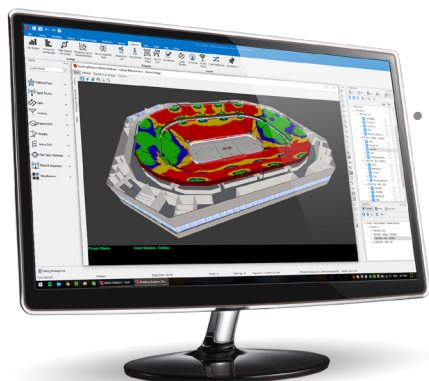# iBwave
Design Suite

A single solution to streamline the design of all your indoor wireless network projects.

People expect wireless connectivity everywhere they go. But providing seamless connectivity is not easy to do. Venues can be complex, technologies are converging and evolving, equipment is expensive, and projects can be time-consuming and costly. For carriers, the complexities of deploying wireless solutions can often lead to a backlog of projects, missed revenue, slow market growth and ultimately, unhappy customers. Keeping customers happy starts with a great network design.

iBwave Design Suite provides incredibly powerful suite of tools to design indoor wireless networks. Our software is used by hundreds of operators, OEMs, and integrators around the world. It simplifies even the most complex of deployments, significantly reduces deployment time, and can cut your costs in half. It is more capable, powerful, and productive than any software on the market.
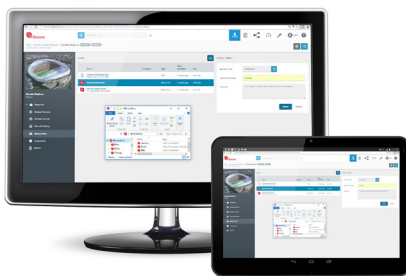
iBwave Training & Certification
Interactive learning to facilitate best practices for in-building wireless network planning and design

iBwave Cloud

iBwave Design
Powerful cellular + Wi-Fi network planning & design software

iBwave Mobile
A mobile app for site surveys and preliminary network designs

iBwave Unity
Cloud-connected central hub to view and manage all your sites

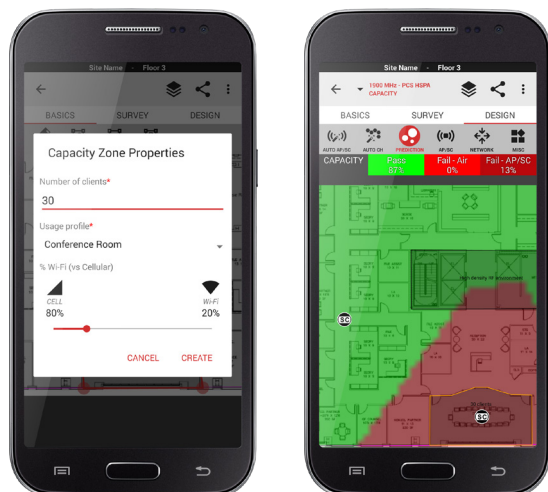| Accelerate deployments By 50% | Advanced RF propagation and capacity analysis | Reduce Project costs By 30% | Collaborate With project Partners | Manage all your Projects from a Central hub |

iBwave
Design Suite

Simplify your site survey toolkit

Install the iBwave Mobile Planner app on the existing phone or tablet you bring on-site to transform it into the ultimate iBwave site survey tool. Use it to capture and centralize customer requirements, floor plans, photos, notes, construction markup and RF measurements

- Draw floor plans or create them from a picture
- Seamless data exchange with compatible network test tools
- Create geo-located pushpins with photo, video, audio and text notes
- Add construction markup & cable routes
- One-click PDF reports with annotations, output maps and BOM
- Signoff page or e-signature options to speed up the approval process

ascom
Accuver
enhancell
FALCONSmart™
by mobileCEM Labs
PCTEL®
Connected Solutions
KEYSIGHT TECHNOLOGIES
ROHDE&SCHWARZ
solutelia

