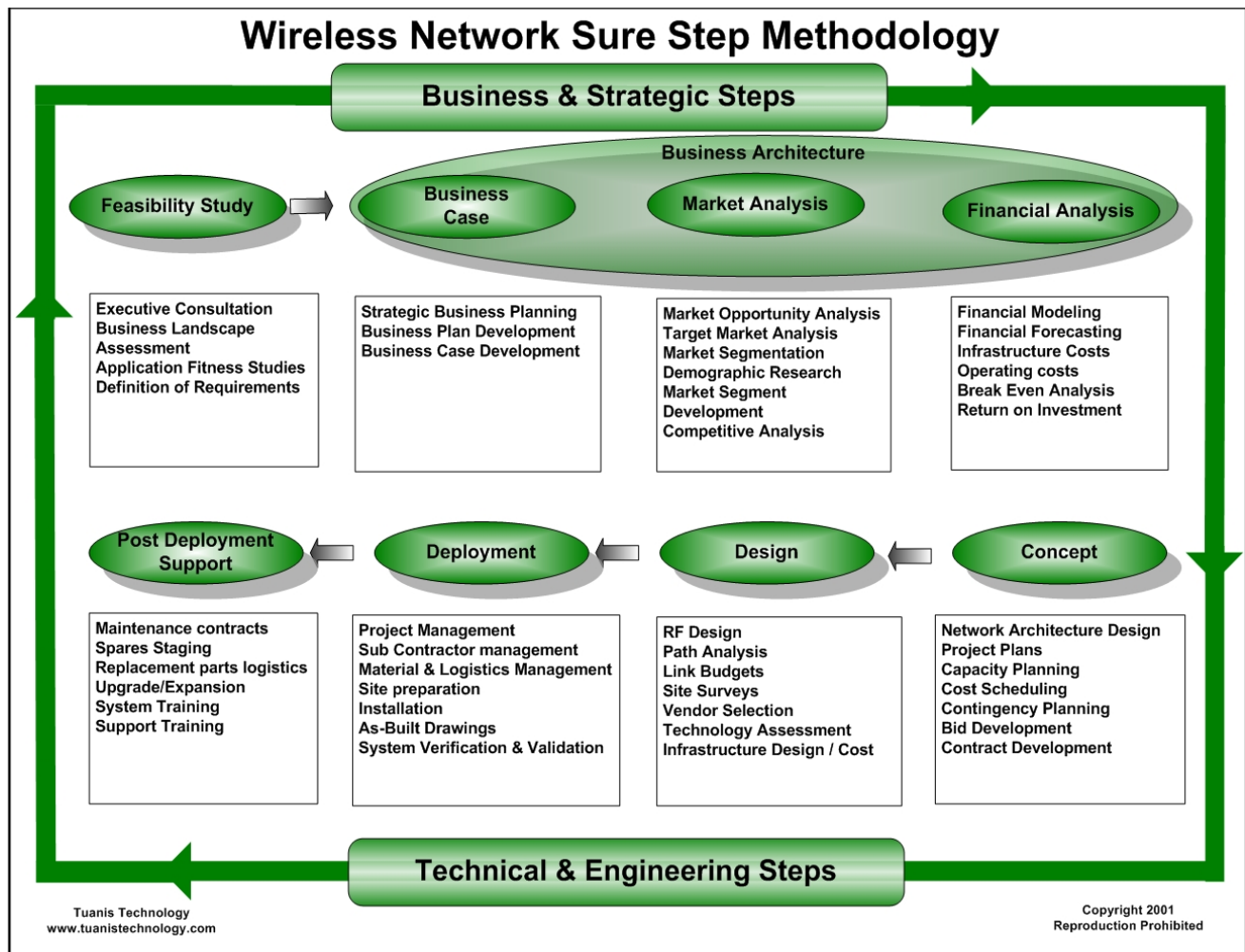# Tuanis Technology

tuanis technology (too-wan-us tek-nol'e-je) adj.
1. Very good, pleasing, excellent 2. Costa Rican slang for
cool 3. The link between business and technology

