Introduzione alle
Architetture Orientate ai Servizi (SOA)

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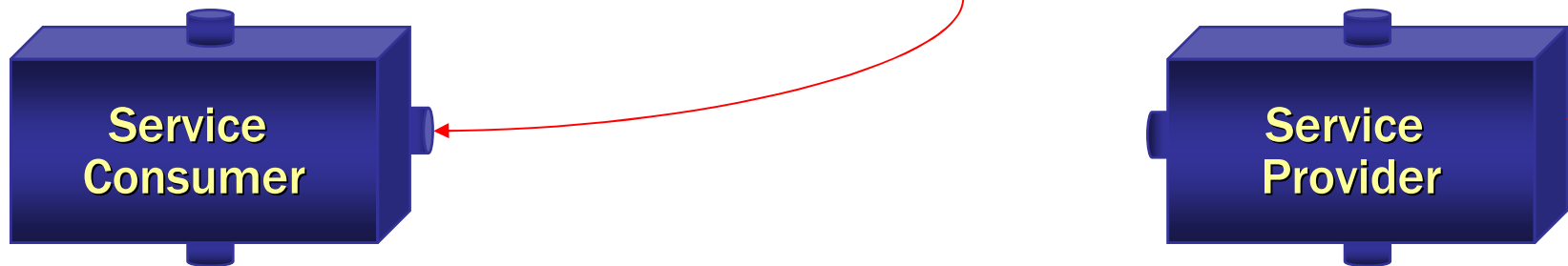
LNGS, 11 Giugno 2008

What is a
Service Oriented Architecture?

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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

Service Consumer

Service Provider

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 Statelessness
  - 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"

http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf (12 Oct 2006)

SOA and Two Main Approaches For Realizing It

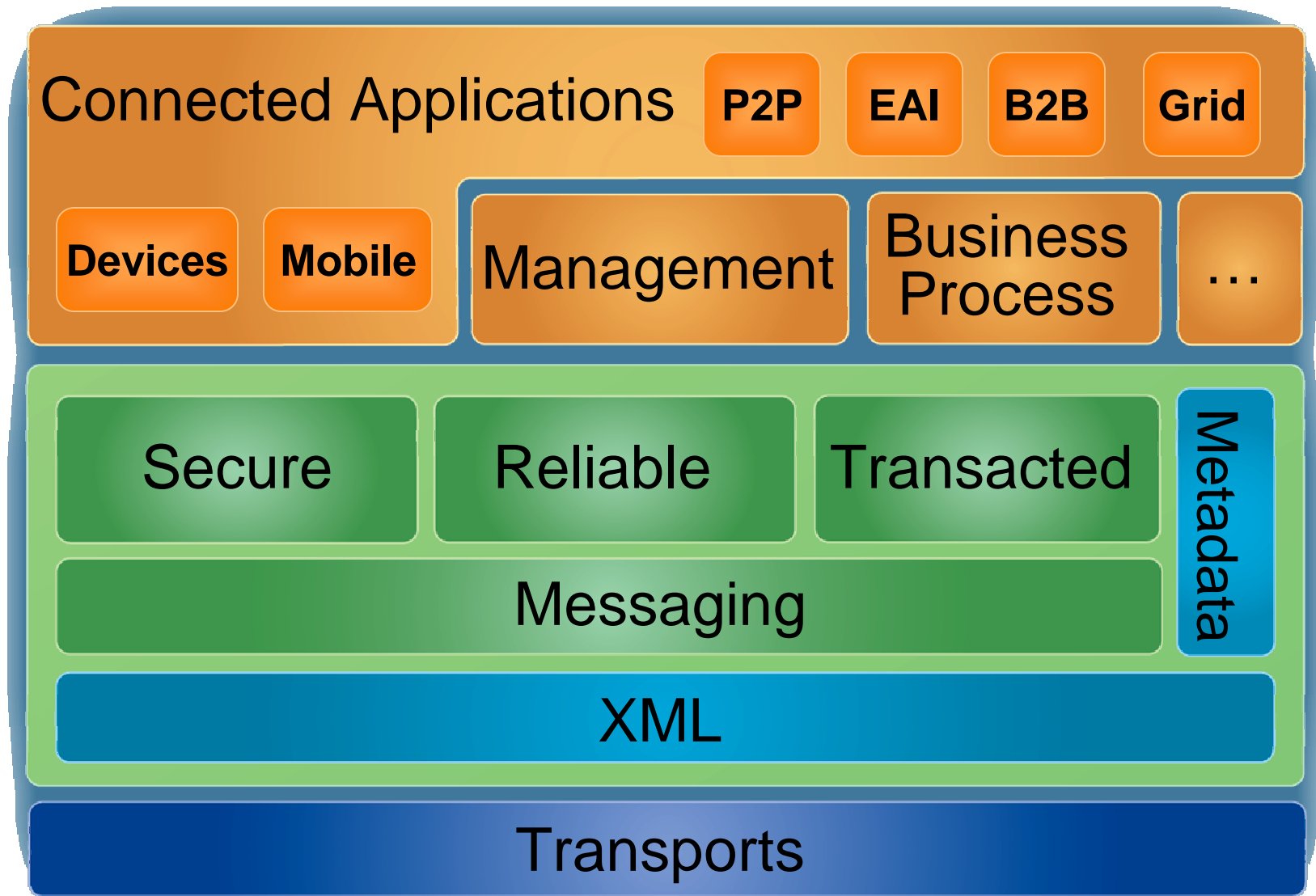| Business	SOA as an approach to business/IT alignment	
Architecture	Technical SOA	REST
Technology	SOAP, WSDL, WS-*	(RESTful) HTTP, URI, ...

