CONDUIT3G

Pre-Market Technology Briefing and Disclosure

NOVATICS®

Abstract:

The evolution of wireless networks into a primary mode of voice and data connectivity has outlined a new and unprecedented need for rapid expansion of both capacity and service quality. This is especially true for Third Generation systems, which must accommodate exponential growth in usage levels, application bandwidth and consumer value expectations.

Conduit3G technology (C3G) was developed as a means of allowing providers to rapidly meet the demands of next-generation operation. Employing radical new Air Interface Medium control innovations, Conduit3G enables a significant multiplication of spectral efficiency and signal coverage reliability. The result is a firm foundation for 3G services that maximizes utilization of existing frequency allocations and infrastructure, while providing for efficient long-term network scalability.

The following Pre-Market Technology Disclosure is intended to provide a brief introduction to Conduit3G technology and its impact on Third Generation network development. Organizations interested in evaluating C3G capabilities are invited to contact:

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Executive Overview:

As wireless providers transition to service models that merge conventional capabilities with broadband data access, their networks will require a significant multiplication in performance. This is evidenced by the current migration to 3G applications, which is already outlining a need for dramatic improvements in application bandwidth and service reliability.

However, approximating wireline-grade data functionality in the mobile environment is proving to be a uniquely challenging endeavor. Throughout every market, critical gaps in Air Interface Medium control technology are confounding efforts to adapt networks for Third Generation connectivity. Without the integration of substantially more sophisticated medium control capabilities, network infrastructure will be unable to meet the technical prerequisites of true full-scale 3G deployment.

Conduit3G technology represents a radical new means of bridging this looming gap in Third Generation evolution. Through the use of medium control innovations developed by Novatics, Conduit3G allows wireless providers to economically achieve far higher signal control and cellularization potentials. This means that current and next-generation networks will have the ability to realize previously impossible gains in application bandwidth, user capacity and overall reliability.

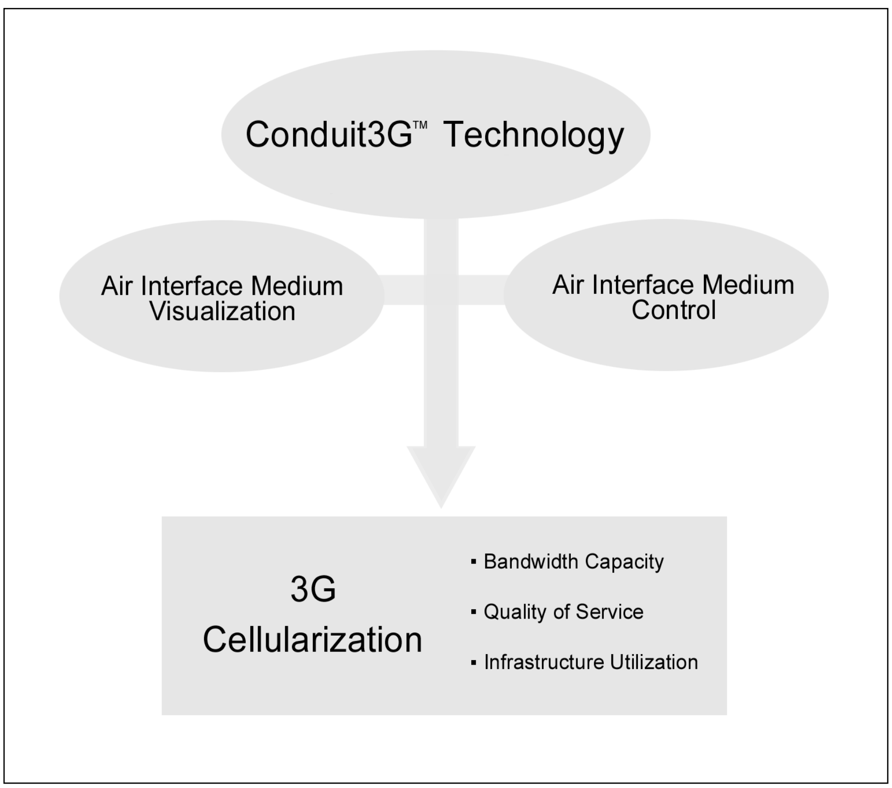

Figure 1. Through the use of proprietary Air Interface Medium visualization and control innovations, Conduit3G technology allows providers to economically achieve significant new levels of bandwidth capacity, QoS and long-term scalability.

Conduit3G Technical-Case Advantages

Conduit3G technology enables a geometric increase in the ability of network providers to visualize and control the intricate dynamics of their Air Interface Medium. This newfound command over the mobile operational environment effectively bridges many of the most challenging technological barriers to full-scale Third Generation application viability. Through the deployment of proprietary C3G technologies, providers can realize the following technical-case advantages:

- System-Wide QoS Improvement
- Significant Multiplication In Spectral Efficiency
- Considerable Growth In Bandwidth / Capacity Potential
- Long-Term Infrastructure Scalability

Conduit3G Business-Case Advantages

A significantly increased ability to precisely control the wireless medium translates directly into improved network reliability and spectral efficiency. At the levels of Air Interface control made possible by Conduit3G, contemporary networks can expect double-digit multiplication in both coverage assurance and per-user bandwidth potential. Such capabilities reflect a wholly new capacity to maximize the utilization of existing infrastructure, while increasing mobile application speed and reliability. Through the deployment of proprietary C3G technologies, providers can realize the following business-case advantages:

- Reduced Subscriber Churn
- Increased Broadband ARPU
- Accelerated Time To Market
- Reduced Buildout / Retrofit Costs

Section 1: The 3G Technology Gap

The past decade has been a period of unprecedented expansion in the wireless telecommunications industry. In the years since the introduction of 2G services, mobile voice and data access has rapidly evolved from a costly luxury enjoyed by a privileged few to a ubiquitous necessity that readily crosses demographic boundaries.

Today, the effects of increased frequency allocation and provider competition have manifest themselves in a wireless market where soaring licensing and infrastructure costs routinely clash with the realities of an especially challenging commercial environment. Characterized by powerful downward price pressures and consistently high levels of subscriber churn, the mobile telecom arena has become a progressively more unlikely place from which heavily mortgaged network providers can extract reasonable returns on their investment. Thus, across much of the industry, tomorrow's advanced 3rd Generation applications are now viewed as a means by which current commercial impediments can be overcome. Through the proliferation of robust 3G capabilities, providers see compelling new opportunities to break the competitive stalemate, while substantially growing operating margins with newly forged services.

Unfortunately, however, the implementation of next-generation capabilities has not yet proven itself to be the magic bullet that many were anticipating. This is especially true in urbanized regions, where extremely complex signal propagation environments exist alongside rapidly escalating subscriber densities. Instead of becoming an instant source of revenue expansion, these highly important markets have unveiled substantial technological gaps that now threaten the long-term viability of fully enabled 3G networks.

At the root, this technology deficit is a fundamental inability to adequately control the wireless signal environment, also known as the Air Interface Medium. This is due to the fact that contemporary medium control capabilities still employ underlying technologies that are decades old and predate even the first cellular telephony systems. Thus, they are wholly inadequate in dealing with next-generation network architectures, which demand a level of precision exponentially higher than that of their predecessors. Without a considerable improvement in Air Interface Medium analysis and control capabilities, tomorrow's networks will be unable to meet newly broadened expectations of reliability, subscriber capacity and application bandwidth.

Understanding The Technology Gap

The air interface medium is to wireless what fiber optic cable is to wireline. Yet, whereas fiber optic cable is an easily predictable and scalable resource, the wireless medium - essentially the free space around us - is far more chaotic. Thus, the story of wireless network evolution is closely tied with that of air interface medium control technology. With each successive generation of networking applications, the methods used to prepare the medium have had to become considerably more robust.

