



Release 4.2

## **Model Methodology**

### **Switch Module**

(Book III of VII)

**Verizon**

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## ICM MODEL METHODOLOGY PACKAGE

- Conceptual Framework Book I
- Loop Module Book II
- **Switch Module** **Book III**
- Interoffice Transport Module Book IV
- SS7 Module Book V
- Expense Module Book VI
- Mapping/Report Module Book VII

## **EXPLANATORY NOTE**

In the following documentation, “Verizon” is used to refer to the former GTE Corporation and its operations which are now part of Verizon Communications along with the former Bell Atlantic Corporation.

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# Switch Module

The ICM Switch Module extracts, from its data files, the relevant unit investment by component for each host switch and remotes switch in Verizon's network. These investments are then made state specific, where appropriate, by applying a factor to the element to gross them up for power and test equipment investment and EF&I (Engineered, Furnished, and Installed) costs.

The expenses associated with each switching component are developed in the Expense Module. The Mapping/Report Module maps the components to elements and services and converts switch function investments to monthly costs, including busy hour investments for switch functions, such as call processing, to time of day investments.

## Switching

Switching is the portion of the Public Switched Telephone Network (PSTN) that provides circuit switched connections between a calling party and a called party, or between a calling party and another switching network (for example, one belonging to an Interexchange Carrier). The switching network components extend from the main distribution frame (MDF) through the switch to the interoffice trunk termination. They are shown in Figure 1 below.

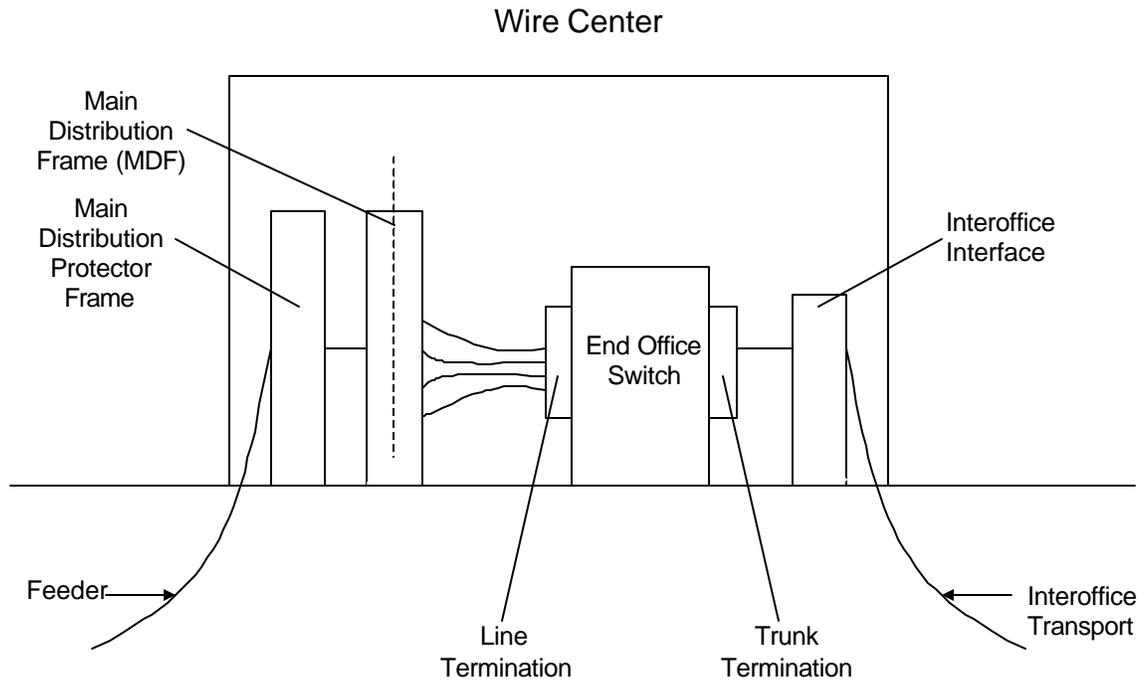


Figure 1: Switching Network Components

Calls that originate and terminate in the same switch are intra-office or line-to-line calls. Calls that originate in one switch and terminate in another are inter-office calls. The switch connection is line-to-trunk in the originating office and trunk-to-line in the terminating office. Some inter-office calls are switched en route by a tandem switch, using a trunk-to-trunk connection.

## Switching Components

The Switch Module estimates investments for the following components:

- Line terminations - Line side switch connection that connects individual loops to the switching components of Verizon's network.
  - Analog, Coin, Integrated Services Digital Network Basic Rate Interface (ISDN BRI), Integrated Services Digital Network Primary Rate Interface (ISDN PRI)
- Trunk terminations - Trunk side switch connection that connects the switching components to other switches.
  - Digital DS-0
- Call setup and minutes of use (MOU) for the following call types:
  - Line to Line (intraoffice)
  - Line to Trunk (originating from end office)
  - Trunk to Line (terminating to end office)
  - Trunk to Trunk (tandem office or host/remote)
- Switched features - Features that enhance end user calling capability such as Custom Calling, CLASS, ISDN and CentraNet. See Appendix B for a complete list of features.

## Modeling Approach

The Switch Module uses the outputs of the SCIS<sup>1</sup> and COSTMOD<sup>2</sup> models as the basis for developing the feature and function investments for each switch and remote in Verizon's serving area. SCIS and COSTMOD calculate material investments for basic switching functions in each type of forward-looking switch deployed in Verizon's network based upon office type, size and usage characteristics. The model results for material investments are then input into ICM.

