

Mobile Network Consolidation **Commercial and Technical Challenges**

February 2018

Introduction

Consolidation end-to-end

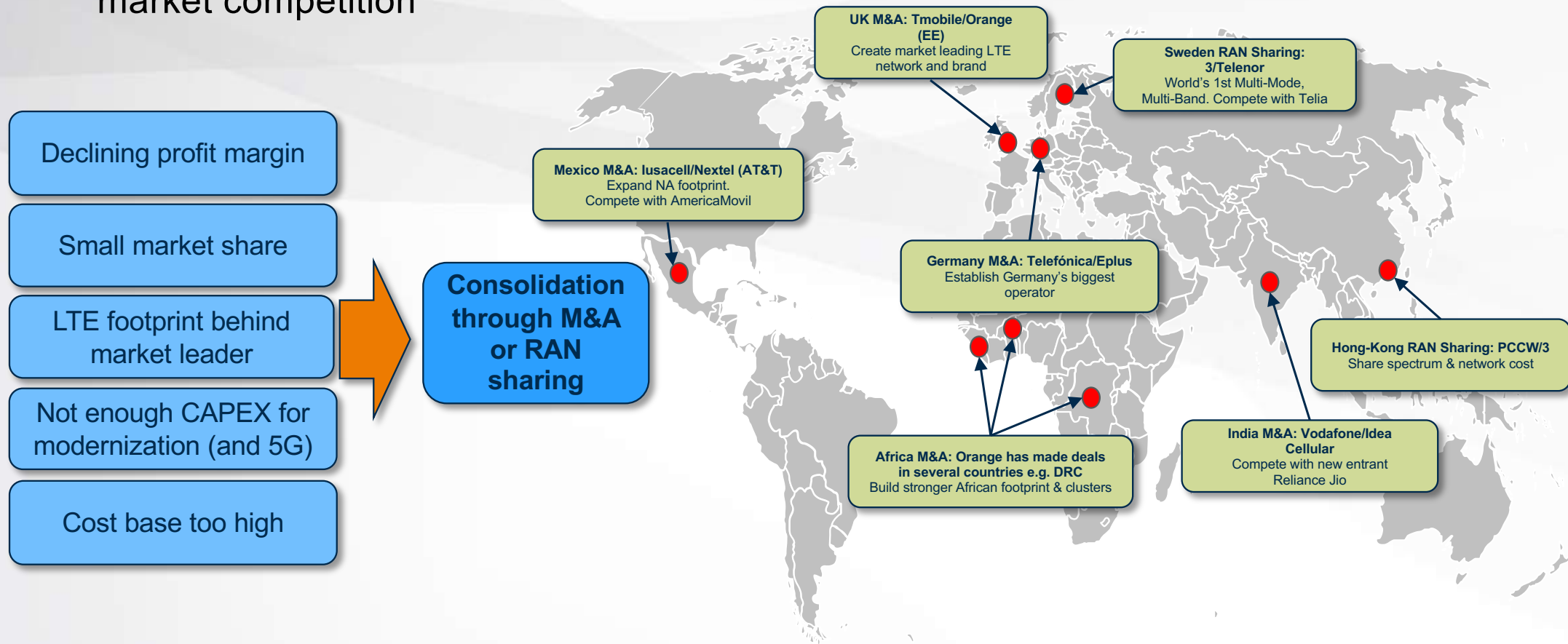
How we can help

References

Our company

Operator consolidation – Market drivers

Consolidation is an option considered by many mobile operators to combat fierce market competition



Trend from Europe is now spreading to other parts of the world

Opportunities to offer new types of services to the enterprise market and to verticals.

Many more types of use cases with very different characteristics and requirements.

Growing pressure to
reduce carbon footprint
and visual pollution

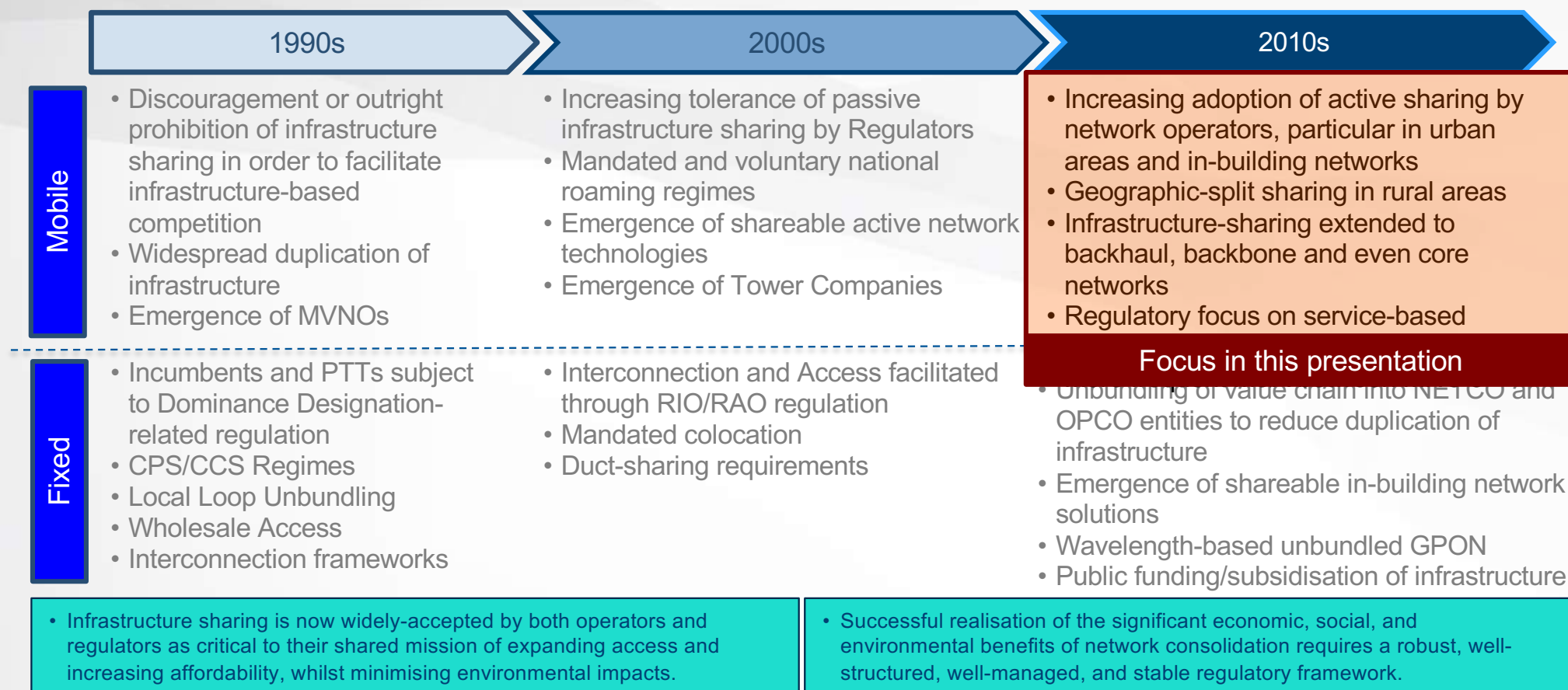


Is consolidation
necessary to remain
relevant and competitive
in the market long term?

