

Analysis Support Center at ANL

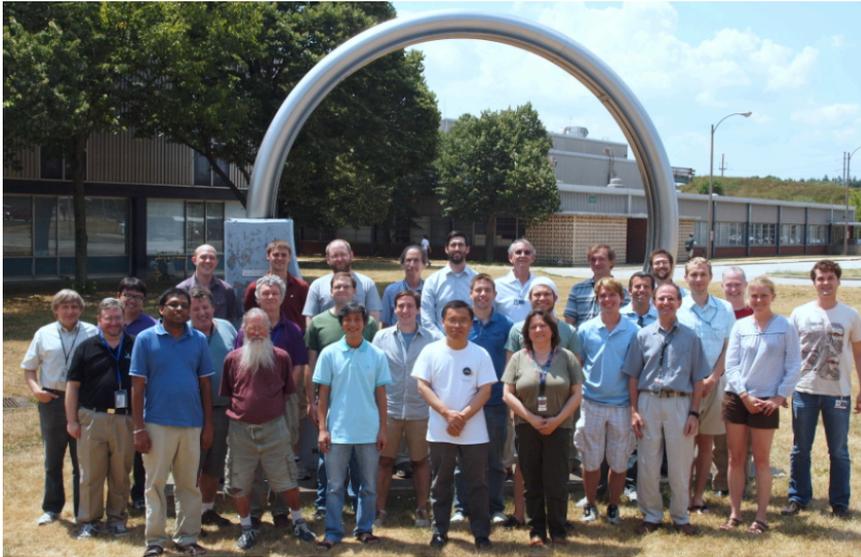
R. Yoshida



DOE Energy Frontier Review 8/1/2011



A snapshot of who's at
ANL Analysis Support Center (ANL ASC)
July 16, 2012



This is a typical presence of people at **ANL ASC** on any given day.

- 17 **ANL Staff** in this picture
- 12 **Visitors** (including 4 summer interns) in this picture

Not in this picture (On travel, working elsewhere etc.)

- 5 **ANL Staff** who are usually at ANL.
- 7 **Long-term visitors**

US ATLAS Charge for ASCs

The Analysis Support Centers (ASCs) were established in 2006 as a part of the analysis support structure of US ATLAS.

Mission of the ASCs: *These centers provide US ATLAS physicists with regional resources, tutorials, support, leadership and focal point for meetings. They provide infrastructure and analysis support in basic ATLAS software as well as expertise in certain areas of detector performance.*

The three centers are:

Argonne National Laboratory (Midwestern region)

Brookhaven National Laboratory (Eastern region)

Lawrence Berkeley National Laboratory (Western region)



From the beginning, ANL ATLAS group and ANL HEP division took the Analysis Support Center idea very seriously.

- ASC can act as a vibrant center for LHC physics for the area Universities*
 - ASC can act as a multiplier of efforts both for the Universities and ANL*
- Over the years, we've made serious investments to make the ASC a success.*

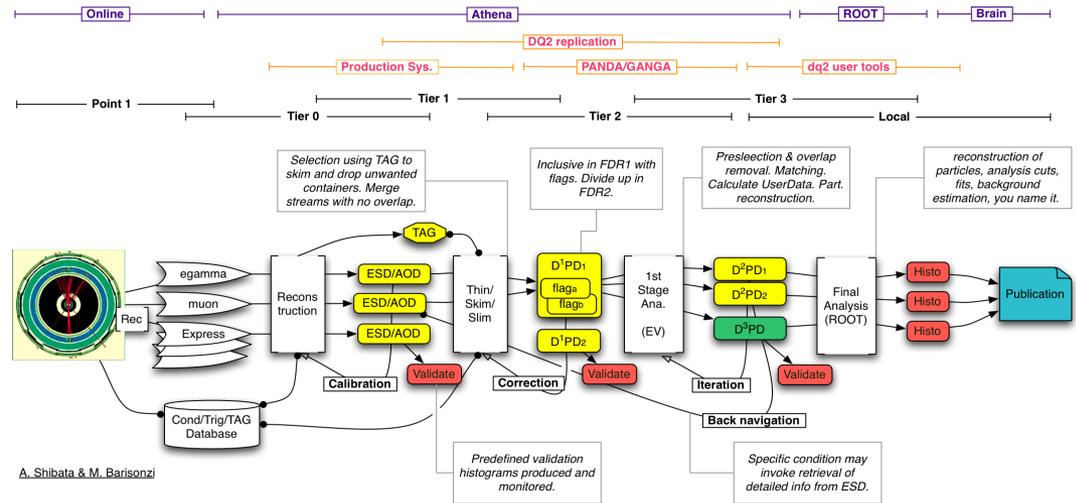
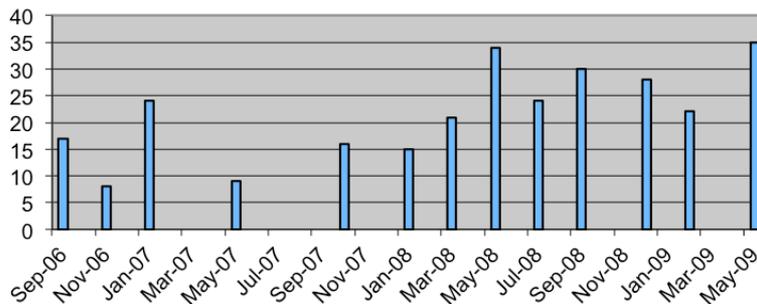
ANL ASC through 2009

