MESSAGE FROM THE MAYOR

A SMART AND DIGITAL CITY BUILT BY CITIZENS, FOR CITIZENS

In March 2014, Montréal created the Bureau de la ville intelligente et numérique, to become a world leader among smart and digital cities. The Bureau’s mission is to devise a Montréal strategy around four axes: Collecting, Communicating, Coordinating and Collaborating.

A new milestone was achieved last fall with a consultation process that brought together Montrealers who discussed and shared ideas on their needs and expectations.

Montréal, Smart and Digital City is an ambitious project that builds on our collective intelligence to forge a distinctive Montréal-based model. The institutional and private sectors have joined with city workers and Montréal citizens in an ongoing dialogue, playing active roles in formulating this strategy. Montréal, Smart and Intelligent City, will be built by citizens, for citizens.

Mayor of Montréal,

Denis Coderre
MESSAGE FROM THE VICE CHAIR OF THE EXECUTIVE COMMITTEE

Ultimately, a smart and digital city means better services for citizens, a universally higher standard of living and harnessing of our metropolis’s resources to ensure its development is in line with the population’s needs. Montréal will be a city that listens to its constituents who will be agents of change.

Vice Chair of the Executive Committee, responsible for the smart city,

Harout Chitilian
This document is intended for Montréal citizens and other stakeholders (civil society organizations, businesses, universities, government agencies and other institutions) interested in the smart city concept. It summarizes the city administration’s research and consultation efforts, while proposing broad project guidelines and their objectives.

1.1 - VISION OF MONTRÉAL

- By 2017, Montréal will be the world’s leading smart city.¹
- As part of this process, the city and community intend to invest in innovative, growth-generating projects.
- Montréal seeks to devise and develop an outstanding quality of life and a prosperous economy with and for citizens through collaborative innovation, state-of-the-art technologies and a bold approach, backed by Montréal’s trademark creativity.

1.2 - RESEARCH AND CONSULTATION

- Four surveys and 7,601 respondents.
- Analysis of over 1 million requests by Montrealers through the 311 service.
- Reviews of best practices (some 100 studies).
- Examination of case studies to identify best practices employed in major cities around the globe (New York, Eindhoven, Barcelona, Columbus, Arlington, Toronto and Lyon).
- Co-design² of public policies (190 experts).
- Town hall meetings and suggestions from citizens (203 participants).
- Examination of technological projects underway in Montréal.
- Collection of ideas sent by citizens (357 in late 2014) through the suggestion box on the Web site of the Bureau de la ville intelligente et numérique de Montréal and from the jevoismtl.com initiative.

1.3 - FOCUS AREAS FOR 2014-2017

- Urban mobility.
- Direct services to citizens.
- Way of life.
- Democratic life.
- Economic development.

¹Intelligent Community of the Year Award, Intelligent Community Forum.
²Process of developing a typically innovative product or service in conjunction with its final user. Source: Adapted from wikipedia.org.
1.4- POLICY GUIDELINES

1. Develop multiservice ultra-high speed telecom infrastructure.
2. Release and use prioritized open data.
3. Create an open, interoperable technological architecture.
4. Develop solutions to urban issues in co-creation with the community.
5. Optimize mobility of people across the island in real time.
6. Expand the provision of direct digital services to citizens and businesses.
7. Develop areas supporting urban innovations and diminish the digital divide.
8. Improve access to democratic life and bolster the culture of transparency and accountability.
9. Promote a leading-edge sector’s growth by employing the smart city strategy as a tool for implementing the project and as an engine of economic development.

Each guideline includes one or more goals, each of which will be associated with quantifiable activities.
MESSAGE FROM THE MAYOR

A Smart and Digital City by Citizens, for Citizens

MESSAGE FROM THE VICE CHAIR OF THE EXECUTIVE COMMITTEE

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5.9 Promoting Growth of a Leading-Edge Sector by Employing the Smart City Strategy as a Catalyst for Bringing the Project to Fruition and as an Engine of Economic Development
The smart city concept has been gaining ground around the world since the mid-2000s. A growing number of cities are gradually adopting it, because of the advantages it offers. But the concept is often misunderstood or seen only in terms of its technological aspects.

The smart city concept (and related Smart Cities movement) has taken off due to political initiatives in the United States, Europe and Oceania aimed at overcoming various urban challenges:

- **Governance issues**: How can different stakeholders’ activities be coordinated in municipal operations, since structures are complex, public budgets are diminishing, confidence in institutions is down and service recipients feel marginalized?

- **Physical issues**: All cities must cope, to different extents, with issues of transportation, scarcity of natural resources, waste management, pollution, public health, congestion and aging infrastructure.

- **Social issues**: Major cities must also contend with a complex socio-political complex, social polarization and a vast number of players that can react and mobilize immediately.

The scale of the challenges is forcing cities to rethink their strategies and to innovate in order to maintain service levels, in particular:

- outsourcing services using outcomes based contracts;
- integration of back office and increasingly front line services;
- online service delivery;
- releasing data so new services can develop and citizens can make informed decisions (providing real-time information on traffic to assist citizens in planning journeys);
- reducing demand for services, for example, promoting independent living allows older people to live much longer in their own communities with less statutory support.

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3.1 - MONTRÉAL’S ROLE AS A SMART CITY

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As we recently saw, Montréal ranks among the world’s top 21 smart cities. Figure 1 illustrates Montréal’s numerous resources in this field.

Montréal has multiple innovation resources and stakeholder cooperation is essential in forging a common vision of a smart city. Montréal intends to take this opportunity to become a model in the field.

The city administration is well situated to play a leadership role in coordinating the efforts to create a smart city by various private, public and community partners.

To become a genuine smart city, though, Montréal must not only promote this concept but integrate its activities (public policies, laws, by-laws, etc.) within a culture of co-creation and co-development (electric service delivery, for example).

