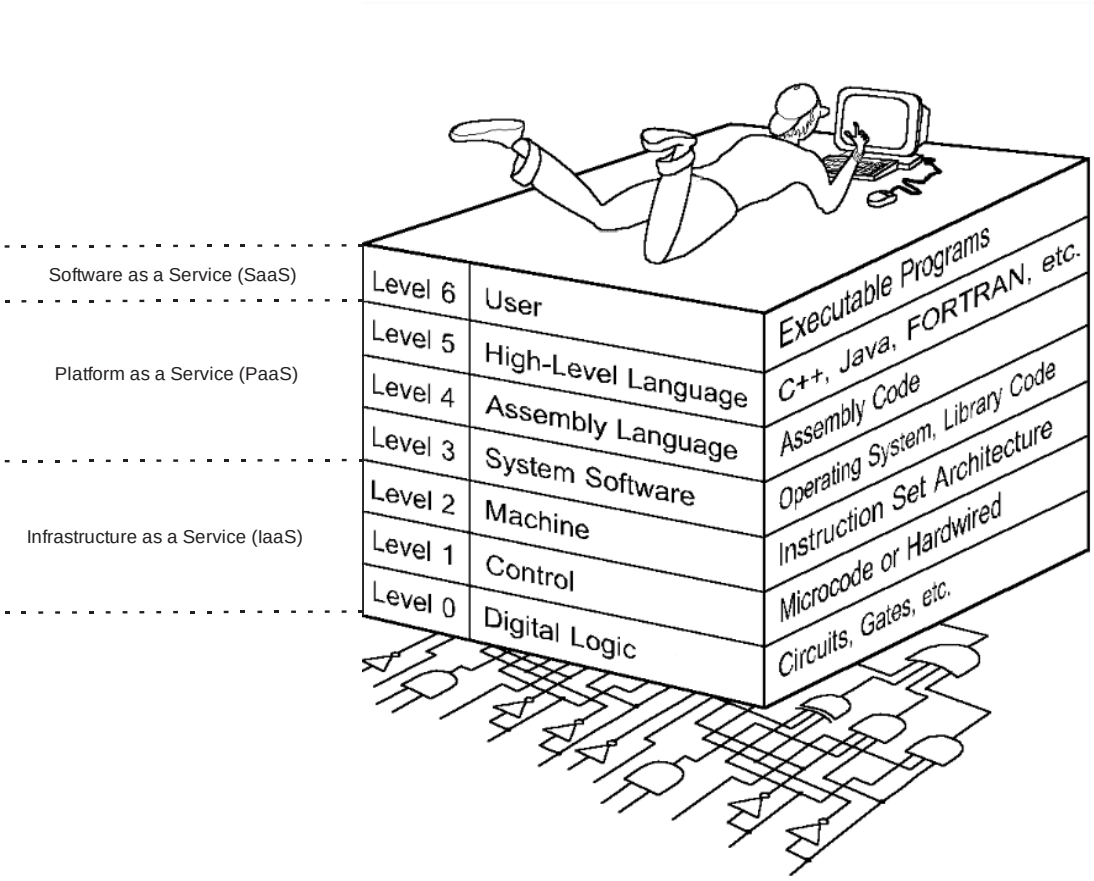

Figure 1.4 Levels of Computing as a Service

Many companies and government agencies "outsource" their data centers to "third-party specialists."

Term	Description
SLA	**Service-Level Agreement**s provide penalties if certain parameters of system performance and availability are not met. SLAs also specify detailed hardware specifications.
Cloud Computing	Cloud computing is the general term for any type of virtual computing platform provided over the internet.
Virtual Machine	Cloud computers present a type of virtual machine to consumers.
SaaS	**Software as a Service** provides an entire application over the Internet to consumers. Well-known examples include Gmail, Dropbox, GoToMeeting, and Netflix.

Term	Description
PaaS	**Platform as a Service** provides server hardware, operating systems, database services, security components, and backup and recovery services. The PaaS provider manages performance and availability of the environment, whereas the customer manages the applications hosted in the PaaS cloud. The customer is typically billed monthly per megabytes of storage, processor utilization, and megabytes of data transferred. Well-known PaaS providers include Google App Engine and Microsoft Windows Azure Cloud Services.
IaaS	Infrastructure as a Service provides only server hardware, secure network access to the servers, and backup and recovery services. The customer is responsible for all system software including the operating system and databases. IaaS is typically billed by the number of virtual machines used, megabytes of storage, and megabytes of data transferred, but at a lower rate than PaaS. The biggest names in IaaS include Amazon EC2, Google Compute Engine, Microsoft Azure Services Platform, Rackspace, and HP Cloud.
elasticity	The ability to add and remove resources based on demand – a feature of both PaaS and IaaS.
Cloud Storage	Cloud storage is a limited type of IaaS. Providers of this kind of storage include Dropbox, Google Drive, and Amazon.com's Cloud Drive.

Cloud Computing Issue	Discussion
Cost	Is it less expensive to maintain a data center owned by the enterprise or is it less expensive to purchase Cloud services? Software architects and programmers must be mindful of resource consumption, because the Cloud model charges **fees** in proportion to the resources consumed.
Flexibility	Once a data center is moved to the Cloud, it may be quite difficult (costly) to return to local control.
Reliability	Providers of Cloud services must be able to provide uninterrupted services despite the requirement to perform routine maintenance. Failure to provide service according to the SLA agreement will incur penalties to the provider.
Security	A business must be convinced that the security provided by the Cloud is adequate to meet their needs and government requirements.