Creating License Exempt Wireless Networks

A Gate Approach

Wireless Network Sure Step Methodology

Business & Strategic Steps

Business Architecture

Feasibility Study	Business Case	Market Analysis	Financial Analysis
Executive Consultation Business Landscape Assessment Application Fitness Studies Definition of Requirements	Strategic Business Planning Business Plan Development Business Case Development	Market Opportunity Analysis Target Market Analysis Market Segmentation Demographic Research Market Segment Development Competitive Analysis	Financial Modeling Financial Forecasting Infrastructure Costs Operating costs Break Even Analysis Return on Investment

Post Deployment Support	Deployment	Design	Concept
Maintenance contracts Spares Staging Replacement parts logistics Upgrade/Expansion System Training Support Training	Project Management Sub Contractor management Material & Logistics Management Site preparation Installation As-Built Drawings System Verification & Validation	RF Design Path Analysis Link Budgets Site Surveys Vendor Selection Technology Assessment Infrastructure Design / Cost	Network Architecture Design Project Plans Capacity Planning Cost Scheduling Contingency Planning Bid Development Contract Development

Technical & Engineering Steps

Tuanis Technology
www.tuanistechnology.com

Overview

Implementing a Broadband Wireless Network (BWN) is not brain surgery. Implementing a *successful* BWN that creates value is a challenge. It requires multiple skill sets and a specific sequence of steps, **regardless of the network simplicity or complexity the steps are the same**. Increased network complexity simply increases the time and effort of each step. For example, a simple single tower digital canopy designed to cover a small community usually does not require an in-depth market and demographic analysis. However, some analysis will be required. It may come in the form of local experience and deduction vs. a formal market study. The actual implementation of a BWN is a technical project. But at its core, a BWN is a business means to an end. A successful technical solution to a business issue means that engineering and business must be linked early in the process.

The Sure Step™ methodology has been developed by capturing and defining the step sequence to a profitable BWN. Sure Step™ is rooted in hands on know-how, client case studies and decades of experience in the network/telecom industry. These data and experiences are then compiled into a sequence of steps which follow standard systems engineering practices. Sure Step™ is a repeatable, milestone based system with clear metrics, easily identifiable progress points and project gateways. In the remainder of this document we detail the steps and provide you with clear understanding of each step and the expected outcome.
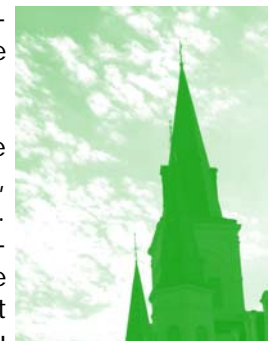
Feasibility Study

Executive Consultation

Senior Management is constantly faced with the delicate balance of providing strategic direction while managing the day to day activities of the organization. When evaluating a business opportunity or determining a strategic direction the input and consultation of industry knowledgeable experts provides invaluable insight. Tuanis offers the unbiased assessment you require to analyze the business alternatives available and back decision criteria with hard numbers. All of our executives offer operational leadership in the telecommunications and data networking industries. Our single minded focus upon the wireless industry allows us to illuminate the primary factors relevant to a successful wireless solution.

Tuanis offers the capability to discuss the broad overview while understanding it is built from ground up experience. Whether you want to discuss the viability of wireless for your organization or need an outside review of your plan, Tuanis can assist. You should expect an interactive and lively discussion that provides direct answers and offers knowledgeable options and strategic alternatives.

Business Landscape Assessment

How will my business concept reside in the world? Should we be in the wireless broadband market? What are the alternatives for service delivery and the business ramifications of each? Risk assessment? Time to market? Business alignment? Can a wireless network improve my bottom line? Will the equipment meet our requirements? What are our requirements?

Providing an objective third party view, Tuanis will analyze available options and provide a detailed written report. We use financial models, market trends, subjective knowledge, real world implementation experience, and structured business case analysis tools to reduce uncertainty. Landscape assessment also includes other significant factors such as consumer trends, competition and regulatory risks. This information is then packaged in a format that allows for inclusion in business cases and investor presentations.

Business Case

Business Consultation

Do you need a business consultant to implement a BWN? You already understand how to do business. Business is simple, isn't it? Yes it is. However ***getting to the simplicity can be complex***.

