Web Technologies

Basic Concepts

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Web Pages, Sites and Applications

Web Page

- Web document that is suitable for web browsers
- Can be accessed through every device
  - Only Internet and Web browser is required
- Web pages are usually written in HTML or XHTML
- May contain text, graphics, hyperlinks, references to other resources
  - Stylesheets, scripts, images

Web Site

- Set of related web pages served from a single web domain
- Hosted on one or more web servers (accessible via network)
- Web sites consist of set of resources
  - Web pages, CSS styles, JS scripts, images, videos, …
- World Wide Web (WWW)
  - All publicly accessible websites in Internet

Web Application / RIA / SPA

- Software application that runs in a Web browser
  - Or is created in a browser-supported language (HTML + CSS + JS)
- Applications are usually broken into logical chunks called "tiers"
- High interactivity and accessibility
- Allows personalized dynamic content to be pulled down by users
  - According to individual settings

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Web Browsers and Layout Engines

Web Browser

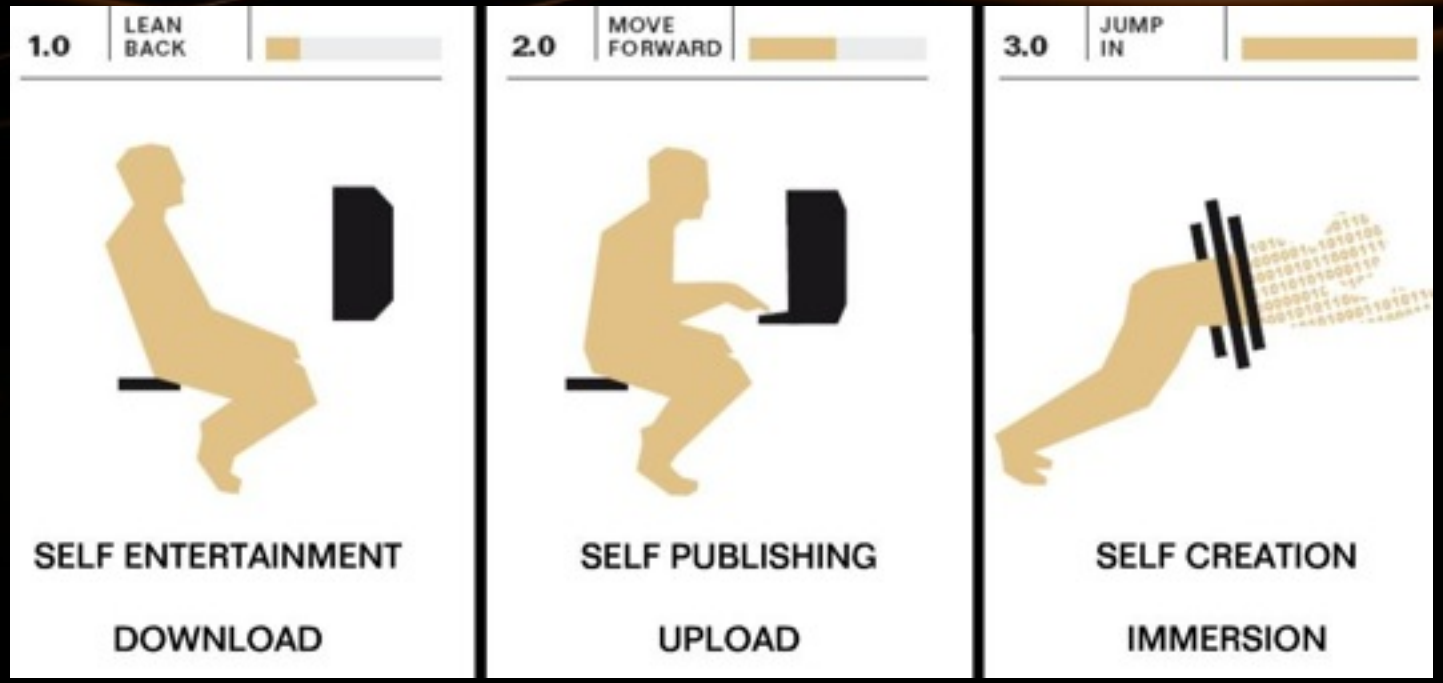
- Web browsers visualize Web content
  - Render HTML, images, CSS, videos, JavaScript, etc.
- Software application for retrieving, presenting and traversing information resources on the World Wide Web
- An information resource is identified by a URI / URL and may be a web page, image, video or other piece of content
- Can used to access information provided by web servers in private networks or files in file systems

Layout Engine

- Takes marked up content (HTML, XML, images, files, ...) + formatting information (CSS, XSL, …)
  - Displays the formatted content on the screen
- A layout engine is typically embedded in *web browsers*, *e-mail clients*, *e-book readers*, *on-line help systems*
  - To display Web content
- Different devices run different layout engines
  - Render HTML and CSS differently

Layout Engines and Web Browsers

- Blink
  - Chrome, Opera 15+
- Gecko
  - Firefox, Netscape, SeaMonkey,
- Trident
  - Internet Explorer, Maxthon
- WebKit
  - Old Chrome, Safari
- Presto and others
  - Old Opera

