GRIN-Global Project

the global plant genebank
information management system

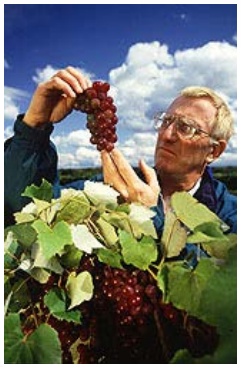
“So what is GRIN-Global?”

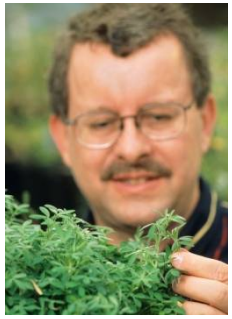
GRIN-Global (GG) is a software suite that enables genebanks to store and manage information associated with plant genetic resources (or germplasm) and deliver that information globally.

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

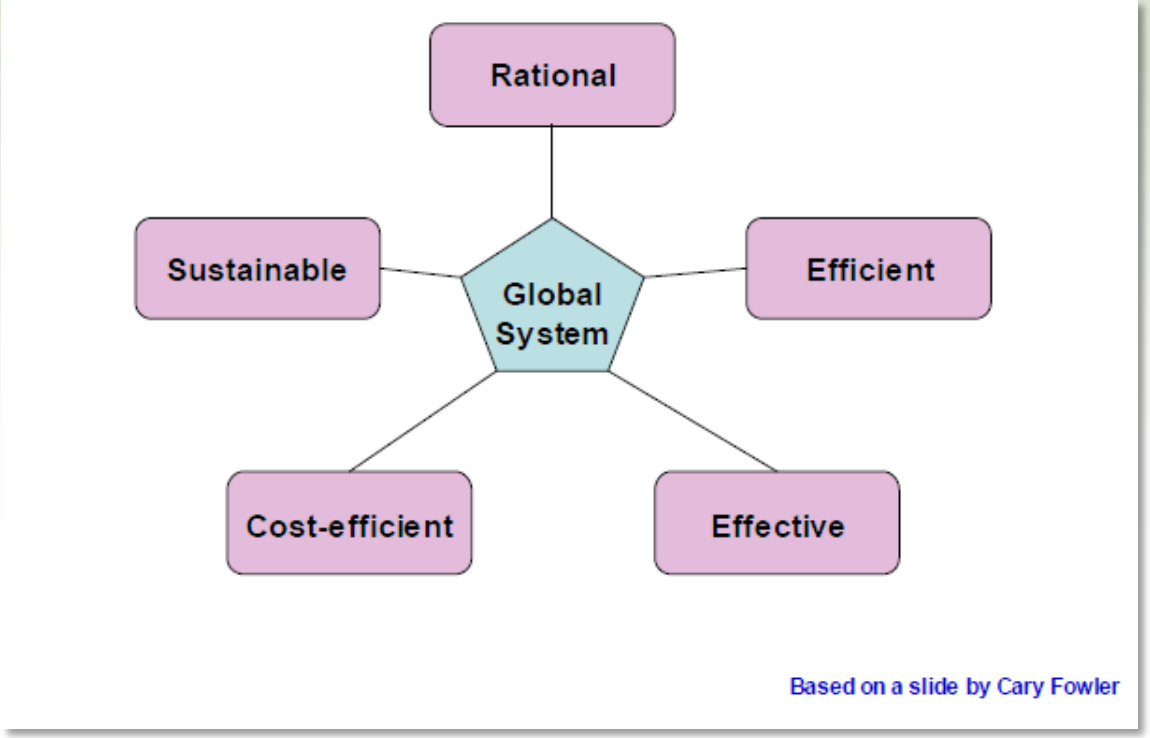
Those germplasm information users, as well as genebank staff responsible for conserving germplasm, require powerful information management systems with flexible search and reporting capabilities.