Business consultation is advice from a third party that has had the experience and opportunity to view many businesses and many business models and is able to apply that knowledge towards your organization. Tuanis consultants provide your executives with advice and direction and insure that your tactical plan matches a sound long term strategy. Your business consultant should be capable of providing business and technical insight on the current and future state of your industry.

Business Case/Plan Development   "If You Fail to Plan, You Plan to Fail"

Broadband Wireless Networks come in two basic flavors.
1. The network *is* your business so your customer pays you for its use. Congratulations, you are a service provider and you need a Business **plan**. (Wireless Internet Service Provider's (WISP) are an example of this type of service provider)
2. The network enhances your existing business processes so you can deliver your product better, cheaper or faster. You are an *Enterprise* user so you need a business **case**.

Regardless of the type of provider in play, the key questions of; How? When? and Where? will we see a return on this investment must be answered. The plan/case is a roadmap that addresses those questions in detail. Financial backers, bankers, venture capitalists and angels require a plan. The executive management team requires a business case to approve budget monies.

The creation of a written business plan/case is frequently avoided under the perception that it's a long, mundane process. Not true! ***The plan is a detailed articulation of your vision.*** The process forces you to tease out the details and fit the grand vision into the cold reality of its destination environment.

Plans are divided into the following basic sections:
- Executive Summary
- Industry Overview
- Company (operation) Overview
- Market
- Sales and Marketing strategy
- Competitive landscape
- Management team
- Financials

Business Cases are divided along similar lines:
- Operational Summary
- Problem/Cost Identification
- Technology Overview
- Network Operations
- Users & Training
- Actual cost savings
- Implementation
- Financials

With Tuanis participation, the planning process will insure a hard, honest look into your organizations resources, management team, financial resources and ability to implement successfully. While this can sometimes be painful, when properly done it retains the core vision but yields a stronger clearer plan and well bonded execution team. For organizations that already have a fully developed plan, an external review provides objective validation and assessment.

Market Analysis

Where are my users? How many of them are there? Do they want what I have to offer? Are they willing to pay for it or willing to use it? Who are the players in the market? Who are potential partners? Competitors?

Service Provider or Enterprise, you need to consider these questions because they define your ultimate payback on the BWN investment.

Market Strategy

Marketing is about "reaching the many"; sales is about "reaching the one".
The market strategy moves a message that causes you to sell service to your constituents, whether they are paying for your service or they have the opportunity to use the network. Creating a compelling value proposition and defining a differentiated position in a competitive marketplace is key to a successful business. The market strategy defines how you will get the message to your users.

Market Research

In the financial model, revenue is ultimately an estimate of the market size and penetration. An accurate portrayal of market size and potential is one of the keys to the credibility of financial forecasting.

Many firms provide 'Market Research' but the majority are experts at creating math models to determine the best course of action. Over the years many have defined the customer as a statistical mold and have effectively convinced some business's that the models accurately predict customer desires. Yet the best marketing success stories were born out of "gut" feel and a keen insight into the specific market. Success depends upon a combination of analytical skills and intuition that comes from in-depth knowledge of the market segment combined with an ability to view the offering from the standpoint of the end user.

Market Segmentation

Who and where are my customers? Do they want my service? Can they pay for my service? Like the real estate market, location is everything. Placing a distribution node in area is an expensive proposition, making sure it will be well used reduces the investment risk. Understanding the people around the node will optimize placement for usage.

Segmentation is typically based on demographics such as; age, race, sex, income, education, occupation, etc. Occasionally it includes psychographic variables like; ethnic belief, interests, hobbies, life-style, etc. Armed with this data and knowing who your most likely customers are allows you to place nodes in the areas with the highest density of potential customers. The product of the segmentation analysis is a written and visual representation of the targeted geographic area.

Competitive Analysis

Competitors, I don't have any competitors!   (Competition is what keeps executives up at night.) What alternative ways can my customers/users receive information? What is the cost? How do my competitors rank in my customers minds? Are they doing better than us? What are they doing we don't?
The competitive analysis of your market area allows you to:
1. Understand the alternatives available to your customer.
2. Evaluate the strengths and weaknesses of those alternatives.

