

Taboret™ Management Application Builder

INTRODUCTION

Management Application Builders allow network-knowledgeable people to build their own solutions to management problems. More important, these new tools are software products specifically designed for fast development of network management applications.

Management Application Builders quickly create custom graphical applications that harvest data stored in the private and standard areas of Simple Network Management Protocol (SNMP) agents, which are ubiquitous in today's networks and systems deployed in enterprise networks. Most equipment being deployed in today's networks is managed through the standard SNMP.

The new economies resulting from use of management application builders offer a means to increase user satisfaction in network management systems. Network administrators, producers of networked products, and network integrators can benefit from using these tools because they allow rapid creation of network management applications. Management Application Builder software dramatically decreases the cost and time required for constructing and deploying enterprise-specific network management applications. By decreasing the cost and time needed to build such systems, producers of the applications can create solutions more closely tailored to their own needs or the needs of their customers.

The value of these systems accrues from their eliminating the expensive and tedious process of developing software yet their robustness and flexibility allows users to create world-class applications.

Taboret is the premiere product in the Management Application Builder category. Taboret offers fast development turnaround and deployment on the most prominent operating systems, network management platforms, and world languages in the industry.

ISSUES AND CHOICES FOR DEVELOPERS OF NETWORK MANAGAEMENT APPLICATIONS

Network Management Applications

Management applications, a core element of most networked products, are software products that end-users run to remotely monitor and configure networked products. The applications are typically highly graphical and customized to a specific device.

In large enterprise networks, the applications operate in conjunction with one or more network management platforms, which discover each network and resident piece of equipment. The network operator uses the platform to display the total topology of the network and each type of equipment; however, platforms do not provide effective information about the activity inside each piece of equipment or device. The role of device management is performed by the management application.

Difficult Choices in Management Application Development

Producers of network products and associated management applications must make difficult choices when planning their engineering and marketing strategies for software development of their management applications. Although the networking industry supports only a few leading approaches for managing networks, meeting user demands with the current tools requires an expensive development team and environment to deliver products that match those demands.

Network management development managers are faced with the costly problem of supporting many *nearly* identical applications to satisfy customer demands for different operating systems, network management platforms, and languages. Before Taboret was available, to develop a sound strategy, producers of networked products had to face several issues and make the right choice to meet engineering, marketing, and cost goals.

Issue: Which Operating Systems to Support

In the network management industry, UNIX has been the operating system of choice for network management. Sun Solaris, Hewlett-Packard HP-UX, and IBM AIX are its the primary contenders, and a new trend toward Microsoft NT has begun. Each operating system supported brings a significant ongoing support cost to the network equipment provider.

When not using Taboret to develop management applications, network equipment producers must decide whether or not to support each operating system by considering the needs of their current and projected customers. Each operating system included for development support brings added costs for development tools, test tools, developers expert in the operating system, hardware, and system administration support.

Issue: Which Network Management Platform to Support

The network administrator market is currently selecting OpenView Network Node Manager from Hewlett-Packard (HP) as the preferred network management platform for large enterprise networks. At the same time, Solstice™ Domain Manager™ from Sun and TME/10 NetView from IBM remain entrenched in the industry. For smaller networks, other options exist, including inexpensive platforms such as SNMPc from Castlerock Computing or no platform at all.

The platforms themselves are provided to developers at discounts or free; however, the skill to construct applications for the complex and varied programming interfaces of each platform comes at a high price. Again the issue is whether or not to support each platform and absorb the costs of elements of development support.

Issue: Which Style of Graphical User Interface to Develop

The standards for graphical user interfaces (GUIs) have centered on two principal approaches: the Microsoft style for the NT environment and the Motif style for UNIX environments. One approach is to develop two versions of the application, one for each style. A second approach is to purchase a GUI development library that operates across both of these environments. The tools available to date that can deliver this special capability are complex, require special training, and have steep learning curves.

Issue: Which Foreign Language to Support

Many network products are destined for foreign shores. Demands for management applications that operate in foreign languages are rising. The cost to construct software that can display in foreign languages requires special operating systems or special tools and translation costs are high.

THE SOLUTION—THE TABORET MANAGEMENT APPLICATION BUILDER

Taboret Management Application Builder provides the solution to difficult issues facing the network management application developer. There are no choices to make because:

- A single application constructed with Taboret operates with multiple platforms, operating systems, user interface standards, and foreign languages.
- The Taboret approach dramatically reduces both the development time and support costs for network management software applications.

In addition to eliminating difficult choices, Taboret is the premiere environment for the complete development of SNMP management applications because:

- Taboret applications can be used for both controlling and monitoring an agent in a network.
- Taboret comprehensive environment supports development of unique, world-class applications with market leading features.
- The Taboret easy to learn, drag and drop, development environment satisfies the needs of network equipment developers and network integrators in solving their management application development tasks at an unprecedented low cost and in a short time.

