Cogent, Inc.
Form 10-K
March 01, 2007
Table of Contents

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

x ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2006

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 000-50947

COGENT, INC.

(Exact name of registrant as specified in its charter)

Delaware	**95-4305768**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
209 Fair Oaks Avenue South Pasadena, California	**91030**
(Address of principal executive offices)	**(Zip Code)**

Registrant s telephone number, including area code: (626) 799-8090

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

Securities registered pursuant to Section 12(g) of the Act: Common Stock

(Title of Class)

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes þ 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 þ

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 þ No ¨

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation of S-K is not contained herein, and will not be contained, to the best of the 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. þ

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, or a non-accelerated filer (as defined in Rule 12b-2 of the Exchange Act):

Large accelerated filer þ Accelerated filer ¨ Non-accelerated filer ¨

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

The aggregate market value of the voting and non-voting common equity held by non-affiliates of the registrant as of the last business day of the registrant s most recently completed second fiscal quarter, based upon the closing sale price of the registrant s common stock on June 30, 2006 as reported on the National Market tier of The NASDAQ Stock Market, Inc. was $509,550,638.*

As of February 15, 2007, there were 94,552,459 shares of the registrant s Common Stock outstanding.

* Excludes shares of Common Stock held by executive officers, directors and stockholders whose ownership exceeds 5% of the shares outstanding at June 30, 2006. This calculation does not reflect a determination that such persons are affiliates for any other purposes.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant s definitive proxy statement to be filed with the Commission pursuant to Regulation 14A in connection with the registrant s 2007 Annual Meeting of Stockholders (the Proxy Statement) or portions of the registrant s 10-K/A, to be filed subsequent to the date hereof, are incorporated by reference into Part III of this Report. Such Proxy Statement or 10-K/A will be filed with the Commission not later than 120 days after the conclusion of the registrant s fiscal year ended December 31, 2006.

Table of Contents

COGENT, INC.

Form 10-K

For the Fiscal Year Ended December 31, 2006

Table of Contents

TRADEMARKS

We have common law trademark rights in and U.S. trademark applications pending for Cogent Systems, BioGate, BlueCheck, Live-ID and PMA. Each trademark, trade name or service mark of another company appearing in this Annual Report on Form 10-K belongs to its holder, and does not belong to us.

Table of Contents

PART I

Item 1. Business

This Annual Report (including the following section regarding Management s Discussion and Analysis of Financial Condition and Results of Operations) contains forward-looking statements regarding our business, financial condition, results of operations and prospects. Words such as expects, anticipates, intends, plans, believes, seeks, estimates and similar expressions or variations of such words are intended to ident forward-looking statements, but are not the exclusive means of identifying forward-looking statements in this Annual Report. Additionally, statements concerning future matters such as the development of new products, sales levels, expense levels and other statements regarding matters that are not historical are forward-looking statements.

Although forward-looking statements in this Annual Report reflect the good faith judgment of our management, such statements can only be based on facts and factors currently known by us. Consequently, forward-looking statements are inherently subject to risks and uncertainties and actual results and outcomes may differ materially from the results and outcomes discussed in or anticipated by the forward-looking statements. Factors that could cause or contribute to such differences in results and outcomes include without limitation those discussed under the heading Risk Factors below, as well as those discussed elsewhere in this Annual Report. Readers are urged not to place undue reliance on these forward-looking statements, which speak only as of the date of this Annual Report. We undertake no obligation to revise or update any forward-looking statements in order to reflect any event or circumstance that may arise after the date of this Annual Report. Readers are urged to carefully review and consider the various disclosures made in this Annual Report, which attempt to advise interested parties of the risks and factors that may affect our business, financial condition, results of operations and prospects.

We were incorporated in California in April 1990 and reincorporated in Delaware in May 2004

Overview

We are a leading provider of Automated Fingerprint Identification Systems, or AFIS, and other fingerprint biometrics solutions to governments, law enforcement agencies and other organizations worldwide. Our AFIS solutions enable customers to capture fingerprint images electronically, encode fingerprints into searchable files and accurately compare a set of fingerprints to a database of potentially millions of fingerprints in seconds. For over sixteen years, we have researched, designed and developed fingerprint biometric technologies that incorporate advanced concepts in fluid dynamics, neural networks, image enhancement, data mining and massively parallel processing. Our proprietary software algorithms, together with optimized hardware, enable our customers to cost-effectively achieve what we believe to be industry-leading accuracy rates and performance. We support the latest standards in fingerprint biometrics and have based our systems on cost-effective, industry-standard hardware and software platforms. We are focused on enabling our customers to expand the capabilities of their systems as their biometrics needs evolve.

Industry Background

Authentication and Identification of Individuals Plays an Important Role in Society

Effectively authenticating and identifying individuals is critical to the safety and integrity of transactions, communications, travel and life in today s society. Security breaches and frauds resulting from failures in authentication and identification systems can cause economic harm and loss of life. As a result of growing public awareness of security and economic risks, people are becoming increasingly willing to submit to security checks and other identity verification procedures. Authentication of an individual s identity is necessary when governments, law enforcement agencies and other organizations need to confirm that an individual is who he claims to be. This necessity arises, for example, when a traveler enters a foreign country, a citizen votes, a

Table of Contents

suspect is arrested, an individual withdraws money from an ATM, a consumer purchases an item on the Internet or an employee seeks access to a restricted area. To authenticate the individual s claimed identity in these types of scenarios, organizations traditionally implement processes to examine the individual s credentials, such as signatures, drivers licenses, passports, access cards, PINs or passwords. If the authentication process indicates that the credentials are invalid or if there are no credentials to examine, such as when an unknown person leaves evidence of fingerprints, known as latents, at a crime scene, organizations frequently initiate an identification process to determine the individual s identity.

Traditional Authentication and Identification Processes are Inadequate

Traditional processes for authenticating and identifying individuals have inherent weaknesses. Criminals and imposters can easily compromise these processes by falsifying credentials by forging a signature, altering a photograph on a driver s license or passport or stealing a physical access card. Imposters can use the compromised credentials to gain unauthorized access to physical locations, such as buildings and airplanes, and to confidential information, such as medical data and financial records, and cause significant harm. Traditional authentication and identification methodologies can also be cumbersome and inefficient to use. Individuals are required to remember several passwords and PINs for the multitude of access, credit and membership cards they carry. The costs incurred by organizations to administer these traditional processes can be significant.

Evolution of Biometric Authentication and Identification Processes

The inadequacies of traditional authentication and identification processes, coupled with more stringent security requirements and an increasingly global economy and mobile population, have in recent years contributed to the increased focus on the development of biometrics. Biometrics is the automated use of unique physiological characteristics of individuals, such as fingerprints, palm prints, faces or irises, to determine or verify an individual s identity. The individual s biometric characteristic is captured and encoded and then compared against previously encoded biometric data stored in an electronic database to determine or verify the individual s identity. Because biometrics technology utilizes an unchanging, unique characteristic of a person that cannot be lost, stolen, shared or forgotten, it has the capability to be more accurate, convenient and cost-effective than traditional methodologies.

Fingerprints have been, and we believe will continue to be, the most widely used biometric because they are relatively simple to capture, either voluntarily or from latents at crime scenes, are relatively non-intrusive and benefit from a substantial existing infrastructure that employs fingerprints for identification. Governments and law enforcement agencies around the world have already created vast databases of fingerprints and the American National Standard Institute and the National Institute of Standards and Technology have standardized a common format, called ANSI/NIST, which is used to describe, classify and share fingerprints. According to the FBI, its criminal database alone contains the fingerprints of more than 50 million individuals. In addition, the United States Department of Homeland Security database contained the fingerprints of approximately 75 million individuals at the end of 2006. Other organizations throughout the world, including foreign governments and law enforcement agencies, other U.S. government agencies such as the National Association of Securities Dealers and the Department of State, and the approximately 15,000 state and local law enforcement agencies in the United States, also have established large fingerprint databases, and these databases are continuing to grow.

Automated Fingerprint Identification Systems

The most pervasive, large-scale fingerprint biometrics technology implementations today are AFIS. AFIS are typically used to compare one person s fingerprints against a large database of fingerprints. This is known as one-to-many matching. The technology for AFIS was originally developed by the FBI and Scotland Yard to facilitate criminal investigations, and AFIS have achieved widespread acceptance within national,

state and local law enforcement agencies globally. AFIS are comprised of fingerprint input scanning devices and software and computers that encode, process and store electronic versions of fingerprints. Originally, the fingerprint input

Table of Contents

devices were scanners that uploaded rolled fingerprint images obtained by rolling all ten inked fingers, known as tenprints, from nail to nail on cards or from latents obtained at crime scenes. Today, electronic fingerprint scanners, known as live-scans, are also available to directly capture flat fingerprint images by pressing the finger onto an input device and submitting the fingerprints to an AFIS. After the fingerprints of the subject are captured, the AFIS encodes the unique features associated with fingerprint ridge endings or bifurcations, known as minutiae, into a data set that is submitted for matching. Most commonly, existing fingerprint biometric systems classify, or bin, the stored fingerprints using basic criteria such as loops and whorls. Using this approach, the search program disregards those portions of the database that are inconsistent with the classification of the subject s fingerprints and only searches the relevant portions of the database.

AFIS deployments range widely in size, cost and complexity. In a local law enforcement deployment, the AFIS may be entirely contained within a single facility, with one or more fingerprint input devices attached to local computers, networked to a low-cost, small scale system capable of searching up to tens of thousands of records. As AFIS grow larger, they may consist of hundreds of fingerprint acquisition stations throughout a state or country and employ dedicated networks for transmission of biometric data and dozens of dedicated computers.

The diagram below represents a typical, full scale AFIS architecture:

Growth Expected in the AFIS Market

The widespread deployment of AFIS and the development of biometric technologies to support the AFIS market have been among the biggest contributors to the growth of the biometrics industry. This growth is being driven by the increase in the worldwide demand for elevated security measures and a general increase in

Table of Contents

willingness for people to submit to security checks and other identity verification procedures. In response to this demand, the United States has increased spending on security measures. Governments worldwide are establishing agencies and departments focused on security, such as the formation of the Department of Homeland Security, or DHS, which integrated numerous existing agencies and formed a single department with the mission of protecting the United States against terrorism. Governments have also announced initiatives mandating heightened security measures and recommending or requiring the use of biometrics technology as part of the overall security solution. As a result, government agencies have indicated that they will make investments in information technology, including biometrics, to fulfill their missions.

