

# Interconnect Business Optimization Solutions from Telarix

## ■ EXECUTIVE SUMMARY

Global telecommunications carriers create billions of operational transactions - business events and service records - every day. Whether it's wireline or wireless, in-country or across the world, the telecommunications carriers are, in effect, huge transaction companies that must sort through every call record, termination charge, tariff change, and switch record in order to smoothly and efficiently interconnect the world's communications. Failure to quickly and correctly process, analyze, and respond to ever-changing rates, routes, and regional requirements can very often be the key difference between profitability and loss for a carrier.

This solution note addresses the operational complexities inherent in the global interconnect business, specifically the business challenges Brazilian domestic carriers face in the transitional regulatory environment created by deregulation. Brazilian carriers now interconnect extensively with other providers to complete calls, driving the need for accurate, real-time intelligence about the traffic moving across the network to enable financial settlements between carriers.

**iXTools**, delivered by Telarix, is a suite of software that operates on Intel® processor based enterprise and carrier grade servers, which gives telecommunications companies the ability to manage costs and drive profitability on their interconnect traffic. Businesses can quickly and easily adopt low rates to international destinations, manage costs and overflows on existing routes, identify capacity opportunities, and ensure vendor invoice integrity, as well as stop or resolve disputes almost before they happen.

iXTools delivers real-time decision intelligence to business and operational managers through web-based tools that provide analysis and reporting on traffic, rates, and destinations almost as quickly as the calls move across the global network. iXTools uses an open architecture based on web and object-oriented technologies. Modules are flexible, scalable, cost effective, and easily deployable. The modules currently available are:

- *iXConnect*: A business intelligence platform designed to analyze both revenue and cost information to ensure maximized carrier profitability. The software traces the path each call takes through the network and determines the cost of call completion.
- *iXRoute*: A comprehensive routing management system that allows development and rapid implementation of optimized network routing plans based on cost considerations, user specified benchmarks, and user specified exceptions.
- *iXTrade*: Eliminates the risk and identifies the opportunities that are driven by international interconnect complexities caused by the lack of global numbering plan standards for each country, city and mobile termination.
- *iXAudit*: Analyzes, audits, disputes, and tracks carrier cost invoices more accurately and efficiently than manual auditing.

This solution note is focused on one aspect of the iXTools product suite, iXTools Brasil, which is an in-country version of iXTools that facilitates and enhances inter-carrier settlement in the Brazilian market.

## ■ CARRIER CHALLENGES

**Connection and Routing:** There is no telecommunications carrier in the world with owned facilities and network in every country in the world. As a matter fact, most long-distance and international carriers don't even own all of the local facilities in their own countries. This means that delivering voice calls internationally and domestically requires that carriers interconnect with each other to originate, transport, and terminate phone calls. And up until about six years ago, international carriers used each other's networks to terminate in-country calls on a quid pro quo basis,

with essentially no cost incurred. These agreements between carriers are called bi-lateral agreements and have been based on mutual benefit rather than commercial principles.

In this environment, all a carrier needed from back office systems was the ability to generate invoices to customers and the ability to track how much traffic they sent to other carriers as well as how much traffic they received on a reciprocal basis.

As the global economy has continued to expand and technology has delivered an increasing array of services to facilitate international communications, the operating environment for carriers has become increasingly complex.

- The number of carriers delivering international traffic has grown from 471 in 1996 to 4,726 in 2002.
- An international call used to require at most two transaction records, or call detail records, to complete. International calls now generate between 5 and 10 call detail records (CDRs) for each call.
- Deregulation around the world is creating a buy-sell rate arbitrage environment, which is replacing the old bi-lateral agreements.
- International PSTN traffic is growing at a rate of about 12% per year, while International VoIP traffic continues to double year over year. Essentially flat revenue trends highlight the margin pressure carriers are operating under.
- Communication providers now process more transactions each year than the credit card industry does.

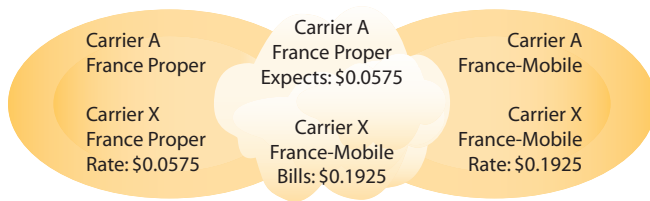
(Source: TeleGeography research and ITU)

Telarix offers two modules within the iXTools product suite that specifically address the connection and routing challenges in today's global telecommunications environment – iXConnect and iXRoute.

