Session ID: SPC251
Unicode Interfaces – Data Exchange Between Unicode and non-Unicode Systems

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Dr. Christian Hansen, SAP AG

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Agenda

Introduction

- About Code Pages
- Communication: The Ideal Picture
- Communication: The Reality

Part I – RFC SAP R3 ←→ SAP R3

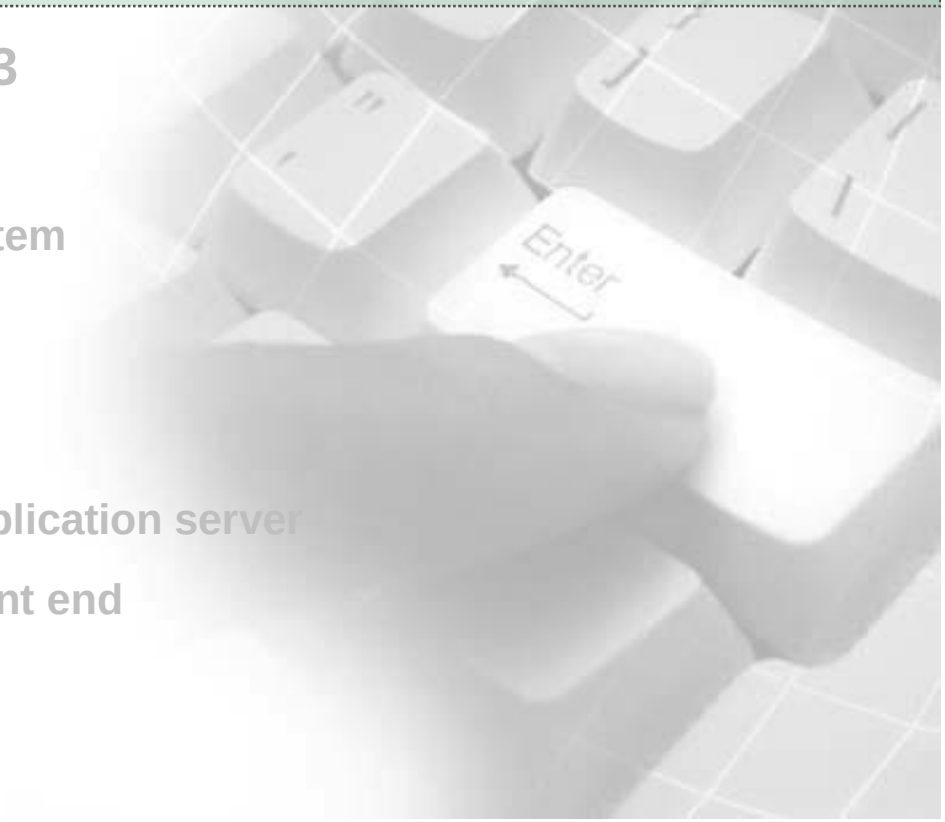
- Unicode ←→ Unicode
- Unicode ←→ single code page system
- Unicode ←→ MDMP system

Part II – File transfer

- Writing and reading files on the application server
- Writing and reading files on the front end

Part III – Common mistakes

Exercises I



Agenda

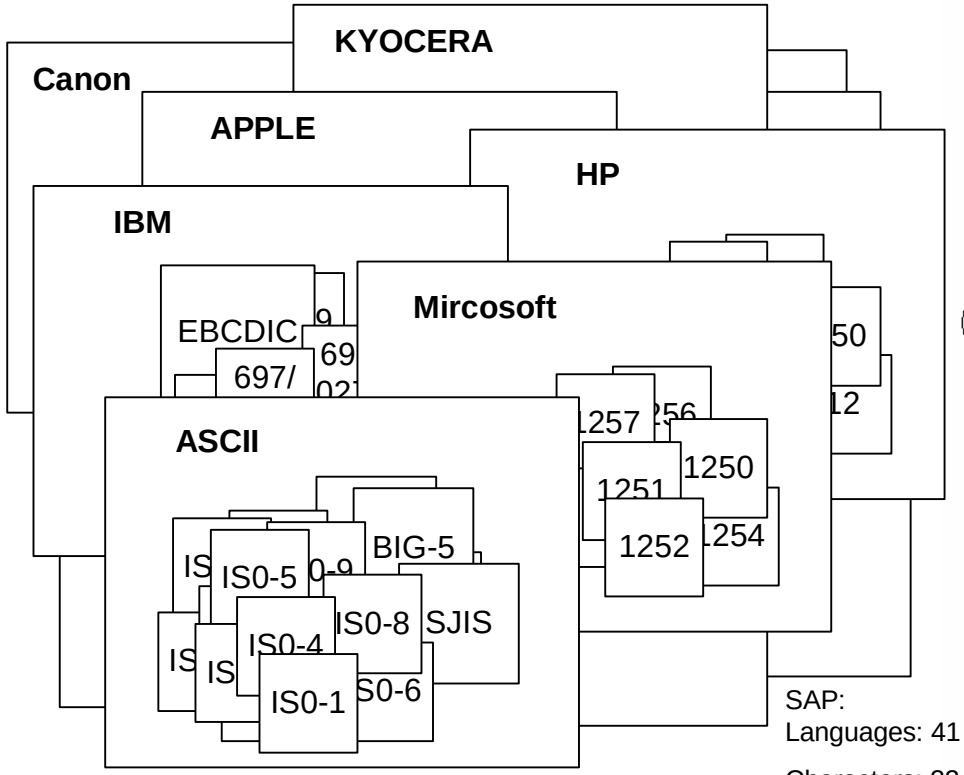
Part IV RFC SAP R3 ←→ RFC client

- Unicode interface for C programming
- Other languages

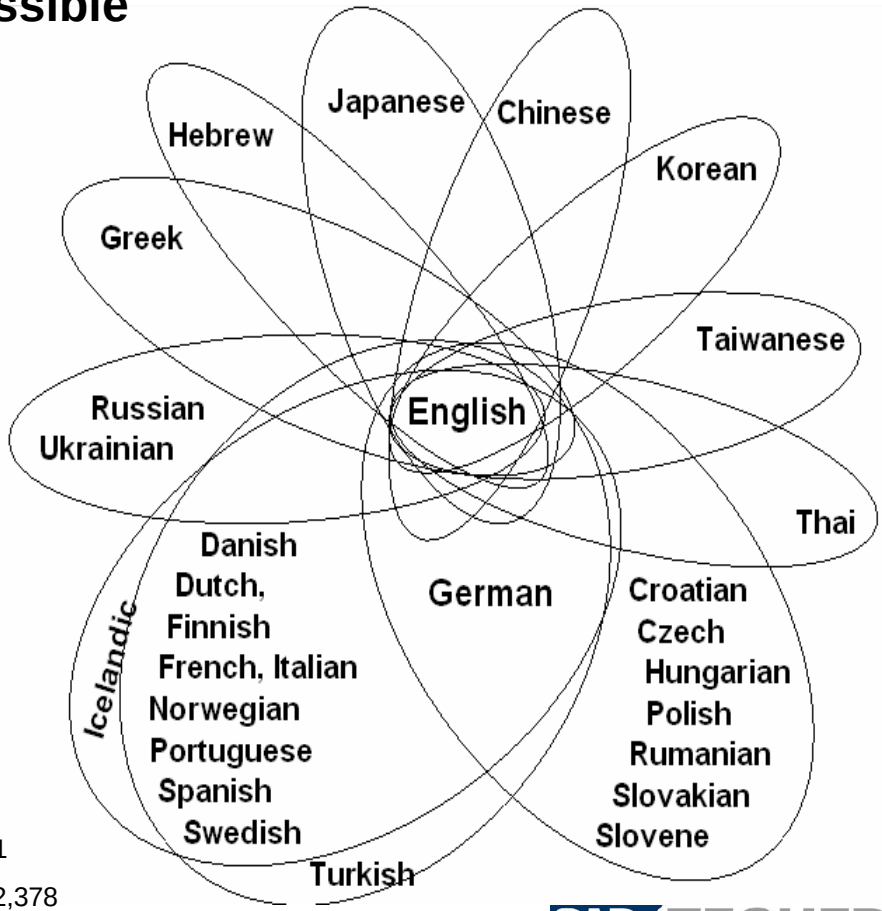
About Code Pages: Conventional Code Pages

Disadvantages of old standard code pages

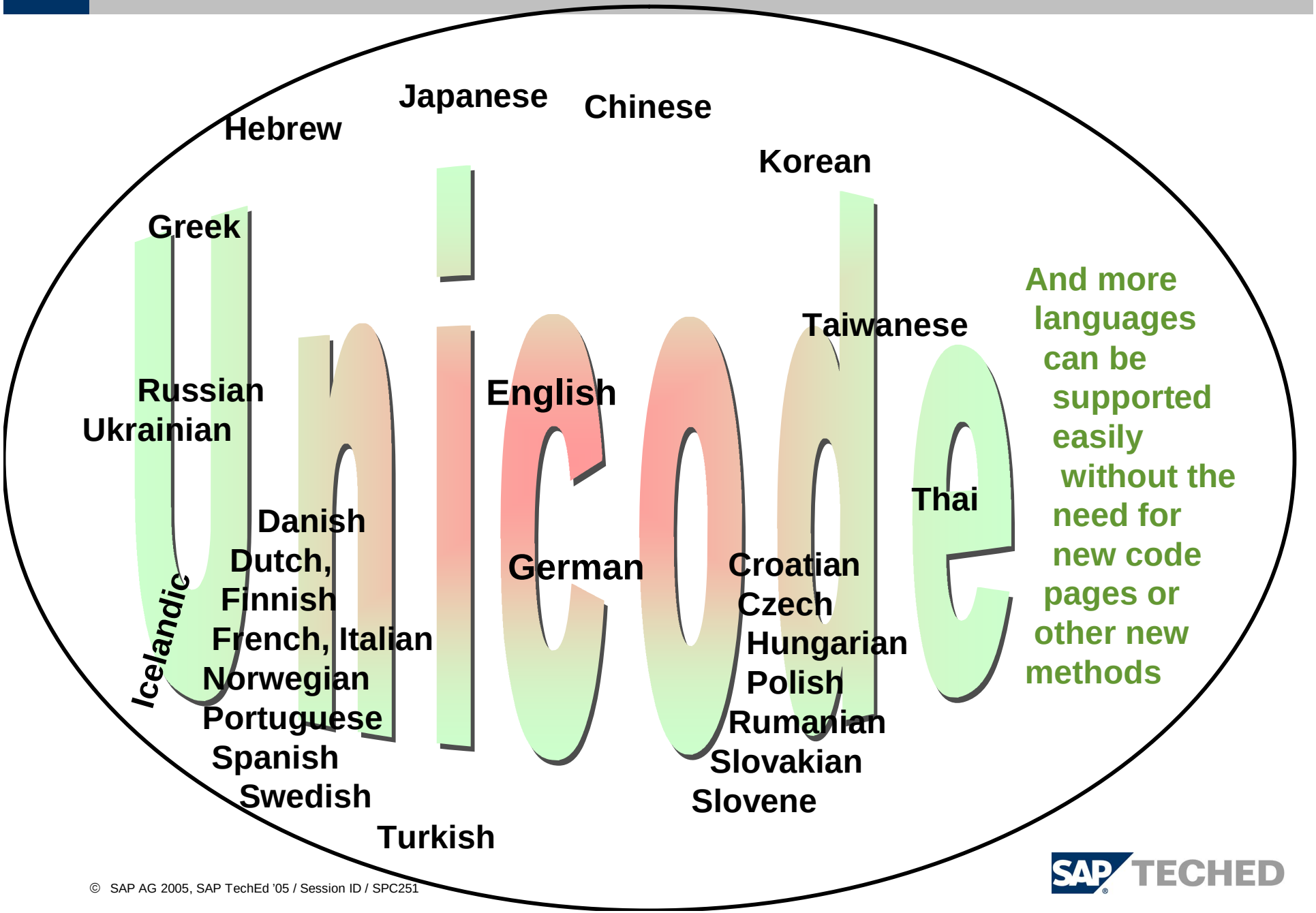
- **Each covers only a subset of all characters used**
- **Incompatibilities between different codepages**
- **Only restricted data exchange possible**
- **Too many of them**



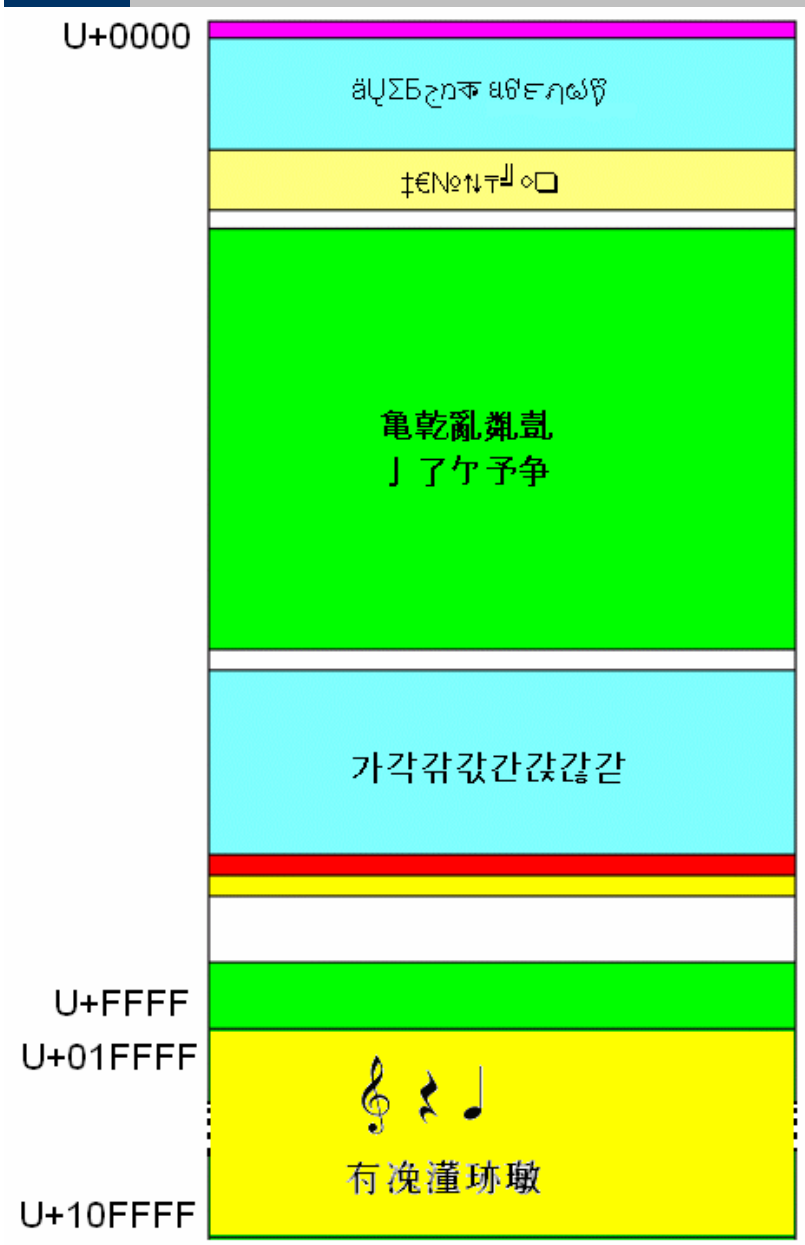
SAP:
Languages: 41
Characters: 22,378
Code Pages: 390



Solution: Unicode, one Code Page for all Scripts



Solution: Unicode characters



ASCII
General Scripts

Symbols

CJK Ideographs

Hangul

Compatibility

65,000 characters

Surrogate Area

Additional
1,000,000 characters

Representation of Unicode Characters

UTF-16 – Unicode Transformation Format, 16 bit encoding

- **Fixed length, 1 character = 2 bytes (surrogate pairs = 2 + 2 bytes)**
- **Platform-dependent byte order (big/little endian)**
- **2 byte alignment restriction**