Early on in the development of 1G analog networks, it was determined that the wireless medium needed to be controlled in new ways. In order to adequately service an increasing number of subscribers with a finite number of frequencies, networks needed methods to ensure coverage while continuously recycling precious spectral resources. The solution was the now familiar process of cellularization. In cellular networks, coverage zones were arranged into regular patterns of cells that ensured signal penetration into vital areas, while segregating the use of certain groups of frequencies. When properly implemented, this cellular approach allowed millions of subscribers to use networks that would otherwise have serviced just thousands.

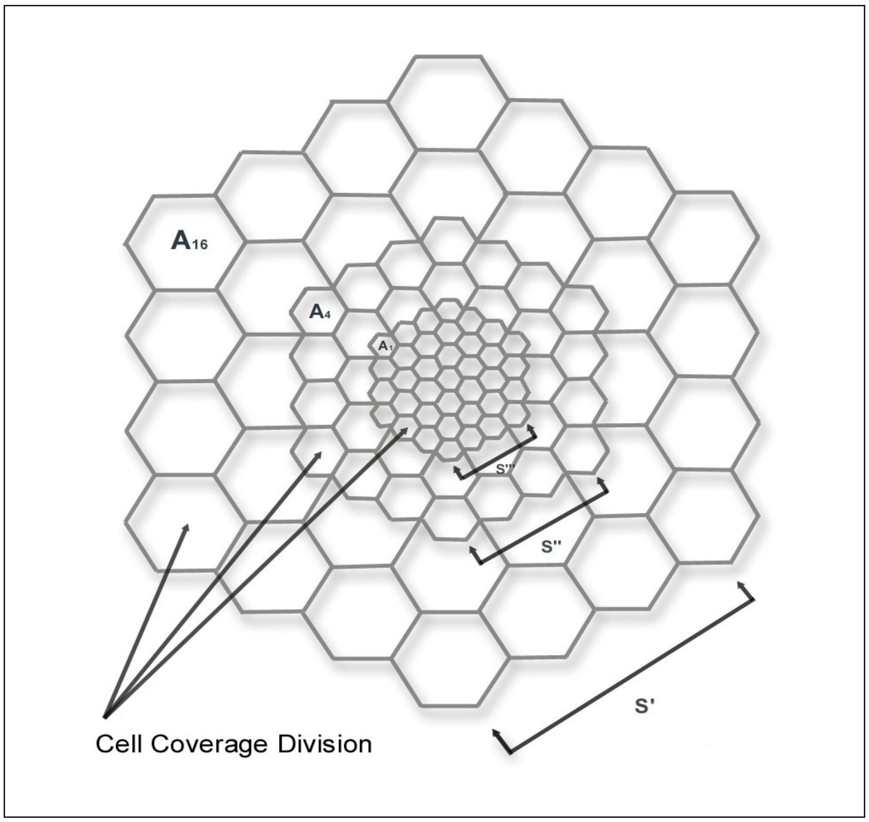

Figure 2. The process of cellularization gives wireless networks a basic means of expanding application bandwidth and capacity with finite spectral resources. For 3G, however, cellularization capability must significantly improve to cope with complex RF environments.

With the coming of 2G, cellular-based medium control strategies needed to quickly become more sophisticated. Despite the addition of new frequencies and capacity multiplying digital transmission protocols, the rapid influx of new subscribers that accompanied the introduction of 2G still meant that both new and existing spectrum had to be reused at a much higher rate. At the same time, falling prices and increased competition created an entirely new class of end-user, who, being dangerously prone to churn, was infinitely less tolerant of network deficiencies. Therefore, medium control technologies had to not only recycle spectrum more effectively, but also aspire to unprecedented levels of coverage assurance and service quality.

At the dawn of 3G, it is obvious that a critical technology gap is forming as conventional medium control technologies reach their limits. This is because 3G networking is much more than a simple outward evolution of current 2nd Generation capabilities. Instead, full 3G capabilities represent an exponential multiplication in complexity throughout virtually every aspect of system operation.

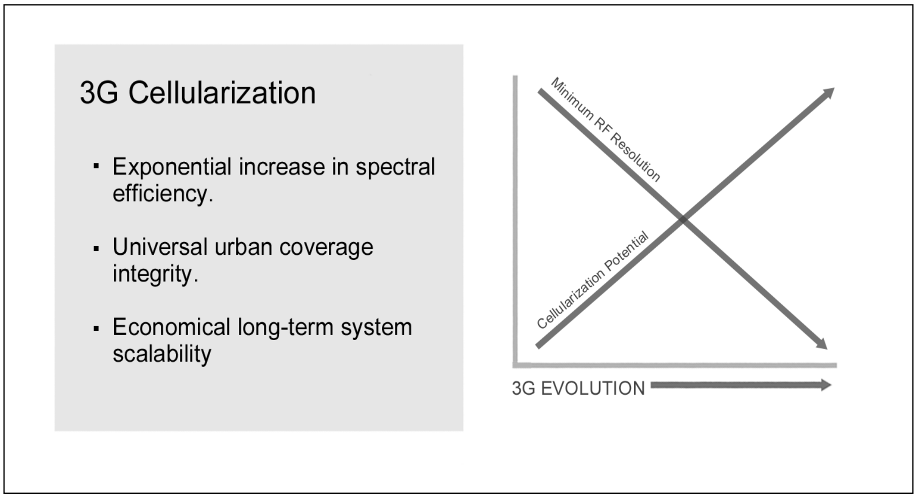

Figure 3. Long-term evolution of 3G is heavily dependant on the ability of networks to achieve significant growth in cellularization potential. Fueled by an increase in RF propagation analysis / control resolution, 3G cellularization forms the foundation for higher spectral efficiency, coverage integrity and long-term scalability.

Cellular-based medium control methods, whose underlying propagation prediction technologies are decades old, were never intended for ultra high performance applications like 3G. In fact, even a few years ago, 3rd Generation's radical requirements for bandwidth, capacity and coverage assurance would have seemed outlandish. Today, however, the situation has changed as wireless networks have been called upon to provide a compelling mobile approximation of the wireline broadband experience. If lofty goals for 3G are to be realized then medium control technology as we know it must be fundamentally transformed.

Need For Enabling Technologies

With the anticipated consumer acceptance of 3G capabilities will come a final and important elimination of remaining distinctions between the wired and wireless communications experience. Therefore, it is increasingly becoming clear to the industry that mobile and wireline medium architectures must share similar performance characteristics.

What has been far less apparent, however, is how such a leap will be possible. In order to achieve reliability and scalability levels in wireless that approach those of landline digital networks, providers will need access to RF propagation control technologies that mold signal coverage with surgical precision. If the vision of rock-solid medium architectures that can reliably accommodate geometric expansion in usage and bandwidth with a finite amount of spectrum is to be realized, then an entirely new breed of enabling technologies must be brought to the forefront.

Evolving existing propagation prediction and control capabilities to meet these challenges is not the answer. While significant achievements in their time, contemporary medium control platforms are based largely upon technologies originally developed in the 1960s and 70s. Therefore, they were never designed to accommodate the unprecedented precision and complexity of next-generation architectures. Serviceable for 1G and early 2G applications, conventional statistics-based propagation prediction and control has no place in 3rd Generation buildout / retrofit management scenarios.

Today, proprietary new technologies are emerging that were specifically developed for the elevated challenges of broadband mobile data applications. Integrated into the Conduit3G technology group, these radical new capabilities exploit recent advances in machine intelligence and remote sensing. In contrast to earlier medium control solutions, Conduit3G-based control platforms permit operators to finely control signal propagation on extremely small scales (i.e. on the order of meters rather than kilometers). Whereas conventional medium management technologies can offer vague probabilities of coverage assurance over a number of city blocks, these new RF environmental control innovations can give a detailed report of network performance on a given street corner.

The profound jump in capability exhibited by these upcoming medium development innovations can be seen as a prime enabler for full 3G functionality. Such new capacities will not only streamline early transitional implementations, but also ensure the long-term viability of mature broadband 3rd Generation functionality. In emerging Conduit3G-based medium control solutions, it is at last possible to envision the root functionality of next-generation wireless networks approaching the developmental and operational stability of their wireline counterparts.

