

NHERI Lehigh IT Overview

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NHERI Lehigh EF IT Systems Manager



Overview and Synergy

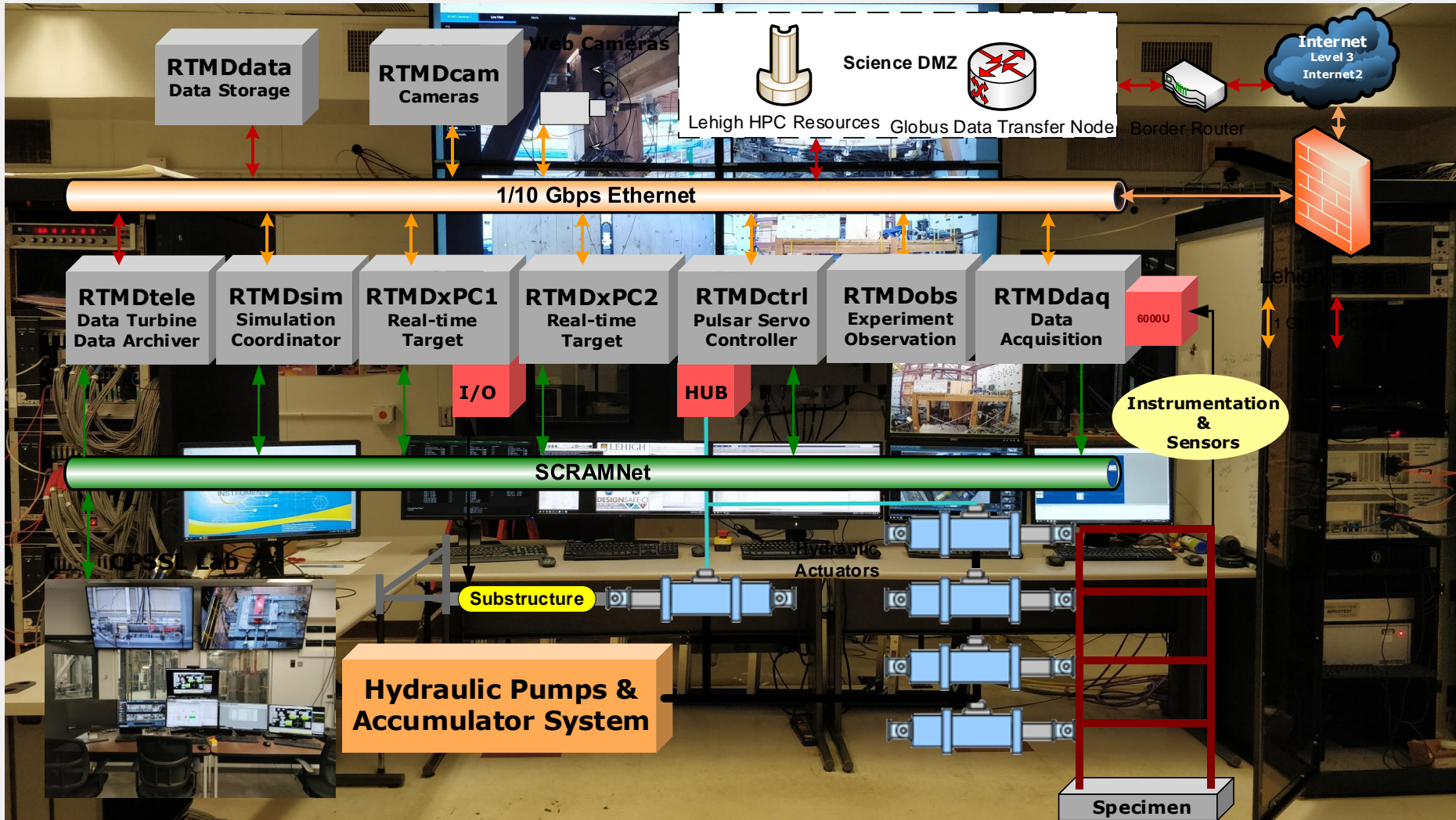
RTMD Lab



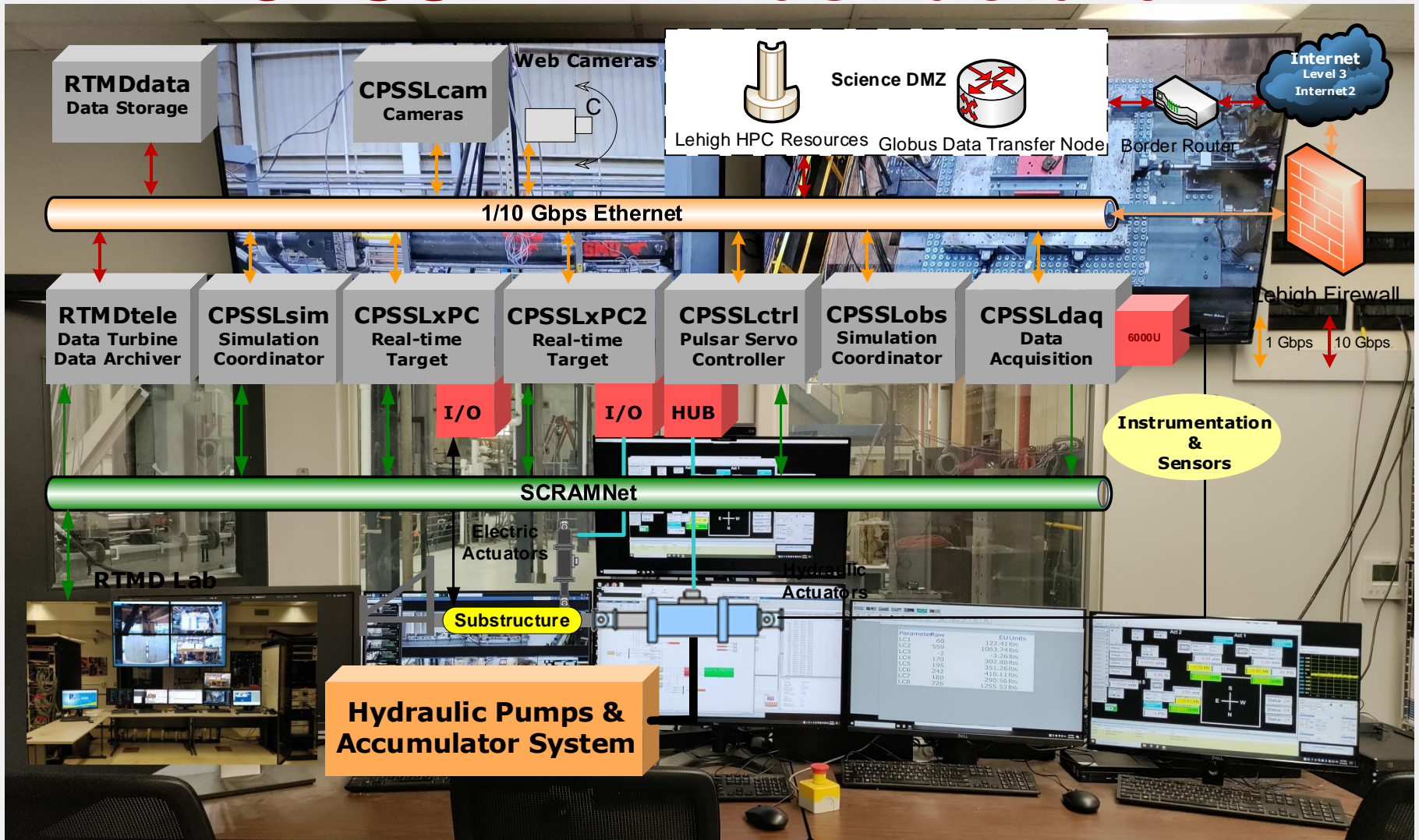
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RTMD IT Infrastructure



