
The 6th Annual Pangalactic
BOINC Workshop

# BOINC: The Year in Review

David Anderson

31 Aug 2010

# Credit: goals

**Device neutrality**: a job should get the same credit no matter what device processes

**Project neutrality**: a computer should get the same credit/day regardless of what project(s) it runs

(easy to show that these can't both be achieved)

# 1st credit system

- CPU time x CPU benchmark
  - not device neutral
- Replication and credit averaging
  - granted credit depends on partner

# 2nd credit system

- “Actual FLOPS”-based
- APIs for reporting FLOP counts
- SETI@home publishes average credit/CPU sec, other projects scale to match
- Problems:
  - most apps can’t count FLOPs
  - doesn’t address GPUs
  - no device neutrality
  - doesn’t prevent cheating w/ single replication

# Philosophy of 3rd system

- Credits is based on peak FLOP count (PFC)
  - PFC(J) = #CPUs * CPU benchmark
    + #GPUs * GPU rated FLOPS
  - Reflects “opportunity cost”, not actual work
- Normalize in 2 ways

# Statistics

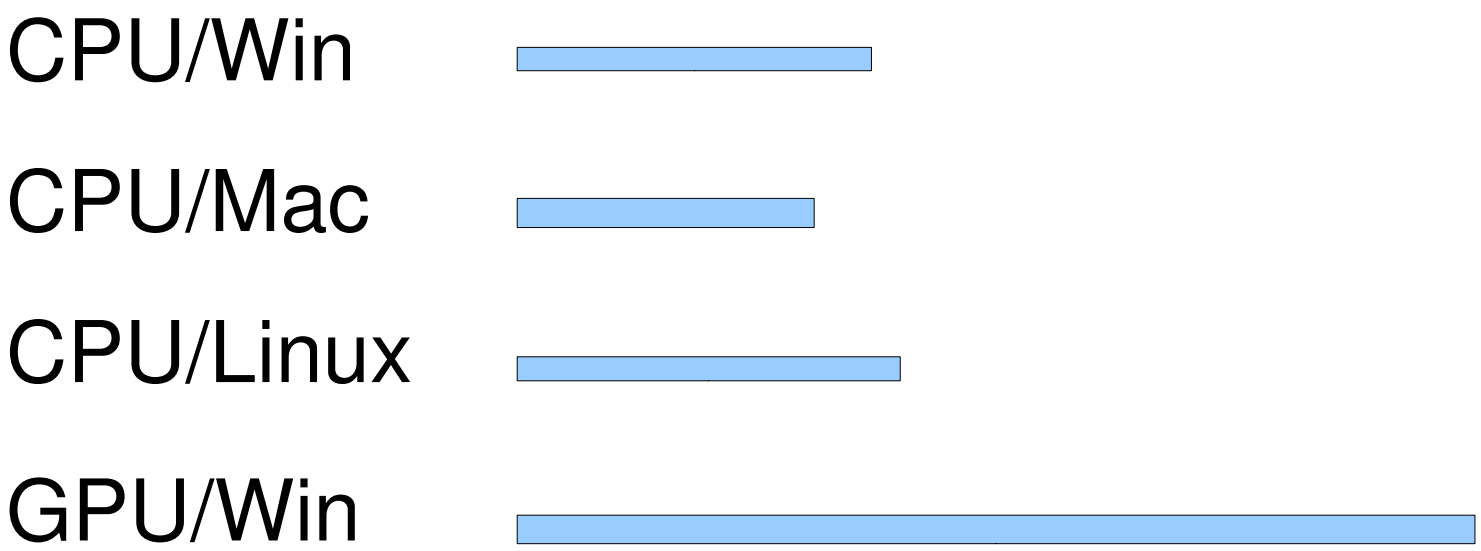
- Maintain mean, variance of

  PFC(J) / WU.fpops_est

- for each:
  - app
  - app version
  - (host, app version)

# Normalize to most efficient app version

mean PFC




Note: this provides device neutrality at the expense of project neutrality

# Host normalization

- Scale PFC for version V, host H by

  V.pfc_avg / H.pfc_avg
- Provides cheat-resistance even with single replication
- but need to prevent cherry-picking: don’t use host normalization unless host has returned N consecutive valid results

# GPU-only projects

- On a project with both CPU and GPU versions, version normalization provides a measure of relative efficiency CPU vs. GPU
- Projects with only GPU apps don’t have this
- Solution: such projects scale by the weighted averages of projects that do

# Experience

- New system tested in SETI@home
- Works, but need to double credit (redefine Cobblestone)
- No project customization

# Job runtime estimation

- Old system:

  R(est) = WU.fpops_est / CPU benchmark

- Maintain and scale by a project-wide “duration correction factor”
- Problems:
  - bad if multiple versions
  - scientists shouldn’t think about FLOPS
  - doesn’t work for GPUs

