



Implementing CDISC LAB, ODM and SDTM in a
Clinical Data Capture and Management System:

« How we did it »

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Who are we?

- [i-clinics] is a software company specialized in image-based solutions for the acquisition and management of clinical trials data
- ClinCAPT is a CDMS offering an integrated system for all modes of acquisition: paper, fax and EDC
- XML4Pharma is a consultancy and Information Technology company specializing in XML for the Pharma industry

Timelines for CDISC Integration

- Preliminary analysis of standards: Q2 2003
- Decision for implementation: Q1 2005
- Selection of partner: Q2 2005
- LAB implementation: Q3 2005
- ODM implementation: Q4 2005
- SDTM implementation: Q1 2006

LAB Implementation

Goal:

Import CDISC LAB-1.0.1 data files into ClinCAPT

Background:

ClinCAPT already included functions to import lab data files in ASCII format:

- Variable length (for instance CSV)
- Fixed length

Scope:

- Flat file only
- Insert & Update, but not Remove

LAB Implementation

The screenshot shows a software window titled "ClinCAPT Study Setup - Xavier - [Lab Data Management]". The main title bar of the window is "Study DEMO - Lab Data Management".

Fields in the main window:

- Lab Upload Code: TEST
- Description: Test LAB data upload
- Domain: Lab Data Item
- Value separator: (empty)
- Variable length:
- Fixed length:

A "Lab Data Item" dialog box is open, showing a list of domain items. The "Domain item" field is set to "CTX_SUBJID - Subject identifier". The "Data field" list includes:

- Site - Site ID
- Investigator - Investigator ID
- Investigator - Investigator Name
- Subject - Screen ID
- Subject - Subject ID (highlighted)
- Subject - Spare Subject ID
- Subject - Subject Initials
- Subject - Subject Sex

Buttons at the bottom of the dialog: Up, Down, Save, Cancel.

System tray at the bottom left: 07/04/2006 11:48 CAPS NUM

ODM Implementation

Goal:

- Export study metadata to ODM 1.2 format
- Import study data from ODM 1.2 format

Analysis:

Help needed for:

- ODM expertise
- XML expertise
- Conversion Oracle DB <-> XML

Joined Development:

- XSL, DB scripts, Process UI: **XML4Pharma**
- Main UI, Pre- & Post-processing: **[i-clinics]**

ODM Implementation

Project tasks:

- Construct a mapping between ClinCAPT database structure and the ODM
- Write the necessary PL/SQL scripts to export Study setup in ODM format
- Develop software / scripts to import clinical data in ODM format into ClinCAPT

ODM Implementation

Mapping between ClinCAPT and ODM:

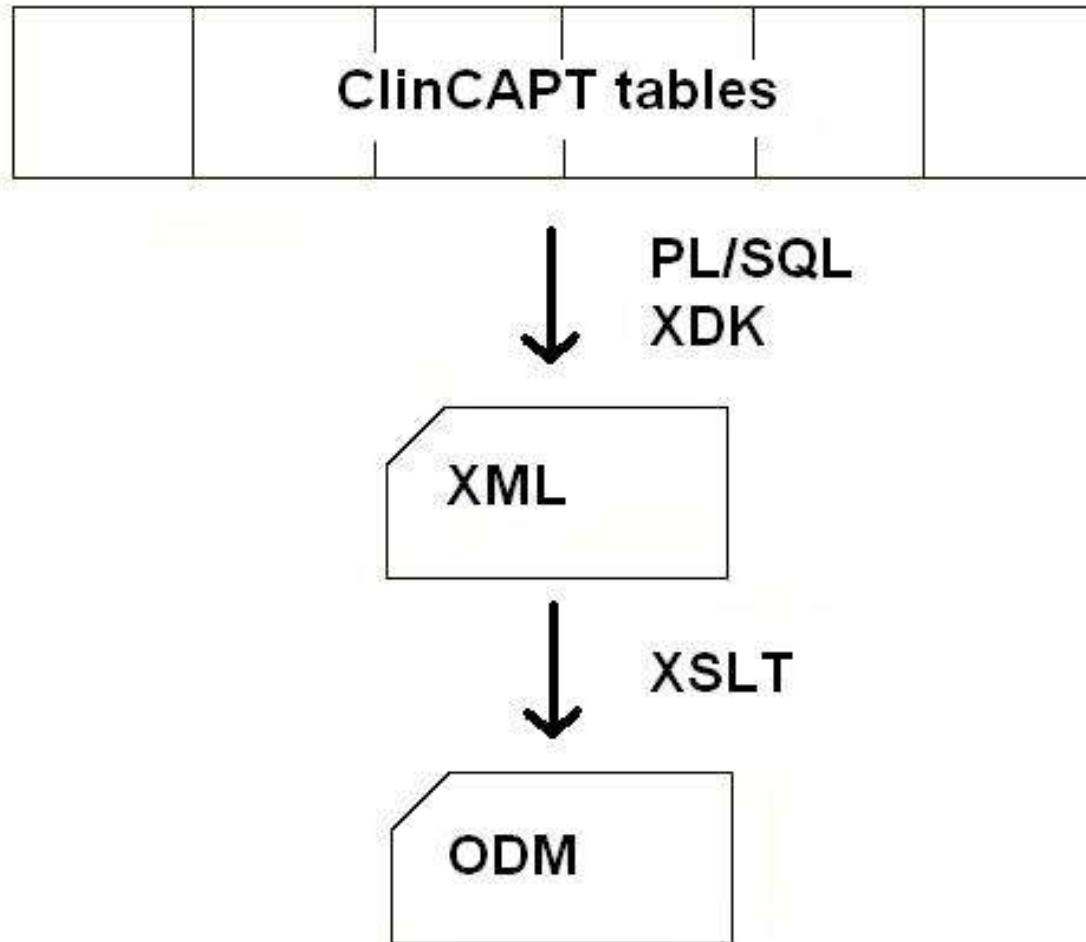
- Study the database structure
- Communicate with the ClinCAPT specialist
- Result: 18-page document describing the mapping

