Canadian Radio-television and Telecommunications Commission
Conseil de la radiodiffusion et des télécommunications canadiennes

Telecom Decision CRTC 2016-379

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Follow-up to Telecom Regulatory Policy 2015-326 – Implementation of a disaggregated wholesale high-speed access service, including over fibre-to-the premises access facilities

In Telecom Regulatory Policy 2015-326, the Commission mandated the provision, to competitors, of disaggregated wholesale high-speed access (HSA) services, including over fibre-to-the-premises access facilities, for the large incumbent carriers.

The disaggregated wholesale HSA service is to be implemented in phases, starting with the provinces of Ontario and Quebec. In this proceeding, Bell Canada, as well as Cogeco Cable Inc. (Cogeco), Rogers Communications Canada Inc, (RCCI), and Videotron G.P. (Videotron) [collectively, the Cablecos], filed proposed configurations for their respective disaggregated wholesale HSA services.

The Commission has made its determinations in this decision with a view to providing Canadians with more choices in services such as broadband Internet access. Increased choice is expected to drive competition, resulting in further investment in telecommunications facilities.

The configurations proposed by Bell Canada and Cogeco for their respective disaggregated wholesale HSA services meet the criterion of excluding a transport component. With respect to RCCI and Videotron, as their proposed configurations do not fully meet the Commission's criterion of excluding a transport component, the Commission ***directs*** *RCCI and Videotron to file configuration proposals that would be available at each of their respective head-ends and would not include a transport component, while taking into consideration the need for a solution that is cost-effective for competitors.*

The Commission determines that Bell Canada and the Cablecos are required to only provide solutions that utilize their proposed routing and switching techniques (characterized as Layer 3 approaches) for their configuration proposals in support of disaggregated wholesale HSA services.

The Commission finds that Bell Canada and the Cablecos are to provide an outside meet-me point to support competitor interconnection to the disaggregated wholesale HSA service, and ***directs*** *Bell Canada to provide an outside meet-me point as a competitor interconnection for the disaggregated wholesale HSA service in addition to its tariffed co-location option.*

Canada

*With the objective of providing competitors with more control over their costs, the Commission **directs** Bell Canada and the Cablecos to provide competitors the ability to buy capacity in 50 megabits per second (Mbps) increments for their disaggregated wholesale HSA services.*

To expedite service introduction, the Commission requests the CRTC Interconnection Steering Committee (CISC) to establish a working group to address resolution of interconnection and related technical and operational issues associated with implementation of disaggregated wholesale HSA services.

Introduction

1. In Telecom Regulatory Policy 2015-326, the Commission determined that the provision of tariffed wholesale high-speed access (HSA) services by incumbent carriers would continue to be mandated, with the provision that aggregated services that include both access and transport components would no longer be mandated and would be phased out in conjunction with the implementation of a disaggregated service consisting of only an access component. The implementation of disaggregated wholesale HSA services[1] includes a requirement to make these services available over fibre-to-the-premises (FTTP) access facilities.

2. The Commission determined that disaggregated wholesale HSA services should be implemented in phases, starting with Ontario and Quebec. Consequently, the Commission directed Bell Aliant Regional Communications, Limited Partnership,[2] Bell Canada, as well as Cogeco Cable Inc. (Cogeco), Rogers Communications Partnership (now known as Rogers Communications Canada Inc. (RCCI)),[3] and Videotron G.P. (Videotron) [collectively, the Cablecos] to file proposed configurations for their respective disaggregated wholesale HSA services (the configuration proceeding).[4]

3. The Commission also determined that the implementation of the disaggregated wholesale HSA service at a specific central office or head-end location in the designated geographic markets would be triggered only by a competitor's request for the service at the specific central office or head-end location in question.

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[1] Disaggregated wholesale HSA services provide high-speed paths between a competitor's end-customer premises and an interface on an incumbent carrier's network (at the incumbent local exchange carrier central office or Cableco head-end) where the competitor connects and routes its end-customer's traffic onto its own network.

[2] Bell Aliant Regional Communications Inc. (Bell Aliant) was integrated into Bell Canada on 1 July 2015. As a result of this integration, Bell Aliant's wireline operations are now part of Bell Canada.

[3] Rogers Communications Partnership ceased to exist as of 1 January 2016. All of its business activities, including its assets and liabilities, are now held by RCCI.

[4] As set out in paragraph 160 of Telecom Regulatory Policy 2015-326, the incumbent carriers operating in other territories will be expected to identify appropriate configurations and implementation plans for their respective disaggregated wholesale HSA services at a later date, depending on demand considerations.

4. Concurrent with the issuance of Telecom Regulatory Policy 2015-326, the Commission issued a letter that, among other things, set out the process for the configuration proceeding.[5] Specifically, the Commission allowed the incumbent carriers to make proposals regarding any implementation issues during either the configuration process or the subsequent tariff process.[6] Parties were asked to raise issues requiring policy determinations that were not directly related to rate setting in the context of the process initiated by the letter.

5. The Commission received proposed configurations from the above-mentioned incumbent carriers, as well as comments on these proposals from Allstream Inc. (Allstream), the City of Calgary (Calgary), the Canadian Network Operators Consortium Inc. (CNOC), Primus Telecommunications Canada Inc. (Primus), Saskatchewan Telecommunications (SaskTel), Shaw Communications Inc. (Shaw), TekSavvy Solutions Inc. (TekSavvy), TELUS Communications Company (TCC), and Vaxination Informatique (Vaxination).

Objectives

6. The Commission's determinations in this proceeding, which flow from those set out in Telecom Regulatory Policy 2015-326, were made with a view to achieving the following objectives:

    - eliminating non-essential facilities from the configurations to the maximum extent feasible;
    - enabling competitors to have greater control over their costs and ability to offer high-quality innovative retail services;
    - promoting symmetry among incumbent carriers' mandated wholesale HSA service offerings where feasible;
    - providing for efficient network operations and maintenance;
    - minimizing service disruption for Canadians in the transition from aggregated to disaggregated wholesale HSA services; and
    - rapid implementation.

Configuration proposals

Bell Canada

7. Bell Canada proposed a disaggregated wholesale HSA service configuration that it would implement, on a competitor's request, in any of its Ontario and Quebec central offices that support HSA services. Bell Canada submitted that following the first competitor request for the disaggregated service at a central office it would establish

[5] http://www.crtc.gc.ca/eng/archive/2015/lt150722.htm

[6] As set out in paragraph 159 of Telecom Regulatory Policy 2015-326, the tariff process will begin after the configurations for disaggregated wholesale HSA services are approved by the Commission.

a point of interconnection (POI) where competitors would interconnect their transport facilities and obtain access for all end-users served through that central office. This includes end-users who are served by copper and fibre access facilities.

8. Bell Canada submitted that to support competitor interconnection at a central office, it would install a POI switch in each central office to be connected to local Ethernet switches. These Ethernet switches would manage the exchange of traffic between the competitors' interfaces at the POI switch and their end-users connected to either copper access facilities served by digital subscriber line (DSL) technology, or FTTP access facilities served by passive optical network (PON) technology.

9. Bell Canada proposed that a competitor using its disaggregated service would be required to co-locate at the serving central office and bring transmission facilities to that central office where Bell Canada would provide links to connect the competitor to its disaggregated service interface on the POI switch.

Cogeco

10. Cogeco proposed a disaggregated wholesale HSA service configuration that it would implement, on a competitor's request, at any of its head-ends in Ontario and Quebec. Cogeco submitted that following the first competitor request for the disaggregated service at a head-end it would establish a POI where competitors would interconnect transport facilities and obtain access to all end-users served by that head-end. This includes end-users served by hybrid fibre-coaxial (HFC) and fibre access facilities.

11. Cogeco submitted that to support competitor interconnection at its head-ends, it would install a POI router in each head-end to be connected to the local cable modem terminating systems (CMTS).[7] The CMTS would manage the exchange of traffic between the competitors' interfaces at the POI router and their end-users using Data Over Cable Service Interface Specification (DOCSIS)[8] technology with connection to end-users through either HFC access facilities or fibre access facilities served by Radio Frequency over Glass (RFoG)[9] technologies.

12. Cogeco proposed that a competitor using its disaggregated service would be required to bring transmission facilities to a designated meet-me point adjacent to Cogeco's head-end (fibre outside splicing closure [FOSC][10]), where Cogeco would extend the transmission facility to its disaggregated service interface on the POI router in the head-end.

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[7] CMTS is a device (usually located at a head-end) that connects to end-user cable modems through a cableco's access network and processes data exchange over DOCSIS [Data Over Cable Service Interface Specification] protocols.

[8] DOCSIS is a telecommunications standard that defines interface requirements for supporting high-speed data delivery over cable infrastructure.

