



Center for Advanced Studies of Rome



SPCoop: Semantic Integration of Italian eGovernment Services

Guido Vetere, IBM Center for Advanced Studies of Rome

INFINT Workshop – Bertinoro
September 30 - October 4, 2007

Outline

- **Background: services interoperability in Europe and Italy**
- **Italian Public Application Cooperation System (SPCoop)**
- **SPCoop Issues and Evolution**

Background: Europe

▪ European Union

- 2003: **interoperability** recognized as the key condition to developing pan-European eGovernment services by the European Commission (under Italian Presidency)
- Interoperable Delivery of European eGovernment Services to public Administrations, Business and Citizens (IDABC) EC Work Programme underway (2005-2009)
- A **European Interoperability Framework** (EIF) recognized as a necessary condition
- EIF focuses on recommendations and defining generic standards with regard to **organizational, semantic and technical aspects of interoperability**
- EIF requires each Member State to define a **Government Interoperability Framework** (GIF).



Background: Italy

- **1997 RUPA (Rete Unitaria della Pubblica Amministrazione)**
 - Transport layer
 - Functions
 - Mail
 - File transfer
 - Security
 - Monitoring
 - Interoperability: CORBA \ DCOM
- **2005 SPC (Sistema Pubblico di Connettività)**
 - As above
 - Interoperability: Web Services
 - eGov SOAP envelop
- **2005 SPCoop (Sistema Pubblico di Cooperazione)**
 - Application Cooperation Layer on SPC
 - Functions
 - Federated Identity
 - Personnel and Organizations directories
 - Semantic Interoperability



Italian eGovernment: the Semantic Turn

- **1997**
 - Central Government (CNIPA) starts designing RUPA
 - Operational and functional Interoperability
 - Focus on middleware
- **2002**
 - Local Government: PEOPLE project
 - Local services standardization
 - Focus on models (UML)
- **2005**
 - SPC set to replace RUPA
 - More focus on semantics (after EU recommendations)
 - Central Government: CNIPA issues the document 'Naming Conventions and Semantics for SPC'
- **2006**
 - Italian Minister for Innovation and Public Administration recommends (semantic) data integration
 - CNIPA-ASSINFORM Work Group: 'Ontologies and Semantics for Public Administration'
 - SPCoop Requirements include semantic annotations and semantic search on WS registry (SICA)
- **2007**
 - SPCoop SICA public tender won by IBM
 - First release on February 2008



Semantic Turn – Expected Benefits

- **Short term**
 - Featured services repository (beyond UDDI)
 - Support semantic annotation
- **Medium term**
 - Support semantic integration
 - Reuse of conceptual schemas
 - Harmonization of conceptual schemas
- **Long term**
 - Reduction of cross-organization cooperation costs
 - Increase of quality and number of public services
 - Reduction of administrative burdens
 - Integrated access to public data