**Dial Code Management:** Traditionally, interconnected carriers conducted business by exchanging termination rates to specific countries or geographic locations such as city or region. The locations are defined by dial-code details. It is this detail that can provide each carrier with significant risk and opportunity. A major industry-wide challenge is that there is no single standard for

international numbering plans. Niche international markets evolve seemingly overnight. This rapid fluctuation makes ITU dial-codes inherently outdated and non-reflective of how business is actually transacted. With the rapid expansion of mobile services such as paging, GPRS and an increased use of number translation services that are geared to both public and private use, a continuous pattern of number plans and change band breakouts is developed.

This industry-wide problem translates into carrier risk because each carrier is defining their “view” of the world in the form of their dial-codes. A carrier’s dial-codes drive their cost, routing, pricing, and billing operations. The carrier risk comes from the differences in how each carrier defines the dial-codes and the pricing associated with those differences as depicted in Diagram 1.



**Diagram 1: International Dial Code Risk**

Assume an operating carrier (Carrier A) routed 1,000,000 France minutes (50% proper, 50% mobile) to a vendor (Carrier X) in a month. 50% of the France Proper minutes (250,000) were treated by Carrier X as France-Mobile. This results in an unexpected billing of an extra \$0.1350 per minute (the difference between the \$0.1925 mobile rate and the \$0.0575 proper rate) for each of these 250,000 minutes. A total unexpected cost of \$33,750.

To make matters worse, Carrier A has probably already sent another 1,000,000 minutes to Carrier X in the next month while the invoice was being created, sent, and audited so the impact is doubled to approximately \$67,500.

A typical carrier is interconnected to between 40 and 100 carriers each of which is sending multiple rate and dial-code change notifications each month. Each offer contains details ranging from a few to as many as 1,000 international breakouts. A couple of simple calculations result in estimated offer detail volumes of between 40,000 and 300,000 per month.

The time required to receive, validate, analyze and input these offers into a system or database can be quite large. The average time spent on an offer is anywhere from 30 minutes to 4 hours depending upon the size and complexity. Analysts typically spend a majority of their time on low-value data manipulation in order to get to the high-value analysis of the exceptions.

Offers are typically processed by mapping destination names and making dial-code assumptions or by performing analysis of dial-codes sporadically when and where possible. For many carriers, this is a very manual process. Considering the volumes previously discussed and factoring in the short timeframe to get offers processed and available for routing, it is clear that quality and accuracy is likely less than desired. A mistake in this offer translation stage, for example applying a \$0.05 proper rate when a \$0.15 mobile rate should have been used, can lead to thousands of dollars in unexpected costs.

Telarix delivers *iXTrade* and *iXAudit*, which are modules within the *iXTools* product suite that specifically address international dial code management risks and opportunities, as well as vendor invoice reconciliation and dispute management.

**■ iXTOOLS BRASIL  
(CARRIER CHALLENGES FOR THE BRAZILIAN MARKET)**

The cost management challenge in the Brazilian market is complicated by the unique identifiers used in Brazil to track interconnection settlements and to enable vendor invoice reconciliation. As these costs can represent more than 50% of revenue, carriers must proactively manage costs and reduce the time required to make and implement critical business decisions in order to remain profitable.

Telarix delivered the in-country version of its flagship product, *iXTools*, to Embratel, the premier communications provider in Brazil offering a wide array of advanced communications services over its own state of the art network. For domestic long-distance service, Embratel interconnects with local carriers to originate and terminate calls. These interconnection costs can represent a significant portion of the revenue. This makes it critical that these charges be accurate and verifiable in order to protect

Embratel's ability to generate healthy margins. Unfortunately, as the domestic long-distance market evolved, Embratel found that its existing mainframe-based legacy systems did not capture all of the information necessary to ensure accurate traffic and telco cost information. This resulted in a significant investment of resources to manage vendor invoice reconciliation and disputes with local providers. Embratel needed an accurate telco cost and traffic information system that could process in excess of 100M call detail records each day, store the information, and create data-marts that enable near real-time analysis and reporting. Additionally, Embratel needed to ensure the integrity of the cost information input into the system and needed a view into actual routing to ensure optimized capacity planning.