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

Web Services Platform

Connected Applications | P2P | EAI | B2B | Grid

Devices | Mobile | Management | Business Process | …

Secure | Reliable | Transacted | Metadata

Messaging

XML

Transports
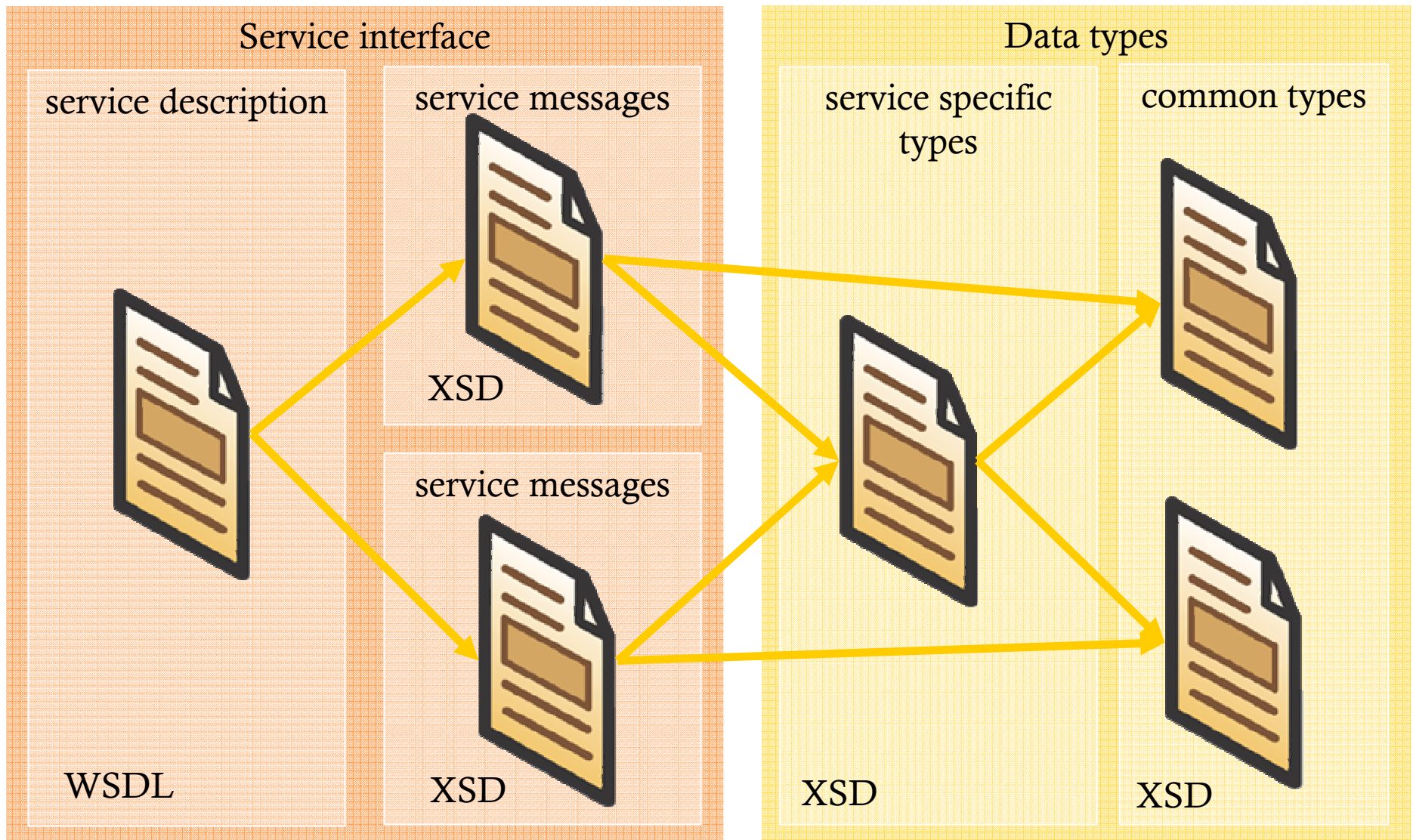
REST: An Architectural Style

- REST: REpresentational State Transfer
  - Models the winning feauters of the Web as architectural elements and constraints

