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# Cloud Computing Guidance Note

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# *Overview of the Guidance Note on Cloud Computing*

The GN has five sections, whose content will be explained in this presentation

1. Introduction – What is cloud computing? Review of prior measurement literature
2. Definition of cloud computing
3. Economics of cloud computing – what drives its rapid growth?
4. Recommendations/Clarifications on Classification and Recording
  - Fixed capital formation of the users and the suppliers of cloud computing
  - Prices & volumes
  - International Transactions
5. Conclusions and Recommendations

# *Introduction*

Cloud computing providers supply on-demand information services over a network.

Services include computing infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS), and software-as-a-service (SaaS)

- Business Process as a Service (BPaaS) can be distinguished as a special type of cloud computing service – it automates tasks done by labor services
- Function-as-a-service (FaaS) can be considered a special type of PaaS

Has become a globally important activity

- Global sales of US \$ 270 billion in sales in 2020
- Accounts for a large share of IT investment
- Services are widely used

# *Definition of Cloud Computing*

Key characteristics of cloud computing technology:

on-demand self-service; broad network access; resource pooling; rapid elasticity; and measured service

Proposed definition

**Cloud computing services consist of computing, data storage, software, and related IT services accessed remotely over a network, supplied on demand and with measured resource usage that allows charging on a pay-per-use basis**

- Actual charges aren't necessarily calculated on a pay-per-use basis

Hosting/co-location services, in which the user's server/software are in a remote datacenter, are closely related and should also be considered when analyzing cloud computing

Definition of a cloud computing industry would also include management and support services for cloud computing

# *Economics of Cloud Computing*

Remotely accessed purchased IT services are replacing ownership of an IT capital stock

- Effect on value added resembles earlier effect of trend to outsource labor inputs

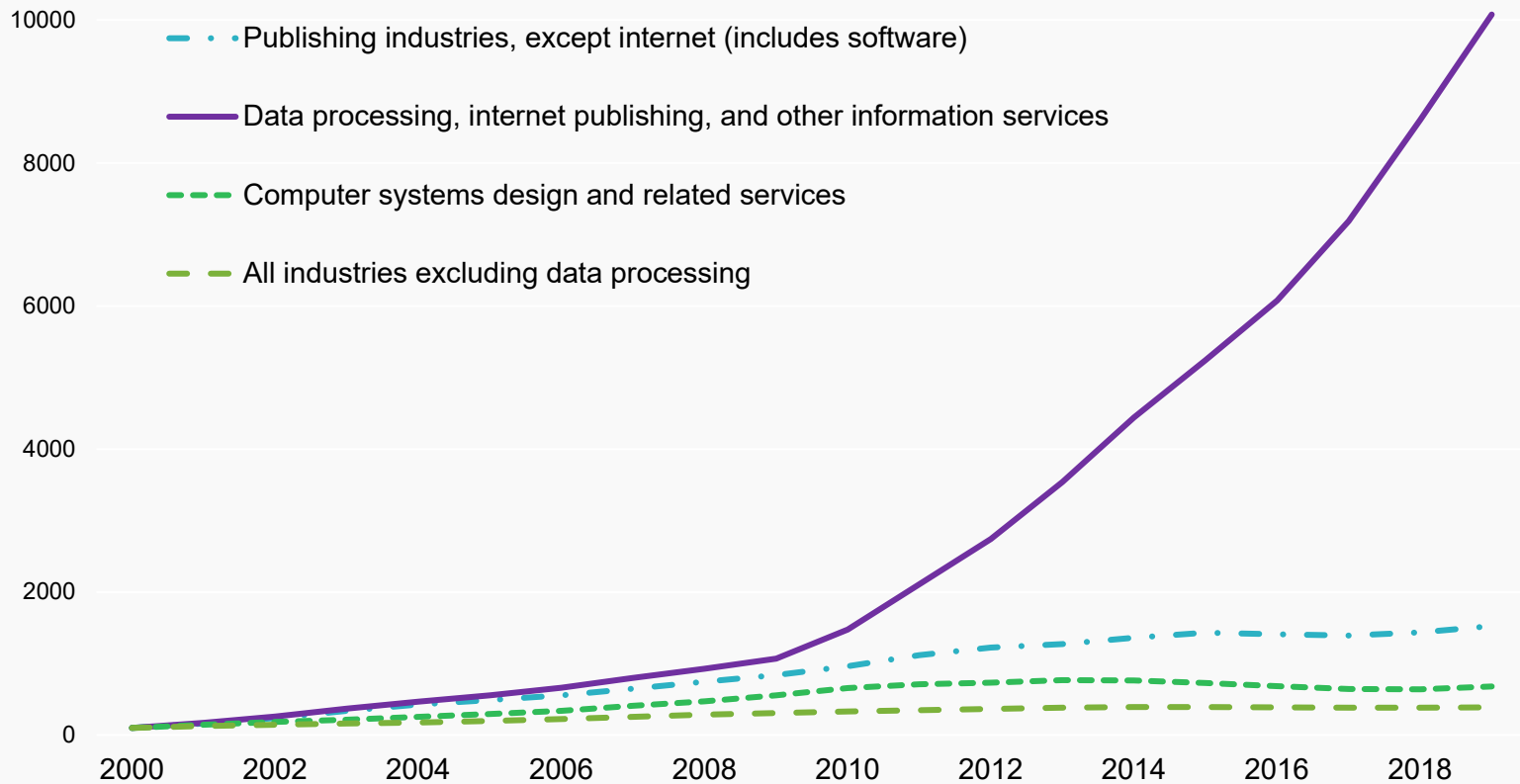
Gains driven by cost and capability advantages, greater agility, and greater security

