Practical experience with moving applications to PostgreSQL

STREAMLINE TECHNOLOGIES INC

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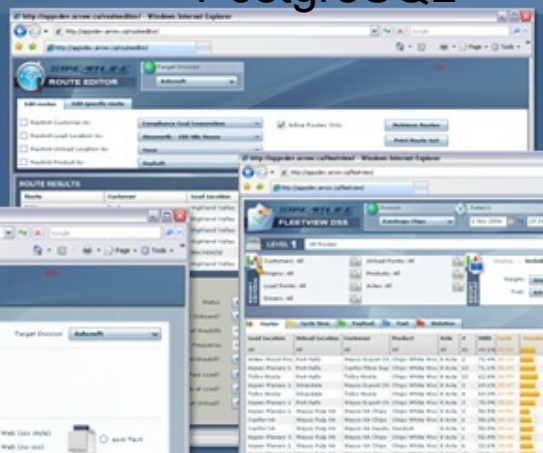
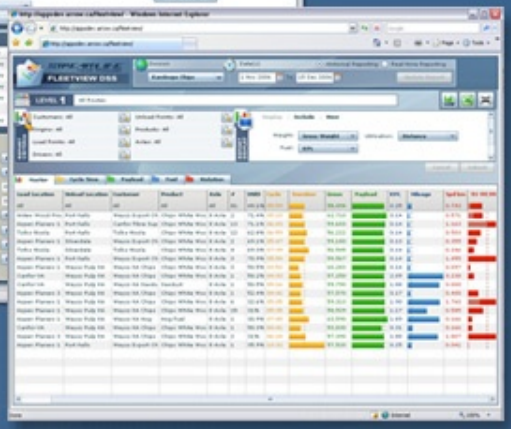
PostgreSQL

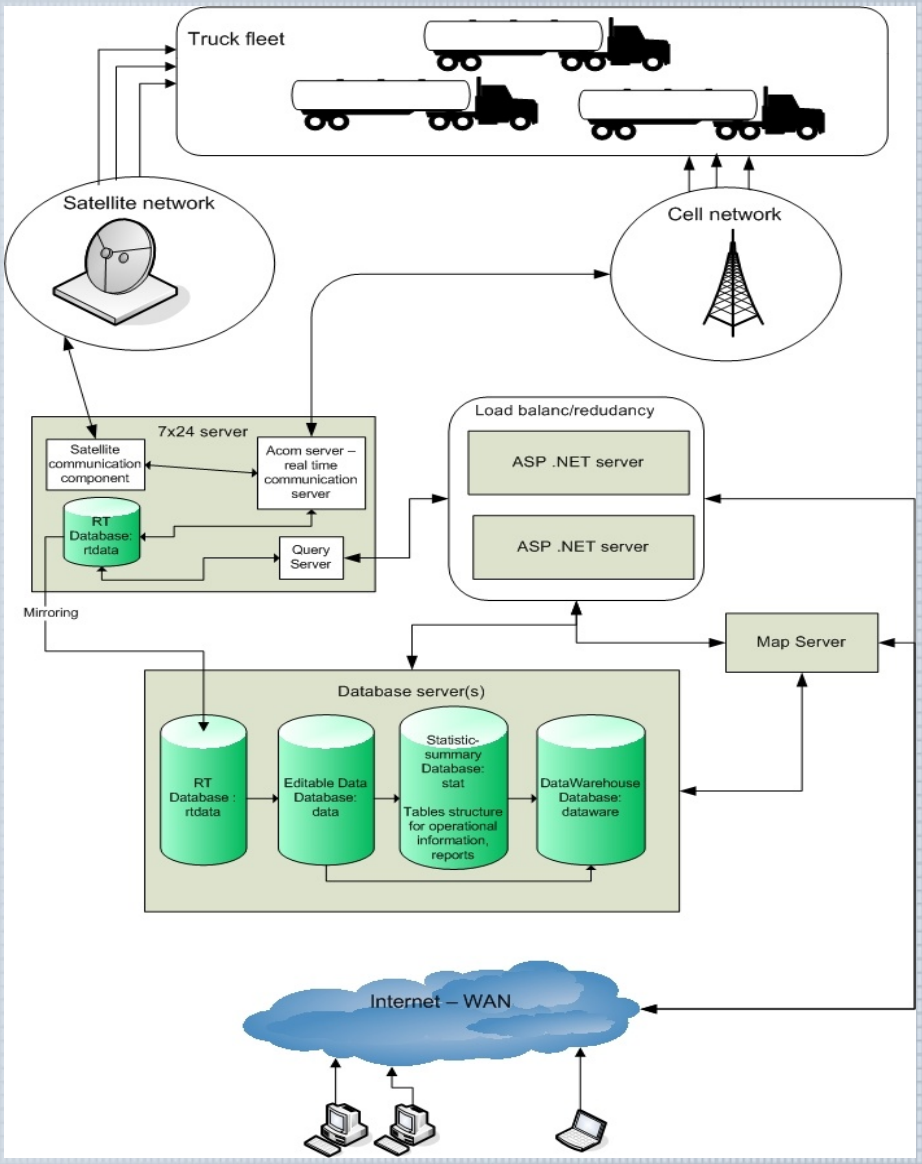
Conference, 2007





Overview

- System architecture
- Communication
- Databases
- Servers
- Client web app.
- Custom client/server app.