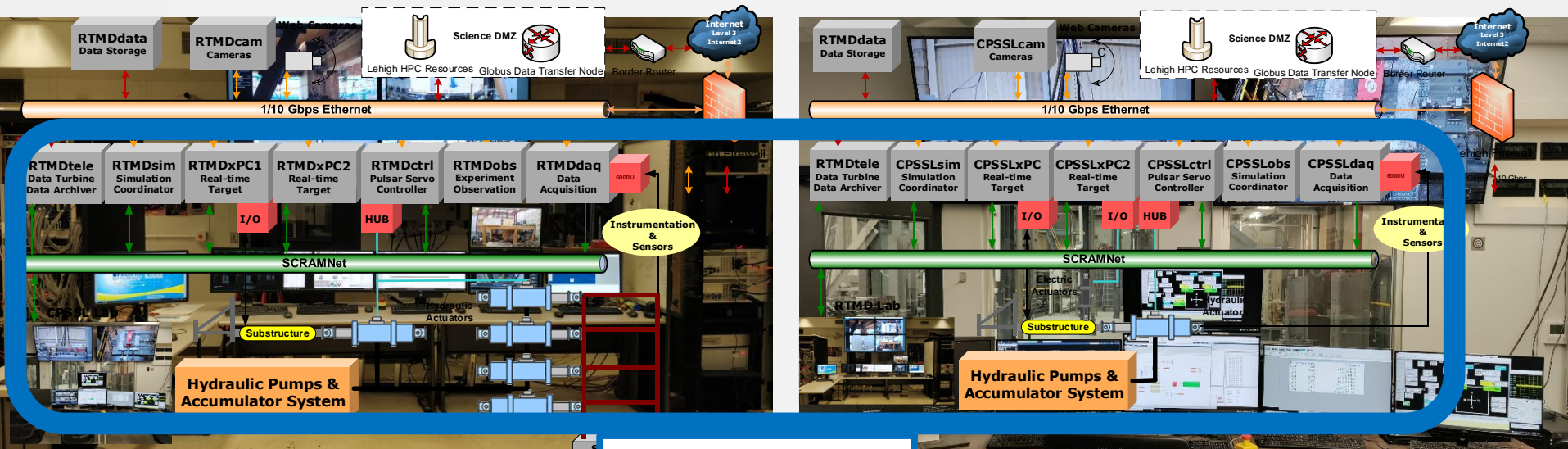
CPSSL IT Infrastructure



System Synchronization

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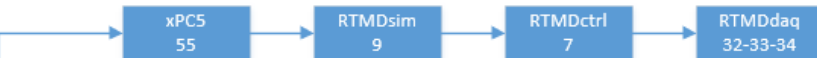
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SCRAMNet GT

SCRAMNet GT Node Map

A121 RTMD Lab



M201 CPSSL Lab



SCRAMNet GT

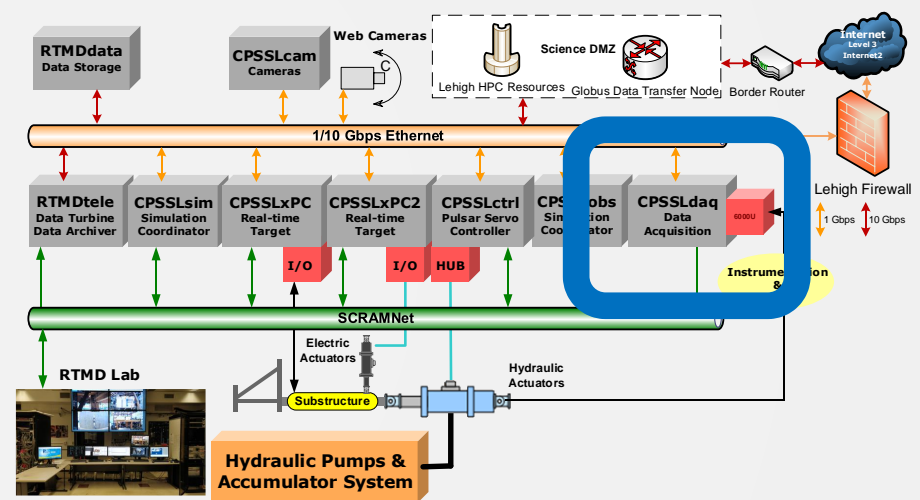
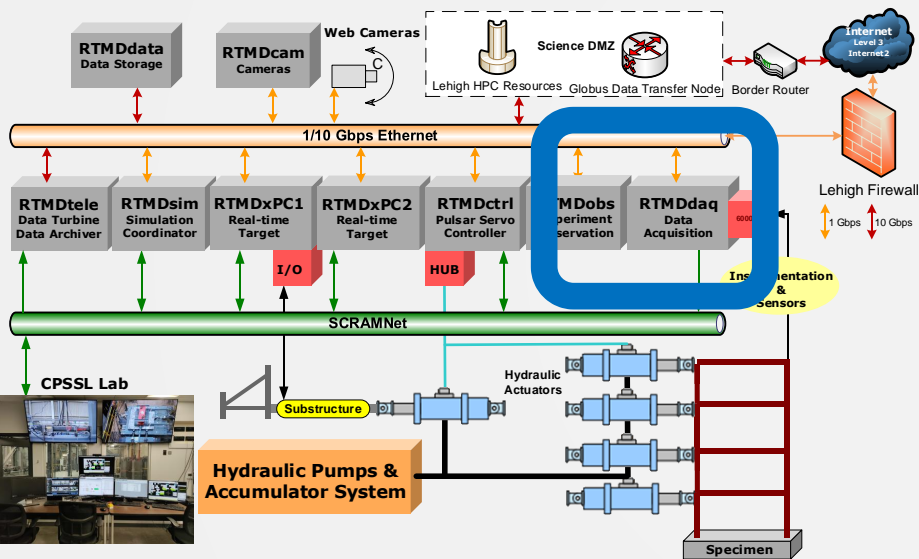
- Fiber-optic based High-Speed, Low-Latency Industrial Protocol for Real-time data control



