

## ESTIMATING TOTAL POWER CONSUMPTION BY SERVERS IN THE U.S. AND THE WORLD

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The amount of electricity used by servers and other Internet infrastructure has become an important issue in recent years as demands for new Internet services have become more widespread.

Total electricity use for servers in the U.S. and the world in 2000 and 2005, including the associated cooling and auxiliary equipment

Data centre power use consists of information technology (IT) loads (such as servers, disk drives, and network equipment) and infrastructure loads (cooling, fans, pumps, lighting, and uninterruptible power supplies or UPS's) which represent 60–80% of total data center IT loads.

Electricity use associated with servers doubled from 2000 to 2005, representing an aggregate annual growth rate of 16% per year for the world. Almost all of this growth is attributable to growth in the numbers of servers.

It is particularly difficult to forecast trends in the IT industry. If the current IDC worldwide forecast holds true, installed base for volume servers will grow by more than 50% from 2005 levels by 2010, while mid-range and high-end installed base will decline 20–30%. If power per server remains constant, those trends would imply an increase in electricity used by servers worldwide of about 40% by 2010. If in addition the average power use per unit goes up at the same rate for each class as our analysis indicates that it did from 2000 to 2005, total electricity used by servers by 2010 would be 76% higher than it was in 2005.

The amount of electricity used by servers and other Internet infrastructure has become an important issue in recent years. This study estimates total electricity used by servers in the U.S. and the world by combining IDC data on the installed base with measured data and estimates of power used by the most popular servers. These estimates are based on more detailed data than previous assessments, and they will help policy makers and businesses attempting to make sense of recent trends in this industry.

Aggregate electricity use for servers doubled over the period 2000 to 2005 both in the U.S. and worldwide. Almost all of this growth was the result of growth in the number of volume servers, with only a small part of that growth being attributable to growth in the power use per unit. Total power used by servers represented about 0.6% of total U.S. electricity consumption in 2005. When cooling and auxiliary infrastructure are included, that number grows to 1.2%, an amount comparable to that for colour televisions. The total power demand in 2005 (including associated infrastructure) is equivalent (in capacity terms) to about five 1000 MW power plants for the U.S. and 14 such plants for the world. The total electricity bill for operating those servers and associated infrastructure in 2005 was about \$2.7 B and \$7.2 B for the U.S. and the world, respectively.