



Innovation within IBM Development through University Collaborations

**Andy Rindos, Head, RTP CAS &
WW CAS Strategist**

Opportunities for University Partnerships with IBM

Many IBM business units and divisions have dedicated university relations programs to:

- Promote and support collaborative research and educational projects between IBM development & academia
 - Technical vitality/technology transfer/portfolio innovation, proof-of-concepts, real-world testing & evaluation, user profiles development, performance measurements, usability studies, traffic characterization, open-source software development, etc. – as well as curricula development, skills building and K-12 outreach
- Create & maintain an atmosphere conducive to successful recruiting - & facilitate sales
- Integrate IBM hardware and software products into university curriculum/research
- Increase IBM visibility and stature in the community (through publicity, academic publications, community engagements, etc.)

These programs include:

- Numerous **Centers of Advanced Studies (CAS)** – local university relations programs:
 - WebSphere: RTP, Toronto , Ottawa, France; Tivoli: Chicago, Tucson; GBS: HC (Endicott)
- **STG University Alliances; Tivoli and Rational WW University Relations Programs; University Delivery Services (UDS)**

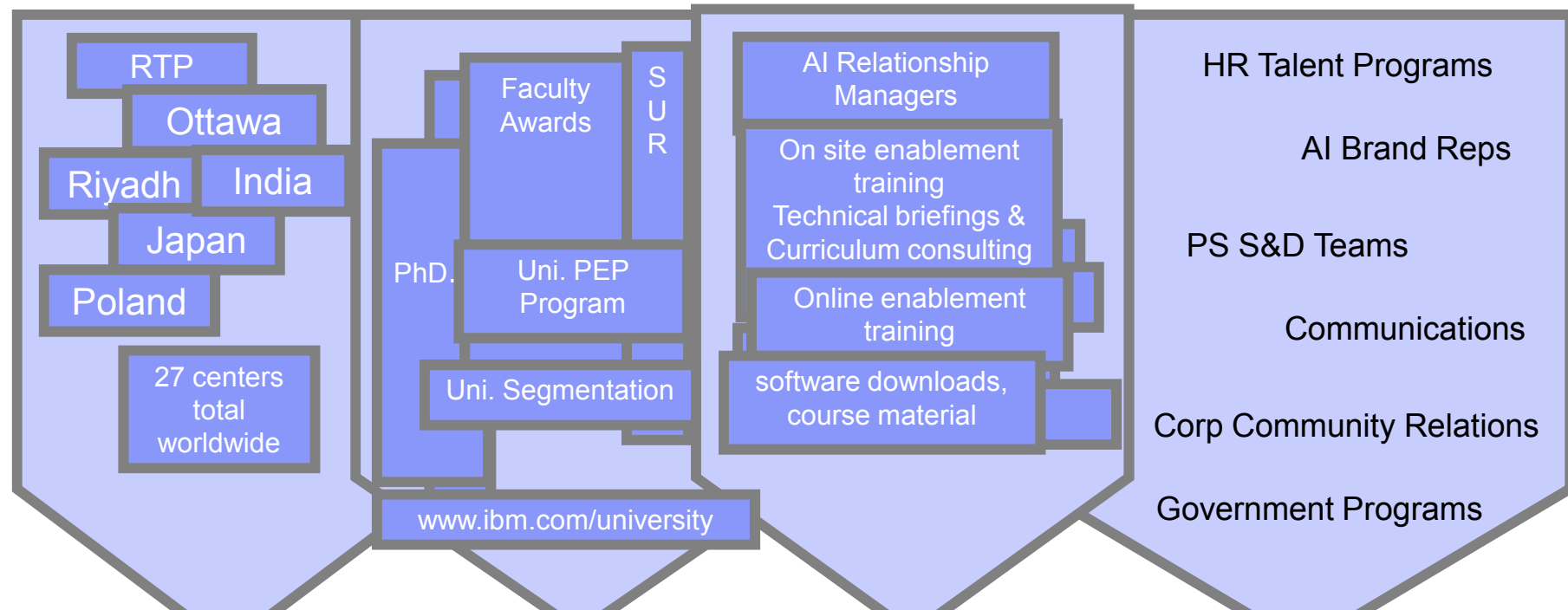
All of these programs utilize the resources of **IBM Global University Programs (GUP)** and the **IBM Academic Initiative (AI)**. In return, they support the agenda of these programs, and sometimes provide (co-)funding .

Additionally, each country (except for the US) has a university relations (UR) country leader and often a UR team. (Note that for many countries, IBM is only represented by services and/or sales.)

Note that BigData and Analytics are top priorities of IBM GUP, AI and many CAS' – reflecting the priorities of IBM development and services generally. Related: Smarter Planet and cloud computing.

IBM Worldwide University Programs: moving towards a seamless virtual organization