In commercial confidence

Operator consolidation – Regulatory framework

Over past two decades, regulatory policies concerning consolidation have evolved from forbidding such arrangements to tolerance and now to active encouragement and even to mandating (e.g., Mexico) network consolidation



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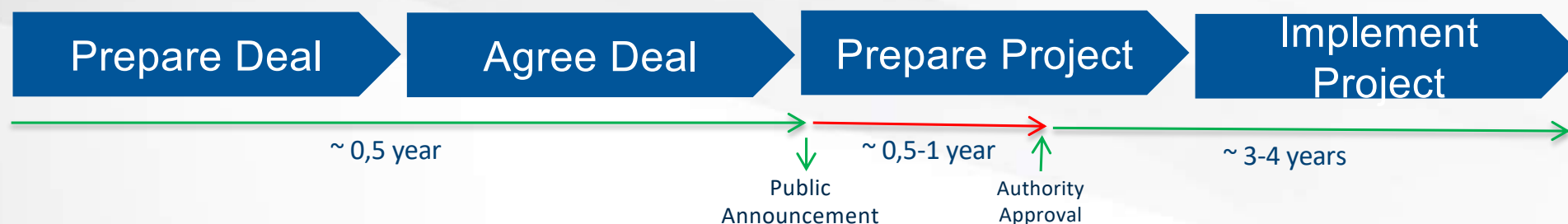
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Network consolidation – End to end

Consolidation of network infrastructure following M&A or RAN Sharing agreement is a very complex, challenging and time consuming project. Total lead time from initial business case analysis to completion of target network implementation is typically 3-5 years.

Main phases:



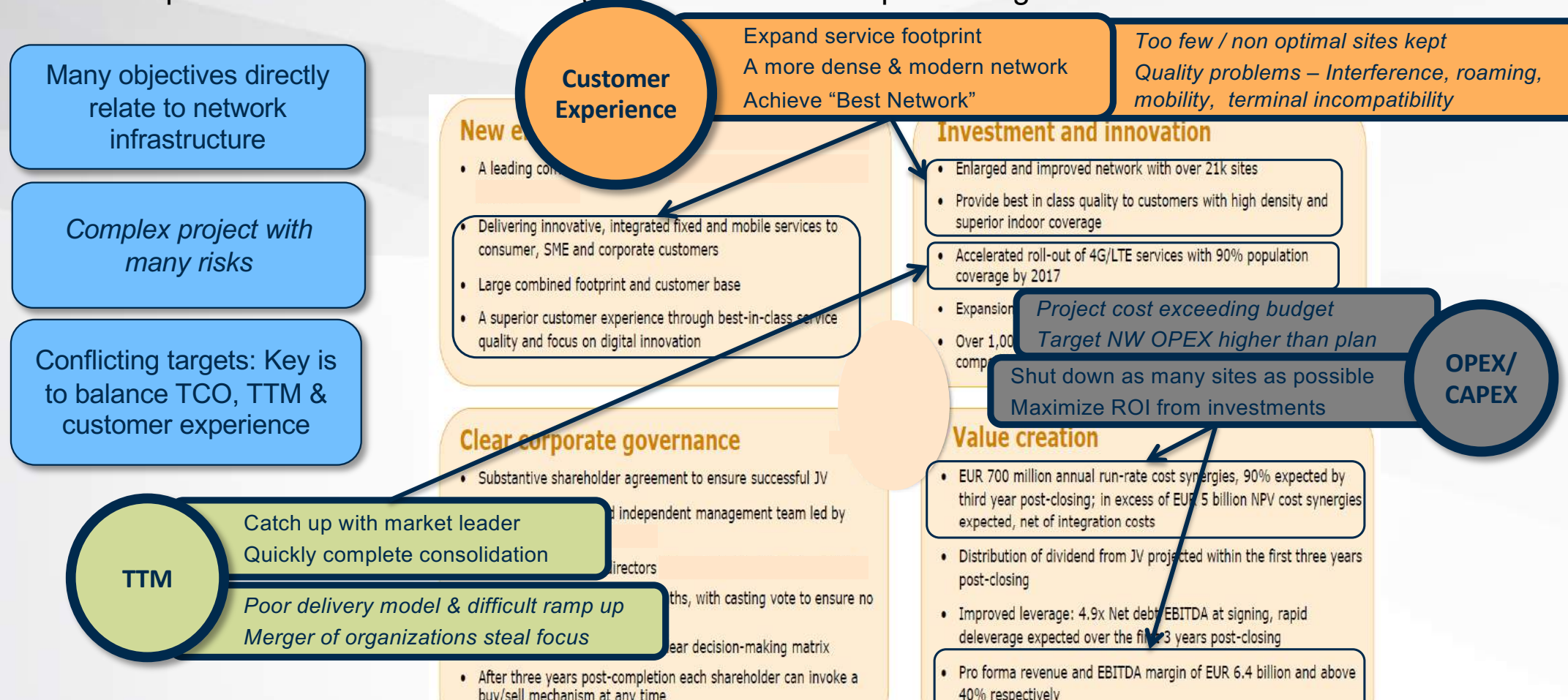
Key activities:



We will now look at the challenges in each phase and key activity

Prepare deal – Define objectives

Example of announced business targets from recent European merger



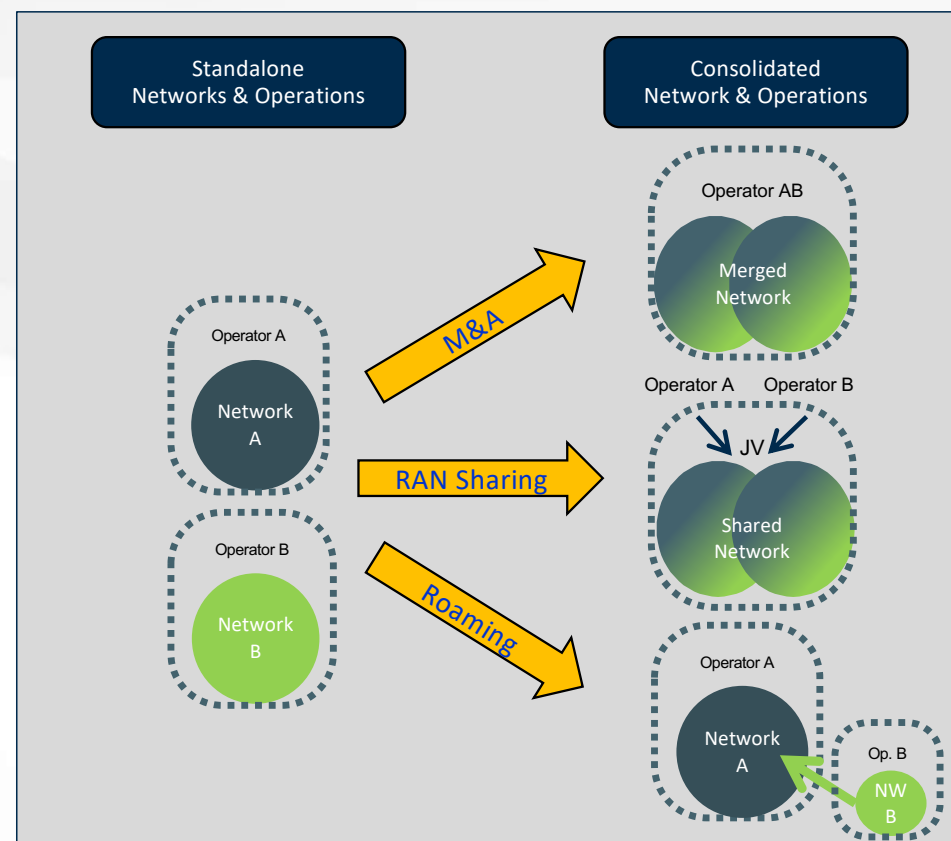
In coming years we can expect targets covering 5G integration, IoT connectivity technologies and a vision regarding the consolidated operator's position in the eco system

Prepare deal - Choosing business model

Operator's business objectives determine business model

Key considerations

- **Market position** – Is current market share sustainable?
- **Financial status** – Need to address both revenue and cost? Funds available for M&A?
- **Spectrum** - Long term need vs. current and planned future allocation?
- **Authorities** – M&A allowed and/or spectrum sharing allowed, remedies for approval?
- **Target operator** – Availability of, and likely interest from, suitable operator to consolidate with?



