Linux on System z

Presentation by Bill Thirsk
Vice President of Information Technology/CIO
Harry Williams
Director, Systems and Technology
Marist College
Marist Profile

MISSION: “Marist is dedicated to helping students develop the intellect and character required for enlightened, ethical and productive lives in the global community of the 21st century” (Marist Strategic Plan 2004-2009)

- Official State Charter Granted in 1946
- Liberal Arts College Emphasizing Teaching & Learning
- 180 Acres of Riverfront Campus
- 4,400 Full-time Undergraduate Students
- 850 Full-time and Part-time Graduate Students
- 750 Adult Continuing Education Students
- 32 Bachelor’s Degree Programs
- Graduate Degrees in 11 Fields
- Fully Online MBA, MPA, MS/IS, & Communication Graduate Degree
Marist Profile (continued)

**A Nationally Recognized Regional College**

- Princeton Review – Best 366 Colleges 2008
- U.S. News & World Report - Top Tier Of Northern U.S. Colleges
- “Highly Selective” - Time/The Princeton Review
- Acceptance Rate in Most Selective 8% of US Colleges and Universities
- Barron’s Best Buys In College Education
- Nearly 9,200 Freshman Applications for the 950 Seats Available Fall 2008
Leadership in Technology

“...Marist seeks to distinguish itself by the manner in which it uses information technology to support teaching, learning and scholarship at both the undergraduate and graduate levels...” (Marist Strategic Plan 2004-2009)

- One of the first colleges with fully Networked Campus
- Internet2 Research Institution
- Sakai Open Source Adoption, Spring 2008
Leadership in Technology (continued)

Data Center

- Modern Server Environment
  - Two System z “mainframes” running z/OS, z/VM, Linux for z
  - Four System p servers running AIX and Red Hat Linux
  - Intel based Linux & Windows 2003 Servers
  - 165 Traditional Servers
  - 650+ Virtual Servers
- 50 Terabytes State-of-the-Art IBM storage
- DB2, Content Manager & ERP systems
  - First SunGard Banner on System z platform, now in production
Innovative Projects & Partners

Marist Institute for Public Opinion (MIPO)

- Nationally Recognized Center Founded in 1978
- Provides Scientific Surveys on
  - Elections
  - Policy issues
  - Human interest topics for the public
- Provides Unique Student Educational Opportunities
- Exploring Innovative Internet Survey Techniques
- State of Art Predictive Dialing
Innovative Projects & Partners (continued)

FDR Presidential Library

- Digitize and “Web Publish” FDR Library’s Holdings
  - Includes President’s Secretary Files
  - Key documents sought after by researchers
  - Extensive photographic holdings

- National Showcase For IBM’s Digital Library Technologies
  - First presidential library with original holdings online

- Digitization Of Primary Source Material Continues
  - Roosevelt Churchill correspondence
  - Eleanor Roosevelt’s “My Day” newspaper columns
  - Former Secretary of Treasury, Henry Morgenthau’s diaries under consideration
  - Education Programs for K-12 Teachers and Students
Marist’s Role in Technology and Innovation

- The creation of wealth relies on the creation of knowledge.
  - This is the core of true innovation

- Innovation requires ‘mash-ups’
  - Something old
  - Something new
  - Leveraged together to create new ways of operating
Marist’s Role in Technology and Innovation (continued)

IBM Customer Reference Video

http://www.marist.edu/it/green.html
The Joint Study

A Unique Research Partnership with IBM

- IBM / Marist Partnership supports students of all disciplines throughout their academic career.
- Marist participates in the IBM Value chain as both a contributor and as a consumer.
  - Research
  - Teaching and Learning
  - Scalability of Operations and efficiency
  - ISV ‘lift and move’ development, testing, and operations
  - Applied Research for new markets
The Joint Study (continued)

