Aerospace ID Forum

UNIVERSITY OF CAMBRIDGE
Institute for Manufacturing

AUTO-ID LABS

Aerospace ID

Aerospace ID
Technologies
Programme

September 2005 – June 2007

Victor Prodonoff Jr. *Programme Director*

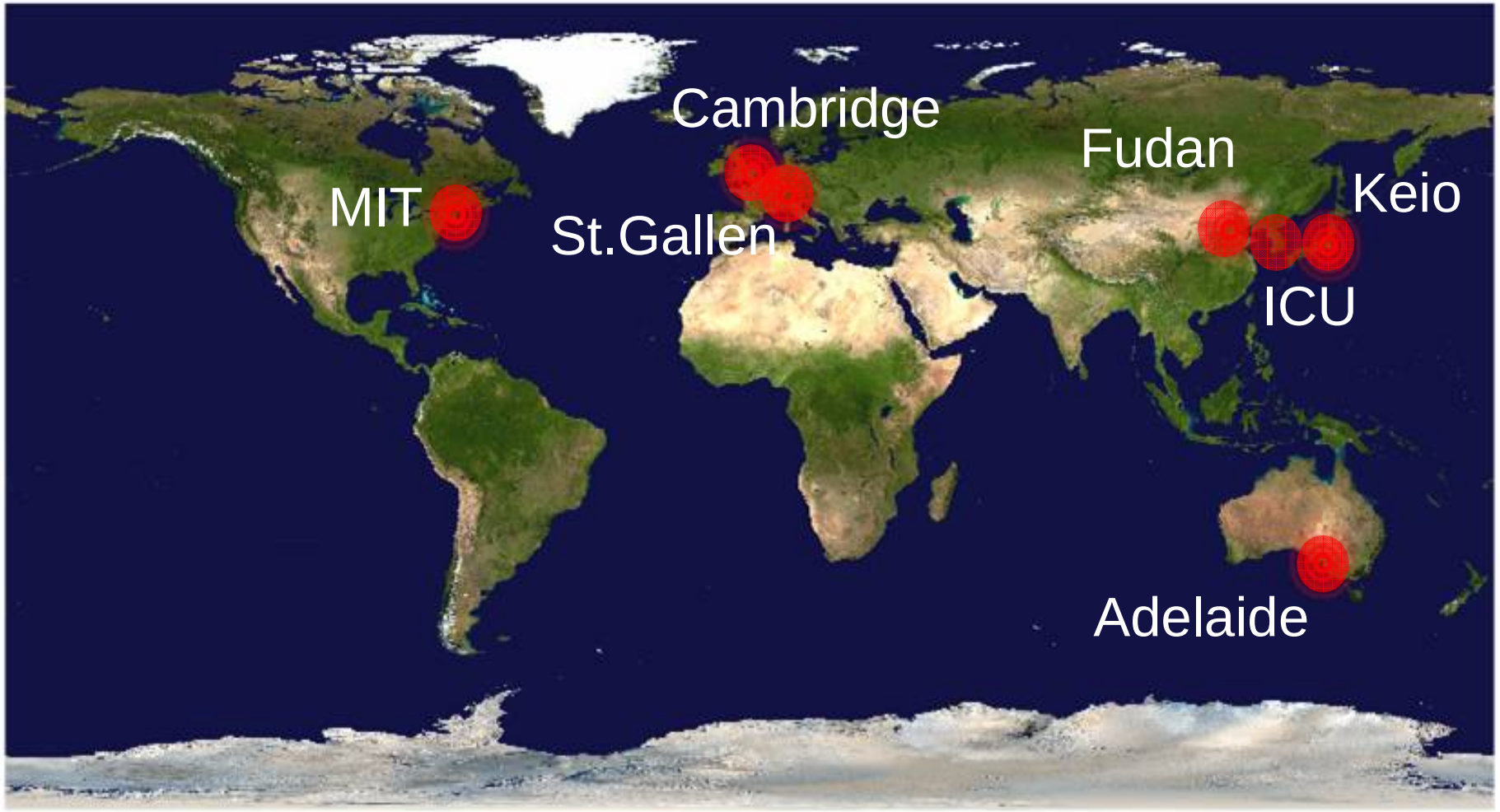
Cambridge Auto-ID Lab

- Based in the Institute for Manufacturing
- Intelligent Automation Systems research since 1995
- Ran European Auto ID Center 2000-2003