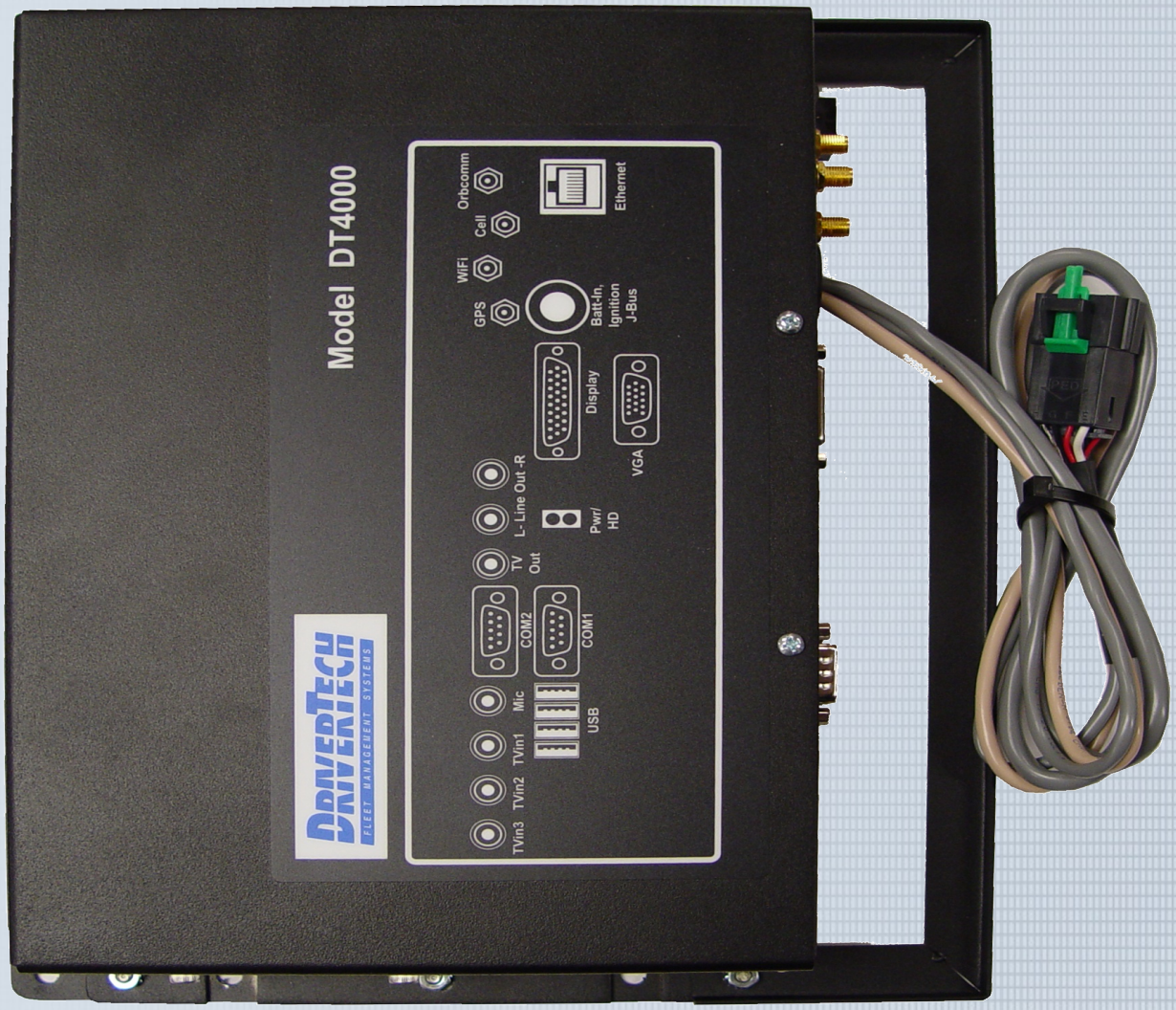


Applications

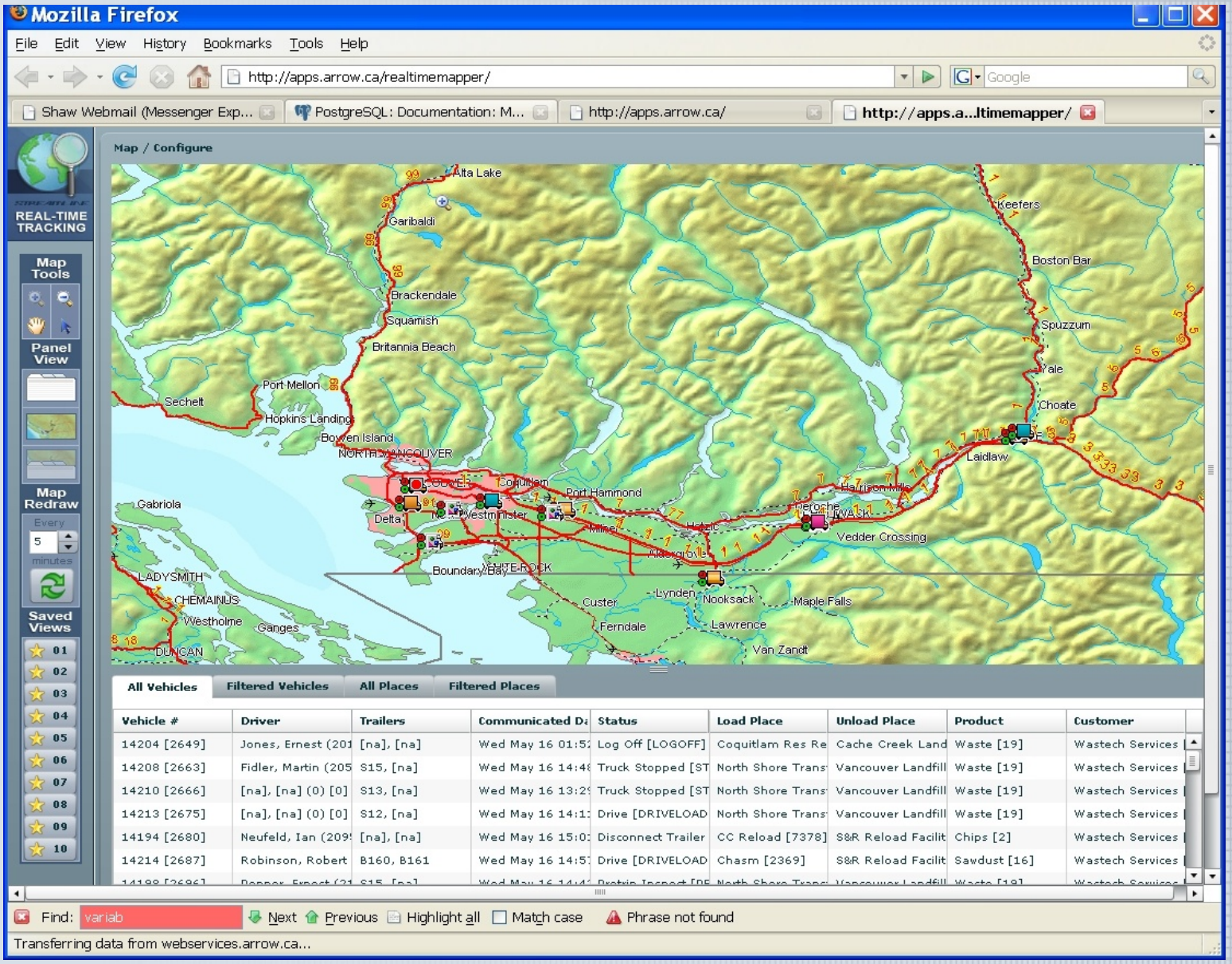
- Truck on board Orion data collection and communication system
- Servers applications
  - Map server
  - Data transformation server
  - Web application/services, Web servers: .NET
  - Web reporting server: java
- Client/server applications
- Batch data transformation applications

