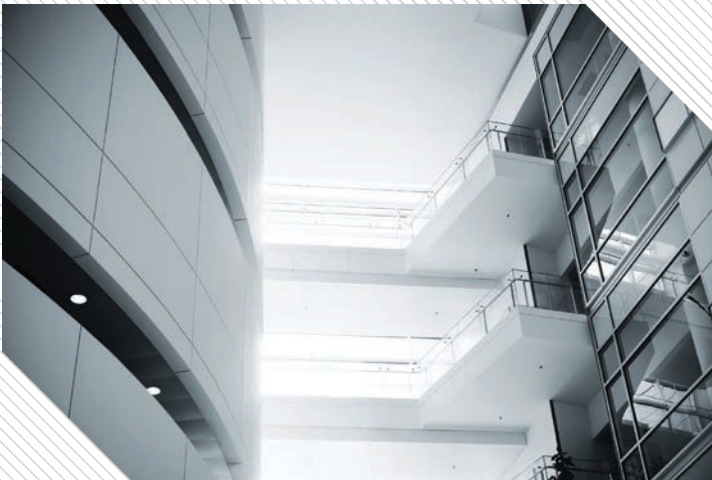


WHITE PAPER

PRODUCT SUITE



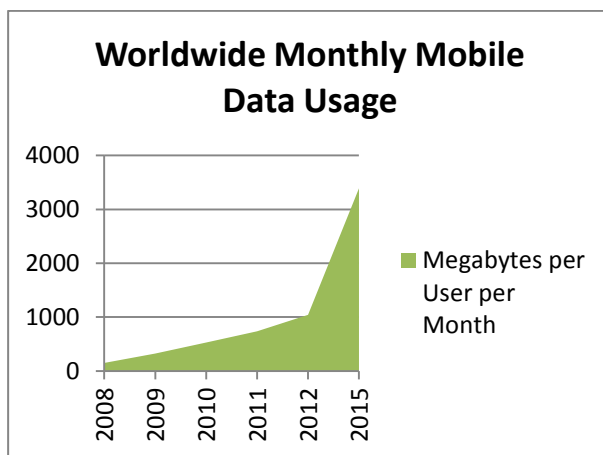
MAY 31, 2013

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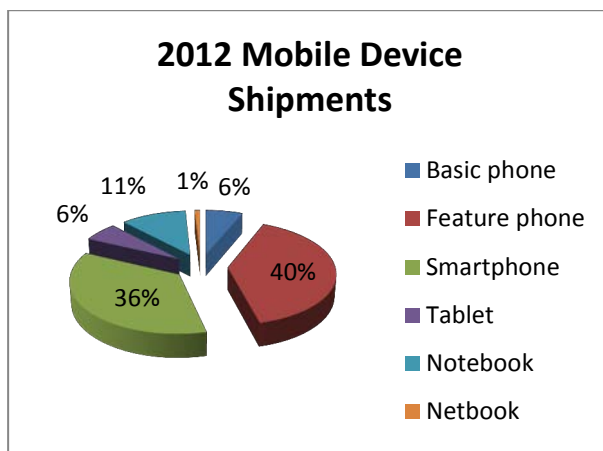
INCREASING WIRELESS DEMAND ON THE HORIZON

The smartphone is becoming ubiquitous and the increasing influence of social media platforms in everyday life has accelerated the adoption of connected smartphones and tablets, driving the demand for anytime, anywhere connectivity. This has resulted in a rise of in-building projects and deployments in order to get closer to the mobile subscribers, whether by introducing new technologies or improving capacity for the ever-increasing bandwidth demands. As shown in the accompanying figures, mobile data demand is growing at a phenomenal pace. Social networks and rich mobile web experiences demand constant connectivity for content updates and many popular gatherings such as stadium concerts or sports events now have social or second screen components.