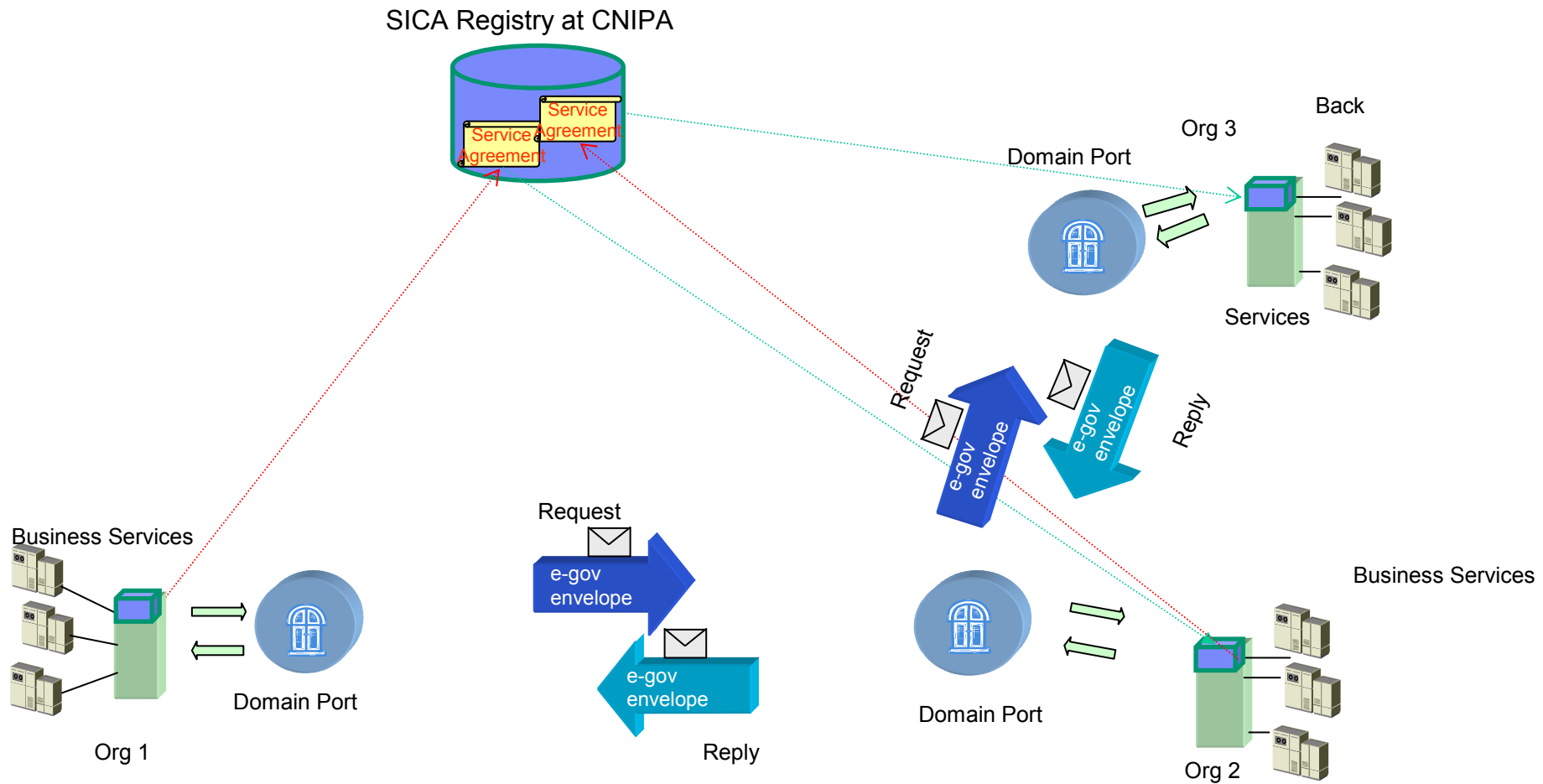


SPCoop Basics

- **Principles**
 - Organizational independency
 - Backward compatibility
 - Local responsibility for services and data
- **Elements**
 - WS Qualified Endpoints (eGov SOAP envelope)
 - Central Registry
- **Service agreements (accordo di servizio)**
 - SLAs
 - (Annotated) WSDL-XSD Schemes
 - Semantic Specs (Ontologies)
 - Service Behavior Specs
 - Documentation (Text)



SPCoop Service Oriented Architecture



Support for Semantic Annotations in SPCoop

- **Service Agreements (as for semantics is concerned)**

- Each org specify service semantics by annotating schemes with respect to some (arbitrary) ontology
- Annotated schemes are managed and searched centrally by way of a semantic enabled registry (SICA)

- **Ontologies**

- No 'semantic standards' available yet
- Working Group 'Ontology & Semantics' at CNIPA underway