Taboret Operations

The Taboret Management Application Builder consists of two principal elements:

- Taboret Editor
- Taboret Run-Time Engine

Application developers use the Taboret Editor to create a Management Application Definition using the Management Information Base (MIB) definition for the target SNMP agent. The Taboret Editor outputs the definition of the application as an ASCII file for ease of use of the same file on different operating systems. The Taboret Run-Time Engine processes the Management Application Definition when the application is executed.

The relationship of the principal Taboret elements is shown in Figure 1. After creating the Management Application Definition, there is no need for the MIB definition. The Taboret run-time engine is deployed together with your Management Application Definition and any graphics used in the application for the end-user GUI.

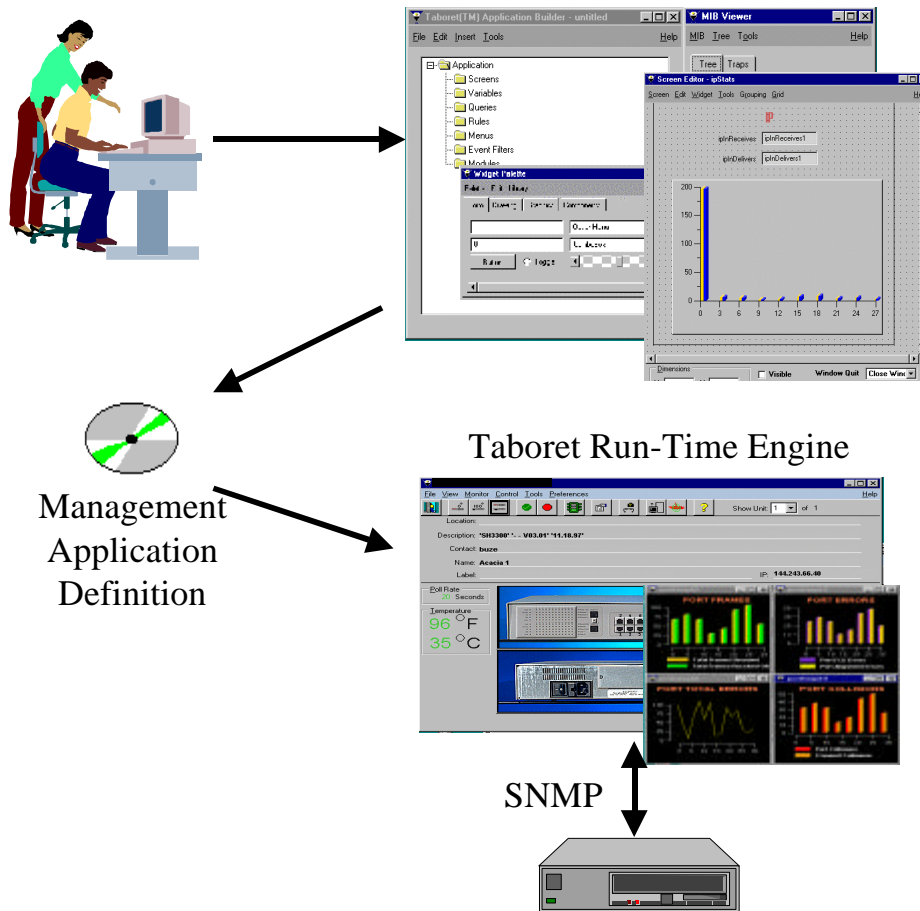


Figure 1. Taboret's Principal Parts Streamline the Application Building Process

Taboret Development Process

The most effective approach to developing a Management Application Definition is to repeat the “build, test, and demonstrate” cycle, shown in Figure 2. The Taboret Editor’s WYSIWYG development environment, the SNMP protocol stack, and the ability to run the application at any time during the development process provides for rapid iterative development.

By rapidly building the “look and feel” aspects of their application first, developers can get fast feedback from the rest of the team or their customers. With Taboret, developers create applications so quickly that it is not unusual to incorporate comments and demonstrate an entirely new version of the example application in just hours.

The key to Taboret’s development power is that the quickly built applications aren’t just GUI screens, they are automatically connected through the SNMP protocol to your agents.

