5G perspective from a fixed wholesale operator

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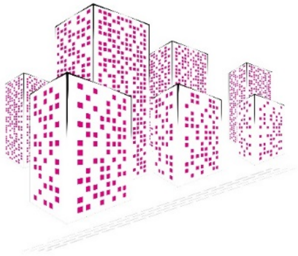
OUR MISSION - OUR MODEL

- ✓ Open Fiber enters into the Telco market in 2016 with the mission to create a Full Fiber Access Network able to bring the GIGABIT Society in all the Italian Household.
- ✓ Open Fiber is a company owned by ENEL and CdP, created with the aim to enable and boost the competitive digital ecosystem with Fiber Access Solution.
- ✓ Open Fiber propose a Wholesale Only Model offering Fiber passive and active access solution.
- ✓ Open fiber is not operating in the retail Mkt.

OPEN FIBER – NUMBERS

CLUSTERS «A&B»



- ✓ Infrastructure completed in **Milan, Turin, Bologne** and ongoing in **94 cities**.
- ✓ More **271** main cities within the OF first phase delivery plan.
- ✓ **9,5** Millions of households.
- ✓ **3,9** Billions Euro for network deployment (90% within 2022)
- ✓ **8'000** workers on construction sites.
- ✓ **2,6** Millions HH FTTH ready at the beginning of 2018.

CLUSTERS «C&D»

1° public tender: 3.043 cities

2° public tender: 3.710 cities

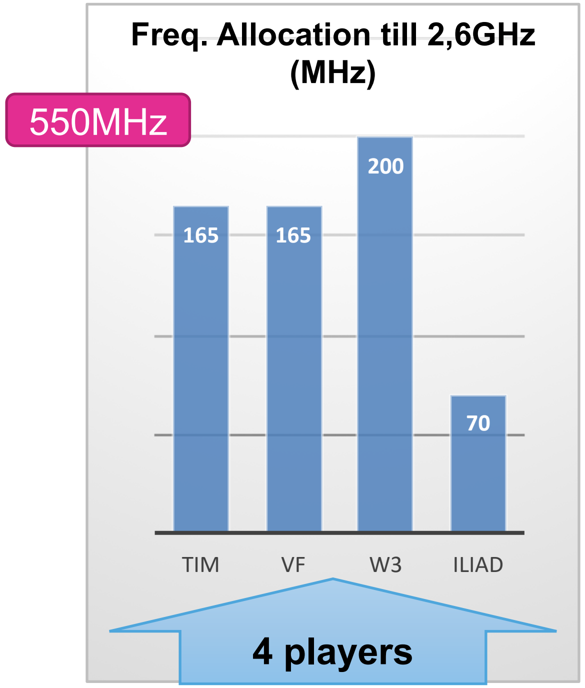
- ✓ Open Fiber was awarded the 1° and 2° Public Tender to deploy and manage a UBB public access network in «white areas»

- ✓ **6.753** cities in **16** regions
- ✓ **9,3** Millions of households
- ✓ **13,8** Millions of inhabitants
- ✓ **500'000** Gov.t and business premises.
- ✓ **5000** radio station for Fixed Wireless Access.

The 3° public tender for 3 regions is currently ongoing.