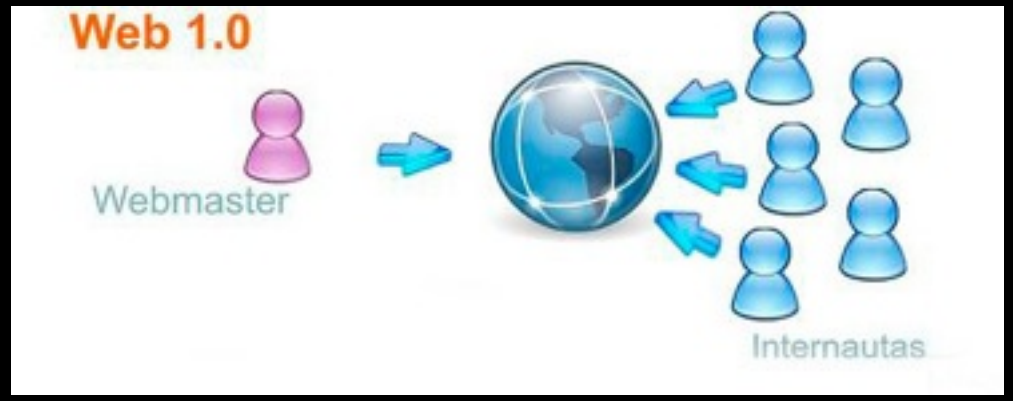


Web Evolution - History and Future

Web 1.0 - 4.0

Web 1.0

- Experts call the Internet before 1999 “Read-Only” web
- Sites are static. They might contain useful information, but there's no reason for a visitor to return to the site later.
  - Low variety of content
  - Sites aren’t interactive
  - Applications are proprietary
- 10 000 editors server 500 millions internet users



Web 2.0

- The writing and participating web (User-generated content)
- New applications may allow every users to interact and collaborate with each other in a social media dialogue as creators of content
- What is Web 2.0?
  - Rich Internet Applications (RIA)
  - Social Web
  - Web-Oriented Architecture (WOA)
    - RSS, Web services, feeds, etc.

