October 30, 2009

Ms. Kelley Goes
Secretary, WV Department of Commerce
Chair, West Virginia Broadband Deployment Council
Bldg. 6, Room 525
State Capitol Complex
Charleston, WV 25305-0311

Dear Secretary Goes,

It is our pleasure to provide to the Broadband Deployment Council a report that details:

- the existing broadband infrastructure owned, leased, used, operated, or purchased;
- all programs or initiatives designed to increase the usage of broadband and broadband based educational applications;
- and all training provided to instructors in the use of broadband and broadband based educational applications

for our state's public post-secondary system, as required by House Bill 4637 (2008).

Additionally, this report provides a basic analysis of the data collected in a recent survey of our institutions as requested in HB 4637.

We hope this information is helpful to the Council, and we are encouraged by the continued growth and emphasis on broadband deployment and utilization across the state.

Sincerely,

Brian Noland, Ph.D.
Chancellor
West Virginia Higher Education Policy Commission
1018 Kanawha Boulevard, East
Suite 700
Charleston, WV 25301

James L. Skidmore
Chancellor
Community and Technical College System of West Virginia
1018 Kanawha Boulevard, East
Suite 700
Charleston, WV 25301

Broadband Infrastructure, Usage, and Training in the Public Baccalaureate and Graduate College System

Bluefield State College

Broadband Infrastructure

Campus LAN: Gigabit network utilizing Cisco 3750G POE switches. Fiber connects all buildings and links floors within buildings.

WAN: Cisco 3825 Router connecting Bluefield State College (BSC) to WVNET via a DS3 using 25Mb of bandwidth. There is a current threshold of 13.3Mb for Internet traffic. Multiple T1s are used to connect campuses located in Beckley, Lewisburg, and Summersville, which all route back to Bluefield and are behind a firewall.

Broadband Usage

1. High use of Blackboard WebCT Campus and Moodle (called CART) on campus.
2. Intensive use of broadband in delivery of lab courses in business, education, health sciences, and engineering technology.
3. Intensive use of interactive video technology to teach BSC classes in Welch, Lewisburg, Beckley, and Summersville, and at Pocahontas County High School.
4. Intensive use of online tutorials across some disciplines.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	109	1,524
Spring '09	169	2,451
*** Total**	**278**	**3,975**

Source: WV Virtual Learning Network, Course Enrollment 08-09

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

Training is made available in the Blackboard WebCT Course Management System (CMS). 2008-09 demonstrated a dramatic increase in the number of online courses offered over the previous academic year—112. Faculty training in Blackboard and PowerPoint use also continued.

Concord University

Broadband Infrastructure

Concord University has fiber optic cabling to every building on campus terminating in the Rahall Technology building. CAT5 and CAT6 copper network cable is wired to every classroom, office, and residence hall room. Cisco 3750(G) routed switches are deployed throughout the campus. 80Mb of bandwidth to the internet is provided via the local phone company—Frontier—for the campus. The entire network is gigabit capable.

Concord currently has bids to place wireless access into each residence hall, the athletic stadium, and the commuter parking areas. This initiative will give complete wireless coverage to the campus.

Broadband Usage

Concord utilizes the Blackboard CE 6 learning system as its main resource for hosting online courses. Using this technology, instructors can easily place their syllabi, lecture notes, announcements and other resources online, as well as use Blackboard instruments such as live chat, whiteboard, email, discussion boards, and online assessments. Blackboard can be accessed by both instructor and student from any computer with internet connectivity. At present, Concord only facilitates courses that use Blackboard as a supplement to face-to-face courses. There are no online courses that are entirely online with no face-to-face meeting requirements.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	21	298
Spring '09	N/A	N/A
Total	**21**	**298**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Concord provides courses via videoconferencing to students who would otherwise be too far from campus to take classes. Videoconferencing is also used by a variety of individuals at Concord to conduct business meetings, budget meetings, and other conferencing with distant sites. The Center for Academic Technologies currently uses the H.323 (IP) and H.320 (ISDN) standards for transmission and has available three types of CODECs for faculty/student use: Vtel, Tandberg, and Polycom.

Broadband Training

The Center for Academic Technologies (CAT) provides monthly training on various classroom support technologies including Blackboard course development, use of video conferencing, Mediasite software and web development services, as well as the use of supplemental technologies into the classroom that provide instructional strategy support.

One web-based resource developed by the CAT is the website "Teaching & Learning: Educational Technology Resources for Faculty, Staff, & Students." This website serves as an online resource for instructional strategies, productivity tools, and reference materials. It fosters more effective teaching practices using technology to create an effective learning experience, enhances the quality of teaching and learning in Concord University courses, and supports teaching and learning at all levels and in all contexts in which instruction occurs at the university.

Fairmont State University

Broadband Infrastructure

Fairmont State University (FSU) has in place a sophisticated internal network that uses Cisco equipment (ASA firewalls, Cisco switches & routers) and Packeteer products to manage bandwidth. Gigabit Ethernet is deployed to many on-campus locations, and also in place is a 20Mb "ring" to some of the remote locations in the Fairmont and Clarksburg areas (the Center for Workforce Education, the Gaston Caperton Center, the Robert C. Byrd National Aerospace Education Center, and FSU GearUp).

Internet service/broadband access providers include Time Warner (10Mb, soon to be 30Mb), WVNET (26Mb), and Fibernet (100Mb carrier to WVNET).

The main campus is supported by multimode and single mode fiber connected to every building providing a minimum of 1Gb Ethernet to every building's wiring closets. The fiber all originates from the data center in Colebank Hall and creates a star network topology. An example of this is if a building has a closet on each floor (3 floors), each floor has a "home run" of fiber running back to Colebank. In 60 percent of the main campus locations, Ether-Channeling provides two 1Gb simultaneous fiber connections to increase bandwidth and redundancy.

