



Hotspot Success Stories

Leading Pronto Hotspot
Figures and Facts



Hotspot Success Stories: Leading Pronto Hotspot Figures and Facts

Summary

This white paper provides quantitative examples of successful Pronto enabled Wi-Fi hotspots.

The primary objectives of the white paper are to:

1. Help current and prospective Pronto customers become familiar with some of the data sets available from the Pronto OSS, and the potential exploitation of such data in the daily business monitoring and management.
2. Assist prospective Pronto customers in their business planning process.
3. Establish some key qualitative and, as space permits, quantitative data on new and promising hotspot types.

Introduction

Given the recent phenomenon of Wi-Fi hotspots and the huge penetration of the WLAN technologies in all aspects of everyday life, the subject is widely tracked, commented and researched.

Unfortunately, this overwhelming amount of enthusiasm is rarely based on hotspot usage fundamentals. Key market indicators are widely up to speculation when actual measurement or estimation could have been the obvious way to arrive at conclusions.

Furthermore, on a daily basis “success stories” are pronounced or “disasters” predicted usually without any collaborating evidence.

It turns out that hardly any of this is necessary and the hotspot market can be characterized by the following:

- It is a valid business undertaking for the long haul in almost all types of public places.
- As in any other business, good planning and, especially in this case, suitable site selection are paramount.
- Ongoing monitoring of a few key parameters from the plethora supplied from the Pronto OSS allow for full visibility of the business buildup. Furthermore, these parameters help forecast demand for the next few months, and they can be at the basis of timely corrective action if such is required.

- While the Pronto OSS supports all types of conceivable pricing structures, the key decisions of course lie with the hotspot operators. Pricing has obviously to reflect the realities of the marketplace, the increased Wi-Fi equipped and aware population and the historical data on the hotspot usage.

- In many instances the operator may find it beneficial to use the detailed data supplied by the Pronto OSS for targeted promotional campaigns.

Only some examples of the possible uses of the Pronto OSS recorded data are given here. The operator may find that for his particular operational environment, monitoring other usage parameters as well can be highly beneficial.

Pronto Networks provides the data in this white paper in order to showcase a few of the hundreds of successful hotspots that it currently powers, and to help current and prospective clients to better plan and monitor their business. No claim or representation is made, that similar levels of performance will be attained in any specific situation, but the opinions expressed and the arguments made here by TeleAnalytics Inc. do not constitute any explicit or implicit encouragement for the adoption of any specific business strategy. Data presented in this white paper may have omitted a number of trivial practical details and others have been withheld in order to protect the confidentiality of operators and venue owners. Revenue Data are on an accrual basis in order to avoid any possible confusion originating from the variety of prepaid, postpaid and subscription pricing structures of different operators.

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Detailed and in many instances statistically significant analysis of the actual Hotspots Usage can be found in this year's edition of the

The Public Access WLAN FactBook 2004

which the company publishes annually from January 2002. This year's report, among others, contains the detailed analysis of hundreds of hotspot usage and traffic data sets obtained from a number of sources around the world.



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Hotels

A significant percentage of the Pronto enabled hotspots are in hotels. Usage rates are on the increase due to higher availability of Wi-Fi enabled devices and widespread Wi-Fi awareness in the business traveler segment. At the same time, the cost of the service is a miniscule percentage of the total business travel cost. Also in 2003, hotels of mixed clientele, or clientele dominated by the leisure traveler, started recording very significant usage uptake.

Hotels - Country Of Operation

Hotel hotspots are hardly a US phenomenon. At the end of 2001 when hotel hotspots in the country were covering less than 1% of about 4,500 four and five star hotels (luxury and business class), the same figure in Sweden was already at 54%. For the four and five stars establishments, there exists a principle of "geographical invariance of the clientele," which reflects the basic fact that the clientele in this type of hotel is fairly independent of the country where the hotel is located.

Many of the brightest success stories of operators powered by the Pronto OSS happen outside the US and in many cases the revenue per user can be 30-35% higher than in corresponding US hotels. This difference reflects the fact that the Wi-Fi 24 hour rate is normally connected to the room

rate, which for hotels belonging to the same chain is significantly higher outside the US. Furthermore, in this kind of location, the requirement for convenient broadband access to the Internet is at increased levels, given longer stays and significant time zone differences.

A Latin American case is illustrated in Figure 1. The hotel has only 60 rooms, and room pricing and type of clientele makes it much more of an "economy" than a business establishment. Notwithstanding the above, the hotel reached its today level of usage (about 160 guest-days per month) in six months. This service uptake when adjusted for an average 70% occupancy and also adjusted for weekday loading (as opposed to weekends) means that approximately 16.5% of the weekday registered guests are opting for Wi-Fi service. Quite a number of Wi-Fied US business hotels having in room wireline broadband Internet service would consider such a penetration very satisfactory.

Hotels - Type and Category

It used to be assumed that the only hotels that provided a safe investment for a Wi-Fi operator were four-five star ones and those that had a low percentage of tourists in their clientele.

While this assumption was not universally true even in the early days, today the "Wi-Fi adoption

Figure 1

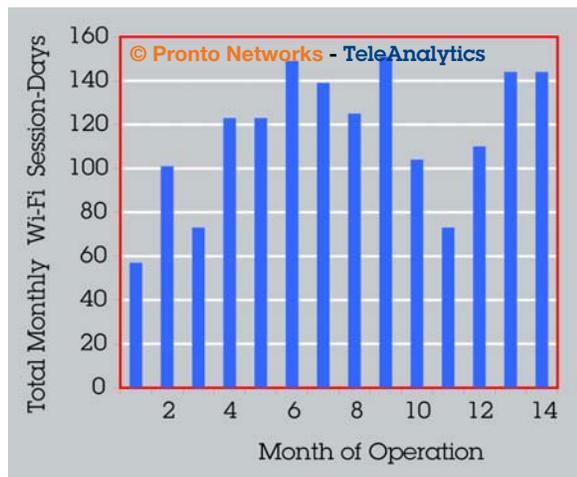
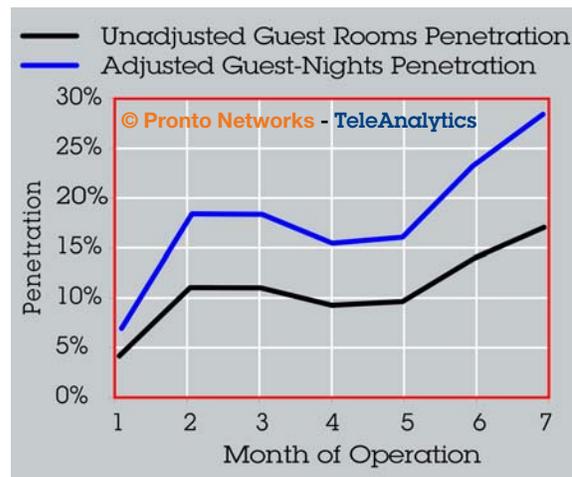


Figure 2





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gap" is many times harder to identify. The graph in Figure 2 illustrates how Wi-Fi success stories are common in economy hotels as well. This hotel in the southern US has just a few rooms short of 130 and an undiscounted room rate of \$89.

