Welcome to HTCondor Week #16

(year 31 of our project)

CHTC Team 2014

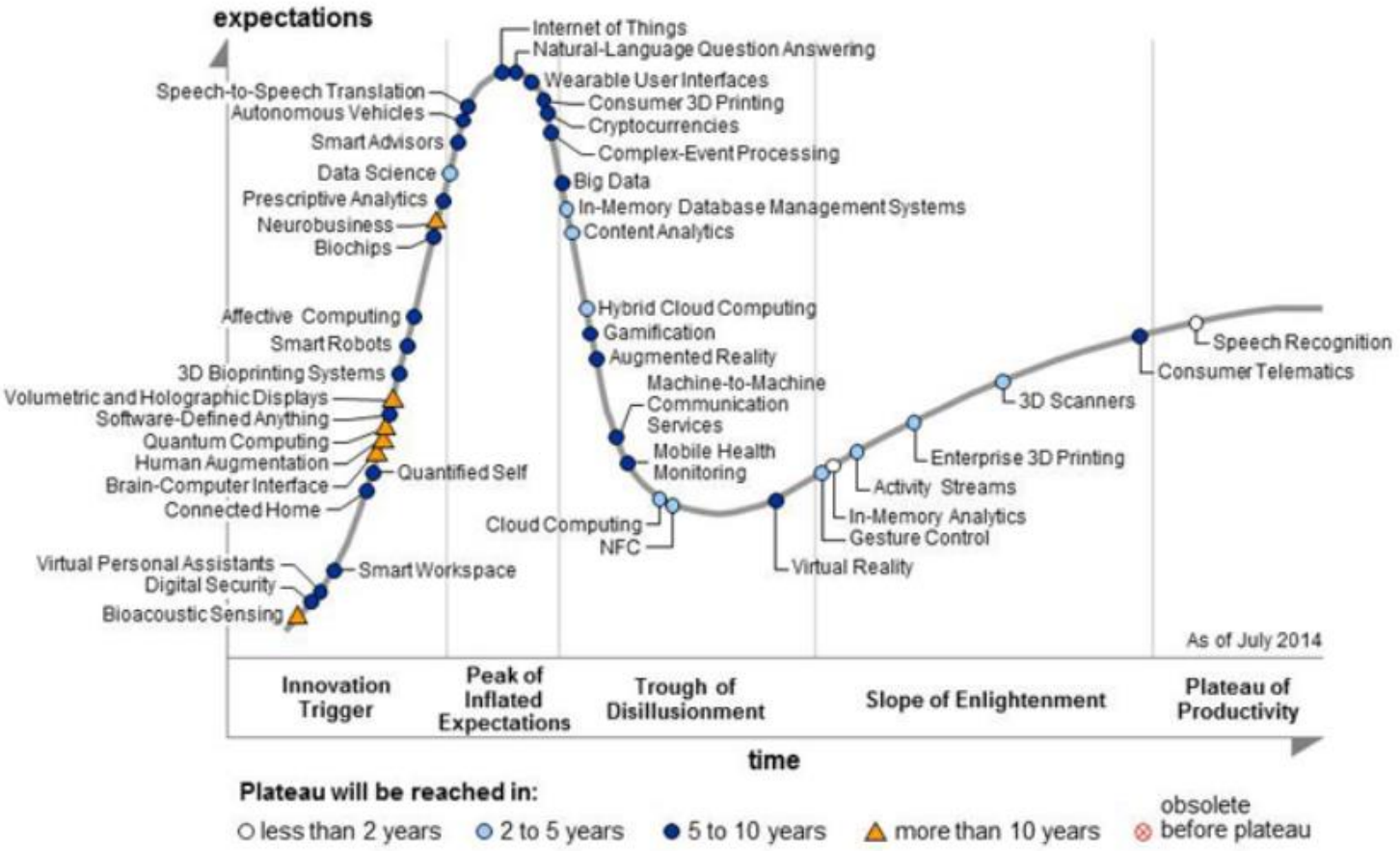
Driven by the potential of Distributed Computing to advance Scientific Discovery

