RF Interoperable Portable Contracts

Making daily life easier for Citizens

(powered By SmartCITIES technical approach)

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PORTUGAL

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Megatrends in Cities daily Life

- **Megatrends**
  - Demographic change
  - Urbanization
- Some **Consequences**
  - Increasing scarcity of **natural resources**
  - Rapid changes in **economic balance** within metropolitan areas
  - Increasing **mobility** needs
  - Growing demand for **security**
- **Transportation** and **related services** are a key topic and may become a **strong driver** for **cities integrated services**
- **RF technologies** can play a relevant role on these services

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Increasing **demand** for Interoperable City Services

- **Mobility** related Services
  - **Transports** (Public and Private), Parking, Tolls, Car-sharing, Car-polling…
- Municipality related **City** services
  - Schools, Pools, Libraries, Sports, Tourism, Culture, Waste, Commerce…
- Municipality **Institutional** services
  - Licensing, Taxes, Subsidies, Students, Elderly, Health…
- Other **Private** service providers
  - Football Clubs, Cinemas, Corporate Access…
- Other mass market **emergent service providers** and **stake-holders**
  - Mobile Phones operators
  - Banking and Payment operators

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But, are there **sound basis** for interoperable City Multi-Services?

	Up-Side	Down-side
For Citizens	➲ Easier, quicker, more intuitive and integrated access to **city services**	➲ "Bad-perceptions" about **data-privacy** and **personal** freedom
For Services	➲ Better adaptability to **customer demand** ➲ Better control on **operations** ➲ **Improved infrastructure cost** and revenue sharing	➲ Lacking the mind-set on "**additional returns**" on base investment ➲ **Business models** and agreements ➲ **Shared decisions** on standards
For Society	➲ Better **services for citizens** ➲ Better **tools** for city **megatrends management**	➲ **Complex** to manage several **stake holders** and still keep the service **open**, **modular**, **progressive** and **sustainable**

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Basic **concept** for Interoperable City Multi-services

- RF Portable Devices
- Services
- Integration and Management
- Interoperability

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But, Interoperable City Multi-Services … is **not just about RF** technology!

- Some basic **requirements**
  - Define sound multi-service **business models**
  - Common accepted **standards** and **guidelines** for interoperable systems and information
  - Clear **interfaces** and **architectural** layers
  - **Secure** and trust framework

- Should **avoid**
  - Making the usage of any existing **services more cumbersome**
  - Dependency on "**all on-line**" type of architectures
  - Dependencies on a **single type of portable device**
  - Dependencies on **specific hardware vendors**
  - Dependencies on **monolithic architectures**

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The Role of **RF Portable Devices** (Customer Media) and **Portable Contracts**

Multi-service	Several combined services stored inside the same device
Decentralized	On-line, off-line and mixed-mode communications
Secure	Decentralized security at the device and terminal levels
Convenient	RF proximity, vicinity, long-range and contact
Interoperable	Easy integration of new devices, readers and services
Open and Multi-supplier	Easy integration of new systems into the schema
Multi-terminal	Multi-platform terminal interoperability software
Modular Architecture	Modular, either at the terminal or back-office levels
Scalable	Gradual and sustainable expansion of services

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How to provide Interoperable City Multi-services

Electronic Ticketing
for Public Transports and City-Services

Operations Management
for Transportation and Mobility Services



- Process Blueprints and Technical Architectures
- Solutions for electronic ticketing management
- Electronic Ticketing as a service

Consumers

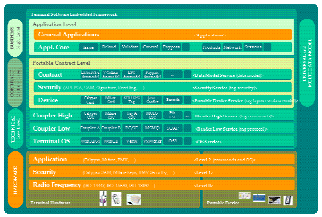
Service Providers

Technical Approach




- Solutions for Regular Services
- Solutions for Flexible services
- Solutions for complementary services

Software Interoperability Frameworks
for RF Portable Devices and Contracts



- Interoperability tools
- Interoperability services

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An approach based on Interoperability **Embedded Framework**