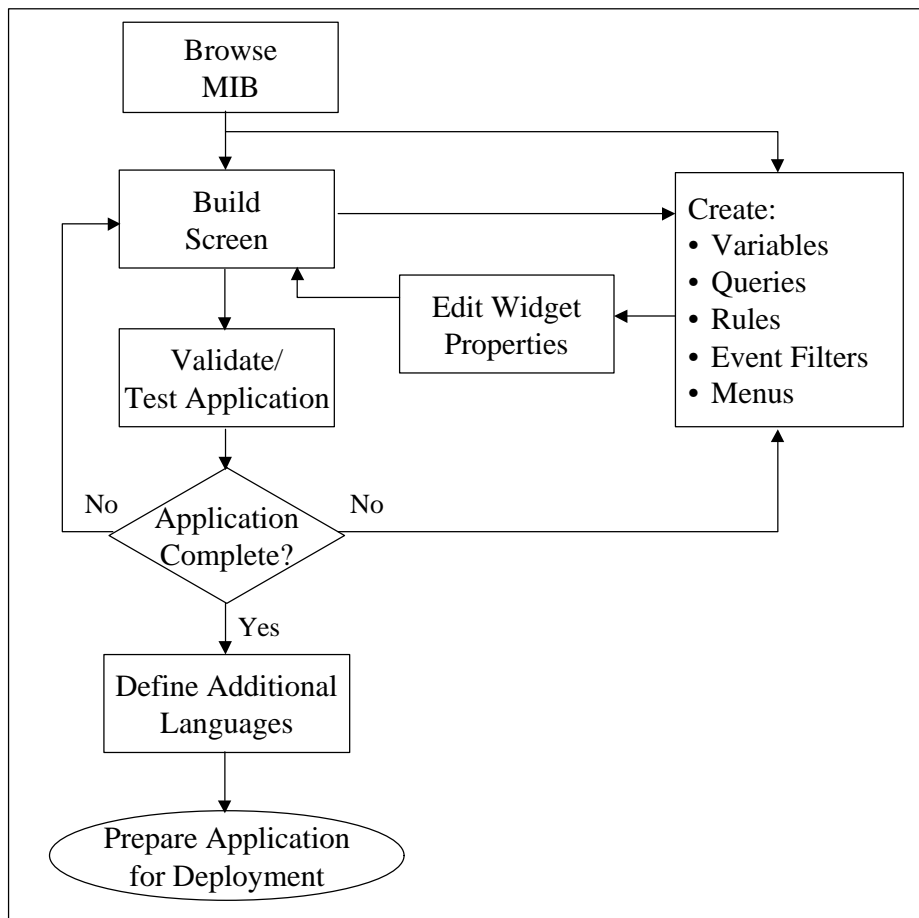


Figure 2. With Taboret, Applications Are Built, Tested, and Demonstrated Iteratively in a Rapid Development Process

Assembling the Application

Before you begin you compile your MIB into the Taboret Editor. Next, through a process of assembly, you construct a screen for your application, usually through a three-step process:

1. Drag a GUI widget (e.g., Bar Chart) from the Widget Pallet and drop it on the screen editor.
2. Drag a MIB variable (e.g., tcpInSegs) from the MIB Tree and drop it on the widget.
3. Double click on the Widget to access a widget editor and change any display or processing properties to suit your needs.

Next, you save and run the application: Your screen opens and the chart begins graphing the value retrieved from the agent.

You then return to the Taboret Editor and add any number of screens and widgets to finish your application.

That's it!

TABORET EDITOR CAPABILITIES

The powerful capabilities of the Taboret Management Application Builder are integrated into the Taboret Editor to allow rapid definition of a complete state-of-the-art SNMP management application. Taking advantage of the capabilities is both quick and easy to learn while you develop a complete and precise definition of your application.

MIB Compiler

The Taboret MIB compiler allows you to include any SNMP Version 1 or Version 2 MIB to be processed by your application. The compiler processes the ASN.1 defined MIBs and displays the MIB hierarchically in the Taboret user interface in a tree format. Once compiled, the MIB can be used in the rest of the Editor to define easily which data elements should be processed in the application. Taboret's searching tools, such as a MIB Viewer, help you quickly find elements in the MIB and use them through "drag and drop" operations. With a mouse click on any MIB element in the MIB tree, Taboret displays the definition of a selected element from the MIB definition.

The Taboret MIB compiler checks and flags errors in the definition file. Taboret provides useful feedback about how to correct common errors. Figure 3 shows the MIB Viewer tree display with a definition.

