News From the REXX Compiler

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IBM
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Agenda

- News from the REXX Compiler
  - Packaging an application
    - General considerations
    - DLINK
    - Function packages

Compiler

IBM Compiler and Library for SAA
REXX/370
Release 2

5695-013 5695-014

Available for CMS and MVS
Library is part of REXX/VSE
**Alternate Library PTFs**

<table>
<thead>
<tr>
<th>CMS</th>
<th>PTF</th>
<th>APAR</th>
<th>MVS</th>
<th>PTF</th>
<th>APAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler</td>
<td>UN51503</td>
<td>UN51833</td>
<td>UN51504 JPN</td>
<td>PN48015</td>
<td>UN51834 ENU</td>
</tr>
<tr>
<td>Library</td>
<td>No PTF, additional product tape</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Introduction of Copyright, Alternate Library

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**Copyright**

- This program welcomes you ...
- © This program copyrighted for ...
- © COPYRIGHT MY Company, Vienna, Austria ...

say 'hello world'
Alternate Library

- Compile program
  - with ALTERNATE and SOURCELINE
    - use CONDENSE to hide source
    - DLINK does not work
- Distribute Alternate Library
  - without royalties, without paperwork
- Alternate Library
  - is installed on systems without Library
  - invokes interpreter when compiled program is run

Distributing REXX

<table>
<thead>
<tr>
<th>Library required</th>
<th>Library optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source exposed</td>
<td>Source hidden</td>
</tr>
<tr>
<td>Maintenance problems</td>
<td>no problems</td>
</tr>
<tr>
<td>Packaging few options</td>
<td>all options</td>
</tr>
</tbody>
</table>

AltLib

AltLib

Interpreter

Program

Compiled

Source

Compiled

Library

Interpreter

Optional

Hidden (CONDENSE)

No problems

Some options
What's missing

- TRACE support
- REXX I/O for CMS
- INCLUDE facility
- MARGINS

Agenda

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    - General considerations
    - DLINK
    - Function packages
Performance

/* REXX Inner */
cvi=sysvar('SYSCPU')
Do i=1 To 1000
  Call inner
End

cve=sysvar('SYSCPU')
Say 'CPU time' cve-cvi
Exit

inner: Procedure
Return

/* REXX Caller */
cvi=sysvar('SYSCPU')
Do i=1 to 1000
  Call outer
End

cve=sysvar('SYSCPU')
Say 'CPU time' cve-cvi
Exit

/* REXX Outer */
Return

Performance (MVS)

INN R/CALLER

OUTER EXEC (SYSPROC)

CEXEC (SYSPROC)

MODULE (STEPLIB)

MODULE (DLINKed)

Compiled

Interpreted
Performance (CMS)

![Chart showing performance metrics for various modules and processes]

Applications

![Diagram illustrating applications and their interconnections]
Internal - External

<table>
<thead>
<tr>
<th></th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td>good</td>
<td>bad</td>
</tr>
<tr>
<td>Maintenance</td>
<td>many</td>
<td>one</td>
</tr>
<tr>
<td>Distributed development</td>
<td>impossible</td>
<td>possible</td>
</tr>
<tr>
<td>Pieces</td>
<td>one</td>
<td>many</td>
</tr>
<tr>
<td>Search order</td>
<td>certain</td>
<td>uncertain</td>
</tr>
<tr>
<td>Variable sharing</td>
<td>easy</td>
<td>hard</td>
</tr>
</tbody>
</table>

Include (not yet available)

Programming, DLINK, Function packages

DLINK, Function packages

DLINKed Applications
**DLINK**

- Search overhead zero
- Requires Compiler
- Does not work with Alternate Library

**Function Packages**

- Commonly used functions
- Early in the search order
- Functions must understand REXX function invocation
Search Order (CMS)

RXEXTFNC
RXSYSFN LOAD RXEXTFNC
RXLOCFN LOAD RXEXTFNC
RXUSRFN LOAD RXEXTFNC

continue search

Applications with Function Packages

Function packages
Function Packages

- First in search order
- Compiler allows to write functions in REXX
- Works with Alternate Library
- May require explicit loading/unloading on CMS
- DLINK may be used when Alternate Library is not used