- Since **RF Portable Contracts** are more than RF-IDs
  - **Stored-values** inside RF devices
  - Structured by a **data model** with **interoperable** rules and formats
  - Supported by **distributed transactions** and **security** means

- Supported by a **Software Embedded Framework**
  - **Independent** from device, terminal and technology
  - Follow multi-sector **standards** (e.g. Mifare, Calyso, EPC, ISO, EMV, NFC, ITSO, IFM…)
  - Support for **off-line** and **on-line** operation and transactions
  - **Secure** data and transactions

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The Interoperability Embedded Framework

BUSINESS High Level

CONTRACT Medium Level

TECHNICAL Low Level

HARDWARE

UNIVERSAL and MULTI DATA MODEL

Terminal Software Embedded Framework

Application Level

General Applications <Applications>

Appl. Core Issue | Reload | Validate | Control | Paypass | … | Products Catalog | Network | Sessions | …

Portable Contract Level

Port. Contract LisboaViva datamodel | 7 Colinas datamodel | EPC datamodel | Paypass datamodel | Belgium datamodel | … <**Data Model Service** (data model)>

Port. Device Calypso Card | Mifare Card | RFID EPC Tag | Java Cardlet | Barcode | … <**Portable Object Service** (tag layout & data model)>

Security (API-ESA, SAM, Signature, Receiling, …) <**Security Service** (tag security)>

Coupler High Calypso CSC | Mifare CSC | Tag A CSC | MODS CSC | File CSC | … <**Reader High Service** (tag commands)>

Coupler Low Coupler A | Coupler B | PC/SC | MSMQ | SOAP | … <**Reader Low Service** (tag protocol)>

Terminal OS Win32/64 | WinCE | Verix | VxWorks | OS3 | … <**OS Service**>

Application (Calypso, Mifare, EMV, EMV Contactless, NFC, EPC, …)

Security (Calypso SAM, Mifare keys, EMV Security, …)

Radio Frequency (ISO-14443 type A/B, ISO-15693, ISO-18092, ISO-18000, ISO-14223, …)