Main goal: **Get US ATLAS physicists ready for analysis.**

- Huge collaboration
- Complex detector
- Complex analysis model



Partitipants at ANL Jamborees



- Pedagogical Jamborees every other month
- Trained almost 100 US ATLAS physicists
- Tier 3 development

At the same time

- Start of long-term visitors (5 in 2009)
- Establishing presence in analysis and performance groups in ATLAS.

ASC Strategy 2009-2011

Main Objective: Transform ASC from a mainly pedagogical center based on periodic meeting/tutorials to true analysis center that serve as a home base and support structure for US ATLAS analyzers based in the US.



Specific steps:

- Jamborees/Meeting: increase physics content, decrease number of pedagogical meetings. Go to once/twice per year with high physics content.
- Improve physical infrastructure for hosting.
- Increase the number of long term **visitors**.
 - More hosting for graduate students. Develop support model.
 - Faculty/Staff—develop long-term research cooperation with university groups.
 - Undergraduates—SULI internships. Give them real ATLAS research experience.
- Strong participation in ATLAS analysis groups through **ANL ASC**.

Infrastructure Improvement

- Meeting and Guest offices space: 2006 (~1800 sq. ft), 2008 requests and demands → new space with ~2500 sq. ft. **2010-11: consolidated space with clustered offices and common discussion areas for ASC staff and visitors.** Currently providing guest offices for ~15 visitors + 4 summer students. Still some space for expansion
- Conference rooms with **VC** capability: one for ~40 people. one for ~12 people.
- Local Computing facilities:

2006

8 cores
800 GB



2012

240 cores
100 TB



In ANL TCS Building



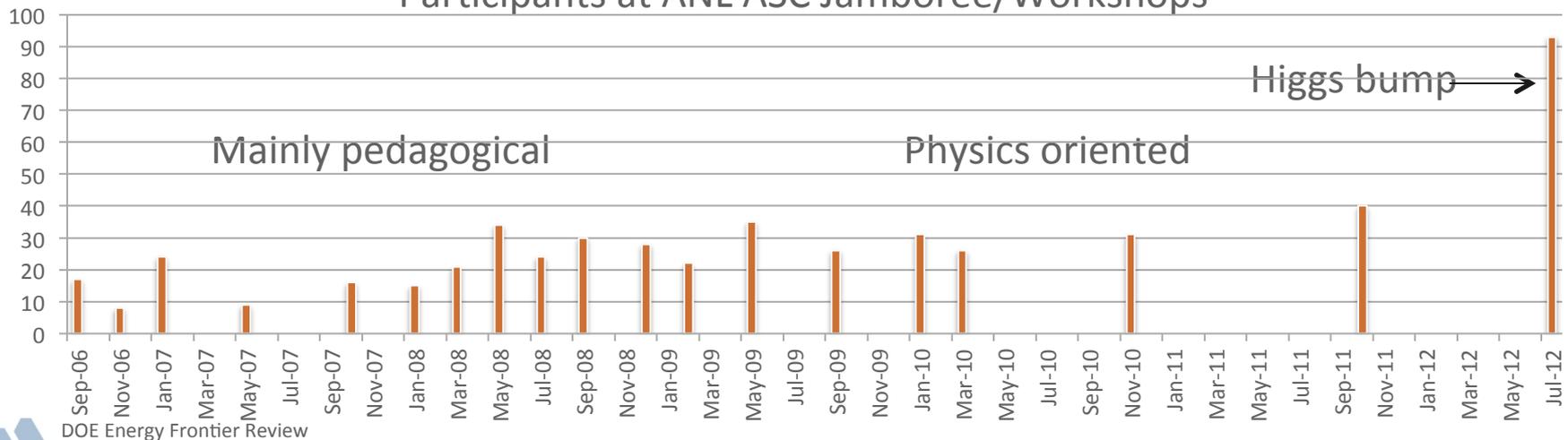
- Secretarial support [**Rezek**] and computer sys admin support [**Sather**] added (2011-12).

