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Introduction

Analytics are part of the DNA of any digital company and if used effectively can help to drive the business by providing answers to the following questions. What are customers looking for? How are they using our services? How often? Are they satisfied with us or likely to leave? What else can we sell to them? Are we selling the right things? What are we doing well? Where can we improve?

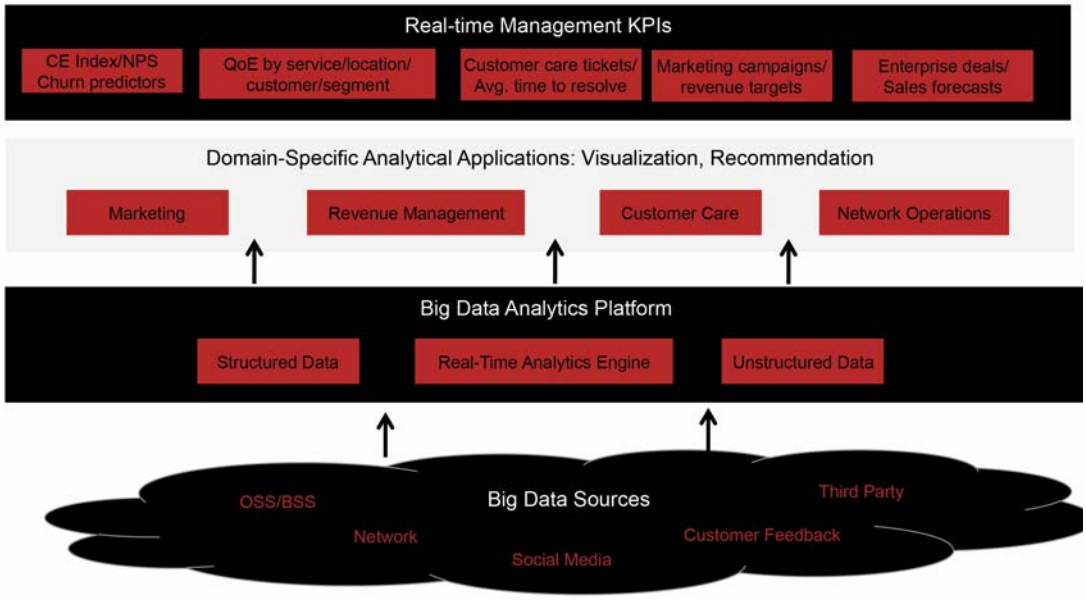
Communications service providers (CSPs) have an advantage in many ways by having lots of rich customer data from network usage, devices, applications, customer behaviour to location data, CRM and billing data – and if joined up and analysed, can provide end-to-end insight into operations, services and customers. The challenge is that there is such a thing as having too much data, it's overwhelming, it's complex and hard to know where to begin.

Service providers are wisely taking a use case approach to analytics in order to solve key business problems, particularly around customer experience management. This can range from understanding churn predictors to gaining insight into a customer's actual experience with services in real-time and taking proactive action if a service is degraded – or even better predicting where service could be impacted and fixing the problem before a customer even notices.

Defining analytics

Analytics is data mining, algorithms, identifying anomalies, trends, predictions, associating semantics and making actionable conclusions from the data. Big data analytics involves analysing huge volumes of structured data – that is, data from a database, and unstructured data from social media usage, mobile application, location data, network quality data, payment data, device data and ▶

Figure 1: How big data analytics feeds CSP management dashboards



Source: Heavy Reading

channel interactions, to uncover patterns and trends, but still requires intelligent algorithms and logic to uncover insight.

Large service providers are actively recruiting data scientists, though they are still not so easy to find, with universities and colleges adding new big data analytics courses to meet growing demand from the business sector. Service providers are also buying in vendor solutions with proven algorithms and expertise that support real use cases and business results. In addition, vendors are seeing demand for professional services to customise use cases and algorithms and provide data science resources to solve ad hoc problems.

