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NC Education Cloud Work Plan

NC Education Cloud Team
August 11, 2011

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Introduction

This report outlines a plan for the deployment of the NC Education Cloud (NCEdCloud) program as specified in the NC Race to the Top grant funded by the US Department of Education. The plan supports the detailed scope of work approved by the US Department of Education in January 2011.

The primary objective of the NCEdCloud is to provide a world-class IT infrastructure as a foundational component of the NC education enterprise. Moreover, the NCEdCloud will provide for:

- Equity of access to server and storage resources;
- Efficient scaling according to aggregate NC K-12 usage requirements;
- Consistently high availability, reliability and performance;
- A common infrastructure platform to support emerging instructional and data systems;
- Sustainable and predictable operational model.

As such the NCEdCloud will facilitate migration from LEA-hosted server infrastructure to provider-hosted application and infrastructure services. Through a dedicated support organization with supporting procurement, management and infrastructure services, we convert from a decades-old inequitable and locally constrained technology support environment to a contemporary and consistent education enterprise solution.

Background

In developing this plan, the NC Education Cloud project team based its work on collaboration and planning methodology proven out in the School Connectivity Initiative (SCI). The team conducted site surveys and interviews with all 115 North Carolina Local Education Agencies (LEAs) and 9 Charter Schools, interviewed representatives from states that have adopted cloud services in state level deployments, discussed E-rate consortium possibilities with peer state and Federal Communications Commission (FCC) leaders, and conducted live request for information sessions with nearly 20 private sector service providers and vendors. Through this due diligence process we explored cloud-related considerations, including:

- A range of representative cloud platform architectures
- Opportunity to leverage public-private partnerships
- Best practice operating principles of regional and statewide support models
- Support for regional consortia
- The most cloud-ready applications and services
- E-rate support considerations
- Local LEA support models
- State agency (e.g., NCDPI and NCITS) support and services
- Sustainable financial models

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Informed by our comprehensive planning and diligence process, we offer an operating and execution plan in the sections that follow. The remainder of the plan includes an *Executive Summary* followed by a detailed description of the five primary operating strategies. Appendices provide supporting data and detailed findings collected during the development of the plan.

NC Education Cloud Executive Summary

The NC Education Cloud program builds upon the foundation of the NC School Connectivity Initiative (SCI) – with reliable, high bandwidth, scalable network connections to each school enabling the option of moving IT infrastructure and support outside the school and district domain – and into the *cloud*. The option of transitioning enterprise IT services to the cloud allows LEAs to:

- Gain cost advantages of consortium buying of common services;
- Deliver anywhere, anytime, access to education resources;
- Refocus limited technical support resources on instruction;
- Realize efficiencies of contemporary IT technologies more rapidly.

A *cloud-enabled* LEA provides for an optimal combination of applications and services hosted in the cloud with local network, file, domain, and directory services. The details of an optimal combination of local and cloud-hosted infrastructure are tied to contracts, local capacity, local Board policies, and related LEA requirements and constraints.

