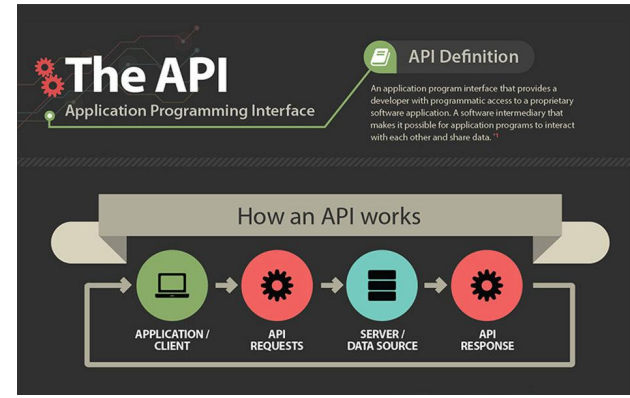


P3 Case Study : A new computer aided dispatch system for Bangbai

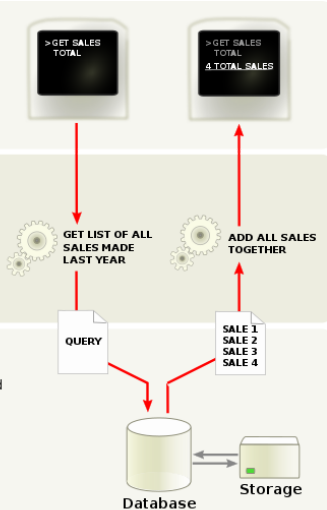
Explanations were compiled by Frankfurt International School students.
They have NOT been edited or approved by a teacher. Use at your own risk.

Term	Definition	Examples
Application programming interface (API)	An application program interface (API) is a set of routines, protocols, and tools for building software applications. Basically, an API specifies how software components should interact. Additionally, APIs are used when programming graphical user interface (GUI) components. https://www.webopedia.com/TERM/A/API.html	
Client side random	A load balancing algorithm executed when a request is sent to the EMIS to complete a certain task. The list of IP addresses of the servers responsible for handling this task is sent to the client's device, and the connection to any of these servers is chosen randomly by the device of the client sending the request, meaning that, since the chance of any of these designated servers being used by a given client is random, the load on all of these servers is guaranteed to be balanced. [Source]	Suppose there are 5 servers dedicated specifically to processing, say, photographic reports sent to the EMIS. If a user wants to share an image, the IP addresses of the servers would be sent to that user's phone and chosen at random to establish a connection to one of the servers.
Cluster	In the context of this case study, the term relates to servers, where more than one server is used to handle a certain kind of function or service if a large number of digital requests is received from users. [Source: Case study document]	If more than one server is dedicated to processing a given task, a load-balancing algorithm can be used to maintain a stable connection between any client and the servers, as well as decrease the total load on each

		server, since multiple servers are faster than one.
Cluster of servers	Two or more computers working together to provide higher availability, reliability and scalability than can be obtained through the use of one computer. In a server cluster, each server owns and manages its local devices and has a copy of the operating system and the applications or services that the cluster is managing. Devices common to the cluster, such as disks in common disk arrays and the connection media for accessing those disks, are owned and managed by only one server at a time. For most server clusters, the application data is stored on disks in one of the common disk arrays, and this data is accessible only to the server that currently owns the corresponding application or service.	
Commercial software	Commercial software is any software or program that is designed and developed for licensing or sale to end users or that serves a commercial purpose.	Windows, Photoshop e.t.c.
Computer aided dispatch (CAD)	Features complete, integrated capabilities for call handling, dispatching, intelligent mapping, field communications, data reporting and analysis, and application integration. Can either be used to send messages to the dispatcher and/or use to store and retrieve data. Sends to a destination for a given purpose.	Taxi Cabs, couriers, field service technicians, mass transit vehicles or emergency services.
Cookies	A packet of data sent by an Internet server to a browser, which is returned by the browser each time it subsequently accesses the same server, used to identify the user or track their access to the server.	A small text file that stores username, password etc.
Custom software	Custom software (also known as bespoke software or tailor-made software) is software that is specially developed for some specific organization or other user. As such, it can be contrasted with the use of software packages developed for the mass market, such as commercial	What we are making for our clients. (IA's)