Big data analytics, in the case of CSPs, bridges four key areas including the network data from probes – the mediation layer, combined with data from IT systems such as CRM, billing, customer care and channel data; the big data analytics platform for data storage, including streaming engine for real-time analytics; the vendors that bring value in terms of adding logic/algorithms to support key use cases or applications and recommendations; and visualisation, reporting and business intelligence tools.

A Hadoop-based open source big data platform is quickly becoming the de facto standard for CSP analytics platforms. Many service providers are also pushing vendors of OSS, BSS and network probes to make it far easier to ingest the data from their systems in support of real-time data analytics modules, as well as SQL access to the data to support ad-hoc queries. Ideally, service providers want to get to the point where they are analysing data in real-time, understand the customer context and can for example send customers a personalised offer at the right time, such as when a customer is trying to watch video or running low on mobile data, and can immediately offer a top-up or a better plan if they see a customer watching lots of videos on mobile.

Market drivers

There are a number of business drivers behind why service providers are keen on using analytics: revenue is stablising, Average Revenue Per User (ARPU) is not increasing at past levels, competition is increasing and customers are becoming more demanding, more savvy about the latest apps and harder for CSPs to engage.

- **Cost reduction and efficiency**

The prices that consumers are willing to pay for voice, mobile data, IPTV and broadband stays around the same or even goes down every year, while the cost of network infrastructure keeps climbing. CSPs are under pressure to reduce operating costs in order to maintain profits. Analytics can be applied across a service provider's entire business to run it more efficiently. For example by reducing calls to customer care, increasing quote to cash in enterprise sales cycles, increasing cross-sell and upsell potential, reducing customer churn or improving efficiency of marketing budget.

- **Revenue growth**

Digital transformation, digital services, cloud services, digital ecosystems and partners – it's about innovating, changing legacy business processes and figuring out how CSPs can generate revenue with new products and services. There is competitive pressure to deliver real-time digital services with a better customer experience and, in general, reduce the time it takes to launch new services or co-develop services with new partners. Analytics play a key role in terms of understanding opportunities, what new services customers may want, segmenting customers for personalised real-time marketing, and in general customer experience management and joining up the channel experience.

- **Network and IT transformation**

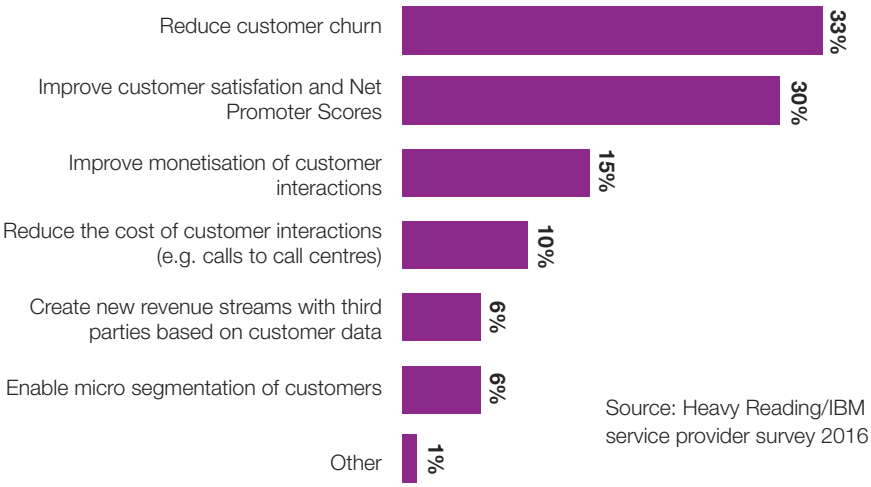
The transformation of IT systems, such as operational and billing systems (OSS and BSS), as well as migrating networks to software and open standards with network functions virtualisation (NFV) and software defined networking (SDN) are also related to overall business goals to reduce costs and grow revenue. The new IT and network infrastructure have to support business goals and be:

- Scalable and application-aware, IT and networks can't live in silos
- Less expensive to maintain using standard servers and containers
- Faster and easier to launch new services
- More open in that network and IT systems talk to each other so data can be shared with big data and analytics platforms
- Easier to run with automation and analytics.