The unadjusted penetration rate shown in the graph is referring to the total number of user sessions in a month over the total number of room-nights per month, or (130X30) in this case.

Obviously such a metric reflects the service penetration to rooms, not to actual guests. Therefore after assuming an average 70% occupancy rate and the normal weighting of bookings between workdays and weekends, the adjusted penetration is the Wi-Fi penetration of "guest-nights."

In simpler terms it provides the percentage of registered guests that use the service. In this case, the Pronto enabled hotspot is already running very close to a 30% penetration rate of all week-day registered guests.

Hotels - Busy Day & Busy Hour

In Telephony the capacity of the system is designed to be able to withstand the voice demand under a worst-case scenario (busy hour), the usual assumption being that this is the hour slot just before noon.

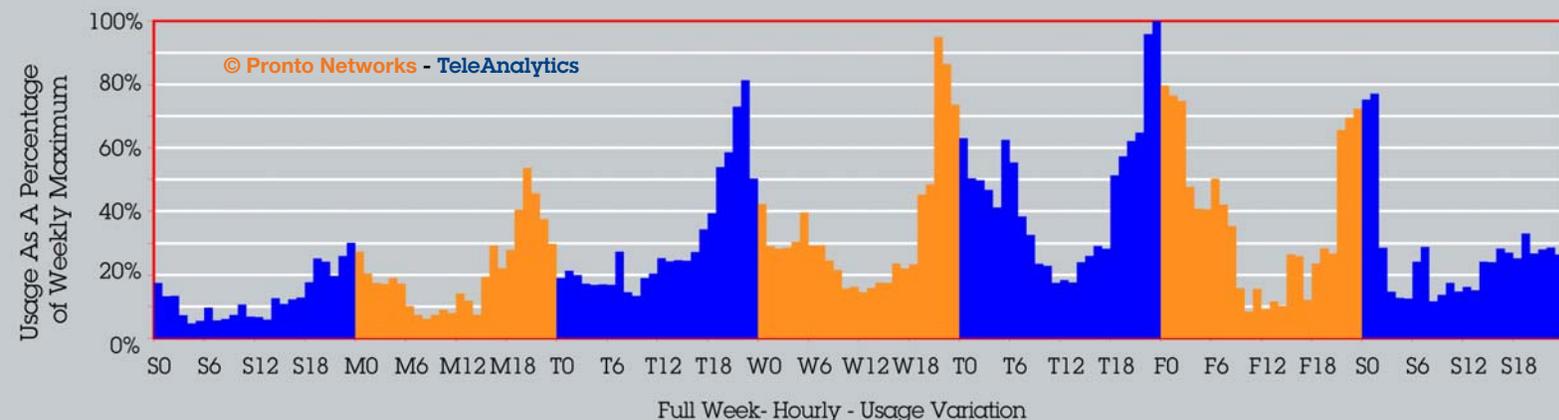
In IP networks that carry mainly data traffic, as is

currently the case for hotspots, the traffic is extremely bursty and the notion of a busy hour exists only in the average sense. If short term bursts cannot be accommodated by the backbone bandwidth (the RF part of the network is never the problem), the results can range from being completely undetectable by the end user to serious delays and complaints.

While year-round usage variability is a complex phenomenon, variability over the week is fairly uniform across hotels. With the exception of tourist resorts, the "busy day" for the rest of the hotels is most often on Thursdays and sometimes on Wednesdays (the graph in Figure 3 is for a hotel running at about 30 sessions a day). Obviously, the lightest days are Saturday and Sunday, with usage at 30-40% of maximum.

Finally, the usage variability over a single day can be seen in the same diagram, with the maximum usage normally happening around 9:00 PM. Traffic during night hours stays as high as 10-20% of maximum, since few customers have reasons to shut down their laptops (charges are almost universally on a 24 hour basis). There is also a certain amount of traffic consisting of "keep alive" messages, arriving emails, and of course some users working either late or early in the morning hours.

Figure 3





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Hotels - Session Duration & Traffic Volume

Although the Pronto OSS supports comprehensive billing capabilities, US hotel hotspot operators most often are basing their pricing on a 24 hour billing period. A reasonable average time to mark the start of the 24-hour billing period is 1:00 PM.

In any event, the mean total session duration is shown in Figure 4, and a mean value of 232 minutes per user (just short of 4 hours) has been estimated by averaging the relevant data from five hotels. For interested readers, in many cases the average login time is very well approximated by an exponential distribution, as could be expected.

Both session duration and download volume per user were seldom an issue in the early hotel hotspot days; every reasonable connection, from a good ADSL on upward, was sufficient. Increased 2003 usage levels, though, make some more careful considerations necessary.

Figure 5 helps explain the point. In this case the data are from a large Pronto powered hotel hotspot (400 rooms plus). The blue curve is the actual volume downloaded per day (Gbytes), while the white one is the 30-day (one month) moving average. As can be seen from both curves (but possibly more conclusively from the moving average one), the hotel started at an average daily download volume of approximately 0.4

Gbytes. In about six months though, an increase in the number of users drove the same figure to about 1 Gbyte. Daily usage peaks reached nearly 3.5 Gbytes.

Even at 3.5 Gbytes a day, if the traffic was completely uniform it would not amount to more than 30% of a T1 capacity. Given though that the IP traffic collected from hotspots is extremely bursty, this location, if it was to be provisioned by a single T1, would have resulted in fairly serious complaints in at least in 30-40 instances.

Bandwidth Monitoring & Management

Running out of backbone bandwidth would have been a welcomed event, if it always meant that usage increased beyond planned levels or that backbone link upgrades were trouble free and economical.

Broadband availability is still problematic even in developed countries, but bandwidth monitoring and management is required even when backbone links are relatively abundant and reasonably priced. This requirement among others originates from the well known fact in residential Internet provisioning, that 5% of users are usually responsible for 95% of the traffic.

In most Wi-Fi hotels things never get so bad, since the clientele seldom consists of teenagers

Figure 4

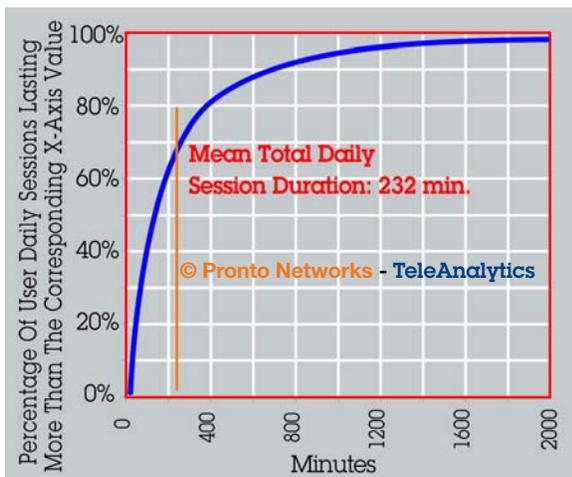
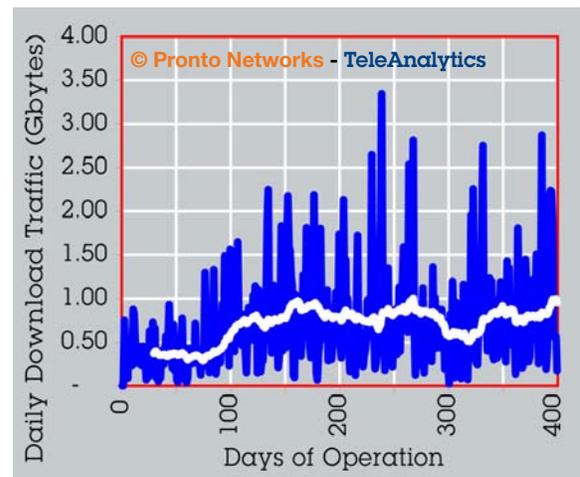


Figure 5





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who in a single night try to download every video clip on the Internet. There are some cases, though, where the total download per user is over one Gbyte in a 24 hour period.

