



TELUS/IDC Internet of Things Study 2014

The Connected Canadian Business

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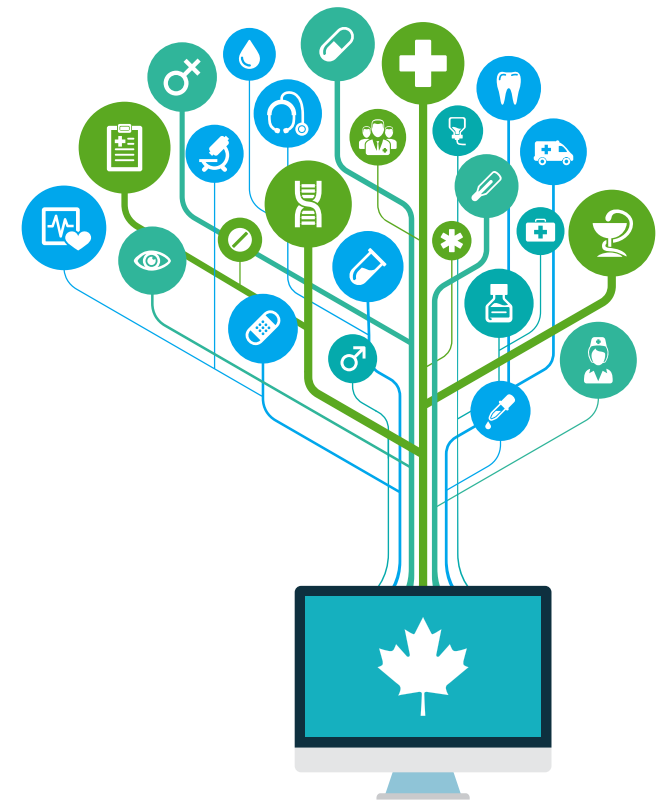
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The Internet of Things in Canadian Business

Enabling Innovation and Productivity Now Through the Next Decade

Executive Summary

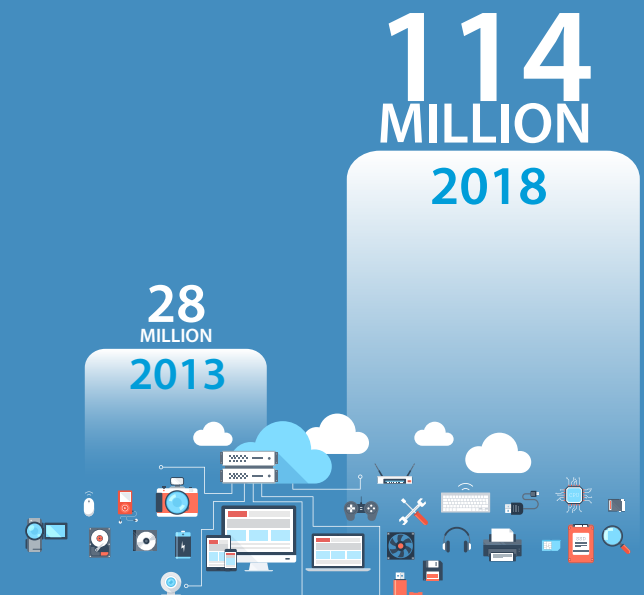
The Internet of Things (IoT), often referred to as Machine to Machine (M2M), is enabling innovation and transforming Canadian business and society. In this InfoDoc, IDC examines the IoT solutions deployed by or being budgeted by Canadian medium and large organizations. At the heart of IoT are intelligent systems that connect devices, automate processes and transmit data. The most common IoT solutions being deployed are related to asset tracking and security monitoring, but there are almost limitless applications as we enter a phase of rapid growth.



Beyond the 13% of organizations deploying or budgeting for IoT today, an additional 30% are planning to launch IoT solutions within the next two years. Overall, IDC Canada forecasts the number of installed autonomous intelligent and embedded systems — i.e., smart connected “things” — to grow from 28 million units in 2013 to 114 million units by 2018.

Use cases vary by industry, but the benefits most often cited from IoT deployments are greater productivity and reliability. Most IoT deployments involve both IT and line of business departments and the majority are considered relatively straightforward projects. Wireless connectivity, cloud computing and big data solutions are the underpinnings of IoT as organizations seek to manage large and variable workloads across a variety of locations and unlock value from growing sources of data.