Claims for "benefits" provided by Distributed Processing Systems

P.H. Enslow, *"What is a Distributed Data Processing System?"* Computer, January 1978

- High Availability and Reliability
- High System Performance
- Ease of Modular and Incremental Growth
- Automatic Load and Resource Sharing
- Good Response to Temporary Overloads
- Easy Expansion in Capacity and/or Function

We are driven by Principals (– Hype)



Source: Gartner (August 2014)

Definitional Criteria for a Distributed Processing System

P.H. Enslow and T. G. Saponas *""Distributed and Decentralized Control in Fully Distributed Processing Systems"* Technical Report, 1981

- Multiplicity of resources
- Component interconnection
- **Unity of control**
- System transparency
- **Component autonomy**

Global Scientific Computing via a Flock of Condors

CERN 92

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MISSION

Give scientists effective and efficient access to large amounts of cheap (if possible free) CPU cycles and main memory storage

THE CHALLENGE

How to turn existing privetly owned clusters of *workstations*, *farms*, *multiprocessors*, and *supercomputers* into an efficient and effective Global Computing Environment?

In other words, how to minimize wait while idle?

APPROACH

Use wide-area networks to transfer batch jobs between Condor systems

- Boundaries of each Condor system will be determined by physical or administrative considerations

TWO EFFORTS

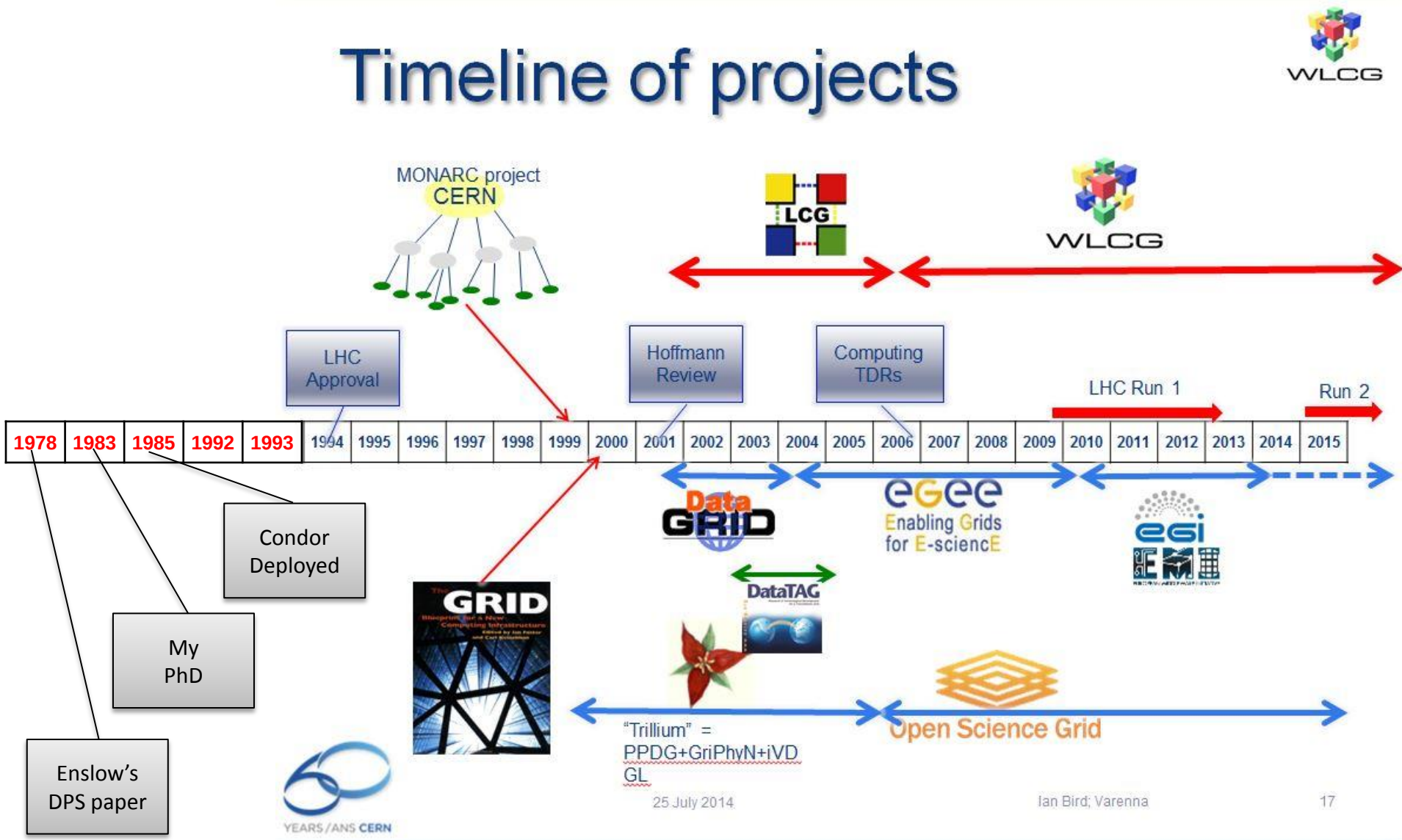
- ***UW CAMPUS***
  Condor systems at Engineering, Statistics, and Computer Sciences
- ***INTERNATIONAL***
  We have started a collaboration between CERN-SMC-NIKHEF-Univ. of Amsterdam, and University of Wisconsin-Madison

