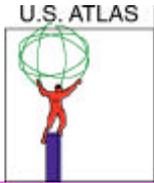




# U.S. ATLAS Computing

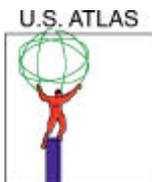
- Overview
- Status of ATLAS computing
- U.S. ATLAS
  - u Project Management Organization
  - u Status of efforts
    - s Core software
    - s Subsystems
    - s Facilities
  - u Schedule
  - u Funding Profiles
- Summary



# Scale of Computing Effort

---

- **Rough scaling of factors of 5 to 1E+3 in relevant parameters from Tevatron Experiments**
  - u **Manpower x5**
  - u **CPU/event x1E+3 (event complexity)**
  - u **Data volume x10 to x1E+2 (channel count)**
  - u **Distribution of data x10**
- **U.S. effort comparable to scale of Tevatron experiment.**
- **Effort \$15M/year**



# Scales from experience

## HENP Computing Challenges



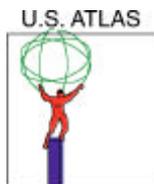
Experiment	Data	Compute
E895 (AGS)	10 TB/yr	600 SPECint95
BaBar (SLAC)	400 TB/yr	5,000 SPECint95
STAR (RHIC)	266 TB/yr	10,100 SPECint95
PHENIX (RHIC)	700 TB/yr	8,500 SPECint95
D0 Run II (FNAL)	280 TB/yr	4,075 SPECint95
CDF Run II (FNAL)	464 TB/yr	3,650 SPECint95
ATLAS (LHC)	1100 TB/yr	2,000,000 SPECint95

Experiment	Countries	Institutes	Collaborators	Time Frame
E895 (AGS)	3	12	49	2000
BaBar (SLAC)	9	85	600	2010
STAR (RHIC)	7	34	400	2010
PHENIX (RHIC)	10	41	400	2010
D0 Run II (FNAL)	11	77	500	2005
CDF Run II (FNAL)	8	41	490	2005
ATLAS (LHC)	34	144	1700	2015

LAWRENCE BERKELEY NATIONAL LABORATORY

CFTull@lbl.gov · ATLAS Control · 01 sep 99 · <http://arc.nsls.gov/control/>

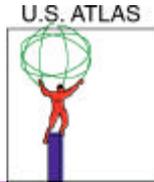
BNL PCAP Meeting  
10-11 Jan. 2000



# Goals for this year

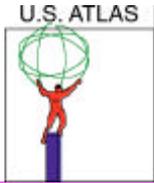
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- **Project organization**
  - u **Management**
  - u **Organize efforts**
- **Integration into ATLAS**
- **Inception/development of software**
- **U.S. support facilities**
  - u **Planning/development of infrastructure**
- **Prepare for “Lehman” Review**



# International ATLAS

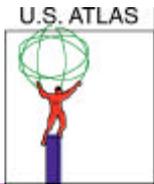
- **Computing Coordinator**
  - u **Norman McCubbin (RAL)**
    - s **Responsibility: Core software**
- **Physics Coordinator**
  - u **Fabiola Gianotti (CERN)**
- **Detector specific sim/reconstruction**
  - u **Computer Steering Group (CSG)**
  - u **Organized within subsystem**
- **Report of Architecture Task Force**
- **Establishment of Architecture Team**
- **Hoffman Computing Review**



# Architecture Taskforce

- **Software partitioned into work packages**

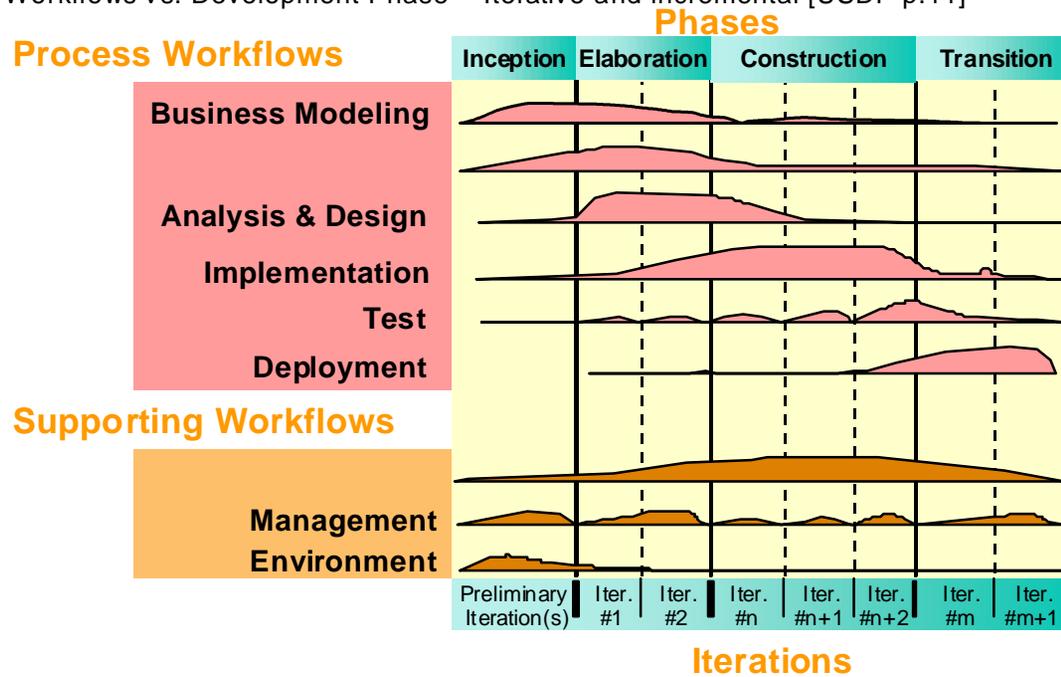
- u Katsuya Amako, KEK
- u Laurent Chevalier, CEA
- u Andrea Dell'Acqua, CERN
- u Fabiola Gianotti, CERN
- u Steve Haywood, RAL (Chair)
- u Jurgen Knobloch, CERN
- u Norman McCubbin, RAL
- u David Quarrie, LBL
- u R.D. Schaffer, LAL
- u Marjorie Shapiro, LBNL
- u Valerio Vercesi, Pavia



