analysys mason

www.analysysmason.com

Presentation for Industry Group 1 (IG1)

2012 update of OPTA's fixed and mobile BULRIC models

5 July 2012 • Ian Streule, Matthew Starling, Alex Reichl

Confidentiality notice

analysys mason

Introduction

Background to the original BULRIC model

Updates proposed to the BULRIC models

Next steps

Supplementary material

Introduction

- Analysys Mason Limited ('Analysys Mason') has been commissioned to assist the Onafhankelijke Post en Telecommunicatie Autoriteit ('OPTA') in updating the existing bottom-up long-run incremental cost (BULRIC) models for fixed and mobile networks in the Netherlands
  - the original BULRIC models were released in April 2010
  - the updated versions of these BULRIC models will help inform future OPTA decisions on the pricing of regulated fixed and mobile services after the current regulation ends in 2013, until 2016

The Analysys Mason project team

Name and title	Role in the project
Ian Streule (Partner)	Project Director (and Project Manager for development of the original BULRIC models)
Matthew Starling (Manager)	Project Manager, leading the update of the BULRIC models
Alex Reichl (Associate Consultant)	Assisting in the update of the BULRIC models

analysys mason

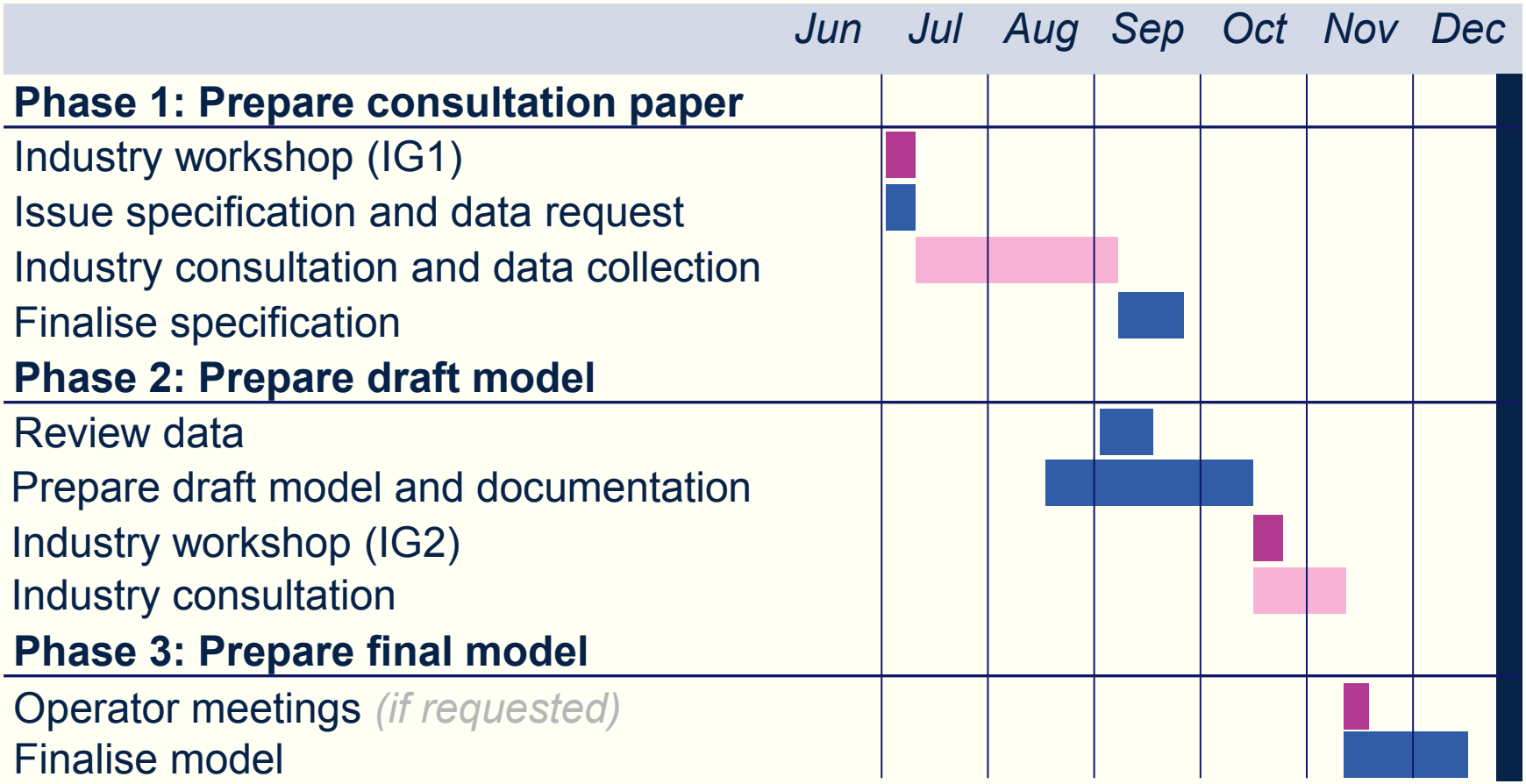
The process involves three phases, with industry involvement requested in each

Phase 1: Consultation paper preparation	▪ Issue specification and data request issued ▪ Industry workshop (IG1) ▪ Period of industry consultation and data collection ▪ Finalisation of specification
Phase 2: Draft model preparation	▪ Data review ▪ Preparation of draft model and documentation ▪ Industry workshop (IG2)
Phase 3: Final model preparation	▪ Operator meetings (if requested) ▪ Finalisation of the updated BULRIC models

KEY Project task Project task involving industry

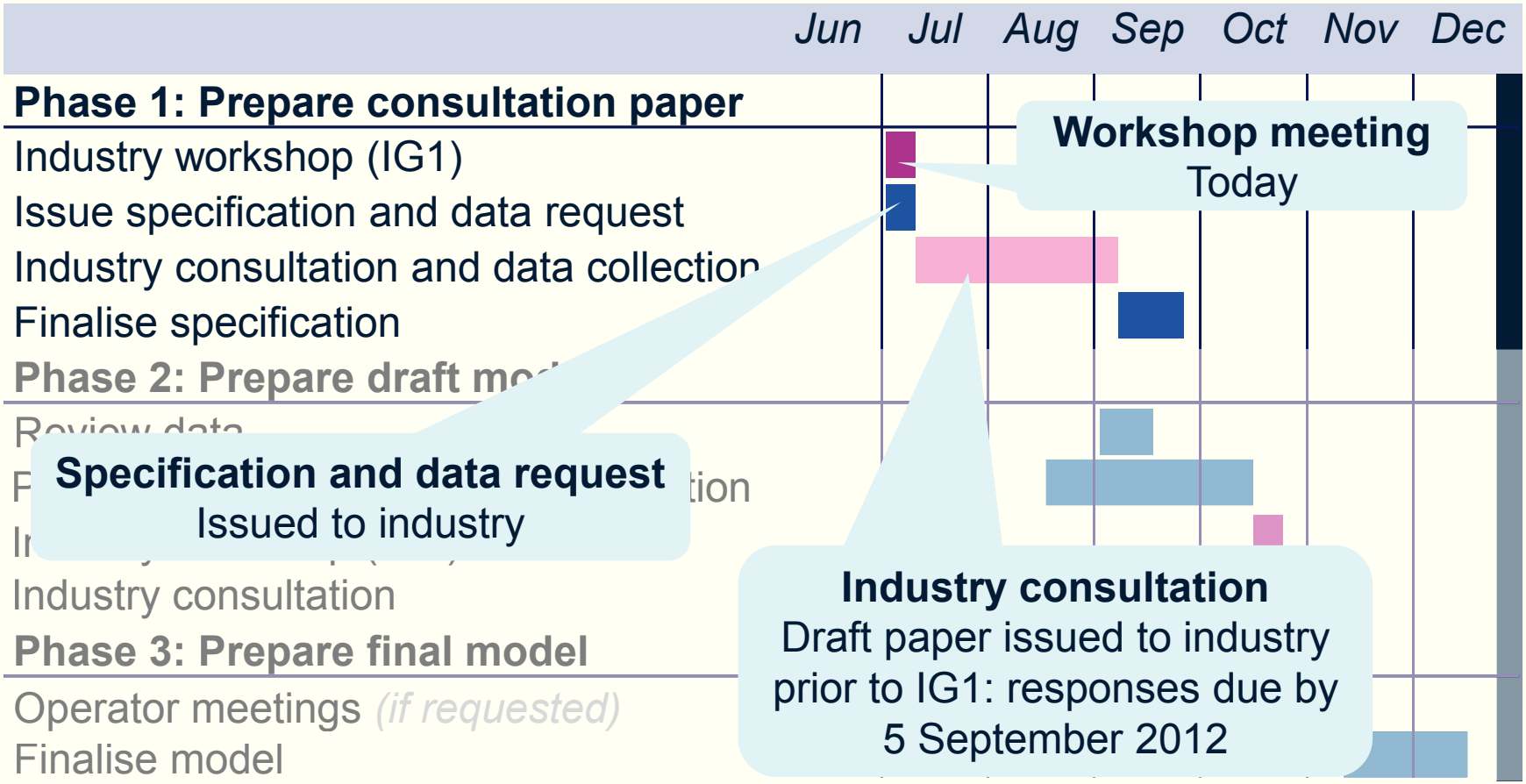
analysys mason

The project is due to last six months



analysys mason

Phase 1: Prepare consultation paper

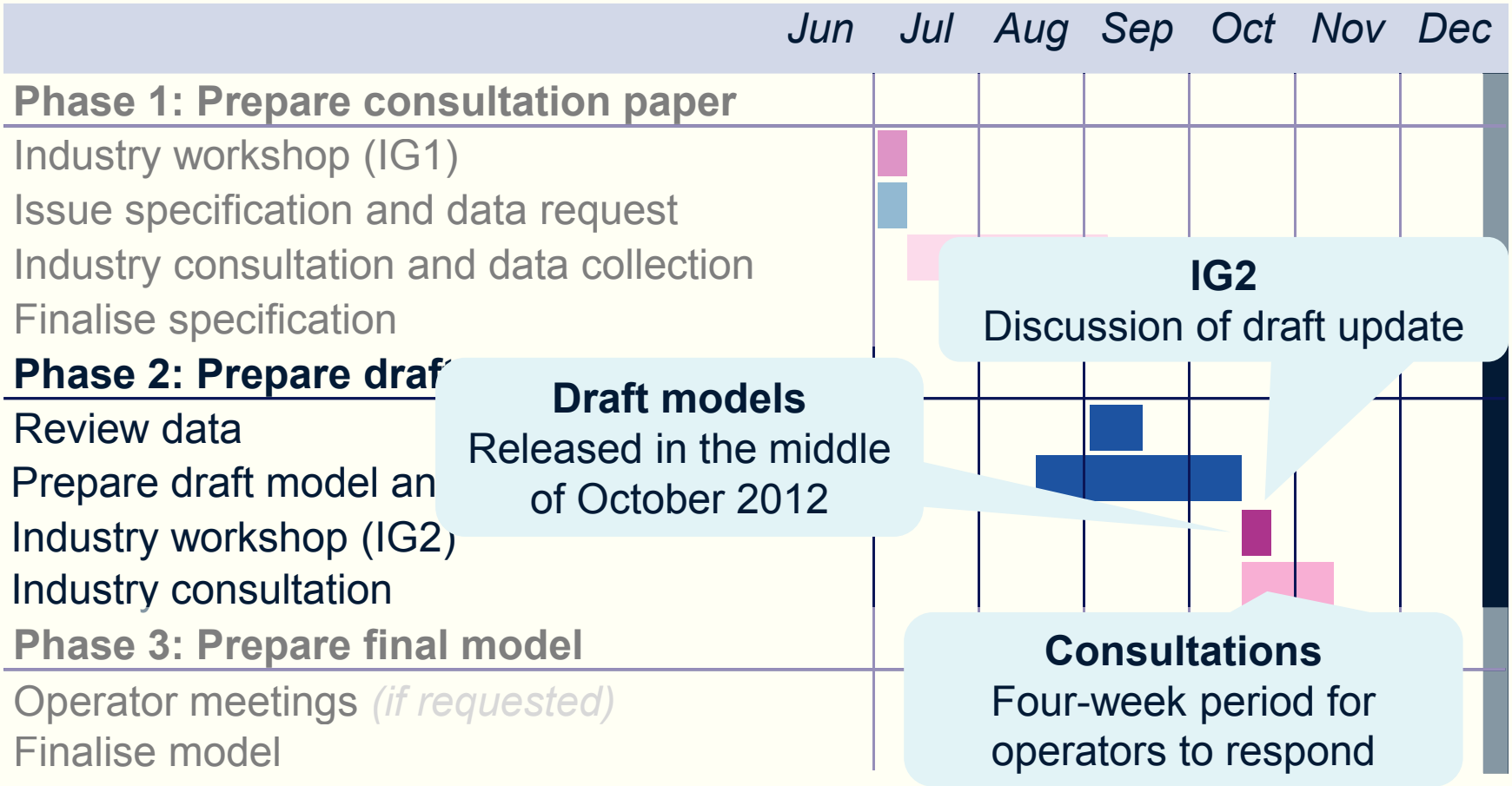


KEY

- Model development
- Operator consultation period
- Industry meetings/workshops
- Holiday periods

