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Spectrum Management Services

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# Spectrum is the enabler of wireless technologies

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Spectrum is most important of asset of all wireless service providers; maximising the value of this scarce resource is the shared objective of both service providers and regulators.

- Spectrum is the critical asset enabling wireless services, demand for which is continuously growing.
- Consolidation and drive for economies of scale will impact spectrum arena, resulting in fewer but stronger actors on a much more global arena.
- Regulatory landscape impacted by global trends, no longer just another mobile license, business models and eco-systems are to become global and regulatory alignment is a key success factor for much of the new 5G/IoT area.
- Trading and leasing scenarios are likely to appear for spectrum assets, where the traditional national interest is challenged by benefits of multi-national corporations and their customers (including end-users/people).
- Very diverse 5G spectrum needs for different vertical businesses, paired with legacy (2G-4G) consolidation require active and efficient spectrum management processes.
- New verticals (IoT) requiring spectrum and proper business valuation, with a much shorter re-evaluation period and uncertain value than for traditional "Voice-and-Data".
- Much greater complexity in business and revenue models means valuation is profoundly challenging and is different for different players in a given vertical sector or eco-system. Since business models are virtually "under construction" the goal posts are moving.
- With the continuous introduction of technology advancements, especially affecting 4G/5G and WiFi, greater efficiency is expected from the available spectrum. Business logic will put enormous cost pressure on all global business models requiring any form of connectivity.
- Any spectrum actor will need to handle the threat and opportunity of unlicensed/unregulated spectrum together with a licensed portfolio.

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# Key developments in the spectrum domain

New business models, new applications and business models enabled by IoT/5G, and consolidation and restructuring within the industry are driving fundamental changes in spectrum management.

| Key drivers | Impact |
|---|---|
| New business models | • Spectrum bands and their viability for various services and network design aspects<br>• Government Regulation: licensing for society, verticals<br>• Spectrum portfolio management and economics<br>• Re-positioning of the traditional MNO possible/likely<br>• Complete connectivity offerings over various spectrum bands |
| IoT / 5G | • New services (IoT) and spectrum demands<br>• Device evolution vs spectrum strategies<br>• RAT (Radio Access Technologies) vs Spectrum needs<br>• 5G entry itself and its impact on existing schemes<br>• Base Station infrastructure impact and consequences for spectrum |
| Consolidation | • Competition vs. ecosystem with collaboration and network sharing<br>• Regulated vs. unregulated spectrum<br>• Life-cycle approach and long-term spectrum economy<br>• Spectrum sharing: New tech possibilities |

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# NGP Spectrum Services Overview

NGP offers a portfolio of innovative services designed to enable clients to maximise efficiency and value derived from their spectrum assets

| NGP Spectrum Services | Typical Client | |
|---|---|---|
| | **Operator** | **Regulator** |
| **Spectrum Portfolio Management**<br>• Spectrum re-farming planning and implementation<br>• Spectrum Valuation | ✓ | |
| **Spectrum Sharing and Pooling**<br>• Business and Contractual Model<br>• Business and Operational Impact Analysis | ✓ | ✓ |
| **Radio Access Technology Spectrum Efficiency**<br>• In-band sharing, MIMO, Carrier Aggregation | ✓ | |
| **Licence Bid Support**<br>• Business cases and application process management<br>• Bidding strategy support | ✓ | ✓ |
| **Spectrum Policy Development**<br>• Policy and regulatory framework optimisation and harmonisation | | ✓ |

Spectrum Planning

Spectrum Acquisition

Spectrum Deployment

Spectrum Optimisation
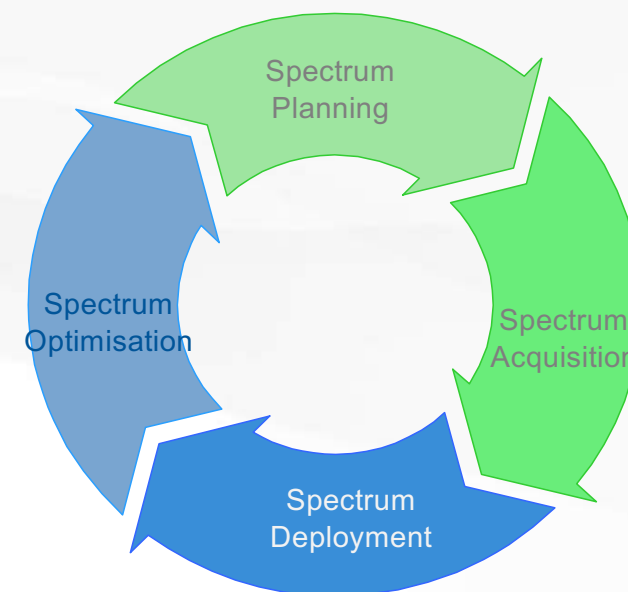
*NGP's portfolio of spectrum services assists operators to maximise the value of their spectrum assets at every stage in the spectrum life cycle*