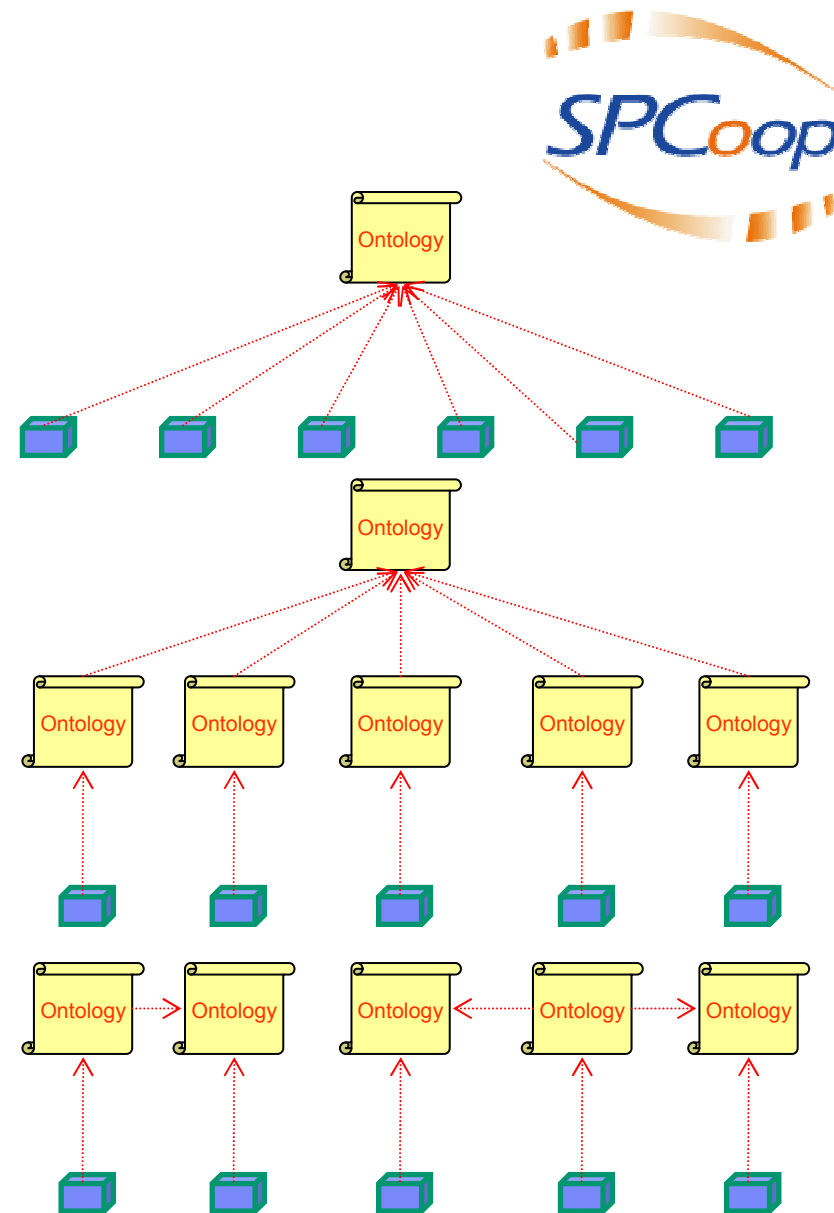
- **SICA Registry & Repository**

- IBM to develop a management\query system for SAWSDL (W3C) annotated schemes
- OWL and (fragment of) UML supported as ontology languages
- Basic semantic search functions to be delivered shortly
- A Scientific Committee to envisage evolutionary scenarios

```
<xsd:simpleType name="CodiceFiscale">  
  sawsdl:modelReference="http://cnipa.it/ontologies/Fisco#CF">  
  <xsd:restriction base="xsd:string"/>  
</xsd:simpleType>  
  
<wsdl:interface name="CodiceFiscaleLookupService">  
  <wsdl:operation name="CFLookup"  
    pattern="http://www.w3.org/ns/wsdl/in-out"  
    sawsdl:modelReference="http://cnipa.it/ontologies/Utilities#Lo  
    okupServices">  
    <wsdl:input element="CFLookupServiceRequest"/> <wsdl:output  
    element="CFLookupServiceResponse"/>  
  </wsdl:operation>  
</wsdl:interface>
```