Key trends and use cases

Broadly speaking, analytics use cases break down into two areas – operational (network planning and customer care) and revenue generating (marketing and commercial teams) – but the lines are starting to blur as analytics is becoming a more strategic, horizontal function in the larger CSPs, and frequently has a CEO-level mandate. Interest in ▶

Figure 2: Top drivers for customer data analytics



Source: Heavy Reading/IBM global service provider survey 2016

analytics from small operators is there but may have a more narrow view such as an emphasis on analytics for purposes for revenue generation or incremental ARPU.

1. Analytics to identify churn predictors and reduce churn

Reducing customer churn and retaining customers is the top reason cited by one-third of service providers for better understanding the customer experience. Not surprisingly as it is significantly more expensive to win a new customer than to maintain an existing one. Churn reduction is closely related to the need to improve customer satisfaction and net promoter scores (NPS) or voice of the customer improvement.

Improving monetisation of customer interactions is among the top three CEM initiatives. This requires CSPs to build a better relationship with their customers by personalising engagement. In order to do this effectively, insight about the customer is key and real-time contextual analytics are needed to understand when for example it's appropriate to send an offer to customer, and what type of offer: cross-sell/upsell, free minutes or something else. Creating third party revenue offers based on customer data and customer micro-segmentation are still relatively small at 6%, although Heavy Reading research finds these are emerging areas that will become more important in personalising marketing offers and services in the future.

2. Analytics focus shifts from network to customer QoE

Leading service providers are setting up Service Operating Centres (SOCs) and using real-time analytics to monitor the actual end user service experience not just layer two and three network QoS monitoring. This can then be correlated into a real-time Customer Experience Index (CEI), an inside-out proxy NPS score that is calculated based on different interactions with the CSP. The CEI can be monitored by segments of customers, such as high value business customers and by location. A key trend is that QoE across all services – mobile and fixed – that a customer buys is being monitored, as a bad experience with one service, such as IPTV can impact overall satisfaction and likelihood to churn. The CEI can then be monitored by the SOC in real-time across different customer segments, for example, enterprise or VIP customers.

The SOC also plays a key intermediary role between the customer-facing departments such as customer care, sales and marketing and network teams such as network operations and engineering. The main goals of moving to a Service Operating Centre are to:

- Improve the customer perspective of network performance
- Prioritise customer-affecting issues
- Monitor the customer view of real-time service experience
- Gain a unified view of customer experience

The application of advanced methods of predictive analytics and machine-learning techniques will make it possible to anticipate service-quality degradations with a reasonable level of accuracy, enabling service providers to take proactive action or even automated pre-emptive action.

3. Network planning and optimisation

Analytics are being used for network planning as service providers look to invest in network infrastructure in terms of value such as where is there network congestion and where are VIP customers being most impacted. Analytics can also be applied to identify which network element is mostly affected by degradation, which devices and services are being used at cell sites to prioritise fault resolution and network planning, as well as for assessing dropped calls, VoLTE and video quality. Also for network planning forecasts, service providers can correlate customer mobile data usage and behaviour with location patterns and predict coverage needed in six months, in one year or another timeframe.

4. Proactive care

Proactive care has several dimensions. One one hand it's about empowering customer care agents (Levels one and two) with diagnosis and insights into an individual subscriber's recent activities in order to improve fault resolution time and customer service. Another cost efficiency advantage is that Level two agents can solve problems without needing to refer calls to smaller Level three technical teams.

It also can be about reducing inbound calls to call centres, for example many of the calls to call centre agents are around billing, and this could be resolved by improving how bills are presented, enabling customers to understand them more easily, improving digital self-care, or by communicating when customers are close to using their mobile data limits to avoid bill shock.

Proactive care also relates to proactive monitoring, solving problems before they impact customers and applying analytics and machine learning to identify patterns and resolve frequent errors. If for example, an error relates to a subscriber's particular handset configuration, send them the solution of course, but what about other customers in same situation that are likely experiencing the same problems? CSPs that care about the customer experience can take a further proactive step to identify other subscribers with the same issue that are having a bad experience with roaming – they may not have complained, since only about 1 in 20 people experiencing problems actually bother to call, but the risk of them churning can be reduced.

