Agenda

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Introduction

Unicode SAP System – Why and How
Unicode Conversion Paths – Basic Concept
How to Convert a System
Unicode Conversion Paths
Hardware, Sizing, Downtime
Additional Information
References and Contacts
What is Unicode?

“Unicode is] the encoding standard [which] provides the basis for processing, storage and interchange of text data in any language in all modern software and information technology protocols.”

see: http://www.unicode.org

ما هي الشفرة الموحدة "بونيكود"؟ in Arabic
什麼是Unicode(統一碼/標準萬國碼)? in Chinese (Traditional)
What is Unicode? in English
ეს არის ევოლოციური ნიმუში? in Georgian
Τι είναι το Unicode? in Greek
यूनिकोड क्या है? in Hindi
Cos'è Unicode? in Italian
ユニコードとは何か？in Japanese
유니코드에 대해? in Korean
Что такое Unicode? in Russian
Solution: Unicode, One Code Page for All Scripts

And more languages can be supported easily without the need for new code pages or other new methods (e.g. Vietnamese, Indic Scripts)
SAP Pre-Unicode Solutions: Single Code Pages

- Turkish
- Croatian
- Czech
- Hungarian
- Polish
- Rumanian
- Slovakian
- Slovene
- Greek
- Hebrew
- Japanese
- Korean
- Taiwanese
- Thai
- Russian
- Ukrainian
- Danish
- Dutch
- Finnish
- French
- Italian
- Norwegian
- Portuguese
- Spanish
- Swedish
- Icelandic

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Disadvantages of old standard code pages

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

Languages: 41
Characters: 22,378
Code Pages: 390
Pre-Unicode Solution for Multiple Languages: MDMP

West European View

Japanese View

Korean View
Pre-Unicode Solution for Multiple Languages: MDMP

<table>
<thead>
<tr>
<th>West European View</th>
<th>Japanese View</th>
<th>Korean View</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOR</td>
<td>SPRAS</td>
<td>NAME</td>
</tr>
<tr>
<td>B</td>
<td>DE</td>
<td>blau</td>
</tr>
<tr>
<td>G</td>
<td>grün</td>
<td>grün</td>
</tr>
<tr>
<td>R</td>
<td>rot</td>
<td>rot</td>
</tr>
<tr>
<td>Y</td>
<td>gelb</td>
<td>gelb</td>
</tr>
<tr>
<td>B</td>
<td>EN</td>
<td>blue</td>
</tr>
<tr>
<td>G</td>
<td>green</td>
<td>緑</td>
</tr>
<tr>
<td>R</td>
<td>red</td>
<td>赤</td>
</tr>
<tr>
<td>Y</td>
<td>yellow</td>
<td>黄</td>
</tr>
</tbody>
</table>

No support as of mySAP ERP 2005
Introduction

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Who Needs Unicode?

Acting in global business requires support of a Global Character Set!

- Companies running global business processes like Global HR Systems or Global Master Data Management
- Companies offering Web Services to their customers: Global Master Data containing multiple local language characters.
- Companies using Open Standards: J2EE and .NET integration (JAVA speaks Unicode)
- Collaborative Business: Integration of Third Party Products that run on different code pages
Example: Application Impact

Example: CRM Business Partner
Example: System Integration and Non-Unicode

Unicode
Non-Unicode
Example: System Integration and Unicode

- ABAP Unicode: 不明
  Jörg Müller

- J2EE Unicode: 不明
  Jörg Müller

- Web Dynpro
  ABAP Unicode: 不明
  Jörg Müller
  J2EE Unicode: 不明
  Jörg Müller

Unicode
Non-Unicode
Example: Scripts Supported With Unicode

- In South Asian countries there are a lot of different official scripts, for example Devanagari (mainly used for writing Hindi), Tamil and Kannada. These scripts are supported in Unicode SAP systems.

- General information about South Asian scripts in the Unicode standard are available here: [http://www.unicode.org/versions/Unicode4.0.0/ch09.pdf](http://www.unicode.org/versions/Unicode4.0.0/ch09.pdf)

- Attached to SAP Note [73606](#) you will find an excel sheet listing all languages which are technically supported in SAP systems.

- SAP Note [895560](#) provides information about languages which are only supported in Unicode SAP systems.
In this table the column NAME contains the term for color 'Blue' in three Indic script languages:

- नीला (Hindi (HI))
- ಹಸಿ (Kannada (KN))
- குறு (Tamil (TA))
Internationalized Software With Unicode

- The **Unicode** Standard was adopted by industry leaders e.g. Apple, HP, IBM JustSystem, Microsoft®, Oracle, SAP, Sun™, Sybase, Unisys and many others.

- **Unicode** is required by modern standards such as XML, Java™, ECMAScript (JavaScript™), LDAP, CORBA 3.0, and WML.

- **Unicode** is the official way to implement ISO/IEC 10646 and is supported in many operating systems and all modern browsers.
Conclusion: Why Convert to Unicode?

Unicode defines the character set for ...
... efficient text processing in any language
... maintaining text data integrity

Unicode systems ...
... need only one locale (Unicode locale = platform-independent)
... integrate seamless in existing system landscape (SAP and non-SAP systems)
... provide all ISO 639-2 language keys and 86 additional country-specific language keys
→ a total of 560 technically supported languages!

Users can ...
... enter and display any character from any script no matter which logon language they use
... print text data in multiple languages
Why Convert to Unicode?

- One character set in system landscape
- Easy handling for endusers
- Lower operation costs
Ways to Your Unicode SAP System

Supported Unicode Conversion Paths

Unicode Conversion without Upgrade

'standard' path: Web AS 6.20 – mySAP ERP 2004

Combined Upgrade & Unicode Conversion

for target release mySAP ERP 2005 only

Twin Upgrade & Unicode Conversion

pilot project
Prerequisites

- **Unicode-based mySAP components**
  - For current status, see SAP Note 79991.

- **Unicode-enabled ABAP programs**
  - For more information, please visit the following session:

  Related Workshops/Lectures at SAP TechEd 2006
  
  SPC251, Making Programs Unicode Enabled, Hands-on
All Unicode Conversion Paths are based on one concept.

