



# ICIS and NunGems status report

May 2006 (CIMMYT)

Casper aan den Boom



# Development of NUNGEMS database

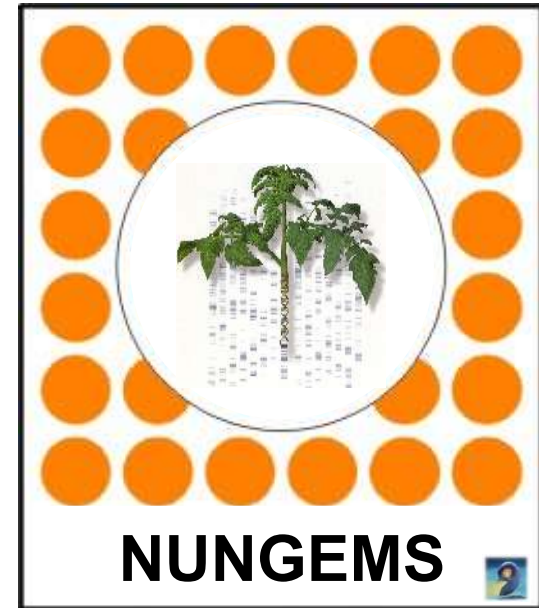


(by Paul Buddiger, Nunhems)

