**ASSIGNMENT 1 FRONT SHEET**

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| **Student declaration**  I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice. | | | |
|  |  | **Student’s signature** |  |

**Grading grid**

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| **❒ Summative Feedback: ❒ Resubmission Feedback:** | | |
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# I. Presentation

# II. Guidebook

## 1. Server technologies and management services

### 1.1 Purpose of Domain Name System (DNS)

To connect to a service or device over the internet, one’s device must be provided with an IP address of the destination as an identifier. Most connections are established by the user providing the address for the device. However, remembering the IP address for each service that one wants, would be a chore for the user and worsen their experience. For that reason, DNS, a system that translates strings of characters, usually ones that provide a name or short description of what a service or website does into an appropriate IP address, was born. DNS is similar to a phonebook; the user only has to remember the name of the service and it provides the address number (Cloudflare, 2022).

DNS resolution is the process of translating a hostname (such as www.example.com) into a computer-friendly IP address (such as 192.168.1.1). Each device on the Internet is assigned an IP address, and that address is required to locate the relevant Internet device, much as a street address is used to locate a certain residence. When a user requests a webpage, a translation must take place between what the user puts into their web browser (example.com) and the machine-friendly address required to access the example.com webpage (Cloudflare, 2022).

### 1.2 Types of Domain Name System

DNS has different components and each of them has multiple types. There are 3 types of DNS queries, 3 types of DNS servers, and 10 types of common DNS records.

#### Types of DNS queries:

* **Recursive Query**: A DNS client presents a hostname in a recursive query, and the DNS Resolver "must" reply with either an appropriate resource record or an error message if it cannot be located. The resolver initiates a recursive query process, beginning with the DNS Root Server and continuing until it locates the Authoritative Name Server (for more information on Authoritative Name Servers, see DNS Server Types below) that contains the IP address and other information for the requested hostname.
* **Iterative Query:** A DNS client submits a hostname in an iterative query, and the DNS Resolver offers the best answer it can. The DNS resolver returns the appropriate DNS entries if they are in its cache. If this is not the case, it directs the DNS client to the Root Server or another Authoritative Name Server that is closest to the appropriate DNS zone. The DNS client must then re-run the query against the DNS server to which it was routed.
* **Non-Recursive Query**: A non-recursive query is one for which the DNS Resolver knows the response. It either returns a DNS record quickly because it already has it in local cache, or it requests a DNS Name Server that is authoritative for the record, indicating that it absolutely has the proper IP for that hostname. There is no need for extra rounds of inquiries in any situation (like in recursive or iterative queries). Rather, the client receives a quick answer.

(ns1, 2022)

#### 3 Types of DNS Servers

* **DNS Resolver:** A DNS resolver (recursive resolver) is intended to handle DNS requests that include a human-readable hostname, such as "www.example.com," and is in charge of tracking the IP address associated with that hostname.
* **DNS Root Server:** The root server is the initial stage in the process of going from a hostname to an IP address. The DNS Root Server determines the Top-Level Domain (TLD) from the user's query — for example, www.example.com — and gives information for the.com TLD Name Server. In turn, the server will offer information for domains in the.com DNS zone, such as "example.com." Worldwide, 13 root servers, denoted by the letters A through M, are administered by organizations such as the Internet Systems Consortium, Verisign, ICANN, the University of Maryland, and the United States Army Research Lab.
* **Authoritative DNS Server:** Higher level DNS servers determine which DNS server is the "authoritative" name server for a certain hostname, which means it has the most up-to-date information for that hostname. The last stop in the name server query is the Authoritative Name Server, which accepts the hostname and delivers the proper IP address to the DNS Resolver (or if it cannot find the domain, returns the message NXDOMAIN).

