



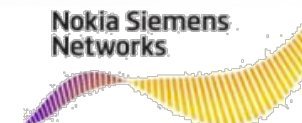
TD-LTE Going Mass Market

Tiago Machado
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February 2012

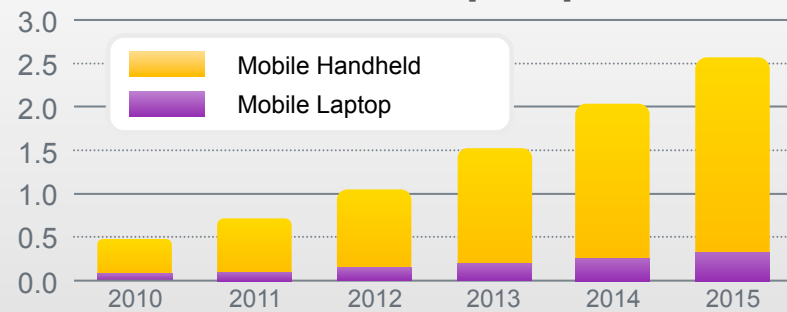
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TD-LTE Product Marketing. / Stephane Daeuble / August 2011



Supporting a future with a Gigabyte for each user, everyday

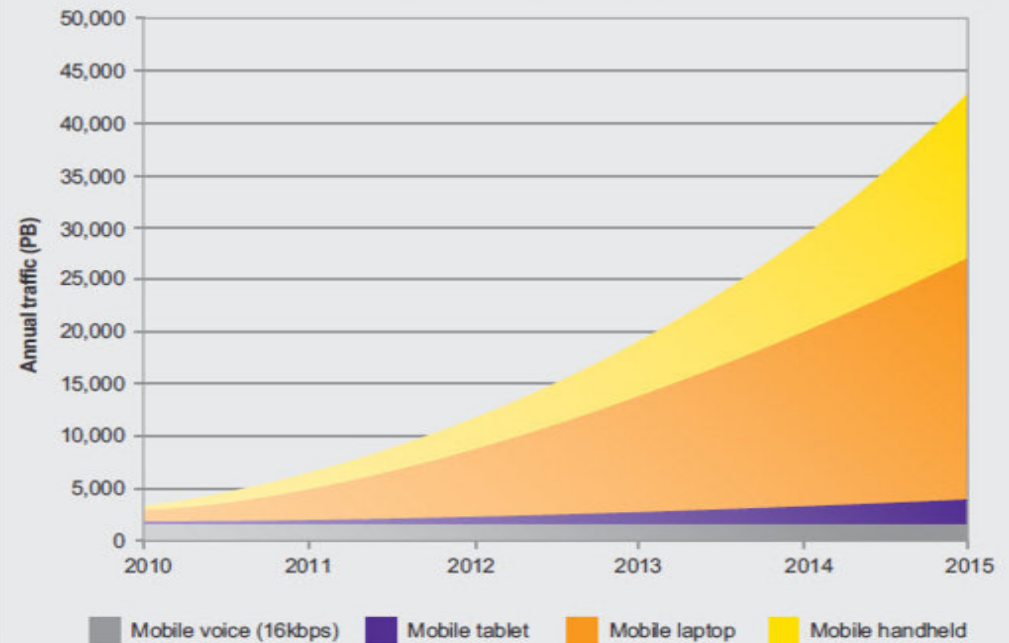
Mobile Broadband **Subscriber** [Billion]



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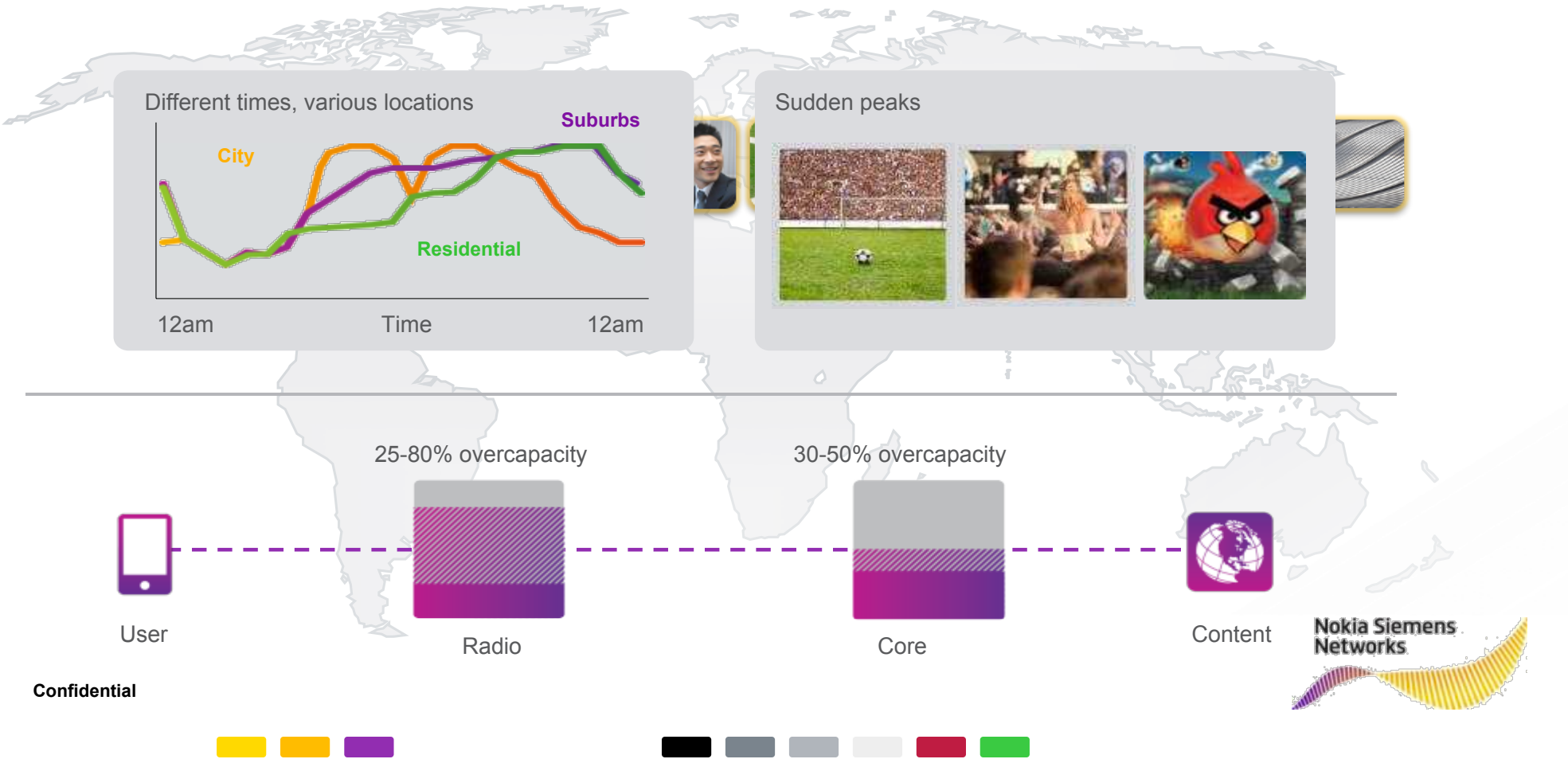
Global Mobile Traffic Forecast