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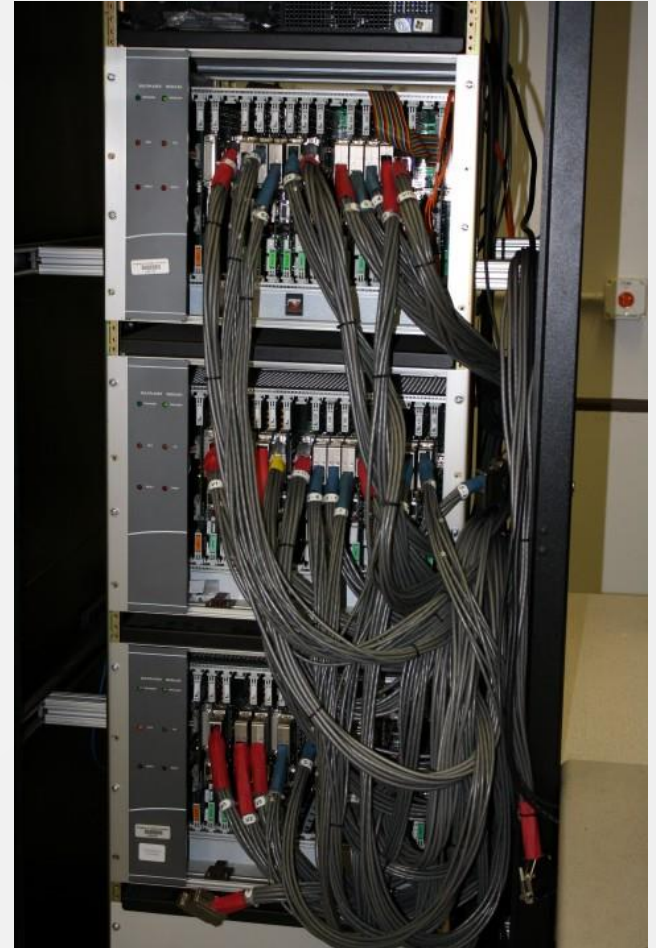
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Data Acquisition

Data Acquisition

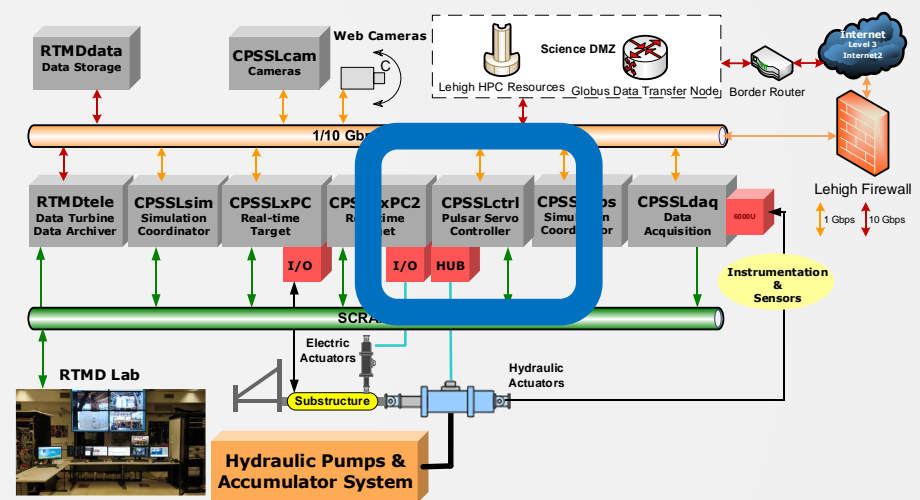
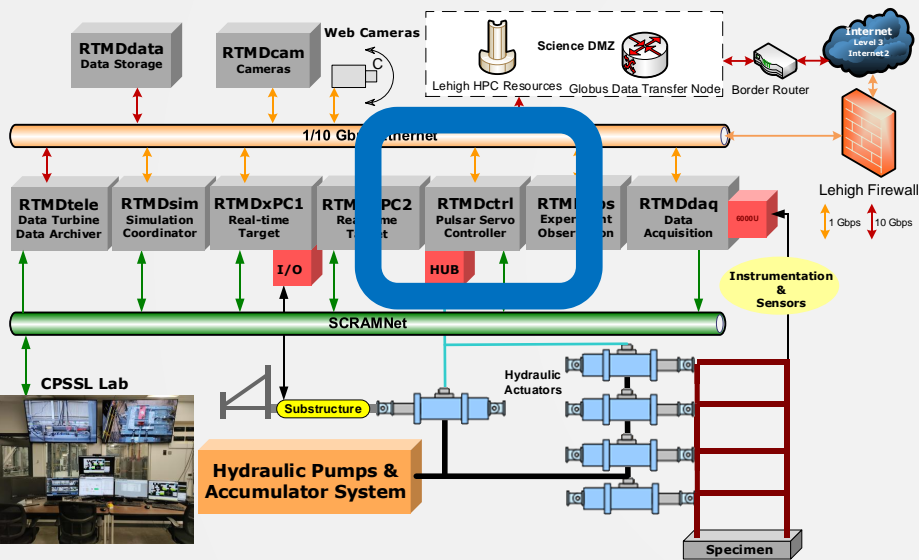
- Pacific Instruments 6000 Data Acquisition Systems
- RTMD Lab
 - 304 channels, 384 expandable
 - Voltage, Strain, Thermocouple
- CPSSL PI 6000
 - 32 channel
 - 16 bridge/voltage
 - 16 voltage/thermocouple
- Variable sampling rates
 - 4 kHz for Real-time Testing



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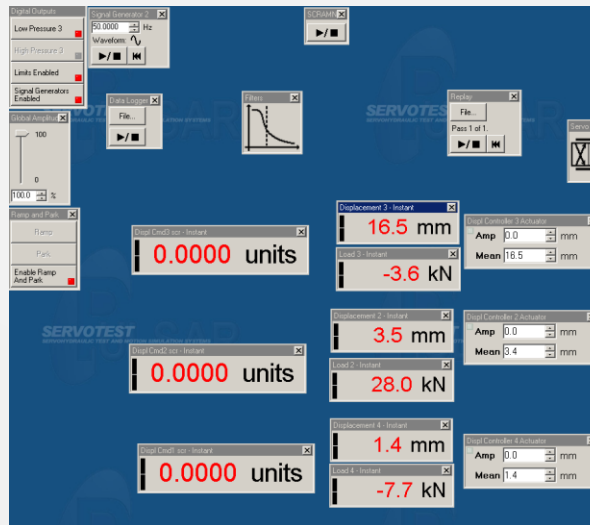
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Control Systems

