

Progetto, Costruzione, Collaudo e Gestione di una Rete di Telecomunicazioni Mobili

1. **Obsolescenza delle reti**
2. **Tecnologia e Standard**
3. **La gara per la licenza: Asta o Beauty Contest?**
4. **L'anticipation plan**
5. **La gara internazionale per la costruzione**
6. **La negoziazione, il contratto, i rischi**
7. **Il kick off**
8. **Il progetto**
9. **L'implementazione**
10. **L'entrata in servizio commerciale**
11. **La garanzia**
12. **Manutenzione e obblighi pluriennali**

Progetto Installazione Collaudo e Gestione di una rete Mobile di Telecomunicazioni

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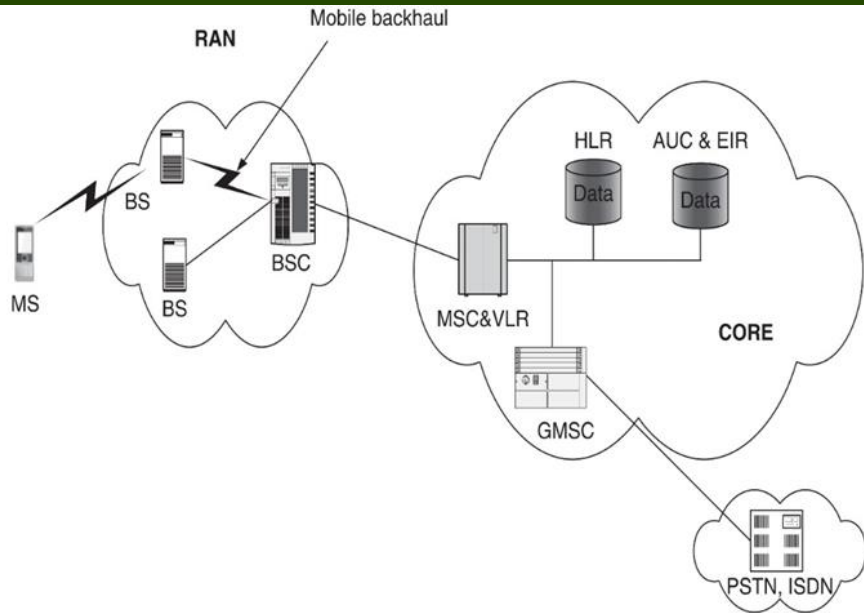


Figure 7.1 GSM System architecture.

- BS: Radio Base Station
- BSC: Base station controller
- MS: Mobile Subscriber
- MSC: Mobile Switching Centre
- VLR: Visitors Location Register
- AUC: Autentication Center
- EIR: Equipment Identity Register
- GMSC: Gateway MSC
- PSTN: Public Switched Telephone Network
- ISDN: Integrated Services Data Network
- RAN: Radio Access Network



Ericsson RBS GSM 2202 - 1998

GSM Architecture

Il sistema

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MSC,VLR,HLR,MGW,EIR

1996, Red Mòvil ENTEL Bolivia, RBS AMPS/D-AMPS Ericsson e Digital Microwave Backbone - Ruta Nacional 4 La Paz - Tambo Quemado, altitudine 4.215 mslm.

Perché si costruisce una nuova rete?

▶ Innovazione Tecnologica

▶ Utenti

▶ Servizi

▶ ... nascono nuove necessità ...



1981



2019

1G: telefonica, analogica, per pochi

2G: telefonica, digitale, per molti

3G: telefono+dati, per tutti

4G: broadband, all-IP

5G: eMBB (enhanced Mobile Broad Band)

mMTC (massive Machine-Type Communications)



URLLC (Ultra Reliable Low Latency Communications)

