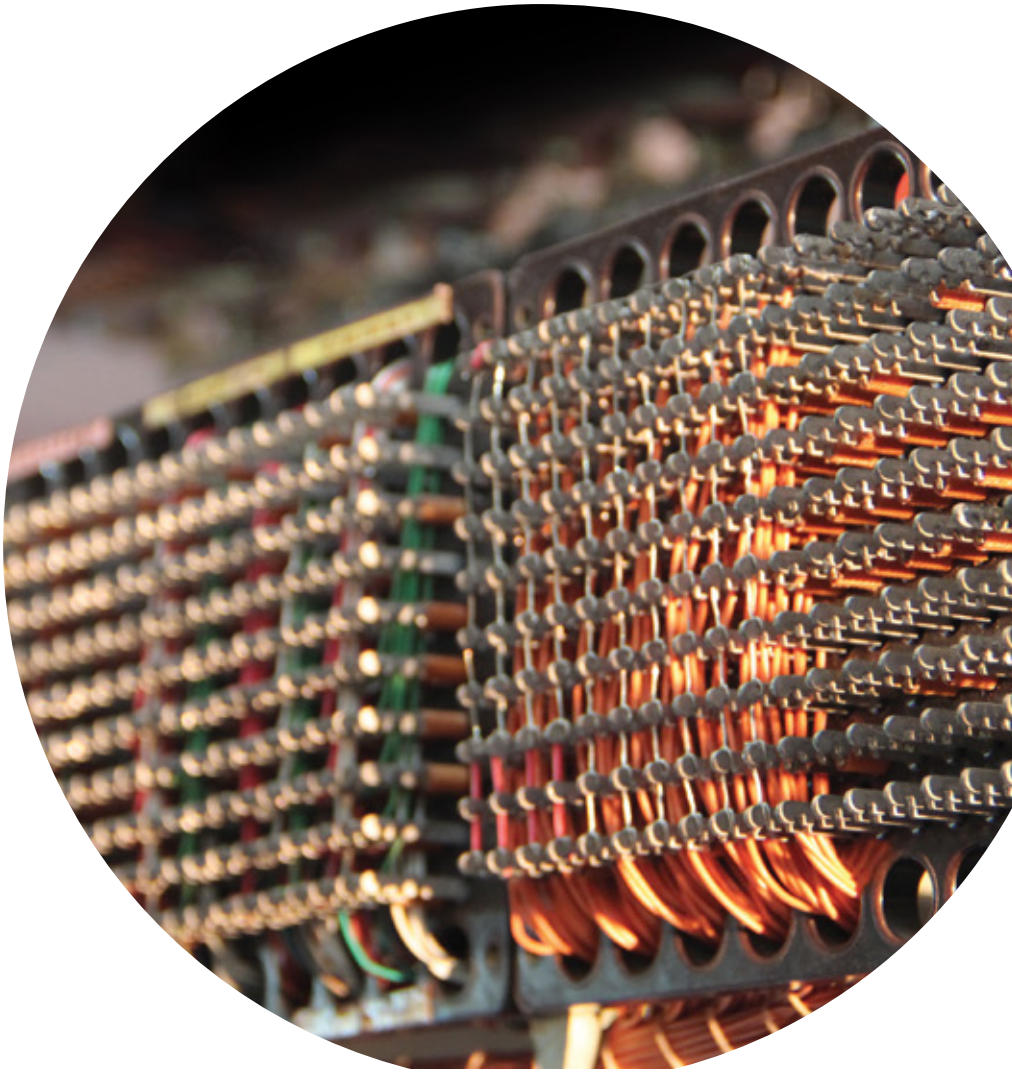
altice labs

History and value




P T

The history of Altice Labs is linked to the history of telecommunications sector evolution in Portugal.

The origin of Altice Labs dates back to 1950 when an engineering team was set up to develop in house the most advanced telecommunications technology at the time.

Over the years, a set of historical landmarks can be identified: Automatic switching; Full digitalization of the transmission network; The origin of University of Aveiro; First Broadband ATM European connection (Aveiro - Madrid); First cellular prepaid service in the world; Innovative interactive TV service; First interoperable ONT.

R&D&I capabilities supported by a structured Innovation process are extended with a dynamic ecosystem of partners, from industry and universities in Europe, aiming to transform knowledge into value in the final form of innovative products and services.

All the knowledge acquired allowed Altice Labs to innovate in technological areas and support the internationalization of the PT Group with a distinctive technology in the areas of optical networks, service delivery and network control platforms and

The history of Altice Labs is linked to the portuguese telecommunications sector evolution

1950's - 1970's

Automatic Switching

GECA (Study Group for Automatic Switching) was created in 1950 with the challenge of developing in Portugal the most advanced telecommunications technology by that time and that was imported – automatic switching. The available central switches (central offices) in the market were suited only for a couple of towns in Portugal due to its large capacity.

So GECA was able to develop small capacity automated central offices at the beginning but evolving to medium and large capacity in the years ahead.

Another "invention" by this engineering team was the "shared line" equipment by what the same copper line was shared by several clients, extending the telephone service with less capital expenditure in the switch.

While countries in Europe were starting the process of automatic switching in large towns, Portugal had two projects in parallel, one for large cities and the other for small country cities. This lead, years later, Portugal to became the first country in the world with a completed automated switching network.

In 1972 GECA becomes CET (Telecommunications Study Centre) with an additional purpose: school. It was necessary to re-qualify all the technicians and engineers to a new technology: electronics.

In 1973 Aveiro University was created inside the campus of CET, first with telecommunications and electronics classes.
For several years engineers of CET were teachers and many of the first students were PT's technicians.

ATU-61 developed in GECA in 1961
With an initial capacity of 192 access lines, expandable to 384, with possibility of 16 joints of double meaning IN/OUT.
It integrating however, more reliable equipment.

ATU-52 developed in GECA in 1952
With capacity for 42 network lines and three joints of double meaning IN/OUT, it was the first switching station designed in Portugal.

GECA (1950)

ATU-52

ATU-61

CET (1972)

Created in 1973

Aveiro University

universidade de aveiro

SASC-2R

EIUT

SASC-2R developed in GECA in 1978
Technological evolution of the previous SASC-2.
Switching system to apply in urban stations of medium and large capacity.

EIUT developed in GECA in 1975
Allowed equip the stations of the Network Group Centers, in order to fully remodel, long distance telephone service.
System recorders, used a national version of the R2 signaling system CCITT.

ELD

MIC 30

Full digitalization of the transmission network

- *Electronics*
- *Digital Transmission and Switching*
- *Network Management Systems*

Broadband

First Broadband ATM european connection (1993)

acts
ADVANCED COMMUNICATIONS TECHNOLOGIES & SERVICES

EURESCOM **Passive Optical Network** in Aveiro (FIRST)

First European ATM broadband connection

MIMO

First cellular prepaid service in the world

- *International R&D collaboration*
- *Broadband Transmission*
- *Intelligent Networks*
- *Television (IPTV)*

1980's

Digital Transmission and Switching

In the late 70's, started the development of digital transmission with introduction of electronics in the network.

When there was only experiments on how to use microprocessors in the telecommunications network, Altice Labs (CET) managed to develop a robust and pioneer system – MIC 30 - to interconnect digitally central offices.

This lead to strong reductions on investment as an alternative to traditional cable expanding.