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5See: www.lapresse.ca/actualites/montreal/201310/22/01-4702471-montreal-parmi-les-21-villes-intelligentes-de-lannee.php
4For a business, co-creation means developing products/services sustainably, in conjunction with clients. Source: Adapted from wikipedia.org.
7There are two type of co-development: horizontal (within several administrations of the same type) and vertical (between stakeholders - citizens to programmers).
8Delivery over the Internet of secure and non-secure government services to users. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.
3.2 DIFFERENT SMART CITY CONCEPTS

The smart city concept has greatly evolved in the past few years, with a number of conflicting definitions:

1. 1. IT-based model (computers, detectors, networks, etc.):

“The use of Smart Computing technologies to make the critical infrastructure components and services of a city— which include city administration, education, healthcare, public safety, real estate, transportation, and utilities— more intelligent, interconnected, and efficient.”

2. 2. Concept built around the use of big data:

“A Smart City looks at all the exchanges of information that flow between its many different subsystems. It then analyzes this flow of information, as well as of services, and acts upon it in order to make its wider ecosystem more resource-efficient and sustainable.”

3. 3. An organic factor incorporating different aspects of city living:

“A smart city is one where there is the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens.” February 2014, UK Department for Business, Innovation & Skills (BIS) Smart City Framework Report

“Smart cities should be regarded as systems of people interacting with and using flows of energy, materials, services and financing to catalyse sustainable economic development, resilience, and high quality of life; these flows and interactions become smart through making strategic use of information and communication infrastructure and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society.”

European Innovation Partnership on Smart cities and Communities - Strategic Implementation Plan. 2013.

This final definition is the one most common today. Technologies are now regarded as “force multipliers” for achieving targeted results.

9 A technological device designed to detect the presence of a particular object or substance and to emit a signal in response. Used in alarms, fire prevention systems and satellites, for example. Source: Adapted from www.linternaute.com/dictionnaire/fr/definition/senseur/

10 Forester’s White Paper, Washburn et al. (2010).

11 All data continuously generated in real time from sources of different kinds, exhibiting exponential growth. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

12 Velosa III et al. (2010).
When Montréal’s new administration took office in the fall of 2013, it expressed its intention to become an internationally recognized leader among smart and digital cities. The document Montréal, ville intelligente et numérique describes the four focus areas defined by Montréal’s elected officials: collection, communication, collaboration and coordination. As part of this process, the Bureau de la ville intelligente et numérique (BVIN) was set up in 2014 and tasked with:

4.1 THE VISION

When Montréal’s new administration took office in the fall of 2013, it expressed its intention to become an internationally recognized leader among smart and digital cities. The document Montréal, ville intelligente et numérique describes the four focus areas defined by Montréal’s elected officials: collection, communication, collaboration and coordination. As part of this process, the Bureau de la ville intelligente et numérique (BVIN) was set up in 2014 and tasked with:

1. Collecting
2. Communicating
3. Coordinating
4. Collaborating

Establishment of the Bureau de la Ville intelligente et numérique (BVIN)

Consulting:
- Citizens
- City workers
- Community
- International models

Identifying:
- Needs, issues and priorities

Defining:
- Criteria
- Orientations

Seeking approval:
- From decision-making bodies

Prioritizing:
- Short-term projects
- Major projects

Seeking approval:
- From decision-making bodies

Deploying:
- Initiatives, ongoing review and key performance indicators

Spring-Summer

Ongoing dialogue with citizens

FIGURE 2: MONTRÉAL’S INITIATIVE
1. Defining Montréal's smart city strategy.
2. Designating strategic initiatives and formulating funding/partnership programs to support project implementation.

4.1.1 - COLLECTION

Transparent management and open government:
- Releasing bulk data and developing applications so users can display and use such information.
- Collecting and analyzing telemetry data\textsuperscript{14} to boost control over and optimize the use of public resources.

4.1.2 - COMMUNICATION

Information access and distribution systems
- Developing a Web platform and mobile apps for distributing information to citizens in real-time.
- Deploying wired and Wi-Fi\textsuperscript{15} broadband\textsuperscript{16} networks.
- Creating local new technology learning and creation centres.

4.1.3 - COORDINATION

Digital public services
- Developing smart transport, infrastructure, security, energy, water and environmental management systems.
- Providing digital, while preserving conventional, access to public services (311, permit issuance, etc.).

4.1.4 - COLLABORATION

Supporting industry, to stimulate innovation and creativity.
- Helping private and institutional stakeholders set up networks of technology incubators\textsuperscript{17} and accelerators\textsuperscript{18}.
- Addressing the needs of technology start-ups.
- Encouraging use of the public space for testing innovative solutions to municipal issues.

\textsuperscript{14}Use of acoustic, optical and radio signals to measure the distance between an observer and distant location. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

\textsuperscript{15}Wi-Fi uses microwaves to connect different computer devices to a network and permit data transmission between them. Source: Adapted from wikipedia.org.

\textsuperscript{16}A technology transmitting more than 1,544 megabits/second (Mbit/s). Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

\textsuperscript{17}Generally, an NPO provides services similar to those of an accelerator, but tends to spend more time on participating businesses. An incubator provides a broader range of services in terms of facilities and coaching services. Incubators are often sponsored by universities, colleges and economic development agencies. Source: Adapted from the Canada National Research Council.

\textsuperscript{18}Generally, a for-profit business operated by venture capital investors to generate returns on investments in client firms. Accelerators provide a range of services to businesses at the start of their growth, including financial support, advice on business, office space, development and additional services provided through partner organizations. Source: Adapted from the Canada National Research Council.
In October and November 2014, the BVIN conducted extensive desk research and public consultations among stakeholders to produce a clear pictures of needs and issues, as well as to define Montréal’s smart city priorities.

This phase:

- Produced a strategic reference framework.
- Pinpointed best practices.
- Highlighted and prioritized citizen concerns.
- Classified focus areas.
- Validated a project assessment and selection matrix.

The BVIN used different means to find out what municipal stakeholders want:

- Four surveys.
- Study of Montrealers’ 311 requests.\(^1^9\)
- Review of case studies in major international cities to define best practices.
- Co-design of public politics, town hall meetings and suggestions from citizens.
- Analysis of projects now underway in Montréal.
- Compilation of suggestions from citizens.

\(^{19}\) 311 is used in many US and Canadian cities as a single, easy telephone access point for citizens seeking non-urgent municipal services.
4.2.1 - SURVEYS CONDUCTED BY MONTRÉAL

The city conducted several phone and Web surveys in 2012, 2013 and 2014 on the use of services by citizens.

