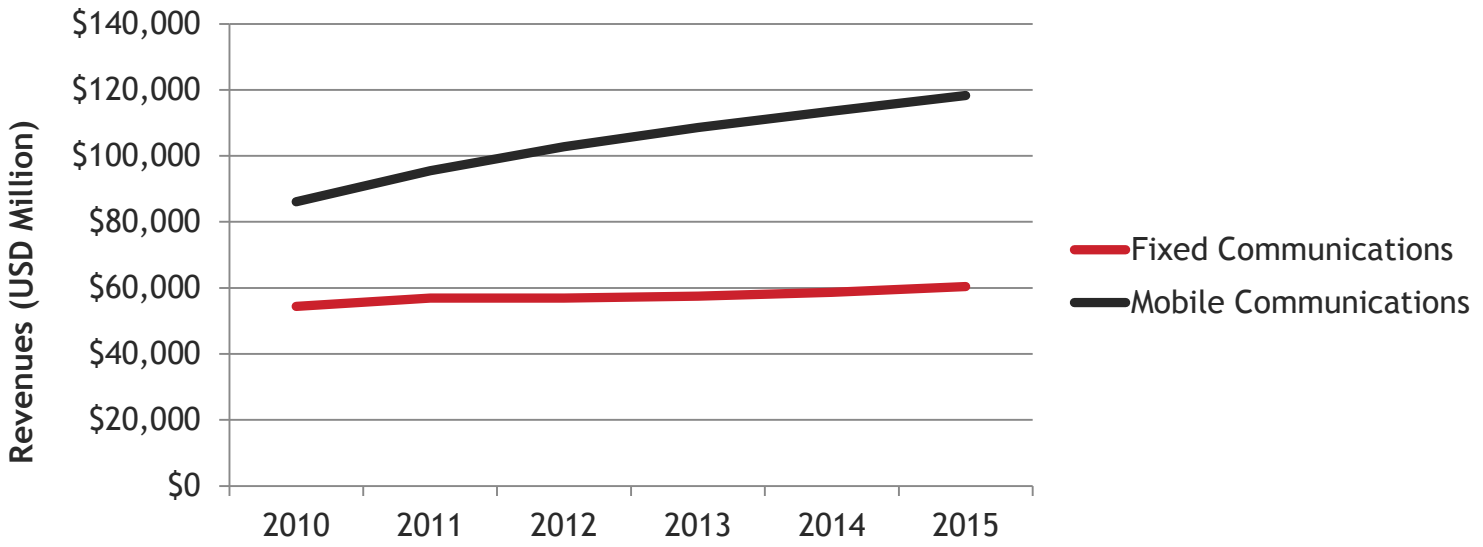
LTE in LATIN AMERICA

TeleSemana Webinar

Vinicius Caetano – November/2011

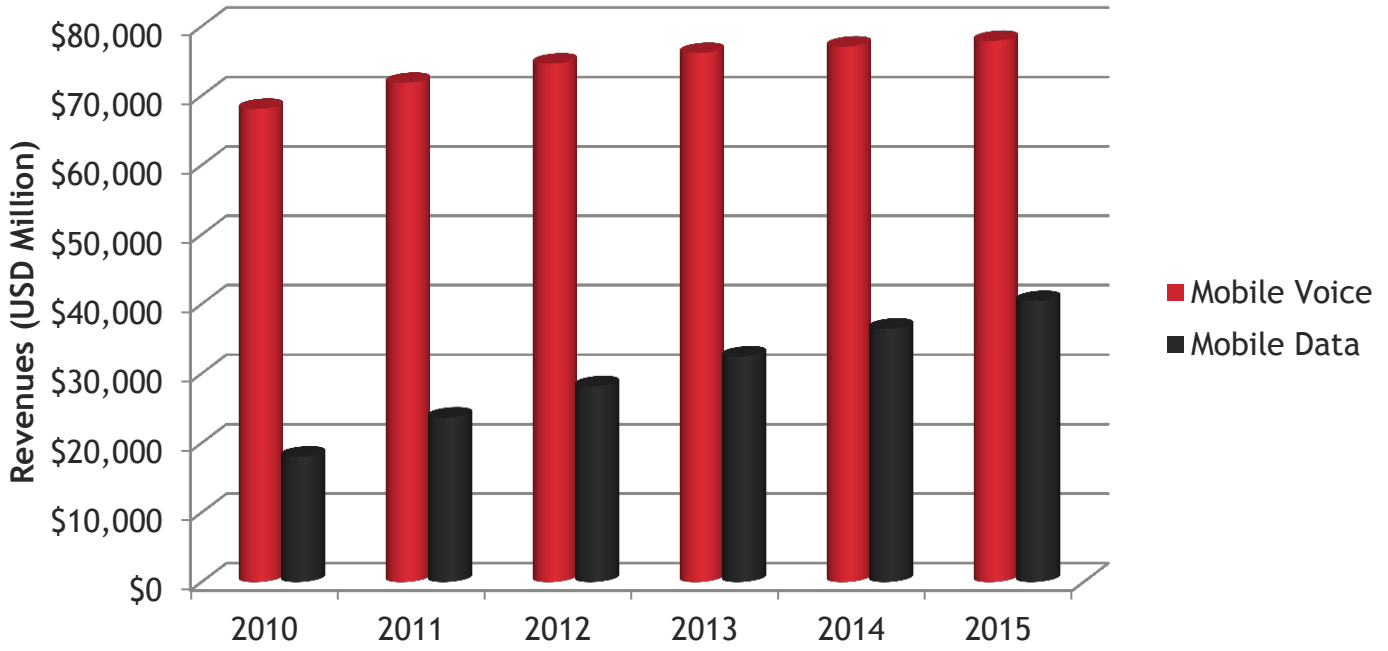
Mobile operators in Latin America have long surpassed their fixed peers in terms of revenues and subscriptions