Section 2: Bridging The Technology Gap – Conduit3G

The move to Third Generation applications represents more than a piecemeal evolution of current capabilities. Rather, the adoption of 3G functionality reflects a dramatic shift in attitudes about wireless. Whereas mobile networks were once just an ancillary extension of wireline infrastructure, they are now fast becoming primary communications utilities that must closely approximate the speed and reliability of their wired counterparts.

However, as noted in the previous section, technology needed to accommodate the massive expansion in bandwidth capacity and service reliability associated with 3G is today only partially available. Despite notable advances in both handset and base station technology, critical gaps in air interface medium control remain as obstacles to the cost-effective buildout and long-term viability of true next-generation networks. Such gaps have outlined a new and unprecedented need for enabling technologies that can allow providers to exponentially multiply the service quality and capacity of existing spectrum and infrastructure.

Conduit3G was developed by Novatics to be just such an enabling technology. Composed of several proprietary RF propagation analysis, visualization and control innovations, C3G technology stands as a singular new means of controlling the wireless Air Interface Medium. This enhanced control translates directly into a newfound ability to significantly broaden the bandwidth and reliability potential of both current and anticipated network infrastructure.

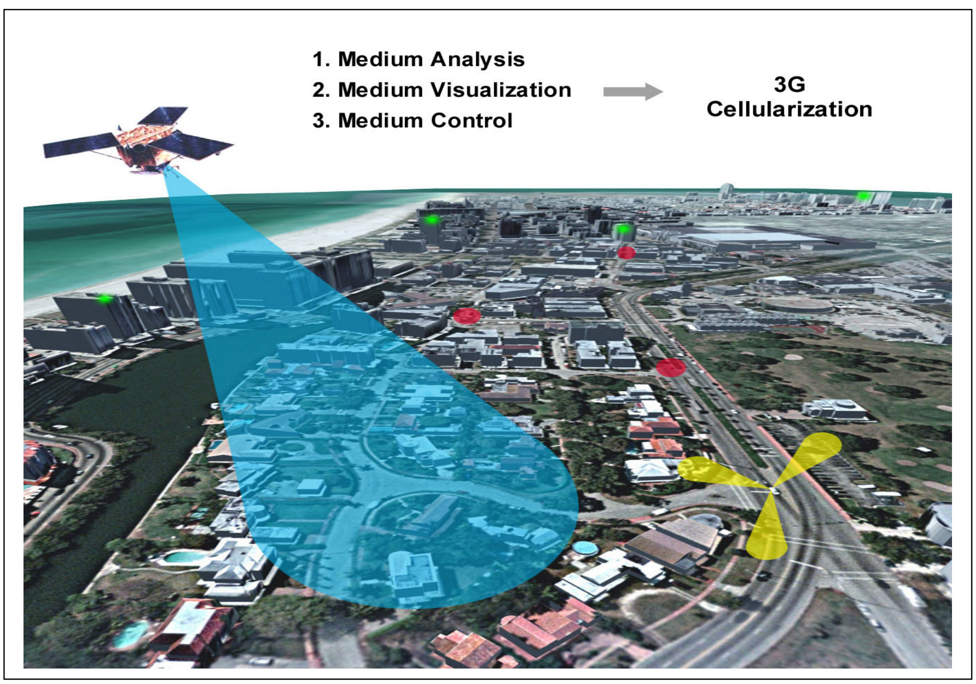

Figure 4. Conduit3G combines proprietary RF analysis, visualization and control capabilities into one highly functional Air Interface Medium management technology. Through the use of C3G, providers can leverage limited spectrum and infrastructure in ways that significantly multiply bandwidth and reliability for next-generation applications.

Air Interface Medium Analysis

In order to develop wireless infrastructure that can approximate the speed and reliability of wireline data networks, service providers will require a means of understanding the precise characteristics of the Air Interface Medium. Thus, before networks can move toward signal control and cellularization strategies appropriate for 3G applications, considerable evolution must take place in their ability to predict, survey and quantify the RF propagation dynamics of complex urban coverage environments.

Contemporary techniques, which use a combination of predictive statistical, ray-tracing and in-field survey methodologies are simply not up to the task. Largely developed decades before even the first 1G analog networks, traditional capabilities were never designed for the stratospheric demands of Third Generation networking. Thus, they are generally incapable of supporting the surgically precise cellularization planning needed to secure rapid and cost-effective escalation in application bandwidth and QoS (Quality of Service).

A significantly improved means of RF propagation prediction and analysis represents the first and most critical step in enhanced Air Interface Medium control for 3G implementations. This is why Conduit3G incorporates a completely new and proprietary set of technologies, which have the ability to assess Air Interface Medium characteristics with many times the detail and accuracy of all other current and anticipated capabilities. Known collectively as DISCLOSE (Direct In-Situ Comparative non-Line Of Sight Evaluation), these radical new capabilities establish the capacity to treat the Air Interface Medium as a stable resource with high degrees of long-term predictability.

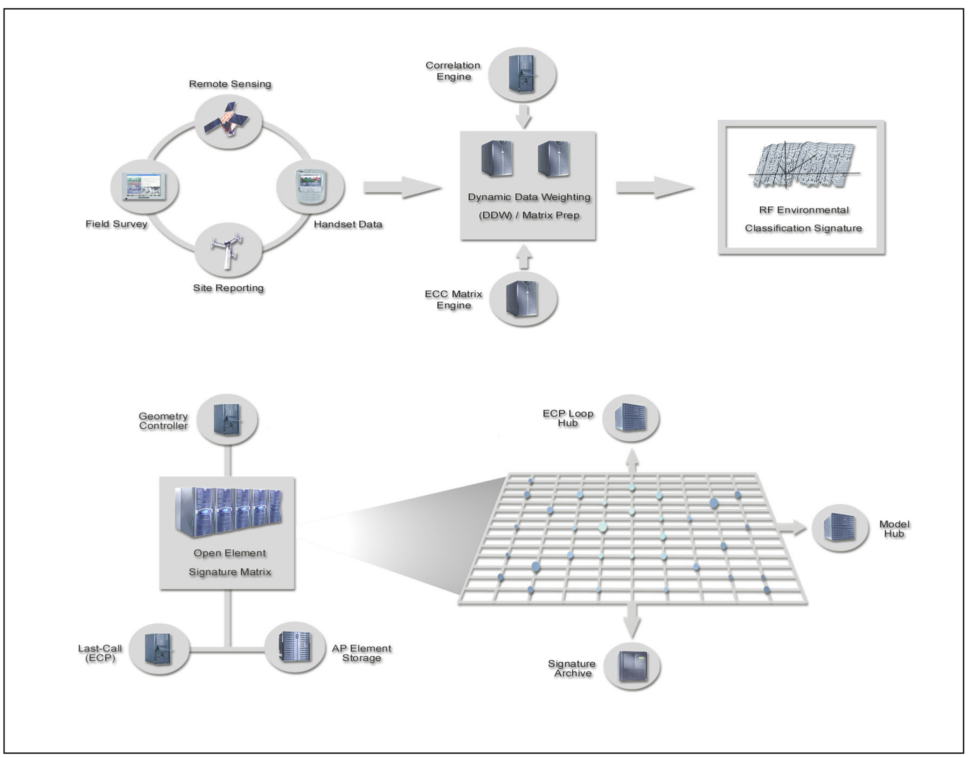

Figure 5. Conduit3G relies on radical new RF propagation prediction / analysis technologies like DISCLOSE to create projections of current and anticipated network coverage with unprecedented levels of speed, accuracy and economy. Such advanced capabilities stand as basic prerequisites to full-scale 3G network operation.