CMS Function Package Example

- Two files
  - RXUSERFN is function package loader
  - USERFN is function package glue code
- "Glue" code for a function package
  - Use without royalties
  - Allows free naming of function package
    - Requires renaming of files
    - Explicit loading of package and all functions with "RXmynname LOAD"
    - Explained in RXUSERFN header
Necessary Modifications

RXUSERFN ASSEMBLE

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Command</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;PACKAGE</td>
<td>SETC</td>
<td>'USERFN'</td>
<td>Name of the package to load</td>
</tr>
<tr>
<td>&amp;RXPACK</td>
<td>SETC</td>
<td>'RX&amp;PACKAGE'</td>
<td>Name of this program</td>
</tr>
<tr>
<td>&amp;CR(1)</td>
<td>SETC</td>
<td>'My Copyright'</td>
<td>Copyright notice</td>
</tr>
<tr>
<td>&amp;CR(2)</td>
<td>SETC</td>
<td>'second line'</td>
<td>Copyright notice continued</td>
</tr>
</tbody>
</table>

USERFN ASSEMBLE

<table>
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<tr>
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<tr>
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<td>SETC</td>
<td>'USERFN'</td>
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</tr>
<tr>
<td>&amp;CR(1)</td>
<td>SETC</td>
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<td>Copyright notice</td>
</tr>
<tr>
<td>&amp;CR(2)</td>
<td>SETC</td>
<td>'second line'</td>
<td>Copyright notice continued</td>
</tr>
<tr>
<td>&amp;FUN(1)</td>
<td>SETC</td>
<td>'USER1'</td>
<td>Name of function</td>
</tr>
<tr>
<td>&amp;FUN(2)</td>
<td>SETC</td>
<td>'USER2'</td>
<td>Name of function</td>
</tr>
<tr>
<td>&amp;FUN(3)</td>
<td>SETC</td>
<td>'USER3'</td>
<td>Name of function</td>
</tr>
</tbody>
</table>

Obtain the Source Code

- Email - write a note to
  - hansjako@vabvm1.vnet.ibm.com
  - ATIBMCXP at IBMMAIL
- Disk - get one
  - as long as supply lasts
  - if you can't use email
  - if you have a way to upload code
- Supplement
  - type in
Agenda

- News from the REXX Compiler
  - Copyright
  - Alternate Library
- Packaging an application
  - General considerations
  - DLINK
  - Function packages
  - Function package example
Function Packages

**Function Packages**

* Entry/exit conditions:
  * Entry:
    * Standard SVC conventions.
    * R0 points to a registered PLIST (SVC 300 linkage).
    * R1 points to a registered PLIST (SVC 300 linkage).
  * Exit:
    * Return to caller.
    * Return code is passed back from USERF after invocation of original PLIST.
    * Return code from unsuccessful USERF.
    * R0: success.
    * R0: failure.
    * 4: indicate bad PLIST.

* Operation:
  * User function (USERF).
  * User function (USERF).

* Macros:
  * USERF.
  * USERF.

* Error handling routines:
  * Error handling routines.
  * Error handling routines.

* DCs:
  * DC 0.

* Function:
  * USERF.

* Copyright notice:
  * This code is provided on an as-is basis.

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Function Packages ...

