AT&T and TÉLÉSYSTÈMES Partnering in France

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How do you make the sale and satisfy a customer in another country who is interested in your product but wants the technology and support to be in that country? One solution is described in this paper. By joining forces, AT&T and TÉLÉSYSTÈMES (a subsidiary of France Télécom) were able to provide the technology—an AT&T NetMinder™ network-traffic-management system—and local support that meet the needs of France Télécom. Today, France Télécom's new international network management center uses a NetMinder system to monitor and control telephone traffic between France and the rest of the world. AT&T provided the knowledge, training, and technology that TÉLÉSYSTÈMES needed to support and enhance the system once it was introduced in France. Besides its ability to provide close customer support, TÉLÉSYSTÈMES contributed its knowledge of the customer and its experience in managing telecommunications projects. The blending of both partners' approaches to software development led to mutual process improvements. This paper discusses the partnership and cultural issues we faced and how we resolved them, the benefits that resulted, and the lessons learned.

Background

On April 4, 1991, France Télécom DTRE officially inaugurated its new international network management center. From this center, France Télécom DTRE monitors and controls telephone traffic between France and the rest of the world. (DTRE stands for Direction Des Réseaux Extérieurs and means Division of Exterior Networks. France Télécom DTRE is a division of France Télécom and is responsible for France's international network. This includes all aspects of providing international telephone service to France Télécom's customers.)

The success of this high-technology center is the result of the combined efforts of AT&T and TÉLÉSYSTÈMES, an independent subsidiary of France Télécom. (Initially, the AT&T members of the partnership were AT&T Bell Laboratories and AT&T Network Systems. AT&T Network Systems International has since joined them.) By working together, AT&T and TÉLÉSYSTÈMES developed the version of the AT&T NetMinder network-traffic-

management operations system that supports the center. We refer to this version of the system as the NetMinder DTRE system.

AT&T and TÉLÉSYSTÈMES joined in a strategic partnership to do adaptive development and introduce and support AT&T's NetMinder product—i.e., the NetMinder DTRE system—in France. (*Adaptive development* refers to the development of customer-specific features to add to the existing software-feature base. Examples include support for France's switches, French maps for displays, and the French language for displays and documentation.) As their part of this arrangement, AT&T Bell Laboratories and AT&T Network Systems provided the knowledge, training, and technology that TÉLÉSYSTÈMES required to assume long-term responsibility for the support and enhancement of the NetMinder system for France Télécom DTRE. This effort gave AT&T's customer, France Télécom DTRE, technology that is based in France. In turn, AT&T acquired a partner, TÉLÉSYSTÈMES, that is close to this customer on a daily basis.

This paper describes the approach taken by the partnership, the issues that had to be addressed, the benefits that have resulted, and the lessons learned. (Panel 1 defines acronyms and terms used in this paper.)

AT&T's NTM Systems. AT&T, the global leader in network-traffic management, has over 15 years of experience in the development of network-traffic-management (NTM) systems and the operation of NTM centers. Three NTM centers serve the AT&T network:

- The AT&T Worldwide Network Management Center in Bedminster, New Jersey. This center is responsible for the AT&T domestic long-distance network and its connections to other nations.

- The AT&T Regional Network Operations Centers in Atlanta, Georgia, and Denver, Colorado. These two centers are responsible for the interface between AT&T's network and the networks of the Regional Bell Operating Companies and Independent Telephone Companies.

The NetMinder system is designed to provide centralized, real-time surveillance, display, analysis, and control of traffic flow in telecommunications networks. AT&T's NetMinder product line began with the development of a new NTM system, the Regional Network Management System (RNMS), which supports the AT&T Regional Network Operations Centers. Shortly after the inauguration of this system in 1988, development was started to extend AT&T's NetMinder NTM product family to other domestic and international applications. This product family now includes:

- Regional Network Management System for use in AT&T's Network Services Division.
- Network Traffic Management Operations System (NTMOS) for domestic applications. This product is used by the Regional Bell Operating Companies and the Independent Telephone Companies.
- NetMinder NTM system for international applications.

All NetMinder products share the same basic system but have customer-specified features and a customer-selected product name. The key features of all NetMinder products are:

- Real-time traffic-data collection from network entities including switching systems, service-control points (i.e., databases), and signal-transfer points.
- Real-time processing of collected data to determine exception conditions (i.e., network failure or congestion) according to user-specified thresholds.
- A flexible user interface that features user-customizable graphics displays. The interface includes video projection for quick assessment of network-traffic conditions, alphanumeric displays for detailed analyses of data and to activate traffic control (e.g., call rerouting), and printers for paper reports.
- Auditing capabilities for synchronizing the NetMinder system's database with network-entity databases.
- A *déjà vu* capability that allows users to recreate and reanalyze past network events and user actions.

