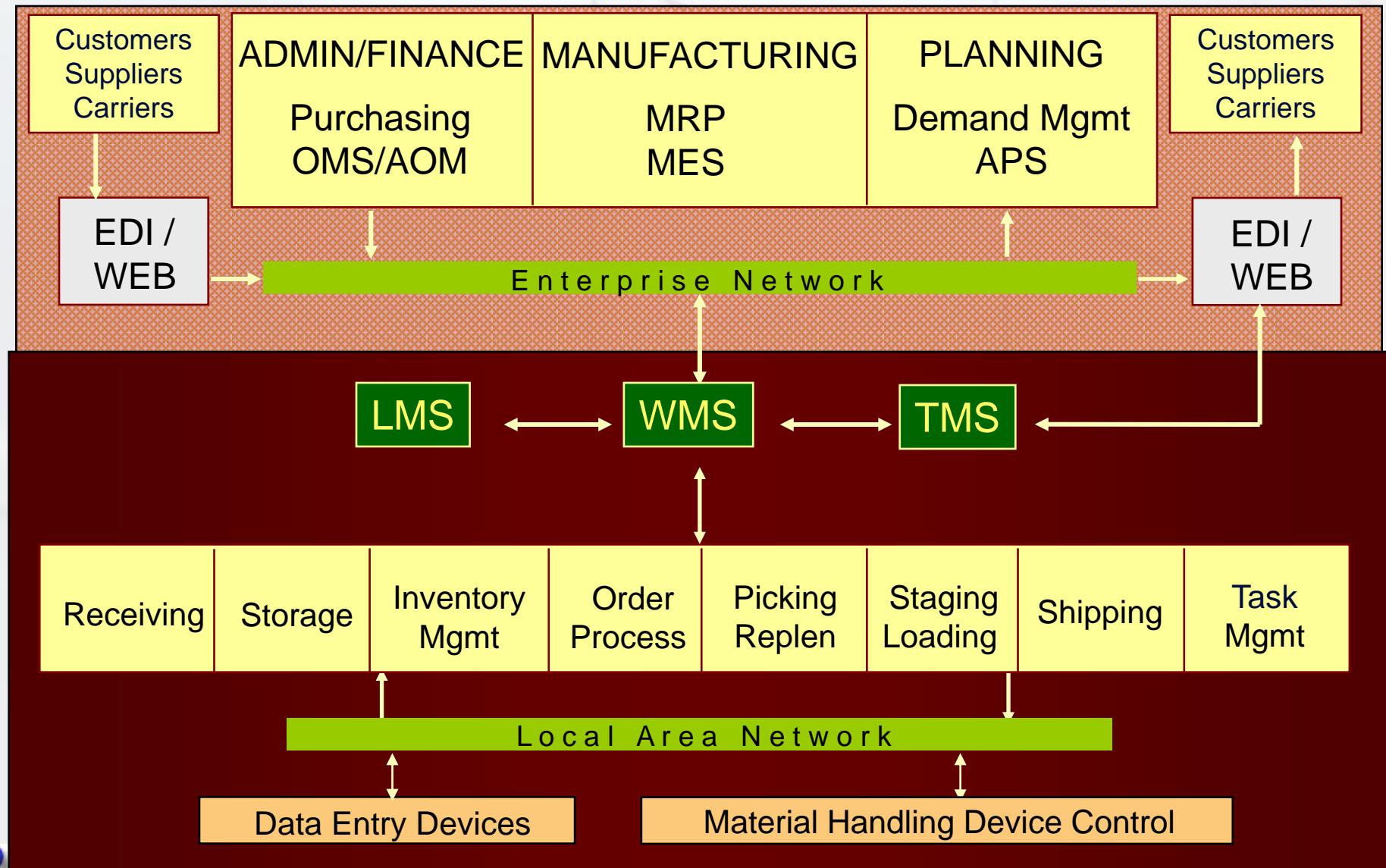


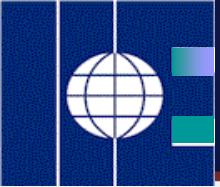


Push/Pull Interface

Raid Expertise

ENTERPRISE SYSTEM

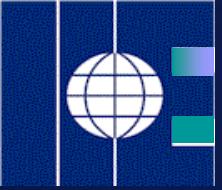




RFID Enabled Auto Replenishment

RFID
EXpertise



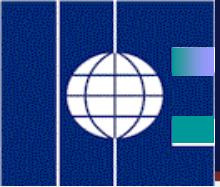


RFID in Logistics



RAID





RFID in Logistics

- RFID has been envisioned in Logistics for
 - Military Operations
 - Getting Food to Soldiers
 - Managing Inventory in the Supply Chain
 - Minimizing the Bullwhip effect
 - Managing the Tractor Trailer/Rail/Port Interface
 - Optimizing Trucking/Rail/Barge Schedules
 - Optimizing Real-Time Stock replenishment
 - Vendor Managed Inventory