- While fixed phones are usually a home phone for many users, mobile phones are personal and destined to a single user, increasing the revenue potential for mobile services.
- Latin American mobile users value the benefits of mobility and also perceive economical benefits from switching to mobile communications. When comparing fixed and mobile phones in Latin America, fixed phones are often described as expensive and not flexible.
- Mobile subscriptions and revenues continue to increase in the region, while the fixed communications market has stagnated, heavily dependent on data revenues to sustain its size. By 2015, Pyramid expects mobile revenues to be nearly double the amount of the revenues in the fixed communication market.



Mobile market revenue breakdown is quickly changing: while the voice market is stabilizing, data revenues and subscriptions are growing significantly

- With increasing competition in the mobile segment, mobile operators often relied on pricing strategies not only to attract clients away from fixed operators, but also from its mobile peers. Price wars have taken place primarily on the voice side, with promotions allowing for free minutes, no roaming charges, no long distance fees, unlimited intra-network calls, among other benefits.
- Mobile voice revenues are basically being traded for market share points and operators are now betting on mobile data to increase their ARPU.



Source: Pyramid Research (2011)

Mobile data is becoming a more important source of revenues year on year, but what is allowing that to happen?

- Until recently, data usage was mostly concentrated among SMS messages. However, with the evolution of terminals and the network, users can now easily substitute a computer for a smartphone or a tablet for basic internet browsing and not so demanding applications.

GREATER VARIETY OF HIGH SPEED ACCESS OPTIONS

Key Forces:

- Migration to 3G, 3G+ and 4G networks
- Expansion to new geographic locations
- Adoption of mobile broadband solutions, sometimes as fixed network substitutes
- An increasing number of retailers offer WiFi access, often for free
- Governments and NGOs lead projects to improve connectivity (e.g. National BB Plans)

Market Growth

INCREASINGLY VERSATILE AND AFFORDABLE DEVICES

Key Forces:

- Pressure on prices given greater availability of devices
- Improved form factors and features
- Devices pre-loaded with 3G and 4G
- Introduction of netbooks and MIDs
- Enhancement of operating systems

RICHER INTERACTIVE APPLICATIONS

Key Forces:

- Growth of user generated content
- Development of online communities/virtual spaces of collaboration, exchange and mashups
- Greater number of online transactions across verticals (e-commerce, e-banking, e-government)
- Shift in leisure time attracts advertising spend

Source: Pyramid Research (2011)

Faster networks also lead to faster, better and more complex services, which are good for operators, content developers and for the final user