Looked at GEMS (ICIS module) and Magellan  
User requirements



Concept :  
Nautilus - LIMS  
configure instead of develop



Nunhems' Genetic data Management System



nunhems®

# HIERARCHY



**STUDY**

**SAMPLE**

**ALIQUOT**



**PROJECT**

**MAP**

**MARKER**  
**GENE**  
**QTL**



# NUNGEMS explorer - dynamic data



	Name	Pd	Qu...	External Reference	Pc	Mas - Na...	Cm	Parentlabel	Sample Id - Name	Linkagegroup
	informativity									
	E11M47_M115.8 - 1 - Pu0V_map1	AFLP		E11M47_M115.8	E11M47		20.9		Pu0V_map1 - 2 - Pu0V	Pu0V_all_6
	E11M47_M141.5 - 1 - Pu0V_map1	AFLP		E11M47_M141.5	E11M47		16.9		Pu0V_map1 - 2 - Pu0V	Pu0V_all_9
	E11M47_M142.5 - 1 - Pu0V_map1	AFLP		E11M47_M142.5	E11M47		16.9		Pu0V_map1 - 2 - Pu0V	Pu0V_all_9
	E11M47_M180.9 - 1 - Pu0V_map1	AFLP		E11M47_M180.9	E11M47		75.2		Pu0V_map1 - 2 - Pu0V	Pu0V_all_2
	E11M47_M191.9 - 1 - Pu0V_map1	AFLP		E11M47_M191.9	E11M47		30.3		Pu0V_map1 - 2 - Pu0V	Pu0V_all_5
	E11M47_M387.8 - 1 - Pu0V_map1	AFLP		E11M47_M387.8	E11M47		25.7		Pu0V_map1 - 2 - Pu0V	Pu0V_all_6
	E11M47_M390.0 - 1 - Pu0V_map1	AFLP		E11M47_M390.0	E11M47		25.7		Pu0V_map1 - 2 - Pu0V	Pu0V_all_6
	E11M48_M-46.8 - 1 - Pu0V_map1	AFLP		E11M48_M-46.8	E11M48		60.4		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M48_M120.4 - 1 - Pu0V_map1	AFLP		E11M48_M120.4	E11M48		30.2		Pu0V_map1 - 2 - Pu0V	Pu0V_all_6
	E11M48_M262.4 - 1 - Pu0V_map1	AFLP		E11M48_M262.4	E11M48		2		Pu0V_map1 - 2 - Pu0V	Pu0V_all_9b
	E11M48_M373.9 - 1 - Pu0V_map1	AFLP		E11M48_M373.9	E11M48		6.4		Pu0V_map1 - 2 - Pu0V	Pu0V_all_1b
	E11M48_M529.1 - 1 - Pu0V_map1	AFLP		E11M48_M529.1	E11M48		45.5		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M48_M90.5 - 1 - Pu0V_map1	AFLP		E11M48_M90.5	E11M48		7.1		Pu0V_map1 - 2 - Pu0V	Pu0V_all_3c
	E11M49_M158.3 - 1 - Pu0V_map1	AFLP		E11M49_M158.3	E11M49		41.8		Pu0V_map1 - 2 - Pu0V	Pu0V_all_2
	E11M49_M180.1 - 1 - Pu0V_map1	AFLP		E11M49_M180.1	E11M49		68.8		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M153.4 - 1 - Pu0V_map1	AFLP		E11M50_M153.4	E11M50		77.4		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M153.4 - 2 - Pu1H166_map1	AFLP		E11M50_M153.4	E11M50		55.3		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M195.2 - 1 - Pu0V_map1	AFLP		E11M50_M195.2	E11M50		7.4		Pu0V_map1 - 2 - Pu0V	Pu0V_all_6
	E11M50_M195.2 - 2 - Pu1H166_map1	AFLP		E11M50_M195.2	E11M50		46.5		Pu1H166_map1 - 2 - Pu1H	Pu1H166_6
	E11M50_M196.6 - 1 - Pu1H166_map1	AFLP		E11M50_M196.6	E11M50		11.8		Pu1H166_map1 - 2 - Pu1H	Pu1H166_1b
	E11M50_M198.9 - 1 - Pu0V_map1	AFLP		E11M50_M198.9	E11M50		16.8		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M208.6 - 1 - Pu1H166_map1	AFLP		E11M50_M208.6	E11M50		45.1		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M218.0 - 1 - Pu1H166_map1	AFLP		E11M50_M218.0	E11M50		18.4		Pu1H166_map1 - 2 - Pu1H	Pu1H166_3
	E11M50_M218.7 - 1 - Pu1H166_map1	AFLP		E11M50_M218.7	E11M50		18.4		Pu1H166_map1 - 2 - Pu1H	Pu1H166_3
	E11M50_M236.5 - 1 - Pu0V_map1	AFLP		E11M50_M236.5	E11M50		10.3		Pu0V_map1 - 2 - Pu0V	Pu0V_all_1b
	E11M50_M244.4 - 1 - Pu1H166_map1	AFLP		E11M50_M244.4	E11M50		57.5		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M244.6 - 1 - Pu1H166_map1	AFLP		E11M50_M244.6	E11M50		57.5		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M368.1 - 1 - Pu1H166_map1	AFLP		E11M50_M368.1	E11M50		20.2		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M390.0 - 1 - Pu1H166_map1	AFLP		E11M50_M390.0	E11M50		5.4		Pu1H166_map1 - 2 - Pu1H	Pu1H166_5
	E11M50_M392.1 - 1 - Pu1H166_map1	AFLP		E11M50_M392.1	E11M50		5.4		Pu1H166_map1 - 2 - Pu1H	Pu1H166_5
	E11M50_M496.0 - 1 - Pu0V_map1	AFLP		E11M50_M496.0	E11M50		1.8		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M498.4 - 1 - Pu0V_map1	AFLP		E11M50_M498.4	E11M50		1.8		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M523.1 - 1 - Pu0V_map1	AFLP		E11M50_M523.1	E11M50		90.1		Pu0V_map1 - 2 - Pu0V	Pu0V_all_8
	E11M50_M523.1 - 2 - Pu1H166_map1	AFLP		E11M50_M523.1	E11M50		38.8		Pu1H166_map1 - 2 - Pu1H	Pu1H166_8
	E11M50_M564.2 - 1 - Pu1H166_map1	AFLP		E11M50_M564.2	E11M50		28.9		Pu1H166_map1 - 2 - Pu1H	Pu1H166_1b
	E11M54_M113.3 - 1 - Pu0V_map1	AFLP		E11M54_M113.3	E11M54		3.6		Pu0V_map1 - 2 - Pu0V	Pu0V_all_2