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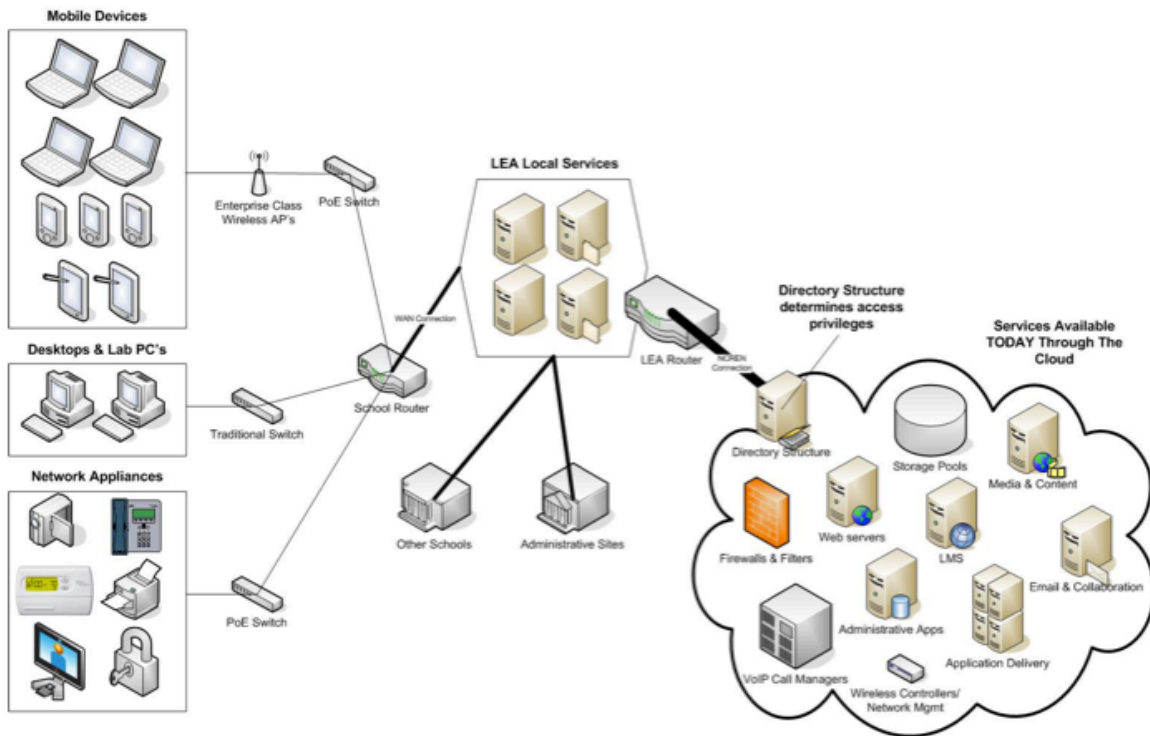


Figure 1. A Cloud-enabled LEA

Site Surveys

The NCECloud team developed a 300-plus question online survey to capture technical details of LEA IT infrastructure, costs, service models, and vision on the role of technology as it relates to operational and instructional goals within the school district. We couple the survey with an onsite interview process intended to validate the fact-based responses and to dig into the more subjective elements of the survey. The final element of the planning support methodology includes advisory and working groups that set priorities and dive into the details of the cloud services and platforms that rise to the top in our LEA survey and interview process.

Service Opportunities

Informed by survey data, site interviews, provider, and stakeholder discussions we have identified a superset of cloud service opportunities and providers. In the commercial cloud marketplace services can be grouped into application, enterprise, and network categories. In general, services that are candidates for inclusion in the NCECloud meet the following requirements:

- A substantial number of LEAs could benefit from (and are interested in) the service

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- A substantial number of providers exist that would materially compete to provide the service
- It is practically feasible to migrate LEAs to and sustain the service.

