From: daveb (Dave Babcock)  
Date: Sun, 29 Nov 1998 23:50:13 -0800 (PST)  
Subject: Kickoff meeting summary

IBM 1620 Restoration Team Meeting - 11/21/98
-----------------------------------------------------------

General:

The meeting was held at The Computer Museum History Center's Visible Storage in Mountain View, California. The meeting was on Saturday, November 21, 1998 from 10:45am until 3:15pm. A number of people stayed until 6:30pm discussing more project details & ideas and more carefully examining the machine.

The purpose of the meeting was to get the team together; to go over all of the basic project information; to get familiar with the 1620's architecture and physical layout; to discuss issues; and to do more planning.

The meeting was videotaped for later reference.

Everyone received a Lab Book, a IBM 1620 Model 1 Reference Card (X26-5743-2) and a IBM 1620 Model 1 Reference Manual (A26-5706-1).

There are 24 people working on some aspect of the project. All are unpaid volunteers donating their time, effort and expertise.

Team members:

The following people were present for the meeting. I've also listed everyone's primary project area(s).

Dave Babcock       HW SW PC Sim Web
Steve Casner       HW SW PC
Tim Coslet         HW
Lee Courtney        SW
Joe Crespo         HW  PC
Adams Douglas      SW  Sim Web  Came from San Diego for meeting
Joe Fredrick       HW
Eugene Kim         SW  Other Publicity
Bill Maddox        HW SW
Len Shustek        HW SW
Dag Spicer         HW  PC
Dave Wise          HW SW PC  Came from Portland for meeting

The following people are also on the team but not able to make the meeting.
Meeting summary:

Welcome & introductions

Len Shustek (Chairman of the Board, The Computer Museum History Center) welcomed and thanked everyone for volunteering to help with the restoration and spoke of the importance of the work. Everyone then took turns introducing themselves and describing their background with the 1620. Two members of the team came from out of the area to attend. Three people have never used the 1620. Only three people have had any experience with the hardware but most share the experience of the 1620 being the first computer they ever programmed. A very versatile group with a broad background in computers both hardware and software.

Video clips

Three video clips showed the IBM 1620 past, present and future. First, an educational program from the mid 1960's showed Fred Gruenberger demonstrating a Pythagorean triplets program to Dr. Richard Hamming. Second was video shot in August 1998 of Dave Wise's 1620 running in the basement of his home. Finally, a portion of the SciFi movie "Colossus - The Forbin Project" with multiple IBM 1620 consoles controlling the supercomputer which ultimately takes over the world.

Dave Wise's experience

Dave Wise has the only operational IBM 1620 in the world (that we know of). He described his work of the past 20 years first restoring and then keeping his machine running. Much of the planning of our restoration project is based on Dave's knowledge and experiences. After seeing the video of his 1620 running and hearing how it was done, the team was even more excited about getting the museum's 1620 operational.

Architecture training

DaveB then gave a tutorial on the architecture of the IBM 1620. This
included the machine's general characteristics; data flow; data formats; memory layout; instruction format; instructions; arithmetic operations and tables; I/O; and basic console operation. The tutorial was meant as a refresher for those who programmed the machine 25 years ago and some context for those new to the machine.

It is strongly recommended that everyone carefully read the IBM 1620 Model 1 Reference Manual handed out at the meeting.

Machine walk thru

Dave Wise and Joe Crespo (one of the original IBM 1620 development engineers) did a careful "walk thru" of the machine's hardware. Everyone gathered around the machine, opened it up and explored the hardware. Dave and Joe described where things are located; the characteristics of the power supplies; the function of each "gate" in the machine; the interconnect wiring; the features of the main and MAR core memories; the use of the CE switches, remote control and floating point cycle indicator box; the location of peripheral connectors; the IBM convention for labeling gates and card slots; and so on. The people working on the HW restoration now have a good basis of common understanding.

Project information

The Computer Museum History Center's IBM 1620 Restoration Project has the following goals:

To restore the IBM 1620 computer to operation while preserving it's historic authenticity.

To expand the museum's collection of IBM 1620 related history.

To share the history of the IBM 1620 with the world.

To learn from and have fun with the project.

There are competing issues with the first goal and they were a subject of discussion at the meeting. It is very important that the machine's original "character" remain intact. If restoring it to operation should require significant changes, then its better to not do it.

The Computer Museum in Boston restored several machines but this is the first such project in California. We're expecting to learn alot which will help future restorations. The 1620 web site and simulator are prototypes of what will be done for other machines in the museum's collection.

FYI - We have decided NOT to broadly publicize what we are doing yet.
The restoration project was announced at the Museum Fellow's Dinner (to some nice applause) and in limited other places but no general media coverage. We want to wait until the "right" moment to make the most impact.

The rules we'll follow on this project are:

Carefully document everything we do.

We'll keep a master Log Book with the machine to record everything done to the system. This will not only help with continuity from week to week with different volunteers present but be important documentation for the future. As you think of ideas, write them down in your Log Book and then share them with the team.

