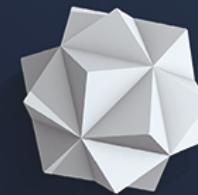
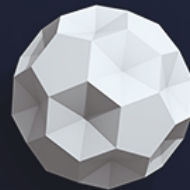


Economic analysis of the effects of the BT/EE merger in SFBB and mobile backhaul

Presentation for Sky



13 August 2015

CRA Charles River
Associates

Introduction

- These slides summarise our analyses of the effects of the BT/EE merger on the *incentive and ability* of the merged entity to distort competition in the supply of two distinct inputs that are critical for communication services going forward: the supply of the *VULA/GEA input* which is needed for SFBB, and the supply of *backhaul services* for mobile operations.
- Sky is a direct purchaser of the VULA input from BT, and as an MVNO (to start operations in the coming year) it indirectly depends on the quality and terms at which O2 obtains backhaul from BT.
- In both of these areas the merger raises clear concerns that need to be systematically investigated, as suggested in these slides.
- All assumptions and calculations are provided in an attached spreadsheet.
- We would welcome the opportunity to discuss the analysis with the CMA economic team.

Contents (1)

We have focused on vertical concerns in the supply of *fixed broadband*.

Integration of BT – supplier of the key *non price regulated* input into SFBB – with EE – the UK’s largest MNO – has the potential to exacerbate concerns about distortions in the supply of the input to rivals in SFBB.

The effects of the merger on the supply of inputs for broadband should be analysed systematically. Using both a simple “vertical arithmetic” approach and a “vertical GUPPI” approach, we find that:

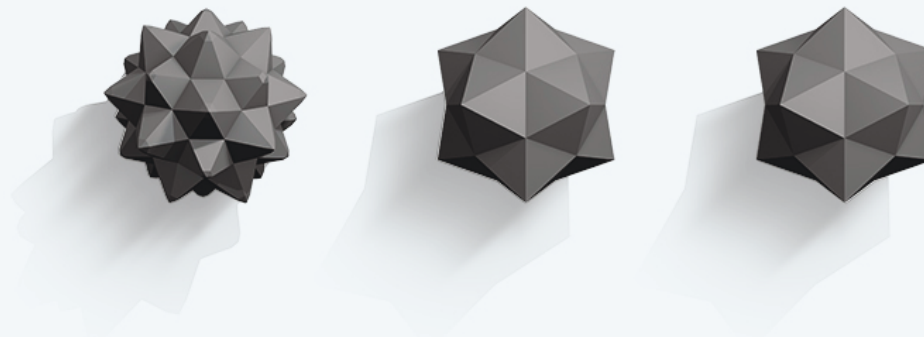
- The merger **expands BT’s ability to foreclose rivals in fixed broadband** by creating **opportunities for cost reallocation out of its retail cost stack, and for “contributing” the mobile margin to the VULA margin test**, thus making room for charging a higher wholesale price for the key VULA/GEA input while still passing the margin control test;
- **BT already has incentives to withhold (raise the price of) the key VULA/GEA input**, although these are kept in check by the margin control test (which appears to be binding). The merger **increases these incentives further**.
- Because the merger creates more “headroom” to pass the test, as well as further opportunities to “game” the test, i.e. greater ability to foreclose, **BT should be expected to act on its increased incentive**.

Contents (2)

A distinct concern is that the merger will create incentives for BT to distort also the supply of the key *backhaul* input to competitors (MNOs, and operators like Sky relying on an MVNO contract).

- A major concern is that **BT will discriminate in favour of EE in the supply of backhaul**, thus lowering the relative quality of rivals.
- BT could also seek to disadvantage rivals by **increasing the cost of backhaul to them**.
- The merger creates **greater ability to increase the cost of the backhaul input**, and a simplified “vertical arithmetic” based on simple high level calculations suggests that – at least *prima facie* – BT will have **incentives to do so**.