1. Prepare non-Unicode system.

2. Export non-Unicode database and convert non-Unicode data.

3. Create new Unicode database and import the non-Unicode database.

4. Do post-conversion activities in the Unicode system.
Ways to Your Unicode SAP System

Supported Unicode Conversion Paths

Unicode Conversion without Upgrade

- 'standard' path: Web AS 6.20 – mySAP ERP 2004

Combined Upgrade & Unicode Conversion

- for target release mySAP ERP 2005 only

Twin Upgrade & Unicode Conversion

- pilot project
Prepare Non-Unicode System

All character data in the non-UC database require language information before the database export is executed.

[code page assignment]

Single Code Page Systems/
Unambiguous Blended Code Page Systems
(ca. 90% of all customer systems)

MDMP Systems/
Ambiguous Blended Code Page Systems
(ca. 10% of all customer installations)

WHY?
Content in Unicode System

Unicode

... we need to know the language/code page of every character ...
### MDMP → Unicode Database Conversion

**MDMP System (logon language DE)**

<table>
<thead>
<tr>
<th>Language</th>
<th>Code Page Switch</th>
<th>Unicode System</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE</td>
<td>1100</td>
<td>синий</td>
</tr>
<tr>
<td>RU</td>
<td>1500</td>
<td>красный</td>
</tr>
<tr>
<td>JA</td>
<td>8000</td>
<td>желтый</td>
</tr>
<tr>
<td>KO</td>
<td>8500</td>
<td>желтый</td>
</tr>
</tbody>
</table>

**Code Page Switch**

- 1100 -> 4103
- 1500 -> 4103
- 8000 -> 4103
- 8500 -> 4103
Example: Russian Text Data in MDMP System

The Hex-code entry 0xE2D5DAE1E2 is found in a database table which has no language key.

**MDMP system configuration**
- ISO-8859-1 (Western Europe)
- ISO-8859-2 (Eastern Europe)
- ISO-8859-5 (Cyrillic)

The entry could be either:
- åÕÚåâ English
- âÕÚåâ Polish
- тёкст Russian

<table>
<thead>
<tr>
<th></th>
<th>E2</th>
<th>D5</th>
<th>DA</th>
<th>E1</th>
<th>E2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO-8859-1</td>
<td>å</td>
<td>Ö</td>
<td>Ú</td>
<td>á</td>
<td>â</td>
</tr>
<tr>
<td>ISO-8859-2</td>
<td>å</td>
<td>Ō</td>
<td>Ú</td>
<td>á</td>
<td>å</td>
</tr>
<tr>
<td>ISO-8859-5</td>
<td>т</td>
<td>е</td>
<td>к</td>
<td>с</td>
<td>т</td>
</tr>
</tbody>
</table>

Worst case: Russian speakers have to identify the data manually.
Problem
Code page assignment in MDMP/Ambig. Blended Code Page Systems is complex, because ...

ALL table rows in the database need code page information!

Solution: You can...
- use existing language information
- create and maintain a Vocabulary (collect words → assign language)
- import and use a Vocabulary from another system (sandbox → prod. system)
- use various assignment methods delivered by SAP
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Prepare Non-Unicode System: Transaction SPUMG

**Preparation**
- Set up the Conversion Project
- Check Prerequisites
- Plan database downtime during conversion
- Enable Customer Developments

**Unicode Conversion**

**Finalization**
- Unicode system is up and running
- Verification of Data Consistency
- Integration Testing focused on language handling

Conversion Preparation in non-Unicode system
In transaction SPUMG you collect and analyze character data without code page information. SPUMG creates control information that will be used during the database conversion.

SPUMG consists of several database scans

- Consistency Check
- Tables without Language Information
- Tables with Ambiguous Language Information
- Tables with Language Information
- Reprocess
- INDX Analysis
- INDX Repair
SPUMG Language Lists

All languages supported in non-UC SAP systems are inserted automatically:
- active
  - installed in the system, can be used for Vocabulary maintenance
- inactive
  - not installed, but can occur in tables with Lang. Info
  - cannot be used in Vocabulary but during conversion
Maintain the SPUMG settings and then initialize the worklist for the Consistency Check!
Consistency Check

- Checks table consistency (existence in DDIC, access)
- Writes control information to SPUMG control tables
- Classifies tables into tables with or without language information (MDMP only)

Single Code Page and MDMP!
The goal of this scan is to build the Vocabulary!

All tables without language information are scanned.
All tables with language information are scanned.

Words with an ambiguous language are added to the Vocabulary.
The Vocabulary must be filled and maintained before the database export is executed.

You can

- Reuse existing language code page assignments imported from other systems or delivered by SAP
- Insert language keys automatically with scan *Tables with Language Information*
- Create *Vocabulary Hints* to assign a language based on other table fields
- Manually assign language to word in the Vocabulary
- Do automatic language assignment with predefined methods
- Download and use language patterns

MDMP only!

SAP Notes
756534
756535
871541
All tables with language information are scanned.

This scan assigns languages to words in the Vocabulary based on the values of other tables in the database.
Vocabulary Hints

All words contained in rows where NAME_FIRST is ‘HUGO’ and NAME_LAST is ‘MÜLLER’ are assigned language DE (German).
This Hint applies to all tables containing words which should be assigned language DE in the Vocabulary.
Filled-by-categories indicate how language has been assigned to entry.
Vocabulary Assignment Methods

Vocabulary

Auto Assign

Class or interface name (1)  4 Entries found

Class name | Description
-----------|-------------
CL_UMG_AL_IMPORT | VOCABULARY IMPORT
CL_UMG_AL_NA_CHARSTAT | CHARACTER STATISTICS FOR NON ASIAN LANGUAGES
CL_UMG_AL_TECHNICAL_PROPERTIES | TECHNICAL PROPERTIES
CL_UMG_AL_YA_CHARSTAT | CHARACTER STATISTICS FOR ASIAN LANGUAGES

MDMP only!
Reprocess

- This scan simulates R3load behavior.

