Telecom Connections

ESRI • Fall 2009

GIS for Telecommunications

Multiservice Telco Improves Data Access with Spatial Network Management Applications

Farmers Telephone Cooperative (FTC), the third-largest telephone cooperative in the United States, recently modernized its network management system for fiber infrastructure. It chose a geographic information system (GIS)-based solution that delivered a comprehensive management and reporting system as well as powerful business intelligence tools.

Headquartered in Kingstree, South Carolina, FTC offers local, long-distance, and wireless communications and high-speed Internet, security, and video services to more than 60,000 customers spread over five rural counties. With the goal of providing the most advanced technology at economical prices to its customers, FTC recently completed a multiyear fiber build-out for digital loop carriers, schools, and large businesses.

With the expansion, FTC modernized its network management system by converting to NetWORKS, software based on ESRI ArcGIS and offered by ESRI business partner Enghouse Systems, Ltd. After extensive research, FTC chose NetWORKS because it provides solutions to the company's modernization needs.

FTC needed to incorporate GPS accuracy for its mapped facilities and be able to integrate networkwide data into one display, provide simultaneous multiuser access, and define security and accountability features for each user. Although its existing CableCAD system (also an Enghouse product) was fast, it had limitations caused in part by its proprietary design. Data sharing was difficult, land-base problems were hard to fix, and limitations in the programming language created a dead end for customization. Report production was tedious, and making even a small change to the data structure, such as changing a field from alphabetic to numeric characters, required a database reorganization that was cumbersome.

This NetWORKS image displays copper cable lines that are color-coded by distance to source and layered over an aerial photograph.

NetWORKS is network design and management software for telecommunication service providers (as well as electric utilities and CATV services). Built on GIS technology by ESRI, NetWORKS employs an open, interoperable, and Web-deployable platform that is easy to customize and makes it possible to interface with enterprise applications such as customer information systems. The software suite provides geospatially based network and facilities management capabilities for both copper and fiber, and its modular design enables flexible implementation.

NetWORKS' features matched FTC's needs with an added capability of viewing the network on top of aerial imagery. The challenges FTC faced in changing over to NetWORKS included cost, possible work backlogs and

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disruption during conversion, and personnel training on the new technology.

Before the move to NetWORKS, FTC prepared a detailed conversion plan that mapped out the required steps for populating the new system with data, migrating records, training personnel, and posting backlogged work. Meanwhile, FTC chose Design South Professionals, Inc. (DSP), of Anderson, South Carolina, for the job of acquiring more than 62,000 submeter GPS points to map FTC facility locations. DSP completed the project in 10 months.

Enghouse services did the work of converting CableCAD data to NetWORKS, rubber sheeting the mapped facilities to the new GPS points, then cleaning the data. Enghouse personnel also developed NetWORKS customizations such as distance to source, percent utilization, and query manager.

The business intelligence customizations include

Distance to source—This gives a user-defined, color-coded view of existing cables. At a glance, the viewer sees where advanced services are available or not available. Customer service representatives use this tool to make decisions about advance services capabilities. Marketing uses distance to identify customers who are eligible for new products because their location is within a certain distance from the network.

> "There is much less redundant work when you have all the data at your fingertips."

Percent utilization—This gives a user-defined, color-coded view of capacity utilization for each cable.

These NetWORKS images show percent utilization of copper cable color-coded in increments of 20 percent displayed with and without the aerial photograph layer.

Technology Used

Software—ESRI ArcGIS Server and ArcGIS Desktop, Enghouse NetWORKS Editor (based on ArcEditor), NetWORKS Viewer (based on ArcView), FieldWORKS (based on ArcView), FiberWORKS, CopperWORKS

Hardware—Microsoft SQL Production Server, File Server, Development Server

Reports—This provides a way to build queries and reports to extract information from the database. Predefined as well as customizable reports are available.

Aerial photography—This is made available from ESRI data, makes many design decisions easier, and saves windshield time. For example, finding out whether a road has two or four lanes or checking the exact location of a house is much faster.

The new system was ready for implementation after 18 months of planning and conversion activities. FTC office personnel started using the system after attending three one-day training sessions in ESRI ArcGIS basics and the CopperWORKS and FiberWORKS modules. System administrators received more extensive ArcGIS and server training. Results have been rewarding.

"Maps are a big part of our planning meetings, and now that our entire system of 17 exchanges and 7 CLEC [competitive local exchange carrier] exchanges are on one database, creating comprehensive maps showing everything from interexchange fiber routes to board member districts is simple," says Mark Brown, FTC plant design supervisor. "There is much less redundant work, because steps are eliminated when you have all the data at your fingertips."

"The way ArcGIS inherently handles and displays data aids in producing reports," says Allan Matthews, FTC systems and network administrator. "The openness of the data stored in Microsoft SQL Server creates many new possibilities for integration into other company systems."

FTC also implemented FieldWORKS, the Enghouse mobile solution, which gives field personnel access to digital maps and design information in the field, including the trace, search, and reports tools.

"In the future, we would like to add data connectivity in the field using our advanced cell network," says Brown.

For more information, visit www.ftc-i.net or contact the ESRI telecommunications industry team at telecominfo@esri.com.

Telecom Trends

By Randy Frantz
Telecommunications & LBS Industry Solutions Manager
ESRI

$7.2 Billion Spells Opportunity for a Broadband Nation

In its December 2008 report on broadband usage, the international Organization for Economic Cooperation and Development (OECD) listed the United States as the largest broadband market in the OECD, with 77 million subscribers. However, the U.S. market was ranked 15th in penetration, with only 25 broadband subscribers per 100 inhabitants. Some argue that the low rate reflects the difficulty of reaching sparsely populated areas in rural America. Nevertheless, Canada, with a population density one-tenth that of the United States, has a broadband penetration rate 10 percent higher than its southern neighbor. The reality of the situation is, whether you live in a city or on a ranch, broadband access is critical to competing and succeeding in today's global economy.

