

Services and Routers Architecture in an ISP

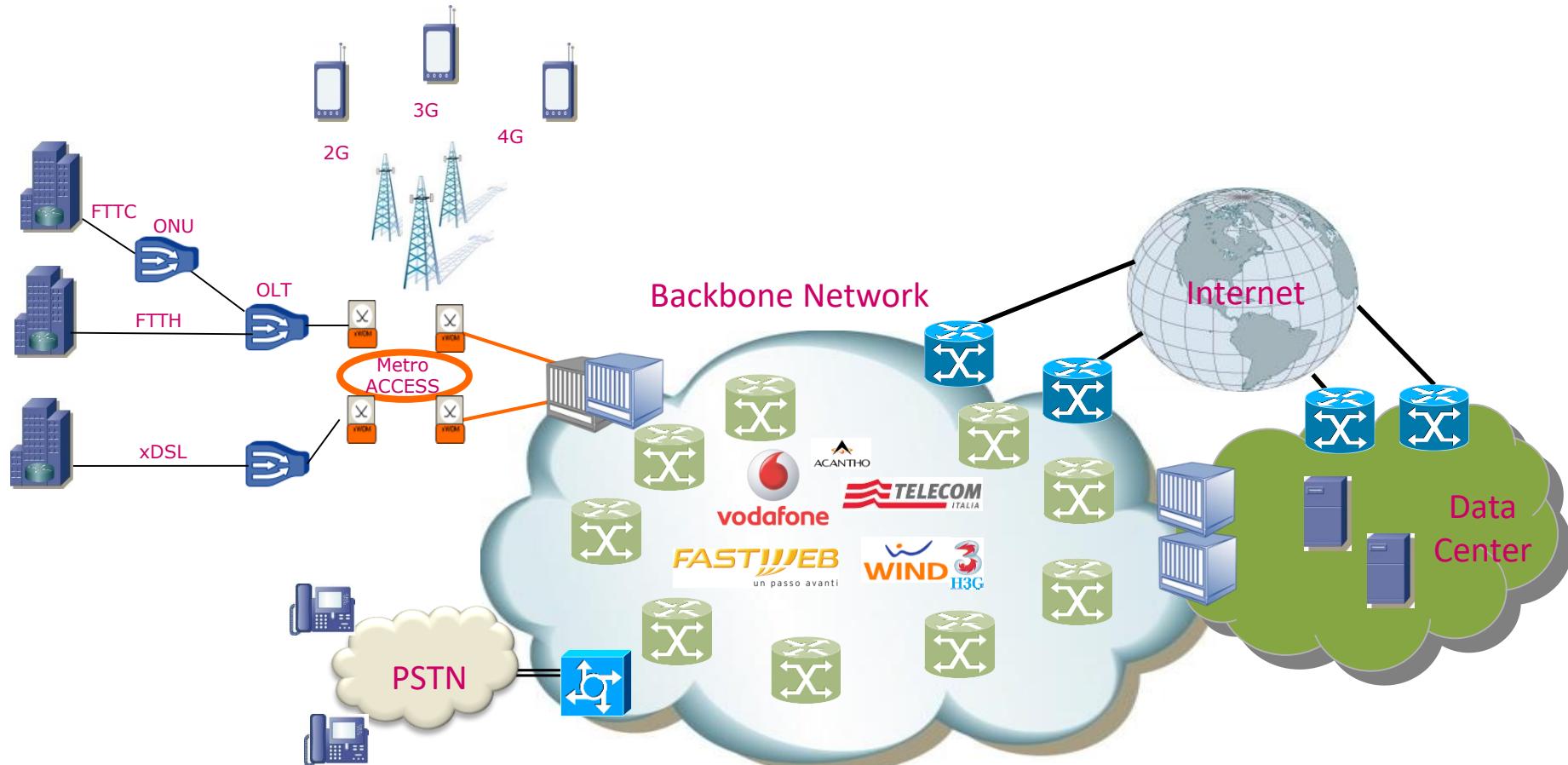
Relatore: Ing. Marco Borelli (K Labs Trainer and Professional Services Engineer)



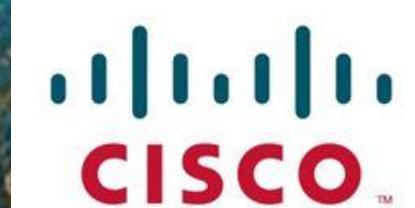
Agenda

- 1
- 2
- 3
- 4
- 5
- 6

- Telco Network Architecture
- Metro/Core Routers Evolution
- What does a PM do in an ISP ?
- ISP Typical Services
- Lab Practice
- K Labs Job opportunities
- K Labs Internship



Worldwide Top Router Vendors



Metro and Core Routers: Cisco



RV



900



ISR 1111



ASR 1002



Cisco 2000



IISR serie 800



IISR serie 800



ASR 920



ASR 9000

Router piccola impresa

Router per filiali

Router Aggregazione WAN

Router Industriali

Router ISP

Router Carrier

- 4 LAN ports
- Dual GE WAN, Category 4 LTE
- 1 GB DRAM and 2 GB flash
- Group Encrypted Transport VPN, firewall
- Internal power supply
- Fanless

- Cisco SD-WAN security
- Dual Ethernet WAN
- 8 LAN ports
- 8 GB DRAM and 8 GB Flash
- PoE

