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POLL

How much code have you produced in your career?

A few KLOC

Guest Blog

Technology development strategy in difficult times

By Rajeev Gupta,
Project Manager,
Hardware Systems,
elfochips Ltd.



Rajeev Gupta

Technology makes life easier with products or processes for our convenience, satisfaction or pleasure but often, a new technology that is developed ends up not offering any of these benefits. Instead it results in (an avoidable) loss of time and resources, both of which are luxuries in the context of the current global economic meltdown.

So it is only right that we first look at system design methodology, the criteria for selecting a given technology and an overview of the market prospects to ensure bright prospects for a technology under active consideration for development.

Involvement in the development of any technology needs a basic understanding of the following aspects:

- Is the process or product under development relevant to the present technology trend? For instance, the design of a radio receiver around old valve devices is not an acceptable trend.
- Will it meet user expectations? This requires understanding the expectations of potential users.
- Features of the process or product should be evaluated under the category of must-have, desirable, acceptable and/or not-so-necessary. A comparative statement listing the competitive options is extremely important.
- Affordability and reliability of the system for the target user - a system designed for higher-end application needs different costing than a consumer oriented mass-market product.
- Development time-line – if a technology requires an unrealistic amount of time for development as against its intended applications, the development of such a system may end up not being fruitful.

- 100s of KLOC
 Millions of LOC
 A trillion
- Vote

- Innovation in technology development is a good, even necessary differentiator when compared to existing technology. In the current scenario, designs for example, need to be oriented to ultra-low power consumption.

Technology trends

It is interesting to realize that trends in the process of product development change on similar lines as that of fashion and so, an understanding of the past, present and future fashion of a technology is vital for better system development.

In the last few years, web-based technology developments have been in vogue and in great demand for all sorts of communication. Many systems have developed around web applications such as financial transactions, advertisements, news coverage, company and private information exchange, search engines, peer-to-peer portals, and for that matter, even gambling. Thus, web-based systems have been in the fashion.

Technologies that have evolved around it are high-speed internet communications, broadband networks over legacy infrastructure, broadband networks over new dedicated infrastructures, wireless internet access, home, office and industrial control systems, air-conditioners or even entertainment systems being controlled through web-based systems, surveillance and security systems and infotainment and knowledge systems.

In short, web-based systems have been in great fashion. Thus, a new product under development must have the possibility of connecting to the Internet.

User expectations of technology

In the last few years, the introduction of laptops and mobile phones and the kind of acceptability they have been met with, makes it clear that users everywhere clearly prefer compact, portable and low-power devices. No wonder then that many electronic products are getting compact, light in weight and portable. Devices also need to be feature-rich with multi-functional approach, designed with additional features such as camera, bill payment options, payment of parking fees, video, GPS, city maps, traffic information, street locators, navigation and other similar functions.

Technology helps in evolving user expectations and in turn, the expectations help in evolving the technology - so it is a continuous process.

Product features

The initial stage of the project development life-cycle selects the features of the project, these being selected on the basis of must-have, desirable and not-necessary trade-offs. Such a selection calls for insight into the future of technological development evidenced by the camera option in mobile phones, storage-media support on surveillance systems, wireless LAN for PDA, GPS connectivity for hand-held devices or even the city maps on mobile phones.

Affordability and reliability of a product or process: At the time of selecting relevant technology, evaluation of affordability and reliability is important. A product developed for defense applications is usually costly but with extremely high reliability and so capable of working under extended stress, whereas a product for the consumer mass market will have different affordability and reliability parameters.

Systems developed for defense or critical industrial application usually needs rigorous testing for failure mode evaluation and corrective action (FMECA) analysis. It may need detailed FTA (failure tree analysis) also while the reliability requirements for a consumer product are less severe.

Development time-line: Every technical development is usually a time-bound

activity and the results of the development should be delivered at the end of that time-line. However, the time-line again depends on the prior knowledge or estimate of the technology involved, wherein the time-line depends on the features being provided in the system. Thus, a balancing act is required between the features, cost and time schedule of the technology under development.

Innovation in the technology development: Every technical development should include innovative methods by way of introducing new concepts, new designs or using improved features. In these times, when the possibility of climate change is drawing much attention and deservedly so, it is imperative that designs consume the minimum possible power. Every mW of power consumed is converted into heat which contributes to even further heat generation.

Global warming is now a very real phenomenon and every device generating waste-heat is a contributor to this phenomenon. All new processors, peripherals and devices are now incorporated with power-down features and designers should use these features for lower power consumption. Advanced power management techniques should automatically power-down inactive peripherals, memory and core functional units.

There are direct benefits of low power consumption, wherein the size and cost of power supply is reduced; the design will be compact with better reliability and higher MTBF (mean time-between-failures). Most of the processors have internal subsystems such as SD card port, RGB888 port and a video port which can be power-managed for optimum performance.

Many processors provide the option of using two clock sources with switching techniques for switching-in a lower frequency source during idle time. On detection of input signal activity, the processor shall switch-over to the higher frequency source for high-speed processing. The system shall tolerate an initial latency period for the frequency switch-over.

Many new Ethernet controllers have an internal mechanism for power-down when in an idling state. Even video encoders detect the presence and absence of output cables and will disable/enable its power consumption accordingly. Software command and register setting options are provided on almost all peripheral devices for the selective power-down options.

Additional innovative methods for power optimization: Switching circuits are designed around P-channel MOSFETs, for power-down of peripherals through software using processor's GPIO lines, wherein power to the peripherals such as SD card, SPI-based RF transceivers, RS232 serial drivers, USB ports, video encoders, LCD screens that can be switched off during idle periods. It may be noted that every extra transition of clocks consume power, thus it is possible to reduce the internal clocking activities of FPGAs or processors for further power reduction.

The systems using high-end FPGAs tend to consume reasonably high power, but this can be reduced by reduction of internal clock frequency during idle periods. In many systems, the devices can switch to lower clock-frequency during house-keeping functions. Most of the system functions are now defined as idle, sleep-mode, power-down and high-activity mode. These features are implemented through register settings and specific commands within the power management domain.

Conclusion

This technology development strategy is important for every designer and needs to be a part of basic understanding. Tough competition and lower demand for run-of-the-mill systems mean that careful pro-active technical issues resolution is most important. A proposer direction in technology selection, user perception, cost, system reliability and long-term applicability can create a winning combination for the product or process in development.

It needs to be recognized that every reference-design, product or process design shall eventually become a trend-setter with long-term applications. It is important that some innovation should be brought into the system which provides better features than the previous generation systems. A comprehensive approach towards developing software, hardware and system can provide a win-win situation for successful technology development.

Posted by **Rajeev Gupta** on **Apr 9, 2009 01:29 AM** in [Guest](#)

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