A Unique Research Partnership with IBM

A History of Innovative Educational Projects

- **1981** – College Writing on Computers
- **1988** – Use of large system by a small customer
- **1994** – Automated student telephone directory
- **1994** – Marist College World Wide Web, served off S/390
- **1995** – MERIT -- electronic reserve room
- **1998** – Development of New Digital Library
- **1999** – Linux for S/390 distribution download hosted at Marist
- **2000** – First college to develop a Linux R&D Lab
The Joint Study (continued)

A Unique Research Partnership with IBM

2000 – Present: Track Record of Moving from Research to Application

- Virtual Servers
  - Started as test of zSeries virtual Linux servers
  - Individual virtual Linux servers
    - Provided to all students in Specific Computer Science courses
    - Over 600 simultaneous virtual servers running – continually evolving

- FDR Digital Library
  - 3.4M hits per month for research – 120,000 unique visitors
  - Usage will continue to climb as more holdings made available

- Introduction to College Writing
  - Online course
  - Rich media integrated into instruction
The Joint Study (continued)

A Unique Research Partnership with IBM

Current Initiatives – Project Greystone

A K-12 Educational Portal

- Pilot School Districts - Poughkeepsie & Highland
- Greystone Consortium Created – 18 School Districts
- Providing:
  - Access to Marist Resources - eBrary
  - Access to graduate courses for faculty
  - Access to college credit courses for students

- Migrating to a Sakai based environment
- Provide Sakai hosted environment for K-12 faculty use

Initially funded by an IBM Shared University Research Grant in 2003
The Joint Study (continued)

A Unique Research Partnership with IBM

Current Initiatives

- z/VM and Linux for z Images
- z/OS Training
- z/OS Knowledge Center
- z/OS Test Drive Systems
- Marist z/OS Certificate Program Support
- Sakai Project – WebSphere/DB2 Enablement
- Sakai Project – Porting to System z
- Sakai Cloud/zSaaS – Proof of Concept Project
- Banner-z
Success on System z

Linux on System z

Marist and the IBM Mainframe

- Long history of innovative use of mainframe services to support academic experience
- First IBM mainframe at Marist: 1978
- First academic collaboration with IBM: 1981
- Processor progression:
  - S370 -> 4341 -> 4381 -> 3090 -> 9121 -> 9672 -> z900 -> z9
  - Also z990 on loan from IBM for joint projects
  - Various models within each of the processors
Success on System z (continued)

Linux on System z

- Virtualization and the Mainframe
  - IBM’s VM operating system has been used at Marist on mainframes since 1980.
  - Use of virtualization to provide many services with few resources has always been priority.
    - Limited physical space in Data Center
    - Limited hardware and environmentals (power, cabling, cooling, racks, etc.)
    - Limited number of staff needed to control large number of services
Success on System z (continued)

Linux on System z

- Linux on the Mainframe

  - By end of 1997 the need for distributed services was growing at Marist. Cost of supporting Windows platform was a large concern.
  
  - Interest in Linux was growing, but need for separate server hardware, environmentals was a concern.
  
  - In mid-1999, IBM approached Marist about joint project to provide Linux image for s390 mainframe.
  
  - Marist distribution of Linux for s390 debuted on Internet, January 2000.
Success on Systems z and p

System z Software

- Server virtualization with z/VM on IBM System z
  - z/VM 5.4 on IBM z9 and z990
  - Various Linux Operating Systems including:
    - Red Hat
    - SuSE Linux Enterprise Server (SLES)
    - Slackware
  - CMS
  - Preparing to Run OpenSolaris on z/VM
Why Virtualize on System z?

