

SG-Networks Database and Planning Tool Documentation

**Jerry Armes
Micronet Communications, Inc.**

13 January 2011

**SG-Networks
SG Communications
OpenSG Users Group**

Table of Contents

- Introduction.....4
- Using This Software.....5
- The Software License.....6
- The Utility Profile.....7
 - The Metering Tab.....7
 - The Customer Tab.....8
 - The Substations and Field Devices Tab.....9
 - The Infrastructure Tab.....10
- Queries.....11
 - Application Level Query Analysis.....11
 - Traffic Analysis.....12
 - Alternate Path Application Level Query Analysis.....13
 - Traffic Analysis.....13
 - Alternate Path Selection by the User.....13
 - Network Level Query Analysis.....14
 - Traffic Analysis.....14
 - Network Level Traffic over 24 Hour Period.....15
- The Database.....17
 - Database Organization.....18
 - Database Structure19
- Summary.....20
- Appendix A: Data Parsing Documentation.....21
 - Data Parsing.....22
 - Software License.....22
- Appendix B: Table Documentation.....23
 - Actors23
 - AlternativePathConnections.....24
 - AltPathExporttoCSV.....25
 - Application2ApplicationConnections26
 - Application2ApplicationWithBracketHierarchy.....27
 - ApplicationConnectionsExportToCSV.....28
 - ApplicationQueryReportData.....29
 - CloudCrossings.....30
 - Daily_Traffic.....30
 - Domains.....31
 - ExcelAppConnectionsImport.....31
 - Hourly_Traffic.....32
 - NetConExportToCSV.....33
 - NetworkQueryReportData.....34
 - Network_Connections.....35

NIST_ACTORS.....	36
NIST_Domains.....	36
NIST_LogicalConnections.....	36
Organizations.....	37
Payloads.....	37
PayloadType.....	37
Profiles.....	38
SavedAltPathConnections.....	40
SavedUserApplicationProfileRecords.....	41
SavedUserNetworkProfileRecords.....	42
Transmission_Media.....	43
UseCases.....	43
UtilityProfileExportToCSV.....	44
UtilityProfileReportData.....	46

Introduction

The primary mission of the SG Networks Task Force has been to establish a reference network architecture in the form of a System Diagram. Detailed connections between actors are shown, and network clouds to be crossed in the process by wireless communications are identified. Based on that architecture, approximately thirty use cases are being developed to encapsulate the wireless communications requirements of the Smart Grid.

Initially, these use cases are entered into a System Requirements Spreadsheet. However, as the number of spreadsheet entries number in the low thousands, the task of assimilating and utilizing the data generated, the need for a database format and related traffic planning software became evident. Hence the planning tool described herein.

The tool accesses an underlying database of Use Cases and the parameters of those use cases, combined with the connections and cloud crossings identified on the SG-Networks System Diagram to provide insights into specific areas of interest to a given user of the tool.

A key element of the tool is a Utility Profile wherein a user can specify the number and types of meters, substations, field devices, data aggregation points, etc. Basic infrastructure calculations are provided to provide average distances between entities, service areas around substations, etc. for later wireless coverage planning. Also included are system parameters that support construction of message payloads, and subsequent traffic planning.

Queries are structured in three primary areas:

- Network-Centric views of Actor to Actor communications links and cloud (network) crossings allow examination of traffic at the physical layer level, although no provisions currently exist for protocol overheads.
- Application Level 7 views of Payload Source to Target composite communications links allow analysis of specific payload routes.
- Alternative Paths of the Application Level connections allow the user to examine the various alternatives that exist for routing payloads from Source to Target Actors.

For each of the queries, traffic analysis routines and graphics have been developed, and these are discussed through the body of this document.

Software was written to routinely map the data from the System Requirements Spreadsheet into appropriate database tables. This software is documented in Appendix A.

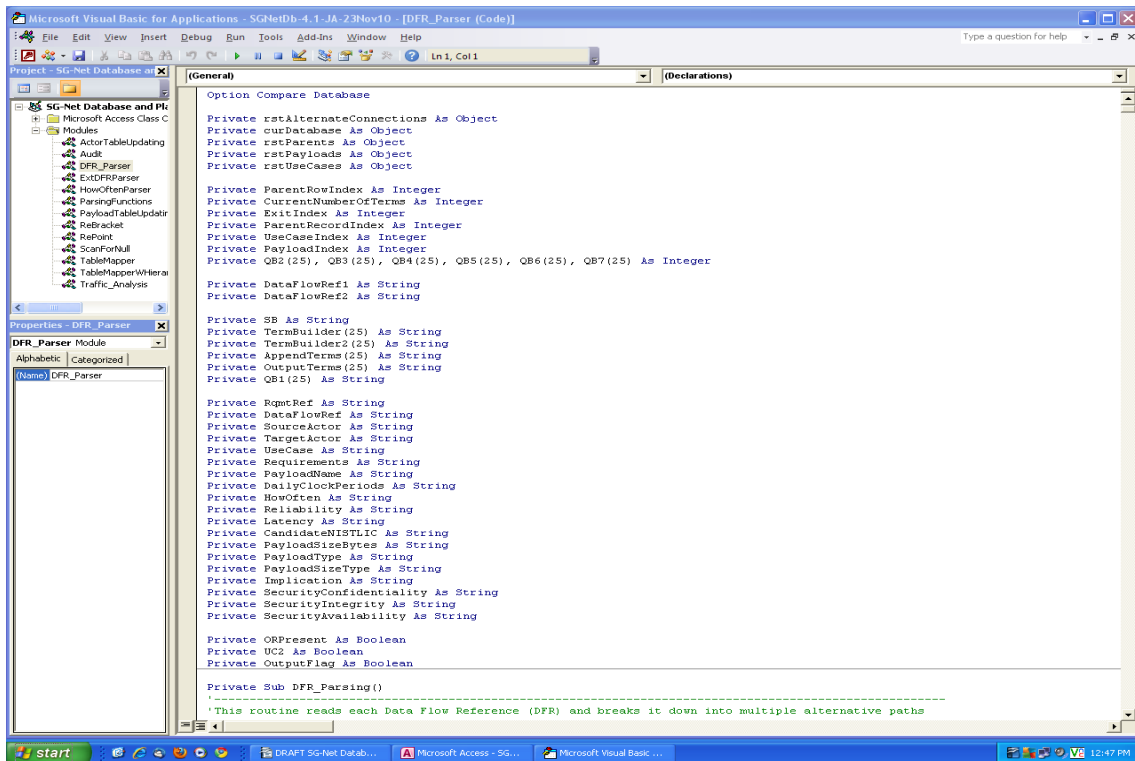
Numerous database tables have been developed to support this tool. Appendix B is devoted to a discussion of the tables, and explaining the purpose of each one.

Using This Software

This software was developed using the Microsoft Access 2000™ database and associated Visual Basic for Applications (VBA) language.¹ This platform was a convenient one because many people within SG-Net have a copy and hence could run and evaluate the software during the development process. In order to provide maximum effectiveness, graphical presentations are based on a grid display of data rows similar to a spreadsheet. Charts are also utilized to portray the results of traffic studies. Standard Access reports are used in a variety of ways.

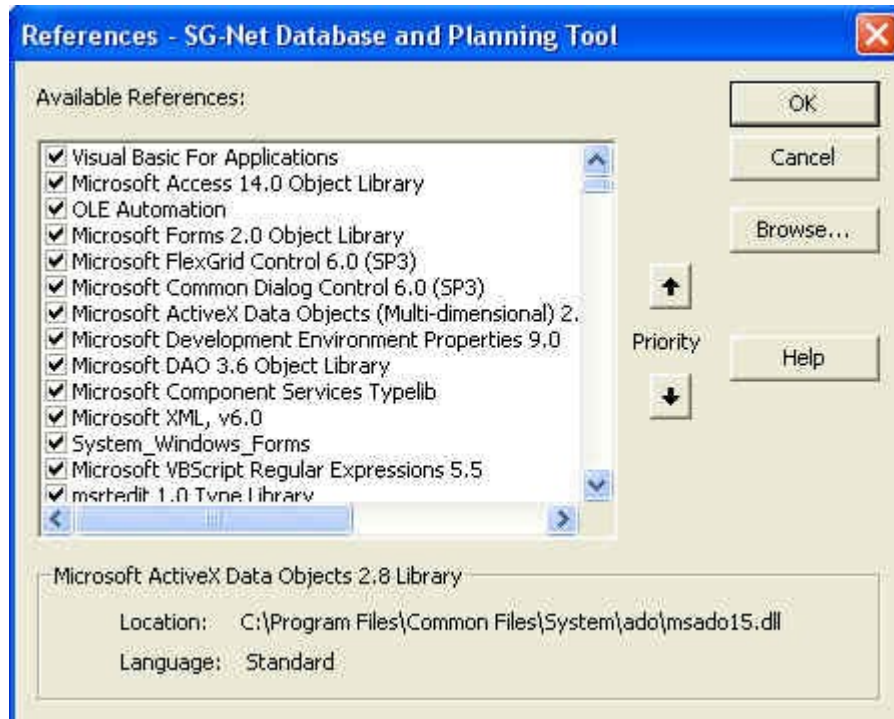
The charts and grid displays may create difficulties for some users as they require the user have on their computer a number of Active X controls. Most of these will be resident by default by anyone using Microsoft Office.

In order to establish whether or not anything is missing, the user can install the Access database, and load the database file provided through SG-Networks. Selecting Modules takes the user to the area where VBA is supported. Opening any one of those modules will yield a screen that looks something like the following graphic.



When this screen is reached, selecting Tools-References will lead to a screen such as the following.

1 TM designates trademarked items, and are shown in this document with owner names.



If any of these items have the word **MISSING** at the beginning of their description, an Active X control is missing and will have to be supplied externally.

For the Grid Display, the relevant file is [msflxgrd.ocx](#) while for the chart, the appropriate file is [mschrt20.ocx](#). IF they do not exist on the user's computer, it will be necessary to find them, put them on the computer, then use the Browse button to find them in order to eliminate the **MISSING** labels.

The Software License

Each routine in the software bears a copy of the license statement as shown here.

'Copyright (C)Micronet Communications, Inc., 2010, Author: Jerry Armes (jarmes@micronetcom.com) This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or any later version. This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

The Utility Profile

A profile capability has been included that allows anyone to establish a set of parameters, define it as a project, and analyze alternative scenarios based on that set of data. Multiple individuals within a Utility can establish unique profiles, and each individual can establish multiple profiles for examination of What-If scenarios.

The profile form contains four tabs that hold parameters for Metering, Customers, Substations, and Infrastructure Calculations.

When the user is finished with a given set of parameters, the profile can be updated in the database, a report can be generated, and the data can be exported to a CSV file.

The Metering Tab

The form as shown here has Electric Meter quantities on the left, Gas Meter quantities in the center, and System Parameters to support traffic analysis of metering payloads on the right

The screenshot shows a Microsoft Access form titled "UtilityProfile : Form" with a menu bar (File, Edit, View, Insert, Format, Records, Tools, Window, Help) and a toolbar. The form is set to "Tahoma" and has a dropdown menu for "DFW-Metrolplex". There are buttons for "Export to CSV", "Report", and "Save to Utility Profile". A control group contains radio buttons for "Distributed Control" and "Centralized Control". The "Metering" tab is selected, showing a grid of parameters and their values:

Number Smart Meters	17000	Number Gas C/I Meters	4000	Number PHEV Meters Accessed Through EST Non-Smart Meter	24000
Number Smart Meters With NIC	5000	Number Gas Residential Meter	4900	Number PHEV Meters Accessed Through Smart Meter EST	6000
Number Smart Meters With EST	200	Number Meters That Lose Power Per Day	100	Number Utility Customer Premise Browser Users PrePay Enrollment Per Premise Meter	2500
Number of Electric C/I Meters	4000			Number Utility Customer Premise Browser Users PrePay UnEnrollment Per Premise Meter	7000
Number of Residential Electric Meters	20000			Number REP Customer Premise Browser Users PrePay Enrollment Per Premise Meter	8000
Total Number Electric Meters	15000			Number REP Customer Premise Browser Users PrePay UnEnrollment Per Premise Meter	4000
Number PHEV Meters	3000			Application Error Event Per Meter Per Day	5
Number PrePay Meters with IHD	2500			Number Switch Operations Per Meter Per Day	10000
Number PrePay Meters With Customer EMS	3000			Number Switch Operations Per PrePay Meter Per Day	2800
Number PrePay Enrollments	500			Number On-Demand Commands Per Meter Per Day	1000
Number PrePay Enrollments Per Day	15000			Number of Smart Meter Bulk Message Batches Per Day	2500
Number PrePay UnEnrollments Per Day	5000			Number of Smart Meters In Each Bulk Message Batch	25000
Number PHEV Meter Connections Per Day	3400				
Number PrePay Meters	5000				

Records: 1 of 1

The Customer Tab

While sparsely populated at the present, with only a few customer related quantities, a separate tab provides growth for later inclusion of HAN devices and traffic parameters.