Networks

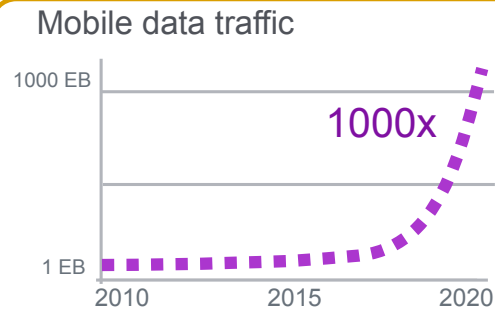


Demand is unpredictable



What will the world want from wireless by 2020?

Support up to 1000 times more traffic

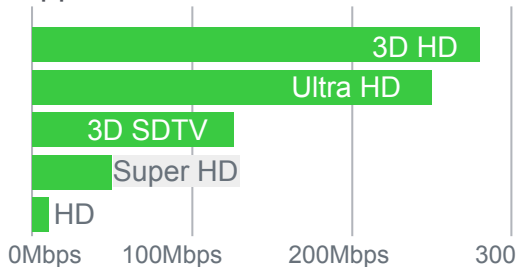


Rock solid, ubiquitous connectivity

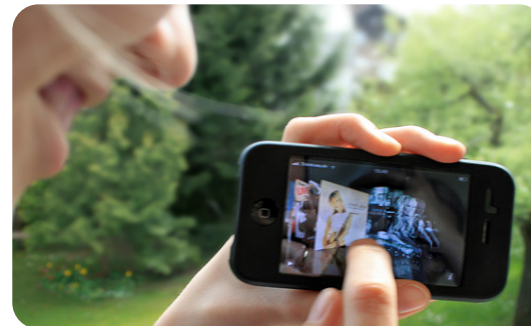


©2011 Intuitive Surgical, Inc.

Apps bandwidth demand



Gbps peak speeds



Millisecond latency for true "local feel"

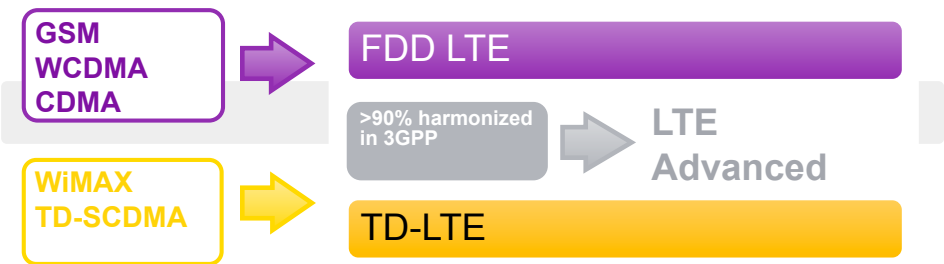
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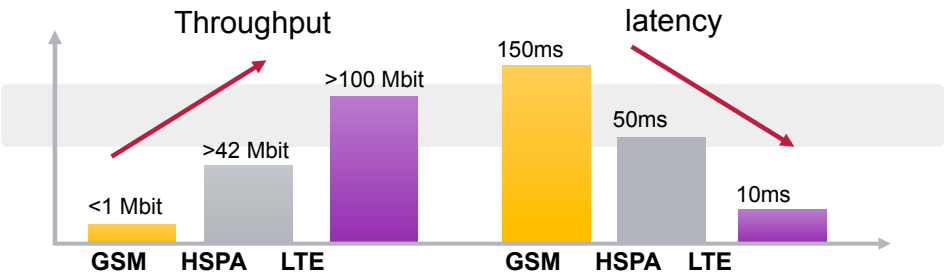


LTE market drivers

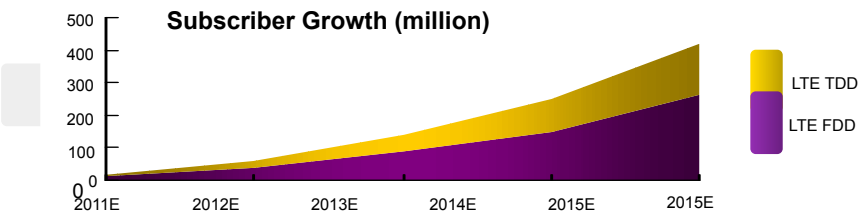
Technology convergence for the first time