Orion data collection and communication system

Orion data collection and communication system



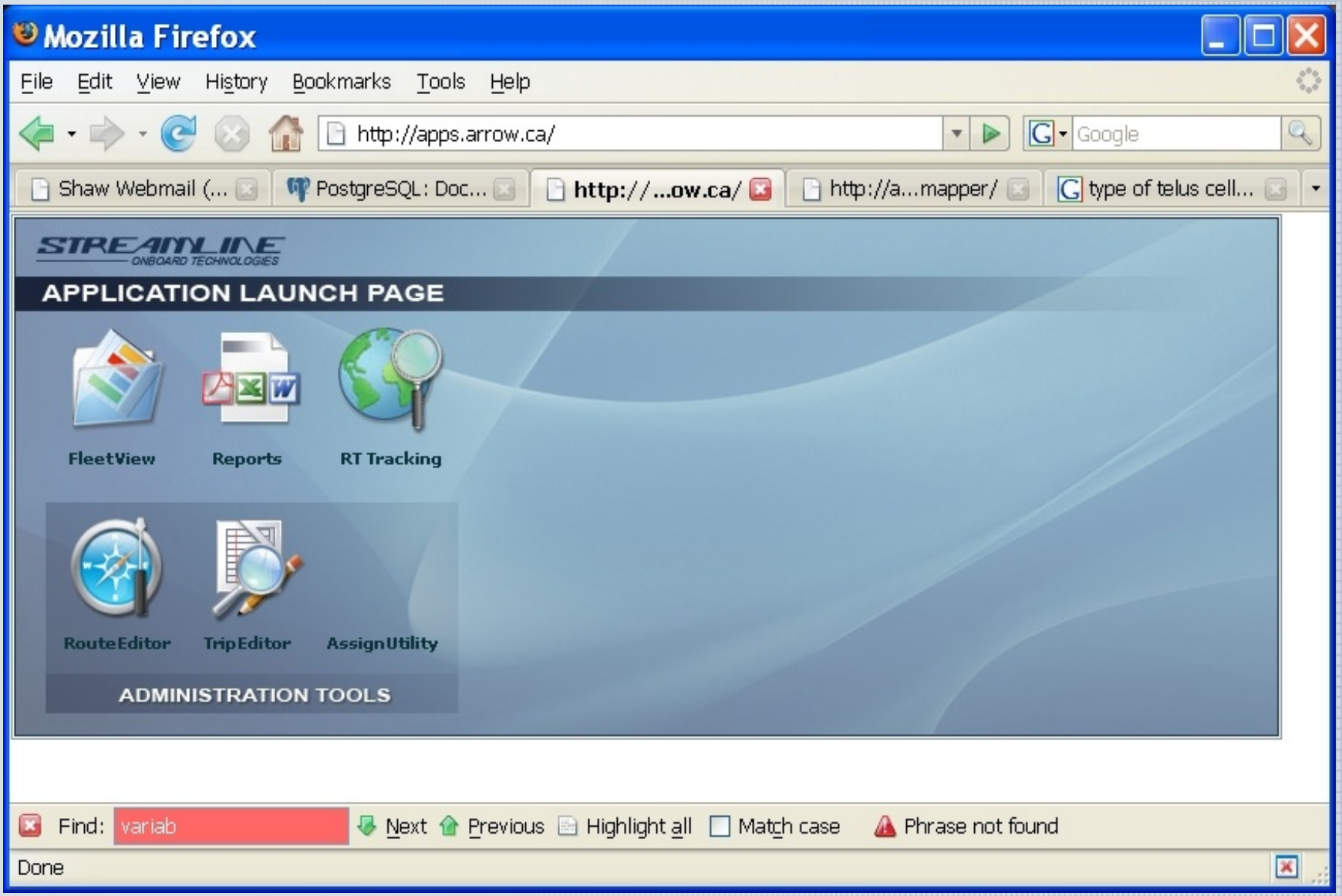
Servers applications - Map server

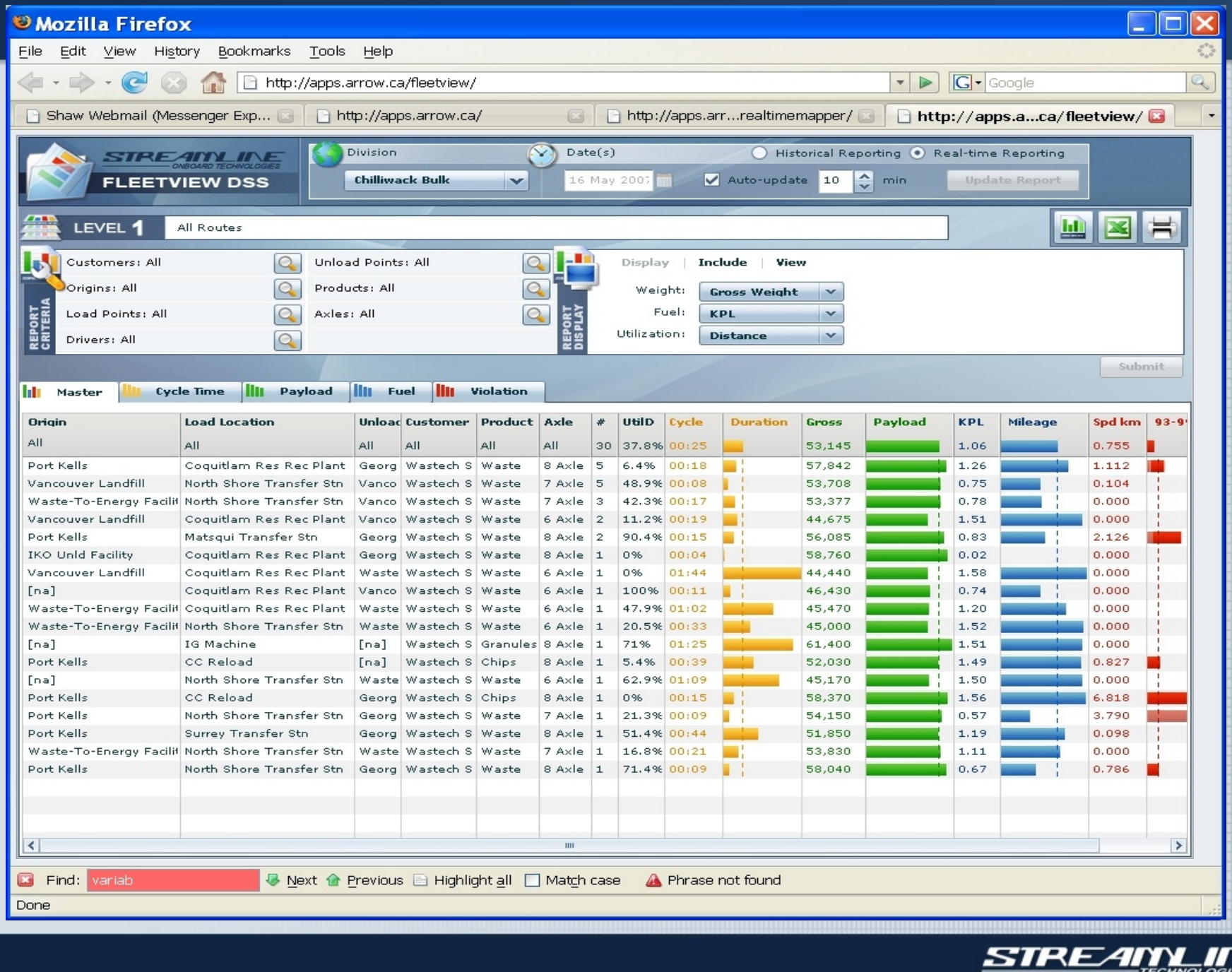


Servers applications - Data transformation server

- Receive data from cell network (currently PCS)
- Decode data
- Recalculate and compare information from Trucks to stored on PostgeSQL
- Store data on PostgreSQL
- 24/7 service, windows application

