

GRIN-Global Project

the global plant genebank
information management system



“So what is GRIN-Global?”

GRIN-Global (GG) is a software suite that enables genebanks to store and manage information associated with plant genetic resources (or germplasm) and deliver that information globally.

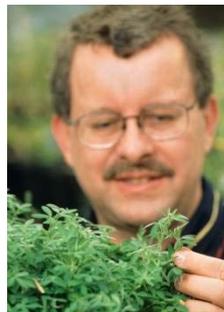
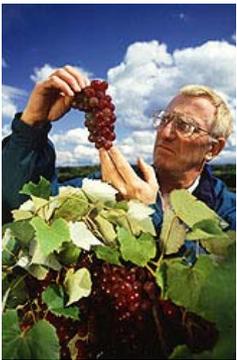


Genebanks, Biodiversity, and Plant Genetic Resources

“Complementary conservation strategies couple the protection of wild plant populations and traditional crop varieties where they have evolved, with the collection and preservation of genetic diversity in gene banks.”

-- Stephanie L. Greene, Thomas Hart

http://www.ncgia.ucsb.edu/conf/SANTA_FE_CD-ROM/sf_papers/greene_stephanie/sgreene.html



Why You Should Care

... a decline in global biodiversity threatens plant genetic diversity, the raw materials we rely on for food, fiber, fuel, medicine and industrial products...

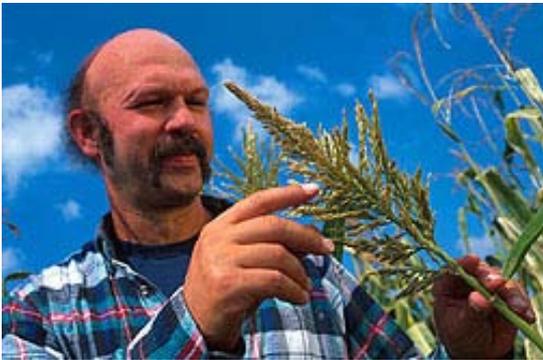


Seed banks are important infrastructures for preserving what diversity we still have left. Through massive monocultures rather than diverse farms, we're putting our livelihood at risk by not giving space to what various plant species we have left.

"If crops don't adapt to climate change, neither will we," says Cary Fowler, an expert in biodiversity. Key to ensuring that crops will be able to adapt is maintaining crop diversity. We're at risk of losing the very diversity of plant variety that will keep us alive in a warming environment. See Dr. Fowler's [TED talk](#) about the issue.

...Why You Should Care

Researchers, breeders, and farmers can obtain descriptions of plant traits and other information that enables them to identify and place orders for plant germplasm specifically suited for their needs.



...Why You Should Care

Those germplasm information users, as well as genebank staff responsible for conserving germplasm, require powerful information management systems with flexible search and reporting capabilities.



The Need for GRIN-Global

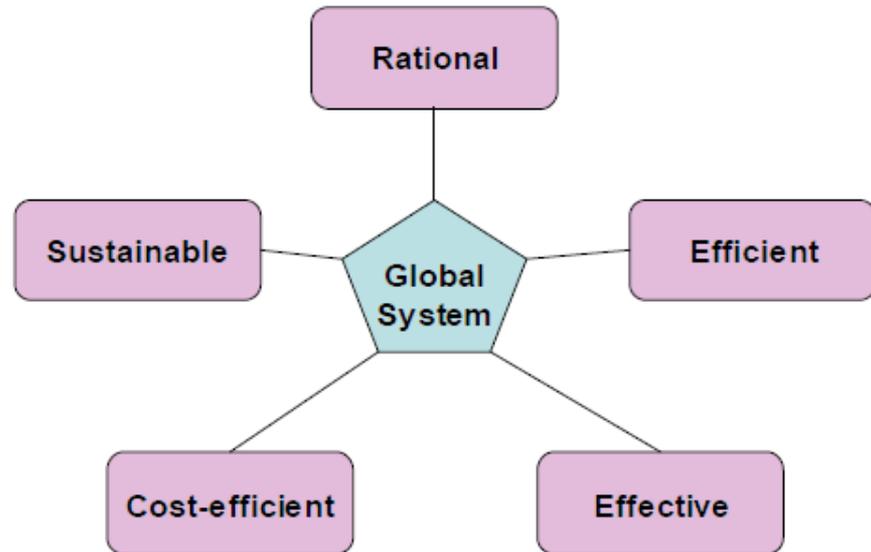


Many national genebanks lack effective technology for documenting and managing collection information digitally.

Global Crop Diversity Trust



The Global Crop Diversity Trust recognized this common need of the world's genebanks-- consequently the Trust initiated the GRIN-Global project



Based on a slide by Cary Fowler

GRIN -- a Superior Genebank Information Management System

The Germplasm Resources Information Network (GRIN), developed by the USDA's Agricultural Research Service National Plant Germplasm System, is recognized internationally as a superior genebank information management system



GRIN--1986-present:
25 years of continuous
development and
enhancements



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Plant Gene Resources of Canada uses a version of GRIN that has handled more than 40,000,000 requests for information over a nine year period since May, 2001

[Canadian Plant Germplasm System](#)

GRIN-Global Partners

In 2008, the Global Crop Diversity Trust awarded a grant to USDA/ARS and Bioversity International to enhance and expand GRIN to address global germplasm information management needs



Trust



Bioversity



ARS

USDA/ARS Role

- Upgrade and expand the current GRIN system's design and user interface to develop GRIN-Global, a global plant genebank information management system
- Provide an enhanced GRIN database schema
- Construct a core set of technologies for updating data stored on a centralized information management system and for distributing centralized data to existing, off-site systems



Bioversity International's Role

- Support deployment of GRIN-Global internationally, through regional PGR networks and its Regional Offices.
- Translate the new system into Arabic, French, Russian and Spanish, and implement it in developing countries.
- Implement and monitor barriers to adoption.