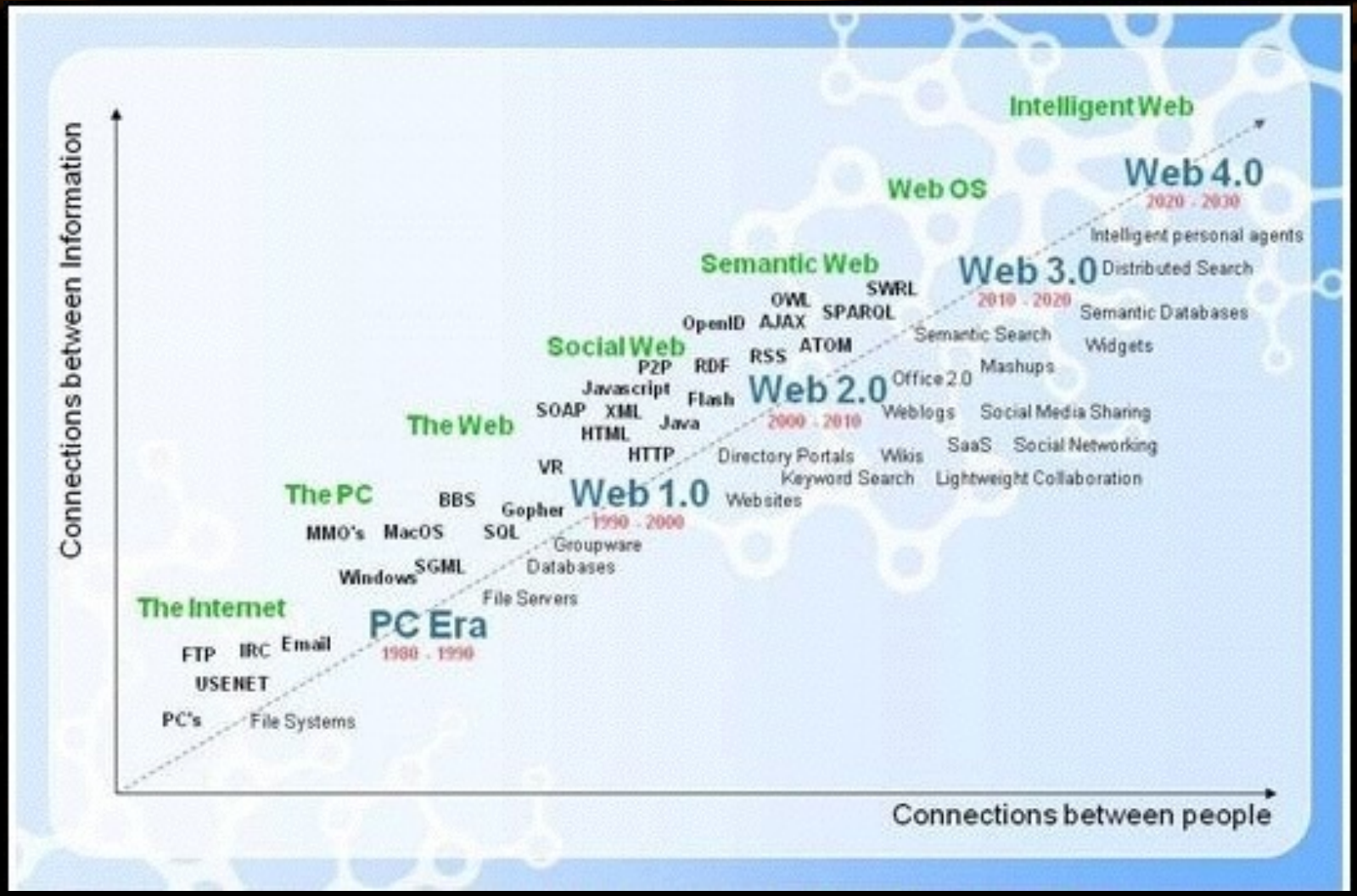
Web 3.0

- "Semantic Web" is sometimes used as a synonym for "Web 3.0“
- The Web 3.0 browser will analyze your response, search the Internet for all possible answers, and then organize the results for you
  - Artificial intelligence
  - Personalization
  - Mobility
  - Semantic Web

Web 4.0

- “The next Web” – the ultra-intelligent electronic agent
- Recognize you when you get in front of it because all of your devices are getting a little camera
- And with facial recognition, they’ll know it’s you
- Web 4.0 is often characterized as the Web OS
  - The entire web being a single operating system where information flows from any one point to any other

Web Evolution



http://www.evolutionoftheweb.com/

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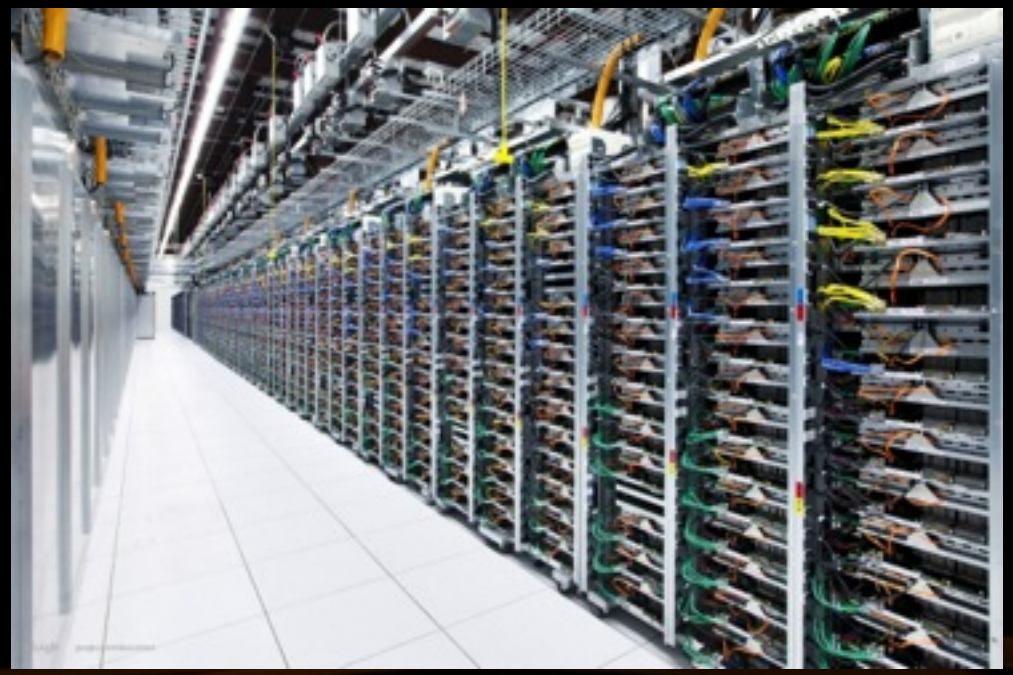
Hardware Servers

Hardware Server

- Physical computer (a hardware system) dedicated to running one or more such services
- Usually servers are placed in data centers
- Typical computing servers are:
  - Database server
  - File server
  - Mail server
  - Web server