True mobile broadband user experience

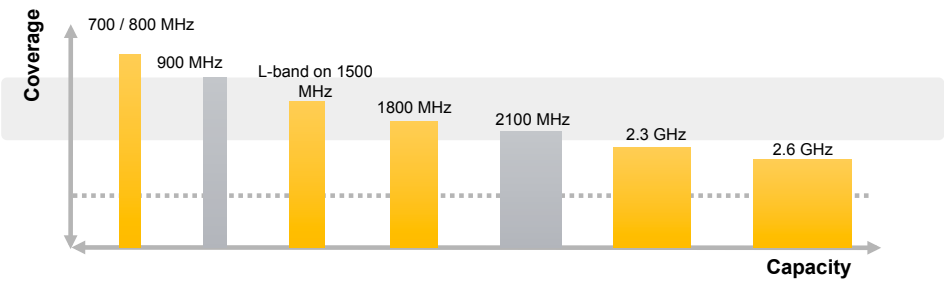


Chance for new market entrants



Source: Pyramid Research & Heavy Reading, Jan. 2011

Ecosystem support: Multiradio / Multiband



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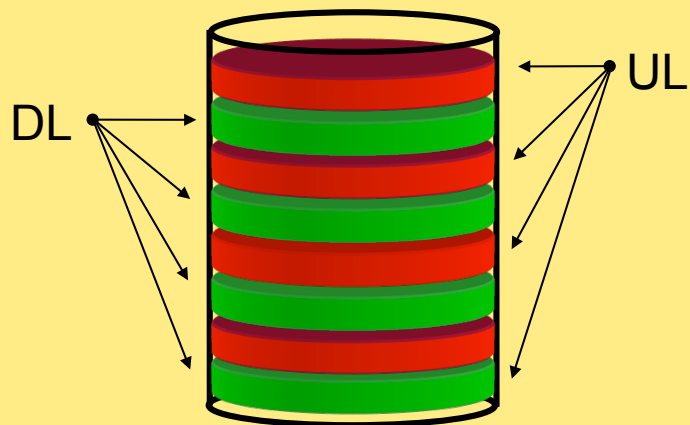
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FDD vs. TDD basics

TDD

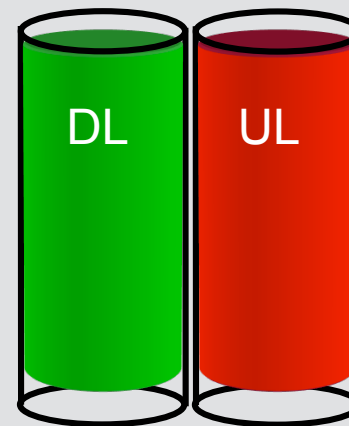
Single Shared Pipe for Upload & Download



Devices Upload / Download during a fraction of the time using a larger pipe

FDD

Dedicated Pipes for Upload & Download



Devices Upload / Download on dedicated but smaller pipes



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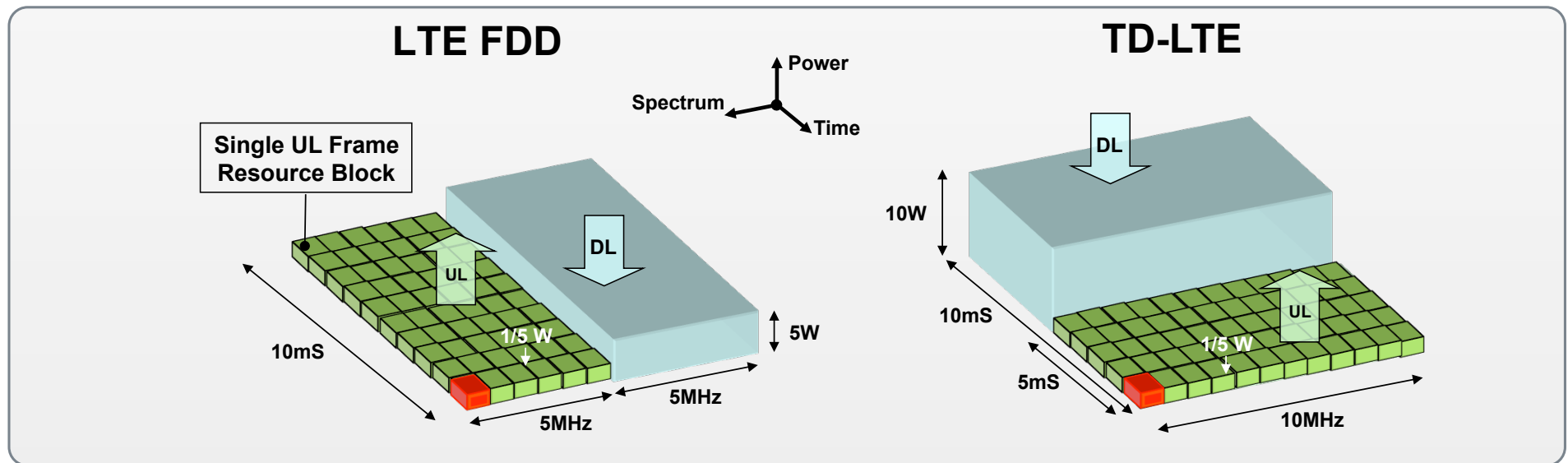
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TD-LTE Coverage

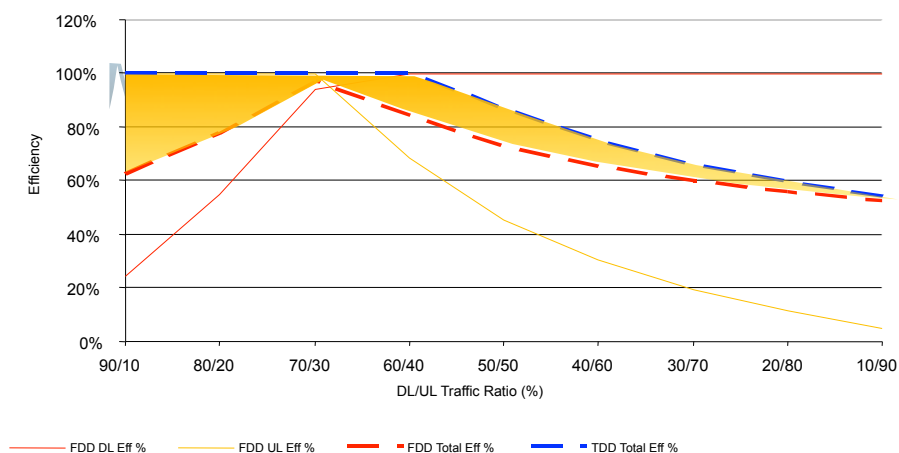
Similar Coverage for TD-LTE & LTE-FDD

**Same RF Structure, Same Resource Block => Same RF Power/Time/Bandwidth Density
Same Power Transmitted during the Same amount of time as FDD-LTE**