The screenshot displays a Microsoft Access form titled "UtilityProfile : Form". The form is set to the "Customer" tab, with other tabs including "Metering", "Substations", "Field Devices", and "Infrastructure". The form contains several input fields for customer-related data:

DFW-Metrolplex	Export to CSV	Report	Save to Utility Profile	<input type="radio"/> Distributed Control	<input checked="" type="radio"/> Centralized Control
Metering Customer Substations Field Devices Infrastructure					
Number Customers with Utility EMS	<input type="text" value="1"/>				
Number Customers With Customer EMS	<input type="text" value="20000"/>				
Number Customers With JHD	<input type="text" value="9000"/>				
Number of Demand Response Customers	<input type="text" value="7600"/>				
Number PHEV Charging Events Per Day	<input type="text" value="10000"/>				

At the bottom of the form, there is a record navigation bar showing "Record: 1 of 1". The Windows taskbar at the bottom shows the Start button, several open applications (SGNetDb-WIP-3A-17..., UtilityProfile : Form, and Untitled - Paint), and the system clock showing 10:50 AM.

The Substations and Field Devices Tab

Substation quantities are included at the top left of this form, with related Distribution Field Devices and Field Area Network Gateways at the lower left.

System parameters to support traffic analysis of substation related payloads are shown in the center of the form.

The screenshot shows a Microsoft Access window titled "Microsoft Access - [UtilityProfile : Form]". The window has a menu bar (File, Edit, View, Insert, Format, Records, Tools, Window, Help) and a toolbar. Below the toolbar, there is a dropdown menu for "Tahoma" and a font size of "8". The main content area is divided into three sections:

- SUBSTATIONS**
 - Number Distribution Substations: 1000
 - Number Transmission Substations: 200
 - Total Number Substations: 1200
- DISTRIBUTION FIELD DEVICES**
 - Number Distribution Field Area Network (FAN) Gateways: 65
 - Number Distribution Regulators: 20
 - Number Capacitor Banks: 30
 - Number Distribution Field Sensors: 35
 - Number Distribution Sectionalizers: 40
 - Number Distribution Switches: 45
 - Number Distribution Reclosers: 50
 - Number Distribution Customer Storage Units: 55
 - Number Distribution Customer Generation Units: 60
 - Number Distribution DAC: 70
 - Number Distribution SCADA RTU: 75
 - Number Distribution Circuit Breakers: 75
- SYSTEM PARAMETERS**
 - Number of Daily Dispatch Periods for SubStation Distributed Storage Units: 1
 - Number of Substation Distributed Storage Unit Power Loss Events Per Day: 1
 - Number Field Devices Per Distribution Substation: 575
 - Number Field Devices Per Transmission Substation: 0

At the bottom of the window, there is a status bar showing "Records: 1 of 1" and a taskbar with the Start button and several open applications: "SQLNetDb-WIP-3A-17...", "Microsoft Visual Basic...", "UtilityProfile : Form", and "untitled - Paint". The system clock shows "11:01 AM".

The Infrastructure Tab

Implicit in the calculations shown on this tab is the assumption that wireless coverage facilities for Automatic Metering Infrastructure (AMI) networks, Substation Networks, Field Area Networks (FAN), etc. will often be placed on substation properties simply because the utility already owns or leases these properties. While this will not always be the case, often it will be.

Microsoft Access - [UtilityProfile : Form]

File Edit View Insert Format Records Tools Window Help

Tahoma 8 B I U

DFW-Metroplex Export to CSV Report Save to Utility Profile Distributed Control Centralized Control

Metering Customer Substations Infrastructure

UTILITY		SYSTEM PARAMETERS	
Project	DFW-Metroplex	Number Firmware Upgrades Per Month	5
Author	Jerry Armes	Number DAP Update Events Per Day	6800
Company	Micronet	Number In-scope Faulted Primary Circuit (with tie circuits) Reconfig Switch Devices	2
Utility Service Area (Square Miles)	9286	Number Zone Isolation Steps	3

ELECTRIC METERS		SUBSTATIONS		PHEV	
Total Number Electric Meters	2212000	Total Number Substations	1200	Total Number PHEV	3000
Average Number Electric Meters Per Square Mile	236.9	Average Number Substations Per Square Mile	.1	Average Number PHEV Per Square Mile	.3
Average Meter to Meter Separation Distance (Miles)	.15	Average Substation to Substation Separation Distance (Miles)	6.3	Average PHEV Coverage Area	3.1
Average Coverage Area (Square Miles) Per Meter	.004	Average Coverage Area Per Substation (Square Miles)	7.7	Average Distance Between PHEV Locations (Miles)	.7
Average Radius (Miles) of Each Meter Coverage Area	.07	Average Substation Service Area Radius (Miles)	3.1	Average Number PHEV per DAP	10.0

GAS METERS		DATA AGGREGATION POINTS (DAPS)	
Number C/I Gas Meters	4000	Total Number DAPS	300
Number Residential Gas Meters	4900	Average Number Meters Per DAP	7333.3
Total Number Gas Meters	12000	Average Number DAPS Per Square Mile	.0
		Average Coverage Area Per DAP (Square Miles)	31.0
		Average Radius (Miles) of Each DAP Coverage Area	6.3
		Average Distance (Miles) Between DAP Locations	12.6

Records: 1 of 1

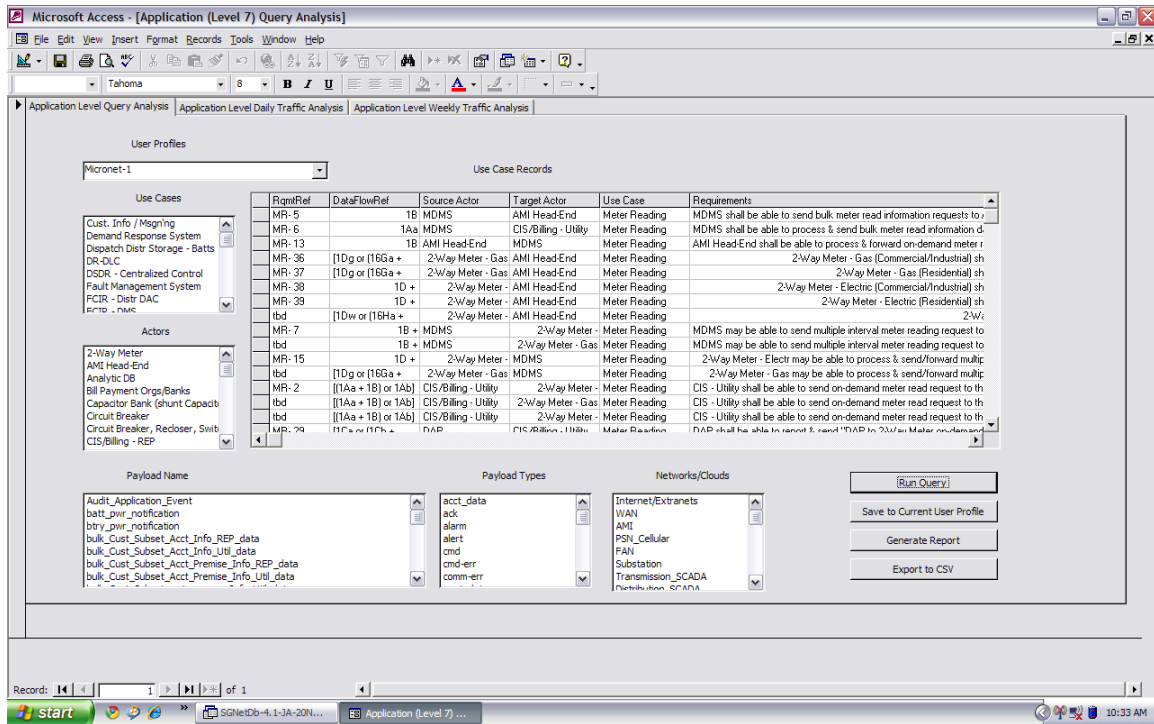
Start | SQNetDB-WIP-3A-17... | UtilityProfile : Form | untitled - Paint | 11:28 AM

Queries

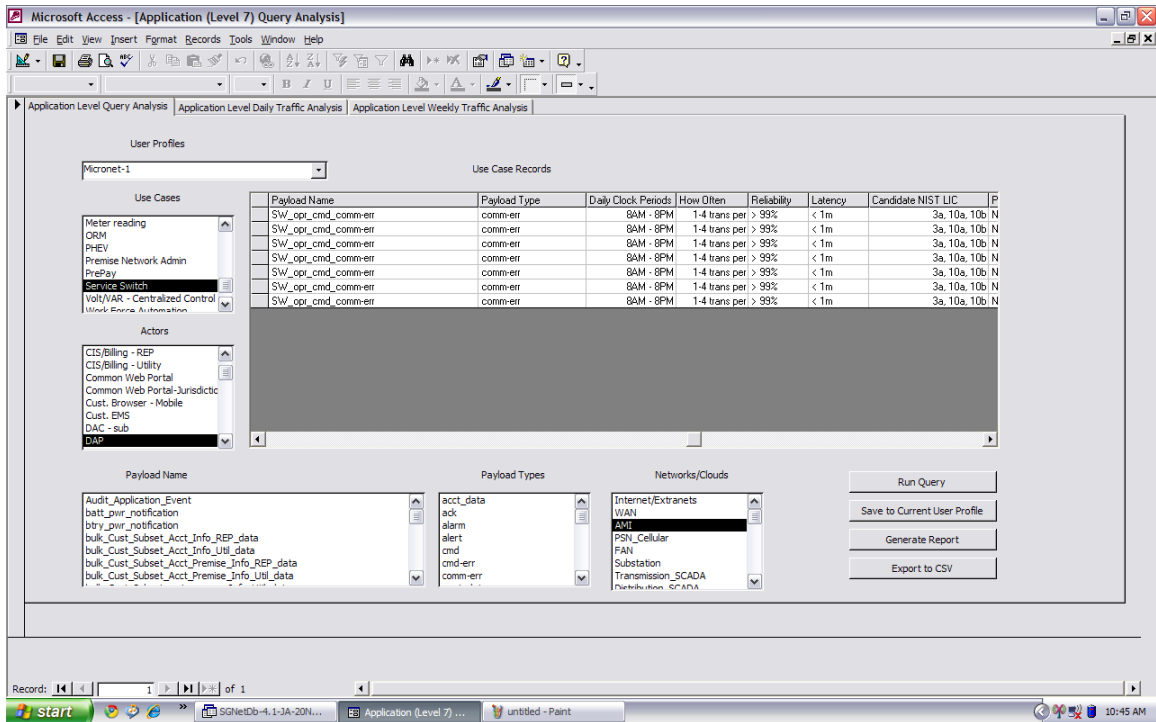
Three form-based queries are provided that allow the user complete flexibility in selecting those Use Cases, Actors, Payloads, Payload Types, and Network Cloud Crossings of interest. These are addressed individually.