# Stages in Software Management

## Software Development Process: USDP

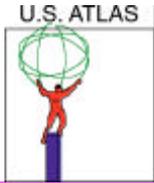
n Workflows vs. Development Phase - Iterative and incremental [USDP p.11]





# ATLAS/CERN Schedule '00

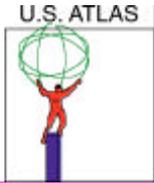
- **Jan '00**
  - u **Start preparations for software agreement**
  - u **Launch Architecture Team**
  - u **First meetings of Hoffman Review**
- **May '00**
  - u **First release of control/framework from A-Team**
- **June '00**
  - u **Report from Hoffman Review**
- **Fall '00**
  - u **Preparations for MOU's**



# U.S. Leadership Roles

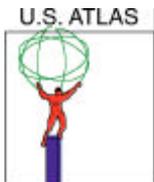
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- Frank Paige - Co-convener of SUSY working group
- David Malon - Co-leader of database group
- Craig Tull - Architecture Team
- Ian Hinchliffe - Leader of Event Generator group
- David Quarrie – Architecture Team, Task Force
- Paolo Calafiura – Architecture Team
- John Parsons - Co-convener of Top working group
- Misha Leltchouk - L Ar simulation coordinator
- Michael Shupe - Convener of Background working group
- Fred Luehring - TRT software coordinator
- Steve Goldfarb - Muon Database Coordinator
- Tom LeCompte - Tilecal Database Coordinator
- Krzys Sliwa - Chair of ATLAS World-wide computing group
- Frank Merritt - Training contact, Tilecal Reconstruction coord.
- Bruce Gibbard - Regional center contact
- John Huth- National Board contact



