ESSENCE Desktop Edition: A Self-Contained Disease Surveillance Application

Background

Objective

The ESSENCE Desktop Edition (EDE) was created to offer a disease surveillance tool that can be efficiently deployed on a stand-alone computer in diverse settings.

The original web-based version of ESSENCE (Electronic Surveillance System for the Early Notification of Community-based Epidemics) is used to monitor the health of populations and detect disease outbreaks early in order to prevent their spread[1].

ESSENCE collects pre-registered health surrogate data including, among others, hospital admission, doctor visits, and over-the-counter (OTC) drug sales. It uses anomaly detection algorithms that flag unusually high counts of disease indicators which may suggest a possible disease outbreak. Users can view alerts and the demographic details and geography of reported cases causing the alerts.

Electronic biosurveillance is potentially useful during crisis situations and in resource-poor areas of the world with limited computer expertise. But the web-based release of the original ESSENCE limits its use to areas with reliable internet access.

EDE mimics the flow, functionality and analytic power of web-based ESSENCE but can be used anywhere a single desktop or laptop computer can function.

Methods

EDE uses the Eclipse Rich Client Platform (ECP), a customizable application framework built with software units called plugins. The Eclipse ECP is well supported and scalable framework providing a wide array of features and continued application growth[2]. EDE utilizes the Java programming language and the Eclipse Rich Client人類。

Plug-ins allow developers to develop, upgrade, and deploy new features without rebooting the entire application.

The EDE consists of the following plugins:

- Desktop Core
  - Provides the main user interface including query building, graph visualization, and mapping capabilities.
- Desktop Data Core
  - Provides underlying data query mechanism to support multiple databases.
- Detector Temporal Core
  - Provides temporal detection algorithm frameworks for analysis of data.

Releases of the EDE will be able to add additional features and customizing including unique mapping support and database connections.

ESSENCE Desktop Edition Flow

The flow of the ESSENCE Desktop Edition: STARM release is as follows:

1. Creating a DataSource
   A DataSource can be created, saved, and used multiple times for future queries. In this wizard you can configure a DataSource to connect to a table or view in a database.

2. Creating a Query
   A new query can be created from a DataModel. This interface is dynamic and allows you to graphically build and save a query.

3. Executing a Query
   Execution of a query returns results in several ways including:
   - Time series
   - Bar charts
   - Pie charts
   - Tabular listings

4. Compare Results
   Multiple queries can be executed and displayed simultaneously for comparison. The time series have the capability to zoom and create images.

5. Details View
   Users can create exportable pie charts and bar graphs for further analysis of any executed query.

6. Map Configuration
   STARM can export query results into ESRI and launch programs such as EpidMap that will produce maps displaying this data.

Conclusions

EDE is an easy to deploy, upgradeable and extensible desktop application that provides similar functionality to the current web deployment of ESSENCE.

EDE users can configure the system specifically for the variables included in their databases, including the selection of input data features that can be extended and upgraded by future developers.

References

[3] "Tips & Info" is a trademark of the Centers for Disease Control and Prevention (CDC)

The authors wish to acknowledge the support provided by the collaboration of the Philippines, AsiaPRES, Village Healthcadre Project, and the University of Michigan School of Public Health, along with the EHRIT Center in the development of this application.

This work was supported by US Department of Defense (DOD) Geospatial Designing Effective Systems (GDES) under contracts H98230-09-D-0001, T.0, B03.