NTM for International Applications. Two key factors contributed to AT&T's decision to market the NetMinder NTM system globally:

Figure 1. France Télécom DTRE wanted NTM technology and support for it to be based in France. AT&T and its partner TÉLÉSYSTÈMES (a subsidiary of France Télécom DTRE) adapted the AT&T NetMinder NTM system to meet this need, and TÉLÉSYSTÈMES provides local maintenance support and enhancements. This photograph shows the new France Télécom DTRE Network Management Centre, which uses a NetMinder system to manage France's international gateway network. The NetMinder DTRE system collects traffic data from the network's switches and provides a variety of displays for monitoring the network and analyzing network failure and congestion conditions. (Photograph by Yves Guilamon, France Télécom DTRE.)

- The worldwide demand for NTM systems is growing rapidly as telecommunications providers around the world modernize and expand their networks. The providers need operations support systems that will help them manage the complexity of their networks and maximize call completions.
- The NetMinder system has the features, flexibility, and performance to meet the NTM needs of telecommunications providers.

Typical international applications include centralized network traffic management of gateway networks, national toll and local networks, and intelligent overlay networks. Gateway networks handle traffic into and out of a country. (The paper by Fossett et al. in this issue discusses the partnering issues for such networks.[1]) Intelligent overlay networks, each a separate network, make it possible to provide services such as advanced 800 calling and calling-card service. AT&T sells intelligent networks made up of 5ESS® switches, network-control points that act as databases for translations, 5ESS switch signal-transfer points, and various operations support systems.[2,3] These intelligent networks are then connected into the telecommunications networks of PTTs.[4,5] (PTT stands for *Postal, Telegraph, and Telephone* and refers to the national governmental agency responsible for combined postal, telegraph, and telephone services in many European countries.)

In addition to the system sold to France Télécom DTRE, AT&T has sold NetMinder systems to PTTs in other various countries.

The *NetMinder* DTRE System. The France Télécom DTRE application of the NetMinder NTM system provides network-traffic-management capabilities for France's international gateway network. The NetMinder DTRE system collects real-time traffic data from the switches in that network, and provides a variety of graphical and alphanumerical displays for monitoring the network and analyzing network failure and congestion conditions.

France Télécom DTRE's international network management center (Figure 1) features an array of video monitors that continuously display the status of France's international gateway network and its traffic to other networks around the world.

Reasons for Partnering

France Télécom DTRE was in the market for an NTM system for its gateway network, and also wanted to have NTM technology and support that are based in France. AT&T had the NetMinder system, which would provide the functionality that France Télécom DTRE needed.

The solution was for AT&T to partner with TÉLÉSYSTÈMES, a subsidiary of France Télécom, to provide the system that France Télécom DTRE wanted. The business and technical benefits of this partnership extended to AT&T, TÉLÉSYSTÈMES, and their customer, France Télécom DTRE.

Business Benefits. The major business benefit was simply that, as a partnership, AT&T and TÉLÉSYSTÈMES were able to make the sale of the NetMinder system to France Télécom DTRE.

Figure 2. The exchange of technical knowledge for this project was a multiyear effort. It started with the definition, development, and deployment of the NetMinder DTRE system, and evolved to include the establishment of a development environment at TÉLÉSYSTÈMES to support the product's ongoing maintenance.
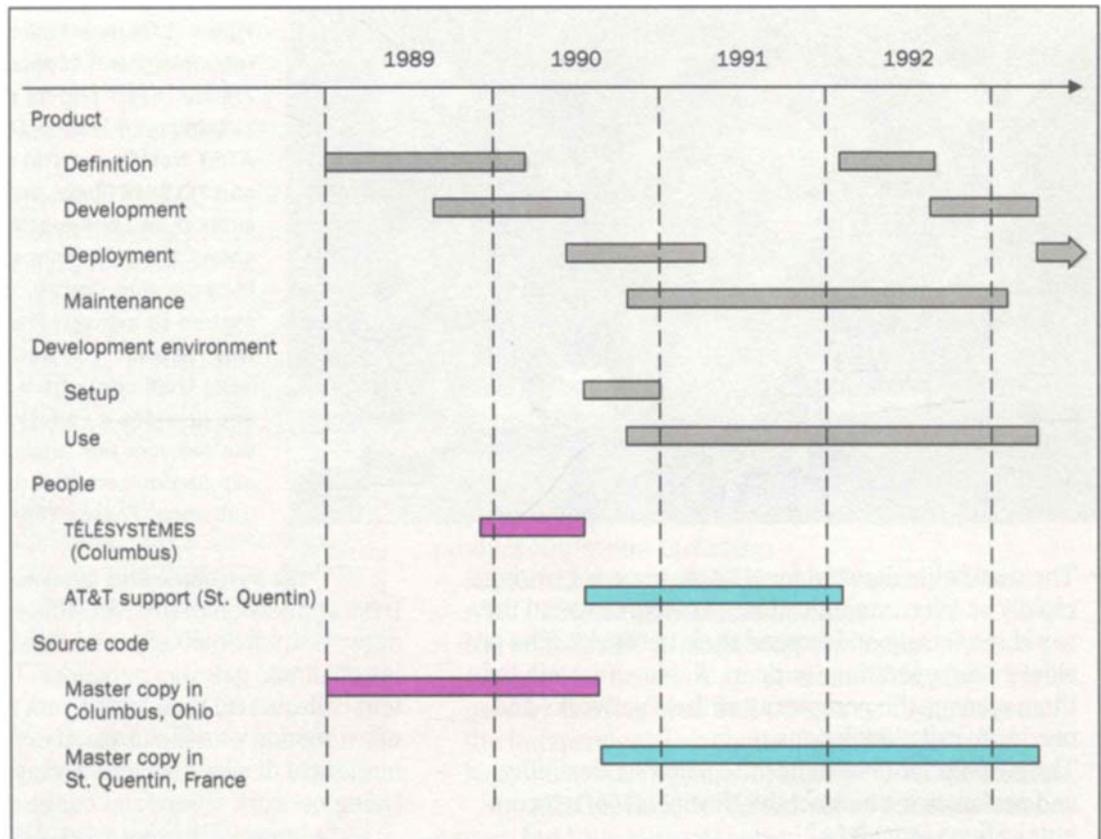
Through this partnership, AT&T was providing its Netminder product and its extensive traffic-management knowledge and experience—expertise that is recognized around the world. TÉLÉSYSTÈMES, on the other hand, was contributing its experience in dealing with France Télécom DTRE and in managing telecommunications projects, along with its ability to provide close customer support.

