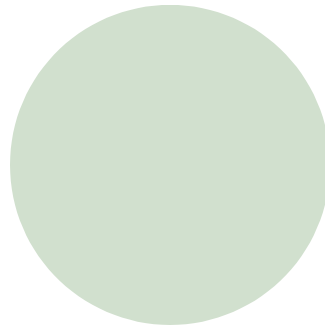
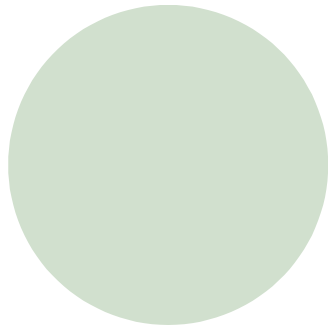


Genetic Resources Information Management System

Genetic Resources Center, IRRI



RPrantilla , MHabito, and
TMetz

ICIS Workshop 2006



Outline

- Part 1: GRIMS Overview
- Part 2: IRGCIS Integration with IRIS
- Part 3: GRIMS GUI

Part 1: GRIMS Overview

I. Introduction

- a. Background
- b. Objectives
- c. Modules

II. Application Development

- a. Tools
- b. Testing
- c. Documentation
- d. Source Code Management
- e. Graphical User Interface (GUI) Design

III. Database Management

- a. Database Functions and Procedures
- b. Database Triggers
- c. Aides to Parallel Implementation
- d. Schema
- e. Migration to PostgreSQL

Terminology



- Incoming sample – a germplasm sample that is received by the genebank through a donation, a collecting activity, or some other activity and that is worthwhile preserving

<http://cropwiki.irri.org/icis/index.php/GRIMS>

Background



- There is an existing system called the International Rice Genebank Information System (IRGCIS)
 - Developed using Oracle Developer 2000
 - Oracle Database Server 8.0.5
- GRIMS is a re-implementation of IRGCIS that uses ICIS Schema (i.e. GMS, IMS, and part of DMS) and some sub-systems.

Objectives



1. To upgrade the existing information system by providing efficient quality control over all genebank operations, including the acquisition of germplasm, its safe storage and maintenance, its characterization, and its distribution.
3. To integrate IRGC data into International Rice Information System (IRIS)
5. To improve efficiencies and cost-effectiveness in conserving and making available genetic resources as Global Public Goods

Main Modules



- Acquisition

- Donor information registration and passport registration
- Incoming sample initial seed increase, viability monitoring, and inclusion into the IRGC collection

- Multiplication

- Replanting of IRGC accession to replenish stock, and for special request (i.e. Genebank restoration)
- Dependent on seed stock and seed viability

Cont...

Main Modules



- Seed Management
 - Inventory monitoring
 - Viability monitoring
 - Seed distribution
 - Frequently requested accessions monitoring
 - NCGRP backup
 - Seed monitoring in the drying room
- Characterization
 - Morphological and agronomic traits
 - Reactions to biotic and abiotic stresses

Application Development : Tools



- **Borland Delphi Professional Version 6.0 / 2006**
 - **recently acquired Borland Developer Studio which includes Delphi 2006**
- **Fast Reports Reporting Tool**
- **Barcode Font**

Application Development :

Programming Methods

- Re-using of ICIS Delphi Libraries that interfaces to the ICIS DLL Function
- Common library used by GMSSearch, SetGen, and InTrack)
 - GMS, GMSLib, DMS, DMSLib
 - i.e. creating seedlist, retrieving valid values for the passport descriptor, etc.
 - Example of calling ICIS DLL inside delphi code:

```
iFind:= DMS_getScaleDis(rSDis,FIND_FIRST);  
while iFind = DMS_SUCCESS do begin  
    .....  
    iFind:= DMS_getScaleDis(rSDis,FIND_NEXT);  
end;
```

Application Development :

Programming Methods

- **Module-specific library: e.g. acquisition -> ACQLIB.pas, characterization-> CHALIB.pas**

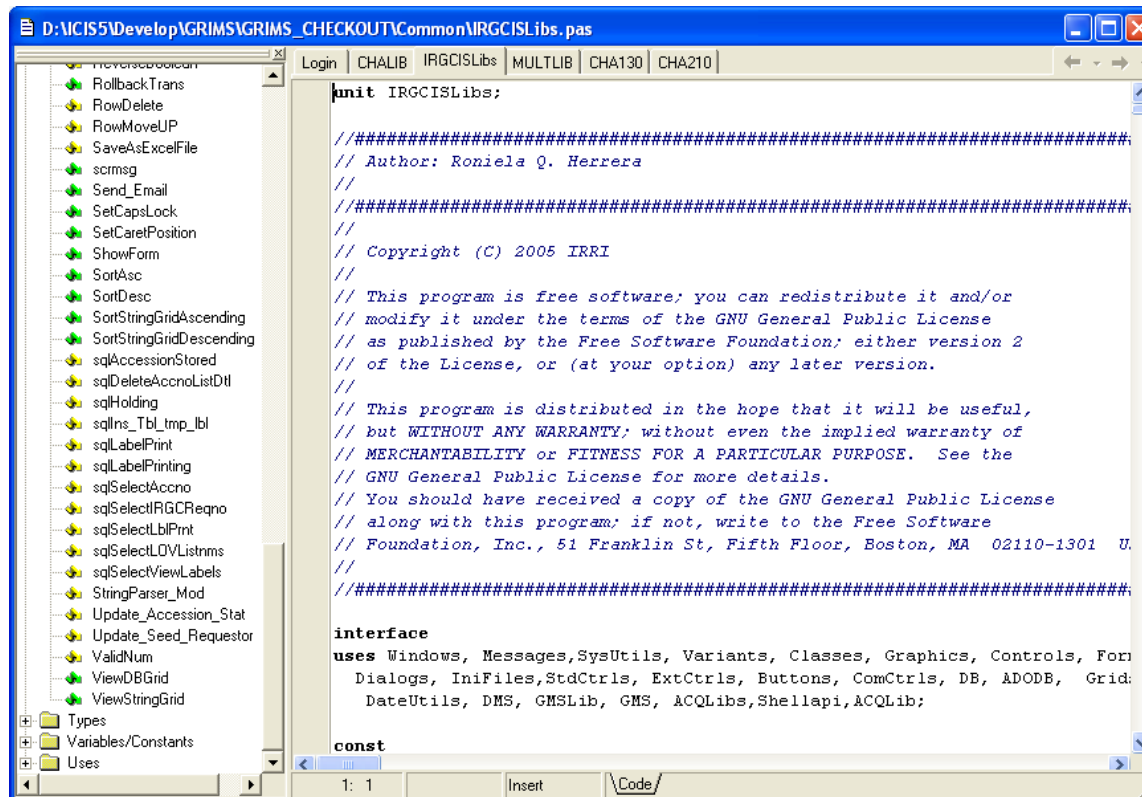
```
unit CHALIB;

//#####
//
//   CHALIB.pas
//
//   (Library used by GRIMS Seed Characterization Module)
//
//   This includes: global variables, general functions,
//                  specific functions, SQL functions,
//                  strings & constants used in the module
//
//   Author: MCDLHabit0
//
//#####
//
// Copyright (C) 2005 IRRI
//
// This program is free software; you can redistribute it and/or
// modify it under the terms of the GNU General Public License
// as published by the Free Software Foundation; either version 2
// of the License, or (at your option) any later version.
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// You should have received a copy of the GNU General Public License
// along with this program; if not, write to the Free Software
// Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 U.S.A.
```

