

RED HAT INC
Form 10-K
April 29, 2010
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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

Annual Report Pursuant to Sections 13 or 15(d) of the Securities Exchange Act of 1934

(Mark One)

Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934
For the fiscal year ended February 28, 2010

OR

Transition Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934
For the transition period from _____ to _____

Commission File Number: 001-33162

RED HAT, INC.

(Exact name of registrant as specified in its charter)

Delaware

(State of Incorporation)

06-1364380

(I.R.S. Employer Identification No.)

1801 Varsity Drive, Raleigh, North Carolina 27606

(Address of principal executive offices, including zip code)

(919) 754-3700

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, \$0.0001 par value	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of large accelerated filer, accelerated filer and smaller reporting company in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer
Non-accelerated filer

Accelerated filer
Smaller reporting company

(Do not check if a smaller reporting company)

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

The aggregate market value of the common equity held by non-affiliates of the registrant as of August 31, 2009 was approximately \$3.2 billion based on the closing price of \$22.96 of our common stock as reported by the New York Stock Exchange on August 31, 2009. For purposes of the immediately preceding sentence, the term affiliate consists of each director, executive officer and greater than 10% stockholder of the

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registrant. There were 188,643,958 shares of common stock outstanding as of April 23, 2010.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of Red Hat, Inc.'s Definitive Proxy Statement to be filed with the Securities and Exchange Commission and delivered to stockholders in connection with its annual meeting of stockholders to be held on August 12, 2010 are incorporated by reference into Part III of this Form 10-K. With the exception of the portions of the Proxy Statement expressly incorporated into this Annual Report on Form 10-K by reference, such documents shall not be deemed filed as part of this Annual Report on Form 10-K.

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ITEM 1. BUSINESS

OVERVIEW

We are a global leader in providing open source software solutions to the enterprise, including our core enterprise operating system platform, Red Hat Enterprise Linux, our enterprise middleware platform, JBoss Enterprise Middleware, our virtualization solutions and other Red Hat enterprise technologies. We employ an open source software development and licensing model that uses the collaborative input of an international community of contributors to develop and enhance software. We actively participate in this community-oriented development process, often in a leadership role, and leverage it to create our Red Hat- and JBoss-branded enterprise technologies.

We believe the open source development and licensing models offer advantages over the proprietary software development and licensing models both for Red Hat and our customers. Through the open source development model, we leverage the community of developers and users, whose collective resources and knowledge supplement the developers we employ. As a result, we believe we are able to offer functionality enhancements and upgrades more quickly and with less development cost than is typical of many proprietary software vendors. In turn, our customers are able to take advantage of the quality and value of open source software, which we help develop, aggregate, integrate, test, certify, deliver, maintain and support for their enterprise use.

The collectively developed software is distributed under open source licenses, such as the GNU General Public License and GNU Lesser General Public License, permitting access to the human-readable software source code. These licenses also provide relatively broad rights for licensees to use, copy, modify and distribute open source software. These broad rights afford significant latitude for our customers to inspect, suggest changes, customize or enhance the software if they so choose.

Red Hat's participation in the community-driven development process is illustrated by Red Hat's sponsorship role in the Fedora Project and the JBoss.org communities. This participation enables us to leverage the efforts of these international communities, which we believe allows us to reduce both development cost and time and to enhance community acceptance and support of our products and technologies. Thus, we are able to use the Fedora Project and the JBoss.org communities as proving grounds and virtual laboratories for new technology that we can draw upon for inclusion in our enterprise technologies. Additionally, the open and transparent nature of these projects provides our customers and potential customers with access and insights into the future direction of Red Hat products and technologies.

We offer a choice of operating systems and virtualization options for servers, work stations, mainframes and desktops that support multiple application areas, including the data center, cloud deployments, software as a service, edge-of-the-network applications, information technology infrastructure (applications such as database, ERP and large web servers), mainframe computing, corporate desktop and technical/developer workstations.

JBoss Enterprise Middleware delivers a range of middleware products for developing, integrating, deploying and managing distributed composite and web-based applications. JBoss Enterprise Middleware is based on the Java programming language that enables the deployment of service-oriented architectures. JBoss Enterprise Middleware provides an application infrastructure for building and deploying distributed applications that are accessible via the Internet, corporate intranets, extranets, clouds and virtual private networks. Examples of applications deployed on JBoss Enterprise Middleware include hotel and airline reservations, online banking, credit card processing, securities trading, healthcare systems, customer and partner portals, retail and point-of-sale systems and telecommunications network infrastructure.

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Our hosted content distribution services, Red Hat Network (RHN) and JBoss Customer Support Portal (JBoss CSP), permit these Red Hat enterprise technologies to be updated and configured. Our management offerings, Red Hat Network Satellite (RHN Satellite) and JBoss Operations Network (JBoss ON), permit our customers to provision, update, monitor and manage these and other technologies in an automated fashion. Our suite of training and other professional service offerings also enable enterprise customers to leverage the performance and scalability benefits of our enterprise technologies in their environments.

We also provide other infrastructure enterprise technologies, including software development tools, higher availability clustering of systems and services, and directory services. We intend to continue to expand capabilities available under our open source architecture to help meet the performance, security, reliability and scalability requirements critical to the enterprise. In addition, we also offer a range of consulting, training and support services that are designed to help our customers derive additional value from Red Hat enterprise technologies.

In addition to our development and licensing models, we believe that our business model differentiates Red Hat from many software companies. We provide Red Hat enterprise technologies under annual or multi-year subscriptions. Through the life of a subscription, a customer is entitled to specified levels of support as well as security updates, bug fixes, functionality enhancements and upgrades to the technology, when and if available, via our hosted content distribution services (i.e., RHN and JBoss CSP). This business model allows the customer to access consistent improvements to and innovations in our technologies and the services it needs for the duration of the subscription.

We sell subscriptions to Red Hat enterprise technologies directly to customers and indirectly through various channels of distribution. We sell directly to customers through our sales force and our web store. Our indirect sales channels include distributors, systems integrators, resellers, telecom/network technology companies, cloud computing providers, hosting providers and independent software vendors (ISVs). In addition, leading global server and workstation hardware vendors support and pre-load Red Hat enterprise technologies on various servers and workstations and also sell their hardware together with Red Hat Enterprise Linux as part of pre-configured solutions. Red Hat Enterprise Linux and JBoss Enterprise Middleware technologies also have gained widespread support from many of the leading ISVs and independent hardware vendors (IHVs). With the support and tools we make available, many of these companies have engineered and certified that their offerings run on or with Red Hat Enterprise Linux, JBoss Enterprise Middleware technologies and Red Hat Enterprise Virtualization or, in the case of some IHVs and ISVs, have built their products using Red Hat Enterprise Linux, JBoss Enterprise Middleware and Red Hat Enterprise Virtualization. We believe widespread support from these companies helps to increase the level of market acceptance and adoption of our enterprise technologies. See NOTE 2 to the Consolidated Financial Statements.

The benefits of the open source development model are becoming better recognized and the acceptance of open source software is continuing to grow. We see this growth in the number of Linux server operating systems in use today, the increasing number of JBoss Enterprise Middleware deployments and an increased level of interest in open source virtualization technologies.

Red Hat, Inc. was incorporated in Connecticut in March 1993 as ACC Corp., Inc., which subsequently changed its name to Red Hat Software, Inc. Red Hat Software, Inc. reincorporated in Delaware in September 1998 and changed its name to Red Hat, Inc. in June 1999. Except as otherwise indicated, all references in this report to we , us , our , the Company , the registrant , or Red Hat refers to Red Hat, Inc. and its subsidiaries.

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INDUSTRY BACKGROUND

Origins of open source software

The open source software development model originated in academic and research environments. The model is based on the collaborative development of the software's source code, the human-readable code that is used to develop software based on open protocols and standards. Whether individually or in groups, and regardless of location, participating developers, many of whose projects are commercially funded, make their code available over the Internet, give and receive comments on open source code and modify it accordingly. This development model gives open source software an inherent level of transparency and choice that contrasts with the proprietary software development model.

Under the proprietary model of software development, a software vendor generally develops the code itself or acquires components from other vendors, without the input from a wider community of participants. The vendor generally licenses to the user only the machine-readable binary (or object) code, with no or limited rights to copy, modify or redistribute that code, and does not make the source code available to the user or other developers. Moreover, peer review and collaborative enhancements are not readily possible because of the lack of access to the source code. In contrast, under the open source development model, the software vendor provides users and other developers with access both to the binary code and the source code and permits the user to copy, modify and redistribute the code to others.

The growth of the Internet has greatly increased the scale and efficiency of open source software development through the availability of collaborative technologies such as email lists, news groups and websites. These technologies have enabled large communities of independent developers, located around the world, to collaborate on more complex open source projects.

We believe that open source software is a viable and arguably superior alternative to traditional proprietary software. As compared to the proprietary model, the open source model:

- allows a company's in-house development team to collaborate and innovate with a global community of independent developers and testers;
- provides the user access to both binary and source code, and the right to inspect, copy, modify and alter the software;
- offers greater flexibility through open rather than proprietary protocols and formats; and
- permits the user ongoing access to improvements made to the software that are distributed by others.

Moreover, we believe open source software offers many potential benefits for software customers and vendors. Not only are customers able to take advantage of the quality and value of open source software, but they can inspect and help diagnose problems easily, and they also may choose to customize the software to suit their particular needs. Vendors are able to leverage the community of open source developers, reducing development costs, decreasing time-to-market and mitigating the risks associated with developing new software solutions.

Challenges to the widespread adoption of open source by the enterprise

Despite a strong initial market acceptance of Red Hat Enterprise Linux, JBoss Enterprise Middleware and other Red Hat enterprise technologies by large enterprises, a number of obstacles exist to the continued growth and adoption of these technologies within the enterprise, including:

- competition from well-established proprietary software industry participants such as Hewlett-Packard Company (HP), International Business Machines Corporation (IBM), Microsoft Corporation (Microsoft), Novell, Inc. (Novell), Oracle Corporation (Oracle), Sun Microsystems, Inc., which was acquired by Oracle in early 2010 (Sun), and VMware, Inc. (VMware);

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- a limited number of established, profitable and viable open source industry participants;
- uncertainty as to the long term success of a development and business model not based on limiting access to proprietary technology; and
- potential concern over threats of intellectual property infringement claims.

OUR BUSINESS

We generally offer and provide our enterprise technologies with related services to our customers in the form of annual or multi-year subscriptions. Our subscription model is designed to provide customers with an all-inclusive software solution, incorporating product delivery, problem resolution, ongoing corrections, enhancements and new versions and compatibility with a portfolio of certified hardware and software applications. In addition, Red Hat customers are eligible to participate in our Open Source Assurance program, which provides certain assurances to customers in the event there is an intellectual property infringement issue with our enterprise products. We believe that the chief information officers of large enterprises select Red Hat enterprise technologies and choose to pay on a subscription basis because of the business value, flexibility and rapid innovation that we provide.

Our subscription business model contrasts with the typical proprietary software license model from a revenue recognition perspective. Under our subscription model, we generally defer revenue when we bill the customer and recognize revenue over the life of the subscription term. In contrast, under a proprietary software license model, the vendor typically recognizes license revenue in the period that the software is initially licensed.

We believe the success of our business model is influenced by:

- the extent to which we can expand the breadth and depth of our technology and service offerings;
- our ability to enhance the value of subscriptions for Red Hat enterprise technologies through frequent and continuing innovations to these technologies;
- the acceptance and widespread deployment of open source solutions by small, medium and large enterprises and government agencies;
- our ability to generate subscription revenue for Red Hat enterprise technologies; and
- our ability to provide customers with consulting and training services that generate additional revenue.

Use of the open source development model

We have embraced the open source model in the development of our technology solutions and services. By developing under a collaborative model, we provide a mechanism for independent and commercial developers and our customers to influence our enterprise technologies and to receive the benefits of the collective contributions.

