

Customer experience management



Technical paper

Business opportunity For long enough, network operators have been trying to crack the problem of monitoring their users' experience.

As the magic of network connectivity has become ordinary, and quality of network service has risen generally to the point where quality problems are not a limiting factor, network operators are struggling to invent differentiating features. Adding new network services usually requires large infrastructure investments. The return is often poor. Customers want to make two-party voice calls, access the Internet, and send messages. Once a network offers those facilities, uptake on incremental network services has been weak.

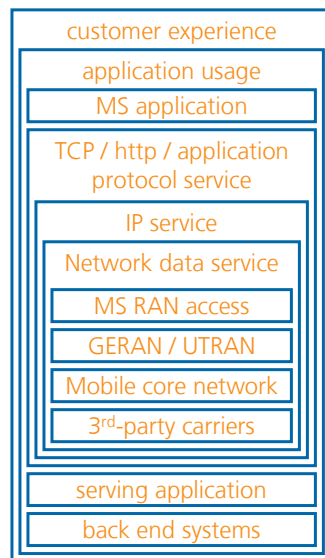
Market advantage In this context, offering service management features to network customers begins to look attractive. Service management facilities can often be added with relatively small investment and without disruption to existing services. In particular, service quality monitoring facilities can do a lot to make a merely average network look attractive. While most networks offer technically good service, a network that can persistently show its customers how good it is has a significant market advantage.

The widespread inadequacy of customer experience monitoring has been recognized as a barrier for market development. Regulators such as Ofcom are encouraging customer service analysis, and may in time make it mandatory.

By getting an accurate and timely view of their users' experience, network operators and service providers can be alerted to unplanned events which are reducing consumption of their network services (and thence reducing revenue), and can action timely diagnosis and resolution. By understanding their users' behaviour, they can inform their campaign management better than any amount of focus group navel-gazing, and they can customize specific upsale propositions per individual. By appreciating their users' perceptions of their network services, they can lead appropriate and effective customer retention activities.

Technical challenge Customer network service management has always been difficult. Why? Because before the operator can present service quality information to the customer, the operator has to have the information. What quality of service is a given customer, or a given user, actually receiving? Mostly, the network operators don't know.

Customer service reporting was not a matter of much interest until the time when real competition arose between networks. Inconveniently, the competing networks were cellular wireless networks, where the relationship of user service to network equipment state was fluid. The network operators' knowledge of their service quality was limited to knowing which cells were working properly. The users, who could tell very easily what their service quality was like, had a huge information advantage over the operators. With 2G and 3G mobile networks there came more helpful signalling standards, and the possibility of monitoring signals at the RAN-core interface in sufficient depth to build a view of individual users' network connection quality, in terms of attach time, call setup time, proportion of calls prematurely released, and so on. The prospect of delivering a precis of this information to the customers, maybe even direct to their 'phones, became a lot brighter. Many network operators now offer rich and accurate voice service quality information to their corporate customers. (continues)



But soon after 2G, much of the market's attention shifted to data transports – GPRS, DSL, DOCSIS and others. Data services are enormously richer than voice services, and the simple measurements that so effectively can characterize a voice service, are next to useless for a data service.

The difficulty lies firstly in the fact that the customer's experience of a networked data service is a composite of the behaviour of the network, of the serving application, the user's access device (say a PC or a PDA) and the applications that it's running. Secondly it is exacerbated by the weakness of the relationship between the network attributes that the network operator can readily measure, and the network service that the user receives.

Most data network technologies fail to give the network operator a view from the perspective of the user access devices. With deregulation of network services, the user's access device is only rarely effectively controlled by the network, and may even be of a type unsupported by, or unknown to, the operator.

Technologies but not solutions

There are many systems technologies that offer to solve the customer experience monitoring problem. Each of them in fact solves a little bit of the problem, but all of them leave large parts of the problem unsolved.

