How Big-Web and DevOps Changes Academic Programs in System Administration

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برعاية معالي مدير
الدكتور خالد بن سعد المقرن
علوم الحاسب و المعلومات
اتفاقيات الشراكة
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حفل تخريج الدفعة الرابعة من طلاب الجامعة


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Agenda

- The world is changing, how should we teach the next generation of system administrators?
- What are some of the influences on the curriculum?
- What should be some of the topics and technologies in our new curriculum?
- What have we done at RIT?

Why Should our Curriculum Change?

- Because jobs are changing?
- Because technology is changing?
- We are getting bored teaching the same old, same old?
- Underlying abstractions are changing?
- Why now?

How are we different from Industry

- Ratio of experienced instructors reversed
- Need to reserve time for research and scholarship
- Different relationship with our organizations
- Outsiders looking in
- Lack of owned hardware to support a class of 30
- Need to share hardware with multiple sections and classes
- Ours is only one of the classes students take

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Reply Reply All Forward

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Total Customer [totalcustomer@go.terrapinn.com]

To: Charles Border

Tuesday, November 05, 2013 5:22 AM

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What should the goal of our curriculum be?

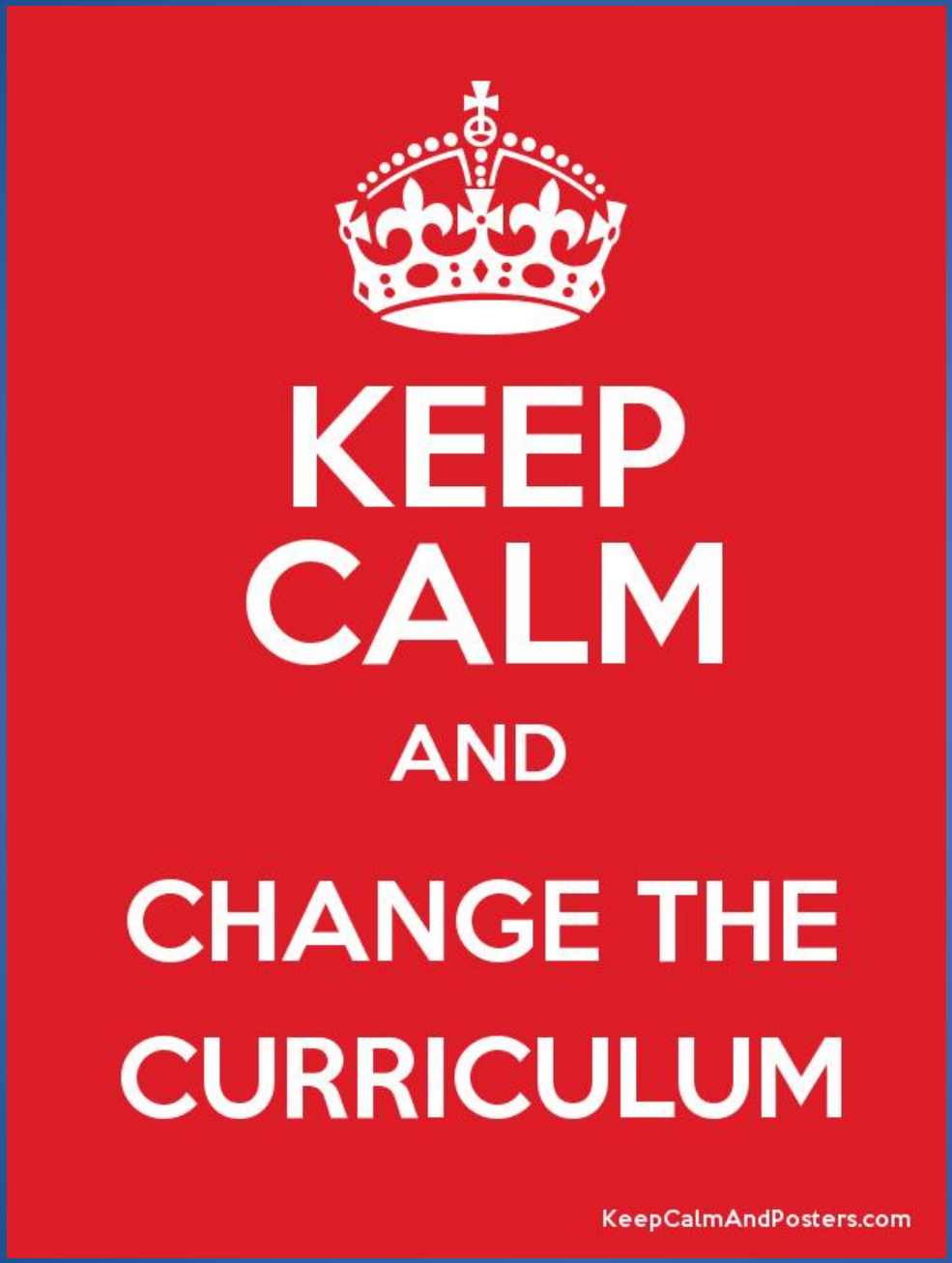
- Training so industry does not have to?
- Prepare our students to be billable on day one?
- Make our students happy?
- Enhance the university enrollment so we make our deans happy?
- Serve the greater good by helping more people to participate in the Internet revolution.
- Provide education in the basic underlying technologies that will allow students to build a long-term career?