### ■ SOLUTIONS OVERVIEW

*iXConnect* facilitates cross-functional collaboration between sales, network operations, and financial management departments, providing unprecedented real-time access to business-critical information. The data gathering and reporting capabilities allow operators to effectively manage interconnect relationships, including traffic and rate offer management, relationship history tracking, as well as reporting on key sales performance indicators and trends. Cost management reports based on real-time traffic are incorporated to capture the actual financial impact of network traffic. And exception reporting compares actual traffic to the Least Cost Routing guide (LCR) and quantifies the financial impact.

*iXRoute* is designed to help routing optimization and network provisioning teams collaborate effectively to deliver the best possible route quality at the lowest cost. *iXRoute* has numerous configurable parameters, enabling users to define quality, margin and other benchmarks for each switch, service, and destination. *iXRoute*'s automated routing optimization algorithm combines user-defined benchmarks with financial and network data to build the optimal route guide. The workflow management tool tracks routing changes from creation to network implementation. And the reporting feature is capable of comparing existing route guides to the actual flow of traffic, calculating the opportunity cost of insufficient interconnect capacity and overflow. *iXRoute* provides a centralized database where routing exceptions can be added,

stored, audited, and communicated to the appropriate departments like Operations, Finance, or Networking, for example.

*iXTrade* enables carriers to identify and eliminate dial-code risk before it happens in a carrier's network. The solution implements timely, proactive and preventative measures at precisely the right place in the business process—at the time of purchase. *iXTrade* qualifies the purchase based on the buyers specific dial-code setup and assists that buyer in determining quickly and accurately where significant risks and opportunities can be found. The business intelligence delivered by *iXTrade* assists the carrier in running a more stable back office operation by laying a strong foundation for buying, routing, selling and billing wholesale international termination services. *iXTrade* starts with the basic assumption there will be no industry standard for dial-codes. The task of synchronizing carrier offers is tackled head-on by our intelligent, high performance analysis engine, analyzing every offer for 16 specific discrepancy types. The analysis engine for this complex business problem is wrapped in a simplified user interface that gives the user the ability to focus their efforts primarily on the risk and opportunity exceptions while providing access to full details where needed.

A carrier implementing *iXTrade* will see significant improvement in the time it takes to enter and analyze an offer (from 2 hours to 15 minutes), as well as eliminating the risk of "cherry picking", improved cost accrual accuracy, and reduced workload disputes.

*iXAudit* is designed to analyze, validate, dispute, and track supplier interconnect invoices in the most efficient manner possible. It provides a flexible work flow to expedite the identification and management of disputes. The dispute is managed by the system from the point of identification to resolution, providing management with a clear view of outstanding disputes. *iXAudit* supports the automatic transfer of information to back-office General Ledger systems to complete payment processing and manage dispute accounting.

*iXTools Brasil*: Telarix worked closely with Embratel over a period of nine months to deploy the in-country version of its *iXTools* product, *iXTools Brasil*. The result was a carrier-grade business

intelligence solution specific to the Brazilian market that provides accurate telco costs and traffic information and can process in excess of 200M call detail records each day. The solution required upgrades and modifications to Embratel's existing legacy systems to ensure interoperability. The Telarix solution was deployed on a platform of 12 Intel processor based servers. The Telarix solution also included the API(s) necessary to ensure data integrity by creating an environment where data entered once was available to multiple systems operating on different platforms. Embratel required that the system process 100M CDRs in a twelve hour period, and was stress tested by Intel over two week period. The results showed that the implemented Telarix solution, running on an Intel platform, processed 200M CDRs in a twelve-hour period.

### ■ REFERENCE IMPLEMENTATION

A brief review of the functionality delivered by the system will put the hardware components in perspective.

iXTools can receive Call Detail Records (CDRs) from any mediation device or CDR collector, which collects charging information from the switches. iXTools has a flexible transaction processing interface that can accept the CDRs as they become available in either their raw form or in a summarized/aggregated format. iXTools also has an advanced process scheduling controller that automatically manages the collection and processing of CDR data from the mediation devices. This feature allows iXTools to process data as it becomes available and hence provide a real-time view of the business.

iXTools provides a database for maintaining and managing interconnect agreements with vendors / carriers. The database holds information such as physical interconnect detail, buy rates by destination, and rate plans. Users can input this information into iXTools through a web-based user interface or they can upload the data using text or Excel files as inputs. iXTools uses the vendor database to calculate least cost route guides for each quality of service level that the vendor provides. iXTools also provides a database similar to the vendor database for maintaining and managing interconnect agreements with customers/suppliers. The database holds information such as interconnect detail, sell rates by destination, and rate plans. Similar to the vendor information,

users can input this information into iXTools through a web-based user interface or they can upload the data using text or Excel files as inputs.

