G1: CHANGING MARKET DYNAMICS

Overcoming the Limitations of Traditional Fixed Wireless Access (FWA)

TARANA

Large portions of both developed and especially developing economies remain underserved in an ongoing digital divide that makes real broadband ever more urgent, as evolving modes of work, education, commerce, health care, and entertainment increase dependence on great connectivity. Copper-based fixed access networks are increasingly exhausted. Wireless alternatives continue to fail in the face of the significant technical challenges in carrier-class fixed access, including pervasive obstructions, spectrum scarcity, interference, changing conditions, and unworkable deployment models.

Tarana innovation has solved all these problems. Our Gigabit 1 platform (G1) is powered by the results of more than 10 years of focused R&D, and crafted from its custom silicon up to its cloud-based service automation with a completely fresh approach to fixed wireless. Extensively validated by tier-1 operators and well proven in carrier scale networks, our fundamental advances in multi-radio performance completely transform the economics of delivering gigabit-class access. The G1 platform features the base node (BN), remote node (RN), and Tarana Cloud Suite (TCS) for management.

❯ Up to 800 Mbps Aggregate Per Link
❯ Up to 2.4 Gbps Capacity per Sector
❯ Up to 9.6 Gbps Capacity per Site (4 BNs)
❯ Up to 250 Clients per Sector
❯ Up to 1000 Clients per Site (4 BNs)
❯ 5 GHz (unlicensed) or 3 GHz (CBRS)
❯ Works in NLoS and nLoS
❯ Cancels Interference
❯ Fiber-Class Reliability
❯ Fast to Deploy
❯ More Affordable than Fiber

Remote Node (RN)

Base Node (BN)

Residential Coverage
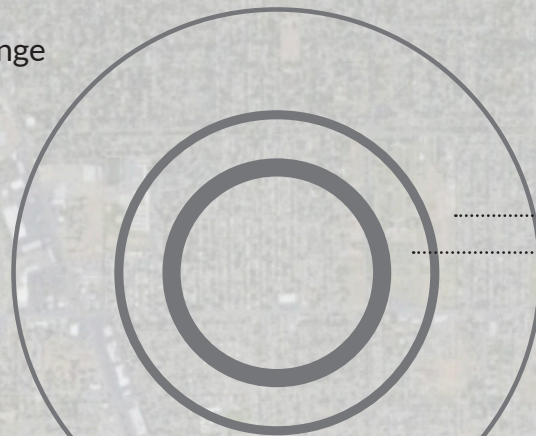
An example highlighting the Sacramento, CA metro area.

25m tower,
1,000 HH/km²
Erceg B propagation

Cell-Edge Mbps

——— 800
——— 500
——— 200

|⎯⎯⎯⎯| 1 km

G1 Range
3 GHz

Households Passed

········ 61,100
············· 21,700
·················· 10,100

G1 Range
5 GHz

··············· 22,800
················· 8,100
·················· 3,700

5G mmWave
28 GHz
(for reference)

○ ··················· 68

Degree of Link Obstruction

○　RN Interference

—　Link Interference

35 dB EPL

NLoS

nLoS

0 dB

As measured by Tarana Cloud Suite (TCS).