U.S. lawmakers have signed two important legislative acts that support broadband access expansion—the Broadband Data Improvement Act (BDIA) and the American Recovery and Reinvestment Act (ARRA). GIS will play a critical role in supporting activities targeted by these acts because it can be used to identify areas underserved or unserved by broadband.

One impediment to implementing an effective policy to expand broadband is a lack of quality data. Although GIS provides the technology to map broadband coverage, information on broadband rates and coverage areas is generally not available at a refined level. That is probably because, until recently, the Federal Communications Commission (FCC) only required reporting of broadband connection counts at the ZIP Code level on Form 477, the required form for filing local telephone competition and broadband data. Under that scenario, if one customer in a ZIP Code had service, then service was considered available throughout the entire ZIP Code. With some ZIP Codes covering over 50,000 people, availability was often overstated.

The good news is that the FCC recently mandated reports of broadband service at the census tract level—an area that includes up to 8,000 persons. While this is a significant improvement, reporting to the block group or even the block level, as required by some states, would be much better for mapping coverage.

The BDIA directs the U.S. Secretary of Commerce to award grants for the development and implementation of state-level programs to identify and track the availability and adoption of broadband services. GIS can be used to create the geographic inventory maps that the states are required to develop and maintain. These maps can then be aggregated and made available to the public through a Web page on the Department of Commerce Web site as mandated in the act. A system that uses GIS server technology will provide a more detailed assessment of broadband service availability. ESRI is responding to broadband mapping needs with the BroadbandStat solution and Telecommunications Mapping and Analysis Package (see pages 8 and 9) and by working with Connected Nation (see the article "GIS Fills the Gaps for State-Based Broadband Initiative" in the spring 2008 *Telecom Connections*).

The $350 million BDIA funding is part of $7.2 billion that ARRA has allocated for broadband expansion. Public and private entities are competing for some of these funds that are being dispersed in the form of grants and loans to build and expand broadband infrastructure. Funding requests will be evaluated on their ability to deliver broadband to the community, which includes increased access for public locations such as schools, libraries, and health facilities. States that use GIS to create coverage maps will have the data in a format that can easily be integrated into their broadband network expansion plans and grant requests. These states will have a competitive advantage in demonstrating need during the funding application process.

State, private, or federal capabilities to post mapped service areas online also contribute to accountability and transparency in the funding process. Online coverage maps make it easy for Web site visitors to compare pre- and postfunding broadband coverage. With $7.2 billion allocated to expand broadband, taxpayers will certainly want to see where investment delivers results.

Best regards,

Randy

Level 3 Synchronizes Fiber Data with Mobile GIS Application

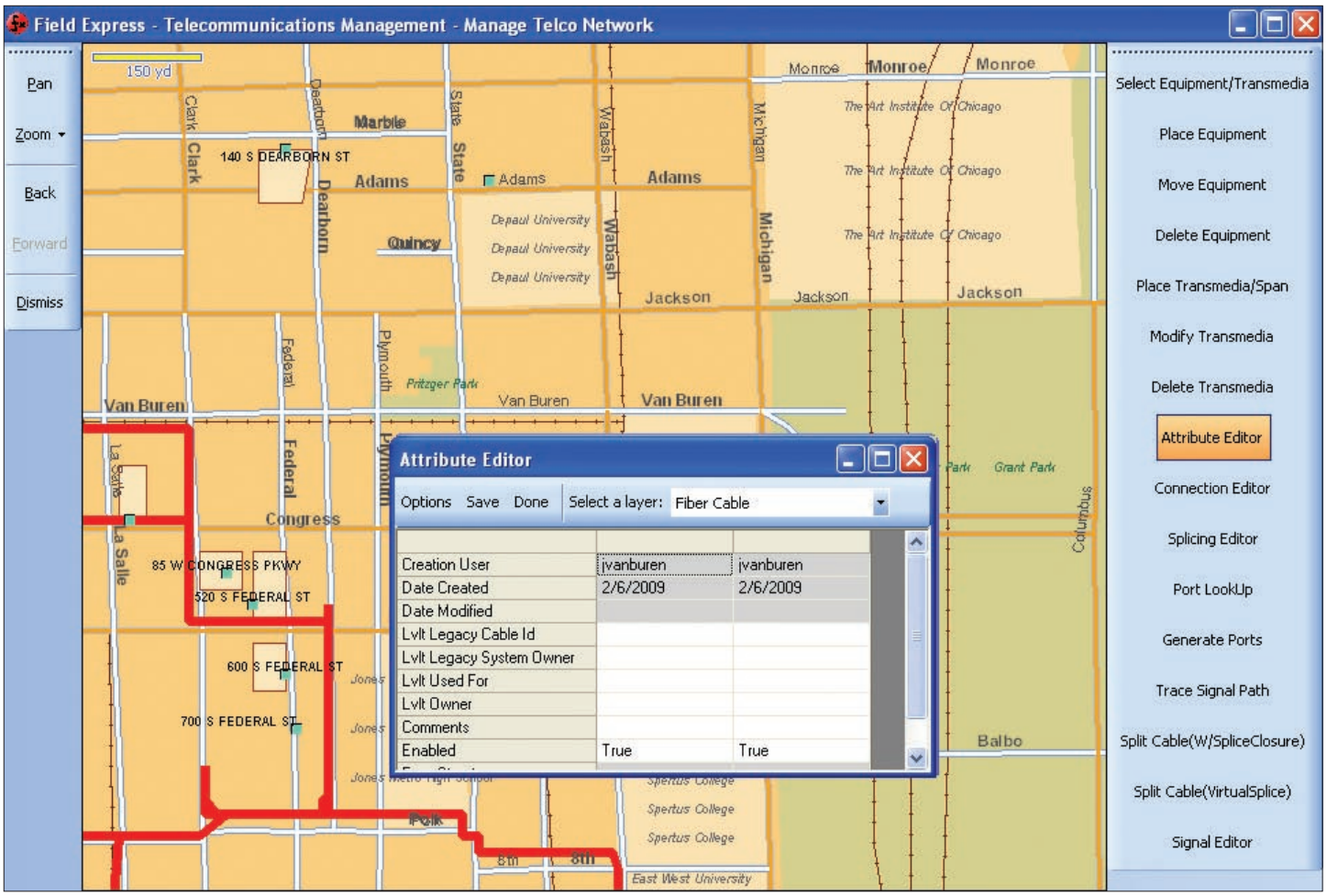
Level 3 Communications, an international communications company headquartered in Broomfield, Colorado, operates as one of the largest IP transit networks in North America and Europe. Through acquisitions of WilTel, Progress Telecom, ICG, Telcove, Looking Glass Networks, and Broadwing, Level 3 now owns and maintains over 48,000 intercity route miles. However, the fiber data maintained by these companies was kept in various formats, and when the acquisitions were made, Level 3 received these different datasets or, in some cases, did not receive any data at all. To maintain the most up-to-date records and provide quality customer service, the company needed to standardize a data platform for the newly acquired companies that would allow all existing data to be seamlessly populated into a central database.

