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What to expect from  
Operators newly  
acquired Spectrum in  
Pakistan

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License, Technology,  
Device Eco-system &  
Operators likely UMTS  
and LTE Strategies

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**Note:**

*This paper may include predictions, estimates or other information that might be considered forward-looking. While these predictions represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these statements, which reflect our opinions only as of the date of this paper.*

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## 1. Introduction

This white paper is for professionals who have an interest in knowing the various aspects of the recently auctioned NGSMA spectrum going beyond the flashy advertisements to see possibilities and specifically what to expect in term on data speeds or throughputs by the operators who secured the spectrum and their possible strategies. Certain sections have deliberately explained very technical issues in general terms for easy understanding to enable non-technical managers as well to benefit from the report

The paper also highlights available spectrum consolidation options, compatible technologies and touches upon the important subject of the device eco system. Finally, some light has been thrown on the areas of likely upgradations

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**As soon as the auction was over the race of advertisement of embracing 3G/4G technology promising blazing speeds and newer applications started**

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where investments will have to be made in the network which has been a topic of discussion amongst professionals in the industry.

PTA held the most awaited Pakistan NGSMA spectrum auction on 23<sup>rd</sup> April, 2014. It was a historic day for the Telecom Industry and probably for the people of Pakistan. We can all move forward now in the technology domain

after almost a decade and can finally restart the engine that has for years not been operational. While, the Spectrum auction itself was a small step but the change of mindset that follows will enable and be the game changer for the things to come-certainly for good.

PTA designated 30 MHz bandwidth in 2100 MHz spectrum and 20 MHz bandwidth in 1800 MHz spectrum. The spectrum was divided into two lots of 10 MHz and two lots of 5 MHz for 2100 MHz, while two lots of 10 MHz were reserved for 1800 MHz spectrum. Zong and Mobilink each secured 10 MHz bandwidth in 2100 MHz spectrum while

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**Warid announcement to go for 4G has also created a very interesting situation for the market and raised eyebrows that if it was the case why not earlier**

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Ufone and Telenor secured 5

MHz each in 2100 MHz spectrum. Only Zong among these four operators got one lot of 10 MHz in 1800 MHz spectrum.

As soon as the auction was over not only the four who secured the spectrum in the NGSMA but Warid,

who did not participated in the auction also jumped into the race of advertisement of embracing 3G & 4G technology promising blazing speeds and newer applications. The timing of the Warid announcement to go for 4G LTE has also created a very interesting situation for the market and raised eyebrows that if it was the case “why now not earlier, is it possible and how?”.

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**Going beyond the flashy advertisements specifically what to expect in term on data speeds or throughputs by the operators who secured the spectrum and their possible strategies is important to understand**

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**PTA held the most awaited spectrum auction on 23rd April, 2014 after almost a decade of unsuccessful attempts which itself is a big achievement**

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“We are worth the wait, indeed.”  
The best is yet to come  
4G LTE

[www.waridtel.com](http://www.waridtel.com)

We would like you to visit the PhoneWorld website ( [www.phoneworld.com.pk](http://www.phoneworld.com.pk)) and benefit from the other information available which shall also be upgraded from time to time. Your valuable comments are also welcome so that we can improve and come up with more relevant content.



**Welcome to Mobilink**  
For a bigger, faster, better everyday.  
Backed by 20 years of trust, Mobilink is thrilled to bring next generation technology to Pakistan's largest family of customers for whom new opportunities, experiences, entertainment and lifestyle content will deliver a bigger, faster, better everyday.



## 2. License & Spectrum, Technology Roadmap & Device Eco System

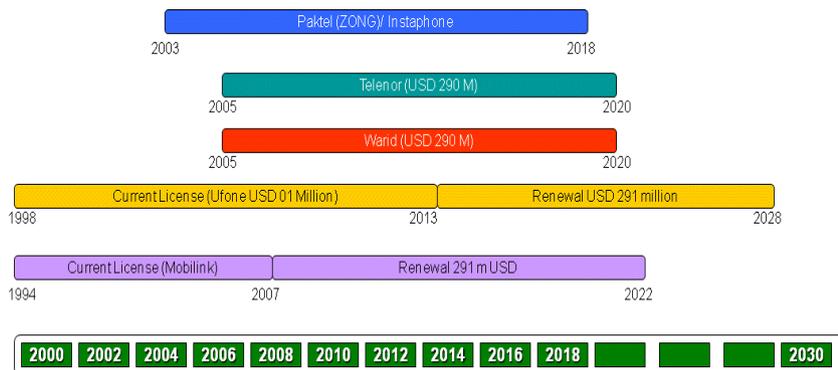
### 2.1 License Neutrality & Spectrum Consolidation reuse

