z/TPF EE V1.1
z/TPFDF V1.1
TPF Toolkit for WebSphere® Studio V3
TPF Operations Server V1.2

IBM Software Group

TPF Users Group Fall 2005

Z/TPF Enhancements and Structure Changes of Interest for Applications Programmers

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Venue : Applications Development Subcommittee

AIM Enterprise Platform Software
IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

Agenda

- Program Packaging
- Application Stack Structure
- Program Linkage

Program Packaging

Definitions

- All z/TPF ECB Programs will be loaded as Shared Objects
- All C DLLs, DLMs, and LLMs will be known as CSOs, C Shared Objects.
- All BAL programs will be referred to as BSOs, BAL Shared Objects.

BSO Structure

- Initially, 1 BSO = 1 assembler program
- Eventually, 1 BSO = many assembler programs
  - Refer to BSO program CVAA
    CVAA is comprised of:
    CVAA
    CVAJ
    CVAH
    CVAI
    CVAD
    CVAO
- An assembler program may reside in more than one BSO.

BSO Structure

- 4.1 program structure location 0 is the start of the listing and the program.

BEGIN

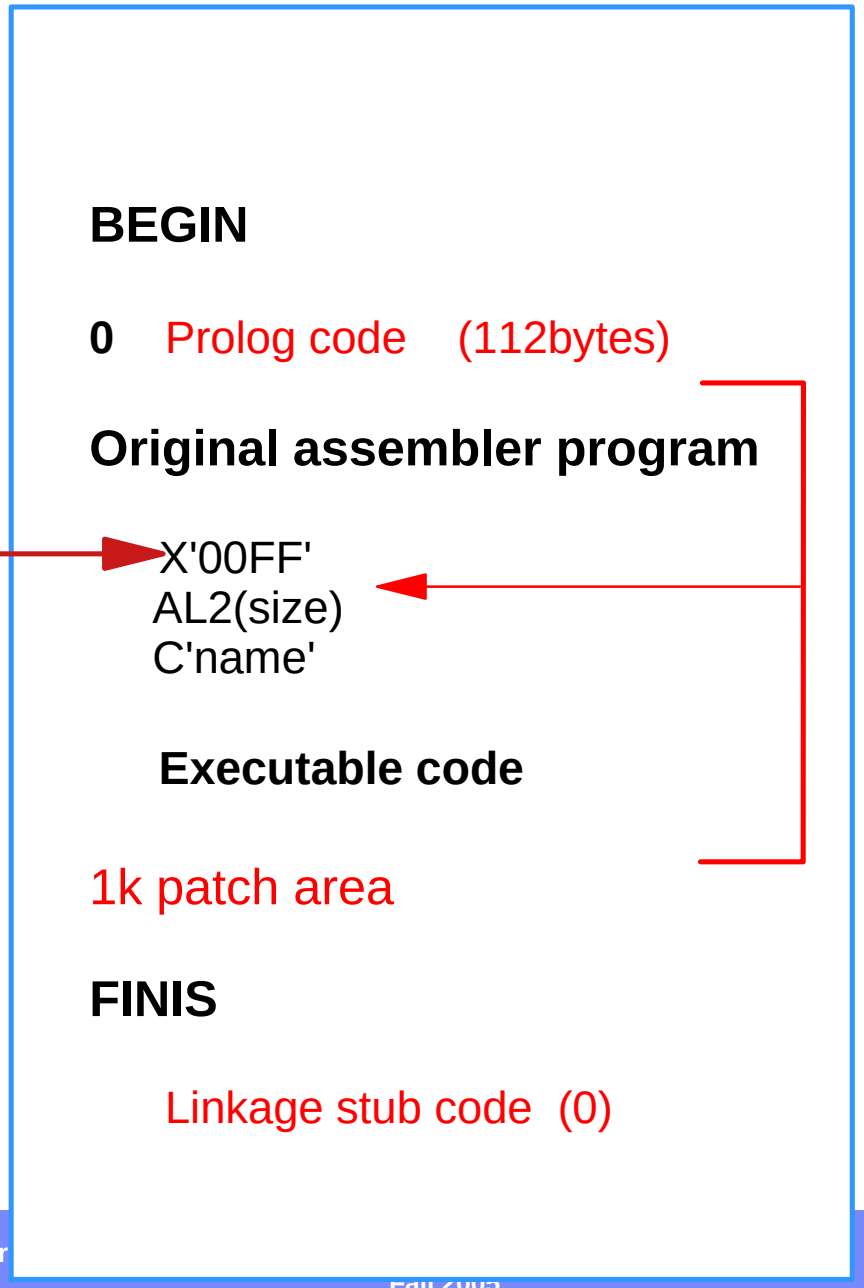
0 X'00FF'
AL2(size)
C'name'

Executable code

FINIS

BSO Structure

- z/TPF program structure
  - BEGIN macro adds prolog code
  - R8 still points to original program object
  - A 1K patch area is added to the end of the program
  - The FINIS macro generates all kinds of stub code



BSO Support

- Benefits
  - Faster linkage between programs (internal)
  - >4K programs supported
  - Application stack provided
  - Register usage expanded (R0-R8, R10-R13)
- Considerations
  - All programs use the allocation characteristics defined for the BSO

New Support

- BEGIN -
  - VERSION= no longer necessary
  - BASE= defines base register, 1 or multiple or none
  - AMODE= defines mode of operation 31or 64bit
  - TV= defines transfer vectors
  - TYPE= defines type of program
    - Executable - normal E-Type program
    - Data - program used as data record
    - Keypoint - system keypoint record

New Support

- BEGIN -
  - BASELESS= macros can generate baseless code
  - EREGSAVE= macros will save R10-R13 (DEFBC)
  - TRNAME= defines setting of trace/tagging field
  - DSECT=, USEREG= defines user area on stack
- APSTKC - used with DSECT=

Example

- Getting Application stack space through BEGIN:

```
BEGIN NAME=CVZZ,IBM=YES,
      DSECT=WORKAREA,USEREG=R4

SAVE_IT  DS    F
LAST_ADR DS    F

APSTKC
```

New Support

- FINIS - No parameters but.... generated code
  - ENTxC/BACKC linkage code
  - ALASC, FLIPC, CALLC, and GLOBC macro code
- ENTxC macros - branch to linkage code in FINIS
- BACKC - branch to linkage code in FINIS
- ALLOC - allocates space on the stack

```
ALLOC     SIZE=1000,ADDR=R2,ERROR=NO_ROOM
```