In many markets, such as the EU, authority policies limit the number of available options

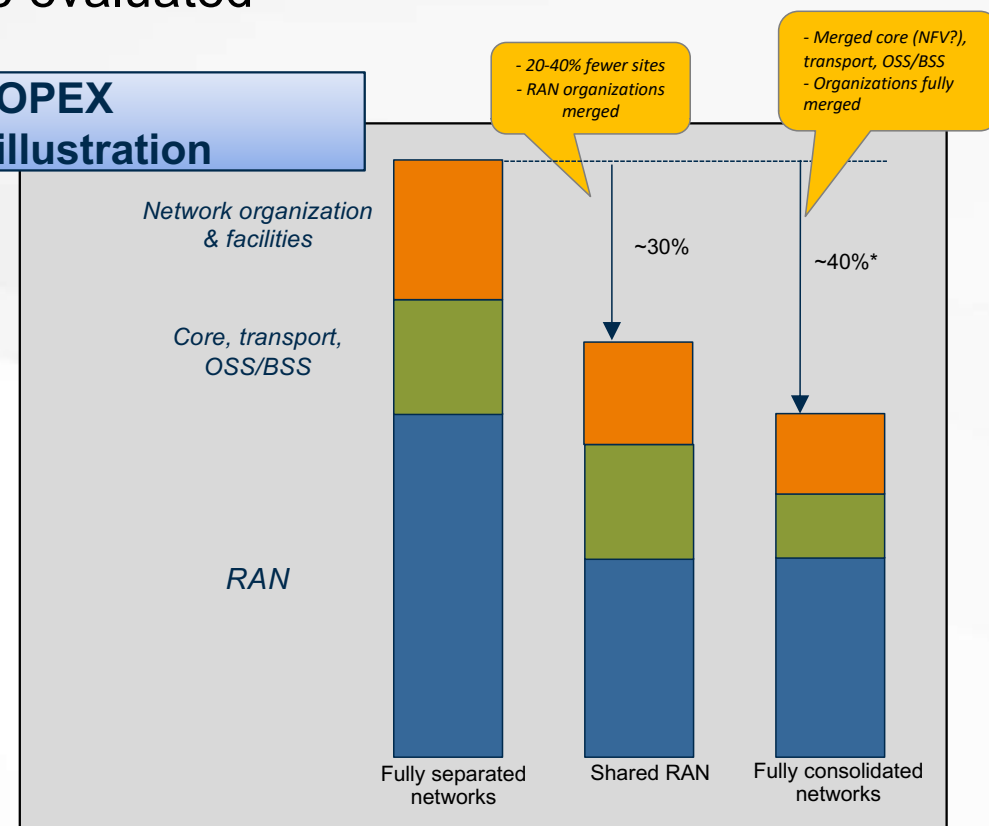
Prepare deal – Analyse business case

During the business case analysis the end user and financial impact of different evolution scenarios for the target network are evaluated

Key aspects to consider

- **Vision** – Overall target network objectives and desired position vs. competitors
- **Evolution plan** - Capability roadmap vs. technology evolution, spectrum availability, service offerings and traffic forecast
- **Project** - Resource and time estimate for consolidation implementation plan
- **TCO** - OPEX savings potential for infrastructure and organization, required CAPEX for project and target network and to support technology evolution, balance between swap & reuse of equipment, ROI

OPEX illustration



* For the full consolidation case there are additional OPEX savings in marketing & sales, customer support etc.

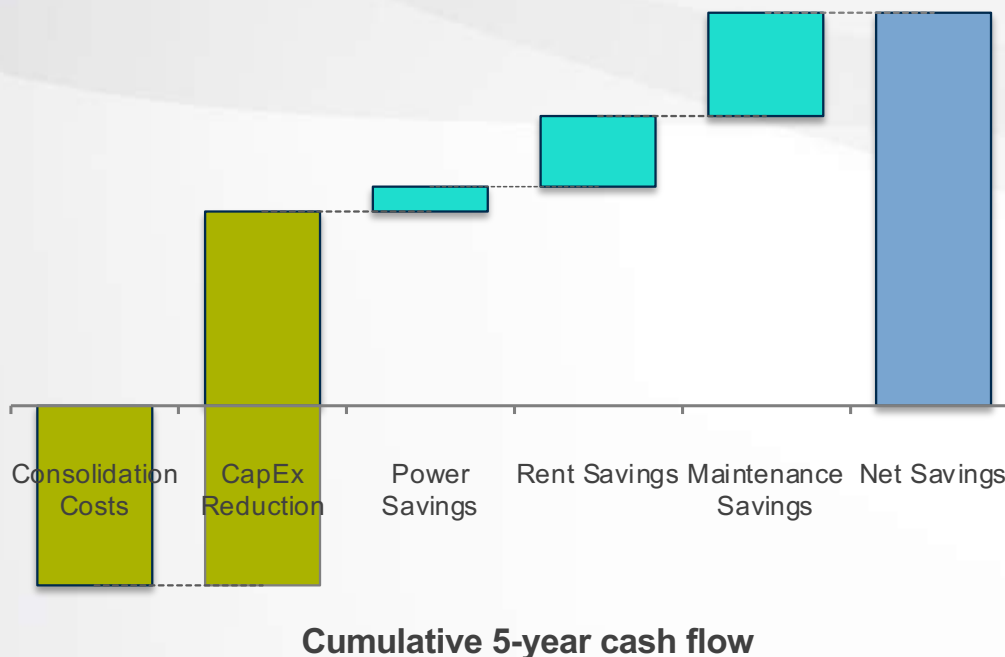
NGP has developed a scenario analysis tool that is easy to adapt to the specifics of each case

Prepare deal - Investment in consolidation

Short-term increases in CAPEX are required to realise consolidation-driven cost reductions and establish a modern future proof network capable of supporting the technology evolution

Consolidation economics

- In the first years of a network consolidation initiative, planning & design activities together with HW&SW for modernization & swap of nodes, transport connections and OSS/BSS platforms drive most of the increased CAPEX requirements.
- Implementation costs arising from node consolidation and upgrade, site decommissioning, re-location and operational transfer are the main cost drivers.
- After the initial phase, reductions in CAPEX requirements are possible as many planned expenditures can be eliminated.
- OPEX reductions achieved are permanent and main contributor to consolidation business case NPV.