# NUNGEMS explorer - static data



	Name	Article T...	Kind	Title	First Author	Biblio
NUNGEMS	ART_1	QTL	Tomato	Fine mapping of quantitative trait loci for improved f...	FRARY, A	GENOME (2003) 46:235-243
Templates	ART_2	QTL	Tomato	Genetics of drought tolerance during seed germinati...	Foolad, M	Genome (2003) 46:536-545
Workflows	ART_3	QTL	Tomato	QTLs for Tomato Powdery Mildew Resistance (Oidui...	Bai, Y	Molecular Plant Microbe Interactions (2003) 16
Instruments	ART_4	QTL	Tomato	Quantitative Trait Locus Analysis of Leaf Dissection I...	Holtan, H	Genetics (2003) 165: 1541-1550
System	ART_5	QTL	Tomato	The making of a bell pepper-shaped tomato fruit: ide...	Van der Knaap, E	Theor Appl Genet (2003) 107: 139-147
Syntaxes	ART_6	QTL	Tomato	Mapping QTLs conferring early blight (Alternaria sola...	Zhang, L	Molecular Breeding (2003) 12: 3-19
QUERIES	ART_7	QTL	Pepper	Molecular mapping of capsaicinoid biosynthesis gene...	Blum, E	Theor Appl Genet (2003) 108: 79-86
CROPS	ART_8	QTL	Pepper	QTLs for resistance to powdery mildew in pepper un...	Lefebvre, V	Theor Appl Genet (2003) 107: 661-666
Artichoke	ART_9	QTL	Pepper	Comparative mapping of Phytophthora resistance lo...	Thabuis, A	Theor Appl Genet (2003) 106: 1473-1485
Carrot	ART_10	QTL	Pepper	Mapping of yield-related QTLs in pepper in an inters...	Rao, G	Theor Appl Genet (2003) 106: 1457-1466
Cucumber	ART_11	QTL	Pepper	fs3.1: a major fruit shape QTL conserved in Capsicum	Ben Chaim, A	Genome (2003) 46: 1-9
PROJECTS	ART_12	MAP	Pepper	Linkage of the A locus for the presence of anthocya...	Ben Chaim, A	Theor Appl Genet (2003) 106: 889-894
MAPS	ART_13	MAP	Pepper	Polygalacturonase: a candidate gene for the soft fle...	Rao, G	Plant Molecular Biology (2003) 51: 135-141
MAP_ENTRIES	ART_14	MAP	Tomato	The heat-stable root-knot nematode resistance gen...	Ammiraju, J	Theor Appl Genet (2003) 106: 478-484
LIT_PROJECTS	ART_15	MAP	Tomato	Homoeologous pairing and recombination in Solanum...	Ji, Y	Theor Appl Genet (2003) 106: 979-989
LIT_MAPS	ART_16	MAP	Tomato	The self-pruning gene family in tomato	Carmel-Goren, L	Plant Molecular Biology (2003) 52: 1215-1222
LIT_MAP_ENTRIES	ART_17	TRAIT	Cucumber	Comparative mapping of ZYMV resistances in cucum...	Park Y.	Theor Appl Genet (2004) 109: 707-712
GENE	ART_18	GENE	Cucumber	Molecular characterization and isolation of the F/fge...	Mibus H.	Theor Appl Genet (2004) 109: 1669-1676
QTL	ART_19	TRAIT	Melon	Five independent loci each control monogenic resista...	Krantz J.D.	Theor Appl Genet (2004) 108:1033-1038
TRAIT	ART_20	QTL	Melon	Identification of quantitative trait loci involved in frui...	Monforte A.J.	Theor Appl Genet (2004) 108:750-758
ARTICLES	ART_21	MAP	Tomato	Candidate gene analysis of anthocyanin pigmentatio...	De Jong W.S.	Theor Appl Genet (2004) 108:423-432
QUERIES	ART_22	MAP	Tomato	Mapping Ol-4, a gene conferring resistance to Odiu...	Bai, Y., Lindhout P.	Theor Appl Genet (2004) 109: 1215-1223
Leek	ART_23	MAP	Tomato	Mapping, genetic effects and epistatic interaction of...	Coaker, G.L.	Theor Appl Genet (2004) 108: 1047-1055
Lettuce	ART_24	MAP	Pepper	QTL mapping of anthracnose (Colletotrichum spp.) r...	Voorrips, R.E., Groenwold, R.	Theor Appl Genet (2004) 109: 1275-1282
Melon	ART_25	MAP	Tomato	The tomato homolog of the gene encoding UV-dama...	Lieberman, M., Levin, I.	Theor Appl Genet (2004) 108: 1574-1581
Onion	ART_26	MAP	Pepper	QTL analysis of fertility restoration in cytoplasmic ma...	Wang, L.H., Palloix, A.	Theor Appl Genet (2004) 109: 1058-1063
Pepper	ART_27	MAP	Pepper	Characterization and molecular genetic mapping of ...	Lee, J.M., Kim, B.D.	Theor Appl Genet (2004) 108: 619-627
Spinach	ART_28	MAP	Tomato	A comparative study of the genetic bases of natural...	Frary, A., Tanksley, S.D.	Theor Appl Genet (2004) 109: 523-533
Watermelon	ART_29	MAP	Tomato	Evaluating the genetic basis of multiple-locule fruit in...	Barrero, L.S., Tanksley, S.D.	Theor Appl Genet (2004) 109: 669-679
Tomato	ART_30	MAP	Tomato	Localization of jointless-2 gene in the centromeric re...	Budiman, M.A., Wing, R.A.	Theor Appl Genet (2004) 108: 190-196
Eggplant_x	ART_31	MAP	Tomato	Fine mapping of the parthenocarpic fruit (pat) mutat...	Beraldi, D., Mazzucato, A.	Theor Appl Genet (2004) 108: 209-216
Cauliflower_x	ART_32	MAP	Tomato	Advanced backcross QTL analysis of a Lycopersicon ...	Frary, A., Tanksley, S.D.	Theor Appl Genet (2004) 108: 485-496
Pea_x	ART_33	MAP	Tomato	Inheritance and genetic mapping of cucumber mos...	Stamova, B.S., Chetelat, R.T.	Theor Appl Genet (2000) 101:527-537
ARTICLES	ART_34	MAP	Tomato	A molecular linkage map of tomato based on a cross ...	Chen F.Q, Foolad, M.R.	Genome (1999) 42: 94-103
NUNHEMS_NETHERLANDS	ART_35	MAP	Tomato	The broad-spectrum tospovirus resistance gene Sw...	Brommonschenkel, S.H., Ta...	Molecular Plant Microbe Interactions (2000) 13
PRIMER_LIST	ART_36	MAP	Tomato	RAPD and AFLP tagging and mapping of Beta (B) an...	Zhang, Y., Stommel, J.R.	Theor Appl Genet (2000) 100: 368-375
MAS_LIST	ART_37	MAP	Tomato	FS8.1, a major QTL, sets the pattern of tomato carp...	Ku, H.M., Tanksley, S.D.	Theor Appl Genet (2000) 101: 873-878
MLPA_LIST						
NUNHEMS_USA						
NUNHEMS_INDIA						