• Servers applications - Web application/services




Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://apps.arrow.ca/fleetview/
Google
Shaw Webmail (Messenger Exp...
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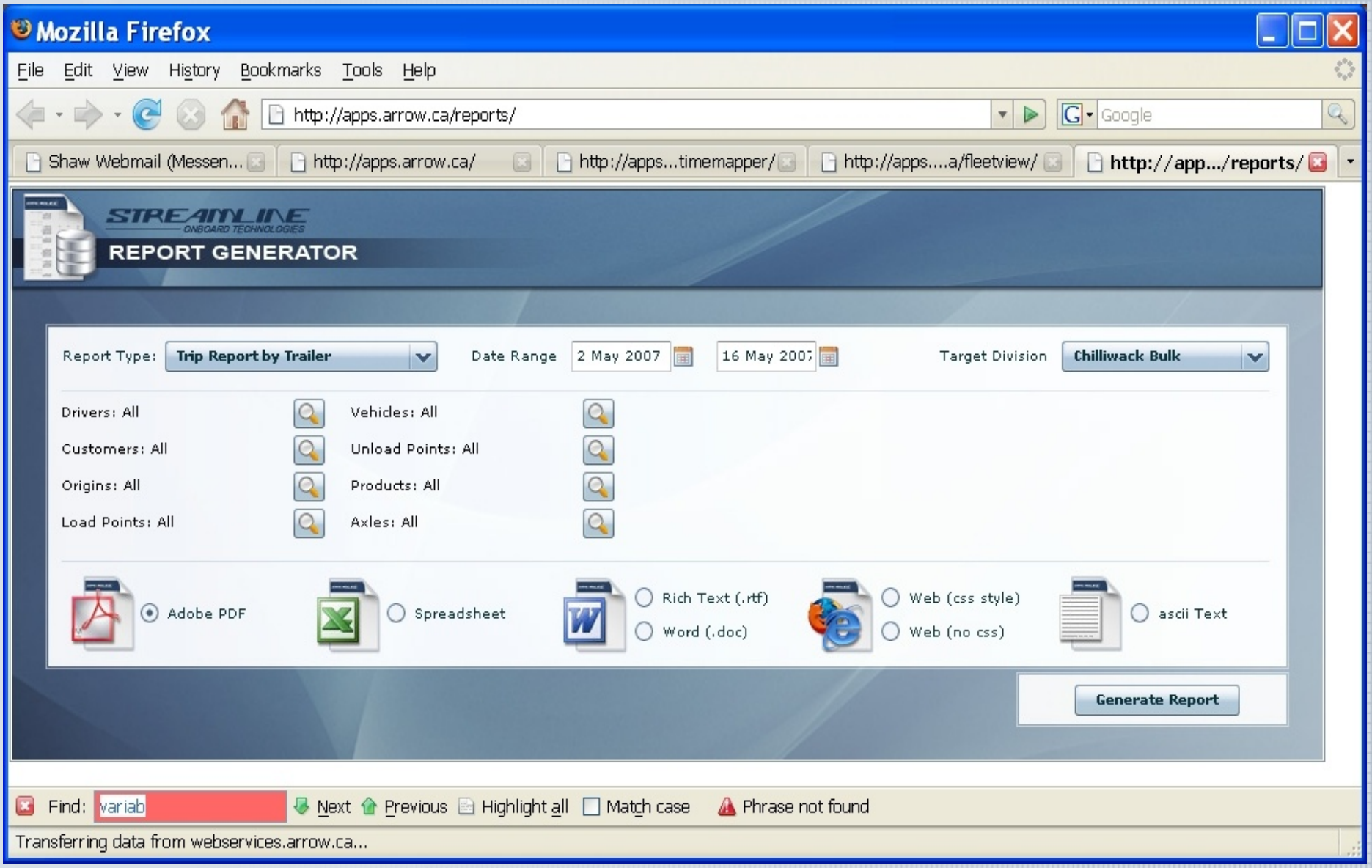
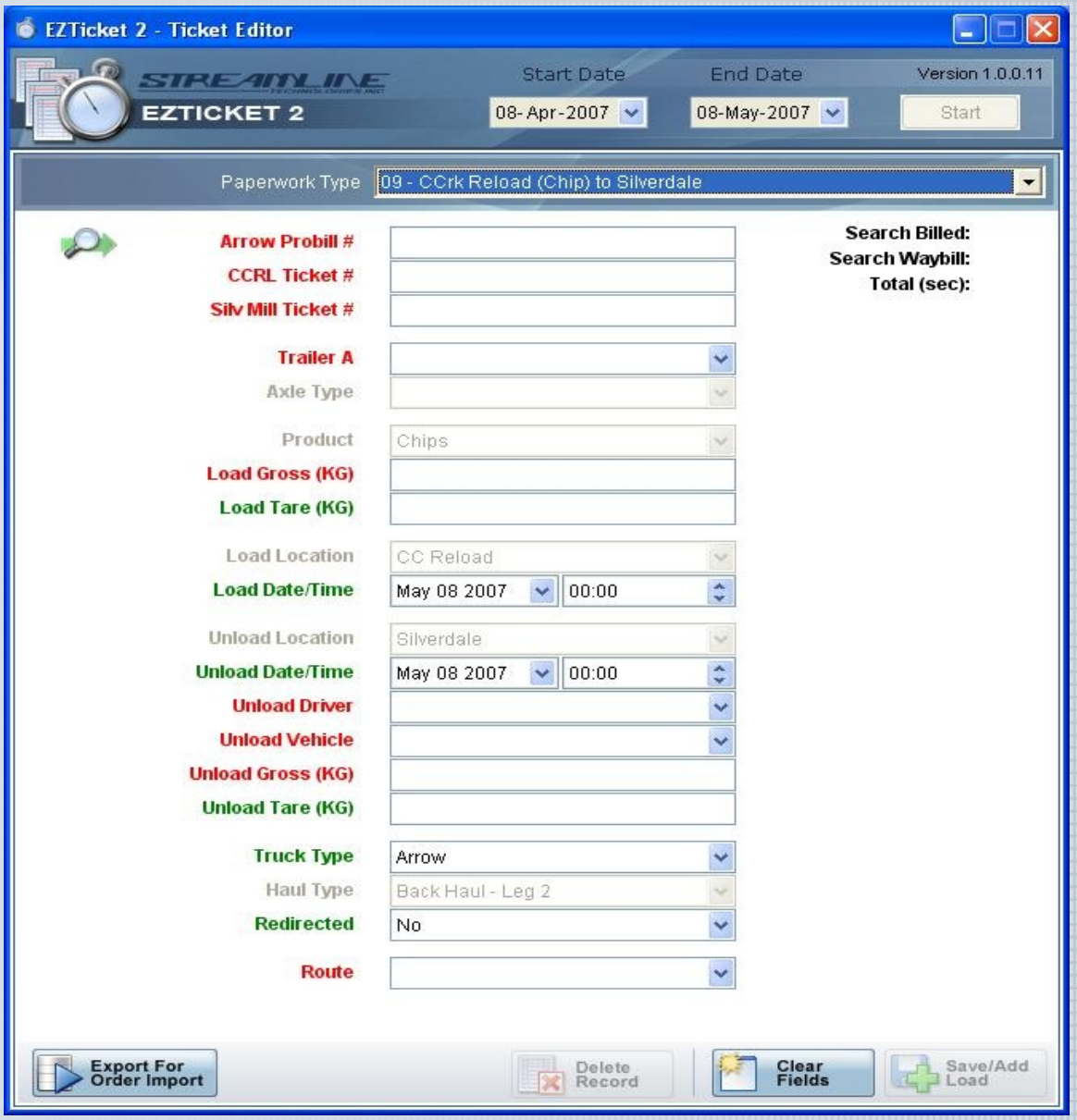
FLEETVIEW DSS
Division
Chilliwack Bulk
Date(s)
16 May 2007
Historical Reporting
Real-time Reporting
Auto-update
10
min
Update Report
LEVEL 1
All Routes
REPORT CRITERIA
Customers: All
Origins: All
Load Points: All
Drivers: All
Unload Points: All
Products: All
Axles: All
REPORT DISPLAY
Display | Include | View
Weight: Gross Weight
Fuel: KPL
Utilization: Distance
Submit
Master
Cycle Time
Payload
Fuel
Violation
Origin | Load Location | Unload | Customer | Product | Axle | # | UtilD | Cycle | Duration | Gross | Payload | KPL | Mileage | Spd km
All | All | All | All | All | All | 30 | 37.8% | 00:25 | 53,145 | 1.06 | 0.755
Port Kells | Coquitlam Res Rec Plant | Georg | Wastech S | Waste | 8 Axle | 5 | 6.4% | 00:18 | 57,842 | 1.26 | 1.112
Vancouver Landfill | North Shore Transfer Stn | Vanco | Wastech S | Waste | 7 Axle | 5 | 48.9% | 00:08 | 53,708 | 0.75 | 0.104
Waste-To-Energy Facili | North Shore Transfer Stn | Vanco | Wastech S | Waste | 7 Axle | 3 | 42.3% | 00:17 | 53,377 | 0.78 | 0.000
Vancouver Landfill | Coquitlam Res Rec Plant | Vanco | Wastech S | Waste | 6 Axle | 2 | 11.2% | 00:19 | 44,675 | 1.51 | 0.000
Port Kells | Matsqui Transfer Stn | Georg | Wastech S | Waste | 8 Axle | 2 | 90.4% | 00:15 | 56,085 | 0.83 | 2.126
