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Painting the big picture

AT&T tackles full plant design documentation

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AT&T Broadband is the nation's largest provider of video and broadband data services. In addition to providing traditional cable television services to more than 14 million subscribers nationwide, the company also delivers a variety of advanced broadband services, including high-speed, content-enriched cable Internet service and local phone service.

Following the purchase of TCI and MediaOne, AT&T developed new ways to manage the newly acquired equipment and networks and streamline operations to serve customers faster and more effectively. But that wasn't always the case.

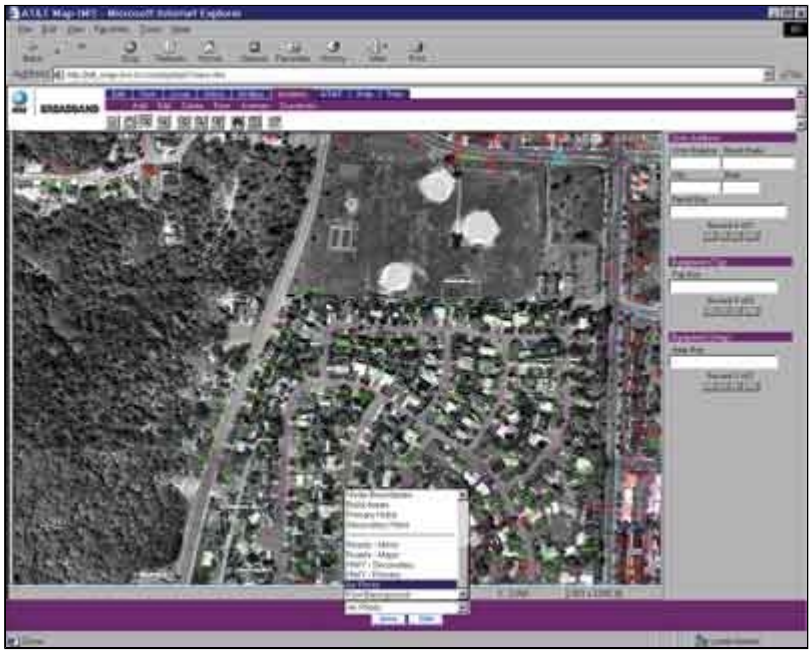

Figure 1: AT&T Broadband's intranet provides maps, reports, and applications to thousands of employees, helping them identify equipment, track projects, check availability of service in a customer's neighborhood, and more.

Using the company's Washington region as a case study, AT&T Broadband has brought the best practices of AT&T's existing operations to the cable and broadband industry. The Washington team is introducing new ideas to streamline business workflow and improve customer service. In a sense, the company is "going back to the drawing board" by reinventing the computer-aided design (CAD) system that companies use to design and map hybrid fiber/coax networks.

The Washington market consists of more than 18,000 miles of plant infrastructure, strung past 1.8 million homes. Once AT&T Broadband acquired the networks, the

company began upgrading the infrastructure to support new services. The cable TV transmission medium and plant infrastructure all have different values during the business life cycle. But in 1998, there were few ways to effectively manage the key assets and value of AT&T Broadband's plant.

Traditionally, cable companies have created and maintained libraries of detailed network and equipment drawings. Even though these critical documents could be generated faster and stored more efficiently with software, use of the system beyond drafting was limited.

Most cable companies maintain various spreadsheets and other databases in an attempt to manage key plant assets. But the cable industry has few, if any, examples of companies that have undertaken full plant design documentation. Most MSOs don't make the most of the data that's stored on engineering documents. Instead, they are merely using the technology to create a picture.

When the Seattle telephony plant was built beginning in 1999, AT&T Broadband had a turnkey contractor responsible for the creation of design and engineering documentation. AT&T Broadband's role was to perform quality control (QC) and approve the product.

Beyond the sheer volume of physical design documents, other factors were slowing AT&T Broadband's rate of QC. The primary contractor was using many subcontractors to do the work. Although the data might still be accurate, each company employed its own standards, using different layers and symbols to represent the equipment. This variation slowed quality control considerably, as each design had its own look and feel. Because of this inconsistency, the data in the drawings would be of little value.

To redesign the system, AT&T Broadband engineers referred to the existing library of paper designs and maps left by subcontractors. It was quickly realized that many of the paper maps were missing and precious few digital design files remained.

In addition, hundreds of engineers from different design firms had drafted the original library, using inconsistent methods for symbolization and cartography. Without a single standard, the resulting mishmash of designs made interpretation tedious.

While designing the telephony plant, engineers discovered that they needed to:

Pinpoint the exact location of the home in relation to every element of the plant.

Define the relationships of individual homes to things like Public Service Answering Points (PSAP), Rate Center, and MSAG.

Quickly identify issues in the plant that affect customers' critical services.