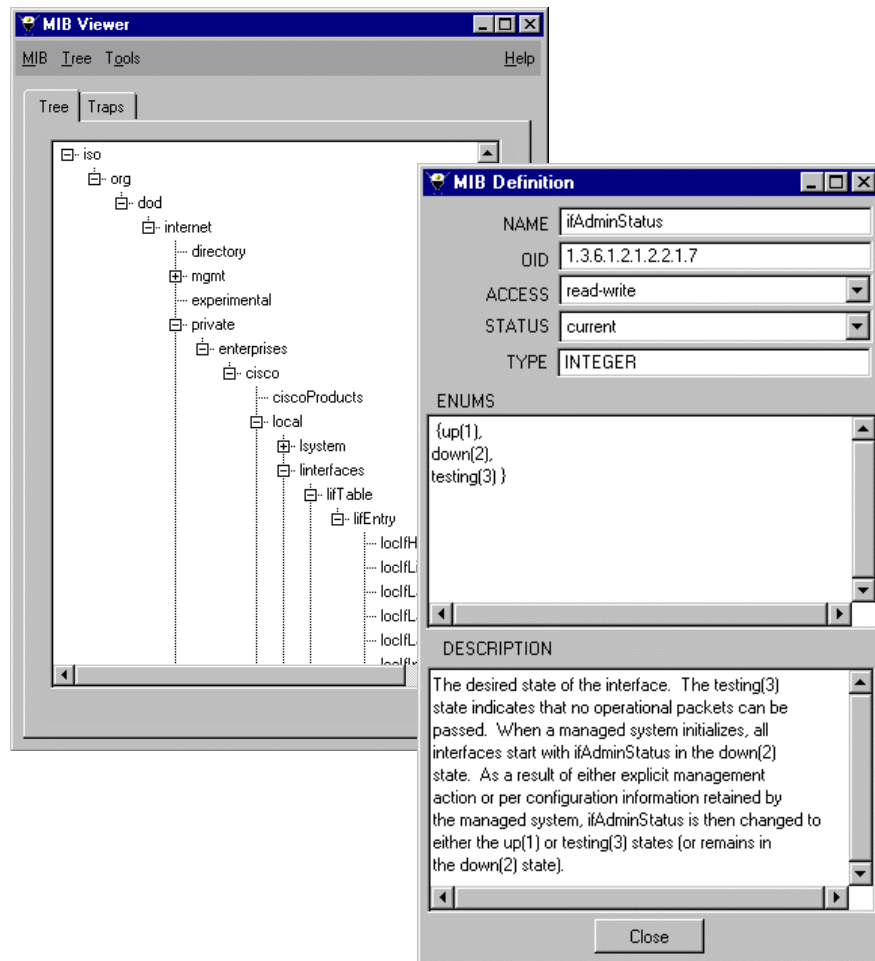


Figure 3. Taboret's MIB Viewer Displays the Enterprise MIB Elements and Definition

User Interface Components

The Taboret Editor provides a wide range of user interface components—widgets—that can be used in the GUI design of the application. The widgets are organized on pallets so that developers can quickly find them and place them in their application by dragging and dropping. The widgets offer a comprehensive set of interactive capabilities, including forms, graphics, and charts.

You can control and customize each widget you select for the application. Some of these controls include logic or mathematical manipulation of the data; conversion to an enumerated display; operations defined for user actions, such as mouse click; definition

of a floating help; and input data validation. All widgets allow precision location, sizing coloring, and selection of fonts—both style and size.

Figure 4 shows two tabs of the Widget Palette and the Widget Editor property sheet typical for use in customizing the behavior of a widget. Widgets have a drag and drop feature that makes them easy to add to the GUI when building an application.

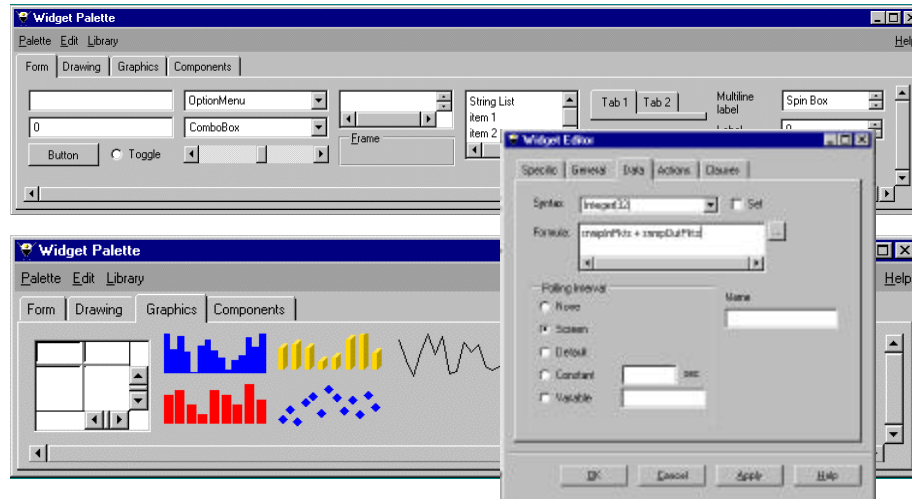


Figure 4. The Taboret Widget Palette Provides Graphical Screen Elements and Methods for Customizing Them

User Interface Design

The Screen Editor (see Figure 5) provides the drawing area for organizing each screen in your management application. Items, such as the MIB elements scale widget, are dragged and dropped on the screen editor and have a similar look and feel in the running application. The Screen Editor provides convenient features to speed screen layout, including alignment, sizing, groups, snap to grid, and layering. For convenience, while developing an application, the developer can run the application directly from the Taboret Editor to test widget behavior and examine the look and feel.