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



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

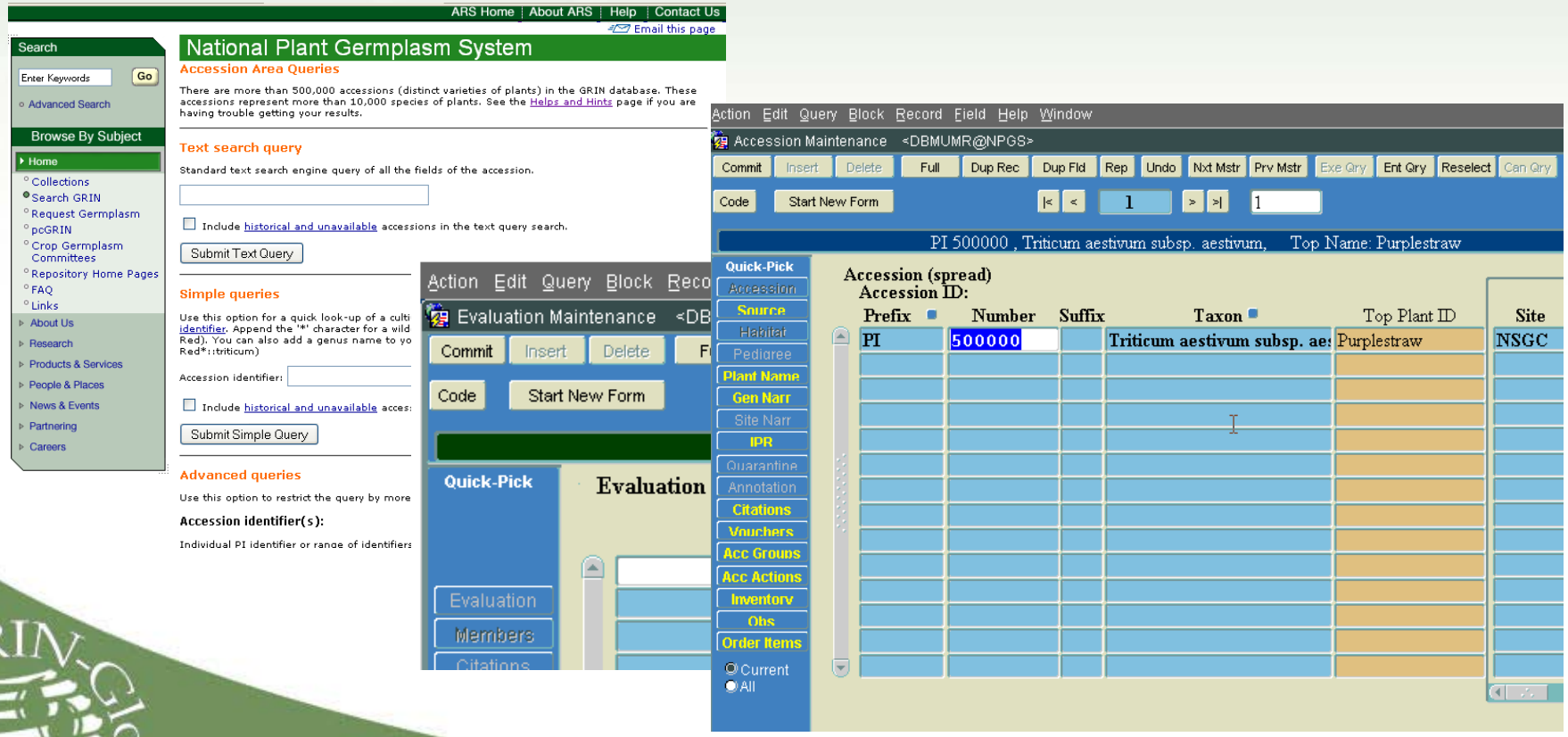
Agriculture and Agri-Food Canada

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

Why don't more international genebanks use GRIN?

Genebanks interested in adopting GRIN were challenged by the program's complexity, and by the cost of software licensing fees.



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

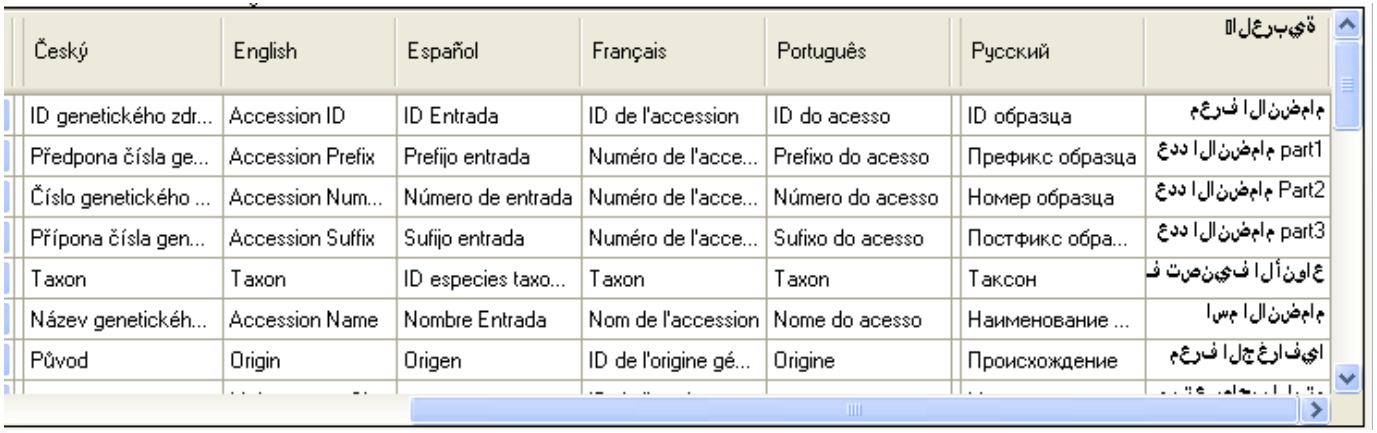
ARS

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.



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Přípona čísla gen...	Accession Suffix	Sufijo entrada	Numéro de l'acce...	Sufixo do acesso	Постфикс обра...	مامضنلا ددع part3
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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.

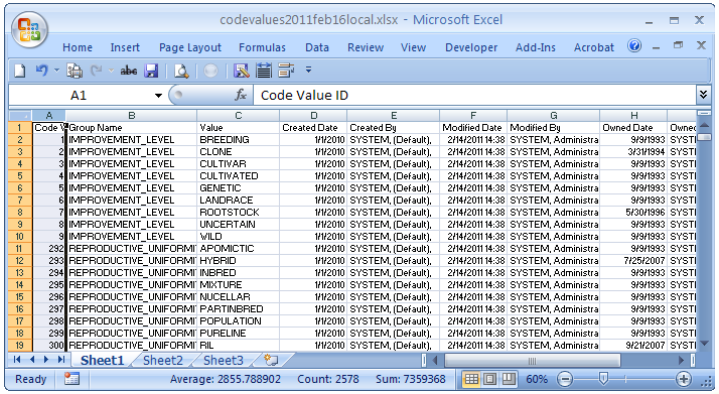
GRIN-Global Design

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

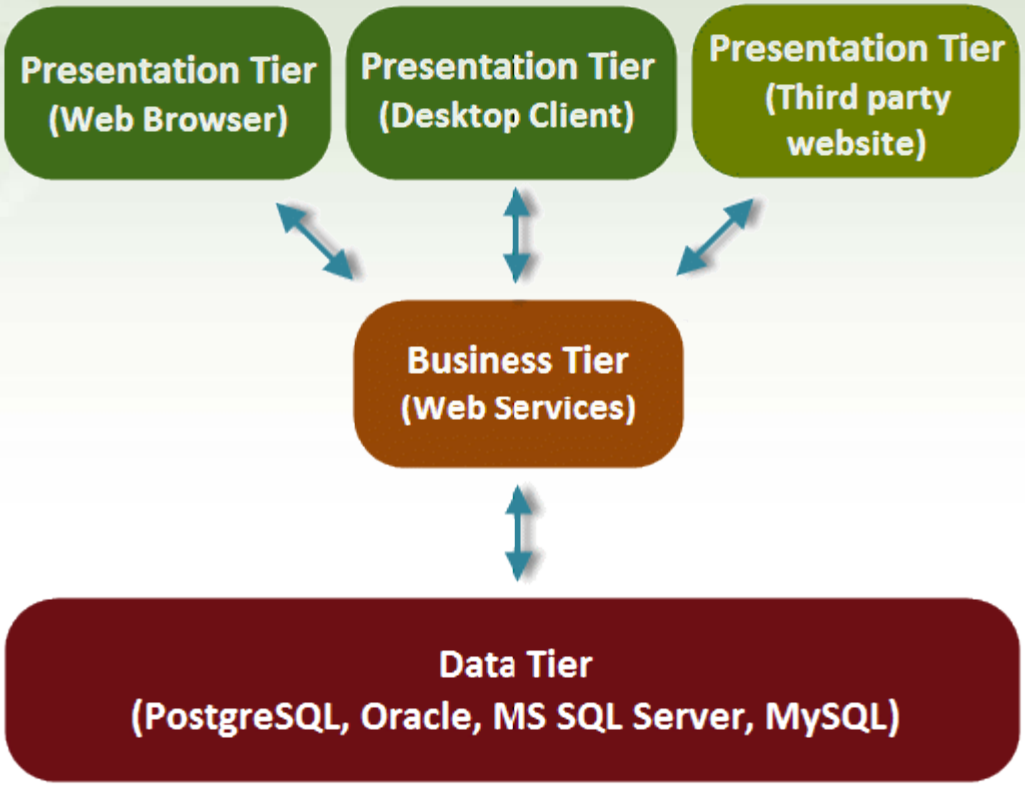
- The GRIN-Global Application Program Interface (API) provides web services–software modules accessible over the internet via standard messaging protocols.

