

TCSL-70130 Lecture 08: Cloud Computing in Education 雲端運算之教育應用

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Lecture Topics

- What is **cloud computing**
- **History** of cloud computing
- **Characteristics** of cloud computing
- Cloud computing **platforms**
- Cloud computing in **education**
- **Tools** and **use cases**

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3 What is Cloud Computing?

➤ **Cloud computing** is the **on-demand** availability of computer system **resources**, especially **data storage** and **computing power**, **without** direct active **management** by the **user**. (Wikipedia)

Cloud computing

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4 Facilitating Technologies

➤ The growth of cloud computing is facilitated by:

- Low-cost **commodity computers**
- Low-cost high capacity **commodity storage**
- High-capacity **commodity networks**
- **Virtualization** technologies
- **Service-oriented architecture (SOA)**
- **Autonomic/Utility computing**

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Origin of Cloud Computing

- Since 1950s, **huge** and **expensive mainframe** computers were used in organizations.
- "**Time-sharing**" schedules on the mainframe were used for ROI (return on investment).
- Many users could **access a mainframe** computer from **connected stations** that carried **no processing power** of their own.
- This type of **shared computational power** is the basic **premise** of the cloud.

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Origin of Cloud Computing

- In 1966, **J.C.R. Licklider's** revolutionary idea of interconnected system of computers resulted in the development of **ARPANET**.
- ARPANET is the predecessor of the Internet.
- Licklider also envisioned a world where **everyone** would be **connected**; to have the ability to **access** specific **programs** and **data**, **regardless** of where the **access point** might be **located**.
- This is known today as **cloud computing**.

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History of Cloud Computing

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- In 1999, **Salesforce** pioneered the idea of using the **Internet** to **deliver software** to end users (by downloading). Business could **purchase** software **on-demand**.
- In 2006, **Amazon** launched **Amazon Web Services (AWS)** and **Elastic Compute Cloud (EC2)** which popularized the idea.
- Since then, ICT giants (IBM, Google, Apple, Microsoft, Oracle, ...) started offering cloud platform/services.

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Characteristics of Cloud

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- **On-demand self service**: A consumer can have **computing capabilities on-demand** w/o human interaction with service provider.
- **Broad network access**: Capabilities are available over the **network** and accessed through **standard** mechanisms.
- **Resource pooling**: Resources are offered to multiple consumers using **multitenant model** which are assigned based on consumer demand.

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Characteristics of Cloud

- **Rapid elasticity:** Capabilities can be **elastically provisioned** and **released** to scale rapidly outward and inward with demand. Capabilities appear to be unlimited and can be appropriated in any quantity at any time.
- **Measured service:** **Automatically control** and **optimize** resource use with **metering**. Resource usage can be monitored, controlled, reported and charged.

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WHY Use Clouds

- **Economies of scale:** Making computing, storage, ... services available to organizations/individuals of all sizes/kinds.
- **Reduction of costs:** Cost of deploying applications in the cloud can be much lower than on-site hosting (lower h/w costs).
- **Universal access:** Allow resource access any time any where via the Internet.
- **Up to date software:** Cloud services are always up to date.

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WHY Use Clouds

- **Choice of applications:** Allow flexibility to experiment and choose service options and pay only for what is actually needed.
- **Potential to be greener and more economical:** Average cloud energy consumption is far less than that of on-site deployment everywhere.
- **Flexibility:** Allow users to switch applications easily and rapidly to suits their needs.