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<sup>1</sup> As discussed more fully herein, the Switching Cost Information System (SCIS) was developed by Telcordia to model the investments for the features and functions of switching equipment.

<sup>2</sup> In this document, COSTMOD refers to Verizon's proprietary switching model developed to provide switch investments for the GTD-5 technology.

Within ICM, busy hour call setup and MOU investments are converted to rate period-specific investments. One of two composite factors is applied to the SCIS/COSTMOD outputs to determine loaded unit investments<sup>3</sup>. The factor depends on whether the output is a termination/usage investment or a switched feature investment. Both factors include loading for EF&I, power, and test investments. The factor for line or trunk terminations and usage also accounts for melded vendor pricing of initial switch purchases and additions.

Land and building expenses associated with switch investments are captured in the Expense Module. The switch right-to-use fees (RTU) are included in the SCIS/COSTMOD investment outputs.

Figure 2 is a flow chart depicting the Switch Module.

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<sup>3</sup> Loaded unit investment includes the material vendor price and all Verizon labor and minor materials required for installation.

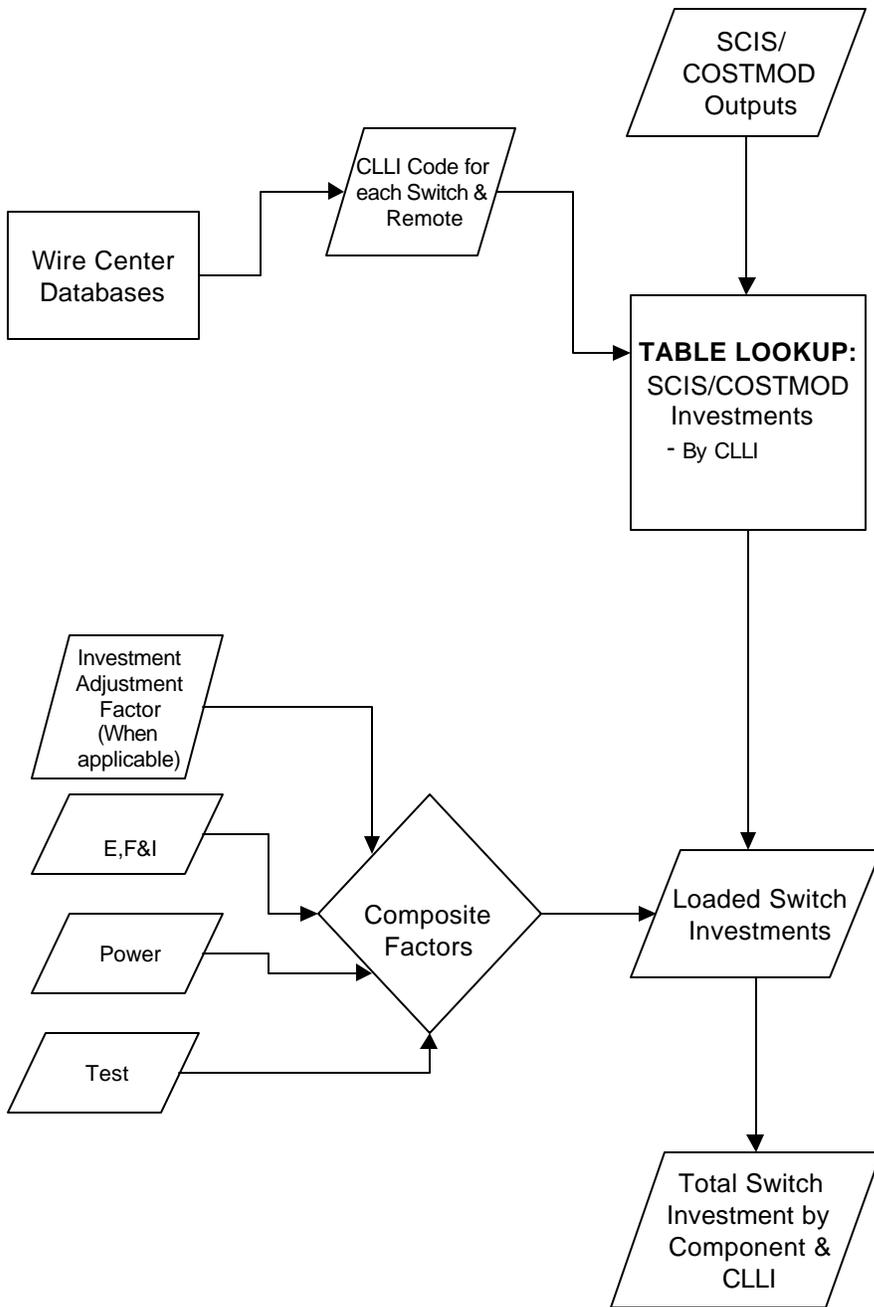


Figure 2: Switch Module Flow Chart

## Data Inputs

The Switch Module uses data from the following sources to develop the switch investment primitives:

- Wire Center Databases
- SCIS/COSTMOD

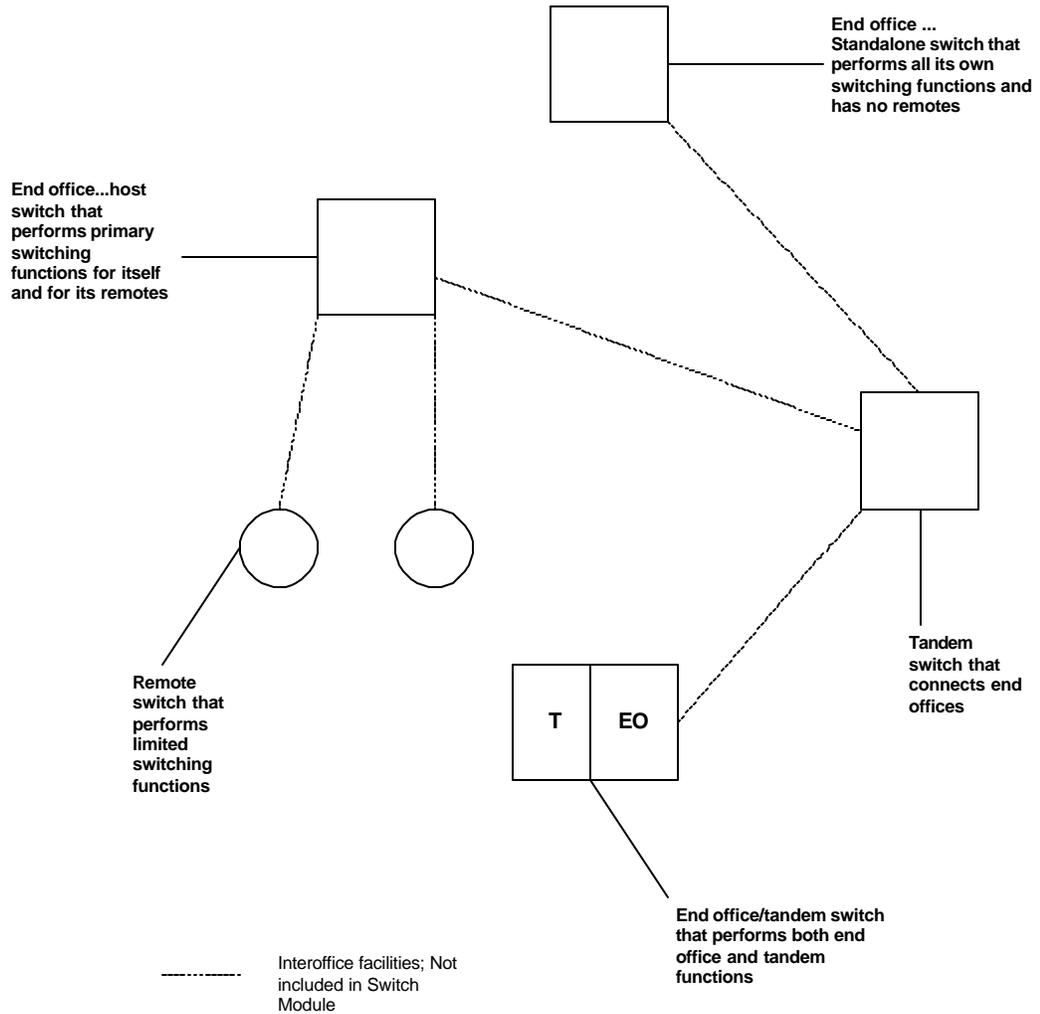
The composite factors are themselves made up of factors that are developed outside of the model. The composite factors may include some or all of the following items:

- Investment Adjustment Factor
- Engineered, Furnished, and Installed (EF&I) Factors
- Power Investment
- Test Equipment Investment

The Switch Module inputs and their sources are described below.

### Wire Center Data

Figure 3 below shows the different switch classes in Verizon's network.



**Figure 3: Switch Categories**

The CLI codes for Verizon’s switches in a particular state are derived from the NECA<sup>4</sup> 4 wire center database. The CLI codes identify each switch by town, state, and switch class (host, remote, or tandem). The location of each switch in latitude and longitude is obtained from the CLONES<sup>5</sup> database.

Verizon provides the following information for each switch:

- Switch vendor and technology type
- Homing arrangements that identify the CLI code of the host end office for each remote

<sup>4</sup> National Exchange Carrier Association

<sup>5</sup> Central Location On-Line Entry System

- Homing arrangements that identify the CLLI code of the tandem for each end office

## Switch Types

The Switch Module uses four digital switch types (5ESS, DMS-10, DMS-100, and GTD-5) that represent the forward-looking technology that Verizon will use in its network. The switch vendors, models, and classes that may be represented in ICM by these switch types are shown below:

	<u>Class</u>
Lucent 5ESS (end office)	5
Lucent 5ESS (tandem/end office)	4/5
Lucent 5ESS (tandem)	4
Lucent 5ESS Remote	5
Nortel DMS-10 (end office)	5
Nortel DMS-10 Remote	5
Nortel DMS-100 (end office)	5
Nortel DMS-100/200 (tandem/end office)	4/5
Nortel DMS-100 Remote	5
Nortel DMS-200 (tandem)	4
Lucent/AGCS GTD-5 (end office)	5
Lucent/AGCS GTD-5 (tandem/end office)	4/5
Lucent/AGCS GTD-5 Remote	5

Verizon includes these switch types in its existing network and will continue to support them in the future.

Verizon currently has switches in its network that are not one of the four types included in the Switch Module. If the wire center database indicates that a switch other than those listed above is installed at a particular location, one of the above is substituted in its place.

