



Large Scale Hotspots

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Concourse Communications

A Boingo Wireless Company

Concourse Communications - At a Glance

- Wireless neutral-host provider since 1997 with 103 employees and offices in Chicago, Dallas, New York and Los Angeles.
- Industry leader in turnkey cellular/Wi-Fi with 30% market share of total 1.17M enplanements daily across 12 airports.
- Roaming relationships with top WISPs covering over 70 airports in North America and over 60,000 hotspots worldwide.
- Focused in generating non-airline revenue via neutral-host model, always adding value to ALL airport stakeholders.

Concourse Managed Airports

Location	Cellular Network	Wi-Fi
Newark Liberty Airport – all public areas	✓	✓
JFK International Airport – Terminals 1,4,6,8 and 9	✓	✓
LaGuardia: Central and US Airways Terminal	✓	✓
Detroit Metro Airport – McNamara, L.C. Smith Terminals	✓	✓
Minneapolis/St. Paul Airport – Lindbergh and Humphrey	✓	✓
Chicago O'Hare International Airport – all areas	✓	✓
Chicago Midway Airport – all areas	✓	✓
Nashville International Airport – all public areas		✓
Oklahoma City Intl. Airport – all areas		✓
Ottawa International Airport – all areas		✓
Greater Toronto Airport Authority – T1		✓
Baltimore-Washington International Airport – BAA		✓



Be Net Neutral



- Create turnkey support for transaction-based users with predominant local branding in each location
- Allows for seamless integration of WISPs
- Shows dedication to serve passengers, airport authority, airlines and concessionaires
- It gives you a business model that maximizes network use and income

Overview

- Solving the problem
- Network Design Approach
- Vendor Relationships
- Hotspot System Design
- Security
- AAA Services

Solving the Problem

- Designing a hotspot system that supports over 100,000 sessions a month
- Building a NOC that can support the hundreds of devices being monitored and scale it with growth
- Offer 24/7 customer support
- Offer flexible billing options & monthly accounts
- Be reliable, but cost effective

Network Design Approach

- Overlapping wireless coverage in all designated areas
- Support for 802.11g/b with VLAN, VPN and QoS/CoS
- VoIP capability w/ fast roaming and packet prioritization
- Centrally managed and redundant AAA and mobile application platform
- Transparent integration for seamless roaming
- Robust tools for security, network operations and maintenance

Vendor Relationships

- Cisco (Core switches & AP's)
- Microsoft (Server OS & Back Office Systems)
- Mikrotik (Hotspot Gateways, AP's & Mesh Nodes)
- Supermicro & IBM (Server Hardware)
- Net Near U (Day Pass Billing / Technical Support)

Hotspot System Design

- Reliable hardware from proven vendors
- 802.11a/g & WMM (QoS, VoIP, Power Control)
- Power over Ethernet (PoE) is your friend!
- Bandwidth – need to scale, plan for at least 3 to 30Mbps (DSL Backup)
- Cisco Access Points (1200 / 1131)
- VLAN's on switch network to partition traffic by SSID
- Mikrotik Mesh Nodes using WDS