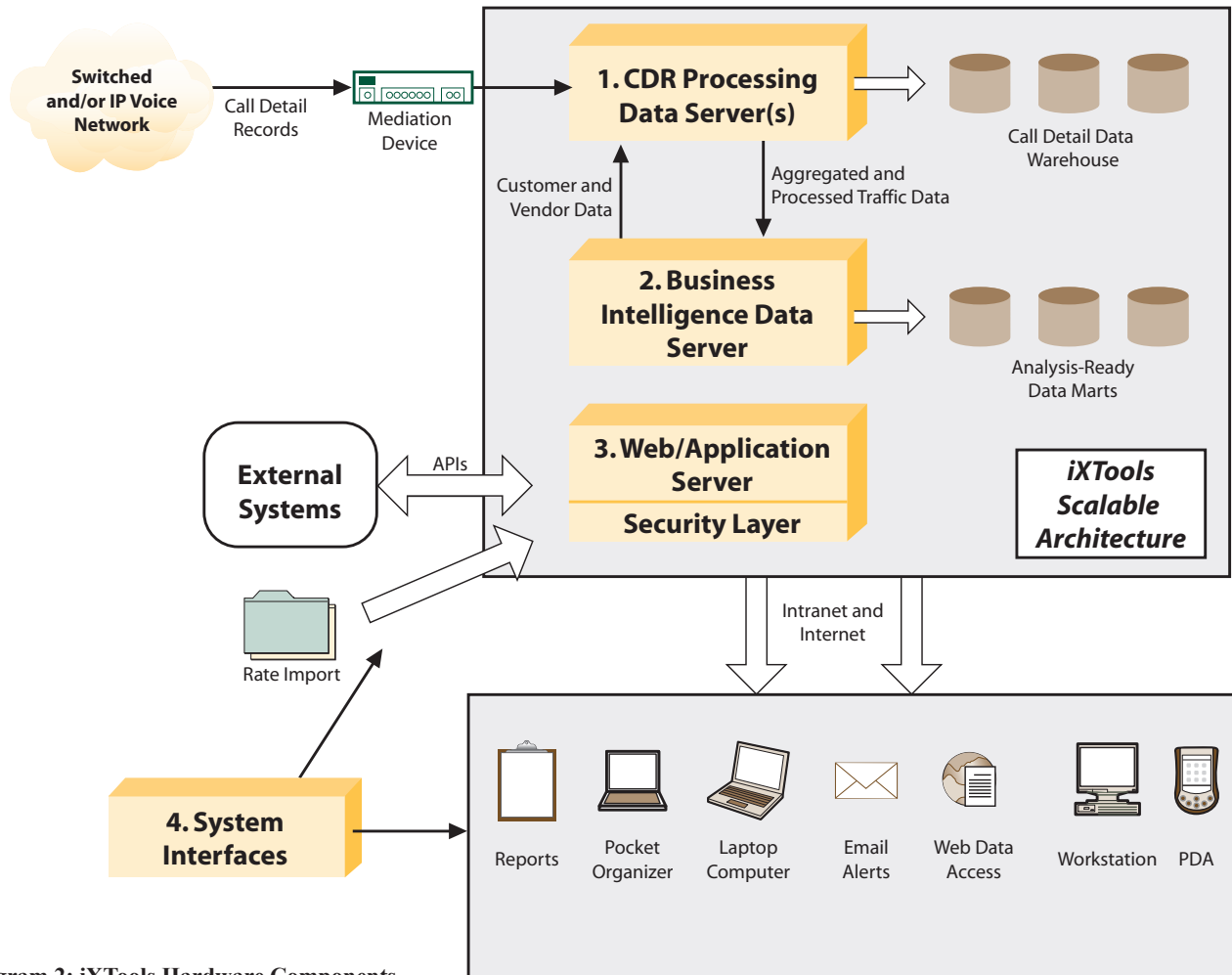
iXTools is a table-driven system with a web-based user interface that provides a high level of flexibility. The system stores reference data and business rules information in a relational database. Users can add, change, and delete this reference information to create the desired operation of the system.

