Paper Analyses

Paper: "Integrated Power Management for Video Streaming to Mobile Handheld Devices"

The ability to get multimedia content on the move, has been a hot topic the last years. Video streaming might be the hardest part to solve, in terms of performance and power consumption. This paper addresses the power consumption part.

Their approach tries to identify interaction parameters between low level architectural optimizations, OS power-saving mechanisms, and adaptive middleware techniques, and optimize these to reduce the power consumption. They aim to develop and integrate hardware based architectural optimization techniques with high level OS and middleware approaches for improvements in power savings and the overall user experience (in the context of video streaming to a low-power handheld device. One of the problems with multimedia, is that uses a lot of the biggest power consuming parts such as the CPU, the network and the display.

The energy saved by this approach is pretty impressing, but a huge weakness is that it requires a proxy. The proxy might be subject to several problems. Depending on the deployment, it might be a single-point-of-failure. In addition, the deployment of proxies itself imposes a problem as it would require a lot of time, effort and money. Solutions that require more hardware, seems to have a lower chance of getting implemented that those that only require what is already there.

One thing I did not get, is whether it supports multiple access points. That is, if a user is on the move and has to connect to another access point in order to stay connected to the network. They say they assume that network connectivity is maintained at all times, but does this include a transition from one access point to another.

The approach has a lot of "features", such as the dynamically adaption to changing network and device conditions, the use of a proxy as a buffer station to send bursts of data, and the accounting of attributes for the wireless access points (like buffer capabilities) and the underlying network protocol (like packet size). It seems that they have been quite thorough, and cite relevant research.

The difference between sleep and idle was way more than I expected. As they say, setting the network interface to sleep from idle, is a good place to save power. However, they could have checked a couple of WLAN cards to illustrate that the difference is so big in general. It probably is that big in general, but only referring to one card is not sufficient.

I feel kind of disappointed that they only did the measurements on a Compaq iPAQ 3650. Again, as I mentioned before, doing something on one device is not sufficient (except if their goal had been to optimize the power consumption for this specific model). Although, the results show that a lot of the battery can be saved by using the mechanisms suggested in this paper. Even though it might not be as much as for the iPAQ, I believe it is safe to say that it would increase the battery time in general. Evaluating approaches is often hard and requires a lot of time, so I see why they only did it on one device, but it would be interesting to see how it would perform on another device.

In most cases, they were able to run the CPU at a significant lower voltage which was due to the highly optimized code and the initial high speed of the simulated XScale processor. And as they point out, a real device might not be able to scale the frequency to such a low level. How much this would affect

the result is unclear. If doable, they could have presented an estimate.

The motivation is OK. They have some figures all over the paper, which I found helpful. Some of the graphs could have been explained some more.

Under future work, they say that it would be interesting to study the behavior of the system when multiple clients received video. This would include the constraints of using a proxy in terms of its need of bandwidth and admission control algorithms. The proxy might be the weakest link in this system, and in order to really see whether this is a good idea or not, a larger experiment including several client in a real environment should be conducted.

Abbreviations (shortened)
OS – operating system
QoS – Quality of Service