Technical Benefits. The technical benefits to TÉLÉ-SYSTÈMES are that it has acquired the knowledge and technology necessary to support and enhance the NetMinder NTM system deployed for France Télécom DTRE. These acquisitions included:

- The hardware and software source code for the NetMinder DTRE system.
- A complete development environment at TÉLÉSYS-TÈMES in St. Quentin, France (outside Paris), including a NetMinder DTRE system for laboratory use. This is a separate and distinct hardware and software system that TÉLÉSYSTÈMES uses to develop and test the NetMinder DTRE system.

- The training and software tools necessary to do development and handle software-configuration control.

AT&T gained technical knowledge about the interface to network elements, and both AT&T and TÉLÉ-SYSTÈMES brought their approaches to software development into the partnership. The blending of these approaches led to mutual process improvements.

The technical benefits to the customer are, again, that technical support is available locally and that TÉLÉSYSTÈMES can spend time at the customer site to understand customer issues, concerns, and enhancement requests. Also, because the technical documentation is translated locally, it can be adapted more easily to customer needs.

Approach to the Exchange of Technology

Early on, the partners recognized that the exchange of technical knowledge would be a multiyear effort. It would start with the definition, development, and deployment of the NetMinder DTRE system, and

evolve to include the establishment of a development environment at TÉLÉSYSTÈMES that could support the ongoing maintenance of the product. (See Figure 2.)

The key business considerations were to set up the business partnership and establish guidelines for conducting business together. A major issue was to define the scope of the technical knowledge required.

Exchanging Technical Knowledge. Three main elements were involved in the exchange of technology:

- Knowledge and application software associated with the delivery of Release 1.0 of the NetMinder system to France Télécom DTRE.
- Knowledge and software tools to establish a software development environment for the NetMinder DTRE system at TÉLÉSYSTÈMES.
- Knowledge about the operation, administration, and maintenance of the NetMinder DTRE system in the customer's environment.

The primary methods for transferring the technology were:

- Establish training courses.
- Prepare and deliver documentation.
- Prepare and deliver software and the appropriate software licenses.
- Provide on-the-job training, wherein developers and testers from AT&T and TÉLÉSYSTÈMES worked together as a team.

Project Responsibilities. All design and development was done at AT&T's facility in Columbus, Ohio, where the implementation team for the NetMinder system is located.

For this project, the team consisted of AT&T Bell Laboratories people who did the development and system testing, two software engineers from TÉLÉSYS-TÈMES who also did development and system testing, and AT&T Network Systems people who did the beta testing and support. The two TÉLÉSYSTÈMES employees were temporarily transferred to Columbus to participate in the development process. During their nine-month assignment in Columbus, they reported to AT&T management and were referred to as resident visitors (RVs) in AT&T. (*Beta testing* refers to the second stage of testing for a software product. It follows the initial testing stage of software development and occurs before commercial release of the product. Beta tests are conducted away from the software manufacturer's premises, at a test site that is called the *beta site*.)

After the Netminder DTRE system was delivered, TÉLÉSYSTÈMES handled the coordination of activities in France and has managed the local field support during the NetMinder DTRE system's one-year warranty. All these functions had to be done in France because of the associated locality issues such as local maintenance, time differences, and language and cultural differences.

Key Technological Challenges

The technical challenges the partners faced were numerous. Most problems were unforeseen and, when they were discovered, we solved them as a team. The rest of this section gives some insight into those challenges and the approach we used to solve them.

Defining Release 1.0 Software. The initial delivery of the NetMinder system to France Télécom DTRE was the most difficult phase of the partnership because both sides had much to learn.

