Harmonization of the Digital Dividend

Perspectives from the Asia Pacific Region

May 2011

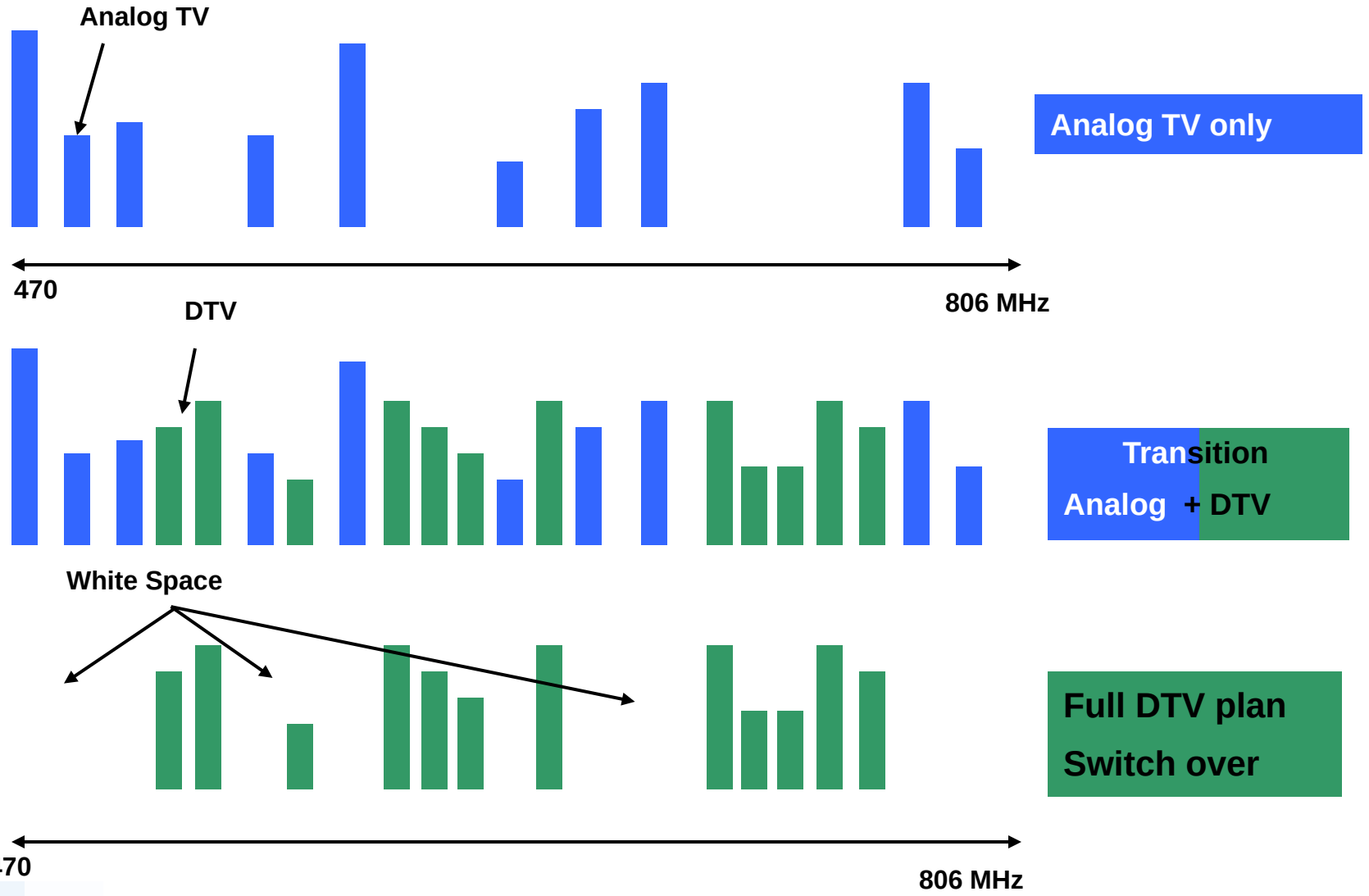
Overview

- Digital Dividend
- Value of the Digital Dividend for mobile broadband
- Mobile industry trends
- Importance of spectrum and harmonization
- Technologies best suited to meet the increased demand
- Frequency bands planned for new technologies such as LTE
- Asia Pacific Telecommunity developments on harmonized 698-806 MHz frequency arrangements

