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Compilation Guidance Note on Cloud Computing

Prepared by the Statistics Department

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Compilation Guidance Note on Cloud Computing[1]

Cloud computing has shifted computing from local systems to remote data centers, changing how information and communication technology (ICT) services are delivered to businesses, governments, and households. It replaces traditional hardware and software ownership with scalable, on-demand solutions, but also complicates macroeconomic data compilation and analysis.

This paper examines the challenges cloud computing poses for compiling and interpreting Balance of Payments (BOP) statistics and National Accounts (NA). Issues include cloud service classification, changes in ICT investment, and difficulties tracking economic activities due to intangible assets and multinational companies. The paper offers practical guidance and tools to address these concerns in the digital economy.

A. INTRODUCTION

1. **Digitalization and the integration of digital technologies are changing work processes and commercial transactions.** Cloud computing has emerged as a pivotal technology in this landscape. Cloud computing has shifted computing activities from local devices to remote data centers accessed via networks, commonly referred to as "the cloud." The increased use of cloud computing has led to the replacement of owned computing and communication equipment and software with purchased ICT services. Cloud computing is also used in the delivery and production of many digital services provided over the internet, including AI computing services. These services are often utilized as inputs for producing other goods and services.

2. **Cloud computing has become a global industry, with widespread use across businesses, governments, and households.** Various entities acquire hardware and software services both internationally and domestically, relying on a few large cloud computing providers, which are part of multinational enterprises (MNEs).

3. **This development affects the compilation and interpretation of macroeconomic data and presents challenges to traditional economic measurement concepts and practices.** For instance, cloud computing is shifting ICT investment patterns from large diversification across many industries to a much more concentrated kind of business. There are also challenges related to measuring economic activity due to the increasing role of intangible assets—such as data and intellectual property—as sources of value. Moreover, because these assets can easily be moved from one economy to another, attributing the location of the service provider to a specific economy can be difficult. MNEs may hold such assets in various organizational units depending on their global strategies and customers' needs. It could complicate cross-border flows of service provision and purchase.

4. This note aims to provide methodological guidance, outline challenges that can be faced by compilers and data users of balance of payments (BOP) and SNA, and suggest tools that may be useful in addressing these challenges.

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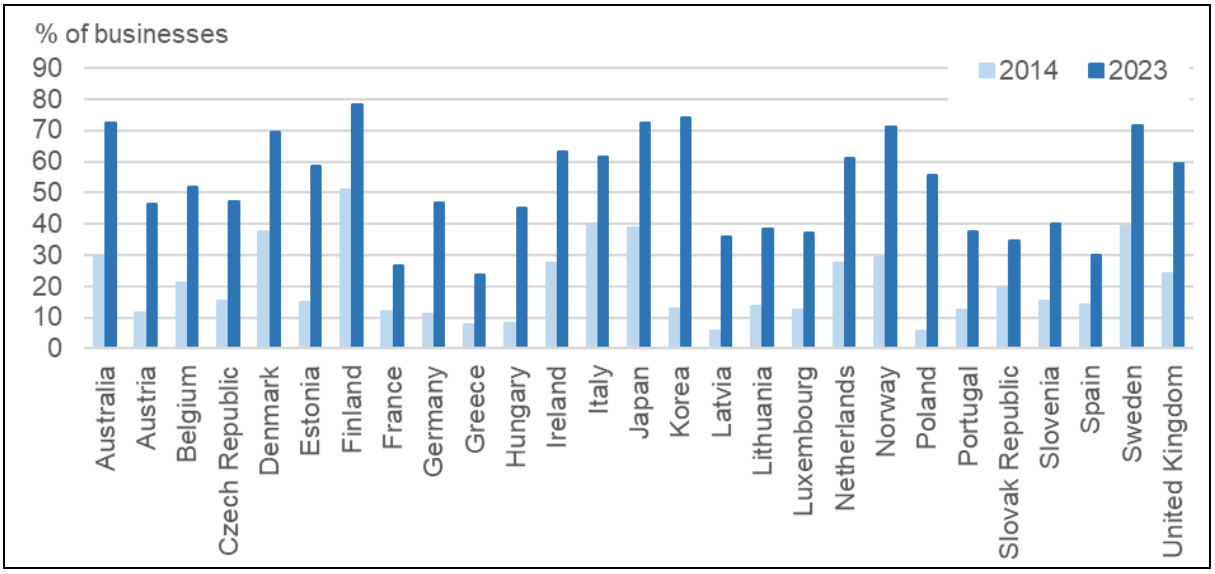
Figure 1. Growing Trend for Cloud Computing Services



Note: Applies to business with 10 employees or more (except Japan for which applies to business with 100 employees or more).
Source: OECD

B. DEFINITION AND BACKGROUND

5. **Cloud computing transactions require updated statistical guidance.** Although recordings for similar transactions were generally covered in the *Balance of Payments and International Investment Position Manual, sixth edition (BPM6)*, cloud computing was not specifically mentioned in the manual, and further clarifications on the appropriate recording of cloud computing were necessary.

6. **Updated manuals and guidance notes address the statistical treatment of cloud computing.** In the discussions of updating *2008 SNA* and *BPM6*, a guidance note (GN) DZ.8 Measurement of Cloud Computing in National Accounts was prepared, defining cloud computing services as "computing, data storage, and related IT services accessed remotely over a network, supplied on demand and with measured resource usage." The GN highlighted (i) needs for detailed classification of cloud computing services and hosting services, (ii) fixed capital formation of the users of cloud computing services, (iii) fixed capital formation of cloud computing suppliers, (iv) prices and volumes of cloud services and services enabled by cloud computing, and (v) international transactions associated with cloud computing. The White Cover (Pre-Edited) Versions of the *Integrated Balance of Payments and International Investment Position Manual, seventh edition* (*BPM7*) and the *2025 SNA*—both released in March 2025—introduced a digitalization chapter featuring cloud computing concepts discussed in the GN, as well as a globalization chapter covering MNE-related topics.

7. **This note is intended to provide methodological guidance and identify suitable data sources and adjustments for compiling information in accordance with *BPM7* and the *2025 SNA*.** It offers relevant guidance for various economies, including both providers and users of cloud computing services, as well as associated entities. The document outlines potential challenges encountered by compilers and users of BOP and SNA and recommends tools that may assist in overcoming these challenges.

Box 1. Cloud Computing Services in U.S. National Accounts

U.S. Bureau of Economic Analysis (BEA) produces economic statistics that highlight specialized areas of the economy through its system of satellite accounts, including the digital economy satellite account. BEA first developed estimates of cloud services output as part of the August 2020 publication of its digital economy statistics. The definition for cloud services was taken from BEA's 2019 Benchmark Survey of U.S. Direct Investment Abroad (BE-10), specifically, cloud services represent computing services that customers can access from a shared pool of configurable computing resources in a flexible and on-demand way, without active management by the customer. BEA's research determined the primary North American Industry Classification System (NAICS) industry producing cloud services is NAICS 518210, "data processing, hosting, and related services."