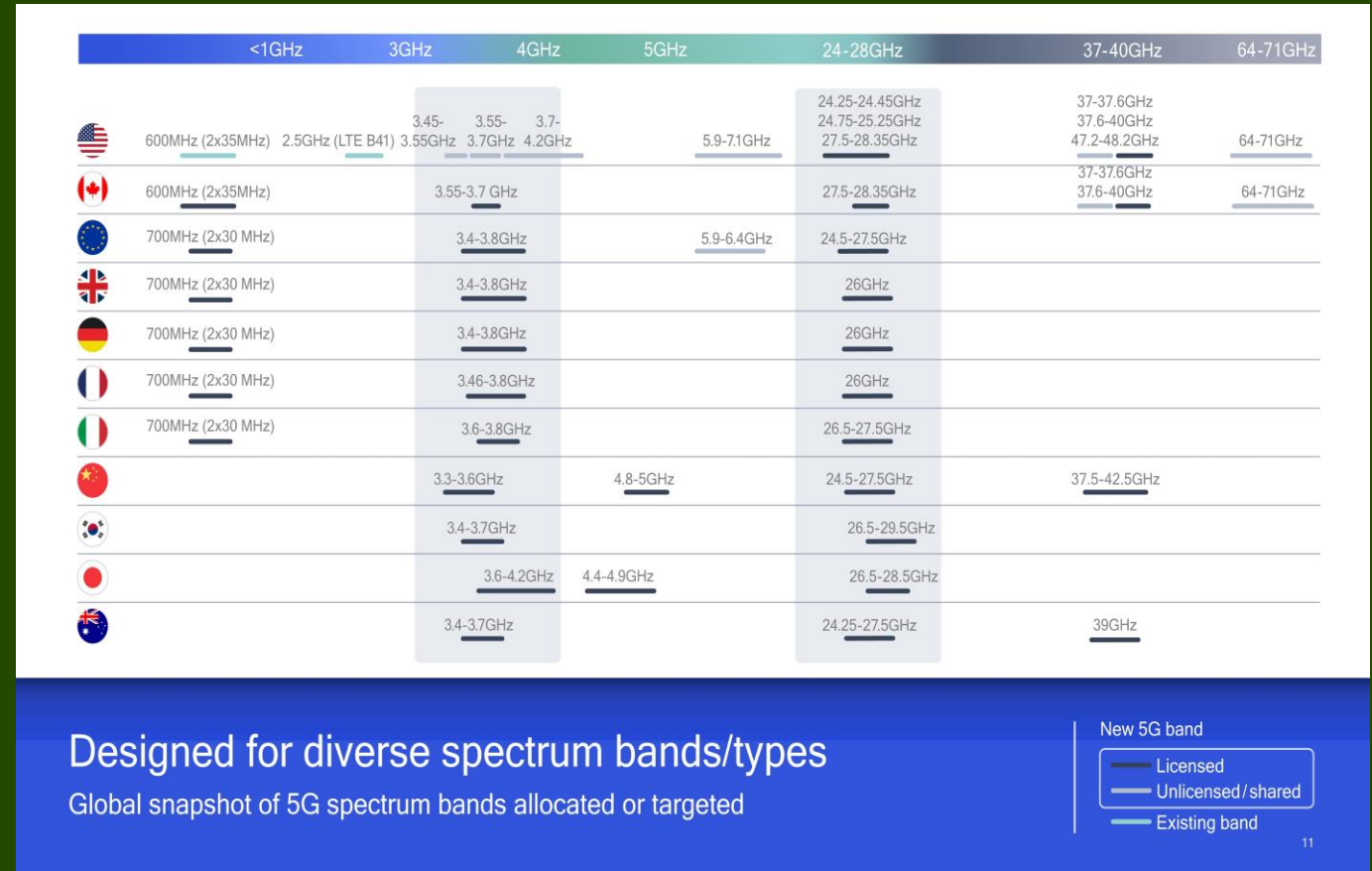
Quando si costruisce una nuova rete?

- Frequenze disponibili
- Standard definito (3GPP)
- Business case profittevole
- Licenza operatori concessa

TR 21.915 V1.0.0 (2019-03)
Technical Report

**3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Release 15 Description;
Summary of Rel-15 Work Items
(Release 15)**



La gara per la Licenza: Asta o Beauty Contest?

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Anticipation Plan

In April 2019, The Ministry of Internal Affairs and Communications (MIC) has assigned spectrum in the 3.7 GHz, 4.5 GHz and 28 GHz bands

In April 2019, The Ministry of Internal Affairs and Communications (MIC) has assigned spectrum in the 3.7 GHz, 4.5 GHz and 28 GHz bands through a beauty contest to the four mobile operators in Japan. Spectrum has been assigned as follows:

- NTT Docomo: 3.6-3.7 GHz, 4.5-4.6 GHz and 27.4-27.8 GHz
- KDDI: 3.7-3.8 GHz, 4.0-4.1 GHz and 27.8-28.2 GHz
- Softbank: 3.9-4.0 GHz and 29.1-29.5 GHz
- Rakuten: 3.8-3.9 GHz and 27.0-27.4 GHz

The mobile operators committed to the following coverage of the population 5 years after issuance of the licence:

- NTT Docomo: >90%
- KDDI: >90%
- Softbank: 64%
- Rakuten: 56%

The mobile operators also committed to the following investments in their 5G networks:

- NTT Docomo: 7 billion USD
- KDDI: 4.1 billion USD
- Softbank: 1.8 billion USD
- Rakuten: 1.7 billion USD

