

## Chapter 13

### **Joint Project on Microsoft's Windows CE**

The product announcement of the SH microprocessor was made in November 1992, and in the next year, 1993, the sales promotion activities became vibrant and the name of SH gradually became known to the world.

In such a circumstance, a joint development to install Microsoft's new OS for consumer applications (later called Windows CE) on SH microprocessor was started.

This is a project that can also be called the final step towards the "independence war" of the microprocessor architecture for many years.

Regarding how it was started, the background and processes are described in detail in the personal note of Tony Moroyan at HMSI at that time, which has been contributed to the home page of Hitachi Semiconductor OBs (Seminowa-kai). I would like to introduce the situation at that time, based on Tony's note, and also by tracking my own memory.

Following the direction of Bill Gates, 6 members of Microsoft headed by Harel Kodesh visited Japan and also visited Hitachi on this occasion.

On Hitachi side, the attendance was from the head office, computer group, consumer electronics group, and semiconductor group who were all Japanese members except for Tony who joined the meeting from the US. And Tony naturally became a sort of window person of Hitachi to Harel of Microsoft. The company's new policy towards the consumer field was presented from the Microsoft side, and a proposal was made to cooperate with Hitachi.

The response to their proposal from Hitachi was very much delayed, and Harel got angry about it and gave a call to Tony one day. "If you can only move in such a slow response, we want to remove Hitachi from the joint development partner list. If you really intend to join us, we want you to submit your proposal by next Monday."

After receiving this call, Tony judged that the situation was critical, and decided to take an emergency measure upon consulting with Hastukano, then President of HMSI. It was to directly appeal to me, GM of Semiconductor Div., to ask for discretionary powers to HMSI to make and submit a proposal to make it in time.

Recognizing that this project was extremely important not only for SH microprocessors but also for Hitachi's semiconductor business as a whole, and also for the group of information and consumer electronics, I approved Tony's request in principle and instructed him to take an urgent action. In addition, I told him that since I would commit myself to the joint development with Microsoft and would support it, I asked him to work on it in a drastic way. On my request, Tony spent the whole week end to make the proposal in time by the next Monday. In this way, we could somehow manage to come on the start line of this joint development project with Microsoft. After several business level meetings, the official kickoff of the project was held on February 23, 1994.

The first executive meeting took place at their headquarter building in Redmond, near Seattle. The executives headed by Senior Vice President Nathan Myhrvold and Craig Mundie, the top of consumer group, were present at the meeting, and Harel took over the whole meeting as the person in charge of the project.

From Hitachi side, in addition to me, participants were Hatsukano, the president of HMSI, Tony Moroyan, and Kihara, Mngr. of Microprocessor Design Dept. The microprocessor to be installed with the new OS was SH-3, but at this point it was still in the stage of paper machine without any real physical entity. It was the start of the project relying on the actual achievement of SH-1 and SH-2, and on the SH-3 specs on the paper.

The code name of this project was "Pulsar", and the name of the consumer OS to be installed in the SH microprocessor was "Pegasus", which later became Windows CE.

What was strongly requested at this meeting was strict observance of the development schedule of the SH-3 (100 MIPS version) and the compiler, and strict follow up of each mile stone. Also, each major milestone was decided for the development of evaluation board, ICE (In Circuit Emulator), debugging tools and so on. The development of the compiler required very high level professional skills, and it could not be handled only by the Hitachi semiconductor group. We decided to make use of external resources, and after many twists and turns, we finally selected a venture company, Bsquare which was founded by Bill Baxter who had worked on compiler development at DEC. The projects leaders of both sides were Harel on Microsoft side and Kihara on Hitachi side. HMSI's Tony worked on full-time coordination of the total project. In addition, Hideaki Chaki of the Microprocessor Software Design Dept. was in charge of software development on full-time basis, and he would make frequent visits to Microsoft and HMSI, making necessary coordination.