Český	English	Español	Français	Português	Русский	أبي بوعلم
ID genetického zdr...	Accession ID	ID Entrada	ID de l'accession	ID do acesso	ID образца	م امضن ال ا فرعم
Předpona čísla ge...	Accession Prefix	Prejijo entrada	Numéro de l'acce...	Prefixo do acesso	Префикс образца	م امضن ال ا ددع part1
Číslo genetického ...	Accession Num...	Número de entrada	Numéro de l'acce...	Número do acesso	Номер образца	م امضن ال ا ددع part2
Přípona čísla gen...	Accession Suffix	Sufijo entrada	Numéro de l'acce...	Sufixo do acesso	Постфикс обра...	م امضن ال ا ددع part3
Taxon	Taxon	ID especies taxo...	Taxon	Taxon	Таксон	ع اون أ ال ا في نصت ف
Název genetickéh...	Accession Name	Nombre Entrada	Nom de l'accession	Nome do acesso	Наименование ...	م امضن ال ا م سا
Původ	Origin	Origen	ID de l'origine gé...	Origine	Происхождение	اي فارغ ج ل ا فرعم

Hence GRIN-Global

Genebanks can tailor a powerful information management system to meet their specific requirements because GRIN-Global has been developed with free or open source software and its source code is available.



GRIN-Global manages many different types of data...

- Passport and Provenance
(Accession ID, Taxonomy, Accession name, Origin, Material Type, Maintained By, Availability, Intellectual Property, Material Transfer Agreement Status)
- Phenotypic and Genetic Marker Observations
- Images of germplasm
- Germplasm inventory (e.g. number of seeds in storage)
- Requests for germplasm and order fulfillment
- and much more...

GRIN-Global & Interoperability

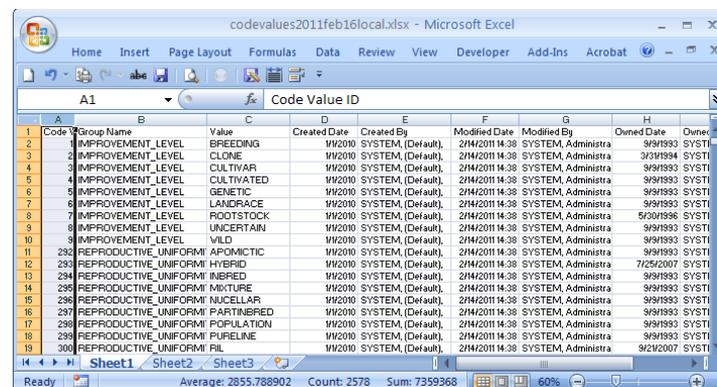
GRIN-Global will interoperate with databases that provide specialized genomic, ecogeographic, and many other types of information needed for multidisciplinary research objectives.

GRIN-Global Design

New applications written with the .NET framework and browser-based components comprise a system flexible enough to handle the needs of both small and large organizations.

...Design...Web Services

- The GRIN-Global Application Program Interface (API) provides web services-software modules accessible over the internet via standard messaging protocols.
- The web services allow the data to be retrieved in various formats - XML, CSV, TXT - making it platform independent. Any application that can make HTTP requests can use the GRIN-Global API.

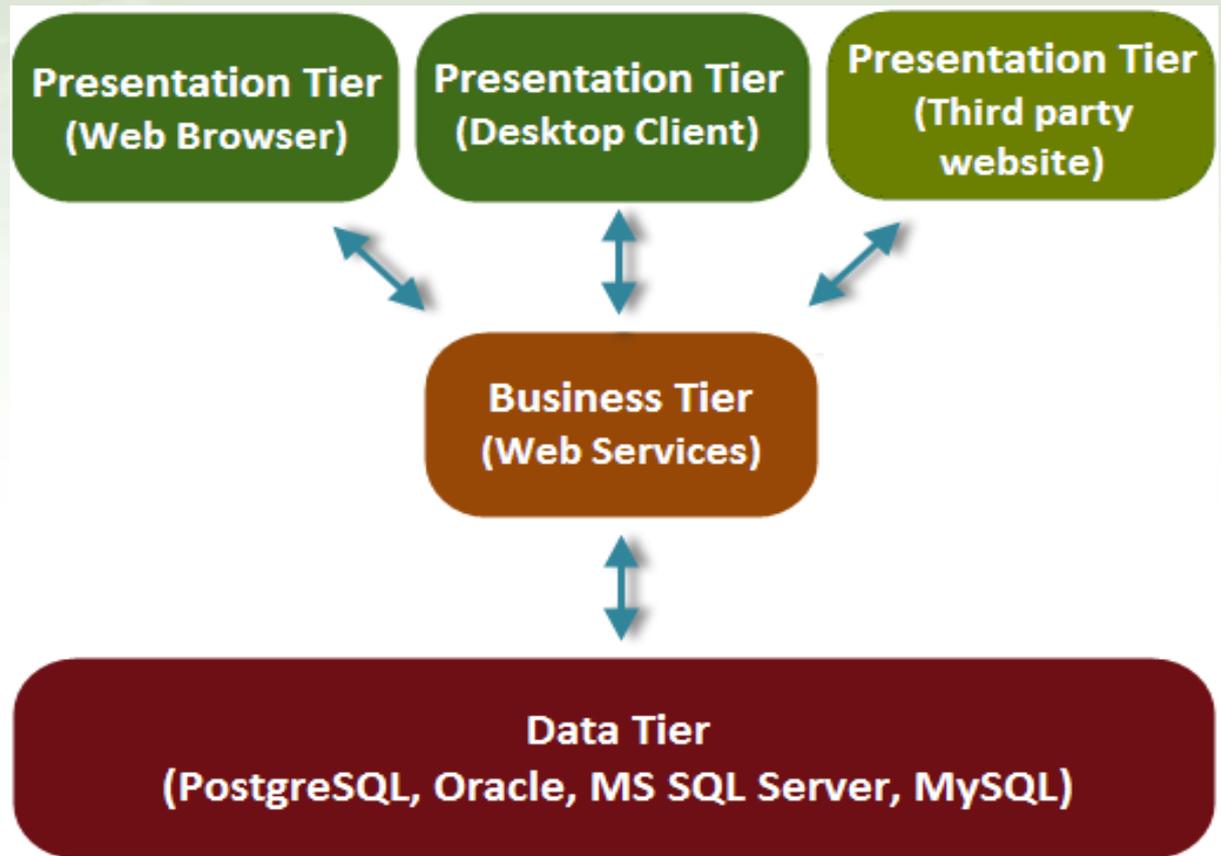


The screenshot shows a Microsoft Excel spreadsheet with the following data:

Code	Group Name	Value	Created Date	Created By	Modified Date	Modified By	Owned Date	Owned By
1	IMPROVEMENT_LEVEL	BREEDING	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
2	IMPROVEMENT_LEVEL	CLONE	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
3	IMPROVEMENT_LEVEL	CULTIVAR	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
4	IMPROVEMENT_LEVEL	CULTIVATED	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
5	IMPROVEMENT_LEVEL	GENETIC	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
6	IMPROVEMENT_LEVEL	LANDRACE	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
7	IMPROVEMENT_LEVEL	ROOTSTOCK	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	5/30/1996	SYSTEM
8	IMPROVEMENT_LEVEL	UNCERTAIN	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
9	IMPROVEMENT_LEVEL	WILD	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
11	REPRODUCTIVE_UNIFORM	APOMICTIC	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
12	REPRODUCTIVE_UNIFORM	HYBRID	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	7/25/2007	SYSTEM
13	REPRODUCTIVE_UNIFORM	INBRED	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
14	REPRODUCTIVE_UNIFORM	MIXTURE	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
15	REPRODUCTIVE_UNIFORM	NUCELLAR	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
16	REPRODUCTIVE_UNIFORM	PARTIBRED	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
17	REPRODUCTIVE_UNIFORM	POPULATION	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
18	REPRODUCTIVE_UNIFORM	PURELINE	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/9/1993	SYSTEM
19	REPRODUCTIVE_UNIFORM	FIL	1/1/2010	SYSTEM, (Default)	2/14/2011 14:38	SYSTEM, Administra	9/2/2007	SYSTEM

...Design...3 Tiers

The system architecture uses three tiers - database, business, and presentation - that can be developed and modified independently.



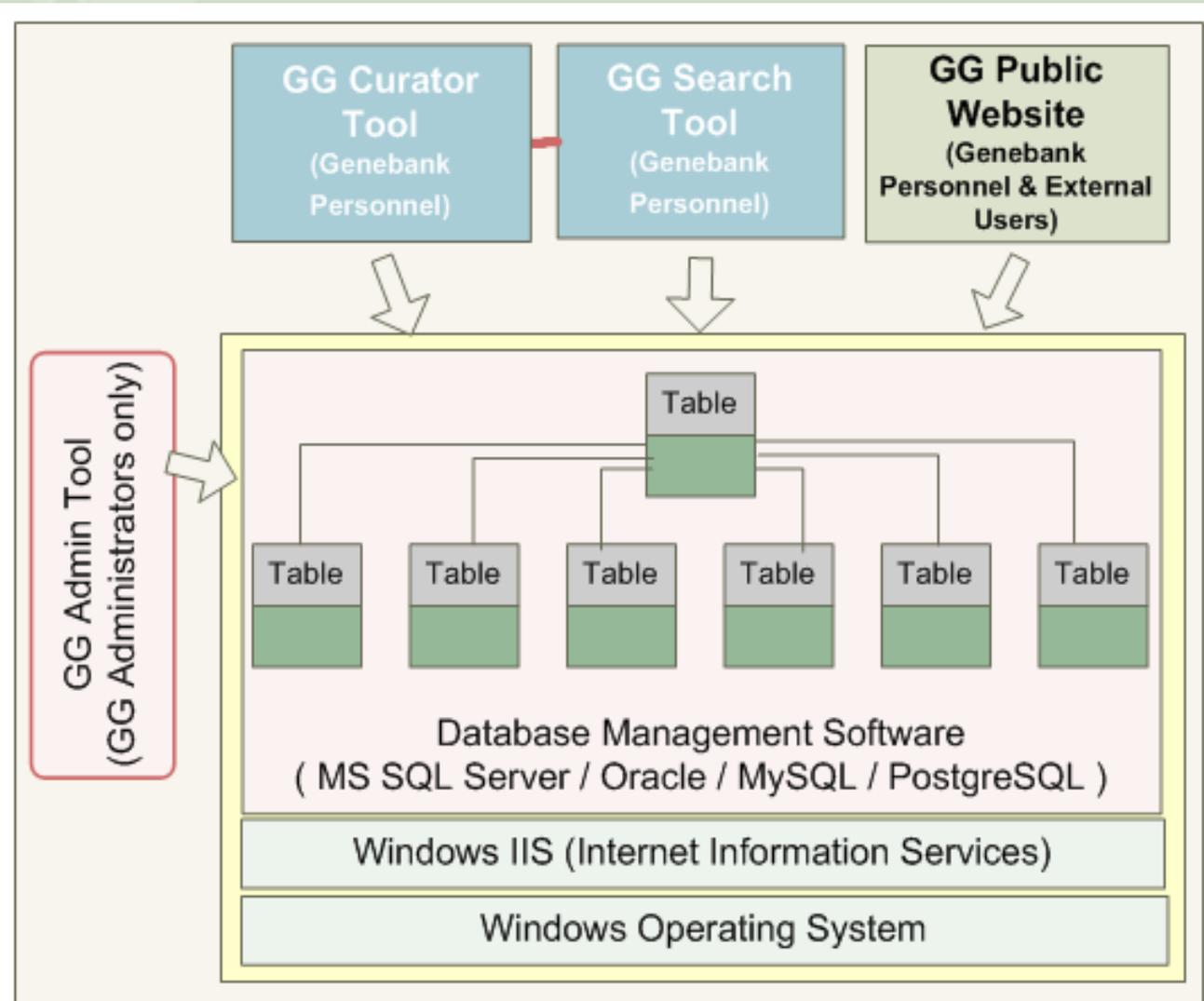
...Design...Open Source

- Supports free or open source database management systems:

MySQL, Oracle Express, MS SQL Express, or PostgreSQL

- By providing all source code for system components, GRIN-Global enables genebanks to tailor the application to meet their specific requirements

GRIN- Global Environment



GRIN-Global Environment

- The GRIN-Global (GG) program suite runs in a Windows environment. Besides the basic Operating System, GG also requires the Windows IIS.
- One of the four supported database engines (SQL Server, Oracle, MySQL, or PostgreSQL) is required. The database software houses the many GRIN-Global data tables. GG is a relational database system -- these tables are related by key fields. The major related “families” of tables include Accessions, Inventory, Taxonomy, and Orders.
- Users access the data via the GRIN-Global applications: the Curator Tool (CT), the Search Tool, and the Public Website. The CT and the Search Tool are closely integrated - the CT has a Search button which invokes the Search Tool; however, the Search Tool can run as a stand-alone application and will be listed as a GG option on the Windows Start menu.

Alternative GRIN-Global Configurations

Alternative 1: Stand-alone PC

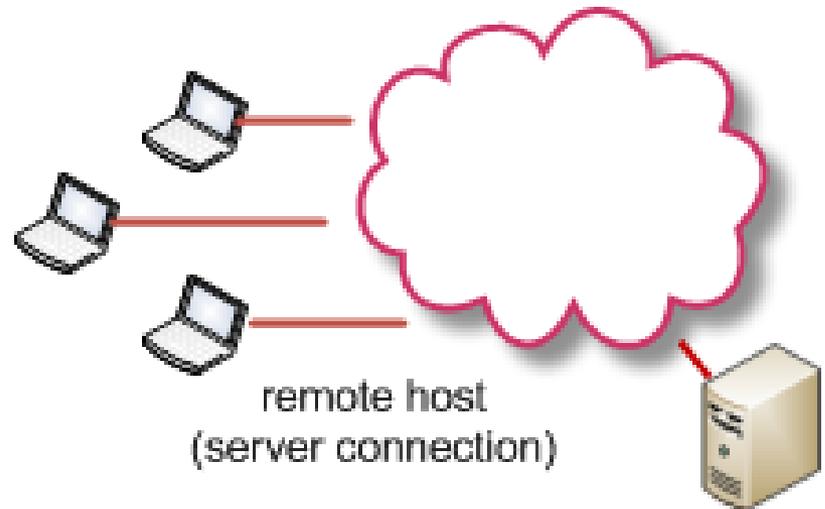
The entire GG suite of apps installed on one PC



localhost

Alternative 2: PC networked to a server

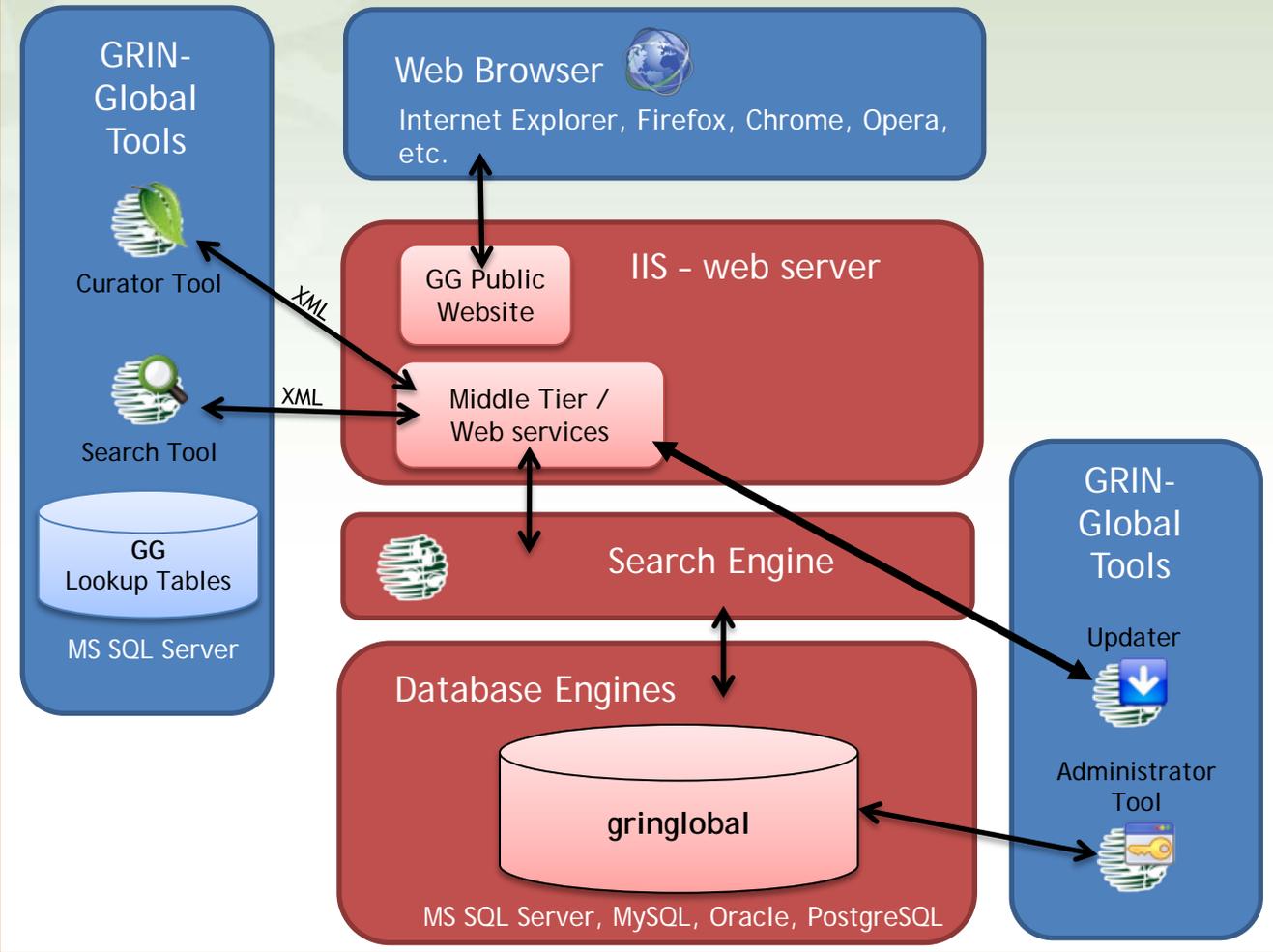
Client apps installed on each PC; server apps on the remote server