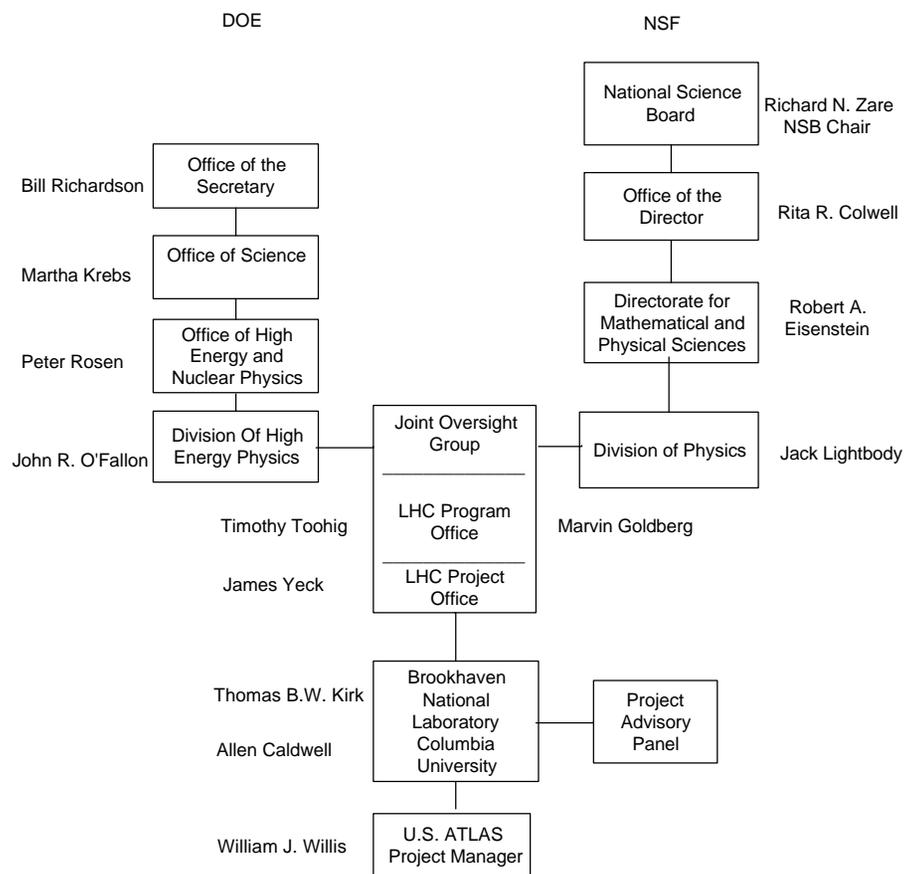
# U.S. ATLAS Computing

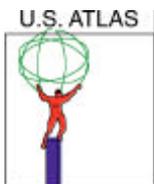
- **NSF, DOE: LHC computing activities are to be a “project”**
- **Implications for U.S. ATLAS:**
  - u **Direct reporting lines through Project Manager (Bill Willis) and BNL Directorate (Tom Kirk)**
  - u **Appointment of Associate Project Manager for Computing and Physics (John Huth)**
- **Reporting lines through Joint Oversight Group (JOG)**