Four remote locations connect back to the FSU Campus (Colebank Hall) using Metro WAN service hosted by Time Warner. This metro WAN uses a "ring topology" to provide a 20Mb pipe between these locations. (See above for location names).

Two other remote locations—Braxton Co. High School and Weston High School—connect back to the FSU campus (again, Colebank Hall) using "point-to-point" T1s provided by Verizon.

Commodity internet service is supported by two different providers, Time Warner and FiberNet. FSU has installed fiber from Bryant Street to the front of Colebank Hall to connect directly to Time Warner at 30Mb. Another fiber run exists between Locust Avenue and Colebank Hall that connects to Fibernet Metro WAN. The two connections provide complete physical and logical redundancy – if one goes down, service is automatically maintained through the other so that the campus is able to function and be connected to the outside world. Border Gateway Protocol (BGP) routing is enabled on the network equipment to insure continuous availability. The connection to WVNET through Fibernet provides a 26Mb connection to the commodity internet.

FSU recently renovated its data center (stage I of three possible stages), which allows integration of new technologies in a stable and secure environment.

Bandwidth is continuously monitored and added to support a growing demand for online and Internet research/information from the campus community.

In order to provide reliable data traffic on the network, Quality of Service (QOS) is maintained by utilizing 100 percent Cisco equipment, which in turn tags voice traffic and automatically allocates bandwidth to support peak demands.

For additional security, residence hall (dorm) network users are segregated from the campus community/business operations. The residence hall bandwidth usage is managed by utilizing a Packeteer appliance. The segregation of residence halls does not interfere with student abilities to access academic course material and student services since those services are provided through public Internet and do not require presence in the institutional operational (highly secure) network in order to function.

On-campus lab computers utilize a separate domain and network so that the network can be further segregated, prioritized and controlled apart from traffic generated on the main campus network.

Current educational applications are clustered around server farms to provide high availability and access to the user community. These systems utilize a hardware load balancer, along with redundant gigabit network connections.

A distinct Research and Development Network is deployed for Science and Technology faculty. This R&D network was created so that research faculty can install servers, conduct "destructive testing" and perform other academic research in an environment that they can fully control, but which cannot impact the security and operations of the main campus network.

In terms of network monitoring, mission critical servers, appliances, and switches are continuously "pinged" to verify response while monitoring mission critical services running on servers and networks. Monthly "snap shots" of mission critical server configurations are created so that useful point-in-time comparisons are archived. Code on the traffic shaper (Packeteer) is continually upgraded to monitor, tag and control non-work related traffic (primarily from the residence halls) for all networks on campus.

FSU's IT unit also provides support for local campus research initiatives, including blade server support for the Science & Technology department, and an overall framework to provide sustainable, stable computing resources.

Broadband Usage

FSU is one of three institutions in West Virginia that provides hosting services for Blackboard/Vista as well as handling all online course delivery. Hosted partners

include WV Northern Community College, West Liberty State College, Eastern WV Community & Technical College, and Pierpont Community & Technical College. FSU is the largest participant in the Global Grid Exchange (G2EX) project managed by the West Virginia High Tech Consortium with 923 active nodes, and an approximate value of $10 million per year provided to the West Virginia and regional research economy that is serviced by the G2EX project.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	89	2,257
Spring '09	N/A	N/A
Total	**89**	**2,257**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

FSU currently provides training through the Learning Technologies Center (LTC) for full-time faculty and adjuncts both at FSU and Pierpont Community & Technical College in the use of Blackboard/Vista and other learning technologies. The LTC also provides training on demand for hosted partners and other institutions in the state of WV on occasion.

Glenville State College

Broadband Infrastructure

Glenville State College (GSC) has a fiber optic delivered 100Mb Carrier Ethernet link from FiberNet connecting to WVNET for WAN connectivity. 45Mb of this available bandwidth is currently purchased for the use of faculty, staff and students at GSC. The core router and 95 percent of all of switches on campus are Cisco products. Other minority network equipment vendors are Cabletron/Entrasys, 3Com and Trendnet.

All major buildings on campus have fiber optic cable between them that was installed in the late 1980's. The fiber is 62.5 micron ATT multimode cable utilized in a star configuration bringing all buildings back to the Harry B. Hefflin Administration building. Recently remodeled buildings now have multiple strands of both multimode and single mode fiber available within the buildings. Wiring closets between floors are connected via fiber at 1Gb speeds. Most are running at 1Gb with two running at 100Mb via single mode fiber back to the core.

Most buildings have limited wireless (WiFi) connectivity in place with the Robert F. Kidd Library being the only building having total coverage. Faculty, staff, and students living in GSC Corp. units are connected to the main campus via Motorola canopy broadband wireless equipment at 100Mb.

Broadband Usage

GSC continues to be an innovative and driving force behind the use of broadband in North Central WV. The number of partners continues to grow, and initiatives that depend upon sustainable, stable computing resources brought online. Agreements with West Virginia Regional Jail System, Juvenile Justice System, Department of Corrections training centers, local entities (police, newspaper) are expanding GSC's environment of learning.

Grant funding from NCC, US Department of Education, US Department of Justice, NASA, PDS, and HEPC has helped to expand the network, security, support, training and utilization of broadband services. This allows GSC to build and support student success by offering additional bandwidth for tutoring, WebCT instruction, research, training, and video conferencing. The amount of hardware resources and broadband required continues to grow very quickly.

