

# AIDA WP2

## Common Software

### - The LC perspective -

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# The AIDA project

Advanced European Infrastructures for Detectors at Accelerators

<http://www.cern.ch/aida>

- EU project in the 7<sup>th</sup> Framework program for research infrastructure in Europe
- AIDA addresses infrastructures required for the development of detectors for future particle physics experiments. In line with the European strategy for particle physics
  - sLHC, ILC/CLIC, neutrino facilities, B-factories
- project duration: 4 years
- start: Feb. 2011
- total budget: 8 MEUR

# AIDA workpackages

| WP# | Type  | Task   | Description   | WP Leaders   |
|-----|-------|--|---|--|
| 1   | MGT   | <b>Project management and communication</b>                    |   | <b>S. Stavrev (CERN)</b><br><b>L. Serin (CERN)</b>             |
|     |       | 1.1  | Project management and administration                           |  |
|     |       | 1.2  | Communication and dissemination                                 |  |
| 2   | COORD | <b>Common software tools</b>                                   |   | <b>F. Gaede (DESY)</b><br><b>P. Mato (CERN)</b>                |
|     |       | 2.1  | Coordination and communication                                  |  |
|     |       | 2.2  | Geometry toolkit for HEP  |  |
|     |       | 2.3  | Reconstruction toolkit for HEP                                  |  |
| 3   | COORD | <b>Microelectronics and interconnection technology</b>         |   | <b>H-G Moser (DESY (MPG-MPP))</b><br><b>V. Re (INFN-PV)</b>    |
|     |       | 3.1  | Coordination and communication                                  |  |
|     |       | 3.2  | 3D Interconnection  |  |
|     |       | 3.3  | Shareable IP blocks for HEP                                     |  |
| 4   | COORD | <b>Relation with industry</b>                                  |   | <b>S. Stapnes (CERN)</b><br><b>P. Sharp (STFC)</b>             |
|     |       | 4.1  | Coordination and Network Working Groups                         |  |
| 5   | SUPP  | <b>Transnational access DESY</b>                               |   | <b>I. Gregor (DESY)</b>  |
|     |       | 5.1  | Test beams  |  |
| 6   | SUPP  | <b>Transnational access CERN</b>                               |   | <b>H. Breuker (CERN)</b>                                       |
|     |       | 6.1  | Test beams and irradiation facilities                           |  |
| 7   | SUPP  | <b>Transnational access European irradiation facilities</b>    |   | <b>M. Mikuz (JSI)</b>  |
|     |       | 7.1  | Access to JSI, Slovenia   |  |
|     |       | 7.2  | Access to UCL, Belgium  |  |
|     |       | 7.3  | Access to KIT, Germany  |  |
| 8   | RTD   | <b>Improvement and equipment of irradiation and beam lines</b> |   | <b>M. Moll (CERN)</b>  |
|     |       | 8.1  | Coordination and communication                                  |  |
|     |       | 8.2  | Test beams infrastructure at CERN and Frascati                  |  |
|     |       | 8.3  | Upgrade of PS proton and neutron irradiation facilities at CERN |  |
|     |       | 8.4  | Qualification of components and common database                 |  |
|     |       | 8.5  | General infrastructure for test beam and irradiation lines      |  |
|     |       | 8.6  | Coordination of combined beam tests and common DAQ              |  |
| 9   | RTD   | <b>Advanced Infrastructure for detector R&amp;D</b>            |   | <b>M. Vos (CSIC (IFIC))</b><br><b>V. Boudry (CNRS (IN2P3))</b> |
|     |       | 9.1  | Coordination and communication                                  |  |
|     |       | 9.2  | Gaseous Detector Facilities                                     |  |
|     |       | 9.3  | Precision Pixel Detectors                                       |  |
|     |       | 9.4  | Silicon Tracking Devices  |  |
|     |       | 9.5  | Highly Granular Calorimetry                                     |  |

# goal of WP2 – 'Common Software'

develop core software tools that are useful for the HEP community at large and in particular for the next big planned projects: sLHC and Linear Collider (ILC/CLIC)

## Objectives

### Task 2.1: Coordination and communication

- Monitor the progress of the work in the work package
- Coordinate and schedule the execution of the tasks and subtasks
- Prepare progress reports – internal and on deliverables