Diagram 2 illustrates the different hardware components of iXTools Brasil.

**CDR Processing Server:** This component is responsible for processing high volumes of call transactions. The CDR Processing Server receives CDR data from the mediation platforms on an automatic schedule. The raw CDR data is validated, augmented, and rated (price and cost). The resulting enriched CDR is loaded into the relational database. The CDR Processing Server interacts with the Business Intelligence (BI) Server to request information necessary for processing a call. Once processing has completed, aggregate summary information is posted into the BI Server. Depending on the quantity of data to be processed, multiple CDR Processing Servers will exist in an implementation.

**Business Intelligence Server:** The Business Intelligence (BI) Server component uses relational database engine and application software to handle the data-intensive components of the application. The server software holds key information such as originating carrier, trunk, rate and traffic information. In addition, the BI Server includes analysis-ready data-marts that hold aggregate information on traffic volumes, revenues, costs, margins and routing information.

**Web Server:** The Web Server is a collection of business rules and application logic that provides a secured connection and access between the user and the database information. The Web Server interacts with the BI Server to read and write data as a response to the user requests. The Web Server can be implemented either with local access (Intranet) or with remote access (Internet or dial-up connection). The Web Server consists of Microsoft Internet



**Diagram 2: iXTools Hardware Components**

Information Server, XML, Active Server Pages, and application code such as JavaScript and VBScript.

**Backup Server:** This component is responsible for all tasks concerning back-up copies. All data from the SAN storage should be copied every day to provide a major guarantee of the data integrity. A separate server is used to run the backup software and to control the tape library unit that is used to store the data.

**User System Interfaces:** The user interacts with the application using a web browser such as Internet Explorer. The user can perform data entry, data analysis, and multi-dimensional reporting using the web browser. Through the browser, the user creates and

maintains account information, accesses route guides, generates reports, and analyzes the collected traffic information. The browser provides a graphical user interface with navigation style similar to other familiar Windows/Internet applications, hence reducing user-training requirements. In addition, users can exchange data with the system by importing and exporting files and can receive e-mail alerts and event notification pages through Internet ready devices such as mobile phones.

iXTools Brasil is an open system that can interact and exchange data with other operational systems such as billing and accounting systems. This exchange of data is performed through direct database access such as ODBC and SQL, data export and import

such as Excel and flat files, and standard APIs. Electronic system file exchanges with iXTools Brasil requires Embratel to make the necessary modifications to their legacy systems and deliver the data in a standard format to iXTools Brasil.

Process Flow: CDR data from the mediation system is loaded to iXTools through a File Transfer Process (FTP). These files contain data from all international gateway switches. A schematic view of the data flow for the implementation is shown in Diagram 3.

As part of the CDR load processing, the CDR processing server will import the CDR records, standardize the record formats into an internal iXTools Brasil format (Enriched CDR), and subsequently process the records, e.g., rate and cost. The CDR Processing Server stores the rated information in its local SQL database and sends the aggregated results of CDR processing to the Business Intelligence Server. In order to process the CDRs, the CDR processing server must access data stored in the Business Intelligence Data Server. This information includes such elements

such as EOTs, CNLs, rates, connection details, etc. stored in the local SQL Server databases of the Business Intelligence Data Server.

All components of the iXTools solution (Web, Business Intelligence, CDR, Backup, Interfaces, and Staging servers) are available on enterprise and carrier grade servers from Intel. These servers are typically Pentium® or Xeon® processor based 2-way servers. The carrier grade servers from Intel are NEBS and ETSI compliant servers which meet the stringent equipment requirements for deployments in a central office environment. Key features include:

- NEBS-Level 3 and ESTI-certified to withstand extreme heat, humidity, altitude, and seismic zone 4 earthquake shock.
- Telecom alarm and system management features for interfacing with central office alarm systems.
- Extended product lifecycle support to protect customer investments.