Broadband Training

Depending upon the topic area, training is provided by IT staff and/or contracted out to vendors. Training for faculty is provided in the following: Microsoft Windows XP, Microsoft Windows Vista, Microsoft Office Suite products, SunGard HE Banner SIS, Smarthinking, TeacherEase, WebCT Vista, and use of Video Conferencing equipment.

Marshall University

Broadband Infrastructure

Marshall University's Campus Network (MUnet) is a 10Gb Ethernet backbone linking major buildings supporting over 10,000 gigabit Ethernet ports on three primary campuses in Huntington, South Charleston, and Point Pleasant. The Huntington campus is linked in a WAN to South Charleston with one 100Mb and one 1Gb circuit. The 100Mb circuit is from Verizon and uses TLS, the other circuit supporting the Disaster Recovery plan, from nTelos uses Ethernet over MPLS. The Point Pleasant campus is linked with a 100Mb Verizon TLS circuit. The Huntington Medical School campus is linked via a university owned fiber MANs on the 10Gb campus backbone and the Huntington Robert C. Byrd Institute is linked via another metro fiber run. Other Huntington locations are linked via 100Mb and 10Mb Verizon TLS circuits.

Nearly 80 percent of campus owned space is covered via an 802.11n wireless network with over 300 wireless access points.

The campuses are linked to the commodity Internet via a 400Mb circuit. Plans are underway to extend this connectivity via a 1Gb circuit to Internet2 in addition to the commodity Internet service. Quality of Service (QOS) is supported throughout the entire MU network for both video, voice, and other real time applications.

Over 40 percent of the voice circuits are VoIP and all of the video conference facilities—nearly 50 end points—are IP based with High Definition video bridging supporting legacy ISDN and multipoint connectivity. Plans are currently underway to upgrade all voice endpoints to VoIP with support for FAX and a limited number of analog lines via analog gateways.

Broadband Usage

MU has more than 200 totally online course offerings that have more than 5,000 enrollments each semester. These courses provide a rich multimedia experience that is best experienced via a broadband connection. Marshall University will expand into an advanced, high bandwidth network with Internet2 via a FCC grant for the WV Telehealth Alliance. MU will support improved health care coordination in rural areas through telehealth applications, applied research and health education. The expanded access will also provide a framework for the emergence of even higher performance networks in the future and provide new research and educational tools to faculty, staff and students. Additionally, Marshall University is in collaboration with all partner institutions and will pursue connections to a next generation network to support increasing demands for performance, reliability and security. Internet2 will provide transformative tools for learning and research in networked environments. Among the most significant

emerging technologies are visualization, advanced collaboration tools, bioinformatics, virtual reality, telemedicine, and tele-immersion. Currently, notable research progress is being made in areas of biotechnology, cancer therapy, and gene mapping in rural populations at risk for cardiovascular disease. Marshall University's current broadband network connects all associated regional campuses via 100Mb and 10Gb Metropolitan Ethernet Network connections. Marshall University's School of Medicine's West Virginia Biomedical Research Infrastructure Network (WV-BRIN) grant provided 10Gb connections to all of MU's research facilities including the College of Science and the Robert C. Byrd Biotechnology Science Center and the Marshall University School of Medicine facilities adjacent to Cabell Huntington Hospital. This project also supports the stated objectives of the Appalachian Cardiovascular Research Network (ACoRN) which are to establish a research network which identifies cardiovascular disease genes using bioinformatics approaches (gene mapping and functional genomics), train network faculty and foster the development of undergraduate faculty and student training in bioinformatics. These projects require collaboration within and outside the state's borders.

Marshall University has a multidisciplinary team of researchers investigating biomechanics, motor control, muscle performance and robotic control systems. These groups will benefit from high performance computing resources to greatly increase their contributions to the next generation of robotic control systems based on simulations and modeling of animal biomechanics, and applied biomedical applications of biomechanical research such as motor recovery following trauma, and artificial limb development. Environmental sciences rely heavily on computer modeling to develop new methods to process the ever-growing databases and generate novel analytical procedures to predict the influence of individual parameters in complex ecosystems. The proximity of the Ohio River and the ongoing studies on its water quality and its complex array of pollution sources can provide another application for supercomputer modeling. Weather prediction has been an important scientific vehicle that is intimately linked with supercomputer analysis. Since no existing research or educational program exists in the field of meteorology in the State of West Virginia, the availability of new and top-of-the-line computer resources and the already present scientific expertise will lead to the development of a unique asset for the region. Similarly urban ecology through the use of GIS imaging will be developed into a test bed for supercomputer modeling in environmental sciences. Theoretical mathematics, physics, and chemistry are also heavily dependent on high-end computing. In chemistry for example, iterative modeling is a critical process that can contribute to the determination of structure/function of macromolecules.

The WVNano initiative, comprising collaborative research between MU and WVU on detection of marker biomolecules, will contribute to the refinement of new methods to design probes and interfaces necessary for the monitoring of interacting biosystems. The outcome will benefit fundamental and applied

research in the fields of medicine, environmental sciences, and other molecular feature recognition fields including drug and explosive detection (bioterrorism).

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	346	6,150
Spring '09	410	7,116
Total	**756**	**13,266**

Source: Marshall University Course Enrollment '08-'09

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

The MUOnline Design Center, a unit within Information Technology, provides two instructional designers and technical support to faculty for the development and deployment of online courses. Many of these utilize video, audio and other bandwidth intensive resources. Research faculty have also been provided instructional material resources for utilizing tera grid technology.

