

NETADVANTAGE RELEASES LATEST VERSION OF HYBRID RING/DWDM PLANNING TOOL

In May of 2003, NetAdvantage Inc. (<http://www.netadvantageinc.com>) released an upgrade to its software tool suite, NetModeler™, that integrates SONET ring and DWDM optical network design and optimization onto a single platform. The new tools features enhanced vendor equipment libraries and continues the best features of earlier tools, including true multi-period planning and optimization using NetAdvantage's proprietary "Try_X" optimization heuristic technology for robust and adaptive planning of large-scale optical networks starting from existing facilities with embedded demands. It incorporates a card-level configurator to complement the base port-level optimization planning heuristic. NetModeler™ is currently being further developed and additional vendor-specific technology models are being added to support optical network planning, RFP response evaluation, and architectural risk management decisions for optical networks.

SATELLITE NETWORK OPTIMIZATION AND RISK ANALYSIS TOOLS

While many telecom carriers are experiencing huge losses and postponing planned capacity investments, some sectors continue to plan major purchases to alleviate erosion of profits and increase revenues. Global communications satellite companies are among those that must still make billion-dollar bets on when, where and what new satellite and terrestrial capacity to add to optimally balance the costs of infrastructure investments against potential additional revenues. In September, 2002, NetAdvantage (<http://www.netadvantageinc.com>) delivered to a satellite company a design and proof-of-concept software prototypes showing how to use available data to optimize infrastructure investment decisions while taking into account realistic uncertainties in future demands, delivery times, and potential failures of satellites at launch or in orbit. The new methodology and software design promise to bring powerful new tools for risk management and decision-making to the industry. Uncertainty and risk analysis capabilities will be introduced into NetAdvantage's line of telecommunications network planning and optimization tools starting in 2003.

ESTIMATING THE TRUE COSTS OF OPTICAL NETWORKS

What is the true cost to a network service provider of supplying one unit of capacity, e.g., a DS3 or an OC-192, to its customers? The answer is important for competitive benchmarking and in developing acquisition strategies, but it is not easy to obtain -- in part because of the high fixed costs and low marginal costs of providing optical capacity. In July, 2002, Cox Associates delivered to a national network service provider an Optical Network Cost model that shows how changes in network architectures, technology platforms, and engineering rules affect CAPEX, OPEX, NPV, and other metrics over time. The model provides a new level of realism in understanding cost drivers and the impacts on national network economics of specific architecture and engineering choices now being evaluated by this customer. It is now being used to study the financial consequences of strategies such as delaying the roll-out of gigabit ethernet in metropolitan areas or applying different cap-and-grow strategies for network architecture migration toward DWDM mesh topologies.

NEW SONET RING PLANNING TOOL ADDRESSES NEXT-GEN ADMs

In June, 2002, NetAdvantage (<http://www.netadvantageinc.com>) released to Sprint a new multi-period SONET ring planning tool that incorporates far greater flexibility in objectives (allowing the user to weight criteria such as ring interconnect costs, mileage costs, and equipment costs as desired) and a rich menu of design options for fine-tuning the engineering constraints placed in network design. The new tool models next-gen as well as legacy ADMs, allows designs that are restricted to existing rings and topologies or that allow new ones to be created, and considers the consequences of early design decisions on capacity available in subsequent periods. According to Dr. George Bell, who led the software development for NetAdvantage, this tool provides a new level of realism and flexibility in the design of SONET networks that makes it especially valuable for use with existing network planning processes. George Fischer of NetAdvantage, who worked closely with Dr. Magesh Srinivasan, the Sprint Project Manager, to assure that NetAdvantage addressed all high-priority business and engineering issues, says that "Our new RingPlanner tool is the first in the industry to allow economic and engineering rules and priorities to be changed on the fly while still providing high-quality multi-year network design and traffic routing plans. NetAdvantage has already extended this new planning platform to mesh topologies."

COX ASSOCIATES INTRODUCES BROADBAND CONFIGURATORS

In March, 2002, Cox Associates delivered to a Passive Optical Network (PON) company two configurator software tools for deciding when, where, and how to deploy Fiber to the Business (FTTB) and Fiber to the Home (FTTH) using PONs technology. As inputs, these configurators take shelf, card, and rack equipment costs; fiber, splitter, and transport costs; pricing plans (e.g., volume discount schedules); and demand data (e.g., number of buildings by category, distance from chassis, total number of POTS, T1s, coax drops, etc. per building in each category, and protection requirements.) As outputs, they produce cost and equipment requirements summaries and detailed bill-of-materials reports showing exactly how many of what items, down to the card level, will be required to meet demands. The configurators can instantly calculate the detailed equipment requirements needed to support different demand scenarios and policies on over-provisioning ratios and other optional engineering requirements.