Application Development :

Programming Methods

- **Common library for all modules: IRGCISLibs.pas**



```
unit IRGCISLibs;

//#####
// Author: Roniela Q. Herrera
//
//#####
//
// Copyright (C) 2005 IRRI
//
// This program is free software; you can redistribute it and/or
// modify it under the terms of the GNU General Public License
// as published by the Free Software Foundation; either version 2
// of the License, or (at your option) any later version.
//
// This program is distributed in the hope that it will be useful,
// but WITHOUT ANY WARRANTY; without even the implied warranty of
// MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
// GNU General Public License for more details.
// You should have received a copy of the GNU General Public License
// along with this program; if not, write to the Free Software
// Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 U.
//
//#####

interface
uses Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Form
  Dialogs, IniFiles, StdCtrls, ExtCtrls, Buttons, ComCtrls, DB, ADODB, Grid,
  DateUtils, DMS, GMSLib, GMS, ACQLibs, Shellapi, ACQLib;

const
```

Application Development :

Programming Methods

- **Naming convention of forms**

- **All .dfm files are named using the use-case code**
- **The Name property of a form is a string with prefix “frm” followed by the use-case code.**

e.g. For CHA110.dfm: ‘frmCHA110’.

Application Development :

Programming Methods

- **Naming convention of form objects**
 - **Prefixed with a short string containing a few letters from the name of the component type**
 - **Followed by a word that describes the information/event related to the component**

e.g. btnSubmit is of type TButton
 → “Submit” button

Application Development :

Programming Methods

- **Naming convention of variables**

- Prefixed with first letter of variable's data type followed by a word that describes the value being stored by the variable.

e.g. `sSpecies` is of type `String`
stores the species code

Application Development :

Programming Methods

1. Naming of functions and procedures

- **Name is descriptive of what the function/procedure does.**

e.g.

- `procedure Create_Prooflist;`
- `function Insert_Generation(iGid,iAccno:longint;
sCropyear, sSourceCropyear:string):boolean;`

Application Development :

Programming Methods

8. Re-writing of IRGCIS source code

- Algorithms in the GRIMS modules are based on existing algorithms in the IRGCIS.
- GRIMS mirror the fundamental functionalities of IRGCIS.
 - However, a number of algorithms from IRGCIS were revisited and modified to meet the changing requirements of system users.
- Introduced new technologies (i.e. ICIS and bar-coding)

Application Development : Documentation

Request Seed for Distribution [\[edit\]](#)

[GRIMS main](#) > [GRIMS functionality](#) > [Seed Management](#)
[Next](#)

Overview [\[edit\]](#)

This is a standalone form that enables the user to request a germplasm.

Graphical User Interface [\[edit\]](#)

Step 1: Create seedlist by accession(s)

Step 2: Verify seedlist processed by the system

Step 3: Request for distribution

Use Case Definition [\[edit\]](#)

Use Case Name	1.1.1 Request Seed for Distribution
Use Case Definition	The use case allows the actor to request seed for distribution. This is accessed using standalone application and external request shall be accommodated using different [web] interface.
User Contacts	n/a
Actors	Genebank Seed Export Secretary
Location	Genebank

GRIMS Development is documented in the form of Wiki articles on the Internet.

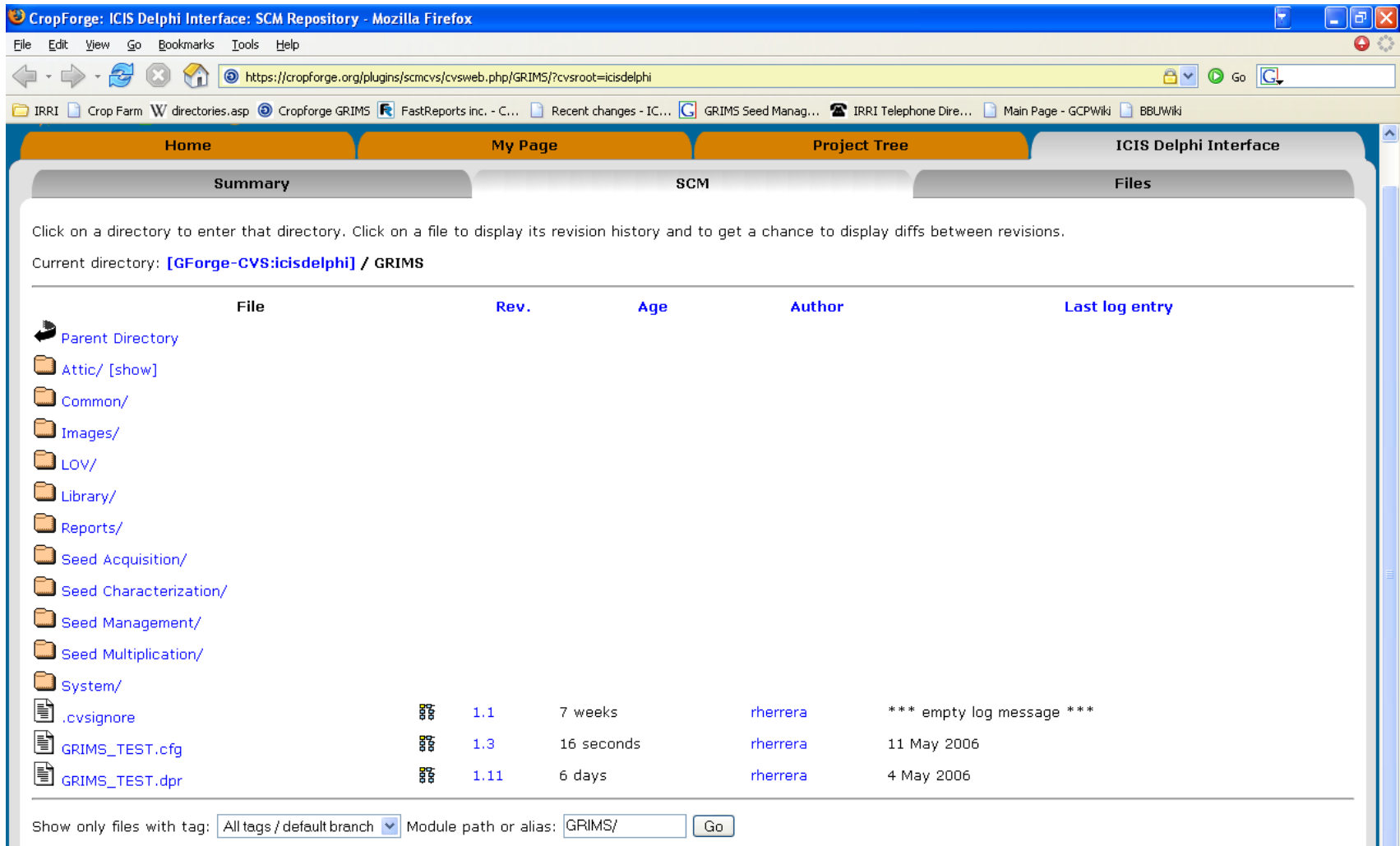
ICISWiki:

<http://cropwiki.irri.org/icis/index>.