IDC Canada forecasts the number of smart connected “things” — to grow from 28 million units in 2013 to **114 million units by 2018**



Introduction

New opportunities for growth are intersecting with technological capabilities in ways never seen before through the rise of the Internet of Things. From multinational corporations like GE, to world-class cities like Barcelona, businesses and governments are embracing the Internet of Things (or IoT) to build a smarter world around us. Brand new platforms, supply chains and partnerships are forming to take advantage of the Internet of Things. CXOs looking to gain competitive advantage need to examine how IoT can reshape what is possible in their business. The alternative is to fall behind global innovators that are already utilizing new applications to creatively reinvent their industries.



Businesses and governments are embracing the Internet of Things (**IoT**) to build a smarter world around us.

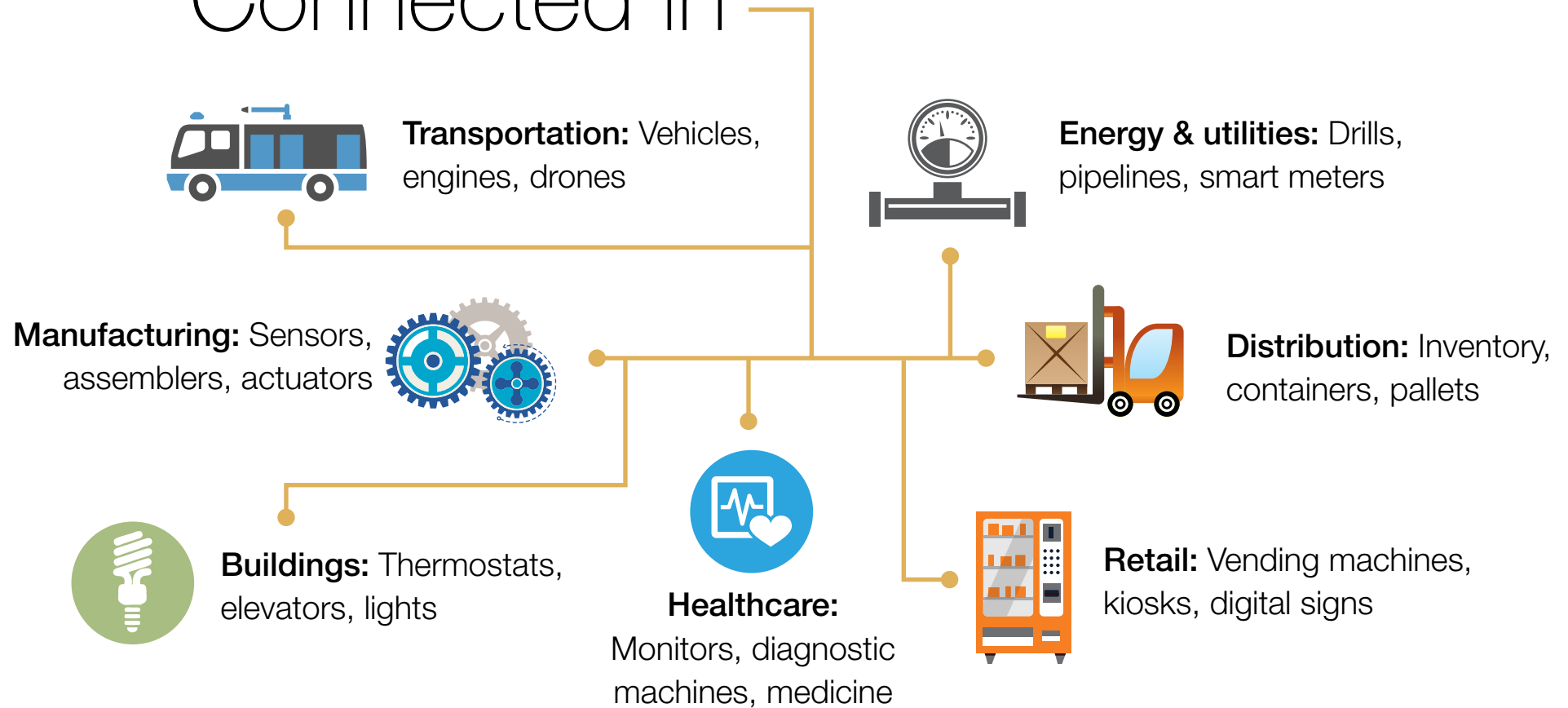
What is IoT?