- Time to provision a new server
  - Minutes on System z verses days for x86
- Disk space is no longer part of the Total Cost of Ownership (TCO) equation
  - Storage Area Network (SAN) space costs are the same for x86 and System z
- Licensing Costs
  - Cost is by Engine – using Oracle as an example, System z can run multiple Oracle instances on the same set of engines with no increase in cost
- Reliability, Availability, Serviceability
Success on Systems z and p (continued)

**Linux on System z**

- Primary mainframe – z9 Business Class
  - 3 General Processors, 3 Integrated Facility for Linux (IFLs), 64G memory
  - 2 LPARs - z/VM 5.4.0 runs both
    - MARIST – contains main legacy systems (4 z/OS 1.9), numerous Linux and CMS based services
    - MARLINUX – Linux servers only (36 and growing)
      - Hosts primary “git” server for Linux on System z (allows Open Source Community to submit code for review and incorporation into Linux kernel)
Success on Systems z and p (continued)

*Linux on System z*

- Development mainframe – z990
  - Used for testing, development, and proof-of-concept projects.
  - Original part of Open Source Development Lab (OSDL) project
  - Debian and Slackware have servers for development work.
  - Hosts Marist student academic servers (>600 currently)
  - IBM PoC image deployment infrastructure
  - z/OS Test Drive Images
  - Cognos

- Disk services:
  - 2 IBM 8100s
  - 1 IBM 8300
  - SAN using DS4800
Success on Systems z and p (continued)

*Linux on System z*

- Current Staffing:
  - ✓ Systems Programmer for z/VM, Hardware Support, and other duties
  - ✓ Systems Programmer for Linux Development/Support, mostly z, some x86
  - ✓ Server Administrator for Linux Support mostly x86, some z
  - ✓ LDAP, Operations (Server Monitoring), Networking, etc. are handled by normal staffing
Success on Systems z and p (continued)

Linux on System z

- Student Academic Linux Servers:
  - Currently based on Marist Linux distribution
  - Kernel and basic configuration files stored on shared, read/only disk (one copy shared among all servers)
  - Servers each have individual read/write space for programs, additional software, etc.
  - Students receive 1-5 servers depending on course requirements
  - Students retain servers across academic career, use as a portfolio, and courses can build on work of pre-requisite courses
Success on Systems z and p (continued)

**Linux on System z.**

- Student Academic Linux Servers:
  - Have been utilized by courses for:
    - Web Development I and II
    - Java programming (Tomcat)
    - Database development (MYSQL)
    - Linux skills
    - Parallel programming
Success on System z

- Currently virtualized on z/VM
  - Webmail Interface to IMAP Using Horde
  - General Web Server for all Faculty, Staff and Students
  - A Wiki
  - IceCast – audio streaming server (encoding on Intel server)
  - Test servers for all server admin staff
  - Various projects for The Linux Foundation supporting Open Source development on System z (formerly Open Source Development Labs – OSDL)
  - Slackware for System z development
  - SysLog
  - Oracle Database Servers (at least 8)
  - LAMP Web Servers
    - Over 20 Different Servers in Production
    - 600 Servers for Students
    - Supports Student Government to Functions and Clubs
- General Linux Server for Student Computer Society
- Test Servers for our Sakai Environment and Development
- Production Servers for Sakai with DB2 / WebSphere
- Firewall for the other Linux Servers
- Subversion Server for all Marist Development
- NTP Server for Campus
- Central Authentication Server (CAS-JASIG)
- Email Gateway Hub
- Main College Web Servers including Production and Test
- College Library Web Servers
- Web content management systems (OmniUpdate, WordPress)
- Xymon (Hobbit) monitor for servers and network devices
Future on System z Research@Marist.edu

Applied Research to try “new” things on z

- Automated provisioning
  - Linux and/or z/OS servers with application configuration
- Hybrid Computing
  - Cell Processor to perform High Performance Computing
- Open Source porting to System z
- IBM Middleware support for Open Source applications
- Cognos Business Intelligence
Future on System z Automated Provisioning

Faculty & students are business users & are unaware they are using a mainframe.

<table>
<thead>
<tr>
<th>Linux</th>
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<td></td>
<td></td>
<td>S1</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

Faculty & students are business users & are unaware they are using a mainframe.
Future on System z Open Source Porting

- Continue to try various Open Source Packages
- Providing sandbox platform for Open Source Community to try software on real System z hardware
- Maintaining and developing Sakai running on System z
  - Work in progress to support HBCU
- Updating Kuali to run on System z
Future on System z Open Source Porting (continued)

Most issues fall into a few categories

- Big Endian vs Little Endian – very few of these due to Sun architecture
- Sun Java vs IBM Java
- Less is more – Too many Linux admin or Open Source applications solve a problem by throwing more hardware (memory) at the problem.
Future on System z
IBM Middleware on Open Source Apps

Sakai 3.0 with DB2 and WebSphere Application Server

➤ Continuing development of Sakai cloud server.