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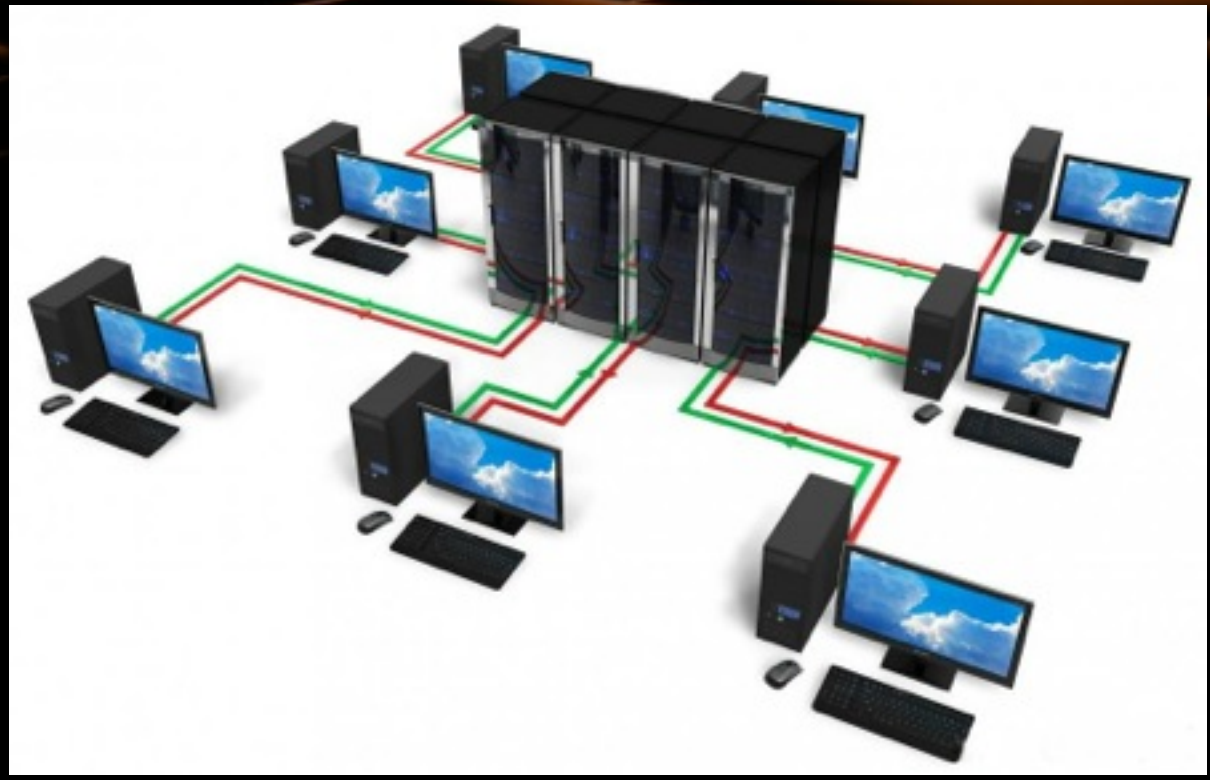
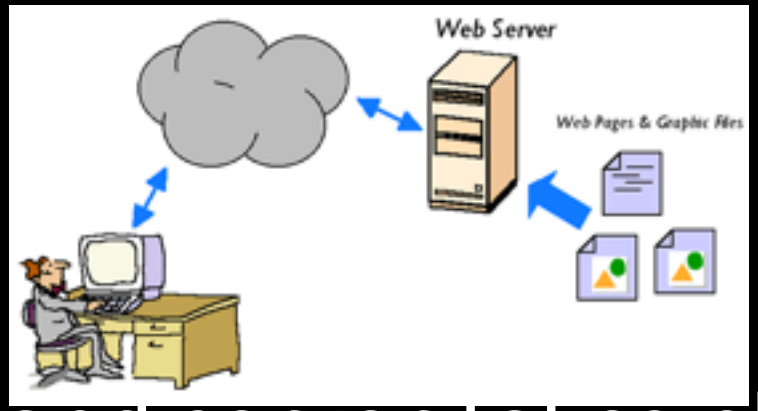