Ministero dello Sviluppo Economico			
DIREZIONE GENERALE PER I SERVIZI DI COMUNICAZIONE ELETTRONICA DI RADIODIFFUSIONE E POSTALI			
PROCEDURA PER L'ASSEGNAZIONE DI DIRITTI D'USO DELLE FREQUENZE NELLE BANDE 694-790 MHz, 3600-3800 MHz e 26.5-27.5 GHz			
Fase dei miglioramenti competitivi			
Giornata n.	02/10/2018	Situazione dopo la tornata n. 171	
Graduatoria CHIUSA 700_R [Blocco riservato in banda 700 MHz] *** CHIUSA ***			
Vincente n. 1	Iliad Italia S.p.A.	[05/09/2018 10:00:00]	676 472 792,00
TOTALE			676 472 792,00
Graduatoria CHIUSA 700_FDD [Blocchi generici in banda 700 MHz]			
Vincente n. 1	Vodafone Italia S.p.A.	[10/09/2018 10:10:00]	345 000 000,00
Vincente n. 2	Telecom Italia S.p.A.	[10/09/2018 11:30:00]	340 100 000,00
Vincente n. 3	Telecom Italia S.p.A.	[10/09/2018 11:30:00]	340 100 000,00
Vincente n. 4	Vodafone Italia S.p.A.	[10/09/2018 10:10:00]	338 236 396,00
TOTALE			1 363 436 396,00
Graduatoria CHIUSA 700_SDL [Blocchi SDL generici in banda 700 MHz]			
	Disponibile	-----	-----
	Disponibile	-----	-----
	Disponibile	-----	-----
TOTALE			0,00
Graduatoria CHIUSA 3700_C1 [Blocco specifico in banda 3700 MHz]			
Vincente n. 1	Telecom Italia S.p.A.	[tomata n. 169]	1 694 000 000,00
TOTALE			1 694 000 000,00
Graduatoria CHIUSA 3700_C2 [Blocco generico in banda 3700 MHz]			
Vincente n. 1	Vodafone Italia S.p.A.	[tomata n. 168]	1 685 000 000,00
TOTALE			1 685 000 000,00
Graduatoria CHIUSA 3700_C3_C4 [Blocchi generici in banda 3700 MHz]			
Vincente n. 1	Wind Tre S.p.A.	[tomata n. 170]	483 920 000,00
Vincente n. 2	Iliad Italia S.p.A.	[tomata n. 159]	483 900 000,00
TOTALE			967 820 000,00
Graduatoria CHIUSA 26G_D [Blocchi generici in banda 26 GHz]			
Vincente n. 1	Telecom Italia S.p.A.	[10/09/2018 11:30:00]	33 020 000,00
Vincente n. 2	Iliad Italia S.p.A.	[tomata n. 61]	32 900 000,00
Vincente n. 3	Fastweb S.p.A.	[07/09/2018 11:00:00]	32 600 000,00
Vincente n. 4	Wind Tre S.p.A.	[10/09/2018 10:00:00]	32 586 535,00
Vincente n. 5	Vodafone Italia S.p.A.	[10/09/2018 10:10:00]	32 586 535,00
TOTALE			163 693 070,00
TOTALE BANDA 700			2 039 909 188,00
TOTALE BANDA 3700			4 346 820 000,00
TOTALE BANDA 26G			163 693 070,00
TOTALE GENERALE			6 550 422 258,00

CAPO IV Obblighi di copertura

Art. 12 (Obblighi di copertura e utilizzo per le frequenze 700 MHz FDD)

1. Entro 36 mesi dalla disponibilità nominale delle frequenze, ciascun aggiudicatario dei lotti di frequenza in banda 700 MHz FDD è tenuto ad avviare il servizio commerciale, come definito all'art. 11, comma 2, utile a soddisfare i requisiti operativi *standard* necessari a permettere ad almeno l'80% della popolazione nazionale la corretta fruizione, in maniera ragionevole anche in ambiente *indoor*, di servizi 5G, tali da garantire lo sviluppo di applicazioni per tutti gli scenari d'impiego attesi m-MTC, URLLC, eMBB, comunque assicurando in quest'ultimo caso d'uso una velocità nominale di *download* non inferiore a 30 Mbps. La copertura dovrà in ogni caso comprendere tutti i comuni con più di 30.000 abitanti e tutti i capoluoghi di provincia. Un nuovo entrante ha 12 mesi in più per raggiungere gli stessi obiettivi di copertura ed avvio del servizio. Ai fini del predetto obbligo riguardo la copertura dei comuni è possibile ricorrere ad accordi fra gli operatori con le seguenti condizioni e limiti:

- a. l'accordo riguarda al più 2 operatori per un determinato gruppo di comuni;
- b. ciascun accordo non supera il 20% dell'entità dell'obbligo;
- c. l'accordo riguarda il soddisfacimento dell'obbligo utilizzando le specifiche frequenze a 700 MHz FDD;
- d. la durata dell'accordo sia di norma pari alla durata del diritto d'uso; nel caso l'accordo dovesse cessare per qualunque motivo i contraenti debbono soddisfare l'obbligo individualmente.

La gara d'appalto (internazionale) per la costruzione della rete

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COMMITTENTE

1. PUBBLICO
2. PRIVATO
3. MISTO

TIPO DI GARE

1. PUBBLICA
2. RISTRETTA
3. TRATTATIVA PRIVATA

SCOPE OF WORK

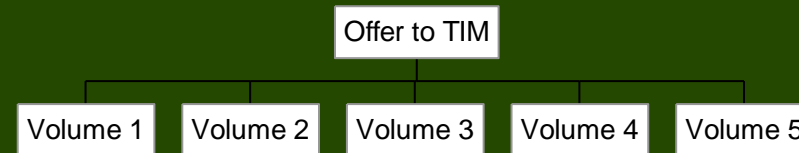
1. TURN KEY
2. SUPPLY OF GOOD AND SERVICES
3. SUPPLY OF GOODS
4. SERVICES

TENDER DOCUMENTS

1. TERMS AND CONDITIONS
2. TECHNICAL SPECIFICATION

Ericsson Offer

The tender has been divided into five main volumes in ten binders, and structures it around TIM requirements.



