ILC Controls Update

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EPICS Collaboration Meeting – DESY, April 2007

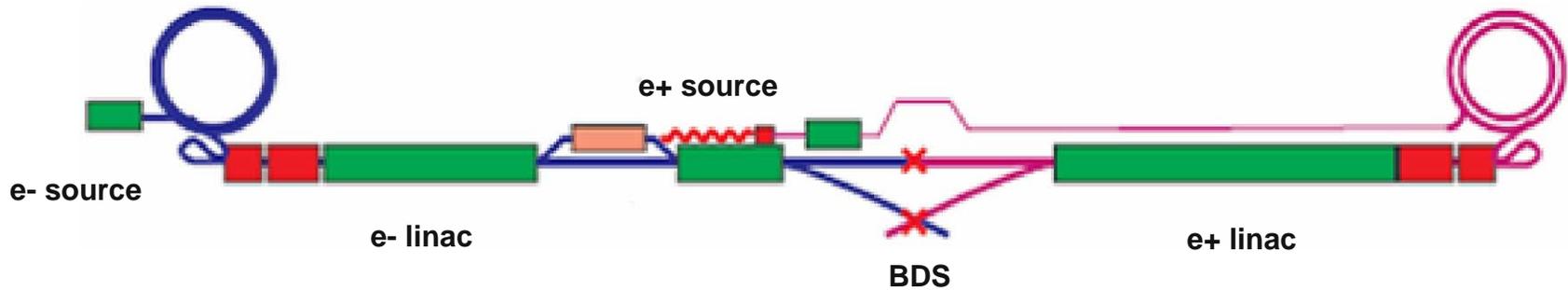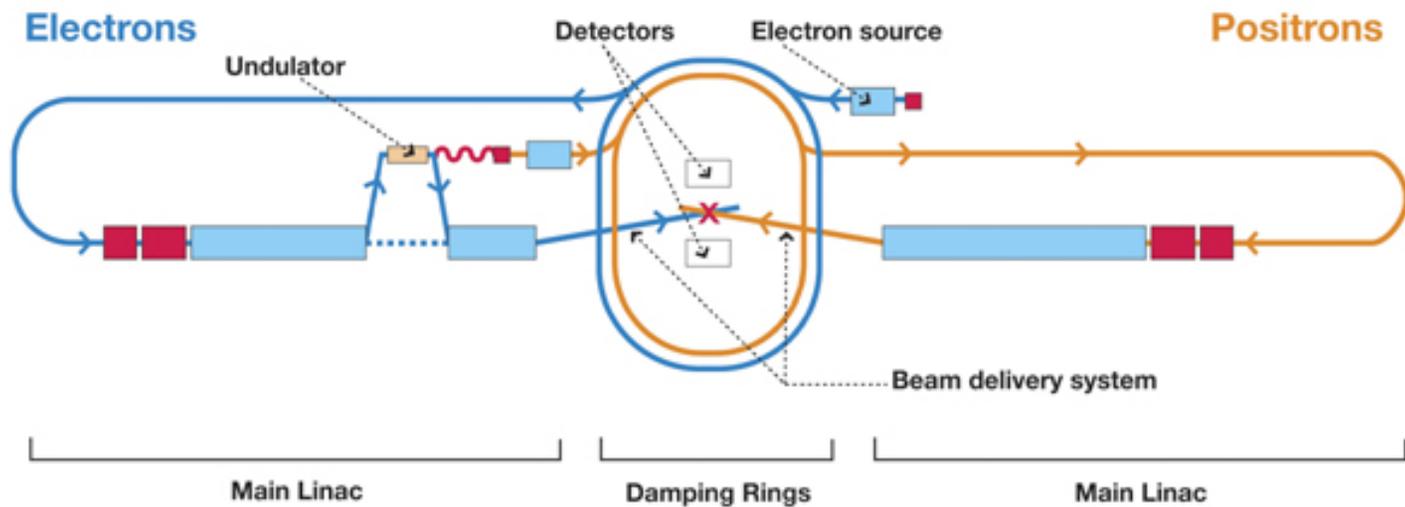# *ILC Design Changes since June 2006*