This joint development project extended over 4 calendar years from the proposal in 1993 to the finish in 1996, and we positioned it as the most important project of Hitachi semiconductor. I attended every major milestone meeting, to make sure that there would not be any oversight.

The first-cut sample of SH-3 was completed in the middle of November of this year, after 9 months from the kick-off meeting, and debugging was started. The "one-shot-success" was the only way to keep the schedule promised with Microsoft, and we had only to rely on miraculous good fortune.

I was waiting for reports with such anxiety and expectation, and the report came to me, "It is almost working on the original specification" It was truly a miraculous "one shot success!". This widely opened up the project prospect.

We could provide evaluation boards to them on schedule at the end of the year, and we achieved a major milestone, the key step for the project members of both parties.

With these developments, the second executive meeting was held on March 9, 1995. The main responsibility on Microsoft side was transferred from R&D group headed by Myhrvold to PEG (Personal Electronics Group), making one step forward to commercialization. The meeting was held in Tokyo, with Senior Vice President Brad Silverberg and other key members. Since it was the meeting at the stage of SH-3 becoming from paper machine to real product, that is, from virtual to real, they highly valued the Hitachi's capability and the meeting became a very lively one.

In this meeting, the report was made as to the progress of business cases utilizing the new OS, with the candidates of mobile information terminal equipment from Casio, Compaq, Nokia, LG and others.

We had been told that together with SH, MIPS and X86 were also the candidate processors which the new OS would support. It was our strong determination that we absolutely must win this competition. They told us that SH was ahead so far. There was a possibility that their new OS

would be installed first in the SH, which would be an epoch-making event, and it was a chance in a million!

The architecture of X86 was almost monopolizing the PC market, but in the coming nomadic era, there was a possibility that SH microprocessor would carry a role of main engine.

In response to their presentation, I told them our firm determination towards this project. "In the semiconductor division of Hitachi, the microprocessor business is most important, and above all things, the SH microprocessor with our own architecture is the most important product. We have been promoting it aiming at "the main engine in the nomadic era", and once the Microsoft OS (Pegasus) is installed, it will really get the strength of Samson. We are determined to work on this project with all our power, including the support from the company wide laboratories. I commit myself deeply and I will make sure that everything will be properly executed."

In August of the same year, I took a business trip for the third executive meeting at the Microsoft headquarters in Redmond. From their side, Vice President Paul Maritz who was very close to Bill Gates, Silverberg, SVP, and other key members including Harel would join the meeting, with the purpose of project review and relationship building.

From Hitachi side, besides me, HMSI president Hatsukano and Tony, Kihara, Mngr. of Design Dept., Kawashimo of MGO, and Chaki of software development attended. Since it was also a summer vacation period, deepening mutual friendship was also the purpose of this time, but it began with a bit of happening.

A golf game with Microsoft people for socialization had been planned in the afternoon of the arrival day, but unfortunately it was a bit rainy day. In Hitachi's customs, "to play in a light rain" was normal, and it was unlikely that we would cancel in light rain especially in summer. We anyhow went to the golf course, Bear Creek. However, no member of Microsoft was there. Since mobile phones were not popular yet, we could not get in touch with them, and we started out only with members of Hitachi for the moment. At last, after we played several holes, three of them came. We found that there was no "play in light rain" even in summer in the custom of Microsoft. It was a misunderstanding brought by the difference between the two companies' internal common sense. Anyhow, they also joined the game following the Hitachi style. However, as the holes advanced, the rain gradually became heavier, and the temperature also became very cold, and the weather became a one not in summer. We finally gave up with two more holes to go, and we chattered in the club house. We now found out the reason of no "play in light rain". When in Rome, do as the Romans do. By the way, we received the present of shirts with Microsoft company logo at this time. At this point, the progress of the project was relatively smooth, and we enjoyed lively talks at the dinner. Especially, the delicious local wine was abundantly served, and the atmosphere was even more relaxed.