Unlike conventional RF propagation prediction and modeling capabilities, DISCLOSE does not rely on either statistical projection or extensive drive testing. Instead, DISCLOSE uses a combination of machine intelligence and remote sensing to rapidly gather immense quantities of information about the topology of a given coverage environment. This information is combined with an extensive library of RF signal dynamics signatures in a broad diversity of environment types. Together, both remote sensing and signal dynamics signatures are combined into a multi-terabyte heuristic matrix, which, through a series of proprietary processes, produce insight into network coverage that is exponentially more detailed and accurate than any competing method. *(For more information on how DISCLOSE works, please see p.20)

Through the use of DISCLOSE technology, Conduit3G fundamentally redefines the limitations of Air Interface Medium analysis. Whereas RF propagation prediction was once a highly inaccurate process with functional resolution on the scale of kilometers, it can now allow developers to confidently assess signal coverage details on the scale of meters or less.

Air Interface Medium Visualization

The inherent intangibility of the wireless medium is at the center of most challenges associated with next-generation network buildout and augmentation. Unlike wireline-based networks, where the transmission medium characteristics are static and easily quantifiable, wireless networks must cope with an Air Interface Medium that is both highly variable and generally unpredictable. Thus, before wireless providers can fully transition to service offerings that untether broadband data capabilities, mobile networks must assume levels of predictability and control that approximate those of their wireline counterparts.

Through the integration of DISCLOSE, Conduit3G technology is able to radically redefine the predictability of the Air Interface Medium. Yet, despite the tremendous leap in RF propagation analysis capacity represented by DISCLOSE, such capabilities are only the first step in achieving the ultra-high levels of network control required for Third Generation expansion and operation. This is why Conduit3G also integrates proprietary Air Interface Medium visualization capabilities. Going well beyond the limitations of conventional "coverage maps," these new visualization capabilities effectively translate raw network performance data into both intuitive and highly actionable information.

As Conduit3G combines vastly more accurate network performance prediction and analysis with equally improved visualization capabilities, the resulting product is one that greatly changes how both developmental and operational stage personnel deal with network infrastructure. Through the exploitation of C3G-enabled analysis / visualization functionality, the constant uncertainty associated with Air Interface Medium engineering is largely eliminated. Replaced with technologies capable of accurately divining and representing RF performance data with unprecedented accuracy and on unprecedented scales, the costly and time-consuming methodologies of 1G / 2G networks can yield to C3G medium visualization capabilities that merge reliable system performance assays with high-confidence long-term prediction.

Figure 6 depicts a typical "low resolution" Conduit3G-enabled classification of signal penetration in an urbanized coverage environment. Here, contrasting colors are used to make a rough analysis of signal penetration for two individual site sectors. In this case, the yellow overlay represents areas where average signal levels are above transmission protocol minimum 99.3% of the time for a given sector, while blue represents the same service quality standard for a complementary sector. RF performance feature resolution for this image is <3 meters at 1900Mhz in all conditions, making this visualization far more detailed and accurate than that produced by virtually any conventional means.

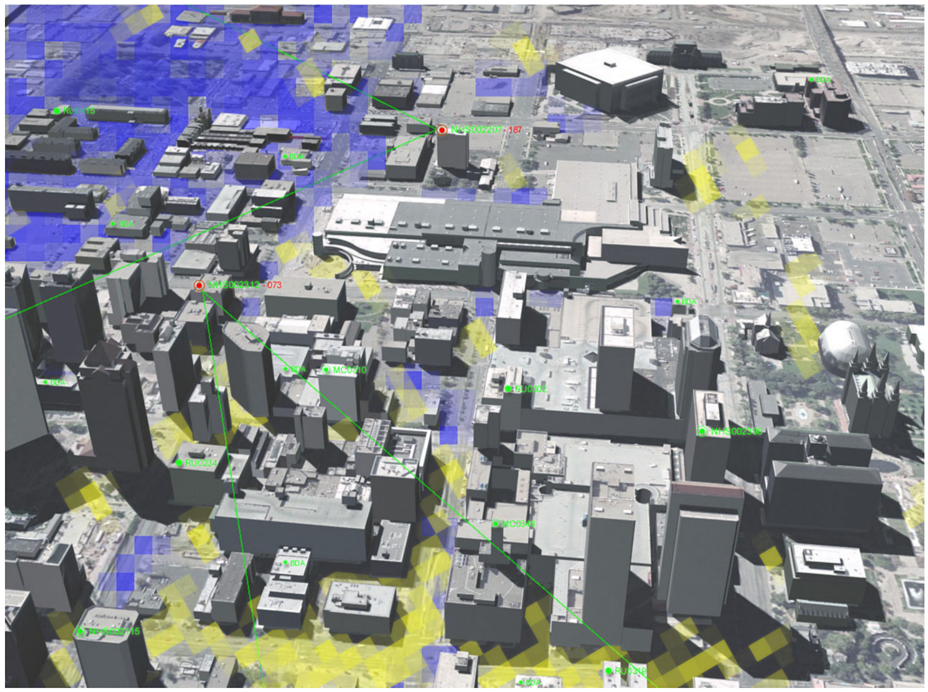

Figure 6. C3G visualization gives operators and developers an unprecedented window into network dynamics. Even in low-resolution mode, Conduit3G accurately reveals the intricate details of sectorization and cell fragmentation. This provides the basis for highly efficient next-generation infrastructure evaluation and capacity planning.

However, what is most significant about Figure 6 is not its relatively high level of detail and accuracy, but rather the fact that it represents the minimum standard resolution made possible by Conduit3G-enabled analysis / visualization technology. Through the exploitation of its proprietary RF analytic / predictive components, C3G technology is able to move substantially beyond conventional technology towards the ultimate theoretical limits of propagation analysis in urban coverage zones. Possessing the ability to depict RF features whose dimensions are single digit multiples of the target wavelength, C3G-enabled systems approach the maximum possible visualization resolution for networks operating in highly complex signal environments. Higher resolutions are not only impractical, but also technically impossible due to "rogue" spatial envelope fading caused by moving environmental components. Thus, even in its early stages, Conduit3G can be considered a final evolution of signal visualization for urban wireless applications.

While enhanced analysis capabilities form the foundation for Conduit3G's most critical long-term RF prediction capabilities, such advancements are only as good as the visual interface through which they can be utilized. For the levels of network performance awareness needed to fulfill the promise of true Third Generation applications, simple 2D situational mapping is just not adequate. This is why C3G relies on leading-edge 3D virtual environmental simulation capabilities. Developed specifically for Conduit3G and the associated needs of engineers deploying C3G-enabled developmental and operational plans, these visualization capabilities are as advanced as the RF environmental data they contain.

Immersed in a highly realistic virtual urban environment, developers can utilize the full potential of C3G-enabled propagation analysis capabilities. Through a synthesis of highly accurate meter-scale urban propagation prediction with carefully rendered environmental models, the air interface medium can be rapidly transformed from a nebulous entity into an extremely well understood resource. Such a metamorphosis has implications that go well beyond simply accelerating conventional system engineering efforts. Instead, a vastly more accurate and intuitive window into urban RF behavior translates into significant new opportunities for both complex cellularization plans and long-term buildout visibility.

