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LTE Network Sharing

Some Operational & Management Aspects

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Executive Summary

- 3GPP release 8 and beyond provides LTE carriers with a rich set of mandatory and optional features to support network sharing.
- Recent changes in the cellular industry have made LTE network sharing a compelling value proposition.
- However, the 3GPP standard doesn't specify how the network management domains will be shared.
- Partners in a shared network need to complement the standard with operational agreements to guarantee the same level of operational efficiency on the shared network than on their dedicated network.

Agenda

- LTE Network Sharing – Overview
- Managing a Shared LTE Network
- Conclusion

The Triggers

- Lower margins

  … at a time when competition and the need to invest rapidly on 4G technologies have reduced carriers' margins
- A change of attitude in the industry

  … with incumbents partnering against new entrants

  … with carriers extending their co-location and roaming agreements

  … with regulators favoring fast broadband roll-out over collusion risks

  … wholesalers leasing spectrum and reselling capacity
- All-IP Networks

  …easing network interconnection
- The LTE Standard

  … integrating advanced network sharing capabilities with higher maximum throughput by sharing spectrum (up to 6 operators)
- A mature outsourcing industry

  … facilitating the creation of Joint Ventures

"It is expected that 30% of all LTE networks in the next five years will involve some form of active network sharing" Source: Ovum Report, "Mobile Network Sharing – a post recession reality" Sept. 14, 2010 by Emeka Obiodu

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Types of Network Sharing

National Roaming

- Standard Roaming Agreement
- National version of the International Roaming
- Most beneficial in low-traffic & non-overlapping coverage areas

Passive Sharing

- Site Sharing: site, tower, antenna, power, transmission…
- Common in 2G & 3G
- Major Capex Savings

Active Sharing

- RAN & spectrum
- Require operational agreements
- Major Capex & Opex savings

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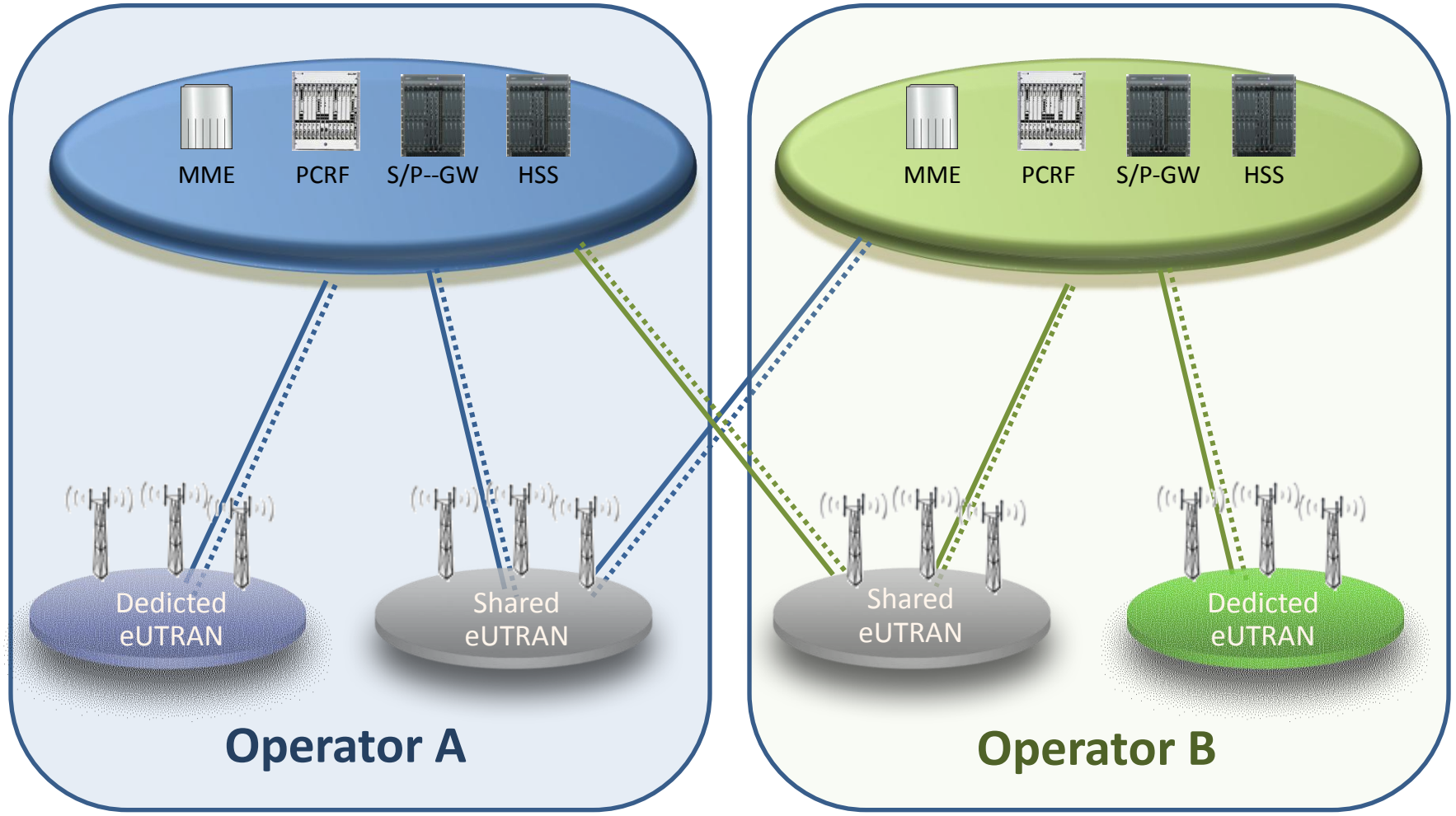
Business Models for Sharing