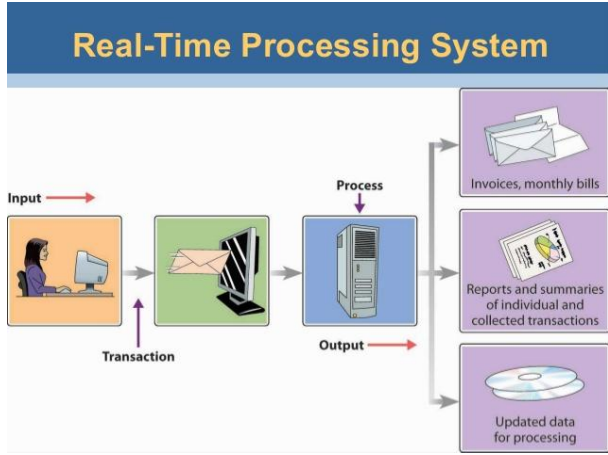
	off-the-shelf (COTS) software, or existing free software.	
Emergency control centre (ECC)	A building or room where control room operators receive incoming telephone calls from members of the public in need of assistance.	
Emergency management information system (EMIS)	A replacement for the CAD system specifically targeted at being able to handle increasing demand for easily accessible emergency services. Communication over the internet rather than operators, as well as the implementation of databases and servers to store reported information and increase capacity of requests are used.	An emergency system operating based on a smartphone app available to the public to communicate with a city's (Bangbai's) information system.
Emergency Number	112 is the common emergency telephone number that can be dialed free of charge from most mobile telephones and, in some countries, fixed telephones in order to reach emergency services (ambulance, fire and rescue, police) https://en.wikipedia.org/wiki/112_(emergency_telephone_number)	112 is the common emergency telephone number
Failover	If, when enabled, a server goes offline/becomes unavailable, another server (likely in the same cluster) continues processing the defective server's requests. [Source: Case study document]	A malfunction of a load-balancing algorithm could lead to one server receiving an excessively large amount of requests, while others in the cluster may not receive any, leading to impaired performance of the overloaded server.
Future-proof	The concept of future-proofing is the process of anticipating the future and developing methods of minimizing the effects of shocks and stresses of future events. This term is commonly found in electronics, data storage, and communications systems. (https://en.wikipedia.org/wiki/Future_proof)	Skyrim
Global positioning system (GPS)	The GPS (Global Positioning System) is a "constellation" of approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment.	

	(https://searchmobilecomputing.techtarget.com/definition/Global-Positioning-System)	
HTTP or HTTP/2	Hypertext Transfer is a protocol that defines how messages are formatted and transmitted along with what actions the World Wide Web and browsers should take in response to various commands. Typing in a URL is a HTTP command to the web requesting to fetch and transmit the requested web page. Stateless protocol because each command works independently, without any knowledge of the commands that came before it. HTTP/2 is the major revision of HTTP used in the world wide web.	
Load balancing algorithm	An algorithm of sorting data packages, or requests being sent from user communications with servers, which optimises the amount of processing done by each server within the system by distributing requests evenly among the servers. [Source] Essentially, there are two types of load balancing algorithms: client-side and server-side. If there are multiple servers dedicated to processing the same task or request from a potential user, one of those servers must somehow be selected before a connection is established for the given packet of data to be processed. Client-side load balancing allows the user to select the server connection. Sometimes this is done randomly, sometimes selected manually by the user. However, a server-based algorithm operates independently of the user, and the connection to a particular server is “decided” by hardware or software within the cluster of servers, rather than the user’s device. [Source]	Client-side random, weighted round robin, source IP hash (from case study).