Therefore, the operator has to have tools that perform:

1. Reliable original traffic dimensioning to detect early on suspicious sites that may run into bandwidth problems in the first few months of operations.
2. Reliable and high-resolution tools to detect increases in bandwidth requirements and to decide if they are transient (a convention in town), or persistent enough to warrant an upgrade in capacity.
3. Remote user level management capabilities. Upgrading to a higher capacity is usually not possible overnight and also costs money. Therefore guarding against "bandwidth abuse" needs to be implemented at least as a precautionary step.

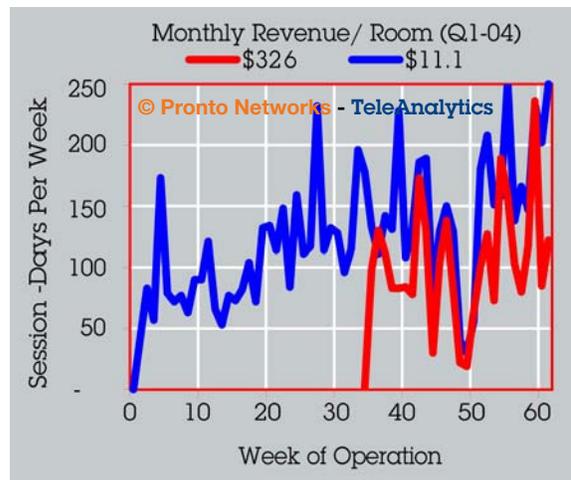
Pronto addresses all these requirements by a plethora of capabilities built in both the OSS and the Pronto Gateway, and supplies a multitude of hooks and/or tools to monitor and manage bandwidth down to the individual user level, if so desired.

Hotel Hotspot Service Revenue

Pronto powered hotel hotspots are generating serious revenue for the operator, with many operators estimated to be well over the break-even point on either an individual hotspot or company basis.

Figure 6 shows the weekly daily user sessions records for two US hotels, from start of operations till the end of March 2004. The revenue low around the 50th week is due to the 2003 holiday season and the following one to two weeks that hotel occupancy normally requires in order to recover to pre-holiday levels. The records, if week-to-week variations are smoothed out, show a very significant revenue climb and equally importantly

Figure 6



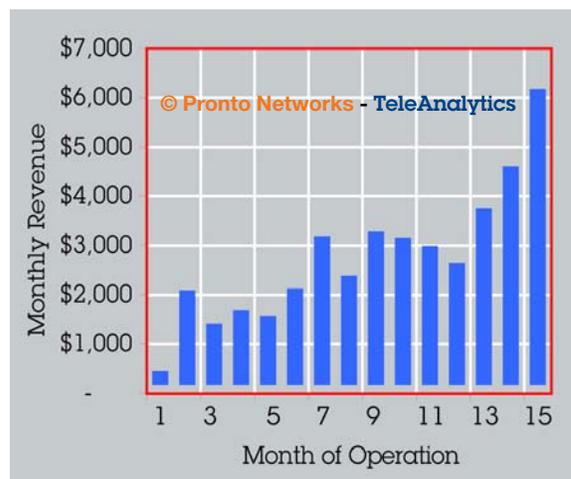
no signs of revenue saturation in sight.

Hotel hotspots are very serious revenue generators, and they ride the rapidly rising waves of broadband Internet penetration, Wi-Fi enabled terminal devices, and in the near future VoIP.

The maximization of revenue per hotel is a task that starts with location selection, but reliable and trouble/complaint free operations and close monitoring of the hotspot business development enabled by the Pronto OSS are key to success.

The table on the next page summarizes some of the revenue fundamentals. for the two hotels

Figure 6-A





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mentioned above.

Hotel A enjoyed a phenomenal 181% average revenue increase in a single year (Q1-03 to Q1-04). Improved uptake of Wi-Fi across all market segments drove Hotel B to exceed the average revenue attained in Q1-04 in only 4 weeks from the start. For Hotel A that basically started one year earlier and operated in conditions of reduced demand than the ones currently prevailing, the same milestone was reached in 27 weeks.

On the other hand, Hotel B due to the nature of its clientele and better Wi-Fi coverage enjoys a \$32.60 monthly revenue per room, while the same figure stands at \$11.10 for Hotel A. The better performance of Hotel B on a per room basis is clear, notwithstanding the fact that Hotel A is in a higher hotel class than Hotel B (a difference of 208% in daily non-discounted rates).

Figure 6-A shows the revenue buildup for Hotel A.

	Hotel A	Hotel B
Country	US	US
Room Rate	208%	100%
Number of Rooms	340%	100%
Monthly Rev./ Room (Q1-04)	\$11.10	\$ 32.60
Monthly. Rev / Room (Q1-03)	\$ 6.10	N/A
Annual Rev. Increase	181%	N/A
Weeks to Exceed 04 Average	27	4



Coffee Shop Hotspots

Cafe hotspots started appearing in California as early as 1999, and in some countries like Austria grew to the point of mass phenomena. In other cases, like the Nordic Countries, the deployments are dominated by traveling businessperson oriented hotspots. In Korea, the saturation deployments meant that practically all locations of even questionable value have been attempted.

Cafe hotspots do not generally enjoy the “invariance of the clientele” that basically dominates the hotel and airport hotspot market segments. The user uptake and consequently revenue is greatly dependent on cultural habits of the country, the locality of the café, the type of clientele, climate and others.

On the CAPEX side, this type of hotspot shares with the related category of bars and restaurants the lowest cost per venue, usually a single Pronto Hotspot Controller or Pronto compatible WLAN hardware. Furthermore, beyond general business expenses and hotspot management costs, the only running cost is the cost of an ADSL line. In a sense, cafe hotspots when successful can be real moneymakers, and unless very poor business judgment is shown they can break even at very anemic levels of usage.

A certain amount of media noise has been made that this type of hotspot is good only for the venue owner and not the operator, or that cafes that offer free Wi-Fi will kill the “for a fee” hotspots. Things are hardly at the point where oversimplifications like the one briefly mentioned above may be considered conclusive. Some points to consider:

1. The “location once more owns the customer,” and not many users are willing to walk a few blocks for a free Wi-Fi hotspot, or to miss their favorite sandwich or the company of their friends.
2. Most often problems arise only out of a combination of bad location selection and unreasonable pricing.