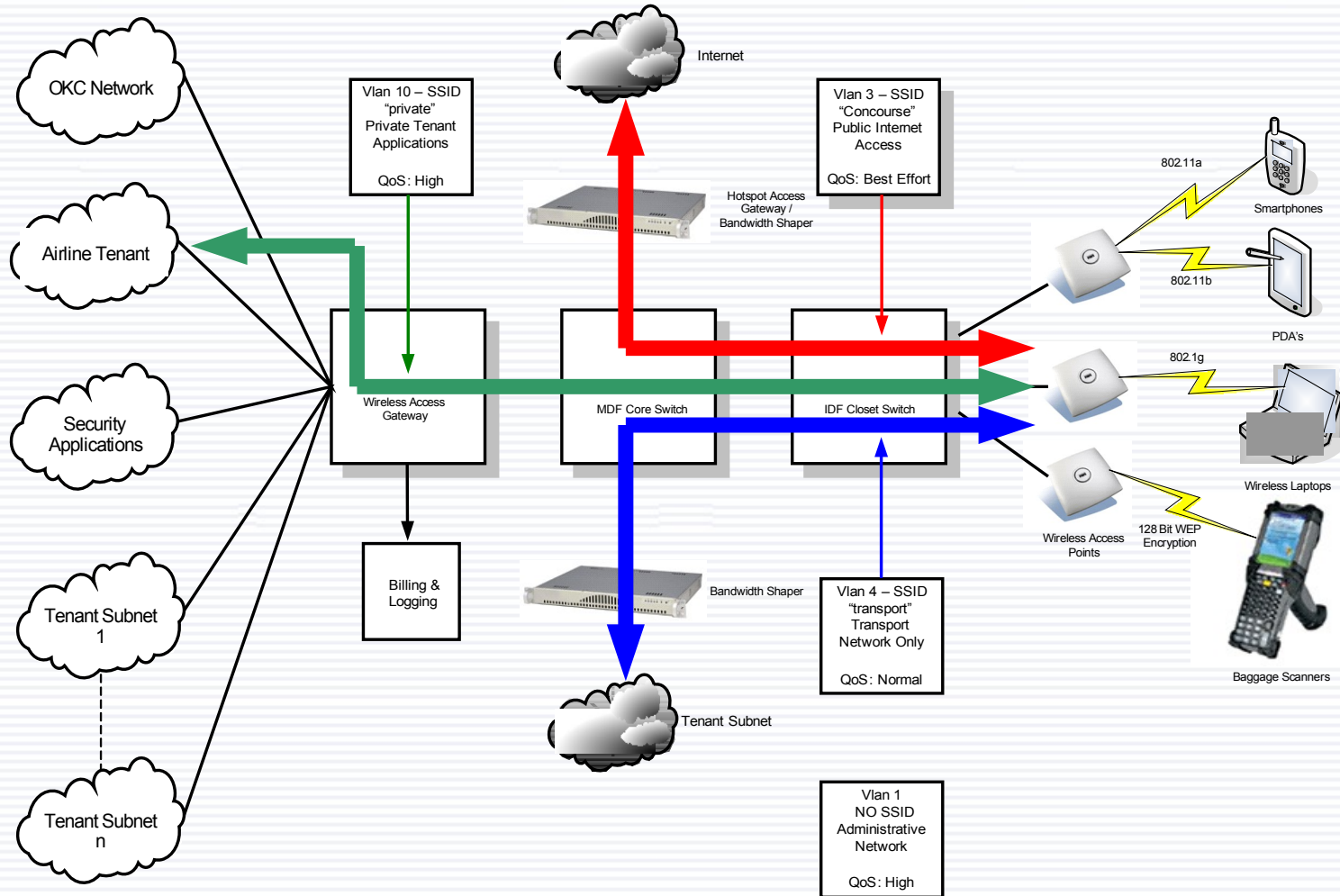
Why Mikrotik?

- Very affordable, Linux based operating system (\$50-\$150 / license)
- Scales based on amount of server hardware
- Almost unlimited users, over 200+ per system
- VLAN Support, Firewall, P2P Filtering, PCQ Bandwidth Shaping & QoS
- Web Proxy & Universal Client
- WISPr Compliant – XML Embedded Tags
- Ease of use and easy to train technical support

Why SuperMicro & IBM?

- RouterBOARDS cannot handle the load of a typical airport hotspot
- Affordable server platforms
- BIOS console redirection (No monitor needed)
- Dual Intel gigabit integrated LAN ports
- Serial ATA hard drive support
- Processor speeds up to 3Ghz, P4
- RouterOS V3 will support dual processor configurations
- 200 hotspot users per 3Ghz, P4 Box & 1 gig RAM

WiFi Logical Design



NOC Operations

- IPSwitch What's UP Gold Professional 2006 for device monitoring & reporting
- Dude Server (RouterOS Upgrades / Mesh)
- CACTI (PHP/MySQL MRTG) – raxnet.net
- ASP.NET extranet portal for roaming partners
- 24 / 7 Help Desk from Net Near U (English & French)
- Trouble ticket system from Global Support Software (Switching to Remedy)