✓ Multiple tenets, one home

Porting SunGard HE Banner
Future on System z
Cognos Business Intelligence

- Marist has just started developing curriculum to teach Cognos
- Cognos will be the basis for the infomatix curriculum
- Initial implementation solely Linux on z with a cloud configuration to follow in a SaaS environment.
Strategic Focus on Innovation

- Our division’s mission sets the mandate

- "Become a recognized leader in using information technology to support teaching and learning in all environments."

- Marist College, recognized for excellence by U.S. News & World Report and Barron's Best Buys in College Education, is noted for its leadership in the use of technology.
What does Innovation look like at Marist?

**Learning Innovation:** Identity Quests & Media Platforms

**Teaching Innovation:** Inverse Distance Learning (iDL)

**Business Innovation:** Open source, open systems, open platforms

**Research Innovation:** Corporate Joint Studies and Applied Research

All through single or multi-partner solution development and deployment.
Innovation

http://mediaplatform.marist.edu/mp32/4000/5053/5057/5251/Presentation/default.htm
Partnering – The Force Multiplier:

What we cannot do alone, we may certainly achieve together.
Attracting Partnerships
“What inspires one may not inspire everyone. Select an inspired service provider.”
Innovative Partnerships

New twists on server virtualization are helping campuses maximize their IT resources.

By John Burton

The virtualization of servers offers cost savings and increased efficiency. Although virtualization can solve many management and resource challenges, IT experts recommend taking different approaches, depending on a campus's project needs, hardware makeup, and appetite for experimentation. While not the answer to all server challenges, virtualization makes problems such as potential security breaches easy to remedy, according to many IT professionals.

The term “virtualization” refers to the management, provisioning, and use of server features and functions on logical rather than physical grounds. Virtualization's many forms are also a factor in determining what strategy to take.

The concept of virtualization is not new. For decades, virtualization has been done on mainframes. Using software, the mainframe is split into two or more segments, with each segment being apportioned to a different user.

Increasingly, campuses are implementing another variation on virtualization, in which a single application or process is distributed across many machines in grid computing arrays. Another popular approach is to mimic the mainframe scheme with multiple server instances running on a single hardware box.

However, instead of large, expensive mainframes, the hardware box in question is an inexpensive, commoditized machine.

CDW-G EdTech, February – March 2006

Prove yourself by attracting the public eye.

Our goal, one press release per month concerning technology.
Innovative Partnerships (continued)

Virtual Reality

Marist College finds cost and space savings through server virtualization.

CDW-G, January 2007
Innovation Challenge – Picking Each Other

Scout v Pragmatist

Investigator v Pacifist

Collaborator v Individual Expert

Experimenter v Supervisor

Evangelist v Agnostic

Frontiersman v City Dweller
Innovation Challenge – Picking Each Other (continued)

Scout v Pragmatist

Investigator v Pacifist

Collaborator v Individual Expert

Experimenter v Supervisor

Evangelist v Agnostic

Frontiersman v City Dweller
Concept of Reverse Outsourcing:

Venture Education – Private Colleges and Universities

We have found corporations are looking to colleges to provide “Venture Intellect” with formal contracts providing each party a consideration for a consideration.

This offers companies and organizations short term / high intensity development environments, functions, and products that can be immediately moved to production and to the market.
First Mover Advantage

SunGard Higher Education

First and only research license to move Banner, Luminis, and other Higher Education ERP Software Applications to the System z platform.