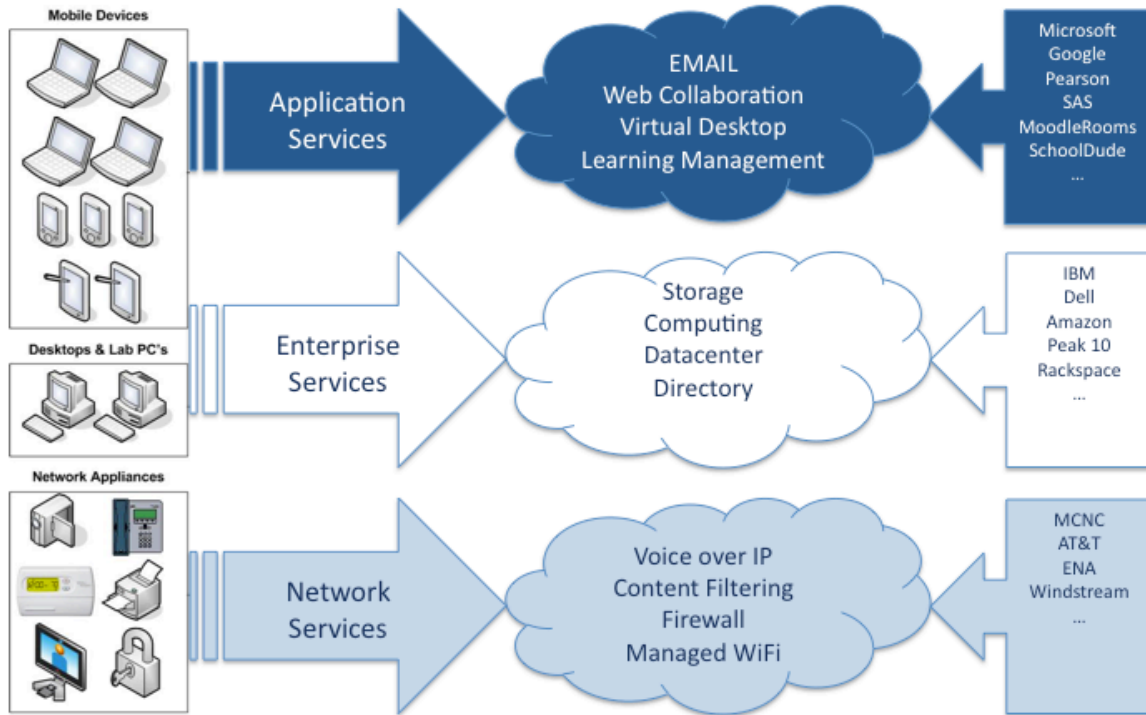


Figure 2. Cloud Service Candidates

Leveraging E-rate

In the graphic representation of NCeCloud service candidates above, it is worth noting that EMAIL, Voice over IP, content filtering, and Firewall cloud services are all priority-1 e-Rate eligible services. That is to say, LEAs may apply (or join a consortium that applies) for federal e-Rate discounts (of up to 90%) if these services are procured via a competitive bidding process and within e-Rate policy guidelines. It is possible that some services not e-Rate eligible today will be deemed eligible in future filing years. While e-Rate eligibility alone does not justify migration to a cloud service, it does provide a compelling cost benefit in many cases.

Supporting Statewide Systems

The NCeCloud program also addresses the provision of shared infrastructure services supporting the Race to the Top instructional improvement system (IIS) and professional development system (PDS). These systems require content management, identity management, and data management services and interfaces. Further the IIS and PDS represent an important trend of bringing together data, content, and analytics in support of more contemporary and progressive instructional delivery and support systems. In

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order to foster a competitive marketplace and a sustainable environment for the IIS, PDS, and related systems, the NCEdCloud team proposes the deployment of state-wide shared infrastructure platforms that integrate and provide common data and content interfaces to LEA and provider systems alike. LEA IT platforms can be categorized into systems supporting one or more of the following:

- Learning and instructional systems
- IT enterprise
- Business operations

Contemporary instructional support systems such as the NC IIS and PDS integrate across business, enterprise, and learning systems. In the current NCDPI and LEA environment, each individual instructional application and system includes its own data, content, and identity mechanisms. This duplication of these “behind the curtain” mechanisms creates a perpetual and costly integration problem across systems that share data and content. The NCEdCloud team is developing an architecture that provides standard learning management, identity, content, and data management interfaces and services in order to simplify connecting provider solutions to the data and the content. These *Shared Learning Infrastructure* elements enable and support the integration of data and content into individualized instructional improvement and support applications that comprise the Instructional Improvement System. The result is the elimination of duplicate spending, the avoidance of inconsistent views of data and content, and a healthy market environment that encourages, facilitates and supports provider competition.

