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# WEB-CENTRIC COMPUTING - ASSIGNMENT 1

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# Web-Centric Computing Assignment 1

## Abstract

Epi de Dieu Ltée" is a noteworthy bakery and pastry shop in Quatres-Bornes. It has been set up in 2002 with the intent of providing the vicinity with baked goods and all things cake. The owners thence set out to provide catering services and daily delivery of staple bakeries. Recent expansion brought such additions as assuring backup supply of goods to retail stores and home delivery of orders to the business' services. In the same vein, "Epi de Dieu Ltée" adopted a computerized business management solution, resulting in an extant, to-date IT set-up with a working internet connection; analogous to a client's expected computing infrastructure.

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## Introduction

### The Company

"Epi de Dieu ltée" is owned and run by its founder, Mrs Thomas, who counts amongst the 4 employees of the business. It comprises of a bakery contiguous to a retail outlet where its goods are sold The bakery operates every day from 05:30 to 20:30, with the exception of Sundays on which it closes at 21:30.
From its establishment, it has succeeded to catch the interest of a regular loyal customer base with its variety of baked & pastry products.
Nonetheless, to continue being successful, "EdD ltée" must seek to modernise its operations to cope with the competition.

## Products & services

As part of its provided services, the bakery produces a certain daily supply of bread and cakes intended for individual consumption as well as for supplying local shops. The shop also provides catering services for special occasions such as parties, weddings or anniversaries, and now also undertakes orders from large-scale retailers in the likes of the ‘Super-U’ and ‘Jumbo’ supermarkets. Currently orders are placed either via phone call or in person on the premises.

An outline of some processes we are to consider yields:

- Taking orders
  “Epi de Dieu ltée” offers customers the possibility of placing orders ahead of a time where the client comes

- Responding to customer queries
  “Epi de Dieu ltée” receives quite a number of phone enquiries about the products of the shop (the different items available, the stock and their price)

- Serving customers
  To benefit from the advantages that this solution provides, “Epi de Dieu ltée” recently computerised their bookkeeping processes. Nonetheless, the system in place is not optimal; The person serving customers uses a spreadsheet to log sold items. The data is then input directly into their database tables at the end of the day.

- Delivery
  “Epi de Dieu ltée” provides delivery to local shops, large-scale retailers as well as individuals, depending on the nature of the order and the proximity.

## Problem Statement

The problems faced by the client can be outlined as:

- Info about the products of the shop are only accessible to people having access to the shop itself
- A large amount of redundant phone queries about products of the shop is consistently received
- Taking orders exclusively via phone calls is inefficient in that it may lead to errors

# Attempt at a solution

To the incurred problems, we propose a web-based solution: A website showcasing the client’s business and services and acting as a portal to the later by enabling customers to place orders. The aims of the website are various; to display updated information about the business and its products to customers, to provide customers a modern way of performing transactions as well as creating a web presence for the business in the view of identifying potential leads.

# Description of Proposed System

The proposed system is centred on a website.
The latter would be host to information about the business, be a means of two-way communication with the business and enable users to buy products of the business.
Users will have the option to register to benefit from a personalised experience.
The solution will also feature a web-app that will only be accessible the business's owner.
The web-app will feature a Content-Management System (CMS) which will enable the user (probably the owner) to add, modify and arrange content on the site.
The web-app will also be connected to the website's database and consist of a dashboard which will, for instance, display the description and of orders for the day and the business's stock.
It will also double as a Point-Of-Sales app to be used at the shop's counter, replacing the current spreadsheet, such that sales immediately update stock in the database.

# Justification

The client currently relies on traditional means of advertising such as business cards, poster adverts etc.
A website enables the business to tap into a certain demographic unattainable before: that of the ever-growing user base of internet services. It's setup is followed by the adoption of digital marketing strategies such as display advertising, search engine optimization (online visibility) and social media marketing (Facebook, Tumblr, Google+). These techniques have proven to be more affordable compared to traditional marketing, to increase profitability in terms of revenues, to improve connectivity with the customer and to offer real-time results for the business strategies employed (web traffic). In that view, the website can serve the purpose of building brand image while maintaining a competitive approach in the catering business, which is important for survival as well as for business expansion. We postulate that an online presence for Epi de Dieu ltée would help it gain an edge over its competitors in its field.

