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What is Cloud Computing? NIST Definition of Cloud Computing: "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal effort or service provider interaction."	**The three Cloud Service Models:** SaaS – Software as a Service PaaS – Platform as a Service IaaS – Infrastructure as a … (pyramid: Software / Platform / Infrastructure)
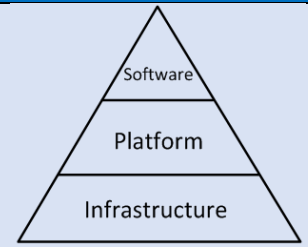
Four key cloud deployment models

Hybrid Cloud - this deployment model helps businesses to make most of the protection of data and applications in a private cloud, while using as well the cost- effective aspects of the public cloud for other applications.

Private Cloud - Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally. Users "still have to buy, build, and manage them - essentially lacking the economic model that makes cloud computing

Public Cloud - services and infrastructure are offered to numerous clients (multi-tenant) who actually sharing the cost of the provider's infrastructure. Clients pay for use.

Community cloud - shares infrastructure between several organizations from a specific community with common concerns (compliance, jurisdiction, etc.), whether managed internally or by a third-party, and either hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized

Benefits

Financial:
- Lower overall TCO for IT due to competitive pricing
  Why: clients sharing to cost of provider's infrastructure
- Reduced IT management costs: Why? IT administration overhead is significant part of TCO, when using cloud services you can reduce the number of IT staff and save
- Pay per use: clients only pay for their real consumption No need to size and run infrastructure continuously for peak load, you only pay for what you actually used.
- Cost treatment benefit: OPEX and no CAPEX

Supply side savings:
- Provider able to bulk buy of electricity and utilities
- Multi tenancy = scale, labour cost is lower / client

Environmental:
- More efficient infrastructure utilization = less hardware
- Commuting less, no travel required to do office work.

Technological:
- Rapid, on-demand scalable IT – compute can scale up / down automatically, following business usage pattern
- Access anywhere / any device – access to the service does not depend on computer you are using
- Faster provisioning, not weeks or months but hours or minutes

Competitive advantage
- Start-ups not forced to invest heavily in infrastructure
- Established companies: agility, quick scale up/down, no capital invested in assets which quickly loose value

Operational:
- Reduced dependence on internal IT infrastructure
- Clearer focus on business: Instead on pouring resources into managing technology organizations can focus on core business and managing the business processes.

Possible pathways
1) Full migration of IT to the Cloud: transition all existing IT services to one or more cloud service providers.
2) Gradual transition: Systematically replace on premise applications and IT services with SaaS Cloud applications.
3) Mixed (hybrid) approach with sensitive systems migrating to private cloud and others to public cloud.

True cloud characteristics
1) On-demand self-service – automatic deploy/destroy without human interaction from the provider
2) Broad network access – accessible from any device
3) Resource pooling – multi tenancy where resources dynamically assigned to clients depending on need
4) Rapid elasticity – quick or automatic scaling up/down and quick turnaround times.
5) Measured Service – metering use and monitoring

When it is not Cloud?
- Renting rack space in a Data Centre and running a few or a single application is not cloud computing;
- Server virtualization in itself unless can deploy/destroy servers in minutes is not cloud computing;
- Outsourcing of IT is not Cloud Computing, has different purpose, goals and attributes.

Why cloud is more economical?
Virtualization: makes higher average utilization possible
Economies of Scale: better utility, licence prices
Different usage pattern: provider can allocate resources not used by a client to other clients.
Automation: less IT personnel required to manage large fleets of compute used by a number of different clients

More details on the service models

SaaS (Software as a Service) clients using the provider's applications running on a cloud infrastructure. The client does not manage or control the underlying infrastructure and has limited or no influence on the features released of the application capabilities. Software developed and maintained and released by the service provider.

PaaS (Platform as a Service) - cloud providers deliver a computing platform, typically including operating system, database, or web server. Clients can develop, run, or deploy their software solutions on the platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some providers, underlying computer and storage resources scale automatically to match application demand.