- Wholesalers
  - Lease the spectrum
  - Resell capacity
  - Tend to focus on rural areas
- Joint Venture
  - Co-owned by the sharing partners
  - Manages the shared network
  - Broadcast multiple PLMN-IDs
- Geographical split
  - Each sharing partner manages autonomously its portion of the shared eUTRAN
  - Each partner can additionally own a dedicated eUTRAN (e.g. dedicated in urban, shared in rural)

Active Sharing – Geographical Split



Each sharing partner can operate a dedicated LTE network in addition to the shared LTE network

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The Benefits

- Capex & Opex savings
  … particularly at the LTE network launch with low-traffic
- Faster time-to-market
  … with roll-out efforts shared between sharing partners
- Retain Control on Competitive Differentiators
  …on QoS, devices, services, charging & billing, customer management….
- Higher Customer Data Throughput
  … by sharing spectrum
- No dependencies on devices
  … with network sharing a mandatory feature in LTE devices
- Transparent to end-users
  … with no impact on competitive service offerings
- Evolvable to a fully dedicated network
  … enabling carriers to selectively evolve the shared component into a fully dedicated network

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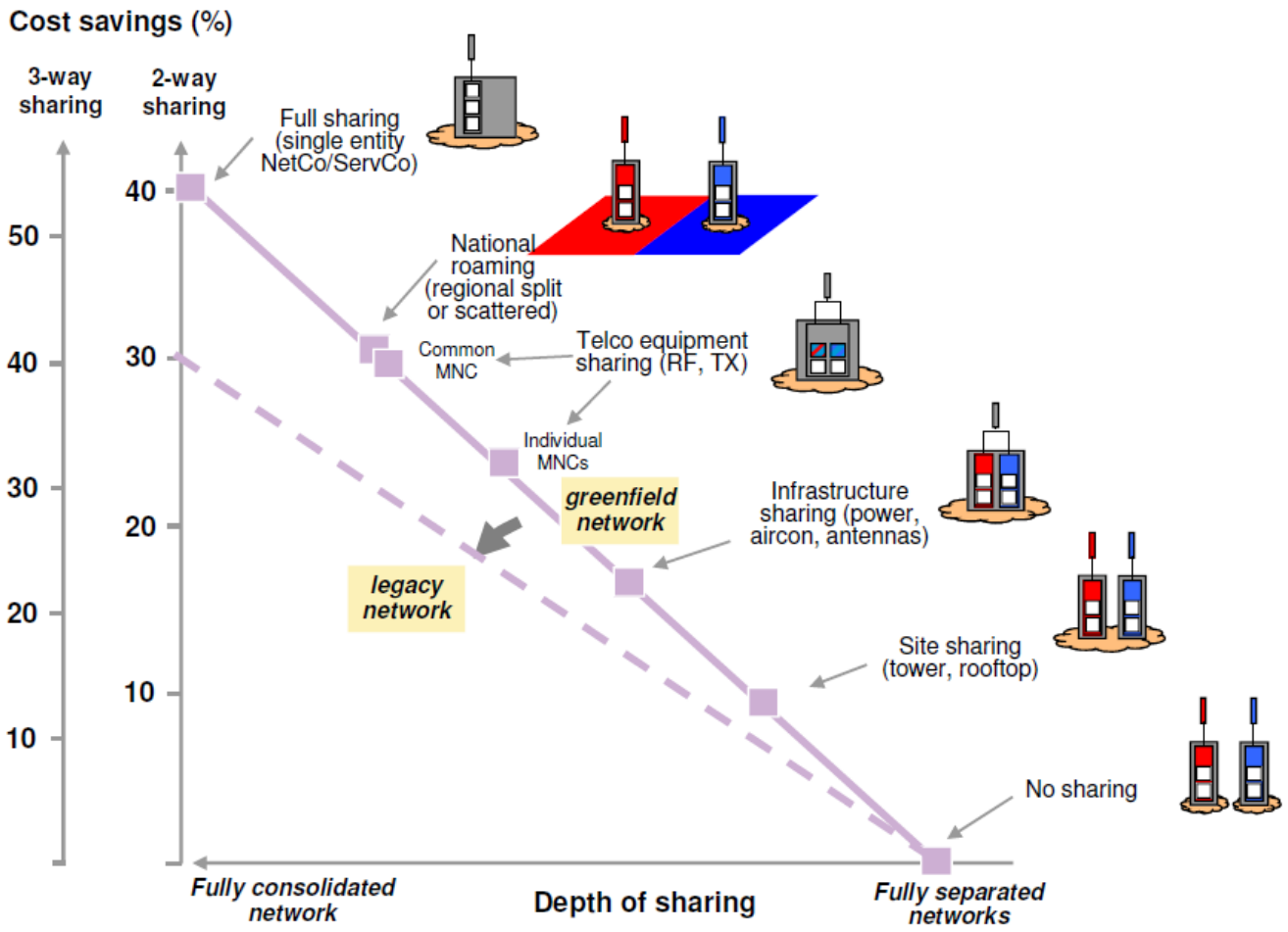
Network Sharing Cost Benefits