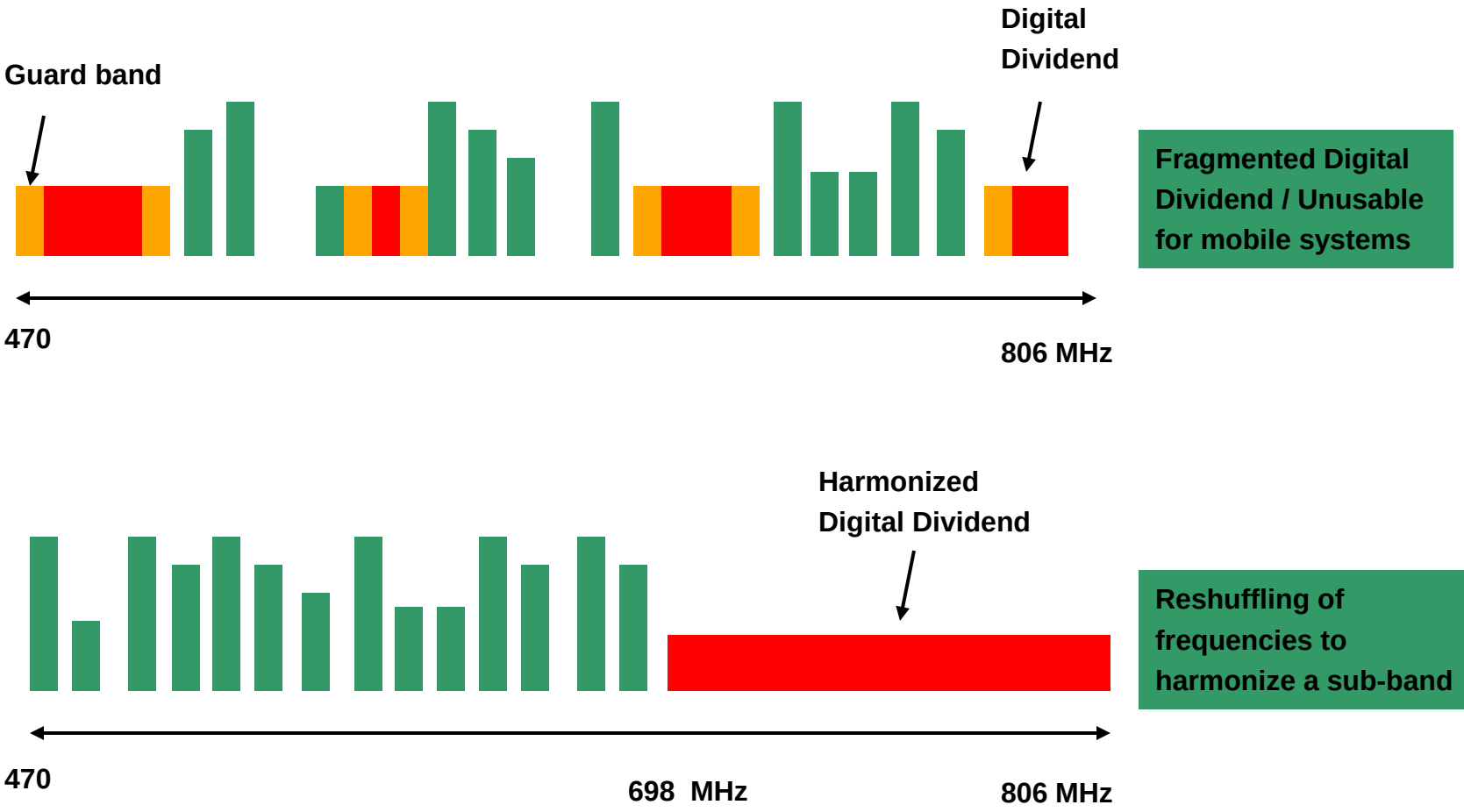
What is the Digital Dividend

- Spectrum that has been freed by the analog to digital transition of terrestrial broadcast television
  - Spectrum for terrestrial television is being re-organized to accommodate newer and more efficient digital television services
    - Improved picture and sound quality, ancillary data service
- Once in a generation opportunity to realize scarce and valuable UHF spectrum resources
  - Spectrum below 1 GHz is ideal for addressing coverage requirements of mobile/mobile broadband services

UHF Digital Dividend: Fragmentation Risk



Harmonization is a prerequisite for Mobile Services



Digital Dividend ideally suited to meet coverage requirements and serve rural areas

Effect of frequency on range and capex
Coverage of rural areas at about 30% of the cost of 2100 MHz