# Reporting Lines

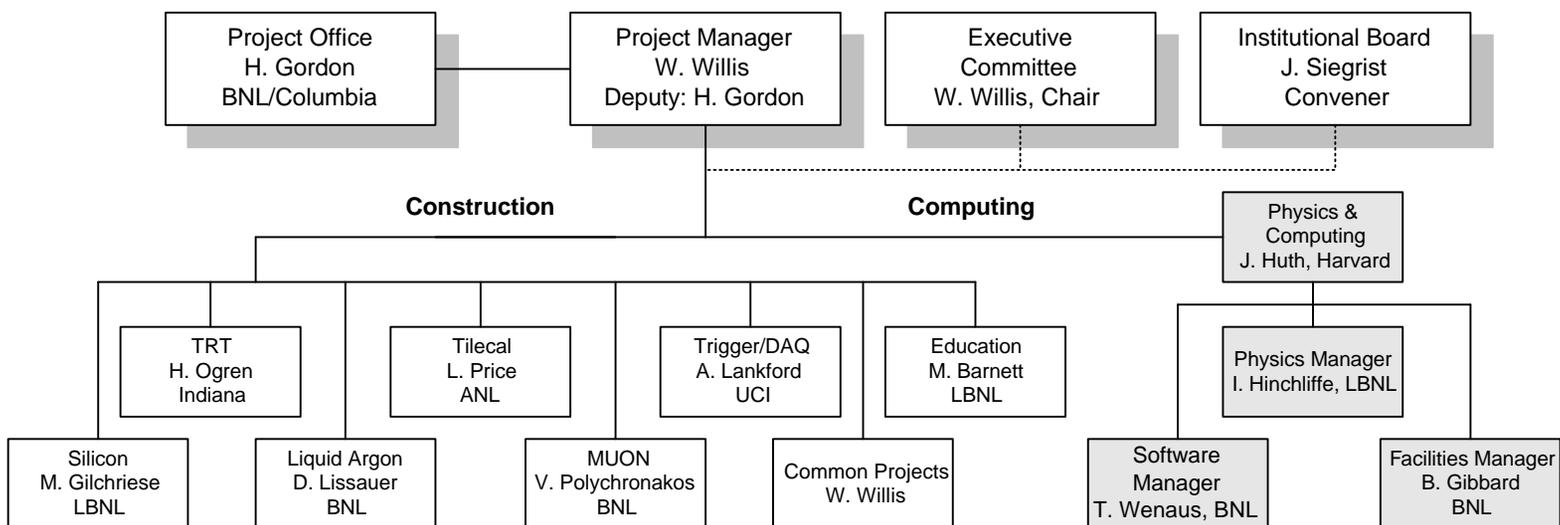
DOE-NSF-U.S. ATLAS Organization





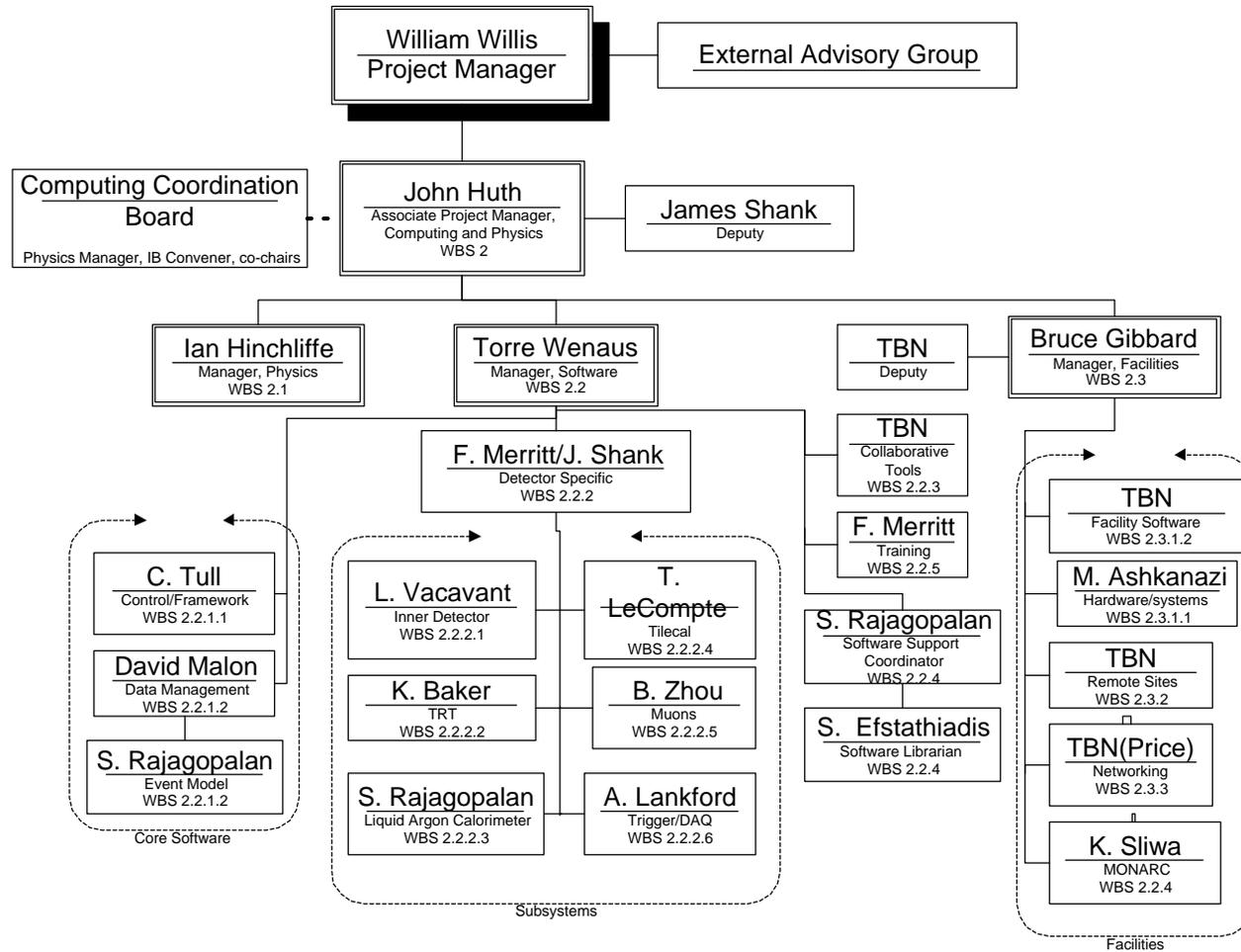
# Computing in U.S. ATLAS

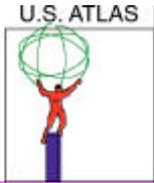
## U.S. ATLAS Organization





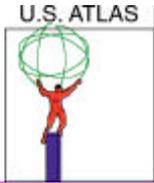
# Computing Management





# Management Structure

- Reflects flow of deliverables to, from ATLAS
- Software: Torre Wenaus (BNL)
  - u Detector – F. Merritt/J. Shank
- Physics: Ian Hinchliffe (LBNL)
- Facilities: Bruce Gibbard (BNL)
  - u Deputy

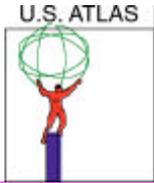


# Management Plan

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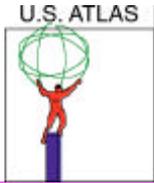
- **Associate Project Manager**

- u **Member of E.C.**
- u **Develop and execute project plan**
- u **Establish and maintain project organization+Tracking**
- u **Develop annual budget requests**
- u **Liason to ATLAS Computing Management**
- u **Appoint L2 managers**
- u **Review and approve MOU's to CERN and Institutes**
- u **Exercise change control authority**
- u **Establish advisory committees where appropriate**
- u **Provide reports and organize reviews**



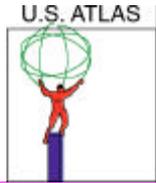
# Level 2 Managers

- **Appointed by APM, concurrence of Exec. Comm.**
- **Members of E.C. (+ APM, + deputy)**
- **Generic responsibilities**
  - u **Develop definition of milestones and deliverables**
  - u **Define, with APM, organizational substructure of level 2**
  - u **Develop, with APM, annual budget proposals**
  - u **Identify resource imbalances within subprojects and recommend adjustments**
  - u **Deliver scope of subproject on time within budget**
  - u **Maintain cost and schedule**
  - u **Provide reports to APM, PM**
  - u **Liason with counterparts at CERN**