Application Level Query Analysis

When no parameters are selected by the user, the resulting query is unfiltered, and presents everything in the underlying table as an output.



When selections are made, as shown in the following screen, the number of records that meet all of the stipulations called out by this user naturally results in a much smaller number of output records.



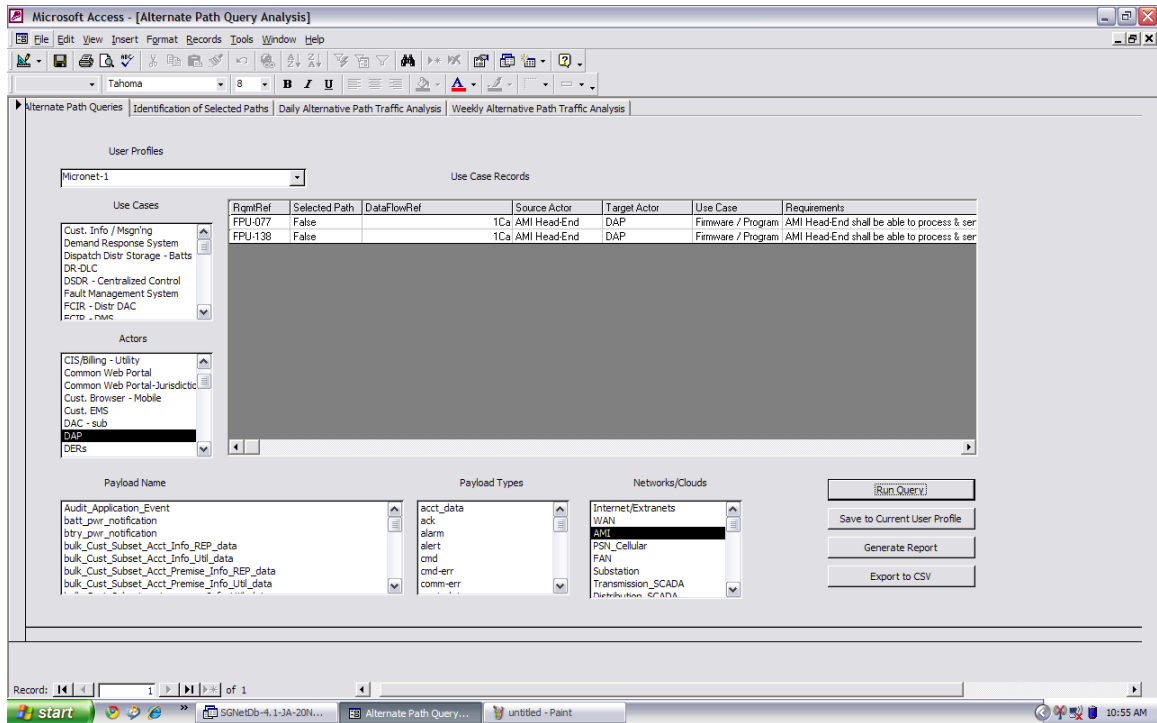
The application level query is completely operational, including cloud crossings as well as Use Cases, Actors, Payloads, and Payload types.

Traffic Analysis

While traffic analysis placeholder graphics have been placed on tabs behind the Application Level Query and the Alternative Path Query, they are not operational as of this writing.

The Traffic Analysis code for these forms will be substantially the same as that used in the Traffic Analysis of the Network Level Query Analysis Form. That modeling is not complete as many record formats are currently not recognized by the parsing routines within the traffic analysis. Consequently, the rationale is simply to complete the modeling on this form, then migrate it to the other two forms.

Alternate Path Application Level Query Analysis



The alternate path query is completely operational, including cloud crossings as well as Use Cases, Actors, Payloads, and Payload types.

Traffic Analysis

While traffic analysis placeholder graphics have been placed on tabs behind the Alternate Path Application Level Query, they are not operational as of this writing.

Alternate Path Selection by the User

A request for graphical selection of alternate paths has been made, and a placeholder tab has been added to support that. At this time, that feature is not complete.

Network Level Query Analysis

The network level query examines records from the Network_Connections table. These are considered child records in the sense that they map the connections between actors at the network level. Consequently, for each parent record at the Application level, there will typically be several interim child records that define the intermediate actor-actor communications for the network.

This analysis should be limited to network designers, as without judicious selection of query parameters, one can easily double or triple count the same traffic flow as it proceeds along the path through multiple successive actors.

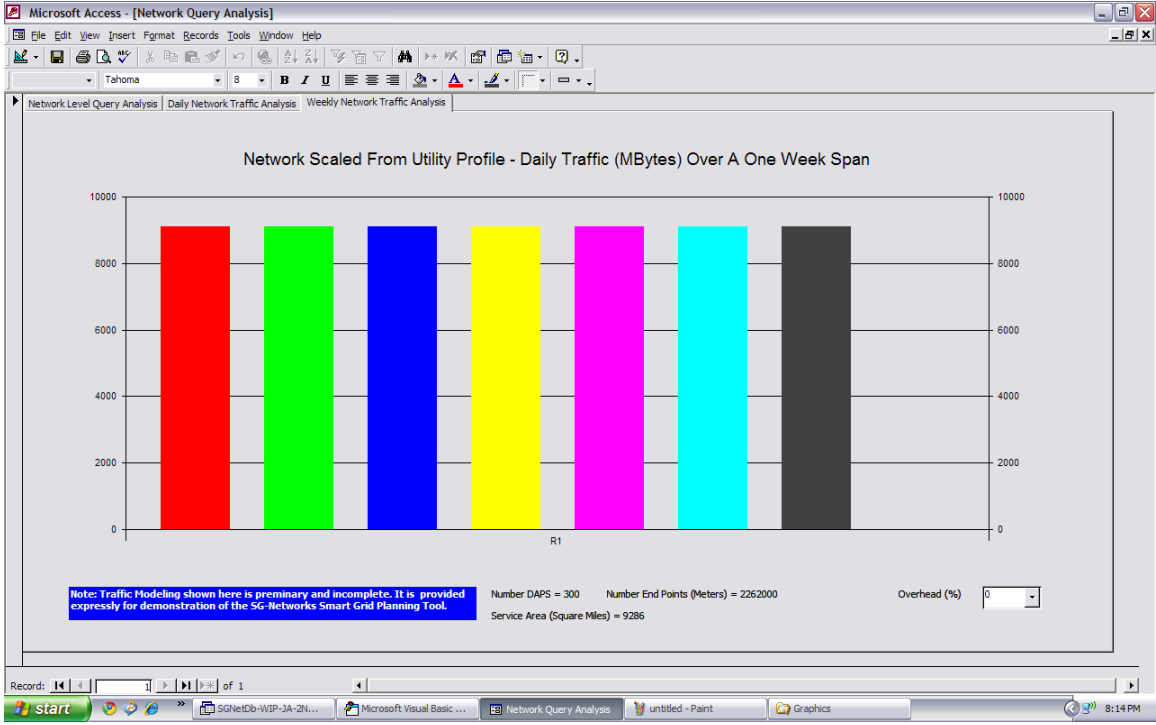
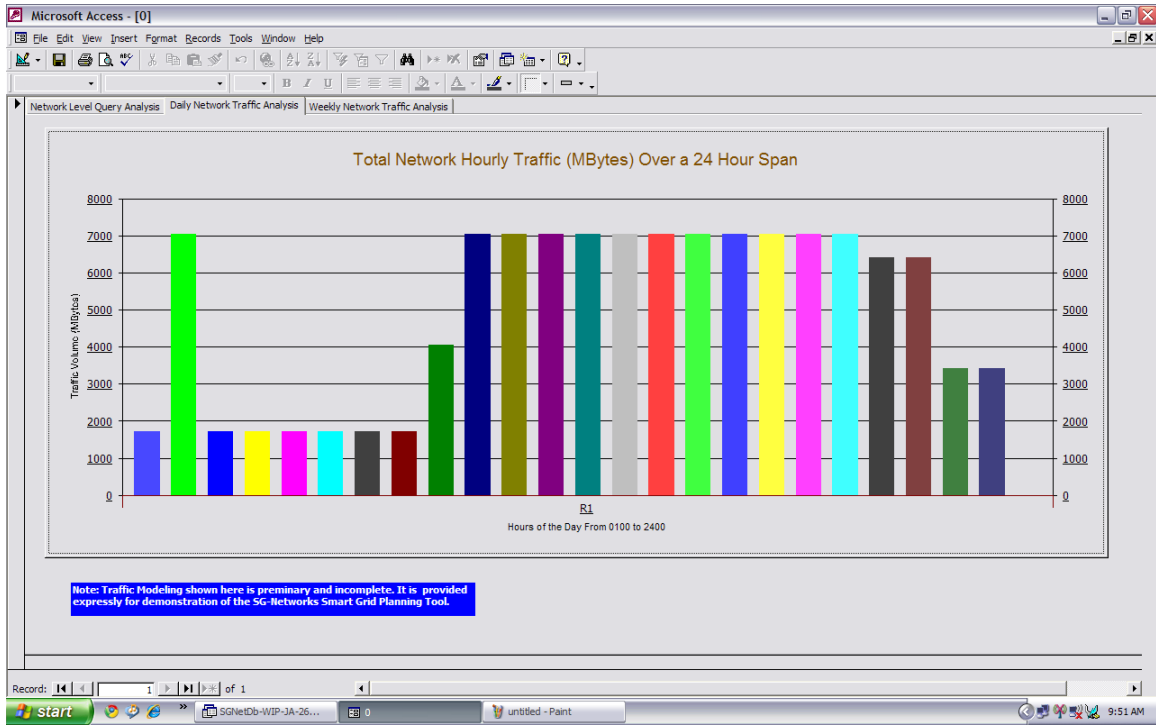
FromRef	DataFlowRef	Source Actor	Target Actor	Use Case	Requirements
MR-32	1Dg	2Way Meter - Gas	DAP	Meter Reading	2Way Meter - Gas (Commercial/Indus
tbd	185a	2Way Meter - Gas	ESI - Smart Meter	Meter Reading	2Way Meter - Gas C/I shall be
tbd	58a	ESI - Smart Meter	DAP	Meter Reading	ESI - Smart Meter shall be able to send multi interval data meter reads de
tbd	186b	2Way Meter - Gas	ESI - Utility	Meter Reading	2Way Meter - Gas C/I sh
tbd	58b	ESI - Utility	DAP	Meter Reading	ESI - Utility shall be able to send multi interval data meter reads data to D
MR-58	1Ca	DAP	AMI Head-End	Meter Reading	DAP shall be able to forward 2Way Meter - Gas (Commercial/Industrial)
MR-59	1Cb	DAP	Internet / Extranet	Meter Reading	DAP shall be able to process & forward 2Way Meter - Gas (Commercial/
MR-60	1Cc	DAP	Internet / Extranet	Meter Reading	DAP shall be able to process & forward 2Way Meter - Gas (Commercial/
MR-61	1Cb	Internet / Extranet	AMI Head-End	Meter Reading	Internet / Extranet gateway(s) - Utility shall be able to inspect & forward 2
MR-33	1Dg	2Way Meter - Gas	DAP	Meter Reading	2Way Meter - Gas (Resider
tbd	185a	2Way Meter - Gas	ESI - Smart Meter	Meter Reading	2Way Meter - Gas (Residential) shall be
tbd	58a	ESI - Smart Meter	DAP	Meter Reading	ESI - Smart Meter shall be able to send multi interval data meter reads de
tbd	186b	2Way Meter - Gas	ESI - Utility	Meter Reading	2Way Meter - (Residential) sh
tbd	58b	ESI - Utility	DAP	Meter Reading	ESI - Utility shall be able to send multi interval data meter reads data to D
MR-62	1Ca	DAP	AMI Head-End	Meter Reading	DAP shall be able to forward 2Way Meter - Gas (Residential) multiple-int
MR-63	1Cb	DAP	Internet / Extranet	Meter Reading	DAP shall be able to process & forward 2Way Meter - Gas (Residential) sh

The alternate path query is completely operational, including cloud crossings as well as Use Cases, Actors, Payloads, and Payload types.

