PACKETOP

Planning For Small Cell and 5G Location, Location, Location

White Paper

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Challenges

Doing more with less is seldom easy. But leading-edge technologies help mobile operators do just that to meet the burgeoning demands on their networks. Network equipment is more sophisticated than ever, and packet analysis allows mobile operators to make smarter decisions about how they deploy capital and adjust their networks to maintain the quality of service.

The shift to small-cell networks has been one fundamental step toward next-generation technologies. Until recently, mobile networks consisted of expansive cells with modest capacity. To fix a service problem affecting only a small area within a cell, an operator had to enhance the network's coverage and capacity over the entire cell, including places where service was already good.

Now, small cell technology has made it possible for mobile operators to set up and operate dense networks of small, high-capacity cells. These networks typically cost less to upgrade than networks of large cells do. Network equipment has gotten better as well: it is less costly to buy and operate, more flexible, and more powerful. Mobile operators should also use sophisticated packet analysis to gain insights into capturing the maximum value from capital investments.

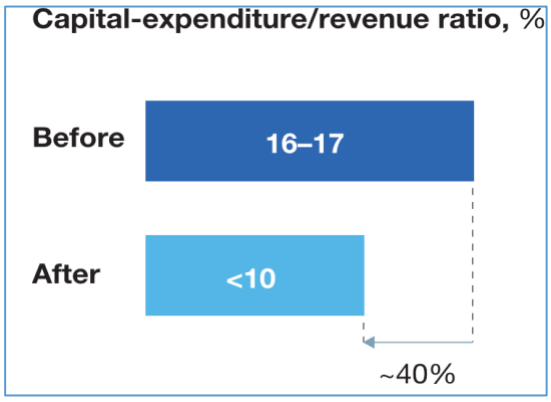

Fig. 1 McKinsey: a-future-for-mobile-operators Feb 2017

Analytics for smarter capital spending

Advanced packet analysis can help mobile operators determine which capital investments in their networks will produce the most value. Operators collect data about where, when, and how much subscribers use their mobile handsets, but need packet analysis for per subscriber coverage and interference location data. The data needs to be very precise: mobile operators need to establish coverage,

interference and usage patterns within five-by-five-meter squares, roughly the size of a studio apartment.

By running the data through packet analysis algorithms, a mobile operator could pinpoint where and when network coverage and interference issues happen and which customers they affect most. With that information, it can project how much a possible upgrade might improve the satisfaction—and ultimately the retention—of its more profitable customers. An operator can also determine the highest levels of network performance that do not yield diminishing returns in customer satisfaction. Such findings let the mobile operator avoid investments that would make their networks better than necessary. With these techniques, mobile operator's capital expenditures can prioritize value creation rather than network performance.

Machine learning for increased operations efficiency

Networks made up of small cells are not only less expensive to maintain than networks of large cells but also more flexible. One benefit of flexibility is that operators can save money by reducing or increasing each cell's coverage as demand for service fluctuates. (Adjusting coverage is harder with large cells. Even if some areas in such a cell are experiencing low demand, its coverage and capacity has to be kept uniformly high to maintain the quality of service in areas where demand is strong.)

Mobile operators need to use packet analysis to determine where to make upgrades and use machine learning to adjust their networks automatically as interference changes cell edge coverage or even to base adjustments on predictions. If a packet analysis machine-learning model has records of network data usage, plus interference and coverage issues and then receives new packet analysis data in real time, it can predict when cell edge coverage might be impacted and adjust cell coverage preventively.

All of these network technologies promise to lower costs and make it faster and easier to change networks in response to problems or new customer needs. McKinsey estimates that the newest technologies would let operators lower their capital expenditures (CAPEX) by up to 40 (Fig. 1) percent—thus pushing these costs down to under 10 percent of revenues—and their network-operating (OPEX) expenses by a similar amount (Fig. 2).