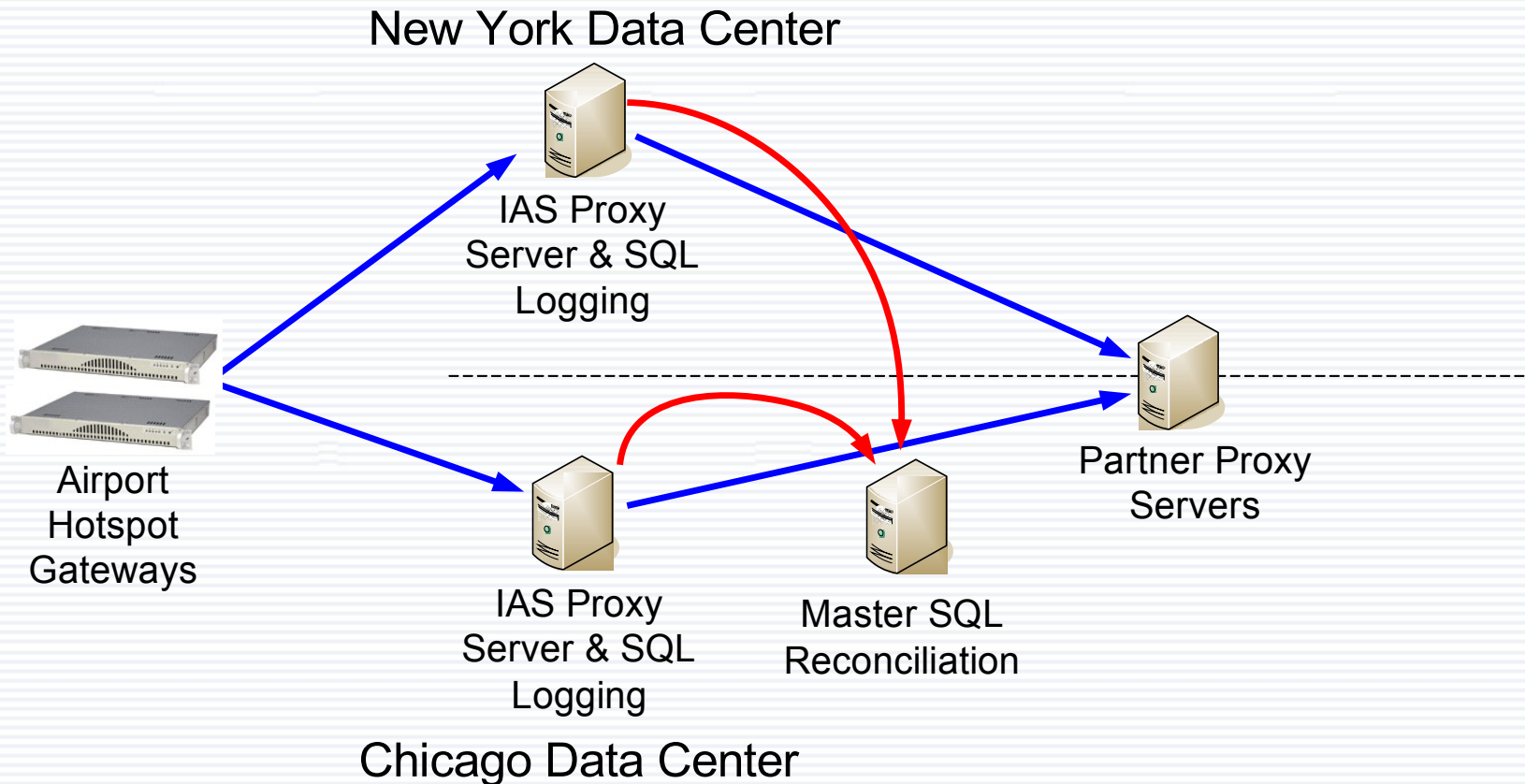
Security

- Cisco IOS IDS Firewall Edge Protection
- Mikrotik RouterOS 2.9.38
- IPSec VPN connections to NOC
- VLAN Separation – AP Management
- Device Management Network (Out of Band Serial)
- Protect your hotspot gateway with input chain firewall rules
- Turn off all RouterOS IP services and use rules to allow NOC / Dude Server to monitor