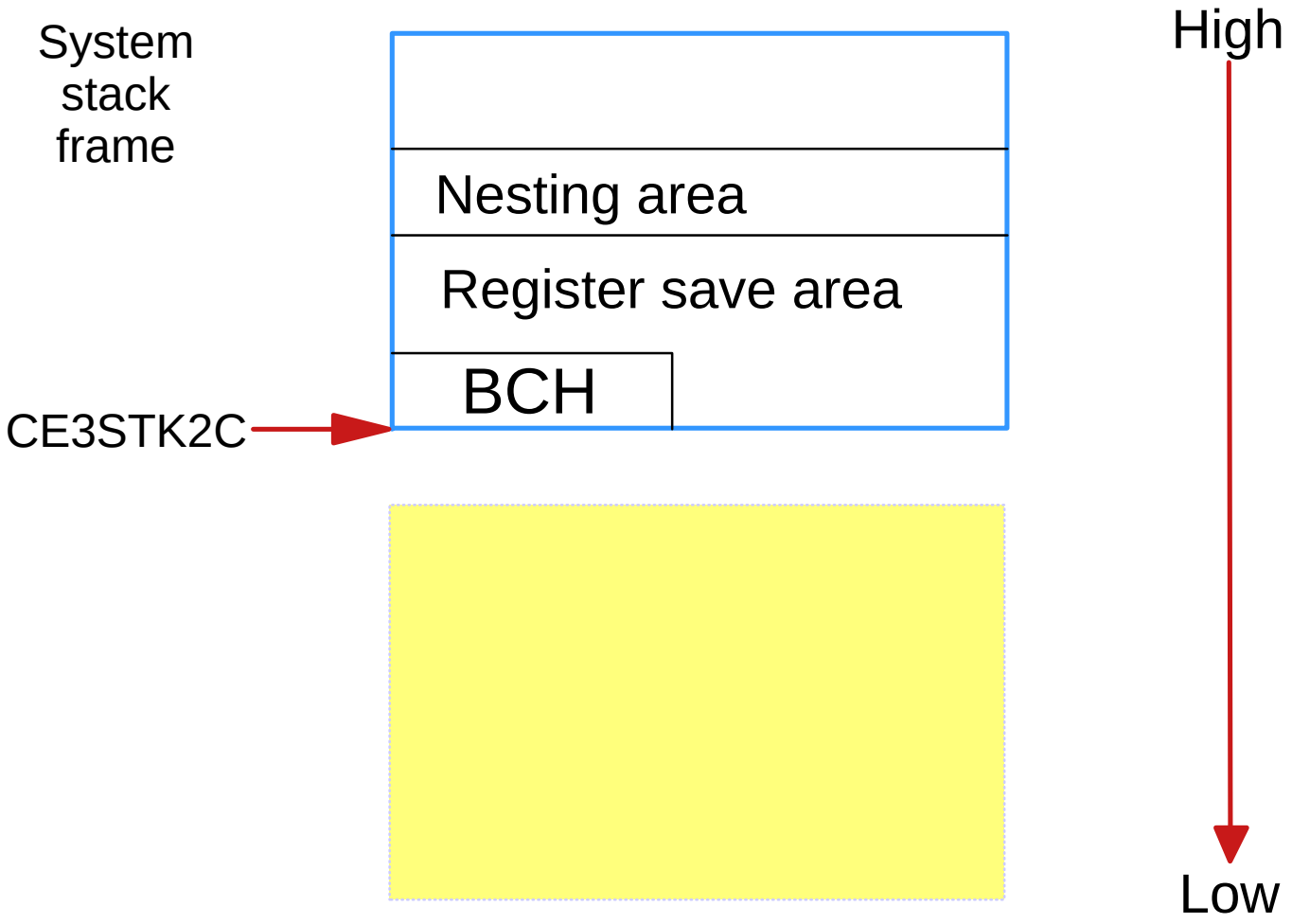
New Support

- CPROC and CALLC - call 'C' functions from assembler code

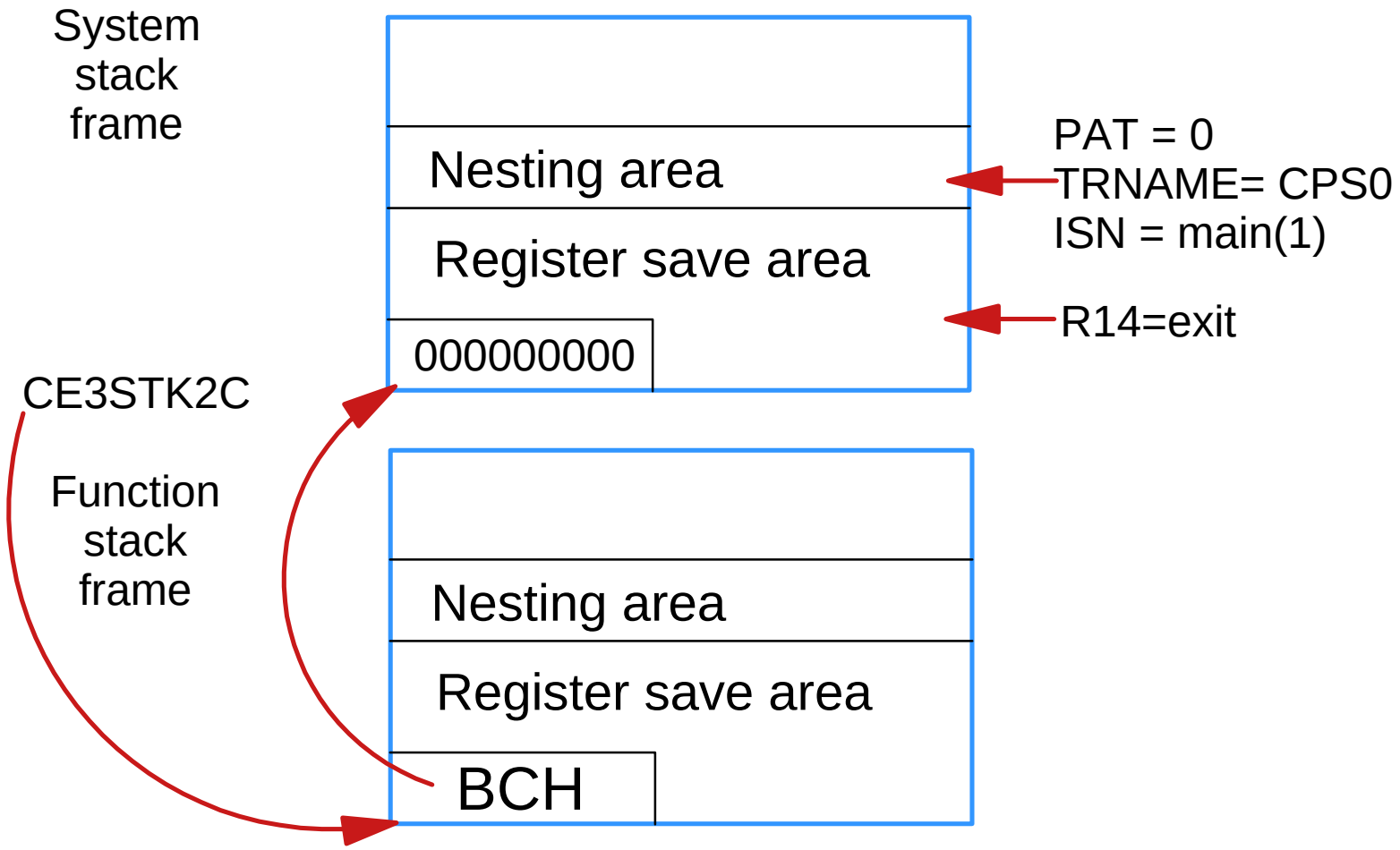
```
CPROC RETURN=p,getcc,(i,i,i)  Call C function
LGHI  R2,D1
XGR   R3,R3
LGHI  R4,L1
CALLC getcc(R2,R3,R4)

CPROC RETURN=i,CVZ5,(p,i,i,i) Call C program
LA    R14,KEYPT               Record Type for CVZ5
LA    R7,DE                   Read Level for CVZ5
LA    R0,KPTR_NO_HOLD         No Hold Flag for CVZ5
LA    R1,DF                   Validate KPTR Flag for CVZ5
LLGFR R14,R14                 Clean up ptr field for call
CALLC CVZ5(R14,R7,R0,R1)      Read KPtr Rec
```

