Software Infrastructure

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Infrastructure Overview

In some circumstances, TR&D activities may require substantial investment in the design and development or implementation of technological infrastructure that does not constitute a research challenge in its own right (e.g. a test platform for new instrument components or a laboratory information management system). If necessary, such a project may be included in the application under the Infrastructure heading.

From “Changes in the NCRR Biomedical Technology Research Resources (P41) Program”, May 14, 2008.

Specific Aims

1) **Software products** for biomedical community
2) **Framework** for Center applications
3) **Core software infrastructure** for TRDs and DBPs
Infrastructure Context

Software Engineering Best Practices

1) Layered architectures
2) Open source
3) Version control
4) Regression testing
5) Portability
6) Interoperability
7) Bug tracking & discussion lists
8) Frequent releases (binary & source)
9) Modern C++ standards
10) NEW: Scripting / provenance
Seg3D: Current Snapshot

Infrastructure
Seg3D: New UI
Seg3D: Controller
Seg3D: Action Architecture

Infrastructure

User Interface

Action

Data & Algorithms

Core: Boost (threads/memory/signal slots/event handler)
ITK / Teem (Filters, Volume objects, Importers)
SCIRun (Refactored: Scene Graph / Isosurface / Tools)

Make system: CMake
Build systems: Xcode, Visual Studio, gcc/make
Packaging system: CPack
Operating systems: Windows XP+, OSX 10.5+, Linux gcc 4+
Seg3D: Action Architecture

General Action Sources
- User interaction
- Internal script
- Provenance buffer
- Other applications
  * SCIRun
  * Other workflow systems (e.g. Vistrails, Kepler)
BioMesh3D

Stage 2: Material Interface
Stage 3: Medial Axis
Stage 4: Sizing Field
Stage 6: Distribute Particles
Stage 8: Volume Mesh

Input Labelmap (e.g. from Seg3D)

Output Tetrahedral Mesh (Scaled Jacobian Coloring)
Recent Progress
- Cross-Platform: Windows, OSX, Linux
- Client-Server Prototype
BioMesh3D: Client-Server

Clients

BioMesh3D Services Broker

Rendering

Compute

Rendering and Compute

Servers

Infrastructure

UPDATE
BioMesh3D: Client-Server

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BioMesh3D: Client-Server

![Diagram of BioMesh3D: Client-Server architecture]

- **Clients**
- **BioMesh3D Services Broker**
- **Rendering**
- **Compute**
- **Rendering and Compute**
- **Servers**
Summary of Recent Progress

Key technologies:
- Client-server framework (with remote visualization)
- Application pipelines
- Provenance and action engines

Ubiquitous “online thin portable devices” (e.g. iPhone)
- Ideal for accessing cloud of servers/data
- Need thin software layer to tie devices to servers

Technologies prototyped in Seg3D and BioMesh3D
- Ultimately will be integrated into other CIBC applications
- Laying the ground work for the next 5 years