In addition, in some states, Verizon has replaced electro-mechanical switches with pair gain devices. These pair gain devices retain a CLLI code because they have replaced obsolete switches. When they appear in the wire center database, the code REMX\_(host switch type) is placed in the substitution column of the XXNODES.DB table.

## SCIS/COSTMOD

SCIS and COSTMOD are engineering-oriented, PC-based models that are used to produce investments for features and functions of the switching equipment in Verizon's telecommunications network. SCIS determines switching investments for the equipment Verizon purchases from Nortel and Lucent Technologies. COSTMOD produces switching investments for the Lucent/AGCS switching technology. Based on the switch-specific engineering rules provided by the manufacturer, office size, and traffic and demand inputs, these switching cost models calculate the material unit investments for features and functions by switch type.

This engineering orientation requires a set of inputs for each office modeled. Some inputs are technology-specific (5ESS, DMS-100/200, DMS-10, or GTD-5) because each technology is different in its design. However, the basic inputs are similar and include the following:

- Type of office (host, standalone, remote, tandem)
- Number of lines (including integrated DLC lines)
- Line traffic characteristics (for example, CCS (centum, or 100, call seconds) per line and the line concentration ratio)
- Processor utilization
- Number of trunks (local and tandem)
- Trunk traffic characteristics (for example, calls and CCS per trunk)
- Traffic characteristics for switched features
- Switch vendor discounts
- Average fill

The outputs are investments by feature and function for central office and remote equipment.

The following total and unit investments are outputs of the switching models:

- Getting started investment per millisecond (related to processing time for call-setup)
- Investment per line termination
- Investment per line CCS
- Investment per call
- Investment per trunk CCS
- Investment per tandem trunk CCS
- Investment per switched feature (based on the above outputs for basic switch functions)

Switched feature investments (for example, call waiting) are based on vendor engineering rules, user inputs of feature characteristics, and modeled office investments for switching functions. Switch function investments capture the costs of the switch, such as processor real time, used to provide switched calls and features. Network characteristics and user demand are then used to determine the specific switching resources used by a particular feature. These calculations are carried out within the models, and investment reports are generated for each feature.

SCIS and COSTMOD are run in both the average and marginal/capacity modes to provide investment inputs for ICM. Marginal/capacity investments are used to estimate volume sensitive (VS) investments. The difference between average and marginal/capacity investments is used to estimate volume insensitive (VIS) investments. Average investments (the equivalent of the summation of VS and VIS) are used to produce average costs. For additional information, see the SCIS and COSTMOD output reports in Verizon's filing package.

## Switch Model Inputs

To develop the inputs for ICM, engineering data (lines, trunks, call attempts, CCS) was retrieved from Verizon's engineering systems for each CILLI. These systems are:

- Traffic Data Collection System
- Trunk Traffic Estimator
- Traffic Sensitive Forecast

Each switch was then modeled through SCIS or CostMod to produce unique investments for each CLLI based on site specific data.

## Composite Factors

Composite factors are developed within ICM to convert switch material unit investments to loaded investments. The composite factors applied to usage, and line and trunk investments include investment adjustment; engineered, furnished, and installed; power; and test factors. The factors applied to switched features contain the same components with the exception of the investment adjustment factor. Each of the factor components, described below, is developed in studies external to ICM. To review the detailed calculations, refer to the *ICM Module Support Documentation*.

## Investment Adjustment Factor

To ensure that switch investments are forward-looking, switch list prices are discounted to reflect Verizon vendor contracts and quotes. Vendors' quotes typically include separate prices for new switch placements and for additions to existing switches. The ICM switch investment outputs for usage and line and trunk terminations reflect a meld of the two discounts.

Since discounts for new switch purchases are input into SCIS and COSTMOD, these models' outputs (usage and line- and trunk terminations) are adjusted within ICM using the Investment Adjustment Factor to reflect the meld of new and additions pricing. The Investment Adjustment Factor does not apply to switched feature investments. The switched feature outputs reflect only the new switch discount price.

## Engineered, Furnished & Installed Factors

Two Engineered, Furnished and Installed (EF&I) factors are developed to include labor investments for engineering and installation and minor materials. They are listed below:

EF&I - I: Includes installation costs that occur in the time between delivery of equipment from the vendor and when the switch is turned over to the local operating forces.

EF&I - EF: Includes costs for Verizon engineering and furnishing, local installation, acceptance and supply loadings.

Both factors vary by switch type and line size category. Since labor rates and minor material and supply loadings differ by state, state-specific EF&I factors are developed for each state.

## Power Investment

All of the equipment, rectifiers, and batteries, required to provide DC power and backup power to the switch are included in power investment. Power investment values are developed using engineering and vendor guidelines and account for both labor and material costs.

Although the power investments do not vary by switch type, they do vary by switch and remote size as shown below:

Small (up to 5,000 lines)	Small Remote (up to 2,600 lines)
Medium (8,300 lines)	Large Remote (3,750 lines)
Large (13,300 lines)	
Very Large (29,200 lines)	
Extra Large (60,000 lines)	

Unique power investments are developed for each state to reflect state-specific labor costs.

## Test Equipment Investment

The test equipment investment includes miscellaneous monitoring and administrative test equipment. It is determined by using Verizon's engineering practices and vendor contracts. Test material investment is constant for all host switch types and sizes. Test equipment material investment does not vary by state; however, after loading state-specific EF&I factors to test equipment material the cost of the test equipment investment will vary by state.