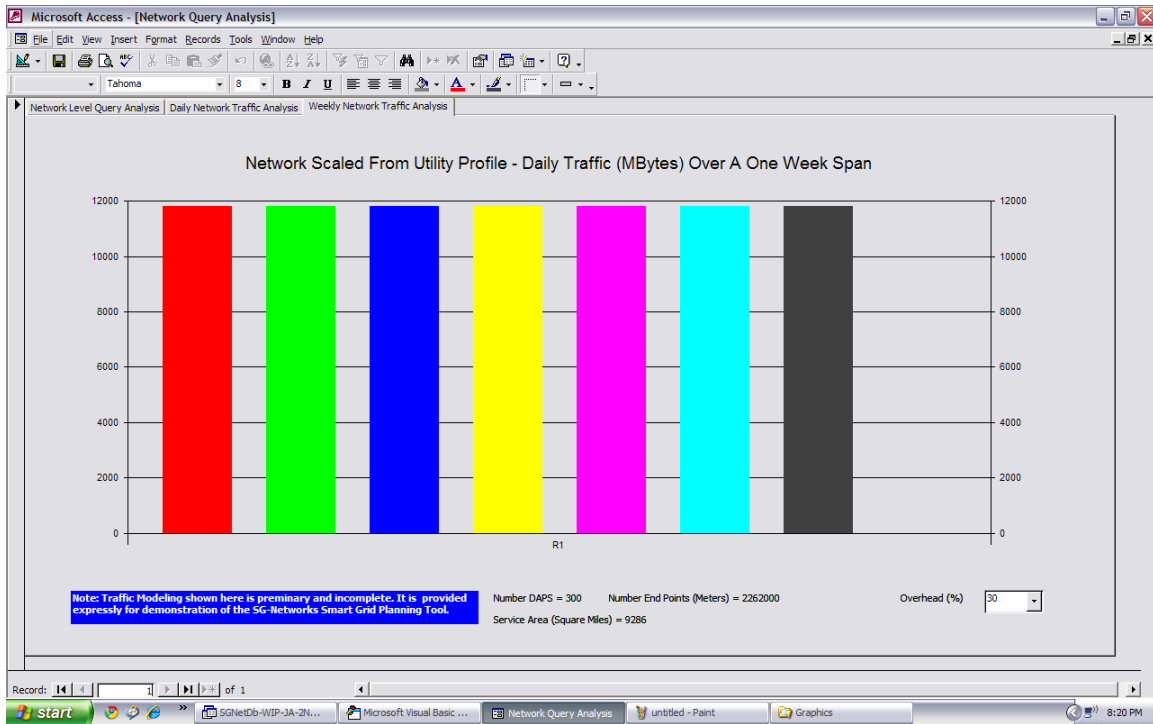
Traffic Analysis

The traffic analysis for a twenty four hour day is shown on the next screen with no filters applied. Following that is the traffic analysis over a week, where each day has been compressed into a single bar. These capabilities show primarily the approach being taken. The underlying modeling of the traffic flows is not complete as of this writing.

Network Level Traffic over 24 Hour Period



Notice the Overhead setting at the lower right. Since the payloads defined in SG-Networks are done at the Application level, no network overhead is applied. With this parameter, it becomes possible to explore scenarios at various levels of network overhead. For example, a plot of weekly traffic with 30% overhead is given here.



One excellent suggestion planned was to add the overhead as a separate series in a stacked bar format. That feature has not yet been implemented as of this writing.

The Database

The SG-Net Database provides a vehicle for organizing and documenting a high level of detail in Use Case records generated by the SG-Net Task Force within the Open SG Users Group. The version number on this release, Version V4.0, simply indicates that the corresponding database is current with Version 4 of the System Requirements spreadsheet.

Details of individual message payloads traveling across the Smart Grid network are well documented in an Excel-based system requirements spreadsheet file. The Data Flow Reference summarizes alternative paths, shown on the System Diagram, as to how a given message may travel across the network.

Parent rows contain a comprehensive description of the Application level connections between a Source Actor and a Target Actor for the delivery of a specific payload message.

A Data Flow Reference column documents the requirements of each message, including the alternative paths that can be used in message delivery. The data flow reference includes "+" and OR statements to describe both the primary and alternative paths.

Parsing software in the database breaks down the Data Flow Reference column into each of the alternative paths that can carry a given message across the Smart Grid, and places them in a separate table, where each record is indexed to its parent record. The details of the parsing process are discussed in Appendix A.

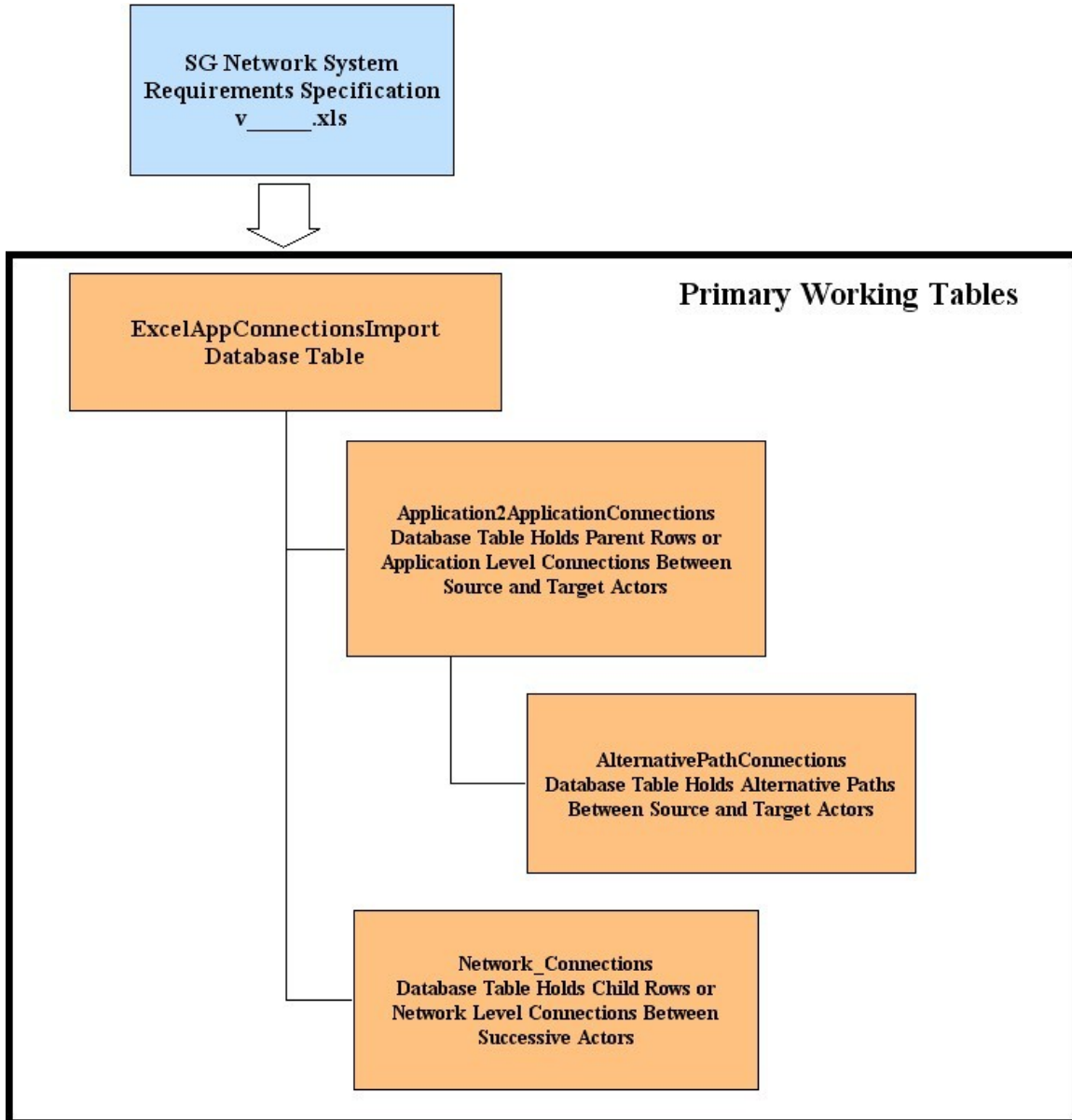
Under normal usage, there is no requirement for a user to run any software. This is strictly provided to support the input of new data into the database from a system requirements spreadsheet.

Child rows in the spreadsheet contain each of the individual Actor-Actor connections required to implement parent row (Application Level) connections.

The working tables that support these processes are shown in the next section.

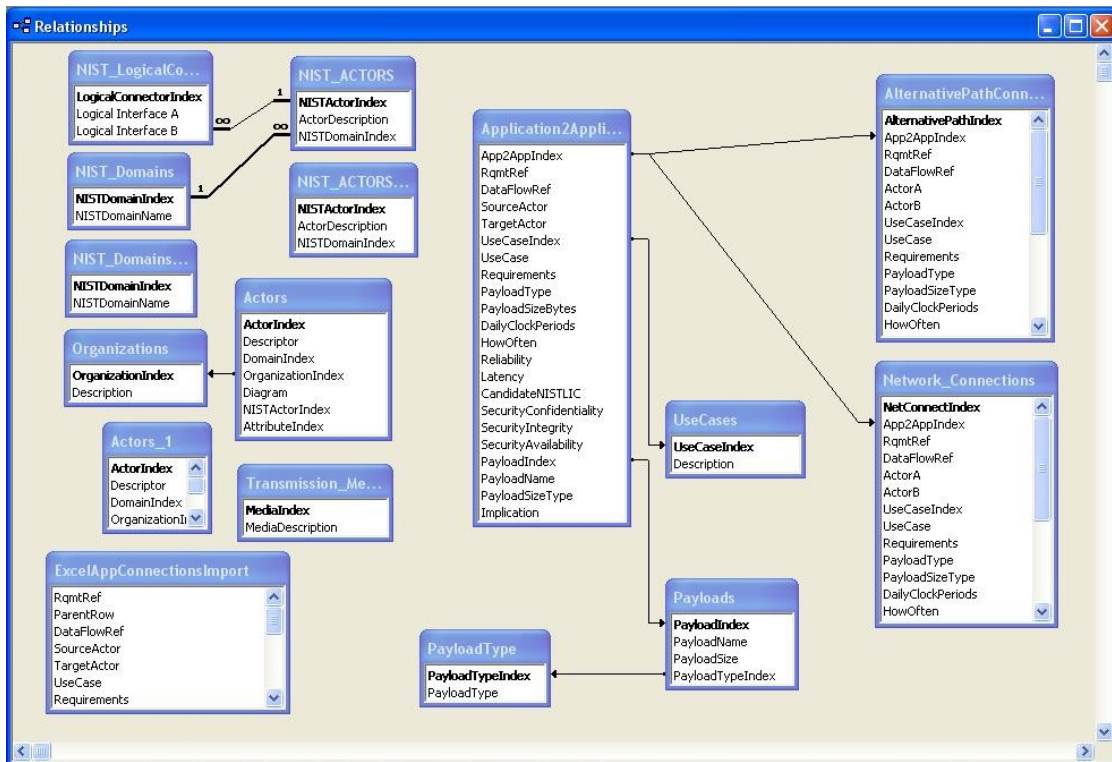
Database Organization

The database is organized to allow the contents of a System Requirements Excel file to be pasted into an input table, where internal software can process the information, move to other tables, support queries, etc. The primary working tables are shown here.



Database Structure

A schema diagram shows the input table at the lower left, along with the Application2ApplicationConnections table holding the parent rows. Note that both the Network_Connections and AlternativePathConnections tables are indexed back to the Application2ApplicationConnections parent table. In addition, tables exist for tracking Use Case descriptions, Actors, Payloads and Payload Types. The tables also support tracking the origins of the work being done with linkages back to the original NIST actors and domains.



