E51

Approaches to Application Development for z/VSE

Wilhelm Mild

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HiperSockets	OS/390*	WebSphere*
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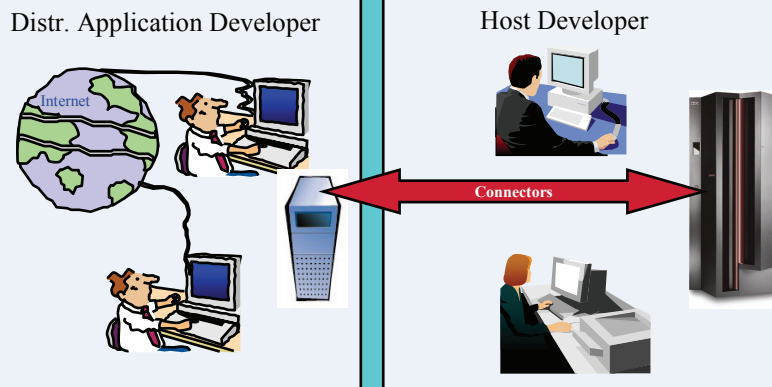Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation.
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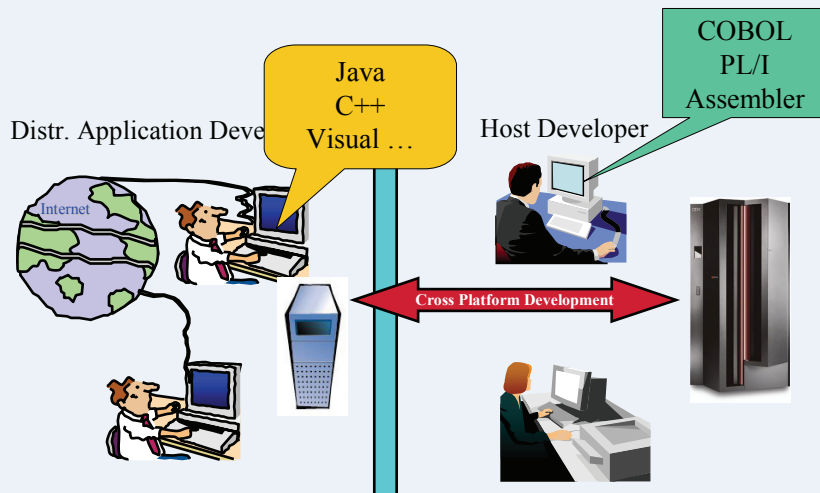Intel is a registered trademark of Intel Corporation.
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IT environments and their challenge

f **Two IT worlds want a common solution**

Distr. Application Developer

Host Developer

Internet

Connectors

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'Distributed' Development Landscape…

COBOL
PL/I
Assembler

Java
C++
Visual …

Distr. Application Deve…

Host Developer

Internet

Cross Platform Development

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Native VSE Application

- **Typical interdependencies ...**

VSE Application

Compiler ?

Target Environment ?
(batch/CICS)

Interfaces ?

JCL ?

Language ?

Setup ?

Coding
Techniques ?

Vendor Products ?
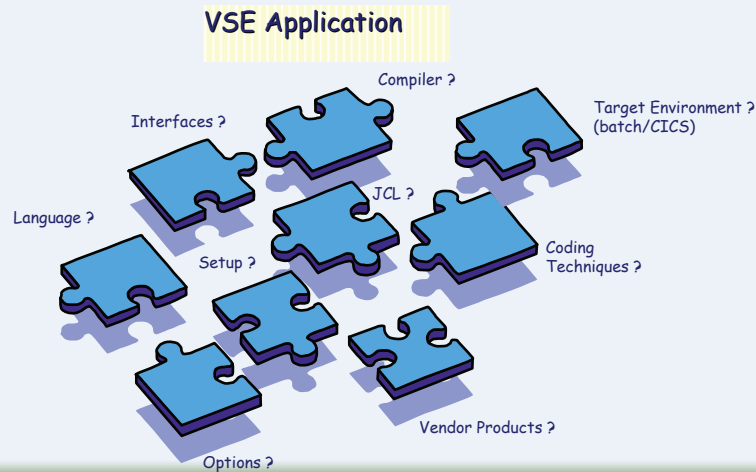
Options ?

Goals of today's IT

- **Optimization of Development**
  - **performant, less resources**
- **Omit redundancies**
  - **optimize processes**
- **Reduce IT complexity**
  - **efficient data flows and data stores**

VSE Development options

- **Existing applications**
  1) Use of modern tools for development (i.e. PC tools instead of ICCF)

  2) Modernize – develop graphical interfaces (in Java or COBOL)

- **New Applications for VSE**
  1) Use of modern development environments (i.e. Eclipse based)

  2) Cross-Platform solution development environments (i.e. 4GL Methods)