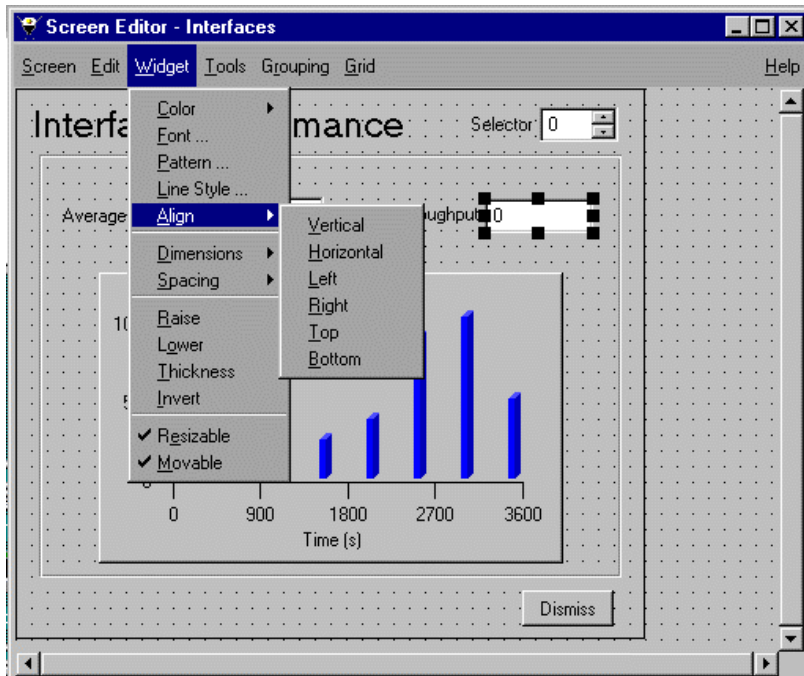


Figure 5. The Taboret Screen Editor Displays a Clear View of the GUI Design

Application Behavior Control

You may define properties, conditions, and network responses for application elements as you build the application interface, and you may reuse the elements you create. These capabilities are specific to building SNMP management applications. The following editors have special functions for use in Taboret applications.

- ***Variable Editor***. For manipulating scalar values in the application.
- ***Query Editor***. For manipulating tables or collections of scalar values in the application.
- ***Rule Editor***. For evaluating and taking actions on conditions in the application.
- ***Event Filter Editor***. For processing and taking actions upon receipt of Traps or Notifications.
- ***Menu Editor***. For creating menus and other means to control the flow of the application use.

Variable Editor

You use variables to retrieve and store scalar MIB values, as well as to store intermediate values used inside the application. Variables use data scoping to allow global or local use as required. Variables can be processed with mathematical expressions and string manipulation functions from the formula editor.

Variables may be directly added to application screens to create text or integer fields; included in a rule to be inserted into the application; or used as a widget property, such as a condition.

As you work with variables, you may perform any of the following:

- Name global variables to represent values for agents for use in screens, formulas, and widget properties
- Create formulas and have Taboret verify their syntax automatically
- Associate variables with widgets (i.e., assign and set conditions)
- Share variables among several active widgets
- Define the beginning value of the variable; that is, the value of the variable when you run the application

Query Editor

You may set up global and screen-specific queries to group information such as scalar variables or to retrieve information from MIB tables. Queries collect data from the agent in parallel. Queries include automatic or user-defined indexing for table row retrieval from the agent. Each data element returned from a Query can be used in the same manner as a Taboret variable.

Event Filter Editor

You can specify the application's response to traps and notifications from network agents using Event filters, which allow traps to be taken apart and each variable evaluated.

As you work with event filters, you may perform the following:

- Specify the trap or notification name
- Identify the source device or device location
- Enter a condition (i.e., formula) for the event

Rules Editor

You may set up global rules to perform application-wide actions based on If-Then-Else conditions that you define. You may define more than one response to each condition, such as open a screen; pass a system call; and perform a Get request. The trigger conditions are any Boolean formula or expression. Taboret also supports rules that are local to a widget and which “fire” only when the widget is operating in the application (i.e., the screen on where they are located is open).

Menu Editor

To control the flow of your application, you can create pulldown and pop-up menus. Taboret also allows easy development of applications organized in folders or with button bars.

Polling Control

You specify how often your application retrieves and calculates data by specifying polling intervals. Each variable, query, screen, and widget in your application can have its own polling rate. Polling may be set as follows:

- **None:** The element is polled only when another element that references it is polled.
- **Default:** The entire application is set with a single default-polling rate.
- **Constant:** Data are polled the constant rate you specify when you build the application.
- **Variable:** Polling rate is defined by a numeric variable, query column, or a previously defined screen widget. The polling rate changes if the value of the referenced variable changes. End users may change the polling rate when running the final application when you setting polling using a variable.
- **Screen:** Data are polled for screen widgets only at the rate defined for the screen containing the widget.

Polling for global data elements begins when the application executes. When a screen is opened, the application immediately retrieves and displays the information for each widget on that screen. If a widget has a defined polling rate, the data element begins its polling when the screen opens, and polling continues until the screen closes.

End User Help

Taboret allows you to create help for your end user. With Taboret, the help you create is easy to display in HTML using the end-users web browser, Windows Help, and Taboret.

Taboret provides its own hypertext environment. Your help can be connected to any Taboret screen widget to allow easy and consistent access to help.

Taboret widgets also allow you to define floating help, or tool tips, to give your users hints whenever they pause over an area of your application.

Scripting

Taboret provides a scripting environment to let you define the exact processing required and uses the Tcl scripting language, which is the standard and is easy to use. You can apply scripting when your application:

- Requires precision control over the behavior of agent interaction
- Uses complex algorithms with complicated control flow (e.g., looping) to calculate information for use by the application

The Tcl language is extended to include several Taboret-specific functions. The Tcl scripts can be launched in a variety of ways including:

- The firing of a rule
- Receiving a trap or event notification
- A user action (e.g., button click, menu selection)
- Under an evaluated condition for a widget

Using the scripting language, any of the Taboret variable or query contents can be included in the processing. In addition, the scripts can call for SNMP Sets and Gets to the agent through the Taboret Run-Time Engine.