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Types of Cloud

 <p>Public Cloud</p> <ul style="list-style-type: none"> ➤ Services are owned and operated by a third party provider. ➤ The maintenance is bared by the service provider. ➤ Pay-as-you-go model. Thus, the setting and operating cost is less. ➤ Lesser security as the platform is shared. ➤ Lesser flexibility & control over the cloud environment. 	 <p>Hybrid Cloud</p> <ul style="list-style-type: none"> ➤ Often called as 'the best of both worlds', it combines both public & private cloud. ➤ Greater flexibility & more deployment options. ➤ Cloud bursting is also possible. ➤ Network complexities & compliance issues. ➤ Can be extremely expensive. 	 <p>Private Cloud</p> <ul style="list-style-type: none"> ➤ Dedicated to a single organization. ➤ Higher security as the resources are not shared. ➤ Greater flexibility to control the cloud environment. ➤ Purchase and maintenance has to be bared by the organization ➤ Expensive than public cloud.
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Types of Cloud Services

Cloud computing service categories

SaaS Software as a service	PaaS Platform as a service	IaaS Infrastructure as a service
<p>A software distribution model in which a third-party provider hosts applications and makes them available to customers over the internet.</p> <p>EXAMPLES: Salesforce, NetSuite and Concur</p>	<p>A model in which a third-party provider hosts application development platforms and tools on its own infrastructure and makes them available to customers over the internet.</p> <p>EXAMPLES: AWS Elastic Beanstalk, Google App Engine and Heroku</p>	<p>A model in which a third-party provider hosts servers, storage and other virtualized compute resources and makes them available to customers over the internet.</p> <p>EXAMPLES: AWS, Microsoft Azure and Google Compute Engine</p>

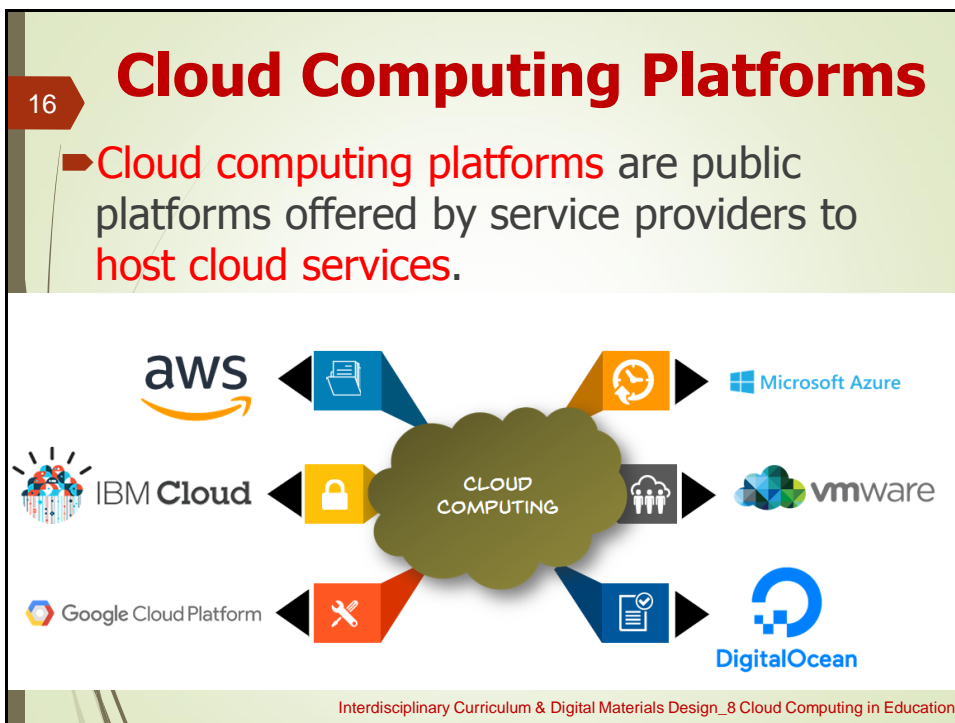
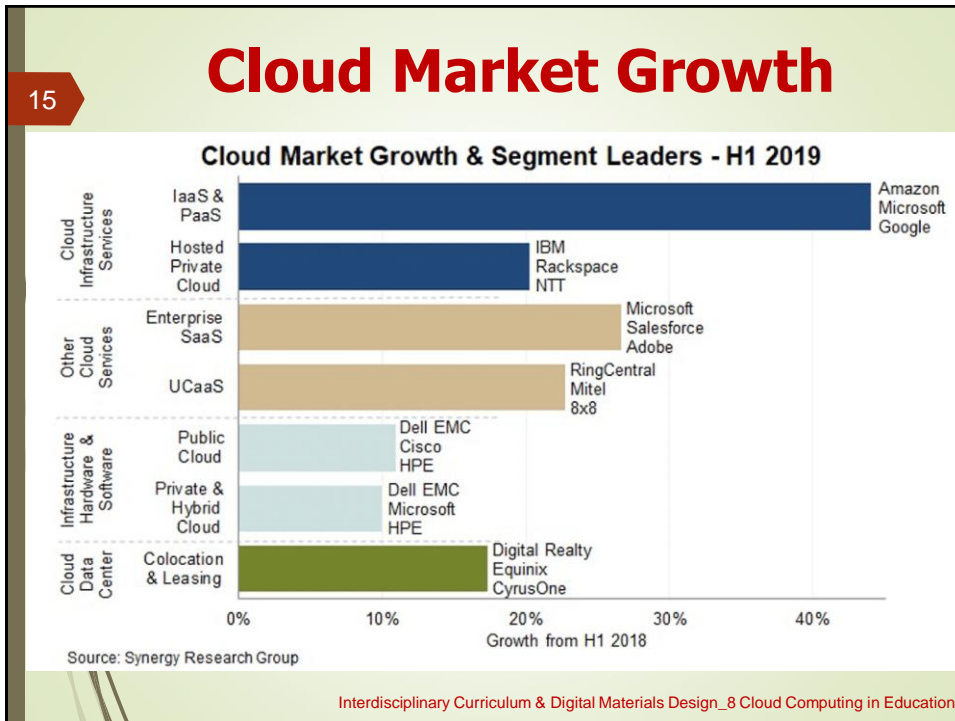
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Cloud Computing Services