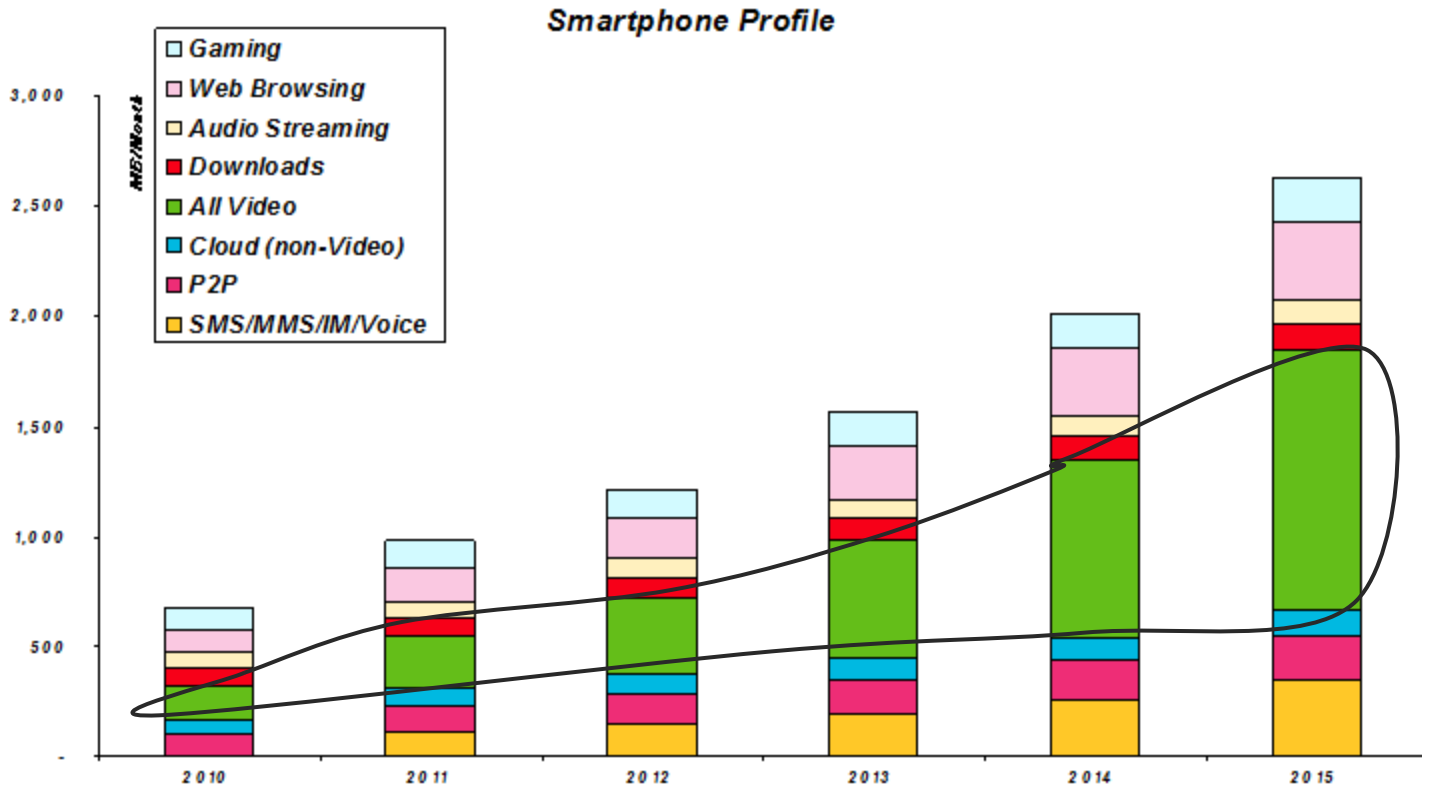
Mobile Broadband Internet, VoIP and VAS

Mobile Gaming

Mobile HD Video Live – On Demand

User Content Social Networks

Video is dominating traffic growth around the world and we expect the same to happen in Latin America

