

# CA 2E Technical Update



Co-branded Logo Footprint  
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**cm** FIRST

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# About the Speaker

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> Rory Hewitt

> Software Architect, 2E Development Team

- First joined Synon in 1997
- Original architect of Web Option
- Designer of various 2E & 1E features
  - RPG IV Generator
  - Componentization/Wrappering
  - Duplicate Parameter Contexts
  - Physical File Batch Processing
  - Database Triggers
  - YCVTSPLF

# Abstract

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This session will take an in-depth look at some of the new technical features included within Release 8.5 of CA 2E.

We will focus on the new ILE Service Program Support

# Agenda

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- > Current ILE Support in CA 2E
  - What's in it?
- > Upcoming Release
  - ILE Service Program Support

# 2E at CA

## 2E 8.0

- > COBOL ILE
- > Web Option enhancements

OCTOBER 2002

## 2E 8.1 SP1

- > Subfile drop/fold
- > \*RTVFLDINF
- > Minor enhancements

NOVEMBER 2005

## 2E 8.5 Beta

- > ILE Service Programs
- > Web Service Generation
- > And More...

AUGUST 2009

2002

2003

2004

2005

2006

2007

2008

2009

2010

2000 -SEPTEMBER 2001

## 2E 7.0 and 7.0+

- > RPG IV Generator
- > Componentization
- > Duplicate Parm Contexts
- > Batch Processing
- > Web Option Launch

OCTOBER 2004

## 2E 8.1

- > Database Triggers
- > Several minor enhancements

SEPTEMBER 2007

## 2E 8.1 SP2

- > Default templates
- > Updated Compile Preprocessor
- > More enhancements
- > Numerous fixes

# CA 2E Current Release

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## > Release 8.1 Service Pack 2

- a.k.a. r8.1 SP2 / 8.1.2
- Released in 2008

## > Release 8.5

- Released in August 2009

# ILE Service Program support

***“A service program is a collection of runnable procedures and available data items that are used by other ILE program objects and service programs. Service programs are system objects of type \*SRVPGM and have a name specified when the service program is created. “***

- > A service program cannot be called directly
- > Typically used for common routines that are frequently called within an application and across applications
- > Similar concept to DLLs on Windows

# ILE Service Program Support

## Before 8.5

- > You could define an external function as \*MODULE
  - But no support to combine modules into Service Programs
  - Modules compiled into each calling program

## With 8.5

- > New Service Program function type
  - Select 2E modules to include in the Service Program
  - Select external modules to include in the Service Program
  - Generate and compile within 2E

# ILE Service Program Support

## Technology

- New integration point with hand-coded IBM i applications
- Provides the foundation for 2E Web Services support

## Deployment

- More flexible deployment options for 2E applications
- One service program instead of separate programs
- Modular, reusable code

## Performance

- Can improve function call performance
- Performance tuning option for batch processing

# CA 2E r8.5 - ILE Service Program support

- > Ability to define Service Programs
  - New "Service program" function type
  - No action diagram or screen (obviously)
  - All-new function options
  
- > Fully integrated with existing model functionality
  - Impact Analysis
  - Change Management
  
- > Can include modules created outside 2E model

# CA 2E r8.5 - ILE Service Program support

## > Not i5/OS source-based objects

- Our support uses one source member per \*SRVPGM
  - Generation control information
  - Creation options (used by 1E compile preprocessor)
  - Export list
- Allows better integration with change management tools
- Same \*DSNR/\*PGMR/\*USER authority as elsewhere

## > System-generated or hard-coded signatures

- We suggest the latter...

EDIT FUNCTION DETAILS

HEWR00185M

Function name . . : customer service program    Type : Service program  
 Received by file. : customer                    Acpth: \*NONE  
 Workstation . . . : NPT                           Signature . . . : \*GEN  
 Source library. . : HEWR00185G

Object	Source	Target
? Type	Name	HLL    Text
SPG	UUD8SPS	BND    customer service program    Service program

Object attribute is 'BND'

Object type is 'SPG'

New M and P selection options

SEL: E-STRSEU, O-Compiler Overrides, M-Modules, P-Procedures  
 F3=Exit    F7=Options    F8=Change name    F9=Change signature    F20=Narrative

## SERVICE PROGRAM MODULES

HEWR00185M

Function name . . : customer service program Type : Service program

Received by file. : customer

? Module	Library	Text			
UUE1XFR	HEWR00185G	Change customer module	Execute external functio		
UUE2XFR	HEWR00185G	Create customer module	Execute external functio		
UUE3XFR	HEWR00185G	Delete customer module	Execute external functio		
UUE4XFR	HEWR00185G	Retrieve customer module	Execute external functio		