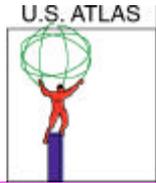
# Specific Responsibilities

- **Physics Manager**
  - u **Generators, physics objects, benchmark studies, mock data challenge**
- **Software**
  - u **Core**
  - u **Detector specific sim/recon**
  - u **Training**
- **Facilities**
  - u **Tier 1,2, networking, support**



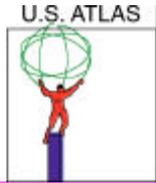
# Project Engineer

- **Same roles as project engineer's for construction project**
  - u **Tracking**
  - u **Reviews, oversight**
  - u **Reporting**
  - u **Technical input**
- **Needs further definition**
  - u **Analogs in Construction Project**
    - s **Mechanical**
    - s **Electronics**



## Computing Coordination Board

- Main path of input from collaboration
- Physics Manager, Institute Board Chair are co-chairs
- APM, Deputy, Facilities Manager, Software Manager + 3 at-large members
- Role:
  - u Provide input on priorities and requirements for facilities
  - u Selection of Tier 2 sites



# High Levels of WBS

- **Draft WBS**

- u **2.1 Physics**

- s **Generators, benchmarks, mock data challenges, physics objects**

- u **2.2 Software**

- s **2.2.1 Core**

- **Control/Framework, database, event model, analysis tools**

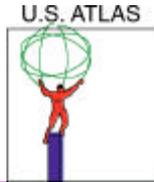
- s **2.2.2 Detector specific simulation and recon.**

- s **2.2.3 Collaborative tools**

- s **2.2.3 Training**

- u **2.3 Facilities**

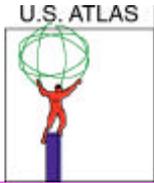
- s **Regional center, remote sites, networking, support**



# Policy Issues

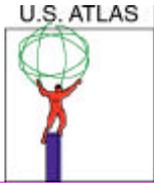
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- **Local Computing Support**
  - u **Until Tier 2 centers – limited development support, in coordination with BNL site**
- **Physicist Support**
  - u **Not on project funds**
  - u **N.B. expect/need approx. 50 postdocs by 2005**
- **Relation to Construction Project**
  - u **Adjudication by Proj. Manager, APM**
  - u **Common areas:**
    - s **Computing in support of detector configuration**
    - s **Trigger/DAQ common software**



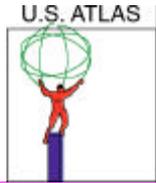
## Activities Since May '99

- U.S. ATLAS Web-site
- Regular video conferences
- Computing support at BNL
- Organization of funding requests
- Advisory group appointment
- PMP, project planning
- NSF ITR proposal with LIGO, CMS, SDSS
- Negotiations with ATLAS on deliverables
- Interactions with agencies
  - u JOG, Computing review



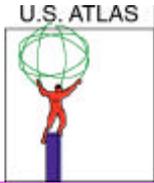
# Software

- **Core Software**
  - u **Control/Framework (Tull)**
  - u **Database, Tilecal Pilot Project (Malon)**
  - u **Event Model (Rajagopalan)**
- **Detector-specific sim/reconstruction**
  - u **Mainly physicists – base program**
  - u **Estimate 2 software prof./ subsystem in support**
- **Training (Merritt)**
  - u **Establishment of OO courses (BNL, U. Chicago)**



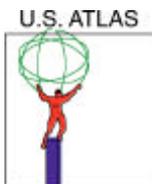
# General Requirements

- **Software must last over lifetime of experiment, yet track language changes**
  - u **Well defined interface layers**
- **Maintainability, engineering critical**
  - u **Number of users, use of software professionals**
- **Adaptability to distributed environments**
- **Learn from experiments working on OO (BaBar, D0, CDF, STAR)**



# Software Development

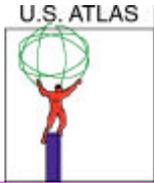
- **Asymptotic level - est. 10 software professionals**
- **Peak load (circa 2003) est. 20 S.P.'s**
- **Extrapolations based on existing experiments and proposed areas of responsibility, fractional of U.S. participation**
- **Choice of “technology”, requirements can influence actual needs.**



# Core Software Projection

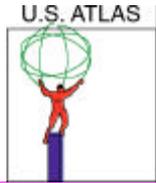
																	Total	Total \$k
Control	0.6	120	2.2	440	4	800	4	800	4	800	3	600	2	400	2	400	21.8	4360
Data management	0.7	140	3	600	5	1000	6	1200	7	1400	7	1400	7	1400	7	1400	42.7	8540
Subtotal	1.3	260	5.2	1040	9	1800	10	2000	11	2200	10	2000	9	1800	9	1800	64.5	12900
Contingency	1		1		1.4		1.4		1.4		1.4		1.4		1.4			
Subtotal w/ cont.		260		1040		2520		2800		3080		2800		2520		2520		17540