ODM Implementation

Export study metadata to ODM

- Written as a set of PL/SQL scripts
- Uses Oracle XDK technology
 - XML-SQL Utility for PL/SQL
 - XMLDOM package
- Usage of XSLT stylesheets

ODM Implementation



ODM Implementation

Importing ODM Clinical data into ClinCAPT - Strategy

- Split ODM input document into XML structures that correspond to ClinCAPT table structure
- Load XML structures into Oracle tables using Oracle's XML-SQL Utility

ODM Implementation

Importing ODM Clinical data into ClinCAPT - Workflow

- Load ODM file
- Connect to study database
- Verify Country, Investigator, Location against information in database
- Verify Visit ID, Form ID, ItemGroups, Items against database tables
- If all OK, split ODM in XML structures corresponding to database table structures
- Upload XML data using XML-SQL Utility

ODM Implementation

Importing ODM Clinical data into ClinCAPT - Technology

- To split XML documents, we need XSLT2
 - Or write complicated software
- Oracle's 9i XSLT engine does not support XSLT2
- So, a Java GUI was developed
 - Using SAXON as XSLT2 engine
- An XSLT stylesheet was developed to do the transformations

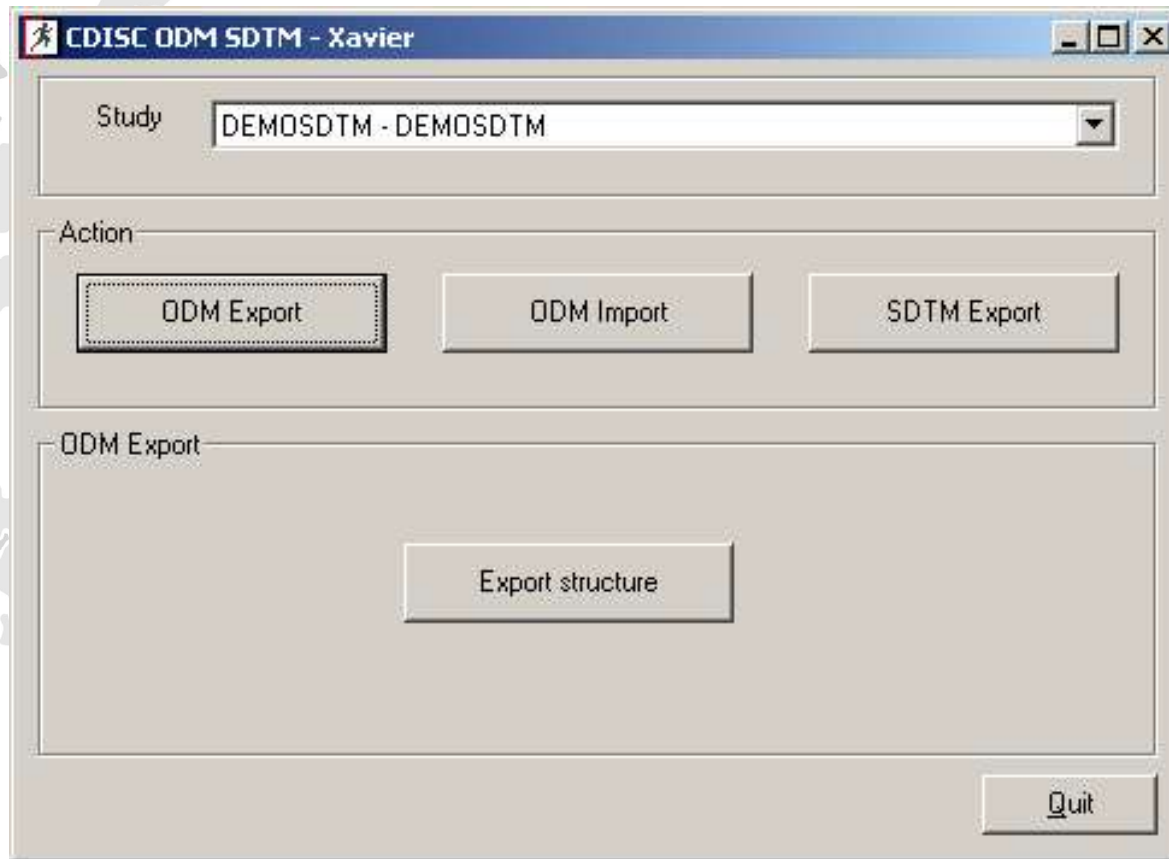
ODM Implementation

Making a CDMS ODM-compliant view of a CDISC consultant

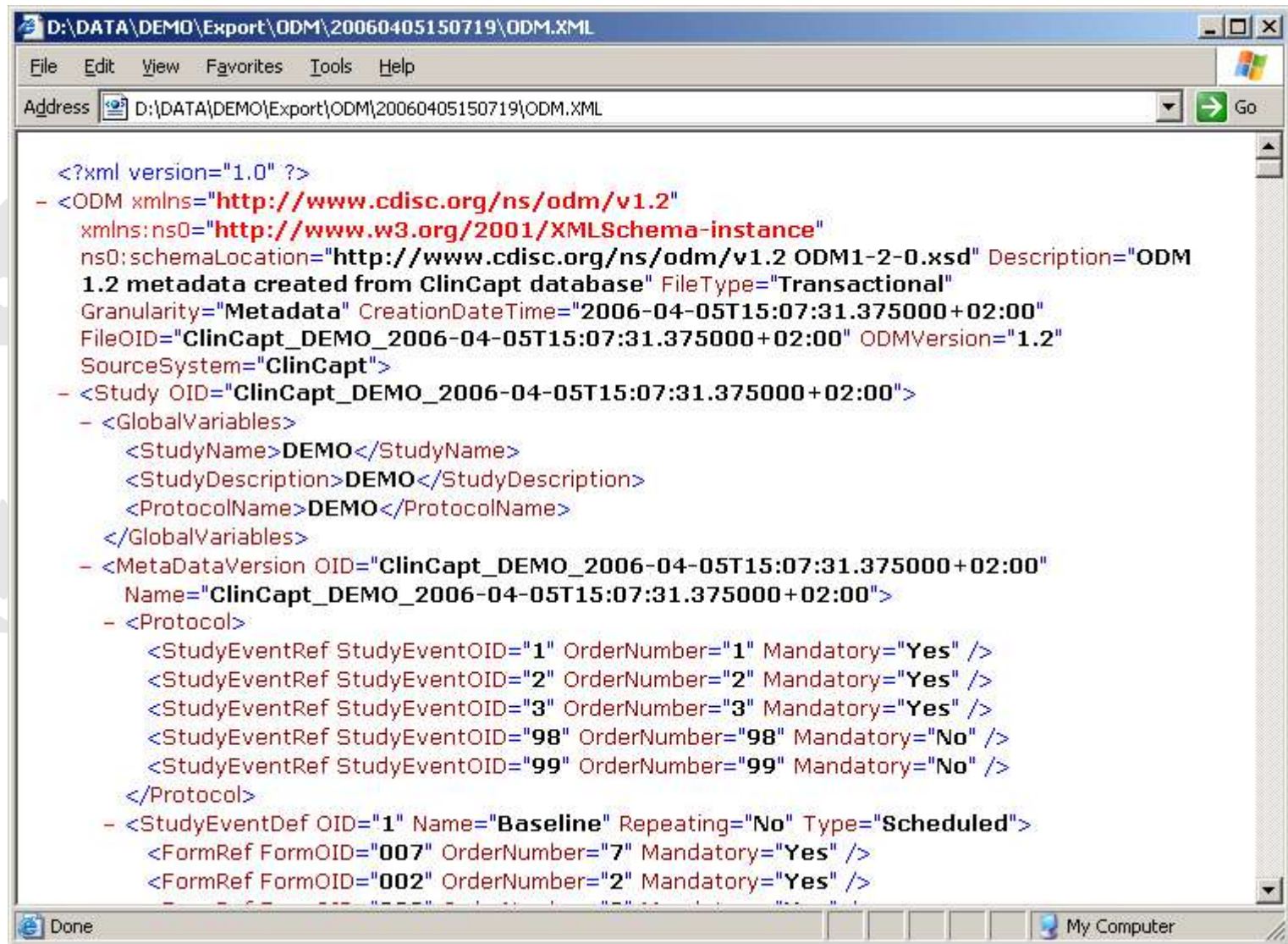
- Learn to understand the database structure
- Communicate a lot with your customer
- Use tools and utilities that come with the database as much as possible
- Making a CDMS CDISC-ODM compliant is easy ...