The Release 1.0 development was a concentrated effort to produce a system that could manage France's international gateway network, and to establish a good base of knowledge that TÉLÉSYSTÈMES and AT&T could use to evolve the product.

The NetMinder system is a product that is intended for many applications, both domestic and international. These applications are built on a common software base, called the *core*, which is used in various NetMinder products and is common to all of them. In addition, all applications have *adaptive software*, i.e., software that is developed for a particular product to meet its specific needs. (We use the terms $1.xnm$ and $1.xdtre$ to refer to the core and the adaptive software for the NetMinder DTRE system, respectively. The x is a digit that represents the release or generic. For example, 1.0 refers to the first release, while 1.1, 1.2, and so on designate subsequent releases to correct problems or add enhancements.)

This software structure raised the issue of whether to deliver the entire NetMinder system or only those parts that were explicitly required for the France Télécom DTRE application. The decision was made by the AT&T Intellectual Properties group to deliver the entire NetMinder system, except for clearly defined modules that the customer did not require. Also, use of the delivered source code was restricted to this application. This meant TÉLÉSYSTÈMES could not use or sell it for other applications, and France Télécom DTRE could use it only for the intended application.

Figure 3. Software architecture of the NetMinder system. The *audit* and *control* modules are not needed if the network elements cannot provide the data necessary to drive them. For the France Télécom DTRE application, this data was not available so both modules were removed. All other modules were retained.
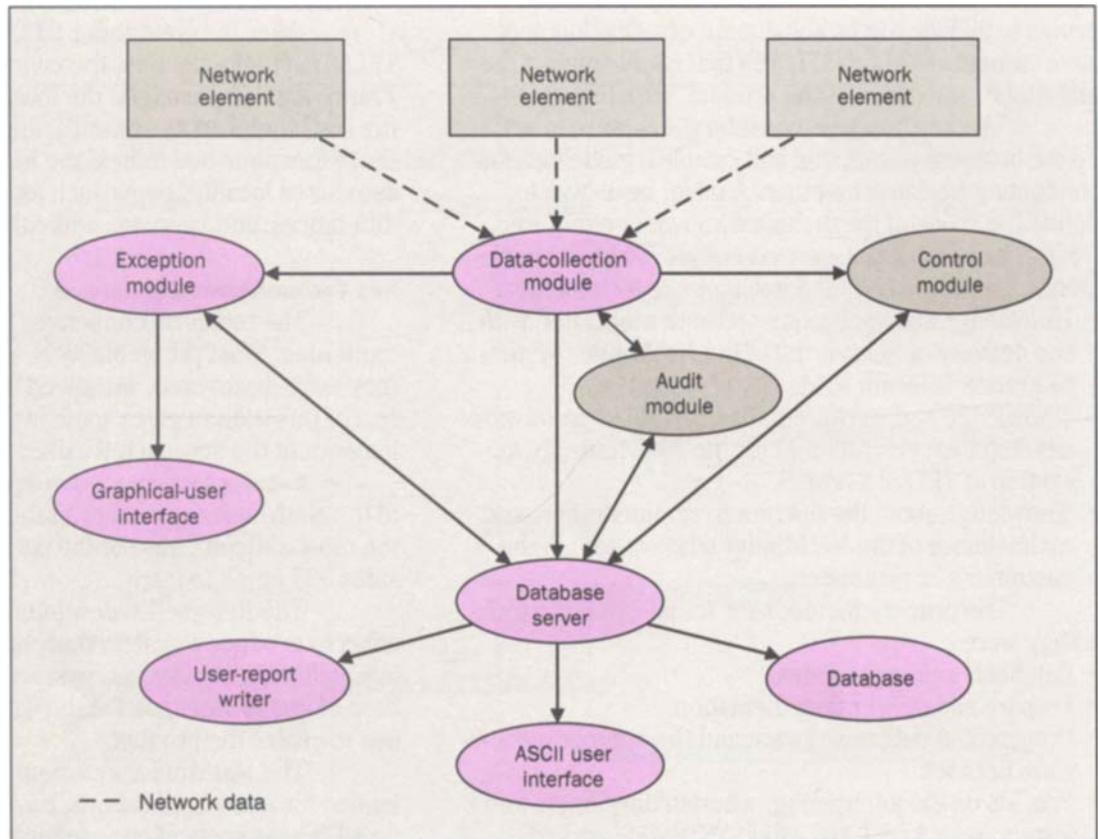

Figure 3 represents a high-level view of the software architecture of the NetMinder system. The *audit module* and *control module* are data driven, which means that they are needed in the configuration only if the network elements can provide the data these modules require. For this application, that data was not available. Therefore, the audit and control modules were removed, but all the other modules were retained.