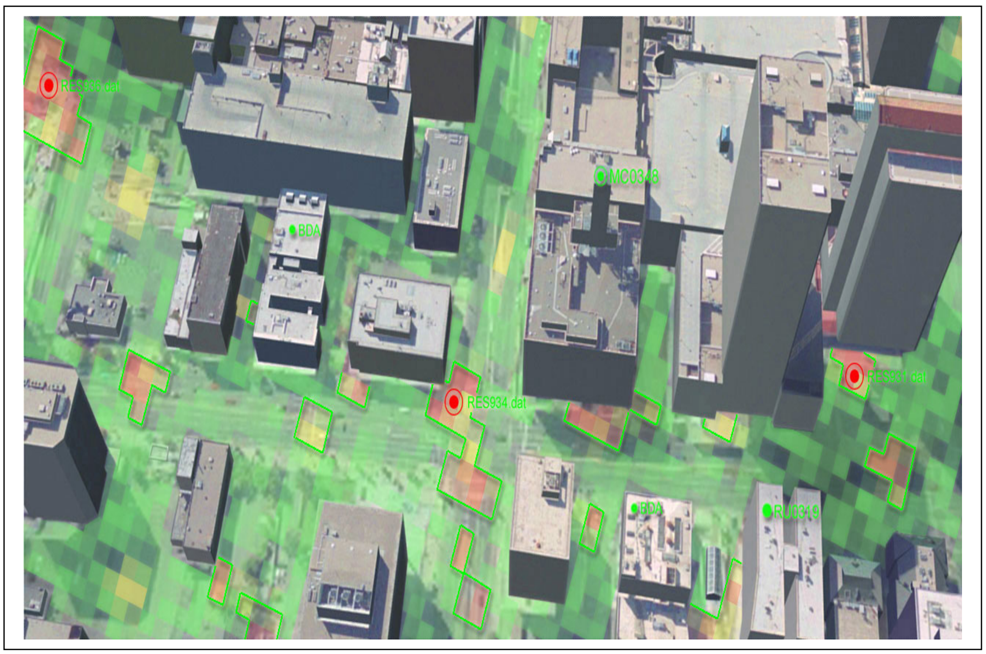

Figure 7. Conduit3G-enabled Air Interface Medium visualization can combine a multitude of RF performance factors into a single QoS measurement. Highly accurate and intuitive, this 1900MHz wideband CDMA survey plots signal quality at a resolution of <25 wavelengths. C3G software identifies minute coverage faults for later dissection and repair.

Figure 7. illustrates another basic C3G-enabled visualization scenario. Here average signal quality for a 1900MHz W-CDMA carrier is represented using a simple graded color scheme. Signal strength, temporal coherence, and adjacent/co-channel interference factors are weighted and combined into one relative QoS measurement, giving operators an instant and easily interpretable impression of urban coverage performance. Accurately depicting RF performance features on the order of 20 – 25 wavelengths, this level of visualization capability removes a significant amount urban network uncertainly by providing consistently high-confidence signal topology on never before seen micro-scales.

By substantially lowering the minimum scale from which RF propagation features can be accurately resolved and displayed, Conduit3G satisfies a major initial criterion for effective micro-cellularization in urbanized service environments. As C3G-based Air Interface Medium capabilities pervade network planning and operational efforts, this enhanced resolving power begins to reveal the true complexities of cellular zones in densely populated network service areas. Far from the neat and orderly geometries of their textbook counterparts, C3G uncovers the intricate dynamics of real-word urban cells, which routinely display extremely high levels of variability, discontinuity and fragmentation.

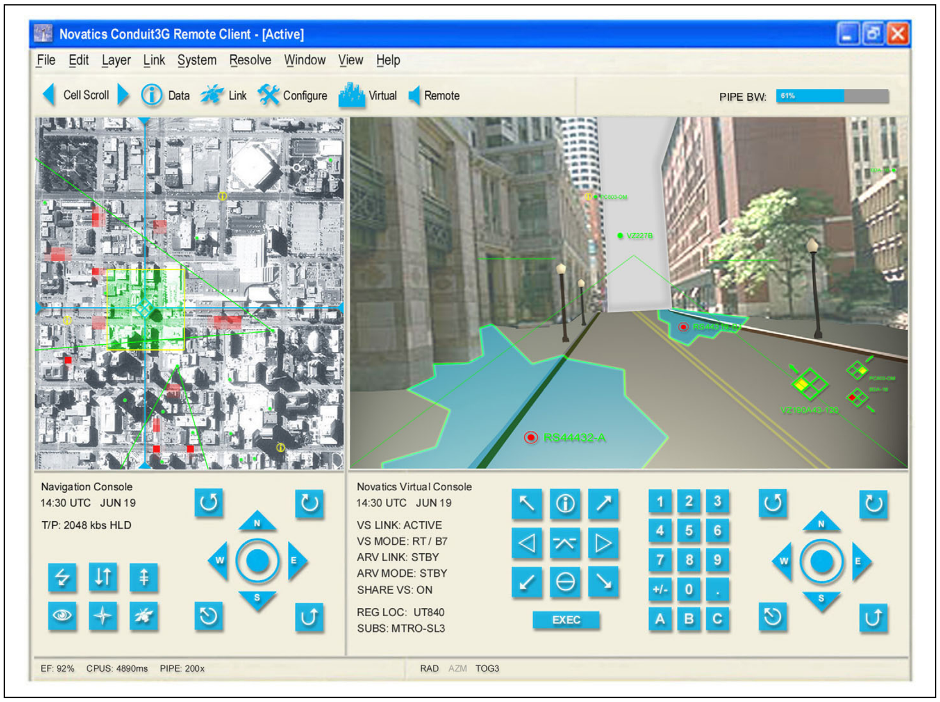

Figure 8. Using ultra-high resolution DISCLOSE medium analysis capabilities, C3G visualization can classify and display coverage faults on extremely small scales. Through the use of Conduit3G remote client software, this visualization data can be rapidly interpreted in a realistic virtual coverage environment.

Figure 8 illustrates the true potential of Conduit3G visualization capabilities. Developed to cope with the most sophisticated micro and pico-cellular development and retrofit scenarios, this highly realistic walk-through environment presents engineers with a theoretical maximum in precision visualization accuracy. Able to experience a virtual environment closely resembling that experienced by subscribers, network personnel can quickly understand and dissect critical network coverage faults. Such faults, resolved using DISCLOSE-based predictive analysis capabilities, can be identified and resolved long before they negatively impact buildout efficiency or service quality.

As providers continue to decrease urban cellular scales, the need for extreme accuracy and surgically precise control of both RF signal propagation and integrity factors will dramatically increase. This is has already become true in many of the most demanding urban markets. As geometric growth in demand for capacity and service reliability compel the creation of ever smaller and more intricate cellularization planning, both design tolerances and error margins will need to be many orders of magnitude tighter than they have ever been. Having a precise visual command over current or proposed network performance and resources will be critical.

Air Interface Medium Control

Utilization of DISCLOSE-based RF propagation analysis and prediction technology allows Conduit3G to give providers a wholly new window into the dynamics of their network. Such a window allows for spectacularly accurate understanding of system performance in current configurations, as well as confident projection of application and infrastructure growth potential well into the future.

However, enhanced network performance visibility is only a first part of the long-term next-generation service equation. To create the wireline-like operational environment espoused by 3G mobile broadband service models, providers need to acquire medium control capabilities that can balance the competing requirements of capacity/reliability assurance and urban design adaptation.

Conduit3G integrates proprietary HANC (Heuristic Autonomous Network Control) technology. A complement to DISCLOSE-based medium analysis and visualization capabilities, HANC allows providers to quickly and efficiently develop the advanced medium control architectures necessary for long-term retrofitting and operation of next-generation broadband infrastructure.

The HANC-based Air Interface Medium Control process begins with the highly accurate meter-scale propagation analysis data provided by DISCLOSE. This enhanced RF analysis information is combined with real-time and historical network performance reporting to generate an ultra-high confidence picture of both current and anticipated network performance potential with existing infrastructure configurations.

Using an advanced heuristic RF projection process, HANC takes such Air Interface Medium data and applies it to an almost infinite diversity of possible network configurations ranging from simple re-alignment of existing legacy infrastructure to complete new buildout and retrofit scenarios. Benefiting from a wholly new ability to accurately project network performance parameters well into the future, HANC-based system engineering can give providers unprecedented levels of system evolution visibility. This means that next-generation operators can plan network upgrades in ways that best balance the competing requirements of service engineering / capital expenditure efficiency. *(For more information on how HANC works, please see Novatics HANC briefing.)

By combing DISLOSE-based RF visualization with HANC-based RF projection, Conduit3G-enabled Air Interface Medium control allows providers to take a much more wireline-like approach to network buildout planning and execution. Through a double-digit percentage increase in visualization and projection accuracy, C3G can fundamentally change the system engineering process into one that is not only considerably more efficient, but also far more economically / technologically sustainable well into the network lifecycle. Conduit3G replaces reactive "trial and error" engineering methodologies with ultra-high probability network configuration plans. Using HANC-based medium control, these planning capabilities remove the commercial uncertainty associated with long-term capacity escalation, while dramatically reducing the time interval between network engineering and actual service execution.