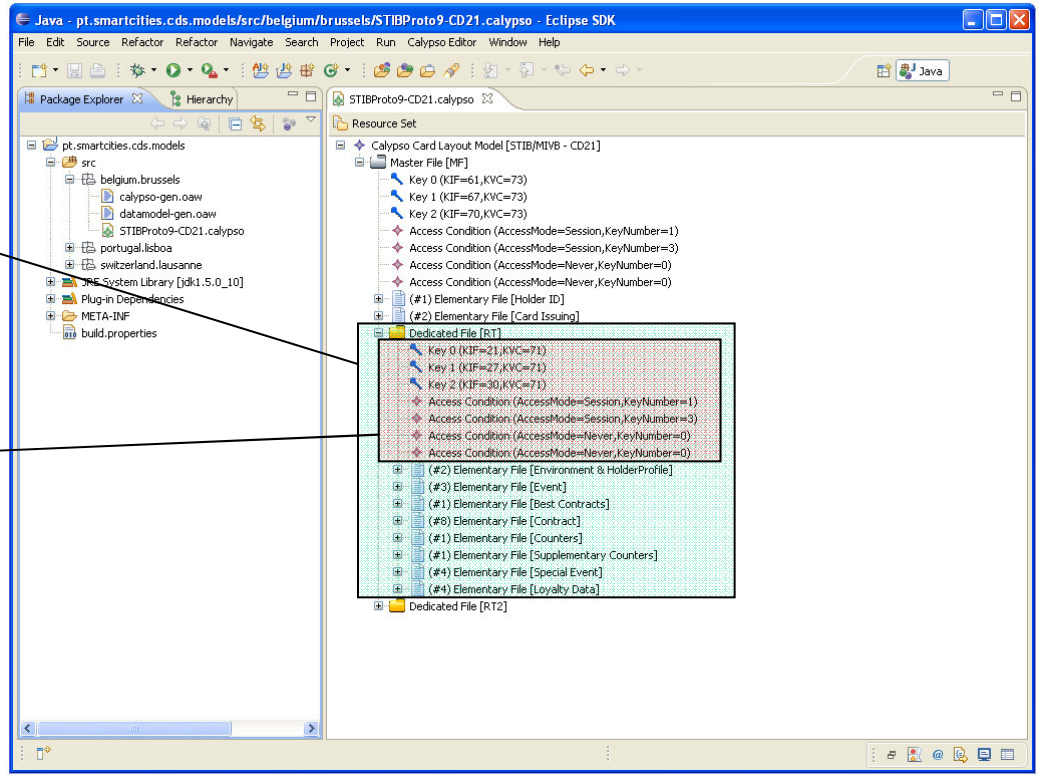
Terminal Hardware

RF Portable Device

The **Design Studio** for Embedded Framework

Step 1 – Define Device Physical Layou

- Design device applications **physical layout**
- Support memory, sector-based, file system (e.g. ISO-7816-4) or other formats
- Configure **security** parameters to access the data
- **Frees** customer from dealing with device **specific technology** details



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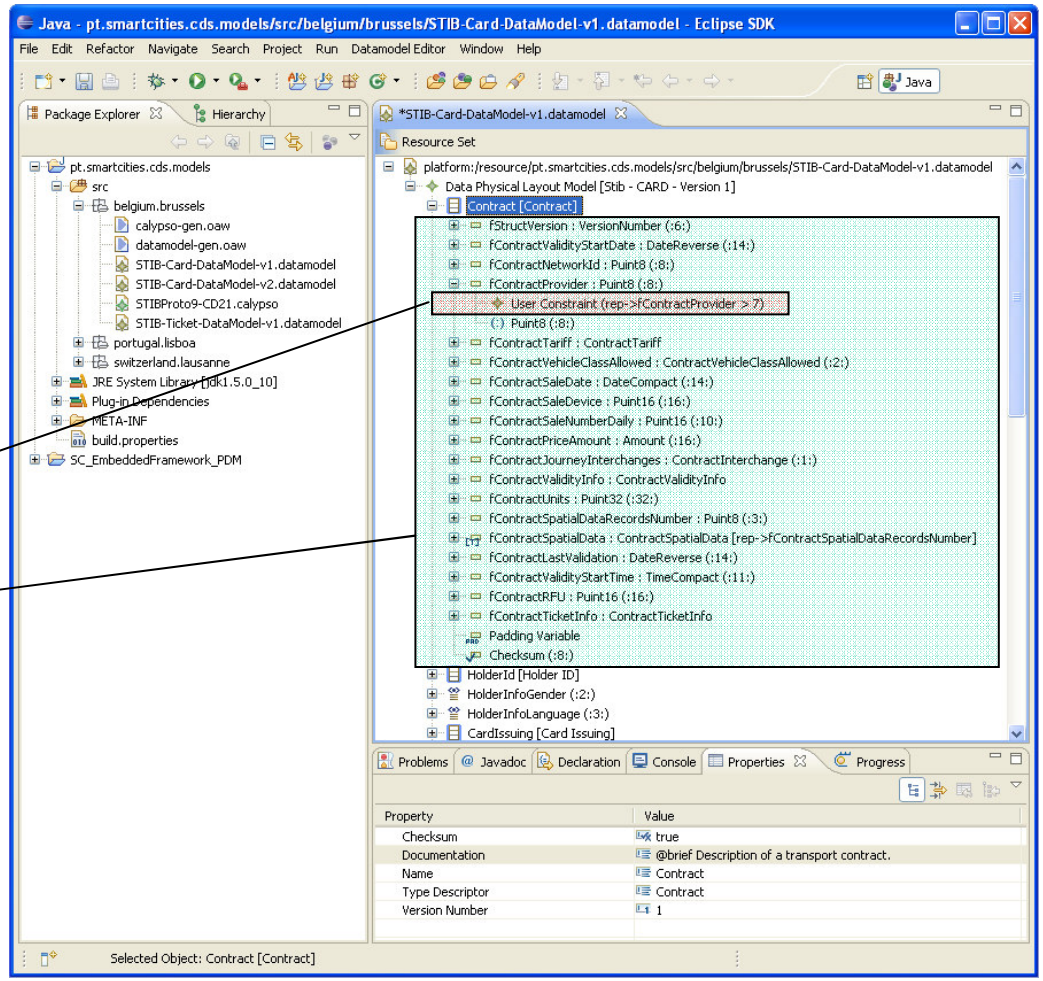
The **Design Studio** for Embedded Framework