More details on the next two slides

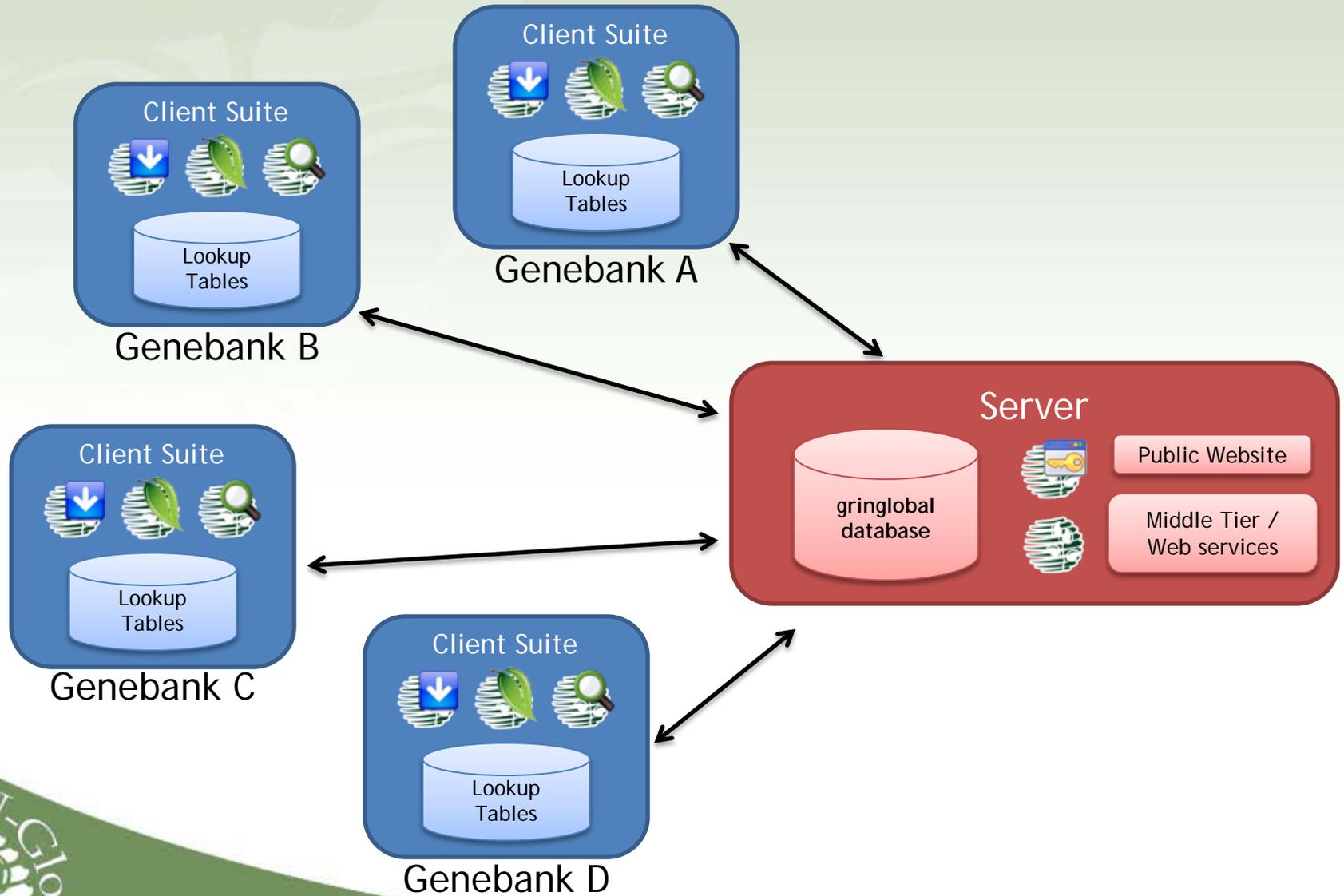
GG System Architecture Overview – Single PC