To begin this process, Level 3 hired a third-party contractor to migrate all the existing fiber network data into the newly formed geodatabase. Once the existing data was migrated from various platforms, Level 3 addressed the need for new data capture and data cleanup/corrections. It turned to systems integrator 3-GIS, an ESRI business partner based in Alabama, to provide Field Express Chameleon as the mobile application for this data capture.

"We selected Field Express Chameleon because it is a simple tool that provides timely data without being intrusive to the field engineer's daily routine," says Gino Mancuso, senior analyst, Level 3.

Field Express Chameleon is a field editing tool built around ESRI's ArcGIS Mobile technology. By leveraging the capabilities of Field Express Chameleon and ArcGIS Mobile technology, Level 3 successfully captured critical, accurate data and fluidly posted it into the central database repository through ArcGIS Server, ESRI's server-based GIS for centralized geodata management and mapping capabilities.

"The objective was to put a tool in the hands of the field technicians who have the firsthand knowledge of the network to accurately inventory our OSP network," says Greg Connors, GIS manager, Level 3. "It has allowed us to simplify a very complicated project of inventorying 21,000 miles of OSP fiber by breaking it down into simplified tasks and quickly training over



Field Express Chameleon's attribute editor makes it easier to update infrastructure information during on-site inspections.

100 field technicians—from across the country and with no GIS experience—to load and model our OSP network in a centralized database."

Field Express Chameleon gives field technicians the ability to edit data in the field, capture new inspection information, and manage related records. The application uses ArcGIS Mobile technology to transfer data updates to and from a laptop or a handheld field device running Windows Mobile or XP. It can run in either an Internet-connected or Internet-disconnected mode and, when connected, uploads or downloads data using an ArcGIS Server map service.

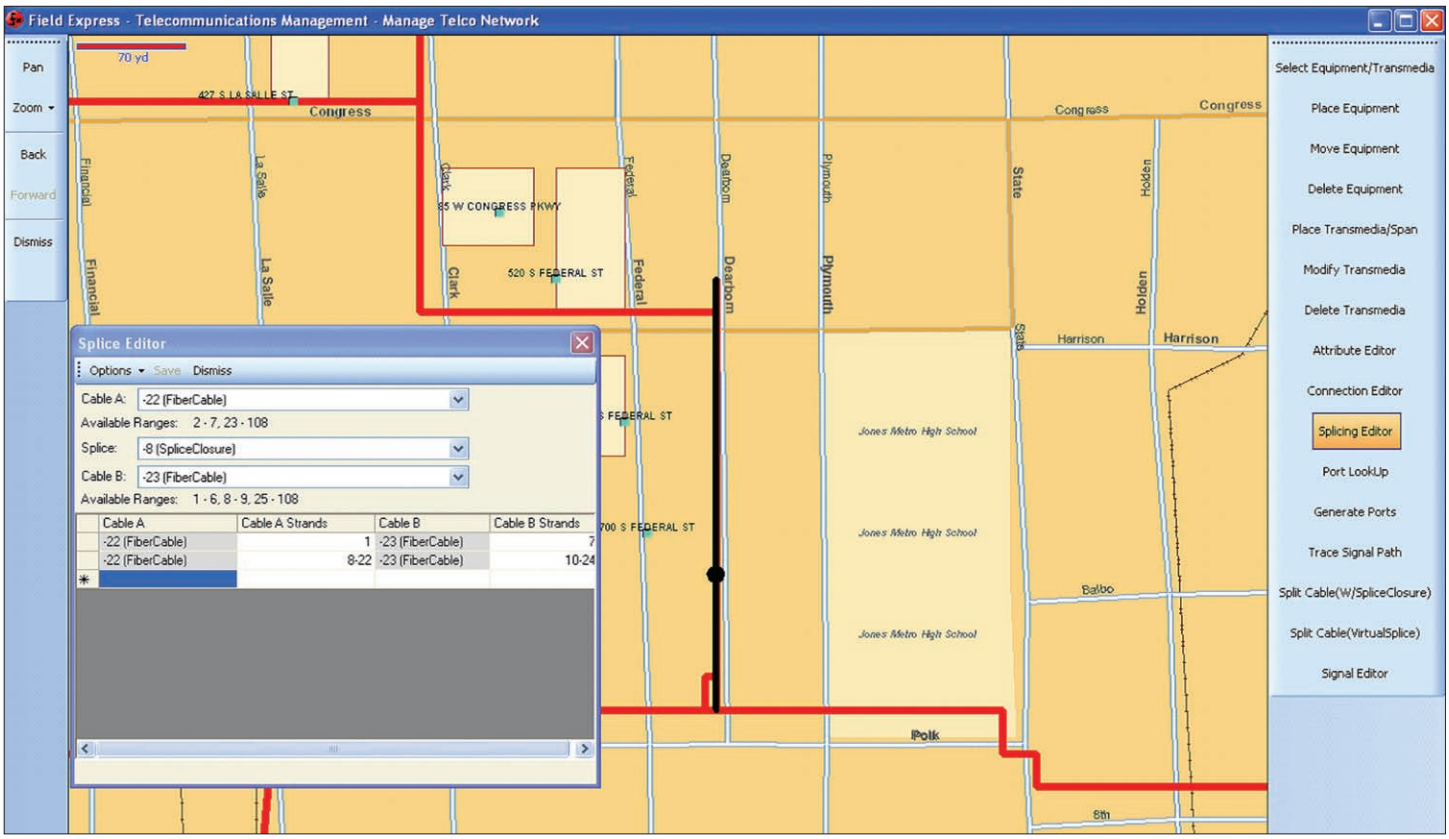
Training went quickly, as it was performed in a Web Demo environment that lasted just two hours. The demo was broadcast across the country to Level 3 field crews, who were then able to download the software and immediately begin using it. After a pilot phase, Level 3 began full data capture in June 2008 by mobilizing field crews in specific regions. Level 3 technicians took existing data as a starting point and corrected and extended the data with field inspections to create an accurate record for outside plant infrastructure.