# Physics

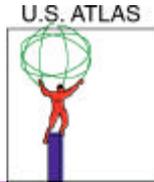
- **Analysis activities are coordinated overall with International ATLAS**
- **U.S. Contributions:**
  - u **Software as deliverables (e.g. support of event generators, interfaces)**
  - u **Computing support via facilities**
- **Project “calls” on funds for physics:**
  - u **Person to maintain interfaces**
  - u **Effort associated with benchmark studies, mock data challenges**
- **Expect 1 FTE “level of effort” on project from FY '01 on**



# Training

---

- All by Object Mentor (BaBar, others)
- Organized by Frank Merritt
- Courses approximately 1 week long
- Aug. 9 - BNL - OO Design - 13 people
- Sept. 20 - U.C. - OO Design - 15 people
- Oct. 18 - ANL or BNL - Advanced OO - 10 people
- Nov. 8 - FNAL - GEANT 4 - 14 people

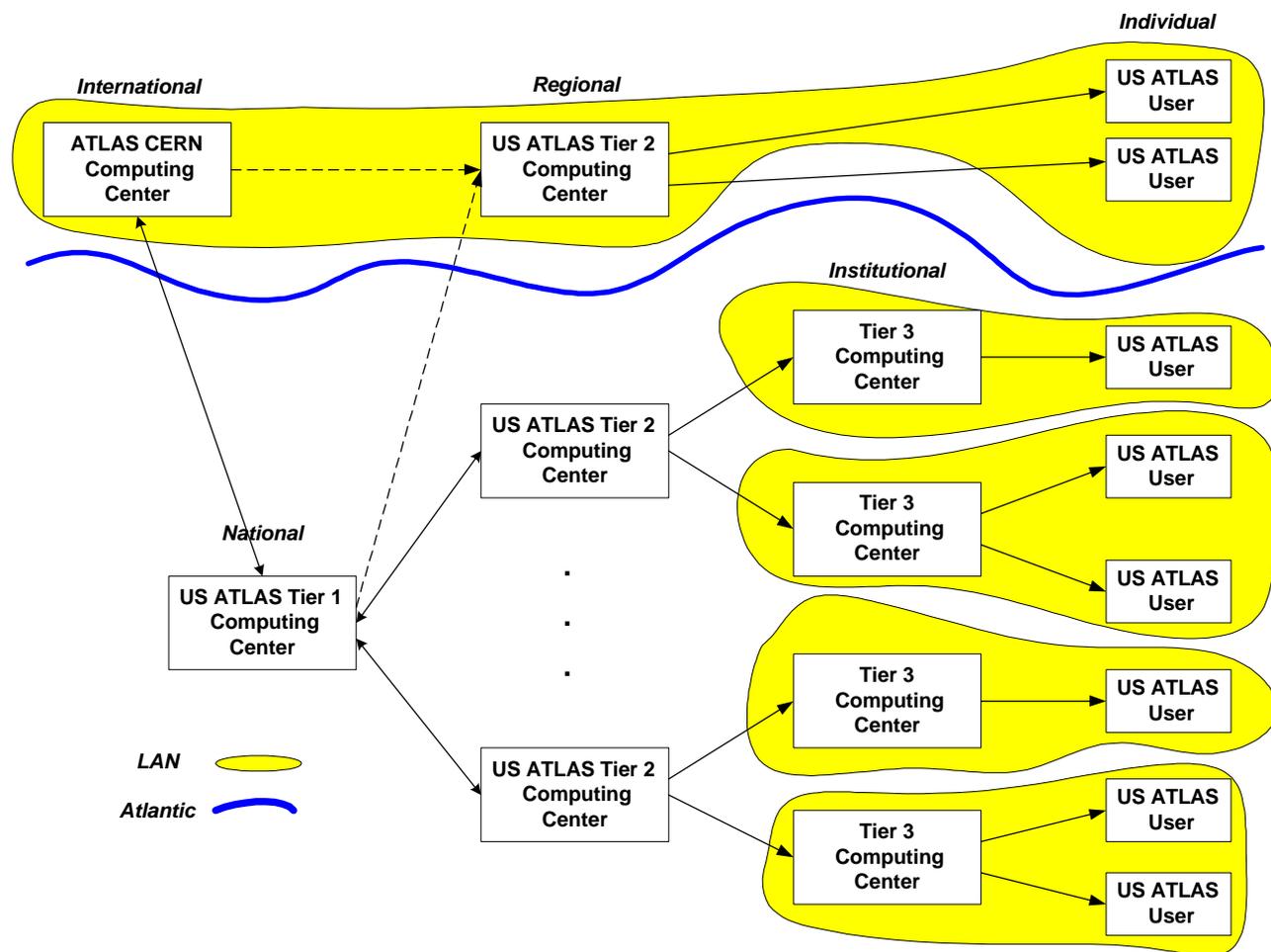


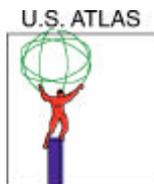
# Facilities

- **BNL ramping up support facility**
  - u **Taps into RHIC Computing Facility**
- **Issue of Tier 1/2 facilities**
  - u **Scale of Tier 2 sites**
    - s **Size for support staff, infrastructure**
    - s **Computing model for U.S. (e.g. grids)**
    - s **R+D being addressed in NSF ITR proposal**
- **In the process of developing policy on usage, support of platforms at institutions**