# New system

- Maintain mean, variance of normalized elapsed time for each (host, app version)
- Predicted runtime = mean * WU.fpops_est

(per-app-version duration correction factor)

# Other per-(host, app version) items

- Daily quota (for host punishment)
- Consecutive valid results: replaces error rate for
  - “reliable” mechanism
  - cherry-picking prevention

# Notice system

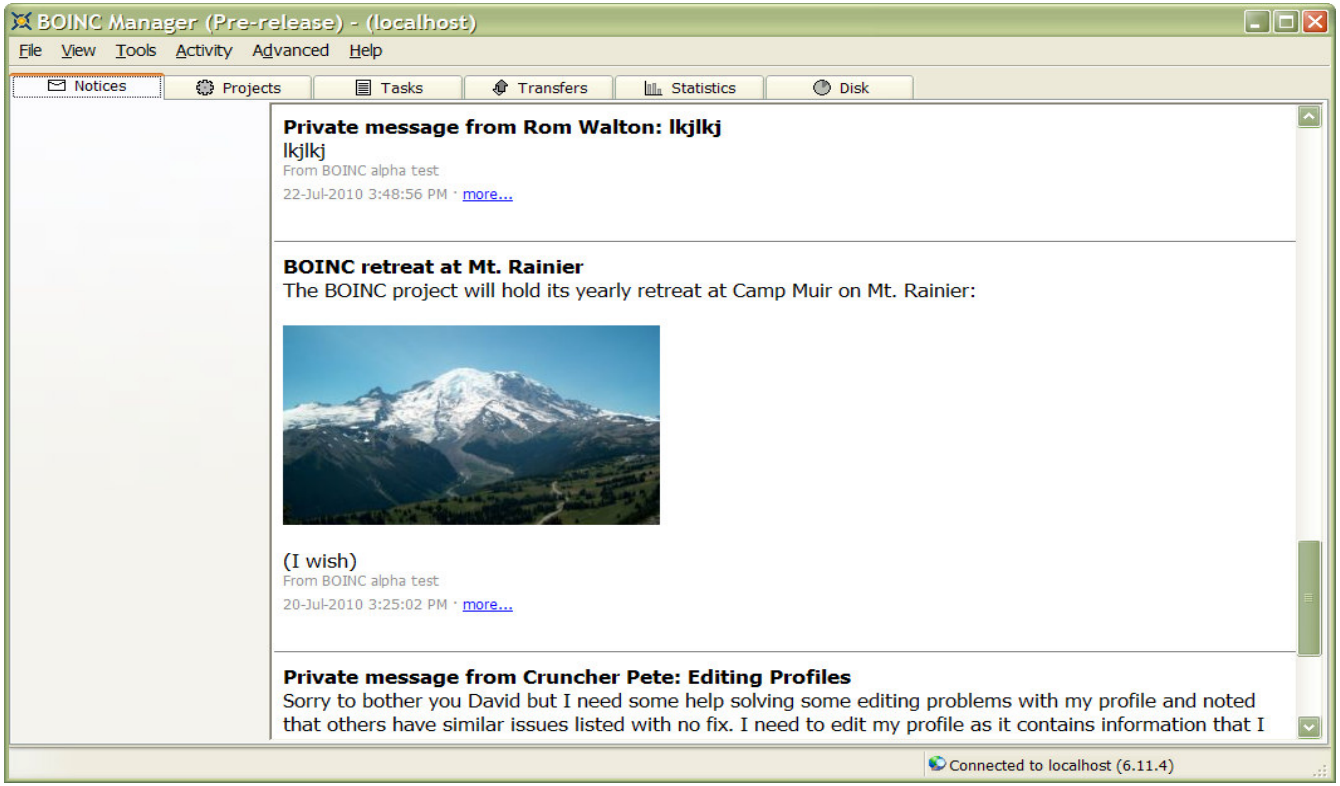
- How does the BOINC client software communicate with volunteers? Currently: the Messages Tab. Problems:
  - Requires user to look
  - Non-prescriptive techno-babble
  - Only bad news
  - Only text
  - Non-translatable

# Notices architecture

- Multiple “notice” sources
  - from client
  - from schedulers
  - RSS feeds from projects
    - project news
    - private messages
    - friend requests
    - messages in subscribed threads
    - ...