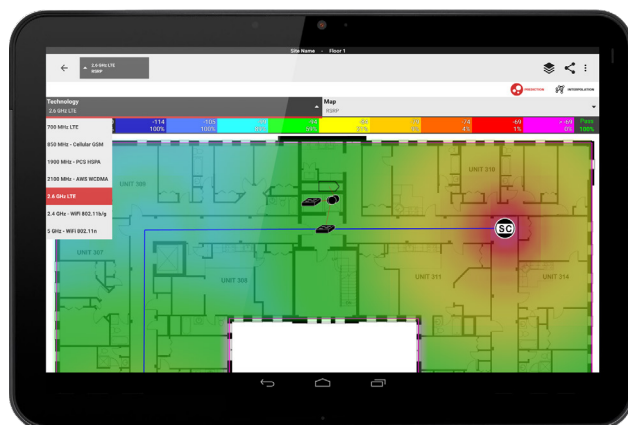## Design for Capacity to avoid surprises later on

Reduce the chance of errors and create workable designs the first time around with iBwave Mobile Planner. Define peak capacity zones and number of clients per floor. With the help of capacity maps you can view pass/fail results on each floor based on set thresholds per capacity requirements

- Set split between Wi-Fi and Cellular technologies, including VoLTE and VoWiFi
- Define peak capacity zones and set number of clients per floor
- Select simple pre-configured usage profiles (can be customized in iBwave Design)
- Instant capacity maps render pass or fail results on each floor.

Design networks and test coverage on-site

Eliminate the risk of missing construction obstacles that cause issues during installation by starting the design of your network directly on-site with either automatic or manual access auto-placement. Then as you walk you can physically validate access point planned locations and run prediction on-the-spot to assess how the network will perform once deployed.

- Active and Passive surveys (Wi-Fi)
- Continuous Walk survey mode for Wi-Fi surveys
- System design for small cells and Wi-Fi
- Access to the iBwave database of components
- Automatic Placement of access points
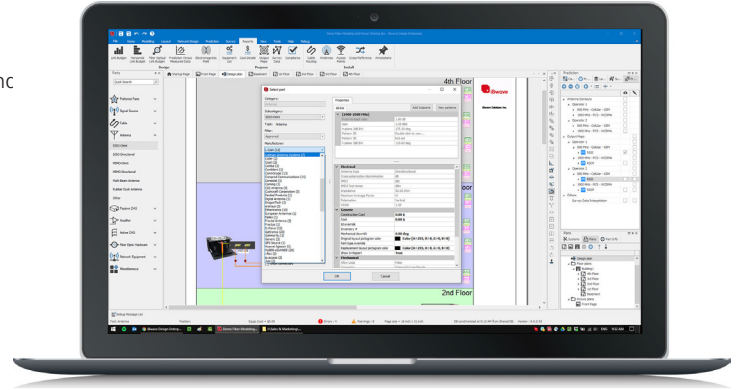- Prediction maps (Including: RSSi, SNIR, Handoff & Throughput, CCI, Overlap)
- Route CAT5 cable

![iBwave Design Suite logo] **D.** iBwave
Design Suite

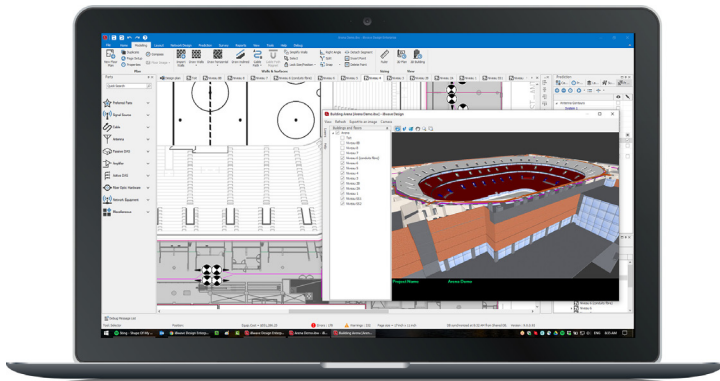## HetNet Design with a database of over 34,000 parts

Design every detail of your in-building wireless networks using our database of over 34,000 components and counting for all wireless technologies. Automate and simplify designing large and complex in-building wireless networks. Deliver more projects in less time and watch your project pipeline and revenues grow.