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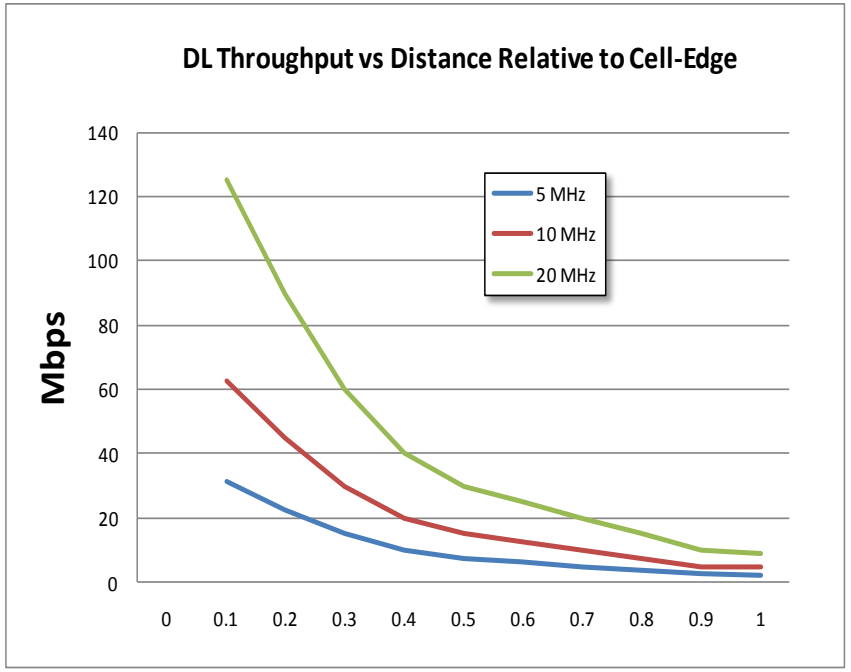
Source: Vodafone http://www.gsmworld.com/documents/Vodafone.pdf

Sharing Spectrum

- Sharing spectrum increases the data throughput across the cell
- Initially, only contiguous channels in the same band can be shared
- With LTE-advanced, non-contiguous channels can also be shared