In the 80's, along with the introduction of microprocessors in switching and transmission equipment, the use of computers enabled several applications for network management and traffic control – namely MTGC (Great Capacity Traffic Meter).

In the 80´s, a small capacity local digital switch - ELD - was developed to cope with the lack of offer from the big manufacturers in this market segment.

1990's

International R&D collaboration

In the 1990's, Altice Labs (CET) started collaborating within European R&D funded projects, connecting to European operators, industry and academia. This opened to us new areas of research namely Intelligent Networks and Broadband transmission.

One of these projects was FIRST from (1991-1997) that enabled us to start working in PON for broadband access via a network deployed in Aveiro.

It was also in 1993 that the first European ATM broadband connection was established between Aveiro and Madrid.

In 1999 CET becomes PT Inovação, now, 2016 - Altice Labs.

First cellular prepaid service in the world

In 1995 TMN launched the first commercial cellular prepaid service in the world. This started a mobile service revolution. At the beginning the service was based on "hot billing", collecting call records once a while, performing calculations offline and disabling the service if the balance was reached.

This lead to fraud and losses. So Altice Labs (PT Inovação), developed a software – vssp - that anticipated the Intelligent Network standards to mobile networks (by that time this architecture was focused on fixed networks).

This software could be used in any network of whatever technology and made possible real-time control of calls, related with customer balance management.

This was exported to Brazil in 1999 with the first cellular prepaid service in America.

Mobile prepaid service expanded years later to every mobile network operator in the world.

2000's

Innovative interactive TV service

In 1995, Altice Labs (CET) was one of the 20 companies worldwide to team-up with Microsoft for their Video on Demand and Interactive TV initiative. The future of Interactive TV scenario at Expo'98 and the launch of TV Cabo Interactiva in 2001 were key milestones of the journey ahead. In 2001, TV Cabo launched, what we believe, has been the first Cable TV Digital Service in the world with access to an Electronic Program Guide and interactivity. In 2003 TMN launched the first commercial live TV service over GPRS. MEO, launched in 2008, has been widely recognized as one of the best IPTV offers available in the world.

In 2004 TMN start deploying 3G network and Altice Labs developed EMILO single equipment pioneering with both ATM and SDH switching. 3G networks initially used ATM for interfaces on Node B and RNC. As RNC were centralized, it was necessary to build an ATM aggregation network for the traffic between Node B and RNC. With EMILO for TMN's Mobile Backhaul, it was possible to reuse existent SDH network and save CAPEX.

In 2005 it was possible to connect to the Internet all 8.300 Portuguese schools using picoDSLAM, an 8 ADSL ports remotely powered equipment developed by Altice Labs (PT Inovação).

2010's

First interoperable ONT / NG-PON2

The launch of the first interoperable ONT by Altice Labs broke the monopoly of the existing OLT vendors. This innovation was consolidated within the standardization bodies, leading to increasing competition in this area and a drastic reduction in the price of terminal equipment.

Altice Labs was the first company to obtain the BroadBand Forum certification (BBF.247), being recognized as one of the most important players in this area.

NG-PON2 is the next wave of PON technology that is able to assume a consolidation function for most of the services supported nowadays with different technologies.

In 2015, Altice Labs was the first company to develop and present a First optical network with 10Gbps symmetrical speed. This NG-PON2 solution incorporates two optical termination equipments: the Optical Line Termination - OLT (central device) and the Optical Network Termination - ONT (customers' terminal equipment).

This was a pioneer demonstration worldwide as it was the first time that an operator presented these symmetrical speeds. Also it was the first time this was made with tunable ONTs, which allows the choice for a different wavelength or light color without service disruption in cases of failure, and on real network scenario.

This technology makes possible the massification of the access to optical fiber, thus responding to the growing demands for bandwidth and allowing a more efficient cost management, in particular for corporate clients.

Landmark projects and timelines

The main success factor in developing innovative products is, on the one hand, the close cooperation with universities and on the other, the proximity that Altice Labs's (PTIn's) researchers and technicians have to operations, engineering, information systems and business areas at PT.
Complete understanding of the pain points leads to more adequate solutions. Once they are tested and proven in the field, there is a potential to monetize the solutions in other markets, through integration partners or commercial channels.

Altice Labs has been developing products and services that helped in many ways PT in Portugal and in its international operations:

To be more efficient, saving operational costs with:
Optimizing service provisioning time;
Minimizing complaint customer calls;
Improving call centre performance;
Detecting malfunctions before customer awareness;
Improving service reposition time.

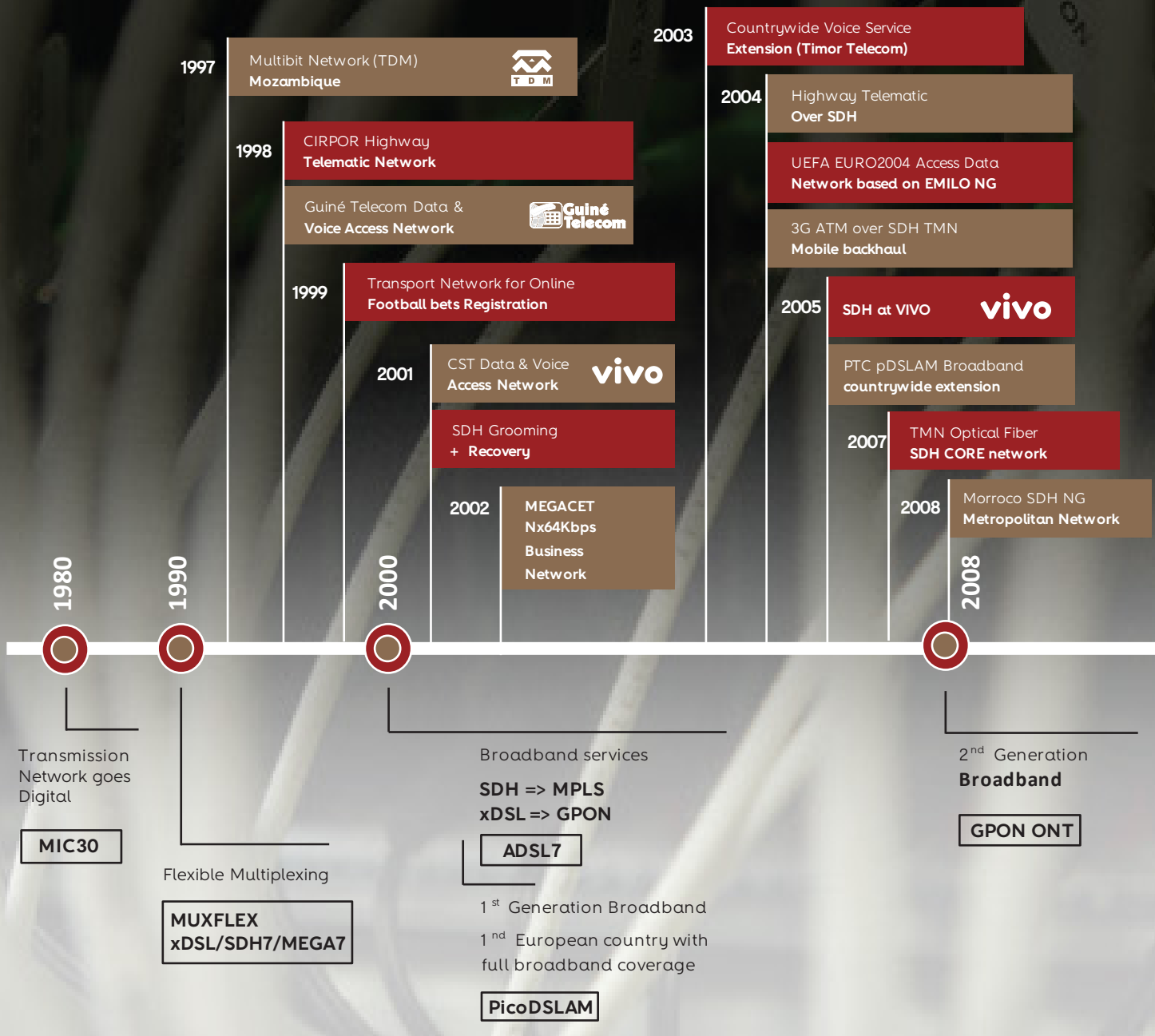
To differentiate against competitors with:
Advanced services;
Innovation attributes;
To develop unique solutions that overcome technical challenges optimizing CAPEX and OPEX spending.