Our open source software operating system

One of the most widely known open source technologies is the Linux kernel, the operating system engine of Red Hat Enterprise Linux. An operating system is the software that allows a computer and its various hardware and software components to interact. A worldwide community of developers collaborates to improve the Linux kernel, and we believe we are able to integrate the best of those improvements into our stable, yet innovative and high-performance Red Hat Enterprise Linux platform. Moreover, as discussed below, Red Hat Enterprise Linux enjoys the support of major original equipment manufacturers (OEMs) and ISVs, increasing the interest of developers in adding further enhancements to

the Linux kernel.

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We seek to engineer Red Hat Enterprise Linux to be a comprehensive, technically advanced, reliable and stable operating system. Red Hat Enterprise Linux is an integrated, open source operating system that meets the performance, reliability and scalability demands of chief information officers of large and small enterprises, from the edge of the network to cloud deployments to the data center.

Our operating system is intended to be:

- flexible and scalable capable of running clusters of thousands of systems in a large enterprise on a single device;
- functional able to handle discrete or multiple applications accessed by multiple users;
- adaptable allowing the user to modify the software to meet particular needs and requirements;
- stable and reliable constantly reviewed and fine-tuned by developers worldwide;
- secure offering some of the highest levels of security in the commercial operating system market; and
- high performing yielding an array of quality performance results using industry benchmarks.

Our virtualization and other operating system options

Virtualization allows a single computer system to function as multiple virtual systems by abstracting operating systems and application software from the underlying hardware infrastructure, thereby allowing customers to use a common hardware infrastructure to run multiple operating systems and applications. A major component of our virtualization technology is the Kernel Virtual Machine (KVM) platform, which is integrated within the Linux kernel. Our current version of Red Hat Enterprise Linux includes integrated virtualization.

Red Hat s virtualization offerings and other operating system options are intended to maximize resource allocation and operational flexibility both within corporate networks and in cloud computing environments. Red Hat Enterprise Virtualization for Servers is compatible with Red Hat Enterprise Linux and its ecosystem of certified hardware systems and software applications. Our virtualization solutions are designed to allow enterprises to centrally manage virtual environments.

Our middleware tools and platforms

Middleware generally refers to the software that enables the development, operation and integration of software programs and applications. JBoss Enterprise Middleware combines, integrates and refines features from the JBoss.org communities into stable, enterprise-class platform distributions for application and service hosting, content aggregation, data integration and application integration for both the development and deployment of applications.

Our middleware tools and platforms are intended to:

- decrease development complexity;
- improve end-user experience;

- reduce business process friction;
- enable flexibility; and
- lower the total cost of ownership.

Our systems management solutions

RHN, RHN Satellite, JBoss CSP and JBoss ON provide management and software delivery services for Red Hat Enterprise Linux and JBoss Enterprise Middleware technologies. With a focus on open standards and

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scalability, our management solutions help organizations increase productivity, lower costs and enhance security by provisioning, managing, monitoring and updating systems.

These management solutions provide organizations with flexibility, security and scalability. Red Hat's customers can manage their deployments by connecting to Red Hat's hosted servers as part of a base subscription, or by implementing the enhanced on-site functionality of RHN Satellite and JBoss ON.

Our services

Our services offerings consist of training, consulting and support designed to meet the needs of the enterprise. With these services, our goal is to help promote customer success by sharing knowledge, experience and advice at all stages of the information technology (IT) life cycle.

By providing consulting and support services that help to enable infrastructure, application integration and middleware solutions, we facilitate the further adoption and use of our products in the enterprise. In addition, our training services help populate customers with skilled Red Hat certified architects, engineers and administrators who often serve as internal open source advocates, increasing opportunities for the successful adoption and use of our enterprise technologies. Our service capabilities promote and reinforce the use of open source solutions as well as our Red Hat and JBoss brands.

Support by leading independent software and hardware vendors and systems integrators

To facilitate the widespread deployment of Red Hat Enterprise Linux, JBoss Enterprise Middleware and Red Hat Enterprise Virtualization, we have focused on gaining broad support for our technologies from the providers of hardware, software and systems integrator services critical to the large enterprise. For example, leading software vendors with applications that run on, or with, our enterprise technologies include BMC Software, Inc. (BMC), CA, Inc. (CA), HP, IBM, Microsoft, Oracle, SAP AG (SAP), Sybase, Inc. (Sybase), Symantec Corporation (Symantec) and VMware. In addition, we have certification and pre-load arrangements with leading hardware providers including HP, IBM and Dell Inc. (Dell), as well as Cisco Systems, Inc. (Cisco), Fujitsu Limited (Fujitsu), Fujitsu Siemens Computers (Holding) BV (Fujitsu Siemens), Hitachi, Ltd (Hitachi), and NEC Corporation (NEC), and certification agreements with leading networking and storage companies including Cisco, EMC Corporation (EMC), HP, NetApp, Inc., (Net App), Nokia Corporation (Nokia) and Nokia Siemens Networks. We also have strategic alliance relationships with the leading semiconductor providers Advanced Micro Devices, Inc. (AMD) and Intel Corporation (Intel).

An online destination for the open source community

We are dedicated to helping serve the interests and needs of open source software users and developers online. Our websites, which include redhat.com, jboss.org, fedoraproject.org and opensource.com, serve as a substantial resource for information related to open source initiatives. These websites contain news we believe to be of interest to open source users and developers, features for the open source community, a commerce site and a point-of-access for software downloads and upgrades. Visitors to our websites can organize and participate in user groups, make available incremental code improvements and bug fixes and share knowledge regarding the use and development of open source software. By acting as a publisher of open source information and by facilitating the interaction of developers, particularly through the Fedora and JBoss.org projects, we believe our websites have become community centers for open source. Additionally, redhat.com serves as a primary customer interface, web store and order mechanism for many of our products and services.

Segment reporting

Red Hat is organized primarily on the basis of three geographic business units: the Americas, EMEA (Europe, Middle East and Africa) and Asia Pacific. These business units are aggregated into one reportable

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segment due to the similarity in the nature of products provided (e.g., Red Hat Enterprise Linux, JBoss Enterprise Middleware and Red Hat Enterprise Virtualization products), financial performance economics (e.g., revenue growth and gross margin), methods of distribution (direct and indirect) and customer classification and base (e.g., distributors, resellers and enterprise).

Geographic Areas

As of February 28, 2010, Red Hat had more than 65 locations around the world, including offices in North America, South America, Europe, Asia and Australia. As stated above, we manage our international business on the basis of three geographic business units: the Americas, EMEA and Asia Pacific. See NOTE 2 to our Consolidated Financial Statements for further discussion of our geographic areas of operation. See Item 1A, Risk Factors , for a discussion of some of the risks attendant to our operations.

Backlog

The total value of all non-cancellable subscription and service agreements at February 28, 2010, included deferred revenue classified as a current liability of \$480.6 million, long-term deferred revenue of \$165.3 million and backlog (the value of customer contracts to be billed in the future) not reflected in our financial statements in excess of \$190.0 million. The total value of all non-cancellable subscription and service agreements at February 28, 2009, included deferred revenue classified as a current liability of \$382.1 million, long-term deferred revenue of \$161.0 million and backlog not reflected in our financial statements in excess of \$190.0 million. The amount of backlog at February 28, 2010 that we expect to be billed during the fiscal year ending February 28, 2011 is in excess of \$90.0 million.

BUSINESS STRATEGY

Our business strategy is designed to (i) gain widespread adoption of Red Hat enterprise technologies by enterprise users globally, (ii) generate increasing revenue from our existing customer base by renewing existing subscriptions and providing additional value to our customers, and by growing the number of enterprise technologies that comprise our open source architecture, (iii) generate increasing revenue by providing additional systems management, support and other targeted services and (iv) generate increasing revenue from additional market penetration through a broader and deeper set of channel partner and other strategic relationships, including OEMs, other hardware partners, ISVs, cloud computing providers, value-added resellers (VARs) and systems integrators and our own international expansion, among other means.

The key elements of our strategy aim to:

Increase the adoption of Red Hat enterprise technologies by enterprise users globally

A growing number of enterprise users view Red Hat Enterprise Linux as a viable operating system and JBoss Enterprise Middleware as a viable middleware platform for mission-critical areas of their information technology infrastructure. An increasing number of these users deploy JBoss Enterprise Middleware as a comprehensive middleware reference architecture and product portfolio for development, deployment and integration of distributed applications, business processes and web services used in a service-oriented architecture. In addition, we see increasing interest among enterprise users for our virtualization and virtualization management offerings. We seek to promote further adoption of our enterprise technologies by expanding the breadth and depth of our technology and service offerings (such as messaging, high performance computing, realtime and virtualization), bringing new management services to market, improving our technology infrastructure to ease the purchasing and renewal process, offering expanded services, focusing on new geographic markets, and capitalizing on the success of our existing strategic relationships. We believe the relationships with our strategic partners will continue to stimulate the technical advancement and widespread

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distribution of our enterprise technologies and the growth of existing third-party enterprise applications using Red Hat enterprise technologies. We believe that the low-cost, high-value offerings from Red Hat are a catalyst for change in the IT industry, enabling new deployments and migrations, which encourage a larger ecosystem of compatible hardware and software solutions.

Continue to expand virtualization and other platform offerings

We intend to expand our enterprise virtualization suite of server, client and management product offerings to enable customers to increase their deployments of virtualization in enterprise and mission-critical environments. We also expect to continue to invest resources to further develop and market our cloud computing, messaging, realtime and grid product offerings.

Continue to expand routes to market

We intend to continue to grow our traditional distribution, reseller, OEM, ISV and channel partner networks on a global basis. In addition, we are enhancing our relationships with the systems integrators in order to expand our reach into customers who traditionally rely on system integrators for advice and recommendations regarding their technology purchases.

Continue to pursue strategic acquisitions and alliances

We expect to continue to pursue a selective acquisition strategy as opportunities arise to complement and expand our offerings and service capabilities. We also intend to create and extend our strategic alliances where it is beneficial to our business.

Continue to grow our presence in international markets

We have operations in a number of countries in the Americas, EMEA and Asia Pacific, with over 65 offices worldwide. We expect to continue to expand our operations geographically.

We offer our technologies and documentation in various languages. See NOTE 2 to the Consolidated Financial Statements for a discussion of our revenue by geographic area.

Continue to invest in the development of open source technology

We intend to continue to invest significant resources in the development of new open source technology in areas that include messaging, virtualization, cloud computing, real-time computing, middleware, management, security and identity, capitalizing on our substantial experience working with the open source model and community. We expect this continued investment to take the form of expenditures on internal development efforts, as well as continued funding of third-party open source projects and the expansion of our developer services.

PRODUCTS AND SERVICES

Red Hat's software solutions, consisting of Red Hat enterprise technologies such as Red Hat Enterprise Linux, JBoss Enterprise Middleware and Red Hat Enterprise Virtualization, are at the center of our subscription strategy and our open source architecture. Our services offerings, principally directed toward our medium and large enterprise customers and the leading hardware providers with whom we have strategic relationships, include technical support and maintenance, training, professional consulting services, engineering services and hardware certification.

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Generally, we provide our enterprise technologies with related services in the form of annual or multi-year subscriptions. Our subscriptions include a bundle of services encompassing product delivery, problem resolution, ongoing corrections, enhancements and new versions, certified capability with a portfolio of hardware and software applications and Red Hat's Open Assurance program. The subscriptions offer varying levels of support services as well as access to basic software updates and configuration management functionality via our integrated management technologies RHN, RHN Satellite, JBoss CSP and JBoss ON.