Control Systems

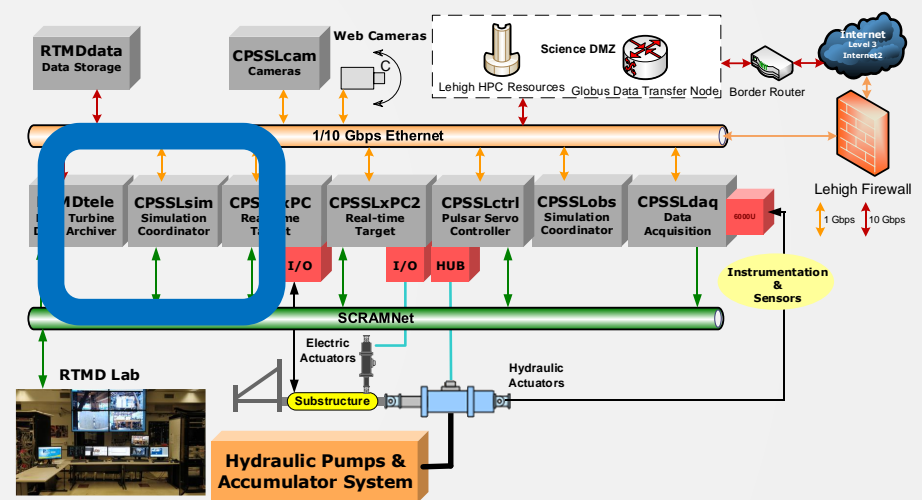
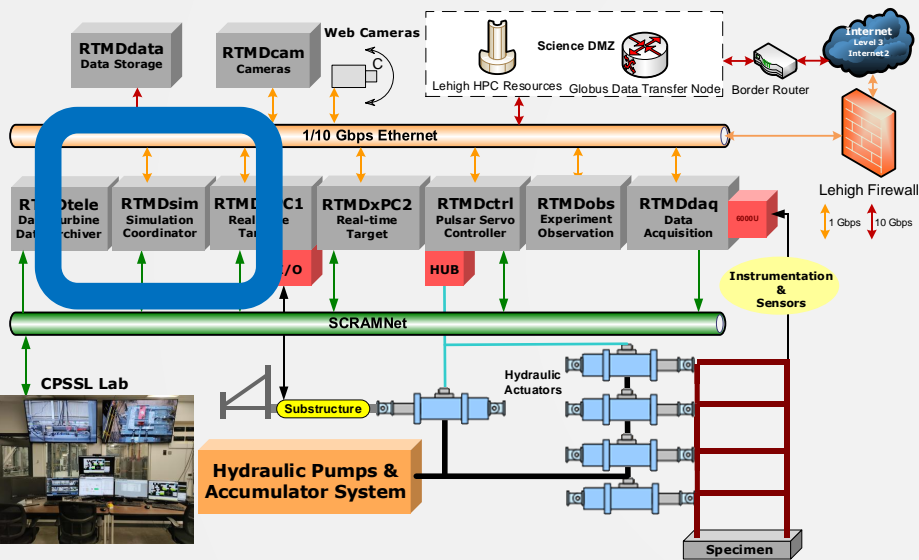
- Servotest Pulsar Hub Control System
 - Configurable servo-control system for hydraulics actuator PID control
 - 2048Hz or higher control rate
 - 20 years of support
 - Customizable interface



IT Infrastructure

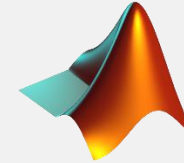
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Development and Simulation Coordination

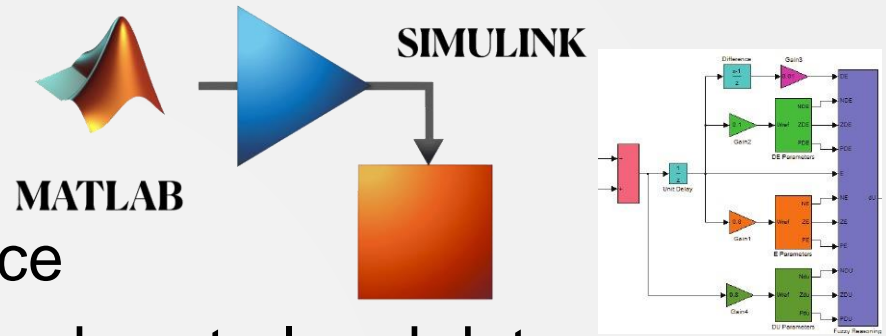
Model Development and Simulation Coordination



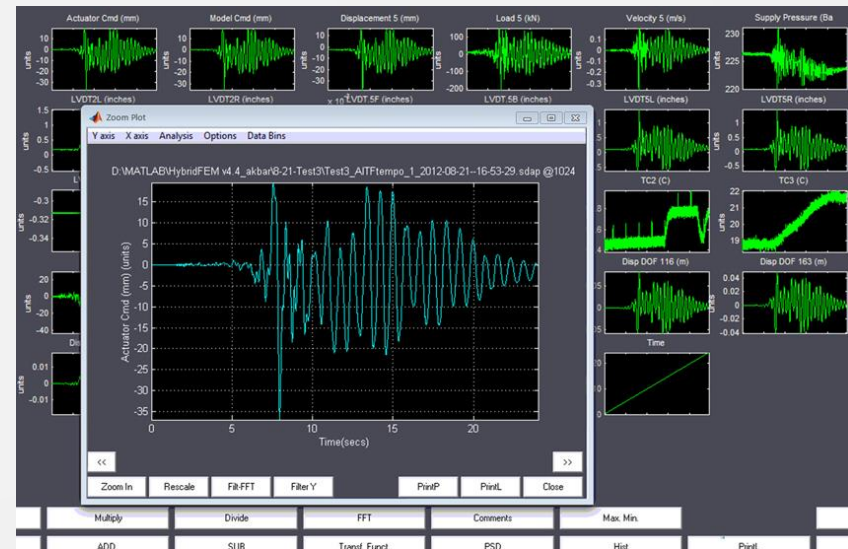
- Dell Precision Workstations
 - High power workstation for compilation and processing
 - GPU and SCRAMNet GT200 Nodes
- Speedgoat Performance Targets
 - Dedicated Intel i7 4Ghz 4-Core real-time systems
 - Various I/O modules
 - Real-time and custom applications
- Multiple Targets
 - Defined roles in experiments
 - Parallel processing for larger, more complex models