Military Logistics

RAID EXPERTISE

Improving Visibility and Reducing Inventory in Military Supply Chains





RFID in Military Logistics

RFID Expertise

PORTABLE DEPLOYMENT KIT



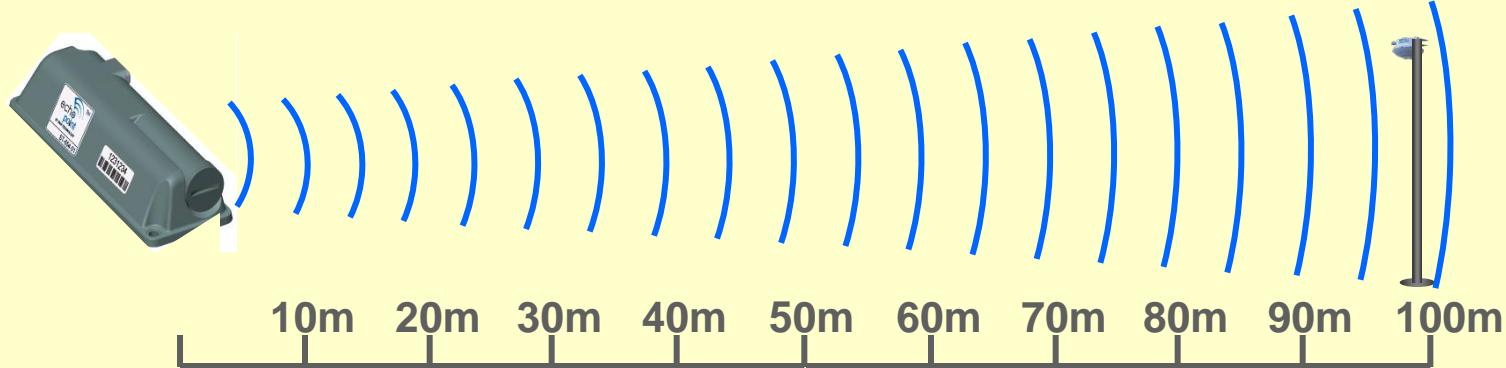
- PDK enables:
 - Rapid force deployments
 - Satcom ITV communications without fixed infrastructure
 - Reading/writing of tags, printing of bar code labels
- Features:
 - Lightweight (56 pounds) for handing by single soldier
 - Ruggedized case and laptop
 - Low power source: HUMVEE generator
 - Commercial applications





Active RFID Technology (Echo Point)

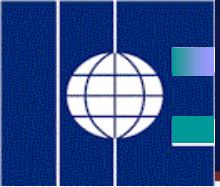
Battery Enabled Active Tags Transmit Up to 100M / 300Ft To Readers



