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Bridging Global Computing with Grid (BIGG)

Sophia Antipolis, November 29th, 2006

Service Oriented Architecture for Telco Service Layer
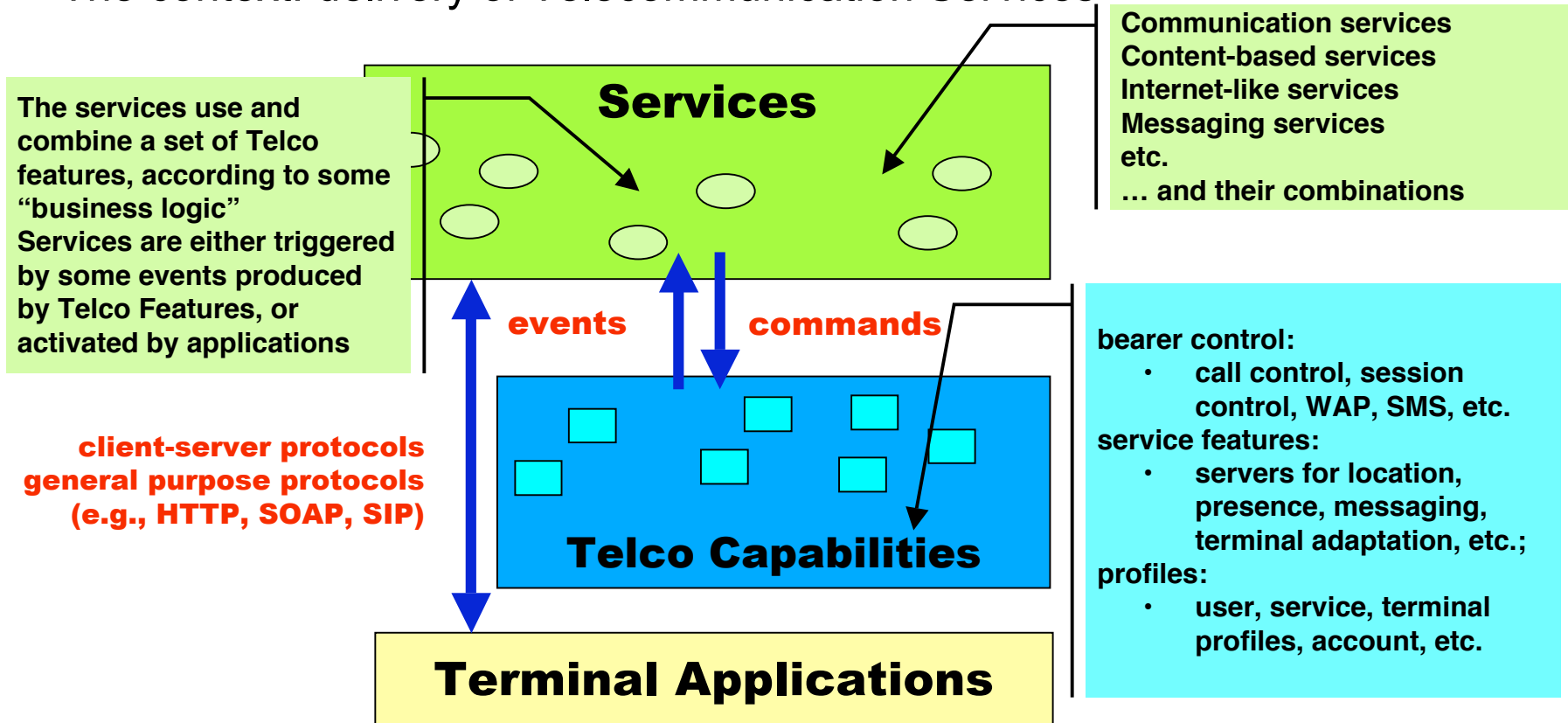
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SOA for Telco Service Layer

Agenda

▸ Evolution of Telecomunication Service Layer towards SOA

▸ SOA in Telecommunication Service Layer: key aspects

▸ Some open issues

SOA for Telco Service Layer

The context: delivery of Telecommunication Services

Services

**Communication services
Content-based services
Internet-like services
Messaging services
etc.
… and their combinations**

**The services use and combine a set of Telco features, according to some "business logic"
Services are either triggered by some events produced by Telco Features, or activated by applications**

events   **commands**

**client-server protocols
general purpose protocols
(e.g., HTTP, SOAP, SIP)**

Telco Capabilities

bearer control:
  · **call control, session control, WAP, SMS, etc.**
service features:
  · **servers for location, presence, messaging, terminal adaptation, etc.;**
profiles:
  · **user, service, terminal profiles, account, etc.**

Terminal Applications

▸ In a telecommunication infrastructure the Service Layer is in charge to the creation, execution and management of Telco Services;

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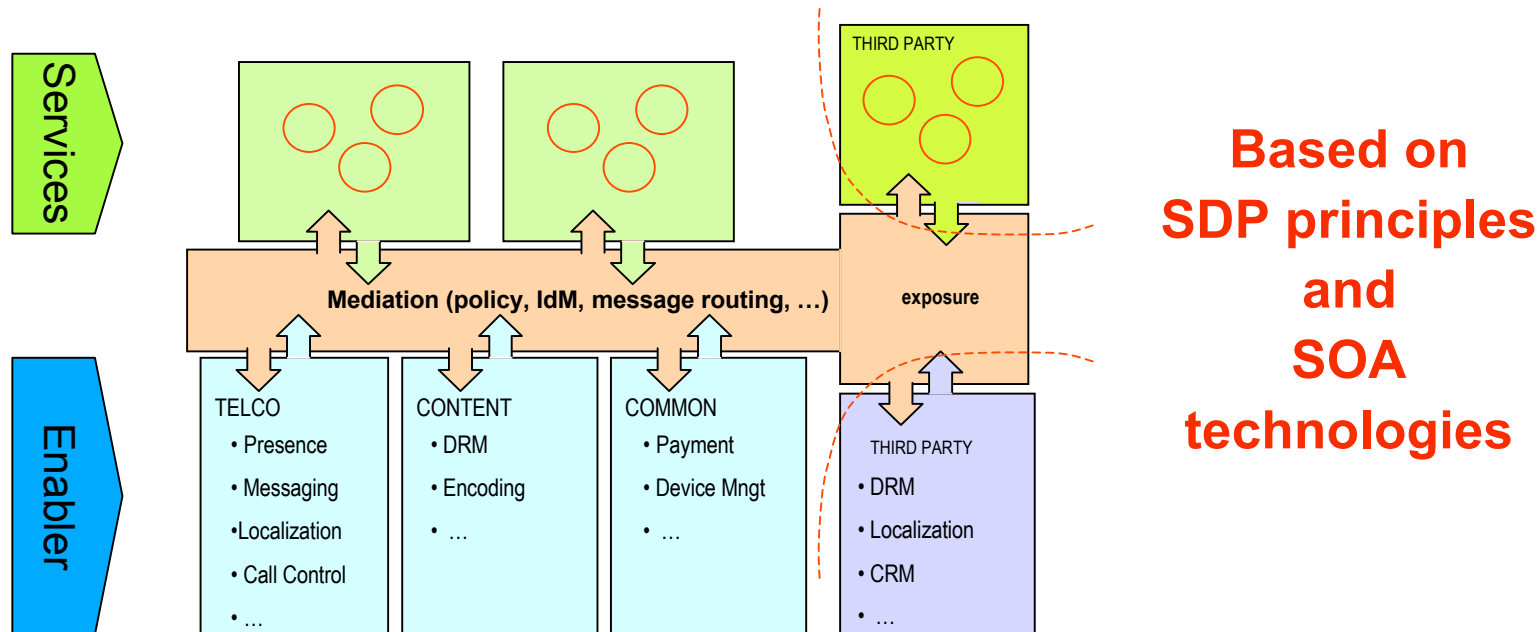SOA for Telco Service Layer