Initial estimates of cloud services output were based on revenue data from the Economic Census for products within NAICS 518210. Subsequent research determined the Economic Census product categories that include cloud services also include unrelated internet and data products, resulting in cloud services output being overestimated in the initial estimates. Beginning in the November 2022 publication, BEA began estimating cloud services output using alternative data sources. For 2013–forward, data on cloud services revenue from the International Data Corporation (IDC) have been used to estimate cloud services output. The IDC data were determined to be a reliable data source after examining their methodology and comparing their company-level data to cloud revenues from BEA's BE-10 data. Since data prior to 2013 were unavailable from IDC, the 2005–2012 values were back-casted from the 2013 value using growth rates for cloud services revenue from public financial filings for major cloud companies, including AWS, Salesforce, Google, Microsoft, and IBM. The most recent release of the digital economy satellite account from December 2023 shows that while cloud services represented just 7.5 percent of digital economy GDP in 2022, it saw the fastest growth in current-dollar value of any component between 2017 and 2022, with an annual average growth rate of 27.2 percent.

C. TYPES OF CLOUD COMPUTING

8. **Cloud computing providers deliver a comprehensive array of services—including infrastructure, platforms, and software—across networks as needed, enabling users to access, develop, or automate applications without the necessity of owning physical hardware.** These services offer remote access to computing power, data storage, software, and related ICT resources on demand, with billing typically based on usage, either through pay-per-use models or capped pricing structures. Resource allocation is optimized via pooling, while rapid elasticity permits users to scale resource consumption efficiently according to their requirements. The main categories of cloud computing services are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Business Process as a Service (BPaaS), and Function as a Service (FaaS). Together, these service types streamline both IT operations and business processes for organizations. The following table presents a summary of these principal cloud computing service categories.

Table 1. Types of Cloud Computing Services

Type of Cloud Service	What It Provides	Examples
Infrastructure as a Service (IaaS)	Virtualized computing resources such as servers, storage, and networking. Users can install their own OS, software, and licenses.	Amazon Web Services (AWS) EC2, Microsoft Azure Virtual Machines
Platform as a Service (PaaS)	A framework for developers to build, test, and deploy applications without managing infrastructure. Includes runtimes, databases, and tools.	Google App Engine, Microsoft Azure App Service
Function as a Service (FaaS) (subset of PaaS)	Event-driven execution of applications; code runs in response to triggers without managing servers.	AWS Lambda, Google Cloud Functions, Azure Functions
Software as a Service (SaaS)	Fully functional applications delivered over the web; users access via a browser, no installation or maintenance required.	Gmail, Microsoft 365, Salesforce
Business Process as a Service (BPaaS)	Automation and management of business processes using cloud platforms, often combining SaaS and PaaS.	ADP (payroll), Workday, Salesforce Service Cloud

9. **Cloud computing services are typically organized into a layered structure, each offering different levels of abstraction and control.** This layered structure allows organizations to access infrastructure either as a standalone service or embedded within higher-level cloud solutions. IaaS can be delivered directly by specialized IaaS providers who offer virtualized computing resources such as servers, storage, and networking. However, IaaS may also be provided indirectly by PaaS or SaaS providers as part of their broader service offerings---where the infrastructure layer supports platform tools or software applications but may not be separately visible to the end user.

10. **On-demand delivery defines cloud computing, distinguishing it from services that simply provide network access or have fixed-term contracts like annual agreements.**

D. COMPILATION GUIDANCE

RECORDING OF CLOUD COMPUTING SERVICES IN THE BOP

11. **Cloud computing services are recorded as computer and information services in the BOP.**[2] These services are often provided across borders through interconnected facilities and are attributed to the location where they are used. Most cloud computing services are used as inputs in the production of other outputs, such as digital services (including streaming video, ridesharing, or telecom services), non-digital services (such as insurance, education, or government services), or research and

[2] The digitalization chapter in *2025 SNA* and *BPM7* describes that cloud computing users with a long-term contract for dedicated access to a server in a cloud computing data center are considered to be economic owners of the server if the operating risk is borne by the user, making the contract a financial lease (*2025 SNA* 11.99–11.101; *BPM7* 16.16). However, in *BPM7*, no distinction is made in the treatment of licenses to use based on whether they will be used in production for more than one year or less, and whether the licensee assumes risks and rewards of ownership (*BPM7* 11.100). The alignment of BOP service items with the SNA could be achieved by extending EBOPS categories.

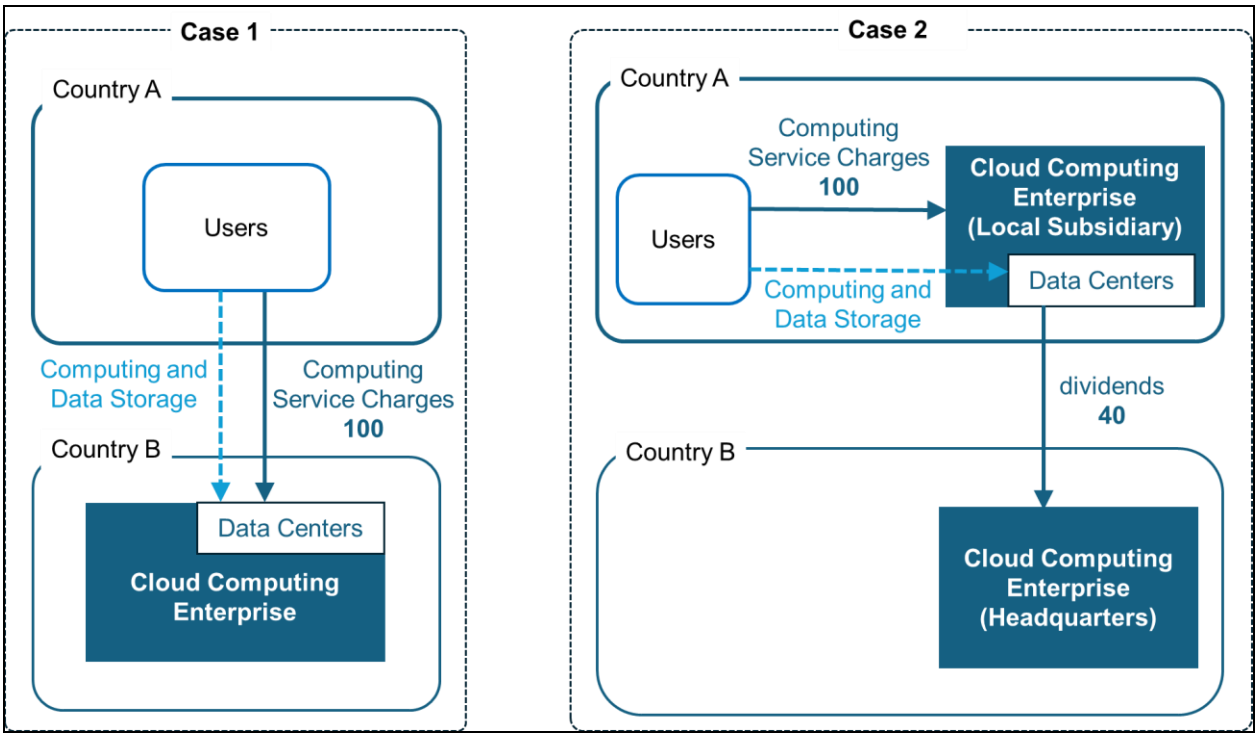
development and software assets. These cloud computing services are typically consumed at the location where the related production process occurs.

12. **It is essential to distinguish between the billing entity and the actual location of service delivery, especially when resource pooling and dynamic workload allocation obscure the production site.** These complexities make it difficult (i) to determine whether a transaction is domestic or cross-border, and (ii) to correctly attribute the partner economy in cross-border transactions. To ensure accurate recording of cloud computing services in the BOP, in principle, compilers should attribute the transaction to the location where the service is provided. Compilers should consider using supplementary data sources, such as enterprise surveys or user console interfaces, to improve attribution accuracy.