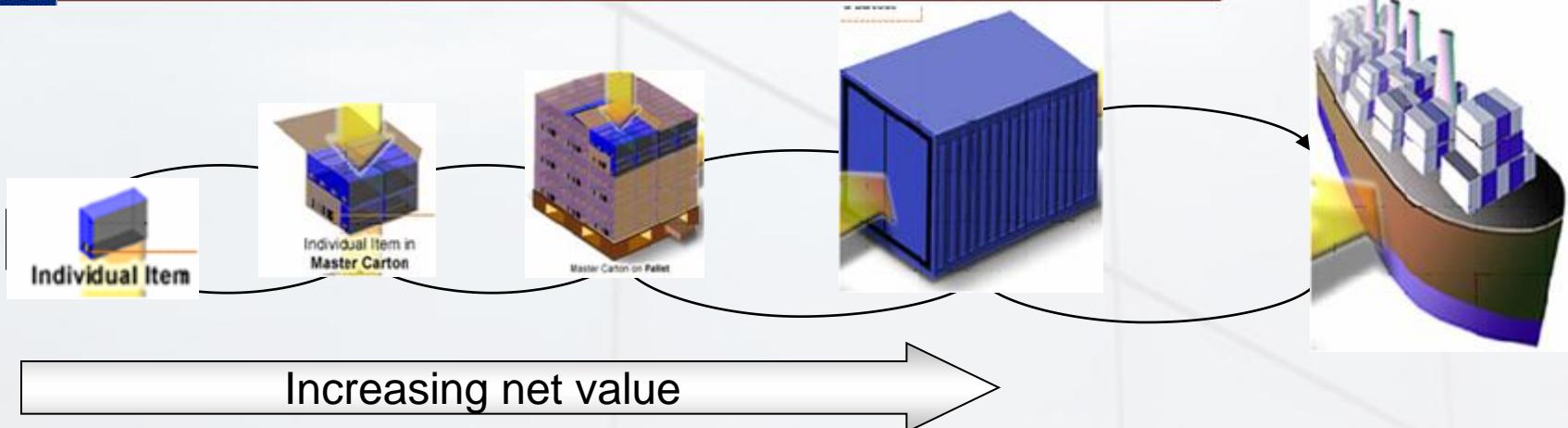
Signpost Triggers Tag Transmission Identifying Spot Location



Tag Can Travel Outside Signpost Range While Transmitting to Reader



Nested Visibility



Passive RFID



Active RFID

GPS & SATCOM



Increasing net investment

Similar nesting for:

- Retrograde
- Manufacturing, kitting, assembly
- Remanufacturing, disassembly, demilitarization





Smart & Secure Containers: RFID Link Between Defense and Commercial

Data

- Container ID
- Location
- Date, Time
- Tag ID
- Battery Status
- Security Status
- Environmental Status
 - Temp, Humidity, Shock

Automatically Capture Data,
Accurately and Reliably

Savi Reader SR-650

Wireless Reading
up to 100 meters



SaviTag - ST-676



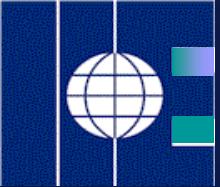


Capture Data Dock Side

RAID Expertise

Chain of custody control through confirmation of physical movement and container status at process points like the port crane operations





RFID in the Future



RAID





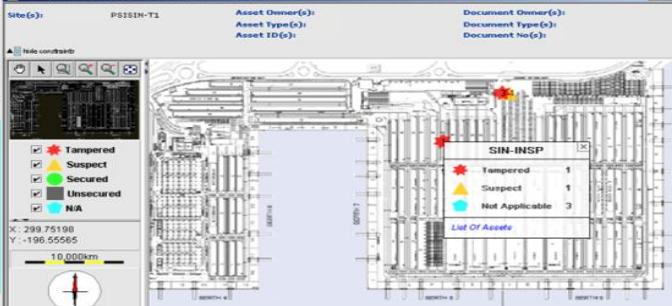
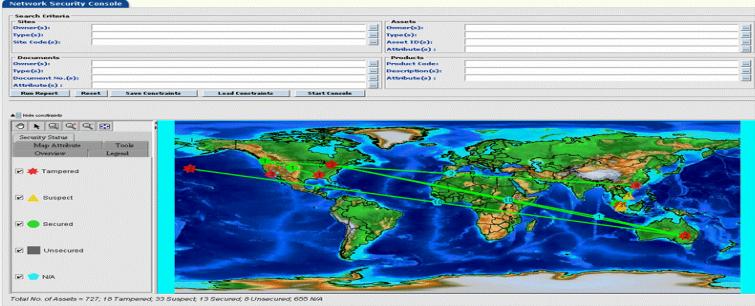
RFID in the Future

- RFID Future includes
 - Retail Automation
 - NASA Space Utilization
 - Incorporating the internet of things
 - Others

