

Software Development for US ATLAS Computing

(Based partly on David Malon's talk at the
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Goals of the US ATLAS Software Effort

- **In close coordination with CERN, contribute proportionately to the definition, design, development, and deployment of software critical to the success of ATLAS**
- **Ensure development and delivery of a US computing infrastructure to support effective collaborative research by US ATLAS physicists, both before and after the LHC becomes operational**
- **Facilitate and support widespread participation by US physicists in the specification, design, and development of physics-specific software, and in overall ATLAS computing**

Components for Achieving These Goals

- **Explicit coordination of US ATLAS software efforts by the US Regional Center, with specific efforts to facilitate, encourage, and support widespread involvement by US physicists in ATLAS computing**
- **Specific and significant software development efforts:**
 - **A pilot project (testbeam data analysis)**
 - **Core software development**
 - ✦ **Concentrated in control or database domains**
 - **Detector-specific reconstruction**

By design, these projects inform and advance one another.

Pilot Project: Testbeam data analysis and related software

- Why testbeam?
 - Directly addresses facilitation and involvement of US physicists in specification and use of next-generation software NOW, in a context they care about NOW, rather than waiting until 2005
 - ✦ An early success is critical in recruiting new people
 - The proposing institutions have a significant physicist clientele in this area, so that software developers have ongoing guidance and feedback
 - Provides testbed for analysis tools and data storage solutions proposed by ATLAS while there is still time to influence their design and specification--based on real data
 - ✦ NOW is the time for this feedback
 - Natural means to leverage particular US software strengths

Testbeam Software Development: Initial Plans

- **Provide access to testbeam data--initially, from the tile calorimeter-- stored in an object database, for physics analysis via ATLAS candidate analysis tools**
- **Develop GEANT-4 based simulation software for the tile calorimeter testbeam effort**
- **Generalize database design and data analysis efforts beyond tile calorimeter to other testbeam efforts**
- **Discussion on Thursday afternoon**

Core Software Development

- **Why?**
 - **It is our obligation.**
 - **Core software domains are both critical and drastically understaffed.**
 - **It is an area of particular US strength, and allows leverage based on other US efforts (e.g., HENP Grand Challenge) and experience (BaBar, CDF/D0, STAR, ...).**
 - **The US has a vital interest here--US physicists can collaborate effectively from afar only if software infrastructure, database, and data distribution issues are addressed appropriately.**
 - **We have been asked, collectively and individually, to help.**

Core Software Development: Task Selection

- Done in collaboration with the overall ATLAS Computing Coordinator, with explicit agreement on US role and corresponding deliverables
- In cases in which the US does not take lead responsibility for an entire domain, agreements will also involve the appropriate domain architects
- Emphasis will be in areas of
 - unique US strength
 - specific unmet need in ATLAS, and/or critical milestones
 - unique US need
- Important not to dilute US effort too broadly
- These considerations lead us in the direction of the Database Domain and/or Control Domain for early US efforts.

US ATLAS Software Coordination

Management aspects of coordination are addressed elsewhere.

First-year software coordination goals:

- **Integrate US efforts into CERN-based ATLAS software development process, efforts, and plans**
- **Facilitate and encourage participation by US physicists ATLAS software development**
 - pilot project is designed to be a significant step in this direction
 - will encourage and provide OO assistance to physicists wishing to participate in the ATLAS Software Process
 - training, an appropriate infrastructure, and support are all part of this, and will come from the Infrastructure function
- **Participate in the specification of software requirements for a regional center**
- **Specify and evaluate tools and training needed to support US developers, compatible with CERN training and tools**

Detector-Specific Reconstruction

- **Effort will largely proceed from the Universities**
 - Coordination will be through the US ARC and the overall ATLAS detector reconstruction project
- **US ARC will provide assistance in the form of software professionals**
 - Especially along boundary lines between detectors and core software
 - Assistance and training also provided by Infrastructure: see Craig Tull's talk.
- **Right now, people want to help, but don't know where to start.**

“Contribute proportionately...”

- **US proportionate share of ATLAS software development is approximately 20% of the ATLAS estimate of 1000 FTE-years: 200 FTE-years**
- **Average over 6 years is 33 FTEs/year**
- **We envision an approximate 60/40 balance of physicists and computing professionals, given our focus on core software**
- **Rampup is steep, partly because software infrastructure must be in place earlier than other components, partly because we are serious in our intention that the testbeam data and simulation work support ongoing physics efforts (rather than just be a demonstration project).**

Scope and Scale

- **We have assessed the scope and scale of the proposed efforts in multiple ways**
 - Top down: **What does it mean to be 20% of ATLAS computing, with an emphasis on core software?**
 - Bottom up: **How much effort will it take to accomplish the specific proposed tasks?**
 - Sideways: **What does the experience of other experiments tell us about the scale of effort needed to deliver specific components?**
- **We have asked the US funding agencies to support effort at this level.**
 - 48 FTE-years of software professionals for core software
 - 36 FTE-years of software professionals for reconstruction and simulation
 - 115 FTE-years of physicists

Summary

- **The US plans to contribute at least it's proportional share to ATLAS computing.**
 - Sum is 200 FTE-years
 - Both physicists and software professionals
- **Besides detector reconstruction, we want to make a large impact on core software**
 - Database and Control Domains seem like the best match
- **US Funding agencies are aware of these plans (our next review in early May)**
- **We are starting now, with a “Pilot Project”**