Summary

As PAP2 draws to a close, this work has come to a halt, with substantial amounts yet to be done by the next group that assumes the task. The parsing of the Data Flow Records for Release 4.1 of the System Requirements is complete, resulting in nearly 1100 alternate path records in the AlternativePathConnections table.

The traffic analysis is functional in the Network Level Query Analysis, but does not include nearly all of the Use Case records, so this is an area where a significant effort awaits.

A graphical user interface (GUI) for selection of appropriate alternative path records by a given utility has been discussed, but not started, so this too is left to the next effort.

The Utility Profile index provides a common key to the stored records of any given user, including analysis outputs from multiple forms. When the traffic analysis is complete, a logical task at that point will be to generate one or more comprehensive reports summarizing the work saved by any given user.

The work done here used the 2000 version of Microsoft Access, and this runs well on versions up to 2003. Tests on the 2010 version of Access reveal that the ActiveX controls used are no longer supported, so migration to later versions of Access will take some redevelopment.

Considering that modeling in VBA puts the user at the mercy of the upgrade path of Access, probably a much better approach is to use the data tables produced under this work, and move the analytical studies up to a language such as C# or VB. This will gain more flexibility in the modeling and ease the transition to a web-based user interface as well as avoiding the Access migration limitations.

Appendix A: Data Parsing Documentation

A number of tables and related software routines have been developed to support this effort. The starting point is a table named *ExcelAppConnectionsImport*. This table should be initially cleared by erasing all rows of data in it. Then the rows of the Excel Spreadsheet making up the current version of the SG Network System Requirements Specification Excel spreadsheet file can be copied and pasted into the *ExcelAppConnectionsImport* table. It is worth noting that while *ExcelAppConnectionsImport* table is not an indexed table, all other tables in the database are auto-indexed for data integrity.

Upon successful completion of this paste operation, it is necessary to scan this table for Null Fields as there will be empty cells in the ***SG Network System Requirements Specification*** Excel spreadsheet file. Running the Module named ***ScanForNull***, examines each field in the ***ExcelAppConnectionsImport*** table and inserts "tbd" into any Null fields.

The next routine to be run is called Table Mapper. This routine searches the ***ExcelAppConnectionsImport*** table, and maps both the Parent and Child Rows to two additional tables. Parent rows are placed in the ***Application2ApplicationConnections*** table while Child rows are placed in the ***Network_Connections*** table.

In both of these tables, the exact bracket nomenclature from the ***SG Network System Requirements Specification*** Excel spreadsheet file are maintained.

For further analysis of the Parent Rows, an additional working table is provided named ***Application2ApplicationWithBracketHierarchy***.

Mapping into this table from the ***ExcelAppConnectionsImport*** table is done with a Module named ***TableMapperWHierarchy***. To ensure data consistency across various authors, a routine named ***ReBracket*** is used to standardize the brackets for various levels in accordance with the following table.

Bracket Level	Bracket Type
Level 1	[]
Level 2	{ }
Level 3	()
Level 4	< >
Level 5	\$ %
Level 6	/ \
Level 7	- _
Level 8	: ;
Level 7	^ ~
Level 8	· ,

Data Parsing

Since the parent rows describing application-to-application connections often contain alternative routing, it is desirable to break these down into the alternative specific routes the message may travel. This is done using a routine called DFR_Parser.

This routine has to accomplish two things. First, a parsing operation is done to extract each of the data segments of the Data Flow Record (DFR) and isolate them for later use in building alternative routes. However, to support the reconstruction process, their bracket levels, aggregations (+) and OR statements must be carefully logged.

The second operation is the construction of the individual alternative routes and mapping of them to the **AlternativePathConnections** table.

Finally the records in the **AlternativePathConnections** table represent alternative paths as first recorded in the **SG Network System Requirements Specification** Excel spreadsheet file and mapped to the **Application2ApplicationConnections** table.

However, they were generated by analysis of the **Application2ApplicationWithBracketHierarchy** table and consequently are indexed to that table.

Since queries and reports will need to maintain the original bracket formatting of the **Application2ApplicationConnections** table, it is essential that the indexes of the records in the **AlternativePathConnections** table reflect the parent record in the **Application2ApplicationConnections** table and not the **Application2ApplicationWithBracketHierarchy** table.

A module to accomplish this task has been written and named **RePoint**.

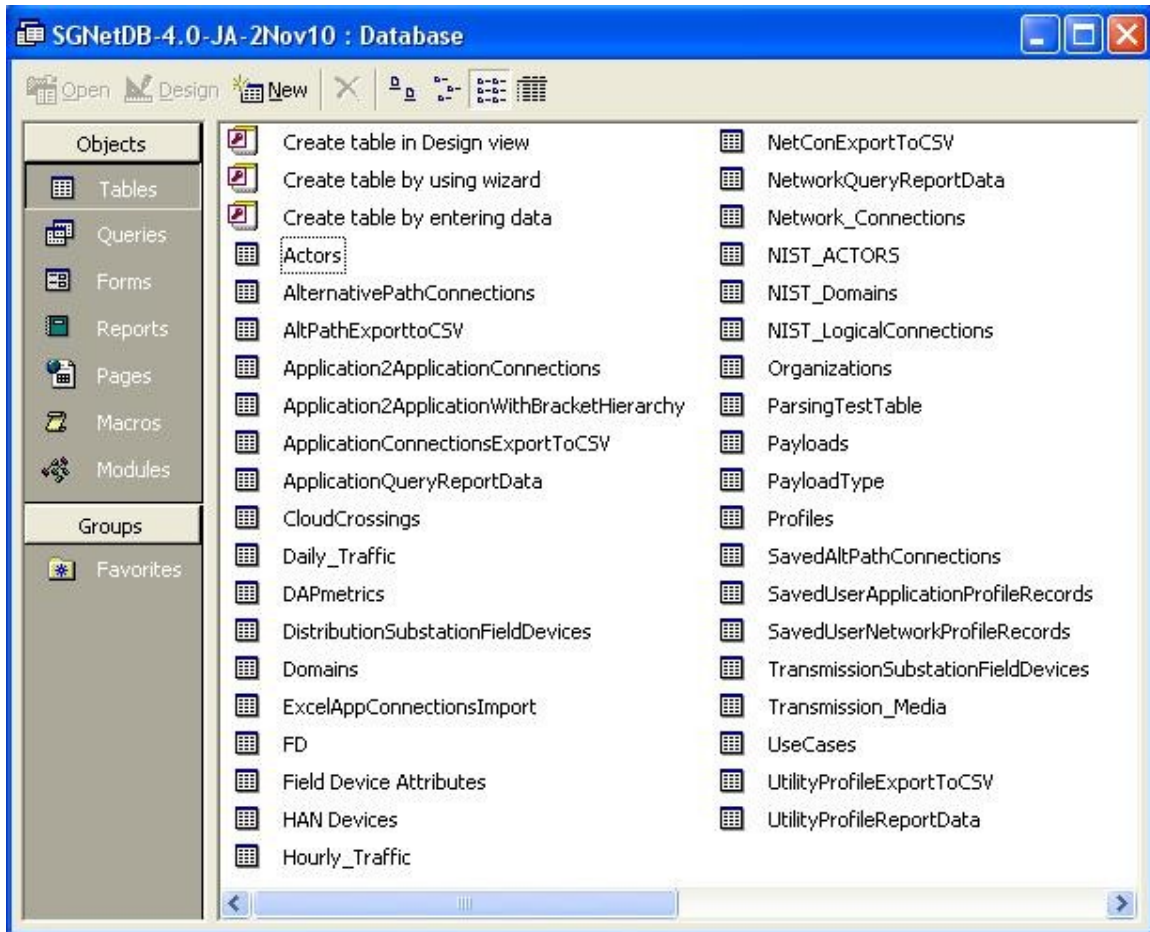
Software License

Each software routine in the database includes the following license statement.

Copyright (C)Micronet Communications, Inc., 2010, Author: Jerry Armes (james@micronetcom.com) 'This program is free software; you can redistribute it and/or modify it under the terms of the 'GNU General Public License as published by the Free Software Foundation; 'either version 2 of the License, or any later version.

'This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; 'without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. 'See the GNU General Public License for more details. 'You should have received a copy of the GNU General Public License along with this program; 'if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, 'Boston, MA 02111-1307 USA

Appendix B: Table Documentation



Actors

This auto-indexed table holds descriptions of all of the system actors as defined by SG-Network. These are not necessarily the same as the original actors as proposed by NIST, which are described in the NIST_ACTORS table. An index is included in the Actors table to allow linkage to NIST_ACTORS when the definitions are comparable. Another index is included to allow linkage to the Domains table. Provision has been made for English Names to be assigned to the actors, and provision also exists to designate whether or not each actor is included in the Systems Requirement Specification (SRS). Finally, an attribute index has been included for future growth, wherein an Actors Attributes table can be added in the future if needed, for use in detailed analysis and/or simulations.

Actors : Table	
Field Name	Data Type
ActorIndex	AutoNumber
Descriptor	Text
DomainIndex	Number
OrganizationIndex	Number
Diagram	Yes/No
EnglishName	Text
InSRS	Yes/No
NISTActorIndex	Number
AttributeIndex	Number

AlternativePathConnections

When Application level (Level 7) connections are made defining the transmission of a given Payload message originated by a Source Actor and delivered to a Target Actor, a parent record will be entered into the System Requirements Spreadsheet, and the Data Flow Reference will be a complex equation that defines multiple alternative routes that the payload can travel across the network. When the data from the System Requirements Spreadsheet is read by the parsing software of Appendix A, it breaks down this complex Data Flow Reference into discrete components, each of which is a unique path across the grid. These individual paths are mapped to the AlternativePathConnections table by the parsing software. Ultimately, the user will be able to select desired paths from this table to be implemented in a given utility's network design.

AlternativePathConnections : Table			
	Field Name	Data Type	
🔑	AlternativePathIndex	AutoNumber	Index for Alternative Path Connections at the Applications Level
	PathSelector	Yes/No	
	App2AppIndex	Number	
	RqmtRef	Text	
	DataFlowRef	Memo	
	ActorA	Text	
	ActorB	Text	
	UseCaseIndex	Number	
	UseCase	Text	
	Requirements	Memo	
	PayloadType	Memo	
	PayloadSizeType	Text	
	DailyClockPeriods	Memo	
	HowOften	Memo	
	Reliability	Memo	
	Latency	Text	
	CandidateNISTLIC	Text	
	PayloadIndex	Number	
	PayloadName	Text	
	PayloadSizeBytes	Text	
	SecurityConfidentiality	Text	
	SecurityIntegrity	Text	
	SecurityAvailability	Text	
▶	Implication	Memo	

AltPathExporttoCSV

This table supports the process of generating a CSV file from a user-configured query of the AlternativePathConnections table. When the Export to CSV button is pressed on the form entitled *Alternate Path Application Level Query Analysis* the software writes the results of the query to this table. A separate function is then called that reads the table and generates the CSV file.

AltPathExporttoCSV : Table	
Field Name	Data Type
PathSelector	Yes/No
App2AppIndex	Number
RqmtRef	Text
DataFlowRef	Memo
SourceActor	Text
TargetActor	Text
UseCaseIndex	Number
UseCase	Text
Requirements	Memo
PayloadType	Memo
PayloadSizeType	Text
DailyClockPeriods	Memo
HowOften	Memo
Reliability	Memo
Latency	Text
CandidateNISTLIC	Text
PayloadIndex	Number
PayloadName	Text
PayloadSizeBytes	Text
SecurityConfidentiality	Text
SecurityIntegrity	Text
SecurityAvailability	Text
Implication	Memo

Application2ApplicationConnections

When Application level (Level 7) connections are made defining the transmission of a given Payload message originated by a Source Actor and delivered to a Target Actor, a parent record will be entered into the System Requirements Spreadsheet, and the Data Flow Reference will be a complex equation that defines multiple alternative routes that the payload can travel across the network. These parent records are mapped to the Application2ApplicationConnections table by the parsing software.