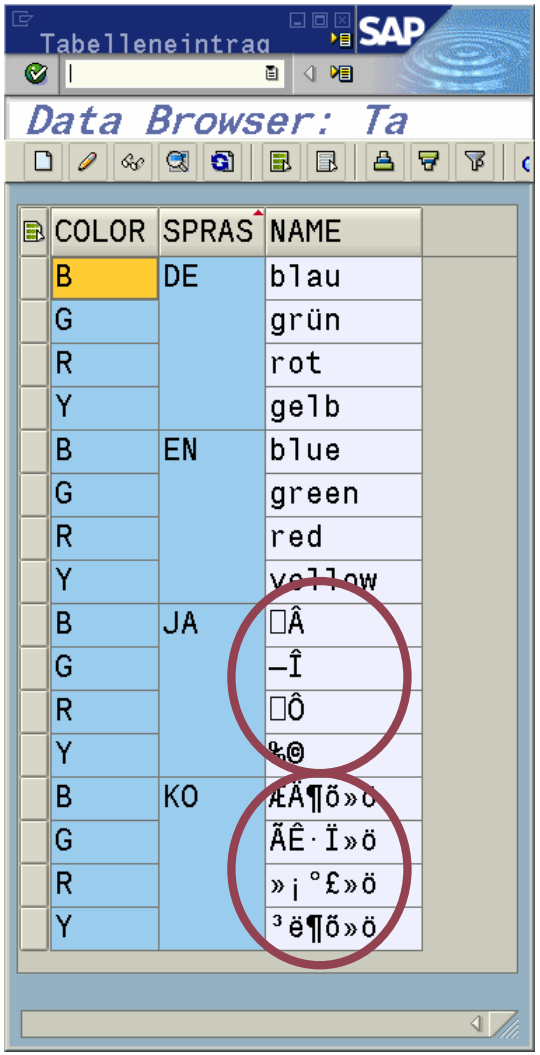
UTF-8 – Unicode Transformation Format, 8 bit encoding

- **Variable length, 1 character = 1...4 bytes**
- **Platform independent**
- **no alignment restriction**
- **7 bit US ASCII compatible**

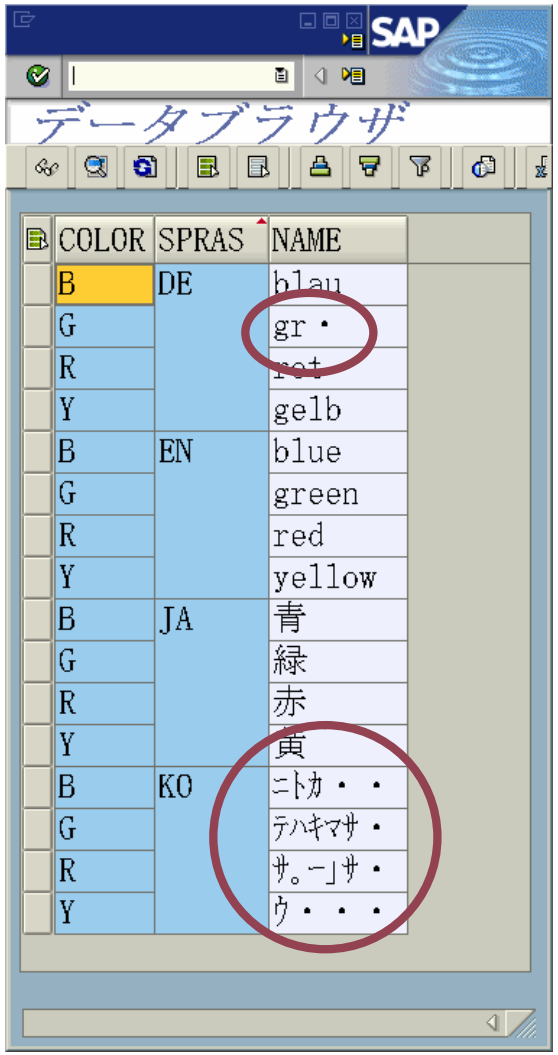
Character	Unicode scalar value	UTF-16 big endian	UTF-16 little endian	UTF-8
a	U+0061	00 61	61 00	61
ä	U+00E4	00 E4	E4 00	C3 A4
α	U+03B1	03 B1	B1 03	CE B1
會	U+3479	34 79	79 34	E3 91 B9

Old solution for multiple languages: MDMP*

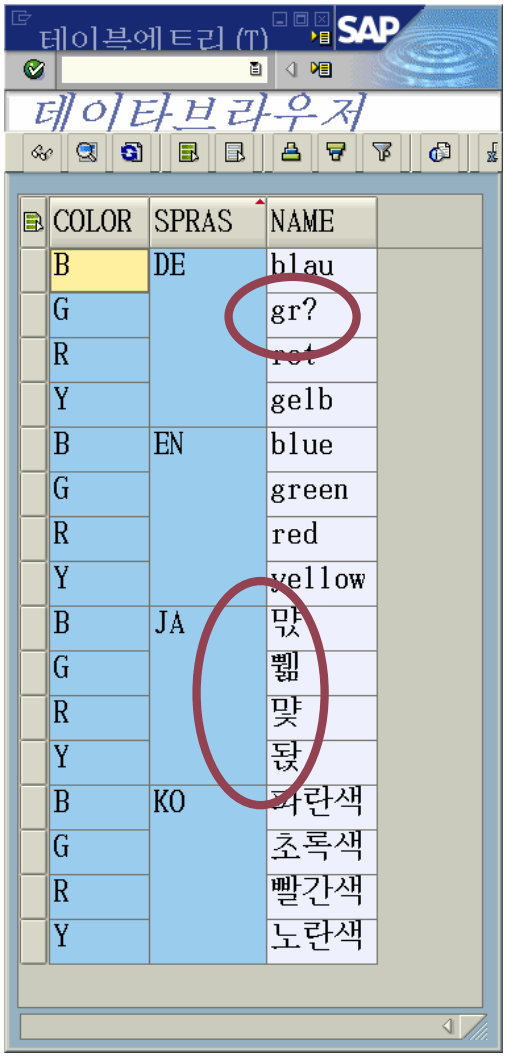
West European View



Japanese View



Korean View



* Check your system type with report RSCPINST → current configuration

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Old solution for multiple languages: MDMP

West European View

Japanese View

Korean View

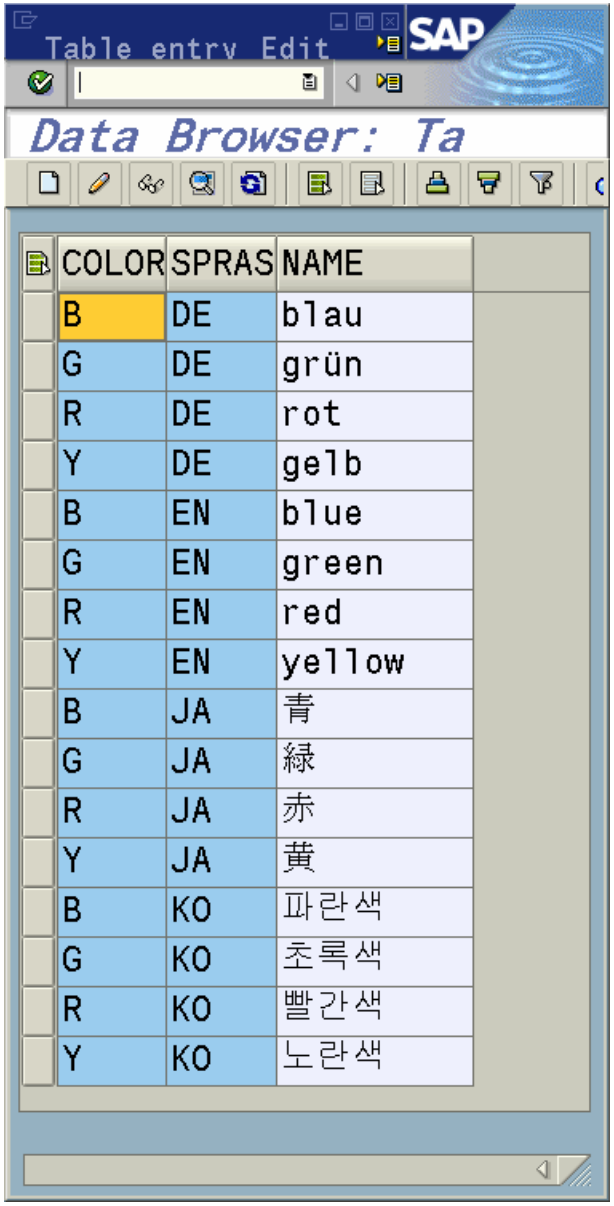
End of support with NetWeaver '04

(see notes 838402 and 79991)

(As of release NetWeaver 04s and moving forward, MDMP will no longer be supported)

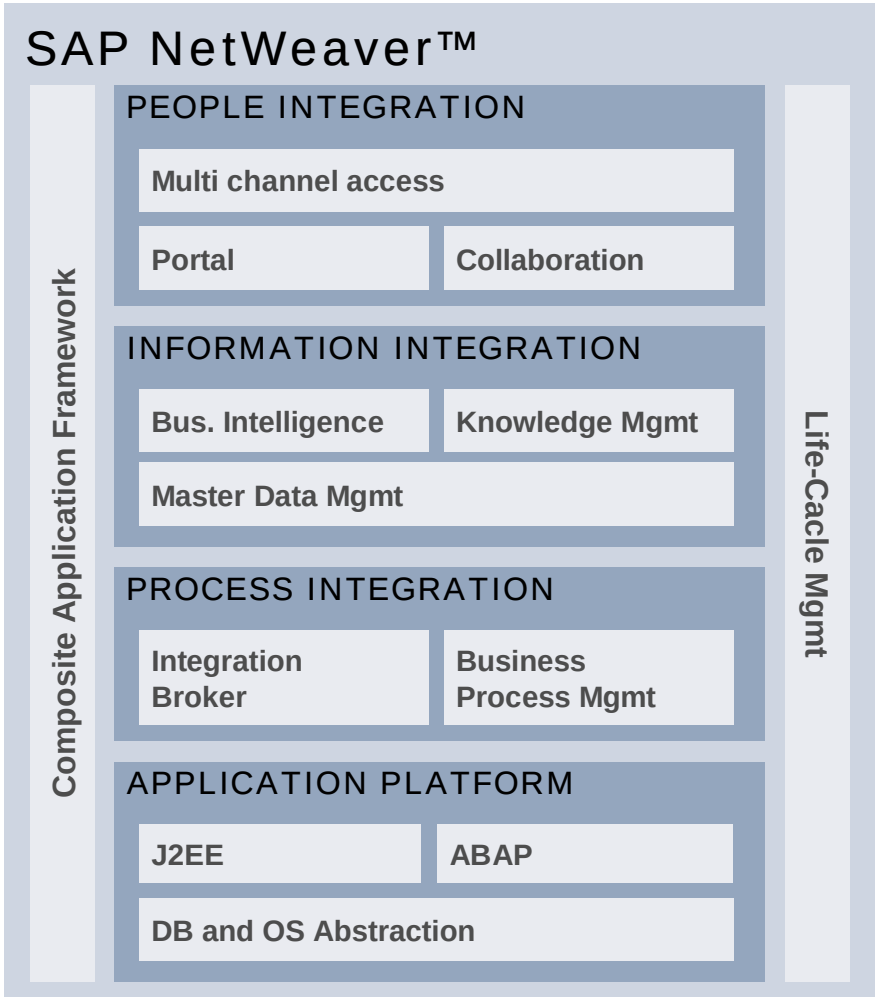
Only supported solution for multilingual systems: Unicode

Unicode



COLOR	SPRAS	NAME
B	DE	blau
G	DE	grün
R	DE	rot
Y	DE	gelb
B	EN	blue
G	EN	green
R	EN	red
Y	EN	yellow
B	JA	青
G	JA	緑
R	JA	赤
Y	JA	黄
B	KO	파란색
G	KO	초록색
R	KO	빨간색
Y	KO	노란색

SAP NetWeaver™ the integration platform?



Evolution of mySAP Technology

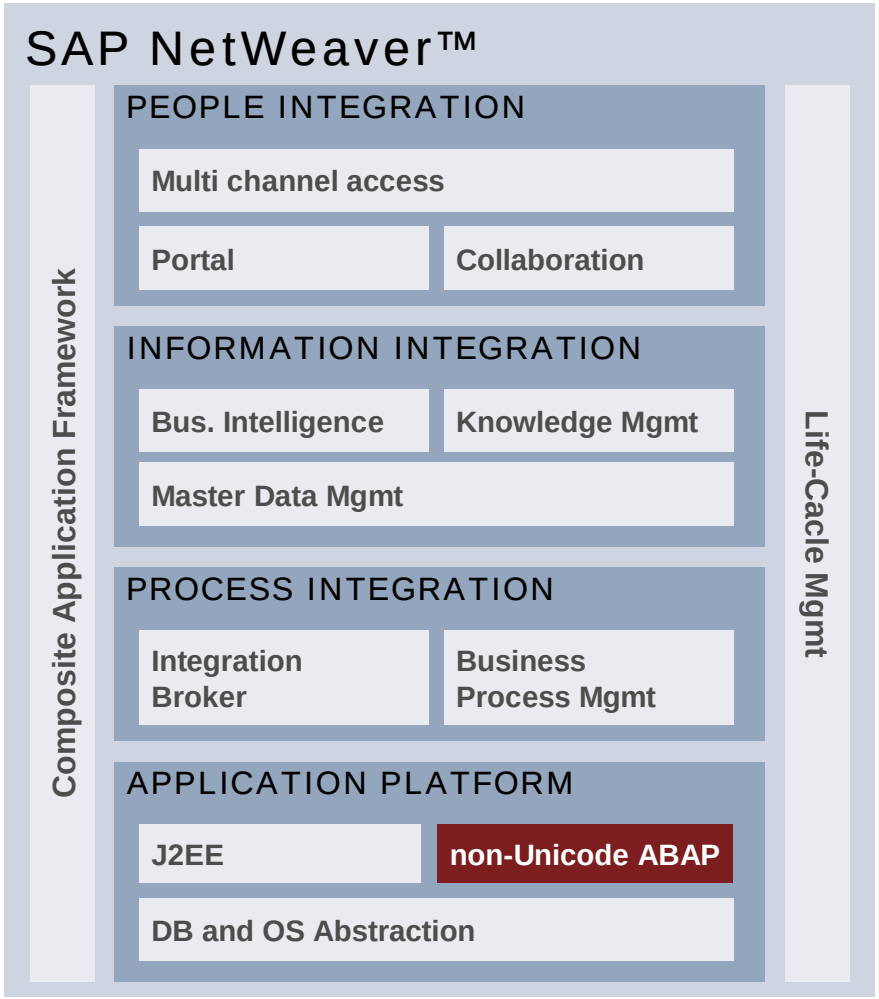
Unifies and aligns people, information and business processes

- **Integrates across technologies and organizational boundaries**
- **A safe choice with full .NET and J2EE interoperability**

The business foundation for SAP and partners

- **Powers business-ready solutions that reduce custom integration**
- **Its Enterprise Services Architecture increases business process flexibility**

SAP NetWeaver™ with non-Unicode ABAP stack



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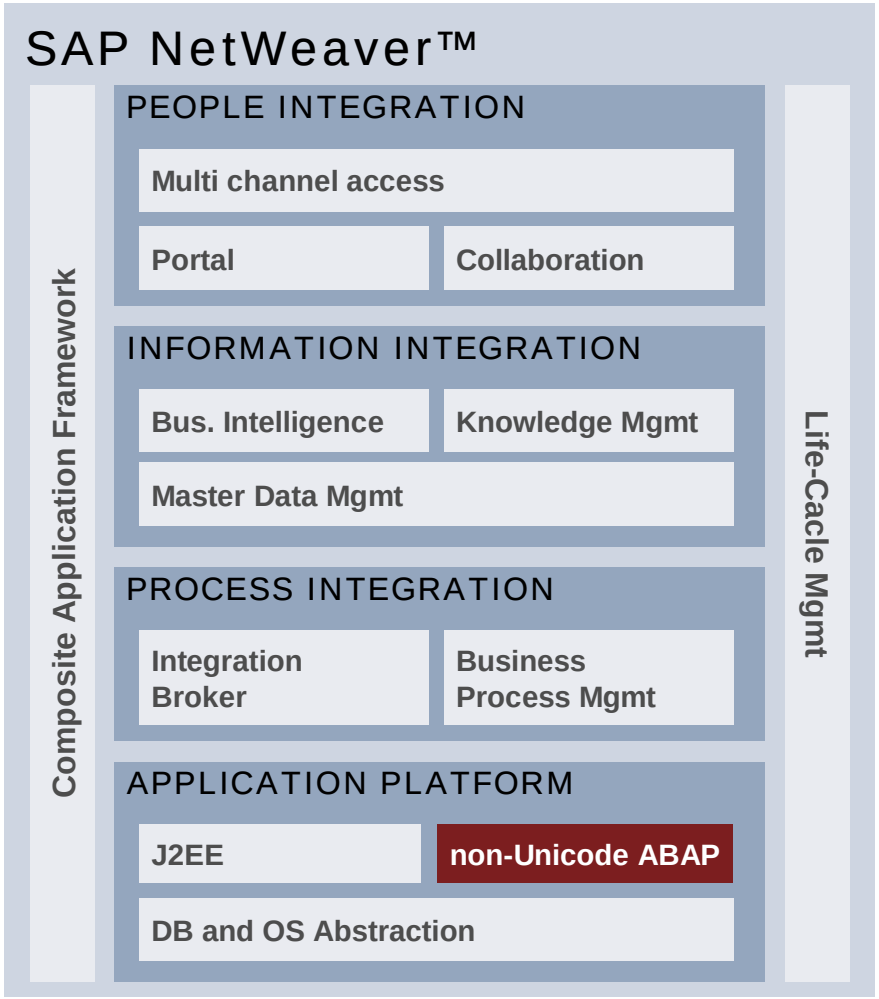