From enhancing assembly line productivity to improving patient care, the IoT is enabling innovation and transforming business and society. At the heart of IoT are intelligent systems that connect devices, automate processes, and transmit data. The data derived from machines, sensors or other connected things is inherently valuable, improving processes and decision-making in a variety of situations. Outcomes can range from better route planning, higher quality manufacturing, faster delivery times, lower environmental impact, and shorter wait times, to better patient care.

IDC defines the Internet of Things (IoT) as **a network of networks of uniquely identifiable end points (or things) that communicate without human interaction using IP connectivity — be it locally or globally.**

The IoT brings meaning to the concept of ubiquitous connectivity for businesses, governments, and consumers with its innate management, monitoring, and analytics.

Examples of THINGS Being Connected in



Why Now?

The need to compete in a global economy is driving Canadian companies to innovate and enhance productivity.

Governments are seeking to better serve citizens — a catalyst of change — in many public sector organizations that are embracing IoT. The globalization of business, the move to smarter government, combined with the advancement in technology, networks, and standards are all driving forces behind the boom in IoT. The miniaturization of processors brings the scale of computing down to a size that allows for nearly limitless deployments.



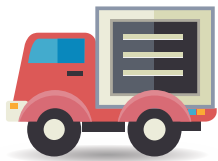
Wireless network speed and coverage have advanced to allow for many more disparate as well as mobile things to be connected. Industry standards around IP networking, the industrial Internet and global carrier partnerships have matured to a point where interoperability is far less of a hurdle. Innovators are thinking big about IoT and possibilities are endless, but within reach of most organizations. Real working IoT applications exist today that greatly benefit a number of sectors.

**Real working
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Applications and Benefits of IoT in the Real World

Transportation and asset tracking — use ubiquitous connectivity and leverage telematics and RFID devices to monitor and control shipping equipment and cargo on a worldwide basis. Increasingly, producers are able to monitor and analyze inventory security and quality across the supply chain safely. For example, monitoring the transport of food from farm to fork to ensure that it does not spoil while in transit.



Transportation and safety

Incorporate vehicle telematics, emergency call systems with embedded wireless SIMs and diagnostic monitoring to ensure driver and fleet safety.



Public transit

Municipal governments can use IoT solutions to run, operate, and monitor public transit systems for fuel optimization, fleet, and fleet content tracking, as well as positive train control — a system for monitoring and controlling train movement as a means to improve railway safety (i.e., train separation or collision avoidance).



Smart utilities

Use connectivity to remotely monitor and better manage energy consumption by automatically measuring, monitoring, and optimizing home and commercial building energy usage.



Discrete manufacturing

Deploy robotics to further automate production of automobiles and other equipment, as well as extending machine life through predictive maintenance.



Insurance

Connect to vehicle onboard diagnostic (OBD) ports to analyze driving patterns, allowing insurance companies to offer usage-based insurance and reward safe drivers and businesses through lower premiums.



Remote healthcare monitoring

Perform continuous and real-time readings of vitals such as blood pressure, heart rate or sugar levels to notify caregivers and/or medical personnel in the event of elevated readings (allows for remote patient care).



Distribution

Reduce inventory loss through asset tracking, RFID tagging and geo-fencing, automated warehouse fulfillment by improved inventory “picking” and packing, more efficient product delivery through automated realtime route planning.



Oil and Gas

Wirelessly connect meters to remote oil wells to securely monitor oil flow, well head pressure, and other operational metrics. Monitor gas flow and pressure through pipelines with wireless sensors and meters.

Canadian Businesses Implementing IoT

IDC examined the current state of IoT deployments in Canada. IDC surveyed 209 organizations across Canada to understand what IoT solutions have been implemented, their benefits and importance, deployment characteristics, and lessons learned.