- It checks if the code page information in the Vocabulary is sufficient for the conversion. If not, the Reprocess creates a log entry for the table.
The Reprocess Log contains:
- table name
- key values
- reason why no code page could be assigned.

Users can assign a language to each entry here. This information is used later in the Unicode system for repairing wrongly converted data.

---

**Reprocess Log of table UMG_TEST_4**

<table>
<thead>
<tr>
<th>Key</th>
<th>Text</th>
<th>Reason</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>grün</td>
<td>grün</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>%©</td>
<td>%©</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>☕</td>
<td>☕</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>☕</td>
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<tr>
<td>☕</td>
<td>☕</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

---

SAP Note 938374
INDX-type tables consist of

- a transparent part which is treated like the other transparent tables in the database during the conversion preparation.

- a binary part which contains the code page information used during the EXPORT TO DATABASE /IMPORT FROM DATABASE statement.

In MDMP Systems the handling of INDX-type tables is improper in a way that a wrong code page might be stored in the binary part of the table.
### INDX-Type Tables: Structure

<table>
<thead>
<tr>
<th>Character area</th>
<th>Transparent Part</th>
<th>Binary Part</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MANDT</th>
<th>RELID</th>
<th>SRTFD</th>
<th>SRTF2</th>
<th>......</th>
<th>CLUSTR</th>
<th>CLUSTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(3)</td>
<td>C(2)</td>
<td>C(n)</td>
<td>INT4</td>
<td>INT2</td>
<td>LRAW</td>
<td></td>
</tr>
<tr>
<td>Client</td>
<td>Area</td>
<td>ID</td>
<td>Line cnt</td>
<td>User data (opt)</td>
<td>Ing of data</td>
<td>Data cluster</td>
</tr>
</tbody>
</table>

- **Character area**
  - Binary Part
  - Transparent Part
These two scans handle the binary part of INDX-type tables:

1. All INDX-type tables without language information are scanned and all text hidden in the INDX-cluster part is analyzed. Words are added to the Vocabulary.
2. The Vocabulary is used for assigning correct code pages before the database export.

Consistency Check → INDX Analysis → INDX Repair

- Vocabulary
- Vocabulary
- Adjust Code Page Info in INDX cluster data

To be maintained
INDX Log of table UMG_TEST_INDEX1

<table>
<thead>
<tr>
<th>Key</th>
<th>Text</th>
<th>Reason</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSC_TABLE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSSTRING_DE</td>
<td>Pförterhauschen</td>
<td>3</td>
<td>DE (German)</td>
</tr>
<tr>
<td></td>
<td>Pförterhauschen</td>
<td></td>
<td>EN (English)</td>
</tr>
<tr>
<td></td>
<td>Pförterhauschen</td>
<td></td>
<td>JA (Japanese)</td>
</tr>
<tr>
<td></td>
<td>Pförterhauschen</td>
<td></td>
<td>KO (Korean)</td>
</tr>
<tr>
<td></td>
<td>Pförterhauschen</td>
<td></td>
<td>ZI (Customer reserve)</td>
</tr>
<tr>
<td></td>
<td>Pförterhauschen</td>
<td></td>
<td>ZH (Chinese)</td>
</tr>
</tbody>
</table>
Final Steps in Non-Unicode Systems

Update the worklist to add changed or new tables to SPUMG. You can display the new tables in the Log.

Create the Unicode nametabs. Afterwards do not import new or modify existing DDIC objects! Otherwise the Unicode nametab will become invalid!

MDMP only!

Single Code Page and MDMP!
Database Export, Conversion and Import

Preparation

- Set up the Conversion Project
- Check Prerequisites
- Plan database downtime during conversion
- Enable Customer Developments

Unicode Conversion

Finalization

- Unicode system is up and running
- Verification of Data Consistency
- Integration Testing focused on language handling

SAPinst (R3load)

Database Export, Conversion & Import

SUMG

Conversion Completion in the Unicode system

SPUMG

Conversion Preparation in the non-Unicode system
When you perform a Unicode Conversion, you perform a System Copy.

**Standard System Copy Procedure:**

**Basic Steps**

- **Preparation tasks**
- **Export of non-UC database with SAPinst (internally R3load)**
- **R3load performs database export and data conversion to Unicode according to content in Export Control Table and in the Vocabulary. R3load creates a log for later use in Unicode system in case code page information is not available.**
- **Installation of new database on the target system with SAPinst R3load performs import of converted database.**
- **Post-Processing tasks**
Database Export, Conversion and Import: Overview

- SPUMG
  - Re-process Log
  - Control Table
  - Vocabulary

- R3load Log

- EXPORT
  - non Unicode
  - R3load
  - Data
  - Conversion

- IMPORT
  - Unicode
  - R3load

Unicode Data Conversion

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Database Export, Conversion and Import: Overview

- **SPUMG**
  - Re-process Log
  - Control Table
  - Vocabulary

- **R3load**
  - Log

**EXPORT**
- non Unicode
- R3load

**IMPORT**
- Data
- R3load
- Unicode

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Unicode System – First Steps

1. Install Unicode Kernel + Unicode Executables
2. Start Unicode System
3. Logon to Unicode System
Database Export, Conversion and Import: Overview

- **SPUMG**
  - Re-process Log
  - Control Table
  - Vocabulary

- **R3load Log**

- **EXPORT**
  - non Unicode
  - R3load
  - Data

- **IMPORT**
  - Re-process Log
  - Control Table
  - Vocabulary
  - R3load
  - Unicode

- **Conversion**

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Database Export, Conversion and Import: Overview

Export

SPUMG

R3load Log

non Unicode

R3load

SUMG

Reprocess Log
Control Table
Vocabulary

IMPORT

Unicode

Data

R3load
Post-Conversion Activities: Transaction SUMG

**Preparation**
- Set up the Conversion Project
- Check Prerequisites
- Plan database downtime during conversion
- Enable Customer Developments

**Unicode Conversion**
- Conversion Preparation in non-Unicode system
- Database Export, Conversion & Import
- Unicode system is up and running
- Verification of Data Consistency
- Integration Testing focused on language handling

**Finalization**
- SUMG Conversion Completion in the Unicode system
Post-Conversion Activities: Conversion Completion

In the Unicode system you might recognize data which have not been converted correctly. In order to ‘complete’ the conversion procedure, the data can be converted once again in transaction SUMG – using the correct language information.