- IBM
- Oracle
- rSmart

✓ Assist in developing integration to Sakai
Banner z – proof of concept

SunGard Higher Education, IBM, and Marist
- Currently running the Oracle Database on the z
- Marist contributes to SunGard Pillar Group
  - Emerging Markets
  - Concentrating on SaaS
- Financials and Fundraising in Production
  - Oracle DB up and running on zLinux server
- Banner apps installed on pLinux and connected to DB
- 90% of the code has been compiled on zLinux
  - Code migration will begin on successful compile (spring 2009)
- Savings – true ‘Return on Assets’
  - The Banner ERP requires a minimum 5 to 7 large p servers
  - Our instance requires only 2
    - Our instance will require none
  - The z9 has already paid for itself
Marist was awarded a contract from the New York State Office of Science, Technology, and Academic Research (NYSTAR) in September 2004

Established Marist as a College Applied Research and Technology Center (CART).

The CCODC offers services, support, and training to assist NYS companies in applying leading-edge information technology at substantial cost savings.
CCODC (continued)

Institute for Data Center Professionals (IDCP)

- Training arm of the CCODC.
- Vendor neutral certifying body for the professionals who manage the world’s data centers.
- Provides a curriculum in support of IDCP certification.
- Partially funded by the National Science Foundation.
Why Is Professional Education So Urgent?

One of the 77 million baby boomers reaches 60 every seven seconds (28%).

- That is around 11,960 people a day and 4 million a year.
- By 2020 that segment will be 36% of the population.

The age for retirement was set at 65 by Kaiser Willhelm in the late 1800's.

- It is now generally accepted among gerontologists that life expectancy may exceed 85 years-- and may, in fact, approach the biblical life span of 120.

Nearly 6,000 Americans turn 65 every day, that figure will jump to 9,000 as the baby boomers age.

Nearly 35 million Americans were 65 or older in year 2000.

305,953,000 total US population /154,650,000 workers

17 percent birthrate decline since 1990.

- Birth rate is 13.9 per 1,000 and declining
- Mortality rate is 9.6 per 1,000 and increasing
- The only “help” is immigration
CCODC

*Enterprise Systems On-Demand Computing (z/OS) Certificate. NOW an approved Academic Program*

- Marist College and IBM have jointly developed the Enterprise Systems On-Demand Computing certificate program.

- The program is available through the Marist Institute for Data Center Professionals.
Marist z/OS Certificate Program

Mainframe Training for IT Professionals

- Distinguishing characteristics:
  - Available worldwide
  - Technology focused, business exposure
  - Taught by System z industry experts

- Format
  - Fully online, web based delivery
    - iLearn/Sakai collaborative learning environment
  - 10 – 12 week courses

- Cost
  - Significantly reduced with scholarship funding from IBM and New York State (NYSTAR)
Marist z/OS Certificate Program (continued)

Year One: System z Associate Certificate Modules
- Modules include Introduction to z/OS and Major Subsystems, Introduction to z/OS Networking, and Introduction to z/OS Security
- All Year 1 modules approved for college credit

Year Two: System z Professional Certificate Modules
- Modules include, z/OS Advanced Topics, z/OS RAS and Diagnostics, and z/OS Emerging Technologies
- Qualifying exam for direct entry to Professional Certificate

Year Three: z/OS Expert Certificate
- Systems Administration Track
  - Installation and Configuration
  - Systems Measurement and Tuning
  - DB2
- Application Development Track
  - Application Development Environment
  - J2EE on System z
  - COBOL
Marist z/OS Certificate Program (continued)

**Year Three: z/OS Expert Certificate**

➢ Also under consideration:

✓ z/VM (partner with Binghamton University)

✓ zLinux

✓ Advanced Assembler (Basic/Advanced possibly offered as separate Certificate)

✓ Advanced COBOL (Basic/Advanced possibly offered as separate Certificate)
# z/OS Certificate Program