The frequencies that are currently being used in Pakistan for the deployment of GSM mobile telecommunication systems are 900 MHz and 1800 MHz. All current mobile spectrums given out are governed by technology neutral licensing regime which means that operator can deploy any technology as they feel like in the allocated spectrum. While, GSM (Global System for Mobile Communication) technology is currently deployed in Pakistan on 900 MHz and 1800 MHz spectrums but for upgradation there are other factors that needs to be seen such as device eco system, painless shifting of existing customer base to vacate the spectrum for new technology, network upgradation itself etc., in addition to regulatory approvals, some of these are covered in the later part of this report.

The Mobile Cellular Policy published by MoITT in January 2004 available on the Ministry of IT & Telecom’s web site, the technology neutrality is indicated in section-5 (article 5.1). As written, the policy states, “**The PTA will issue new national, technology neutral, Mobile Cellular licenses for 15 years tenure**”. The renewal clause 5.4 of the same document further cements it resolve for the nature of the licenses which states “**The Mobile Cellular License under this policy will replace the existing licenses as soon as possible or at least upon expiry of the current licenses**”, indicating all mobile cellular operators would have the same license terms including technology neutrality.

Therefore, Warid could possibly deploy LTE, if it wishes to take that route under current licensing regime fulfilling certain regulatory permissions that

are probably concerned more on roll-out, QoS etc., which they need to coordinate with the PTA. The mobile licenses awarded for GSM in Pakistan and there renewals are shown in the figure. The most recent is the renewal of Ufone license for a further period of 15 year. Pakistan license renewal regime being long term requires it to be technology neutral so that the best of the breed technology and services are made available to the consumer, which is as a very important element. The stability in making renewals over decades provides continuity establishing a very conducive business environment, which needs to be appreciated.



The table shows the frequency allocation of the operators before and after auctioning process. As

Mobile Spectrum In Pakistan					
OPERATORS	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Zong (China Mobile)	7.6	6	10	10	33.6
Mobilink (VimpleCom)	7.6	6	10	-	23.6
Telenor	4.8	8.8	5	-	18.6
Ufone (Etisalat)	7.6	6	5	-	18.6
Warid	4.8	8.8	-	-	13.6
Total	32.4	35.6	30	10	108

additional bandwidth is now allotted to the operators which is in lots of 5MHz and 10 MHz in 2100 MHz spectrum and 10 MHz bandwidth in 1800 MHz spectrum, operators are now more capable of deploying new technologies like UMTS and LTE with or without spectrum consolidation to offer better user experience. According to PTA’s Information Memorandum published on 17<sup>th</sup> March 2014 section 2.2.1 “The spectrum to be auctioned will give the successful Operator a License to build, own and operate a technology-neutral network and offer licensed services to consumers only for the Next Generation Mobile Services for which it is permitted”. The guiding principal on technology is the QoS obligation rather than specific mentioning whether an operator should deploy WCDMA/HSUPA/HSDPA/ HSPA+/LTE etc., which makes the NGSMA award also technology neutral. These QoS obligations are provided both in the NGSMA IM as well in the draft license template to be issued to spectrum winners. Another area to be addressed is the coverage obligations which are different for the NGSMA and the earlier issued licenses.

While, regulatory aspect and approval is the first thing that an operator must have (spectrum neutrality varies from country to country but most licenses around the world have technology neutral regime specially that have long term mobile license given out) the second most important aspect is to have harmonized bands for any technology. This essentially means that how much or which is the preferred band for technology deployment. In today’s world technologies that are developed specifically to a country and does not have a large deployment base, tends to die out because of unviable and unfavorable eco system. A harmonized frequency band brings with it the economies of scale, enables a large variety of vendors and ensures competition and cost effectiveness both for infrastructure and devices.

Compatible Technologies			
FREQUENCY	TECHNOLOGIES		
	GSM (2G)	UMTS (3G)	LTE (4G)
900	Yes	Yes	Yes*
1800	Yes	No	Yes
2100	No	Yes	Yes
*Limited deployments in 900 MHz spectrum of LTE			

The table highlights the technology that has been given out to the

operators in Pakistan which can be deployed or is most suited to be deployed on their respective frequency spectrum. Since, UMTS & its evolved version is widely deployed in 2100 MHz and also in 900 MHz therefore it remains the preferred spectrum for 3G, whereas for LTE the most favourable spectrum band remains 1800 MHz and some deployments are also seen in 2100 MHz and 900 MHz (although they remain limited in number-this is for three mobile spectrum in Pakistan. Other LTE bands include 700/800 MHz and 2600 MHz).