Yard Management



Aircraft Parts Tracking

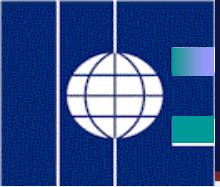




The Future of Retail

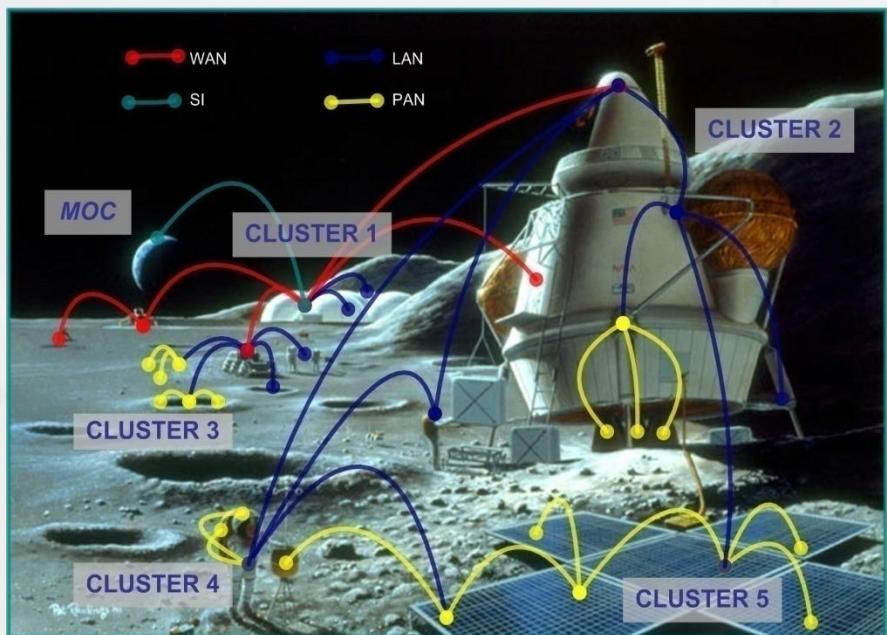
R&D EXPERTISE



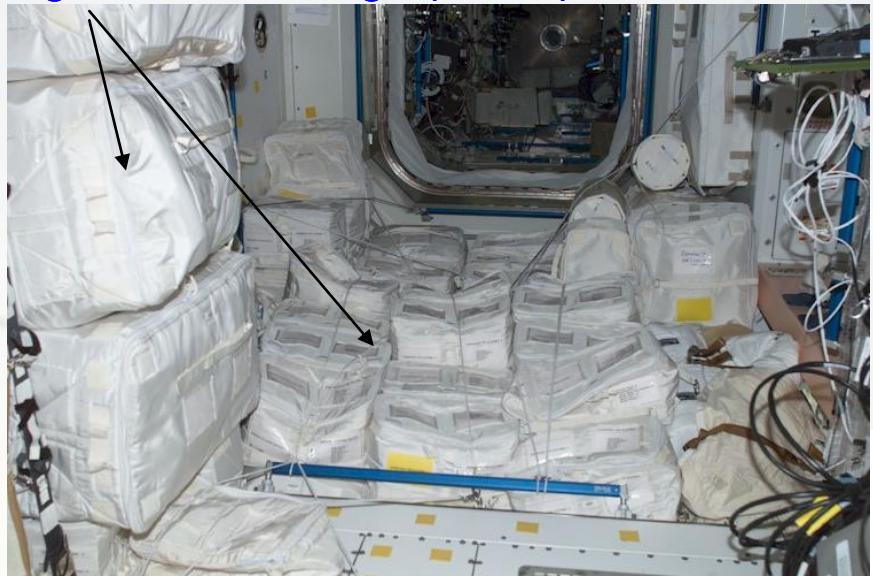


NASA Environment

RAID EXPERTISE



Cargo Transfer Bags (CTBs)



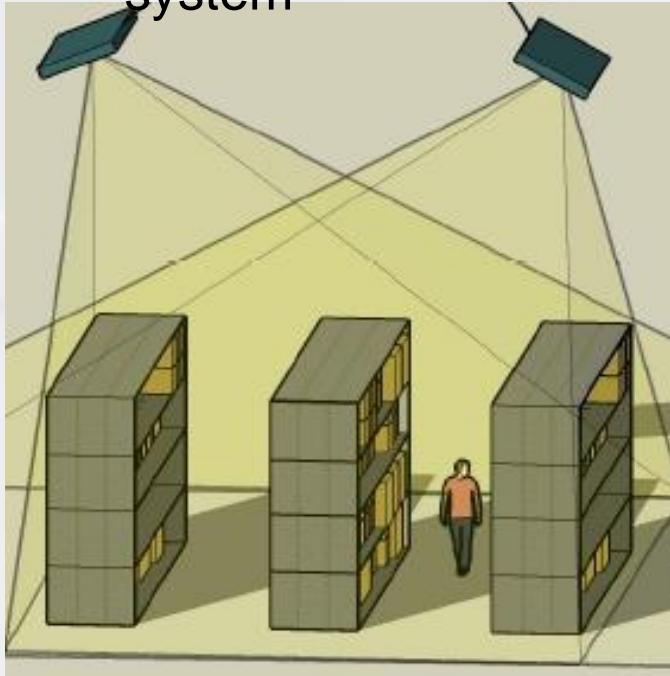


RTLS Concepts

RFID Expertise

Fixed RFID readers

Either permanently attached to structure or portable
With steerable phased array antennae in a full XYZ locating system