Services (2)

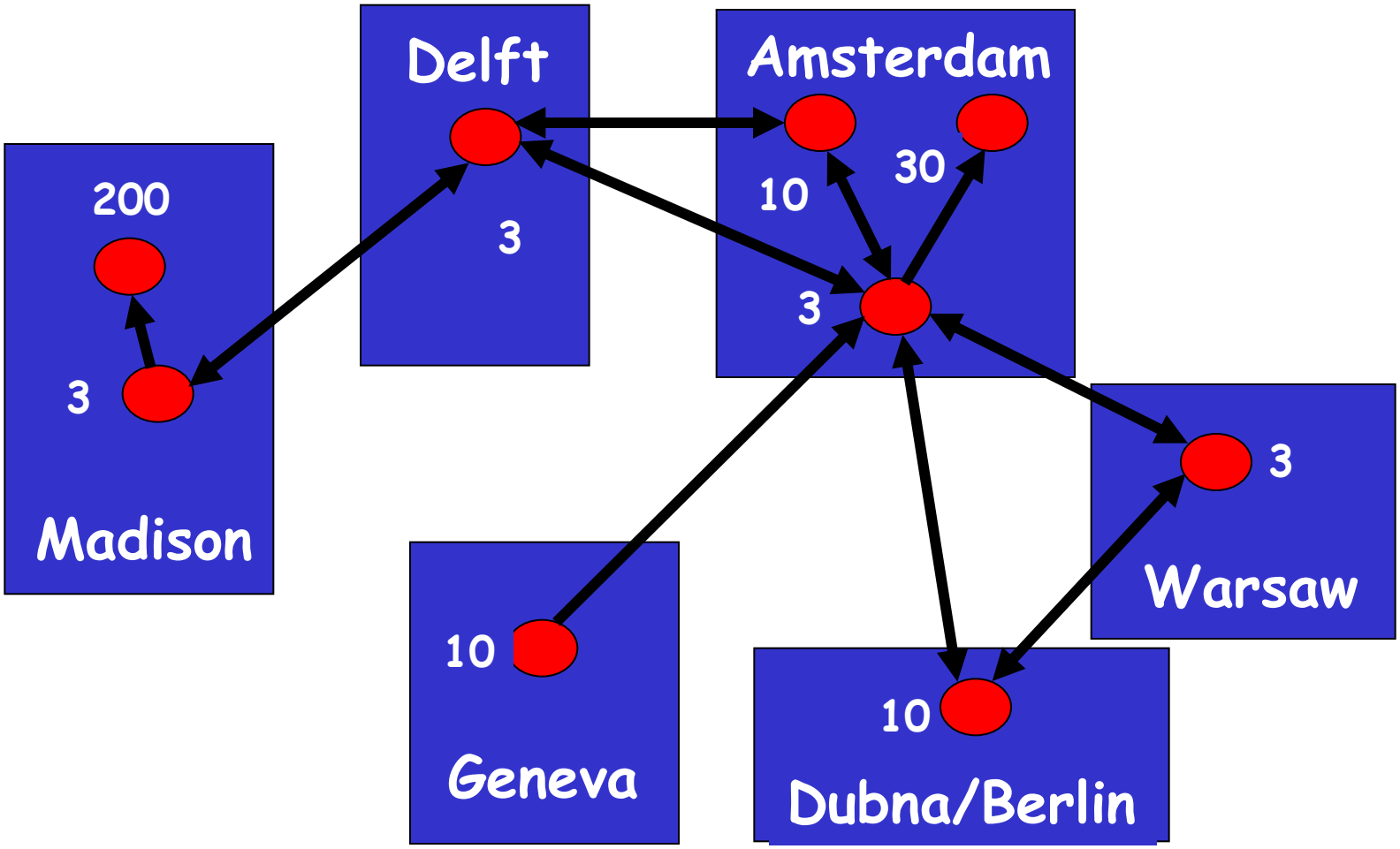
Batch:

- SLC6 migration: SLC5 CEs decommissioned, no grid job submission to SLC5
  - SLC5 WNs final migration ongoing
- Batch system migration, from LSF to HTCondor
  - Goals: scalability, dynamism, dispatch rate, query scaling
  - Replacement candidates:
    - SLURM feels too young
    - HTCondor mature and promising
    - Son of Grid Engine fast, a bit rough
  - More details of selection process: https://indico.cern.ch/event/247864/session/5/contribution/22/material/slides/0.pdf

Timeline of projects



1994 Worldwide Flock of Condors



D. H. J Epema, Miron Livny, R. van Dantzig, X. Evers, and Jim Pruyne, "*A Worldwide Flock of Condors : Load Sharing among Workstation Clusters*" *Journal on Future Generations of Computer Systems*, Volume 12, 1996

In 1996 I introduced the distinction between High **Performance** Computing (**HPC**) and High **Throughput** Computing (**HTC**) in a seminar at the NASA Goddard Flight Center in and a month later at the European Laboratory for Particle Physics (CERN). In June of 1997 HPCWire published an interview on High Throughput Computing.

HIGH THROUGHPUT COMPUTING: AN INTERVIEW WITH MIRON LIVNY 06.27.97
by Alan Beck, editor in chief HPCwire
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This month, NCSA's (National Center for Supercomputing Applications) Advanced Computing Group (ACG) will begin testing Condor, a software system developed at the University of Wisconsin that promises to expand computing capabilities through efficient capture of cycles on idle machines. The software, operating within an HTC (High Throughput Computing) rather than a traditional HPC (High Performance Computing) paradigm, organizes machines

High Throughput Computing is a 24-7-365 activity and therefore requires automation

FLOPY ≠ *(60*60*24*7*52)*FLOPS*

CHEP 2000

CHEP INFORMATION
- Bulletins
- Committees
- Scientific Program
- Docs by topics
- Social events
- Conference location
- Secretariat

GRID INFORMATION
- **Grid** WShop & Tutorial
- **Grid** Program

USEFUL LINKS
- Visiting Padova
- INFN Padova
- University of Padova
- **CHEP**: '94 '95 '97 '98

Last update: *Mar 3, 2000*

PROGRAM OF THE GRID WORKSHOP

- The available presentations are in MS Power Point® (ppt) or Acrobat® (pdf) format
- Shift-click or use the right mouse button to download and save the file

Saturday February 12, 2000

Location:
Dipartimento di Fisica
Via Marzolo 8 Padova (Aula A)

09:00-09:30 **Overview of HEP GRID projects**
Harvey Newman

09:30-10:00 **PPDG**
Richard Mount

10:00-10:30 **Condor and GRID**
Miron Livny

Step IV - Think big!