Application Stack Structure

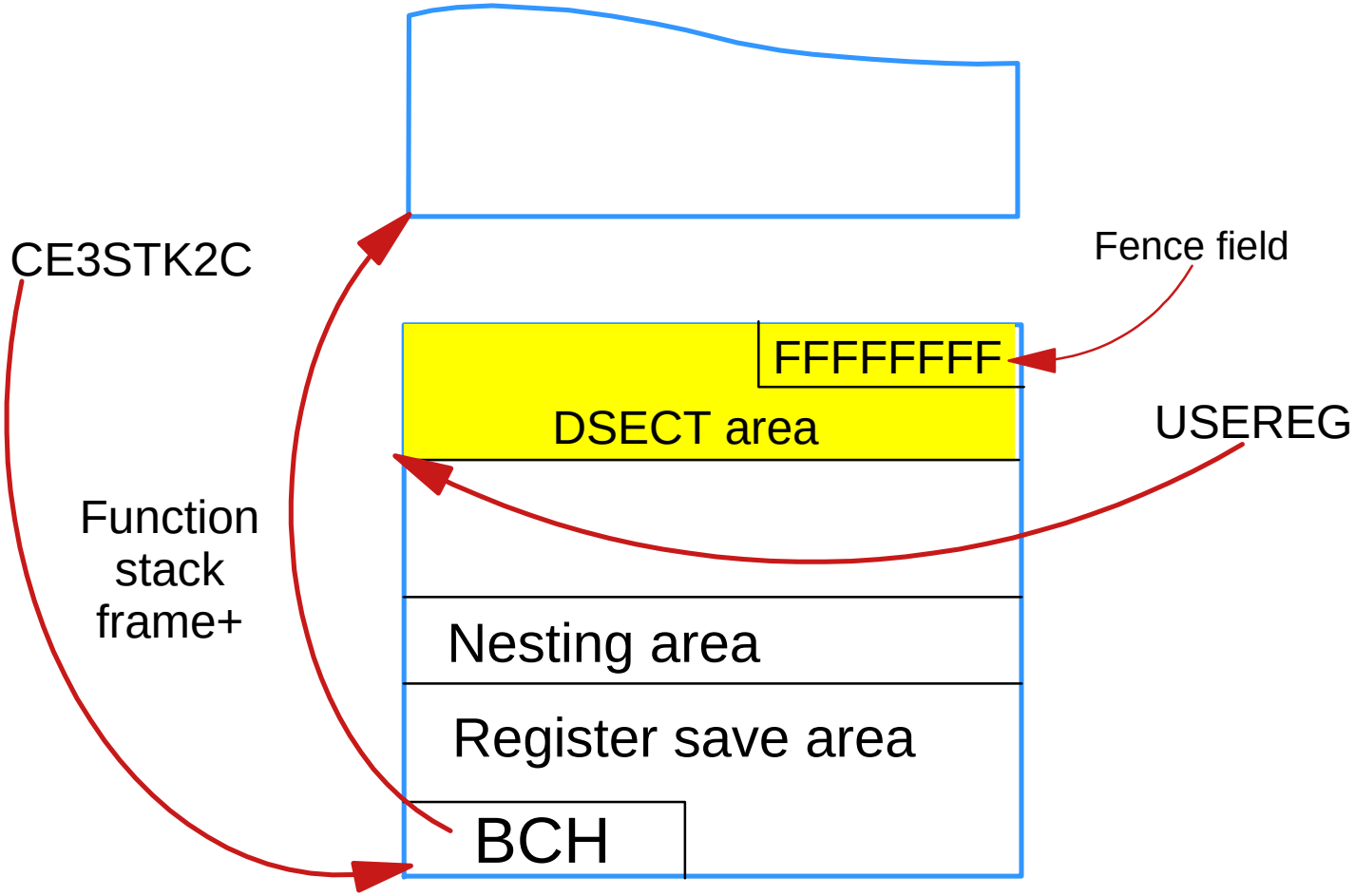
Application Stack Structure



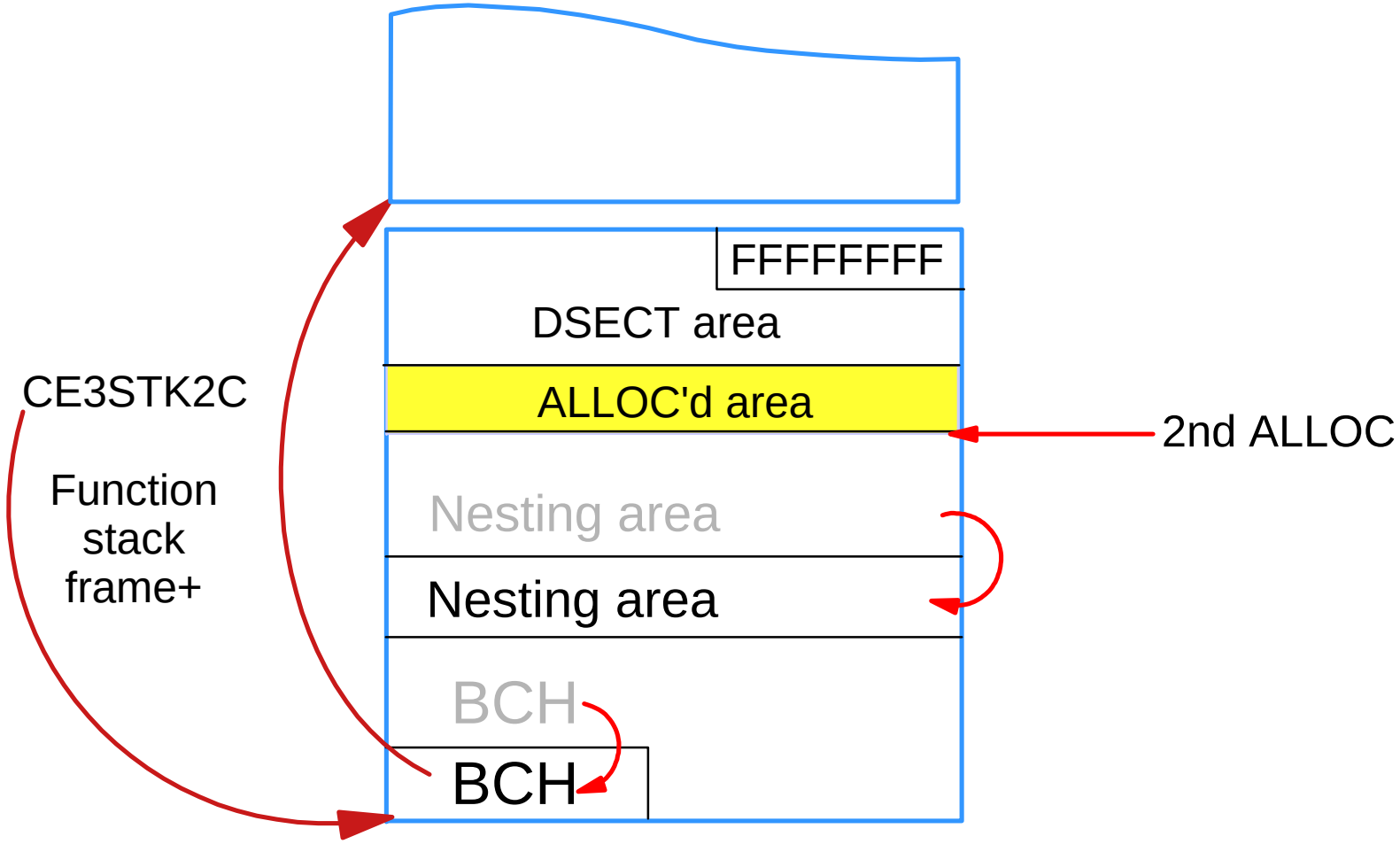
Application Stack Structure