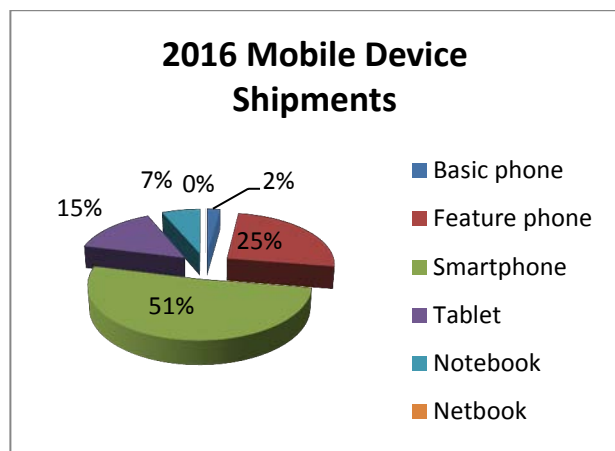


Source: Portio Research (2012)

- Mobile data usage is expected to grow 20-fold by 2017, according to Portio Research (2012).
- Shipments of smartphones, the heavier users of mobile data, are expected to grow from 694.8M units shipped in 2012 to 1,342.5M units shipped in 2016, accounting for slightly over 51% of the mobile device market. (Canalys, February 2013)



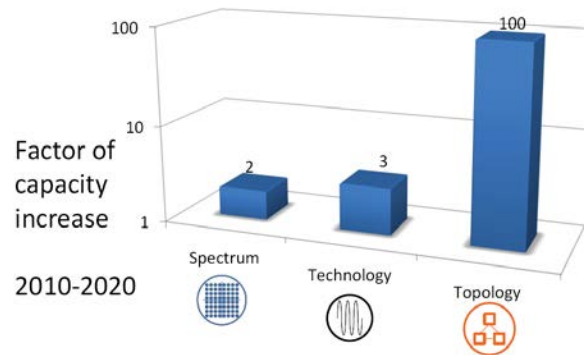
Source: Canalys (February 2013)



Increased demand is good for business but operators worldwide are now struggling to find networking solutions to keep up with this increased demand for data capacity. While the boost in business opportunities is good for the in-building ecosystem, the burgeoning workload creates its own problems such as project coordination challenges, too much demand for finite resources and slimmer margins due

to increased competition. In order to grow, customers need to streamline processes and reduce project life cycles by reducing time spent on administrative tasks.

There are typically three approaches operators can take to increase capacity to varying degrees; add spectrum, upgrade technology or improve the topology. Adding spectrum and upgrading technology are expensive options. They can even be cost prohibitive when buying spectrum. Modifying the topology and introducing multi-technology sites to offload the macro system are more likely solutions to increasing capacity. In a nutshell, operators need to take on more in-building projects in order to increase capacity.



CURRENT CHALLENGES

1. IN-BUILDING DATA IS SCATTERED AND DISORGANIZED

In-building network projects are becoming increasingly large in size and complexity. What started as small systems of passive components feeding off the macro network have become large multi-technology and multi-sector systems composed of active and passive components covering everything from cellular to Wi-Fi networks. The increasing complexity obviously introduces more documentation and work collateral, often times resulting in deficient revision control and archiving processes. At present, critical data needs to be stored and archived to facilitate consultation, metrics retrieval and collaboration across the organization.

Traditional design platforms or processes implicate a large variety of disconnected tools. The lack of a unified format and platform limit the possibilities for file sharing and collaboration, hence reducing teamwork quality and knowledge transfer opportunities to cover for employee turnover. With RF designers working on their computers locally with their own tools, the progress information of projects and designs quickly becomes scattered and valuable data is often misplaced or simply lost, with some customers reporting losing up to 30% of past project data due to negligence. Considering the sizes of current in-building network projects, there are often many different teams involved in the design, installation and commissioning of such large scale deployments. These resources all need to have access to the design data at various stages in the project and it is important that each person has access to the latest project designs and data, with the option of looking up historical design information. Furthermore, with the rapid evolution of wireless technology and capacity needs, projects and sites often need to be maintained or upgraded to new technologies. Having a central location detailing historical data relating to a site allows for quicker project kick start and deployment times, helping customers lower costs by reducing overall project time.

2. PROJECT LEADS LACK TOOLS TO TRACK PROGRESS

With the growing amount and scale of current in-building projects, it can get complicated to synthesize all the available data in order to get a high-level view of an organization's operations. This can be problematic because in order to prevent critical roadblocks or redoing work due to mistakes, management and project managers require a centralized view of a company's ongoing projects, allowing for a holistic view of the company's in-building activities. They need to possess the tools to identify problems early and readjust quickly, ultimately saving costs and time in the long run.