[9] RFoG is a type of PON deployed by cablecos to deliver their radio frequency (RF) signals that carry video, data and voice services. In some cases, RFoG is used to replace the coax portions of HFC facilities.

[10] FOSC refers to a location close to the head-end where fibre will be connected from the POI router to the transport facility owned or leased by a competitor.

RCCI

13. RCCI proposed a disaggregated wholesale HSA service configuration that it would implement, on a competitor's request, at 34 head-ends (referred to as the designated head-ends) out of its 35 head-ends in Ontario. RCCI submitted that following the first competitor request for the disaggregated service at one of the designated head-ends, it would establish a POI where competitors would interconnect transport facilities and, for 33 of its designated head-ends, obtain access to all end-users served by only that head-end. At the remaining designated head-end, competitors would obtain access to all end-users served by that head-end, as well as end-users served by the 35th head-end. RCCI indicated that its configurations would support end-users served by HFC and fibre access facilities.

14. RCCI submitted that, to support competitor interconnection at any of its 34 designated head-ends, it would install a POI router to be connected to existing routing equipment at the head-end. For 33 of the designated head-ends, this routing equipment would be connected to the local CMTS and optical line terminals (OLTs)[11] (where applicable) at the head-end. For the remaining designated head-end, the routing equipment would be connected to the local CMTS and OLTs (if applicable) at that head-end and to the CMTS at the 35th head-end, which does not have routing equipment in place, through transmission facilities.

15. The routing equipment at each of the 34 designated POIs would manage the exchange of traffic between the competitors' interfaces at the POI router and their end-users connected to (i) HFC access facilities served by DOCSIS technology, (ii) fibre access facilities served by DOCSIS technology in combination with RFoG technology, or (iii) fibre access facilities served by PON technology.

16. RCCI proposed that competitors using its disaggregated service would be required to bring transmission facilities to a designated meet-me point adjacent to RCCI's head-end (FOSC), where RCCI would extend the transmission facilities to its disaggregated service interface on the POI router in the designated head-end.

Videotron

17. Videotron proposed a disaggregated wholesale HSA service configuration that it would implement, on a competitor's request, at 22 designated head-ends out of its 50 head-ends in Ontario and Quebec. Videotron submitted that following the first competitor request for the disaggregated service at one of the 22 designated head-ends, it would establish a POI where competitors would interconnect transport facilities and, depending on the head-end, obtain access to all end-users served by only that head-end or obtain access to all end-users served at that head-end along with end-users served by one or more of the 28 head-ends that were not designated

[11] An OLT is a device which serves as the service provider end-point of a PON. OLTs perform conversion between the signals used by the service provider's equipment and the fibre-optic signals used by the PON and co-ordinate the multi-plexing between the conversion devices on the other end of that network.

head-ends. Videotron submitted that its configurations would serve end-users served by HFC access facilities, and indicated that it had no current plans to deploy fibre access facilities.

18. Videotron submitted that, to support competitor interconnection at any of its 22 designated head-ends, it would install a POI router to be connected to existing routing equipment at the head-end, and in some cases to routing equipment at another head-end. For some POIs, this routing equipment would be connected to only the local CMTS at the head-end, and for the remaining POIs, the routing equipment would be connected to the local CMTS and would also be connected through transmission facilities to CMTS at one or more of the 28 head-ends not designated as POIs. These 28 head-ends are equipped with CMTS but not with routing equipment.

19. The routing equipment at each of the 22 designated head-ends would manage the exchange of traffic between the competitors' interfaces at the POI router and their end-users connected to HFC access facilities served by DOCSIS technology.

20. Videotron proposed that a competitor using its disaggregated service would be required to bring transmission facilities to a designated meet-me point adjacent to Videotron's head-end (FOSC), where Videotron would extend the facilities to its disaggregated service interface on the POI router in the designated head-end.

Issues

21. The Commission has identified the following issues to be addressed in this decision:

    - What, if any, level of aggregation is acceptable for mandated disaggregated wholesale HSA services?
    - Which Layer solution should be used for the configurations proposed by Bell Canada and the Cablecos for their disaggregated wholesale HSA services?
    - At what locations should competitors be able to interconnect to disaggregated wholesale HSA services?
    - Should more flexible arrangements for transport facilities be allowed for competitors?
    - Should the capacity-based billing (CBB) capacity increment be reduced from 100 megabits per second (Mbps) to 1 Mbps for disaggregated wholesale HSA services?
    - Should a competitor using a 10-Gigabit Ethernet (GigE) interface to interconnect to a disaggregated wholesale HSA service be required to maintain a minimum capacity order of 3 gigabits per second (Gbps) on the interface?

- Should an incumbent carrier be required to simultaneously provide aggregated and disaggregated services for a competitor at a disaggregated area?
- Should a CRTC Interconnection Steering Committee (CISC) working group be established for the resolution of interconnection and related technical and operational issues related to implementation?

What, if any, level of aggregation is acceptable for mandated disaggregated wholesale HSA services?

22. In Telecom Regulatory Policy 2015-326, the Commission mandated a disaggregated wholesale HSA service that would provide competitors with high-speed paths to end-customers' premises served by an individual central office or head-end through a local interface at the central office or head-end. These high-speed paths include an access component and an interface but do not include a transport component.[12]

Positions of parties

23. With respect to Bell Canada's configuration proposal, Allstream submitted that a strictly central-office-based disaggregated HSA service is inefficient, expensive, and unworkable from an incumbent local exchange carrier (ILEC) and competitor perspective, and that it runs counter to the evolution of telecommunications technology to higher levels of aggregation. Allstream stated that for regions that are served by FTTP, it would make more sense to aggregate FTTP to a natural aggregation point similar to a head-end. Allstream indicated that local interconnection region (LIR) hubs may represent the ideal aggregation/interconnection points, which would result in a reduction in Ethernet switches for competitor interconnection.

24. CNOC, supported by TekSavvy, submitted that any service configurations should be disaggregated to the maximum extent possible – to the central office level for Bell Canada, and to the head-end level for Cogeco, RCCI,[13] and Videotron. Further, configurations with maximum disaggregation provide competitors with greater control over their networks and underlying costs, leading to service innovations that will benefit consumers.

25. CNOC submitted that configurations that contain aggregation over multiple central offices or head-ends would result in high CBB costs and jeopardize competitor sustainability.

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[12] In Telecom Regulatory Policy 2015-326, the Commission found that it was not practical or feasible for competitors to duplicate the access component of wholesale HSA services, including those over FTTP access facilities but that it was generally practical and feasible for competitors to duplicate the transport component of wholesale HSA services.

[13] CNOC accepted not having access to a fully disaggregated service at one of RCCI's 35 head-ends.

26. CNOC submitted that Allstream's LIR-based aggregation proposal was not appropriate since it relies on a topography designed to support voice competition, whereas Bell Canada's aggregation approach for its broadband services is based on its broadband remote access server (BRAS)[14] architecture.

27. CNOC requested that the Commission clarify which of Bell Canada's central offices are remotes, and not true central offices. CNOC stated that a level of disaggregation beyond true central office level is inappropriate and would distort the standard configuration envisioned in Telecom Regulatory Policy 2015-326.

28. Vaxination submitted that Bell Canada had upgraded its centralized BRAS a few years ago, and that Bell Canada did not confirm that BRAS functionality to support legacy DSL and fibre-to-the-node (FTTN) end-users was being moved from central locations to each central office. Vaxination submitted that Bell Canada's proposed disaggregated service configuration would require the installation of BRAS equipment in each central office supporting the service, which would greatly increase costs.

29. Bell Canada, supported by SaskTel and TCC, submitted that ILEC disaggregation should be at the central office level. Bell Canada stated that making disaggregated service available from fewer POIs (i.e. aggregation across central offices) would require it to provide transport facilities, which would be inconsistent with Telecom Regulatory Policy 2015-326. Bell Canada submitted that in that decision, the Commission did not contemplate a disaggregated service that included transport facilities, and that mandated transport facilities would be contrary to the Commission's objective to encourage competitor investments in alternative transport. TCC added that mandating inter-office transport would be imposing regulation where it is not required, since such transport can be self-provided.

30. Videotron submitted that its configuration proposal would allow it to maintain its network architecture by connecting its POI routers to the existing routing equipment in place for its retail network. Further, to provide a fully disaggregated solution (to its 50 POIs) while maintaining its current network architecture, Videotron would have to deploy a POI router, on competitors' request, at any of the 22 head-ends with routing functionality and the 28 head-ends that have no routing functionality. At the time a competitor requests disaggregated service at one of the 28 head-ends without routing functionality, Videotron would need to deploy a POI router at that head-end and link it through transport facilities to the routing functionality at the appropriate head-end(s) where the POI router could access the CMTS in the local head-end. This configuration would lead to extra costs for transport facilities and POI router equipment, which would not be incurred in the case of Videotron's configuration proposal with 22 POIs.