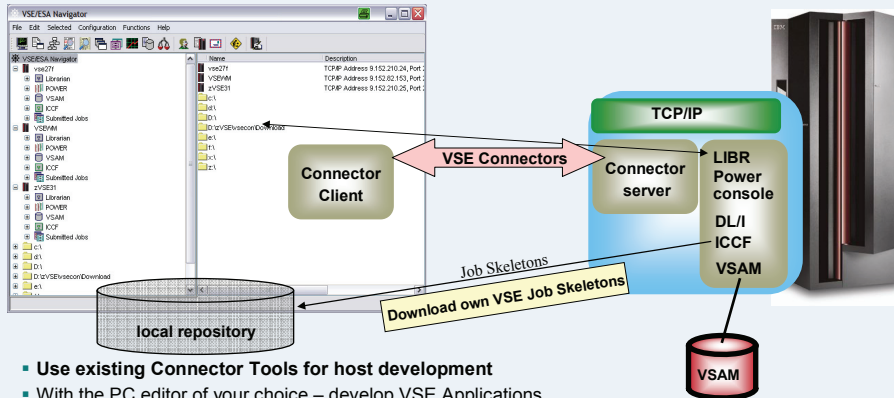# VSE existing application considerations

- **Interactive Interface Support to build your applications**
  - Primary Library, OPTION 8, in order to build your applications

- **JCL Skeletons for various application languages and call structures**
  - Batch main/subroutines, CICS or DB2 target environments etc.
  - Considerations for suitable translate and compile steps
  - Language independent stubs such as CICS DFHELII ...
  - Appropriate compile and pre-processor options etc.

- **Security Issues**
  - Every CICS TS transaction needs to be "security-enabled" prior to first execution
  - The IUI provides associated support via selection path "Resource Definition" --> "Define Transaction Security"

- **Program Maintenance from outside-VSE environment**
  - needs to ensure use of current compile skeletons, related options, stubs etc.

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Existing Applications

(1) Use of existing modern tools for z/VSE development

PC/Workstation with VSE Navigator

z/VSE Server

VSE/ESA Navigator
File Edit Selected Configuration Functions Help

Name	Description
vse27f	TCP/IP Address 9.152.210.24, Port
VSBAM	TCP/IP Address 9.152.82.153, Port
zVSE31	TCP/IP Address 9.152.210.25, Port

TCP/IP

Connector Client

VSE Connectors

Connector server

LIBR
Power console

DL/I
ICCF
VSAM

Job Skeletons

Download own VSE Job Skeletons
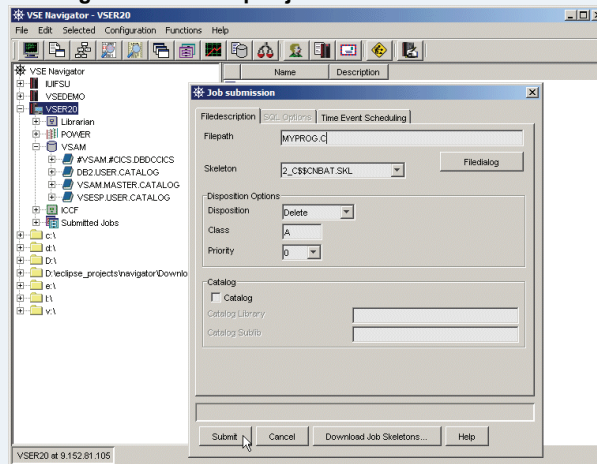
local repository

VSAM

- **Use existing Connector Tools for host development**
- With the PC editor of your choice – develop VSE Applications
- Use Helper plugins for PC – VSE process preparation (Compile, Analysis)

Existing Applications

(1) Use of existing modern tools for z/VSE development
Helper plugins

- **VSE Navigator: VSE compile/job submission …**

VSE Navigator - VSER20
File Edit Selected Configuration Functions Help

VSE Navigator
- IUIFSU
- VSEDEMO
- VSER20
  - Librarian
  - POWER
  - VSAM
    - #VSAM.#CICS.DBDCCICS
    - DB2.USER.CATALOG
    - VSAM.MASTER.CATALOG
    - VSESP.USER.CATALOG
  - ICCF
  - Submitted Jobs
- c:\
- d:\
- D:\
- D:\eclipse_projects\navigator\Downlo
- e:\
- t:\
- v:\

Name   Description

Job submission

Filedescription | SQL Options | Time Event Scheduling

Filepath   MYPROG.C

Skeleton   2_C$$CNBAT.SKL   Filedialog

Disposition Options
Disposition   Delete
Class   A
Priority   0

Catalog
☐ Catalog
Catalog Library
Catalog Sublib

Submit   Cancel   Download Job Skeletons…   Help

VSER20 at 9.152.81.105

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Existing Applications

(1) Use of existing modern tools for z/VSE development

Helper plugins

- **JCalc_LEVSE Tool**
  - SVA related Phase allocations – report, downloaded to PC ...
    http://www.ibm.com/servers/eserver/zseries/zvse/downloads/tools.html

- **JLink_LEVSE Tool**
  - Analyze lists + generate report in Browser
    http://www.ibm.com/servers/eserver/zseries/zvse/downloads/tools.html

- **JDisplay_AR_Commands**
  - Java front-end in WebSphere environment, connecting to z/VSE server, exploiting VSE Connector API for console communication ...
    http://www.ibm.com/servers/eserver/zseries/zvse/products/connectors.html

z/VSE Home➔ Downloads ➔ Tools

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JCalc_LEVSE Tool (Part 2)

❏ **The basic functionality**
  - ➢ Allocate descriptions to modules identified (focus on SVA eligible routines)
  - ➢ Prepare a JTable overall view (with option to calculate a storage summary)

Routine Name	Description	Decimal Size	SVA Eligible	AMODE	RMODE	SVA List
CEEBINIT	Initialization/termination for batch	53856	YES	24	24	$SVACEE
CEEBLIBM	Library routine retention init/term	20184	YES	ANY	24	$SVACEE
CEEBLRR	Library routine retention interface	920	YES	ANY	24	$SVACEE
CEEBNATX	Null Abnormal termination exit	2	YES	31	ANY	$SVACEE
CEEBXTAN	Batch Abnormal termination exit table	274	YES	31	ANY	-