SUMG provides two Completion Types

I. Automatical Completion:
   - Based on R3load Log and language information from Reprocess Log

II. Manual Repair:
   - Repair Hints
   - Manual Language (Code Page) Assignment
I. Automatical Completion

1. Enter path and name of the file which contains the path(s) of the XML-file(s).

2. **R3load Log**
   - table name, key value, code page used for the conversion, error messages

Reprocess Log
- table name, key value, lang. which were manually assigned in SPUMG.
II. Manual Repair: Repair Hints

1. Create Condition

2. Create Hint

3. Save Hint

4. Execute Hint

Once created you can reuse Hints in other systems.
II. Manual Repair: Manual Language Assignment

You can add single tables, assign the correct language to corrupt table data, and then convert the data again.

Note

Manual language assignment should only be done by users who are able to recognize the correct language of the data.

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Supported Unicode Conversion Paths

Unicode Conversion without Upgrade

'standard' path: Web AS 6.20 – ERP 2004

Combined Upgrade & Unicode Conversion

for target release ERP 2005 only

Twin Upgrade & Unicode Conversion

pilot project
Many customers have R/3 4.6C systems with MDMP configurations. They want to upgrade to the highest release: ERP 2005.

**Problem:**
Starting with release ERP 2005 MDMP support is discontinued. Customers can not upgrade their MDMP systems to ERP 2005 first and then convert to Unicode. Customers can not convert to Unicode first and then upgrade to ERP 2005 because 4.6C is not a Unicode-enabled release.

**Solution**
The "Combined Upgrade & Unicode Conversion (CU&UC)" enables customers to upgrade to ERP 2005 and switch to Unicode simultaneously.
Example: R/3 4.6C MDMP → SAP ECC 6.0 Unicode

Combined Upgrade & Unicode Conversion Process

SAP R/3 4.6C MDMP Preparation

SAP ECC 6.0 non-Unicode

SAP ECC 6.0 Unicode Conversion Process Finish

SAP BASIS 4.6C/D

SAP BASIS 7.00

SAP BASIS 7.00

*ECC = Enterprise Central Component in release ERP 2005

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**Example: R/3 4.6C MDMP → SAP ECC 6.0 Unicode**

*SAP Basis 6.20 Sandbox*

*SAP Basis 4.6C MDMP*

**SPUM4 activities**

**PREPARE**

Import SPUM4  
Module Ext.

**SAPup**

**Transport of Copies**

**SAP BASIS 7.00 non-UC**

**DB conversion**

**SUMG**

**SAP BASIS 7.00 Unicode**

**Export**  
**Import**

**R3load**

*Note: There are preparation steps which can only be performed in a system with a Unicode enabled release (> Web AS 6.10). Therefore an additional preparation system (sandbox system) is required.*
Example: Main Steps

Production Time

1. Unicode enabling of customer programs and conversion of customer code pages*
2. Transport for import of customer programs and code pages during Upgrade
3. Upgrade Preparation incl. import of preconversion tool SPUM4 in 4.6C
4. Preconversion in 4.6C using SPUM4
5. First Upgrade Phases (incl. create UC nametab)

Downtime

6. Upgrade (SAPup)
7. Consistency check and nametab check in ECC 6.0 non-UC
8. Unicode Conversion (system copy with SAPinst)
9. Automatical completion in ECC 6.0 UC (SUMG)
10. Manual completion steps in ECC 6.0 Unicode
The CU&UC downtime includes

- **SAPup** – 'usual' Upgrade Downtime
- **SAPinst** – System copy downtime, highly depending on the database size, hardware and time spend on optimization, Customer-specific actions
- **SUMG** – Automatical completion process after database import in Unicode system
Customers with MDMP systems on SAP releases \( \leq \text{R/3 4.6B} \) can not upgrade their systems to ERP 2005.

They can not make use of the CU&UC because the Unicode Preconversion Tool is not utilizable in their release.

**Solution**

A release-independent concept which allows a combination of Upgrade and Unicode conversion.
The "Twin Upgrade & Unicode Conversion" enables customers to perform both procedures in one downtime window!

How?
Preparation steps (SPUMG) are done in an upgraded copy of the production system (Twin system):

- The Twin system is used for collecting all necessary information required for a fast run in the production system and for creating the control information needed for the correct conversion of the MDMP data.
- The results are then reused during the conversion of the production system in order to minimize the downtime.
TU&UC: Example R/3 4.5B MDMP → SAP ECC 6.0 Unicode

PRODUCTION RUN

Production System R/3 4.5B MDMP

Upgrade

Production System ECC 6.0 MDMP

System Copy + Conversion

Production System ECC 6.0 Unicode

SUMG

Copy Prod. System R/3 4.5B MDMP

System Copy

UCCHECK Cust. CP conversion

Copy Prod. System ECC 6.0 MDMP

Upgrade

Transport of Copies

Import results

SPUMG

TWIN RUN

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Further Information

SAP Service Marketplace Quick Links:

www.service.sap.com/unicode@sap
www.service.sap.com/unicode
www.service.sap.com/upgrade-erp

FAQ:
SAP Note 928729 „Combined Upgrade & Unicode Conversion FAQ“
SAP Note 959698 „Twin Upgrade & Unicode Conversion FAQ“

Required Documentation:
„Combined Upgrade & Unicode Conversion Guide“

www.service.sap.com/unicode@sap

Component Upgrade Guide

www.service.sap.com/upgrade-erp

„Homogeneous and Heterogeneous System Copy for SAP Systems based on SAP NetWeaver 2004s“

www.service.sap.com/installnw2004s
Introduction
Unicode SAP System – Why and How
Unicode Conversion Paths – Basic Concept
How to Convert a System
Unicode Conversion Paths
Hardware, Sizing, Downtime
Additional Information
References and Contacts
Conversion Project: Timeline

How long does it take to convert a system?