# Spectrum Portfolio Management

Maximising the value of spectrum assets requires active management of the spectrum portfolio as market demand and technology options evolve over time.

**Spectrum Allocation**
- Alignment of coverage and capacity with market needs and market strategy
- Optimisation of allocation by Radio Access Technology (RAT)

**Spectrum Change Roadmap**
- Phased implementation, including interim configurations
- Spectrum deployment optimised in all phases
- Spectrum fees minimised by harmonising licensing with capacity requirements

**Regulatory Alignment**
- Spectrum holdings harmonised with global and local trends
- Customer requirements, availability and economics of both network infrastructure and end-user hardware
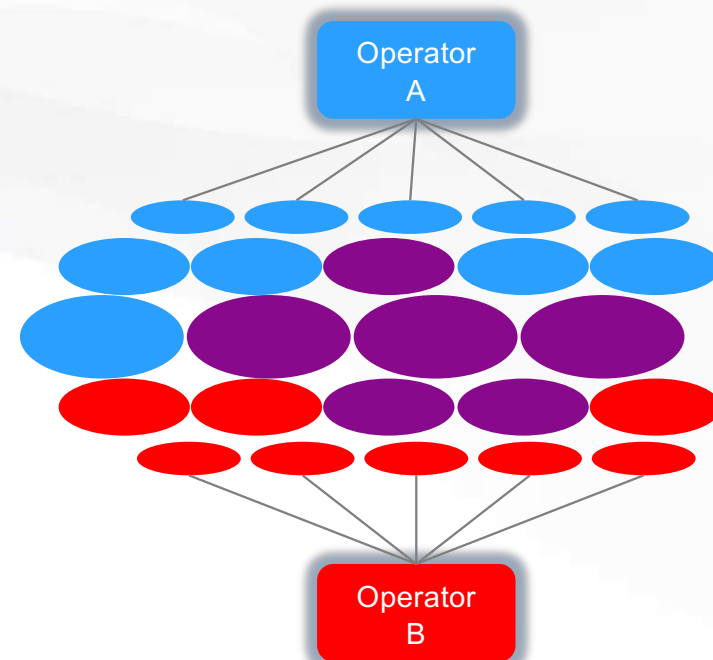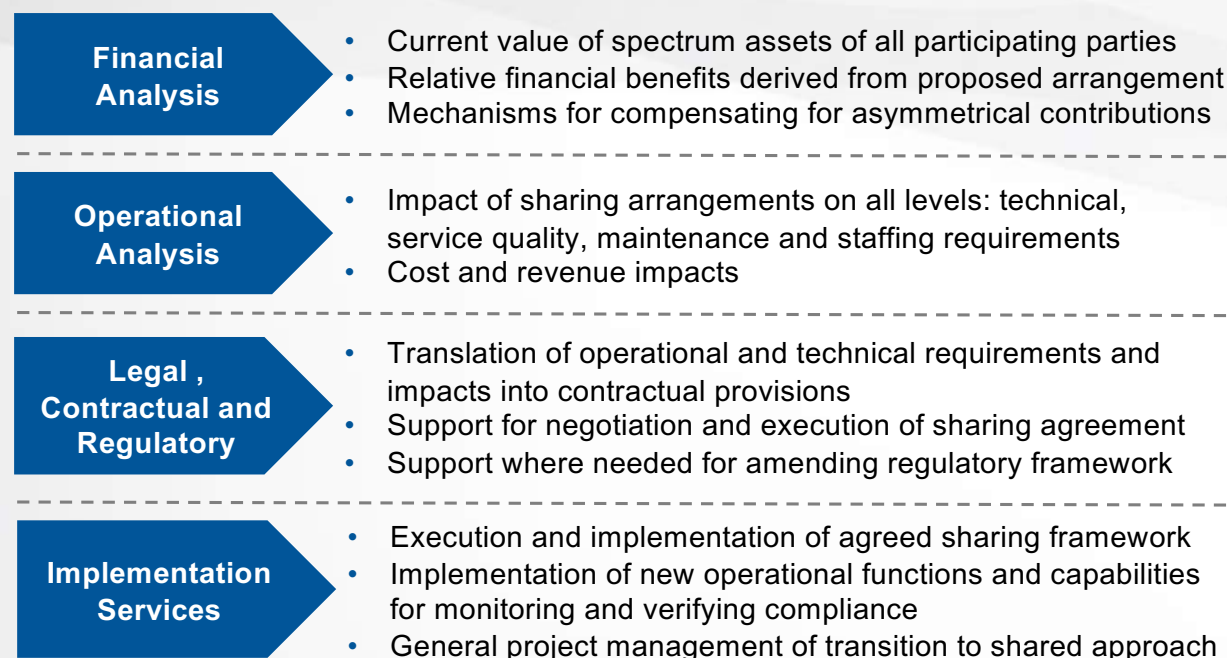- Spectrum valuation and licensing support