Level 3 divided the data capture/correction effort into three tasks. First, technicians make sure the route and building information is entered accurately into the database. Next, using existing records or making field visits, they correct and enter data for all the cable access points (CAPS) and spans (conduits, trenches). Then, with existing records or field-collected data, they update or enter new data for the cables and equipment. This last task includes very detailed information such as cable configuration, strand-level splicing, panel configuration, port-to-strand connectivity, and fiber consumption.

Level 3 has completed the first 2 phases and has 10 additional phases under way. The completed phases include the fiber capture for markets in Seattle, Washington; Atlanta, Georgia; Chicago, Illinois; Austin and Houston, Texas; Cincinnati, Ohio; and San Francisco, San Luis Obispo, and Los Angeles, California. When complete, Level 3 will have recorded fiber data for 118 markets spanning 21,000 route miles of fiber.

For more information about Field Express Chameleon, contact Amy Garrison at agarrison@3-GIS.com or visit www.3-GIS.com.

Field Express Chameleon by 3-GIS



Drop-down windows in the Field Express Chameleon splicing editor window help reduce data entry errors.

GIS Networks Broadband TV, Internet, and Telephone

Polish Provider Implements a Server GIS-Based System

Network inventory systems do not increase the turnover or income of operators in a direct way, yet it is thanks to them that operators acquire the operational efficiency expected by their clients and shareholders. Instantaneous access to the information about the network, its components, and the parameters of installed hardware, along with its usability statistics and configuration details in today's telecommunications industry, is worth its weight in gold.

The extent of the benefits of using a network inventory system depends on how well the system reflects the physical network and how many and which business processes make use of the collected data. A hybrid fiber-coaxial (HFC) network is much more complex than the traditional copper and optical networks. This is due to the technological aspects of the services provided. It was for this very reason that Polish telecommunications provider ASTER decided to have a new network inventory designed and implemented by a network inventory systems provider.

Entering New Markets with a New Network

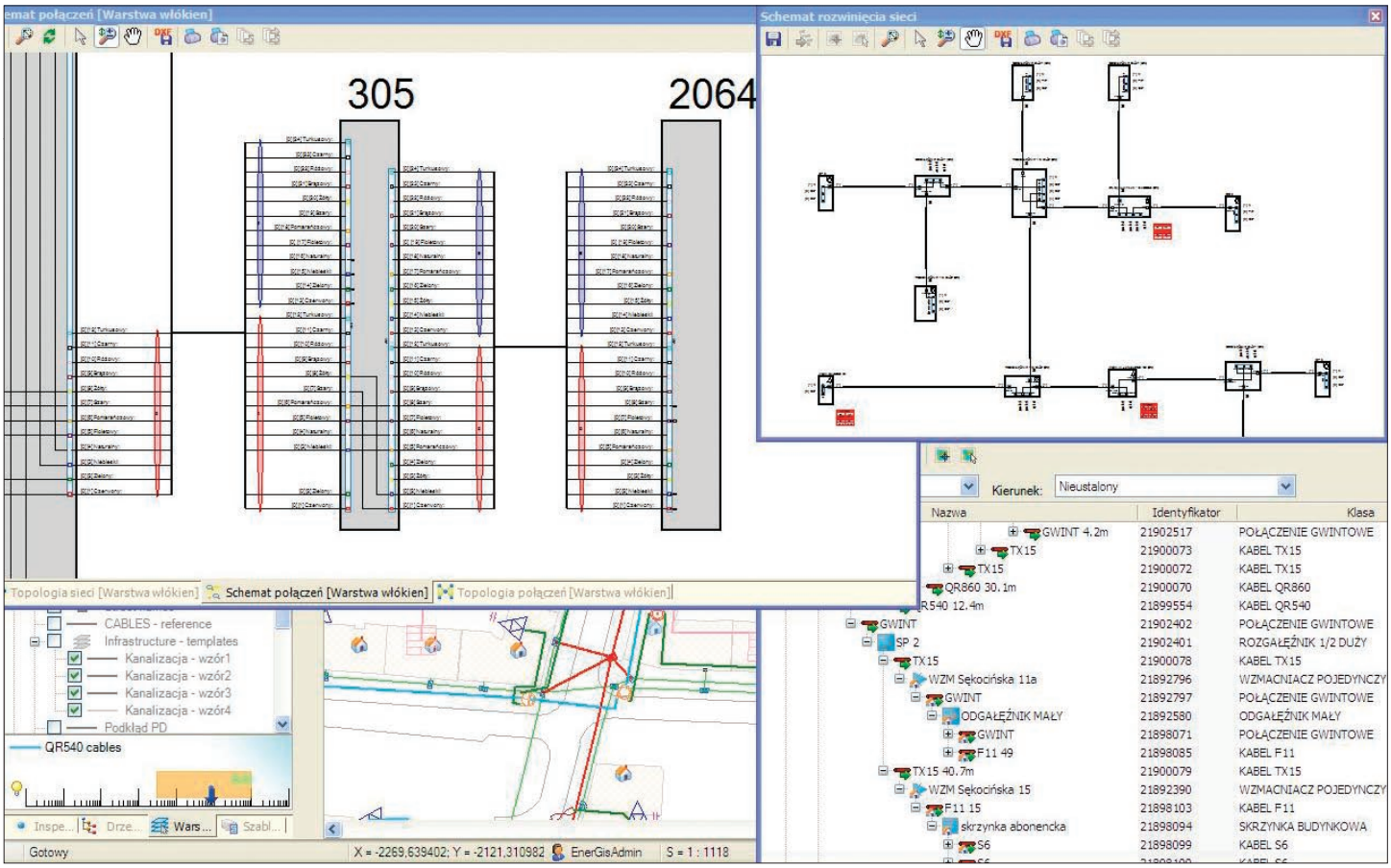
ASTER is the first telecom provider in Poland, and one of the first in Europe, to introduce cable TV and offer a triple service of TV, Internet, and telephone. Currently, ASTER provides services to 500,000 subscribers to analog cable television, 48,000 subscribers to digital television, 118,000 subscribers to the Internet, and 44,000 subscribers to digital telecommunications. After a 10-year period of fast-track development, ASTER began to consider entering new markets. This initiative was difficult without a unified network inventory system.