Third Generation Cellularization

The principle of cellularization, which was so important to establishing the viability of 1G / 2G infrastructure, is even more critical to the long-term development and operation of fully enabled 3G systems. Whereas strict cell-based spectrum and coverage management often represented little more than an added efficiency for earlier generations, they are a fundamental prerequisite to even the most rudimentary Third Generation functionality.

However, for true 3G networks to reach their ultimate application potential, a significantly more advanced form of urban cellularization capability will need to be utilized. This Third Generation Cellularization must have the ability to accommodate no less than a double-digit multiplication in cell miniaturization, confinement and signal penetration uniformity.

Conduit3G represents the prime enabling technology for Third Generation Cellularization. Through the use of DISCLOSE and HANC-based air interface medium visualization / control innovations, C3G permits geometric expansion in control over the local RF coverage environment. This control forms a secure and highly predictable basis for the establishment of Enhanced Cellular Design Models (ECDMs), whose capacity to balance the precision of 3G coverage deployment with the inherent unpredictability of urban propagation with be an essential part of next-generation operation.

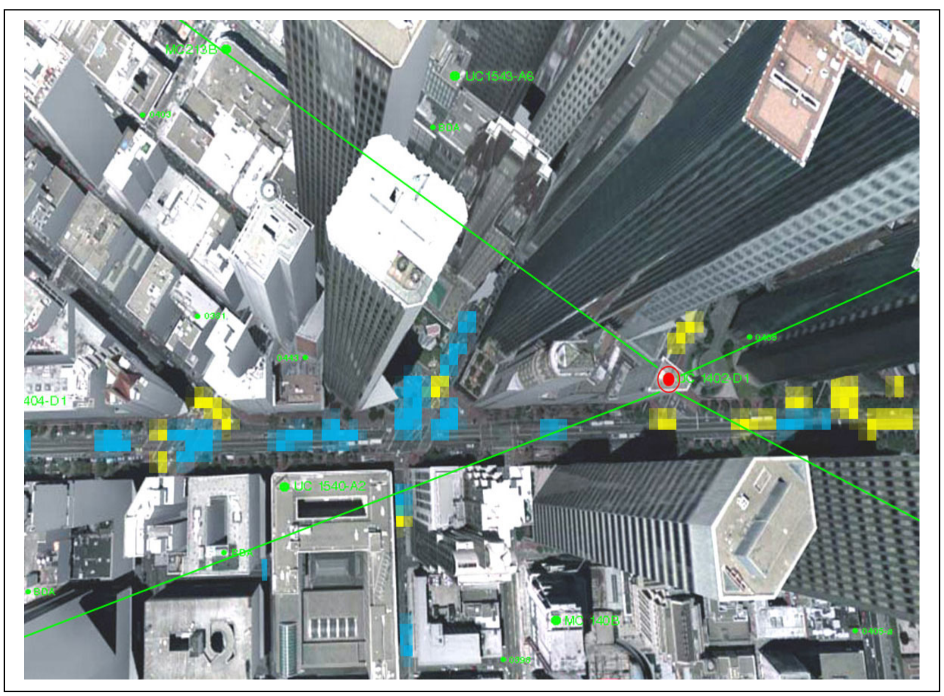

Figure 9. Influence of two 1900 MHz wideband CDMA cell sectors emanating from a single site in a high-density urban coverage environment. A typical configuration for 2.5G and early 3G infrastructure, cell coverage zones exhibit poor confinement, considerable fragmentation and highly inefficient levels of sector overlap.

Enhanced Cellular Design Models (ECDMs) for 3G networking must cope with a broad diversity of factors never before encountered by previous generational development methodologies. Primary amongst these is the aforementioned need to produce dramatically reduced cellular scales, while markedly increasing overall inner-cell coverage quality.

However, the need for improvement in cell scaling and integrity is only a first part of the challenge in ECDMs for 3G wireless. This is because such improvements must take place in the context of densely urbanized coverage environments, where a combination of building topography and non-idealized site locations conspire to create extremely high levels of undesirable cell coverage overlap and fragmentation. Left unattended, these conditions can significantly frustrate application bandwidth / QoS expansion, even in systems that have achieved reasonably high levels of cell miniaturization.

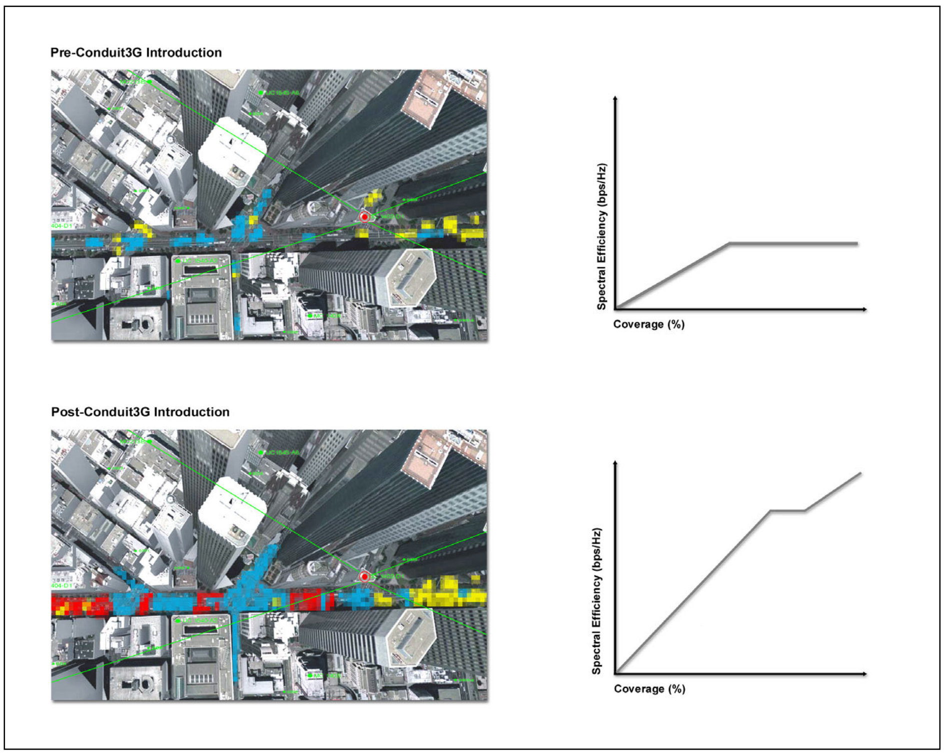

Figure 10. 1900 MHz wideband CDMA cell sector influence before and after deployment of Conduit3G technology. C3G-enabled Air Interface Medium control allows engineers to cope with the competing requirements of coverage reliability and spectral efficiency. C3G allows universal coverage to exist alongside precision micro-cellular planning.

Conduit3G component technologies are able to adapt highly complex urban cellular patterns in ways that can markedly increase the efficiency of infrastructure utilization. This is illustrated in Figure 10. C3G medium visualization, projection and control capabilities have the capacity to drive ECDMs that not only generically increase basic cellularization potential, but also allow for micro and pico-scale cell structures that are highly conformal to the structure of their local environment. Through timely ultra-precise analysis and control over small, medium and large scale RF propagation characteristics, C3G permits providers to deploy highly eccentric quasi-cellular geometries that effectively "knit" together displaced or fragmented areas of the cell coverage zone. Such capability allows even the most complex and hostile RF coverage environments to assume markedly higher levels of reuse planning and signal penetration uniformity, all without the need for significant addition of either new sites or supporting infrastructure.