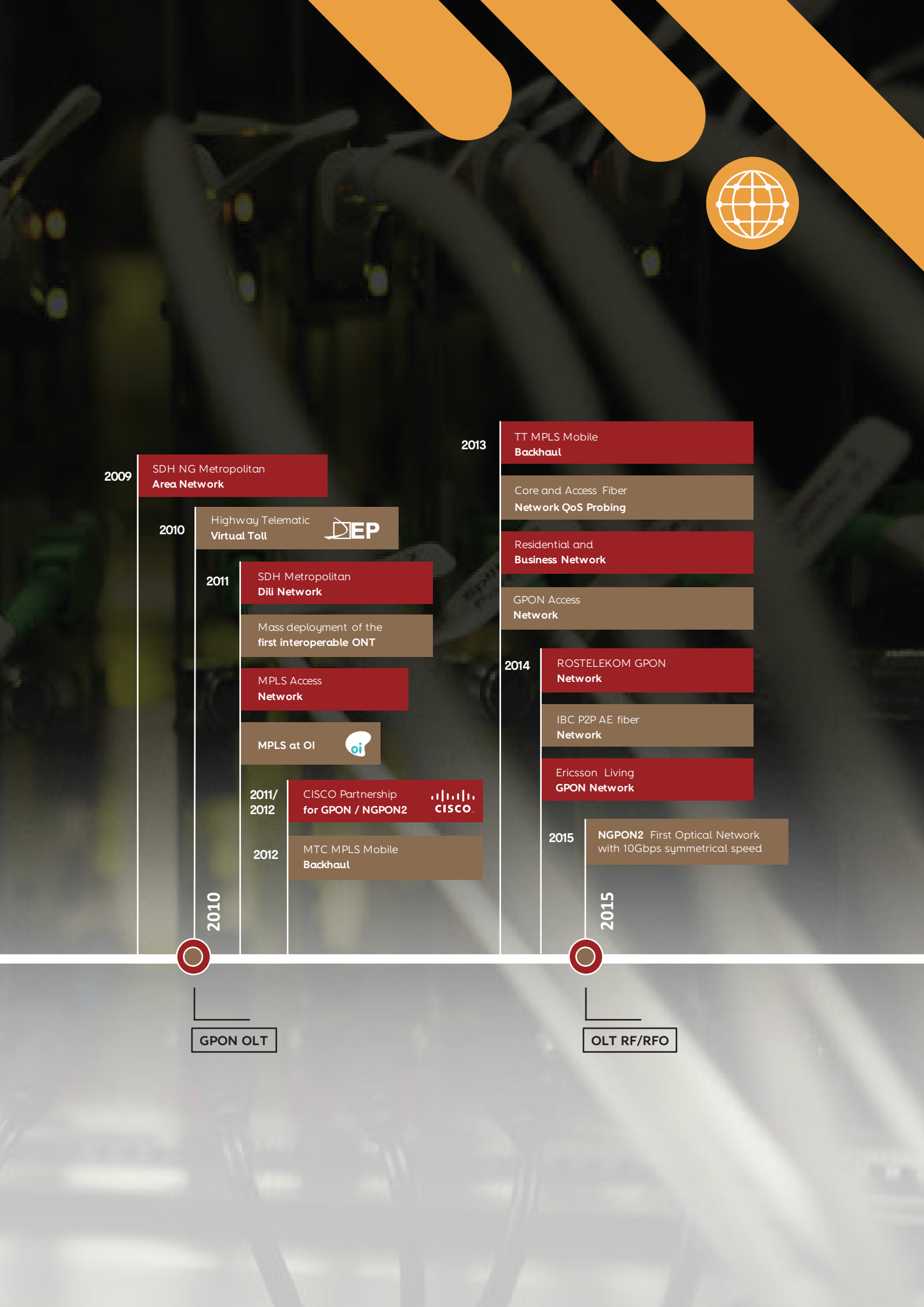

Connectivity
Operations Support Systems
Network Control and Services Platforms
Digital, Internet & Television

Connectivity timeline

Connectivity is the area of expertise which addresses high quality access to applications and data, anytime anywhere, where security and strong infrastructures are the main pillars.

These needs are answered through network equipment and solutions related to transport (MPLS), access solutions (GPON), guarantee of quality of service (QoS) and deployment of FTTx networks.




2009
SDH NG Metropolitan
Area Network
2010
Highway Telematic
Virtual Toll
DEP
2011
SDH Metropolitan
Dili Network
Mass deployment of the
first interoperable ONT
MPLS Access
Network
MPLS at OI
oi
2011/
2012
CISCO Partnership
for GPON / NGPON2
CISCO
2012
MTC MPLS Mobile
Backhaul
2010
GPON OLT
2013
TT MPLS Mobile
Backhaul
Core and Access Fiber
Network QoS Probing
Residential and
Business Network
GPON Access
Network
2014
ROSTELEKOM GPON
Network
IBC P2P AE fiber
Network
Ericsson Living
GPON Network
2015
NGPON2 First Optical Network
with 10Gbps symmetrical speed
2015
OLT RF/RFO

Connectivity

1980 – MIC 30 - digital transmission.

90s – transport networks evolved to SDH and the access networks to xDSL. Altice Labs introduces its product line MEGA7, supporting these technologies along with digital flexible multiplexing - MUXFLEX.

1998 – CIRPOR Highway Telematic Network (Estradas de Portugal) First National Highway Telematic network and one of the firsts in Europe, transporting Voice (SOS), Data (Telematic) and Video (PTZ Traffic Cameras).

1998 – Guiné Telecom Data & Voice Access Network (Guiné Telecom) Deployment of a countrywide network for Data and Voice services.

1999 – Transport Network for Online Sports Bets Registration (Santa Casa da Misericórdia) Transport network for TOTOLOTO online (most popular sports bets in Portugal) – Portugal.

2001 – CST Data & Voice Access Network (Companhia São Tomense de Telecomunicações) Deployment of a countrywide network for Data and Voice services – Sao Tome and Principe.

2002 – MEGACET Nx64Kbps Business Network (PT) Business and Enterprise network for Data and Voice Services based on EMILO equipment – Portugal.