> "Network development departments can design based on actual analysis as opposed to guesswork."

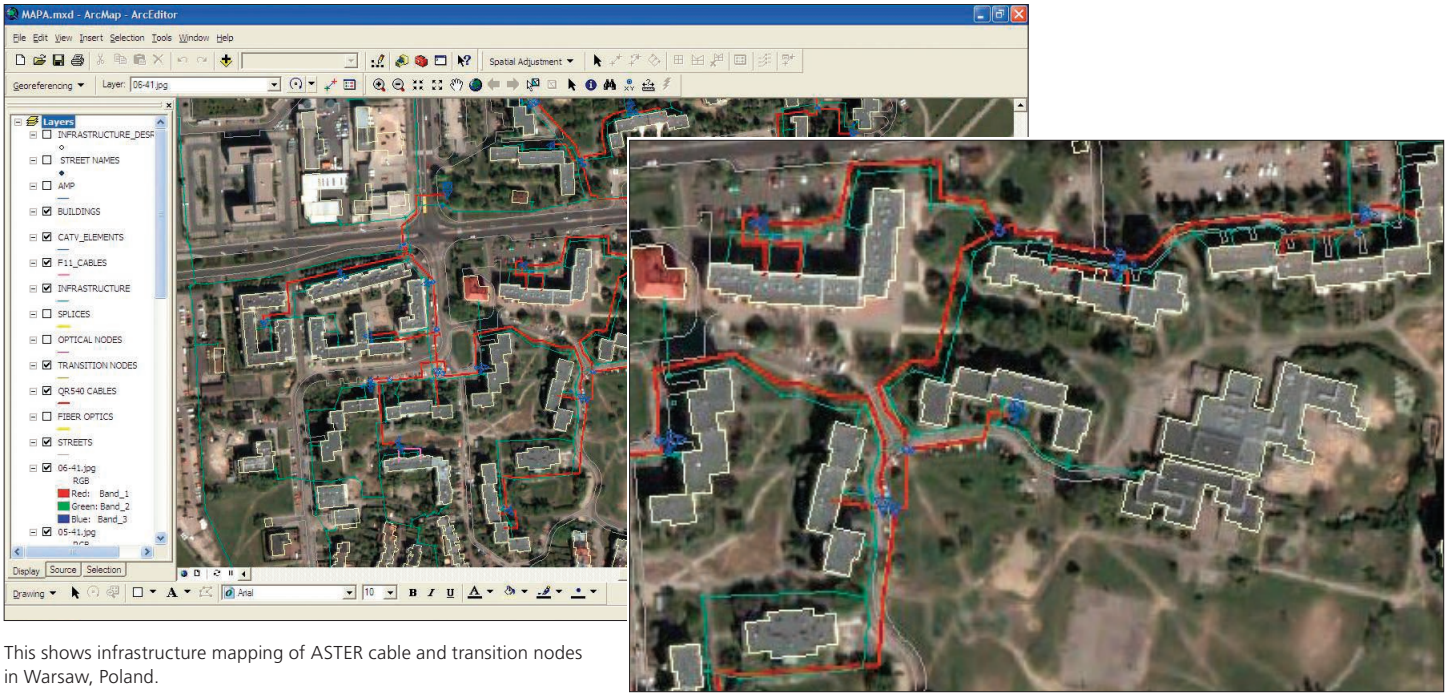
"Without a network inventory system, one cannot think of automating the processes—key to the long-standing profitability of any operator," says Bogdan Klata, network inventory manager for ASTER. "The market will be getting more and more competitive in time, and this will force us to have even better control over operational costs. A network inventory system is the cornerstone of successful management on the operational level, which involves launching services, modifying their parameters, and planning future network development."

ASTER required that it be able to

- Provide information on copper and hybrid fiber-coaxial networks.
- Serve multiple users simultaneously,



ASTER's new network inventory system enables retrieval and viewing of information from its entire network—both copper and optical.



This shows infrastructure mapping of ASTER cable and transition nodes in Warsaw, Poland.

including network inventory department employees, network design departments (developing the copper and optical networks separately), service departments, network supervision center, and customer service department.

- Fully integrate with SAP and a network management system.

ASTER chose Poland and American-based Suntech S.A., an ESRI business partner, to provide a solution that implemented an efficient and scalable database for ASTER based on an ArcGIS Server and Microsoft SQL Server platform.

"When searching for a provider, we set our requirements very high in every area," says Klata. "Data import from previous systems and its unification were at least as challenging as the new solution itself. The task consisted of analyzing and standardizing the information stored in CAD and Bentley MicroStation files, Microsoft Access databases, Microsoft Excel spreadsheets, and text exports from various applications."

Approximately one million network components were mapped and described by means of the place of installation, list of available parameters, and current configuration. The server-based system also contains the information on minimal operating parameters, such as noise level in individual network segments, and power level. This data can be used to manage the network (in problem detection, for example). ASTER also uses its network inventory system to store technical documentation that, among other data, contains information on the ways to access devices, principles of servicing and extending, and its warranty dates.