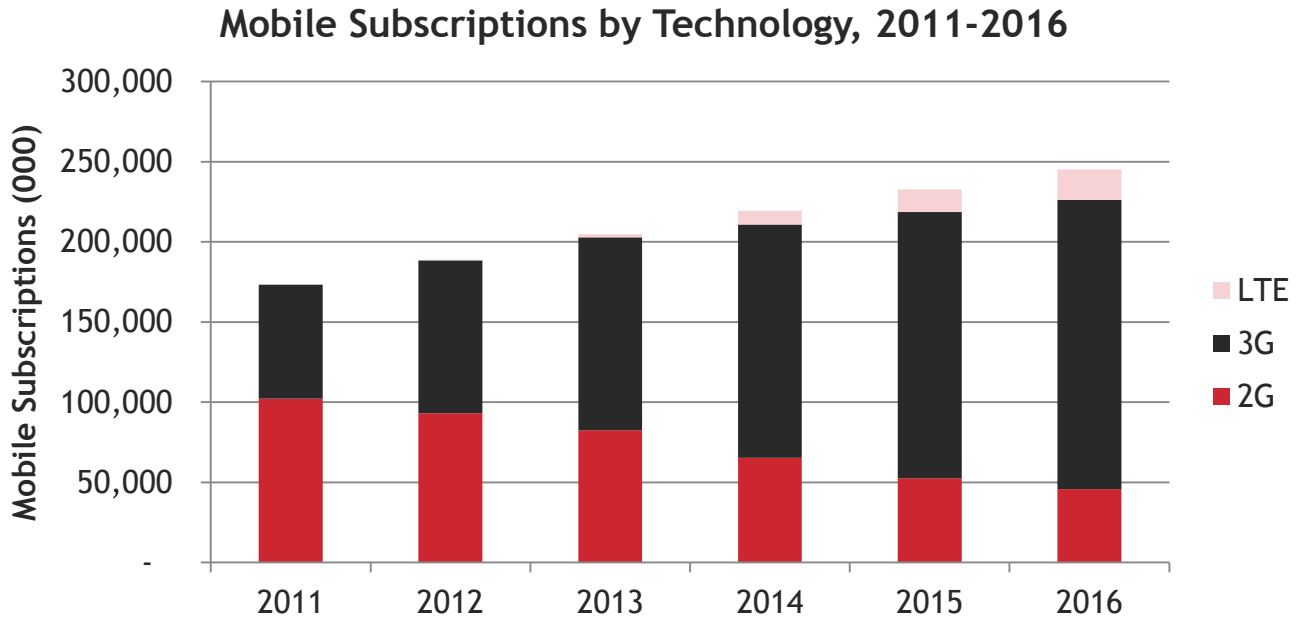


- Data usage per smartphone user projected to grow from 700MB to 2.5GB per month
- Video and Web browsing are the top traffic generating applications
- Improvements in processors (1GHz+) and screens (up to 720i) will drive consumption

Source: Pyramid Research, Heavy Reading 2011

In order to keep up with increasing data usage, networks in the region must adapt and evolve. 3G and LTE networks are quickly displacing 2G.

- Within 3-4 years of its first deployments in the region, 3G networks already account for 26% of the subscriptions in service in Latin America. In fact, 41% of all mobile phones sold in Latin America in 2011 will be based on the 3G technology.
- With the high speeds already provided by 3G, Pyramid Research expects that LTE will take a little longer to develop. Even so, we expect LTE subscriptions to account for 6.9% of all mobile subscription in Latin America in 2016, which is 4 years after its first commercial deployments in 2012. In 2016, LTE devices will account for 48.5% of all mobile devices sold.



Source: Pyramid Research (2011)

This trending 4G adoption is illustrated by many trial across Latin America, several only waiting for specific regulation to be launched

- **Argentina**
  - Telecom Personal, June 2010 in 2.6 GHz
  - Telefonica, December 2010 in 1.7/2.1 GHz
- **Bolivia**
  - Entel Movil, 1H 2011 in 700 MHz
- **Brazil**
  - Oi, June 2011 in 2.6 GHz
  - Sky, 2011 in 700MHz
- **Chile**
  - Entel, December 2009 in 2.6 GHz
- **Dominican Republic**
  - Wind Telecom, Sept 2011, 2.6 GHz
- **Mexico**
  - América Móvil, Lab test of 1.7 / 2.1 GHz
  - Iusacel, network launch planned for 2012
- **Peru**
  - Telefonica, June 2010 in 700 MHz
- **Uruguay**
  - ANCEL, 2Q 2011 in 1.7 / 2.1 GHz

Source: 4G Americas, Pyramid Research (2011)

THANK YOU!

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Executive Summary

- Introduction
- LTE – What exactly has changed as compared to 2G/3G?
  - New Radio Technology
  - Flat, All-IP Network Architecture
- Impact of New Features in LTE on Tests, Measurement and Analysis
- Typical tests to measure LTE performance
  - Call Setup
  - Mobility Performance (Re-selection/Handover)
  - Data Throughput
  - Latency
- Similarities in Test Procedures – LTE vs. 3G/2G
- Typical issues observed in initial LTE networks

¿CUÁNTO HAN CAMBIADO REALMENTE LAS REGLAS DEL JUEGO?