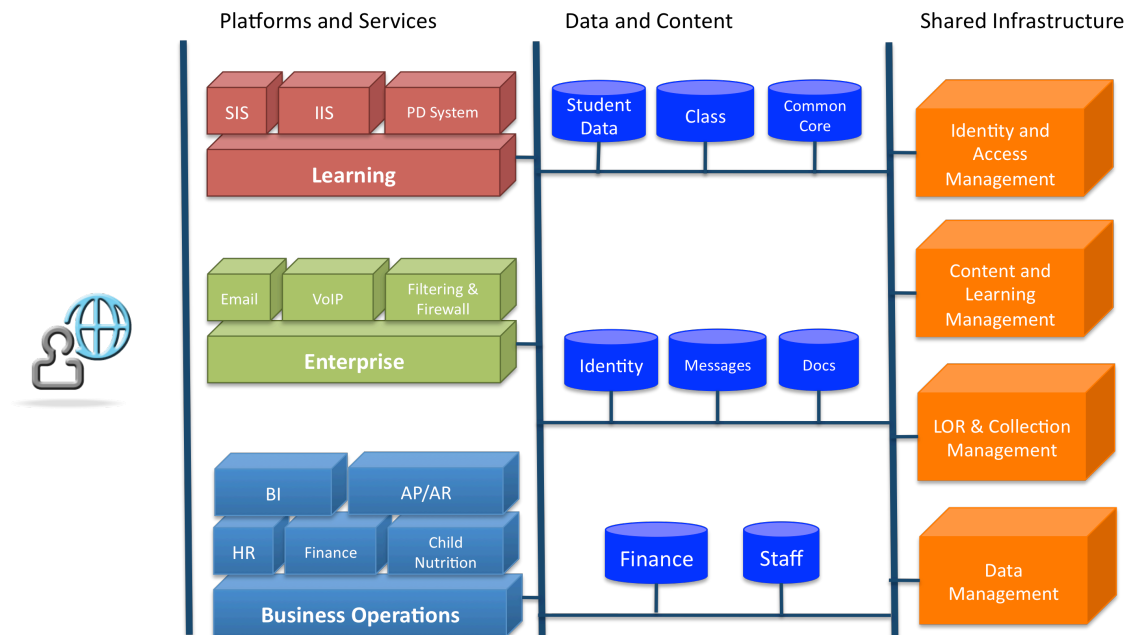


Figure 2. Shared Infrastructure Platform

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Goals

To address the needs identified above, the NCEdCloud endeavors to accelerate the local education agency and school adoption of contemporary learning management and instructional strategies by incorporating modern IT services and strategies while leveraging the scale of the public education enterprise. To that end, this operating plan is focused on four primary goals – as specified in the NC Education Cloud detailed scope of work – namely:

1. Increase IT reliability
 - All servers hosted in data centers with reliable and resilient power, cooling, and network.
 - Data backed up and distributed across at least 2 data centers
 - All server infrastructure secured physically and logically
2. Increase IT efficiency
 - Leverage server virtualization to deploy logical servers
 - Provide shared server deployments to support common LEA services across LEAs
 - Automatically scale server and storage resources to meet demand.
3. Decrease aggregate (state-wide) cost
 - Procure infrastructure as a service
 - Pay based on usage where feasible and appropriate
4. Increase the number of LEA technical staff supporting instruction
 - Transition LEA server hosting and management to cloud providers

Guiding Principles

To achieve these goals, the NCEdCloud team has created a plan based on a set of guiding principles aligned with contemporary IT best practices and the *Education Technology Master Plan*¹ developed for NCDPI by Gartner - Including:

- Buy software and application services in lieu of building infrastructure
- Avoid custom development and non-standard interfaces
- Embrace data and content standards
- Decouple content and data from access systems and tools to the greatest extent possible
- Provide NCEdCloud services to all NC LEAs and Charter Schools on an opt-in basis
- Migrate LEAs to NCEdCloud services over a 2-3 year period based on readiness, existing LEA contract obligations, and practical deployment considerations
- Conduct site interviews in Q3 Calendar Year 2011 to provide comprehensive baseline LEA data