About the Canadian IoT Survey

209 Canadian organizations surveyed by phone & web

- 73 medium-sized firms (100-499 employees)
- 136 large firms (500+ employees)
- 50 from Quebec & Atlantic Canada
- 90 from Ontario
- 69 from Western Canada
- Included 122 IT decision-makers as well as 87 business leaders across a variety of departments
- Conducted in March and April 2014

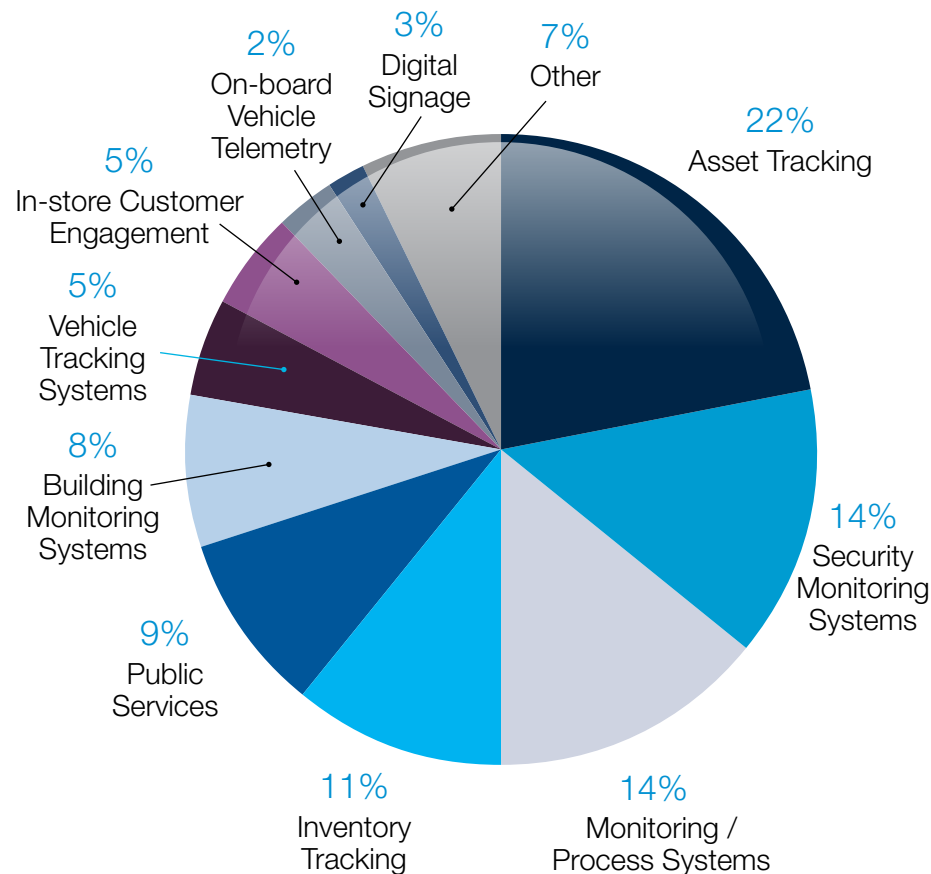
So where are Canadian businesses today?



IoT solutions have been adopted by 6% of organizations and are currently being deployed by an additional 7% of medium and large organizations in 2014. An additional 30% plan to adopt an IoT solution over the next 24 months. When asked about the most important IoT project, the use cases most frequently cited are asset tracking and security monitoring, but a variety of other applications have been deployed (see chart on next page). Canadian businesses identify productivity and reliability as the top two benefits of IoT solutions. Productivity is a notable challenge facing Canadian businesses in a global economy. In fact IDC Canada's 2013 Top Executive Study revealed that drive to improve productivity is the top priority among Canadian CXOs. Embracing IoT is one pathway to productivity enhancement.



Main IoT Solution



Source: TELUS/IDC Internet of Things Study 2014 (n=209)

Attributes of Canadian IoT Deployments

- Most IoT deployments are considered tactical or strategic, while only **13%** are viewed as transformational
- Average number of devices deployed: **5,220**
- **54%** of projects used both wireless and wireline connectivity
- Wireless only solutions found in **28%** of IoT projects
- **WiFi and 4G LTE** cellular connectivity were most common wireless technology
- Main platform or application deployed internally or on-premise in **72%** of cases
- Cloud or hosted solutions are used in **28%** of cases
- Line of business and IT work collaboratively on the majority of IoT implementations

Examining Different Industries and Their Adoption of IoT Solutions in Canada

The applicability of the Internet of Things to business must be understood in terms of vertical sector, since the value of IoT is based on individual use cases across these sectors. The top IoT solutions adopted today and benefits by industry are shown in the following tables.