PRESENTADOR: MARCEL DEL PRADO
DIRECTOR REGIONAL AMERICA LATINA Y EL CARIBE

ASCOM

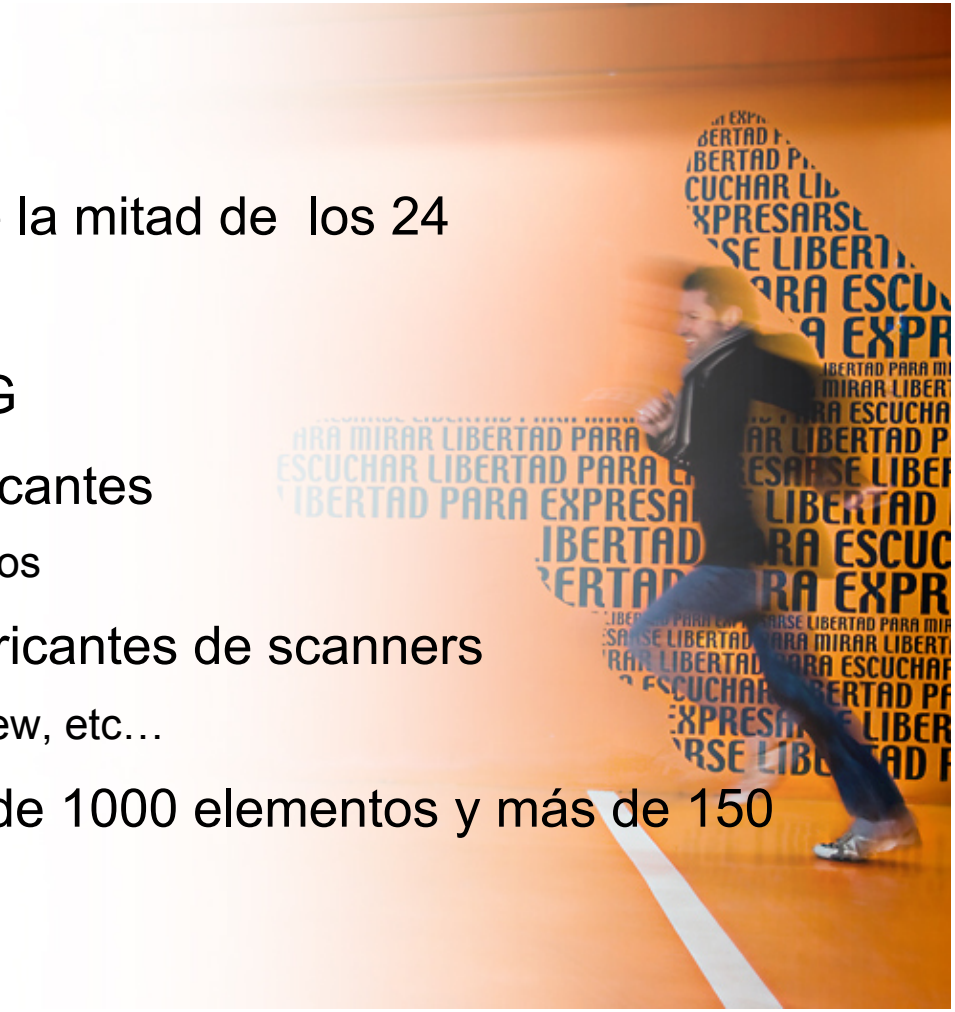
- Más de 2,100 empleados a nivel global
- Presencia en más de 20 países
- Ventas anuales que superan USD $620M
- Listado en la bolsa de valores de Suiza (SWX)
- Línea de productos TEMS: Herramientas para medición, prueba, monitoreo, benchmarking, y post proceso

www.ascom.com

Ascom Network Testing

Líder en la industria:

- Herramienta de medición para más de la mitad de los 24 despliegues de LTE
- Plataforma multi-tecnologia - 2G/3G/4G
- Mayor cantidad de relaciones con fabricantes
  - Más de 300 dispositivos (UEs) integrados
- Compatibilidad con alta gama de fabricantes de scanners
  - PCTel, Rohde & Schwartz, DRT, Andrew, etc…
- Recolección de información de más de 1000 elementos y más de 150 eventos



DESAFIOS EN CAMPO MULTI-TECNOLOGIA

No existe solución que brinda información total en tiempo real

- Se requieren múltiples herramientas para tener la mayor cantidad de información posible para tener la mayor visibilidad posible
  - Drive Test
  - Proceso de eventos brindados por OSS
  - Benchmarking
  - Monitoreo de servícios
  - Aplicaciones en teléfonos inteligentes

Como Obtener la Mejor Calidad y Mejorar la Experiencia del Usuario

Todo se basa en el programa de calidad

- Enfoque en la experiencia del usuario
- Creación de mapas entre KPIs, QoS, y QoE
- Definición y entendimiento de interdependencia de tiempo y espacio físico
- Selección de la herramienta adecuada para distintas fases de la red
  - Planeamiento, tuning, optimización
- Instalación correcta de equipo
- Verificación constante de equipo
- Logs para eventos inesperados

Targets radio network OPEX savings

LTE TESTING, HAS THE GAME REALLY CHANGED?