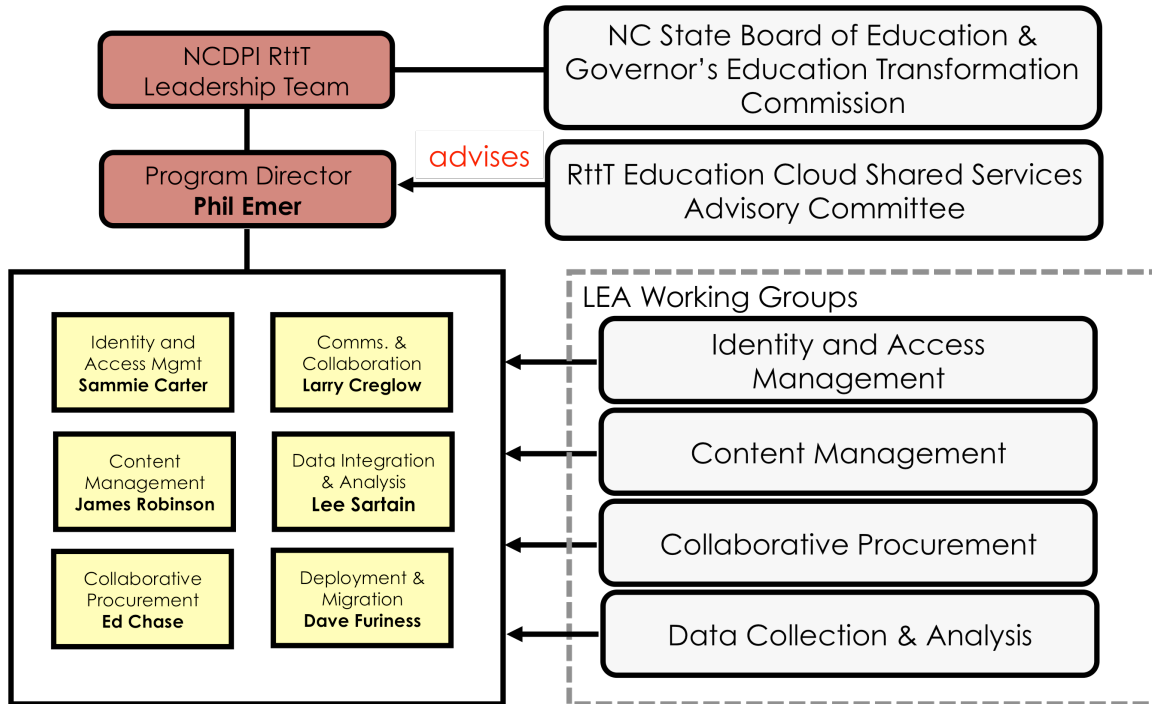
¹ Final report dated 16 December 2008 Gartner Engagement: 222073430

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- Meet recurring costs associated with NCEdCloud services via a combination of existing State (school connectivity) and local funds
- Establish a sustainable support model for the NCEdCloud.

Methodology and Organization

The NCEdCloud program team comprises a program director, project leads, oversight, advisory, and working group structures, as illustrated below.



The NC State Board of Education and Governor's Education Transformation Commission provide overarching RttT governance and oversight, respectively.² The NCEdCloud program director is accountable to the RttT leadership team and is tasked with overall management of the NC Education Cloud program planning and execution. An advisory committee of 16 LEA leaders (two from each region) provides guidance to the program director and the NCEdCloud team in general. Subject matter experts in cloud project areas are responsible for developing and executing on individual project plans. These project leads facilitate an LEA working group to ensure that the resulting services align with the needs of the LEAs. Working groups are seen as temporary structures that will be created as cloud opportunities are identified. The Cloud Shared Services Advisory Committee is seen as a standing committee that will be part of a sustaining NCEdCloud organization.

² The Office of State Budget Management and the Enterprise Project Management Office of the NC State CIO also provide operational oversight per NC statute.

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Findings

Through the course of LEA site interviews we have collected volumes of specific infrastructure, application, cost, and service management data. We summarize high level findings and observations here.

| General LEA Challenges | LEA Concerns w/ NC Education Cloud | Beneficial NC Education Cloud Services | Other Observations |
|--|--|---|--|
| Professional development | Recognizing the high cost of change (funding, resources, PD) | Identity Management | LEAs leveraging web-hosting solution (eChalk, etc.) as an LMS/content management system. “One-stop shop” for teachers – acts as a portal |
| Quantity and/or age of client devices (Technology Refresh) | Consistency/stability/continuity of funding | Internet filter, spam/malware protection | Identity Management for instructional platforms is cumbersome and time consuming |
| Portfolio management/technology governance | Service security and reliability, data ownership | Digital content (eBooks, video streaming, etc.) | Majority of LEA expenditures related to integrated learning systems - significant debate regarding their effectiveness |
| Tech and ITF Ratios | Decoupling integrated LEA systems | Consortium buying | 100% On-line testing presents a significant challenge and may be impossible |