Note: Large phases marked red, default SVA entries in blue   Help   Calculate SVA loadlist   Cancel

  - ➢ Generate VSE shared virtual area (SVA) statistics/storage report

Chosen View Dependent Sum Calculation (in bytes)

Loadlist	SVA-31 Requirement	SVA-24 Requirement	Setup Type
$SVACEE	1122646	272608	IBM default
$SVAEDCM	1643420	0	IBM default
$SVAEDC	2291284	160	Optional
$SVAIBMM	212928	37024	Recommended
$SVAIBM	292719	37024	Optional
$SVAIGZM	155864	0	Recommended
$SVAIGZ	411240	169232	Optional

OK

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Existing Applications

(1) Use of existing modern tools for z/VSE development

Helper plugins

JLink_LEVSE_Analyzer Tool (Part 1)

❑ **Cross-check VSE Compile/link Lists**
- ➢ **GUI application front-end (3 step user-interaction: file chooser, build, show report)**
- ➢ **VSE application summary overview (e.g. resources involved, coding techniques ...)**
- ➢ **Event/context specific summaries & explanation (e.g. compile- options/messages ...)**
- ➢ **Specific warnings ... (e.g. indicators for improper stub usage etc.)**

JLink_LEVSE_Analyzer Tool - Copyright IBM Corp. 2005 - Build id: 20050224¥1.02

Purpose: Inspect Customer Provided Compile/Linklist(s)

○ **Step 1: Enter File Chooser Dialog**   ○ Step 2: Build LNKEDT Report   ○ Step 3: Show Analysis Report

Current processing status :   Browser in use : C:\Program Files\Internet Explorer\IEX

Type in optional report identifier, e.g. PMR #:

JLink_LEVSE_Analyzer Tool (Part 2)

❑ **Sample report generated (web browser view)**

C Prelinker - Object Resolution events

CEESETL	Unresolved prelink module reference. Also check linkage editor resolution
WARNING EDC4015:	Unresolved references are detected. Verify if the reference(s) given in this section are later resolved by the linkage editor

C Prelinker - Writable Static events

INFORMATIONAL EDC4013:	No map contents displayed as no writable static was found

Linkage editor - Autolink events

CEESG003	Signature module for C/VSE has been linked into application phase	Library reference not visible in link list (typical for C)
CEESTART	Compiler generated default entry point available	Library reference not visible in link list (typical for C)
EDCINPL	LE/C initialization triggered (might involve an assembler program with EDCPRLG and EDCEPIL macros coded)	Library reference not visible in link list (typical for C)
PRINTF	C Run-Time library function - printf (Format and Write Data)	Library reference not visible in link list (typical for C)

Linkage editor - Unresolved Reference events

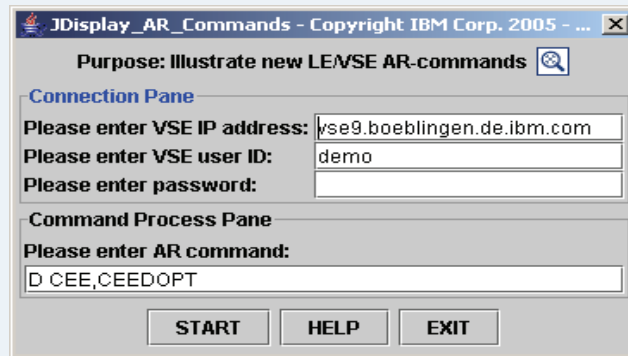|	
EXTRN CE$SETL	Do not code the CEESETL callable service. For C routines the setlocale() function should be used instead
WXTRN @@DLL	Internal LE/C reference, fine to be present

Slide 1

Existing Applications

(1) Use of existing modern tools for z/VSE development

Helper plugins

JDisplay_AR_Commands (Part 1)

❑ **GUI Communication with VSE Console**

JDisplay_AR_Commands - Copyright IBM Corp. 2005 - ... ☒

Purpose: Illustrate new LE/VSE AR-commands 🔍

Connection Pane

Please enter VSE IP address: `vse9.boeblingen.de.ibm.com`

Please enter VSE user ID: `demo`

Please enter password:

Command Process Pane

Please enter AR command:

`D CEE,CEEDOPT`

| START | HELP | EXIT |

Slide 2

Existing Applications

(2) Modernize – Develop graphical interfaces – in Java

PC/Workstation Front-End Development

z/VSE Server

TCP/IP

TN3270

LIBR
Power
console

DL/I
ICCF

CICS TS

VSAM

DB2

VSAM
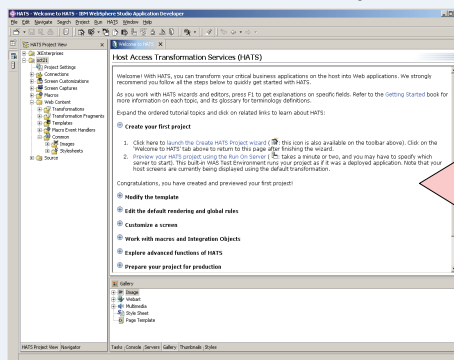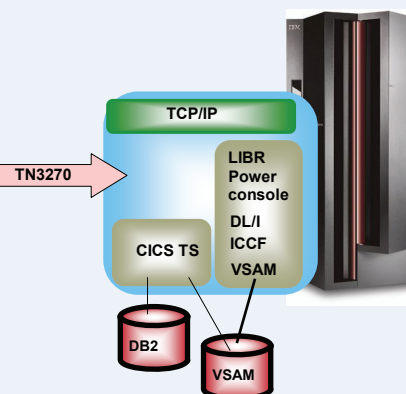
- **Application-Development – in Java** (i.e. HATS Studio or Eclipse)
- The new application accesses unchanged VSE application and data
- the new application is a web application using internet technologies