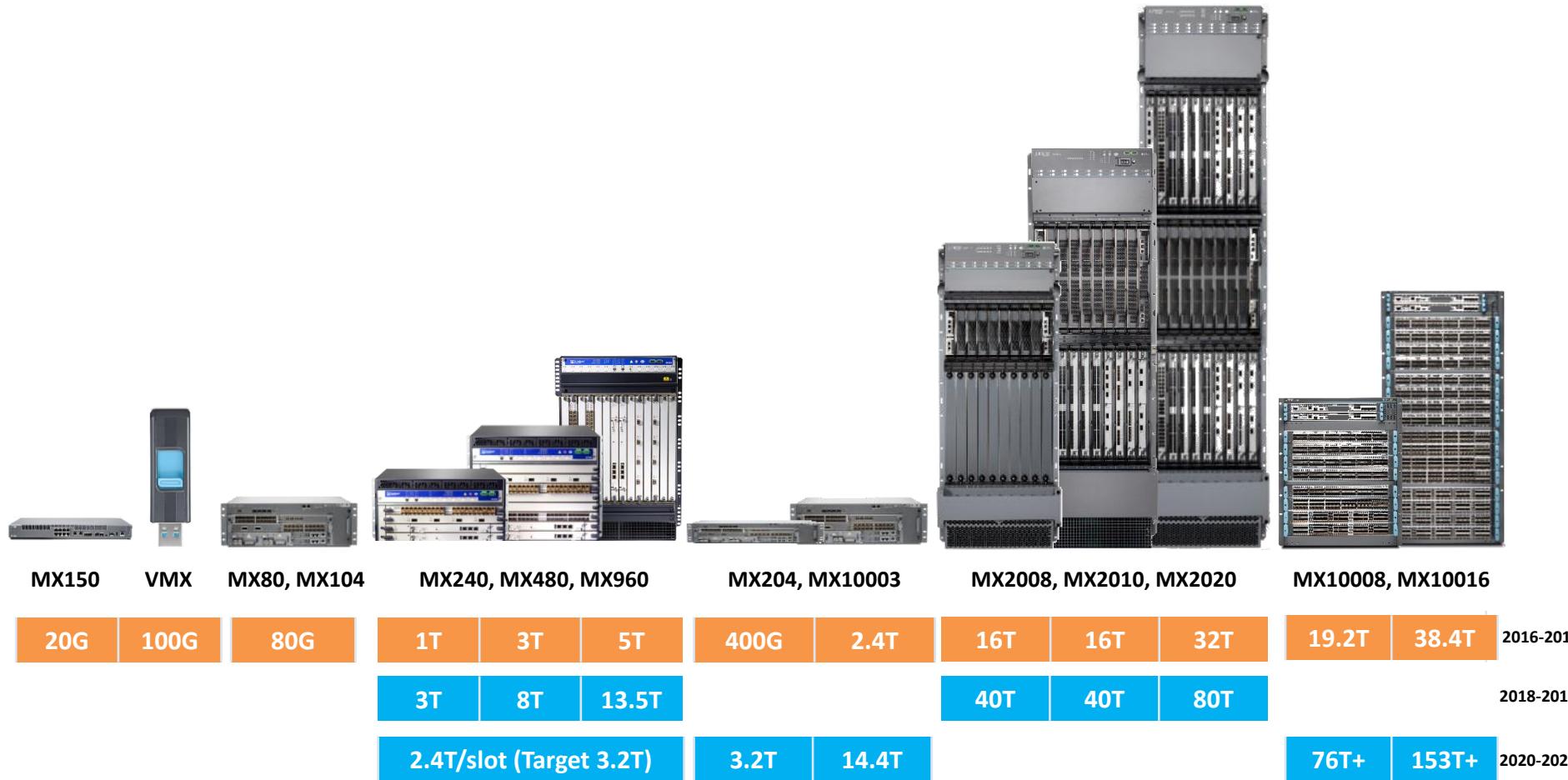
- SD-WAN ready
- SFP built-in GE ports
- Hardware redundancy
- SFP Built-in

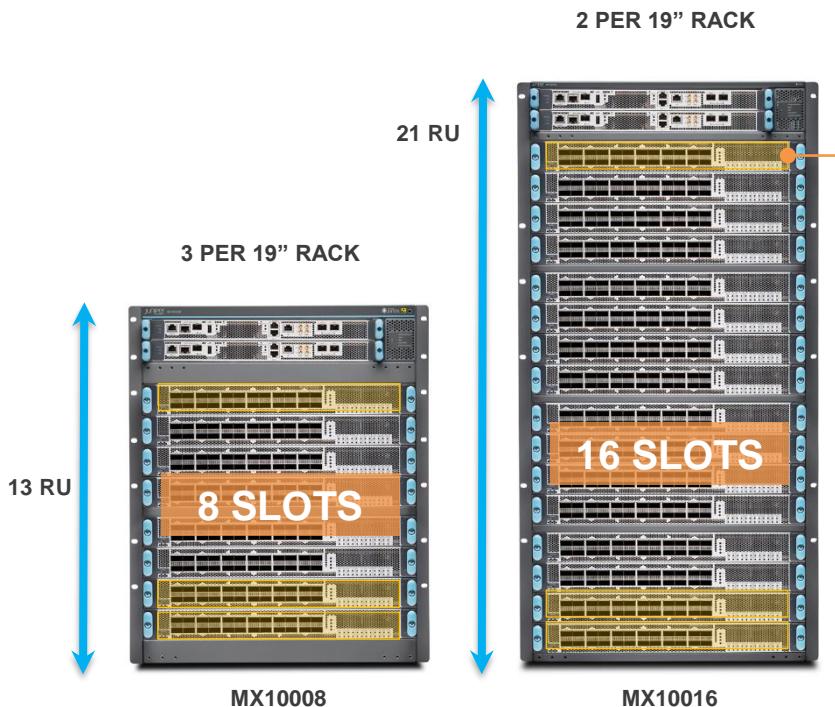
- Modular
- Extended lifetime
- Low power consumption
- -40°C to +60°C
- Hot-swappable

- 10G uplink
- Cisco SD-Access-ready
- Hardware redundancy
- Ethernet port adapters: 6
- Shared port adapters: 12