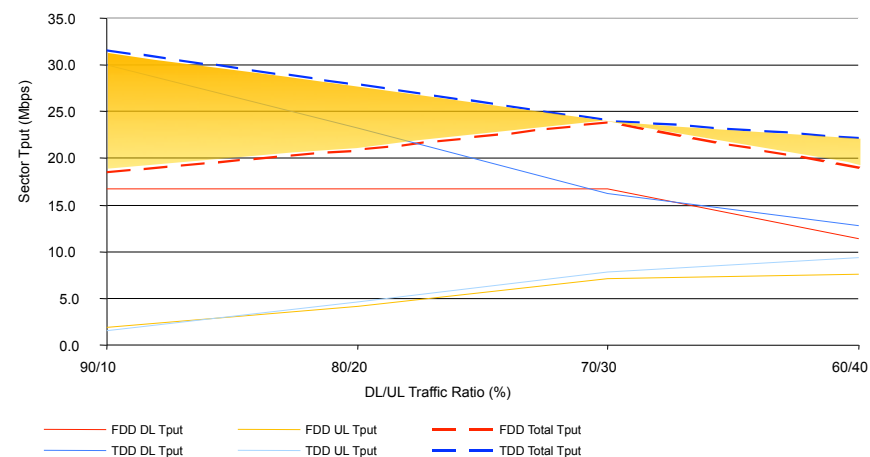


FDD vs TD-LTE spectrum utilization (varying UL/DL traffic models)

FDD/TDD Spectrum Utilization Comparison



TDD vs. FDD Throughput
(at 10+10MHz / 20MHz)



In a data driven world, all spectrum would probably be defined as TDD

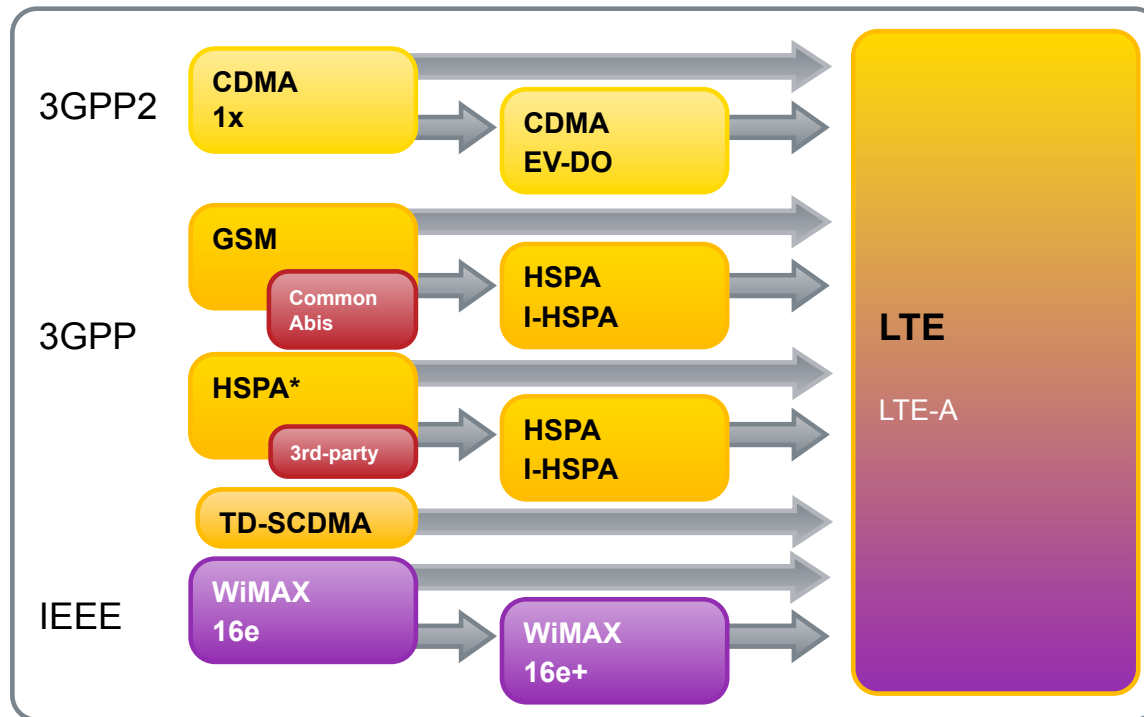


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Unique ability to evolve all technologies LTE



- Multi-standard network evolution to a common technology on common platform
- Clear evolution path for each technology
- Smooth evolution to All-IP and flat architecture

*and I-HSPA with existing Nokia Siemens Networks portfolio



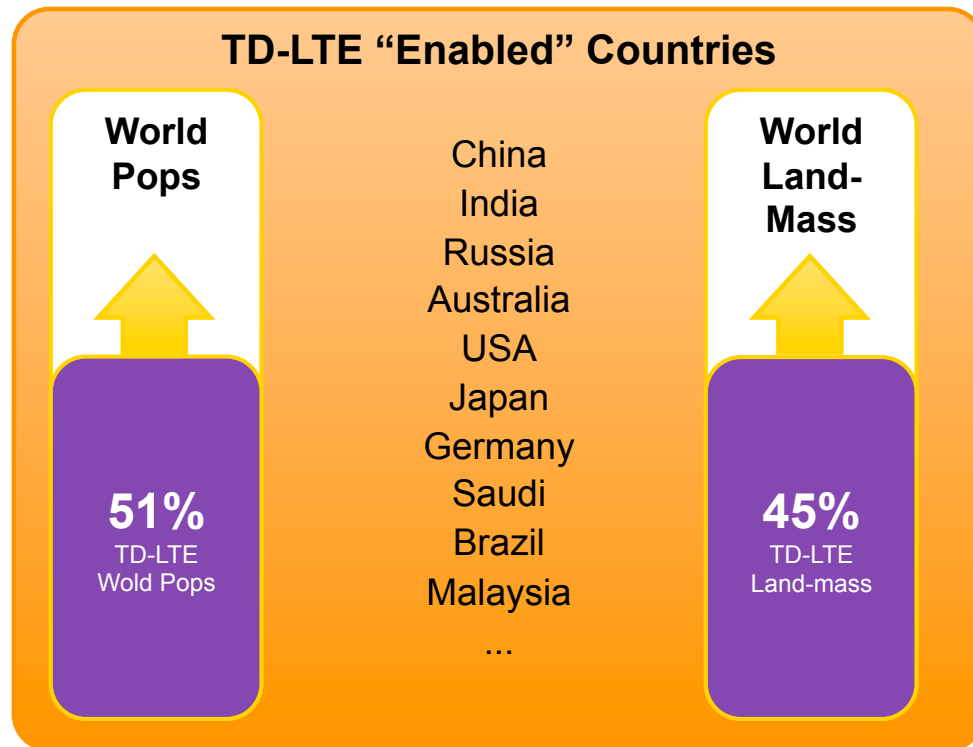
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TD-LTE Global Adoption