- 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.



…Design…3 Tiers

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



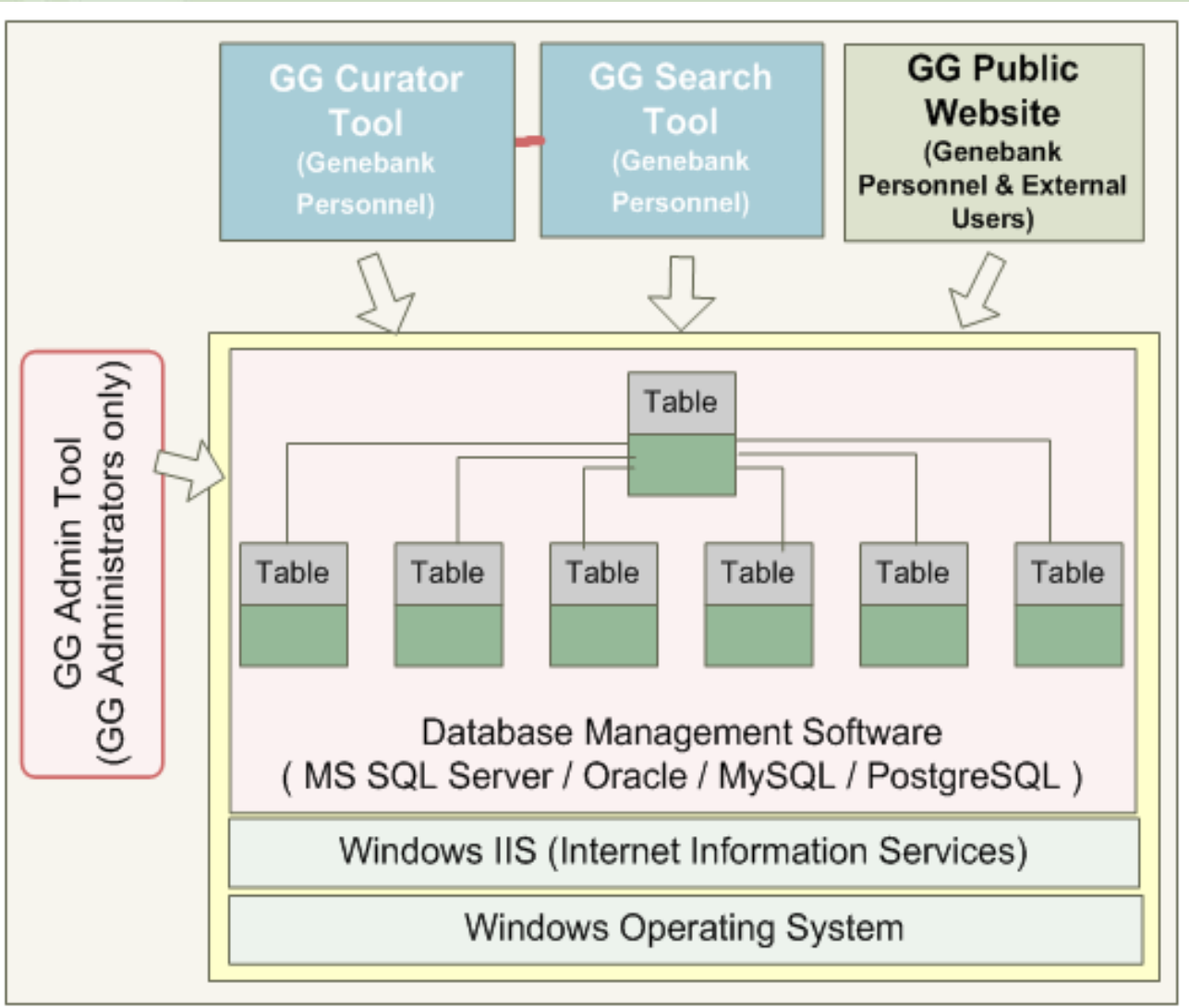
…Design…Open Source

- 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 also run as a stand-alone application.