(ns1, 2022)

#### 10 Top DNS Record Types

* A hostname and its matching IPv4 address are stored in an **Address Mapping record** (A Record), also known as a DNS host record.
* A hostname and its accompanying IPv6 address are stored in an **IP Version 6 Address record** (AAAA Record).
* **A Canonical Name Record** (CNAME Record) can be used to alias one hostname to another. When a DNS client requests a record containing a CNAME pointing to another hostname, the DNS resolution process is redone using the new hostname.
* **The mail exchanger record** (MX Record) indicates the domain's SMTP email server, which is used to route outgoing emails to an email server.
* **Name Server records** (NS Record)—specifies that a DNS Zone, such as "example.com," is assigned to a certain Authoritative Name Server and lists the name server's address.
* **Reverse-lookup Pointer records** (PTR Records) enable a DNS resolver to submit an IP address and get a hostname (reverse DNS lookup).
* PKIX, SPKI, PGP, and other encryption certificates are stored in a **certificate record** (CERT Record).
* **Service Location** (SRV Record)—similar to MX, but for various communication protocols.
* **Text Record** (TXT Record)—contains machine-readable data such as opportunistic encryption, sender policy framework, DKIM, DMARC, and so on.
* **Start of Authority** (SOA Record)—this record appears at the beginning of a DNS zone file and indicates the Authoritative Name Server for the current DNS zone, the domain administrator's contact information, the domain serial number, and how frequently DNS information for this zone should be refreshed.

(ns1, 2022)

### 1.3 How domain names are organized and managed

Domain names are arranged into subdomains, which are subordinate levels of the root domain of the Domain Name System. Top-level domains (TLDs) are the first-level collection of domain names that include generic top-level domains (gTLDs) like .com, .net, and.org, as well as country code top-level domains (ccTLDs). In the instances google.fr and google.com.au, the ccTLDs are indicated to the right of the dot, such as.fr or.au. Second and third-level domain names in the DNS system, such as DomainTools or Google, are classified as top-level domains. End users can often reserve these domains to host web pages, establish publicly accessible Internet resources, and link the Internet to local area networks. Second-level domains often provide the name of the organization and/or are descriptive of the service offered, whilst third-level domains are used to point to a specific server inside an organization. (domaintools, 2022)

### 1.4 Purpose of Communication protocols

Communication protocols enable network devices to communicate with one another. They are utilized in both analog and digital communications and may be used for a variety of tasks ranging from file transfer between devices to internet access.

Protocols of communication that are often used include:

* Instant messaging: A variety of instant messaging network protocols enable instantaneous, text-based conversations on cellphones and PCs.
* Routing protocols allow routers and other network devices to communicate with one another. There are additional routing protocols that are designed expressly for ad hoc networks.
* Bluetooth: Bluetooth devices, such as headsets, smartphones, and PCs, function thanks to a number of Bluetooth protocols.
* File transfer protocols are used whenever files are transferred from one device to another, whether over a physical or digital media (FTP).
* Internet Protocol (IP): Internet Protocol (IP) is a protocol that allows data to be transferred between devices via the internet. Without IP, the internet could not function as it does today.
* The Hypertext Transfer Protocol (HTTP) outlines how data is delivered over the internet and how web servers and browsers should respond to requests. This protocol (or its secure equivalent, HTTPS) may be found at the beginning of many URLs or web addresses on the internet.

(comptia, 2022)

### 1.5 Purpose of Server Hardware

Server hardware is computer hardware that is designed to handle a huge amount of data/information and their input/output while maintaining its integrity and uptime. Its hardware is designed in such a way because servers are computers with the purpose of providing computing power/service to multiple users simultaneously. Server hardware typically includes:

* A huge amount of ECC-RAM (64+GB) that is capable of checking for memory errors in real-time, preventing memory corruption.
* Array(s) of storage drives to store necessary generated by and for the users, with redundancy to prevent data from being lost due to drive corruption.
* CPU with a high number of cores (32+) to handle multiple tasks and data flows at once.
* High bandwidth network card to ensure the connection speed and latency of the data flows, especially for multiple users.