A website provides a 24/7 service, making the information available at any time. The clients can also contact the pastry through messages or mail, means which are non-intrusive to the business. This would result in a streamlined workflow with fewer interruptions since employees will not be required to answer phone calls.

The solution would also enable customers to purchase products online by placing orders. This is much convenience for a client of the site since the latter does not have to go on the premises just to place an order for a later date for example.

Such an order portal produces direct revenue and measurable profit.

Users of the website who opt to create an account would also benefit from a customised user experience. They will for example be able to customise their cakes as per their wishes and benefit from advantages which the owner of the business might decide.

All in all those benefits would considerably increase the productivity of the business, decrease paper work and related inventory stock and also allow the business owner to make better stock planning, leading to making the business more cost efficient.

A website is consistently accessible accessible from a range of devices such as smartphones, tablets, or laptops that are connected through to the internet. The latter would be updated every day so as to keep our clients in the loop for any changes that would be made or any sort of promotions that would be available.

# Technological considerations

Below is a non-exhaustive rundown of the main technologies to be considered when developing the solution. The constraints (if any) of the inclusion of a technology in the website is listed

**-Client-Side Technologies**

## HTML5 and CSS3

The website's and web-app's front-end will be built using **HTML** as markup language, and **CSS** as style sheet language.

It will be developed adhering to the latest W3C specifications of the HyperText Mark-up Language's and Cascading StyleSheets' syntax and semantics, namely, **HTML5** and **CSS3**. Those specifications

Constraints:

- Client-side: *Requires an HTML5 compliant user-agent*
- Server-side: *Requires an HTTP Server*

## JavaScript

JavaScript is a client-side scripting language used to make web pages more dynamic

Constraints:

- Client-side: *Requires a user-agent featuring a JavaScript engine (all major browsers do)*
- Server-side: *None*

# AJAX / AJAJ

*Asynchronous JavaScript and XML* (**AJAX**) is a methodology employing handling of user-generated events, data retrieval and DOM manipulation to the ends of dynamically adding or modifying the page's content.
This increases a web page's interactivity, speed and usability.
The procedure provides the advantage that its server requests are *non-blocking* in nature (requests do not interrupt interaction with the page) and do not require reloading an entire page to display new content which is dependent upon the user's actions. In the AJAJ variant, data is transported strictly in **JSON** instead of **XML** or plain-text in AJAX.
Using raw AJAX/AJAJ calls creates no dependency (on javascript libraries for instance).

Constraints:

- Client-side: *A user-agent adhering to the XMLHttpRequest Object Standards*
- Server-side: *None*

Performance Note:

AJAX positively influences performance since its asynchronous nature makes the pages feel more responsive

# Markdown

**Markdown** is a mark-up language intended for web-writing. It is intended to be as easy to write as it is easy to read. As such, it would be a nice addition to the website's CMS to enable easy styling from the administrator.
Markdown's syntax can easily be converted to HTML by parsing it on the server, thus adding no dependency of support by rendering engines.

Constraints:

- Client-side: *None*
- Server-side: *Requires parsing and conversion to HTML*

Other technologies that will be investigated include JavaScript **WebWorkers** and **WebSockets.** Both positively influence website performance.

**-Server Side Technologies**

# Apache HTTP Server

The server needs an application which will listen for connections and transmit back (serve) HTML pages to clients who initiate connection.

The application to be used for that purpose is the Apache HTTP Server

# PHP Hypertext Pre-processor

The back-end applications making up the logic of the website and web-app will be written in PHP.
PHP is a server-side scripting language that powers in excess of 39% of the websites on the internet.

# Database

The website's data will be organised and stored in a relational database which will be hosted on the website's server.

The relational database management system to be used is MySQL which is a widely used open-source RDMS.

**Development-Oriented Technologies**

# Source Code Editor

Source code editors are supercharged text-editors in essence. They have features specifically designed to simplify and speed up input of source code, such as syntax highlighting, indentation, autocomplete and bracket matching functionality.

The Source Code Editor to be used primarily is Notepad++.