Changes to the Fundamental Abstractions

- Rockwood's IT Paradigm Shifts:
- Virtualization stops being about consolidation and begins enabling:
  - Self-service, automated, infrastructure without bare metal
  - HPC becomes less interesting
  - Role of the OS changes
  - Broad platform standardization becomes realistic

Changes to the Fundamental Abstractions

- Scale of operations
  - Need for automation
- Expectation from users of post sale support
  - Change from shrink wrapped to constantly updated software
- Availability of computational capacity
- Cost of capital relative to labor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What should we change to?

- What are the outcomes that our students should experience as a result of their educational experience?
- What projects should our students be able to **do**?
- We can't **do** industry scale projects?
- So what proof of concept projects can we **do**?

Is it time for a new name?

- Operations
- Computer Operations
- Systems Engineering
- Web Systems and Engineering

Environment We are Working in

- More demands for external funding and research
- Enrollments basically flat
- Desire to recruit more women and ALAANA Students
- More outreach
- More, more, and more

UNDERLYING CONCEPTS

Workload Characterization

- Architecture matches workload
- Operations management
- TCP/IP
- Lots of HTTP and HTTPS
- Packet captures

Comparative Virtualization Architectures

- Software architectures determine what software can do
- We should not become a VMWare, Xen or HyperV shop
- Tradeoff: if you standardize, life is easier, but not as educational

Comparative Cloud Architectures

- Free time available on all the major clouds
- Student need to see the cloud as just another architecture
- Workload determines architecture
- Cloud enabling technologies:
  - segregation of services/multi-system architectures,
  - workload characterization,
  - identity federation,
  - load balancing,
  - content distribution networks.

Infrastructure Automation

- Scripting: making changes on one machine
- Infrastructure automation: making changes on more than one machine
- Standardization issue, again

Agile development methodologies

- How can we model this in the curriculum?
- Projects that don’t start from scratch
- Projects that involve other groups
- Projects that involve distant groups

System and Enterprise Security

- Students love security (not sure why)
- Security is different in the cloud (more GRC and audit stuff)
- Hack of the day
- Teaching security by teaching hacking
  - Learn to defend, not learn to hack
- What to do with this might be a good conversation starter at LISA

Enterprise Systems Architectures

- Architecture fits the workload
- Role of load balancers
- Database architectures