Photo 13.1 and Photo 13.2 are pictures of the dinner with Microsoft executives where I participated in the gifted shirt. Also, a lot of wine glasses on the table remind me of the excitement of those days.



Photo 13.1 Picture of dinner meeting with the Microsoft executives (1)  
From left, Silverberg, the author (wearing a gifted shirt from them), Chaki, Harel Kodesh



Photo 13.2 Picture of dinner meeting with the Microsoft executives (2)  
From left, Hatsukano, Silverberg, Tony Moroyan, the author

The 3<sup>rd</sup> executive meeting with Paul Maritz was held on the next day after this lively dinner, and the Photo 13.3 is the picture taken in the hotel lobby before we left there. The meeting itself was mainly mutual confirmation about the situation at the time, and there is not much in my memory.



Photo 13.3 Commemorative picture before the meeting at Microsoft (August 1995)  
From left, Hideaki Chaki, Norishige Kawashimo, the author, Yoshikazu Hatsukano, Toshimasa Kihara

In the following year, on 22nd May 1996, the 4th executive meeting was held in Tokyo, and Microsoft executives up-dated the status of the project and talked how to proceed in the future. Prior to this, a kickoff of the new OS had been held on 7th and 8<sup>th</sup>, sponsored by Microsoft, and it was reported that approximately 150 ISVs (software vendors) participated and it was a very active event.

Also, it was reported that in the competition of SH versus MIPS, the SH camp was leading, and the specific names of Casio, LG, HP and Compaq as potential users were mentioned. Also, since the support of X86 series seemed to be hardly proceeding, it was a form of one to one competition between SH vs. MIPS.

The victory in this round was approaching, but we could not ease up until the very end. According to the schedule of Microsoft, the press release of the new OS would be held around the summer, and on the next day after the COMDEX exhibition held in the US in November, each company's portable consumer equipment (later named HPC for handheld PC) would be put into the market all at once. The price would be around 500 dollars. The countdown was finally approaching.

The press release of the new OS from Microsoft was held on September 16, 1996 (US time), and the official name was "Windows CE". Moreover, the palmtop computer using this OS was to be called HPC (Handheld PC).

In response to this announcement, Hitachi held a press conference on September 17 (Japan time) and explained the strategy for SH microprocessor.

In the newspapers of the next day, articles with big headings appeared such as "Epoch making in that Windows is installed in SH microprocessor, other than Intel", "New OS and SH microprocessor to be an initiator of mobile personal computers", and greatly enhanced the name of the SH microprocessor.

The great efforts of the microprocessor team which had been made over the years finally came to fruition, and it was the greatest appreciation to the people who had been engaged in this project.

Following this announcement, HPC product announcements were made from seven companies in November's COMDEX. The five companies adopted SH microprocessor; HP, Compaq, Casio, Hitachi, and LG Electronics. On the other hand, two companies, NEC and Philips, adopted MIPS. SH clearly won the one to one match by 5 to 2.

It can be said that SH-microprocessor's clear victory in COMDEX represents victory of architectural independence war over many years. The status of the main engine of the nomadic era was established.

Though it had been a long-term project over four years, it was a memorable milestone for SH microprocessor. Fig.13.1 shows HPC's standard system platform using SH-3.

