

WBS	Description	Dictionary
<b>2.2</b>	<b>Software</b> (S. Rajagopalan)	U.S. ATLAS Software breakdown
<b>2.2.1</b>	<b>Coordination</b>	ATLAS Coordination Roles
2.2.1.1	Software Project Coordination	Coordination Roles in Software
2.2.1.2	Data Management Coordination	Coordination Roles in Data Management
<b>2.2.2</b>	<b>Core Services</b> (D. Quarrie)	Framework, EDM, Detector Description, Analysis Tools and Grid Integration
<b>2.2.2.1</b>	<b>Framework</b> (P. Calafiura)	Software development in support of ATLAS framework support for main programs, kernel interfaces, core services. <u>LCG contrib</u> : Provide SEAL plug-in and component support interfaces (CLIs & GUIs to build Athena. <u>LCG contrib</u> : Provide python scripting and binding to dictionary.
2.2.2.1.1	Core Services & Program Flow	
2.2.2.1.2	User Interfaces	
2.2.2.1.3	Event Merging	Infrastructure to merge event hits to study detector pile-up effects
2.2.2.1.4	Calibration Infrastructure	Infrastructure to support time-varying data such as conditions and detector-description
<b>2.2.2.2</b>	<b>EDM Infrastructure</b> (S. Rajagopalan)	Software development in support of Event Data Model infrastructure
2.2.2.2.1	Core Functionalities	Providing basic functionalities to clients and manage data objects
2.2.2.2.2	Backend Services	Infrastructure to communicate with backend services such as persistency services
2.2.2.2.3	History Support	Infrastructure to communicate with backend services such as Infrastructure for saving history information of event data objects
2.2.2.2.4	Navigation Support	Infrastructure to support uni and bi-directional links between data objects
<b>2.2.2.3</b>	<b>Detector Description</b> (J. Boudreau)	Detector description includes the design and implementation of a system through which material geometry, readout geometry, and alignment information is accessed throughout all Atlas applications that are concerned with geometry. The implementation of indi

2.2.2.3.1	Detector Element Identifiers	ATLAS detector elements are known to the detector description software by unique identifiers. This item covers the design and development of the software supporting detector element IDs.
2.2.2.3.2	Atlas Geometry Tool	Main infrastructure package of geometry description in Atlas. It is a data layer designed for low memory consumption through shared instancing, compressed transformations, an embedded symbolic language for parametrizing transformations, and boolean shape
2.2.2.3.3	Geometry Browser	An interactive 3D display for the geometry, the Browser displays precisely the same transient representation that simulation and reconstruction will use. It builds and displays detail upon demand for memory optimization. The browser is an application whi
2.2.2.3.4	DB support	The database infrastructure is not the responsibility of the detector description team, but the application of this infrastructure to the geometry description is its responsibility. This item covers both time-independent and
2.2.2.3.5	Geom. versioning & configuration	time-dependent geometry infor A mechanism must be put in place to enable the configuration of geometry. User-driven configuration information must be read in order to configure the geometry, and then in addition passed persistently from one executable to the next for consistency.
2.2.2.3.6	Integration suport	Clients of the geometry kernel include all of the subsystems engineers who describe their geometries in terms of geometrical primitives, and also to simulation and reconstruction people who use these geometries within their respective physics projects. A
<b>2.2.2.4</b>	<b>Graphics</b>	Services providing for access to ATLAS detector and event graphics tools from the Framework, including creating and populating graphics objects from transient event, geometry and other data; and graphics presentation and manipulation.
<b>2.2.2.5</b>	<b>Analysis Tools</b>	Software tools and environments supporting physics analysis including histogramming and fitting packages, tightly integrated with the offline framework, graphics and other tools (e.g. distributed computing services) to provide a user analysis environment.

<b>2.2.2.6</b>	<b>Grid Integration</b>	The principal resource for implementing distributed functionality will be the Grid Computing software under development in various collaborative projects. Managing the practical application of Grid tools in the Framework -- defining and implementing inter
<b>2.2.3</b>	<b>Database</b> (D. Malon)	
<b>2.2.3.1</b>	<b>Database services &amp; Servers</b>	This work package is responsible for tasks related to deployment of database services.
2.2.3.1.1	Operation Support	Server configuration, operation and optimization. Technology-specific product version selection, external package maintenance.
2.2.3.1.3	Database Administration	Security, authentication, authorization machinery. Database administration tool development, backup and reliability-related services
2.2.3.1.6	Distributed Services	Data Replication and other distributed services
<b>2.2.3.2</b>	<b>Common Data Mgmt Software</b>	This work package is responsible for development of software used for all data, regardless of type.
2.2.3.2.1	Persistency Services	Conversion Services and data-type-independent integration of data management software into the ATLAS execution framework
2.2.3.2.2	Concurrency Control	Infrastructure related to simultaneous access to data including transaction management.
2.2.3.2.3	Placement Services	Software to control physical placement of data, clustering by type or use, file size management.
2.2.3.2.4	Dictionary Services	connections to dictionary services
2.2.3.2.5	Schema Management	Schema management and evolution infrastructure
<b>2.2.3.3</b>	<b>Event Store</b>	This work package is responsible for the software and infrastructure beyond the generic data management work required for successful development and deployment of a (multi-petabyte) event store.
2.2.3.3.1	Event Databases	Event data specific connections of persistence technology to ATLAS execution framework; specific development required to deploy generator, simulation, raw, reconstruction, analysis, test beam event databases.
2.2.3.3.2	Pileup support	Database infrastructure for random selection and mixing from minimum bias event databases on farms of processors.