Drive testing

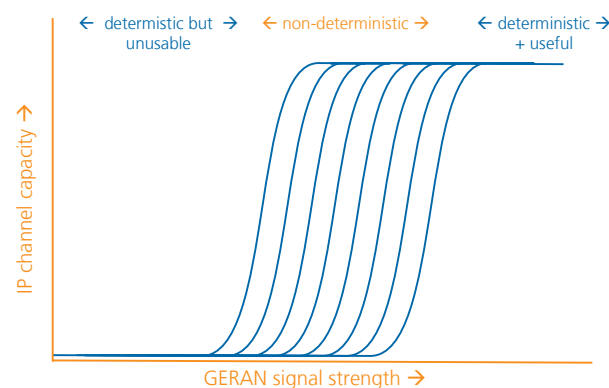
In mobile data networks, drive testing provides only a very limited view of the network's effectiveness. Even with autonomous drive testing, where for example taxi cabs are fitted with drive test devices, the testing can only cover access from the street. As most network use is from indoors, and as 3G RAN technologies provide notoriously poor in-building reach, outdoor measurements are close to fatuous. Any sample-based network coverage testing can only report the coverage at the time of the test. As many RAN technologies (including GSM) use frequency hopping, network coverage in fact changes from one minute to the next. And of course measuring the coverage, or capacity, of the RAN tells the operator next to nothing about the end-to-end service experience of its users.

Injection sampling

A more robust approach to service monitoring is to use an injector to simulate live user behaviour for an appropriate choice of application. But which application? Perhaps this week it should be Facebook, but next week it could be something else, and the network application market is so volatile that the network operators will never be able to predict it. And because the networked service environment is so complex, and because there are so many uncontrolled variables in it, to get a statistically significant sample set would require so much sampling that the sampling traffic would become an uneconomic load on the network.

Signal analysis

A number of products attempt to derive customer experience information directly from surveillance of the network signalling. However, the relationship between the two is at best tenuous. Consider the case of data services delivered over a GSM mobile network. Historically, signal strength has been presented as a reasonable metric of service quality. But look at the graph below: it shows how the effective IP channel capacity across a GERAN varies with signal strength. While it's clear that very poor signal strength implies very poor capacity, and that very good signal strength implies high IP capacity, the intermediate region (where the majority of RAN users find themselves) exhibits a gross lack of determinacy. A moderate signal strength may give good IP throughput, or none, or something in the middle, and the factors that affect the result are so various and complex that the result is impossible to predict.



More generally, measuring capacity at any level below that of the end user's experience is deeply unreliable. Measure the raw data rate: what does that tell you about the IP data rate? Measure the IP network performance: what does that tell you about the TCP performance, or the http performance? Not much – the relationships are too nonlinear. Measure http performance: you'll find that you're measuring somebody's web server performance as much as the network's.

Measure standard applications protocols A, B and C: that tells you nothing about the nonstandard applications protocols that your customer's proprietary applications use. It tells you nothing about the traffic in closed protocols such as Skype. Measure all the protocols you can think of: how does that relate to the user's experience?

Device service metrics

There are a number of device service metric products around, which rely on implanting a software agent into the user's access device, to monitor the user's behaviour and the on-screen application performance, and to report it to the network operator. But while these have been available for some time, they haven't made huge headway in the market, because of a number of difficulties. To install the agent in the access device (say smart phone, or laptop) before shipping would require collaboration with a large number of device vendors. And while a diminishing minority of network access devices (say low-end phones) have a controlled and predictable software environment, many data access devices can run the software of the user's choice, and so are an unpredictable environment in which for an agent to operate. Lastly, there is a widespread perception among network operators that users will regard the technology as a breach of their privacy, and change networks to avoid it.

Business intelligence

Another way to get an understanding of the customer's use of the network is to apply a classical business intelligence approach, using data warehouse technology to mine the network's traffic records. This is a low-impact form of monitoring, because the traffic records are collected anyway, and are warehoused by most operators. But obviously, it can only provide historical data, and crude data with a limited scope at that.