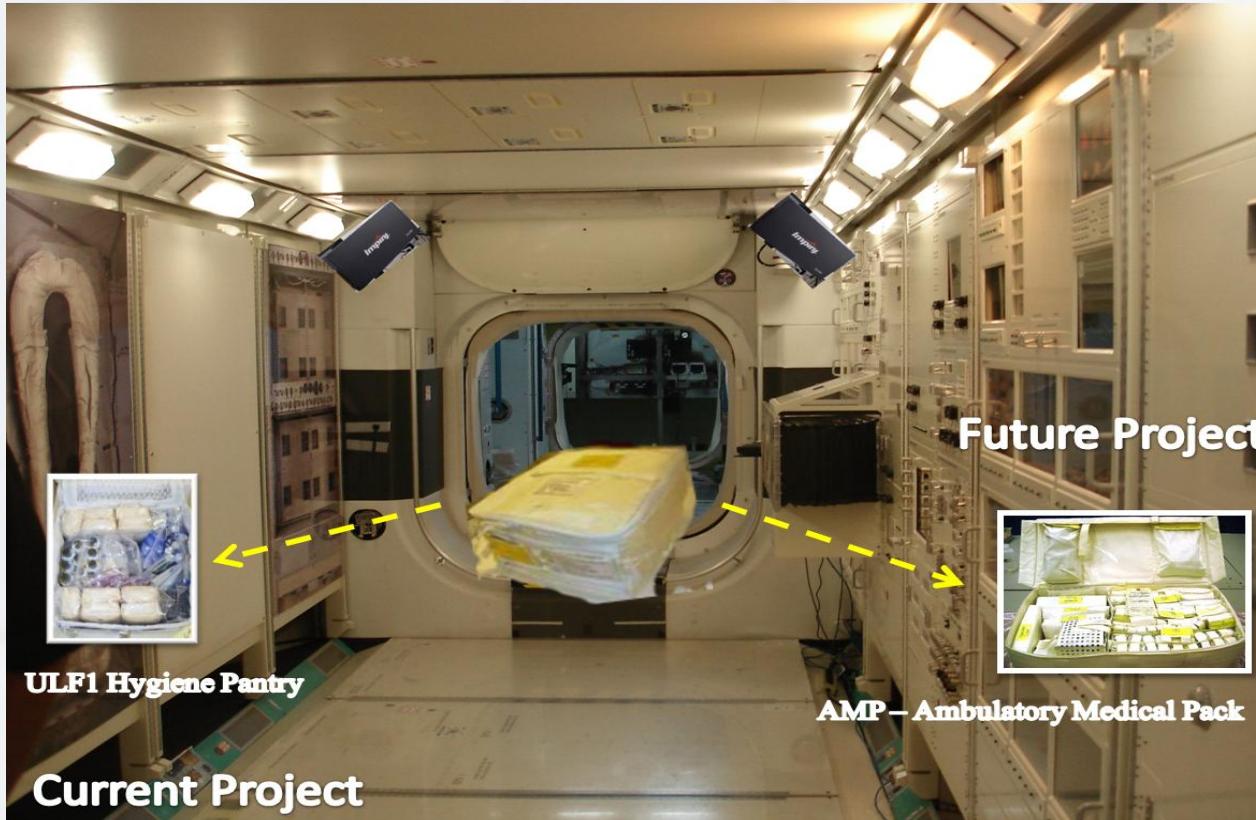
Steerable Phased Array Antenna (SPAA)

Works with any Gen 2 UHF Passive RFID tags
Does not interfere with handheld solution
Greatly improves general radio penetration to and from inside of building
Two antennae can give XYZ position within a few feet





Smart Backpack Concept (Future)