Internationalization

Taboret lets you build applications that can be moved quickly to many local languages. The Taboret language database allows quick and straightforward translations of screen elements that use Unicode characters. Adding a new language is fast: After the translation elements are keyed in the application screens, simply enter the translation for each key in each language desired in the language database—and you are done. The same database can be distributed to all your users around the world. The display language is specified at run-time.

With this feature, you can build, test, and maintain a single application for all your localized offerings. Once defined as a multi-language application, new languages can be added at anytime. Because it is not necessary to enter and test them all before distributing the application, new languages can be added quickly based on market needs.

Figure 6 shows the Taboret language database being populated in English, Kanji, and Spanish.

	Key	English	日本語	Español
1	&change	Change	変わる	Cambio
2	&file	File	書類	Archivo
3	&OK	OK	宜しい	OK
4	&select	Select	選ぶ	Selección
5	&edit	Edit	変種する	Revisión
6	&option	Option	選択権	Opción
7	&language	Language	言語	Idioma
8	&list	List	目録	Lista
9	&cancel	Cancel	取消す	Cancelar

Figure 6. The Taboret Language Database Reflects the Keys and Replacement Language Terms

Organizing Work

The Taboret Editor provides an intuitive organization tool that allows you to manage and maintain all the elements of your application—the Application Tree. This organizing tool uses a familiar structure that appears in the main window of the Editor. You can also define modules to contain elements to organize your work. The tree graphically depicts the data scoping applied to each variable and query used in your application. Figure 7 shows the first level of application tree before any elements are inserted. As you insert elements, its name appears under its category in the tree.

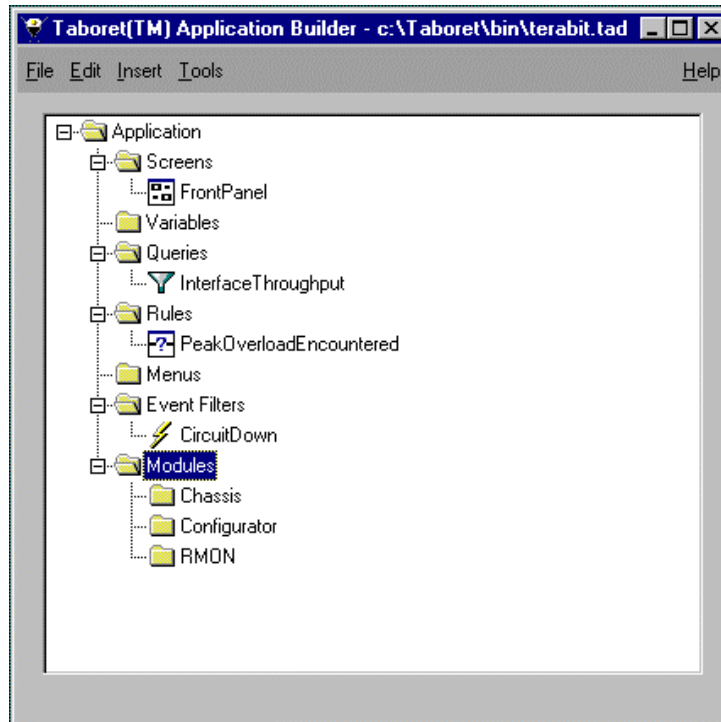


Figure 7 The Application Tree in the Application Builder Provides a Visual Display of the Contents of the Application

Debugging Support

Because it is so easy to display agent information using a Taboret application, you do most of your debugging right on your screens after running the application. You create debug screens that display the raw data from the agent. For example, to validate the example graph, you can drag tcpInSegs from the MIB tree and drop it onto a debug screen as an integer. Running this application will quickly allow a validation of the behavior to ensure that your screen displays the correct data.

The Taboret Editor also has a validation tool that scans the application and identifies components that are being used but are not properly defined.

TABORET RUN-TIME ENGINE CAPABILITIES

The Taboret Run-Time Engine is a software component that runs the Management Application Definition created using the Taboret Editor. The run-time engine displays the user interface in either a Motif or Windows style, depending on which operating system you are running on; controls interaction with and processing of data from the agent; and integrates into the SNMP protocol stack of the network management platform.

Protocol Use

The Taboret Run-Time Engine automatically detects whether the agent supports SNMP or SNMP version 2 and selects the right protocol usage techniques. Taboret supports all SNMP commands including Get, Get-Next, Get-Bulk, Set, Trap, and Notification interaction. Taboret passes the community strings to the agent as well.

Taboret has solved a problem encountered by most management applications: agents that can't keep up with the demands of the management application. Taboret solves this problem by allowing developers to set up a threshold of how much data an agent can process. Taboret controls the flow of requests so that the agent will stay below this threshold. This mitigates the nonlinear behavior of an application toward an agent, such as when huge loads of requests are dumped on an agent (e.g., when an application first starts up or when something goes wrong in the network).

