

# FACTFILE: GCSE DIGITAL TECHNOLOGY Unit 1 – DIGITAL DATA



## Fact File 17: Cloud Technology implementation and application, security and impact on local systems

### Learning Outcomes

Students should be able to:

- define the term cloud computing;
- describe the advantages and disadvantages of cloud computing for an organisation;
- describe the impact of cloud computing on gaming, file storage and sharing (including collaborative tools).

### Content:

- What is Cloud Computing?
- Advantages & Disadvantages of Cloud Computing;
- Impacts of Cloud Computing.

### What is Cloud Computing?

I am writing this document using Google Docs, which is a word processing application that runs in my browser. My files are stored in my Google Drive and I can access them from my desktop PC, from my laptop or from my Android mobile phone. I can create a document on my PC at home, continue editing it on the train using my laptop (providing I have an internet connection) and finally print the finished document when I reach my workplace. This is cloud computing, and it enables me to access the services that are important to me, seamlessly, anywhere that I have an internet connection and a suitable device.

#### Cloud Computing

*“Cloud Computing is using the internet to provide services that would normally be provided by a local area network (LAN).”*

BCS Glossary of Computing, 13th edition, p 123.

In addition to word processing, Google also supplies me with cloud based email, spreadsheets, calendar and presentation software. Microsoft, Apple and many other providers also offer cloud based office applications.

Cloud computing is not, however, limited to office applications. Many of you will have used a music service such as Spotify or will have read a Kindle ebook: these are cloud based services. With Spotify, the music is

stored on a server (or server farm) and can be streamed directly to your mobile phone. You never even need to know where the server is located, as the app on your phone handles all of the communication tasks. We often describe this data as being stored *in the cloud*. You may be able to store some of the music on your phone from time-to-time for convenience (e.g. so that you can listen to it when you don't have an internet connection) but the master copy remains *in the cloud*, available to you when and where you want it. Social media services such as Facebook, Youtube, Twitter and Instagram are also cloud based. Social media, is almost always cloud based as this is what makes sharing possible.

Some of the services mentioned above may be familiar to you, as they are targeted at consumers and other casual users. Many businesses also use cloud based services. In these cases the services offered may be more specialised, and the following distinction is sometimes drawn between different kinds of service.

- **Software as a Service (SaaS)** provides applications that run on remote computers – in the cloud – and that connect to users' computers via the internet, often in a web browser.
- **Platform as a Service (PaaS)** provides cloud-based services such as software development tools and database management, that support the building and delivery of cloud-based applications.
- **Infrastructure as a Service (IaaS)** provides computing resources that may include servers, networking, storage, and data center space.

Often an organisation that decides to make use of cloud-based services rents them from a *cloud provider*, who manages and maintains the services. The cloud provider's services may be used by many different organisations. This is known as a *public cloud*.

In a *private cloud*, on the other hand, the services are managed for the use of a single organisation. They may be managed by the organisation itself, or by an external *cloud provider*.

The rights and responsibilities of the cloud provider and customer are specified in a special agreement known as a *Service Level Agreement (SLA)*. The SLA specifies the responsibilities of both parties (service provider and customer), and details the services that are to be provided as well as their quality and availability. In many cases the SLA might be a legally binding contract. If the cloud provider and cloud user are simply two departments in the same organisation, then the SLA may simply be less formal.

## Advantages & Disadvantages of Cloud Computing

Cloud computing offers many advantages to an organisation but, as with all technologies, there are also disadvantages.

### Advantages

- **Lower Initial Cost:** Upfront costs can be kept low because cloud storage and associated applications can be rented from a cloud provider. In addition, cloud based applications often work effectively with low specification workstations because some of the processing is carried out in the cloud. This reduces the investment needed for specialist software and hardware.
- **Enhanced Scalability:** As an organisation's needs grow, more resources (storage and/or bandwidth) can be rented from the cloud provider. At any given time the organisation only pays for what it needs.
- **Ease of Maintenance:** Software is installed in a single server (or server farm) and so rolling out updates and bug fixes is relatively straightforward. For similar reasons, it is also straightforward to have effective backup and restore processes.
- **Ease of Support:** Normally, all users are using the same version of the software. This makes it easier to track bugs and to provide effective end user support.
- **Convenient Access:** Users can access their files from a location and device of their choosing, and without the need for specialist software (often a web browser is all that is needed).

- **Collaborative Working:** Users may be able to share files and work collaboratively with colleagues. For example, two or more users can simultaneously edit the same document using Google Docs.
- **Security:** There is a single access point to all data. This enables the cloud provider to focus resources on keeping it secure. See below for a corresponding disadvantage.

### Disadvantages

- **Connection:** Cloud computing relies on an internet connection. If there is an interruption then the organisation's business may be disrupted.
- **Application Availability:** The organisation may be restricted to use only the application suite supplied by the cloud provider. While this may be designed to suit the requirements of many cloud users, it is unlikely to be optimal for any individual organisation's requirements.
- **Proprietary Lock In:** If the organisation is not satisfied with their cloud provider and decides to move to a different one, they may find it difficult to export their data in a suitable format.
- **Security:** Cloud storage represents a single target that may attract the attention of cybercriminals. See above for a corresponding advantage.