Cost advantages possible because of higher utilization and economies of scale

Many digital intermediation services and digitally delivered services and AI capabilities were made possible by cloud computing

Contributes to growing relative importance of data assets and R&D assets

Figure 1: Computer Hardware Real Capital Stock in the US  
(Volume indexes, 2000=100)



Source: BEA-BLS industry-level production account, expanded capital detail (2021 release). Author's calculations of the index for all industries ex. data processing use capital compensation as weights.

# *Classification and Recording of Fixed Capital Formation by CC Users*

## **Software:**

Software licenses for more than a year are software assets of the user even if the software is accessed via cloud computing

Software subscriptions from software publishers are not part of cloud computing

Business accounting rules treat cloud computing implementation costs as investment

- They consist mostly of software development and software training

## **Economic ownership of IT assets:**

Existing SNA guidelines for determining economic ownership of leased assets can be applied to long-term contracts for access to IT resources via cloud computing

- Party who bears the risk and is responsible for maintenance and upkeep is the economic owner

## *Recording of Fixed Capital Formation of Cloud Computing Suppliers*

Own-account investment in IT equipment by cloud computing enterprises and other operators of hyper-scale datacenters can be significant and must be included in estimates of equipment investment

Existing SNA/BPM guidelines are sufficient for identifying financial leases for datacenter structures (which make the user of the structure the economic owner

Existing SNA/BPM guidelines on residence and joint ownership cover the investment by cloud computing enterprises in cross-border and inter-continental undersea cables



# *Prices and Volumes of Cloud Services and Services Enabled by Cloud Computing*

Menus of cloud computing services are complex, and characteristics of the products vary

Pricing a small set of relatively straightforward products is a practical way to compile a price index for cloud computing services

Compiling quality-adjusted price indexes for the new and improved digital products enabled by cloud computing is challenging

# *International Transactions associated with Cloud Computing*

The main suppliers of Cloud Computing services are MNEs that supply services globally via cross-border data flows and investment in local datacenters and edge locations

Measuring gross flows of cross-border CC services may be challenging given resource pooling

- Ordering, production, and consumption of CC services can take place in different countries
- The estimates of net cross-border flows of cloud computing services should be consistent with estimates of local production and local consumption of these services
- Development of experimental estimates of international transactions would be helpful
- International collaboration between national accounts and balance of payments experts to develop shared guidelines would also be helpful

Standard guidelines for measuring FDI can be applied to measure cloud computing FDI

## *Conclusions and Recommendations*

IT capital stocks are increasingly located remotely and increasingly owned by cloud computing enterprises, so the data on cloud computing services in the digital SUTs is important information

Cloud computing services are defined as *computing, data storage, software, and related IT services accessed remotely over a network, supplied on demand and with measured resource usage that allows charging on a pay-per-use basis*

- Hosting in remote datacenters would be useful to aggregate with cloud computing

No new conceptual issues, but gross flows of cross-border services, own-account investment, and economic ownership/residency may present practical measurement challenges

Experiments on compiling gross flows of cross-border cloud computing services could clarify the extent of the practical measurement challenges

## *Comment received in a Prior Presentation*

In classifying BPaaS and related services, how can compilers draw the line between an IT service based on business process and management software run in the cloud and a business process/management service produced with the help of IT inputs?

# *Questions for the AEG and BOPCOM*

Is a global consultation needed for the cloud computing GN?

If so, what questions should be asked?

Do you have any suggestions of items that need to be added, or areas that need to be clarified in the GN?