Presented by: Angel Ivanov
Director, Technical Sales

LTE TESTING

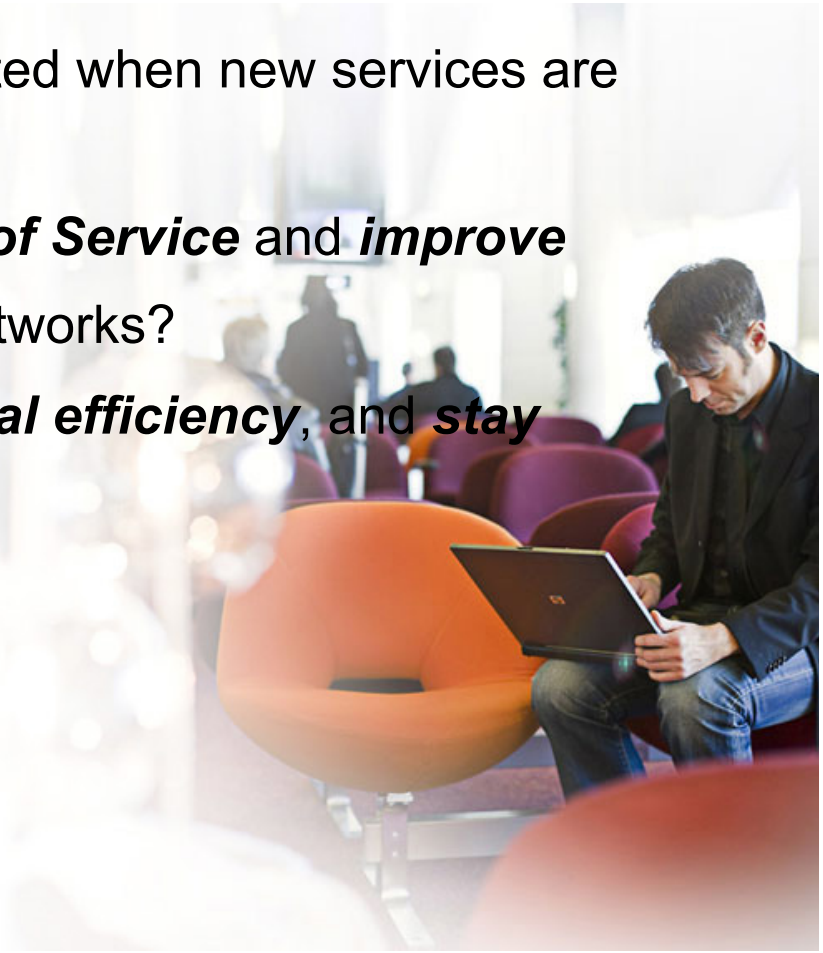
GO EVERYWHERE

Telecommunications is moving in new directions:

- Unparalleled mobility and coverage
- Increased focus on quality and operational efficiency
- Explosive growth of data service
- Focus on testing real subscriber experience
- Migrating Core Networks to IP

OPERATORS' CHALLENGES

- How to keep up their ***test procedures*** updated when new services are introduced?
- How to deliver the highest possible ***Quality of Service*** and ***improve the User experience*** while rolling out LTE networks?
- How to ***manage costs***, ***maintain operational efficiency***, and ***stay ahead of the competition***?

