Taxonomy

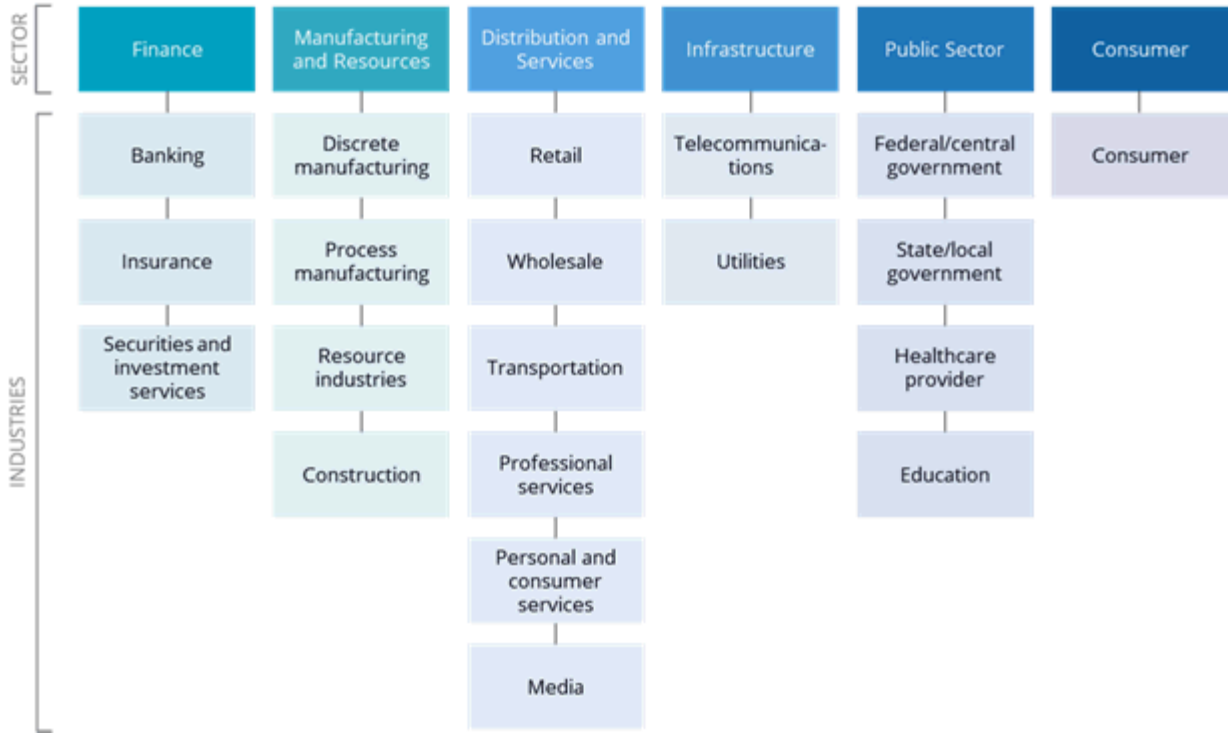
IDC's Worldwide Semiannual Blockchain Spending Guide Taxonomy, 1H18

Jessica Goepfert
Yash Ahuja
Roberto Membrila
Stacey Soohoo
Eman Elshewy
Jonathan Leung
James Wester
Ashutosh Bisht
Ivana Slaharova
Carla La Croce
Yoko Ono
Mohamed Hefny

IDC'S WORLDWIDE SEMIANNUAL BLOCKCHAIN SPENDING GUIDE TAXONOMY

FIGURE 1

IDC's Standard Industries



Source: IDC, 2019

IDC's Worldwide Semiannual Blockchain Spending Guide taxonomy is intended to provide a framework to categorize and relate technology elements within this fast-growing market. This document contains definitions for all the industries, use cases, and technologies contained within IDC's Worldwide Semiannual Blockchain Spending Guide. It also provides an overview of IDC's standard vertical and company classification systems and methodology.

February 2019, IDC #US44734619

This IDC taxonomy:

- Defines blockchain as a digital, distributed ledger of transactions or records; distributed ledgers technology (DLT) allows new transactions to be added to an existing chain of transactions using a secure digital signature
- Provides a definitional guide to IDC's blockchain forecasts, spending guide, and related research documents
- Serves as a framework for how IDC organizes its blockchain research and forecasts, in addition to providing details on IDC's forecast methodology for this evolving area

SEMIANNUAL BLOCKCHAIN SPENDING GUIDE TAXONOMY CHANGES FOR 1H18

There are no technology, industry, or use case taxonomy changes in this version of the Worldwide Semiannual Blockchain Spending Guide, compared with the 2H17 version published in July. That is, the scope of coverage in terms of spending captured in the Worldwide Semiannual Blockchain Spending Guide has not changed. There are some updates to how IDC defines and looks at blockchain types, specifically permissionless and permissioned blockchains. In addition, a definition of blockchain as a service (BaaS) has been provided, along with a clarification on the distinction between distributed ledger technology and blockchain technology. An expanded definition of tokens has been provided within the exclusion section to provide additional insight on the addressable market.

In addition, alignment to the latest IDC software and service taxonomies were made. For details of software or service taxonomy changes, please refer to *IDC's Worldwide Semiannual IT Spending Guide by Industry and Company Size Taxonomy, 2019* (forthcoming).

TAXONOMY OVERVIEW

This IDC study provides a detailed description of IDC's Worldwide Semiannual Blockchain Spending Guide taxonomy. For 2019, this taxonomy includes a description of the technologies as well as the industries and use cases. It also provides an explanation of IDC's blockchain market forecast methodology.

What Is a Vertical Industry?

