



Highway to the Cloud

Many On-Ramps, Many Routes

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COSN
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One way or another, most districts are already in the cloud. More than half of the IT workload in K12 schools are currently running in the cloud, primarily using Software-as-a-Service (SaaS) to provide e-mail and other productivity tools, learning management and student information systems, digital content, and other digital learning resources.

SaaS offers an easy, initial on-ramp to the cloud allowing districts to take advantage of benefits such as cost-effective, easily managed services that reduce the management load of critical utilities.

Leading districts, however, are looking at cloud much more comprehensively. They have a vision of being able to perform sophisticated analytics in the service of learning based on the “big data” capabilities of the cloud to populate and correlate data in varying formats across multiple data sets. They want to use these data sets to personalize learning for each student. They want to find efficiencies that will provide more resources to teaching and learning. They hope to gain insights that will help predict when students are off track for graduation.

Districts are also looking at how cloud will help manage burgeoning trends such as the Internet of Things. What may begin as management of HVAC or video cameras in the school can grow to manage any kind of sensors and personal devices as those become part of the learning environment.

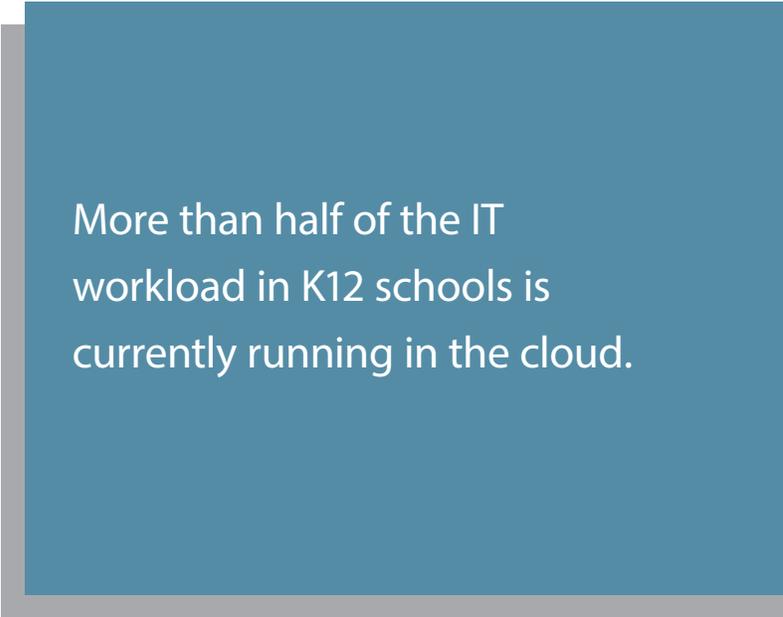
Most districts are still considering whether to move toward the holistic management and integrated data services made available by the cloud. And most districts will retain some functionality locally even as they move to the cloud, as not all legacy software is a good candidate or well architected to take advantage of the performance efficiencies of the cloud.

For more information about advantages, disadvantages, and misconceptions about the cloud, please see CoSN’s Guide to the Cloud

Each district will have to choose when and how to make the move to the cloud, and the possibilities and paths for doing so are as varied as the districts that choose them.

There are four common reasons for shifting to the cloud, each with their own on-ramps:

- Addressing a specific opportunity or issue
- Realizing efficiencies and simplifying management
- Gaining the insights possible with big data tools
- Getting access to new technologies and tools as they become available



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Drivers for Cloud Adoption

There are many drivers that lead districts to venture into cloud computing. The most common is using software-as-a-service (SaaS) for e-mail or other cloud-based services such as a Learning Management System (LMS), collaboration tools, messaging among students or to parents, and so on. SaaS can also support IT service management with software that provides help desk ticketing and more.

Other common drivers are Disaster Recovery, Backup, and Business Continuity. With cloud computing, districts get redundancy for disaster recovery by default. When looking to restore data, as with a ransomware attack, the cloud can offer backup services very cost effectively. Districts also have the option of geographic flexibility - they can choose where they want their data stored so their workloads will be in a functioning data center in case of a disaster.

Many districts get a toehold in the cloud by taking advantage of temporary capacity. Perhaps the district wants to try something new, or perhaps they just need an additional server temporarily and don't want to pay for it. In the cloud they can spin up a server, use it while needed, then shut it down again, paying only for what they use. This is a popular way to support dev-test without paying for servers that are sitting idle most of the time - when it comes time to test new software before releasing it, the servers can be spun up, then shut down until the next release comes around.

Managing the security of servers and OS's can be a driver that is solved when those servers are moved to the cloud. Also, there are many options for cloud-based security where districts used to purchase appliances, such as filtering, e-mail hygiene, log aggregation, and SIM tools.