1. Background on regulation of key broadband inputs

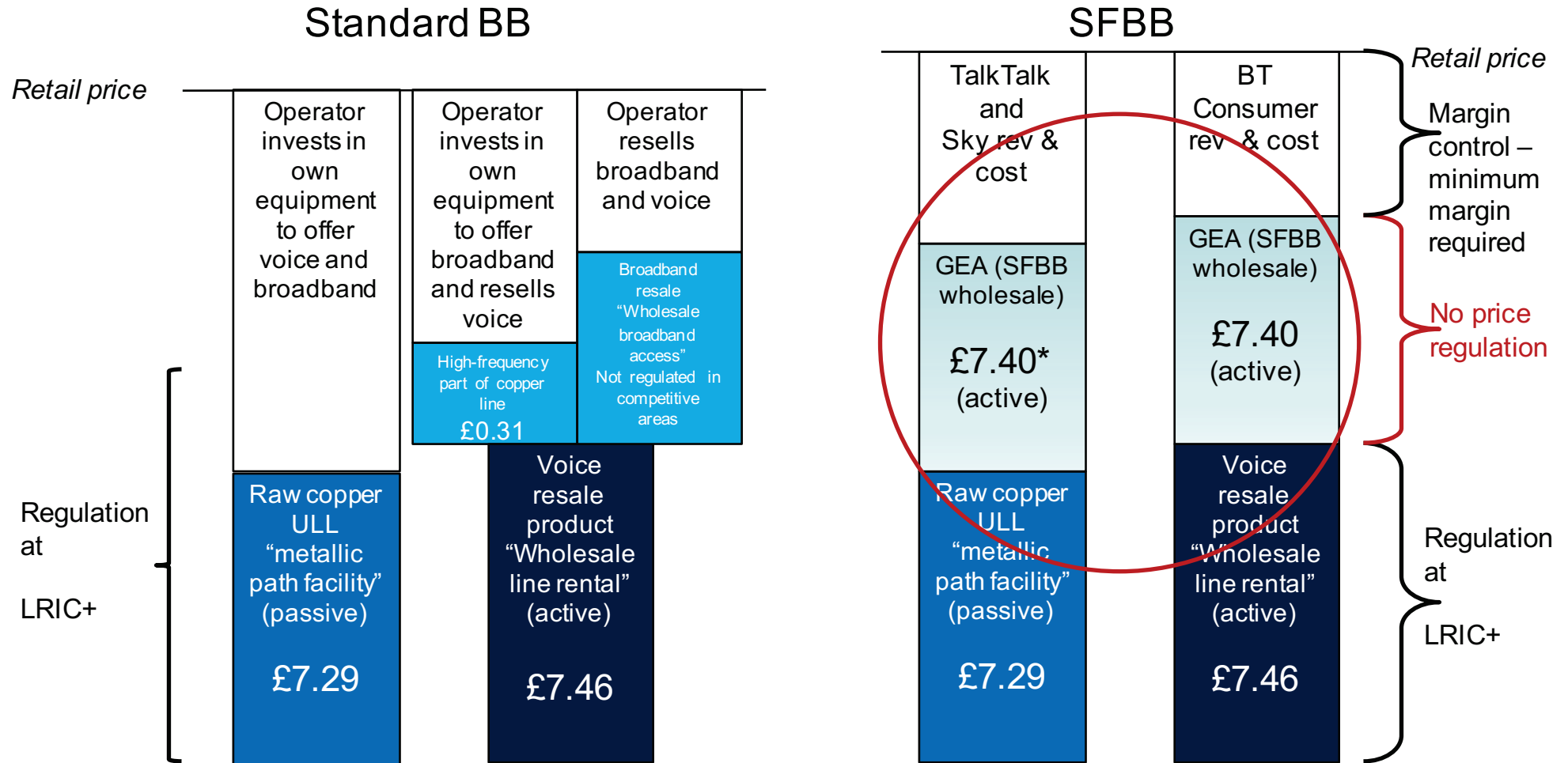


Vertical analyses
13 August 2015

CRA Charles River
Associates

Relevant regulatory background in broadband

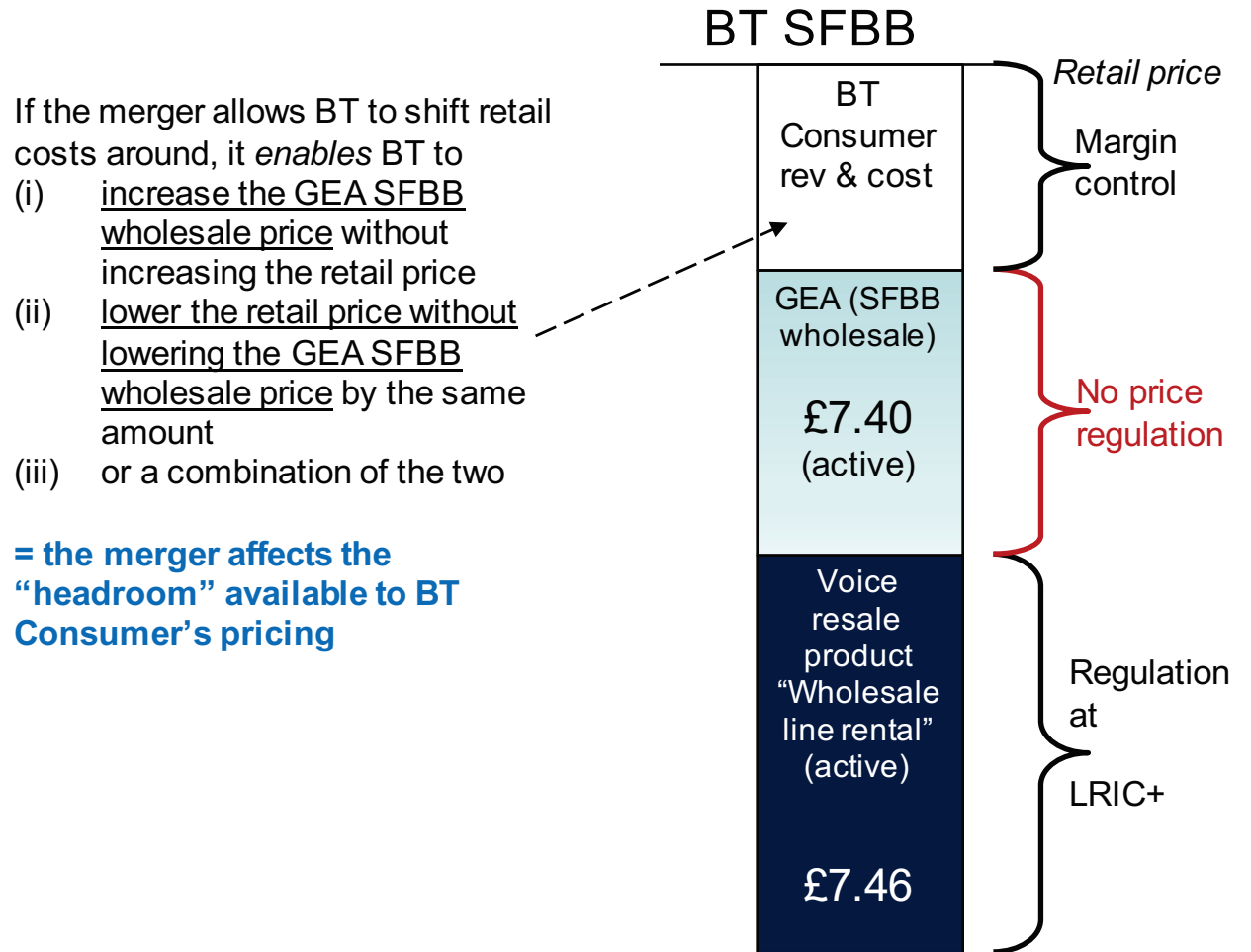
While the input for standard bb is regulated at cost (LRIC+), the key input for SFBB is *not* regulated. BT's conduct is subject only to margin control (and implementation of the test is under litigation)