A very relevant tool for every operator



Main 4G networks for some operators



Complimentary for most traditional operators



Opening up new markets for the others



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TDD spectrum global reach

Key Global TD-LTE spectrum

BC40

2.3 GHz
100MHz

BC38-41

2.6 GHz
20-190MHz

BC42-43

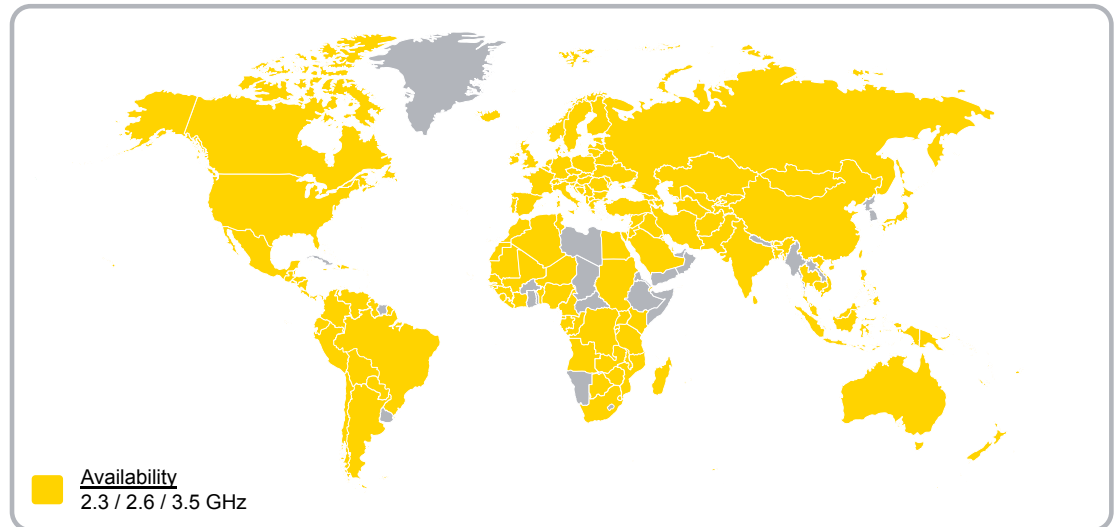
3.4-3.8 GHz
400MHz

700MHz of TD spectrum bandwidth

Largely unused spectrum + Lowest spectrum price

Incoming new TD-spectrum auction in many countries (Europe, LAC, ...)

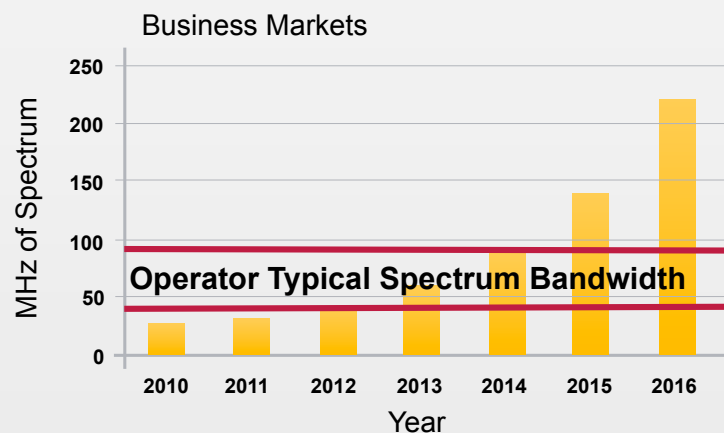
Bands with large continuous spectrum for **true broadband and scope for LTE-A 100MHz TD carriers**



700MHz TD-LTE Spectrum – Key for operator spectral needs

Current FDD Spectrum pool not big enough for mass market mobile broadband...

Operator Spectrum Requirement



TDD spectrum can provide 100 to 150MHz of additional bandwidth per operator in almost all countries