A vertical industry is the set of all economic entities that offer goods and/or services designed to meet the specific needs of a group of customers or constituents. It is a well-defined segment as opposed to a broad, generic, and less-specialized market. Because IDC's vertical research is rooted in deep economic and firmographic data, our taxonomy classification process parallels that of economic classification systems whereby we arrange organizations into groupings based on similar processes, products, services, and other behaviors and characteristics.

IDC's vertical market research is grounded on data of the worldwide economies. Our models and forecasts are based on the highest availability of statistical sources on the economy. Key economic data and inputs include:

- The number of organizations by industry
- The number of employees by industry
- Revenue by industry

- GDP by industry
- Investment climate business surveys

Thus, when selecting the vertical industries for the taxonomy, we incorporate data from key reference code systems such as:

- The **Strategic Intelligence Center (SIC)** for the Americas and Asia/Pacific regions
- The **NACE Rev. 2** for Western Europe, Central Europe, and the Middle East and Africa
- The **International Standard Industrial Classification (ISIC)** for reference in building up internationally comparable statistics on a worldwide basis
- The **Japan Standard Industrial Classification (JSIC)** for Japan

Economic Entities, Enterprises, and Establishments

An economic entity is a producing unit, organization, or business. In our standard taxonomy and forecasting methodology, economic entities are recognized at the enterprise level (as opposed to the establishment level). For classification purposes, the definition of an enterprise goes beyond the broad colloquial concept of a business or an organization. Rather, an enterprise implies ownership of, or control over, legal, administrative, and fiduciary arrangements and organizational structures and resources to achieve objectives. Whenever possible, in IDC research, an enterprise has a common information system (IS) strategy and associated budget and decision making. The business strategy of the enterprise is reliant upon the various parts of the organization working together. An establishment, on the other hand, can be thought of as a single physical location or local unit where business is conducted. An enterprise may be made up of many establishments, or in the case where an enterprise is a single-location organization, the concept of enterprise and local unit/establishment coincides.

As noted previously, a vertical industry is made up of a group of enterprises that share common production and distribution of goods and services. Although an enterprise may operate in several product or service areas, IDC aggregates vertical industries based on the enterprise's principal activity as determined by the value contributed to the organization relative to other activities. For example, in the United States, this is referred to as the organization's primary SIC code. The NACE system is used in Europe to determine the enterprise's principal activity.

IDC's Sectors and Associated Primary Vertical Markets

The objective of IDC's vertical industry taxonomy is to study and analyze IT adoption, spending, and trends in a worldwide consistent fashion. It is intended to assist organizations with their strategy, marketing, planning, sales, and operations. With this objective in mind, IDC has defined 20 primary vertical markets, which are collectively exhaustive and mutually exclusive. Refer back to Figure 1 that lists the IDC industry taxonomy by primary sectors and vertical market industries.

Table 1 defines and provides company examples for each of IDC's primary vertical markets and sectors. IDC's Worldwide Semiannual Blockchain Spending Guide presents the market opportunity for all of these industries with the exception of consumer. Consumer is currently excluded from the blockchain definition.

Table 1 defines each of these industries by SIC, NACE, and JSIC codes.

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
Finance	Banking	Citigroup, Bank of America, Wells Fargo & Co., Bank of New York Mellon Corp., Ameribank Corp., Santander, American Express	6011, 6019, 6021, 6022, 6029, 6035, 6036, 6061, 6062, 6081, 6082, 6091, 6099, 6111, 6141, 6153, 6159, 6162, 6163	64	62, 63, 64
	Insurance	AIG, UnitedHealth Group, Anthem Inc. (formerly WellPoint Health Networks Inc.), Allstate Corp., Aflac Inc., Marsh & McLennan Companies Inc.	6311, 6321, 6324, 6331, 6351, 6361, 6371, 6399, 6411	65	67
	Securities and investment services	Merrill Lynch & Co., Morgan Stanley, Goldman Sachs Group Inc., Simon Property Group Inc., Equity Office Properties Trust	6211, 6221, 6231, 6282, 6289, 6712, 6719, 6722, 6726, 6732, 6733, 6792, 6794, 6798, 6799	66	65, 66
Manufacturing and resources	Discrete manufacturing	Bombardier, Boeing, United Technologies, Ford, General Motors, Polo Ralph Lauren Corp., Intel, AMD, IBM, Apple, Caterpillar	23–25, 31, 34–38, all of 39 excluding 3911, 3914, 3915, 3996, 3999	14, 15, 16, 25, 26, 27, 28, 29, 30, 31, 32	11 (116–119), 13, 20, 25, 26, 27, 28, 29, 30, 31, 32
	Process manufacturing	Dow Chemical, DuPont, Kaiser Aluminum Co., Alcoa, International Paper Co., Reynolds Group, Nestlé, Tyson Foods, Unilever, P&G Co., PepsiCo, Coca-Cola, Bare Escentuals Inc., BP, ConocoPhillips, Tupperware, ExxonMobil	20–22, 26, 28–30, 32–33, 3911, 3914, 3915, 3996	10, 11, 12, 13, 17, 19, 20, 21, 22, 23, 24	9, 10, 11 (110–115), 12, 14, 16, 17, 18, 19, 21, 23, 24)