Example
Getting Application stack space through BEGIN:



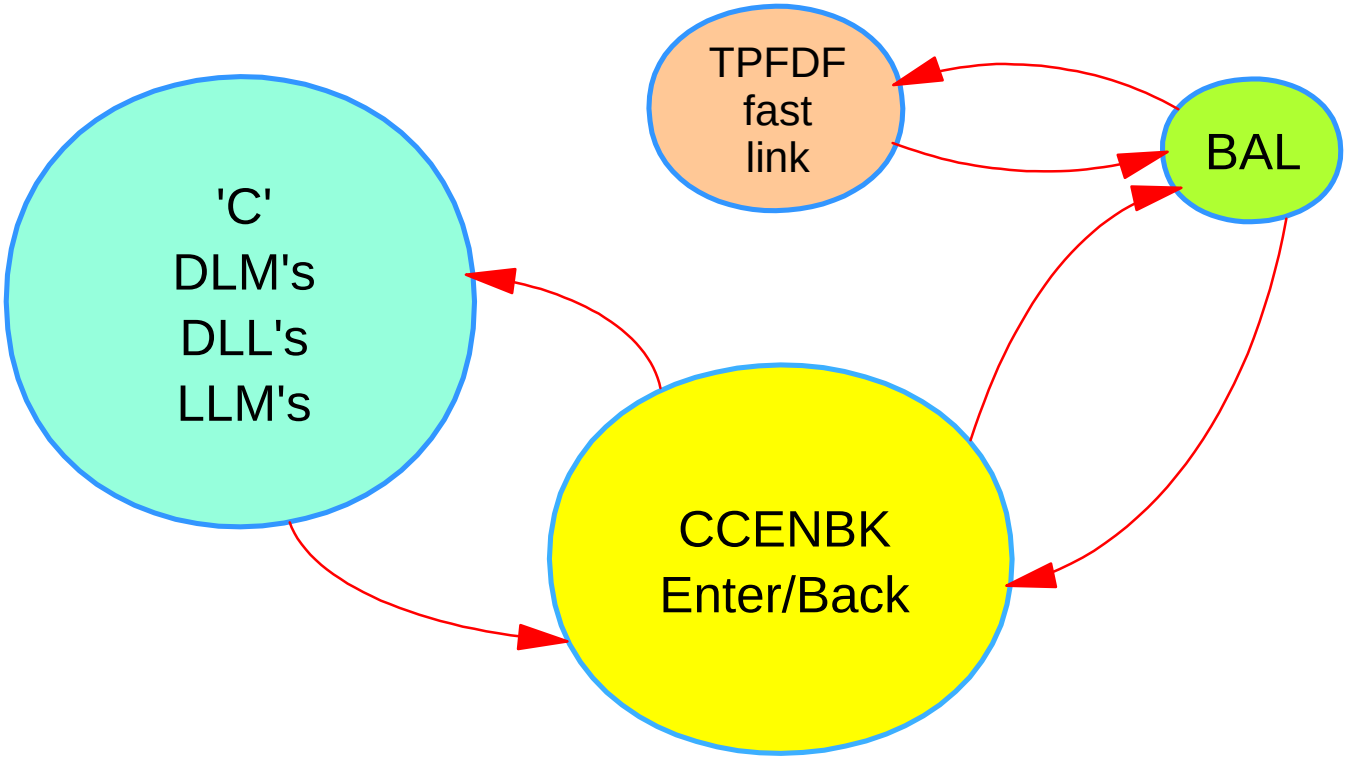
Example
Getting Application stack space through ALLOC:



Program Linkage

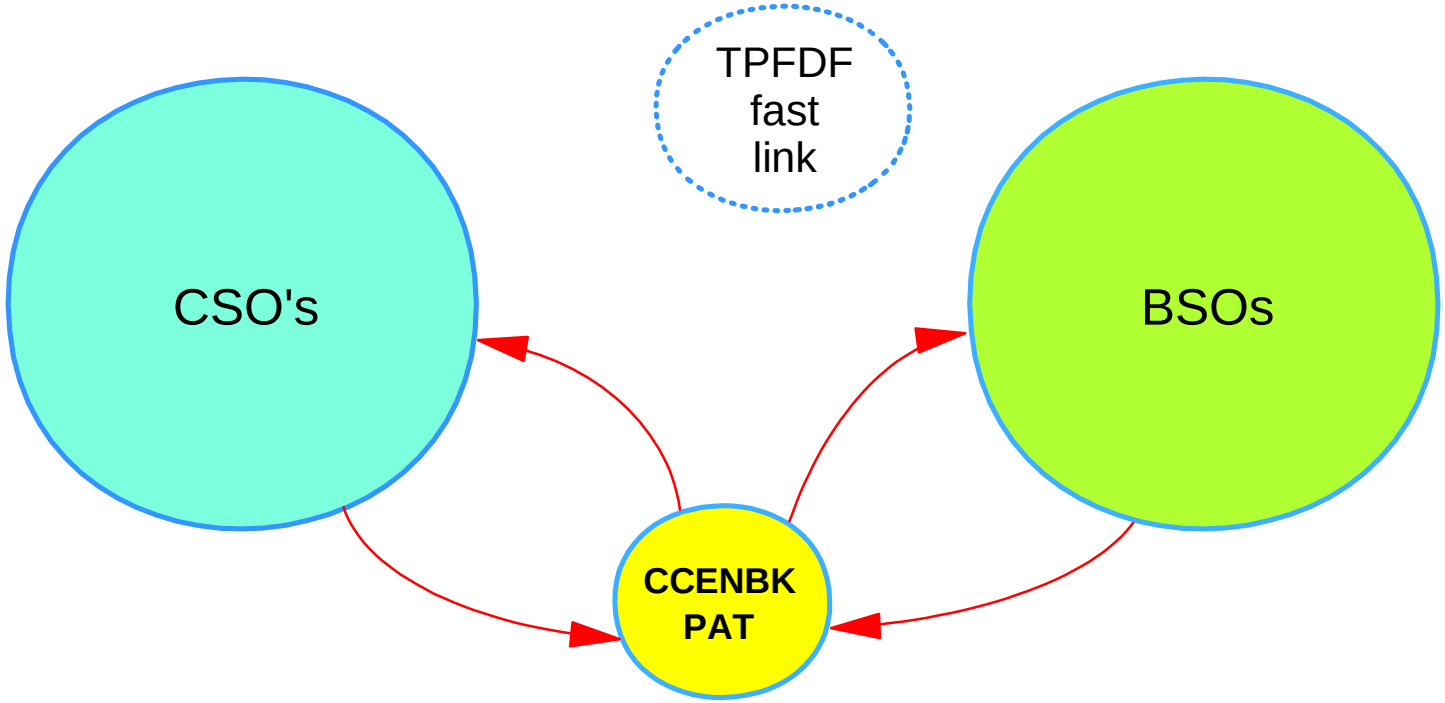
Program Linkage

TPF4.1 linkage review



Program Linkage

z/TPF linkage



Program Linkage Overview

- Linkage stubs are provided for these linkages types:
  - CSO-CSO
  - BSO-BSO
  - CSO-BSO
  - BSO-CSO
- Linkage stubs must also be aware of addressing mode:
  - 64bit-31bit
  - 31bit-64bit
- Additional stubs are provided for:
  - Program trace groups
  - Standard library fast linkage
  - Special library faster linkage

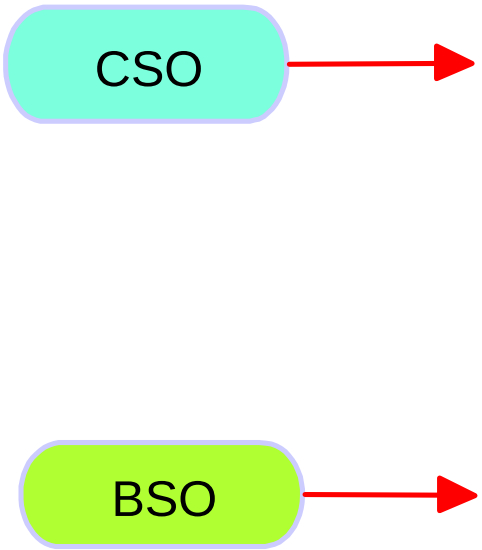
Linkage Types

- Load Time Linkage
- Link time linkage
- Run Time Linkage
- Nonstandard Linkage

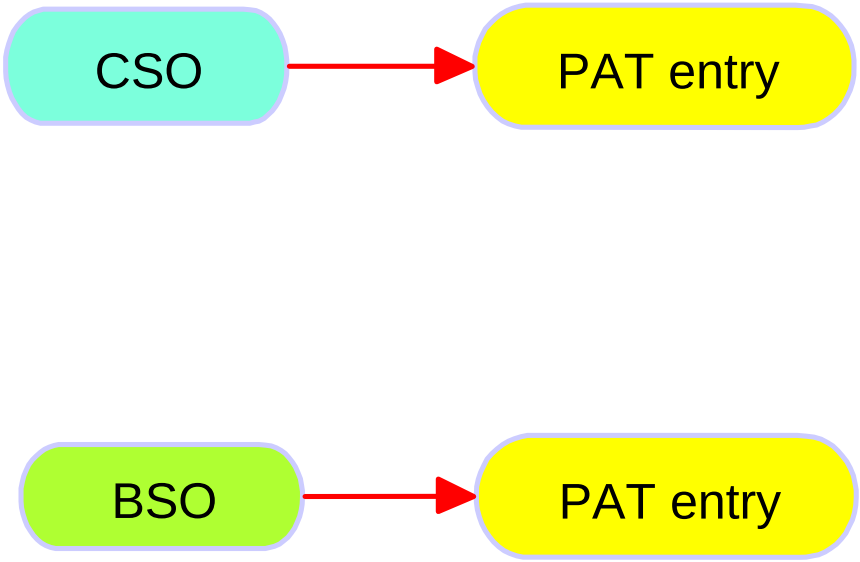
Load Time Linkage

- Normal linkage (external or internal)
- Linkages are resolved at program load time
- Round trip cost for BSO external linkage is 151 instructions

External Linkage



External Linkage



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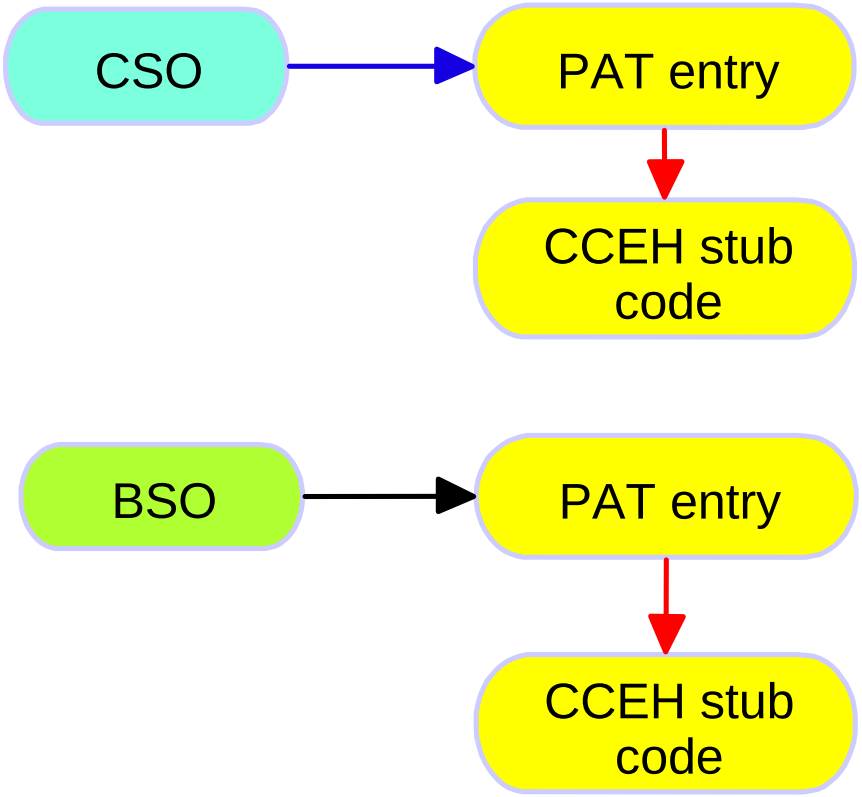