The project timeline depends on a number of factors:
Dependencies

Single Code Page or MDMP Conversion?
- MDMP requires more preconversion tasks and postconversion handling in the Unicode system

Processing of Cluster Tables
- Sizes of cluster tables (compared to transparent tables)

Hardware

Optimize parallelization of Export/Import processes
Hardware Requirements – Overview

- Based on parallel benchmarking of Unicode / non-Unicode test systems
- Note: The CPU/RAM figures are measured average numbers on SAP Application Servers and will be different for different transactions.
- Additional CPU/RAM hardware resource requirements on standalone DB servers must be provided by DB vendors.

**CPU**
- +30%
- depending on existing scenario (MDMP, double-byte)

**RAM**
- +50%
- Application Servers are based on UTF-16 internally

**Database size**
- UTF-8*: up to +10%
- UTF-16: +20..60%

* 10% is the observed maximum for bigger systems (db size > 200 GB).

**Network Load**
(SAP GUI for Windows)
- UTF-8
- almost no change due to efficient compression
Expected Hardware Requirements – Database Size

Database growth is depending on

- Database Unicode Encoding Scheme (e.g. CESU-8 vs. UTF-16)
- Database settings (page size, extent size)
- Hardware compression
- Language in use (e.g. Japanese vs. English: for double-byte characters UTF-16 requires less storage than UTF-8)
- Tables (LRAW fields are in some cases not converted while CHAR fields are)
- Application modules in use (ratios: tables/indices, text/binary data)
- Reorganization frequency
  - Unicode conversion includes a DB reorganization
  - DB growth is often compensated by shrinking due to reorganization (especially the indices)
### Expected Hardware Requirements – Database

<table>
<thead>
<tr>
<th>Database (Platform)</th>
<th>Encoding</th>
<th>Additional Storage Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2 for AS/400</td>
<td>UTF-16</td>
<td>+10…20% *</td>
</tr>
<tr>
<td>DB2 for z/OS</td>
<td>UTF-16</td>
<td>+20…25% **</td>
</tr>
<tr>
<td>DB2 /Universal Database for Unix/NT</td>
<td>UTF-8</td>
<td>-10%</td>
</tr>
<tr>
<td>MaxDB</td>
<td>UTF-16</td>
<td>+40…60%</td>
</tr>
<tr>
<td>MS SQL</td>
<td>UTF-16</td>
<td>+40…60%</td>
</tr>
<tr>
<td>Oracle</td>
<td>CESU-8</td>
<td>-10%</td>
</tr>
</tbody>
</table>

*Small growth as biggest part of the ASCII based database is already Unicode

* *With hardware compression, which is always used for SAP Unicode installations

---

**Average database growth measured in customer systems (sum of all sizes)**
- UTF-8 and CESU-8: -13% (more than 90% of the databases have shrunk)
- UTF-16: +30…40%
System Downtime

- Highly depends on the hardware used (like CPU, disk, ...) but also on performance optimization.

- Use SAP Note 857081 „Unicode conversion: downtime “estimate”“ to get an early orientation about:
  - expected downtime
  - potential bottlenecks
  - possible measures for improvement
  - how to analyze test results
  - how to compare results of different migration projects
Depending on hardware and parallelization effort, the R3load runtimes throughput is 100 – 200 GB/h. Highest measurements up to 300GB/h.
How to Estimate the Downtime

SAP Note 857081 provides a calculation formula for scenario-based rough estimation.

What you can do

- Download the SAR.file from the Note attachments.
- Consider your scenario and use the figures for calculation of the downtime with the formula.
- Compare the result with your test results.

What we would like you to do

- Please provide us with your scenario and the results.
- Please make suggestions how to improve tools, procedures and the formula.

internationalization@sap.com
How to Estimate Downtime

**Source DB**
- Disk Input-Output (IO) – Read, Sort (if RAM not sufficient)
- CPU – Sort, Index search (for splitted tables)

**Application Server**
- Disk IO – Store compressed data (ignorable)
- CPU – Convert, Compress, Decompress

**Target DB**
- Disk IO – Write, Index creation
- CPU – Index creation

**Network**
- Gigabit Ethernet is sufficient
How to Improve the Downtime

- Use two separate databases for export and import. Distribute R3load Export/Import processes among multiple machines with the Distribution Monitor (see following slides).

- More information about the system copy optimization methods listed below are available at www.service.sap.com/systemcopy → optimization.
  - Unsorted export (SAP Note 954268)
  - Import with Fastload (R3load-loadprocedure fast): (e.g. Oracle: SAP Note 864861 )
  - Database tuning according to DB type (e.g. Oracle: SAP Note 936441)
  - Split long running tables with R3ta: (SAP Note 952514)
Runtime measurements show that using additional hardware (CPU power) speeds up the overall runtime of the system copy process as part of the Unicode conversion.

For a Unicode conversion it makes sense to distribute the data load among multiple machines because most of the CPU power is spent on the conversion during the export, especially for processing cluster tables.

The System Copy Tool Distribution Monitor is designed to take advantage of additional hardware (application servers, PCs,...) for the database export/import.
Degree of Parallelization without DISTMON

1. SAPinst pure

- Source system NUC
  - R3load Export Processes
  - R3load Import Processes

- Target system UC

Sequential Export and Import

2. Migration Monitor

- Source system NUC
  - R3load Export Processes
  - R3load Import Processes

- Target system UC

Parallel Export and Import Processes
3. Distribution Monitor

**Parallel Export and Import on multiple machines**

- **Source system NUC**
  - R3load Export Processes
  - R3load Export Processes
  - R3load Export Processes

- **R3load Import Processes**

- **Target system UC**
  - R3load Import Processes
  - R3load Import Processes
  - R3load Import Processes
System Copy with Distribution Monitor

1. Import Preparation
   Start SAPinst in target system, stop before data should be imported.
   **No DDIC changes after this point!**

2. Export Preparation
   Configure DISTMON
   Start DISTMON preparation

3. Beginn of System Downtime
   Start DISTMON for export on each machine
   Start DISTMON for import on each machine
   Export and Import can run in parallel.