Application Development :

Source Code Management

CropForge: <https://cropforge.org/>



The screenshot shows a web browser window titled "CropForge: ICIS Delphi Interface: SCM Repository - Mozilla Firefox". The address bar displays the URL <https://cropforge.org/plugins/scmcvs/cvsweb.php/GRIMS/?cvsroot=icisdelfi>. The browser's bookmark bar includes "IRRI", "Crop Farm", "directories.asp", "Cropforge GRIMS", "FastReports inc. - C...", "Recent changes - IC...", "GRIMS Seed Manag...", "IRRI Telephone Dire...", "Main Page - GCPWiki", and "BBUWiki".

The main content area features a navigation bar with tabs for "Home", "My Page", "Project Tree", and "ICIS Delphi Interface". Below this, there are sub-tabs for "Summary", "SCM", and "Files". A message states: "Click on a directory to enter that directory. Click on a file to display its revision history and to get a chance to display diffs between revisions." The current directory is identified as "[GForge-CVS:icisdelfi] / GRIMS".

A table lists the files and directories in the current directory:

File	Rev.	Age	Author	Last log entry
Parent Directory				
Attic/ [show]				
Common/				
Images/				
LOV/				
Library/				
Reports/				
Seed Acquisition/				
Seed Characterization/				
Seed Management/				
Seed Multiplication/				
System/				
.cvsignore	1.1	7 weeks	rherrera	*** empty log message ***
GRIMS_TEST.cfg	1.3	16 seconds	rherrera	11 May 2006
GRIMS_TEST.dpr	1.11	6 days	rherrera	4 May 2006

At the bottom, there is a search bar with the text "Show only files with tag: All tags / default branch" and a dropdown menu. To the right, it says "Module path or alias: GRIMS/" followed by a "Go" button.

Application Development :

Graphical User Interface (GUI) Design

- Most GRIMS UIs are patterned after existing IRGCIS UIs.
- Usability Rule-Of-Thumb: Minimize typing/keyboard input.

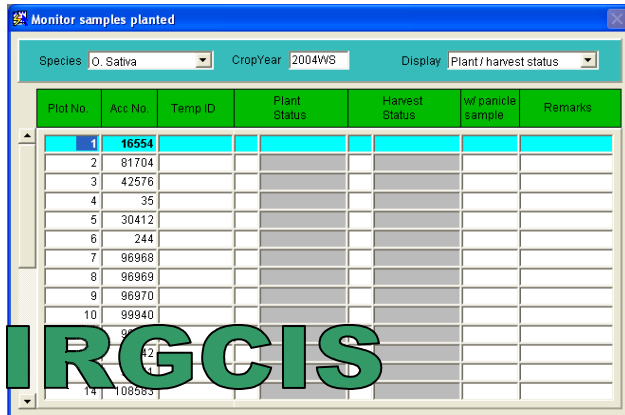
IRGCIS

GRIMS

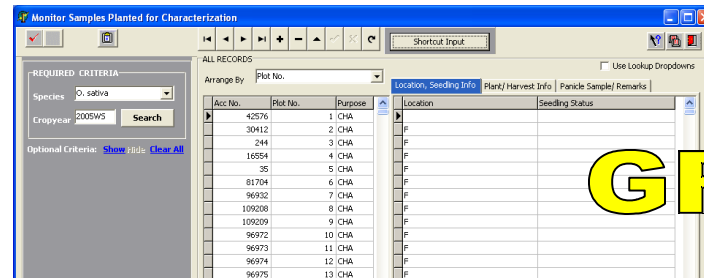
Application Development :

Graphical User Interface (GUI) Design

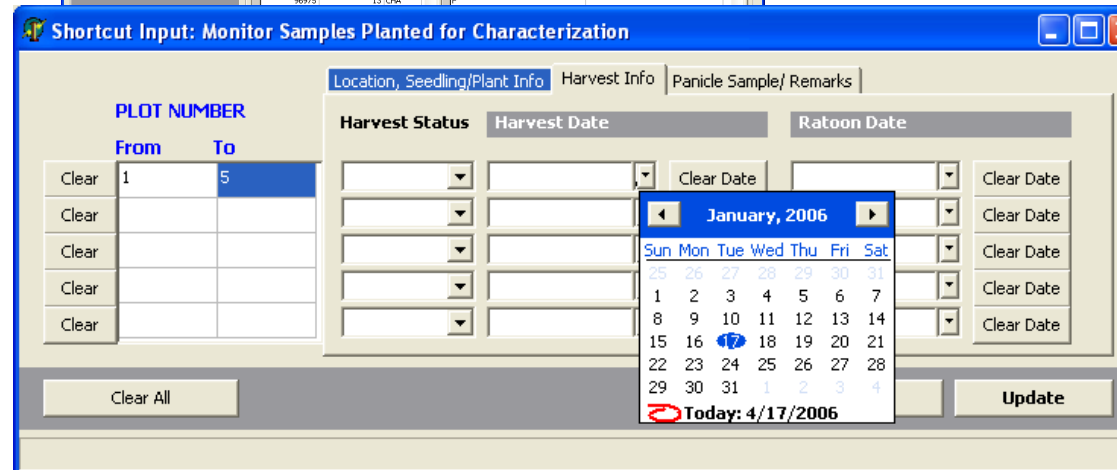
New UIs developed for GRIMS to address areas of improvement in IRGCIS



IRGCIS



GRIMS



Application Development :

Graphical User Interface (GUI) Design

- **Printing of reports/ proof list in more re-usable format**
 - MS Excel
 - Notepad
- **A number of IRGCIS reports/ prooflist are created in Oracle Developer Reports builder which doesn't allow copying and pasting of the result to a new file format**

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Database Management:

Stored Procedures and Functions

- Database Server Specific
- Stored Procedure
 - Executes on the database with possible input & output parameters
 - Does data manipulation operation (i.e. insert, delete, update)
- Function
 - Does data manipulation operation as well, but returns a value
 - Can be called inside a SQL query

- Example:

```
SQL> SELECT Get_Accno(gid) accno, gid, nval FROM NAMES
2 WHERE gid =1 and ntype=6;
```

ACCNO	GID	NVAL
747	1	T 12-42

Database Management:

Stored Procedures and Functions

```
CREATE OR REPLACE FUNCTION Get_Imsapack(xAccno NUMBER, xCropyear  
VARCHAR2:='') RETURN NUMBER IS
```

```
xVal          NUMBER;  
CURSOR c1 IS  
    SELECT NVL(SUM(trnqty),0)  
    FROM IMS_LOT a, IMS_TRANSACTION b  
    WHERE a.lotid=b.lotid AND trnstat=1  
          AND scaleid=-1000  
          AND a.eid= Get_Gidcropyear(xAccno,xCropyear) ;  
  
BEGIN  
    OPEN c1;  
    FETCH c1 INTO xVal;  
    IF c1%NOTFOUND THEN  
        xVal := 0;  
    END IF;  
    RETURN xVal;  
    CLOSE c1;  
  
END;
```

Cursors are pointers used to fetch rows from a result set. One can think of a cursor as a data structure that describes the results returned from a SQL SELECT statement. One of the variables in this structure is a pointer to the next record to be fetched from the query results.

www.orafaq.com/glossary/faqqlosc.htm

Database Management:

Calling a stored procedure inside Delphi code using ADO

```
function Mark_Insufficient_Distribution(strIrgcreqno:string):boolean;
//-----
// author: rqh
// description : marks the seed as insufficient for distribution
//-----
var storedProc:TADOStoredProc;
begin
  try
    try
      Result:=True;
      if strIrgcreqno='' then exit;
      storedProc:=TADOStoredProc.Create(nil);
      storedProc.Connection:=adoCnn;
      with storedProc do begin
        ProcedureName := 'Mark_Insufficient_Distribution';
        Parameters.Refresh;
        parameters.ParamByName(Parameters.Items[0].Name).Value := strIrgcreqno;
        ExecProc;
      end;
      GRC_Information('Done checking list for insufficient stock!');
    finally
      storedProc.Free;
    end;
  except on e:exception do
    begin
      Result:=false;
      messagedlg('Error encountered.',mtInformation,[mbOK],0);
    end;
  end;
end;
```

Database Management:

Aides to Parallel Implementation

- Use of Database Trigger

- A program in a database that gets called each time a row in a table is INSERTED, UPDATED, or DELETED.
- Allows checking that any changes are correct, or filling in missing information before the data is committed in the database

Database Management:

Aides to Parallel Implementation

```
CREATE OR REPLACE TRIGGER I_LOCAL.tbl_acs_tgr
    AFTER UPDATE OF TRAYNO, cropyear, amt_bulk, num_apack, amt_base ON accession_stored
FOR EACH ROW
DECLARE
    xScaleid INTEGER;

BEGIN
--Description: This trigger is fired whenever an update/ delete is made to ACCESSION_STORED table COLUMN
-----trayno, cropyear, amt_bulk, num_apack, amt_base.

    IF (:OLD.TRAYNO<>:NEW.TRAYNO) THEN
        Update_Lot_Locid(:NEW.gid, :NEW.trayno, :NEW.stotype);
    END IF;

    IF (:OLD.amt_bulk<>:NEW.amt_bulk) AND (:OLD.amt_bulk=NULL AND :NEW.amt_bulk IS NOT NULL)
        AND (:NEW.STOTYPE='A') THEN
        Append_Trigger_Imsbulk(:NEW.gid, :NEW.accno, :NEW.cropyear, :NEW.amt_bulk);

    END IF;

    IF ((:OLD.amt_base<>:NEW.amt_base) OR (:OLD.amt_base IS NULL AND :NEW.amt_base IS NOT NULL) )
        AND (:NEW.STOTYPE='B') THEN
        Append_Trigger_Imsbase(:NEW.gid, :NEW.accno, :NEW.cropyear, :NEW.amt_base);
    END IF;

    IF (:OLD.num_apack<>:NEW.num_apack) AND (:NEW.STOTYPE='A') THEN
        Append_Trigger_Imsapack(:NEW.gid, :NEW.accno, :NEW.cropyear, :NEW.num_apack);
    END IF;

End;
/
```

Database Management:

Aides to Parallel Implementation

Append data to IMS tables

```
xDate:=TO_NUMBER(TO_CHAR(SYSDATE,'YYYYMMDD'));
xuserid:=Get_Icिसuserid(USER);
xScaleid:=-1000;

xLotID:=Get_Lotid(xeid,xscaleid);
xCurrTrnQty:=Get_Imsapack(xAccno,xCropyear);
xTrnid:=Get_Nexttrnid(xeid,xscaleid);

  IF (xAmt>0) AND (xLotid=0) THEN

      SELECT LOT_SEQ.NEXTVAL
      INTO xLotid
      FROM dual;

      INSERT INTO IMS_LOT...
      INSERT INTO IMS_TRANSACTION ...
      xTrnid:=xTrnid+1;

  END IF;

  xTrnQty:=xAmt- xCurrTrnQty;

  IF xTrnQty<>0 THEN
      INSERT INTO IMS_TRANSACTION ...
  END IF;

END;
/
```

Database Management:

Oracle to PostgreSQL Database Migration

- Under way
- Slight differences on the following:
 1. Data type declaration
 - Varchar2
 - Varchar
 2. Function call
 - Select <function> from dual
 - Select <function?
 3. Creation of stored procedures and functions
 - Create or replace <function > Return varchar2 **IS**
 - Create or replace <function> Returns VARCHAR **AS** **\$\$**
 - ...
 - **LANGUAGE 'plpgsql';**



Part 2: Integration with IRIS

Part 2: Integration with IRIS

I. IRGCIS-IRIS Integration (GRIMS)

- a. IRGCIS Data in IRIS before World Bank (Phase I) Project
- b. Strategy of Data Migration to IRIS
- c. ICIS Applications in GRIMS
 - i. Incoming germplasm registration (SHU Portal)
 - ii. Germplasm distribution (seed export)
 - iii. Inventory management
 - iv. Seed list management
 - v. Study

II. Design/ Implementation Issues and Solution

IRGCIS Data in IRIS Before World Bank Phase I Project

- IRGC Accession
 - ~100,000 accessions
- Location information
 - Some data contains inconsistent info
 - donor location vs origin
- Names
- Due to the Data Quality Activity of WB project, the data in IRIS needs to be updated as well