2.3GHz	100MHz	BC 40
2.6GHz	50-150MHz	BC 38-41
3.5GHz	400MHz	BC 42-43

Over 50% of world operators are planning to deploy TD-LTE*

Informa, May 2011 – 500+ Telecom players survey



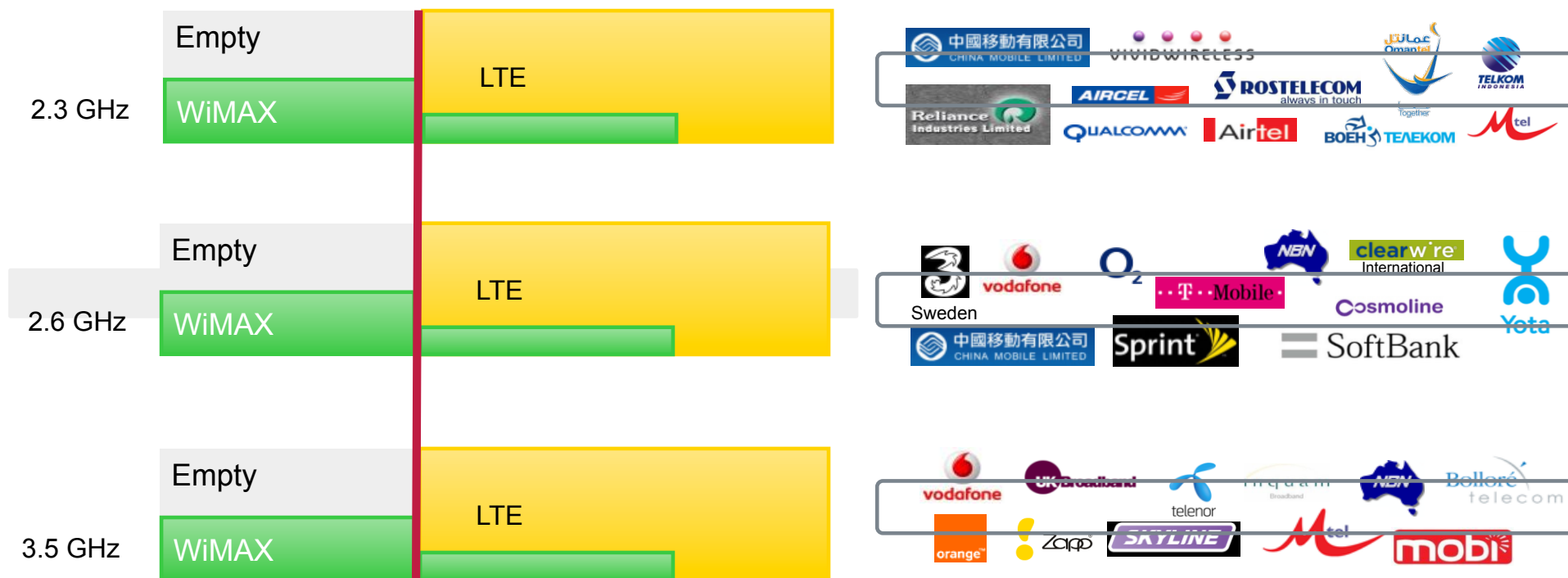
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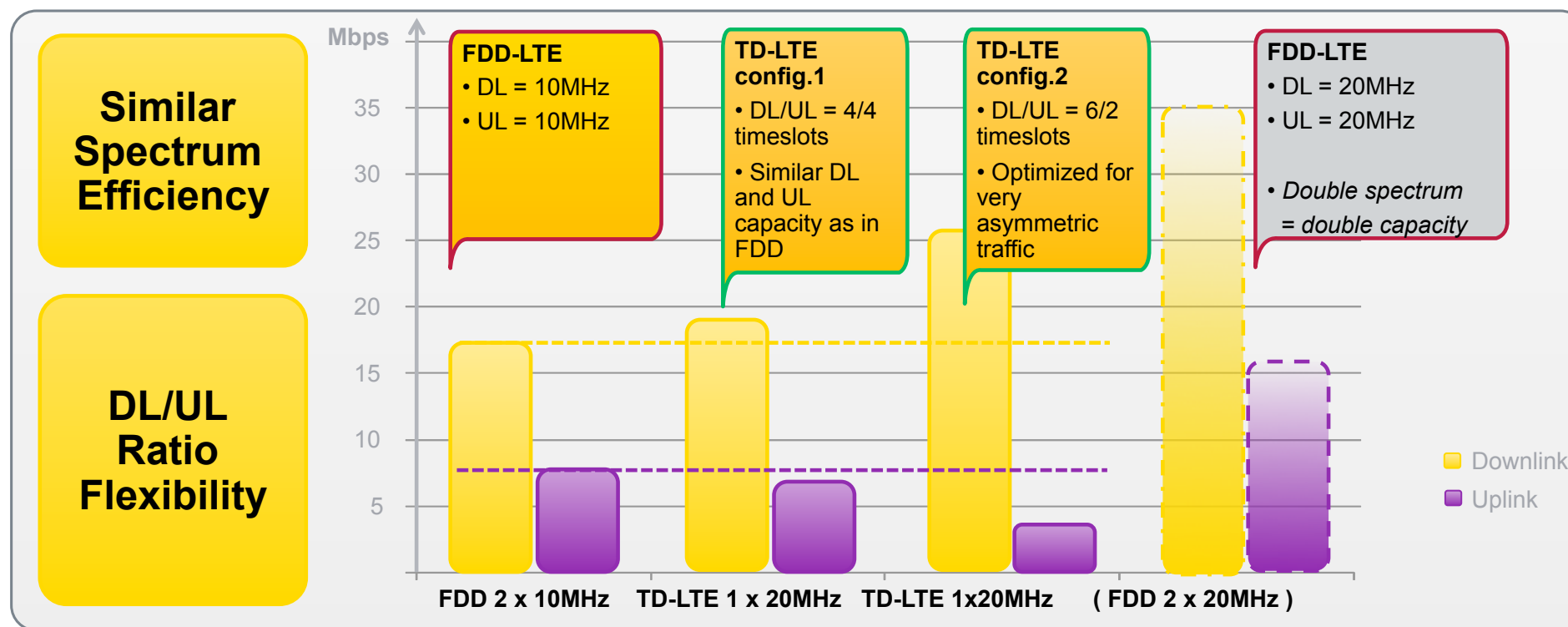


TD-LTE spectrum operators view



TD-LTE Capacity

Similar spectral efficiency for TD-LTE and LTE-FDD



TD-LTE – a very relevant tool for every operator

True 4G performance

Comparable Performance FDD-LTE

Global & Local Roaming

TD-LTE / FDD-LTE / 3GPP / 3GPP2

Affordable Spectrum

Sold for 10x less than FDD equivalent

Economy of Scale

- LTE Momentum Driving Common Network Hardware
- Large Operators TD-LTE Opportunities Driving the Device Economy of Scale

Traditional CSP – Augment FDD-LTE

- Increased Capacity (Overlay/Underlay)
- or specific Apps (M2M, Video Broadcast)

Greenfield - TD-LTE main LTE network

Global roaming + potential MVNO capability with other 3GPP/3GPP2 operators for underlay in early deployment stage with transparent

WiMAX CSP – Migration path to join LTE

Leverage current spectrum asset

Scope for evolution to TD-LTE when time is right



TD-LTE Complimentary Use to Augment Current Networks

Doubling Capacity

Additional Macro Layer
Blanket Coverage
Or Specific Areas (Road/Train/etc...)

