# Introduction to IBM i Merlin

Steve Will – <u>stwill@us.ibm.com</u> DE, IBM i CTO

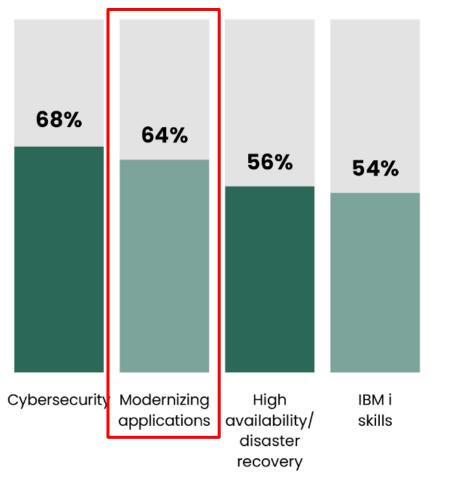
Tim Rowe – <u>timmr@us.ibm.com</u> IBM i Business Architect



### IBM i Customers need to modernize their business applications



### What are your top concerns as you plan your IT environment?



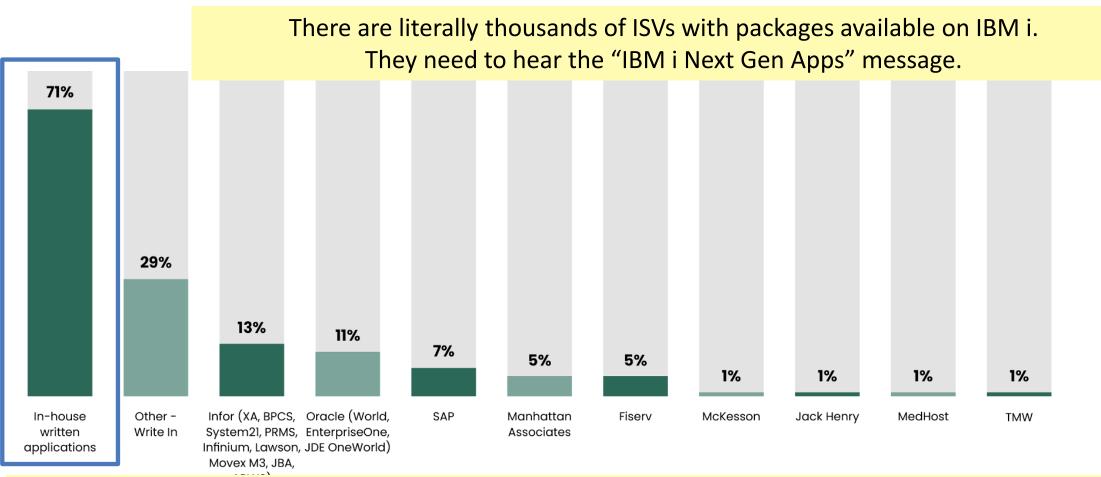
- Some use "modern" tools and methods
  - Must "cobble together" various pieces
  - Must "force-fit" IBM i native file systems
- Some (many) are stuck/still using inefficient old tech
  - No automated change control, project builds
  - Often in monolithic (not modular) designs
  - Source Editors from the 1980's

https://www.fortra.com/resources/guides/ibm-i-marketplace-survey-results

### Survey Results – Applications Running on IBM i



#### Which business applications are you running on IBM i?



Many IBM i users have application code unique to their enterprise..

The Question: Modernize, or Re-platform? The Answer: IBM i Next Gen Apps

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https://www.fortra.com/resources/guides/ibm-i-marketplace-survey-results

3

Attributes of "IBM i Next Gen Apps"





Quickly Respond to Business Needs DevOps, CI/CD, Agile



Encapsulate processes & data Creating assets for the business



Blend technology Using the "best fit for purpose"

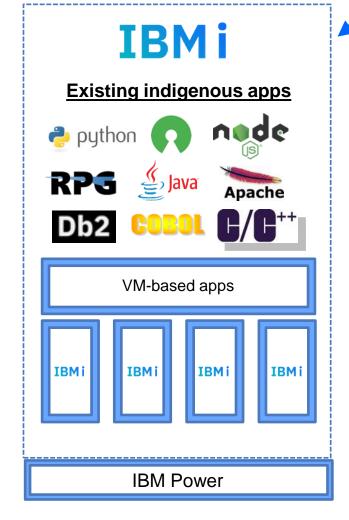


Easily incorporate new tech Even if the tech is not "in-house"

https://techchannel.com/Trends/04/2022/ibm-i-next-gen-apps

IBM i and Cloud – IBM i Next Gen Applications – Prepared for Cloud



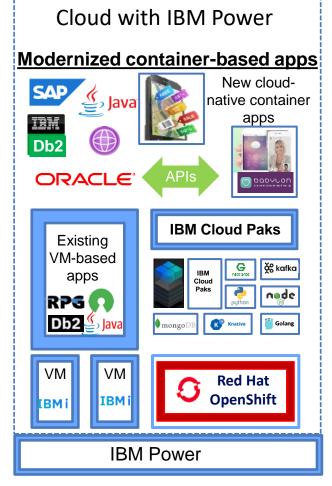


Existing applications can get value from cloud-based applications through services

- Existing IBM i applications call services
- IBM i applications can **provide services** to others easily, in a standard Restful way

#### **IBM i Next Gen Applications**

- Agile/DevOps capable
- Modular
- Mixed programming languages
- Producing & Consuming Services





# Modernization Engine for Lifecycle Integration



## A safe, secure IBM i focused modern development ecosystem

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# What Issues does Merlin Help Solve





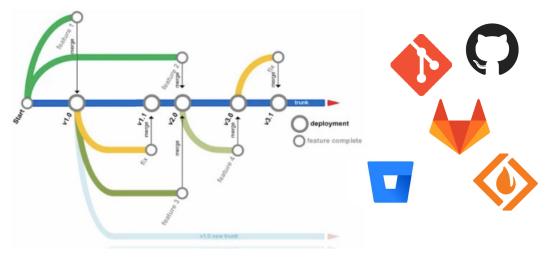






# What Issues does Merlin Help Solve





#### Modern / Centralized Source Control and Branching

#### Modern RPG

ctl-opt bnddir('ACCRCV'); dcl-f custfile usage(\*update); dcl-ds custDs likerec(custRec); dcl-f report printer;

read custfile custDs; dow not %eof;

if dueDate > %date(); // overdue?
 sendOverdueNotice();
 write reportFmt;
 exec sql insert :name, :duedate into
 mylib/myfile;



- Fixed to Free
- Refactoring



#### Browser Centric VsCode Based IDE

EXPLORER	PR0300.RPGLE ART200-Work_with_article.PGM.SQLRPGLE	ORD200.PGM.SQLRPGLE × OUTLINE	
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PROSOD.RPGLE  PRoject.mk TXT001.RPGLE XML001.RPGLE XML001.RPGLE	110         order by datord des;           111         exec sql open cl;           122         stepbl = lod;           133         endsr;           134         // Load Subfile           135         begsr d@ligit;	ବୁ dipatr,ri ବୁ sfmsg ବୁ sfmsg ବୁ sfmsg2 ବୁ sfmsg3 ବୁ sfmsd କୁ en01	

- Outline View
- Tokenization
- Content Assist
- Code formatting
- Understand Languages
  - RPG
  - SQL
  - Embedded SQL
  - CL
  - Cobol
  - DDS