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3. While the full potential is still not completely clear, these type of venues may prove key to the upcoming VoWLAN wars and consumer oriented VoIP.

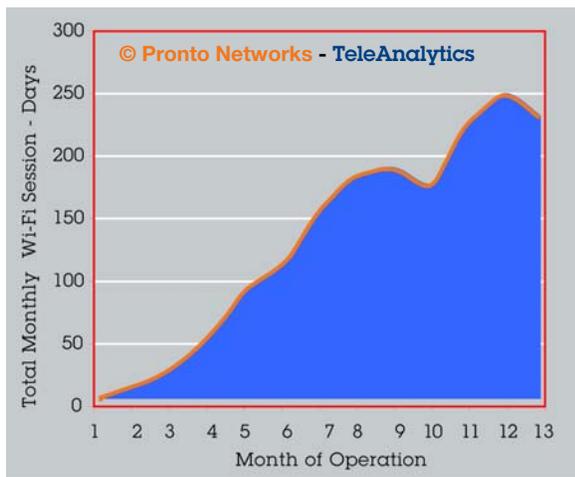
Pronto enabled coffee shop hotspots are provided with the same carrier grade operations and business management tools as much higher visibility hotspots.

Coffee Shops - Wi-Fi Service Adoption

Claims sometimes are made of coffee shop hotspots, touting several tens of different user sessions per day. While whenever these cases exist they are definitely welcomed by their operators, coffee hotspots can be profitable with as few as tens of sessions a week, not a day. Figure 7 shows the service adoption for a successful Pronto powered East Coast coffee hotspot. The build-up of user traffic was fairly quick with about 20 new sessions gained per month, and at the time of this study is running at well over 300 session-days per month.

It appears that cafe hotspots near educational institutions are doing best, since the majority of patrons own the necessary terminal equipment (mainly Wi-Fi equipped laptops) and students can afford to spend more time in a cafe than for instance office workers.

Figure 7



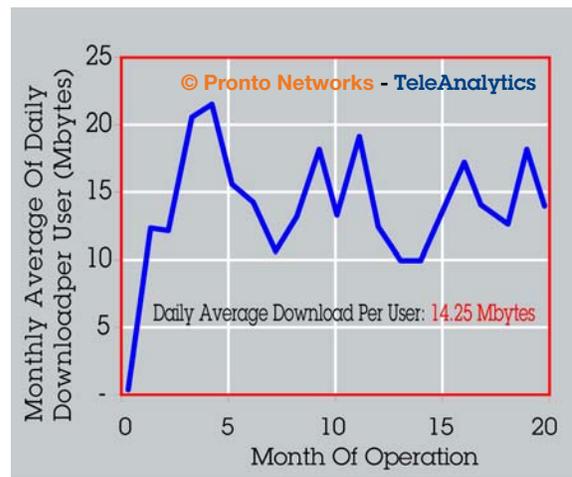
Coffee Shops - User Duration and Traffic

Figure 8 shows the average daily download volume per user for a Pronto enabled café hotspot, averaged over successive months of operations. As expected, download volume per user is not a common issue. At current usage levels and while no significant stream data traffic develops (voice, video), the widely used ADSL links are adequate. An average of 14.25 Mbytes daily volume of download traffic per user has been calculated for this particular hotspot, and a value of 25 Mbytes appears reasonable to be used for a priori planning purposes.

On the other hand, the situation is likely to change under the expected in the near and medium term inroads of VoWLAN and consumer oriented VoIP. These changes will become necessary not so much by the bandwidth requirements of digitized voice (usually of the order of 16 Kbit/sec), but by the requirement to enforce a certain amount of QoS on the wireline broadband feed. Furthermore, ADSL is a credible solution, as long as traffic remains highly asymmetric, a condition partially only met in voice dominated WLANs.

If for the time being the download volume per user is of secondary importance in a café hotspot, the same does not apply to the total daily user session duration.

Figure 8





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Offering Wi-Fi at a cafe hotspot can increase significantly the average time that a patron spends in the venue, but it can be hardly expected to fully transform it. A quick coffee stop for nearby office workers who mostly pop in to pick up food and beverages to take back with them, would seldom be transformed just because it was Wi-Fi provisioned. Furthermore, the venue owner may well determine that such an increase of the average time a patron spends on the premises is not to the best of his overall business interests.

The situation shown for the Wi-Fi session duration per user in Figure 9 is indicative of a successful hotspot. It does not mean though that an "optimal profile" exists, or that wide variability of this parameter cannot be present among successful cafe hotspots.

Coffee Shop Hotspots Rush Hour

It was found that the peak usage in coffee shops happens between 11:00 AM and 5:00 PM, with the 2:00 PM hour slot the most common. This maximum usage does not necessarily coincide with the maximum number of patrons in the venue, and Wi-Fi can be credited with keeping customers on premises after the lunch time rush hour. Figure 10 is based on Thursdays usage data for a Pronto enabled popular hotspot, averaged over the first quarter of 2004. It does show a significant amount of usage from early in the morning

till closing time.

Coffee Shop Hotspots Customer Acquisition

Obviously, the bottom line for a hotspot is the revenue generated as compared to CAPEX and OPEX, but monitoring new user buildup can be of significant importance to the operator:

1. This indicator is usually a reliable tool to help predict the usage levels to be attained 1-6 months in the future.
2. It allows in the critical customer acquisition phase to establish the pattern of products used by the customer (daily pass, hourly charge and others).
3. This information, depending on the prevailing privacy laws and marketing strategy of the operator, can be used for highly targeted inexpensive marketing campaigns. The objective of these campaigns is usually to increase the usage level of new users or to attract them to a subscription based service offering.

This indicator and a marketing platform supporting it is relevant to most types of hotspots, but especially important for cafes and similar locations which have to depend on or build a permanent or semi permanent clientele.

Figure 9

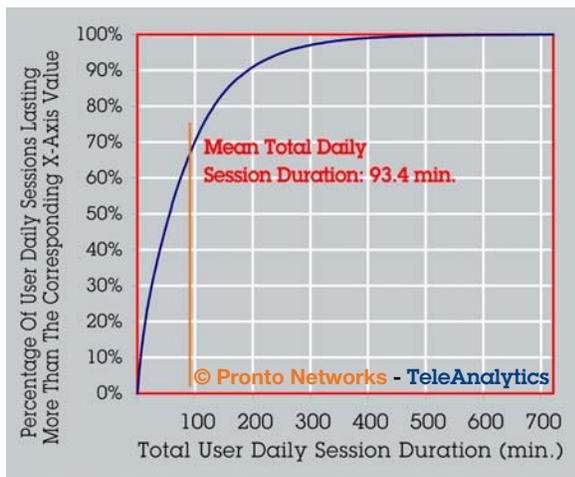
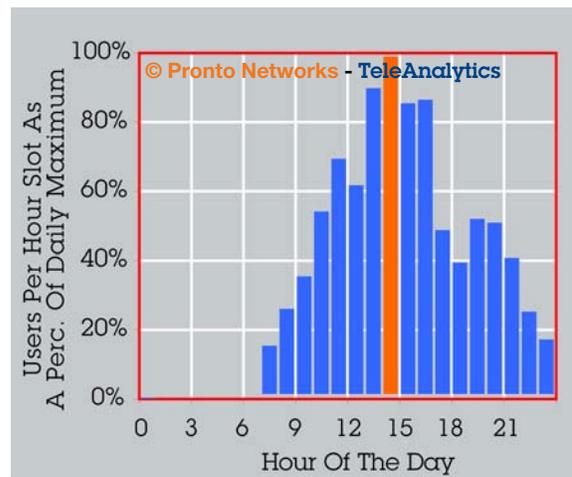


Figure 10





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This insight, fully supported by the data of the Pronto OSS, is illustrated in Figure 11 with data from a Pronto powered café hotspot.