13. **Regulatory requirements may affect the geographic attribution of cloud services.** In certain circumstances, users may have specific preferences or regulatory obligations regarding the geographic location of their data storage or computing operations. Such information can support a more precise attribution of service flows. For instance, the Lei Geral de Proteção de Dados (LGPD, General Personal Data Protection Act) in Brazil imposes specific requirements on the location and handling of personal data. Under the LGPD, organizations leveraging cloud computing must ensure that data storage and processing comply with Brazilian regulatory standards, particularly regarding the transfer of personal data across borders. In practical terms, this may mean that cloud service providers must either maintain data centers within Brazil or guarantee compliance with LGPD through contractual safeguards and technical measures when processing data abroad. These legal frameworks demonstrate how regulatory obligations can shape cloud service delivery, affecting the attribution of service transactions.

14. **The following charts illustrate basic examples of cloud computing service transactions between an IaaS provider and the users.** In Case 1, users in Country A purchase cloud computing services from a company based in Country B and pay service charges of 100. In Country A, the payment is recorded as computer services in BOP. In Case 2, users access cloud computing services through a local subsidiary of a cloud computing enterprise, with payments made to the local subsidiary. In this scenario, user data is stored in data centers located in Country A and operated by the local subsidiary. The local subsidiary may pay dividends out of their profits, to the parent in Country B. In this case, while dividends are recorded under investment income, payment of the computing service charges is not recorded in BOP as it is a resident-resident transaction.

Figure 2. Examples of Cloud Computing Services Transactions



BOP Recordings (Case 1)

Country A

Current Account	Credits/ revenues	Debits/ expenditures
Services Computer services		100 (to Country B)

Country B

Current Account	Credits/ revenues	Debits/ expenditures
Services Computer services	100 (from Country A)	

BOP Recordings (Case 2)

Country A

Current Account	Credits/ revenues	Debits/ expenditures
Earned income Dividends		40 (to Country B)

Country B

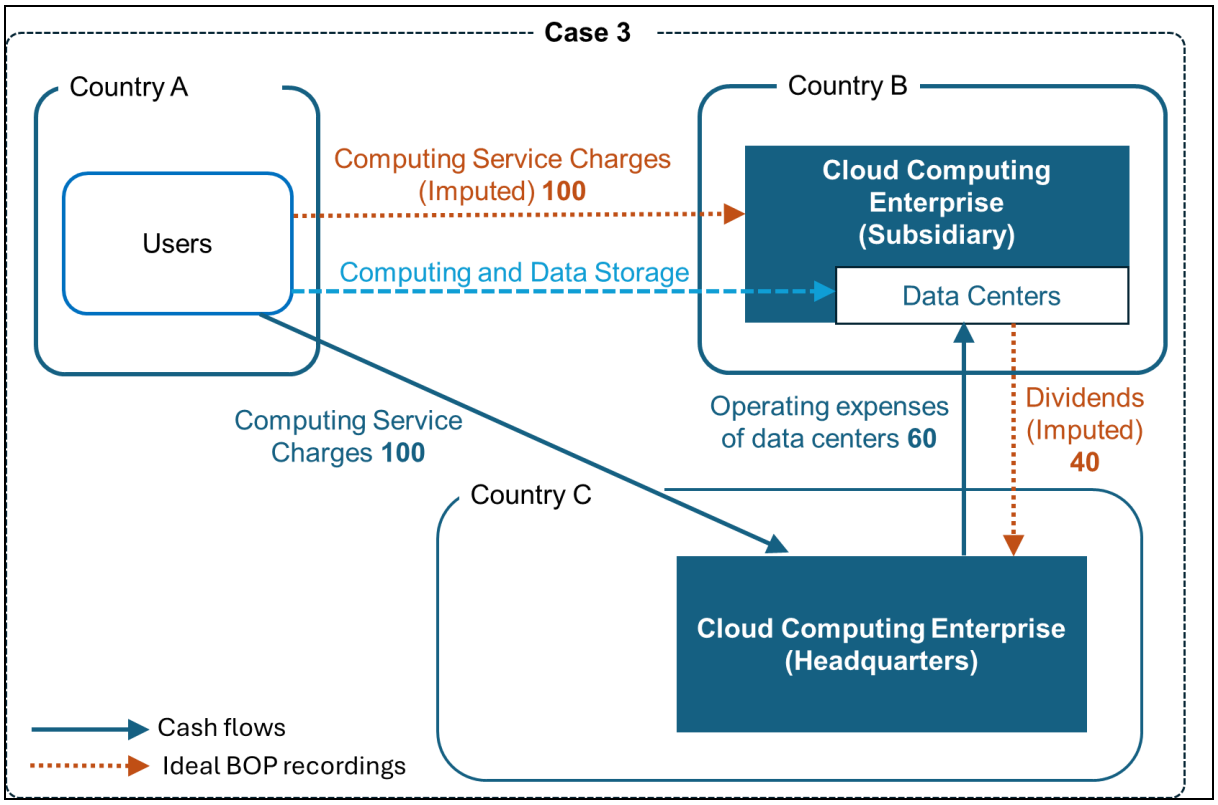
Current Account	Credits/ revenues	Debits/ expenditures
Earned income Dividends	40 (from Country A)	

15. **Complex transaction structures require careful BOP treatment.** There are cases where the billing entity is different from the location of the service provider. In case 3, for example, users in Country A make payments to the cloud computing enterprise's headquarters in Country C, while the actual computing and data storage services are delivered by a subsidiary in Country B. The transaction observed include: (i) computing services charge payment from Country A to Country C, and (ii) payment of operating expenses of data centers from Country C to Country B. What would be the BOP recordings for this case? Ideally, if the services are provided from Country B while users pay computing service charges to the headquarters in Country C, compilers of BOP should record the transaction as an import of services from Country B.

- The ideal approach is to record the imputed payment of computing service charges from Country A to Country B, as well as imputed payment of dividends from Country B to Country C[3]. When carrying out these imputations, it is important that compilers ensure treatments are consistent with those applied in counterpart economies. However, in reality, compilers may not always have enough data to confirm the consistency or to guarantee the assessments.
- The second-best approach will be to record transactions based on the actual payments. In situations where compilers face uncertainty regarding the attribution of services import/export counterparts and the assurance of symmetric treatment with the counterpart economy, it is advisable to record transactions based on actual payments as a practical approach.

[3] This is an example of hidden dividends and investments in transfer pricing; it represents a return on equity to the parent that is not formally declared as a dividend but is embedded in intra-group arrangements. The imputation ensures that the BOP accurately reflects the economic benefit transferred from the subsidiary to the parent, even if it is not explicitly recorded as a dividend in company accounts (see *BPM7* 3.113–3.116, 12.120–121).