It is for this reason of deployments that the ECO system for 3G remains quite mature and favorable in 2100 MHz and for LTE in 1800 MHz for Pakistan.

## 2.2 Technology Roadmap

The radio networks are different when we talk about data rates or user experience with that of fixed line networks. In fixed line networks, an operator commits the data rates which can be achieved without any limitation to the number of users currently accessing the network. Whereas, in the case of wireless networks, channel is being shared between all the users. So as the number of users increases, the peak data gets divided between the users. For example, in case of Rel-8 WCDMA network, the peak throughput is around 42 Mbps which is available to a single user accessing the network. When an extra user is added to the network, this peak throughput will be equally divided

by the network scheduler among the two users if they are in the same RF conditions and using the same modulation scheme.

From a network operator prospective, it is important to take care of network resources by providing data packages which should be limited to specific data rates to avoid congestion or overloading the networks. Capping data bundles such as 2 Mbps or 4 Mbps should be introduced so the network overall data capacity can be better utilized among the users. Also data bundles should be provided with limited download data such as 1GB, 2GB, 4GB etc., or fair usage packages instead of unlimited bundles.

LTE-Advanced” and “Wireless MAN-Advanced” are the official designation of IMT-Advanced, qualifying them as true 4G technologies-Operators follow a different convention of 4G definition that essentially regard LTE and its releases as 4G technologies

Third Generation technology standard was developed in the late 1990s and early deployments were seen in the early and mid-2000. The purpose behind was to improve speed and data capabilities. 3G standard was defined by the Third Generation Partnership Project (3GPP) and later standardized by the ITU-T. Popularly, known as the Universal Mobile Telecommunications System (UMTS), the 3G system is based on Wideband CDMA (WCDMA) that operates in minimum of 5 MHz bandwidth and can produce download data rates of typically 384 kbps under normal conditions and up to 2 Mbps in some instances.

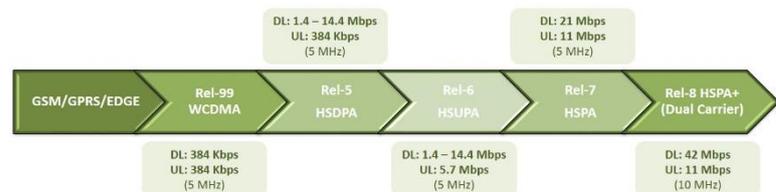
After the release of WCDMA (Release 99) there was need of more data throughput, as the smartphones started to evolve with more data oriented application over passage of time. So, in the light of the demand of higher data rate 3G standards were enhanced to offer extended data speed and capacity.

Users experience will be much lower data rates than peak rates being dependent on the network optimization, traffic/users, devices category etc.

The newer releases of WCDMA have added high speed packet access (HSPA) that use higher level 64QAM (Quadrature Amplitude Modulation) to get speeds up to 21 or 42 Mb/s downlink (DL) and up to 5.7 and/or 11 Mb/s uplink (UL). A roadmap of 3G (WCDMA) technology and standards has been set from Release 99 to Release

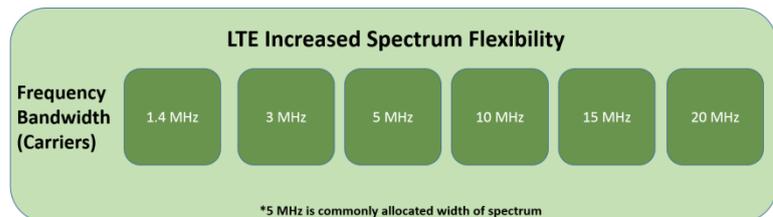
9 and beyond but the current commercial deployments are till Rel-8. The various commercially deployed releases and corresponding DL and UL are as provided in the figure. The user shall experience much lessor data rates that are dependent on the network optimization, traffic/users, devices category etc.

Currently, the average speed per user of most LTE networks are limited to 6 Mbps to 20 Mbps which cannot be termed as true 4G networks. ITU which is the standardisation body defines 4G networks as technology that offers download speeds of 100 Mbps on mobile devices or 1 Gbps on fixed wireless connection. Wireless carriers all over the world have turned 4G into marketing term, although the proper definition of 4G defined earlier as the peak data rate, that must be at least 100 Mbps for a technology to be called 4G.



