

IFB102: Further Investigation Questions

Braydan Newman

n11272031

Class 5: Languages and Libraries

1) Programming Languages

Rust

The programming language Rust is a relatively new programming language coming out in 2010, that has gained a wide user base due to its ability to be used well in almost all uses. Rust is a strong, statically typed language. The closest existing language would be C++ syntactically but is better with memory safety and speed. The origins of Rust stem from Mozilla who were the creators of the language in the intent to use this new language to help aid in the development of their browser Mozilla Firefox. Due to its better features, it became favoured by many developers over C++. The Rust programming language has developed support over the years for almost every application, from embedded systems, creating CLI tools, Web Assembly with or without the combination of Javascript and even networking. The only downside to using Rust instead of a language like C++ is that C++ has been around since 1985 and has a wider user base with more support and more frameworks. Whereas Rust is still new and is still in the early stages of the life cycle of programming languages.

Class 6: The Web

2) Big Web Sites

Scalability

Popular websites such as Facebook and google have billions of users every day alone. Due to this no one server can handle every request coming from every user. Thus, the solution is to have many servers all doing the same thing. Each server can handle 1000 people so if you have 10 servers you can handle 10000 people all making requests to the servers at once.

The problem with this approach is in how the internet actually works. If you had multiple servers just facing the open net directly each server would have a separate ip address, and due to DNS (Domain name system) if you type “google.com” it gets translated to the ip address 142.250.204.14. The problem is how do we share the load between the servers if the ip address always sends the traffic to the same ip address.

Load Balancer

A load balancer sits Infront of all the servers, while the servers sit on their own sub net with only the load balancer facing the open net directly. The function of the load balancer is to share the user connections between the servers. There are many approaches to this like Round Robin, where as a user connects, it gets given to the next server, then the next connection is given to the next one. There are others like Recourse based where the next user goes to the server with the least number of connections.

Class 7: Security

2) Securing Home PC

There are a few main challenges in securing a home PC, some of them from incompetence in the part of a user,

Security Vulnerabilities and challenges:

General preventatives:

Firewall - on your PC and router that blocks all traffic from un trusted sites and ip addresses

Don't be stupid – The biggest curse of systems being infected is downloading and running random files even from people you know. To help prevent this never enable the ability for files to run scripts unless you know what you are doing. e.g. Don't enable macros on any office 365 suite, unless you know you can trust it or have written it yourself.

Anti-Virus – A antivirus is not a catch all solution to all malware and virus on a computer, an antivirus uses a couple of tools to detect a virus. It has a data base of already found viruses and compares programs with this data base, but this data base doesn't get updated straight away. The anti-virus also watches a program and detects if they are doing suspicious things to important system files.

Malware

For malware there are a couple of preventatives and solutions in case this does occur.

Backup – Having a backup for all your important data or even a complete backup of your entire system. This will make any attempt to exploit you for access to your files pointless.

Viruses (Bot net)

Being infected with a virus that creates a backdoor in your PC and adds your computer to a bot net

Monitor your network usage – The only way a program can communicate with the outside world is through your network. Thus, if you monitor this and what is being sent and received you will be able to see if programs are connecting to unwanted computers.

Outdated software

Update software if security vulnerabilities are found – The most common way to get hack into a server is using its out-dated software as an entire point, but this can also be used on a home PC, the most common programs you want to keep up to date is your Internet Browser, or pretty much anything that relies on the internet to function.

Physical access to your PC

TPM Module – A TPM (Trusted Platform Module) is a module in a computer that is used to enhance a computers security with encryption and decryption, it also used for protection authentication credentials

Encryption on the storage device – If some has physical access to your computer it's very hard to stop them but if the system is turned off you can encrypt all your data and thus nothing can be read off your storage.

Don't ever use a computer – this will prevent all cyber-attacks and if you must use a computer do not plug in anything nor connect it to a network to stop it from being compromised by the outside world

Class 8: Mobile, Cloud and the Internet of Things

2) Internet of Things

The real reason for IoT is the ability to have everything connected to each other and the internet (Smart Devices), this can mean a very low computational task that happens frequently to a fringe that connects to a shopping list app on your phone. I'll be looking at a possible application on a farm. On general a farm has a large amount of land with many different fields, crops and animals. With this you could want to have a "smart farm" where each field sends soil data, weather data, and sets up a system to turn on irrigation when certain criteria are met. For animals the level of the water trough could be measured and various other metrics. The data collection alone could be greatly beneficial for the farm owner as with all this data predictions on future sessions could be done more precisely and each field could be treated differently to the field next to it from information gathered, increasing yield and decreasing loss. The data would also be coming in, in real time thus the farmer can monitor all farms at once from any location, greatly increasing the response time of a farmer to respond to matters on the farm.

Due to limited things the IoT devices would need to do, the hardware would not need to be fast nor big, reducing cost, power consumption, and size in comparison to a fully capable desktop computer. The transmission of data great distances is also much more power efficient as hardly any data needs to be sent.

IoT would be perfect for an application like this and countless others.

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