- Industrially driven research programmes

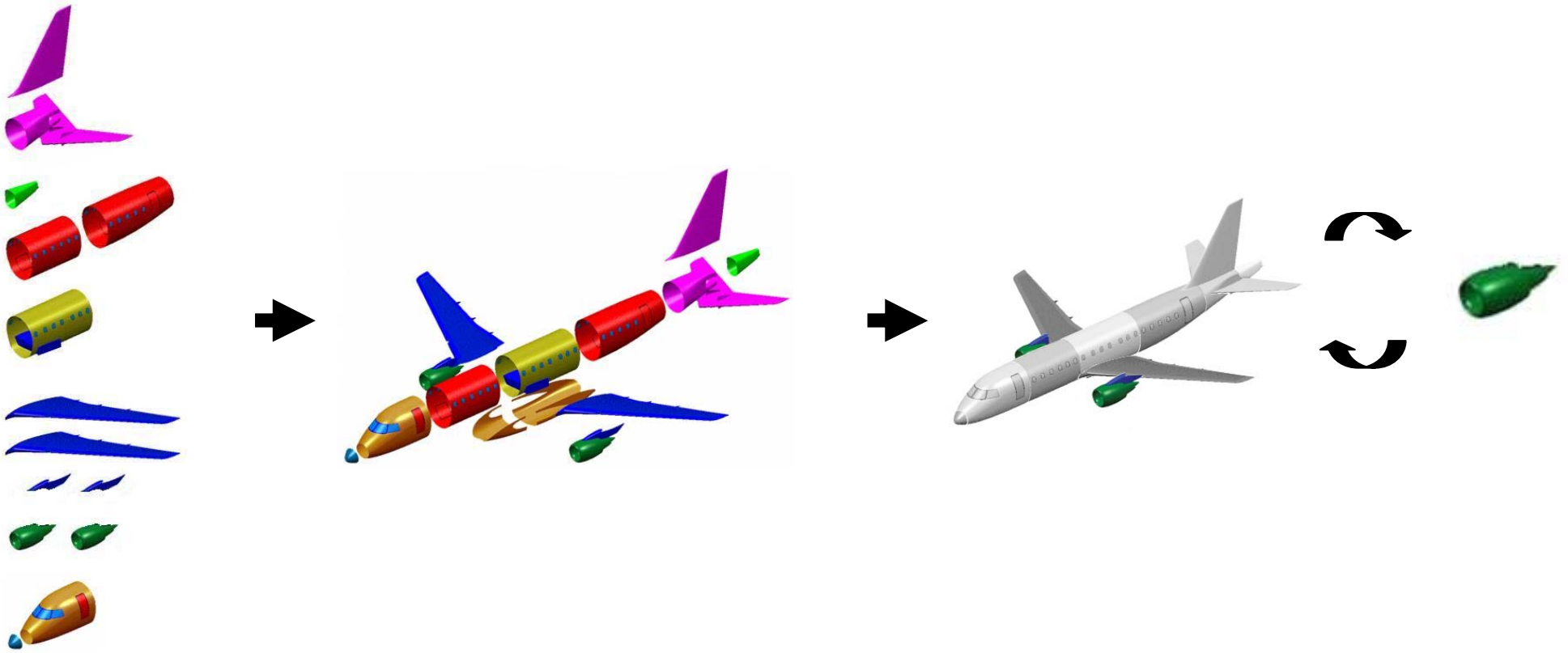
UNIVERSITY OF CAMBRIDGE
Institute for Manufacturing

7 Auto-ID Labs



Long life cycle

Suppliers Integrator Operator MRO

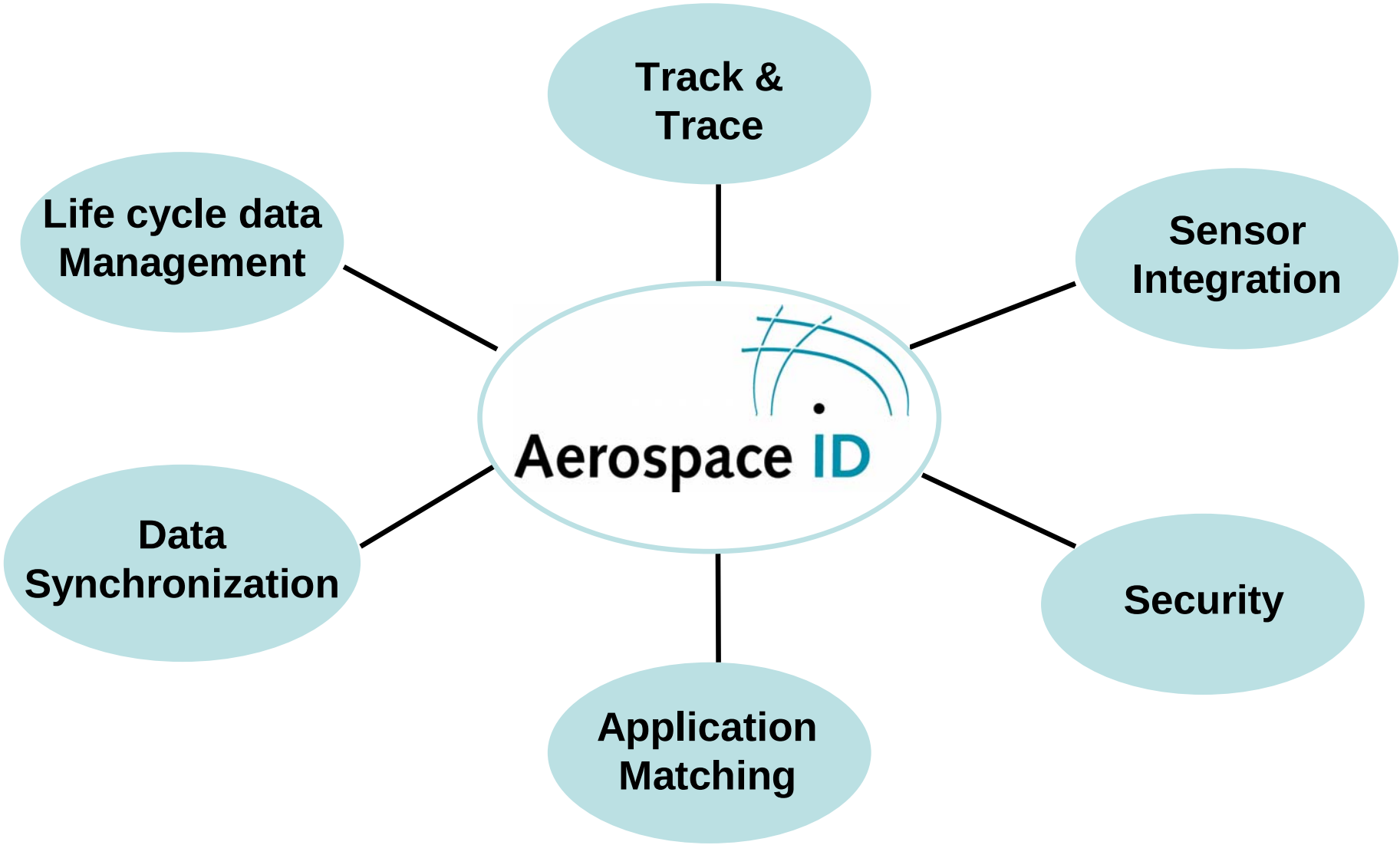


Programme facts

Remove the barriers to wide-scale Automated ID deployment in the aerospace sector through timely and effective R&D