- Was

- Now

ILC Reference Design Report

- Completed March 2007 (more or less)
  - Available at www.linearcollider.org
  - Includes initial value estimate
    - *1.78 Billion (ILC Units) for site-dependent costs, such as the costs for tunneling in a specific region*
    - *4.87 Billion (ILC Units) for shared value of the high technology and conventional components*
    - *13,000 person-years effort (== 22 million person-hours)*
  - 1 ILC Unit = 1 US$ 2007 (== 0.83 Euro, == 117 Yen)

- Next major task is the Engineering Design Report
  - And the R&D program necessary to support an engineering design
 - Due roughly end of 2009

RDR Control System Chapter

- Section 3.12 of the RDR contains:
    - Overview
    - Requirements and Technical Challenges
    - Impact of Requirements on the Control System
    - Control System Model
    - Remote Access / Remote Control
    - Timing and RF Phase Reference
    - Beam-based Feedback
    - Information Technology (IT) Computing Infrastructure
    - Cost Estimation, Bases of Estimates
    - Table of Components

Requirements and Technical Challenges

- Scalability
  - Quantity of technical systems
  - Physical distances between systems
- High availability
  - Simulations indicate control system must provide 99% to 99.9% availability
  - This in turn implies individual "IOC" must be 99.999% available
- Extensive automation and beam-based feedback
- Synchronous control system operation
- Precision RF phase reference distribution
- Standards and standardization, quality assurance
- Requirements on technical equipment
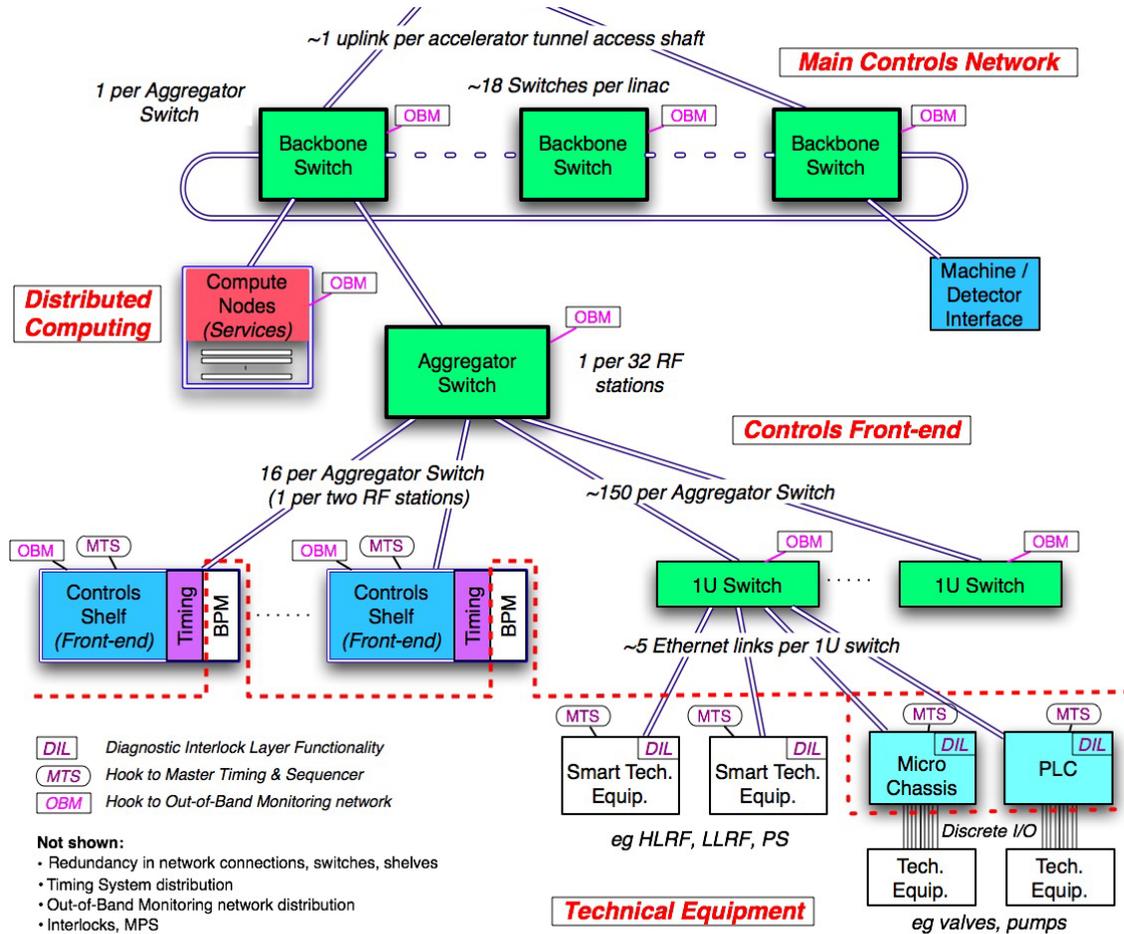- Diagnostic interlock layer