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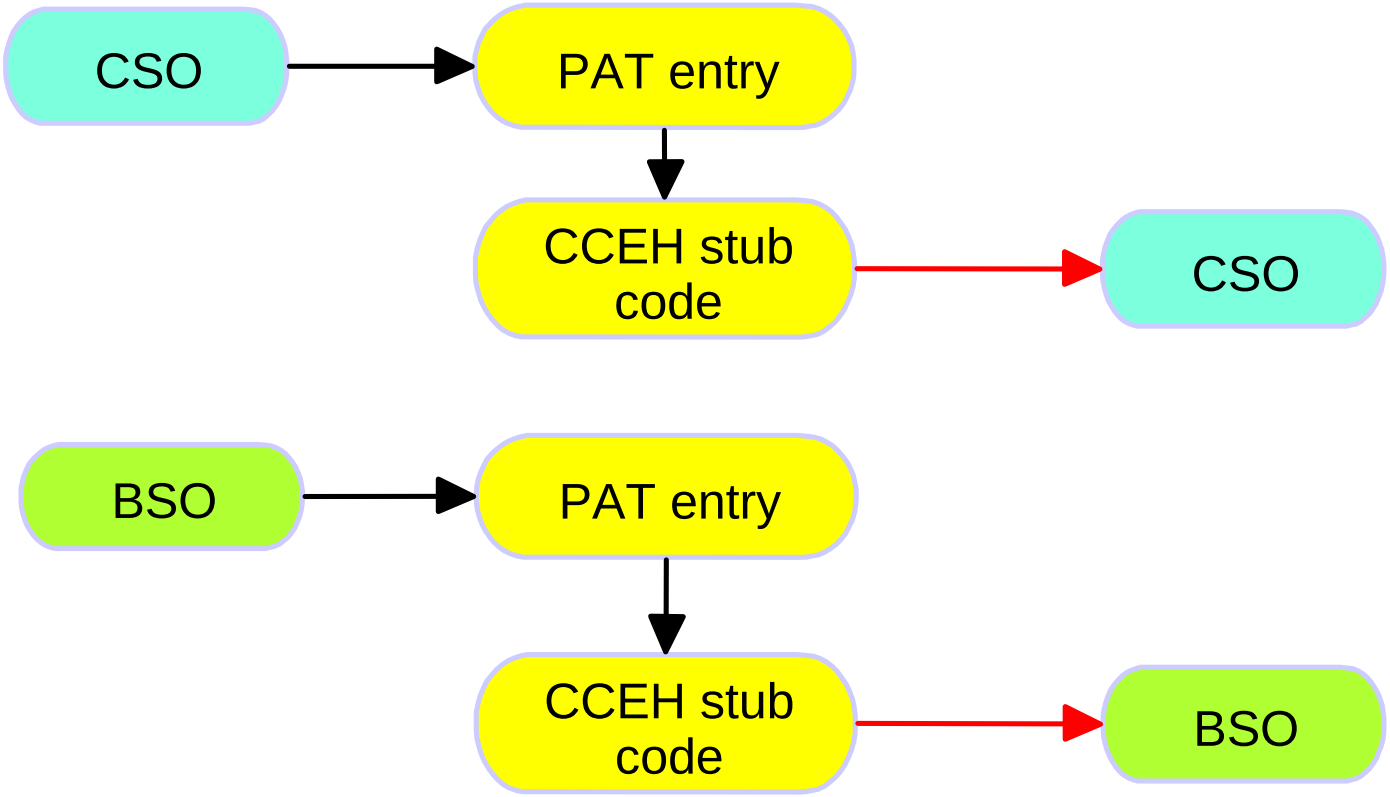

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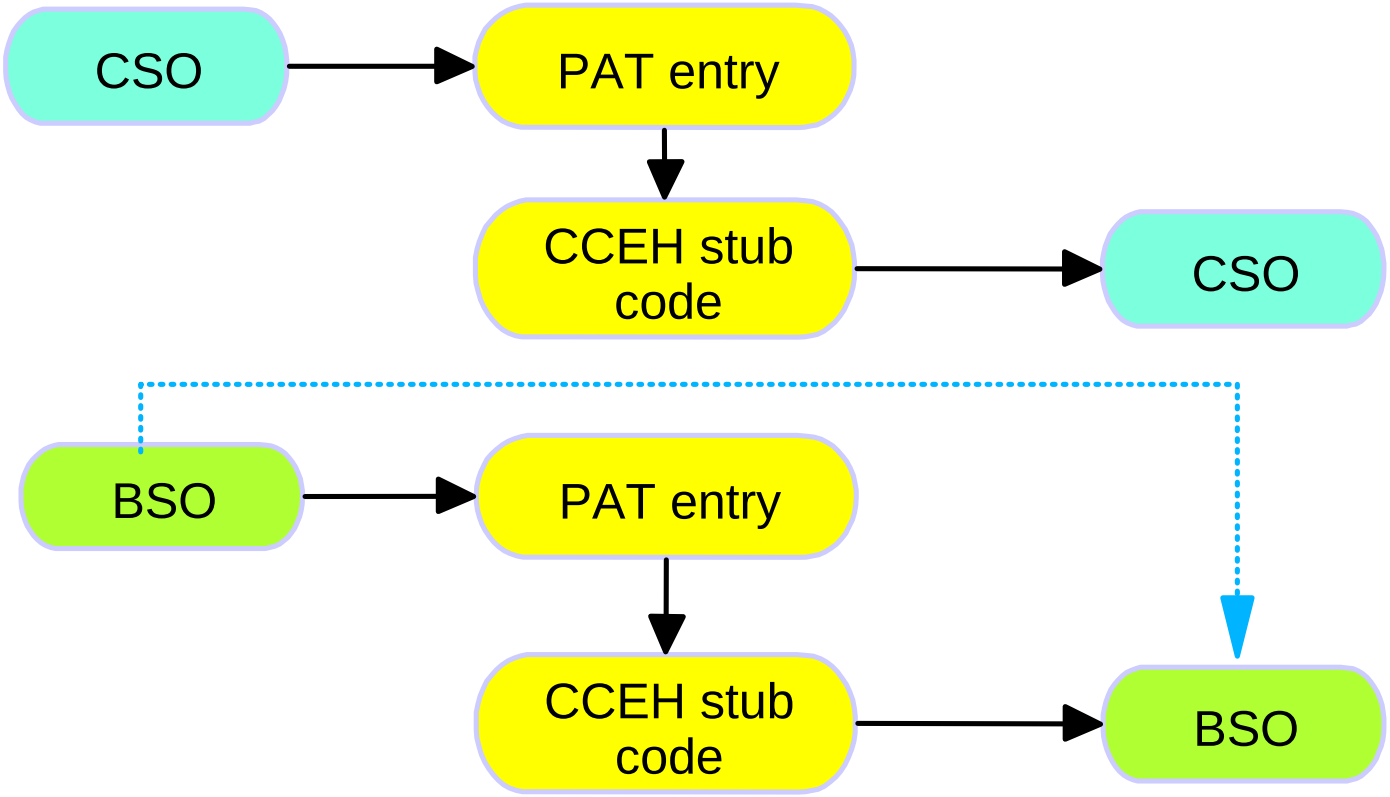