Application2ApplicationConnections : Table		
	Field Name	Data Type
▶	App2AppIndex	AutoNumber
	RqmtRef	Text
	DataFlowRef	Memo
	SourceActor	Memo
	TargetActor	Memo
	UseCaseIndex	Number
	UseCase	Text
	Requirements	Memo
	PayloadType	Memo
	PayloadSizeBytes	Text
	DailyClockPeriods	Memo
	HowOften	Memo
	Reliability	Memo
	Latency	Text
	CandidateNISTLIC	Text
	SecurityConfidentiality	Text
	SecurityIntegrity	Text
	SecurityAvailability	Text
	PayloadIndex	Number
	PayloadName	Text
	PayloadSizeType	Text
	Implication	Memo

Application2ApplicationWithBracketHierarchy

Table holds the Parent Application Level End-To-End Paths that represent logical connections across the network, although the brackets have been organized in accordance with the bracket level in order to facilitate parsing of the data for generation of Alternative Paths for each Parent logical connection.

Field Name	Data Type
App2AppIndex	AutoNumber
RqmtRef	Text
DataFlowRef	Text
SourceActor	Text
TargetActor	Text
UseCaseIndex	Number
UseCase	Text
Requirements	Memo
PayloadType	Memo
PayloadSizeBytes	Text
DailyClockPeriods	Memo
HowOften	Memo
Reliability	Memo
Latency	Text
CandidateNISTLIC	Text
SecurityConfidentiality	Text
SecurityIntegrity	Text
SecurityAvailability	Text
PayloadIndex	Number
PayloadName	Text
PayloadSizeType	Text
Implication	Memo

ApplicationConnectionsExportToCSV

When the user runs the Application Level Query Analysis form, a button is available on the form labeled **Export to CSV**. Pressing it causes the contents of this table to be erased. It is replaced by the contents of the query in memory. Since the contents are continually erased to make way for the next export, there is no unique index assigned to the record.

A separate routine reads the table and generates the CSV export file.

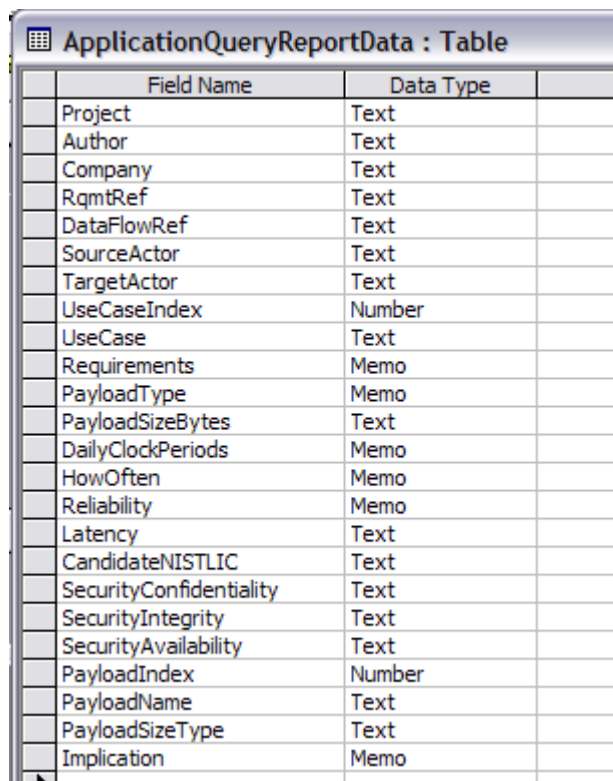
ApplicationConnectionsExportToCSV : Table		
Field Name	Data Type	
RqmtRef	Text	
DataFlowRef	Text	
SourceActor	Text	
TargetActor	Text	
UseCaseIndex	Number	
UseCase	Text	
Requirements	Memo	
PayloadType	Memo	
PayloadSizeBytes	Text	
DailyClockPeriods	Memo	
HowOften	Memo	
Reliability	Memo	
Latency	Text	
CandidateNISTLIC	Text	
SecurityConfidentiality	Text	
SecurityIntegrity	Text	
SecurityAvailability	Text	
PayloadIndex	Number	
PayloadName	Text	
PayloadSizeType	Text	
Implication	Memo	

ApplicationQueryReportData

When the user runs the Application Level Query Analysis form, a Report button is available on the form. When the Report button is pressed, the contents of this table are erased, and the contents of the query in memory is written to this database table. Since the contents are continually erased to make way for the next report, there is no unique index assigned to the record.

A report linked to the table is run to actually generate the report.

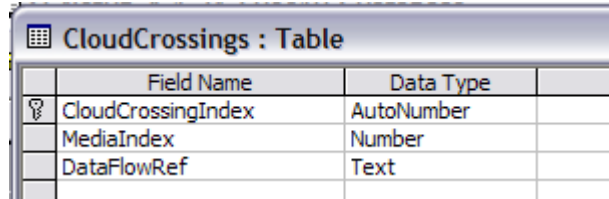
The fields of the table are as follows:



Field Name	Data Type
Project	Text
Author	Text
Company	Text
RqmtRef	Text
DataFlowRef	Text
SourceActor	Text
TargetActor	Text
UseCaseIndex	Number
UseCase	Text
Requirements	Memo
PayloadType	Memo
PayloadSizeBytes	Text
DailyClockPeriods	Memo
HowOften	Memo
Reliability	Memo
Latency	Text
CandidateNISTLIC	Text
SecurityConfidentiality	Text
SecurityIntegrity	Text
SecurityAvailability	Text
PayloadIndex	Number
PayloadName	Text
PayloadSizeType	Text
Implication	Memo

CloudCrossings

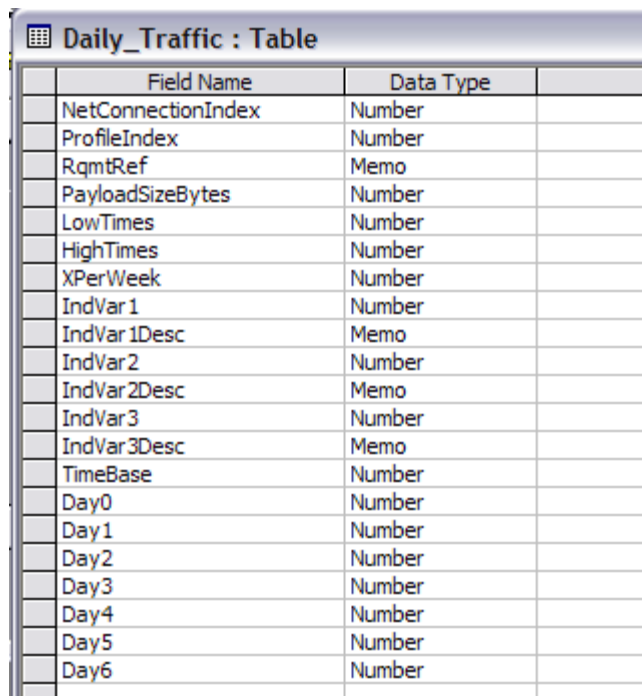
The cloud crossing table holds the Actor-Actor links that cross any given media or cloud.



	Field Name	Data Type	
	CloudCrossingIndex	AutoNumber	
	MediaIndex	Number	
	DataFlowRef	Text	

Daily_Traffic

When the user generates a query using the Network Level Query Analysis form, a traffic analysis of an average seven day week is generated along with the query, and plotted on a graph located on a tab behind the query form tabular display. The daily traffic data levels are stored in this table



	Field Name	Data Type	
	NetConnectionIndex	Number	
	ProfileIndex	Number	
	RqmtRef	Memo	
	PayloadSizeBytes	Number	
	LowTimes	Number	
	HighTimes	Number	
	XPerWeek	Number	
	IndVar 1	Number	
	IndVar 1Desc	Memo	
	IndVar 2	Number	
	IndVar 2Desc	Memo	
	IndVar 3	Number	
	IndVar 3Desc	Memo	
	TimeBase	Number	
	Day0	Number	
	Day1	Number	
	Day2	Number	
	Day3	Number	
	Day4	Number	
	Day5	Number	
	Day6	Number	

Domains

This table was originally created to allow the flexibility of adding additional domains by SG-Networks if appropriate. As of this writing, the table is still a mirror image of the NIST_Domains table.

	Field Name	Data Type	
🔑	DomainIndex	AutoNumber	
	DomainName	Text	

ExcelAppConnectionsImport

This table is used as the starting point for all analysis work done by this tool. The rows from the Excel Spreadsheet holding the System Requirements are pasted into a blank version of this table. The table is not indexed.

	Field Name	Data Type	
	RqmtRef	Text	
	ParentRow	Text	
	DataFlowRef	Memo	
	SourceActor	Text	
	TargetActor	Text	
	UseCase	Text	
	Requirements	Memo	
	Payload_Name	Text	
	PayloadType	Text	
	DailyClockPeriods	Memo	
	HowOften	Memo	
	Reliability	Memo	
	Latency	Text	
	CandidateNISTLIC	Text	
	SecurityConfidentiality	Text	
	SecurityIntegrity	Text	
	SecurityAvailability	Text	
	PayloadSizeType	Text	
	PayloadSizeBytes	Text	
	Implication	Memo	

Hourly_Traffic

When the user generates a query using the Network Level Query Analysis form, a traffic analysis of an average twenty-four hour day is generated along with the query, and plotted on a graph located on a tab behind the query form tabular display. The hourly data levels are stored in this table.

Hourly_Traffic : Table		
Field Name	Data Type	
NetConnectionIndex	Number	
ProfileIndex	Number	
RqmtRef	Memo	
BeginHour 1	Number	
EndHour 1	Number	
BeginHour 2	Number	
EndHour 2	Number	
PayloadSizeBytes	Number	
LowTimes	Number	
HighTimes	Number	
IndVar 1	Number	
IndVar 1Desc	Memo	
IndVar 2	Number	
IndVar 2Desc	Memo	
IndVar 3	Number	
IndVar 3Desc	Memo	
TimeBase	Number	
Hour0000	Number	
Hour0100	Number	
Hour0200	Number	
Hour0300	Number	
Hour0400	Number	
Hour0500	Number	
Hour0600	Number	
Hour0700	Number	

Hourly_Traffic : Table		
Field Name	Data Type	
Hour0800	Number	
Hour0900	Number	
Hour 1000	Number	
Hour 1100	Number	
Hour 1200	Number	
Hour 1300	Number	
Hour 1400	Number	
Hour 1500	Number	
Hour 1600	Number	
Hour 1700	Number	
Hour 1800	Number	
Hour 1900	Number	
Hour 2000	Number	
Hour 2100	Number	
Hour 2200	Number	
Hour 2300	Number	

NetConExportToCSV

When the user runs the Network Level Query Analysis form, a button is available on the form labeled **Export to CSV**. Pressing it causes the contents of this table to be erased. It is replaced by the contents of the query in memory. Since the contents are continually erased to make way for the next export, there is no unique index assigned to the record.

A separate routine reads the table and generates the CSV export file.

Field Name	Data Type	
RqmtRef	Text	
DataFlowRef	Text	
SourceActor	Text	
TargetActor	Text	
UseCaseIndex	Number	
UseCase	Text	
Requirements	Memo	
PayloadType	Memo	
PayloadSizeBytes	Text	
DailyClockPeriods	Memo	
HowOften	Memo	
Reliability	Memo	
Latency	Text	
CandidateNISTLIC	Text	
SecurityConfidentiality	Text	
SecurityIntegrity	Text	
SecurityAvailability	Text	
PayloadIndex	Number	
PayloadName	Text	
PayloadSizeType	Text	
Implication	Memo	

NetworkQueryReportData

When the user runs the Network Level Query Analysis form, a Report button is available on the form. When the Report button is pressed, the contents of this table are erased, and the contents of the query in memory is written to this database table. Since the contents are continually erased to make way for the next report, there is no unique index assigned to the record.