Control System Functional Model
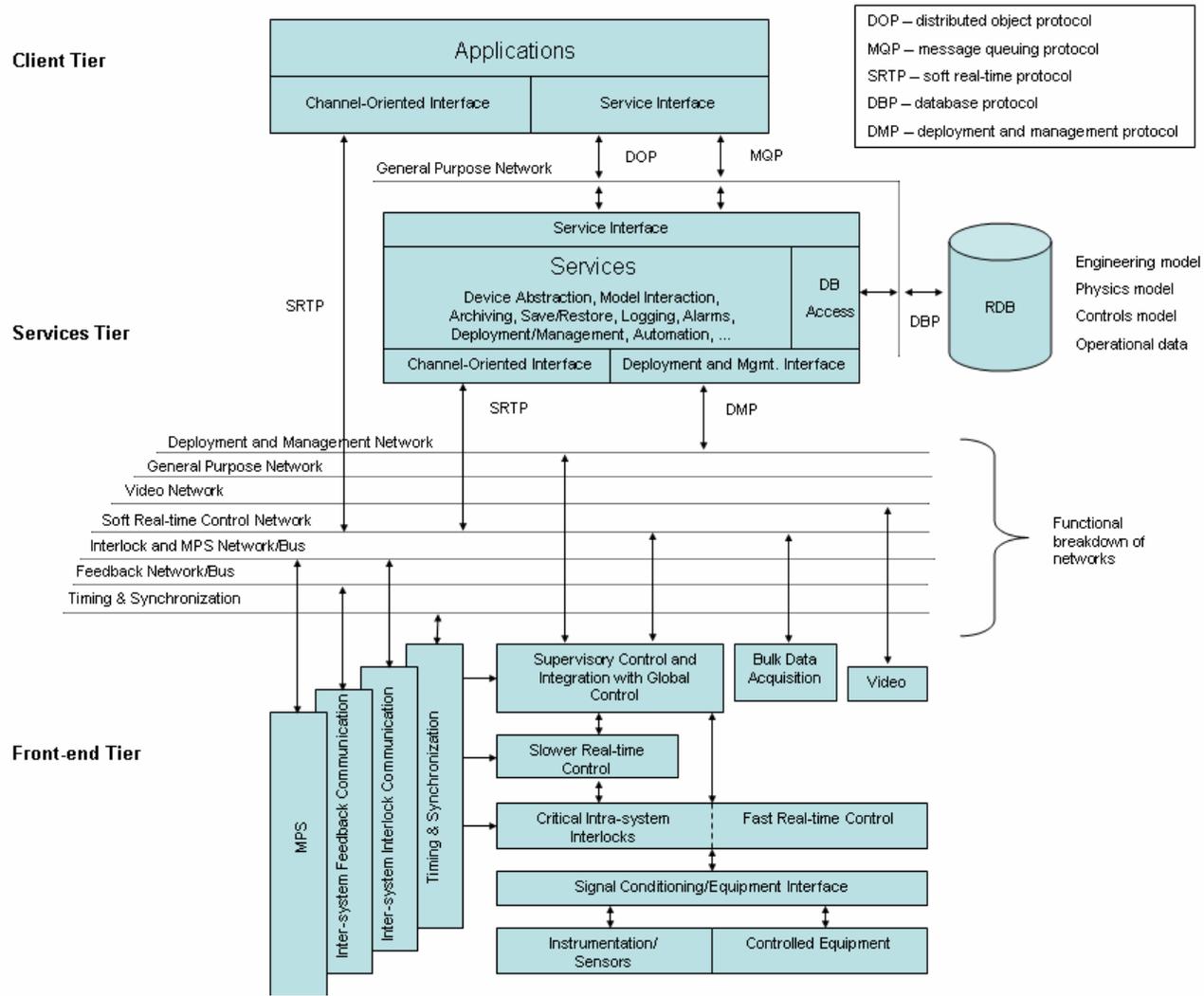
Control System Physical Model