- Up to 3.2 Tbps per slot
- From 2 to 44 slot

Metro and Core Routers: Juniper





Universal chassis across all product families

Dense 10GE, 40GE and 100GE

Optimal power and cooling design for DC / COLO

Scalable card/fabric interconnect, capacity increase

2.4T Line Card supported @ FRS

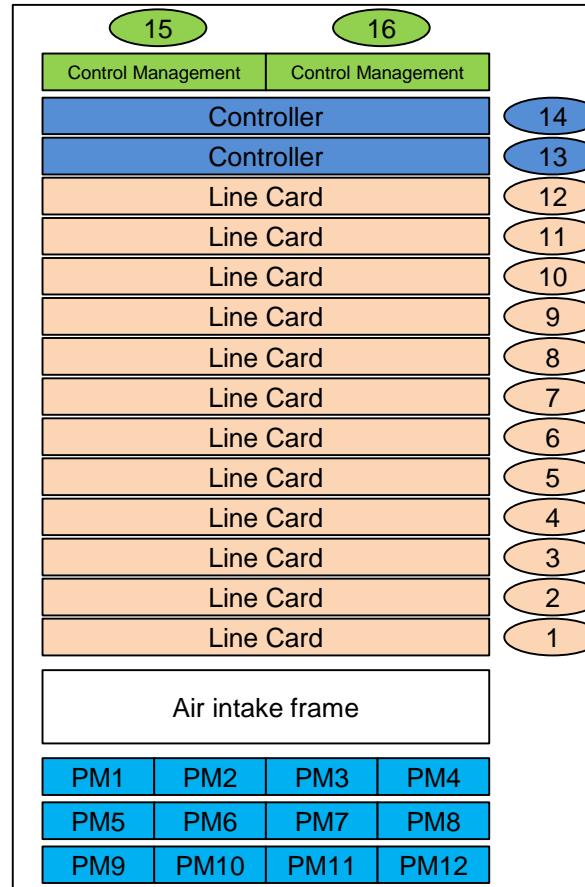
MAIN FEATURES

COMPACT, OPTIMIZED FOR DC AND COLO

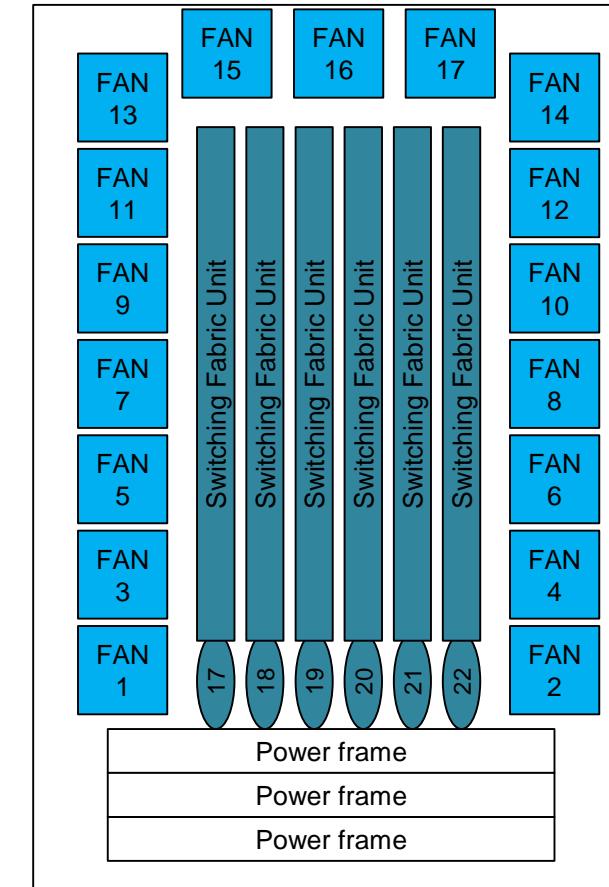
DC-NEBS (GR-3160) COMPLIANT

10GE / 40GE / 100GE

Slot Distribution Diagram example



front view



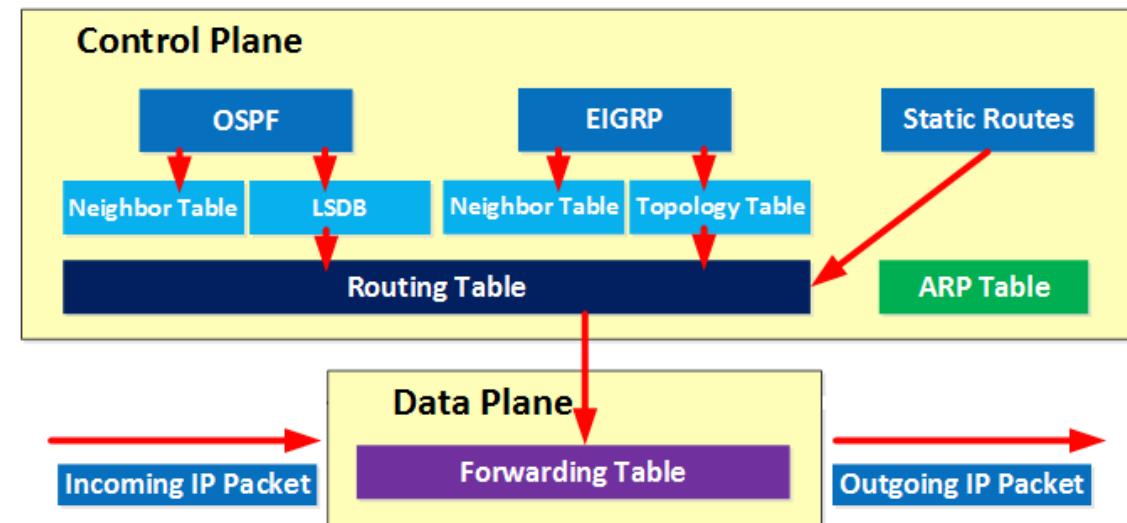
rear view

**ASIC**

- 28nm process
- 23.44mm x 23.15 mm die size
- More than 60% power consumption reduction
- 400 Gb/s Network Processor