Step 1 – Define Device Physical Layou

Step 2 – Define Data Model

- Create or adapt **data models** to customer requirements
- Support for several **standards** (e.g. ISO-14904, EN-1545, ISO-24014, Intercode, ITSO, …)
- **Constraints** validation
- Define specific **encoding rules**



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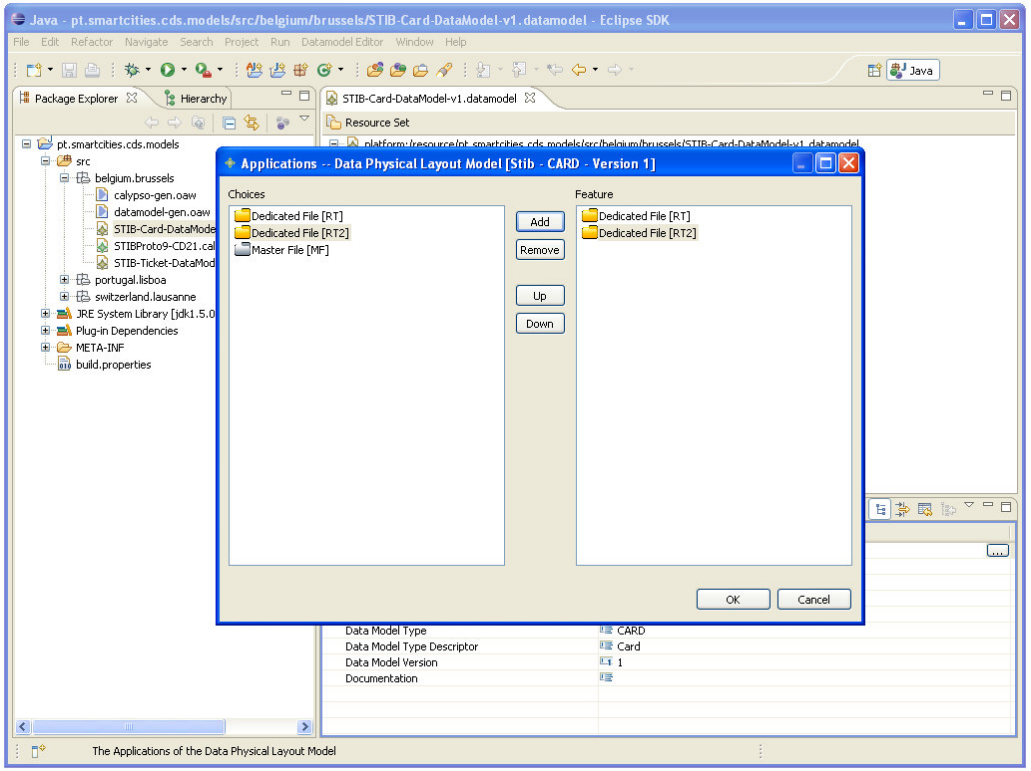
The **Design Studio** for Embedded Framework

Step 1 – Define Device Physical Layou

Step 2 – Define Data Model

Step 3 – Map Physical Layout to Data Model

- **Bind** device applications to the data model version(s)
- Manage **occupation rate** of the device application files