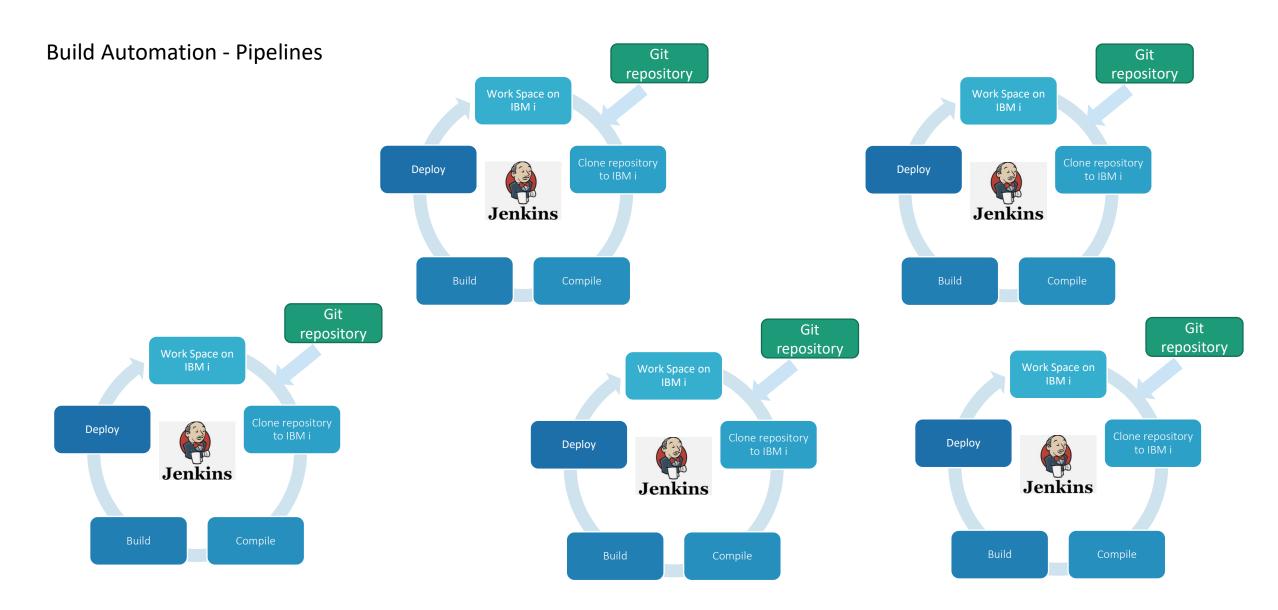
#### **Application Blueprint**





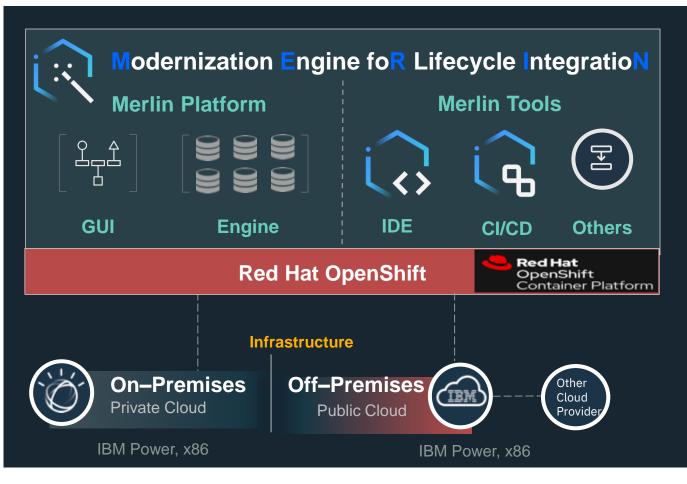
- Impact Analysis
- Program
   Understanding
- Data Usage
- Pgm Flow

# What Issues does Merlin Help Solve





### Merlin



What is it? Today

### **IBM Developer - IDE**

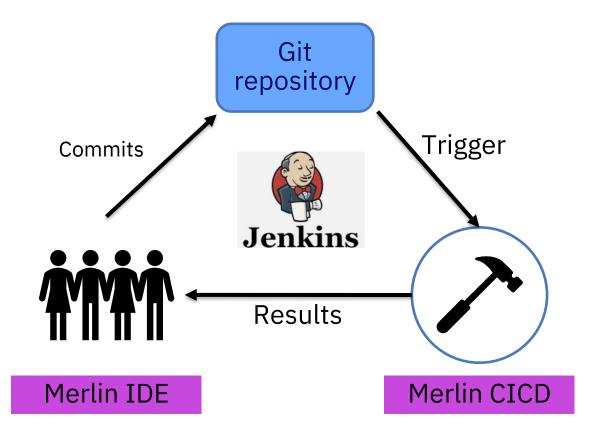
### Pipelines for All – CI/CD

### Merlin the engine / framework





### Automated reliable application build and deployment - Pipelines



### IBM i Merlin



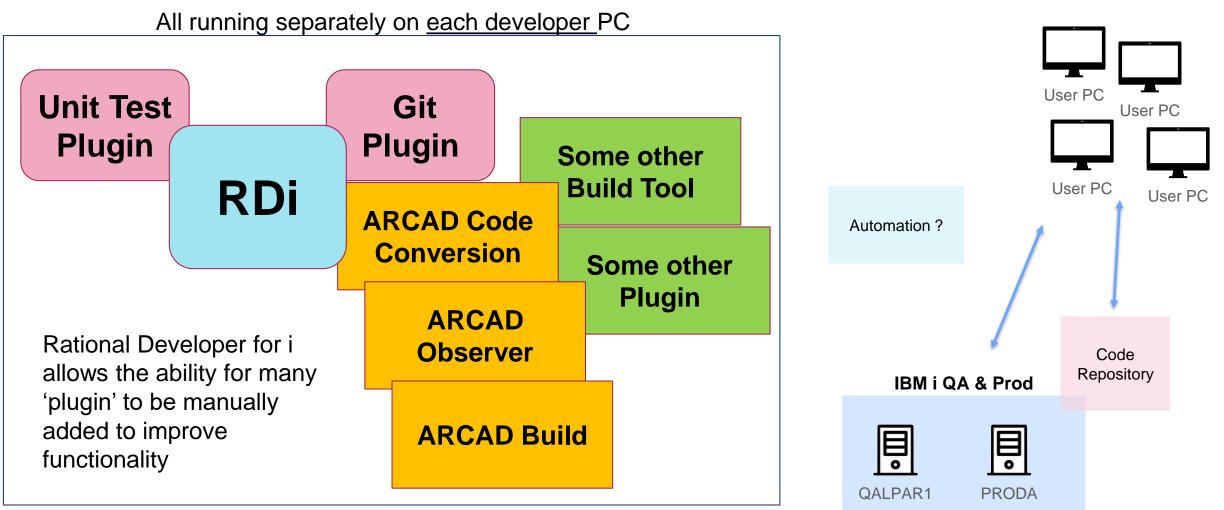
#### Modern Browser based developer environment

> File	Edit Selection View Go Run	Terminal Help				
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- Outline View
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  - SQL
  - Embedded SQL
  - CL
  - Cobol
  - DDS
- Impact Analysis
- Intelligent Build
- Full Git Integration
- Debugger



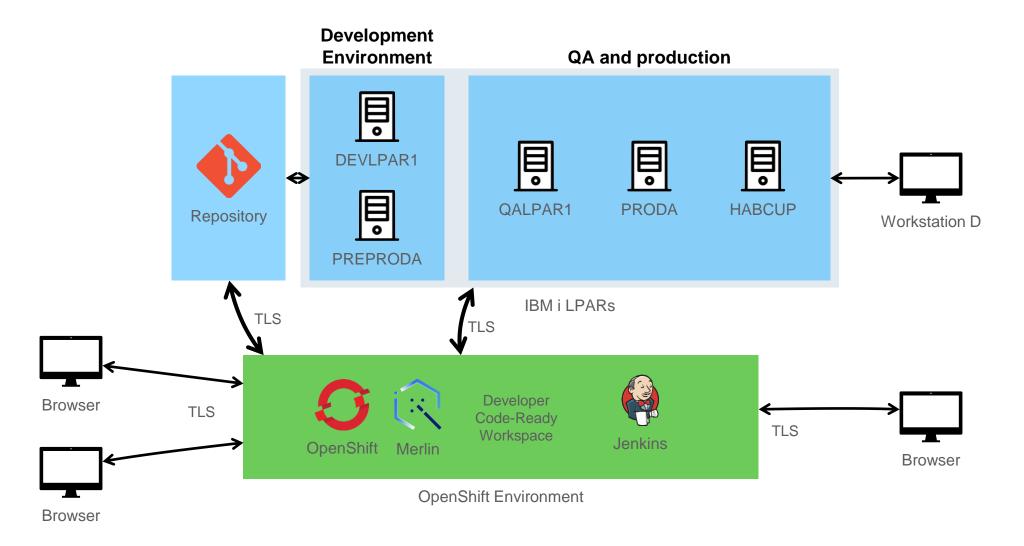




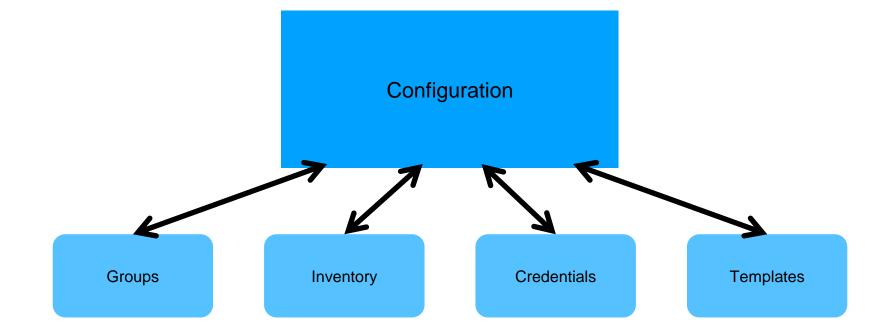
In all cases, additional function / features are all manually added, and no unified support



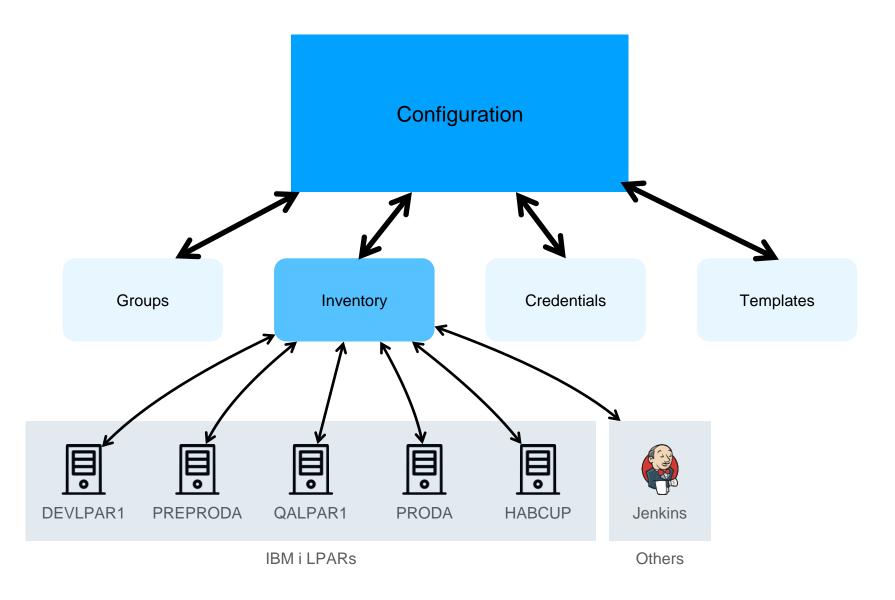
# Network Topology for dev (Merlin style)