Districts also look to the cloud to support student development of websites or software as their work can be "sandboxed" and won't accidentally affect any existing servers. This is helpful for computer science or visual media instructional support.



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Efficiencies

Districts find cost efficiencies in moving to cloud-based infrastructure-as-a-service, often when they reach a tipping point such as needing new infrastructure or hardware refresh, adding or upgrading software, or other situations where the need for a new purchase might tip the scales in favor of moving to the cloud.

Many districts begin their journey to the cloud looking for reasons of efficiencies. Cost efficiencies and simplification of the management process are both starting points.

Districts find cost efficiencies in moving to cloud-based infrastructure-as-a-service, often when they reach a tipping point such as needing new infrastructure or hardware refresh, adding or upgrading software, or other situations where the need for a new purchase might tip the scales in favor of moving to the cloud. Perhaps they are resource constrained and need their people working on things other than a data center refit. Perhaps they have a change to their risk profile with more onerous requirements such as HIPAA compliance. Perhaps the grant that bought their hardware is no longer available when it needs to be refreshed.

Some districts simplify their device management by changing to virtual desktop applications, removing the need to touch every device in order to manage or patch it.

Some districts simplify by moving capabilities to the cloud such as Student Information Systems, Mobile Device Management, Mobile Application Management, Enterprise Resource Planning, Identity Management, and so on.

Some districts are able to take advantage of the shift offered by cloud services to shift from using Capital Expenditures to using Operational Expenditures.

Insights

More advanced cloud users may look to cloud services to provide data analytics and tracking for student support. Cloud services support importing data of all kinds and performing analytics that find surprising correlations that can lead to unexpected insights - a critical step towards the personalization of learning for every student.

Cloud providers offer quick start templates and canned software that make development easier than starting from scratch. K12 IT teams are beginning to build up acumen and developing and sharing that learning and their own templates back out.

Very few districts have mature practices in using data for student success and don't have data scientist on their payroll to do that work. Instead, machine intelligence can be used in the cloud by building models and using pre-built models on how data correlates to identify opportunities. This used to be done by hand by data scientists but now they instead build the models which improve through machine intelligence. It is an emerging skill set for schools to understand and apply the outputs.

Through the cloud, data leaves its silos and can be made available to anyone who needs it. This democratization of data puts more power in the hands of teachers and families to understand a student's progress and struggles in real time.

New Technology

The cloud offers services that districts may not consider commissioning in their own data centers: Big Data and Hadoop, Machine Learning, Artificial Intelligence, IoT, stateless nosql databases, and so on.

Cloud environments also offer services to support serverless architectures. These are applications that depend on third-party services or code running in containers. By moving most of the computing to the front end and using these services, there is no need for an always-on server to support the application, leading to further efficiencies. Districts have the option of bypassing the step-by-step evolution that was necessary for pioneers and leapfrogging straight to serverless architectures.

Considerations

Moving to the cloud can be very simple using some of the on-ramps and more complex using others.

To be successful, districts need to train their IT staff for life in the cloud by

Helping them be comfortable with the service and support available

Ensuring they know how to interact with cloud services and tools

- New versions of software
- Cloud level certification for core engineers - managing the environment and the platform
- Train staff in how to provision in the cloud
- Learn how to buy things in different ways - understand where cost savings can happen and think differently about design
- Switch IT mindset to consumption from. investment
- Recognize that the staff still need a lot of the same traditional skill sets - still need security engineers, network engineers, etc.
- Note that low cost technical training is available in places such as Coursera, Linux Academy, Cloud Guru, and Udemi

Another consideration is connectivity. With so much of the workload now living in the cloud, a district may need to increase their bandwidth and obtain a redundant link for secure data.

Districts also need to consider their funding. Their finance organizations are looking for 3-5 year capital expense budgeting which can be difficult to manage given the variability of cloud operational expenditures.

Mature Cloud Platform

New Opportunity

Insights

Efficiencies and Simplification

New Technologies

Addressing a Specific Opportunity or Issue

- Software as a Service
- Disaster Recovery and Backup
- Temporary Capacity
- Managing Security

Realizing Efficiencies and Simplifying Management

- Cost Efficiencies
- Resource efficiencies
- Management Simplification
- Shift from Cap-Ex (Capital) to Op-Ex (Operations)

Gaining the Insights Possible with Big Data Tools

- Analytics and Tracking for Personalization
- Quick Start Templates
- Data Democratization

Getting Access to New Technologies and Tools

- Big Data
- Machine Learning
- Artificial Intelligence
- IoT
- Serverless Computing and Databases

This paper is part of [CoSN's Smart Education Networks by Design \(SEND\): Cloud Initiative](#)

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