# Molecular data in ICIS



## Marker assisted selection / Marker assisted backcross breeding

ENTRYCODE	UNIQUE_ID	DESIGNATION	GID	ENTRY_ID	MV_LOC-	MV_MK-	GENE_SOURCE	MAS_REMARKS	AFLP1	MAS_7	AFLP2	AFLP3	AFLP4	AFLP5	AFLP6	AFLP7
					PRED_ML9	PRED_ML9	_ML									
05_1698-6P	CUP 4-55317	VDS745-12-6P	-55317	158	R		Aster	recombinant -> small introgression	A	R	B	A	<b>B</b>	A	A	A
05_1698-7P	CUP 4-55318	VDS745-12-7P	-55318	159	R		Aster		A	R	B	A	<b>B</b>	A	C	A
05_1698-8P	CUP 4-55319	VDS745-12-8P	-55319	160	R		Aster		A	R	B	A	<b>B</b>	A	C	A
05_1726-2P	CUP 4-55504	VDS763-7-3-2P	-55504	345		S	Aster	MK_23M59 (0cM)no seg all S	B	R	A	<b>B</b>	A	A	A	A
05_1726-3P	CUP 4-55505	VDS763-7-3-3P	-55505	346		H	Aster	MK_23M59 (0cM)no seg all S	B	R	A	H	H	A	H	A
05_1726-4P	CUP 4-55506	VDS763-7-3-4P	-55506	347		H	Aster	MK_23M59 (0cM)no seg all S	B	R	A	H	H	A	H	A
05_1726-5P	CUP 4-55507	VDS763-7-3-5P	-55507	348		R	Aster	MK_23M59 (0cM)no seg all S	B	R	A	A	<b>B</b>	A	B	A