2003 – Countrywide Voice service (Timor Telecom) Deployment of a countrywide network for voice service based on MUXFLEX technology – East Timor.

2004 – UEFA EURO2004 Access Network (PT) Access network to deliver full telco services for the Euro2004 Football stadiums supported on EMILO equipment – Portugal

2004 – 3G ATM over SDH TMN Mobile backhaul (TMN) TMN 3G network for connecting Node B to RNC (Mobile Backhaul) supported over EMILO, a PT Inovação equipment enabling ATM and SDH switching in the same equipment.

2005 – pDSLAM Broadband countrywide extension (PT) Broadband countrywide deployment using a 8 port DSLAM. Key infrastructure enabling government eSchool program, connecting all the 8.300 schools to the internet - Portugal.

2007 – TMN Optical Fiber SDH CORE network (TMN) Deployment of the fiber core network mobile backhaul domain based on EMILO STM16 tunnels at TMN – Portugal.

2008 – SDH Metropolitan Network (Meditel) Deployment of the Mobile Backhaul Metropolitan rings of Meditel based on EMILO equipment – **Morocco.**

2009 – SDH Metropolitan Area Network (Angola Telecom) Deployment of the Metro and Access domains of the Angolan Landline Operator – Angola.

2010 – Highway Telematic Virtual Toll Deployment of a telematic solution supporting virtual toll system over highway concessions for AENOR - Portugal.

2010 – First interoperable ONT with mass deployment at Portugal Telecom's FTTH network.

2011 – SDH Metropolitan Dili Network (Timor Telecom) Deployment of the SDH based Metropolitan network of Dili – East Timor.

2011 – MPLS Access Network (Multitel) Deployment of a MPLS based Access network to attend Business and Corporate Customers of Multitel – Angola.

2012 – MTC MPLS Mobile Backhaul (MTC) Deployment of a MPLS based Mobile Backhaul network to attend 3G and future 4G data services for MTC – Namibia.

2013 – TT MPLS Mobile Backhaul (Timor Telecom) Deployment of a MPLS based Mobile Backhaul network to increase 3G capabilities and future 4G data services for TT – East Timor.

2013 – Core and Access Fiber Network QoS Probing (Meditel) Deployment of an integrated QoS fiber probing system for core and access domains at Meditel – Morocco.

2013 – Residential and Business Network (United States Air Force) Deployment of a GPON based residential and enterprise network for Base das Lages - Azores.

2013 – GPON Access Network in Spain Deployment several regional GPON infrastructures in Northern Spain for APFUTURA .

2014 – ROSTELEKOM GPON Network Deployment of a GPON equipment network to attend ROSTELEKOM FTTH residential customers – Russia.

2014 – IBC P2P AE Fiber Network (IBC) Mass Deployment FTTx Peer-to-Peer Active Ethernet network with countrywide extension for IBC (Israel Broadband Company) – Israel.

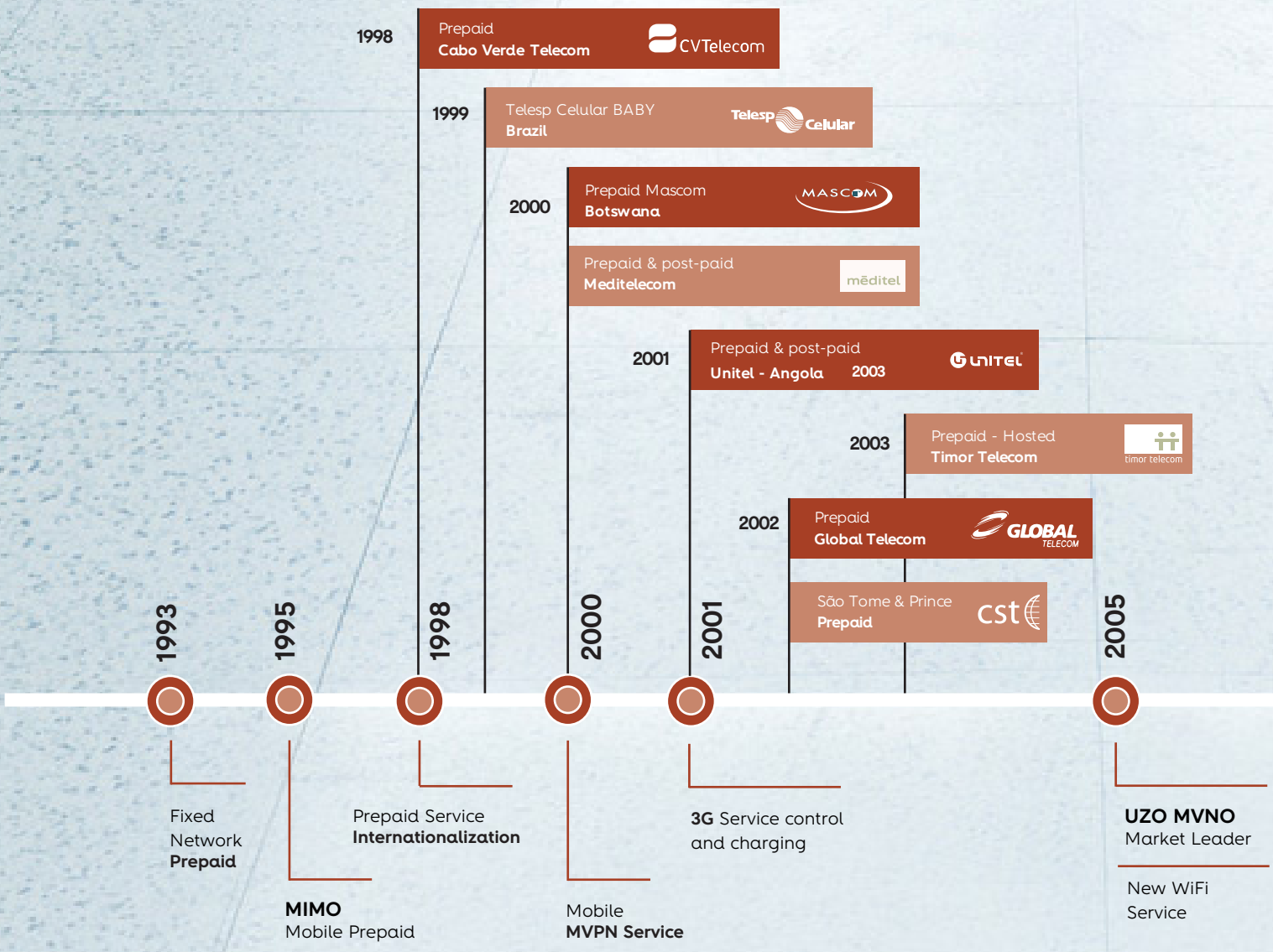
2014 – Ericsson Living GPON Network Deployment of a GPON based network for a full pack FTTH residential services – USA.

2015 – NG-PON2 First Optical Network with 10Gbps tunable and symetrical speed.

Network Control & Service Platforms timeline

Network Control and Service Platforms portfolio gives telcos the ability to act on their network and enhance the service experience they provide to their customers, as well as being able to properly manage their products' portfolio and charge the usage of network assets and services. On top of this policing and monetization capacities, a set of services is also made available so that the operator can differentiate itself when addressing corporate and personal markets.