Wisper Internet
91 RNs on 1 BN

**94% of links
≥ 400 Mbps DL Plan**
Unlicensed 5 GHz

14.7 km
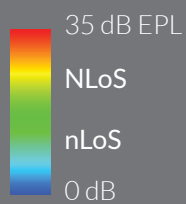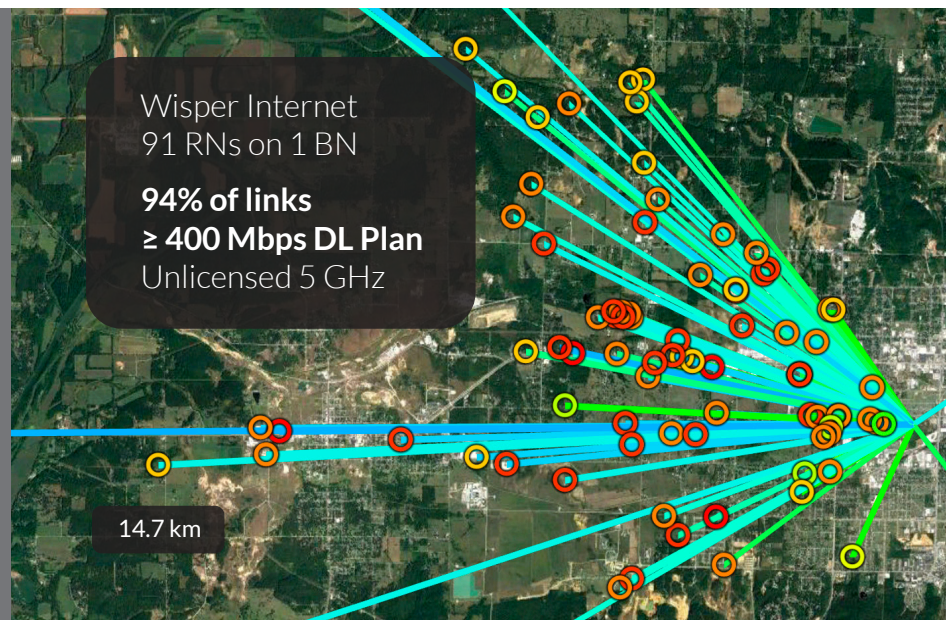
Network Architecture

Simple, IP-based network architecture, supported by the Tarana Cloud Suite (TCS), enables multiple subscriber access models for highly cost-efficient residential and enterprise service.

Remote Nodes (RNs)

Enterprises or MDUs

Houses With Wi-Fi

Base Nodes (BNs)

Backhaul

Tarana Cloud Suite (TCS)
- › Admin Portal
- › Network Analytics
- › CBRS SAS DP
- › Knowledge DB
- › AAA (for Infra.)
- › Service Management

API

Operator Cloud

Control

Data

| Subscribers | Tarana | Aggregation | Management | Internet |
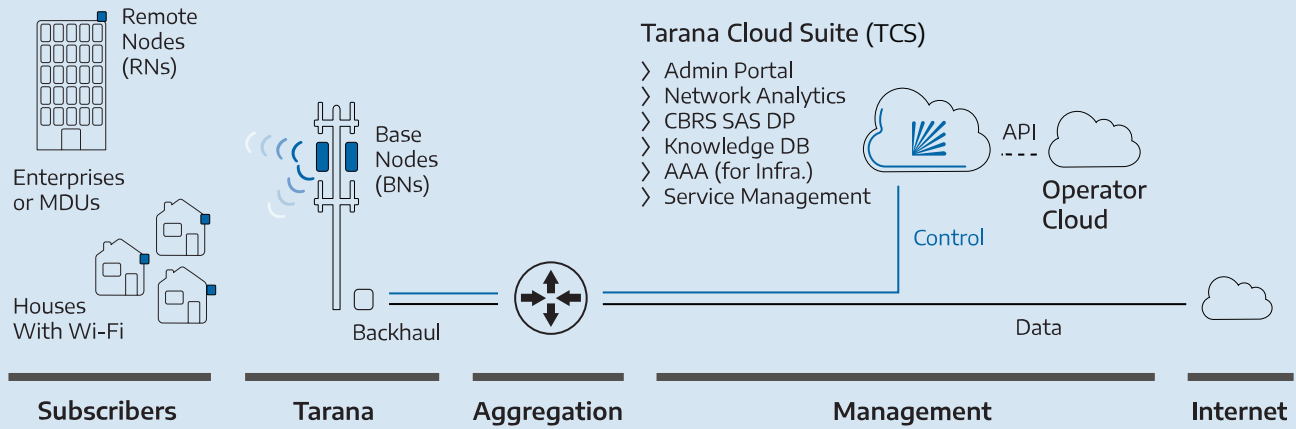
Tarana Cloud Suite (TCS)

TCS powers efficient network planning, zero-touch provisioning, SDN management, and support automation.