Strategy of Data Migration to IRIS

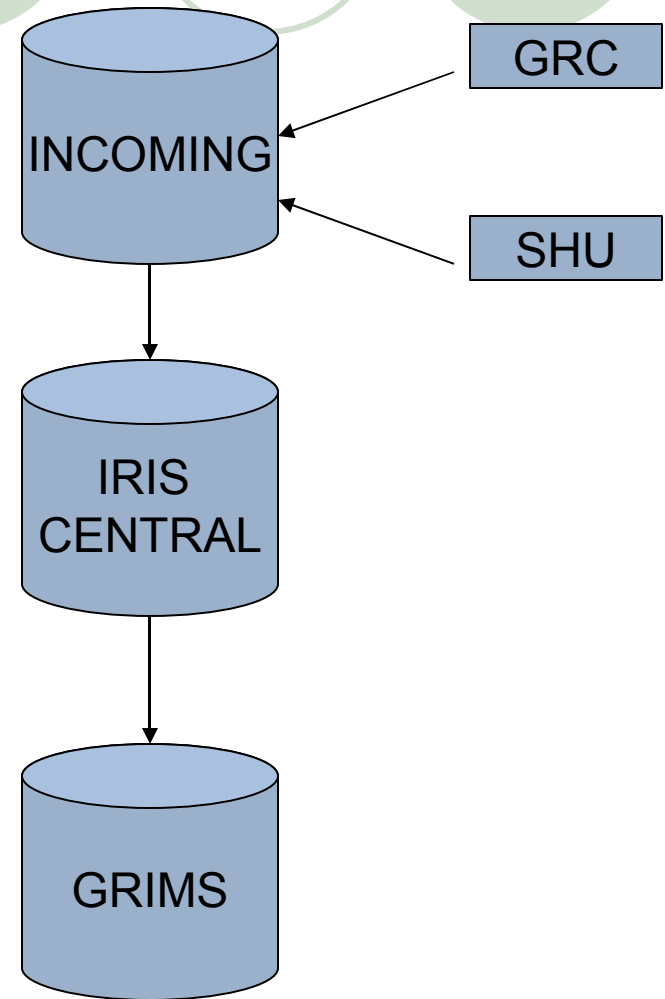
1. Identification of accession generation information
 - Assignment of negative germplasm identifier to all available accession generation
2. Assignment of seed packet identifier (LOT ID)
 - Active
 - Bulk
 - Aluminum packet
 - Paper
 - Base
 - Aluminum can

Strategy of Data Migration to IRIS

1. Reformatting of passport data into IRIS standard, stored as germplasm ATTRIBUTE
 - i. Defined passport descriptors in ICIS user defined field table (UDFLDS)
 - ii. Transformed IRGCIS valid values for passport descriptors and for morpho-agronomic traits into ICIS SCALE, SCALEDIS, SCALECON
 - iii. Created script that inserts and formats the IRGCIS passport data into ICIS ATTRIBUTE table
- Still outstanding
 - Loading of Morpho-agronomic passport data in the DMS as STUDY

ICIS Applications for Data Management

- Curation of Incoming Data through IRIS
 1. Input incoming data using SetGen in a separate IRIS local database for incoming germplasm
 2. Upload the entire incoming local database to the central database (IRIS Database Administrator)
 3. Import to GRIMS database
- Listdata (trigger on update/insert/delete to insert data automatically to IRGCIS)



Integration to IRIS : Germplasm distribution/ seed export

1. The request is made by accession number and the seed source (GID) is initially unknown
2. After finalizing the seed source and updating of the seed stocks, the seedlist is created which can be view
3. A seed export template is filled in by the user which is submitted to the Seed Health Unit.

The screenshot shows a software window titled 'IRIS - IRIS/IRIS' with a 'Browse Window' tab. It displays a list of germplasm accessions. The columns are: Tax, Description, Date, Entry Code, Source, and ID. The data includes various accessions from different sources like CHINA, HSIANG CHU CHEN 15, CHANG CHOW, TUNG CHANG, WEE TUNG, CHANG CHOW, FU SHI HANG, NARB 4, YEN TAO HSEH (D 1280), CHANG LU, TA YEN TSI, NANG HSIANG KU, and HSIANG CHANG.

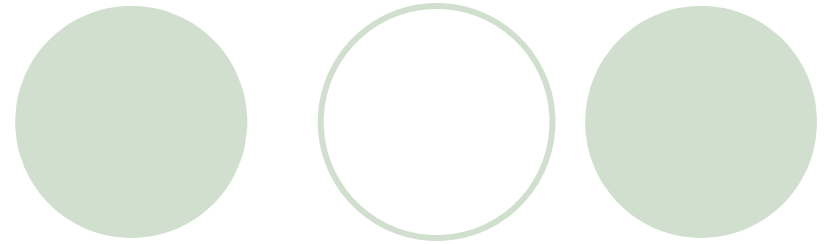
Tax	Description	Date	Entry Code	Source	ID
IRIC 000 180555	CHINA	1	180555		1837238
IRIC 070 180555	CHINA	2	180555		1837902
IRIC 735 180555	HSIANG CHU CHEN 15	3	180555		1837307
IRIC 080 180555	CHANG CHOW	4	180555		1838085
IRIC 072 180555	CHANG CHOW	5	180555		1838088
IRIC 073 180555	TUNG CHANG	6	180555		1838089
IRIC 082 180555	WEE TUNG	7	180555		1838090
IRIC 083 180555	CHANG CHOW	8	180555		1838100
IRIC 084 180555	FU SHI HANG	9	180555		1838112
IRIC 106 180555	NARB 4	10	180555		1780280
IRIC 1018 180555	NARB 4	11	180555		1780281
IRIC 1048 180555	YEN TAO HSEH (D 1280)	12	180555		1838173
IRIC 1049 180555	CHANG LU	13	180555		1838173
IRIC 1071 180555	TA YEN TSI	14	180555		1838199
IRIC 1075 180555	NANG HSIANG KU	15	180555		1838226
IRIC 1078 180555	HSIANG CHANG	16	180555		1838226

The screenshot shows a Microsoft Excel spreadsheet titled 'IRGC REQUEST # 20000008'. It contains a table with columns: ACCNO, IRGC, GID, SOURCE, NAME, ORIGIN, SPECIES, LOCATION, PLOTNO, and IPSTATUS. The data lists various accessions with their corresponding accession numbers, GIDs, sources, names, origins, species, locations, plot numbers, and IP statuses.