Source-Code Administration. Initial development of software for this application was done in Columbus, Ohio. But once beta testing started in June 1990, two versions of the source code had to exist simultaneously—one in Columbus, and the other at TÉLÉSYSTÈMES in St. Quentin, France. AT&T needed the source code in Columbus to provide a proper environment for investigating and fixing problems (in both the adaptive and core software) during the beta-testing and acceptance periods, which began in June 1990. In addition, TÉLÉSYSTÈMES needed the source code in St. Quentin to provide an

environment for the continued support and maintenance of the system in France. Beta testing took place at the France Télécom DTRE Network Management Centre in Bagnolet, France, a suburb of Paris.

How to ensure that changes to one version were replicated in the other was an obvious problem, but the solution was nontrivial. We solved this problem through procedure:

- Until France Télécom DTRE accepted the system, all official changes were to be completed in Columbus by the development organization. (*Official* refers to code that has been tested and verified in the customer's product. Until this testing and verification has been completed, all code changes—including new generics—remain "unofficial.")
- After the acceptance period, the official copy of the software and responsibility for configuration management was to reside at the TÉLÉSYSTÈMES site, and all official changes were to be made there.
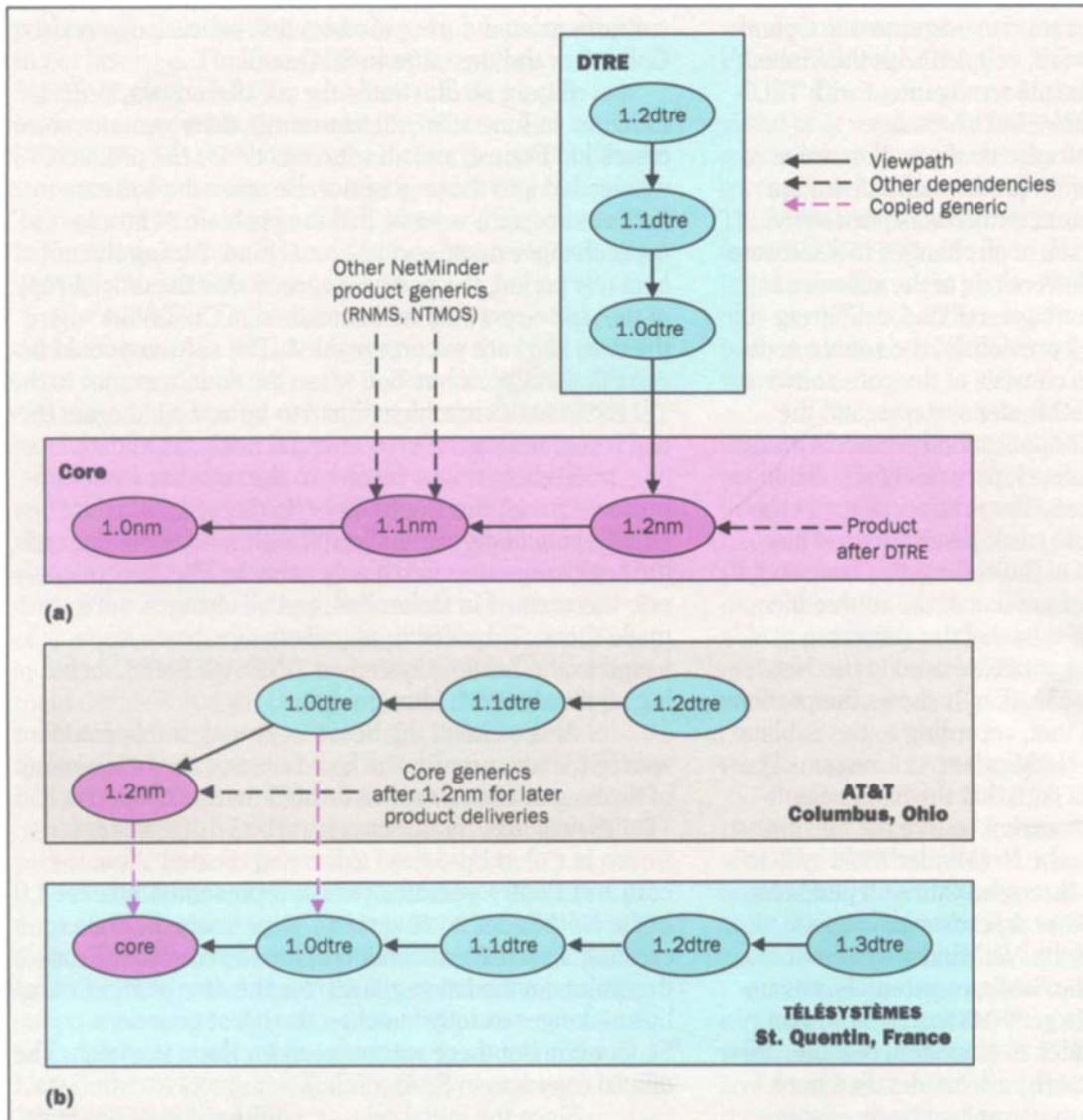
Figure 4. The Sablime™ software product administration system was used to manage the software configuration. The terms *1.xdtre* and *1.xnm* refer to a generic (i.e., version) of the software for the NetMinder DTRE application and for the system's core software, respectively. *Dependencies* refers to source code for other applications whose source files rely on other core-software generics. (a) The "current" software configuration for the NetMinder DTRE system, as seen with the Sablime tool. The source file for this configuration consists of the code in the 1.2 generic plus all the unchanged code in earlier generics. (b) During beta test of the system, source code existed simultaneously at two sites. Until France Télécom DTRE accepted the NetMinder DTRE system, the official copy of the source code was in Columbus and all changes to the software were made there. After the NetMinder DTRE system had been accepted, the official copy resided in France and TÉLÉSYSTÈMES made all the software changes.