**General Purpose CPU**

Control Plane and Data Plane Separation 2/2





36*100GE QSFP28



36*40GE QSFP+

48*10GE SPF+ +
2*40GE+2*100GE

10GE Flex Port



SFP-T: RJ45,
GE electrical



100m

SFP: GE optical
port connection

500m,
10Km, 40km,
80km, 100km

10GE AOC:
Short-distance, low-
cost connection



3m, 10m, 20m

10GE copper cable:
Low-cost connection
within 5m

1m, 3m, 5m,
7m, 10m

SFP+: 10GE optical
port connection

100m, 220m, 300m,
1.4km, 10km,
40km, 80km

40GE Flex Port



QSFP+ connection

100m, 150m, 300m,
400m, 1.4km, 10km,
40km

40GE copper cable:
Low-cost connection
within 5m



1m, 3m, 5m

40GE AOC:
Short-distance, low-
cost connection



10m

One 40GE splits into 4*10GE

**Fiber
connection**



300m, 1.4km, 10km

**Copper cable
connection**



1m, 3m, 5m

AOC connection



10m

100GE Flex Port



CFP 100G fiber connection



100m,
10km, 20km,
40km, 80km



CXP 100G fiber connection



100m



CFP2 100G fiber connection



100m, 10km



QSFP28 100G fiber connection



100m, 500m
2km, 10km

100GE split into 2/3*40GE



100m

Cable connection



10m

100GE split into 8/10/12*10GE



100m

100GE split into 4*25GE



100m, 500m

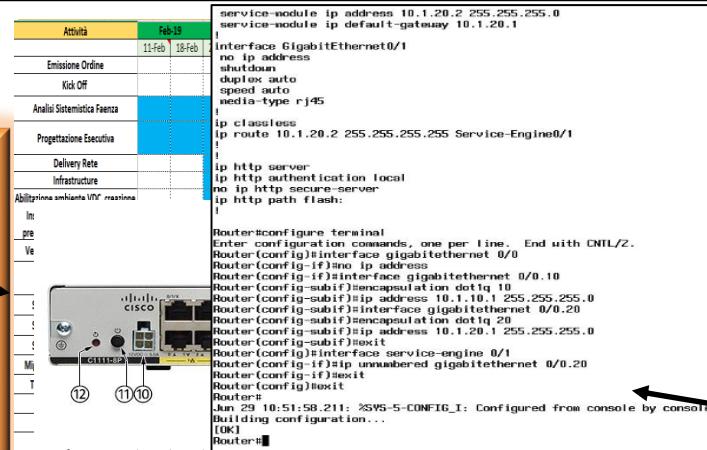


1m,
3m, 5m

What does a PM do in an ISP ?

Presale

- Analisi requisiti
- Incontro/Call Cliente
- Analisi di fattibilità
- Verifica SLA
- Relazione Proposta tecnica
- Relazione Conto economico
- Norme ISO



Progetto esecutivo

- GANTT
- Raccolta requisiti e informazioni
- Network Inventory
- Verifica permessi
- Approvvigionamento apparati
- Realizzazione Progetto esecutivo
- Realizzazione configurazioni
- Analisi/Supporto delivery
- Norme ISO

Check

PROSPECT
Credit check

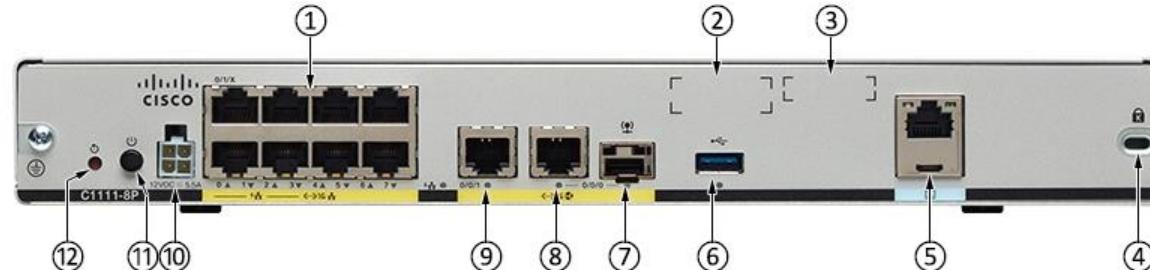
Delivery

POST SALES
NOC

Project
Manager



Cisco ISR 1100 Series



Cisco ISR 1100 Series

Model	WAN				LTE Advanced (CAT6)	802.11ac	LAN switch			Integrated USB 3.0 AUX/console
	GE	GE/SFP combo	ADSL2/VDSL2+ or G.FAST	GE			GE	PoE or PoE+	GE	
C1111-8P	1	1	-	-	-	-	8	4	2	Yes

WiFi

Model	WAN				LTE Advanced (CAT6)	802.11ac	LAN switch			Integrated USB 3.0 AUX/console
	GE	GE/SFP combo	ADSL2/VDSL2+	GE			GE	PoE	PoE+	
C1111-8PWY*	1	1	-	-	-	2X2 MIMO	8	4	2	Yes

WiFi + LTE

Model	WAN				LTE Advanced (CAT6)	802.11ac	LAN switch			Integrated USB 3.0 AUX/console
	GE	GE/SFP combo	ADSL2/VDSL2+	GE			GE	PoE	PoE+	
C1111-8PLTEEAWX*	1	1	-	1 EMEAR & North America	2X2 MIMO	8	4	2	Yes	

Cisco ISR 1100 Series

Costo Vs Performance



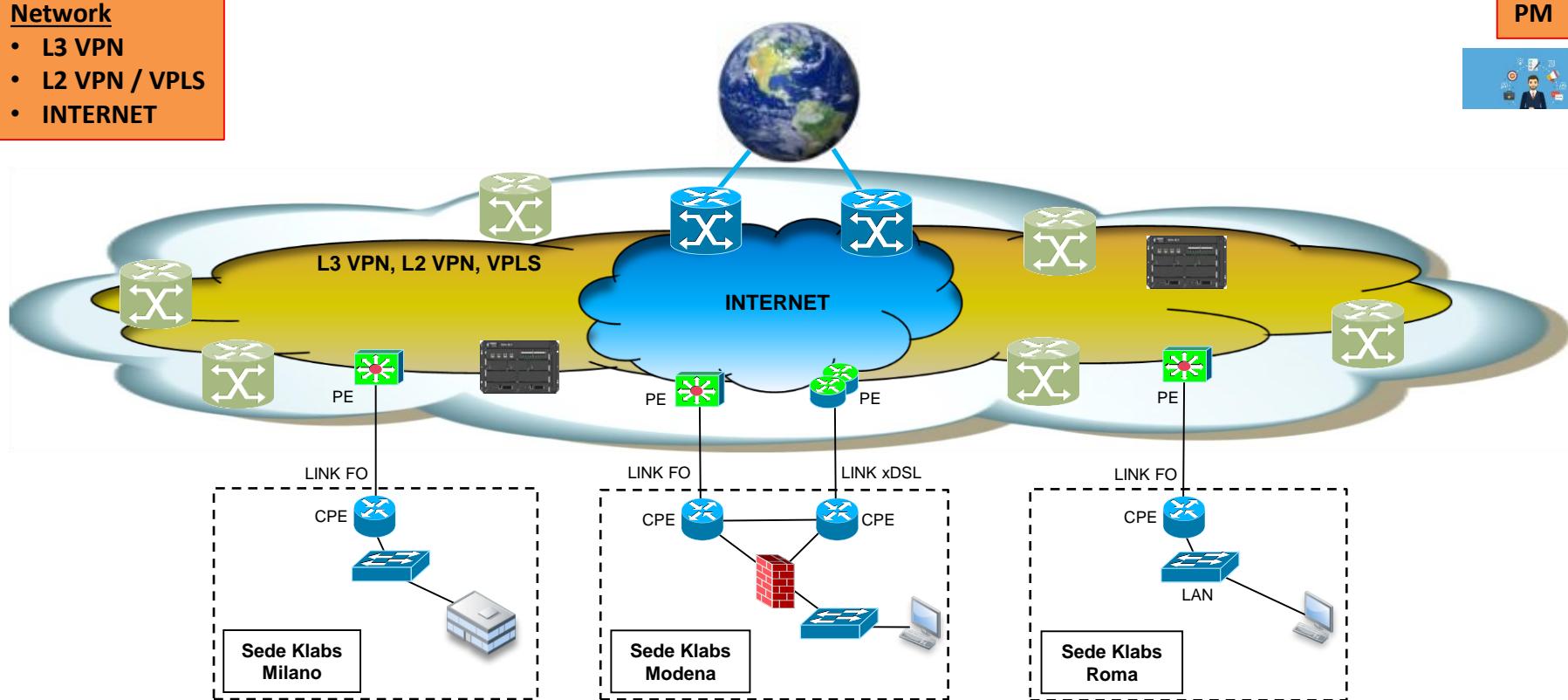
- 420 €
- 950 Mbps in semplice routing
- 900 Mbps con NAT da singolo PC
- Valore che si riduce con più apparati connessi