If you know how

ODM Implementation

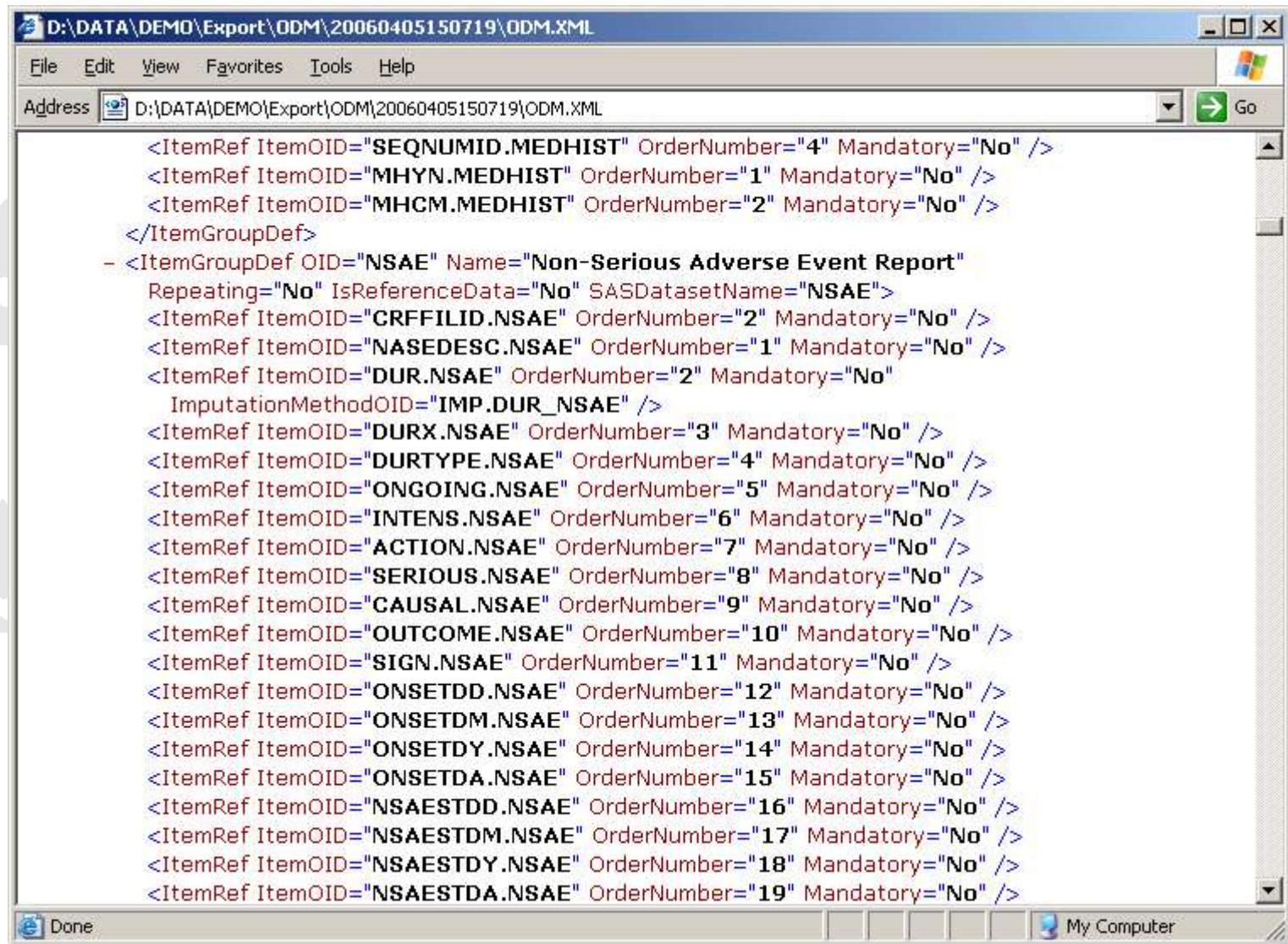


ODM Implementation



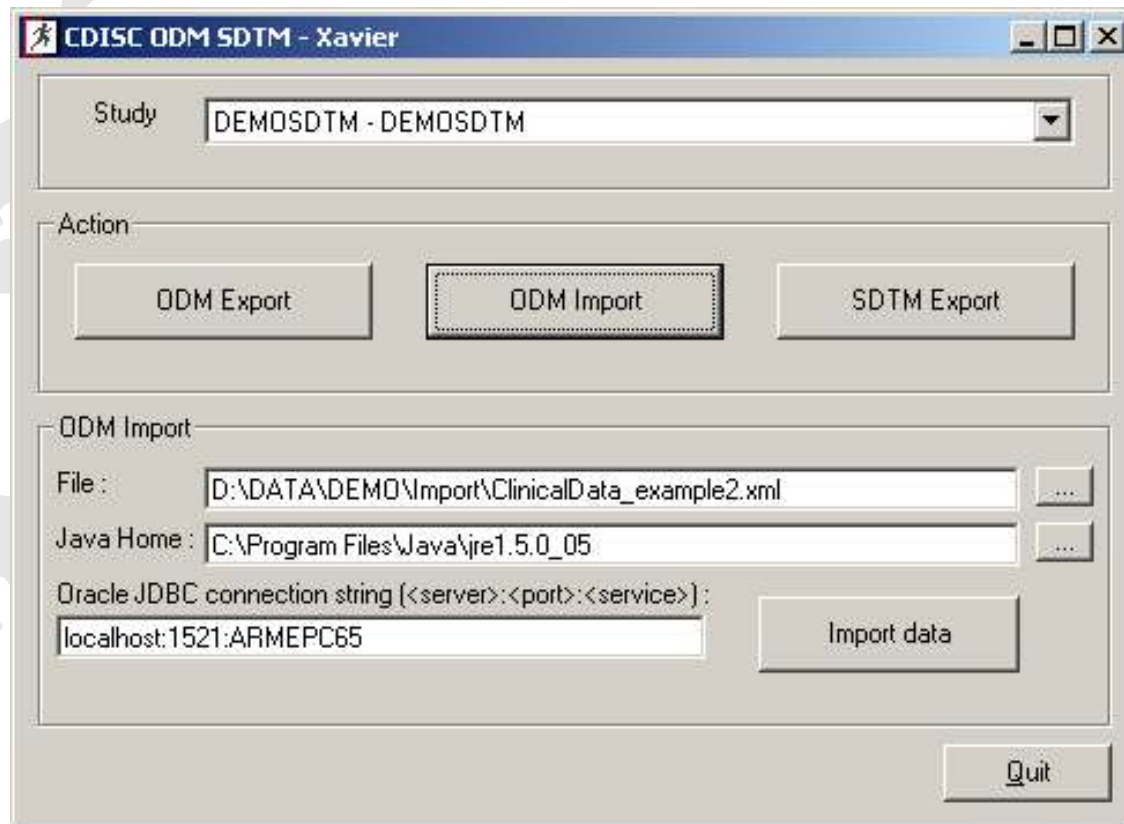
```
<?xml version="1.0" ?>
- <ODM xmlns="http://www.cdisc.org/ns/odm/v1.2"
  xmlns:ns0="http://www.w3.org/2001/XMLSchema-instance"
  ns0:schemaLocation="http://www.cdisc.org/ns/odm/v1.2 ODM1-2-0.xsd" Description="ODM
  1.2 metadata created from ClinCapt database" FileType="Transactional"
  Granularity="Metadata" CreationDateTime="2006-04-05T15:07:31.375000+02:00"
  FileOID="ClinCapt_DEMO_2006-04-05T15:07:31.375000+02:00" ODMVersion="1.2"
  SourceSystem="ClinCapt">
- <Study OID="ClinCapt_DEMO_2006-04-05T15:07:31.375000+02:00">
  - <GlobalVariables>
    <StudyName>DEMO</StudyName>
    <StudyDescription>DEMO</StudyDescription>
    <ProtocolName>DEMO</ProtocolName>
  </GlobalVariables>
- <MetaDataVersion OID="ClinCapt_DEMO_2006-04-05T15:07:31.375000+02:00"
  Name="ClinCapt_DEMO_2006-04-05T15:07:31.375000+02:00">
  - <Protocol>
    <StudyEventRef StudyEventOID="1" OrderNumber="1" Mandatory="Yes" />
    <StudyEventRef StudyEventOID="2" OrderNumber="2" Mandatory="Yes" />
    <StudyEventRef StudyEventOID="3" OrderNumber="3" Mandatory="Yes" />
    <StudyEventRef StudyEventOID="98" OrderNumber="98" Mandatory="No" />
    <StudyEventRef StudyEventOID="99" OrderNumber="99" Mandatory="No" />
  </Protocol>
- <StudyEventDef OID="1" Name="Baseline" Repeating="No" Type="Scheduled">
  <FormRef FormOID="007" OrderNumber="7" Mandatory="Yes" />
  <FormRef FormOID="002" OrderNumber="2" Mandatory="Yes" />
```