From vertical service platforms…

▶ Vertical service platforms focused on specific Telco Capabilities and Service Classes, e.g. platforms for:

  ▸ SMS/MMS-based services;

  ▸ location-based services;

  ▸ content-based service;

  ▸ voice/circuit systems (e.g., IN);

  ▸ IMS services (e.g., SIP AS);

▶ Vertical approaches, based on deployment of loosely integrated systems (named "Silos")

Services

Telco Capabilities

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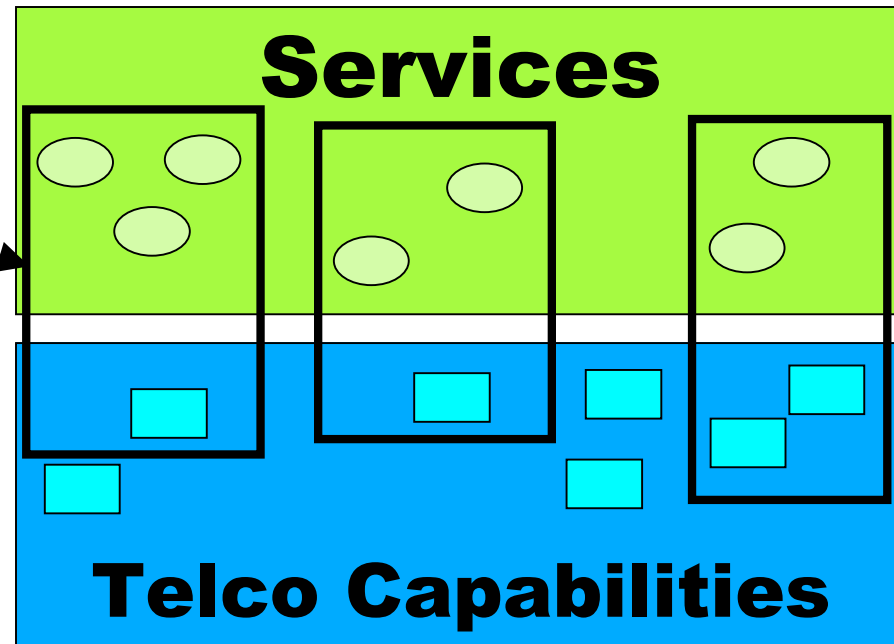
SOA for Telco Service Layer

… to horizontal service architectures

▸ Sharing of enablers among all the entities in the platform, by means of well-defined open/public interfaces;

▸ (Logical) decoupling of the Execution Environments from the enablers;

**Based on
SDP principles
and
SOA
technologies**

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SOA for Telco Service Layer

SOA in Telco Service Layer

▸ SOA is an enabling technology for the evolution of the Service Layer structured in a set of shared and reusable Service Enablers:
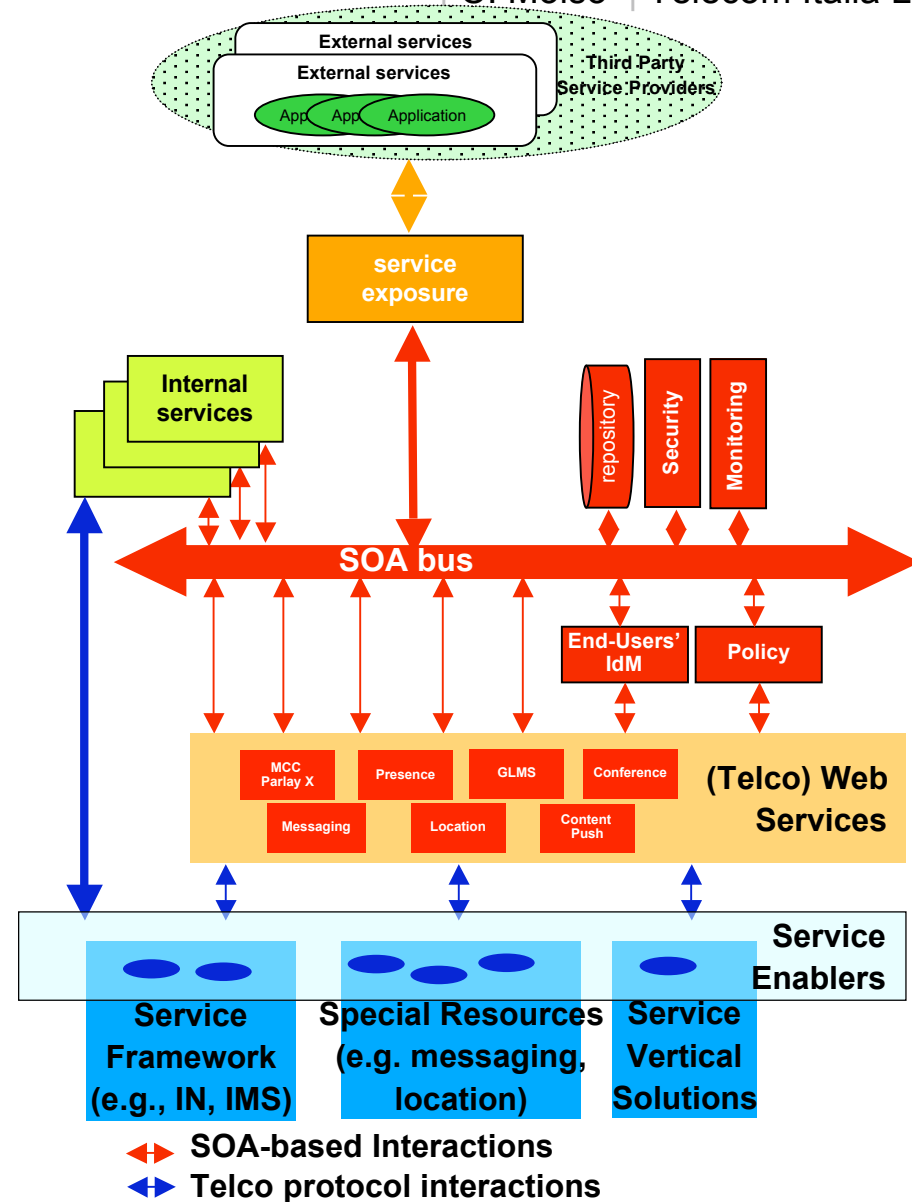
- ▸ Web Services to enable applications to easily access the Service Enabler

