Core Computational Facility (CCF)

Providing high performance computing and experienced IT personnel for data analysis and visualization, data mining, and code and database development to support a wide range of biomedical applications.

Positioning VBI at the forefront of life science-oriented computational capabilities. The Core Computational Facility (CCF) at the Virginia Bioinformatics Institute (VBI) is responsible for providing a secure, stable, and manageable infrastructure to support the Institute's data-intensive research. The architecture focuses on scalability and flexibility to ensure fulfillment of future computational and data requirements. The goal of the CCF is to enable excellence through proactive technological development and implementation.

SUPPORTING CUTTING-EDGE RESEARCH

State-of-the-art hardware infrastructure

The computing facilities at VBI include two data centers occupying 1850 square feet. Current resources encompass more than 1.75 TB of RAM, over 750 processor cores distributed across 150 servers and clusters, and more than 200 TB of disk storage. The center hosts a Storage Area Network (SAN) ensuring high-speed data access and reliability; network connectivity is achieved via gigabit Ethernet between the desktop and data centers and high-speed paths to Network Virginia and Internet2.

Uninterruptible power is safeguarded by diesel generators, power distribution units, and UPS units, while temperature and humidity in the data centers are controlled by multiple HVAC units. On and off-site data backup and recovery procedures ensure critical data is protected.

Solutions provided by the CCF are modular and scalable while maintaining data and power design structures that avoid single points of failure. Aggressive, proactive monitoring and ongoing refinement ensure maximum availability in support of scientific efforts across the project life cycle.

Advanced software infrastructure

The primary operating system of VBI's servers is OpenSuSE and Novell's SuSE Linux Enterprise Server (SLES). The CCF also supports Windows, Red Hat, and Solaris servers. Software development resources include:

- **Jira** – for bug and request and issue tracking
- **Confluence** – for collaboration and data sharing
- **Subversion/Gforge** – for code management
- **Request Tracker (RT)** – for systems management and request tracking
- **Oracle and MySQL** support and assistance

Professional, experienced staff

The CCF is staffed with IT professionals dedicated to the maintenance and advancement of VBI's high-performance computing resources. All systems hosted in VBI's data centers are monitored 24 hours a day/365 days a year, and on-call system administrators respond to operations impacts to production services outside of normal business hours.

MAJOR NEW INITIATIVES

The CCF is embarking on a mission to bring sophisticated applications requiring high performance computing infrastructure; a broad set of embedded, maintained, and ready-to-use national/international databases (-omic, text, image and other); and a cadre of application development specialists. Combined, these components enable basic and clinical biomedical researchers and transdisciplinary scientists to quickly and effectively translate even the most computationally intense ideas into solutions, which are then made widely available via the web to a broad base of users.

VBI's CCF will have resources available to bring biomedical researchers, transdisciplinary scientists, and information technologists together to more effectively and efficiently solve a wide range of problems. A critical component of our cyber-infrastructure is the ability to bridge this gap and create solid solutions to the problems posed to the Institute.

OVERVIEW OF ARCHITECTURE

MAJOR SYSTEMS

Elenwe - Domain on Sunfire Enterprise 15000 (72 processors and 288 GB of shared memory)

