# Spectrum scarcity and heavy traffic drive emerging Asia–Pacific operators to consider 2G/3G migration

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2G remains a significant technology in emerging Asia–Pacific, accounting for 46.8% of active SIMs in the region at the end of 2016. The challenge for mobile network operators (MNOs) in emerging Asia–Pacific is to deliver satisfactory service to their many remaining 2G customers, while simultaneously repurposing spectrum for 3G and 4G. Both 3G and 4G generate proportionately more revenue than 2G – we estimate that 3G/4G connections generated an ARPU 3.25 times higher than that of 2G connections in 2016. MNOs should consider deploying single RAN networks and using dynamic spectrum allocation to ease the process of repurposing spectrum for 3G and 4G.

## Spectrum scarcity and high levels of traffic in emerging Asia–Pacific make 2G migration more challenging

One challenge of repurposing current 2G spectrum for 3G and 4G is that many emerging Asia–Pacific MNOs do not hold large spectrum portfolios. The absence of digital dividend spectrum is particularly important, because sub-1GHz spectrum is crucial to cost-effectively establishing nationwide LTE coverage, which is still missing in many emerging Asia–Pacific markets. Emerging market MNOs that do not have access to digital dividend spectrum must make greater use of the 900MHz band to achieve nationwide LTE coverage. However, this band only contains 35MHz of spectrum and is already used for GSM. Emerging markets also often have higher numbers of MNOs than is common in more-developed markets – this reduces the amount of spectrum per MNO, including sub-1GHz spectrum suitable for widespread coverage. For example, sub-1GHz spectrum is divided between four or five MNOs in most emerging Asia–Pacific markets, but is typically divided between three players in EU member states.

Repurposing spectrum for more spectrally-efficient technologies (particularly 4G) has become increasingly urgent in emerging Asia–Pacific, as some markets in the region have higher usage per MHz of spectrum than more-developed markets. For example, traffic per head of population in Malaysia was more than double that in Germany in 2016, yet only 79% as much licensed spectrum was available (Figure 1).

*Figure 1: Available spectrum (MHz) and monthly data traffic per head of population (GB), selected developed and emerging markets, 2016*
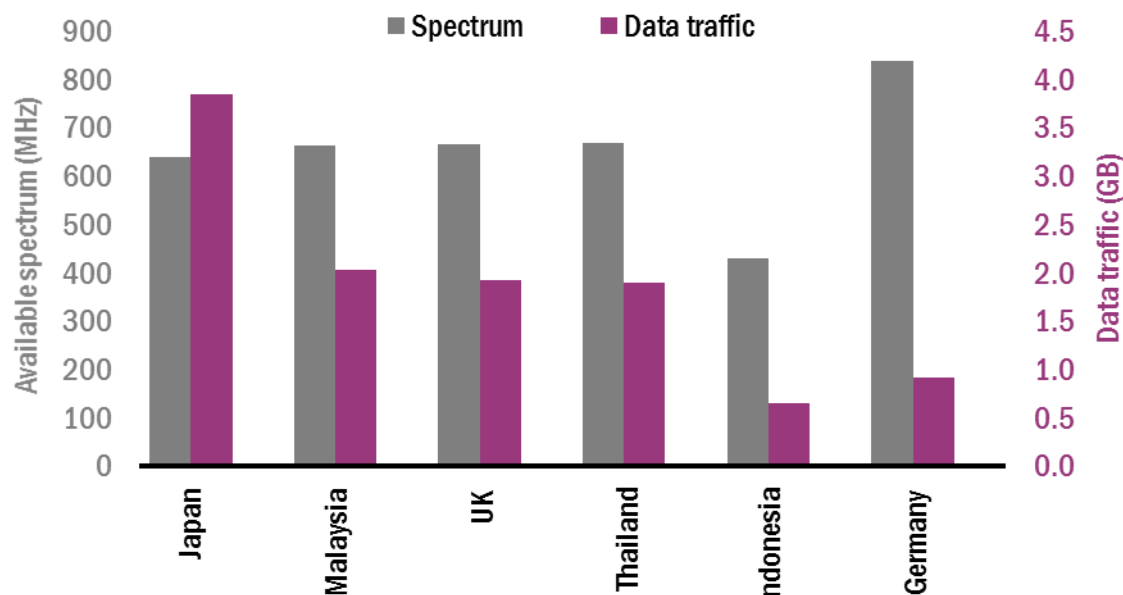