### 1.6 Purpose of Operating Systems

The most crucial program that runs on a computer is the operating system. It handles the memory and operations of the computer, as well as all its software and hardware. It also enables you to communicate with the computer even if you do not understand the computer's language. A computer is worthless without an operating system. (gcfglobal, 2022)

The operating system (OS) of one’s computer oversees all the software and hardware on the machine. Most of the time, many computer applications are running concurrently, and they all require access to your computer's central processing unit (CPU), memory, and storage. All of this is coordinated by the operating system to ensure that each software receives what it needs. (gcfglobal, 2022)

### 1.7 Purpose of Web Server software

Web server software is accessed via website domain names and guarantees that the site's content is delivered to the requesting user. The software side is likewise made up of several components, including at least one HTTP server. HTTP and URLs can be understood by the HTTP server. A web server, in terms of hardware, is a machine that holds web server software as well as other items linked to a website, such as HTML texts, photos, and JavaScript files. (Gillis, 2020)

When a web browser, such as Google Chrome or Firefox, requires a file housed on a web server, the browser will send an HTTP request to the server. When the webserver receives the request, the HTTP server will accept it, retrieve the content, and provide it to the browser through HTTP. (Gillis, 2020)

More specifically, when a browser requests a page from a web server, a number of actions will occur. First, a URL will be entered into a web browser's address bar. The IP address of the domain name will then be obtained by the web browser, either by translating the URL through DNS (Domain Name System) or by searching in its cache. The browser will be sent to a web server as a result of this action. The browser will next use HTTP to request the particular file from the webserver. The web server will react by delivering the requested page to the browser through HTTP once more. The web server will respond with an error message if the requested page does not exist or if something goes wrong. The webpage will then be shown by the browser. (Gillis, 2020)

Multiple domains can also be hosted on the same web server. (Gillis, 2020)

### 1.8 Relationship between technologies above with regards to designing, publishing, and accessing a website

A web browser uses a hypertext transfer protocol to interact with a web server in order to obtain web pages (HTTP). It is a TCP/IP-based communication protocol that is used to transport data across the Internet. It establishes guidelines for computers to interact with one another. HTTP specifies how the requesting client creates and delivers data to the server, as well as how the server replies to these requests.

The server is powered by distinct hardware and support devices such as an HDD, CPU, RAM, and a network card. Upgrading or modifying the configuration of a private server necessitates modifications to the server's hardware, which necessitates hardware and server needs to assure the server's components.

Every desktop operating system has a simple text editor. As a result, the operating system performs admirably and may provide long-term service to your business and sales websites. Visual Studio Code may be used on Windows, Mac, and Linux operating systems to create a website using The HyperText Markup Language.

Web Server Software is also just a piece of software. It is installed and operates on a computer, and the server functions as a Web Server, allowing users to view Web site information from another computer on the network. The HTTP protocol is used by the webserver to convey data to the client across the Internet.

### 2.1 The capabilities and relationships between front-end and back-end website technologies

#### 2.1.1 Front end

The frontend is the component of the website that one can view and interact with directly in order to access the system's backend features. It includes everything the user can see, interact, and click. The position of a web designer has evolved significantly over time, but the essential duties of website creation have not. Frontend is all about the website's bells and whistles, such as the graphical user interface, which includes flashy buttons, bright graphics, navigation menus, and so on. Frontend is sometimes known as "client-side" since the activity occurs on the client-side, which in this case is the user. A client is often the computer application that is viewing it, such as a web browser. (Khillar, 2018)

The frontend is primarily the web browser, and everything the user sees and interacts with on the website is within the purview of frontend development. Frontend development contributes to a better user experience in terms of design and simplicity of use, and it is the responsibility of the web designer to design websites. A web designer does not work with coding. In fact, they are in charge of overseeing all parts of developing and revamping websites with both aesthetically appealing features and a user-friendly design. A frontend developer's job is to create an environment that the user can see and touch using a combination of technologies such as HTML, CSS, and JavaScript. (Khillar, 2018)