Shepherd University

Broadband Infrastructure

Shepherd University's commodity Internet connection remains at 40 Mb/s. Equipment is being replaced this year which will enable us to expand that connection in future years while maintaining our current levels of network management. Shepherd does not subscribe to Internet2. The campus network is a gigabit fiber-optic network core with a mixture of mostly Cat-5e and Cat-6 connections to end points. An 804.11(g) wireless network is available in selected locations (e.g., library, student center, and a few other buildings). The wireless network, administrative network, and student residential network are segmented into virtual LANs with access control lists between each of the VLANs. Shepherd has partnered with Frontier Communications to extend wireless network access to almost all academic buildings on campus beginning with the fall 2009 semester. NAT is used for all internal addressing.

Broadband Usage

In 2008 the University replaced the WebCT learning management system with Sakai—an open-source system. An instructional technologist in the Center for Teaching and Learning has created Sakai instances for all courses. All instructors are invited to seminars and sessions for using Sakai as part of their classroom instruction; approximately 20 percent of the faculty use CTL resources at some point during the academic year. Expansion of the wireless network into classroom spaces proceeds as funding permits. Alternatives to the campus-owned and managed wireless network are being explored (i.e., outsourcing the wireless LAN to a local Internet provider).

The Office of Admissions is developing downloadable video clips ("vodcasts") for prospective students. These clips help introduce Shepherd's unique educational opportunities to high school and transfer students. While Shepherd University's World Wide Web presence is entirely accessible to dial-up users, vodcasts target the increasing percentage of incoming students with broadband connections. It is hoped that increased usage of these technologies by the administration will encourage their use among the faculty for teaching.

On-campus usage of the infrastructure continues to increase. Our Internet connection is routinely at 100% utilization during peak academic times (weekdays, 10 am to 6 pm). Approximately 1/3 of the course sections at Shepherd now use the Sakai learning management system (up from about 20% in 2008). Beginning in fall 2009, two programs (nursing and music) are using Apple iPod Touches as mobile computers for instructional purposes, taking advantage of the wireless networks available in their primary teaching locations.

Broadband Training

As described above the Center for Teaching and Learning assists instructors in the use of Sakai. No other formal programs are in place, although the IT Services User Support area assists instructors having problems with information technology. Implemented in Fall 2009, a new leave management system now requires all employees to submit sick and vacation time electronically. Therefore we have employees who are not traditional computer users (e.g., dining service workers or custodians) using computers and computer accounts as part of their work routine. As a result, additional technology training is being offered on campus to employees.

West Liberty University

Broadband Infrastructure

West Liberty University has in place two physically and logically segregated networks. Our administrative network is an internal network that is comprised of a Cisco Infrastructure utilizing Cisco 3750G switches, Cisco Catalyst 4507 switches, Cisco ASA 5550, Cisco ACS, and a Cisco WLSE. The residential network consisting of seven dorms and numerous residential units are currently being serviced by a Comcast High Speed Broadband connection. Users are guaranteed 6Mb download and 768Kb upload speeds and the network as a whole can burst to 7Gb as needed. 802.11a/b/g wireless access has been deployed for our students in the academic buildings.

West Liberty University's WAN network utilizes a Cisco 3825 router connecting to CityNet via a DS3 using 45Mb of bandwidth.

The campus is supported by multimode fiber connected to every administrative and academic building on campus.

West Liberty University also has in place a satellite location at the Highlands in Triadelphia, WV. This location consists of a Cisco 2921 router utilizing 5Mb of bandwidth from Stratuswave.

Broadband Usage

The majority of West Liberty University's major applications are housed at off-campus locations, so these services are made available to the campus via existing broadband connections. Sakai, an open source product, replaces Blackboard / Vista, hosted by Fairmont State University, for 2009-2010. Our instance of Sakai is hosted by rSmart. The switch reflects a choice to move to a platform with features better aligned with our needs rather than a dissatisfaction with the hosting services provided. Email continues to be provided via Google Apps for Education and Banner is provided through WVNET. There is a marked increase in the use of Web 2.0 tools to support instruction.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	14	282
Spring '09	16	338
Total	**30**	**620**

Source: West Liberty University

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

To better support student learning and faculty productivity West Liberty University created a new 11-month faculty position, the Online Learning Specialist, and established a formal compensation plan to provide faculty a monetary incentive for online course development and teaching. The Online Learning Specialist's responsibilities, working with both IT and faculty, include training and support for the use of Sakai, iTunesU, Turnitin, online Web2.0 tools, Google Apps for Education, instructional technologies such as interactive whiteboards, student response systems, and streaming video such as Discovery Education. Each of these tools depends heavily upon broadband availability. During May 2009, 47 faculty members completed the training for use of Sakai to support online learning. Additional trainings, June-August 2009, were completed by 26 freshmen experience instructors and/or faculty members.

West Virginia School of Osteopathic Medicine

Broadband Infrastructure

The West Virginia School of Osteopathic Medicine (WVSOM) leases a 22Mb metro Ethernet connection from the Lewisburg Campus to the State Capitol Complex, Building 6, in Charleston via FiberNet. A 10Mb internet connection is managed by WVNET. This provides connectivity for the faculty/staff network supporting Banner, Web site and other institutional applications, including Microsoft exchange. WVSOM leases a second 10Mb internet connection provided by Suddenlink Communications. This second connection provides for an independent, internet-based student network accessible via Cisco wireless access points located throughout the campus. Students access all web-based applications and printers found throughout campus via this network.

These connections are managed by firewall and Packeteer/Packetshaper filtering appliances. These allow WVSOM to manage network traffic thereby providing priority to academic applications.

Broadband connectivity is used to link WVSOM with campuses and Mountain State Osteopathic Training Institution sites throughout WV. These include over 20 hospitals and clinics that provide clinical training for graduate students and postgraduate internship and residency training. Additional connectivity used for video conferencing is provided via MDTV.

Bandwidth utilization is monitored and can be increased based on demand.

