EXS SwitchKit

Lucent Technologies
Bell Labs Innovations

Switch Development and O&AM System

EXS SwitchKit provides a comprehensive, high-level and open programming environment for the development and maintenance of EXS TM switching systems. SwitchKit includes a feature-rich OA&M (operations, administration and maintenance) system and a high-level API suite, freeing developers to concentrate on revenue-generating applications and services. Because it facilitates the development and integration of Lucent switch-based telephony applications, it delivers important benefits to both system integrators and service providers.

SwitchKit greatly reduces time and costs in the deployment and maintenance of switch-based solutions - providing a quantitative edge in the increasingly competitive, dynamic, global, and deregulated markets.

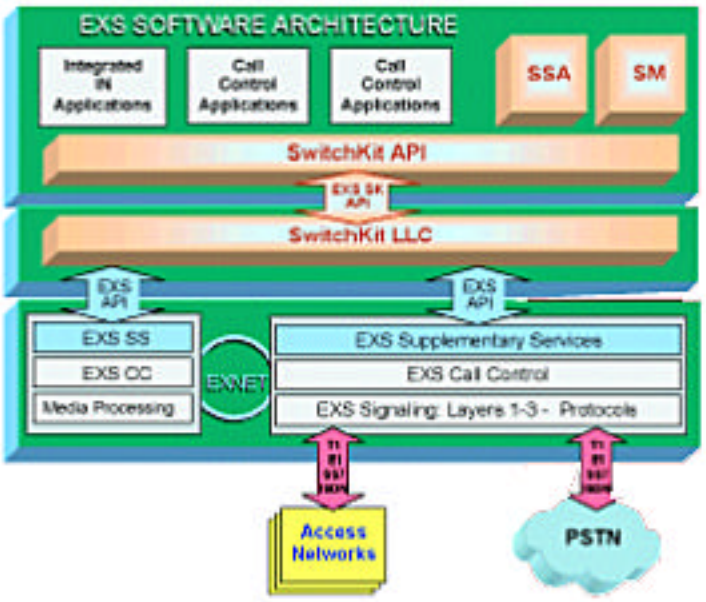
SwitchKit enables the development and implementation of custom, highly differentiated services, providing a qualitative edge in response to the demands of the telecommunications marketplace.

EXS SwitchKit is implemented in a modular manner. It segregates administration and configuration functions from the application, enabling multiple services to utilize a single, consistent OA&M system. Since an application developed using SwitchKit does not need to concern itself with OA&M overhead, it can be simpler, modular, more efficient, and easily maintained. Furthermore, applications are portable and scalable because they operate independently of the switch utilities. The result is that developers can implement applications and services with better price performance and superior flexibility over a wide range of market needs and sizes.

EXS SwitchKit supports resource sharing and redundancy. It lets multiple independent applications efficiently share a single switch by handling the channel sharing and message routing automatically. Resources such as cards, lines and nodes can be added to the environment while an application is running and configured automatically. Thus, multiple solutions and facilities can be developed and delivered through a single, open and programmable switch platform - Lucent's EXS - for superior return on investment and reliability in all aspects of the services creation and provisioning process.

EXS SwitchKit Overview

EXS SwitchKit provides an open, unified and modular environment for switch management and development of third-party applications and services. It supports the features and protocols offered by Lucent's EXS switching systems. It gives developers a single source for long-term development support and a single OA&M system for multiple hosts, applications and services.



EXS SwitchKit has been developed based on the C programming language and industry-standard communications protocols, so that it can be ported to a wide variety of platforms. It is designed to be easily scalable and upgradable, so that modules can be added and or extended, enabling easy growth of existing services and addition of new ones - without redesign. EXS SwitchKit features include: redundant low-level communications modules, eliminating any single point of failure; modules which administer, configure, and automatically manage the operation of Lucent switches; and a C and C++ API suite for Lucent based on an industry-standard call processing module. EXS SwitchKit has been designed to support the performance of Lucent hardware. The result is the applications can make better and more efficient usage of Lucent resources. Running under either Windows NT® or UNIX®*, EXS SwitchKit provides a comprehensive suite of tools described below.

Low Level Communication Module (LLC)

The LLC is responsible for intelligently coordinating and routing all communication (e.g. messages) between application modules and the switch. It is the only module that communicates directly with the switch, via either serial port or Ethernet connection, and can distribute and collect messages to and from all application modules. The LLC handles all the low level communication tasks, such as framing and queuing messages, calculating checksums, handling special characters, and intelligently assigning sequence numbers to keep track of each message independent of its point of origination. It also acknowledges switch-originated messages and monitors whether the switch is appropriately responding to messages sent by the host. Finally, it logs and reports all the messages that pass between the switch and the host, and stores messages for debugging or statistical purposes. The LLC also manages sets of system-wide resources such as message sequence numbers and channel allocations:

Channel Management. The low level communication module keeps track of the state of all spans and channels resident on the switch. It also stores and maintains a hierarchical set of channel groups that the user defines. This functionality allows the LLC to intelligently allocate channels to application modules upon demand, since the application need only specify the high level channel group from which it is requesting a channel.

Administration. The LLC also handles some configuration and run-time administration tasks. It ensures that the system software is downloaded. It is also responsible for communicating with the redundant matrix, if one is configured. The LLC always automatically routes messages to the active matrix. Therefore, if the primary matrix becomes unavailable, and there is an automatic switchover process, the LLC will seamlessly reroute messages to the backup matrix once it becomes active.

Distributed Secure Communications. As a distributed communications manager, the low level communication module accepts requests from application modules for various types of messages, alarms or polls. It implements a secure authentication algorithm to provide network security by preventing unauthorized messages to be sent or received from the switch.