Alternative GRIN-Global Configurations

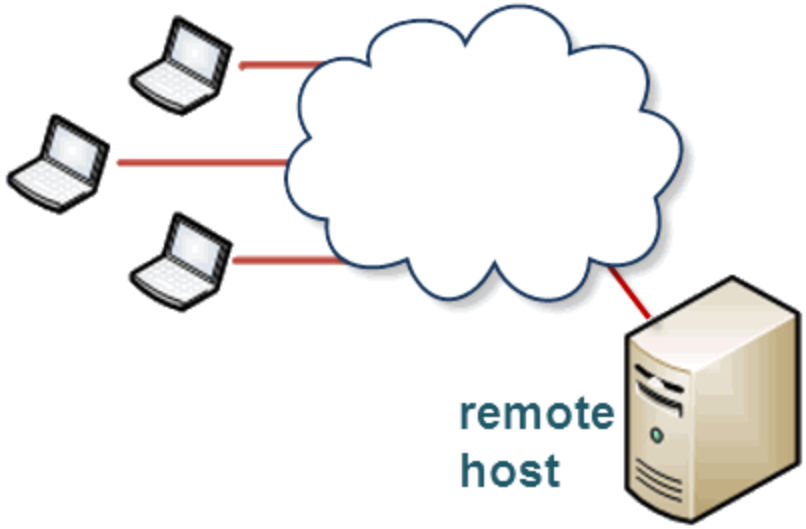
Alternative 1: Standalone PC

The entire GRIN-Global application suite installed on one PC

local host

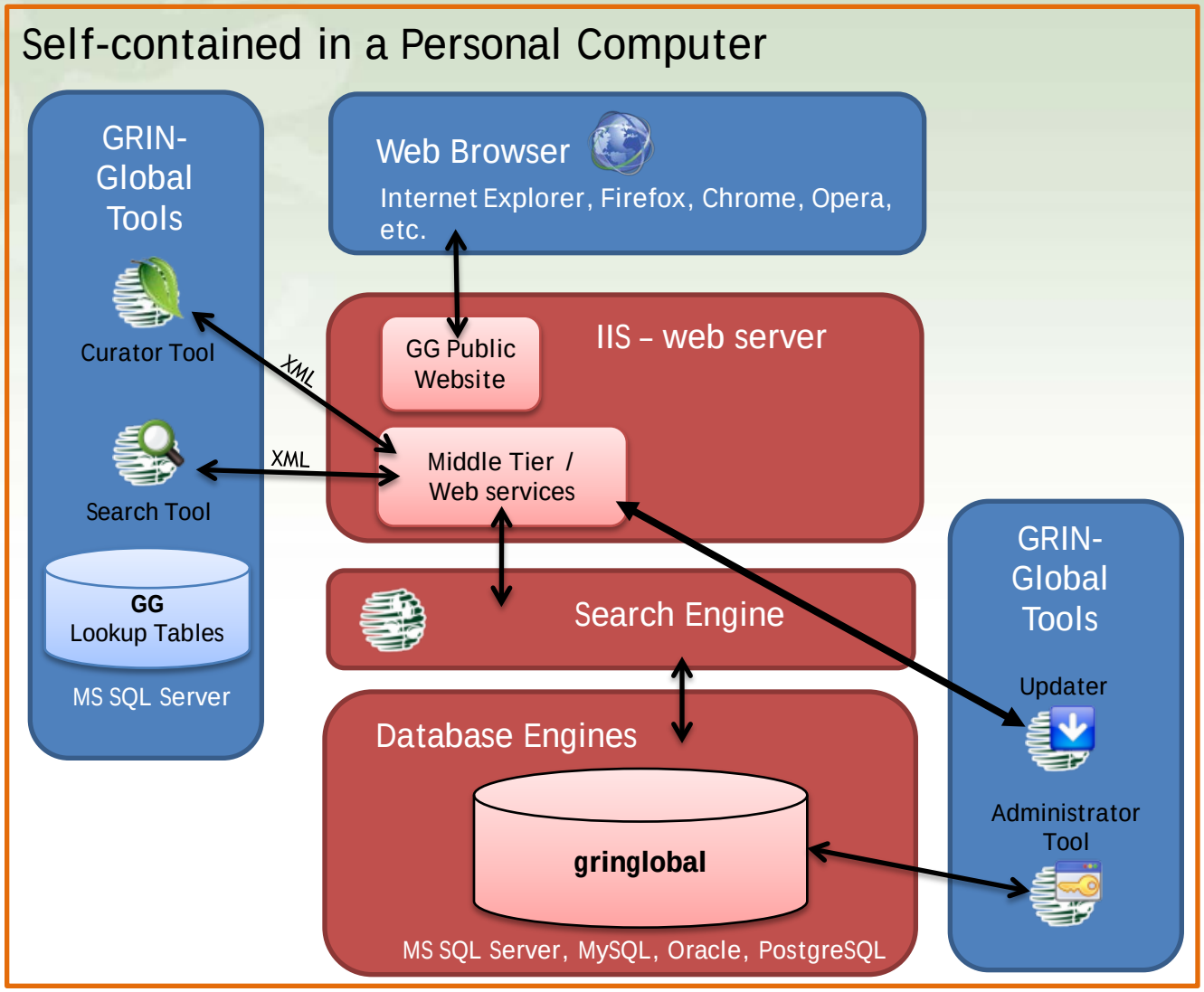
Alternative 2: PC Networked to a Server

Client application installed on each PC; server applications on the remote server