# Notice delivery

- System tray popup
- Notices tab



# GPU support

- Exclusive apps
- Show GPU projects in attach wizard
- Snooze/suspend/resume GPU
- app_plan(): specify GPU RAM requirements
  - use in scheduling; boinc_temporary_exit()
- Sample CUDA/OpenCL apps
- Support Fermi GPUs

# Multithread app support

- boinc_init_parallel()
  - suspend/resume multiple threads
- show projects in attach wizard

# Other goodies

- GUI RPC as HTTP
  - enable GUIs based on web technologies
- Web: project news as a message board
  - easier to post
  - users can discuss
- Preferences
  - Transfer at most X MB every N days
  - suspend if non-BOINC CPU load exceeds X

# More goodies

- Stuff for Intel PtP
  - web-based registration (manager finds cookie)
  - HTTP proxy autodetect
- Server logging
  - <debug_xxx> flags instead of -d 3
  - -d 4 means print DB queries

# Upcoming

- Rewrite or replacement of Simple View
  - or entire Manager?
- VM app support
  - BOINC installer includes VirtualBox?
- Volpex
  - IPC for BOINC apps
  - virtual cluster
- Integration with Drupal

# What we didn’t do

- Integrate remote job submission system from GPUGRID
- Accelerated batch completion

# Adoption by scientists

- Single-scientist projects: a dead end
  - Barriers to entry are too high
  - Wrong marketing model
  - Doesn’t handle sporadic requirements

# Adoption by scientists

- Most scientists outsource HPC decisions to IT people
- IT people fear and loathe volunteer computing

Napoleon: Volunteer computing just can't handle the kinds of jobs that *real* scientists run.

Me: What precisely is different about these jobs?

Napoleon: THEY'RE JUST DIFFERENT, THAT'S ALL

# A way forward

Distinguish:

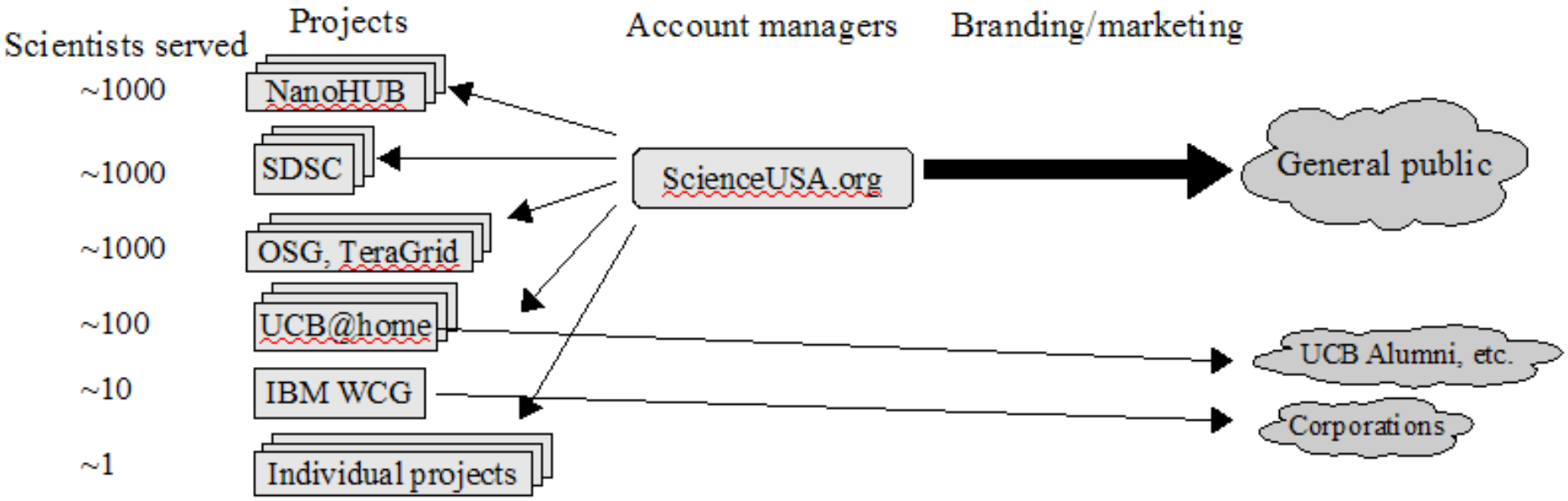
- Project operation
  - operate servers
  - port apps, interface with scientists
- Marketing
  - branding/strategy
  - mass media, online, non-traditional
  - web development
  - make bundling deals with computer/OS vendors

# Project == existing HPC provider

- Supercomputer centers
- National grids (Teragrid, OSG)
- Hubs
  - “Facebook + iPhone app store” for science area
  - e.g. Nanohub
  - HUBzero/BOINC integration proposal

# ScienceUSA.org

- A consortium of funding agencies and HPC providers
- Unified brand, web site for scientific volunteer computing in U.S.; implemented using account manager mechanism
- Volunteers choose research areas, not projects
- Committee of consortium members allocates computing power among projects




- How to realize this?
- European/Asian counterparts?

# Summary

- Volunteer computing has not approached its potential
- There are still many skeptics
- Let’s keep working