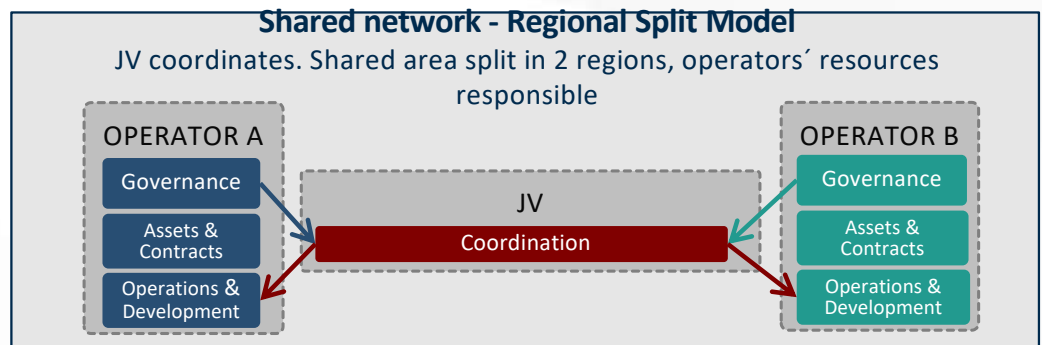
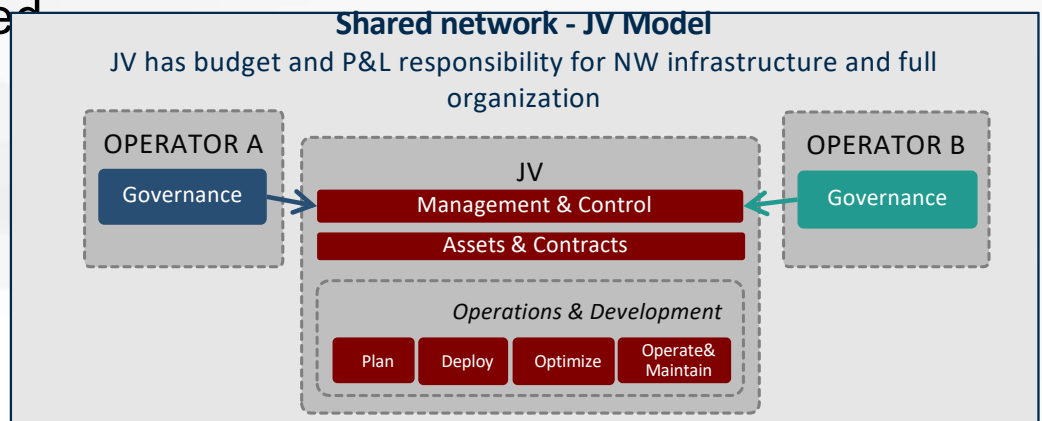
Effective planning for and execution of a consolidation initiative maximises project NPV

Agree deal – Operational model

Following M&A, the two operators' organizations typically merge into a new JV.
In the case of network sharing, the choice of operational model will determine to what extent an organizational merger is required

Operator challenges

- Adapt organization to the needs of the future business model and role in the eco system
- Understanding what key competencies are needed to manage consolidation and technology evolution (5G, NFV, IoT etc.)
- Find balance between insourcing and outsourcing
- Plan for how to manage staff redundancy
- In the case of RAN sharing, agree on JV model and mandate for JV



With its experience from MS services procurement and operational benchmarking, NGP can support operators with analysing the pros and cons with different models and dimensioning the new network organization

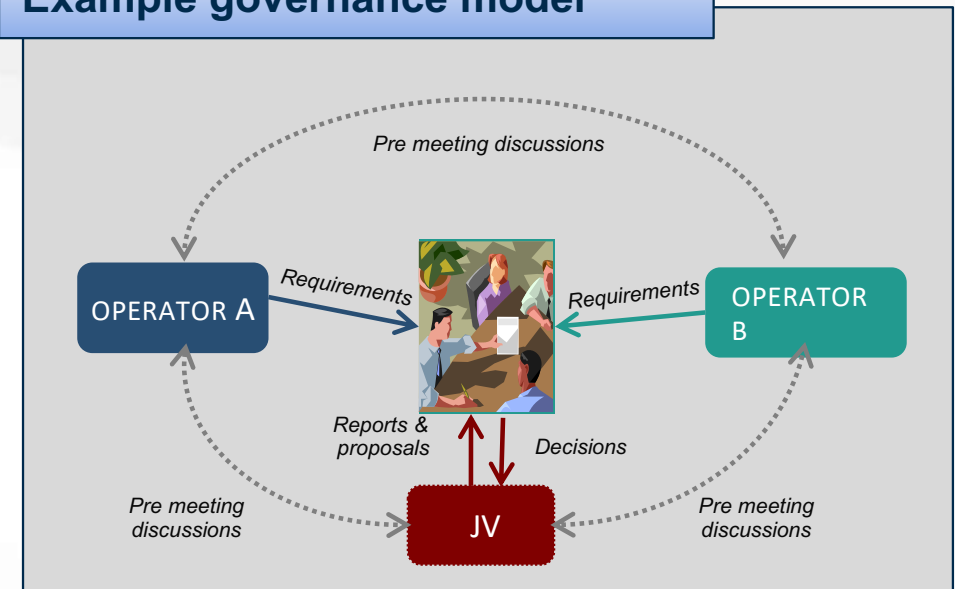
Agree deal – Network sharing model

The network sharing agreement is the foundation for the joint venture between the operators. It should support effective day-to-day management of a shared network and also secure long term survival of the cooperation

Operator objectives

- Secure fair network access & usage
- Build in enough flexibility to support technology and service evolution
- Manage neutrality & integrity in systems and communication
- Agree principles for allocating costs
- Design governance model with the right balance btw Operator control and JV independence
- Align requirements for JV reporting

Example governance model



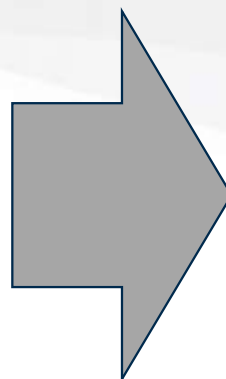
NGP has supported operators with developing and negotiating both passive and active sharing agreements

Prepare project – Implementation strategy

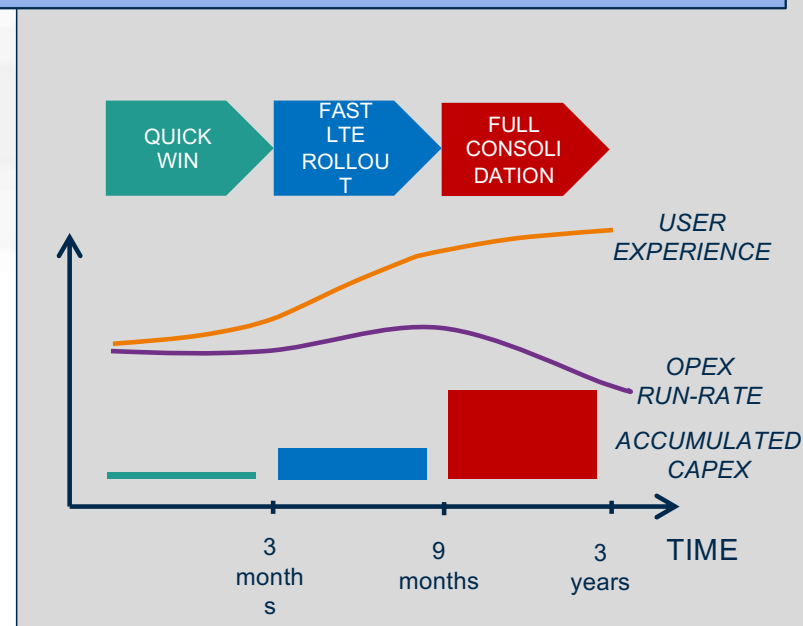
The high level plan is designed based on the key business objectives. Improving the end user experience has highest priority in most cases.

Operator Challenges

- What are the key activities to start with and how long will it take?
- How to quickly expand coverage footprint?
- How to obtain best in class user experience across technologies & frequency bands?
- What is the optimal balance between investment in target network, equipment reuse and overall cost reduction?
- How to simplify architecture & achieve scalability?