Broadband Usage

WVSOM utilizes web-based resources in support of all four years of graduate student medical education. WVSOM utilizes a WAN to deliver video and other applications to statewide campuses and postgraduate training sites. There are no on-line courses as such. Graduate student pre-clinical and clinical training utilizes the Secure On-line Learning Environment (SOLE), developed at the WVU School of Medicine. All curricular material is made available via this application (which is similar to Blackboard/WebCT). Testing is conducted online using SOLE or LXR. The statewide campuses utilize these applications extensively. The management of rotations, evaluations, grading, et cetera, is done using web-based applications.

WVSOM is a partner in the WV Telehealth Alliance, formed to manage the FCC rural telehealth grant program, and the WV Health information network initiative, which is developing linked health-related databases. WVSOM will be providing training and will also participate in evaluation and data analysis.

Broadband Training

Instructors receive training in the use of the web-based course management system and the web site content management system. Training in the use of videoconferencing equipment is also available. Computer labs are maintained for demonstrating the use of web-based applications, and web-based seminars (webinars) are being developed to train staff at remote sites.

West Virginia State University

Broadband Infrastructure

West Virginia State University (WVSU) has in place a campus LAN utilizing Gigabit fiber connections in a combination of star and ring topologies to each of 26 buildings on the Institute campus via a multimode fiber backbone with 1Gb routers in most buildings and providing 1Gb – 10Mb connections in buildings.

Off campus facilities include Valley Fork (Clay County), WVSU Economic Development Center (Kanawha Blvd, Charleston), WVSU Capital Center (Summers Street, Charleston), Shawnee Regional Park (Dunbar), Fayette County Courthouse (Fayette County), Summers County Courthouse (Hinton), Wyoming (Pineville), Roosevelt Center (Charleston), Carroll Terrace (Charleston), and Nicholas County (Summersville) and are served via multiple methods including shared facilities, DSL, cable and dedicated T1 (Verizon, FrontierNet, WV FiberNet).

Internet service providers include WVNET (16Mb) and FiberNet (100Mb to the Governor's Office of Technology/WVNET).

Wireless LAN is supported in the Library and Student Union for visitors and students with portable computing devices. It is also supported in other locations on campus where portable computer labs may be deployed. The wireless connections are used when needed and simplify connection to internet services to facilitate quick setup of the portable computing labs.

The main campus network is composed of 3 networks sharing a common public network:

1. An administrative network protected by a Cisco PIX firewall and includes separate fiber connections to five buildings.

2. A student residential network that incorporates a registration system and is segregated from the other networks. Bandwidth to the residential network is managed using a Packeteer appliance.

3. A third network exists using VPNs on the public network for the WVSU Research and Development Corporation.

Network service is provided for the WV State Community and Technical College on the public network through 3 routers.

The separate private networks are deployed in each building or logical building segment using smoothwall routers. Public network service is provided via on-campus DSL or fiber to WV Clearing House, College Summit, Upward Bound,

Kanawha County Adult Basic Education, and Kanawha County Collaborative Programs.

Campus network operation is insured by continuously monitoring segment and critical servers via TCP connect, ping, and resource availability.

Campus infrastructure is built according to published campus standards (http://standards.wvstateu.edu).

Broadband Usage

The campus continues to expand its use of WebCT, a product that supports using the web for delivering course content. While the primary use of WebCT at WVSU is for web assisted or web enriched classes, WVSU also offers online courses using WebCT.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	12	267
Spring '09	N/A	N/A
Total	**12**	**267**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

WVSU currently provides training on WebCT/ Blackboard/Vista and other learning technologies for full-time faculty and adjuncts through the Center for Instructional Technology (CIT).

West Virginia University

Broadband Infrastructure

West Virginia University (WVU) supports three core network locations; one in downtown Morgantown, one in the Evansdale Campus, and one in the Health Sciences Center; each is connected by redundant single-mode (SM) fiber. Campus buildings are connected to the core locations via redundant SM fiber. The fiber is owned by WVU.

Wireless networking (WLAN) is handled by Cisco LWAPPs controlled by five WiSM blades, four located at the core sites and one at the Evansdale Residential Complex. One WLC44 located at Potomac State College in Academy Hall. Currently B- and G- signals are deployed with no plans to go to N-signal at this time.

The wide-area network (WAN) consists of several different types of circuits. The main MPLS WAN consists of a 1 Gb connection (100 Mb access) in Morgantown with remote connections to WVUP (25Mb), WVUIT (30Mb), City Hospital (45Mb), Jefferson Hospital (45Mb), Princeton (1.5 Mb Frame) and WVU/Health Sciences - Charleston (20Mb). Additional sites—Center for Rural Emergency Medicine, Fire Training Center, Jackson's Mill, and the Center for Excellence in Disabilities—each have 1.5Mb Frame Relay circuits that land on the WVU ATM backbone via an ATM OC3. WVU has a total internet bandwidth of 540 Mb with 45 Mb of that connection dedicated to WVU Hospital. There are various other locations, both residential, and college oriented, that have DSL connections to the WVU backbone via ATM. There are additional broadband connections via Telemedicine (MDTV), and IVIN interactive academic classrooms are multiple sites across West Virginia.

Finally there is a full T1 connection to WVU Jackson’s Mill.

Broadband Usage

West Virginia University Extended Learning — eLearn.wvu.edu —takes courses around the state and around the globe through off-campus programming and distance learning technology via broadband. WVU provides access to graduate programs as well as many undergraduate online classes. Most students tend to be adult learners, but courses are also offered to many high school students through online and hybrid classes offered in high schools. WVU offers more than 21 graduate degrees and certificates in online and/or blended formats and 3 undergraduate degree completion options. WVU Extended Learning has also expanded into the non-credit field to address the needs of all life-long learners.