Top IoT Solutions by Industry

Industry	Solutions
Manufacturing	Process Monitoring/Control; Security Monitoring Asset Tracking
Primary (including Oil/Gas)	Security Monitoring Process Monitoring/Control
Distribution	Asset Tracking Vehicle Tracking
Retail	Asset Tracking Digital Signage
Financial Services	Asset Tracking Security Monitoring; Building Monitoring
Healthcare	Security Monitoring Telehealth; Inventory Tracking; Digital Signage
Government	Asset Tracking Public Services (e.g., weather monitoring)
Utilities	Asset Tracking Smart Meters

IoT Customer Case Study: Transportation

Arrow Transportation Systems chose TELUS to provide the mobile data connectivity it needed to manage its fleet. Each of its trucks has a mobile SIM card, enabled with mobile data tracking, which allows Arrow to transfer all sorts of critical data with respect to mechanical and driver safety. Over 300 trucks had to be moved to a synchronous system, and all of the company's computers had to be changed to accommodate the new technology. TELUS helped Arrow get all of its vehicles onto the new network within a year's time.

The process itself was relatively straightforward. SIM technology is well-understood according to TELUS but the challenge for Arrow lay in putting the technologies together in a way that works. With the implementation of TELUS' wireless technology, Arrow realized a number of benefits, particularly in its ability to compete in new markets. With its newfound ability to collect data more efficiently, Arrow has more control of safety within its operations; by taking stock of its fleet performance and optimizing staff resources, Arrow is able to provide better service to its customers. The system also has enough direct benefits to completely pay for itself according to Arrow executives. TELUS' solution helped Arrow reduce its costs while increasing its scope and providing it access to its trucks on a more consistent basis.



Over 300 trucks had to be moved to a synchronous system



TELUS helped Arrow get all of its vehicles onto the new network within a year's time

Source: Allen, Amy. "Case Study: TELUS AND Arrow Transportation Systems." IT in Canada Online. Posted in C-Level Insight. 20 March 2014. [Link](#)

Benefits of IoT Solutions In Canada

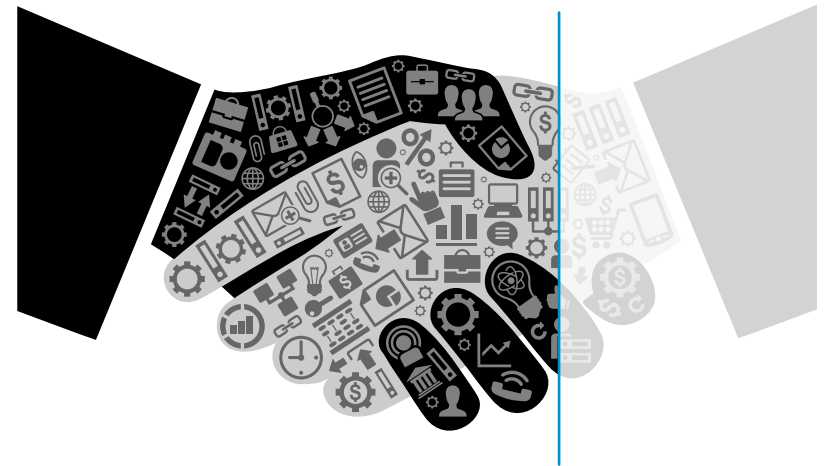
Top IoT Benefits by Industry

	Greater Productivity	Improved Quality of Service	Improved Security	Greater Reliability	Cost Savings	Faster Decision-Making
Manufacturing	#2	#1				
Primary (including Oil/Gas)	#2				#1	
Distribution	#2	#1				
Retail			#1	#2		
Financial Services	#1		#2			
Healthcare	#1	#2				
Government	#1			#2		
Utilities		#1				#2

Business and IT Share Responsibility

IDC research has shown that Canadian business leaders are getting increasingly involved in technology decisions.

IoT is fundamentally about business, enabled by technology. In the majority of projects (77%), IT departments are working in collaboration with business leaders during the implementation of IoT solutions. This is an extension of a trend already underway in Canadian organizations, where business departments increasingly have a role in technology selection.



In the majority of projects **(77%)**, IT departments are working in collaboration with business leaders during the implementation of IoT solutions

From Pilots to Transformational IoT Projects

IoT projects have the potential to encompass many business process elements, but they don't need to be complicated. Our survey finds that complexity doesn't seem to be a hindrance, as two-thirds of IoT deployments are described as "straightforward" or "relatively straightforward."