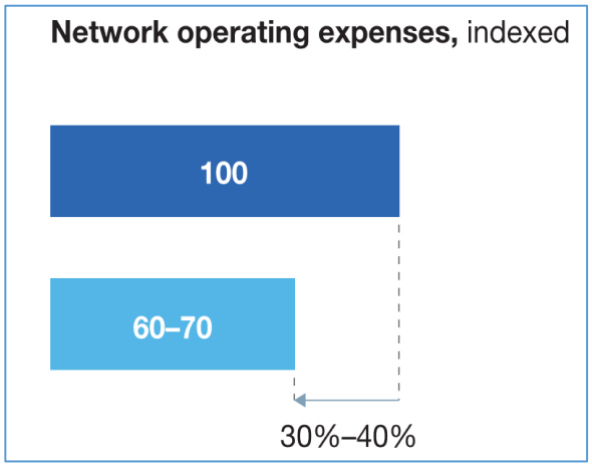

Fig. 2 McKinsey: a-future-for-mobile-operators Feb 2017

Packet analysis is the key to analyzing root-cause events that when geo-located provide critical insights into where coverage and interference issues exist that can be resolved quickly to prevent churn. Basing CAPEX and OPEX decisions simply on capacity overload data may cause a distorted view since packet loss events caused by coverage and interference issues often times reduce bandwidth capacity and therefore limit data usage in the affected area.

The problem is sub-second packet loss events trigger a TCP slow start process that reduces session throughput by 50% (See “Packet Analysis Improves Throughput, Video and Voice Quality”, PACKETOP dated December, 2017). These sub-second packet loss events and the frequency of their occurrence has a significant effect on throughput and data usage. Therefore, data usage is under reported in locations within the cell that are experiencing coverage and/or interference issues and over reported in locations without these issues. In fact, because coverage and interference issues can substantially effect throughput and therefore data usage, some CAPEX and OPEX is currently being spent in the wrong locations.

Solution

It can be appreciated that methods for detemning canidate locations for cell sites in mobile networks have been in use for years, but small cells (See Fig. 3) and 5G cells require signigicantly higher granularaty and new metrics. Typically, mobile operator network teams drive test the mobile network to identify areas that need improvement. Drive testing has become less effective since packet analysis is required to determine the packet loss events that have an effect on throughput and data usage. As a result, automating the location canidate process of intra cell automated cell planning (ACP) utilizing packet analysis significantly reduces CAPEX and OPEX as compared to existing inaccurate manual time consuming merthods.

The main problem with conventional location canidate processes is existing drive, walk and mobile network element based KPIs are not granular enough to detect and analyze packet loss events. PACKETOP solves these problems by providing packet analysis that non-intrusively detects and analyzes packet loss events and geo-locates them to determine location. Unique patent pending PACKETOP aglorithyms provide packet loss event location indicators for encrypted and non-encrypted data flows. These geo-located loss events are captured without utilizing personal subscriber data.

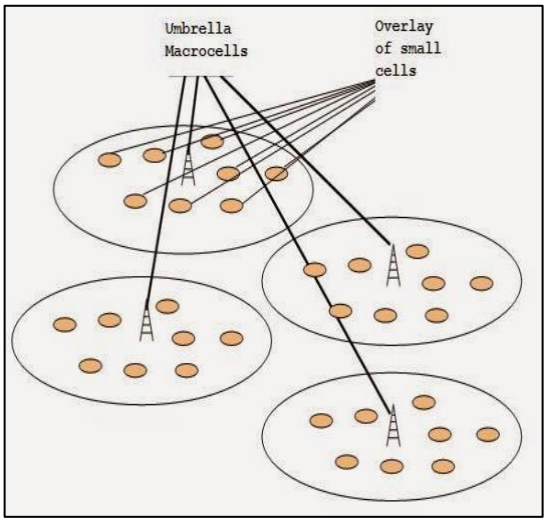

Fig. 3 Small cells overlay macrocells

PACKETOP utilizes packet analysis to automate and improve the network planning cell location canidate process by incorporating intra-cell geo-located real-time packet analysis coverage and interference metrics. These new metrics enable next generation, multi-dementional, machine learning, artiful intreligence aglorithems to propose locations for new small cell and 5G canidates. Utilizing these new network planning techniqies mobile operators are able to reduce CAPEX and OPEX spend.

Conclusion

This white paper builds upon the previous white paper “Packet Analysis Improves Throughput, Video and Voice Quality”, PACKETOP dated December, 2017. The previous white paper discussed why packet loss events are a serious problem for all IP, packet based, mobile networks, causing serious throughput video and voice quality issues not currently detected and analyzed. These loss events reduce data usage which significantly impacts the accuracy of existing network planning cell location candidate processes. PACKETOP solves these problems by providing packet analysis that non-intrusively detects and analyzes packet loss events and geo-locates them to determine location. Unique patent pending PACKETOP aglorithyms provide packet loss event location indicators for encrypted and non-encrypted data flows. These geo-located loss events are captured without utilizing personal subscriber data.

Increase small cell and 5G cell location candidate accuracy and reduce time consuming manual processes with PACKETOP packet analysis.

For more information visit www.packetop.com or email info@packetop.com