

Spotwave Wireless White Paper

Extending the In-Building Wireless Footprint



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Extending the In-Building Wireless Footprint 1

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Overview 1

Enhancing in-building coverage 2

The SpotCell™ solution 3

 Recognizing customer value 4

 Increased usage 5

 Account management 5

 Cost reduction 5

Business model application 6

Tracking 7

Conclusion 7

Appendix A – Business model scenarios 8

Appendix B – Baseline revenue stimulation scenario 9

Extending the In-Building Wireless Footprint

Overview

Enhancing in-building coverage

Wireless Service Providers are continually expanding their networks by deploying directional antenna structures, on-frequency repeaters, as well as macro-, micro-, or pico-cell solutions. A by-product of this expansion is improved coverage inside buildings. However, the degree to which coverage is improved is a complex equation dependent upon factors such as location, type of construction and window glazing. Where in-building coverage remains a problem some service providers have deployed pico-cells inside buildings but for buildings of less than 100,000 square feet, justifying the cost of these installations is difficult.

As a result Wireless Service Providers look to on-frequency repeaters in an attempt to solve smaller in-building coverage areas and when justifying a repeater solution it is important to consider not only the initial hardware costs but also to remember hidden costs, related to:

- engineering it as part of the RF network
- continuously monitoring it for oscillation
- making adjustments to it to keep pace with the ongoing evolution of the RF network in that area

Directional antenna structures and on-frequency repeaters (which are treated as extensions to the existing macro network) are commonly assembled using components from a variety of vendors. They are complex to design and typically expensive to implement and maintain. With installed systems starting at \$20,000 deployment typically occurs in buildings of between 20,000 and 100,000 square feet. As a result, much of the Wireless Service Providers' efforts are focused on the larger, more public venues such as train and subway stations, airports, hotels, and sports stadiums. In some cases these systems are installed by the property owners and used to improve coverage in multiple frequency bands (that is, they are carrier neutral).

The SpotCell™ solution

The good news for Wireless Service Providers is that there is a sound business case to enhance in-building coverage for only their subscribers by deploying a SpotCell adaptive on-frequency repeater. With SpotCell it is economically feasible to expand the wireless coverage area inside buildings up to 20,000 square feet.

Typical deployment scenarios range from a floor or a portion of a floor within a high-rise office building to a warehouse or a complete office building of this size. This greatly expands the market for in-building coverage as approximately 90% of the buildings in the United States fall into this category. SpotCell™ also lends itself for use within larger office buildings as it can be deployed to enhance coverage on a floor or for a specific tenant within a multi-tenant building. As depicted in Figure 1¹ there is a relationship between building size and the level of technical expertise required to improve coverage using the traditional technology, and contrasts this with the low technical requirements of SpotCell.