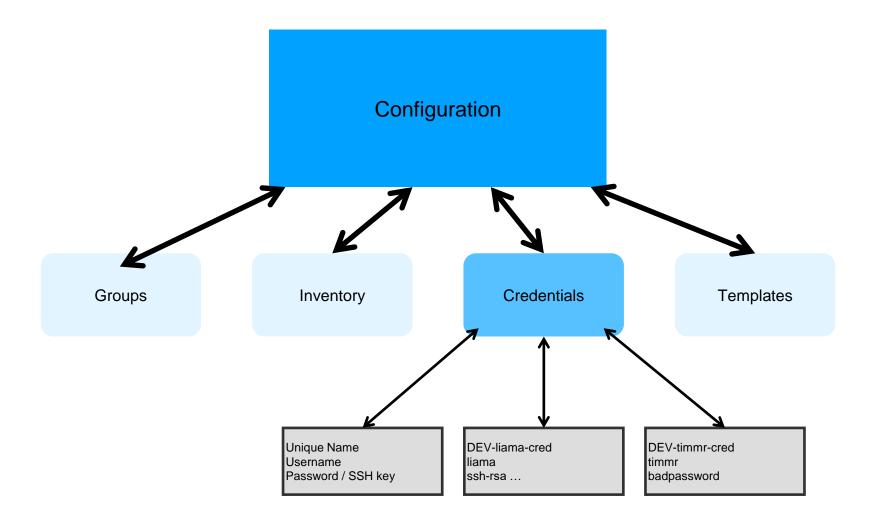




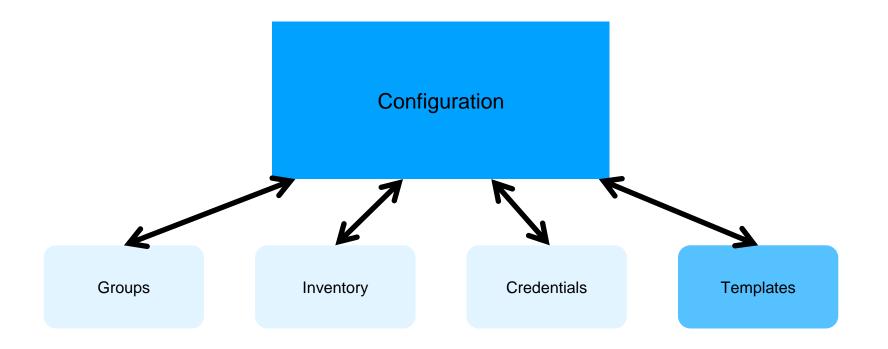




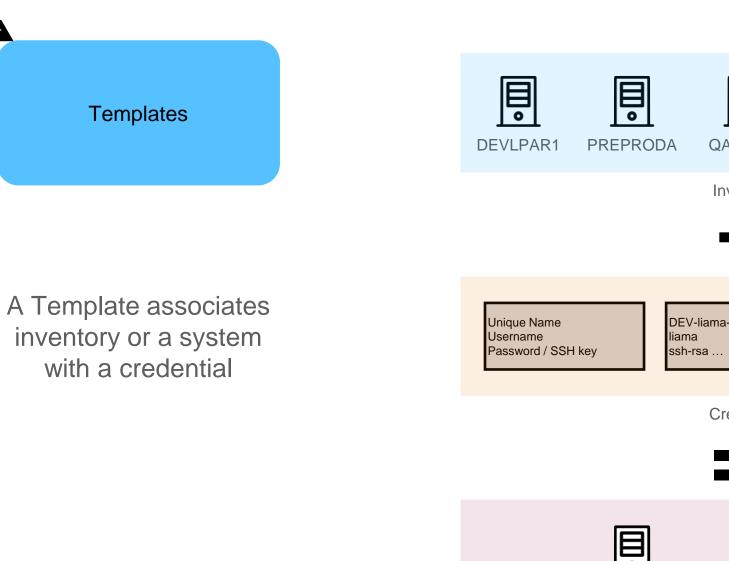


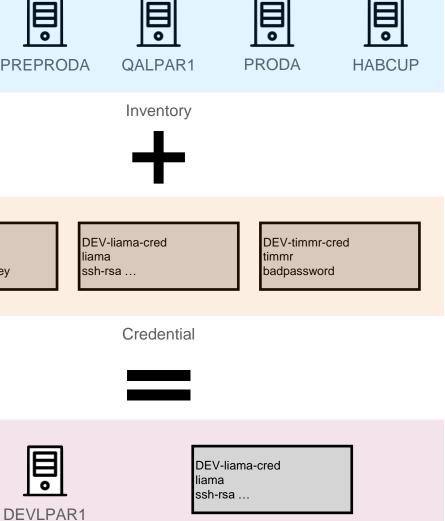












liam-dev-template

What are Developers Already Doing ?

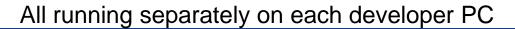


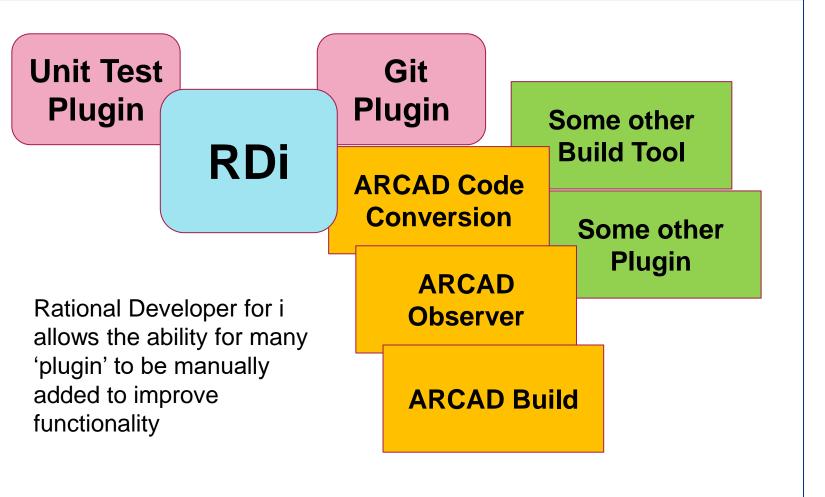
- Modern RPG
  - Helping to solve the talent gap
- RPG integration with modern development tools and strategies
  - Git
  - Jenkins
  - DevOps
- Connectivity with Cloud/Container apps Rest APIs
  - Call RPG Business logic with a Rest connection
  - Call a Rest based service from RPG

### Merlin was created to help simplify our IBM i customers journey to leveraging these already existing options



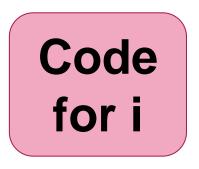








SEU – No plugins can be added

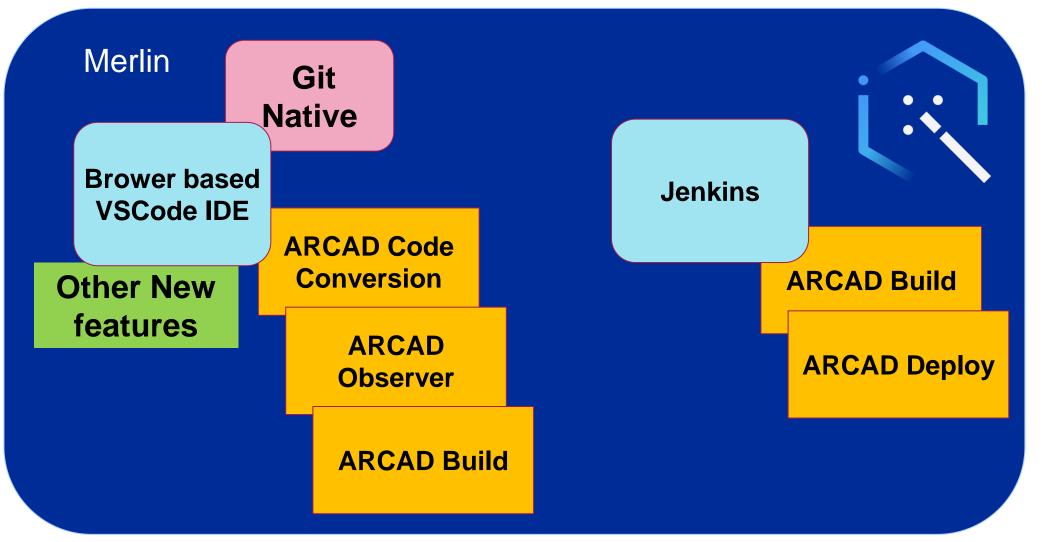


Plugin can be added....TBD

In all cases, additional function / features are all manually added, and no unified support