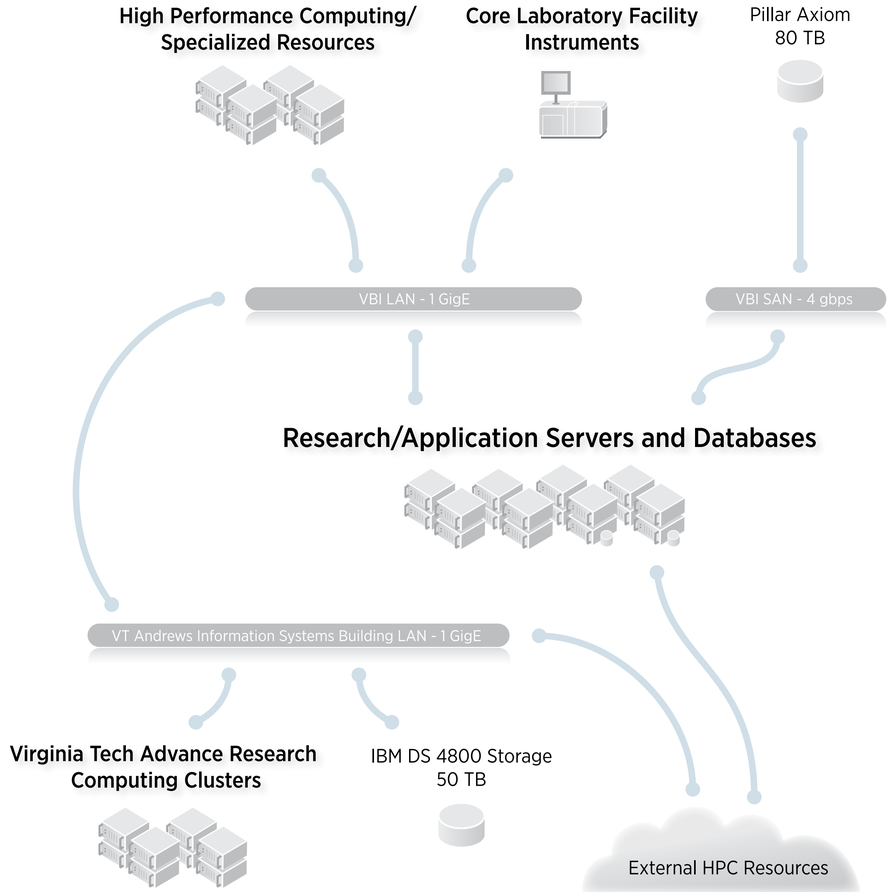
Decypher - TimeLogic Decypher sequence comparison accelerator FPGA cards

Moria – Shared compute server (64 GB memory, 16 logical processors)

Hermes – a new cluster grown out of the original Storm system developed at the University of Texas Southwestern

Pillar Axiom 500 – enterprise-class storage solution

IBM Tivoli Storage Manager – provides on and off-site backup/recovery



SUPERIOR SERVICES & SOLUTIONS

Server (dedicated and shared/virtual) hosting

Deployment, administration, support, and maintenance of server instances are included with this service. Servers are housed in VBI's secure data centers with fast and reliable network access. Industry best practices are followed for system maintenance.

Database hosting

CCF database personnel manage central information resources at VBI, ensuring data availability to authorized users while maintaining security and data recovery capabilities. The group's preferred database system is Oracle 10g/11g and MySQL hosting is also available. These databases are hosted on servers running SuSE Linux Enterprise Server and SAN-attached disk storage on a Pillar Axiom 500 storage system houses database files.

Building and supporting unique systems

High performance computing systems are developed by incorporating existing resources and tools or by developing new systems. CCF development specialists working along with other CCF personnel will ensure that these systems are web accessible, scalable, and maintainable over the entire lifecycle of the system.

Application development, maintenance, and deployment

Development specialists are available to assist with the development and deployment of HPC-based applications. This ensures an effective systems architecture, as well as scalable and maintainable deployment of these applications.

Data specialists

For databases and other data-related tasks not utilizing the CCF Database Hosting service, database support, monitoring, and maintenance is available for an hourly rate. CCF Data Specialists can also assist with database design and architecture as well as data access strategies and development.

Enable and support research collaborations

The CCF works with Virginia Tech's Advanced Research Computing group to provide the proper solutions for potential problems researchers may encounter. CCF personnel are actively involved with on- and off-campus groups, promoting best practices of systems management, sustainable research computing, and information technology security.

Other services

The CCF offers videoconferencing capabilities using a software-based approach via Adobe Connect Pro as well as H.323 hardware solutions.

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