Neutral Wholesale Model
SUMMARY

• The cellular market is extremely inefficient, with a small number of carriers dictating supply and pricing.

• Implementing an Open Access Wireless Market (OAWM) will allow supply and demand to determine prices by time and location, with the following consequences:
  – It will increase innovation, generate new use cases, and diversify traffic patterns
  – It will eliminate the barriers to entry

• This will transform the industry by increasing network utilization, reducing the price of data per GB and increasing data consumption dramatically.

• Rivada is actively working on implementation opportunities globally.
FROM MONOPOLY TO VIBRANT COMPETITION

Monopoly
- Original “Ma Bell” telecommunications

Oligopoly
- Spectrum auctions
- Mobile communications

Competition
- Open Access Wireless Market (OAWM)
  - Wholesale-only provider eliminates the conflict of interest in the carrier retail / wholesale market
  - Neutral network with transparent, non-discriminatory pricing to MVNOs and wholesale consumer
  - Time and location pricing enhances network efficiency and promotes low-cost entry
THE MOBILE MARKET TODAY IS HIGHLY CONCENTRATED AND RETAIL CENTRIC

Network Operators

Vertical Integration

- Spectrum
- Network
- Wholesale
- Retail

Licensed Spectrum

verizon

T-Mobile

Sprint

Retail Market

- verizon
  - $230 B
- T-Mobile
  - $195 B
- Sprint
  - $53 B
- TRACFONE
  - $33 B
- $61 B

Wholesale Market
THE MOBILE MARKET TOMORROW WILL BE MORE DIVERSIFIED

**Spectrum**
- Licensed Spectrum
- Shared Spectrum
- Spectrum Holders

**Network Operators**
- Vertical Integration
  - Spectrum
  - Network
  - Wholesale
  - Retail
- Excess Capacity
- Frictionless Access
- Transparent Prices
- Net Neutrality Repeal

**Retail Market**
- verizon
  - Wholesale: $230 B
  - Retail: $195 B
- T-Mobile
  - Wholesale: $53 B
- Sprint
  - Wholesale: $33 B

**Wholesale Market**
- Spectrum Network Wholesale
- Additional Capacity in Constrained Markets
- OAWM
- Neutral Wholesale
MVNO & Wholesale Evolving

**Wholesale**
- Wholesale-only provider eliminates the conflict of interest in the carrier retail / wholesale market

**Neutral**
- Neutral network with transparent, non-discriminatory pricing to MVNOs and wholesale consumers

**Time and Location pricing**
- Time and location pricing enhances network efficiency and promotes entry
## THE RANGE OF POTENTIAL CUSTOMERS IS WIDE & VARIED

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There are many interested parties and more to come:

- Diversifying the wireless ecosystem
- Innovating business models
- Diversifying the traffic patterns
THE NEUTRAL WHOLESALE NETWORK REDUCES THE TENSION BETWEEN COMPETITION AND EFFICIENCY

- More Value Chain Agents
- Network Sharing (e.g., MORAN or MOCN)
- Passive Infrastructure Sharing (e.g., Tower sharing)
- Independent operation

National Needs
- Universal Service
- Competition
- Public Safety
- Data explosion

Right Conditions
- Global Standards
- Technological Flexibility
- Demand Heterogeneity
- Scarcity

Policy Innovations
- Spectrum Access
- Infrastructure Access
- No Influence
- ISO

Business Innovations
- Neutral Wholesale
- Time and Location Pricing

The FUTURE

Combination of Neutral Wholesale and Time and Location Pricing
The Current Model

- Market size is a determinant of profitability
- Smaller network operators cannot compete due to economies of scale

Demand aggregation allows the neutral host to enjoy economies of scale previously available only to dominant MNOs
THE WHOLESALE MARKET REPRESENTS LESS THAN 10% OF THE ENTIRE MARKET GLOBALLY

The Current Model

- Inherent conflict of interest between seller (carrier) and buyer (MVNO)
- Buyers are competing with their own suppliers
- This hinders competition and keeps MVNOs small
OPERATORS ARE TRADITIONALLY VERY POOR AT MAXIMISING THEIR ASSETS

Network Utilization in 2016

The Current Model

- Networks are built to meet peak demand
- Network utilization is low
- Spectrum utilization is low
- Investment diminished

Spectrum Usage in 2016

Source: http://dfmonitor.eu/networkeconomics/
The Current Model

- There is a big mismatch between data needs and pricing
- Data needs and value vary by time and location
- Data prices are constant
APPLYING THE RIVADA SOLUTION HAS A DRAMATIC EFFECT ON ASSET USAGE AND REVENUE