SaaS (End users)	Services	Examples
<p>Email, Office, Automation, CRM, Website testing, Communication, Games</p>	<p>SalesForce, GMail, NetSuite</p>	
PaaS (Application developers)	Services	Examples
<p>Execution runtime, Database, Web Server, Development Tools,</p>	<p>Microsoft Azure, Google AppEngine, Heroku, Sausalito</p>	
IaaS (Network architect)	Services	Examples
<p>Virtual Machine, Servers, Load balancers, CPU, Backup services.....</p>	<p>Amazon EC2, S3, SQS, GoGrid, Mosso</p>	

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Cloud Computing in Education

- Cloud services used in education:
 - **Email:** Gmail, Yahoo Mail, ...
 - **Storage:** Dropbox, Google Drive, OneDrive, ...
 - **Office:** Google Docs, Microsoft 365(Office 365), Polaris Office, FreeOffice, ...
 - **Photos, pictures, images:** IDrive, Adobe Creative Cloud, Flickr, ...
 - **Video, movies:** YouTube, pCloud, Sync.com, MEGA, ...
 - **Course platforms:** Thinkific, LearnWorlds, Teachable, Kajabi, Podia, ...

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Benefits of CC in Education

- Strong virtual classroom environments
- Ease of accessibility
- Extensive cost-savings
- Secure data storage
- Scalability
- Agility and innovation
- Greater reach/collaboration of students
- Minimal hardware requirements

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Tools and Use Cases – G Suite

- **G Suite for Education** is specially designed for classroom.
- It includes productivity apps: Gmail, Hangouts, Calendar, Google Drive, Google Docs.
- Extra features on above apps for classroom.
- **Google Classroom** also provide links of Google cloud services for education.

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Tools and Use Cases – Microsoft Office 365 Education

- **Online version** of popular **office apps** like Word, PowerPoint, Excel, ...
- Work and save directly on the cloud.
- Compatible with desktop versions.
- **Additional classroom tools**
- **Free** for students and educators

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Tools and Use Cases – Coursera

- Offers a variety of **online courses** from established universities and instructors.
- Also offers **lessons** on specific **career skills** and **grants** university-recognized **degrees**.
- It has become a powerful and popular source of online learning.

