

# PROMISE



## Product Lifecycle Management and Information Tracking using Smart Embedded Systems

**EU FP6 IP 507100  
IMS 01008**





### European Union

Research partners (**BIBA, Cambridge University, CIMRU, HUT, ITIA-CNR, SINTEF, POLIMI**): system modeling, knowledge management and logistics and decision making.

Solution providers (**SAP, Infineon, Indyon, Stockway, InMediasP, COGNIDATA**): Infineon, Indyon and Stockway will develop e-integrated hardware and software infrastructure of PROMISE. **SAP, COGNIDATA** and InMediasP will be responsible for the Product Data and Knowledge Management issues.

Industrial partners (**Centro Ricerche FIAT, Caterpillar, Merloni, WRAP, INTRACOM, FIDIA**): specifications and requirements tasks, scenario specification and testing & evaluation.

### Switzerland

Research partner (**EPFL**): DFX and Product Data and Knowledge Management issues in close collaboration with the respective CH & EU participants.

Industrial partners (**Bombardier Transportation, ENOTRAC**) are interested in the information flow and management for design, service and maintenance of railway systems.

# IMS PROMISE

## regions & partners



### Japan

**Research partners (University of Tokyo, Waseda University, Chuo University)** will develop the product life cycle models, simulation algorithms and tools for the validation of the PROMISE developments.

**Industrial partners (Toyota Motors)** will contribute as end-users mainly for testing the results produced in Japan.

### USA

**Research partners (University of Wisconsin-Milwaukee, Stanford University, University of Michigan)** will develop e-Maintenance and e-Service web-enabled systems used in the MOL phase of a product's life cycle.

**Industrial partners** linked with the **Intelligent Maintenance Systems Center (IMS)** run by the above academic organisations will provide the necessary input from the industrial point of in the above activity.

### AUSTRALIA

**Research partners (IRIS)** will develop EOL management systems.

**Industrial partners (MTI, AEEMA)** linked with IRIS will provide the necessary input from the industrial point of in the above activity.





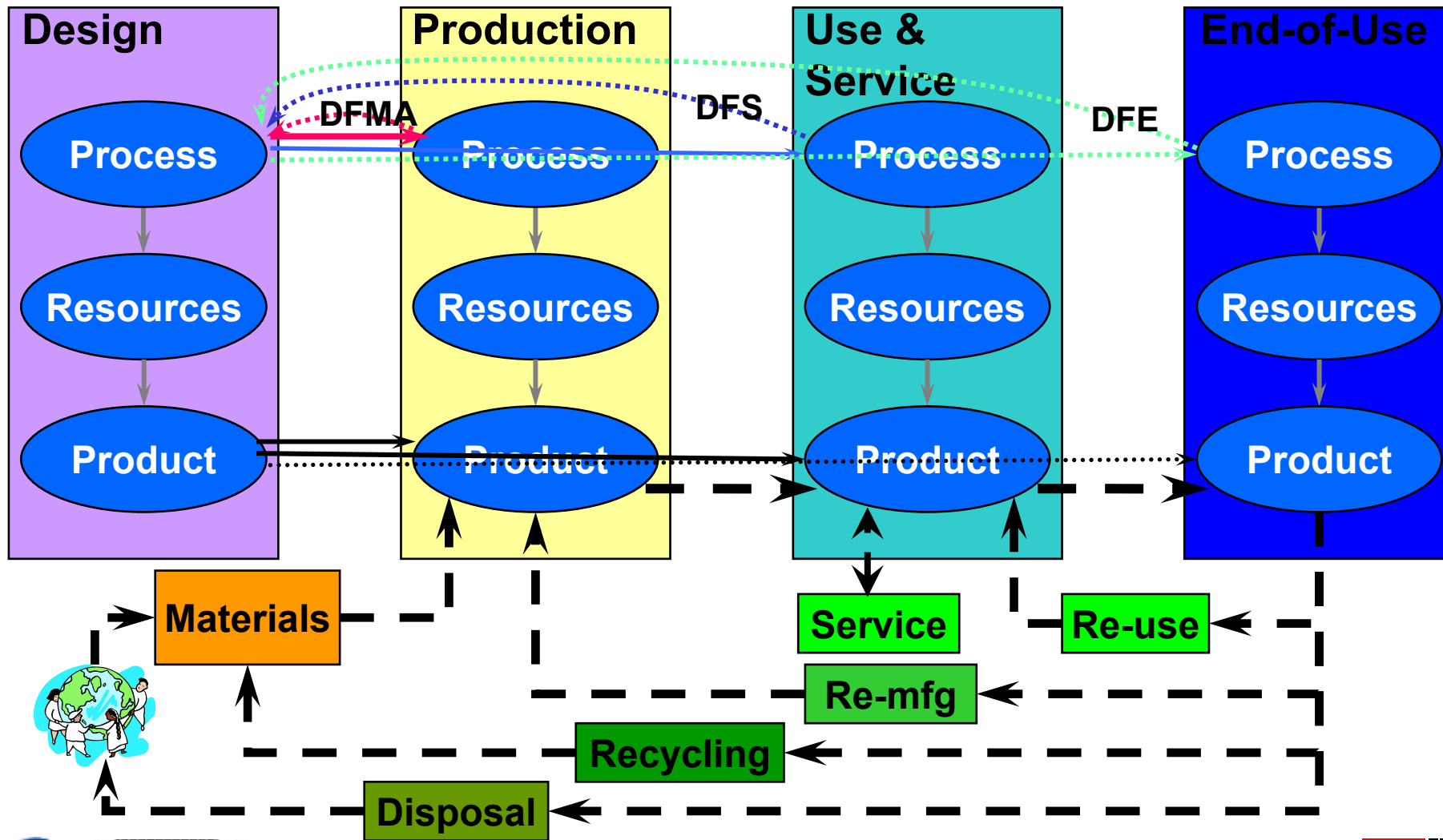
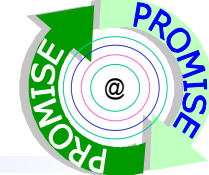
# Closed-loop PLM