<table>
<thead>
<tr>
<th>Pre-Reqs</th>
<th>Certificate</th>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
<th>Value</th>
<th>Audience</th>
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<tr>
<td>No z/OS</td>
<td>Associate</td>
<td>z/OS Intro.</td>
<td>z/OS Networking</td>
<td>z/OS Security</td>
<td>Basic z Skills</td>
<td>New to Sys. z</td>
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<tr>
<td>Prof./Equiv.</td>
<td>Expert (Appl)</td>
<td>COBOL</td>
<td>RDz</td>
<td>JAVA</td>
<td>Deep z Skills</td>
<td>z Experienced</td>
</tr>
<tr>
<td>Prof./Equiv.</td>
<td>Expert (Sys. Prog)</td>
<td>z Install</td>
<td>Performance</td>
<td>DB2</td>
<td>Deep z Skills</td>
<td>z Experienced</td>
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<td>Basic COBOL</td>
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<td>z/OS Intro.</td>
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<td>Pass Mastery Exam</td>
<td>New to Sys. Z</td>
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<td>No z/OS</td>
<td>Mastery Exam Prep (self-paced)</td>
<td>z/OS Intro.</td>
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<td>Low cost, start any time</td>
<td>New to Sys. z</td>
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*Shaded Cells reflect new courses to be developed*
Marist z/OS Certificate Program (continued)

Participating Enterprises (all)

- ACG - Auto Club Group
- Aegon USA
- Aetna, Inc.
- Aformatik Training & Consulting GmbH & Co KG
- Alcan Global ATI- North America
- Ameritech
- Atlantic & Pacific Tea Company
- Auto Zone
- Bank of America
- Bank of Tokyo
- BMC Software
- Boston University
- CIGNA Healthcare
- Citigroup
- Commonwealth office of Tech, State of KY
- Credit Suisse
- Depository Trust & Clearing Corporation
- Donovan Data Systems
- Emirates Airlines
- Fidelity Investments
- Great-West Life
- IBM
- Insurance Services Offices (ISO)
- JP Morgan Chase
- Kawasaki Motors Corp. USA
- LexisNexis
- Liberty Insurance Company
- Louisiana Housing Fin Ag / Baton Rouge C.C.
- Marist (F/T)
- MassMutual Financial Group
- Metavante
- Mitchell Martin
- Mortgage Guaranty Ins. Co.
- Nationwide Insurance Co.
- New York University
- Norfolk Southern Corporation
- NYS Dept of Tax & Fin
- OCIT, Sacramento Cty
- Ohio Public Employees Retirement System
- Partsearch Technologies
- Progressive Insurance
- PSC Electrical Contracting
- Rutgers University - Office of IT
- SAIC
- Sears Holdings Corporation
- Self Employed Consultant
- TAG
- Thompson Financial- Transaction Services
- T. Rowe Price
- Verizon
- Wachovia Bank
Marist z/OS Certificate Program (continued)

Spring 2009 Cohort

- Associate Certificate (Three Modules)

  - Standard Cost: $5265

  - Projected Scholarships will reduce cost to $2550
    - Scholarship funding from IBM and NYSTAR
    - Scholarship funding finalized early 2009
    - Group discount available for multiple students from an enterprise in one cohort
    - Application for module credit allows use of Corporate tuition reimbursement benefits
Marist z/OS Certificate Program (continued)

Courses Offered as Part of the Undergraduate Program

- Spring 2007
  - z/OS Assembler Language
    - Hands on access
    - Lab exercises
- Fall 2008
  - Introduction to z/OS and major subsystems
- 2009/2010
  - Integrate z/OS Networking and Security classes
  - z/OS Internship opportunities at IBM and other major companies
Community to Revitalize Undergraduate Education in Enterprise Computing

Update to Community

Roger L. Norton

http://ecc.marist.edu/
### Founding Partners

<table>
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<tr>
<th>Industry</th>
<th>Academic</th>
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<tr>
<td>Aetna</td>
<td>Marist College</td>
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<td>Bank of America</td>
<td>Illinois State University</td>
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<td>North Carolina Central University</td>
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### New Partners

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<td>Leipzig University/Tuebingen university</td>
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<td>Medco</td>
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Primary Goals of Community

Long Term: A continuing community, and a cost-effective curriculum based on non-proprietary standards, shared among partners and other colleges and universities.