[14] A BRAS identifies and routes the traffic between an end-user and its service provider on an incumbent's network.

31. Shaw supported Videotron's proposal for offering POIs at 22 of 50 head-ends. Shaw stated that Videotron's proposal that POIs be made available at head-ends with existing routing functionality mirrors its own retail Internet traffic routing.

32. Shaw submitted that disregard for whether head-ends have existing routing functionality would ignore evolution and future network design plans for certain carriers. In today's cable-based networks, many head-end buildings have no routing functionality, since networks have evolved to the use of more centralized routing facilities. Requiring interconnection at head-ends that currently have no routing functionality would increase equipment costs and require unnecessary transport costs, and would be inconsistent with the goals of Telecom Regulatory Policy 2015-326.

Commission's analysis and determinations

33. The configurations proposed by Bell Canada and Cogeco include an access component and a local interface, but not a transport component. Therefore, both proposed configurations meet the Commission's criterion of excluding a transport component for the disaggregated wholesale HSA service.

34. Although concerns were raised regarding the costs of providing the additional functionality required at each central office for Bell Canada's proposed configuration, implementing proposals that make use of connection to more centralized functionality would result in disaggregated wholesale HSA service configurations that include a company transport component for some areas, which would not meet the above criterion.

35. RCCI's proposed configuration meets the above-mentioned criterion for 33 of its 34 designated head-ends, but the proposal for the 34th designated head-end fails to do so as it includes a transport component required for providing wholesale HSA access to end-users served by its remaining head-end (i.e. the 35th head-end).

36. Videotron's proposed configuration meets the above-mentioned criterion for only a subset of the 22 designated head-ends while the proposals for the remaining designated head-ends include a transport component. As submitted by Videotron, the company's approach for a fully disaggregated solution for its 50 head-ends, while maintaining its current network architecture, would require more transport than its proposed configuration with 22 designated head-ends.

37. Although Cogeco does not have routing functionality at most of its head-ends, the company proposed a disaggregated wholesale HSA service configuration that provides access paths to end-users that do not include a transport component. Accordingly, alternative approaches to Videotron's proposals to achieve full disaggregation to the head-end level with no transport component are feasible. It is recognized that such a level of disaggregation would potentially require architectural changes along with associated costs. However, the need for any such architectural changes would only be triggered upon a competitor request for disaggregated wholesale HSA service at one of the 28 head-ends not currently equipped with

routing functionality and would only apply to the relevant head-end where a competitor has made a request for disaggregated wholesale HSA service.

38. In light of the above, the Commission **directs** RCCI and Videotron to file configuration proposals that would be available at each of their respective head-ends and that would not include a transport component, taking into consideration the need for a solution that is, as much as possible, cost-effective for competitors.

Which Layer solution should be used for the configurations proposed by Bell Canada and the Cablecos for their disaggregated wholesale HSA services?

Positions of parties

39. Bell Canada and the Cablecos proposed disaggregated wholesale HSA service configurations that can be characterized as Layer 3 service solutions.[15] In response to Commission interrogatories, they also described potential configurations for disaggregated Layer 2 wholesale HSA services.[16]

40. CNOC submitted that the disaggregated HSA service should use a Layer 2 configuration to the maximum extent feasible to provide competitors greater control of their networks, service offerings, and underlying cost structure. CNOC cited certain competitive advantages of a Layer 2 configuration over a Layer 3 configuration, including the following:

    - more efficient data transport since Layer 2 data transmissions are not burdened by as much protocol overhead;
    - greater compatibility with networking advances, such as "jumbo frames,"[17] which further improve the performance and efficiency of data transmissions;
    - much more flexibility in terms of a competitor's network equipment choices and ability to overlay network protocols and functions, as desired;
    - more straightforward processes to identify subscribers and map Internet Protocol (IP) addresses, thereby allowing competitors to manage services and equipment much more efficiently; and
    - a much more flexible range of simplified options for wholesale businesses that would allow competitive entry and expansion into wholesale service markets.

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[15] Layer 3 or network layer services are typically Internet Protocol (IP)-based services. A Layer 3 HSA service provides access between end-users and service providers that use IP protocols for exchanging data.

[16] Layer 2 or data-link layer services are typically Ethernet-based services. A Layer 2 HSA service provides access between end-users and service providers that use Ethernet protocols for exchanging data.

[17] Jumbo frames are large Ethernet frames (for Ethernet, data is carried in data units called frames). Each frame contains addresses and controls information along with data. Standard Ethernet frames can include 1,500 bytes of data and jumbo frames can include up to 9,000 bytes of data.

Layer 2 service solution for Cablecos

41. The Cablecos submitted that they could provide an emulated Layer 2 HSA service using Layer 2 virtual private network (VPN) technology over their existing Layer 3 IP/multi-protocol label switching (MPLS)[18] networks. They also submitted that they have used this approach to serve business customers.

42. Cogeco indicated that it could establish a point-to-point Layer 2 VPN circuit from each end-user served by a competitor to the POI router. At the POI router, each Layer 2 VPN circuit would be associated with a pre-defined virtual local area network (VLAN) tunnel to establish the overall connection between each end-user and the competitor.

43. Notwithstanding the Cablecos' view on potential provision of a Layer 2 service solution, they all opposed the implementation of such a Layer 2 solution. They submitted that the implementation of a Layer 2 solution would require manual provisioning of end-users and manual re-configuration when end-users are moved from one CMTS to another as a result of a node split. Given the complexity of the provisioning process for the proposed Layer 2 service solution, manual provisioning is not scalable to support the provisioning of the large number of end-users that would be required for disaggregated wholesale HSA services. Also, given that node splits are fairly common, manual re-configuration triggered by node splits would be required with some frequency and would be burdensome to accomplish. The automation of manual processes would require substantial investment in provisioning, operating, and billing systems to support only the competitors.

44. The Cablecos indicated that there was limited cable modem support for Layer 2 VPNs. Cogeco and RCCI indicated that they each had certified only one cable modem that could be used in their respective networks. To make use of the Layer 2 service, competitors would have to change cable modems for all end-users not using a supported cable modem.

45. Cogeco submitted that it would have to upgrade the POI routers it had proposed for its Layer 3 service configuration to support its proposed Layer 2 service configuration, and that this would result in increased service costs. Cogeco added that transitioning to a Layer 2 service configuration would make its existing security strategies that rely on Layer 3 service monitoring and intervention ineffective and could put all competitors' and Cogeco's end-users at risk of being vulnerable to security-related attacks.

46. Cogeco argued that the limit of 4,095 separate VLANs per POI would limit competitor growth capability at a POI. RCCI submitted that the use of VLANs could result in potential capacity management and load sharing/balancing issues at the interfaces to competitors.

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[18] MPLS is a type of data-carrying technique for telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses.

47. Cogeco indicated that the provision of a Layer 2 service solution would entail a fundamental re-engineering of its existing CMTS network that would not benefit Cogeco's core business or its wholesale HSA service customer base, and that would incur significant costs and impose a substantial administrative burden on both Cogeco and its third-party Internet access (TPIA) service customers with little demonstrated benefit.

48. The Cablecos submitted that in comparison with Layer 2 service solutions, the Layer 3 service solutions they have proposed are more efficient, cost-effective, and less exposed to manual errors which could lead to end-users being affected.

49. CNOC acknowledged that there are credible technical issues with implementing a Layer 2 service solution over DOCSIS standards, but noted that as Layer 2 VPN service solutions are being offered to business customers, Layer 2 service solutions alongside Layer 3 are feasible on a limited scale. Given the sparse level of RFoG deployments, the Cablecos would need to do much less work to enable Layer 2 service connectivity for RFoG deployments than for their FTTN-based TPIA services. CNOC requested that the Commission require the cable carriers to provide separate Layer 2 and Layer 3 cost studies for FTTP- and RFoG-based services, and Layer 3 cost studies for all other FTTN-based TPIA services.

50. The Cablecos submitted that CNOC's cost study request should be rejected. RCCI submitted that CNOC's argument that Layer 2 service solutions should be explored over FTTP because of the current low level of deployment does not address technical challenges and does not defuse the scalability issue. Videotron submitted that it did not have any approved plans to deploy FTTP, including RFoG, and that, as such, CNOC's arguments regarding the ease of implementing Layer 2 service solutions on Videotron's network are speculative. Cogeco submitted that it is providing fibre access services using RFoG, and that, as such, the limitations associated with providing a Layer 2 service solution over DOCSIS technology apply.

51. RCCI addressed the technical benefits of Layer 2 service solutions identified above that applied to the Cablecos. Regarding protocol overhead, RCCI's Layer 2 approach would require additional overhead packets, so this approach would be less efficient than its Layer 3 proposal. Potential jumbo frame efficiency does not apply to Layer 2 DOCSIS, since packets must be split into the size limit of DOCSIS, which does not operate with jumbo frames. IP address provisioning for RCCI's Layer 2 configuration would not differ from what has to be done to provision IP addresses for its Layer 3 configuration.