IKO Unld Facility | Coquitlam Res Rec Plant | Georg | Wastech S | Waste | 8 Axle | 1 | 0% | 00:04 | 58,760 | 0.02 | 0.000
Vancouver Landfill | Coquitlam Res Rec Plant | Waste | Wastech S | Waste | 6 Axle | 1 | 0% | 01:44 | 44,440 | 1.58 | 0.000
[na] | Coquitlam Res Rec Plant | Vanco | Wastech S | Waste | 6 Axle | 1 | 100% | 00:11 | 46,430 | 0.74 | 0.000
Waste-To-Energy Facili | Coquitlam Res Rec Plant | Waste | Wastech S | Waste | 6 Axle | 1 | 47.9% | 01:02 | 45,470 | 1.20 | 0.000
Waste-To-Energy Facili | North Shore Transfer Stn | Waste | Wastech S | Waste | 6 Axle | 1 | 20.5% | 00:33 | 45,000 | 1.52 | 0.000
[na] | IG Machine | [na] | Wastech S | Granules | 8 Axle | 1 | 71% | 01:25 | 61,400 | 1.51 | 0.000
Port Kells | CC Reload | [na] | Wastech S | Chips | 8 Axle | 1 | 5.4% | 00:39 | 52,030 | 1.49 | 0.827
[na] | North Shore Transfer Stn | Waste | Wastech S | Waste | 6 Axle | 1 | 62.9% | 01:09 | 45,170 | 1.50 | 0.000
Port Kells | CC Reload | Georg | Wastech S | Chips | 8 Axle | 1 | 0% | 00:15 | 58,370 | 1.56 | 6.818
Port Kells | North Shore Transfer Stn | Georg | Wastech S | Waste | 7 Axle | 1 | 21.3% | 00:09 | 54,150 | 0.57 | 3.790
Port Kells | Surrey Transfer Stn | Georg | Wastech S | Waste | 8 Axle | 1 | 51.4% | 00:44 | 51,850 | 1.19 | 0.098
Waste-To-Energy Facili | North Shore Transfer Stn | Waste | Wastech S | Waste | 7 Axle | 1 | 16.8% | 00:21 | 53,830 | 1.11 | 0.000
Port Kells | North Shore Transfer Stn | Georg | Wastech S | Waste | 8 Axle | 1 | 71.4% | 00:09 | 58,040 | 0.67 | 0.786
Find: variab
Next Previous Highlight all Match case Phrase not found
Done