Network Efficiency

The Taboret Run-Time Engine uses the following automatic techniques to make the most efficient use of the network based on your application design:

- **SNMP Command Packing.** Taboret automatically packs SNMP packets with multiple SNMP requests when you design the application to perform the requests at one time. For example, the Taboret Query Editor feature allows you to retrieve collections of rows from a table or set of scalar values from a MIB. Developers who need to obtain simultaneous measurements from the agent frequently use this powerful construct. When the Query is performed, the Taboret Run-Time Engine packs a request for scalar values into as few requests as possible. If the query retrieves rows from a table, the Taboret Run-Time Engine uses the Get-Next or Get-Bulk commands depending on the capabilities of the agent.
- **Data Re-Use.** Taboret's use of data scoping also provides developers with direct control over the periodic retrieval of MIB information. Global variables can be defined allowing a single MIB value to be retrieved once and used in several places of the application. Local variables can be defined allowing a MIB value to be independently retrieved for each use in the application. The developer can define any combination of this functionality.
- **Periodic Data Retrieval.** With Taboret, the developer can choose many ways to control the frequency of periodic data retrieval from the agent. The developer can control the periodic retrieval, or polling, of any data element used in the application. The simplest application can elect to update all data in the application on a periodic basis and the more complicated can define specific screens, variables, or widget update at independent rates. The most elaborate application may elect to poll for any particular value or group of values at a rate defined using a variable. You may enter the variable or provide an algorithm for its calculation.

INTEGRATION WITH EXTERNAL SYSTEMS

Taboret provides a range of methods to use in integrating Taboret with other applications or data sources:

- **System Calls and Scripts:** Allow calls to external programs using system calls so that the application can launch system scripts or standalone programs. Scalar values may be passed in and out of the application with system calls.
- **File Input and Output Capabilities:** Allows retrieved data from the agent to be passed out of the application. Taboret also allows files to be read into the application and displayed. Taboret reads and writes delimited files.
- **Launch Control of a Taboret Application:** Allows parameters to be passed into the application to customize behavior. Taboret is designed to be launched from network management platforms, scripts, command lines, or other programs. In addition to IP addresses, these variables become scalar Taboret variables and can be used for a variety of purposes to customize the operation of the session with the application.

DEPLOYING TABORET APPLICATIONS

The major advantage of any Taboret application is that it will run without change on a variety of the industry leading network management platforms and operating systems. The list of supported systems is always growing, so please contact ARINC to get the latest availability. The current network management platforms are described below.

Protocol and Platform Integration

The run-time engines integrate the user interface directly into HP OpenView, IBM NetView, or native Windows NT protocol stack, greatly reducing the amount of training and development time required for a management application developer in the programming and integration with a network management platform or protocol stack. No programming is required to create an application that writes or retrieves any data to or from an SNMP agent.

By using the existing protocol stacks, most deployed by the network administrators, Taboret allows you to avoid conflicts resulting from port contention and to eliminate the possibility that your implementation of protocols will be incompatible with your agent.

Taboret applications can be launched from the network management platform map or menu, the command line, or with NT desktop. Taboret provides a utility to help you to quickly create the tedious registration files needed to integrate into the GUI of the network management platforms.

Working with HP OpenView

Taboret supports HP OpenView Network Node Manager version 4.0 and later. Taboret run-time engines for OpenView are available for Hewlett-Packard HP-UX, Sun Solaris, and Microsoft NT.

As shown in Figure 8, Taboret applications are integrated into OpenView at two integration points.

- **OpenView Windows (OVw):** OVw integrates with Taboret just as it would any other HP OpenView application, such as the Event Viewer and MIB Browser. All applications processes are separate from the OVw process. Registration files specify a command line execution and indicate run-time parameters. A set of information can be passed from the topology to the integrated application. Registration files also specify rules for when an application can be run and how many can be run concurrently. A utility is provided with Taboret that helps you build these registration files quickly.
- **OpenView SNMP API:** This interface is used to communicate SNMP data to and from a managed device. This is the same API used by HP OpenView applications, such as the MIB Browser and the Event Viewer. Sets and Gets are implemented using an SNMP daemon (snmpd). Traps and Notifications (events) are registered for and received by a trap daemon (trapd).