- ✅ Active/Passive DAS, Wi-Fi, small cells, public safety
- ✅ 5G, LTE, LTE Advanced, CBRS, IoT, LoRa support
- ✅ Database of more than 34,000 network components
- ✅ Detailed network diagrams with automated link budget calculations
- ✅ Coax, CAT5 or Fiber cabling backhaul modeling
- ✅ Automated AP/SC placement and optimal antenna placement
- ✅ Customizable equipment cost and list of approved parts
- ✅ Network validation and error checking

Built-in 3D modeler to improve design accuracy and wow customers

iBwave Design for PC let's you view network designs in advanced 3D. View the height and placement of components, how components are connected floor-to-floor, and toggle your design layers to customize your view. Use iBwave Viewer to share the 3D view of the design with your customer, showing them exactly what the network will look like, and how it will perform after deployment.
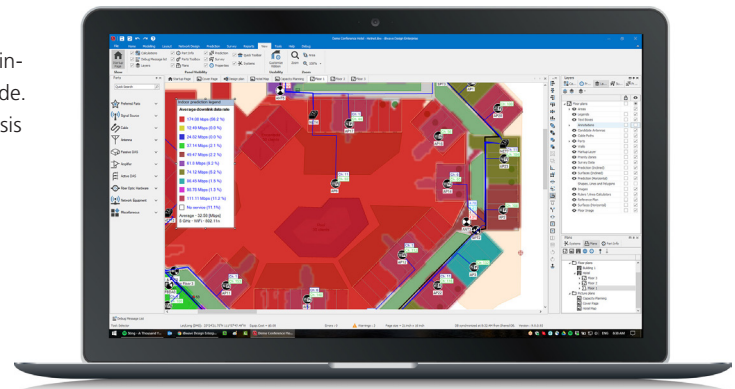
- ✅ Model multiple buildings and multi-layered floor plans
- ✅ Import floor plans from CAD, PDF and image files
- ✅ Automate modeling for linear and curved walls, horizontal and inclined surfaces
- ✅ Zone layer per wireless service
- ✅ Toggle design layers
- ✅ Export to Google Earth
- ✅ Export 3D images to image files

Advanced RF propagation and capacity analysis to validate your design before deployment

Test the coverage and throughput of your network before it is deployed using the in-building prediction engine proven and trusted by thousands of customers worldwide. Simulate the traffic usage on your network with the most advanced capacity analysis tool on the market to ensure that you will meet traffic demands. Validate the performance compliance based on your customer requirements and prevent costly changes post installation.

- ✅ Fast Ray Tracing COST231 and VPLE (quick design) propagation
- ✅ Precise 3D coverage output maps (RSSI, RSCP, RSRP, PDSCH-RP, SS-RSRQ)
- ✅ Signal quality and data rate output maps (SNIR, RSRQ, MADR)
- ✅ Smart Antenna Contouring to show live signal strength predictions
- ✅ Body loss modeling for highly dense venues (stadium, arena, etc.)
- ✅ Detailed multi-technology traffic definition and network capacity validation
- ✅ LTE best server & hand-off matrix to optimize existing design for higher data rate
- ✅ LTE frequency re-use to increase overall user data throughput
- ✅ Body loss modeling for highly dense venues e.g. stadium, arena,...
- ✅ Capacity and average downlink data rate per user maps
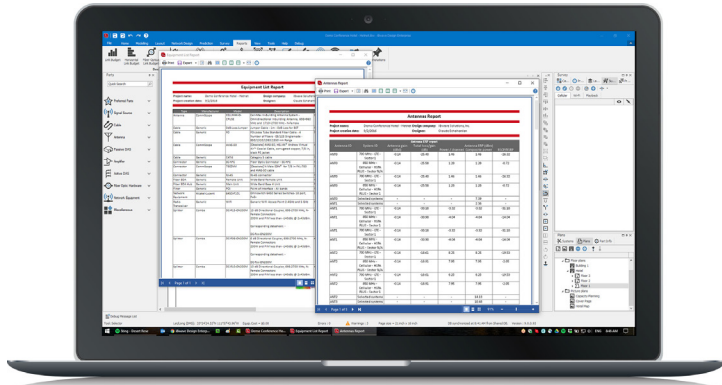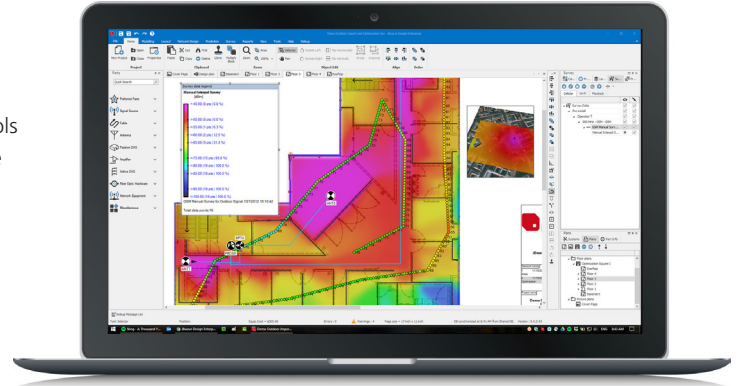- ✅ Wi-Fi Offload modeling (VoWi-Fi and VoLTE)
- ✅ PIM calculations and EMF calculation and analysis
- ✅ Compliance results based on user defined pass/fail criteria
- ✅ Define multiple areas with different compliancy requirements.