## The PROMISE approach



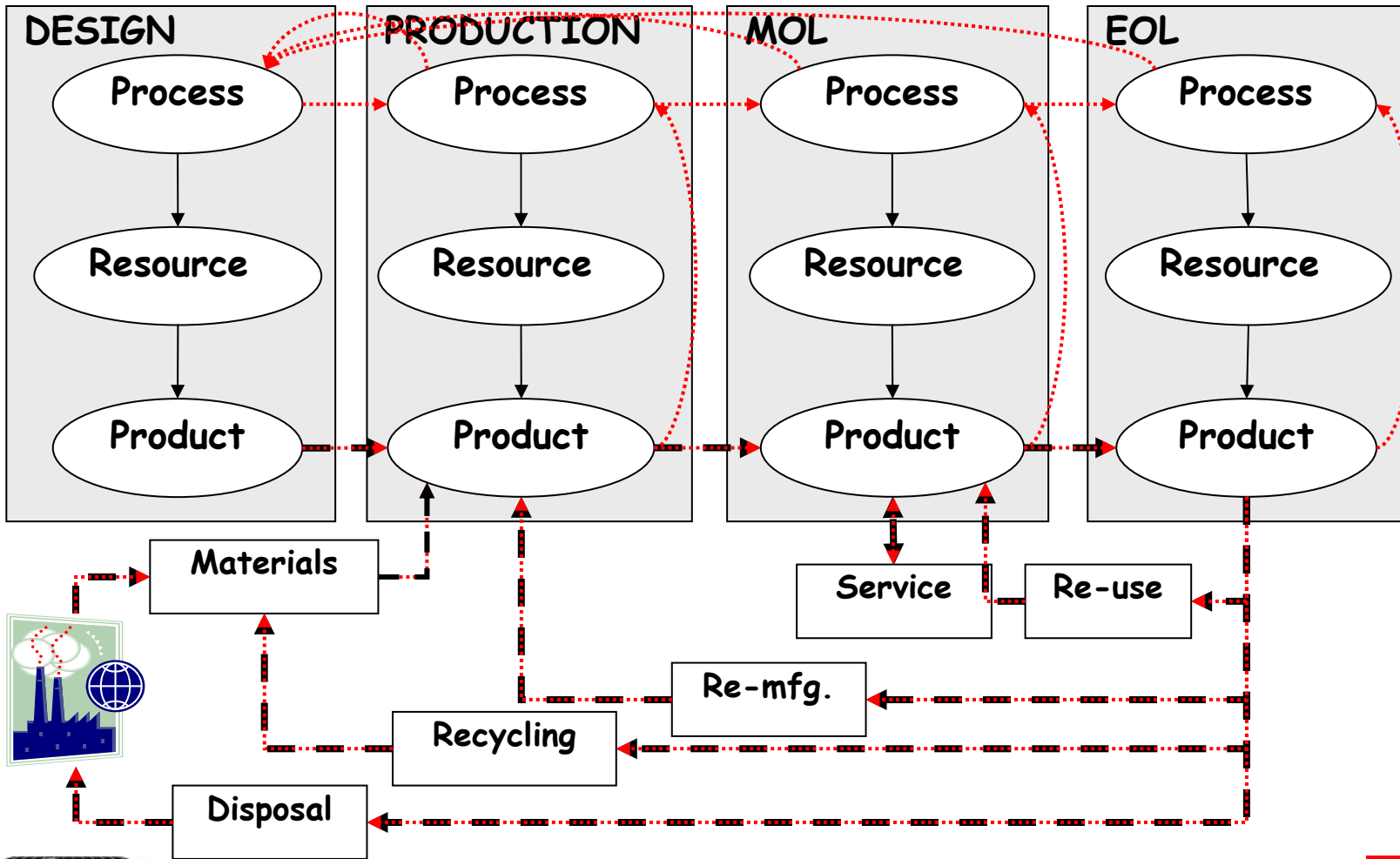
# Product System flows

Material flows - - - -



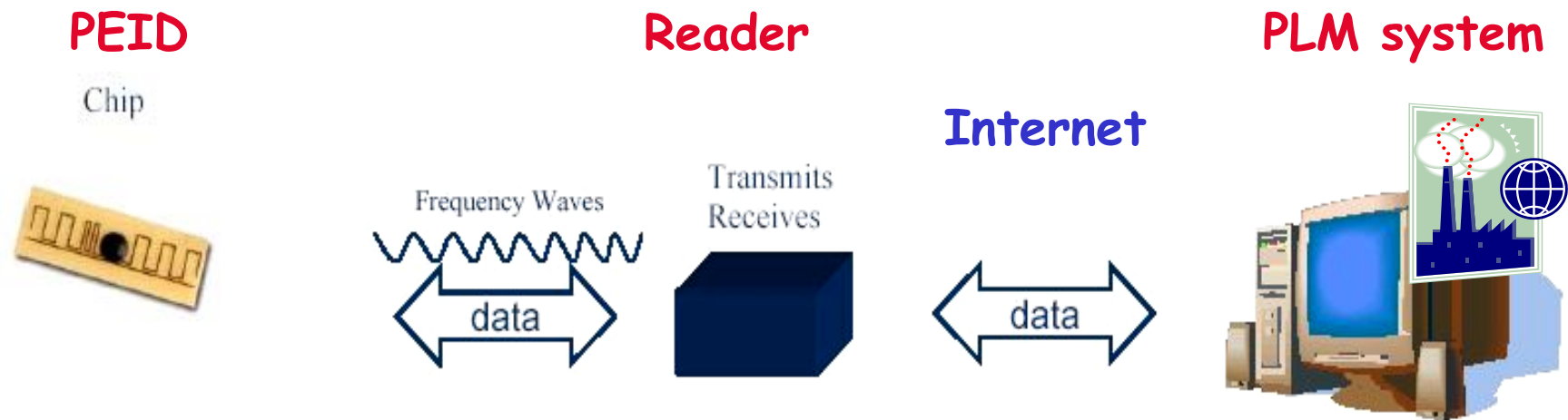
# PROMISE:

## Closing the information loops

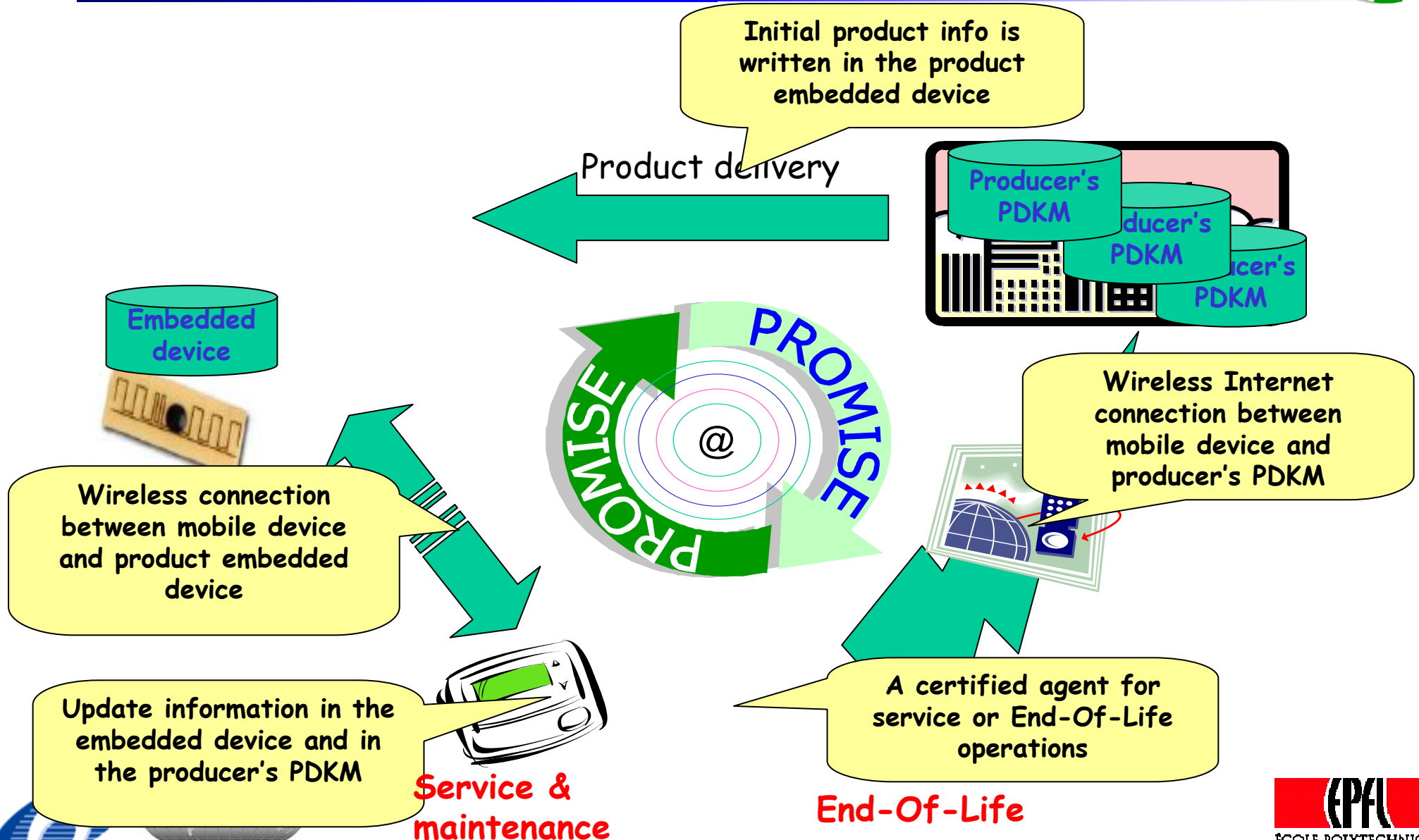


# PROMISE enabling technologies

- A possible & feasible approach:
  - ⊕ Applications based on PLM systems enabled via PEID and wireless Internet