"Drawing on the information stored in the network inventory system, one can quickly determine whether a customer located at a certain address can be granted access to a given service at once or the network has to be first changed in structure or in configuration," explains Klata. "As for network development departments, they can design new nodes based on actual analysis of the use of network capacity as opposed to guesswork."

ASTER's network is reinforced by dedicated modules used by network development departments. Dedicated modules enable users to determine which areas of the network need to be expanded. The system has also been equipped with collaboration mechanisms—a company cannot design a telecommunications network single-handedly—and mechanisms for simultaneous development of various projects covering the same area.

"To design a network, one needs visualizations and objects from a library that are synchronized with SAP ERP [enterprise resource planning] and are placed on the map and with building diagrams," says Klata. "In this way, it is clear which devices are available, which can be linked together and how, and what the parameters of the installed objects are."

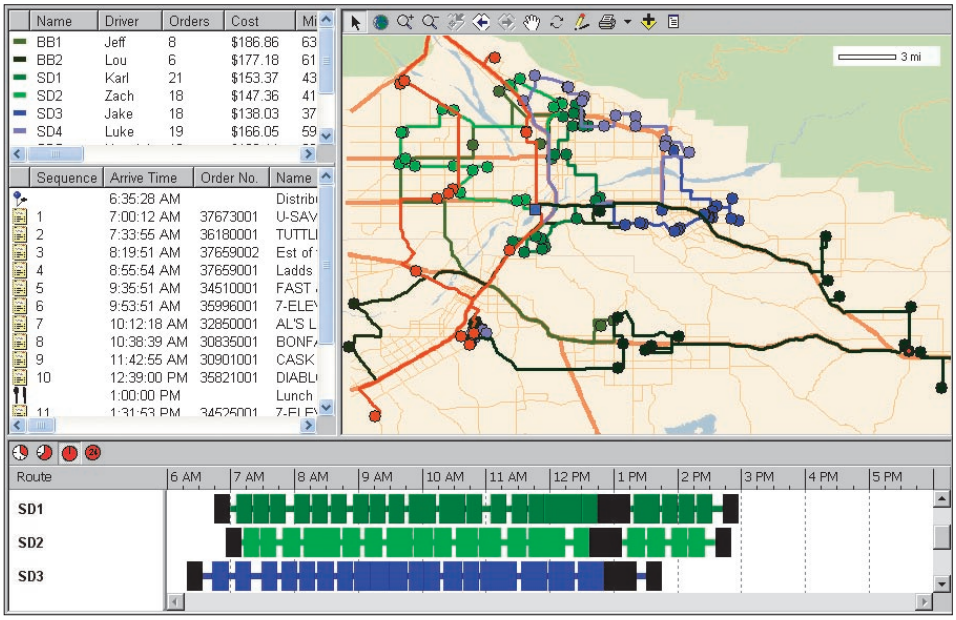
The system enables ASTER to quickly verify the possibility of connecting a client to the network. The quicker services are launched, the sooner invoices can be issued and the sooner the investment in the network will be returned. In addition, availability of information about the pace of network expansion allows a detailed plan for purchasing devices, and information gathered in the system can be drawn from when negotiating purchase contracts.

For more information, contact Radek Domurad, product manager, Suntech S.A. (e-mail: info@suntechtechnologies.com), or Agnieszka Kalinowska-Szymczak, ESRI Polska (e-mail: aszymczak@esripolska.com.pl).

Efficient Fleet Management for a Business of Any Size: ArcLogistics

ArcLogistics replaces the countless paper maps, pushpins, and juggling of orders to help the scheduler efficiently assign and allocate vehicles based on the "big picture" of vehicles, workers, orders, streets, and business rules.

ArcLogistics helps telecommunications businesses create optimized routes and solve complex scheduling problems that take into account individual business rules and drive times based on real street networks. Organizations that implement ArcLogistics for their work crew routing and scheduling report reduced fuel costs and improved customer service, which result in an immediate and significant return on investment. Typical payback time for ArcLogistics is less than four months.



Build routes based on actual network drive time and business rules, not straight-line distances.

Vehicle Routing

Vehicle routing is a critical factor for field operations with customer and problem-call schedules that change hourly or daily. ArcLogistics provides time savings in the scheduler's office and field with customizable best-route calculation and an easy way to add new stops or respond to emergency calls throughout the day.

With ArcLogistics, the scheduler doesn't just sequence a single route; the entire fleet is optimized while considering the unique processes of any business and the needs of its customers. Customer demand for defined time windows means companies must be able to offer times suitable for both the customer and the fleet. ArcLogistics offers two time windows and a priority function, enabling customer delivery requests to be honored. The rewards are double—increased competitive advantage and better customer loyalty.

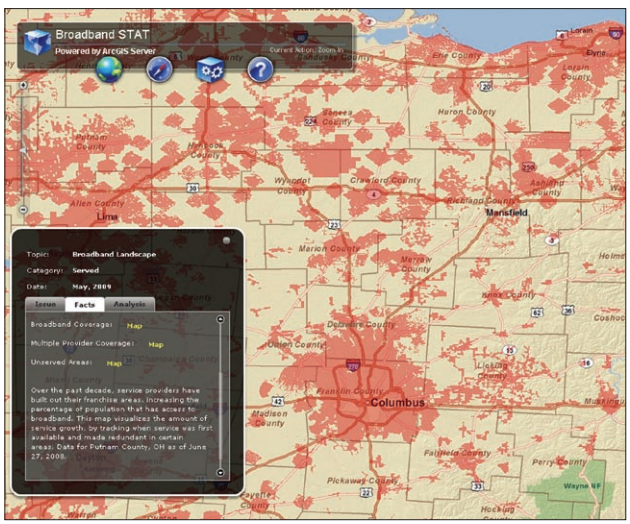
Complex Routing Simplified

ArcLogistics comes with street data from NAVTEQ or Tele Atlas for the United States, Canada, and Europe. Companies can use their own network datasets in ArcLogistics and add their own barriers and U-turn policies. In

BroadbandStat Optimizes State Broadband Mapping Results

BroadbandStat is an ESRI Web application that provides states with a Web-based framework for viewing, analyzing, and sharing broadband service and related data. It can be used by states for broadband mapping and planning needs related to the U.S. State Broadband Data and Development Program.