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Construction	Toll Brothers Inc., PulteGroup Inc., D.R. Horton Inc., Lennar Corp., Dycom Industries Inc., MasTec Inc.	1521, 1522, 1531, 1541, 1542, 1611, 1622, 1623, 1629, 1711, 1721, 1731, 1741, 1742, 1743, 1751, 1752, 1761, 1771, 1781, 1791, 1793, 1794, 1795, 1796, 1799	41, 42, 43	6, 7, 8
	Resource industries	Chiquita Brands, Fresh Del Monte Produce Inc., Schlumberger Ltd., Blue Diamond Growers, Arch Coal, Consol Energy Inc., Marathon Oil Corp., Apache Corp., Freeport-McMoRan Inc.	111, 112, 115, 116, 119, 131, 132, 133, 134, 139, 161, 171, 172, 173, 174, 175, 179, 181, 182, 191, 211, 212, 213, 214, 219, 241, 251, 252, 253, 254, 259, 271, 272, 273, 279, 291, 711, 721, 722, 723, 724, 741, 742, 751, 752, 761, 762, 781, 782, 783, 811, 831, 851, 912, 913, 919, 921, 971, 1011, 1021, 1031, 1041, 1044, 1061, 1081, 1094, 1099, 1221, 1222, 1231, 1241, 1311, 1321, 1381, 1382, 1389, 1411, 1422, 1423, 1429, 1442, 1446, 1455, 1459, 1474, 1475, 1479, 1481, 1499	1, 2, 3, 5, 6, 7, 8, 9	1, 2, 3, 4, 5

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
Distribution and services	Retail	Best Buy, Pathmark, Home Depot, Walmart, Amazon, Target, Whole Food Market, TJX Companies Inc., Nordstrom Inc., CVS Health Corp., Sherwin-Williams Co.	5211, 5231, 5251, 5261, 5271, 5311, 5331, 5399, 5411, 5421, 5431, 5441, 5451, 5461, 5499, 5511, 5521, 5531, 5541, 5551, 5561, 5571, 5599, 5611, 5621, 5632, 5641, 5651, 5661, 5699, 5712, 5713, 5714, 5719, 5722, 5731, 5734, 5735, 5736, 5812, 5813, 5912, 5921, 5932, 5941, 5942, 5943, 5944, 5945, 5946, 5947, 5948, 5949, 5961, 5962, 5963, 5983, 5984, 5989, 5992, 5993, 5994, 5995, 5999	45, 47, 56	56, 57, 58, 59, 60, 61, 76, 77
	Wholesale	Tech Data Corp., Anixter International Inc., McKesson Corp., Cardinal Health Inc., Sysco Corp., Unified Grocers Inc.	5012, 5013, 5014, 5015, 5021, 5023, 5031, 5032, 5033, 5039, 5043, 5044, 5045, 5046, 5047, 5048, 5049, 5051, 5052, 5063, 5064, 5065, 5072, 5074, 5075, 5078, 5082, 5083, 5084, 5085, 5087, 5088, 5091, 5092, 5093, 5094, 5099, 5111, 5112, 5113, 5122, 5131, 5136, 5137, 5139, 5141, 5142, 5143, 5144, 5145, 5146, 5147, 5148, 5149, 5153, 5154, 5159, 5162, 5169, 5171, 5172, 5181, 5182,	46	50, 51, 52, 53, 54, 55

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
			5191, 5192, 5193, 5194, 5198, 5199		
	Professional services	Microsoft, Accenture, Deloitte, Google, Facebook Inc., SAP, Fujitsu Inc., PayPal Holdings Inc.	6512, 6513, 6514, 6515, 6517, 6519, 6531, 6541, 6552, 6553, 7311, 7312, 7313, 7319, 7322, 7323, 7331, 7334, 7335, 7336, 7338, 7342, 7349, 7352, 7353, 7359, 7361, 7363, 7371, 7372, 7373, 7374, 7375, 7376, 7377, 7378, 7379, 7381, 7382, 7383, 7384, 7389, 7513, 7514, 7515, 7519, 7521, 7532, 7533, 7534, 7536, 7537, 7538, 7539, 7542, 7549, 7622, 7623, 7629, 7631, 7641, 7692, 7694, 7699, 8111, 8711, 8712, 8713, 8721, 8731, 8732, 8733, 8734, 8741, 8742, 8743, 8744, 8748, 8999	33, 58.2, 62, 63, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 80, 81, 82	39, 40, 68, 69, 70, 71, 72, 73, 74, 85, 87, 89, 90, 91, 92, 93, 94, 95, 96, 99
	Personal and consumer services	Marriott International, Wynn Las Vegas LLC, Six Flags Entertainment Corp., AMC Entertainment Holdings Inc., DHX Media Ltd., The American Red Cross, Goodwill Industries, Museum of Modern Art	7011, 7021, 7032, 7033, 7041, 7211, 7212, 7213, 7215, 7216, 7217, 7218, 7219, 7221, 7231, 7241, 7251, 7261, 7291, 7299, 7822, 7829, 7832, 7833, 7841, 7911, 7922, 7929, 7933, 7941, 7948, 7991, 7992, 7993, 7996, 7997, 7999, 8322, 8331, 8412, 8422, 8611,	55, 59.13, 59.14, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99	75, 78, 79, 80, 94