# Ideas in a nutshell





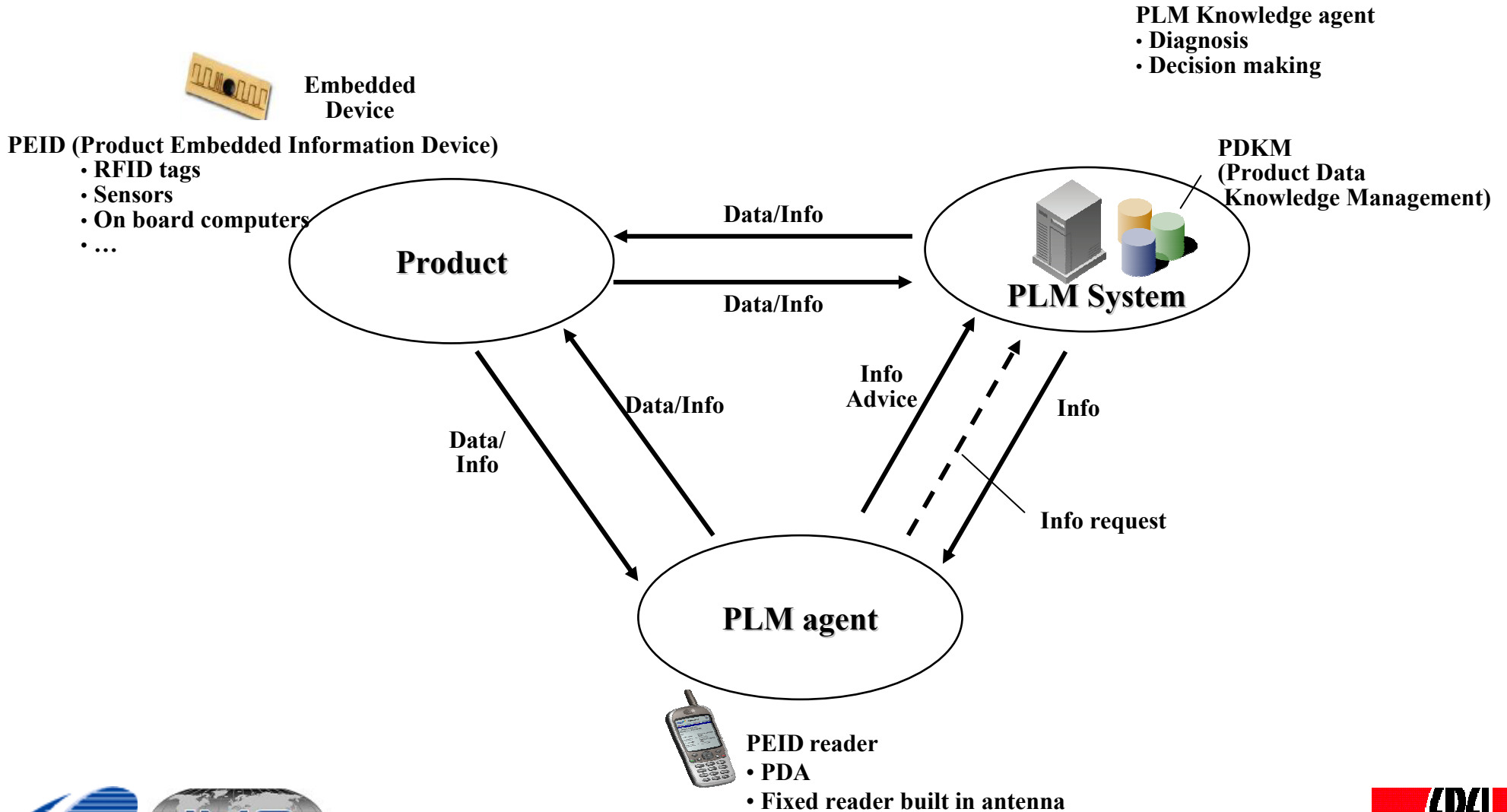
# Product identification technologies



- With emerging technologies, in particular, product identification technologies, the whole product lifecycle can be made visible and controllable.

Technologies	Definition	Product lifecycle		
		BOL	MOL	EOL
RFID	Radio Frequency IDentification: Communication technology for collecting and transferring information via radio waves	•	•	•
EPCglobal	Electronic Product Code: Product unique code	•	•	•
ID@URI	Identifying physical product items and linking to the product agents that handle their information	•	•	•
WWAI	Application-level protocol for distributed article information, peer-to-peer networking	•	•	•
GPS	Global Positioning Systems: Satellite navigation system used for determining one's precise location and providing a highly accurate time reference	—	•	•
GIS	Geographical Information System: Information system capable of assembling, storing, manipulating, and displaying geographically-referenced information	—	•	•