Red Hat Enterprise Linux technologies

Red Hat Enterprise Linux is an operating system built from various open source software packages including the Linux kernel, and is designed expressly for enterprise computing. Red Hat Enterprise Linux delivers the features required for commercial deployments, including:

- Support for a wide range of ISV applications from vendors such as BMC, CA, HP, IBM, Microsoft, Oracle, SAP, Sybase and Symantec;
- Certification on multiple architectures and leading OEM platforms, including Cisco, Dell, Fujitsu, Fujitsu Siemens, HP, Hitachi, IBM, NEC and Sun;
- Comprehensive technical support, with up to 24x7, one-hour response, available both from Red Hat and selected ISV/OEM partners;
- Performance and scalability in accordance with leading industry benchmarks;
- Stability based upon periodic upgrade cycles on a when and if available basis and multiyear support lifecycle; and
- Virtualization capability incorporated into the core operating system.

Red Hat Enterprise Linux is generally offered in three configurations:

- *Red Hat Enterprise Linux* a base product server offering with virtualization support and a virtual guest offering for use with Red Hat or third-party hypervisors.
- *Red Hat Enterprise Linux Advanced Platform* a comprehensive solution bundle that includes Red Hat Enterprise Linux, Red Hat Global File System and Red Hat Cluster Suite. Red Hat Enterprise Linux Advanced Platform targets customers who require a complete, integrated virtualization solution.
- *Red Hat Enterprise Linux Desktop* an open source desktop offering.

We believe that these configurations simplify the product selection and purchase process and drive deeper product adoption, while providing the flexibility that our customers desire. Each of these offerings includes virtualization capabilities that provide customers with tools to help in optimizing both existing and new hardware while providing more deployment options regarding variable workloads, virtual appliances, legacy applications and testing configurations.

JBoss Enterprise Middleware

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JBoss Enterprise Middleware provides a suite of products for developing, deploying, integrating and managing distributed, composite and web-based applications and services. JBoss products are based on the Java programming language, are deployed on a variety of leading operating systems and support a distributed, modular, reusable and open standards-based Service Oriented Architecture or SOA deployment for applications and data. JBoss Enterprise Middleware offerings consist of a number of deployment platforms, tools and development frameworks, including:

- *JBoss Enterprise Application Platform* provides an environment for building, hosting and deploying Java-based applications and services. It includes JBoss Application Server, Seam, Hibernate, JBoss Cache, JBoss Transactions, JBoss Messaging and JBoss Web services.

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- *JBoss Enterprise Web Platform* leverages the Java Enterprise Edition Web Profile concept to provide a standards-based environment for building light Java applications.
- *JBoss Enterprise Web Server* a single enterprise open source solution for large scale websites and lightweight applications that utilize Apache Tomcat and Apache Web Server.
- *JBoss Enterprise SOA Platform* provides the environment for deploying and integrating SOAs and business processes.
- *JBoss Enterprise Portal Platform* provides a Java-based platform for deploying standards-based portals.
- *JBoss Enterprise BRMS* a business rules management system that enables business policy and rules development, access and change management.
- *JBoss Developer Studio* provides an Eclipse-based application development environment for developing Java applications and development tools for building rich web-based applications and SOA services.
- *JBoss Enterprise Data Services Platform* provides an environment integrating distributed data sources and provides for data federation, data abstraction, data transformation and metadata management.
- *JBoss Hibernate Framework* an object/relational mapping and persistence framework.
- *JBoss Seam Framework* an application framework for building Web 2.0 applications.
- *JBoss Web Framework Kit* an integrated bundle of open source frameworks that are used for building light Java applications.

Red Hat Enterprise Virtualization

Red Hat Enterprise Virtualization for Servers is designed to enhance the capital and operational efficiencies of our customers by increasing server utilization and deployment flexibility. Our virtualization solution for servers consists of two offerings:

- *Red Hat Enterprise Virtualization Hypervisor* a hypervisor based on KVM technology that essentially converts the Red Hat Enterprise Linux kernel into a virtualization platform; and
- *Red Hat Enterprise Virtualization Manager for Servers* a server virtualization management system that provides advanced capabilities for both host and guest operating systems, including high availability, live migration, power manager, storage manager and system scheduler.

Red Hat Enterprise Virtualization for Servers is compatible with Red Hat Enterprise Linux and its wide ecosystem of certified hardware systems and software applications. Our virtualization solution allows enterprises to centrally manage virtual environments.

Additional Red Hat enterprise technologies

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Red Hat enterprise technologies also include other technology infrastructure, including software for software development, high availability clusters of Linux systems and storage, directory server services and authentication of users. These applications broaden customer choice and are components of our open source architecture vision for the enterprise. These technologies include:

- *Red Hat MRG* integrates open and scalable messaging, a real-time kernel with predictable performance and grid management tools for high-performance distributed computing solutions, including virtualization, cloud computing and bare-metal mission-critical applications.
- *Red Hat Developer Offering* provides integrated development environments and support for application developers.

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- *Red Hat Cluster Suite* features clustering and uses application fail-over technology, which is designed to enable high-availability application environments.
- *Red Hat Global File System* is an enterprise-strength clustered file system for Linux, designed for commercial and technical computing applications requiring access to shared data.
- *Red Hat Certificate System* is a scalable authentication system for appropriately limiting access to mission-critical resources and data.
- *Red Hat Directory Server* centralizes application settings, user profiles, group data, policies and access control information into an operating system-independent, network-based registry.

Red Hat systems management solutions

RHN, RHN Satellite, JBoss CSP and JBoss ON provide management and software delivery services for Red Hat Enterprise Linux and JBoss Enterprise Middleware technologies. With a focus on open standards and scalability, our management solutions help organizations increase productivity, lower costs and enhance security by provisioning, managing, monitoring and updating systems.

Services for Red Hat Enterprise Linux and JBoss Enterprise Middleware are available to provide organizations with the appropriate level of flexibility, security and scalability based on their size and needs. Red Hat's customers can manage their deployments by connecting to Red Hat's hosted servers or by implementing the enhanced functionality of RHN Satellite and JBoss ON.

Red Hat Network Through RHN, Red Hat provides an on-line method for its customers to obtain certified software and upgrades and to manage, provision and monitor deployments of Red Hat Enterprise Linux.

RHN Update Module The RHN Update Module is an entry-level offering included with each subscription for Red Hat Enterprise Linux, providing functionality enhancements and upgrades to individual systems. The RHN Update Module includes functionality such as a graphical user interface, priority notification, errata information, and Red Hat Package Manager (RPM) dependency checking and auto update. RHN Update Module also gives customers access to electronic delivery of software related to their Red Hat subscriptions. This is the default method for accessing subscription services for Red Hat Enterprise Linux.

Customers may purchase entitlements to the following additional RHN modules on an annual subscription basis:

RHN Satellite RHN Satellite provides RHN functionality, such as managing system profiles and reporting data, locally on a customer's system behind its IT firewall. A customer's RHN Satellite server connects with RHN over the Internet to download updates and upgrades. RHN Satellite offers customers greater control and flexibility over the management of their Red Hat Enterprise Linux systems and may also be used to distribute custom or third party content to their Red Hat Enterprise Linux systems, and monitor the health of their systems. Additional RHN Proxy Servers can be added to an RHN Satellite deployment to improve performance and package downloads for remote locations.

RHN Management Module The RHN Management Module allows customers to manage systems running Red Hat enterprise technology. Designed to enable scalable enterprise administration, the RHN Management Module features systems grouping, role-based administration and scheduled actions.

RHN Provisioning Module The RHN Provisioning Module includes features such as operating system provisioning (for new, unformatted systems or previously deployed systems), configuration management, multistate rollback, scheduled remote actions, auto discovery, configuration tools and RPM-based application provisioning.

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RHN Monitoring Module The RHN Monitoring Module, only available for RHN Satellite deployments, adds performance-tracking capabilities. Users can configure monitoring checks based on numerous pre-built probes, or they can create their own. Email or pager warnings send alerts when defined performance thresholds are crossed.

JBoss Customer Support Portal Through JBoss CSP, Red Hat provides an on-line method for JBoss Enterprise Middleware customers to obtain certified software, access to the JBoss information knowledge base and software update alerts and advisories, as well as interact with our JBoss technical support engineers.

JBoss ON JBoss ON is deployed in a manner similar to RHN Satellite and allows the customer to manage its JBoss Enterprise Middleware environments. Similar to RHN Satellite, JBoss ON functionality includes inventory, software update, administration, configuration management and resource deployment. JBoss ON also provides an extended module for monitoring and alert notifications on the status of JBoss Enterprise Middleware deployments.

Red Hat training, consulting and support services

Red Hat offers a range of services that are designed to help our customers derive additional value from Red Hat enterprise technologies.

Training Our training services consist of an array of performance-based courses designed to meet the diverse needs of our customers. We deliver more than 30 Red Hat Enterprise Linux and JBoss Enterprise Middleware courses offered worldwide in classroom, corporate on-site and online settings. These courses span topics such as system administration and advanced enterprise development, deployment security, middleware and role-based offerings. Certification paths include Red Hat Certified Technician, Red Hat Certified Engineer, Red Hat Certified Data Specialist, Red Hat Certified Security Specialist, Red Hat Certified Virtualization Administrator, Red Hat Certified Architect and JBoss Certified Application Administrator.

Consulting We offer the services of experienced consultants to assist with the technology infrastructure needs of our customers. Our offerings include assessments, installations, upgrade planning, platform migrations, solution integration and application development.

Support Our Red Hat subscriptions generally include varying levels of technical support to assist customers with installing, configuring and using Red Hat enterprise technologies. Additionally, we offer a technical account manager (TAM) service for customers that require a more personalized support relationship. The TAM service is designed to offer a highly skilled, proactive support engineer that understands a customer s IT infrastructure and serves as a primary point of contact for technical support that is tailored to the customer s business.

COMPETITION

In the operating systems market, we compete with a number of large and well-established companies that have significantly greater financial resources, larger development staffs and more extensive marketing and distribution capabilities. These competitors include Microsoft, Novell, Sun and Oracle, all of which offer hardware-independent, multi-user operating systems, and various virtualization software for Intel platforms that compete with Red Hat s offerings. Moreover, HP, IBM, Sun and Unisys Corporation each offer the UNIX operating system. Many of these competitors bundle competitive operating systems, such as UNIX, with their own hardware and additional software offerings, thereby making it more difficult for us to penetrate their customer bases. Moreover, Sun also provides its Solaris UNIX software under an open source license. In addition, with virtualization emerging as an important element of the operating environment, virtualization software companies like VMware, Microsoft, Citrix Systems, Inc. (Citrix) and Novell are also competitors to Red Hat. No assurance can be given that our efforts to compete effectively will be sufficient.

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Within the specific category of Linux operating systems, our chief competitor has historically been Novell, with its SUSE brand of Linux. In 2006, Oracle, a large and well-capitalized company, also began to sell support for its version of the Linux operating system. See Item 1A, Risk Factors . Other, less well-capitalized, Linux brands include Ubuntu, Debian Mandriva, and other regionally-specific distributions. The financial and legal barriers to creating a new Linux distribution are relatively low because the open source license governing Linux distributions permits copying, modification and redistribution.

In the middleware market, we compete with a number of large and well-established companies that have significantly greater financial resources, larger development staffs and more extensive marketing and distribution capabilities. These competitors include, but are not limited to, IBM, Microsoft, Oracle and Sun, all of which offer broad portfolios of enterprise Java and non-Java middleware products. All of these vendors offer the majority of their middleware products under a typical proprietary software license model. IBM and Sun often bundle hardware and software for their customers, making it more difficult to penetrate these customer bases.

In the virtualization market, we compete with a number of large and well-established companies that have significantly greater financial resources, larger development staffs and more extensive marketing and distribution capabilities. These competitors include, but are not limited to, VMware, Microsoft, Citrix, Novell and Oracle, and in the case of VMware and Microsoft, have virtualization technologies that are certified and supported with Red Hat Enterprise Linux operating system offerings.

With our services offerings, we face competition in the market for services related to the deployment of our enterprise technologies and the development and integration of applications. Our competitors in the market include HP, IBM, Oracle and Sun, as well as other technology consulting companies.