analysys mason

Phase 2: Prepare draft model

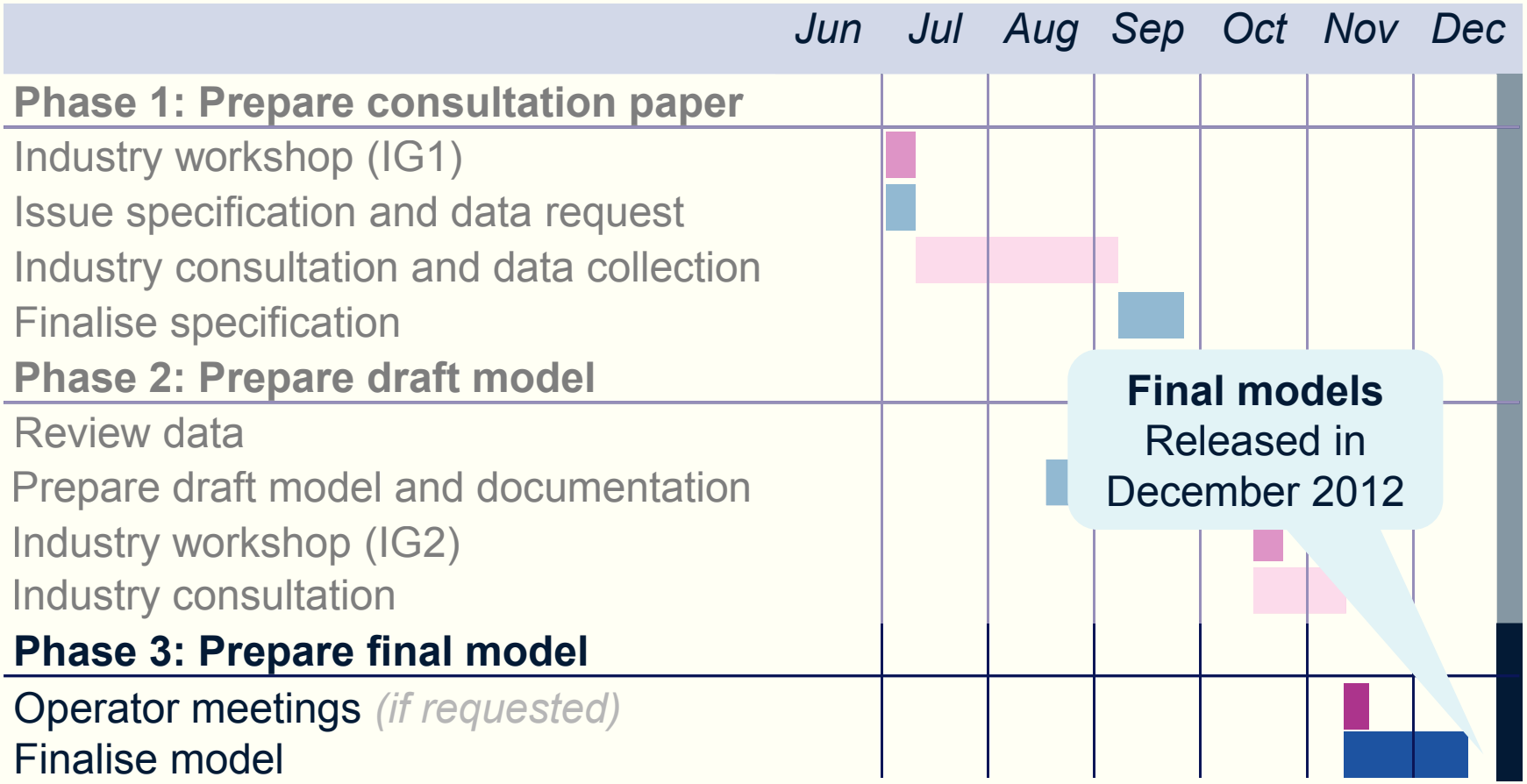


KEY

- Model development
- Operator consultation period
- Industry meetings/workshops
- Holiday periods

analysys mason

Phase 3: Prepare final model



analysys mason

Introduction

Background to the original BULRIC model

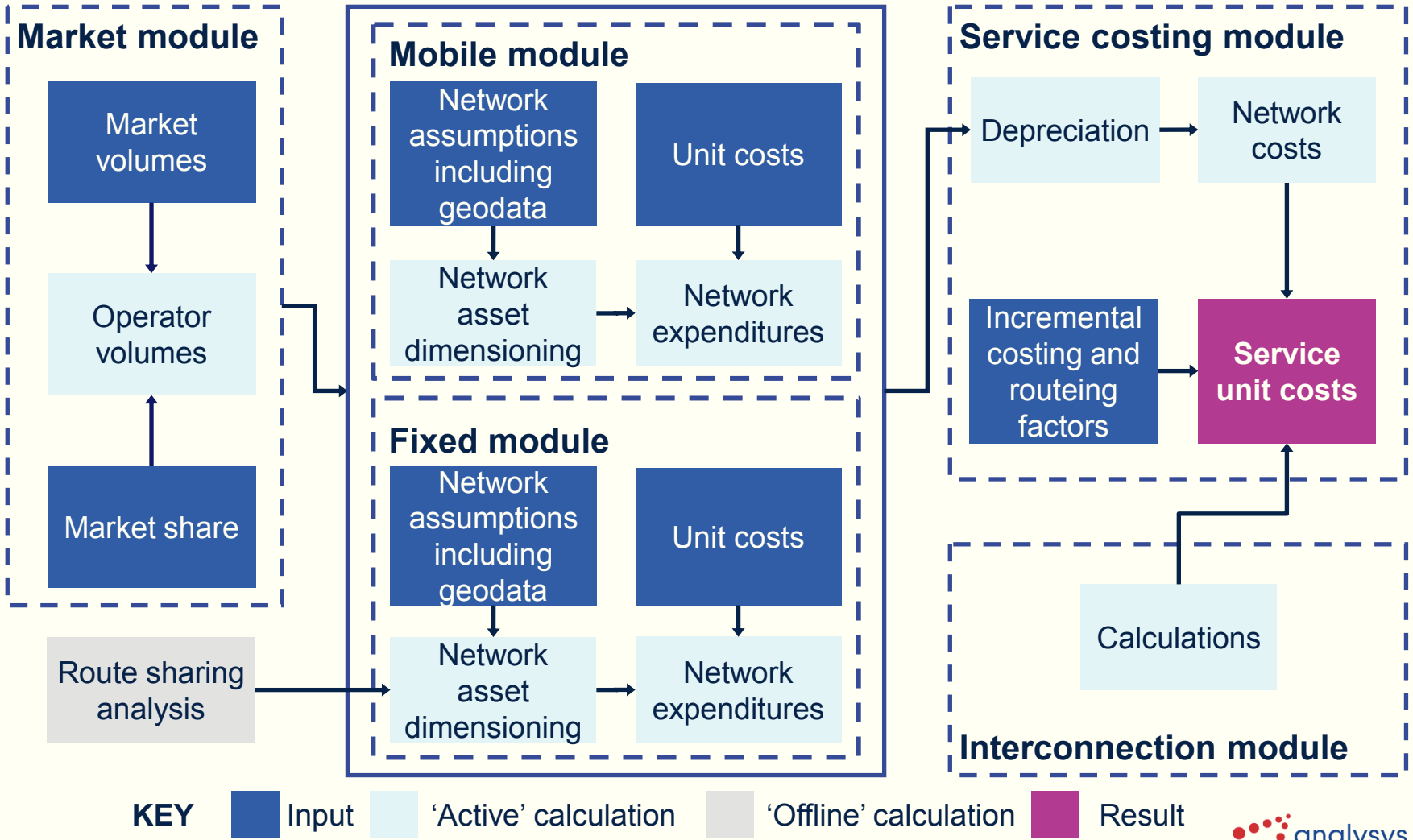
- Model specification
- Mobile network design
- Fixed network design
- Costing approaches

Updates proposed to the BULRIC models

Next steps

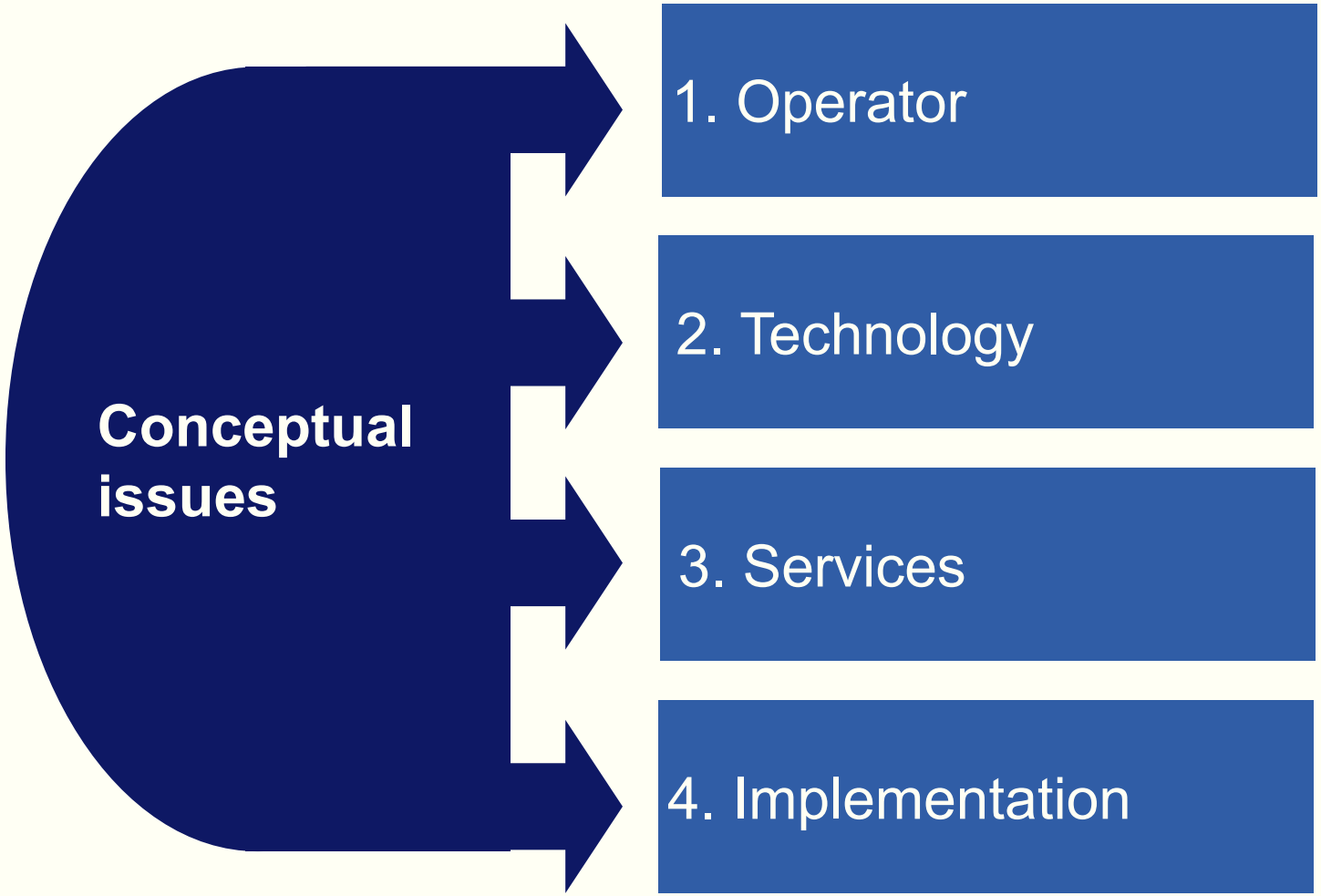
Supplementary material

A modular approach was used in the construction of the model



analysys mason

The original model was developed according to four key dimensions



analysys mason

Original concepts: Operator

1. Operator
2. Technology
3. Services
4. Implementation

Conceptual issue	Recommendation for original model
Type of operator	Develop models of hypothetical existing operators
Network footprint of operator	National levels of coverage, with indoor coverage for the mobile networks
Market share	50% market share for the fixed operator and 33.3% market share for the mobile operator
Roll-out and market share profile	Hypothetical profile applied consistently to both the fixed and mobile models
Scale of operations	Service provider and MVNO volumes will be included in the market, and full-scale operations modelled

KEY To be revisited

analysys mason

Original concepts: Technology [1/2]

1. Operator

2. Technology

3. Services

4. Implementation

Conceptual issue	Recommendation for original model
Radio network	GSM deployed in 900MHz/1800MHz bands, UMTS as 2100MHz overlay
GSM radio spectrum	Model an operator with 33.3% of 67.6MHz of 900MHz spectrum and 33.3% of 114MHz of 1800MHz spectrum
UMTS radio spectrum	Model an operator with 2×10MHz of UMTS spectrum
Spectrum payments	Assume 15-year spectrum licences with assumed values of per MHz per pop
Mobile switching network	Deploy 2G+3G MSCs at launch, followed by MSS+MGW layered equipment
Mobile transmission network	Model a national leased dark fibre network and self-provided transmission equipment running STMn in the 2G/3G core network, with Gbit/s after 2011

KEY To be revisited

analysys mason

Original concepts: Technology [2/2]

1. Operator

2. Technology

3. Services

4. Implementation

Conceptual issue	Recommendation for original model
Fixed access network	Model a copper-based fixed access network using VDSL at the MDF
Fixed switching network	An IP BAP NGN will be modelled, with associated platforms and support for a reasonable level of redundancy and service qualities
Fixed transmission network	Model IP and IP/MLPS over Ethernet and WDM in the fixed next-generation core network
Network nodes	Apply the modified scorched-node principle

KEY To be revisited

Original concepts: Services [1/2]

1. Operator

2. Technology

3. Services

4. Implementation

Conceptual issue	Recommendation for original model
Service set	Provide all the commonly available Dutch voice and non-voice services. The associated economies of scope will be shared across all services
Fixed voice services	All voice traffic will be modelled, independent of specific technologies (such as ISDN) that can be used
Fixed non-voice services	Fixed transmission services, interconnection establishment, co-location and xDSL data backhaul will be modelled as different services
Fixed NGN services	All fixed services are defined as technology-independent and thus can be conveyed via an NGN

KEY To be revisited

analysys mason

Original concepts: Services [2/2]