Joe Crespo or DaveB must be present whenever the machine is worked on.

Use good engineering judgement and practices.

Keep track of time and expenses.

Not only to help this project but also future projects. We are asking you to record in your Log Books the time you spend and in general what you are doing. Also record any expenses you incur - you can either consider it a donation and receive a letter to that effect from the museum or be reimbursed. Please check with DaveB before any significant expenses - we might be able to find or get an item donated.

Communicate via email.

Please use email sent to 'IBM1620_team@merlin.engr.sgi.com' as much as possible - it will keep everyone informed and mail to that alias is automatically archived.

Handle the IBM 1620 with the care it deserves.

The IBM 1620 Restoration Project actually consists of 5 distinct but closely related sub-projects: HW restoration, PC interface, software, simulator and web site. Each was talked about in some detail.

Project - HW restoration

The primary focus of this project is restoring the IBM 1620 to operation. We're starting with the main unit and then plan to restore the IBM 1623 extended memory unit. If we are able to acquire other peripherals, then they too will be restored.
Some of the tasks to be done are: prep work (gathering test equipment, routing building power, finding replacement parts, making extender cards, etc.); physically clean out the machine; visually inspect the system for shorts, bent contacts, loose wires, etc.; individually bench test the power supplies (open and under load); get power sequencing to work; debug the core logic; debug instruction execution using diagnostics; recondition, test and install console typewriter when received; adjust memory for optimal reliability; perform margin testing; application program testing; restoration of extended memory; and restoration of other peripherals.

There are two possible paths to dealing with failed components. If we can locate a surplus 1620 then we'll swap good SMS cards for bad. This is the preferred approach since it nicely preserves the machine's historic authenticity. The alternate approach is to repair bad SMS cards by replacing failed components with modern equivalents. If we do this, then the replacement will be properly marked (with red nail polish?) and carefully documented in the master Log Book. Encapsulated quad snubber modules will require a different solution. If we ever acquire spare parts then the upgraded cards and modules can be replaced at that time. Dave Wise has had no power supply problems and only a few dozen failed fans, transistors and capacitors. He continues to have mechanical problems with the typewriter.

There were more details discussed at the meeting and the HW team seems ready and anxious to proceed. They agreed to schedule work days every other Saturday beginning January 9th. Not everyone can make it every time but we should have enough help each session to make progress. There is no other schedule or commitment to when the work will be completed. We want to do a careful job and not rush the work.

Project - PC interface

The museum 1620 is missing it's console typewriter. Fortunately, a private collector - Ken Cairns - has agreed to donate a spare one that he has. However; he won't be able to get it to us until April. So we plan to emulate the console typewriter thru a custom interface to a PC. Len pointed out that even when we have a console typewriter we may choose to use the PC-based emulator at times to save wear and tear on the mechanical unit. At the meeting, Dave Wise offered to LOAN us his console typewriter if we need a real one before ours arrives.

A second feature of the custom PC interface is to emulate the paper tape reader and punch. This is necessary because we have no program input/output device for the 1620 and need something. Note that the PC-emulated console typewriter can't reasonably be used for program input/output because the 1620 circuitry limits it's speed to 10 cps. Loading the CU01 diagnostic would therefore take ~ 30 minutes.
The tasks to be done are: define requirements; design HW interface and the SW to drive it; build the HW; code the SW; debug interface using Dave Wise's 1620; and use it with museum's 1620. None of the emulated devices will require any modifications to the 1620. The PC interfaces will plug into the 1620's standard I/O connectors and the power distribution block.

A first cut at the HW design using 2 bi-directional parallel ports has been done by Dave Wise. The design is currently being refined. A PC-based circuit layout program has been donated and will be used to design the board itself. Depending on cost, we may have an outside company cut, etch and drill the board.

Project - Software

We already have some 1620 software that Dave Wise has read and archived. We have access to many more paper tapes (Dave Wise) and card decks (Ken Cairnes) that we can borrow to "copy". We also have listings of yet more software which could be entered. It is the work of the SW team to gather, catalog, organize and (if necessary) modify 1620 software. The HW team may also need some specialized diagnostic programs written to isolate problems with the machine.

The SW team will need to define a "standard" PC file format for storing punched card, paper tape and disk images. The museum will potentially be archiving on-line, software for many different historic machines. The file format we define should be capable of, or at least extensible to, handling binary, hollerith, ASCII, EBCDIC, etc. from many different media. It is likely that we'll need to develop some software tools to view, edit and convert the data images.

The same PC file format will be used by the PC paper tape emulator and the functional simulator. We'll probably want to develop C/C++ and Java libraries of reusable reader/writer routines. The SW, PC interface and simulator teams will need to coordinate their development and testing efforts.

The SW team also needs to work out a means for reading paper tapes and punched cards. Dave Wise can read paper tapes and Paul Pierce can read read punched cards but both are in Portland. It would be best if we could read the media locally.