A competitive analysis conducted by Tuanis determines your competition today and who might be your competition in the future. We define their strengths and weaknesses and provide insights on how to effectively compete with them. We also provide insights into technologies on the horizon that effect you, your competition and the playing field.

Financial Analysis

What is the ROI on being a service provider? Which is better, installing a wired LAN or wireless? What's payback of a wireless LAN? What will my capex be as a service provider? Where should we price our product or service?

When you approach financial backers, VC's, angels, bankers, suppliers or executive management teams they all ask the same financial questions. Your ability to provide quality answers determines funding. Standard values such as, NPV, opportunity cost, ROI, breakeven analysis, are all used to determine the viability of an investment. By combining financial information with market research we can forecast revenue. Reviewing various scenarios creates a risk profile for the investor. Knowing and understanding the risk is a function of the credibility of the data upon which the assessment is based.
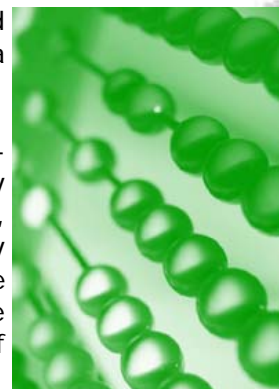
Financial Modeling

Purchase? Lease? Outsource? Flat Rate pricing? Tiered Pricing?

Financial models identify the answers. A financial model is founded in traditional accounting practices but offers the flexibility to be modified based upon market conditions or changing user needs.
At Tuanis we offer simple yet highly developed financial modeling structures that are focused on BWNs.

Financial Forecasting

I'm going to make money but how much? And when? If we deploy a wireless network will it save us any money? Will we be more productive?

Financial forecasting answers these questions. A successful business plan/case must have a developed a financial forecast for the business proposition. Business plan Forecasts include; cash flow statements, balance sheets, income statements and ratio statements that all balance properly. For a business case; ROI estimates, cost reduction, savings forecast, and productivity increase forecasts.

Tuanis applies real world implementation experience and costs to the financial models to develop highly reliable cost predictors for determining the success of a wireless network implementation.

Breakeven Analysis (ROI, NPV)

Return on Investment (ROI), Net Present Value (NPV), these don't make networks work, do they? Only if you want your network to pay for itself. All financial models have variables used as the basis for determining the forecasted numbers. The quality of those variables determines the quality of the forecast. Beyond determining the ROI or NPV, an analysis of the key variables that will affect the success or failure of the model is necessary. Tuanis applies its in-depth industry knowledge to the model and provides insight to the potential bumps and factors that will affect the model.

Concept

Now we get to talk about some hardware! During this step of the process, technical issues come to light. Combined with marketing and financial data and we are now able to spend some time on the

Network Architecture Design

Critical to the success of any wireless network is proper engineering. This involves determining the system architecture, distribution points, backhaul requirements, and system performance requirements.

Network engineering cannot be conducted in a vacuum; it must consider the financial impact of the system design and the ability to meet the end user requirements. Network engineering combines multiple talent sets including

- RF Engineering
- Technical knowledge of specific vendor equipment
- Data network design
- Real world feasibility

Cost Scheduling

During the deployment of a BWN monies will have to be released. Determining when and the specific criteria for those expenditures is the role of cost scheduling. Based on the network architecture and deployment schedule, cost scheduling serves to advise funding entities on when what monies will be needed and for what. A detailed cost schedule plan carries into the overall project management of a BWN deployment.

Contingency Planning

What if the product you select is delayed? How will delays in the deployment phase be addressed?

A fully developed contingency plan considers the what if's. It defines who is responsible and the method of escalation should an issue arise during the project implementation.

Bid Development

A BNW project may consist of one or several sub-contracted elements. If it is competitively bid then RFP's (Request For Proposal) must be developed.

A RFP is your written articulation of the needs of the project and expectations of participants. Well written RFP's solicit usable responses from qualified firms who are capable of providing the required services or products. Response matrix and pre-determined evaluation methods allow for rapid vendor selection. The quality of the RFP will drive the quality of the bid responses. Tuanis Technology brings experience from both sides of the table on RFP development.