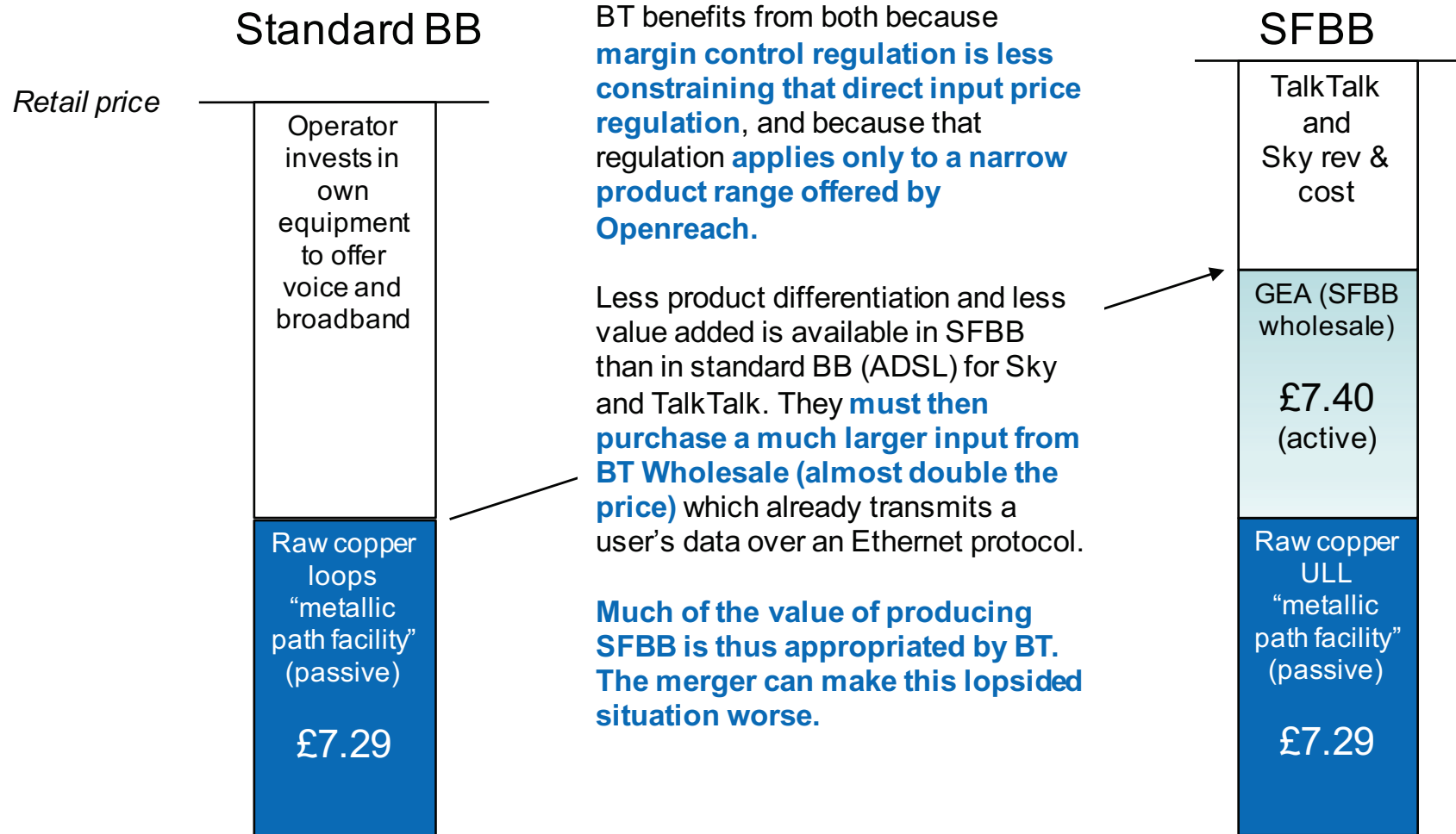
Vertical analyses
13 August 2015

*GEA-FTTC 40 Mbit/s download / 10 Mbit/s upload

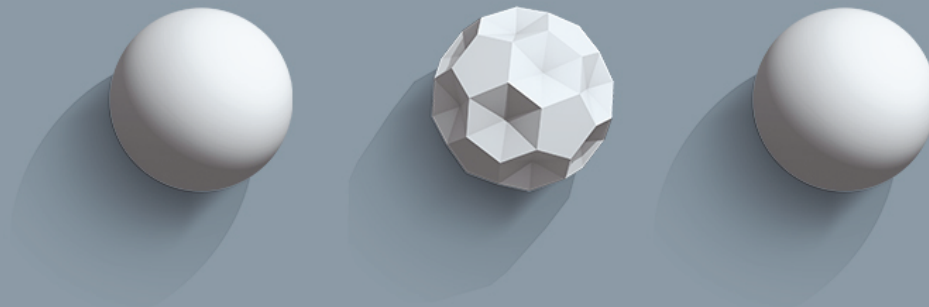
Relevant regulatory background (2)



Relevant regulatory background (3)



2. BT gains more headroom for the VULA margin test post-merger (greater *ability* to foreclose)



The proposed VULA margin control test

The proposed VULA margin test (which is being litigated by BT in any event) is intended to test whether:

Retail price of the product which includes SFBB – Costs of making the product available to consumers – VULA wholesale price \geq 0.