Network

- L3 VPN
- L2 VPN / VPLS
- INTERNET

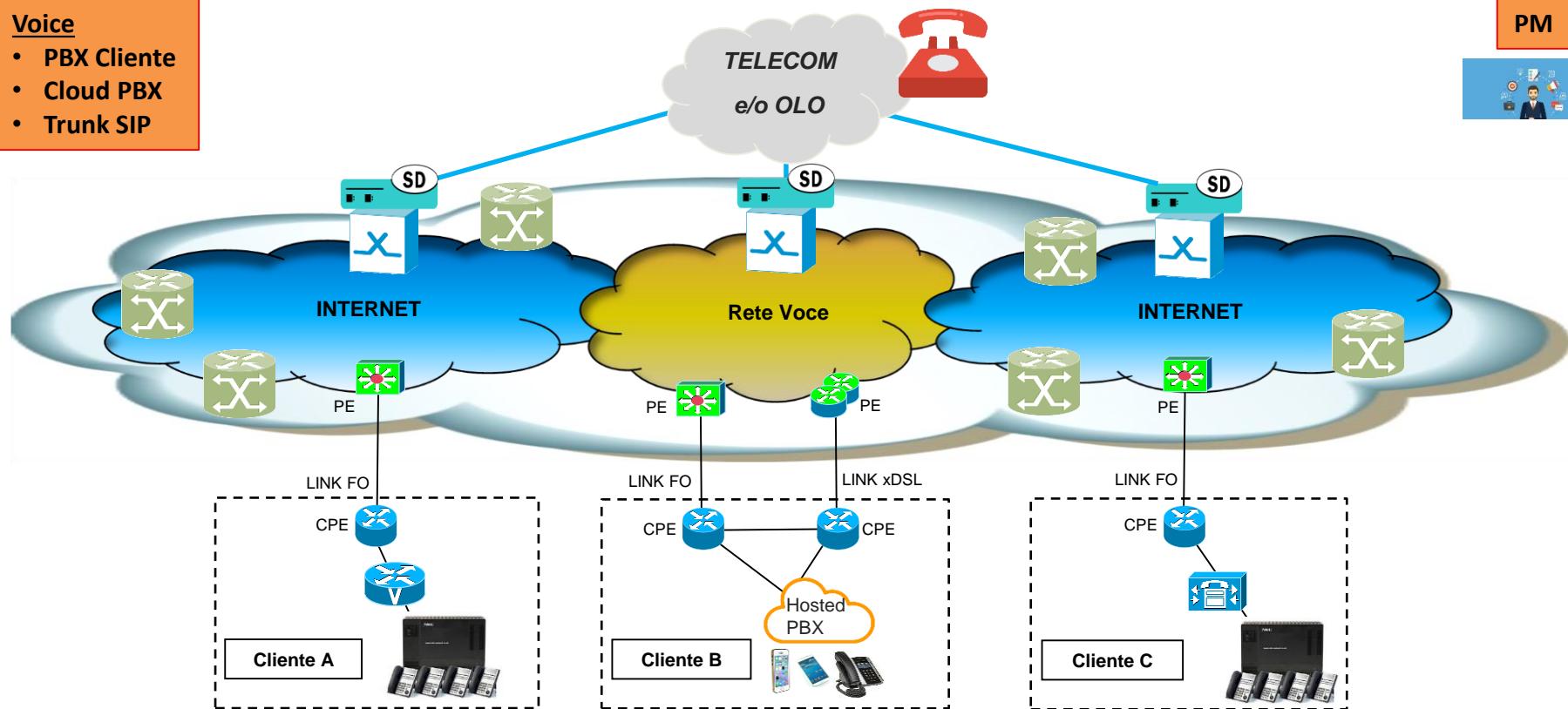
PM



Voice

- PBX Cliente
- Cloud PBX
- Trunk SIP