In October 2010, ITU further released a statement in Geneva, Switzerland “ITU’s Radio communication Sector (ITU-R) has completed the assessment of six candidate submissions for the global 4G mobile wireless broadband technology, otherwise known as IMT-Advanced. Harmonization among these proposals has resulted in two technologies, “LTE-Advanced” and “Wireless MAN-Advanced” being accorded the official designation of IMT-Advanced, qualifying them as true 4G technologies.” Operators follow a different convention calling LTE, TD-LTE, LTE-Adv and Wimax 2 as 4G technologies.

LTE uses a completely different radio technology. Instead of wideband CDMA, it uses orthogonal frequency division multiplexing (OFDM) and OFDM access. OFDMA modulation technique divides a channel usually 5, 10 or 20 MHz wide into smaller sub-channels. The data is divided into slower streams that modulate the subcarriers with one of several modulation schemes like QPSK, 16QAM and 64QAM.



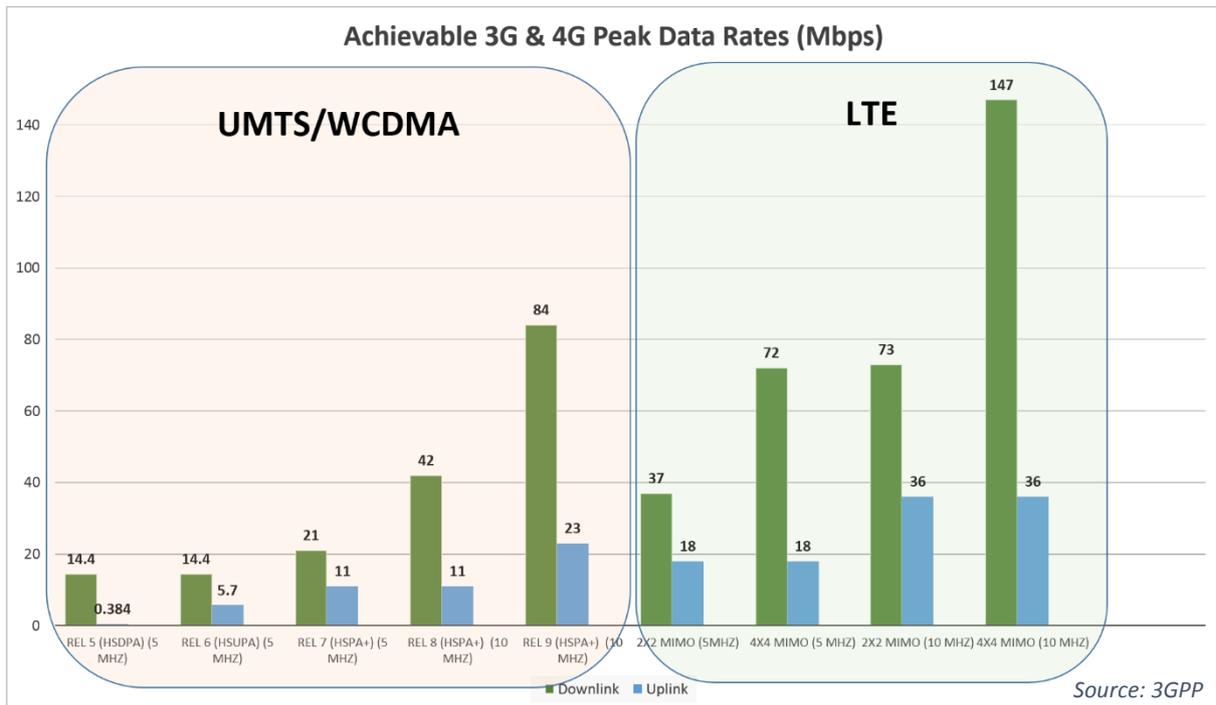
LTE also defines multiple input multiple output (MIMO) operation that uses several transmitter-receiver-antennas. The data stream is divided between the antennas to boost speed and to make the link more reliable. Using OFDM with higher order modulation and MIMO enables LTE deliver data at a rate to 100 Mb/s downstream and 50 Mb/s upstream under the best conditions. The spectrum in LTE technology is more flexible as compared to UMTS. The figure illustrates the spectrum flexibility in LTE. There are two techniques of MIMO in 4G, one is 2x2 MIMO which uses two antenna’s for forward link transmission and the other is 4x4 MIMO which uses four antennas.