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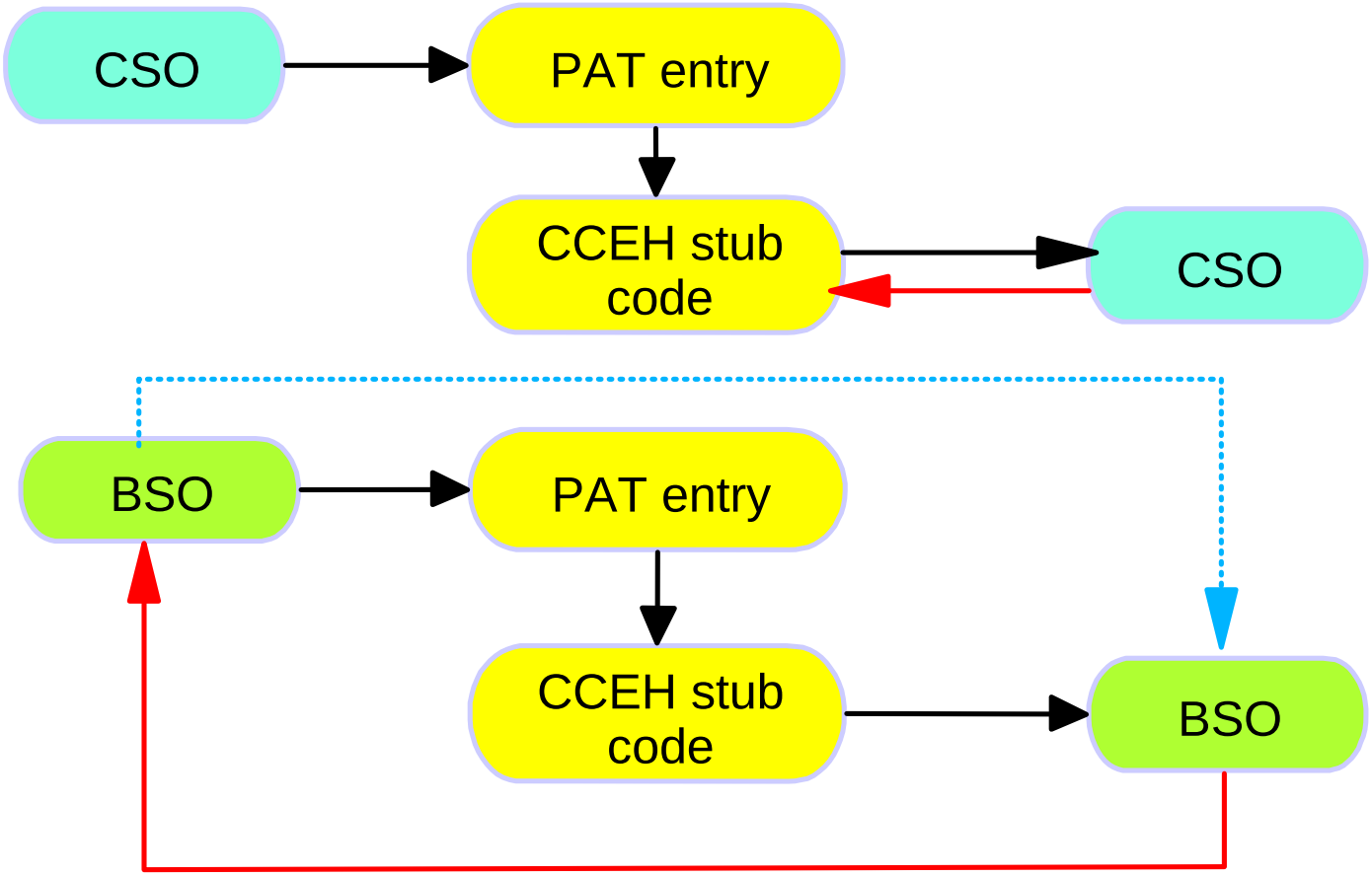
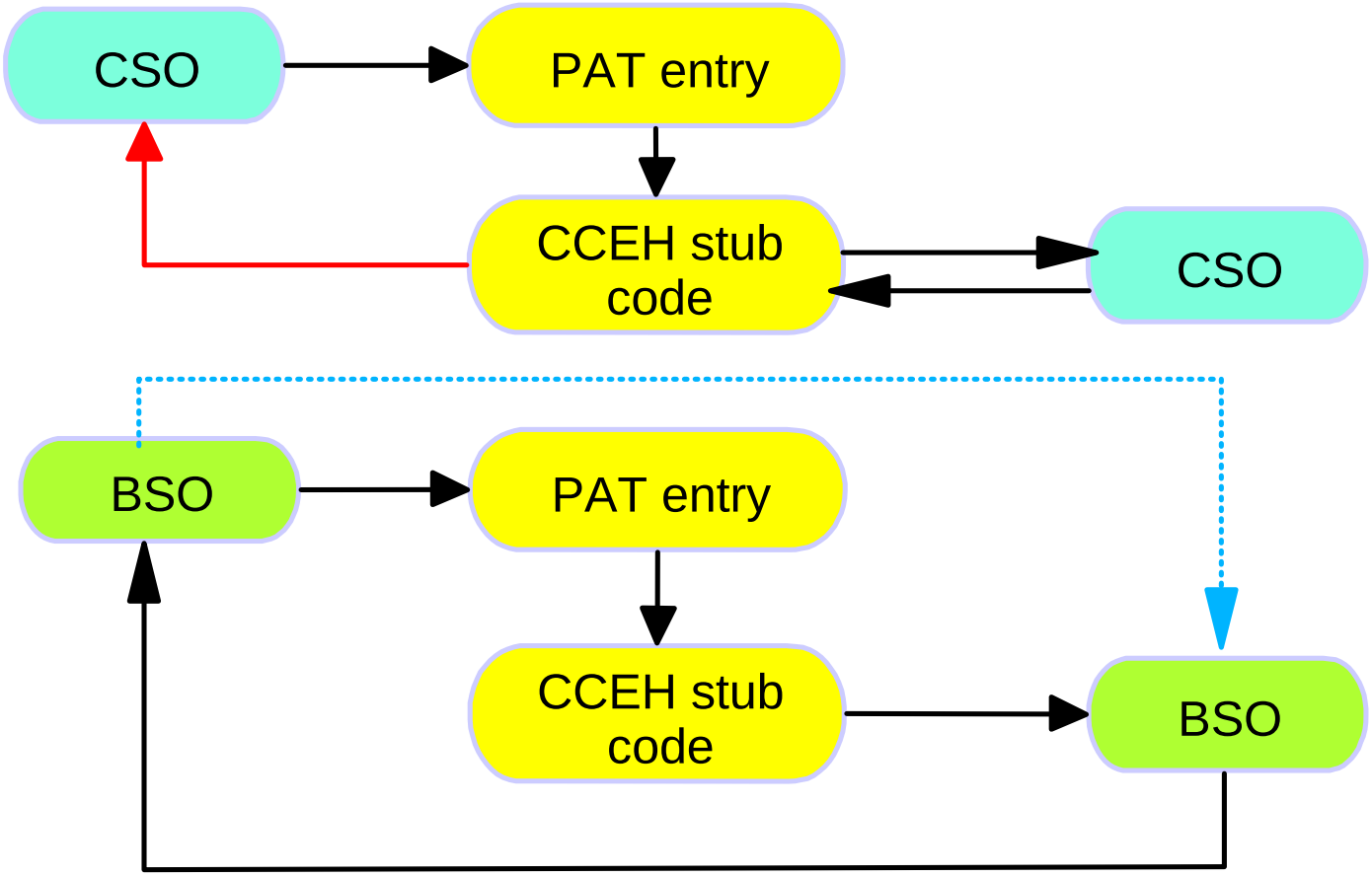