iBwave
Design Suite

Integration with 3rd party collection and outdoor planning tools

iBwave Design integrates will all the major collection tools and outdoor planning tools. This means you will spend less time manually transferring data between tools and more time leveraging RF measurements and outdoor prediction to deliver the most accurate and optimized designs for your customers.

- ✅ Import RF measurements from any leading RF collection tool
- ✅ Import RF prediction data from any leading outdoor planning tool
- ✅ Consider macro network using a given value, macro planning tool, or survey measurements
- ✅ Calibrate the prediction model using CW field measurements
- ✅ Survey measurement and prediction vs. measured reports
- ✅ Wi-Fi active and passive surveys

Automatic reports and proposals to close projects faster

Closing out a project can take a lot of manual effort and valuable time. With iBwave Design Enterprise, key project reports for closing projects can be produced with the click of a button and then easily reproduced again and again when design changes occur. Reports can also be customized and branded to suit your needs.

- ✅ Annotations, Output maps & Survey data reports
- ✅ Equipment list & Cost Details reports
- ✅ Link budget and horizontal link budget reports
- ✅ Antennas report
- ✅ Cable Routing & Cross-reference report
- ✅ Access Points & Small Cells report
- ✅ Compliance report

> *Without a doubt, iBwave spared us many hours of work. We not only built a network to support the 15,000 people that the stadium can accommodate but we also delivered it within record budget and timescales – within a third of the time when compared with conventional methods.*

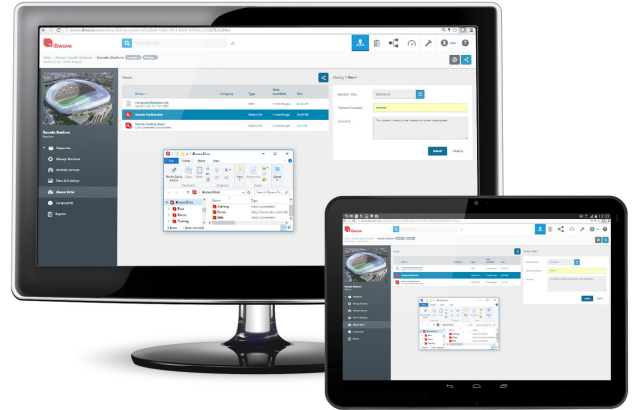**- Peter Liseborg, Senior Net Planner for Telenor Denmark -**

iBwave
Design Suite

Synchronize all of your project information

When you have many people or teams working on a project it's hard to keep all of the information synchronized. People end up using the wrong or outdated versions of the design and as a result costly and time-consuming mistakes are made, putting the project's schedule and budget at serious risk. With iBwave Unity Enterprise, all of your wireless network project information is automatically synched in one location so you are always working with the latest info.
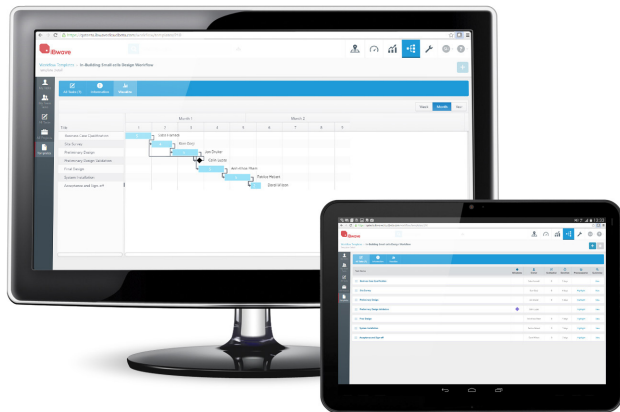
- ✔ iBwave Drive (built-in file synchronization utility for all files between Unity and Design)
- ✔ Version control of Design file
- ✔ Optional API to integrate with other business critical systems
- ✔ Field customization to integrate all your own site data
- ✔ Import/export for fast batch update using a generic tool like Excel

