WP4: Project office for Linear Collider detectors

The infrastructures developed in particular in WP10 of this proposal will result in a complex and sophisticated experimental infrastructure. To coordinate and manage the building and eventual operation of this infrastructure we propose to put into place a networking infrastructure, called the "Project Office for Linear Collider detectors". This project office will manage and operate the infrastructure built up through WP10, and it will develop and make available more generally tools for the management of distributed detector development projects. Close links and adequate structures will be put in place to ensure efficient communication and complete documentation. This workpackage will thus be a show case for a project coordination office of future large new detectors. A particularly important issue is the design of a common data acquisition framework based on modern technologies and integrating the diverse detector types employed in EUVIF. The WP4 network will support the design and provide the coordination of the various EUVIF tasks

The project office will base its tools and methods on existing efforts within the LHC detector projects as well as the Linear Collider projects. It will closely work with existing project offices for the LHC and ILC projects. An important aspect of this work will be the support and contribution to concrete projects, to validate and exercise the tools under realistic conditions. To this end, the project office will participate in the technical coordination of the proposed EUVIF facility, and support other advanced development projects like e.g. the machine detector interface design for the ILC and CLIC.

Work Package title	Project Office for Linear Collider detectors							
Activity type								
Participant number								
Participant short name	CERN	DESY	ETHZ	ULB	LLR	INFN	UMAN	RHUL
Person-months per participant	42	87	48	24	6	12	12	12
Participant number								
Participant short name	UCAM	UNI-GE						
Person-months per participant	12	83						

Objectives:

Task 1: Project Office Tools

- Access and support for general information and documentation systems using a Electronic Document Management System (EDMS);
- Standardization and access to engineering tools, as well as putting in place mechanisms to exchange information between different tools;
- Standardization and access to project planning tools, support in the application of these tools to a complex project;
- Definition of standards in the interface specifications, change control and reviewing procedures of complex projects.

Task 2: Coordination of Linear Collider Activities
Task 2.1: Coordination of the Vertical Integration Facility EUVIF

- Propose and develop specifications of the interfaces, ensure the compliance to these by prototypes to be integrated into EUVIF.
- Coordinate a common DAQ architecture to be used by the experimenters at the EUVIF, based upon developments in task 3.
- Coordinate a common slow control architecture, based upon developments in task 3.
- Coordinate the operation and usage of EUVIF

Task 2.2: Application of project office tools to the CLIC forward region integration

- Get the overview and make the assessment of engineering and documentation tools used so far for existing studies providing essential input for the CLIC forward region integration
- Propose a coherent set of engineering tools and interfaces for the CLIC forward region study
- Participation in the CLIC forward region engineering study process, with particular aim to monitor issues related to engineering tools and documentation coming up during the actual engineering design process

Task 3: Common DAQ and detector controls for integrated detector tests

- Define a common DAQ architecture including protocols, interfaces, etc. .
- Provide an event building facility that allows the different detectors to connect via the predefined interfaces.
- Provide a detector control and monitoring infrastructure including conditions monitoring and configuration management.
- Provide a prototype detector interface to the common DAQ.
- Provide an online event processing with event filter capabilities based on offline software.

Description of work:
Task 1: Project Office Tools

The Project Office will develop an infrastructure of tools, standards and expertise, which will be made available to the groups proposing complex new experiments.

The distributed design of a complex facility requires a powerful central data base system to store information, to manage the information flow, and to provide means to validate and release information. This functionality is provided by so-called Engineering Data Management Systems (EDMS). Within the Global Design effort (GDE) for the International Linear Collider, an EDMS software has been setup and is maintained for the accelerator design and management. The Project Office in its branch located at DESY will develop, install, and make available a system for the experimental community. This will involve the development of the system to meet the needs of the experimental community, the operation of the system, and support for its usage.

The EDMS system will be fed from a number of different data sources, among them design systems (CAD), project management tools, and different drawing packages. A major goal of the project office will be to provide transparent and easy access to the EDMS for the experimental community, while faced with a very heterogeneous environment at the different partner laboratories. The goals of the project office therefore are twofold: develop mechanisms to exchange information between different packages, in a transparent and easy manner, and, at the same time, work towards reducing the numbers of options used in the community and try to establish a small number of standard systems.

In addition to providing the underlying data management tools, the project office will propose and eventually provide different tools needed to efficiently advance the projects. Among them will be general project management tools, planning tools, and tools to follow and control costs. The selection of the tools will be done in close collaboration with the users. Given the international scope of these projects, discussions will not be restricted to the members of DevDet, but involve the international community as well. Particular emphasis will be placed on the early application of these tools to concrete projects, among the first being the EUVIF facility.

To do this the Project Office will require one full time staff member at DESY starting in 2009. The Office will work in close cooperation with the DESY Information and Project Support group IPP to develop and maintain the necessary tools. It will be supported by members from DESY on the technical questions and by providing the needed computing resources. DESY, CERN and LLR will collaborate on this task.

Task 2: Coordination of Linear Collider Activities
Task 2.1: Coordination of the Vertical Integration Facility EUVIF

As a first practical application of the tools developed under Task 4.1, the Project Office will coordinate the Vertical Integration Facility EUVIF described under WP10 of this proposal. EUVIF is a large-scale infrastructure made available to the LC community to test and further develop detectors in an integrated way for the next generation Linear Colliders ILC or CLIC. The installation and operation of this infrastructure is a major task, which requires significant resources and support. The Project Office branch located at CERN and University of Geneva will coordinate the setup, the commissioning and the running of this facility. It will work with the participants to define common standards wherever possible. A major effort will be devoted to documenting interfaces and keeping this documentation up-to-date.