The Instructional Technology Resource Center (ITRC) increases the extent to which technology enhances the quality of teaching and learning at WVU. The

ITRC's mission is to support, promote, and enhance teaching effectiveness at the University through instructional strategies and faculty development. The ITRC promotes methods that enable the University to achieve its goals of providing a student-centered technology enhanced educational experience for all students. With 6 Instructional Designers and 3 Multi-Media Designers, the ITRC developed approximately 40 online courses in 2008, bringing WVU's total to over 300 totally online courses.

WVU operates an enterprise Course Management System using Blackboard Vista that hosts the WVU main campus including Health Sciences, WVUIT, Bridgemont Community and Technical College, Potomac State College and WVU-Parkersburg. Representatives from units and hosted institutions meet monthly for updates and training on eCampus Course Management System. This group, or eCampus Points of Contact, provides information and support within units on aspects related to eCampus including plug-ins and auxiliary tools (see https://ecampus.wvu.edu/faculty). Currently the Course Management System (WVU eCampus) numbers are reflected in the chart below:

Semester	Distinct Students Enrolled	Total Enrollments	Sections	Max # of Concurrent Users
Fall '08	30,603	174,720	4,802	3,684
Spring '09	29,359	160,147	4,721	3,857
Summer '09	11,041	25,920	1,294	1,106
Fall '09[1]	32,389	171,400	4,705	3,444

Additionally, the Health Sciences Center offers faculty assistance through the Academic Technologies unit. Pedagogy and effective teaching strategies are enhanced through the Teaching Scholars program for Health Sciences faculty. Some individual Colleges host local instructional technology support units, e.g., Human Resources and Education's Teaching Learning Center, Business and Economics' Technology Support Unit, and Eberly College's Center for Computing Literacy.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	342	6,256
Spring '09	331	5,609
Summer '09	275	4,457
Total	**948**	**16,322**

Source: WVU enrollment data for section 7D1 (Extended Learning online/web)

* Total is not a unique student count, so likely includes head count duplication.

[1] Initial statistics, final semester statistics are compiled at the end of term.

Broadband Training

Training is provided by the Office of Information Technology and the ITRC to all new and current faculty on all campuses. Training includes effective online teaching, how to use the enterprise course management system, and all associated eLearning tools. This provides faculty with the information needed to quickly and easily integrate into the classroom. Web-based tools are often used to provide these training opportunities.

The Computer Science/Electrical Engineering Department offers a periodic course in parallel and grid computing. Ad hoc and on-demand training is also available on-campus, conducted by the Pittsburgh Supercomputing Center in the use of High Performance Computing tools.

Discussion and recommendations regarding deployment of additional collaborative tools such as Wikis, blogs, document management, and other online tools to support teaching and learning as well as administrative efficiencies are also under consideration.

Broadband Infrastructure, Usage, and Training in the Community & Technical College System

Blue Ridge Community and Technical College

Broadband Infrastructure

The campus backbone is interconnected via 1Gb links. Wireless covers both academic and administrative areas. The one remote facility is connected back to Blue Ridge using a T1 link.

Broadband Usage

Currently, Blue Ridge CTC uses MyMathLab and SMARThinking online tutoring in the academic foundation courses. The SMARThinking is available to the entire campus but is primarily used in the academic foundations writing course. Blue Ridge also provides the Cisco CCNA curriculum which is entirely online. Instructors use WebCT Version 4 hosted at WVNet with more instructors offering online and blended courses. Workforce Development has a video streaming project for a client that is hosted at mac space.

It is proposed that MyWritingLab be piloted later this year. A second proposal this year is to develop a course space for all courses in WebCT to provide business continuity.

Digital library resources include EBSCO Host, LLW Premium Nursing database and Encarta. Access is also provided to the databases at the Martinsburg-Berkeley County Public Library.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	35	682
Spring '09	N/A	N/A
Total	**35**	**682**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

Academic departments train instructors in MyMathLab and SMARThinking. Professional development days cover special topics taught by individuals who attend conferences or other training. WebCT training and help is provided by the institutional IT department.

New River Community and Technical College

Broadband Infrastructure

The New River CTC broadband network is an integrated voice, video and data network that connects six locations in Beaver, Beckley, Lewisburg, Princeton, and two sites in Summersville. Fiber connections (10Mbps) connect each campus location to the COLO in Charleston, which is provided by Alpha Technologies with Fibernet as the Internet Service Provider. A dedicated 10Mbps circuit is also currently in place for data and video traffic routed directly to WVNET and all institutions with networks provided by WVNET (rather than going out to the Internet and then back to these WVNET locations). The Internet connection is currently a 30Mb circuit. New River does not currently have access to Internet2. The New River wireless network is available at each of our six locations using 802.11n. All switches, routers, gateways, firewalls, and wireless access points are Cisco equipment and gigabit speeds to the desktop are supported. A Cisco VoIP phone system is currently being deployed at all six locations to replace the existing phone system, which is provided by Bluefield State College.

Broadband Usage

With six locations, New River relies heavily upon the broadband network for all academic and administrative services. The Beckley campus is currently the primary location for most server-based solutions (email, web, active directory, etc.) but SCT Banner and WebCT are both currently hosted in Morgantown by WVNET, although staff at New River administers them. In January 2010, New River will complete the transition to the ANGEL learning management system, which will replace WebCT. It will be hosted by New River on servers located in Beckley. A combination of Windows Server 2003 and 2008 comprises the majority of New River hosted solutions, although some key services are hosted on Mac OS X Server.