## Model Processing

The Switch Module determines the loaded unit investments for each Verizon host and remote switch in a state. SCIS/COSTMOD switch investments for line and trunk terminations are pulled from the switching investment table (XXSWINV.DB) based on the switch CLLI.

The investment for usage and switched features for hosts is also pulled from the (XXSWINV.DB) table. SCIS/COSTMOD outputs are inputs in the (XXSWINV.DB) table. For remote switches, the usage and switched feature investments for the associated host switch are used.

When a pair gain device has been substituted for a switch (REMX in the Substitution column of the XXNODES.DB table), the Switch Module uses the appropriate digital loop carrier (DLC) investments from the Outside Plant and Material table<sup>6</sup> in place of the line and trunk terminations. Usage and switched feature investments are calculated, like remotes, based on the host end office CLLI.

Busy hour usage related investments for remote switching, end office switching, tandem switching, and automatic message accounting (AMA, i.e., Billing Expenses) are converted to an investment per call setup and minute of use (MOU) by rate period, using Verizon's usage methodology.

Once the switch investments are determined, the appropriate composite factors are applied to reflect investment adjustments (when applicable), EF&I, power, and test loadings.

The switch investment components are then passed to the Mapping/Report Module where costs are calculated for basic network functions, unbundled network elements, and services.

## Outputs

The Switch Module outputs are used to develop monthly costs for the following:

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<sup>6</sup> Digital loop carrier investments are used in the Mapping/Report Module for calculating loop investment.

- Line Terminations
- Trunk Terminations
- Ports
- Switched Features
- End Office Switching
  - Average Minutes of Use
  - Originating Call Setup, Minutes of Use
  - Terminating Call Setup, Minutes of Use
  - Intraoffice Call Setup, Minutes of Use
- Switching - AMA Recording (Automatic Message Accounting)
- Tandem Switching
  - Average Minutes of Use
  - Minutes of Use, Call Setup.

## Appendix A: Data Input Tables (Switch)

The data input tables are listed below. The tables can be viewed and printed by selecting **View Tables/Switch** on the tool bar. The name of each database file is listed; often the first two letters indicate state (that is, xxexbase.db). A user may modify data in all of the tables listed below. Detailed descriptions of each of the tables are provided in the following section.

Following the description of data input tables, a “bubble chart” for Switching is provided under the heading ‘Processing Flow’. The chart contains a graphic representation of the database files that are inputs to and outputs of the Switch Module.

### Switch

- Switching
  - Switch (SWITCH.DB)
  - EFI (XXEFI.DB)
  
- SW Inv – Retail & SW Inv - Wholesale
  - Termination (XXSWINVR.DB & XXSWINVW.DB)
  - Usage (XXSWINVR.DB & XXSWINVW.DB)
  - Features (XXSWINVR.DB & XXSWINVW.DB)
  - Total Investment (XXSWINVR.DB & XXSWINVW.DB)
  - Miscellaneous (Power, Test equipment, and Investment Adjustment Factor) (XXSWINR.DB & XXSWINVW.DB)
  - RTU (XXSWINR.DB & XXSWINVW.DB)
  
- Nodes
  - Switching Nodes (XXNODES.DB)
  
- Features
  - Features (FEATURES.DB)
  
- Usage Parameters (USGRATE.DB)

## Switch [SWITCH.DB]

**Purpose:** Lists the type of switch used and whether the switch is a Host or a Remote. The switches used represent forward-looking technology that Verizon will use in its network.

### Column Headings:

**SWITCH TYPE** One of four switch types (5ESS, DMS-10, DMS-100, or GTD-5), plus REM to designate remote switches. The following specific switch types are utilized by Verizon:

- Lucent 5ESS (end office and remote)
- Nortel DMS-10 (end office and remote)
- Nortel DMS-100 (end office and remote)
- Lucent/AGCS GTD-5 (end office and remote)

**ID** Designates switch type for mapping purposes

**HOST/REM** H or R indicates whether the switch is a host switch located in the end office, or a remote. D indicates a Digital Pair Gain serving as a wire center.

## EFI [XXEFI.DB]

**Purpose:** Lists the EF&I (engineered, furnished and installed) factors, the Investment Adjustment Factor, the Power Investment, the Test Investment, and the Loop Test Investment for host and remote switches by Switch Type and Size.

### Column Headings:

SWITCH TYPE	Type of host or remote switch
SIZE	Line size category.
EFI - I	Verizon Installation: Includes installation occurring between delivery of equipment from the vendor until the switch is turned over to the local operating forces.
EFI - EF	Verizon Engineering and Furnishing: Includes Verizon engineering and furnishings, local installation, acceptance and supply loadings.
IAF	Investment Adjustment Factor: A factor applied to initial switch cost to adjust for growth switch cost. The result is weighted investment for switch.
POWER INV	Power Investment: Loaded cost of Central Office DC power equipment
TEST INV	Test Investment: Material cost of monitor and test equipment
LOOP TEST	Loop Test Investment: Material cost of 4 TEL Loop Test Equipment

## Termination [XXSWINV.DB]

**Purpose:** Lists termination investments by CLLI

**Column Headings:**

CLLI	Common Language Location Identifier (CLLI) code of the switch
INVESTMENT TYPE	Code identifying the switch investment type T0001 Line Termination Analog T0002 Trunk Termination T0003 Line Termination Digital T0004 Analog Trunk Termination T0005 Coin Line Termination T0006 BRI T0007 PRI B T0008 PRI D
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	SCIS/COSTMOD average investment in dollars
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## Usage [XXSWINV.DB]