The complexity of configuration management in Columbus for multiproduct software, coupled with the limited hardware resources, made this arrangement with TÉLÉSYSTÈMES not only desirable, but necessary.

To manage the software configuration, we used the AT&T Sablime™ software product administration system.[6] The Sablime system (which was previously known as SABLE) keeps track of all changes to a software system and allows multiple versions of the software to exist simultaneously, including versions for different applications. As mentioned previously, the source code for any NetMinder system consists of the core software, which is common to all NetMinder systems, and the adaptive software, which is application-specific. With the Sablime system, software developers can easily "build" a source file for an application. They can reconstruct the source code for any version; track precisely what has changed from one version of the code to the next; and, if needed, restore a particular version of the source file.

Figure 4a shows a subset of the software-configuration-management structure used in the NetMinder product for this application. It shows the portion of the NetMinder product that, according to the Sablime system, refers only to the NetMinder DTRE system. The term *viewpath* refers to the path that the Sablime software searches to build the current source file for this application. As we can see, the NetMinder DTRE system's adaptive software, 1.0dtre through 1.2dtre, depends on the 1.2nm core generic. *Other dependencies* refers to viewpaths for other versions of the NetMinder system that could be searched using the Sablime system. For example, NetMinder products (e.g., RNMS and NTMOS) that existed before the NetMinder DTRE system rely on earlier core generics. These viewpaths are not detailed here.

Two complete hardware and software systems were to be delivered in France. One was the actual NetMinder DTRE system, i.e., the "field" system, which was to be installed at the France Télécom DTRE Network Management Centre. The other would be used as the development, test, and support system at the TÉLÉSYSTÈMES site in St. Quentin. To facilitate this environment, we also sold licenses to TÉLÉSYSTÈMES for the Sablime system and other software tools. In June 1990, both the NetMinder DTRE software and the Sablime software were taken to the TÉLÉSYSTÈMES site and loaded on the hardware there. Thus, two sets of the NetMinder DTRE

software existed during the beta-test interval, one set in Columbus and the other in St. Quentin.

Figure 4b illustrates the parallel software configurations. In June 1990, the *core* and *1.0dtre* generics were created in France, and all source code for the product was loaded into these generics. Because the software had been copied, we now had the problem of how to track changes made on either machine. During the initial beta-test period, the partners agreed that the official copy of the software would be maintained in Columbus where the core software experts resided. The software could be compiled in Columbus but, when the code was sent to the TÉLÉSYSTÈMES machine, it had to be compiled again there and tested before the system in the field was updated.

To help track changes to the software in Columbus, we "froze" the 1.0dtre generic there. That meant changes no longer were allowed within this generic, and further change required a new generic. The 1.1dtre generic was created in Columbus, and all changes were made there. At agreed times, all changes were transferred to the Sablime system at TÉLÉSYSTÈMES, including all files in the 1.1dtre generic.

At the end of the beta-test period, the updated source file was sent for the last time, and the official copy of the source code now was located on the TÉLÉSYSTÈMES machine. Simultaneously, the 1.1dtre node was frozen in Columbus, and 1.2dtre was created. Also, the core and 1.0dtre generics (which represented Release 1.0 of the NetMinder DTRE system) were frozen in France, creating a permanent version of the tested code. (From this point on, the latest generic for the dtre part in Columbus no longer exactly matched the latest generic in St. Quentin but there was no need for them to match. The official copy was in St. Quentin.)

Since the initial release, additional generics have been created to handle various upgrades or a release that includes several software corrections or product enhancements. One such release was done to support the network during the 1992 Winter Olympic Games in Albertville.

Ongoing corrections for software problems either in the core or dtre portions of the software sometimes are still done in Columbus, but software changes are no longer built in Columbus. When France Télécom DTRE encounters a problem, the center personnel call TÉLÉSYSTÈMES to investigate and, if possible, provide a solution. If TÉLÉSYSTÈMES is unable to solve the

problem, it asks the Columbus development organization to get involved. The Columbus staff may work with TÉLÉSYSTÈMES to correct the problem, or may elect to correct it themselves and transmit the affected files to TÉLÉSYSTÈMES. TÉLÉSYSTÈMES then compiles and builds the software in France and tests it before delivery to France Télécom DTRE. Recently, AT&T Network Systems International was introduced into the loop between TÉLÉSYSTÈMES and Columbus.