To support a 9-county area of southern West Virginia, New River heavily utilizes video-based course delivery that we refer to as the Interactive Video Network (IVN). Currently, we have five IVN classrooms owned by New River with two in Summersville, two in Lewisburg and one in Beckley. Additionally, we have five IVN classrooms owned by Bluefield State College that are deployed on New River campuses with two in Beckley, two in Lewisburg and one in Summersville. Furthermore, New River manages five additional IVN classrooms that are located at the Public Higher Education Center. New River is currently creating four additional classrooms that will be available by January 2010 with two in Princeton, one in Lewisburg, and one in Summersville. All newly created IVN classrooms are High Definition video supporting multipoint connectivity and duo video (instructor plus content using two simultaneous video streams). A 24-port Cisco MCU is currently being implemented to bridge, schedule and manage these video connections and it will provide 16 HD ports for video. A 5-port IPVCR is

currently being configured to record and stream the IVN content following the live delivery for students to review and to assist students who might miss an IVN class.

Currently the Spring 2010 schedule has 92 course sections being offered via IVN with some of those courses also being web-enhanced, meaning that they will additionally use the ANGEL learning management system. Each IVN course is comprised of at least two course sections and some comprise as many as 3-4 sections, so 92 course sections on the schedule indicates 46 or fewer actual courses. The Spring 2010 schedule currently has 77 ANGEL course sections on the schedule (completely online) and one section actually does equal one course. We have 19 course sections on the Spring 2010 schedule that are web-enhanced, meaning they utilize ANGEL for some portion of the course delivery. And every course section on the schedule (over 600 total) has access to the ANGEL learning management system so that it may be used as a supplement to traditional classes.

A five-year Title III grant has been instrumental to New River's development of a broadband network infrastructure and accompanying online services by funding a large portion of these startup initiatives.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	57	1,042
Spring '09	71	1,560
Total	**128**	**2,602**

Source: New River CTC

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

The Center for Teaching Excellence provides an instructional designer to support faculty for development and deployment of traditional, online, video-based and hybrid forms of instruction. A centralized college Help Desk works collaboratively with Information Technology staff deployed to each campus location to provide technical support for all New River students, faculty and staff. The New River IT staff also directly supports the Public Higher Education Center located in Beaver, WV that is comprised of six colleges and universities.

West Virginia Northern Community College

Broadband Infrastructure

West Virginia Northern Community College has three campus locations—Wheeling, Weirton, and New Martinsville—networked together via T1 and D3 lines. Network traffic routes through Cisco routers and switches at all locations. Fixed firewall and traffic limiter/filtering are provided through a software/hardware solution. The connection among the three campuses is via VPN. The college is currently working with a regional internet security designer/engineer to restructure the flow of traffic for both intra- and internet usage at the college and campuses. This restructuring will increase bandwidth and the availability of services to support increased use of technology for distance education, and remote connections of classes via internet/intranet applications.

Broadband Usage

The college currently uses Blackboard Vista as its primary CMS for delivery of distance education classes, hybrid courses and programs. Other modalities are also in use, using a combination of hardware and software, to deliver classes via video web conferencing. Three classrooms are fully outfitted with IP Video instruction stations.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	19	325
Spring '09	N/A	N/A
Total	**19**	**325**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

Faculty and staff professional development sessions are offered throughout the year in the use of all technology initiatives. Some of these sessions include the use of CMS systems like Blackboard, video web conferencing between campuses and with area high schools, web page design and development, and a variety of user applications available for use.

Southern West Virginia Community and Technical College

Broadband Infrastructure

Southern West Virginia Community & Technical College currently has four campus locations, and one off-site location at Lincoln County High School. All campus locations and the Lincoln County site have their Internet access routed through the Logan campus site. So, all Internet traffic comes from Charleston to the Logan campus and is then routed to the appropriate satellite campus location. For traffic that is dependant on the state wide infrastructure, such as ICR classrooms, the traffic is routed from each campus's ICR facility to the facility that is either hosting the event, or watching the conference via ICR. Southern also utilizes a 10 megabyte connection between the Williamson campus and the Logan campus that is provided by Suddenlink Communications at a monthly subscription cost. The rest of the College's connectivity is provided by Verizon. The connection to the state network and the Internet is through WVNET, the statewide ISP for higher education institutions.

Broadband Usage

Wireless network access is currently being deployed at each campus location. There is a secure and unsecured VLAN defined for this. The secure link is for use by college employees and allows access to applications that are not available for student use. The student VLAN allows access only to the internet and is routed to a separate connection to remove the traffic from the campus network. This is accomplished by purchasing a low cost connection from the local cable company at each campus. The Williamson Campus is completely set up and functional, and the other three campuses are in progress with completion expected by December 2008.

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	65	547
Spring '09	N/A	N/A
Total	**65**	**547**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

Broadband Training

None.

CTC Outsourced Broadband Services

The following CTCs are either hosted on four-year campuses or broadband services are managed by another institution. Broadband data related to these institutions are reported as part of the host institution. Where possible, online course enrollment figures are reported.

- CTC at WVU Tech – Broadband services provided by WVU

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	11	134
Spring '09	N/A	N/A
Total	**11**	**134**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

- Marshall CTC – Broadband services provided by Marshall University
  - Course enrollment is included in the host institution data.