Figure 3. Examples of Cloud Computing Services Transactions



Ideal BOP recordings (first-best approach, Case 3)

Country A

Current Account	Credits/ revenues	Debits/ expenditures
Services		
Computer services		100 (to Country B)

Country B

Current Account	Credits/ revenues	Debits/ expenditures
Services		
Computer services	100 (from Country A)	
Earned income		
Dividends		40 (to Country C)

Country C

Current Account	Credits/ revenues	Debits/ expenditures
Earned income		
Dividends	40 (from Country B)	

Practical BOP recordings (second-best approach, Case 3)

Country A

Current Account	Credits/ revenues	Debits/ expenditures
Services		
Computer services		100 (to Country C)

Country B

Current Account	Credits/ revenues	Debits/ expenditures
Services		
Computer services	60 (from Country C)	

Country C

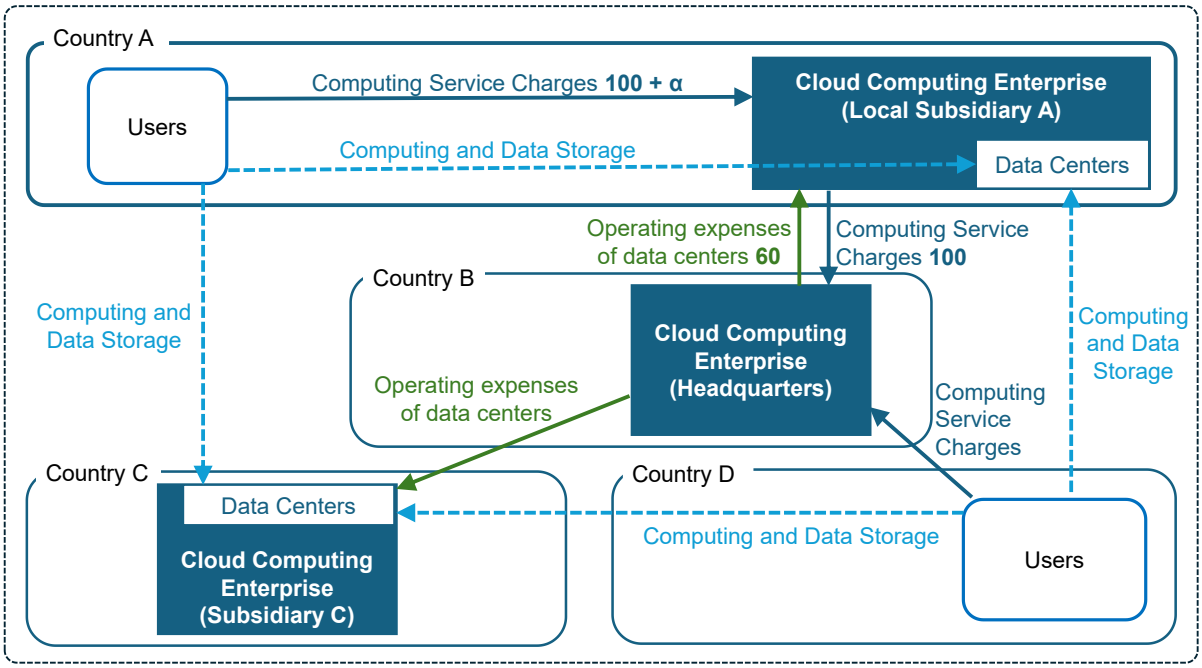
Current Account	Credits/ revenues	Debits/ expenditures
Services		
Computer services	100 (from Country A)	60 (from Country B)

16. However, in many cases, neither users nor compilers have sufficient evidence to accurately identify the service provider's location. The imputation for the ideal approach should only be adopted when supported by reliable information. Compilers are also encouraged to collaborate with partner economies to ensure consistency and accuracy.

Box 2. Complex Cloud Computing Service Transactions Across Economies

In practice, transactions can be significantly more intricate. Resident users may use data centers located both within and outside the country. Additionally, both residents and nonresidents may utilize data centers within the country. Transactions of cloud computing service charges can be frequently observed within a cloud computing enterprise group. The diagram below presents a simplified illustration of such scenarios. These circumstances present challenges in accurately attributing service charges to the economy where the service is provided. As stated above, when compilers are unsure about service counterparts or symmetric treatment between economies, recording transactions according to actual payments is a practical solution.

Figure. Complex Cloud Computing Service Transactions

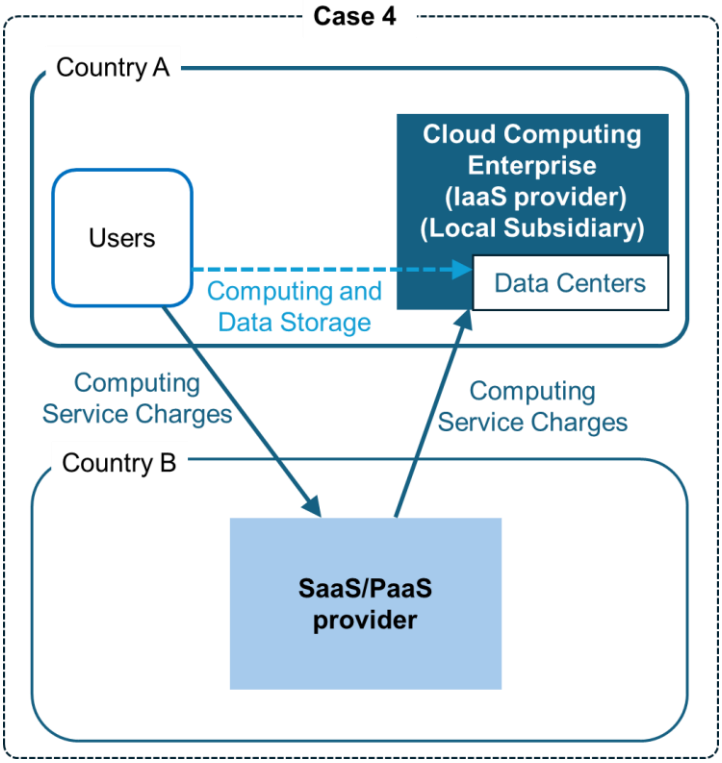


17. **Transactions involving cloud computing services such as SaaS and PaaS can present additional complexities.** SaaS/PaaS providers frequently rely on supplementary cloud computing resources, including IaaS, and final users may not have access to details regarding contracts between the SaaS/PaaS providers and the IaaS providers, particularly with respect to the location of data processing and storage.

18. **In such circumstances, attributing the counterpart economy of the transaction to the direct party of the contract is a standard and effective practice.** It offers clarity and consistency. For example, in Case 4, a user in Country A contracts with a foreign SaaS/PaaS provider in Country B but selects a data center in Country A for data storage. In such circumstances, this arrangement is typically classified as a resident-nonresident transaction under standard practice. Nonetheless, given the rapidly

evolving nature of cloud computing, it may be beneficial to periodically review the practice, and evaluate alternative options, such as including IaaS providers or considering data storage locations.

Figure 4. Transactions involving SaaS and PaaS



19. **BPaaS presents classification challenges.** BPaaS can encompass a range of functions, from purely digital automation to business process outsourcing that involves significant expert input. When the BPaaS offering is primarily focused on providing business advice, strategic guidance, or management support, it should be classified under professional and management consulting services. Conversely, if the service is centered on delivering automated computing solutions, leveraging cloud infrastructure to execute standardized tasks, it is more appropriately classified as computing services.

20. In practice, it is essential for BOP compilers to remain vigilant regarding the delineation of computer services from other categories of services. As cloud offerings diversify, questions arise concerning the line between computer services and other services, while technologically enabled by the cloud, may fall under multiple statistical classifications. For example, distinguishing between pure infrastructure provision and services that integrate significant content, cultural, or intellectual property components requires nuanced judgment, as the boundaries of digital service categories continue to shift with innovation.