- Get access (account(s) + certificate(s)) to Globus managed Grid resources
- Submit 599 "To Globus" Condor glide-in jobs to your personal Condor
- When all your jobs are done, remove any pending glide-in jobs
- Take the rest of the afternoon off …

A "To-Globus" glide-in job will ...

- ... transform itself into a Globus job,
- submit itself to Globus managed Grid resource,
- be monitored by your personal Condor,
- once the Globus job is allocated a resource, it will use a GSIFTP server to fetch Condor agents, start them, and add the resource to your personal Condor,
- vacate the resource before it is revoked by the remote scheduler

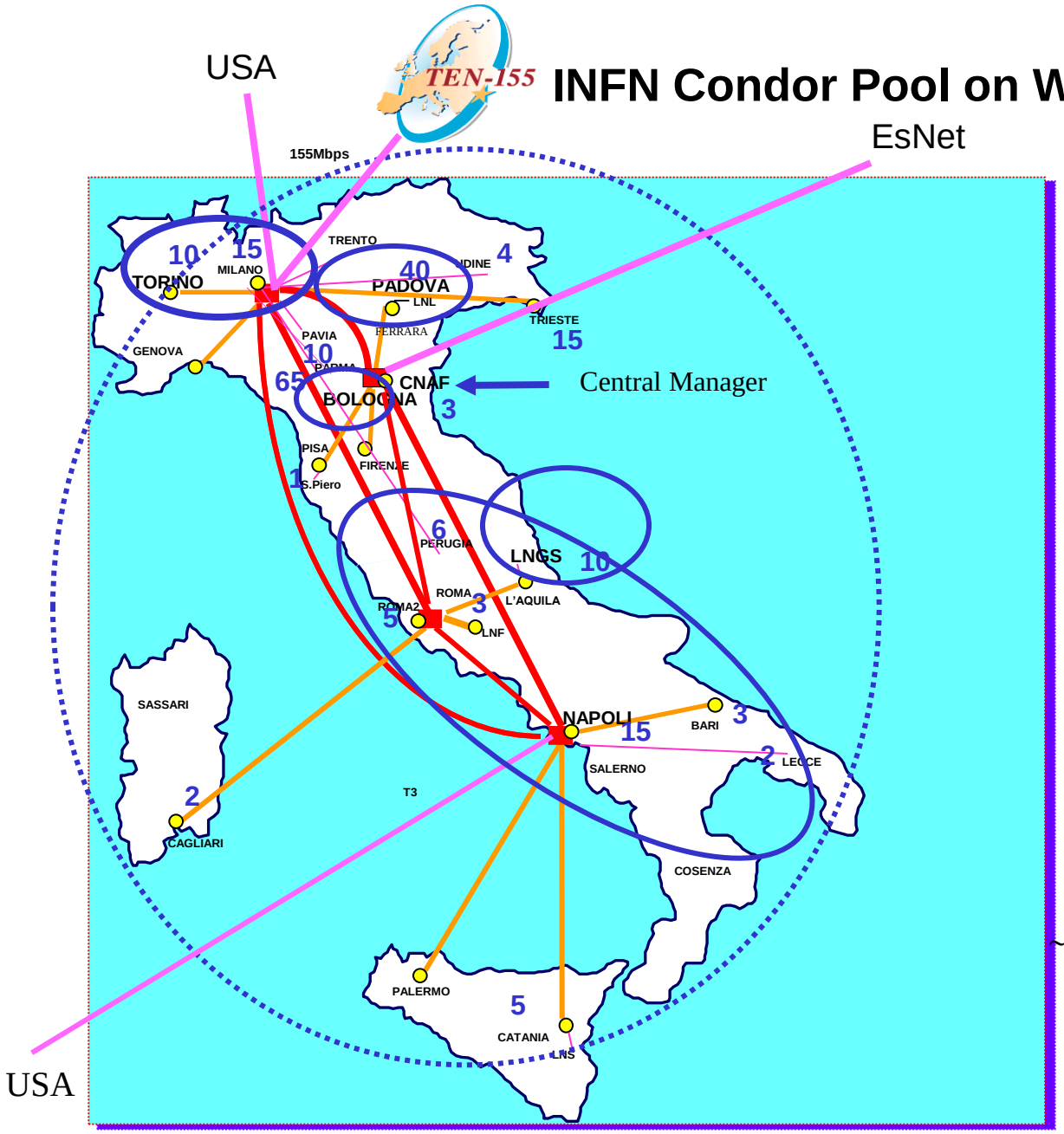
THE INFN GRID PROJECT

- **Scope**: Study and develop a general INFN computing infrastructure, based on GRID technologies, to be validated (as first use case) implementing distributed Regional Center prototypes for LHC expts: ATLAS, CMS, ALICE and, later on, also for other INFN expts (Virgo, Gran Sasso ….)
- **Project Status:**
  - Outline of proposal submitted to INFN management 13-1-2000
  - 3 Year duration
  - Next meeting with INFN management 18th of February
  - Feedback documents from LHC expts by end of February (sites, FTEs..)
  - Final proposal to INFN by end of March

INFN & “Grid Related Projects”

- Globus tests
- “Condor on WAN” as general purpose computing resource