Layer 2 service solution for Bell Canada

52. Bell Canada submitted that it would be technically feasible to modify the current architecture for its aggregated Layer 2 HSA service and adapt some of its existing processes to implement a disaggregated Layer 2 HSA service, in line with the solution proposed by the competitors that expect to interconnect at one of Bell Canada's central offices on a Layer 2 switch.

53. However, Bell Canada argued that the migration of end-users from its aggregated Layer 3 HSA service would cause end-user service interruptions, since individual end-user VLANs would have to be set up and HSA service subscribers would have to be converted from the aggregated Layer 3 model to the dedicated VLANs. Moreover, depending on the way competitors implement the disaggregated HSA service in their network, the modems that a competitor is using for its aggregated HSA service end-users would have to be either reconfigured or even replaced in some cases. This would require significant time and resources to implement for both Bell Canada and the competitors.

54. As is currently the case for Bell Canada's retail high-speed Internet services and its wholesale Layer 2 and Layer 3 aggregated HSA services, the disaggregated Layer 2 and Layer 3 services would both be best-effort services without support for multi-casting.[19] Competitors would continue to be able to send various types of traffic, including multi-casting traffic, but Bell Canada's network would still be indifferent to the type of traffic and treat all wholesale and retail Internet traffic equally.

55. Bell Canada submitted that although its Layer 2 aggregated HSA service has been available, competitors have not made significant use of it, and the demand for the service is decreasing.

56. Bell Canada noted that its Layer 3 configuration proposal factored in the new requirement to provide the service on FTTP in addition to legacy DSL and FTTN, as well as the need for the disaggregated solution to co-exist with the existing aggregated HSA service. Bell Canada submitted that it is relying on its Layer 3 approach to serve its retail FTTP end-users. Bell Canada added that it was advantageous to use a single method to regroup all HSA service types that is aligned with how Bell Canada delivers its own retail Internet services over all access types. Transposing the existing Layer 3 design for FTTN and legacy DSL HSA services to the design of the FTTP HSA service would be simpler, faster, and cheaper to implement than a Layer 2 approach which would require development of new processes.

57. CNOC requested that the Commission require Bell Canada to provide separate Layer 2 and Layer 3 cost studies for its legacy DSL-, FTTN-, and FTTP-based services. CNOC submitted that there are no technical reasons why Bell Canada could not provide a Layer 2 service.

58. Allstream submitted that to be consistent with retail offerings, Bell Canada should be required to support a VLAN-based service, similar to its Layer 2 disaggregated HSA service, to allow for the use of disaggregated wholesale HSA service for competitors' business services.

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[19] Multi-casting is a mechanism for simultaneously transmitting the same data to a group of end-users on a network in an efficient manner.

59. Allstream submitted that Bell Canada's case for a Point to Point Protocol over Ethernet (PPPoE)-based Layer 3 solution[20] for the disaggregated HSA service was weak, especially where competitors connect at each central office. IP over Ethernet (IPoE) with a VLAN per-customer access would be more flexible and consistent with business market requirements. Implementation of a VLAN-based design, such as those used by MTS Inc. and SaskTel, would eliminate much of the inefficiency associated with Bell Canada's proposed Layer 3 design.

60. Bell Canada submitted that to comply with the Policy Direction,[21] the same design principles should apply to all incumbent carriers that are mandated to provide HSA service. Since cable infrastructure can reasonably support only a Layer 3 solution, the ILECs' design should also be a Layer 3 solution. A common Layer 3 design provides Internet service providers with equal opportunities to compete with incumbent carriers regardless of wholesale service supplier and addresses the perceived competition issues in the retail Internet market. Bell Canada indicated that it also uses a Layer 3 solution to deliver its retail Internet service and that the Layer 3 solution enables competitors to offer telephony, video, and broadband services. Imposing a Layer 2 solution on Bell Canada would impose a heavier regulatory burden on it than on the Cablecos.

61. Bell Canada stated that the implementation of Layer 2 service indirectly results in mandating wholesale Ethernet access service – which the Commission specifically did not mandate in Telecom Regulatory Policy 2015-326. Competitors could obtain FTTP connections with speeds that would provide the equivalent of Ethernet access.

62. Bell Canada submitted that competitors have not provided evidence of innovative services that could arise only from a Layer 2 solution. With respect to video services, Bell Canada submitted that during the proceeding leading to Telecom Regulatory Policy 2015-326, competitors alleged that Bell Canada's Layer 3 aggregated HSA service could not deliver competitive retail video services because of CBB rates, not because of the Layer 3 nature of the service. However, competitors did not indicate that Bell Canada's Layer 2 HSA service was any better suited to video delivery.

63. Bell Canada submitted that a Layer 2 solution is not cheaper for it to implement because of its requirement to provision wholesale HSA services over FTTP facilities. Adapting existing Layer 3 retail processes for FTTP would be cheaper than setting up a Layer 2 solution that cannot leverage existing FTTP processes and systems. Further, costs to a competitor for a Layer 2 configuration are not lower than for a Layer 3 configuration when higher set-up charges for the Layer 2 configuration are considered.

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[20] Point to Point Protocol (PPP) is a session control protocol commonly used to support DSL access. It is used to establish a connection between an end-user and a network, authenticate and authorize the end-user, assign an address, and manage the session. When PPP is supported over Ethernet, it is called PPPoE.

[21] *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, P.C. 2006-1534, 14 December 2006

64. Bell Canada stated that there was no evidence on the record of the magnitude of savings for the following technical benefits of the Layer 2 solution cited by CNOC:

    - jumbo frames – practical experience suggests insignificant savings; jumbo frames are useful in very low-speed networks; and
    - overheads – approximately 0.5% additional overhead is incurred because of PPPoE/Layer 3 overheads.

Commission's analysis and determinations

65. Both of the Layer 2 and Layer 3 configurations submitted by Bell Canada and the Cablecos address the elimination of the transport component and the associated reduction in CBB charges to a similar extent, a key benefit for disaggregated services (as noted by Bell Canada and CNOC). The Cablecos and competitors agreed that there are challenges to offering Layer 2 service solutions on DOCSIS networks on a large scale, and therefore a Layer 3 service solution has to be offered by the Cablecos.

66. RCCI provided acceptable explanations to address several of CNOC's claims of technical benefits for Layer 2 solutions, specifically that there would not be any reduction of protocol overheads or any value for jumbo frame support for Cableco Layer 2 service because of DOCSIS limitations.

67. With respect to CNOC's request that Layer 2 service solutions be provided to the maximum extent possible in parallel with the Layer 3 service solutions, specifically for fibre-based access configurations including RFoG, CNOC has not provided convincing rationale to support its request. If such a service is implemented to support fibre-based access configurations, the need for mechanized scalable provisioning processes and the associated costs cannot be put off but instead will have to be addressed in the near term as fibre-based access deployment continues to increase.

68. Given the scalability concerns raised by the Cablecos which would result in inefficient operations and maintenance, and the lack of demonstrated compelling technical benefits, the Commission finds that the Cablecos should be required to provision a Layer 3 service solution for disaggregated wholesale HSA service.

69. Although Bell Canada could provide both Layer 2 and Layer 3 service solutions, which it has been providing for its aggregated wholesale HSA services, the requirement for the disaggregated service to support FTTP which is only offered by Bell Canada as a Layer 3 service solution on a retail basis would likely require Bell Canada to incur additional costs related to system and process development to support a Layer 2 service solution for its disaggregated service.

70. As competitors have not made significant use of Bell Canada's Layer 2 aggregated HSA service and demand for the service is decreasing, the Commission is not persuaded that competitors would choose the disaggregated version of the Layer 2 service, given that it could potentially have service provisioning costs similar to those of the Layer 2 aggregated service.

71. In addition, if Bell Canada were required to provide a Layer 2 solution, the re-configuration of existing end-users served by the aggregated Layer 3 solution would be costly, disruptive, and require more time to migrate to end-users than the disaggregated Layer 3 solution.

72. A requirement for Bell Canada to provide both a Layer 2 and Layer 3 disaggregated service while the Cablecos are only required to provide a Layer 3 disaggregated service would introduce an extra regulatory burden for Bell Canada and would result in a lack of symmetry between the wholesale HSA service offerings for Bell Canada as compared to the Cablecos.

73. In spite of CNOC's argument that the technical benefits of a Layer 2 service solution would provide competitors greater control of their networks, their service offerings, and the underlying cost structure, no compelling evidence was provided in support of a superior Layer 2 service solution versus the proposed Layer 3 service solutions.

74. Accordingly, the Commission determines that Bell Canada and the Cablecos are required to only provide service solutions that utilize their proposed routing and switching techniques (characterized as Layer 3 approaches) for their configuration proposals in support of disaggregated wholesale HSA services.