## Genetic distancing

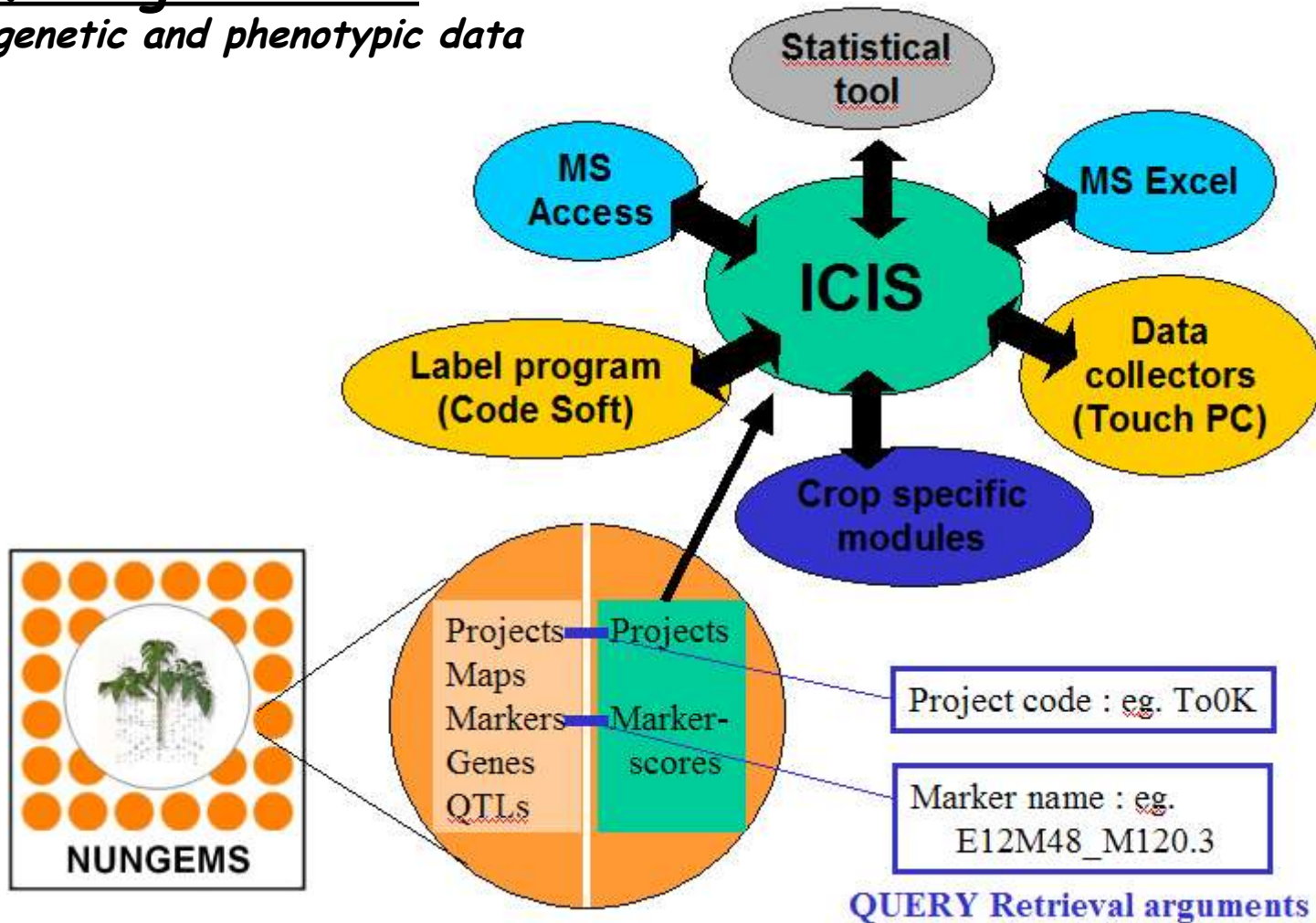
ENTRYCODE	UNIQUE_ID	DESIGNATION	GID	ENTRY_ID	AFLP1	AFLP2	AFLP3	AFLP4	AFLP5	AFLP6	AFLP7	AFLP8	AFLP9	AFLP10
05_1793-2P	CUP 4-56093	VDG477-4-10-2-	-56093	934	A	C	A	<b>C</b>	A	A	A	A	C	A
05_1793-3P	CUP 4-56094	VDG477-4-10-2-	-56094	935	A	C	A	<b>C</b>	A	C	A	A	C	A
05_1797-2P	CUP 4-56099	VDS742-44-1-2F	-56099	940	A	C	A	<b>C</b>	A	C	A	A	C	C
05_1797-3P	CUP 4-56100	VDS742-44-1-3F	-56100	941	C	A	<b>C</b>	A	A	A	A	A	C	C
05_1799-3P	CUP 4-56106	VDG487-23-14-2	-56106	947	C	A	C	C	A	C	A	A	C	C
05_1800-1P	CUP 4-56107	VG718-3-1-1P	-56107	948	C	A	C	C	A	C	A	A	C	C
05_1805-3P	CUP 4-56118	VS724-6-2-3P	-56118	959	C	A	A	<b>C</b>	A	C	A	A	C	A