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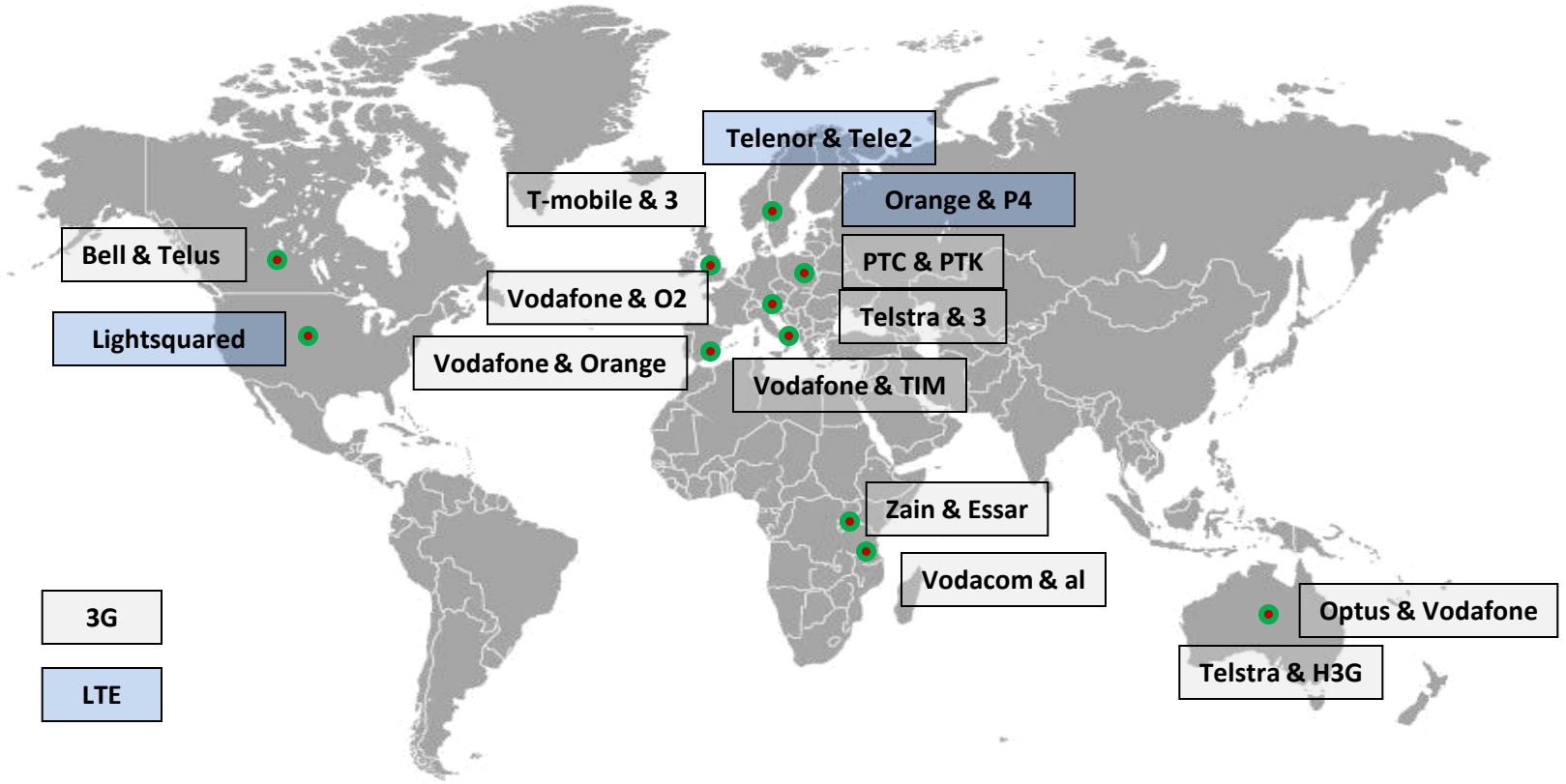
Active Sharing – Some announcements



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Active Sharing: The Options

- Sharing at Different Network Levels
  - eUTRAN only (i.e. MOCN)
  - eUTRAN and partially Core (i.e. GWCN)
- Security
  - IPSec-based VLAN per operator
- QOS Management
  - Partners can control QoS via the standard QOS Class Identifier (QCI) values (1-9)
  - Partners can additionally configure operator-specific QCIs
- Dedicated & Shared Spectrum
- Dedicated & Shared Backhaul
- Mobility Profiles – Specific Per Partner
  - Intra-LTE from shared to shared
  - Intra-LTE from shared to dedicated
  - Inter-RAT from shared to dedicated
- Voice Support – Specific Per Partner
  - CSFB
  - VoLTE

The 3GPP LTE standard offers a wide range of network sharing options that enhance the value proposition of active sharing