5. Marketing analytics and data monetisation

By implementing big data analytics, marketing teams can develop targeted use cases, such as: creating granular customer segmentation; providing personalisation-based differentiated offers; and introducing real-time marketing campaigns such as top up mobile data or tailored content. By enriching CRM data with analytics on customer behaviour, application usage, location and devices, mobile operators are seeing improvements in marketing campaign effectiveness, uplift in revenue and are beginning to expand this across channels. According to Heavy Reading research, 86% of CSPs say location data is important to customer data monetisation, with nearly half (48%) stating it is or will be the main focus of their monetisation strategy. Customer location data is key for service providers in enabling mobile advertising and for example sending real-time offers and coupons to

customers based on mobile location from third-party businesses in the vicinity.

Another strategy could be to sell anonymised/aggregrated customer data to third parties. Some CSPs do that today, for example to the transport and travel/hospitality sector who want to understand subscriber demographic and movement patterns. Data privacy is always a concern as well as persuading customers to opt-in, but service providers believe these challenges can be overcome if there is an exchange of value such as discounts or reductions in restaurants and retailers and customers trust the terms of usage – that data will be anonymised and aggregated.

NFV and SDN analytics

The other area that is getting attention in CSPs is the increasing relevance of analytics in service testing, orchestration and assurance, especially in virtualised NFV/SDN networks where real-time and proactive analytics are needed to ensure service quality.

The move to virtualised network functions with NFV and software defined networks (SDN) will have a huge impact on how service providers manage the service lifecycle, how services are created, how customers consume services, how services are tested and monitored and how the end-to-end customer experience is managed. 85% of service providers say analytics will be important in managing NFV, with more than half saying it will be essential.

NFV and SDN highlight the need for new approaches and tools both for fulfilling services and assuring them in a dynamic environment. CSPs need to be able to assure the compositions of virtualised network functions (VNFs) they instantiate on demand to support customer-facing services so that they can guarantee service performance and availability. Services and the virtualised infrastructure they depend on must be assurable as soon as they come into existence or the speed advantages of virtualisation are lost. Real-time contextual analytics will be key in determining performance, policy and assurance of services.

This will require tightly integrated and automated insight and analytics of virtualised network infrastructure, devices, customer profiles and application and service provisioning and assurance, customer usage and behaviour and of course real-time service experience monitoring.

This will be a real catalyst in changing where and how network and service data is collected, what type of data is collected, where it is stored and for how long, how it is analysed and will force a more strategic, horizontal discussion on the role of analytics in service providers. This will be key as most of the challenges to using analytics effectively are not so much the tools, as many are available from vendors today, but organisational and culture issues, lack of skills and clarity around ownership and strategy within the service providers.

Looking ahead

Who's responsible for analytics?

It depends. Part of the problem for service providers in terms of driving a master customer data management strategy is a lack of clarity around ownership and a leader with authority to drive that across the organisation. Big data analytics platforms tends to be managed by IT or a big data organisation in the larger service providers, others have established a CEM office, but marketing and sales are also buying analytics tools and systems to support their needs.

When Heavy Reading asked CSPs who in the organisation has the main responsibility for ▶

customer profiling initiatives, the responses were across the board, with responsibility across sales and marketing, product/service management and customer care. Just one in five (19%) CSPs said that the customer experience management (CEM) function is in charge of customer profiling initiatives, which typically takes charge in other industries. This could also be a sign of the early stages and relative immaturity of customer profiling and analytics within communications service providers. The structure and responsibility is still very much in silos and driven by departmental use cases rather than coordinated at a strategic level with common organisational KPIs and processes and a central customer profiling hub.

Customer data profiling is still a work in progress. CSPs are collecting service quality of experience and customer care data, but getting to a single view of a customer journey or lifecycle and a complete view across services is tricky because as one service provider says “we’ve got so many systems to bridge across.”