Meeting, Jamborees and Workshops

- Increase cooperation with other groups in organizing meetings
 - July, 2012: Open Jamboree/Meeting on “Discovery Physics at ICHEP”
 - Nov, 2011; [US LHC Users Organization](#) Annual Meeting hosted at ANL ASC.
 - Nov, 2011: Fermilab: CTEQ workshop on “Confronting Theory with Experiment : Puzzles, Challenges and Opportunities in the LHC Era” Joint [LPC-ANLASC-CTEQ](#)
 - June, 2011: DESY-Zeuthen SM Benchmarks Workshop Joint [LPC-ANLASC-DESY](#)
 - Nov, 2010: Fermilab: CTEQ workshop on “SM Benchmarks at the Tevatron and the LHC” Joint [LPC-ANLASC-CTEQ](#)
 - May. 2009: ANL ASC Jamboree joint session with [ANL/IIT Theory Institute](#)
- Decrease the number of meetings: but more physics oriented.



Participants at ANL ASC Jamboree/Workshops



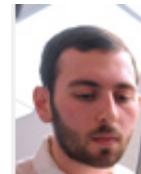
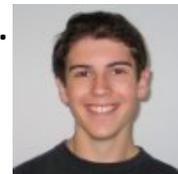
Long-term visitors

- Graduate Student visitors.
 - 2006-9: a few student visitors. [Brian Martin \(MSU\)](#), [Chad Suhr](#), [Rob Calkins \(NIU\)](#) were at ANL for ~year and then stationed at CERN by their institutes.
 - 2010-12: established ANL ASC Graduate Fellowship with help from the lab (~3 awarded annually) + [Scarlet Norberg \(OU\)](#), [Amanda Kruse \(Wisconsin\)](#), [Chad Suhr \(NIU\)](#), [Dan Pluth \(ISU\)](#), [Ho-Ling Li \(Chicago\)](#), [Chen Zhou \(Duke\)](#) + more student visitors [Steven Cole](#), [Fayez Abu-Ajamieh](#), [Blake Burghgrave \(NIU\)](#), [Meg Shea \(Duke\)](#) + student return from CERN: Martin, Suhr, Calkins.
 - Normally 4-7 Graduate Students at ANL ASC for the past 2 years.
- Working with Graduate Students
 - Close consultation with their advisors
 - For Graduate Fellows, a more formal partnership
 - Agree on research topic, set milestones and goals
 - Agree on technical task for students. More often than not, ANL can help students do much of (if not all of) their authorship qualifying tasks.