In the logic of the test, **the lower the costs of making the product available, for given price, the higher the VULA wholesale price can be (for passing the test).**

Importantly, in practice **the test applies only to the weighted average of all BT's products which include SFBB.**

BT can “remove costs” or “gain headroom” for margin control: gains greater *ability* to foreclose

There are various ways in which BT could **“remove costs” from its retail activities and gain “headroom” for purposes of its margin control test:**

1. Merger synergies reduce retail costs: this is an efficiency but **how these synergies are allocated is not neutral** and may be difficult for Ofcom to monitor effectively
2. Addition of 24.5m retail customers allows **the reallocation / reshuffling of retail costs**
3. **Bundling of fixed and mobile products in one contract creates greater “headroom” for BT to pass the test, as it allows BT to benefit from the margin on the mobile component of the bundle**
4. Other ways in which the merger increases BT’s ability to game the VULA test

Reallocation of costs between BT and EE for purposes of the margin control test

For purposes of the VULA/GEA margin control test, there are **a number of items over which BT will have a degree of discretion in terms of allocation between BT Consumer and BT EE following the EE merger**. These include:

- Customer acquisition
- Customer services cost
- Online advertising
- Home hub costs
- SG&A costs

By **moving to EE costs which genuinely belong to SFBB, BT has more scope to circumvent the VULA test post-merger.**

Margin reallocation with mobile bundling (1)

- Ofcom stated that, should BT launch bundled fixed/mobile services, it must consider whether an equally efficient operator would be capable of matching the price BT charges for its bundles*. Thus the price of the relevant mobile/fixed bundle would appear in the margin formula together with the relevant costs of making the bundle available to consumers.
- However, Ofcom noted that “it is not possible to provide detailed guidance on the treatment of mobile services before they have been launched”*. It has only indicated it would add the following mobile costs and revenues to the VULA margin control.
 - Revenues: ongoing package revenues, mobile service set-up fees, out of package revenues, incoming termination revenues
 - Costs: LRIC+ costs of outbound termination, payments to MVNO partners***, mobile overhead costs, mobile subscriber acquisition costs, mobile network set-up costs

However, because of the way the test is implemented at present (averaging on the *portfolio* of BT retail offers including SFBB), offering a bundle including mobile *automatically* increases the “headroom” for the test as the mobile margin contributes to the average margin.

*Ofcom VULA Statement, 5.85 ** Ofcom VULA Statement, 6.71, ***With the integration of EE, the cost equivalent of “payments to MVNO partners” would be the cost of providing mobile origination and transmission

Margin reallocation with mobile bundling (2): *example*

Post-merger

New VULA headroom = £2.5

Retail price £35 each

BT sells stand-alone products and bundle

$$50\% * (£35 - £35) = 0$$

$$50\% * (£70 - £35 - £30) = £5$$

Suppose 50% of SFBB customers previously had EE mobile and now switch to bundle

VULA implemented on portfolio of BT products including VULA input: the test applies on average of the two. Mobile margin can thus ensure test is passed on higher VULA price.

VULA margin	Profit £5
£20	EE cost
(no head-room)	
Open-reach wls cost	£30
£15	

VULA margin	Profit £5
£20	EE cost
(no head-room)	
Open-reach wls cost	£30
£15	

VULA margin	Profit £5
£20	EE cost
(no head-room)	
Open-reach wls cost	£30
£15	

Further opportunities for cost reallocation to be guarded against

- BT could argue that because it gives BT Sport “for free” to EE users (for example in the form of the BT Sports App), part of BT Sport costs should be allocated to mobile users. **This would lower the cost of BT Sport allocated to bundles between BT Sport and SFBB, making it possible to charge a higher wholesale price for VULA and still pass the test.**
- Currently, first the proportion of of BT’s residential broadband subscribers that take BT Sport via SFBB is computed. Then that proportion is applied to the net costs of BT Sport after wholesale revenues, advertising revenues and direct revenues is allocated to *all* SFBB subscribers (whether BT Sport subscribers or not). That amount is divided by the total number of SFBB subscribers to yield the average contribution that the average SFBB subscriber makes to the recovery of the cost of BT Sport.*
- Allowing the spreading of the cost of BT Sport also over nominal mobile users would lower the share apportioned to SFBB users. It would reduce unit costs and increase the unit margin for bundles which include BT Sport even if those “users” are not interested in BT Sport and/or SFBB.
- **Given the “averaging” approach of the test, this again would make it possible to increase the VULA price.**

*Ofcom calls this the “take-up” method, VULA Statement, 6.325
Vertical analyses
13 August 2015