Future





A single interface from IBM and fully supported by IBM, combining the key features required for modern IBM i Development



# **RPG a Modern Language**



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# Transformation of RPG

Transformation



007900	I*				
008000	IAPIERR	DS			
008100	II	256	B	1	40ERRSIZ
008200	II	0	В	5	80ERRLEN
008300	II			9	15 ERRMIC
008400	II			16	16 ERRNBR
008500	II			17	256 ERRDTA

# Modern RPG





ctl-opt bnddir('ACCRCV'); dcl-f custfile usage(\*update); dcl-ds custDs likerec(custRec); dcl-f report printer;

#### read custfile custDs; dow not %eof; if dueDate > %date(); // overdue? sendOverdueNotice(); write reportFmt; exec sql insert :name, :duedate into mylib/myfile;

# What Are the Risks of Staying with old RPG



Staying with OLD RPG

- Record level access
- Column based code style
- Monolithic
- Remains largely single threaded
- Difficult to maintain

Transforming to Modern RPG

- Embedded SQL
- Set based data access
- Modular
- Easy to leverage as a Rest API
- Maintainable
- Self Describing





# **Modernization Best Practices**

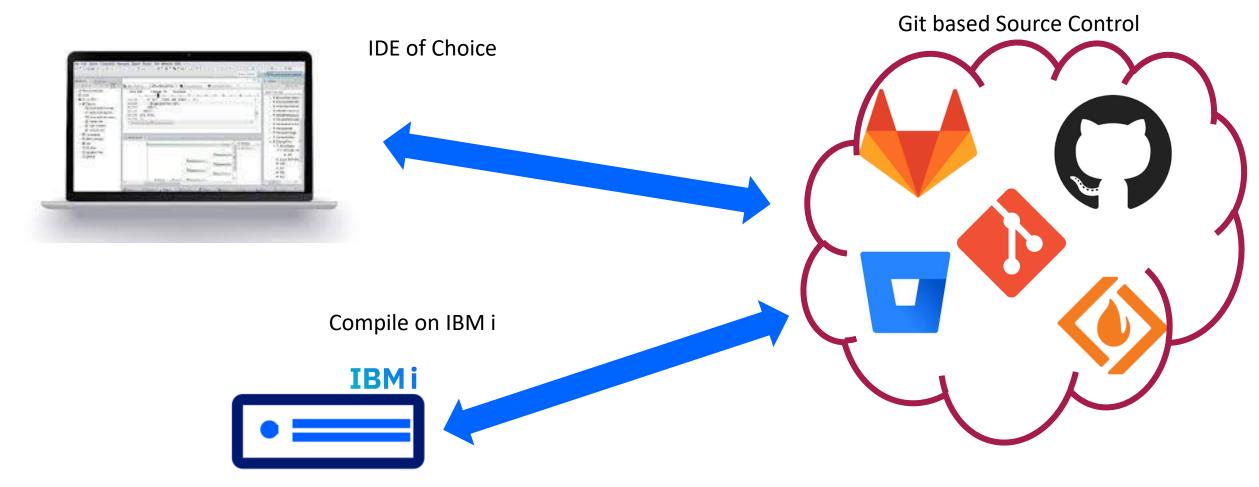
Refactor

- Rename Refactor
  - Change variables to self describing
- Modular
  - Extract Procedures
  - Leverage Service programs
  - ILE at its core is designed for maintainability
- Record -> Set based data access
  - Convert from DDS to DDL
  - Use surrogates to leave some programs unchanged (record access) and key programs leverage the power of SQL
- Be targeted
  - Not all programs need to be refactored



# Git with ILE





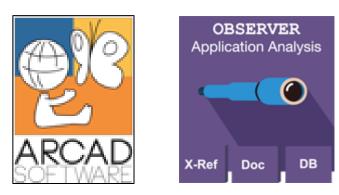
ALL ILE compiles support stream files

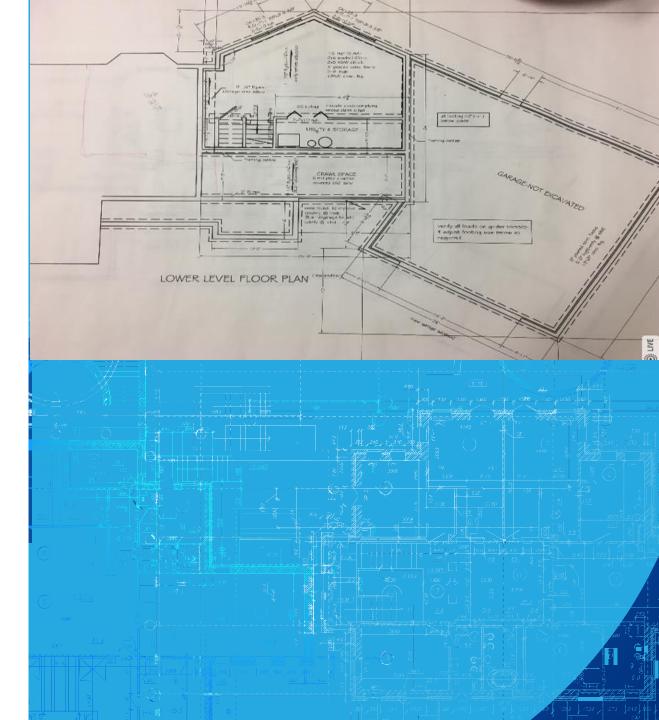
https://www.ibm.com/support/pages/how-use-source-control-rdi

# Why a Tool for Analysis?

Provides the BluePrint for the application

- Rapid analysis for hot fixes
- Application Change Studies (cost estimation)
- Redesign/re-architecting/SOA
- Extraction of business rules
- Application modernization
- Skill transfer
  - Help new people learn the application
- Generation of documentation required by regulatory constraints

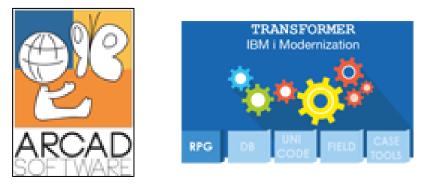




# How to Convert into Modern RPG?

#### IBM i Anywhere IBM i Everywhere

- ARCAD Converter (Transformer)
  - Plugs into RDi
  - Green Screen interface for MASS conversion
    - Convert multiple source members at once
  - can be ordered from IBM
    - ARCAD Converted for i 5733-AC1
  - Or acquire from ARCAD Free Trial