# CSS Preprocessor

A CSS preprocessor is an interpreter or compiler that dynamically interprets or precompiles a scripting language to CSS. It aims to extend the CSS language by injecting constructs - such as variables, functions, inheritance, and mixins - from programming languages (particularly Object-Oriented ones) into CSS scripting; such that the latter's WET *(Write Everything Twice)* static rules are dropped in favour of clean DRY *(don't repeat yourself)* code.

Preprocessors are invaluable tools for building CSS frameworks for their philosophy promote themability (global changes), maintainability, and extensibility.

Lastly, considering the compiled version of **SASS** and **LESS** preprocessors, it should be noted that: 1. Pure CSS is already valid SasScript and LesScript. 2. Preprocessing CSS *cascades* (pun intended) no dependency down to the client or server infrastructure since it compiles to scripts in pure CSS3.

Constraints:

- Client-side: *None*
- Server-side: *None*

# Linting

A lint is a tool developed to flag non-portable programming constructs or those which do not adhere to the language's semantics or philosophy, generally by means of static source code analysis.
To quote CSSLint.net: "CSS LINT. Will hurt your feelings*. (And help you code better)".

The lints we are to consider for our purposes are **CSSLint**, **JSLint**
HTML5 standard compliance will be ensured by validation HTML code through the **W3C validator service **
Constraints:

- Client-side: *None*
- Server-side: *None*

# Requirements of the Web platform

Based on the above analysis of the different technologies to be implemented, it is possible to produce a set of specifications outlining the requirements of the website's host environment.

## Hardware Requirements

Developing, serving and accessing the content of the website has different hardware requirements.
In general, the server is required to be the most powerful computing environment followed by the development computer and lastly the client computer.

What follows are the major hardware considerations for the three environments.

**Processing Power**

The server is the one which requires the most processing power to handle concurrent requests. Then comes development does not tax hardware much. A fast CPU and a decent amount of RAM is all that’s needed for most web development work. Expensive graphics cards and ultra-performance CPUs aren’t that much required.

**Development Environment**

| Component | Spec | Note |
|---|---|---|
| Processor | Intel core i5 | To ensure smooth operation of the software to be used and switching between them. |
| Storage | 200 Gb | Not a definite requirement but is enough storage space for required applications and OS |
| RAM | 4 Gb | Development PC should be able to handle several applications running at the same time |
| Display | Minimum of 1024 * 768 | 1024*786 is the most popular screen resolution. A higher one is recommended |
| Downlink speed | 1 – 10 Mb/s | To test performance of the server. Not a definite requirement |

Notes: Development environment specifications are only guidelines. Different configurations will be tested to ensure compatibility.
For instance: Each aspect of the website will be tested by accessing from computers with different specifications (e.g.: lower RAM, Processing Power etc)

**Server Environment**

| Component | Spec | Note |
|---|---|---|
| Processor | Intel core i7 | To smoothly handle requests from concurrent users |
| Storage | 200 Gb | Not a definite requirement but is enough storage space for required applications and OS |
| RAM | 4 Gb | Adequate |
| Uplink speed | 10+ Mb/s | To handle a downlink of 10Mb/s |

**Note: Disk-Access Latency**

An aspect of the server's Hard-Drive which might act as bottleneck if not optimised is disk-access latency.
For that reason, Solid-State Disks are preferred to Hard-Disk Drives as storage media on the server.

**Client Environment**

The website will be developed to support the maximum number of client terminal configurations possible.

As a general rule, any device that an end-user normally uses to browse the internet is a device with a configuration that will enable using the website.

The browsers that are guaranteed to be supported are desktop and mobile versions of Google Chrome, Mozilla Firefox, Opera and Safari.

# Software Requirements

### Operating System

There is no limitation as to what the website should be developed or hosted on or accessed from. When it comes to development and hosting a Linux distribution is preferred since it is open-source and ASP is not being used on the server, thus Windows would bring an unrequired expense on the server. Windows 7 and above can be used on the development PC since those versions will support the applications required.

### User-Agent

The website will be developed to support the latest revisions of the most popular major browsers, namely Chrome, Mozilla Firefox, Opera, Internet Explorer, Edge and Safari. As such, the client pc can use any of these browsers to access the website and the development PC should feature an installation of each for testing purposes.