3. BT's *incentive* to foreclose rivals in SFBB



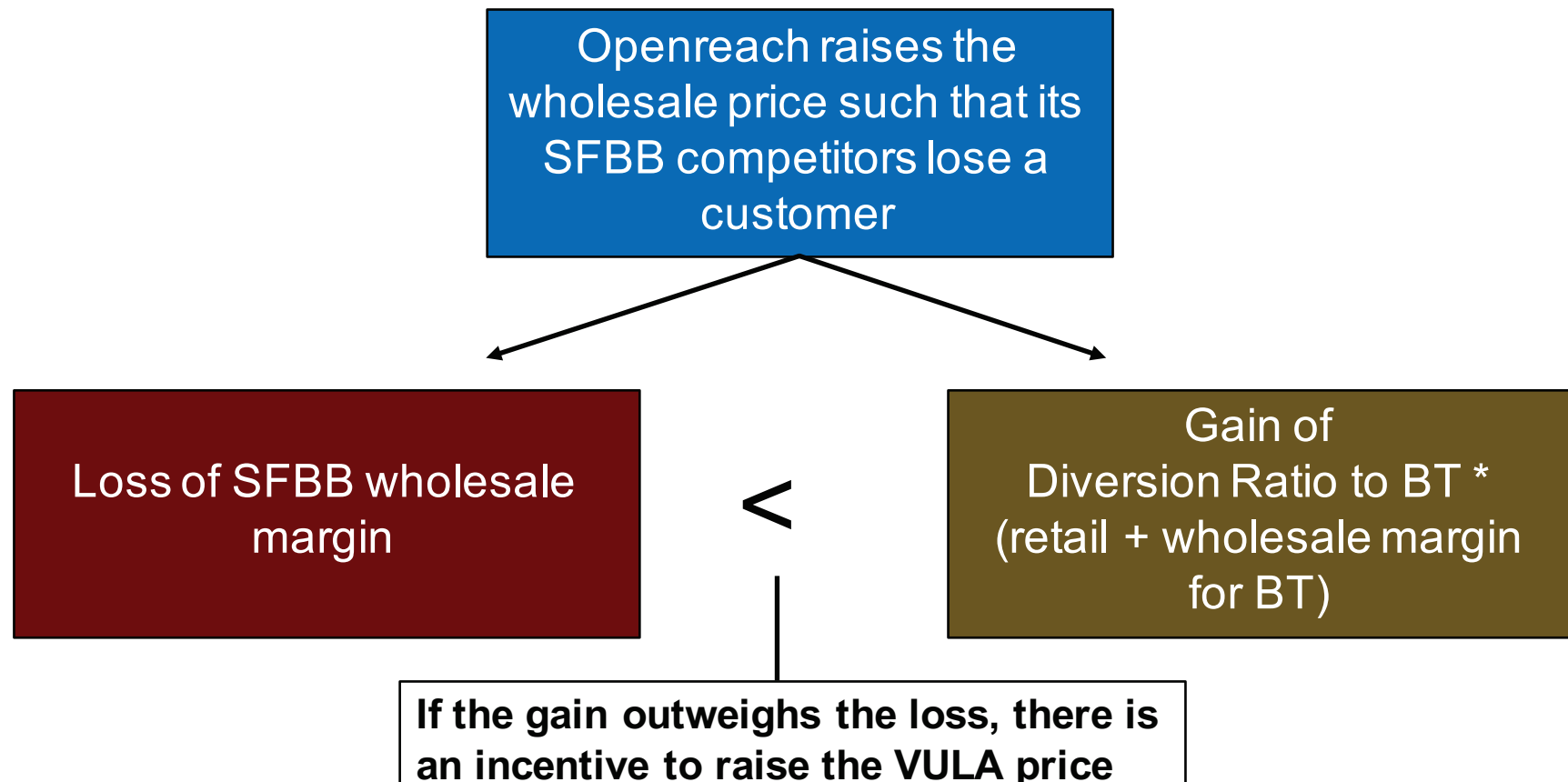
Incentive to raise the VULA wholesale price

If the change in the required margin control allows BT to increase the VULA wholesale price, **would it have incentives to do so?** Two approaches:

- **“Vertical arithmetic”**: What would be the effect of raising the VULA price enough to decrease the sales of rivals by one unit? The *cost* to BT of such a strategy would be equal to its profit margin on the lost sale of VULA. The *benefit* to BT would be the *integrated* margin (retail prices – costs of making available to consumers minus VULA marginal cost) that it can expect to make on retail customers re-captured from rivals.*
- **“Vertical GUPPI (Gross Upward Pricing Pressure Index)”**: this considers the “pricing pressure” on VULA directly due to the merger (i.e., to internalisation of the diversion from VULA-based fixed broadband to EE’s mobile broadband product) – assuming that current prices are not constrained by the regulation of VULA margins (i.e. assuming the regulation is not binding)

**Note: the technique is strictly a simplification as it does not consider directly the benefit of a price increase, but of withholding the input altogether. Still, if incentives to withhold are found this is usually deemed significant for purposes of “raising rivals’ costs” either via increases in the price or decreased in quality of the upstream input sold to downstream rivals.*

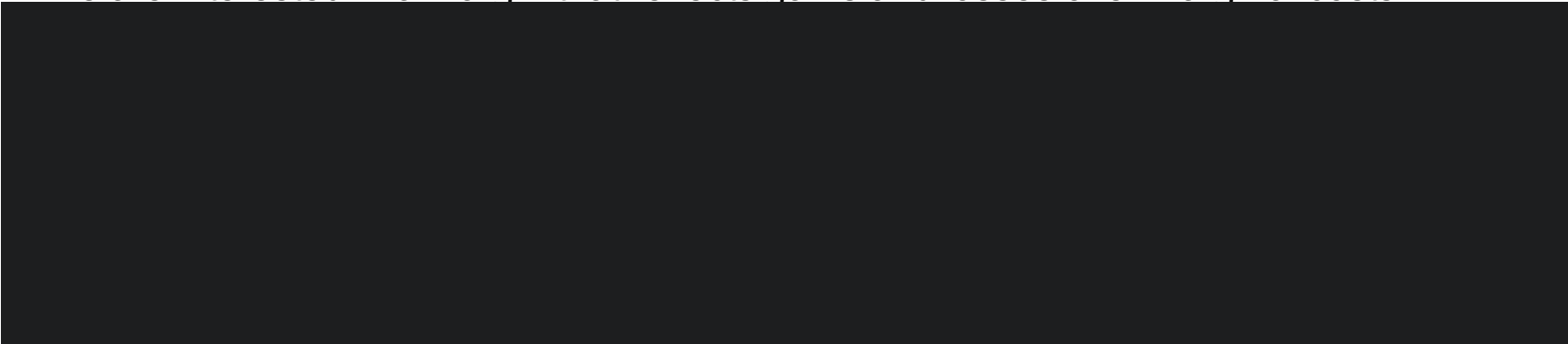
Incentive to raise VULA wholesale price – “vertical arithmetic” (1)



“Vertical arithmetic” (2): wholesale margins

Assume that as the VULA wholesale price is increased, the retail price of Sky and TalkTalk is also increased and the customer switches away: **BT loses the wholesale margin on this customer.**

We are interested in a margin that reflects gains and losses over marginal costs.



The “vertical arithmetic” analysis would find an incentive to withhold the VULA input if the margins earned by BT from additional retail sales (i.e., margins multiplied by the corresponding diversion ratios) exceed this number.