- Industry-driven and supported
- Multiple players from the Aerospace industry
- 18 months duration *(originally)*
- Extendable in scope and in duration

Research Themes



Sponsors

AIRBUS

BOEING

EMBRAER

BAE SYSTEMS

Messier-Dowty
SAFRAN Group

AVIALL

IATA

AIR TRANSPORT ASSOCIATION

ASIANA AIRLINES

BT

T · · Systems · · ·

SITA

VI | AGENTS
value innovation agents

SPC

Afilias
GLOBAL REGISTRY SERVICES

AEROID
Identification Technologies

IFS

Removing barriers to adoption

- ROI
- Process improvement
- Standardization
- Infrastructure
- Technology selection
- What next?

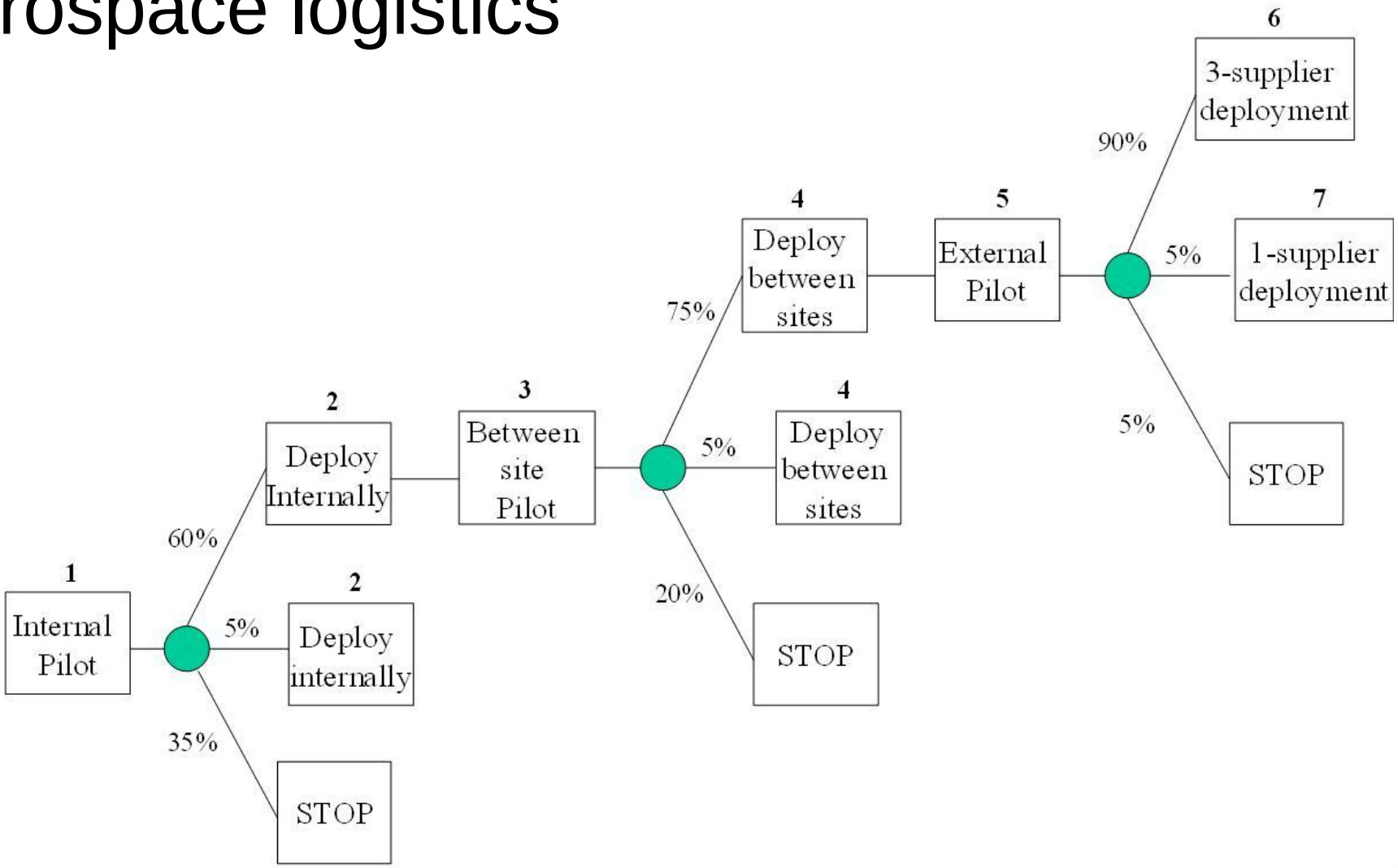
Value drivers in logistics

Inventory related

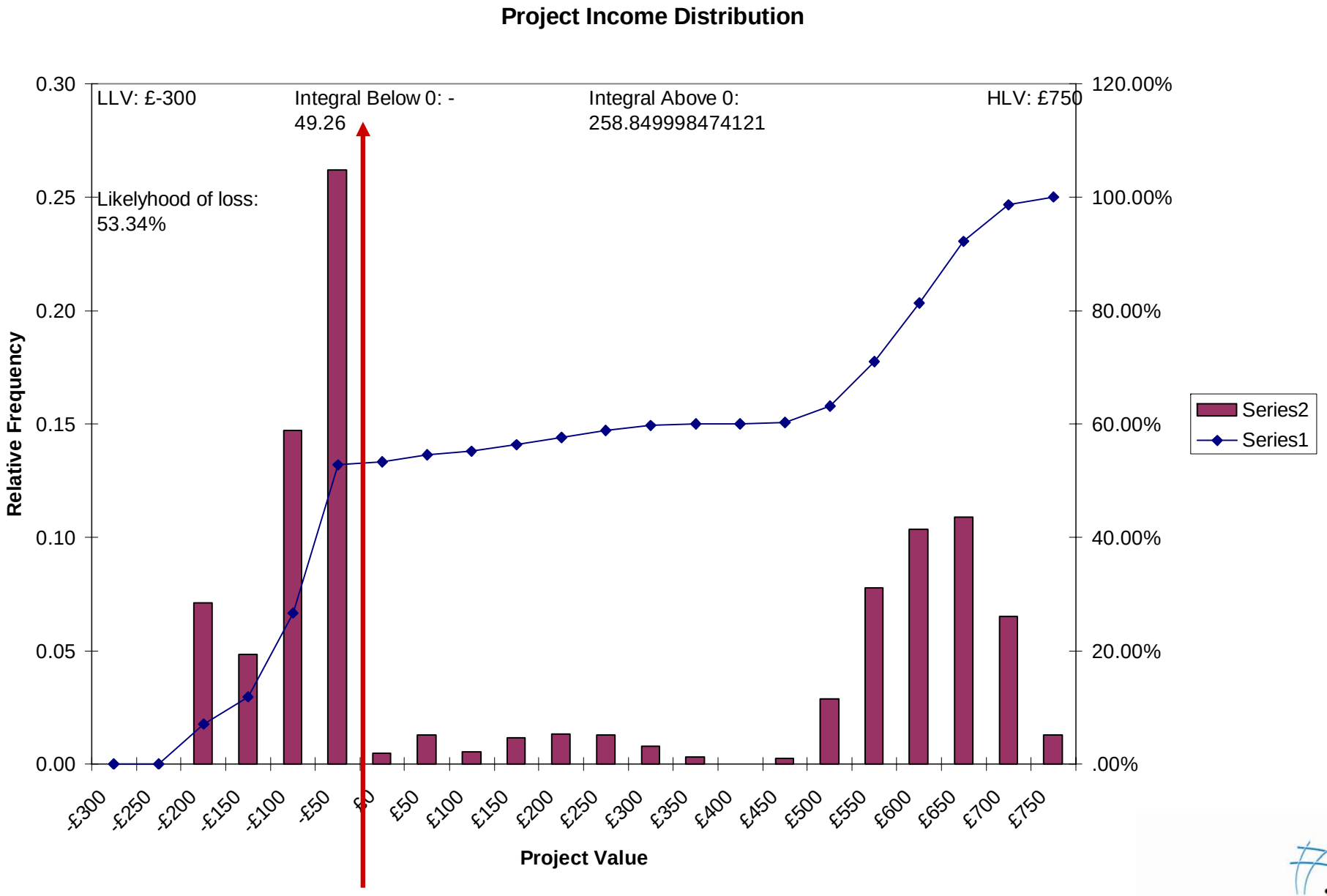
- Inventory turns — cost of good sold / inventory
- Safety stock — to avoid out-of-stocks
- Discarded inventory — obsolete, expired, damaged
- Shrinkage — stolen, misplaced, lost in transport
- Out-of-stocks — production is interrupted