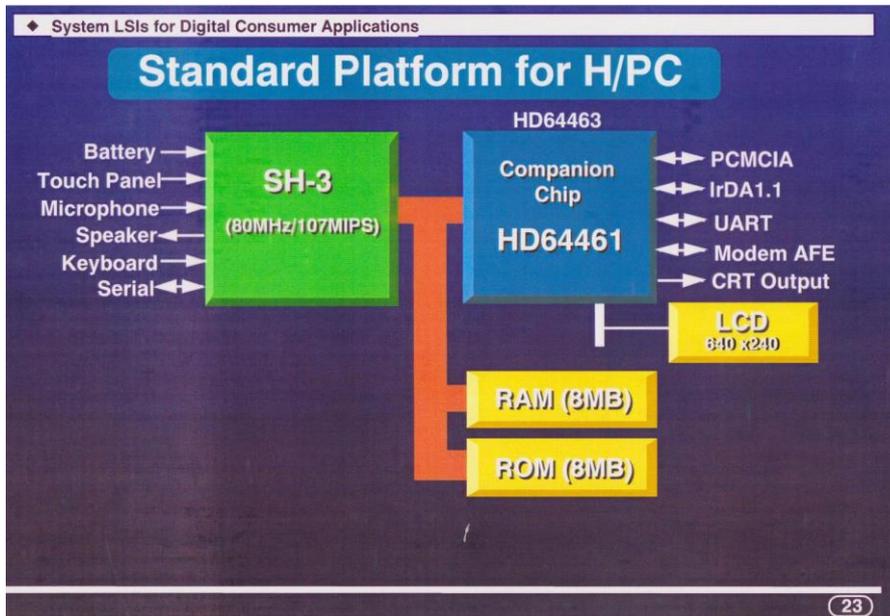


Fig. 13.1: System configuration of HPC : From Makimoto’s lecture materials in 1998

Fig.13.2 compares the features of HPC and notebook PC. Although HPC is one third of the notebook PC in terms of performance, considering the cost, size, and battery life, it can be said that it played a leading role at that time in the nomadic era. Such trends have since been handed over to net PCs, smart phones, tablet terminals, and so on.

The table, titled "PC vs Handheld PC(H/PC)", compares Notebook PC and H/PC. The columns are Notebook PC, H/PC, and Remarks. The rows are Battery Life, Size, Cost, and Performance. The table is set against a dark blue background with a white border at the top and bottom.

	Notebook PC	H/PC	Remarks
<b>Battery Life</b>	4.5 Hours	8 Hours	2 times longer
<b>Size</b>	4000 cc	800 cc	5 times smaller
<b>Cost</b>	3000 \$	1000 \$	3 times cheaper
<b>Performance</b>	360MIPS CISC	130 MIPS RISC	3 times slower

Fig. 13.2 Comparison of features for notebook PC versus HPC : From Makimoto’s lecture material, 1998

The fifth executive meeting with Microsoft executives was held in Redmond on November 24, right after COMDEX was over. It was a summary meeting of the project, so to speak. From their side, Craig Mundie (the top of consumer div.) and Harel Kodesh (the project leader) with Paul Maritz as the head attended the meeting. From our side, besides me, Hatsukano, Onishi (in charge of HPC at the consumer electronics div.), Kihara and Tony Moroyan (HMSI) attended the meeting. At the start of the meeting, a comprehensive report from Harel was given, and it started with the utmost compliments for Hitachi’s cooperation.

According to the memo at this time, it was as follows; “--- Hitachi was unbelievably cooperative and supportive, like hungry students, as a 7B\$ company”

We thankfully received this as the greatest compliment for all the members of Hitachi who worked on this project.

He also said that they had a future plan to utilize this OS in wider applications in addition to HPC, including games, graphics applications, home multimedia, and internet TVs, and so on. He indicated that MS wanted to strengthen the strategic cooperative relationship with Hitachi (semiconductor and consumer electronics division) in these fields.

I responded to this, with the message that the installment of the new OS to SH microprocessor was an epoch-making event in the history of Hitachi semiconductor, and I added that it was the greatest pleasure that we could successfully accomplish this jointly with Microsoft. I expressed our deep appreciation for their support. And also, I told them that with this foothold for SH to move forward to a global standard processor position, we would like to build up even deeper relationships with MS. Everyone of the project members shared such feelings. At the end of this meeting, I got an unexpected gift from MS. It was a model of HPC equipped with Windows CE. As shown in Photo 13.4, it was imprinted with my name, but it is obvious that it was given for the accomplishment of all the microprocessor related people of Hitachi. Photo 13.5 is a memorial picture of all of us at the time of receiving this present.