Line 40         Colum 50         Replace           1.10         0.10         0.11         0.11         Namedon statistics           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Colum 1.0         Replace           001300         DC1-C @F12         Colum 1.0         Replace         Replace         Replace           001300         DC1-C @F12 <th>(r) - (<b>-</b> (-</th> <th></th> <th></th> <th>20 8 5 🕅 🖬</th> <th></th> <th></th> <th></th> <th>Quick Access</th> <th></th> <th>0 4 0 <b>6</b> 9</th> <th></th>	(r) - ( <b>-</b> (-			20 8 5 🕅 🖬				Quick Access		0 4 0 <b>6</b> 9	
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002200         Dcl-C @PRINT         CONST(X'F6');           002300         Dcl-C @PRINT         CONST(Y'F6');           002300         Dcl-C @PRINT         CONST(Y'F6');           002300         Dcl-C @PRINT         C         @PRINT           002300         Dcl-C @PRINT         CONST(Y'F6');         C         @PRINT           002300         Dcl-C @PRINE         C         @PF         @OF           002300         Dcl-C @PRALE         CONST('ABCDEFGHIJKLMNOPQRST-         @OF         @OF           003300         Dcl-C CMAS         CONST('ABCDEFGHIJKLMNOPQRST-         @OF         @OF         I         '1'<'C								X.LT,	C		
002200       //       00500       I*         002200       Dcl-C (0FK       CONST('0');       00500       I       '0'       C       00FK         002200       Dcl-C (0FALSE       CONST('1');       00500       I       '1'       C       00FK         002200       Dcl-C (0FALSE       CONST('ADDEFCHIJKLMN0PQRST-       00500       I       '1'       C       00FK         002200       Dcl-C (CHARS       CONST('ADDEFCHIJKLMN0PQRST-       006000       I       '1'       C       00FK         002200       Dcl-C (CHARS       CONST('ADDEFCHIJKLMN0PQRST-       006000       I       '1'       '1'       C       00FK         002200       OpT-C (CHARS       CONST('ADDEFCHIJKLMN0PQRST-       006000       I       '1'       '1'       C       00FK         002300       OpTSturkxyz');       006000       I       '1'       '1'       006000       I       '1'       '1'       '1'       C       00FK         003300       @OFM*       Zaned('3')       Pos('1);       ///       007300       I       1''       1''''''''''''''''''''''''''''''''''''									c		
002400       DC1-C @OFF       CONST('0');       005700       I       '0'       C       @OFF         002500       DC1-C @OFK       CONST('0');       005800       I       '1'       C       @OFF         002200       DC1-C @FRUE       CONST('1');       005800       I       '1'       C       @FRUE         002300       DC1-C @FRUE       CONST('ACDEFGHIJKLMNOPORST-       005800       I       '1'       C       @FRUE         003000       DC1-C @FRUE       CONST('ACDEFGHIJKLMNOPORST-       006500       I       'ABCDEFGHIJKLMNOPORST-C       CHARS         003000       DC1-DS *n PSDS;       @FGM       Char(10)       Pos(1);       //       006500       I       'opgrsturwoyz '         003300       @FART       Zoned(3:0)       Pos(37);       //       006500       I       11       10 @FGM       E         003300       @GATA       Char(10)       Pos(1);       //       007700       I       11       10 @FGM       E       E         003300       @GATA       Char(10)       Pos(244);       //       007700       I       11       10 @FGM       E       E       E       E       E       E       E       E       E			CONST(X P	· ),				A 10		GUITIN	
002200       Dcl-C (@N       CONST('1');       005800       I       '1'       C       @ON         002200       Dcl-C (@FALSE       CONST('0');       005800       I       '0'       C       @FALSE         002200       Dcl-C (#ARS       CONST('ABCDEFGHIJKLMNOPORST-       005800       I       '0'       C       @FALSE         002300       Dcl-C (HARS       CONST('ABCDEFGHIJKLMNOPORST-       006500       I       '1''       C       @FALSE         003300       QC/C (HARS       CONST('ABCDEFGHIJKLMNOPORST-       006500       I       'ABCDEFGHIJKLMNOPORST-       C       C       C       HARS         003300       QC/O       Cl-D:bs 'n PSDS;       Const('ABCDEFGHIJKLMNOPORST-       006500       I       'UWXYZABCdefghijKIm-       006500       I       'UWXYZABCdefghijKIm-       006500       I       'UWXYZABCdefghijKIm-       006500       I       115857AT       E       E       006500       I       006500       I       115857AT       E		Dcl-C @OFF	CONST('0'	);				'0'	с	@0FF	
002200       DC1-C @FALSE       CONST('9');         002200       DC1-C @FALSE       CONST('ADCDEFGHIJKLMNOPORST-         002300       DC1-C (ARS       CONST('ABCDEFGHIJKLMNOPORST-         003300       DC1-C (ARS       CONST('ABCDEFGHIJKLMNOPORST-         003300       DC1-C (ARS       CONST('ABCDEFGHIJKLMNOPORST-         003300       DC1-C (ARS       CONST('ABCDEFGHIJKLMNOPORST-         003300       Opgrstuwwyz ');       006500       I 'UWXYZabcdefghijKIm-         003300       @PCM       Char(10)       Pos(1);       //         003300       @PCM       Char(10)       Pos(1);       //         003300       @PARKS       Zoned(3:0)       Pos(1);       //         003300       @PARKS       Char(10)       Pos(2);       //         003300       @PARKS       Char(10)       Pos(2);       //         004100       @USNA       Char(10)       Pos(244);       //       007300       I       244 253 dUSNA       _E         004100       @USNA       Char(10)       Pos(244);       //       007300       I       244 253 dUSNA       _E         004300       @GSRCL       Char(10)       Pos(324);       //       007300       I       334 423 dSRC	002500	Dcl-C @ON				005800	I	'1'			
002200       DC1-C @TRUE       CONST('1');       006100       I       '1'       C       @TRUE         002200       DC1-C (ARAS       CONST('ABCDEFGHIJKLMN0PQRST-       006200       I       'ABCDEFGHIJKLMN0PCRST-C       CHARS         003100       UVMXYZabcdEFGHIJKLMN0PQRST-       006200       I       'ABCDEFGHIJKLMN0PXC'       C       @TRUE         003100       UVMXYZabcdEFGHIJKLMN0PQRST-       006200       I       'ABCDEFGHIJKLMN0PXC'       C       @TRUE         003100       UVMXYZabcdEFGHIJKLMN0PQRST-       006200       I       'BACDEFGHIJKLMN0PXC'       C       @GTRUE       C       @TRUE       C       <		11									
002900       //       00200       //         003000       0///       00000       1       *ABCDEFGHIJKLMN0PORST-         003000       0///       00000       1       *UVWX72abcdefghijKlm-         003000       0///       00000       1       *UVWX72abcdefghijKlm-         003000       0///       00000       1       *UVWX72abcdefghijKlm-         003000       0///       00000       1       100000         003000       00000       1       100000       1       100000         003000       00000       1       1100000       1       100000       1       1000000       1       100000       1       100000       1       100000       1       1000000       1       1000000       1       1000000       1       1000000       1       1000000       1       1000000       1       1000000       1       1000000       1       1000000       1       10000000       1       10000000       1       10000000       1       100000000       1       1000000000       1       10000000000000       1       1000000000000000000000000000000000000											
003000       DC1-C CHARS       CONST('ABCDEFGHIJKLHNOPQRST-       005300       I       'ABCDEFGHIJKLMNOPQRST-C       CHARS         003100       UVMX72abcdEfghijkLm-       'opgrstuwsyz');       'opgrstuwsyz');       'opgrstuwsyz'         003300       //       'opgrstuwsyz');       'opgrstuwsyz';       'opgrstuwsyz'         003300       //       'opgrstuwsyz';       'opgrstuwsyz';       'epgrstuwsyz';         003300       (//       Char(10)       Pos(1);       //       'opgrstuwsyz';       'epgrstuwsyz';         003300       (//       Char(10)       Pos(1);       //       'opgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz';       'epgrstuwsyz;			CONST('1'	);				'1'	С	@TRUE	
003100 UWWX72bcdefghijklm- 003200 op/rstuwsyz'); 003300 // 003300 // 003300 // 003300 @667 Th 720red(5:0) Pos(1); 003300 @676 Th 720red(5:0) Pos(1); 003300 @676 Char(10) Pos(37); 003300 @677 Char(10) Pos(37); 003300 @677 Char(10) Pos(37); 003300 @677 Char(10) Pos(37); 003300 @677 Char(10) Pos(24); 003300 @677 Char(10) Pos(24); 004400 @057 Char(10) Pos(24); 004400 @687 Char(10) Pos(24); 004400 @687 Char(10) Pos(314); 004400 @687 Char(10) Pos(314); 004400 @687 Char(10) Pos(314); 004400 @687 Char(10) Pos(324); 004400 Char(10) Pos(1) NX/(255); 004400 Char(1) Pos(1) NX/(255);			CONCT ( 1 AD	CDE ECUIT 3KI MNODODCET					MNODODCT C	CUADC	
003200       0/0grstuwwyz'';         003300       //         003300       //         003300       (//         004300       (//         004300       (//         004300       (//         004300       (//         004300       (//         004300       (//				LUEFORIJKLMNUPQKSI-						CHARS	
003300       //*       006600       1*       10       006700         003300       0°0700       10       505       10       0°0700											
003400       PCL'Ds *n PSDS;       0007400       I       5DS         003500       @PGM       Char(10)       Pos(1);       //       000600       I       11       10       0PGM       E         003500       @PGAMS       Zoned(5:0)       Pos(1);       //       000600       I       31       150       000700       E       3700       PARMS       E<								opq: scavwxyz	-		
003600       @6TAT       Zoned(5:0)       Pos(1L);       //       006900       I       11       150857AT       E         003700       @PARMS       Zoned(3:0)       Pos(37);       //       007700       I       3700       PARMS       E         003900       @POSID       Char(7)       Pos(40);       //       007700       I       91169       Pos(40);       E         004000       @UDBNA       Char(10)       Pos(244);       //       007700       I       244       253       UDBNA       E         004100       @UDBNA       Char(10)       Pos(254);       //       007700       I       244       253       UDBNA       E         004200       @UDBNA       Char(10)       Pos(324);       //       007700       I       264       269       UDBNA       E         004300       @SRCL       Char(10)       Pos(324);       //       007700       I       314       323       @SRCL       E       E         004400       @SRCL       Char(10)       Pos(324);       //       007700       I       314       323       @SRCL       E       E         004700       D       Char(10)       Pos(324);<	003400	Dcl-Ds *n PSDS;				006700	I	SDS			
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<										1 10 @PGM	_E
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<					11						_ <u>E</u>
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<			Zoned(3:0)	Pos(37);	11				3	7 390@PARMS	
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<			Char(7)								
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<											
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<											
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<	004200	<b>@JOBNO</b>	Char(6)	Pos(264);					26	4 269 @JOBNO	Ē
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<			Char(10)	Pos(304);	11		I		30	4 313 @SRCF	_E
004501       End-Ds;         004600       //         004400       Dc1-Ds APIERR;         004400       BinDec(9:0)       Pos(1) IX2(256);         004400       ERRSIZ         004500       I         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005000       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       ERRVIC         005200       End-Ds;         005200       End-Ds;         005200       End-Ds;         005200       CL Ds *n;         005500       McGLEN       BinDec(9:0)         005500       McGLEN       BinDec(9:0)       Pos(1) IXZ(0);         005500       McGLEN       BinDec(9:0)<				Pos(314);	11				31	4 323 @SRCL	E
004600 /// 00 FULDS APTERR: 006800 IAPTERR DS 004900 ERRSLE BinDec(9:0) Pos(1) IX/256); 004900 ERRSLE BinDec(9:0) Pos(1) IX/20); 005000 ERRNER Char(7) Pos(9) IX?; 005000 ERRNER Char(7) Pos(9) IX?; 005000 ERRNER Char(7) Pos(9) IX?; 005000 ERRNER Char(7) Pos(9) IX?; 005000 ERRNER Char(240) Pos(1) IX?; 005000 II 1 0 B 1 40FERR DS 008300 II 0 B 5 80FRNER 008300 II 1 0 B 1 40FERR DS 008300 II 1 0 B 5 80FRNER 008300 II 1 12 1726 ERRNER 008500 II 1 12 1726 ERRNER 008500 II 1 12 5 ERRNER 008500 II 0 DS 008500 IS 008500 IS 008			Char( <mark>10</mark> )	Pos(324);	11				32	4 333 @SRCM	_E
004700         Dcl-bs.AptCRR;         008400         ERRS1Z         BinDec(9:0)         Pos(1)         IXZ(256);         008300         I         256         B         1         40RRS1Z           0044000         ERRS1Z         BinDec(9:0)         Pos(1)         IXZ(256);         008300         I         0         B         5         8087RMLC           005100         ERRNTA         Char(7)         Pos(1)         IXZ(35);         008300         I         0         B         5         8087RMLC           005100         ERNOTA         Char(240)         Pos(1)         IXZ(1)         0         B         5         8087RMLC           005201         End-0s;         008300         I         0         D5         008300         I         008300         <				-				DC			
004900 ERRIZ BinDec(9:0) Pos(1) INZ(256); 005500 ERRNUR Char(7) Pos(9) INZ; 005500 ERRNUR Char(7) Pos(9) INZ; 005500 ERRNUR Char(7) Pos(9) INZ; 005500 ERRNUR Char(240) Pos(17) INZ; 005500 ERRDTA Char(240) Pos(17) INZ; 005500 CL-Ds*n; 005500 MSGCTR BinDec(9:0) Pos(1) INZ(0); 005500 MSGCTR BinDec(9:0) Pos(1) INZ(0);		Dol-De ADTERR							P	1 40588517	
004900         ERRLEN         BinDec(9:0)         Pos(5) INZ(0);         008300         II         9 15 ERRNTC           005500         ERRNTR         Char(1)         Pos(1) INZ;         008300         II         16 16 ERRNTR           005201         End-Us;         008300         I         17 256 ERRNTA         008400         I           005201         End-Us;         008300         I         17 256 ERRNTA         008400         I           005201         End-Us;         008300         I         008400         I         008400         I           005201         End-Us;         008300         I         008400         I         008400 <t< td=""><td></td><td></td><td>BinDec(9.0)</td><td>Pos(1) IN7(256):</td><td></td><td></td><td></td><td>250</td><td></td><td></td><td></td></t<>			BinDec(9.0)	Pos(1) IN7(256):				250			
005000         ERRNIC         Char(7)         Pos(9) IX2;         008400         I         16         16 ERRNER           005100         ERRNIC         Char(7)         Pos(9) IX2;         008400         I         1726         1726           005201         ERROTA         Char(240)         Pos(17) IN2;         008500         I         1725         008500         I           005201         ERROTA         Char(240)         Pos(17) IN2;         008500         I         008500         I         008600         I*           005201         ERROTA         Char(240)         Pos(1) IN2;         008600         I*         0086700         I*         008670         0086700         I*         008670         008670         I*         008670         008670         008670         008670         I*         008670         008670         I*         008670         008670         008670         008670         008670         008670         008670         008670         I*         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670         008670 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>~</td> <td></td> <td></td> <td></td>								~			
005100 ERRNBR Char(1) Pos(16) INZ; 008500 I I 1 17 256 ERRDTA 005200 ERRDTA Char(240) Pos(17) INZ; 088600 I * 005300 // 005400 DC1-0s*n; 009500 I 0 0 B 1 40MSGCTR 005500 MSGCTR BinDer(9:0) Pos(1) INZ(0); 09900 I I 0 B 5 80MSGLEN 005500 MSGCTR BinDer(9:0) Pos(1) INZ(0); 09900 I I * 005500 MSGCTR BinDer(9:0) Pos(1) INZ(0); 09900 I I * 009000 I I 0 B 2 80KSGF FLGHT400 ' 9 28 MSGF			Char(7)								
005201 End-Ds; 005300 // 005300 DC1-Ds *n; 005500 MSGCTR BinDec(9:0) Pos(1) INZ(0); 005500 MSGCTR BinDec(9:0) Pos(2) INZ(0); 005500 MSGCTR BinDec(9:0) Pos(5) INZ(0); 009000 I I *RSNSGF FLGHT400 '9 28 MSGF 009000 I I *RSNSGF FLGHT400 '9 28 MSGF 009000 I I *RSNSGF FLGHT400 '9 28 MSGF 009000 I V *RSNSGF FLGHT400 '9 28 MSGF 009000 I V *RSNSGF FLGHT400 '9 28 MSGF	005100	ERRNBR	Char(1)	Pos(16) INZ;		008500	II				
005300 // 008800			Char(240)	Pos(17) INZ;							
005400 Dcl-Ds *n; 008500 II 80 B 5 80M5GLEN 005500 M5GCTR BinDec(9:0) Pos(1) INZ(0); 009000 II "FRSM5GF FLGHT400' 9 28 M5GF 009000 II "FRSM5GF FLGHT400' 9 28 M5GF 0000 V V V V V V V V V V V V V V V V V											
005500 MSGTER BinDer(5:0) Pos(1) IN2(0): 09000 I I *RSMSGF FLAT400 *9 28 MSGF 009000 I I *RSMSGF FLAT400 *9 28 MSGF 000100 I I * **RSMSGF FLAT400 *** *** *** *** *** *** *** *** ***											
005600 MCGLEN BinDec(0.0) Doc/5) TN7/90).			DisDec(0,0)								
		MSGLEN		POS(1) INZ(0); Pos(5) INZ(80);	*						*
	<	CONTRACTOR OF THE OWNER			)	<					