ITALY: FREQUENCY ALLOCATION BEFORE THE 5G AUCTION

Pure Mobile Use

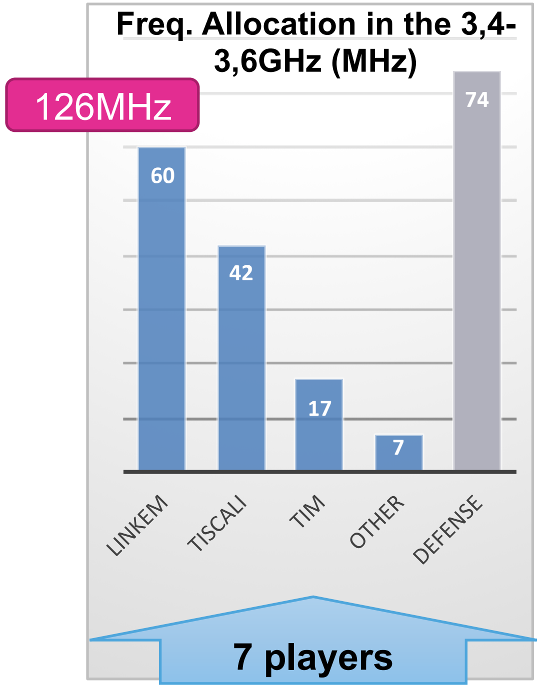


Pure Mobile Use

National allocation
National coverage

price ~ 55 €cents/MHz/pop

Fixed Wireless Use

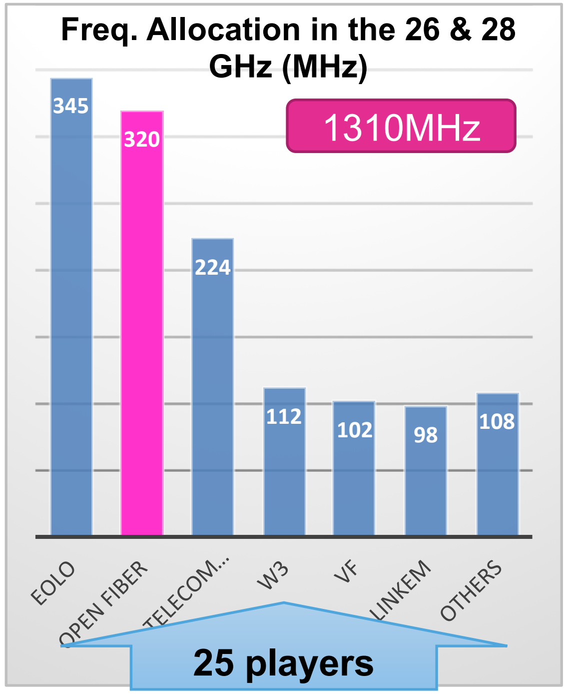


Pure Fixed wireless Use

Regional allocation
Regional coverage

price ~ 2 €cents/MHz/pop

Fixed Use: MW links

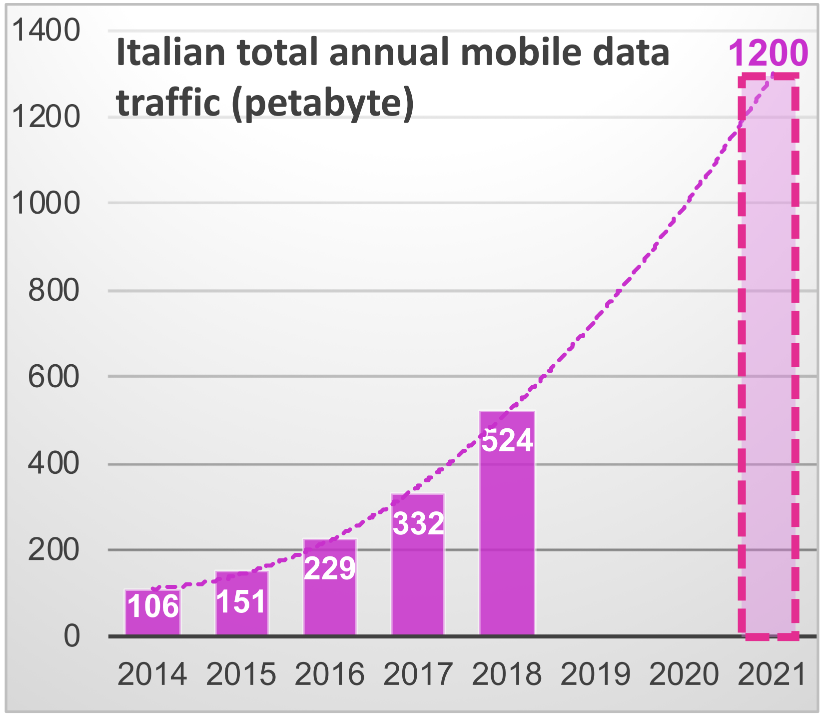


Pure Fixed Use (FWA and PTP)