For our management offerings, we compete with a number of large companies that have significantly greater financial resources, larger development staffs and more extensive marketing and distribution capabilities. These competitors include, but are not limited to, BMC, CA, HP, IBM, Microsoft, Novell and Oracle, all of which offer support for heterogeneous operating system environments, such as Linux, Solaris, AIX, HP-UX and Windows. Many of these competitors have legacy client/server offerings that require relatively long implementation cycles and are difficult to displace in enterprise customers due to, among other reasons, switching costs. There are numerous other companies that focus exclusively on management offerings that are likely to support Linux-based systems as well as non-Linux-based systems.

The recent acquisition of Sun by Oracle could place additional competitive pressure on Red Hat across the virtualization, operating systems and middleware markets. Oracle's acquisition of Sun creates a large, integrated supplier of enterprise software that may also provide hardware optimized for these software products. In addition, Oracle's ownership of the Solaris technologies could make it more difficult for Red Hat to penetrate Sun's installed base of customers.

The open source software market is not characterized by the traditional barriers to entry that are found in the proprietary software model due to the nature of open source technology. For example, anyone can copy, modify and redistribute Red Hat Enterprise Linux, JBoss Enterprise Middleware and our other open source products. However, they are not permitted to refer to these products as Red Hat or JBoss products unless they have a formal business relationship with us that allows such references. Moreover, as it relates to our enterprise technologies and management offerings, our customers agree that during their support relationship with Red Hat, they will purchase a support subscription for each computer system, CPU or other unit on which they deploy Red Hat's software. In addition, the primary means by which customers can receive a certified version of Red Hat enterprise software and receive certified functionality enhancements and upgrades to a copy of Red Hat enterprise software is to purchase and maintain a current subscription directly from us or our partners with whom we have agreements.

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We believe that the major factors affecting the competitive landscape for our products include:

- the name and reputation of the vendor;
- the ability to adapt development, sales, marketing and support to the open source model;

Potential conflicts of interest could arise

We, Wells Fargo Securities, LLC and our respective affiliates may engage in trading activities related to the Index or the common stocks underlying the Index that are not for the account of holders of the securities or on their behalf. These trading activities may present a conflict between the holders' interest in the securities and the interests we, Wells Fargo Securities, LLC and our respective affiliates will have in the proprietary accounts, in facilitating transactions, including options and other derivatives transactions, for our customers and in accounts under our management. These trading activities could be adverse to the interests of the holders of the securities.

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We, Wells Fargo Securities, LLC and our respective affiliates may presently or from time to time engage in business with one or more of the issuers of the common stocks underlying the Index. This business may include extending loans to, or making equity investments in, such companies or providing advisory services to such companies, including merger and acquisition advisory services. In the course of business, we, Wells Fargo Securities, LLC and our respective affiliates may acquire non-public information relating to these companies and, in addition, one or more of our affiliates or the affiliates of the agent may publish research reports about these companies. Neither we nor the agent make any representation to any purchasers of the securities regarding any matters whatsoever relating to the issuers of the common stocks underlying the Index. Any prospective purchaser of the securities should undertake an independent investigation of these companies as in its judgment is appropriate to make an informed decision regarding an investment in the securities. The offering of the securities does not reflect any investment or sell recommendations as to the Index or the securities underlying the Index by us, Wells Fargo Securities, LLC or our respective affiliates.

The calculation agent may postpone the valuation date and, therefore, determination of the Final Index Level and the maturity date if a market disruption event occurs on the valuation date

The valuation date and, therefore, determination of the Final Index Level may be postponed if the calculation agent determines that a market disruption event has occurred or is continuing on the valuation date with respect to the Index. If a postponement occurs, the calculation agent will use the closing level of the Index on the next succeeding trading day on which no market disruption event occurs or is continuing as the Final Index Level. As a result, the maturity date for the securities would be postponed. You will not be entitled to compensation from us or the calculation agent for any loss suffered as a result of the occurrence of a market disruption event, any resulting delay in payment or any change in the level of the Index after the valuation date. See “Specific Terms of the Securities—Valuation Date” and “— Market Disruption Events” below.

There are potential conflicts of interest between you and the calculation agent

The calculation agent will, among other things, determine the amount of your payment at maturity on the securities. Our wholly-owned subsidiary, RBC Capital Markets, LLC, will serve as the calculation agent. We may change the calculation agent after the original issue date without notice to you. The calculation agent will exercise its judgment when performing its functions. For example, the calculation agent may have to determine whether a market disruption event affects the Index. Since this determination by the calculation agent will affect the payment at maturity on the securities, the calculation agent may have a conflict of interest if it needs to make a determination of this kind. In addition, the calculation agent determined the initial estimated value of the securities set forth on the cover page of this pricing supplement.

Risks associated with non-U.S. companies.

The level of the Index depends upon the stocks of companies located within the Eurozone, and thus involve risks associated with the home countries of those non-U.S. companies, some of which are and have been experiencing economic stress. The prices of these non-U.S. stocks may be affected by political, economic, financial and social factors in the home country of each applicable company, including changes in that country’s government, economic and fiscal policies, currency exchange laws or other laws or restrictions, which could affect the value of the securities. These foreign securities may have less liquidity and could be more volatile than many of the securities traded in U.S. or other securities markets. Direct or indirect government intervention to stabilize the relevant foreign securities markets, as well as cross shareholdings in foreign companies, may affect trading levels or prices and volumes in those markets. The other special risks associated with foreign securities may include, but are not limited to: less liquidity and smaller market capitalizations; less rigorous regulation of securities markets; different accounting and disclosure standards; governmental interference; currency fluctuations; higher inflation; and social, economic and political uncertainties. These factors may adversely affect the performance of the Index and, as a result, the value of the securities.

The securities will not be adjusted for changes in exchange rates.

Although the equity securities that comprise the Index are traded in euro, and your securities are denominated in U.S. dollars, the amount payable on your securities at maturity, if any, will not be adjusted for changes in the exchange rates between the U.S. dollar and the euro. Changes in exchange rates, however, may also reflect changes in the applicable non-U.S. economies that in turn may affect the level of the Index, and therefore your securities. The amount we pay in respect of your securities will be determined solely in accordance with the

procedures described in this pricing supplement.

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Significant aspects of the tax treatment of the securities are uncertain

The tax treatment of the securities is uncertain. We do not plan to request a ruling from the Internal Revenue Service or from the Canada Revenue Agency regarding the tax treatment of the securities, and the Internal Revenue Service, the Canada Revenue Agency or a court may not agree with the tax treatment described in this pricing supplement.

The Internal Revenue Service has issued a notice indicating that it and the U.S. Treasury Department are actively considering whether, among other issues, a holder should be required to accrue interest over the term of an instrument such as the securities even though that holder will not receive any payments with respect to the securities until maturity or earlier sale or exchange and whether all or part of the gain a holder may recognize upon sale, exchange or maturity of an instrument such as the securities should be treated as ordinary income. The outcome of this process is uncertain and could apply on a retroactive basis.

Please read carefully the section entitled “Supplemental Discussion of U.S. Federal Income Tax Consequences” in this pricing supplement, the section entitled “Tax Consequences” in the accompanying prospectus and the section entitled “Certain Income Tax Consequences” in the accompanying prospectus supplement. You should consult your tax advisor about your own tax situation.

For a discussion of the Canadian federal income tax consequences of investing in the securities, please read the section entitled “Tax Consequences” in the accompanying prospectus and the section entitled “Certain Income Tax Consequences” in the accompanying prospectus supplement. You should consult your tax advisor about your own tax situation.

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SPECIFIC TERMS OF THE SECURITIES

The securities are to be issued pursuant to the terms of the Indenture dated as of October 23, 2003, between Royal Bank of Canada and The Bank of New York Mellon (as successor to JPMorgan Chase Bank, N.A.), as Trustee, as supplemented by the First Supplemental Indenture dated as of July 21, 2006, between Royal Bank of Canada and The Bank of New York (as successor to JPMorgan Chase Bank, N.A.), as Trustee and by the Second Supplemental Indenture dated as of February 28, 2007 between Royal Bank of Canada and The Bank of New York Mellon (as successor to JPMorgan Chase Bank, N.A.), as Trustee (the Base Indenture, together with the First Supplemental Indenture and the Second Supplemental Indenture, the “Indenture”).

The information contained in this section and in the prospectus supplement and the prospectus summarizes some of the terms of the securities and the Indenture. This summary does not contain all of the information that may be important to you as a potential investor in the securities. You should read the Indenture before making your investment decision. We have filed copies of the Indenture with the SEC.

Issuer: Royal Bank of Canada

Specified Currency: U.S. dollars

Principal Amount: \$1,000 per security

Aggregate Principal Amount: \$3,328,000

Agent: Wells Fargo Securities, LLC

The agent may make sales through its affiliates or selling agents.

Agent Acting in the Capacity of: Principal

Pricing Date: January 31, 2018

Original Issue Date: February 5, 2018

Maturity Date: February 7, 2022, subject to postponement as described below. The maturity date will be a business day. In the event the maturity date would otherwise be a date that is not a business day, the maturity date will be postponed to the next succeeding date that is a business day and no interest shall accrue or be payable as a result of that postponement.

January 31, 2022. However, if that day occurs on a day that is not a trading day or on a day on which the calculation agent has determined that a market disruption event (as defined under “—Market Disruption Events” below) has occurred or is continuing, then the valuation date will be postponed until the next succeeding trading day on which the calculation agent determines that a market disruption event does not occur or is not continuing; provided that in no event will the valuation date be postponed by more than five trading days. If the valuation date is postponed by five trading days, and a market disruption event occurs or is continuing on that fifth trading day, then the Final Index Level will nevertheless be determined as set forth on the next page under “—Closing Level of the Index”. If the valuation date is postponed, then the maturity date of the securities will be postponed by an equal number of business days.

The Index: The return on the securities is linked to the performance of the EURO STOXX 50[®] Index (the Index).

Payment at Maturity: At maturity, for each security you own, you will receive a cash payment equal to the maturity payment amount. The maturity payment amount to which you will be entitled depends on the change in the level of the Index based on the Final Index Level relative to the Initial Index Level, and whether or not the Final Index Level is below the Buffer Level. The maturity payment amount for each security will be determined by the calculation agent as described below:

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- If the Final Index Level is greater than the Initial Index Level, the maturity payment amount per security will equal the lesser of:
 - (a) $\$1,000 + (\$1,000 \times \frac{\text{Final Index Level} - \text{Initial Index Level}}{\text{Initial Index Level}} \times \text{Participation Rate})$; and
 - (b) the maximum maturity payment amount
- If the Final Index Level is less than or equal to the Initial Index Level but greater than or equal to the Buffer Level, the maturity payment amount per security will equal \$1,000.
- If the Final Index Level is less than the Buffer Level, the maturity payment amount per security will equal:

$$\$1,000 - (\$1,000 \times \frac{\text{Buffer Level} - \text{Final Index Level}}{\text{Initial Index Level}})$$

In such a case, you will lose up to 80% of your principal.

If the Final Index Level is less than the Buffer Level, you will lose up to 80% of your principal. If the Final Index Level is zero, the maturity payment amount will be \$200.00 per security.

If any payment is due on the securities on a day which is not a business day, then that payment may be made on the next day that is a business day, in the same amount and with the same effect as if paid on the original due date. No interest shall be payable as a result of such postponement.

Maximum

Maturity Payment: \$1,700.00 per security

Amount:

Initial Index Level: 3,609.29, which was the closing level of the Index on the pricing date.

Final Index Level: The closing level of the Index on the valuation date, as determined by the calculation agent.

Buffer Level: 2,887.432, which is 80% of the Initial Index Level.

Closing Level of the Index: The official closing level of the Index or any successor index (as defined under “—Discontinuation of the Index; Adjustments to the Index” below) published by the Index Sponsor or any successor index sponsor at the regular weekday close of trading on that trading day. In certain circumstances, the closing level will be based on the alternate calculation of the Index described under “—Discontinuation of the Index; Adjustments to the Index” below.