1. Operator

2. Technology

3. Services

4. Implementation

Conceptual issue	Recommendation for original model
Mobile services	Aggregate mobile traffic across all subscriber types
Traffic volumes	Apply a market-average profile to the modelled 1/N operator
Points of interconnect	Fixed and mobile interconnection will both be modelled at four points
Interconnection and co-location	A separate module will calculate the costs of services applicable to voice interconnection These costs will not be allocated to voice minutes
Wholesale or retail costs	Only wholesale network costs will be included in the cost models Retail costs will be excluded

KEY To be revisited

analysys mason

Original concepts: Implementation [1/2]

1. Operator

2. Technology

3. Services

4. Implementation

Conceptual issue	Recommendation for original model
Increment approaches	Calculate Pure BULRIC, Plus BULRAIC and Plus Subscriber BULRAIC
Demarcation between traffic- and access-related costs	Assumed to be the first point of traffic concentration in the network such that resources are driven by traffic load
Depreciation method	Use economic depreciation
Modelling timeframe	Employ a 50-year modelling timeframe, using 2004–2053

KEY To be revisited

analysys mason

Original concepts: implementation [2/2]

1. Operator
2. Technology
3. Services
4. Implementation

Conceptual issue	Recommendation for original model
WACC	Will be maintained unless OPTA requires changes to the WACC calculation methodology to be made
Mark-up mechanism	Use EPMU in the Plus BULRAIC and Plus Subscriber BULRAIC models No mark-up is required in the Pure BULRIC case Include facility for non-EPMU

KEY To be revisited

analysys mason

Introduction

Background to the original BULRIC model

- Model specification
- **Mobile network design**
- Fixed network design
- Costing approaches

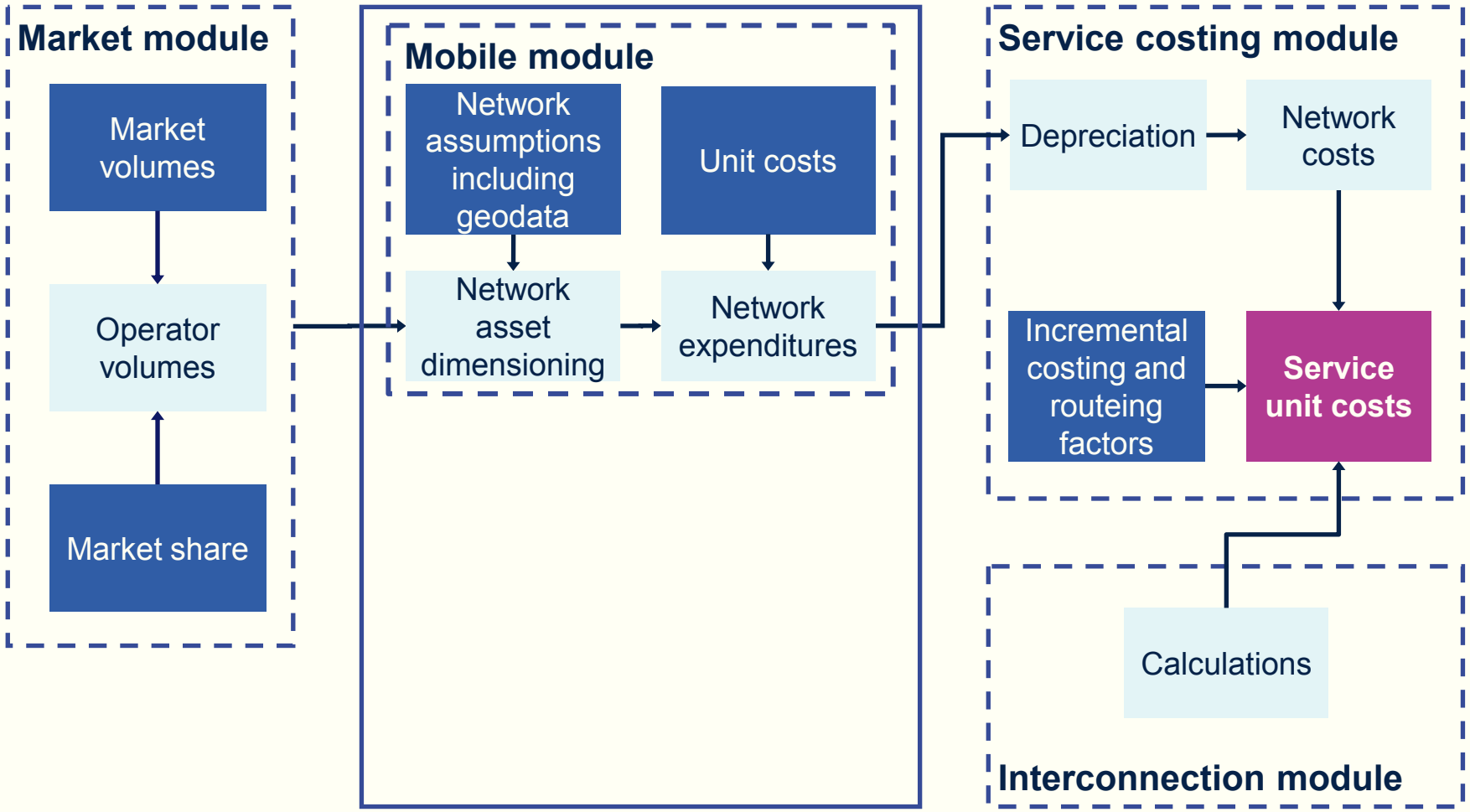
Updates proposed to the BULRIC models

Next steps

Supplementary material

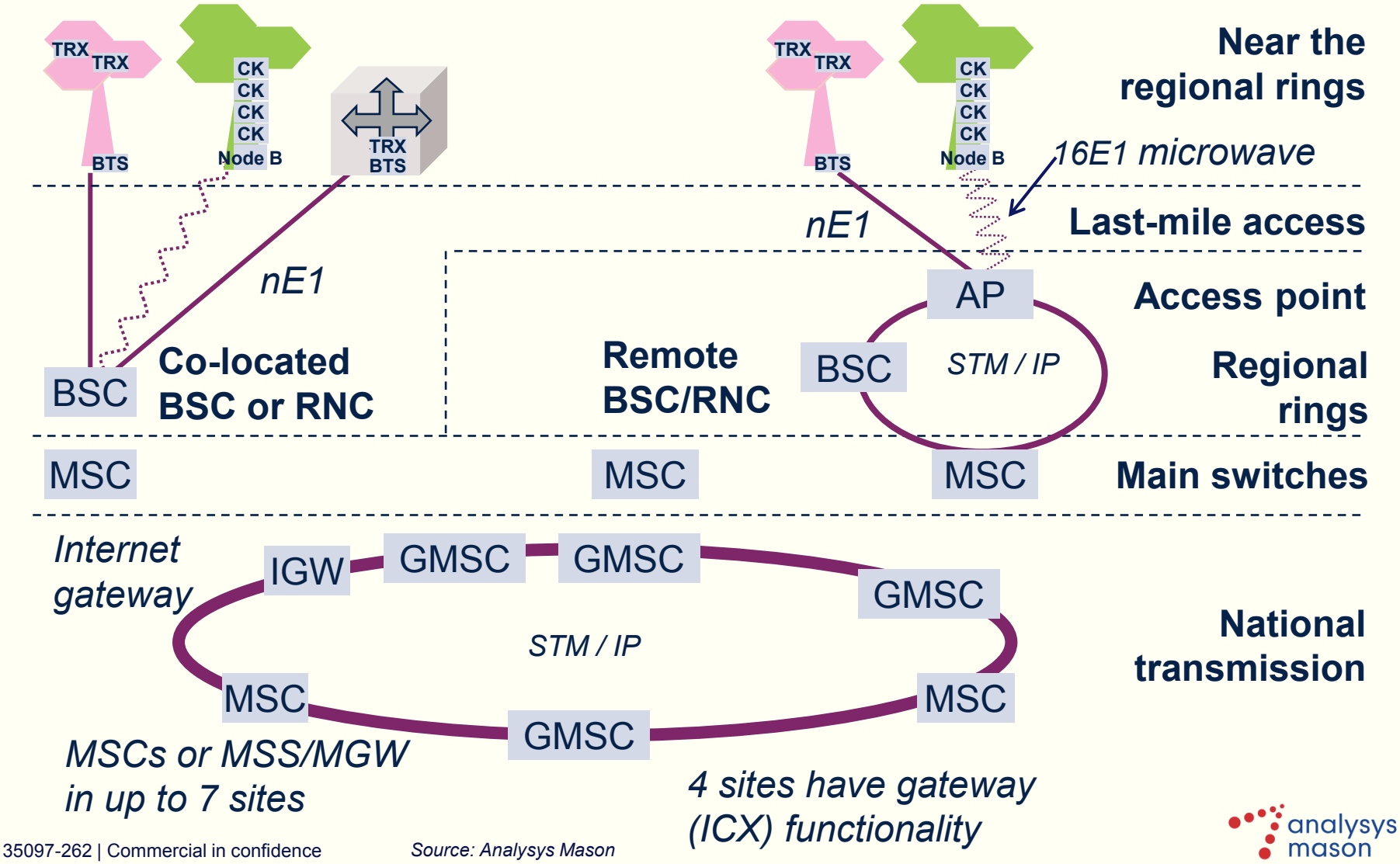
analysys mason

A modular approach was used in the construction of the model



analysys mason

Overview of mobile network



Source: Analysys Mason

analysys mason

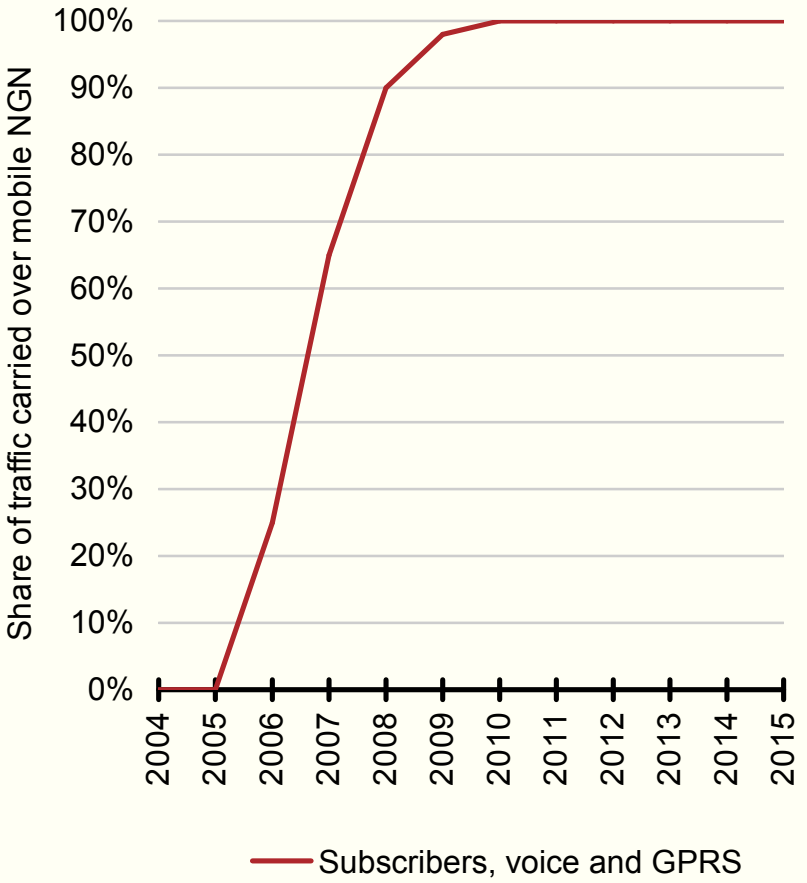
We modelled a hypothetical existing operator, assuming coverage and market share

- The model enabled the calculation of a cost that is relevant for the existing suppliers of termination in the Netherlands
- Actual network characteristics were taken into account
  - 2G roll-out in 2004/05
  - service launch in 2006
  - adding capacity with 1800MHz
  - adding overlay with 2100MHz
- We modelled coverage such that our operator rolled out a national network at launch
  - this reflected the existing providers
- We modelled a market share of 33.3%
  - an objective *and* neutral approach led to the use of a market share of 1/N
    - there are three national mobile operators

A rapid rate of network roll-out was assumed

- It was assumed that the operator has access to a full 1/N share of the mobile market at launch
  - i.e. it has a pre-existing legacy business
- Our approach was that the rate of network roll-out was rapid
  - *national roll-out during 2004/2005*
- We used a roll-out curve to model the load-up for basic services (voice, SMS and low-speed data)
  - this load-up curve is a key input to the mobile model

Mobile network load-up curves



Source: Analysys Mason

analysys mason

The mobile radio technology is a mix of GSM900/1800 and UMTS2100

- Spectrum allocations were considered to be endogenous
  - operators own similar amounts of 900MHz
  - 1800MHz and 2100MHz allocation is asymmetric, but compensated by spectrum payments
- It was therefore assumed that forward-looking spectrum and coverage costs were symmetrical

- GSM/UMTS appeared to be the efficient technology mix
  - all existing operators used a GSM/UMTS mix
  - they operated in a competitive market, stimulating efficient use of technology
- We assumed that 4G was unlikely to be used to deliver large volumes of voice termination in the short term

We assumed that the modelled operator had a 1/3 share of 900MHz and 1800MHz spectrum and 2×10MHz of 2100MHz spectrum