As one CSP put it: “We capture customer responses to factors such as price, customer service and billing in different ways but we are thinking about coupling them with network metrics in the same model because when customers change networks, they look at price and the network quality together as a single value proposition.”

There is no shortage of data to be collected and analysed as service providers continue to build a richer picture of customers in order to drive effective personalisation and monetisation and improve the user experience. There is a strong desire in the future to add psychographic and behavioural, personality insights, social media data, smartphone app and content usage and IPTV viewing habits.

Overcoming barriers to monetising customer data, customer data privacy legislation and persuading customers to opt in top the list of concerns. Data privacy legislation is something the entire industry has to deal with and will vary by region. Customers are more likely to opt in if they see value for them, for example, mobile coupons with retailer discounts, and trust the service provider with their data. Younger internet consumers are accustomed to sharing their data in return for freely using internet services. A big issue is that regulations around data privacy will vary in local markets as governments roll out privacy regulations and CSPs have to be on top of what they can collect, store and use, and ideally have these rules built into their analytics systems and processes.

Digital transformation is disruptive and there’s a fair degree of uncertainty around how all the systems will work together in the end, opensource and cloud-based sytems, and while ongoing transformations of legacy OSS and BSS systems are worthwhile to deliver omni-channel engagement or improve service onboarding, the changes can complicate analytics strategies. Also reorganisations and creation of digital transformation teams can change the operating model of how network and business departments work and impact analytics, business intelligence (BI) platforms, metrics and KPIs within the network teams.

Predictive analytics, machine learning and automation undoubtedly are the future for service providers. The general consensus is that real-time telemetry, analytics, optimisation and policy will be required to enable orchestration of network services in virtualised software defined networks. This has to be automated to monitor the service experience and visibility of configured network state in real-time. Machine learning can be applied to network traffic, QoE service metrics, calls to customer care, device problems, video viewing

patterns, among others. The possibilities are endless and some of the largest CSPs are bringing machine learning experts from other industries in-house. Machine learning is already being used today for example to predict problems in the network or services, or identify bottlenecks or recurring issues and problems that customer care appear to be dealing with.

Conclusion

CSPs are at a critical point where an intimate understanding of customers is needed to win their loyalty, as well as drive further value from the customer relationship. On the other hand, big changes are underway in terms of how virtualised software-defined networks will operate and the IT systems needed to support how services are created, managed and billed are being transformed. Service providers are starting to see the value of analytics to help them both deliver a better customer experience and also making data more insightful and useful to departments across the organisation. Ideally all teams are using the same data and analytics in customised views, though this remains a work in progress as service providers try to overcome data silos, organisational challenges and who has responsibility for customer experience management and customer data analytics. Big data analytics strategies are still at early stages, mainly around customer experience management and marketing use cases but as value is proved, analytics will become a more critical business enabler that can provide insights and common KPIs across network, commercial and management teams.

About Heavy Reading

Heavy Reading, the research division of Light Reading, offers deep analysis of emerging telecoms trends to network operators, technology suppliers and investors. Its product portfolio includes in-depth reports that address critical next-generation technology and service issues, market trackers that focus on the telecom industry's most critical technology sectors, exclusive worldwide surveys of network operator decision-makers that identify future purchasing and deployment plans, and a rich array of custom and consulting services that give clients the market intelligence needed to compete successfully in the global telecom industry. **www.heavyreading.com**

ASTELLIa
BEYOND THE NETWORK

Company summary

Astellia provides a real-time network and subscriber intelligence solution called Nova to mobile operators which correlates probe-based data with network vendor's call traces to identify low-performing network elements, measure device impact on the network, benchmark handsets, analyse application usage and understand customer mobility through advanced geolocation algorithms. Founded in 2000, Astellia is headquartered in Rennes, France and has 480 employees globally and over 120 mobile operator customers.