3. LACK OF BEST PRACTICE GUIDELINES CAUSES INEFFICIENCIES

When using ad-hoc project processes, the main drawbacks are the potential for errors and the added complexity during the review process. Modern in-building projects are much more sensitive to minute design variations and precise design guidelines are needed to deliver high quality compliant projects. In addition, the absence of best practice guidelines and the lack of homogeneous tool outputs renders comparing in-building projects challenging due to the lack of comparable metrics. Finally, the lack of

standard processes makes training new resources difficult, reducing the efficiency of the existing staff.

4. INTERNAL AND EXTERNAL COLLABORATION IS TEDIOUS

Collaboration for an in-building project now involves many contributors, including external partners, and requires better communication and sharing features to ensure rapid quality project delivery. Separate companies working on a neutral host site will want to be able to share operator deployment requirements, company design templates and component requirements with all players involved. Sharing information between different organizations or companies working on the same project is never simple, with IT limitations and non-compatible working environments being the main obstacles. This is in addition to the basic challenge of having disconnected teams collaborating on multiple projects with many contributors using their own tools.

5. RESOURCE UTILIZATION IS NOT OPTIMIZED

RF engineers are valuable resources and their time is precious. They are often the focal points of in-building projects so are therefore highly solicited for questions, data and reports. Having a tool to automate some or all of these tasks can free them up to work on other projects, increasing the customer's project turnover. Automation also addresses another huge challenge of in-building projects, which is the possibility for human error due to the large complexity of new in-building networks. Using a tool to automate tasks helps optimize resource utilization, increasing efficiency.

iBwave VALUE PROPOSITION

iBwave is one of the first companies to recognize the demand for integrated software to expedite indoor systems design and deployment. With a team of experienced RF engineers, the company develops a full suite of products that standardizes, streamlines and manages the in-building wireless project life cycle. The product suite includes an RF planning tool, a mobile application for site survey activities, and a management platform, all integrated in a seamless environment that ensures the persistence of project information over time, increases collaboration and improves productivity. Overall, it increases project quality, reduces cost and accelerates time to market.

1. iBwave UNITY

iBwave Unity is an in-building wireless management platform that aggregates and standardizes all IBW project information and ensures data persistence. It helps control and reduce costs, accelerates time to market, while increasing project delivery quality by managing all the customer organization's IBW projects in one standardized, globally collaborative and secure environment. It offers advanced data mining and reporting capabilities that allow the dissemination of IBW business intelligence across the organization through a single web interface. The list of features includes:

- A central repository to store all in-building project documents including iBwave Design files and all other related documents such as floor plans, AutoCAD files, contracts, and more, in a secured central repository
- A web interface accessible via either personal computer or mobile device that provides access and disseminates real-time in-building intelligence across the organization
- A workflow management framework to track and control costs, resources and schedules for in-building projects, providing full visibility for on-going projects, including the ability to identify bottlenecks, allowing for real-time adjustments
- Predefined and customizable reports that deliver instant access to network, technical and - financial data for unprecedented visibility and control across the in-building project portfolio
- A robust API interface that extends the functionality of the Unity platform by exchanging in-building information with the customer organization's ERP, finance, asset management or other business applications
- New features will continue to complement iBwave Unity's functionality in the near term, including features such as project compliance, key performance indicators, data mining, an external interface for subcontractors and partners, and enriched functionality to the Workflow Module.

2. iBwave DESIGN

iBwave Design is the leading software to automate in-building design planning activities. It takes the user through network planning, design, costing, validation, documentation and reporting, delivering top network performance, reducing capital expenditure and increasing productivity. The tool allows RF engineers to keep pace with new technologies including 3G and 4G (LTE, WiMax), Wi-Fi, Tetra, Zigbee, and with the latest deployment architectures such as fiber DAS and small cells. The list of features includes:

- Network architectures with automated RF calculations for 2G, 3G, 4G (LTE, WiMax) cellular technologies as well as Wi-Fi, public safety bands and more
- A comprehensive database with over 10,000 network components from industry-leading manufacturers
- The ability to import floor plans imported from AutoCAD and PDF with the location of all equipment and cable routes
- Full set of reports including link budget, BOM, project cost and electromagnetic compliancy limits
- Ray-tracing based propagation simulation with detailed network performance plots for coverage, throughput and capacity
- Integration with leading outdoor planning and survey measurement tools for accurate interference modeling

3. iBwave MOBILE

The iBwave Mobile application is the perfect companion for the field team performing survey activities and installation work. It transforms smartphones and tablets into tools for assessing project information, collecting building information and creating as-built documentation. The list of features includes:

- Access to project design information including trunking diagrams, floor plans, equipment location and cable routes
- Ability to attach text, pictures, videos and audio notes directly to building floor plans
- Editing features to update antenna location and cable routes as well as create as-built documentation reflecting the final installation configuration

4. INTEGRATED PORTFOLIO

All three iBwave products are seamlessly integrated to facilitate the collaboration between departments and with external partners. iBwave Design and iBwave Mobile are directly connected to the iBwave server and offer functionalities to save, load projects and control versioning and access rights. Once a project created in iBwave is stored in Unity, the specifications of the venue (BOM, floor plans, design architecture, technologies supported) are made available to everyone involved through the web interface and this information is combined with the rest of the projects for the generation of dashboards and KPIs on the overall network and project deployment process.

PRODUCTIVITY GAINS AND COST BENEFITS

1. INCREASE PRODUCTIVITY

Working with an integrated environment eliminates extra work by generating complete documentation for an in-building project (link budget, prediction maps, bill of materials, EMF reports). Users can create DAS designs in minutes by interconnecting components picked from the iBwave Database of over 10,000 components. **Up to 50% of the IBS design time can be saved when compared to ad-hoc design methods.**

iBwave Design allows full performance simulations of wireless networks with coverage, throughput and capacity results, reducing the need for expensive site surveys. Network validation and advanced calculations are done automatically in iBwave Design, which dramatically reduces the number of errors and surprises during the installation. Most of the optimization work can be done with the software without costly interventions. **It can help cut down site visit activities by 20 to 30%, which results in shorter project life cycles and a reduction in expenses.**

Collaborating and storing all project information in iBwave Unity ensure that the valuable data about past deployments is secured and not lost over time. This eliminates the overhead tasks of looking for project information needed to upgrade sites to new technologies. In some cases, it can even eliminate the overhead of recreating designs completely because the information cannot be found anymore. The platform also increases the overall productivity of the teams involved by facilitating the exchange of information and providing access to information in real time.

2. REDUCE MANAGEMENT OVERHEAD

Managing and centralizing all in-building activities around iBwave reduces the management overhead involved with the coordination of all parties taking part in a project. Reports typically requested by the management, procurement and installation teams are generated automatically in iBwave Design and iBwave Unity. This allows the RF team to focus their valuable time on design activities. Furthermore, many of the overhead coordination activities of projects are automated in Unity, with automatic project status updates and project dashboards generated for ongoing projects and tasks. At any time, project managers can view which projects are delayed, over budget, potential bottlenecks and the availability of resources. The number of meetings and emails for coordination purposes can practically be eliminated.

iBwave Unity also facilitates communication between all parties involved by providing a framework to exchange files and project information. Once stored in the platform, project information can be accessed seamlessly by users from iBwave Design, iBwave Mobile or the Unity Web interface. No need for complex information exchanges through email and FTP connections. Information is always available at the right time from anywhere and the user is always guaranteed to work with the latest project files. In addition, teams adopting the iBwave standard can focus their time on the right activities and gain productivity.

3. CONTROL COSTS AND CAPITAL EXPENDITURES

The iBwave product suite allows network operators and system integrators to track and control project cost information through the life cycle of a project from the business case to the commissioning phase. iBwave Design can create an output of bill of materials based on the design, allowing for an accurate estimate of costs for equipment and installation needs. In Unity, project cost information can be documented and tracked for each phase of a project and provides the ability to generate reports and statistics over time, giving customers tools to better select contractors based on their past performances. It also facilitates better estimation of project costs for future projects of similar venue types or network architecture.

In addition, iBwave Design lets users simulate the network before it is actually deployed. The RF engineers can create various network scenarios and run them against performance criteria agreed on for the venue while using automated functions included in the software to optimize hardware for the most cost-efficient design. This helps prevent overbuilding and avoids extra costs.