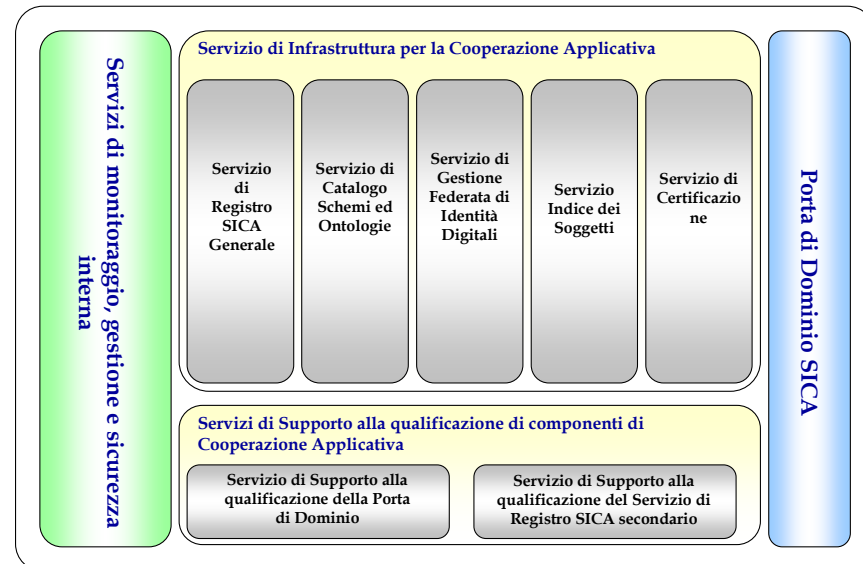
Ontologies in SPCoop

- **SPCoop ‘agnosticism’**
 - Does not enforce any service-to-ontology mapping geometry
 - Does not require standard ontologies
 - Does not tell how ontologies could be mapped the one another, if they are mapped at all



The SICA Registry

- **Crawl, Walk, Run approach**
- **February 2008**
 - Service Agreement Lifecycle
 - Activation
 - Subscription
 - Dismission
 - Basic semantics
 - Declared inclusion dependencies
 - Ontology versioning
 - Deprecation (fine grained)
 - Ontology browsing
 - Concept retrieval
 - Inclusion\Role navigation
 - Basic semantic query functionalities
 - Retrieve services\data-types related to a concept
 - Atomic queries



Semantics in SPCoop - Issues

- **Modeling \ Annotation**
 - Modeling felt as overhead
 - Skill shortage
 - Lack of immediate rewarding
- **Central \ Local Governance**
 - No regulatory ontologies available so far (need of both political and technical guidelines to build them)
 - ‘Bottom up’ attitude (existing XML Schemas promoted at the rank of ontologies)
 - No reasonably viable automatic ontology mapping (need to take semantics seriously)
- **Slow adoption**
 - Few real services available so far
 - Need of dissemination and education programs

SPCoop Evolution

- **A Scientific Committee will drive SPCoop evolution**

- Advisory Board
- Support dissemination and education
- Depict future scenarios

- **Possible directions**

- eGov Top Level Ontology
 - People, Geopolitical Entities, Organizations, Roles, Processes, Services, Administrative Acts, etc
 - Ontologies reconciliation
 - Specify semantic constraints for annotations
 - E.g. Operations \leftrightarrow Process, Data Type \leftrightarrow Entity, etc
- Support ontology-to-ontology mapping (beyond OWL)
- Support schema-level queries
 - E.g. select all the (classes of) services that people with roles $R^1 \dots R^n$ can access
- Data Exchange
 - Generate, test, deploy transformation code
- Data Integration
 - Map existing directories with eGov Ontology and get concept-based access to them
 - Integrate data services
- Implement mediation services (e.g. service bus)