Participation Rate: 200%

As determined by the calculation agent in its sole discretion, a “market disruption event” means any of (A), (B), (C) or (D) below:

Market Disruption Events: A. Any of the following events occurs or exists with respect to any security included in the Index or any successor index, and the aggregate of all securities included in the Index or such successor index with respect to which any such event occurs comprise 20% or more of the level of the Index or such successor index:

- a material suspension of or limitation imposed on trading by the relevant stock exchange for such security or otherwise at any time during the one-hour period that ends at the scheduled closing time for the relevant stock exchange for such security on that day, whether by reason of movements in price exceeding limits permitted by the relevant stock exchange or otherwise;
- any event, other than an early closure, that materially disrupts or impairs the

ability of market participants in general to effect transactions in, or obtain market values for, such security on its relevant stock exchange at any time during the one-hour period that ends at the scheduled closing time for the relevant stock exchange for such security on that day; or

- the closure on any exchange business day of the relevant stock exchange for such security prior to its scheduled closing time unless the earlier closing is announced by such relevant stock exchange at least one hour prior to the earlier of (i) the actual closing time for the regular trading session on such relevant stock exchange and (ii) the submission deadline for orders to be entered into the relevant stock exchange system for execution at the scheduled closing time for such relevant stock exchange on that day.

B. Any of the following events occurs or exists with respect to futures or options contracts relating to the equity index or any successor index:

- a material suspension of or limitation imposed on trading by any related futures or options exchange or otherwise at any time during the one-hour period that ends at the close of trading on such related futures or options exchange on that day, whether by reason of movements in price exceeding limits permitted by the related futures or options exchange or otherwise;

- Any event, other than an early closure, that materially disrupts or impairs the ability of market participants in general to effect transactions in, or obtain market values for, futures or options contracts relating to the Index or such successor index on any related futures or options exchange at any time during the one-hour period that ends at the close of trading on such related futures or options exchange on that day; or

- the closure on any exchange business day of any related futures or options exchange prior to its scheduled closing time unless the earlier closing time is announced by such related futures or options exchange at least one hour prior to the earlier of (i) the actual closing time for the regular trading session on such related futures or options exchange and (ii) the submission deadline for orders to be entered into the related futures or options exchange system for execution at the close of trading for such related futures or options exchange on that day.

C. The Index Sponsor fails to publish the level of the Index or any successor index (other than as a result of the Index Sponsor having discontinued publication of the Index or successor index and no successor index being available).

D. Any related futures or options exchange fails to open for trading during its regular trading session.

For the purposes of determining whether a market disruption event has occurred:

- the relevant percentage contribution of a security included in the Index or any successor index to the level of such index will be based on a comparison of (x) the portion of the level of such index attributable to that security to (y) the overall level of such index, in each case using the official opening weightings as published by the relevant index sponsor as part of the market opening data;

- the “scheduled closing time” of any relevant stock exchange or related futures or options exchange on any trading day means the scheduled weekday closing time of such relevant stock exchange or related futures or options exchange on such trading day, without regard to after hours or any other trading outside the regular trading session hours; and

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an “exchange business day” means any trading day on which (i) the relevant index sponsor publishes the level of the Index or any successor equity index and (ii) each related futures or options exchange is open for trading during its regular trading session, notwithstanding any related futures or options exchange closing prior to its scheduled closing time.

Related Futures or Options Exchange: An exchange or quotation system where trading has a material effect (as determined by the calculation agent) on the overall market for futures or options contracts relating to the Index.

Relevant Stock Exchange: For any security underlying the Index, the primary exchange or quotation system on which such security is traded, as determined by the calculation agent.

If the Index Sponsor discontinues publication of the Index and the Index Sponsor or another entity publishes a successor or substitute index that the calculation agent determines, in its sole discretion, to be comparable to the Index (a successor index), then the calculation agent will substitute the successor index as calculated by the Index Sponsor or any other entity for the Index and calculate the Final Index Level as described above under “—Closing Level of the Index.”

If the Index Sponsor discontinues publication of the Index and:

- the calculation agent does not select a successor index, or
 - the successor index is no longer published on any of the relevant trading days,
- the calculation agent will compute a substitute level for the Index in accordance with the procedures last used to calculate the level of the Index before any discontinuation but using only those securities that were included in the Index prior to that discontinuation. If a successor index is selected or the calculation agent calculates a level as a substitute for the Index as described below, the successor index or level will be used as a substitute for the Index for all purposes going forward, including for purposes of determining whether a market disruption event exists, even if the Index Sponsor elects to begin republishing the Index, unless the calculation agent in its sole discretion decides to use the republished Index.

Discontinuation of/Adjustments to the Index: If the Index Sponsor discontinues publication of the Index before the valuation date and the calculation agent determines that no successor index is available at that time, then on each trading day until the earlier to occur of:

- the determination of the Final Index Level, or
 - a determination by the calculation agent that a successor index is available,
- the calculation agent will determine the level that would be used in computing the maturity payment amount as described in the preceding paragraph as if that day were a trading day. The calculation agent will cause notice of each level to be published not less often than once each month in The Wall Street Journal, another newspaper of general circulation or a website or webpage available to holders of the securities, and arrange for information with respect to these levels to be made available by telephone.

Notwithstanding these alternative arrangements, discontinuation of the publication of the Index would be expected to adversely affect the value of, liquidity of and trading in the securities.

If at any time the method of calculating the level of the Index or the successor index changes in any material respect, or if the Index or successor index is in any other way modified so that the level of the Index or successor index does not, in the opinion of the calculation agent, fairly represent the level of the Index had those changes or modifications not been made, then, from and after that time, the calculation agent will, at the close of business in The City of New York, on each date that the closing level of the Index is to be calculated, make any adjustments as, in the good faith judgment of the calculation agent, may be necessary in order to arrive at a calculation of a level of a stock index comparable to the Index or the successor index, as the case may be, as if

those changes or modifications had not been made, and calculate the closing level with reference to the Index or the successor index, as so adjusted. Accordingly, if the method of calculating the Index or a successor index is modified and has a dilutive or concentrative effect on the level of that index e.g., due to a split, then the calculation agent will adjust that index in order to arrive at a level of that index as if it had not been modified, e.g., as if a split had not occurred.

Neither the calculation agent nor Royal Bank of Canada will have any responsibility for good faith errors or omissions in calculating or disseminating information regarding the Index or any successor index or as to modifications, adjustments or calculations by the Index Sponsor or any successor index sponsor in order to arrive at the level of the Index or any successor index.

Calculation Agent:	RBC Capital Markets, LLC will serve as the calculation agent. All determinations made by the calculation agent will be at the sole discretion of the calculation agent and, absent a determination of a manifest error, will be conclusive for all purposes and binding on the holders and beneficial owners of the securities.
Trustee:	The Bank of New York Mellon
Business Day:	For purposes of the securities, a business day means a Monday, Tuesday, Wednesday, Thursday or Friday that is not a day on which banking institutions in The City of New York generally are authorized or obligated by law, regulation or executive order to close.
Trading Day:	A day, as determined by the calculation agent, on which (i) the Index Sponsor is scheduled to publish the level of the Index and (ii) each related futures or option exchange is scheduled to be open for trading for its regular trading session.
	We will pay any amounts to be paid by us on the securities without deduction or withholding for, or on account of, any and all present or future income, stamp and other taxes, levies, imposts, duties, charges, fees, deductions or withholdings (taxes) now or hereafter imposed, levied, collected, withheld or assessed by or on behalf of Canada or any Canadian political subdivision or authority that has the power to tax, unless the deduction or withholding is required by law or by the interpretation or administration thereof by the relevant governmental authority. At any time a Canadian taxing jurisdiction requires us to deduct or withhold for or on account of taxes from any payment made under or in respect of the securities, we will pay such additional amounts (Additional Amounts) as may be necessary so that the net amounts received by each holder (including Additional Amounts), after such deduction or withholding, shall not be less than the amount the holder would have received had no such deduction or withholding been required.
Additional Amounts:	<p>However, no Additional Amounts will be payable with respect to a payment made to a holder of a security or of a right to receive payments in respect thereto (a Payment Recipient), which we refer to as an Excluded Holder, in respect of any taxes imposed because the beneficial owner or Payment Recipient:</p> <ul style="list-style-type: none"> (i) is someone with whom we do not deal at arm's length (within the meaning of the Income Tax Act (Canada)) at the time of making such payment; (ii) is subject to such taxes by reason of its being connected presently or formerly with Canada or any province or territory thereof otherwise than by reason of the holder's activity in connection with purchasing the securities, the holding of securities or the receipt of payments thereunder; (iii) is, or does not deal at arm's length with a person who is, a specified shareholder (within the meaning of subsection 18(5) of the Income Tax Act (Canada)) of Royal Bank of Canada (generally a person will be a specified shareholder for this purpose if that person, either alone

or together with persons with whom the person does not deal at arm's length, owns 25% or more of (a) our voting shares, or (b) the fair market value of all of our issued and outstanding shares);

(iv) presents such security for payment (where presentation is required) more than 30 days after the relevant date (except to the extent that the holder thereof would have been entitled to such Additional Amounts on presenting a security for payment on the last day of such 30 day period); for this purpose, the relevant date in relation to any payments on any security means:

a. the due date for payment thereof, or
 b. if the full amount of the monies payable on such date has not been received by the Trustee on or prior to such due date, the date on which the full amount of such monies has been received and notice to that effect is given to holders of the securities in accordance with the Indenture;

(v) could lawfully avoid (but has not so avoided) such withholding or deduction by complying, or requiring that any agent comply with, any statutory requirements necessary to establish qualification for an exemption from withholding or by making, or requiring that any agent make, a declaration of non-residence or other similar claim for exemption to any relevant tax authority; or

(vi) is subject to deduction or withholding on account of any tax, assessment, or other governmental charge that is imposed or withheld by reason of the application of Section 1471 through 1474 of the United States Internal Revenue Code of 1986, as amended (Code) (or any successor provisions), any regulation, pronouncement, or agreement thereunder, official interpretations thereof, or any law implementing an intergovernmental approach thereto, whether currently in effect or as published and amended from time to time.

For the avoidance of doubt, we will not have any obligation to pay any holders Additional Amounts on any tax which is payable otherwise than by deduction or withholding from payments made under or in respect of the securities at maturity.

We will also make such withholding or deduction and remit the full amount deducted or withheld to the relevant authority in accordance with applicable law. We will furnish to the Trustee, within 30 days after the date the payment of any taxes is due pursuant to applicable law, certified copies of tax receipts evidencing that such payment has been made or other evidence of such payment satisfactory to the Trustee. We will indemnify and hold harmless each holder of the securities (other than an Excluded Holder) and upon written request reimburse each such holder for the amount of (x) any taxes so levied or imposed and paid by such holder as a result of payments made under or with respect to the securities, and (y) any taxes levied or imposed and paid by such holder with respect to any reimbursement under (x) above, but excluding any such taxes on such holder's net income or capital.

For additional information, see the section entitled "Tax Consequences—Canadian Taxation" in the accompanying prospectus.

Authorized Denominations:	\$1,000 and integral multiples of \$1,000 in excess thereof.
Form of Securities:	Book-entry
Listing:	The securities will not be listed on any securities exchange.
Failure to Pay Maturity Payment	In the event we fail to pay the maturity payment amount on the maturity date, any overdue
Amount When Due:	payment in respect of the maturity payment amount of the securities on the maturity date will bear interest until the date upon which all sums due in respect of such

securities are received by or on behalf of the relevant holder, at a rate per annum which is the rate for deposits in U.S. dollars for a period of six months which appears on the Reuters Page LIBOR01 (or any replacement page or pages for the purpose of displaying prime rates or base lending rates of major U.S. banks) as of 11:00 a.m. (London time) on the first business day following that failure to pay. That rate will be determined by the calculation agent. If interest is required to be calculated for a period of less than one year, it will be calculated on the basis of a 360-day year consisting of the actual number of days in the period.