---

Automate your project workflow to stay agile

When project managers spend too much time manually doing tasks, it's hard to stay strategically agile and risks to the project's schedule, budget and quality increase. And With iBwave Unity, key project management tasks are automated so the project manager's time is optimized and they can focus on managing the project's success criteria, removing road blocks and mitigating risks.
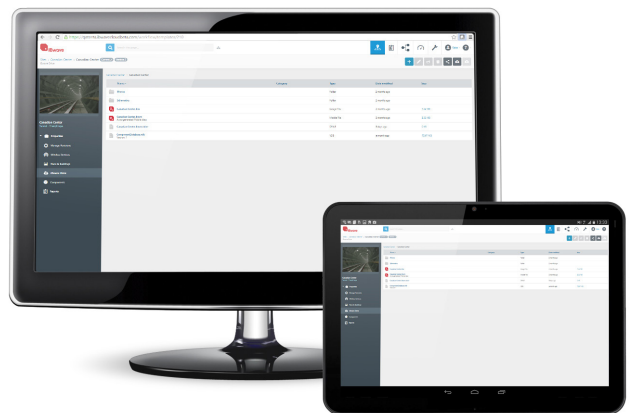
- ✔ Best-practice or customized workflow templates
- ✔ Task check lists
- ✔ Gantt chart, Project assignment report, Project results and detailed status report
- ✔ Resource assignment, cost and schedule tracking and reports
- ✔ Automatic email notifications to team members
- ✔ Summary and detailed project cost reports

Simpler collaboration with external stakeholders

With iBwave Unity, working with your external stakeholders becomes much simpler to do with secure file sharing and the free iBwave Viewer. The result? You can be more efficient and nobody is wasting their time searching for the latest files or missing information.

- ✔ iBwave Drive (Desktop folder to share and access project files, role-based security)
- ✔ Automatic synchronization of files and info between Unity and iBwave Design
- ✔ Secure remote file sharing with external stakeholders
- ✔ iBwave Viewer, a free read-only version of iBwave Design to view files

iBwave

Design Suite

---

iBWAVE DESIGN (for PC) FEATURE SET

SYSTEM DESIGN

▸ Automatic wireless services creation for multi-band small cells and Wi-Fi components
▸ Trunking diagram for indoor RF system design
▸ Multiple systems, technologies, and bands - including 5G
▸ Support base stations and off-air repeaters
▸ Power sharing interface (%) for neutral host system designs
▸ Coaxial, radiating, fiber-optic and CAT5 cable signal distribution
▸ Multi-strand fiber-optic cables and components support for fiber modeling
▸ 5G individual beamforming capabilities
▸ Redundant DAS designs
▸ Donor antenna isolation validation
▸ Preferred lists of components
▸ Connector validation for coaxial and fiber-optic cables
▸ Automatic cable and splitter selection for optimal system balancing
▸ Network validation and error checking
▸ Grouping of systems by operator and wireless services
▸ Full 3D antenna patterns
▸ Wizard to duplicate sectors
▸ 5G Beamforming capabilities
▸ LTE Nth Best Server and hand-off matrix
▸ Body loss modeling
▸ LTE frequency re-use
▸ LTE-Advanced Carrier Aggregation
▸ LTE LAA - Licensed Assisted Access
▸ Edit properties for multiple components at once
▸ Support MIMO 2X2, 3X3, and 4X4

FLOOR PLANS

▸ Multi-layered floor plans with layout plans, walls, DAS equipment, cables and more
▸ Import floor plans from .dwg, .dxf, .jpeg, .bmp, .tiff, .gif or .pdf files
▸ Automatic cable length measurements
▸ Automatic cable alignment
▸ Drawing tools for walls, lines, shapes, text and images
▸ Ruler to calculate dimensions and areas
▸ Display antenna contours and calculations