Conclusion

- **Semantic Turn driven by political institutions**
 - European Commission
 - Italian Central and Local Government
- **Formal standards for semantics (almost) in place**
 - Industrial and Open Source Tools available
 - SPCoop in synch with state of the art
- **Ontological analysis about to start**
 - ‘Authoritative’ Top Level Ontology to be delivered
 - Extensive conceptualizations could be built incrementally on solid foundations
 - Semantic standardization
- **Adoption is an issue**
 - Disseminate, educate, encourage
 - Promote local actions
- **Research needed to get more value out of SPCoop**
 - Generate transformation code
 - Provide support to services composition \ orchestration
 - Integrate data-oriented services
 - ...



Thanks



IBM Centers for Advanced Studies

Centro Studi Avanzati di Roma

Backup

SAWSDL

- **Semantic Annotation on WSDL (SAWSDL) is a recent (8/07) W3C standard**
- **SAWSDL “focuses on semantically annotating the abstract definition of a service to enable dynamic discovery, composition and invocation of services”**
- **Two extension attributes for WSDL and XML schemes**
 - **Model Reference** *to specify the association between a WSDL or XML Schema component and a concept in some semantic model*
 - Interfaces and Data Types mapped to concepts
 - **Schema Mapping** *that are added to XML Schema element declarations and type definitions for specifying mappings between semantic data and XML*
 - lifting schema mappings *lift* data from XML to a semantic model
 - lowering schema mappings *lower* data from a semantic model into an XML structure

WSMO Editor

The screenshot displays the WSMO Studio interface, which is used for editing and managing Web Service Modeling Ontologies (WSMO) and their associated Web Service Description Language (WSDL) files.

Navigator: Shows a project structure for "SAWSDL Demo" containing files like "BasicRealTimeQuotes.wsdl", "LSDIS_Finance.owl", "purchaseOrder.wsdl", "SAWSDL-latest.wsdl", and "SUMO_Finance.owl".

Ontology Navigator: Displays a hierarchical ontology structure. Key elements include "Aggregate", "Bundle", "GraphicsBundle", "DesignersBundle", "MobileBundles", "InvestmentConsultantsBundle", "OnlineBundle", "BankersBundle", "BroadbandBundle", "DesignersBundle", "InvestmentConsultantsBundle", "BundePart", "Computer", "Desktop", "Laptop", "NetworkConnection", "DialupConnection", "DSLConnection", "OnlineService", "GameNetAccount", and "SharePriceFeed".

SA-WSDL Editor - SAWSDL-latest.wsdl: Shows the WSDL document structure. The main element is "wsdl:description", which contains "wsdl:types" and "Order". The "wsdl:types" section defines several elements:

- OrderRequest** (complexType): Contains "xs:sequence" with "customerNo (xs:integer)" and "orderItem (item)".
- complexType [item]** (xs:all): Contains "EAN (xs:string)", "quantity (xs:integer)", and "restriction [xs:string]".
- OrderResponse** (Confirmation): Contains "simpleType [Confirmation]" and "enumeration [Confirmed]", "enumeration [Pending]", and "enumeration [Rejected]".

 The "Order" section defines an "order" element with a URI reference and includes "OrderRequest" and "OrderResponse" as children.

Mapping Info: A table at the bottom right provides a mapping between WSDL elements and their Model References:

WSDL Element	Model Reference
wsdl:elementDeclaration (OrderRequest)	=> http://www.w3.org/2002/ws/sawSDL/spec/ontology/purchaseorder#Ord...
wsdl:typeDefinition (item)	=> http://www.w3.org/2002/ws/sawSDL/spec/ontology/purchaseorder#Item...
wsdl:elementDeclaration (OrderResponse)	=> http://www.w3.org/2002/ws/sawSDL/spec/ontology/purchaseorder#Ord...
wsdl:typeDefinition (Confirmation)	=> http://www.example.org/example/address
wsdl:interfaceOperation (Order/order)	=> http://www.w3.org/2002/ws/sawSDL/spec/ontology/rosetta#RequestPur...