THE COBOL COMPILER FOR THE SIEMENS 3003

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Abstract.
This paper describes the design of a fast Cobol Compiler with extensive error
detection. It is implemented as a 10 pass compiler on the Siemens 3003 computer
with a core store of 8000 words, using one systems tape and two working tapes.
The structure of the object program produced by the compiler is discussed with
respect to storage allocation, administration of files, and addressing of data items.
In the description of the compiler particular emphasis is placed on the error detection
phase, where the source program is analysed with respect to syntax, data
descriptions and operand types.

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1. Introduction.
The Siemens Cobol Compiler was developed by the compiler group at
Regnecentralen, Copenhagen, headed by Peter Naur and Jorn Jensen. The compiler processes full elective COBOL 61, except for a few minor
omissions mainly dictated by the characteristics of the machine and by
the existing conventions for data formats on tape. It is implemented as
a 10 pass compiler on the Siemens 3003 computer with a core store of
8000 words, using one systems tape and two working tapes. In this con-
figuration it processes a Cobol source deck at the rate of 250 cards per
minute, generating final machine code.

The contract for the development of a Cobol compiler was given to
Regnecentralen as a result of the demonstration of the highly successful
GIER ALGOL compiler at the IFIP Conference in Munich in August,
1962. After an initial period spent in getting acquainted with the language,
the design and programming of the system was initiated in March, 1963.
Effective testing of individual passes started in May, 1964, and the final
system, amounting to 39000 instructions, was delivered in July, 1965,
after a total effort of 15 man-years.

The major problem of implementation turned out to be the numerous
definition problems created by the vagueness of the official Cobol report
(ref. 1). The basic translation scheme was largely taken over from the
GIER ALGOL compiler as described by Peter Naur (ref. 2). The present
paper describes in detail the design of the Siemens Cobol compiler. The
novel features, as compared to the GIER ALGOL compiler, are: the
analysis of the complex data structure, the handling of the Copy features,
and the administration of data files at run time.

2. The Systems Configuration.

The Siemens 3003 is a large-scale, tape-oriented computer with a mini-
mum core store of 8000 words. Each word consists of 24 bits interpreted
as a one-address instruction, a binary integer, or 4 alphanumeric charac-
ters. Words and characters may be indirectly addressed. Index registers
are not available. Parallel binary operations take 30 to 70 microseconds,
serial character operations from 200 to 500 microseconds.

The minimum configuration of peripheral units used by the translator
consists of a typewriter, a line printer (750 lines per minute), three mag-
netic tape units (46000 characters per second) and a card reader (650
cards per minute). The typewriter is used for messages to the operator
and instructions to the monitor. The source program is input from the
card reader and listed on the line printer together with possible error
messages to the programmer. One tape contains the translator, segmented
into 10 passes, and two working tapes are used to store the partially
translated program. The final object program is normally generated on
one of the working tapes, but it may also be punched on cards or papertape.