ROI tool

Aerospace logistics



Decision tree output



Removing barriers

ROI

- Process improvement

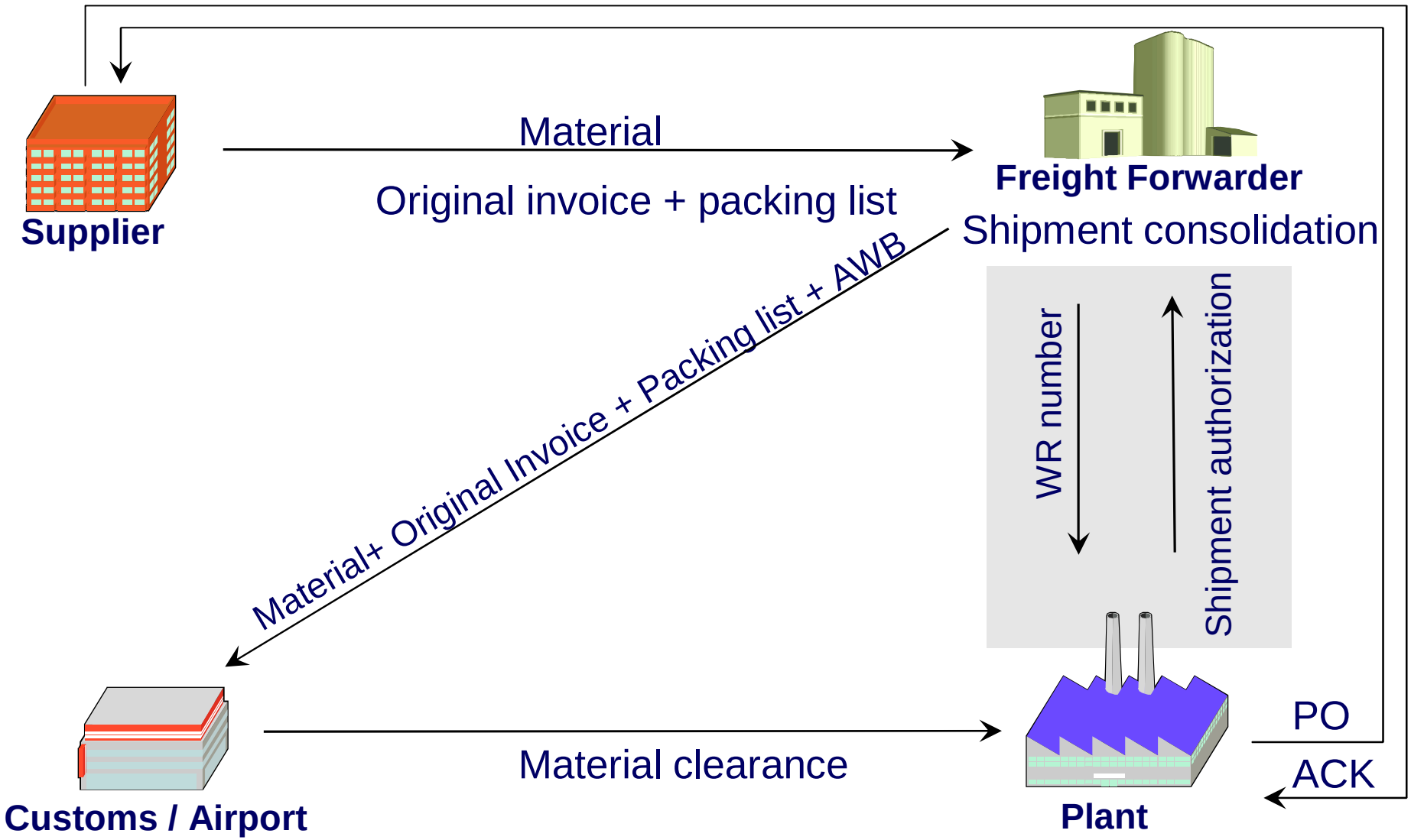
Standardization

Infrastructure

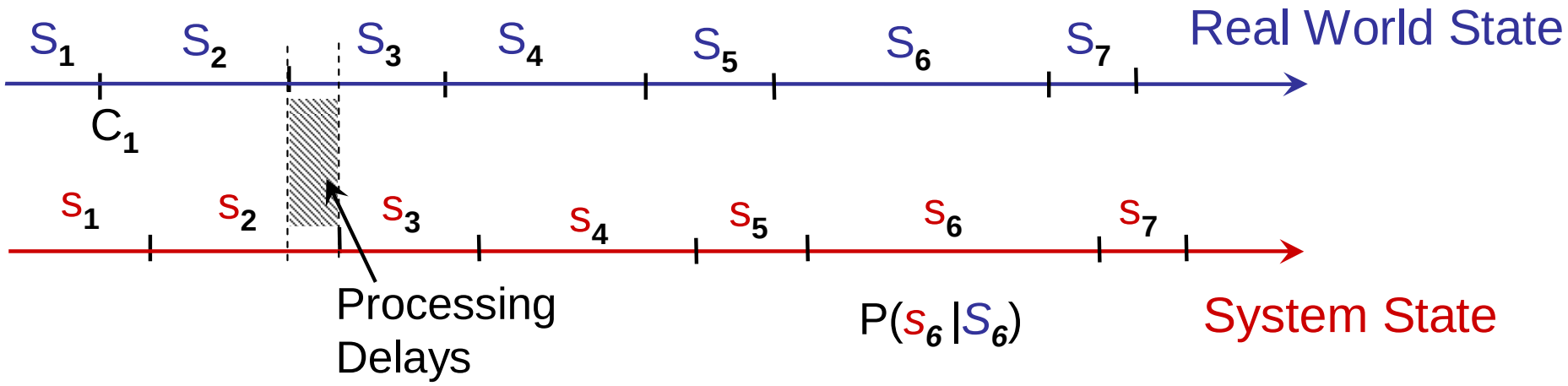
Technology selection

What next?

Logistics


Material
Original invoice + packing list
Supplier
Freight Forwarder
Shipment consolidation
Material+ Original Invoice + Packing list + AWB
WR number
Shipment authorization
Material clearance
PO
ACK
Customs / Airport
Plant