A report linked to the table is run to actually generate the report.

The fields of the table are as follows:

NetworkQueryReportData : Table		
	Field Name	Data Type
	Project	Text
	Author	Text
	Company	Text
	RqmtRef	Text
	DataFlowRef	Text
	SourceActor	Text
	TargetActor	Text
	UseCaseIndex	Number
	UseCase	Text
	Requirements	Memo
	PayloadType	Memo
	PayloadSizeBytes	Text
	DailyClockPeriods	Memo
	HowOften	Memo
	Reliability	Memo
	Latency	Text
	CandidateNISTLIC	Text
	SecurityConfidentiality	Text
	SecurityIntegrity	Text
	SecurityAvailability	Text
	PayloadIndex	Number
	PayloadName	Text
	PayloadSizeType	Text
	Implication	Memo

Network_Connections

This table holds the Actor-Actor connections that make up the Physical Layer of the communications network of the Smart Grid.

	Field Name	Data Type
🔑	NetConnectIndex	AutoNumber
	App2AppIndex	Number
	RqmtRef	Text
	DataFlowRef	Text
	ActorA	Text
	ActorB	Text
	UseCaseIndex	Number
	UseCase	Text
	Requirements	Memo
	PayloadType	Text
	PayloadSizeType	Text
	DailyClockPeriods	Memo
	HowOften	Memo
	Reliability	Memo
	Latency	Text
	CandidateNISTLIC	Text
	PayloadIndex	Number
	PayloadName	Text
	PayloadSizeBytes	Text
	SecurityConfidentiality	Text
	SecurityIntegrity	Text
	SecurityAvailability	Text
	Implication	Memo

NIST_ACTORS

The list of actors originally established by NIST in the Interoperability Standards Roadmap are maintained in this table as an indexed list.

NIST_ACTORS : Table		
	Field Name	Data Type
🔑	NISTActorIndex	AutoNumber
	ActorDescription	Text
	NISTDomainIndex	Number

NIST_Domains

This table holds an indexed list of the NIST Domains.

NIST_Domains : Table		
	Field Name	Data Type
🔑	NISTDomainIndex	AutoNumber
	NISTDomainName	Text

NIST_LogicalConnections

At the beginning of this work, the connections between NIST Actors were codified and placed in this table as an indexed list.

NIST_LogicalConnections : Table		
	Field Name	Data Type
🔑	LogicalConnectorIndex	AutoNumber
	Logical Interface A	Number
	Logical Interface B	Number

Organizations

Within the NIST framework of Domains, the Operations domain was further subdivided by SG-Networks into Operating Organizations. These are kept in this table as an indexed list.

Organizations : Table	
Field Name	Data Type
OrganizationIndex	AutoNumber
Description	Text

Payloads

This table holds an indexed list of the various payloads, each with their size in bytes, provision for a name in plain English, and a payload type index.

Payloads : Table	
Field Name	Data Type
PayloadIndex	AutoNumber
PayloadName	Text
PayloadSize	Text
PayloadTypeIndex	Number
ExpandedPayloadName	Text

PayloadType

This table holds an indexed list of the various types of payloads.

PayloadType : Table	
Field Name	Data Type
PayloadTypeIndex	AutoNumber
PayloadType	Text

Profiles

The content of all given Users Profiles are kept in this working database table.

Profiles : Table			
	Field Name	Data Type	Description
	UtilityIndex	AutoNumber	
	ProfileName	Text	
	UserName	Text	
	UserCompany	Text	
	ServiceAreaSqMiles	Number	Service Area in Square Miles
	NumberDAPS	Number	
	AveNumberDAPSPerSM	Number	
	AveDAP2DAP	Number	
	AveDAPServiceAreaSM	Number	
	AveDAPServiceAreaRadius	Number	
	NumberDAPUpdateEventsPerDay	Number	
	NumberElectricCIMeters	Number	
	NumberSWOperationsPerMeterPerDay	Number	
	NumberElectricResidentialMeters	Number	
	NumberElectricPrePayMeters	Number	
	NumberElectricPrePayMetersWIHD	Number	
	NumberElectricPrePayMetersWCustomerEMS	Number	
	NumberPrePayEnrollments	Number	
	NumberPrePayMeterEnrollmentsPerDay	Number	
	NumberUTCustPremBrowUsersPrePayEnrollPerPremMtr	Number	Number Utility Customer Premise Browser Users PrePay Enroll Per Premise Meter
	NumberUTCustPremBrowUsersPrePayUnEnrollPerPremMtr	Number	Number Utility Customer Premise Browser Users PrePay UnEnroll Per Premise Meter
	NumberREPCustPremBrowUsersPrePayEnrollPerPremMtr	Number	Number REP Customer Premise Browser Users PrePay Enroll Per Premise Meter
	NumberREPCustPremBrowUsersPrePayUnEnrollPerPremMtr	Number	Number REP Customer Premise Browser Users PrePay UnEnroll Per Premise Meter
	NumberPrePayMeterUnEnrollmentsPerDay	Number	
	NumberSWOperationsPerPrePayMeterPerDay	Number	

Profiles : Table			
	Field Name	Data Type	Description
	NumberElectricMeters	Number	
	AveNumberEMperSM	Number	
	AveNumberEMperDAP	Number	
	AveEM2EM	Number	
	NumberOnDemandCommandsToMetersPerDay	Number	
	NumberSmartMetersDeployed	Number	
	FirmwareUpgradesPerMonth	Number	
	NumberSmartMetersInBulkMsgBatch	Number	
	NumberSmartMeterBulkMgBatchesPerDay	Number	
	NumberPHEVmetersAccThroughNSMESI	Number	Number PHEV Meters Accessed Through Non-Smart Meter ESI
	NumberPHEVmetersAccThroughSMESI	Number	Number PHEV Meters Accessed Through Smart Meter ESI
	NumberPHEVmeters	Number	
	AveNumPHEVperSM	Number	
	AveNumPHEVperDAP	Number	
	AvePHEV2PHEV	Number	
	NumberPHEVChargingEventsPerDay	Number	
	NumberPHEVMeterConnectionsPerDay	Number	
	NumberSmartMetersWNIC	Number	
	NumberMetersWESI	Number	
	NumberMetersThatLosePowerPerDay	Number	
	AppErrorEventPerMeterPerDay	Number	
	NumberCustomersWCustomerEMS	Number	
	NumberCustomersWUtilityEMS	Number	
	NumberCustomersWIHD	Number	
	NumberDemandResponseCustomers	Number	

Profiles : Table			
	Field Name	Data Type	Description
	NumberGasCIMeters	Number	
	NumberGasResidentialMeters	Number	
	TotalNumberGasMeters	Number	
	TotalNumberMeters	Number	
	NumberDistributionSubstations	Number	
	NumberTransmissionSubstations	Number	
	NumberTotalSubstations	Number	
	AveNumberSUBSPerSM	Number	
	AveSUB2SUB	Number	
	AveSUBServiceAreaSM	Number	
	AveSUBServiceAreaRadius	Number	
	NumberFieldDevicesPerDistSubstation	Number	
	NumberFieldDevicesPerTransSubstation	Number	
	DMSSCADAType	Text	
	NumberZoneIsolationSteps	Number	
	NScopeFPCWTCISD	Number	in-scope faulted primary circuit (with tie circuits) Isolation switch devices
	NumberDistRegulators	Number	
	NumberDistCapBanks	Number	
	NumberDistFieldSensors	Number	
	NumberDistSectionalizers	Number	
	NumberDistSwitches	Number	
	NumberDistReclosers	Number	
	NumberDistCustStorage	Number	
	NumberDistCustGeneration	Number	
	NumberDistFanGateways	Number	

Profiles : Table			
	Field Name	Data Type	Description
	NumberDistDAC	Number	
	NumberDistRTU	Number	
	NumberDistCircuitBreaker	Number	
	NumberComWebPortalPrePayMtrs	Number	
	NumberUtilityPrePayMeters	Number	
	NumberREPPrePayMeters	Number	
	NumberDACSubDistrStorUnit	Number	
	NumDailyDispatchPerForSSDSU	Number	
	NumSSDSUPowerLossEventsPD	Number	
	NumLODevicesPerFaultedCkt	Number	
	NISFPCID	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Devices
	NISFPCIRD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Redosers Devices
	NISFPCISWD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Switch Devices
	NISFPCISECTD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Sectionalizer Devices
	NumCirReconStepsPerSS	Number	NumberCircuit Reconfiguration Steps Per SubStation
	tbNumPrimaryCktWTCBreakers	Number	Number Primary Circuit (with tie circuits) Breakers

SavedAltPathConnections

When the User runs the Application Level Query Analysis form, using filters for Use Cases, Actors, Payload Names, Payload Types, and Networks or Clouds, the option is available to save these records with an index attached to the Utility/User profile. To accomplish this simply run the query to be saved, then press the button labeled **Save to Current User Profile**.

In a later expansion of the software, it will then be possible for any given user to access all of the stored queries that that user has generated. Since each one has a unique index, in addition to the Utility Index, any number of profiles can be saved by any User/Utility without fear of loss.

SavedAltPathConnections : Table			
	Field Name	Data Type	
?	AlternativePathIndex	AutoNumber	Index for Alternative Path Connections at the Applications Level
	PathSelector	Yes/No	
	App2AppIndex	Number	
	RqmtRef	Text	
	DataFlowRef	Text	
	ActorA	Text	
	ActorB	Text	
	UseCaseIndex	Number	
	UseCase	Text	
	Requirements	Memo	
	PayloadType	Memo	
	PayloadSizeType	Text	
	DailyClockPeriods	Memo	
	HowOften	Memo	
	Reliability	Memo	
	Latency	Text	
	CandidateNISTLIC	Text	
	PayloadIndex	Number	
	PayloadName	Text	
	PayloadSizeBytes	Text	
	SecurityConfidentiality	Text	
	SecurityIntegrity	Text	
	SecurityAvailability	Text	
	Implication	Memo	

SavedUserApplicationProfileRecords

When the User runs the Application Level Query Analysis form, based using filters for Use Cases, Actors, Payload Names, Payload Types, and Networks or Clouds, the option is available to save these records with an index attached to the Utility/User profile. To accomplish this simply run the query to be saved, then press the button labeled **Save to Current User Profile**.

In a later expansion of the software, it will then be possible for any given user to access all of the stored queries that that user has generated. Since each one has a unique index, in addition to the Utility Index, any number of profiles can be saved by any User/Utility without fear of loss.

SavedUserApplicationProfileRecords : Table		
	Field Name	Data Type
?	SavedUserProfileRecordIndex	AutoNumber
	ProfileIndex	Number
	RqmtRef	Text
	PathSelector	Yes/No
	DataFlowRef	Text
	SourceActor	Text
	TargetActor	Text
	UseCaseIndex	Number
	UseCase	Text
	Requirements	Memo
	PayloadType	Memo
	PayloadSizeBytes	Text
	DailyClockPeriods	Memo
	HowOften	Memo
	Reliability	Memo
	Latency	Text
	CandidateNISTLIC	Text
	SecurityConfidentiality	Text
	SecurityIntegrity	Text
	SecurityAvailability	Text
	PayloadIndex	Number
	PayloadName	Text
	PayloadSizeType	Text
	Implication	Memo

SavedUserNetworkProfileRecords

When the User runs the Network Level Query Analysis form, based using filters for Use Cases, Actors, Payload Names, Payload Types, and Networks or Clouds, the option is available to save these records with an index attached to the Utility/User profile. To accomplish this simply run the query to be saved, then press the button labeled **Save to Current User Profile**.

In a later expansion of the software, it will then be possible for any given user to access all of the stored queries that that user has generated. Since each one has a unique index, in addition to the Utility Index, any number of profiles can be saved by any User/Utility without fear of loss.