- “GRID” working group to analyze viable and useful solutions (LHC computing, Virgo…)
  - Global architecture that allows strategies for the discovery, allocation, reservation and management of resource collection
- MONARC project related activities

INFN Condor Pool on WAN: checkpoint domains



GARR-B Topology

155 Mbps ATM based Network

- access points (PoP)
- main transport nodes

CKPT domain
hosts

Default CKPT domain @ Cnaf

~180 machines ⇒ 500-1000 machines

6 ckpt servers ⇒ 25 ckpt servers

The Open Science Grid (OSG) was established in 7/20/2005

Open Science Grid

OSG Ribbon Cutting – July 20

CENTER FOR HIGH THROUGHPUT COMPUTING

Open Science Grid

WISCONSIN UNIVERSITY OF WISCONSIN–MADISON

The **OSG** is …

Open Science Grid

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

CENTER FOR
HIGH THROUGHPUT
COMPUTING

… a **consortium** of science communities, campuses, resource providers and technology developers that is governed by a council. The members of the **OSG** consortium are ***united in a commitment to promote the adoption and to advance the state of the art of distributed high throughput computing*** (**dHTC**).

OSG adopted the HTCondor principal of *Submit Locally and Run Globally*

Today, HTCondor manages daily the execution of more than 600K pilot jobs on OSG that delivers annually more than 800M core hours