The AFIS market is also poised for growth in its core law enforcement sector. Many of the approximately 15,000 state and local law enforcement agencies in the United States utilize AFIS solutions. Many of these law enforcement agencies are upgrading their AFIS based on the development of technology that enables new AFIS capabilities, such as 1,000 pixels per inch (ppi) resolution instead of the conventional 500 ppi resolution for better image quality. Many law enforcement agencies are also seeking to make their AFIS web-enabled and to enable their AFIS to search fingerprints using both flat and rolled methods and to search palm prints. We believe law enforcement agencies not currently using AFIS solutions are also likely to deploy such solutions to achieve faster response times and increased accuracy than they are achieving through existing methods.

Growth Expected in the Market for Other Fingerprint Biometrics Products and Solutions

In addition to AFIS, the market for other fingerprint biometrics solutions is expected to increase. Advances in AFIS technology and widespread deployment of AFIS are resulting in both increased public awareness and acceptance of biometrics solutions and the establishment of an infrastructure that we believe will expedite the adoption of other fingerprint biometrics solutions. As a result of the advances necessitated by the development of the AFIS market, fingerprint biometrics solutions have become much more sophisticated and capable of application in a number of other environments. Several initiatives requiring increased spending on other fingerprint biometrics solutions have already begun. For example, numerous foreign jurisdictions around the world have begun to establish national identification card programs, which will require the issuance of smart ID cards with embedded fingerprint information for each citizen. Foreign jurisdictions such as Hong Kong, Italy, Morocco, the United Kingdom and Thailand have implemented or are in the process of implementing national identification programs. In addition, countries such as Venezuela have begun to use fingerprint biometrics systems to streamline the voting process and prevent fraud in local and national elections. Moreover, consumers have also begun to embrace biometrics authentication, particularly for the purposes of providing increased security on laptops, cell phones and other smart handheld devices that are beginning to store increasing amounts of personal information.

Governments, Law Enforcement Agencies and Other Organizations Face Challenges in Implementing Successful Fingerprint Biometrics Solutions

To satisfy the evolving needs of the AFIS market and the emerging market for other fingerprint biometrics solutions, vendors must deliver systems that achieve increasingly high levels of both accuracy and performance in a cost-effective and scalable manner. Many existing solutions are challenged in their ability to meet these needs because they are limited by the following problems:

Inaccuracy. Accuracy rates of AFIS solutions are measured in two ways: detection failure rates and false positive rates. Detection failures occur when an AFIS fails to match a submitted fingerprint against a matching fingerprint in the database. A false positive occurs when a fingerprint is incorrectly matched to a fingerprint in the database. Many AFIS solutions have a relatively high detection failure rate, particularly when tenprints are not available, due to the use of binning and a limited ability to use fingerprints with poor image quality. Classification binning relies heavily on data supplied by a full tenprint, and errors made in the binning process can also cause detection failures. Classification errors are particularly problematic for systems that attempt to search flat fingerprints because they are

Table of Contents

frequently binned differently from rolled fingerprints, even when the prints belong to the same person. Because the quality of fingerprint images stored as minutiae datasets in databases is highly variable, existing AFIS have difficulty matching against poorer quality images. This makes it difficult for existing systems to effectively match against digitized versions of older fingerprint cards, poorer quality latents taken at crime scenes and fingerprints that were improperly taken at law enforcement or government agencies.

Performance Constraints. To address heightened security requirements, organizations are beginning to perform biometric authentication checks in areas of high traffic, such as election polls, airports, embassies or state/country borders, where it is more challenging to capture full tenprints. In these environments, fast capture and response times are required. Moreover, many AFIS use binning to try to expedite response times, but AFIS that use binning are ineffective at delivering accurate search results in a timely manner when the subject submits less than a full tenprint, as binning under such circumstances eliminates much less of the database and necessitates a broader and more time-consuming search.

High Costs and Lack of Linear Scalability and Flexibility. In addition, integration of these biometric products and solutions with existing networks and infrastructure can be costly and complex. As databases and the number of searches grow, governments, law enforcement agencies and other organizations need flexible systems that can be scaled in a linear and cost-effective manner. Using most existing fingerprint biometrics solutions, governments, law enforcement agencies and other organizations have had to purchase multiple costly servers to assemble the requisite processing power to achieve acceptable response times and accuracy rates, and these large server deployments are complex and costly to manage on an ongoing basis.

The constraints and shortcomings of many existing fingerprint biometrics solutions have inhibited the rate of deployment outside of traditional law enforcement environments. These constraints have become more pronounced as a result of the increased focus on security and protection from terrorism, as well as increased attention to economic losses from fraudulent activity, the rising costs of administering and the cumbersome nature of using traditional authentication and identification methodologies. These needs create a significant opportunity for a vendor that can leverage the technology developed in large AFIS deployments to provide accurate, rapid, scalable, flexible and cost-effective fingerprint biometric solutions to both the existing AFIS and the emerging other fingerprint biometrics solutions markets.

Our Solution

We are a leading provider of advanced AFIS and other fingerprint biometrics solutions to governments, law enforcement agencies and other organizations worldwide. For over sixteen years, we have researched, designed, developed and marketed advanced fingerprint biometric technologies and integrated solutions. We believe our proprietary software algorithms, together with optimized hardware, enable our customers to cost-effectively deploy AFIS solutions that consistently deliver industry leading accuracy rates and performance. Our solutions are designed to be scalable, enabling customers to seamlessly expand the capabilities of their AFIS, and flexible, enabling customers to deploy our AFIS in a variety of operating systems and hardware configurations. As a result, we provide a complete AFIS solution that enables customers to achieve a low total cost of ownership both upon initial deployment and throughout its entire lifecycle. Key benefits of our solutions include:

End-to-End Solution and Services Capability. We have designed and developed a fully integrated AFIS solution comprised of our proprietary fingerprint biometric software, together with optimized hardware and professional services. We offer all of the elements a customer needs to deploy fingerprint biometric solutions, including:

Search and Retrieval Software. At the core of our solutions are our proprietary search algorithms that accelerate the matching process while maintaining accuracy. This software can run on standard hardware, but in larger deployments our customers typically run it on servers that we enhance with our

Table of Contents

Programmable Matching Accelerator, or PMA, boards that are optimized for rapid searches. The combination of powerful searching software and optimized hardware processing speeds enables us to deliver fingerprint biometrics solutions that can meet the most demanding requirements of governments, law enforcement agencies and other organizations.

Capture Devices. We offer several types of capture devices that enable our customers to obtain and process either flat or rolled fingerprints in a wide variety of places without ink, such as police stations, airports, polling stations and immigration offices. All of our live-scan devices run our proprietary Image Flow software, which employs advanced algorithms to improve feature extraction from the fingerprint images, thereby enhancing search accuracy. We also offer portable devices that enable customers to obtain and process fingerprints remotely. Our live-scan devices provide real-time image previews on screen for improved quality control and reduced processing time.

Systems Integration Services. Our service abilities enable us to deliver full end-to-end solutions regardless of the operating or network environment and to design custom interfaces to existing systems. Our highly trained and skilled engineering professionals have extensive expertise in designing and deploying AFIS and other biometrics solutions that are integrated with our customers existing systems. Because our core intellectual property resides in our software capabilities, we can cost-effectively bundle our software with optimized off-the-shelf hardware components to create solutions for our customers that deliver the performance capabilities they demand. Moreover, our solutions implement standards-based approaches that simplify integration and support.

High Accuracy Rates. We believe our solutions enable our AFIS customers to search large databases with industry leading accuracy and performance. In an April 2005 study published by the National Institute of Standards and Technology evaluating the accuracy of 1:1 matching, our solution was rated the most accurate. A key factor in our ability to achieve these accuracy rates is our approach of searching the entire database rather than relying on binning like most other AFIS. As a result, our solutions do not suffer from binning errors, and we can more effectively search both flat and rolled prints, which leads to increased accuracy. Moreover, because our software reflects our over sixteen years of research and development on neural network, fluid dynamics and advanced image processing principles, we are able to extract more minutiae from lower quality fingerprints to minimize detection failures and false positives.

High Performance. Our solutions deliver high performance and enable rapid response times when searching large databases while still maintaining a high degree of accuracy. Our PMA servers accelerate the processing capability of standard server architectures and can compare over two million fingerprints per second per PMA server. We achieve this performance level by implementing our advanced search algorithms and our proprietary Data Flow technology, which enables massively parallel processing on our PMA servers to eliminate the need for binning. Because we do not need to bin, our solutions can rapidly search based on any number of prints. Furthermore, our PMA servers can be easily clustered together, which enables customers to employ multiple servers in an integrated solution and achieve throughput levels that scale with their needs. Our rapid response times enable our customers to deploy our systems in high traffic areas where real-time authentication or identification based on flat prints is critical.

Significant Cost Savings and Linear Scalability and Flexibility. The power, linear scalability and flexibility of our solutions can result in significant cost savings to our customers. The power of our solutions reduces our customers initial costs and related ongoing maintenance and administrative costs because one of our PMA servers running our software can typically accomplish the equivalent processing of multiple Windows, UNIX or Linux servers working with other existing AFIS solutions. In addition, our solutions enable our customers to expand their systems smoothly and economically as their processing needs grow and as their systems evolve because they can incrementally purchase additional PMA servers which can be easily connected to one another, or rack mounted, to linearly scale matching throughput and support system growth as their databases grow and the number of required searches increases. Moreover, all of our current products are backwards compatible with earlier versions, enabling our customers to integrate our solutions with their existing network and infrastructure

Table of Contents

and easily and cost-effectively upgrade their systems as we develop new generations of our technology. Furthermore, our solutions are flexible and work effectively in heterogeneous network environments that include multiple hardware systems and operating systems such as Windows, UNIX and Linux. As a result, we believe the total cost of ownership of our solutions is lower than the cost of competing solutions.

Products and Services

We offer biometrics solutions to the government sector, which consists of federal, state, local and foreign governments and agencies, including immigration/border control agencies, electoral commissions and law enforcement agencies and the market for other fingerprint biometric solutions, which are emerging applications primarily for the commercial sector. Our products for the government sector are principally AFIS solutions, and our products for the commercial sector, which generated less than 2% of our revenues for 2006, are other fingerprint biometric solutions principally based on our proprietary application specific integrated circuit, or ASIC, technology. At the core of each of our products is our proprietary Image Flow Processing, Data Flow Computing and Information Fusion software.