Load (raw) marker scores into ICIS.  
 Project name (eg. CuOA) and marker name  
 (eg. E12M48\_M124.6) are keys.



# Interfacing to ICIS

Linking genetic and phenotypic data

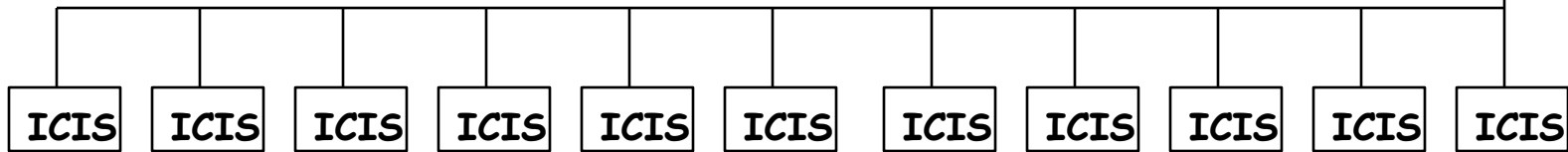
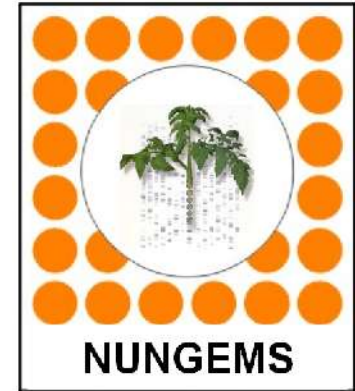