These needs pointed to one alternative: a "one source," query-capable database that could produce a visual product. Such a tool represented a drastic change from the traditional cable-industry paradigm of knowledge remaining in an engineer's head or stashed under the seat of a maintenance vehicle.

Initially, AT&T Broadband was concerned about keeping startup and maintenance costs in line, accessing source code for future enhancements, and ensuring that it would realize the benefits of these efforts before competitors.

AT&T Broadband embarked on the development process by engineering more than 15,000 miles of plant and rebuilding another 13,000 miles in Washington state The Washington market needed people familiar with the network and its assets, as well as those with the skill sets to develop a flexible, modular tool. Development of such a tool required team members from diverse disciplines.

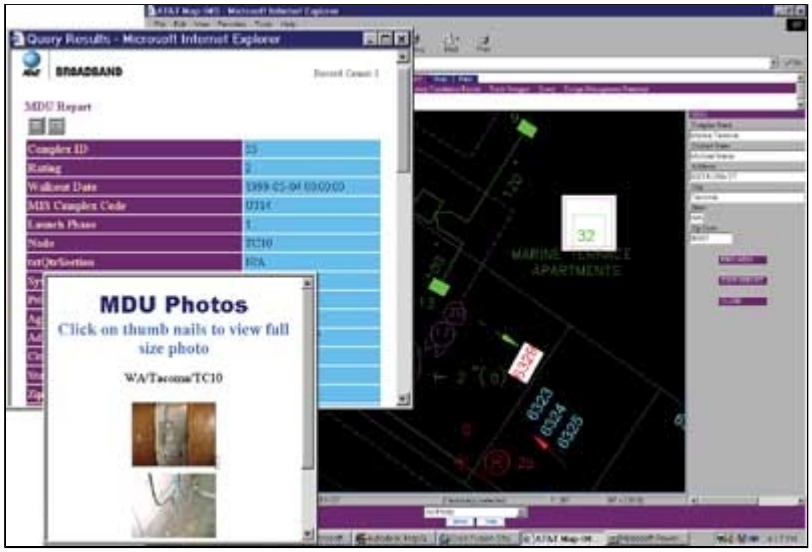

Figure 2: Detailed design drawings, reports, scanned documents, and equipment photos are delivered from a Web browser to employees who previously had little or no access to this information.

The company sought the assistance of Autodesk to better understand the problem. The Washington market team recognized the value of building a seamless network database instead of a traditional design library in digital format.

From the start, the goal was to build intelligence into the designs and ensure that they worked together as a system without the use of proprietary software or licensing.

The Washington market engineering team first had to convert existing records into an intelligent database. When digital files were available, the contractor performing the conversion applied its quality control process to ensure that the cables were logically connected and didn't simply appear to connect graphically. Paper maps were converted into digital format from scratch. When no record existed in digital or paper form, the team gave field engineers land parcel maps and sent them on "walkouts" to sketch and redline existing facilities.

Before mapping could start, the team needed a standard language and process. The engineering team looked inside and outside for expertise in building database models. The Washington market team's Information Systems (IS) group worked with Kanotech Information Systems Ltd., a Canadian CAD and GIS (Geographic Information System) development company, to help create standards for intelligent mapping.

The maps received from contractors looked great, but lacked a consistent description of the network. Although the company required that Autodesk software be used, there was little, if any, way to effectively QC the work.

These details may seem insignificant at first, but they serve as the basis for the intelligent data model for all the analysis and advanced applications that were envisioned for the company. Representatives from all of AT&T Broadband's major markets, together with database specialists and Kanotech, hammered out the graphic standard.

But creating guidelines and documenting the standard was not enough.

The engineers created designs and maps using the basic software product. But often the results did not meet the new standard. We worked with Kanotech to build an automated drafting and quality-control application named the AT&T Mapping Application Drafting Assistant, or ATT_MappDR, for short. This application helped the contract engineers perform the test themselves and see immediately if they adhered to our standard.

The engineering team discovered that by building a standard and enforcing it with

automated drafting and quality-control applications, the cost of capturing the information fell significantly. The team no longer required hundreds of employees to manually inspect and approve the submissions.

They were still creating the basic maps that every team across the country was required to build, but they were also getting the graphics in a standard format that made the task of building an intelligent model easier. Plus, they were doing it less expensively.

AT&T Broadband and Kanotech then began to develop several applications that would streamline not only the engineering process, but other business tasks as well.

