OPEN SYSTEMS ARCHITECTURE

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Abstract: *We used Open Systems Architecture in several local projects and achieved very flexible and economically low-cost result with this. This design gave the users of the systems a lot of advantages in terms of future upgrades and repairing. Open systems Architecture also solved the problem of being specific manufacturer dependent. In terms of quality this design allows to use the most reliable and high-quality part from different competitor manufacturers and vendors.*

Key words: *Open standard, Adaptability, Modularity, Interoperability, Portability, Scalability, Cross-platform*.

Introduction

Open systems architecture is a system design approach which aims to produce systems that are inherently interoperable and connectable without recourse to retrofit and redesign. [1]

Systems design is a process of defining and engineering the architecture, methods, and interfaces necessary to accomplish a goal or fulfill a set of requirements. In open systems architecture, the design includes intentional provisions to make it possible to expand or modify the system at a later stage after initial operation. There is no one specific universal open systems architecture (OSA), but it is essential the specific OSA applicable to a system is rigorously defined and documented. [1]

General characteristics of Open Systems are listed below:
• Use of open and commonly accepted standards
• Adoption of interface protocols and data standards
• Determination of standard services
• Use of products provided by more than one manufacturer
• Interoperability with minimal effort
• Easily scalable and upgradeable systems
• Cross-platform portable applications

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• Portable users (user can easily adapt to different systems for the same purpose) [2]

In most cases there is a confusion between Open Architecture and Open Source, but they do not mean the same thing. Open-source software means that their source code is open. On the other hand, open architecture is the development and integration of different companies into the same product. For example, the fact that we can easily integrate different hardware elements with interfaces such as PCI bus, PCI Express, VME into the computers we use today means that they provide the necessary conditions for open architecture. In this way, it is aimed to add a new capability to an existing software by third party developers or companies, thus preventing company dependency. It is aimed that the electrical and protocol level standard interfaces provided in the hardware are also in software products. [2]

The developed Open Systems Architecture prioritize the following quality attributes in their designs:
- Adaptability (Application to the requirements of different platforms)
- Modularity (Detachable from the system, or add-on)
- Portability (Transferable from one system to another)
- Scalability (Scale to be larger or smaller according to need
- Interoperability (effective data sharing with other systems

Of course, beyond these, the main concern is to reduce the cost of the systems. [2] [3]

Results

For the past a few months we implemented some open architecture and closed architecture local systems with the same purpose. These included workstation PCs, IP camera systems, NAS systems etc. The results showed that the closed architecture systems (black box) gave more stable and user friendly environments for the users. However, when it comes to flexibility and upgradability the whole systems needed to be replaced with new models completely. On the other hand, Open architecture systems provided completely flexibility and upgradability. The whole system can even be upgraded step by step in a long period without losing its operational state. The main reason for this is the manufacturers of the parts mostly provide backward compatible products in order to gain more profit in every market. This also forces the competitors to do so and produce even more compatible and more reliably parts in variety options. Besides, open architecture gives a chance to make choices when picking up the system modules according to the quality for the usage and amount of the customer budget.

Especially, for the small companies which are newly formed this systems can be implemented in a very basic level (entry level) and can be upgraded step by step without any extra costs as they need. This provides any small companies very high amount of economic savings.

The only downside of using Open Architecture Systems is it requires a specialist for implementing any part and module of the systems. As the modules are compatible with many systems they need to be configured specifically for every system depending on the implementation design. This require some skills and experience from engineer and sometimes even from the user whereas any modules can be implemented easily by anyone without extra knowledge in closed systems. As they all are specifically designed to be used with the exact system, all the modules and parts will be plug-and-play.

Let us see two workstation computers as an example for these systems:

The first one is a laptop with SoC (System on Chip) which was built with closed architecture design. You bought it in a specific configuration (depending on the type of CPU, amount of RAM, Storage Space such as SSD, etc.) according to your needs. This system will usually be a lot stable and more efficient than other type of systems with the same configuration.

The second one is a custom-built desktop PC with the same configuration for the same purpose. However, you built it in a traditional way that each part such as CPU, motherboard, RAM, GPU, SSD is from variety of compatible vendors. This system might be a little less stable compared to the first one, but it will be cheaper and free to customize.

As the time passes your needs might change, the requirement for the newer version of the software might change into a different level. In this case you might need more CPU/GPU power, more memory space and so on.

For the first system it is completely impossible to upgrade these parts as they all are integrated and soldered as a single part inside a single chip. In the other hand, you can easily upgrade every part of the second system as they all are detachable and available in many configurations. In most cases, you only need to upgrade only a few parts and you will have more powerful completely new system without buying the whole new system.

This is the best example for the advantages of the open architecture systems. Today the world is changing very fast, working conditions and needs for the technology are changing every day. More flexible and cost-effective technologies are the key for every individual and businesses to success.

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