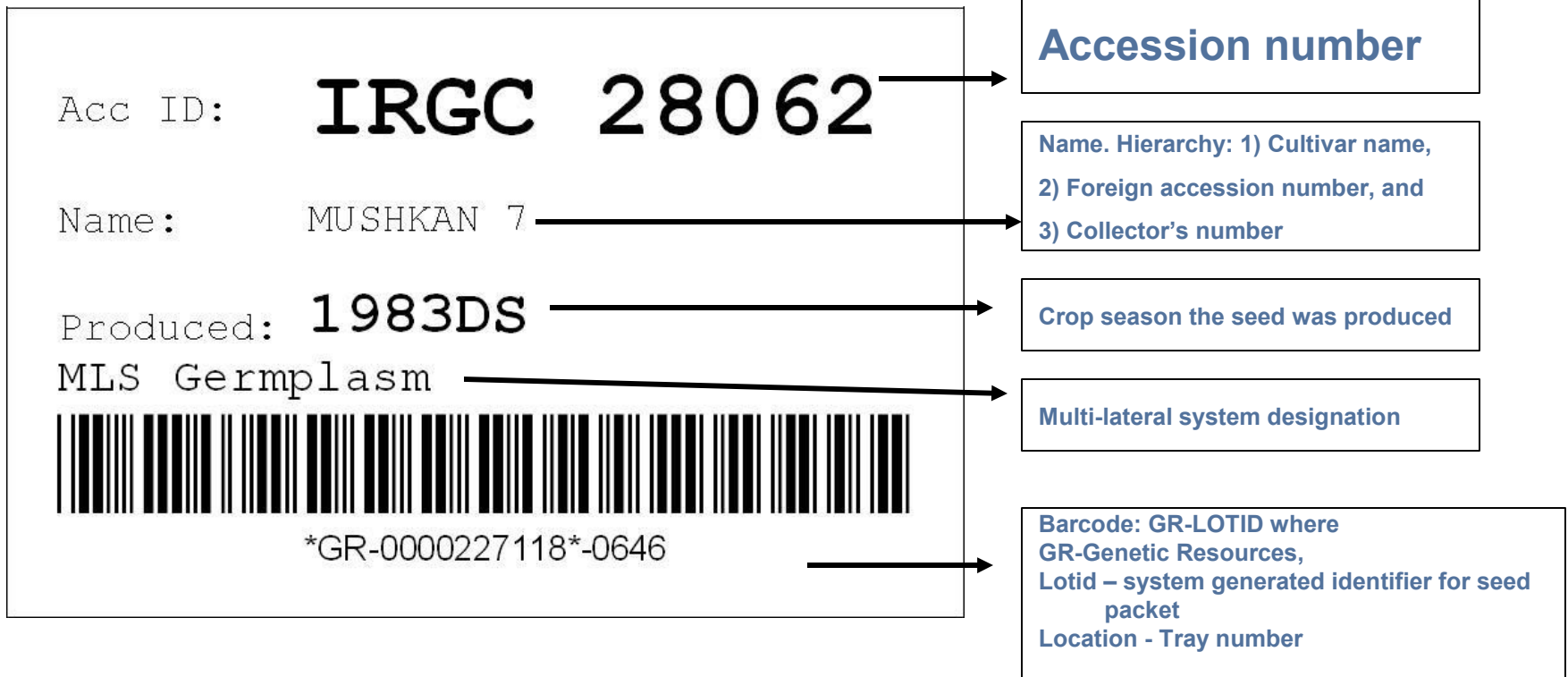
ACCNO	IRGC	GID	SOURCE	NAME	ORIGIN	SPECIES	LOCATION	PLOTNO	IPSTATUS
1	290	IRGC 290	1837238	1801D3	CHINES	CHINES	PORTUGAL	CULTIVAT	MLS DERMPPLASM
2	070	IRGC 070	1837902	1801D3	CHINA	CHINA		CULTIVAT	MLS DERMPPLASM
3	735	IRGC 735	1837307	1801D3	KUAN CHIKUAN	CHI CHINA		CULTIVAT	MLS DERMPPLASM
4	960	IRGC 960	1838085	1801D3	CHANG CHANG	CHI CHINA		CULTIVAT	2300 MLS DERMPPLASM
5	972	IRGC 972	1838088	1801D3	CHANG CHANG	CHI CHINA		CULTIVAT	MLS DERMPPLASM
6	973	IRGC 973	1838089	1801D3	TUNG CHA TUNG	CHA CHINA		CULTIVAT	MLS DERMPPLASM
7	980	IRGC 980	1838090	1801D3	WEE TUNG	WEE TUNG	CHINA	CULTIVAT	MLS DERMPPLASM
8	983	IRGC 983	1838100	1801D3	CHANG CHANG	CHI CHINA		CULTIVAT	MLS DERMPPLASM
9	994	IRGC 994	1838112	1801D3	7372	7372	CHINA	CULTIVAT	MLS DERMPPLASM
10	1018	IRGC 1018	1780280	1801D3	NARB 4	NARB 4	CHINA	CULTIVAT	UC4 3326 MLS DERMPPLASM
11	1018	IRGC 1018	1780281	1801D3	NARB 4	NARB 4	CHINA	CULTIVAT	UC4& 2166 MLS DERMPPLASM
12	1048	IRGC 1048	1838173	1801D3	180415	180415	CHINA	CULTIVAT	MLS DERMPPLASM
13	1049	IRGC 1049	1838173	1801D3	180415	180415	CHINA	CULTIVAT	MLS DERMPPLASM
14	1071	IRGC 1071	1838199	1801D3	TA YEN TSI	TA YEN TSI	CHINA	CULTIVAT	MLS DERMPPLASM
15	1075	IRGC 1075	1838226	1801D3	MAO HSIANG KU	HSIANG CHINA		CULTIVAT	MLS DERMPPLASM
16	1078	IRGC 1078	1838226	1801D3	HUNG CH HUNG	CHI CHINA		CULTIVAT	MLS DERMPPLASM
17	1080	IRGC 1080	1838226	1801D3	HSIANG CHANG	CHI CHINA		CULTIVAT	MLS DERMPPLASM
18	1127	IRGC 1127	1838271	1801D3	KWAN CHAWAN	CHI CHINA		CULTIVAT	183 MLS DERMPPLASM
19	1169	IRGC 1169	1838330	1801D3	FU DAN 1	FU DAN 1	CHINA	CULTIVAT	MLS DERMPPLASM
20	1180	IRGC 1180	1838345	1801D3	HUNG MI HUNG	MI CHINA		CULTIVAT	MLS DERMPPLASM
21	1180	IRGC 1180	1838350	1801D3	CHI KOU 1	CHI KOU 1	CHINA	CULTIVAT	MLS DERMPPLASM
22	1180	IRGC 1180	1838356	1801D3	CHI TA 1	CHI TA 1	CHINA	CULTIVAT	MLS DERMPPLASM
23	1184	IRGC 1184	1838359	1801D3	HUNG MI HUNG	MI CHINA		CULTIVAT	MLS DERMPPLASM
24	1186	IRGC 1186	1838381	1801D3	HUNG SO HUNG	SO CHINA		CULTIVAT	MLS DERMPPLASM
25	1200	IRGC 1200	1838399	1801D3	WU SHI WU SHI	CHI CHINA		CULTIVAT	MLS DERMPPLASM
26	1205	IRGC 1205	1838371	1801D3	TAO TAO TAO	TAO CHINA		CULTIVAT	MLS DERMPPLASM
27	1207	IRGC 1207	1838374	1801D3	HSIA HSI HSI	HSI CHINA		CULTIVAT	MLS DERMPPLASM
28	1220	IRGC 1220	1838391	1801D3	PI 180615	PI 180615	CHINA	CULTIVAT	UC 2914 MLS DERMPPLASM

Integration to IRIS:

Inventory Management



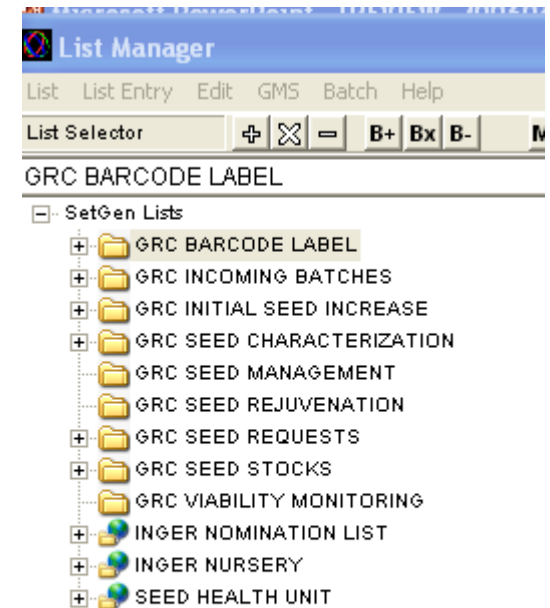
- IMS Lot
- IMS Transaction



Integration to IRIS:

Seed list management

- The list is grouped according to process which is performed by GRIMS
- i.e.
 - Barcode Labels – generic printing of barcode labels
 - Initial Seed Increase – seed list used only by incoming samples for initial seed multiplication
 - Seed requests/ distribution
 - Already in production database



Implementation Issues & Solution

- Viability data is yet to be uploaded to the DMS
- Characterization data is already in DMS but the data is not yet used for selection of planting materials
- Germplasm taxonomy and mission information are not properly represented in ICIS schema.