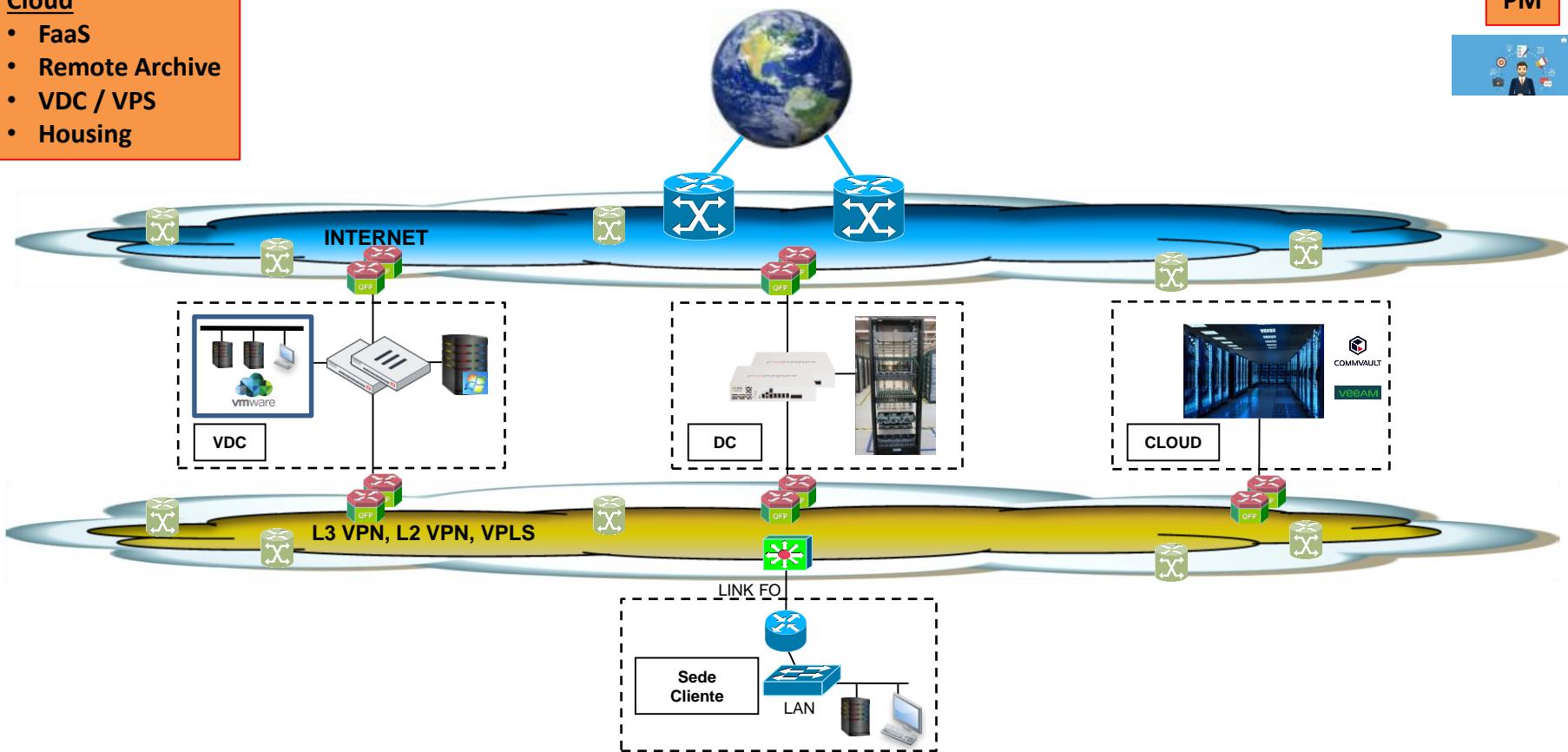
PM



Cloud

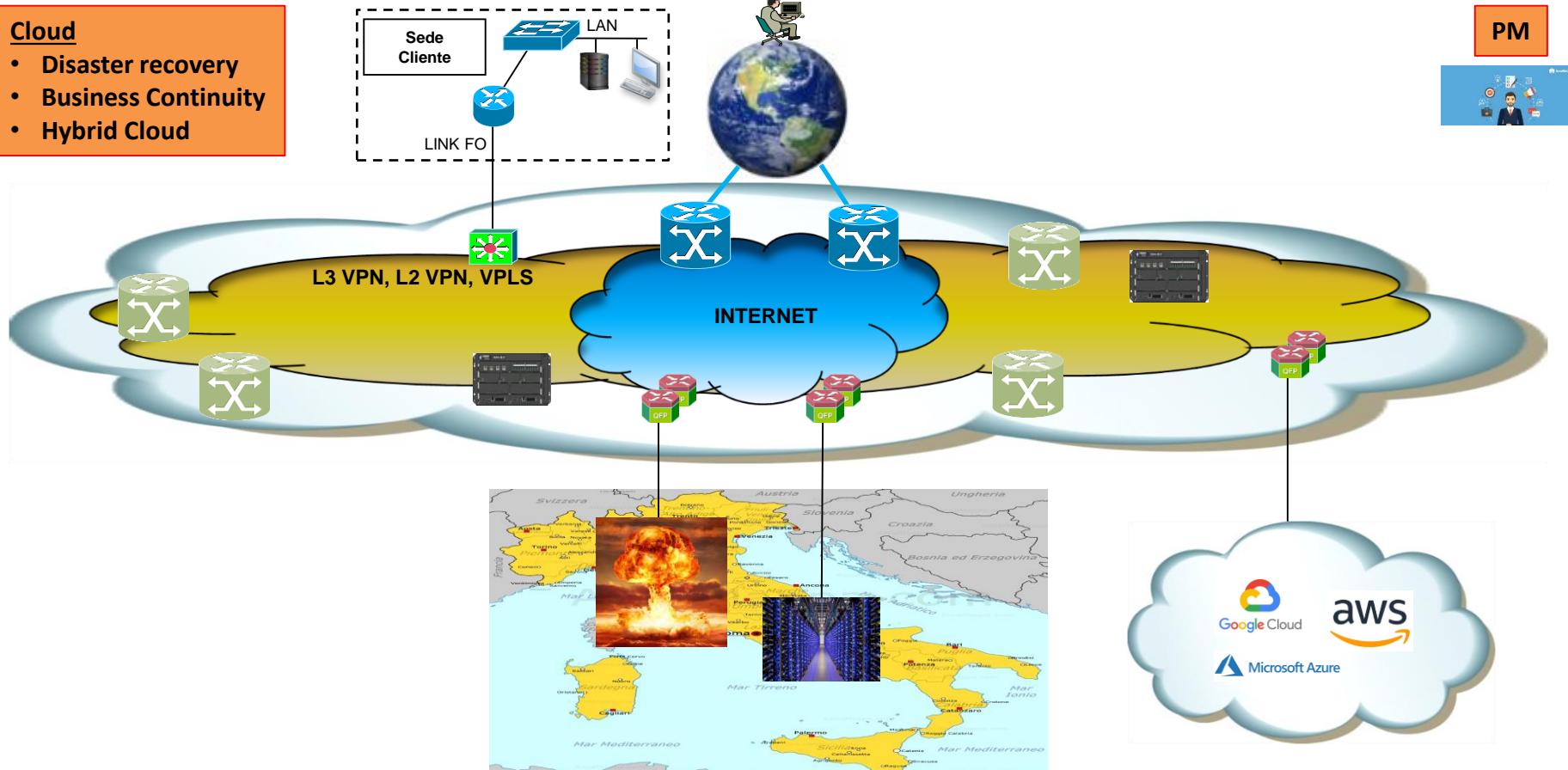
- FaaS
- Remote Archive
- VDC / VPS
- Housing

