

# Intro to Web Services Intro to Multi-tiered Systems

COMP.6210 Web Services & Design Methodologies

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## Today's Topics:

This week we will start looking at what goes on behind the scenes in a typical commercial web environment. We'll discuss:

- Client-Server Architecture
- Multi-Tiered Systems
- Intro to Web Services
- Intro to Cloud Computing

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## Client-Server Architecture

- **Client-server architecture** (client/server) is a network architecture in which each device on the network is either a client or a server.
- **Servers** are powerful computers dedicated to managing disk drives (file servers), printers (print servers), or network traffic (network servers ).
- **Clients** are devices on which users run applications. Clients rely on servers for resources, such as files, devices, and even processing power.

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## Client-Server Architecture

- Client-server architecture applies equally to software (processes) as well as hardware
- Servers can be powerful software applications dedicated to managing or providing a service to an end-user (client).
  - A web server is a software program that serves web pages.
  - It usually does, but doesn't have to, run on a server computer. (You can run a web server on your own local PC)
  - Any computer running server software is deemed to be a 'server'

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## Client-Server Architecture

- Clients are software applications that connect to and make use of services or resources offered by servers.
  - A web browser views web pages requested from and delivered by a web server (or servers)

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## Multi-Tiered Systems

- Multi-Tiered architecture (often referred to as n-tier architecture) is a client-server architecture in which presentation, application processing, and data management functions are physically separated.
- Often referred to as n-tier architecture. It provides a model by which developers can create flexible and reusable applications.
- By separating an application into tiers or layers, developers have the option of modifying or adding a specific layer, instead of reworking the entire application. Developers can add discrete functionality to their systems without needing to redo the entire application.
- A 3-tier model is typically composed of a presentation tier, a domain logic tier and a data storage tier.
- WordPress is an example of a 3-Tier system

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# Multi-Tiered Systems

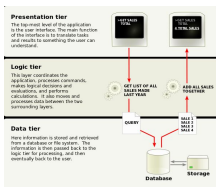
- Presentation Tier
  - User interface – i.e. web page in a browser
- Domain Logic Tier
  - Receives request, gets and formats data, sends reply
- Data Storage Tier
  - Database storage & retrieval system

The diagram illustrates a three-tier architecture. At the top is the **Presentation Tier**, which includes a 'User' and a 'Web Browser'. A text box explains that this tier is the user's view of the application, responsible for user requests and responses, and for controlling the user's environment. Below this is the **Logic Tier**, which contains 'Application Servers'. A text box states that this tier handles requests from the presentation tier, performs business logic, and communicates with the data storage tier. At the bottom is the **Data Storage Tier**, which includes a 'Database' and 'Storage'. A text box explains that this tier stores data and retrieves it as requested by the logic tier. Arrows show the flow of data: from the User to the Web Browser, then to the Application Servers (Logic Tier), and finally to the Database and Storage (Data Storage Tier). A 'Server' label is placed between the Logic and Data Storage tiers. A 'Data' label is placed between the Presentation and Logic tiers.

- User interface – i.e. web page in a browser

- Receives request, gets and formats data, sends reply

- Database storage & retrieval system



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# Multi-Tiered Systems

- Multi-Tiered systems may have more than 3 tiers
- The domain logic (business logic) tier can be split so that it can function as separate layers and distribute the data retrieval and processing requirements further afield.
- Usually these cross machine boundaries
  - The logic layer requests data from 2 or more separate databases or from other processes located elsewhere.
  - Think of a WordPress webpage with your own data and an embedded google map, weather forecast widget, etc.
- These are referred to as  $n$ -tier systems

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# Intro to Web Services

- A web service is any piece of software that makes itself available over the internet and uses a standardised messaging system to communicate.
- Web Services can be big or small, ranging in size from services like MS Office 365, Gmail, Xero through to a simple RSS stock ticker or weather/news feed that you embed on your web pages.
- Some web services can talk directly to the end user whereas others are 3<sup>rd</sup> party services that communicate via another site or service



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## Intro to Web Services

- 3<sup>rd</sup> party web services typically use standard protocols such as HTTP, SOAP (simple object access protocol) and REST (representational state transfer) to pass requests and data between processes
- HTML, XML or JSON (javascript object notation) are used to encode all communications with a web service.
  - E.g. a client invokes a web service by sending an XML message, then waits for a corresponding XML response containing the reply



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## Intro to Cloud Computing:

What is Cloud Computing?



