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End-to-End Arguments in System Design

When files or data are transferred from one computer to another connected via a same network, there are possibilities that errors can occur during the copying or transfer process. Some of the errors may include reading incorrect data, the loss or change of bits in a packet, transient error and buffering and copying errors. When designing systems that allow data to be copied or transferred from one host to the other across a network it is important to create them in such a way that there is end-to-end-reliability guarantee. The end-to-end argument in networking simply means that it is not efficient or economic to place functions at lower levels of a system because the applications at that lower level that don’t need the function must still pay for it too. The second reason is that in the event that there is less information at the lower level than at the higher level hence the functions would do the job less efficiently. The cost benefit Analysis (CBA) shows that placing functions at lower levels of a system is not worth the cost of doing so.

Ways in which errors can be prevented when transferring data from one host to the other across the same network include using a retry/commit and a checksum to detect failures. A retry/commit sort of works like a while loop in OOP, which means as long as the data being transmitted is incorrect, it will keep trying until the correct information is received at the other end. This solution can cause delays and is generally not recommended for large chunks of data as large portions of time may be taken in trying to correct the errors by retrying to relay the information across the network. A checksum is a block of digital data that is embedded into a network system for the purpose of detecting errors. However, it is important to note that the checksum does not detect all errors, some small errors can still escape the attention of the checksum and remain undetected. The three most important aspects when designing a network system are reliability, performance, and cost. It is of paramount importance to design something that will allow correct information to be passed across a network and this should be done efficiently and at the lowest possible cost (Saltzer et al).

The main benefit of end-to-end implementations is that such implementations tend to reduce the amount of processing required in the network. This allows the network to operate at higher speeds thus processing faster and optimizing performance although local implementations of functions may enhance performance above that which is achievable using end-to-end implementations alone. Network systems that use end-to-end arguments are easier to design, improve and change, and this relatively short design time allows them to track improvements in implementation technologies, hence end-to-end design allows us to access and use the most recent innovations and produce network of the highest quality. Another advantage is that End-to-end functions need only to be encountered once, i.e. at the endpoints, whereas localized functions may be encountered multiple times, the repeated processing can also slow down the network and degrade performance. The end-to-end arguments serve as a guide to designers for placing functionality in a communication system. The end-to-end arguments are considered just as importantly as other factors for certain functions such as congestion control and routing during the design of network systems. Routing is basically a way of choosing a path for traffic in a network system and is quite important too when designing a network system just like the end-to-end arguments are(Moors).

Whisper systems created a way of encrypting text messages, this method of encryption is called Signal. This allows users to communicate using texts while remaining confident that nothing can be intercepted in transit over the internet. Signal has unique features that are not found on the standard SMS platform for example the “timer”, this feature allows any conversation to be configured to delete sent and received messages after a specified interval, this feature makes use of a feature that makes use of a clock that starts ticking for each recipient once they have read their copy of the message. The main advantage of this time feature is that it provides a way to keep the message tidy. The user determines the duration they want before the messages are deleted, this can range between five seconds to one week. Facebook and WhatsApp messengers recently announced that their messengers now contain end-to-end encryption. This method of encryption is based on signal protocol and hence signal itself is end-to-end encrypted too. Standard SMS platforms don’t have such a high-level method of encryption and therefore are not as secure as Signal (Marlinspike).

Signal desktop is another great feature of Signal that is more efficient that the standard SMS desktop capability. It’s also end-to-end encrypted and allows users to send high-quality texts, pictures, and video messages for free. Countries with a lot of censorship on private messaging like the U.A.E and Egypt have users experiencing a lot of accessibility problems when they visit these countries, however, Signal’s latest versions include a feature that detects censorship and applies circumvention when needed. This means that when users with phone numbers from other countries visit places where censorship is being deployed, signal will work without a VPN (Virtual Private Network). Another safety feature that Signal has but standard SMS doesn’t have is the Safety Numbers, safety numbers allows Signal users to verify that their communication with a contact is private, this can be done either by scanning a single QR code or by comparing a number (Marlinspike).

Works Cited

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