The new toolbox

Over the course of a year, AT&T Broadband and Kanotech developed the first in a family of software tools built on top of Autodesk GIS software–Autodesk Map, for designing and mapping the network, and Autodesk MapGuide, for publishing data over the Web. The suite of applications is known as ATT_MApp (pronounced “at map”) and the first completed tool was ATT_MAppDR. This design and quality-control application helped the Seattle team meet its mapping and design requirements while driving overall production costs down by almost one-third. Currently, four of six applications are completed and in use for map production, network operations and customer support. They include:

ATT_MAppWO (WalkOut)–This “walkout” application is a mobile version of the drafting and design tool, optimized for pen-based computing, for engineers to sketch and capture maps from the field. The new streamlined process eliminates some time-consuming steps from the old paper-based drafting system. In addition, from the first point of data capture, the team is laying the groundwork for the connectivity model that engineers use to perform network traces and design.

ATT_MAppFM (Fiber Module)–This application is a complete fiber-optic design, project tracking, and infrastructure documentation tool that automates the creation of splice documents and bills of material (BOM) for construction. In addition, it is built using the same connectivity model applied with ATT_MAppDR and, as a result, can perform “most probable equipment failure” analyses throughout the network.

ATT_MApp-IMS (Infrastructure Management System)–This Web-based tool is built on top of Autodesk’s Web mapping technology that extends the mapping information beyond the engineering department. Integrated with other corporate databases, this application offers reporting features to query customer, demographic and network equipment information from a desktop computer.

ATT_MAppRF (Radio Frequency) and ATT_MAppIP (Inside Plant)–These two applications, currently under development, contain the design and business logic behind coaxial networks and plant equipment management. The Inside Plant application models the complete connectivity from the signal’s origination to its termination, associating all equipment elements in the system

The engineering applications have helped to speed the department’s operational tasks and save money. However, it is the Web and Intranet applications that have caught the attention of the entire business.

The Web changes everything

What was once considered purely “engineering data” is now available to the marketing department, sales staff, customer service, field crews and finance office. There are few AT&T Broadband employees who can’t access this information. This contrasts with the dozens of staff that previously had direct access to the digital design data using expensive proprietary software licenses.

AT&T’s business depends on the careful management of its assets, and this network is spread across thousands of miles of cable and equipment. This project is designed to assist all business groups to more effectively manage, query, report and update the company’s network information.

In the past, it sometimes took several days to discover whether service was available in a customer’s neighborhood. Now, customer service representatives can answer the customer’s question and start the order process immediately.

Sales and marketing departments can track projected growth and target new opportunities. The finance department can now use a Web browser and maps to view all the company's assets, tracking these against the company's own rate and billing boundaries.

Operations can monitor service and match customer addresses to the network to identify outages, resolving the issue before the entire neighborhood calls to complain. Meanwhile, the engineers themselves now have Web-based applications offering network trace and design query features that are easy to use and much faster than the older system.

The answers to common questions are now at each employee's fingertips. We have transformed what was traditionally an engineering task into a critical business task. Not even counting the savings, we are doing business smarter and more competitively.

Within engineering alone, the savings are huge. Tasks that are traditionally performed by proprietary design software are being tied into the drafting and design system. In startup situations, we're looking at $2.8 million in savings during the first year, based on reduced software and resource costs. On top of this, we eliminated most of our annual maintenance costs because we own these applications outright. Fewer contracted engineers and lower software costs–it all adds up.

In addition, the company is seeing savings from reduced operational costs outside engineering. Instead of recording the same information in the field or on the phone while talking to a customer, employees are accessing the maps and equipment data that we already captured correctly the first time. Now, we are embarking on the next phase of this project–creating our own design tools on top of the intelligent mapping system.

We have selected standard tools for good reason. We don't want to make the mistake of building our applications using an obscure or proprietary software or programming language. We picked Autodesk tools because they are standards-based, and we can create custom applications on top of them.

We also are looking at ways to manage and distribute the data more efficiently. We want to store hundreds of separate design files in a single database for easier management. We've built central databases for the Web applications, but these sit apart from the original design files. We have planned, by year's end, to edit, store, analyze and distribute information from a single source out of an Oracle structure.

In addition to central data storage, the team is looking for mobile technologies that support the service crews. We've got ATT_MAppWO for the engineers in the field, but the service crews are still left with paper maps or CDs of maps for use on laptops.

We've got thousands of employees in the Washington region. Many work all day in the field, installing service and making repairs. They'd like the same access to the current maps and equipment data that their colleagues in the office have, but our mobile tools today only support data capture for engineering tasks. Welding desktop computers to the dashboard of the van isn't an option. We're looking for the equivalent of our Web mapping application, ATT_MApp-IMS, in a sturdy mobile device.

AT&T brought in a method to intelligently manage and share information with employees that is, for the most part, novel in this industry. To be sure, we employed tools from other industries, but we also put our own "broadband stamp" on the system.

Although this project was initially developed in one of AT&T Broadband's 13 regions, the results and savings gained attention across the company. Last August, the company made ATT_MAppDR a corporate standard nationwide.