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HATS Advantages:
▪Combine / Integrate

Host Access Transformation Server (HATS)

- **A Web-to-host integrator, HTML emulator ...**
- **rules-based transformation engine, application integration ...**
- **converts green screens to graphical user interfaces in web applications**
- **improves ease-of-use of host applications.**
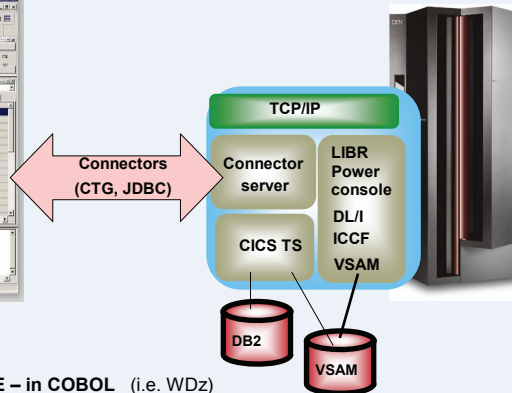
Benefit: Easily extend existing applications to the web

Existing and new Applications

(2) Modernize / new – Develop graphical interfaces – in Cobol

PC/Workstation COBOL Development

z/VSE Server

Connectors (CTG, JDBC)

TCP/IP

Connector server

LIBR Power console

DL/I ICCF VSAM

CICS TS

DB2

VSAM

local repository
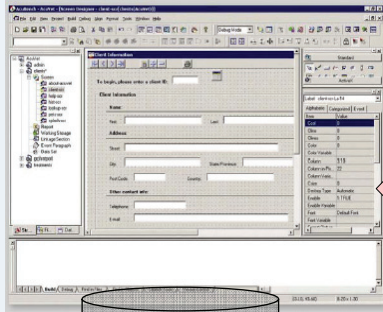
- **Application development on PC, for VSE – in COBOL** (i.e. WDz)
- Use existing COBOL expertise
- COBOL Compiler and Runtime (COBOL Virtual Machine) on PC
- New application in COBOL – access to existing data and applications via Connectors (CTG, JDBC)

Existing Applications

(1) Use of existing modern tools for z/VSE development

Conclusion

➢ **Core applications can be developed, maintained with modernized methods**

➢ **Existing development expertise is used**

➢ **increased effectiveness**

➢ **modern versioning software can be used**
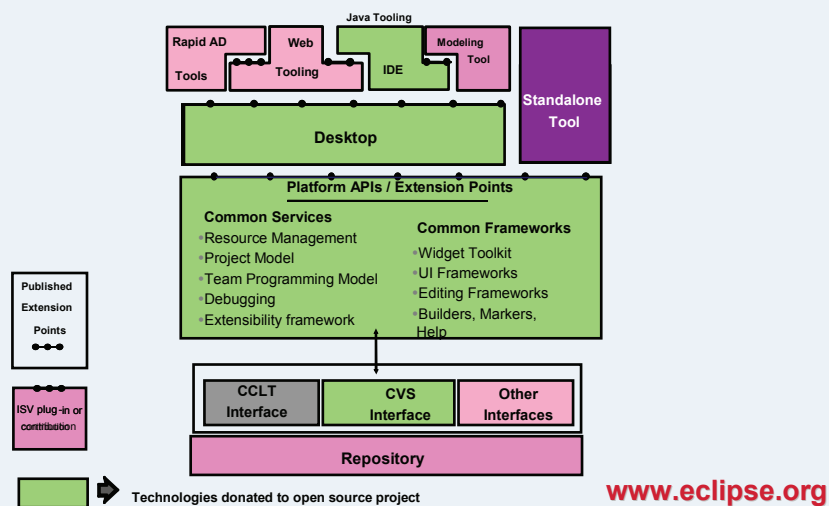
VSE Development options