ODM Implementation



```
D:\DATA\DEMO\Export\ODM\20060405150719\ODM.XML
File Edit View Favorites Tools Help
Address D:\DATA\DEMO\Export\ODM\20060405150719\ODM.XML Go
<ItemRef ItemOID="SEQNUMID.MEDHIST" OrderNumber="4" Mandatory="No" />
<ItemRef ItemOID="MHYN.MEDHIST" OrderNumber="1" Mandatory="No" />
<ItemRef ItemOID="MHCM.MEDHIST" OrderNumber="2" Mandatory="No" />
</ItemGroupDef>
- <ItemGroupDef OID="NSAE" Name="Non-Serious Adverse Event Report"
  Repeating="No" IsReferenceData="No" SASDatasetName="NSAE">
  <ItemRef ItemOID="CRFFILID.NSAE" OrderNumber="2" Mandatory="No" />
  <ItemRef ItemOID="NASEDESC.NSAE" OrderNumber="1" Mandatory="No" />
  <ItemRef ItemOID="DUR.NSAE" OrderNumber="2" Mandatory="No"
    ImputationMethodOID="IMP.DUR_NSAE" />
  <ItemRef ItemOID="DURX.NSAE" OrderNumber="3" Mandatory="No" />
  <ItemRef ItemOID="DURTYPE.NSAE" OrderNumber="4" Mandatory="No" />
  <ItemRef ItemOID="ONGOING.NSAE" OrderNumber="5" Mandatory="No" />
  <ItemRef ItemOID="INTENS.NSAE" OrderNumber="6" Mandatory="No" />
  <ItemRef ItemOID="ACTION.NSAE" OrderNumber="7" Mandatory="No" />
  <ItemRef ItemOID="SERIOUS.NSAE" OrderNumber="8" Mandatory="No" />
  <ItemRef ItemOID="CAUSAL.NSAE" OrderNumber="9" Mandatory="No" />
  <ItemRef ItemOID="OUTCOME.NSAE" OrderNumber="10" Mandatory="No" />
  <ItemRef ItemOID="SIGN.NSAE" OrderNumber="11" Mandatory="No" />
  <ItemRef ItemOID="ONSETDD.NSAE" OrderNumber="12" Mandatory="No" />
  <ItemRef ItemOID="ONSETDM.NSAE" OrderNumber="13" Mandatory="No" />
  <ItemRef ItemOID="ONSETDY.NSAE" OrderNumber="14" Mandatory="No" />
  <ItemRef ItemOID="ONSETDA.NSAE" OrderNumber="15" Mandatory="No" />
  <ItemRef ItemOID="NSAESTDD.NSAE" OrderNumber="16" Mandatory="No" />
  <ItemRef ItemOID="NSAESTDM.NSAE" OrderNumber="17" Mandatory="No" />
  <ItemRef ItemOID="NSAESTDY.NSAE" OrderNumber="18" Mandatory="No" />
  <ItemRef ItemOID="NSAESTDA.NSAE" OrderNumber="19" Mandatory="No" />
  </ItemGroupDef>
```

ODM Implementation



ODM Implementation

Import of ODM into ClinCAPT

Protocol (Study):
DEMOSDTM

Load ODM File

ODM File: ClinicalData_example2.xml

Open ClinCAPT Database

Database: jdbc:oracle:thin:@localhost:1521:ARMEPC65

Import ODM into ClinCAPT database

Connected to ClinCAPT Database

SDTM Implementation

Goal:

Export study data to SDTM 3.1.1 format (SAS and XML)

Background:

Pre-existing SAS XPT export module

Analysis:

- Help needed for crucial decision: SDTM compliance within ClinCAPT or post-processing at export time?
- Help needed to identify hurdles

Scope:

Provide SDTM datasets for statistical analysis

SDTM Implementation

The decision was made to build SDTM compliance within ClinCAPT

Advantages:

- Data model consistency
- Immediate availability of SDTM datasets
- No complex data mapping at export time

Disadvantages:

- SDTM incurs rigid constraints for data model

SDTM Implementation

ClinCAPT is delivered with an SDTM library based on SDTM version 3.1.1:

- Codelists (controlled terminologies)
- Valuelists (identifiers)
- Domains & domain items

The library is adapted to the specific requirements of the application, in particular for date handling.

SDTM Implementation

SDTM compliance must be defined when a New study is created:

ClinCAPT Study Setup - Xavier - [Create new study]