High level implementation plan



Learnings from reference projects and best practice developed by other operators help operator identify best solution and project approach

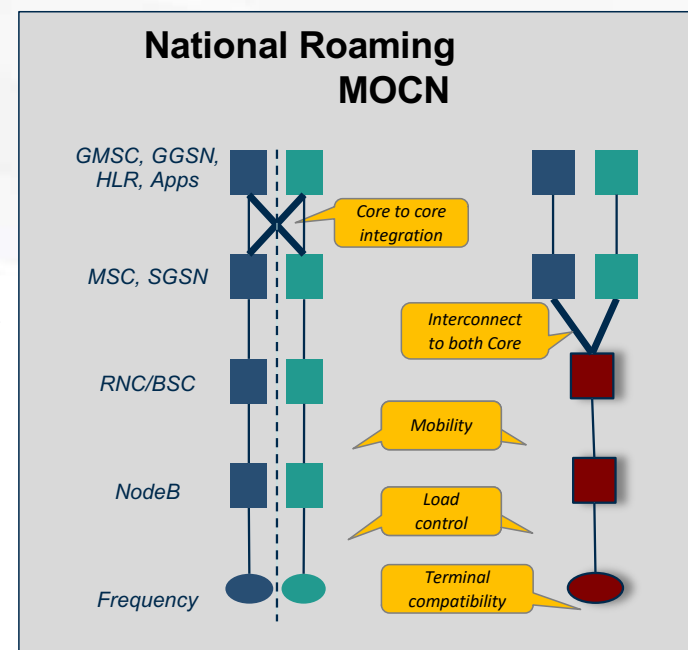
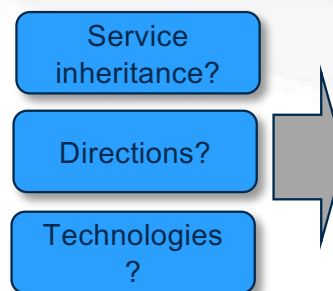
Prepare project – Quick coverage expansion

As a first step, operators often want to quickly expand coverage footprint.

Network sharing techniques National Roaming and MOCN are often used in this case, to quickly expand coverage by allowing subscribers from operator A to roam on operator B's network and vice versa

Each case is unique

- The solution design considers many aspects such as:
 - Implementation complexity
 - Vendor interoperability
 - Mobility
 - User experience impact
 - Time to market
 - Support for new use cases such as NB-IoT



Extensive lab and pilot testing is required to verify the chosen solution in the legacy network environment

Prepare project – RAN design

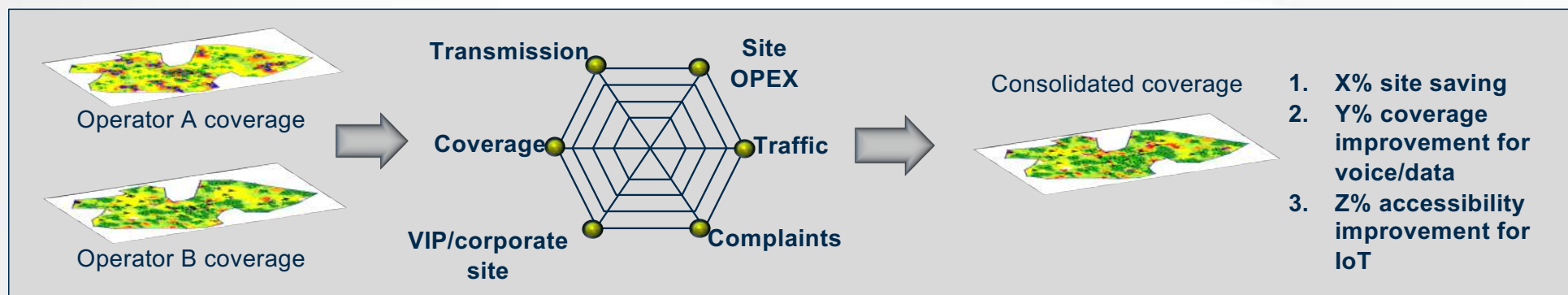
Proven tools and methodology are necessary to manage radio access network site selection and planning for optimal balance between cost saving and user experience

Scenario Complexity

- Multi-band
- Overlapping 2G/3G/4G
- Coverage/capacity balance
- Miscellaneous path connections
- End-user-centric vs. IoT-centric requirements
- 5G coverage requirements?

Required solution

- Synchronous 2G/3G/4G + 5G/LPWA
- Multi dimensional analysis
- Automatic planning
- Iterative calculation & optimal routing
- Solution fit with diverse requirements (people/IoT)



Poor site selection negatively affects network quality. Post deployment changes are expensive

Prepare project – Core design

It is essential to plan carefully for the migration of existing services supported by the Core and VAS platforms

Scenario Complexity

- Multiple services
- Legacy nodes and services
- Complex design
- Proprietary solutions
- Poorly documented existing design
- Multiple categories of subscribers with different services
- Regulatory and Legal requirements

Required solution

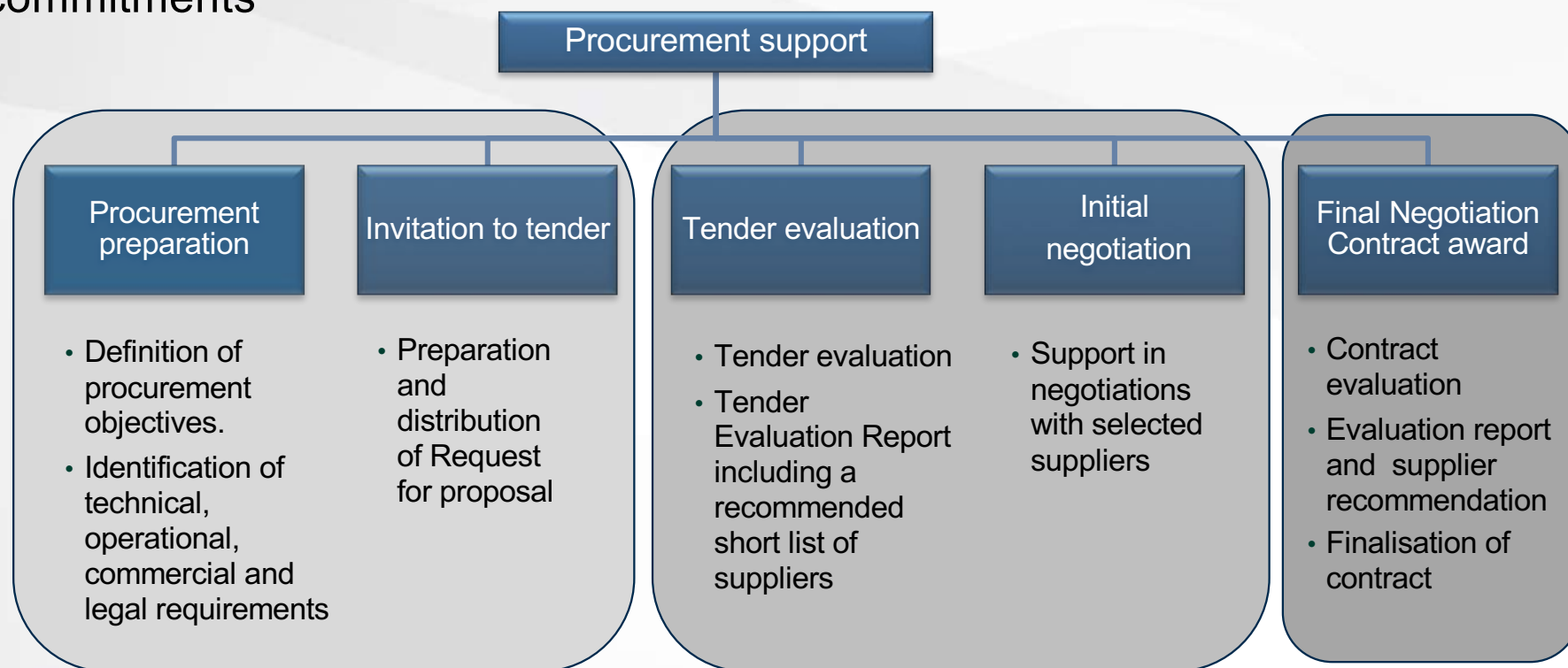
- Identify existing services
- Re-design existing services based on existing equipment
- Classify the categories of subscribers and the number of subscribers for each category
- Identify the traffic requirements for each type of service