- **Existing applications**
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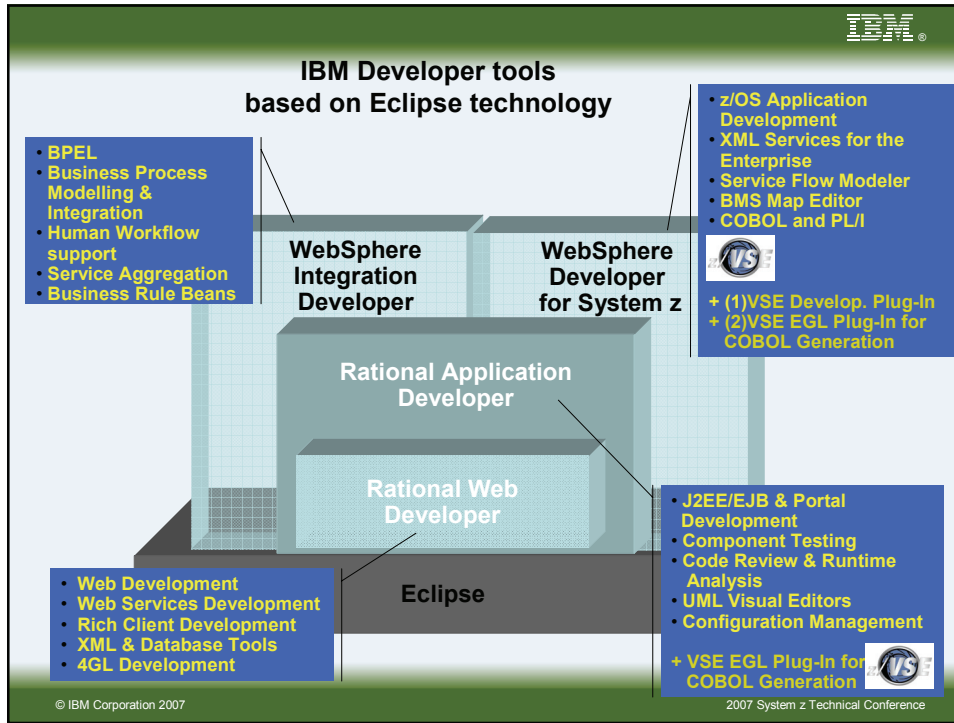
- **New Application for VSE**
  1) Use of modern development environments (i.e. Eclipse based)

  2) Cross-Platform solution development environments (i.e. 4GL Methods)

New applications for VSE
(1) Use of modern development environment !

Java Tooling

Rapid AD Tools | Web Tooling | IDE | Modeling Tool

Standalone Tool

Desktop

Platform APIs / Extension Points

Common Services
- Resource Management
- Project Model
- Team Programming Model
- Debugging
- Extensibility framework

Common Frameworks
- Widget Toolkit
- UI Frameworks
- Editing Frameworks
- Builders, Markers, Help

Published Extension Points

ISV plug-in or contribution

CCLT Interface | CVS Interface | Other Interfaces

Repository

Technologies donated to open source project

www.eclipse.org

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IBM Developer tools based on Eclipse technology

- **BPEL**
- **Business Process Modelling & Integration**
- **Human Workflow support**
- **Service Aggregation**
- **Business Rule Beans**

- **z/OS Application Development**
- **XML Services for the Enterprise**
- **Service Flow Modeler**
- **BMS Map Editor**
- **COBOL and PL/I**

WebSphere Integration Developer

WebSphere Developer for System z

+ **(1)VSE Develop. Plug-In**
+ **(2)VSE EGL Plug-In for COBOL Generation**

Rational Application Developer

Rational Web Developer

- **J2EE/EJB & Portal Development**
- **Component Testing**
- **Code Review & Runtime Analysis**
- **UML Visual Editors**
- **Configuration Management**

- Web Development
- Web Services Development
- Rich Client Development
- XML & Database Tools
- 4GL Development

Eclipse

+ **VSE EGL Plug-In for COBOL Generation**

Rational Application Developer (RAD)

Integrated Development Environment (IDE)

Functionality for Enterprise Development

- **Additional perspectives**
  EGL ...
- **Migration Assistance:**
  EGL V6 Migration, VisualAge Generator Migration
- **Control Windows/Views**
  EGL generation, SQL errors ...
- **Additional developer tools:**
  e.g. page designer, web site designer, portal tools, service data objects, XML tools, UML Visual Editor etc.

Tech-article: **IBM Rational Developer: Powerful support for rapid Java and J2EE development**
http://www.ibm.com/developerworks/rational/library/dec04/parkin/

Real time access to VSE data and subsystems with Java-Based Connector

Web Client

z/VSE Server

WebSphere AS

Browser

HTTP

RMI over IIOP

IIOP

- Java servlet or JSP

- EJB server

- Web Services

HTML, Java servlet, applet or EJB

JAVA BEANS

CONNECTOR

TCP/IP

Connector server

LIBR Power ICCF console DL/I VSAM

VSAM
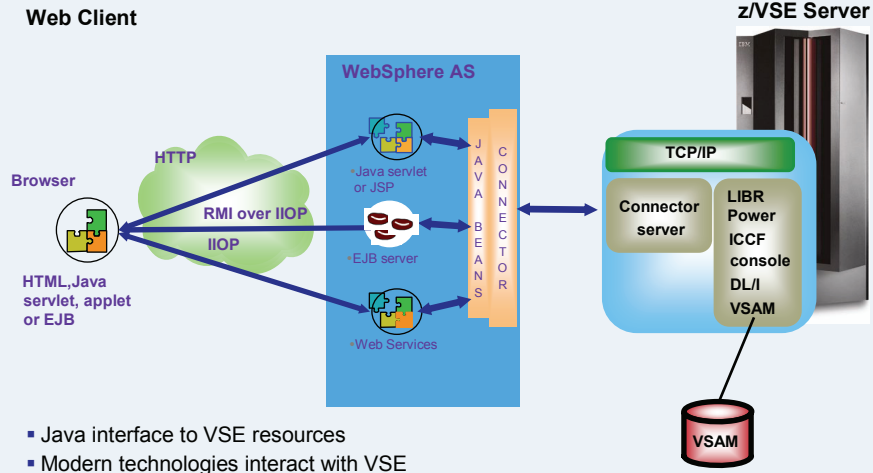
- Java interface to VSE resources
- Modern technologies interact with VSE