Web Servers

Apache, IIS, nginx, lighttpd

Web Server

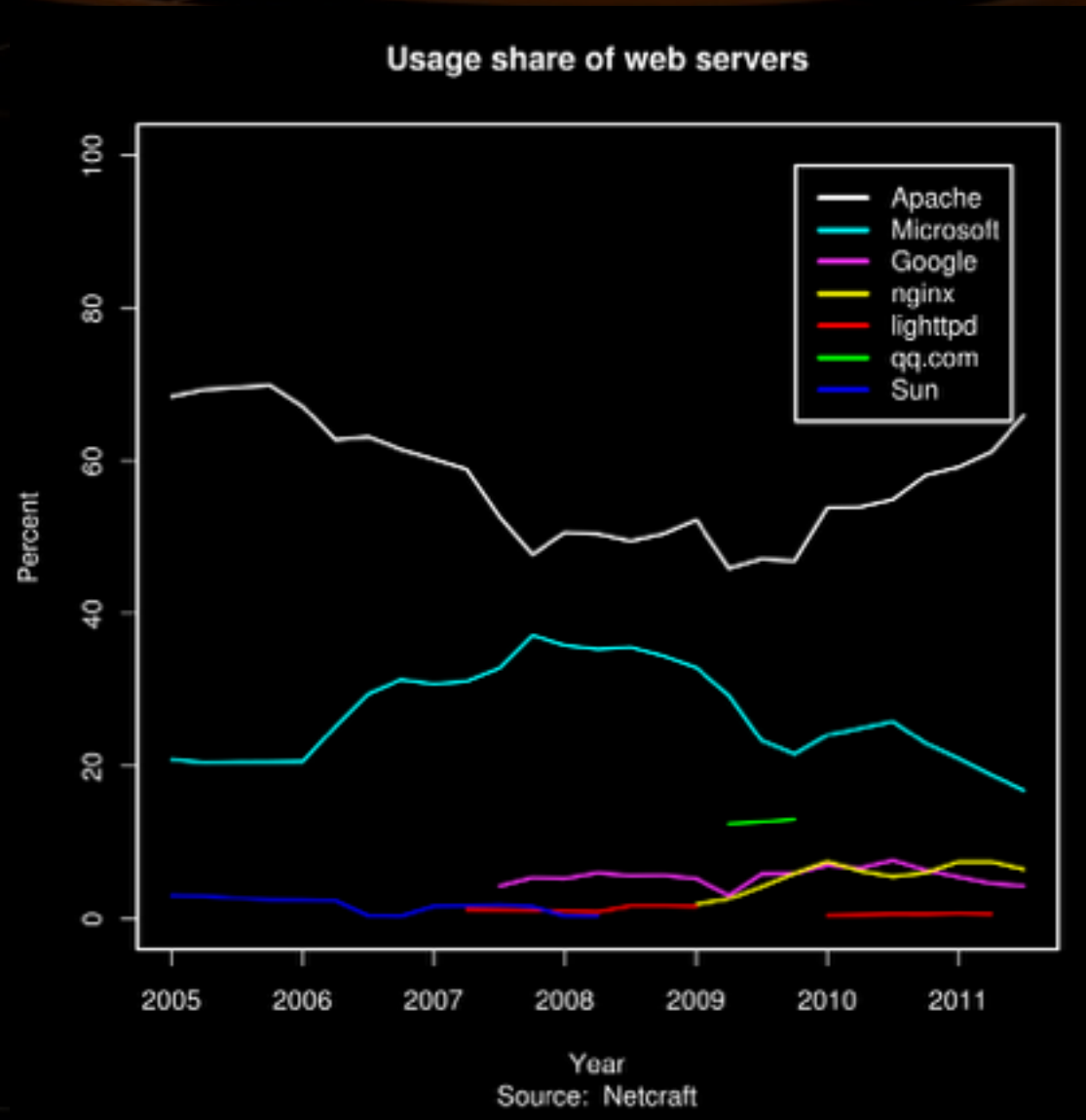
- The primary function of a web server is to store, process and deliver web pages to clients
  - Handle web requests
  - Serve web content



- The communication between client and server takes place using the HTTP
- These requests are redirected to other software products (ASP.NET, PHP, etc.), depending on the web server settings

Web Servers Market Share – Feb 2014

- Apache
  - 38.22 %
- IIS (by Microsoft)
  - 32.80%
- nginx (by Igor Sysoev)
  - 15.00%
- GWS (by Google)
  - 2.30%