Servers applications - Web reporting server: java

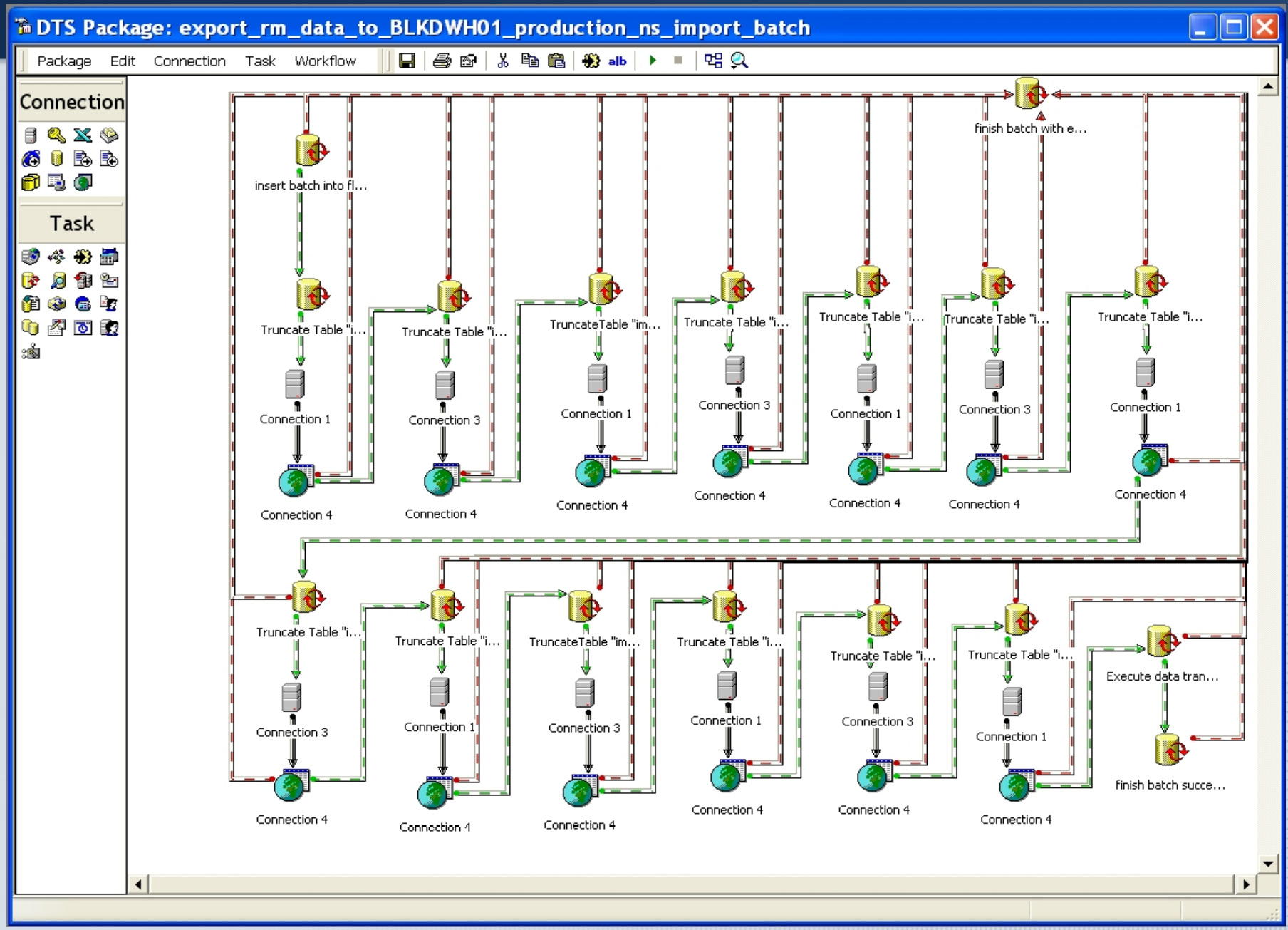


Client/server applications



Batch data transformation applications

- Daily synchronization data from MSSQL company resource repository system with PostgreSQL DB – DTS, psqlODBC
- Daily import data from external text file sources (customers, etc) – DTS, psqlODBC
- SQL scripts to transform and calculate data when moving from one schema to other – stat calc., datawarehouse transformation, PHP



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Propagation of PostgreSQL inside company

- Spread informations
- Compare RDBMS features, stability, price, scalability
- Show PostgreSQL support from other companies (Sun, EnterpriseDB, Novell)
- Advantage of following standards (SQL 99)
- Port simple application to PostgreSQL and show performance
- Be prepare for not logical questions and arguments.

Compare RDBMS features, stability, price, scalability

Purpose	PostgreSQL 8.1	MySQL 5.0	FireBird	Oracle 9.i	MSSQL2000	Sybase
Use with mainstream business application	4 - Breadth of features support mainstream workloads.	3 – very new major version – it still include many bugs.	3 - Support mainstream workloads. Different internal and external SQL	5 – All standard and extended features support mainstream workloads. Excelent scalability and tuning capability	4 - All standard and extended features support mainstream workloads.	4 - All standard and extended features support mainstream workloads.
Target for migration from Oracle, DB2, MS SQL, or other server class RDBMS	5 – ver 8.1 SQL 99 compliance and database features ease migration	5 - SQL 99 compliance and database features ease migration	4 - SQL 92 entry level compliance	5 - SQL 99 compliance and database features ease migration	5 – SQL 99 compliance and database features ease migration	5 - SQL 99 compliance and database features ease migration
Distribute with a closed source application	5 - BSD license *, PostGIS GPL lincese **	3 - Requires commercial license.	4 - and ***	1 – Commercial license required	1 – Commercial license required	1 – Commercial license required
Use for production quality J2EE/ASP/PHP web site	4 - Leverages scalability and database features.	3 - new major version has few bugs and few missing features, missing GIS	4 - Leverages scalability and database features.	5 - Leverages scalability and database features.	4 - Leverages scalability and database features.	4 - Leverages scalability and database features.
Use for datawarehouse, data minining, GIS app.	5 – All features for complex queries, GIS module, extended data types	4 – Extremely fast load process, very fast response to simple queries. Complex queries have to be manually tuned, lack of data types	3 – Queries have to be manually tuned, lack of data types	5 – All features for complex queries, GIS module, extended data types, standard interface to many 3-th party tools	4 – All features for complex queries, missing internal GIS module-, lack of provided data types –user-defined data types	4 – All features for complex queries, missing internal GIS module – external module SQS, lack of provided data types –user-defined data types
Cost for version to utilize 2 dualcore CPUs and 8GB RAM	Total: 0 USD	595 USD/server on Linux Total: 595 USD	Total: 0 USD	Enterprise version 40,000 USD/CPU(*0.75/core) on Linux Total.: 120000 USD	Enterprise version 19,999 USD/CPU + Ent. Win Server - 3,999 USD Total: 43997 USD	31,679 CAN/CPU on Linux Total: 63358 CAN