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Tools and Use Cases – Blackboard

- Provide **cloud-based learning software** for grades K-12, higher education and government.
- **Blackboard Classroom** provides virtual classroom video conferencing, assignment management, classroom analytics and more.
- Can access these tools from any computer, smartphone or tablet.

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Tools and Use Cases – Knowledge Matters

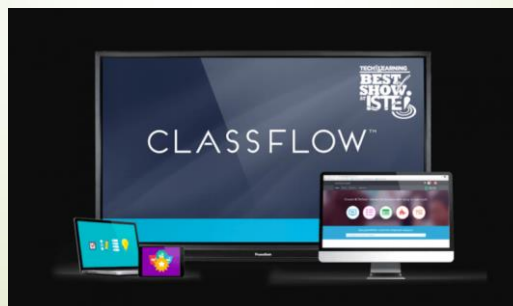
- Specially good for cloud-based business simulations.
- To mimic situations students would encounter in a business environment.
- Give students the chance to practice real-world problem-solving.
- The company also offers Virtual Business lessons and Case Simulations.

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Tools and Use Cases – ClassFlow

- Designed for connected whiteboards and displays.
- Help teachers create interactive lessons, quizzes and activities.



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Tools and Use Cases – D2L

- **Brightspace** learning management system
- For K-12 and higher-ed teachers to create and distribute lessons.
- Students can complete assignments from their **portfolio app**.
- A **dashboard display** lets teachers track student progress.

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Tools and Use Cases – A Cloud Guru

- An online database of courses designed to teach and train people in cloud computing.
- Eg. Learn AWS
- Help students study for official certification exams.
- Used by over 800,000 people in 181 countries.

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Tools and Use Cases – Viridis

- Viridis creates a cloud-based software that **connects** community college **students** to **job databases** for career matching.
- Students can **track** their **progress** and what they're studying.
- Viridis uses that information to **highlight specific skills** and **list the jobs** they are most qualified for.

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Tools and Use Cases – Muzzy Lane

- Make learning more like playing a game in order to retain students' attention and increase their engagement.
- **Muzzy Lane Author** platform uses cloud-based simulations to put students in specific scenarios.
- Help students practice decision making like in the real world.

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Tools and Use Cases – Top Hat

- Apps let college students and lecturers **interact** with the course material and each other.
- Teachers can **quiz** students, start **discussions** or send out reading **material**.
- Students can participate via **smartphone** or **computer**.
- Especially helpful in **large lecture classes**, where it's harder to ensure student participation.

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Tools and Use Cases – Edlio

- Specializes in **building websites** and **communication platforms** for schools.
- It's **content management system** for schools powers more than 10,000 school websites across North America.
- Also offer the parent engagement app **Sangha**, which keeps parents in the loop about their child's academic and extracurricular activities.

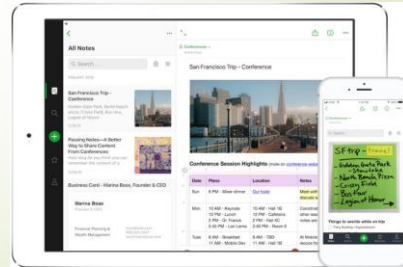


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Tools and Use Cases – Evernote

- ▶ Let users **take notes** on their phones, tablets or computers, then **save** all to the **cloud**.
- ▶ **Sync** notes **across all devices** therefore no need to lug around multiple notebooks.
- ▶ Also let users save audio files, photos and hyperlinks.



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Remark: Digital Divide

- ▶ The widening sociological gap between those who have internet and computer access and those who don't is often referred to as the **digital divide**.
- ▶ Will cloud computing **widen** the digital divide?
- ▶ Teachers employing more online resources may risk **exacerbating** an already significant **educational disparity** and inadvertently **discriminating** against students based on **geographic location** and **economic class**.

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