Finally, it is not clear whether we need to develop a 1620 assembler or not. Once the simulator is operational, we should be able to use the real SPS assembler. However; if we could develop a quick-and-dirty assembler for the early project phases, that might prove useful.

Project - Simulator
This sub-project is, for the most part, independent of the hardware restoration work. However, the simulator is part of the bigger goal to share the history of the IBM 1620 with the world. The material on the 1620 web site will statically present information about the machine but to really understand the system, one has to run it. Most people will be unable to travel to California to experience the real 1620. It is also not known how much hands-on use of the machine we will be able to support. That leads us to develop a full-functionality simulator.

The idea is to create an IBM 1620 simulator written in Java. It will simulate the machine, not at the instruction level, but at the instruction state (cycle) level. This level of simulation will allow a completely accurate front panel display and machine operation.

After downloading the software from our web site the user would "configure" the simulator with all of the options and peripherals desired. [One volunteer suggested that this be done on an IBM "Order Form" which would also show the rental and purchase costs of such a system.] The simulator would then launch separate Java threads for each independent functional unit (ie: CPU, console typewriter, card reader/punch, paper tape reader/punch, disk, etc.). Each thread would have it's own window. The contents of each window would be a digital photograph of the real device being simulated. The user would "operate" the device by clicking the mouse on it's "buttons" and "switches". The graphics would be appropriately animated to show depressed buttons, flipped switches and illuminated lights.

The simulator will provide an authentic looking rendering of a real IBM 1620 running. The speed of simulation will be "throttled" to match the 1620's actual speed. The simulator will provide no capabilities beyond what the 1620 offered. If it was difficult to do something on the 1620 (like examine memory) then it will be equally difficult with the simulator. Again, the goal is not to merely run old 1620 code but to recreate the experience of running the machine as much as possible.

To major tasks are: define requirements; design simulator; code core simulator; code GUI; integrate and test basic simulator; code, integrate and test each peripheral device; and write user documentation. The team has already started to lay out the structure of the simulator and to investigate the machine simulators done by Bob Supnick based on Mimic.

Project - Web site

Everyone on the restoration team is already familiar with the preliminary IBM 1620 web site at 'http://reality.sgi.com/daveb/IBM1620'. It has gone through a number of iterations to get the current structure. Some material is on the site but there is a tremendous backlog of...
technical information, photos, videos, documents, stories, facts, etc. to be added.

The work to be done involves entering and formatting the accumulated material; gathering more information; writing CGI scripts for the 'contact' pages; updating the GuestBook with received emails; documenting the restoration effort; moving the entire site to TCMHC's server; advertising the web site; and on-going maintenance.

Wrap up

There was more discussion about some issues, ideas for locating a surplus 1620, suggestions for how to debug the hardware, and so on.

The meeting came to a close with DaveB thanking everyone for their volunteering for the project.

Postscript:

After the formal meeting, more things came up which the team should be aware of.

Dave Wise and Joe Crespo traced out some of the paper tape interface and determined that it is NOT fully installed on our machine. There are a total of 4 missing SMS cards in the 'D' gate at least one of which is needed for paper tape and to do the PC interface. More work is needed to determine what the types the missing cards are.

Dave Wise and DaveB spot checked the level 'F' logic diagrams against the machine. They don't match. It appears that the museum's machine is newer than what we thought it was. IBM must have manufactured a 'G' level machine. There are also 4 unidentified 'X' connectors on the bottom of the 'A' and 'B' gates that don't exist on a level 'F' machine. We're guessing that the 'G' machine incorporated the disk, line printer and plotter interfaces.

Dave Wise also offered to LOAN us SMS cards out of his machine if that will help the debugging effort move quicker. For now, his machine is more valuable to us running than not. It is very important that the PC interface be carefully debugged on a known-good machine. We can do comparision runs on his machine and ours. Dave can also read and archive more needed software (like other diagnostics?).

Steve Casner donated two binders of material containing the reference manuals and FULL assembly listings for Monitor I, Monitor II and all the utilities and compilers they included.

More leads on where 1620's used to be. Maybe one still exists. Eugene
Kim offered to do a "Want Ad" notice for Doctor Dobb's Journal.

Tim Coslett found he has two of the SMS card edge connectors and around two dozen vintage IBM transistors types 026, 034 and 083.

Joe Fredrick offered to loan some test equipment that he has and to purchase and then loan us other needed equipment.

I will be mailing out the meeting handouts to those who couldn't attend and have sent me their mailing address.

In the next week I will be emailing general project status to those who can't participate but want to be kept informed. The restoration team will be copied on it.

I am setting up a separate web site for the restoration team. Let me know what contents would be useful. Better yet, email me some material.

I'd like to see an email discussion started about what equipment we need for the restoration.

Finally, more effort is needed to track down a surplus 1620 and peripherals we can have. Any ideas?

Thanks,
DaveB

Go to messages for November 1998 or latest