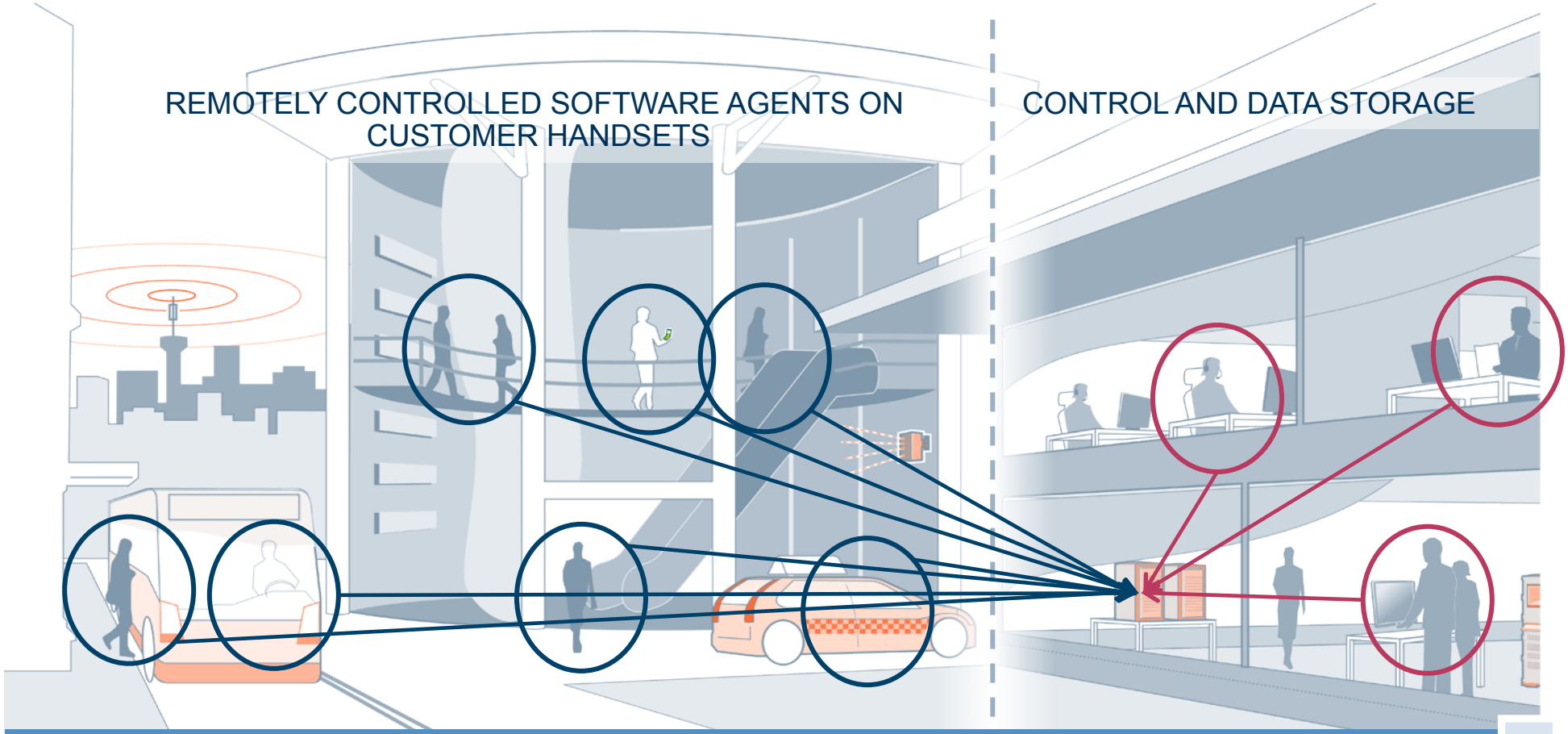


COLLECTING DATA FROM REAL SUBSCRIBERS

- Mobile service Quality of Experience (QoE) solution
  - Measurement of true customer experience (network and device)
  - Customer perception captured via event-driven questionnaires
  - KPIs based on detailed insight into the mobile user's experience
- Software agents in smart phones to measure network and device performance and usage data
  - Usability research
  - Marketing and consumer insights

Measuring the customer's true experience

COLLECTING DATA FROM REAL SUBSCRIBERS (2)