AAA Services

- Microsoft Server 2003 Internet Authentication Service – Provides radius proxy services
- Steel Belted Radius for local SQL Auth from IAS
- SQL local server logging
- Distributed across multiple systems

AAA Redundancy



Troubleshooting

- Create the virtual user experience remotely!
- Use APC Power switching hardware
- Console server with built in modem
- SNMP Management
- Help desk support calls (last resort!)

Market Development Plan

Revenue Generation

- Public Wi-Fi to transaction-based users
- Private Wi-Fi access to tenants (i.e. airlines, and concessionaires)
- Portal sponsorship and advertisement
- Indirect advertising income & value-added applications

Customer Satisfaction

- Business, public and community awareness
- Ongoing IT support & best practices
- Online Surveys

Generating Revenue

- WiFi Public Internet Access (DayPass & Monthly)
- Private Wireless Access Service (PPPoE)
- Airport Employee User Access – Fixed Accounts
- Club Room Branding by using virtual hotspots
- Value-added applications
(remote printing, download music, movies)

Private Wireless Access Service

Service Type	Description	Price
Dedicated Wireless Internet Service	384kbps PPPoE Internet. Secured and encrypted	\$299/setup \$159/mon
VLAN unmanaged	512kbps - layer 2 access to customer cross connect Customer selected SSID	\$1,000/setup \$500+/mon + usage
VLAN managed	512kbps w/ QoS, over-air authentication, security and encryption	\$per device

- Market solution driven
- Based on bandwidth and security type
- QoS support
- VoIP support
- Self managed
- Roadmap includes
 - Network Access
 - Sponsorship promo
 - Presence awareness
 - Wireless check-in
 - Baggage apps
 - Triple play