**Procurement Support**
- Collection and documentation of vendor requirements and technical specifications, including post-implementation support and maintenance
- Future-proofed hardware and contractual arrangements
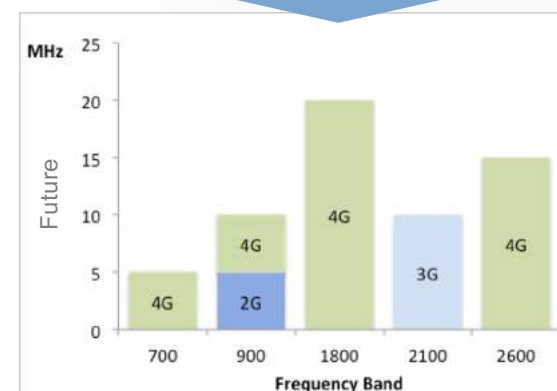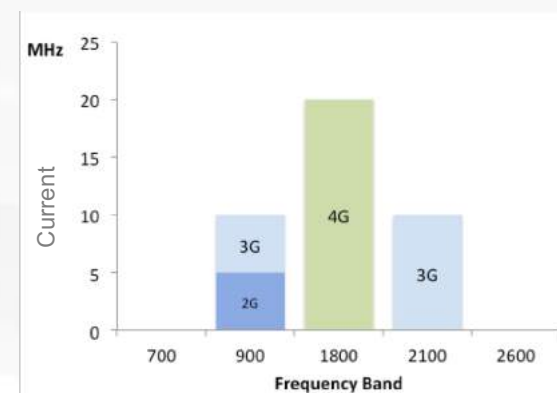
# Spectrum Sharing Arrangements

Spectrum sharing and pooling arrangements offer operators the opportunity to use spectrum assets more efficiently by exploiting geography- and time-driven differences in demand. NGP assists operators in navigating the complex technical, contractual and regulatory issues required.

**Financial Analysis**
- Current value of spectrum assets of all participating parties
- Relative financial benefits derived from proposed arrangement
- Mechanisms for compensating for asymmetrical contributions

**Operational Analysis**
- Impact of sharing arrangements on all levels: technical, service quality, maintenance and staffing requirements
- Cost and revenue impacts

**Legal , Contractual and Regulatory**
- Translation of operational and technical requirements and impacts into contractual provisions
- Support for negotiation and execution of sharing agreement
- Support where needed for amending regulatory framework

**Implementation Services**
- Execution and implementation of agreed sharing framework
- Implementation of new operational functions and capabilities for monitoring and verifying compliance
- General project management of transition to shared approach