<table>
<thead>
<tr>
<th>Survey Type</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOM survey</td>
<td>November 14-21, 2012</td>
</tr>
<tr>
<td>SOM survey</td>
<td>November 25-29, 2013</td>
</tr>
<tr>
<td>Web survey</td>
<td>October 31-November 12, 2014</td>
</tr>
<tr>
<td>Phone survey</td>
<td>November 10-14, 2014</td>
</tr>
</tbody>
</table>

A total of 7,601 citizens responded. Results show that citizens' key concerns pertain to urban mobility and road work.

**TABLE 1: SURVEYS CONDUCTED BY MONTRÉAL**

**FIGURE 3: PRIORITIES INDICATED BY MONTREALERS (WEB SURVEY)**

Web survey results were then confirmed by a phone survey, as illustrated in Figure 4:

**FIGURE 4: PRIORITIES INDICATED BY MONTREALERS (PHONE SURVEY - 2014)**

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20October 31-November 12, 2014.
21November 10-14, 2014.
In late 2013, a SOM survey\textsuperscript{22} showed that citizen priorities for the new Administration were:

1. Public transit (52%).
2. Water mains and sewage line (52%).
3. Better expenditure management (51%).
4. Water main and sewage line management (49%).
5. Greater transparency and good governance (48%).

### 4.2.2 - ANALYSIS OF MONTREALERS’ REQUESTS TO THE 311 SERVICE

In 2013, citizens made over 1 million calls to the city’s 311 line.

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>NUMBER OF REQUESTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different kinds of pickups</td>
<td>92,170</td>
<td>37.2%</td>
</tr>
<tr>
<td>Roads</td>
<td>73,290</td>
<td>29.6%</td>
</tr>
<tr>
<td>Trees, parks and environment</td>
<td>24,893</td>
<td>10%</td>
</tr>
</tbody>
</table>

**TABLE 2: MAIN CATEGORIES OF 311 LINE REQUESTS (2013)**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>NUMBER OF REQUESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree branch (ash borer) pickups</td>
<td>25,276</td>
</tr>
<tr>
<td>Bulky refuse pickups</td>
<td>12,785</td>
</tr>
<tr>
<td>Garbage pickups</td>
<td>12,456</td>
</tr>
<tr>
<td>Streetlights</td>
<td>12,153</td>
</tr>
<tr>
<td>Illegal waste dumping</td>
<td>11,921</td>
</tr>
</tbody>
</table>

**TABLE 3: GROWING NUMBER OF 311 CALLS ON THESE TOPICS (2013)**

The smart city concept is evolving, as noted above. Furthermore, a review of worldwide initiatives in this area quickly demonstrates that each has a local character, specific to its community’s situation, concerns and political priorities.

The BVIN conducted in-depth studies of different smart cities throughout the world.

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\textsuperscript{22}November 25-29, 2013. See: donnees.ville.montreal.qc.ca/dataset/sondage-satisfaction-citoyens-2013/resource/2a41a407-26cc-4b9e-acac-9a083f33c76d
ARLINGTON (US): EMERGENCY COMMUNICATIONS CENTRE

Focus area: direct services to citizens

Arlington maintains a very informative Web site\footnote{http://emergency.arlingtonva.us/} that centralizes all emergency municipal information. A Twitter feed and Facebook page supplement it. This is a fairly simple and inexpensive example of a digital service that provides excellent benefits to the public.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{image}
\caption{
Emergency Communications Centre
\end{figure}
The 22@Barcelona Innovation District Project is seeking to revitalize 200 hectares of industrial land and attract knowledge-economy businesses. A real driving force of economic development, this project may generate some €180 million in public investment. All municipal infrastructure will be redesigned and redeployed, putting 22@Barcelona on technology’s leading edge. One factor that drew the BVIN’s attention was the idea of providing organizations with public spaces to conduct tests and using the city as an urban laboratory.

http://www.22barcelona.com/content/blogcategory/49/280/lang,en/
http://www.22barcelona.com/content/view/698/897/lang,en/
TechColumbus invests human and financial capital in Ohio’s brightest entrepreneurs and most promising ideas. Everything we do is directed toward accelerating startups’ progress toward becoming successful, sustainable, high-growth businesses.

Since inception, we have served more than 500 entrepreneurs and companies. Our investment of $12.3M in 140 firms has attracted more than $540M in co-investment. More than 20 percent of our companies have achieved commercial success or profitable exits, returning a value of $2 million to TechColumbus.

We invest these dollars in the next generation of startups, perpetuating the innovation economy. The average salary of these businesses is $64,000.

TechColumbus business founders further contribute to the entrepreneurial community by sharing their experience and lessons learned with fellow entrepreneurs.

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Nine VentureNEXT Startup Award Finalists WOW Judges in Pitch Competition
5 Sticky Customer Situations and How to Deal with Them
SpringBox Labs Announces New Director and Completes Milestone Renovation
IncubaTour Stop 3: Going big but making room for small in New Albany
Focus area: way of life, economic development

Brainport Health Innovation is a platform for Dutch and international healthcare partners, government agencies and research institutions to share knowledge and develop joint healthcare/technology initiatives.

脑港健康创新平台是荷兰和国际医疗保健合作伙伴、政府机构和研究机构的平台，旨在共享知识并开发医疗保健/技术倡议。

**PROJECTS**

Brainport Health Innovation is active in various fields and constantly develops new projects.

**Remote services**

Which eHealth services must become available starting in the Eindhoven region? This is the subject of the Remote Services project being undertaken by Brainport Health Innovation. An open and inexpensive provision should offer all residents with an internet connection in their homes access to all eHealth services.

Sub-projects will have to provide greater insight into viable and affordable connection to remote services. End user demand is key to the structure and execution of the sub-projects. Using eHealth services can promote the independence of older people, the chronically ill and handicapped people in need of care. Also, eHealth applications can help cater for personnel shortages, reduce the costs of healthcare and support volunteer aid workers. Themes like safety and loneliness are focal points, too, in this project since these are often reasons why people tend to give up their independence.

**Living Lab eHealth**

The Living Lab eHealth is an open laboratory where aging people are able to physically test new services in an approachable way. With insight into user needs, the Living Lab explores the possibilities of eHealth applications and can showcase in this insight and the possibilities to the administrators. It is an open innovation platform where care providers and technology companies can also perform real-life testing.