At what locations should competitors be able to interconnect to disaggregated wholesale HSA services?

Positions of parties

75. Bell Canada and the Cablecos proposed that their existing approaches for interconnection with third-party transmission facilities be maintained for disaggregated wholesale HSA services. Bell Canada proposed that the competitor be required to co-locate and bring its transmission facility to the central office where Bell Canada provides links to the service interface. The Cablecos proposed that the competitor bring its transmission facility to a designated meet-me point adjacent to the Cableco head-end (FOSC), where the Cableco would then extend the facility to the service interface within the head-end.

76. CNOC submitted that the disaggregated wholesale HSA services would not be successful unless competitors had access to simple, efficient, and affordable interconnection options. To satisfy these criteria, CNOC requested that Bell Canada and the Cablecos be required to provide competitor interconnection through a fibre termination at a pedestal or splicing enclosure located outside of the central office or cable head-end (meet-me point). CNOC also requested that co-location within central offices continue to be an option for competitor interconnection.

77. CNOC, supported by Allstream, submitted that with Bell Canada's proposal for mandatory co-location for each competitor that uses the disaggregated wholesale HSA service, the high costs of co-location would reduce demand for the disaggregated service. The engineering costs of co-location in a single Bell Canada central office are prohibitively expensive (Allstream submitted that such costs can be hundreds of thousands of dollars) and obtaining co-location can sometimes be difficult due to space and access constraints. CNOC, supported by Primus, submitted that the expensive co-location requirement for the disaggregated wholesale HSA service is a barrier to entry that would lead to a substantial lessening and prevention of competition in the downstream market for broadband services.

78. Bell Canada submitted that leveraging existing well-established co-location processes and tariffs would result in lower costs for the disaggregated service. Co-location has always been used to handle third-party facilities, both when they bring their own fibre facilities to a central office and when using backhaul facilities of another provider. The introduction of disaggregated service does not justify the expense and effort of creating another mandated interconnection location option (i.e. the meet-me point that Cablecos provide, because they are not required to provide co-location). Further, CNOC has provided no evidence to demonstrate that a meet-me option would be less costly than existing co-location options such as virtual co-location[22] where the competitor pays for floor space and power.

79. TCC submitted that the Commission should allow for connection points outside of a head-end or central office where interconnection within a building is not possible due to physical space limitations or other factors.

Commission's analysis and determinations

80. The Commission considers that an outside meet-me point is the appropriate location for interconnection of competitors' transport facilities to the Cablecos' disaggregated wholesale HSA service and notes that there was no objection to this proposal on the record of this proceeding.

81. Several competitors stated that the requirement for co-location in Bell Canada's central offices to terminate their transport facilities would be a significant barrier to their use of the disaggregated wholesale HSA service because of the high costs of co-location that would limit the use of Bell Canada's disaggregated HSA service and constrain their ability to compete in downstream markets using the service.

82. An external meet-me point for Bell Canada could satisfy most of the interconnection needs of competitors. If the meet-me point is similar to that of the Cablecos, it is expected that the costs for supporting competitor interconnection would be similar to the costs and the associated rates that have been established for the Cablecos. The

[22] Under Bell Canada's definition of virtual co-location, Bell Canada provides unsegregated floor space for placing a competitor's transmission equipment which it leases to Bell Canada, with Bell Canada being responsible for the maintenance and repair of equipment. Bell Canada's existing tariff does not address interconnection and exchange of traffic between virtually co-located competitors.

potential lower costs for interconnection at an external meet-me point as compared to the costs of co-location could be an incentive to use the disaggregated service that could lead to more rapid implementation.

83. In light of the above, the Commission considers it appropriate that Bell Canada be required to provide a meet-me point similar to that of the Cablecos to enable connection to Bell Canada's disaggregated wholesale HSA service.

84. Furthermore, competitors should also continue to have the option to co-locate in central offices. In this regard, numerous service providers are already co-located in central offices. In addition, such established co-locators may be able to leverage their existing co-location to provide disaggregated wholesale HSA services or support other competitors planning to provide disaggregated wholesale HSA services. The service demarcation point for the disaggregated wholesale HSA service is at the interface. Therefore, the process for establishing tariffs for a meet-me point can be treated separately from the costing of the proposed configurations.

85. In light of the above, the Commission

- finds that Bell Canada and the Cablecos are to provide an outside meet-me point to support competitor interconnection to the disaggregated wholesale HSA service; and
- **directs** Bell Canada to provide an outside meet-me point as a competitor interconnection for the disaggregated wholesale HSA service in addition to its tariffed co-location option.

Should more flexible arrangements for transport facilities be allowed for competitors?

Positions of parties

86. CNOC submitted that flexible arrangements for obtaining transport supply would stimulate a competitive market for transport services and lead to making the disaggregated wholesale HSA services more accessible to competitors. CNOC further submitted that Bell Canada and the Cablecos should be required to provide competitors with the following options for transport facilities:

- the ability to use another provider's transport facilities to a POI without co-location;
- the ability to use a co-located provider's transport facilities by another co-located provider;
- the ability to use a virtually co-located provider's transport facilities by another virtually co-located provider; and
- any other option whereby multiple competitors and/or alternative providers can share one of the incumbent's ports.

87. Bell Canada and the Cablecos allow the use of other providers' transport facilities, but some have included constraints that limited the flexibility of the arrangements. Therefore, CNOC requested that, to give effect to the interconnection arrangements referenced in paragraph 86 above, the Commission should

    - reject RCCI's objection to the use by a virtually co-located provider of another virtually co-located provider's transport facilities;
    - reject Bell Canada's proposal to apply the primary purpose restriction[23] to the disaggregated wholesale HSA service; and
    - ensure that bottleneck facilities must be tariffed and not permitted to constrain the ability of a co-located competitor to access and make use of competitive transport facilities available at central offices.

88. CNOC submitted that allowing interconnection of virtually co-located providers could provide competitors with efficiencies in obtaining transport facilities. Under CNOC's definition, virtual co-location involves the provision of space on a rack for an edge device that a competitor uses to manage its network. The edge device could include functionality that allows interconnection between virtually co-located providers and exchange of traffic between them.

89. CNOC submitted that competitors accessing transport facilities of a co-located service provider at a central office will have capacity requirements exceeding those associated with the use of unbundled loops, and therefore it is inappropriate to apply the primary purpose rule for the diaggregated wholesale HSA service configuration.

90. The Cablecos submitted that competitors would be permitted to connect to use transport facilities leased from another party to transport their disaggregated wholesale HSA traffic through interconnection at the external meet-me point (FOSC). The Cablecos submitted that co-location at a head-end was not feasible because of space and power limitations and that virtual co-location, as currently provided by these carriers, only permitted competitors to have transmission monitoring equipment placed inside the head-end. The Cablecos submitted that virtual co-location as described by CNOC, which would allow for interconnection between competitors within a head-end, could not be supported because of space and power limitations.

91. Cogeco submitted that it did not consider CNOC's option to allow multiple competitors and/or alternative providers to share an interface port to be appropriate, because providing such arrangements would require the introduction of more

[23] Under the primary purpose rule, competitors that are co-located in an ILEC central office are allowed to make use of another co-located provider's transport facilities, subject to a constraint on the amount of traffic that can be exchanged between the co-located service providers. A co-located competitor would connect to the disaggregated HSA service through an interface via a central office link, and then connect to the co-located transport provider through an interconnecting carrier-to-interconnecting carrier (IC-to-IC) link to exchange traffic with the transport provider. The Commission set out the primary purpose rule in Telecom Decision 97-15 (see paragraphs 45 and 46) although it did not label it as such.

expensive disaggregated POI routers than originally proposed. The POI router chosen for its disaggregated configuration does not have capability to segregate traffic associated with multiple competitors or alternative providers transmitted through a single interconnection port. In addition, multiple competitors sharing a port will complicate Cogeco's support model and put at risk all competitors sharing the port. Cogeco noted that Distributed Denial of Service (DDoS) attacks[24] on one competitor would impact others sharing the port and that troubleshooting procedures would have to be reviewed.

92. Similarly, RCCI submitted that combining traffic of many or all competitors on a few interfaces (i.e. sharing of interfaces by competitors) will raise issues as to separation of traffic and survivability. Competitors generally do not lease redundant facilities to enable re-routing of traffic when the facility used to interconnect to the service fails.

93. Bell Canada submitted that its proposed disaggregated service configuration neither addresses transport nor adds restrictions to competitor behaviour in co-location space or upstream.

94. Bell Canada submitted that, as repeatedly confirmed by the Commission, the primary purpose rule should be maintained as it prevents third parties from using co-location to turn central offices into competitor hubs.

