application layer is formed with a collection of all needed software modules for SaaS applications. Service applications in the layer include daily office management work, such as information retrieval, document processing, & calendar & authentication services. The application layer is also heavily used by enterprises in business marketing & sales, consumer relationship management (CRM), financial transactions, and supply chain management.

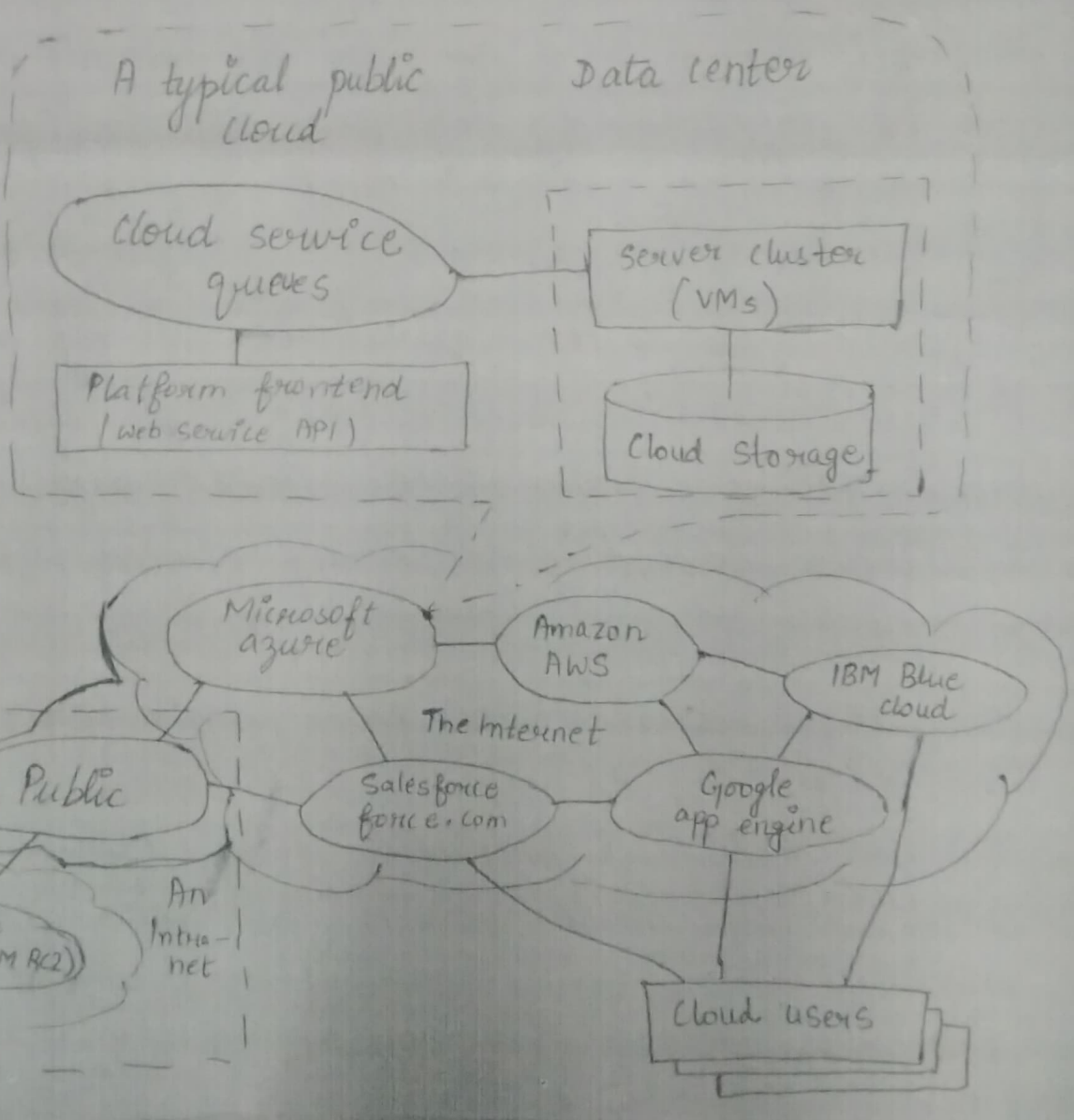
(II) Public Clouds:

* A public cloud is built over the Internet & can be accessed by any user who has paid for the service. Public clouds are owned by service providers & are accessible through a subscription. The callout box in top of fig. 4.1 shows the architecture of a typical public cloud. Many public clouds are available, including google app engine (GAE), Amazon web services (AWS), Microsoft azure, IBM blue cloud & salesforce.com's force.com. The providers of the aforementioned clouds are commercial providers that offer a publicly accessible remote interface for creating & managing VM instances within their proprietary infrastructure. A public

cloud delivers a selected set of business pro
The application & infrastructure services are
offered on a flexible price-per-use basis.

* Private Clouds :

A private cloud is built within the domain of an intranet owned by a single organization. Therefore, it is client owned & managed, & its access is limited to the owning clients & their partners. Its deployment was not meant to sell capacity over the Internet through publicly accessible interfaces.



Public, Private & hybrid clouds illustrated by functional architecture & connectivity of representatives clouds available by 2011.

Private clouds give local users a flexible & agile infrastructure to run service workloads within their administrative domains. A private cloud is supposed to deliver more efficient & convenient cloud service. It may impact the cloud standardization, while retaining greater customization & organizational control.

* Hybrid Clouds :

* A hybrid cloud is built with both public & private clouds, as shown at the lower-left corner of fig. 4.1. Private clouds can also support a hybrid cloud model by supplementing local infrastructure with computing capacity from an external public cloud. For eg. : the research compute cloud (RC2) is a private cloud, built by IBM, that interconnects the computing & IT resources at eight IBM research scattered throughout the United States, Europe & Asia. A hybrid cloud provides access to clients, the partner network, & third parties. In summary, public clouds promote standardization, preserve capital investment & offer application flexibility. Private clouds attempt to achieve customization

and offer higher efficiency, resiliency, security & privacy. Hybrid clouds operate in the middle with many compromises in terms of resource sharing.