- Volume 1 – Executive Summary
- Volume 2 – Commercial Specification
- Volume 3 – Technical Specification
- Volume 4 – After Sales Services Quotation
- Volume 5 -- Appendix

International Bids: Key factors of success

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Tecnici

- Qualità
- Turn key capability
- Innovazione
- Assistenza

Finanziari

- Solidità
- Dimensione
- Prezzo
- R&D Expenses
- Storia aziendale

Reputazione

- Quota di mercato/Referenze
- Partnership
- Relazione con cliente

Altri

- Nazionalità

La negoziazione, il contratto, i rischi

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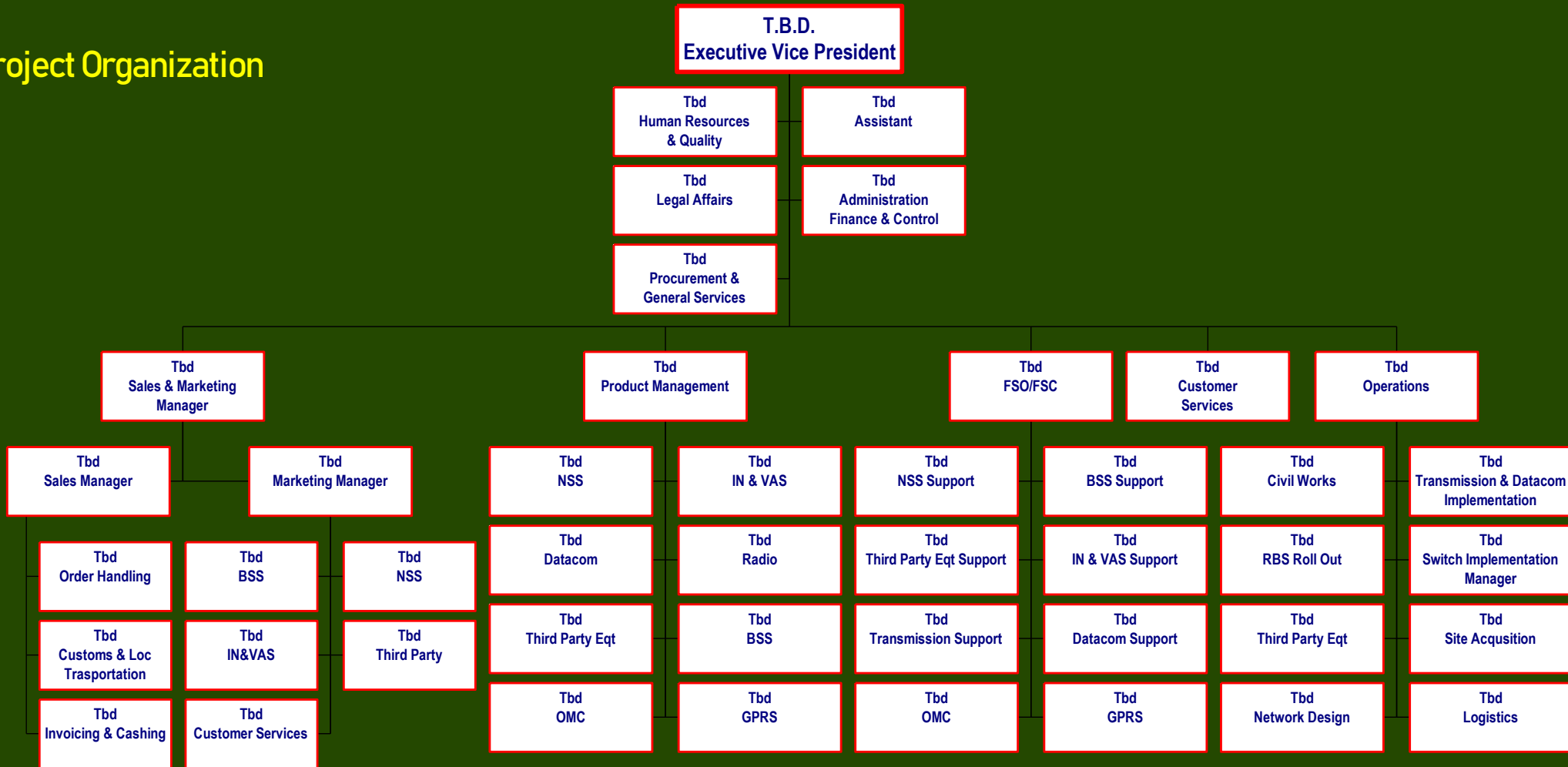
La negoziazione, il contratto, i rischi