Simulation Coordinator



- Host Workstations
 - MATLAB/Simulink Interface
 - Coordinator of synchronized control and data acquisition
 - Hydraulics on/off testing – numerical simulation for safety, validation & training
 - Process and analyze data
 - GPU Node for analysis

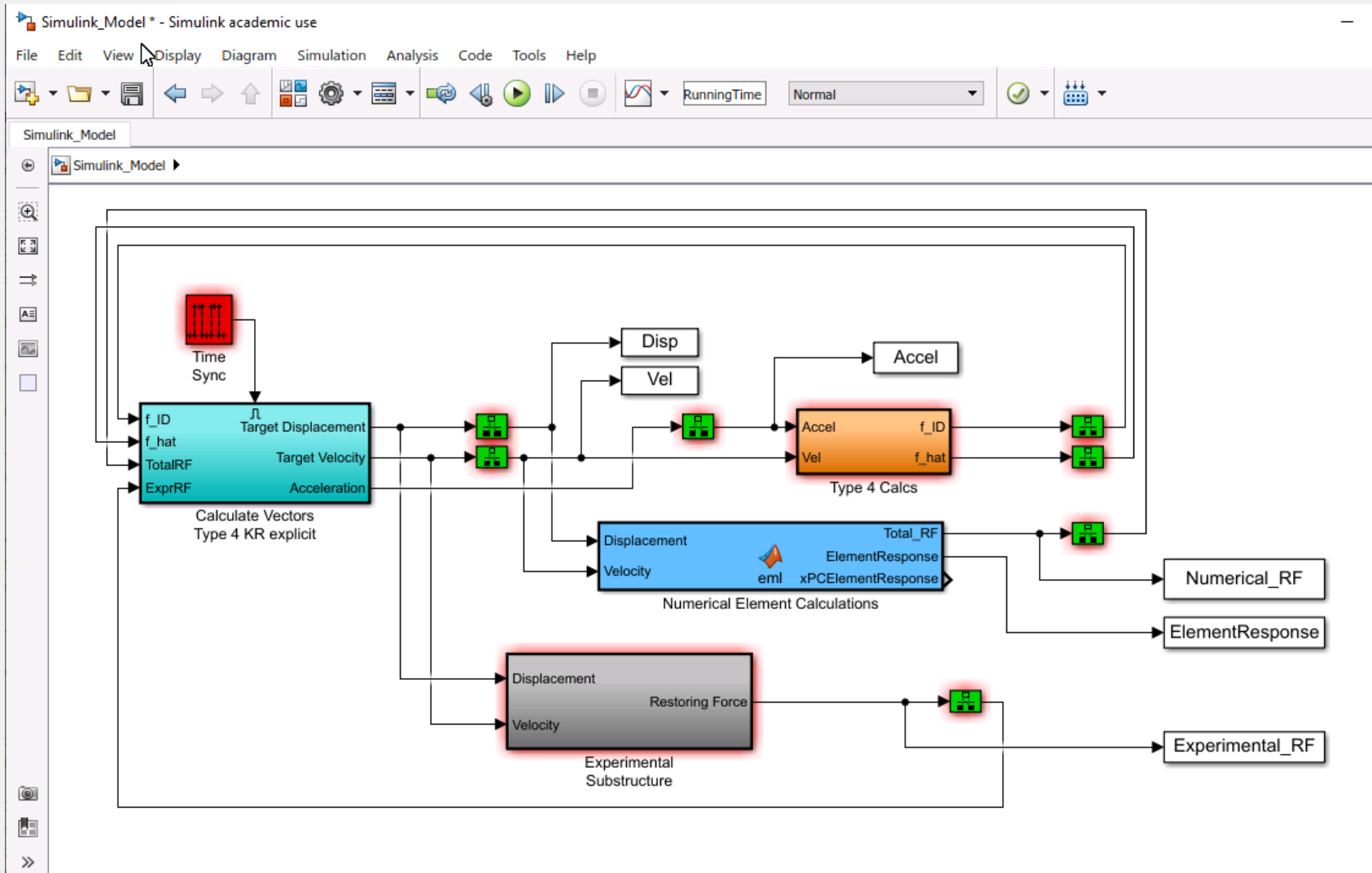


Real-Time Targets

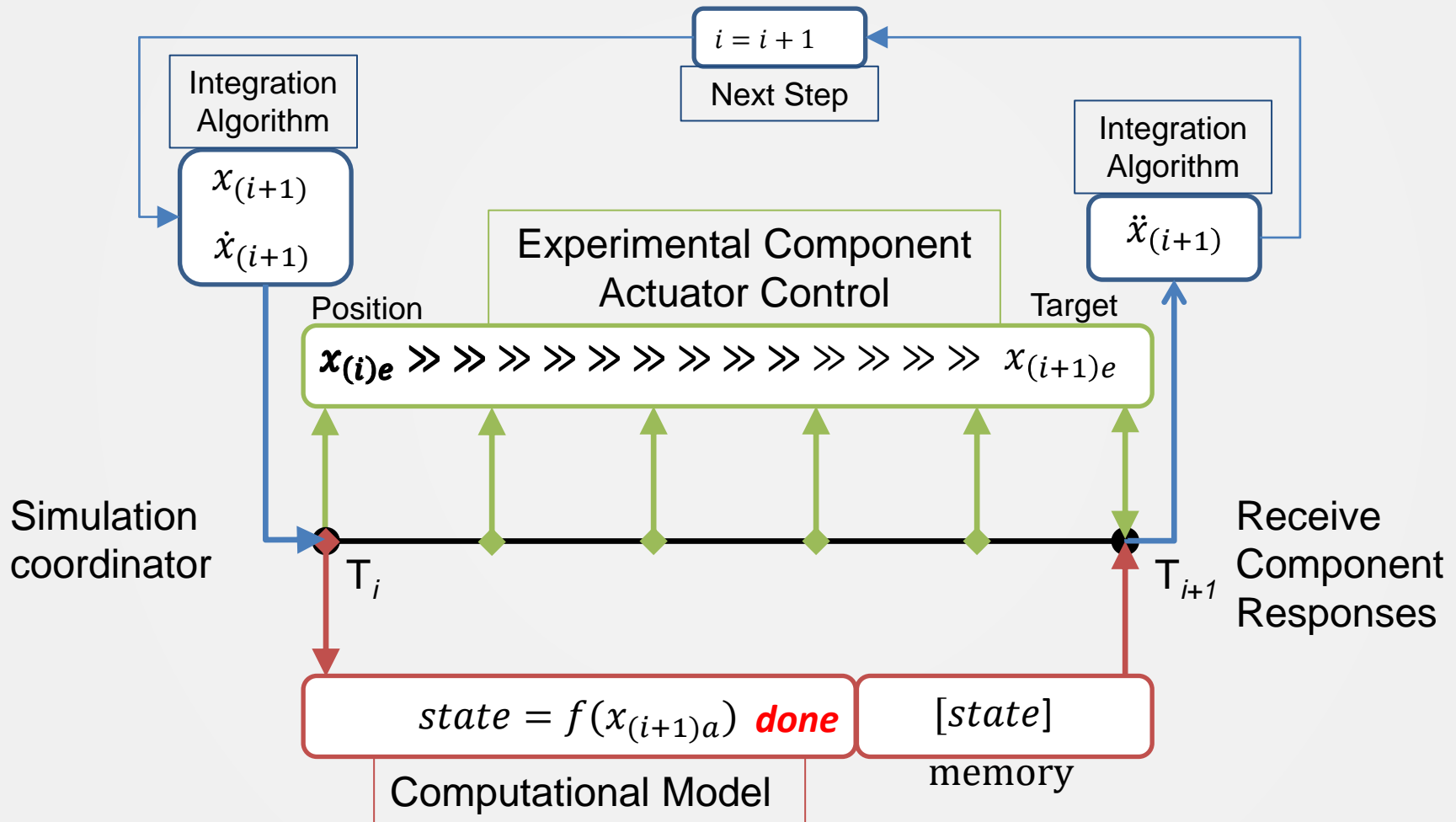
- Speedgoat systems, CPU performance up to 4 GHz
- Industrial quality design for robustness
- Multi-core support for parallel processing
- >>> **Facilitates RTHS**<<<
- SCRAMNet GT
- Synchronized Multi-system execution
- Built-in modules for data acquisition and control
- “Bring your own model” infrastructure for researchers