### 2.3 Expected Data Rates

Those operators who have 5 MHz bandwidth such as Ufone and Telenor can implement **Rel 7 (HSPA+)** of UMTS Technology which can achieve a peak data rate of **21 Mbps** (64 QAM) for downlink and **11 Mbps** (16 QAM) for Uplink, whereas operators who have invested more in the spectrum and have 10 MHz of bandwidth can do carrier aggregation to implement **Rel 8 (HSPA+)** which can provide them with a peak data rate of **42 Mbps** in downlink and **11 Mbps** in uplink. Therefore, operators such as Zong and Mobilink will have definite technical advantage in user experience over their competitors given that they have similar networks and subscribers for the sake of comparison. The question arises whether **Rel 9** of UMTS can also be implemented with 10 MHz bandwidth? , the answer to this is ‘Yes’ but there is almost no eco-system at present to support **Rel 9**. Therefore, beyond **Rel 8** UMTS the focus will or has already shifted towards **LTE** unless a viable eco system for Rel 9 is established. It is important to note that the spectral efficiency of 10 MHz UMTS in **Rel-9** is more than 10 MHz for 2x2 MIMO **LTE**.

The figure below compare the data rates of UMTS and LTE for the amount of spectrum and carriers that has been either recently acquired by operators as a result of the NGSMA or due to consolidation/re-allocation.



## 2.4 Device Availability & Compatibility

As UMTS and LTE services are being rolled out in Pakistan there are few things that should be kept in mind from user’s perspective, most important being availability of compatible devices. Devices that are presently available in Pakistani market are mostly GSM and to certain extent UMTS supported. Devices that support LTE are also available but they are very few in numbers and are quite expensive. Smartphones that are available in the market these days support 2x2 MIMO LTE technology. Whereas for 4x4 MIMO LTE technology there are no handsets but only dongles and routers that are available commercially.

Smartphone available that support LTE operate on the deployment of 2x2 MIMO, whereas for 4x4 MIMO, only dongles are used as currently no smartphone can support 4x4 MIMO technology

The table shows the network, frequency and the data rates which are the main features that needed to be checked from a user prospective. These features enable users to avail the maximum data rates from a

Device Compatibility			
Features	Examples		
Network Support	GSM (2G)	UMTS/HSDPA (3G)	LTE (4G)
Frequency Support	GSM 850/900/1800	HSDPA 850/900/1900/2100	LTE 700/850/1800/2300
Speed/Data Rates	GPRS/EDGE	HSDPA 42 Mbps, HSUPA 5.7 Mbps	LTE 150 Mbps DL, 50 Mbps UL

network. While readers can check on GSM arena the devices available globally but we shall shortly be releasing a list and specifications for WCDMA & LTE supported phones in Pakistan on our website

and would like to encourage the readers to visit our web site for specifications and local pricing information ([www.phoneworld.com.pk](http://www.phoneworld.com.pk)).

“What Makes a Smartphone Smart?” Well, there is no standardization body like the ITU that has a global definition but an acceptable market definition for a smartphone is “A smartphone is a device that has a combination of quality & fast processor, support advance Operating Systems (such as Android, iOS, BB, MS etc), & technology (WCDMA, LTE etc), can perform multitasking and other high end features”.

The most important feature unlike what people think is the processor as smartphones is like a small computer that delivers a powerful experience. Understanding how a smartphone works helps you in

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3G Smartphone is now affordable for a large population touching Rs.5,000 range whereas the LTE smartphone is still over Rs. 15,000 and will take atleast a year or so to achieve critical mass

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making a purchase decision or helps your customers. The processor is the brains of the device that makes nearly all the smartphone features possible. All those apps, the great camera, responsive graphics and screen performance, high-speed connectivity and now even the low consumption of the battery—all are driven by the processor. Popular processors include: Qualcomm Snapdragon, NVIDIA, Tegra, Samsung Exynos, Apple A5, Texas Instruments OMAP and Intel ATOM.

While, the prices of white label (that does not have a brand name) UMTS (3G) smartphone has reached USD 35 FoB China and the most low cost 3G phones shall be available in the Pakistani market for Rs. 5,000 range that is quite affordable for a very large population. In addition to the availability of affordable or low cost 3G smartphone the operators has already started focusing on various initiatives like financing, trade off etc., that would trigger the shift from a simple GSM to UMTS Smartphones and/or subscriptions. The prices for low cost LTE smartphone is still over Rs. 15,000 and it will take atleast a year or so to be available at a price point that can achieve critical mass in a market like Pakistan.