Operator A

Operator B

# Radio Access Technology Spectrum Efficiency

In-band sharing technologies offer new opportunities for operators to more efficiently utilise their existing spectrum assets. *Several technology options have been evolving over the years in 2-4G, they should be put to use as much as legacy networks can cope.*
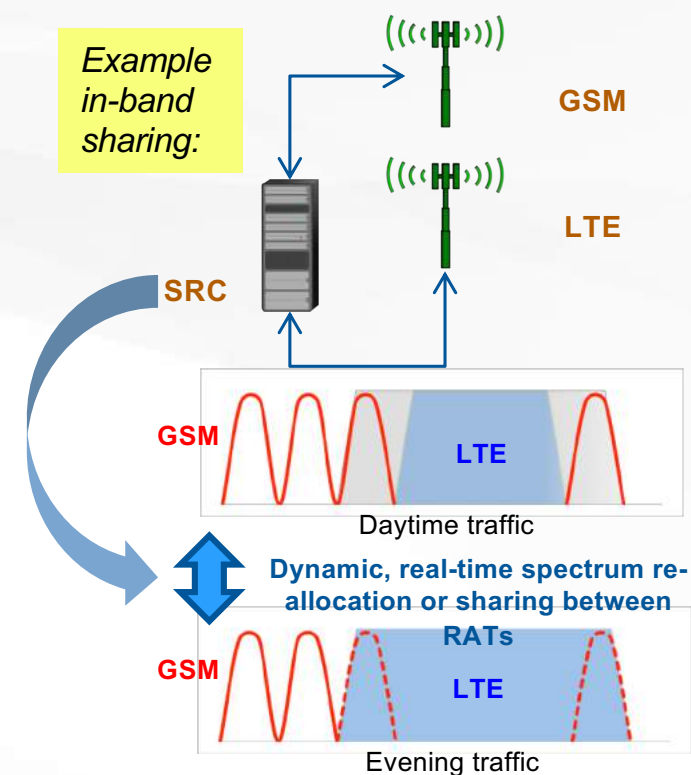
**Quick Win!**
- Allows operators to expand the technical limits on capacity of existing spectrum assets
- Short implementation roadmap; exceptional return on investment

**Operational Performance**
- Increased capacity and quality of service
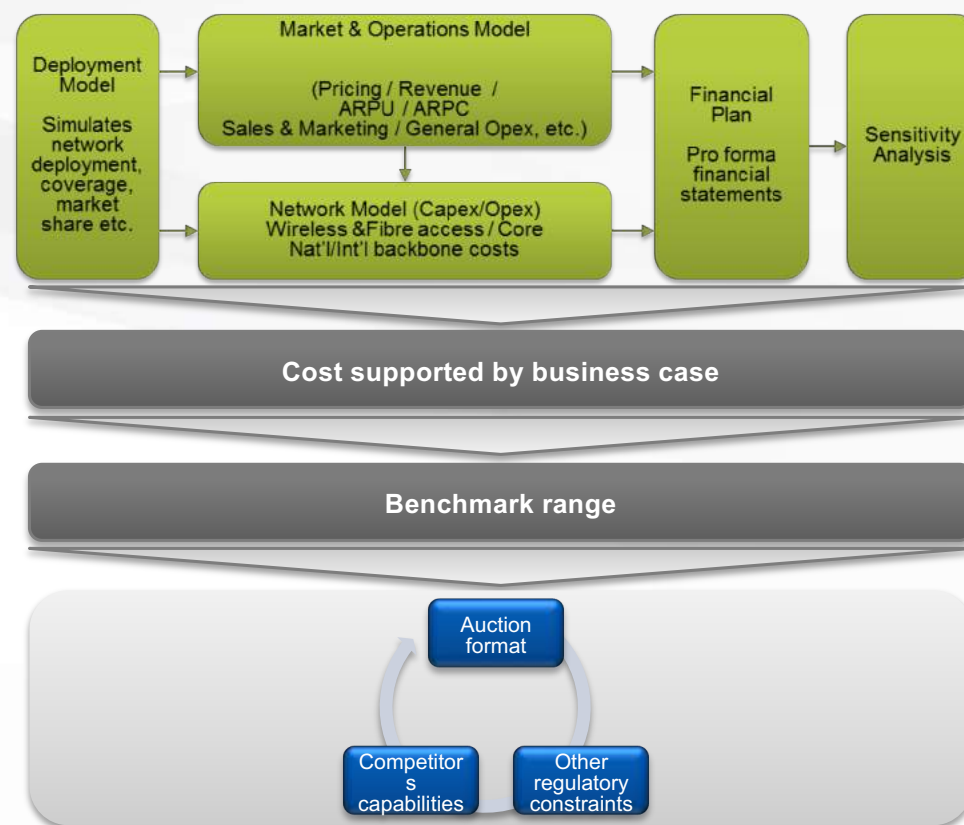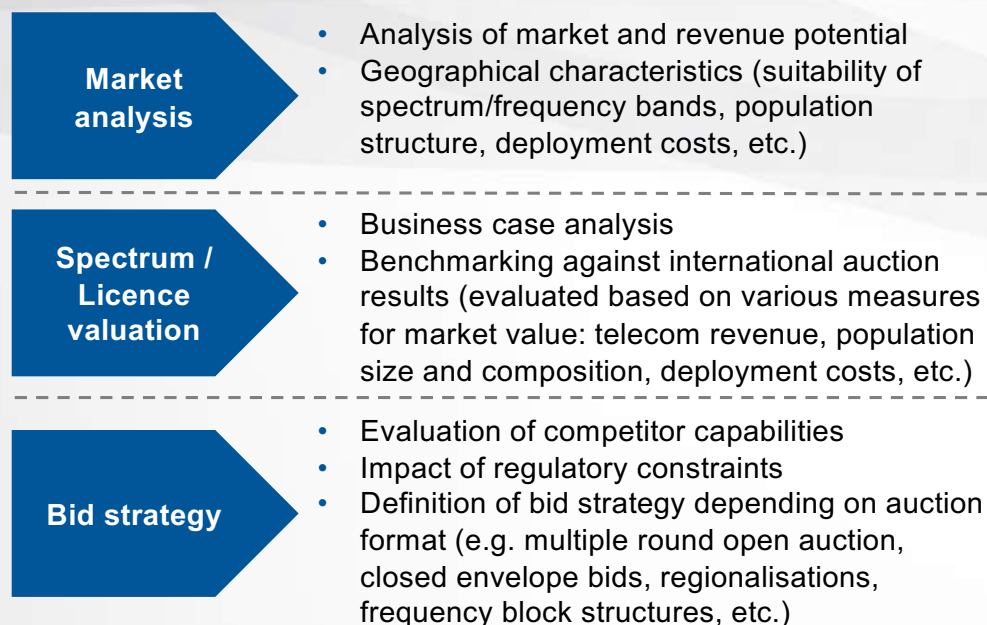- Improved end-user KPIs for both Radio Access Technologies (RATs), for both voice and data