As an additional offer, media server, multimedia and content delivery solutions are also included in the portfolio.



2006 Prepaid vivo

2008
RTC
Real Time Data Charging with Cost Control

2011 ACM PT

2011
LTE
Support

2012 ACM CVTelecom

2012 ACM oi

2012
MEO Card
VOD Support

2013 SEC oi

2013 Smart2M PT

2013
MEO M4O
4P Charging

Global Connect
Convergent Centrex with RTC

M2M Managed
Connectivity

2013/2014 Prepaid & Post Paid Namibia mtc

2014 ACM Claro

ACM mtc

2014
MEO M5O
5P Service

2015 Smart2M oi

Smart2M MASCOM

2015

Network Control & Service Platforms

1993
The first IN based prepaid card for fixed line networks is launched over Altice Labs's (CET's) platform: NGIN – Next Generation Intelligent Network.

1995
The world's first GSM mobile prepaid service is launched (MIMO Service by TMN). This event marks also the birth of the NGIN platform for service control and charging.

1998
Marks the first internationalization of the NGIN Technology, deploying a prepaid platform at Cabo Verde Telecom.

1999
NGIN platform is deployed in São Paulo, at the Telesp Celular mobile operator, running TDMA/CDMA technology.

2000
The mobile VPN service is launched. NGIN expands to two new operators in Morocco and Botswana.

2001
Support for 3G service networks is introduced. The NGIN platform expands to Angola.

2002
NGIN expands to Global Telecom (Brazil).

2003
NGIN expands to East Timor (remote hosting).

2005
A full MVNO is launched on top of the NGIN platform, ahead of all competition - UZO.

2006
Altice Labs is awaderd the project for supplying a full service platform to VIVO swapping seven different platforms.

2008/2009
New technology support is introduced into the NGIN platform: Real Time charging for all services, WiFi and LTE service support.

2010/2015
NGIN is multi-technology and the centralized rating and charging system for convergent services.

2011
ACM, a personalized and real time context one-to-one marketing tool is deployed at PT, both for MEO and UZO.

2012
ACM deployed at CVT and Oi.

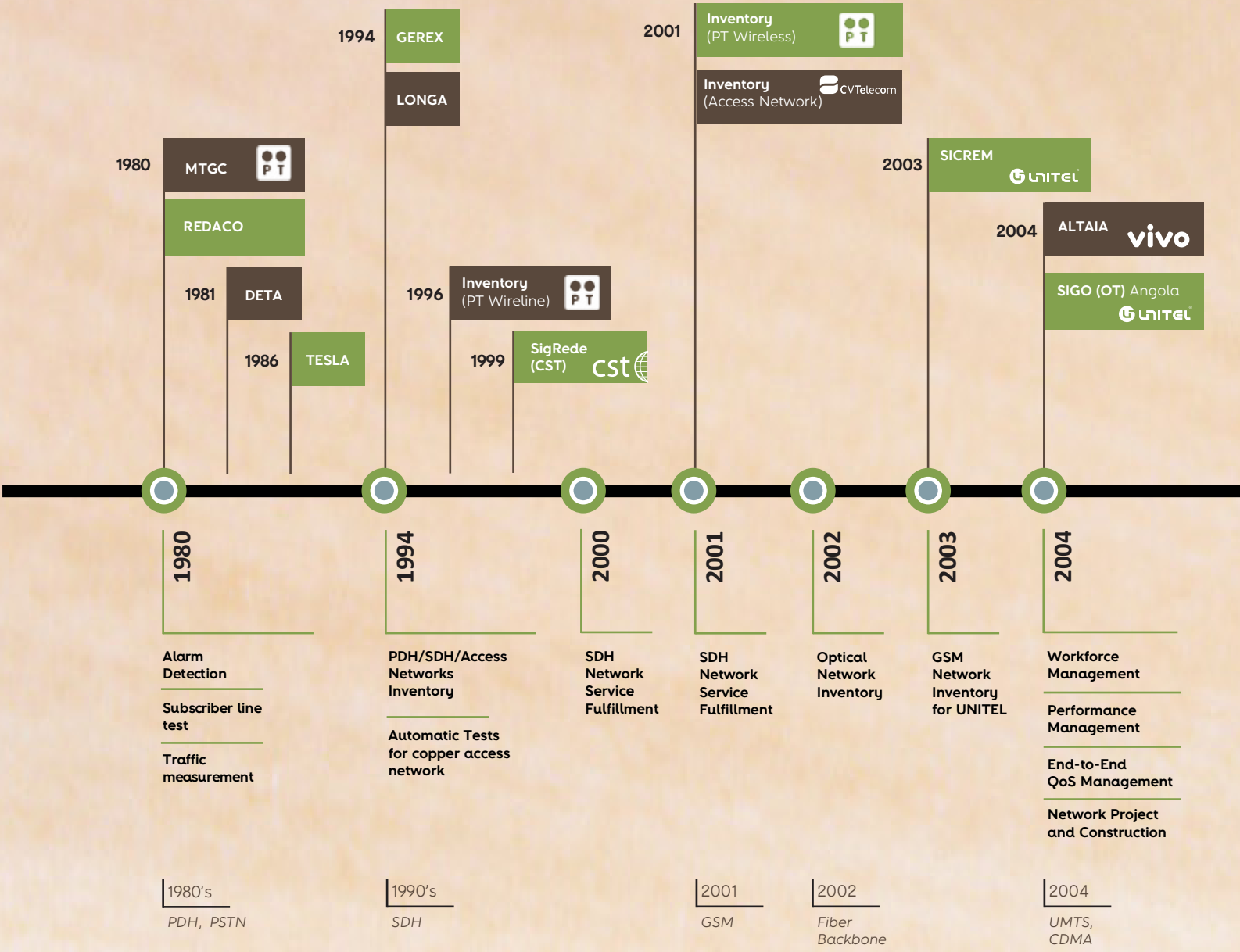
2013
ABC – Advanced Business Communications - deployed at PT as Global Connect; Smart2M deployed at PT.