Box 3. Measuring Cloud Computing in the European Union

Cloud computing activities play a central role in the European Union (EU) Digital and Industrial Strategy, with extensive resources and legislative efforts directed towards making this industry more significant across the Union. However, the nature of the Single Market introduces complexities in compiling Balance of Payments (BOP) statistics for this sector. The flexible rules to provide services across EU countries allows companies to establish their legal headquarters in any EU Member State, often in locations different from the location of their physical data centers.

This situation is challenging for BOP compilers because the invoicing country where the cloud computing enterprise headquarter is located may not coincide with the country hosting the data centres, and the BOP compilers must rely solely on financial flows to determine the counterpart country (second-best approach), which in practice could lead to significant misallocation of current transactions.

For example, countries with a concentration of larger cloud providers' headquarters might be recorded by other EU Member States as primary counterparts, despite lacking substantial data center infrastructure and service activities related to data storage and computation. It is also possible that some transactions may be recorded as cross-border transactions, when in reality the service is ultimately provided domestically by a local data centre. Presently, the impact of this characteristic on the BOP figures of EU Member States and the full extent of the phenomenon cannot be quantified but are well known.

There are severe practical limitations for following the first-best approach as well, which implies to allocate the provision of services to the country ultimately providing the service. Collecting opinions from industry partners, Eurostat—the statistical office of the EU—concluded that even with General Data Protection Regulation provisions allowing companies to obtain information about where data is stored and encouraging data retention within the EU, it is often challenging for enterprises to determine the specific country where services are provided. Thus, the first-best approach still presents a challenge for compilers to allocate the provision of services correctly.

In September 2025, Eurostat conducted a survey among European Union Member States to assess the current capabilities of reporting countries in compiling data on cloud computing activities. Approximately half of the reporting countries responded, highlighting significant challenges in gathering data for most cross-border cloud computing activities. Countries that are able to collect some information generally rely on direct surveys to gather data for the compilation of Balance of Payments transactions related to cloud computing, such as the International Trade in Services Survey, with limited use of administrative data sources such as business registers, tax records, and payment data.

Respondents pointed out limitations in current surveys, which may potentially be addressed with the introduction of the cloud computing topic in the new Digitalization chapter in the BPM7 manual. Many countries rely on tax registrations to allocate flows or depend on survey respondents to identify counterpart enterprise locations. They also face difficulty differentiating between cloud computing service types (which have been presented in this note), as well as between contract maturities (short-term vs. long-term), which could have a direct impact in the compilation of cloud computing services.

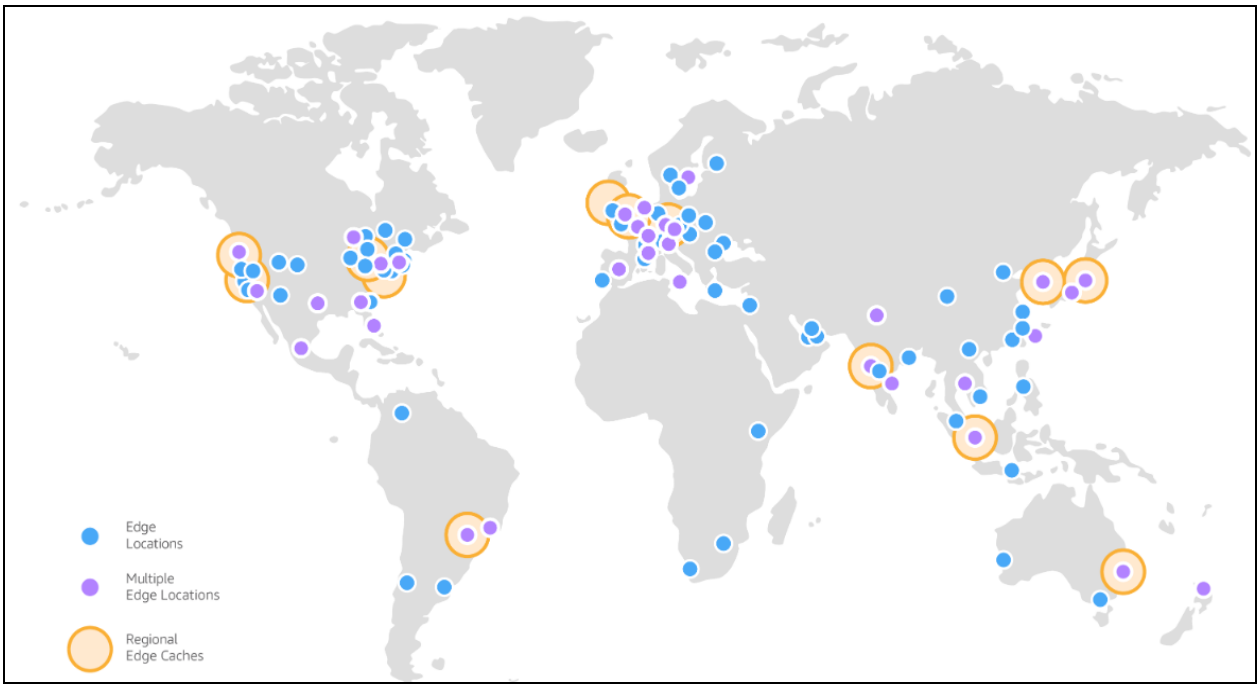
European countries' concerns about the complexity of implementing a survey-based approach for accurately capturing cloud computing activities were noted. New compilation methods, possibly involving exchange of information and data between affected countries, may be necessary for proper recording of cloud computing transactions in the BOP accounts. Transitioning to precise geographical allocation of these activities is challenging. However, the majority of countries anticipate improvements in their current compilation practices, and with the publication of the BPM7 and continuous cooperation among countries and international organizations, should enhance the

OTHER MAJOR BOP ITEMS RELATED TO CLOUD COMPUTING SERVICES

Foreign Direct Investment by Cloud Computing Service Providers

21. **MNE's foreign direct investment in cloud infrastructure is significant for BOP.** Major cloud computing service providers are MNEs with clients and operations in multiple countries. These companies provide services internationally by enabling cross-border data flows and establishing local datacenters, along with other infrastructure connected through international cable networks, including undersea cables. For instance, as illustrated in the figure below, Amazon Web Services (AWS) has 117 Availability Zones worldwide[4].

Figure 5. AWS Edge Locations and Regional Edge Cashes as of August 2025



Source: Amazon Web Services Website

[4] Availability Zone in AWS is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region.

22. **Investments made abroad by cloud computing service providers are recorded as foreign direct investment (FDI) in BOP, and treatment of MNEs in line with *BPM7* should be maintained.** In certain situations, multi-territory enterprises may conduct integrated operations across multiple economic territories, such as those involving undersea cables. If a parent entity or distinct branches cannot be clearly identified, it is necessary to allocate the enterprise's total operations among the respective economic territories. The allocation should utilize available data that best represent the contributions to actual operations; this could include equity shares, equal allocations, or distributions based on operational factors such as tonnage or wages. Where tax authorities have recognized the multi-territory structure, any established prorating formula should serve as the basis for statistical reporting. (*BPM7* 4.13, 4.66, 4.68)

Establishing and Operating Data Centers

23. **The establishment and operation of data centers by cloud computing service providers is recorded in the BOP if it involves resident-nonresident transactions.** The ongoing operation of these data centers, encompassing capital expenditures, maintenance, and technological upgrades, is likewise relevant for capturing both the initial investment and the subsequent production of services. These physical assets support the delivery of cloud computing services to clients worldwide, further blurring the line between domestic and international service provision as workloads are dynamically allocated according to demand, regulatory requirements, and operational efficiency.