**Common Infrastructure / Broadband**

An open, common Internet-based network is needed in order to give patients greater control and choice in how they organise their care. This network must be both approachable and give all parties access to these clients. Further standardisation is required in the technology used by the healthcare providers to ensure that customers and markets are not screened off. To this end, Brainport is bringing together all the parties involved to encourage the creation of a
EINDHOVEN (NETHERLAND): DESIGN CONNECTION BRAINPORT**-DESIGN CONSORTIUM

Focus area: way of life, economic development

Design Connection Brainport is an Eindhoven-based design consortium belonging to Brainport Health Innovation.

Design has been in the DNA of the Eindhoven region for decades. Thanks to its industrial and technological background, Eindhoven has developed into a city of innovation and creativity, a fact that is acknowledged by the numerous innovative products invented, developed and manufactured in Brainport.

Opening of Van Gogh-Van Roossgaarde Bicycle Path
November 12th, 2014

Yesterday was the opening of the Van Gogh-Van Roossgaarde cycle path in Eindhoven. It is the first light-emitting cycle trail in the world.

DFW 2014 ‘City in Motion’
October 28th, 2014

Eindhoven is preparing for the light art festival GLOW. The theme for the eighth edition this year is City in Motion. Fifty international artists will transform Eindhoven city centre into a dynamic light landscape with light installations, sculptures, projections and performances at locations all over the city.

UP: Successful 13th DDW
October 27th, 2014

Dutch Design Week (DDW) reflects on a successful thirteenth edition. In spite of the autumnal weather, the...
LYON (FRANCE): OPTIMOD’LYON, SMART MOBILITY

Focus area: urban mobility

Optimod’Lyon is an integrated platform for innovation in multimodal urban transportation. Optimod’Lyon is an integrated platform for innovation in multimodal urban transportation.

Road network, public transport, local trains, car-sharing, carpooling, and also Vélo’v (Lyon bike sharing service, first one set up in France), ... the agglomeration of Lyon has an important panel of transport and services organised in a meshed network helping connections. However, the diffusion of information on travel conditions is today disorganised. The challenge is to centralise all mobility data within a single data centre, producing integrated user information, in real time, about all modes of transport.

AN INFORMATION PLATFORM
> CENTRALISING ALL MOBILITY DATA

COLLECTING DATA IN A REAL TIME COLLECTOR
- Transmission of data by networks and services operators
- Recovery of «road traffic» data via fixed and mobile sensors

CONSOLIDATING & PROCESSING THE DATA COLLECTED
- Consolidation of data about all transport modes in Grand Lyon’s mobility data centre: real time and fixed data

THE PARTNERS
- Grand Lyon / Geoloc Systems
- Cité de Metz / Autoroutes Trafic
- Parkeon / Ville de Lyon

THE PARTNERS
- Grand Lyon / Cityway
- Let - Université Lyon 2

Movement of passengers or freight involving different successive modes of transportation. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.
Lyon plans to offer three new services based on centrally collected and managed mobility information.

**THREE MAJOR SERVICES**

> ORGANISING TRAVEL FOR PASSENGERS, TRAVELLERS AND FREIGHT PROFESSIONALS

1. **1 HOUR TRAFFIC PREDICTION**
   - Optimising the operation of urban networks via Grand Lyon’s CRITER system (management of 1,500 traffic lights), anticipating the congestion rather than acting after it occurs.
   - Informing the user about probable traffic conditions encountered in the next 60 minutes.

   **THE PARTNERS**
   PHÉNIX ISI / IBM / GRAND LYON

2. **AN URBAN NAVIGATOR ON MOBILE PHONE**
   - Having at anytime real time and all-mode information so as to optimise the journey accounting for events.
   - Combining all modes of transport and services to organise the journey.
   - Having the benefit of all GPS functionalities.
   - Having a voice interface for the route calculator.

   **THE PARTNERS**
   CITYWAY / GRAND LYON / ORANGE BUSINESS SERVICES

3. **A NAVIGATOR FOR URBAN FREIGHT AND AN OPTIMISATION TOOL FOR DELIVERY ROUTES IN THE CITY**
   - Informing drivers on traffic conditions via a mobile application including the geometry of roads, height of bridges, availability of delivery areas, historic traffic data, in real time and in prediction at 1 hour.
   - Improving the management of deliveries with an online route optimisation tool.

   **THE PARTNERS**
   RENAULT TRUCKS / IBM / LIRIS-INSa / GRAND LYON
A bit like Montréal’s Blue Bonnets development, New York’s Hudson Yards involves rebuilding a neighbourhood from scratch. This is the United States’ biggest private real-estate project. Twenty-four million visitors per year are expected at the site. It will have 17 million square feet of commercial and residential space and 5 office towers, plus 100 shops, restaurants, some 5,000 residences, cultural spaces, parks, one public school and a large hotel. A subway line extension is even planned to provide better transit to the area.
City 24/7 provides one-stop access to all of New York’s digital services. In addition to delivering 311 service, City 24/7 integrates information from government programs, local businesses and citizens. It can be downloaded as a smartphone or tablet app and used on the go.
NEW YORK (US): LED STREET LIGHTS

Focus area: sustainable development

In 2009, New York City decided to switch some 300,000 street lights to LED technology. Doing so should generate huge energy savings.

With the installation of these and future energy-efficient lighting solutions, the New York City Department of Transportation is becoming an international leader in green lighting.

Looking Ahead
Over the next year, the New York City Department of Transportation will be participating in the United States Department of Energy Gateway Program, installing, and evaluating LED luminaires. Upon successful completion of the program, data collected from New York City’s LED installations will be used to help other cities looking to convert to LED fixtures.

With the installation of these and future energy-efficient lighting solutions, the NYCDOT is becoming an international leader in green lighting. In this decade alone, NYCDOT has cut its carbon footprint by thousands of tons and saved millions of dollars through its energy-saving initiatives. These numbers will increase as the LED program expands and more lights are converted to energy-efficient luminaires. NYCDOT will continue its research to identify the latest in energy-efficient technology to ensure New York City is lit by the greenest, most cost-effective lighting possible.