In this case, after a “get to know you” period that lasted a few months after the Wi-Fi service was available, new customers that tried or adopted the service were attracted at a rate of more than 20 per month, which predicted the high usage levels enjoyed today several months before they were witnessed.

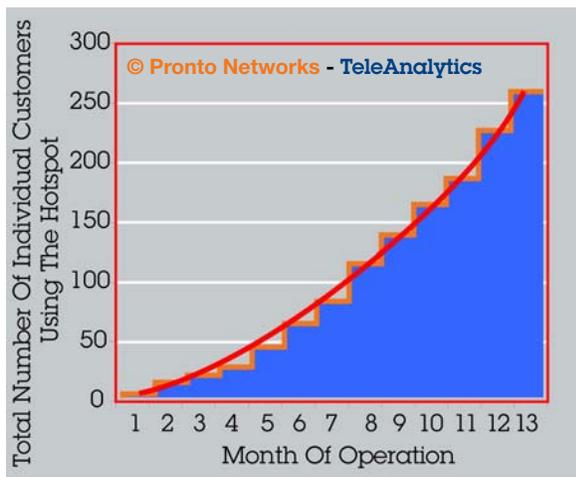
Coffee Shop Hotspot Usage Distribution

An ideal café hotspot should in general have:

1. A wide customer basis, usually of the order of several hundred patrons per year even if most of them use the service infrequently.
2. A solid basis of recurrent users, which are prone to opt for a subscription offering, thereby establishing a minimum monthly revenue level.
3. Enough one-off users, which under today’s prevailing price structures are usually more profitable per session than subscription based users.

Clearly such an ideal situation has too much to do with the venue selection, but the available Pronto

Figure 11



customer profile data captured during registration allow for low cost, email campaigns to improve the customer mix in terms of revenue and indirectly helps customer retention. A good mix of customer types is shown in Figure 12 with data from a Pronto enabled café hotspot over a period of 12 months.

Coffee Shop Hotspot Revenue Generation

Given the CAPEX required, and assuming careful selection of the venue, realistic pricing, close monitoring and targeted marketing, the coffee shop hotspot segment can be fairly lucrative. Figure 13 shows an example.

Figure 12

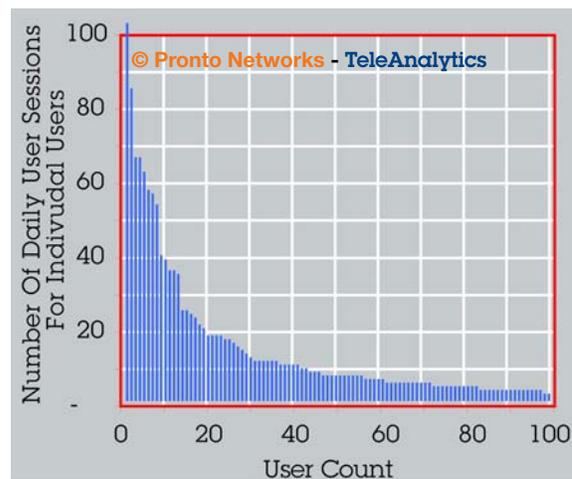
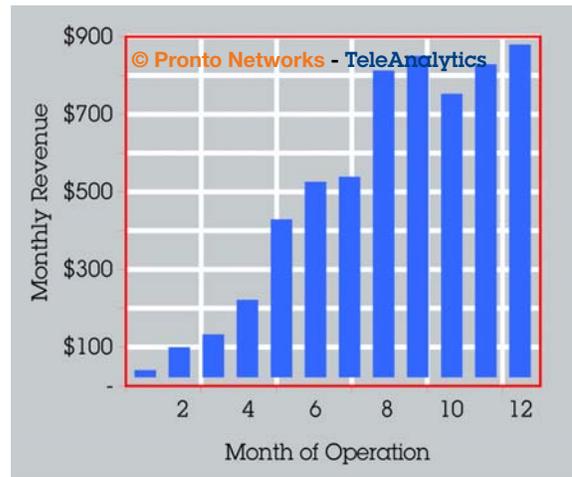


Figure 13





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Apartment Buildings (MDUs) Hotspots

ISPs were attracted to MDUs (Multi-Dwelling Units) as early as 1995-96. The business cases were basically based on:

1. The residential Internet traffic, mainly consisting from individual WWW surfing, is highly multiplexable.
2. By bringing a suitable broadband link (T1 or SDSL in most cases) to the MDU the operator could possibly hope to capitalize on the nature of the Internet traffic and supply 20-50 "T1" in building connections, out of a single one connecting the MDU to the backbone.

In the multiple attempts made in 1997-2001 to build such alternatives to Cable and ADSL, the key problem was the cost and many times the regulatory or logistical complexity of the in-building broadband distribution. It was simple enough to bring broadband to the wiring closet in the basement, but another issue altogether to distribute it to individual apartments. Traditional delivery of the broadband through Broadband Wireless Access did not help either, since the delivery was still to the rooftop, not to the apartments.

Most attempts to build an industry out of Internet delivery to MDUs were made on the basis of wire-line short distance technologies, most commonly

the Cisco pioneered LRE (Long Range Internet) which is capable of providing broadband over standard telephone grade wiring.

Attempts though were made to solve the problem wirelessly mainly by illuminating the usually large windows found in MDUs. These attempts were not successful either since the frequencies used (millimeter wave part of the spectrum) were having poor performance in penetrating glass with even low levels of lead, curtains and all other types of even minimal obstructions to a clean LOS (Line of Sight) to the client computer.

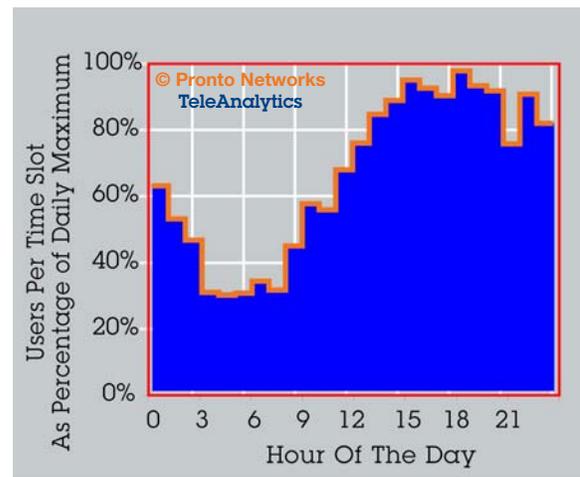
The popularity of Wi-Fi resurrected the concept of the illumination of buildings with broadband from the outside. Vivato introduced at the end of 2002 a phased array antenna based Wi-Fi AP, while at the end of 2002 BelAir Networks marketed their mesh network AP for similar applications. Evaluation of either approach is too lengthy to be included here.