User Experience

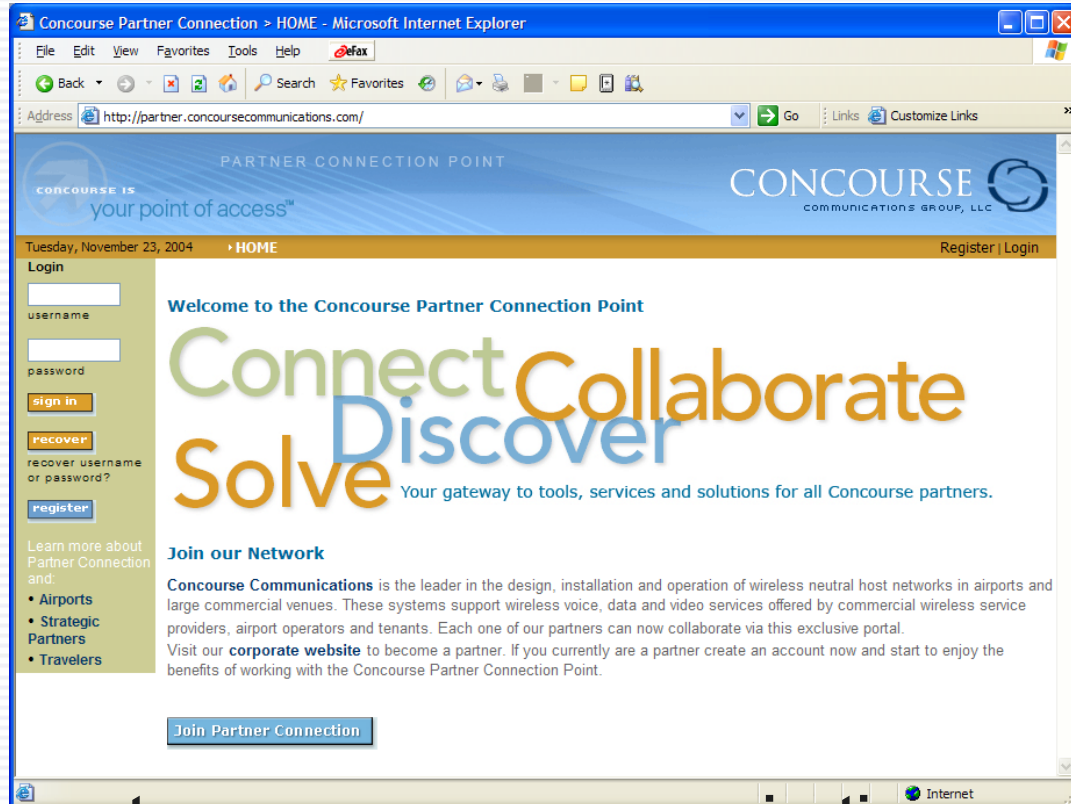


- Boingo WiFi & Venue-specific Branding
- Traveler portal content
 - Flight watch
 - Wireless print/photo
 - Newspaper
 - Movies
 - Home sync
 - Commerce
- Market pricing or complimentary AccessPass
 - \$7.95 24-hours pass
 - Fee-based roamer session
- Sponsorship opportunities

Advertise your service!



Total Customer Satisfaction



- Industry and business intelligence center
- Integrated network management
- Airport NOC friendly
- Flexible and scalable

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Thank You
Questions?

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Solar Powered RouterBOARDS

Solar Industry Trend

- Shortage of polysilicon today
- Total production 1,638 MW in 2005
- Demand far exceeds supply today
- PV suppliers not moving at pace of Moore's law
- Efficiency is 14% today, 20% by 2012
- Crossover point for solar energy to compete with the electric grid sometime between 2010-2015

Why Solar?

- Remote site with no power
- Cost prohibitive to run power
- Backup power

Amp Hours & Beer!

- Amp hours and beer have a lot in common!
- One amp of current for one hour is one Ah
- Battery capacity throws us off because it is similar to glass of beer.
- Dependent on the rate of discharge. The faster the rate of discharge, the less total Ah capacity that can be delivered.

Perket's Equation

$$I^n T = C$$

- I = Discharge Current
- n = Valued related to battery construction (Typically 1.2)
- T = Duration of Discharge (Hours)
- C = Capacity removed as a result of that discharge (Ah)

Let's Measure I

- Routerboard 532 with 1 - 2 400mw cards in idle transmit mode (ap-bridge mode)
- Routerboard 532 with 1 SR2 – 230ma @12Vdc
- Routerboard 532 with 2 SR2 – 330ma @12Vdc

What's n again?

- Battery factor based on construction
- n is never equal to 1 – even in the best of batteries
- Exponent n has normal values of 1.05 to 2 with 1.2 being a common value.

How Long?

- T is how many hours we want to run
- Need to cover nighttime hours and cloudy days
- 3 days gives us a good run time in case the sun gods are not with us.
- 24 Hours x 3 Days gives us a value of 72 for T

What size battery?

$$I^n T = C$$

$$.33^{1.2} \times 72 = 19aH$$



The Solar Panel



- Need to factor your peak daytime sunlight (Chicago is 2 hours / day)
- Oversize the panel for a quick battery recovery
- Many to choose from. For 12V batteries, use a 16V to 24V panel
- 12V sealed batteries charge at a rate of 14.4V
- To recover from 3 days of no sunlight, you need a 9.5A output panel (19ah / 2 peak hours) --- However the panel continues to produce beyond 2 peak hours, so a 7A panel would be okay.

The Charge Controller



- Lots to choose from, but no need to get expensive for routerboard equipment
- Morningstar is one of the better brands
- Low power consumption
- Lightning Protection
- Epoxy Encapsulated
- PWM Charging & Reverse Current Protection
- Temperature Compensation & Load Disconnect

Products Used

- Kyocera KC-130 130 Watt Solar Panel (7.39A, 17.6Vdc) \$600
- 110aH Sealed Battery from Universal Battery \$170
- RB532 in outdoor enclosure w/ 2 SR2 cards
- Morningstar SunSaver 10 - \$59

Thank You!

Questions?