- Industry partners will identify large systems skills required now and into the future
- Academic partners will share current curricula
- Academic partners will identify their areas of specialization and help to develop the curriculum in those areas
- Community will develop broad-based undergraduate curriculum that all partner schools will share
NSF CPATH (continued)

Expected Outcomes

- Interdisciplinary community of industry leaders and scholars
- Documented plan to revitalize enterprise computing undergraduate education
- Semi-annual online and on-site forums
- Industry mentoring and internship programs
- Online collaboration environment hosted on Marist enterprise server
- Community access to enterprise data center
NSF CPATH (continued)

What is Enterprise Computing?

The hardware, software, and practices used in large systems:

- Composed of groups of computational entities connected by a network to form a virtual centralized computing facility
- Often thousands of simultaneous users
- May remotely host applications from multiple businesses
- Capable of data processing and data mining on a vast scale

**Hardware** is uniquely resilient - average failure rates measured in decades.

**Software** applications are often distributed geographically and organizationally and require standards for integration of heterogeneous components.

**Practices** include continuous availability, system automation, disaster recovery and guaranteed data integrity, security, and retention
NSF CPATH (continued)

**Current Curricula at Founding Schools**

- Illinois State University
  - Enterprise Computing Systems program
- Marist College
  - Undergraduate and System z certificate program, currently nine courses
- North Carolina Central University
  - 3 course certificate program
  - Every CIS major must take Intro to the Mainframe course
- San Jose State University
  - DB2 In-Depth Certificate Program
- Stevens Institute of Technology
  - MSIS with Concentration in Enterprise Systems
- University of Arkansas
  - Courses in SAP, RDz, zVM, zLinux, DB2 and TP;
  - MBA in Business Intelligence and ERP
- Widener University
  - Large Scale Computing Program
- Binghamton University
  - zVM and zLinux skills
Which enterprise computing skills should be prioritized?

- Software development skills
- System programmers
- Application development and tools
- High volume transaction processing
- Data mining and business intelligence applications
- System test skills
- System Admin and DBA skills
- System and network security
- Network skills
- System Architects
  - Integration of heterogeneous components
- Application Architects
  - Applications that span enterprise and distributed systems
- Facilities Management skills
  - Data centers that minimize energy requirements
- Business continuity and disaster recovery
- Others?
NSF CPATH (continued)

*Online Conference Tentative Plans February 22-26, 2010*

- Interviews with Industry Executives
- Abbreviated online course – Introduction to Enterprise Computing
- Videos of Researcher and Faculty Lectures
  - Future Directions for Large Systems Technology
  - Others
- Online discussion groups on Industry Skills needs
- Outreach to new academic and industry members
NSF CPATH (continued)

*In Person Conference Tentative Plans June 27-29, 2010*

- Industry Executives and experts
- Introduction to Enterprise Computing
- Videos of Researcher and Faculty Lectures
  - Future Directions for Large Systems Technology
  - Others
- Discussion about Industry Skills needs
- Panel discussions
- Outreach to new academic and industry members
NSF CPATH (continued)

Sample from the Conference Agenda from 2009

- Welcome and Keynote Speaker: Nick Donofrio, IBM Corp
- Enterprise Computing: Bridging the gap to Generation-Y with RDz and zLINEUX Web - David Douglas and Christine Davis, U of A
- Education Advisory Council & Development & Use of DB2 Educational Material - Jasminder Singh, IBM
- Bringing Open System and Open Source Software to Large-Scale Enterprise Systems - Chu Jong and Kyoungwon Suh, Illinois State
- Inclusion of Virtualization on the Mainframe in an Intro Mainframe Course - Cameron Seay, North Carolina Central University
- In Search of the 21st Century Systems Programmer - Joseph Sinnott, Verizon
- Mainframe Jobs at Verizon - Heather Bruchey, Verizon
- DB2 Education and Panel Discussion - Jasminder Singh, IBM and Gene Fuh, IBM
- IT Workforce Trends Implications for Curriculum & Hiring - Christine Bullen, Stevens Institute of Technology
NSF CPATH (continued)