Engineering Hardware Payloads

RAID EXpertise



Marshall Space Flight Center /
Johnson Space Center
Rack Training and Management



Element Rotation Stand



Destiny Lab Scaffolding

Kennedy Space Center
Hardware Development



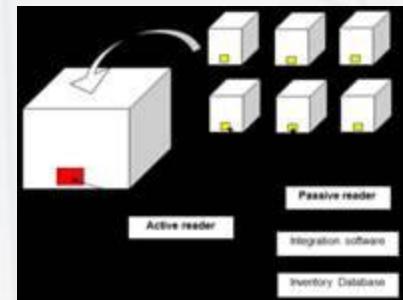


Engineering Hardware Payloads

RAID EXPERTISE



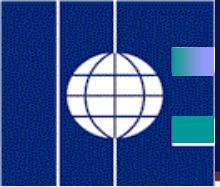
Fig. 1a Smart Rack



1b Drawer level view

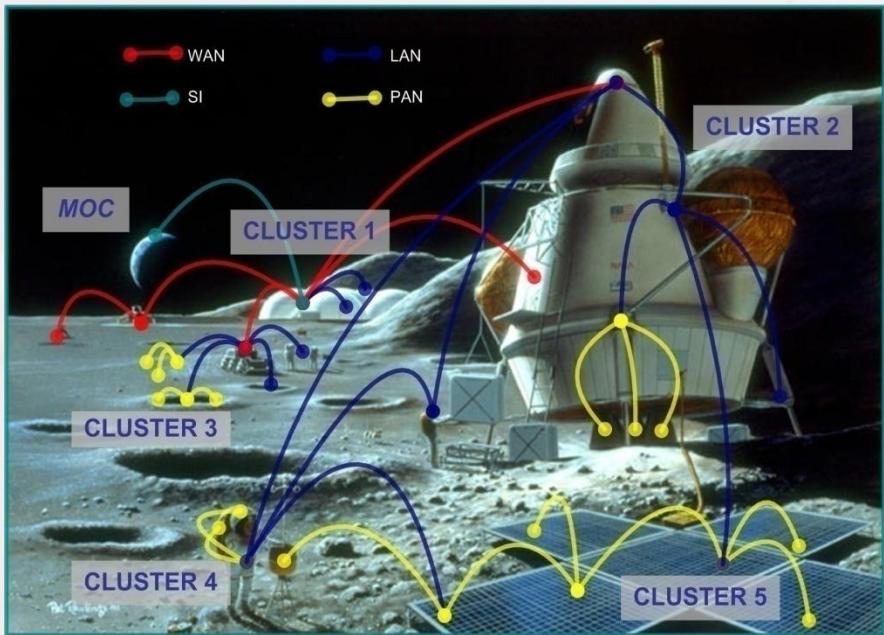
Marshall Space Flight Center /
Johnson Space Center
Rack Training and Management





RFID in Space Missions

RFID Expertise



Cargo Transfer Bags (CTBs)

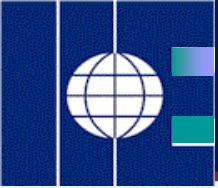


Kevin Gifford, CU-Boulder

RAID

Technology. All rights reserved.