Design Issues & Solution:

Selection of Planting Material for Characterization

- Importance of null value
- In DMS, null value means no row/ record
- Plant selection criteria for seed characterization is based on the following:
 1. Accessions with no single description
 2. Accessions with incomplete description
 - incomplete stage(s)
 - number of null traits
 3. Accessions for re-characterization/verification
 - range of accessions
 - morpho-agron traits

Select Planting Material for Characterization

Species: O. sativa Type of Accessions: Old Registered

OLD REGISTERED ACCESSIONS

Feature:

With no single description

With incomplete description

For re-characterization/verification >>Specify: Accession number range(s)

Accession number range(s)

Morpho-agronomic traits

Design Issues & Solution

Selection of Planting Material for Characterization

- Considerable execution time if flat table is used
- E.g. Select O.sativa accessions with no specified traits (no descriptors)

```
select  a.accno,a.croyear
from    morpho_agron1 a
where   get_sppcode(get_mgid(accno)) = 'S'
        and      get_status_acc(accno) = "AV"
        and      a.pop_code =          'A'
        and      GET_NULL_TRAIT(a.accno,a.pop_code) = 45
```

Design Issues & Solution

Selection of Planting Material for Characterization

```
CREATE OR REPLACE FUNCTION Get_Null_Trait (xAccno  
NUMBER,xPop_Code VARCHAR2) RETURN NUMBER IS
```

```
cnnumber NUMBER;
```

```
sppCode CHAR(1);
```

```
CURSOR cSat IS
```

```
SELECT (45 - (
```

```
    DECODE(hdg_80head,NULL,0,1) +  
    DECODE(sdht_code,NULL,0,1) +  
    DECODE(mat,NULL,0,1) +  
    DECODE(blpub_veg,NULL,0,1) +  
    DECODE(blco_rev_veg,NULL,0,1) +  
    DECODE(blSCO_rev_veg,NULL,0,1) +  
    DECODE(la,NULL,0,1) +  
    DECODE(ligsh,NULL,0,1) +  
    DECODE(cco_rev_veg,NULL,0,1) +  
    DECODE(ligco_rev_veg,NULL,0,1) +  
    DECODE(auco_rev_veg,NULL,0,1) +  
    DECODE(cuan_repro,NULL,0,1) +  
    DECODE(noco_rev,NULL,0,1) +  
    DECODE(inco_rev_repro,NULL,0,1) +  
    DECODE(cust_repro,NULL,0,1) +  
    DECODE(fla_repro,NULL,0,1) +  
    DECODE(pty,NULL,0,1) +  
    DECODE(second_br_repro,NULL,0,1) +  
    DECODE(pex_repro,NULL,0,1) +  
    DECODE(pa_repro,NULL,0,1) +
```

```
    BEGIN  
    sppCode:=Get_Spp_Code(xAccno);  
    IF sppCode='G' THEN  
        OPEN cGlab;  
        FETCH cGlab INTO cnnumber;  
        IF cGlab%NOTFOUND THEN  
            cnnumber := 0;  
        END IF;  
        CLOSE cGlab;  
    ELSIF sppCode='S' THEN  
        OPEN cSat;  
        FETCH cSat INTO cnnumber;  
        IF cSat%NOTFOUND THEN  
            cnnumber := 0;  
        END IF;  
        CLOSE cSat;  
    ELSIF sppCode='W' THEN  
        cNumber:=0;  
    END IF;  
    RETURN cnnumber;  
END;  
/
```

Design Issues and Solutions: Taxonomy information

- At the moment, GRIMS and IRGCIS uses the taxonomy number provided by IPGRI.

TAXNO	NOT NULL	NUMBER (5)
KINGDOM	NOT NULL	VARCHAR2 (30)
DIVIPHYLUM		VARCHAR2 (30)
CLASS		VARCHAR2 (30)
ORDR		VARCHAR2 (30)
FAMILY		VARCHAR2 (30)
GENUS	NOT NULL	VARCHAR2 (60)
GHYBRID		VARCHAR2 (1)
GAUTHOR		VARCHAR2 (100)
SUBGENUS		VARCHAR2 (30)
SECT		VARCHAR2 (30)
SER		VARCHAR2 (30)
SUBSERIES		VARCHAR2 (30)
SHYBRID		VARCHAR2 (1)
SPECIES	NOT NULL	VARCHAR2 (60)
SAUTHOR		VARCHAR2 (100)
SUBSP		VARCHAR2 (30)
SSPAUTHOR		VARCHAR2 (100)
VARHYBRID		VARCHAR2 (1)
BVAR		VARCHAR2 (30)
VARAUTHOR		VARCHAR2 (100)
SVHYBRID		VARCHAR2 (1)
SUBVAR		VARCHAR2 (30)
FORMA		VARCHAR2 (70)

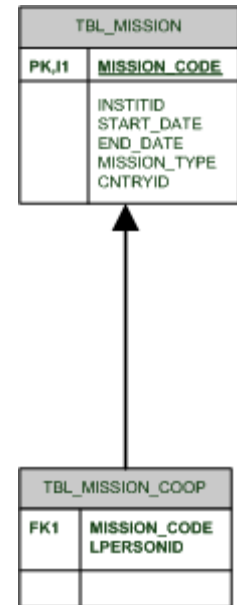
Design Issues and Solutions: Collecting mission

● Mission

Name	Null?	Type	Comment
-----	-----	-----	-----
MISSION_CODE	NOT NULL	NUMBER(5)	Code given to a mission
INSTITID		NUMBER(10)	Funding institute
START_DATE		NUMBER(10)	Date when the mission started
END_DATE		NUMBER(10)	Date when the collecting mission ended
MISSION_TYPE		VARCHAR2(5)	Rescue collecting Immediate use Gap filling Research purpose Opportunistic reasons
CNTRYID		NUMBER(10)	Location or country where the mission was held