More widely applicable approaches are usually of an "opportunistic" nature and are based on standard Wi-Fi gear. Depending on construction materials, it is not necessary for the Wi-Fi coverage provided by a single AP to exhaust itself inside a single apartment. Enough RF power may exist in nearby apartments or "escape" through the windows and illuminate other apartments or common areas.

Figure 14



Figure 15





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Such approaches may sometimes lower broadband distribution cost even in high-rise MDUs, but their applicability to 1-3 floor apartment buildings is more common. Furthermore, since the end delivery to the client device is through Wi-Fi and not any kind of wires, the proposition is even more appealing.

Finally an interesting improvement to the user experience in the broadband MDU provisioning comes as a byproduct of the Wi-Fi approach. Since a typical MDU installation uses an in-Premises Access Gateway to drive the Wi-Fi APs, precise bandwidth shaping/management per user can be easily accomplished. Therefore no single teenager (or many for that manner) can monopolize the bandwidth by sampling every video clip on the Internet. Not all alternative access methods can claim the same respect for every single user experience.

Pronto-Powered MDU Hotspots

Pronto powers many of these new generation MDU installations, and the rather phenomenal performance of one of them is shown in Figure 14.

The three floor MDU has 70 rental units and ample outdoor space including a pool. As shown in Figure 14, a Pronto powered operator managed to build a very respectable clientele in only nine months. At the time of writing, the “hotspot” was

running at more than 450 session-days per month.

The penetration attained can be better visualized by putting it in context of the general Internet provisioning in the US. Within three months, permanent subscriber penetration was already hovering around 37% (Figure 14), which is clearly **impressive**, and of course shows obvious signs of saturation at a point well above the national average.

Pronto can work with the MDU operator to accommodate a plethora of deployment, provisioning and billing options that can maximize flexibility and profitability in any given case.

Session Statistics

As expected, session statistics for MDU hotspots are similar to other types of residential Internet delivery. Figure 15 shows that activity exists around the clock with the after 2:00 AM hours showing the lowest level. This activity is generally 30-40% of the maximum, as can be expected during the late evening hours.

Similar to the general residential Internet case is the situation for the download volume per user. In this case it averages approximately 51.9 Mbytes over the 9 months of operation as shown in Figure 16.

Finally, the situation is similar for the daily session duration found in residential markets as well,

Figure 16

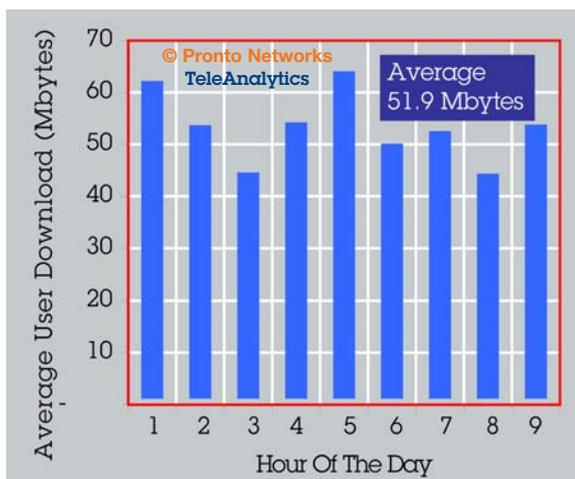
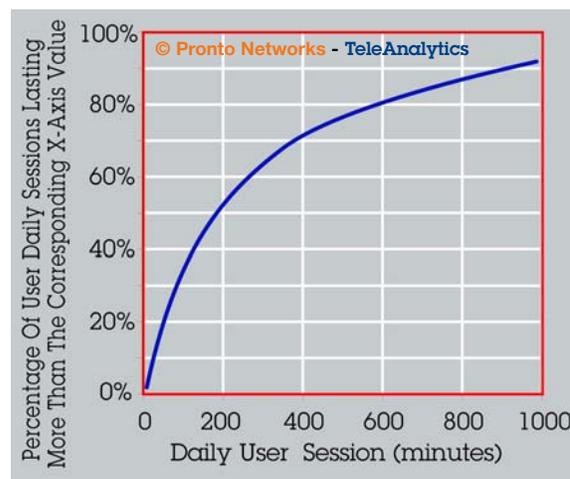


Figure 17





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where sessions are long and sometimes span whole days. This can be seen in Figure 17 where approximately 8% of the sessions are longer than 1000 minutes, a case of course radically different from cafes and other types of hotspot categories where the user population is much more transient.

Customer Acquisition and Users Distribution

In this MDU the customer acquisition phase was very fast, with most of it completed by the first six months as shown in Figure 18. The reasons are fairly simple. Neither the broadband, nor the Wi-Fi propositions need any more introductions, and the availability of suitably equipped PCs is either ensured during manufacturing or easily and inexpensively done in the aftermarket. Therefore, after some trials on the reliability of the service, its performance and understanding of the pricing structures, adoption was almost en bloc. Clearly for this level of penetration the saturation level is in sight.

As expected, distribution of user sessions is quite different than others shown for other types of hotspots.

User population in this case is permanent and therefore also limited. Therefore, a fairly clear threshold exists before the thirtieth in terms of usage tenant (Figure 19). Before this threshold, usage ranges from 5-7 days a week on a subscription basis to 2-3 per month. After this threshold,

the usage rapidly drops to insignificant levels reflecting the small number of transient users in this hotspot category.

MDU Revenue Buildup

Revenue buildup followed the rapid pace of service adoption, with the monthly revenue of many users stabilizing to the monthly subscription rate they opted for. Revenue, almost total subscription based, in only three months stabilized at just less than \$800 a month; a non trivial achievement given only 70 apartments in the MDU and a low monthly subscription rate.