### 3. Operators Strategy

The additional bandwidth that the operators have acquired in the NGSMA will enable them to deploy newer technologies. Current telecom scenario in Pakistan suggest that the operators that obtained new bandwidth in 2100 MHz spectrum will deploy a version of WCDMA preferably HSPA+ (or 3G as they call it) whereas in the newly acquired spectrum bandwidth of 10 MHz in 1800 MHz it will deploy LTE ( or 4G as they prefer to call).

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From the network point of view the additional bandwidth that has been acquired by the operators will enable them to deploy newer technologies

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Historically, and uptill now GSM mobile operators in Pakistan were operating in 900 MHz and 1800 MHz spectrum. Mobilink, Ufone and Zong were first to deploy networks in Pakistan and they were allocated 7.6 MHz bandwidth in 900 MHz spectrum and 6 MHz bandwidth in 1800 MHz spectrum, while Telenor and Warid came later and were allocated 4.8 MHz in the 900 MHz spectrum. To compensate for the less bandwidth allotted in 900 MHz, these two operators were allotted bandwidth of 8.8 MHz in 1800 MHz spectrum.

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Zong has the highest total bandwidth which is 33.6 MHz while Mobilink holds the second place with total of 23.6 MHz

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As a result of the NGSMA, Zong now has a total bandwidth of 33.6 MHz, while Mobilink holds 23.6 MHz and Telenor, Ufone and Warid 18.6 MHz, 18.6 MHz and 13.6 MHz respectively. The additional spectrum holds interesting options for each operator which will be discussed in this chapter.

#### 3.1 Zong- Flexing muscles

Zong has the lowest subscriber base amongst the four successful bidders of the NGSMA, but it currently has the largest pool of spectrum at its disposal, thus giving a very strong signal to the market that it has aggressive plans for the market. It is currently utilizing 900 MHz and 1800 MHz spectrum for GSM voice and GPRS/EDGE services. As Zong has acquired 10 MHz in 2100 MHz, it will be able to deploy dual carrier i.e. 2 carriers of 5 MHz. The dual carrier deployment will help in providing more capacity and better data services than single carrier. Zong shall be able to launch Rel-8 of UMTS technology that provides carrier aggregation enabling peak

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Zong shall be able to launch Rel-8 of UMTS technology that provides carrier aggregation enabling peak data rates of up to 42 Mbps in downlink and 11 Mbps in uplink.

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Zong's priority would be to launch and aggressively roll-out its UMTS network and have some hotspots of LTE fulfilling the license roll-out obligations and for marketing purpose

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data rates of up to 42 Mbps in downlink and 11 Mbps in uplink.

In the 1800 MHz spectrum, Zong can also launch its LTE services either on 10 MHz that it recently acquire or 15 MHz (by adding previously allotted 5 MHz chunk from existing 1800 MHz spectrum used for GSM voice/data) which can provide data rates around 110 Mbps with 2x2 MIMO in downlink, which would be a true 4G network as per ITU definition. Zong can also implement 4x4 MIMO technology in

lesser spectrum i.e. 10 MHz providing peak data rate of 147 Mbps which can be used to support provide only data dongles packages to its customers.

If anytime in future, Zong feels it should swap its existing GSM (2G) network completely, they can also launch UMTS in 900 MHz which is already used in many countries around the world and have a friendly eco system. However, at this point Zong’s priority would be to launch and aggressively roll-out its UMTS network and maybe have some hotspots also of LTE in the short term fulfilling the roll-out obligations of the license which are quite relaxed for LTE and for marketing purpose.

Zong Mobile Spectrum					
OPERATOR	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Zong (China Mobile)	7.6	6	10	10	33.6

### 3.2 Mobilink-Maintaining lead

Mobilink is providing its GSM and GPRS/EDGE services on 900 MHz and 1800 MHz spectrum. The newly acquired spectrum by Mobilink in 2100 MHz will most likely be used for UMTS services. Like Zong, Mobilink can launch dual carrier UMTS services i.e. 2 carriers of 5 MHz each, as it also has 10 MHz in 2100 MHz spectrum. The dual carrier deployment in 2100 MHz will help in providing more capacity and better data rates. Mobilink will also be able to launch Rel-8 of UMTS technology that provides carrier aggregation enabling peak data rates of up to 42 Mbps in downlink and 11 Mbps in uplink.