Self-contained in a Personal Computer



GRIN-Global System Architecture Overview

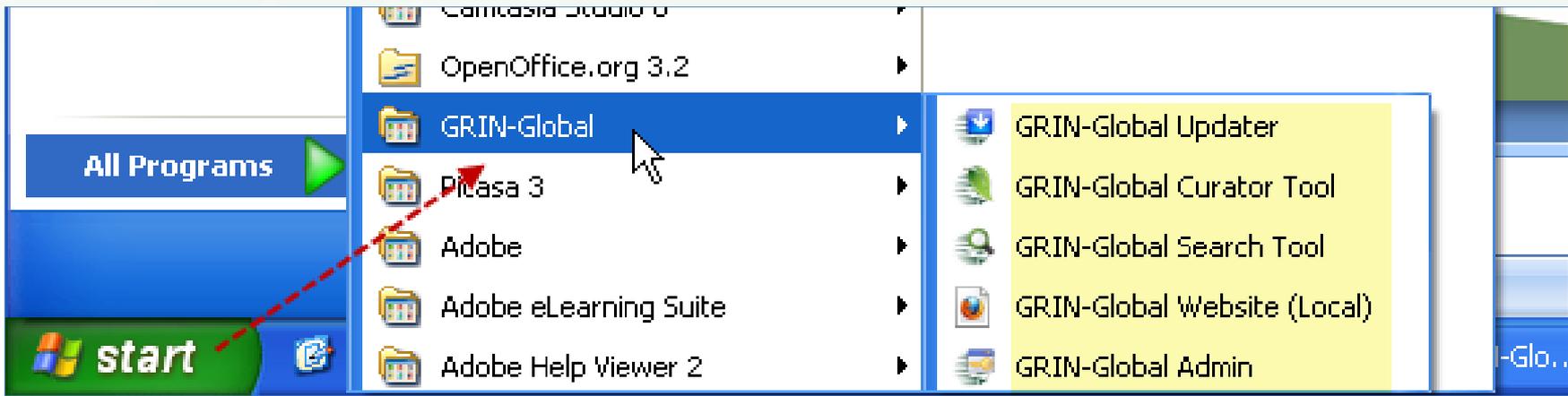
- Networked to a Server





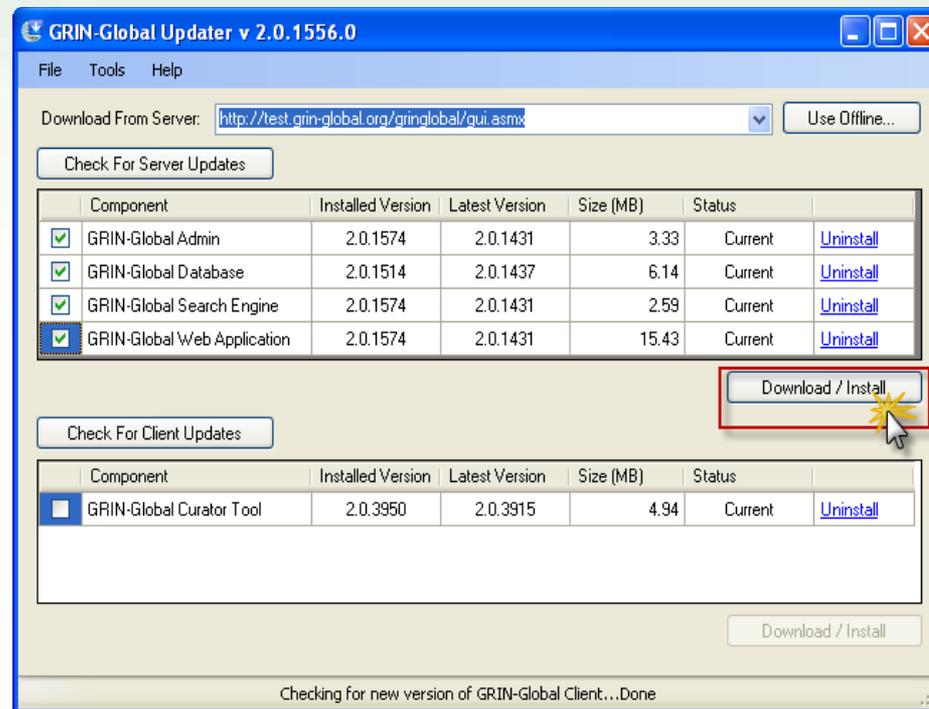
GRIN-Global Suite of Software Components

After GRIN-Global is installed, its components are accessible from the Windows Start button.



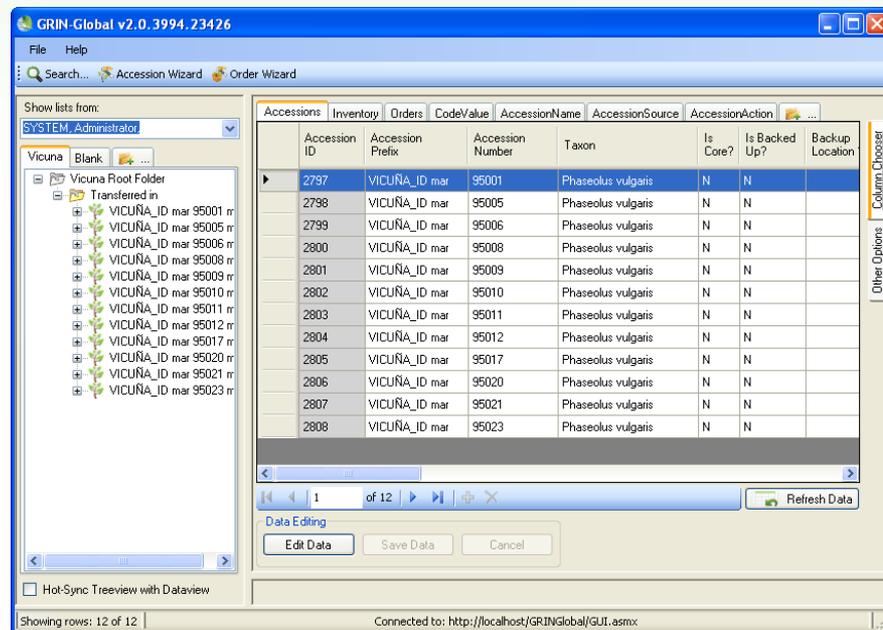
Updater

The GRIN-Global program updater operates on all of the locally installed GRIN-Global applications.



Curator Tool

The Curator Tool is a GRIN-Global application designed primarily for curators and genebank workers who will create and manage their genebank's data