Dr. Paul Thompson, who led all aspects of this project for Cox Associates, points out that this ability to immediately see the consequences of different business and engineering decisions, as well as the impacts of alternative demand scenarios, helps both equipment vendors and their customers agree more quickly on what network design makes best sense and what bill-of-materials will best support it.

The new PONS Configurators are now being developed as a new product offering by [NetAdvantage Inc.](http://www.netadvantageinc.com)

CARD-LEVEL SONET RING MODELING FOR REDBACK'S SMARTEDGE™ SWITCH

In September, 2001, NetAdvantage (<http://www.netadvantageinc.com>) delivered to Redback Networks a SONET ring planning and optimization software suite (NetPlanner) that optimizes the configuration of SONET rings taking into account card-level models and constraints. The tool integrates optimization of equipment placement, interconnect, traffic routing, grooming down to the STS-1 level, VT1.5 management, and a host of user options for specifying design philosophies and goals. It models specific types of fiber media (including Allwave and Truwave and accounts for optical loss budgets in performing higher-level network planning and optimization. The tool is commercially available from Redback Networks and NetAdvantage.

DARK FIBER, SONET AND WIRELESS PLANNING TOOL

In September, 2001, Cox Associates delivered a dark fiber, SONET, and fixed wireless planning tool to Sprint for optimizing the deployment of equipment in metro area buildings and Pops to carry traffic from buildings to Sprint's network. The tool recommends where to place equipment and how to route traffic to meet the goal of carrying all traffic with all protection requirements satisfied (down to a per-demand level of granularity) at minimum cost.

OPTIMIZING DARK FIBER CONFIGURATIONS IN METROPOLITAN AREAS

Fiber network operators must continually decide where to invest in their own equipment and POPs to carry metro-area business traffic and where to rely on ECs to carry traffic for them. In February, 2001, Cox Associates completed a heuristic optimization tool for designing the location and interconnection of hubs and the use of dark fibers in downtown metropolitan areas to minimize the costs of carrying business traffic. For known demands, this tool demonstrated substantial cost savings compared to manual (non-optimized) solutions. Extensions to uncertain demands are part of our reserach agenda for 2001.

VIEWING AND EDITING LIGHTPATH ASSIGMNENTS IN MESH NETWORKS

In December, 2000, Cox Associates' Optical Network Products section delivered to Tellium (<http://www.tellium.com/>) a new graphic user interface (GUI) for planning and displaying detailed lightpath assignments for service and restoration in mesh topology networks. This tool, PlaNet 4.0, can read files from Tellium's Wavelength Management System and use the results to accomplish mesh routing and restoration and to view the results.

WHERE TO PLACE OPTICAL ADD-DROP MULTIPLEXERS (OADMs)?

In September, 2000, Cox Associates delivered an Optical ADM placement and SONET Ring Design Tool to Kestrel Solutions to quantify the cost savings from deploying new telecommunications equipment within metropolitan area networks using Kestel's unique optical Frame Division Multiplexing technology. The tool allows users to quickly analyze the cost advantages of vendor-specific equipment over legacy ATM, SONET and/or DWDM systems. It allows users to view the topology of network SONET rings and identifies equipment that can replace SONET add/drop multiplexers and reduce fiber and regeneration costs. It enables network operators to make critical decisions about how best to deploy optical network equipment over multiple planning periods by providing cost, routing, and ring information.

OPTIMAL DEPLOYMENT OF OPTICAL CROSS CONNECTS CUTS OPTICAL NETWORK COSTS

Our June, 1999 update (see below) described the first demonstration of software tools developed by Cox Associates for Tellium. Cox Associates' proprietary optical network planning and optimization software and GUI is now being offered commercially through Tellium as a software product called PlaNet (<http://www.tellium.com/product.htm>). In September, 1999, we worked in partnership with Tellium, using our internal beta version of the next release of PlaNet, to develop an optimized network design for Extant, a major Tellium customer. The results show Extant how to slash the costs of building their high-speed optical network among eight cities this year. A news story covering this work is at: <http://www.internettelephony.com/archive/9.20.99/stnews.htm>.

COX ASSOCIATES AT SUPERCMM '99

In June of 1999, Tellium Optical Networking Systems (<http://www.tellium.com/product.htm>) demonstrated their Aurora series of Optical Cross Connects at SUPERCMM 99 in Atlanta. They also demonstrated an Optical Network Planning Tool, developed by Cox Associates in partnership with Tellium, as well as a Mesh Restoration simulation tool. Together, these products and tools provide carriers with a full range of products and intelligent software to meet their optical networking needs. The Cox Associates Optical Network Planning Tool for optimal planning and deployment of Optical Cross Connects and WDM systems is now available through Tellium. (Contact: Nick Devito, Product Manager, 732-923-4175).