A straightforward plan begins with modest pilot projects, like many new technology implementations. When asked whether projects were tactical/strategic or transformational, IDC finds that the majority (77%) are the former. These IoT projects are often tracking things or people, which makes sense given that asset tracking is one of the most mature solution areas within IoT.

Attributes of Transformational IoT Projects

- More often associated with process monitoring and control and inventory tracking solutions
- Faster decision-making most often cited as the top benefit or outcome
- Majority implemented by line-of-business leaders
- Tend to require greater customization yet more often considered very straight forward
- Vast majority in large enterprises (500+ employees)
- Have more devices connected: 6,274 on average

Any valuable asset, be it a piece of heavy equipment or cattle, can be tracked using geo-location data, tags and sensors.

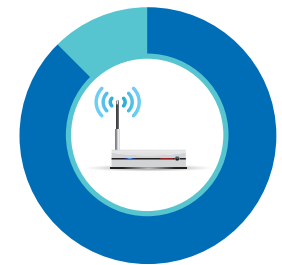
Transformational projects, on the other hand, fundamentally change business processes or become a launch pad for brand new businesses. Today they represent only one out of every eight IoT projects in Canada. IoT has the potential to disrupt business models. The impact IoT can have on industries is nearly limitless. Over time, IDC expects the percentage of transformational IoT projects will rise as business leaders explore the possibilities of new applications and learn from pilot implementations. Transformational projects have distinct characteristics. Most promising is the fact that transformational projects were more often considered “very straightforward.”

Today transformational projects represent only **one out of every eight** IoT projects in Canada

Looking at IoT Deployment Options: IoT and Connectivity

While wired connectivity can play an important role in IoT solutions, increasingly IDC expects wireless networks to be central to the network of IoT. In our study we find that wireless network technologies are used in 82% of cases. Wireless can include 2G, 3G and LTE cellular access types.

Other types of wireless standards like WiFi, Bluetooth, Zigbee, MQTT, 6LoWPAN are used in certain deployment scenarios. In particular, MQTT, Zigbee and 6LoWPAN are used when wireless connections are needed for simple, lightweight messaging in low power situations or where network bandwidth is limited. IDC believes that wireless network heterogeneity will be the norm rather than the exception for the short to medium term.



In our study we find that wireless network technologies are used in 82% of cases.

Wireless Messaging Technologies

LTE

Long Term Evolution - 4G mobile communications standard.

Zigbee

A low-cost, low-power, wireless mesh network standard.

MQTT

Message Queue Telemetry Transport.

6LoWPAN

IPv6 over low-power wireless personal area network.

IoT and Cloud

Cloud computing models are a natural fit for IoT

Cloud computing models are a natural fit for IoT. First, the inherent flexibility and scalability offered by cloud is ideally suited to handling the potential for growth in IoT. IoT projects can have deployments in the millions (think smart meters today). Consider the data generated by millions of end-points and the analytics required to make real-time decisions: this data needs to be safely and securely stored somewhere.

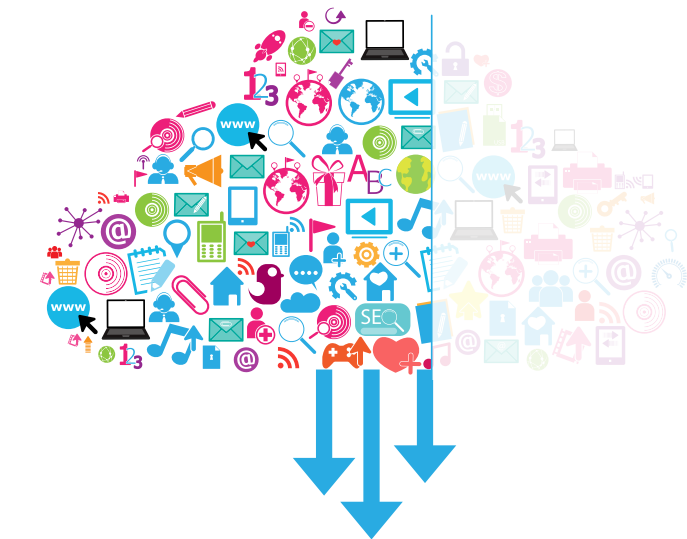


Building Blocks of IoT: Intelligent Systems

Devices or things in the IoT are managed by intelligent systems. **Intelligent systems are defined as securely managed electronic systems that run a high-level operating system (HLOS) and autonomously connect to the Internet, execute native or cloud-based applications, and analyze data collected.** Intelligent systems possess greater programmability and performance, integral connectivity, and the potential to capture, analyze, and forward data to/from other systems.