IaaS (Infrastructure as a Service) - the most basic cloud service model offering computing infrastructure as a service to subscribers. IaaS abstracts the user from the details of infrastructure. Resources (virtual-machines, disk-image library, raw block storage, file or object storage, firewalls, load balancers, IP addresses, VLANs) offered on-demand from the provider's large pools of equipment installed in data centers.

See: https://en.wikipedia.org/wiki/Cloud_computing

What if you may be not allowed to use Cloud?

If you not allowed by legislative or internal policy reasons to use Cloud – e.g. data cannot leave the office – you simply cannot use external Cloud Services, but

IT Outsourcing (ITO) vs. Cloud

Enablers: traditional ITO is often driven by the difference of cost of labour in different regions of the world to save. Cloud is enabled by technology (virtualization, internet, automation) which are the key enablers of cost saving)

Function: outsourcing is a well-known method wherein a third party provider performs a specific function on behalf and for the benefit of the company. Outsourcing typically covers functions that cloud computing, or indeed any form of computing, doesn't perform.

Adopting cloud makes a business more agile & flexible because services can be turned up and down at will.

Cloud utilization Risks

Security breach (external) – provider's information security systems fail and data stolen or destroyed.
Data Protection risks: provider's backup systems or policies failing and may cause loss of information.
Security breach (internal) – information is accessible through internet former employees may continue to access, traffic can be observed, userid/password stolen.
Vendor lock-in: customer tied to a given cloud provider
Vendor failure: if cloud provider fails there is a potential loss of client's IT service(s) or data. Business could burst.

When there is no benefit from Cloud?

If your organization is already realized benefits form scale, automation, virtualization and has proven record of excellent uptime, no unplanned outages and using dynamic scaling, achieved high utilization rates of the IT infrastructure – in other words already realized the benefits from Cloud, has 5 star cost effective IT function – there will be no further benefits from moving to Cloud.

Cloud adoption process flow
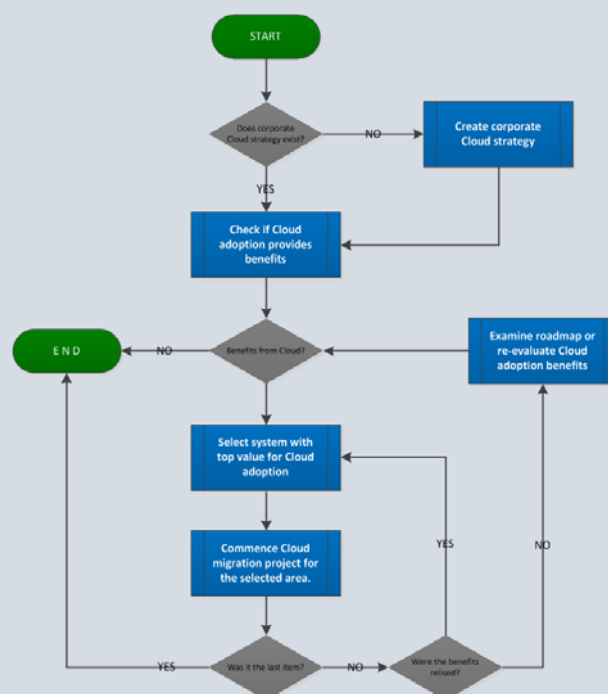
Problems when it is not true cloud

1) Human intervention means possibility of errors & much slower (up to x100 or x 1000) service times.

2) If use is limited to certain devices, benefits of any device access can't be realized, limiting locations of use.

3) If not elastic, the turnaround times become long and clients will lose strategic advantage and quick time to market benefits. Also applies to scaling up/down speed, if these are days instead of minutes the whole point of dynamic scaling and its benefits are lost.

4) If costs are not known in advance or hard to reconcile you client may not save from using cloud provider

5) If the service is not measured in simple metrics it is hard to be sure that maximum efficiencies are achieved.