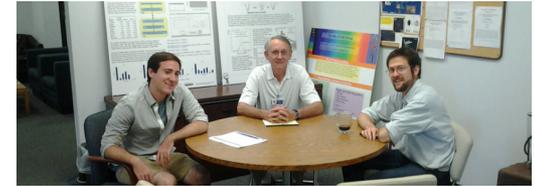
Long-term Visitors

- **Graduate Student Experience Example:**
 - [Scarlet Norberg](#) (OU) came as a ANL ASC Graduate Fellow April 2011
 - Involved in direct photon analysis ([Chekanov](#) and [Blair](#)). Made presentations to the ATLAS Standard Model subgroup. Now involved in 2012 data publication. [see [LeCompte](#) talk]
 - Technical authorship qualifying task: monitoring and analyzing TileCal PS trips [see [Proudfoot](#) talk].
 - At CERN May 2012. Immediate integration and participation in the experiment.
 - Expressed desire to come back to ANL ASC while finishing her thesis.
- Several students at ANL ASC worked/working on thesis after their return from CERN. [Martin](#) (MSU), [Calkins](#), [Suhr](#) (NIU)
- All Grad. Students who spent time at ANL so far have expressed desire to come back to ANL during their thesis work.
- **Undergraduate Interns:** we have had 3-4 SULI students every summer for the last 3 years. All do substantial work and present work to ATLAS groups. One ([Johnson](#)) qualified as an ATLAS author on a physics publication [[Paramonov](#)], another ([Levy](#)) a PRD co-author with [Chekanov](#), [Proudfoot](#), [Yoshida](#).



Long-term Visitors

- Established cooperation with faculty/staff
 - **Chicago**: Analysis, FTK [[Pilcher](#), [Kim](#), et. al. + students]
 - **MSU**: Analysis and Operations [[Huston](#) + student]
 - **Oklahoma, ISU**: so far on analysis only [[Chen](#), [Abbott](#) + students]
 - **Duke**: Tier3, physics analysis, upgrades [[Benjamin](#), [Goshaw](#), [M.Kruse](#)+students]
 - **NIU**: Physics analysis, operations, upgrades [[Chakraborty](#), [Lima](#), [Yurkewicz](#), [Zutshi](#)+students]
 - **Wisconsin**: Physics analysis, operation [[Mellado](#)+students]
- Example of how analysis cooperation develops...
 - Shared physics interest, e.g. boosted objects: ISU
 - Visiting Faculty and Students
 - Faculty: [Chen](#), Student: [Pluth](#)
 - Interests and connection with others at the ASC [e.g. [Li](#), W' to boosted top]
 - ANL ASC shared topic [[Asquith](#), [Auerbach](#), [Chekanov](#), [Proudfoot](#), [Yoshida](#)]
- **US ATLAS ASC Fellows**: [Chen](#) (ISU) [Yurkewicz](#) (NIU)
 - Since 2011. Significant addition. Provide leadership
 - Organizers of local meeting: July 2012 workshop.



Opportunities created through ANL ASC

- **Example 1:** US ATLAS Tier3 development.
 - Tier3 ARRA funding → needed to organize urgently in 2009.
 - ANL ASC environment [computing expertise, analysis oriented organization, proximity to key organizations] + coordination at ANL ASC [[Benjamin](#) (Duke) and [Yoshida](#)]
 - Successful Tier3 deployment at 42 US ATLAS institutes.

- **Example 2:** TileCal Operations and Upgrade
 - ANL Expertise [[Proudfoot](#), [Chekanov](#), [Drake](#)]
 - Key diagnostics for power supply trips developed at ANL ASC.
 - ASC student participation ([Norberg](#), Oklahoma)
 - Characterization of trips, reliability analysis.
 - Engineering students at Wisconsin participation through ASC contacts.
 - Further studies about reconstruction
 - ASC student participation ([A. Kruse](#), Wisconsin)



