

## **Integrated mobile processors to challenge standalone application processors, says Petrov Group (part 2)**

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Recently several handset IC companies have announced integrated mobile processors – products that integrate baseband processor and application processor together with graphics core on a single chip. These products offer reduced size and cost as well as reduced time to market.

This is part 2 of an analysis of mobile processors by the Petrov Group. Part 1 analyzed mobile standalone (S/A) application processors for handsets and tablets.

Up to this point Qualcomm was the only company to ship integrated mobile processors (IM processors) for smartphones in volume, according to Lj Ristic, managing director for mobile/wireless business at the Petrov Group. However, the smartphone market as whole is dominated by solutions that rely on a combination of separate basebands and standalone application processors (S/A application processors).

For all practical purposes Qualcomm has had a monopoly in this segment until now. It is true that ST-Ericsson announced its U8500 solution a year ago but because of market dynamics that product did not get traction, and Qualcomm was the only company to ship its line of Snapdragon IM processors to customers. Qualcomm is also the only company to offer a CDMA solution in the IM processor segment and the only company to support both HSPA and CDMA standards. Qualcomm also supports LTE. The next generation of Snapdragon integrates a baseband that supports multi-mode, LTE and HSPA, and includes a dual-core Cortex A-9 application processor with Adreno graphics core.

The rest of the companies focus on the evolved 3G WCDMA standard that includes HSPA+ and HSPA, China's version of WCDMA known as TD-SCDMA, and 4G LTE. It should be pointed out that all companies that are currently pursuing integration of baseband with an application processor on a single chip come from the baseband side of the business with deep roots and expertise in the development of standalone baseband processors, said Ristic

ST-Ericsson promises to deliver one of the most competitive solutions which leverages knowledge from its line of very competitive standalone baseband and application processors. ST-Ericsson offers the U4500 and T5008 products in addition to U8500. U8500 and U4500 are aimed at the global market while T5008 is targeting China. T5008 includes baseband that supports TD-HSPA+, dual-core Cortex A-9 application processor and ARM's MALI 400 GPU.

Broadcom's BC28150 is following similar strategy as its baseband supporting HSPA, dual-core application processor and its own graphics core. The same is true for Renesas; its MP5225 includes baseband supporting multi-mode LTE and HSPA standards, a dual-core Cortex A-9 application processor and Imagination Technologies graphics core.

Marvell is pursuing a strategy of addressing the global HSPA market but also focusing on China's mobile market by supporting the TD-SCDMA standard, a wise move on their side, commented Ristic. MediaTek, on the other hand, clearly wants to address the global market outside China by developing MT6573 for lower cost smartphones. The integrated application processor inside their product is based on ARM 11 running at 650MHz. This is about two generations behind the rest of the crowd, but its strategy may work for low-end price sensitive products.

MediaTek is also pursuing development of a standalone application processor whereby it will also integrate a graphics core based on Imagination Technologies. It is clear that MediaTek wants to expand from a baseband line of products into a full line of mobile processor products. All other companies from the list are already offering S/A application processors.

The manufacture of IM processors is clustered at the 45/40nm node, the same situation as we have with S/A application processors. There is also indication that the next generation of integrated IM processors will migrate to the 32/28nm node, commented Ristic.

### **What would be the impact of IM processors on the overall mobile device market?**

A likely answer to this question could come from looking into the mobile device market, analyzing trends, and pointing out major factors that are shaping this market. The Petrov Group defines the mobile device market as a market that is inclusive of mobile handsets (both smartphones and non-smartphones) and tablets – in other words the market made up of devices that almost exclusively use wireless technologies for communication.

One of the major forces shaping this market is the proliferation of smartphones with their media-rich experience offering. Another force shaping this market is the sudden popularity of tablet devices.

The major reason for the rapid proliferation of tablets is the fact that they leverage mature hardware technology from smartphones. Many companies use the same hardware platform for both smartphones and tablets, therefore significantly reducing time-to-market, said Ristic. Examples include Apple's iPhone and iPad, Samsung's Galaxy S smartphones and Galaxy Tab, or Motorola's Xoom Tablet and Droid Bionic smartphone. Thus, it should be no surprise that we have witnessed more than 100 tablet models mushroom in less than a year, and this trend is going to continue in the short run.

### **Analyzing the mobile device market by combining mobile handsets and tablets together**

The mobile device market reached 1.5 billion units in 2010 and is expected to double to three billion units by 2015 with a compound annual growth rate of 14%. The fastest growing segment will be tablets with a CAGR of 65%, but they will still represent only 7% of the total mobile device market in 2015, said Ristic. On the other hand, smartphones will pass the one billion units mark by 2015 and take a market share of 42%.

The total number of mobile processors (including basebands, S/A application processors, and IM processors) reached 1.8 billion units in 2010. It is expected that the total number of mobile processors will reach close to four billion units by 2015 with a compound annual growth of 17%.