“Vertical arithmetic” (3): retail diversions

Diversions ratios	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Broadband-type choice				
Diversions from SFBB on Sky/TT to ADSL	0%	0%	20%	20%
Diversions from SFBB to mobile BB	0%	0%	4%	4%
Diversions to Fixed/mobile bundle	0%	13%	13%	30%
Diversions to SFBB	100%	87%	63%	46%
SFBB platform choice				
Diversions to Openreach	76%	48%	76%	76%
Diversions to VM	24%	52%	24%	24%
Market share on mobile				
EE	31%	31%	31%	31%
Market share on ADSL				
BT	30%	30%	30%	30%
Market share on bundles				
BT/EE	30%	30%	30%	30%
Diversions ratios to BT/EE products				
ADSL	0%	0%	6%	6%
SFBB	76%	42%	48%	35%
Mobile	0%	0%	1%	1%
Bundle	0%	4%	4%	9%

The scenarios are described on the next slide.

“Vertical arithmetic” (4): retail diversions - scenarios

- [Scenario 1](#) assumes that: a) foreclosed SFBB customer would only divert to a SFBB product, either on BT or on Virgin Media; b) they would not downgrade to ADSL, or divert to a mobile product or to a bundled product; c) the probability of choosing BT is BT’s 76% share of SFBB gross adds (our base case).*
- [Scenario 2](#) assumes that there is a diversion to fixed/mobile bundles of 13%, with the remaining diversion to SFBB. We use 13% indicatively, as this is the average EU take-up of bundled offers that include mobiles. A further difference to Scenario 1 is that the split between Virgin Media and SFBB is by market shares rather than gross adds. Diversion to the BT/EE bundled product is by the combined market share of BT+EE in a pro-forma broadband/mobile market, where the subscribers are added together (concept of “revenue generating units”). That bundled market share is 30%.
- [Scenarios 3](#) is meant to depict a customer who had chosen to go upgrade to Sky/TT SFBB but now diverts. With 20% they divert to SBB (assumption); with 4% to mobile only (share of smartphone only households); with 13% to bundles (EU average share of bundles); diversion to BT SFBB over VM is on gross adds. Diversions to EE on mobile, BT on SBB and BT/EE on the bundles are based on respective market shares.
- [Scenario 4](#) is meant to be a “high bundling” scenario. Parameters are as in Scenario 3 except that diversion to a bundle is equal to the 2014 share of bundling in France of 30% (highest bundling share in EU-5).

* this can be considered as a pre-merger scenario as there is no diversion to any product including mobile

“Vertical arithmetic” (5): incentive?

We use Sky’s estimates of BT’s ARPUs and marginal costs to derive BT’s contribution margins (including wholesale and retail components) from an additional retail sale of SBB or SFBB. For EE’s mobile we assume a 50% contribution margin:

- SBB: [REDACTED]
- SFBB: [REDACTED]
- Mobile : £ 19.00 ARPU - £ 9.50 cost = £ 9.50
- Bundle: [REDACTED]

*Bundle contribution margin is average of SBB/Mobile and SFBB/Mobile bundle and a discount of 13% on the bundle price (AnalysysMason estimate, *Multiplay services in Europe* (2013))

Applying the diversion ratios from the previous slide leads to the following results:

	Scenario 1	Scenario 2	Scenario 2	Scenario 3
Sum of margins * diversion ratios	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Net benefit from withholding VULA	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

We thus find an incentive to withhold VULA input already at current prices.*

*The test does not postulate a price increase post merger, but focuses on withholding. The incentive also exists pre-merger, so the margin control regulation is likely to be the current constraint. With greater “headroom”, BT will likely act on the incentive to increase VULA prices. The VULA test does not need to be strictly binding for it to be a constraint. BT may want to leave a minimum headroom to allow for additional flexibility in the introduction of new products. BT also has an interest not to upset a regulation that is ultimately beneficial.

Alternative approach: “vertical GUPPI” (1)

An alternative approach is Moresi and Salop’s (2012) “**vertical GUPPI**” (vertical-equivalent of measures of upward pressure on prices now routinely used in the assessment of horizontal mergers).

The main feature of this approach is that it allows for the pre-merger level of the wholesale price to be profit-maximising for BT (rather than being constrained by the VULA margin-control test) and focusses on **BT’s incentives to further increase that price after the merger.**

We consider the same scenarios used for the “vertical arithmetic” analysis and assume that BT does not capture any of the diversions to fixed-mobile bundles pre-merger while the merged entity BT/EE would capture a fraction of those diversions equal to its current share of “revenue generating units” (i.e. 30%).

Alternative approach: “vertical GUPPI” (2)

The vGUPP formula for this case is

$$vGUPPI_u = DR_{EE} \cdot \frac{m^{EE}}{w} + DR_{BTEE} \cdot \frac{m^{BTEE}}{w}$$

where w is the VULA price, m^i and DR_i are the margins and diversion ratios from VULA-based SFBB to the merged entity’s mobile (EE) and fixed-mobile bundle (BTEE) products.

Notes:

- 1) We consider only the “upstream” vGUPPI, keeping downstream prices fixed.
- 2) We assume that the VULA input is essential for current VULA-based SFBB suppliers.

Alternative approach: “vertical GUPPI” (3)

Assuming:

- $w = \text{£}7.40$ (VULA) + $\text{£}7.29$ (line rental) = $\text{£}14.69$,
- unit margins and diversion ratios as in the VA analysis

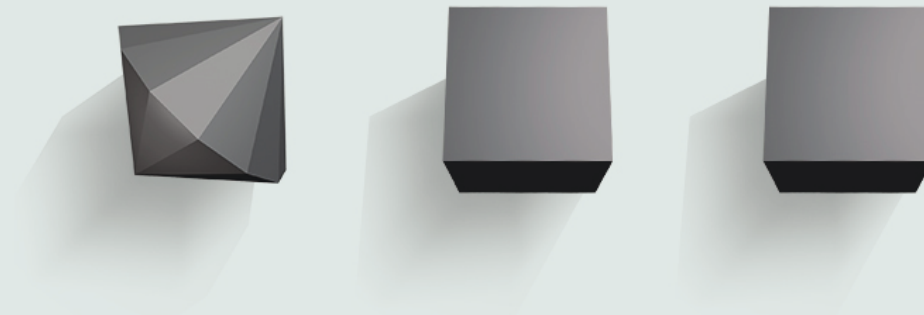
Using the scenarios described in the analysis using “Vertical Arithmetic”, we obtain the following estimates of pricing pressure on the VULA post-merger:

Scenarios
vGUPPIu

1*	2	3	4
[REDACTED]			

*Scenario 1 assumes that there is no diversion to either mobile BB or fixed/mobile bundles. Therefore no upward pricing pressure is found by construction. This scenario was constructed for use in the “vertical arithmetic” analysis to show that, if the VULA test acts as a constraint pre-merger, an incentive to raise the VULA price is found even without assuming diversion to mobile. It is presented here for completeness.