#### 2.1.2 Back end

The backend, commonly known as the "server-side," is the component of the website that the client cannot view or interact with. Backend web development is responsible for everything that happens behind the scenes. It all comes down to how the website functions; it's more of an indirect service provider for frontend development. It is the component of the system that has no direct interaction with the users. It operates on the server-side, as opposed to the frontend, but communicates with it to verify everything is working properly. Every program has a considerable amount of non-user interface code that deals with all of the sophisticated processes that operate in the background. Backend specialists are often programmers and developers. (Khillar, 2018)

Backend developers are in charge of everything that does not require developing a user interface, such as writing APIs, establishing libraries, or adding utility to whatever the web designer does. They improve communication between the presentation and business layers. In contrast to frontend web designers, they play an important part in web development and their position is very collaborative. In a nutshell, backend web development is the combination of developing and maintaining a software application's basic functional logic. To put it simply, backend developers build code to ensure that everything works properly on the frontend. They tend to spend more time than web designers working out reasoning and applying algorithms to guarantee the website runs effectively. It is a website's central processing unit. (Khillar, 2018)

#### Relationships between front-end and back-end website technologies

The front end refers to the user interface/client and the code/tools associated with it, whereas the back end refers to the server-side and the code/tools associated with it. CSS, HTML, and JavaScript, as well as the numerous tools and frameworks that deal with these technologies, comprise the user interface code and tools, and this is how the user/human will interact with the program. The back end/server will interact across the internet in response to queries using the "HTTP" protocol, which permits requests/responses in the form of "packets" via a network or networks.

The back end has some logic written in code (PHP, Python, Java, etc.) that will tell the server what to do... do I want to get some data, generate new data, update some data, remove some data, etc. The server will next typically connect with some form of data-store, such as a database, to store and present data in an orderly manner. Of course, there are many more procedures and technologies involved, but this is the basic link between front-end and back-end; it permits interactions between a human on a browser (or another server with just back-end through APIs) and a server/database somewhere on the internet.

### 2.2 How these relate to presentation and application layers

#### Application Layer

End-user applications such as web browsers and email programs employ the application layer. It defines protocols that allow the software to exchange and receive data while also presenting useful data to consumers. The Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol (POP), Simple Mail Transfer Protocol (SMTP), and Domain Name System are a few examples of application layer protocols (DNS). (Imperva, 2022)

#### Presentation Layer

The presentation layer is in charge of preparing data for the application layer. It specifies how two devices should encode, encrypt, and compress data such that it is reliably received on the other end. Any data transmitted by the application layer is prepared for transmission across the session layer by the presentation layer. (Imperva, 2022)

### 2.3 Review database

A database is a structured collection of information or data that is often kept electronically in a computer system. A database management system is generally in charge of a database (DBMS). The data and the DBMS, as well as the applications that are linked with them, are together referred to as a database system, which is frequently abbreviated to just a database. (Oracle, 2022)

To facilitate processing and data querying, data in the most popular types of databases in use today are often structured in rows and columns in a sequence of tables. After then, the data may be readily accessed, managed, amended, updated, regulated, and organized. For creating and querying data, most databases employ structured query language (SQL). (Oracle, 2022)

### 2.4 Review IDE

An integrated development environment (IDE) is application development software that incorporates common developer tools into a single graphical user interface (GUI). An IDE is often made up of the following components:

* + A source code editor is a text editor that may help you write software code by highlighting syntax with visual cues, giving language-specific auto-completion, and checking for problems as you type.
  + Local build automation: Tools that automate simple, recurring operations associated with making a local build of software for usage by developers, such as converting computer source code into binary code, packaging binary code, and performing automated tests.
  + Debugger: A software that can visually indicate the location of a defect in the source code and is used to test other applications.