nunhems®



NunGems is ONE database over ALL crops

ICIS has for each crop-implementation a different set of database



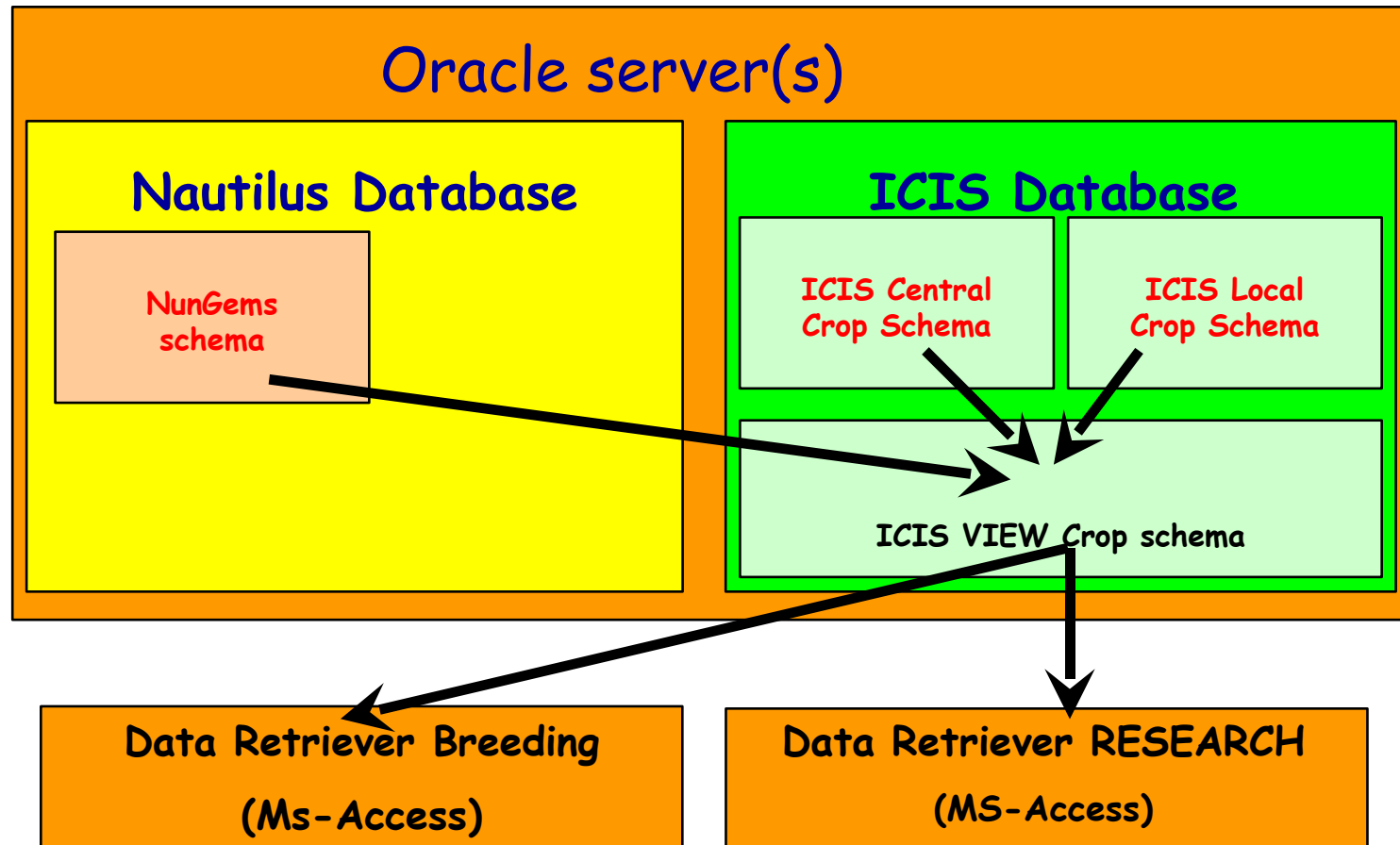
# Link ICIS - NunGems



- Both ICIS and NunGems databases are on (same) Oracle server
- Link is Read-Only from ICIS into NunGems
  - Link via
    - ProjectCode (eg PU1X)
    - Unique Marker name (eg E23M59\_M297.1)
    - (Unique Germplasm Identifier (eg CUL 5-99584))
- Goal is "reports" for:
  - Breeders  
(Marker data next to their "breeders" data)
  - Research scientists  
(Pedigree data next to their "marker" data)



# Link ICIS - NunGems



# Nunhems ICIS-Crop Retriever

## linked Oracle views to ICIS and NunGems



Desktop ANLNUN0016 - Citrix ICA Client

Microsoft Access

CULNUN1V1-BR\_WORKSHOP : Database

Objects

- Tables
- Queries
- Forms
- Reports
- Pages
- Macros
- Modules
- Groups
- Favorites

