



# **TECNOLOGIE DI CLOUD COMPUTING PER IL CALCOLO SCIENTIFICO**

**Presentazione stage per studenti triennali** | Università di Torino Mar 6, 2013

# IL CENTRO DI CALCOLO INFN



## ● Ricerca tecnologica

- Core Computing per l'esperimento ALICE (e non solo)
- Partecipazioni a progetti nazionali ed europei di R&D sul calcolo scientifico e distribuito
- Virtualizzazione & interattività

## ● Servizio & supporto

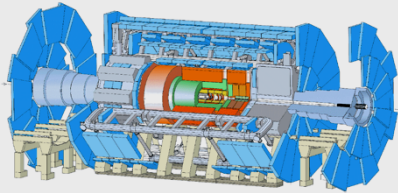
- Servizio IT di Sezione
- Infrastruttura per Sezione e Dipartimento di Fisica
- Gestione PoP GARR
- Tier-2 e coordinamento dei Tier-2 italiani per ALICE
- Coordinamento sicurezza ROC italiano

- High Performance Computing
  - Attività CPU-bound
- High Throughput Computing
  - Attività I/O-bound

## **Per esempio:**

- Analisi dati di esperimenti
- Simulazioni Montecarlo
- Simulazioni numeriche

**ATLAS**



**CMS**



23 €/GB  
300TB ≈ 7 milioni di €!

Una pila di dischi  
più di 3km!

