Introduzione alle Architetture Orientate ai Servizi (SOA)

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What is a Service Oriented Architecture?
What is a Service

• Service:
  – The performance of work (a function) by one for another

• Software Service:
  – The performance of work (a function) by one software component for another entity
Needs vs. Capability

• A Service Provider offers Capabilities
  – A capability is a resource that may be used by a service provider to achieve a real world effect on behalf of a service consumer

• A Service Consumer has Needs:
  – A need is a measurable requirement that a service participant is actively seeking to satisfy
Design Principles

• Principles that Implements:
  – Standardized Service Contract
  – Service Reusability
  – Service Autonomy
  – Service Stateless
  – Service Discoverability

• Principles that Regulate:
  – Service Loose Coupling
  – Service Abstraction
  – Service Composability
SOA: Aligning Business with IT

– driven by business, not technology
– focusing on shared and re-used functionality
– aligning business and IT
– relying on strong governance
– can be implemented using any architecture, technology, or set of products
Definition from OASIS

“Service Oriented Architecture is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations”

## SOA and Two Main Approaches For Realizing It

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**Technical SOA**

- SOAP, WSDL, WS-*/
- (RESTful) HTTP, URI, ...

**Business**

- SOA as an approach to business/IT alignment

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What is a Web Service

“Software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web service in a manner prescribed by its description using SOAP-messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards”

http://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/
Service Interface Contract

Service interface
- service description
- service messages

Data types
- service specific types
- common types

WSDL
- XSD
- XSD

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Web Services Platform

- Connected Applications
- Devices
- Mobile
- P2P
- EAI
- B2B
- Grid
- Management
- Business Process
- …
- Secure
- Reliable
- Transacted
- Messaging
- Metadata
- XML
- Transports
REST: An Architectural Style

• REST: REpresentational State Transfer
  – Models the winning features of the Web as architectural elements and constraints

• Can be applied to machine-to-machine interaction
  – RESTFul Services

• Not a protocol
  – e.g., You can build RESTFul Services with HTTP or SOAP
REST Principles

- Give Every “Thing” an URI
- Allow multiple representations for the same resource
- Uniform Interface (pre-defined semantics)
  - GET/PUT/POST/DELETE/...
- Stateless Communication
Grid

“A system that is concerned with the integration, virtualization, and management of services and resources in a distributed, heterogeneous environment that supports collections of users and resources (virtual organizations) across traditional administrative and organizational domains (real organizations)”

http://www.ogf.org/documents/GFD.44.pdf
Jan 2005
Open Grid Service Architecture

• A Service Oriented Architecture defining a set of core capabilities and behaviors that address key concerns in Grid systems
  
  http://www.ogf.org/documents/GFD.80.pdf

• Defined by the Open Grid Forum
  
  http://ogf.org
Cloud Computing: What is it?
What Happened After the Grid was Born

• Virtualization has become a Commodity
  – Cost-free solutions available
• Service Orientation in software systems emerged with realization on Web Services and RESTful HTTP
• New Business Models are now possible
Talk @ Open Grid Forum 23
Barcelona, 3 June 2008

http://ogf.org/gf/event_schedule/index.php?id=1334
Check Werner’s blog http://www.allthingsdistributed.com
Cloud Computing

- outsourced
- pay-as-you-go
- on-demand
- somewhere in the internet
- ...

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Types of Clouds: Applications in the Cloud

• Some company hosts an application in the internet that many users sign-up for

• and use without any concern about
  – where, how, by whom the compute cycles and storage bits are provided

• The service being sold (or offered in ad-sponsored form) is a complete end-user application

• Examples:
  – gmail, yahoo mail, google apps, …
Types of Clouds: Platforms in the Cloud

Developers write their application to a more or less open specification

... and then upload their code into the cloud where the app is run magically somewhere,

... typically being able to scale up automagically as usage for the app grows.

Examples:

Mosso, Google App Engine, and Force.com
Types of Clouds: Infrastructure in the Cloud

- This is the most general offering that Amazon has pioneered and where RightScale offers its management platform.
- Developers and system administrators obtain general compute, storage, queueing, and other resources and run their applications with the fewest limitations.
- This is the most powerful type of cloud in that virtually any application and any configuration that is fit for the internet can be mapped to this type of service.
- Examples:
  - Amazon Web Services (both REST and WS-*)
70% vs. 30%
Success Stories

• Application in the Cloud
  – One for all: Google GMail and Apps
  – Free for educational institutes
    • Some US university are migrating their services to Google
      – University of Notre Dame
        http://oit.nd.edu/google/faq.shtml#onlysolution
    • In Italy:
      – University of Ferrara: 25.000 accounts
        http://www.lswn.it/comunicati/stampa/2007/arriva_my_desk_at_unife/
      – Università di Torino: in fase sperimentale
        http://www.unito.it/rss/permalink-729.htm
Success Stories

• Infrastructure in the Cloud
  – SmugMug: Organize and Share Your Photos
    • 300,000 Customers
    • ~300M photos for 0.5 PB storage
      – not counting replicas
    • Started with own data center in 2002, later moved to Amazon S3, EC2 and SQS
  – Animoto:
    • Automatically Generate Professionally Produced Videos
    • Scaled from 10 to 4,000 VM instances in 3 days
    • [http://animoto.com/](http://animoto.com/)
Questions

• Infrastructure as a Service is a reality
  – Not convenient for Scientific Computing
  Yet...

How long it will take for “infrastructure as a service” providers which are competing with our in-house solutions?

How do we maintain the added value of INFN infrastructure?

Note:
EGEE/CERN made a comparative study between EGEE Grid and Cloud (a la Amazon) [https://edms.cern.ch/file/925013/3/EGEE-Grid-Cloud.pdf](https://edms.cern.ch/file/925013/3/EGEE-Grid-Cloud.pdf)
Conclusion

- In distributed systems, SOA is an evolutionary approach to model distributed capabilities and the interaction with them.

- OGSA is the application of SOA to Grid systems.

- Web Services is the selected stack of technologies chosen for implementing OGSA (other approaches are viable).
  - Current middleware such as gLite are transitioning to standard-based service interfaces.

- Cloud Computing is a type of SOA with a different business model than Grid.
  - Infrastructure Clouds could be used to extend available resources.