The Project Office ensures a consistent information structure related to the technical infrastructures and tools provided by EUVIF, based on the EDMS developed under Task 4.1. In the preparatory phase, the Project Office establishes detailed technical specifications for all components and services, in the form of a master plan. While individual partner institutes or groups provide individual infrastructure or detector components, the Project Office checks their compatibility with the global technical framework and the master plan. Change control procedures ensure that the documentation provided is accurate and up-to-date. During the installation phase, the Project office is central in the definition of installation scenarios and scheduling.

To do this task one full time person will be required at CERN, starting in 2010. It will receive support from the University of Geneva as far as Data Acquisition aspects are concerned, and from CERN on technical and administrative matters. DESY will support the operation of the EUVIF facility.

Task 2.2: Application of project office tools to the CLIC forward region integration
As a second practical study of applicability and optimisation of the tools developed under Task 4.1, the Project Office will participate in the detector integration efforts for the forward region of a future CLIC detector. This entails the sector of a future CLIC experiment located symmetrically around the interaction region and very near to the incoming and outgoing electron and positron beams. From the experimental physics point of view, particle detection in this region is essential to provide hermeticity to a future CLIC detector. This region is also very important as the luminosity measurements and beam condition monitoring are performed there. This will provide input to the tuning of the beams to maximize the interaction rate over a nanometre-sized beam spot. From the accelerator side, the region houses part of the beam delivery system, such as focusing quadrupoles, vacuum tube, as well as beam stabilisation and alignment elements. Moreover, in view of the particle background rates induced by beam-beam and focalising effects, the region will house a radiation shield.

This study will be a very relevant test-case example of the use and exchange of project office tools, because the

work covers new collaboration efforts, integrating building blocks that have so far been produced by separate communities.

Over the past years, extensive studies have already been carried out in relation to the ILC forward region design. These studies involve a number of beam and physics simulation tools (including tools further developed under WP2), engineering design and documentation tools for experiments and accelerator (see WP4-1), as well as hardware developments (see WP10-3.3). Of high relevance for the CLIC forward region, they nevertheless will need major adaptations for CLIC. The integration of the CLIC forward detector region design will interface with the CLIC accelerator design, which so far has been using different engineering standards, principally based on the engineering tools used for LHC at CERN.

The participation in the engineering study of the CLIC forward detector region with particular emphasis on the assessment, adaptation and monitoring of the project office tools is therefore of high relevance within the process of setting-up project office tools for the Linear Collider community. The actual work performed under this work package covers only part of the full engineering effort for the integration of the CLIC forward region, because it concentrates principally on the application of project office tools. This task will be carried out by CERN, in collaboration with the ILC forward study teams, in particular DESY.

Task 3: Common DAQ and detector controls for integrated detector tests

For the Vertical Integration Facility a common Data Acquisition (DAQ) system has to be provided that allows easy integration of various detector components and ensure efficient data taking of the facility for varying detector setup. To allow for an easy exchange of detectors a common interface and a protocol has to be defined and prototypes for the hardware setup as well as the software components have to be provided from the common DAQ side. The different detector components should then interface to the common DAQ via these tools to ensure compatibility.

The common DAQ itself will then provide event building and if necessary event selection capability on an online computing facility (event building farm) and a network based uplink to persistent storage. The software on the event building farm should be as close as possible to the offline computing environment envisaged.

In addition detector control interfaces for detector configuration and conditions monitoring should be provided as well as the interface to calibration and alignment data for a possible online event processing in case event filter capability is needed.

Defining the common DAQ architecture including the protocols and interfaces to the detectors will be done by all participants involved in this task. (DESY, UNI-GE, ULB, UCAM, UMAN and RHUL).

The central event building facility will interface the different detector components to the permanent storage. This will be provided by the work of Manchester University and Royal Holloway University London.

The University of Cambridge will work on the detector control and monitoring infrastructure using custom made controls and commercial fan-outs.

A prototype of the detector interface to the central DAQ based on ATCA and Ethernet will be provided by the work of University of Brussels and DESY. Existing developments like PCIExpress will be adapted accordingly from the Universities of Manchester and Geneva.

Deliverables of tasks	Description/title	Nature[1]	Delivery month[2]
4.1.1	Assessment report on relevant engineering and documentation tools used so far for LC studies	R	M8
4.1.2	Make available EDMS system	D	M12
4.1.3	Demonstrate Exchange/ Interoperability	R	M14
4.1.4	Description of appropriate suite of project tools, together with some prototype installations	R	M22
4.1.5	Report on the operation/support of the engineering and documentation tools	R	M48
4.2.1	Set of specifications for the CLIC forward region integration design	R	M10
4.2.2	Mechanical and electrical interface specification for EUVIF	D	M18
4.2.3	Report on EUVIF (together with WP10)	R	M48
4.2.5	Status presentation of advanced CLIC forward region integration design with proof of successful application of project office tools	R	M24
4.3.1	DAQ Architecture description	R	M24
4.3.2	Interface Prototype	P	M30
4.3.3	Event building facility	P	M36
4.3.4	Detector control infrastructure	P	M36

List of Milestones for the task

Milestones	Description/title	Tasks involved	Delivery month[2]	Means of verification
4.1	Project Office in place	4.1.1,4.1.2, 4.1.3,4.1.4	M20	R
4.2	DAQ Interface and Protocol definitions	4.3.1, 4.3.4	M21	R
4.3	Event building demonstrator	4.3.2	M30	R
4.4	Detector controls demonstrator	4.3.3	M30	R
4.5	Start of EUVIF commissioning	All	M42	R

[1] Nature: R=Report, P=Prototype, D=Demonstrator, O=Other
[2] Counted from the starting date