Dynamic Load Sharing. The LLC implements dynamic application load sharing. Multiple application modules can register on a common group of inbound channels, allowing dynamic distribution of inbound calls to the application module with lowest load. If any module becomes unavailable, the LLC will handle the dynamic redistribution of messages seamlessly.

Switch Manager

Switch Manager (SM) provides a switch configuration utility to help maintain EXS switching environments to 30,000 ports and beyond in a state of readiness. It assists developers in specifying how the switch and switch resources should be configured. It reads the configuration files and sends configuration messages to the switch, and supports automatic query of the switch to determine its current hardware setup and configuration. Configuration files are comprised of easily-used text names and fields. The switch can also be dynamically reconfigured. For example, even while running traffic, Switch Manager can re-configure the switch automatically if the switch or

*The SwitchSite Admin module is EXS SwitchKit currently runs under Windows NT only

any of its individual cards lose configuration -such as when a card is pulled. Switch Manager can assist the developer in specifying the configuration of resources - boards, spans, DSPs and channels - by providing default values and choice lists for all configuration messages. In addition, it enables users to define inseize and outseize rules, call progress analysis parameters, hierarchical groups of channels, custom tones, and filters and timers. The location of system software files, programmable protocol tables and VRAS prompts can be specified so that they may be downloaded automatically. Switch Manager enhances reliability with extensive fault detection and notification features. It monitors alarms and user-defined responses; tracks matrix heartbeat and switchover recovery; and automates N+1 network redundancy.

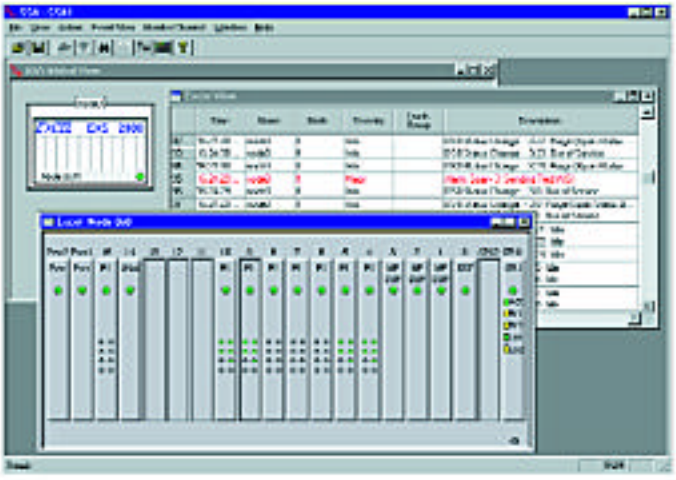
SwitchSight Admin

SwitchSight Admin (SSA) is a real-time switch maintenance and administration application. Through an intuitive graphical user interface, it lets developers monitor the current state of the switch in real-time, even remotely over multiple terminals, for optimal administration. The state of the switch and all its components and alarms are graphically displayed in real time, enabling users to see activities on the switch as they occur. The state of the switch can be easily changed at any time via simple point & click operations. Users can also create and maintain trunk groups through the user-friendly interface. They can trace and view channel status in real-time. SwitchSight Admin shields system developers from low level, code-intensive channel and trunk group assignment and maintenance. Channels and trunk groups can be taken in and out of service without downtime. And, detailing of alarms and statistics no longer requires decoding of log files.

Application Programmer's Interface (API)

SwitchKit API provides a high level interface between the application and the EXS API, to facilitate even more rapid switch-to-application integration. The straightforward C or C++ language application programming interface is based on industry standards, automatic configuration and redundancy control, descriptive logs and error messages. It extracts Lucent's EXS API suite in C/C++ Library format. This feature enables the application developer to support EXS messaging as well as administrative messages (between the application and the low level communication module) with all the benefits of a high-level language API. A set of C and C++ libraries and header files enables a simple, direct interface to the capabilities provided by the other modules (e.g., sending and receiving Lucent messages through the LLC). The API lets the user application communicate with the LLC and the switch, and avail itself of services of the other modules. It enables switch configuration from within the developer's application, and facilitates communication between multiple applications.

The **power** of EXS SwitchKit allows Lucent application developers to concentrate their efforts on building their telephony applications, without dealing with complex configuration requirements or administrative tasks. It enhances applications by providing increased reliability and seamless integration of multiple applications and multiple hosts. The **flexibility** of EXS SwitchKit allows developers to have control over low-level administrative tasks if warranted. In short, EXS SwithKit lets developers address the call processing aspects of their solutions as they see fit - giving them the power to implement new services easily, quickly and profitability.



EXS SwitchKit provides a high-level graphical user interface to speed and facilitate the monitoring and administration of switch operations in real-time.

EXS SwithKit Benefits

- Cuts time to market for new services
  - Reduces development time
  - Speeds delivery of new applications
- Reduces development expenses
  - Leverages software engineering resources
  - Enhances return on investment
  - Minimizes cost of continuing development
- Facilitates and simplifies telephony application development
  - Provides messaging throughout transparent to host and switch
  - Delivers complete support of Excel EXS feature set
  - Supports multiple applications and services on a single platform
- Future-proofs applications system investments
  - Facilitates seamless upgrade/expansion of SwitchKit-developed applications
  - Facilitates development of services in response to market trends
- Enhances application reliability and robustness
  - Supports distributed architecture; redundant software modules; no single point of failure
  - Enables application load sharing; and configurable alarm handling and reporting
- Improves network management and reliability
  - Provides real time monitoring and maintenance
  - Leverages operations resources through graphical tools
  - Allows more effective deployment of system resources

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