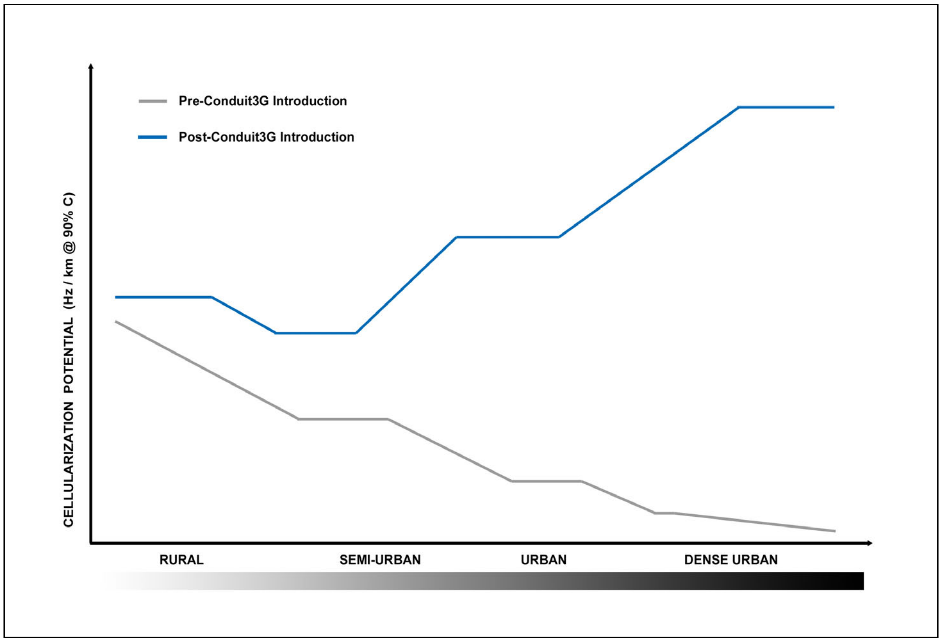

Figure 11. Using conventional Air Interface Medium control technologies, cellularization potential degrades significantly in the very environments where it is most needed. Conduit3G technology adapts to the complexities of dense urban structural topologies, allowing cellularization potential to increase linearly with user demand.

Conduit3G technology allows providers to effectively overcome traditional barriers to precise long-term signal control and capacity / bandwidth load planning. This is evidenced in Figure 11. Whereas the coverage and cellularization potential of conventional signal control technologies degrades with increasing urbanization density, the ability of Conuit3G to produce reliable and highly efficient coverage planning increases in almost direct proportion to environmental complexity. Through this singular ability to economically multiply spectral efficiency and coverage assurance in traditionally hostile RF environments, Conduit3G represents the foundation for exponentially more efficient and sophisticated 3G cellularization.

Section 3: New Technology Behind Conduit3G

Contemporary medium control capabilities rely on RF propagation analysis technologies that are decades old. Based largely upon statistically derived prediction methodologies and cumbersome "drive-testing" survey techniques, these capabilities date from a time in which wireless networks were considerably less complex. Thus, they are generally inadequate in producing and supporting the advanced cellularization schemes that characterize Third Generation network operation.

The purpose of Conduit3G exists in creating an entirely new level of Air Interface Medium visualization and control capability. Through the integration of such capability into next-generation buildout and operation efforts, C3G allows providers to establish Enhanced Cellular Design Models (ECDMs) of unprecedented complexity. Such 3G enabled ECDMs cost-effectively establish the foundation for broad-based gains in network application capacity, service reliability and long-term scalability.

Enabling the network performance gains necessary to meet technical prerequisites for next-generation operation means significantly exceeding RF propagation prediction / control capabilities. Thus, in developing Conduit3G, Novatics was forced to abandon "prior art" methods and technologies in favor of an entirely new approach to medium visualization and management. Founded on a series of proprietary innovations, Conduit3G reflects a new generation of wireless propagation control technology that is specifically suited to the uniquely lofty needs of Third Generation operation. Appreciably exceeding the speed and accuracy of previous RF medium management capabilities, these innovations represent the first practical means of universally achieving wireline-like functionality in the mobile environment.

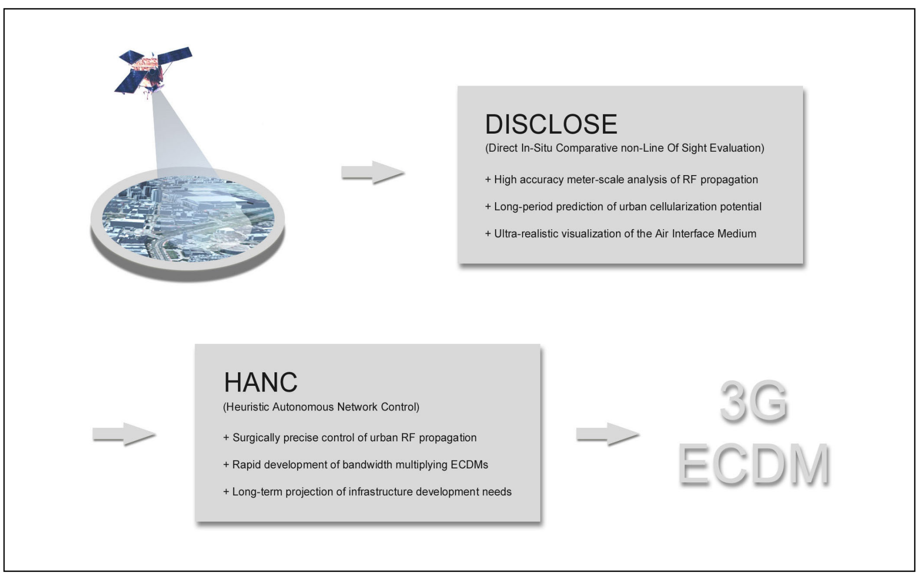

Figure 12. Using ultra-high resolution DISCLOSE medium analysis capabilities, C3G visualization can classify and display coverage faults on extremely small scales. Through the use of Conduit3G remote client software, this visualization data can be rapidly interpreted in a realistic virtual coverage environment.

DISCLOSE Technology

(Direct In-Situ Comparative non-Line Of Sight Evaluation)

Direct In-Situ Comparative non-Line Of Sight Evaluation technology forms the backbone of Conduit3G capability. Based on a series of proprietary Novatics innovations, DISCLOSE is able to appreciably exceed the limitations of current and anticipated conventional wireless medium analysis / visualization capabilities.

Simply put, for development and operational engineers, DISCLOSE transforms low confidence / low resolution kilometer-scale propagation prediction and analysis into high confidence / high resolution meter-scale visualization of the mobile environment. Through the deployment of DISCLOSE-enabled RF predictive analysis functionality, developers can experience network planning and management capabilities, the accuracy of which is enhanced by greater than two orders of magnitude.

DISCLOSE achieves such dramatic gains in the scope and accuracy of wireless medium analysis and visualization by employing fundamentally new RF environmental collection, computation and projection technologies. Moving well beyond the boundaries of conventional statistical and ray-tracing based propagation survey methodologies, DISCLOSE technology uses a radically new combination of remote sensing and machine intelligence to generate the micro-scale analysis needed for wireline-like buildout / control of next-generation mobile infrastructure.

The DISCLOSE process begins with highly comprehensive RF environmental data collection. Remote sensing, in-field surveys, handset reporting and site reporting data are taken from an area of uniform propagation characteristics (Such an area can be as large as several kilometers are as small as a few meters). Through a proprietary process, this data is precisely weighted and then compiled into an intricate "RF Environmental Classification Signature."