2.2.3.3.3	Persistent EDM	Infrastructure for persistent organization of event data objects; persistent connections between input and output events, and data in earlier event processing stages.
2.2.3.3.4	Event Selection Support	Support for iteration over specific events of interest, including subselection from collections via filter predicates.
<b>2.2.3.4</b>	<b>Non-Event Data Management</b>	This work package is responsible to manage static and dynamic detector description data, including geometry, primary numbers, conditions, configuration needed by offline applications, calibration, alignment, and other data that is not part of the event stream
2.2.3.4.1	Geometry & Primary Numbers	Infrastructure to manage the primary numbers that parameterize ATLAS detector description, geometry databases, and specific services to populate and read such databases.
2.2.3.4.2	Conditions & Configurations	Infrastructure to manage time-varying conditions, including DCS data, detector configuration, incident data, and other detector state information arriving asynchronously to event data.
2.2.3.4.3	Calibration	Infrastructure to manage calibration, alignment, and other calculated time-varying values.
2.2.3.4.4	Time Validity Infrastructure	Shared infrastructure for access to interval-of-validity or time sequence data.
<b>2.2.3.5</b>	<b>Collections, Catalogs, Metadata</b>	This work package is responsible for the catalogs and metadata queried by physicists to identify and select data of interest, and for the underlying catalogs and metadata used for bookkeeping and globally distributed, replicated data resource management.
2.2.3.5.1	Event Collection Catalogs	Infrastructure to organize the ATLAS event store according to collections of interest (runs, datasets, physics samples, Higgs candidates, ...)
2.2.3.5.2	Event Level Metadata (tag db)	Infrastructure to associate and query event-level metadata to select individual events of interest from larger collections
2.2.3.5.3	File & replica catalogs	Infrastructure to identify, locate, and manage the (replicated) data files that underly physics collections and datasets.
2.2.3.5.4	Transformation catalogs	Infrastructure to support standard job description (recipe) repositories, to associate recipes with data products before and after they have been produced, and to track and manage the provenance of data as it is successively processed and reprocessed.

2.2.3.5.5	Metadata services	Common infrastructure to integrate metadata from disparate sources; metadata layer by which physicists browse, query, identify, and select data of interest.
2.2.3.5.6	Bookkeeping support	Database support for bookkeeping and other data needed to manage production.
<b>2.2.4</b>	<b>Application Software</b>	Software development in Simulation, Reconstruction & Analysis
<b>2.2.4.0</b>	<b>Coordination</b>	Coordination of software development in simulation, reconstruction and analysis.
<b>2.2.4.1</b>	<b>Simulation</b>	Geant3 and GEANT4 based simulation
2.2.4.1.1	Geant3 simulation support	Support for Geant3 based simulation
2.2.4.1.2	Pixels	Pixel detector simulation, digitization, EDM, byte stream, and readout simulation.
2.2.4.1.3	TRT	TRT detector simulation, digitization, EDM, byte stream, and readout simulation.
2.2.4.1.4	LAr Calorimeter	LAr detector simulation, digitization, EDM, byte stream, and readout simulation.
2.2.4.1.5	Tile Calorimeter	Tile Calorimeter detector simulation, digitization, EDM, byte stream, and readout simulation.
2.2.4.1.6	Muon System	Muon System detector simulation, digitization, EDM, byte stream, and readout simulation.
2.2.4.1.7	Radiation Backgrounds	Simulation of radiation background levels within the ATLAS detector cavern.
<b>2.2.4.2</b>	<b>Subsystem Reconstruction</b>	Detector Reconstruction of Raw and Simulated Data
2.3.4.2.1	Pixels	Pixel clustering algorithms.
2.3.4.2.2	TRT	TRT drift-time to drift distance calibration.
2.3.4.2.3	Inner Detector Track Reconstruction	Track reconstruction using all parts of the Inner Detector.
2.3.4.2.4	LAr Calorimeter	LAr reconstruction and calibration algorithms.
2.3.4.2.5	Tile Calorimeter	Tile Calorimeter reconstruction and calibration algorithms.
2.3.4.2.6	Calorimeter Combined	Place holder for work involving using both the tiles and LAr - may not be useful.

2.3.4.2.7	Muon System	Muon system detector calibration and track reconstruction.
2.3.4.2.8	Inner Detector and Muon System	Combined Inner Detector and Muon System track reconstruction.
<b>2.2.4.3</b>	<b>Combined Reconstruction</b>	Reconstruction across detector boundaries
2.2.4.3.1	e /Gamma	Electron and photon identification and reconstruction.
2.2.4.3.2	Jets / ETmiss / Tau	Jet, Etmis, and Tau identification and reconstruction.
2.2.4.3.3	b - tagging	b-jet tagging and reconstruction algorithms.
2.2.4.3.4	Muon	Muon identification and reconstruction.
<b>2.2.4.4</b>	<b>Analysis</b>	Analysis software for identifying particles and physics signatures
<b>2.2.4.5</b>	<b>Trigger</b>	Software development for use in trigger environment
2.2.4.5.1	Level 1 Simulation	
2.2.4.5.2	Level 2 Reconstruction	
2.2.4.5.3	Level 3 Reconstruction	
<b>2.2.4.6</b>	<b>Combined Testbeam Software</b>	Software for summer 2004 combined testbeam run.
2.2.4.6.1	Simulation	
2.2.4.6.2	Reconstruction	
2.2.4.6.3	Online Monitoring	
<b>2.2.5</b>	<b>Infrastructure Support</b>	
2.2.5.1	Software support	Support of software in U.S. ATLAS, Development of tools associated with software support, close coordination and participation with ATLAS and LCG software support teams.
2.2.5.2	QA/QC	Software quality assurance ensuring necessary tools are in place to help in the software validation process.
2.2.5.3	Training	Training of physicists to familiarize them with the ATLAS software. This involves organizing hands-on tutorials, establishing tutorials for physicists to take them offline and helping physicists with their software development.