

GROWING DEMAND FOR CLOUD COMPUTING FUELS U.S. EXPORTS

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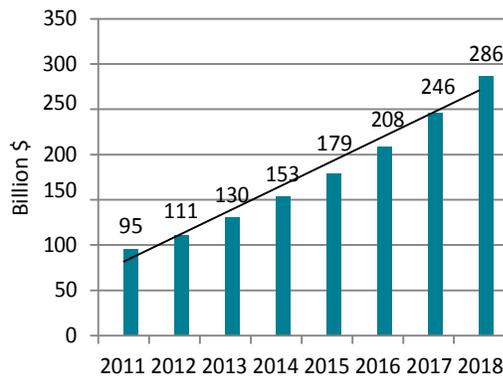
Worldwide demand for cloud computing services is rising, with double-digit compound annual growth rates expected through 2018. Cloud services offer scalable and flexible capabilities, enabled by information technology (IT) and delivered via the Internet, giving them an edge over the fixed (and usually higher) costs of in-house equipment and traditional systems management. In particular, public cloud computing services, designed for a largely unrestricted user market, are becoming integral to IT systems due to declining costs and rapid deployment. U.S. firms were early innovators in cloud computing and currently dominate the industry. To meet growing demand, they are increasingly serving customers across borders.

Gathering Clouds

Significant improvements in processing power, storage capacity, and communication transmission have contributed to the development of cloud computing. Macro forces driving demand include globalization, which creates new markets; technological advances, such as faster broadband and improved data protection; and deregulation, such as new rules increasing the availability of radio spectrum for commercial use. The cost savings of renting IT hardware and cloud services, quick deployment, and flexibility and scalability have also increased adoption. Gartner Inc. forecasts that over half of all U.S. enterprises will purchase some form of cloud services in 2015¹

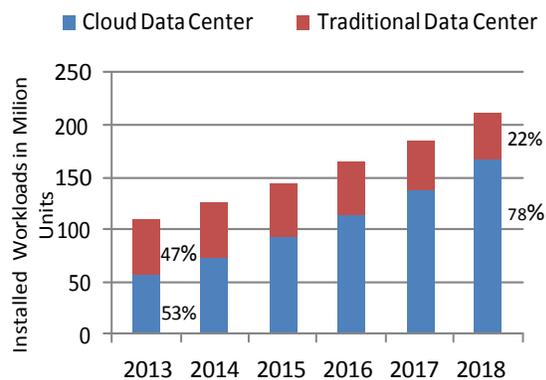
Although estimates vary, most industry forecasts foresee continuing, rapid expansion of public cloud computing. Forrester Research forecasts that global public cloud service revenues will reach \$191 billion by 2020, up from \$25.5 billion in 2011.² Gartner Inc. predicts that most new IT spending by 2016 will be for cloud computing; global end-user spending on public cloud services should reach \$286 billion in 2018, achieving a compound annual growth rate of 17.1% from 2011 to 2018 (figure 1). Cisco forecasts a steady shift in workload distribution from traditional data centers to cloud data centers (figure 2).

Figure 1 Projected global public cloud services market



Source: Gartner, Inc., 2014

Figure 2 Projected global workload distribution



Source: Cisco Global Cloud Index, 2013–18

U.S. Firms Pursue Market Opportunities

The United States has the world’s largest cloud computing industry, based on revenues. Nine of the 10 largest cloud computing service providers (based on the estimated number of servers) have U.S. headquarters, as do 9 of the 10 top generators of software-as-a-service revenue among the global 100 software firms (table 1). As

¹ Heavily regulated industries such as financial services and healthcare are adopting cloud services more slowly.

² Exclusive of equipment.

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demand for cloud computing grows, U.S. firms are increasingly serving customers in other countries and are transferring data across borders, between storage locations and customers, and between data centers.