AFIS Solutions

We offer a variety of products and services designed to enable customers to deploy cost-effective, accurate and high performance AFIS solutions. We offer our PMA servers bundled with our proprietary software to perform the searching and matching functions that are central to an AFIS, as well as live-scan fingerprint capture devices. We also deliver design and integration services and necessary computing and equipment infrastructure to enable deployment into diverse and heterogeneous environments. Our customers typically deploy our AFIS solutions in either traditional AFIS environments, such as law enforcement, where we market our solution as Cogent Automated Fingerprint Identification System, or CAFIS, or in live production environments, such as border crossings, where we market our solution as Cogent Live-ID.

We offer two primary AFIS solutions, each of which incorporates our PMAs and our live-scan devices:

Cogent Automated Fingerprint Identification System. CAFIS is our full-function, networked AFIS solution for local, regional and national systems. While each CAFIS deployment is unique to the customer due to its specific design and integration requirements, all such deployments employ our proprietary software, and the larger deployments rely significantly on our PMA servers. We believe that CAFIS is one of the most accurate systems in the world for twoprint, tenprint, latent and palm print searches.

CAFIS can be integrated with external AFIS, live-scan systems, hand-held wireless devices, secure web-based Internet solutions and other information systems. CAFIS features a modular and expandable architecture that can be scaled to meet any agency s database size, throughput and integration requirements. CAFIS can quickly and accurately search databases of enrolled subjects, with multiple records per subject in image resolutions of both 500 ppi and 1,000 ppi. Any number of modular elements can be incorporated into CAFIS, including PMA servers, workstations, live-scans and wireless handheld computers. For agencies with modest throughput requirements, systems can be configured using an NT or UNIX-based transaction server hosting our Image Flow, Data Flow and Information Fusion software. For local agencies, we provide an affordable AFIS solution on a stand-alone workstation that incorporates much of the tenprint and latent functionality and all the accuracy of large-scale AFIS systems. This workstation can scale to support larger-scale systems as agency needs change. CAFIS can be configured with a number of built-in safeguards that ensure service resiliency, while providing safety of information through its fault tolerant architecture, disk mirroring, automated database backup and disaster recovery options. It is also capable of integrating other authentication and identification solutions, such as facial recognition and smart cards.

Cogent Live-ID. Our Live-ID AFIS solution enables our customers to rapidly identify individuals who submit their fingerprints for border crossings, background checks, fraud prevention, criminal investigation, document identification, voting stations and other activities where security is a concern. Live-ID has been

Table of Contents

deployed in many demanding environments, including the US-VISIT program and the Venezuelan elections. As a result of our powerful searching and matching technology and the improved feature extraction from our image capture technology, Live-ID provides a rapid and efficient identification solution using only two flat fingerprints. Our Live-ID system can be configured to run on hand-held devices, notebook computers, stand-alone workstations and enterprise systems serving users in a vast network of sites. Live-ID can be implemented on platforms operating under UNIX, Windows and Linux, enabling users to submit search transactions and receive results with a standard web browser. Live-ID can also be used in non-governmental environments to provide authentication of an individual s identity for a variety of transactions, including e-commerce applications.

Live-ID implements our Data Flow matching technology to accurately search entire databases containing up to millions of records in a matter of seconds. Our Information Fusion technology makes it possible to combine identification systems so that Live-ID can search databases of digital photographs, signatures and demographic data simultaneously.

AFIS Products

We offer two key products in our AFIS solutions deployments:

Programmable Matching Accelerator Servers. Our proprietary PMA server is a high-speed image matching server at the core of a customer s AFIS or Live-ID system that can support search speeds of up to two million print comparisons per second per server. These speeds, which are made possible by the integration of our proprietary software with our advanced design PMAs, are necessary to adequately address the needs of customers that require real-time identification results when searching databases containing thousands to millions of records.

Our PMAs are modular units that enable customers to linearly increase matching throughput to support system and database growth by rack-mounting multiple PMA servers. PMA servers are comprised of up to eighteen of our PMA boards integrated with a commercially available server that has a high-speed input/output processor board and multiple random access memory drives. Our PMA boards use field programmable gate array integrated circuits optimized to run our proprietary software, rather than costly general purpose microprocessors or inflexible ASICs. As a result, we can cost-effectively program our PMA servers to perform a variety of matching tasks for fingerprints and palm prints. Our PMA boards also provide redundancy because the PMA boards house mirrored databases in on-board random access memory that contain files used by the system to generate fingerprint matches. The mirrored configuration and speed of the random access memory allow the system to perform simultaneous search transactions at very high speeds while still maintaining the reliability of the system.

Live-scan Systems. We offer a suite of live-scan systems running our proprietary software that improve minutiae feature extraction during the capture and encoding of fingerprint and palm print data. These systems can capture rolled or flat fingerprints and palm prints of a subject in an easy-to-learn and inkless manner. Using our software, these products enable real-time previewing, which helps the operator to place, guide and align the fingers and palms correctly, and provide immediate feedback, including error messages, if prints are not captured at an acceptable quality. These features improve the efficiency of the fingerprint capture process and enhance the effectiveness of the matching process by capturing and submitting high quality fingerprints to the AFIS or Live-ID system more quickly than live-scan devices that utilize other software programs. Scanning resolution meets ANSI/NIST and Federal Bureau of Investigation standards, and the scanner is certified to meet and exceed Federal Bureau of Investigation requirements. All data formatting is done with Federal Bureau of Investigation certified compression algorithms. Textual and graphic information is displayed in a single monitor, with a graphic user interface and on-screen buttons and zoom features. Our live-scan product suite is designed to enable integration within larger AFIS and booking management systems, including CAFIS, Live-ID and legacy AFIS solutions.

Table of Contents

Our live-scan booking station is an advanced live-scan system designed to withstand extreme working conditions such as those present in jails and prisons. The system features a high-security glass front and a ruggedized cabinet. We also offer a desktop live-scan system and a portable live-scan system.

AFIS Services

Design, Integration and Training. We offer design and integration services and training that complement our AFIS product solutions. At the commencement of a large CAFIS or Live-ID deployment, we establish project management teams that utilize a formal project management development process to meet the customer s desired performance objectives. We develop and deliver customized solutions to governments, law enforcement agencies and other organizations that require integration with existing information systems that interface with external AFIS systems. We also work with major systems integrators in providing tailored solutions. After installation, we conduct performance tests to validate performance objectives. We also offer tailored training plans that include classes, on-the-job training and in-house seminars. As part of our training services, we provide customized user guides along with manuals.

Outsourced Live-ID Biometric Processing Services. We provide a fully outsourced Live-ID service on a hosted application service business model. Systems are housed and maintained in a secure data center at our headquarters. The data center is equipped with high-speed, fault-tolerant Cogent PMA matchers and enterprise servers. Customers using this service can offer fingerprint matching services for applications such as background checks without investing in an entire AFIS infrastructure and pay on a transaction basis.

ASIC Applications

Our proprietary ASIC is designed to perform biometric image processing and matching for both fingerprints and facial images for the commercial sector. Based on a microprocessor core, our proprietary ASIC incorporates a powerful two-dimensional digital signal processing engine and supports memory bus interfaces with synchronous dynamic random access memory, read-only memory, flash memory and static random access memory devices. Our proprietary ASIC is typically delivered as part of our proprietary Identification Module, which is a stand-alone image processing and biometric matching unit designed for applications requiring biometric identification and authentication. To provide maximum flexibility for integrating the Identification Module with a variety of user applications, the module supports a number of fingerprint sensor options, including silicon sensors and optical sensors and communication interface options, as well as magnetic stripe card, contact smart card and contactless smart card readers.

The Identification Module supports both one-to-one authentication and one-to-many identification applications. Host application systems can manage the Identification Module through common communication protocols, such as Ethernet. We also offer an original equipment manufacturer, or OEM, development kit for application development and integration. This kit comes with a variety of tools and options to provide high degrees of flexibility and customization for a wide range of applications.

Examples of applications powered by our proprietary ASIC are:

BioGate. BioGate is a physical access control system that provides a sophisticated, accurate and customizable biometrics solution to support a variety of access control environments. This system can replace existing access card systems with an easy-to-use system that controls access by requiring that an individual seeking entry submit to a finger scan to confirm his right to access a restricted area. Featuring our matching

software, a 500 ppi resolution silicon fingerprint sensor and a contact smart card reader or optional magnetic stripe card reader, BioGate provides a high level of accuracy and speed. BioGate can increase security while making the access control system more convenient for authorized personnel.

Table of Contents

National Identification Card Programs. Numerous foreign jurisdictions around the world have begun to establish national identification card programs, which will require the issuance of smart ID cards with embedded fingerprint information. Foreign jurisdictions such as Hong Kong, Italy, Morocco, the United Kingdom and Thailand have implemented or are in the process of implementing national identification programs. Many of these programs involve enrolling citizens in a database and issuing each citizen an identification card, some of which are smart cards that contain a chip, such as our proprietary ASIC, that has a digital template of fingerprints embedded in it. This information can be accessed and matched against a real-time scan of a citizen s finger to enable real-time authentication of the citizen s identity for a variety of purposes. Our proprietary ASIC is currently used in the Hong Kong Smart Identity Card Program.

MobileIDENT. MobileIDENT integrates our proprietary ASIC with a forensic quality fingerprint sensor (500 ppi resolution), a digital camera, a smart card reader and a Windows mobile-based Pocket PC to create a handheld AFIS that can locally store and search fingerprints on our proprietary ASIC chip. MobileIDENT can also communicate with a central AFIS search engine with results returned to the MobileIDENT. In addition, MobileIDENT supports match-on-card authentication whereby a captured fingerprint is compared to fingerprint minutiae stored on a smart card. MobileIDENT enables law enforcement officers to make rapid and effective identifications and authentications at ports of entry and exit, at sporting events, for roadside vehicle checks, for major public events and at any remote location where timely identification or authentication checks may be required.