# Concept of PROMISE: Closed loop PLM



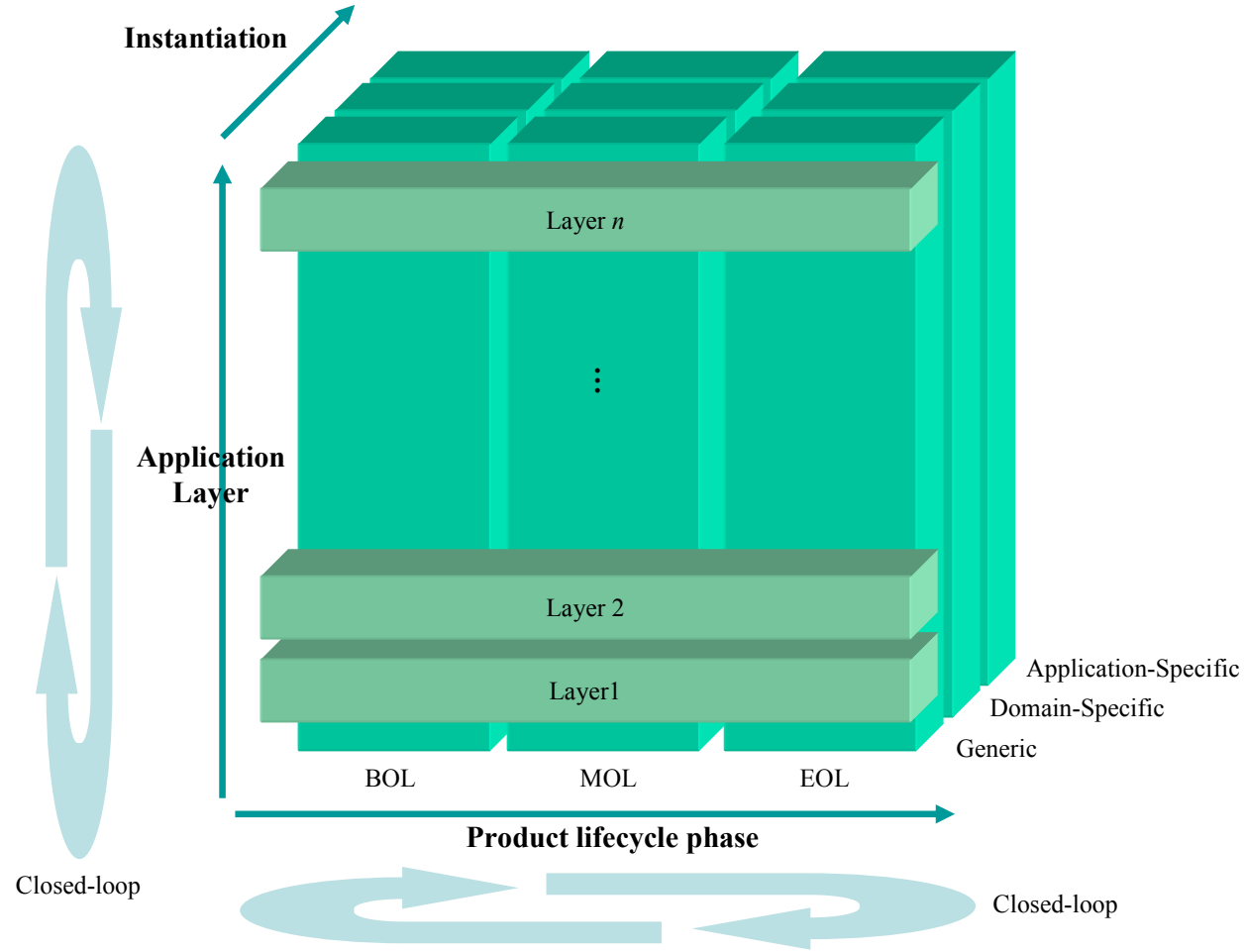
# Characteristics of closed-loop PLM



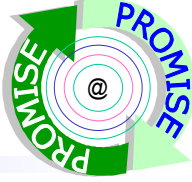
- Using PEID
  - ✓ Product identification
  - ✓ Memory
  - ✓ Communication unit
  - ✓ Power management
  - ✓ Data processing
- Horizontally closed
  - ✓ The product lifecycle information can be used to streamline operations of middle of life (MOL) and end of life (EOL). The product lifecycle information also goes back to the designer and producer (BOL) so that the information flow can be horizontally closed over whole product lifecycle
- Vertically closed
  - ✓ Information control flow is vertically closed. This mean that based on gathered data by PEID and sensors, we can analyze product related information and take some decisions on behavior of products, which will affect data gathering again.



# Framework for closed-loop PLM

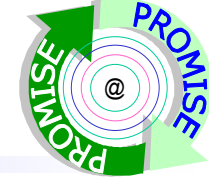


# PLM modeling



- Management of whole product lifecycle activities,
- Management of product related data and resources,
- Collaboration between customers, partners, and suppliers,
- Enterprise's ability to analyze challenges and bottlenecks, and make decisions on them.

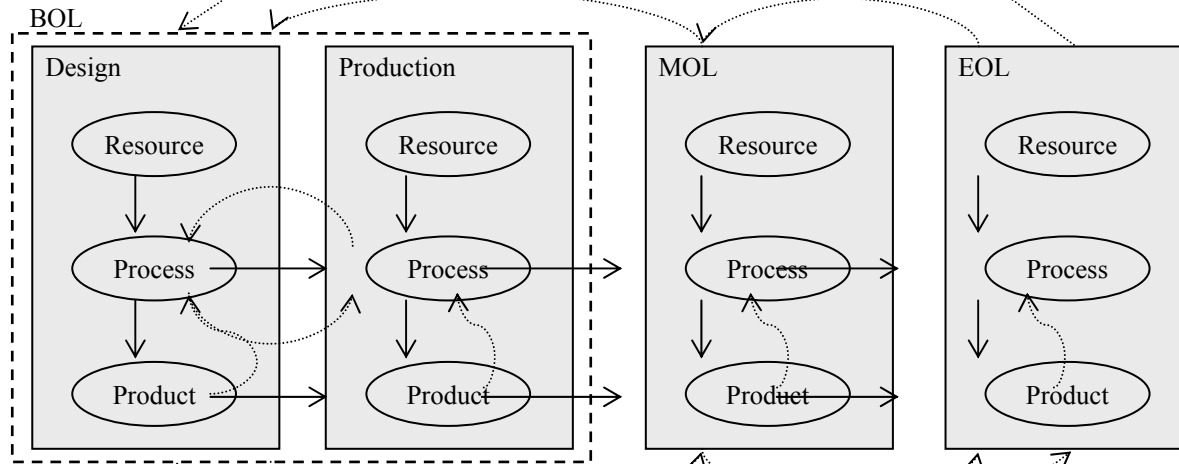
# Lifecycle information



- Mode of use,
- Conditions of retirement and disposal,
- Recovery information

- Product usage info.,
- Failure,
- Maintenance,
- Service event

- Product status,
- Recovery information

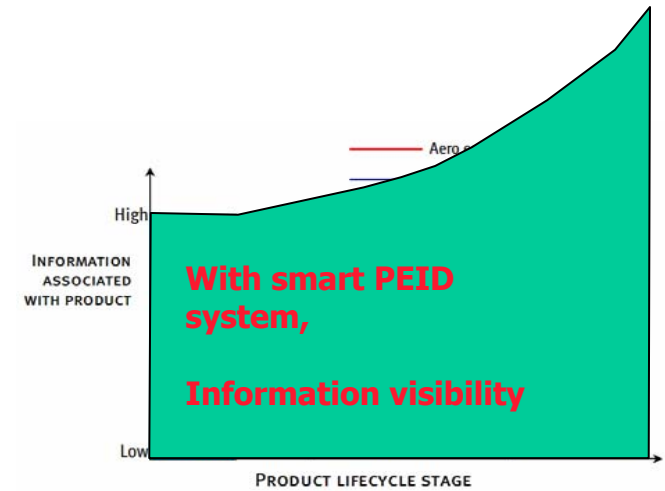


- Product definition data,
- Up-to-date product data

- History data

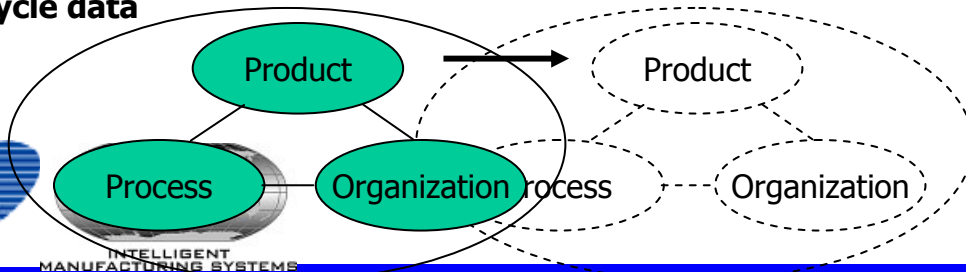
- Assembly/disassembly info.,
- Material info. for reuse