- Conduct a business case analysis for the services to be migrated
- Marketing team should assess if it is worthwhile to migrate services with low usage and high cost for implementation

Core / VAS design will highly impact the experience of subscribers post-migration

Prepare project – Select vendors

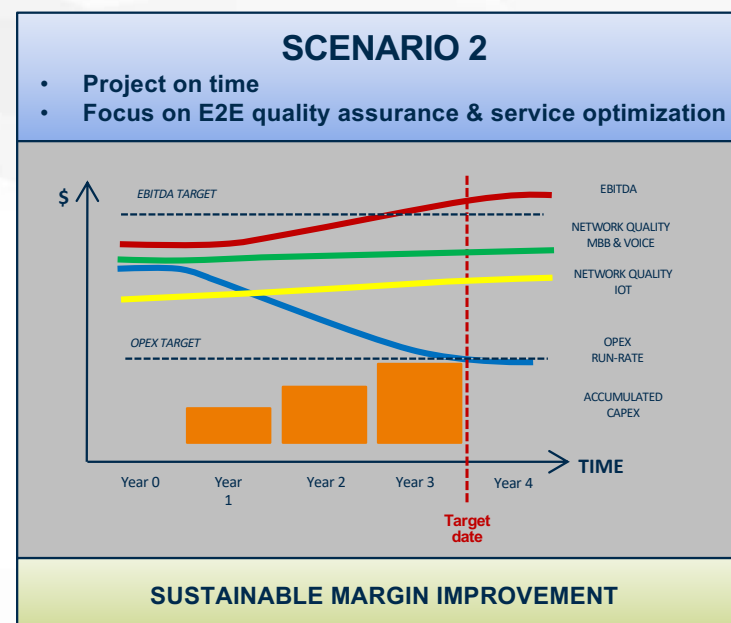
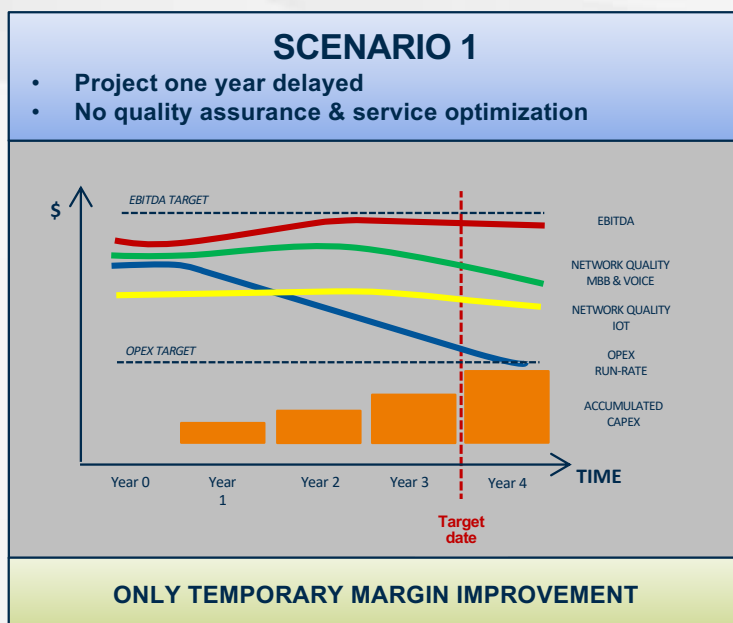
The success of the consolidation project is highly dependent on finding the best partners. Vendor selection must be based on a balanced assessment of suppliers' availability of resources with the required skills, offered pricing and performance commitments



NGP provides expertise in RFP preparation, tender evaluation, vendor selection and contract negotiations

Implement project - Execution is business critical

Poor execution performance delays OPEX saving and network modernization. Network quality is degraded, increasing churn and reducing ARPU over time. Network consolidation must address both cost and revenue for sustainable improvement



Innovative implementation solutions and delivery model are required to manage user experience, reduce need for rework and minimize overall lead time

Implement project – Project planning

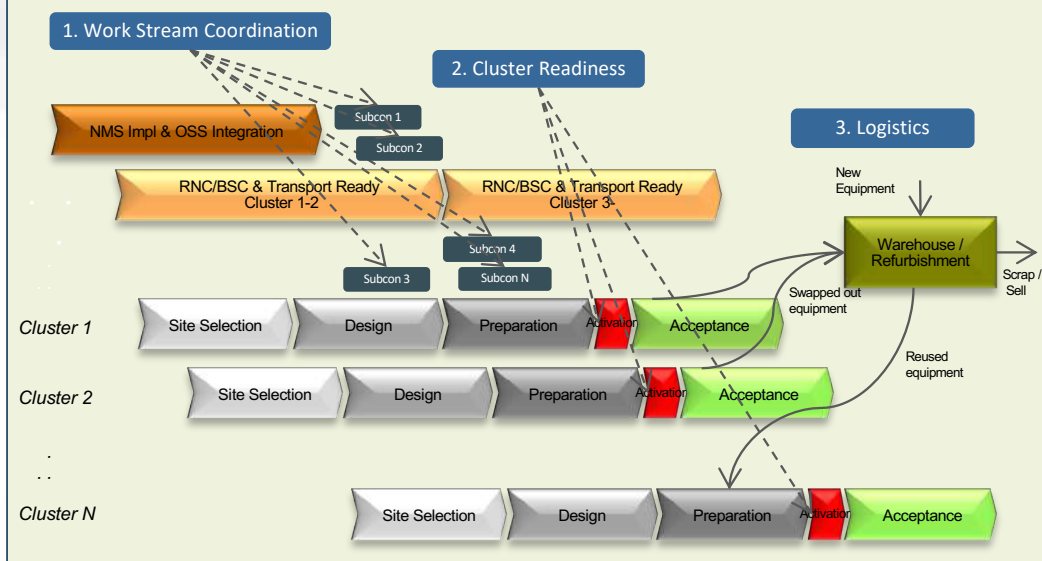
A network consolidation project is much more complex to execute than a traditional swap or rollout project. To complete it in time, on budget & without risking the user experience is a very demanding task.