4. ENSURE PROJECT QUALITY AND REDUCE CHURN RATE

Network validation and advanced calculations allows users to verify the soundness of their assumptions through error checking, compliance verification and uplink and downlink calculations. The user can design an in-building network for specific voice and data applications with specified reliability criteria in order to deliver performance that will impress and retain subscribers. Also, seamless integration with outdoor prediction and survey measurement tools allows users to build network infrastructure that will seamlessly integrate with its environment, with interference reduced to the minimum. **By working with a common framework and tool automation, customers of iBwave have reported that the number of errors at the design phase have dropped by more than 90%.**

Better coordination and communication between all parties involved in in-building projects combined with the right set of tools results in higher quality for systems deployed and a reduction in system failures. It also provides the operation teams with complete and up-to-date documentation about existing deployments, which allows them to quickly locate point of failure equipment. This reduces the downtime for maintenance and support activities.

5. REDUCE PROJECT ACCEPTANCE CYCLE

The operator and manufacturer-agnostic qualities of iBwave's tools increase the credibility of its designs. Using iBwave Design and Unity to demonstrate to building owners, before deployment, the best topology to achieve the desired objectives, allowing iBwave customers to shorten the project acceptance cycle by proposing a trusted impartial design.

6. REDUCE ECOLOGICAL FOOTPRINT

The centralized approach offered by iBwave offers a unique advantage from an ecological standpoint. With many large global companies implementing green policies, there are distinct ecological and cost saving opportunities associated to electronically archiving past designs and collateral, eliminating the need to store and archive paperwork, thus reducing the ecological footprint of the company. iBwave's tools allows for the customer to save on documentation and storage space costs while dramatically reducing the usage of paper.

With iBwave Mobile, site surveys are completed quickly and efficiently by transforming smartphones and tablets into tools for accessing project information, collecting building information and suggesting design modifications. This handy app eliminates the need for additional site surveys, therefore reducing travel and its ecological implications.

7. CONCLUSION

Having seen the benefits, reduction of costs and increases in quality, many Tier-1 operators around the world have standardized their ecosystem on the iBwave platform. **By using the integrated iBwave portfolio over hundreds of deployments, operators and system integrators have reported reducing their overall project deployment life cycles by over 30%, while gaining full visibility on their project timelines, resources and expenses.**

CONCLUSION

iBwave’s integrated product suite enables its customers to save time from daily tasks with regards to their in-building projects. On an individual level, the time savings may seem small per week but when multiplied across all users in the organization, the time and money savings can be tremendous.

iBwave’s return on investment/total cost of ownership analysis tool has demonstrated savings of between 30% to 35% per year, with payback within a year for operators migrating to iBwave’s integrated product suite. The following chart shows the estimated cost savings per year using iBwave’s products and strong gains are anticipated in all phases of the in-building process.

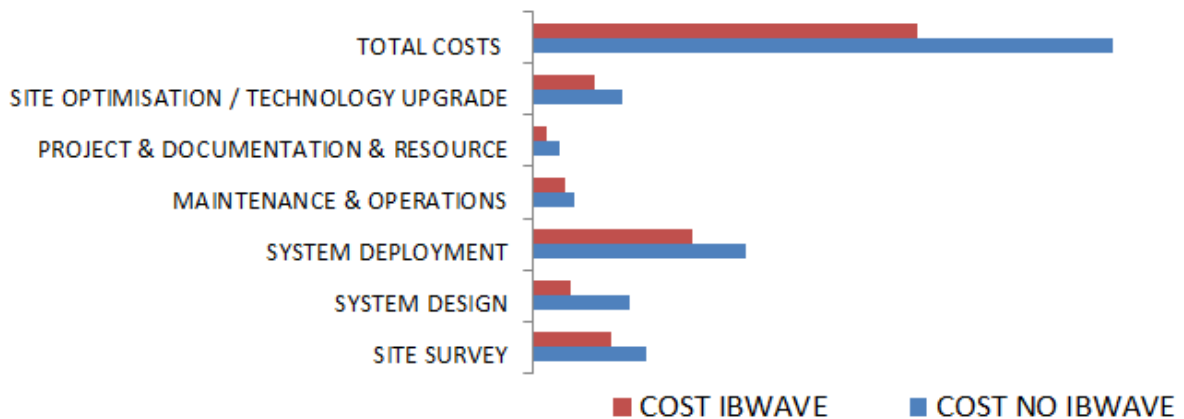


Figure 1: Savings per year using iBwave's integrated product suite

With product suite deployments around the world and the backing of a multi-disciplinary team of experts and professionals constantly validating and improving the performance of its products, iBwave is confident that its prospective clients’ businesses can quickly realize significant benefits during the lifecycle of existing in-building sites or through the deployment of new ones with the acquisition and implementation of its product suite.



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