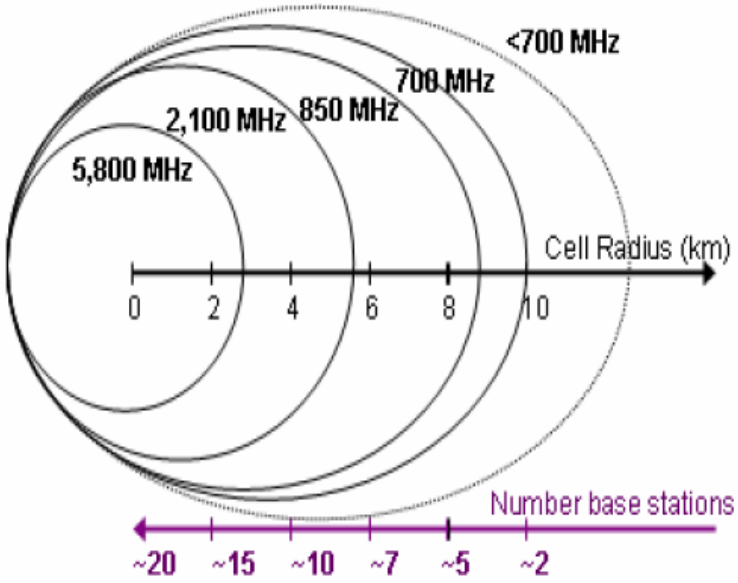
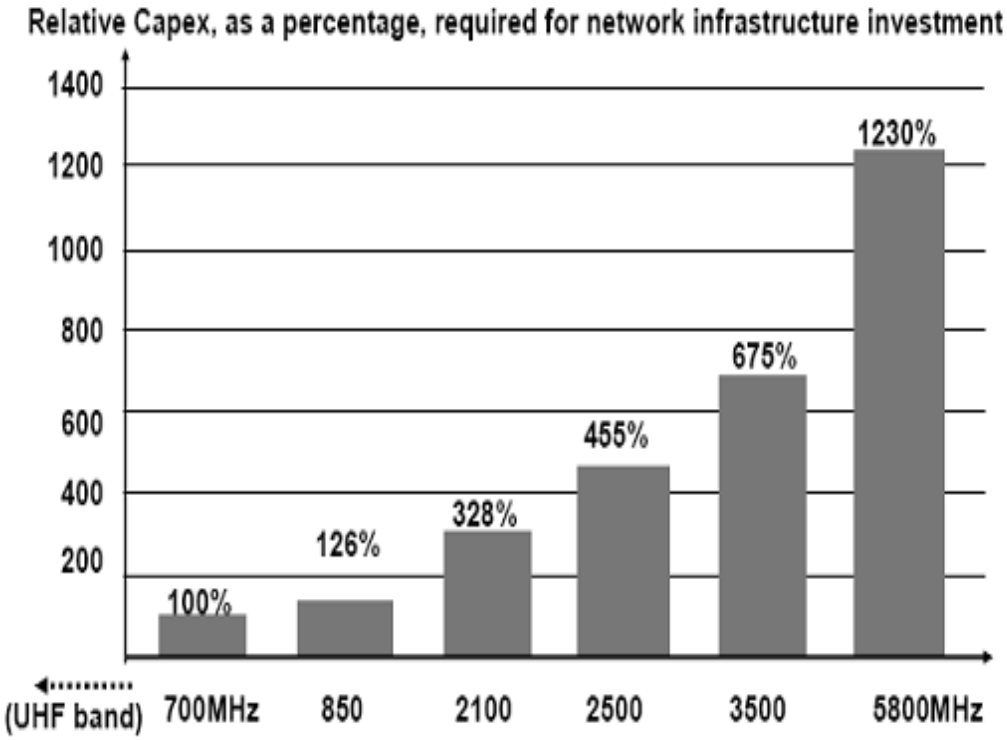


Figure 2.The propagation characteristics of spectrum

Source: BBC R&D.



The need for thousands of extra base station sites removed

Why Wireless Connectivity Matters

Wireless Reach™ from Qualcomm

Mobile Voice

+.81%

GDP per capita

+10%

Impact of an increase in penetration for developing countries

Internet / Broadband

+1.38%

GDP per capita

Source: *World Bank Information and Communications for Development 2009: Extending Reach and Increasing Impact.*

Economic and social benefits of mobile broadband….some examples

- GDP and investment
  - Bringing mobile broadband levels in emerging markets up to those of more mature markets could add $150b~$180b to GDP and 6.6m~8m direct and indirect jobs in Asia (*McKinsey & Company Inc., The Global Information Technology Report 2009 – 2010*)
  - Economic and social benefits of digital dividend spectrum for mobile have been qualified as between $7b~$10b in Australia (*Spectrum Value Partners, 'Getting the most out of the Digital Dividend,' 2008*)
  - Mobile industry will invest $800b globally during the next five years, $550 billion of which is earmarked for mobile broadband *(A.T. Kearney 2008*)
  - Direct and indirect economic effects of mobile in the European Union were 208 billion Euros and 165 billion Euros respectively in 2007 (*Spectrum Value Partners, 'Getting the most out of the Digital Dividend,' 2008*)
  - Allocating at least some UHF spectrum to mobile operators would generate between €63 billion and €145 billion in NPV *Spectrum Value Partners, 'Getting the most out of the Digital Dividend,' 2008)*
  - An estimated $729 billion would be added to the GDP of Asia Pacific nations by 2020 through allotting the 700 MHz band to mobile broadband. (*The Boston Consulting Group (BCG), Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific, October 2010*)