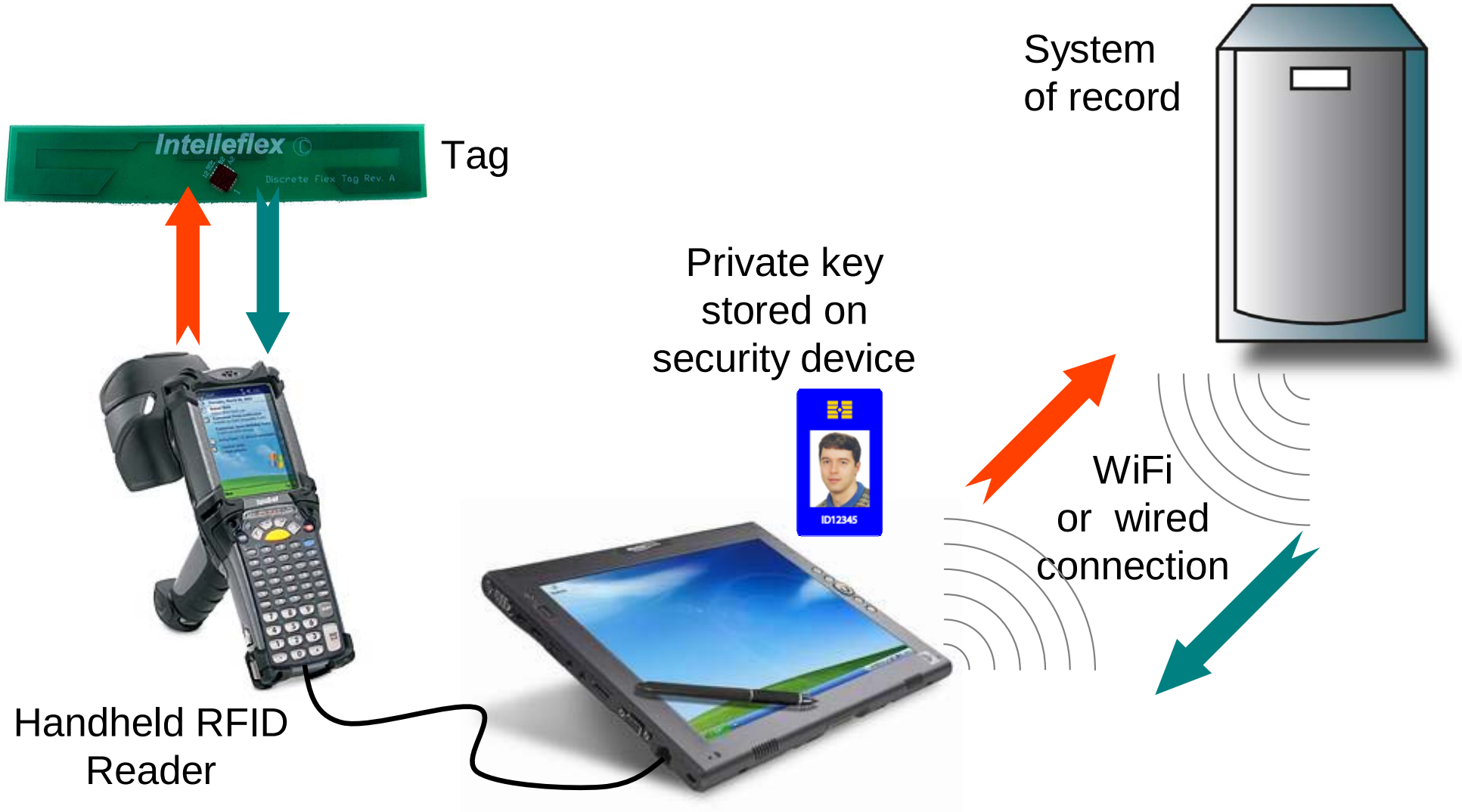
Track & Trace



- timeliness
- completeness
- accuracy

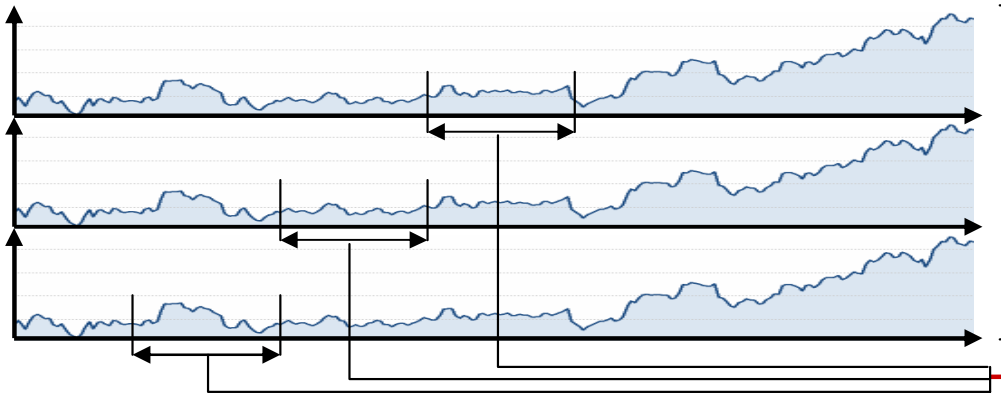
$$RIC = \frac{1.85}{2.37} = 78\%$$

Aircraft maintenance



Sensor Integration

General Problem



Sensor Fusion

→ *Merge multiple sensors*

+

Merge diverse data sources

(RF)ID-Based **Sensor Integration**

AerospaceID

Application requirements

Integration and extension

Implementation and testing

Requirements analysis

- Integration platform
- Landing gear monitoring
- Part pooling scenarios

Technology development

- Networked RFID/sensor integration architecture (with Keio & ICU Auto-ID Labs)

Lab infrastructure development

- Preparation for demos, tests, domain applications

Removing barriers

ROI

Process improvement

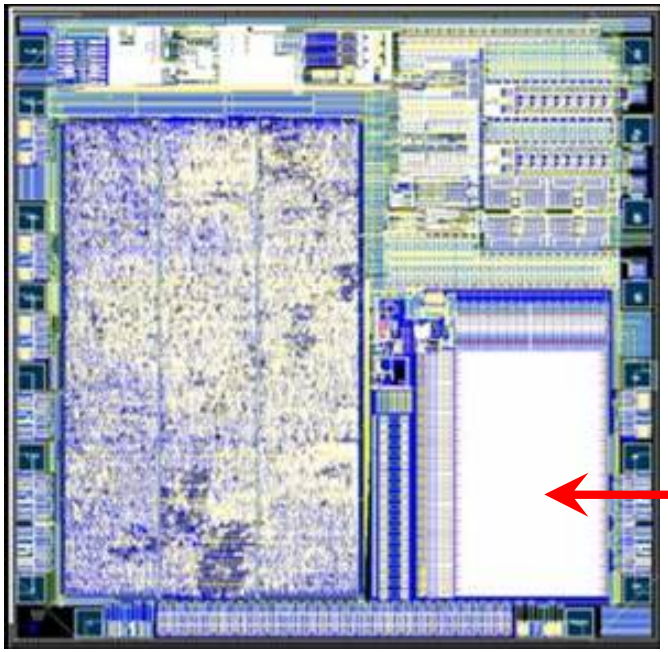
- Standardization

Infrastructure

Technology selection

What next?