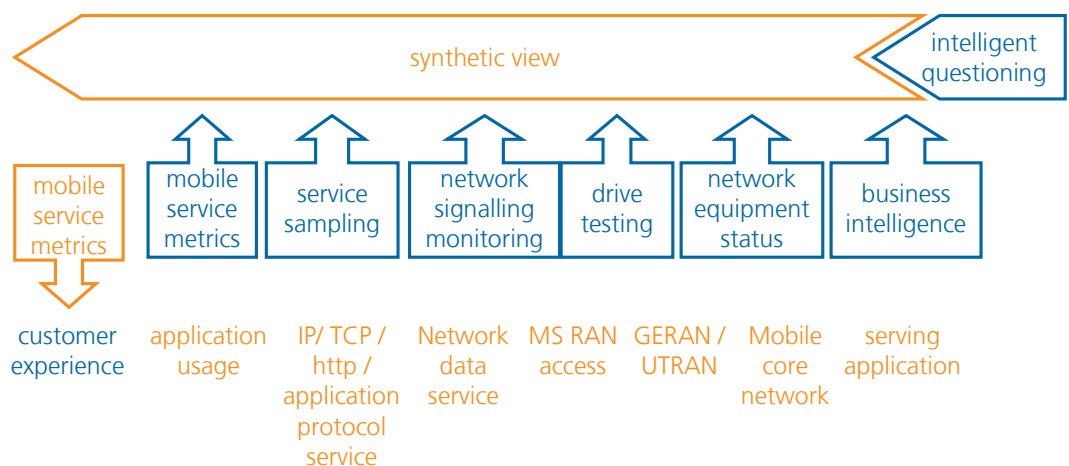
Network management

The last approach that we consider here is of monitoring the network equipment. On the face of it, as the operability of a network service must depend on the status of the equipment that bears it, surveillance of the equipment ought to yield good service quality information. On closer inspection however, this proves to be almost completely untrue. The relationship between network topology and service topology is complex, and in next-generation carrier networks it is practically non-deterministic. While clever analysis of network asset status can yield useful service information, it is necessarily incomplete, and generally (for reasons of computational complexity) at a level above that of the individual user.

Smart approach

In IPL's experience, the way to address the customer experience monitoring problem is to do two things. Firstly, to accept that the problem is a complex composite, and that any effective solution will also be a composite of surveillance technologies. IPL has long experience of forming a synthetic end-to-end service view from disparate surveillance technologies, so we know that it can be done and that it yields useful results.

Synthetic view



Secondly, to ask the right questions. If you start from a prejudiced choice of "solution" technology, you will end up only asking the kind of question which that technology can answer, and you will almost certainly fail to provide the kind of information that can lead to economically advantageous business action. But conversely, if you start naively from a statement of blue-sky business information demands, you will probably ask for the impossible, and in the end be disappointed. This is an area where it's very helpful to frame your questions in the context of a wide understanding of what all the various solution

technologies can deliver, and of their costs and benefits.

IPL has been working in network customer service management since the 1990s. We have advised a number of national carriers on service management system requirements and solution architectures. We have implemented a number of network service management solutions, including large scale network signalling analysis, mass market user device quality reporting and network service assurance. We are independent; we have first class systems engineering skills; we have independent-minded staff who really understand carrier networks and businesses. We offer, in fact, the safest and the fastest route to genuine customer experience management.

IPL Founded in 1979, IPL has a long history of successfully delivering excellent value consultancy and end-to-end software-intensive solutions to both the public and private sectors.

IPL's consultancy is renowned for its quality and value. Our consultants are talented and independent-minded individuals with extensive industry experience. We consistently exceed our clients' expectations through a combination of imaginative thinking, managerial and technical expertise and many years of systems engineering experience.

IPL's track record in end-to-end software solutions development is exceptional. Our proven development methodology allows us to cut through technical complexity, manage risk and completely focus on delivery. We consistently deliver reliable, efficient and accurate systems to a precise schedule.

IPL is an ISO9001:2000/TickIT registered company having a permanent workforce of 240, revenues of ca. £21M p.a. and 40,000 sq ft of secure office space in central Bath.