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
			8621, 8631, 8641, 8651, 8661, 8699		
	Transportation	Union Pacific Railroad Co., Greyhound Lines Inc., United States Postal Service, FedEx Corp., Werner Enterprises, Royal Caribbean Cruises, American Airlines Group Inc., Delta Airlines Inc., Plains All American Pipeline	4011, 4013, 4111, 4119, 4121, 4131, 4141, 4142, 4151, 4173, 4212, 4213, 4214, 4215, 4221, 4222, 4225, 4226, 4231, 4311, 4412, 4424, 4432, 4449, 4481, 4482, 4489, 4491, 4492, 4493, 4499, 4512, 4513, 4522, 4581, 4612, 4613, 4619, 4724, 4725, 4729, 4731, 4741, 4783, 4785, 4789	49, 50, 51, 52, 53, 79	42, 43, 44, 45, 46, 47, 48, 49, 86
	Media	New York Times Co., Time Warner Inc., News Corp., The Walt Disney Co., CBS Corp., Comcast, 21st Century Fox America Inc.	2711, 2721, 2731, 2732, 2741, 2752, 2754, 2759, 2761, 2771, 2782, 2789, 2791, 2796, 4832, 4833, 4841, 7812, 7819	18, 58.1, 59.11, 59.12, 59.2, 60	15, 38, 41
Infrastructure	Telecommunica-tions	AT&T Inc., Verizon Communications Inc.	4812, 4813, 4822, 4899	61	37
	Utilities	Commonwealth Edison Co., Waste Management Inc., National Grid, Duke Energy	3999, 4911, 4923, 4924, 4925, 4931, 4932, 4939, 4941, 4952, 4953, 4959, 4961, 4971, 4922	35, 36, 37, 38, 39	33, 34, 35, 36, 88
Public sector	Healthcare provider	Magellan Health Services, Brigham and Women's Hospital, Mayo Clinic, Kindred Healthcare Inc., Quest Diagnostics Inc.	8011, 8021, 8031, 8041, 8042, 8043, 8049, 8051, 8052, 8059, 8062, 8063, 8069, 8071, 8072, 8082, 8092, 8093, 8099, 8351, 8361, 8399	86, 87, 88	83, 84

TABLE 1

IDC's Worldwide Sector and Vertical Taxonomy: Company Examples of Primary Markets by SIC Codes, NACE Codes, and JSIC

Sector	Primary Vertical Market	Example Organizations	SIC Codes	NACE Codes	JSIC
	Federal/central government	Department of Defense, Department of Health and Human Services, Department of Justice	9111, 9121, 9131, 9199, 9211, 9221, 9222, 9223, 9224, 9229, 9311, 9411, 9431, 9441, 9451, 9511, 9512, 9531, 9532, 9611, 9621, 9631, 9641, 9651, 9661, 9711, 9721	Part of 84	97
	State/local government	City of New York Police Department, California Department of Transportation, Massachusetts Department of Health and Human Services (including Mass Health insurer)	9111, 9121, 9131, 9199, 9211, 9221, 9222, 9223, 9224, 9229, 9311, 9411, 9431, 9441, 9451, 9511, 9512, 9531, 9532, 9611, 9621, 9631, 9641, 9651, 9661, 9711, 9721	Part of 84	98
	Education	University of Notre Dame, Framingham High School, Apollo Education Group Inc., Milton Academy	8211, 8221, 8222, 8231, 8243, 8244, 8249, 8299	85	81, 82
NA	Consumer	The consumer segment encompasses all home purchases by and for private households. Home-based businesses, however, are captured in the 1–9 employee segment and are classified in the appropriate primary vertical (typically in professional services).	NA	NA	NA

Source: IDC's Customer Insights and Analysis Group, 2019

DEFINITIONS

IDC defines blockchain as a digital, distributed ledger of transactions or records. The ledger, which stores the information or data, exists across multiple participants in a peer-to-peer network. There is no single central repository that stores the ledger. Distributed ledgers technology (DLT) allows new transactions to be added to an existing chain of transactions using a secure digital or cryptographic signature.

IDC defines blockchain as a digital, distributed ledger of transactions or records.

The underlying processes supporting blockchain ledgers are the blockchain protocols that aggregate, validate, and relay transactions within the blockchain network. New blocks of transactions can be added to existing blockchains and dispersed to other parts of the blockchain network. Blockchain technology allows the data to exist on a network of instances or "nodes," allowing for copies of the ledger to exist rather than being managed in one centralized instance, as seen in many traditional systems. Nodes within the network contain a complete copy of the entire ledger, making it available to those that can access the network.

Blockchain is designed to be an incorruptible, decentralized network with enhanced security properties, allowing data and transactions to be transparent to members of the distributed ledger.

Key Characteristics of Blockchain

Table 2 summarizes and explains some of the characteristics that distinguish blockchain from traditional, centralized databases or similar technologies.

TABLE 2

Characteristics of Blockchain

Characteristic	Explanation
Distributed	This is a critical area that distinguishes blockchain from traditional databases. A connected and synchronized system of nodes allow transactions to be stored on the network, guaranteeing the validity of a recorded transaction. As the blockchain is distributed, it eliminates the risks that come with data being held or validated centrally as everyone has access to the ledger.
Decentralized consensus	Decentralization eliminates the role of a designated administrator to approve, clear, and settle transactions on the ledger. The ledger or blockchain's protocols process, validate, or authenticate what goes into the ledger, allowing the process to be automatic. This differs from the centralized database that most companies use today. Before a transaction is executed, agreement in the form of a digital signature must be made, preventing inaccurate or fraudulent transactions from being added to the network.
Transparency	Transparency comes with blockchain-based time-stamping of a date and location. As each transaction and asset has a distinguished provenance, improved trust among participants of the blockchain may result.
Incorruptible	Blockchain creates an immutable record of all transactions that have occurred on the distributed ledger. Once a transaction has been recorded, it can never be changed. Subsequent transactions can be recorded to change the asset, but the original record will remain on the blockchain.

Source: IDC's Customer Insights and Analysis Group, 2019

Blockchain Types

There are multiple models evolving to separate blockchain types into categories. IDC separates blockchains into two main types:

- Permissionless blockchain
- Permissioned blockchain

As the market evolves, the types of blockchain have gradually transitioned from a focus on public, private, or federated/consortium blockchains to a focus on permissionless and permissioned blockchains. This transition is driven by a larger focus on user authorization and trust (i.e., what a user can do) rather than user authentication and anonymity (i.e., who the user is). IDC has chosen to look at blockchain types from the perspective of user authorization and the distinction between permissionless and permissioned blockchains.

