

RECOLLECTIONS: SOME DATES AND EVENTS CONCERNING THE IBM ACS PROJECT

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BACKGROUND:

The influence of the National Security Agency (NSA) and the Atomic Energy Commission (AEC) laboratories, LRL Livermore and LASL Los Alamos, in the Cold War years of the 1950's and 60's is hard to realize now. They really set the pace for computer development during that era, especially for supercomputers. As a former LASL staff member I found myself frequently in the middle of planning meetings and bidders conferences involving supercomputers.

The IBM 7030 (Stretch) was the leading supercomputer in the industry for over 8 years -- from the beginning of development in 1956 until about 1964.

In 1960 Stretch was nearing delivery. Interest turned toward what the next super machine would be. A number of engineering improvements in Stretch were being considered under the name "SuperStretch". In 1958-59 the IBM 7090, built using Stretch circuits and memories, was designed and built.

November 2, 1960: A meeting at Yorktown was held with LRL people on the subject. E.A. Adams, W.L. Shevel, and A.L. Leiner made presentations. LRL said a 10-20 times Stretch design "would be of considerable interest."

The first Stretch was delivered to Los Alamos in April 1961, about a year late and not as fast as hoped for. Under pressure from LRL the price on the 7030 was then cut, guaranteeing its financial failure.

IBM TURNS AWAY:

In a famous speech at the 1961 Western Computer Conference, Chairman Tom Watson Jr., effectively shut down all supercomputer development in IBM for at least three years, by blasting the engineers for losing so much money on Stretch.

One result of Mr. Watson's negative comments was an investigation into "what went wrong with Stretch" was mounted. Several memos were written.

May 8, 1961: I wrote a 14 page memo to E.R. Piore, Chief Scientist, titled "Stretch Investigation" in defense of the project.

May 17, 1961: I wrote a memo to A.G. Anderson, Director of San Jose Research, recommending that a Stretch follow-on be built in San Jose. Names mentioned as key players were Gene Amdahl, John Cocke, Norm Hardy, Floyd Johnston.

July 11-12, 1961: The "Stretch Users Group" met at Los Alamos. Organizations represented were: LASL, LRL, AWRE, MITRE, CEIR, Weather Bureau, and IBM. They all were waiting for the next model.

July 31, 1961: Meetings were held at LRL (and later at LASL) on the subject of a 10-20 x Stretch design. Gene Amdahl described a push-down stack architecture design -- quite a departure from Stretch. LRL said they wanted the next machine in 1963.

In 1962 IBM's supercomputer activities were curtailed. The proposed high-end extension to the S/360 line, later called "Project X" or "Model 9X", was the only live project. The Stretch follow-on was dropped as too expensive. Fortunately, J. Cocke and others in Research continued studies in theory, architecture and programming languages.

Other companies went after the large scientific market. The Solomon Computer project was started. (Fall Joint Computer Conference 1962). The CDC 6600 was widely discussed (e.g. it was "being built by 16 men and a janitor"). By 1963 it was becoming very apparent to customers that IBM was no longer in the supercomputer race, and other companies really were going to deliver.

March 21, 1963: A photo-digital storage device called "Cypress" was proposed to LRL. The idea of individual display workstations were discussed, but no supercomputer.

August 20, 1963, after visiting the AEC Labs, I wrote a memo to E.R. Piore, Chief Scientist of IBM, entitled "Some Comments on the AEC Computer Situation". I pointed out how IBM was about to lose its most prestigious scientific customers to competition. (This memo was later used in the government's anti-trust suit.)

AND TURNS BACK:

IBM salesmen were really worried about the competition. This was communicated to Chairman Tom Watson Jr. by many people. The situation was largely his fault, he confessed in his book, *Father, Son & Co.* (1990). He wrote: "Making an example out of STRETCH shook up the engineers all right, but it turned out to be a grievous mistake. The engineers understood me to be saying, 'No more of those big machines around here'."

First week of September 1963. Tom Watson Jr. had a meeting of senior executives at Jackson Hole, Wyoming. This was later called the "Jenny Lake conference." It marked the real jump-start of Project Y and turned up the heat on Project X.

September 30, 1963: G.L. Tucker wrote in a memo to E.R. Piore: "At Jenny Lake Mr. Watson instructed Research to mount an effort directed toward a scientific processor substantially beyond the 6600 or Project X. At the same time he instructed DSD (Poughkeepsie) to move ahead with Project X as fast as possible."

September 10, 1963. Tom Watson Jr., Dean McKay, Spike Beitzel and I met in Los Angeles. We discussed supercomputers.

PROJECT X and PROJECT Y:

At the beginning of 1964 there were two active supercomputer efforts underway: (1) Project X: a high-end extensions of the S/360 family which had been underway in Poughkeepsie for some time, and (2) Project Y: a faster non-S/360 machine of all new design at Research Yorktown. (Note: The term "S/360" was not used nor announced until May 1964.)

March 24, 1964. I completed a study: "An analysis of the effects of a large core storage on computer programs at Lawrence Radiation Laboratory" at the request of LRL.