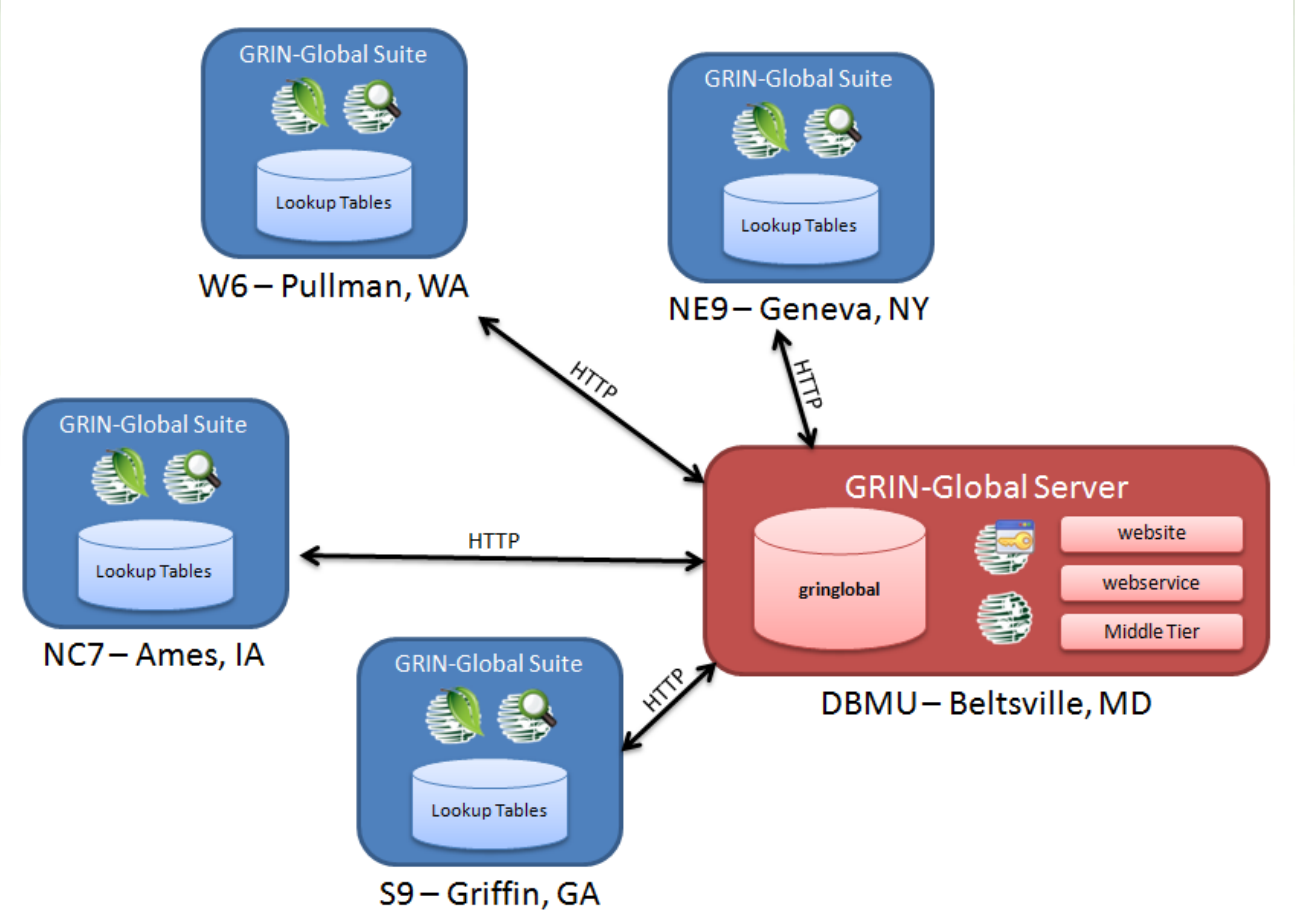


More details on the next two slides

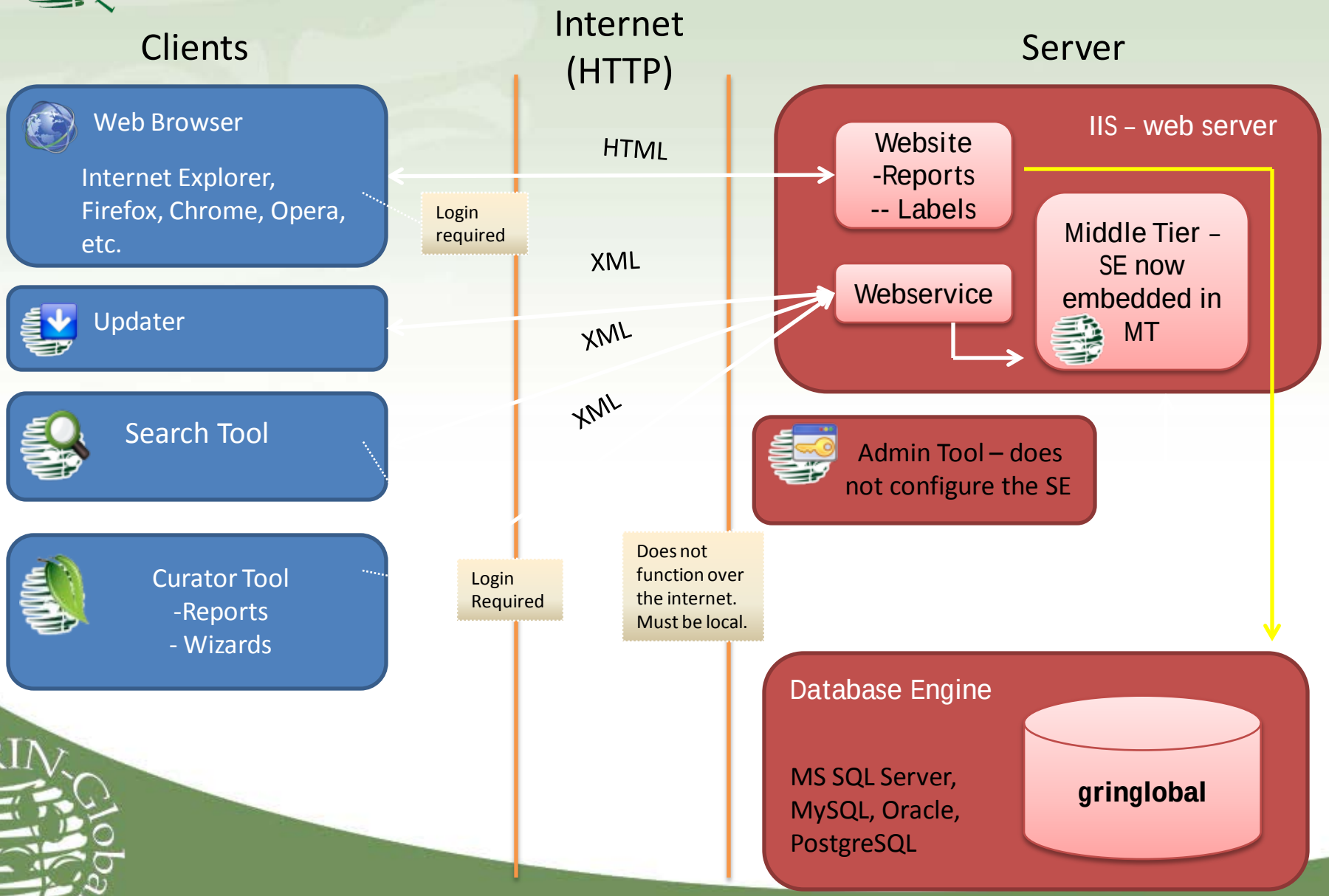
GG System Architecture Overview – Single PC