* BSD license allows free use within closed source application

** GPL license allows free use but custom chan ges to source code have to be open too.

*** IPL v 1.0 and IDPL licenses are similar to GPL. Their definitions a re on http://firebird.sourceforge.net/index.php?op=doc&id=ipl and http://firebird.sourceforge.net/index.php?op =doc&id=idpl

Port simple application to PostgreSQL, performance

Test between MySQL 4.1 and PostgreSQL 8.1. Lower value is the better. Indeces are created on the same fields

Query type/task type	MySQL 4.1 result in sec	PostgreSQL 8.1 result in sec
FleatView level 3 – 10users x 20 queries; Used table testvwFulCycle in db test, no indices	1176.47	344.83
FleatView level 3 – 2users x 5 queries; Used table testvwFulCycle in db test, no indices	38.46	8.93
FleatView level 3 – 10users x 20 queries; Used table testvwFulCycle in db test, indices	747.74	
FleatView level 3 – 2users x 5 queries; Used table testvwFulCycle in db test, indices	27.03	17.86
Load 393635 rows of vwFullCycle table data into db – MySQL MyISAM engine	7.76	27.1 – use only 1 storage engine
Load 393635 rows of data from txt file into db – MySQL InnoDB engine	28.28	28.5 – use only 1 storage engine

Introduction PostgreSQL to developers

- Adjust to new or different datatypes
  - Timestamp – MSSQL datetime
  - Serial – MSSQL bigint identity
  - Bigserial – MSSQL integer indentity
  - Timestamp with time zone – MSSQL has no such data type
- Functions – MSSQL stored procedures
- Triggers – new,old row approach versus spec. table inserted, deleted

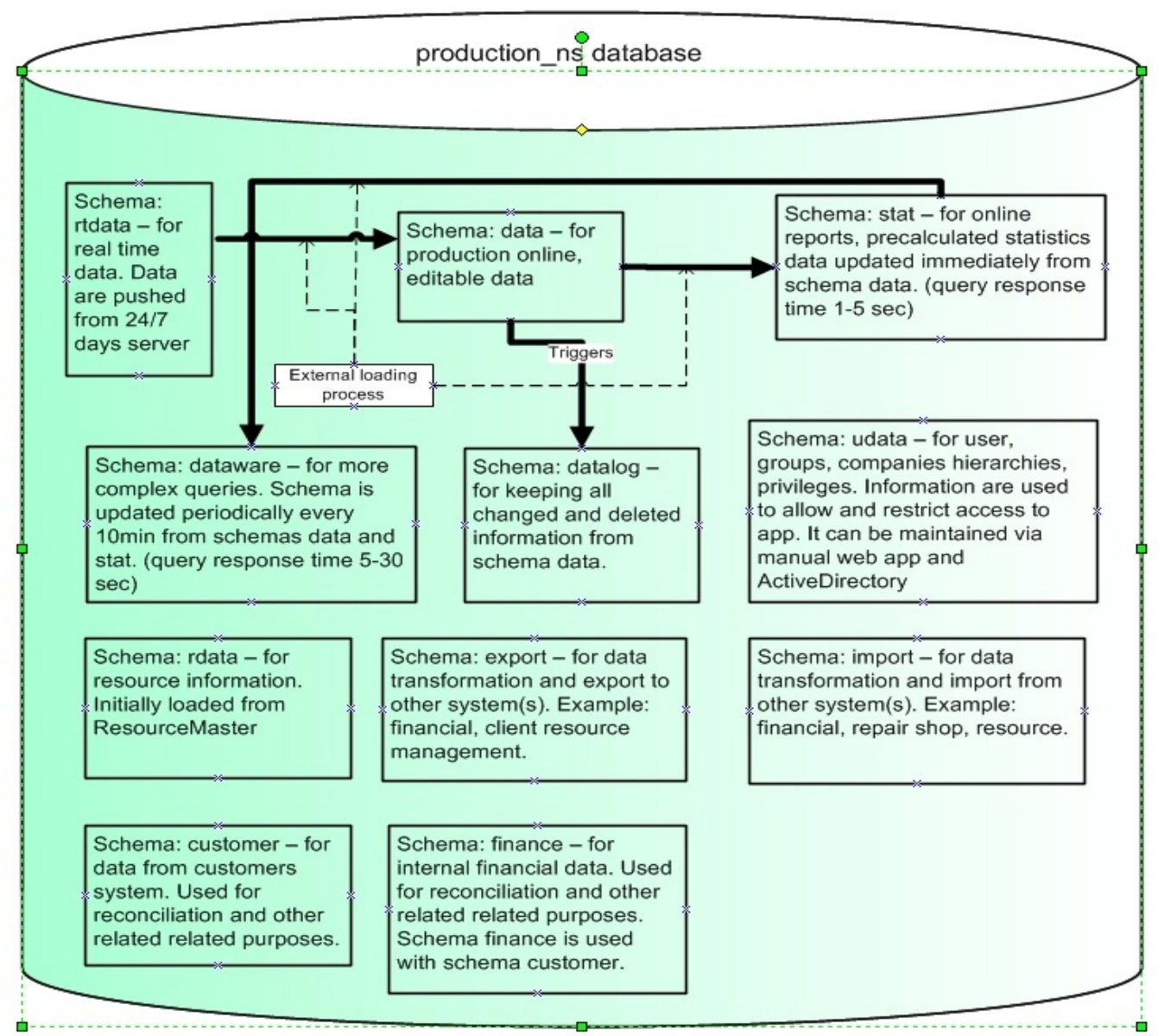
Introduction PostgreSQL to developers

- Problems with data connection components
  - Windows OS
    - ODBC - psqlODBC
      - .NET – slower performance
      - Borland C++ Builder – slow performance, big overhead
    - Native PostgreSQL data components
      - .NET
        - http://www.crlab.com/pgsqlnet/ - problems with timestamp
      - Borland C++ Builder 5-6
        - microOLAP - PostgresqlDAC problems with bigint, timestamp
        - pgExpress – more for Delphi then for C++ Builder

Introduction PostgreSQL to developers

- Problems with data connection components
  - *NIX OS
    - Native libraries in C, C++ - very good and stable
    - PHP – use native connection to PostgreSQL
      - PEAR
        - DB – old but STABLE, almost no bugs, db abstraction layer
        - MDB2 – current, still some bugs, db abstraction layer
      - ADOdb – MS ADODB like interface, db abstraction layer
      - PECL – in development, bugs, sister to PEAR, compiled packages, db abstraction layer PDO

Database Design. What is correct approach?