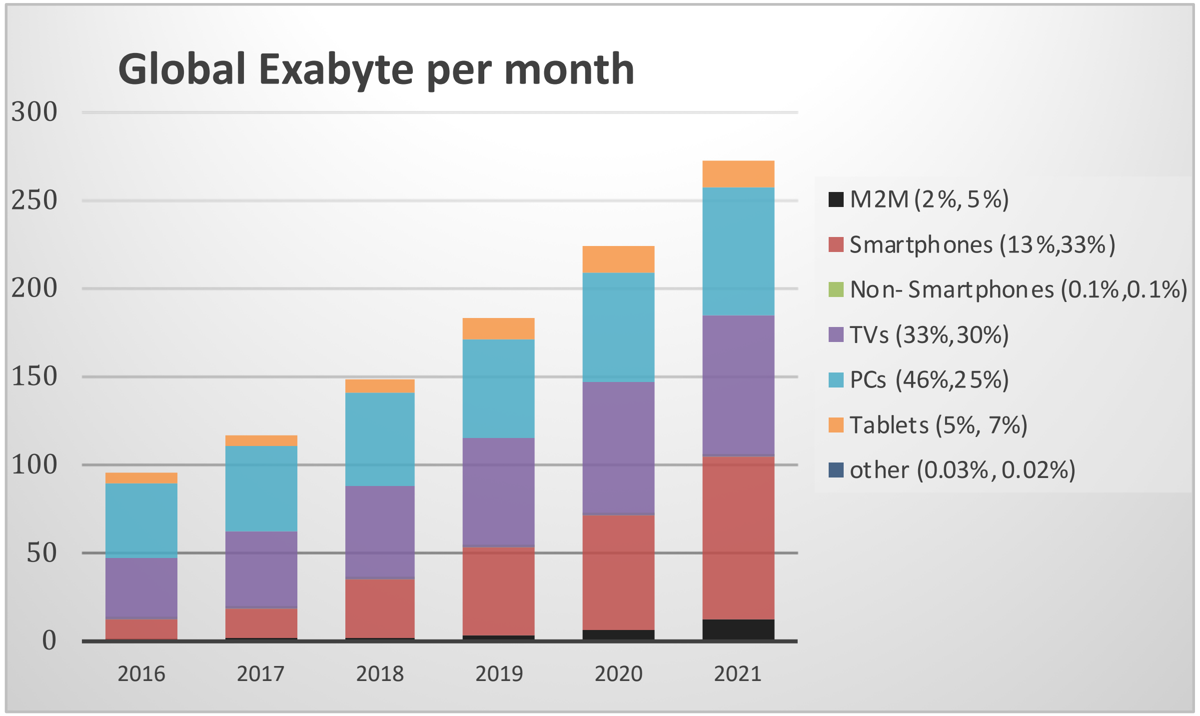
Regional allocation
local coverage

price ~ 0,2 €cents/MHz/pop

TRAFFIC GROWTH:
A TREND IN FIXED AND MOBILE SERVICES



Source: estimation on data from *Osservatorio AGCom Q2* 2018



Source: CISCO VNI global IP traffic forecast 2017

- ✓ MOBILE traffic growth requires more spectrum -> higher frequencies
- ✓ FIXED Wireless Access services will be forced to move to higher frequencies (mmW) and to wired solutions (FTTH).

THE (ITALIAN) TREND:

- ✓ Mobile Operators use the Spectrum to provide mobile broadband access (< 2,6 GHz -> 3,6-3,8 GHz).
- ✓ In the Fixed Market the usage of Spectrum was largely increased in the last 5 years to provide the coverage necessary to reduce digital divide in remote areas (WiMax and PmP solutions). Almost all the spectrum in the 3,4-3,6 GHz portion and large part of the Spectrum awarded in the 26-28 GHz portion are used to provide FWA
- ✓ The traffic growth both on mobile and fixed services will stress more the need for frequencies giving less value to the national coverage.
- ✓ Technology and Service Neutrality applied to Spectum Usage:
  - ✓ Allows innovation and best usage of spectrum
  - ✓ Facilitates the shift from fixed usage to mobile usage
- ✓ Following the 5g auction, the cost of services requiring a wide national coverage will increase -> Coverage won’t be the priority

THE 5G AUCTION IN ITALY :
RESULTS*

BAND	blocks	Duration (years)	WINNNER	Price	Price* (€cent /MHz/pop)	Last auction reference
700 MHz	2 blocks 2x5 MHz res.	15 (22-37)	ILIAD	676 M€	€cent 73,1	€cent 70 (France 700MHz 2015)
	4 blocks 2x5 MHz	15 (22-37)	TIM & VF	680 M€		
700 MHz SDL	4 blocks 5 MHz	-	-	-		
3,6- 3,8 GHz	2 blocks 80 MHz each	19 (19-37)	TIM, VF	1680 M€	€cent 37,3 !	€cent 14,5 (UK 3,4GHz apr.'18) or €cent 2,3 (IT 3,4GHz Wimax '07)
	2 blocks 20 MHz each	19 (19-37)	ILIAD, W3	500 M€	€cent 43,9 !	
26GHz	5 blocks 200 MHz each	19 (19-37)	TIM, FW, ILIAD, W3, VF	33 M€	€cent 0,3	€cent 0,2 (IT '17 FWA 28GHz)