During the project planning, the high level implementation plan is broken down into smaller activities, phase by phase and domain by domain

Operator Challenges

- Manage dependencies between a multitude of activities, subcontractors and 3rd parties
- Coordinate between network domains for maximum synergies
- Get the project up and running as quickly as possible (including logistics)
- Maintain focus on the end user experience during execution
- Quickly detect & act on coverage degradation, congestion or mobility problems

Critical Tasks

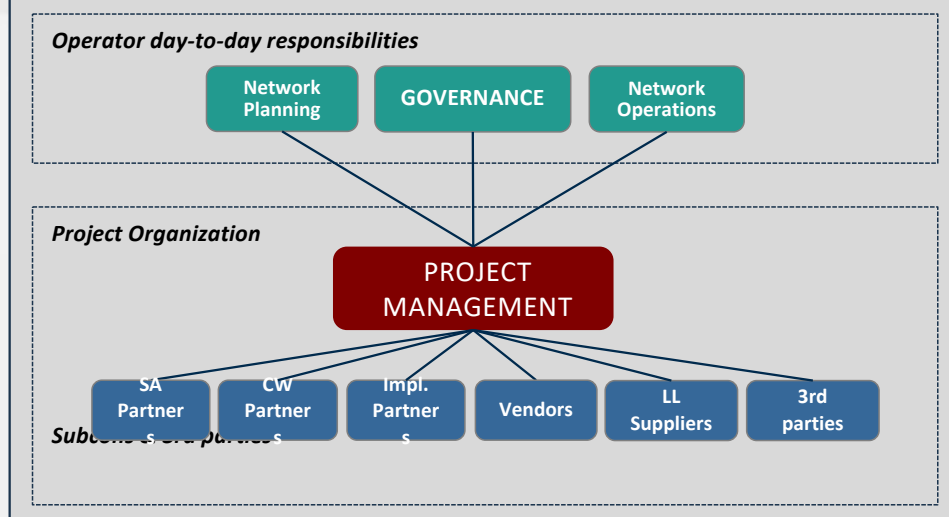


Successful consolidation requires a delivery model adapted for the complexity, in combination with new competencies and skills

Implement project – Delivery model

Experiences from consolidation projects in recent years show best result is achieved if one party with relevant experience has full responsibility E2E for project execution and quality assurance. This could be an inhouse or outsourced function.

Example Project Model



Success factors

- Clear governance & accountability
- Quick project start and ramp up by reusing best practice & expertise
- Proven methodology increase efficiency, maximize synergies, reduce human errors & unplanned downtime
- Project mgt. team capable of managing both execution and technical challenges
- Understanding the needs of future business and revenue models

With its extensive experience from managing large and complex projects, NGP is the ideal partner for project delivery model design and implementation

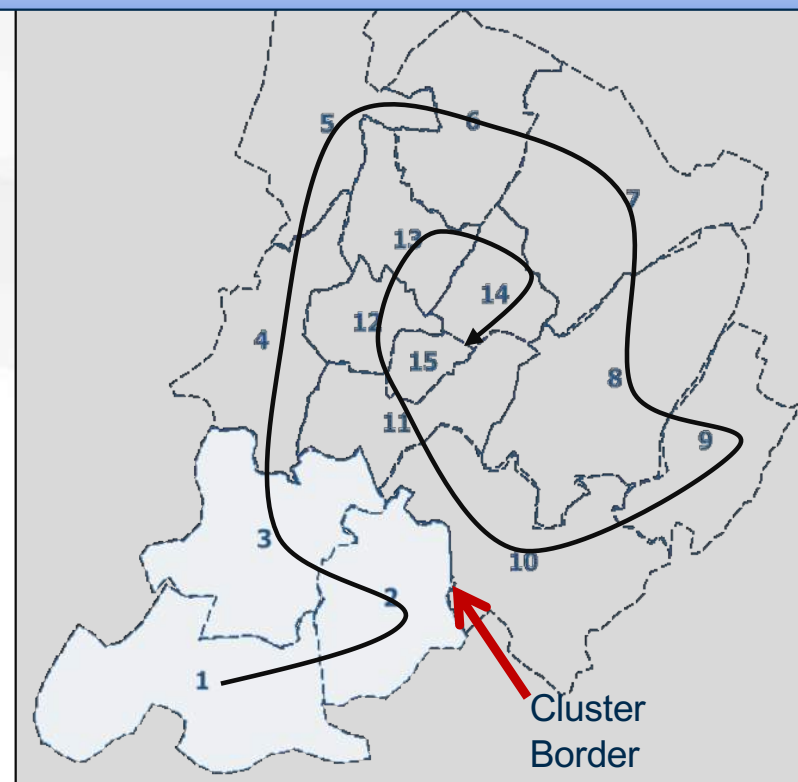
Implementation project – Methodology

Consolidation of RAN is by far the most costly and resource consuming part of the project.

Challenges

- Manage mobility between consolidated and non consolidated areas
- Avoid risk for congestion & coverage degradation when sites are turned off
- Coordinate cluster preparations for radio and transmission to maximize synergies
- Manage handling of swapped out equipment for timely reuse in other sites
- Coordinate site design of active and passive equipment

Example showing cluster based approach



Without a highly effective and robust implementation methodology, mistakes will occur, resulting in delays, dissatisfied end users and degraded financial performance

Implementation project – Methodology

Consolidation of Core, if not planned properly, has a risk of impacting existing user experience

Challenges

- Live subscribers with legacy services
- Services re-design
- Subscriber migration
- Mobile number portability
- SIM cards and logistics
- Elaboration of migration plan
- Communication with subscribers to be migrated
- Monitoring & testing during and after migration

Example of migration steps

1. Capacity assessment of new subs & services
2. Procurement, if required
3. HLD for services to migrate
4. LLD for services to migrate
5. Acceptance testing
6. Migration plan for subscribers
7. Migration monitoring & testing plan
8. Test the migration plan with Friendly Users
9. Migrate subs with low complexity services
10. Migrate subs with high complexity services
11. Monitor migration success

The migration methodology for Core has to be carefully prepared and tested, for each step of the migration

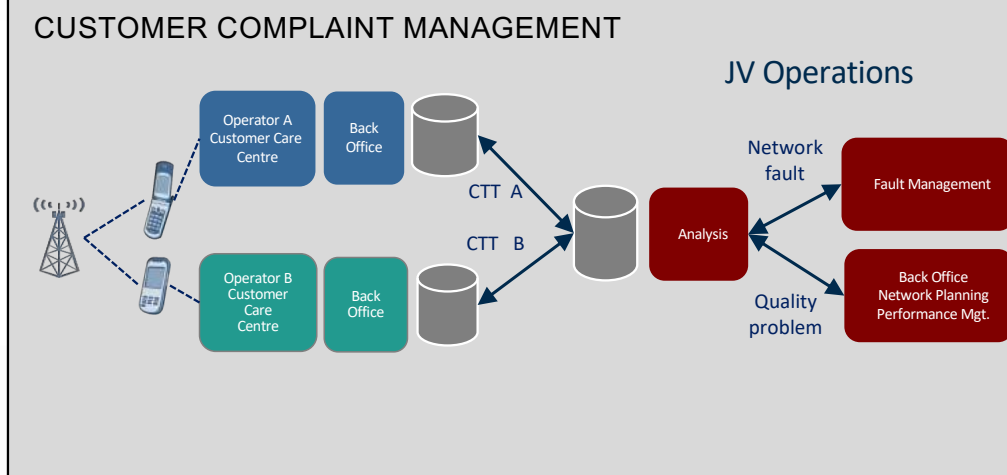
Implement project – Quality Assurance

During consolidation, operational and support processes must function independently of fault or complaint location, in consolidated or non consolidated areas. This requires close coordination between the two operators before and during the merger of the two organizations.