Economic and social benefits of mobile broadband….some examples

- Productivity
  - For every 1% increase in broadband penetration there could be a 0.1% productivity gain in the overall economy *(LECG Research)*
  - The replacement of face to face and paper transactions with electronic processes will save travel time and money in dealing with third parties such as banks and the government *(BCG, October 2010)*
  - The economic output per MHz of bandwidth is estimated at €168 million for mobile compared to €28 million for digital TV (*SCF Associations Study)*
- Job Creation
  - Asia Pacific region could expect to see 1.1 million new business activities, both additional units in existing operations and entirely new enterprises, between 2014 and 2020. They are projected to generate 2.3 million new jobs *(BCG, October 2010*)
- Government Revenue
  - Enhanced income primarily from corporation tax, VAT and income tax would come to $131 billion over the period from 2014 to 2020 *(BCG, October 2010*)

Boston Consulting Group Report Released Nov 2010

"*Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific*"
(http://gsmworld.com/documents/bcg_report_2010.pdf)

- Benefits to Indonesia:
  - Generate an extra $22.6b GDP relative to broadcasting
  - Create 167,000 new business activities
  - Create 327,000 additional jobs
  - Increase in tax revenue of $9.4b
- Benefits to Malaysia:
  - Extra $17.5b in GDP
  - 23,000 new business activities
- Benefits to India:
  - Extra $71b in GDP

The Biggest Platform in the History of Mankind

>5 BILLION WIRELESS SUBSCRIBERS WORLDWIDE

>1B

3G SUBSCRIPTIONS NOW

~2.7B

3G SUBSCRIPTIONS BY 2014

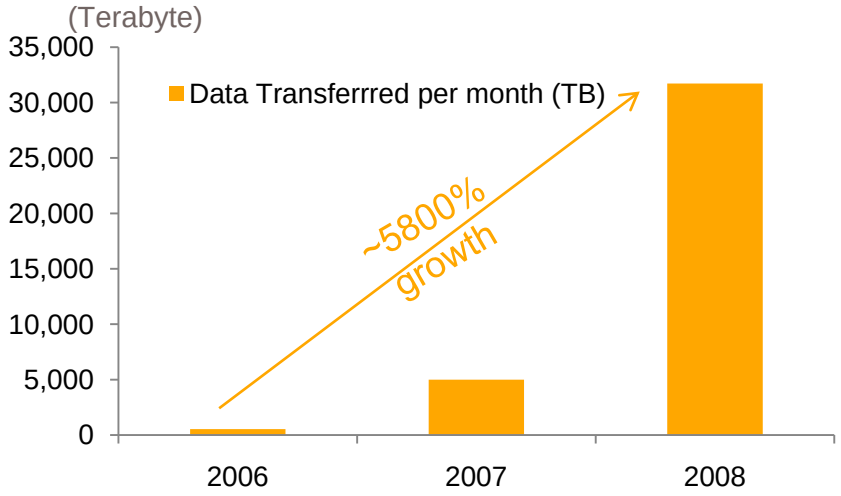
Source: Wireless Intelligence estimates as of Jan 2011