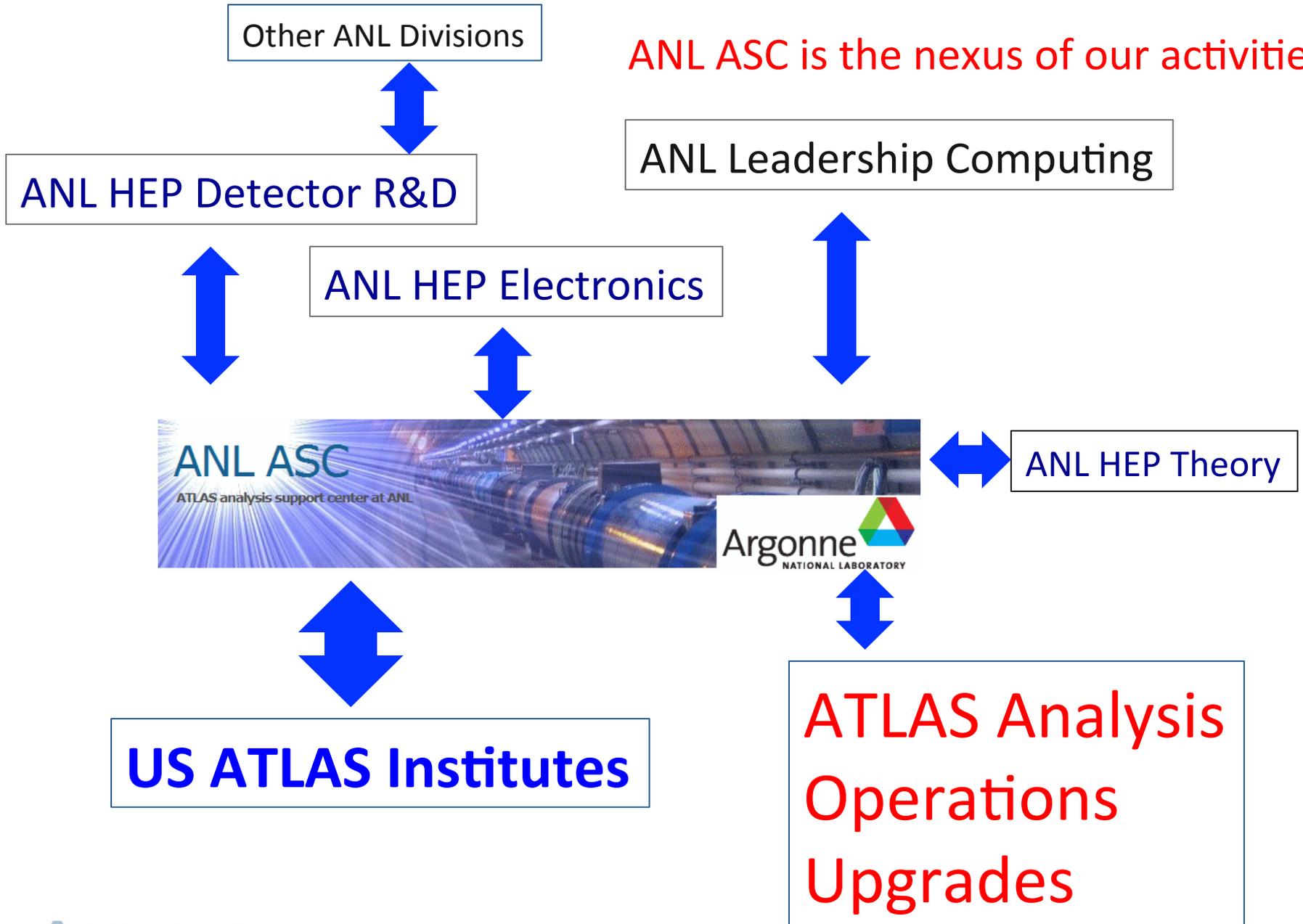
Opportunities...

- **Example 3:** Upgrade tracker firmware development
 - Presence of expertise and interest [[Benjamin](#) + ASC student [Zhou](#) (Duke)]
 - So far small ANL involvement.
 - Exploring possible areas of cooperation with ANL HEP R&D group
- **Example 4:** Running GEANT on supercomputers
 - ANL is the home of the [Leadership Computing Facility \(ALCF\)](#) housing Blue Gene.
 - Recent demonstration made of running GEANT on Blue Gene architecture [[LeCompte](#)]
 - Necessary expertise to turn this into a feasibility demonstration for MC generation on supercomputers [i/o expertise-[Van Gemmern](#), Simulation-[LeCompte](#), Grid infrastructure-[Benjamin](#)]



These examples demonstrate that we have reached “critical mass” at the ANL ASC where new opportunities arise from the presence of numerous expertise and interests of the visitors, and their interactions.

ANL ASC is the nexus of our activities



Strategy and Plans 2012-2015

- **Main ASC strategy:**
 - Increase (and seize) opportunities in technical/upgrade areas as well as in analyses.
 - Create explicit opportunities for visiting students for hardware work. Current HEP grad. students lack this type of opportunity. This will be done in close cooperation with the R&D group.
- **Expect ~20-30% increase in ANL ASC activities** based on the growth from last two years.
 - Enough infrastructure to support this size growth.
 - We expect even more activity and new opportunities:
 - Phase 1: ANL staff works with visitors
 - Phase 2: Visitors work with visitors
- **ASC will continue to be the nexus of ATLAS activities at ANL.**
- **Analysis Support Center *IS* the Strategy of the ATLAS group.**