    http://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm

- 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

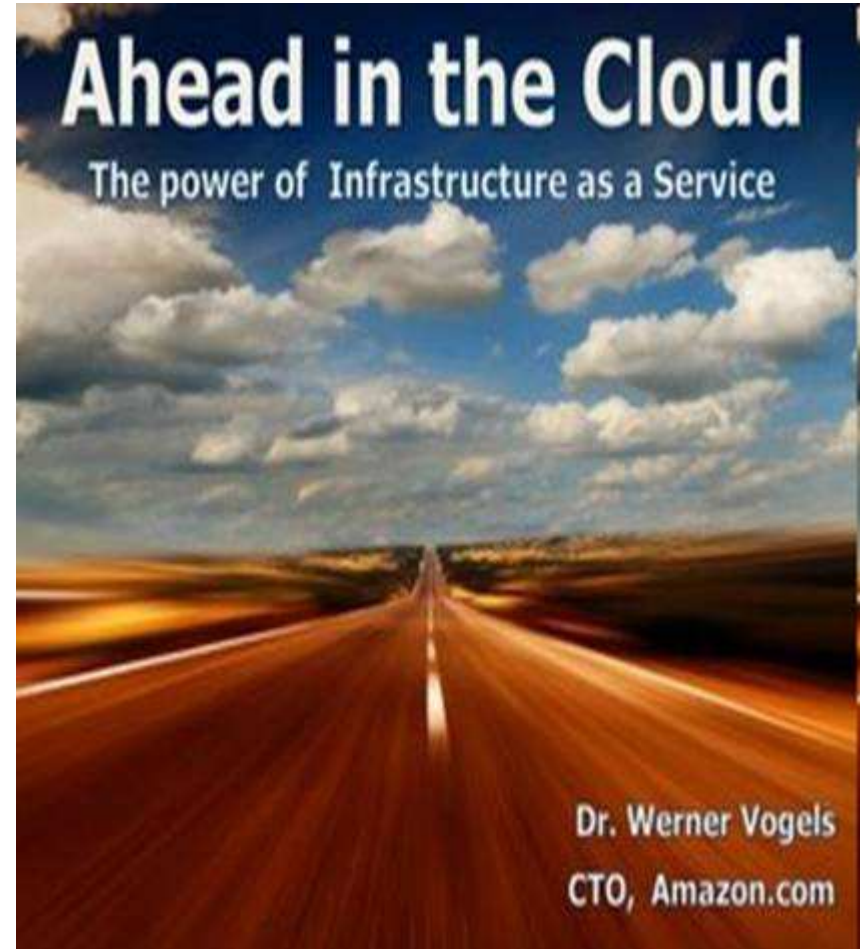# Cloud Computing: What is it?

?

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

Ahead in the Cloud
The power of Infrastructure as a Service

Dr. Werner Vogels
CTO, Amazon.com

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

- ...