Permissionless Blockchain

A permissionless blockchain allows anyone to access and contribute data to the blockchain. This is a truly decentralized blockchain with no single authority granting privileges to change the database. Instead, consensus algorithms selected to support a permissionless blockchain handle approving changes and edits. For some industries and organizations, a permissionless blockchain will present serious issues regarding latency, privacy, security, risk, and compliance. Financial services and healthcare providers, for instance, will likely avoid permissionless blockchains because of regulations regarding privacy and security. However, there are use cases where the truly open and decentralized nature of a permissionless blockchain offers an attractive alternative, especially in applications where the cost to build and maintain a database are not outweighed by the benefits. Examples include the Decentralized News Network (DNN), which combines news creation with decentralized networks to deliver news and content that is curated by the community. Writers produce news content that is reviewed and fact-checked before being published and rewarded with tokens. In this instance, a permissionless blockchain allows for a self-sustaining model that focuses on the accuracy of content rather than advertising revenue or corporate interests. Some additional use cases would include public records like identity or property ownership.

Permissioned Blockchain

Permissioned blockchains allow only entities with the requisite access rights to add, view, and/or edit data in the blockchain. Permissioned does not imply a central owner or authority necessarily. Permissioned blockchains can be built to be "open," in the sense that any party can view data in the database, but the existence of rights that can limit what type of access parties can have is what makes a blockchain permissioned. In addition, permissioned blockchains can be built to provide levels of privacy as well. Permissioned blockchains will be the likely preferred option for enterprise applications, especially for firms in regulated industries, and by regulators themselves, as access to view data and history can be granted as necessary or required by regulators. Ripple is a prime example of a permissioned blockchain. In this instance, the network owner has control over who can be a transaction validator, providing banks and other financial institutions the security and stability current SWIFT banking systems cannot.

Blockchain as a Service

Blockchain as a service is in the provision of infrastructure, software, and/or platform services by a third party to assist clients with the development and/or management of their blockchain initiatives.

BaaS allows customers to leverage cloud-based solutions and adopt blockchain technology without investing or developing the blockchain solution in-house. For example, BaaS offers enterprises the ability to outsource infrastructure such as network, storage, and management to build blockchain implementations and applications. In addition, blockchain-as-a-service offerings provide enterprises with support for various protocols that help enterprises build implementations and applications. This spending is not currently captured in IDC's Worldwide Semiannual Blockchain Spending Guide.

Distributed Ledger Technology Versus Blockchain

While the terms *distributed ledger technology* and *blockchain* have been used interchangeably, from a technological standpoint, they are not the same. Distributed ledger technology is an umbrella term that is used to describe technologies which distribute information, data, or records. R3's Corda is an example of a distributed ledger. Blockchain is one form of distributed ledger technology, as not all distributed ledgers require a chain of blocks to aggregate, validate, and relay transactions in a secure manner. A blockchain's structure and use of blocks that are linked to one another allows it to be secure through cryptographic signatures. While every blockchain is a distributed ledger, not every distributed ledger is a blockchain. IDC has chosen to focus on the blockchain market but also address related technologies that fall within distributed ledger technology.

Exclusions

The initial application of blockchain to cryptocurrencies like Bitcoin has spawned a great deal of interest and investment as it represents a disruptive way of allocating and valuing resources, either physical or digital. Cryptocurrencies are a subset of the larger topic of tokens and that topic is seeing significant investment, especially in venture capital. However, the spending surrounding most types of tokens, especially cryptocurrencies, is excluded in IDC's Worldwide Semiannual Blockchain Spending Guide. Spending surrounding utility, asset, and security/equity tokens are, however, included in IDC's Worldwide Semiannual Blockchain Spending Guide.

There are multiple frameworks evolving to separate tokens into categories, but IDC separates tokens into four main types:

- Cryptocurrencies/currency token
- Utility tokens
- Asset tokens
- Security/equity tokens

Cryptocurrency or Currency Token

Cryptocurrencies like Bitcoin and Litecoin are a type of digital currency that is intended to be a store of value and a medium of exchange. Unlike a fiat currency, meaning a currency distributed by a state or government, the value of a cryptocurrency is not pegged to anything but is instead established by a community and is determined by its ability to purchase goods and services.

As spend toward these currency tokens are excluded from IDC's Worldwide Semiannual Blockchain Spending Guide, any spend toward hardware, software, or services for the purpose of mining cryptocurrency are also excluded and firms or companies involved in mining (Bitmain, Bitfury, etc.) are also excluded from the IDC's Worldwide Semiannual Blockchain Spending Guide.

Utility Token

Utility tokens are the digital representation of an underlying commodity or service. The value of the underlying commodity or service can be physical (e.g., similar to a commodities contract for oil or corn) or digital (e.g., access to a network). Regardless of what the underlying asset is, these assets are fungible, meaning the items are indistinguishable from one another.

Asset Token

Asset tokens are similar to utility tokens in that the value of the token is tied to an underlying asset. However, the underlying asset connected to the token is not fungible; for instance, the token could represent ownership of a particular plot of land, automobile, or diamond. In addition, the token could represent ownership of a digital asset or intellectual property such as a song or patent.

Security or Equity Token

A security/equity token is similar to a stock and represents ownership of a corporation or company. The security/equity token carries with it equity in the organization and, depending on the way the token is distributed, can convey certain rights to the token holder (e.g., voting rights or dividend distribution).