In 2010 IM processors comprised only 2% of market share with 30 million units, all of them in smartphones and none in tablets. Assuming that IM processors will reach 40% of market penetration in smartphones and 25% of market penetration in tablets by 2015 one could expect half a billion units for IM processors by 2015 with a CAGR of 79% and a market share of 14%.

S/A application processors had a market share of 16% reaching close to 300 million units in 2010. By 2015 they should triple in size and reach close to one billion units with a market share of 24% and CAGR of 26%.

Baseband processors had dominated the mobile processor market in 2010. They had a market share of 82% of the total mobile processor market, reaching almost 1.5 billion units. By 2015 their market share will decline but they will still dominate the market with around 60% of market share, reaching 2.4 billion units with a compound annual growth of 10%.

One can draw several observations from these numbers, summarized Ristic: IM processors will be the smallest segment of the mobile processor market by 2015 with a market share of 14%. S/A application processors will be about twice the size of IM processors (by unit numbers) by 2015. Baseband processors will still dominate the mobile processor market by 2015, being almost five times bigger than the IP processor segment and 2.5 times bigger than the S/A application processor segment.

### Implications for competitors in the mobile processor market

Qualcomm, ST-Ericsson, Broadcom, Marvell, MediaTek, and Renesas, all companies that are pursuing the IM processor path, should do well in the future not only because of the integration strategy but also because all of them will be offering baseband and S/A application processor products – hence a full-range product portfolio.

Intel and Spreadtrum may decide to join this list of IM processor vendors, but integration is not essential for the success of their mobile processor business. Intel already has a strong position in the market with baseband processors, and it is more critical for it to be successful with its S/A application processor for smartphones than to pursue the integration path, said Ristic. Spreadtrum has a strong position in the China market with its basebands, and the integration path may not be the best strategy forward.

Companies focusing only on S/A application processors such as Apple, Samsung, Nvidia, Texas Instruments, and Freescale should also do well as long as they continue to offer competitive products. The S/A application processor market segment for mobile devices should triple by 2015.

Finally, baseband processors still matter a great deal and so do the companies that offer these products. The list of top baseband competitors includes Qualcomm, Intel, ST-Ericsson, Broadcom, Marvell, MediaTek, Spreadtrum, Renesas, Icera and Via Telecom, Ristic concluded.

<b>Petrov Group: Integrated mobile processors</b>					
<b>Company</b>	<b>Part</b>	<b>Baseband</b>	<b>Application Core</b>	<b>GPU Core</b>	<b>Node</b>
Qualcomm	MSM8660	HSPA/CDMA	Dual Core, Cortex A-9	Adreno 220	45nm
Qualcomm	MSM 8960	LTE/3G	Dual Core, Cortex A-9	Adreno 320	28nm
ST-Ericsson	U4500	HSPA+	Single Core, Cortex A-9	Mali 400	45nm
ST-Ericsson	T5008	TD-HSPA+	Dual Core, Cortex A-9	Mali 400	32nm
Broadcom	BCM 28150	HSPA	Dual Core, Cortex A-9	VideoCore IV	40nm
Marvell	PXA 978	HSPA/TD-SCDMA	Dual Core, Cortex A-9	Vivante GC200	40nm
MediaTek	MT6573	HSPA	ARM 11	PowerVR SGX	40nm
Renesas	MP5225	LTE/HSPA	Dual Core, Cortex A-9	PowerVR SGX2	45nm

Source: Petrov Group, compiled by Digitimes, March 2011

**Petrov Group: Mobile device and mobile processor shipments and market share, 2010 and 2015**

<b>Mobile devices</b>	<b>2010 units (m)</b>	<b>2010 market share (%)</b>	<b>2015 units (m)</b>	<b>2015 market share (%)</b>	<b>CAGR (%)</b>
Non-smart phones	1,200	79	1,500	51	5
Smartphones	300	20	1,250	42	33
Mobile handsets	1,500	99	2,750	93	13
Tablets	18	1	220	7	65
Total mobile devices	1,518	100	2,970	100	14
<b><u>Mobile processors - Phones</u></b>	<b>2010 units (m)</b>	<b>2010 market share (%)</b>	<b>2015 units (m)</b>	<b>2015 market share (%)</b>	<b>CAGR (%)</b>
Non-Smart baseband	1,200	66	1,500	39	
<b>Smartphones</b>					
Baseband	270	15	750	19	
S/A application processors	270	15	750	19	
IM processors	30	2	500	13	
<b><u>Mobile Processors - Tablets</u></b>					
Baseband	18	1	170	4	
S/A application processors	18	1	170	4	
IM Processors	0	0	50	1	
Total baseband	1,488	82	2,420	62	10
Total S/A application processors	288	16	920	24	26
Total IM processors	30	2	550	14	79
<b><u>Total mobile processors</u></b>	<b><u>1,806</u></b>	<b><u>100</u></b>	<b><u>3,890</u></b>	<b><u>100</u></b>	<b><u>17</u></b>

Source: Petrov Group, compiled by Digitimes, March 2011

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