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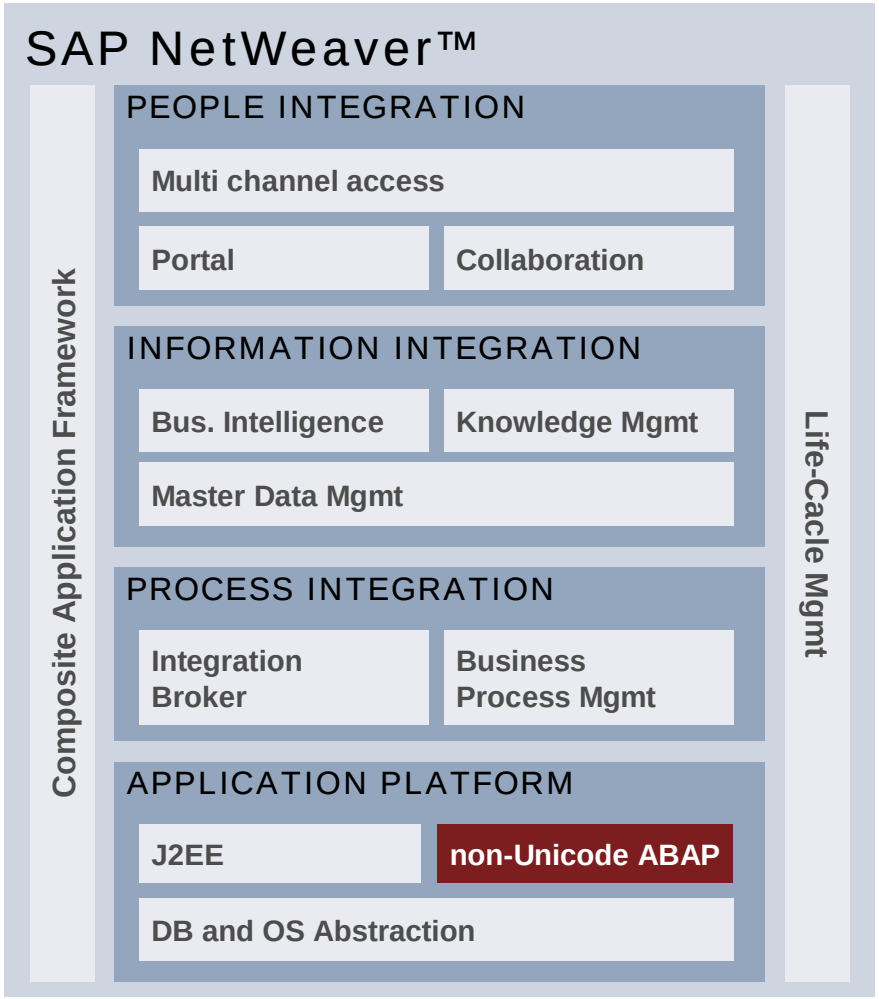

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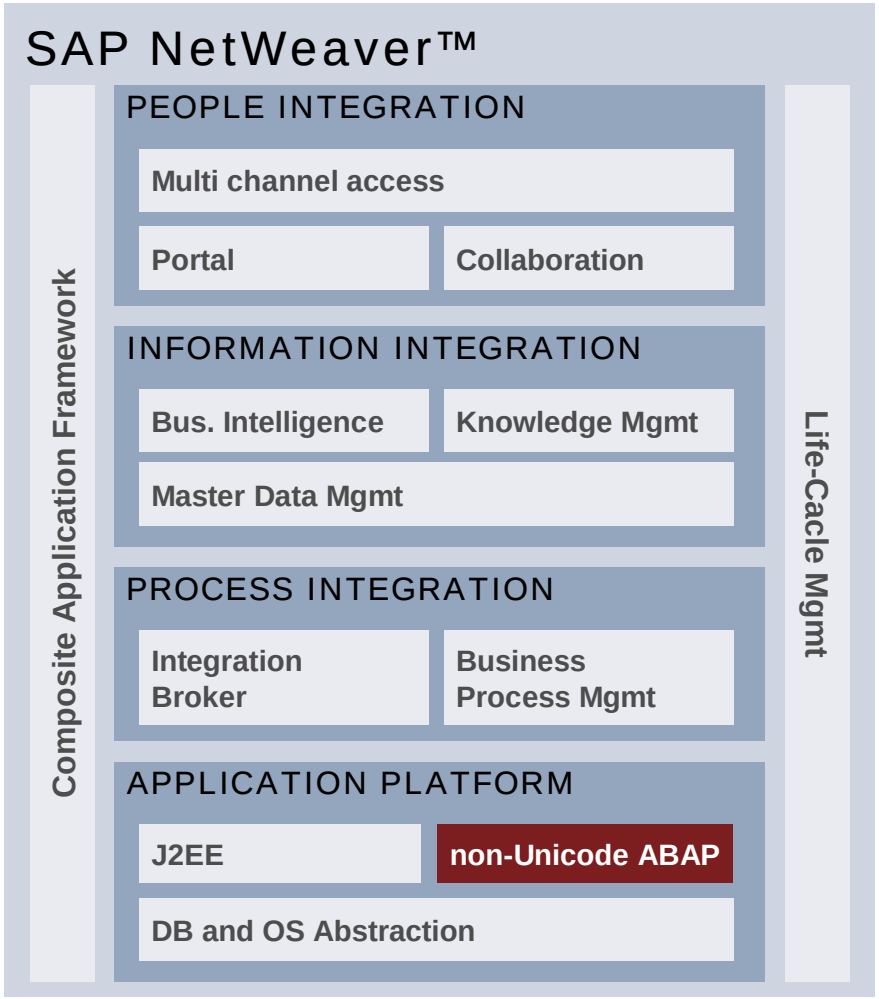

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Unifies and aligns people, information and business processes

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The business foundation for SAP and partners

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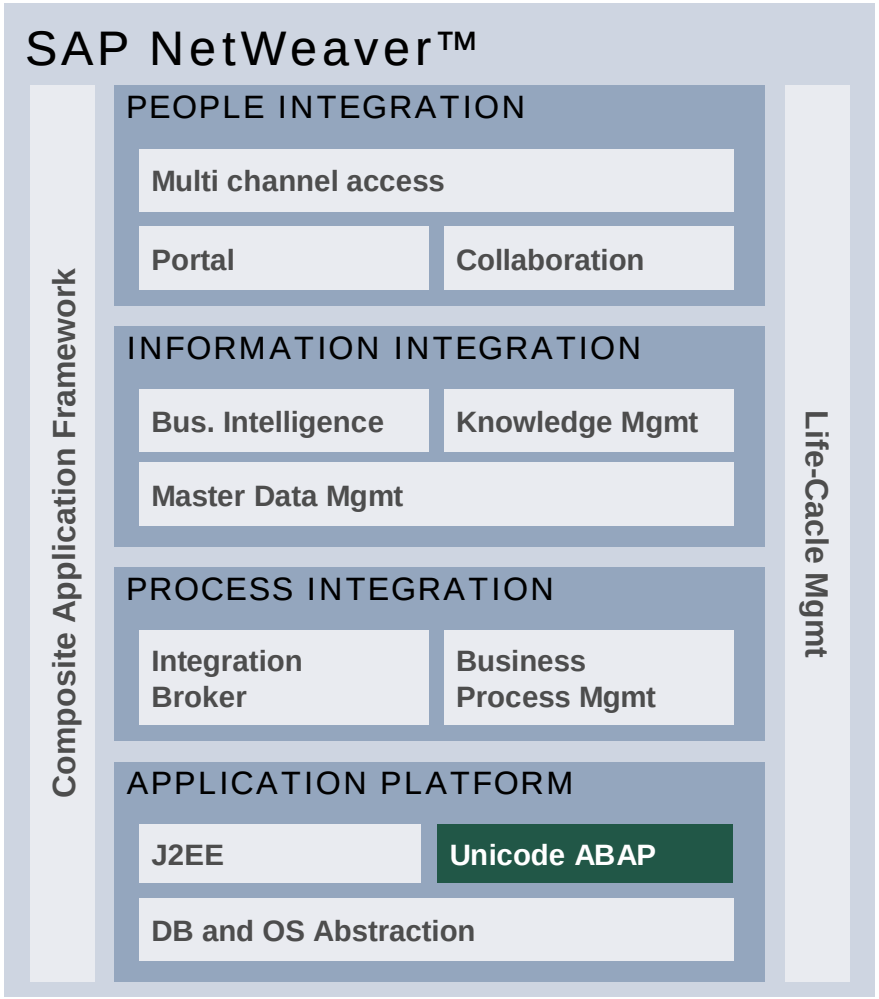
Only solution for full integration: Unicode



Evolution of mySAP Technology

Unifies and aligns people, information and business processes yes

- **Integrates across technologies and organizational boundaries** yes
- **A safe choice with full .NET and J2EE interoperability** yes

The business foundation for SAP and partners

- **Powers business-ready solutions that reduce custom integration**
- **Its Enterprise Services Architecture increases business process flexibility**

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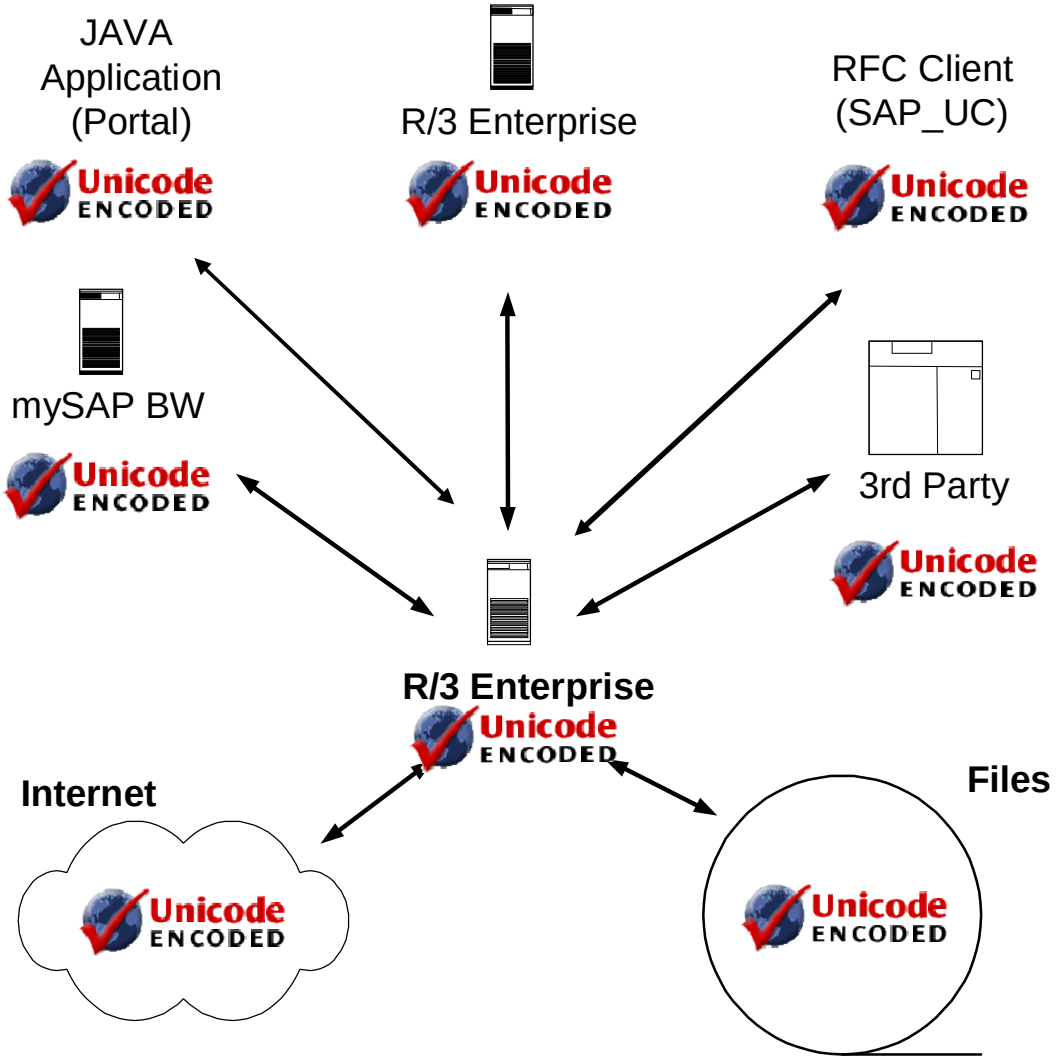
Communication: The Ideal Picture

The ideal Picture: only Unicode components

- **Conversions are done algorythmically (1:1 relation)**
- **No data misinterpretation**
- **No data loss**
- **All business relevant characters available at the same time**
- **...**



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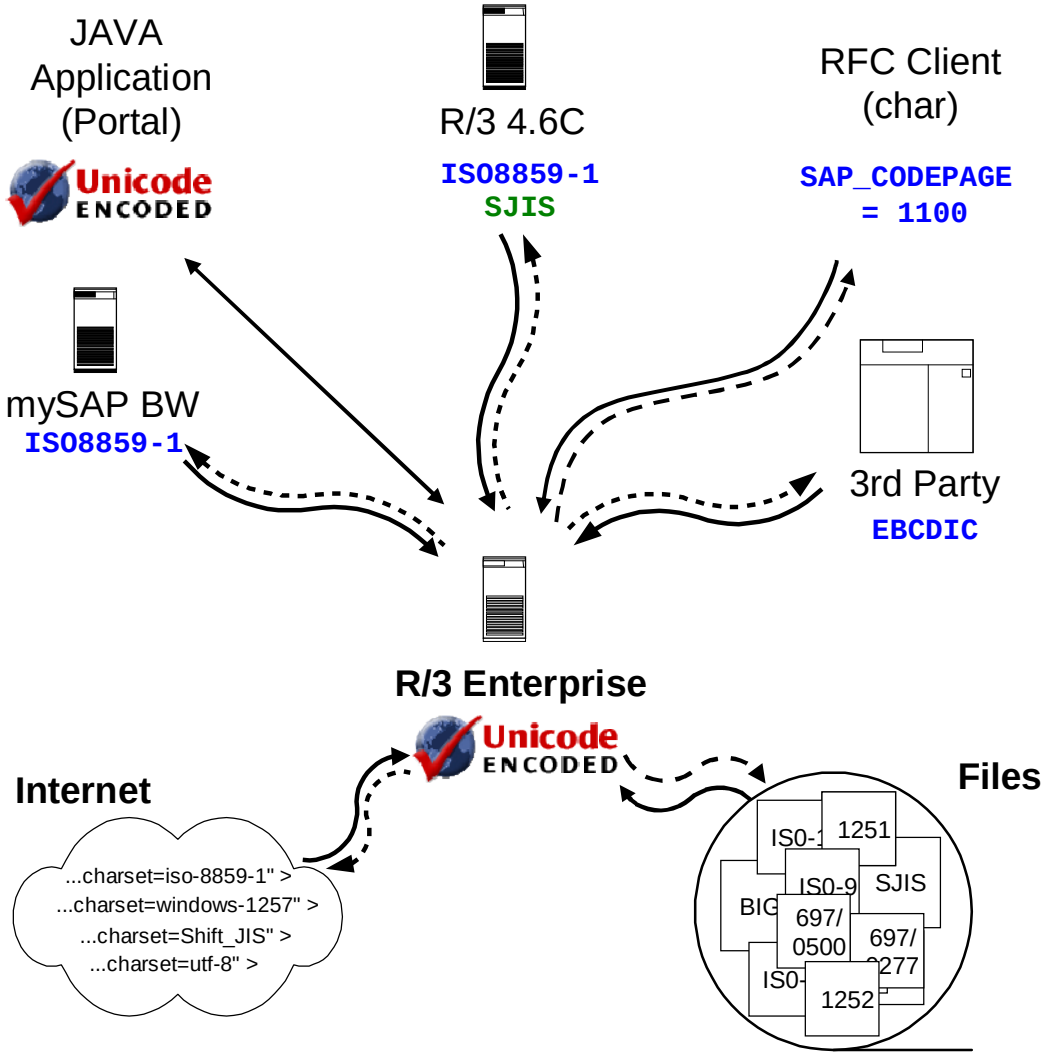
Communication: Reality

The reality: Unicode and non-Unicode components

- **Conversions between incompatible code pages everywhere**
- **Only common subset exchangeable**
- **Special rules have to be obeyed to make communication possible**
- **...**



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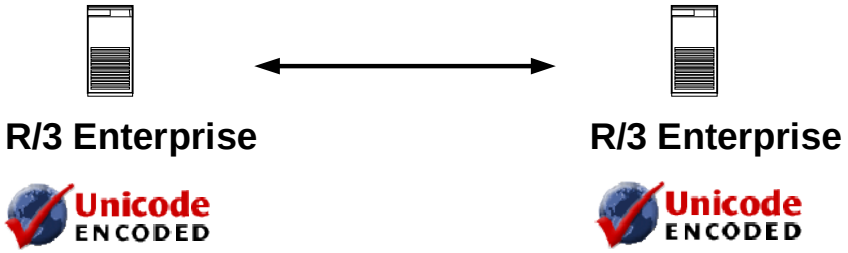
Contents

RFC Unicode ←→ Unicode



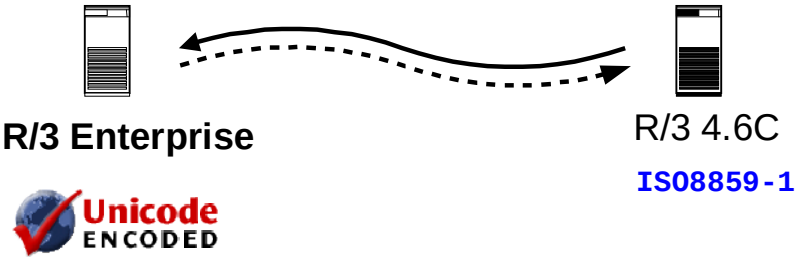
In case of an Unicode ←→ Unicode combination RFC passes all character data without code page conversion or merely with adaption of the endianness.