**Purpose:** Lists usage investments by CLLI.

### Column Headings:

CLLI	Common Language Location Identifier (CLLI) code for switch
INVESTMENT TYPE	Code identifying switch usage investment type. U0000 AMA U0001 Line – Line Call Setup U0002 Line - Line Minutes U0003 Line – Trunk Call Setup U0004 Line – Trunk Minutes U0005 Trunk – Line Call Setup U0006 Trunk – Line Minutes U0007 Trunk – Trunk Call Setup U0008 Trunk – Trunk Minutes
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	SCIS/COSTMOD average investment in dollars
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## Features [XXSWINV.DB]

**Purpose:** Lists feature investments and numbers by CLLI.

**Column Headings:**

CLLI	Common Language Location Identifier (CLLI) code for switch
INVESTMENT TYPE	Code assigned to switch features included in ICM.
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	SCIS/COSTMOD average investment in dollars
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## Investment [XXSWINV.DB]

**Purpose:** Lists investment types by CLLI

**Column Headings:**

CLLI	Common Language Location Identifier (CLLI) code for switch
INVESTMENT TYPE	L0001 – Indicates switch investment
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	SCIS/COSTMOD average investment in dollars
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## Miscellaneous [XXSWINV.DB]

**Purpose:** Lists miscellaneous investments by CLLI.

**Column Headings:**

CLLI	Common Language Location Identifier (CLLI) code for switch
INVESTMENT TYPE	Indicates type of adjustment applied to switch investments. M0001 Power M0002 Test Equipment M0003 Investment Adjustment Factor
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	Amount of investment (power and test) or factor (Investment Adjusted Factor).
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## RTU FEES [XXSWINV.DB]

**Purpose:** Lists Right To Use Fees by CLLI.

**Column Headings:**

CLLI	Common Language Location Identifier (CLLI) code for switch
INVESTMENT TYPE	Code assigned to feature RTU fees in ICM.
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous R – RTU Fees
AVERAGE INVEST	SCIS/CostMod Investment in dollars.
VS INVEST	SCIS/COSTMOD marginal investment in dollars

## Switching Nodes [XXNODES.DB]

**Purpose:** A comprehensive listing of wire center data by CLLI

### Column Headings:

CLLI	Common Language Location Identifier (CLLI) code of the switch
HOST CLLI	CLLI code of the Host switch
SWITCH TYPE	Type of switch, such as DMS-100 or 5ESS
CLASS	Class 4 (Tandem only), Class 4/5 (Tandem part of Tandem/End Office), or Class 5 (End Office only or End Office part of Tandem/End Office))
HML	Indicates density of area (populated after ICM processing)  $H > 1,000$ lines per square mile Buried feeder cable is trenched. Percent hand dig, concrete removal and boring are applied.  $50 < M \leq 1,000$ lines per square mile Buried feeder cable is trenched. Percent hand dig, concrete removal and boring are applied.  $0 \leq L \leq 50$ lines per square mile Buried feeder can be plowed. Percent hand dig, concrete removal and boring are <u>not</u> applied.
LATITUDE	Latitude of the Wire Center
LONGITUDE	Longitude of the Wire Center
TOTAL LINES	Total number of lines served by the demand units assigned to the wire center (populated by ICM after processing)
NON SWITCHED LINES	Non-Switched lines for the Wire Center
DEMAND POINTS	Number of records in the Demand Table with demand > 0
LINE TERMS	Total number of lines served by copper feeder in the demand units assigned to the wire center (populated by ICM after processing)
BRI	Number of Basic Rate Interface ISDN lines for the wire center from Verizon ARMIS data. Used to create a weighted average cost for ISDN UNEs.
PRI	Number of Primary Rate Interface ISDN lines per wire center from

## ICM 4.2 Switch Module

	Verizon ARMIS data. Used to create a weighted average cost for ISDN UNEs.
PBX	Private Branch Exchange (PBX): Number of PBX Lines
KEY	Number of Key Lines
CENTRANET	Number of Centranet Lines
COIN	Number of Coin Lines
B1	Number of Business Lines
ROAD FEET	Total number of road feet in the demand points that are assigned to the wire center
ROAD FEET RATIO	Total road feet with demand divided by total road feet
BEDROCK	Measure of BedRock depth in inches
WATER TABLE	Measure of Water Table depth in inches
CLUSTER COUNT 12 Kft	The number of clusters for the Wire Center when 12 Kft loop limit is used. (Updated by ICM).
DISTANCE ADJ	The amount subtracted from the maximum loop length to determine the maximum feeder length in feet. (Height + Width) divided by 2
WIDTH DEAMNDPT.	The distance in feet of one two-hundredth of a degree of latitude
HEIGHT DEMAND PT	The distance in feet of one two-hundredth of a degree of longitude
DU	Distribution capacity copper utilization (fill) factor
FU	Feeder capacity fiber utilization (fill) factor
F AERIAL PCT	Portion of fiber facilities that is aerial
F BURIED PCT	Portion of fiber facilities that is buried
F UNDGND PCT	Portion of fiber facilities that is Underground
C AERIAL PCT	Portion of copper facilities that is aerial
C BURIED PCT	Portion of copper facilities that is buried
C UNDGND PCT	Portion of copper facilities that is underground
TIER B	Designates category of labor activity rates from the Outside Plant Placement Table(XXLABR.DB) to be used. TRUE = Tier B rates, FALSE = Tier A rates.