The BroadbandStat solution features a dashboard-style display and an interactive map with options that make it easy to combine data in different ways for viewing and analyzing. State planners and decision makers benefit from having access to a shared operating picture and using geospatial analysis tools for identifying areas that are unserved or underserved by broadband. They can also use BroadbandStat to evaluate the impact of proposed broadband projects and monitor the effects of changing coverage. For example, the application makes it possible to combine broadband coverage data, broadband adoption statistics, and demographic information to identify where digital divides and other barriers to broadband adoption exist.



BroadbandStat features easy-to-use tools for combining and viewing data.

Based on ESRI ArcGIS Server technology, BroadbandStat uses the Adobe Flex application

addition, each vehicle can be assigned multiple rules including driver and vehicle specialties, time constraints, start and end locations, and vehicle operation costs.

The cost savings of ArcLogistics can also be extended to the cab, thanks to ArcLogistics Navigator, ESRI's in-vehicle navigation solution. ArcLogistics Navigator enables route planners and schedulers to send ArcLogistics preoptimized stops and routes to the driver. ArcLogistics Navigator is GPS enabled and helps guide the crew to the next stop with turn-by-turn directions, map displays, and audible directions.

Potential Return

ArcLogistics helps companies

- Reduce costs by 10 to 30 percent by minimizing mileage, overtime, vehicles, scheduling, and waiting.
- Increase productivity by 10 to 15 percent by servicing more customers per vehicle, responding to same-day requests, and reducing cycle time and driver-to-dispatcher ratio.
- Improve customer service and satisfaction by offering and meeting tighter delivery time windows.

For more information, visit www.esri.com/arclogistics.

programming interface (API) to provide a rich Internet application (RIA) user experience. It is available from ESRI and is included in solutions offered by ESRI business partner Connected Nation for state-based broadband initiatives.

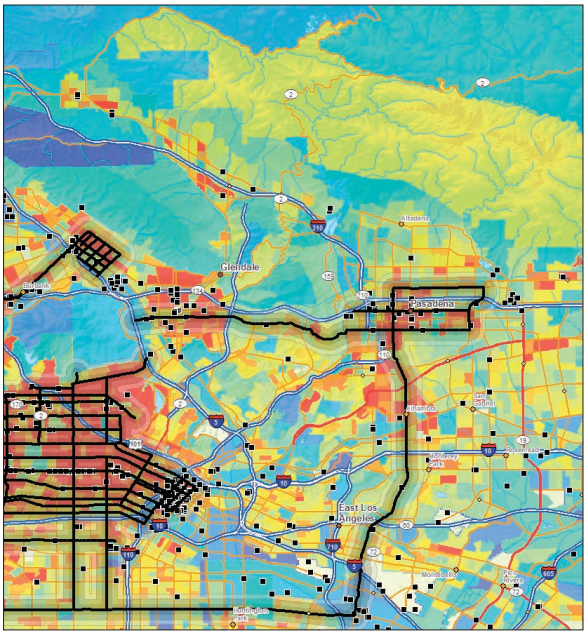
With BroadbandStat, you can

- Visualize broadband coverage areas.
- Analyze barriers to broadband adoption.
- Give the public the ability to find broadband options in its area.
- Evaluate the impact of proposed broadband projects.
- Provide transparency to the broadband funding process.
- Track broadband growth.

For more information, visit www.esri.com/bbstat or e-mail telecominfo@esri.com.

New Package Targets Telecom Stimulus Funds

ESRI's Telecommunications Mapping and Analysis Package (TMAP) helps U.S. broadband service providers and telecommunications companies develop applications related to the American Recovery and Reinvestment Act of 2009 (ARRA). The software and data combination makes it possible to analyze cable and wire center data and locate areas ideal for broadband expansion, including rural and remote areas that are unserved or underserved by high-speed Internet. ARRA will make available up to $7.2 billion for activities related to broadband expansion in the United States over the next year.



ESRI Business Analyst desktop identifies high-value areas for broadband expansion in this map of Los Angeles.

Key Features

- Map the location of existing service providers' operating areas in your state or region or nationally.
- Identify rural and remote areas as required in your funding application.
- Analyze demographics and develop business intelligence to determine which areas will develop into a profitable market capable of sustaining new services.

The resulting maps and information are compelling evidence that you can use to justify your project and qualify for funds through the Broadband Initiatives Program (BIP) and Broadband Technology Opportunities Program (BTOP).

