**Interview Questions**

Databases

* Indices
  + Database indexes are data structures that optimise queries by providing a method of faster lookup for information
  + Necessary for massive, constantly-in-use databases
  + Each row in a table has a unique key which distinguishes it from other row, usually a generated ID
  + Adding indexes to tables takes time because of the UPDATE query so it is best used for frequently searched tables
* Transactions
  + Transactions are units of work in databases, they are made of four properties
    - Atomic where commitments are made to full extent of query, not halfway
    - Consistency, whereby changes happen only if the new state of the system is valid i.e. if an SQL query fails to commit to a query it will revert the entire operation to the previous state
    - Isolated which only allows visibility once the transaction is committed
    - Durability so once the change occurs the change is permanent, and the user does not need to worry about checking each alteration

Testing

* Unit Testing
  + Unit testing works on the smallest components of software.
  + This could be performed on classes, methods or functions.
  + I wrote unit tests in C# for a .NET application which checked that pricing of retailer products was correct against a JSON Duty/Vat template
  + I also used JUnit for testing with an Android application where I compared function results against expected API calls for car licences and Object character recognition
* System Testing
  + System tests are completed on whole systems or multiple integrated components
  + Some types include Regression testing, Load testing and migration testing
  + Regression testing is reoperation of functional and non-functional tests to check if software still works correctly after a change
  + Load testing checks how the software can perform in extreme environments of performance, scalability and volume
  + I ran into a problem before where someone had made a change to another area of the Pricing system for products and it was making my system tests fail, It ended up being a build issue and sorted through Visual Studio tools

Networks

* Load Balancer
  + Load balancer distribute network traffic over multiple resources in order to make them more efficient.
  + They scale the capacity and reliability over a network of container applications
  + Azure Load Balancer provides low latency and high throughput, with the ability to scale the flow of users in a network trying to access a system.
  + Azure Load Balancer also allows for distribution of resources to multiple availability zones which are data centres capable of handling a lot of traffic
* DNS
  + DNS or Domain Name Server is a protocol system for resources and services connected to the Internet
  + A domain name would be [www.letsgetchecked.com](http://www.letsgetchecked.com) and has a 1:many relationship with many different IP addresses
  + It is organised in a hierarchy with root servers such as letsgetchecked.com being searched for as .com is the domain name but underneath the IP address is being resolved by the client connection.

Operating Systems

* Process
  + A process in an operating system is a program being executed by one or more threads
  + It contains code and that is actively running on a thread
  + Processes have states, from Start, ready, running, waiting, and terminated
  + Android applications have a process lifecycle whereby an activity which controls a UI screen has start stop destroy pause states
* Thread
  + Threads consist of a program counter a stack and set of registers
  + They run within programs with a sequence
  + Web browsers are multi-threaded applications, containing different tasks such as images, animations and user functions such as chat bars all being managed by independent threads
  + Android has a single thread model whereby any API calls or intensive functions must not block the UI thread
  + Therefore implementation of applications should be optimised to counter the Android model
* Tracing
  + Tracing is a method for specialising the logging of information about program execution
  + Windows has event tracing whereby it logs kernel or application events to a log file for a user to examine
  + It is useful in Visual Studio to monitor the path of program execution. Provided Trace and Debug classes in C# can monitor code to examine performance during development, deployment and productions stage of the code lifecycle

Web

* HTTP as transport
  + Hypertext transfer protocol is an application layer protocol with a lot of support in most programming languages
  + It can be used to transport html and xml documents across the web
  + It is activated as a request for information from a client to a server
  + The server then responds by returning a web page or information from the likes of an API call
  + Postman is a tool that I used to ping a server that I used so what I would do was provide a http URL with a secret client key
  + This then generated a unique http web page for me to access a retailer checkout page in a development environment
  + Postman provided the likes of GET, POST, PATCH, DELETE http requests
* Status codes
  + HTTP status codes are separated into five main categories, each category having three digits, the first being the class, the second and third clarifying the role
  + 1XX responses provides the server with information from the client side such as to continue with a process or to switch to a different protocol
  + 2XX responses indicate a successful action on behalf of the client
  + 3XX responses refer to possible redirection actions such as notifying the client of a permanently moved URI, to switch to a proxy server in order to access the information
  + 4XX responses indicate client errors where the server returns an explanation either stating that client is forbidden to retrieve information, bad request indicating poor syntax or payload was too large or the infamous 404 not found
  + 5XX responses are server side errors which indicate a problem with the server, these could be incorrect implementation of request method, bad gateway or timeout and also insufficient storage required to process a request

Messaging

* Asynchronous Messaging vs RPC
  + Asynchronous messaging is a method of communication whereby two or more users in a conversation have the freedom to start, pause and resume messaging eliminating the need for acknowledgement Facebook and whatsapp groups
  + RPC messages are similarly synchronous messaging which require a call message and then reply from the other side. In a network, a client makes a remote call to a server and receives a reply containing the requested result. Like picking up a phone
* Durable vs non-durable
  + Durable messages are those messages which will always be sent to the client even though they may not be subscribed to whatever is sending them messages. An example is an order processing application, so the likes of letsgetchecked would have to provide events to a customer such as order updates, testing results even though the customer may not be active at a certain time
  + Non durable messages would be the likes of messages which are removed after a certain period of time regardless of whether the user is active or not. An example if a search results for latest Google news documents, the customer would only want relevant results so that older news would be removed from relevancy

Security

* Authentication
  + Authentication by definition is the act of proving the identity of a user, this is most commonly done using login username or email and password
  + Other authentication techniques include two factor authentication whereby multiple endpoints are used to confirm the identity of a user. This could be using a email and password and then after also confirming through a mobile application or fingerprint
  + Azure authentication for example uses standard login and a mobile app connected to the Azure account, Microsoft Authenticator
  + Azure can be set up so that the user does not type in password but simply uses their mobile phone to login each time
  + Microsoft Azure Active Directory contains the user details and using request to that server from the client allows the verification of the user. Process agents decrypt the unique ID of the mobile phone to verify the user
* Hashing
  + Hashing is the process of transforming a key into another value, it is one way compared to encryption
  + A cryptographic function converts a key into obfuscated text
  + SHA is an example of an algorithm used to scramble a key such as a password
  + Secure Hashing algorithm outputs n bit value which can be used to represent the original data in external environments