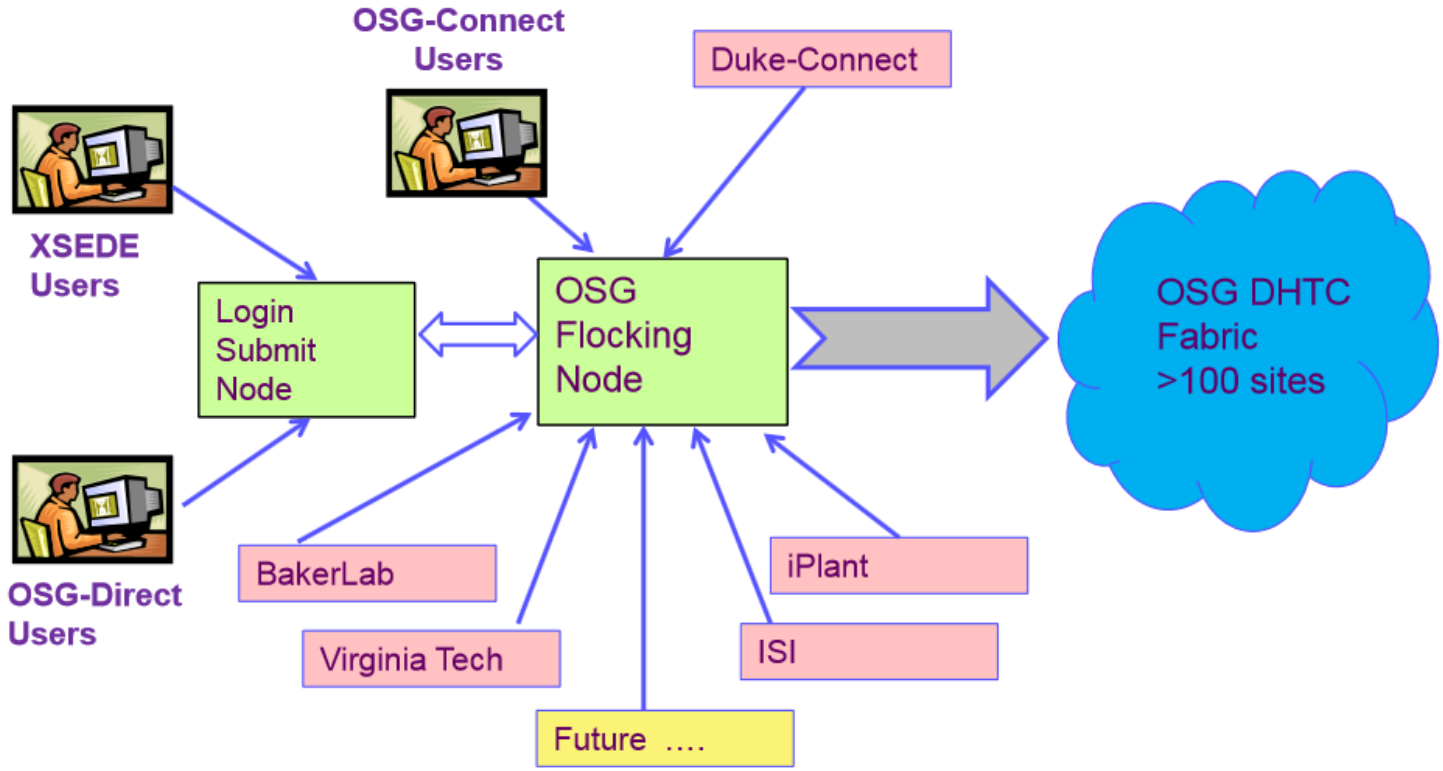
Jack of all trades, master of all?

HTCondor is used by OSG to:

- As a site batch system (HTCondor)
- As pilot job manager (Condor-G)
- As a site “gate keeper” (HTCondor-CE)
- As an overlay batch system (HTCondor)
- As a cloud batch system (HTCondor)
- As a cross site/VO sharing system (Flocking)

Open Science Grid

Easier "On-Ramp" to the OSG DHTC Fabric



Access operates under the osg VO using glideinWMS pilot overlay system; currently engineered to access ~20K cores (on an average day total OSG usage is ~100K cores)

Perspectives on Grid Computing

Uwe Schwiegelshohn Rosa M. Badia Marian Bubak Marco Danelutto
Schahram Dustdar Fabrizio Gagliardi Alfred Geiger Ladislav Hluchy
Dieter Kranzlmüller Erwin Laure Thierry Priol Alexander Reinefeld
Michael Resch Andreas Reuter Otto Rienhoff Thomas Rüter Peter Sloot Domenico
Talia Klaus Ullmann Ramin Yahyapour Gabriele von Voigt

We should not waste our time in redefining terms or key technologies: clusters, Grids, Clouds... What is in a name? Ian Foster recently quoted Miron Livny saying: "I was doing Cloud computing way before people called it Grid computing", referring to the ground breaking Condor technology. It is the Grid scientific paradigm that counts!

Thank you for building such

a wonderful HTC community