- ▸ Policy to control that the usage of capabilities by applications fulfills subscribed conditions (SLAs)

▸ SOA allows decoupling of application execution environment and enablers:

- ▸ easy development of applications controlling multiple and heterogenous service enablers, through composition/orchestration

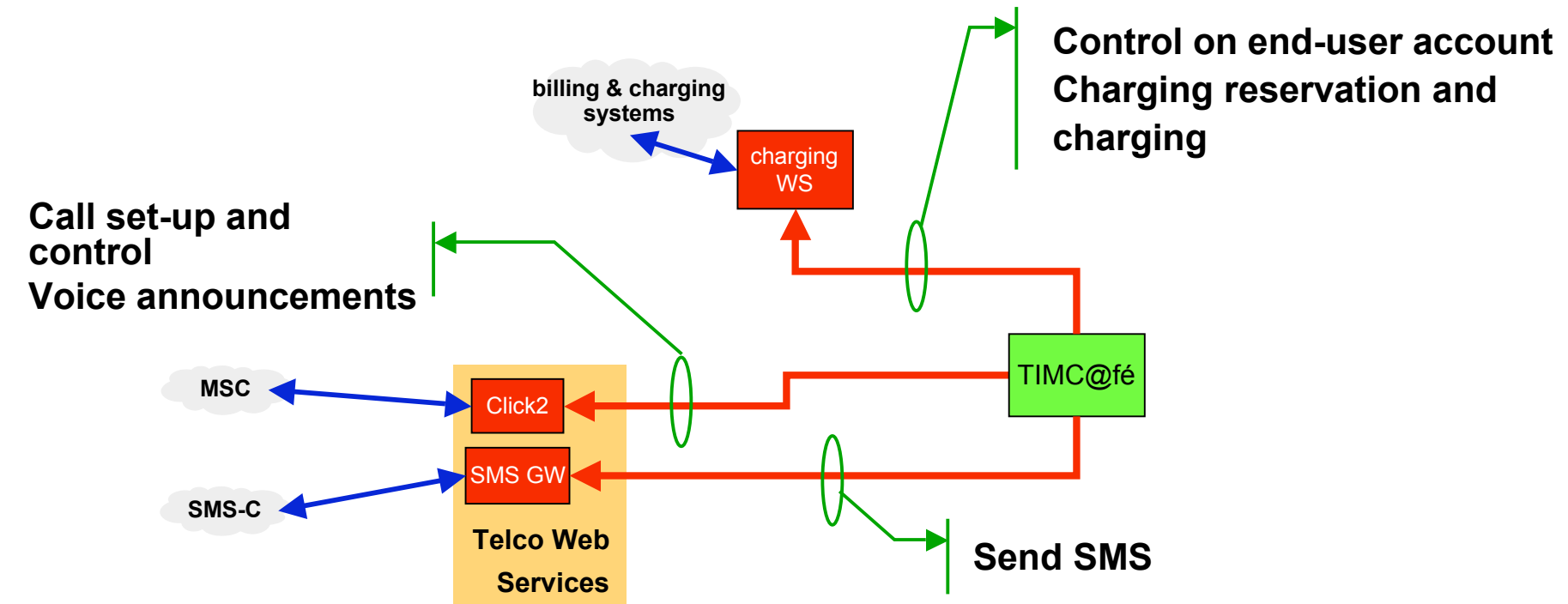▸ SOA enables advanced business models in the service delivery:

- ▸ exposure of services as web services to be easily integrated in 3rd party IT systems/Internet applications

External services
External services
App App Application
Third Party Service Providers

service exposure

Internal services

repository | Security | Monitoring

SOA bus

End-Users' IdM | **Policy**

MCC Parlay X | Presence | GLMS | Conference
Messaging | Location | Content Push
(Telco) Web Services

Service Enablers

Service Framework (e.g., IN, IMS) | **Special Resources (e.g. messaging, location)** | **Service Vertical Solutions**

⬌ **SOA-based Interactions**
⬌ **Telco protocol interactions**

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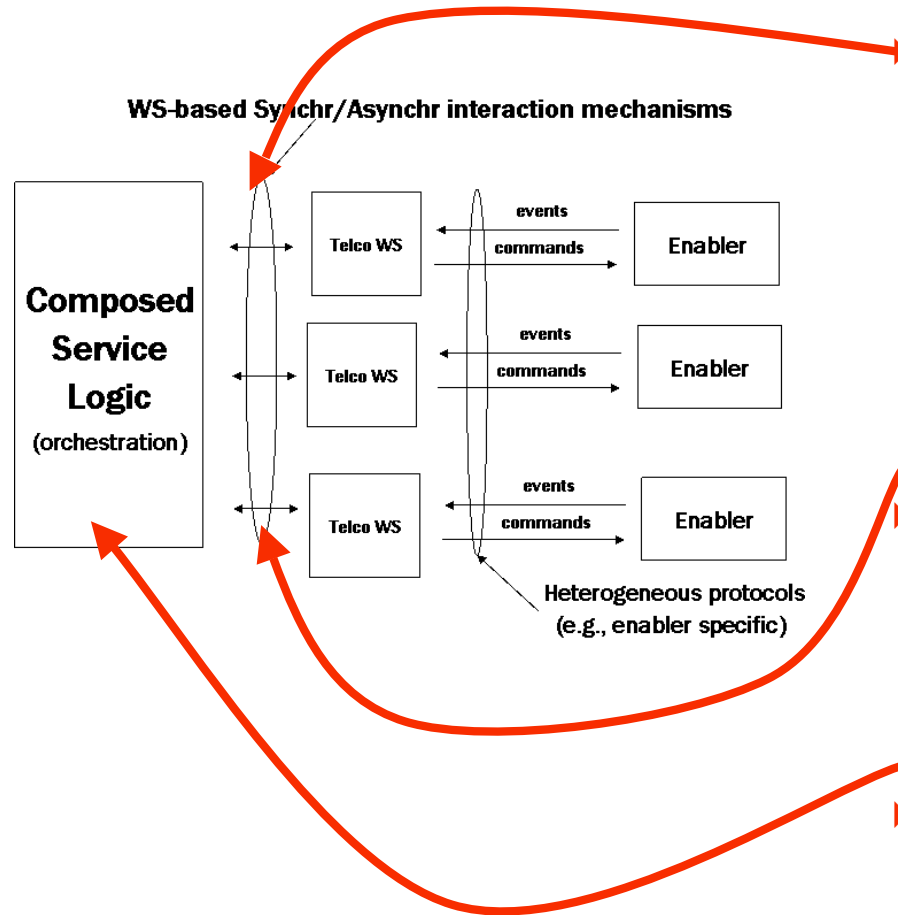SOA for Telco Service Layer