Addressable Market

IDC views the potential opportunity for blockchain by use case. This approach establishes a rich vocabulary and framework to enable meaningful conversations between vendors and clients by painting a vivid, specific portrait of the potential end state. An IDC use case is a conceptual framework that provides a view of business value that is created when a set of technologies come together. Use cases are not defined by the technology itself. Rather, the parameters of a use case are defined by the value being created and recognized by an organization. Use cases can be categorized according to three primary benefits they provide:

- Creation of new products and services
- Optimizing operations
- Transforming the customer experience/creating customer loyalty

For each industry segmented in IDC's Worldwide Semiannual Blockchain Spending Guide, we have selected key use cases and developed adoption models. We selected the use cases that represent the majority of blockchain spending today. Our models allow for "other" use cases beyond those listed to account for the "long tail" opportunities that lie outside these key examples. These models help better imagine blockchain technology-fueled business scenarios that have the potential to transform existing industry processes and businesses.

Table 3 lists the use cases IDC is including in the Worldwide Semiannual Blockchain Spending Guide. This list will be frequently refined as some use cases are retired and new use cases become valid.

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
Banking	Cross-border payments and settlements	Tracking, tracing, and managing cross-border/international payments and settlements; creates alternate payment and settlement "rails" built for immediate payment and settlement
	Custody and asset tracking	Maintain immutable records of financial agreements and asset ownership; blockchain is used to digitally represent a record of ownership in order to significantly reduce settlement time and eliminate the need for paper; includes the record management of various assets such as cash, loans, and mortgages property
	Identity management	Identity management and confirmation (includes digital signature management); authenticate identities, manage personal and financial data, and assist in identity as a service
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; includes post-transaction settlement processes (e.g., loan contract paperwork, payments and other financial assets)
	Transaction agreements	Enforce and execute commercial transactions and agreements through smart contracts such as smart property contracts; enforceable agreements that are automatically executed on a distributed ledger when conditions set by all involved parties are met
	Others	Includes all other blockchain use cases in banking not elsewhere classified, such as loyalty programs and others
Insurance	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
	Claims processing, filing, and management	Process claims and assist in claims adjudication and payment reconciliation; ease the transfer of data and premium payments between insurers, consumers, brokers, reinsurers, and other parties; includes the following types of insurance: medical insurance, parametric insurance, and microinsurance
	Others	Includes all other blockchain use cases in insurance not elsewhere classified, such as risk provenance, asset usage history, and identity management
Securities and investment services	Custody and asset tracking	Maintain immutable records of financial agreements and asset ownership; blockchain is used to digitally represent a record of ownership in order to significantly reduce settlement time and eliminate the need for paper; includes the record management of stocks and bonds and their associated certificates of ownership
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Others	Includes post-trade settlements, sharing ownership records, investment analysis, and all other blockchain applications in securities and investment services not elsewhere classified
Discrete manufacturing	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; create a digital paper trail of the movement of goods; includes monitoring the movement of merchandise, goods, and materials and registering each leg of a trip or movement throughout the supply/value chain or manufacturing process
	Cross-border payments and settlements	Tracking, tracing, and managing cross-border/international payments and settlements; creates alternate payment and settlement "rails" built for immediate payment and settlement

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking equipment that is used within the manufacturing process or supply/value chain and monitoring product parts and services that were performed
	Lot lineage/provenance	Verify origin and authenticity of a product as it moves throughout the value chain; captures information about all inputs of a product, enabling accurate visibility and traceability into the history of a product; includes product and brand counterfeit/fraud detection, reduction, and prevention and maintaining records to assist in quality control; can include environmental impacts on the product, such as storage container conditions, as the product is transported
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; can include banks, financial institution, brokers, suppliers, manufacturers, retailers, wholesalers, and others involved in the transaction
	Warranty claims	Track, maintain, and validate virtual warranties and warranty claims
	Others	Includes all other blockchain use cases in discrete manufacturing not elsewhere classified
Process manufacturing	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; create a digital paper trail of the movement of goods; includes monitoring the movement of merchandise, goods, and materials and registering each leg of a trip or movement throughout the supply/value chain or manufacturing process

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
	Cross-border payments and settlements	Tracking, tracing, and managing cross-border/international payments and settlements; creates alternate payment and settlement "rails" built for immediate payment and settlement
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking equipment that is used within the manufacturing process or supply/value chain and monitoring product parts and services that were performed
	Lot lineage/provenance	Verify origin and authenticity of a product as it moves throughout the value chain; captures information about all inputs of a product, enabling accurate visibility and traceability into the history of a product; includes product and brand counterfeit/fraud detection, reduction, and prevention and maintaining records to assist in quality control; can include environmental impacts on the product, such as storage container conditions, as the product is transported
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; can include banks, financial institution, brokers, suppliers, manufacturers, retailers, wholesalers, and others involved in the transaction
	Warranty claims	Track, maintain, and validate virtual warranties and warranty claims
	Others	Includes all other blockchain use cases in process manufacturing not elsewhere classified

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
Retail	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; create a digital paper trail of the movement of goods; includes monitoring the movement of merchandise, goods, and materials and registering each leg of a trip or movement throughout the supply/value chain
	Cross-border payments and settlements	Tracking, tracing, and managing cross-border/ international payments and settlements; creates alternate payment and settlement "rails" built for immediate payment and settlement
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking equipment that is used within the supply/value chain and monitoring product parts and services that were performed
	Lot lineage/provenance	Verify origin and authenticity of a product as it moves throughout the value chain; captures information about all inputs of a product, enabling accurate visibility and traceability into the history of a product; includes product and brand counterfeit/fraud detection, reduction, and prevention and maintaining records to assist in quality control; can include environmental impacts on the product, such as storage container conditions, as the product is transported
	Loyalty programs	Maintain loyalty program memberships and rewards system
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; can include banks, financial institution, brokers, suppliers, manufacturers, retailers, wholesalers, and others involved in the transaction
	Warranty claims	Track, maintain, and validate virtual warranties and warranty claims
	Others	Includes all other blockchain applications in retail not elsewhere classified