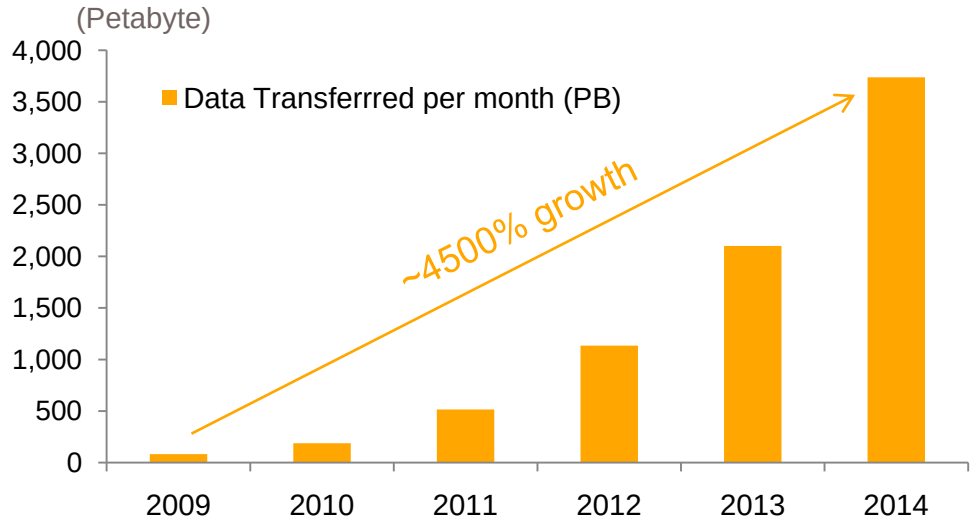
The Internet Goes Mobile

ALL DEVICES ARE BETTER WHEN THEY CONNECT TO THE NETWORK

Explosive Growth in Data Demand

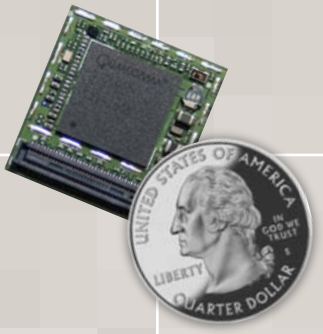
ABI Research, April 2009





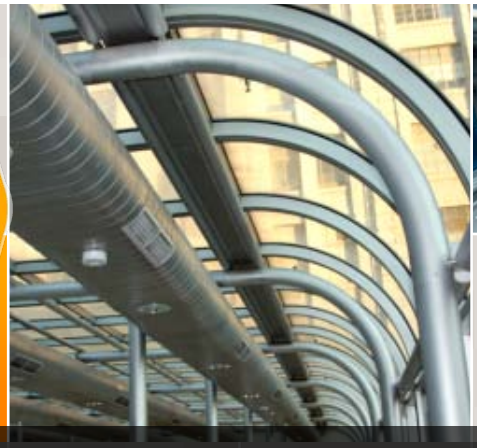
Trends Driving Data Growth

- 3G subscriber growth
- Smartphone penetration
- Broadband connectivity
- Flexible data plans
- Shift to cloud computing



6
Billion People

50
Billion Machines



The Internet of Everything

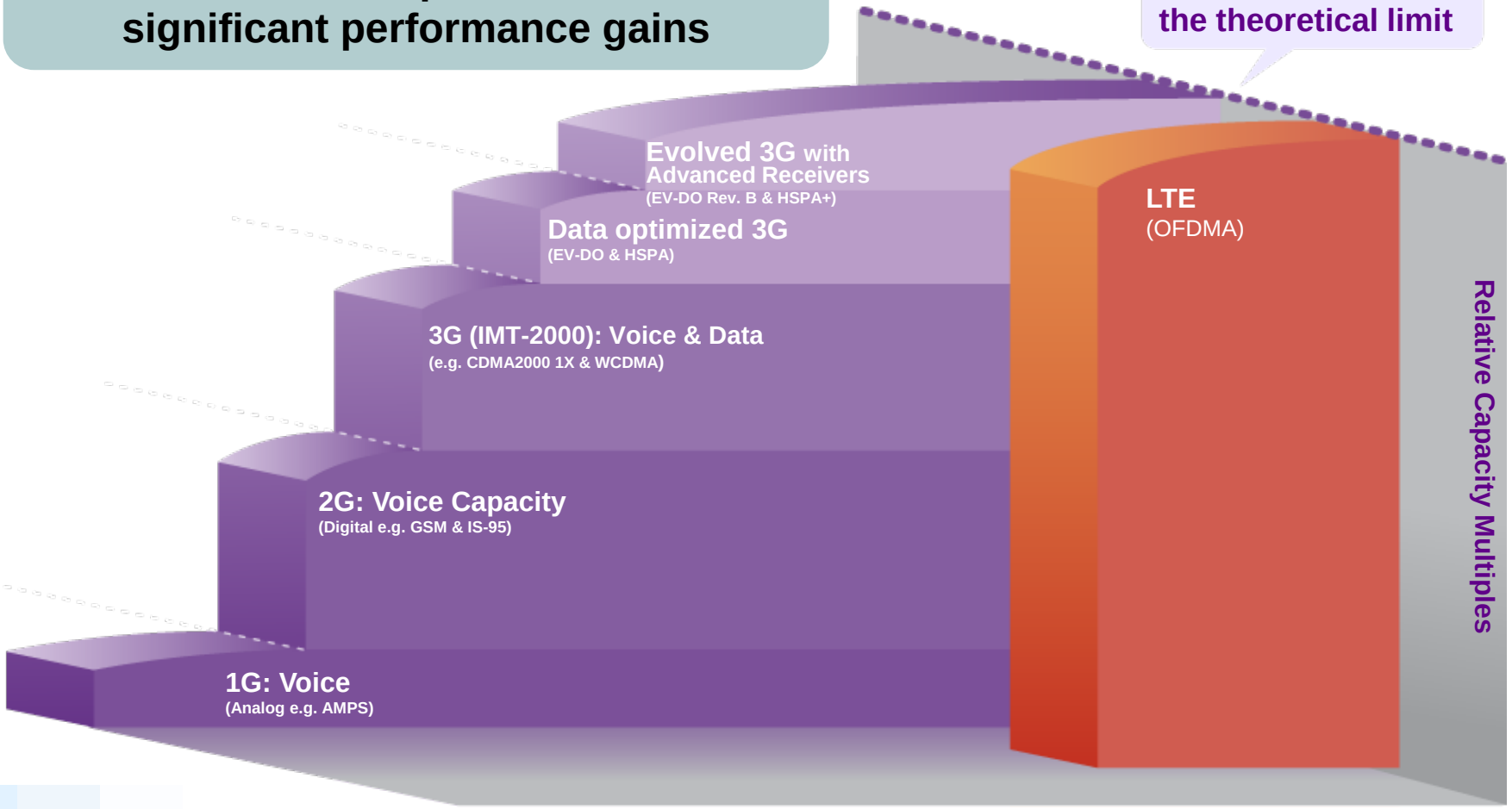
The Next Wave of Connectivity,
Where Everything is Intelligently Connected