RF CALCULATION

▸ Downlink calculations
▸ Uplink calculations

3D BUILDING MODELING

▸ Draw curved stadium walls and surfaces
▸ Show floor plan and building in 3D with DAS equipment
▸ Show building cuts in 3D
▸ Draw inclined surfaces automatically

▸ Support inclined surfaces as trapezoids
▸ Draw cables running along inclined surfaces with the ability to stop walls at incline
▸ Create elevation view of the building on the Design Plan
▸ Show building location in Google Maps or Bing Maps
▸ Export building to Google Earth

PROJECT DOCUMENTATION

▸ Use drawing tools to add lines and shapes, also add text and images
▸ Create picture plans and photo mock-ups
▸ Create annotations (text, audio, picture, video)
▸ Create project revisions
▸ Protect project file with password
▸ Export project to .dxf format and all annotations to zip file
▸ Print project documentation

REPORTS

▸ Antennas, Access Points, Cable routing and Cross-reference
▸ Equipment list and Cost details
▸ Link budget and Horizontal link budget
▸ Annotations, Survey data, output maps and Prediction vs. measured data
▸ Electromagnetic Field (EMF)
▸ Compliance
▸ Design version tracking

COMPONENTS DATABASE

▸ Centralized component database of active and passive components including detailed technical specifications
▸ Over 29,000 components from more than 300 vendors
▸ Import and export libraries of components
▸ Sub-component support
▸ Database editor to add, edit or delete components
▸ Customized pricing and part numbers
▸ Share component database between multiple users
▸ List of approved parts
▸ List of equivalent parts
▸ List of errors and warnings configurable in the database of components

TOOLS

▸ Frequency calculator
▸ Power convertor
▸ Intermodulation calculator
▸ Net scan

PLATFORM SUPPORT

▸ 64-bit support
▸ Multiple processor support

iBwave Design Suite

iBWAVE MOBILE PLANNER FEATURE SET

IBWAVE INTEGRATION

▶ Create a new project from scracth or from a template
▶ Download and upload projects from iBwave Cloud or iBwave Unity and work offline
▶ Transfer projects directly to/from iBwave Design through USB
▶ Store up to 10 GB of projects on iBwave Cloud
▶ Share projects from iBwave Cloud by email to external partners

SITE SURVEY

▶ Display surrounding network signals (Network Scan)
▶ Capture site details, contact information and initial requirements
▶ Create, scale and geolocalize floor plans
▶ Add geolocated photo, text, video and audio annotations to floor plans
▶ Create geolocated pushpins with photo, text, video and audio annotations
▶ Draw and type text on photos
▶ Draw construction markup & cable routes on floor plans
▶ Integrate with 3rd party network test tools
▶ Share iBwave floor plans, transmitters & zones to apps on the same device
▶ Display back all received measurements on iBwave floor plans
▶ Save survey measurements in the project for access in iBwave Design

AS-BUILT DESIGN

▶ Submit design changes to iBwave Design for approval:
▶ Update all components location and height
▶ Update antenna azimuth, downtilt and mount orientation
▶ Update cable routes and add measured length

REPORTING

▶ Generate reports from free iBwave Viewer (PDF, PPT, DOC, XLS and more)
  › Annotations & floor plans
  › Survey measurements (plots)
  › Equipment list
  › Prediction maps
▶ Generate a report on the mobile device (PDF)
  › Project summary
  › Annotations
  › Output maps
  › Equipment list (including sub-components, inventory # and cost)
▶ Signoff page or e-signature approval option from the mobile app

PREDICTION

▶ Define the prediction area on floor plans
▶ Define multiple attenuation zones with different density levels
▶ Define peak capacity zones and set number of clients per floor
▶ Run interpolation of survey measurements
▶ Run multi-floor prediction for Access Points and Small Cells using VPLE propagation model
▶ Consider interfering survey measurements (ex: neighboring & outdoor signal) in prediction maps
▶ Prediction Pass/Fail indicator on network compliance KPIs