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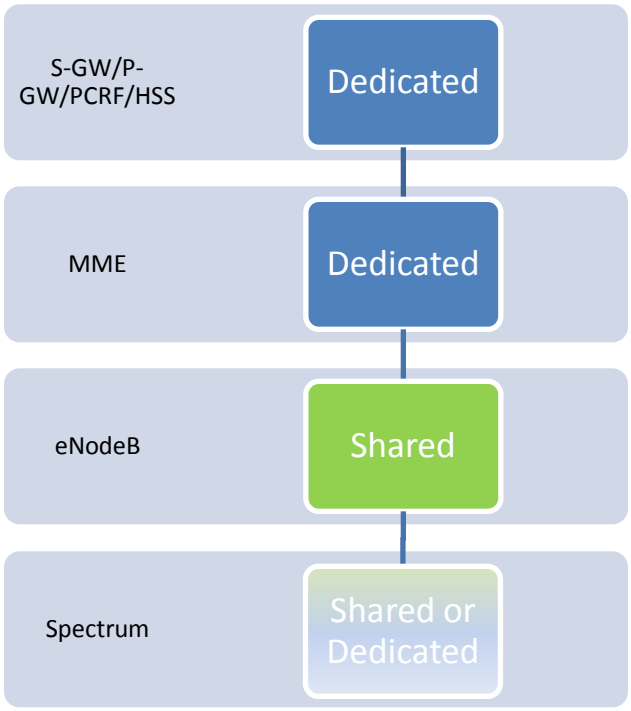
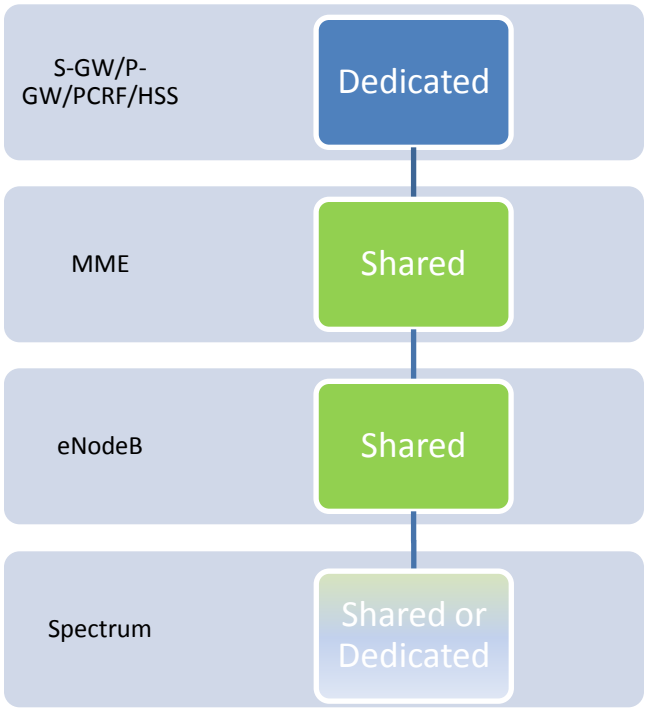
Sharing Options: MOCN vs GWCN



Multi-Operator Core Network (MOCN)

- No need for MME interfaces to partner's MSC & SGSN
- No need for HSS addresses of all roaming partners



Gateway Core Network (GWCN)

- Lower Costs with shared MME

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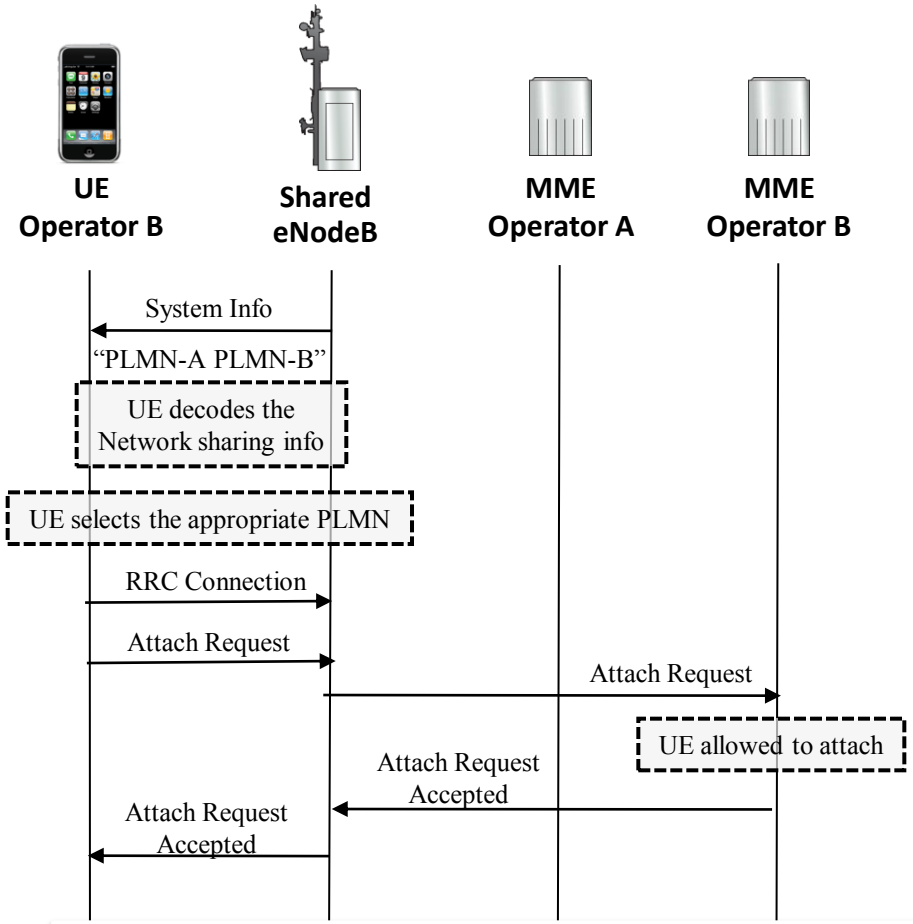
MOCN: How does it work?