Addressing Data Demand Growth

- Evolve 3G to increase capacity and performance
- Free up 2G spectrum for more efficient 3G
- Boost data capacity with LTE for new and wider spectrum
- Bring network closer to the user —add small cells like femtocells

While Data Consumption Is Growing, Radio Link Improvements Are Diminishing…

Leveraging topology and mitigating interference will provide the next significant performance gains

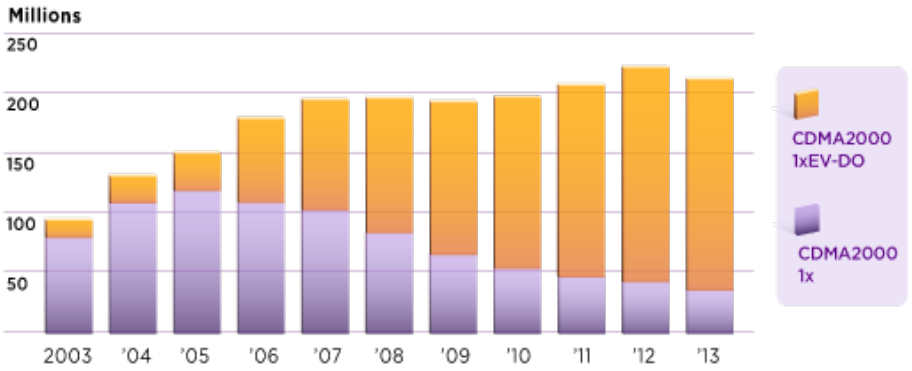


Why Frequency Harmonization Matters

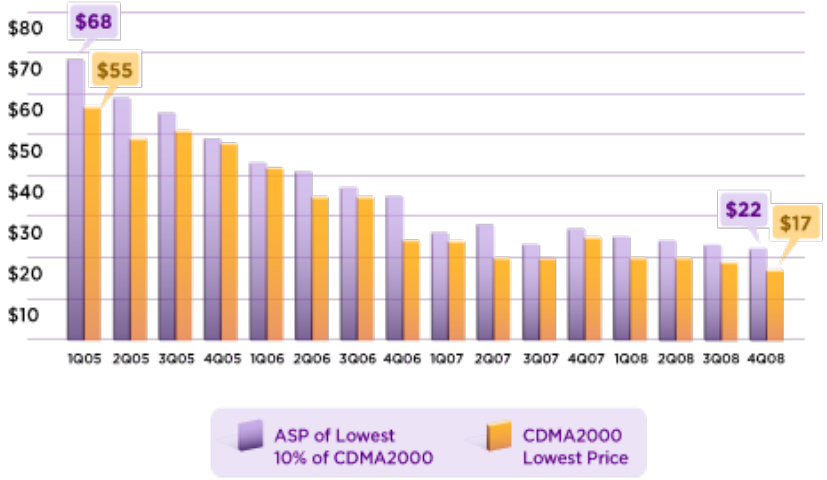
- Economies of scale drive down cost of mobile device
- Facilitates international roaming
- Number of bands that can be incorporated into a mobile device is limited
- Minimizes inter-system and cross-border interference