Events of Default and Acceleration: If the maturity of the securities is accelerated upon an event of default under the Indenture, the amount payable upon acceleration will be determined by the calculation agent. The amount will be the maturity payment amount, calculated as if the date of declaration of acceleration were the valuation date.

Terms Incorporated in the Master Note: All of the terms in “Specific Terms of the Securities.”

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EURO STOXX 50® INDEX

All disclosures contained in this document regarding the Index, including, without limitation, its make-up, method of calculation, and changes in its components, have been derived from publicly available sources. The information reflects the policies of, and is subject to change by, STOXX Limited, as the sponsor of the Index (“STOXX”). STOXX, which owns the copyright and all other rights to the Index, has no obligation to continue to publish, and may discontinue publication of, the Index. None of us, Wells Fargo Securities, LLC or RBCCM accepts any responsibility for the calculation, maintenance or publication of the Index or any successor index. The Index was created by STOXX and is currently wholly owned by Deutsche Börse AG. Publication of the Index began in February 1998, based on an initial index level of 1,000 at December 31, 1991. Changes to the component stocks are implemented on the third Friday in September and are effective the following trading day. Changes in the composition of the Index are made to ensure that the Index includes the 50 market sector leaders from within the EURO STOXX Total Market Index. Additional information about the Index is available on the STOXX Limited website: <http://www.stoxx.com>. However, information included in that website is not included or incorporated by reference in this document.

For each of the 19 EURO STOXX regional supersector indices, the stocks are ranked in terms of free-float market capitalization. The largest stocks are added to the selection list until the coverage is close to, but still less than, 60% of the free-float market capitalization of the corresponding supersector index. If the next highest-ranked stock brings the coverage closer to 60% in absolute terms, then it is also added to the selection list. All current stocks in the Index are then added to the selection list. All of the stocks on the selection list are then ranked in terms of free-float market capitalization to produce the final index selection list. The largest 40 stocks on the selection list are selected; the remaining 10 stocks are selected from the largest remaining current stocks ranked between 41 and 60; if the number of stocks selected is still below 50, then the largest remaining stocks are selected until there are 50 stocks. In exceptional cases, STOXX’s management board can add stocks to and remove them from the selection list.

The index components are subject to a capped maximum index weight of 10%, which is applied on a quarterly basis.

The Index is composed of 50 component stocks of market sector leaders from within the EURO STOXX® supersector indices, which includes stocks selected from the Eurozone portion of the STOXX Europe 600® supersector indices. The component stocks have a high degree of liquidity and represent the largest companies across a wide range of market sectors.

Computation of the Index

The Index is calculated with the “Laspeyres formula,” which measures the aggregate price changes in the component stocks against a fixed base quantity weight. The formula for calculating the index level can be expressed as follows:

$$\text{Index} = \frac{\text{free float market capitalization of the index at the time}}{\text{divisor of the index at the time}}$$

The “free float market capitalization of the index” is equal to the sum of the products of the closing price, number of shares, free float factor, weighting cap factor, and the exchange rate from local currency into the index currency for the component company as of the time that the Index is being calculated.

The divisor of the Index is adjusted to maintain the continuity of the Index’s values across changes due to corporate actions, such as cash dividends, rights offerings, stock dividends from treasury shares, repurchases of shares and self tender, and spin-offs.

Index Maintenance

The composition of the Index is reviewed annually, based on the closing stock data on the last trading day in August. Changes in the composition of the Index are made to ensure that the Index includes the 50 market sector leaders from within the Index. The component stocks are announced on the first trading day in September. The free float factors for each component stock used to calculate the Index, as described below, are reviewed, calculated, and implemented on a quarterly basis and are fixed until the next quarterly review.

The Index is subject to a “fast exit rule.” The index components are monitored for any changes based on the monthly selection list ranking. A stock is deleted from the Index if: (a) it ranks 75 or below on the monthly selection list and (b) it has been ranked 75 or below for a consecutive period of two months in the monthly

selection list. The highest-ranked

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stock that is not an index component will replace it. Changes will be implemented on the close of the fifth trading day of the month, and are effective the next trading day.

The Index is also subject to a “fast entry rule.” All stocks on the latest selection lists and initial public offering (IPO) stocks are reviewed for a fast-track addition on a quarterly basis. A stock is added, if (a) it qualifies for the latest STOXX blue-chip selection list generated end of February, May, August or November and (b) it ranks within the “lower buffer” on this selection list.

The Index is also reviewed on an ongoing basis. Corporate actions (including initial public offerings, mergers and takeovers, spin-offs, delistings, and bankruptcy) that affect the index composition are immediately reviewed. Any changes are announced, implemented, and made effective in line with the type of corporate action and the magnitude of the effect.

License Agreement

Royal Bank of Canada has entered into a non-exclusive license agreement with STOXX, which grants us a license in exchange for a fee to use the Index in connection with the issuance of certain securities, including the securities.

STOXX has no relationship to Royal Bank of Canada, other than the licensing of the Index and its service marks for use in connection with the securities.

STOXX does not:

§ sponsor, endorse, sell or promote the securities.

§ recommend that any person invest in the securities or any other financial products.

§ have any responsibility or liability for or make any decisions about the timing, amount or pricing of the securities.

§ have any responsibility or liability for the administration, management or marketing of the securities.

§ consider the needs of the securities or the owners of the securities in determining, composing or calculating the Index or have any obligation to do so.

STOXX will not have any liability in connection with the securities. Specifically, STOXX does not make any warranty, express or implied, and STOXX disclaims any warranty about:

- the results to be obtained by the securities, the owner of the securities or any other person in connection with the use of the Index and the data included in the Index;
- the accuracy or completeness of the Index or its data;
- the merchantability and the fitness for a particular purpose or use of the Index or its data;
- any errors, omissions or interruptions in the Index or its data; and
- any lost profits or indirect, punitive, special or consequential damages or losses, even if STOXX knows that they might occur.

The licensing relating to the use of the Index and trademark referred to above by Royal Bank of Canada is solely for the benefit of Royal Bank of Canada, and not for any other third parties.

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Historical Closing Levels of the Index

Since its inception, the level of the Index has experienced significant fluctuations. Any historical upward or downward trend in the closing level of the Index during any period shown below is not an indication that the closing level of the Index is more or less likely to increase or decrease at any time during the term of the securities. The historical levels of the Index do not give an indication of future performance of the Index. We cannot make any assurance that the future performance of the Index or the trading prices of the common stocks underlying the Index will result in holders of the securities receiving a positive total return on their investment. We obtained the closing levels of the Index listed below from Bloomberg Financial Markets without independent verification. The actual levels of the Index at or near maturity of the securities may bear little relation to the historical levels shown below.

The following graph sets forth the daily closing levels of the Index for the period from January 1, 2008 to January 31, 2018, and the table below sets forth the published quarterly high, low and quarter end closing level of the Index for the same period. This historical data on the Index is not indicative of the future level of the Index or what the market value of the securities may be. Any historical upward or downward trend in the level of the Index during any period set forth below is not any indication that the level of the Index is more or less likely to increase or decrease at any time during the term of the securities.

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High, Low and Period-End Closing Levels of the Index

Quarter/Period – Start Date	Quarter/Period – End Date	High Closing Level of the Index	Low Closing Level of the Index	Quarter/Period – End Closing Level of the Index
1/1/2008	3/31/2008	4,339.23	3,431.82	3,628.06
4/1/2008	6/30/2008	3,882.28	3,340.27	3,352.81
7/1/2008	9/30/2008	3,445.66	3,000.83	3,038.20
10/1/2008	12/31/2008	3,113.82	2,165.91	2,447.62
1/1/2009	3/31/2009	2,578.43	1,809.98	2,071.13
4/1/2009	6/30/2009	2,537.35	2,097.57	2,401.69
7/1/2009	9/30/2009	2,899.12	2,281.47	2,872.63
10/1/2009	12/31/2009	2,992.08	2,712.30	2,964.96
1/1/2010	3/31/2010	3,017.85	2,631.64	2,931.16
4/1/2010	6/30/2010	3,012.65	2,488.50	2,573.32
7/1/2010	9/30/2010	2,827.27	2,507.83	2,747.90
10/1/2010	12/31/2010	2,890.64	2,650.99	2,792.82
1/1/2011	3/31/2011	3,068.00	2,721.24	2,910.91
4/1/2011	6/30/2011	3,011.25	2,715.88	2,848.53
7/1/2011	9/30/2011	2,875.67	1,995.01	2,179.66
10/1/2011	12/31/2011	2,476.92	2,090.25	2,316.55
1/1/2012	3/30/2012	2,608.42	2,286.45	2,477.28
4/1/2012	6/30/2012	2,501.18	2,068.66	2,264.72
7/1/2012	9/30/2012	2,594.56	2,151.54	2,454.26
10/1/2012	12/31/2012	2,659.95	2,427.32	2,635.93
1/1/2013	3/31/2013	2,749.27	2,570.52	2,624.02
4/1/2013	6/30/2013	2,835.87	2,511.83	2,602.59
7/1/2013	9/30/2013	2,936.20	2,570.76	2,893.15
10/1/2013	12/31/2013	3,111.37	2,902.12	3,109.00
1/1/2014	3/31/2014	3,172.43	2,962.49	3,161.60
4/1/2014	6/30/2014	3,314.80	3,091.52	3,228.24
7/1/2014	9/30/2014	3,289.75	3,006.83	3,225.93
10/1/2014	12/31/2014	3,277.38	2,874.65	3,146.43
1/1/2015	3/31/2015	3,731.35	3,007.91	3,697.38
4/1/2015	6/30/2015	3,828.78	3,424.30	3,424.30
7/1/2015	9/30/2015	3,686.58	3,019.34	3,100.67
10/1/2015	12/31/2015	3,506.45	3,069.05	3,267.52
1/1/2016	3/31/2016	3,178.01	2,680.35	3,004.93
4/1/2016	6/30/2016	3,151.69	2,697.44	2,864.74
7/1/2016	9/30/2016	3,091.66	2,761.37	3,002.24
10/1/2016	12/31/2016	3,290.52	2,954.53	3,290.52
1/1/2017	3/31/2017	3,500.93	3,230.68	3,500.93

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4/1/2017	6/30/2017	3,658.79	3,409.78	3,441.88
7/1/2017	9/30/2017	3,594.85	3,388.22	3,594.85
10/1/2017	12/31/2017	3,697.40	3,503.96	3,503.96
1/1/2018	1/31/2018	3,672.29	3490.19	3,609.29

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SUPPLEMENTAL DISCUSSION OF CANADIAN FEDERAL INCOME TAX CONSEQUENCES

An investor should read carefully the description of material Canadian federal income tax considerations relevant to a Non-resident Holder owning debt securities under “Tax Consequences—Canadian Taxation” in the accompanying prospectus.

SUPPLEMENTAL DISCUSSION OF U.S. FEDERAL INCOME TAX CONSEQUENCES

The following, together with the discussion of U.S. federal income taxation in the accompanying prospectus and prospectus supplement, is a general description of the material U.S. tax considerations relating to the securities. It does not purport to be a complete analysis of all tax considerations relating to the securities. Prospective purchasers of the securities should consult their tax advisors as to the consequences under the tax laws of the country of which they are resident for tax purposes and the tax laws of the U.S. of acquiring, holding and disposing of the securities and receiving payments under the securities. This summary is based upon the law as in effect on the date of this pricing supplement and is subject to any change in law that may take effect after such date.

Supplemental U.S. Tax Considerations

The following section supplements the discussion of U.S. federal income taxation in the accompanying prospectus under “Tax Consequences – United States Taxation” and prospectus supplement under “Certain Income Tax Consequences – United States Taxation” with respect to U.S. holders (as defined in the accompanying prospectus). It applies only to those initial holders who are not excluded from the discussion of U.S. federal income taxation in the accompanying prospectus. You should consult with your own tax advisor concerning the consequences of investing in and holding the securities.