**SERVICE PROGRAM MODULES**  
**lists modules that comprise**  
**the service program**

Bottom

SEL: P=Procedures D=Remove

F3=Exit F6=Add module F12=Cancel F13=Quick exit

## SERVICE PROGRAM EXPORTS

HEWR00185M

Function name . . : customer service program Type : Service program

Received by file. : customer

? Module Library Text

Type Export name

UUE1XFR	HEWR00185G	Change customer module	Execute external functio
*PROC	UUE1XFR		
UUE2XFR	HEWR00185G	Create customer module	Execute external functio
*PROC	UUE2XFR		
UUE3XFR	HEWR00185G	Delete customer module	Execute external functio
*PROC	UUE3XFR		
UUE4XFR	HEWR00185		Execute external functio
*PROC	UUE4XFR		

**SERVICE PROGRAM EXPORTS**  
lists procedures and data  
that are exported from the  
service program

Exports can be moved up and  
down in the export list to  
avoid signature violations

Bottom

SEL: +=Move Up -=Move Down D=Remove

F3=Exit F5=Refresh F12=Cancel F13=Quick exit

## SELECT MODULE

HEWR00185M

? File	Function	GEN name
_ Address	temp eef	UUAVXFR
_ Address	MOD1	UUEPXFR
_ Address	MOD2	UUERUPR
_ Address	Process Address	UUDNXFR
_ Address	Select Address	UUAFSRR
_ Address	Update Address	UUDOXFR
_ Address	17081849_exceptfun	UUAXXFR
_ Address		UUEEUPC
_ Address		TESTPLI
_ customer		UUE1XFR
_ customer	Create customer module	UUE2XFR
_ customer	Delete customer module	UUE3XFR
_ customer	Retrieve customer module	UUE4XFR
_ customer	Select customer 2	UUCYSRR
_ customer	Select customer 3	UUCZSRR

**SELECT MODULE screen  
allows user to add modules  
from the CA 2E model to the  
service program**

Bottom

SEL: X=Select P=Procedures

F3=Exit F6=Add external module F12=Cancel F13=Quick exit

SELECT EXTERNAL MODULE:

HEWR00185M

Module . . . . . :

? Object	Library	Text	
<u>Y</u>	<u>Y1SRC</u>	<u>Processing</u>	
— YCMDPRC	Y1SRC	Command processing	
— YERRPRC	Y1SRC	Error processing	*M
— YJOBPRC	Y1SRC	Job processing	
— YLNKLST	Y1SRC	Linked list processing	
— YOBJPRC	Y1SRC	Object processing procedures	*M
— YPRCDTA	Y1SRC	Data processing	*M
— YSTRPRC	Y1SRC	String processing procedures	*M

**SELECT EXTERNAL MODULE  
screen allows user to add  
non-CA 2E modules to the  
service program...**

Bottom

SEL: X=Select P=Procedures

F3=Exit F5=Refresh F12=Cancel F13=Quick exit

EDIT FUNCTION DETAILS

HEWR00185M

Function name . . : customer service program Type : Service program  
 Received by file. : customer Acpth: \*NONE  
 Workstation . . . : NPT Signature . . : \*GEN  
 Source library. . : HEWR00185G

Object	Source	Target
? Type	Name	HLL Text
<u>SPG</u>	<u>UUD8SPS</u>	BND <u>customer service program</u> <u>Service program</u>

**Use F9 to specify \*SRVPGM signature option (\*GEN, \*SRVPGM or hard-coded)**

SEL: E-STRSEU, O-Compiler Overrides, M-Modules, P-Procedures  
 F3=Exit F7=Options F8=Change name **F9=Change signature** F20=Narrative

SEU==&gt;

Generated binder source consists of 3 sections

UUD8SPS

\*\*\*\*\* Beginning of data \*\*\*\*\*

```
0001.00 /*H: Generated by CA 2E release 8.5 (1325) */
0002.00 /*H: Object type : *SRVPGM */
0003.00 /*H: Company : HEWR00185M */
0004.00 /*H: System : HEWR00185M */
0005.00 /*H: User name : HEWR001 */
0006.00 /*H: Date : 05/04/09 Time : 21:55:30 */
0007.00
0008.00 /*Z: MODULE (HEWR00185G/UUE1XFR HEWR00185G/UUE2XFR + */
0009.00 /*Z: HEWR00185G/UUE3XFR HEWR00185G/UUE4XFR) EXPORT (*SRCFILE) + */
0010.00 /*Z: OPTION (*DUPVAR *DUPPROC *NOWARN) BNDDIR (QC2LE YBNDDIR) + */
0011.00 /*Z: TEXT ('customer service program Service program') */
0012.00
0013.00 /*Y: ADDBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUD8SPS *SRVPGM)) + */
0014.00 /*Y: POSITION (*FIRST) */
0015.00
0016.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE1XFR *MODULE)) */
0017.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE2XFR *MODULE)) */
0018.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE3XFR *MODULE)) */
0019.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE4XFR *MODULE)) */
0020.00
```