95. Bell Canada submitted that competitor sharing of ports on its POI switch that connects competitors to its disaggregated wholesale HSA service is technically possible but would create logistical issues. As capacity on a port would be allocated to any and all competitors on the port, it would be up to competitors to resolve issues as to how capacity at the port is to be managed.

Commission's analysis and determinations

96. Competitors have some choices on the use of other carriers' transport facilities when they interconnect to Bell Canada and the Cablecos' wholesale HSA services.

97. The Cablecos currently allow competitors to make use of another provider's transport facilities to connect to the POI. As physical co-location is not feasible for head-ends, use of a co-located provider's transport facilities by another co-located provider cannot occur. However, there is no constraint on the use of another provider's transport facilities up to the meet-me point where the transport facility is connected by the Cableco to the POI interface in the head-end.

98. Under the existing regime that applies to Bell Canada, competitors that are co-located can use another co-located provider's transport facilities, subject to the primary purpose rule. Also, competitors that are not co-located can use the transport

[24] A DDoS attack is an attempt to make an online service unavailable by overwhelming it with traffic from multiple sources.

facilities of another transport provider that is co-located; in this case, the co-located transport provider would have to obtain the disaggregated wholesale HSA service from Bell Canada on behalf of the competitor and be the customer of record from Bell Canada's perspective.

99. With the above-noted Commission directive for Bell Canada to provide an external meet-me point for competitor interconnection to the disaggregated wholesale HSA service, competitors will be able to use other providers' transport facilities in a similar manner as for the Cablecos. The transport provider would not have to be the customer of record for the disaggregated wholesale HSA service.

100. CNOC's proposed definition of virtual co-location for Cablecos would allow the virtual co-locators to have equipment at the head-end that would support interconnection between them and allow exchange of traffic at the head-end. The Commission considers that given the lack of space cited by the Cablecos and the obligation to provide interconnection with the Cablecos only at the meet-me point, the virtual co-location as proposed by CNOC is not feasible.

101. The Commission notes that Bell Canada's tariff does not make any distinction between interconnection arrangements for virtually co-located and other types of co-located providers. Accordingly, there are no tariff-based differences in interconnection arrangements for virtually co-located and other types of co-located providers.

102. With respect to CNOC's request that the primary purpose rule not be applied for the disaggregated wholesale HSA service, the Commission considered, in Telecom Decision 2013-100, that the removal of the primary purpose rule would eliminate an important safeguard that prevents co-located competitors from using the ILEC's facilities primarily to interconnect and exchange traffic with other co-located competitors. In this regard, CNOC did not provide any evidence to demonstrate how the removal of the primary purpose rule would continue to ensure that the main purpose of co-location is to interconnect with ILEC networks or to access ILEC services.

103. With respect to CNOC's concern regarding capacity that can be associated with unbundled loops for the purpose of demonstrating adherence to the primary purpose rule, the Commission notes that CNOC provided no evidence to support its claim that competitors accessing transport facilities of a co-located service provider at a central office will have capacity requirements exceeding those associated with the use of unbundled loops that the Commission established in Telecom Decision 2012-209 and revised in Telecom Decision 2013-100.[25.]

[25] In Telecom Decision 2012-209, the Commission developed a revised calculation for determining the loop-based traffic capacity that incorporated traffic of both high-speed access service (based on average peak usage averaged over all co-located central offices) and voice service (64 kilobits per second). In Telecom Decision 2013-100, the Commission revised the calculation so that the capacity to be associated with high-speed access service was based on average peak usage by co-located central office. This revised

104. For the existing Bell Canada aggregated wholesale HSA service, competitors are able to share interfaces. However, one competitor has to obtain the interface and resell the service to other competitors. The Cablecos indicated that port sharing could be done. However, both Bell Canada and the Cablecos have indicated that there are issues associated with port sharing including capacity management, security concerns, and survivability.

105. With respect to CNOC's request to ensure that all bottleneck facilities be tariffed, no evidence was provided on specific bottleneck facilities that were problem areas.

106. In light of the above, the Commission

- **denies** CNOC's request that RCCI be required to allow virtual co-location as proposed by CNOC;
- **denies** CNOC's request to remove the primary purpose restriction for disaggregated wholesale HSA services; and
- finds that no additional tariff items related to bottleneck facilities have been identified at this time.

Should the CBB capacity increment be reduced from 100 Mbps to 1 Mbps for disaggregated wholesale HSA services?

107. In Telecom Regulatory Policy 2011-703, the Commission established the CBB model for charging competitors for the network traffic generated by end-users of the aggregated wholesale HSA services. Under the CBB model, competitors lease network capacity to support their usage requirements in increments of 100 Mbps. Incumbents have proposed that the 100 Mbps capacity increment be applied to charging for network traffic generated by end-users of the disaggregated wholesale HSA service.

Positions of parties

108. CNOC requested that the capacity increment be reduced to 1 Mbps for the disaggregated wholesale HSA service. CNOC's proposal would allow competitors to have the flexibility to assign appropriate capacity to individual POIs without wasteful and costly excess capacity.

109. RCCI noted that the company's largest aggregated wholesale HSA service model customers have hundreds of 100 Mbps increments of capacity and since the competitors run very high levels of utilization over these increments, the competitors are not accumulating wasteful and inefficient capacity. RCCI submitted that it does not anticipate that smaller competitors will choose a disaggregated wholesale HSA

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formula better estimates the capacity of high-speed-access-enabled loops thereby mitigating/eliminating any distorting effects that the previous formula might have had on the amount of traffic that could be exchanged between two co-located competitors under the primary purpose rule.

service and therefore the issue of CBB increment size for those competitors is irrelevant.

110. RCCI submitted that there would be significant practical challenges if it were to be receiving daily orders in increments of 1 Mbps from potentially more than 15 customers for their disaggregated wholesale HSA service distributed across 34 POIs. Furthermore, each order has to be planned, scheduled, and introduced in a controlled and coordinated manner to ensure there are no harmful impacts on the shared network, arguing that the prospects for billing disputes and administrative costs are substantial.

111. RCCI submitted that the Commission could consider setting a CBB increment of 50 Mbps until a competitor reaches a throughput of 500 Mbps at a POI, after which the 100 Mbps increment would apply. Such an approach is, however, more complex than the current approach and would increase the possibility of error.

112. Videotron noted that the download speeds sold to end-users by competitors using its network already vary between 5 and 100 Mbps, with the average speed constantly growing. Videotron submitted that, in this context, 100 Mbps capacity is not excessive. In fact, some competitors using Videotron's aggregated wholesale HSA service already have several 10 Gbps circuits in service at centralized POIs. When the total competitor traffic is divided by the 22 disaggregated POIs offered by Videotron, the average traffic per POI would require multiple 100 Mbps capacity increments to support it.

113. Videotron submitted that any capacity increment less than 100 Mbps is likely to create a situation where it would have frequent requests to change a competitor's capacity, without producing any tangible benefit for consumers. Even if these requests were limited to one per month, the workload would be considerable and would increase the risk of error in processing these requests.

114. Cogeco submitted that the 1 Mbps capacity increment requested by CNOC is inappropriate as the block size does not even cover the monthly bandwidth needs of a competitor's average end-user. The average bandwidth allocation of a TPIA end-customer was greater than 1 Mbps and has been growing at a steady pace since the introduction of the aggregated model.

115. Cogeco submitted that with such a low-capacity increment, multiple orders from multiple competitors are to be expected every month at multiple disaggregated POIs, increasing management time and costs. Further, some of its aggregated wholesale HSA service customers already consider that the current timelines are onerous. Accordingly, reducing the size of the capacity increment and hence increasing the volume and complexity of these requests will only contribute to extending the timelines even further.

116. Vaxination noted that the service charges to the competitors for frequent capacity change requests would likely negate any advantage that CNOC sees in reducing the

CBB increment. Vaxination submitted that an alternative method where the incumbent carrier automatically adjusts the monthly rate based on how much capacity is used by the competitor would reduce ordering delays and service charges.

Commission's analysis and determinations

117. Bell Canada and the Cablecos did not question the technical feasibility of modifying the capacity increment. The Commission notes that a reduction of the capacity increment would provide competitors with additional flexibility and better control of capacity and costs than the existing 100 Mbps capacity increment.

118. At the same time, as indicated by the Cablecos, allowing the proposed 1 Mbps capacity increment could lead to a significant ongoing increase of requests for capacity changes that would require significantly more management time and costs, though there are no indications that there would be requirements for developing additional processes to support the change in CBB increment.

119. With the existing tariff structure for competitor requests for capacity increments[26] for the aggregated wholesale HSA services, a competitor can request multiple increments in an order, and be subject to one service charge for the order and a separate service charge per interface for activation of the capacity increments on interfaces. Given the level of the service charges which are expected to be similar for disaggregated wholesale HSA services, competitors would likely minimize their requests for changes to their purchased capacity increments.