Second, the distributed and mobile nature of many IoT end-points means that application connectivity will be needed across a varied set of locations with potentially fluctuating workload demands. In Canada, among the 24% of cases where external providers are used to manage the IoT platform or application, 61% of cases use external cloud solutions. The remaining cases are hosted solutions. We expect this to grow in the near term. Cloud is also used more often by large organizations and more often cited by line-of-business respondents compared to IT respondents in IDC's survey.

In Canada, among the **24%** of cases where external providers are used to manage the IoT platform or application...



61% of cases use external cloud solutions.

IoT Means (Big) Data

With the potential growth in the number of endpoints, increasingly sophisticated workloads, and new applications being written, the amount of data being generated is expected to grow rapidly over the next decade. Today in Canada most businesses (74%) are storing data generated from IoT deployments internally. Big Data storage can become a constraint, as will access to robust analytic tools without access to high-performance computing resources and skills.

Cloud solutions can help overcome each of these constraints. One of the benefits of Big Data technologies is the ability to analyze diverse sets of information. In the world of IoT, this will be the norm — massive amounts of sensor data, geo-location, possibly even audio and video streams, will become valuable raw material for business insight, real-time decision making, and even prediction.



One of the **benefits of Big Data** technologies is the ability to analyze diverse sets of information.

IoT and Security

Security is without a doubt a top of mind issue among Canadian CXOs when discussing any new technology. In an IDC Canada IoT survey, ensuring the security of the solution was considered a “major challenge” by 31% and “minor challenge” by 47% of respondents. As IoT solutions become more widespread, security will certainly become a higher profile consideration.

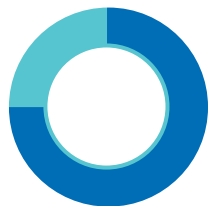
Business will need to ensure security across endpoint devices (modules, SIMs), networks as well as the application and the resulting machine data being generated and stored. Securing the IoT is key as these deployments will be reinventing the physical business process. Organizations need to be proactive about security and this requires selecting the right partner that can fortify networks, devices, applications, data and other physical assets.

Ensuring the security of a solution was a ...



Creating Your Organization's Future: Practical Considerations for IoT

The process begins by scoping with clear business outcomes in mind. When it comes to IoT initiatives, the number one lesson learned from IDC's survey is that preparation and planning is key. Collaboration and communications with internal stakeholders and external resources is also critical, as well as setting appropriate budgets and project management controls.



Three-quarters of organizations required some degree of customization

Take stock of your organization's own objectives and ask yourself:

- ✓ What processes can be automated?
- ✓ Where do our most valuable assets reside?
- ✓ Can we extend connectivity through the value chain to enable new efficiencies?
- ✓ What might our competitors do if they embrace IoT solutions faster than us?
- ✓ Can we create brand new businesses through IoT?