SEU==> \_\_\_\_\_ UUD8SPS

0011.00 /\*Z: TEXT('customer service program Service program') \*/

0012.00

0013.00 /\*Y: ADDBNDDIRE BNDDIR(\*LIBL/YBNDDIR) OBJ((\*LIBL/UUD8SPS \*SRVPGM)) + \*/

0014.00 /\*Y: POSITION(\*FIRST) \*/

0015.00

0016.00 /\*Y: RMVBNDDIRE BNDDIR(\*LIBL/YBNDDIR) OBJ((\*LIBL/UUE1XFR \*MODULE)) \*/

0017.00 /\*Y: RMVBNDDIRE BNDDIR(\*LIBL/YBNDDIR) OBJ((\*LIBL/UUE2XFR \*MODULE)) \*/

0018.00 /\*Y: RMVBNDDIRE BNDDIR(\*LIBL/YBNDDIR) OBJ((\*LIBL/UUE3XFR \*MODULE)) \*/

0019.00 /\*Y: RMVBNDDIRE BNDDIR(\*LIBL/YBNDDIR) OBJ((\*LIBL/UUE4XFR \*MODULE)) \*/

0020.00

0021.00 STRPGMEXP PGMLVL(\*CURRENT) SIGNATURE(\*GEN)

0022.00

0023.00 EXPORT SYMBOL('UUE1XFR')

0024.00 EXPORT SYMBOL('UUE2XFR')

0025.00 EXPORT SYMBOL('UUE3XFR')

0026.00 EXPORT SYMBOL('UUE4XFR')

0027.00

0028.00 ENDPGMEXP

0029.00

\*\*\*\*\* End of data \*\*\*\*\*

\*\*\*\*\* Beginning of data \*\*\*\*\*

```

0001.00 /*H: Generated by CA 2E release 8.5 (1325) */
0002.00 /*H: Object type : *SRVPGM */
0003.00 /*H: Company : HEWR00185M */
0004.00 /*H: System : HEWR00185M */
0005.00 /*H: User name : HEWR001 */
0006.00 /*H: Date : 05/04/09 Time : 21:55:30 */

```

0007.00  
0008.00  
0009.00  
0010.00  
0011.00  
0012.00  
0013.00  
0014.00  
0015.00  
0016.00  
0017.00  
0018.00  
0019.00  
0020.00

Header details  
H\* lines describing the  
source member and object

SEU==&gt;

Generated binder source consists of 3 sections

UUD8SPS

\*\*\*\*\* Beginning of data \*\*\*\*\*

0001.00  
0002.00  
0003.00  
0004.00  
0005.00  
0006.00  
0007.00**Compilation instructions**

Z\* and Y\* lines used by the  
compile preprocessor to  
create the service program

```
0008.00 /*Z: MODULE (HEWR00185G/UUE1XFR HEWR00185G/UUE2XFR + */
0009.00 /*Z: HEWR00185G/UUE3XFR HEWR00185G/UUE4XFR) EXPORT (*SRCFILE) + */
0010.00 /*Z: OPTION (*DUPVAR *DUPPROC *NOWARN) BNDDIR (QC2LE YBNDDIR) + */
0011.00 /*Z: TEXT ('customer service program Service program') */
0012.00
0013.00 /*Y: ADDBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUD8SPS *SRVPGM)) + */
0014.00 /*Y: POSITION (*FIRST) */
0015.00
0016.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE1XFR *MODULE)) */
0017.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE2XFR *MODULE)) */
0018.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE3XFR *MODULE)) */
0019.00 /*Y: RMVBNDDIRE BNDDIR (*LIBL/YBNDDIR) OBJ ((*LIBL/UUE4XFR *MODULE)) */
0020.00
```

SEU==>

Generated binder source consists of 3 sections

UUD8SPS

0011.00  
0012.00  
0013.00  
0014.00  
0015.00  
0016.00  
0017.00  
0018.00  
0019.00  
0020.00  
0021.00  
0022.00  
0023.00  
0024.00  
0025.00  
0026.00  
0027.00  
0028.00  
0029.00