120. According to Cogeco, the average bandwidth requirement per end-user for its TPIA service is more than 1 Mbps. Also, the bandwidth requirement to support an average end-user has been increasing at more than 30% per year.[27] Therefore, by the time the disaggregated wholesale HSA service is implemented, the average bandwidth requirement per end-user will likely be significantly higher than CNOC's proposed 1 Mbps increment.

121. A reduced CBB increment for the disaggregated wholesale HSA service would provide competitors more control of their costs, especially during initial deployments of the service. However, the Commission considers that, as suggested by RCCI, a 50 Mbps increment would be more appropriate as it takes into account the continual growth in end-user bandwidth requirements as well as the Cablecos' concerns regarding increasing administrative burden.

122. In addition, to further address the concerns regarding increasing administrative burden, it would be appropriate to limit each competitor's requests for changes in capacity to one per month for each disaggregated wholesale HSA service area that they serve.

123. In light of the above, with the objective of providing competitors with more control over their costs, the Commission **directs** Bell Canada and the Cablecos to provide

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[26] See paragraph 32 of Telecom Decision 2012-636.

[27] See paragraphs 33 to 40 of Telecom Decision 2016-117.

competitors the ability to buy capacity in 50 Mbps increments for their disaggregated wholesale HSA services. This change in capacity increment is not to apply to the existing aggregated wholesale HSA services which utilize a 100 Mbps capacity increment.

Should a competitor using a 10-GigE interface to interconnect to the disaggregated wholesale HSA service be required to maintain a minimum capacity order of 3 Gbps on the interface?

124. In a series of Telecom Orders,[28] the Commission set a requirement that a competitor using a 10-GigE interface for interconnecting to Videotron, RCCI, Cogeco, or Bell Canada's aggregated wholesale HSA service be required to maintain a minimum order of 3 Gbps capacity on the interface. CNOC requested that the requirement for a minimum capacity order be eliminated for the disaggregated wholesale HSA service.

Positions of parties

125. Cogeco and Videotron submitted that competitors should be required to maintain a minimum capacity order of 3 Gbps on a 10-GigE interface when interconnecting to the disaggregated wholesale HSA service.

126. Cogeco submitted that it had assumed that moving to a disaggregated wholesale HSA service model would translate to competitor bandwidth requirements being fragmented over multiple disaggregated POIs. In light of this, Cogeco selected a smaller carrier grade router for the POI router for its disaggregated configuration when compared to the router used for its aggregated configuration. This smaller carrier grade router is equipped with multiple 1 Gbps interface ports and a limited number of 10 Gbps interfaces. Cogeco submitted that given the limited number of 10 Gbps ports available on each router, maintaining a minimum capacity order of 3 Gbps will ensure that POI router bandwidth usage efficiency is maintained so that no additional unnecessary POI equipment is required in the long run.

127. CNOC noted that the cost of 10 Gbps routers and related equipment has been declining rapidly in the last few years and is comparable to the cost of 1 Gbps equipment. As such, CNOC submitted that the reservation of 3 Gbps of capacity in order to justify the deployment of 10 Gbps equipment is not justifiable.

Commission's analysis and determinations

128. As submitted by CNOC, prices for 10-GigE interfaces and prices for equipment supporting multiple 10-GigE interfaces are declining significantly.[29] In contrast, Cogeco submitted that the 3 Gbps threshold was needed for its proposed POI router to ensure efficiency of bandwidth usage.

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[28] See Telecom Orders 2012-634, 2012-635, 2014-205, and 2015-163.

[29] In Telecom Decision 2016-117, the Commission determined that it was appropriate to apply a 26.4% annual price reduction for traffic-sensitive network equipment.

129. The Commission notes that when a competitor has low demand, the 3 Gbps capacity threshold can be a barrier to the use of 10-GigE transport facilities. Without the 3 Gbps minimum capacity order constraint, it may be cost-effective for a competitor to lease or build 10-GigE transport facilities rather than using 1-GigE transport facilities when it starts serving a particular area and thus avoid issues related to migration from 1-GigE transport facilities to 10-GigE transport facilities as demand grows.

130. The CBB rates for the disaggregated wholesale HSA service will determine whether the 3 Gbps capacity threshold will remain a barrier or issue for competitors wishing to utilize the 10-GigE interface. If the CBB rates are low, then the capacity threshold may become a lesser issue.

131. An assessment of the continuing need for the 3 Gbps capacity threshold depends on the CBB costs for the disaggregated wholesale HSA service which are to be assessed in the tariff proceeding referenced earlier in this decision. At the same time, it would be appropriate to assess impacts of ongoing reductions in POI router equipment costs along with any requirement to upgrade the POI router equipment if the 3 Gbps capacity threshold was removed.

132. Accordingly, the Commission defers making a determination on the requirement for a minimum capacity order on a 10-GigE interface to the tariff process referenced above.

Should an incumbent carrier be required to simultaneously provide aggregated and disaggregated services for a competitor at a disaggregated area?

Positions of parties

133. Cogeco, supported by RCCI and Videotron, submitted that it could not support the provision of both aggregated and disaggregated services within a disaggregated area for a TPIA customer. When an existing TPIA customer that is interconnected at an aggregated POI chooses to interconnect its network at the disaggregated POI for a given disaggregated area, all of the TPIA customer's end-users located within this area supported by the aggregated POI will have to be migrated from the aggregated to the disaggregated POI. The provision of simultaneous service from the aggregated and disaggregated POIs in a given area introduces operational complexities including the requirement for two different types of MPLS network segmentations for every TPIA customer in each serving area (one for aggregated and one for disaggregated), along with the requirement to assign IP addresses to the TPIA customer specific to each aggregated and disaggregated service. Furthermore, such a design configuration would result in a significant increase in the day-to-day operations for the company and TPIA customers, and would render troubleshooting activities more complex, and thus create additional delay in any resolution.

134. Videotron requested that the Commission confirm that it would not be required to simultaneously provide aggregated and disaggregated service for a competitor at a disaggregated area.

135. CNOC requested that prohibitions on simultaneous aggregated and disaggregated wholesale HSA service for an individual competitor at a single POI be conditional on the completed transition of all end-users to disaggregated service with minimal disruption to the end-user.

136. Cogeco submitted that the company is agreeable to maintaining competitor access through the aggregated POI for a limited period negotiated and discussed with the competitor and, for greater certainty, until its end-customers have been entirely transitioned to the disaggregated POI. However, Cogeco suggested that all orders received after the end of the transition period for the disaggregated POI will only be fulfilled at the disaggregated POI.

Commission's analysis and determinations

137. Parties generally agreed that the incumbents should not be required to simultaneously provide both the aggregated and disaggregated wholesale HSA service to a competitor at a disaggregated area.

138. Although Bell Canada and the Cablecos have not fully described their migration processes, they have indicated that there would be minimal disruption of service under their proposed configurations.

139. The Commission determines that Bell Canada and the Cablecos are not required to simultaneously provide aggregated and disaggregated service for a TPIA customer at a disaggregated area, subject to an efficient transition process that minimizes disruption to end-users.

Should a CISC working group be established for resolution of interconnection and related technical and operational issues related to implementation?

Positions of parties

140. CNOC requested that the Commission convene a 90-day CISC process to achieve collaborative resolution on various interconnection and related technical and operational issues associated with disaggregated wholesale HSA service model implementation. The CISC process should take place concurrently with the tariff process referenced earlier in this decision.

141. Bell Canada submitted that it does not oppose a CISC process provided the appropriate stakeholders are involved. However, if the Commission does initiate a CISC process, the working group should not run concurrently with the tariff phase of the proceeding as the CISC process could result in changes to the expected disaggregated wholesale HSA service model design.

142. Cogeco submitted that it is not in favour of the establishment of a CISC process since it is of the view that the Commission should not adopt a one-size-fits-all model; rather, the Commission should instead take into account the differences in the underlying network technologies of each wholesaler when approving the proposed disaggregated wholesale HSA service model configurations. Further, the resolution of detailed technical and operational issues associated with the implementation of the disaggregated wholesale HSA service model should be left to bilateral discussions between each incumbent carrier and competitor that would take into account the network and specific operational context of each business relationship.

143. RCCI submitted that it does not oppose a CISC process to address detailed matters of implementation but requested that the activities of any CISC process arising out of the decision must be clearly defined in the decision.

144. Shaw submitted that, given the technical nature and complexity of network interconnection to the new disaggregated wholesale HSA service, a collaborative CISC process may be an appropriate forum in which to finalize these details. If the Commission were to initiate a CISC process, the issues to be discussed must be well-defined and limited to network interconnection specifications for the disaggregated wholesale HSA service model in order to achieve completion within a reasonable time frame. Shaw requested that the participants at the CISC discussions should be limited to those entities operating in Ontario and Quebec, and that a separate CISC process would need to be established for the subsequent implementation proceedings dealing with other areas of the country.

