



MAXIMIZING CAPACITY AND QoS IN LTE SPECTRUM THROUGH SINR OPTIMIZATION

MANAGE MULTIPLE FREQUENCIES ACROSS A CLUSTER OF SITES TO OVERCOME COVERAGE CHALLENGES

HIGH DENSITY CELL SITE DEPLOYMENTS PERFORM BETTER WITH LINK CONDITIONING

Cell sites are individually engineered to support expected users based on past data about traffic and KPIs, but what's really needed is immediate response to current demands on the network. User density, location in the sector, applications used, environment (weather, time of day, auto traffic) are all factors creating a dynamic environment that cannot be compensated through network design.

Link Conditioning® from ISCO International is a set of adaptive algorithms working across a cluster of sites to cooperatively adjust to actual conditions. In addition to freeing up capacity to carry more traffic and increasing data rates, the network works more efficiently with changes made automatically across the cluster instead of manually managing each cell site.

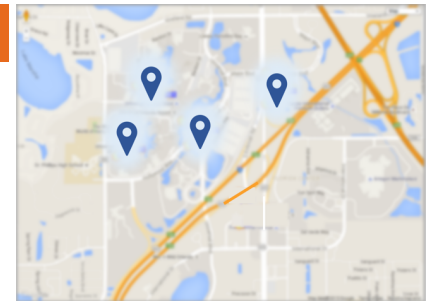
Wireless networks are like a jigsaw puzzle, with a variety of frequency bands pieced together to cover as much area and as many users as possible. Each frequency has tradeoffs; lower frequencies cover large areas but sacrifice signal quality, and higher frequencies offer attractive signal properties for a smaller coverage area. ISCO's Link Conditioning® optimizes SINR across a cluster of cell sites in multiple bands to improve QoS and deliver the best experience possible for users in a specific area. After Link Conditioning® helped a Tier 1 operator get troublesome sites to perform on par with others in the area, they expanded the feature to all bands for even greater improvement.

Network optimization is more efficient and performance improves with cohesive management across the cluster of cell sites.

PROBLEM

High Noise Figure
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Low Coverage

Number of Sites: 47
Goal: Improve system gain in the area by 10% across all frequency bands



SOLUTION

Proteus1AIR™ with Link Conditioning® from ISCO International

Defer carrier adds • Improve KPIs at challenged sites • Reduce limits on uplink coverage

DEMONSTRATING THE VALUE OF SINR OPTIMIZATION

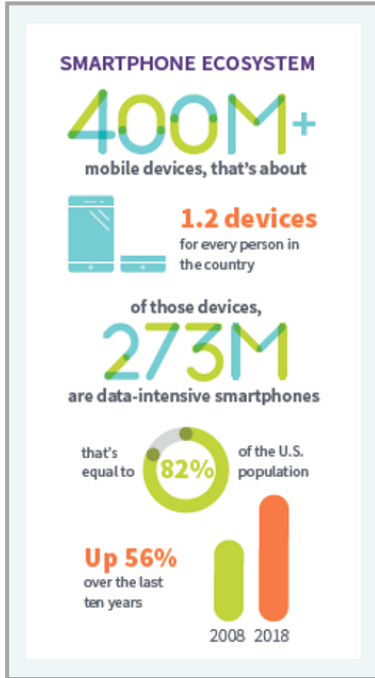
- A Tier 1 mobile network operator was experiencing poor KPIs at high traffic sites located near a major tourist attraction
- ISCO implemented Link Conditioning® in a cluster covering 159 sectors of LTE, improving spectral efficiency and KPIs (see back Figure 1)
- Link Conditioning® expanded to a higher frequency band which showed results consistent with the earlier deployments, well above the 10% improvement target (see back Figure 2)
- Additional issues affecting performance were identified, including interference mitigated by ISCO's PurePass® network function



LINK CONDITIONING®

See back page for results and qualification criteria

KEEPING UP WITH WIRELESS TRENDS AT AN OUTDOOR TOURIST ATTRACTION



Source: CTIA Annual Wireless Survey 2018

As smartphone ownership grows and visitors use their phones for more data-intensive applications, the operator continually adjusts the network to enable the same amount of spectrum to carry more traffic. ISCO'S LINK CONDITIONING[®] was deployed on cell sites throughout a major tourist attraction to help improve performance on all sites in the cluster. The initial deployment improved both uplink and downlink KPIs.

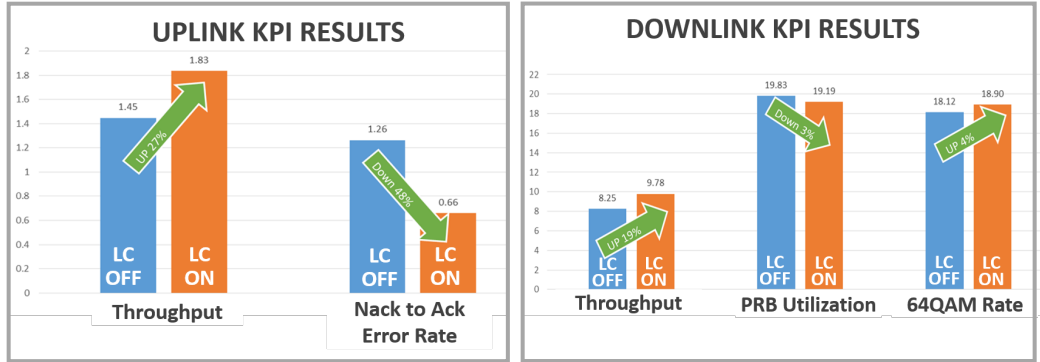


Figure 1: Uplink and Downlink KPI Changes with Link Conditioning Off and On in Phase 1 Cluster

Source: Operator's KPI Reporting System

IMPROVED: End user experience • Site capacity • Spectral efficiency

SUCCESS

is defined as more efficient use of spectrum. Comparing KPIs with Link Conditioning[®] ON and OFF shows it improved capacity across the cluster of sites even at a higher frequency band.

Phase 2 Deployment Results	Week 1 LC OFF	Week 2 LC ON	% Change
Uplink Volume (#)	2564.08	3916.47	53%
Uplink Throughput (#)	1.99	2.15	8%
Uplink PRB Capacity Utilization (%)	9.77	13.14	34%
Uplink NckAck Retries (%)	0.32	0.26	-19%
RSSI Uplink DBM (#)	-115.59	-114.48	-1%
Downlink Volume (#)	17857.3	20753.63	16%
Downlink Throughput (#)	5.81	6.81	17%
Downlink PRB Capacity Utilization (%)	28.14	34.19	21%
Downlink NckAck Retries (%)	0.42	0.46	10%
Average Users (#)	27.38	31.22	14%

SPECTRAL EFFICIENCY IMPROVEMENTS LEAD TO BETTER KPIs

- Higher volume
- Faster throughput
- More users
- Affects both uplink and downlink
- Most improvements exceed 10%

Figure 2: Uplink and Downlink KPI Changes in Phase 2 Cluster with Link Conditioning Off and On

Source: Operator's KPI Reporting System

QUALIFICATION CRITERIA

Link Conditioning[®] will have the greatest impact when most sites in the cluster meet the following criteria:

Physical Characteristics	
Frequency Bands	2/25, 4/66, 5, 12/17, 13, 30 Other bands upon request
Location Type	Tower Top, Shelter, Roof, Parking Structure, Billboard, Building Side, CoW

Metric	Threshold
Max RRC Users (#)	> 40
DL Volume (GB)	> 20
PUSCH SINR (dB)	≤ 3
DL Throughput (Mbps)	< 4