Figure 18

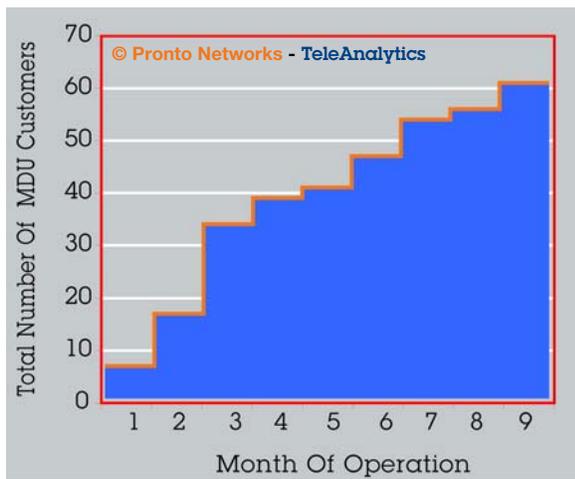


Figure 19

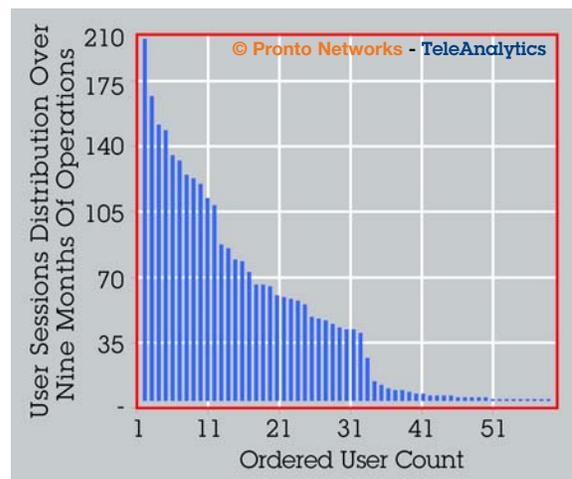
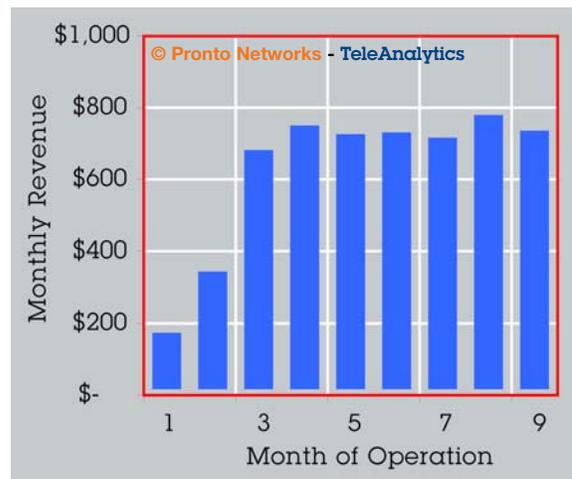


Figure 20





Hotspot Success Stories: Leading Pronto Hotspot Figures and Facts

Outdoor Installations

The potential for outdoor hotspots became evident during the course of 2003. The Wi-Fi technology can be leveraged to provide coverage of whole towns at data rates that no other wireless technology can even come close.

Furthermore, in these so-called Community Networks customers do not need to be in any given location to be covered. The coverage can economically be provided to businesses, residencies, and street parks providing a “wireless sea of broadband connectivity” that covers both stationary and mobile users provided the vehicular speed do not reach freeway levels.

Finally, the introduction of inexpensive VoWLAN handsets, provided that the WLAN infrastructure is voice grade, opens the door for the operator to offer in the near future limited-area mobile voice services as well.

Technologically these large-scale hotspots can cover several square miles and, provided that the ubiquity of coverage is somewhat relaxed, they are economical even for cities of more than 200,000 inhabitants (Sweden).

The major cost for these installations is not the cost of the active components (APs, routers, etc.), but the cost of:

1. Suitable placement of the APs
2. Supply of broadband to the APs
3. Supply of electrical power to the APs

Given the above considerations, large scale outdoor Wi-Fi projects have to follow different architectural and business principals than the ones dominating the indoor environment.

1. The role that the premises owner plays in the indoor case is replaced in the outdoors by public or semipublic entities that can commit the required rights to locate the APs in convenient and low cost locations. Usually the City Authorities are the ones to sponsor the operator, and this

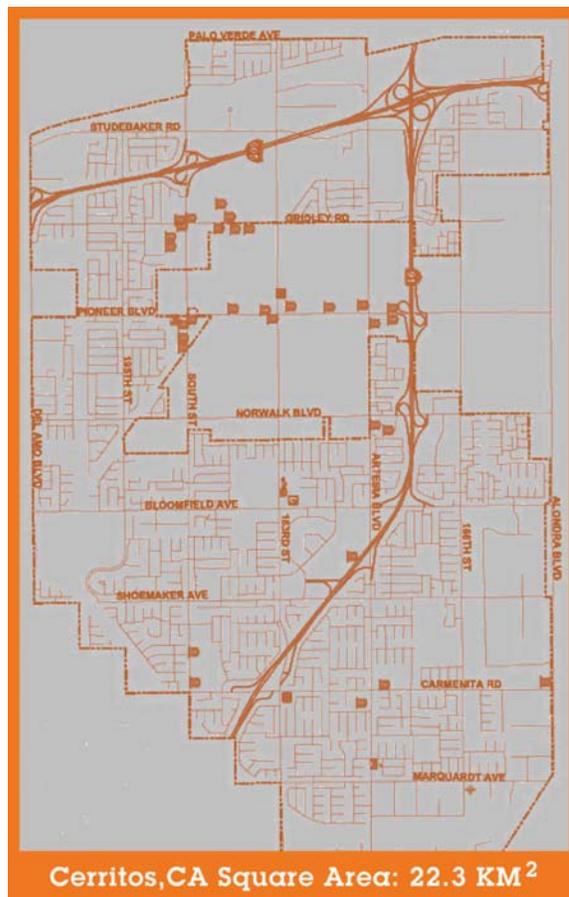
arrangement typically provides for the location of the APs on utility poles. In other cases the sponsors have been regional governments, electrical utilities, or seaports.

2. The location of the APs on utility poles or similar does not only ensure low cost AP placement and good RF capabilities, but also almost always low cost access to electricity.

3. In this approach the remaining link is the distribution of broadband. The almost universal way to tackle this remaining issue is by employing Wi-Fi itself in a “wireless backbone network” role.

The equipment used in large outdoor installations

Figure 21





Hotspot Success Stories: Leading Pronto Hotspot Figures and Facts

belongs to two major groups that reflect two major existing architectures:

1. Standard off-the-shelf Wi-Fi gear is used to implement both the part of the network that communicates to the end user devices (edge network) and the backbone transport. In such a case every “node” of the network is a weatherproof box that depending on its position in the overall network can contain more than one Wi-Fi radio (usually in different bands), external antennas and some low cost routers that control the flow of data between the edge and the backbone network.
2. Mesh networks are up to a point purpose-built assemblies of the above components, with suitable antennas integrated in the housing boxes. Depending on the manufacturer, routing capabilities that allow for the “self-healing” of the network and the optimization of the traffic flow may be supported.

The sponsor of a Community Network is quite often its first customer as well, especially if it is the city hall. This way the city can avoid cellular charges for all kinds of city maintenance personnel. Further down the road Community Networks may be called to increasingly carry emergency services traffic.

Pronto Outdoor Installations

Pronto has been involved in scores of outdoor hotspots or so called “hotzone” projects. Some of these projects covering Community Networks, marinas and RV parks are briefly described here.

Community Networks - Cerritos California

In early 2004 Airmesh Communications commissioned one of the biggest Multiservice Community Networks in Cerritos, a city in the Los Angeles basin. A mesh architecture was selected for this high visibility project with Tropos Networks supplying 130 of its mesh APs. Pronto Networks provided the total OSS solution for this project covering approximately 51,000 inhabitants and an area

of 22.3 square kilometers. Pricing of the service is shown in the next table.