Table 1 Cloud Computing: Major U.S.-headquartered firms and their services

<i>Software-as-a-Service</i>	<i>Platform-as-a-Service</i>	<i>Infrastructure-as-a-Service</i>
Applications aimed at private users	Tools for development, testing, hosting, and application maintenance	Disk space and database services
<i>Salesforce.com</i> – Customer relationship management	<i>Force.com</i> – Developer tool kit	<i>Amazon Web Services</i> – Website hosting
<i>Facebook</i> – Social networking	<i>Microsoft Azure</i> – Applications	<i>Eucalyptus</i> – Open-source software

U.S. exporters and multinational firms are increasing exports of cloud computing services, but the amount of trade is difficult to measure. Official data give an incomplete picture, and international classifications do not separately identify cloud services.³ Despite such challenges, the most recent data from the U.S. Bureau of Economic Analysis show that in 2010–13, the estimated value of U.S. cross-border exports of public cloud services rose 83% to nearly \$3.0 billion; in 2009–12, estimated value for affiliate sales⁴ rose 187% to \$3.9 billion (table 2). The largest regional markets for U.S. cross-border exports of cloud computing services in 2013 were Europe (41%) and Asia-Pacific (33%). Europe dominated the regional markets for affiliate sales in 2012 with 71%, with Asia-Pacific again ranking second at 18%.⁵

Table 2 Estimated U.S. exports of public cloud computing services (million \$), 2010–13^a

<i>Cross-border exports</i>	2010	2011	2012	2013	% change 2010–13
Computer services	36	89	90	136	277
Computer software	1,584	1,933	2,309	2,832	79
Total	1,620	2,022	2,399	2,968	83
<i>Sales by majority-owned affiliates</i>	2009	2010	2011	2012	% change 2009–12
Computer systems design and related services ^b	265	589	653	938	254
Software publishers	1,098	1,738	2,362	2,977	171
Total	1,363	2,327	3,015	3,915	187

Source: Cloud computing services export estimates based on BEA data and calculated by author.

^a The portions of cross-border exports and sales by majority-owned affiliates that, based upon BEA data, went to cloud computing services. BEA reports cross-border transactions by type of service delivered regardless of the industry of the firm delivering the service, while it reports affiliates' services supplied by the industry of the firm, regardless of the service delivered. Affiliate sales figures are supplied with a one-year lag. See Berry and Reisman, "Policy Challenges of Cross-Border Cloud Computing," 8–10, for a description of the calculation method.

^b Excludes Canada, for which BEA suppressed data for 2009 to preserve firm-level confidentiality.

Looking forward, impediments to future increases in U.S. exports include a lack of customization in large cloud applications, difficulty integrating cloud applications with existing on-premises systems, and security concerns,⁶ which call for local data to be kept on local servers. Nevertheless, should worldwide demand continue to expand as forecast, U.S. firms will be well positioned for continued export growth.⁷

³ Most analysis of trade in cloud computing relies on estimates from market research firms and industry associations.

⁴ Affiliate sales are services supplied to local and other foreign markets by foreign affiliates of U.S. multinational companies.

⁵ Available data indicate that the United Kingdom, Germany, and Japan were the largest country markets for both cross-border exports and affiliate sales.

⁶ Security depends on how a product is made and used, not by whom or where; cloud computing can actually increase security.

⁷ SaaS is the most rapidly growing cloud service and is expected to represent 59 percent of the total cloud workload in 2018.

Sources: Berry, Renee, and Matthew Reisman, "Policy Challenges of Cross-Border Cloud Computing," *Journal of International Commerce and Economics*, May 2012; Forrester Research, "The Public Cloud Market Is Now in Hypergrowth," April 2014; Gartner Inc., "Forecast: Public Cloud Services, Worldwide, 3Q14 Update," 2014; PWC, "Global 100 Software Leaders," May 2013; U.S. Department of Commerce, Bureau of Economic Analysis, "U.S. International Services," October 2014; U.S. Department of Commerce, National Institute of Standards and Technology, "The NIST Definition of Cloud Computing," September 2011.

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