Bring Your Own Device
FOR SCHOOLS

Cloud computing and BYOD

POCKET GUIDE

Future Classroom Lab
by European Schoolnet

European Schoolnet

This is one of four shorter 'pocket guides' that has been developed from the full report, Bring Your Own Device for Schools: Technical advice for school leaders and IT administrators that was published by European Schoolnet with support from Acer and the GSMA as part of the work of Ministries of Education in its Interactive Classroom Working Group (ICWG). It is designed for school leaders or new IT Administrators in schools that have decided to implement a Bring Your Own Device strategy and who are looking for practical, introductory advice regarding the technical aspects of doing this. The publication may also prove useful to more experienced IT Administrators who are interested in other schools' experiences of BYOD implementations.

Related pocket guides that you may find helpful:

- "BYOD Pocket Guide: Technical Advice for School Leaders and IT Administrators". - This pocket guide is an abridged version of the full BYOD Technical Guidelines: Bring Your Own Device for Schools: Technical advice for school leaders and IT administrators.

- "BYOD Pocket Guide: An introduction to the technologies and terminology" - This pocket guide describes some of the technologies required to support BYOD, especially those associated with broadband and wireless networks. It is intended to provide a basic understanding of the technologies and jargon to enable school leaders to take part in informed discussions of key technical issues that will need to be addressed when planning and implementing BYOD.

- "BYOD Technical risks planning" - Planning for the introduction of BYOD should include a risk planning process. This guide describes some of the risks, their impact and how they might be prevented or mitigated.

It has been observed[1] that "It is no coincidence that the rapid expansion of cloud services and the near ubiquitous presence of mobile devices has occurred virtually simultaneously". Our Swiss schools interviewee Phillipe Devaud commented that using cloud based services in addition to BYOD increases the extent to which students can be "both location and device independent".

What is cloud computing?

Cloud computing involves organisations and individuals using, via the Internet, external shared computing resources rather than, or in addition to, using computing power, applications and data storage resident on their own local servers, computers or devices. The large number of users sharing these resources enables economies of scale to be made which keeps down costs for individual users. The cloud metaphor comes from the fact that most end users of cloud computing resources do not need to know, and indeed do not care, exactly where these are physically located.

What do these clouds look like?

The physical structure of clouds is distributed networks of computer centres each containing very large numbers of computer servers. Research company Gartner estimate that Amazon is the largest provider of cloud services via their Amazon Web Services (AWS) brand. The on-line technology news service Data Center Frontier have reported that Amazon has dozens of data centres grouped into regional clusters around the world with each data centre housing between 50,000 and 80,000 servers.

1   Lee JC, "Mobility and cloud computing: a natural fit, but enterprise policy needed", 2014, Meridian

The benefits of cloud computing

Increasingly, Ministries of Education in Europe are offering guidance for schools on how to effectively implement cloud computing services[2] A general benefit of cloud computing is that it enables schools to relatively easily and cost effectively provide students, staff and parents with access to school content and services using their own devices from any location with Internet access.

Schools are also able to benefit from the economies of scale of sharing server hardware with other organisations and to reduce the administrative burden on school IT staff as this is taken over by or shared with cloud computing providers.

There can be additional cost and resource advantages for schools in using cloud based versions of services needed to manage their Wi-Fi networks and their BYOD policy. These solutions may be developed by schools, if they have the expertise, or can be services that schools subscribe to. Schools can, for example, subscribe to:

- a cloud based WLAN controller solution instead of having a controller resident on the schools Wi-Fi network and needing to be maintained by school IT Administrators.

- a cloud based SaaS (Software as a Service) mobile device management and/or mobile application management system. The FRI-TIC ICT regional centre in Switzerland have compared the cost of purchasing and maintaining an MDMS/MAMS (40,000 Swiss Francs to set up plus annual costs of 10,000 Swiss Francs) with the cost of subscribing to a cloud based service (16,500 Swiss Francs per annum).