4. Complete SAPinst in target system

5. End of System Downtime
Platforms and Databases

SAP supports Unicode systems on the following platforms

<table>
<thead>
<tr>
<th>Database system</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Server</td>
<td>W2K¹ Linux¹ Solaris HP OS/390 AIX AS/400 Tru64²</td>
</tr>
<tr>
<td></td>
<td>x - - - - - - -</td>
</tr>
<tr>
<td>Oracle</td>
<td>x x x x - x - -</td>
</tr>
<tr>
<td>DB2</td>
<td>x x x x x x x -</td>
</tr>
<tr>
<td>SAP DB</td>
<td>x x x x - x - -</td>
</tr>
<tr>
<td>Informix²</td>
<td>- - - - - - - -</td>
</tr>
</tbody>
</table>

Default = 64 bit versions

¹32 bit versions still available
²There will be no support for Informix and Tru64!

SAP Note 379940

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Printing in Unicode Systems

Cascading Fonts Printing Solution

Printing of all Unicode characters on any printer with Cascading Fonts-enabled device types. No modification of forms required!

SAPWIN/PCL/POST Script

- SAPscript forms
- SmartForms
- ABAP Lists

Related Lecture at SAP TechEd 2006

ULM105, SAP Printing News – From Conventional SAP Printing to Central Print Management with HP
Cascading Fonts: Reasons

Note: The ‘#’s are only used here as placeholders to demonstrate the problem. Normally the section is empty.

All text data is displayed in a particular font. In Unicode Systems you can enter more characters than one classical SAP font contains.

What to do when one font does not cover all scripts and characters to be displayed or printed?

<table>
<thead>
<tr>
<th>Car Line</th>
<th>Flight Date</th>
<th>Departure</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR 0400</td>
<td>07.09.2004</td>
<td>10:10:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LH 0400</td>
<td>07.09.2004</td>
<td>10:10:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LW 0400</td>
<td>20.10.2004</td>
<td>10:30:00</td>
<td>667.18 USD</td>
</tr>
<tr>
<td>DK 0402</td>
<td>28.11.2004</td>
<td>13:30:00</td>
<td>667.18 USD</td>
</tr>
<tr>
<td>DH 0402</td>
<td>31.12.2004</td>
<td>13:30:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LH 2402</td>
<td>02.09.2004</td>
<td>10:30:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>LH 2409</td>
<td>20.10.2004</td>
<td>07:10:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>LH 2407</td>
<td>15.12.2004</td>
<td>07:10:00</td>
<td>242.93 USD</td>
</tr>
</tbody>
</table>

Total: 3.501.186 ITL, 2.063.18 USD
Cascading Fonts: Solution

Classical font names in SAPScript and Smartforms documents remain unchanged.

When Unicode text is displayed or printed the fonts are switching automatically.

One cascading font is used for one ABAP List according to the logon language.

Users can create desired font combinations for each script of the world in the Cascading Fonts Customizing (transaction i18n).
Example

When the whole string is written in one font (e.g. HELVE), "上海" cannot be displayed correctly. In order to display "上海" correctly, an additional font which contains these characters is required.

With Cascading Fonts you can define subsets of fonts for each classical font, for example:

Classical Font HELVE +
- CNSONG (Chinese font) [Han script]
- THANGSAN (Thai font) [Thai script]
Cascading Fonts: Customizing

### Customizing SAP Cascading Fonts

<table>
<thead>
<tr>
<th>Global Cascading Font Name</th>
<th>Script</th>
<th>Sub SAP Font</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELVE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HELV_J7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HANJYU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAKKATANG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KOREAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KRANKGAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THAI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THAIYON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIMES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIMES_J7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIMES_NGON</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Device type dependent data of HELVE_J7:

<table>
<thead>
<tr>
<th>Device Type</th>
<th>GD Type</th>
<th>Font Info</th>
<th>Uploaded Font Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM</td>
<td>SAPWIN</td>
<td>SineUn</td>
<td>SineUn</td>
</tr>
<tr>
<td>TRAINER</td>
<td>SAPWIN</td>
<td>SineUn</td>
<td>SineUn</td>
</tr>
<tr>
<td>CHECKPOINT</td>
<td>POLS</td>
<td>CHECKPOINT</td>
<td>SAPUnicodeFont_31000</td>
</tr>
</tbody>
</table>
Example: ABAP List

### English

<table>
<thead>
<tr>
<th>Native text</th>
<th>ASCII text</th>
<th>Packed number</th>
<th>Integer</th>
<th>Floating point number</th>
</tr>
</thead>
<tbody>
<tr>
<td>abcd</td>
<td>abcd</td>
<td>12345</td>
<td>100</td>
<td>3.03E+01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left</th>
<th>Center</th>
<th>Right</th>
<th>Number</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>abcde</td>
<td>12345</td>
<td>abcde</td>
<td>12345</td>
<td>abcde</td>
</tr>
<tr>
<td>12345</td>
<td>abcde</td>
<td>12345</td>
<td>100</td>
<td>3.03E+01</td>
</tr>
</tbody>
</table>

### Japanese

<table>
<thead>
<tr>
<th>Native text</th>
<th>ASCII text</th>
<th>Packed number</th>
<th>Integer</th>
<th>Floating point number</th>
</tr>
</thead>
<tbody>
<tr>
<td>あいうえお</td>
<td>あいうえお</td>
<td>12345</td>
<td>100</td>
<td>3.03E+01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left</th>
<th>Center</th>
<th>Right</th>
<th>Number</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>あいう</td>
<td>12345</td>
<td>あいう</td>
<td>12345</td>
<td>あいう</td>
</tr>
<tr>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
</tr>
<tr>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
<td>あいう</td>
</tr>
</tbody>
</table>

### Korean

<table>
<thead>
<tr>
<th>Native text</th>
<th>ASCII text</th>
</tr>
</thead>
<tbody>
<tr>
<td>알이삼시오육칠팔구</td>
<td>12345</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left</th>
<th>Center</th>
<th>Right</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>알이삼시오육칠팔구</td>
<td>12345</td>
<td>알이삼시오육칠팔구</td>
<td>알이삼시오육칠팔구</td>
</tr>
</tbody>
</table>
Dear Sir or Madam,

We would appreciate payment of the following invoice as soon as possible. Thank you for placing your confidence in us.