1260 MHz allocated	**5 Operators**	**6,55 B€**

* Price is normalized to a 20-years long license

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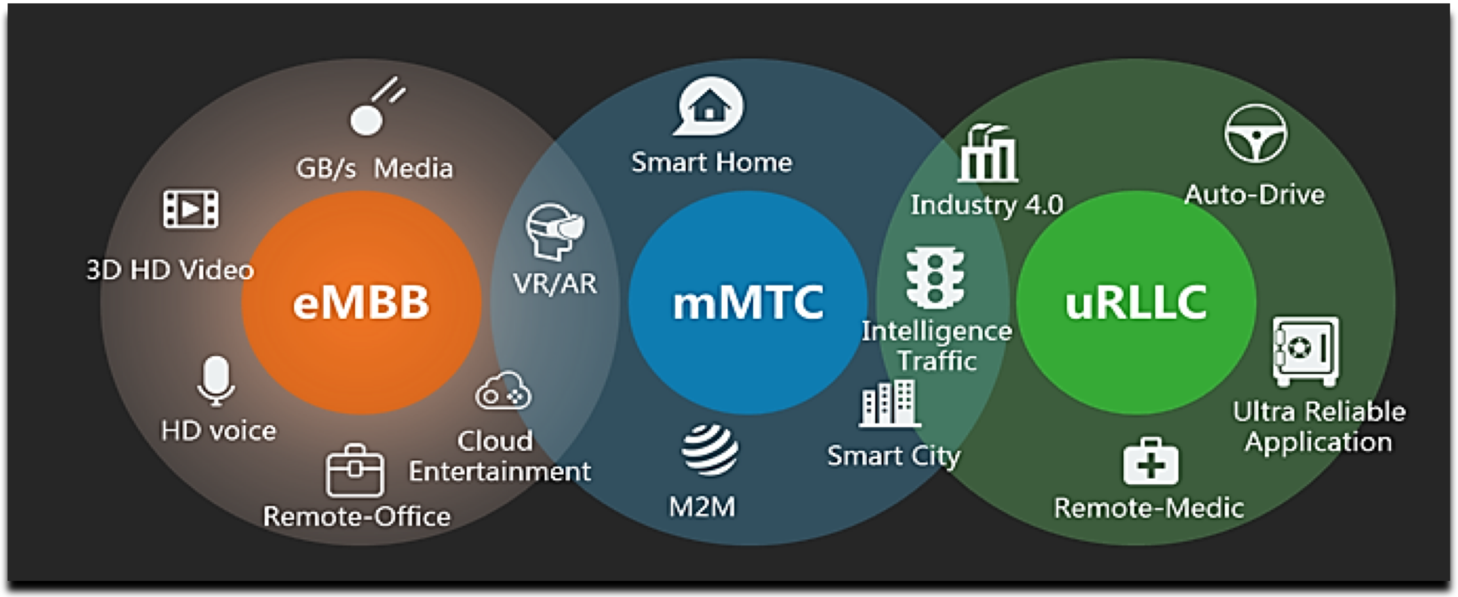
EVOLUTION OF PRICES

		Before Auction	Auction	Δ (%)
< 2,6 GHz	Quantity (MHz)	550	60	~ +10%
	Price (€cent /MHz/pop)	~ 55	~ 73	~ +33%
3,4 – 3,8 GHz	Quantity (MHz)	126	200	~ +160%
	Price (€cent /MHz/pop)	~ 2	~ 40	~ +2000%
26-28 GHz	Quantity (MHz)	1310	1000	~ +75%
	Price (€cent /MHz/pop)	~ 0,2	~ 0,3	~ +50%

THE 5G NEW PARADIGM:
HOW WILL IT FIT WITH THE CURRENT MODEL



- ✓ It's not just a matter of capacity. Each service requires a specific mix of
  - ✓ Coverage
  - ✓ Throughput
  - ✓ Availability
  - ✓ Reliability
  - ✓ Latency
  - ✓ Security
- ✓ Some services require a full national coverage, or to be developed in remote areas.
- ✓ The current prices paid by mobile Operator for additional spectrum hardly fit with the new paradigm of 5G service perspective, where new services require ex ante investment, planning, and may be a long run return.

CONCLUSIONS

- The Italian auction shows that the shift from fixed to mobile usage increases the value of the spectrum (~ x 20)

- Mobile Operators will concentrate the usage of higher frequencies in the most densely populated areas, having low incentives to guarantee fixed coverage in remote areas -> fixed operators will shift to very high (mmw) frequencies or wired solution

- Coverage (availability of services) in specific areas will not be a priority -> This could affect the take up of some 5G services in some areas that are not first priority for mobile operator.

- The frequency allocation model currently used (auction) does not resolve the planning issues for new 5G services. Some 5G services that could be of extreme benefit for the social life (remote health monitoring just to cite one) but without a short term financial return, could be delayed or partially available

- Could have we thought it in a different way?

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