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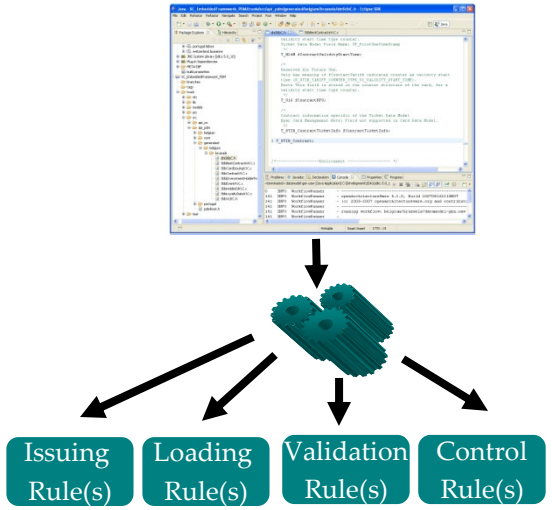
The **Design Studio** for Embedded Framework

Step 1 – Define Device Physical Layou

Step 2 – Define Data Model

Step 3 – Map Physical Layout to Data Model

Step 4 – Adapt Application Business Rules



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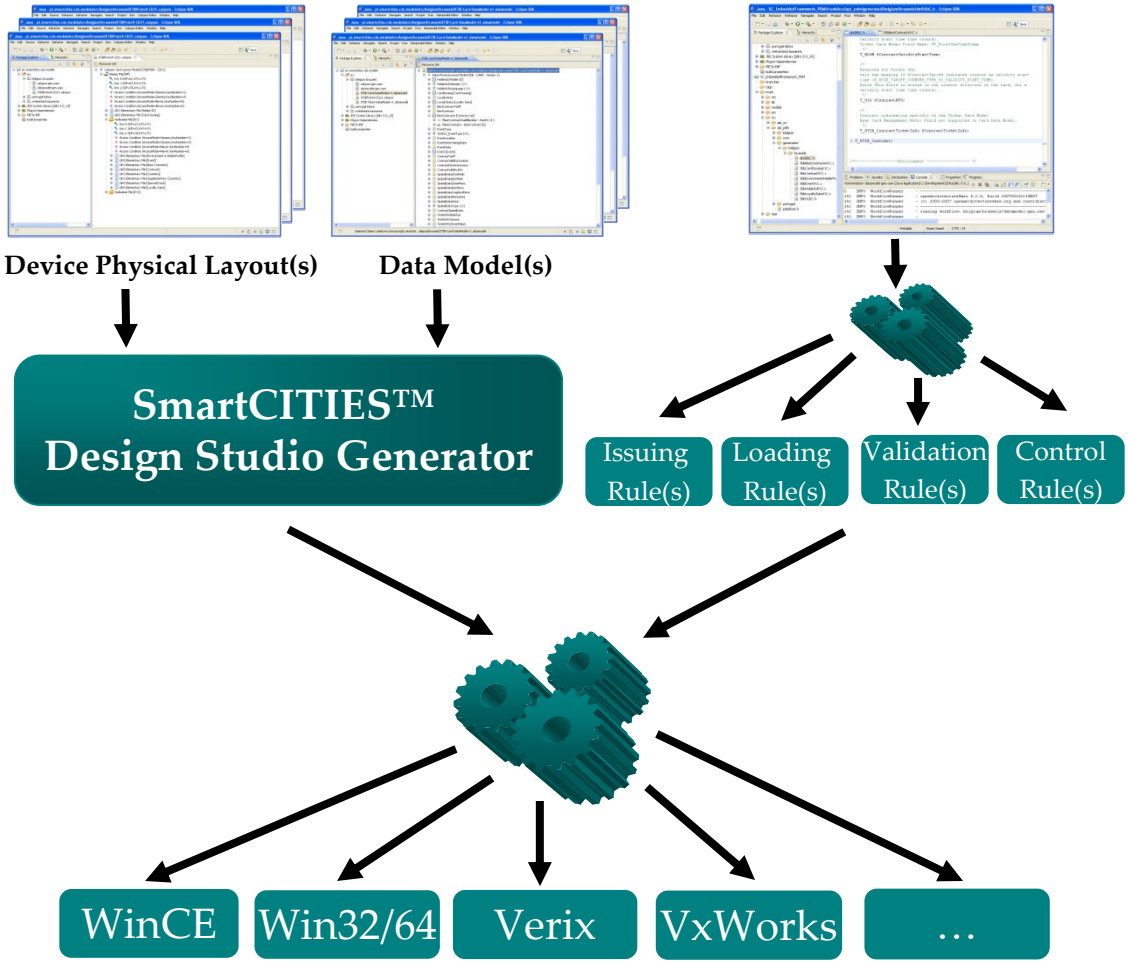
The **Design Studio** for Embedded Framework