### Task 2.2: Geometry toolkit for HEP

- Allow the description of complex geometrical shapes, materials and sensitive detectors
- Provide interfaces to full simulation programs (Geant4), fast simulations, visualization tools and reconstruction algorithms
- Allow for the misalignment of detector components
- Provide an interface to calibration constants and conditions data

### Task 2.3: Reconstruction toolkit for HEP

- Tracking toolkit based on best practice tracking and pattern recognition algorithms
- Provide alignment tools
- Allow for pile up of hadronic events
- Calorimeter reconstruction toolkit for highly granular calorimeters based on Particle Flow algorithms

# partner involved from LC community

- **task2: Geometry toolkit**
  - CERN, LLR, DESY, STFC
  - task leader: CERN
- **task3: Reconstruction toolkit**
  - **Tracking toolkit**
    - DESY, OeAW
  - **Particle Flow Algorithms**
    - UCam, CERN, LLR
  - task leader: DESY

# Deliverables for WP2

## Deliverables

blue: responsible partner

| Del no. | Description/title   | Partners:                     | Delivery |
|---------|---|-------------------------------|----------|
| D2.1.1  | Project web infrastructure to document software packages                                      | CERN, DESY                    | M3       |
| D2.1.2  | Central code repositories and other infrastructure required for the software development      | CERN, DESY                    | M4       |
| D2.2.1  | Software design for geometry toolkit including the interfaces for the reconstruction toolkits | CERN, DESY, LLR, UniGla, STFC | M12      |
| D2.2.2  | Software toolkit for detector geometry, materials and detection technologies                  | CERN, DESY, LLR, UniGla, STFC | M38      |
| D2.3.1  | Software design for tracking toolkit  | DESY, OeAW, KFKI              | M12      |
| D2.3.2  | Software design for PFA tools   | Ucam, LLR, CERN, STFC         | M12      |
| D2.3.3  | Design for handling the pile-up in sLHC   | INFN, NTU, KFKI               | M18      |
| D2.3.4  | Software toolkit with tracking algorithms   | DESY, OeAW, KFKI              | M12      |
| D2.3.5  | Particle Flow software tools  | Ucam, LLR, CERN, STFC         | M38      |
| D2.3.6  | Alignment tools software tools  | UniGla, STFC                  | M38      |
| D2.3.7  | Trigger simulation software tool  | STFC                          | M38      |

# WP2 - Milestones

Partners:

blue: responsible partner

| Milestone number <sup>59</sup> | Milestone name  | Lead beneficiary number | Delivery date from Annex I <sup>60</sup> | Comments  |
|--------------------------------|---|-------------------------|--|---|
| MS10                           | Running first prototype of the particle flow algorithm.         |                         | UCAM, LLR                                | Application to LC detector (Task 2.3)             |
| MS11                           | Running prototype of tracking toolkit including some algorithms |                         | DESY, OeAW                               | Application to ILD-TPC simulation (Task 2.2)      |
| MS12                           | Running prototype of the geometry toolkit                       |                         | CERN, DESY, LLR                          | Application to ILD detector simulation (Task 2.2) |
| MS13                           | Running prototype of the tracking code for the pile-up          |                         | INFN, NTU, KFKI                          | Application to sLHC simulation (Task 2.3)         |
| MS14                           | Integration of tracking toolkit into LC software framework      |                         | DESY <sup>14</sup>                       | Validation of physics performance (Task 2.3)      |
| MS15                           | Application of PFA tools to sLHC detectors                      |                         | UCAM, LLR                                | Demonstration of concept (Task 2.3)               |

milestones chosen such, that integration w/ LC software is key ingredient



# The LC perspective

- development of detector and framework independent software tools for geometry description and reconstruction fits nicely into current LC situation w/ three detector concept groups
- milestones include adaption to LC framework(s)
- => we keep doing what we planed to do anyhow and gain from AIDA :
  - (additional) manpower
  - community strengthening
  - need for proper software design !



# a proposed strategy for AIDA WP2 (LC)

- different timescales with AIDA project and upcoming documents: CDR, DBD
- implement and improve the needed tools now
  - GEAR, improved tracking, PFA, ...
- start thinking about definition of '**abstract interfaces**' now  
crucial for success -> we have to get it right !
- further develop and improve the tools in the context of LC software with general application and interfaces in mind
- not everyone involved in AIDA - only EU partners
  - keep up close communication and collaboration with international partners outside AIDA
  - everything we do for LC software within AIDA has to fit into the international context of the LC software