Rational Application Developer (RAD)
New applications for VSE
(1) Use of modern development environment !
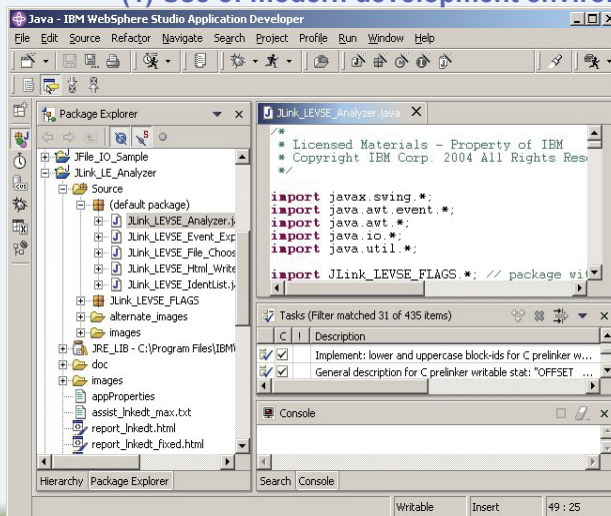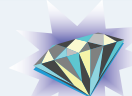
Based on the eclipse platform

http://www.eclipse.org
Open architecture for integrated Web- & application development. Supports the plug-in model

➢ **Different Perspectives**
Java-, Profiling-, Debugging-, CVS Repository-, J2EE-, XML ...
➢ **Basic Functions** like:
Project-, class-, interface-generation, code-formatting
➢ **Control Windows**
Source code, tasks, console-messages, package explorer ...
➢ **Developer Tools like:**
Profile-agents for analysis, javadoc generator
➢ **Tools for execution, test**

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JDisplay_AR_Commands tool

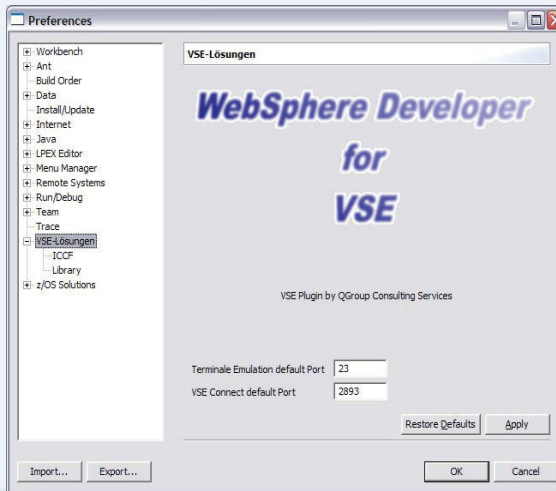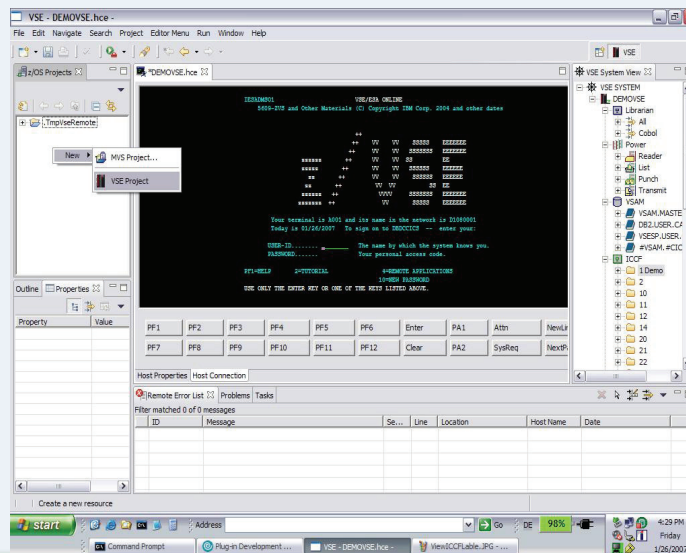❑ **VSE Console Messages in WebSphere Development Environment**
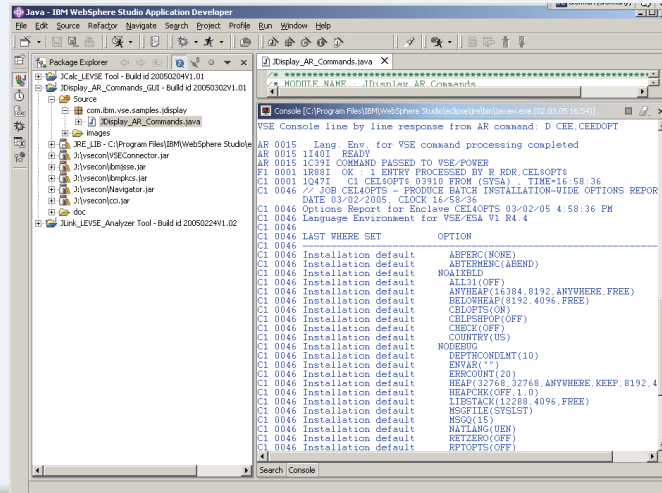
z/VSE Plug-in for WDz (Overview)
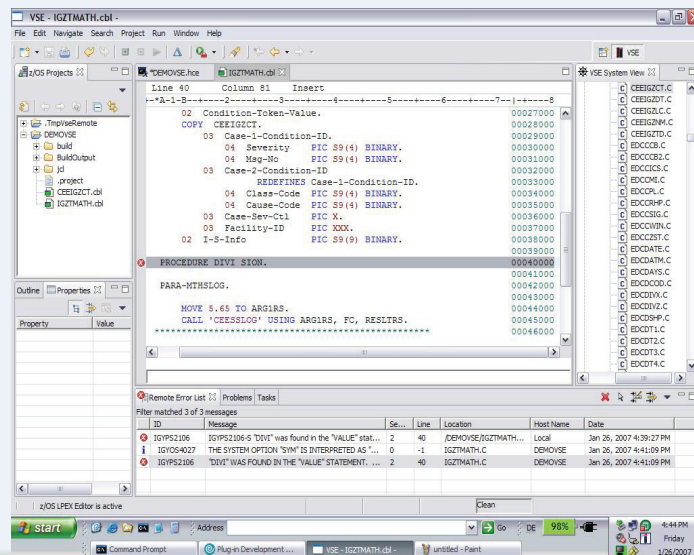
14