Mobilink will launch Rel-8 of UMTS technology and also has an option to use existing 5 MHz bandwidth of 1800 MHz for LTE by shifting its voice services to UMTS 2100 MHz

Mobilink priority would have to aggressively roll-out its UMTS network and maintain its market position for the next few years. It may not be interested or have an ambition to have an LTE network in the short to medium term

Mobilink also has an option that it can use its 5 MHz bandwidth of 1800 MHz spectrum for the deployment of LTE by shifting its voice services to UMTS 2100 MHz spectrum. In that case, average data throughputs for UMTS will be lower.

Mobilink priority would be to launch and aggressively roll-out its UMTS network and maintain its market position for the next few years. It may not be interested or have an ambition to have an LTE network in the short to medium term.

Mobilink Mobile Spectrum					
OPERATOR	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Mobilink (VimpleCom)	7.6	6	10	-	23.6

### 3.3 Telenor- Tough times ahead

Telenor enjoys a very strong brand position and the market expected it maybe more aggressive to pursue large additional spectrum for data play. Similar to Zong and Mobilink, Telenor is providing GSM and GPRS/EDGE services on 900 MHz and 1800 MHz spectrum. The variance is in the spectrum

blocks between these operators, Zong and Mobilink has 7.6 MHz in 900 MHz and 6 MHz in 1800 MHz spectrum whereas Telenor has lessor bandwidth in 900 MHz spectrum i.e. 4.8 MHz but has more bandwidth of 8.8 MHz in 1800 MHz spectrum.

Since, Telenor has 5 MHz in 2100 MHz spectrum it cannot use this for providing dual-carrier services as Zong and Mobilink but Telenor will be able to launch Rel-7 of UMTS technology

Telenor will be able to launch Rel-7 of UMTS technology which provides peak data rates of 21 Mbps in DL and 11 Mbps in UL.

Telenor large customer base could make it challenging to use its existing 1800 MHz for LTE.

which provides peak data rates of 21 Mbps in downlink and 11 Mbps in uplink. Also, it may have an option to deploy LTE in the existing 1800 MHz spectrum but this would be very challenging because of the fact that Telenor has an existing 35 million customer base

and it would not be feasible to accommodate them on its other spectrum blocks for voice.

Possibilities and Viability to consolidate with Mobilink could have been enormous if any of these entities would have acquired additional spectrum in 1800 MHz

We have earlier in our whitepapers (available on our website [www.phoneworld.com.pk](http://www.phoneworld.com.pk)) touched upon the issue of spectrum consolidation between Telenor and Mobilink (having similar shareholding). The possibilities and viability to consolidate their spectrum/network and deployment of both LTE as well UMTS could have been enormous if any of these entities would have acquired additional spectrum in 1800 MHz. If not, Telenor may have to face tough times in its ambition to continue lead the market when it comes to providing quality service.

Telenor Mobile Spectrum					
OPERATOR	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Telenor	4.8	8.8	5	-	18.6

### 3.4 Ufone – Missing Target

Ufone being Government of Pakistan and also part of the PTCL family that also has ambitious plans for data was perhaps the only upset for the market. However, this probably is for reason of the technical default made by their auction team. They were although the aspirants for the 02<sup>nd</sup> 10 MHz block of 1800 MHz but ended up with only 5 MHz in 2100 MHz instead of much bigger spectrum.

Ufone being GoP and part of the PTCL family that also has ambitious plans for data was perhaps the only upset for the market



While, Ufone may not have done very well at the auction

but there post auction 3G promo that have a flavour of humour has taken a definite lead over it competitors and amused the viewers, while conveying the message loud and clear about 3G data capability .

Currently, Ufone also is providing GSM and GPRS/EDGE services on 900 MHz and 1800 MHz spectrum. The new spectrum block acquired by Ufone in 2100 MHz will be used for UMTS services. Ufone has 5 MHz in 2100 MHz spectrum and will be able to launch Rel-7 of UMTS technology which provides peak data rates around 21 Mbps in downlink and 11 Mbps in uplink as Telenor.

Ufone could be looking at the unsold spectrum of 850 MHz or 1800 MHz or the possible buy-out of Warid that it was engaged prior to the auction

As already discussed, Ufone is the only other operator besides Zong that has applied for the 1800 MHz in the recently concluded NGSMA auction. However, it was not able to acquire the same as it was pegged with getting 10 MHz of spectrum in 2100 MHz and was technically not

qualified to get 1800 MHz. They would possibly be either looking at the unsold spectrum of 850 MHz or 1800 MHz that does not fall within the 18 month moratorium or the possible buy-out of Warid that it was engaged with prior to the NGSMA.

