Welcome to HTCondor Week #16
(year 31 of our project)
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


– 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 privately 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

- **1978** Enslow's DPS paper
- **1983** My PhD
- **1985** Condor Deployed
- **1992** LHC Approval
- **1993** MONARC project CERN
- **1994** Hoffmann Review
- **1995** Computing TDRs
- **1996** LHC Run 1
- **1997** Run 2

Additional notes:

- "Trillium" = PPDG+GriPhyN+iVD
- Open Science Grid
- DataTAG
- Enabling Grids for E-sciencE
- eGI EMI

Timeline events:

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

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 \textcolor{red}{24-7-365} activity and therefore requires \textcolor{red}{automation}

\textcolor{blue}{FLOPY} \not= (60 \times 60 \times 24 \times 7 \times 52) \times FLOPS
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
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
The OSG is ...
... 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)
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)

Aug 19, 2014
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