BlueCheck. BlueCheck is a Bluetooth enabled mobile fingerprint scanner for law enforcement applications. Weighing only 3 ounces the BlueCheck is equipped with a durable LCD display for real-time feedback, a 500 dpi fingerprint sensor and our proprietary ASIC technology for embedded encryption, image compression and on-device matching. Used with our Live-ID and MobileIDENT software, BlueCheck allows users to perform in-the-field fingerprint capture and identifications.

Technology

We developed our proprietary technology through an extensive research and development program focused on innovative algorithms for image processing and biometric identification. These highly complex matching algorithms are the core of our technology, and we have optimized the hardware deployed in our customers systems to run these algorithms efficiently. Our engineers have extensive expertise in matching algorithms, image enhancement, image compression, fuzzy mathematics, morphology, neural networks, security, encryption, communications, data mining and data fusion. By leveraging this expertise over our sixteen year history, we have developed advanced algorithms for statistical pattern recognition, structural pattern recognition, random process modeling and error and distortion modeling.

Image Flow Technology. Our Image Flow software utilizes fluid dynamics principles to perform real-time identification and classification of minutiae and other irregularities that define the unique biometric features. Since fingerprints have a natural graphical flow embodied in the ridges in human fingers, our Image Flow software enables our algorithms to identify the patterns of a fingerprint similar to the surface appearances associated with fluid flow. This enables us to employ mathematical modeling, using the principles of fluid dynamics, for enhancing poor fingerprints lifted from crime scenes or less than optimal images. Utilizing ridge pattern information in a fingerprint image, our Image Flow algorithms capture the flow information via partial differential equations, solve the numerical equations, and provide accurate feature data associated with the fingerprint image. By analytically modeling these natural flows, which are unique to each individual, our software can establish a positive identity using a variety of biometrics, including fingerprints, palm prints, and facial images. Our image processing software operates throughout our AFIS solutions to enable more detailed feature extraction to improve the accuracy of searches and descriptive function modeling to improve the speed of searches.

Table of Contents

Data Flow Technology. Utilizing innovative hyper-pipeline and massively parallel computing architectures, our Data Flow super computing technology provides an in-depth analysis of the similarity of natural object characteristics to accurately and automatically identify matching characteristics. This technology enables very high-speed computation, and it is scalable to run on hand-held computers, desktop computers and enterprise servers. Our Data Flow technology utilizes parallel processing techniques to deliver high throughput by conducting parallel database searches while expending minimal time per comparison. The Data Flow technology implements a design paradigm that features a dataflow computing architecture based upon the Single Instruction Multiple Data, or SIMD, dataflow computer model. The SIMD model packs multiple data elements into a single register and performs the same calculation on all of them at the same time, and computational accelerators move performance bottlenecks from the processor into the processor s memory hierarchy. This technology enables us to optimize both our accuracy and transaction throughput by capitalizing on the fact that all the fingerprints in the database can be accessed in parallel. We have also developed advanced wavelet compression and coding design technologies to enhance system speed.

The design of our PMA boards also manifests our Data Flow technology. The PMA board design features extremely high input/output bandwidth to process the database using a massively parallel and hyper-pipeline architecture implemented on a single card that plugs into a standard interface on a commercially available server. Our PMA servers have been designed to support the high-speed capabilities of the Data Flow algorithms and provide scalable matching units that can individually perform two million fingerprint comparisons per second. For every transaction, our PMA server initializes the search engine by loading the search fingerprint minutiae data to the search engine. The PMA server continues sending the fingerprint minutiae data to the data pipe of the search engine while the search engine data pipe is not full.

Information Fusion Technology. Our Information Fusion technology integrates data mining and data fusion technologies with biometric identification to enable the transformation of raw data into business information. To meet customer requirements, AFIS and other fingerprint biometrics systems must integrate with larger communications and information systems. Our Information Fusion technology improves the accuracy of our solutions by utilizing sophisticated fusion algorithms to combine biometric data from multiple sources and multiple algorithms.

Our Information Fusion technology includes system integration tools and techniques to integrate information from disparate information systems, such as intelligence systems, criminal history systems and border crossing systems. This technology includes advanced workflow and state transition modeling architectures that we use to develop custom workflows and seamless integration of data in customers information systems. Rather than maintaining multiple versions of our software for a variety of applications and customers, our Information Fusion software requires only one master version that is both dynamically and statically configured based on each customer s requirements. Information Fusion facilitates the rapid development of extension modules for individual customer deployments to address specific needs, and we can frequently use the functionality developed for one customer in future customer deployments. This technology also provides an efficient framework for providing customer support of delivered systems, which can reduce customers maintenance costs and increase system reliability. The ability to provide integration across local, state, national and international systems is a key advantage for governments and law enforcement agencies in implementing heightened security procedures.

Customers

We have derived, and believe that we will continue to derive, a significant portion of our revenues from a limited number of customers. Revenues from the sale of our solutions to the National Electoral Council of Venezuela (CNE) were 38% and 37% of total revenues during the years ended December 31, 2005 and 2006, respectively. Revenues from the sale of our solutions to the Department of Homeland Security were 31% and 11% of total revenues during the years ended December 31, 2005 and 2006, respectively.

Table of Contents

Sales and Marketing

We market our AFIS solutions and other fingerprint biometrics solutions directly to end-users and indirectly through prime contractors. We market our proprietary ASIC device indirectly through OEMs, resellers and distributors. As of December 31, 2006, we employed 20 individuals who were involved in our sales and marketing efforts.

Sales efforts for our AFIS and other government related fingerprint biometrics solutions are predominantly focused on establishing and maintaining new and existing relationships with defense and IT solutions companies that typically serve as prime contractors on government projects. We also market our AFIS and other government related fingerprint biometrics solutions directly to end customers if the project is focused primarily on a biometrics implementation. For large AFIS deployments, a government entity typically issues a request for proposal, or RFP. In the RFP, the entity will usually provide the project s specifications and performance requirements, and then solicit proposals from prospective prime contractors who are on the approved vendor list. Because we are one of four leading vendors that offer AFIS solutions, we are typically included in any U.S. or international RFP that is open for competitive bidding. We enhance our opportunities for being selected as a prime or subcontractor by utilizing references from our existing customers, usually bidding on a fixed price basis and employing consultants who have strong relationships in our international markets. We assemble a multi-disciplined project management team to draft the proposal, or to assist with drafting if we are the subcontractor, negotiate the actual contract and deploy the solution. Once our solution has been deployed, the project management team educates our customer on the use of our AFIS and other biometrics solutions. The project management team is also frequently involved in upgrading our customers to more comprehensive solutions as their needs grow. In addition, when competing for local, state and international contracts from governments and law enforcement agencies, we seek to team with local systems integrators in the jurisdiction in which the contract is to be performed.

Our sales efforts for our proprietary ASIC device are focused on OEMs, resellers and distributors. We attempt to identify markets that would benefit from biometrics, such as the market for corporate and personal security, and then partner with leading vendors in those areas. We frequently rely on references from our existing AFIS customers to obtain new commercial customers.

As part of our general sales and marketing efforts we have also established the Cogent User Group. The main purpose of this group is to provide feedback on existing solutions, identify needs for new products and identify new desirable capabilities for both existing and new solutions. We have an annual user conference where members can provide feedback on our solutions and products. We utilize the information gathered from members of the Cogent User Group and the information gathered from clients by our project management teams to better enable us to create and deliver to our customers timely upgrades and new solutions that meet evolving customer needs.

Manufacturing and Suppliers

For our PMA servers, we conduct finish assembly operations, quality assurance, manufacturing engineering, documentation control and integration at our headquarters facility in South Pasadena, California. We acquire the servers from commercial suppliers such as IBM and Hewlett-Packard. We outsource the assembly of our PMA boards to contract manufacturers to reduce fixed costs and to provide flexibility in meeting market demands. We directly purchase the components of our PMA boards, including printed circuit boards, field programmable gate arrays and memory integrated circuits, and our contract manufacturers assemble them to our specifications. The contract manufacturers deliver the assembled PMA boards to us, and we perform finish assembly procedures before testing and integrating the final products into the commercial servers with software and manuals in our South Pasadena, California facility.

Table of Contents

Samsung Semiconductor, Inc. fabricates our proprietary ASIC wafers in Asia. Various subcontractors perform assembly, packaging and testing of our ASICs, allowing us to purchase and receive only finished ASIC product. We maintain a facility in Shenzhen, China where we perform research and development and assembly of our consumer and commercial products that incorporate our proprietary ASIC. We had 43 employees in Shenzhen as of December 31, 2006. Certain components of our products that are assembled in Shenzhen are outsourced to contract partners, none of which are sole source suppliers. We also store and distribute our inventory of consumer and commercial products from the Shenzhen facility.

Most component parts used in our products are standard off-the-shelf items, which are, or can be, purchased from two or more sources. In addition to Samsung, IBM and Hewlett-Packard, we utilize products from suppliers such as Sun Microsystems and Dell Computer, which provide computer workstations, L-1 Identity Solutions and Cross Match Technologies, which provide live-scans, Oracle, Informix, Sybase and Microsoft, who supply database software and Atmel, which supplies sensors. We select suppliers on the basis of functionality, manufacturing capacity, quality and cost. Whenever possible and practicable, we strive to have at least two manufacturing locations for each product. Nevertheless, our reliance on third-party manufacturers involves risks, including possible limitations on availability of products due to market abnormalities, unavailability of, or delays in obtaining access to, certain product technologies and the absence of complete control over delivery schedules, manufacturing yields, and total production costs. The inability of our suppliers to deliver products of acceptable quality and in a timely manner or our inability to procure adequate supplies of our products could disrupt our ability to meet customer demands or reduce our gross margins.

Customer Service

We believe that customer service is critical to our success, and we have committed significant resources to this function. Our contracts provide for telephone, web-based or email support and occasionally on-site support. Our systems are configured for remote access, allowing us to solve most problems remotely and without customer involvement. We also maintain a customer support database that allows us to both resolve problems and prevent recurrences of prior problems.