- The PLMN-IDs of partners are all broadcasted on the air interface
- The UE selects its operator and indicates the selected PLMN-ID in the RRC Connection request
- The eNodeB forwards the attachment request to an MME belonging to the appropriate operator
- 3GPP TS 23.251 & TR 22.951

The MME is selected based on the PLMN-ID provided by the UE

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What is not in the Standard?

- Enhanced Product Options
  - Capacity sharing features: fully-pooled, fully-Split, partial reservation
  - Usage Information & Counters: segregation by PLMN-ID
  - QoS Management: policing, traffic-shaping per operator…
- Network Management Considerations
  - Fault Management
  - Configuration Management
  - Accounting Management
  - Performance Management
  - Security Management
- Business Considerations
  - Planning & sharing network expenditures
  - Private in-building customers
  - …

The network sharing agreement needs to address key product, network management, and commercial considerations.

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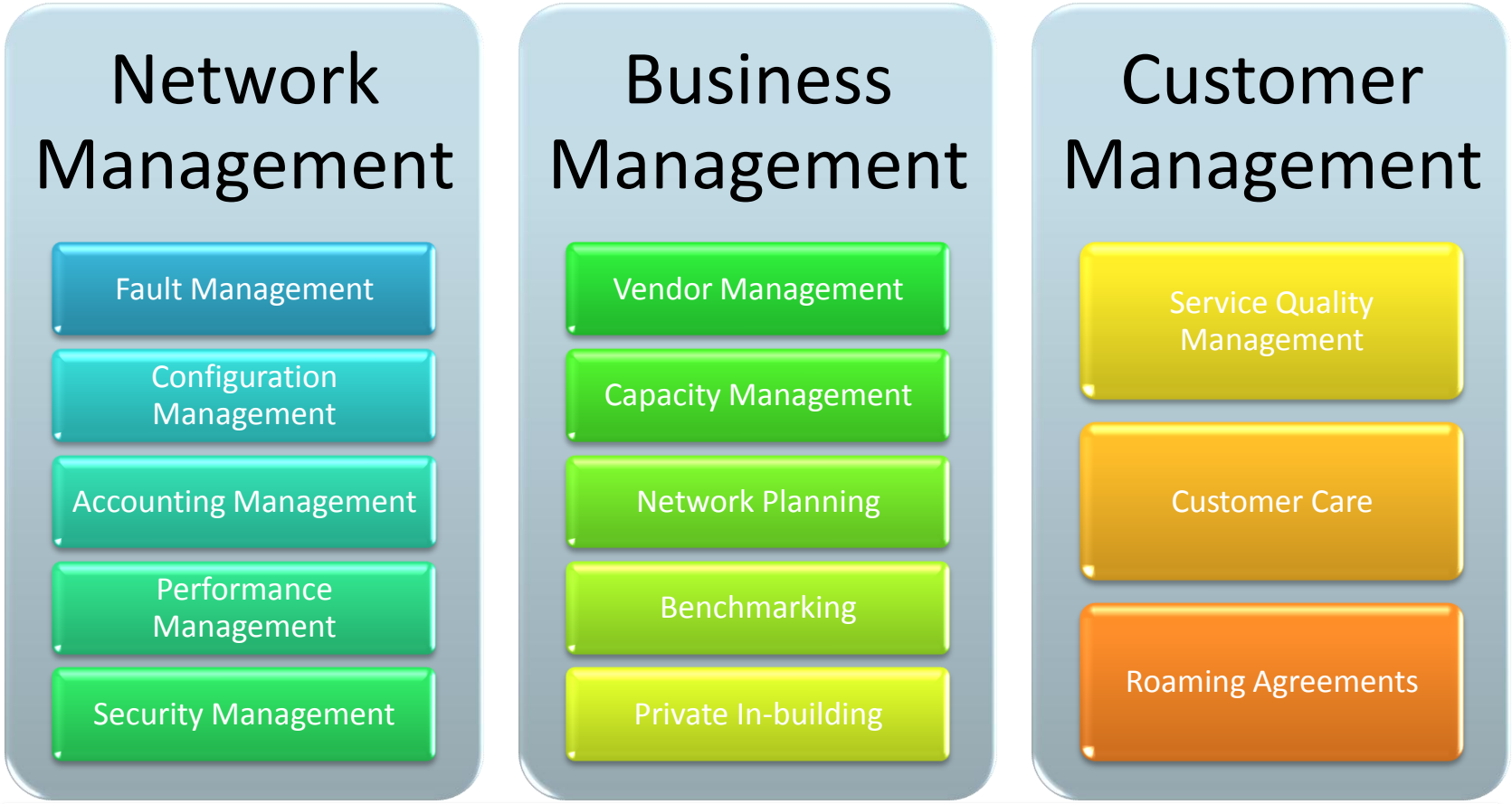
The Principles of Shared Network

- **Network Management** : although only one partner is accountable to actively manage its portion of the shared network, both partners are accountable to define, supervise, and monitor the network management practices.
- **Customer Management** : each sharing partner shall retain both the full control over the management of their customers and the capability to cater to their satisfaction as if they were served on their dedicated network.
- **Business Management** : optionally, including some business management domains in the sharing agreement can improve the operational efficiency of the partners even further, while preserving a desired level of competition among them.