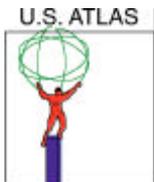
# Facilities Model





# Facilities

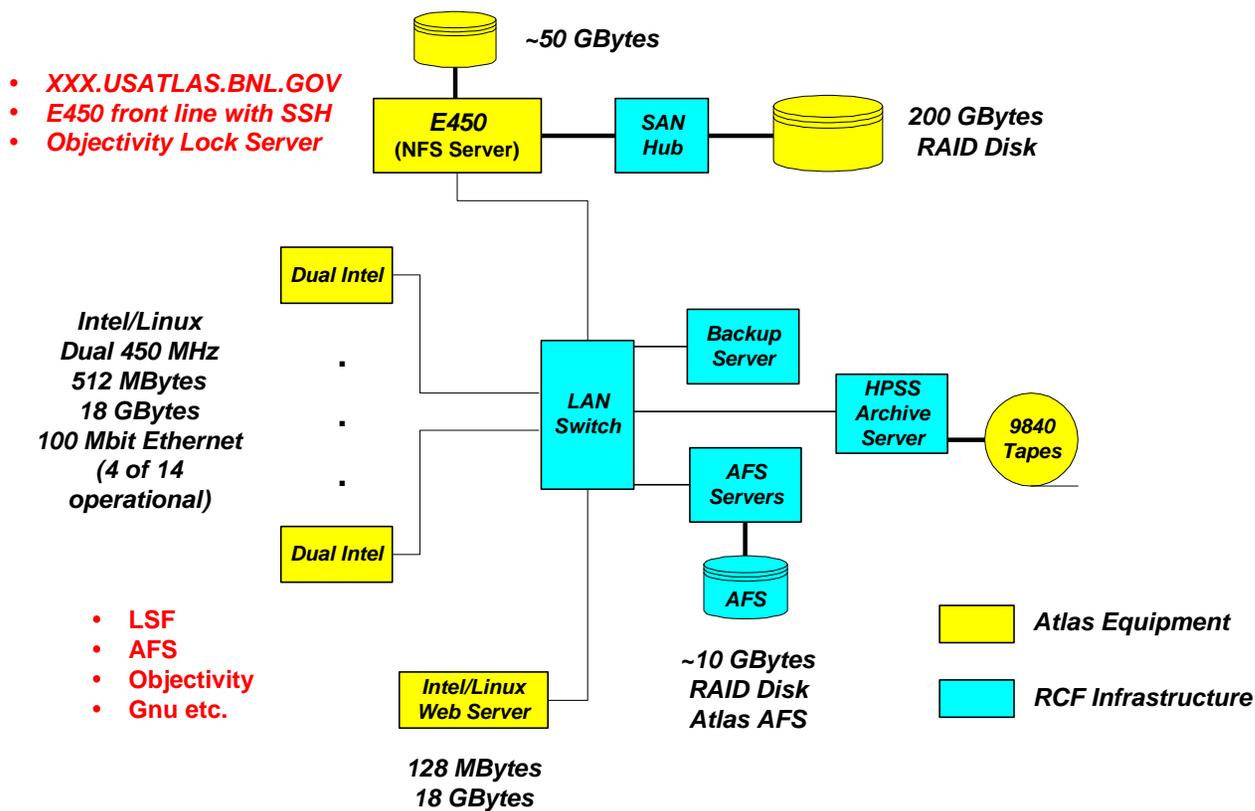
- **Tier 1 (Regional Center)**
  - u **BNL**
  - u **Leverages RCF**
    - s **ATLAS specific needs, however.**
  - u **Primary support function for U.S.**
    - s **Code release, support**
    - s **Major processing, event store**
  - u **Personnel scale estimate:**
    - s **Roughly linear ramp from 3 FTE's (now) to 26**



# Present Configuration

## US Atlas Tier 1 Facility

Current Configuration







# MONARC

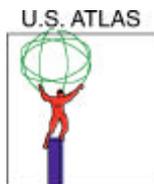
- **Models of Networked Architecture at Regional Centers (ATLAS+CMS)**
  - u **Alexander Nazarenko, Tufts**
  - u **Tasks:**
    - s **Validate simulation models**
    - s **Perform first simulations of LHC architectures**
    - s **Now focus on planning for regional centers**
  - u **Model validation**
- **Understanding of U.S. computing facilities**



# Priorities

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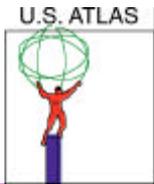
- **Critical personnel**
  - u **People who would otherwise be lost, fulfilling a critical role**
- **Core software effort**
  - u **Prerequisite to inclusion of sim/recon software**
  - u **Architecture team support**
- **Support of U.S. efforts (facilities)**
- **Critical studies**
- **Transition to OO**