**Implementation Support**
- Evaluation, planning and implementation
- Vendor-specific tuning
- Procurement and vendor negotiation support
- Integration with existing RAT-specific investments

*Example in-band sharing:*

GSM

LTE

SRC

GSM    LTE

Daytime traffic

**Dynamic, real-time spectrum re-allocation or sharing between RATs**

GSM    LTE

Evening traffic

# Licence Bid Support

We support the client through all the stages of the acquisition process for new spectrum and licences using an approach is based on proven tools and methodologies.

**Market analysis**
- Analysis of market and revenue potential
- Geographical characteristics (suitability of spectrum/frequency bands, population structure, deployment costs, etc.)

**Spectrum / Licence valuation**
- Business case analysis
- Benchmarking against international auction results (evaluated based on various measures for market value: telecom revenue, population size and composition, deployment costs, etc.)

**Bid strategy**
- Evaluation of competitor capabilities
- Impact of regulatory constraints
- Definition of bid strategy depending on auction format (e.g. multiple round open auction, closed envelope bids, regionalisations, frequency block structures, etc.)

# Spectrum Policy Development

As an essential scarce resource, effective spectrum management is a key element of regulatory policy. Recent market and technological developments have created new opportunities for increasing efficient use of spectrum, but have also increased the complexity of the role of the regulator.