- **UTF-16 big endian = SAP code page 4102**
- **UTF-16 little endian = SAP code page 4103**

Information about the destination is maintained in SM59→ → special options → character width in target system

- **1 Byte = non-Unicode**
- **2 Byte = Unicode**

RFC Unicode ←→ non-Unicode single code page

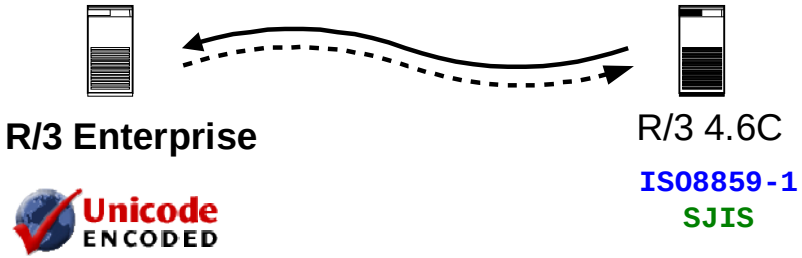


In case of an Unicode ←→ non-Unicode single code page combination, RFC passes all character data with code page conversion between Unicode and the old code page.

As Unicode is a true superset of any old standard codepage not all Unicode characters can be transfered to the non-Unicode system:

Ä	←→	Ä
ß	←→	ß
あ	→	#
東	→	#
한	→	#
ฬ	→	#

RFC Unicode ←→ non-Unicode MDMP



In case of an Unicode ←→ non-Unicode MDMP combination RFC passes all character data with code page conversion between Unicode and the different old code pages.

Which of the MDMP code pages is choosen depends on the language:

Ä	← DE →	Ä
ß	← DE →	ß
あ	← JA →	あ
東	← JA →	東
한	→	#
ฬ	→	#

Excursion: Difference between “flat“ and “deep“ data types

- **Flat:** **C, N, D, T, X, I, F, P and any structure consisting only of these fields**
- **Deep:** **STRING, XSTRING, table types, object references and any structure containing one of these types**

Deep data types are transferred using an UTF-8 encoded XML format (XRFC).

RFC Unicode ←→ non-Unicode MDMP

Excursion: Difference between “flat“ and “deep“ data types

Detailed conversion paths:

Deep data:	**Unicode → XML UTF-8**		**→ target code page**
Flat data:	**Unicode →**	**non-Unicode compatible source code page**	**→ target code page**
Deep data:	**Unicode ←**	**non-Unicode compatible target code page**	**XML UTF-8 ← source code page**
Flat data:	**Unicode ←**		**← source code page**

Unicode system **Non-Unicode system**

RFC Unicode ←→ non-Unicode MDMP

Deriving code pages a): Data without text language field

Source system	Data type	Source code page	Intermediate format *	Target code page
Unicode	Flat	Unicode	Logon language **source system * ***	Logon language **target system**
	Deep		UTF-8 based XML	
non-Unicode	Flat	Logon language **source system**	Logon language **source system**	Unicode
	Deep	SY-LANGU **source system**	UTF-8 based XML	

* XML / non-Uniocde compatible code page

* * You may switch to “Logon language target system” using RFC bit option 0x200 at SM59 → Special options → RFC Bit Options

Example: Flat data, logon language German

Ä	**← Logon = DE →**	**Ä**
あ	**Logon = DE →**	**#**

RFC Unicode ←→ non-Unicode MDMP

Deriving code pages b) : Data (flat) with text language field

Flat Structures containing a language field (domain SPRAS, DDIC data type LANG) with maintained text language flag have a special handling:

For TABLES parameters automatic language code page assignment is done during RFC for each row independent of logon language.

This enables sending and and receiving tables from MDMP systems (different code pages for each row):

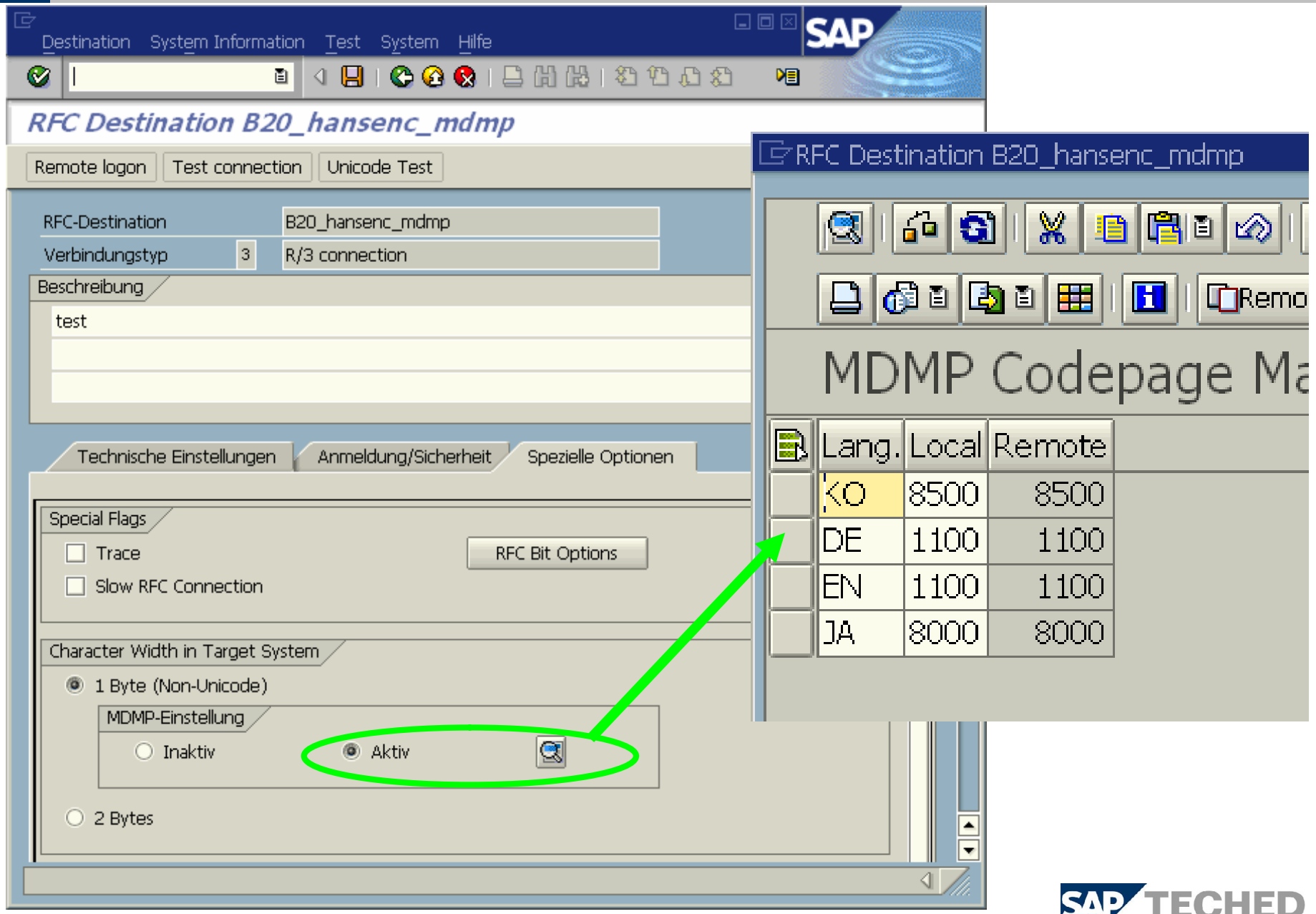
Ä	**← Logon = DE / text language = DE →**	**Ä**
あ	**← Logon = DE / text language = JA →**	**あ**

Deriving code pages b) : Data (flat) with text language field

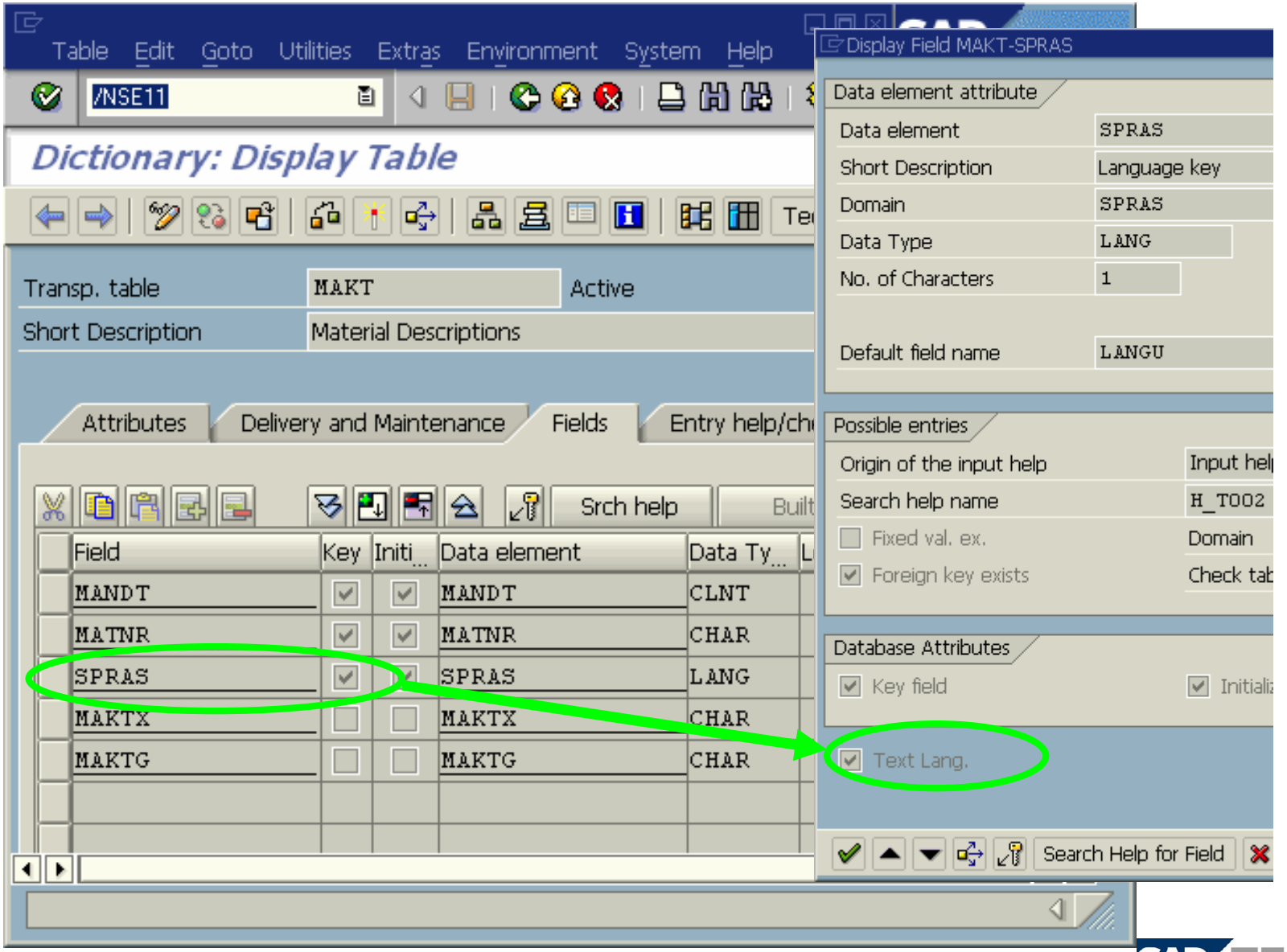
Automatic code page assignment is activated/configured by the following actions in the Unicode system:

- **Maintaining text language flag with SE11**
- **Maintaining language code page assignment with SM59 for outgoing calls**
- **Maintaining language code page assignment for incoming calls from legacy systems that don‘t pass their code page information with a pro forma destination (note 722193)**

Maintain RFC destination SM59: MDMP settings



SE11: Maintain text language flag



RFC Unicode ←→ non-Unicode MDMP

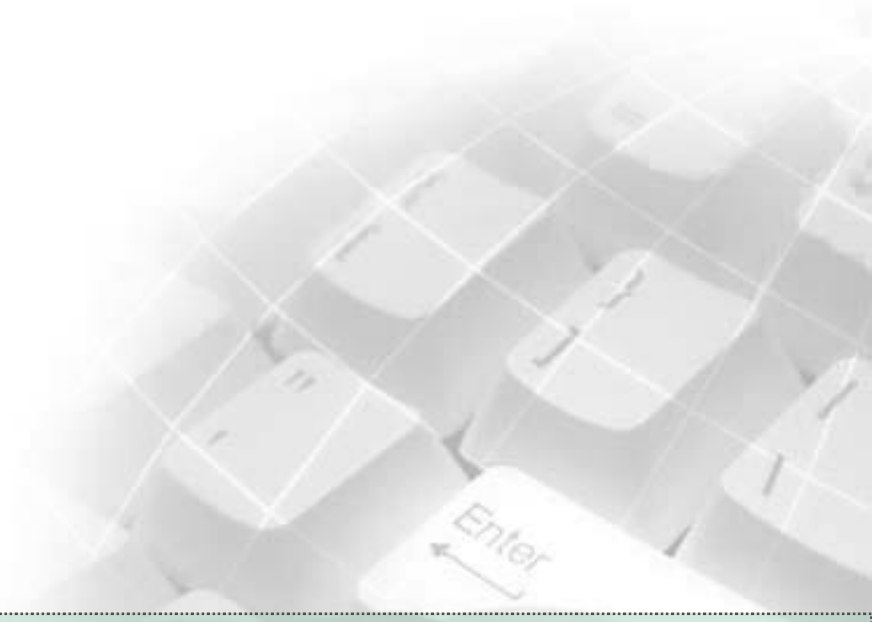
Deriving code pages b) : Data (flat) with text language field

Frequent problem: data with invalid or unknown text language:

Ä	**text language = DE →**	**Ä**
あ	**text language = JA →**	**あ**
Ö	**text language = éÂ →**	**runtime error RFC_CONVERSION_TABLE**
ß	**text language = ES →**	**runtime error RFC_CONVERSION_TABLE**

If it is not possible to delete the wrong or obsolete data in the source system proceed as described in the note 809279 “RFC non-Unicode to Unicode with unknown text language”

Contents



File transfer: Application server

Pattern for writing/reading files on the application server:

OPEN DATASET IN <modus> MODE
TRANSFER/READ
CLOSE DATASET

<modus>:

- **BINARY MODE**
  Uninterpreted sequence of bytes.
- **TEXT MODE ENCODING UTF-8 / NON-UNICODE / DEFAULT**
  Pure unstructured text data. DEFAULT equals UTF-8 in Unicode systems and NON-UNICODE in non-Unicode systems.
- **LEGACY TEXT/BINARY MODE**
  Produces an format compatible to non-Unicode systems. Text data is always written in NON-UNICODE format. Not character-like structures are allowed. The only difference between TEXT and BINARY is, that in case of TEXT an EOF (END OF FILE) marker is added.