Multitier architecture	A client–server architecture in which presentation, application processing, and data management functions are physically separated. The most widespread use of multi tier architecture is the three-tier architecture. [Source]	Presentation tier The top-most level of the application is the user interface. The main function of the interface is to translate tasks and results to something the user can understand. Logic tier This layer coordinates the application, processes commands, makes logical decisions and evaluations, and performs calculations. It also moves and processes data between the two surrounding layers. Data tier Here information is stored and retrieved from a database or file system. The information is then passed back to the logic tier for processing, and then eventually back to the user.  <pre> graph TD subgraph Presentation_Tier [Presentation tier] P1[>GET SALES TOTAL] P2[>GET SALES TOTAL & TOTAL SALES] end subgraph Logic_Tier [Logic tier] L1[GET LIST OF ALL SALES MADE LAST YEAR] L2[ADD ALL SALES TOGETHER] end subgraph Data_Tier [Data tier] Q[QUERY] S[SALE 1
SALE 2
SALE 3
SALE 4] DB[(Database)] ST[(Storage)] DB <--> ST end P1 --> L1 L1 --> Q Q --> DB DB --> S S --> L2 L2 --> P2 </pre> Three-tier application overview
Proxy Server	In computer networks, a proxy server is a server (a computer system or an application) that acts as an intermediary for requests from clients seeking resources from other servers. A client connects to the proxy server, requesting some service, such as a file, connection, web page, or other resource available from a different server and the proxy server evaluates the request as a way to simplify and control its complexity. Proxies were invented to add structure and encapsulation to distributed systems.	
Real-time	Computer systems that have to adjust to real world events.	Robots that use sensors to maintain balance must act based on wind or other external forces.
Redundancy	The inclusion of extra components which are not strictly necessary to functioning, in case of failure in other components.	A car can be unlocked both my remote and by a physical key.
Representational state transfer	Representational State Transfer (REST) is a style of architecture based on a set of principles that describe how networked resources are defined and	

	addressed. https://www.service-architecture.com/articles/web-services/representation_al_state_transfer_rest.html	
Scalability / scalable architecture	A scalable architecture is an architecture that can scale up to meet increased work loads. In other words, if the work load all of a sudden exceeds the capacity of your existing software + hardware combination, you can scale up the system (software + hardware) to meet the increased workload. http://tutorials.jenkov.com/software-architecture/scalable-architectures.html	Computing- adding more computers to a problem involved quite a bit of overhead such that scalability was limited.
Safety Critical	A safety-critical system or life-critical system is a system whose failure or malfunction may result in one (or more) of the following outcomes: - Loss or severe damage to equipment/property - Environmental harm [Source]	
Session	a session is a semi-permanent interactive information interchange between two or more communicating devices, or between a computer and user ((https://en.wikipedia.org/wiki/Session_(computer_science))	
Session IP hash	Producing hash values for accessing data or for security. A hash value (or simply hash), also called a message digest, is a number generated from a string of text. The hash is substantially smaller than the text itself, and is generated by a formula in such a way that it is extremely unlikely that some other text will produce the same hash value. Hashes play a role in security systems where they're used to ensure that transmitted messages have not been tampered with. The sender generates a hash of the message, encrypts it, and sends it with the message itself. The recipient then decrypts both the message and the	Hashing is also a common method of accessing data records. Consider, for example, a list of names: • John Smith • Sarah Jones • Roger Adams To create an index, called a hash table, for these records, you would apply a formula to each

	hash, produces another hash from the received message, and compares the two hashes. If they're the same, there is a very high probability that the message was transmitted intact.	name to produce a unique numeric value. So you might get something like: • 1345873 John smith • 3097905 Sarah Jones • 4060964 Roger Adams Then to search for the record containing Sarah Jones, you just need to apply the formula, which directly yields the index key to the record. This is much more efficient than searching through all the records till the matching record is found.
Session management	Session management is the process of securing multiple requests to a service from the same user or entity. In many cases, a session is initialized by authenticating a user or entity with factors such as a password. Once the user is authenticated, subsequent requests authenticate the session as opposed to the user themselves. (https://simplicable.com/new/session-management)	
Socket	A network socket is an internal endpoint for sending or receiving data within a computer network. It is a representation of this endpoint. Sean Devine	
Source IP hash	Source IP Hash load balancing uses an algorithm that takes the source and destination IP address of the client and server to generate a unique hash key. This key is used to allocate the client to a particular server. [Source]	
Stateful / stateless / maintaining state	A stateless system can be seen as a box where at any point in time the value of the output(s) depends only on the value of the input(s) [after a	