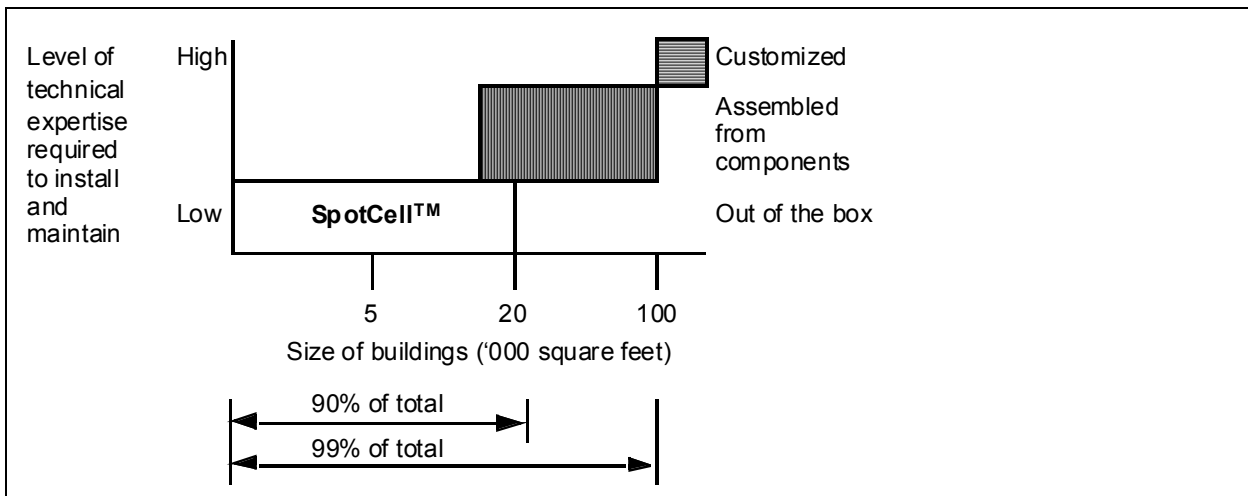


Figure 1: Ease of installation vs. building size

Costs are kept low because SpotCell is an out-of-the-box technology that does not require any specialized tools or knowledge to install. As well, it is fully adaptive, meaning that it intelligently adjusts its power level to suit its installation environment and to prevent interference. By remaining stable under a broad range of conditions it is transparent to the network and the subscriber thereby eliminating the need for service provider reconfiguration and ongoing monitoring.

Since the SpotCell is band/carrier specific, a sound business case exists for Wireless Service Providers to enhance in-building coverage for their specific subscribers by deploying a SpotCell. Not only do in-building coverage gaps cost them money, but Wireless Service Providers are also foregoing revenues due to lower in-building usage by existing subscribers and fewer wireless subscribers in locations where coverage gaps exist. Simply put, many subscribers refuse to use their phones where they know coverage is poor.

¹ Based on the information contained in the “1999 Commercial Buildings Energy Consumption Survey” there are close to 4.7M commercial buildings in the United States, of which approximately 4.2M, or 90%, of the buildings have less than 25,000 square feet, representing some 40% of the total commercial floor space.



Recognizing customer value

Customer value is a consideration when deciding when and where to enhance in-building coverage. As shown in Figure 2, Wireless Service Providers have a choice in terms of how much of the initial investment they want to pass along to their business customers.

Cost to subscriber	Low	Carrier subsidizes		
			Cost sharing	
	High			Customer purchase
		Key accounts 0 to many	High usage (10-20 users)	Low usage (<10 users)

Figure 2 – Relationship value matrix

When it comes to their key business accounts, Wireless Service Providers may choose to underwrite the entire SpotCell investment. For example, fixing the coverage problem in the CEOs office has a high strategic value. At the other end of the spectrum are locations where a business customer only has relatively few users with sporadic usage patterns. Here the value to the service provider is relatively low and they may not be interested in making an investment. In situations where the Wireless Service Provider cannot justify the investment they may want to consider selling the SpotCell to their customers on either a breakeven or a for-profit basis.

In between these two extremes is a group of customers for whom the Wireless Service Provider is prepared to enter into a cost-sharing arrangement to deploy a SpotCell. As shown in Appendix B, a business model must have the ability to evaluate the following cost sharing arrangements:

- the first option utilizes subsidization whereby the carrier underwrites a portion of the initial SpotCell investment similar to what is currently done for handsets
- alternatively, the Wireless Service Provider may offer the customer a service coverage option priced on a \$/month/user to recover all or a portion of the cost

Both of these approaches can significantly reduce the payback associated with deploying a SpotCell, which in turn significantly reduces the risk associated with recovering the Wireless Service Provider’s investment.

As well, in view of the SpotCell’s simple, low-cost installation, coupled with its ability to adapt to a broad range of RF environments, Wireless Service Providers can easily re-deploy units to another location should the customer decide to move or change carriers.



Increased usage

By deploying SpotCell at a customer's location there will be an increase in the Average Revenue Per User (ARPU) due to increased usage by existing subscribers. Improved coverage helps establish mobile devices as reliable, daily business tools due to better sound quality, which leads to more spontaneous use as well as fewer calls being blocked, dropped, or disconnected. In discussions with various wireless carriers in North America usage typically increases by 15 - 20%, and in one location the usage increased by 40%!

Furthermore, improved in-building coverage promotes the rapid adoption of wireless data applications as the majority of the interactive IP data transactions take place inside buildings.

Account management

Wireless Service Providers can also use in-building systems as part of their account retention plan. If a customer's contract is up for renewal, the deployment of a SpotCell can avoid the carrier having to offer lower rates or one-time incentives to retain the customer. As well, SpotCell provides an opportunity or incentive to secure a commitment for additional users at the location. Both are critical to profitability as it establishes a barrier to exit, making it more difficult for the customer to leave if they have to forego their superior in-building coverage. The service provider can also brand the indoor unit to serve as a tangible/visible reminder of who is providing the service.