Contract Development

As a BWN operator, you will be making promises to your users. These promises are based on your ability to deliver. If this involves outside entities to help you deliver the final product, the quality of your promise to your customer will be affected by your sub-contractors. Developing contracts that are clear, concise and enabling for all parties becomes a key feature of success. Again, Tuanis Technology brings expertise and experience from both sides of the table.

Design

RF Engineering

All wireless system solutions are a trade off between performance, available solutions, geographic limitations, equipment limitations, budget considerations and implementation timeframes. Many RF engineering functions are closely related and intertwined with the site survey and field survey analysis. These areas tend to be conducted in concert and the outcome provided in detailed written reports.

RF services consist of the following specific areas

Frequency planning service
> Determine the frequencies to be utilized by each radio
> Review interference factors based upon site survey data

Path analysis
> Conduct a path profile
> Review climatic conditions
> Review potential reflection points
> Determine fresnel zone and clearance requirements
> Consideration of issues such as terrain, natural and manmade obstacles, foliage, etc.

Link Analysis (budget)
> Determines the system availability
> Determine the throughput performance

Distribution optimization and propagation coverage
> Provide optimal coverage from distribution points
> Determine propagation coverage based upon computer modeling
> Overlay potential distribution sites using target market selection.

Microwave backhaul paths
> Determine the backhaul path based upon throughput performance requirements
> Generate equipment requirements for backhaul solutions.

Capacity analysis
> Provide detailed capacity scenarios
> Generate user to capacity ratio analysis

Site engineering specifications
> Creation of detailed site specifications
> Determine antenna location and mounting

While each of the above services provides a higher degree of certainty that a given wireless configuration will perform as envisioned, there is a fine line between using the needed services and providing a timely and budget sensitive solution.
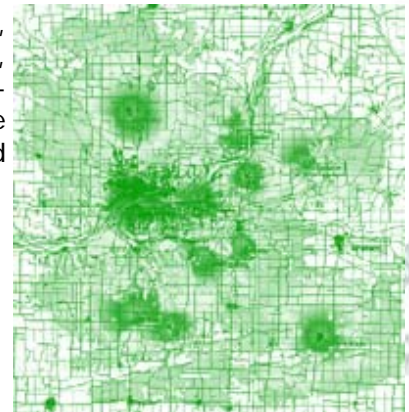
Vendor Evaluation/selection

Is the new guy the best? Do I only want an industry leader?

How do you determine what solution is the best for your needs. In large deployments this decision can have far reaching financial and market implications. For other projects the effect may not be as dramatic but the risk is still significant. Tuanis is constantly evaluating new equipment and wireless technologies. With our concentration upon the unlicensed wireless marketplace we understand the advantages and potential pitfalls of the various components used to create a wireless network.

Technology Assessment

Determined to purchase wireless products but unsure of which product or solution to implement?   802.11b 802.11a 802.11g, proprietary LOS, NLOS. Which way to go? Tuanis evaluates products for technical feasibility to determine the scale of risk in selection of a specific path. We are capable of combining this data with the business and financial analysis to determine the overall business benefit for a given direction.

Clients may combine this assessment with executive or strategic consulting services to create a complete presentation for an executive management team. Tuanis provides either a central role in the final presentation or a support only role. **With our singular focus on our clients success, we have no need to "blow our own horn".** When preferred we will work as part of a larger team. For example; when an organization is conducting due diligence we may be secured to provide technology assessment of the investigated entity.

Site Survey
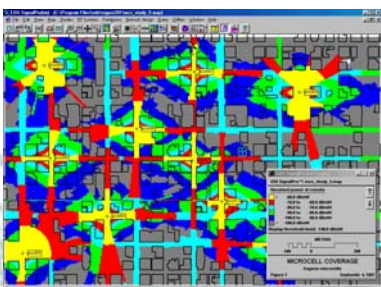
In any wireless system design some level of site survey is required. The site survey provides the engineering teams with key information about the operational environment of the system. Without a highly detailed site survey in place, any design is suspect. The basic design parameters are unknown so the design will be a best guess effort. The degree to which a survey is conducted is dependent upon the complexity of the network. For example; if you are planning on installing only a few indoor access points and are willing to risk issues such as interference then a professional survey may not be suitable. However if you plan to deploy multiple radios in a multi-story building or an outdoor point to point (PTP) connection then a professional survey must be conducted.   To be a useful business tool, a Site Survey must be more than a bound collection of datum and observations.