GRIN-Global System Architecture Overview – Networked to a Server

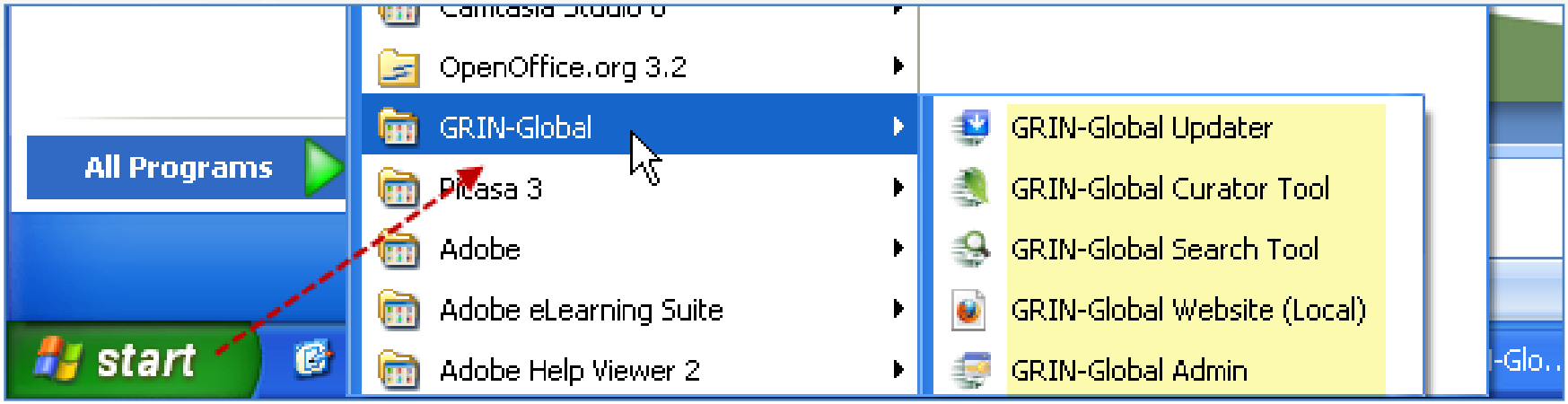


Current Status of G-G System Architecture 2014



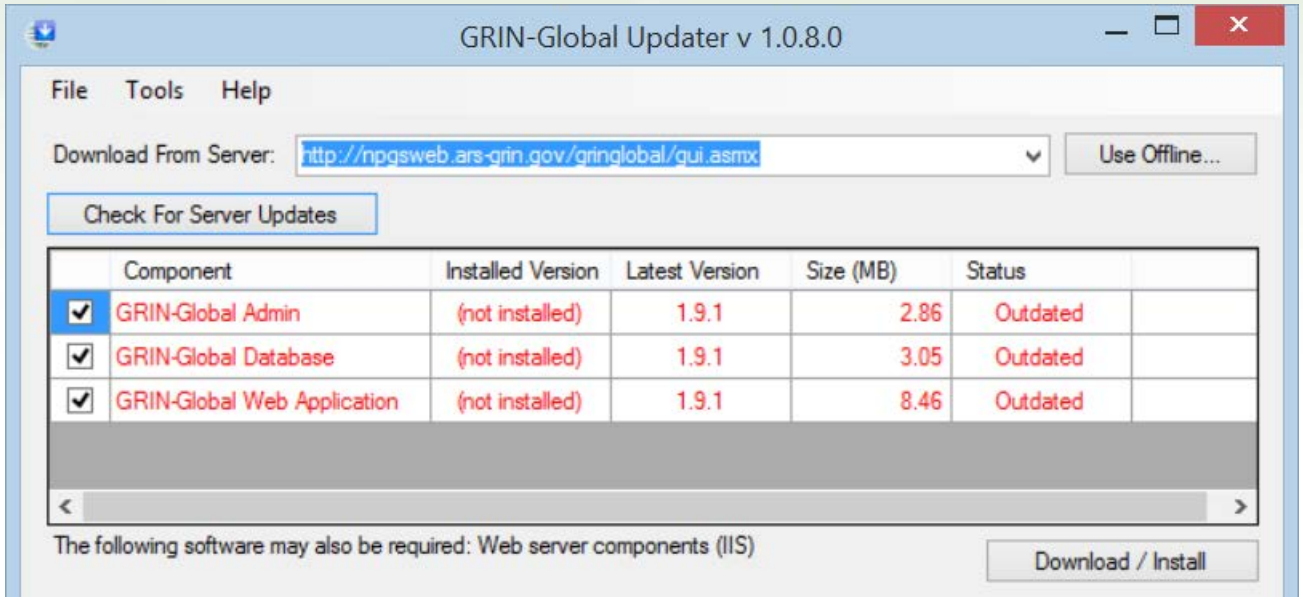
GRIN-Global Suite of Software Components

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



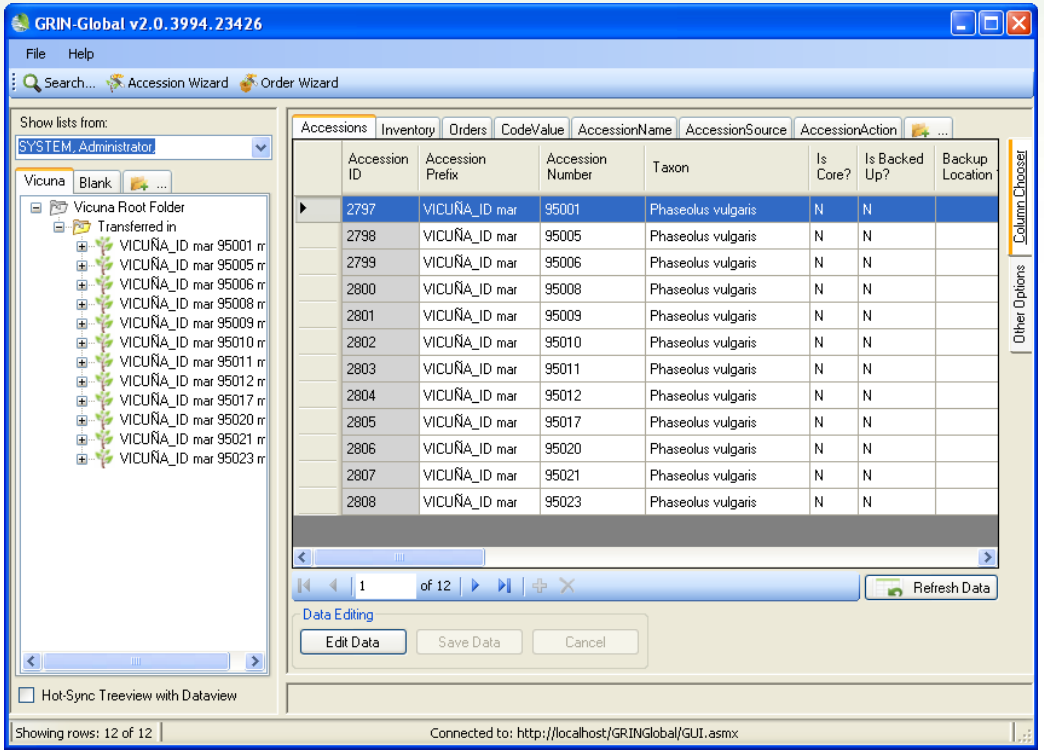
Updater

The GRIN-Global program updater is used to install the server GG components.