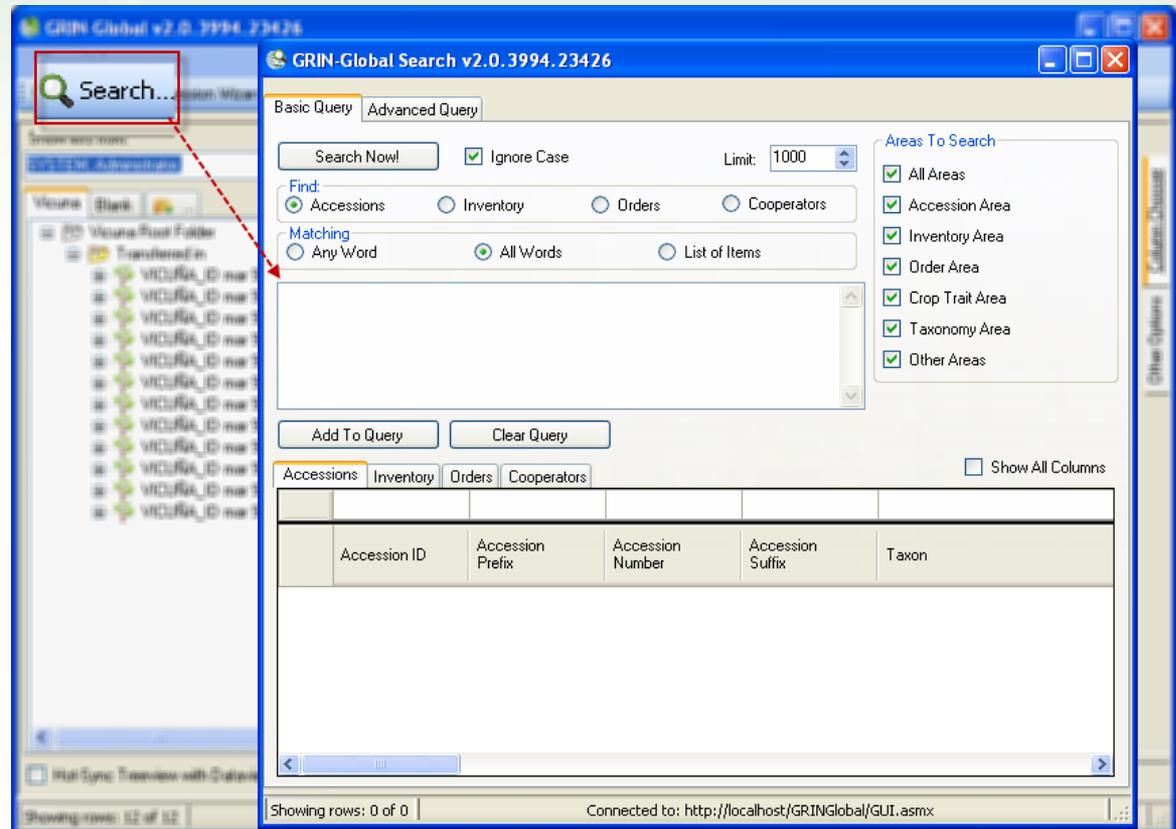


The screenshot displays the GRIN-Global v2.0.3994.23426 application window. The interface includes a menu bar (File, Help), a search bar, and navigation buttons for 'Accession Wizard' and 'Order Wizard'. A left sidebar shows a tree view of 'Vicuna Root Folder' with sub-items for 'Transferred in' and a list of 'VICUÑA_ID' entries. The main area features a table with columns: Accession ID, Accession Prefix, Accession Number, Taxon, Is Core?, Is Backed Up?, and Backup Location. The table lists 12 rows of data for 'Phaseolus vulgaris'. Below the table is a 'Data Editing' section with 'Edit Data', 'Save Data', and 'Cancel' buttons. The status bar at the bottom indicates 'Showing rows: 12 of 12' and 'Connected to: http://localhost/GRINGlobal/GUI.aspx'.

Accession ID	Accession Prefix	Accession Number	Taxon	Is Core?	Is Backed Up?	Backup Location
2797	VICUÑA_ID mar	95001	Phaseolus vulgaris	N	N	
2798	VICUÑA_ID mar	95005	Phaseolus vulgaris	N	N	
2799	VICUÑA_ID mar	95006	Phaseolus vulgaris	N	N	
2800	VICUÑA_ID mar	95008	Phaseolus vulgaris	N	N	
2801	VICUÑA_ID mar	95009	Phaseolus vulgaris	N	N	
2802	VICUÑA_ID mar	95010	Phaseolus vulgaris	N	N	
2803	VICUÑA_ID mar	95011	Phaseolus vulgaris	N	N	
2804	VICUÑA_ID mar	95012	Phaseolus vulgaris	N	N	
2805	VICUÑA_ID mar	95017	Phaseolus vulgaris	N	N	
2806	VICUÑA_ID mar	95020	Phaseolus vulgaris	N	N	
2807	VICUÑA_ID mar	95021	Phaseolus vulgaris	N	N	
2808	VICUÑA_ID mar	95023	Phaseolus vulgaris	N	N	