Operator Challenges

- Adapt operational processes to maintain service level with roaming implemented and a continuously changing border between consolidated and non consolidated areas
- Integration of OSS's for effective ticket handling etc.
- Align operational SLA's on a service by service basis

Example solution



Tools and processes must be adapted in order to maintain service levels
in network operations and customer support

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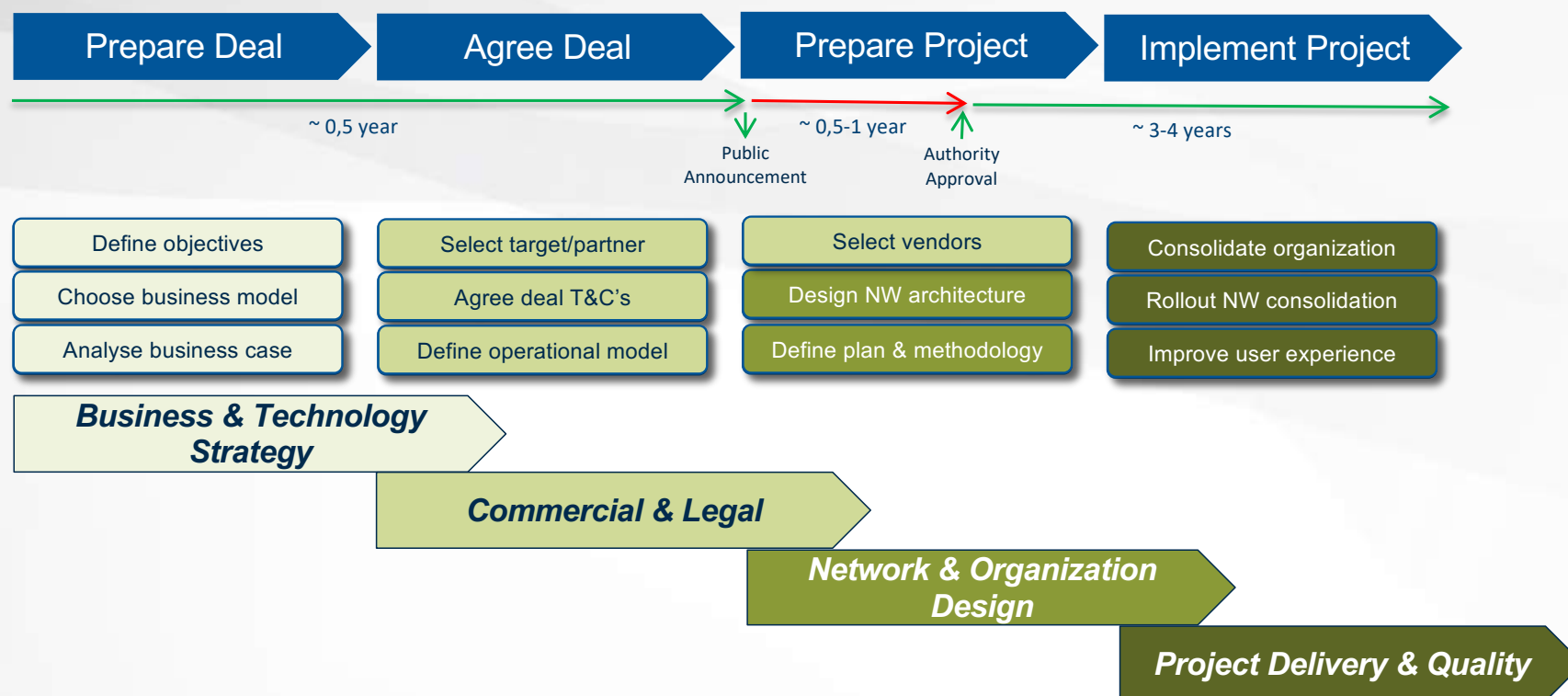
How we can help

References

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How can we help?

The previous slides emphasize the need to have an end-to-end approach to network consolidation. The collective telecom expertise of our team of advisors, all specialists in their field with ability to see the full picture, sets us apart as consulting partner for consolidation projects.



With Netcom Global Partners as your Partner, key business objectives are achieved

Customer Experience

Time To Market

TCO Saving

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Network consolidation experience

The network consolidation experience of NGP and its affiliates ranges from business case analysis and strategy definition, to systems procurement, target network design and project implementation.

Development of Strategy for Quick Coverage Expansion following Acquisition

- Working on behalf of a large American operator, we developed a strategic plan for network consolidation following acquisition of an operator in Latin America. This included analysis of different solutions (MOCN or National Roaming) for achieving quick expansion of 3G and 4G coverage footprint.

Negotiation and Implementation of Active Network Sharing Agreement

- Working on behalf of a RAN sharing JV in Northern Europe, we negotiated and implemented an improved network sharing agreement between the JV and the two operators.

Programme Management of Group-wide Consolidation Initiative

- Working on behalf of global mobile operator with operations in 15 countries, we managed a group-wide programme to reduce network OpEx through active sharing initiatives across group markets
- Collectively, these initiatives delivered over USD 1 billion in incremental value to the group

Network consolidation experience

The network consolidation experience of NGP and its affiliates ranges from business case analysis and strategy definition, to systems procurement, target network design and project implementation.

Migration of Subscribers & Services following Network Acquisition

- Working on behalf of an operator in Norway, we developed a strategy for migrating subscribers and services from the old network to the new network, and executed the migration plan
- Identification of services to be migrated, re-design of services on new network, business case evaluation of services to be migrated
- Elaboration of migration strategy for subscribers, dry testing, execution and monitoring of migration

Network merge of two wireless networks (2G/3G/4G)

- Supporting an operator in Indonesia for the merge strategy
- High level solution: migration strategy, design and planning principles, definition of intermediate steps and end-state, risks and trade-offs analysis
- Project Plan: Elaboration of the Detailed Migration Plan

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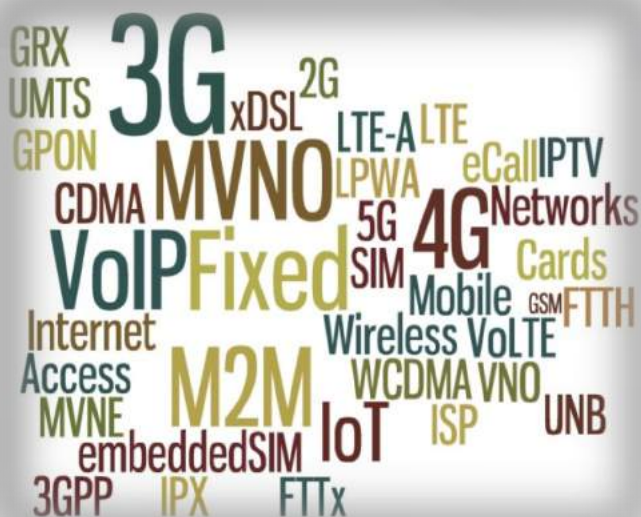
NGP is a global consultancy providing telecommunications sector clients expert advice and support on strategy, technology, operational and other issues, enabling clients to profitably compete and grow their businesses.



- 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
- 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 and 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

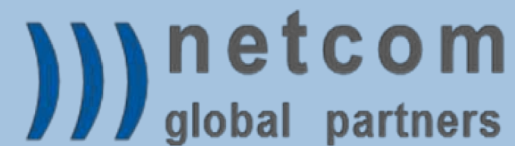
Our global experience

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 | • Nokia Networks | • Telenor |
| • Axiata | • Orange / Getesa | • TeliaSonera |
| • Bell Canada | • Orange / Jordan | • Telkomsel |
| • Batelco | • Orange /Switzerland | • Teracom |
| • CellularOne | • Umniah / Jordan | • T-Mobile / Germany |
| • Canadian Imperial Bank of Commerce | • Orascom Telecom (now Global Telecom Holding / Vimpelcom) | • T-Mobile /Poland |
| • Digicel | • Ooredoo Group | • Tigo / Millicom |
| • Du | • OnePhone | • TIM Brazil |
| • Emtel | • Sabafon | • Turkcell |
| • Ericsson | • SmarTone | • Viettel |
| • FarEasTone | • Smart Philippines | • Vivendi |
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