RTHS: Simulink

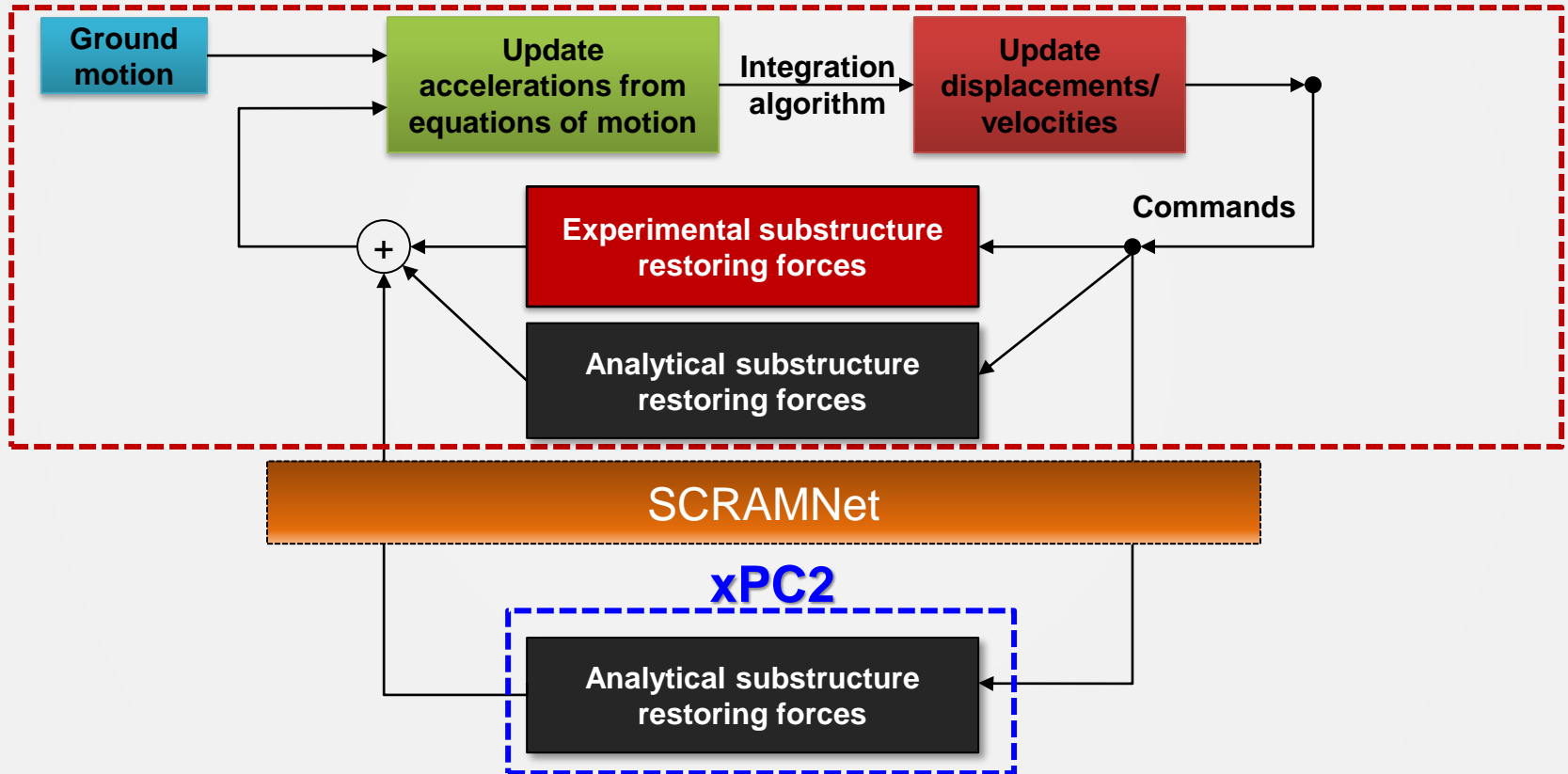


RTHS: Model Flow through Simulink Simulation



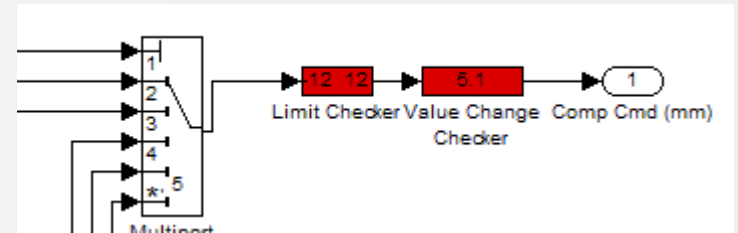
RTHS: Multiple Targets

xPC1



Simulation Safety

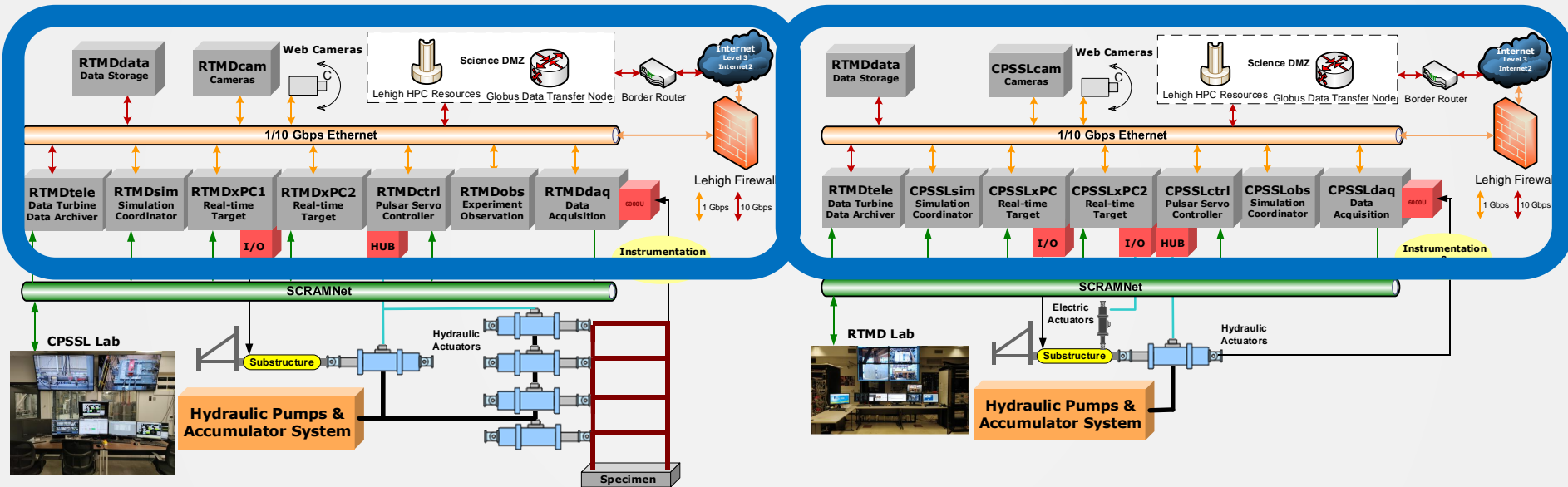
- Command software limits
 - Bound and rate limits
- Controller software limits
 - System trip and shutdown
- Hardware displacement limit switches
- E-Stop buttons



IT Infrastructure

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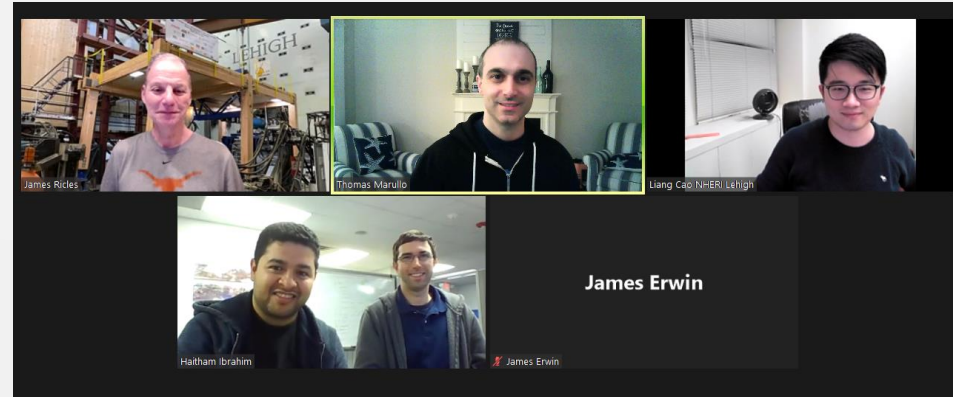
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Telepresence
and
Observation

Collaboration

- Zoom
- Shared Desktop
- Remote Desktop
- Data Streaming
- Cameras
- Cloud Storage



Data Streaming

- Data Turbine (RBNB) (dataturbine.org)
 - Aggregates data from systems integrated on SCRAMNet GT ring
 - Storage archive of test data based on timestamps
- Real-Time Data Viewer (RDV)
 - Plot-based and numerical observation of data locally and remotely
 - Time-controlled playback