AT&T in Columbus still keeps a copy of the latest source code in the latest generic for the NetMinder DTRE system, but changes are collected only after TÉLÉSYSTÈMES has loaded corrections on the customer's machine (i.e., France Télécom DTRE's machine).

The Sablime Tool. Another challenge was how and when to train TÉLÉSYSTÈMES personnel to use software tools, such as the Sablime software administration system. This type of training was difficult to complete during the development cycle because of the amount of work involved with developing the NetMinder DTRE system. Therefore, AT&T and TÉLÉSYSTÈMES management decided that this training would follow development and delivery of the NetMinder DTRE system to France Télécom DTRE. The AT&T support staff in Columbus and in France handled all the initial software administration using the Sablime system in France. Columbus personnel accessed the system remotely.

Training on the use of the Sablime system was done through video tapes and hands-on learning after the tools and software were installed at the TÉLÉSYSTÈMES location. This meant that AT&T people had to provide support via remote system access, telephone conversations, and site visits when necessary to maintain the NetMinder DTRE system and the Sablime software on the TÉLÉSYSTÈMES machine.

Even with the Sablime system, maintaining the source-code configuration for the NetMinder DTRE system is a complex task. Therefore, training and support for this tool are ongoing efforts as we add new generics and change the source code.

Software Maintenance. To enhance customer support for the NetMinder DTRE system and help continue the transfer of technology, AT&T sent a representative to France to work with TÉLÉSYSTÈMES for 18 months. The transfer of expertise and technology continued through ongoing interaction between AT&T and TÉLÉSYSTÈMES

when problems arose and through the questions that France Télécom DTRE (i.e., the customer) asked.

During this time, the support team, which consisted of several TÉLÉSYSTÈMES engineers and the AT&T representative, was under the control of TÉLÉSYSTÈMES management. Thus, the AT&T representative reported to TÉLÉSYSTÈMES management much the same as the RVs from TÉLÉSYSTÈMES reported to AT&T management during the development phase. This support arrangement not only gave France Télécom DTRE a local contact for support, but also simplified contact with AT&T in Columbus when necessary.

The support arrangement also provided a learning tool for both sides. TÉLÉSYSTÈMES learned more about the NetMinder DTRE system in general, and also became familiar with development and support tools that had not been required during the development phase in Columbus. During this time, AT&T was able to learn more about the needs of France Télécom DTRE and was able to get timely customer feedback on suggestions and system corrections, which might not have been possible without such an arrangement.

People Aspects of the Transfer of Technology

People made the AT&T and TÉLÉSYSTÈMES partnership a success, and good communication was vital. The NetMinder system team adopted a small-team approach to develop the system for France Télécom DTRE. Thus, they were able to act quickly on problems and solve them as a small, integrated team.

Focused Team Approach. As mentioned before, a key aspect of the partnership was for TÉLÉSYSTÈMES to send software engineers to AT&T to help in the planning and design of the NetMinder DTRE system. At AT&T, they participated in all aspects of the product realization process—from system specification to testing—and then in a supporting role. These RVs had to meet several criteria, including fluency with the English language, experience with the UNIX® operating system and the C programming language, and some experience with system development for real-time systems. (UNIX is a registered trademark of UNIX System Laboratories, Inc.)

The purpose of the RV arrangement was not only to provide NetMinder DTRE system technology to TÉLÉSYSTÈMES, but also to enable AT&T to gain knowledge about other development methodologies and get

assistance from TÉLÉSYSTÈMES to develop the product. The RVs were given the same work environment as other developers within AT&T Bell Laboratories and also had access to formal training courses, as well as on-the-job training. The RVs were instrumental in making AT&T employees sensitive to some of the cross-cultural issues that are specific to doing business in France. The best example is the importance of social interactions with ones customer, which is really true of many places in the world, not just France.

As a small team of developers, testers, documenters, and trainers, AT&T and TÉLÉSYSTÈMES developed the NetMinder DTRE system for France Télécom DTRE. The team met often, and no distinction was made between AT&T and TÉLÉSYSTÈMES team members. This approach allowed everyone to work across corporate and cultural barriers, except for the occasional use of American slang that was inevitable in both technical and casual conversations.

This team worked to accomplish all aspects of a successful system, including:
- The system proposal and contract
- System specification and requirements
- System design
- System development
- User and technical documentation
- Testing
- Training.

Language and Communication. Perhaps the biggest problem was the language barrier. It did not greatly affect the relationship between AT&T and the TÉLÉSYSTÈMES personnel in Columbus, but did affect communication with TÉLÉSYSTÈMES personnel in France. All deliverable documents, including the user documentation, had to be translated into French.

Initially, all technical documentation (e.g., design descriptions) for the NetMinder DTRE system was written in English, and translated by either the RVs or the project chief at TÉLÉSYSTÈMES in France. There were no serious problems with the technical documentation, because everyone involved understood the technical content. However, a problem arose with the user documentation.