SOA in Telco Service Layer: a case study

▶ possibility to activate a (switched) call from two participants in a chat, by keeping anonimity of caller and callee numbers (feature of TIMC@fé service)

Control on end-user account
Charging reservation and charging

billing & charging systems

charging WS

Call set-up and control
Voice announcements

MSC

Click2

SMS-C

SMS GW

Telco Web Services

TIMC@fé

Send SMS

SOA-based interactions

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SOA for Telco Service Layer

SOA in Telco Service Layer: service composition and execution

WS-based Synchr/Asynchr interaction mechanisms

Composed Service Logic (orchestration)

Telco WS

events / commands → Enabler

Telco WS

events / commands → Enabler

Telco WS

events / commands → Enabler

Heterogeneous protocols (e.g., enabler specific)

Policy Enforcement:

▸ general purpose policies: enforced by the SOA Bus (by message intermediaries)

▸ component service specific policies: enforced by the component implementation

▸ possible involvement of external decision points: e.g., end-user account management

Message interaction patterns:

▸ request-response

▸ event notification handling
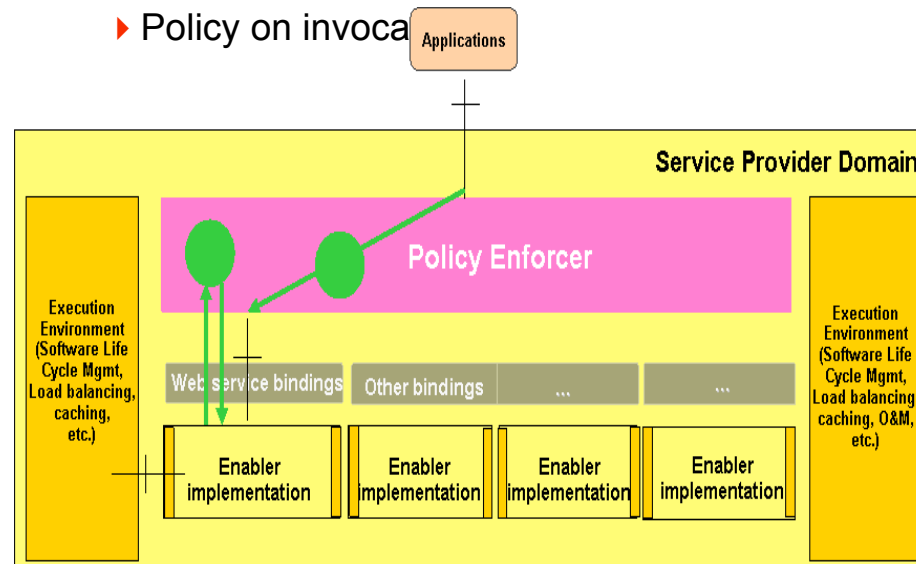
▸ asynchronous interactions

▸ solicit-response

Application execution environment:

▸ synchronous/asynchronous composition

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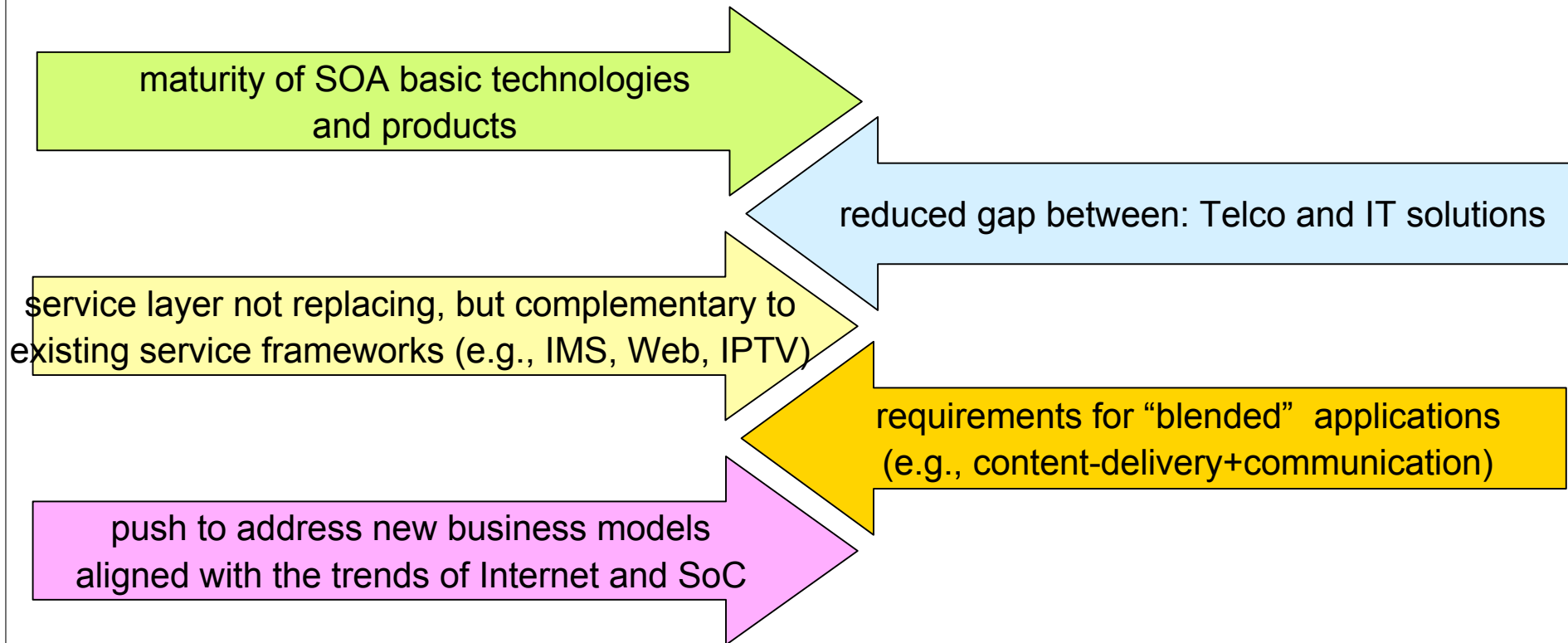Bridging Global Computing with Grid (BIGG)

SOA for Telco Service Layer

SOA/WS trends in Telco world

▶ 3GPP: Parlay X Web Services (v2.0)

- ▶ Third Party Call
- ▶ Call Notification
- ▶ Short Messaging
- ▶ Multimedia Messaging
- ▶ Payment
- ▶ Account management
- ▶ Terminal Status
- ▶ Terminal Location
- ▶ Call Handling
- ▶ Audio Call
- ▶ Multimedia Conference
- ▶ Address List Management
- ▶ Presence

▶ Liberty Alliance:

- ▶ Web Services for handling Identities and attributes

▶ OMA: Policy Enforcement Execution Management:
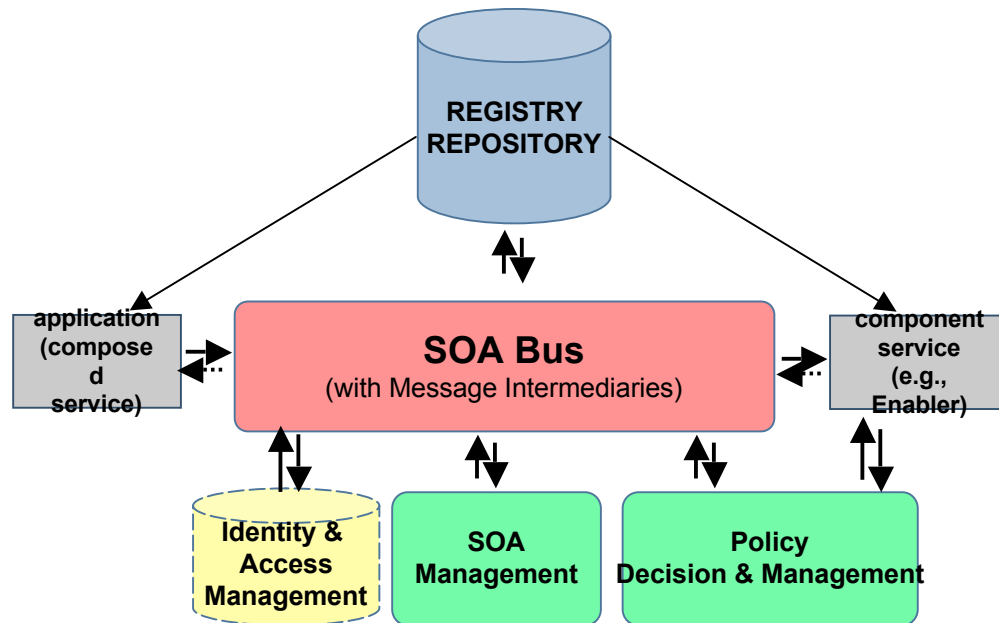
- ▶ Policy on interception
- ▶ Policy on invoca[tion]

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SOA for Telco Service Layer

Why to move towards SOA-based architecture?

maturity of SOA basic technologies and products

reduced gap between: Telco and IT solutions

service layer not replacing, but complementary to existing service frameworks (e.g., IMS, Web, IPTV)

requirements for "blended" applications (e.g., content-delivery+communication)

push to address new business models aligned with the trends of Internet and SoC

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SOA for Telco Service Layer

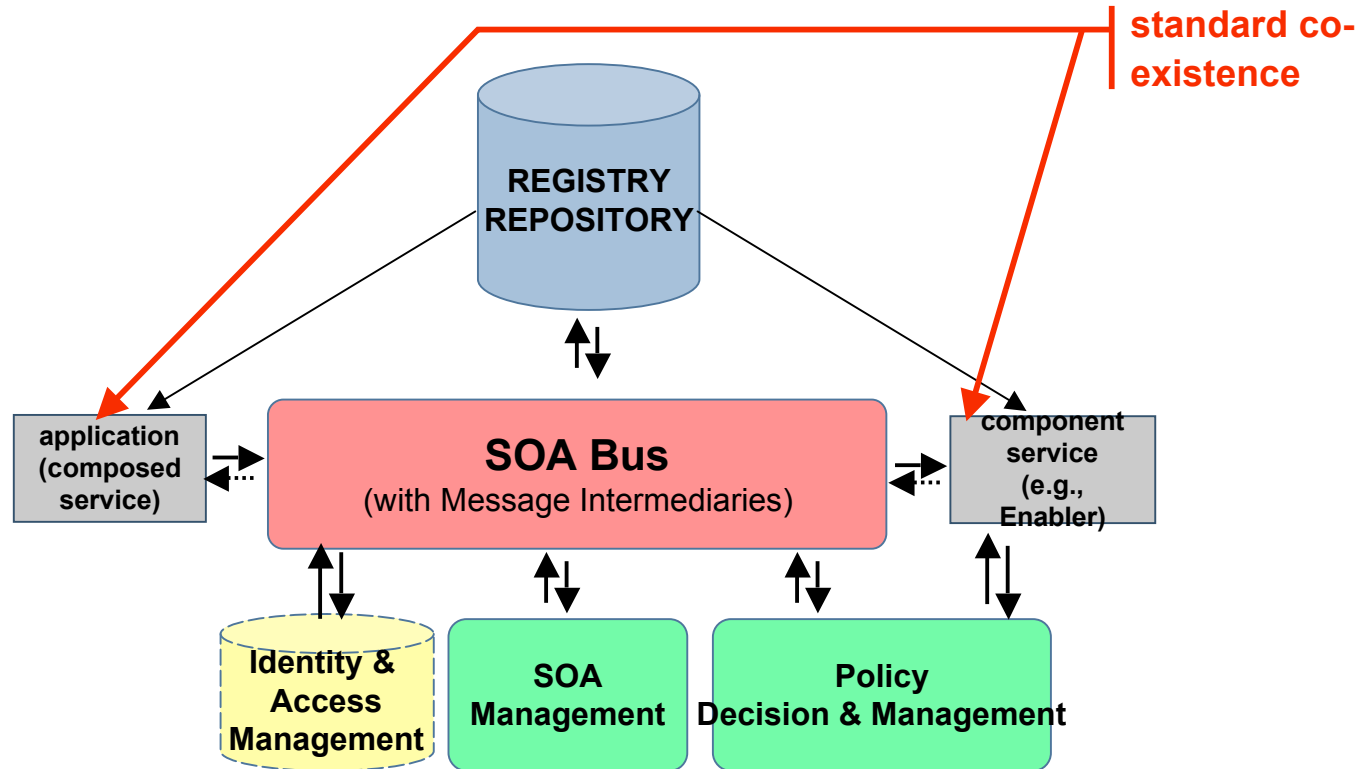# SOA in Telco Service Layer: are there any open issues?