June 23, 1964. There was a request from LRL Livermore for a "Solomon" (parallel) machine. G. Amdahl, J. Cocke, J. Bertram and I met to help plan IBM's response.

September 17, 1964. Meeting at LRL. Saw the CDC 6600 being tested.

In 1964 Jim Pomerene, formerly chief engineer on the Princeton machine and on Stretch, designed a rival parallel system called the Parallel Network Digital Computing system (PNDC). It assumed a December 1, 1964, start date with a delivery in December 1966. It was to be a 32-way parallel system built from existing circuits. It was presented to LRL Livermore in January 1965.

March 21, 1965, New York. Met with J. Cocke and J. Bertram on status of Project Y. Planning for Armonk meeting.

March 24, 1965, Armonk. An Executive meeting on High Speed Computers. Topics included: Mod 92, 6800, David (successor to Solomon), Project Y, etc. Present were: A.K.Watson, J. Haanstra, P. Knaplund, W. Hume, E.R. Piore, et al.

There were more meetings in April, including one with S. Fernbach and N. Hardy of LRL.

ACS PROJECT STARTED:

June 1, 1965. I received a phone call from Max Paley saying that the new project (ACS) to be located in California had been approved by Executives.

June 9, 1965. Met in Oakland with M. Paley, J. Cocke, J. Bertram. Plans for first phase.

August 3-7, 1965. Arden House Conference, Harriman estate, New York. First Full-scale planning meeting. Speakers included:

- M. Paley - Introduction. "There is an air of destiny".
- H. Kolsky - Competition
- J. Bertram - Architecture and Programming
- T.C. Chen - S/360 Mod 92, 95.
- H. Schorr - Project Y
- J. Pomerene - Parallel design
- J. Schwartz - NYU multi-instruction design
- J. Logue - Circuits and packaging
- L. Shevel - Memory technology (cost 5 cents/bit!)
- G. Nielson - Schedules - two phase (3Q65, 4Q67)
- A. DiMarko - Technology turn-around times (6-12 weeks)
- C. Davis - I/O controls
- R. Arnold - Programming system
- G. Amdahl - Summary

The questions of (1) S/360 compatibility, (2) multiprocessing, and (3) time-sharing, were for "later study".

August 7, 1965, Friday evening, the conclusions were presented to John Haanstra.

September 8, 1965. First meeting with J. Bertram et al at Sunnyvale, CA. (The first temporary location of ACS on Kifer Road.)

November 8, 1965. J. Haanstra visited ACS.

Nov 17, 1965. Planning conference on arithmetic, precision, etc.

During 1966 many meetings, many people were recruited. Some names mentioned: T.C. Chen, R. Meagher, C. Freiman, L. Alsop, C. Galtieri, G. Kennard, R. Pickett, E. Sussenguth, J. Cocke, W.A. Christopherson, ...

August 3, 1966. Meeting on FORTRAN. H. Schorr, F. Allen, N. Hardy, et al.

August 23, 1966. NSA Group visits ACS. Full presentation of plans.

There was considerable pressure from Marketing (DPD) to bid the ACS machine to LRL early because of serious competition.

October 14, 1966. M.O. Paley wrote a memo against any outside commitment of the ACS program that requires a contract prior to September 1968.

January 5, 1967. First meetings at Menlo Park (New building on 2800 Sand Hill Road). Planning for Science Advisory Committee (SAC).

Jan 12-13, 1967. The IBM Science Advisory Committee met at Menlo Park. T.J. Watson Jr. came briefly Full presentation of project. SAC was worried that the hardware technology would not be ready in time.

Jan 13, 1967. Had dinner with Ralph Palmer, Herman Goldstine, et al. Palmer requested that I do a report on the system and software issues of ACS. I worked on this for a month with a small committee including John Backus and R.J. Creasy, who also prepared reports.

February 13, 1967. "Palmer Committee Report" completed.

There were many other meetings during 1967. The S/360 comparability issue became hot as the year ended. The S/360 design by Amdahl and Earle (ACS/360) was often referred to as "AEC/360" for "Amdahl-Earle Computer".

March 18-19, 1968. Meetings with G. Amdahl and J. Cocke. Marketing Hq. (DPD) asked me to prepare a position paper on the S/360 Compatibility issue.

April 26, 1968. The paper "Compatibility Paper for ACS" completed. It stated that DPD was not concerned if a few non-S/360 machines were built for scientific purposes, but if the goal were to build and market a large number of them, then DPD would be very concerned.

END GAME:

In May 1968 the ACS/360 proposal was selected over the Project Y ACS design. Amdahl had "won the war". The Project Y design was dropped. However he also "lost the peace" because his machine was not built either. Other priorities in Poughkeepsie with S/360 Mod 95, Mod 85, etc. blocked it and it was dropped in May 1969. The ACS project continued on until the people dispersed. Some went back to Yorktown and Poughkeepsie, others joined the Research Lab in San Jose.

Gene Amdahl left IBM in 1970 and founded the Amdahl Corporation where he served as chairman during the 1970's. The Amdahl 470 machine (strongly influenced by the AEC/360 ACS design) was very

successful.