NO STATUTORY, JUDICIAL OR ADMINISTRATIVE AUTHORITY DIRECTLY DISCUSSES HOW THE SECURITIES SHOULD BE TREATED FOR U.S. FEDERAL INCOME TAX PURPOSES. AS A RESULT, THE U.S. FEDERAL INCOME TAX CONSEQUENCES OF AN INVESTMENT IN THE SECURITIES ARE UNCERTAIN. BECAUSE OF THE UNCERTAINTY, YOU SHOULD CONSULT YOUR TAX ADVISOR IN DETERMINING THE U.S. FEDERAL INCOME TAX AND OTHER TAX CONSEQUENCES OF YOUR INVESTMENT IN THE SECURITIES, INCLUDING THE APPLICATION OF STATE, LOCAL OR OTHER TAX LAWS AND THE POSSIBLE EFFECTS OF CHANGES IN FEDERAL OR OTHER TAX LAWS.

In the opinion of our counsel, Morrison & Foerster LLP, it would generally be reasonable to treat the securities as pre-paid cash-settled derivative contracts in respect of the Index for U.S. federal income tax purposes, and the terms of the securities require a holder and us (in the absence of a change in law or an administrative or judicial ruling to the contrary) to treat the securities for all tax purposes in accordance with such characterization. If the securities are so treated, a U.S. holder should generally recognize capital gain or loss upon the sale, exchange or maturity of the securities in an amount equal to the difference between the amount a holder receives at such time and the holder’s tax basis in the securities. In general, a U.S. holder’s tax basis in the securities will be equal to the price the holder paid for the securities. Capital gain recognized by an individual U.S. holder is generally taxed at preferential rates where the property is held for more than one year and is generally taxed at ordinary income rates where the property is held for one year or less. The deductibility of capital losses is subject to limitations. We will not attempt to ascertain whether the issuer of any of the component stocks included in the Index would be treated as a “passive foreign investment company” within the meaning of Section 1297 of the Internal Revenue Code of 1986, as amended (the Code), or a “United States real property holding corporation” within the meaning of Section 897 of the Code. If the issuer of one or more of such stocks were so treated, certain adverse U.S. federal income tax consequences could possibly apply. You should refer to any available information filed with the SEC by the issuers of the component stocks included in the Index and consult your tax advisor regarding the possible consequences to you in this regard.

Alternative Treatments. Alternative tax treatments of the securities are also possible and the Internal Revenue Service might assert that a treatment other than that described above is more appropriate. For example, it would also be possible to treat a security, and the Internal Revenue Service might assert that a security should be treated, as a single debt instrument. Pursuant to such characterization, since the securities have a term that exceeds one year, such a debt instrument would be subject to the special tax rules governing contingent payment debt instruments. If the securities are so treated, a holder would generally be required to accrue interest currently over the term of the securities even though that holder will not

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receive any payments from us prior to maturity. In addition, any gain a holder might recognize upon the sale, exchange or maturity of the securities would be ordinary income and any loss recognized by a holder at such time would be ordinary loss to the extent of interest included in income in the current or previous taxable years in respect of the securities, and thereafter, would be capital loss.

Because of the absence of authority regarding the appropriate tax characterization of the securities, it is also possible that the Internal Revenue Service could seek to characterize the securities in a manner that results in tax consequences that are different from those described above. For example, the Internal Revenue Service could possibly assert that any gain or loss that a holder may recognize upon the sale, exchange or maturity of the securities should be treated as ordinary gain or loss.

The Internal Revenue Service has released a notice that may affect the taxation of holders of the securities. According to the notice, the Internal Revenue Service and the U.S. Treasury Department are actively considering whether the holder of an instrument such as the securities should be required to accrue ordinary income on a current basis. It is not possible to determine what guidance they will ultimately issue, if any. It is possible, however, that under such guidance, holders of the securities will ultimately be required to accrue income currently and this could be applied on a retroactive basis. The Internal Revenue Service and the U.S. Treasury Department are also considering other relevant issues, including whether additional gain or loss from such instruments should be treated as ordinary or capital and whether the special “constructive ownership rules” of Section 1260 of the Code, which very generally can operate to recharacterize certain long-term capital gains as ordinary income and impose an interest charge, might be applied to such instruments. Holders are urged to consult their tax advisors concerning the significance, and the potential impact, of the above considerations. We intend to treat the securities for U.S. federal income tax purposes in accordance with the treatment described in this document unless and until such time as the U.S. Treasury Department and Internal Revenue Service determine that some other treatment is more appropriate.

Backup Withholding and Information Reporting. Please see the discussion under “Tax Consequences — United States Taxation — Information Reporting and Backup Withholding” in the accompanying prospectus for a description of the applicability of the backup withholding and information reporting rules to payments made on the securities.

Non-U.S. Holders. The following discussion applies to non-U.S. holders of the securities. A non-U.S. holder is a beneficial owner of a security that, for U.S. federal income tax purposes, is a non-resident alien individual, a foreign corporation, or a foreign estate or trust.

Except as described below, a non-U.S. holder will generally not be subject to U.S. federal income or withholding tax for amounts paid in respect of the securities, provided that (i) the holder complies with any applicable certification requirements, (ii) the payment is not effectively connected with the conduct by the holder of a U.S. trade or business, and (iii) if the holder is a non-resident alien individual, such holder is not present in the U.S. for 183 days or more during the taxable year of the sale, exchange or maturity of the securities. In the case of (ii) above, the holder generally would be subject to U.S. federal income tax with respect to any income or gain in the same manner as if the holder were a U.S. holder and, in the case of a holder that is a corporation, the holder may also be subject to a branch profits tax equal to 30% (or such lower rate provided by an applicable U.S. income tax treaty) of a portion of its earnings and profits for the taxable year that are effectively connected with its conduct of a trade or business in the U.S., subject to certain adjustments. Payments made to a non-U.S. holder may be subject to information reporting and to backup withholding unless the holder complies with applicable certification and identification requirements as to its foreign status.

Under Section 871(m) of the Code, a “dividend equivalent” payment is treated as a dividend from sources within the United States. Such payments generally would be subject to a 30% U.S. withholding tax if paid to a non-U.S. holder. Under U.S. Treasury Department regulations, payments (including deemed payments) with respect to equity-linked instruments (“ELIs”) that are “specified ELIs” may be treated as dividend equivalents if such specified ELIs reference an interest in an “underlying security,” which is generally any interest in an entity taxable as a corporation for U.S. federal income tax purposes if a payment with respect to such interest could give rise to a U.S. source dividend. However, the IRS has issued guidance that states that the U.S. Treasury Department and the IRS intend to amend the effective dates of the U.S. Treasury Department regulations to provide that withholding on dividend equivalent payments will not apply to specified ELIs that are not delta-one instruments

and that are issued before January 1, 2019. Based on our determination that the securities are not

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delta-one instruments, non-U.S. holders should not be subject to withholding on dividend equivalent payments, if any, under the securities. However, it is possible that the securities could be treated as deemed reissued for U.S. federal income tax purposes upon the occurrence of certain events affecting the Index or the securities (for example, upon an Index rebalancing), and following such occurrence the securities could be treated as subject to withholding on dividend equivalent payments. Non-U.S. holders that enter, or have entered, into other transactions in respect of the Index or the securities should consult their tax advisors as to the application of the dividend equivalent withholding tax in the context of the securities and their other transactions. If any payments are treated as dividend equivalents subject to withholding, we (or the applicable withholding agent) would be entitled to withhold taxes without being required to pay any additional amounts with respect to amounts so withheld.

As discussed above, alternative characterizations of the securities for U.S. federal income tax purposes are possible. Should an alternative characterization, by reason of change or clarification of the law, by regulation or otherwise, cause payments on the securities to become subject to withholding tax, we will withhold tax at the applicable statutory rate. The Internal Revenue Service has also indicated that it is considering whether income in respect of instruments such as the securities should be subject to withholding tax. We will not be required to pay any additional amounts in respect of such withholding. Prospective investors should consult their own tax advisors in this regard.

Foreign Account Tax Compliance Act. The Foreign Account Tax Compliance Act (“FATCA”) will impose a 30% U.S. withholding tax on certain U.S.–source payments, including interest (and OID), dividends, other fixed or determinable annual or periodical gain, profits, and income, and on the gross proceeds from a disposition of property of a type which can produce U.S.–source interest or dividends (Withholdable Payments), if paid to a foreign financial institution (including amounts paid to a foreign financial institution on behalf of a holder), unless such institution enters into an agreement with the U.S. Treasury Department to collect and provide to the U.S. Treasury Department certain information regarding U.S. financial account holders, including certain account holders that are foreign entities with U.S. owners, with such institution or otherwise complies with FATCA. In addition, the securities may constitute a “financial account” for these purposes and thus, be subject to information reporting requirements pursuant to FATCA. FATCA also generally imposes a withholding tax of 30% on Withholdable Payments made to a non-financial foreign entity unless such entity provides the withholding agent with a certification that it does not have any substantial U.S. owners or a certification identifying the direct and indirect substantial U.S. owners of the entity. Under certain circumstances, a holder may be eligible for refunds or credits of such taxes.

The U.S. Treasury Department and the IRS have announced that withholding on payments of gross proceeds from a sale or redemption of the securities will only apply to payments made after December 31, 2018. We will not pay any additional amounts in respect of any FATCA withholding. Therefore, if such withholding applies, any payments on the securities will be significantly less than what you would have otherwise received. Foreign financial institutions and non-financial foreign entities located in jurisdictions that have an intergovernmental agreement with the United States governing FATCA may be subject to different rules. Prospective investors are urged to consult with their own tax advisors regarding the possible implications of FATCA on their investment in the securities.

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USE OF PROCEEDS AND HEDGING

The net proceeds from the sale of the securities will be used as described under “Use of Proceeds” in the accompanying prospectus supplement and prospectus and to hedge market risks of Royal Bank of Canada associated with its obligation to pay the maturity payment amount at maturity of the securities.

The initial public offering price of the securities includes the underwriting discount and commission, as well as hedging and other costs associated with the securities. Our hedging costs include the projected profit that our hedge counterparty expects to realize in consideration for assuming the risks inherent in hedging our obligations under the securities. We have hedged our obligations under the securities through an affiliate of Wells Fargo Securities, LLC and/or one or more of our affiliates, and we may in the future adjust our hedge. Because hedging our obligations entails risk and may be influenced by market forces beyond our or our counterparties’ control, this hedging may result in a profit that is more or less than expected, or could result in a loss.

We have no obligation to engage in any manner of hedging activity and will do so solely at our discretion and for our own account. No holder of the securities will have any rights or interest in our hedging activity or any positions we or any counterparty may take in connection with our hedging activity.

The hedging activity discussed above and other trading activities that we, Wells Fargo Securities, LLC and our respective affiliates may engage in may adversely affect the level of the Index, the market value of the securities from time to time and the maturity payment amount you will receive on the securities at maturity. See “Risk Factors — Hedging transactions may affect the return on the securities” and “— Potential conflicts of interest could arise” for a discussion of these adverse effects.

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SUPPLEMENTAL PLAN OF DISTRIBUTION

The securities are being purchased by Wells Fargo Securities, LLC (the agent) as principal, pursuant to a distribution agreement between the agent and us. The agent has agreed to pay certain of our out-of-pocket expenses of the issue of the securities.

From time to time, the agent and its affiliates have engaged, and in the future may engage, in transactions with and performance of services for us for which they have been, and may be, paid customary fees. In particular, an affiliate of the agent will be our swap counterparty for a hedge relating to our obligations under the securities.

In the future, the agent and its affiliates may purchase and resell the offered securities in market-making transactions, with resales being made at prices related to prevailing market prices at the time of resale or otherwise. Wells Fargo Securities, LLC may act as principal or agent in such transactions.

The agent has committed to purchase all of these securities in the initial public offering of the securities if any are purchased.

