

System software

Code generation



Generating code

- What can we generate?
 - generate raw machine code
 - generate object code
 - print symbol table
 - print program (as .lst file)
 - print .log file
 - etc.



Generating raw code

- Visitation
 - Node.emitCode(byte[] data, int pos)
 - byte[] Code.emitCode()
- Memory image
 - can be copied into the main memory of SIC/XE
 - afterwards it can be executed
 - not relocatable

Generating object file

- Visitation
 - transform raw code to hex notation
 - some commands must be dealt with separately
- Object file
 - see also slides for „Loader“
 - start and end have `H` and `E` record
 - actual code is stored within `T` records

Generating Ist file

- Contents
 - address, raw code in hex, label, commadn, operands
- Enables
 - ease of checking the generated code
 - ease of debugging
 - ease of optimization

Generating Ist file

- Contents of the file
 - list of blocks
 - list of symbols
 - list of literals
 - list of relocation



Relocatable code

- Resolving code
 - When do we need relocation?
 - Relocation table
- Generating object code
 - M records are generated from the relocation table



```

0000:          . Rutine za zaslon
0000:          ScrSub      START  0
0000: B400          first   CLEAR  A
0002: 53201E       loop1   LDCH   =C'*'
0005: 4B203D       JSUB   scrfill
0008: 4B2037       JSUB   srclear
000B: 3F2FF4       J      loop1
000E: 010005       LDA    #5
0011: 6D0004       LDS    #4
0014: 4B2011       JSUB   scrgoto
0017: 53200A       loop   LDCH   =C'A'
001A: 4B2016       JSUB   scrch
001D: 3F2FF7       J      loop
0020: 3F2FFD       halt   J      halt
0020:          LTORG
0023: 2A          *0    BYTE C'*'
0024: 41          *1    BYTE C'A'

```

HScrSub00000000B853

T0000001DB40053201E4B203D4B20373F2FF40100056D00044B201153200A4B2016

T00001D1D3F2FF73F2FFD2A4100000021202590400F2FF54F0000072FEF5790B800

T00003A1DB800132FE64F0000532011B4106D27865790B800B8403B2FF74F000020

T00B85003030001

M00003705

M00004B05

E000000


```

0025:                . ***** Screen
0025:                scrcols    EQU     80
0025:                scrrows    EQU     25
0025:                scrllen    EQU     2000
0025: 000000          scrpos     WORD    X'000000'
0028:                . screen goto A=row S=col
0028: 212025          scrgoto    MUL     #scrcols
002B: 9040           ADDR     S,A
002D: 0F2FF5         STA     scrpos
0030: 4F0000         RSUB
0033:                . print A=ch
0033: 072FEF          scrch     LDX     scrpos
0036: 5790B800        +STCH   screen,X
003A: B800           TIXR    A
003C: 132FE6         STX     scrpos
003F: 4F0000         RSUB
0042:                . clear/fill screen
0042: 532011          scrclear LDCH   =C' '
0045: B410           scrfill  CLEAR  X
0047: 6D2786         LDS     #scrllen
004A: 5790B800        scrclearl +STCH  screen,X
004E: B840           TIXR    S
0050: 3B2FF7         JLT     scrclearl
0053: 4F0000         RSUB
0053:                LTORG
0056: 20             *2     BYTE  C' '
0056:                ORG     47104
B800: 00....00      screen  RESB   80
B850: 030001         LDA     1
B850:                END     first

```

HScrSub00000000B853

T0000001DB40053201E4B203D4B20373F2FF40100056D00044B201153200A4B2016

T00001D1D3F2FF73F2FFD2A4100000021202590400F2FF54F0000072FEF5790B800

T00003A1DB800132FE64F0000532011B4106D27865790B800B8403B2FF74F000020

T00B85003030001

M00003705

M00004B05

E000000