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Strategies

The NCedCloud team has identified five manageable strategies for accomplishing the NCedCloud goals. These key strategies reflect significant review by the Cloud Team and vetting process with many stakeholders, including the LEAs, NCDPI, the NC e-Learning Commission, and other state peer technical and e-Rate leaders across the country. This list of five strategies narrows the operating plan to a manageable scope, but the detailed programs and actions that support the strategies are comprehensive and not neatly packaged into five buckets. To meet and exceed the identified goals, NCedCloud will:

1. Transition LEA infrastructure to a cloud-centric **IT Enterprise** service model that includes:
 - A total cost of ownership decision support system;
 - State convenience contracts for enterprise cloud service offerings;
 - Consortia-based competitive procurements and related e-rate filings for managed Email, voice over IP, content filtering and other candidate services.
2. Deploy an NC **shared learning infrastructure** that includes:
 - Identity and access management;
 - A learning object repository and collections management system;
 - Data management tools (operational data store).
3. Modernize statewide **business operations** systems by:
 - Conducting a business process review;
 - Deploying a shared infrastructure as a service model aggregating compute, storage, software, and support elements of LEA-hosted i-Series/AS400 equipment;
 - Updating core HR and financial systems to support modern data integration and services models.
4. Form a **dedicated NCedCloud support organization** (identified for e-Rate purposes as an “education service agency”) and support network that:
 - Supports LEA shared service procurement, provisioning, and support;
 - Is governed jointly by the State and LEA stakeholder community;
 - Meets FCC e-Rate guidelines.
5. Initiate a **digital inclusion** model to address anywhere any time access to the Shared Learning Infrastructure platform.

In the sections that follow, we provide more detailed descriptions of each of the five strategies, including specific actions and deliverables. The NCedCloud team will develop specific execution plans as needed for individual projects contained within these strategies.

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IT Enterprise

The NCEdCloud will provide LEAs with service-based alternatives to local hosting and administration of server and network appliance infrastructure. Site surveys provide data related to specific infrastructure deployments, support, and funding models across NC LEAs. It is clear from the summary survey data that Email, VoIP, AS400/i-Series³, and content filtering represent ripe opportunities for migration to cloud service models. It is also clear from summary data that LEAs spend substantial resources on learning applications and content licensing, though the details around service-based alternatives are less clear and require further investigation – particularly, to understand the relationship between these application and content solutions and emerging instructional improvement system functions and services.

In order to move on service migrations, we must analyze and organize the survey data to support total cost of ownership modeling; create process and organization to support collaborative procurement and shared funding; and, manage competitive procurements around individual and/or bundled opportunities. Specific actions include:

- Process and analyze the data from surveys and interviews
- Identify missing elements of data collection & survey process
- Develop a strategy for continuous collection of data required to support cloud decision-making, and total cost of ownership analysis
- Integrate survey data with AMTR data collection process
- Establish vetting process for collaborative procurement opportunities
- Create a blueprint for K12 enterprise in-the-cloud
- Identify districts for opt-in cloud email services consortium
- Develop cloud-based email competitive procurement and e-rate filing
- Identify districts for opt-in VoIP services consortium
- Develop cloud-based VoIP competitive procurement and e-rate filing
- Develop migration plans for Email and VoIP services

Deliverables

| WHAT | WHEN | COORDINATOR |
|-----------------------------------|-------------|--------------------|
| Survey summary analysis | 10/1/2011 | Courtney Ziefle |
| Integrated AMTR/TCO data system | 12/31/2011 | Courtney Ziefle |
| Enterprise in-the-cloud blueprint | 10/1/2011 | Dave Furiness |
| Email consortium filing (470) | 12/1/2011 | Ed Chase |
| VoIP consortium filing (470) | 12/1/2011 | Ed Chase |

³ We include AS400/i-Series work as part of the *Business Operations* strategy since that infrastructure hosts NCDPI budget and HR applications in addition to local finance and payroll systems.