File transfer: Application server

Code page selection NON-UNICODE:

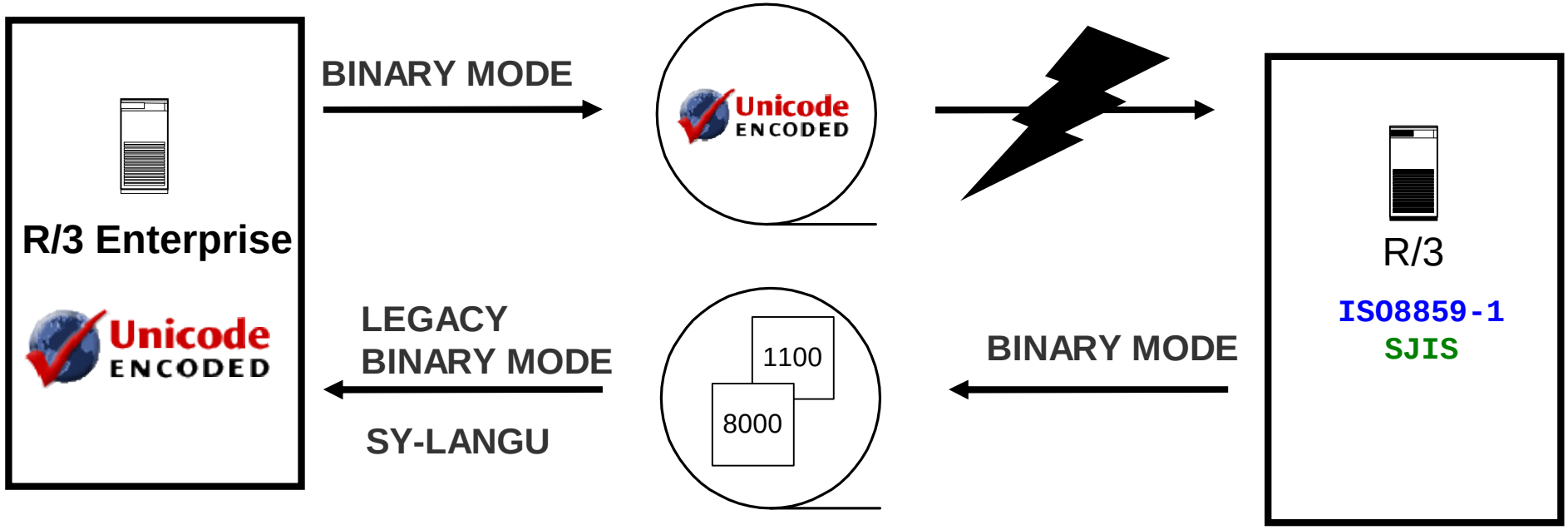
If during data transfer a Unicode ←→ non-Unicode conversion is neccessary, the non-Unicode code page is derived from the current system language SY-LANGU, which may be changed by using SET LOCALE LANGUAGE <lang>.

Advantages and disadvantages for data exchange:

- **BINARY. Not a good exchange format in itself. Use this for writing/reading prepared data of well known format (e.g. XML /UTF-8 as XSTRING) or use for write/read on the same application server**
- **TEXT MODE: UTF-8 is a good exchange format. Structures may not be transfered as a whole. Only single fields**
- **LEGACY MODES: Only for reading or writing non-Unicode data. Structure and code page information is considered.**

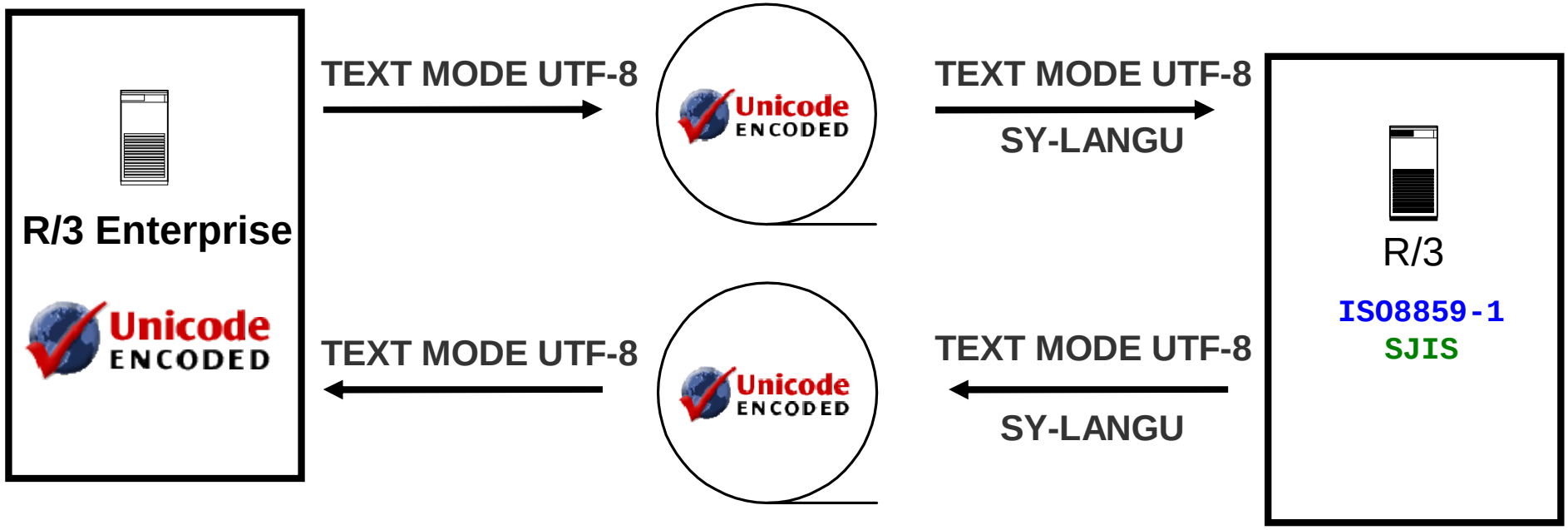
File transfer: Application server

Example 1: BINARY MODE



File transfer: Application server

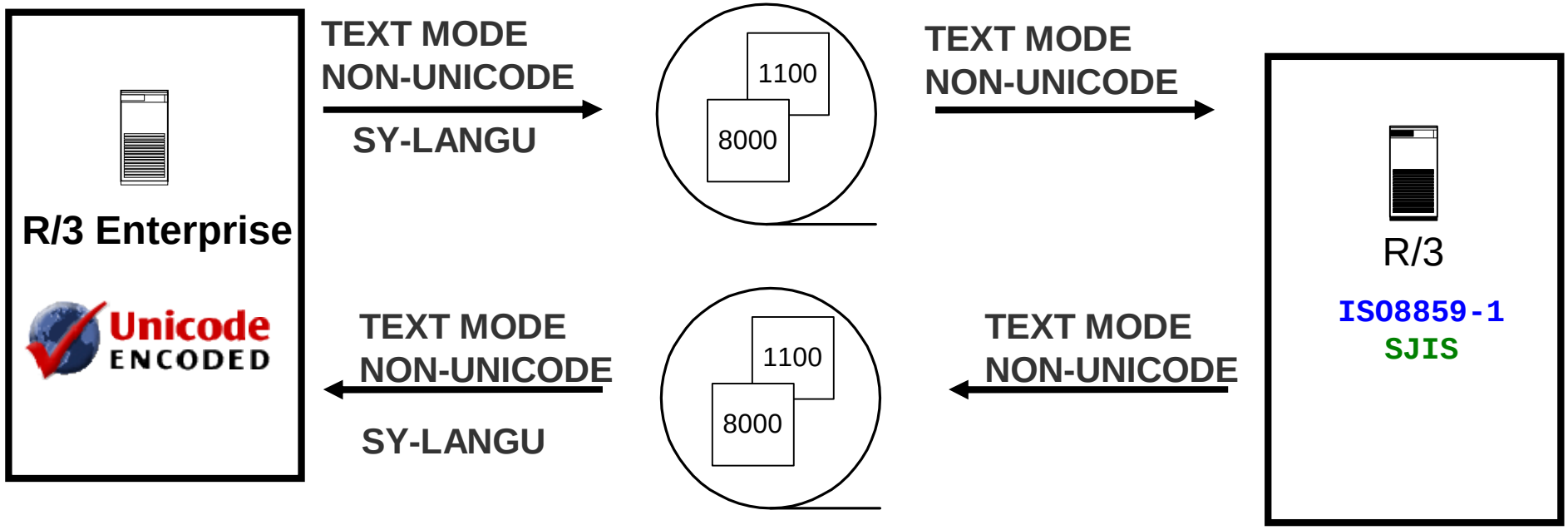
Example 2: TEXT MODE UTF-8



☺ **Full charset supported (no data loss in the file)**

☹ **Structured data as a whole → write field by field =** ☺

Example 3: TEXT MODE NON-UNICODE

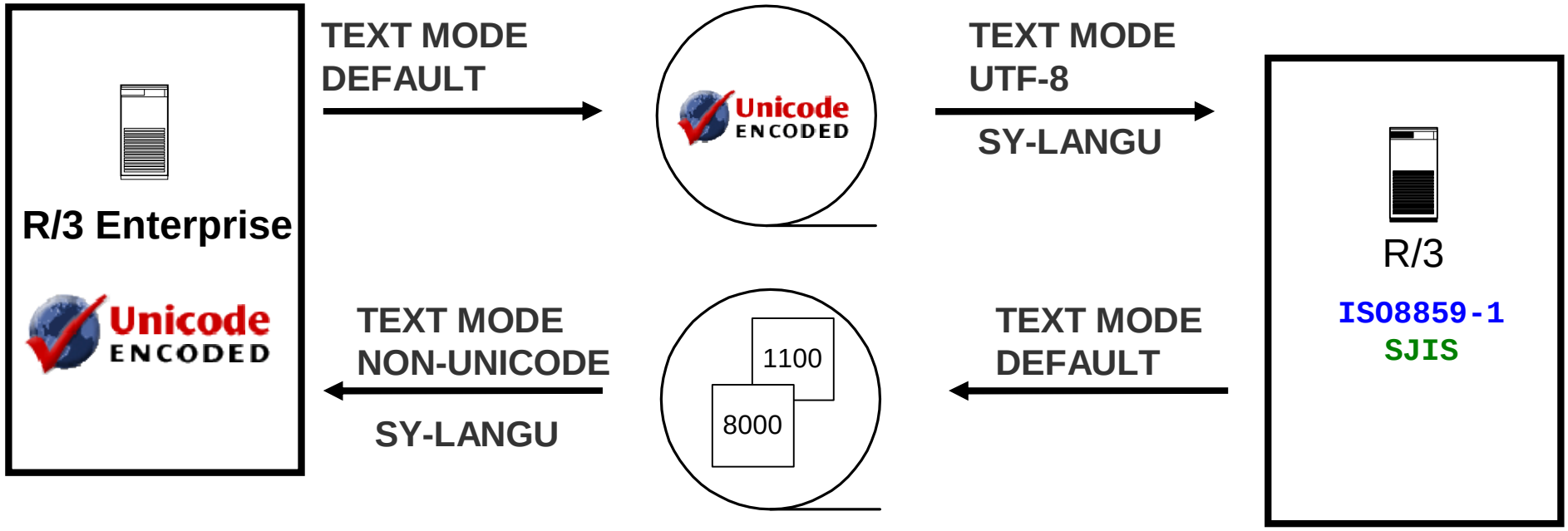


☹ Only part of UC charset supported (possible data loss in the file)

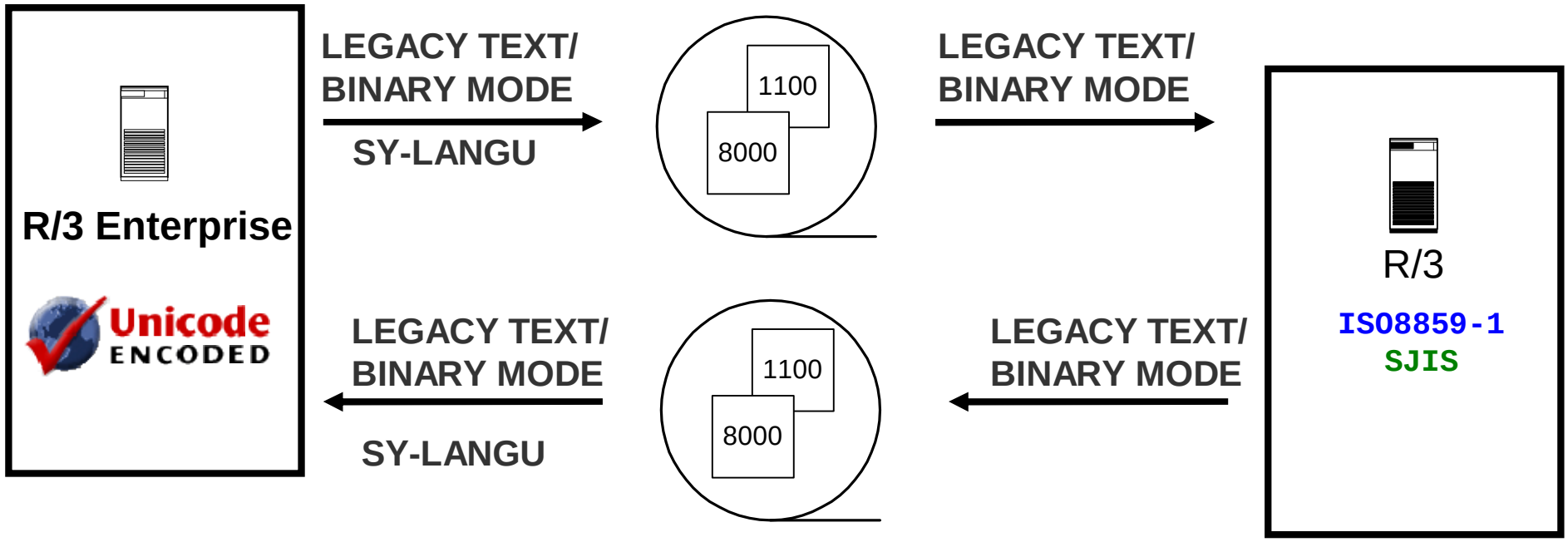
☹ Structured data **as a whole → write field by field =** ☺

File transfer: Application server

Example 4: TEXT MODE DEFAULT



Example 5: LEGACY TEXT/BINARY MODE



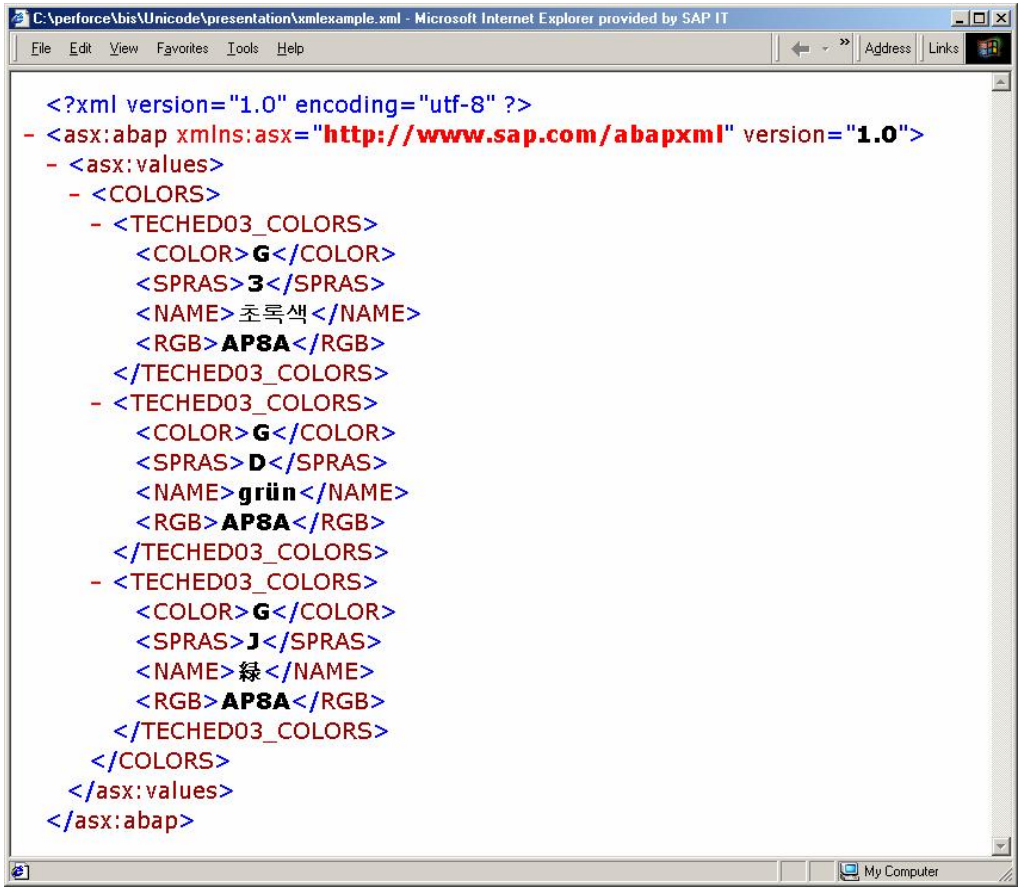
☹ Only part of UC charset supported (possible data loss in the file)