- z/VSE local and remote Compile
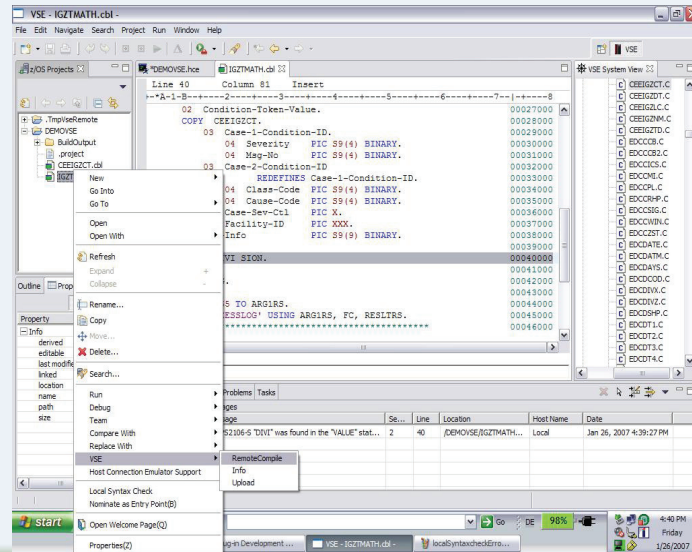
- z/VSE Syntax checking and highlighting

(2)Cross Plattform Solution development
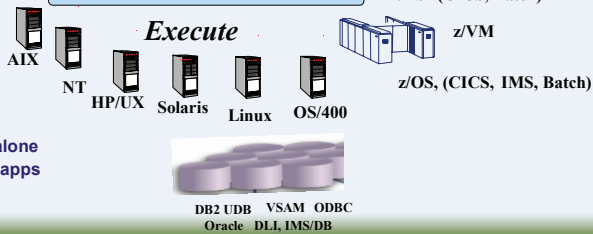### Approach with VisualAge Generator

Rapid Development

Develop Test

IBM 4GL history:
CSP (~1981) -> VAGen (~ 1994) -> EGL/ WSED (~2003)
Migration-Options available ...

Generation

Generate

Execution
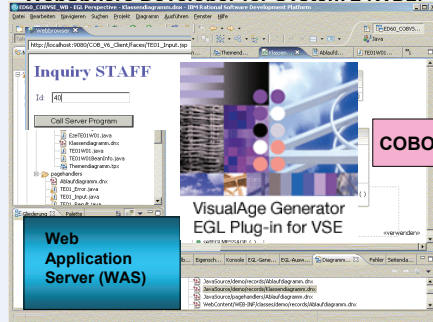
GUI, Java, HTML, C++, COBOL, PL/I

z/VSE(CICS, Batch)

Execute

z/VM

AIX

NT

z/OS, (CICS, IMS, Batch)

HP/UX   Solaris   Linux   OS/400

- Multiple platforms
- Client /Server Applications
- Java applets/servlets or standalone
- Multiple database/file support apps

DB2 UDB   VSAM   ODBC
Oracle   DLI, IMS/DB

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(2)Cross Plattform Solution development
Approach with VisualAge Generator

* New: VisualAge Generator EGL Plug-in for VSE *

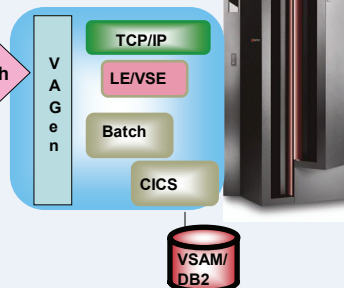**Rational Application Developer (RAD) or WebSphere Developer for System z (WDz)**

z/VSE

Inquiry STAFF

Id 40

Cell Server Program

„Generate"

VisualAge Generator
EGL Plug-in for VSE

COBOL/CICS/batch

V A G e n

TCP/IP

LE/VSE

Batch

CICS

Web Application Server (WAS)