Ufone Mobile Spectrum					
OPERATOR	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Ufone (Etisalat)	7.6	6	5	-	18.6

### 3.5 Warid – Down but not out

Warid did not participate in the NGSMA and was not able to secure any new spectrum in either 2100 MHz or 1800 MHz spectrum. However, it came up with a very interesting advertisement immediately after the auction that it is about to launch LTE services without getting into the NGSMA auction. We have discussed this issue in detail under the license neutrality section.



Therefore, will restrict our discussion here on technical and network aspects only.

Warid has around 12 million and its spectrum is not fully utilized, therefore technically it may be able to launch LTE technology using its existing 1800 MHz spectrum

Since, Warid has around 12 million and its spectrum is not fully utilized, therefore technically it may be able to launch LTE technology using its existing 1800 MHz spectrum. As we have also touched upon the issue on how much spectrum is needed for LTE deployment in the earlier section (LTE carriers can be in the following configurations 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz) therefore Warid could possibly deploy LTE on 5 MHz bandwidth which provide data rates around 37 Mbps using 2x2 MIMO or 73 Mbps using 4x4 MIMO (for dongles only).

The possible launch of LTE by Warid will not only help in arresting churn but could add value in case it decides to persue its earlier intention of selling its shares to other operators/new comer maintaining its asset value.

Warid Mobile Spectrum					
OPERATOR	Pre NGSMA		Post NGSMA (New Allocations)		Sub-Total
	900 MHz	1800 MHz	2100 MHz	1800 MHz	
Warid	4.8	8.8	-	-	13.6

## 4. Investment

Migration path of mobile networks is an important aspect to consider before deploying a new technology. As discussed earlier, the existing deployed networks in Pakistan are all GSM and have data paths till GPRS and EDGE.

After the NGSMA, due to addition of new frequencies in 2100 MHz and 1800 MHz, operators that have appropriate amount of spectrum are now able to deploy WCDMA and LTE networks that are highlighted in the preceding chapters.

Technology	Mobile Station	Base Station Subsystem	Network Subsystem	Other Networks
GSM (2G)	SIM + Mobile Equipment	BTS + BSC	MSC	PSTN, PLMN, Internet
UMTS (3G)	Require Changes (3G handsets)	Require changes	Reuse	Reuse
LTE (4G)	Require changes (4G handsets)	Require changes	Require changes	Reuse

The change in the network comes

with additional investment to be done in certain components. In case of migration from GSM to UMTS, operators will be able to reuse their core network part that includes network subsystem and other networks, which are the same for GSM and UMTS networks. For the access part which is also known as wireless part, operators will have to invest in both the base stations subsystem which is known as NodeB's (in GSM it is called BTS) and the antennas which should be able to communicate on 2100 MHz.

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For the deployment of 3G, operators can reuse their core part which is same for 2G networks. For the access part which is also known as wireless part, operators will have to invest for both the base stations and the antennas

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Also, backhaul (in general term it is the link from tower to the base) will have to be upgraded which is quite important. The backhaul upgradation is particularly going to be very expensive and challenging to be upgraded for rural or mountainous regions. The operators will have to find

innovative solutions like wideband radios, LEO Satellites instead of GEO that offer extra capacities in fulfilling this requirement.

The deployment of NodeB's from network planning point of view will be also be different from GSM base stations as UMTS network will be operating on higher frequencies which will require additional sites.

Investment will also be required in operator's core part as most of the networks already deployed are 3G ready. This shall require license updates to provide new releases like Rel-7 and Rel-8 of WCDMA and are largely dependent on the manufacturer.

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LTE is an IP based system and the main emphasis is on the data services, while the voice (VoLTE) functionality is not yet supported in currently launched smartphones

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The deployment of LTE will be a challenging task tough for the mobile operators, as the entire chain of the system will either have to be replaced or require major changes.

LTE is an IP based system and the main emphasis is on data services. The bigger challenge is not on the operator side but on the consumer side that relates to LTE devices specially because voice (VoLTE) functionality is not yet supported in existing smartphones. In order to support voice services

on LTE network it must fall back on UMTS or GSM networks. One of the advantages of LTE network is the transition (handovers to other radio access technologies) from LTE technology to legacy networks which include going directly onto GSM without having to go through UMTS.