☺ Structured data

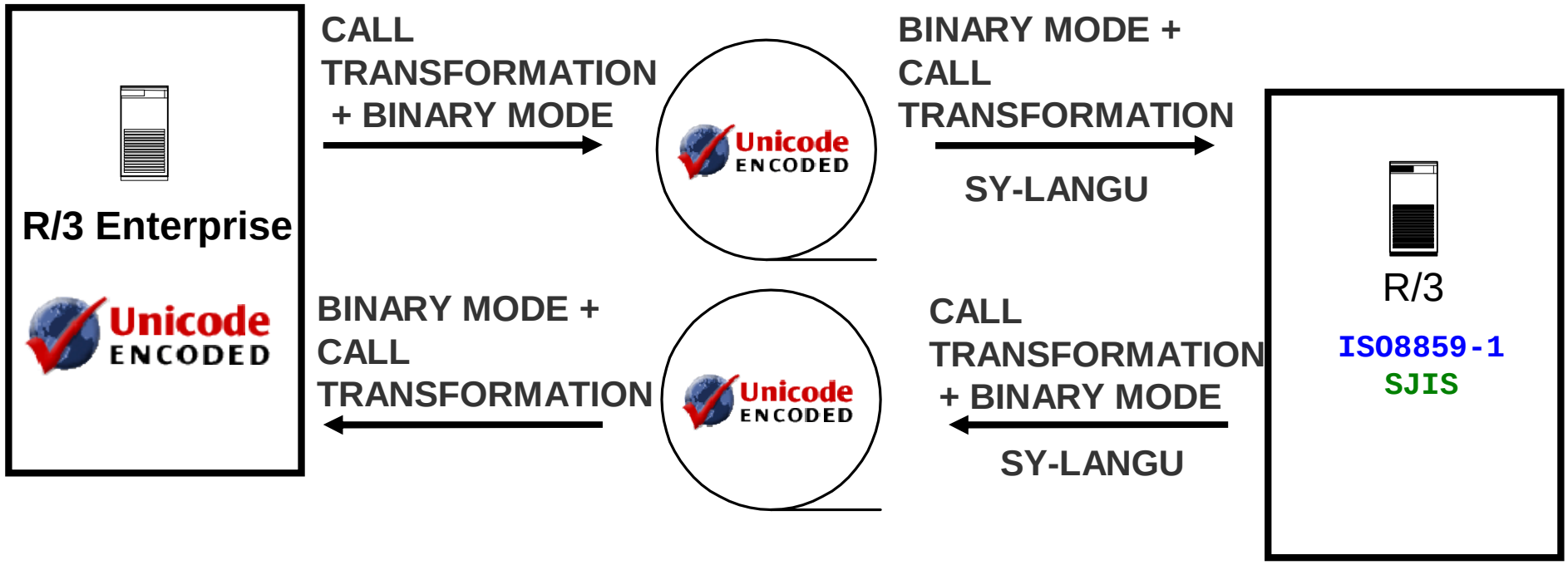
Using XML as transport format

Use CALL TRANSFORMATION with target data type XSTRING to create an UTF-8 based XML representation of your data.

- **Structure information (no layout / alignment problems)**
- **UTF-8 based (no data loss)**
- **Transport in binary form**



Example 6: UTF-8 based XML + BINARY MODE



☺ Full charset supported (no data loss in the file)

☺ Structured data

Additional Remarks I:

- **The only Unicode Format supported with OPEN DATASET is UTF-8. UTF-16 is not supported**
- **If you still need to read Unicode and non-Unicode files at the same time, you have to provide users the chance to select the outside code page (see note 752835 Usage of the file interfaces in Unicode systems). OPEN DATASET ENCODING DEFAULT does not do it for you .**

  As workaround for missing selection possibilities you may want to convert the files on the file system prior to loading them. For this purpose you may use the following tools:
  - **sapiconv** **note 752859**
  - **RSCP_CONVERT_FILE** **note 747615**

Additional Remarks II: Byte Order Mark (BOM)

Byte-Order-Marks (BOM, U+FEFF) are used to indicate the encoding of Unicode files and and are not part of the file content.

SAPs recommendation:

- **Automatically detect UTF-8 encoded files with:**
  CL_ABAP_FILE_UTILITIES=>CHECK_FOR_BOM
- **Read UTF-8 files with:**
  OPEN DATASET IN TEXT MODE ENCODING UTF-8 FOR INPUT SKIPPING BYTE ORDER MARK
- **Write files always with BOM:**
  OPEN DATASET IN TEXT MODE ENCODING UTF-8 FOR OUTPUT WITH BYTE ORDER MARK

See also SDN Weblog https://weblogs.sdn.sap.com/pub/wlg/2194

File transfer at the frontend with GUI_UP/DOWNLOAD

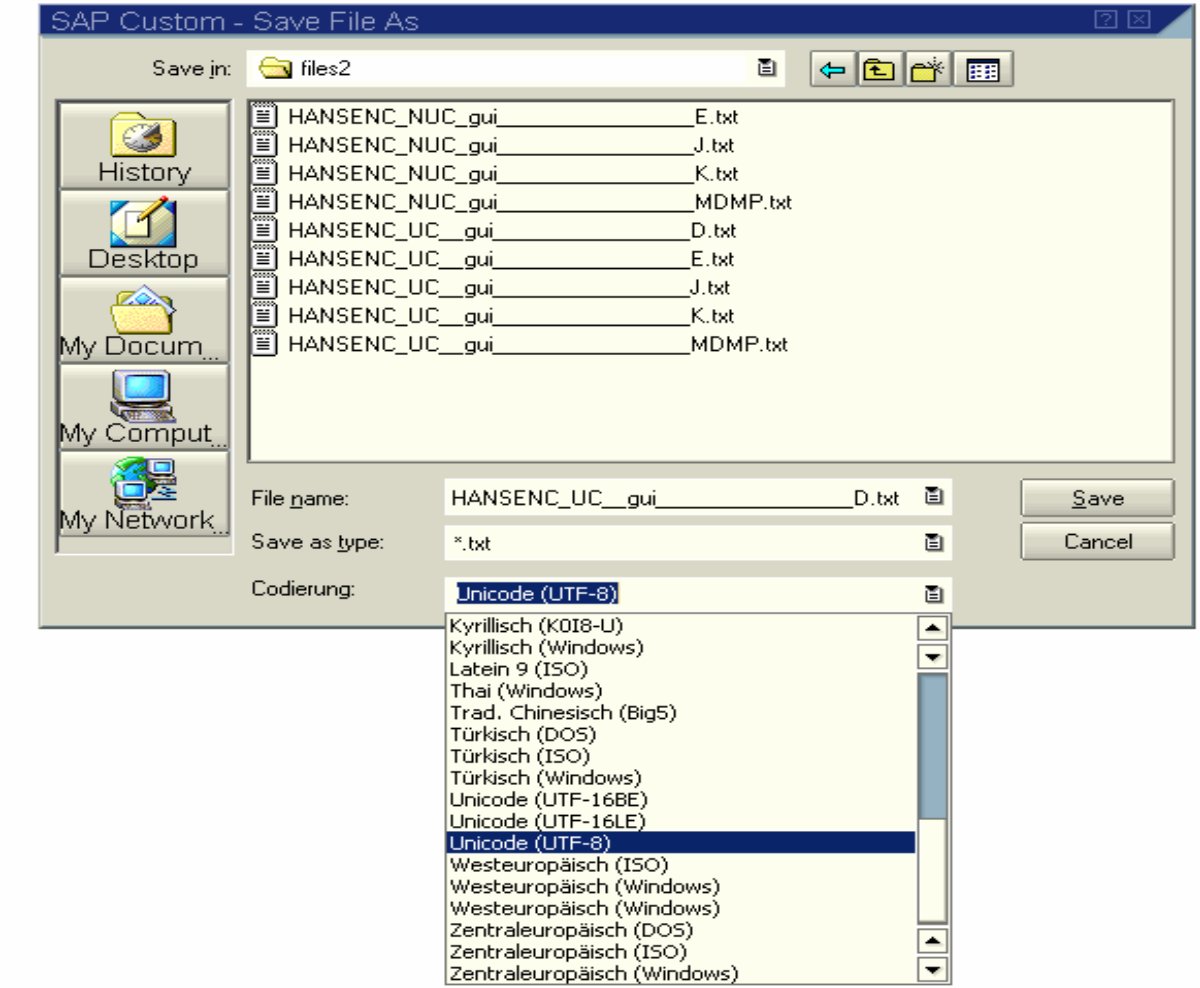
The function modules GUI_/UPDOWNLOAD convert data into textual representation. Structures are allowed.

Determination of the outside code page:

- **Front end code page matching to the current system code page (SY-LANGU, SET LOCALE LANGUAGE)**
- **Declared explicitly with optional parameter CODEPAGE (Starting with release 6.20 SP 21).**
- **In interactive mode use CL_GUI_FRONTEND_SERVICES=>FILE_OPEN/SAVE_DIALOG (parameter WITH_ENCODING = 'X') to select the code page. (only SAPGUI 6.40)**

File transfer: Frontend

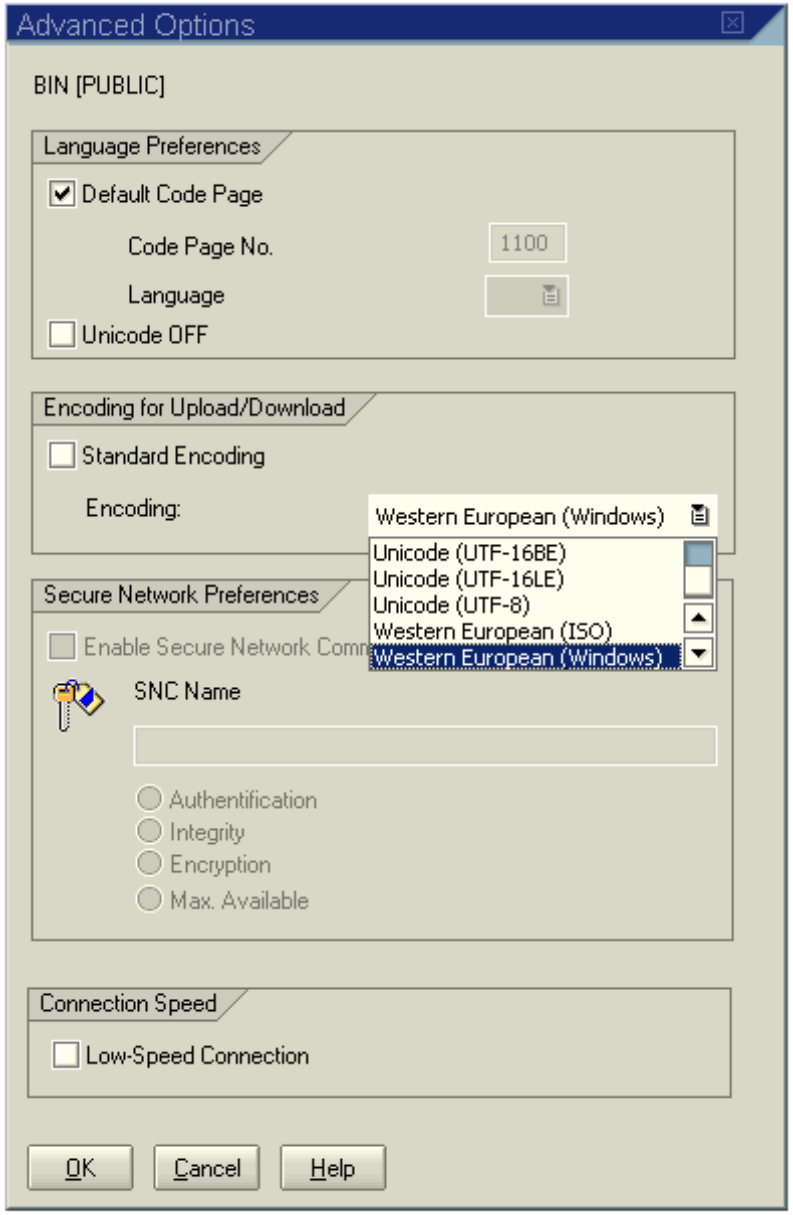
cl_gui_frontend_services=>file_open/save_dialog



File transfer: Frontend

Change default Encoding for Upload/Download :

SAP Logon → Properties → Advanced



Overview: RFC and File transfer

RFC and file transfer from a Unicode systems perspective

			Target code page derived from	Suited for structured data	Reading/Writing single records	Transfer of "MDMP data" possible
XML			SY-LANGU	Yes	No	No
OPEN DATASET	**TEXT MODE**		SY-LANGU	Yes (field by field)	Yes	Yes
	LEGACY	**TEXT MODE**	SY-LANGU	Yes	Yes	Yes
		BINARY MODE	SY-LANGU	Yes	Yes	Yes
GUI	**UPLOAD**		SY-LANGU	Yes	No	No
	DOWNLOAD		SY-LANGU	Yes	Yes (Append)	Yes
RFC	**flat**	**With language key**	Value of language key	Yes	-	Yes
		Without language key	Logon language	Yes	-	No
	deep		Logon language	Yes	-	No

Contents

Common mistakes: overview

Things you should never do!

Type hiding

Missing text language field

Wrong length assumptions

Sending data that is not in the receivers codepage

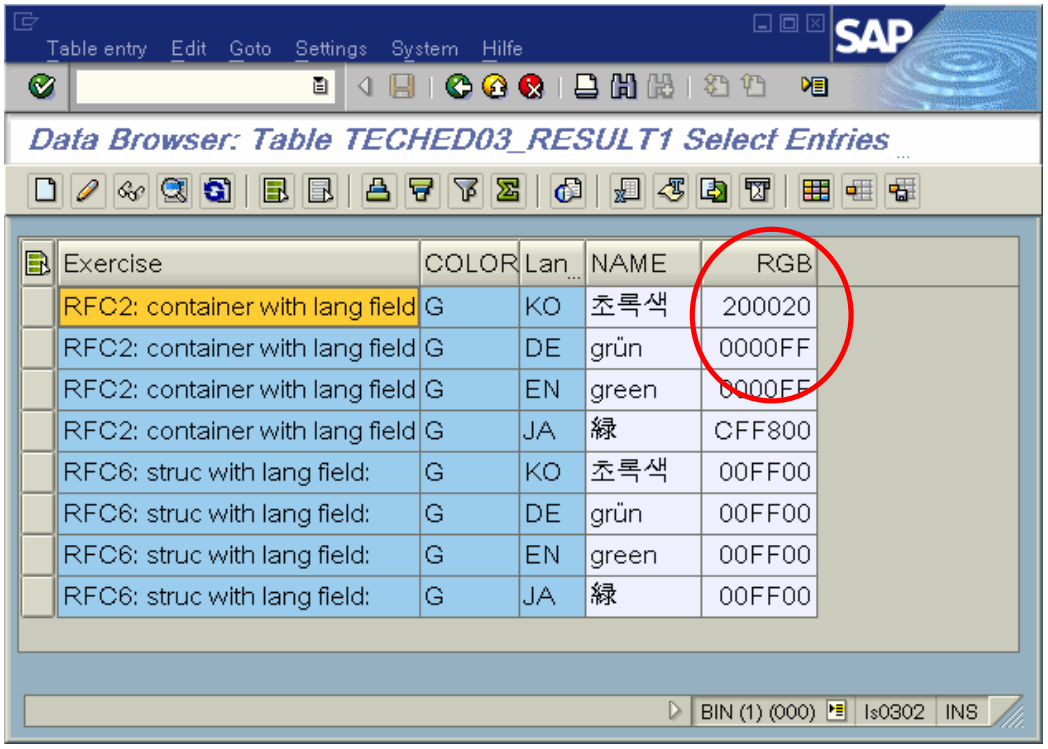
...

Common mistakes: Type hiding: binary data

Don't hide types 1

If you conceal the true types from the system the system cannot anything for you. As a consequence, data may, for example, be subject to unwanted codepage conversions.