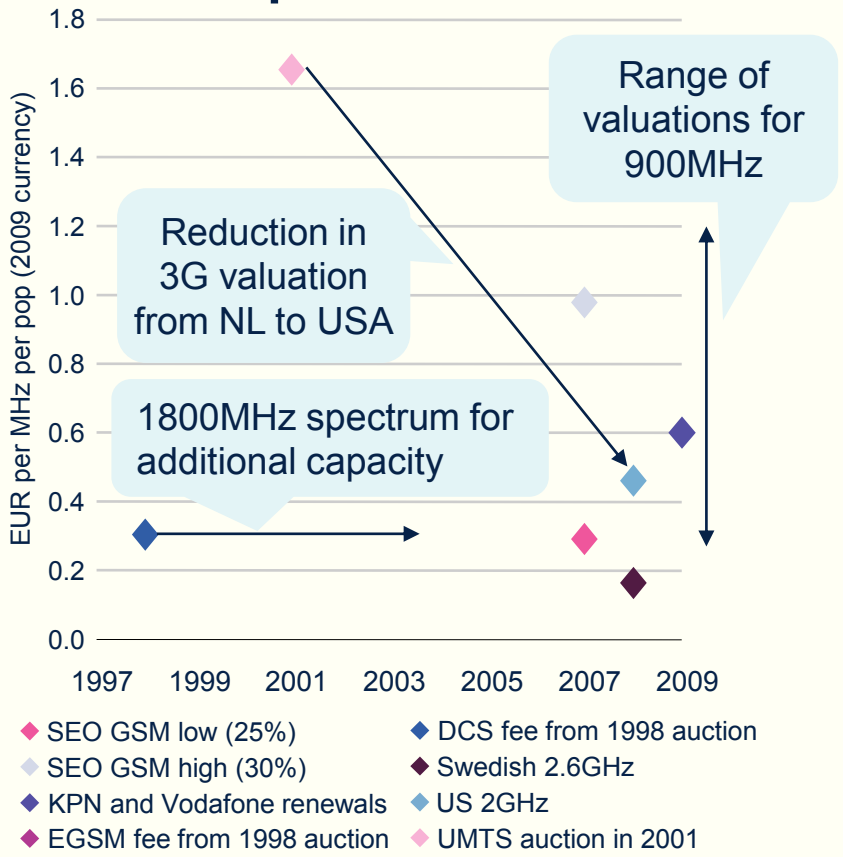
We used both GSM900/1800 and UMTS2100 radio technology, with UMTS as an overlay

Mobile spectrum fees were defined from a series of auctions

- Spectrum fees have historically been assigned by different mechanisms (e.g. auction, allocation, extension, trade, etc.)
- We applied a "current valuation" for mobile spectrum, based on recent auctions that were likely to indicate the value of spectrum for mobile network use in the Netherlands

	900MHz	1800MHz	2100MHz
Total amount	22.6	38.0	20.0
EUR per MHz per pop, for a 15-year licence	0.70	0.30	0.45
Fee, EUR million	259	186	147

Relevant spectrum valuations

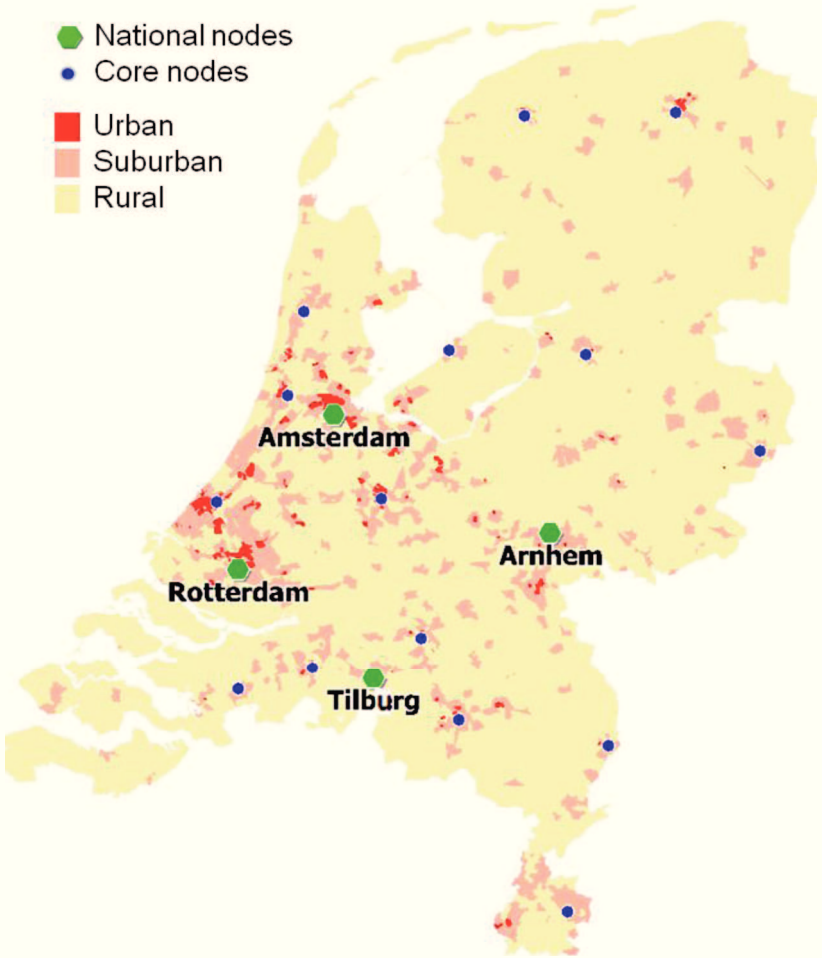


Source: Analysys Mason

analysys mason

Main nodes are based on population centres and operator information

Main node locations



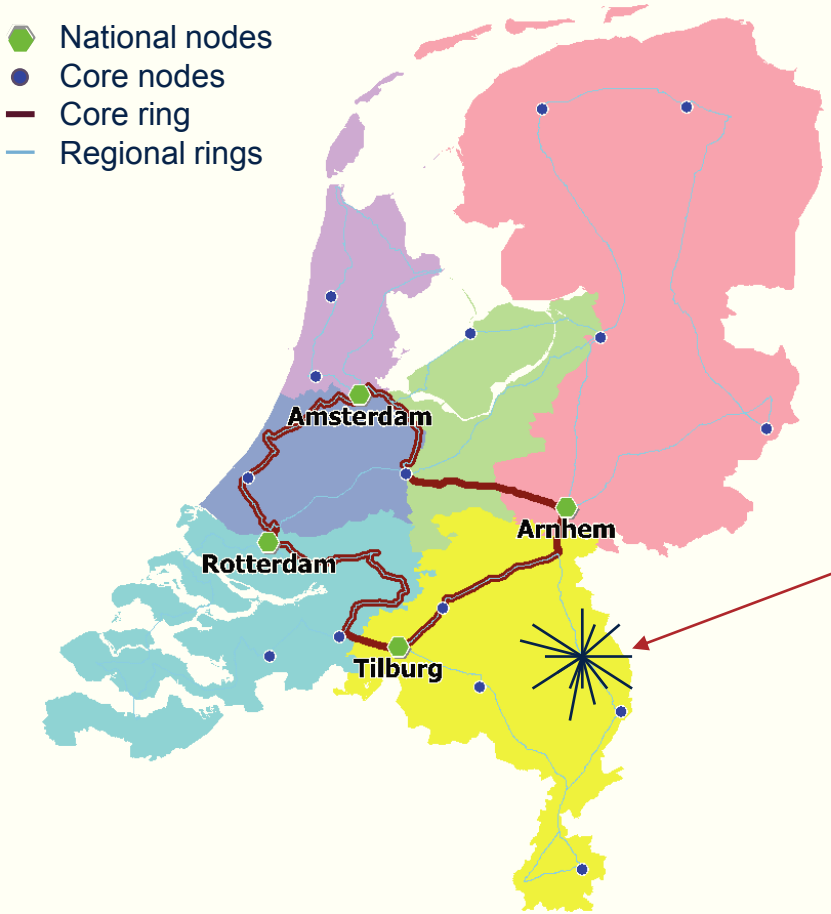
- We obtained population and area data for 4000 Dutch Zip4 regions
- Geotypes were specified by population density (consistent with the 2006 mobile model)
- We identified 19 main node locations corresponding to areas with high population density
  - around 12% of radio sites serve urban areas, which account for only 0.95% of the land mass
  - compared with rural sites, a greater proportion of urban sites are multiple-technology

Source: OPTA, Statistics Netherlands, Analysys Mason geo-analysis

analysys mason

The Netherlands is served by 1 central core ring and 6 regional rings

Regions and mobile rings



- A central core ring connects eight main cities in the central region
  - four national nodes were identified on the central core ring based on a visual scorched-node approach
- We split the Netherlands into six regions served by six rings
  - each ring is connected to at least one national node
  - radio sites are connected in a star formation to remote BSCs or transmission access points on the regional rings

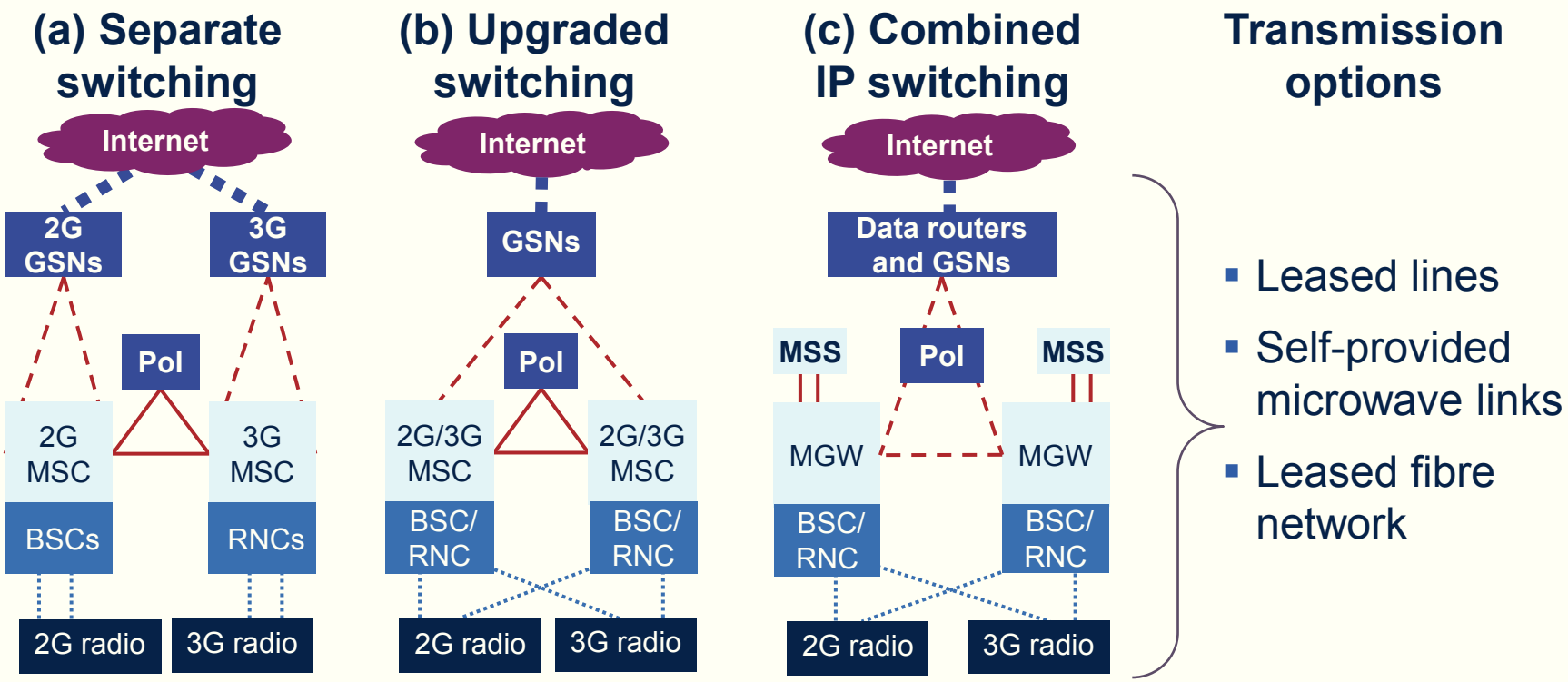
Source: OPTA, CBS, Analysys Mason geo-analysis

analysys mason

An increasing proportion of voice traffic was carried over the 3G network

- From 2006, an increasing proportion of voice traffic was carried over the 3G networks
  - we forecast for 35% of voice to move to 3G in the long-run
- The effect of this 35% migration rate was to maintain GSM utilisation
- The UMTS network was overlaid onto the GSM network from 2004 onwards, and carries:
  - the majority of low-speed mobile data traffic
  - all HSPA mobile broadband data traffic
- Radio network coverage profiles are applied in the model
- The modelled operator had 99.1% GSM population **indoor** coverage in 2006
  - this coverage was deployed using 900MHz spectrum
  - 1800MHz spectrum was only used for capacity upgrades
- UMTS coverage was assumed to increase from 52% at mid-year 2006 to 90% population in the long term

For the mobile core and transmission, there were three options: we modelled (*b*) and (*c*)



- Separate 2G and 3G switching layers (Option a) would appear reasonable for an actual operator, but not one deploying as-new in 2004
- Migration to layered MSS+MGW (Option c) was applied in 2009 and 2010

analysys mason

Opex and capex details were derived from operator, OPTA and Analysys Mason inputs