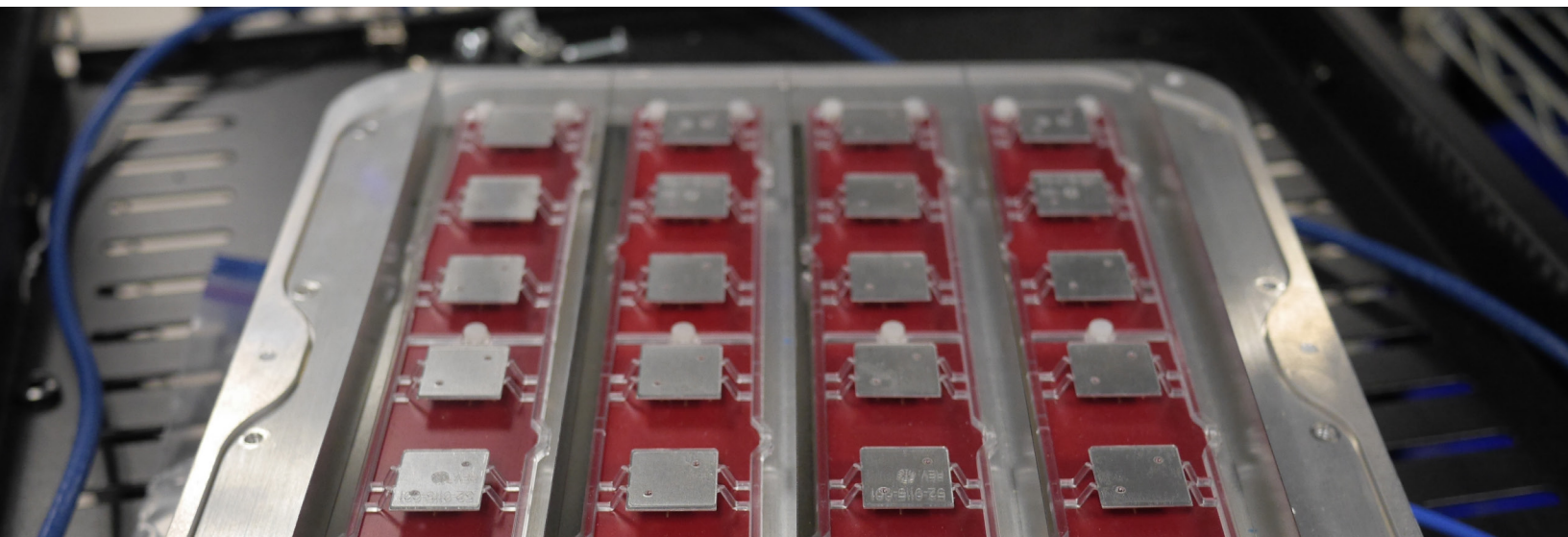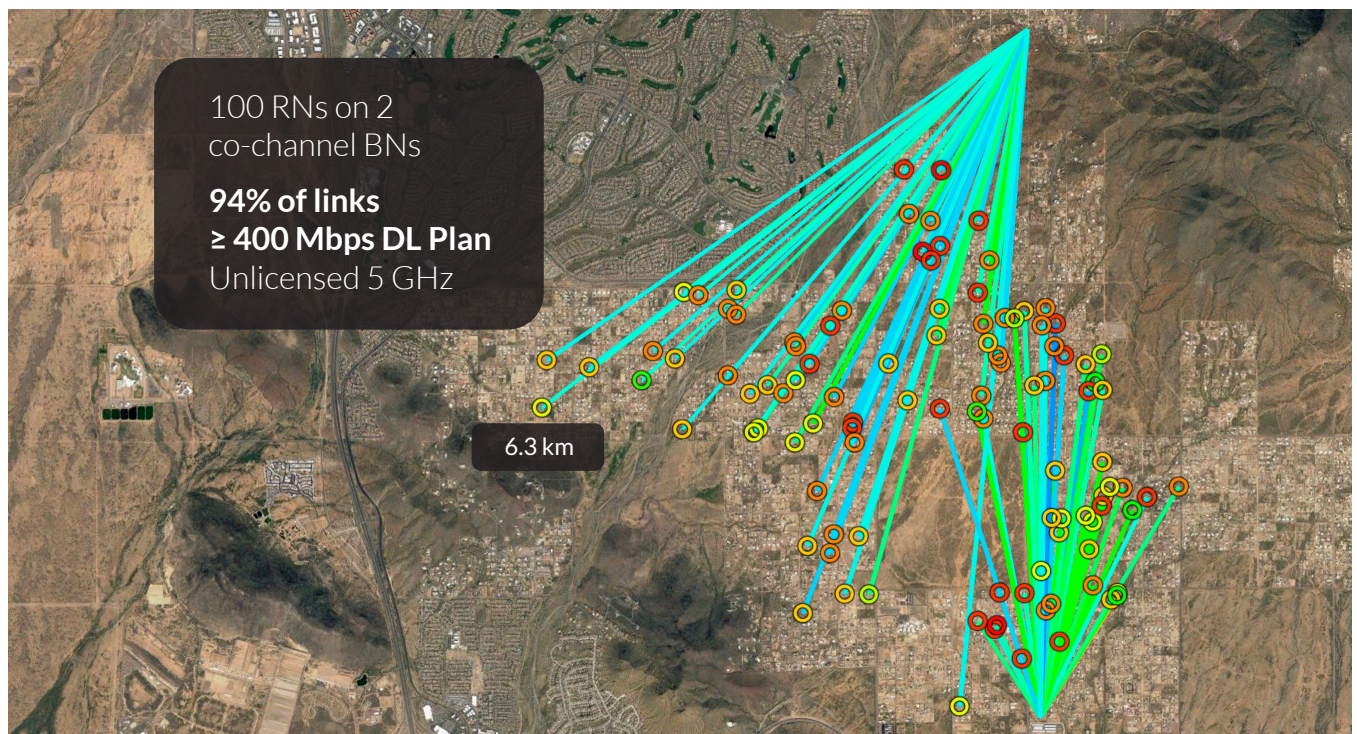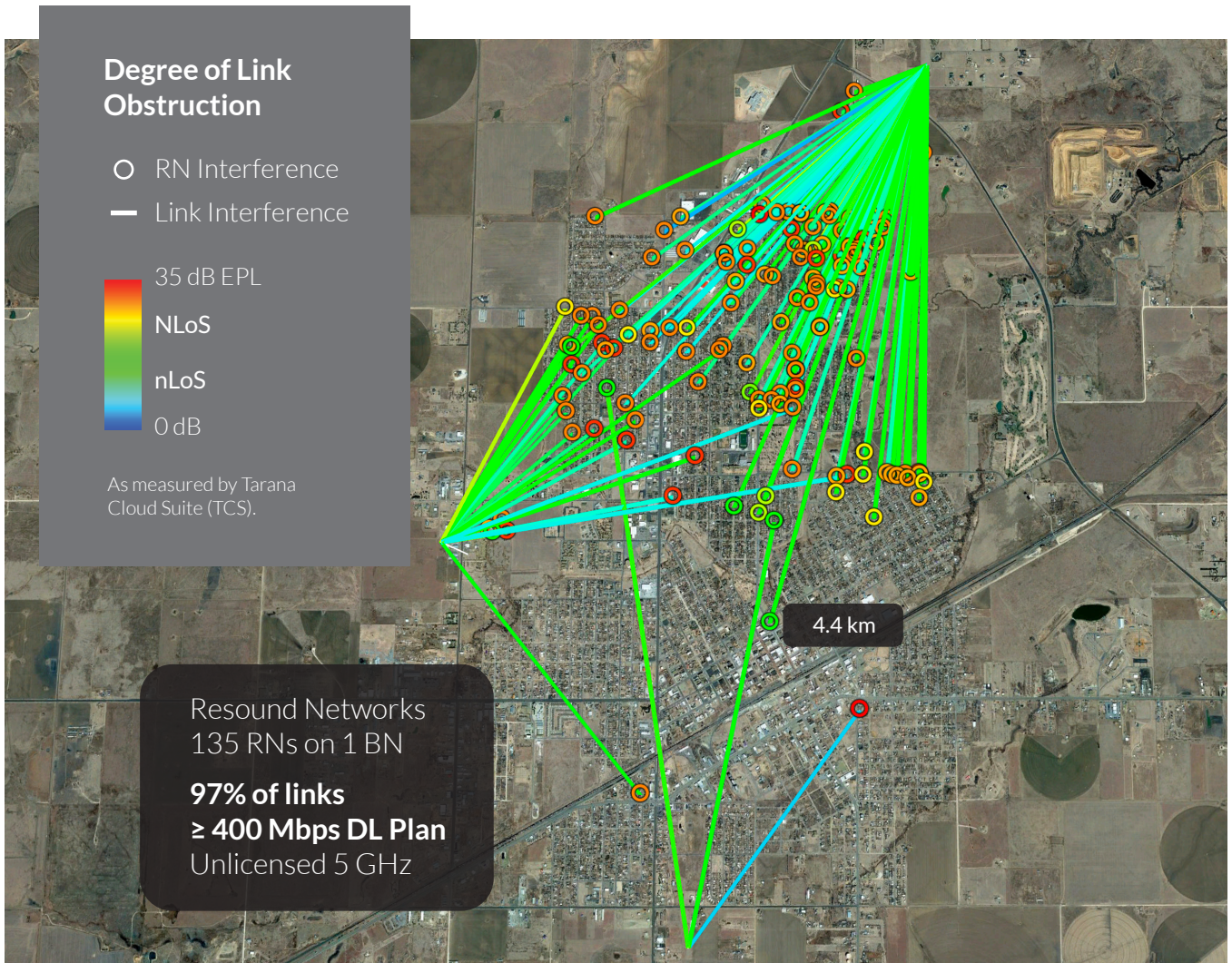|	
Subscriber Service Activation	› API support for zero-touch deployment configuration › Infrastructure authentication › QoS management
Management and Maintenance	› 24 x 7 x 365 KPI monitoring and management, including historic data › Fault logging, correction, and reporting › Firmware & configuration management automation › End-user login and management with role-based access
Radio and Network Planning Integration (U.S. only, requires HH data)	› Spectrum management — CBRS SAS domain proxy › Coverage footprint prediction (heatmap in Google Earth) › Capacity prediction for each cell or sector › Cell densification analysis › Household-level service-level estimation to help identify targets
Fault Management and Network Analytics	› Alarms and historic events with e-mail alerts › User-defined threshold-based alerts › Alarm correlation, capacity expansion, anomaly detection
REST API for Carrier System Integration	› Device inventory, and network topology › Subscriber provisioning and billing integration › Geo-mapping information