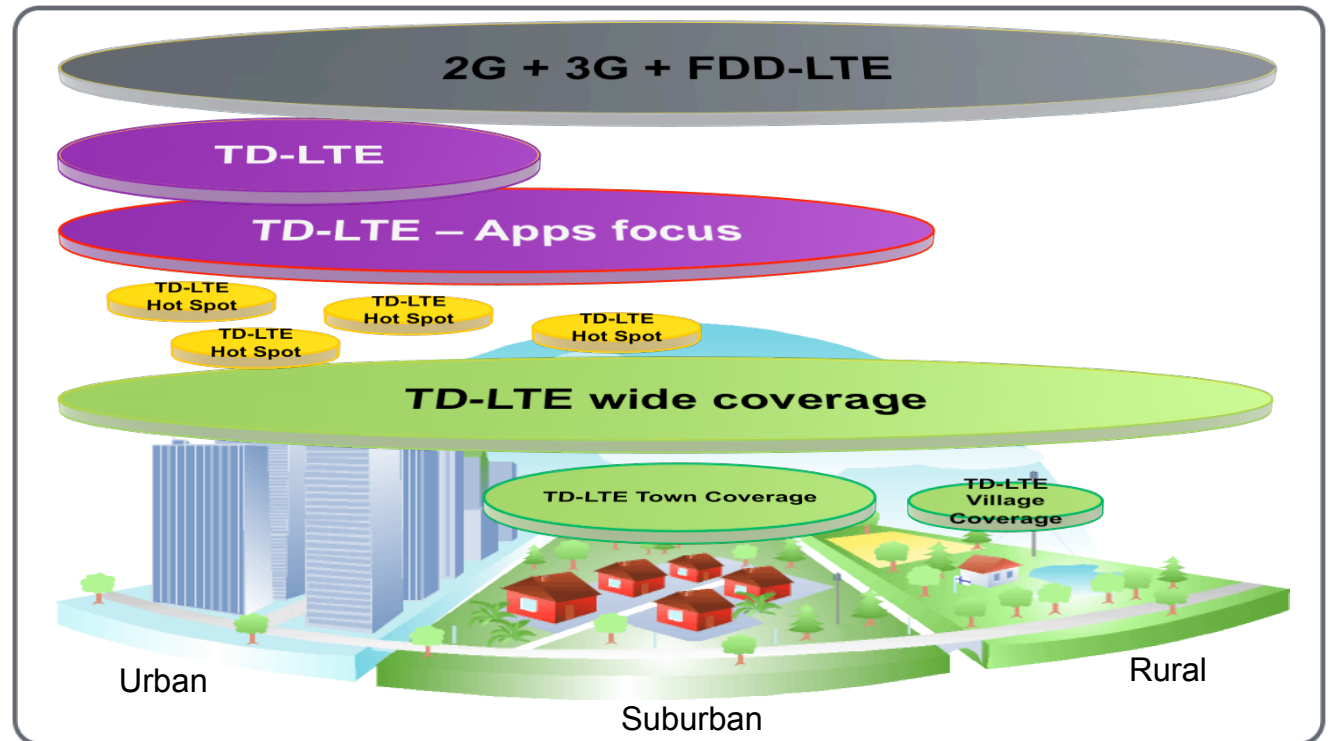
Application Targeted

Additional Macro Layer
M2M (Uplink bias)
MBMS (Downlink bias)

Indoor/Outdoor Hot Spot Spectrum

For Small Cell Underlay

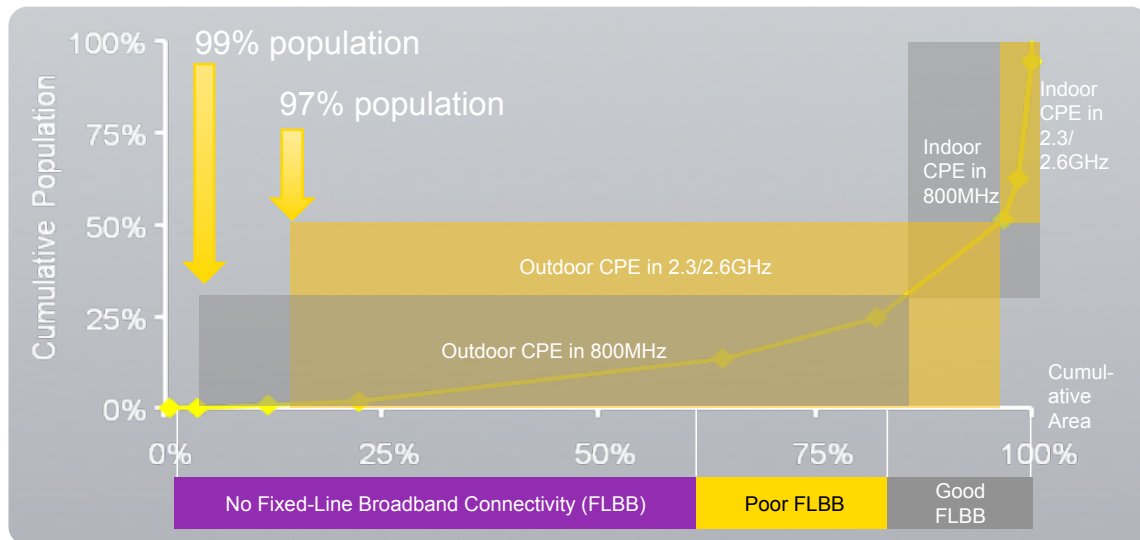
Fixed Line Replacement Rural Leverage



TD-LTE applications: Addressing the digital divide

>2GHz spectrum bands also provide an opportunity for rural coverage

Fixed Line Broadband & LTE



Outside-In Strategy

- Phase 1: Target areas with poor DSL connections.
- Phase 2: Expand to areas with no fixed-line connection (untapped market).
- Phase 3: Leverage CPE to re-capture 'lost' fixed-line connections (increase ARPU with CPE option).
- Use of CPE (indoor or outdoor) will significantly improve the business case for rural coverage.

Rectangles show segments where profitable coverage can be achieved.