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## Intro to Cloud Computing:

- Cloud computing is a general term for the delivery of hosted services over the internet.
- Cloud computing enables users to use a computing resource, such as a virtual machine, storage or an application as if it were a utility - just like electricity, water, phone - rather than having to build and maintain their own computers.
- Three of the main benefits of cloud computing are:
  - **Self-service provisioning:** End users can spin up computing resources for almost any type of job on demand. This eliminates the need for IT administrators to provision and manage local computing resources.
  - **Elasticity:** Companies can scale up as computing needs increase and scale down again as demands decrease. This reduces the need for massive investments in local infrastructure which may or may not remain active.
  - **Pay per use:** Users pay only for the resources and workloads they use. They don't need to invest in expensive equipment that they may only use once or twice a month.



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## Intro to Cloud Computing:

- Cloud computing service categories
  - The definition and understanding of cloud computing has changed over time, to the point where it had become the most misunderstood of the jargon buzzwords in IT.
  - Lately it has been shaken out into three broad service categories:

Infrastructure as a Service	Software as a Service	Platform as a Service
IaaS providers, such as Amazon Web, supply a virtual machine instance and storage that let users migrate computing tasks to a remote virtual machine. Users have an allocated storage capacity and can start, stop, access and configure the VM and storage as desired. (own OS, own software)	SaaS is a distribution model that delivers software applications over the internet. Microsoft Office 365 and Xero are SaaS offerings for productivity software and accounting services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access.	In the PaaS model, providers host development tools on their infrastructures. Users access these tools over the internet using APIs, web portals or gateway software. PaaS is used for general software development. Google App Engine, Google Maps.

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## Intro to Cloud Computing:

Cloud computing sounds like a cool idea but there is one obvious issue with the way it works. What is it?

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## Intro to Cloud Computing:

**Cloud computing deployment models**  
Cloud computing services can be private, public or hybrid.

Private Cloud	Public Cloud	Hybrid Cloud
Private cloud services are delivered from a business' data centre to internal users. This model offers versatility and convenience, while preserving the management, control and security common to local data centres.	In the public cloud model, a third-party provider delivers the cloud service over the internet. Public cloud services are sold on demand, typically by the minute or hour. Customers only pay for the CPU time, storage or bandwidth they consume.	Hybrid cloud is a combination of public cloud services and on-premises private cloud. Companies can run mission-critical jobs or sensitive applications on the private cloud while using the public cloud for jobs that must scale on demand.

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## Intro to Cloud Computing:

### Security

Security remains a primary concern for businesses thinking about using the cloud - especially the public cloud.

Public cloud providers share their hardware infrastructure between lots of customers, as public cloud is a multi-tenant environment.

This environment demands rigorous isolation between logical computing resources. At the same time, access to public cloud storage and compute resources is guarded by account login credentials.

Many organisations are still hesitant to place data or work in the public cloud for fear of outages, loss or theft.

However resistance is fading as logical isolation has proven reliable and the addition of data encryption and various identity and access management (IAM) tools has improved security within the public cloud.

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## Summary

### Client-Server Architecture

- Defined and reviewed client-server architecture and discussed how the terms applied to both hardware and software environments

### Multi-Tiered Systems

- We looked at multi-tiered systems and discussed the role of each tier
- We also defined and discussed n-tier systems

### Intro to Web Services

- We introduced what a Web Service is

### Intro to Cloud Computing

- We looked at and clarified the term 'cloud computing'. We discussed service categories, deployment models and security issues.

We will revisit some of these topics in later sessions as we progress through the course

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