

Connected Learning Advisory

Te Ara Whītiki



Planning for a Cloud Migration

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Introduction

This guide will provide you with a basic understanding of why you might consider moving from using a server at your school to a service delivered from the Internet, or Cloud. Then, it outlines the practical steps to plan and make the transition. This guide is intended to be useful for both technical and non-technical people but has been written with principals and teaching staff in mind.

Making a decision about why you might move to a cloud services, how to move and which cloud-based systems to use to support teaching and learning is complex. Schools need to ensure that they have a robust decision-making process behind the choices that they make. Whilst the main considerations are addressed, this guide cannot claim to provide a comprehensive checklist covering every aspect. It is important that a school seeks specialist support from experienced providers in order to completely transition to the cloud.

The Ministry is supporting schools to make greater use of cloud services through the [Cloud Transformation Project](#). We encourage schools to find out more about this project.

Once you have read this guide you are welcome to contact the Connected Learning Advisory to get more personal assistance. We aim to provide consistent, unbiased advice and are free of charge to all state and state-integrated New Zealand schools and kura. Our advisors can help with all aspects outlined in this guide as well as provide peer review of the decisions you reach before you take your next steps.

For more information visit www.connectedlearning.org.nz

Check out our resources at resources.connectedlearning.org.nz

Call us for personalised service on 0800 700 400

Make a personal inquiry via our online form at query.connectedlearning.org.nz

Email info@connectedlearning.org.nz

What are Cloud Services?



A cloud service is any resource that is provided over the Internet. Using cloud services means servers and software are no longer located in the school or on an individual device.

The ICT industry uses the following two terms to describe the cloud services commonly used by schools:

- **Software as a Service (SaaS)** - software applications are run from data centres rather than on an individual computer or server at a school. e.g. Microsoft Office 365 or Google's G Suite for Education, online Student Management Systems, ePortfolios, library systems or accounting solutions.
- **Infrastructure as a Service (IaaS)** - servers are hosted on hardware located in a provider's data centre instead of running at your school.

A third type of service, Platform as a Service (PaaS), is used by software developers to make and run applications on a cloud hosted platform. In general, schools do not use PaaS. For more information about SaaS, PaaS and IaaS see [Appendix 1](#). You might also hear about different types of Cloud Computing (Public, Private, Community or Hybrid). These are described in [Appendix 2](#).

SaaS, IaaS or In-School Servers?



Software as a Service (SaaS) has matured to the point that schools should consider this as the default solution and only use Infrastructure as a Service or an in-school server if there is no viable SaaS option available.

The simplest cloud services to implement and maintain are Software as a Service. In-school servers and Infrastructure as a Service solutions generally require a high level of technical expertise to implement and are typically more expensive to maintain.

Why Use Cloud Services?



The operational and pedagogical advantages for using cloud services can be compelling and are likely to include:

- **Collaboration** — cloud-based services typically have collaboration as a key feature and make collaborating with others more simple.
- **Any time, any place, any device access** — your files, applications, data and email can be accessed readily from the cloud from any internet-connected device at any location be it school, home or elsewhere.
- **Reduced cost and complexity** — no need to purchase, install and maintain internal servers such as for email or files. By using cloud services, devices such as laptops and tablets may not need to be as highly specified so might be cheaper to purchase.
- **From capital to operational costs** — Expenditure shifts from a few large capital outlays every few years to steady, on-going monthly costs.

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- **Centralised updates** — updates to cloud services are rolled out by service providers without each person having to install new software which means you are always running the latest version with the latest features and functionality.
 - **Improved security** — cloud service providers have the scale and resources to be able to deliver very robust standards of security and are highly motivated to deliver secure services as their reputation depends on it.
 - **Improved data resiliency and service reliability** — your data typically resides in multiple internet data-centers with robust back-up and disaster recovery procedures and is less prone to incidents at your school such as theft, malfunction, or disaster. The scale of cloud-delivered solutions should mean the services are more reliable than what can typically be provided via on school hardware. This increased reliability is increasingly expected by teachers and students and increases their confidence to use digital technologies for learning.
 - **Elasticity** — resources needed (e.g. file storage size or processing power) can be easily scaled up and down as needed rather than you having to predict use patterns up-front with the extra resources left dormant until the server eventually reaches capacity.
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Common Considerations When Choosing Cloud Services



If your school has a fibre connection provided by N4L and has had a MoE funded network upgrade then you should be well positioned to make use of cloud services. There are, however, some common concerns voiced by schools considering cloud services that we have outlined below. It is important to note that many of these concerns are not particular to the cloud, and you would need to consider them even if you use an in-school solution.