Analytics credentials

Nova Analytics focuses on capabilities to detect, correlate, analyse, report and troubleshoot issues related to network performance management, service quality management, subscribers application usage and device performance. Key use cases are customer experience management and Service Operating Centre (SOC) tools, monitoring service quality or QoE, troubleshooting issues related to network performance, handset behaviour and subscriber usage. Astellia's solution is built on a big data architecture and provides analytics based on various sources of information: Astellia's probes, other vendor probes, call traces and systems such as CRM and billing. Astellia supports a common data platform with different analytics applications for network operations, marketing and customer care. For example, the customer care application enables Level 1 and 2 support teams to understand the meaning behind subscriber KPIs and suggest possible solutions to reduce handling time as well as the number of tickets that need to go to Level 3 support.

Key differentiators

- Experienced in mobile network monitoring and troubleshooting solutions and can provide a full end-to-end view across different network elements.
- Combines network data with user plane data, deep packet inspection (DPI) data on subscriber application and device usage and geolocation to support big data analytics and insight on subscriber behavior and service quality.
- Provides analytics tools to support a SOC team including correlating service QoE with geolocation, as well as professional services.
- Acquired Ingenia Telecom, a provider of a radio network optimisation solution, which advanced its geolocation capabilities to support RAN optimisation and marketing teams.

COMPANY PROFILES

Company summary

EXFO provides communications service providers (CSPs) with test orchestration and performance intelligence solutions to ensure the smooth deployment, maintenance and management of next generation, physical, virtual, fixed and mobile networks. EXFO serves more than 97% of the world's top 100 communications service providers. Headquartered in Canada, EXFO has a staff of more than 1,500 people with operations in over 25 countries.

Analytics credentials

The core functionality of EXFO Xtract is retrieving, correlating, aggregating, enriching, storing, analysing and processing massive volumes of source data in real time to form a consolidated view into service experience. EXFO Xtract also contains advanced analytics capabilities for service modeling that enable CSPs to automate the linking of any given service with its physical and logical resources. This in turn makes it possible for CSPs to easily recognise network elements, services and subscriber groups that have been impacted by service degradations, and to minimise efforts to keep the service up-to-date. EXFO Xtract offers pre-packaged solutions that include predefined integrations to necessary KPI, KQI and Service Experience Index (SxI) definitions, data sources, service models, data-processing rules and pre-defined dashboards designed to solve domain-specific use cases in the most efficient way.

Key differentiators

- EXFO Xtract is a comprehensive E2E analytics solution thanks to its ability to collect and combine data from various data sources, including active, passive, network and third-party sources, and from mobile agents.
- EXFO Xtract can be deployed in conjunction with any other technology, network architecture or equipment vendor. CSPs can count on EXFO's industry expertise to use data from these sources to rapidly deploy new services, analyse performance baselines and accurately pinpoint service-affecting events.
- Total cost of ownership (TCO) is predictable, thanks to EXFO Xtract's self-service architecture. After the initial investment, operator teams or third-party developers can add their own data sources, analytics logic, dashboards and reports on top of the EXFO Xtract analytics platform.

Company summary

Guavus provides big data analytics applications for operational intelligence. Guavus software collects, enriches and correlates massive volumes of structured and unstructured data analysed by machine intelligence techniques to trigger contextualised actions for real-time decisioning. Guavus offers analytics applications for communications service providers, cable and media companies and Industrial Internet of Things (IIoT) verticals. Founded in 2006, Guavus is headquartered in California, employs 500 employees and has offices in Mexico, Montreal, Singapore, the UK and India.

Analytics credentials

Guavus Intelligent Data Mediation analyses data in real-time as it streams from the network, devices and fault monitoring systems and correlates that with data from customer care, social media, as well as data from CRM and billing systems to create real-time analytics and insight. This provides real-time intelligence to improve the customer experience and support the transition to Service Operating Centres (SOCs). Guavus also applies predictive analytics to network, care and field operations data to quickly detect and prioritise network and service anomalies by customer impact and provides more informed and personalised customer service, such as pushing a likely reason for call insight to call centre staff. Guavus also supports marketing with next best offer applications for customer retention or upsell.