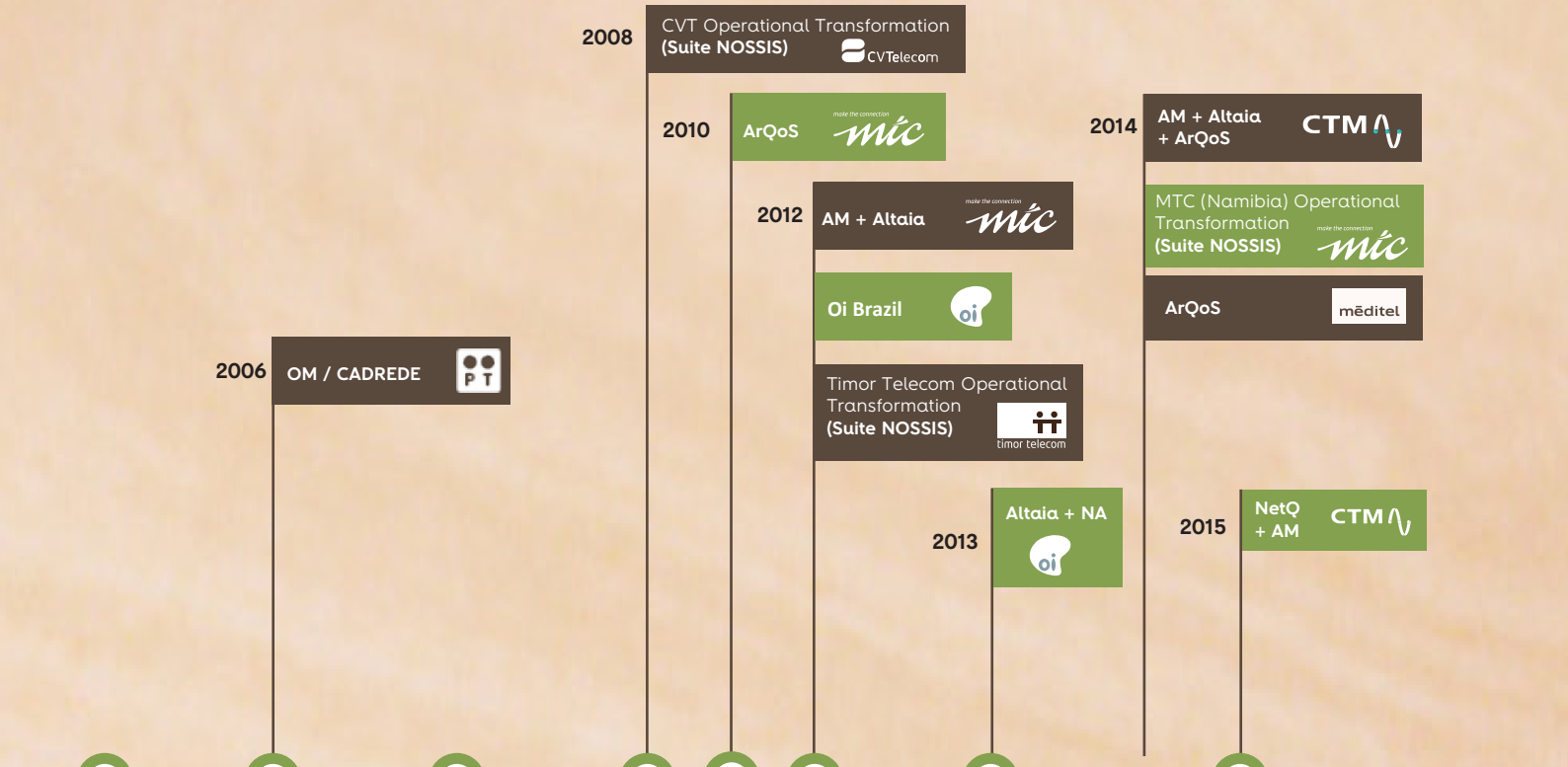
2014
NGIN expands to Namibia; ACM deployed at MTC - Namibia and Claro - Brazil.

2015
Smart2M being deployed at Oi - Brazil and Mascom - Botswana.

Operations Support Systems timeline

Operations Support Systems (OSS) consist in software, and occasionally hardware that support the back-office activities which operate a Telco network and provision, ensuring customer services. OSS software is specifically dedicated to telecommunications service providers and mainly used for supporting network processes to maintain network inventory, configure network components, provision services and manage faults. OSS assembles services and assures network performance, helping operators to plan, build and optimize their network.





2005

Multi-technology Service Mediation and Activation

2006

Problem Management

Convergent Service Fulfillment

Network Unified Inventory

2007

Customer & Network Care

NOSSIS Suite
Convergent Multi-technology OSS Solution

2008

GPON

N-Play over FTTx/FTTH

2010

2012

NOSSIS Suite
TMForum Frameworx v12.0 Certification

4G

2013

NOSSIS Suite
Is finalist of Excelence Awards from TMForum for Operational Efficiency

2015

OSSaaS
Cloud Based NOSSIS Suite

NetQ
is TM Forum Excelence Awards Finalist in Customer Centricity

2005

xDSL, MetroEthernet, MPLS, IP
3-Play over xDSL

2008

N-Play over FTTx/FTTH

2009

4G

Operations Support Systems

1980
REDACO - Billing Data Collection;
MTGC – Great Capacity Traffic Meter.

1981
DETA – Detection and Transfer of Alarms.

1983
OSCAR – Central System for Network Management.

1986
TESLA – Subscriber Line Test.

1994
LONGA for PDH networks QoS; GEREX for Copper Network Automatic Tests.

1996
Development of the first inventory system for PDH and SDH networks.

1999
SigRede - Access network management System for CST.

2000
ARCO - SDH automated provisioning.

2001
SICREM – GSM network Inventory for TMN;
SigRede for CVT.

2002
CRO Optical Fiber Networks Inventory.

2003
SICREM GSM network Inventory for Unitel.

2004
Development and deployment in VIVO (Brazil) of ALTAIA Platform for GSM and CDMA Network Performance Management and ArQoS Platform for QoS Probing.

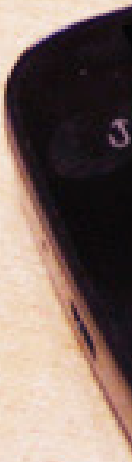
2004
Deployment in PT and Unitel (Angola) of SIGO-OT for Workforce Management.

2005
Deployment of NA – Network Activator - Platform for Convergent Service Activation & Mediation in Portugal Telecom's wireline operations.

2006
Deployment of SIGO-TTK for Problem Management in Portugal Telecom's wireless and SigRede at Guiné Telecom.

2007
Deployment of NetQ Platform for Customer&Network Care in wireline operations in Portugal, providing an unified all-in-one application for the call centers and technical support.

2007
First Release of the NOSSIS Suite: a complete OSS Multi Technology and Convergent solution, based on the pre-integration of Altice Labs' (PT Inovação's) OSS Products.



2008
OSS suite in Portugal Telecom's operations supports FTTH N-Play Service Inventory Activation & Configuration.

2008
Full deployment of NOSSIS Suite to support CVT (Cabo Verde) Operational Transformation to N-Play.

2012
Full deployment of NOSSIS Suite to support Timor Telecom (East Timor) Operational Transformation to N-Play. Deployment in Oi (Brasil), ALTAIA Platform for Convergent Performance Management.