24. **Understanding the legal, economic, and organizational frameworks of these data centers is crucial.** For example, data centers may be wholly owned by the local subsidiary, operated as joint ventures, or contracted through specialized local partners. Cross-border transactions associated with the construction, leasing, and equipping of data centers must be measured accurately to ensure the completeness of BOP statistics.

Hosting and Co-location Services

25. **Hosting and co-location services are included in computer services in BOP.** Those services are exported when foreign-owned IT assets, such as servers and software, are hosted in a resident data center. Similarly, these services are imported when locally owned ICT assets are hosted in a nonresident data center. (*BPM7* 16.19)

26. Leasing of computers without an operator is typically included in operating leasing. Leasing of data center buildings to cloud computing enterprises (lessee) is typically included under financial lease provided the lessee bears the operating risks. (*BPM7* 11.105, 16.17)

Intellectual Property Products of Cloud Computing Service Providers

27. **Cloud computing has given rise to new categories of assets, including data assets, software, nonfungible tokens, and artificial intelligence (AI) systems.** These developments involve significant intellectual property products (IPPs). It is essential to thoroughly understand transactions within MNEs that provide cloud computing services. The intangible characteristics of IPPs complicate both the transfer and usage of these assets, introducing considerable measurement complexities. This challenge is particularly acute for IPP transactions within MNE groups. The primary issue concerns the identification of economic ownership. To address these complexities, a dedicated chapter on globalization was included in *BPM7* and the *2025 SNA*, specifically addressing the intricate structure of MNEs and the

statistical challenges associated with IIP-related transactions within MNE groups (*BPM7* 15.13–27, 15.33–37).

28. When IPP-related transactions take place outside the domain of MNE groups, such transfers are generally identifiable through market transactions, and this makes the recording less complicated. Observable examples include payments for licenses to reproduce or distribute (or both) software, which are classified under charges for the use of intellectual property n.i.e. (*BPM7* 11.96). These transactions often involve cloud-hosted software and platforms, especially in SaaS and BPaaS models.

RECORDING AND CLASSIFYING HARDWARE AND SOFTWARE INVESTMENT IN SNA

Recording and Classifying Hardware Investment

29. **Recording hardware investment depends on asset ownership and risk.** When on-premises IT assets were more widely used by firms, IT asset purchases were widely dispersed across industries. Cloud computing has caused ownership of these assets to be increasingly concentrated among firms in this industry. If the remote provider bears the operating risk of the IT equipment, the service should be classified as cloud computing, and the cloud provider should be considered the owner of the asset. If the client bears the operating risk, the service is classified as co-location rather than cloud services.

30. **Compilers should be mindful of own-account investment in IT equipment by cloud providers, which may not be easily identified in company financial statements.** Dedicated survey questions could be used to identify these investments. Valuation should be at sum of costs, including the costs of materials and the workers who design and build the equipment.

Recording and Classifying Software Investment

31. **The economic activity classification used for compilation of the production accounts groups software publishing, including the provision of remote access to software, separately from other cloud computing services.** Companies that primarily provide access to software that they hold copyright for are classified in International Standard Industrial Classification (ISIC) class 582, Software publishing. This may include some of the large SaaS providers. Companies that primarily provide other cloud computing services, including IaaS and related services, are classified in ISIC class 631, Computing infrastructure, data processing, hosting and related activities. As a result, these activities will be recorded separately in GDP by production.

32. **If a company is primarily engaged in developing software, they are classified as a software publisher even if the developed software is offered through remote on-demand access as SaaS.** When a cloud company provides access to software developed by others, this is classified as cloud services. While in theory this service could also be considered as intermediation of software services and measured on a margin basis, in practical terms it is highly unusual for a cloud provider to provide access to third-party software without providing additional bundled value-added services as well. In cases of remote access to third-party software, the software license is an asset of the cloud provider and the client purchases software rental services, in cases where a customer purchases IaaS and then uses the computing to operate their own purchased software, known as “bring your own license”, the license is an asset of the customer.

33. **Software investment classification depends on license terms.** Software licenses of one year or more of use are classified as investment and capitalized. Licenses for use of less than one year are considered as intermediate consumption of software services. (*2025 SNA* 11.99–11.101)

E. DATA SOURCES

SURVEYS ON MNES

34. **Information from global cloud computing service providers can contribute significantly to understanding exports and imports of these services.** Payments within an MNE to each local establishment, including payments on behalf of the local establishment rerouted through that establishment, as well as country-level breakdowns of total provision of cloud computing services are particularly valuable in compilation of macroeconomic statistics. Additionally, if information on the gross flows of cloud computing services is available, it becomes possible to generate more precise estimates of international transactions in these services.

35. **Surveys of MNEs can improve measurement of cloud service exports and imports.** Surveys targeting the MNEs should be designed to capture the detailed information on gross flows of cloud computing services by country, intra-group transactions, licensing arrangements, and the geographic distribution of cloud service production.

36. **International cooperation may assist national statistics offices in developing consistent estimates.** The UNECE Guide to Sharing Economic Data in Official Statistics discusses international data sharing for the purpose of enhancing the measurement of MNEs and international transactions. Ongoing cooperation between national accounts specialists and balance of payments statisticians is necessary to develop further guidelines for data sharing.

SURVEYS ON CLOUD COMPUTING SERVICES USERS

37. **In addition to cloud computing service providers, users may also offer valuable information regarding usage.** Surveys are an effective means of gathering such data. It is advisable for BOP compilers to conduct a preliminary survey on cloud computing usage to obtain a general overview of cloud-related transactions. Subsequently, relevant questions can be integrated into existing surveys, such as trade in services surveys and enterprise surveys. The preliminary survey may include questions about the types of cloud services utilized, the purposes of usage, the geographical location of cloud service providers, and the value of cross-border payments related to cloud services. It is important to identify instances where the billing address differs from the data center location[5], so that compilers can make appropriate adjustments when the billing address does not correspond to the actual location of the service provider. Sample questions for the preliminary survey are provided in Annex B.

[5] Users may select or may be able to identify the location of service provider using console interface such as the AWS Management Console.

Box 4. Measuring Cloud Computing Services in U.S. International Economic Accounts

The United States is home to important cloud services providers. Due to the digital nature of these services, measurement in an international context can pose challenges. In particular, companies may provide these services from a single location or across countries and areas, which can make the residency of the service provider ambiguous. Many U.S. companies that provide cloud services are also multinational enterprises and international service traders, which makes them in-scope for BEA surveys on the Activities of Multinational Enterprises (AMNE) and international trade in services. BEA has collected information on cloud computing on both of these sets of surveys.

AMNE Surveys

BEA added a dedicated set of questions on cloud computing to the 2019 and 2024 Benchmark Surveys of United States Direct Investment Abroad. The survey asked both U.S. MNE parent companies and their foreign affiliates for the value of cloud computing service sales and associated expenses. BEA has also collected information on cloud computing service revenue on its 2022 Benchmark Survey of Foreign Direct Investment in the United States.