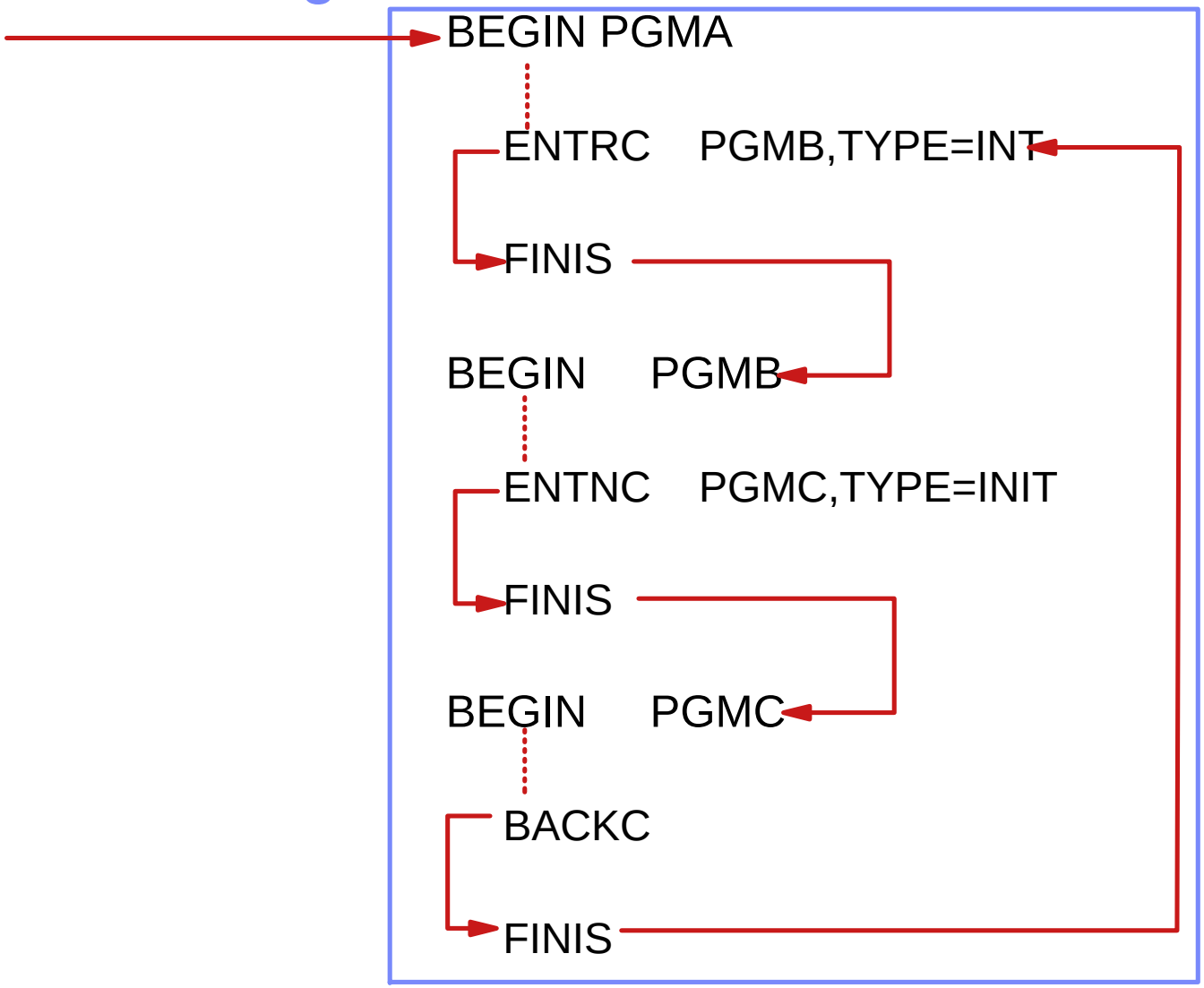
External Linkage



Link Time Linkage

- Special Fast Linkage (internal)
- CSO linkage generated by compiler
- BSO linkage generated by macros
  - BEGIN - generates code to support internal linkage
  - ENTNC TYPE=INT
  - ENTRC TYPE=INT|TPFDF,SAVEREGS=YES|NO (CP usage)
  - BACKC TYPE=TPFDF
  - CLINKC, SLINKC, and RLINKC subroutine linkage
- Round trip cost for BSO internal linkage is 47 instructions

Internal Linkage for BSOs



Run Time Linkage

- Longest linkage (external)
- Linkage resolved at run time
- SO branches to program name hash routine in CCEH
- Hash routine branches to PAT stub
- Used when ENTxC PROGRAM=name is coded

Nonstandard Linkage

- Getting the base address of a program and branching to it.
- Define program as TYPE=DATA
- Use GETPC prog ADDR=R7 to get core address

Trademarks

Notes

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

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