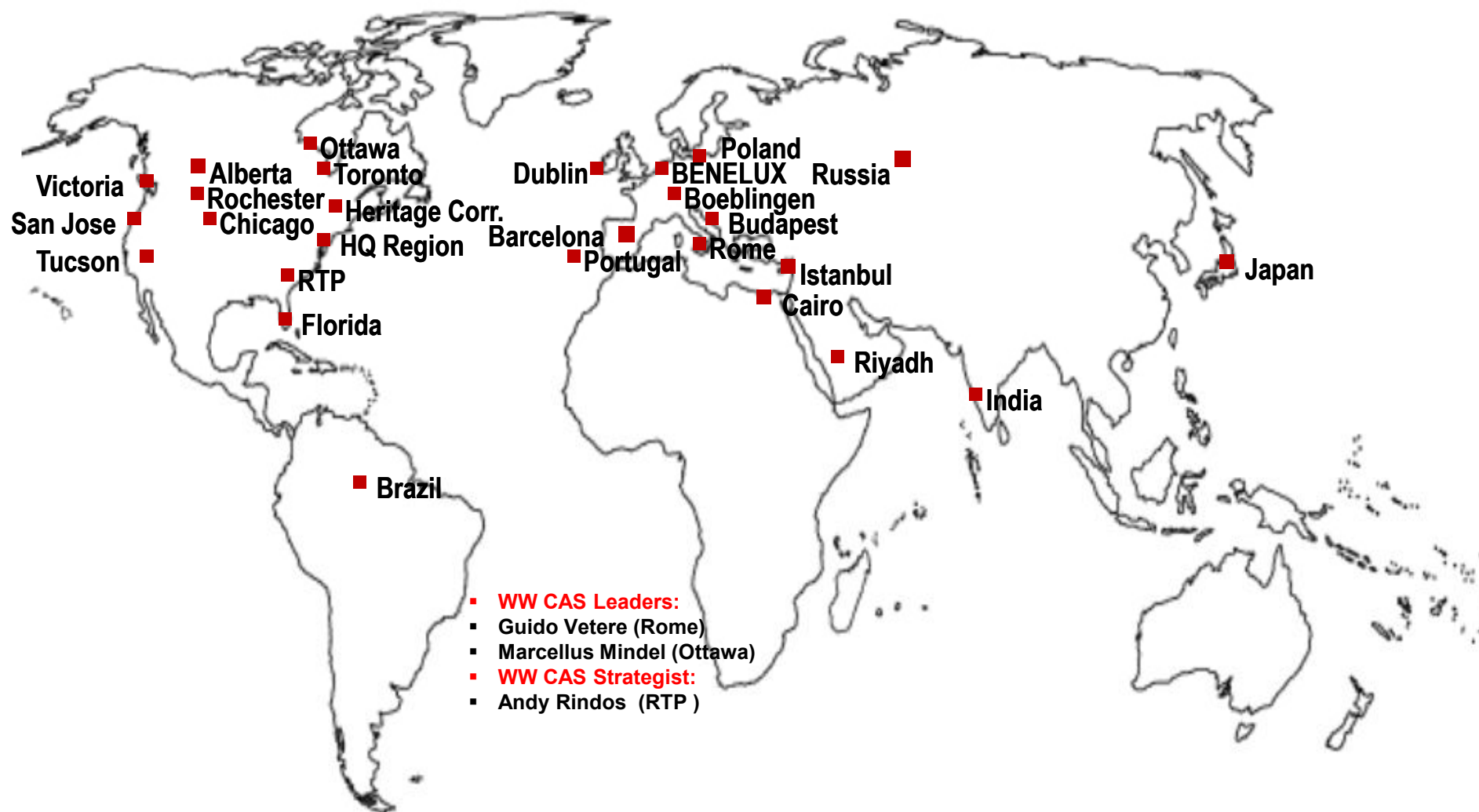
Ctrs. for Advanced Studies Global University Programs Academic Initiative



Worldwide University Programs

CAS is an official corporate university relations program, representing the high-touch local UR mission, with an overall goal of integrating the pillars of UR activities – research (a CAS specialization), recruiting, skills and curricula.

IBM Centers for Advanced Studies



RTP CAS (as an example)

Coordinates university relations for the IBM development and services communities in NC.

Sponsoring execs from SWG, STG, GTS and GBS (plus the state senior exec from NC), each providing an annual funding budget and overseeing a technical advisory board, who meet all quarterly.

Each year, we define a set of research focus areas with a call for proposals. The technical advisory boards vote on submitted proposals to their corresponding business unit, requiring $\frac{3}{4}$ majority approval for funding (usually as Faculty Awards).

2011 funded proposals:

Dynamic Linux Provisioning on z/VM using xCAT and VCL

RDMA Enabled Servers

Development of Cloud Computing Infrastructure to Support Curriculum, Research, Tech Development

Virtual Machine Image Discovery and Distribution via Improved Bittorrent and OLIVE

Towards a Science of Design: Extensible Rational Tools for Pattern Based Software Development

Sensor Electronics for a Smarter Planet

Scalable integration of customer databases

Fault Tolerance and Load Balancing on Cloud Computing Platforms

Representing and Orchestrating Composite Applications in Open Cloud Networks

Data & Visual Analytics for TCR Data Within the IBM Cognos Business Intelligence Unit

Middleware Appliances in Modern Data Centers: Research and Education Issues

Automatic Extraction and Validation of Business Rules from Natural Language Documents

Toward Secure and Privacy-Preserving Data Transfer & Data Analytics in a Health Information Exchange

Onsite Performance Anomaly Diagnosis for Cloud Computing Infrastructures

Integrating Computing into K-12 through the Adventures in Alice programming

The Alice Symposium: A venue for sharing Innovative Alice Ideas

A Deeply Digital Shared Platform for Teaching and Learning in K-12 Education

Inspiring and Aspiring STEM in K-16 through broadening and revolutionizing of VENTURE and VICTORY

Cloud Implementation Challenges, Strategies, and Communications in K-20 Educational Implementation

Giving Communities Accessibility Through VCL Cloud Computing

Project Lead The Way Gateway Summer Academy: Creating a New Breed of Scholars for the 21st Century.

IBM University Day

Over 300 attendees from 36 universities/organizations

Analytics for a Smarter Planet

November 19th, 2010, 9:00 AM - 3:30 PM

at the IBM RTP EAFC. Speakers included

Deepak Advani (VP, Predictive Analytics),

Rod Smith (VP, Emerging Internet Technologies),

Mike Riegel (VP Marketing, ISV & Developer Rels)

plus the chairs/heads of the CSC, ECE,

Statistics/OR, Mgt & CIS depts. of NC State, UNC-

CH, Duke, App State, GSU & UMBC

**Also Workshops for predictive analytics,
appliance programming, mainframe & UDS**

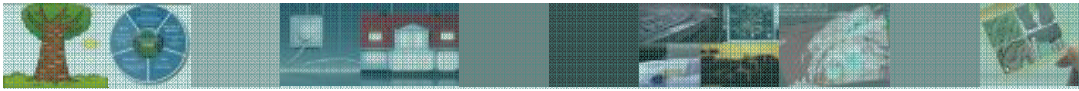


Backroom: The HBCU Cloud Leadership Workshop

**(NCAT, NCCU, TSU, NSU, VA State, Bowie State, Morgan, Prairie View
A&M, Morehouse, Tuskegee, Alabama A&M, Howard, Hampton)**

and the IBM Cloud Academy Birds-of-a-Feather meeting





Information about IBM's Global University Programs: www.ibm.com/university

IBM University Relations: Worldwide - Mozilla Firefox: IBM Edition

File Edit View History Bookmarks Tools Help

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Country/region [select]


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Tools for today. Knowledge for tomorrow.