Enter Next-Generation FWA

Short for next-generation fixed wireless access, ngFWA is an entirely new technology that addresses the drawbacks of traditional fixed wireless access (FWA). Existing FWA approaches are based on technologies that fulfill their original purpose well (4G/5G for mobility and Wi-Fi for indoor networks), but are not as successful at scalable fixed access in mainstream markets. ngFWA delivers fiber-class speeds, high capacity, NLoS/nLoS capabilities, interference cancellation, quick time to market, cost efficiency, and more. To offer fast, affordable access more broadly, the industry needs this new generation of FWA to augment last-mile fiber by meeting a clear set of new requirements.

ngFWA Defined

> Fiber-class (100 Mbps to 1 Gbps) per-household speeds and low latency at long range, with support for symmetric (100 Mbps down /100 upstream) service where desired

> High capacity per neighborhood for economically scalable deployment

> Solid connections despite obstacles in the way (like other houses, trees, and vehicles moving on the streets) and interference from other wireless networks

> Consistent service quality throughout the neighborhood, to support clean subscription plan marketing, sales, and fulfillment

> High-quality service delivery in unlicensed spectrum to avoid the high cost of licensed spectrum

> Simple installation at the home, and ideally customer self-installation

Degree of Link Obstruction

○ RN Interference

— Link Interference

35 dB EPL
NLoS
nLoS
0 dB

As measured by Tarana Cloud Suite (TCS).