NC Shared Learning Infrastructure

During Race to the Top proposal development, we identified requirements for content, learning, and identity management platforms in support of planned instructional and professional development systems. Through the site interview process, we have validated our early assumptions and identified complimentary requirements for a data management platform. At the same time on the national stage the Gates and Carnegie foundations have partnered through the Council of Chief State School Officers (CCSSO) to support and fund a multi-state collaboration to develop and deploy a national level shared learning infrastructure (SLI). The CCSSO SLI work comprises content and data standards; content, data, and identity management infrastructure; a core set of “built-in” applications that leverage the content and data management infrastructure; and, application interfaces supporting third-party development and integration with the SLI.

We refer to the NCEdCloud content, data, and identity management work as the NC SLI since it is aligned with the national SLI conceptualized by Gates Et al. SLI work in general supports standards and middleware infrastructure as a platform for teacher, student, and parent facing applications and services. These applications and services include curricular content, assessments, collaboration tools, education analytics and related learner-focused instructional support tools. It is important to note that in North Carolina, the NC WISE student information system (SIS) platform and its deployment specifics are tightly coupled with both the shared learning infrastructure and the instructional improvement system work. Furthermore, consolidation in the education software industry is driving focus toward IIS application suites with SIS functions embedded within the IIS suite. This consolidation demands that we pay careful attention to the details surrounding the IIS, the SLI, and NC WISE as decisions made for one will have lasting implications for all. Specific SLI actions include:

- Develop architecture and plan for LEA-facing Identity and Access Management service
- Provide identity management requirements and architectural input to Gates-Carnegie SLI team
- Document technical specifications for provider interfaces to the IAM service
- Initiate an IAM pilot
- Identify candidates for operations and support of IAM service elements
- Develop an IAM service scope and operating model
- Establish contract vehicle with IAM provider(s)
- Establish common standards for meta-data tagging and content schema
- Provide content management requirements and architectural input to Gates-Carnegie SLI team
- Develop an interim content development, store, and management strategy
- Develop a long-term plan for content development, store, and management
- Document technical specifications for provider interfaces to a formalized NC content store

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- Identify candidates for operations and support of content management service elements
- Develop content management service scope and operating model
- Establish contract vehicle with content management provider(s)
- Develop a common data model supporting instructional improvement system data inputs and outputs
- Define requirements for extracting data from NCDPI managed aggregate data systems
- Establish a mechanism for exchanging authoritative data (a.k.a., a data management service) available to LEAs and LEA facing systems
- Identify and engage sustaining operator of data management services.

Deliverables

| WHAT | WHEN | COORDINATOR |
|---|-----------|----------------|
| IAM provider specifications | 10/1/2011 | Sammie Carter |
| Interim content strategy | 8/1/2011 | James Robinson |
| LOR provider specifications | 10/1/2011 | James Robinson |
| Data Management provider specifications | 09/1/2011 | Data architect |
| IAM plan and service scope | 10/1/2011 | Sammie Carter |
| LOR plan and service scope | 12/1/2011 | James Robinson |
| Data Management plan and service scope | 11/1/2011 | Data architect |

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Business Operations

Day to day LEA financial and human resource transactions are supported by a combination of state and locally operated software systems. NCDPI manages a state level budget reporting application (BUD), and an HR management system (HRMS). LEAs employ one of four financial and payroll systems – namely, Oracle (Wake), Lawson (CMS), ISIS (51 districts and all Charters), Sartox (62 districts). All ISIS, Sartox, and HRMS software and databases are run atop IBM i-Series hardware with some applications relying on IBM Domino environments as well. Most districts rely upon systems administration and support desk help outsourced to Cook Consulting Inc.