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
Wholesale	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; create a digital paper trail of the movement of goods; includes monitoring the movement of merchandise, goods and materials and registering each leg of a trip or movement throughout the supply/value chain
	Cross-border payments and settlements	Tracking, tracing, and managing cross-border/international payments and settlements; creates alternate payment and settlement "rails" built for immediate payment and settlement
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking equipment that is used within the supply/value chain and monitoring product parts and services that were performed
	Lot lineage/provenance	Verify origin and authenticity of a product as it moves throughout the value chain; captures information about all inputs of a product, enabling accurate visibility and traceability into the history of a product; includes product and brand counterfeit/fraud detection, reduction, and prevention and maintaining records to assist in quality control; can include environmental impacts on the product such as storage container conditions as the product is transported
	Regulatory compliance	Assist in maintaining records for regulatory compliance and checks
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; can include banks, financial institutions, brokers, suppliers, manufacturers, retailers, wholesalers, and others involved in the transaction
	Others	Includes all other blockchain use cases in wholesale not elsewhere classified

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
Professional services	Property ownership management	Maintain real estate transactions on a blockchain once the buyer and seller agree on a deal and a contract is made; allow all parties involved in the transactions to track the progress of the deal once it is completed
	Others	Includes all other blockchain use cases in professional services not elsewhere classified, such as staff recruitment and management, audit for accounting, and general ledger for accounting
Personal and consumer services	Loyalty programs	Maintain loyalty program memberships and rewards system
	Others	Includes hotel inventory or property management, identity management, and all other blockchain use cases in personal and consumer services not elsewhere classified
Healthcare provider	Identity management	Identity management and confirmation (includes digital signature management); authenticate identities of both patients and healthcare providers, manage personal and medical data, and assist in identity as a service
	Others	Includes tracking patient consent and authorization, clinical trials, claims processing and filing, product fraud detection such as counterfeit drugs, equipment and service/parts management, health record exchange, master patient index, and all other blockchain use cases in healthcare provider
Transportation	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; creating a digital paper trail of the movement of goods; includes monitoring the movement of trains, planes, and other transportation vehicles and their contents/cargo and registering each leg of a trip
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking repaired equipment and monitoring product parts and services that were performed
	Loyalty programs	Maintain loyalty program memberships and reward system

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
	Others	Includes all other blockchain use cases in transportation not elsewhere classified, such as shared use management and big data market transaction management
Telecommunications	Identity management	Identity management and confirmation (includes digital signature management); authenticate identities, manage personal data and assist in identity as a service; enable authentication across devices
	Payment/cross-carrier management	Assist with customer billing/payments and streamlining transaction processes both between telecom providers and settlements with consumers; allows for secured clearing and settlements and includes roaming management and facilitating/managing subscriber access across networks and operators
	Others	Includes cellular network management, internal processes management, connectivity provisioning, asset management for infrastructure/mobile devices, and all other blockchain use cases in telecommunications
Media	Others	Includes royalty payments/management, content copyright management, and all other blockchain use cases in media
Utilities	Energy settlements	Maintain transactions and tracking the energy that is being produced and consumed; facilitate peer-to-peer energy transactions and global trade automation
	Others	Includes carbon certificate trading, security management, infrastructure asset management, electric vehicle charging payment network, and all other blockchain use cases in utilities
Construction	Others	Includes material provenance, equipment and service/parts management, regulatory compliance, and all other blockchain use cases in construction
Resource industries	Asset/goods management	Monitor the movement of assets or goods, creating a full track and trace system or registry; creating a digital paper trail of the movement of goods; includes monitoring the movement of merchandise, goods, and materials and registering each leg of a trip or movement throughout the supply/value chain

TABLE 3

IDC's Worldwide Semiannual Blockchain Spending Guide by Industry and Use Case, 2019

Industry	Use Case	Description
	Equipment and service/parts management	Collecting/maintaining inspection and maintenance information of equipment involved in general operations and/or goods production or distribution; includes tracking equipment that is used within the supply/value chain and monitoring product parts and services that were performed
	Trade finance and post-trade/transaction settlements	Provide a record of transactions in payments between parties involved in the transaction; in addition, facilitate the movement or flow of trade receivables and provide trade delivery and payment confirmation; can include banks, financial institution, brokers, suppliers, manufacturers, retailers, wholesalers, and others involved in the transaction
	Others	Includes all other blockchain use cases in resource industries not elsewhere classified, such as regulatory compliance
Federal government	Identity management	Identity management and confirmation (includes digital signature management); authenticate identities, manage personal data, maintain citizenship records, manage government-issued credentials such as passports, SSN, refugee status and birth certificates, and assist in identity as a service
	Others	Includes asset registration, voting, taxes, regulatory compliance, and all other blockchain use cases in federal government
State and local government	Others	Includes asset registration, identity management, voting, taxes, regulatory compliance, and all other blockchain use cases in state/local government
Education	Others	Includes education records management, student debt, activity and cost management, and all other blockchain use cases in education
Consumer	N/A	N/A

Source: IDC's Customer Insights and Analysis Group, 2019

Technology View of the Blockchain Market

Table 4 outlines and describes the various technologies associated with the blockchain market opportunity.