<table>
<thead>
<tr>
<th>Car Line</th>
<th>Flight</th>
<th>Departure</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LH 0400</td>
<td>07.09.2004</td>
<td>10:10:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LH 0400</td>
<td>07.09.2004</td>
<td>10:10:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LH 0400</td>
<td>28.10.2004</td>
<td>10:10:00</td>
<td>667.16 USD</td>
</tr>
<tr>
<td>LH 0402</td>
<td>28.11.2004</td>
<td>13:30:00</td>
<td>1.167.056 ITL</td>
</tr>
<tr>
<td>LH 0402</td>
<td>24.02.2004</td>
<td>13:30:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>LH 2402</td>
<td>02.09.2004</td>
<td>10:30:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>LH 2407</td>
<td>28.10.2004</td>
<td>07:10:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>LH 2407</td>
<td>15.12.2004</td>
<td>07:10:00</td>
<td>242.93 USD</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>3.501.968 ITL</td>
</tr>
</tbody>
</table>

We have the translation in the following languages:

- Arabic
- Russian
- Greek
- Hebrew
- Japanese
- Korean
- Hungarian
- Chinese

Yours sincerely,
IDES HOLDING AG
We start with a Unicode string

The string’s characters belong to different Unicode areas (ranges)

The string has an assigned SAP font:
- **COURIER**

The Cascading Tool maps SAPFONT + Unicode range to a font

**SAPFONT:** COURIER

**BASIC LATIN:** Courier New

**CYRILLIC:** Arial

**HAN:** MSMincho

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Cascading Fonts SAPWIN Device Type

Customer Form:
Font HELVCYR 12 pt bold
Language = Russian

Customer Form:
Font HELVE 12 pt bold
Language = German

Customer can keep existing forms

Cascading Fonts Customizing tool:

<table>
<thead>
<tr>
<th>SAPfont:</th>
<th>Script:</th>
<th>Windows Font:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELVE</td>
<td>BASIC LATIN</td>
<td>Arial</td>
</tr>
<tr>
<td>HELVE</td>
<td>LATIN-1 SUPPL</td>
<td>Arial</td>
</tr>
<tr>
<td>HELVE</td>
<td>CYRILLIC</td>
<td>Arial</td>
</tr>
<tr>
<td>HELVE</td>
<td>OTHERS</td>
<td>Arial Unicode MS</td>
</tr>
<tr>
<td>CNSONG</td>
<td>BASIC LATIN</td>
<td>SimSun</td>
</tr>
<tr>
<td>CNSONG</td>
<td>HAN</td>
<td>SimSun</td>
</tr>
</tbody>
</table>

Device type builder generates metrics

Character width database

Unicode character widths are recorded in the device type

Device Type
ZSWINCF
Printer Font HELVE 12 bold
Unicode Character metrics table:
U+0041 = 741
U+0042 = 741
U+0410 = 630
U+0411 = 704
...

SAP Note 906031

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https://service.sap.com/unicode@sap
Multinational Issues

Enabling Business Globalization

SAP's solutions are purpose-built for deployment anywhere in the world, as our unparalleled customer base in nearly 140 countries proves.

Country Versions, Languages

Our solutions follow global best business practices, with specific functions and features to account for varying national tax laws, accounting laws, and manufacturing regulations in over 40 countries: our country versions.

You can run all country versions simultaneously in the same system. And what’s more, each user can log on in the language that suits them best, with 30 languages to choose from. The benefits speak for themselves.

Service

Our global service network will help you implement and run your SAP solution, wherever you are. With development centers, offices, and partners worldwide, we couldn’t be better placed to help.

Further Information

- For an overview of our solutions, see our solution brief, Global Solutions Without Boundaries, and a world map depicting all country versions and languages provided by SAP and its partners. For a more detailed look, see our white paper, Globalization: Meeting Local and Global Requirements.
- If you need planning and implementation guidance regarding country versions - if, for instance, you want to install several country versions simultaneously - take advantage of our value-added service, the SAP Globalization Knowledge Base.
- If you have any questions, check our list of FAQs or contact us at globalization@sap.com.

* On this site, the term “country” is used for convenience only and does not necessarily infer the existence of a nation state.
Further Information

Public Web

www.sap.com
SAP Developer Network: www.sdn.sap.com
SAP Customer Services Network: www.sap.com/services/

Related SAP Education Training Opportunities

http://www.sap.com/education/

Related Workshops/Lectures at SAP TechEd 2006

SPC251, Making Programs Unicode Enabled, Hands-on
SPC203, Integration Between Heterogeneous SAP Unicode and Third Party Systems, Lecture
Contacts

Email to Development Team

internationalization@sap.com

Email to Solution Management Team

globalization@sap.com
THANK YOU FOR YOUR ATTENTION!

QUESTIONS  –  SUGGESTIONS  –  DISCUSSION
Please complete your session evaluation.

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

Thank You!
Customer Conversion Project
Microsoft’s Project Timeline

- 2003: First contact with “Unicode”
- 9-12/2004: Prototype Conversion of Prod. Copy
- 07/2005: Start of Unicode Project
- 11/2005: First Conversion finished
- 01/03/06: Start Risk Area Testing
- 02/24/06: ABAP adjustments Finished *
- 02/28/06: End Risk Area Testing

- IMIG conversion Method needed?
- Downtime conversion (distribution monitor) to be done

- 03/18/06: Unicode Conversion Development system
- 06/01/06: Start Stress Testing in Unicode Sandbox system
- 08/25/06: Unicode Conversion Test system
- 12/09/06: Unicode Conversion Test system
- 02/09/07: Unicode Conversion Production system
- 08/01/2007: Non-Unicode Reference System deleted

* development system: ABAP/Unicode_check=on
Microsoft’s Project Staffing

Technical conversion: 2-3 Basis people

ABAP development: up to 12 developers including 10 external off-shore resources
(Time frame: October 2005 until February 2006)