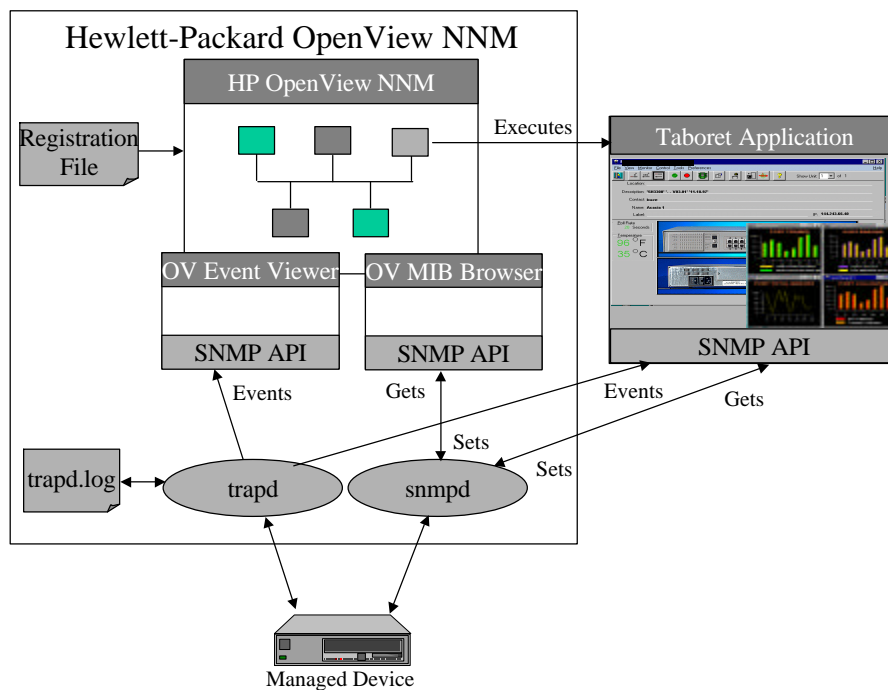


Figure 8. A Taboret Management Application Integrates Easily with HP OpenView

Working with TME/10 NetView from IBM

The Taboret Run-Time Engine runs on the NetView management platform. Taboret run-time engines for NetView are available only on AIX. Because of the legacy between NetView and OpenView, Taboret integrates in a similar fashion for both. (Integration information was discussed in the previous section.)

Working on NT without a Platform

The Taboret Run-Time Engine is available for the Microsoft NT 4.0 environment that requires no other network management platform. This Taboret Run-Time Engine is designed to support very low-cost deployment of a management application to administrators of smaller networks.

The NT standalone can be launched from a variety of platforms or from the NT desktop. The Taboret Run-Time Engine integrates with the native SNMP services provided by Microsoft as shown in Figure 9, which illustrates the integration between Taboret and NT.

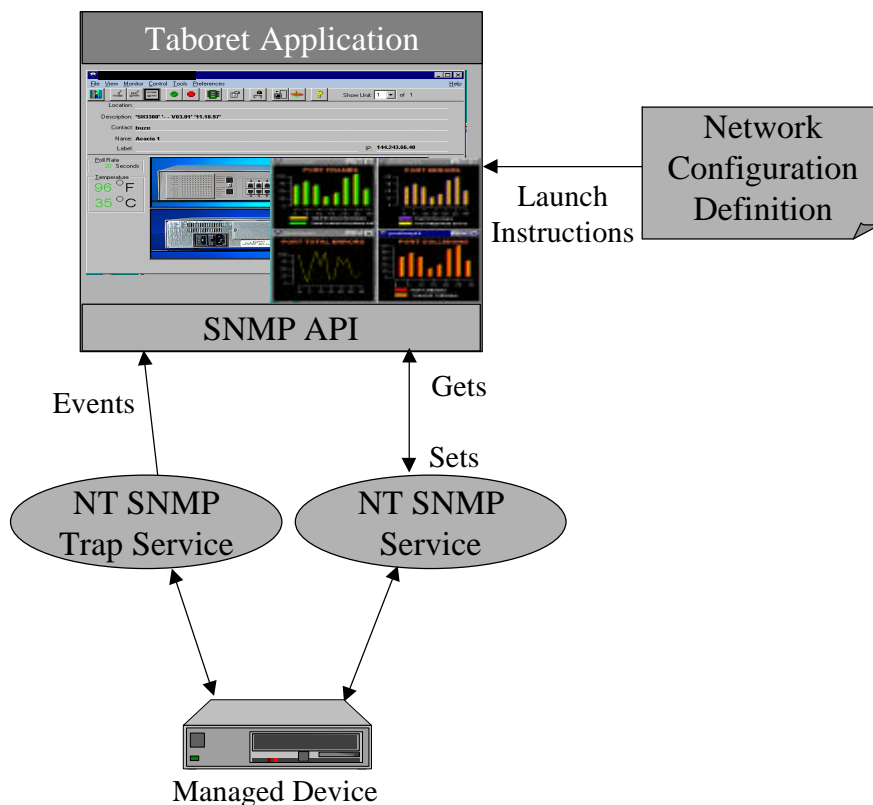


Figure 9. The Taboret Application and Run-Time Engine Integrates with NT

SUMMARY

Management application builders offer a new means for satisfying the demands of the network management industry through fast and inexpensive development of enterprise-specific management solutions. Taboret is the premiere management application builder, offering the ability to create truly custom applications for SNMP-manageable products. Through application-specific functionality, Taboret delivers the solution to fast and low-cost development of applications that will run without modification on the dominant operating systems, industry-leading network management platforms, and in the demanded world languages.

To find out more about Taboret, contact the Taboret sales team at:

Phone: 1-(888)-TABORET
E-mail: taboret_sales@arinc.com
Internet: www.taboret.com

ARINC
100 Bayview Circle, Suite 2000
Newport Beach, California 92660.
USA