PM



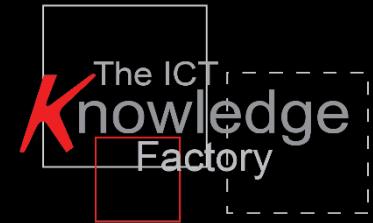
Cloud

- Disaster recovery
- Business Continuity
- Hybrid Cloud



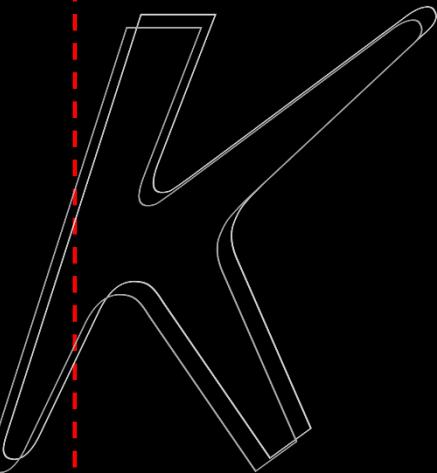
Lab Practice





K Labs

Company Profile



K Labs is a company
specialized in
Technical Trainings
for
Telco and **ICT** market



ISO 9001:2015
Certified



Course Categories

Data Center



Carrier



Multimedia



IoT



Software



Cloud Computing



Fixed Access



Performance Testing



ICT Security



Mobile Networks



IP Networking



LTE



Green IT



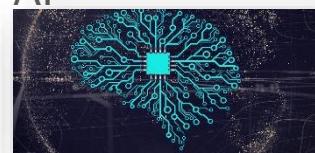
5G



SDN



AI



Python



Blockchain



Customers and Partnership

K Labs delivers training services to a lot of big players or companies involved in the Telecommunication and ICT Market.



K Labs signed training partnership with the most important Manufacturers in the ICT Global Market.

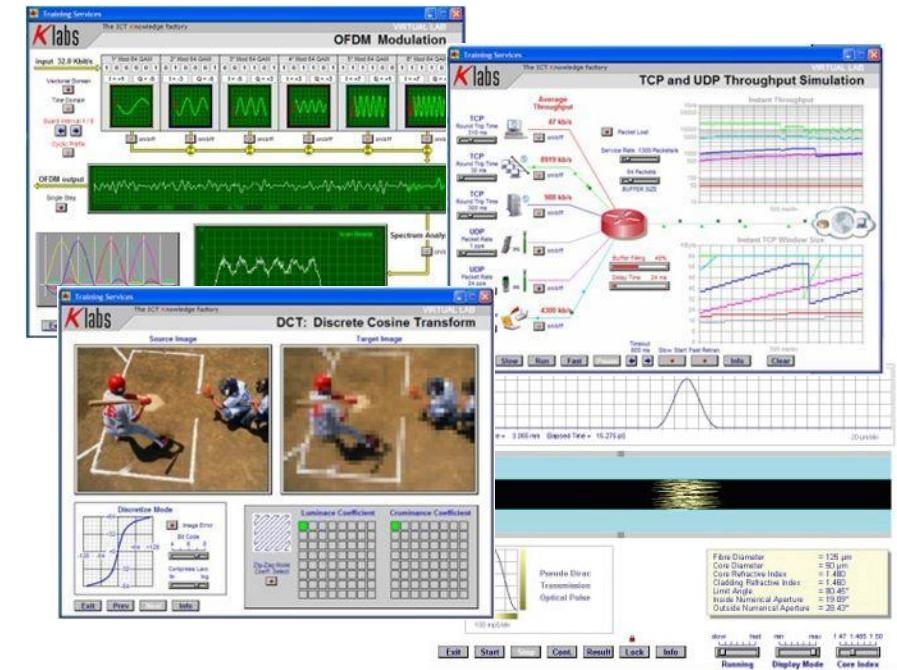


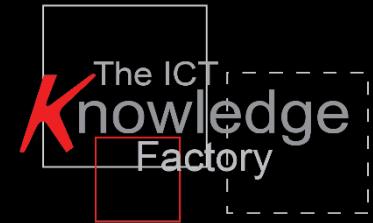
Educational Lab (Multivendor)



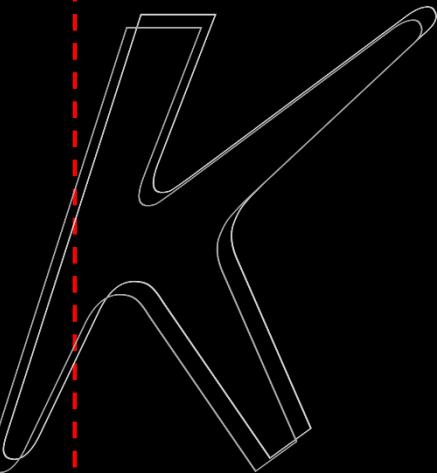
Test Instruments

Virtual Lab (Software simulations)





Career opportunities in K Labs



Project Manager for ICT and TELCO Companies



Technical Trainer





Would you work with the
most important Italian and
European Telecom company?





Authorized Training Center



Authorized Education Partner



Learning Partner



Authorized Learning Partner

Would you be Certified Instructor of the most popular ICT Vendors ?



Authorized Training Center



Accredited Training Partner



K Labs is looking for dynamic people

Do you like travelling ?



Do You Enjoy Meeting New People ?



**Would you
Build A
Successful
Career ?**

**UNIVERSITA' POLITECNICA DELLE MARCHE**

Age: 24

Engineer Instructor at K Labs: 3 Months



Courses already delivered for:

Ennova (IT)

Lutech (IT)

TIM (IT)

Novosco (UK)

Utopia Technology Limited (UK)



UNIVERSIDAD POLITÉCNICA DE CARTAGENA

Age: 27

Engineer Instructor at K Labs: 3 year



100+ Trainings delivered in West Europe for
Fastweb, Lancaster University, Proximus,
Wind, Teléfonica....