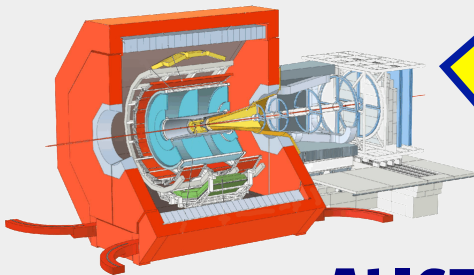
320 MB/s

300 MB/s

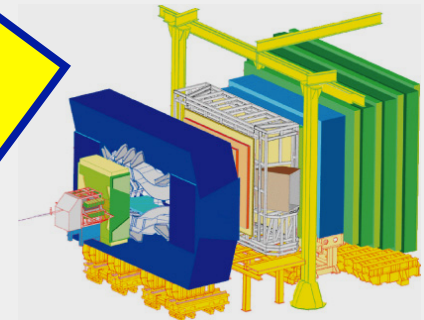
**15 PB/anno**

100 MB/s  
1.25 GB/s

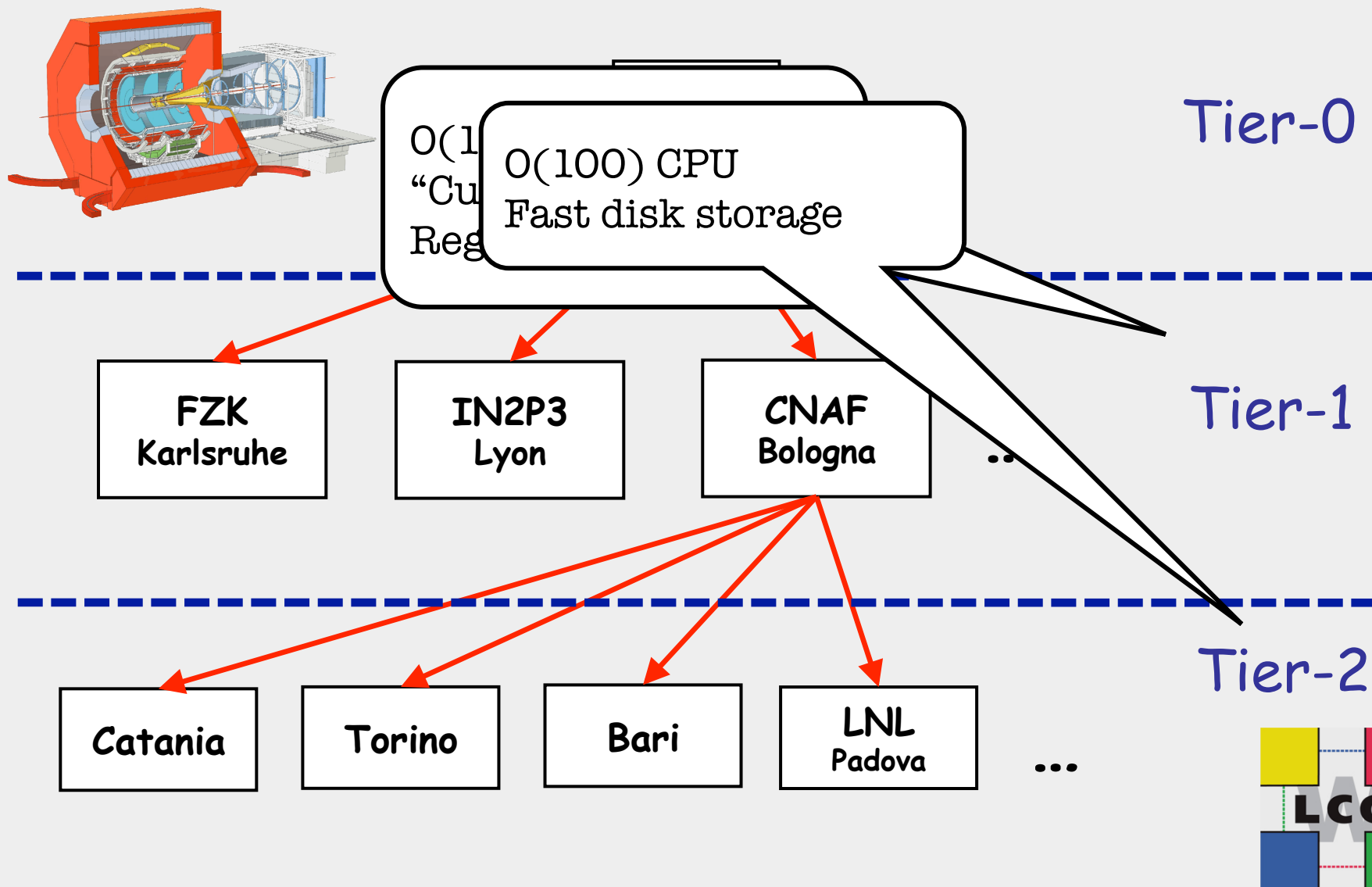
50 MB/s



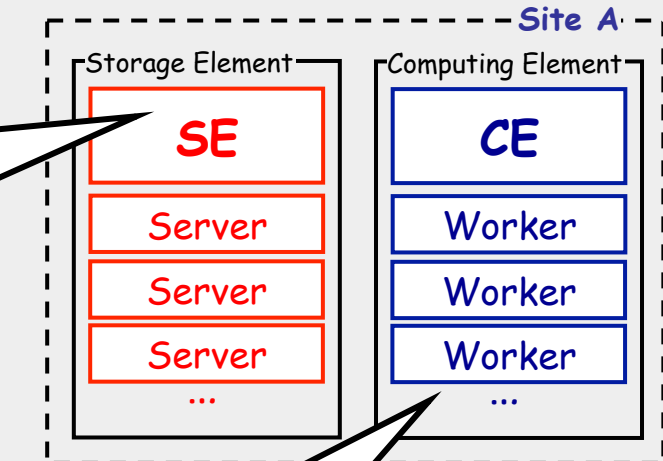
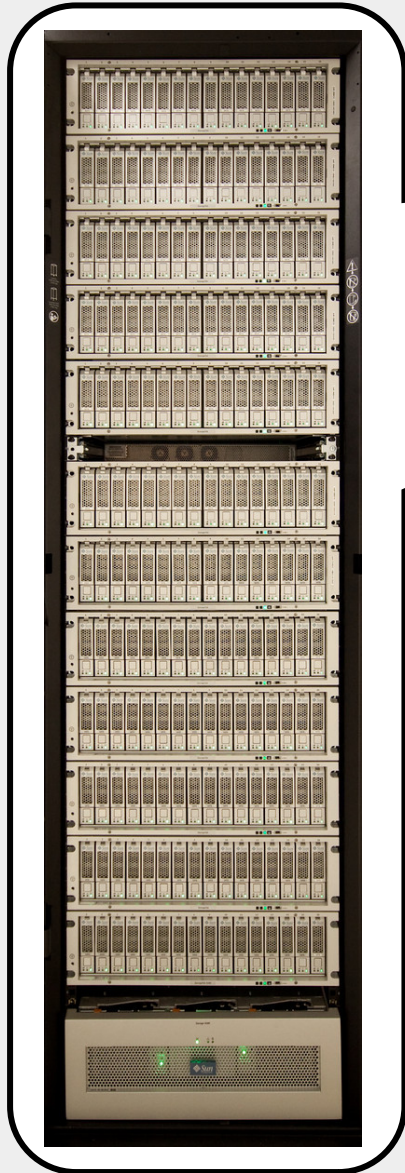
**ALICE**