- Annual opex for network share of business overheads was estimated to be EUR30 million
  - we isolated the interconnection staff costs (EUR0.5 million) in order to avoid double counting
- Opex cost trends were assumed to be zero in real terms
- Capital equipment cost trends were estimated using:
  - operator input
  - comparison of operator unit costs with 2006 BULRIC model
  - Analysys Mason estimates
- The asset lifetimes applied in the model were Analysys Mason estimates of a reasonably efficient asset lifetime
  - these lifetimes determine the periodic replacement of all assets in the model over time
- Network elements were purchased in advance of activation
  - it would be unreasonable to assume instantaneous purchase, installation and activation

analysys mason

Introduction

Background to the original BULRIC model

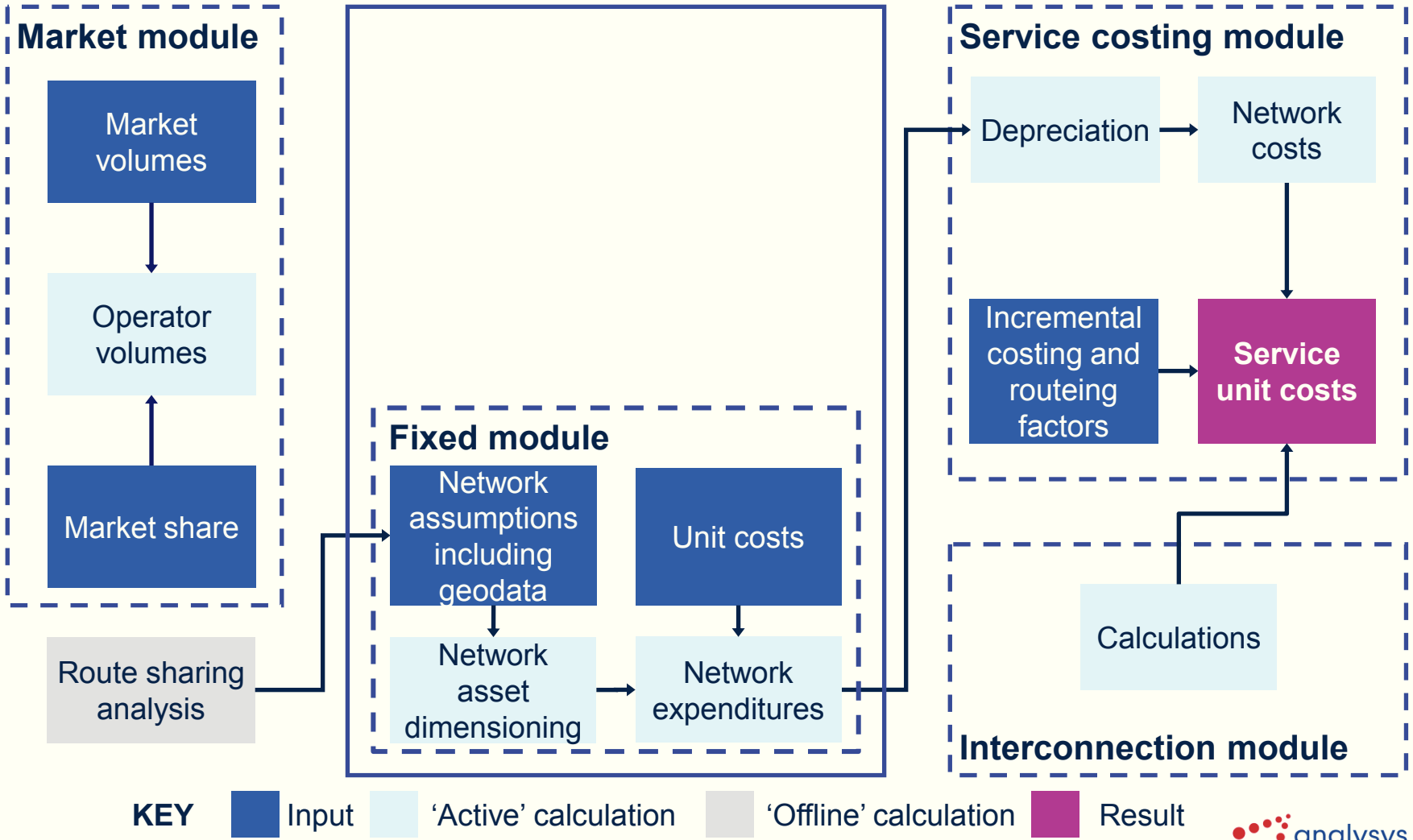
- Model specification
- Mobile network design
- **Fixed network design**
- Costing approaches

Updates proposed to the BULRIC models

Next steps

Supplementary material

A modular approach was used in the construction of the model



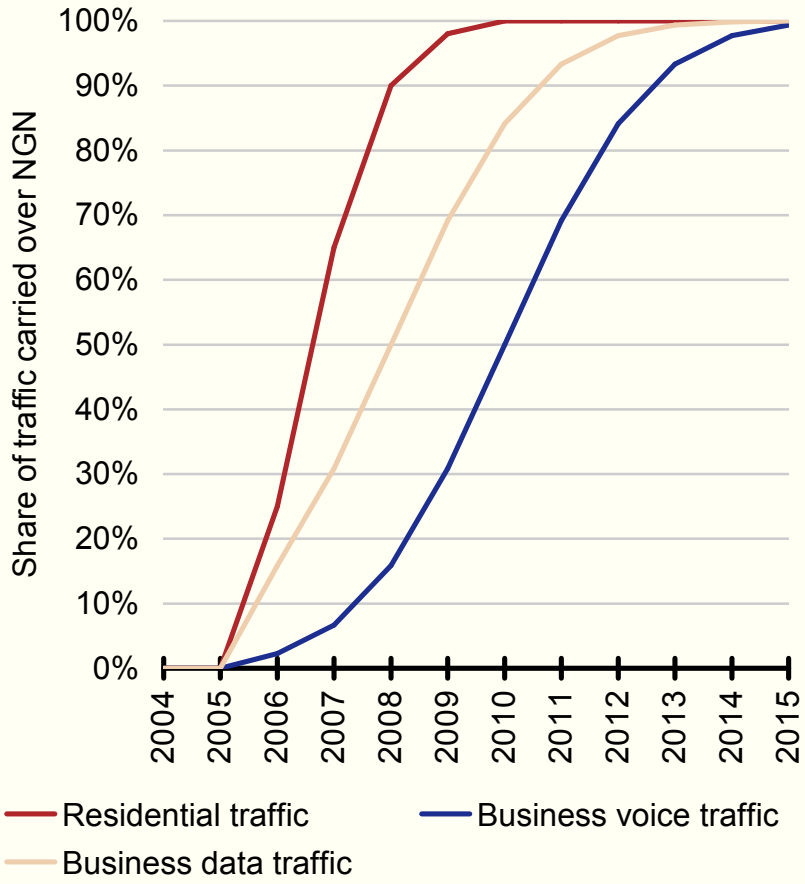
We modelled a hypothetical existing operator, assuming coverage and market share

- This enabled us to calculate a cost that is relevant for the existing suppliers of termination in the Netherlands
- Actual network characteristics were taken into account
  - rolling out an NGN IP core in 2004/05
  - launching service in 2006
  - specific choice of access technology
- We modelled coverage such that our operator rolled out a national network at launch
  - this reflected the existing providers
- We modelled a market share of 50%
  - an objective *and* neutral approach requires using a market share of 1/N
  - there are two national fixed operators

We assumed a rapid rate of network roll-out

- We assumed that the operator had access to a full 1/N share of the market at launch
  - i.e. it had a pre-existing legacy business
- Our approach was that the rate of network roll-out was rapid: *national roll-out during 2004 and 2005*
- We used roll-out curves to model the load-up of NGN traffic
  - there were separate curves for residential and business traffic
  - these load-up curves were a key input to the fixed model

Fixed network load-up curves

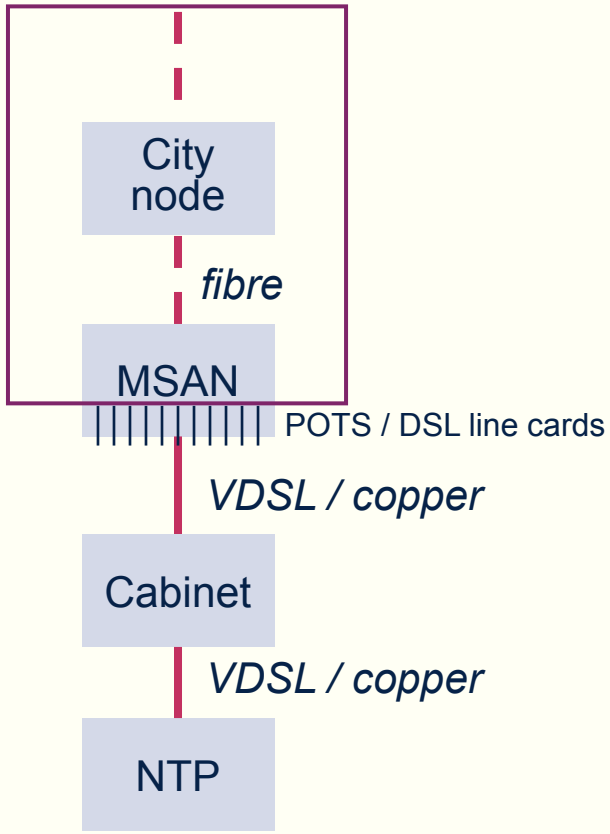


Source: Analysys Mason

analysys mason

We modelled MDF/VDSL copper access with an IP BAP-based fixed NGN core network

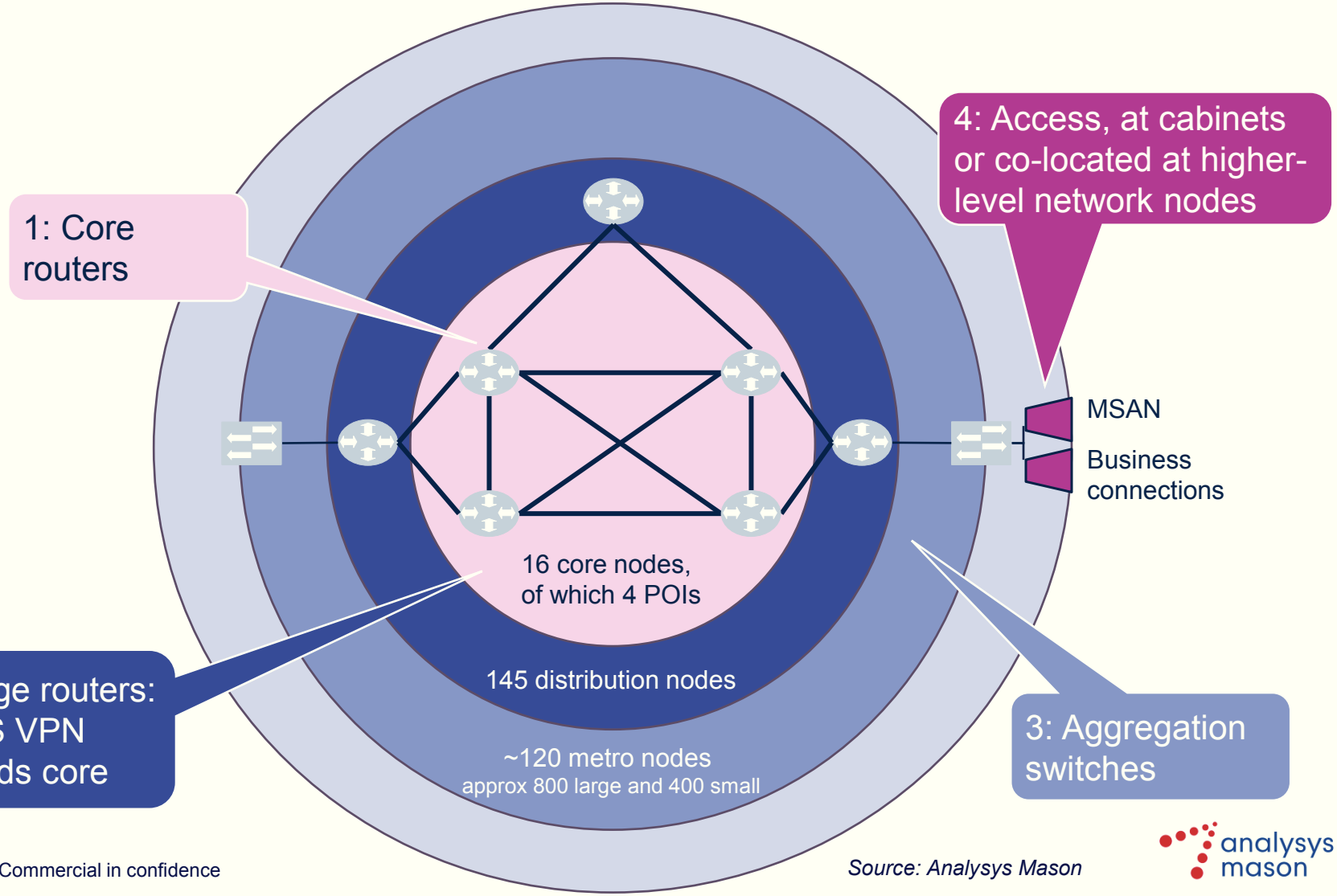
Copper-based access



- The choice of MDF/VDSL copper access was seen to be better than alternatives such as FTTC, FTTH and HFC
- The choice for VDSL-based access limited the options for the core network architecture
  - there was general acceptance of an IP-BAP NGN architecture, using an all IP/Ethernet core
  - E1 interconnection links were included
  - a reasonable level of redundancy was incorporated in the network design algorithms