Information flow

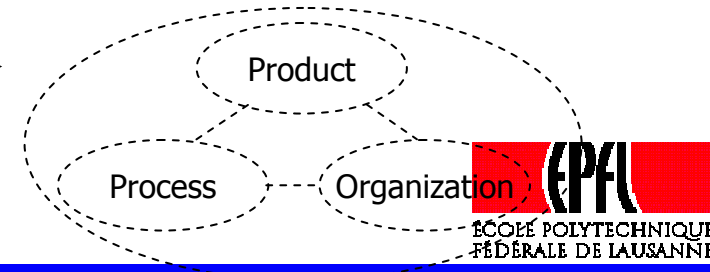


Source: Thomas et. al., IEEE 1999

## Lifecycle data



Changed, Accumulated



# Product lifecycle information modeling



- Which lifecycle object should be traced?
- Relations between lifecycle objects

## Contents

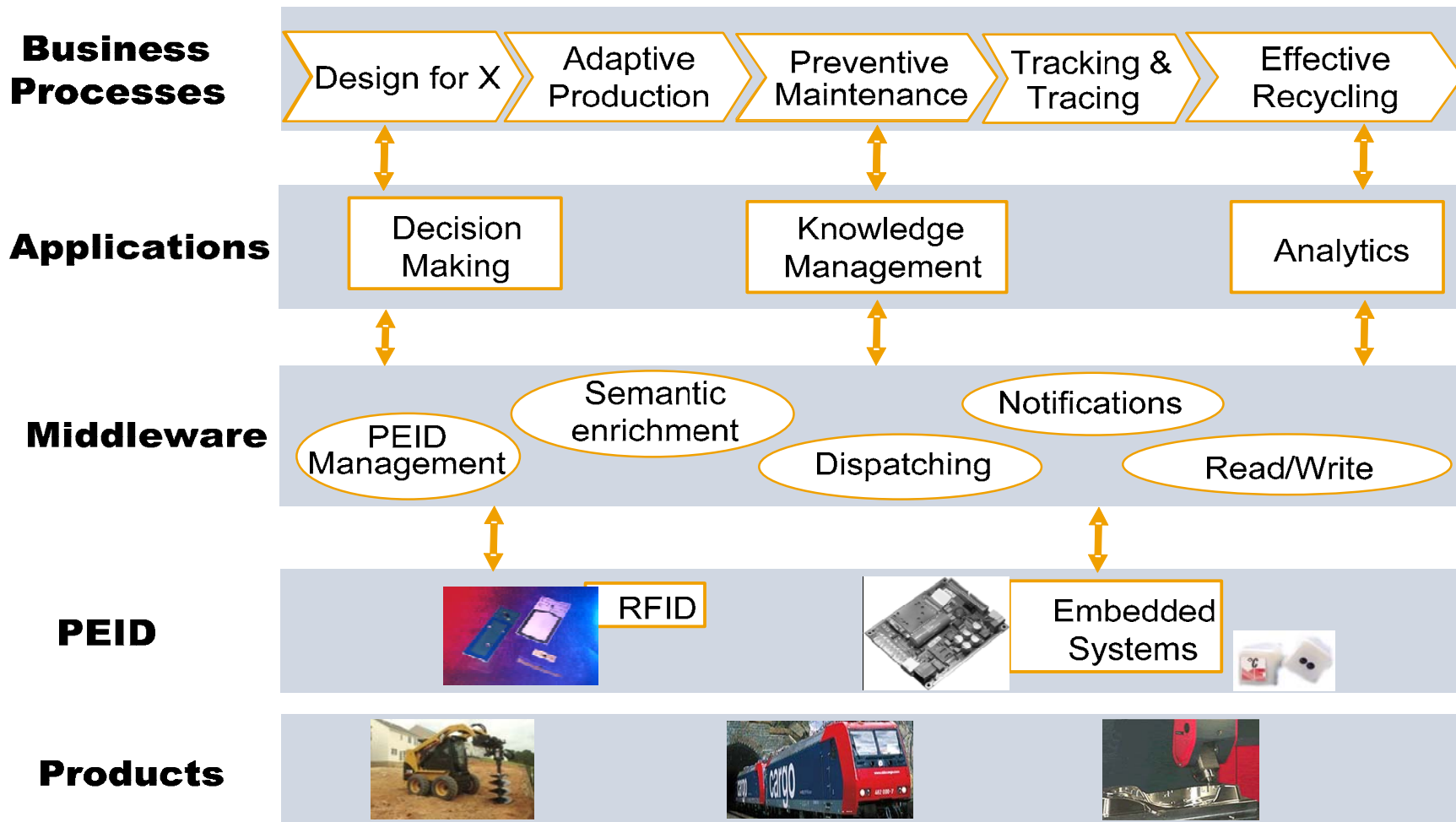
- Use conditions
  - Number of use cycles
  - Runtime in each use cycle
  - Temperature
  - Humidity
  - Voltage, Current, Power
  - Service data: data on service inspections, parts replaced or repaired.
  - Demand for spare parts
  - Demand and prices for components, materials, etc.
  - Disassembly cost
  - Recycling cost
  - Chemicals prohibited
- Logistics, supply chain
  - Item identification
  - Specifications
  - Order numbers
  - Locations
  - Update transactions

## Meta

- Who are you?
- Who created you?
- Who owns you now?
- What kind of a product are you?
- Do you contain hazardous materials?
- Who repaired you?
- What has been happening to you?
- When are you going to expire?
- Where are you going?
- What is your destination?
- When should you arrive at your destination?
- Are you on the right route?
- Are you going in the right direction?
- To which order do you belong?
- To what shipment do you belong?
- To what sub-assembly do you belong?
- What service procedure was carried out on you?
- Who is responsible for what information and data?
- In which form and where do the data exist?
- How can the data be accessed?