<table>
<thead>
<tr>
<th>Function Packages</th>
<th>PAGE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER1 contains a call to USER3 and a call to USERX.</td>
<td>00190000</td>
</tr>
<tr>
<td>= compile USER1 with theplits compiler option.</td>
<td>00190000</td>
</tr>
<tr>
<td>= load USER1 (USER1 RELAX).</td>
<td>00190000</td>
</tr>
<tr>
<td>= GEM USER1 (NAME)</td>
<td>00540000</td>
</tr>
<tr>
<td>If you do this on CMS rel 3 you will get a module</td>
<td>00540000</td>
</tr>
<tr>
<td>runnable on CMS rel 2 and later, which will reside</td>
<td>00540000</td>
</tr>
<tr>
<td>where the rel 3 table is possible.</td>
<td>00540000</td>
</tr>
<tr>
<td>USER1, USER2, and USERX are the known functions.</td>
<td>00540000</td>
</tr>
<tr>
<td>Calls to USER1 (to USERX) and USERX will use GEM.</td>
<td>00540000</td>
</tr>
<tr>
<td>Entry/exit conditions:</td>
<td>00540000</td>
</tr>
<tr>
<td>= Standard SVC conventions.</td>
<td>00540000</td>
</tr>
<tr>
<td>= AI points to a terminated PICT.</td>
<td>00540000</td>
</tr>
<tr>
<td>= This code can run with ANODE 2 or ANODE 3.</td>
<td>00540000</td>
</tr>
<tr>
<td>Exit:</td>
<td>00540000</td>
</tr>
<tr>
<td>RS = 0 = function successfully loaded or exists</td>
<td>00540000</td>
</tr>
<tr>
<td>= functions unloaded</td>
<td>00540000</td>
</tr>
<tr>
<td>= Service call, end call</td>
<td>00540000</td>
</tr>
<tr>
<td>RS - 0 = return code from unsuccessful AIEXT LOAD</td>
<td>00540000</td>
</tr>
<tr>
<td>= long or RESET, but no second arguments</td>
<td>00540000</td>
</tr>
<tr>
<td>= or function not in package</td>
<td>00540000</td>
</tr>
<tr>
<td>= no first argument</td>
<td>00540000</td>
</tr>
<tr>
<td>Macros:</td>
<td>00759000</td>
</tr>
<tr>
<td>= MPSMP or DMPDI</td>
<td>00759000</td>
</tr>
<tr>
<td>= Macros and control blocks:</td>
<td>00759000</td>
</tr>
<tr>
<td>= RECVE</td>
<td>00800000</td>
</tr>
<tr>
<td>= Initiator</td>
<td>00800000</td>
</tr>
<tr>
<td>= WORK</td>
<td>00800000</td>
</tr>
<tr>
<td>= Change Activity:</td>
<td>00800000</td>
</tr>
<tr>
<td>RS - 0 = Added ANODE 3 capability</td>
<td>00800000</td>
</tr>
<tr>
<td>RS - 0 = Added missing branch for service call with</td>
<td>00800000</td>
</tr>
<tr>
<td>ANODE 2 (thanks to Naderi A. Davas for pointing</td>
<td>00800000</td>
</tr>
<tr>
<td>out the problem and providing the solution).</td>
<td>00800000</td>
</tr>
<tr>
<td>RS = 0 = no function in response to a LOAD request</td>
<td>00800000</td>
</tr>
<tr>
<td>without function name specified.</td>
<td>00800000</td>
</tr>
<tr>
<td>End of Specifications</td>
<td></td>
</tr>
</tbody>
</table>

**Function Packages **

<table>
<thead>
<tr>
<th>Function Packages</th>
<th>SPACE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKAGE ROSE AHY</td>
<td>00080000</td>
</tr>
<tr>
<td>PACKAGE ANODE 3</td>
<td>00080000</td>
</tr>
<tr>
<td>PACKAGES CSE</td>
<td>00080000</td>
</tr>
<tr>
<td>USER1 RUCBR,8</td>
<td>Establish Addressability</td>
</tr>
<tr>
<td>USER1 RELAX</td>
<td>Establish Addressability</td>
</tr>
<tr>
<td>BRANCH ADDRESS</td>
<td>00080000</td>
</tr>
<tr>
<td>DIVA SETA USERX</td>
<td>00097000</td>
</tr>
</tbody>
</table>

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2 News from the REXX Compiler - Supplement

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**Function Packages**

- **LOAD request, Check function name against FUNLIST.**
  - S1400000
- **Only function on the requested function.**
  - S1500000
- **PUSH USING**
  - Save USING for area.
  - S1500000
- **OS/94 KH News from the REXX Compiler - Supplement**
- **IC**
- **Function Packages**
- **LOAD request, Check if function is already a nucleus extension, make it.**
- **a nucleus extension if not (CHS rel 5).**
- **Function Packages**
- **PAGE 8 of 8**

---

**Function Packages**

- **LOAD request, Check function name against FUNLIST.**
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- **PAGE 9 of 9**

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  - S1500000
- **OS/94 KH News from the REXX Compiler - Supplement**
- **IC**
- **Function Packages**
- **PAGE 10 of 10**