145. Vaxination submitted that it does not oppose CNOC's request for a CISC process and requested that the mandate of the CISC process should be to define multiple scenarios for disaggregated connections for which incumbent carriers would submit proposed tariffs. Such a CISC process should allow for broad participation, including persons who have not participated in this process.

146. Videotron submitted that there is not likely to be agreement between the parties for some issues raised in this proceeding and, as such, it sees little value in a CISC process. If the Commission were to initiate a CISC process, it should ensure that the mandate of the working group is limited to a small number of specific issues that are directly related to the transition from an aggregated to a disaggregated wholesale HSA service model.

Commission's analysis and determinations

147. A CISC working group could potentially reduce delays in the implementation of the disaggregated wholesale HSA service model in Ontario and Quebec by allowing parties to identify and resolve technical and operational issues associated with service implementation.

148. As requested by several parties, the activities of the CISC working group should be well-defined. The Commission considers that those parties that are directly impacted

by the technical and operational issues associated with implementation of disaggregated wholesale HSA services are best-equipped to define the activities.

149. The activities of the CISC working group, properly defined, would not likely impact the service configurations and their associated costs. Accordingly, the tariff process could be initiated independently of the activities of the CISC working group. In the event an outcome of the CISC working group would have an impact on the tariff process, the impact could be factored into the Commission's assessments of the proposed cost studies.

150. In light of the above, the Commission requests CISC to establish a working group to address resolution of interconnection and related technical and operational issues related to implementation of disaggregated wholesale HSA services.

Other matters

Implementation timelines

151. Parties submitted comments related to implementation timelines that touched on matters such as implementation at a given central office/head-end following the first request for service at that central office/head-end, subsequent implementations at other central offices/head-ends following an initial service request, and subsequent requests for service at a central office/head-end with the service in place.

152. In its 22 July 2016 letter setting out the process for this proceeding, the Commission expected incumbent carriers to make proposals regarding any implementation issues during either the configuration process or the tariff process referenced earlier in this decision.

153. Not all parties have fully addressed implementation timelines in the current configuration proceeding. Bell Canada, for one, indicated that it would be in a better position to estimate implementation timelines once the service design is finalized.

154. The Commission considers that additional information is required to address implementation timelines. Accordingly, the Commission defers making a decision on implementation timelines to the tariff process referenced earlier in this decision.

Costing-related matters

155. Bell Canada and Videotron made proposals related to the treatment of costs for the disaggregated wholesale HSA service. Bell Canada proposed to treat the fibre-access element for both FTTP access and DSL access as a usage-sensitive component in its cost studies for the disaggregated wholesale HSA service. Videotron submitted that the first competitor requesting disaggregated wholesale HSA service at a POI should pay a deposit that represents a substantial part of the cost of the POI router. Parties provided comments on both proposals.

156. Both proposals relate to treatment of service costs. As such, the Commission considers that it would be appropriate to defer making a decision on these cost-related proposals to the tariff phase of the implementation of the disaggregated wholesale HSA service model.

Out-of-scope requests

157. CNOC addressed two additional matters as part of its submissions in this proceeding. Specifically, CNOC requested (i) that the Cablecos be required to implement certain changes to Layer 3 DOCSIS services to address perceived problems and shortcomings of existing Layer 3 DOCSIS services, and (ii) a review of the forbearance criteria for aggregated wholesale HSA services within two years of disaggregated service tariff approvals.

158. The current proceeding is restricted to matters pertaining to the configuration of mandated disaggregated wholesale HSA services, service implementation issues, and disaggregated wholesale HSA service issues requiring policy determinations not directly related to rate setting.

159. With respect to CNOC's requests, the Commission finds that they are not concerned with the matters identified above.

160. In light of the above, the Commission determines that CNOC's requested changes are outside the scope of this proceeding.

Conclusions

161. The Commission **directs**

- Bell Canada and the Cablecos to file tariffs with supporting Phase II cost studies for their disaggregated wholesale HSA service configurations that reflect the determinations set out in this decision within **60 days** of the date of this decision. RCCI and Videotron are to incorporate revised configuration proposals in their tariff filings; and
- Bell Canada to file tariffs, with a supporting Phase II cost study, for the meet-me point location within **60 days** of the date of this decision.

162. Further, the Commission requests CISC to establish a working group to address resolution of interconnection and related technical and operational issues related to implementation of the disaggregated wholesale HSA service.

Policy Direction

163. The determinations made in this decision are consistent with the Policy Direction for the reasons set out below.

164. The Policy Direction states that the Commission, in exercising its powers and performing its duties under the *Telecommunications Act* (the Act), shall implement

the policy objectives set out in section 7 of the Act, in accordance with paragraphs 1(a), (b), and (c) of the Policy Direction.

165. In Telecom Regulatory Policy 2015-326, the Commission determined that disaggregated wholesale HSA services would be mandated and addressed how its determinations are consistent with the Policy Direction.

166. The issues under consideration in this decision relate to the configurations for disaggregated wholesale HSA services and their interconnection arrangements. Therefore, subparagraphs 1(a)(ii), 1(b)(i), and 1(b)(iv) of the Policy Direction apply to the Commission's determinations in this decision.

167. In compliance with subparagraph 1(b)(i) of the Policy Direction, the Commission considers that the policy objectives set out in paragraphs 7(a), (b), (c), (f), (g), and (h)[30] of the Act are advanced by the regulatory measures established in this decision.

168. Consistent with subparagraph 1(a)(ii) of the Policy Direction, the Commission has used measures that are efficient and proportionate to their purpose and that interfere with the operation of competitive market forces to the minimum extent possible. In this regard, the Commission notes that Bell Canada and the Cablecos can use their proposed routing and switching techniques for their disaggregated wholesale HSA service configurations, thus allowing utilization of the existing routing and switching techniques that they use to provide retail services and existing aggregated wholesale HSA services, rather than requiring modifications that would require the companies to incur additional costs and potential changes in ongoing network operations.

169. Consistent with subparagraph 1(b)(iv) of the Policy Direction, the Commission's determinations, as they relate to network interconnection arrangements or regimes for access to networks, are technologically and competitively neutral to the greatest extent possible and do not artificially favour either Canadian carriers or resellers. In this regard, the Commission notes that its determinations require both Bell Canada and the Cablecos to provide equivalent outside meet-me points at which competitors can bring their own or third-party transport facilities for interconnection to the disaggregated wholesale HSA service at a particular central office or head-end.

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[30] The cited policy objectives of the Act are 7(a) to facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its regions; (b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada; (c) to enhance the efficiency and competitiveness, at the national and international levels, of Canadian telecommunications; (f) to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective; (g) to stimulate research and development in Canada in the field of telecommunications and to encourage innovation in the provision of telecommunications services; and (h) to respond to the economic and social requirements of users of telecommunications services.

Secretary General

Related documents

- *Review of costing inputs and the application process for wholesale high-speed access services*, Telecom Decision CRTC 2016-117, 31 March 2016

- *Review of wholesale wireline services and associated policies*, Telecom Regulatory Policy CRTC 2015-326, 22 July 2015, as amended by Telecom Regulatory Policy CRTC 2015-326-1, 9 October 2015

- *Bell Aliant Regional Communications, Limited Partnership and Bell Canada – Introduction of wholesale 10 Gigabit Ethernet interface service*, Telecom Order CRTC 2015-163, 28 April 2015

- *Cogeco Cable Inc. – Service condition for the provision of a 10-Gigabit Ethernet interface option for third-party Internet access service*, Telecom Order CRTC 2014-205, 1 May 2014

- *Canadian Network Operators Consortium Inc. – Application to review and vary Telecom Decision 2012-209 regarding the co-location rule*, Telecom Decision CRTC 2013-100, 1 March 2013

- *Wholesale residential high-speed access services – Capacity-based billing model service charge rates and related matters*, Telecom Decision CRTC 2012-636, 21 November 2012

- *Rogers Communications Partnership – Introduction of 10 Gigabit Ethernet Interconnecting Option – Third party Internet access service*, Telecom Order CRTC 2012-635, 21 November 2012

- *Videotron G.P. – Introduction of 10 Gigabit Ethernet Interconnecting Option – Third party Internet access service*, Telecom Order CRTC 2012-634, 21 November 2012

- *Bell Aliant Regional Communications, Limited Partnership and Bell Canada – Application to review and vary Telecom Decision 2011-355 regarding the co-location rule*, Telecom Decision CRTC 2012-209, 5 April 2012

- *Billing practices for wholesale residential high-speed access services*, Telecom Regulatory Policy CRTC 2011-703, 15 November 2011, as amended by Telecom Regulatory Policy CRTC 2011-703-1, 22 December 2011

- *Co-location*, Telecom Decision CRTC 97-15, 16 June 1997