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Top Stories



[→ Rice University to use IBM supercomputer to advance biomedical research](#)


A smarter planet



Will be instrumented, interconnected, and intelligent.
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Resources for your academic role or function

Faculty	Researchers	Students	IBM customers
<ul style="list-style-type: none">Get product softwareDownload coursewareFind training and tutorials	<ul style="list-style-type: none">IBM ResearchCollaborative ResearchCenters for Adv. Studies	<ul style="list-style-type: none">Get access to toolsPost your resumeBecome a co-op or intern	<ul style="list-style-type: none">Solutions for educationFind qualified studentsShop for IBM products



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Shared University Research Awards (SUR) – Program Overview



Program Overview

- The IBM Shared University Research (SUR) Awards are in the form of equipment, software, services or monetary awards to the university as a whole to promote research in areas of **mutual interest to universities and IBM**. It is not aimed at supporting individuals or a single research project.
- This worldwide program strives to connect the research and researchers at universities with our people in IBM Research, Development, Product Labs, and IBM Services and Solution Centers. In this way, the SUR program is well suited to seed **multi-party collaborations** that include IBM, universities, governments, and other for-profit and non-profit organizations and support a strong ongoing relationship that benefits both the university as well as IBM.
- About 50-70 awards per year worldwide

Program Goals

- **Seed multi-party collaborations** that include IBM, universities, governments, and other for-profit and non-profit organizations
- Increase **collaborative research** with IBM and sharing of university and IBM technologies
- Provide **career opportunities** within IBM for undergraduate, graduate and Ph.D. students.
- Help address **university IT needs** for new technologies, solutions and services

Award Content

IBM Equipment, software, services and/or monetary donations

Audience

Universities with world class, leading researchers who are interested in supporting a strong on-going relationship that benefits both the university as well as IBM to promote research in areas of mutual interest



Faculty Awards (FA) – Program Overview

Program Overview

- The IBM Faculty Award is a monetary award to university faculty members to foster collaboration between researchers at leading universities and those in IBM research, development and services organizations. The awards are selected based on the **global competitiveness** and intended openness of the project. In addition, the program aims at promoting **open courseware and curriculum** innovation to stimulate growth in disciplines and geographies that are strategic to IBM.
- Although the Faculty Awards are not in the form of contracts, we strongly encourage all work to be placed in the public domain, and expect that is the intention of the faculty as well. Though IBM has no right to intellectual property from work completed with award funding, strong collaborations typically result in skills/knowledge transfer, hiring, and future collaborations

Program Goals

- Build long-term collaborative relationships between IBM and faculty to stimulate growth in strategic and exploratory topics
- Promote courseware and curriculum innovation in strategic disciplines and geographies
- Encourage industry adoption of emerging technologies
- Create continuous opportunity to attract and hire exceptional technical and business talent

Award Content

Monetary awards (up to \$40,000 USD)

Audience

Full time faculty at leading universities worldwide



Open Collaborative Research (OCR) Awards – Program Overview



Program Overview

- The Open Collaborative Research (OCR) Awards Program supports strategically important, highly collaborative research projects between IBM and leading universities across a wide range of areas within Computer Science, Engineering, Mathematics and other disciplines where open collaboration would **accelerate innovation** and benefit the world at large and IBM.
- The program promotes the development of open source software, related industry standards and greater interoperability.
- The OCR Awards Program enables multi-year deep collaboration between IBM and university participants and allows faculty to take on new students and obligations.
- Outcomes of collaborations are open—meaning that results are **freely available, and publicly shared—which** provides maximum opportunity for others to build on the results.

Program Goals

- Study highly complex topics that require significant collaboration
- Enable IBM and university participants to forge deep relationships through multi-year collaborations
- Provide collaboration results freely to the public through open source and open standards communities

Award Content

Access to IBM research personnel and/or monetary donations (average of \$100,000 USD) donated for 2 years

Audience

Multiple faculty at leading universities worldwide



PhD Fellowship Program



Goals:

- Build a continuous pipeline to attract and hire exceptional technical talent
- Build long-term collaborative relationships with premier universities and technical faculty
- Promote IBM's image of Technical Leadership

Audience:

- Ph.D. candidates at leading research institutions via the faculty sponsors who nominate them
- Applicants are typically 1-2 years into their Ph.D. program

Content:

- Tuition, variable stipend by Geo, IBM mentor, and optional internship
- Awarded for 9 months; can compete/win each year for up to 3 years

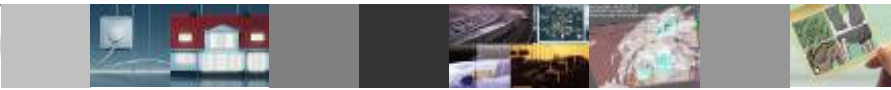
Operation:

- Faculty nominates student – nomination period for 6 weeks Sept/Oct
- IBM review committees assess and rank nominations
- Final slate reviewed and approved by Corporate University Relations

Highly Competitive: IBM Intern experience is a plus for being selected

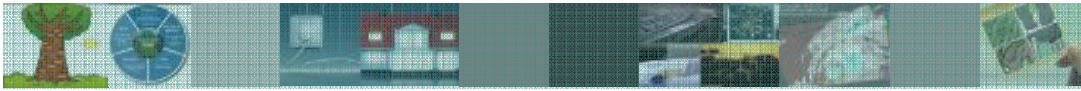
GUP 2012 Priorities (Adaptive)

	PRIORITY AREA	Research	Readiness	Recruiting	Revenue	Responsibility	Regions
	Smarter Cities and Service Innovation, including Global Entrepreneurs - ENTREPRENEURSHIP (Smart Camps & GEP, U-BEES, Students for a Smarter Planet, etc.) - INTERNET OF THINGS (Instrumented, Interconnected, Intelligent) - LIVING LABS (Triple Helix Innovations, Smarter Buildings, Asset Management, CityForward.org) - QUALITY-OF-LIFE (Holistic Modeling (CityOne), STEM Education Pipeline, Jobs & Entrepreneurship)						
	Cloud Computing & Analytics, including Watson Technology - WATSON DEEP-QA (Analytics Skills, Massive Analytics, Stream Computing) - BIG DATA (High Performance Computing, Grand Challenges, Boost University Rankings) - SHARED SERVICE (On-line education, IBM Cloud Academy, IBM Academic Cloud, VCL)						
	Growth Markets - SKILLS GAP (2015 Roadmap requires special focus and emphasis on ramping up global talent) - REGIONAL INNOVATION ECOSYSTEMS (Smarter City Challenge, Universities as Living Labs) - TANDEM AWARDS (connect developed & emerging Twin Towns & Sister Cities to Boost Quality) - ACCELERATING INNOVATION (Bi-Directional Learning' To Be The Best Learn From The Rest)						
	IBM on Campus, including Students for a Smarter Planet & Social Media -- STUDENTS FOR A SMARTER PLANET (Millennials, Social Media, Entrepreneurs) -- ON CAMPUS IBMERS (Checklist for University Relationship Maturity Audit) -- IBM CENTERS (CAS, IIE, University Delivery Centers, Research Collaboratories, etc.) -- ALIGNMENT (IBM Cloud Academy, City Shared Service, Smarter City Challenge, etc.)						
	Events & Ecosystem Alignment - BIG EVENTS (Social Media, Students for a Smarter Planet - SFSP, Entrepreneurs and U-BEE's, etc.) - EXTERNAL STAKEHOLDERS (Professional Associations, National Academies, Science Foundation) - INTERNAL STAKEHOLDERS (S&D, GBS, GTS, STG, SWG, HR, CC&CA, IDR, VC, etc.)						
	Awards Programs - CLASSICS: Shared University Research, Open Collaborative Research, Faculty, PhD Fellowships - SPECIALS: Special Award Programs, Named Awards, Smarter Planet Curriculum Awards - LEVERAGE: Leverage IBM CCC&A with government, foundation, and other external award programs						