UNIVERSITA' DI MESSINA

Age: 41

Engineer Instructor at K Labs: 12 years



CCSI (Certified Cisco Systems Instructor)
 CCIE-Written (Certified Cisco Internetwork Expert)
 CCNA (Cisco Certified Network Associate)
 CCNP (Cisco Certified Network Professional)
 CCDA (Cisco Certified Design Associate)
 CCNA SEC (Cisco Certified Network Associate - Security)
 CCNA DC (Cisco Certified Network Associate - Data Center)



HCIE-HCSI-R&S - Huawei Certified Internetwork Expert-Routing and Switching Instructor
 HCDP - Huawei Certified Datacom Professional
 HCDA - Huawei Certified Datacom Associate
 HCDI - Huawei Certified Datacom Instructor
 HCNA-Big Data Huawei Certified Network Associate - Big Data
 HCPA-IP Huawei Certified Pre-Sales Associate - IP Network



Google Professional Cloud Network Engineer
 Google Professional Data Engineer



AWS Certified Solutions Architect - Associate



Pulse Secure Certified Instructor (PSCI)



JNCDS-SEC: Juniper Networks Certified Design Specialist - Security Design
 JNCIP-DC: Juniper Networks Certified Internet Professional - Data Center
 JNCIA-ER: Juniper Networks Certified Internet Associate - Enterprise Routing
 JNCI-ER: Juniper Networks Certified Instructor - Enterprise Routing
 JNCIP-ENT: Juniper Networks Certified Internet Professional - Enterprise
 JNCIS-ENT: Juniper Networks Certified Internet Specialist - Enterprise
 JNCSP-ENT: Juniper Networks Certified Support Professional - Enterprise
 JNCI-ENT: Juniper Networks Certified Instructor - Enterprise Routing and Switching
 JNCIA-JUNOS: Juniper Net Certified Internet Associate - JUNOS Operating System
 JNCI-JUNOS: Juniper Networks Certified Instructor - JUNOS
 JNCIA-EX: Juniper Networks Certified Internet Associate - Enterprise Switching
 JNCI-EX: Juniper Networks Certified Instructor - Enterprise Switching
 JNCIA-FWV: Juniper Networks Certified Internet Associate - Firewalls and VPNs
 JNCI-FWV: Juniper Networks Certified Instructor - Firewalls and VPNs
 JNCI-JUNOS: Juniper Networks Certified Instructor - JUNOS
 JNCIS-SEC: Juniper Networks Certified Internet Specialist - Security
 JNCI-SEC: Juniper Networks Certified Instructor - Security
 JNCIP-SP: Juniper Networks Certified Internet Professional - Service Provider
 JNCIS-SP: Juniper Networks Certified Internet Specialist - Service Provider
 JNCSP-SP: Juniper Networks Certified Support Professional - Service Provider
 JNCI-SP: Juniper Networks Certified Instructor - Service Provider
 JNCDS-WAN: Juniper Networks Certified Design Specialist, WAN



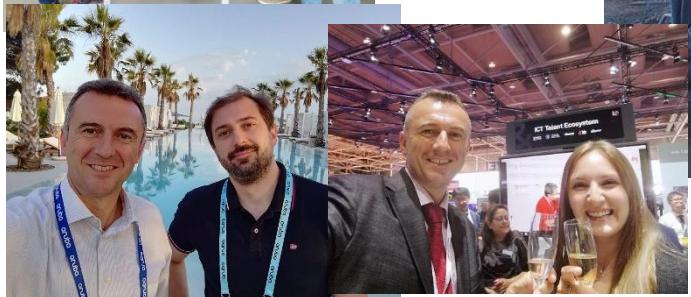
VMWARE VMware Certified Professional 5 - Data Center Virtualization



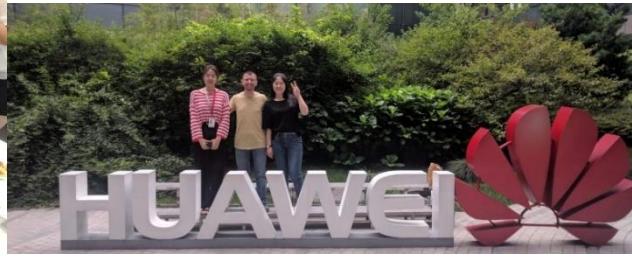
Klanya Certified Instructor - Open Voice



K Labs 'staff

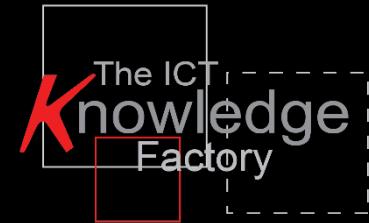


Join our Team

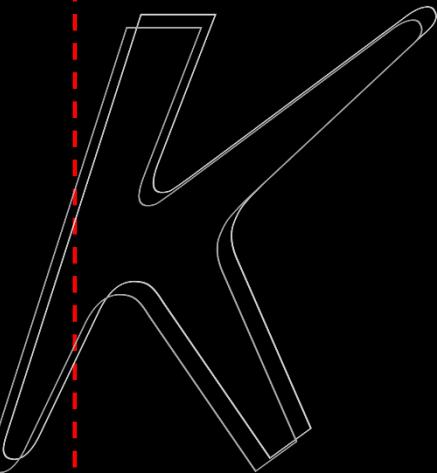




K Labs Internship



**an opportunity to jump
into the ICT world**





Software Defined Networking



Internet of Things



Mobile 5G

Suggestions?

Access

DataCenter

Mobile

Networking

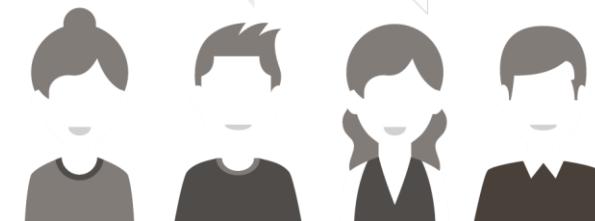
Security

BlockChain

Testing

Augmented
Reality

Cloud



Recruit new graduates



K Labs is looking for Talents!

Join our team of Trainer
and Professional
Services Engineer

Tel. 059 821229
e-mail: job@klabs.it
www.klabs.it