Management Domains



Some management domains to address in individual operational agreements within the network sharing agreement

Operational Agreements: Overview

- **Goals** : defining the purpose of the specific operational agreement
- **Data & Reporting** : data to be exchanged and/or reported, inline vs. off-line, format, frequency, availability & retention, and others
- **Process** : defining primes, mandate, schedule of meetings, data/report to be reviewed, clear scope of accountability, targets, and others.
- **Board Review**: defining board members, schedule of meetings, role & responsibilities regarding resolution of disputes, process changes, and others.
- **Operational Sharing Infrastructure**: defining the requirements for the infrastructure to share/exchange data and reports.

The network sharing shall include a set of operational agreements, one to cover each management domain.

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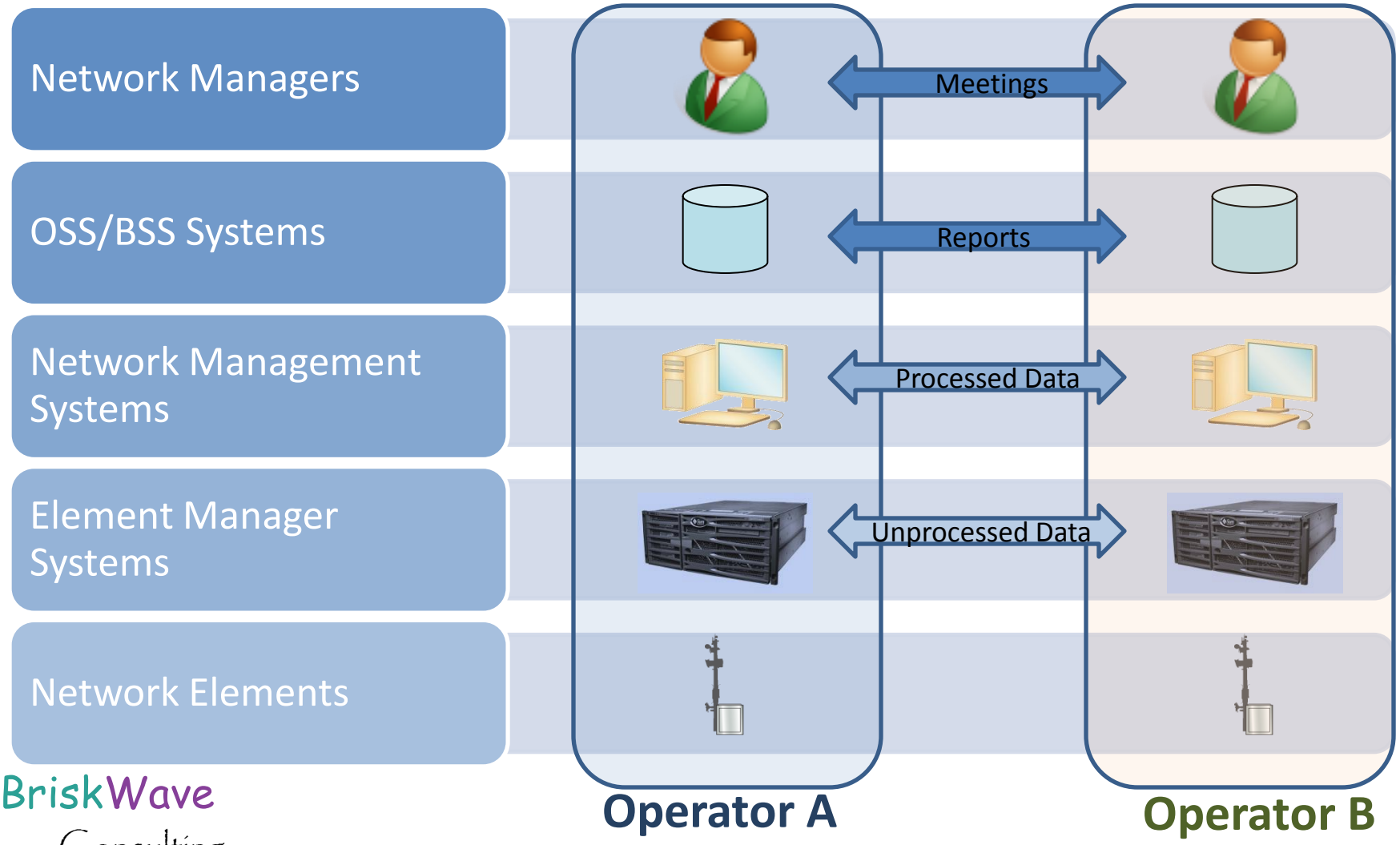
Operational Sharing Infrastructure