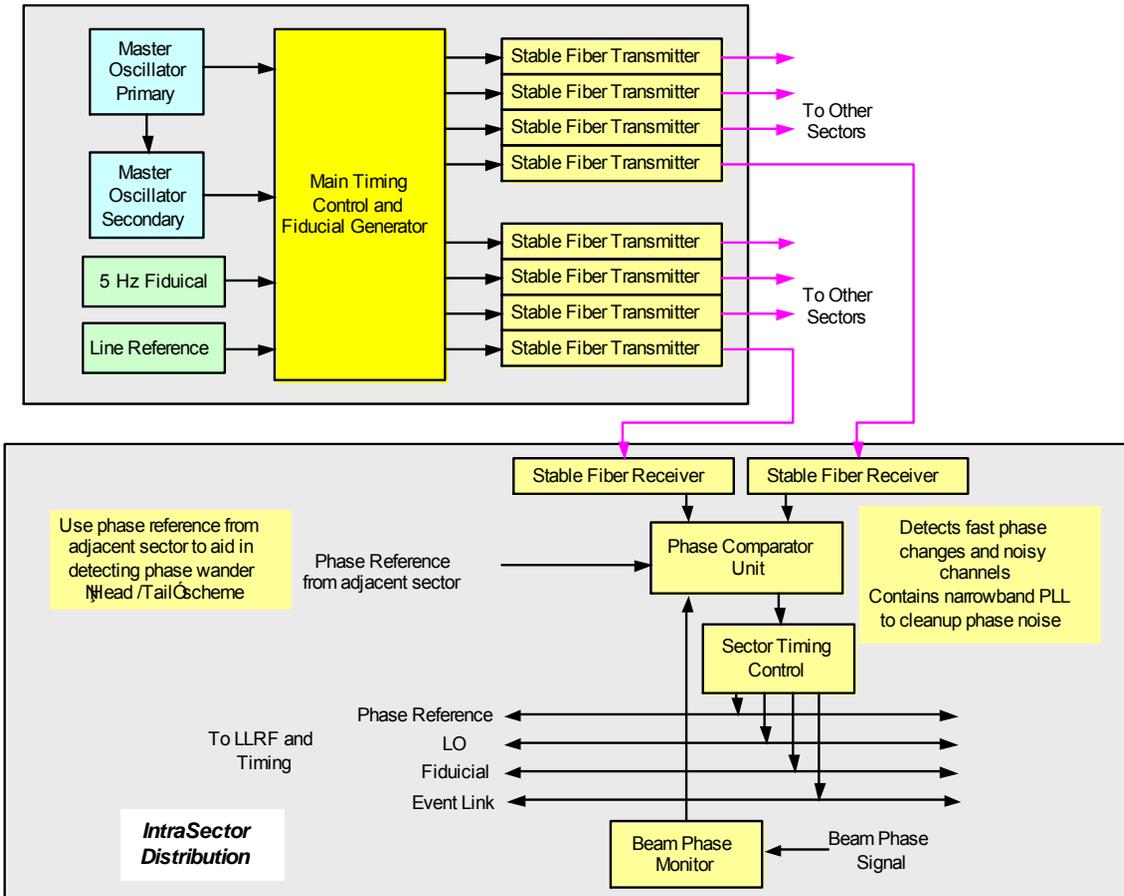- Above Ground - plus initial underground backbone
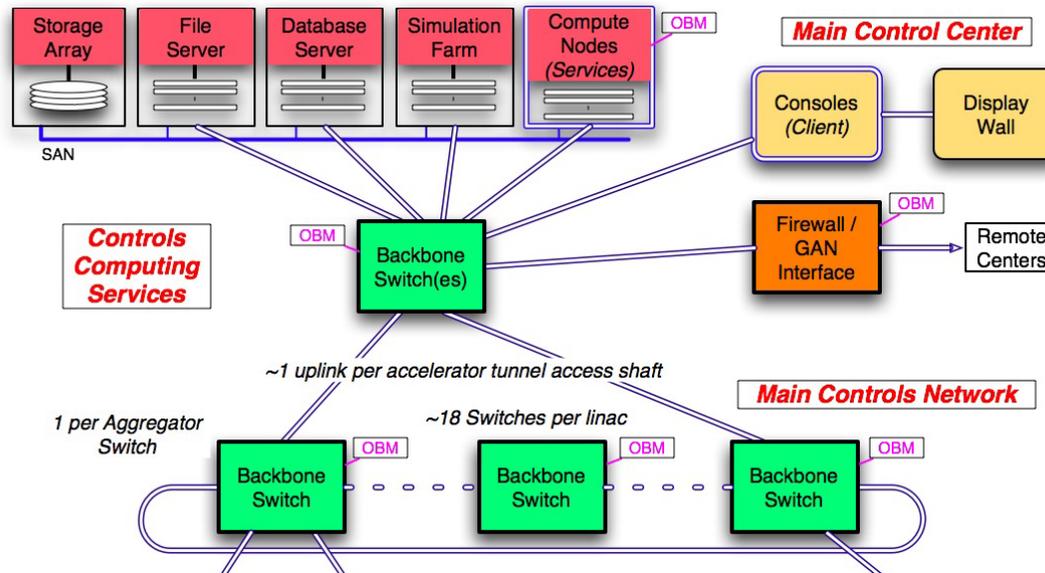
Control System Physical Model