**Spectrum Allocation**

- Auction-based allocation models replaced by 'beauty-contest' and hybrid approaches; willingness to pay no longer viewed as effective proxy for ability to maximise value of scarce resource
- High licence fees divert funds otherwise available for infrastructure investment

**Spectrum Policies**

- Technology-specific licencing regimes replaced with technology-agnostic approach
- In-band sharing, spectrum pooling and dynamic RAT technologies offer opportunities for increased efficiency but adoption may be inhibited by obsolete regulatory frameworks

**Licence Obligations**

- Licence obligations such as roll-out, coverage and GoS/QoS KPIs provide mechanisms for incentivising efficient use of spectrum
- Defining, monitoring and enforcing such obligations however create new challenges and operational burdens for regulators
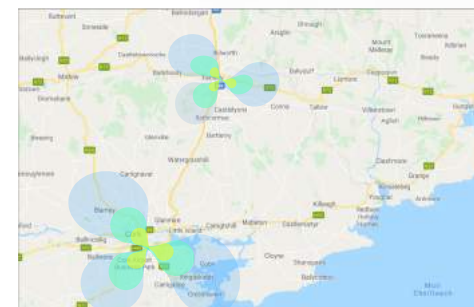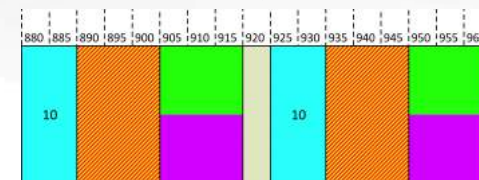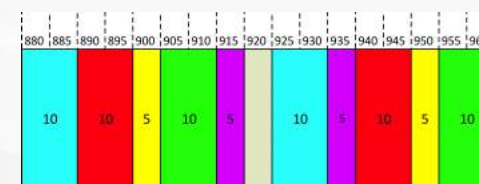
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# Spectrum Services experience, a few examples

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**Spectrum valuation, Mobile Operator, Latin America**

- Valuation of LTE spectrum as basis for auction bid

**Spectrum consolidation 4G (800/1800 MHz), Mobile Operator, Central Europe**

- Analysis of spectrum options for 800 and 1800 MHz for legacy network
- Evaluation of consolidation options (buy/sell).

**License Application LTE, new ISP entrant, South East Asian contry**

- Assisted a local conglomerate with detailed business planning for broadband operation (wireless access and fibre)
- Subsequently supported the operator´s successful application for a licence and spectrum to deploy LTE services.

**Spectrum Efficiency technology 2G-4G, global equipment supplier**

- Development of methods and approaches for minimizing 2G spectrum and combining it with 4G.

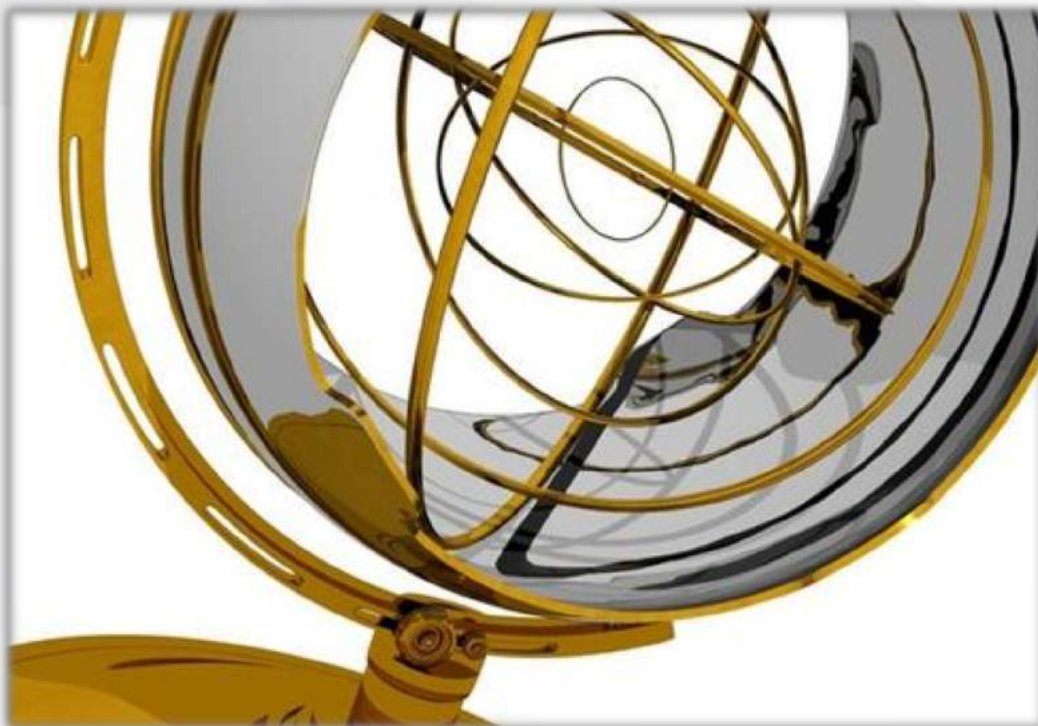Introduction

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# Our company

NGP is a global consultancy providing telecommunications sector clients expert advice and support on strategy, technology, operational and other issues, enabling clients to profitably compete and grow their businesses.