3G Device Cost Declining as Scale Increases

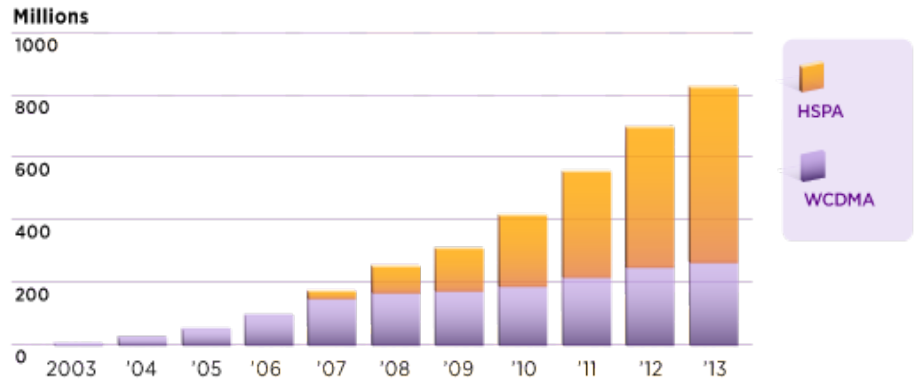
CDMA2000 Global Device Forecast



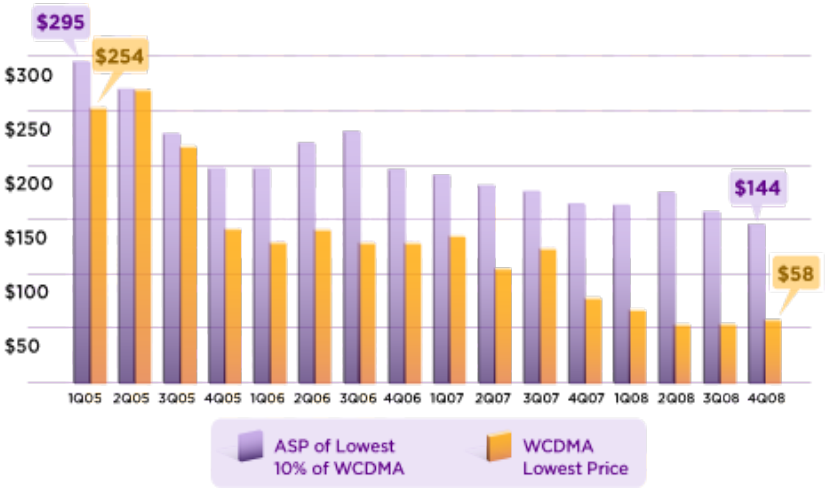
CDMA2000 Handsets Costs



WCDMA/HSPA Global Device Forecast



WCDMA Handsets Costs



Sources: ABI (Q109), WCIS (Mar09), Yankee (Apr09), Gartner (Mar09), IDC (Apr09).

Leading the Transition to Next-gen Networks

QUALCOMM IS THE INDUSTRY LEADER IN BOTH 3G AND 4G TECHNOLOGY

LTE + 3G

Boosts Data Capacity in
Dense Urban Areas

3G

Ensures Similar User Experience
Outside LTE Coverage

LTE Has Strong Commitments

LTE MULTIMODE LAUNCHED

18
LAUNCHES

196
NETWORK COMMITMENTS

LTE TDD GAINING MOMENTUM

>15
TRIALS

NOV 2010
QUALCOMM MOBILITY FIELD TRIAL

GROWING DEVICE ECOSYSTEM

~100
DEVICES

~35
VENDORS

Source: www.gsacom.com, Mar 2011

Frequency Bands Planned for LTE in Asia Pacific

- 698 – 806 MHz
- 2.3 – 2.4 GHz
- 2.5 – 2.69 GHz

Asia Pacific Telecommunity (APT) work on Digital Dividend

- **APT Wireless Group (AWG)** Terms Of Reference:
  - *Share and discuss information of emerging radio technologies, stimulate research and development, and promote related telecommunication business within the Asia-Pacific region*
  - *Pursue effective solutions in the Asia-Pacific region to meet the rapid movements towards digital convergence*
  - *Provide regular channels to discuss and study spectrum sharing methodologies, spectrum harmonization and to provide advice that countries' can use in frequency band planning*
  - *Develop technical and radio regulatory solutions based on emerging and conventional wireless technologies including satellite technologies to meet APT member's needs*
- **March 2008** – AWG initiated Digital Dividend work item
  - Convened Correspondence Group to progress studies
- **September 2010** – AWG agreed on two frequency channel arrangements for 698-806 MHz:
  - FDD
    - 2 x 45 MHz from 703 -748 / 758 – 803 MHz
    - Conventional duplex
    - Guardband from 698 - 703 MHz and from 803 - 806 MHz
  - TDD
    - Taking into account the external 4 MHz guard band (694-698 MHz), a minimum internal guard-band of 5 MHz at the lower edge (698 MHz) and 3 MHz at the upper edge (806 MHz) needs to be considered

APT Report 14: *Harmonised Frequency Arrangements for the Band 698-806 MHz*

- Two frequency channel arrangements have been included in APT Report 14 (http://www.apt.int/AWF-RECREP)