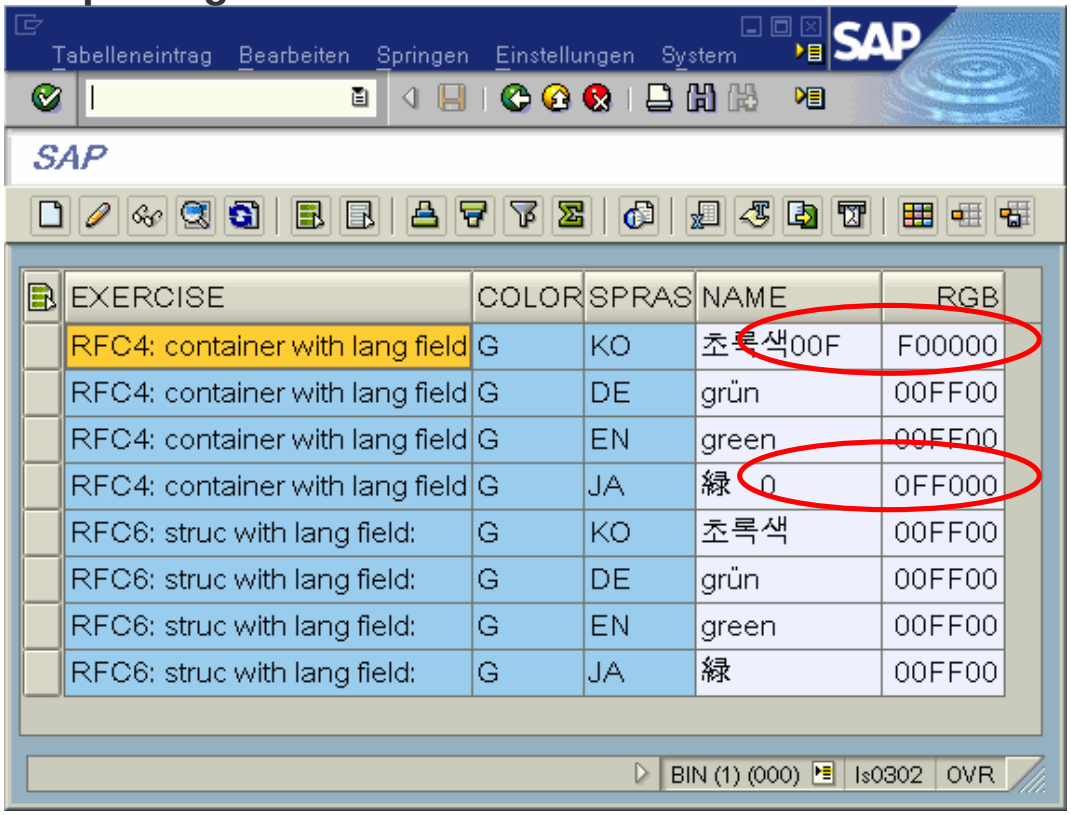
Example: ☠ Transporting binary data in character containers



Don't hide types 2

Even sending a pure characterlike structure in a character container conceals important information – the field boundaries – from the system.

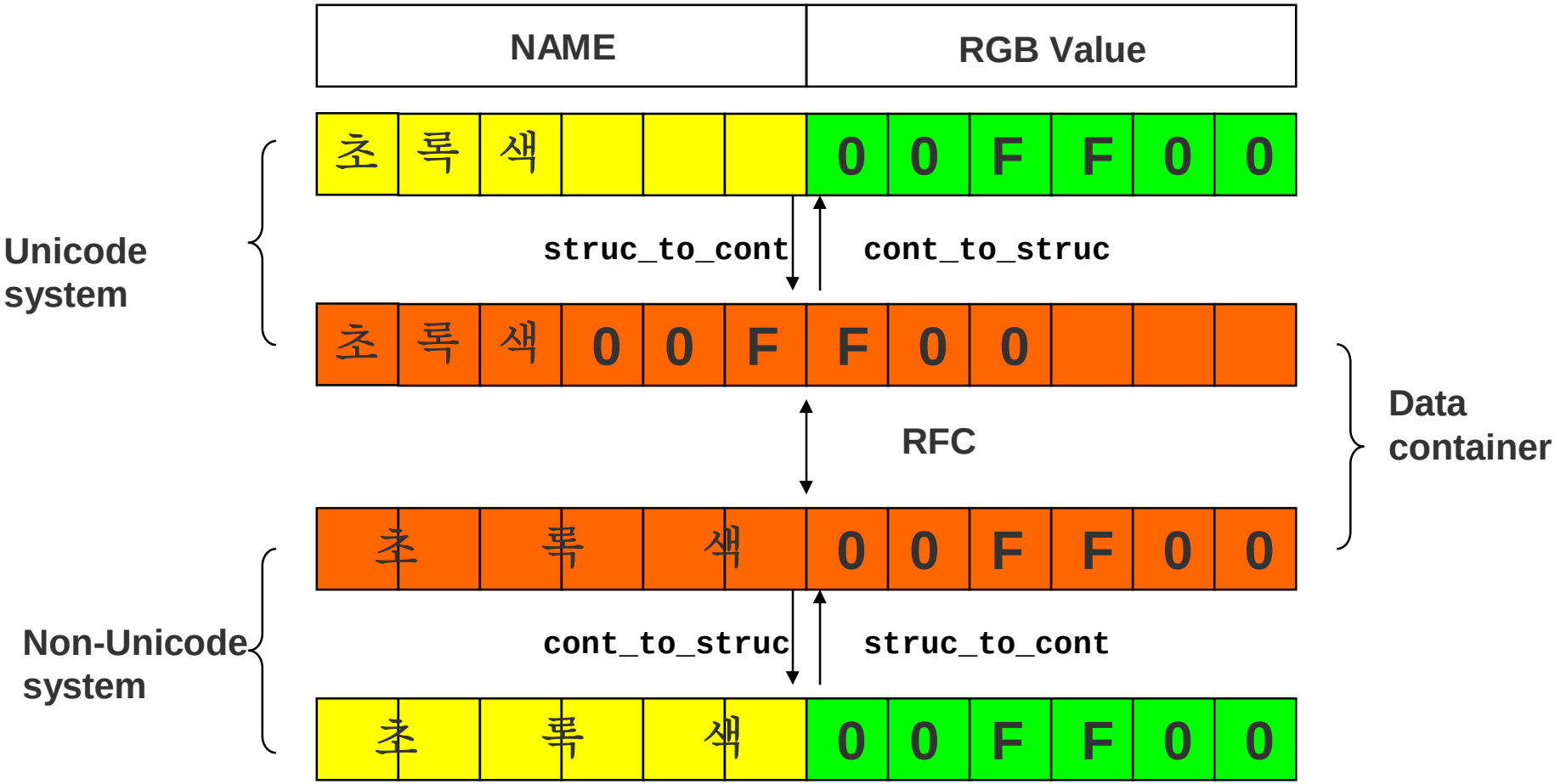
Example: ☠ Transporting characterlike data in character containers



Common mistakes: Type hiding: characterlike data

Workaround if container approach cannot be changed

Use CL_NLS_STRUC_CONTAINER to correct the implicit layout:

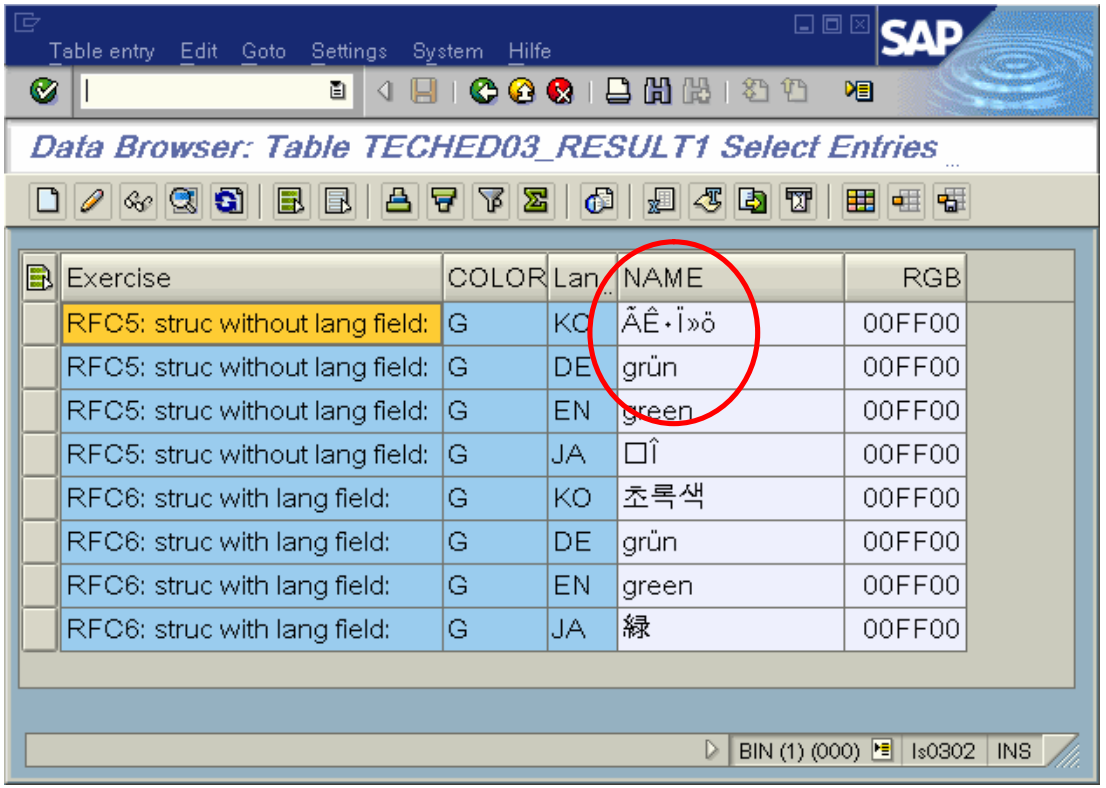


Common mistakes: Missing text language field

Always use text language fields

In principle you must not send any data without text language if the data contains non 7 bit ASCII characters. Otherwise corruption of the data is the result.

Example: ☠ Sending non Latin 1 data without text language field by RFC (German logon)



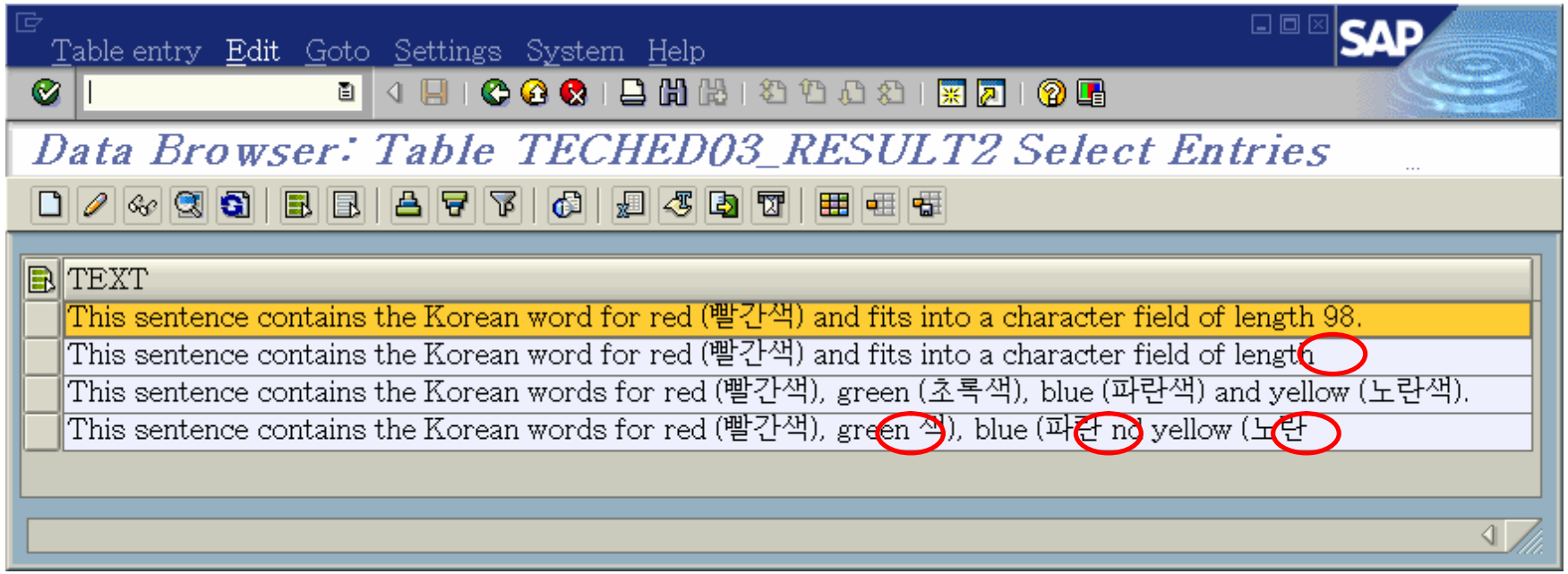
SAP TECHED

Common mistakes: Wrong length assumptions

Problems with length assumptions

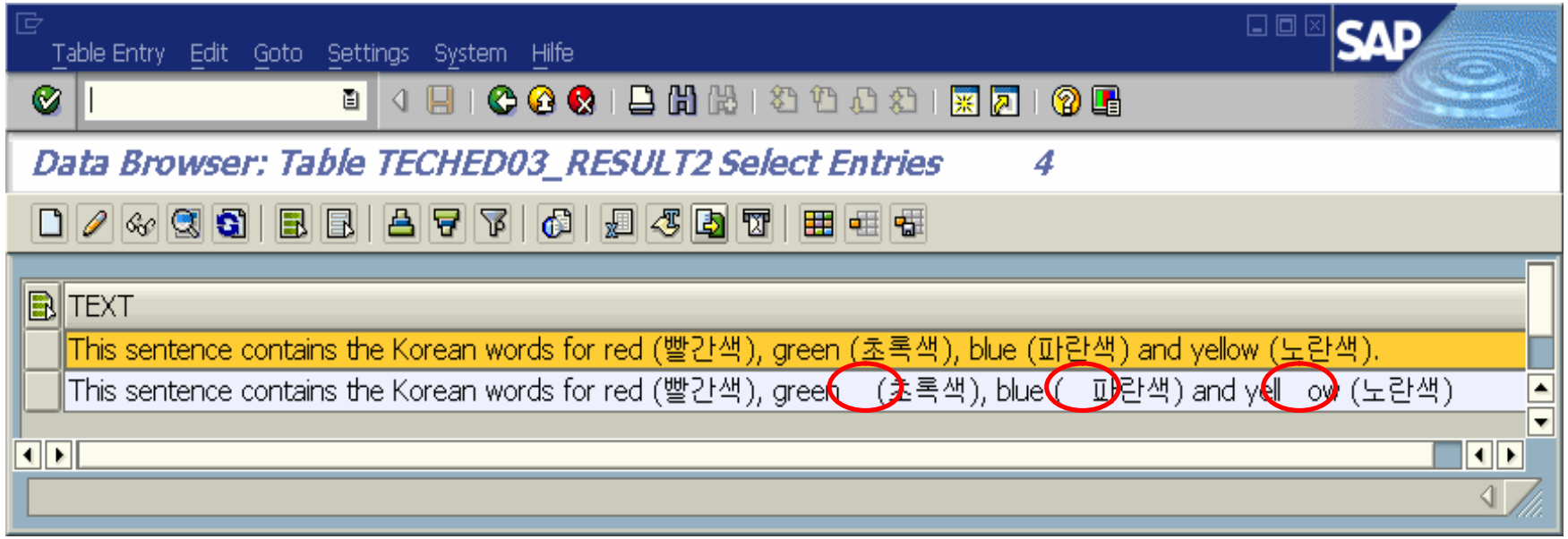
String lengths are not invariant under code page conversions. This may lead to different problems:

In a Unicode system a character field of certain length can hold more characters than the same character field in a non-Unicode system. Sending such data will result in data loss (☠).



Problems with length assumptions (continued)

Breaking a string into a table of fixed line size and sending the table from a non-Unicode to a Unicode-system does not work, since the information about the occupied length is lost and subsequent reassembling into a string will insert unwanted spaces (☠).

