Norwegian Computer Technology

Founding a new Industry

Yngvar Lundh

Research Engineer retired from NDRE

Norwegian Defence Research Establishment
Early history of development
a personal account

• 1950s:
  – Electronic brains
    "Replacing so many matematicians"
  – A few isolated groups in Scandinavia
    BESK, DASK, NUSSE
  – Similar groups in the US and elsewhere
    Probably many military applications.

• 1960s:
  – Group of young research engineers at NDRE
  – Spawning three major businesses
Three growing businesses

- **Norsk Data** grew fast to become "The Flagship of Norwegian Industry" – until the crisis in the late 1980s

- **Computer division** of Kongsberg Våpenfabrikk specialised systems

- Consulting company **Informasjonskontroll**
  Professional knowledge, advice and assistance
In my thesis work I investigated a special digital technique

“Siffer Frekvens-systemet” could add, multiply, divide

Vacuum tube digital logic
Reliability

• Vacuum tubes unreliable
• Much literature about that
• Solid state?

Transistors and magnetic devices were studied and a few experimental transistorized machines were built in the late 1950s in USA.
Fellowship at MIT

• In 1958 – 59 I was guest at MIT and worked on the TX-0 computer
  • Transistors
  • Magnetic core memory
  • CRT screen

• I could use it all by myself
• Studied circuits
Paper tape, CRT, Flexowriter

- Programming in binary
- Some fellow researchers developed useful programming aids:
  - *Tom Stockham*: ”Insight”
  - *Larry Roberts*: ”Text on the screen”
  - *Yngvar Lundh*: Input via light pen
Industrialize?

- Decided to build a digital computer back home
- Idea supported by Karl Holberg
- Met Ken Olsen who had developed TX-0, started DEC and built PDP-1
- Decided ours would be better than his!
Signal processing

- Back at NDRE in 1960
  *Finn Bryn, Helge Ekre* and others had developed theories for enhancing signals from noise
- Challenged to build a digital signal processor, made a proposal
- Hired some new engineers fresh out of university
- The complete signal processor was completed in March 1962
New circuits
all ”from Scratch”

- Transistors
- Printed circuit cards
- Worst case design
- Modularity
- Interconnection
- Strict documentation
"Siffergruppen"

Digital engineering developers at NDRE

Four large cabinets full of cards

Note the reliability test facilities
General purpose!

- Lydia was hard wired to process signals
- Much more efficient than programmable machines
- We wanted to build a general purpose computer
- Karl Holberg “stole” money from another project:

Build a computer “As fast as possible”

It was needed for analysing data from experiments
SAM
Simulator of Automatic Machinery

- Transistors
- Magnetic core memory
- Thin film index memory
- Charactron display
- Light pen
- Paper Tape
- Flexowriter
- 24-bit words
- Microprogrammable

-used in the lab from 1964 to 1973

Cabinet – jakaranda – designed by student
Built by NDRE’s workshop
New, faster circuits

Same card type, Faster circuits

Core memory

Four full cabinets
Better components

Solid state components became basis
Performance and Economy improved in great steps

Early sixties:
• The planar process for transistors
• Second sourcing by competing manufacturers

Mid sixties:
• Integrated circuits

From 1970:
• Semiconductor memories
Antenna steering

hard-wired computer

Råø, Sweden 1964

More economic than programmable computer

"Lydia-modules"
In cabinets

25 meter antenna

Servoes
Software

- for SAM

  Machine code microprogramming

  "Samba" a structured assembly program by Martin Vånar

  "Asem" simplified assembly program by Lars Monrad-Krohn
In 1965-67 interest grew in digital technology and computers. “SAM 2” was developed, for applications in research. Could our knowledge be industrialized?

Siffergruppen began looking for business.
Business

In 1967 the company Norsk Data Elektronikk was founded. Later renamed Norsk Data. Their first product was Nord-1.

Kongsberg Våpenfabrikk had a successful series of digital tools for shipbuilding.
• Became interested in results from Siffergruppen
• Both general purpose computers
• And special purpose systems.

Tough, but stimulating competition

By the end of the 1960s Norway had a growing computer industry.
Trust was basis for success

Great goals in short time

Young engineers given responsibility
Believed they could do it!

Everyone was:
- Responsible for reaching his goal
- No boss interfered

The productive atmosphere was based on TRUST