Competition

The market for biometric solutions is highly competitive, rapidly evolving and fragmented, and subject to changing technology, shifting customer needs and frequent introductions of new products and services. A significant number of established companies have developed or are developing and marketing software and hardware for biometric products and applications that currently compete or will compete directly with our offerings. Our offerings also compete with non-biometric technologies such as public key infrastructure solutions, smart card security solutions, and traditional key, card, surveillance and password systems. Many of our competitors have significantly more financial and other resources than we do. We believe that additional competitors will continue to enter the biometrics market and become significant long-term competitors, and that, as a result, competition will increase in the near term. We sometimes compete with third parties who are also our suppliers or prime contractors. Companies competing with us may introduce products that are competitively priced, have increased performance or functionality or incorporate technological advances not yet developed or implemented by us. Our current principal competitors include:

- diversified technology providers, such as Motorola, Inc. (through its Motorola Business Solutions division), NEC and Safran Group (through its wholly owned subsidiary Sagem Morpho) that offer integrated AFIS solutions to governments, law enforcement agencies and other organizations;

- companies that are AFIS component providers, such as Cross Match Technologies and L-1 Identity Solutions;

prime government contractors such as Northrop Grumman, that develop integrated information technology products and services that include biometrics-related solutions that are frequently delivered in partnership with diversified technology providers and biometrics-focused companies; and

Table of Contents

companies focused on other fingerprint biometrics solutions, such as AuthenTec, BioScrypt, Dermalog and UPEK.

We believe the principal competitive factors in the market for complete AFIS solutions include the following:

- accuracy of matching;
- speed of matching;
- pricing including total cost of system ownership, including initial costs and ongoing maintenance and support;
- customization;
- scalability that enables rapid and accurate matching in extremely large databases; and
- quality of service and support.

We believe the principal competitive factors in the market for other fingerprint biometric solutions include the following:

- degree of security provided;
- ease of use;
- functionality;
- price;
- size; and
- reliability.

We believe that we compete favorably with our competitors in both of the above markets on the basis of the aforementioned factors. Our ability to remain competitive will depend to a great extent upon our ongoing performance in the areas of product development and customer support.

Backlog

We record an item as backlog when we receive a contract, purchase order or other notification indicating the number of units to be purchased, the purchase price, specifications and other customary terms and conditions. Our backlog also includes deferred revenue reflected on our consolidated balance sheet. There can be no assurance that any of the contracts comprising our backlog presented in this Annual Report will result in actual revenue in any particular periods or that the actual revenue from such contracts will equal our backlog estimates. Furthermore, there can be no assurance that any contract included in our estimated backlog that actually generates revenue will be profitable. These estimates are based on our experience under such contracts and similar contracts and may not be accurate. As of December 31, 2005 and 2006, our total backlog was $133 million and $122 million, respectively. The amount of backlog representing contracts awarded but not signed as of December 31, 2006 totaled $6.4 million. Approximately $49 million of backlog is not expected to be filled in 2007.

We cannot assure you that we will realize revenue from our entire backlog or as to timing thereof. In 2006, we derived 41.9% of our revenues from the sale of our solutions either directly or indirectly to U.S. government agencies pursuant to government contracts. Many of these contracts are subject to re-negotiation, budget constraints and termination at the option of the customer. In addition, a significant portion of our revenue is not recognized upon shipment, but is recognized only upon customer acceptance of our systems or over the term of our contracts under the percentage-of-completion method.

Table of Contents

Research and Development

We engage in substantial research and development to advance our core products and develop new products. We conduct research on algorithm development, hardware development, system engineering and architecture, industry standards, technology integration, user productivity features and performance enhancement. We also invest substantial resources in commercializing the technology that we develop in our research and development efforts into products that meet the needs of our customers. We have found that while there are unique features to each client engagement, there is often a degree of commonality. Under our customer contracts, we typically obtain the rights to use any improvements to our technology developed on a particular customer deployment on other customer deployments. As a result, we have historically been able to moderate our research and development expenses by leveraging the improvements developed by our personnel working on customer engagements. Our research and development expense was $8.3 million in 2004, $8.9 million in 2005 and $8.6 million in 2006.

Intellectual Property

Our success will depend in part on our ability to protect our intellectual property. The core technology used in our products and solutions is not the subject of any patent or copyright protection. We have two issued patents on technology related to optical sensors and image reconstructions for the commercial markets. We also rely primarily on a portfolio of intellectual property rights, both foreign and domestic, including trade secrets, trademarks, contractual provisions, patent applications and licenses to protect our intellectual property. Our registered trademarks relate to Cogent Systems, BioGate, BlueCheck, Live-ID and PMA. Our two pending patent applications relate to our Data Flow and Information Fusion technology.

If we fail to protect our intellectual property rights adequately, our competitors might gain access to our technology, and our business would thus be harmed. In addition, defending our intellectual property rights might entail significant expense. Any of our trademarks or other intellectual property rights may be challenged by others or invalidated through administrative processes or litigation. In addition, our patents, or any other patents that may be issued to us in the future, may not provide us with any competitive advantages, or may be challenged by third parties. Furthermore, legal standards relating to the validity, enforceability and scope of protection of intellectual property rights are uncertain. Effective patent, trademark, copyright and trade secret protection may not be available to us in every country where we market our solutions. The laws of some foreign countries may not be as protective of intellectual property rights as those in the United States, and domestic and international mechanisms for enforcement of intellectual property rights in those countries may be inadequate. Accordingly, despite our efforts, we may be unable to prevent third parties from infringing upon or misappropriating our intellectual property or otherwise gaining access to our technology.

We may be required to expend significant resources to monitor and protect our intellectual property rights. We may initiate claims or litigation against third parties for infringement of our proprietary rights or to establish the validity of our proprietary rights. Any such litigation, whether or not it is ultimately resolved in our favor, would result in significant expense to us and divert the efforts of our technical and management personnel. For example, in April 2005, we initiated a lawsuit against Northrup Grumman which asserts that Northrup caused us harm by misappropriating our trade secrets. We have spent a substantial amount of funds in connection with this lawsuit and expect to continue to spend substantial funds in connection with the lawsuit for the foreseeable future. In addition, our management has devoted, and we expect our management to continue to devote for the foreseeable future, a significant amount of time to this lawsuit.

As the number of entrants into our market increases, the possibility of an intellectual property claim against us grows. Our technologies may not be able to withstand any third-party claims against their use. Any intellectual property claims, with or without merit, could be time-consuming and expensive to litigate or settle, and could divert management attention from executing our business plan. In addition, we may be required to indemnify our customers for third-party intellectual property infringement claims, which would increase the cost to us of an

15

Table of Contents

advance ruling in such a claim. An adverse determination could also prevent us from offering our service to others.

We generally enter into confidentiality agreements with our employees, vendors, industry partners and customers. Furthermore, we generally control access to and distribution of our documentation and other proprietary information. Despite this protection, unauthorized parties may copy aspects of our current or future software products or obtain and use information that we regard as proprietary, and such unauthorized use could harm our business.

Employees

As of December 31, 2006, we employed 195 full-time employees, including 85 in research and development, 68 in operations and engineering services, 20 in sales and marketing and 22 in general and administration. We have never had any work stoppage and none of our employees are represented by a labor organization or are party to any collective bargaining arrangements. We consider our employee relations to be good.

Available Information

We file reports with the Securities and Exchange Commission (SEC). We make available on our website under Investor Relations/SEC Filings, free of charge, our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports as soon as reasonably practicable after we electronically file such materials with or furnish them to the SEC. Our website address is www.cogentsystems.com. You can also read and copy any materials we file with the SEC at the SEC s Public Reference Room at 100 F Street, NE, Washington, DC 20549. You can obtain additional information about the operation of the Public Reference Room by calling the SEC at 1-800-SEC-0330. In addition, the SEC maintains an Internet site (www.sec.gov) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC, including us.

Table of Contents

Item 1A. Risk Factors

You should consider each of the following factors as well as the other information in this Annual Report in evaluating our business and our prospects. The risks and uncertainties described below are not the only ones we face. Additional risks and uncertainties not presently known to us or that we currently consider immaterial may also impair our business operations. If any of the following risks actually occur, our business and financial results could be harmed. In that case, the trading price of our common stock could decline. You should also refer to the other information set forth in this Annual Report, including our financial statements and the related notes.

Our business could be adversely affected by significant changes in the contracting or fiscal policies of governments and governmental entities.

We derive substantially all of our revenues from contracts with international, federal, state and local governments and government agencies, and subcontracts under federal government prime contracts, and we believe that the success and growth of our business will continue to depend on our successful procurement of government contracts either directly or through prime contractors. Accordingly, changes in government contracting policies or government budgetary constraints could directly affect our financial performance. Among the factors that could adversely affect our business are:

changes in fiscal policies or decreases in available government funding;

changes in government programs or applicable requirements;

the adoption of new laws or regulations or changes to existing laws or regulations;

Furthermore, Section 871(m) of the Internal Revenue Code imposes a withholding tax of up to 30% on dividend equivalents paid to non-U.S. investors in respect of certain financial instruments linked to U.S. equities. As of the date of this preliminary pricing supplement, the securities should not be subject to withholding under Section 871(m).

Both U.S. and non-U.S. persons considering an investment in the securities should review carefully Summary of U.S. Federal Income Tax Consequences in this pricing supplement and Certain U.S. Federal Income Tax Consequences in the underlying supplement and consult their tax advisors regarding the U.S. federal tax consequences of an investment in the securities (including possible alternative treatments and the issues presented by the notice), as well as tax consequences arising under the laws of any state, local or non-U.S. taxing jurisdiction.

There Can Be No Assurance That The Canadian Federal Income Tax Consequences Of An Investment In The Securities Will Not Change In The Future.

There can be no assurance that Canadian federal income tax laws, the judicial interpretation thereof, or the administrative policies and assessing practices of the Canada Revenue Agency will not be changed in a manner that adversely affects investors. For a discussion of the Canadian federal income tax consequences of investing in the securities, please read the section entitled Certain Canadian Federal Income Tax Considerations in this pricing supplement as well as the section entitled Material Income Tax Consequences Canadian Taxation in the accompanying prospectus. You should consult your tax advisor with respect to your own particular situation.

Market Linked Securities Leveraged Upside Participation to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

HYPOTHETICAL RETURNS

The following table illustrates, for a hypothetical Capped Value of 116.00% or $1,160.00 per security (the midpoint of the specified range of the Capped Value), a Starting Level of 100.00, a Threshold Level of 90.00, a Participation Rate of 125%, a term to maturity of 1.5 years and a range of hypothetical Ending Levels of the Basket:

- the hypothetical percentage change from the Starting Level to the hypothetical Ending Level;
- the hypothetical Redemption Amount payable at maturity per security; and
- the hypothetical pre-tax total rate of return.