TORONTO (CANADA): WATERFRONT, REDEVELOPMENT OF LAKE ONTARIO’S SHORELINE

Structural component: Developing the urban, multiservice ultra-high speed telecom network

Waterfront Toronto\(^{34}\) involves the complete revitalization of a vast district along Lake Ontario. This outstanding initiative has turned what was a garbage and industrial waste dump for over a century into one of the Toronto area’s most stylish neighbourhoods.

The BVIN was interested in the initiative’s digital aspect – a core component of a strategy that won Toronto the 2014 Intelligent Community of the Year Award.

This new community offers ultra-high-speed Internet, with no bandwidth limits.\(^{35}\) Since all sites connected to fibre optics, the project also guarantees every occupant (people and businesses) the fastest speeds on the market. This project will permit development of leading-edge digital services that can be tested in this state-of-the-art environment, giving the industry an opportunity to acquire a strategic edge over the competition. Public Wi-Fi will, of course, be available throughout the site.

\(^{34}\)http://www.waterfronttoronto.ca/our_waterfront_vision/innovation/_intelligent_communities

\(^{35}\)A minimum speed of 500 Mb/s is offered. Basic (high speed) service is generally about 7 Mb/s.
Home to Canada’s first open-access, ultra-high-speed broadband community network, Toronto’s new waterfront communities will be among the most connected in the world.

With affordable and unlimited access to internet speeds exponentially faster than typical North American residential networks, the emerging waterfront neighbourhoods will revolutionize how residents and businesses receive telecommunications services to promote economic growth and development and foster innovation and creativity.

Wired with fibre-optic technology, every home and business in the new communities will be equipped to become first adopters of the web-based technologies and applications of the future. The cutting-edge network will enable the

To be built and operated by Toronto-based telecommunications firm Beanfield Metroconnect in partnership with Waterfront Toronto, the state-of-the-art network will deliver internet connections starting at 500 megabits per second for residential customers and up to 10 gigabits per second for commercial customers – all at an extraordinarily competitive cost. To date, broadband of this quality has not been available for residential users in Toronto, and commercial access is significantly less affordable in Toronto than in other leading world cities.

As an open-access network, residents and businesses will have the ability to choose from a variety of content and service providers for Internet, IPTV (Internet Protocol Television), VOIP (Voice Over Internet Protocol), safety and

what makes an intelligent community so smart?

Västerås, Sweden built an open-access fibre-optic network in 2000. Within just two years, more than 800 new companies set up shop in this lakeside city west of Stockholm. Today, Västerås has earned accolades for its innovation, economic development and telecommunications.

By building an intelligent community on its waterfront, Toronto will be among only a handful of global cities well-acquainted with the value of an open-access ultra-advanced communications network.

The importance of this infrastructure cannot be overstated. It connects residences, workplaces and public
4.2.4 STRATEGIC FRAMEWORK STUDIED

A review of worldwide smart city initiatives has served in defining a strategic framework to guide Montréal’s project.

**Summary of Main Strategic Frameworks Studied**

<table>
<thead>
<tr>
<th>Urban mobility</th>
<th>Direct services to citizens</th>
<th>Way of life</th>
<th>Democratic life</th>
<th>Sustainable development</th>
<th>Economic development</th>
</tr>
</thead>
</table>

**FIGURE 5: SUMMARY OF MAIN STRATEGIC FRAMEWORKS EVALUATED**

4.2.5 - PUBLIC CONSULTATIONS

The city conducted several public consultations (203 participants) and co-design activities (190 experts) from October to November 2014 to determine citizens’ priorities for a smart city. They were:

- Town hall meeting[^37] (Boisé library, Saint-Laurent, November 2, 2014).
- Town hall meeting[^38] (Mile End Library, Plateau-Mont-Royal, November 8, 2014).
- Town hall meeting[^39] (Maison culturelle et communautaire de Montréal-Nord, November 9, 2014).
- Town hall meeting[^40] (Frontenac library, Ville-Marie, November 15, 2014).
- Town hall meeting[^41] (Marc-Favreau library, Rosemont - La Petite-Patrie, November 16, 2014).

[^36]: ejcmtl.ca/le-codesign-resultats/
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• Co-design event on municipal priorities (November 23, 2014).

Hundreds of citizens from all walks of life (contractors, scientists, members of civil society organizations, city workers, etc.), took part in these consultation sessions.

### 4.2.6 - SUGGESTION BOX AND SUGGESTIONS FROM CITIZENS

Some 357 suggestions were received online and at the co-design workshop, of which 232 were selected for further study.

Most of the suggestions perceive technology as a catalyst. Such technology may consist of infrastructure (sensors, detectors, networks) or applications and software. They break down as follows:

![Figure 6: Suggestions by Category](villeintelligente.ocpm.qc.ca/sites/villeintelligente.ocpm.qc.ca/files/ville-intelligente-rapport-codesign.pdf)
4.2.7 - TOWN HALL MEETINGS

Town hall meetings focused on different topics. In some cases, participants were asked to vote on certain statements to indicate their preferences.

SMART CITIES AND THE ECONOMY

1. A city that develops services enabling small, medium-sized and large businesses to grow and create new jobs (supported by 43%).
2. A city that support new immigrants and job seekers (supported by 43%).
3. A municipal laboratory enabling citizens to test new products and services (supported by 26%).
4. A city that promotes an economy of sharing (supported by 26%).
5. A city that combines its resources more efficiently to generate collective wealth (supported by 26%).

SMART CITIES AND CULTURE

1. A city that explores new ways of creating, based on citizen participation, to improve the built environment, the urban landscape, our living areas, etc. (supported by 31%).
2. A city that centralizes cultural information (supported by 26%).

COMMUNITY LIVING, SOCIOCULTURAL DIVERSITY AND THE SMART CITY

1. A city that promotes everyone's participation through digital tools.
2. A city that co-creates urban planning strategies tailored to multicultural communities.
3. A city that helps new citizens find jobs.
4. A city that seeks to span the intercultural divide.
5. A city that delivers accessible and effective services.