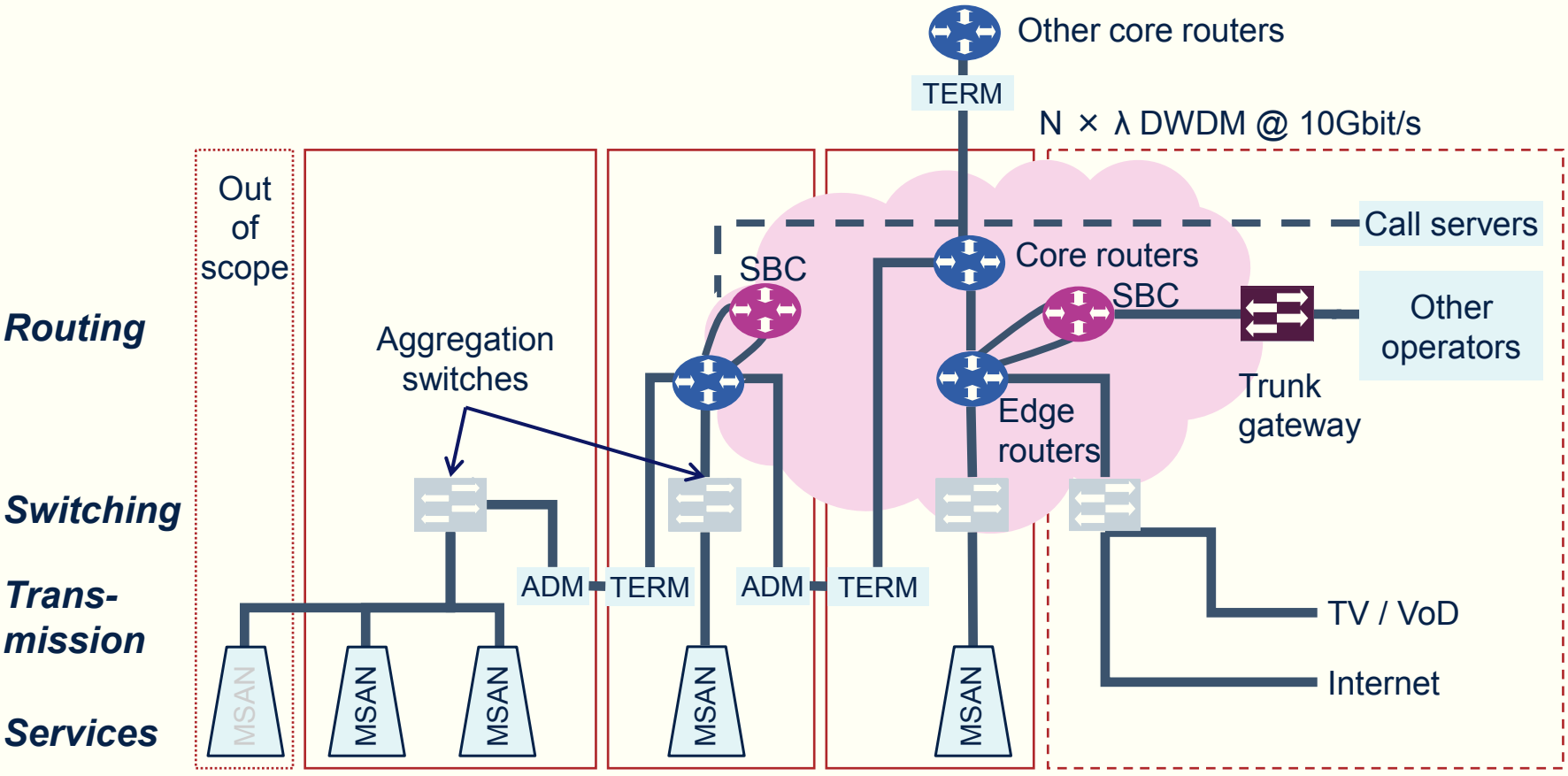
analysys mason

Logically, the modelled network consisted of four hierarchical layers



Source: Analysys Mason

These four layers were mapped onto five different types of physical building



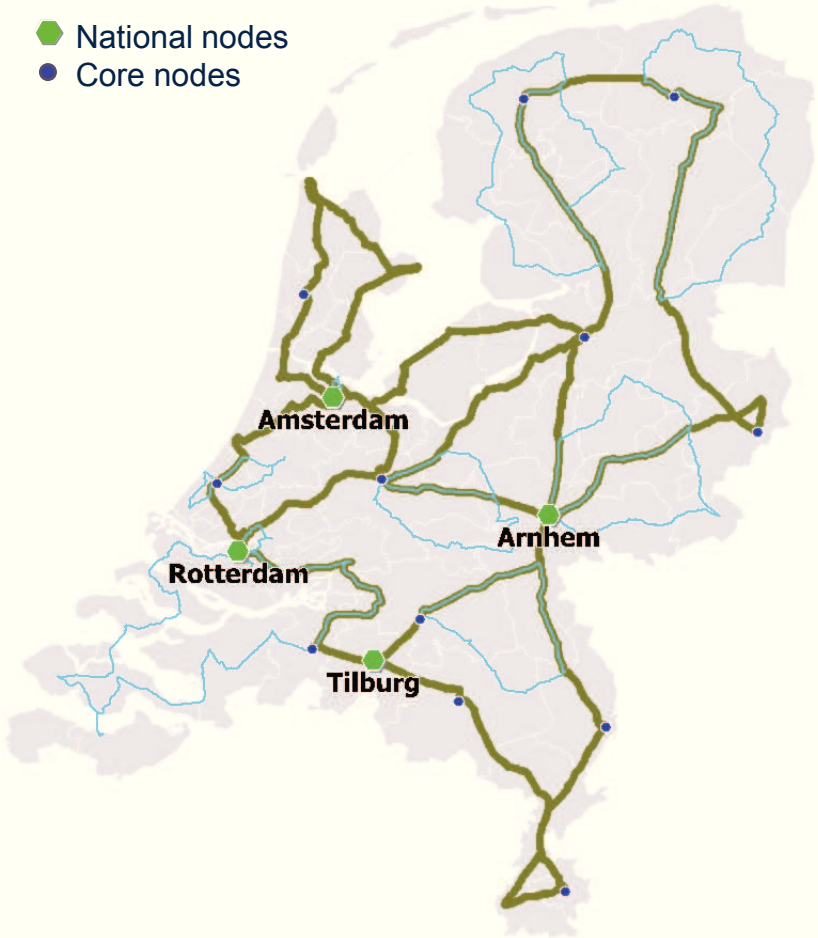
ADM = Add-drop multiplexer; TERM = Terminal multiplexer

Source: Analysys Mason

analysys mason

A modified scorched-node approach was used to construct a network

Fixed regional / national rings



- We defined:
  - 4 national nodes
  - 12 core nodes
  - 145 distribution nodes
  - ~1200 metro nodes
- Six national rings (level-1 rings) connected the national/core nodes
- Thirteen regional rings (level-2 rings) connected the remaining distribution nodes back to the national rings
- Metro nodes were linked back using 8λ CWDM rings to the distribution nodes

Source: Analysys Mason geo-analysis

analysys mason

Network traffic was derived from service traffic

Regional/national traffic split

Network services	Share
Regional outgoing calls	25.8%
National outgoing calls	74.2%
Regional incoming calls	25.8%
National incoming calls	74.2%
xDSL (direct)	25.8%
xDSL (indirect)	74.2%
TV (VoD) – direct	25.8%
TV (VoD) – indirect	74.2%
TV (linear) – direct	25.8%
TV (linear) – indirect	74.2%
Local IP/E-VPN	0.7%
Regional IP/E-VPN	7.6%
National IP/E-VPN	91.7%

- This ratio was estimated from the proportion of population at one regional node, compared to other (national) nodes
  - approximately determined by 4 interconnection points and 4+12 core locations
  - no weighting was assumed for traffic locality
- A small percentage of VPN links were at local and regional level; the majority were at national level
  - approximately based on the reciprocal of the number of edge router locations

Source: Analysys Mason

Some network functionality was assumed to have set deployments at certain nodes

- Session border controllers (SBCs) were present at all distribution, core and national nodes
  - their deployment was driven by voice traffic at the distribution and core/national level respectively
- Core routers were deployed at every core and national node
  - their deployment was driven by the number of core-facing edge router 1/10GE ports and the number of ports to other core routers
- For voice interconnection, we assumed this took place at the four national nodes and used TDM
  - deployment of interconnection equipment was driven by interconnecting voice traffic
- For Internet and TV interconnection, an additional switch per national location was deployed
  - its dimensioning was driven by xDSL, TV and VoD traffic

Opex and capex details were derived from operator and Analysys Mason inputs

- Annual opex for network share of business overheads was estimated to be EUR30 million
  - we isolated the interconnection staff costs (EUR0.5 million) in order to avoid double counting
- Opex cost trends were assumed to be zero in real terms
- Capital equipment cost trends were estimated using:
  - operator input
  - Analysys Mason estimates
- The asset lifetimes applied in the model were Analysys Mason estimates of a reasonably efficient asset lifetime
  - these lifetimes determine the periodic replacement of all assets in the model over time
- Network elements were purchased in advance of activation
  - it would be unreasonable to assume instantaneous purchase, installation and activation

Investments were annualised using a WACC of 7.38% (fixed) or 8.45% (mobile)

Inputs to the WACC calculation

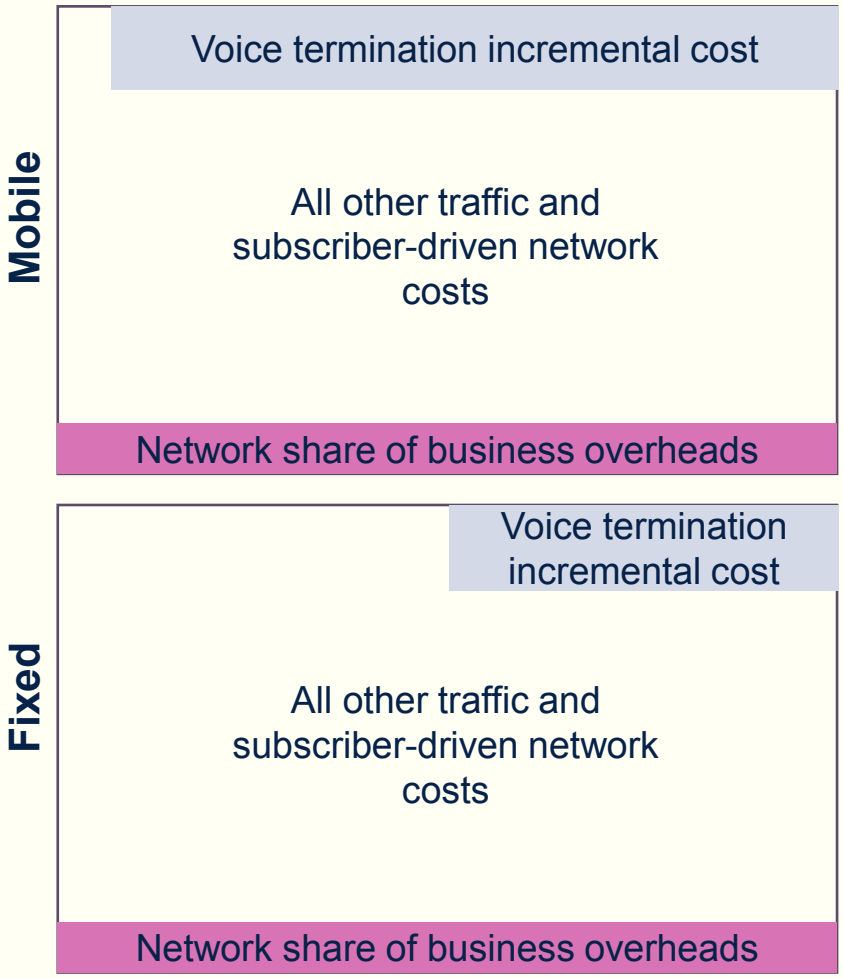
WACC values	Fixed	Cable	Mobile
Risk-free rate (nominal)	3.80%	3.80%	3.80%
Equity premium	6.10%	6.10%	6.10%
Equity beta	0.82	0.89	0.96
Asset beta	0.40	0.41	0.66
Nominal cost of equity (post-tax)	8.83%	9.20%	9.67%
Nominal cost of debt	5.64%	8.60%	5.58%
Debt premium over risk free rate	1.84%	4.70%	1.78%
D/D+E (gearing)	50.92%	53.70%	31.86%
Tax rate	25.50%	25.50%	25.50%
Nominal WACC (pre-tax)	8.69%	10.30%	10.62%
Inflation rate	2.00%	2.00%	2.00%
Real pre-tax WACC	**6.56%**	**8.20%**	**8.45%**

Source: Analysys Mason, WPC-II

Based on OPTA's requirements, we used three costing methods

- In the model, three costing approaches were implemented that differed in the definition of the increment and the treatment of common costs
- These were:
  1. **Pure BULRIC**
  2. **Plus BULRAIC**
  3. **Plus Subscriber BULRAIC**

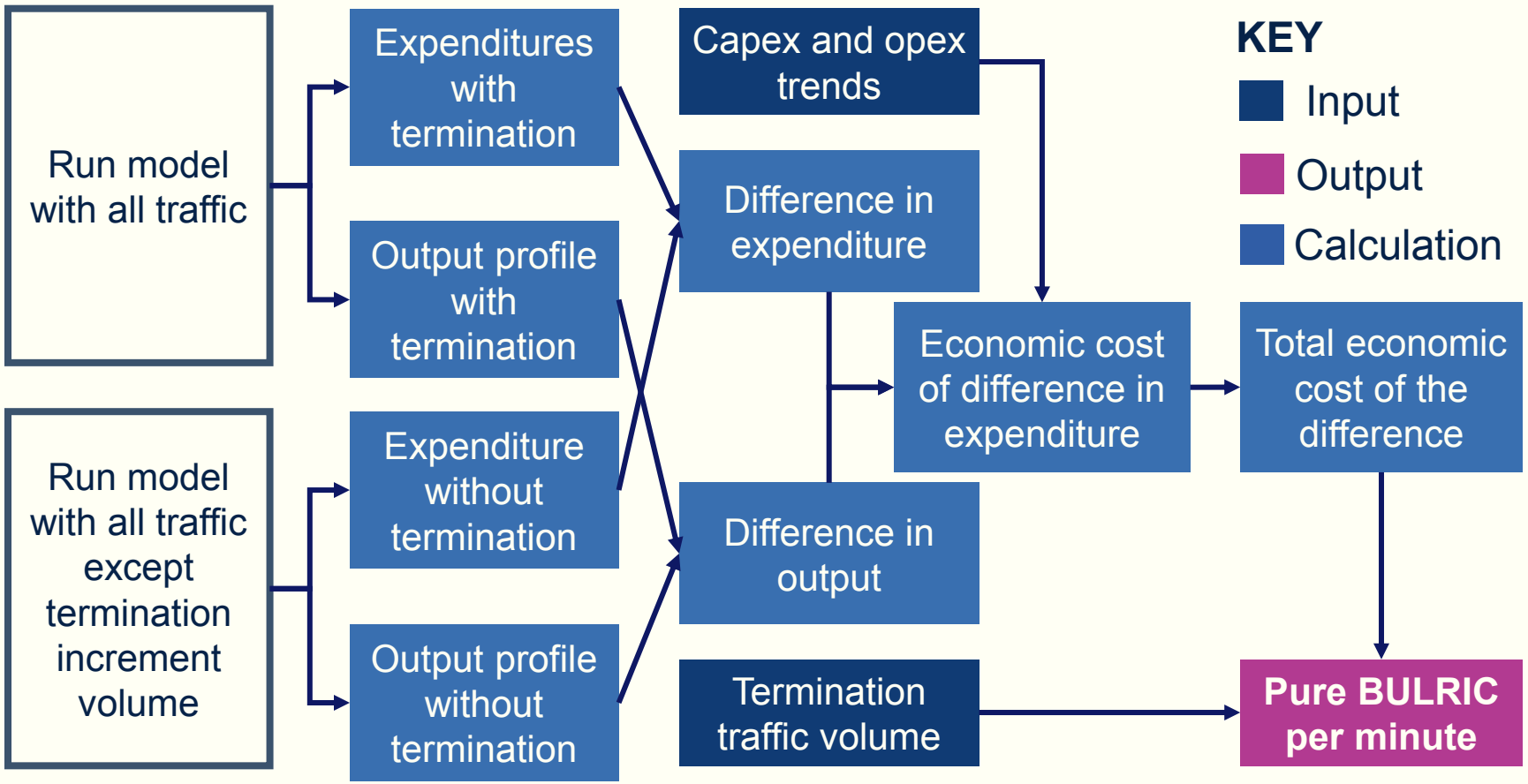
1 The *Pure BULRIC* approach only included incremental costs