A Tuanis Technology 'Site Survey' will contain an exhaustive technical assessment of the implementation environment. We couple this data to a complete system design including all of the necessary equipment and pricing. Where technical trades and recommendations are made, all of the relevant specifications will be provided.

Site Survey Output

You should receive a complete detailed written report of the survey. A typical Site Survey report for one outdoor location or a simple point to point link can range from 10 to 50 pages of information detailing the site and equipment required to successful implement the network.

Site surveys are one of the prime areas not skimp on. Remember the adage — "you get what you pay for". Be sure the organization conducting the survey has experience in surveys and understands completely your organizations business and technical objectives. ***Ask for samples of their previous work.***

Indoor Site Survey

Indoor site surveys are conducted to determine the optimal location of radio's, antenna's and additional equipment. When conducting an indoor site survey consideration is given to the location of existing network access and wireless network equipment.

- Determination of optimal RF coverage
- Determination of AP placement/mounting
- Interference Analysis
- Microwave interferers
- Obstruction evaluation
- Site Description
- Equipment list
- Power requirements/location
- Performance Prediction
- Antenna placement
- Channelization plan
- Site location data
- Cable routing

In an indoor site survey the following topics are reviewed
Because each site survey is unique a standard basis of knowledge is required to successfully complete a through site evaluation. These skills include
- RF technology knowledge
- RF technical behavior experience and knowledge
- Specific vendor knowledge for the proposed equipment
- Technical knowledge of wired networks
- Understanding of data networks

Outdoor Site Survey

Point-to-Point (PTP) and Point-to-Multi-Point (PTMP) **outdoor surveys are more complex** than indoor surveys and require more skill to perform quality surveys.
An outdoor survey should include the following areas of review

- Site Description
- Site access information
- Determination of optimal RF coverage
- Power requirements/location
- Interference Analysis
- Microwave interferers
- Obstruction evaluation
- Visual building inspection
- Topographical map study
- Free space loss
- Installation equipment
- Special circumstances
- Site location characteristics
- Success Prediction
- Determination of Radio placement/mounting
- Environmental considerations
- Antenna placement
- Drive Data
- Visual tower inspection
- Cable routing
- Equipment list
- Link budget
- Area weather analysis

Outdoor surveys require a combination of software analysis and onsite observations. Digital topographical maps are combined with the onsite and drive data collections. Free space loss is calculated and the fresnel zone is determined.
Outdoor surveyors must have both the skills of an indoor surveyor and the following skills
- Knowledge of antennas and wind load factors
- Tower/building climbing experience
- Environmental knowledge
- Familiarity with building codes/electrical codes/government regulations
- In depth RF knowledge of fade path loss, fresnel zone, refraction, reflection and path profiling.

Deployment

Project Management

Projects – endeavors taken on to create either a service or product. **As opposed to "operations", projects are temporary and have a finite life expectancy.** The ability to manage a project successfully requires many skills – time management, people management, relationship management, budget management, and the ability to rapidly prioritize in highly fluid situations.

The Project Management Institute (PMI) breaks down every project into the following phases –
1. Concept
2. Planning
3. Implementation
4. Conclusion

Each of the phases is marked by a deliverable. A written document that is reviewed by both parties and signed off on by both parties. Each phase of a project can be further divided

Concept	**Implementation**
• Determine the goals, specific and measurable	• Manage, identify, resolve problems
• Define the project scope	• Monitor implementation
• Set the basic budget	• Adjust targets
• Select key team members	• Change management
• Begin RFQ creation	• Negotiate
• Phase exit or gate	• Manage to time and budget
Planning	**Conclusion**
• Organize the team	• Reward personnel
• Create statement of work	• Reassign personnel
• Work Breakdown structure (WBS)	• System turnover
• Assign functions and responsibilities	• Training
• Determine activity schedule	• Create final report
• Release Quotes	• As-builts
• Resource planning	• Final Client acceptance/turnover
• Select vendors	
• Detail plan	
• Finalize budget	
• Purchase decisions	
• Determine communication paths	
• Determine Change control paths	
• Procedure development	

In order to successfully complete a project a project manager must possess specific skills including
- Technical knowledge
- People management
- Organizational management and political skills
- Intestinal fortitude to address critical issues head on
- Conflict management skills
- Financial skills
- Trust and respect

The project manager is the center point of all activities during the implementation phase.