- **Step 1 – Define Device Physical Layou**
- **Step 2 – Define Data Model**
- **Step 3 – Map Physical Layout to Data Model**
- **Step 4 – Adapt Application Business Rules**
- **Step 5 – Generate and Compile new Embedded Framework**



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The **Design Studio** for Embedded Framework

Step 1 – Define Device Physical Layou

Step 2 – Define Data Model

Step 3 – Map Physical Layout to Data Model

Step 4 – Adapt Application Business Rules

Step 5 – Generate and Compile new Embedded Framework

Step 6 – Deploy new Embedded Framework

WinCE | Win32/64 | Verix | VxWorks | …

SmartCITIES™ Deploy

CONFERENCE & EXHIBITION on:RFID The next step to THE INTERNET OF THINGS Internet Reloading

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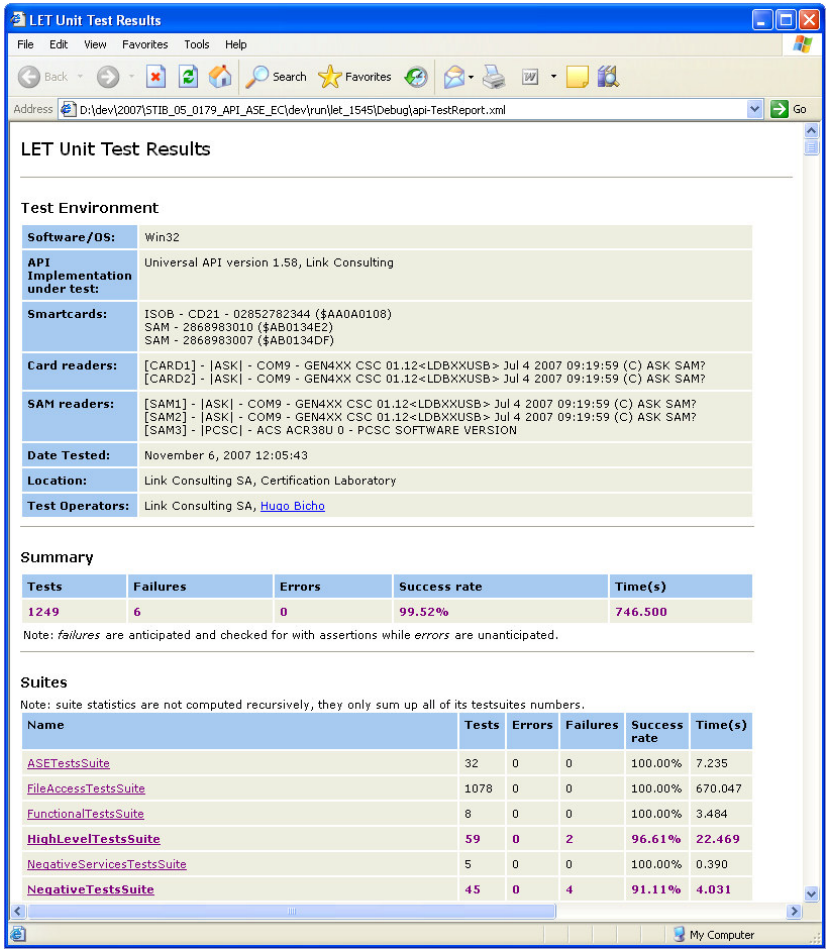
The **Design Studio** for Embedded Framework