2012
NOSSIS Suite TM Forum Frameworx12 Certification.

2013
NOSSIS Suite is a TM Forum Excelence Awards Finalist.

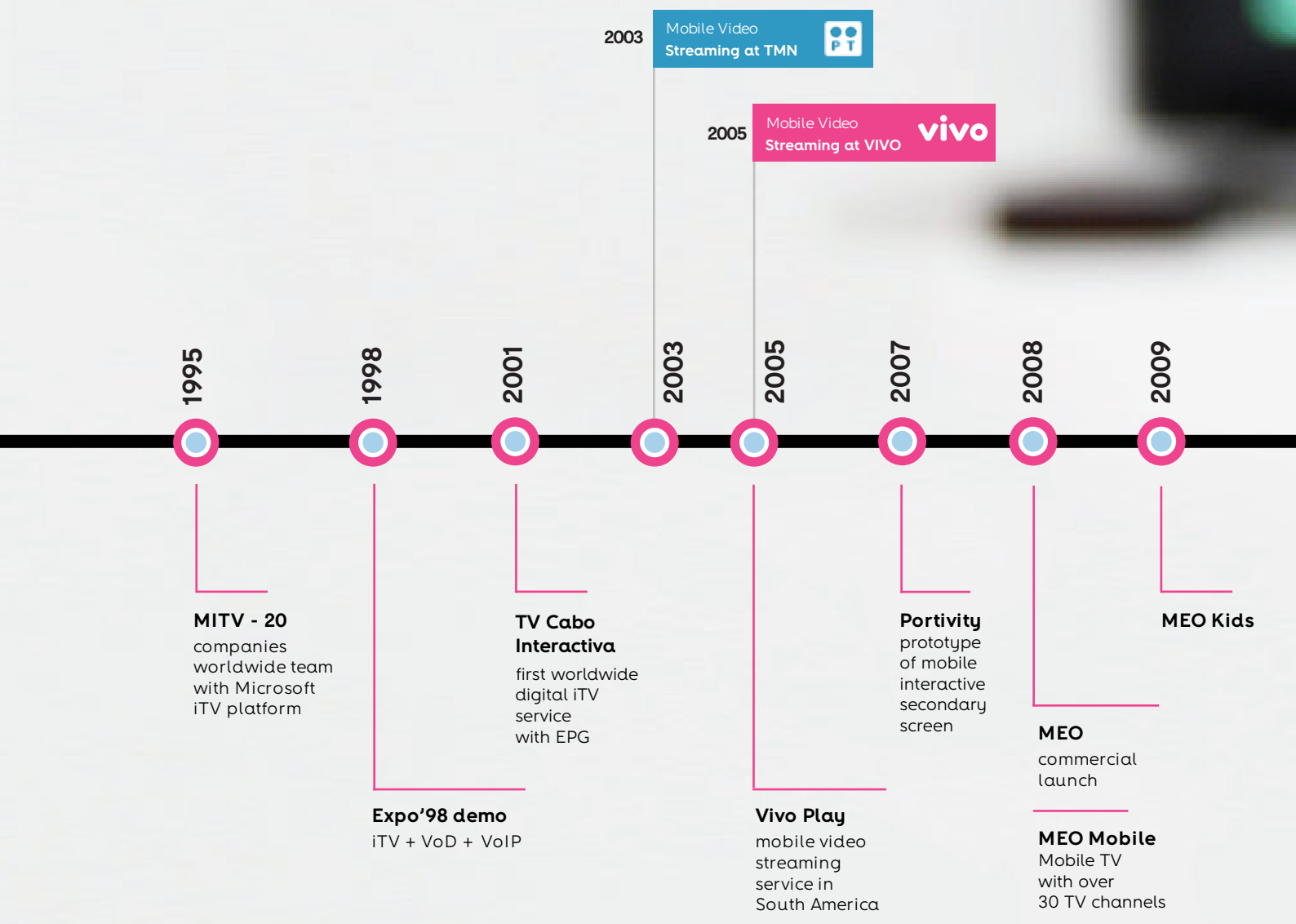
2014
Full deployment of NOSSIS Suite to support MTC (Namibia) Operational Transformation to N-Play.

2015
First Release of the NOSSIS OSS Cloud Suite.

2015
NetQ is TM Forum Excelence Awards Finalist for Customer Centricity.

Digital, Internet & TV timeline

Altice Labs has a highly evolved media service platform providing a real television experience to customers anywhere and at anytime.
Altice Labs offer was built from the ground up to serve IPTV operators and media companies that want to provide their customers with disruptive and distinctive Over-the-top TV services, thus increasing ARPU and reducing churn.



2010

MEO Vox – demo:
voice and
gesture control

MEO Remote
iOS, Android

Q channel
first interactive
channel

Secret Story
reality show
interactive channel

2011

MEO Card
prepaid
video club

MEO 2.0
with new
channel
subscription
management

MEO GO
a new way to
watch TV,
athome and
on the go

2013

Automatic
Program Recording
Virtual DVR, 7 days,
over 80 channels

2014

New
MEO Video Club

2015

MEO 3.0
Totally New Design

Digital, Internet & TV

1995
MITV Initiative – 20 companies worldwide team up around Microsoft iTV platform - March/95.

1998
At the Lisbon World Exposition, Altice Labs showcased one of the first interactive IPTV services in the world, together with VoD (Video on Demand) and VoIP calls (Voice Over IP).

2001
TV Cabo Interactive, a portuguese Cable TV operator, launches the first worldwide digital interactive TV service with an EPG (Electronic Program Guide).

2003
TMN launched the first commercial live TV service over GPRS.

2005
The Brazilian operator VIVO launches Vivo Play, the first mobile video streaming service in South America.

2007
PT Inovação demonstrates the first prototype of a mobile interactive secondary screen ("Portivity").

2008
PT officially launches MEO, its 3P service and also "MEO Mobile TV" with over 30 channels.

2010
Altice Labs demonstrates MEO Vox technology, controlling MEO box with voice and gesture commands.

2010
MEO Remote apps for iOS and Android devices.

2010
Canal Q, First commercial interactive channel.

2010
Secret Story channel, the first interactive reality TV channel.

2011
MEO Card, the prepaid card for VoD (MEO Video Club).

2011
MEO 2.0 with new channel subscription management.

2011
MEO Go applications introduce a new way to watch TV at home and on the go.

2013
Automatic program recording: Virtual DVR, 7 days, over 80 channels.

2015
MEO 3.0 is launched with a totally disruptive user experience.


VIDEOCLUBE
PESQUISA
NOVIDADES
EM DESTAQUE
GÉNEROS
INFANTIL
ADULTOS
SUBSCRIÇÕES
PESSOAL
SAIR
OS MELHORES DO ANO
13 MINUTES

Challenging Use Cases

Challenge 1

How to create a business model capable of turning around the continuous loss of market share PT/TMN was experiencing in the GSM market in 1995, against its recent and aggressive competitor (Telecel, now Vodafone)?

Altice Labs had been working in the field of R&D on Intelligent Networks since the beginning of the 90's and took the challenge from TMN to launch a prepaid GSM service, which became a first in the world. In a few years, TMN became a GSM market leader with a customer base almost entirely prepaid. Besides the innovation and the increased customer satisfaction with a tool for costs control and immediate service with no need for a contract, the costs to TMN were negligible, as compared to the licensing from the industry years later.

NGIN prepaid platform evolved to a full vertical platform for the GSM business and operations support and followed closely the internationalization of PT acting as an accelerator for internationalization and leadership.

Due to the internal capacity to develop and integrate the NGIN platforms into the international operations and to the fact that the IPR belonged to PT, the licensing costs were brought to an absolute minimum and the risk from involving third parties in the core business platform were also minimized.

Challenge 2

How to deploy 3G network with minimum network investment and reusing existing 2G technology with full 3G capacity?

In 2004, TMN start deploying the third mobile generation: 3G.

The evolution to 3G networks, forced mobile operators to big investments. Beyond licenses, they had to deploy new backhaul networks to support packet switching traffic. SDH technology that was being used in 2G networks for mobile backhaul in an efficient way and at a low cost, had to be replaced by ATM networks, much more complex and expensive, as all Node B and RNC interfaces were ATM. As RNC were centralized, it was necessary to build an ATM aggregation network for the traffic between Node B and RNC.

Altice Labs developed EMILO single equipment pioneering with both ATM and SDH switching (not available in the industry) to be installed at Central Offices were there was RNC and at Nodes B. With EMILO for TMN's Mobile Backhaul, it was possible to reuse existent SDH network and save CAPEX.