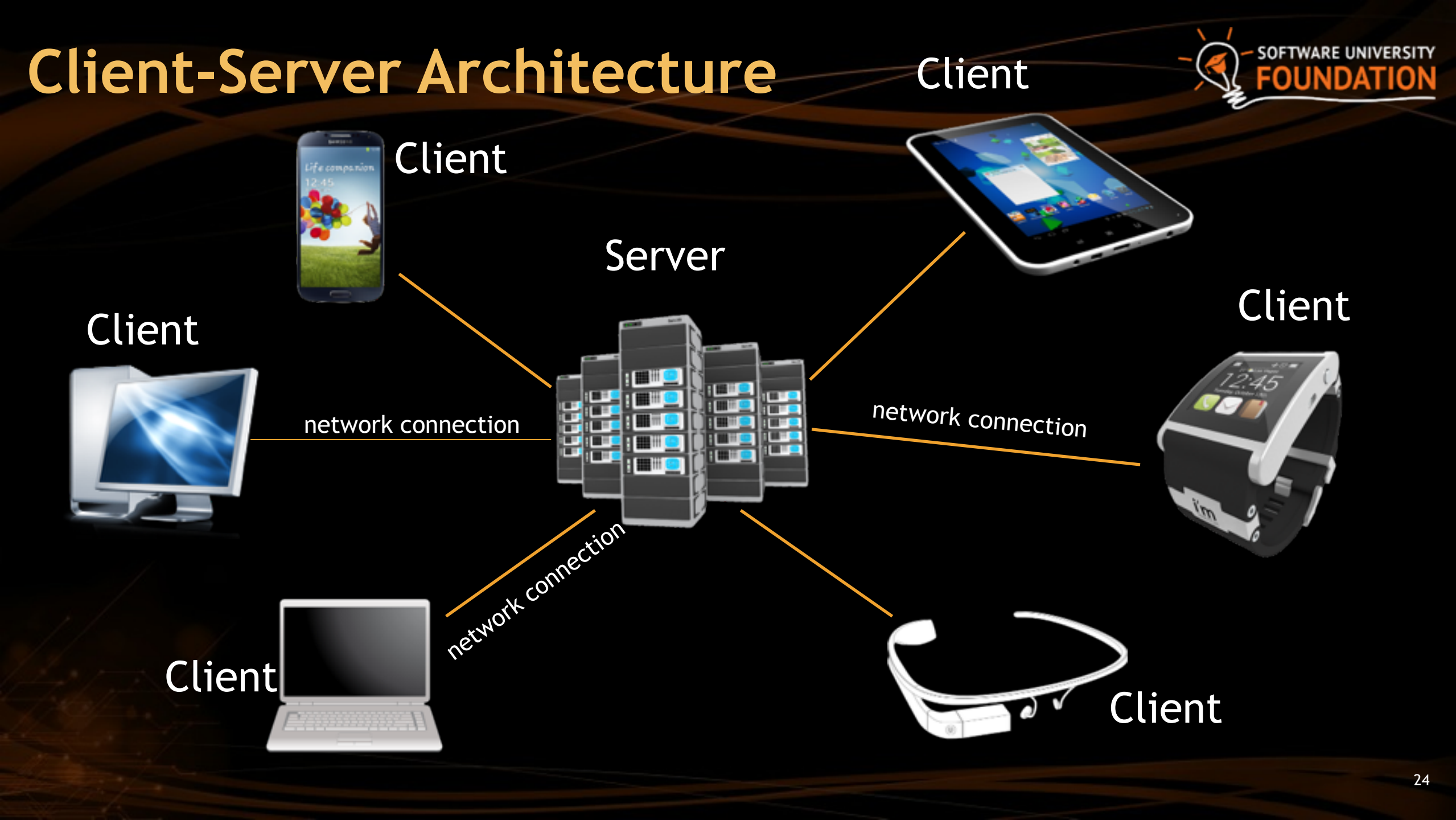
Software Architectures

Client-Server, Multi-Tier, SOA

Client-Server Architecture

- Networks in which certain computers have special dedicated tasks. The client-server model consists of:
  - **Server** – a single machine or cluster of machines that provides web applications (or services) to multiple clients
    - Examples: *IIS web server, WCF based service, cloud services*
  - **Client** – software applications that provide UI (front-end) to access the services at the server
    - Examples: *Web browser, WPF application, HTML5 application, Mobile application, Silverlight application…*

Client-Server Architecture

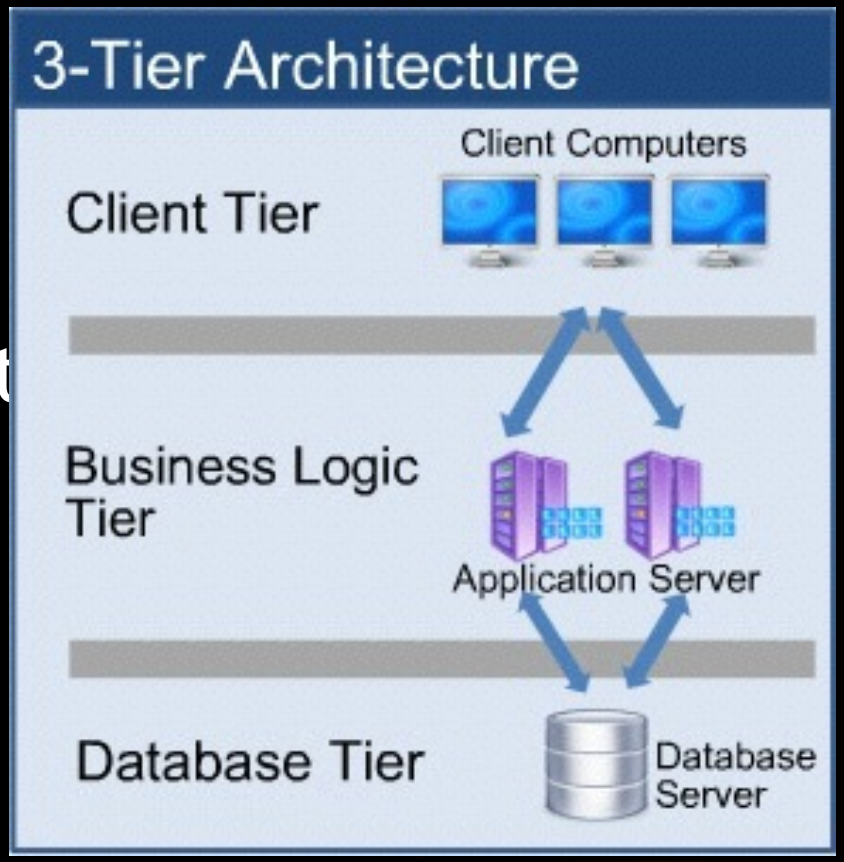


Client-Server Model – Examples

- Web server (Apache, IIS) – Web browser
- FTP server (ftpd) – FTP client (FileZilla)
- EMail server (qmail) – email client (Outlook)
- SQL Server – SQL Server Management Studio
- BitTorrent Tracker – Torrent client (µTorrent)
- DNS server (bind) – DNS client (resolver)
- DHCP server (wireless router firmware) –
  DHCP client (mobile phone /Android DHCP client/)
- SMB server (Windows) – SMB client (Windows)