Summary and Conclusion

- We have achieved the goals we set out for ANL ASC three years ago.
 - ~15 long-term visitors at any time. (22 total, 33 including undergrad interns)
 - Physics oriented center. Many analysis teams at ANL ASC. Many papers, internal notes produced. Periodic physics oriented Jamborees/meetings which are well attended.
 - Established strong cooperation with University groups for mutual benefit and increased physics output overall.
 - Preparatory center for Grad. Students going to CERN. Support for returning ones.
- In addition we have begun to see new opportunities arising out of ASC activities
 - ATLAS operation benefitting from ASC activities
 - Participation of visitors in upgrade related activities at ANL.
 - Brand new opportunities, i.e. Blue Gene
- ANL ASC is living up to the potential we envisioned 6 years ago.
- ANL ASC is and will continue to be central to the activities of the ANL ATLAS group.

BACKUP



Summary and Conclusions

- **ANL ATLAS group and ANL HEP has taken the ATLAS Analysis Support Center very seriously.**
- We believe that such centers can and should be major focal points of the US collider program as LHC results begins to dominate HEP in the next decade.
- We also believe that such centers should be the “home base for analysis teams” rather than a “parallel US analysis organization” of the ATLAS collaborations.
- **We have made major investments in all infrastructure areas for the ASC.** We are making significant contributions to the US ATLAS effort.
 - Bi-monthly analysis meetings. Many young ATLAS post-docs and students have gotten their introduction to ATLAS analysis environment.
 - Building a model T3. Innovative analysis cluster for ATLAS.
- **Goals for the next 3 years →**

Goals and Milestones

- **Goals for the next 12 months.**
 - Enough collaborative infrastructure to support one or two analysis teams
 - *With both ANL and non-ANL members*
 - *Produce at least one analysis recognized by ATLAS collaboration, shortly after first data available.*
 - Host 10-20 regular visitors (double current ~5)
- **Goals for FY2012 and 2013**
 - Grow the regular user base to 20-30
 - At least 3 analysis teams based largely at ANL ASC
 - Several ATLAS physics papers produced with significant contributions resulting from the work of the ANL ASC teams.
- **Ultimately 50-100 users and >5 analysis teams based at ANL ASC.**

Analysis Support Planning

(From DOE/NSF US ATLAS Ops Review Feb. 2012)

- The past year has been transitional for the Analysis Support Organization.
- US ATLAS Institutes were interviewed through-out Spring 2011:
 - Conducted by Analysis Support Managers:
 - 38/43 Institutes interviewed by telephone (~30 min each)
 - Form the basis of our plans for re-organization of the US ATLAS Analysis Support
 - This was done over several months.
 - The general feedback was rather positive
 - All institutes have been able to contribute in substantial ways to physics papers and conference results.
 - True for small as well as large groups
 - Still clear that needs of US ATLAS Institutes have changed since data taking began.
- In parallel we started implementing changes where need was apparent.
- A new Analysis Support Management Plan document has been drawn up.
- We are currently moving to this new Analysis Support Plan.
- (Previous structure is described in the backup slides 28 and 29)

Analysis Support: Physics

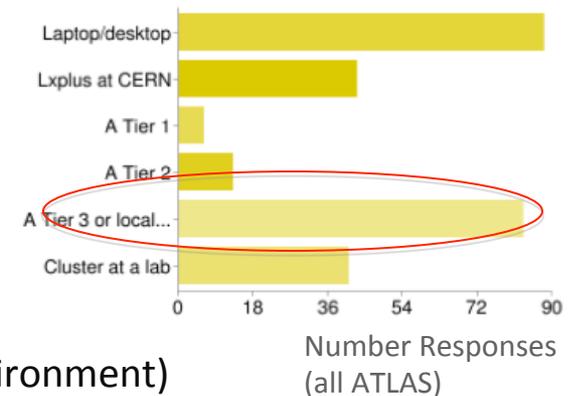
(From DOE/NSF US ATLAS Ops Review Feb. 2012)