- The **Pure BULRIC** approach was based on the EC Recommendation; it specifies that
  - only the cost '*which is avoided when not offering voice termination'* was allocated to this service
  - wholesale termination was treated as the 'last' service in the network
  - non-traffic related costs, such as subscriber costs, were not allocated
  - network common costs and business overheads were not allocated to the end result

Source: Analysys Mason

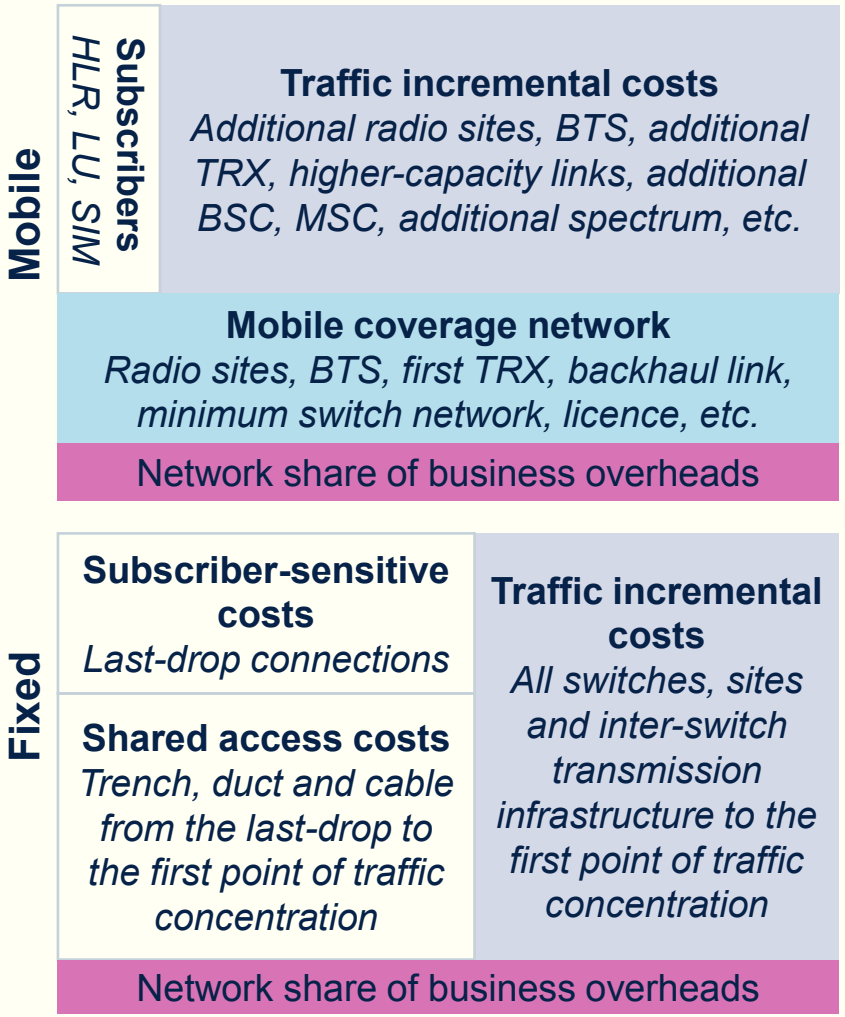
1 We calculated *Pure BULRIC* using the difference between two modelling states



Source: Analysys Mason

analysys mason

2 *Plus BULRAIC* was consistent with previous regulatory costing

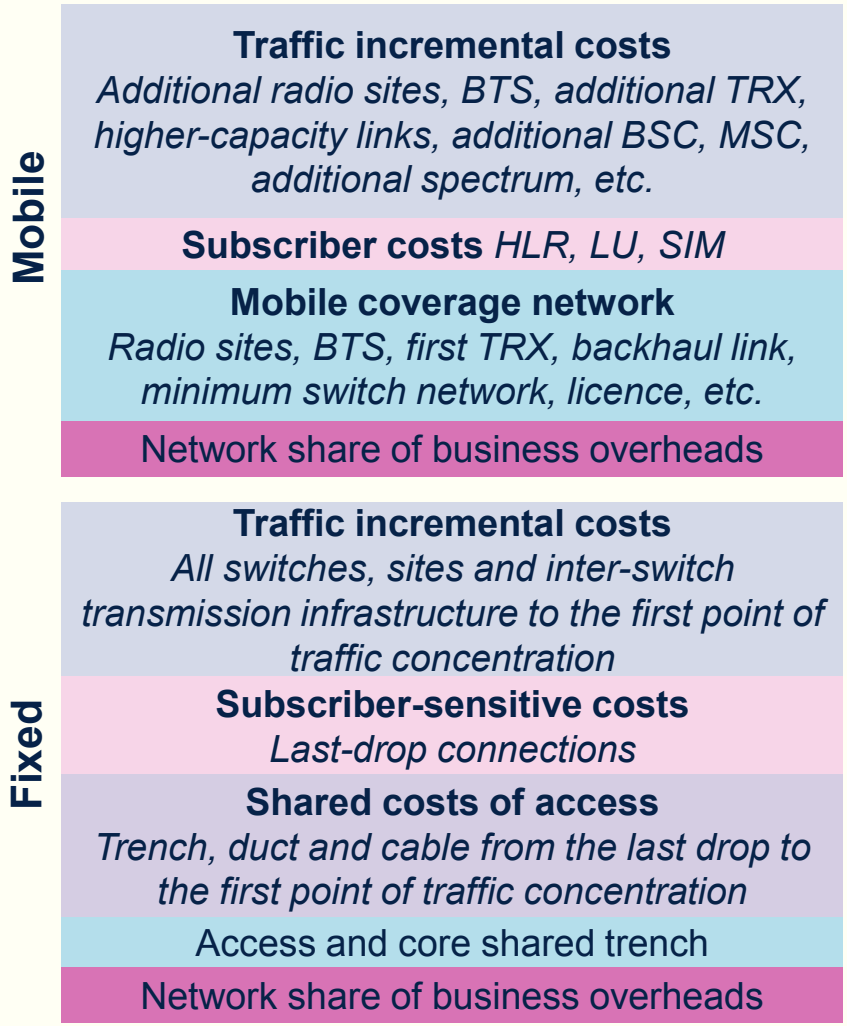


- The **Plus BULRAIC** approach focused on consistency with the previous approach in Europe for fixed and mobile termination costing
- Average incremental costs of traffic were defined in aggregate, then allocated to various traffic services using routeing factors
- Common costs were included (using equi-proportionate cost-based mark-up)
  - we estimated that these were only significant in the mobile network
- A large traffic increment implied that costs common to multiple traffic services were included in the average incremental cost of traffic

Source: Analysys Mason

analysys mason

3 *Plus Subscriber BULRAIC* treated subscriber costs as common



- The previous *Plus BULRAIC* approach assumed a separate subscriber service
- Here, the **Plus Subscriber BULRAIC** approach considered any incremental costs associated with the subscriber access service as common costs to the traffic-related services
- This presented a fully inclusive network cost of termination
- The mobile result can also be considered comparable to the marked-up result from OPTA's previous costing project, in which location update costs were added to terminated traffic

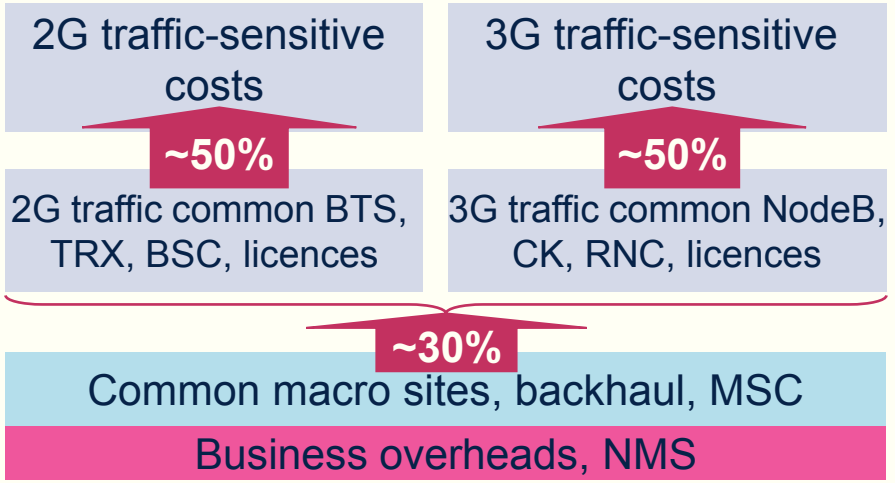
Source: Analysys Mason

analysys mason

Major common costs were identified for the two types of operator

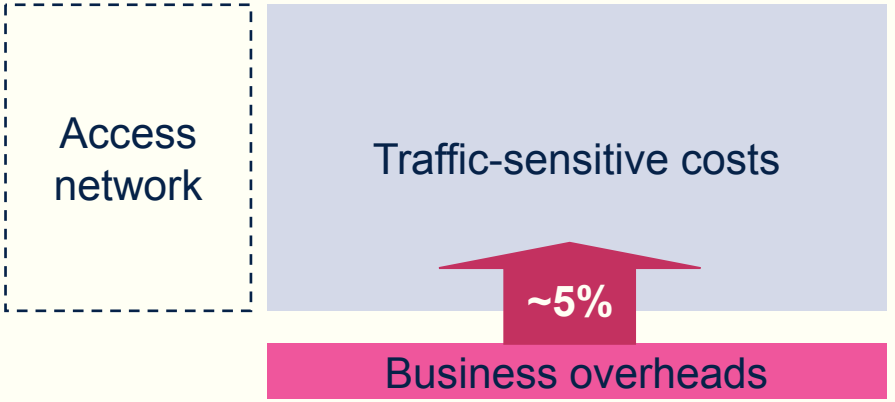
- For the mobile operator, a minimum functioning coverage network was assumed to be common to traffic and subscribers

Common cost structure in the mobile operator



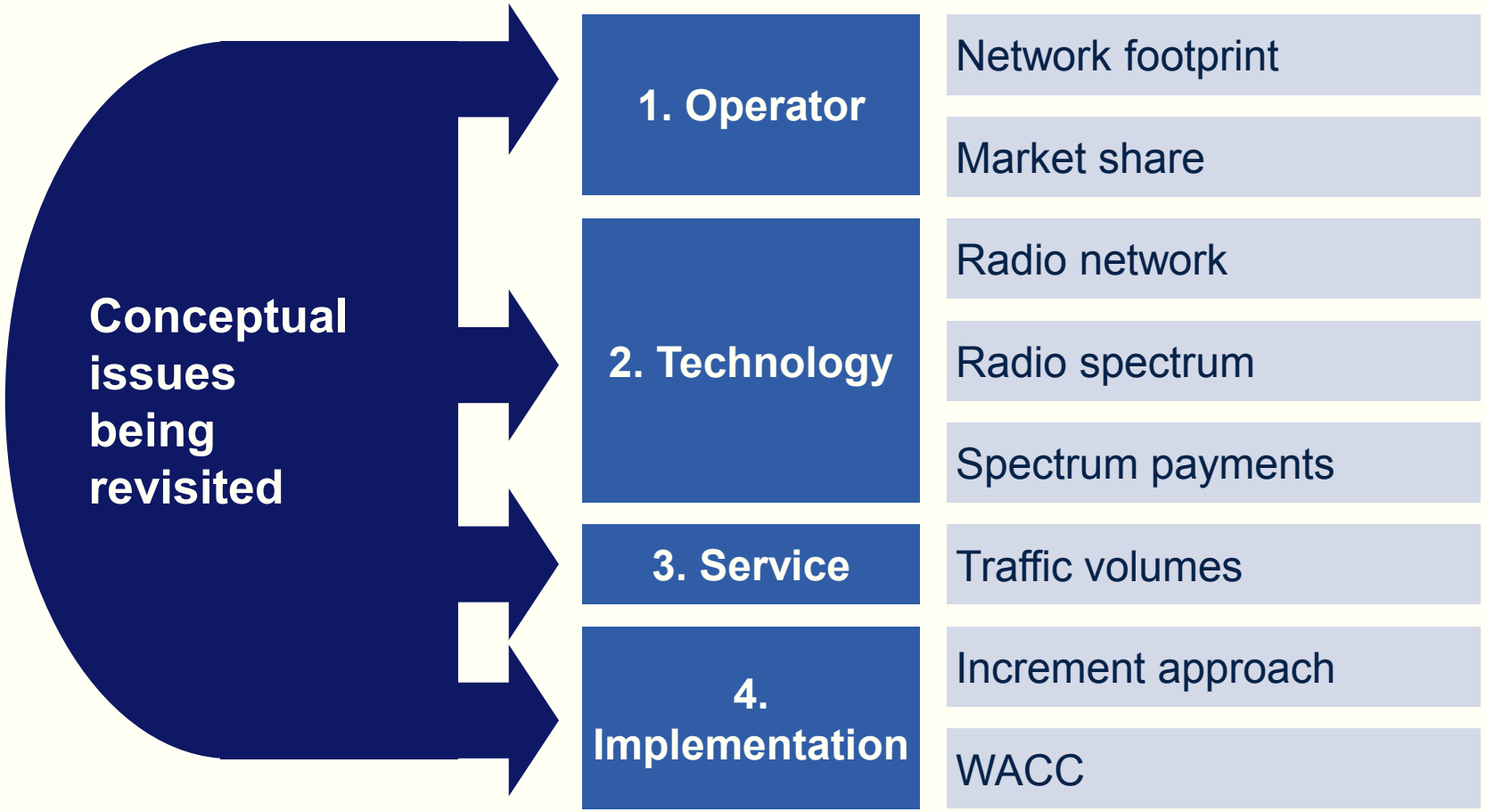
- For the fixed operator, the costs assumed to be common to traffic and subscribers (the fixed access network) were the business overheads
  - all other average incremental costs were allocated on the basis of routeing factors for the different traffic services