- The collective telecom expertise of our team of advisors, all specialists in their field, sets us apart as consulting partner to progressive telecom companies worldwide

- Our teams are engaged in projects worldwide, mostly in Scandinavia, Europe, Asia, Africa and Latin America.

- The global reach of our partnership creates the foundation for an international perspective and cross-cultural understanding of market and organisational issues

- As a strongly focused consultancy, with an in-depth understanding of our niche market, Netcom Global Partners is a responsive and flexible partner for the most demanding clients

# Service overview

Based on our extensive experience in design, deployment and operation of telecommunications services, we help clients converting business ideas and technologies into successful products and services.



**Market and business planning**

- Providing effective market strategies and business plans

**Network sharing, interconnection and regulatory related issues**

- Providing expert advisory services in connection with network sharing opportunities, licence award processes, spectrum auctions, interconnection and access, and other regulatory issues.

**Network planning, design and deployment**

- Supporting procurement and deployment of networks, systems and infrastructure
- Network planning and design, review/audit and optimisation

**Service development & product management**

- Managing development and launch of innovative and profitable services

**Organisation and operations**

- Assisting telecommunications operators in improving operational performance and efficiency

# Our expertise and capabilities

We provide advisory and management expertise in planning, design, deployment and operation of telecom networks and services.

**Some project examples:**

- Operational reviews and audits
- Market opportunity evaluations
- Network planning and design
- Managed Services feasibility reviews
- Indoor coverage solutions
- Network consolidation strategy definition
- Market entry consultancy services for mobile operators and service providers
- License acquisition support / spectrum valuation
- Interconnection, access and wholesale agreements
- Roaming and clearing audits - commercial and technical
- Regulatory, standardisation issues, network numbering
- Number portability implementations (mobile/fixed)
- Fibre rollout, fibre unbundling and fibre sharing and access

- M2M/IoT technologies, solutions and concepts
- Operational KPI benchmarking Service feasibility studies
- Customer Experience management
- Project portfolio and governance strategy
- Project Management Office (PMO) implementation
- Management of service launch and transition projects. Some recent examples: VoLTE, MVNO
- Network procurement RAN, Core
- Project management of mobile and fixed broadband network roll-out
- IMS Migration projects
- Power solutions, "Green Connectivity"
- Commercial and technical due diligence
- Tower, Network and Infrastructure Sharing agreements and implementation

# Our global experience

Our partners, coming from leading telecom operators, vendors and consultancies, bring experience from work with clients in a wide range of countries and regions with different market and regulatory conditions.



**Some clients our partners have worked for:**

- Amara Communications
- Axiata
- Bell Canada
- Batelco
- CellularOne
- Canadian Imperial Bank of Commerce
- Digicel
- Du
- Emtel
- Ericsson
- FarEasTone
- Hi3G / 3
- 3GIS
- ICE / Net1
- Intelig, Brazil
- Meteor
- Mobifone

- Mobtel
- Nokia Networks
- Orange / Getesa
- Orange / Jordan
- Orange /Switzerland
- Umniah / Jordan
- Orascom Telecom (now Global Telecom Holding / Vimpelcom)
- Ooredoo Group
- OnePhone
- Sabafon
- SmarTone
- Smart Philippines
- Sumitomo Group
- Swedish Post and Telecom Authority
- TAL
- TDC
- Telefonica

- Tele2
- Telenor
- TeliaSonera
- Telkomsel
- Telma
- Teracom
- T-Mobile / Germany
- T-Mobile /Poland
- Tigo / Millicom
- TIM Brazil
- Turkcell
- Viettel
- Vivendi
- Vinaphone
- VMS
- Vodafone
- Alcatel
- Huawei
- ZTE

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www.netcomglobalpartners.com

Netcom Global Partners Pte Ltd
10 Anson Road
#14-01A International Plaza
SINGAPORE 079903