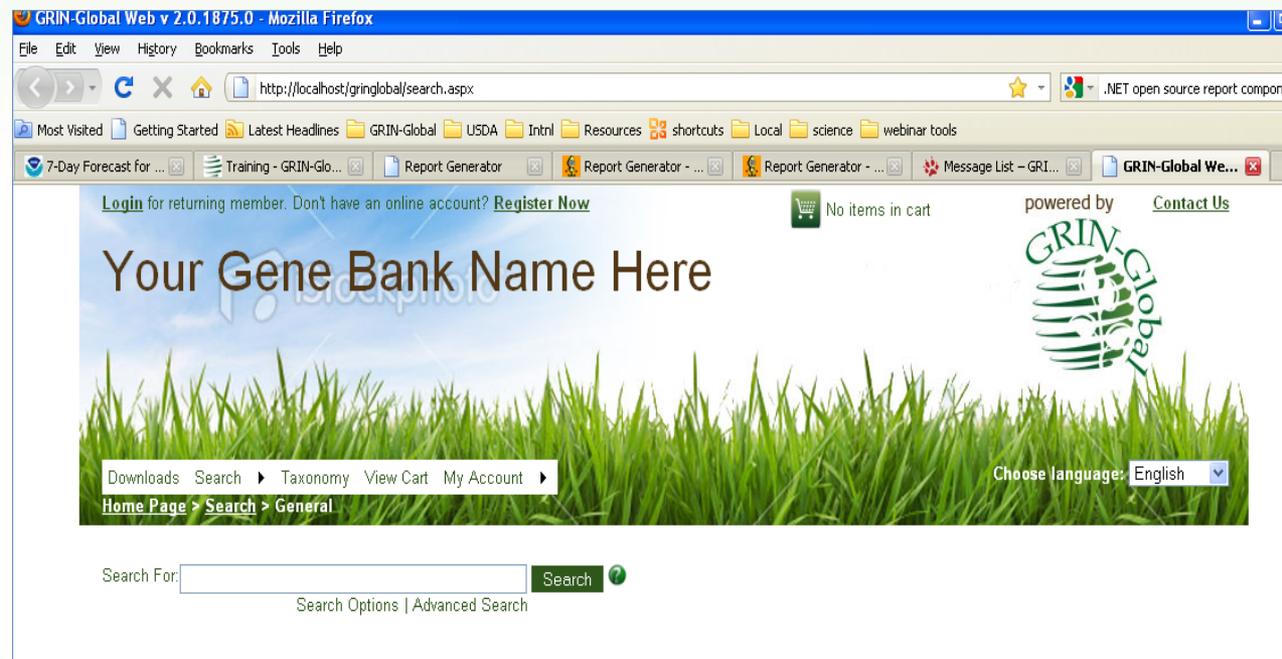
Search Tool

The Search Tool can be launched from the Curator Tool, or launched directly from the Windows Start Programs list



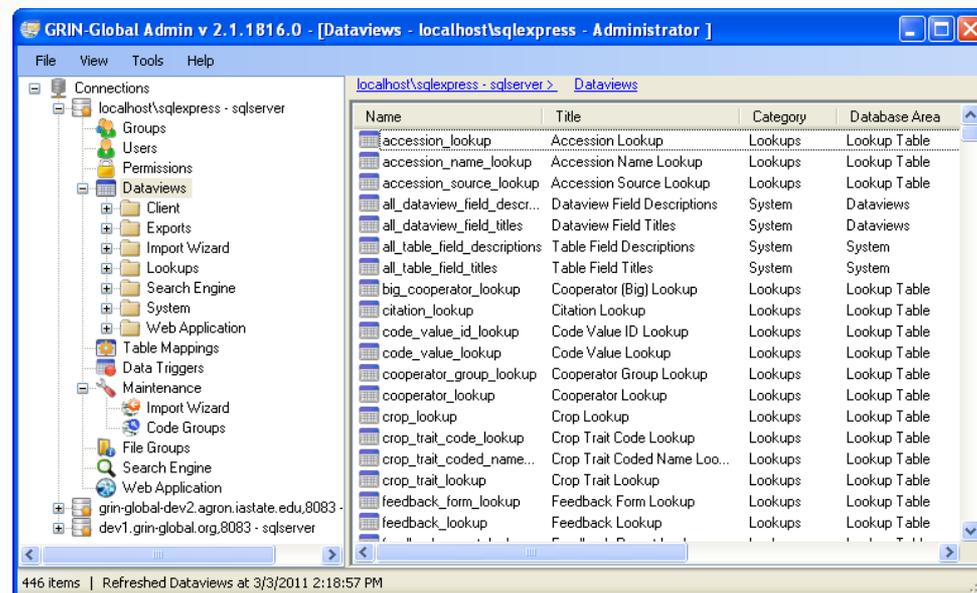
Public Website

Through the Public Website and web services, clientele can access germplasm information; search the entire GRIN-Global database; and order germplasm from the genebank through a “shopping cart facility.”



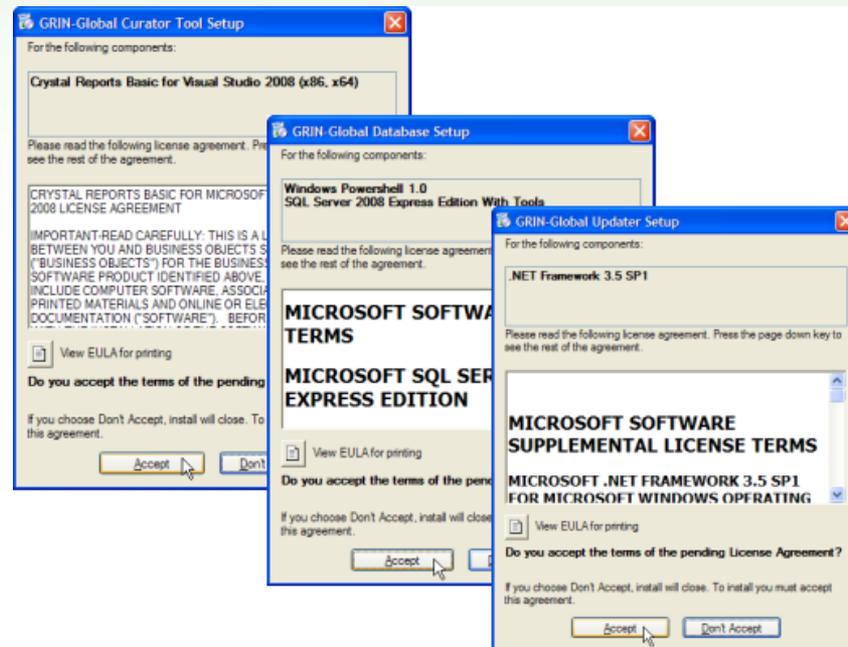
Admin Tool

The Admin Tool for GRIN-Global administrators handles diverse functions including adding or modifying user accounts and their security permissions; importing data; and creating and editing dataviews used by the Curator Tool and the GRIN-Global Public Website.



Installed Components

When GRIN-Global is stored on the user's PC ("localhost"), several programs are installed (if they haven't been already).



For additional information, please visit:

- www.grin-global.org (project background)
- www.grin-global.org/index.php/Training (training and documentation references including videos, exercises, and presentations)

Getting Started with GRIN-Global

- Determine the appropriate configuration (see slide [21](#))
- Install the software (see [Installation Guide](#))
- Import existing organizational data (see the Import Wizard [Cookbook](#))
- Establish user accounts and security settings (see the [Administrator's Guide](#))
- Create or edit data (see the [Curator's Guide](#))