Who We Are: Sampling of Our Regional Leads





The IBM Academic Initiative

Our mission

- Partner with academic institutions to better educate millions of students for a smarter planet and more competitive IT workforce

Our offerings

- No-charge access to IBM technology & tools (thousands of software titles)
- No-charge access to course materials and curriculum (hundreds of modules)
- Skills enhancement supported by a worldwide community of IBM volunteers



A SMARTER PLANET

WILL BE INSTRUMENTED, INTERCONNECTED, INTELLIGENT
PEOPLE WANT IT. WE CAN DO IT.



www.ibm.com/academicinitiative



IBM and Croatian university relations

EMEA University relations leader: Diem Ho

Croatian UR leadership in transition (formerly Kresimir Lugaric)

Highlights:

SRCE (University of Zagreb, University Computing Centre) has established one of the first VCL-based clouds in Europe, as well as established the Linux Academy with IBM in 2004

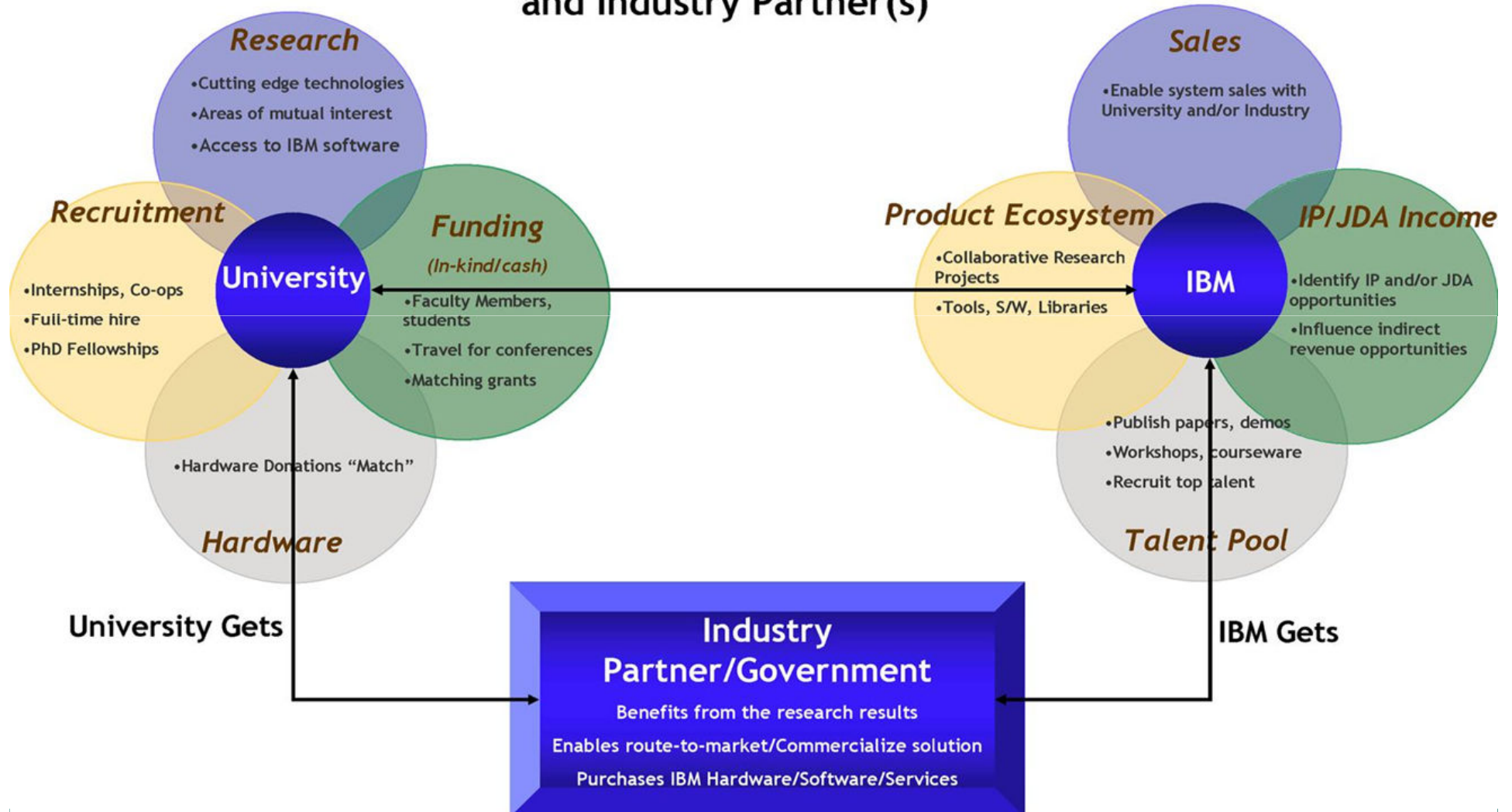
University of Zagreb has received two Faculty Awards and one SUR grant – and won a medal at the IBM sponsored ACM ICPC in 2008.

AI-oriented curricula partnerships with the University of Varazjdin and University of Zagreb.

Institute Rudjer Boskovic and IBM have started joint work on their Data Grid project.

What is a University Alliance?

A win-win-win alliance between IBM, University or Research Institution and Industry Partner(s)