In situations where the customer has multiple locations, some or all of which suffer from poor in-building performance, a service provider can use the deployment of a SpotCell to secure additional business from the customer. This is especially attractive if the other locations are currently with a competitor with poor in-building coverage.

By solving in-building coverage problems, a service provider has an opportunity to focus marketing activities in locations where reliable and consistent performance is a barrier to customer acquisition. In addition, as service providers launch next generation data services, excellent in-building performance is critical to their success and by deploying a SpotCell, customer concerns about performance can be taken off the table.

Cost reduction

On the cost side of the ledger, the SpotCell is extremely attractive relative to other in-building solutions. SpotCell installs in less than an hour and does not require highly skilled technical resources or expensive, specialized test equipment, or tools that are used to implement alternate systems. This equates to an installation cost reduction factor of greater than 2:1 in favor of SpotCell. Further, where the SpotCell can be installed indoors the need to involve and negotiate with the building owner or landlord is eliminated which saves significant time and effort.

In addition, by being fully adaptive the SpotCell remains transparent to the network under a broad range of conditions and maintains the integrity of the spectrum. This translates into lower ongoing maintenance costs as the system automatically adapts to changes in the RF environment as compared to other solutions that require ongoing monitoring and tuning.



Business model application

The business model included in Appendix B can be used interactively to determine the payback associated with deploying a SpotCell. By including or excluding a few key input variables it is possible to determine the payback under a number of standalone scenarios as well as to combine the scenarios to determine a composite payback. Appendix A describes a variety of scenarios to be considered while Appendix B provides a baseline revenue stimulation scenario.

Figure 3 shows the results for the baseline revenue stimulation scenario where current usage is 400 minutes/month; the current rate is \$0.21/minute, and assumes 1 incremental subscriber with an ARPU of \$60.00. In reviewing the results you can see that in order to achieve a 12-month payback, you would require between 6 and 12 existing subscribers depending on the expected stimulation in calling.