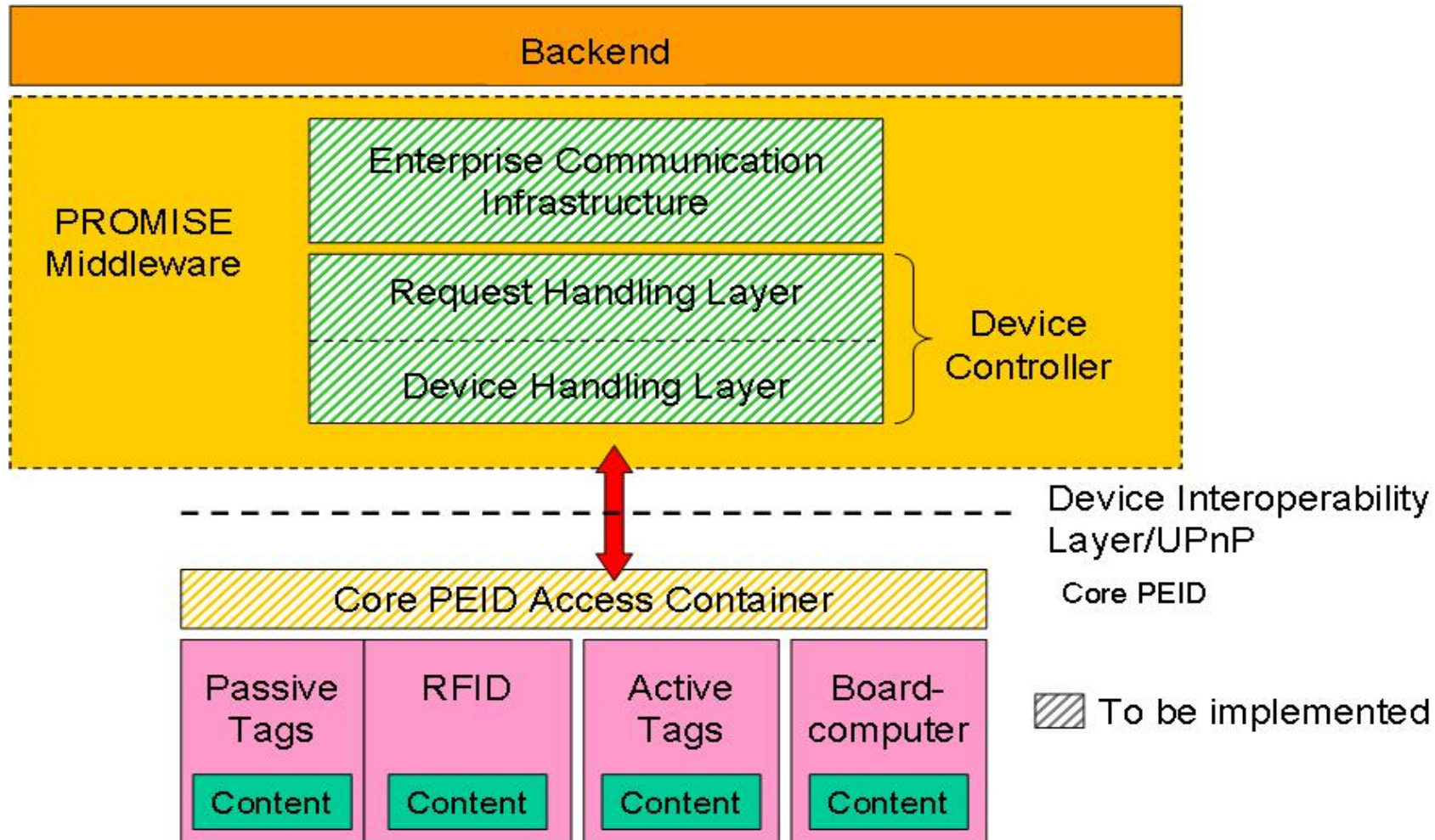


# Overview System Architecture

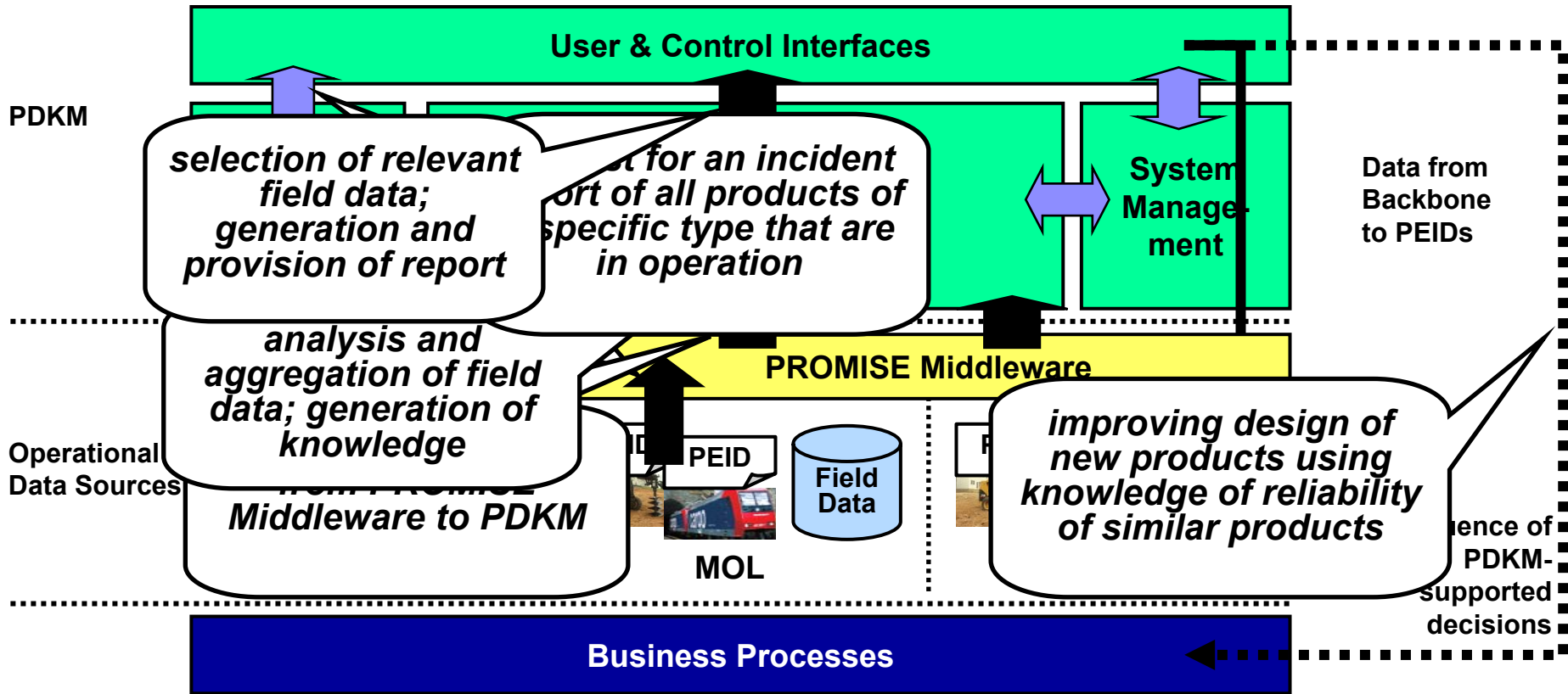




# PROMISE Component Architecture: Functional View



# PROMISE PLM scenario



Metadata flow

Data flow

Control flow



# PROMISE closed-loop PLM

## Instantiation



Generic	Domain-specific		Application-specific	
			Target product	Main issue
Generic model for closed-loop PLM	Lifecycle phase-specific	BOL-DfX BOL-Reconfiguration of production system BOL-Production logistics and warehouse management MOL-Predictive maintenance EOL-Decision making	Locomotive	DfX
			Car bumper (Plastics material)	Production logistics and warehouse management
			Heavy vehicle	Predictive maintenance
			Passenger vehicle	EOL decision making
			Tractor	MOL decision making
			Target product-specific	Automotive Machinery product Network device White goods Locomotive
	Milling machine	Predictive maintenance		
	Gas boiler	Predictive maintenance		