The Rivada Model

- A neutral time and location based market will drive increased utilization
- Prices reflect the value of data at every time and location
- Average prices decrease significantly
- Average utilization increases due to low prices
LOCATION, LOCATION, LOCATION

The Rivada Model

• Prices reflect the value of data at every time and location
• Local Prices reflect local data needs
• Utilization increases everywhere
Anonymized data consumption on a national carrier network

- Data consumption by hour of day
- The network is better utilized in the evening (Netflix Effect) but a lot of capacity is wasted in the early morning.

- The network is broken down into 100 buckets, each with an equal number of sites ordered by usage. The usage in the busiest bucket is 1,700 times greater than the least used bucket.
- Data consumption is highly concentrated in a few buckets, producing low utilization in many areas without much traffic
APPLYING THE RIVADA SOLUTION WILL HAVE A DRAMATIC EFFECT ON DATA USE AND PRICE

The Rivada Model

- Coverage Design for a National Network on the 700 MHz band
- Current Model:
  - Price per GB will drop from $7.1 to $2.3
  - Consumption will rise from 4 GB to 22 GB
- Key economic assumptions:
  - Price elasticity: 1.3
  - Elasticity of substitution: 0.3
AN INCREASE IN NETWORK UTILIZATION HAS A MATERIAL IMPACT ON REVENUE & ENTERPRISE VALUE

The Rivada Model

- Better utilization means more revenue
  - Existing assets are utilized better
  - New investments have better returns

- When compared with a traditional retail-centric network, the Neutral Wholesale Model with the OAWM can increase revenue and enterprise value

- Increasing utilization from 35% to 65%, increases:
  - Revenue by 31%
  - Enterprise value by 45%
CHARACTERISTICS OF THE OPEN ACCESS WIRELESS MARKET (OAWM)

Spectrum Sharing

- Feasible only for marginal quantities of spectrum
- **Vertical sharing** between drastically different uses
  - Military vs Commercial
  - Mobile communications vs Point-to-Point
- **Horizontal sharing** between similar users
  - Redundant and idle investments
- Extremely difficult to manage
  - Interference
  - Incentives

- Market for wireless **capacity**, not spectrum
  - Capacity (throughput) is generated from both spectrum and network assets
  - Based on best practices from existing time and locational markets. Core tenets are efficiency, transparency, simplicity and fairness
  - All users have access to the same technology
- Feasible for large quantities of spectrum across frequency bands
- Compatible with traditional bilateral wholesale contracts
- Simple to manage:
  - Interference is managed at the network level
  - Transparent, market-driven pricing aligns incentives
- See OAWM whitepaper at: OpenAccessWireless.com
RIVADA’S SOLUTION FACILITATES A MORE EFFICIENT WAY OF ALLOCATING SPECTRUM

Current license model:
Licenses are auctioned to the highest bidder

- Bids reflect the value of:
  - Using the spectrum
  - Rents from monopolistic competition
  - Rents from blocking entry
- Consumer prices ($/GB) are high
- Inferior services
  - Slow deployment
  - Constrained coverage
- Barriers to entry are high
  - Few service providers
  - Few users
- Incentivizes spectrum hoarding

- Spectrum is paid recurrently:
  - Price reflects the fair market value value of using the spectrum
  - Innovations get accounted in the price

- Nominal barriers to entry:
  - Local and fast deployment is possible
  - Innovation flourishes – new uses of data
  - Competitive prices
THE SOLUTION IS A PERFECT MERGER REMEDY

• Set aside a portion of capacity to the OAWM
  • Assignment and prices determined to maximize gains from trade in open competitive process
  • Assignment and prices respond to changing market
  • Market evolves with environment
  • Merged entity receives competitive market value for network resource, and ongoing interest in success of service providers

Based on experience:
• Similar to recent 4-to-3 merger remedies in Germany and Ireland, but much more responsive to changing market

• Similar to electricity merger remedy: auction portion of generation as “Virtual Power Plants” e.g. EDF 2001-2012
ALL MARKETS USE SINGLE-PRICE AUCTION

Price ($/GB)

Winning buyers

Winning sellers

Clearing price $p^*$

Demand

Supply

Quantity traded

Quantity (GB/h)

Winning buyers

Winning sellers

ALL MARKETS USE SINGLE-PRICE AUCTION