4. Vertical concerns on mobile backhaul



Concerns about mobile backhaul

- Backhaul of mobile traffic relies to a significant degree on fibre links*
- Openreach provides links from mobile sites to BT exchanges, and from those to interconnection points on the mobile operators' networks**
 - Sites linked with "Ethernet Access Direct" or "Ethernet Access Direct Local Access" if the exchange is a specially designated "Access Service Node"
- Openreach is basket-regulated, i.e. based on *average* of its leased line product prices (with certain additional restrictions proposed to be introduced by Ofcom in its BCMR review). Even pre-merger, Openreach tailors products to BT Wholesale's own requirements, and sells to competitors at high prices = cost advantage to BT Wholesale in competing e.g. with VM to provide managed wholesale products.

Concerns that the merger:

- **Creates incentives to *deteriorate quality for competitors*** – e.g. by **supplying "more and better" backhaul to EE; prioritising the maintenance of EE lines; investment bias in favour of backhaul for EE.**
- **Increases the ability to tailor products to BT/EE by using basket regulation, weak "safeguard caps" on important high speed backhaul products and the indirect sale of Openreach products through BT Wholesale (MNOs purchase 90-100% of BT products from BT Wholesale), which is not regulated.**
- **Increases the ability and possibly incentive to increase backhaul prices.** We have analysed the latter with a few simple/indicative high level calculations based on assumptions and public data. The CMA can follow the logic of our analysis and ask BT and MNOs for the relevant inputs (which Sky does not have).

Estimating backhaul costs per operator*

1. Ofcom estimates on average around 20% of a mobile operator's network costs are backhaul, based on its Mobile Cost Termination model. For 2015/16, the MCT model **computes total backhaul costs of £295m per operator** (leased lines + microwave links).
2. What share goes to BT? Deducting £80mn for microwave, and using BT's share of 80% in leased lines, BT could get up to £172m from an "average" operator.
3. We can also think of an alternative "bottom up" approach: a network with 14,000 sites (Vodafone network) might suggest 8,400 backhaul links (CMA Phase 1 decision: 60%-70% of backhaul is fibre) at a price of around £55m and additional links to interconnection points at a cost of around £38m, arriving at **total backhaul leased line costs of around £95m for the "average" operator** (BT's 80% share would then be £75m). This figure is likely to be lower since it only covers payments to Openreach, while in actual fact operators purchase 90%-100% of their BT backhaul products from BT Wholesale.
4. Cross check: Openreach has external revenues of around £1.95bn, of which we estimate £1.45bn come from fixed access (15m LLU lines and 1m SFBB lines at around £7.50 per month): Openreach direct leased line sales are therefore a maximum of £500m. Given two fixed operators (TalkTalk and Sky) requiring backhaul to their interconnection points, and four mobile operators requiring both site connection and backhaul, if split evenly this would suggest backhaul leased line payments to Openreach could be £100m pa for an "average sized" mobile operator.

*Since Sky is not a mobile operator, estimates were based on public data. Our analysis highlights approaches to how, with detailed operator data, incentives to foreclose can be computed more accurately.

BT's *ability* to raise rivals' costs for backhaul

Post-merger, BT / EE will have **freedom to price discriminate in favour of BT Wholesale and EE, and against other mobile operators:**

- There is an inherent trade-off in the basket approach to regulation of allowing flexibility on the one hand and avoiding exploitation of that flexibility in favour of BT's own downstream divisions on the other. Even with tighter regulatory controls, **basket regulation will continue to allow for price discrimination across operators – and higher prices to EE rivals**
- In addition to the flexibility inherent in basket regulation, discrimination is possible since **90%-100% of all BT backhaul products are sold to MNOs through BT Wholesale, which is not subject to regulation in backhaul.**
- Discrimination can take the form of **designing products that suit EE best**, others less so
- There are only “CPI” safeguard caps, rather than cost-oriented caps, on very high speed backhaul products, which are likely to become very important: the nominal prices are not allowed to increase in the current charge control period. Since costs of high speed Ethernet will continue to fall, this allows BT **not to pass on price reductions.**
- Ofcom has raised the concern that the quality provision of Ethernet is below standard. Post merger, **BT will have the ability to bias the improvement in quality required in favour of EE. Regulating non-discrimination in quality of service is difficult in practice.**
- **The remedy of dark fibre will take significant time to provide a constraint to BT's own active services.**

BT's *incentives* to foreclose / raise rivals' costs

- We conducted the following “proxy experiment”: what would be the “gains and losses” for BT of a strategy to foreclose backhaul, i.e. *how does the wholesale contribution on backhaul sold to rivals compare to the benefit of recouping integrated margin on customers switching to EE?*
- Assume a reduction in BT supply of backhaul to MNOs other than EE, equivalent to *one mobile subscriber*:
 - “Cost” to BT is the loss of margin on “one subscriber unit” of backhaul services;
 - “Benefit” is total margin (upstream + downstream) times the diversion ratio, i.e. what portion of these “lost customers” BT/EE recovers. *Assumption: if BT reduces the supply of backhaul by a “one-mobile-subscriber-equivalent” amount, then EE’s rival have a probability (estimated at) 20% of getting that backhaul amount from somewhere else and keep the subscriber; with the complementary probability of 80% they lose the subscriber who will switch to EE rather than giving up on mobile services. So 80% is the relevant DR to BT/EE. So benefit = 80% x total margin on BT/EE customer.*
 - We use contribution margins that have been suggested in the literature: backhaul – 80% (capital intensive industries), mobile operator 50%
- Results suggests that BT gets payments between £75m-172m from a mobile operator for backhaul leased lines => imply **contribution margin per customer per month of £0.27-0.59 for Openreach & BT Wholesale, dwarfed by EBITDA gain on customer switching to BT/EE with 80% probability.** Suggests incentive to withhold. In practice consistent with incentive to raise rivals' costs