University Delivery Services

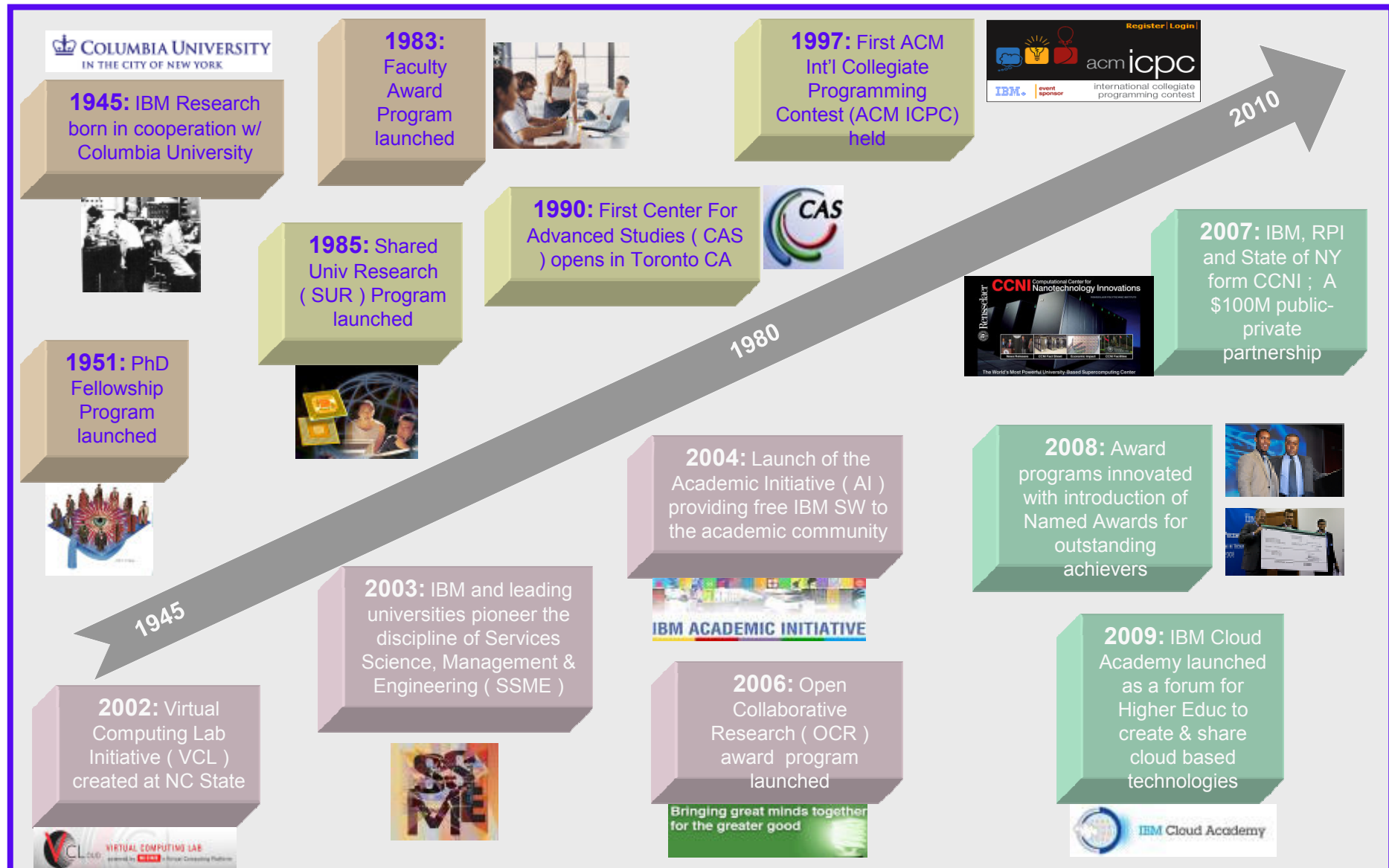
Mission

- University Delivery Services is a program supporting IBM Global Business Services Delivery that provides:
 - dynamically configured resource competencies for new and existing technologies to meet the ever-changing business needs and trends
 - qualified university students, at affordable rates, to perform end-to-end services as part of the delivery team for current IBM contracts
 - a pre-professional hiring pool of skilled junior resources with demonstrated knowledge for IBM and our customer needs
 - a joint method, with our university partners, to enhance student STEM knowledge, at both the university and secondary school levels, of IBM technology, standards and practices
 - a high-touch university recruiting and relations method that works in conjunction with existing practices





Our History: Over 60 Years of Collaborations



What is Cloud Computing?

NIST Definition:

“**Cloud computing** is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (such as networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

More simply, for our purposes here...

A **cloud** can be considered to be a collection of hardware, software and other resources that can be accessed over the Internet, and used to assemble a solution on demand (that is, at the time of the request) to provide a set of services back to the requester.

Services

Hardware as a Service (HaaS) – On demand access to a explicit (specific) computational, storage and networking product and/or equipment configuration possibly at a particular site

Infrastructure as a service (IaaS) – On demand access to user specified hardware, interconnects, and storage capabilities, performance and services which may run on a variety of hardware products

Platform as a Service (PaaS) - On-demand access to user specified combination hypervisors, operating system, and middleware that enables user required applications and services that are running on either HaaS and/or IaaS

Application as a Service (AaaS) - On-demand access to user specified application(s)

Software as a Service (SaaS) - may encompass anything from PaaS through AaaS

Business Processes as a Service (BPaaS)

Cloud as a Service, Security as a Service

VCL: One of the first state education clouds built on IBM technologies



One of the first true clouds ever developed,
specifically designed for education and research

- VCL project planning started in 2002-2003
- NCSU production use started in 2004
- Support for both HPC & non-HPC workloads
- Awards incl. Computerworld Honors Prog. Laureate
- Currently NCSU VCL
 - Open to 40,000+ NCSU student & faculty, as well as 250,000+ in NC
 - 2,000+ Blades in production
 - Delivers over 500,000 CPU hours to general reservations (desktops, sub-clouds, classroom, etc.) annually & over 13,000,000 HPC CPU hours
- VCL sites in US include NC Community College System, many UNC System universities, VA VCL (GMU, ODU, VA Tech, NSU, etc.), GSU, UMBC, MSU, GSU, TSU, Southern, Cal State System, etc.
- User sites outside US include Canada, Japan, China, India, Middle East, Eastern Europe, etc.

A partnership with IBM & others to develop a cloud computing solution specifically targeted for education & research



Substantial support from IBM for VCL development through SURs, CAS Faculty Awards, & BladeCenter / SWG development



WebSphere Technology Institute assisted in the creation of the VCL Apache project



IBM Smart Cloud for Education: VCL solutions include GBS VCL Quickstart Services, etc.