A discussion with your IT support provider or an advisor from the Connected Learning Advisory may be useful to get more clarity on how these perceived concerns might impact on your own particular situation. Most concerns can be addressed with appropriate planning and due consideration.

Will it work?

- **Performance** - consider and test where possible how well the proposed service can be expected to perform
- **Functionality** - trial the proposed cloud service so you can be confident it is suitable for its intended purpose
- **Service Availability** - have contingency plans, particularly for mission critical services like your SMS, in case the service is unexpectedly unavailable
- **Ability to work offline** - understand what offline functionality the service offers

Will it be safe?

- **Security** - this can be hard to quantify but typically security is a key component of any cloud service. Good security practices are everybody's responsibility and begin by getting the basics right around password security.

- **Sovereignty** - currently the MoE have no specific requirements with regards to where data can be held other than schools should be aware that data held overseas can be subject to the laws of that country rather than NZ laws
- **Privacy** - consider if the [12 Principles of the Privacy Act](#) apply
- **Control** - consider the likelihood and impact of the service provider stopping the services you are using

Will it be cheaper?

- **Total cost of Ownership** - consider the cost of the proposed cloud system against the next best alternative. Remember to factor in:
 - the 'hidden' costs of maintaining on-premise equipment such as back-up, maintenance and upgrades
 - whether either alternative has benefits that warrant an additional cost.
- **Migration Costs** - be clear about the costs to change to cloud services

Interoperability



As you move services to the cloud, you need to think about how they will work with each other. Considerations might include:

- **Interoperability of formats** - For example can you open a Word document created in the Microsoft platform in the Google platform (e.g. as a Google Doc) and vice versa? The answer to this specific question is yes, but you should ensure that any cloud service you use is interoperable with other systems that are in common use, and that it is straightforward to withdraw or export your data from the cloud service.
- **Interoperability of identities** - For example how can different systems share credentials of users and log them in automatically?

- **Interoperability with collaborator schools** - For example if your school is, or is considering, becoming a member of a Community of Learning, then the ability to collaborate easily using the same cloud service will reduce barriers to working together.

What Steps to Take to Move to Cloud Services



We recommend that you work towards a situation where your school-based servers are no longer needed or, at least, your school-based hardware is doing only a minimum of discrete tasks. This should be a staged process. Moving from an on-premise service to a cloud based one could be disruptive to a school and needs to be well thought through and planned. You could use the [Planning for Cloud Migration Checklist](#) below to help ascertain your readiness and begin to plan a migration.

You will need to understand which of your current services can be migrated to the cloud and what the implications of that migration are. All decisions need to be made in the context of your school's wider vision, ICT goals and policies.

You will need to plan and budget for a migration to cloud services and the ongoing costs of maintaining those services. Start by considering your current costs including the maintenance, backup, support, eventual system replacement and ongoing costs. Then, consider:

Set-up Costs:

- Technical support to migrate to the new services. Migrating to use a Software as a Service solution (e.g. moving from a school-based SMS to a cloud-based SMS) is unlikely to require significant technical support whereas migrating to an Infrastructure as a Service solution is likely to require specialist expertise. Select an experienced and knowledgeable supplier prepared to provide both initial and ongoing assistance. Ask for references or case studies.
- Time required to be spent by school staff to undertake or assist with the set-up

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- Professional learning - both in-house and with the assistance of external providers

On-going Costs:

- Expected monthly or annual cost of the cloud service (this may be nil - for example if migrating to Google Apps for Education, Microsoft Office 365 or using N4L's services)
- Technical support and staff time required to maintain the cloud services. This may be offset by savings made by not having to support and maintain hardware and software systems at your school.

The Ministry is supporting schools to make greater use of cloud services through the [Cloud Transformation Project](#). We encourage schools to find out more about this project.

Planning for Cloud Migration Checklist

Use the checklist below as part of your planning as you assess the current situation in your school, consider the desired future-state then determine the actions, timeframes and people or teams responsible for those actions.

Server Hardware

Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Age, reliability, capability, expected lifetime.	If your server is old, unreliable and at capacity then this will increase the impetus to make an action plan. If your server is new and running well and is expected to last another three years then you can take a less urgent approach to your migration to the cloud.			

Network Infrastructure

Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Cabled and wireless access	A robust internal infrastructure is necessary for using cloud services.			