Sub-contractor Management

A Typical BWN deployment will involve multiple proficiency sets. Use of sub-contractors is a normal in any complex implementation but improper management of the sub-contractors will result in increased expenses and cost overruns frequently with confusion over the responsible party. Coordination, delegation of duty and close management of the sub-contractors is a delicate skill set. At Tuanis we provide strict rules for all sub-contractors and insure performance through hands-on management of our sub-contractors.

Material & Logistics Management

Ordering, staging and receiving of materials for a BWN project can be a complex process. For medium to large projects there will be hundreds or thousands of required "gizmo's" and parts both very large and very small. Coordination of the ordering, receiving, palletizing, delivery and distribution of the pieces to insure the most cost effective deployment requires dedicated personnel who offer in-depth knowledge of the deployment. Tuanis employment rules require all of its personnel to work in the field at least once yearly. Our clients can be assured that every person providing coordination support of the material and logistics understands and appreciates the steps to successful deployment.

For electronic components, prior to field deployment equipment is delivered to the Tuanis engineering department for testing, burn-in and programming. This minimizes the time spent in the field programming and modifying systems and significantly reduces the chance of project delays due to infant mortality issues in the electronics.

Site Preparation

Part of a smooth and cost effective BWN deployment is insuring that the site is properly prepared for the installation teams. Utilities, site access, construction management plan, permits, and logistics all play a part in insuring proper site preparation.

Tuanis Technologies professional deployment teams insure smooth deployments

Installation

Installation, this is it. All of the engineering, design and business work comes together. Skimp on installation and you'll find yourself spending enormous time troubleshooting, repairing damage to others equipment, or even completely shut down do to code violations. Whether you're installing a multi-radio campus network or a complete wireless local loop you need the appropriate skilled technicians who are "code aware" to complete the installation on time and on budget.

Proper installation of a wireless system requires multiple skill sets. For indoor networks electrical location, network access, aesthetics and disruption of existing business are all factors. In outdoor networks, professional climbing skills, understanding of environmental factors, electrical services, backhaul equipment and distribution equipment knowledge, antenna knowledge, alignment, map knowledge all play roles in successful installation.

Be sure that your installation contractor adheres to all local, state, and federal regulatory requirements.

System Verification & Validation

Insuring that your system has been installed properly and is operating as expected is the role of system verification & validation. Sample activities include – Drive analysis, Data throughput sampling, and power output testing. This verifies that the equipment is operating according to manufacturers specifications and engineered design parameters.

As-Builts

Upon successful completion of installation a quality provider will provide a complete set of as-built documents. As-builts, as the name implies, are detailed drawings and explanations of the installed system. The as-built document provides a baseline of the actual system as of the completion of the installation. Performance characteristics are noted in the as-builts to facilitate problem resolution in the future. For unlicensed systems this is critically important as *FCC regulations can protect you from interferers in the future if your system is properly documented.*

Post Deployment Support

Maintenance

Tuanis partners with only industry leading quality suppliers for all components. However, wireless technology involves active or electrical components which are adversely affected by many external events (lightning is a good one). In order to insure continuous availability a client may select from a variety of maintenance and service options provided by Tuanis Technology. Maintenance agreements are tailored to the requirements of the client and can include annual inspection services for both active and passive components providing quality preventative maintenance.

Tuanis also provides technical phone support to clients on both a contract basis and on a per-call basis.

Spares Staging

For mission critical and large deployments the staging of spares offers an extra measure of security and comfort. Providing updated spare housing and deployment insures that replacement of equipment is available in the un-foreseen event of a product failure.

System Training

For onsite client personnel changes and system management are part of any network deployment. Tuanis supplies complete system training and knowledge transfer of deployed networks.

All personnel who provide training are certified by the manufacturer of the product and a field proven manager.

Support Training

For corporate support personnel or management teams Tuanis offers complete training sets.

All personnel who provide training are certified by the manufacturer of the product and a field proven manager.

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