The SOA infrastructure must be complemented by a **SOA governance** integrated with the service creation process

▶ **Registry/Repository**: directory of the services, with all the relevant information useful for their usage and management

▶ **SOA Management** : management of the SOA infrastructure (e.g., monitoring of WS usage)

▶ **SOA Bus**: mediation functions for processing and control on SOA messages, through Intermediaries (e.g., policy enforcement, security checks, rerouting, load-balancing, event notification)

▶ **Identity & Access Management**: systems to control the access to the services from applications and the involvement of end-users (e.g., privacy)

▶ **Policy Decision & Management**: handling of policies to control that the usage of enablers by applications fulfills the parameters defined at subscription time (SLA)
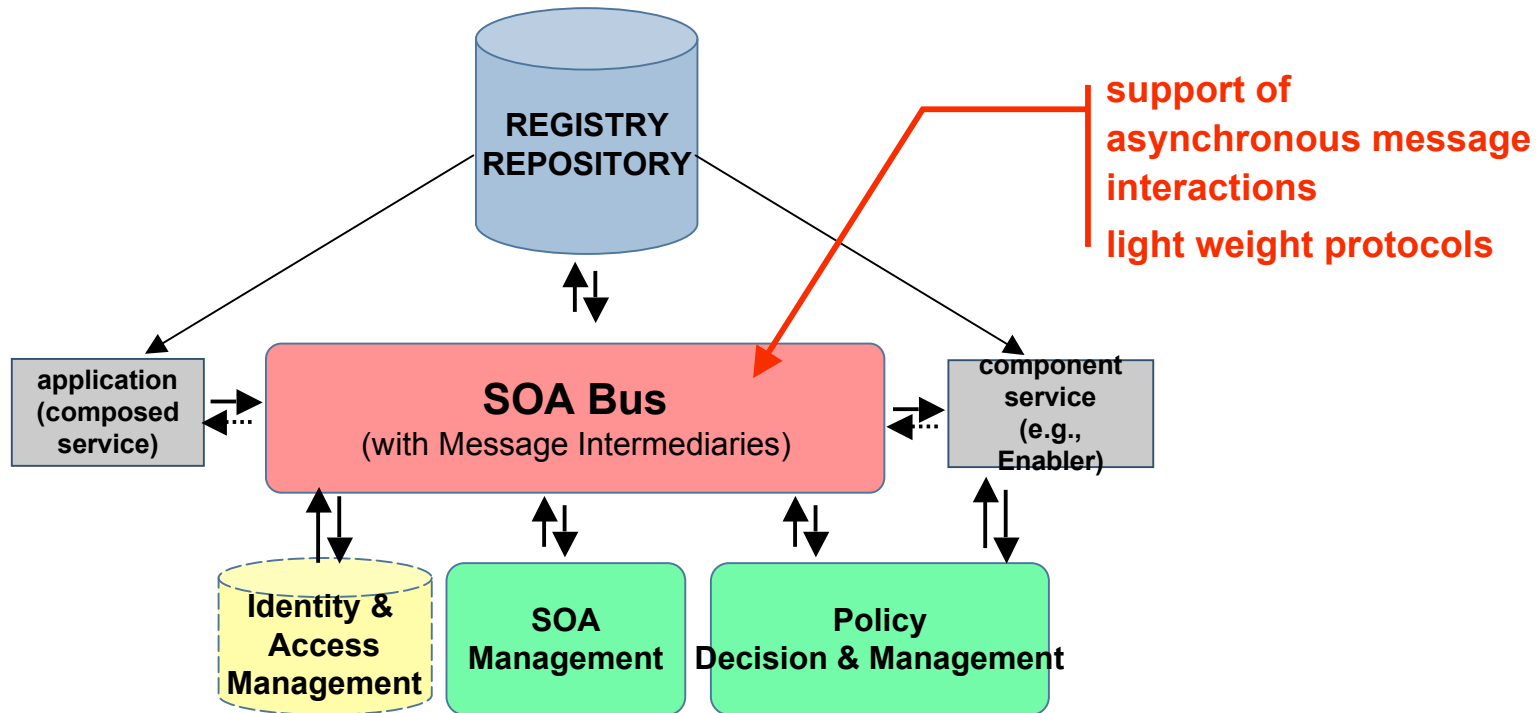
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SOA for Telco Service Layer

SOA in Telco Service Layer: some open issues

standard co-existence

REGISTRY REPOSITORY

application (composed service)

SOA Bus
(with Message Intermediaries)

component service (e.g., Enabler)

Identity & Access Management

SOA Management

Policy Decision & Management

▸ e.g., how to make from BPEL a request based on: WS-Security+WS-Reliability+WS-Addressing?

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SOA for Telco Service Layer

SOA in Telco Service Layer: some open issues

support of asynchronous message interactions

light weight protocols

REGISTRY REPOSITORY

application (composed service)

SOA Bus (with Message Intermediaries)

component service (e.g., Enabler)

Identity & Access Management

SOA Management

Policy Decision & Management

▸ limitations of SOAP on HTTP in supporting Message Exchange Patterns of WSDL (e.g., one-way, notification)

▸ complexity of SOAP extensions (what about REST?)

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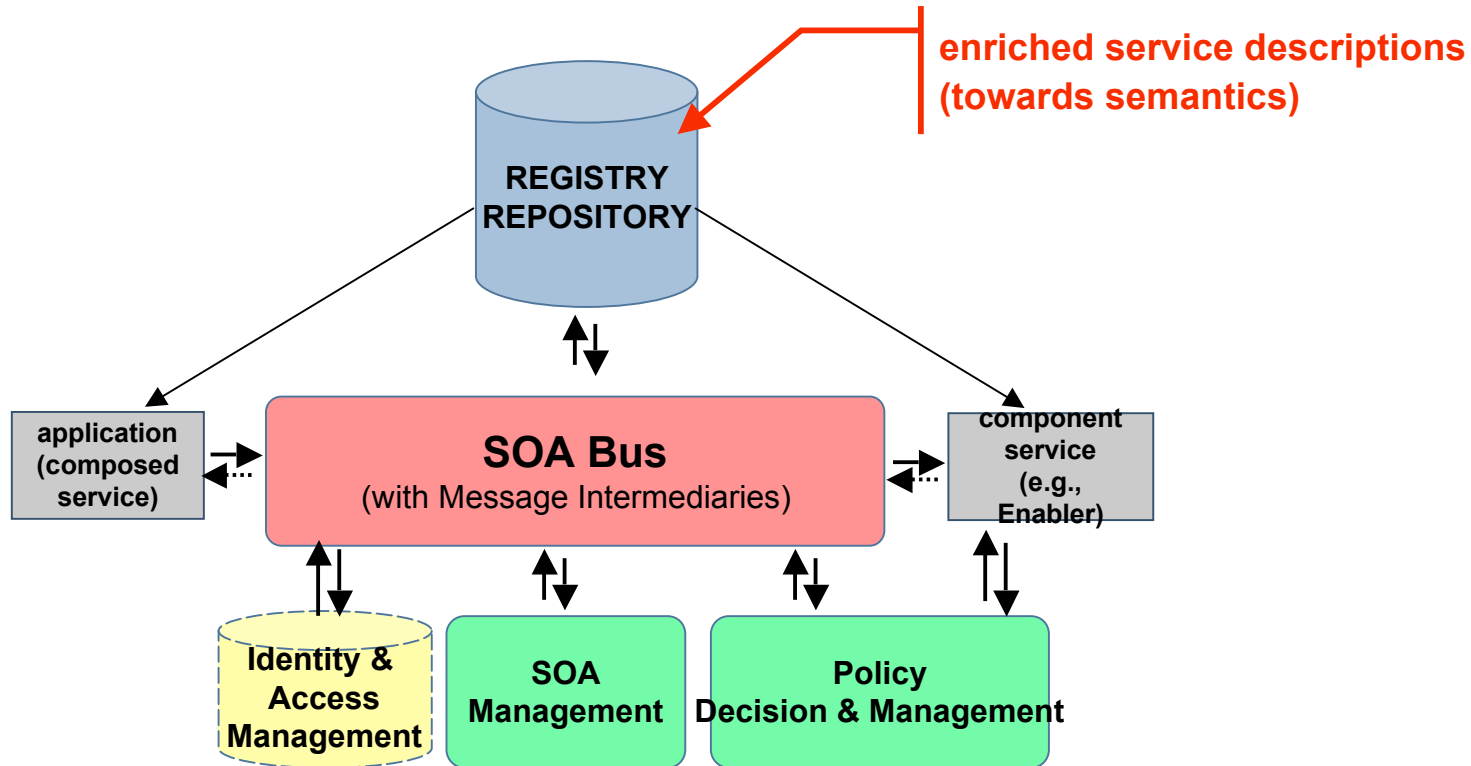13