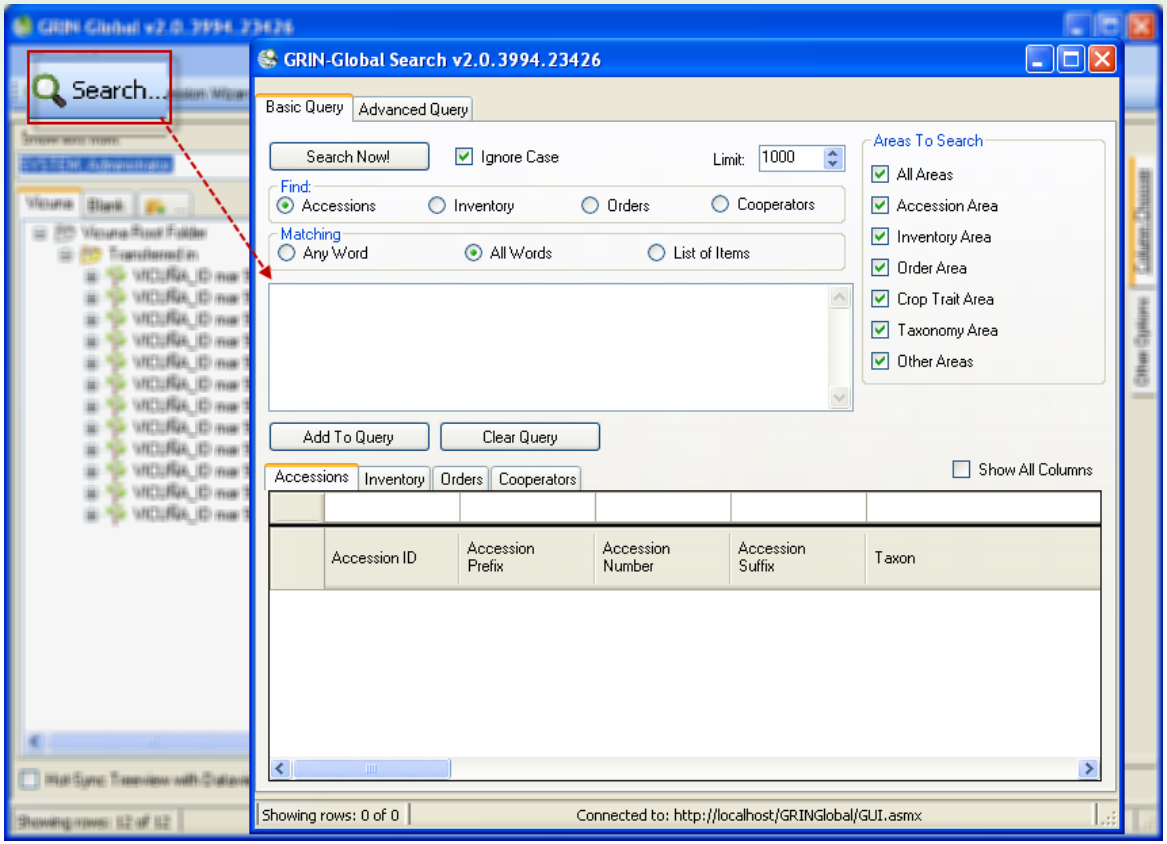
Curator Tool

The Curator Tool is a GRIN-Global application designed primarily for curators and genebank workers creating and managing their genebank's data