SavedUserNetworkProfileRecords : Table	
Field Name	Data Type
SavedUserProfileRecordIndex	AutoNumber
ProfileIndex	Number
RqmtRef	Text
DataFlowRef	Text
SourceActor	Text
TargetActor	Text
UseCaseIndex	Number
UseCase	Text
Requirements	Memo
PayloadType	Memo
PayloadSizeBytes	Text
DailyClockPeriods	Memo
HowOften	Memo
Reliability	Memo
Latency	Text
CandidateNISTLIC	Text
SecurityConfidentiality	Text
SecurityIntegrity	Text
SecurityAvailability	Text
PayloadIndex	Number
PayloadName	Text
PayloadSizeType	Text
Implication	Memo

Transmission_Media

This table holds an indexed list of the wireless media, both wired and wireless, that can be used for data transport.

	Field Name	Data Type	
🔑	MediaIndex	AutoNumber	
	MediaDescription	Text	

UseCases

This table holds an indexed list of the Use Case names that were analyzed by SG-Networks.

	Field Name	Data Type	
🔑	UseCaseIndex	AutoNumber	
	Description	Text	

UtilityProfileExportToCSV

When the user runs the Utility Profile form, a button is available at the top of the form labeled **Export to CSV**. Pressing it causes the contents of this table to be erased. It is replaced by the contents of the Utility Profile in memory. Since the contents are continually erased to make way for the next export, there is no unique index assigned to the record.

A separate routine reads the table and generates the CSV export file.

UtilityProfileExportToCSV : Table			
	Field Name	Data Type	Description
	ProfileName	Text	
	UserName	Text	
	UserCompany	Text	
	ServiceAreaSqMiles	Number	Service Area in Square Miles
	NumberDAPS	Number	
	AveNumberDAPSPerSM	Number	
	AveDAP2DAP	Number	
	AveDAPServiceAreaSM	Number	
	AveDAPServiceAreaRadius	Number	
	NumberDAPUpdateEventsPerDay	Number	
	NumberElectricCIMeters	Number	
	NumberSWOperationsPerMeterPerDay	Number	
	NumberElectricResidentialMeters	Number	
	NumberElectricPrePayMeters	Number	
	NumberElectricPrePayMetersWIHD	Number	
	NumberElectricPrePayMetersWCustomerEMS	Number	
	NumberPrePayEnrollments	Number	
	NumberPrePayMeterEnrollmentsPerDay	Number	
	NumberUTCustPremBrowUsersPrePayEnrollPerPremMtr	Number	Number Utility Customer Premise Browser Users PrePay Enroll Per Premise Meter
	NumberUTCustPremBrowUsersPrePayUnEnrollPerPremMtr	Number	Number Utility Customer Premise Browser Users PrePay UnEnroll Per Premise Meter
	NumberREPCustPremBrowUsersPrePayEnrollPerPremMtr	Number	Number REP Customer Premise Browser Users PrePay Enroll Per Premise Meter
	NumberREPCustPremBrowUsersPrePayUnEnrollPerPremMtr	Number	Number REP Customer Premise Browser Users PrePay UnEnroll Per Premise Meter
	NumberPrePayMeterUnEnrollmentsPerDay	Number	
	NumberSWOperationsPerPrePayMeterPerDay	Number	

UtilityProfileExportToCSV : Table			
	Field Name	Data Type	Description
	NumberElectricMeters	Number	
	AveNumberEMperSM	Number	
	AveNumberEMperDAP	Number	
	AveEM2EM	Number	
	NumberOnDemandCommandsToMetersPerDay	Number	
	NumberSmartMetersDeployed	Number	
	FirmwareUpgradesPerMonth	Number	
	NumberSmartMetersInBulkMsgBatch	Number	
	NumberSmartMeterBulkMsgBatchesPerDay	Number	
	NumberPHEVmetersAccThroughNSMESI	Number	Number PHEV Meters Accessed Through Non-Smart Meter ESI
	NumberPHEVmetersAccThroughSMESI	Number	Number PHEV Meters Accessed Through Smart Meter ESI
	NumberPHEVmeters	Number	
	AveNumPHEVperSM	Number	
	AveNumPHEVperDAP	Number	
	AvePHEV2PHEV	Number	
	NumberPHEVChargingEventsPerDay	Number	
	NumberPHEVMeterConnectionsPerDay	Number	
	NumberSmartMetersWNIC	Number	
	NumberMetersWESI	Number	
	NumberMetersThatLosePowerPerDay	Number	
	AppErrorEventPerMeterPerDay	Number	
	NumberCustomersWCustomerEMS	Number	
	NumberCustomersWUtilityEMS	Number	
	NumberCustomersWIHD	Number	
	NumberDemandResponseCustomers	Number	

UtilityProfileExportToCSV : Table		
Field Name	Data Type	Description
NumberGasCIMeters	Number	
NumberGasResidentialMeters	Number	
TotalNumberGasMeters	Number	
TotalNumberMeters	Number	
NumberDistributionSubstations	Number	
NumberTransmissionSubstations	Number	
NumberTotalSubstations	Number	
AveNumberSUBSPerSM	Number	
AveSUB2SUB	Number	
AveSUBServiceAreaSM	Number	
AveSUBServiceAreaRadius	Number	
NumberFieldDevicesPerDistSubstation	Number	
NumberFieldDevicesPerTransSubstation	Number	
DMSSCADAType	Text	
NumberZoneIsolationSteps	Number	
NScopeFPCWTCISD	Number	in-scope faulted primary circuit (with tie circuits) isolation switch devices
NumberDistRegulators	Number	
NumberDistCapBanks	Number	
NumberDistFieldSensors	Number	
NumberDistSectionalizers	Number	
NumberDistSwitches	Number	
NumberDistRedosers	Number	
NumberDistCustStorage	Number	
NumberDistCustGeneration	Number	
NumberDistFanGateways	Number	

UtilityProfileExportToCSV : Table		
Field Name	Data Type	Description
NumberDistDAC	Number	
NumberDistRTU	Number	
NumberDistCircuitBreaker	Number	
NumberComWebPortalPrePayMtrs	Number	
NumberUtilityPrePayMeters	Number	
NumberREPPrePayMeters	Number	
NumberDACSubDistrStorUnit	Number	
NumDailyDispatchPerForSSDSU	Number	
NumSSDSUPowerLossEventsPD	Number	
NumLODevicesPerFaultedCkt	Number	
NISFPCID	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Devices
NISFPCIRD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Redoser Devices
NISFPCISWD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Switch Devices
NISFPCISECTD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Sectionalizer Devices
NumCirReconStepsPerSS	Number	Number Circuit Reconfiguration Steps Per SubStation
tbNumPrimaryCktWTCBreakers	Number	Number Primary Circuit (with tie circuits) Breakers

UtilityProfileReportData

When the user runs the Utility Profile form, a Report button is available at the top of the form. When the Report button is pressed, the contents of this table are erased, and the contents of the Utility Profile in memory is written to this database table. Since the contents are continually erased to make way for the next report, there is no unique index assigned to the record.

A report linked to the table is run to actually generate the report.

The fields of the table are as follows:

UtilityProfileReportData : Table			
Field Name	Data Type	Description	
ProfileName	Text		
UserName	Text		
UserCompany	Text		
ServiceAreaSqMiles	Number	Service Area in Square Miles	
NumberDAPS	Number		
AveNumberDAPSPerSM	Number		
AveDAP2DAP	Number		
AveDAPServiceAreaSM	Number		
AveDAPServiceAreaRadius	Number		
NumberDAPUpdateEventsPer	Number		
NumberElectricCIMeters	Number		
NumberSWOperationsPerMet	Number		
NumberElectricResidentialMe	Number		
NumberElectricPrePayMeters	Number		
NumberElectricPrePayMeters	Number		
NumberElectricPrePayMeters	Number		
NumberPrePayEnrollments	Number		
NumberPrePayMeterEnrollme	Number		
NumberUTCustPremBrowUse	Number	Number Utility Customer Premise Browser Users PrePay Enroll Per Premise Meter	
NumberUTCustPremBrowUse	Number	Number Utility Customer Premise Browser Users PrePay UnEnroll Per Premise Meter	
NumberREPCustPremBrowUs	Number	Number REP Customer Premise Browser Users PrePay Enroll Per Premise Meter	
NumberREPCustPremBrowUs	Number	Number REP Customer Premise Browser Users PrePay UnEnroll Per Premise Meter	
NumberPrePayMeterUnEnroll	Number		
NumberSWOperationsPerPre	Number		

UtilityProfileReportData : Table			
Field Name	Data Type	Description	
NumberElectricMeters	Number		
AveNumberEMperSM	Number		
AveNumberEMperDAP	Number		
AveEM2EM	Number		
NumberOnDemandCommandsToMetersPerDay	Number		
NumberSmartMetersDeployed	Number		
FirmwareUpgradesPerMonth	Number		
NumberSmartMetersInBulkMsgBatch	Number		
NumberSmartMeterBulkMsgBatchesPerDay	Number		
NumberPHEVmetersAccThroughNSMESI	Number	Number PHEV Meters Accessed Through Non-Smart Meter ESI	
NumberPHEVmetersAccThroughSMESI	Number	Number PHEV Meters Accessed Through Smart Meter ESI	
NumberPHEVmeters	Number		
AveNumPHEVperSM	Number		
AveNumPHEVperDAP	Number		
AvePHEV2PHEV	Number		
NumberPHEVChargingEventsPerDay	Number		
NumberPHEVMeterConnectionsPerDay	Number		
NumberSmartMetersWNIC	Number		
NumberMetersWESI	Number		
NumberMetersThatLosePowerPerDay	Number		
AppErrorEventPerMeterPerDay	Number		
NumberCustomersWCustomerEMS	Number		
NumberCustomersWUtilityEMS	Number		
NumberCustomersWIHD	Number		

UtilityProfileReportData : Table		
Field Name	Data Type	
NumberDemandResponseCustomers	Number	
NumberGasCIMeters	Number	
NumberGasResidentialMeters	Number	
TotalNumberGasMeters	Number	
TotalNumberMeters	Number	
NumberDistributionSubstations	Number	
NumberTransmissionSubstations	Number	
NumberTotalSubstations	Number	
AveNumberSUBSPerSM	Number	
AveSUB2SUB	Number	
AveSUBServiceAreaSM	Number	
AveSUBServiceAreaRadius	Number	
NumberFieldDevicesPerDistSubstation	Number	
NumberFieldDevicesPerTransSubstation	Number	
DMSSCADAType	Text	
NumberZoneIsolationSteps	Number	
NScopeFPCWTICSD	Number	in-scope faulted primary circuit (with tie circuits) isolation switch devices
NumberDistRegulators	Number	
NumberDistCapBanks	Number	
NumberDistFieldSensors	Number	
NumberDistSectionalizers	Number	
NumberDistSwitches	Number	
NumberDistReclosers	Number	
NumberDistCustStorage	Number	
NumberDistCustGeneration	Number	

UtilityProfileReportData : Table		
Field Name	Data Type	Description
NumberDistFanGateways	Number	
NumberDistDAC	Number	
NumberDistRTU	Number	
NumberDistCircuitBreaker	Number	
NumberComWebPortalPrePayMtrs	Number	
NumberUtilityPrePayMeters	Number	
NumberREPPrePayMeters	Number	
NumberDACSubDistStorUnit	Number	
NumDailyDispatchPerForSSDSU	Number	
NumSSDSUPowerLossEventsPD	Number	
NumLODevicesPerFaultedCkt	Number	
NISFPCID	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Devices
NISFPCIRD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Recloser Devices
NISFPCISWD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Switch Devices
NISFPCISECTD	Number	Number In-scope Faulted Primary Circuit (with tie circuits) Isolation Sectionalizer Devices
NumCirReconStepsPerSS	Number	Number Circuit Reconfiguration Steps Per SubStation
tbNumPrimaryCktWTCBreakers	Number	Number Primary Circuit (with tie circuits) Breakers