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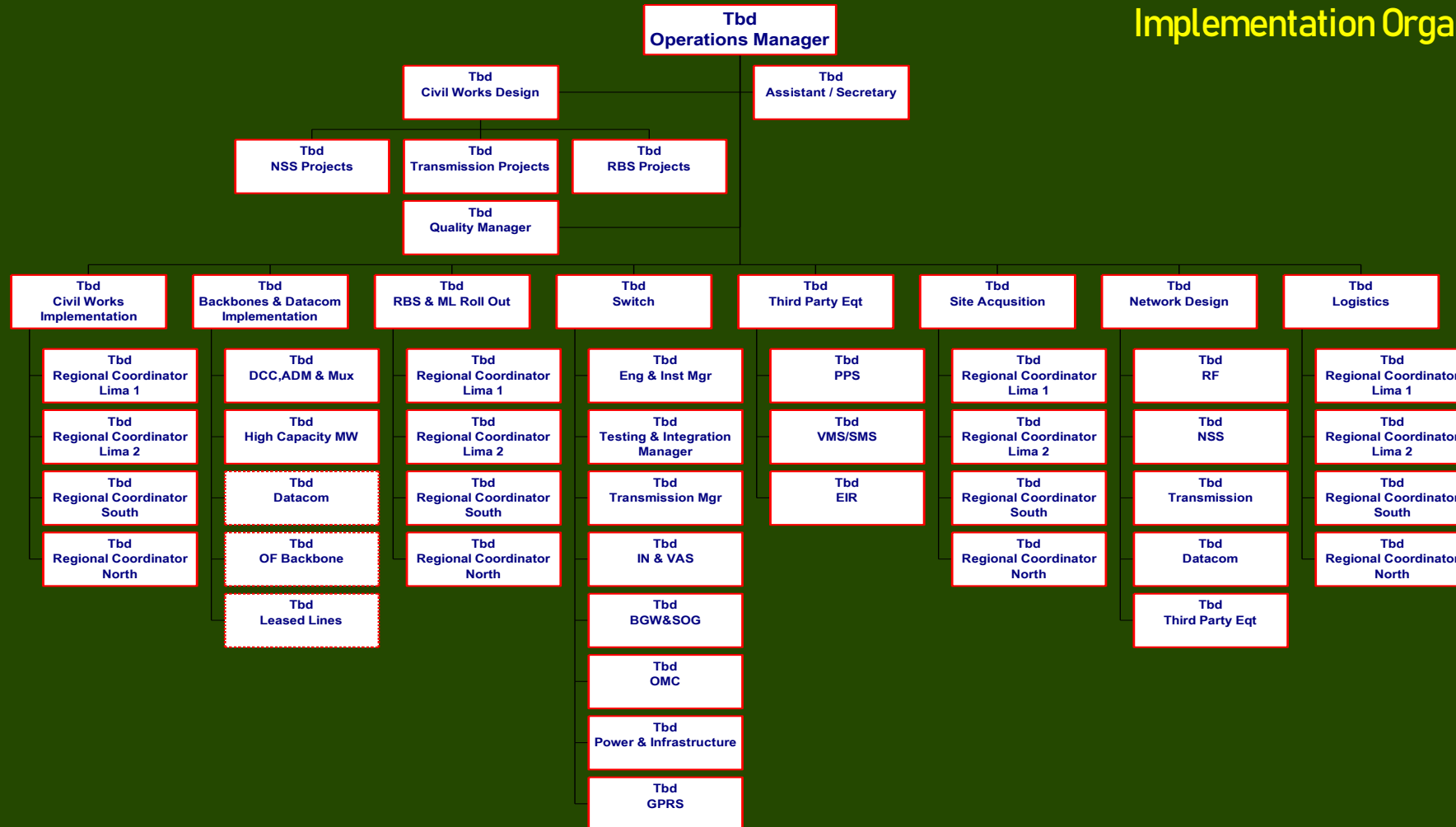
Progetto e implementazione