SAVING MONEY IN METROPOLITAN-AREA NETWORKS WITH DENSE WAVE-DIVISION MULTIPLEXING (DWDM) OVERLAYS

In February, 1999, Cox Associates delivered a design for a DWDM overlay to an existing metropolitan-area fiber network. The client was an optical network equipment manufacturer. The new design showed that optimally deploying dense wave division multiplexing (DWDM) in the existing high-capacity (OC48) fiber network reduces monthly facilities costs by over 50% based on fiber savings alone. Additional savings are achieved by using optical cross-connects to replace DCSs. This analysis makes a compelling case for the economic advantages of DWDM overlays and provides an analysis method, currently being implemented in a software design tool, for designing cost-effective overlays.

BREAKTHROUGHS IN DESIGNING DWDM NETWORKS

NEW GENETIC ALGORITHM QUANTIFIES COST OF RELIABILITY IN DWDM NETWORKS.

In August of 1998, Cox Associates researchers completed a new genetic algorithm (GA) that provides the first fast, accurate computational approach for solving the tremendously difficult problem of optimally locating optical cross connect switches (OXCs) and dense wave division multiplexing (DWDM) equipment within metropolitan area fiber networks. The new algorithm allows DWDM equipment to be placed into a network design to provide guaranteed levels of reliability (e.g., protection against all single-point failures) at minimum cost. Our software works with difficult, real-world (e.g., mesh) network topologies. It provides fast, approximate solutions in approximately 5 seconds and nearly-optimal solutions in approximately 90 minutes for a wide range of network sizes.

WEB-BASED TRUNK LOAD FORECASTING TOOL RELEASED

In December, 1998, Cox Associates released the first Java version of its proprietary Network Design and Optimization graphic user interface (GUI) for use in web-based server applications. Working with the Mathematical and Statistical Modeling group at U S WEST Advanced Technologies, Cox Associates delivered to U S WEST Communications a simple forecasting application of the GUI that displays projected traffic loads (erlangs and busy-hour peg counts) on each trunk group in U S WEST's territory over a one-year planning horizon. Forecasts are displayed simply by double-clicking on links (or typing in trunk group or switch ID codes). Trunk groups with unacceptable blocking probabilities in any future month can be displayed in red. Network planners who reviewed the GUI anticipate that it will greatly ease acceptance and increase productivity among users of the new forecasting system. Approved U S WEST clients can click [here](#) to try out the system over the web.

SPEEDING MEGABIT SERVICE-DELIVERY

In collaboration with the Mathematical and Statistical Modeling group at U S WEST Advanced Technologies, Dr. Douglas Popken of Cox Associates developed a discrete-event simulation model of the service delivery process for U S WEST's Megabit Implementation Design Services Group. The model revealed that lead times and control dates can be greatly reduced, improving service seen by customers, without adding staff or increasing net costs of operations. To achieve lasting improvements, reductions in lead time must be carefully coordinated with improvements in quality-affecting factors, especially central office facilities provisioning. The simulation model identified a self-funding sequence of improvements for achieving quicker service times. To download the report, click [here](#).

MORE RELIABLE BACKHAUL NETWORKS

Also in December of 1998, Cox Associates completed a new design tool for AT&T Wireless. The new tool optimizes backhaul network designs, reducing their average monthly costs while taking into account reliability constraints (i.e., routing diversity requirements) and contract cancellation charges. It uses the latest version of our Network Design and Optimization graphic user interface (GUI) for Windows NT. It also incorporates a new heuristic optimization technique developed by Dr. Jenny Ryan Sanchez, Cox Associates' Project Manager. The new method combines principles of [Tabu Search](#) with [exact solution](#) of linear programming sub-problems. Licensed clients may click [here](#) to download the new reliability-planning and backhaul cost-minimization tool.

USING SIMULATION TO REDUCE SERVICE DELAYS

In October, Cox Associates completed a detailed stochastic simulation model that helped U S WEST Communications to predict impacts of staffing and scheduling decisions on service delays experienced by customers. Working for and in collaboration with the Mathematical and Statistical Modeling group at U S WEST Advanced Technologies, Dr. Douglas Popken of Cox Associates discovered that scheduling of technician shifts interacts with scheduling of customer appointment slots in unexpected ways to powerfully affect total delays experienced by customers. Exploiting these interactions to better balance the assignment of technicians to appointment slots can help improve ability to meet customer preferences while significantly reducing average delays in responding to server requests -- all without increasing labor costs. Approved clients may click [here](#) to download the technical report describing the simulation model and key findings.

COST SAVINGS AT A T & T WIRELESS

Cox Associates has shown A T & T Wireless how to save 10 to 40% of the cost of their backhaul network. Please contact us at +1 (303) 388-1778, info@cox-associates.com