- **Result of the Institute Interviews:**
- **Meetings, workshops, Jamborees**
 - There is no demand for tutorial type Jamborees at the frequency we held them prior to data taking (>6 per year).
 - Perhaps once/year or in some specialized area (D3PD making)
 - There is no demand for general meeting on physics or performance subjects covered by the ATLAS physics groups.
 - US ATLAS physics meetings must fill a specific need, e.g.
 - Strengthen local and national collaboration
 - Discussion with local theoretical community with particular interest
 - In any case, not too frequent
- **Need an organization (Analysis Support Panel) that**
 - Support the annual US ATLAS meeting
 - Support Analysis Jamborees and other meetings at the Analysis Support Centers or elsewhere.
 - Advise on setting priorities on use of US ATLAS computing resources

US ATLAS Analysis Technical Support: Tier3 (From DOE/NSF US ATLAS Ops Review Feb. 2012)

- Tier3 management (0.5 FTE) was moved from facilities to analysis support
 - As end-user analysis facilities, a more natural home
 - Still strong connections to facilities and software efforts
- 42 US ATLAS Tier3 sites (~3.5k cores, ~2.5 PB) are up and running
 - In the process we:
 - Integrated the US ATLAS effort with the ATLAS effort
 - US ATLAS T3 coord. Is ATLAS T3 technical coord.
 - Consolidated technologies
 - OSG: T3 appropriate Grid tools, Condor
 - CERN: CVMFS (web file system)
 - ATLAS Canada: ATLASLocalRootBase (T3 user environment)
 - From Institute Interviews: now crucial part of the institute analysis efforts.
 - Tier3 support: helping individual sites with
 - Initial setup (mostly done now)
 - Solving problems
 - Installing new services

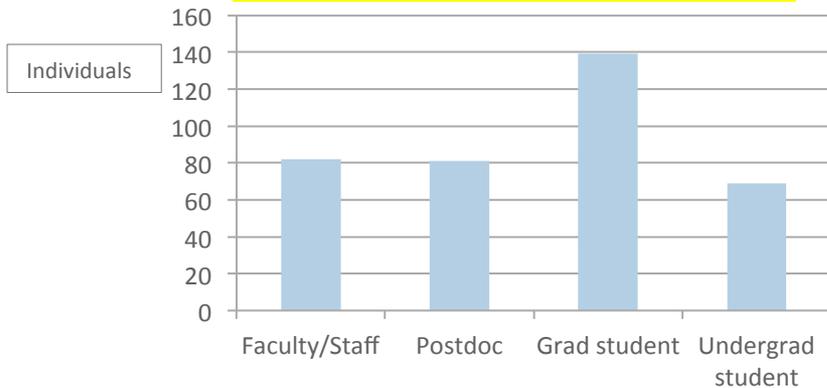
ATLAS PAT Survey (Sept/11)
[Final Analysis done at..]



Tier3 Institute Survey

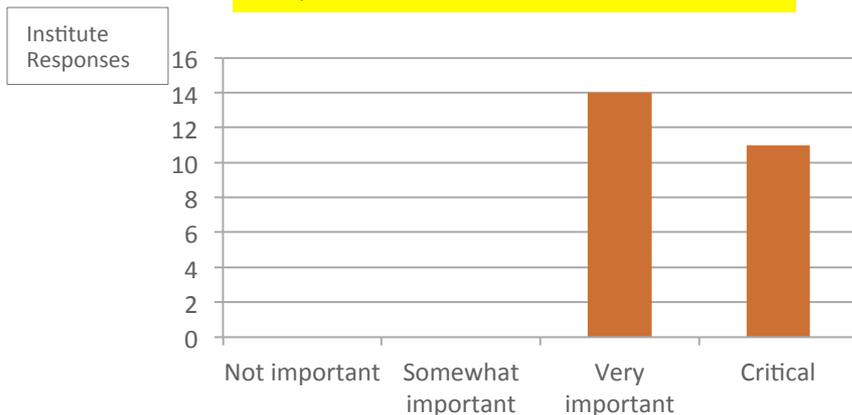
(From DOE/NSF US ATLAS Ops Review, Feb 2012)

Number of analyzers who used (or are using) your T3 up to now.



- We are currently conducting a survey of US ATLAS Institutes with a Tier3.
- 25 responses so far.
- More on p.30 (backup)

How important is your T3 in being able to develop your analysis quickly and to be competitive?



How much more would you estimate your institute was able to do in terms of contribution to papers/analyses due to your T3?