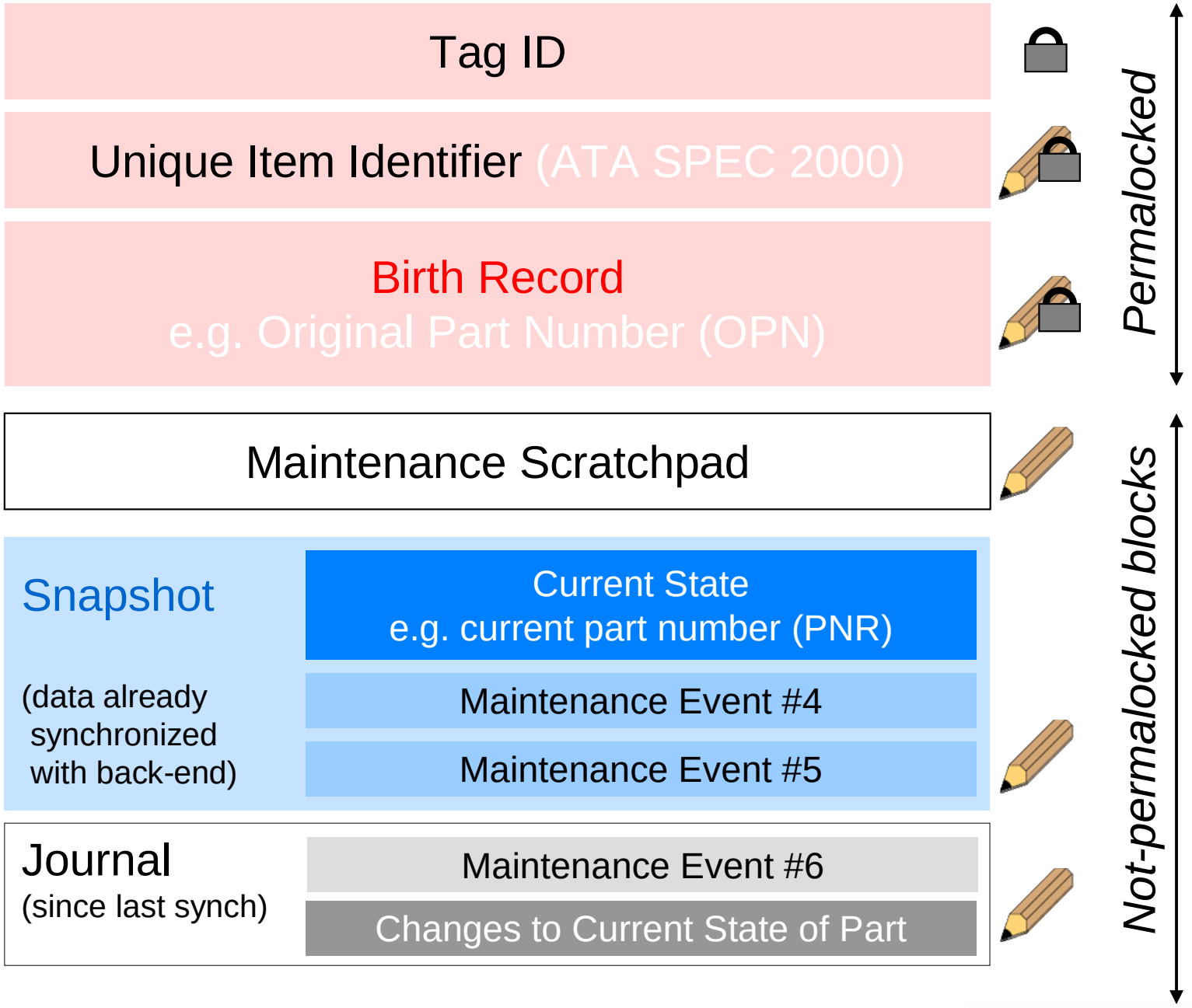
High-memory tags



64Kbit memory block

Tag memory

AIR TRANSPORT ASSOCIATION



Aerospace ID Forum

Identifier

AIR TRANSPORT ASSOCIATION

1

CAG 3 9 8 E 3 / SER 1 8 7 0 M 3 R 0 1 9 P P A 8 5

urn:epc:id:ata1: 398E3 . 1870M3R019PPA85

2

CAG 3 9 8 E 3 / PNO 1 9 Q B A 8 5 / SEQ 1 4 7 3 M 3 R C

urn:epc:id:ata2: 398E3 . 19QBA85 . 1473M3RC

3

CAG 3 9 8 E 3 Serialization # 7623189 Manufacture date May 2007

urn:epc:id:ata3: 398E3 . 7623189 . 05.2007

Removing barriers

ROI

Process improvement

Standardization

- Infrastructure

Technology selection

What next?

Available today!

Removing barriers

ROI

Process improvement

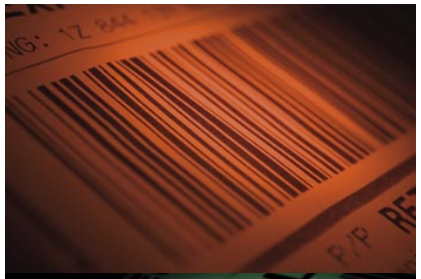
Standardization

Infrastructure

- Technology selection

What next?