A key advantage of cloud computing often cited by commercial companies is its "elasticity", this means the ease with which the amount and type of computing resources purchased by an organisation can be adjusted to adapt to changing requirements.

2   Cloud computing services: Guidance for school leaders, school staff and governing bodies, Department for Education, January 2017, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/584755/Cloud_computing_services_guidance_Jan_2017.pdf

Advice to secondary schools from the Irish Government[3] identifies a further advantage of cloud computing saying, "using cloud based services and applications instead of local server based resources can save significant levels of energy" as well as savings on "technical support and associated costs".

Our Italian interviewee Dario Zucchini commented "Cloud based services and BYOD devices (with excellent broadband and Wi-Fi) delivers significant economic advantage to the school compared with school owned and managed servers and devices".

Cloud computing resource and security considerations

Despite the significant advantages, including cost savings, associated with cloud computing there are some resourcing considerations and security concerns are sometimes expressed.

Security concerns usually relate to free public cloud computing services. An alternative for schools is subscribing to a private cloud service, which provides a secure area, and secure access to it, on a server maintained and managed by a cloud hosting provider.

Some resource implications are obvious. For example, a large number of students connecting to and making prolonged use of cloud based services means greater bandwidth use and increased Wi-Fi network traffic.

Perhaps less obvious is the adoption of cloud computing by suppliers of services to schools. Our Italian interviewee noted that, "there is no digital book that does not have an associated cloud platform" but schools use books provided by many different publishers and each publisher has their own cloud platform and "they each compel schools to carry out the irritating tasks of registering students, creating passwords, etc." thereby creating work for IT Administrators or teachers.

3   "Guidance document for the provision of wireless network installations in post primary schools" Department of Education and Skills, Ireland (2016)

Our Portuguese interviewee, António Santos, emphasised that, "using private clouds, and open source tools to develop cloud based services, has cost and efficiency advantages but this does require schools to have staff with the required technical knowledge and experience to do this.

Cloud deployment models

Many people use public cloud based services that anyone with Internet access can use or subscribe to e.g. Dropbox for storing and sharing files, YouTube for storing and sharing videos. However, companies and schools may feel uncomfortable about locating some of their or their students' content on public cloud services and handing over responsibility for its security to the service providers.
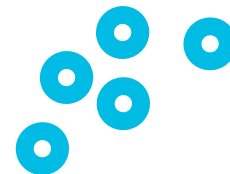
Cloud deployment models

Alternatively schools can subscribe to private cloud services. A school can subscribe to its own private cloud, which is a secure area on a server with that server and access to services on it maintained and managed by the cloud hosting provider that owns the server. Private cloud services can be private to a group of schools, plus perhaps organisations they work with e.g. local education authorities or universities, forming a community cloud.

Hybrid cloud models combine two or more of the private, community or public cloud arrangements.

Cloud services delivery models

Cloud computing allows schools, and other organisations, to effectively outsource elements of their computing services to cloud service providers. The degree of outsourcing varies according to the extent to which schools wish to, or have the appropriate level of expertise to, manage their own services and the availability of cloud based services which meet their needs.

In the first column of the delivery models diagram illustrates the situation where all services are hosted, maintained and managed within a school or group of schools. However schools may need to, or choose to, purchase one or more of the following services from cloud computing providers:

- **Infrastructure as a Service (IaaS)** Organisations subscribing to IaaS are essentially able to build a virtual data centre in the cloud and access many of the technologies and resources of a traditional data centre but they do not need to invest in planning, building, maintaining and managing a physical centre. The Carlos Amarante group of schools in Portugal subscribe to RedHat's private cloud infrastructure including their Gluserfs distributed file system that stores data across multiple remote servers.