Source: Analysys Mason

## Emerging Asia–Pacific MNOs should consider 2G and 3G decommissioning when investing in IoT technologies

MNOs must consider their IoT technology choices when examining possible strategies for repurposing 2G and 3G spectrum. Continuing to invest in 2G and 3G IoT networks will restrict MNOs' ability to eventually decommission these networks and allocate all the spectrum to 4G. In contrast, emerging Asia–Pacific MNOs that do decommission their 2G and 3G networks risk losing significant numbers of IoT subscribers if they do not subsidise their migration. We estimate that 70% of AT&T's 5.6 million 2G IoT customers (as of the end of 2015) were lost because of 2G decommissioning.

## Moving to single RAN networks could ease the conventional spectrum refarming process

Single RAN networks could ease the process of refarming emerging Asia–Pacific MNOs' 2G spectrum for 3G or 4G. Some emerging Asia–Pacific MNOs have already begun conventional spectrum refarming, which requires that a particular block of spectrum is reallocated to a different technology. For example, MNOs in Indonesia and Vietnam have rolled out LTE with refarmed spectrum in the 1800MHz band, which was previously used for GSM. Operators deploying single RAN with both shared baseband and radio head ends will not need to replace hardware when they wish to refarm spectrum, which reduces costs and complexity.

Single RAN networks are already quite common in emerging Asia–Pacific, but they are not universal. Some MNOs in emerging Asia–Pacific markets (such as Vietnam) have prioritised rapid LTE roll-out over the efficiency gains provided by single RAN deployments, thus making it more difficult to implement conventional spectrum refarming in the future.

# Dynamic spectrum allocation could help emerging Asia–Pacific MNOs repurpose spectrum

Dynamic spectrum allocation is another solution that MNOs could use to efficiently repurpose spectrum currently used for legacy technologies. Dynamic spectrum allocation enables 3G or 4G traffic to occupy the 2G part of the spectrum when there is no 2G traffic, but requires innovations such as interference cancellation and joint scheduling. MNOs must have deployed single RAN networks that can be upgraded with new software to use dynamic spectrum allocation. A dynamic spectrum allocation upgrade could cost around USD2500 per site, if only software upgrades (and no hardware changes) are required. Huawei has been a prominent advocate of dynamic spectrum allocation through its CloudAir solution, which has already been deployed in a number of commercial networks.

Dynamic spectrum allocation could deliver significant cost savings in some emerging markets compared to spectrum acquisition. We estimate that the cost of a dynamic spectrum allocation upgrade for the 900MHz band in Thailand would be around USD25 million. This is 48 times less than the cost of acquiring 5MHz of spectrum in the same band (based on benchmarks from the Thai spectrum auction in 2016). However, the cost of acquiring spectrum in the 900MHz band has been much lower in other emerging markets (such as Turkey, based on the spectrum auction in 2015), so the justification for investing in dynamic spectrum allocation is less clear. Nevertheless, dynamic spectrum allocation upgrades could solve the problem of limited mobile broadband throughput due to insufficient spectrum dedicated to LTE. Better LTE network capacity and coverage than competitors are important differentiators for an MNO and will drive revenue gains. MNOs could also retain their 2G networks by deploying dynamic spectrum allocation and thus remove the risk of 2G handset and IoT customer churning due to decommissioning.

For more information on minimising the cost and revenue impact of 2G and 3G decommissioning, see our recently published report *2G and 3G migration: challenges and investment cases for solutions*.[1]

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[1] See www.analysysmason.com/2G-3G-migration-RDNS0/.