Dr. Mladen Vouk, "the father of VCL"

Professor and Head of Computer Science Department, and Associate Vice-Provost for Information Technology, North Carolina State University, Raleigh, NC

Smarter Classroom through Cloud Computing: The Virtual Computing Lab (VCL) in North Carolina

NC STATE UNIVERSITY

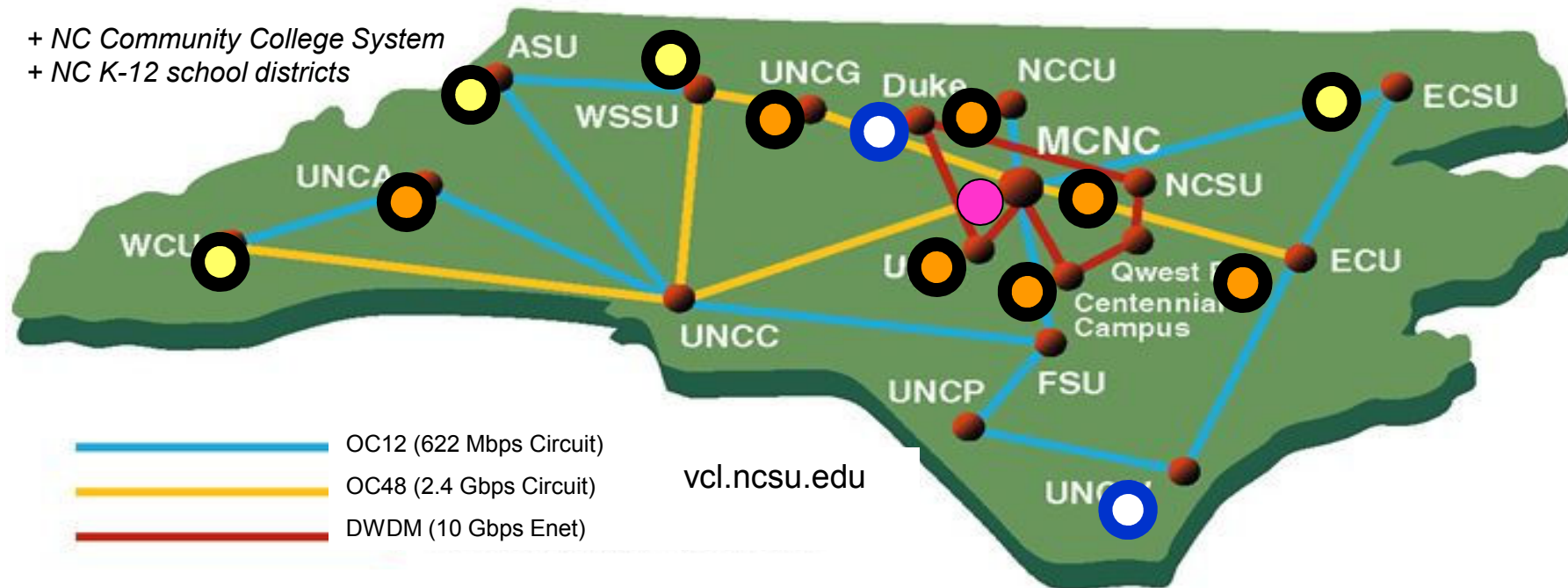


East Carolina University

THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

NCREN3

- + NC Community College System
- + NC K-12 school districts



VCL is a true education cloud computing solution developed by NC State & in production for nearly a decade.

North Carolina Education Cloud

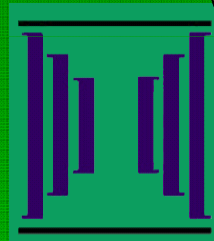
Representing the opportunity for a seamless integration of resources from the state of NC and the IBM Leadership Data Center facilities through cloud computing

Powered by VCL

**NC STATE
UNIVERSITY**



The University
of North Carolina
System



North Carolina Community
College System

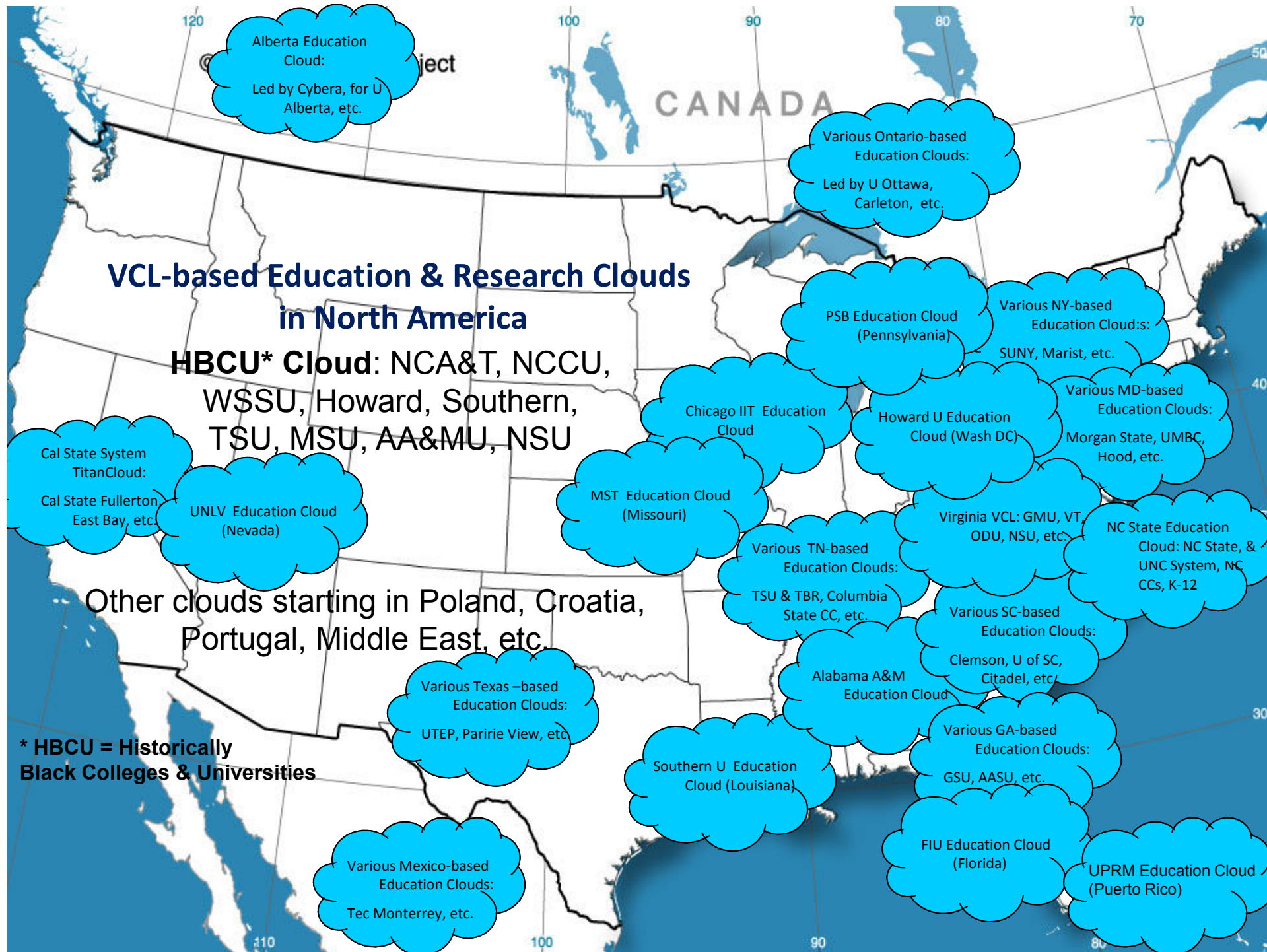
IBM
Leadership Data Center

MCNC

Public Schools of
North Carolina
K-12

*Infrastructure that enables
"Race to the Top"*

Cost-effective, secure and "green" state-wide on-demand delivery and sharing of educational content and state-of-the-art information technology resources and support.