Movement towards instructional improvement and like analytics backed systems exposes inefficiencies inherent in business processes and operational systems. As such, we recommend the modernization of business operations process and systems. Specific actions include:

- Identify an individual or contractor to conduct a business process review
- Define scope of work for business process review
- Conduct business process review
- Complete i-Series RFP review and contract award process
- Identify opportunities to update existing business process support mechanisms as part of i-Series migration
- Develop scope of work for centralizing HRMS services
- Execute on HRMS centralization
- Develop scope of work for interim BUD (BAAS) modifications
- Execute on BUD (BAAS) modifications
- Define updated technical specifications for LEA ERP reporting – aligned with operational data store data model definitions
- Execute on approved business process review recommendations

Deliverables

| WHAT | WHEN | COORDINATOR |
|-----------------------------|-------------|--------------------|
| BAFO on i-Series RFP | 08/25/2011 | Jerry Bunn |
| Business process review SOW | 08/15/2011 | Phil Emer |
| HRMS centralization SOW | 09/15/2011 | Phil Emer |
| BUD modernization SOW | 10/15/2011 | Lee Sartain |
| ODS Tech specs for ERP | 12/1/2011 | Lee Sartain |

Dedicated Support Organization

The NCEdCloud incorporates collaborative procurement, shared governance, cooperative funding, and service delivery into an overall shared services model. In order to build a sustainable and flourishing NCEdCloud, we will need to manage governance, service delivery support, and advisory structures through a dedicated NCEdCloud support organization (in e-Rate terms, an *Education Service Agency*) that can serve as both a technology advisor and a service provider to LEAs. This organization would be administered by NCDPI, but could involve any number of management approaches, including significant outsourcing of particular functions. The School Connectivity Initiative (SCI) provides a foundational approach to NCDPI administration of an LEA-facing support organization. Specifically, the SCI Connectivity Services Manager administers contracts with client network engineering and e-Rate service provider entities that provide dedicated LEA support.

An NCEdCloud support organization will establish and manage process, maintain shared infrastructure, manage LEA cooperative procurement, and support LEA use of shared services in a provider-neutral manner. As many shared services are e-Rate eligible, the support organization must meet FCC (USAC) guidelines for being an *Education Service Agency* in its role as an advisor and a provider to LEAs. Governance must be accountable, inclusive, and transparent. Specific actions include:

- Study HRMS steering committee and shared funding as a potential model for like shared business operations services
- Contact and study organizations in peer states with similar statewide services focus (e.g., Utah Education Network, IlliniCloud, NY BOCES, PAIU)
- Develop template MOU's and Letter's of Agency establishing LEA service and co-op guidelines
- Document a resolution to be voted upon by the NC State Board of Education establishing the dedicated support organization administered by NCDPI that will serve as an FCC-compliant *Education Service Agency*
- Define scopes of work for entities with operating responsibilities related to shared learning infrastructure and services
- Document policy recommendations supporting new governance and operating relationships within the State
- Forward policy special provisions through appropriate legislative committee channels

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Deliverables

| WHAT | WHEN | COORDINATOR |
|--|-------------|--------------------|
| Support Organization resolution to NCSBE | 10/1/2011 | Phil Emer |
| SLI operating scopes of work | 12/31/2011 | Phil Emer |
| Policy recommendations to eLC | 08/15/2011 | Phil Emer |
| Support Organization operational | 6/30/2012 | Phil Emer |

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Digital Inclusion

A final and significant takeaway from the LEA site interview process is the almost universally held expectation that student and teacher access to an individual, mobile and connected device is becoming mandatory. Most LEAs point to the arrival of Common Core online assessments (in 2013-14) as a tipping point driving connected device requirements. Indeed a substantial majority of LEAs are allotting some portion of local RttT funds to one-time procurements of end user devices and/or wireless network infrastructure – a total of nearly \$80M in aggregate spending. Even with this substantial spending each student and teacher will not have access to a connected access device – leaving some *excluded* in the digital education enterprise. Perhaps more importantly, most LEAs see the Cloud as a foundation upon which they can set a sustainable, fully connected, mobile, and always available digital enterprise.

It should be clear that there is currently no federal, state, or local program addressing *Digital Inclusion* in a sustainable manner. This reality will certainly impact the possible scope and impact of some RttT initiatives. While not funded as part of the NC Education Cloud scope, we feel that it is imperative to address digital inclusion, if only as a matter of communications. This public debate is imperative since the solution will require substantive shifts in approach to instructional technology policy, operational support, and funding. We believe that the State should consider allocating and/or seeking funding to study, plan, and deploy a digital inclusion initiative that addresses individual 24x7 access to online instructional and public service resources.