Export definition list  
List of procedures and data exported by the service program, along with the signature definition

```
STRPGMEXP PGMLVL(*CURRENT) SIGNATURE(*GEN)
EXPORT SYMBOL('UUE1XFR')
EXPORT SYMBOL('UUE2XFR')
EXPORT SYMBOL('UUE3XFR')
EXPORT SYMBOL('UUE4XFR')
ENDPGMEXP
```

\*\*\*\*\* End of data \*\*\*\*\*

# CA 2E r8.5 - ILE Service Program support

## > Compilation order

- Modules are generated & compiled
  - Automatically added to model binding directory
  - Picked up by programs which reference binding directory
- Service program is generated & created w/ CRTSRVPGM
  - Automatically added to model binding directory
  - Constituent 2E modules removed from binding directory
- Programs are generated & compiled
  - Now bind-by-reference to \*SRVPGM instead of bind-by-copy to multiple \*MODULES

# CA 2E r8.5 - ILE Service Program support

- > 2E Service program can have 1 – 217 exports
  - Export can be procedure or data (typically procedure)
  - 2E modules consist of a single procedure w/ same name
    - Can add user source to create extra subprocedures
  
- > 2 different implementation methodologies
  - Single module per service program
    - Simplest, similar to OPM (program-only) implementation
    - Large number of small runtime objects
  - Multiple modules per service program
    - Fewer runtime objects
    - Complexity may be outweighed by less maintenance

# CA 2E r8.5 - ILE Service Program support

## > Compile preprocessor now handles CRTSRVPGM command

- Can store every \*SRVPGM-related command within QSRVSRC binder source member
- CRTSRVPGM overrides, ADDBNDIRE, RMVBNDDIRE etc.
- Seamless integration with i5/OS object creation

## > Works with non-2E service programs

- Use 2E model as 'repository' for external service programs
  - Creation information
  - Documentation
  - Source/object control

# Summary

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- > Simplifies application development process
  - Final piece of CA 2E ILE Support 'puzzle'...
  - ...except ILE CL EXCUSRPGM support (coming soon!)
- > Integral to Web Service support
- > Uses new 1E compile preprocessor functionality
- > Allows users to move fully to an ILE environment

# Impact Analysis

- > Before 2E 8.5: Commented-out code treated as active
- > 2E 8.5 provides better options
  - Options to include/exclude commented out calls on usage and reference screens
- > Makes it easier to manage large “legacy” models
  - Ignore commented out calls for more accurate impact analysis
  - Identify commented out code for model cleanup activities

# Display Model Usages at 8.5

New!

New!

```

Gen objs :      3      Display Model Usages  Model  . : SBC1258MDL
Total :        4      Level  . : 001
Object:  Function_C      Owner:  My File
Type :  FUN Attr:  RPG  Include inactive code: *YES Exclude sys objs: *YES
Scope : *EXTFUN Filter: *ANYXXX Current objs only: *YES Reason: *ACTION
Object: _____ Type: XXX  Include obsolete objects: *YES
  
```

```

2=Edit      3=Copy      4=Delete object      5=Display      8=Details      10=Action diagram
13=Parms   14=GEN batch      15=GEN interactive      16=Y2CALL
  
```

Opt	Object	Typ	Atr	Owner	Lvl	Reason	WRN
	My File	FIL	REF		001	*REFFIL	
	Function_C	FUN	RPG	17009615	000	*OBJECT	
	Function_B	FUN	RPG	17009615	001	*ACTION	0
	Function_A	FUN	RPG	17009615	002	*ACTION	

```

F3=Exit      F5=Refresh      F9=Command line      F12=Previous      F15=Top level
F16=Build model list      F21=Print list      F22=File locks      F23=More options
Copyright (c) 2008 CA. All rights reserved.
  
```

Bottom

# 2E Change Management Option r8.5

## > CA 2E CM r8.5

- New release produced with MKS
- Compatibility with and exploitation of 2E 8.5

## > 2E-related features and updates

- Can promote 2E ILE Service Programs
- YCVTCNDVAL/YCVTMDLMSG can run over Model list – new CVTOPT parameter (value can be \*ALL or \*MDLLST)
- Objects displayed in correct order on promotion request
- Object Description on Workbench corrected for Function versions

# Web Service Support in CA 2E

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> See Session 7B - CA 2E Web Services

- Presented by Simon Cockayne
  - Principal Software Engineer, CA 2E Team
  - Designer of CA 2E's Web Service Functionality

> 4pm today, right here!