Common cost structure in the fixed operator



Source: Analysys Mason

Several conceptual issues are being revisited in this upgrade



analysys mason

We will cross-check the modelled operator coverage with those of actual operators

1. Operator	**Network footprint**
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 2: National levels of geographical coverage will be reflected in the models, comparable to that offered by current national operators in the Netherlands, including indoor mobile coverage

- This concept will not be revised
- We will request that Dutch operators provide updated information on their actual coverage profile
  - modelled coverage will be compared against these actual measurements to determine whether any revision of the forecast coverage is warranted

analysys mason

At the start of 2012, the Ministry announced a mobile spectrum auction

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 3: The modelled fixed operator will have a 50% share of the fixed market. The modelled mobile operator will have a 33.3% share of the mobile market

- We do not propose any revision to the assumed 50% share of the fixed market
- The Dutch Ministry announced a large auction of mobile spectrum later in 2012
  - including 800MHz, 900MHz, 1800MHz, 2100MHz and 2600MHz spectrum
  - some 800MHz/900MHz frequencies are reserved for new entrants
- This may lead to new entrants in the Dutch mobile market

analysys mason

We do not believe this should mean revising the modelled mobile market share at this time

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

- N is conceptually the current number of national mobile networks supporting 2G/3G demand in the Netherlands
  - as of July 2012, N = 3
- The next period of price regulation is 2013–2016
- >3 companies may acquire spectrum, but this does not mean >3 separate networks appear in the long term
  - companies may pool spectrum for infrastructure sharing
  - recent market consolidation suggests 4 players may not be sustainable
- The likelihood that N will exceed 3 for a significant part of the period 2013–2016 is therefore low

LTE technologies will continue to be excluded from the mobile BULRIC model

1. Operator	Network footprint
	Market share
2. Technology	**Radio network**
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 6: The mobile model will use both 2G and 3G radio technology in the long term, with GSM deployed in 900MHz and 1800MHz bands, and 3G deployed as a 2100MHz overlay

- Five operators acquired 2600MHz frequencies in the auction in 2010
  - coverage appears to be very low
  - further growth in coverage is unlikely until after the upcoming auction
- Including a LTE network design will have little impact until significant volumes of voice are carried as VoLTE
  - we therefore propose to continue to exclude LTE from the model

analysys mason

We will refine the HSPA network design to accommodate higher speeds and traffic

1. Operator	Network footprint
	Market share
2. Technology	**Radio network**
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

- Actual 3G coverage with 2100MHz frequencies in the Netherlands is high
  - we will therefore retain our assumption of using only 2100MHz frequencies for 3G deployments
- The original BULRIC model contains HSDPA technology up to 7.2Mbit/s
  - if higher speeds have been deployed then we will update the network design to reflect this
  - we will also refine the HSPA network design so that it can deploy upgrades as data traffic increases, rather than the minimum deployment currently used in the model

The 2012 spectrum auction will cause a redistribution of spectrum in the market

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 7: We will model an operator with 33.3% of 67.6MHz of GSM spectrum. We will model an operator with 33.3% of 114MHz of DCS spectrum

- There is 2 × 35MHz of spectrum available in the 900MHz (GSM) band
  - 2 × 5MHz will be reserved for new entrants in the auction
- There is 2 × 70MHz of spectrum available in the 1800MHz (DCS) band
- Spectrum is also available from the 800MHz, 2100MHz and 2600MHz bands
- Spectrum in all bands will be sold in discrete 2 × 5MHz blocks

analysys mason

This will alter the amount of GSM and DCS spectrum allocated to the existing operators

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

- In both bands, we assume that our modelled mobile operator has access to 33.3% of the spectrum being auctioned
  - these values will be rounded down to a whole number of 2 × 5MHz blocks
- Our modelled mobile operator will therefore be assumed to have:
  - 2 × 10MHz of 900MHz spectrum
  - 2 × 20MHz of 1800MHz spectrum
- We do not assume any changes to the allocated 2100MHz spectrum
- Since we are excluding LTE from the model, we do not consider the 800MHz or 2600MHz frequencies to be relevant, since they are primarily used for this technology

analysys mason

The assumed spectrum values will be revisited after the 2012 auction

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 9: Spectrum valuations for 15-year licences in the 900MHz, 1800MHz and 2100MHz bands are each assumed to have their own fixed value per MHz per capita

- Payments for modelled spectrum frequencies are derived using payments from historical Dutch auctions, Dutch spectrum renewal fees and data points from auctions in Sweden and the USA
- Spectrum from these bands is being auctioned in October 2012
  - prices paid in the auction will be used to revise the model inputs

See https://zoek.officielebekendmakingen.nl/stcrt-2012-392.html

We will request updated traffic volume data from the operators and review our forecasts

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	**Traffic volumes**
4. Implementation	Increment approach
	WACC

Concept 21: We will develop a market forecast and apply a market-average profile for the modelled 1/N operator; the discussion of N is covered under concept 3

- This concept will not be revised
- We will request operator service volumes for 2009–2011 and first-half 2012 to update the Market module
  - we will also cross-check other inputs with the latest releases of our third-party sources
- We will review the forecasts of voice and data traffic in the models and update them where necessary

We intend to review key network calculations and costs in the BULRIC models [1/2]

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	**Increment approach**
	WACC

Concept 25: In order to allow OPTA to understand the cost implications of each costing approach (consistency with the EC Recommendation, comparability with earlier costing approaches, and competitive neutrality towards mobile versus fixed operations), the model will calculate Pure BULRIC,
Plus BULRAIC and
Plus Subscriber BULRAIC results

- This concept will not be revised, but key aspects of the implementation of the costing approaches will be revisited

analysys mason

We intend to review key network calculations and costs in the BULRIC models [2/2]

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	**Increment approach**
	WACC

- In the fixed BULRIC model, we will revisit both the hardware and software components of the VoIP platform and its related equipment
  - taking into account prevailing VoIP architectures in the Netherlands
  - considering the network design, its sensitivity to voice traffic and the unit cost assumptions
- In the mobile BULRIC model, we will consider the sensitivity of modelled mobile network assets to the wholesale termination traffic increment
  - based on any new information available from the operators

analysys mason

The WACC calculation will be unchanged unless revisions are determined as necessary

1. Operator	Network footprint
	Market share
2. Technology	Radio network
	Radio spectrum
	Spectrum payments
3. Service	Traffic volumes
4. Implementation	Increment approach
	WACC

Concept 29–34: Set out the calculated values for the cost of equity, risk-free rate, inflation rate, equity risk premium, asset beta, gearing and debt risk premium for the WACC

- The WACC values for the original BULRIC models are calculated using the capital asset pricing model (CAPM)
  - input parameters are sourced from other OPTA workstreams, such as WPC-II
- These values will be maintained until OPTA determines that a revision is necessary

analysys mason

Upcoming milestones following IG1

- The consultation paper has been issued to industry stakeholders
- Electronic versions of these slides will also be provided
- Industry stakeholders are invited to provide feedback to OPTA on the consultation paper, by **5 September 2012**
- Data requests have also been issued
  - there are separate requests for fixed operators and mobile operators
  - both contain questions on demand, network, interconnection and costs
  - there are fewer questions than in the previous projects, since this is an update
  - stakeholders have until **5 September 2012** to provide data submissions
- In the coming weeks we will be available to field any questions on either the consultation paper or the data requests
- It is expected that the draft updated BULRIC models will be issued in October

Main contacts

For OPTA

Giancarlo Salvo

(070) 315 35 00

g.salvo@opta.nl

For Analysys Mason

Matthew Starling

+44 845 600 5244

matthew.starling@analysysmason.com

analysys mason

Introduction

Background to the original BULRIC model

- Model specification
- Mobile network design
- Fixed network design
- Costing approaches

Updates proposed to the BULRIC models

Next steps

Supplementary material

analysys mason

Relevant documents [1/2]

- The original BULRIC models, published in April 2010
  - http://www.opta.nl/nl/actueel/alle-publicaties/publicatie/?id=3180
- Recommendation on termination rate costing published by the EC in May 2009
  - http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:124:0067:0074:EN:PDF
- Final conceptual approach document from the development of the original BULRIC models, released 20 April 2010
  - http://www.opta.nl/nl/download/bijlage/?id=539
- European Commission advise to OPTA to set lower termination price caps in the Netherlands
  - http://www.opta.nl/nl/actueel/alle-publicaties/publicatie/?id=3611

Relevant documents [2/2]

- Announcement of mobile spectrum licence auction in late October 2012 by the Ministerie van Economische Zaken, Landbouw en Innovatie
  - http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/besluiten/2012/01/06/besluit-bekendmaking-van-het-via-de-procedure-van-veiling-verdelen-van-vergunningen-voor-frequentieruimte-in-de-800-900-en-1800-mhz-band/stcrt-2012-395.pdf
- Notice of bands in the spectrum auction
  - https://zoek.officielebekendmakingen.nl/stcrt-2012-392.html
- Notice of extension of the existing GSM licences
  - http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2012/04/04/brief-aan-de-tweede-kamer-over-veiling-mobiele-communicatie-en-transitie.html

Glossary [1/2]

- **2G:** Second generation of mobile telephony
- **3G:** Third generation of mobile telephony
- **4G:** Fourth generation of mobile telephony
- **ADM:** Add-drop multiplexer
- **BAP:** Broadband access platform
- **BSC:** Base station controller
- **BTS:** Base transmitter station or base station
- **BULRAIC:** Bottom-up long-run average incremental cost
- **BULRIC:** Bottom-up long-run incremental cost
- **CK:** Channel kit
- **CWDM:** Conventional wavelength-division multiplexing
- **DCS:** Digital cellular service
- **DWDM:** Dense wavelength-division multiplexing
- **E1:** 2Mbit/s unit of capacity
- **EC:** European Commission
- **EPMU:** Equi-proportionate mark-up
- **FTTC:** Fibre to the cabinet
- **FTTH:** Fibre to the home
- **Gbit/s:** Gigabits per second
- **GSM:** Global system for mobile communications
- **GSN:** GPRS serving node
- **HFC:** Hybrid fibre-coaxial
- **HLR:** Home location register
- **HSDPA:** High-speed downlink packet access
- **HSPA:** High-speed packet access
- **IG:** Industry Group
- **IGW:** Internet gateway
- **IP:** Internet Protocol
- **ISDN:** Integrated services digital network
- **LMA:** Last-mile access
- **LTE:** Long-term evolution
- **LU:** Location update
- **MDF:** Main distribution frame

Glossary [2/2]

- **MGW:** Media gateway
- **MHz:** Megahertz
- **MPLS:** Multiprotocol label switching
- **MSAN:** Multi-service access node
- **MSC:** Mobile switching centre
- **MSS:** MSC server
- **MVNO:** Mobile virtual network operator
- **NGN:** Next-generation network
- **NMa:** Nederlandse Mededingingsautoriteit
- **NodeB:** Denotes the 3G equivalent of a BTS
- **NTP:** Network termination point
- **OPTA:** Onafhankelijke Post en Telecommunicatie Autoriteit
- **PoI:** Point of interconnect
- **SBC:** Session border controller
- **SIM:** Subscriber identity module
- **STM:** Synchronous transport module
- **TDM:** Time division multiplexing
- **TERM:** Terminal multiplexer
- **TRX:** Transceiver
- **TV:** Television
- **UMTS:** Universal mobile telecommunications systems
- **VDSL:** Very-high-bitrate digital subscriber line
- **VoD:** Video on demand
- **VoIP:** Voice over Internet Protocol
- **VoLTE :** Voice over long-term evolution
- **VPN:** Virtual private network
- **WACC:** Weighted average cost of capital
- **WDM:** Wavelength division multiplexing
- **xDSL:** Digital subscriber line technologies

Contact details

Ian Streule

Partner

ian.streule@analysysmason.com

Matthew Starling

Manager

matthew.starling@analysysmason.com

Alex Reichl

Associate Consultant

alex.reichl@analysysmason.com

Analysys Mason Limited
St Giles Court, 24 Castle Street
Cambridge CB3 0AJ, UK

Tel: +44 (0)845 600 5244
Fax: +44 (0)845 528 0760

www.analysysmason.com

Registered in England No. 5177472