3 functional team contacts (FI, HR, SD)

1 cross-team analyst

3 testers

2 consultants (part time)

1 project lead

Extended team includes downstream system representatives, international IT, international/local business users
Metrics for Custom Development in SAP R/3

2,670 Custom Objects to be analyzed

- 68% = 1,814 Objects already Unicode compliant
- 25% = 677 Objects to be adjusted
- 5% = 136 Objects not used
- 2% = 43 Objects obsolete
## Example Microsoft: PRD System

<table>
<thead>
<tr>
<th>SAP Release</th>
<th>R/3 Enterprise 4.7 Ext. Set 1.10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System type</strong></td>
<td>Production System (PRD)</td>
</tr>
<tr>
<td><strong>Platform (non-Unicode/Unicode)</strong></td>
<td>Windows Server 2003 SP1 (x64)</td>
</tr>
<tr>
<td><strong>Database version</strong></td>
<td>SQL 2005 SP1/SP2</td>
</tr>
<tr>
<td><strong>Hardware (non-Unicode)</strong></td>
<td>All server: DL585 with 2.2 GHz CPU, DB: 4-way dual core, 32 GB RAM, x64 AS: 2-way dual core, 16 GB RAM, x64</td>
</tr>
<tr>
<td><strong>Hardware (Unicode)</strong></td>
<td>All server: DL585 with 2.2 GHz CPU, DB: 4-way dual core, 48 GB RAM, x64 AS: 4-way dual core, 32 GB RAM, x64</td>
</tr>
<tr>
<td><strong>Database size (non-UC, in MB)</strong></td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Database size (UC, in KB)</strong></td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Export size (in KB)</strong></td>
<td>Approx. 400 GB</td>
</tr>
<tr>
<td><strong>Log database in import database</strong></td>
<td>400 GB</td>
</tr>
<tr>
<td><strong>SAP Basis 6.20 Support Package</strong></td>
<td>SAPKB62058</td>
</tr>
</tbody>
</table>
Example: Runtimes

## Runtimes of automated conversion steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Runtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for Unicode Conversion Scan runs</td>
<td>4 hours</td>
</tr>
<tr>
<td>Scan Runs in Production (parallelization throttled to max. 5 jobs, to lessen impact onto production processes)</td>
<td>5 days *</td>
</tr>
<tr>
<td>Preparation steps in downtime</td>
<td>3 hrs *</td>
</tr>
<tr>
<td>Techn. Unicode conversion (Distribution Monitor)</td>
<td>13.5 hrs *</td>
</tr>
<tr>
<td>Postprocessing in downtime (e.g. Index creation)</td>
<td>4 hrs *</td>
</tr>
<tr>
<td>SUMG: Automatical Completion</td>
<td>?</td>
</tr>
</tbody>
</table>

"*" = Parallelization possible by scheduling several Jobs.
Duration of downtime for first Unicode conversion in November, 2005: \textit{1 week}

Now:

- 3 hours preparation (downtime)
- 16 hours conversion with Distribution Monitor (2.3TB test database)
- Approximately three hours for index creation (split tables)

$\rightarrow$ Calculated downtime for Production system:

\textbf{24 hours } + time for database backup
Downtime Tuning

Location of Storage
- Export data attached to local application servers

Database settings in import database
- Degree of parallelism
- Simple mode
- Additional log space for import phase

Reorganization in export database
- Indexdefrag for some of the biggest tables

Configuration of Distribution Monitor
- Number processes (export/import)
- Fastload option for SQL
- Split of biggest tables into smaller packages
Hardware Change before Unicode Conversion

SQL 2005 DB mirroring

X: 400 GB additional space for SQL log files

GBit network

Database server
DL585
8 CPU’s, x64
2.2 GHz,
48 GB memory

Application server
DL585
8 CPU’s, x64
2.2 GHz,
32 GB memory

SAP System

CI1
AS1
AS2
AS3

Export data directory

X: 100 GB
X: 100 GB
X: 100 GB
X: 100 GB

X: 400 GB additional space for SQL log files

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**Database server**
- Backup of non-Unicode database
- Stop database mirroring, reconfigure Target SAN (2\textsuperscript{nd} DB server)
- 1\textsuperscript{st} DB for export; 2\textsuperscript{nd} DB server as Unicode database for import
- Change SQL config. on 2\textsuperscript{nd} DB server

**Non-Unicode Database:**
- SQL 2005
- 2.5 TB data (02/06)
- 12 data files
- SQL in Full mode
- Max degree of parallelism=1

**Unicode Database:**
- 2.5 TB data (02/06)
  - Files pre-allocated, but empty!
- 32 data files
- SQL in simple mode
- Max degree of parallelism=0
- Add new log data file on X: drive
Application server
- SAP instances down
- 2 distribution monitor processes per server: export and import
- 8 export processes per server (R/3 load processes)
- 6 to 7 import processes per server (R/3 load processes)
- $\text{R3load.import.loadArgs} = \text{--loadprocedure fast}$
- Export to local X: drive on each server only – 100 GB limit!

GBit network
Database server

- Comparison of non-Unicode and Unicode database done and ok:
  - Create indexes for split tables in Unicode database
  - Adjust SQL server configuration off Unicode Database
  - Create custom objects in database in Unicode Database

Unicode database:
- 2.5 TB data (02/06) WILL GROW FAST!
- 32 data files
- SQL in Full mode
- Max degree of parallelism=1
- Delete log data file on X: drive
Application server
- SAP kernel for Unicode systems installed
- Memory configuration in SAP profiles adjusted
- SAP instances up
- X: drives deleted

GBit network

SAP System
- CI1
- AS1
- AS2
- AS3

Export data directory
- X: 100 GB
- X: 100 GB
- X: 100 GB
- X: 100 GB
CPU Util – Export/Import Servers (4 App Servers)

R/3 Unicode Test Conversion run on 9/3/06 - App Srvr CPU Util
CPU Util, DB1=Source (Blue), DB2=Target (Red)

R/3 Unicode Test Conversion run on 9/3/06 - DB Server CPU Util
DB1 = Source, DB2 = Target
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