Project Organization



Progetto e implementazione

Implementation Organization

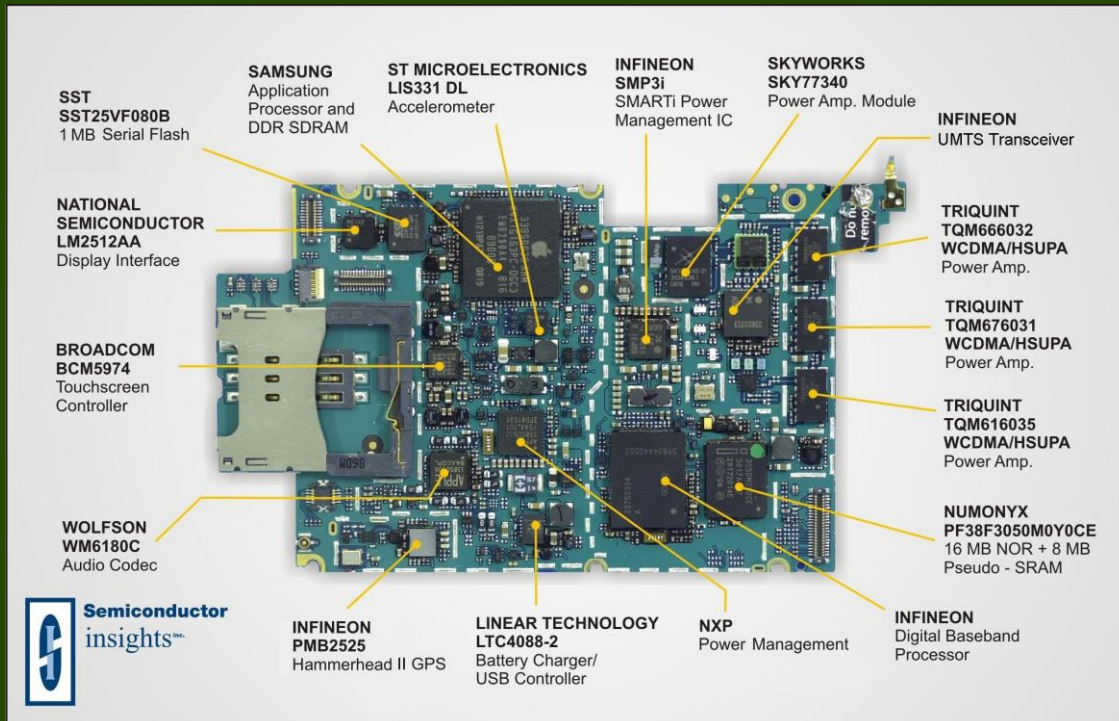


Collaudo, garanzia, prestazioni di lungo periodo

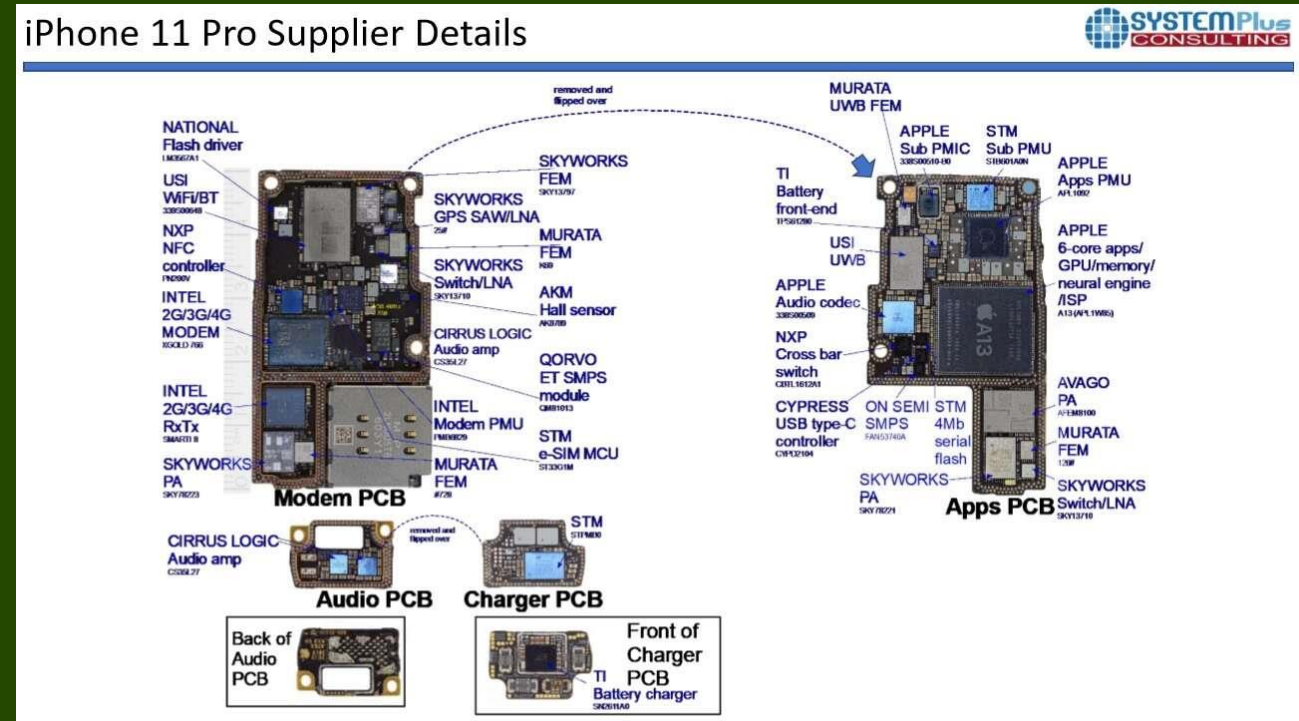
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- NORME
- STANDARDS
- TIME PLAN
- ACCEPTANTE TESTS
- REQUIREMENTS
 - EX-WORKS
 - ON SITE
 - EQUIPMENT
 - SYSTEM
- SYSTEM PERFORMANCE
- PENALTIES
- MINORS (OUTSTANDING LIST)
- ACCEPTANCE CERTIFICATE
- WARRANTY
- REPAIR SERVICE
- SPARES PARTS
- SOFTWARE SUPPORT

Cos'è uno smartphone?