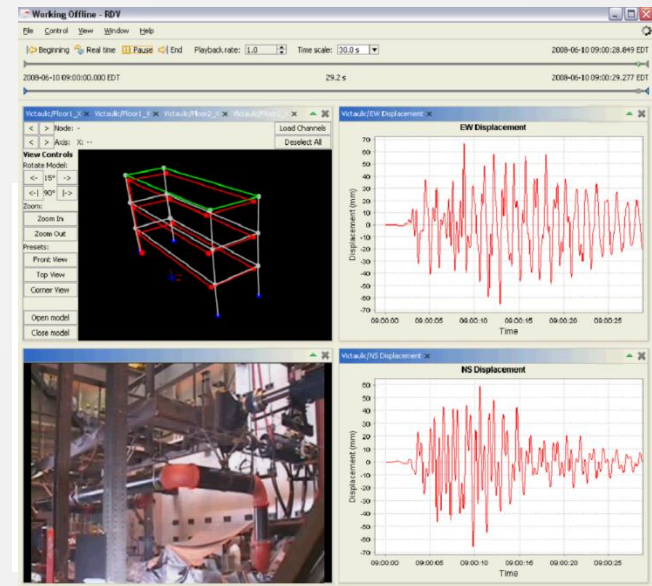


Photo and Video Capabilities

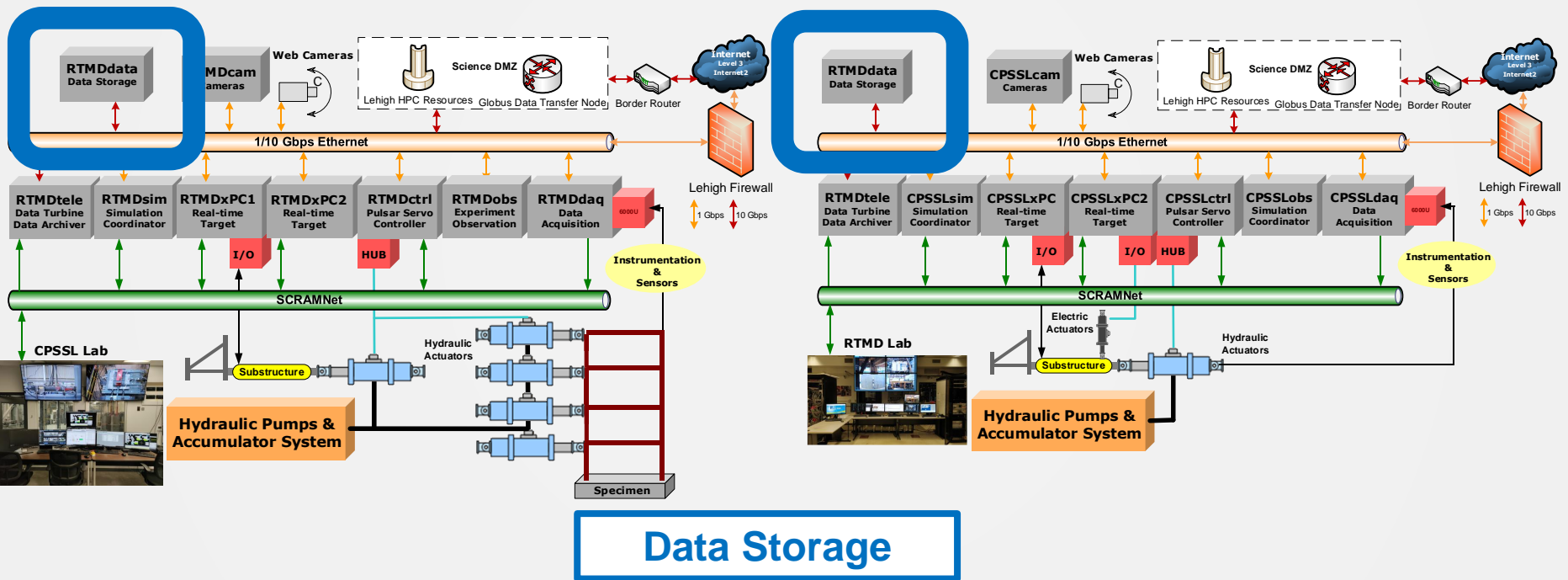
- Video/Imaging systems
 - (30) Amcrest Bullet/PTZ IP Cameras (up to 8k)
 - (4) Sony SNC-EP550 HD (720p HD)
 - (2) GoPro Hero 10 camcorders (4k 60Hz)
 - (9) GoPro Hero 3 Black camcorders (1080p60 HD)
 - Lab Security Cameras
 - Additional camera equipment upon request through LU Media
- Blue Iris Servers
 - Portal for all users to access and control web cameras
 - Archived video available for previous experiments



IT Infrastructure

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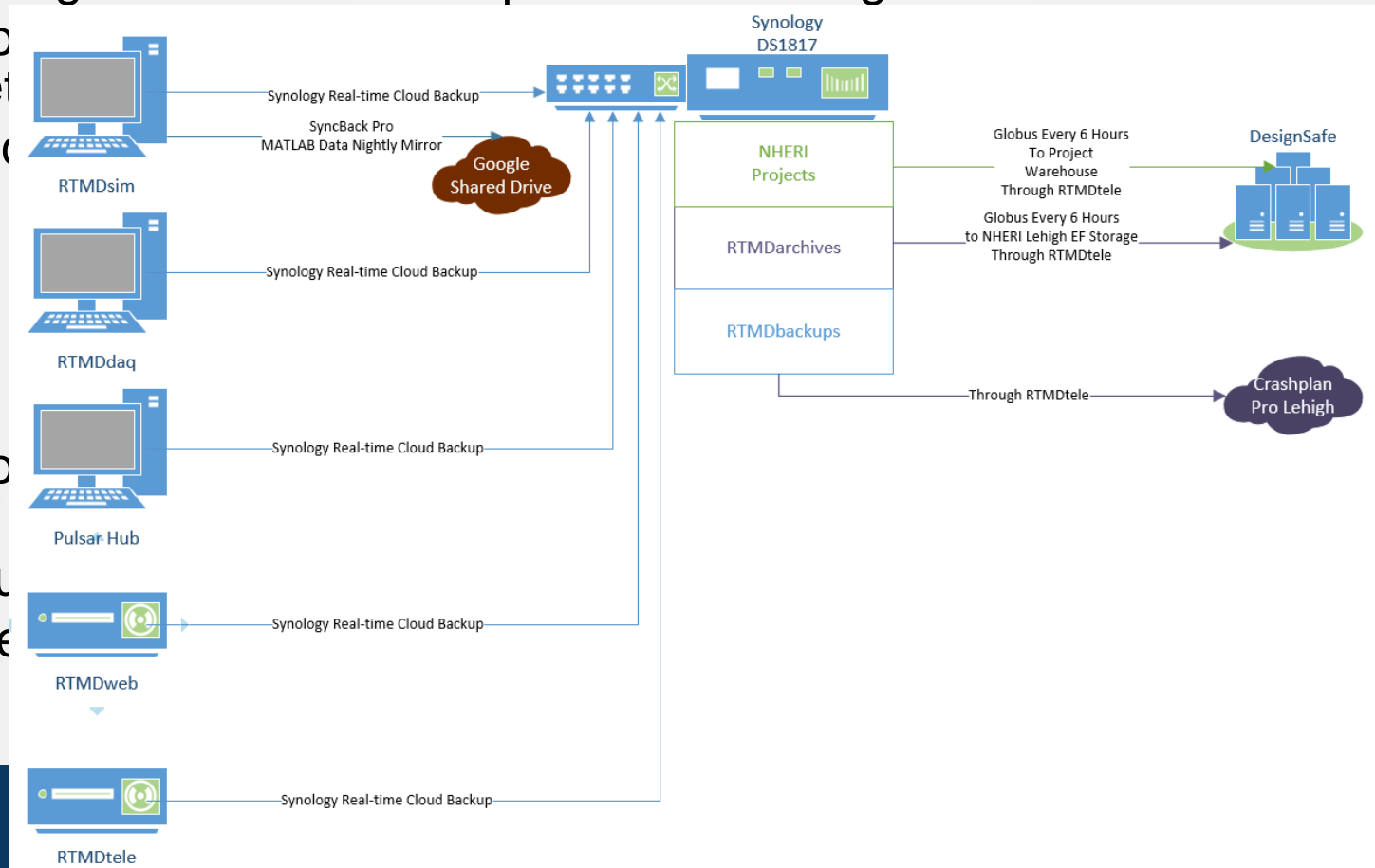
RTMDdata

- Synology DiskStation
 - 50TB Expandable
 - 10Gb Connection
- Dual-disk Redundancy
- Network Attached Storage
- Mirrored to DesignSafe through Globus



Data Management Plan

- Local repository for data storage managed by NHERI Lehigh with offsite backup risk mitigation through DesignSafe-CI
- Google Drive and Crashplan cloud storage



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Thank you