### Apache Installation

An Apache installation is required on the host server to handle serving HTML pages to clients.

### PHP Installation

A PHP installation is required on the server PC to interpret php scripts which make up the back-end logic of the website.

### MySQL Installation

Since MySQL will be used as database management system, it is necessary to have a MySQL installation

### XAMPP/WAMP/LAMP

Such web service solution stacks bundles an Apache HTTP Server installation, the MySQL Relational Database Management System and a PHP installation.
They emulate the environment of a server, enabling unit-tests of a website locally, without the files actually being hosted on a server.
One of the three will be used on the development PC.

## Performance Considerations

The definite requirements of the server will be known once performance benchmarks of the website are performed at an advanced stage of the website's development. Yet, the software to be used for the application as well as its supporting hardware was chosen with performance optimisation in mind.

## Security Issues

The website will be facing the internet which is considered to be an environment where 'anything can happen'. The former and the server hosting it should therefore be equipped to cope with most of those eventualities.
This ensures that the website stays reliable and that critical information is kept confidential.

To this intent:

1. The server should always be free of malware

-An up-to-date anti-malware system must be up and running on the server

2. Security of transactions should be ensured

-Monetary transactions (i.e.: placing orders...) shall be delegated through appropriate APIs to secure online payment gateway services, such as the ones provided by the *Mauritius Commercial Bank* or *paypal.com*

3. User information shall be appropriately encrypted prior to storage

4. Attempts of intrusion should be detected and terminated

-Attempts at connections to other open ports on the server shall be prevented by setting up a firewall on the server.
Furthermore, an Intrusion Detection System (IDS) must be set up to detect and deter suspicious/malicious activities on trusted ports.

# Hardware Implementation

For the website to be accessible on the internet, the files making it up need to *sit* on a host server - essentially an always on pc *hardwired* to the internet.
That host pc can then be accessed through the IP address assigned to it by a Local Internet Registry (usually an ISP) and the files located to access the website.
But the optimal solution is to register a meaningful Domain Name - through a Domain Name Registrar - which will link to the website and be used to access it.

The options to consider for a hosting solution are:

**1. Configuring the client's PC as a server**

Pros:

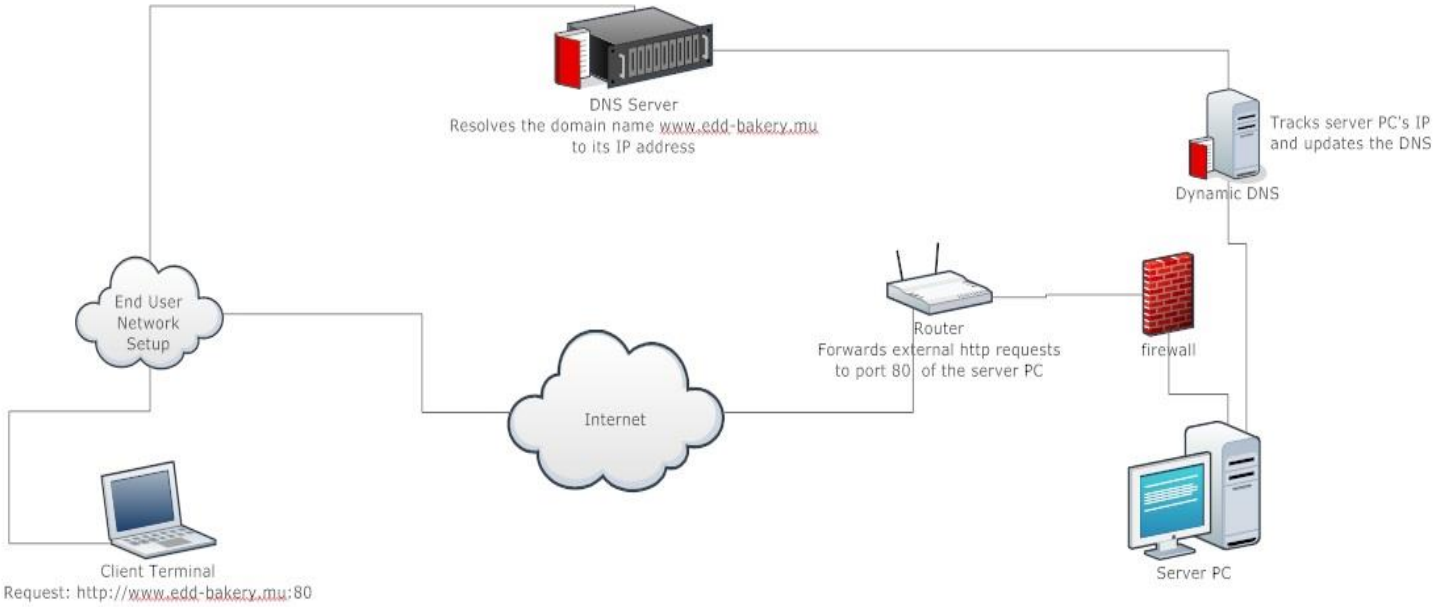
- Flexibility to implement your own tools and technologies and change the former without incurred cost.