With CPE LTE Coverage & Capacity mix in >2GHz bands allows economically viable services deep into Rural areas



TD-LTE – WiMAX operators opportunity

Growing Momentum

WiMAX CSP Choices

- **WiMAX 2** (IEEE 802.16M)
- **FDD/TD-LTE**

Commitments

- **YOTA** (Russia)

Trials

- **Clearwire** (US)
- **P1** (Malaysia)
- **Vividwireless** (Australia)
- **Imagine** (Ireland)

Transition Benefits

- Wider addressable market
- Global Roaming
- Economies of Scale

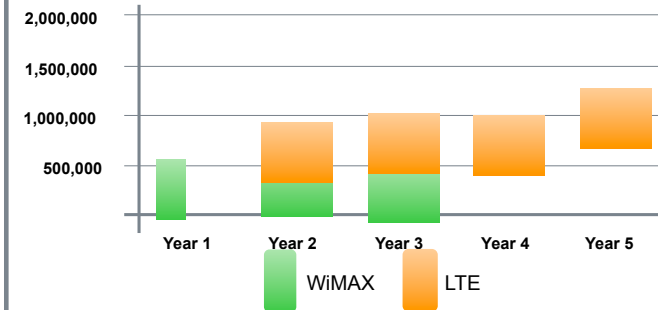
Deployment Strategies

- Dual Network and Device strategy
- Network evolution upgrade
- Green deployment

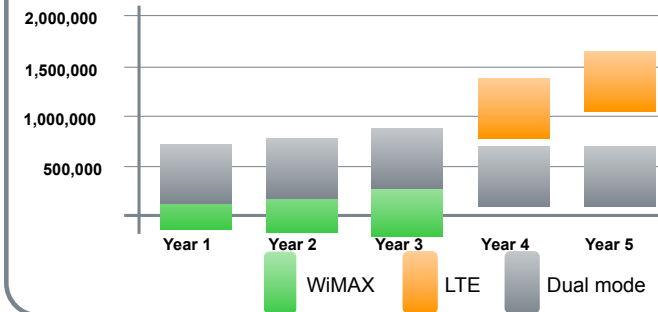
Dual Networks Transition Benefits

- Reduced Subscriber Churn
- Assets Maximization
- Less Network risk
- Less Network costs

Single-mode case devices



Dual-mode case devices



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“3GPP” LTE release is common for FDD and TD-LTE

Rel-8

Introduction of LTE
SAE “All-IP”



ASN.1 freeze
03/2009

Rel-9

Regulatory Voice
IMS
Positioning
PWS



Func. Freeze 12/09
ASN.1 freeze 03/10

Rel-10

LTE-Advanced



~ 12 months post
Rel-9 completion

Standardization for both FDD and TDD has been finished in 3GPP R8 and it's the common release for FDD and TDD.

for



- No separate TD-LTE release and document
- The difference of LTE FDD and TD-LTE only located in physical layer (36.21x). The other 95% parts are the same.
- TD-LTE is one option of LTE, not an isolated system
- FDD/TDD co-work is recommended.



TD-LTE ecosystem status

First commercial TD LTE devices launched in Q3/2011
(USB Dongles)



Commercial devices band combination will depend on individual market requirements

TD-LTE devices will become multimode
(TDD /FDD ...) end of 2011

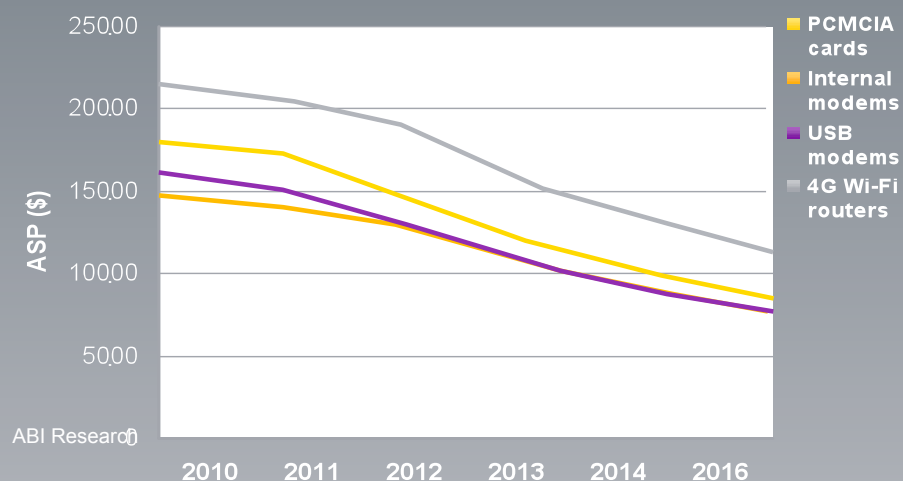
Commercial handsets with
LTE voice capability by 2012



“TD-LTE iPhone committed for 2012”
CMCC, 21st May 2011



LTE device average selling price



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TD-LTE ecosystem: dongles in Q3 2011, phones mid 2012

TD-LTE Chipset Roadmap (combined view)	10Q3	10Q4	11Q1	11Q2	11Q3	11Q4	12Q1	12Q2	12Q3	12Q4
Dongle / Data card		Single mode pre-commercial			Single-mode commercial			Multi- mode commercial		
CPE		Single mode pre-commercial			Single-mode commercial			Multi- mode commercial		
MiFi (mobile hotspot)				Single mode pre-commercial		Multi- mode pre- commercial		Multi- mode commercial		
Terminal (Tablet PC)				Single mode pre-commercial		Multi- mode pre- commercial		Multi- mode commercial		
Mobile phone						Pre-commercial		Single-mode Commercial	Dual-mode Commercial	

TD-LTE IOT partners



TD-LTE Device offering



Mr. ShaYueJia, VP of CMCC: '...
Terminals are always the challenging
area for new technology deployment. We
are very pleased to see the contribution
by Nokia Siemens Networks in this area
to ensure the development of TD LTE.'



LTE Industry Commitment

> 400 million LTE subscribers by 2015

40% of which will be on TD-LTE

81+ LTE networks expected to be in commercial operation by end 2012

154 LTE network operator commitments in 60 countries

Nokia Siemens Networks

Leading the LTE market with 50 commercial LTE customers including 16 commercially launched networks



Thank you