	Passenger vehicle	Reconfiguration of Production system		
	Broad band access system	MOL maintenance/service		
	Refrigerator	Preventive maintenance		



# PROMISE Demonstrators

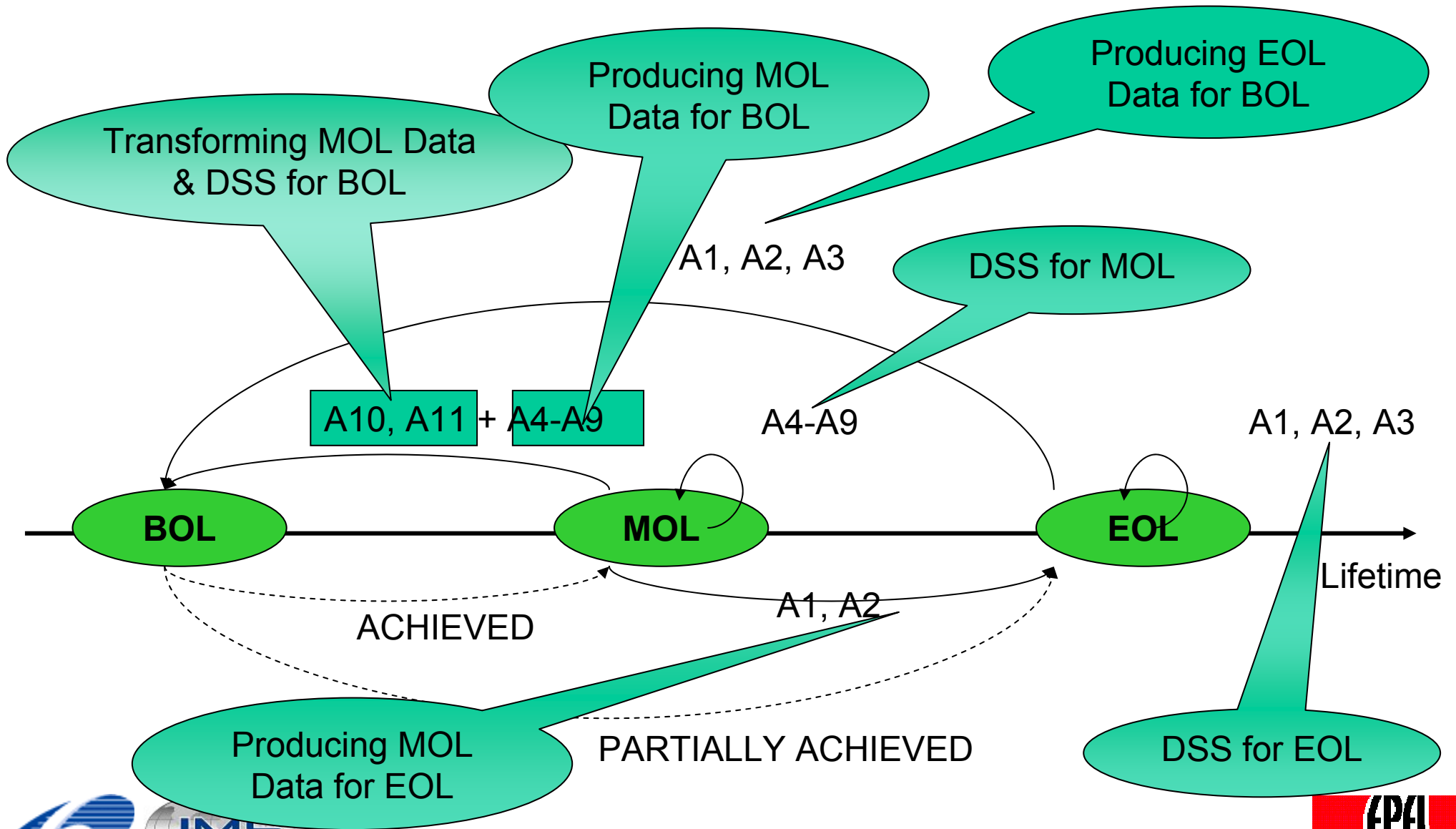


Demonstrators Information management for	Main focus	Partner
A1: Monitoring End of Life Vehicles	EOL	CRF
A2: Heavy load vehicle decommissioning	EOL	CATERPILLAR
A3: Tracking and tracing of products for recycling	EOL	BIBA/INDYON
A4: Predictive maintenance for trucks	MOL	CRF
A5: Heavy vehicle lifespan estimation	MOL	CATERPILLAR
A6: Predictive maintenance for machine tools	MOL	FIDIA
A7: EEE (1)	MOL	MTS
A8: EEE (2)	MOL	WRAP
A9: Telecom equipment	MOL	INTRACOM
A10: Design for X	BOL	BT-LOC
A11: Adaptive Production	BOL	POLIMI



# PROMISE demonstrators

## closing the loops



# Welcome to visit PROMISE at:



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and shortly at

[www.promise.eu](http://www.promise.eu)