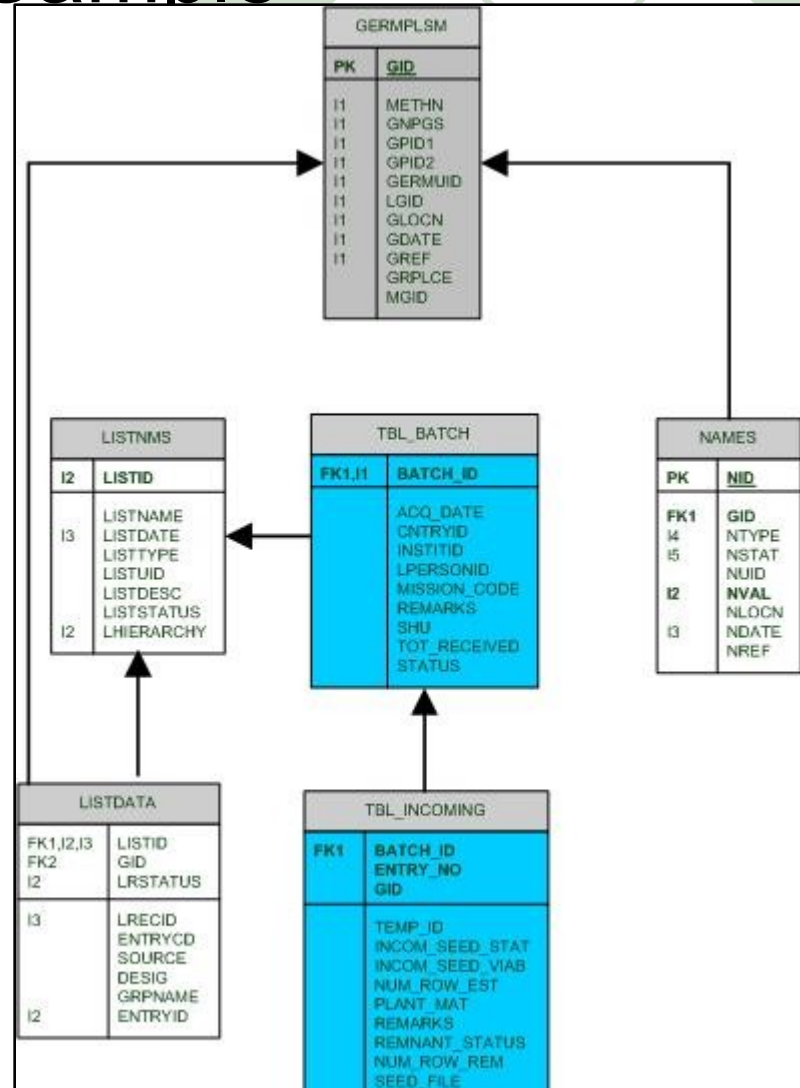
● Mission Collectors

Name	Null?	Type	Comment
-----	-----	-----	-----
MISSION_CODE	NOT NULL	NUMBER(5)	Code given to a mission
PERSONID		NUMBER(10)	Collector ID

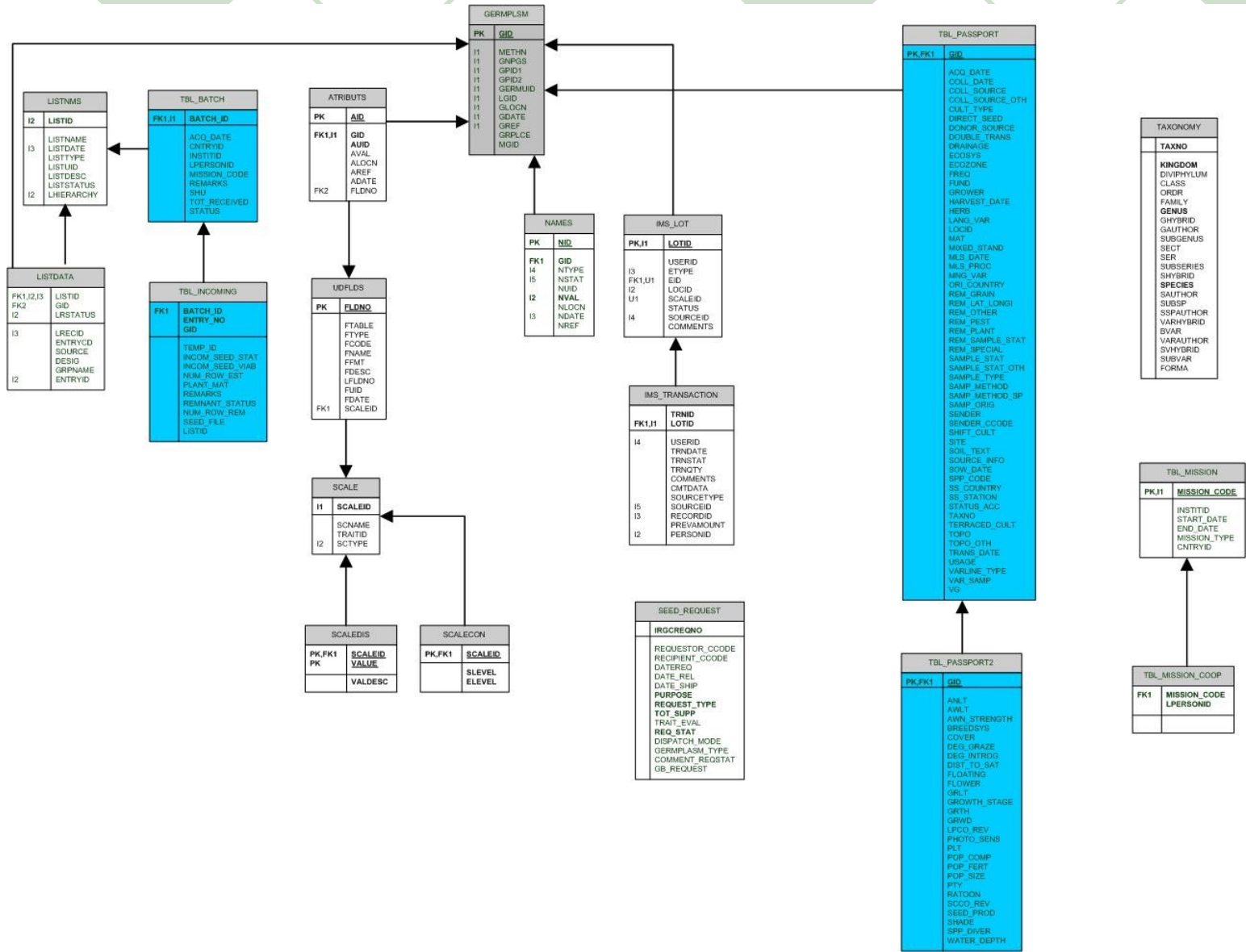


Integration to IRIS: ERD for Incoming Sample

- Listname=
- BATCH_ID



IRIS/ GRIMS/ IRGCIS Integration



Summary and Conclusion

- Heavily used ICIS modules
 - GMS
 - GERMPLSM, NAMESM, LISTNMS, LISTDATA, UDFLDS
 - LOCATION
 - IMS
 - IMS_TRANSACTION, IMS_LOT
- DMS
 - SCALE, SCALEDIS, SCALECON, SCALETAB
 - For publication of data into IRIS Central database

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Part 3: GRIMS GUI