Hypothetical Ending Level	Hypothetical Percentage Change From the Starting Level to the Hypothetical Ending Level	Hypothetical Redemption Amount Payable At Maturity Per Security	Hypothetical Pre-Tax Total Rate of Return
175.00	75.00%	$1,160.00	16.00%
150.00	50.00%	$1,160.00	16.00%
140.00	40.00%	$1,160.00	16.00%
130.00	30.00%	$1,160.00	16.00%
120.00	20.00%	$1,160.00	16.00%
115.00	15.00%	$1,160.00	16.00%
112.80	12.80%	$1,160.00	16.00%
105.00	5.00%	$1,062.50	6.25%
100.00(1)	0.00%	$1,000.00	0.00%
95.00	-5.00%	$1,000.00	0.00%
90.00	-10.00%	$1,000.00	0.00%
89.00	-11.00%	$990.00	-1.00%
80.00	-20.00%	$900.00	-10.00%
75.00	-25.00%	$850.00	-15.00%
50.00	-50.00%	$600.00	-40.00%
25.00	-75.00%	$350.00	-65.00%
0.00	-100.00%	$100.00	-90.00%

(1) The Starting Level.

The above figures are for purposes of illustration only and may have been rounded for ease of analysis. The actual amount you receive at maturity and the resulting pre-tax rate of return will depend on the actual Ending Level and Capped Value.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

HYPOTHETICAL PAYMENTS AT MATURITY

Set forth below are four examples of payment at maturity calculations, reflecting a hypothetical Capped Value of 116.00% or $1,160.00 per security (the midpoint of the specified range for the Capped Value), a Participation Rate of 125%, a Starting Level of 100, a Threshold Level of 90% of the Starting Level, and assuming hypothetical Initial Component Levels, Final Component Levels and Component Returns as indicated in the examples. The terms used for purposes of these hypothetical examples do not represent the actual Initial Component Level of any Basket Component. The hypothetical Initial Component Level of 100.00 for each Basket Component has been chosen for illustrative purposes only and does not represent the actual Initial Component Level of any Basket Component. The actual Initial Component Level for each Basket Component will be determined on the Pricing Date and will be set forth under Terms of the Securities above. For historical data regarding the actual Closing Levels of the Basket Components, see the historical information set forth herein. These examples are for purposes of illustration only and the values used in the examples may have been rounded for ease of analysis.

Example 1. The Redemption Amount is greater than the principal amount but less than the Capped Value:

	SPX	SX5E
Initial Component Level:	100.00	100.00
Final Component Level:	110.00	100.00
Component Return:	10.00%	0.00%

Based on the Component Returns set forth above, the hypothetical Ending Level would equal:

$$100 \times [1 + (50\% \times 10.00\%) + (50\% \times 0.00\%)] = 105.00$$

Since the hypothetical Ending Level is greater than the Starting Level, the Redemption Amount would equal:

On the Stated Maturity Date, you would receive $1,062.50 per security.

Example 2. The Redemption Amount is equal to the Capped Value:

	SPX	SX5E
Initial Component Level:	100.00	100.00
Final Component Level:	120.00	150.00
Component Return:	20.00%	50.00%

Based on the Component Returns set forth above, the hypothetical Ending Level would equal:

$$100 \times [1 + (50\% \times 20.00\%) + (50\% \times 50.00\%)] = 135.00$$

The Redemption Amount would be equal to the Capped Value since the Capped Value is less than:

On the Stated Maturity Date, you would receive $1,160.00 per security.

In addition to limiting your return on the securities, the Capped Value limits the positive effect of the Participation Rate. If the Ending Level is greater than the Starting Level, you will participate in the performance of the Basket at a rate of 125% up to a certain point. However, the effect of the Participation Rate will be progressively reduced for Ending Levels that are greater than 112.80% of the Starting Level (assuming a Capped Value of 116.00% or $1,160.00 per security, the midpoint of the specified range for the Capped Value) since your return on the securities for any Ending Level greater than 112.80% of the Starting Level will be limited to the Capped Value.

Market Linked Securities Leveraged Upside Participation to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

Example 3. The Redemption Amount is equal to the principal amount:

	SPX	SX5E
Initial Component Level:	100.00	100.00
Final Component Level:	115.00	80.00
Component Return:	15.00%	-20.00%

Based on the Component Returns set forth above, the hypothetical Ending Level would equal:

$$100 \times [1 + (50\% \times 15.00\%) + (50\% \times -20.00\%)] = 97.50$$

In this example, the hypothetical final component level of the SPX is less than its hypothetical initial component level, while the hypothetical final component level of the SX5E is greater than its hypothetical initial component level. Although the SX5E appreciated, the large decline in the SPX completely offsets the appreciation of the SX5E and results in the hypothetical Ending Level of the Basket being less than its Starting Level.

Since the hypothetical Ending Level is less than the Starting Level, but not by more than 10%, you would not lose any of the principal amount of your securities.

On the Stated Maturity Date, you would receive $1,000.00 per security.

Example 4. The Redemption Amount is less than the principal amount:

	SPX	SX5E
Initial Component Level:	100.00	100.00
Final Component Level:	60.00	40.00
Component Return:	-40.00%	-60.00%

Based on the Component Returns set forth above, the hypothetical Ending Level would equal:

$$100 \times [1 + (50\% \times -40.00\%) + (50\% \times -60.00\%)] = 50.00$$

Since the hypothetical Ending Level is less than the Starting Level by more than 10%, you would lose a portion of the principal amount of your securities and receive the Redemption Amount equal to:

On the Stated Maturity Date, you would receive $600.00 per security.

To the extent that the actual Component Returns, Ending Level and Capped Value differ from the values assumed above, the results indicated above would be different.

Market Linked Securities Leveraged Upside Participation to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

ADDITIONAL TERMS OF THE SECURITIES

The definitions and provisions below supersede and replace the relevant definitions and provisions set forth in the underlying supplement.

Certain Definitions

A "Trading Day" with respect to the SPX means a day, as determined by the calculation agent, on which (i) the relevant stock exchanges with respect to each security underlying the SPX are scheduled to be open for trading for their respective regular trading sessions and (ii) each related futures or options exchange with respect to the SPX is scheduled to be open for trading for its regular trading session.

A "Trading Day" with respect to the SX5E means a day, as determined by the calculation agent, on which (i) the relevant index sponsor is scheduled to publish the level of the SX5E and (ii) each related futures or options exchange with respect to the SX5E is scheduled to be open for trading for its regular trading session.

The "relevant stock exchange" for any security underlying a Basket Component means the primary exchange or quotation system on which such security is traded, as determined by the calculation agent.

The "related futures or options exchange" for a Basket Component means 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 such Basket Component.

Market Disruption Events

With respect to the SPX, a "market disruption event" means any of the following events as determined by the calculation agent in its sole discretion:

(A) The occurrence or existence of a material suspension of or limitation imposed on trading by the relevant stock exchanges or otherwise relating to securities which then comprise 20% or more of the level of such Basket Component or any successor equity index at any time during the one-hour period that ends at the close of trading on that day, whether by reason of movements in price exceeding limits permitted by those relevant stock exchanges or

otherwise.

(B) The occurrence or existence of a material suspension of or limitation imposed on trading by any related futures or options exchange or otherwise in futures or options contracts relating to such Basket Component or any successor equity index on any related futures or options exchange at any time during the one-hour period that ends at the close of trading on that day, whether by reason of movements in price exceeding limits permitted by the related futures or options exchange or otherwise.

(C) The occurrence or existence of 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, securities that then comprise 20% or more of the level of such Basket Component or any successor equity index on their relevant stock exchanges at any time during the one-hour period that ends at the close of trading on that day.

(D) The occurrence or existence of 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 such Basket Component or any successor equity index on any related futures or options exchange at any time during the one-hour period that ends at the close of trading on that day.

(E) The closure on any exchange business day of the relevant stock exchanges on which securities that then comprise 20% or more of the level of such Basket Component or any successor equity index are traded or any related futures or options exchange with respect to such Basket Component or any successor equity index prior to its scheduled closing time unless the earlier closing time is announced by the relevant stock exchange or related futures or options exchange, as applicable, at least one hour prior to the earlier of (1) the actual closing time for the regular trading session on such relevant stock exchange or related futures or options exchange, as applicable, and (2) the submission deadline for orders to be entered into the relevant stock exchange or related futures or options exchange, as applicable, system for execution at such actual closing time on that day.

(F) The relevant stock exchange for any security underlying such Basket Component or successor equity index or any related futures or options exchange with respect to such Basket Component or any successor equity index fails to open for trading during its regular trading session.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

For purposes of determining whether a market disruption event has occurred with respect to the SPX:

(1) the relevant percentage contribution of a security to the level of such Basket Component or any successor equity index will be based on a comparison of (x) the portion of the level of such index attributable to that security and (y) the overall level of such Basket Component or successor equity index, in each case immediately before the occurrence of the market disruption event;

(2) the close of trading on any Trading Day for such Basket Component or any successor equity index means the scheduled closing time of the relevant stock exchanges with respect to the securities underlying such Basket Component or successor equity index on such Trading Day; provided that, if the actual closing time of the regular trading session of any such relevant stock exchange is earlier than its scheduled closing time on such Trading Day, then (x) for purposes of clauses (A) and (C) of the definition of market disruption event above, with respect to any security underlying such Basket Component or successor equity index for which such relevant stock exchange is its relevant stock exchange, the close of trading means such actual closing time and (y) for purposes of clauses (B) and (D) of the definition of market disruption event above, with respect to any futures or options contract relating to such Basket Component or successor equity index, the close of trading means the latest actual closing time of the regular trading session of any of the relevant stock exchanges, but in no event later than the scheduled closing time of the relevant stock exchanges;

(3) the scheduled closing time of any relevant stock exchange or related futures or options exchange on any Trading Day for such Basket Component or any successor equity index 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

(4) an exchange business day means any Trading Day for such Basket Component or any successor equity index on which each relevant stock exchange for the securities underlying such Basket Component or any successor equity index and each related futures or options exchange are open for trading during their respective regular trading sessions, notwithstanding any such relevant stock exchange or related futures or options exchange with respect to such Basket Component or any successor equity index closing prior to its scheduled closing time.