Network Services				
Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Identity and Access Management	The increased use of cloud services has unfortunately also been accompanied by a proliferation of usernames and passwords to remember so considering identity management in an increasingly cloud-connected paradigm is recommended as Single Sign On solutions become more commonplace. Directory Services to manage and authenticate your users can often be provided by cloud-based services such as Microsoft's Azure active directory or Google's G Suite.			
DNS, DHCP	Domain Name Systems (DNS) and Dynamic Host Configuration Protocol (DHCP) services are likely to be running from your server and are needed for devices on your network to work together. It is likely that they can be configured on your N4L router (if you have one) at no cost.			
Remote Access	Some schools enable remote access to the school server so that files or applications can be used at home. If you run remote access services then a move to the cloud usually means they will no longer be required.			

File storage	Migrating all files, including photos and movies, to the cloud is achievable as long as, once migrated, they are secure and backed-up. If there are exceptionally large files that require access on your school network then you can use an additional storage device, such as Network Attached Storage (NAS) or USB hard drive.			
Printing + print counting software	<p>Printing to network printers and photocopiers traditionally uses a server to configure the printer names, connect users and control permissions. Cloud-based print systems are now available to replace the traditional print server. Alternately the school could use a very small, entry-level server or desktop as the print server.</p> <p>Cloud-ready printers are increasingly commonplace and some older printers can be made cloud-ready by installing firmware upgrades. Discuss this with your printer supplier.</p>			
Email	Email is an important service for schools. Free and very effective cloud-hosted email solutions are available to schools and are included as part of Office 365 and G Suite which many schools are already using. Email is therefore a good candidate for moving to the cloud at the earliest opportunity.			

Applications and Learning Architecture

Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Library Management System	Cloud-based Library Management Systems or Integrated Library Systems are becoming increasingly available. It is recommended that you investigate migrating to a cloud-based system. See the Integrated Library Systems page from the National Library for more information.			
Accounting System	Cloud-based Accounting Systems are becoming increasingly available. You could investigate migrating to a cloud-based system. If this is not feasible then it is usually easy to run an accounting software on an entry-level server or local desktop but be sure that back-ups are being done properly and checked.			
Learning Management System	LMSs are already largely cloud-based but you may like to consider how your LMS will be integrated with other services.			

Curriculum software applications	<p>It is possible that your school will be running software or CD-Roms from a server so that they are available to every compatible device on the network by clicking on shortcuts. While such resources may be very beneficial and well-used, you will need to weigh up the costs of continuing to provide them against the benefits for your learners. Software developers are no longer providing their products in this way.</p> <p>Often there are newer apps/software available online or web-based alternatives that could be considered to replace the legacy ones. As part of your decision-making on whether or not to continue to provide these curriculum softwares we recommend that you survey your teachers about the usage of them. If it is decided that you will no longer continue to make them available, you should provide your teachers with lead-in time and support to adjust their teaching programmes accordingly.</p>			
Operational software applications	<p>Software such as Microsoft Office or Adobe Photoshop or Video Editing Software, etc. may have online or app-based alternatives which can be used instead of the current software. You will need to decide this on a case-by-case basis depending on the level of functionality required by particular groups of users.</p>			
Other network-based	<p>There may be other applications or databases running on your servers such as for careers choices, cataloguing and</p>			

applications and databases	inventory control, telephony systems, building control systems, security cameras, etc. You will need to determine if and how these applications or databases will be able to be cloud based in the future.			
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Technical Management Services

Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Deployment and management of Operating System and Software/Apps on Desktops, Laptops and Tablets	<p>Windows devices: it is likely that a server is being used to deploy the operating system and software to each device.</p> <p>Apple Macs and Macbooks: may be getting managed and re-imaged from a central Mac server.</p> <p>iPads and Android tablets: will either not be managed at all or will be managed by a Mobile Device Management (MDM) system which is likely cloud-based.</p> <p>It is recommended that your school considers the current and likely future ways that devices will be managed and plans accordingly.</p>			

Stakeholder Engagement				
Item	Details	Current Situation	Desired Situation	Actions, Timeframes, Responsibilities
Community consultation	<p>Parents and others in the community will likely share similar concerns about migrating to cloud services. Providing them with information and the opportunity to have dialogue with you about the changes will help everybody to be aligned on the journey. Finding out what other local schools are doing may help you to be further supported with your decisions and may help to provide some consistency for students as they progress through their schooling. Can other schools offer advice on what they have found useful or describe issues that they have had in transitioning to a service?</p> <p>Check what cloud services other schools are using - especially if you are in, or are considering joining, a Community of Learning.</p>			
Teacher capacity	<p>Your teachers will need to be supported in the transition from working in one way to another. Professional learning and development for staff should always be examined when any change process is embarked upon. There are many</p>			