https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=AN&subtype=CA&htmlfid=897/ENUS217-151&appname=lenovous&language=en

https://www.arcadsoftware.com/resource-items/arcad-transformer-rpg-free-format-rpg-conversion/

### IBM Developer – The Merlin IDE





- Outline View
- Tokenization
- Content Assist
- Code formatting
- Understand Languages
  - RPG
  - SQL
  - Embedded SQL
  - CL
  - Cobol
  - DDS

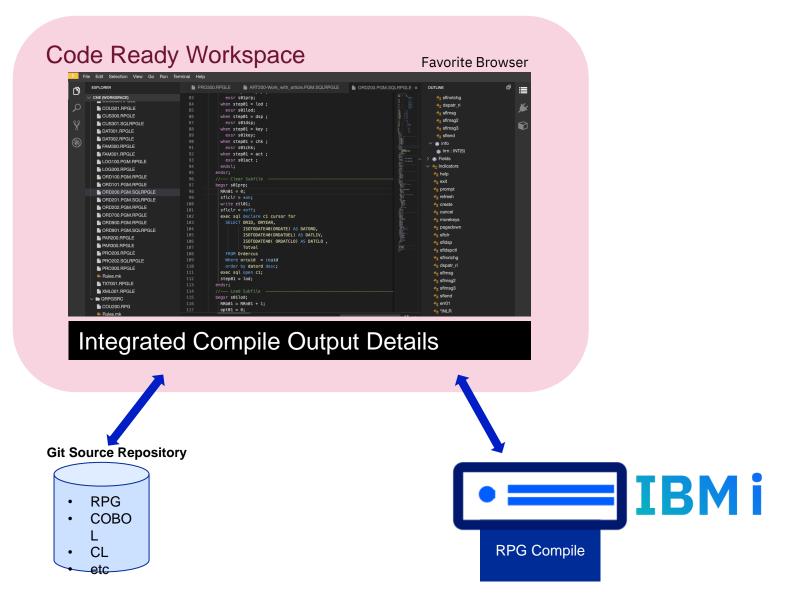
V OHE (MORECARDE)       83       exsr s01prp;         COUSOL RPGLE       84       when step01 = lod;       % sfmsg2         COUSOL RPGLE       86       when step01 = dsp;       % sfmsg2         D CUSSOL RPGLE       88       when step01 = dsp;       % sfmsg3         D DATOOL RPGLE       88       when step01 = key;       % sfmsg3         D DATOOL RPGLE       90       when step01 = act;       % sfmsg3         D DATOOL PRGLE       91       exsr s012ch;       % sfmsg3         D DATOOL PRGLE       92       when step01 = act;       % sfmsg3         D COSOOL PRGLE       93       exsr s012ch;       % sfmsg3         D COSOOL PGM.RPGLE       93       exsr s012ch;       % sfmsg3         D ORDOOL PGM.RPGLE       93       exsr s012ch;       % sfmsg3         D ORDOOL PGM.RPGLE       93       exsr s012ch;       % sfmsg3         D ORDOOL PGM.RPGLE       94       ends1;       % sfmsg3         D ORDOOL PGM.RPGLE       94       ends1;       % sfmsg3         D ORDOOL PGM.RPGLE       94       sftlc1 = son;       % sfmsg3         D ORDOOL PGM.RPGLE       94       sftlc1 = son;       % sfmsg3         D ORDOOL PGM.RPGLE       94       sftlc1 = son;	EXPLORER	PRO:	300.RPGLE ART200-Work_with_article.PGM.SQLRPGLE	ORD200.PGM.SQLRPGLE ×	OUTLINE	đ
■ COU301.RPGLE       84       when step01 = 00;       ***		83	exsr s01prp;		nt sflnxtchg	
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### IBM Developer – The Merlin IDE