The agent has offered the securities in part directly to the public at the public offering price set forth on the cover page of this pricing supplement and in part to WFA and Wells Fargo Advisors Financial Network, LLC or certain securities dealers at such price less a selling concession of \$22.50 per security. In addition to the selling concession allowed to WFA, the agent will pay \$0.75 per security of the underwriting discount and commission to WFA as a distribution expense fee for each security sold by WFA.

After the initial public offering of the securities is completed, the public offering price and concessions may be changed by the agent.

Proceeds to be received by Royal Bank of Canada in this offering will be net of the underwriting discount, commission and expenses payable by Royal Bank of Canada.

The securities are new issues of securities with no established trading markets. We have been advised by the agent that the agent intends to make a market in the securities. However the agent is not obligated to do so and may discontinue market making at any time without notice. No assurance can be given as to the liquidity of the trading market for the securities.

Any price that the agent makes available from time to time after the original issue date at which it would be willing to purchase the securities will generally reflect the agent's estimate of their value, less a customary bid-ask spread for similar trades and the cost of unwinding any related hedge transactions. That estimated value will be based upon a variety of factors, including then prevailing market conditions and our creditworthiness. However, for a period of four months after the original issue date, the price at which the agent may purchase the securities is expected to be higher than the price that would be determined based on the agent's valuation at that time less the bid-ask spread and hedging unwind costs referenced above. This is because, at the beginning of this period, that price will not include certain costs that were included in the initial public offering price, particularly a portion of the underwriting discount and commission (not including the selling concession) and the expected profits of our hedging counterparty(ies). As the period continues, these costs are expected to be gradually included in the price that the agent would be willing to pay, and the difference between that price and the price that would be determined based on the agent's valuation of the securities less a bid-ask spread and hedging unwind costs will decrease over time until the end of this period. After this period, if the agent continues to make a market in the securities, the prices that it would pay for them are expected to reflect the agent's estimated value, less the bid-ask spread and hedging unwind costs referenced above. In addition, the value of the securities shown on your account statement will generally reflect the price that the agent would be willing to pay to purchase the securities at that time.

Our broker-dealer subsidiary, RBC Capital Markets, LLC (RBCCM), does not expect to make a market in the securities. If RBCCM determines that the agent is unable or unwilling to make a market in the securities at any time, RBCCM may, but is not obligated to, make a market in the securities at that time. If RBCCM makes a market in the securities at any time, its valuation of the securities may differ from the agent's valuation, and consequently the price at

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which it may be willing to purchase the securities may differ from (and be lower than) the price at which the agent would have purchased the securities at that time.

Royal Bank of Canada has agreed to indemnify the agent against certain liabilities, including liabilities under the Securities Act of 1933.

No action has been or will be taken by Royal Bank of Canada, the agent or any broker-dealer affiliates of either Royal Bank of Canada or the agent that would permit a public offering of the securities or possession or distribution of this pricing supplement or the accompanying prospectus and prospectus supplement in any jurisdiction, other than the United States, where action for that purpose is required. No offers, sales or deliveries of the securities, or distribution of this pricing supplement or the accompanying prospectus supplement and prospectus, may be made in or from any jurisdiction except in circumstances which will result in compliance with any applicable laws and regulations and will not impose any obligations on Royal Bank of Canada, the agent or any broker-dealer affiliates of either Royal Bank of Canada or the agent.

Selling Restrictions

Argentina

Royal Bank of Canada U.S. Medium-Term Notes program and the related offer of securities and the sale of securities under the terms and conditions provided herein does not constitute a public offering in Argentina. Consequently, no public offering approval has been requested or granted by the Comisión Nacional de Valores, nor has any listing authorization of the securities been requested on any stock market in Argentina.

Brazil

The securities may not be offered or sold to the public in Brazil. Accordingly, this pricing supplement and the accompanying prospectus supplement and prospectus have not been submitted to the Comissão de Valores Mobiliários for approval. Documents relating to this offering may not be supplied to the public as a public offering in Brazil or be used in connection with any offer for subscription or sale to the public in Brazil.

Chile

The securities have not been registered with the Superintendencia de Valores y Seguros in Chile and may not be offered or sold publicly in Chile. No offer, sales or deliveries of the securities, or distribution of this pricing supplement or the accompanying prospectus supplement and prospectus, may be made in or from Chile except in circumstances that will result in compliance with any applicable Chilean laws and regulations.

China

This pricing supplement and the accompanying prospectus supplement and prospectus have not been filed with or approved by the People's Republic of China (for such purposes, not including Hong Kong and Macau Special Administrative Regions or Taiwan) authorities, and is not an offer of securities (whether public offering or private placement) within the meaning of the Securities Law or other pertinent laws and regulations of the People's Republic of China. These documents shall not be delivered to any party who is not an intended recipient or offered to the general public if used within the People's Republic of China, and the securities so offered cannot be sold to anyone that is not a qualified purchaser of the People's Republic of China. Each dealer has represented, warranted and agreed that the notes are not being offered or sold and may not be offered or sold, directly or indirectly, in the People's Republic of China, except under circumstances that will result in compliance with applicable laws and regulations.

European Union

No Prospectus (as defined in Directive 2003/71/EC (as amended, the "Prospectus Directive")) will be prepared in connection with these securities. Accordingly, these securities may not be offered to the public in any member state of the European Economic Area (the "EEA"), and any purchaser of these securities who subsequently sells any of these securities in any EEA member state must do so only in accordance with the requirements of the Prospectus Directive, as implemented in that member state.

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The securities are not intended to be offered, sold or otherwise made available to, and should not be offered, sold or otherwise made available to, any retail investor in the EEA. For these purposes, the expression “offer” includes the communication in any form and by any means of sufficient information on the terms of the offer and the securities to be offered so as to enable an investor to decide to purchase or subscribe the securities, and a “retail investor” means a person who is one (or more) of: (a) a retail client, as defined in point (11) of Article 4(1) of Directive 2014/65/EU (as amended, “MiFID II”); or (b) a customer, within the meaning of Insurance Distribution Directive 2016/97/EU, as amended, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II; or (c) not a qualified investor as defined in the Prospectus Directive. Consequently, no key information document required by Regulation (EU) No 1286/2014 (as amended, the “PRIIPs Regulation”) for offering or selling the securities or otherwise making them available to retail investors in the EEA has been prepared, and therefore, offering or selling the securities or otherwise making them available to any retail investor in the EEA may be unlawful under the PRIIPs Regulation.

Mexico

The securities have not been registered with the National Registry of Securities maintained by the Mexican National Banking and Securities Commission and may not be offered or sold publicly in Mexico. This pricing supplement and the accompanying prospectus supplement and prospectus may not be publicly distributed in Mexico.

Paraguay

This is a private and personal offering. The securities offered have not been approved by or registered with the National Securities Commission (Comisión Nacional de Valores) and are not part of a public offering as defined by the Paraguayan Securities Law. The information contained herein is for informational and marketing purposes only and should not be taken as an investment advice.

Peru

The securities have not been and will not be registered with the Capital Markets Public Registry of the Capital Markets Superintendence (SMV) nor the Lima Stock Exchange Registry (RBVL) for their public offering in Peru under the Peruvian Capital Markets Law (Law N°861/ Supreme Decree N°093-2002) and the decrees and regulations thereunder.

Consequently, the securities may not be offered or sold, directly or indirectly, nor may this pricing supplement, the accompanying supplements or any other offering material relating to the securities be distributed or caused to be distributed in Peru to the general public. The securities may only be offered in a private offering without using mass marketing, which is defined as a marketing strategy utilising mass distribution and mass media to offer, negotiate or distribute securities to the whole market. Mass media includes newspapers, magazines, radio, television, mail, meetings, social networks, Internet servers located in Peru, and other media or technology platforms

Uruguay

The sale of the securities qualifies as a private placement pursuant to section 2 of Uruguayan law 18,627. The securities must not be offered or sold to the public in Uruguay, except in circumstances which do not constitute a public offering or distribution under Uruguayan laws and regulations. The securities are not and will not be registered with the Financial Services Superintendency of the Central Bank of Uruguay.

Taiwan

The securities may be made available outside Taiwan for purchase by Taiwan residents outside Taiwan but may not be offered or sold in Taiwan.

Structuring the Securities

The securities are our debt securities. As is the case for all of our debt securities, including our structured notes, the economic terms of the securities reflect our actual or perceived creditworthiness. In addition, because structured notes result in increased operational, funding and liability management costs to us, we typically borrow the funds under these securities at a rate that is more favorable to us than the rate that we might pay for a conventional fixed or floating rate debt security of comparable maturity. This relatively lower implied borrowing rate, which is reflected in the economic terms of the securities, along with the underwriting discount and commission and hedging and other costs associated with the securities, typically reduced the initial estimated value of the securities at the time their terms are set.

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In order to satisfy our payment obligations under the securities, we may choose to enter into certain hedging arrangements (which may include call options, put options or other derivatives) with an affiliate of the agent and/or one of our subsidiaries. The terms of these hedging arrangements take into account a number of factors, including our creditworthiness, interest rate movements, and the tenor of the securities. The economic terms of the securities and their initial estimated value depend in part on the terms of these hedging arrangements. Our cost of hedging will include the projected profit that such counterparties expect to realize in consideration for assuming the risks inherent in hedging our obligations under the securities. Because hedging our obligations entails risks and may be influenced by market forces beyond the counterparties' control, such hedging may result in a profit that is more or less than expected, or could result in a loss. See "Use of Proceeds and Hedging" on page PS-30.

The lower implied borrowing rate, the underwriting discount and commission and hedging and other costs associated with the securities reduced the economic terms of the securities to you and resulted in the initial estimated value for the securities on the pricing date being less than their initial public offering price. See "Risk Factors—Our initial estimated value of the securities is less than the initial public offering price" above.

VALIDITY OF THE SECURITIES

In the opinion of Norton Rose Fulbright Canada LLP, the issue and sale of the securities has been duly authorized by all necessary corporate action of the Bank in conformity with the Indenture, and when the securities have been duly executed, authenticated and issued in accordance with the Indenture and delivered against payment therefor, the securities will be validly issued and, to the extent validity of the securities is a matter governed by the laws of the Province of Ontario or Québec, or the laws of Canada applicable therein, and will be valid obligations of the Bank, subject to equitable remedies which may only be granted at the discretion of a court of competent authority, subject to applicable bankruptcy, to rights to indemnity and contribution under the securities or the Indenture which may be limited by applicable law; to insolvency and other laws of general application affecting creditors' rights, to limitations under applicable limitations statutes, and to limitations as to the currency in which judgments in Canada may be rendered, as prescribed by the Currency Act (Canada). This opinion is given as of the date hereof and is limited to the laws of the Provinces of Ontario and Québec and the federal laws of Canada applicable thereto. In addition, this opinion is subject to customary assumptions about the Trustee's authorization, execution and delivery of the Indenture and the genuineness of signatures and certain factual matters, all as stated in the letter of such counsel dated January 8, 2016, which has been filed as Exhibit 5.1 to Royal Bank's Form 6-K filed with the SEC dated January 8, 2016.

In the opinion of Morrison & Foerster LLP, when the securities have been duly completed in accordance with the Indenture and issued and sold as contemplated by the prospectus supplement and the prospectus, the securities will be valid, binding and enforceable obligations of Royal Bank, entitled to the benefits of the Indenture, subject to applicable bankruptcy, insolvency and similar laws affecting creditors' rights generally, concepts of reasonableness and equitable principles of general applicability (including, without limitation, concepts of good faith, fair dealing and the lack of bad faith). This opinion is given as of the date hereof and is limited to the laws of the State of New York. This opinion is subject to customary assumptions about the Trustee's authorization, execution and delivery of the Indenture and the genuineness of signatures and to such counsel's reliance on the Bank and other sources as to certain factual matters, all as stated in the legal opinion dated January 8, 2016, which has been filed as Exhibit 5.2 to the Bank's Form 6-K dated January 8, 2016.

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