- Below Ground

Timing and RF Phase Reference

Controls R&D Program – Americas Region

- I am speaking from perspective of Americas region. Similar efforts in European and Asian regions. Goal is to collaborate and coordinate as much as possible.

- Assortment of R&D work going on right now in FY 2007 (Fiscal Year)
- Now planning FY 2008/2009 R&D program
- ILC Controls is part of ILC Global Systems WBS x.2
  - Other Global Systems are Installation, Commissioning and Operations, LLRF, Instrumentation and Feedback, Survey and Alignment

Program Areas for FY 08/09

- Accelerator Design
  - EDR (Engineering Design Report) authoring
  - Requirements development
  - Standards and methodology development
- R&D
  - In support of the EDR
  - LLRF algorithms, beam instrumentation, high availability, front-end electronics platform, diagnostic controller
  - Other R&D work in plan, but less likely to be funded, or none requested:
    - *Control system architecture, installation, survey and alignment*
  - Collaborate, collaborate, collaborate

Program Areas for FY 08/09

- **Facilities**
  - Several facilities under construction at Fermilab, called ILCTA (ILC Test Accelerator) as a whole
  - Most Global Systems work here involves developing controls, instrumentation, and LLRF for running ILCTA. Timescale and goals are somewhat different than ILC controls research.
  - However, the NML facility of ILCTA will serve as a real system in which to test and evaluate prototypes coming from R&D program.

- **Program Management**
  - Managing all of the above

High Availability and Electronics Platform Areas

- High Availability
  - NOT just redundancy
  - Conflict avoidance
  - Model-based resource monitoring (IPMI and SNMP)
  - Model-based configuration management
  - Automated diagnosis
  - Adaptive control
  - Controller redundancy and failover

- Electronics Platform
  - ATCA (Advanced Telecommunications Computing Architecture)
    - *BPM digitizer under development at Fermilab*
  - uTCA
    - *AMC cards for analog I/O (how to route I/O to back of chassis?)*
  - Shelf Management (IPMI over RMCP, IPMB, IPMC, BMC, etc…)
  - Analog electronics environment characterization

ILC Global Systems

- This is an open process.
- People are contributing at all different levels of effort and degrees of formality.
- Please contact people with your ideas
  - Top down via your region's ILC Global Systems Manager
    - *John Carwardine – Argonne National Laboratory*
    - *Stefan Simrock – DESY*
    - *Shinichiro Michizono – KEK*
  - Bottom up via many participants