EDUCATION AND THE SMART CITY

1. A city that promotes access to education through digital means.
2. A city that adapts its digital tools to make educational universally accessible.
3. A city that encourages decompartmentalization of learning through citizen participation and democratization of knowledge.
4. A city that promotes universal digital access.
5. A city that uses digital technologies to democratize education.
TRANSPARENT AND OPEN GOVERNANCE

1. A city that enables citizens to participate in public decisions.
2. A city that uses digital technologies to increase its transparency.
3. A city that brings together citizens, elected officials and decisions.
4. An urban laboratory in which citizens can test and co-build practices, projects and new services.
5. A city that can continuously communicate with citizens on current and future projects.
6. A city built on shared power and participatory democracy.
7. A city that breaks down barriers and pyramid structures to work with an integrated approach.

4.3 - KEY CONCERNS OF CITIZENS

The set of data obtained reveals the key concerns of Montrealers and the focus areas of greatest importance to them. Montréal’s strategy will initially be based on these focus areas.

**Prioritized Focus Areas**

- Urban mobility
- Direct services to citizens
- Way of life
- Democratic life
- Economic development

**Citizens’ Primary Concerns**

- Difficult to get around
- Inadequate supply of direct digital services to citizens.
- Virtual absence of physical or virtual platforms to talk about, experiment with, test or learn about solutions to urban issues.
- Access to democratic life issues. Culture of transparency and accountability must be enhanced.
- Support for wealth and job creation, high-potential future sectors and the community’s economic momentum.

**Corroborated by**

- Priority #1: Web and phone surveys
- Priority #3: SOM, Web and phone surveys
- Consistently brought up in all town meetings and co-design activities
- Priorities #1 and #2: SOM and intercept surveys
- Only 18% of participants thought the economy has had a positive impact on their quality of life

**FIGURE 7: KEY CONCERNS OF CITIZENS**
Apply collaborative innovation, state-of-the-art technology, and Montrealers’ trademark creativity in imagining and developing an exceptional quality of life and prosperous economy, with and for citizens.  

The BVIN’s activities and studies have revealed five focus areas and four structural components supporting them. Goals have been formulated for each area and component, accompanied by relevant international examples.

<table>
<thead>
<tr>
<th>5 Focus Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic development</td>
</tr>
<tr>
<td>Urban mobility</td>
</tr>
<tr>
<td>Direct services to citizens</td>
</tr>
<tr>
<td>Way of life</td>
</tr>
<tr>
<td>Democratic life</td>
</tr>
</tbody>
</table>

- Promote growth of a leading-edge sector by employing the smart city strategy as a catalyst for bringing the project to fruition and as an engine of economic development
- Optimize mobility throughout the island in real time
- Increase the provision of direct digital services to citizens and businesses
- Develop spaces supporting urban innovations and diminish the digital divide
- Improve access to democratic life and bolster the culture of transparency and accountability

<table>
<thead>
<tr>
<th>4 Structural Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications</td>
</tr>
<tr>
<td>Open data</td>
</tr>
<tr>
<td>Architecture</td>
</tr>
<tr>
<td>Community</td>
</tr>
</tbody>
</table>

- Develop ultra high speed multiservice telecom infrastructure
- Release and use prioritized open data
- Create an open, interoperable technological architecture
- Develop, in co-creation with the community, solutions to urban issues

*Collaborative innovation involves multiple parties—such as the city, the academic community, business and civil society—and results in the creation of new products and services.*
5.1 DEVELOPING MULTISERVICE ULTRA-HIGH SPEED TELECOM INFRASTRUCTURE

• Provide free public Wi-Fi access throughout Montréal.
  - Example from New York City: Deployment of free Wi-Fi throughout the Chelsea district to enhance its reputation as a NYC hub of communications and technology.\(^{45}\)

• Promote residential and business access to ultra-high speed last mile\(^{46}\) telecom service.
  (last mile\(^{47}\))
  - Example from Austin: deployment of Google Fiber\(^{46}\) with speeds up to 1,000 Mb/s\(^{48}\) and free broadband access to 5 Mb/s\(^{19}\).

• Include the telecom system in urban planning, particularly in the urban plan and from now on, in project charters.
  - Example from New York City: As previously noted, Hudson Yards was partially planned around the telecom system.\(^{50}\)

5.2 RELEASING, ANALYZING AND USING PRIORITIZED OPEN DATA

• Use municipal data and develop apps to make citizens’ lives easier (such as the MTL InfoSnow App).
  - Example from San Francisco: 33 departments and partners are releasing data to DataSF. Online apps are available for viewing this information.\(^{52}\)

• Promote development of interrelationships between open data from the boroughs, the urban agglomeration, the CMM\(^{53}\) and public/parapublic partners\(^{54}\)).

\(^{44}\) Ultra-high speed Internet service generally provided over fibre-optic lines.
\(^{45}\)chelseaimprovement.com/neighborhood/free_wifi.html
\(^{46}\)Set of agents, operations and associated equipment used for a telecom network's final distribution segments. Source: Adapted from wikipedia.org
\(^{47}\)https://fiber.google.com/about/
\(^{48}\)Mb/s is a quantity of digital data transmitted per unit time (1 million de bits—0 or—per second).
\(^{49}\)https://fiber.google.com/cities/austin/home/
\(^{50}\)www.hudsonyardsnewyork.com/
\(^{51}\)Based on plan priorities and international standards.
\(^{52}\)https://data.sfgov.org/Economy-and-Community/Mobile-Food-Permit-Map/px6q-wjh5
\(^{53}\)Communauté métropolitaine de Montréal.
\(^{54}\)Communauté métropolitaine de Montréal
5.3 CREATING AN OPEN, INTEROPERABLE TECHNOLOGICAL ARCHITECTURE

- Define a technological architecture that will promote system decompartmentalization and data flow, including third parties.

- Example from France: The Chief Data Officer is responsible for decompartmentalizing data and has special authority to require the government to accelerate the release of data.

- Use the capital investment program (3-YCP) to upgrade the city’s IT infrastructure and share data more effectively, particularly with its partners

- Example from San Francisco: Each set of data can be accessed by an API.

5.4 DEVELOPING SOLUTIONS TO URBAN ISSUES IN CO-CREATION WITH THE COMMUNITY

- Mobilize businesses, public institutions, universities and citizens to find and tests solutions to daily problems.