With respect to the SX5E, a market disruption event means any of (A), (B), (C) or (D) below, as determined by the calculation agent in its sole discretion:

(A) Any of the following events occurs or exists with respect to any security included in such Basket Component or any successor equity index, and the aggregate of all securities included in such Basket Component or successor equity index with respect to which any such event occurs comprise 20% or more of the level of such Basket Component or successor equity 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 such Basket Component or any successor equity 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;

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

- 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 such Basket Component or successor equity 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 relevant index sponsor fails to publish the level of such Basket Component or any successor equity index (other than as a result of the relevant index sponsor having discontinued publication of such Basket Component or successor equity 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 purposes of determining whether a market disruption event has occurred with respect to such Basket Component:

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

(2) 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

(3) an exchange business day means any Trading Day on which (i) the relevant index sponsor publishes the level of such Basket Component 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.

If a market disruption event occurs or is continuing with respect to a Basket Component on the Final Valuation Date, then the Final Valuation Date for such Basket Component will be postponed to the first succeeding Trading Day for such Basket Component on which a market disruption event for such Basket Component has not occurred and is not continuing; however, if such first succeeding Trading Day has not

occurred as of the eighth Trading Day for such Basket Component after the originally scheduled Final Valuation Date, that eighth Trading Day shall be deemed to be the Final Valuation Date for such Basket Component. If the Final Valuation Date has been postponed eight Trading Days for a Basket Component after the originally scheduled Final Valuation Date and a market disruption event occurs or is continuing with respect to such Basket Component on such eighth Trading Day, the calculation agent will determine the Closing Level of such Basket Component on such eighth Trading Day in accordance with the formula for and method of calculating the Closing Level of such Basket Component last in effect prior to commencement of the market disruption event, using the closing price (or, with respect to any relevant security, if a market disruption event has occurred with respect to such security, its good faith estimate of the value of such security at (i) with respect to the SPX, the scheduled closing time of the relevant stock exchange for such security or, if earlier, the actual closing time of the regular trading session of such relevant stock exchange or (ii) with respect to the SX5E, the time at which the official closing level of the SX5E is calculated and published by the index sponsor) on such date of each security included in the SX5E. As used herein, closing price means, with respect to any security on any date, the relevant stock exchange traded or quoted price of such security as of (i) with respect to the SPX, the scheduled closing time of the relevant stock exchange for such security or, if earlier, the actual closing time of the regular trading session of such relevant stock exchange or (ii) with respect to the SX5E, the time at which the official closing level of the SX5E is calculated and published by the index sponsor. Notwithstanding the postponement of the Final Valuation Date for a particular Basket Component due to a market disruption event with respect to such Basket Component, the originally scheduled Final Valuation Date will remain the Final Valuation Date for any Basket Component not affected by a market disruption event.

Adjustments to a Basket Component

If at any time the method of calculating a Basket Component or a successor equity index, or the closing level thereof, is changed in a material respect, or if a Basket Component or a successor equity index is in any other way modified so that such Basket Component does not, in the opinion of the calculation agent, fairly represent the level of such Basket Component had those changes or modifications not been made, then the calculation agent will, at the close of business in New York, New York, on each date that the Closing Level of such Basket Component is to be calculated, make such calculations and adjustments as, in the good faith judgment of

Market Linked Securities Leveraged Upside Participation to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

the calculation agent, may be necessary in order to arrive at a level of a Basket Component comparable to such Basket Component or successor equity index as if those changes or modifications had not been made, and the calculation agent will calculate the Closing Level of such Basket Component or successor equity index with reference to such Basket Component, as so adjusted. Accordingly, if the method of calculating a Basket Component or successor equity index is modified so that the level of such Basket Component is a fraction or a multiple of what it would have been if it had not been modified (*e.g.*, due to a split or reverse split in such related equity index), then the calculation agent will adjust such Basket Component or successor equity index in order to arrive at a level of such Basket Component as if it had not been modified (*e.g.*, as if the split or reverse split had not occurred).

Discontinuance of a Basket Component

If a sponsor or publisher of a Basket Component (each, an _ index sponsor) discontinues publication of a Basket Component, and such index sponsor or another entity publishes a successor or substitute Basket Component that the calculation agent determines, in its sole discretion, to be comparable to such Basket Component (a _ successor equity index), then, upon the calculation agent s notification of that determination to the trustee and CIBC, the calculation agent will substitute the successor equity index as calculated by the relevant index sponsor or any other entity and calculate the final component level of such Basket Component as described above. Upon any selection by the calculation agent of a successor equity index, CIBC will cause notice to be given to holders of the securities.

In the event that an index sponsor discontinues publication of a Basket Component prior to, and the discontinuance is continuing on, the Final Valuation Date and the calculation agent determines that no successor equity index is available at such time, the calculation agent will calculate a substitute Closing Level for such Basket Component in accordance with the formula for and method of calculating such Basket Component last in effect prior to the discontinuance, but using only those securities that comprised such Basket Component immediately prior to that discontinuance. If a successor equity index is selected or the calculation agent calculates a level as a substitute for such Basket Component, the successor equity index or level will be used as a substitute for such Basket Component for all purposes, including the purpose of determining whether a market disruption event exists.

If on the Final Valuation Date an index sponsor fails to calculate and announce the level of a Basket Component, the calculation agent will calculate a substitute Closing Level of such Basket Component in accordance with the formula for and method of calculating such Basket Component last in effect prior to the failure, but using only those securities that comprised such Basket Component immediately prior to that failure; *provided* that, if a market disruption event occurs or is continuing on such day with respect to such Basket Component, then the provisions set forth above under Market Disruption Events shall apply in lieu of the foregoing.

Notwithstanding these alternative arrangements, discontinuance of the publication of, or the failure by the relevant index sponsor to calculate and announce the level of, a Basket Component may adversely affect the value of the securities.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

HYPOTHETICAL HISTORICAL PERFORMANCE OF THE BASKET

The Basket will represent an equally weighted portfolio of the following Basket Components, with the return of each Basket Component noted parenthetically: the S&P 500® Index (50%) and the EURO STOXX 50® Index (50%). The value of the Basket will increase or decrease depending upon the performance of the Basket Components. For more information regarding the Basket Components, see the information provided herein and in the accompanying underlying supplement. The Basket does not reflect the performance of all major securities markets.

While historical information on the value of the Basket does not exist for dates prior to the Pricing Date, the following graph sets forth the hypothetical historical daily values of the Basket for the period from January 1, 2014 to April 30, 2019, assuming that the Basket was constructed on January 1, 2014 with a Starting Level of 100 and that each of the Basket Components had the applicable weighting as of such day. We obtained the Closing Levels and other information used by us in order to create the graph below from Bloomberg Professional® Service (Bloomberg) without independent verification.

The hypothetical historical Basket values, as calculated solely for the purposes of the offering of the securities, fluctuated in the past and may, in the future, experience significant fluctuations. Any historical upward or downward trend in the value of the Basket during any period shown below is not an indication that the percentage change in the value of the Basket is more likely to be positive or negative during the term of the securities. The hypothetical historical values do not give an indication of future values of the Basket.

PRS-21

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

THE S&P 500® INDEX

The S&P 500® Index (Bloomberg ticker: SPX <Index>) is calculated, maintained and published by S&P Dow Jones Indices LLC (SPDJI). The SPX consists of stocks of 500 companies selected to provide a performance benchmark for the U.S. equity markets. The top 5 industry groups by market capitalization as of April 30, 2019 were: Information Technology, Health Care, Financials, Communication Services and Consumer Discretionary. See Index Descriptions The S&P U.S. Indices beginning on page S-44 of the accompanying underlying supplement for additional information about the SPX.

In addition, information about the SPX may be obtained from other sources including, but not limited to, SPDJI s website (including information regarding the SPX s sector weightings). We are not incorporating by reference into this pricing supplement the website or any material it includes. Neither we nor the agent makes any representation that such publicly available information regarding the SPX is accurate or complete.

Historical Data of the SPX

We obtained the Closing Levels of the SPX in the graph below from Bloomberg without independent verification. The historical performance of the SPX should not be taken as an indication of future performance, and no assurances can be given as to the Closing Level of the SPX on the Final Valuation Date. We cannot give you assurance that the performance of the SPX will result in any positive return on your initial investment.

The following graph sets forth daily Closing Levels of the SPX for the period from January 1, 2014 to April 30, 2019. The Closing Level on April 30, 2019 was 2,945.83.

PRS-22

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

THE EURO STOXX 50® INDEX

The EURO STOXX 50® Index (Bloomberg ticker: SX5E <Index>) was created by STOXX Limited (STOXX), which is currently owned by Deutsche Börse AG. The SX5E represents the performance of the 50 largest companies among the 19 supersectors in terms of free-float market cap in 11 Eurozone countries. See Index Descriptions The EURO STOXX50® Index beginning on page S-11 of the accompanying underlying supplement for additional information about the SX5E.

In addition, information about the SX5E may be obtained from other sources including, but not limited to, STOXX s website (including information regarding the SX5E s sector weightings). We are not incorporating by reference into this pricing supplement the website or any material it includes. Neither we nor the agent makes any representation that such publicly available information regarding the SX5E is accurate or complete.

Historical Data of the SX5E

We obtained the Closing Levels of the SX5E in the graph below from Bloomberg without independent verification. The historical performance of the SX5E should not be taken as an indication of future performance, and no assurances can be given as to the Closing Level of the SX5E on the Final Valuation Date. We cannot give you assurance that the performance of the SX5E will result in any positive return on your initial investment.

The following graph sets forth daily Closing Levels of the SX5E for the period from January 1, 2014 to April 30, 2019. The Closing Level on April 30, 2019 was 3,514.62.