Cons:

- Speed at which users get served content is limited by the connection's upload speed, which is very low
- The server needs to stay on all day, every day; resulting in much energy wastage, even more important considering the idle time
- A server needs maintenance such as updating the software infrastructure, applying patches, taking necessary measures if suspicious activity is found logged. This can not be left to the client

**Note**: Due to the dynamic nature of the IP address leased by Internet Service Providers to individual subscribers, a Dynamic DNS Service has to be used to track IP address changes and amend the DNS registry.

A Network diagram of this configuration is:




**2. ISP web-hosting services**

Pros:

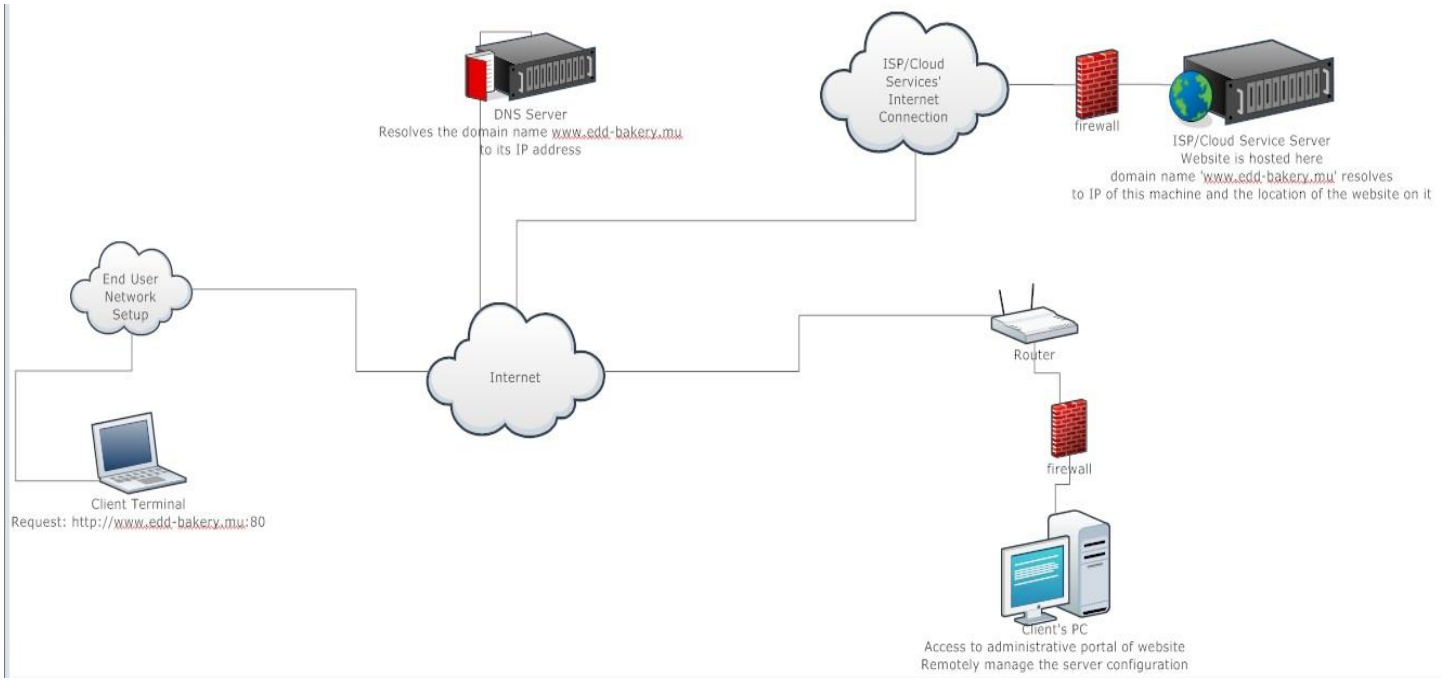
- ISPs have high-speed connection to the internet so the site visitor's download speed is actually the limiting factor when it comes to the time it will take for the site’s content to load from the user-side
- Offers a very high degree of uptime and reliability
- Has a secure operating environment