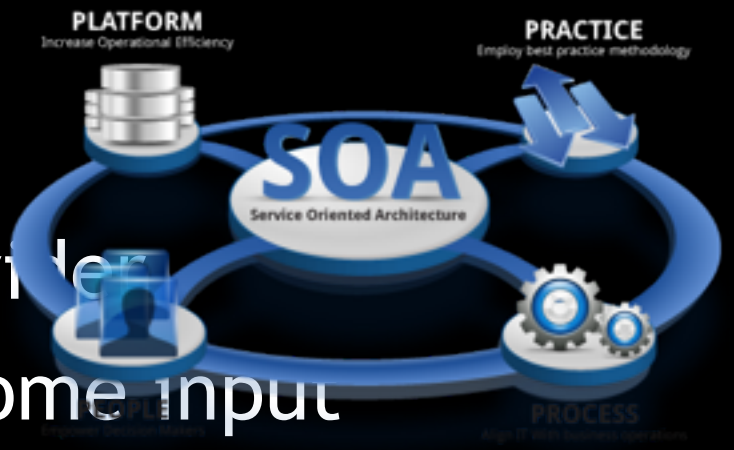
3-Tier / Multi-Tier Architectures

- Three-tier architecture consists of the following layers:
  - Presentation layer (front-end)
    - Responsible for visualizing information
    - Provides the UI of the application
  - Application layer (business tier)
    - Responsible for application functionalit
    - Provides the system logic
  - Data layer (back end)
    - Manages the data of the system

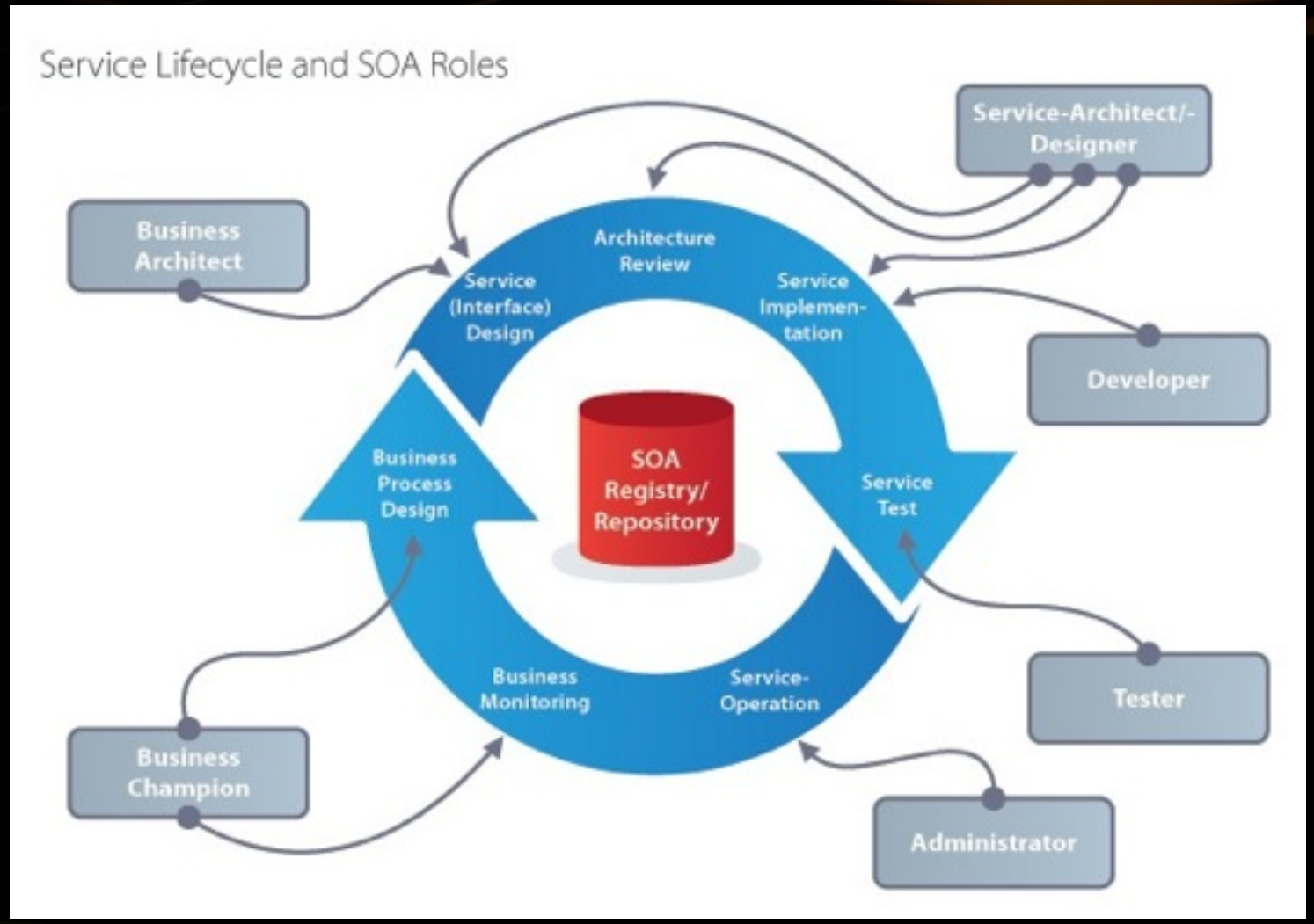


Service-Oriented Architecture (SOA)

- Design pattern based on discrete pieces of software providing application functionality as services to other applications
- Independent of any vendor, product or technology
- Known as service-orientation
- What is service?
  - A piece of work performed by a service provider
  - Provides the client some desired result by some input parameters
  - Has quality characteristics (price, execution, time, etc.)