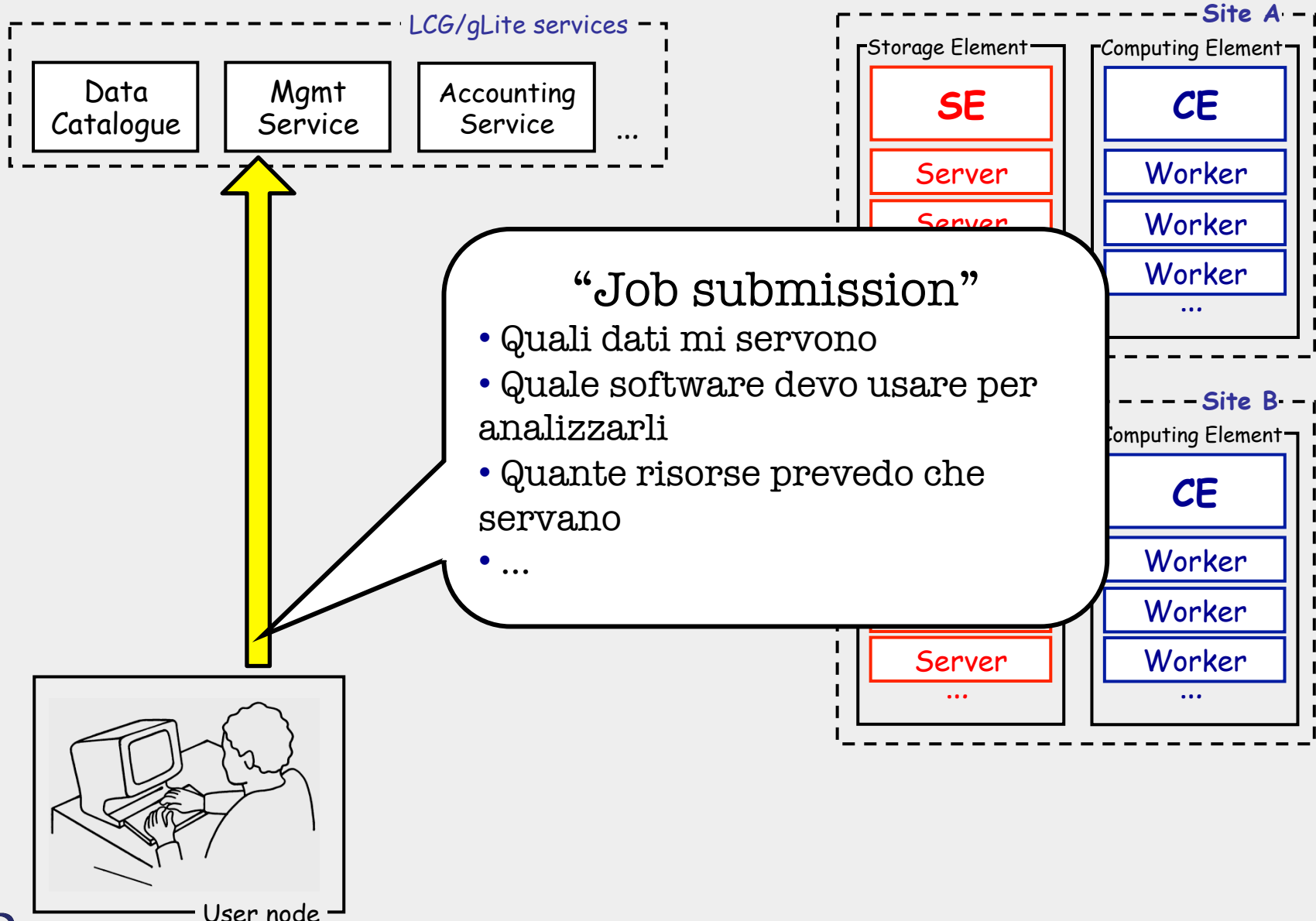


**LHCb**



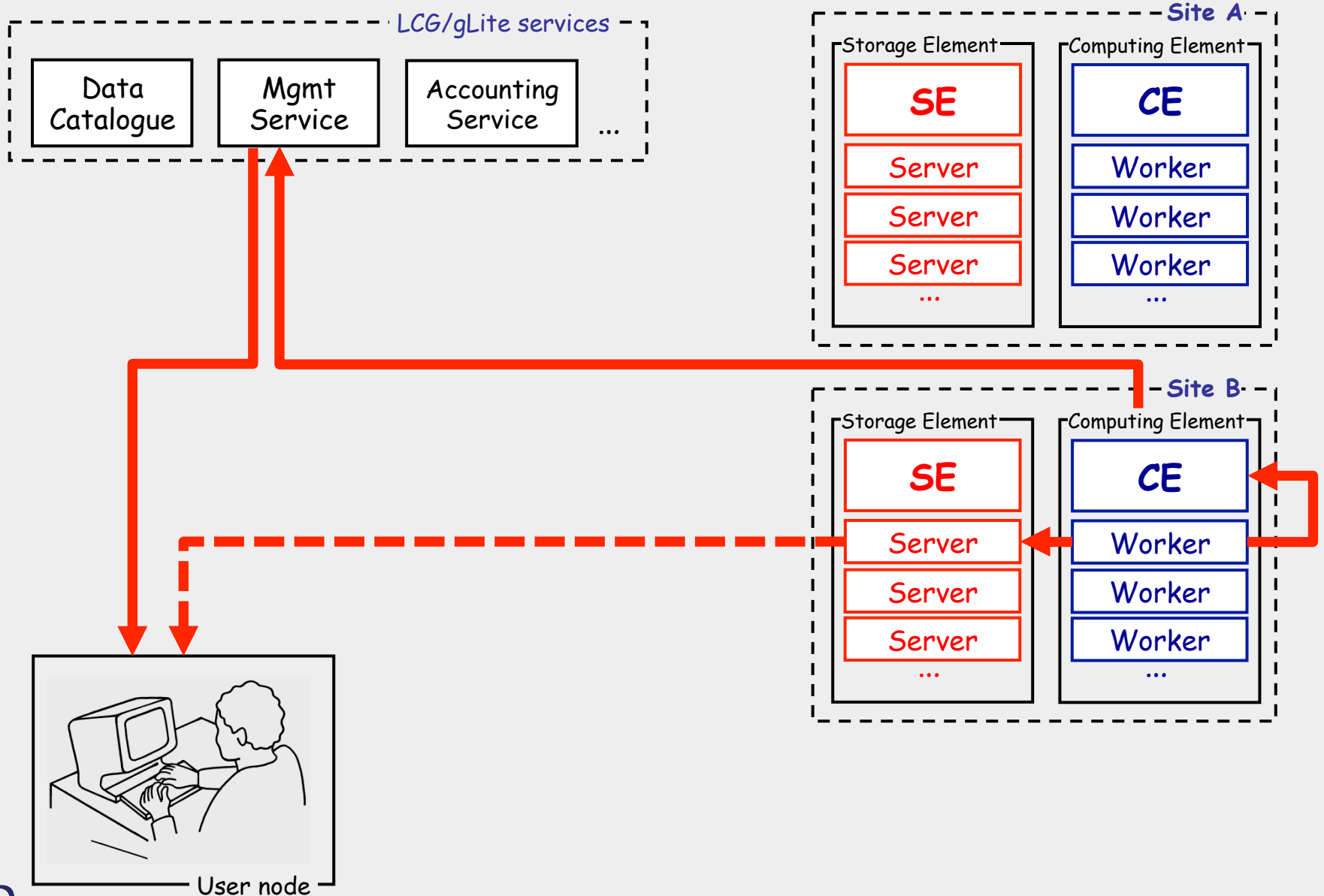
# COME FUNZIONA







# GRID COMPUTING



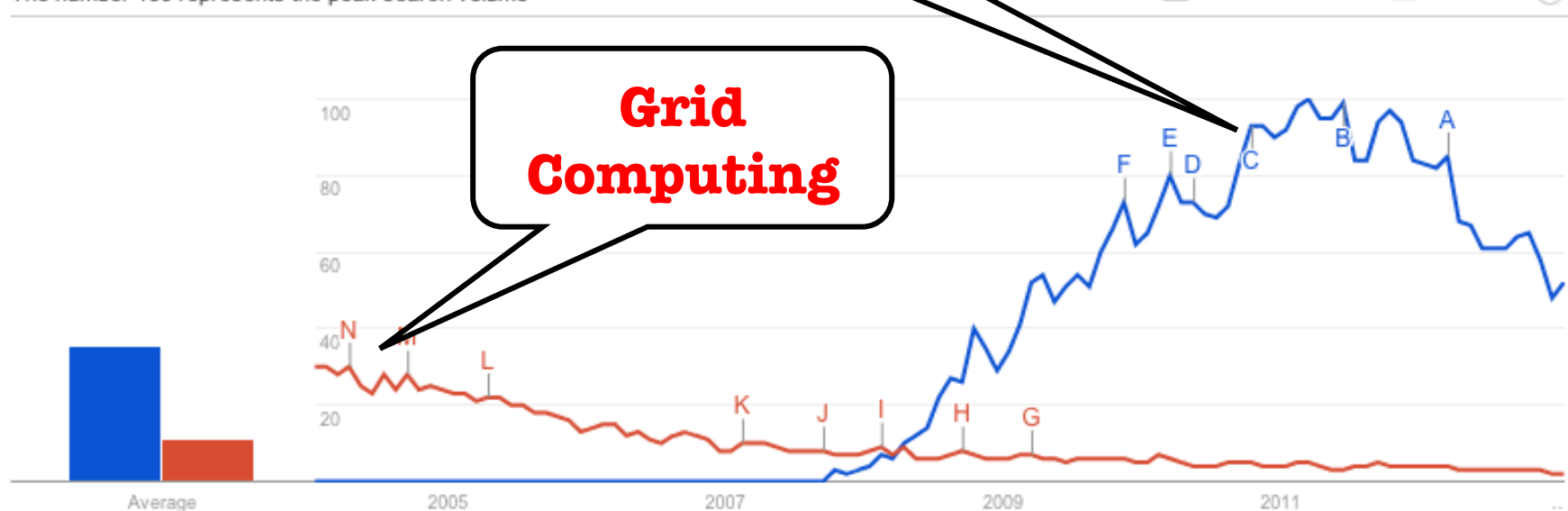
**Cloud Computing**

**Grid Computing**

## Interest over time

The number 100 represents the peak search volume

News headlines  Forecast



Embed

In informatica con il termine inglese **cloud computing** si indica un insieme di tecnologie che permettono, tipicamente sotto forma di un servizio offerto da un provider al cliente, di memorizzare/archiviare e/o elaborare dati (tramite CPU o software) grazie all'utilizzo di risorse hardware/software distribuite e virtualizzate in Rete.