PRS-23

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

THE ESTIMATED VALUE OF THE SECURITIES

The estimated value of the securities set forth on the cover of this pricing supplement is equal to the sum of the values of the following hypothetical components: (1) a fixed-income debt component with the same maturity as the securities, valued using our internal funding rate for structured debt described below, and (2) the derivative or derivatives underlying the economic terms of the securities. The estimated value does not represent a minimum price at which Wells Fargo Securities or any other person would be willing to buy your securities in any secondary market (if any exists) at any time. The internal funding rate used in the determination of the Bank s estimated value generally represents a discount from the credit spreads for our conventional fixed-rate debt. The discount is based on, among other things, our view of the funding value of the securities as well as the higher issuance, operational and ongoing liability management costs of the securities in comparison to those costs for our conventional fixed-rate debt. For additional information, see Risk Factors Our Estimated Value Is Not Determined By Reference To Credit Spreads For Our Conventional Fixed-Rate Debt in this pricing supplement. The value of the derivative or derivatives underlying the economic terms of the securities is derived from the Bank s or a third party hedge provider s internal pricing models. These models are dependent on inputs such as the traded market prices of comparable derivative instruments and on various other inputs, some of which are market-observable, and which can include volatility, dividend rates, interest rates and other factors, as well as assumptions about future market events and/or environments. Accordingly, the Bank s estimated value of the securities is determined when the terms of the securities are set based on market conditions and other relevant factors and assumptions existing at that time. See Risk Factors Our Estimated Value Does Not Represent Future Values Of The Securities And May Differ From Others Estimates in this pricing supplement.

The Bank s estimated value of the securities will be lower than the principal amount of the securities because costs associated with selling, structuring and hedging the securities are included in the principal amount of the securities. These costs include the selling commissions paid to affiliated or unaffiliated dealers, the projected profits that our hedge counterparties, which may include our affiliates, expect to realize for assuming risks inherent in hedging our obligations under the securities and the estimated cost of hedging our obligations under the securities. Because hedging our obligations entails risk and may be influenced by market forces beyond our control, this hedging may result in a profit that is more or less than expected, or it may result in a loss. We or one or more of our affiliates will retain any profits realized in hedging our obligations under the securities. See Risk Factors Our Estimated Value of the Securities Will Be Lower Than The Original Offering Price Of The Securities in this pricing supplement.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

SUPPLEMENTAL PLAN OF DISTRIBUTION

The securities will be purchased by Wells Fargo Securities as principal, pursuant to a distribution agreement between Wells Fargo Securities and us. We have agreed to pay certain of Wells Fargo Securities expenses in connection with the offering of the securities.

Wells Fargo Securities proposes to offer the securities to certain securities dealers, including securities dealers acting as custodians, at the principal amount of the securities less a concession not in excess of $15.00 per security. Such securities dealers may include WFA. In addition to the selling concession allowed to WFA, Wells Fargo Securities will pay $0.75 per security of the underwriting discount to WFA as a distribution expense fee for each security sold by WFA.

We expect to deliver the securities against payment therefor in New York, New York on a date that is more than two Business Days following the Pricing Date. Under Rule 15c6-1 of the Securities Exchange Act of 1934, trades in the secondary market generally are required to settle in two Business Days, unless the parties to any such trade expressly agree otherwise. Accordingly, purchasers who wish to trade securities on any date prior to two Business Days before delivery will be required to specify alternative settlement arrangements to prevent a failed settlement.

The principal amount of the securities includes the underwriting discount received by Wells Fargo Securities and the projected profit that our hedge counterparties expect to realize in consideration for assuming the risks inherent in hedging our obligations under the securities. We expect to hedge our obligations through an affiliate of Wells Fargo Securities, one of our affiliates and/or another unaffiliated counterparty. 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. The underwriting discount and projected profit of our hedge counterparties reduce the economic terms of the securities. In addition, the fact that the principal amount includes these items is expected to adversely affect the secondary market prices of the securities. These secondary market prices are also likely to be reduced by the cost of unwinding the related hedging transaction. See Use of Proceeds and Hedging in the underlying supplement.

The Bank, Wells Fargo Securities or any of our respective affiliates may use this pricing supplement in market-making transactions in the securities after their initial sale. However, it is not obligated to do so and may discontinue making a market at any time without notice.

Selling Restrictions

Argentina

CIBC s Senior Global 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 underlying supplement, prospectus supplement and prospectus have not been submitted to the Comissão de Valores Mobiliáros 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 underlying supplement, 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

Neither this pricing supplement nor the accompanying underlying supplement, prospectus supplement or prospectus constitutes an offer to sell or the solicitation of an offer to buy any securities in the People s Republic of China (excluding Hong Kong, Macau and Taiwan, the PRC) to any person to whom it is unlawful to make the offer or solicitation in the PRC. The Issuer does not represent that this document may be lawfully distributed, or that any securities may be lawfully offered, in compliance with any applicable registration or other requirements in the PRC, or pursuant to an exemption available thereunder, or assume any responsibility for facilitating any such distribution or offering. Neither this document nor any advertisement or other offering material may be distributed or published in the PRC, except under circumstances that will result in compliance with any applicable laws and regulations.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

European Economic Area

The securities may not be offered, sold or otherwise made available to any retail investor in the European Economic Area. For the purposes of this provision:

(a) the expression retail investor means a person who is one (or more) of the following:

(i) a retail client as defined in point (11) of Article 4(1) of Directive 2014/65/EU (as amended, MiFID II);

(ii) a customer within the meaning of Directive 2002/92/EC, where that customer would not qualify as a professional client as defined in point (10) of Article 4(1) of MiFID II; or

(iii) not a qualified investor as defined in Directive 2003/71/EC; and

(b) 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 offered so as to enable an investor to decide to purchase or subscribe the securities.

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 underlying supplement, 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.

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.

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.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

SUMMARY OF U.S. FEDERAL INCOME TAX CONSEQUENCES

The following discussion is a brief summary of the material U.S. federal income consequences relating to an investment in the securities. The following summary is not complete and is both qualified and supplemented by, or in some cases supplements, the discussion entitled Certain U.S. Federal Income Tax Consequences beginning on page S-59 of the underlying supplement, which you should carefully review prior to investing in the securities.

The U.S. federal income tax consequences of your investment in the securities are uncertain. No statutory, judicial or administrative authority directly discusses how the securities should be treated for U.S. federal income tax purposes. In the opinion of our tax counsel, Mayer Brown LLP, it would generally be reasonable to treat the securities as prepaid cash-settled derivative contracts. Pursuant to the terms of the securities, you agree to treat the securities in this manner for all U.S. federal income tax purposes. If your securities are so treated, you should generally recognize capital gain or loss upon the sale, exchange, redemption or payment on maturity in an amount equal to the difference between the amount you receive at such time and the amount that you paid for your securities. Such gain or loss should generally be long-term capital gain or loss if you have held your securities for more than one year.

The characterization described above is not binding on the U.S. Internal Revenue Service (the IRS) or the courts. Thus, it is possible that the IRS would seek to characterize your securities in a manner that results in tax consequences to you that are different from those described above or in the accompanying underlying supplement. For a more detailed discussion of certain alternative characterizations with respect to your securities and certain other considerations with respect to your investment in the securities, you should consider the discussion set forth in Certain U.S. Federal Income Tax Consequences of the underlying supplement. We are not responsible for any adverse consequences that you may experience as a result of any alternative characterization of the securities for U.S. federal income tax or other tax purposes.

Regarding the discussion in the underlying supplement with respect to a dividend equivalent payment made with respect to a U.S. stock or equity-linked debt instrument under the section entitled *Tax Consequences to Non-U.S. Holders*, the IRS has issued a Notice that excludes financial products issued prior to 2021 that are not delta-one with respect to underlying securities that could pay withholdable dividend equivalent payments. Even if the securities should be treated as equity-linked instruments, since the securities should be considered to reference indices, each of which should be treated as a qualified index, the securities should be exempt from the withholding tax rules specified for dividend equivalents.

You should consult your tax advisor as to the tax consequences of such characterization and any possible alternative characterizations of the securities for U.S. federal income tax purposes. You should also consult your tax advisor concerning the U.S. federal income tax and other tax consequences of your investment in the securities in your particular circumstances, including the application of state, local or other tax laws and the possible effects of changes in federal or other tax laws.

Market Linked Securities Leveraged Upside Participation

to a Cap and Fixed Percentage Buffered Downside

Principal at Risk Securities Linked to an Equity Index Basket due December 7, 2020

CERTAIN CANADIAN FEDERAL INCOME TAX CONSIDERATIONS

In the opinion of Blake, Cassels & Graydon LLP, our Canadian tax counsel, the following summary describes the principal Canadian federal income tax considerations under the *Income Tax Act* (Canada) and the regulations thereto (the Canadian Tax Act) generally applicable at the date hereof to an investor who acquires beneficial ownership of a security pursuant to this pricing supplement and who for the purposes of the Canadian Tax Act and at all relevant times: (a) is neither resident nor deemed to be resident in Canada; (b) deals at arm s length with the Issuer and any transferee resident (or deemed to be resident) in Canada to whom the investor disposes of the security; (c) does not use or hold and is not deemed to use or hold the security in, or in the course of, carrying on a business in Canada; (d) is entitled to receive all payments (including any interest and principal) made on the security, and (e) is not a, and deals at arm s length with any, specified shareholder of the Issuer for purposes of the thin capitalization rules in the Canadian Tax Act (a Non-Resident Holder). A specified shareholder for these purposes generally includes a person who (either alone or together with persons with whom that person is not dealing at arm s length for the purposes of the Canadian Tax Act) owns or has the right to acquire or control or is otherwise deemed to own 25% or more of the Issuer s shares determined on a votes or fair market value basis. Special rules which apply to non-resident insurers carrying on business in Canada and elsewhere are not discussed in this summary.

This summary is supplemental to and should be read together with the description of material Canadian federal income tax considerations relevant to a Non-Resident Holder owning securities under Material Income Tax Consequences Canadian Taxation in the accompanying prospectus and a Non-Resident Holder should carefully read that description as well.

This summary is of a general nature only and is not intended to be, nor should it be construed to be, legal or tax advice to any particular Non-Resident Holder. Non-Resident Holders are advised to consult with their own tax advisors with respect to their particular circumstances.

Based on Canadian tax counsel s understanding of the Canada Revenue Agency s administrative policies, and having regard to the terms of the securities, interest payable on the securities should not be considered to be participating debt interest as defined in the Canadian Tax Act and accordingly, a Non-Resident Holder should not be subject to Canadian non-resident withholding tax in respect of amounts paid or credited or deemed to have been paid or credited by the Issuer on a security as, on account of or in lieu of payment of, or in satisfaction of, interest.

Non-Resident Holders should consult their own tax advisors regarding the consequences to them of a disposition of the securities to a person with whom they are not dealing at arm s length for purposes of the Canadian Tax Act.