Let subscribers collect information for you

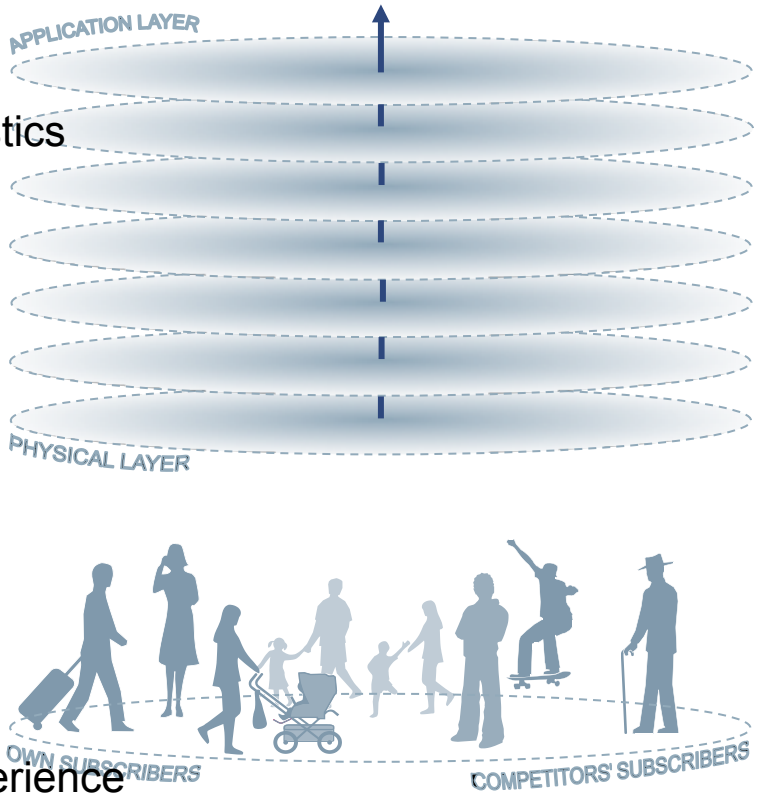
COLLECTING DATA FROM NETWORK ELEMENTS

- For all traffic
  - Recording functions **built into** the network nodes
  - Recording large volumes of traffic in an area of cells
  - All traffic – outdoor, indoor, and M2M
  - All types of traffic, including CS speech, R99 data, HSPA data, LTE Data, LTE Voice
- Highly detailed
  - External events – 3GPP protocol messages (RRC, RANAP, RNSAP, NBAP, S1, X2, NAS)
  - Internal events – more details than available from the protocol analyzer
  - Uplink and downlink radio measurements
- Per-call analysis
  - Follow message sequences
  - Correlate information from different parts of call

Targets radio network OPEX savings

THE COMPLETE PICTURE

- True End-to-End View
  - Correlate application layer data with network events/statistics
  - Find correlation between KPIs and customer experience
  - Monitor device performance per device type
  - Study how user behavior and experience is reflected by the device model / OS
  - Evaluate the usability of the phone and applications
  - Study market trends, top applications, Web sites, and device feature adoption
  - Evaluate the usability of the phone and applications
  - Analyze and determine possible causes of poor user experience



End-To-End View

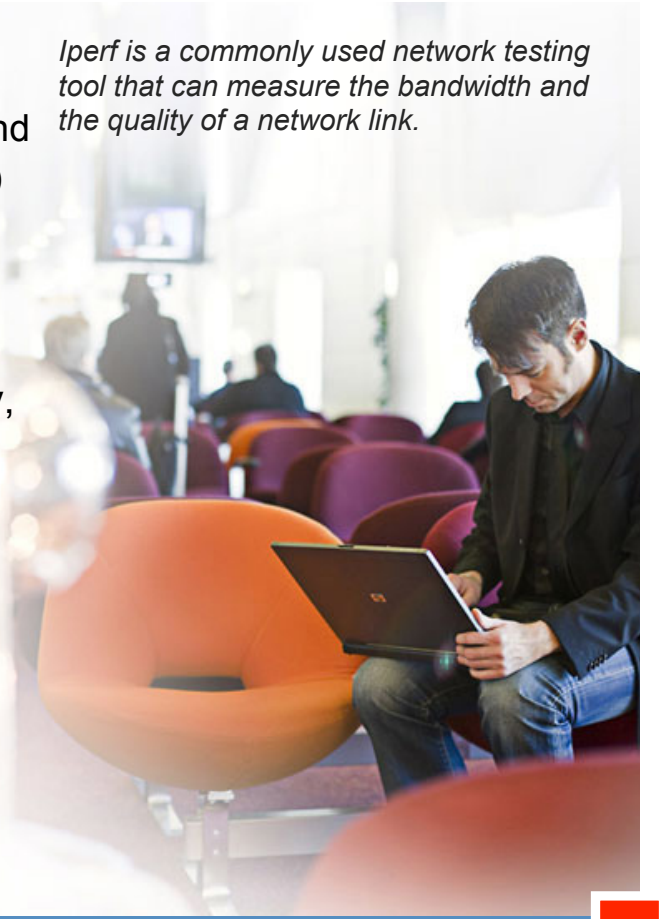
TCP/UDP Testing with IPERF

- TCP Testing
  - Used for data transmissions requiring reliability, sequential delivery, and error-free delivery, such as web surfing (HTTP) and file transfers (FTP)

- UDP Testing
  - Used for time sensitive data transmissions requiring minimal delay, such as real-time services like VoIP, IPTV, DNS, SNMP etc

- IPERF Benefits:
  - Enables TCP and UDP performance evaluation
  - Allows the tuning of parameters and UDP characteristics
  - Measures Average throughput for UDP/TCP download/upload
  - UDP download jitter and packet loss

Iperf is a commonly used network testing tool that can measure the bandwidth and the quality of a network link.



Enables TCP and UDP performance measurements

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