4.4 km

Resound Networks
135 RNs on 1 BN

97% of links
≥ 400 Mbps DL Plan
Unlicensed 5 GHz

100 RNs on 2 co-channel BNs

94% of links
≥ 400 Mbps DL Plan
Unlicensed 5 GHz

6.3 km

Specifications

G1 Radio Network Platform		Base node (BN)
		Remote node (RN)
		Tarana Cloud Suite (TCS)
Topology		Scheduled, concentrated multi-point
Frequency support		5.150–5.250 GHz (FCC/ISED)
		5.725–5.850 GHz (FCC/ISED)
		3.550–3.700 GHz (US CBRS)
Throughput (aggregate)	Per Link	800 Mbps
	Per BN	2.4 Gbps
	Per Site	9.6 Gbps (4 BNs)
Maximum number of clients	Per BN	250
	Per Site	1000 (4 BNs)
Channel bandwidth	BN	80 MHz (2 x 40 MHz)
	RN	80 MHz (2 x 40 MHz)
Duplexing		TDD
Downlink/uplink ratio		Configurable 2:1 or 4.5:1 (network-wide)
Modulation		QPSK 1/2 to 256QAM 7.35/8 UP/DL
MIMO streams per link		1 x 1, 2 x 2
MU-MIMO streams at aggregation point		6 MU-MIMO streams per BN
		24 MU-MIMO streams per site
Spectral efficiency		30 bps/Hz per BN, up to 90 bps/Hz per band, configuration dependent
Range (full rate, frequency dependent)	NLoS	Up to 3 km (may vary depending on vertical asset height, frequency band, morphology, and target cell-edge data rate)
	LoS	Up to 15 km (may vary depending on vertical asset height, frequency band, morphology, and target cell-edge data rate)
Recommended frequency reuse factor		Universal frequency reuse (k=1), enabled by advanced self-interference cancellation
Form factor	BN	Outdoor micro enclosure (fully-integrated antenna, RF, and baseband), 4 BNs for 360° coverage
	RN	Outdoor, single enclosure (fully-integrated antenna, RF, and baseband)
Antenna	BN	Integrated
	RN	Integrated
Beamforming		Auto-convergent, Retro directive
Interference management		Self-interference cancellation, Advanced Burst Interference Cancellation (ABIC)
Latency (1-way average)		<5 ms
Model numbers	BN 5 GHz	G1-BN5ASI002
	BN 3 GHz (CBRS, Cat B)	G1-BN3ASI001
	RN 5 GHz	G1-RN5ASI002, G1-RN5ASI012, G1RN5ASI012
	RN 3 GHz (CBRS, Cat B)	G1-RN3ASI001, G1-RN3ASI011
Compliance		RSS-247, FCC 15E, FCC Part 96, WINNF-TS-0122

Safety		IEC 62368-1, IEC 60529, IEC 60950-1, IEC 60950-22
Data Plane Security	RF Link Encryption	AES-128
Tarana Cloud Suite (TCS)		Scalable microservices based multi-tenant network management
		Zero-touch provisioning and control of radios with streaming telemetry
		Firmware and configuration management
		24x7x365 KPI monitoring and management
		Fault management and historical events
		Network analytics
		SAS-domain proxy
		Northbound Rest-API for customer and operator portal (B/OSS)
Interfaces	BN	Dual 10-Gbps SFP+ and one 1-Gbps data interfaces, additional 1 Gbps mgmt Ethernet interface, ~48V DC power
	RN	1 Gbps Ethernet interface with PoE support
Environmental Rating		IP67
Dimensions (H x W x D)	BN 5 GHz	16.6 x 21.2 x 4.7 inches
	BN 3 GHz (CBRS, Cat B)	16.6 x 21.2 x 5.1 inches
	RN 5 GHz	11 x 12.5 x 3 inches
	RN 3 GHz (CBRS, Cat B)	11 x 12.5 x 3.3 inches
Weight	BN	42 lbs
	RN	8 lbs
Power consumption (typical)	BN	275W
	RN	35W
Mounting	BN	Saddle clamp, band clamps for pole mount (2.375–5 inches OD)
	RN	Band clamp for pole mount (1.5–2.5 inches OD)

Specifications subject to change without notice. Actual results may vary.

Tarana Wireless, Inc. is the industry's performance leader and new category creator in ngFWA (next-generation fixed wireless access), powered by a number of well-proven breakthroughs in precise, multidimensional optimization of radio signals. Its G1 access platform overcomes previously insurmountable network economics challenges for service providers in both mainstream broadband and underserved markets, using free unlicensed spectrum. Unit sales of G1 in its first year are sufficient to cover 15M households, with millions more in the pipeline. The company is headquartered in Milpitas, California, with additional research and development in Pune, India.