Photo 13.4 Present from Microsoft (HPC model with Windows CE)



Photo 13.5 Commemorative picture at the final meeting with Microsoft executives (November, 1996) From the left in the front row Harel Kodesh, Tony Moroyan, Craig Mundie, the author, Onishi (consumer electronics), Kihara.)

Following the above meeting in Redmond, Bill Gates visited the Hitachi headquarters on December 11 of the same year. Photo 13.6 is a gift sent to him at that time. It was written as follows by electron beams on the wafer of 200 mm $\Phi$  which was the most advanced at that time:

*Welcome to Hitachi*  
*Mr. Bill Gates*  
*December 11, 1996*  
*Windows CE & SuperH RISC Engine*  
*For better partnership between Microsoft & Hitachi*



Photo 13.6 Memento gifted to Bill Gates of Microsoft from Hitachi

The global reputation of SH increased by the overwhelming victory of SH installed with Windows CE over other processors at COMDEX. The design-ins expanded in and out of Japan, not only in HPCs, but also in very wide fields including mobile phones, car navigation systems, DVDs and game machines.

The positioning as “main engine in the nomadic era” which had always been a dream from the beginning of the SH microprocessor development was firmly established and expanded. At this point, Hitachi Semiconductor Group and Microsoft were tied in the closest relationship, and we established a Win-Win relationship.

Now, I would like to touch on the evolution of Windows CE after that. It is shown in Fig.13.3 as of 1998. As can be seen from this figure, the version was upgraded every year and spread to cover a wide field of applications other than HPC.

Among them, adoption in automobiles made a major success as Windows Automotive, and more than 50% of automotive electronic equipment manufacturers in Japan adopted “SH microprocessor with Windows Automotive” (information from Chaki).

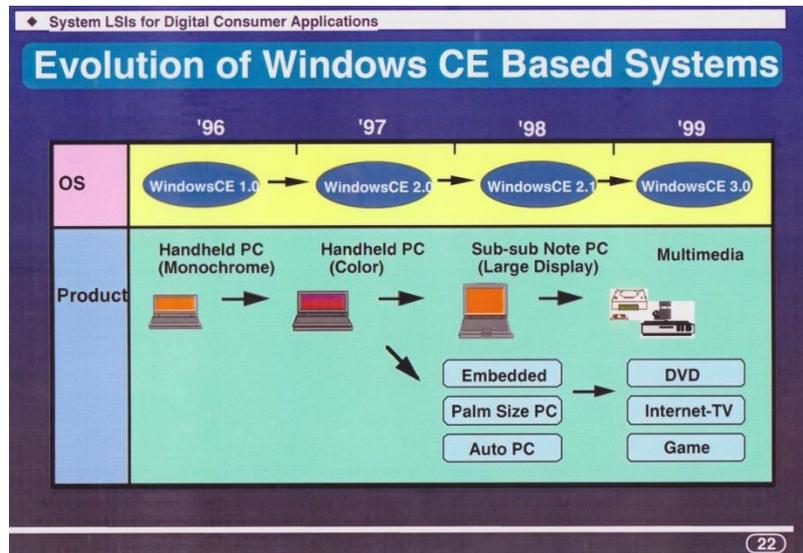


Fig. 13.3 Evolution of Windows CE  
(From Makimoto's lecture materials in 1998)

The original name had been used up to Ver. 5 for Windows CE, but from Ver. 6 onwards it was called "Windows Embedded CE". It was intended to the wider application areas as embedded software, not limited to the consumer field. Also, in March 2011 it made a new debut with the name "Windows Embedded Compact 7".

The age of PC has ended, and the era of post PC, typified by smartphones and tablet PCs began. It is the arrival of the nomadic era which SH aimed at. I do hope that SH microprocessor will develop further and more.

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