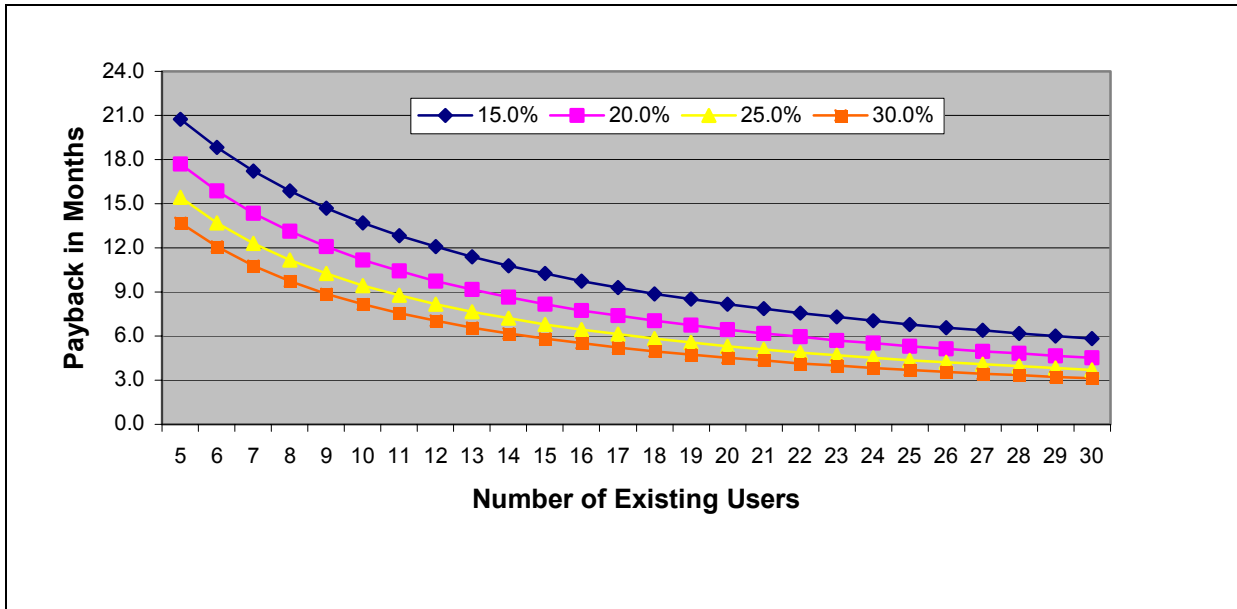


Figure 3 – Revenue stimulation scenario

Similarly, Figure 4 illustrates the scenario in which a customer has unused minutes in the monthly plan and increased use would not generate incremental revenues to the Wireless Service Provider. In this case, if your decision criteria is a 12-month payback then the customer would need to have at least 9 subscribers, would add 3 new subscribers, and agree to a monthly service assurance feature of \$5.00/subscriber. In addition, this scenario assumes that you avoid a cost equal to one month’s ARPU (that is, providing the customer 1 month of free service or a handset upgrade equal to this amount).

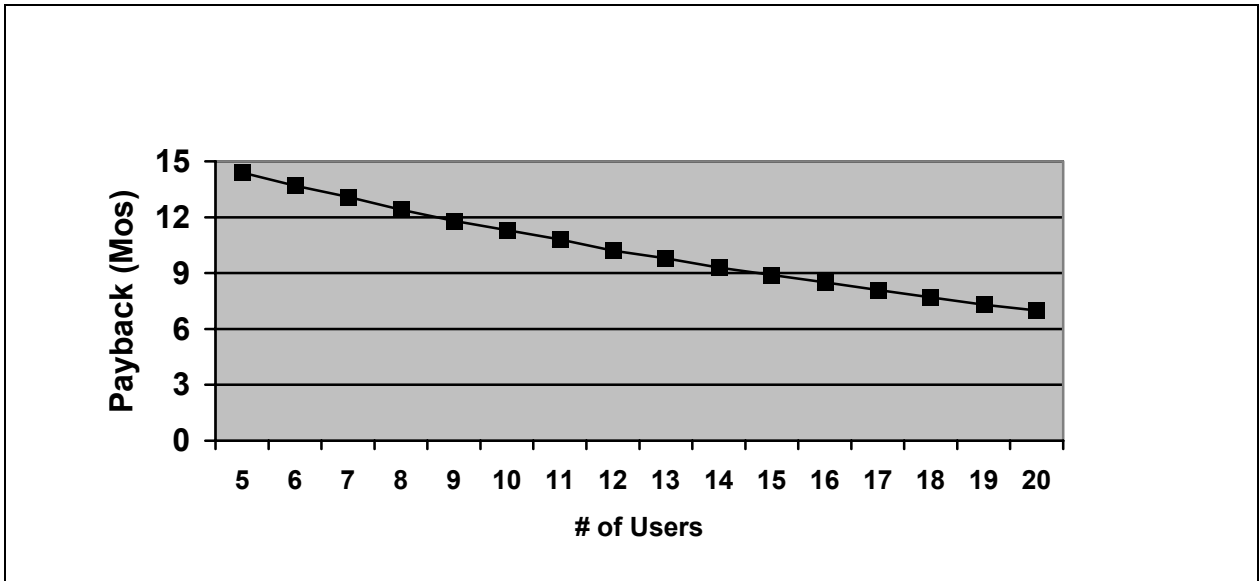


Figure 4 – Unused minute scenario

Tracking

Measuring the success of your in-building program is essential. For example, you may want to consider including a series of questions on in-building performance in your customer surveys. This establishes a baseline against which you can assess the impact of improving in-building performance on overall customer satisfaction. In addition, by tracking customer usage and the quantity of subscribers at a location before and after deploying a SpotCell, you can validate and refine the assumptions being used in the business model.

Conclusion

There is no question that the need exists for a cost effective answer to the problem of in-building wireless coverage. Spotwave Wireless offers an affordable, fully adaptive solution for reliable, always-on wireless coverage. By implementing SpotCell technology, Wireless Service Providers can effortlessly increase customer satisfaction and augment their revenue through increased usage by existing customers and the addition of new subscribers. The benefits are obvious – The choice is clear.



Appendix A – Business model scenarios

SpotCell BUSINESS MODEL OVERVIEW

The model allows the user to interactively assess the payback associated with deploying a SpotCell under the following scenarios. By selectively including or excluding input variables it is possible to combine the scenarios to determine a composite payback.

REVENUE GENERATION

Increased Use By Existing Users - The model applies a minute stimulation factor to current usage to calculate the incremental minutes which are then multiplied by a per minute rate to come up with a \$/month/user figure. The model allows the user to input 4 minute stimulation factors and calculates the payback for a range of users (5-30).