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%
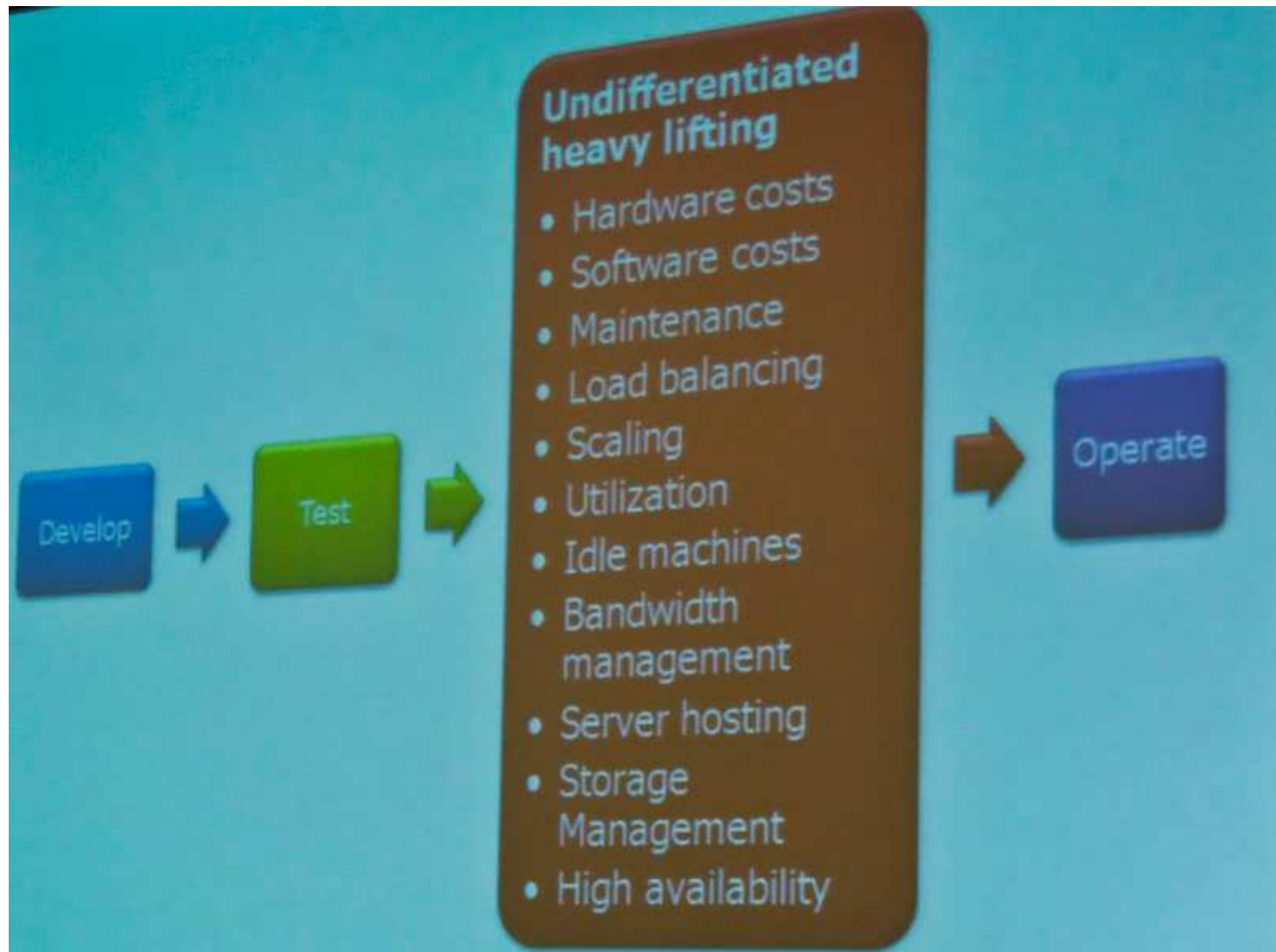
Success Stories

- 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/
      - Universitò 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
    - http://blogs.smugmug.com/don/2008/06/03/skynet-lives-aka-ec2-smugmug/
  - Animoto:
    - Automatically Generate Professionally Produced Videos
    - Scaled from 10 to 4,000 VM instances in 3 days
    - http://animoto.com/

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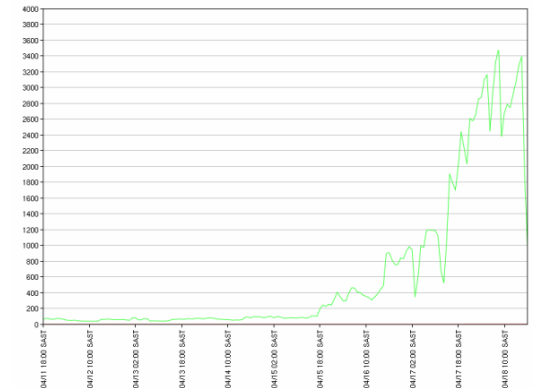
Questions

- ## 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

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