Challenge 3

How to create a breakthrough 3P/4P service from a set of otherwise unrelated telecom services, which can be sold and activated in real time without creating a call center/customer-care nightmare?

In a record time, Altice Labs customized the Network Activator (NA) platform which was capable of provisioning and activating the MEO service (DSL and Fiber) and then orchestrate the configuration of all the telecom and media services behind it, thus drastically reducing the number of errors visible to customers, complaint and asking for support calls, field team interventions and the bad publicity and lost of credibility in the social networks.

Achievements: 400.000 calls avoided, 50 million self-correction operations performed only in the first year after launching 3P/4P service M4O, resulting in enormous cost savings

With NetQ – Network Qualifier, an end-to-end testing and diagnostic system used either as a proactive maintenance or as on demand tool, and different user interfaces and access profiles available for Front-Office, Back-Office or Field Force technicians usage, 20% time reduction for service provisioning has been achieved.

Altice Labs helped PT raise its TV market share from 0% to nearly 40% in about 5 years. The risks in the area of network provisioning and service orchestration were minimal for PT, due to the previously existing experience in this area.

Challenge 4

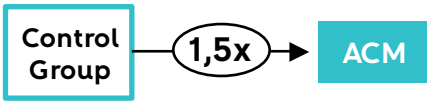
How to get the mobile customers from a mostly prepaid basis to top-up their accounts more frequently and if possible with larger amounts, while at the same time reducing the churning probability of customers who are not topping up??

The solution would be to create micro customer-segments and address them individually and in real-time with a convincing and contextualized value proposition application – ACM – Active Campaign Management. ACM is used by marketing department, has a graphical User Interface and doesn't requires IT/IS actions.

Altice Labs had been working in real time charging solutions for more than 10 years and thus mastered the technology and took the challenge. The platform was launched in 2013.

Results of BTL promotions return for 1Q 2014 at Oi.

http://ri.oi.com.br/oi2012/web/conteudo_en.asp?idioma=1&conta=44&tipo=43743



Challenge 5

How to optimize CAPEX and OPEX of an FTTH network in such a way that makes it possible to mass deploy the technology on a Portuguese countrywide extension (what is now MEO FIBRA branded)?

As a significant part of the necessary FTTH CAPEX was related to the Outside Distribution Network (ODN), Altice Labs developed also a novel all-in-one Optical Distribution Point (ODP) passive equipment, joining a lower size and higher capacity junction box together with fiber termination and splitting capabilities, pointed as a nuclear device at the ODN and replacing three different elements, lowering prices and simplifying logistics.

Apart from the OPEX savings (less power consumption, simplified warehouse and network configurations) Altice Labs's ONT also brought to PT an immediate CAPEX reduction (35% per unit).

On the same line, Altice Labs's ODP achieved significant OPEX savings (simplified logistics, decreased time and installation skills) while getting a significant CAPEX reduction (41% per unit).

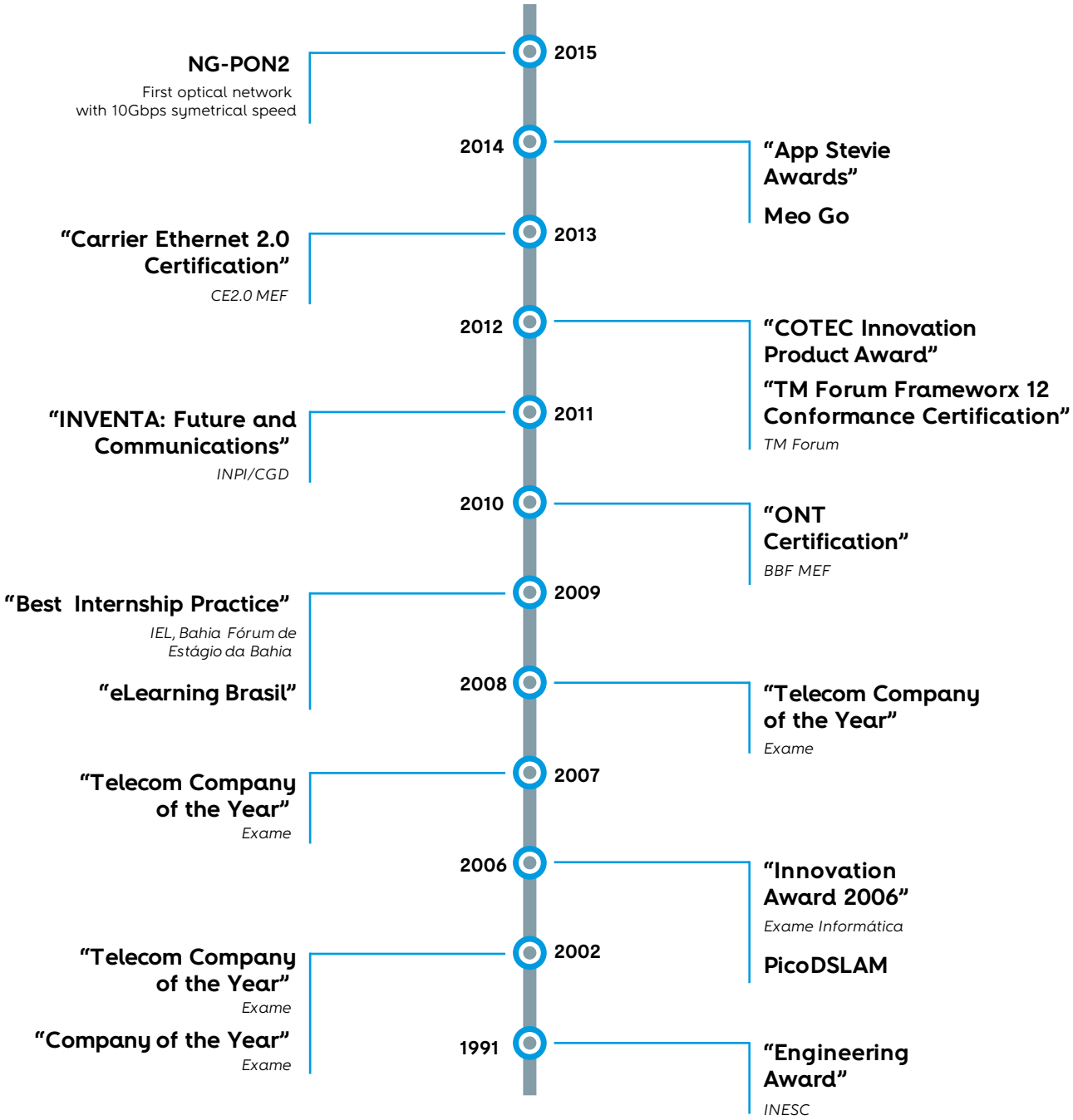
RFO – RF Video Extender (patent pending) is another example with a great impact in PT operations, in extending IPTV service to remote areas. It was reached 90% CAPEX savings in expanding IPTV service coverage to 28 new POPs in rural areas in Portugal. Additional benefits compared to traditional technology: 10x less power consumption, 40x smaller footprint and unlimited range.

Most Innovative FTTH Network: Deployment and Operation

Fibre to the Home Council Europe

2011 Innovation Award

Recent public recognition



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