Information Systems

RAID
EXPERTISE



Web Based Services

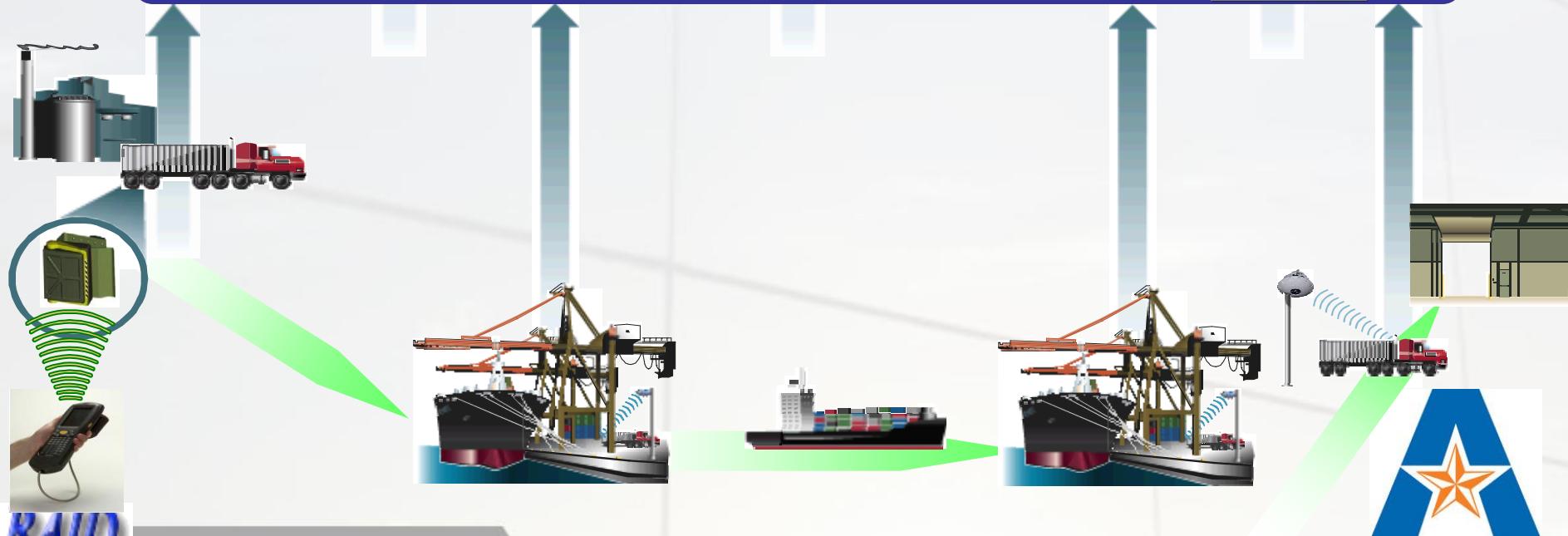
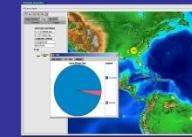


Alert Services



Data Services

The Internet of Things



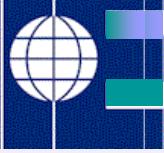


What is Industrial Engineering?

- Working with People, Machines, and Materials
- Helping to do things Better, Faster and Safer

RAID





Different Areas of Industrial Engineering

- Manufacturing Systems
- Operations Research
- Engineering Management
- Human Factors and Ergonomics
- Distribution and Logistics

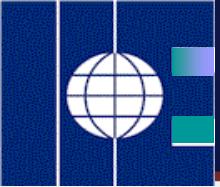




Role of Industrial Engineers

- Common activities include
 - Data Analysis, Benchmarking
 - Cost Analysis, Reduction
 - Process and Quality Improvement
 - Simulation and Flow Analysis
 - Patient, Staff and Appointment Scheduling
 - Space Planning, Layout and Utilization
 - Information Systems

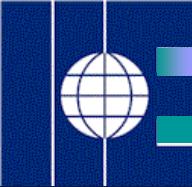




Departments Using IEs

- Systems Engineering
- Management Engineering
- CQI, TQM
- Information Systems
- Facilities Management
- Others





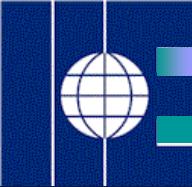
Industrial Engineering STEM Pipeline





IE Pipeline

- Trend towards IEs working in Healthcare (Institute of Industrial Engineers)
 - Educational Scenarios (Lowest to Highest Engagement and costs)
 - Student Project – Free (UG)
 - Student Sponsored Projects – Six Sigma Type (Student Fees)
 - Student Interns (UG/MS)
 - Student Co-operatives (UG/MS)
 - Full-time Employment
 - Research Projects – Faculty/RA



Six Sigma Project Overview





Student Six Sigma Project

- Goal is to save \$100,000 EBIT
- Expectation for Industries to Sponsor Students' Green Belt Certification
 - Sponsorship support such as Savings Affidavit and Other

DEFINE

- {
- Step 1 Define Project Area
- Step 2 Prepare for Project Execution
- Step 3 Select Critical Characteristics
- Step 4 Determine Targets and Specifications
- Step 5 Validate Measurement System
- Step 6 Establish Baseline
- Step 7 Determine Improvement Objectives
- Step 8 Study Process Inputs
- Step 9 Determine Potential Causes
- Step 10 Quantify Key Input Settings
- Step 11 Formulate Implementation Plan
- Step 12 Validate the Plan
- Step 13 Control Inputs and Monitor Outputs
- Step 14 Sustain the Change