The relevant questions are:

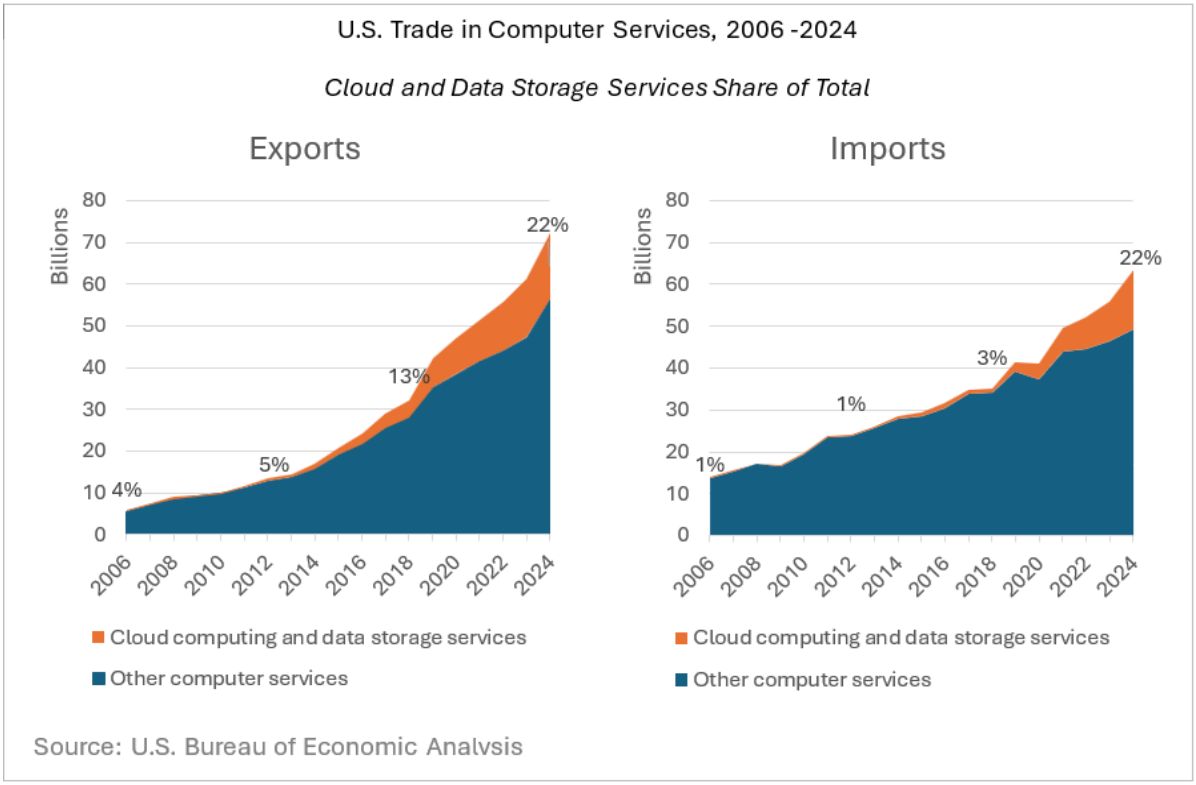
> For cloud computing services, what are the U.S. Reporter's values for:
> *Cloud computing services — Computing services that customers can access from a shared pool of configurable computing resources in a flexible and on-demand way, without active management by the customer. They offer a range of resources, such as access to processing, storage, and networks; platforms for customers to deploy their own applications; and readymade software.*
>
> • Sales or gross operating revenues, excluding sales tax? _____
>
> • Costs and expenses, excluding employee compensation, associated with providing these services? _____
>
> • Number of employees engaged in providing these services? _____

The special data collection on the direct investment surveys faced challenges. First, the response rate on the questions was low, despite outreach efforts before and during the survey collection period. Another challenge was effectively communicating the concept of cloud computing services to survey respondents. Some companies misinterpreted the question and reported these sales although they were not providers of cloud computing services; such companies reported any operating revenues that they attributed to having been generated, or supported, by the move of their own internal information technology systems from local hardware to the cloud.

International Trade in Services Surveys

BEA does not collect information on cloud computing services as an individual service type on its surveys of transactions in selected services and intellectual property. However, cloud computing services are collected as a combined service type along with data storage services. Cloud computing and data storage are included in the published service type 'computer services' in BEA's quarterly International Transactions Accounts statistics. Details for cloud computing and data storage services are published in BEA's detailed annual services statistics, beginning with data for 2006. These

services have grown substantially in recent years, from 4 percent of computer services exports in 2006 to 22 percent in 2024 and from 1 percent to 22 percent of computer services imports.



INTERNATIONAL TRANSACTIONS REPORTING SYSTEM (ITRS)

38. **The international transactions reporting system (ITRS) is also useful to capture cloud computing-related transactions.** However, the ITRS often reflects the location of the billing entity rather than the actual service provider. This can lead to misclassification of the partner economy in BOP statistics. For example, consider a scenario where a company in Country A pays an annual fee to a cloud service provider headquartered in Country C, but the actual data center delivering the service is located in Country B. Without adjustment, the ITRS would record Country C as the partner economy, potentially misrepresenting the geographic distribution of service provision. As outlined previously (refer to Case 3), the ideal approach is to record the imputed payment for computing service charges from Country A to Country B. Compilers are encouraged to refine the data using supplementary sources, such as enterprise surveys, and by collaborating with partner economies, in order to accurately identify the location of actual service providers.

OTHER DATA SOURCES

39. **In addition to surveys and ITRS, compilers may utilize other data sources such as administrative records, financial disclosures, industry reports, and technical metadata to improve the accuracy of recording cloud computing related transactions.** Regulatory filings and tax documents can help identify service locations and ownership of intangible assets, while commercial

datasets[6] may offer revenue and market share insights. Company-level financial statements and licensing contracts may clarify intra-group flows and asset treatment. Metadata from user interfaces and network logs can support attribution of service delivery, especially when billing entities differ from actual providers. Conducting research on quantifying investments in servers and software hosted in foreign locations by users of hosting services would also be useful.

F. COMPILATION CHALLENGES

IDENTIFICATION OF THE COUNTERPART ECONOMY

40. **Identifying the counterpart economy is a major challenge in recording cloud computing services.** Complex intra-group transactions within MNEs present significant challenges to the accurate recording of international transactions. The resource pooling characteristic inherent in cloud computing technology further complicates the measurement of detailed trade flows, particularly when service providers are MNEs operating across multiple jurisdictions and clients do not stipulate specific datacenter locations for service delivery. To optimize workload distribution, cloud computing providers may reallocate tasks to datacenters overseas or store backup data internationally, ensuring continuous availability despite potential data center outages or natural disasters. Additionally, software updates developed at MNE headquarters or designated development centers may be deployed globally to various datacenters as part of SaaS offerings. The unpriced cross-border data flows that facilitate seamless task shifting between sites exemplify a broader challenge in quantifying international transfers of commercially valuable information among related entities, which often occur without explicit payment.

41. **Tax-related factors of MNEs providing cloud computing services have an influence on both their actual and reported transactions.** MNEs operating in sectors with substantial IPPs frequently allocate a disproportionate portion of their global production to low-tax jurisdictions by relocating IPPs and manipulating international transfer pricing. Cloud computing services appear notably impacted by these practices.[7]

42. **The multi-layered structure of cloud computing—encompassing infrastructure, platform, and software services—further adds to the complexity.** Each layer may involve different providers, locations, and contractual arrangements, making it difficult to trace the origin and destination of specific services and to accurately record the economic relationships involved.