- **Step 1 – Define Device Physical Layou**
- **Step 2 – Define Data Model**
- **Step 3 – Map Physical Layout to Data Model**
- **Step 4 – Adapt Application Business Rules**
- **Step 5 – Generate and Compile new Embedded Framework**
- **Step 6 – Deploy new Embedded Framework**
- **Step 7 – Test Embedded Framework**



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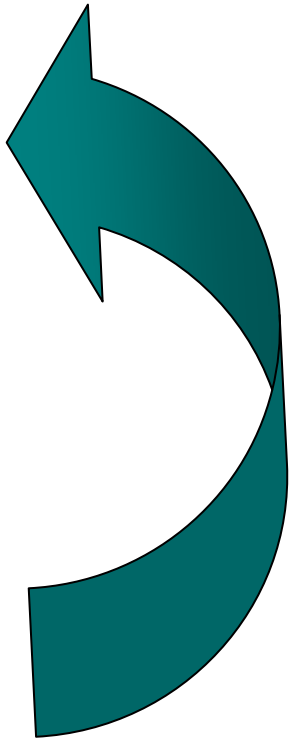

- Iterate around the different steps, refining, verifying, and **certifying** correct **interoperable behavior**

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Case Studies and International References

- Portugal - Lisbon Region
  - Public transport
  - Bank ATM, Payshop retailers, Tourism, Internet
  - Mobile Phones, Banking
- Belgium – Brussels Region, Country wide
- Israel – Country wide
- Brazil – Porto Alegre
- Switzerland – Canton Vaud, Genève
- Spain – Tenerife

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The **Lisboa Viva** Case Study
Base environment for PT services

- OTLIS consortium created for ICARE proj. (**1996**)
  - Assess the usage of RF technologies on Public Transport electronic ticketing

- All the transport modes in Lisbon region
  - **Underground**: Metropolitano de Lisboa (**2000**)
  - **Urban Bus** and **Tram**: Carris (**2003**)
  - **Boats & Ferries**: Transtejo (**2004**)
  - **Trains**: CP (**2005/6**)
  - **Private train**: Fertagus (**2006/7**)
  - **Private light-rail**: Metro Sul do Tejo (**2006/7**)
  - **Sub-urban bus** (private): several operators (**2007**)

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The **Lisboa Viva** Case Study
Existing Services

- Core Service
  - 20 Public Transport Operators (all modes)
  - Serving a region of over 3 million inhabitants

- Portable Devices Examples
  - + 1,8 million contactless smartcards
  - + 10 million RF memory tags
  - + 200.000 RF memory tags for tourists

- Network Examples
  - Selling over + 5.000 Bank ATM
  - Selling over + 300 Payshop retail stores
  - Selling over Internet
  - Selling Lisboa Card on Tourist stores

SIBS
payshop
netSt@rter
ask me Lisboa

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The **Lisboa Viva** Case Study
Future Services

- Combined Services
  - With Street and Closed **Parking**
  - With **Schools** and **Universities**
  - …

- Combined with **EMV Contactless**
  - Payment + Multi-services Portable Contracts
    - **Embedded Framework add-on** for Paypass, Paywave…

- Combined with **NFC Mobile Phone**
  - Remote Loading of Portable Contracts on Mobile Phone
    - **Remote Embedded Framework** for NFC Mobile Phones, Green List, Auto-top-up…

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Your RFID **Conference Card** has more inside than you can imagine...

Use your
RF Interoperable Portable Contracts!

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