MEASURE

ANALYZE

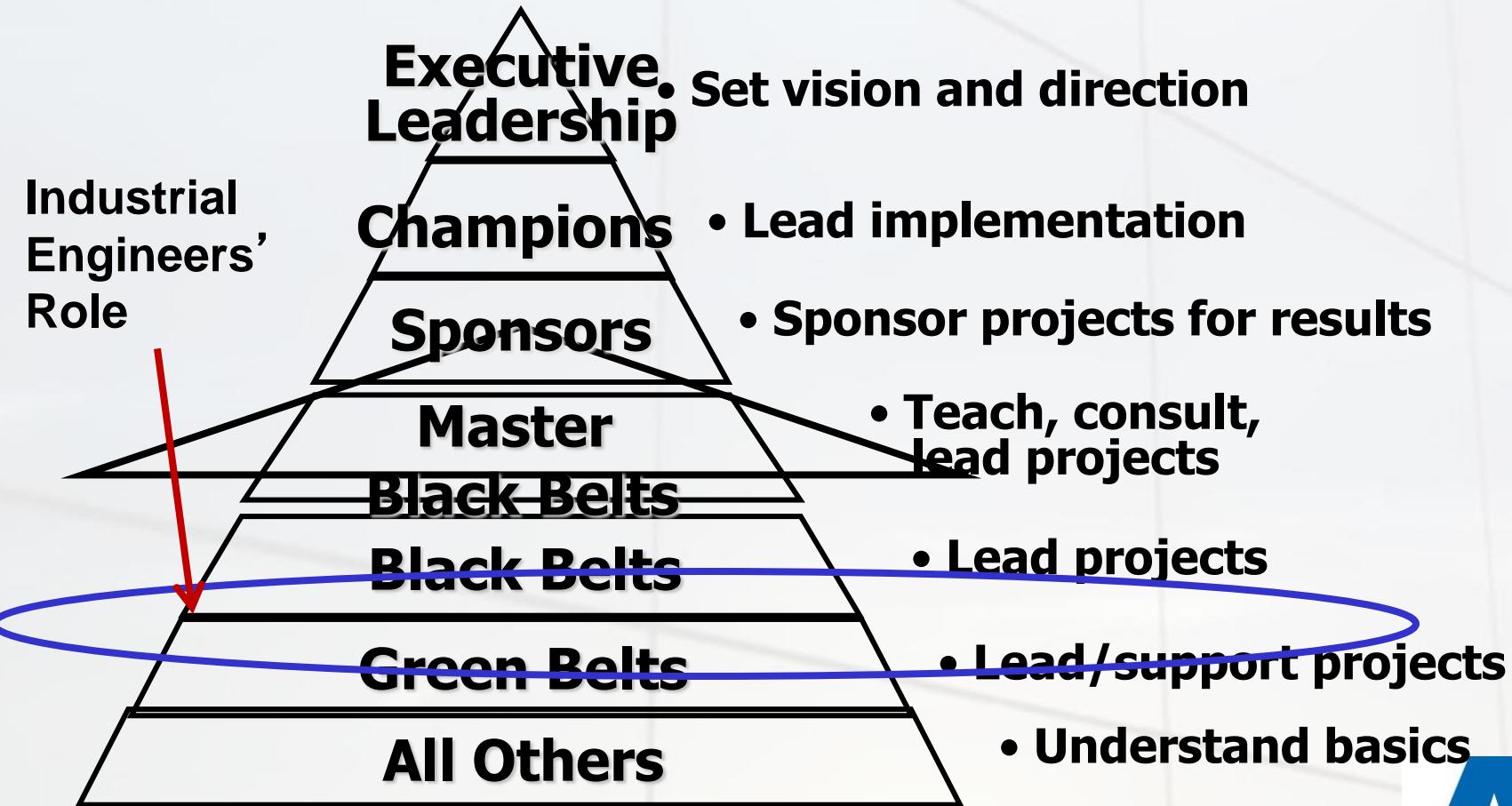
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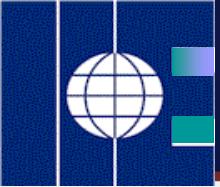
CONTROL





Role of Industrial Engineers in Six Sigma Projects





Contact Information

Erick C. Jones, PhD, CSSBB, P.E.

University of Texas Arlington

Industrial and Manufacturing Systems Engineering

Associate Professor

420 Woolf Hall

Arlington, TX 76019

ecjones@uta.edu

(817) 272-7592