## Features [FEATURE.DB]

**Purpose:** Lists the feature name and number assigned in the model

**Column Headings:**

FEATURE	Alphanumeric code for each switch feature ( <u>e.g.</u> , F0001 for Three Way Calling)
CATEGORY	Code representing type of investment. F – Feature L – Line T – Termination U – Usage M – Miscellaneous
DESCRIPTION	Brief description of the feature (for example, Automatic Callback)
GROUP	Indicates whether the feature applies to an individual line or a business line group.

## Usage Parameters [USAGEP.DB and USGRATE.DB]

**Purpose:** Lists switch parameters such as CCS per Trunk, Call Completion Ratio, SSP Setup Time, and Ringing Time

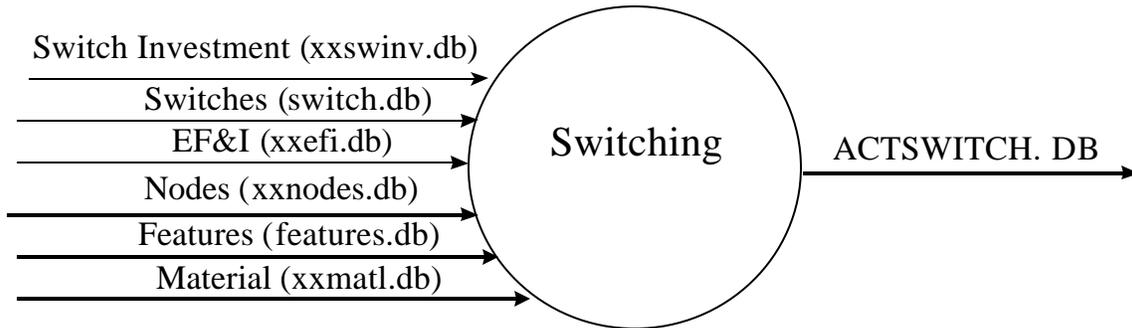
### Column Headings:

INDEX	
DESCRIPTION	Description of Parameters
DAY	Parameters related to the usage in the day time billing period (typically between 8:00 a.m. to 5:00 p.m.)
EVENING	Parameters related to the usage in the evening billing period (typically between 5:01 p.m. to 11:00 p.m.)
NIGHT	Parameters related to the usage in the night billing period (typically between 11:01 p.m. to 8:00 a.m.)
PEAK	Peak usage part of the day
OFF PEAK	Off-peak usage part of the day
24 HOUR	Parameters for costing usage sensitive services during anytime of the day

## Processing Flow

The Switching bubble-chart provides a graphic view of the database files that are input to and output of the Switch Module.

# Switching



## Appendix B: Switched Features

### Usage Features

- AMA Toll Call
- Line-to-Line Call Setup
- Line-to-Line Minute of Use
- Line-to-Trunk Call Setup
- Line-to-Trunk Minute of Use
- Trunk-to-Line Call Setup
- Trunk-to-Line Minute of Use
- Trunk-to-Trunk Call Setup
- Trunk-to-Trunk Minute of Use

### Line Features

- Remote Call Forwarding
- Direct Inward Dialing - Directory Number
- Warm Line

### Custom Calling/Intelligent Network Features

- 3-Way Calling
- Call Forwarding Variable
- Changeable Speed Calling 1-Digit
- Changeable Speed Calling 2-Digits
- In Contact
- Call Waiting
- Cancel Call Waiting
- Dual-Tone Multi-frequency (DTMF) Dialing
- Teen Service (Restricted Distinctive Alerting)

### CLASS Features

- Automatic Callback
- Automatic Recall
- Anonymous Call Rejection
- Calling Number Delivery
- Calling Number Delivery Blocking
- Selective Call Waiting
- Caller ID Name and Number
- Distinctive Ringing / Call Waiting
- Customer Originated Trace
- Selective Call Acceptance
- Selective Call Forwarding
- Selective Call Rejection
- Calling Name Delivery
- Call Waiting ID

## Centrex (CentraNet) Features

- Automatic Alternative Routing
- Call Forwarding Variable
- Call Forwarding Incoming Only
- Call Forwarding Within Group Only
- Call Forwarding Busy Line
- Call Forwarding Don't Answer All Calls
- Call Waiting Originating
- Call Waiting Terminating
- Call Flip-Flop
- Three Way Calling
- Call Transfer Individual All Calls
- Add-On Conversation Hold Incoming Only
- Speed Calling Individual 1-Digit
- Speed Calling Individual 2-Digits
- Customer Dialed Account Recording
- Business Set Group Intercom All Calls
- Last Number Redial
- Authorization Code Immediate Dialing
- Dial Call Waiting
- Loudspeaker Paging
- On-Hook Queuing for Outgoing Trunks
- Off-Hook Queuing for Outgoing Trunks
- Voice / Data Protection
- Authorization Codes for AFR
- Account Codes for AFR
- Code Restriction and Diversion
- Code Calling
- Tie Facility Access
- OUTWATS-Simulated Facility Group
- Direct Connect
- Distinctive Alerting / Call Waiting Indicator
- Call Hold
- Semi-Restricted (Originating and Terminating)
- Fully Restricted (Originating and Terminating)
- Toll Restricted Service
- Call Pick-up
- Directed Call Pick-up with Barge In
- Directed Call Pick-up without Barge In
- Special Intercept Announcements
- Conference Calling 6-Way
- Station Message Detail Recording to RAO
- Station Message Detail Recording to Premises
- Cancel Call Waiting
- Call Forwarding Enhancements (Multipath)
- Executive Busy Override
- Direct Inward System Access
- Recorded Telephone Dictation
- Business Set Call Pickup
- Business Set Access to Paging
- Auth Code for Message Detail Record
- Call Forwarding All (Fixed)
- Call Park
- Dual-Tone Multifrequency (DTMF) Dial 2
- Meet-Me Conference
- Music on Hold
- Business Set Call Back Queuing
- 800 Service-Simulated Facility Group
- Basic Business Set