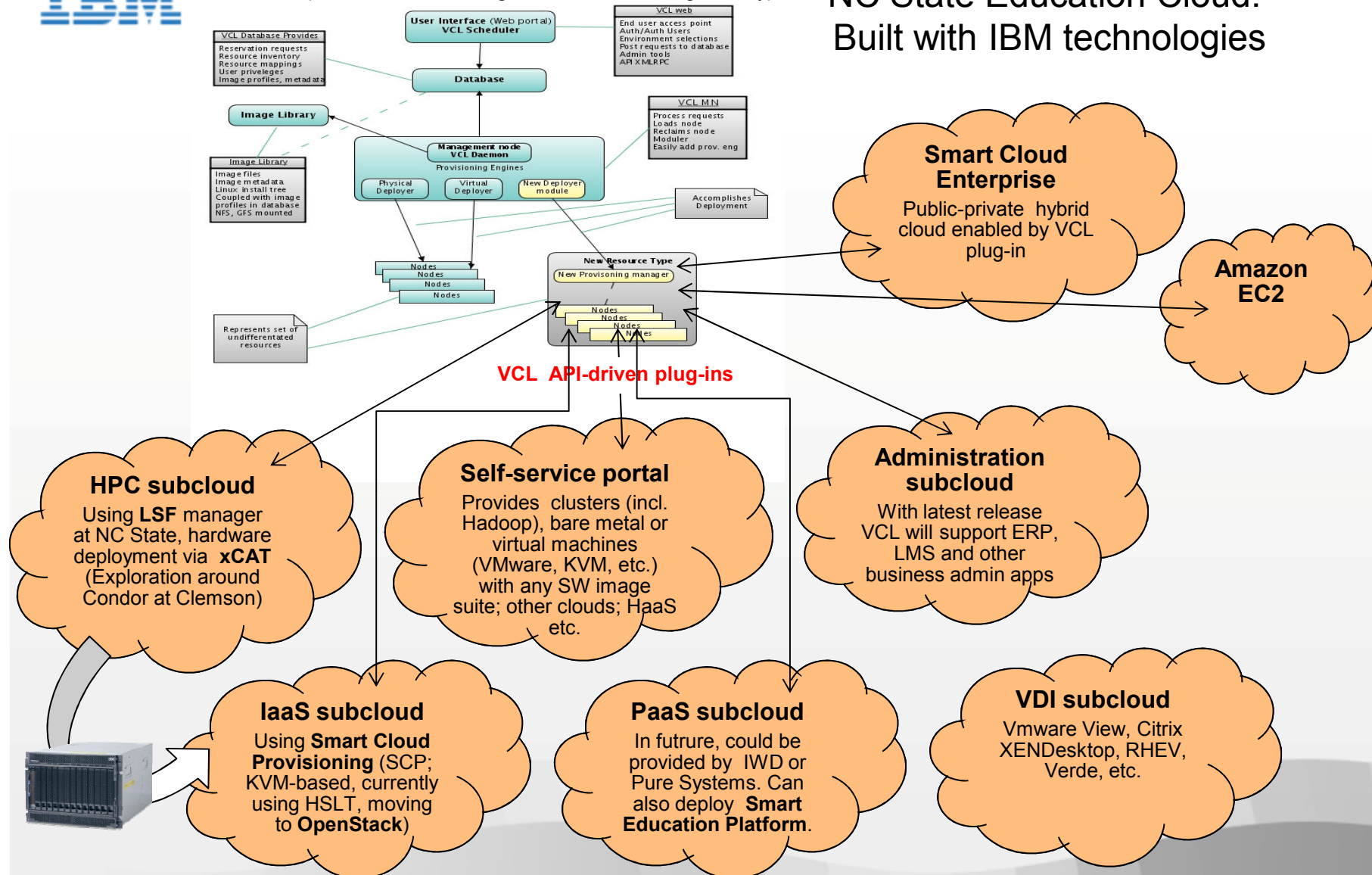




Apache VCL cloud management stack

(code: GUI, db, management daemon, image library)

NC State Education Cloud: Built with IBM technologies





Apache VCL (cloud management stack, with a self-service portal)

HSLT to be replaced by OpenStack, plug-ins from Tivoli CTO. Work begun for IWD

xCAT plug-in (bare metal for all IBM server platforms, most hypervisors)

Native KVM & VMware plug-ins: using Libvirt, can support all hypervisors

SCE, EC2, popular VDI, other plug-ins

Common IBM Cloud Stack

IBM Workload Deployer

Composite patterns integrated with SCP 1Q2012
Advanced orchestration & cloud management in 1H2012

Smart Cloud Provisioning (IaaS)

Image Management

High Scale, Low Touch



HV Shims
Integrated 1Q2012

Deploys to all xSeries, soon enabled for Power and Z
All major hypervisors supported
Work with IBM BlueGene

Server technology: Hardware agnostic, but NC cloud is built on IBM HS2x servers iDataPlex at GSU