Plan	Data Rate Down/Up	Price
Hourly	512/256 Kbits/sec	\$ 4.99
Daily	512/256 Kbits/sec	\$ 8.99
Weekly	512/256 Kbits/sec	\$ 17.99
Monthly	512/256 Kbits/sec	\$ 29.99
Business Mon.	1/1 Mbits/sec	\$ 249.99

Figure 23

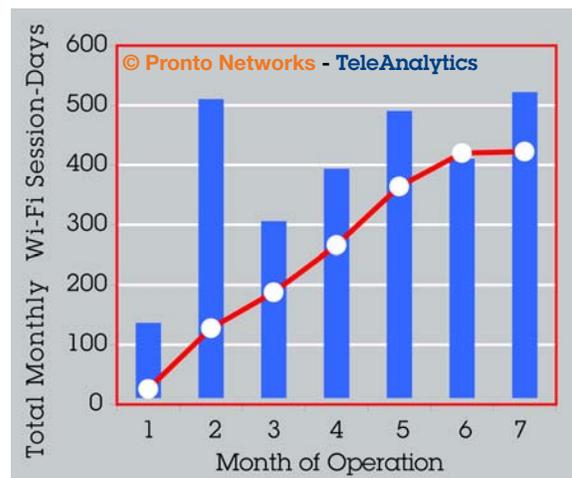
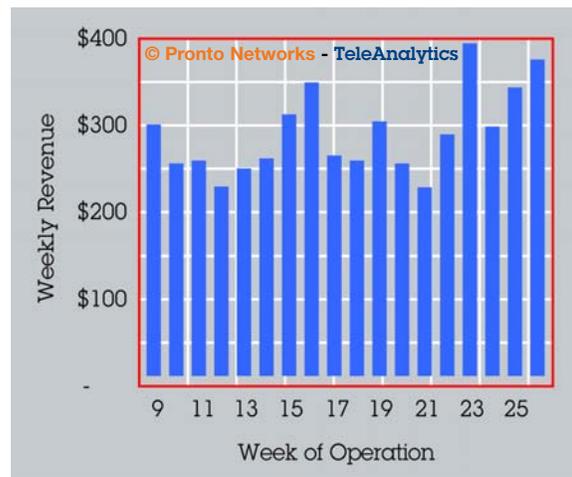


Figure 24





Hotspot Success Stories: Leading Pronto Hotspot Figures and Facts

The citywide network was built with the full support of the municipal authorities on a utility philosophy and it will be used by more than one operator. Usage is targeted at both business and residential users and also open air or in-building hotspot customers.

Roaming among APs is seamless in the sense that no reauthorization is required. Given the early 2004 commissioning, usage statistics are still very preliminary.

RV Parks

Among the scores of medium and large-scale outdoor hotzones, Pronto powers a large number of RV park hotspots/hotzones. Many of the hotspots in this category are already showing significant service uptake. Some of the relevant figures and statistics for RV park hotzones are briefly summarized below.

RV Parks - Service Uptake

The Wi-Fi service uptake for a US RV park is shown in Figure 23 along with a 5 period moving average smoothing function. In the seven short months of operations this RV park was gaining more than 50 session-days per month.

The US census lists more than 7,500 RV parks and campgrounds, but the number rises to approximately 16,000 if mobile home parks and sim-

ilar installations are considered and the total number of people living permanently in these facilities is estimated at over 1,000,000. In this very sizable market (which is very vibrant in Europe as well) the Wi-Fi enabled sites still represent a miniscule percentage of total, notwithstanding the hundreds of sites that came online in 2003.

RV Parks - Revenue Buildup

Revenue buildup for an RV park is shown in Figure 24.

Marinas

A few marinas in the Great Lakes region have been provisioned for “broadband to the boat” by BWA equipment as early as 1999. These early installations have been converted to Wi-Fi, and quite a good density developed across both US coastlines. In Europe, the UK and Netherlands are leading the way, but clearly the Mediterranean is also a major market.

Marinas - Service & Revenue Uptake

The Wi-Fi service uptake for a Pronto powered US marina is shown in Figure 25, along with a 5 period moving average smoothing function. Significantly better figures have been attained in other locations.

The revenue buildup for a Pronto enabled marina Wi-Fi hotzone is shown in Figure 26.

Figure 25

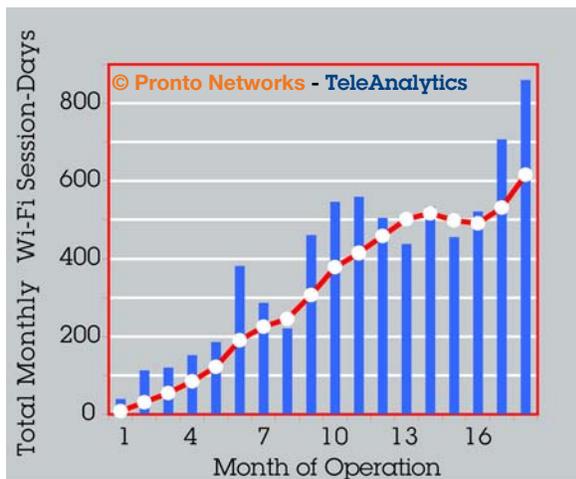
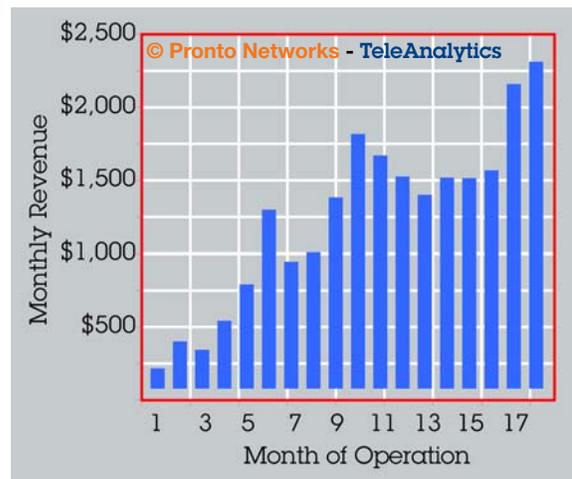


Figure 26





Hotspot Success Stories: Leading Pronto Hotspot Figures and Facts

Pronto Networks

Pronto Networks provides carrier-class Operations Support Systems (OSS) that enable network operators to deploy and manage large-scale public hotspot networks. The company's software handles provisioning, configuration, authentication, access control, security, pre-paid and post-paid billing, and roaming settlement for large public WLAN networks, in addition to remotely managing and updating multi-vendor hardware and Wi-Fi switches. Pronto Networks is funded by BV Capital, Draper Fisher Jurvetson and the Intel Communications Fund. In 2003, Pronto Networks received several awards including *Wired Magazine's* Top 25 Wi-Fi Companies to Watch, the AlwaysOn list of Top 100 Private Companies, and *Computerworld's* Innovative Technology Awards.

Pronto has its headquarters in Pleasanton, CA and offices in Bangalore, India and London, UK.

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