Sample from Conference Agenda from 2009 (cont)

- Top 10 "Declassified" Secrets and Community Favorites - Kathleen Pfeiffer and Don Resnik, IBM
- Business Oriented System Infrastructure Development Life Cycle for Enterprise Systems - Min Jiang, Illinois State University
- Mainframe Course Syllabus provided in Tongji University - Jinsong Feng
- Widener University and JP Morgan Experience Developing Large Systems Computing Program - Suk-Chung Yoon, Widener University and Noah Pascarell, JP Morgan Chase
- Undergraduates Exploring Enterprise Systems at Illinois State University - Justin Provost, Phil Maira and Ryan Hull, Illinois State University
- Cloud Computing within the Enterprise - Andrea Greggo, IBM
- IBM Global Technology Outlook - Guru Rao, IBM Research
- Bringing FOSS to Enterprise Computing Systems - The Kuali Project - Andrew Austin, Illinois State University
- Skills demands of the New Age Enterprise IT - Arunn Ramadoss, Micro Focus
NSF CPATH (continued)

Sample from Conference Agenda from 2009 (cont)

- Enterprise Computing is more than just the mainframe - Linda Grigoleit, IBM
- Mainframe 2.0: Changing the way the mainframe is managed forever - Scott Fagen, CA
- Converged Networking for Next Generation Enterprise Data Centers - Casimer DeCusatis, IBM
- Ways to include Enterprise Computing content in current curriculum - Angelo Corridori, Marist College
- Attaining the Next Edge in Data Center Resiliency and Energy Efficiency - Peter Curtis, Power Management Concepts
- Binghamton University Enterprise Computing Program - Merwyn Jones, Director of Linux Technology Center, Binghamton University
Marist College & IBM are jointly building a solution focused on the intersect between Cloud Computing & Education that other public sector entities are trying to duplicate

**The Marist College Cloud Showcase**

**Collaborative Learning**
Sharing knowledge, courses, and experience across the global campus:
- Bluehouse integration
- IBM learning as a service

**SME Economic Growth**
Providing insightful business services to grow the regional SME community
- Data Cloud EBO partner
- Hosting for SME offers

**Connectivity everywhere**

**Application Development**
Delivering open development services to engage the broader technical community
- Eclipse.org partnership
- Reach to business and scholar community

**Real-time information sharing**

**Expandable Cloud Model**
Enabling efficiency with cloud services for public sector:
- Learning (rSmart’s Sakai)
- Healthcare (OpenMRS)
- Disaster Recovery (Sahana)

**Social computing**

**Global impact**

**Cloud Computing**

**Cloud Computing**

**Real-time information sharing**
IBM Academic Initiative

- At a local college or university near you
- Most Higher Ed. Institutions have business development centers
- Ask for a partnership
Knowledge Center

- Usage continues to grow
  - 160 Schools
  - 390 Professors
  - 1,855 Student IDs

- Test Drive Images
  - Planned usage for 3 courses in z/OS cert program
  - 100+ images in place now and growing

- z/VM Images
  - Piloted fall 2008 – Stevens Institute
www.ibm.com

Search Academic Initiative

Search for your favorite school
Where Will You/Your CIO be in 5 Years?

- A Leader in Making Things Happen
  - Skate to where the puck will be – Wayne Gretzky
  - Recognizing the move to Software as a Service
  - Leading the Charge from Assets to Access by developing a multi-faceted IT Service Strategy
  - Position for future managerial challenges through education
  - Partner, Partner, Partner

- Watching Things Happen?
  - Fighting to Maintain the Status Quo
  - We’re Unique! If it’s NIH (not in house) it won’t work!
  - We can’t trust others with our information
  - Keep thinking operational hardware is an investment
    - What can you sell it for?

- Wondering, What Happened?