TABLE 4

Blockchain Technology Definitions

Technology Category	Technology	Description
Hardware	Servers	A server is a computer or device on a network that manages network resources and provides the necessary infrastructure to build secure blockchain networks. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A print server is a computer that manages one or more printers, and a network server is a computer that manages network traffic. A database server is a computer system that processes database queries. This category includes volume servers, midrange enterprise servers, and high-end enterprise servers.
	External storage system	Storage is the part of a computer system, connected system, or peripheral device that stores information for subsequent use or retrieval. It can take the form of storage, which is an integral component of functional computer systems, or additional systems and devices. In the Worldwide Semiannual Blockchain Spending Guide, we include incremental spending on external storage systems, as internal storage is already counted in the server market values. This spending does not include spending on storage software (captured in other software) or storage services (captured in IT services).
	Network equipment	This includes enterprise network and telecom equipment used to support blockchain deployment. Enterprise network refers to hardware purchased by enterprise customers for the implementation of wired and wireless computer networks, which may be utilized for the transfer of data and voice traffic. Telecom equipment refers to hardware purchased by Telecommunications Service Providers for the implementation of wired and wireless networks, which may be utilized for the transfer of voice and data traffic.
	Other hardware	This category includes mobile phones, peripherals, tablets, traditional PCs, and other hardware.
	Infrastructure as a service (IaaS)	IaaS refers to the provision of basic storage, networks, and servers as a service.

TABLE 4

Blockchain Technology Definitions

Technology Category	Technology	Description
Software	Blockchain platform	Blockchain platforms provide the tools and technology to create, deploy, and manage blockchain networks and smart contracts. These tools also allow users to analyze, organize, and access data stored within the distributed ledger. This category includes items such as application development software; application platforms; data access, analysis, and delivery software; integration and orchestration middleware; quality and life-cycle tools; and structured data management software.
	Security software	This software is responsible for the security of the blockchain solution and network and includes endpoint security, identity and access management, network security, and data security.
	Other blockchain software	This market includes blockchain applications designed to automate specific sets of business processes in an industry or business function or to assist in data processing, making groups or individuals in organizations more productive. Blockchain applications are used to either extrapolate information from the distributed ledger or designed to deliver a specific functionality, either horizontal or industry specific, within the blockchain solution. This category includes collaborative, content, customer relationship management (CRM), engineering, enterprise resource management (ERM), operations and manufacturing, and supply chain management (SCM) applications. This category also includes other software such as network software, storage, system management, or system software.

TABLE 4

Blockchain Technology Definitions

Technology Category	Technology	Description
Services	Business services	Business consulting includes services that define enterprise strategy, goals, and metrics for blockchain adoption. This may involve business model design, value stream analysis and journey mapping, partners and governance, information architecture, risk assessment, and network and membership rules. Blockchain BPO involves execution of key business activities, business processes, or entire functions by an external (third-party) services provider or outsourcer. Specific activities could include, for example, finance and procurement functions, smart contract management, accounting operations (e.g., invoice processing and supplier management), and dispute/resolution. Horizontal blockchain BPO segments, often referred to as "cross-industry" BPO, include membership services, identity management, and key management.
	IT services	Blockchain IT services include IT consulting, systems and network implementations, IT outsourcing, application development, IT deployment and support, and IT education and training. IT services also involve helping buyers create the IT strategy of their overarching blockchain initiative.

Source: IDC's Customer Insights and Analysis Group, 2019

LEARN MORE

Methodology

IDC's Worldwide Semiannual Blockchain Spending Guide taxonomy provides a framework for vendors and enterprises as they look to navigate the complex ecosystem that surrounds this expanding and dynamic market. Both vendors and enterprises can benefit from understanding the main technology components that could be involved in a blockchain implementation as well as the wide and varied potential use cases. Understanding the main industries that are seeing the broadest adoption today will help readers evaluate whether there are similar opportunities that can be seen or applied in their own industry or business.

IDC's Worldwide Semiannual Blockchain Spending Guide taxonomy is used to guide IDC's technology, regional, and industry views of the market. It should be used by readers as a guide to

understand the overall structure of the blockchain market and how IDC organizes its market sizing efforts.

The market data and forecast information presented in IDC's Worldwide Semiannual Blockchain Spending Guide program represent our best estimates of blockchain opportunity by industry, use case, and technology. The data presented is the combination of qualitative and quantitative data from a number of primary and secondary sources, including IDC's worldwide industry and company size market model, the research tanks of IDC's Insights businesses, and IDC's annual ICT survey of end-user organizations.

For this Worldwide Semiannual Blockchain Spending Guide, IDC uses a global, detailed market model to forecast total blockchain spending. The components of the model used to determine a market size and forecast for a use case include demand-side data, supply-side data, industry trends, and the economic outlook to generate a model of technology spending.

IDC's Worldwide Semiannual Blockchain Spending Guide taxonomy will be updated at least once a year to reflect any adjustments to definitions or approaches.

Related Research

- *Understanding the Blockchain Stack* (IDC #US44295318, December 2018)
- *Blockchain: Worldwide Technology Market Update and Spending Outlook* (IDC #US44268418, September 2018)
- *Worldwide Blockchain 2018-2022 Forecast: Market Opportunity by Use Case – 2H17 Update* (IDC #US44184218, August 2018)
- *IDC's Worldwide Semiannual IT Spending Guide by Industry and Company Size Taxonomy, 2018* (IDC #US43526718, January 2018)

Synopsis

This IDC study provides a detailed description of IDC's Worldwide Semiannual Blockchain Spending Guide methodology and taxonomy. It should be used as a companion piece for IDC's Worldwide Semiannual Blockchain Spending Guide and all of IDC's worldwide industry research. Technology suppliers may utilize this approach and structure to also help them build an industry-focused organization.

"IDC's Worldwide Semiannual Blockchain Spending Guide presents a comprehensive view of the blockchain ecosystem and serves as a framework for how IDC organizes its blockchain research and forecasts," said Stacey Soohoo, research manager, IDC's Customer Insights and Analysis group. "It is an invaluable resource to help vendors define and standardize their vocabulary for approaching this expanding and dynamic market."

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

Global Headquarters

5 Speen Street
Framingham, MA 01701
USA
508.872.8200
Twitter: @IDC
idc-community.com
www.idc.com