	certain processing time] A stateful system instead can be seen as a box where at any point in time the value of the output(s) depends on the value of the input(s) and of an internal state. So basically a stateful system is like a state machine with "memory" as the same set of input(s) value can generate different output(s) depending on the previous input(s) received by the system. (https://stackoverflow.com/questions/5436069/what-are-the-differences-between-stateless-and-stateful-systems-and-how-do-they)	
TCP/IP sockets	A socket is bound to a port number so that the TCP layer can identify the application that data is destined to be sent to. An endpoint is a combination of an IP address and a port number. https://docs.oracle.com/javase/tutorial/networking/sockets/definition.html	
Transaction processing system (TPS)	A transaction process system (TPS) is an information processing system for business transactions involving the collection, modification and retrieval of all transaction data. Characteristics of a TPS include performance, reliability and consistency. TPS is also known as transaction processing or real-time processing.	 The diagram, titled "Real-Time Processing System", illustrates the workflow of a transaction processing system. It begins with an "Input" (represented by a person at a computer) which leads to a "Transaction" (represented by a document icon). This transaction is then sent to a "Process" stage (represented by a server rack). The "Process" stage produces an "Output" (represented by a document icon), which is then distributed into three categories: "Invoices, monthly bills", "Reports and summaries of individual and collected transactions", and "Updated data for processing".
URL rewriting	A rewrite engine is a software component that performs rewriting on Uniform Resource Locators, modifying their appearance. This modification is called URL rewriting.	This: http://www.example.com/Blog/Posts.php?Year=2006&Month=12&Day=19

		Can be altered to look like this: http://www.example.com/Blog/2006/12/19/
Virtual private network (VPN)	A <i>virtual private network (VPN)</i> is a network that is constructed using public wires — usually the Internet — to connect remote users or regional offices to a company's private, internal network. A VPN secures the private network, using encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted. This type of network is designed to provides a secure, encrypted tunnel in which to transmit the data between the remote user and the company network.	L2TP, Ipsec tunnels, Dynamic Multipoint VPN
Voice over internet protocol (VoIP)	Voice over Internet Protocol (VoIP), is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line. Some VoIP services may only allow you to call other people using the same service, but others may allow you to call anyone who has a telephone number - including local, long distance, mobile, and international numbers. https://www.fcc.gov/general/voice-over-internet-protocol-voip	Whatsapp, Google Phone, Google Group Chat, FaceBook Video and Voice Chat and Skype
Weighted round robin	Another load balancing algorithm which sorts packets (user interaction with EMIS) of data by service categories, such as “file transfer” (in this case, uploading an image of information to the EMIS), or “requests” (e.g. calling an ambulance). These categories are then addressed by different clusters of servers. Each of these clusters process the requests in a round-robin order , which simply means that the algorithm wires a connection that rapidly rotates from server to server, and the request is sent to whichever server happens to be wired at that particular instant (an example would be a rolling marble which encounters a junction that rapidly alternates between two possible paths: the marble would roll along whichever branch happens to be open when it is at the junction). [Source]	In the case of EMIS, a user request can be categorised by the Logic tier as either: - Emergency request (dispatch) - Report These would then be processed by different clusters of servers.

Zero downtime	Describes a site without service interruption, runs 24/7. To achieve such goals, redundancy becomes a critical requirement at every level of your infrastructure. Along with availability, most important thing to be considered is backing of data. Thorough planning needs to be done for quality services.	- Finance, banking - Transport and major service utilities that are provided by government/private sectors
-------------------------------	---	---

Here are some videos of examples of existing Emergency Management Systems -

RISK Communication Video : <https://youtu.be/TDX3m20u0Nw>

ATOS Call Centers: <https://youtu.be/CzXJh6CFK7k>

SERIS : <https://www.youtube.com/watch?v=h-Zi5uS9GVs>

Social Media : https://www.fema.gov/media-library-data/1454523271800-8e6eb8fba9a12bc3271fe93d85b426b2/F1_on_Social_Media.mp4

Related News Stories

USA - FEMA Emergency Text Message

<https://qz.com/1412525/why-you-didnt-get-the-fema-presidential-phone-alert/>