Compile a single program or Build an Application

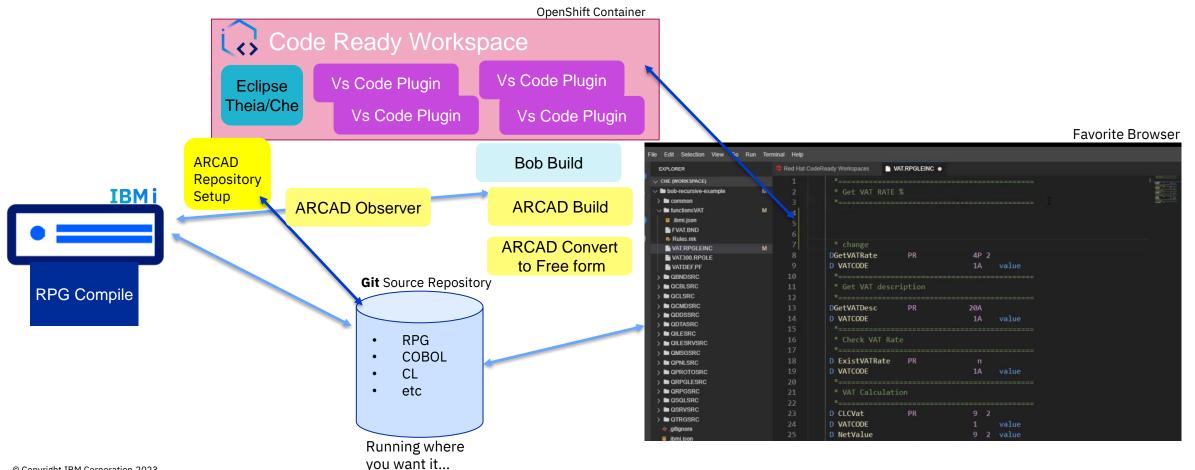




### **IDE** - Today

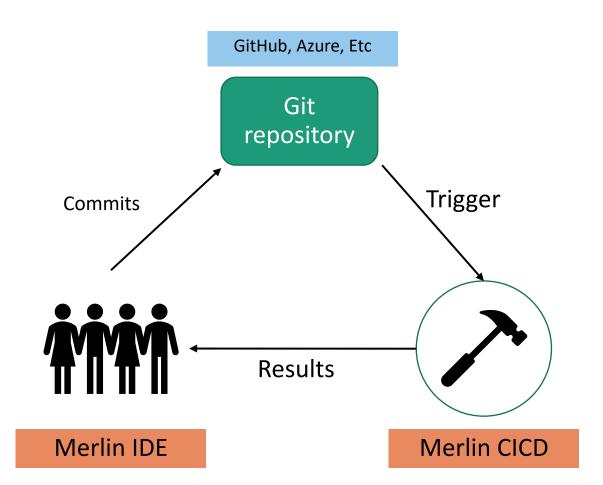


- Rich editing capability
- Build / Compile your project \_



# What is continuous integration?

- Developers commit code to a shared repository regularly
- Repository pushes cause a build to trigger automatically
- Immediate feedback based on build result





# Why CI?

Detect problems or bugs, as early as possible, in the development life cycle Potential bugs and errors are caught earlier in the life cycle which results in better quality software

Fixing broken builds should be treated as a high priority issue for all team members The deployment process should be automated, with no manual steps involved



# Types of 'builds'

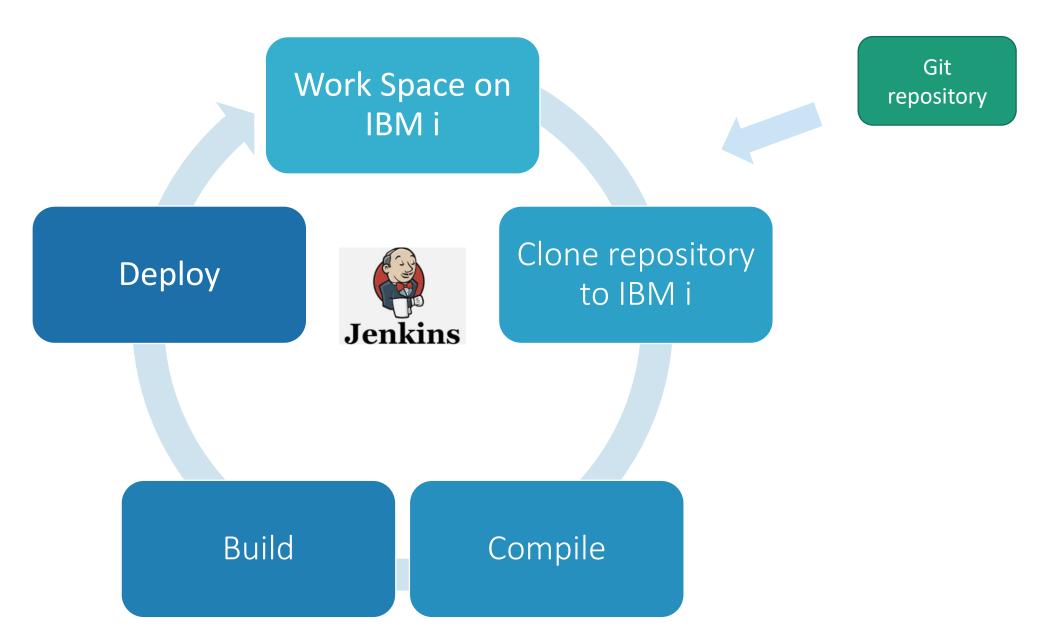
Build

Compile

- Build of entire application, or
- Build of specific portion of application (e.g. a display file and any dependent programs)
- Compilation of a specific sources without the need of launching larger build

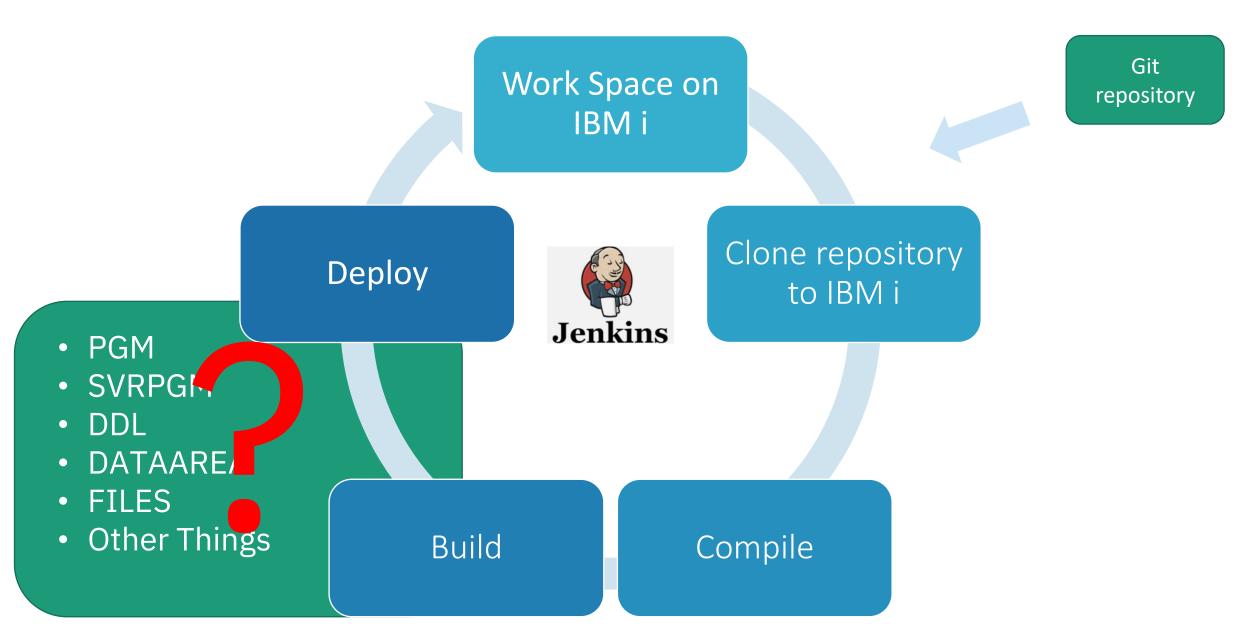
# CI/CD Flow Today



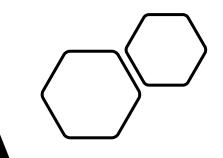


## CI/CD Flow Today





## Any build tool



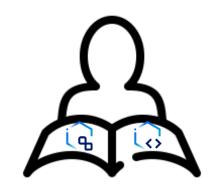
- ARCAD Builder
- Custom build tools
- GNU Make
- ibmi-bob
- Other options ??