WI-FI DESIGN

▶ Collect passive and active Wi-Fi survey measurements
▶ Continuous Walk survey mode
▶ Add Access Points and Network equipment from your Central Database of Components (Over 300 components available from leading OEMs)
▶ Automatic Access Points placement with band optimization
▶ Automatic multi-floor Wi-Fi channels assignment
▶ Technologies: Wi-Fi (802.11 a/b/g/n/ac/ax)
▶ Frequency bands: 2.4GHz & 5GHz
▶ CAT5 Cable Support
▶ Prediction maps: RSSI, SNR, CCI, Capacity, Overlap Zone & Throughput

SMALL CELLS DESIGN

▶ Add Small Cells and Network equipment from your Central Database of Components (Over 1,300 components available from leading OEMs)
▶ Automatic Small Cells placement with band optimization
▶ CAT5 Cable Support
▶ Technologies: 5G: NR / mmWave
                    4G : LTE, WiMAX (802.16)
                    3G : HSPA+ / HSPA / WCDMA
                    2G : GSM / CDMA / EDGE
▶ Frequency bands: 700 / Cellular850 / PCS1900 / AWS2100
                    GSM900 / DCS1800 / UMTS2100 / 2.6GHz
                    LTE TDD 2.3GHz
                    WiMAX 2.5GHz
                    GPS / UWB / Public Safety 4.9GHz
▶ Prediction maps: MADR, RSSI, LTE RSRP, CDMA/WCDMA RSCP, SNIR, SNIR-PDSCH, Capacity, Handoff & Throughput

iBwave Design Suite

iBWAVE UNITY FEATURE SET

SITE AND PROJECT MANAGEMENT

- Centralized project repository
- Dynamic project organization
- Version control of Design files
- Built-in search engine to locate information quickly
- Customized field to integrate all site data
- Import / export with Excel for batch data update
- File attachment organization and categorization
- Remote information sharing for External users
- Possibility to link information to Google map

INTEGRATION WITH IBWAVE DESIGN AND IBWAVE MOBILE

- Automatic population of project data from Design files
- Upload and Download any attachment type
- Define upload validation criteria for Design files to reduce errors

IBWAVE DRIVE

- Built-in file synchronization and sharing functionality across iBwave Unity and Design
- Storage and sharing folder structure controlled based on users' roles
- Open files from/Save files to and Edit files from iBwave Unity and Design

CENTRALIZED DATABASE OF COMPONENTS

- Track the database version for each project design
- Storage and version control of the shared Database of components
- Define a list of approved and equivalent components and sub-components

DASHBOARDS

- Customizable dashboards
- Task summary dashboard
- Project summary dashboard

WORKFLOW MANAGEMENT (OPTIONAL)

- Customizable workflow templates
- Track and assign resources, monitor timelines and costs
- Gantt chart view
- File attachments to project workflow tasks
- Define and manage projects and detailed tasks description with check list items
- Automatic Email notifications based on project criteria
- Milestones and decision engine ensure projects follow best practices
- Add, modify or delete project tasks as needed during a project

MOBILE TABLET COMPATIBLE

- Possibility to access iBwave Unity from Tablet

REPORTS

- Customizable reports and dashboards
- Export reports by email
- Equipment list for each and all projects together report
- Cost details for each and all projects together report
- Cross reference report
- Cable routing for each and all projects together report
- Project design summary for each and all projects together report
- Project per technology report
- Project compliancy for each and all projects together report
- Project assignment report
- Region and contractor performance report
- Project results and detailed status report
- Active projects and tasks reports

APPLICATION PROGRAMMING INTERFACE (API)

- Programming interface to exchange Unity data with third party applications
- API documentation and toolkit available

SECURITY AND ACCESS PRIVILEGES CONTROL

- Define and manage users and roles and access privileges
- Built-in database encryption (256 bit)
- User management (project compliancy, project states, project types, regions, DAS types, feed types, mobile devices)
- Define and manage site, project and folder access privileges
- Define and manage Email notification rules based on user profile
- Access control on workflow templates, tasks and projects
- System monitoring (project history, user activity and history, queue health, status and history, licensing summary, error reports, remote shared errors)

DEPLOYMENT OPTIONS

- On-Premise Deployment
- Cloud Deployment
- Unlimited Storage capacity
- 10 users for standard package (additional seats available for purchase)