	<p>organisations that a school can use to assist with the delivery of professional learning and development if schools feel that they do not have the capacity to develop their own programmes. Ask for a recommendation for a good provider from other schools or search for accredited providers on vendors' websites.</p> <p>Changes in how staff might work with files, email, applications or printing will all need to be carefully managed. If there is a service that staff already feel comfortable and familiar with, then they are more likely to embrace this and be able to offer support and guidance to other staff.</p> <p>Teachers and administrators will need to understand the reasons behind the changes, based primarily on the benefits to students' learning, but also with a view to understanding 'what's in it for me?'</p>			
<p>Student capacity</p>	<p>Students can sometimes be neglected in the change process!</p> <p>They will also need to understand the reasons why the changes are happening and what the benefits are for them along with how they should do things differently in the new environment. The decisions around cloud platforms and applications should be made with the needs of all learners in mind so pay particular attention to how a particular service will improve the accessibility for students who require literacy</p>			

support, with physical disabilities or additional educational needs.			
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Useful Links

[Cloud Transformation Project](#) - Ministry support for schools to migrate to cloud

[Learning in the Cloud](#) - Education Gazette Article

[Privacy in the Cloud](#) - Education Review Series

[Integrated Library Systems](#) - National Library Information about choosing and migrating systems

[Cloud Computing Checklist](#) - Privacy Commission

This guide has been produced in response to a number of specific queries from schools. It should not be read as a recommendation or endorsement of any specific product. The Connected Learning Advisory is a Ministry of Education supported service that provides schools with technology information relevant to their queries and does not recommend one product over another.



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Appendix 1 - Types of Cloud Services (IaaS, PaaS, SaaS)

Infrastructure as a Service (IaaS)

IaaS allows physical servers to be run virtually on hardware located in an IaaS provider's data centre. The CPU, RAM, disk space and network bandwidth can be increased or decreased instantaneously to adapt to the requirements of the server. Examples of international IaaS providers include Amazon Web Services, Microsoft Azure and Google Cloud Platform. There are also many NZ-based IaaS providers. As a data centre is expensive to build and maintain, IaaS providers rely on being of large enough scale to be cost-effective.

Platform as a Service (PaaS)

PaaS is a specialised service that allows software developers to make and run applications (software) on a virtual platform. In general, schools do not use PaaS for software development.

Software as a Service (SaaS)

SaaS is the virtualisation of a particular software application so that it is available to users from any location, usually through a web browser or mobile app. Common SaaS application in use in schools are the Google Apps For Education and Microsoft Office 365 suites and Student Management Systems like eTap and Edge.

Appendix 2 - Types of Cloud Computing (Public, Private, Community or Hybrid)

Public Cloud

The infrastructure is owned, managed and supported by the organisation providing the cloud service which is then made available to the public directly using the internet. The major global providers of public cloud services include Amazon, Facebook, Microsoft, Google, Twitter, etc.

Private Cloud

The ICT solution is operated for a single organisation and utilised by its clients. Access may be restricted such that only users on the local network or trusted wide area network have access to the services but a key attribute will be that the service user and the service provider are on the same, private, trusted network. Eg. School servers virtualised and hosted at a NZ datacentre.

Community Cloud

Services are shared between a group of schools. This is typically within specific areas of service provision such as back-up, i.e. a school may host a data back-up for other schools.

Hybrid Cloud

Comprise more than one type of provision (public, private or community). In this model some ICT resources are likely to be hosted in-house with others hosted on private, public or community clouds. The network arrangements for a hybrid cloud will likely consist of a combination of trusted private networks and some public networks. So, for example, some of the services could be hosted within a school and thus dependent on the school's local area network, some services hosted in a NZ datacentre may rely on a wide area network, and some services hosted on the internet will rely on public network services. Hybrid clouds are particularly important where there are broadband constraints which limit connectivity or where for policy or security reasons there is a need for local hosting.

Adapted from: "Cloud computing: how schools can move services to the cloud - Gov.uk." 2016. 29 Jul. 2016
<<https://www.gov.uk/government/publications/cloud-computing-how-schools-can-move-services-to-the-cloud>>