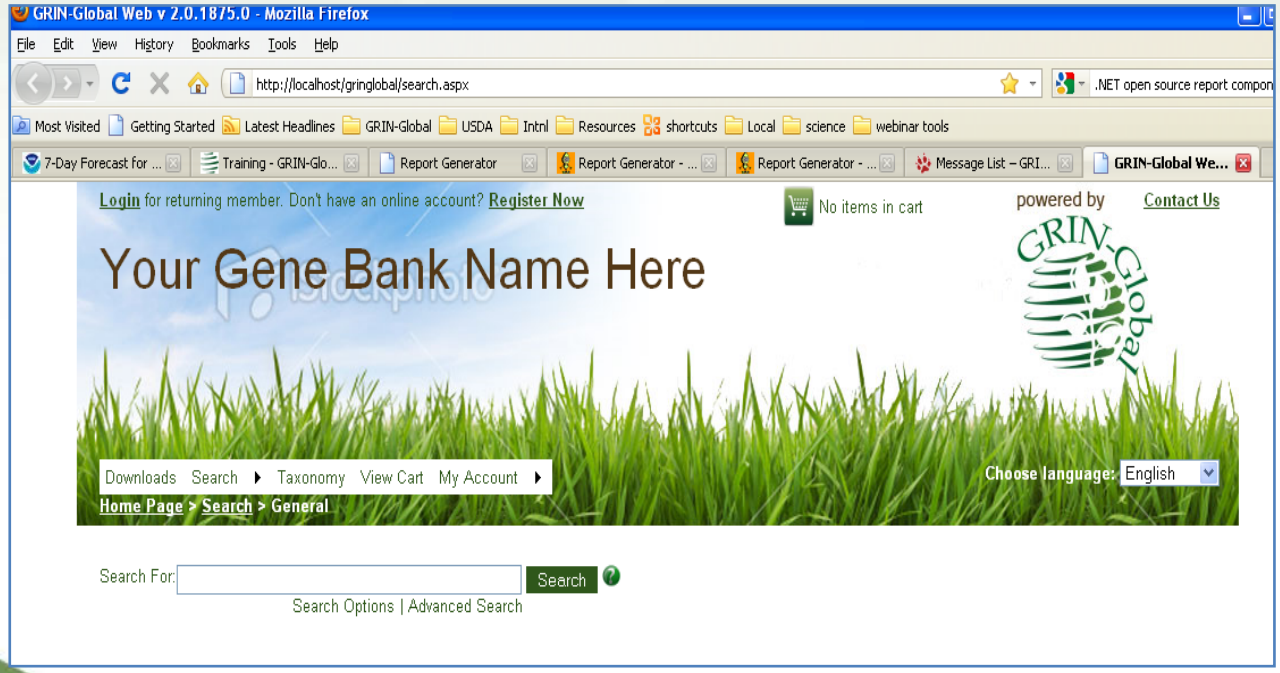
Search Tool

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



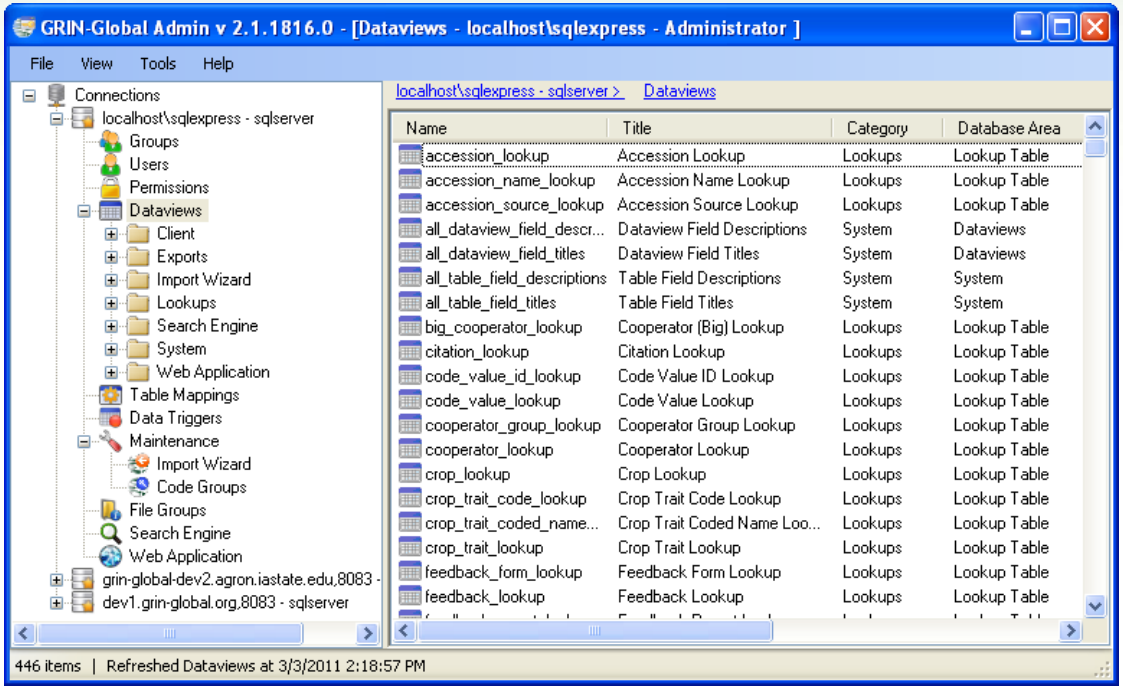
Public Website

Through the Public Website, clientele can search the GG database, access germplasm information, and order germplasm through a “shopping cart facility.”



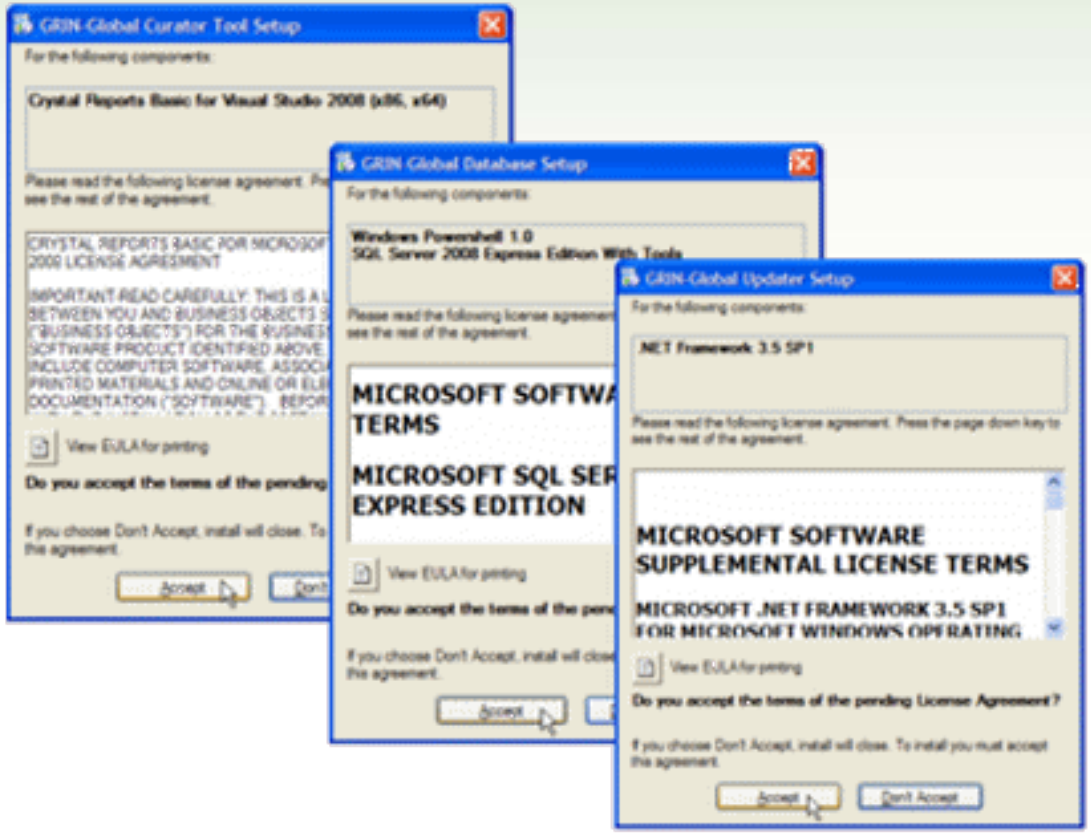
Admin Tool

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.



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)