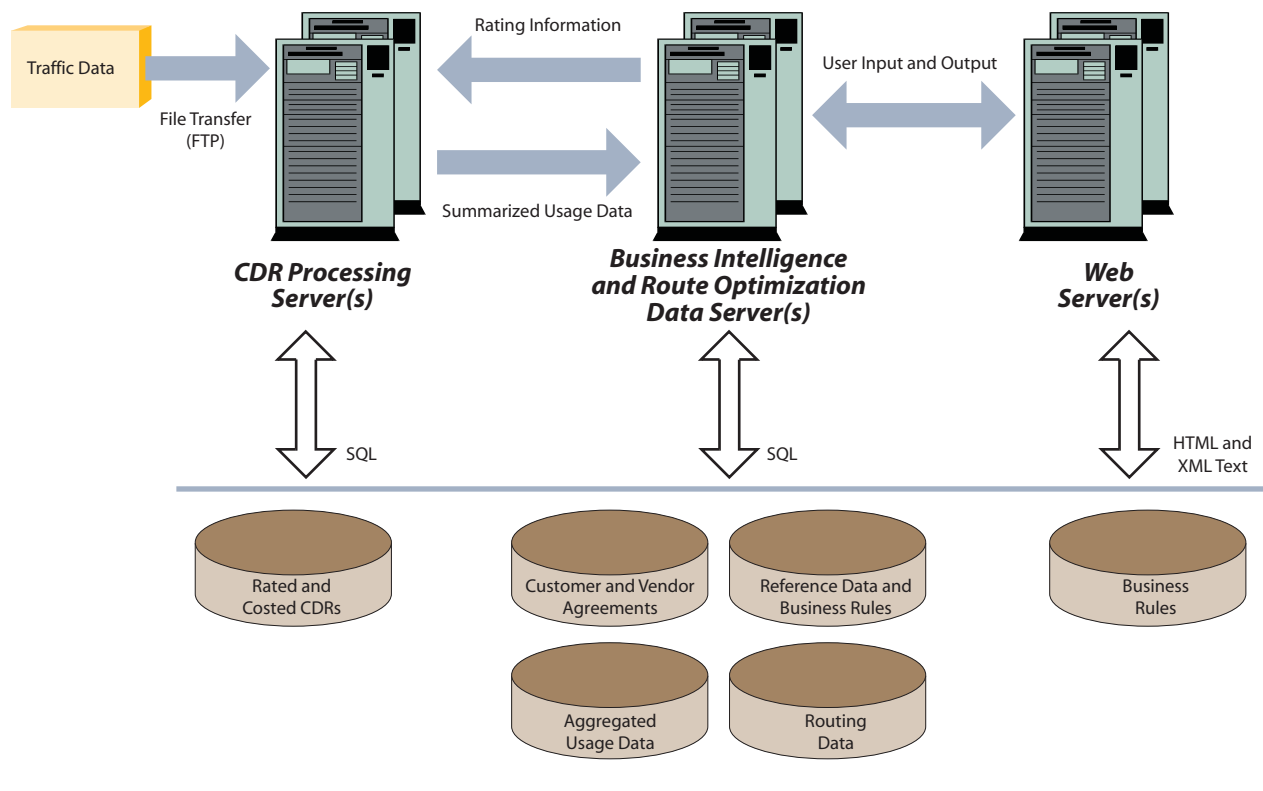


Diagram 3: iXTools Application Data Flow

### ■ CASE STUDY

iXTools has been deployed by many major carriers worldwide such as Global Crossing, T-Systems, BellSouth, Embratel, and Primus. A case study with a performance benchmark with a major carrier is listed below:

One of the client's key requirements was to be able to process 100 Million CDRs in 12 hours. The iXTools based solution provided by Telarix not only met but exceeded the requirements specified by the carrier. The solution was capable of processing 200M CDRs in 12 hours running in single-threaded mode and is highly scalable so as to meet additional capacity requirements in the future. The main technique used in the solution was a "subscription model" to move reference data between BI and CDR processing layers. Additional improvements are also possible by using "Incremental Replication" to move data between the layers, as well as using multi-threading.

### ■ TARGET MARKETS

The target market for iXTools consists of communications service providers worldwide (circuit and packet switched) with revenues in excess of \$100M per year. These include PTTs and IXC's, CLECs, and wireless providers. The product is used in multiple departments including carrier services, finance, network operations, costing, and pricing. The iXTools Brasil product is an in-country version, designed specifically to provide business intelligence to domestic carriers.

### ■ FOR MORE INFORMATION

To receive additional information regarding iXTools, please visit [www.telarix.com](http://www.telarix.com), call (703) 564-9600 or send an email to [bizdev@telarix.com](mailto:bizdev@telarix.com).

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