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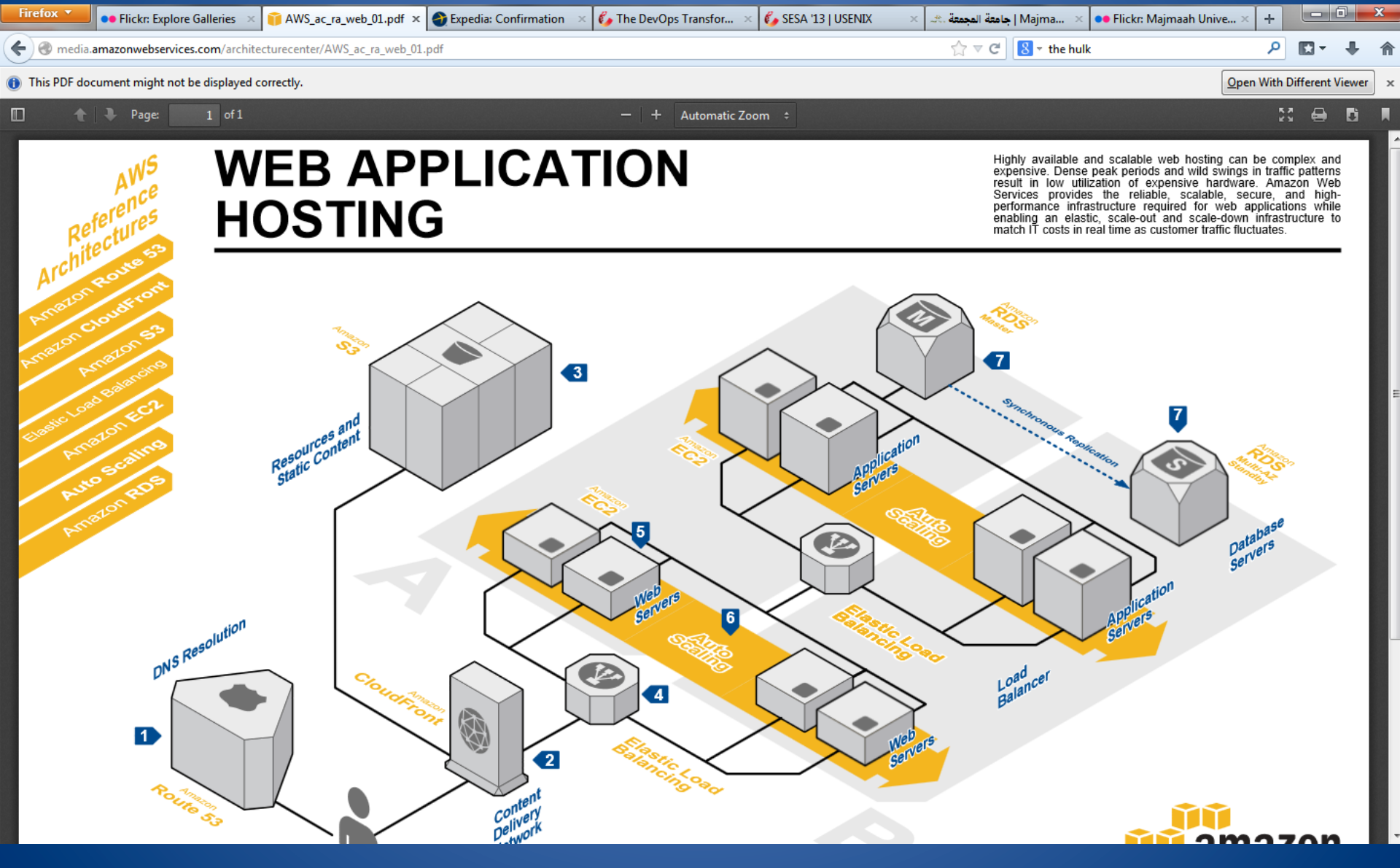

Pervading the curriculum

- Learn by doing
  - Lots of projects
  - Everybody programs
- Develop capacity in such soft skills as:
  - team leadership,
  - oral and written communications,
  - project management,
  - engineering best practices

Renaming Courses

Number	Current Name	New Name
101	NSA Themes	??
102	Computer Systems Concepts	??
220	Introduction to Scripting	Task Automation Using Interpretive Languages
221	Systems Administration I	End User Services and Security
241	Networking I	LAN Switching and Internetworking
242	Networking II	Wireless Networking
245	Network Services	Infrastructure Services and Security
320	Advanced Scripting	Configuration Management

Renaming Courses

Number	Current Name	New Name
322	Systems Administration II	Enterprise Cloud Computing and Security
341	VoIP and Unified Communications I	Real Time Data and IP Telephony
342	VoIP and Unified Communications II	Network Provisioning for Unified Communications
426	System Design and Deployment	??
441	Advanced Routing and Switching	Scalable Routing and Switching
445	Wireless Sensor and Ad-Hoc Networks	Mobile Ad-Hoc and Sensor Networks

New Courses

- 425 Data Center Operations
- 426 System Design and Deployment
- 602 Enterprise Computing
- 710 Network Management
- 712 Advanced Storage Architectures
- 713 Enterprise Service Provisioning
- 715 Network Design and Performance

Questions?