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SOA in Telco Service Layer: some open issues
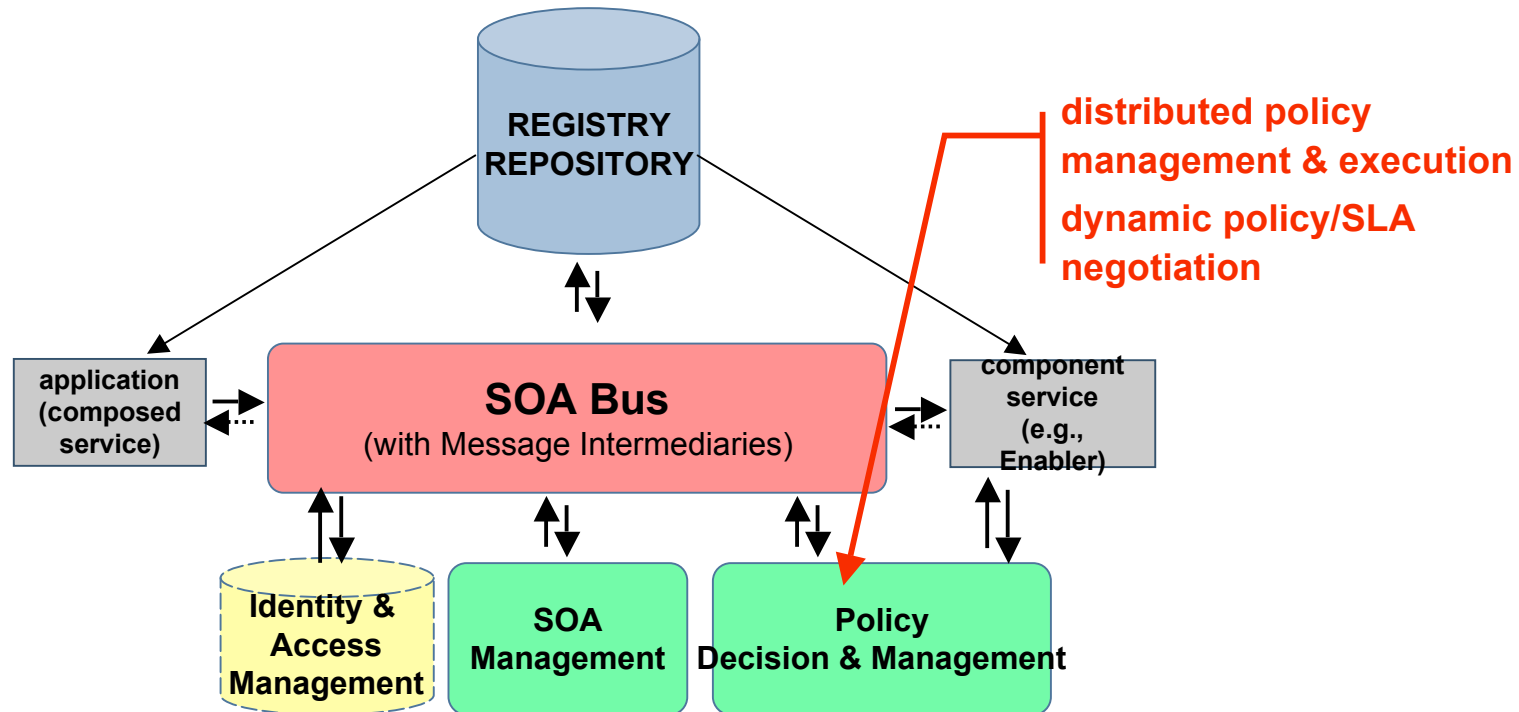
- ▶ support to deal with the dynamic negotiation of SLA
- ▶ support to multiple points/mechanisms of policy enforcements in federated contexts
- ▶ policies on service sessions (possibly involving multiple component services)

SOA for Telco Service Layer

SOA in Telco Service Layer: some open issues

enriched service descriptions (towards semantics)

REGISTRY REPOSITORY

application (composed service)

SOA Bus (with Message Intermediaries)

component service (e.g., Enabler)