Documentation undergoes phased testing similar to software. The complete documentation must be thoroughly reviewed by the developers and testers of the software. Only then is the documentation "finalized,"

i.e., deemed ready for beta testing. Normally, our user documentation was not finalized until roughly one month before the system beta-test interval, but France Télécom DTRE required a French version of the user documentation before beta testing could begin. This meant that the documentation either had to be completed ahead of time or had to be translated quickly. However, user documentation for the NetMinder system is complex enough that translating it in one month was not feasible.

The solution was to provide preliminary documentation to the translators (who worked under contract to TÉLÉSYSTÈMES) as it became available, giving them an early start on the French version. As changes were made, the revisions were transmitted to the translators, so that they could update the French documentation. Thus, the user documentation was available on time and in French.

Another communications issue was how to explain further problems and solutions to the RVs and their colleagues after the RVs returned to France. Because of the complexity of the NetMinder DTRE system and the software tools, visual explanations often were required. Teleconference calls were somewhat effective, but required accompanying facsimile transmissions and electronic mail to support them. Also, copies of the NetMinder DTRE system's graphical display could be sent only by facsimile, which meant they arrived in black and white. Thus, the images had lost the color that was sometimes the object of discussion.

These problems were solved in two ways. The first key to the success of the product and the exchange of technology was AT&T's agreement to send a person from its NetMinder system organization to France for 18 months to serve as the primary support contact. This person was experienced with the NetMinder DTRE system, and also knew the tools used to support a development and test environment. Having a person in France offered two advantages to AT&T:
- We would continue to have close contact with France Télécom DTRE, our customer.
- AT&T could provide on-site support and training when needed.

TÉLÉSYSTÈMES benefited by having a local person available to support the NetMinder DTRE system and explain the problem resolutions that came from Columbus.

The second method that AT&T and TÉLÉSYS-

TÈMES used to solve the communications problem was to conduct weekly teleconference calls. To make the calls more effective, a meeting announcement preceded each call and a meeting summary followed the call. The AT&T person in France participated in these calls and has helped to provide better mutual understanding of issues.

Lessons Learned

Many lessons were learned, some positive and some negative. Each of the following points illustrates some aspects in the hope that others can use them to plan and execute future partnering arrangements.

Partnerships take time. We knew this before entering into a partnership agreement with TÉLÉSYS-TÈMES. However, both parties underestimated the amount of time required to implement a technology transfer agreement and complete the terms of the partnership. The knowledge about network-traffic management that had been accumulated in AT&T over a 15-year period is not entirely tangible. Much of this information was passed from AT&T to TÉLÉSYSTÈMES through hands-on experience and time, not by written word. The same can be said for the exchange of knowledge from TÉLÉSYSTÈMES to AT&T about doing business in France. Most of this exchange came from the time and effort devoted to doing business.

We also learned that *on-the-job training is crucial.* Two people from TÉLÉSYSTÈMES worked with AT&T for 9 months in the United States, and one person from AT&T went to TÉLÉSYSTÈMES in France for 18 months. Both arrangements were required for the partners to absorb the intangible aspects of knowledge transfer. Without these training experiences, we doubt that the system or the partnership would have been successful.

Another aspect of a successful partnership is *open sharing of information* for the benefit of both groups. The sharing helped to establish a trusting relationship, so that each organization shared what it knew to enhance the project.

At system conception, we wasted no time in beginning to work together. The exchange of technology was a joint effort to establish how the system development would take place. By *forming a close working relationship from the outset,* we could avoid nonessential issues and focus on establishing a team that was devoted to the project first, and to an organization second.

In all systems, there are problems and a product that is co-developed and supported by two organizations is no exception. On occasion, *differences in the organizational culture led to delays* in the specification or development of the system. This is particularly true of project activities that AT&T and TÉLÉSYSTÈMES traditionally approach in different ways. Examples include methods for documenting the design of a software module, and the priorities the two organizations placed on the development cycle.

All the people involved with developing this product also had to deal with *cultural differences beyond the corporate kind.* However, we found that both AT&T and TÉLÉSYSTÈMES adjusted to each others' cultural differences so quickly that these differences did not hinder product development.

Summary and Conclusion

The partnership between AT&T and TÉLÉSYS-TÈMES has been successful for both partners and for the customer, as evidenced by the following:
- The customer's "report card" for Release 1.0 of the NetMinder DTRE system was positive. (AT&T Network Systems has initiated a report-card process for obtaining timely quality feedback from its customers.)
- France Télécom DTRE has hired AT&T and TÉLÉSYS-TÈMES as consultants to study future releases for the NetMinder DTRE system.
- The Olympics release was handled almost entirely by TÉLÉSYSTÈMES.
- Plans are well along for the development of a second software generic for the NetMinder DTRE product.

The Olympics features allowed France Télécom DTRE to monitor switches that were not included as supported elements in the original release of the NetMinder DTRE system. Because of the expertise it had gained from the partnership, TÉLÉSYSTÈMES was able to handle this contract requirement from France Télécom DTRE.

Télécom DTRE who made the France Télécom DTRE project a success.

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