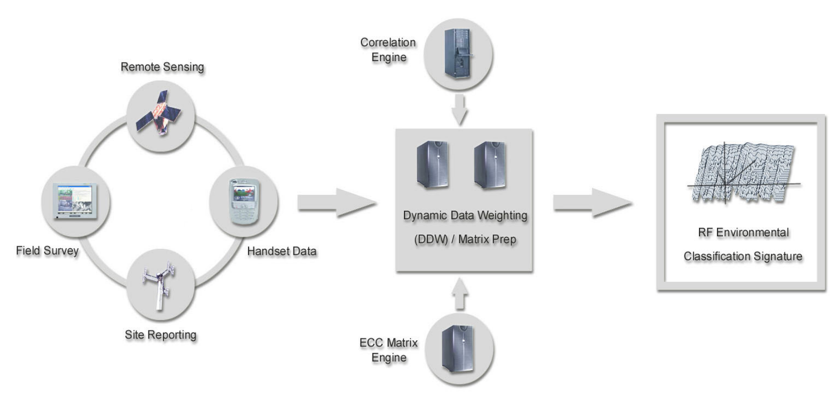

Figure 13. DISCLOSE RF environmental analysis begins with comprehensive data collection over the entire cellular geographic area. Using multi-spectral remote sensing, this analysis seeks out areas of uniformity in propagation dynamics. These areas are thoroughly scanned and then quantified using RF environmental classification signatures.

This signature data is then compiled into a vast signature classification matrix containing millions of discrete complementary signature elements and signature sets, each representing a unique RF micro-environment. Rather than a handful of statistical propagation models that can produce vague results, the extensive environmental characterization database used by DISCLOSE allows for the construction of signal propagation models of ever decreasing scale and ever increasing accuracy.

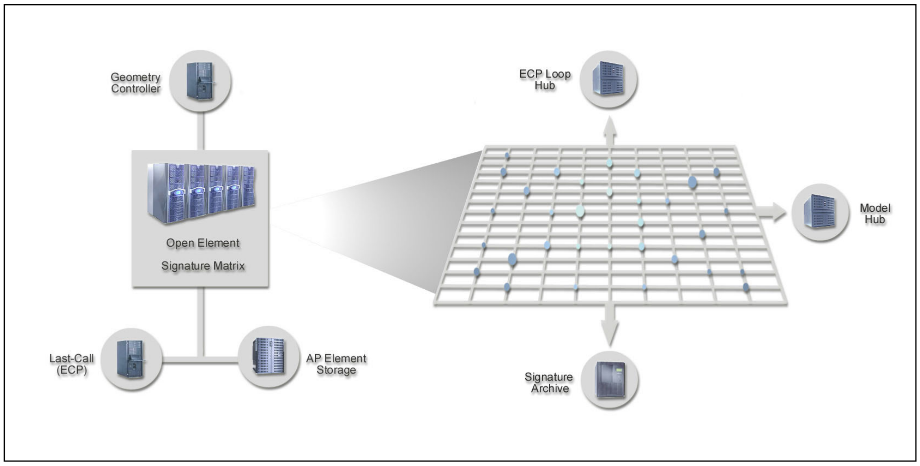

Figure 14. Once acquired, RF environmental classification signatures are weighted and compiled into a vast matrix of other signatures. The resulting matrix, containing data on nearly every RF propagation modality, forms the core of the DISCLOSE process.

Once a critical mass of RF classification signatures has been integrated into the DISCLOSE matrix, the process of scanning and characterizing the most intricate details of a given mobile coverage environment becomes extremely rapid and cost-effective. Using multi-spectral satellite imagery, a network service area is scanned and characterized by variations in its structural topology and material composition. This remote sensing data is then weighted and transformed into a partial RF environmental signature.

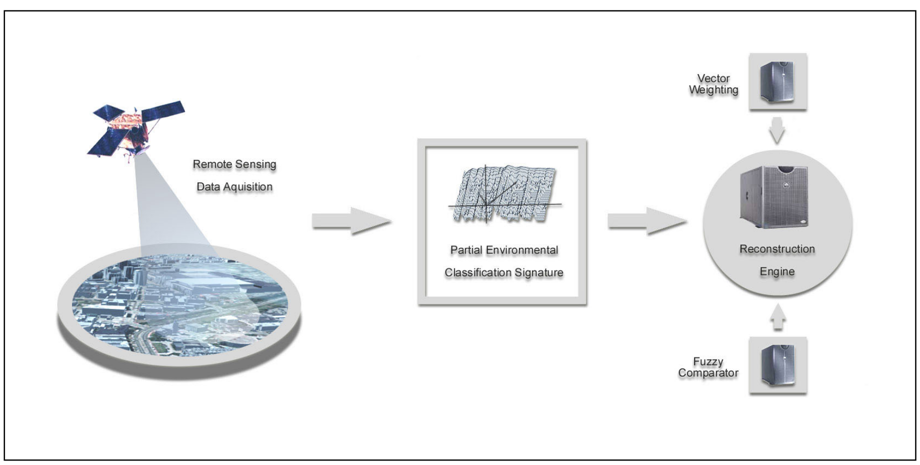

Figure 15. After an appropriate quantity of RF environmental signatures have been collected, the DISCLOSE process requires only "partial signatures" to complete intricate RF propagation analysis. Thus, for most applications, rapid and efficient remote sensing data is sufficient to create high accuracy medium visualization.

Dynamic Weight Domain (DWD) Fuzzy Logic processes then correlate this partial signature with one of the millions in the DISCLOSE characterization matrix, resulting in a near-ideal match for the micro-scale propagation characteristic of the coverage area under study. In this manner, a brief remote sensing-based scan of the local operating environment can, in minutes, produce a far superior basis for medium analysis than prior art methods taking weeks or months.

Following the successful creation of a micro-regional characterization, DISCLOSE data is transported to specialized network visualization software. These applications allow for high-confidence meter-scale interpretation of network performance in historic, near-real time and future projection scenarios. Coupled with HANC-enabled network OSS functionality, DISCLOSE data can efficiently direct manual, automated or hybridized development and modification of system infrastructure elements.

In summary, DISCLOSE technology supplants virtually all prior art RF predictive analysis technologies and methodologies. Using a wholly new remote sensing and heuristic characterization-based approach, DISCLOSE achieves levels of both resolution and accuracy that exceed current alternatives by greater than two orders of magnitude, while dramatically reducing expenditures of temporal and capital resources. As the engine for Conduit3G capabilities, DISCLOSE capabilities form the foundation for high density / high reliability 3rd Generation cellularization planning.

Conclusion

The introduction of Third Generation functionality has become a certainty in virtually all markets. However, far less certain is the long-term commercial viability of next-generation service offerings. Despite significant consumer demand for wireline-like data connectivity in the mobile environment, there still exist considerable technological barriers to universal broadband proliferation.

For providers, 3G applications represent an important opportunity to create badly needed competitive differentiation, while enabling a host of high-margin service offerings. Such offerings translate directly into an unprecedented potential for churn reduction and increased revenue. Yet, before providers can realize the benefits of full-scale Third Generation buildout, critical gaps in Air Interface Medium control technology will need to be bridged. A fundamental prerequisite to the necessary utilization of existing spectrum and infrastructure, radical new medium control capabilities must be evolved that meet exponentially growing demands for bandwidth capacity and service reliability.

Conduit3G technology was developed as a singular new means of achieving the geometric expansion in Air Interface Medium control capability called for by next-generation standards. Exploiting a series of proprietary RF propagation visualization and management innovations, Conduit3G gives providers an unprecedented ability effect ultra-complex Third Generation cellular design strategies. Many times more precise than contemporary capabilities, Conduit3G-enabled cellularization provides a significant multiplication in signal coverage and spectral recycling capabilities. This means that networks can more effectively leverage legacy resources to develop reliable and high-performance mobile data capabilities.

By integrating Conduit3G technology, providers will take a major step in ensuring the fundamental commercial and technological viability of next-generation broadband services. Enhanced Air Interface Medium control will generate a new breed of systems that combine high levels of bandwidth scalability with consistently predictable service quality standards. Thus, through the use of Conduit3G, tomorrow's high performance mobile networks can at last enjoy levels of long-term economic and logistical visibility previously reserved only for their wireline counterparts.

The preceding has been a brief introduction to Conduit3G technology and its impact on Third Generation network development and operation. Organizations interested in evaluating C3G capabilities are strongly encouraged to contact Novatics.