**About Barbara Liskov**

1. What is the greatest joy Liskov experienced in her career?

The greatest joy Liskov experienced in her career us the creative process of solving a problem.

1. What are her main contributions for which she received the Turing Award?

Her main contribution for which she received the Turing Award is using data abstraction to organize software systems.

1. What is the ARPANET? What is the language *Argus*?

The ARPANET was the precursor of the Internet, which only a few universities and a small group of people were using for email and file transfers. *Argus* was a programming language that enabled programmers to write programs that contain components on different computers linked through the Internet.

1. To her, what was it like to develop a computer language?

She compared developing a computer language to mathematics, where you have to find an elegant solution to a problem. Therefore, for her, a computer language should be simple enough in syntax, but very powerful in the means of what a programmer can do with it.

1. What is her advice to those wishing to pursue a career in research?

Her advice to those wishing to pursue a career in research is that they should pick whatever they feel it’s exciting for them, and to avoid taking a direction that is also followed by many others, because there will be many published papers in that specific field. Therefore, she says that one must follow his own star in doing research.

**Security of online information**

1. In the near future, all information will be stored online and accessible from everywhere. What are the three additional objectives addressed in Liskov's vision (besides information being stored online and accessible from everywhere)?

The three additional objectives addressed in Liskov’s vision are: Persistent (so it won’t be lost in case of errors), Sharable, Easy to locate/query/use.

1. What is the first scenario she presents? What are her four wishes in this scenario?

The first scenario that she presents is about getting all the data from a laptop. Her four wishes are that the data should be saved automatically, should be uploaded as needed, should be automatically archived/backup-ed and should be shared under the full control of the user.

1. What is the second scenario she presents? What are her three wishes in this scenario?

In the second scenario, she presents a scenario in which the user wants access from everywhere to his/her medical records. The three wishes related to this scenario are: keeping track of medical records from many hospitals, keeping the medical records available everywhere and being able to have control over the access and the privacy of them.

1. What is the biggest challenge common to these two scenarios?

The biggest challenge common to the two scenarios Liskov presented, is Security.

1. What does she mean by *highly-scalable* storage? What does she mean by a *highly-scalable* access speed?

By “highly-scalable” storage, she refers to the fact that there will be many people whose data files will be stored online. Therefore, there must be a big number of computers that will store these files. The “highly-scalable” access speed refers to the fact that once their files are stored online, people will want to access it. But they won’t be happy to wait not even “10 seconds” for the information to be retrieved from the servers. Therefore, the process must be very fast.

1. What are the two “hugely” important issues of security? What are the two “other” aspects of security?

The two important issues of security are the Confidentiality (privacy) and the Integrity (when someone requests information from the server, this information must be exactly the one requested and not some other one). The other aspects of Security are Reliability (where the information isn’t lost) and Availability (where the information must be available 24/7).

1. What is wrong with having just one server? What is *replication*? What is the main goal of replication protocols?

Having only one server is very dangerous because, if that server encounters an error or a failure, then all your data (and maybe the data of other users as well) may be lost forever. Therefore, in order for Reliability and Availability to take place, replication is required. Replication is basically having multiple copies of one’s data on different servers such that, if one of the server encounters and error and you lose the data from that server, you will still have access to the same data that is stored on a different server. The main goal of replication protocols is that the information is preserved and accessible no matter what kind of failures the system encounters (network failures, machine failures).

1. What is a *Benign* failure? What is the *ordering solution*? What are the three issues that arise from this?

A Benign failure is whether or not the machine is running. The ordering solution is a protocol that orders all the requests from all the replicas such that you have a consistency in the stored data. The three issues that arise from this are: insuring correct behavior (which is dealing with all possibilities when a “primary” fails), handling node recovery (that is, updating the replicas with the newest received data) and providing competitive performance (the system of replicas must act like a “super reliable single machine”, not like a set of multiple computers).

1. What is a *Byzantine* failure? What are the two main causes for this type of failures? What is her solution? Any difference from her solution to Benign failures?

In a Byzantine failure, the computer “gets damaged”, or it is running in a “bizarre way”. It may appear to run correctly, but actually it returns fake data or no data at all. The two main causes for this type of failure are: malicious attacks (malware) and software errors. The solution is the same as in the case of a Benign failure: using a primary replica that will control all the others. Even though, there is a difference from her solution to Benign failures, and this is represented by the fact that replicas might lie and this makes it difficult to choose a primary replica.

1. How important is this research? What does this research mean to you? Did you think that a popular website such as <http://www.nytimes.com/> was hosted by a single server? Does a commercial e-mail service such as Gmail keep a single user's e-mail messages in one server? Do you think Liskov deserves the Turing Award (which is the most prestigious award in computer science)? Keep in mind though that, to make it accessible to everyone, she presented her research in very simple terms, but this research is technically very complex.

Even though this research doesn’t have applications in today’s computing (like the protocol that handles Byzantine failures), the research is useful for future purposes. And usually, research is done not by thinking in terms of today, but thinking in terms of what will the technology require in the next few years. Speaking of using a replicas-system of storage, yes, I was thinking that big sites (like <http://www.nytimes.com/> or other sites that have huge databases) are required to have such a system in order to have a good stability and efficiency (in case of a malware attack). For her research in the security of online information I think that Liskov definitely deserves the Turing Award for thinking of problems that were not really considered important back in 1996, but which are today major problems regarding storing online information. Her research and presentation were very meaningful for me, considering the fact that computer security and cryptography are my main points of interest in computer science.