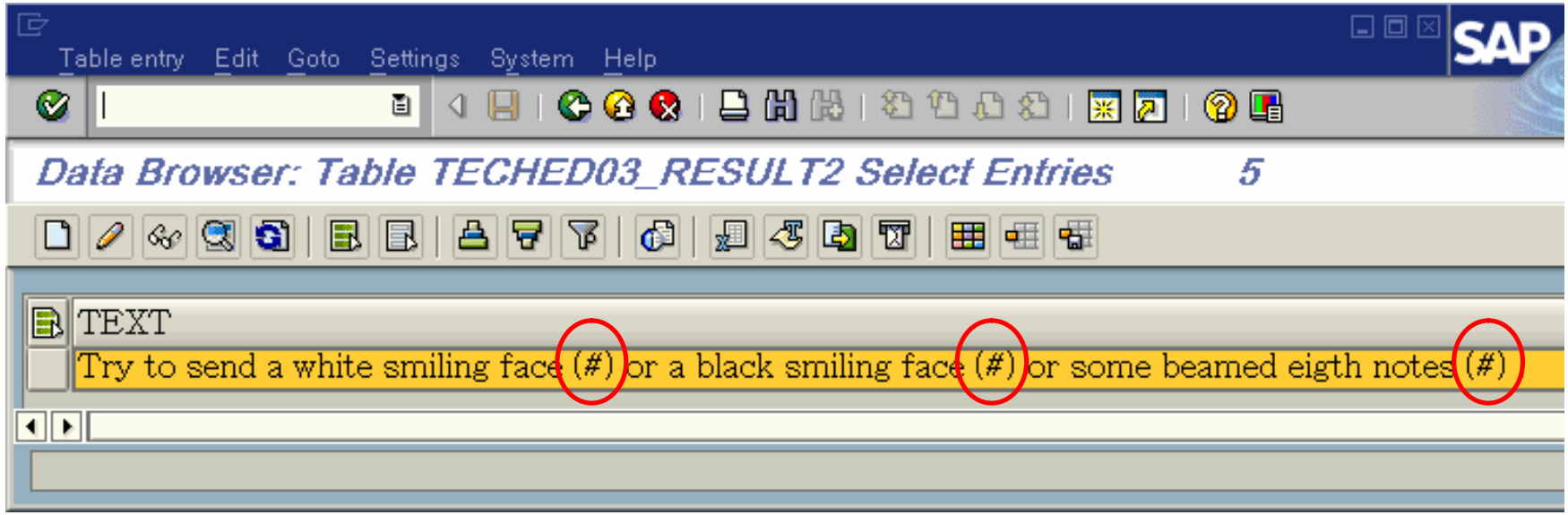


Common mistakes: data not in receivers codepage

Data not in the receivers code page

In general you must not send data from a source system into a target system, if the characters send are not in the target systems code page. Especially don‘t send one of the characters that are only in the Unicode code page to an old-fashioned non-Unicode system:

Try to send a white smiling face (☺) or a black smiling face (☻) or some beamed eigth notes (♫) ! (→ # → ☠)



Contents

Exercises

Send single code page and MDMP data via RFC

- **Type hiding and missing text language fields: TECHED_UNICODE_EXERCISE_11/12/13/14 and15**
- **Wrong length assumptions: TECHED_UNICODE_EXERCISE_16/18**
- **Data not in the receivers code page: TECHED_UNICODE_EXERCISE_17**

Transfer data via file on the application server

- **Writing files: TECHED_UNICODE_EXERCISE_19**
- **Reading files: TECHED_UNICODE_EXERCISE_20**
- **BOM handling: TECHED_UNICODE_EXERCISE_23**

Transfer data via file on the frontend

- **Writing files: TECHED_UNICODE_EXERCISE_21**
- **Reading files: TECHED_UNICODE_EXERCISE_22**

Agenda

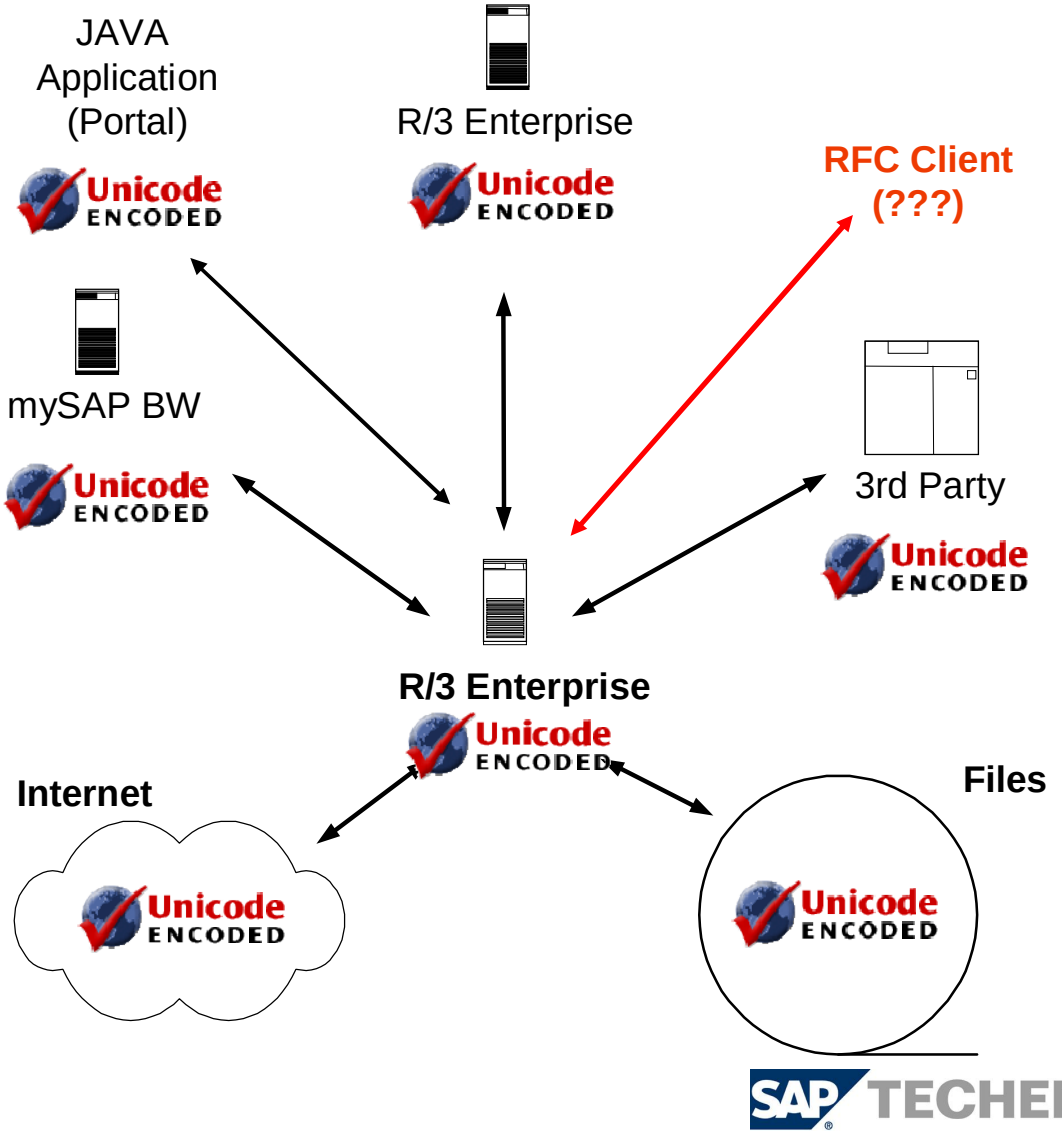
Appendix

- **RFC SAP R3 ←→ RFC client: Unicode interface for C programming**
- **Other languages**

RFC SAP R3 ←→ RFC client

The ideal Picture: RFC Clients ???

- **When I want to Unicode enable my RFC client ...**
- **... what shall I do with type char ???**



SAP TECHED

What you need – Unicode RFC SDK

http://service.sap.com/netweaver

SAP NetWeaver

SAP NetWeaver in Detail

Application Platform

Connectivity

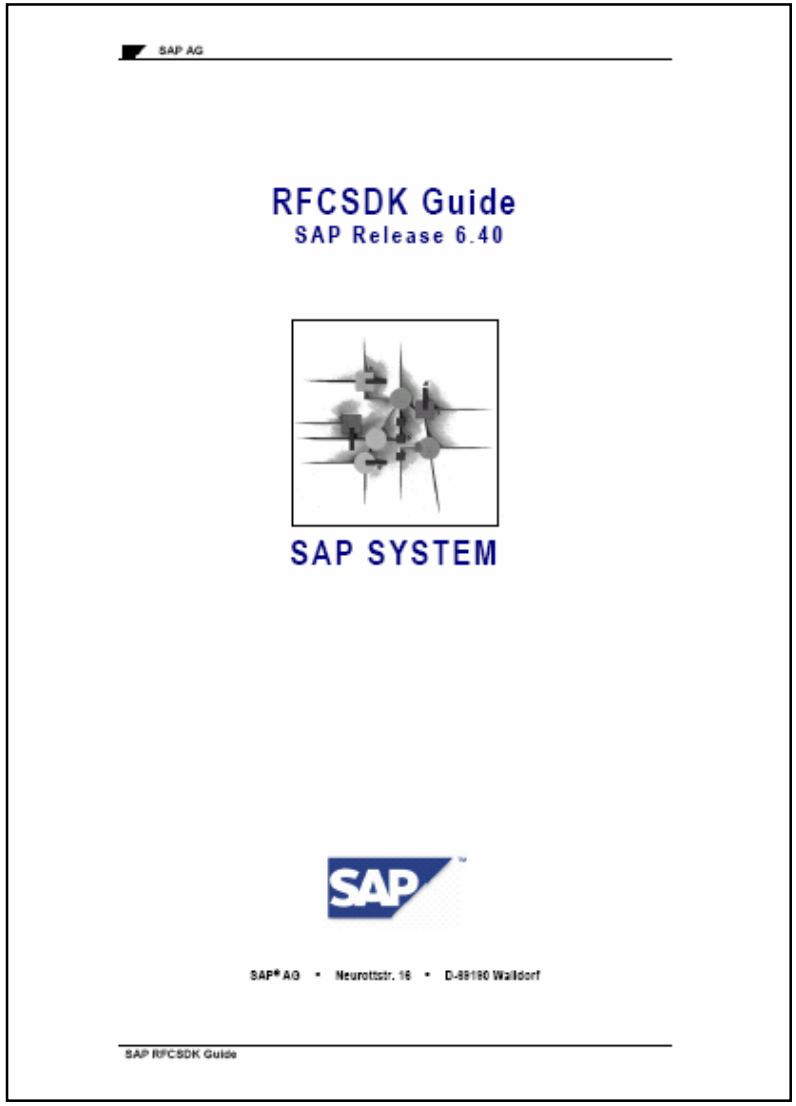
Connectors

RFC Library

Media Library

RFC Library Guide (PDF)

Section: RFC Library and UNICODE



Communication with Java via JCo/JRFC

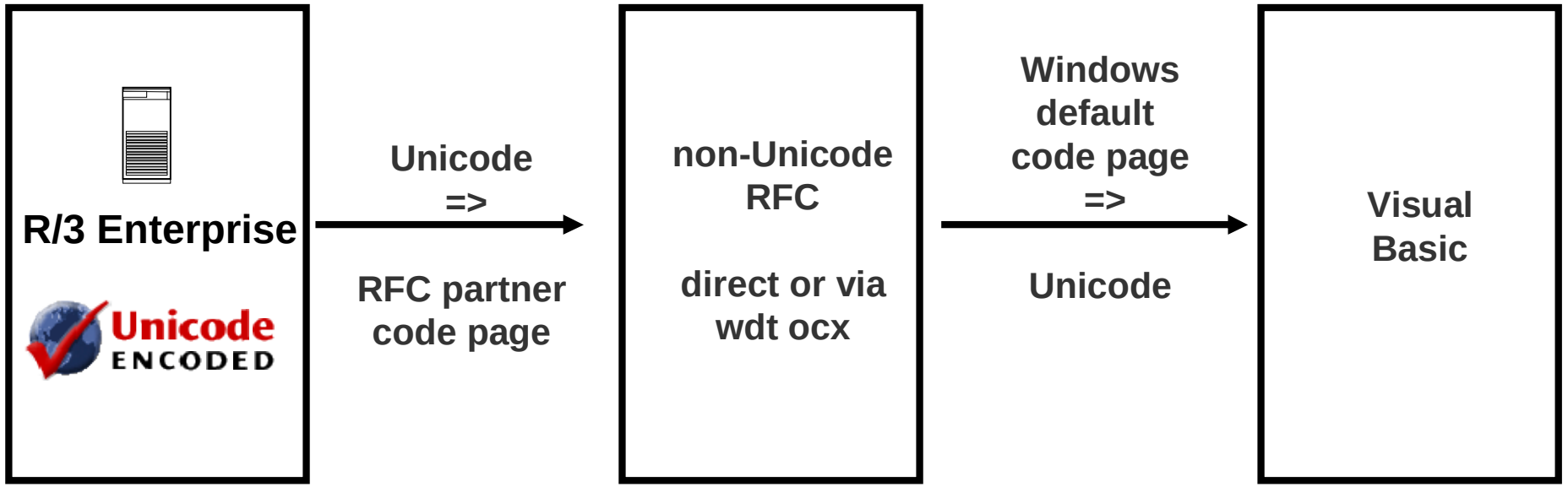
Java uses Unicode ➔ Unicode R/3 makes live easier

For JCo server it is necessary to specify if partners are Unicode:
```
JCo.Server.setProperty("jco.server.unicode","1");
```

JCo server needs different repository for Unicode and non-Unicode partners
➔ One JCo.Server Object can only serve Unicode or non-Unicode partners

This restriction does not exist for JRFC (JCo successor for J2EE applications)

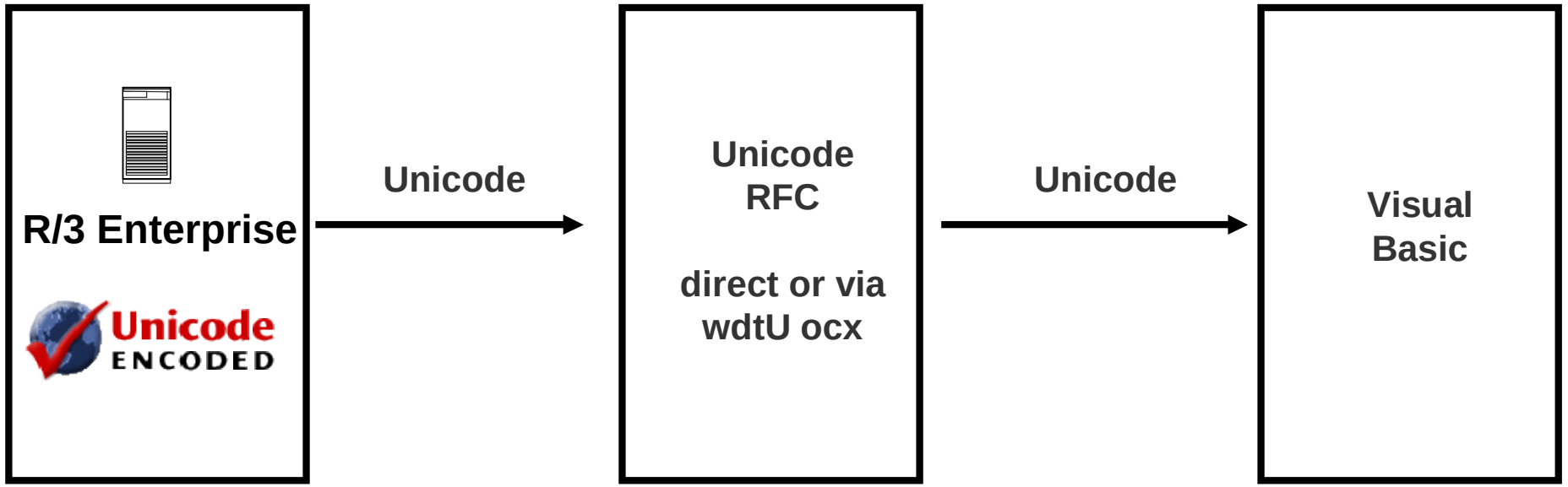
Communication with Visual Basic (1)



Data transfer is restricted to Windows default code page

RFC partner code page must match to Windows default code page

Communication with Visual Basic (2)



With Unicode RFC / Unicode wdt ocx no code page conversion needed

Standard Visual Basic UI controls do not support Unicode
MS Office controls do

Communication with Visual Basic .NET

Visual Basic .NET uses Unicode

Via .NET Connector communication with Unicode and non-Unicode partners possible (transparent for caller)

Further Information

Public Web:

http://www.service.sap.com/Unicode@sap : Technology

http://www.service.sap.com/Unicode : Customer contact

www.sdn.sap.com/sdn/developersguide.sdn : NetWeaver Developer‘s Guide

Related SAP Education Training Opportunities

http://www.service.sap.com/rkt-unicode

Related Workshops/Lectures at SAP TechEd 2005

SPC202 Conversion of SAP Systems to Unicode, lecture

SPC204 Performance Techniques for Unicode Conversion of Single Code Page Systems, lecture (Teched Boston only)

LCM207 SAP Upgrade and Unicode Methodology, (Teched Boston only)

SPC251 Unicode Interfaces – Data Exchange Between Unicode and non-Unicode Systems, hands on

SPC250 Making ABAP Programs Unicode Enabled; hands on

IM101 Dealing with Multi-Language Garbage Data – Lessons Learned, lecture

Questions?

Q&A

Feedback

Please complete your session evaluation.

**Be courteous — deposit your trash,
and do not take the handouts for the following session.**

Thank You !

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