Do ATMs have to compete with Personal Computers and Smart Phones on CPU / Memory Specs?

ATM / Self Service Software Applications are simple desktop applications that are often misconstrued as very complex piece of software with high resource requirements on CPU and memory. It is quite understandable that smart phones are racing towards quadcore and octacore processors and 8 GB RAM or above, given the fact that entertainment and gaming are big targets in that industry. Similarly Personal Computers and Servers need higher CPU / RAM for a wide range of multi-tasking applications that are media rich and compute intensive. **But, there is no reason why ATMs also need to join the same race since the number of applications are fixed and involves predictive functionality.** After all, an ATM's prime purpose is self service transactions and is neither of gaming, entertainment, multi tasking or number crunching. With this thought in question, let us get into some details on what really an ATM does.

What does an ATM do? Is an ATM's performance influenced by its hardware Specs?

The basic list of tasks that an ATM does is listed below:

- ❖ Protocol message exchanges with host switch and monitoring systems
- ❖ Terminal driving - Screen flow navigation for transactions
- ❖ I/O with peripherals - Card reader, EPP, Printers
- ❖ Recording transaction (EJ) and Surveillance images in HDD

None of the above listed tasks are CPU intensive or I/O intensive or memory intensive.

At the most, **the only additional workload for an ATM is to play advertisement videos or do some flashing text or do some streaming video.** For this kind of functionality requirement, **an ATM's high end spec necessarily need not exceed 1.6 GHz single core CPU and 1 GB RAM.** Even for a live interactive video session with a call center executive, the only bottleneck can be the network latency and not the CPU or RAM. *Graphics acceleration is anyway built in on most of the motherboards.*

Are ATMs slow?

If ATM functionality is not very complex, why are they slow? Every one of us at some point of time, definitely have had the first hand experience of an ATM being slow and sluggish. Just try doing a Google search for "ATMs are slow", you could see for yourself the frustration among self service users.

vortex ™

Helping banks reach out

Let us take a look at the typical set of problems experienced by people using ATMs and also reason out the root cause.

Problem	Remarks	Root Cause
Response to user action is not instantaneous	Key entry lag – When an EPP key or a function key is pressed, the key press recognition is slow. Hence, user input shows up on screen slowly. Slow screen change over – The next screen may take a couple of seconds to appear. Poor design of screen content - Text entry / dynamic content placement is not aligned with the background image/color and/or touch area.	All 3 issues are due to poor software design, but give a general perception that a higher CPU/ RAM will improve it.
Card swipe fails	Multiple swipes required for card recognition. Card has to be swiped in a particular slow/fast pattern of insertion and removal.	Should be a card reader software driver implementation issue or a card reader hardware issue.
Receipt printing is slow	Long wait time before printing commences. Slow printing by the print head.	Printer software driver implementation issue or a printer hardware issue.
Touch screen slow or not recognizing the touch area	Screen options are not well aligned with the touch area and the function keys.	Touch screen may not have been calibrated or may need recalibration. Screen design and alignment to be reviewed and fixed.
Cash dispensation is slow	After having chosen for cash withdrawal, ATM throws up the screen "Your request is being processed.." and it stays in that screen for inordinate amount of time (of the order of 30 to 90 seconds or sometimes forever)	Network latency could be primary cause. ATM host's performance and load induced latency would be another big factor. Cash dispenser hardware issues would also be a reason.
Advertisement Video play is jerky	Jittery, jerky, low quality and sluggish video plays.	The video format and the compression formats used may not be suitable for older ATM motherboards. Older ATM motherboards may not have graphics acceleration. However, recent motherboards have built in support.
ATM boot up time is huge	Boot time of ATMs typically should be less than a minute, but sometimes it runs into more than a couple of minutes or even more.	OS hardening may not be done. OS startup (Windows Startup) may have unnecessary programs. HDD scan during boot up will introduce unpredictable delays.

Missing electronic journal records and surveillance images/videos	Transaction disputes are resolved using electronic journals and surveillance data. However, such critical data at times go missing on the ATM.	Disk errors in HDD, induced due to mishandling, would lead to missing journal content and surveillance data. Such errors need to be sensed by software and ATM should go out of service.
ATM hangs during hot weather conditions / no air conditioning	ACs are not 24/7 and ATM motherboard/ CPU may not withstand temperature shoot up. Software application hangs and misbehavior is seen.	Higher end processors require more power, hence more heat gets generated and cooling becomes mandatory. On the contrary, ATMs do not require high end processors.

So what is the cause?

None of the above listed problems would get solved by increasing either the Processor or RAM specs of an ATM. The primary root causes are poor software design choices, software bugs, ATM peripheral device failures and network/ host performance issues.

Is it necessary to Arm the ATMs with more computing power?

The peak load on an ATM is during a transaction when the ATM software is busy engaging the customer and in parallel recording EJ and transaction surveillance images/videos. During this time, even on a 1.6 GHz Intel Atom processor with 1 GB RAM configuration, the CPU utilization stays at less than 20% and RAM utilization stays at 120 MB only on a Linux based Vortex ATM. On a Windows ATM, similar benchmark should result in a CPU utilization of 40% average and RAM utilization of 500 MB. But in reality most of the Windows ATMs are observed to consume higher CPU / RAM leading to the general belief that performance improvement can be achieved through higher hardware configuration. Windows OS applications inherently require higher CPU configuration and more RAM when compared to Linux.

CPU utilization and memory utilization largely depends on the technology being used to build the ATM software. Most of the ATM vendors use either Java or .NET framework with a whole gamut of bloated components. Java and .NET are more suitable for multi-tiered software applications and when coupled with inefficient software architecture can inherently consume more Memory/ CPU than native applications. **Vortex ATMs use native SDKs with no compromise on functionality and performance.**

The below chart shows a typical difference between a Linux OS based Vortex ATM and a Windows 7 based ATM.

	CPU Utilization **	Disk Utilization	RAM Utilization **	Boot up Time	Shutdown Time
Linux Based Vortex ATM *	15%	4 GB	120 MB	43 secs	6 secs
Windows 7 Based ATM	40%	12 GB	512 MB	4 to 8 mins	2 mins

** Recorded during a transaction with surveillance capture in parallel.
* Vortex Linux ATM powered by Intel Atom 1.6GHz single core processor / 1 GB RAM.

After all it is a onetime capital investment, where is the savings?

CPU / Memory configuration has a direct correlation with power consumption and heat dissipation. **A lesser CPU/memory configuration translates to lesser power consumption and less heat dissipation requirement, which implies less electricity costs and no cooling requirement.** The operational cost benefit that a low power ATM brings to the operator is really very huge when compared to the capital expenditure.

An Intel Atom 1.6 GHz dual core processor powered Vortex ATM's total TDP (thermal design power) is only 8 watts with no air conditional requirement. However, an Intel i3 dual core processor powered Windows ATM's total TDP shoots to 50 watts and AC becomes mandatory.

So, what's the take?

It is important to segregate and address each of the above listed causes for all round performance improvement. Specifically on the CPU/ RAM specification, it is important to benchmark the ATM functionality to CPU/ RAM specification and utilization.

Vortex's prime objective has been and shall always be reducing the OPEX cost of financial institutions and operators, which Vortex believes is a big drive towards financial inclusion by making ATMs viable for deployment across the length and breadth of the country. In line with this goal, **Vortex's ATMs are designed from ground up to consume less power with no compromise on functionality and performance.**

Markets worldwide are moving towards environment friendly products and many banks and ATM operators prefer low power consuming products including low power consuming CPUs, which is possible only through an optimal configuration of ATM's hardware specs.