iPhone 3G Main PCB Board



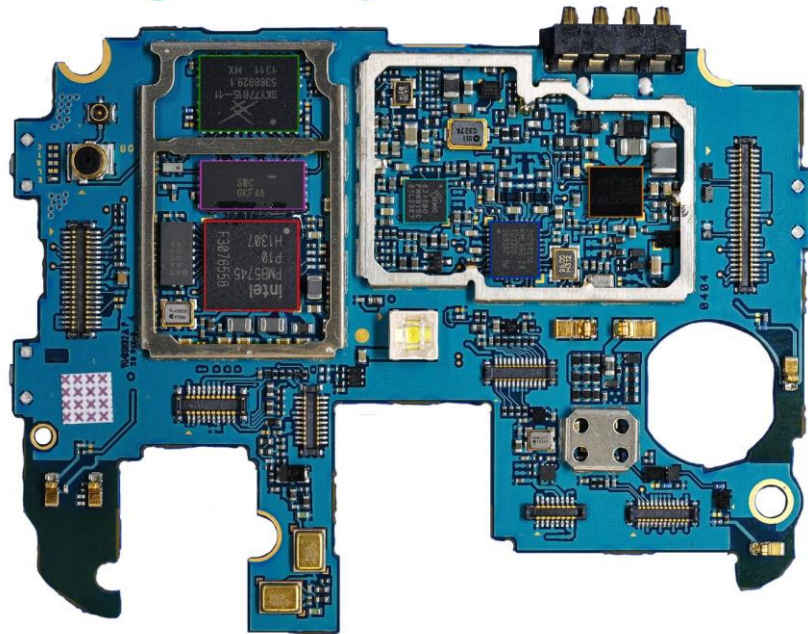
Catena del valore e sistema paese

COMPONENTS

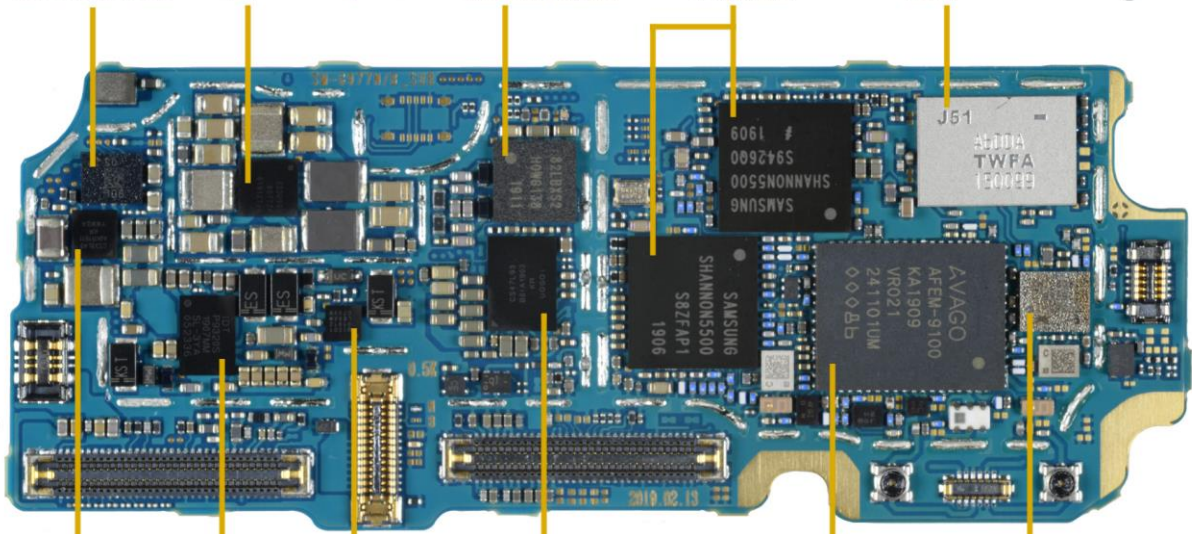
Samsung Galaxy S4

COMMUNICATIONS BOARD, BACK

- Intel PMB5745
Intel SMART! UE3 RF Transceiver
- Broadcom BCM20794
NFC controller IC
- SkyWorks SKY77615-11
Multimode Multiband Power Amplifier Module (WCDMA-HSDPA-HSUPA)
- Murata SWC GKF48
Antenna Switch Module
- Maxim MAX77803
Power Management
- SIMG (Silicon Image) SiI8240
MI-E 2.0 transmitter with HDMI input



TECHINSIGHTS



STMirco LSM6DSO
iNEMO Inertial Module

Samsung S2D0S05
Display Power Management IC

Samsung 82LBSX2
NFC Secure Controller

Samsung Shannon 5500
RF Transceiver

Murata J51
LB FEM

Cirrus Logic CS35L40
Audio Amplifier

IDT P9320
Wireless Charger Receiver IC

Samsung S2M1S01
MST Driver

Cirrus Logic CS47L93
Audio Codec

Avago AFEM-9100
HB/MB FEM

Skyworks SKY77365-11
GSM & PAM

Tech Insights

Samsung 10 5G

Il 5G ed i suoi «rischi»

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- Le frequenze utilizzate
- L'aumento del numero delle antenne
- Il «rischio» delle «radiazioni» non-ionizzanti

Il 5G ed i suoi «rischi»