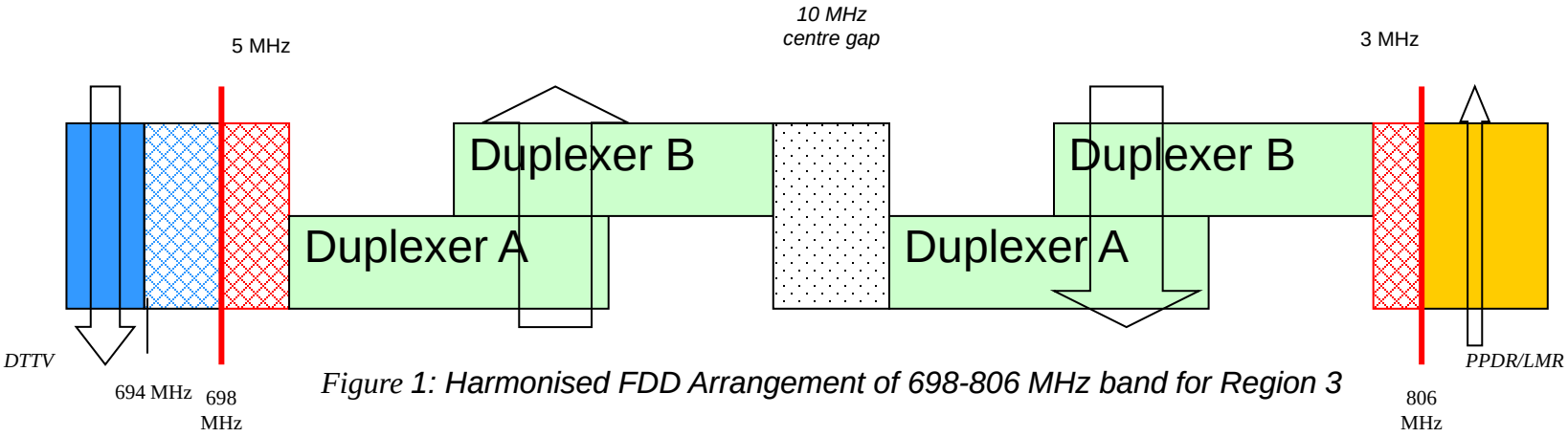


Figure 1: Harmonised FDD Arrangement of 698-806 MHz band for Region 3

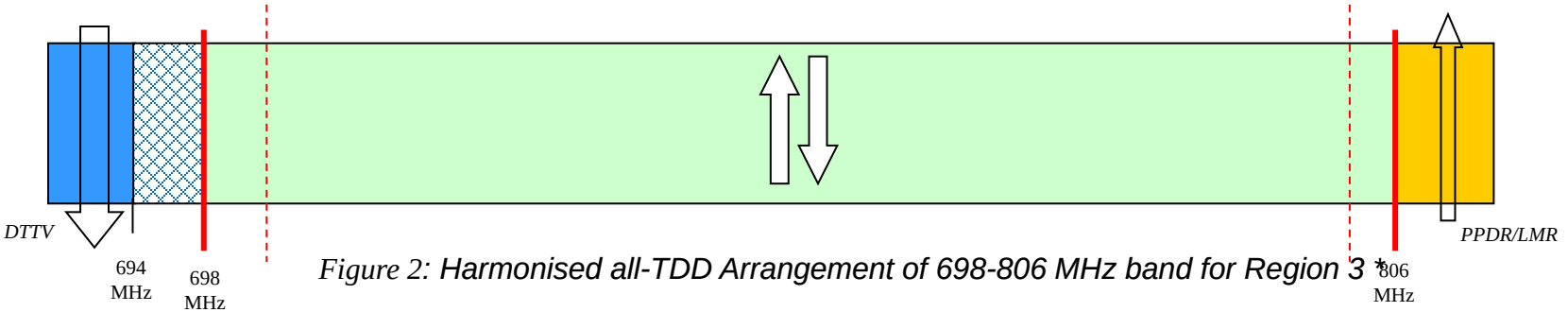


*Figure 2: Harmonised all-TDD Arrangement of 698-806 MHz band for Region 3 **

*Taking into account the external 4 MHz guard band (694-698 MHz), a minimum internal guard-band of 5 MHz at the lower edge (698 MHz) and 3 MHz at the upper edge (806 MHz) needs to be considered.

Ongoing AWG and 3GPP activities

- **March 2011** – AWG initiated work on a draft New APT Report on "Implementation Issues Associated with Use of the Band 698 – 806 MHz by Mobile Services"
  - Objective is to ensure that useful information is available for APT members planning to implement frequency arrangements contained in APT Report 14
  - Correspondence Group reconvened
- **September 2011** – Target for completion of New APT Report on implementation issues
- **May 2011** – New 3GPP Work Item to standardize the APT band plans will be proposed at 3GPP RAN Plenary on May 31
  - Referred to as "APAC 700"
  - Define new band plan in 36-series standards documents and RF specifications
- **March 2012** – Target for completion of 3GPP standardization
- Some APT Administrations are planning to allocate and/or auction spectrum for mobile service usage in the band 698 – 806 MHz in the year 2012, e.g., Australia, India, New Zealand, others?

Qualcomm Recommendations

- Assess the requirements for digital TV and the most spectrum-efficient means of distributing
- Assign digital TV channels in the lower part of the band, approx 470-698 MHz
- Accelerate transition to digital
- Harmonize frequency usage with other Asia Pacific countries so that economies of scale are realized and consumers have access to affordable user equipment
- Adopt national decisions to allocate and assign spectrum in accordance with the APT band plan
- Provide a roadmap with clear timelines for spectrum availability and assignment

Thank You!