VCL code can be installed on BFC, and hopefully soon on PureSystems

Storage technology: NC cloud uses SONAS and StorWize V700 virtual storage

VMware vCenter

VM Control / Director

Xen

KVM

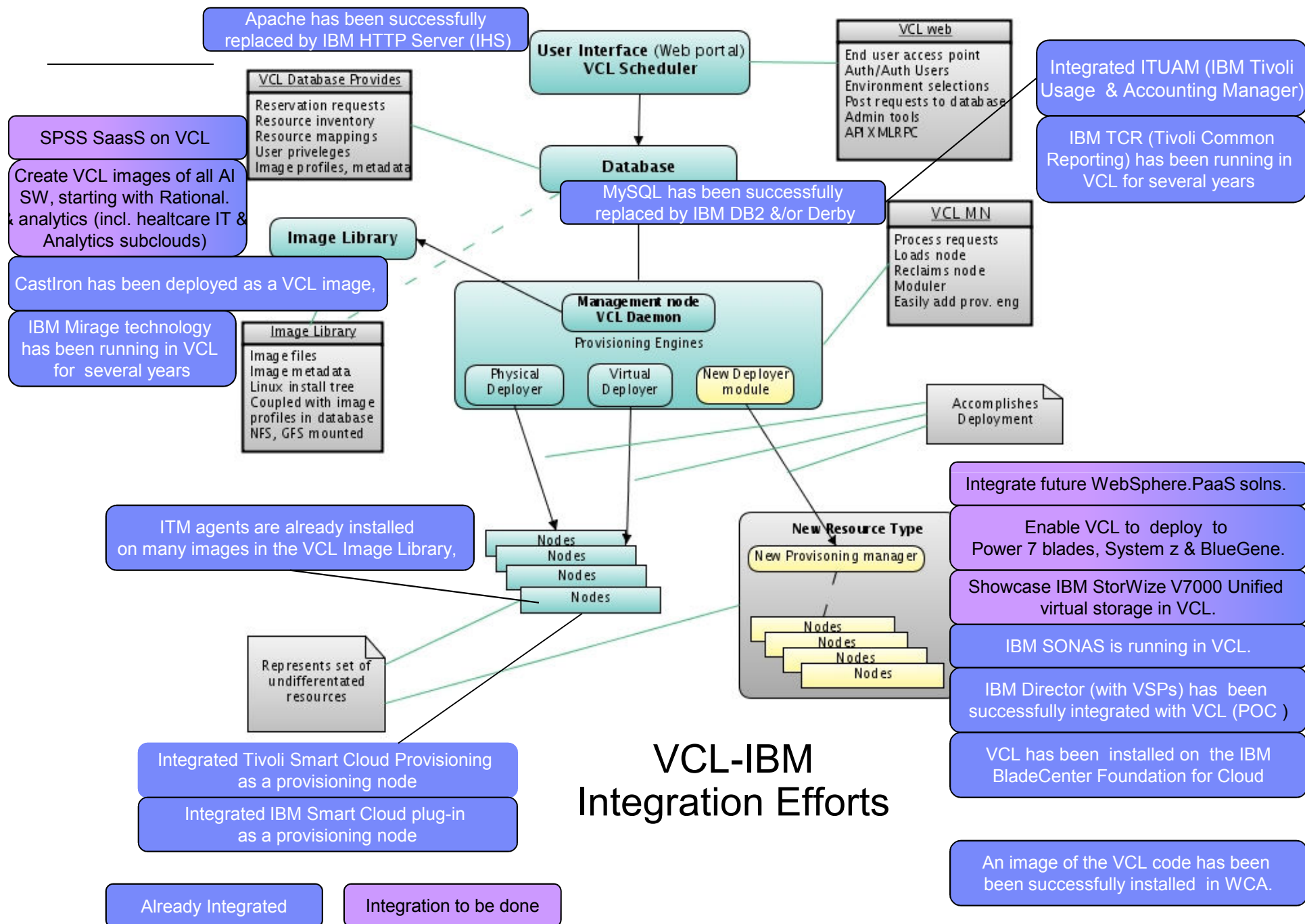
Hyper-V
1Q2012

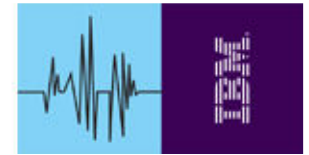
VMware ESXi

z/VM

PowerVM

Cloud architecture for NC VCL 250K users, ~3K servers





IBM SmartCloud for Education

- Apache VCL-based SmartCloud for Education solutions:
 - GBS VCL Quickstart Services in US; Silver Lining (business partner) outside the US
 - Services-integrated blade servers for VCL (including BFC or BladeCenter Foundation for Cloud)
 - IBM Smart Cloud Provisioning (SCP) & other Tivoli products IaaS)
 - API interface to the hosted IBM SmartCloud Enterprise
 - Special SPSS pricing/licensing for VCL users



Coming soon

- Full support of administrative applications (long-term servers, multi-tenancy, persistent sessions, etc.)
- One-click icon-based logon (for iPads or K-12)
- Native KVM plug-in supports Libvirt – and therefore all major hypervisors
- xCat enablement in support of Power & System z (& BlueGene project)
- OpenStack & IWD plug-ins (and PureSystems integration)
- Internet2 community project
- Private cloud equivalent to the Academic Skills Cloud – Rational, analytics, Tivoli, IOC – and WebSphere education programs (around WebSphere Liberty, BPM, WS Commerce, DataPower/appliances, System z)
- SmarterEducation Platform showcase



Opportunities for Partnership

- Apache VCL open source development community:
 - <http://incubator.apache.org/projects/vcl.html>
 - Mailing list vcl-dev@incubator.apache.org ; also vcl-user, vcl-commits
 - Web Site <http://cwiki.apache.org/VCL>
- “VCL bootcamp” at NC State each summer (next will probably be July 2012)
- VCL “Virtual Office Hours” every other Tuesday
- IBM Cloud Academy and ICA CON

Collaborating on transformative models & approaches

IBM Cloud Academy

The mission of the IBM Cloud Academy is to provide an organization for K-12 schools and higher education institutions who are actively integrating cloud technologies into their infrastructures to share best practices in the use of clouds and to collaborate with partners to create innovative cloud technologies and models.

**From IBM Cloud Academy Charter as developed
by initial member institutions, 1Q 2010**

NEW: 1st International IBM Cloud Academy Conference (ICA CON 2012)

1st International
IBM Cloud Academy Conference
ICA CON 2012

Thursday and Friday, April 19 – 20, 2012
Research Triangle Park (RTP),
North Carolina, U.S.

Home Call for papers Chairs and committees Registration Hotels and directions

Call for Papers

We invite submission of papers / presentations or posters on the use of cloud computing for educational and research purposes. Of particular interest will be submissions featuring original research or experience reports that address how the transition to cloud computing is helping to transform education. The latter is intended to facilitate the sharing of best practices with real-world examples illustrating improvements in quality.

Call for papers

Papers / presentations proposals on the implementation and research issues associated with the virtualization technology, management and security policies and user applications that underlie or utilize solutions like the Virtual Computing Lab and SPSS Decision Management for Education are also encouraged, as here is a significant interest in these areas within the academy presently.

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E-mail us

Over 350 attendees from 50+ universities and a dozen countries.

http://www.ibm.com/solutions/education/cloudacademy/us/en/cloud_academy_conference.html



An Invitation to be a v-Partner on NC State's ...

"v-Centennial Campus for a Smarter Planet"

Proposed Engagements

- Research and Lab (**Watson outpost**)
- Education Innovation
(**"AI based, "Ms. BTEC-Watson", ...**)
- Small/Smart City Test Bed
(**v-BTEC, v-FREEDM**)
- "Briefing Center"
- Other ...
- Big-data Analytics
- Visualization
- Healthcare
- Hybrid Cloud Computing
(**ngVCL, facilities as a service, ...**)
- Energy and Environment
- Interoperability, and Interfaces ...
- Other ...