## Centrex (CentraNet) Call Handling Features

- Circular Hunting
- Preferential Multi-line Hunting
- Uniform Call Distribution
- Stop Hunt Key
- Make Busy Key
- Queuing for Multi-line Hunt Groups
- Automatic Route Selection
- Facility Restriction Level
- Expensive Route Warning Tone
- Manual / Time of Day Routing Control
- Foreign Exchange Facilities
- Deluxe Auto Route Selection

## Centrex (CentraNet) Attendant Features

- Fixed Night Service Key
- Attendant Camp-on (Non-data Link)
- Attendant Busy Line Verification
- Attendant Control of Facilities
- Locked Loop Operation
- MDC Attendant Console (per A/G)
- Attendant Autodial
- Attendant Console Test
- Attendant Lockout
- Attendant Secretary
- Attendant Flexible Console Alerting
- Attendant Console Act/Deact of CFU/CFI
- Attendant Interposition Transfer
- Attendant on Incoming Lines
- Fixed Night Service – Call Forwarding
- Attendant Conference
- Attendant Recall from Satellite
- Attendant Position Busy
- Two-Way Splitting
- Attendant Call Park
- Attendant Speed Calling
- Attendant Delayed Operation
- Attendant Multiple Listed Directory Numbers
- Attendant Wildcard Key
- Attendant VFG Trunk Group Busy on Attendant Console
- Attendant Display of Queued Calls by IC Key
- Attendant Recall

## Basic Business Group Features

- Basic Business Group
- Basic Business Group Direct Outward Dial
- Basic Business Group Station-to-Station Inter.
- Basic Business Group Auto ID Outward Dialing
- Privacy Release
- Six-Port Conference
- Basic Business Group Speed Calling Shared
- Basic Business Group Speed Calling 2 Shared
- Basic Business Group Automatic Callback
- Basic Business Group Direct Inward Dialing
- Display Calling Number

## ISDN PRI (Primary Rate Interface)

- Primary Rate Interface
- Circuit Switched Voice/Data for PRI
- Call by Call Access
- Calling Number Delivery to PRI
- Non-Facility Associated Signaling
- Switched Fractional DS1 Originating
- Switched Fractional DS1 Terminating
- PRI D-Channel Backup
- PRI B-Channel

## ISDN BRI (Basic Rate Interface)

- Attendant Busy Verification of Lines/Trunks
- Attendants Call Thru Test
- Shared Call Appearances of a DN
- Bridged Call Exclusion
- Key Systems Coverage for Analog line
- Queuing for ISDN Attendants w/c WI
- Attendants Control of Voice Terminals
- Attendant Night Service (Fixed/Flexible)
- Emergency Access to Attendant
- Attendant Direct Trunk Group Selection
- Attendant Emergency Override
- Auto Dropback to Attendant
- Attendant Original Permission Display
- Attendant Timed Reminder
- Aggregate Work Time/Number of Calls Handled
- Total Number of Calls Handled Display
- Attendant Traffic
- Attendant Number of Calls on Queue
- Packet Switching IEO On Demand B Channel
- Circuit Switched Voice
- Basic Circuit Switched Data
- Packet Switching IAO D Channel
- X.25 Hunt Group
- Outgoing Calling Line ID
- Attendant Power Failure Transfer
- EDS Calling Name Display
- Attendant Camp-On
- Attendant Uniform Call Distribution

## ICM 4.2 Switch Module

- Attendant Trunk Identification
- ISAT Trunk Queuing
- Attendant Trunk Group Indicators
- Call Pick Up
- Attendant Direct Station Selection
- Multiline Hunt Group
- Attendant Position Busy
- Call Hold
- Toll Restricted Service
- Intercom Functions
- Priority Calling Incoming Only
- X.25 Closed User Groups
- X.25 Fast Select Acceptance
- X.25 Reverse Charge
- X.25 Permanent Virtual Call Service
- Code Calling-Answer
- Trunk Answer Any Station
- Bridging
- ISDN Time and Date Display
- Transit Delay Selection & Ind.
- ISDN Facility Restriction Level
- Flow Control Parameter Negotiation
- Outgoing Calls Barred
- Call Forwarding Variable
- Attendant Control of Facilities
- Attendant ID on Incoming Calls
- Business Group Auto Callback
- Attendant Conference
- Circular Hunting
- Attendant Call Hold
- Attendant Call Splitting
- Attendant Through Dialing
- Terminal Management
- Multiple Directory Number Button
- X.25 Fast Select
- X.25 One-way Outgoing Logical Channel
- X.25 Reverse Charge Acceptance
- Direct Connect
- Attendant Serial Call
- Delayed and Abbreviated Ringing
- Intercom Alerting
- Feature Button Inspect
- Inspect for ISDN Terminals
- ISDN Display for Ringing Call Appear
- Incoming Calls Barred
- Throughput Class Negotiation