Database Design

- Real time schema – eliminate overhead
  - No custom triggers
  - Constraints
  - Foreign Key
  - use indexes wisely. Less is more
- Datawarehouse schema
  - Star and snowflake schemata
  - Transformations data
  - Functions versus SQL batch
  - Indexes

Data migration from MSSQL 2000 to PostgreSQL

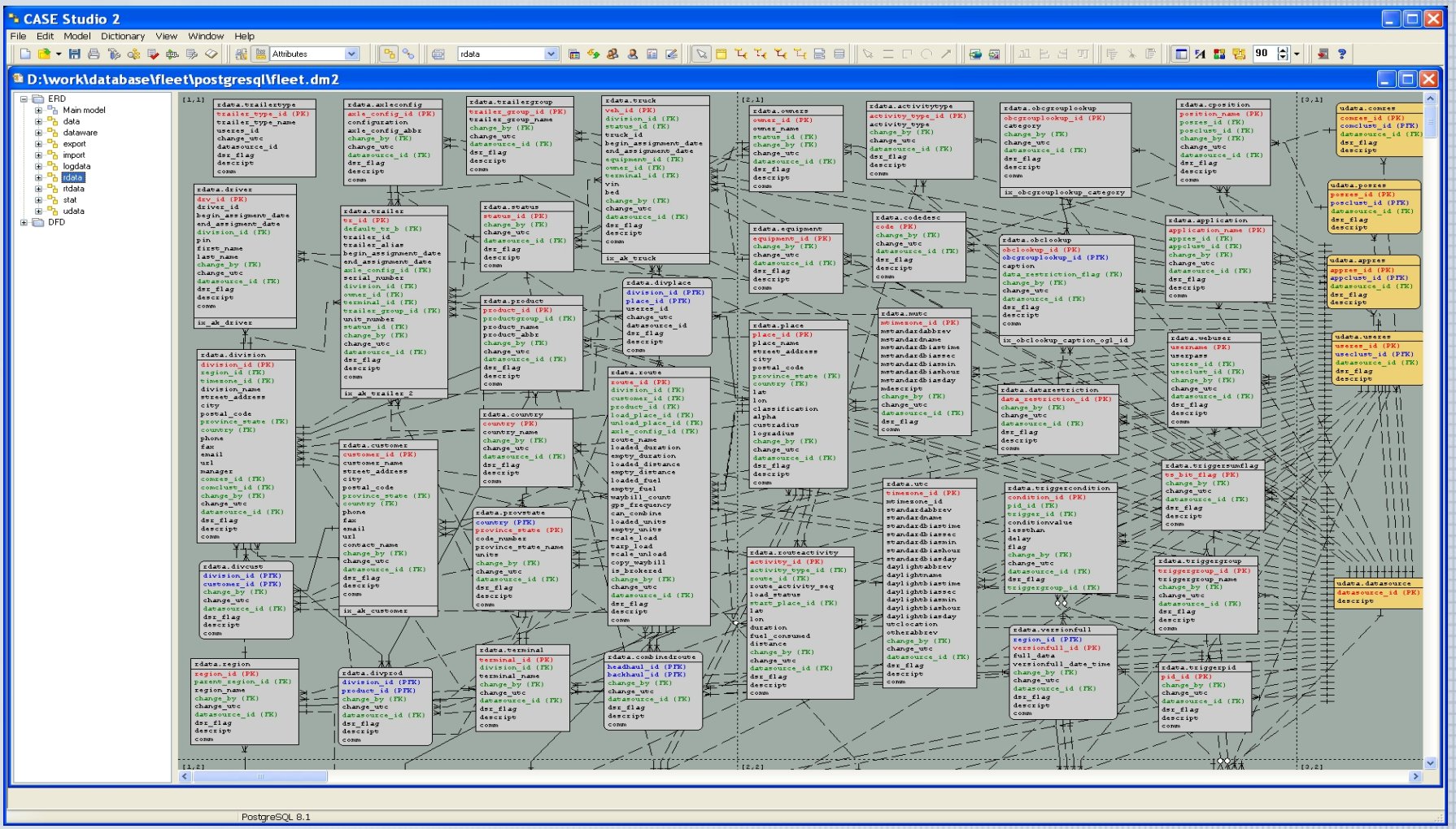
- MSSQL DTS
  - Advantage
    - simple development
    - wide variety of drivers – connections
    - flexibility
  - Disadvantage:
    - Performance
    - Resources

Database GUI tools

- CASE – Toad data modeler formally know as CASE Studio 2, ErWin
- SQL Editor – pgAdmin III 1.6.3, Navicat PostgreSQL, Maestro PostgreSQL: comparison
- Graphical Query Editor – important for windows developer
- Administration tools – pgAdmin III for daily maintenance, command line for setup security, performance tuning, server restart

Database GUI tools

- CASE – Toad data modeler formally know as CASE Studio 2, ErWin



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Database GUI tools

- SQL Editor – pgAdmin III 1.6.3, Navicat PostgreSQL, Maestro PostgreSQL: comparison
  - Similar features: database object browsing
  - Difference: export, import data
  - Stability
- Graphical Query Editor – important for windows developer
  - Help with building/starting building queries
  - Creating complex queries with joins
  - Have visual grasp of problem/query
  - Improve performance of programmer
- Administration tools – pgAdmin III for daily maintenance, command line for setup security, performance tuning, server restart
  - Excellent for remote administration tasks
  - Problems with using on Novell linux10 (formerly SLES10)
  - command line - most powerful

Difference between MSSQL and PostgreSQL

- Case sensitivity - difference between MSSQL, MySQL and PostgreSQL
- Index usage – Which index use in PostgreSQL versus MSSQL. Clustered indexes
- Scalability. Advantage of *NIX over Windows, 64bit OS
- TSQL – programmatic approach to solve performance issues
- PL/PGSQL – problem with performance in some situations

Difference between MSSQL and PostgreSQL

- TSQL – programmatic approach to solve performance issues
  - Example: Calculating Running Totals

Solution	No Index	Index
Temp Table/Cursor	٢ sec	٢ sec
The "Celko" Solution	٢٥ sec	٢٠ sec
The "Guru's Guide" Solution	٣٨ sec	١٧ sec