CLASSIFICATION ACROSS SERVICES CATEGORIES

43. **Clarification is required regarding the management and support services involved in cloud computing, such as guidance and software to implement and utilize core cloud computing functions.** These services assist organizations in deploying and managing cloud computing solutions while ensuring the security of data and applications. An example of such a service is BPaaS. BPaaS

[6] As described above, IDC's cloud services revenue data have been used by BEA to refine estimates of cloud services output. Other market research firms including Gartner offer detailed data on cloud service revenues, market shares and geographic distribution.

[7] Baer et al. (2020) indicate that Ireland and the Netherlands—representing only 2 percent of the OECD countries' GDP—were responsible for 53 percent of OECD countries' exports of computer services in 2016.

provides business process solutions—including payroll, customer service, and accounting—via the internet. It automates labor-intensive tasks using digital workflows, streamlining operational processes. Unlike traditional outsourcing, BPaaS operates on cloud infrastructure and software platforms, enabling organizations to manage business operations without owning the underlying IT systems. Whereas most cloud computing services typically substitute for capital investments, BPaaS replaces labor inputs by automating processes. As BPaaS combines business process outsourcing with software services, it can be categorized as a professional and management consulting services enabled by IT resources. Segmenting cloud computing services to specifically identify BPaaS would enhance understanding of cloud computing offerings.

PRICE AND VOLUME ESTIMATES

44. **Compilation of price indices for cloud computing is challenging because the services are typically purchased as complex bundles of various systems and applications, each with their own pricing features.** IaaS and PaaS data storage and transfer services are usually priced per gigabyte of data. Tiered pricing is often used with lower rates charged per gigabyte for high volume users. SaaS is typically charged as a subscription fee per user per month, with discounts granted to buyers committing to more users and/or longer service periods. Usage-based charges per user session are assessed less frequently. IaaS and PaaS computing capacity is typically charged per hour, though these charges may be assessed per second. These hourly fees vary based on:

- The time when computing is used. Higher fees are charged for times of higher demand. Consumers may receive discounted rates for pre-purchasing increments of time for later use.
- The location of the server. Busier servers will charge higher rates, and customers may receive discounted rates for using servers with lower usage. Customers may be constrained to using servers in specified geographic locations based on privacy laws.
- The amount of memory used per computing hour.

45. **The most practical approach is to use the bill of a non-specified high-volume user in the reference period to set the services to be priced.** In future periods, the cloud provider should provide the current rates that would be charged if a customer were to receive the same amount of specified services in the current period.

G. CONCLUSIONS AND WAY FORWARD

46. **Cloud computing complicates accurate recording of international transactions due to dynamic resource allocation, intra-group transfers within MNEs, and the frequent absence of explicit payments for cross-border data flows.** Tax-related strategies, such as shifting IPPs to low-tax jurisdictions and manipulating transfer pricing, further obscure both actual and reported economic activity. The recording and interpretation of cloud computing services in economic statistics may demand a nuanced approach that accounts for both technological and organizational intricacies.

47. **A key ongoing challenge is the identification of the location of actual computing or data storage.** The resource pooling and dynamic workload allocation inherent in cloud computing make it difficult to pinpoint where services are physically provided. There is room for further consideration of

criteria or methodologies for allocating the economy where the service was provided from, such as using supplementary data sources, enterprise surveys, or technical metadata.

48. **To enhance transparency and comparability, it would be useful for countries to document and disclose their practices in metadata as part of their data quality assessment frameworks**. By sharing information on how service locations are determined and recorded, statistical agencies can support better understanding and harmonization of the statistics.

49. **Improved data collection and multi-faceted approach is necessary to accurately assess the changing role of ICT resources including cloud computing.** This involves recognizing the dynamic and cross-border nature of cloud services, identifying key actors and their roles, and distinguishing between legal and operational realities. Advanced analytics and harmonized reporting standards, combined with data from surveys, ITRS, contracts, network activity, and user interfaces, help reveal resource use and allocation, and lead to more accurate recording of transactions. Collaboration across jurisdictions and vigilance regarding evolving regulations and new technologies are essential to ensure that economic figures reflect both the technical complexity and the real-world significance of cloud computing.

50. **Collaboration and adaptive frameworks are essential for robust economic measurement.** It is necessary for statistical agencies and industry stakeholders to work together to establish best practices for capturing the distributed and dynamic nature of cloud computing transactions, utilizing resources such as Compilers Hub. These joint efforts enhance the reliability and accuracy of measuring economic impact within both national and international accounts.

Questions for the Committee/AEG:

1. *Do the Committee/AEG members agree with the first-best approach and the second-best approach illustrated in Figure 3?*
2. *What are the Committee/AEG member's views on the treatment of transactions involving SaaS and PaaS?*
3. *What minimum metadata and survey variables should be recommended to ensure comparability, given the fragmented and hybridized market?*
4. *Do members agree that the updated note, incorporating comments from AEG and BOPCOM members, should be posted for global consultation?*

References

- *Integrated Balance of Payments and International Investment Position Manual, seventh edition* (*BPM7*) White Cover (Pre-Edited) Version
- Guidance Note on Cloud Computing
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- UNECE Guide to Measuring Global Production
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- Baer, A., Lee, K., and Tebrake, J. (2020), IMF Working paper Volume 2020 Issue 127
- Coyle, D. and Nguyen, D (2019), Cloud Computing, Cross-Border Data Flows and New Challenges for Measurement in Economics

Appendix I. Sample Preliminary Survey Form for Potential Cloud Computing Service Users

Purpose: This survey aims to collect information from enterprises to support BOP compilation, focusing on cross-border cloud computing service flows, licensing arrangements, data center locations, and IPP-related transactions.

SECTION 1: GENERAL INFORMATION

1.1 Company Name:
1.2 Country of Headquarters:
1.3 Industry Classification (ISIC):

SECTION 2: CLOUD SERVICES USAGE

2.1 What types of cloud services does your company use? (Select all that apply)
- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)
- Business Process as a Service (BPaaS)

2.2 What business functions are supported by cloud services?
2.3 Are cloud services used for production, administration, or both?
2.4 What are the primary cloud service providers your company uses?

SECTION 3: CROSS-BORDER SERVICE FLOWS

3.1 Are any cloud services purchased from providers located outside the country?
3.2 Please specify the countries of the cloud service providers.
3.3 What is the approximate annual expenditure on cross-border cloud services?

SECTION 4: LICENSING AND IPP ARRANGEMENTS

4.1 Are cloud services accessed through long-term licenses (more than one year)?
4.2 If yes, are these licenses treated as assets in your accounting records?
4.3 Are any proprietary software or IPP assets hosted or managed via cloud services?
4.4 Are payments made for the use of proprietary rights or IPP? If yes, please specify.

SECTION 5: DATA CENTER LOCATIONS

5.1 Are you aware of the physical location of the data centers used by your cloud service providers?
5.2 Can users select or identify the physical location of the data or computing resources?
5.3 If yes, please specify the location of data or computing resources.
5.4 Are there any restrictions or preferences regarding data center locations?
5.5 Are there cases where the billing address differs from the location of the data center?
5.6 If yes, please provide examples (e.g., billing entity is the headquarters in the US, data center in Asia).

SECTION 6: ADDITIONAL COMMENTS

6.1 Please provide any additional information or comments relevant to your company's use of cloud computing services and its impact on cross-border transactions.