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Performance Management

	Frequency	Format
Data Exchange	Near real-time	• Unprocessed PM counters & KPIs
Reporting	Monthly	• Reports on KPIs vs. targets • Busy-hour, daily, weekly • Market-, eNb-, cell-level
Review Meetings	Monthly	• RF Engineering Primes • Identify Action Plan • Report on Resolution time
Process Board Meetings	Quarterly	• Executive attendance • Define KPIs and targets • Define/review the process

GOALS

1. Provide visibility into the shared network performance
2. Define minimum network performance targets
3. Provide a process to identify and address performance issues within an agreed resolution time

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Configuration Management

	Frequency	Format
Data Exchange	Daily	• Unprocessed eNB & cell configuration data
Review Meetings	Monthly	• RF Engineering Primes • Identify Configuration Issues • Report on Resolution time • Agree on Schedule for Configuration Changes
Process Board Meetings	Quarterly	• Executive attendance • Define/review the process

GOALS

1. Provide visibility into shared network configuration
2. Align and prioritize network configuration changes
3. Provide a process to identify and address configuration issues within an agreed resolution time

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Fault Management

	Frequency	Format
Data Exchange	Real-time	• Unprocessed alarms & logs
Reporting	Monthly	• Network Issue Reports • Open, pending, closed tickets
Review Meetings	Monthly	• Engineering Primes • Review Open Issues • Ticket Resolution Time
Process Board Meetings	Yearly	• Executive attendance • Define/review the process

GOALS

1. Define minimum SLA for network issues
2. Provide visibility into shared network issues
3. Provide a process to identify and address network issues within an agreed resolution time

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Capacity Management

	Frequency	Format
Data Exchange	Real-time	• Capacity-based Threshold Crossing Alarms
Reporting	Monthly	• Capacity Utilization Reports
Review Meetings	Quarterly	• Capacity Engineering Primes • Share Forecasts • Identify Capacity Bottlenecks • Prepare the Capacity Upgrade Plan
Process Board Meetings	Yearly	• Executive attendance • Capacity Metrics and Thresholds • Define/review the process

GOALS

1. Guarantee enough capacity (access, transport….) to meet future needs
2. Agree on capacity guidelines and thresholds
3. Minimize CAPEX spendings

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Vendor Management

	Frequency	Format
Reporting	Monthly	• List of open issues with vendors
Review Meetings	Ad hoc	• Vendor Roadmap Planning • Vendor Support Issues • Joint Test Planning
Process Board Meetings	Yearly	• Executive attendance • Define/review the process • Select common vendors

GOALS

1. Align vendors' roadmap to shared partners' requirements
2. Increase the negotiation leverage
3. Maximize vendors' support & maintenance
4. Share vendors' issues & resolution
5. Share/reduce test efforts on new releases

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Benchmarking

	Frequency	Format
Data Exchange	Ad hoc	• Unprocessed benchmarking and drive-test data
Reporting	Monthly	• Drive-test results
Review Meetings	Monthly	• RF Engineering Primes • Plan Benchmarking Campaigns • Identify action plan & Resolution time
Process Board Meetings	Yearly	• Executive attendance • Define/review the process

GOALS

1. Align benchmarking methodologies and tools
2. Share drive-test efforts
3. Guarantee “best-in-class” network performance

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Customer Care Management

	Frequency	Format
Data Exchange	Near real-time	• Customer Trouble Tickets
Reporting	Monthly	• Open Tickets • Resolution Time
Review Meetings	Monthly	• Customer Support Primes • Identify action plan • Resolution time
Process Board Meetings	Quarterly	• Executive attendance • Align Ticket Definition & Priorities • Define/review the process

GOALS

1. Define SLA for ticket resolution
2. Provide an escalation mechanism into partner's third-level support
3. Provide a process to identify and address customer complaints within an agreed resolution time

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Operational Agreement Checklist

- Identify pre-sharing & sharing-specific data requirement for all OSS & BSS Processes & Tools affected by the network sharing
  - Data
  - Interfaces & Protocol
  - SLA & Processes
- Identify all the management domains to be covered in the network sharing agreement
- For each domain, define an operational agreement
- Set-up an infrastructure to exchange data & reporting
- Define OSS-related network requirements to support network sharing
- Consider including some business management domains
- Insure overall consistency with the evolution and exit strategy

Operational Agreements: Overview

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The network sharing shall include a set of operational agreements, one to cover each management domain.

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Conclusion

- LTE Network Sharing makes a compelling value proposition but requires a well designed set of operational agreements between partners.
- Each network sharing agreement will be different to meet the specific operational needs of both partners.
- Including business considerations beyond pure network management domains into the network sharing agreement can benefit both partners.

THANK YOU

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