**3. Cloud web-hosting services**

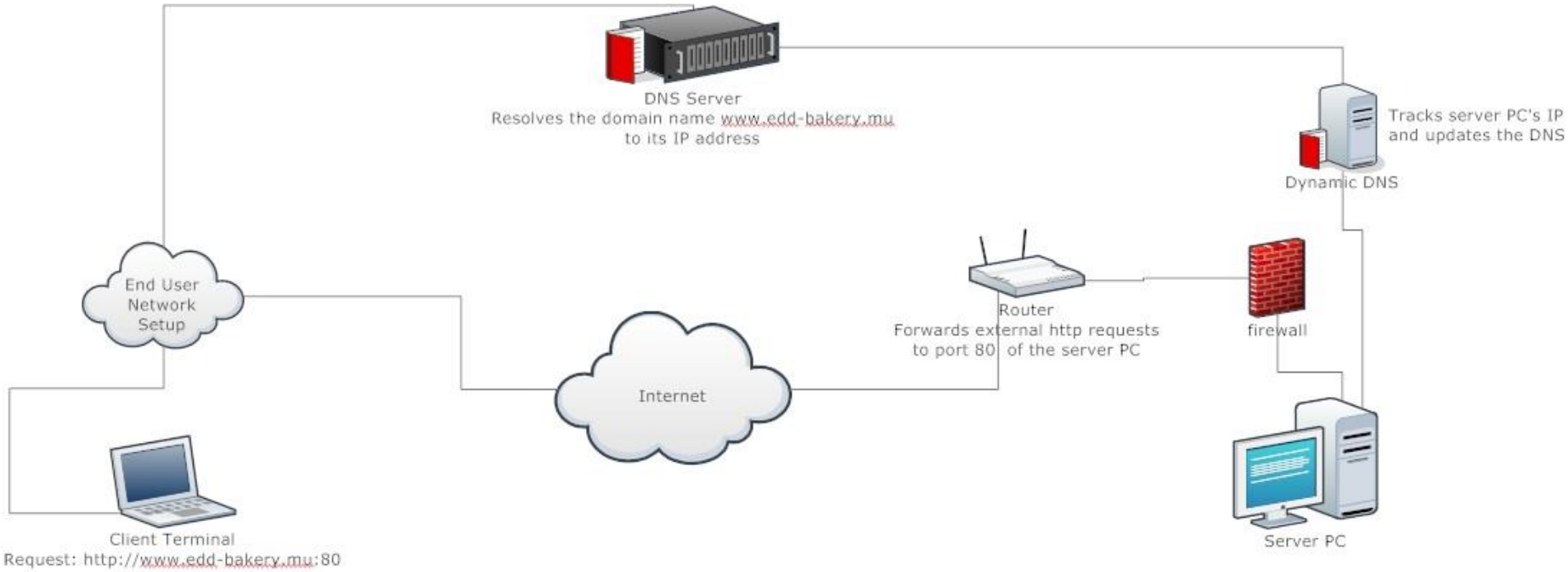
Pros:

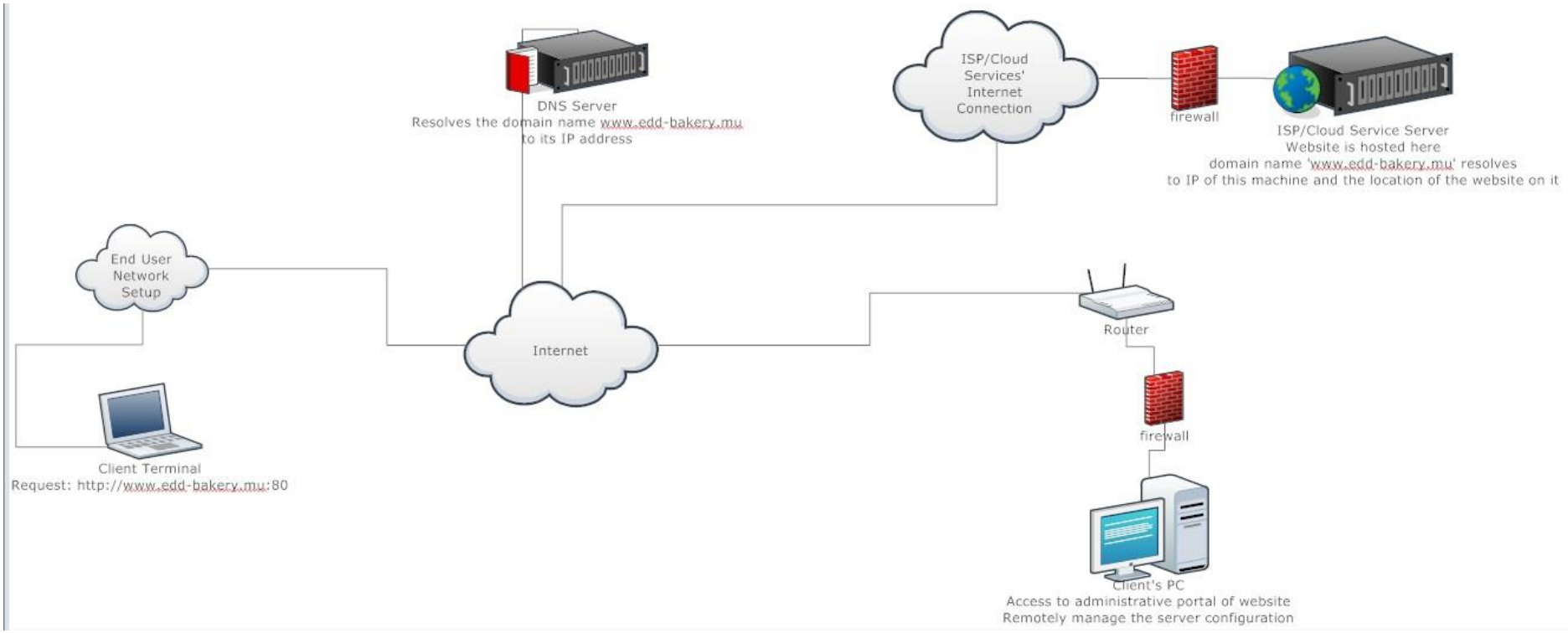
- Has high-speed connection to the internet so the site vistitor's download speed is actually the limiting factor
- Offers a very high degree of uptime and reliability
- Has a secure operating environment
- Much more cost-effective than ISP hosting solutions
- Offers domain-name registration at lower costs

Those two configurations have similar network diagrams:




For the advantages it provides, a cloud hosting solution will be implemented to host the site once it is developed.
This solution will require no additional hardware from the part 'Epi de Dieu ltée'. A suitable domain name will also be registered through cloud service provider.


DNS Server
Resolves the domain name www.edd-bakery.mu
to its IP address
Tracks server PC's IP
and updates the DNS
Dynamic DNS
End User
Network
Setup
Router
Forwards external http requests
to port 80 of the server PC
firewall
Internet
Client Terminal
Request: http://www.edd-bakery.mu:80
Server PC


DNS Server
Resolves the domain name www.edd-bakery.mu
to its IP address
ISP/Cloud
Services'
Internet
Connection
firewall
ISP/Cloud Service Server
Website is hosted here
domain name 'www.edd-bakery.mu' resolves
to IP of this machine and the location of the website on it
End User
Network
Setup
Internet
Router
firewall
Client Terminal
Request: http://www.edd-bakery.mu:80
Client's PC
Access to administrative portal of website
Remotely manage the server configuration