Key differentiators

- Common analytics framework that ingests and correlates high volumes and a wide variety of streaming and stored business, operational and sensor data, regardless of source or type, in real-time.
- Offers a new breed of analytics and machine learning techniques that goes beyond traditional monitoring of service availability to ensure the health of the network and quality of experience of subscribers across a more complex operational environment.
- Strong in the cable sector, particularly in supporting customer care. Pipeline application enables cable operators to collect and analyse IPDR data to better understand per modem bandwidth consumption and network activity.

COMPANY PROFILES

Company summary

Mahindra Comviva provides analytics-based software and solutions to manage a mobile customer's value across the lifecycle in order to improve average revenue per user (ARPU) and the customer experience as well as reduce customer churn. Founded in 1999, Mahindra Comviva is headquartered in India and is present in more than 100 countries worldwide and works with nearly all the tier one CSPs. Mahindra Comviva is part of the $17 billion Mahindra Group, a diversified group of IT businesses that includes IT group Tech Mahindra.

Analytics credentials

Mahindra Comviva's MobiLytix software suite can manage different parts of the telecoms customer lifecycle irrespective of whether the customer is prepaid or postpaid. The platform has different modules to manage the customer lifecycle across digital and retailer channels, such as multi-channel campaign management and real-time marketing including Next Best Offer contextual marketing based on real-time analytics on customer behaviour and interactions. MobiLytix also offers predictive and prescriptive analytics around churn and customer engagement including loyalty management and winback solutions, as well as digital self-care and omni-channel solutions. MobiLytix also offers a retailer management solution to increase revenue from retail point of sale by using analytics to make real-time offers based on location of buyer and buyer history.

Key differentiators

- Experienced in customer value management. Mahindra Comviva works with over 100 mobile operators and has use cases that support incremental ARPU increases after deploying MobiLytix real-time personalized marketing solution.
- Analytics-driven software can analyse customer interaction data, whether it's SMS, email, or digital, in real time and based on that insight take the most relevant marketing decision right at that moment.
- MobiLytix is an all-in-one common software suite covering the ntire customer lifecycle that includes loyalty, campaign management and analytics packages.
- The software interface is easy to use and intuitive so a marketing department user can run a real-time campaign management package without needing IT or technical support.

Company summary

Telarix, a market leader in Interconnect Business Optimisation, provides wholesale billing, business intelligence, fraud management, least-cost routing and partner settlement to carriers around the globe. Telarix provides optimisation software solutions for global carriers to support wholesale carrier-to-carrier interconnects and billing settlements. iXLink, a global interconnect exchange, automates wholesale interconnect purchase processes. iXTools processes over 300 billion wholesale voice, SMS, content and data minutes each year, and provides insight into optimal routing, billing and audit, settlement, trading and managed services. Founded in 1996, Telarix is headquartered in Virginia in the U.S. and supports over 4,000 carriers globally.

Analytics credentials

Telarix brings big data analytics to the complex world of wholesale interconnects and billing. iXInsight is an analysis module for ad hoc reporting and visualisation of carrier data. The addition of a big data platform to iXInsight enables the real-time analytics of rating, routing and reporting data. The business intelligence derived provides vital feedback to Telarix's existing route optimisation system within the iXTools Suite, enabling business intelligence, analytics and data mining to solve use cases such as fraud and dispute management. It also allows the creation of new bundled revenue opportunities for retail and wholesale service providers.

Key differentiators

- Experience in the global wholesale interconnect and billing settlement market and can add value to big data analytics through understanding the end-to-end business process, the players and roles, how they interact with the data and how actions feed into the lifecycle of the business.
- Telarix can effectively support carrier operations with valuable actionable insight. This includes data cleansing, checking errors, especially around complex price lists, promotions and dial codes.
- Using big data platforms such as Hadoop and Spark means Telarix can provide a powerful yet cost-effective open framework for carriers competing in the real-time BI-driven market.
- A single unified platform and process means a service provider can run its entire wholesale business off of one software ystem and one database. iXTools has workflow that can be used by the sales group, finance department, operations, routing, and billing.