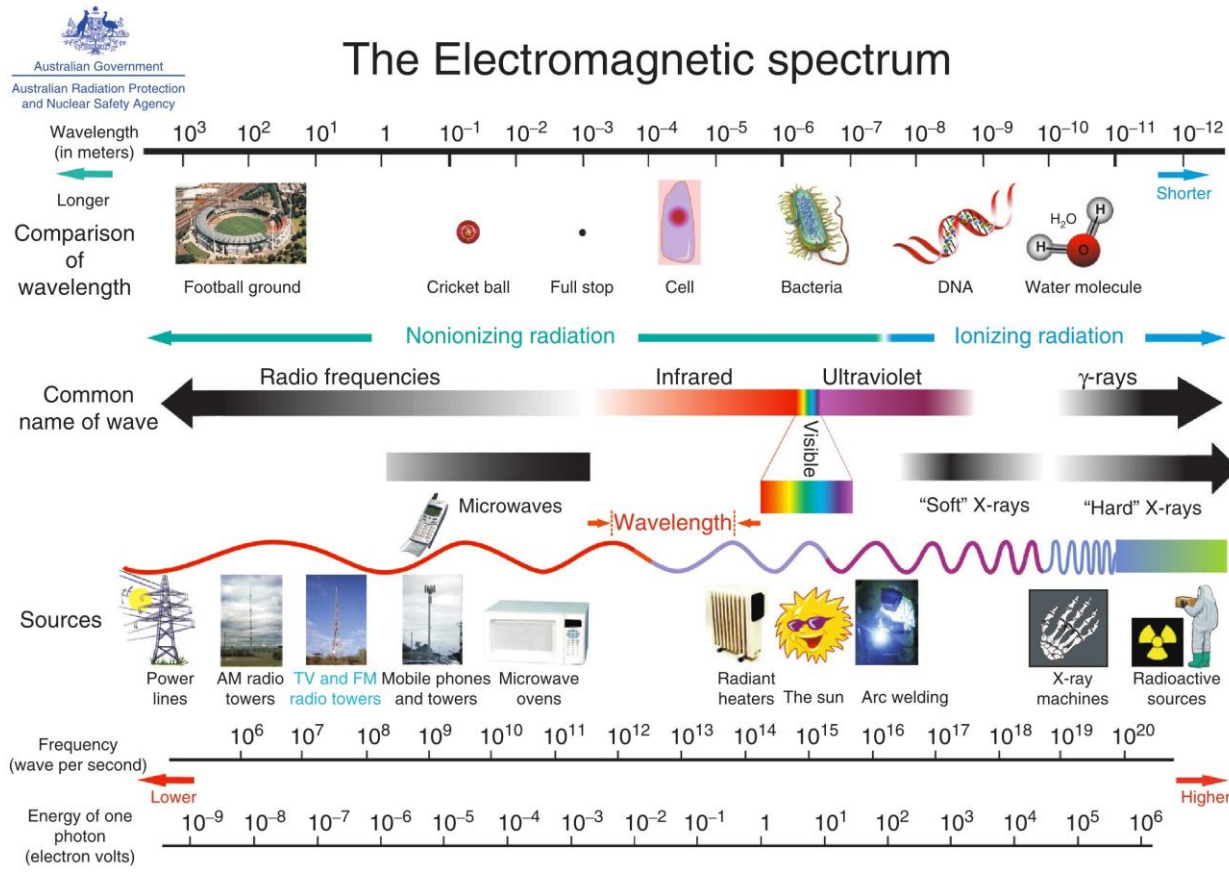













Figure 1.1 The electromagnetic spectrum, from power frequencies through to γ -rays. Top: wavelength in meters; middle: relative sizes of wavelengths, names, and typical sources; bottom: frequency in waves per second or hertz (Hz) and the relative energy of each type. Source: K. Karipidis, ARPANSA, Australia.




Il 5G ed i suoi «rischi»: le frequenze

	<1GHz	3GHz	4GHz	5GHz	24-28GHz	37-40GHz	64-71GHz
	600MHz (2x35MHz) <u>Existing band</u>	2.5GHz (LTE B41) <u>Existing band</u>	3.45-3.55GHz 3.55-3.7GHz 3.7-4.2GHz	5.9-7.1GHz	24.25-24.45GHz 24.75-25.25GHz 27.5-28.35GHz	37-37.6GHz 37.6-40GHz 47.2-48.2GHz	64-71GHz
	600MHz (2x35MHz) <u>Existing band</u>	3.55-3.7 GHz			27.5-28.35GHz	37-37.6GHz 37.6-40GHz	64-71GHz
	700MHz (2x30 MHz) <u>Existing band</u>	3.4-3.8GHz		5.9-6.4GHz	24.5-27.5GHz		
	700MHz (2x30 MHz) <u>Existing band</u>	3.4-3.8GHz			26GHz		
	700MHz (2x30 MHz) <u>Existing band</u>	3.4-3.8GHz			26GHz		
	700MHz (2x30 MHz) <u>Existing band</u>	3.46-3.8GHz			26GHz		
	700MHz (2x30 MHz) <u>Existing band</u>	3.6-3.8GHz			26.5-27.5GHz		
		3.3-3.6GHz		4.8-5GHz	24.5-27.5GHz	37.5-42.5GHz	
		3.4-3.7GHz			26.5-29.5GHz		
		3.6-4.2GHz		4.4-4.9GHz	26.5-28.5GHz		
		3.4-3.7GHz			24.25-27.5GHz	39GHz	

Designed for diverse spectrum bands/types

Global snapshot of 5G spectrum bands allocated or targeted

New 5G band

-  Licensed
-  Unlicensed / shared
-  Existing band

Il 5G ed i suoi «rischi»: le radiazioni non-ionizzanti

ICNIRP

As an independent organization, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) provides scientific advice and guidance on the health and environmental effects of non-ionizing radiation (NIR) to protect people and the environment from detrimental NIR exposure.

HIGH FREQUENCY (100 kHz - 300 GHz)

A few of these epidemiological studies have reported a slight statistical increase in risk of some brain tumours for the small group of long-term and heavy mobile phone users (read more). Reporting biases and weaknesses of the studies may explain the observed findings. Several studies have not reported any increase in brain tumors with mobile phone use. Also, experimental studies on animals and cells have failed to confirm the findings of the epidemiological studies, and there is no biophysical mechanism that could explain carcinogenicity at such low exposure levels.

5G ed i suoi «rischi»: le radiazioni non-ionizzanti

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“**Non-ionizing radiation protection – Summary of Research and Policy Options**”, edito da Wiley nel 2017, AA. VV., editori Andrew W. Wood, Swinburne University of Technology, Melbourne e Ken. Karapidis, Australian Radiation Protection and Nuclear Safety Agency, Melbourne, Australia, pag. 6:

“There is a perception among the scientific community that most health issues from NIR (non-ionizing radiation ndr) **are media generated**, concerned as they are with sources that are part of the normal home or work environment.

This contrasts with ionizing sources, which are limited to specialist environments such as hospital diagnostic and therapy units and uranium mining.

Relatively few people are exposed on a regular basis to these sources (ignoring, for the moment, the background natural ionizing radiation which we are all exposed to continuously).

The notion of the electromagnetic environment of home appliances, mobile phones, and electrical power lines being possibly harmful to health is something that patently affects everybody and **makes for commanding headlines in the media.**

It should be said that, except for consequences of UV and laser exposure, scientific evidence for harm at levels of other forms of NIR commonly encountered **is considered by most of the scientific community to be inconclusive and inconsistent.”**

DOMANDE?

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