BT's incentives to raise rivals' costs (v1)

Wholesale loss for BT from withholding

£295 mn Ofcom est. backhaul cost 2015/16

£80 mn of which microwave

= £215 mn Backhaul cost excl. microwave

80% BT share of leased lines

**= £172 mn Estimated backhaul payments
MNO to BT Openreach & WIs**

19.5 mn Ofcom equiv. estimated subs
2015/16

= £0.74 Backhaul payment to BT per
customer per month

= £0.59 80% contribution margin

Retail gain for BT

£19 ARPU

50% Contribution margin

= £9.50 Contribution margin per user

Diversion Ratio

80% BT market share in leased lines

Wholesale loss < (WIs+Retail gain)* DR?

$£0.59 < (£0.59 + 9.50) * 80\% = £8.07$

Approach 1: based on Ofcom MCT model

- Assume that mobile operator cannot switch away from BT for 80% of its wholesale lines (CMA Phase I decision: BT market share in fibre backhaul)
- *Gain* to BT of foreclosing “one unit” of backhaul is the integrated margin it would make on EE for 80% of lines that cannot be switched – roughly **£8.07** per user
- *Wholesale loss* calculated with reference to the Ofcom modelled network wholesale margin on backhaul is **£0.59** per user
- Net positive gain £7.48 per user

NOTE: While the incidence of backhaul costs on the mobile operator may not seem large enough to anticipate full foreclosure (from higher backhaul prices or degradation of backhaul service quality), recall that mobile operator margins are thin, and it is suggestive of an incentive to raise rivals' costs and distort competition.

BT's incentives to raise rivals' costs (v2)

Wholesale loss

14,000 Sites (Ofcom sitefinder 2012 figures for Vodafone)
= 8,400 fibre backhaul (CMA Decision: 60%-70%)
42% EAD-LA@£4,848 (Ofcom BMCR 15) (site to BT
"ASN" exchange)
EAD@£7,921 (Ofcom BMCR 15) (site to BT
58% exchange)
= £55.7 mn site backhaul cost in m
3,528 1 Gbit Ethernet Backhaul Direct Circuits (estimate:
same number as EAD-LA circuits; exchange to
handover point)
= £38.4 mn EBD@ £10,896 (backhaul to handover point cost)
~ £75 mn Payment to Openreach: 80% of total leased line cost
18.4 mn Vodafone subscribers in m
= £0.34 Payment to Openreach per customer per month
= **£0.27 80% Openreach contribution margin=wholesale
loss**

Retail gain

£19 ARPU
50% Contribution margin
= £9.50 EBITDA margin per user

Diversion Ratio

80% BT market share in leased lines

Wholesale loss < (Wls + Retail gain) * diversion ratio?

$£0.27 < £(0.27 + 9.50) * 80\% = £7.82$

- **Approach 2:** based on "bottom up" geographic reconstruction of an average UK mobile network
- We used Vodafone's statement that it has 14,000 sites and the CMA statement that 60%-70% of these feature fibre backhaul. We built up total backhaul cost for Vodafone multiplying links and lengths by relevant Openreach prices.
- In this scenario the *wholesale loss* to Openreach from losing wholesale margin on a sale of backhaul to Vodafone is smaller. This is probably driven by the fact that we only consider payments to Openreach, when in fact operators purchase managed products from BT Wholesale, which is likely to be captured by the previous approach
- Net positive gain of £7.55 per user.

London

Tel +44 (0)20 7664 3700
99 Bishopsgate
London EC2M 3XD
United Kingdom

Brussels

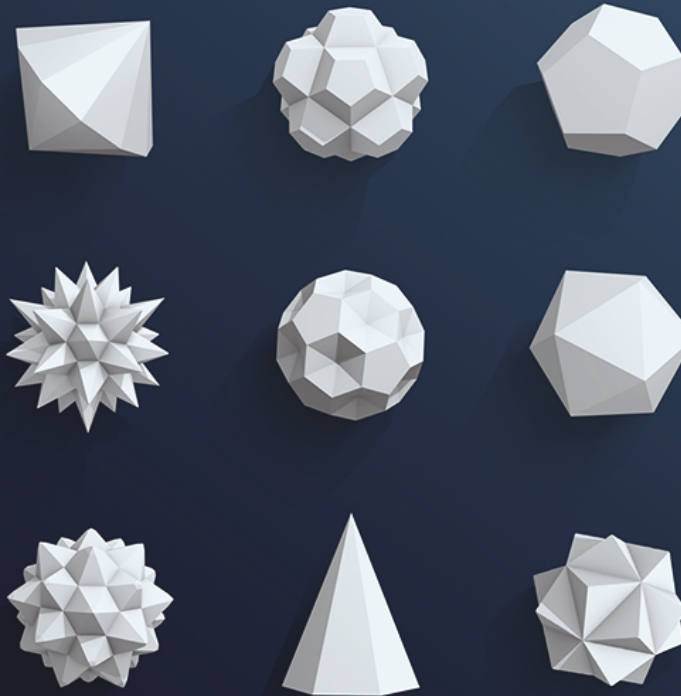
Tel +32 (0)2 627 1400
143 Avenue Louise
B-1050 Brussels
Belgium

Paris

Tel +33 (0)1 70 38 52 78
27 Avenue de l'Opéra
75001 Paris
France

Sydney

Tel +61 (0)2 9779 1500
Level 23, Tower 1
520 Oxford Street
Bondi Junction NSW 2022
Australia



www.crai.com/ecp

13 August 2015