Service-Oriented Architecture (SOA)



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What is "Cloud"?

What is Cloud?

- **Cloud** ≈ multiple hardware machines combine their computing power and resources
  - Share them between multiple applications
  - To save costs and use resources more efficiently
- **Public clouds**
  - Provide computing resources on demand
    - Publicly in Internet
    - Paid or free of charge (to some limit)
  - Amazon AWS, Google App Engine, Microsoft Azure, Rackspace, AppFog, Heroku, AppHarbor, …

Cloud Computing Models

- **Infrastructure as a Service (IaaS)**
  - Virtual machines in the cloud on demand
  - Users install the OS and software they need
- **Platform as a Service (PaaS)**
  - Platform, services and APIs for developers
  - E.g. Java + JBoss + JSF + JPA + MongoDB or JavaScript + Node.js + MongoDB + RabbitMQ
- **Software as a Service (SaaS)**
  - Hosted application on demand (e.g. WordPress)

Summary

- Web pages == formatted text with images and hyperlinks
- Web browser == visualizer for Web pages
- Web site == a set of Web pages, styles and resources
- Hardware Servers are machines that run the IT infrastructure
  - Cloud == computing resources in a data center
- Web Servers == software serving Web content
- Client-server architecture == device connects to a server

Web Technologies – Basic Concepts

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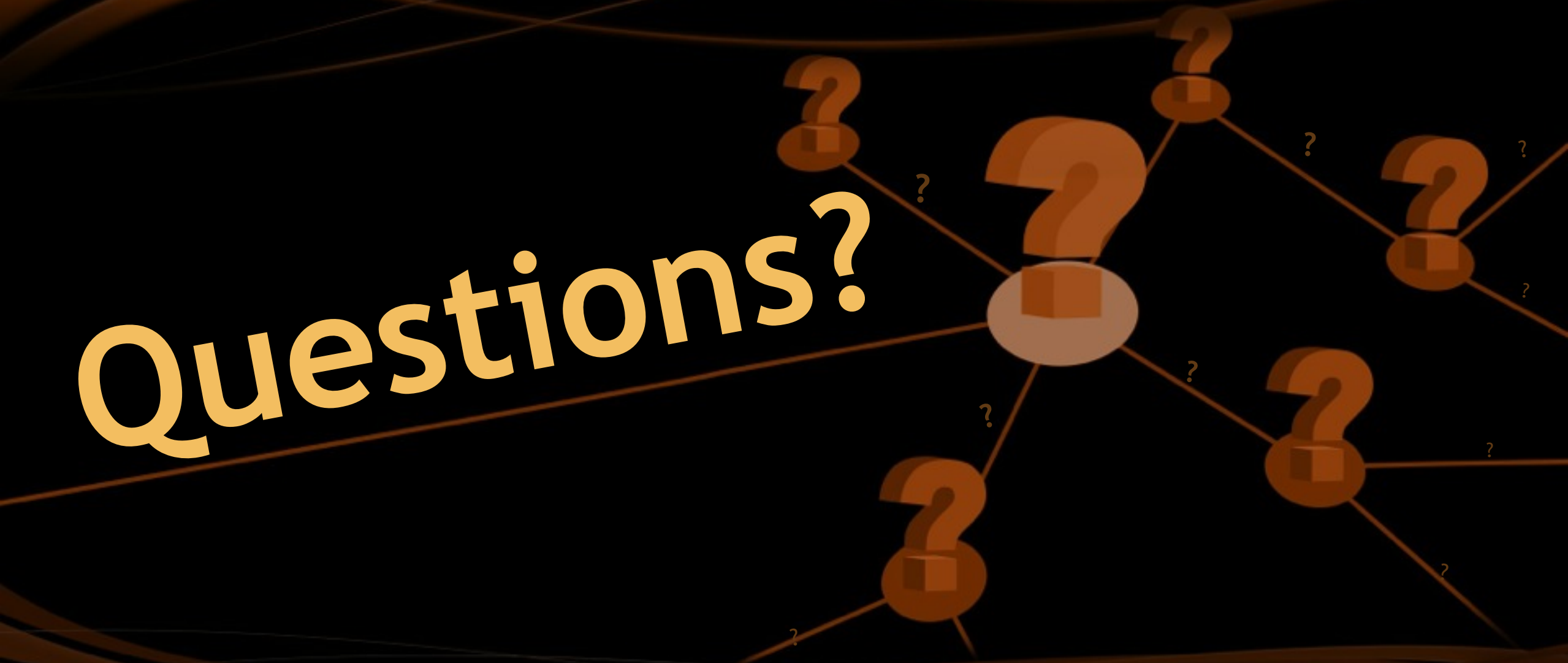

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