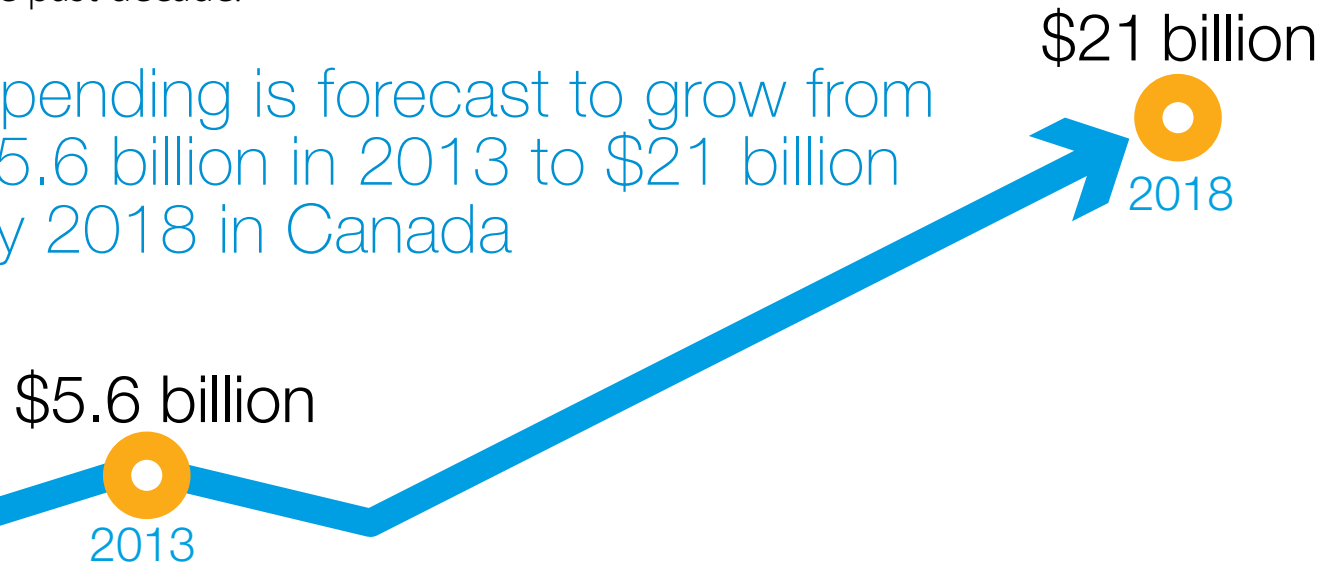
It is critical to build on experience. If you don't have internal experience, learn from early adopters. External providers that have experience deploying IoT solutions know the challenges and can help you avoid them. Their ability to customize a solution is key as many IoT implementations are unique to a process or industry.

IDC's survey finds that three-quarters of organizations required some degree of customization. IoT solutions encompass a collection of technologies and rarely can a single provider do it all. Our study found that only 13% of organizations used the same provider for devices, connectivity, software platform, and data analysis.

Essential Guidance

We are in the early stages of IoT maturity in Canada. Many organizations are in the exploratory phase of development, with pilot projects underway. IDC expects tremendous uptake in IoT solutions in the next several years: spending is forecast to grow from \$5.6 billion in 2013 to \$21 billion by 2018 in Canada. Our study findings show that in addition to the 13% of medium and large organizations already deploying, another 30% of firms are planning to launch IoT initiatives in the next 24 months. Some sectors are more mature, such as utilities and transportation, where solutions have been in-place or rolled out over the past decade.

Spending is forecast to grow from \$5.6 billion in 2013 to \$21 billion by 2018 in Canada



Key considerations for organizations planning to deploy IoT solutions

- ✓ The options for **innovation will flourish as new capabilities are brought forward and standards mature**. We see innovation coming from applications and analytics that drive change to business processes.
- ✓ The analytics layer is critical to enabling an IoT implementation to drive true business value for a company taking advantage of this new connectivity and data being captured. **Leveraging the power of “Big Data”** and the capabilities that big data and analytics vendors offer to enterprises can be extended to IoT applications.
- ✓ A chief contributor to innovation is maximizing the value from know-how and applying that to a business opportunity. **Relying on partners that have the experience, technology, and access to expertise is an ideal way to start.**
- ✓ Select vendors that can show leadership around IoT both in terms of innovation and practical guidance. **Can they demonstrate ROI? Are they reliable suppliers? Are they responsive?** These were the top 3 most important attributes found in IDC’s IoT survey.

Canadian businesses and public sector organizations can seize the opportunity to benefit from the Internet of Things by reimagining business processes, connecting what were once disparate end-points, and ultimately deriving new value from analytics within and across the enterprise.

For More Information

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Sponsor: TELUS

Wondering how M2M can help your business be more efficient, effective and profitable? Start with the right partner:

- ✓ A network partner that offers you coverage, reliability and speed if your solution demands it
- ✓ A hardware provider that offers you proven, reliable routers designed specifically for M2M applications
- ✓ A software partner that can tailor existing applications to your needs or create new applications just for you

TELUS is the only partner you need; together with its M2M partners and dedicated M2M specialists, TELUS can help you design, build and deploy the solution that is just right for your organization.

Learn about the TELUS advantage at <http://about.telus.com/m2m>

Contact TELUS: m2m@telus.com