- Pierpont CTC – Broadband services provided by Fairmont State University

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	29	800
Spring '09	N/A	N/A
Total	**29**	**800**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

- WV State CTC – Broadband services provided by WV State University

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	27	288
Spring '09	N/A	N/A
Total	**27**	**288**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

- WVU at Parkersburg – Broadband services provided by WVU

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	127	2,532
Spring '09	N/A	N/A
Total	**127**	**2,532**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

- Eastern WV CTC – Online courses managed by Fairmont State University

Online Course Enrollment Summary – Academic Year '08-'09		
Semester	**Online Courses Offered**	**Enrollment**
Fall '08	25	682
Spring '09	N/A	N/A
Total	**25**	**682**

Source: WV Virtual Learning Network, Course Enrollment '08-'09 (Spring '09 not yet reported to WVVLN)

* Total is not a unique student count, so likely includes head count duplication.

2009 WV Higher Education Broadband Inventory - Available Bandwidth

Stated in Megabits/Second

Four-Year College & University System

	Backbone		Campus		Satellite Campus		Classroom		Research Facility	
Institution	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**
Bluefield	1,000	1,000	1,000	1,000	1.5	1.5	100	100	-	-
Concord	1,000	1,000	1,000	1,000	-	-	1,000	100	-	-
Fairmont	2,000	100	2,000	100	20	10	1,000	100	-	-
Glenville	1,000	1,000	1,000	100	-	-	100	100	100	100
Marshall	10,000	1,000	10,000	1,000	1,000	100	1,000	1,000	10,000	1,000
Potomac	1,000	1,000	-	-	-	-	100	100	-	-
Shepherd	10,000	10,000	1,000	1,000	-	-	1,000	100	-	-
West Liberty	100	50	28	7	5	0.5	20	4	10	3
WVSOM	1,000	1,000	100	100	-	-	100	100	100	100
WV State	1,000	50	1,000	10	3	1.5	100	10	1.5	0.1
WVU	1,000	1,000	1,000	1,000	23	5	100	100	1,000	1,000
WVU Tech	-	-	-	-	-	-	-	-	-	-
Average	**2,425.0**	**1,433.3**	**1,510.7**	**443.1**	**87.7**	**9.9**	**385.0**	**151.2**	**934.3**	**183.6**
Median	1,000.0	1,000.0	1,000.0	100.0	0.8	0.3	100.0	100.0	0.8	0.1

	Server		PC/Node		Wireless			Internet	Internet2
Institution	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Coverage**		
Bluefield	1,000	100	100	100	-	-	0%	13	-
Concord	1,000	1,000	100	100	-	-	0%	80	-
Fairmont	1,000	100	1,000	100	54	11	90%	26	-
Glenville	1,000	100	100	100	100	11	0%	16	-
Marshall	1,000	1,000	1,000	100	160	11	80%	400	1,000
Potomac	100	100	100	100	-	-	0%	20	-
Shepherd	1,000	1,000	1,000	100	54	11	0%	41	-
West Liberty	10	5	2	2	-	-	0%	6	-
WVSOM	100	100	100	100	-	-	0%	20	-
WV State	1,000	100	1,000	100	-	-	0%	18	-
WVU	1,000	1,000	100.0	100.0	54	11	0%	338	155
WVU Tech	-	-	-	-	-	-	0%	25	-
Average	**684.2**	**383.8**	**383.5**	**83.5**	**35.2**	**4.6**	**14%**	**83.6**	**96.3**
Median	1,000.0	100.0	100.0	100.0	-	-	-	22.5	-

Community & Technical College System

	Backbone		Campus		Satellite Campus		Classroom		Research Facility	
Institution	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**
Blue Ridge CTC	1,000	1,000	1,000	100	1.5	1.5	1,000	100	-	-
CTC at WVU Tech *	-	-	-	-	-	-	-	-	-	-
Eastern WV CTC	-	-	-	-	-	-	-	-	-	-
Marshall CTC *	10,000	1,000	10,000	1,000	1,000	100	1,000	1,000	-	-
New River CTC	1,000	1,000	1,000	1,000	-	-	100	100	-	-
Pierpont CTC *	1,000	100	2,000	100	20	10	1,000	100	-	-
Southern WV CTC	2,000	100	2,000	100	10	1.5	100	100	-	-
WV Northern CC	1,000	1,000	1,000	0.5	100	0.5	0.5	0.5	-	-
WV State CTC *	1,000	50	1,000	10	3	1.5	100	10	1.5	0.1
WVU-Parkersburg	-	-	-	-	-	-	-	-	-	-
Average	**1,700.0**	**425.0**	**1,800.0**	**231.1**	**113.5**	**11.5**	**330.1**	**141.1**	**0.2**	**0.0**
Median	1,000.0	100.0	1,000.0	55.0	2.3	1.0	100.0	55.0	-	-

	Server		PC/Node		Wireless			Internet	Internet2
Institution	**Max**	**Med**	**Max**	**Med**	**Max**	**Med**	**Coverage**		
Blue Ridge CTC	1,000	1,000	100	100	-	-	0%	3	-
CTC at WVU Tech *	-	-	-	-	-	-	0%	25	-
Eastern WV CTC	-	-	-	-	-	-	0%	4	-
Marshall CTC *	1,000	1,000	1,000	100	-	-	0%	400	-
New River CTC	1,000	100	100	100	-	-	0%	18	-
Pierpont CTC *	1,000	100	1,000	100	54	11	90%	36	-
Southern WV CTC	2,000	100	100	100	-	-	0%	8	-
WV Northern CC	1,000	1,000	-	-	-	-	0%	3	-
WV State CTC *	1,000	100	1,000	100	-	-	0%	18	-
WVU-Parkersburg	-	-	-	-	-	-	0%	10	-
Average	800	340	**330.0**	**60.0**	5	1	9%	**52.5**	**-**
Median	1,000.0	100.0	100.0	100.0	-	-	-	14.0	-

* Indicates shared broadband infrastructure with host institution

Data Source: HEPC Higher Education Broadband Infrastructure Survey, October 2009