VSAM/ DB2
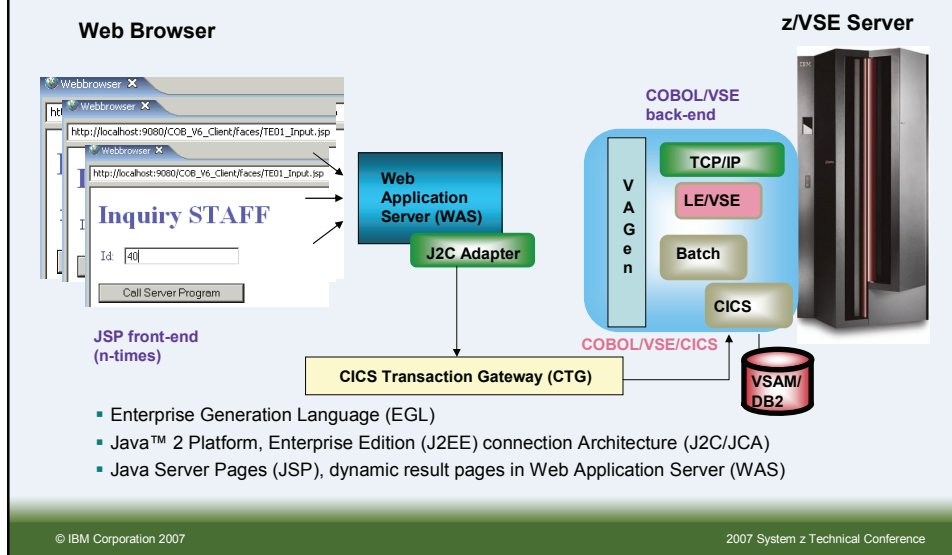
- Enterprise Generation Language (EGL), Visual Age Generator
- Java™ 2 Platform, Enterprise Edition (J2EE) connection Architecture (J2C/JCA)
- Java Server Pages (JSP), dynamic result page known by the Web Application Server (WAS)

Components for the 4GL runtime

Web Browser

z/VSE Server

Webbrowser ✕
http://localhost:9080/COB_V6_Client/faces/TE01_Input.jsp

Webbrowser ✕
http://localhost:9080/COB_V6_Client/faces/TE01_Input.jsp

Inquiry STAFF

Id: 40

Call Server Program

JSP front-end (n-times)

Web Application Server (WAS)

J2C Adapter

COBOL/VSE back-end

V A G e n

TCP/IP

LE/VSE

Batch

CICS

COBOL/VSE/CICS

CICS Transaction Gateway (CTG)

VSAM/ DB2

- Enterprise Generation Language (EGL)
- Java™ 2 Platform, Enterprise Edition (J2EE) connection Architecture (J2C/JCA)
- Java Server Pages (JSP), dynamic result pages in Web Application Server (WAS)

Types of generated Programs via EGL

➢ **VSE applications**
  ➢ **CICS applications,**
    ➢ **including the Compile/Link Jobs and CICS definitions**
  ➢**batch applications**
    ➢ **including Compile/Link Jobs**
➢ **It's very easy to switch the data access method (i.e from VSAM to SQL)**

➢ **Web applications:**
  ➢ **Standalone (without access to VSE)**
  ➢ **With access to Core applications (Core existing CICS, or EGL generated)**

➢ **Distributed Applications**
  ➢ **Mixed applications with a client part and a VSE part in COBOL**

A 'Common' Development environment !

Eclipse is the base !

Rational Application Developer (RAD)

- **Overview RAD for WebSphere Software**
  http://www.ibm.com/software/awdtools/developer/application/index.html
- **Download RAD V6001**
  http://www.ibm.com/support/docview.wss?uid=swg24009346
  - http://www.ibm.com/developerworks/downloads/r/rad
- **Rational Software downloads**
  - http://www.ibm.com/developerworks/websphere/downloads/plugin/
- **Rational Technical Library**
  - **http://www.ibm.com/developerworks/rational/library/**
- **Rational Technical Resources + Best Practices**
  - **http://www.ibm.com/developerworks/rational/**
- **IBM Software Products**
  - **http://www.ibm.com/software/sw-bycategory/subcategory/SW740.html**

Enterprise Generation Language (EGL)

- **Visual Age Generator**
  http://www.ibm.com/software/awdtools/visgen
- **Program Directory (includes setup prerequisites …)**
  http://www.ibm.com/software/awdtools/visgen/library/v45docs.html
- **Overall EGL**
  - **http://www.ibm.com/developerworks/rational/products/egl/**
- **EGL Language Resources (check for latest references - V6 level)**
  - **http://www.ibm.com/developerworks/rational/library/egldoc.html**
- **Samples / Practice**
  - EGL integration with Java using Rational Application Developer V6
    http://www.ibm.com/developerworks/rational/library/05/510_java/#download
  - Generating COBOL using EGL and JSF with WebSphere Studio Enterprise Developer
    http://www.ibm.com/developerworks/websphere/library/techarticles/0502_barosa/0502_barosa.html
    Note: target system in this sample is not z/VSE 3.1 but can be customized !
    It is recommended to use RAD V6 instead WSED !
  - Generating Java using EGL and JSF with WebSphere Studio Site Developer V5.1.2
    http://www.ibm.com/developerworks/websphere/library/techarticles/0408_barosa/0408_barosa.html

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z/VSE Additional Information

- z/VSE Home Page
  http://www.ibm.com/servers/eserver/zseries/zvse/

- z/VSE Solutions and Utilities
  http://www-1.ibm.com/servers/eserver/zseries/zvse/solutions/

Redbooks

- e-business Solutions for VSE/ESA   SG24-5662

- e-business Connectivity for VSE/ESA   SG24-5950

- CICS Transaction Server for VSE/ESA
  CICS Web Support   *SG24-5997-00*

- *Handbook For WebSphere 5*   *SG24-7042*
  (Connectors to z/OS and VSE)

We appreciate your comments on z/VSE: zvse@de.ibm.com