BRV\_NAMES\_CRS\_NM

BRV\_NAMES\_DER\_NM

BRV\_NAMES\_EXT\_LT

BRV\_NAMES\_FRZ\_NR

BRV\_NAMES\_NUN\_NR

BRV\_NAMES\_PRI\_NR

BRV\_NAMES\_RB\_BRE

BRV\_NAMES\_RB\_OBR

BRV\_NAMES\_RES\_NR

BRV\_NAMES\_UN\_CRS

BRV\_VARIATES

BRV\_CROP\_INFO\_GENERAL

**BRV\_NG\_ALL\_01**

BR\_TF90101A\_GID

BR\_TF90101B\_DESIGNATION

BR\_TF90101C\_ECD

BR\_TF90199\_FINAL

BR\_TF90299\_FINAL

BR\_TF90399\_FINAL

BR\_TF90499\_FINAL

BR\_VL00101

LBL\_L002

LBL\_L004

LBL\_L005

LBL\_L008

LBL\_L009

LBL\_L013

LBL\_L017

LBL\_L018

LBL\_L020

BRV\_NG\_ALL\_01 : Table

PROJECT	MAP	MARKER	MAS_NAME	LINKAGEGROUP	CM	POLYMORF_DET
Pu0V	Pu0V_map1	E26M54_M411.7		Pu0V_all_1a	0	AFLP
Pu0V	Pu0V_map1	E11M59_M382.1		Pu0V_all_1a	4,5	AFLP
Pu0V	Pu0V_map1	E26M58_M250.1		Pu0V_all_1a	5,3	AFLP
Pu0V	Pu0V_map1	E26M58_M251.5		Pu0V_all_1a	5,3	AFLP
Pu0V	Pu0V_map1	E14M54_M366.0		Pu0V_all_1a	6,3	AFLP
Pu0V	Pu0V_map1	E14M54_M364.3		Pu0V_all_1a	6,3	AFLP
Pu0V	Pu0V_map1	E23M59_M219.4		Pu0V_all_1a	9	AFLP
Pu0V	Pu0V_map1	E23M59_M170.9		Pu0V_all_1a	10,2	AFLP
Pu0V	Pu0V_map1	E11M54_M348.4		Pu0V_all_1a	10,9	AFLP
Pu0V	Pu0V_map1	E11M60_M233.5		Pu0V_all_1a	12,2	AFLP
Pu0V	Pu0V_map1	E14M90_M179.9		Pu0V_all_1a	15,2	AFLP
Pu0V	Pu0V_map1	E12M86_M270.4		Pu0V_all_1a	16,8	AFLP
Pu0V	Pu0V_map1	E23M50_M52.0		Pu0V_all_1a	20,8	AFLP
Pu0V	Pu0V_map1	E14M52_M119.2		Pu0V_all_1a	23,9	AFLP

# Nunhems ICIS-Crop Retriever

## Example of query



Desktop ANLNUNS0016 - Citrix ICA Client

Microsoft Access - [-Example\_Link\_ICIS\_NunGEMS : Select Query]

File Edit View Insert Query Tools Window Help

BRV\_NG\_ALL\_01

- \* PROJECT
- MAP
- MARKER
- MAS\_NAME
- LINKAGEGROUP
- CM
- POLYMORF\_DETECTOR

BRV\_STUDY\_NAMES

- \* STUDY\_NAME
- STUDY\_TITLE
- PROJECT
- STUDY\_DATE\_START
- STUDY\_DATE\_END
- STUDY\_ID

BRV\_VARIATES

- \* TYPE
- ABBR
- DESCRIPTION
- PROPERTY
- SCALE
- METHOD
- DATA\_TYPE
- STUDY\_NAME
- STUDY\_ID
- PROPERTY\_ID
- SCALE\_ID
- METHOD\_ID
- VARIATE\_ID

USYS\_TL\_DATA\_C

- \* OUNITID
- VARIATID
- DVALUE

USYS\_TL\_OINDEX

- \* OUNITID
- FACTORID
- LEVELNO
- REPRESNO

Field:	PROJECT	MAP	MARKER	MAS_NAME	LINKAGEGROUP	CM	DVALUE	OUNITID
Table:	BRV_NG_ALL_01	BRV_NG_ALL_01	BRV_NG_ALL_01	BRV_NG_ALL_01	BRV_NG_ALL_01	BRV_NG_ALL_01	USYS_TL_DATA_C	USYS_TL_OINDEX
Sort:								
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:								
or:								



# Thanks