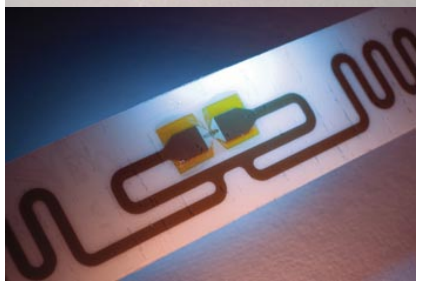
Automatic ID



Bar code

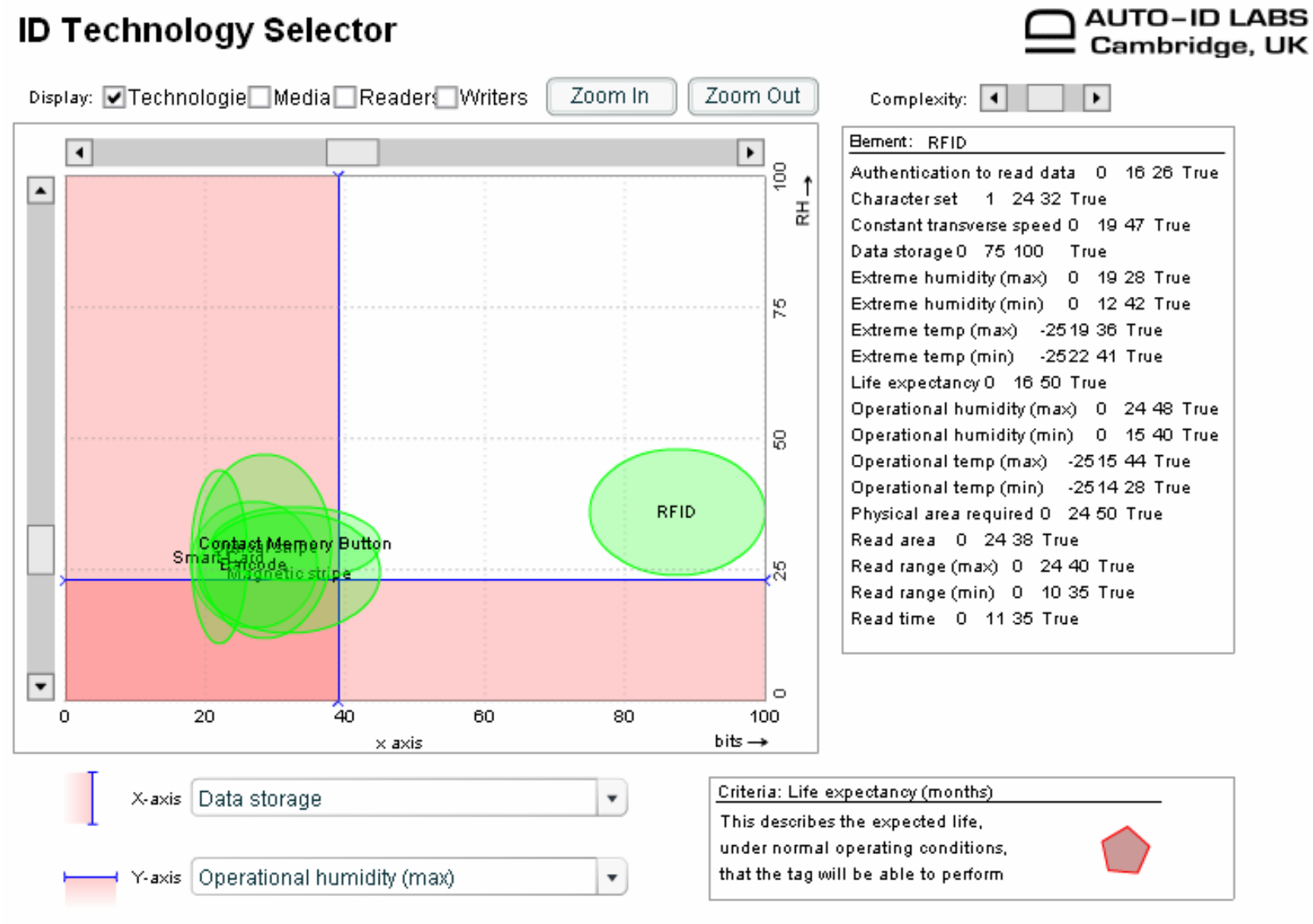
2D bar code

Contact memory button



Passive and active RFID

Tool


ID Technology Selector
AUTO-ID LABS
Cambridge, UK
Display: Technologie Media Readers Writers
Zoom In
Zoom Out
Complexity:
Element: RFID
Authentication to read data 0 16 26 True
Character set 1 24 32 True
Constant transverse speed 0 19 47 True
Data storage 0 75 100 True
Extreme humidity (max) 0 19 28 True
Extreme humidity (min) 0 12 42 True
Extreme temp (max) -25 19 36 True
Extreme temp (min) -25 22 41 True
Life expectancy 0 16 50 True
Operational humidity (max) 0 24 48 True
Operational humidity (min) 0 15 40 True
Operational temp (max) -25 15 44 True
Operational temp (min) -25 14 28 True
Physical area required 0 24 50 True
Read area 0 24 38 True
Read range (max) 0 24 40 True
Read range (min) 0 10 35 True
Read time 0 11 35 True
RH
100
75
50
25
0
0
20
40
60
80
100
x axis
bits
RFID
Contact Memory Button
Smart Label
E-Article
Magnetic stripe
X-axis
Data storage
Y-axis
Operational humidity (max)
Criteria: Life expectancy (months)
This describes the expected life,
under normal operating conditions,
that the tag will be able to perform

Outputs

- Tracking and Tracing

  T&T performance measurement framework;
  A practical tool for deployment decision and ROI calculation.

- Life Cycle ID and Data Management

  An EPC-compatible representation of the ATA SPEC 2000 identifier;
  Format and contents of Birth and Maintenance records;
  Discovery and Notification Services.

- Data Synchronization

  A prototype of the synchronization process, meeting requirements from the Boeing.

Outputs

- Sensor Integration

  An innovative framework for the classification of different integration approaches and architectures;

- ID Application Matching

  An application matching tool to help users choose from available Automatic ID technologies, given a specific operational environment and its constraints.

Removing barriers

ROI

Process improvement

Standardization

Infrastructure

Technology selection

- What next?

Ongoing research

- Services & support engineering

- Airport operations

- Other industrial sectors

  BRIDGE, PROMISE, SMART, IPROMS

Victor Prodonoff Jr.

Univ. of Cambridge Auto-ID Lab

vp255@cam.ac.uk

+44 (1223) 764-306 main

765-608 direct

Aerospace ID Forum

UNIVERSITY OF CAMBRIDGE
Institute for Manufacturing

AUTO-ID LABS