(Red Hat, 2019)

Because different tools do not need to be manually installed and integrated as part of the setup process, an IDE allows developers to start creating new apps fast. When every utility is represented on the same workbench, developers no longer need to spend hours separately learning how to utilize different tools. This is also valuable for onboarding new engineers, who may use an IDE to learn about a team's standard tools and procedures. In reality, most IDE capabilities, such as intelligent code completion and automatic code creation, are designed to save time by eliminating the need to write out whole character sequences. (Red Hat, 2019)

Other popular IDE features are intended to assist developers in organizing their workflow and issue solving. IDEs parse code as it is written, identifying problems caused by human mistakes in real-time. Because utilities are represented by a single graphical user interface, developers may carry out activities without moving between apps. Most IDEs also include syntax highlighting, which employs visual clues to discern grammar in the text editor. Class and object browsers, as well as class hierarchy diagrams for specific languages, are also included in several IDEs. (Red Hat, 2019)

It is feasible to develop apps without using an IDE, or for each developer to create their own IDE by manually integrating numerous utilities with a lightweight text editor such as Vim or Emacs. The benefit of this method for certain developers is the extreme flexibility and control it provides. However, in a corporate setting, the time savings, environment uniformity, and automation features of current IDEs generally outweigh other issues. (Red Hat, 2019)

Today, most business development teams choose a pre-configured IDE that is best suited to their unique use case, thus the question is not whether to use an IDE, but which IDE to use. (Red Hat, 2019)

### 2.5 Review CMS

A content management system (CMS) is software that allows people to generate, maintain, and alter content on a website without requiring specialist technical skills. (Kinsta, 2021)

In layman's terms, a content management system is a platform that allows one to create a website without having to write all of the code from start (or even know how to code at all). (Kinsta, 2021)

Rather than designing your own system for producing web pages, storing pictures, and other activities, the content management system handles all of that fundamental infrastructure for one, allowing them to focus on more forward-facing aspects of their website. (Kinsta, 2021)

Aside from websites, content management systems may also be used for other purposes, such as document management. (Kinsta, 2021)

On a more technical level, a content management system is comprised of two major components:

* + A content management application (CMA) is the component that allows one to add and manage content on their website (like you saw above).
  + A content delivery application (CDA) is the backend, behind-the-scenes procedure that takes the material one enters into the CMA, appropriately stores it, and makes it available to their visitors.

(Kinsta, 2021)

The two platforms work together to make it simple to maintain your website. (Kinsta, 2021)

### 2.6 Website builder

Online website builders are tools meant to be extremely user-friendly, allowing anybody – novice or professional designers – to develop a full website in minutes using a drag-and-drop editor. Users create a website by dragging and dropping pieces to the correct spot; no coding expertise or experience is necessary. It is as simple as rearranging file icons on one’s PC. (Website , 2022)

An online website builder's operation is as follows:

* One begins by selecting the ideal design template for their purposes. Every online website builder has a collection of website templates.
* Each template includes pre-built features and content. To update an element (i.e., replace the text and pictures with your own), simply click on it. This will launch the editor, allowing you to make modifications.
* Enhance one’s website by adding new features and widgets. Images, photo galleries, movies, contact forms, blogs, and social sharing buttons are examples of standard components and widgets (i.e., Facebook Like, Twitter Tweet, Pinterest Pin, and more). If they wish to sell things on their website, they can also include a PayPal Buy Now button or a full-fledged shopping cart.
* When one is satisfied with your new website, simply click the Publish button, and their website will be available online.
* Online website builders are meant to be extremely user-friendly, allowing anybody – novice or professional designers – to develop a full website in minutes using a drag-and-drop editor. Users create a website by dragging and dropping pieces to the correct spot; no coding expertise or experience is necessary. It is as simple as rearranging file icons on one’s PC.

(Website , 2022)

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