- **Platform as a Service (PaaS)** PaaS suppliers provide a platform on which software can be developed and deployed and handle the work of managing servers and network infrastructure, enabling their clients to focus on the application development and business related considerations. The Carlos Amarante group of schools in Portugal subscribes to the Alfresco-in-the-Cloud content management system and open source software (Zimbra Collaboration Suite – ZCS, including an email server and web client and Joomla which enables them to build web sites and online applications) to create cloud based services for their students and staff. Of course, using these open source tools requires technical knowledge and experience and, as Antonio Santos notes, "full time IT network support is not available in every school".

- **Software as a Service (SaaS)** SaaS is the most familiar form of cloud computing for consumers and educators in which web browsers provide access to software running on cloud servers e.g. Dropbox, Google G Suite for Education, Microsoft Office 365. SaaS has the potential to reduce the cost of software ownership as there is usually little or no need for technical staff

to install, manage, and maintain the software. Some SaaS applications may also be free for schools and payment may be by subscription rather than purchasing a software licence.

Cloud services delivery models
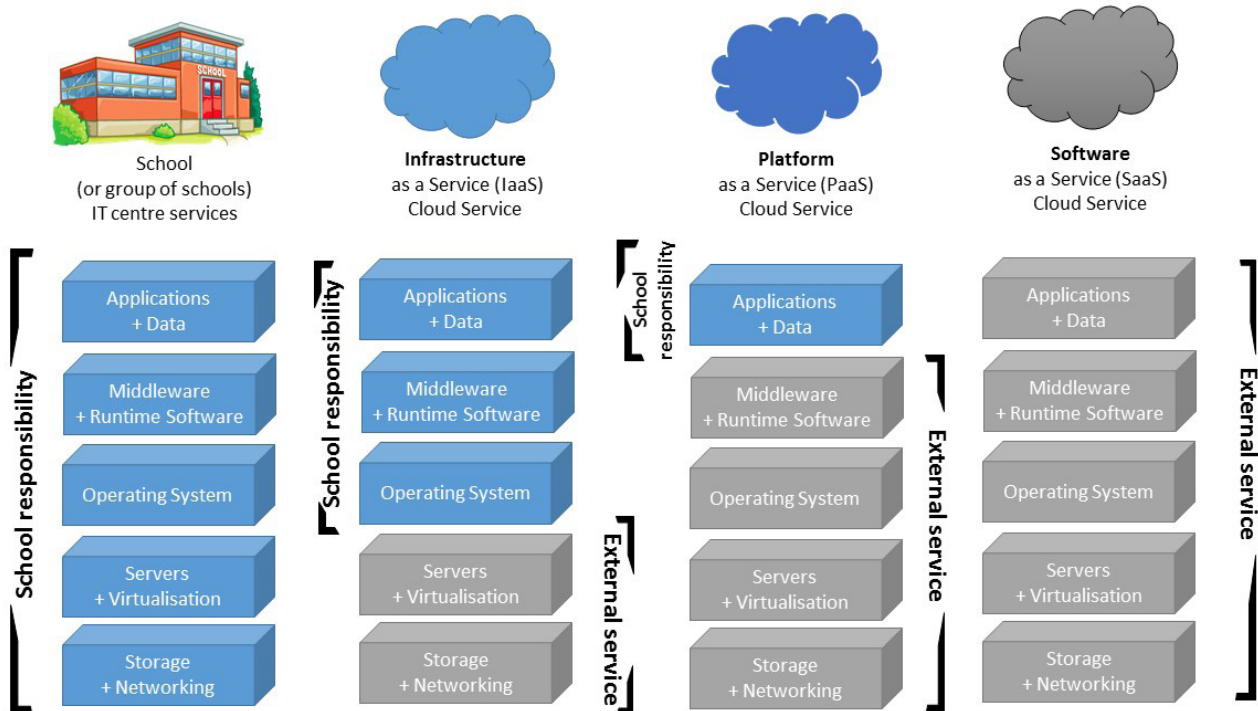
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