# ARCAD Builder

- Automatically detects projects dependency tree
- Highly optimized smart builds and minimal clones
- Integrated into Jenkins, Merlin IDE and Merlin CICD



# Where can I Learn More about Merlin ?





## Merlin Product Page

TRM



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## Image: Second and DevOps Image: Second a

Search

IBM i Modernization Engine for Lifecycle Integration

A development and modernization environment for IBM i applications



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## IBM i Merlin

The coolest IBM product since ADDPFM

Get Started

https://ibm.github.io/merlin-docs/#/

Modern Documentation Hosted on IBM GitHub Targeted for Hands on Usage

- Overview
  - > Merlin
  - > Platform
  - > FAQs
- Source control
- > Moving into git
- OpenShift
- Requirements (todo)

 $\equiv$ 

- > IBM Entitlement
- > Installing Merlin

#### Merlin

- > App Installation
- > Configuration
- > Basic Flows

#### Merlin IDE

- > Usage
- > ARCAD

#### Merlin CICD

- > Usage & Jenkins
- > ARCAD Builder
- > ibmi-bob

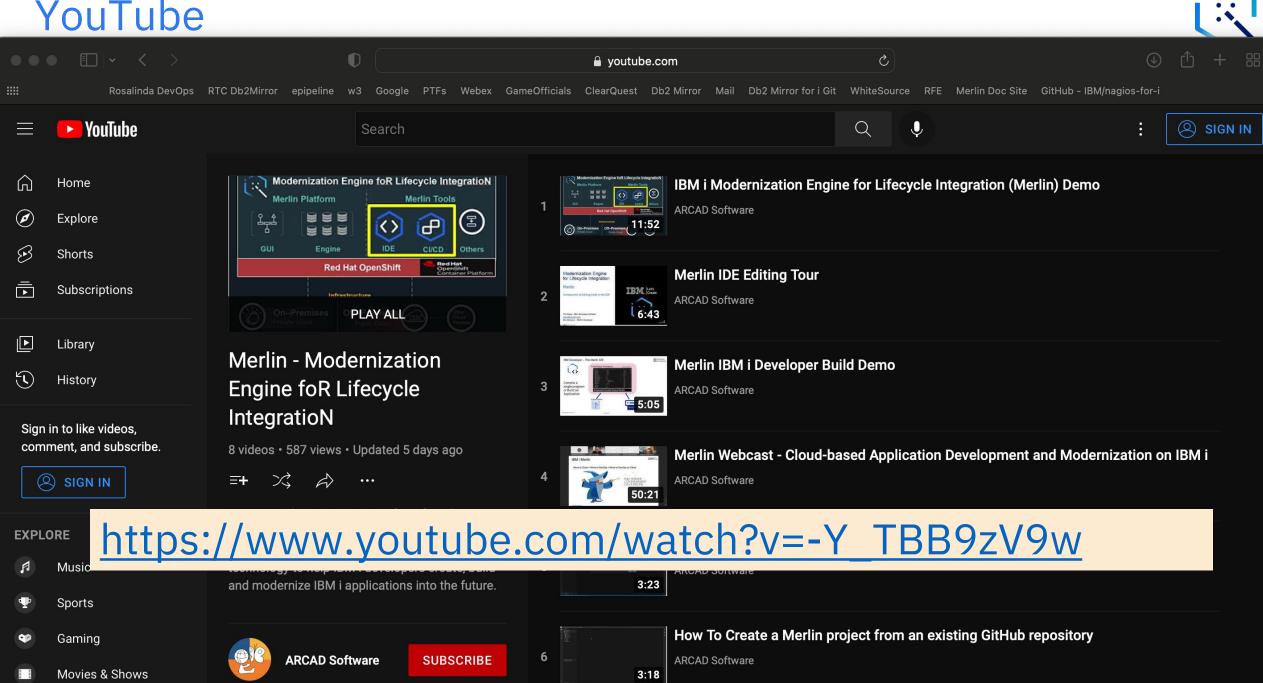
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Home	✓ Overview	
Overview Dashboard	IBM i Modernization Engine for Lifecycle Integration (Merlin IBM i Modernization Engine for Lifecycle Integration (Merlin in the hybrid cloud world. Providing cloud native tools to hel application using standard cloud methods.	ifecycle Integration a) environment has been created to help IBM i users interact b) with modern development and deployment of IBM i native
Projects	Quick Launch	- S
Tools		
Connections	<u>ן רק' רא' רא</u>	>
Provision	IBM i CI/CD         IBM i Developer         IBM i Developer           In merlin-tools         In merlin-tools         In zlj-0	
Authorization	>	
User Management	> Vault Status	- S
Rest APIs	Vault server status:     Output       Token status:     Valid	
Serviceability	>	

IBM i Modernization Engine for Lifecycle Integration (Merlin) is a set of tools run in OpenShift containers which guide and assist software developers in the modernization of IBM i applications, allowing them to realize the value of a hybrid cloud, multi-platform DevOps implementation.

#### Getting started videos

### https://ibm.github.io/merlin-docs/#/

## YouTube



## **IBM i Guided Tours**

- Every Wednesday, 9:00 am Central US Time
  - Everyone is welcome: IBMers, Partners and Customers
  - To register click here
- Series 1 Merlin Guided Tours currently on Series 2
  - Introduction to Merlin and Office Hours (Open for questions)
  - Introduction to the IDE
  - Introduction to the CI/CD capabilities
  - Installation and Configuration



#### https://ibm.webex.com/ibm/onstage/g.php?PRID=bcdcfadf19e9baf2f05ddb4408b445ea



## Best way to touch Merlin?



## Merlin Testdrive

- Public Access
- Pre-Set up
- Place to touch Merlin and get a feel for it
- Pre-Defined RPG App for Edit and Build Purpose
- Not intended for POC
- Requires an Opportunity number



https://ibm.github.io/merlin-docs/#/./guides/overview/sandbox

#### Quick Reference Guide

#### IBM i Modernization Engine for Lifecycle Integration (Merlin) Test Drive

- Overview
- This offering provides shortterm access to a pre-configured IBM i Merlin environment.

## IBMi



IBM Client Engineering for Systems



- Target Audience
- Tech-Sellers and Business Partners who wish to provide a hands-on experience to their clients with the IBM i Merlin product, to help advance an IBM Power opportunity.
- IBM i Experience is recommended.
- Clients can participate with their Tech-Seller requesting the offering.
- IBM i development provides support to your client.
- Client Engineering for Systems supports the systems and infrastructure.
- Do you need access to an environment to showcase IBM i Merlin, and to provide a client hands-on access?
- If so, this offering may be what you're looking for!

#### **Value Proposition**

- Realize the value of a hybrid cloud, multiplatform DevOps implementation.
- Gain hands-on experience with the technology.
- A self-guided tour and sample code are provided.
- Leverage, test, and / or demonstrate IBM i Merlin.
- The user is provided an OpenShift Merlin Workspace and a dedicated IBM i partition.
- IBM Client Engineering for Systems provides the infrastructure, IBM i Development provides the Merlin expertise, while you bring your client.
- VPN Access is provided to remotely access the environment; for the IBM Tech-Seller, BP, and for the client.

Duration



- Up to one week.
- Environment Limitations
  - This is not instructor led training or education.
  - This is not a custom PoC environment.
  - You are not to load HIPAA or PHI data on the IBM systems.

#### Contacts

Contact us at <u>ce4s@ibm.com</u>

(Please include an associated ISC Opp#, and a comment in the form that you're requesting "IBM i Merlin" access.)



## IBM i Modernization with Merlin





### US IBM Technology Services - IBM i MERLIN Service Capabilities

#### **MERLIN** platform installation and initial configuration:

- Configure Red Hat OpenShift Container Platform (OCP) Operator Hub for MERLIN operators
- Create OCP project for the install of MERLIN Operator, create MERLIN instance and launch MERLIN platform
- Configure MERLIN platform global artifacts: inventory, credentials, templates, and vaults
- Provide skills and knowledge transfer on MERLIN platform setup, administration, and operation

#### MERLIN platform tools: IBM i Developer and IBM i CICD

- Provide installation and configuration of the MERLIN platform tools
- Assist clients with the use of the tools including integration into Git repositories and IBM i development systems
  - IDE VSCode features and functions
  - CICD pipeline features and functions
  - Jenkins and Git integration
- Advise on the use of tools for application development, and CICD pipeline creation

#### **IBM i DevOps Discovery Sessions:**

- Explore capabilities of newly announced IBM i Modernization Engine for Lifecycle Integration (MERLIN)
- Explore solutions and tools from IBM i ISVs
- Align your devops CICD requirements and objectives with current IBM i devops solutions form IBM and IBM i ISVs
- Assist with developing roadmaps for initial IBM i devops and CICD initiatives

#### **IBM i DevOps Architecture and Sessions:**

- Craft devops architectures for hardware and software infrastructures supporting IBM i CICD devops initiatives
- Defne phases and scope of initial devops CICD initiatives
- Design details for repositorites, automation servers, CICD pipelines, and tool integrations including Open source options

#### IBM i Modernization with Merlin

### US IBM Technology Services - IBM i MERLIN Service Capabilities

#### Red Hat OpenShift Container Platform (OCP):

- Provide installation of OCP to client's on-premise IBM Power hardware or in the cloud (PowerVS)
- Implement Kubernetes management of pods and services, and container image management
- Advise on use of intuitive UI for deployment, management, and monitoring of containers
- Demonstrate existing Red Hat operator deployment

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# Thank You !





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