### Impacts of Cloud Computing

Cloud computing brings potential benefits to many industries, as well as personal users. Two application areas are described below: gaming and file storage and sharing.

#### Gaming

*Cloud gaming* enables a user to play games that are stored remotely on a server or server farm. A client program, which is stored on the user's computer, connects to the game provider's server to retrieve and run the game. This is sometimes called *gaming on demand*. There are two broad approaches to the design of a cloud gaming platform: video streaming and file streaming.

In the *video streaming* approach the game is stored on the game provider's servers. It is also executed on these servers to produce video, which is then streamed to the user's computer.

- **Advantage:** Can be used with a relatively low spec. computer. All that is needed is the ability to display video.
- **Disadvantage:** Requires a reliable broadband connection with sufficient bandwidth so that gameplay is not interrupted.

Video streaming gaming is also sometimes known as *pixel streaming*.

In the *file streaming* approach the game is stored on the game provider's servers but it is executed on the user's computer. The game code is normally downloaded incrementally: sufficient code is downloaded to enable the play to begin – the remaining code is then downloaded in the background while the user is playing. This is sometimes known as *progressive downloading*.

- **Advantage:** Can be used over a relatively low bandwidth connection.
- **Disadvantage:** Requires that the user have a computer with sufficient power and specification to execute the game.

A significant impact of cloud computing on gaming is that it provides the potential for game designers to monitor user behaviour, performance and preferences in real time. This is valuable feedback, which can be used to improve the product.

## File Storage & Sharing

*Google Drive* and *Dropbox* are two file storage and sharing services that are in common use. Both are available to the personal user as well as the corporate user.

- Google Drive enables anyone with a Google account to store files in the cloud; to access them over an internet connection, and to share them privately or publicly. This is a free service, with limited storage capacity, but the user has the option to pay for additional storage as needed.
- Like Google Drive, Dropbox enables anyone with an account to store files in the cloud; to access them over an internet connection, and to share them privately or publicly. Dropbox also offers a free service, as well as the option to pay for an enhanced service.

Both Google Drive and Dropbox can be accessed using only a web browser. Alternatively, free apps are available for both Android and iOS. With both services, files can be synchronised between devices, so that you work offline. It is also possible, with both services, to have detailed control over whether, and how, files are shared. Unlike Dropbox, however, Google Drive supplies a range of applications for file creation and editing – including word processing, spreadsheets and presentations. With Dropbox it is possible to use Microsoft Office applications for this purpose – providing that you have the online version.

Table 1, below, illustrates the impact use of Cloud-Computing on some common scenarios.

Without Cloud Computing	With Cloud Computing
<p>Stanley is editing a spreadsheet in the office and he wants to continue working on it at home - so he copies it onto a pen drive to take with him. Now Stanley has two copies of the file. When he goes back to the office the next day he must remember to update his PC with the most recent copy.</p> <p>Anyone who does this regularly is likely, sooner or later, to edit the wrong copy of their file. It can be very time consuming to recover from this kind of error.</p>	<p>Stanley edits a single copy of his spreadsheet (e.g. hosted on Google Drive) from home or from the office without worrying about version management.</p>
<p>Linda is to give a presentation away from her normal working office - so she copies the relevant file onto a pen drive. During the presentation Linda notices an error in the file. She corrects this on the spot in case she forgets to do it when she returns to her office.</p> <p>Linda now has two copies of her presentation file and her version management problems are similar to Stanley's.</p>	<p>Linda delivers her presentation using the original version of the file (e.g. hosted on Google Drive). This enables her to correct any errors directly on the original - avoiding the need for version management.</p>
<p>Linda is based in her company's Belfast office, while Stanley is based in the Ballymena office. Their work requires them to collaborate in the writing of an important report, and they decide to use email to accomplish this.</p> <ul style="list-style-type: none"> <li>• Stanley develops an outline for the report using, MS Word, and emails this to Linda.</li> <li>• Linda extracts the document from her email and works on it for a few days before sending it back to Stanley as an email attachment.</li> <li>• Stanley extracts the updated document and continues to work on it before returning it to Linda again for further work.</li> <li>• etc...</li> </ul> <p>This process is time consuming as only one person can work on the document at any given time - the other must wait for their update by email before they can make their next contribution.</p> <p>It also results in the creation of many versions of the report file, with the same version management problems.</p>	<p>A file sharing service such as Google Drive enables Stanley and Linda to work on a single document concurrently (i.e. at the same time).</p> <p>This is quicker because no-one has to wait for an email update.</p> <p>It also avoids any version management problems</p>

Table 1: Cloud-Based File Storage & Sharing Scenarios

## Resources

BBC Bytesize, Technical implementation (networking/connectivity).  
<http://www.bbc.co.uk/education/guides/z2b4kqt/revision>

IBM, Learn about cloud computing  
<https://www.ibm.com/cloud-computing/learn-more/about-cloud/>

Salesforce, What is the cloud?  
<http://www.salesforce.com/uk/cloudcomputing/>

Google Docs  
<https://www.google.co.uk/docs/about/>

Google Drive  
<https://www.google.com/drive/>

Dropbox  
<https://www.dropbox.com/>

Cloud Computing: Moving IT Out of the Office  
<http://www.bcs.org/upload/pdf/cloud-computing.pdf>  
BCS, 2012