- Example from Chile: The MueveTT Innovation Challenge seeks to generate new ideas for passenger transport, road safety and urban mobility information.

5.5 OPTIMIZING MOBILITY OF PEOPLE ACROSS THE ISLAND IN REAL TIME

- Collect, process and distribute data and mobility information in real time, to:

  - Improve the flow of all types of transportation (public transit, alternative, individual, intermodal and freight).

    - Example from Lyon: Optimod’Lyon is an integrated platform for urban mobility and public private cooperation on urban intelligent transportation systems.

    - Let people optimize their trips in real time by providing them with all useful information (public transit schedules, construction site locations, traffic and accident reports, detours, blockages, etc.).
5.7 DEVELOPING AREAS SUPPORTING URBAN INNOVATION AND DIMINISHING THE DIGITAL DIVIDE

- Create “public innovation laboratories” enabling citizens and businesses in their beta phases.
  - Example from Denmark: MindLab comprises three departments from the city of Odense. A true hub of innovation, MindLab focuses on entrepreneurship, digital services, education and employment.68
- Set up workshops to teach citizens about using these new apps.
  - Example from Barcelona: Citilab69 has a teaching and testing component.
5.8 IMPROVING ACCESS TO DEMOCRATIC LIFE AND BOLSTERING THE CULTURE OF TRANSPARENCY AND ACCOUNTABILITY

- Through new technologies, provide better access to all forums for public discussion, in terms of participation and information.
  - Example from Houston: citizens can comment on proposed by-laws.
- Improve distribution of the city’s KPIs (budgets, financial statements, project monitoring, service level targets, etc.) and develop new tools for presenting this information.
  - Example from New York: CheckBook NYC is an online app that posts the city’s daily expenditures.

5.9 PROMOTING GROWTH OF A LEADING-EDGE SECTOR BY EMPLOYING THE SMART CITY STRATEGY AS A CATALYST FOR BRINGING THE PROJECT TO FRUITION AND AS AN ENGINE OF ECONOMIC DEVELOPMENT

- Maximize the economic benefits generated by the smart city initiative:
  - By stimulating local businesses.
  - By attracting top companies.
  - By promoting networking between the research, industrial, venture capital, institutional investor and start-up sectors to build on Montréal’s existing expertise, so it becomes a world leader among smart and digital cities.
    - Example: Urban.us is a venture capital fund focusing on the smart city.
The BVIN had received 232 ideas for project by the end of 2014 through its Web site’s suggestion box, through “I see mtl” and through the experiences of other cities that have embarked on similar initiatives.

Starting in January 2015, a major effort to organize information will be made. Ideas will be grouped by focus area and associated with a structural component, where applicable.

Projects will be developed based on suggestions received until mid-February 2015. Projects will then be selected and processed based on an assessment matrix (next section), then included in the BVIN’s planning portfolio. The action plan will be submitted by late March 2015.

At the same time, the BVIN will initiate various short-term projects. Most have already been approved in various forums or pertain to Structural Components.
6.2 PROJECT SELECTION

Obviously, the number of projects and actions the city could take to make Montréal the world’s leading smart city is vast. Consequently it must select those that will be seen through to fruition and determine their implementation order.

All proposals must accordingly be assessed according to a grid prepared by the BVIN and validated by citizens at the November 23, 2014 Convergence Workshop. The grid will be used to determine the value of projects submitted for approval to the city administration.

The matrix is organized as follows:

<table>
<thead>
<tr>
<th>Projects Reviewed</th>
<th>Selected Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Impact on structural components</td>
<td></td>
</tr>
<tr>
<td>2 Contributions to stated strategic orientations</td>
<td></td>
</tr>
<tr>
<td>3 Scope (impact on citizens)</td>
<td></td>
</tr>
<tr>
<td>4 Cost-effort-return on investment</td>
<td></td>
</tr>
<tr>
<td>5 Short or long-term implementation period</td>
<td></td>
</tr>
</tbody>
</table>

Project analysis and selection will be an ongoing process.
6.3 PUBLICATION OF PROJECT CHARTERS

A public project charter will be produced for each project so everyone can evaluate its elements:

- The project’s actual scope.
- The party responsible for the project.
- The planned funding/partnership structures (if applicable).
- The initial schedule.
- Project KPIs.

Naturally, project definitions will be enhanced through consultations with citizens or experts.

6.4 MONITORING PROJECT PROGRESS

The four-phase project evolutionary cycle is drawn directly from a digital initiative of the UK government. In contrast with cities that merely produce annual reports of their activities, the BVIN intends to constantly post the progress of its projects on its Web site.

Digital Transformation

Government is building digital services that are simpler, clearer and faster to use. We’re starting with these 25 services. You can follow our progress on this page.

<table>
<thead>
<tr>
<th>Discovery</th>
<th>Alpha</th>
<th>Beta</th>
<th>Live</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>15</td>
<td>8</td>
</tr>
</tbody>
</table>

User needs are researched and identified [Learn more about the discovery phase](#).

A core service is built to meet the main user needs [Learn more about the alpha phase](#).

The service is improved, then tested in public [Learn more about the beta phase](#).

The service is public and works well. It’ll be continually improved to meet user needs [Learn more about the live phase](#).

Digital services so good people prefer to use them

The Government Digital Strategy and [departmental digital strategies](#) commit us to the redesigning and rebuilding of 25 significant ‘exemplar’ services. We’re going to make

FIGURE 11: UK GOVERNMENT’S DIGITAL TRANSFORMATION PROJECT PORTAL
The BVIN intends to adopt a project evolutionary cycle during regular consultations with stakeholders (citizens, experts, city workers, partners and associates.)

<table>
<thead>
<tr>
<th>Needs</th>
<th>Prototyping</th>
<th>End-to-end prototyping</th>
<th>The service is officially launched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmarking in conjunction with stakeholders</td>
<td>Modification of scope</td>
<td>Public trials</td>
<td>Feedback mechanisms</td>
</tr>
<tr>
<td>Tests</td>
<td>Corrections</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE 12: PROJECT EVOLUTIONARY CYCLE**

**FIGURE 13: MONTRÉAL’S LEADERSHIP IN ALL PROJECTS BASED ON THIS STRATEGY**
Montréal seeks to become an international leader among smart and digital cities. Broad areas of project focus and implementation will now be the result of collaborative efforts, rather than the sole preserve of city workers or elected officials.