Create new study

New study

Study code: APR2006

Compound: CMP5678 - Compound 5678

Oracle Schema: ClinCAPT_APR2006

Oracle Password: *****

Password confirmation: *****

Oracle tablespace: USERS

SDTM-compliant study

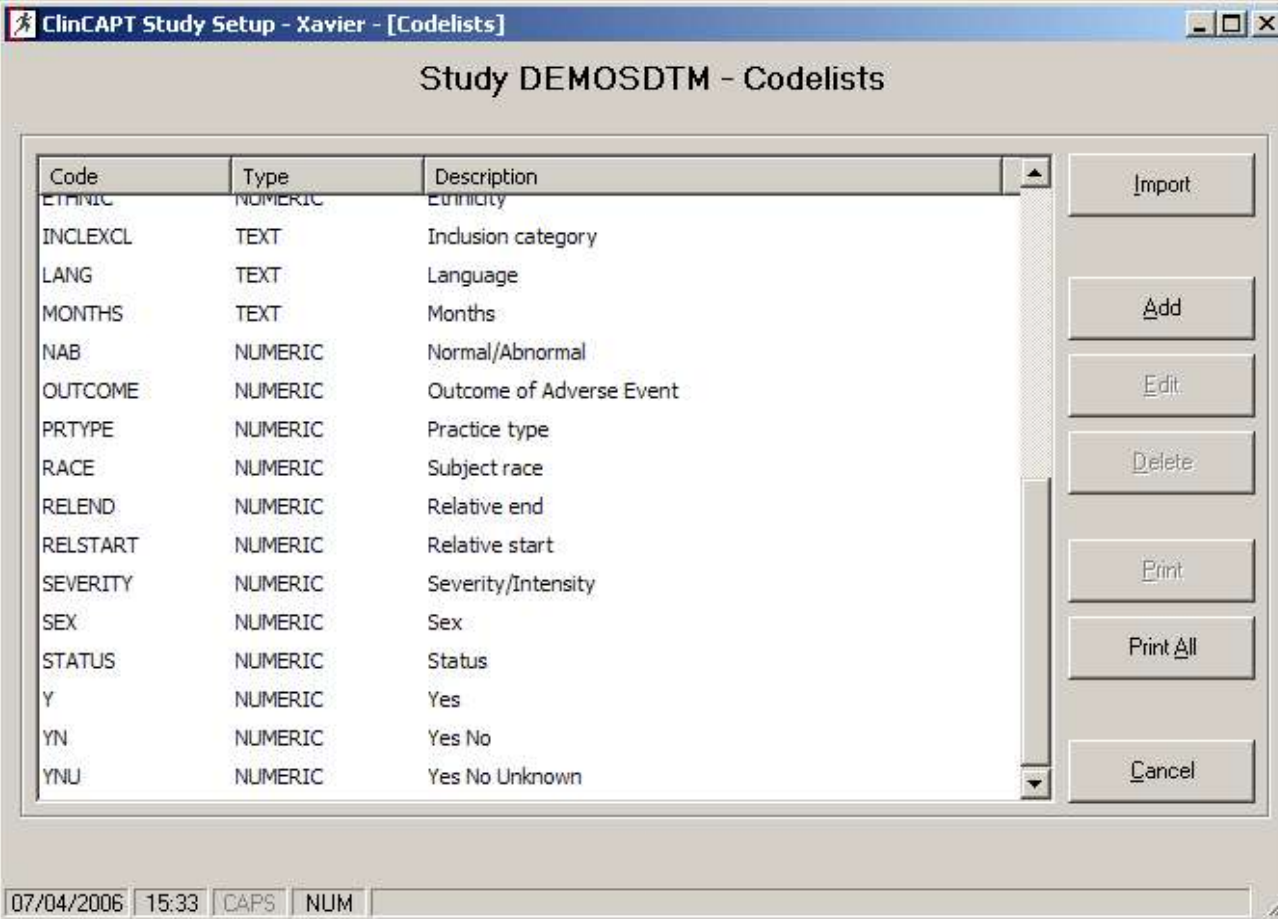
SDTM template: SDTM311 - Template for SDTM Version 3.1.1

Save Cancel

07/04/2006 15:25 CAPS NUM

SDTM Implementation

All codelists defined in the library are automatically created:

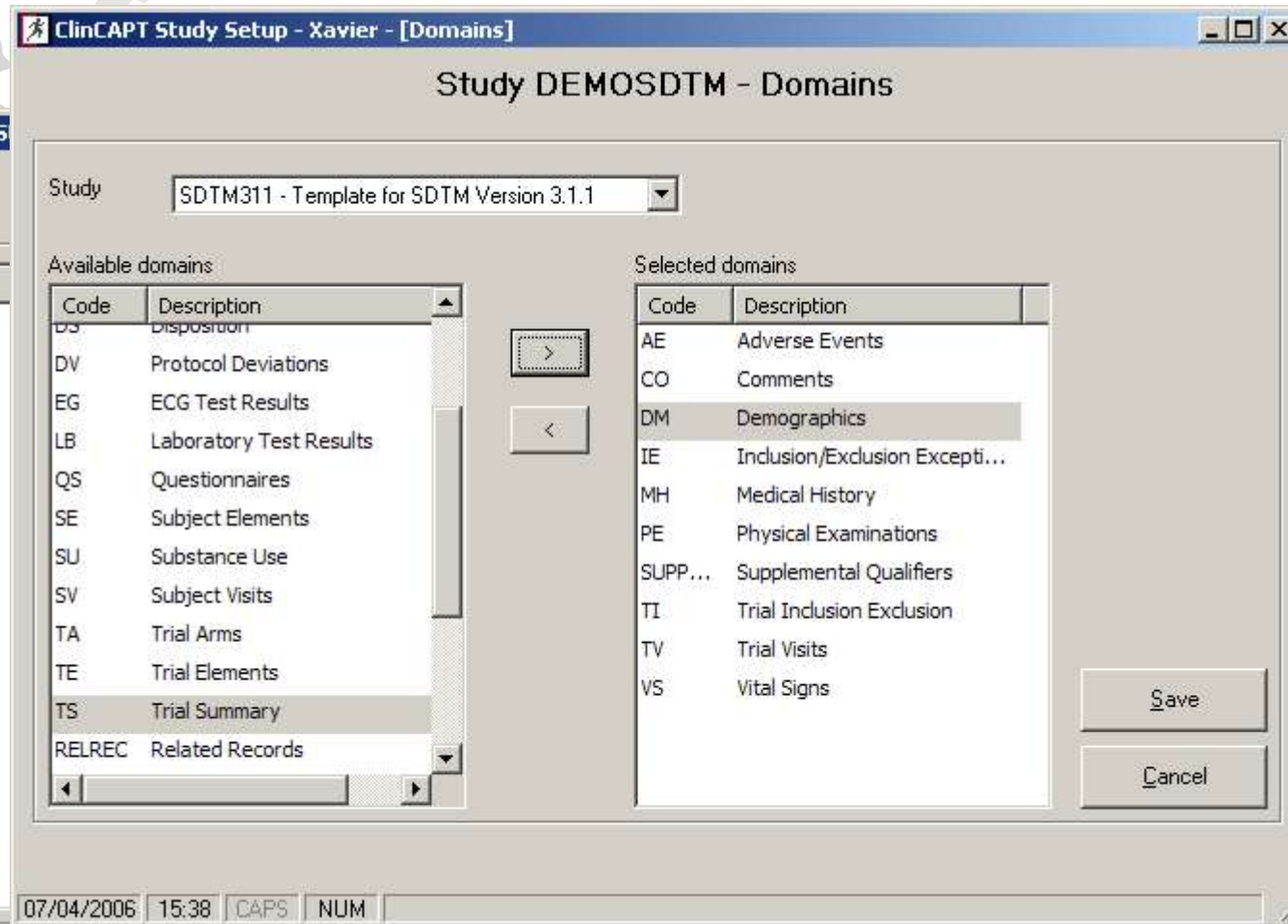


The screenshot shows a software window titled "ClinCAPT Study Setup - Xavier - [Codelists]" with a sub-title "Study DEMOSDTM - Codelists". The window contains a table with three columns: "Code", "Type", and "Description". The table lists various codelists with their respective types and descriptions. To the right of the table are several buttons: "Import", "Add", "Edit", "Delete", "Print", "Print All", and "Cancel". At the bottom of the window, there is a status bar with the text "07/04/2006 15:33 CAPS NUM".

Code	Type	Description
ETHNIC	NUMERIC	Ethnicity
INLEXCL	TEXT	Inclusion category
LANG	TEXT	Language
MONTHS	TEXT	Months
NAB	NUMERIC	Normal/Abnormal
OUTCOME	NUMERIC	Outcome of Adverse Event
PRTYPE	NUMERIC	Practice type
RACE	NUMERIC	Subject race
RELEND	NUMERIC	Relative end
RELSTART	NUMERIC	Relative start
SEVERITY	NUMERIC	Severity/Intensity
SEX	NUMERIC	Sex
STATUS	NUMERIC	Status
Y	NUMERIC	Yes
YN	NUMERIC	Yes No
YNU	NUMERIC	Yes No Unknown

SDTM Implementation

Panels are imported from the library:



SDTM Implementation

SDTM-specific attributes and identifiers are imported from the library:

ClinCAPT Study Setup - Xavier - [Domain]

Study DEMOSDTM - Domains

Domain: VS SAS name: VS

Description: Vital Signs

Type: Subject related

Structure: 1 sign measurement per time point per visit per subject

Capture scope: All records

SDTM Keys: STUDYID, USUBJID, VSTESTCD, VISITNU

Class: Findings Reference data

Purpose: Tabulation Repeating

No sequence
 Numeric sequence
 Text sequence

Sequence	Description
DIABP	Diastolic Blood Pressure
HEIGHT	Height
HR	Heart Rate
SYSBP	Systolic Blood Pressure
TEMP	Temperature
WEIGHT	Weight
FBS	Fasting Blood Sugar

Buttons: Add, Delete, Edit, Save, Cancel, Up, Down

07/04/2006 15:39 CAPS NUM

SDTM Implementation

Items are imported from the library with SDTM-specific attributes & default data types:

The screenshot shows the 'Study DEMOSDTM - Domain items' window. The 'Domain item' tab is active, showing the configuration for the 'ORRES' domain item. The 'SDTM' section is highlighted with a red box, showing the following settings:

SDTM	Core	Origin	Role	Control
	Expected	CRF or Derived	Result Qualifier	

The main configuration area shows the following details for the 'ORRES' domain item:

- Domain item: ORRES
- SAS name: VSORRES
- Description: Result or Finding in Original Units
- Type: TEXT
- Length: 20
- CodeList: (empty)
- Dictionary: (empty)

Buttons for 'Save' and 'Cancel' are visible at the bottom of the configuration area.

At the bottom of the window, a status bar shows the date and time: 07/04/2006 15:45, and the user name: CAPS NUM.

SDTM Implementation

Main difficulties encountered during the implementation:

Date handling in ClinCAPT

SDTCD D (day)	SDTCD M (month)	SDTCD Y (year)	SDTCD A (derived date)	SDTCD H (hour)	SDTCD I (minute)	SDTCD T (derived datetime)
09	MAY	2005	2005-05-09 00:00:00	23	28	2005-05-09 23:28:00
08	MAY	2005	2005-05-08 00:00:00	23		
	APR	2005				
	MAY	2005		23	28	

Date handling in SDTM dataset (ISO 8601)

```
SDTC
-----
2005-05-09T23:28
2005-05-08T23
2005-04
2005-05
```

SDTM Implementation

Main difficulties encountered during the implementation:

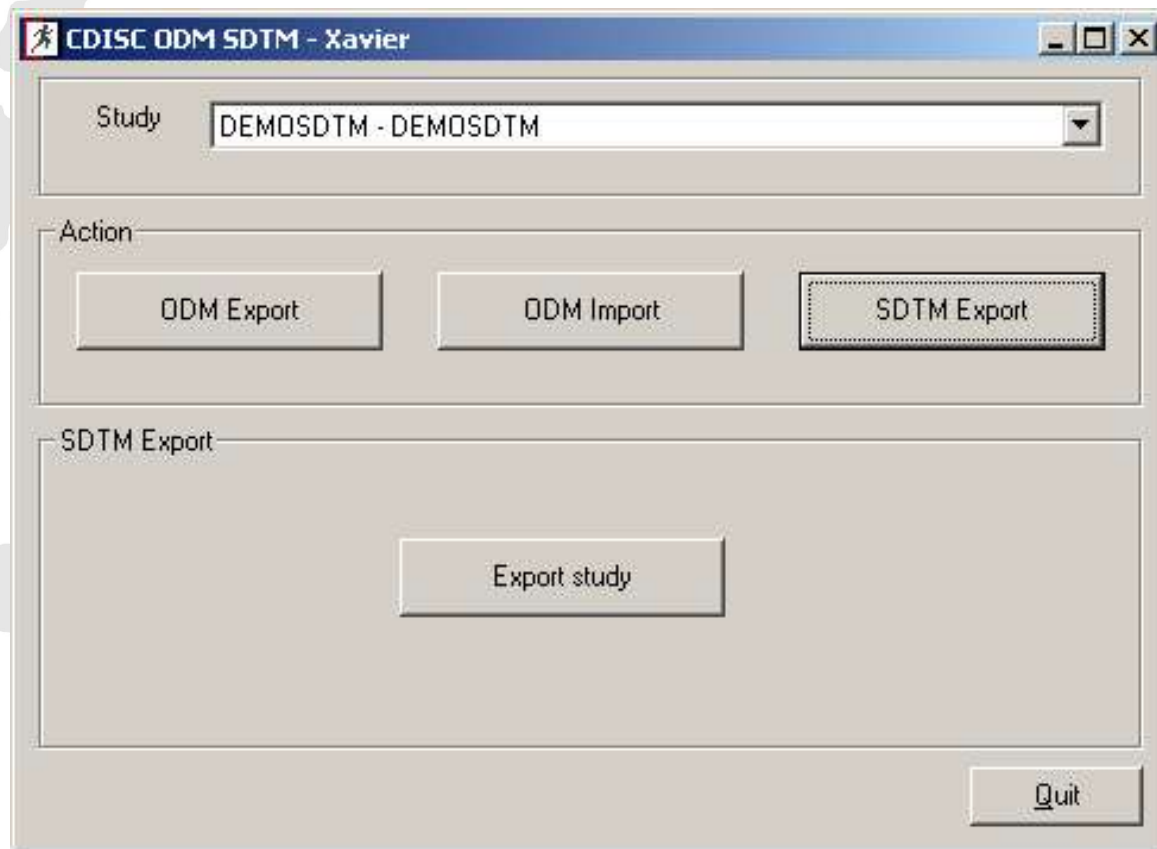
Inclusion/exclusion criteria in ClinCAPT

One record per criterion per subject

Inclusion/exclusion criteria in SDTM

One record per criterion exception per subject

SDTM Implementation



SDTM Implementation

Study DEMOSDTM, Data Definitions

File Edit View Favorites Tools Help

Address <D:\DATA\DEMOSDTM\Export\SDTM\20060220155733\define.xml> Go

Datasets for Study DEMOSDTM					
Dataset	Description	Structure	Purpose	Keys	Location
AE	Adverse Events	Events - One record per adverse event per subject	Tabulation	STUDYID,USUBJID, AETERM, AESTDTC	AE.XPT
CM	Concomitant Medications	Interventions - One record per medication intervention episode per subject	Tabulation	STUDYID,USUBJID,CMTRT,CMSTDTC	CM.XPT
CO	Comments	Special Purpose - One record per comment per subject	Tabulation	STUDYID,USUBJID,COSEQ	CO.XPT
DM	Demographics	Special Purpose - One record per subject	Tabulation	STUDYID,USUBJID	DM.XPT
DS	Disposition	Events - One record per disposition status or protocol milestone per subject	Tabulation	STUDYID,USUBJID,DSSTDTC	DS.XPT
EX	Exposure	Interventions - One record per constant dosing interval per subject	Tabulation	STUDYID,USUBJID,EXTRT,EXSTDTC	EX.XPT
IE	Inclusion/Exclusion Exceptions	Findings - One record per Inclusion/Exclusion criteria exception per subject	Tabulation	STUDYID,USUBJID,IETESTCD	IE.XPT
LB	Laboratory Test Results	Findings - One record per lab test per time point per visit per subject	Tabulation	STUDYID,USUBJID,LBTESTCD,VISITNUM,TPTNUM	LB.XPT
MH	Medical History	Events - One record per medical history event per subject	Tabulation	STUDYID,USUBJID,MHTERM	MH.XPT
PE	Physical Examinations	Findings - One record per body system per visit per subject	Tabulation	STUDYID,USUBJID,VISITNUM,PETESTCD	PE.XPT
QS	Questionnaires	Findings - One record per question per time point per visit per subject	Tabulation	STUDYID,USUBJID,QSTESTCD,VISITNUM,TPTNUM,QSSEQ	QS.XPT

My Computer

SDTM Implementation

SAS System Viewer - [VS.spt]

File Edit View Window Help

	STUDYID	DOMAIN	USUBJID	VSSEQ	VSGRPID	VSSPID	VSTESTCD	VSTEST	VSCAT	VSSCAT	VSPOS	VSORRES	VSORRESU	VSSTRESC	VSSTRESN	VS
1	DEMOSDTM	VS	4568852001	1	005		DIABP	Diastolic				80	mmHg		80	
2	DEMOSDTM	VS	4568852001	2	005		FBS	Fasting B				75	mg/dl		75	
3	DEMOSDTM	VS	4568852001	3	005		HEIGHT	Height				165	cm		165	
4	DEMOSDTM	VS	4568852001	4	005		SYSBP	Systolic				131	mmHg		131	
5	DEMOSDTM	VS	4568852001	5	005		WEIGHT	Weight				112.3	kg		112.3	
6	DEMOSDTM	VS	4568852001	6	005		TEMP	Temperatu				37.5	Celsius		37.5	
7	DEMOSDTM	VS	4568852001	7	005		HR	Heart Rat				65	bpm		65	
8	DEMOSDTM	VS	4568852001	8	012		SYSBP	Systolic				122	mmHg		122	
9	DEMOSDTM	VS	4568852001	9	012		DIABP	Diastolic				80	mmHg		80	
10	DEMOSDTM	VS	4568852001	10	012		HR	Heart Rat				26	bpm		26	
11	DEMOSDTM	VS	4568852001	11	012		FBS	Fasting B				75	mg/dl		75	
12	DEMOSDTM	VS	4568852001	12	018		SYSBP	Systolic				122	mmHg		122	
13	DEMOSDTM	VS	4568852001	13	018		DIABP	Diastolic				80	mmHg		80	
14	DEMOSDTM	VS	4568852001	14	018		HR	Heart Rat				78	bpm		78	

Ready Hdn cols:0 Obs 1-15 of 15 NUM



« Thank you for your attention »

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