**WIKIPEDIA**  
The Free Encyclopedia

- **On-demand self-service.**

- A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

- **Broad network access.**

- Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client.

- **Resource pooling.**

- Computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

- **Rapid elasticity.**

- Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand.

- **Measured service.**

- Cloud systems automatically control and optimize resource use by leveraging a metering capability at a level of abstraction appropriate to the type of service.

## IaaS



(EC2)

Infrastructure-as-a-Service

## PaaS

Platform-as-a-Service



## SaaS

[Software | Storage]-as-a-Service

Google Apps



Dropbox

- **Public cloud**

- Amazon WS

- **Private cloud**

- “Datacenter virtualization” vs. “Infrastructure provisioning”

- **Hybrid cloud**

- “Cloudbursting”

- Infrastruttura IaaS “Private Cloud”
  - Semplifica la gestione
  - Permette maggiore flessibilità
- Basata su tool open-source e molto diffusi
  - OpenNebula, GlusterFS,...
- Circa 30 macchine tra worker e servizi
  - In crescita
- Circa 300TB storage
  - In crescita

# INFRASTRUTTURA A TORINO

OpenNebula Sunstone Documentation | Support | Community Welcome oneadmin | Sign out

Virtual Machines + New Update properties Change owner Change group Shutdown Previous action Delete ?

Show 25 entries Show / hide columns Search:

<input type="checkbox"/>	ID	Owner	Group	Name	Status	Hostname	IPs	VNC Access
<input type="checkbox"/>	2016	oneadmin	oneadmin	DGAS-VRouter	RUNNING	one-kvm-srv-05	172.16.6.254 193.205.66.214	
<input type="checkbox"/>	2232	oneadmin	oneadmin	CE-EMI2-CentOS6	RUNNING	one-kvm-srv-05	192.168.0.60 193.206.184.29	
<input type="checkbox"/>	2021	oneadmin	oneadmin	User-Interface	RUNNING	one-kvm-srv-03	192.168.0.250 193.205.66.193	
<input type="checkbox"/>	2024	oneadmin	oneadmin	SE-Storm-EMI	RUNNING	one-kvm-srv-03	192.168.0.231 193.205.66.192	
<input type="checkbox"/>	2022	oneadmin	oneadmin	MyProxy-slave	RUNNING	one-kvm-srv-02	192.168.0.205 193.205.66.194	
<input type="checkbox"/>	2023	oneadmin	oneadmin	MyProxy	RUNNING	one-kvm-srv-02	192.168.0.199 193.206.184.17	
<input type="checkbox"/>	2026	oneadmin	oneadmin	Site-BDII	RUNNING	one-kvm-srv-02	192.168.0.252 193.206.184.19	
<input type="checkbox"/>	2203	oneadmin	oneadmin	BES-VRouter	RUNNING	one-kvm-srv-01	172.16.7.254 193.205.66.210	
<input type="checkbox"/>	2217	oneadmin	oneadmin	one-2217	RUNNING	one-kvm-srv-01	192.168.5.80 193.205.66.220	
<input type="checkbox"/>	2059	oneadmin	oneadmin	WN-v8.0	RUNNING	one-kvm-27	192.168.3.24	
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<input type="checkbox"/>	2169	oneadmin	oneadmin	PROOF-v8.0	RUNNING	one-kvm-27	192.168.6.2	

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# POSSIBILI ATTIVITÀ A CUI PARTECIPARE

- Studio di un sistema di Object Storage
- Sviluppo di interfacce self-service per la gestione delle macchine virtuali
- Tool di monitoraggio e accounting delle risorse usate
- Integrazione dei sistemi di autenticazione e autorizzazione federate
- Studio e ottimizzazione della performance dei filesystem e dei sistemi di storage
- Sperimentazioni inter-cloud
- Integrazione di nuovi use case

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