The BVIN’s strategy has been dictated out of a concern for transparency and cooperation with stakeholders. Civil society, university, businesses—and in particular, young entrepreneurs – representatives of other cities and levels of government have all made major contributions to producing the 2014-17 Montréal Strategy. Many have participated in the numerous work sessions to which they city invited them, even on weekends. The engagement of Montréal’s collaborative ecosystem is certainly a good omen for the success of the ambitious goals Montréal has set.

The city would like to thank all local stakeholders for their work over the past few months. The city does hope it can continue to count on them to forge transformation projects that will take shape over the next few weeks and that will make Montréal unique and decisive as a smart, digital city. Montréal will take advantage of technological progress, along with the collective creativity and intelligence of its citizens and partners. Montréal will deliver collective well-being in line with all its citizens’ hope and efforts.
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CO-DEVELOPMENT AND CO-CREATION


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• **Smart Cities in Europe 2020 Strategy.** European Commission (2013).

• **Smart City: Experimenting Today for a Better City Living Tomorrow,** Greater Lyon City (2014).

• **The Internet of Everything for Cities.** Cisco (2013).

• **The Top Seven Intelligent Communities in 2011: Health in the Intelligent Community.** Intelligent Community Forum (2011).


### PRESENTATIONS AND VIDEOS

• **Citymart**

• **Le gouvernement ouvert** (2013)

### USEFUL LINKS

• **Apps for Smart Cities Manifesto**

• **European Network of Living Labs**

• **Global Compact Cities Programme**

• **Living Labs Global**

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142 http://www.aderly.com/publications/Smart-City-%28GB%29,id_763.pdf

143 http://www.cisco.com/web/about/ac79/docs/ps/motm/IoE-Smart-City_PoV.pdf

144 https://www.intelligentcommunity.org/clientuploads/PDFs/TopSeven-ICs-2011.pdf


147 http://www.ctg.albany.edu/publications/journals/dgo_2013_smartdisclosure


149 http://ofti.org/le-gouvernement-ouvert/

150 http://www.appsforsmartcities.com/?q=manifesto

151 http://www.openlivinglabs.eu/

152 http://citiesprogramme.com/

153 http://www.llga.org/
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311: Service used in many US and Canadian cities as an easy and single telephone entry point for citizens seeking non-urgent municipal services.

3-YCP: Three-year capital program. Planning of municipal investments over three years.

Accelerator: Generally, a for-profit business operated by venture capital investors to generate returns on investments in client firms. Accelerators provide a range of services to businesses at the start of their growth, including financial support, advice on business, office space, development and additional services provided through partner organizations. Source: Adapted from the Canada National Research Council.

Accountability: Obligation of a manager, executive, director or administrator to demonstrate that s/he has complied with various explicit or implicit conditions in managing and controlling resources under his/her authority. Source: Adapted from the Encyclopédie du parlementarisme québécois.

API: Interface containing functions required for application development. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

Big data: Set of data continuously produced in real time from heterogeneous sources in different formats, with exponential growth. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

Chief data officer: Senior French official responsible for releasing data for all of France.

CMM: Community métropolitaine de Montréal.

Co-Creation: Sustainable development of products and services by a business in active collaboration with its clients. Source: Adapted from wikipedia.org.

Co-Design: Process of developing a typically innovative product or service involving the final user. Source: Adapted from wikipedia.org.

Co-Development: There are two types: horizontal (within different administrations of the same kind) and vertical (between stakeholders, citizens and programmers).

Collaborative innovation: Work involving multiple parties – such as the city, the academic community, business and civil society – and resulting in the creation of new products and services.

Digital divide: Widening inequality in personal computer hardware and Internet access, growing disparities by income level, region and ethnic background. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

Electric service delivery: Delivery over the Internet of secure and non-secure government services to users. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

Fab Lab: A fab lab (from “fabrication laboratory”) is a site in which members of the public can use a host of tools, such as computer-controlled machine tools, to design and produce objects. Source: adapted from wikipedia.org.
**Incubator:** Generally, an NPO that provides services similar to those of an accelerator, but tends to spend more time on the businesses. An incubator provides a broader range of services in terms of facilities and coaching services. Incubators are often sponsored by universities, colleges and economic development agencies. Source: Adapted from the Canada National Research Council.

**Intelligent Transportation System:** New information and communication technology applications for the transport sector. They are “intelligent” because their development is based on features generally associated with intelligence: sensory abilities, memory, communication, information processing and adaptive behaviour. Source: Adapted from wikipedia.org.

**Intermodal:** Intermodal transportation means successive use of two or more forms of transportation to transport an individual or payload from origin to destination. Source: Adapted from wikipedia.org.

**Interoperable:** Ability of heterogeneous computer systems to work together, through the use of shared languages and protocols and to provide reciprocal access to their resources. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

**Last mile:** Set of agents, operations and associated equipment used for a telecom network’s final distribution segments. Source: Adapted from wikipedia.org.

**Mb/s:** Quantity of digital data transmitted per unit time (1 million bits – 0 or 1 – per second).

**Multimodal:** Movement of passengers or freight involving different successive modes of transportation. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

**Prototyping:** Process involved in producing a prototype. The prototype is an incomplete and not final model that could be the product or final object. Source: Adapted from wikipedia.org.

**Detector:** Technology device that can detect something with one or more characteristics. Detectors are used in alarms, fire-prevention systems and satellites. Source: Adapted from www.linternaute.com/dictionnaire/fr/definition/senseur/.

**Start-up:** Young, high-potential firm that spends most of its time raising money. “Start-up” is a term also used for construction companies that have not yet entered the commercial market. Source: Adapted from wikipedia.org.

**Telemetry:** Use of acoustic, optical and radio signals to measure the distance between an observer and distant location. Source: Adapted from the Grand dictionnaire terminologique of the Office québécois de la langue française.

**Ultra-high speed:** Ultra-high speed Internet service generally provided over fibre optic lines.

**Wi-Fi:** Use of microwaves to connect different computer devices to a network and permit data transmission between them. Source: Adapted from wikipedia.org.