Identity & Access Management

SOA Management

Policy Decision & Management

▶ support to dynamic selection/binding and service replanning based on semantic (web) service description
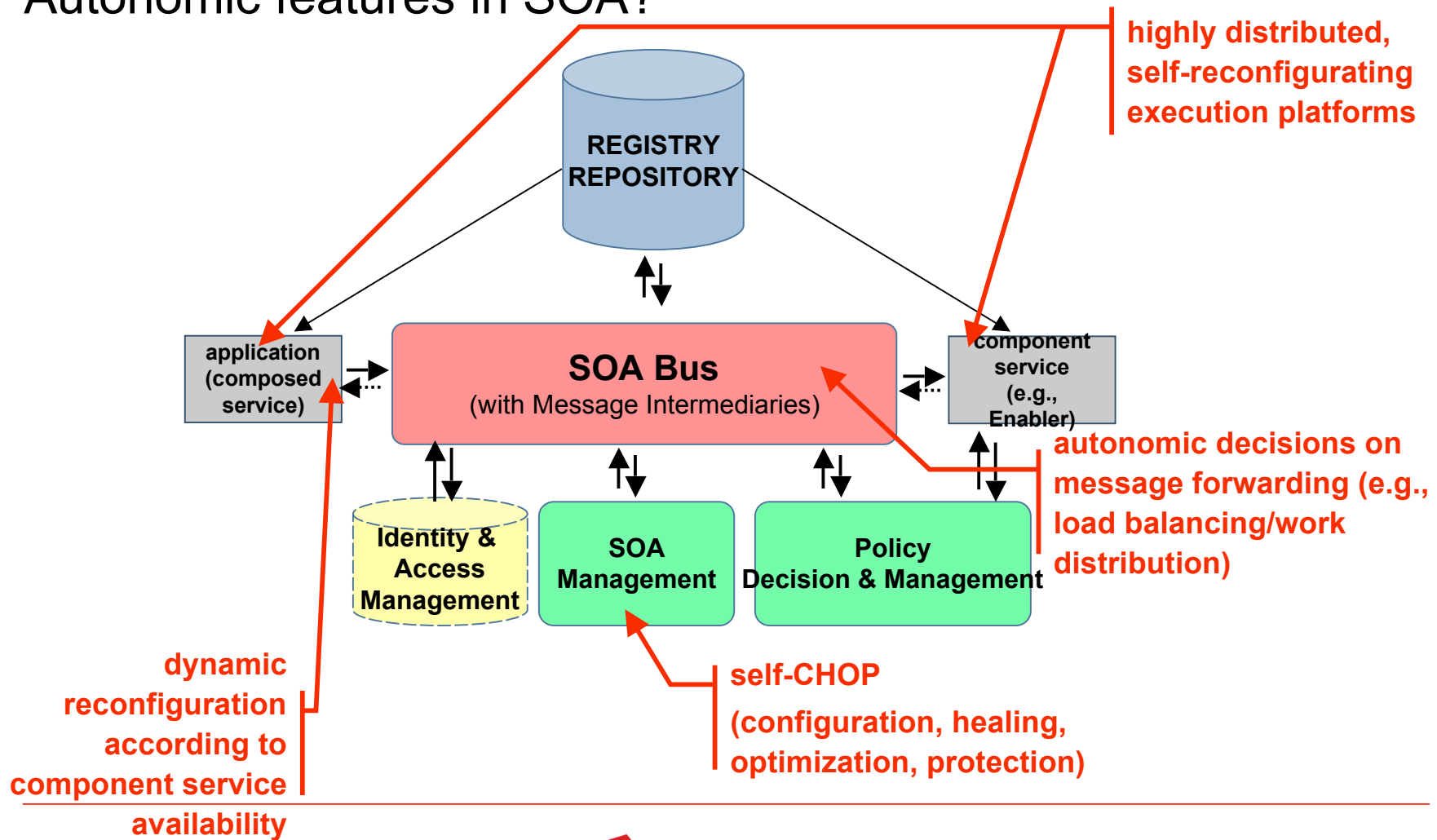
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SOA in Telco Service Layer: some open issues

end-user identity in federated SoC application vs end-user identity

REGISTRY REPOSITORY

application (composed service)

SOA Bus
(with Message Intermediaries)

component service (e.g., Enabler)

Identity & Access Management

SOA Management

Policy Decision & Management
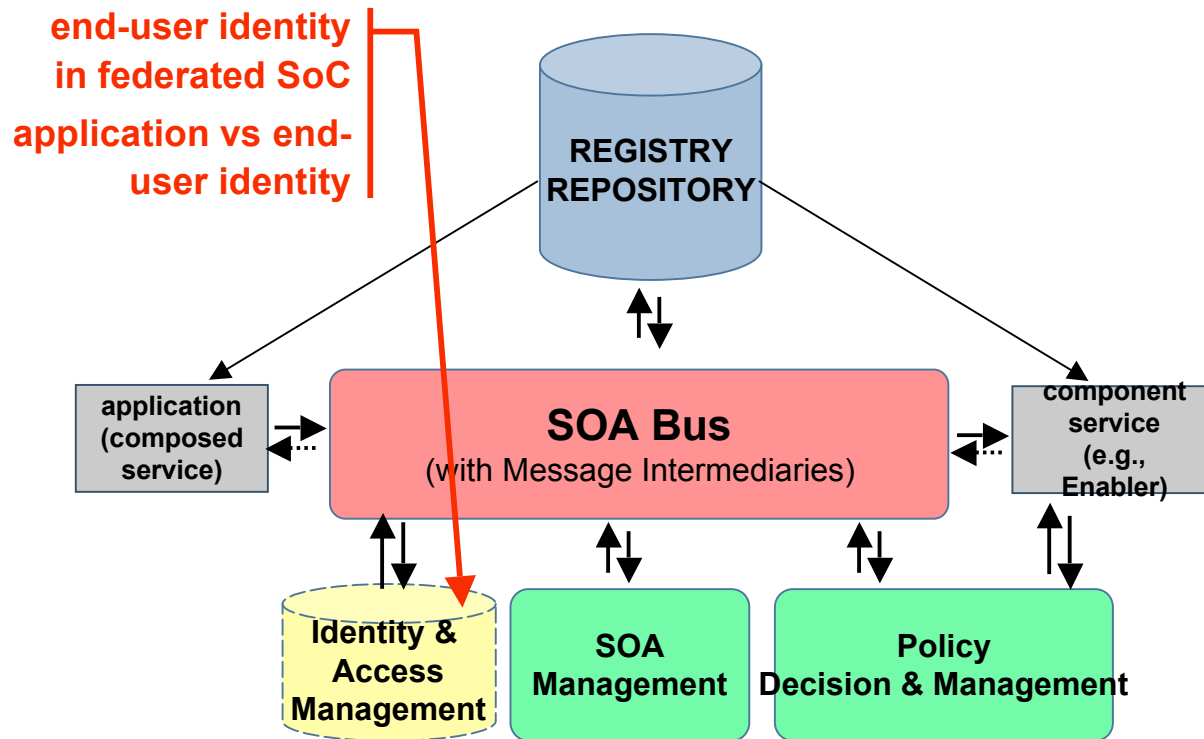
▶ handling of identity/authentication information from composed to component services: identity forwarding, right delegation, privacy, etc.

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SOA for Telco Service Layer

Autonomic features in SOA?

highly distributed, self-reconfigurating execution platforms

REGISTRY REPOSITORY

application (composed service)

SOA Bus
(with Message Intermediaries)

component service (e.g., Enabler)

autonomic decisions on message forwarding (e.g., load balancing/work distribution)

Identity & Access Management

SOA Management

Policy Decision & Management

dynamic reconfiguration according to component service availability

self-CHOP (configuration, healing, optimization, protection)

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SOA for Telco Service Layer

SOA: Web Services or other?

1995: SOA = CORBA

2005: SOA = Web Services

2015: SOA (for Service-Oriented Society) = ??

if Web Services are not enough, we need to identify and specify a coherent set of formalisms, languages, tools, …

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SOA for Telco Service Layer

Issues investigated in IST Project SENSORIA Telco Case Study

Protocol for passing identity information of end-users/applications to Services: formal analysis of the protocol;

Asynchronous interactions with SOAP: definition supported by formal analysis;

Synchronous/Asynchronous Orchestration/Service Composition: analysis on if and how to improve current orchestration languages/tools (e.g., BPEL)

Advanced policy for SLA in WS exposure to 3rd parties: dynamic negotiation; enforcement of policies related to service sessions;

Transactional composition of Service Components (with compensations) for handling failures and exceptions in service logic: formalisms to easily introduce transactional scopes in service logic (e.g., SAGAs+BPEL);

Semantic description of Telecommunication Web Services

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