What's in the Package

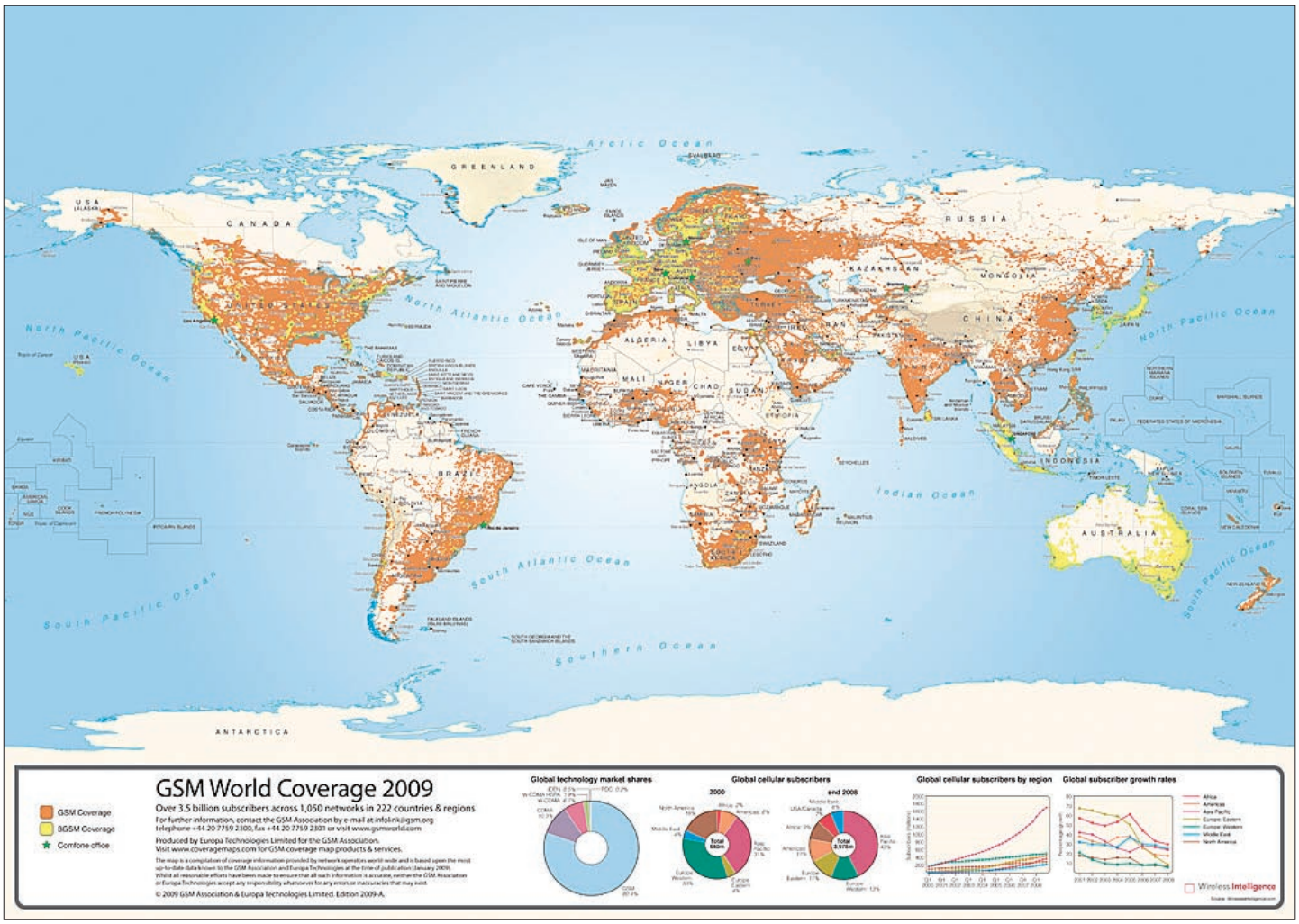
Software	ArcGIS Desktop (ArcInfo, ArcEditor, or ArcView)
	ESRI Business Analyst Desktop
Data	Tele Atlas Wire Center Premium
	MediaPrints Cable Boundaries
	American Roamer CoverageRight (optional)
Training and Workbook	
	Getting Started with GIS
	Learning ArcGIS Desktop
	Getting Started with ArcGIS Business Analyst
	GIS Tutorial Workbook for ArcView 9, Third Edition

For more information about the ESRI Telecommunications Mapping and Analysis Package, call 800-GIS-XPRT (800-447-9778) or visit www.esri.com/tmap.

GSM World Coverage 2009

This map illustrates the extent of cellular coverage worldwide for global system for mobile communications (GSM) and the third generation of telecom standards and technology for mobile networking (3G). More than 1 terabyte of raw data in a variety of formats was compiled from more than 500 network operators and homogenized with ArcGIS software. The world basemap is Global Insight Plus from Europa Technologies.

The publication is produced for the GSM Association, the global trade organization for the leading mobile telecommunications standard. Through sponsorship, over 7,000 copies will be printed and distributed at telecom events, including the 2010 Mobile World Congress in Barcelona, Spain.



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Map by	Warren Vick, Europa Technologies Ltd. Cobham, Surrey, United Kingdom
Contact	Warren Vick, wvick@europa.uk.com
Software	ArcGIS Desktop, MAPublisher, Adobe Creative Suite
Data Source	Global Insight Plus
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2009 Special Achievement in GIS Awards Announced

Congratulations to winners in the Telecommunications category

- ANTEL Telecommunications, Uruguay
- Bouygues Telecom, France
- Farmers Telephone Cooperative, USA
- Motorola Israel, Israel
- ORANGE-Austria Telecommunication GmbH, Austria
- Qatar Telecom, Qatar

To see a list of all award winners along with information on their GIS applications, visit www.esri.com/sag.

Representatives of Bouygues Telecom Mathieu Garnier and Lionel Maisonneuve (left and third from left) accept the SAG Award from ESRI president Jack Dangermond and ESRI France account manager Joris Seznec, far right.

Ron Yagur, Motorola Israel, stands with ESRI president Jack Dangermond during the SAG Award ceremony.

From left, Gernot Tutsch, SynerGIS technical sales director (Austria); ESRI president Jack Dangermond; and Beate Hinterberger, ORANGE Austria Telecommunication GmbH geomarketing manager, pose during the SAG Award ceremony.

ESRI UC Recap

GIS—Designing Our Future

This year's ESRI International User Conference (ESRI UC) drew GIS users from around the globe to San Diego, California, in mid-July. Sessions, speakers, and exhibits focused on the theme GIS—Designing Our Future as GIS professionals strive to meet the challenges of our rapidly changing world. The weeklong conference also offered attendees many opportunities for networking and peer collaboration as well as increasing technical knowledge through support sessions and presentations offered by ESRI staff.

Telecommunications discussion themes included the use of GIS for network design and operation, planning and service deployment, enterprise project implementation, and solving business problems.

Save the Date for 2010

The 2010 ESRI International User Conference will be held July 12–16 in San Diego.

For more information, visit www.esri.com/uc.

An ESRI User Conference attendee views a technical demonstration in the ESRI Industry Solutions Showcase.

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