Incremental Users - The model multiplies the number of incremental users by the Average Revenue Per User (ARPU) to calculate a \$/month figure.

CUSTOMER VALUE

Subsidization - By including a % figure, the user can assess the impact on the payback of cost sharing arrangements with the customer. This would simulate the carrier underwriting a % of the initial cost by either selling the SpotCell to the customer at a reduced rate or billing the customer a one-time service improvement charge.

Service Assurance Option - The user can enter a monthly amount they would charge the customer on a per user basis for providing improved in-building coverage with a view towards recovering all or a portion of the cost of the SpotCell.

COST SAVINGS & AVOIDANCE

Per user costs avoided - The user can input a \$/user cost that will be avoided by improving in-building coverage. Examples of these costs include not having to provide free handset upgrades or one month free service upon contract renewal.

One-time cost savings - This allows the user to input a lump sum figure to address cost savings (e.g., lower equipment cost of a SpotCell relative to an alternate solution) or other cost factors such as the customer goodwill associated with resolving their problem, retention value of the customer.

TYPICAL SCENARIOS

Revenue Stimulation -Base the decision to deploy a SpotCell solely on the revenues generated through the increased usage by existing customers and the addition of new customers once the in-building solution has been deployed. In this case the % subsidization of initial investment, Service assurance option & one-time costs would be set to zero.

Unused Minutes - Here the assumption is that the customer has unused minutes in their monthly plan and the stimulation would not generate new minutes. In this scenario the payback would be driven primarily by the addition of new users in combination with one-time costs avoided by fixing the in-building problem. For example securing additional users or not offering one month free to the customer upon them renewing their contract. This scenario requires the user to set the minute stimulation factors to zero.

Full Meal Deal - This scenario builds on the Revenue Stimulation scenario by including cost avoided and/or cost savings to determine the payback.

Customer Value - This scenario builds on all of the previous scenarios and addresses the case where the carrier recognizes the value of the customer by entering into a cost sharing arrangement with the customer by including either an up front subsidy or a monthly charge.



Appendix B – Baseline revenue stimulation scenario

SpotCell Payback Business Case

Inputs	
# of SpotCells at the location	1
SpotCell cost (\$/unit)	\$2,500.00
Time to install a SpotCell (hr)	1
Installation labour rate (\$/hr)	\$50.00
Current minutes of use (min/month/user)	400
Current \$/min rate (\$/min)	\$0.21
Number of incremental users	1
% subsidization of initial investment	0%
Service assurance option (\$/month/user)	\$0.00
Average Revenue Per User (\$/mo/user)	\$60.00
One-time costs avoided (\$/user)	\$0.00
One-time costs avoided (\$)	\$0.00

Note: SpotCell cost assumes the carrier is buying in volume to justify this level of discount off list price of \$3,500.

Initial Investment	
SpotCell cost	\$2,500.00
Installation costs	\$50.00
Total initial investment	\$2,550.00

Minute stimulation factors	
	15.0%
	20.0%
	25.0%
	30.0%

Existing Users (#)	Payback With Stimulation Of			
	15%	20%	25%	30%
5	20.7	17.7	15.5	13.7
6	18.8	15.9	13.7	12.1
7	17.2	14.4	12.3	10.8
8	15.9	13.1	11.2	9.7
9	14.7	12.1	10.2	8.9
10	13.7	11.2	9.4	8.2
11	12.8	10.4	8.8	7.6
12	12.1	9.7	8.2	7.0
13	11.4	9.2	7.7	6.6
14	10.8	8.6	7.2	6.2
15	10.2	8.2	6.8	5.8
16	9.7	7.8	6.4	5.5
17	9.3	7.4	6.1	5.2
18	8.9	7.0	5.8	5.0
19	8.5	6.7	5.6	4.7
20	8.2	6.4	5.3	4.5
21	7.9	6.2	5.1	4.3
22	7.6	5.9	4.9	4.2
23	7.3	5.7	4.7	4.0
24	7.0	5.5	4.5	3.8
25	6.8	5.3	4.4	3.7
26	6.6	5.1	4.2	3.6
27	6.4	5.0	4.1	3.4
28	6.2	4.8	3.9	3.3
29	6.0	4.7	3.8	3.2
30	5.8	4.5	3.7	3.1