# Priorities

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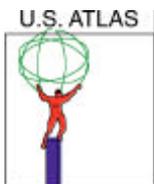
- **Coherency in development of plan**
  - u **Matching of facilities scope to usage**
    - s **E.g. database effort, simulations**
  - u **Contiguous/overlapping areas**
    - s **E.g. event model, database, control/framework**



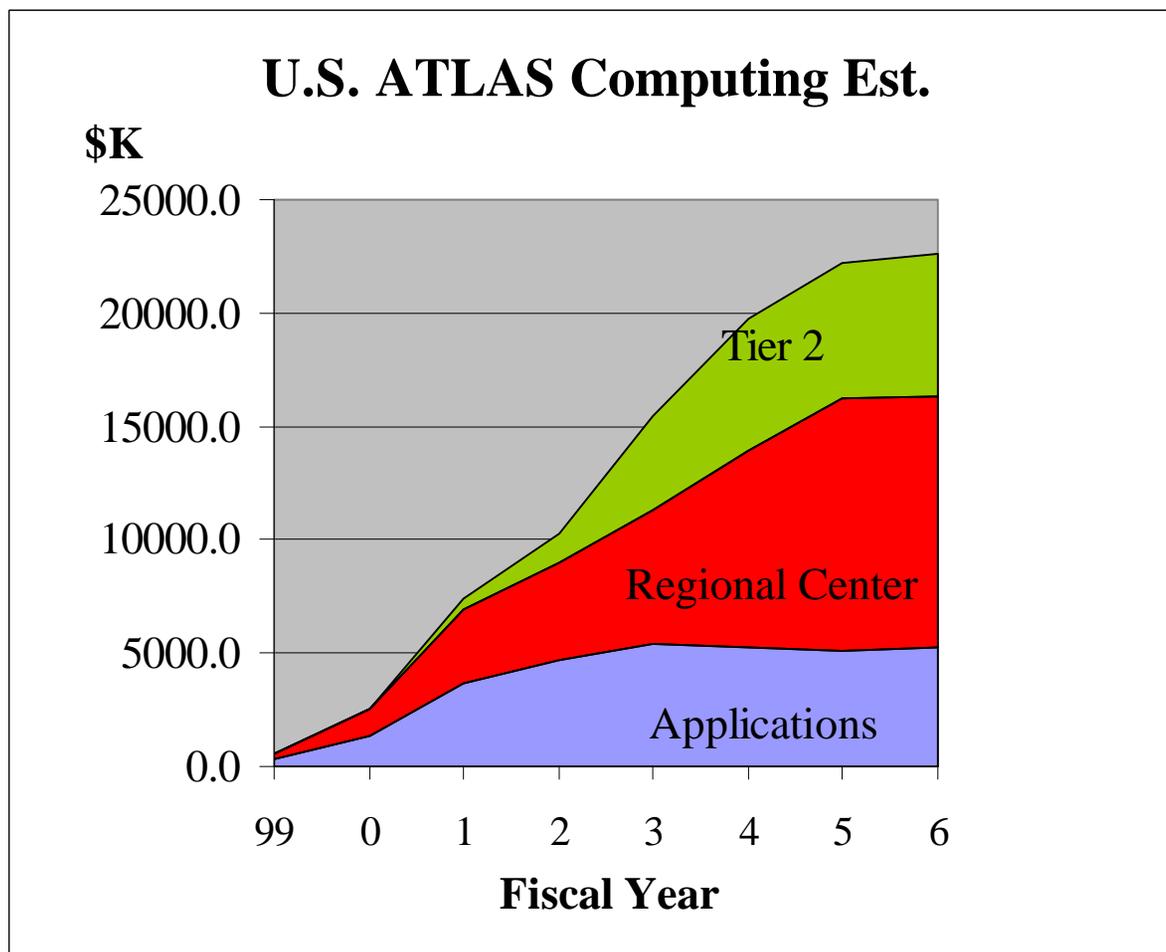
# Summary of Profile

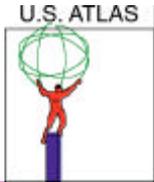
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Tier 2 Facilities									
Tier 1 Facilities									



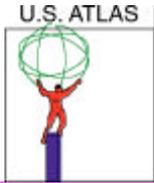
# Profile Breakout





# Schedule for 2000

- **Jan 00**
  - u NSF/DOE Review
  - u Preparations for software agreements
  - u Adjust to FY 00 funding
  - u Architecture team
- **May 00**
  - u A team milestone
- **July**
  - u Hoffman review report
  - u Preparations for MOU's
  - u Ratification of PMP
- **Aug 00**
  - u Prepare for full Lehman review
- **Fall 00**
  - u Full Lehman review



# Summary/Issues

- The U.S. is taking a significant role in ATLAS Computing
  - u We are ahead of ATLAS proper
- Funding will be tight for FY 00, 01
  - u Must adjust priorities
- Policy issues must be settled with collaboration/agencies
- Close to making software agreements