Connectivity

Fundamentals

BRITISH COLUMBIA | Connected Communities

PURPOSE OF THIS GUIDE

Local leaders and planners play a pivotal role in community development.

Today, that role increasingly involves leveraging technology, data and connectivity infrastructure to shape the future of communities and regions.

This guide is to help local leaders and planners use their convening ability to engage partners and stakeholders in a comprehensive approach to connectivity planning.

The guide describes the steps and considerations required to develop an action-oriented connectivity plan with strong links to community development.

Like electricity, connectivity is accessed through an inter-connected, province-wide infrastructure. Shaping the development of this infrastructure across vast areas of the province for public benefit requires a collective, collaborative approach among all those who provide, enable and use connectivity.

The sections described set the stage for a broad conversation about public need, benefits, opportunity, policy alignment, and collaboration in the context of connectivity investments. This conversation becomes a catalyst and strategic leap toward the future envisioned by the community, area, and region.

Connectivity planning takes time. The complexity of living in a digital world makes a comprehensive and collaborative approach necessary; the long-term benefits of connectivity as a vehicle for public good make it worthwhile.

WHERE TO BEGIN

Connectivity planning begins with a comprehensive understanding of community need, potential and the kinds of solutions that connectivity can enable. It concludes with a comprehensive plan that clarifies and prioritizes where investments in connectivity, over time, can enable the community to develop solutions and accelerate desired community outcomes.

Through a learning process, the relationship between connectivity and community goals emerges.

This enables priorities to be assessed within a broader community and regional context and for various roles, collaborations and partnership opportunities to be identified, clarified, understood and assessed.

The knowledge and insight gained through this process translates into stronger investment rationale when seeking funding for connectivity projects flowing from the process.

Ideally, these components become part of existing community planning to ensure strong links between community and connectivity as decisions - on need, use and investment - are made.

STEPS TO SUCCESS

CREATE A TEAM

Much like economic development, connectivity requires investments by many stakeholders, in a variety of ways, at various times, in various areas. By nature, connectivity is collaboration in action.

Therefore, choose candidates with perspectives important to lifestyle (e.g. healthcare, education, economic development, aquaculture, emergency management); who hold key roles in community service delivery (e.g. libraries, community centres, local Internet Service Providers) and who have practical skills in project management, analysis, community engagement, and communications.

The intent is to form a team that can integrate information, incorporate perspectives and conduct an inclusive, transparent and iterative feedback process to ensure the outcome is a connectivity plan that is informative, instructive, actionable and relevant. Finally, ensure the mandate includes a plan to assess community assets, needs, priorities and potential, with connectivity infrastructure plan to enable results.

Actions

- ☑ Choose team members
- ☑ Provide a clear mandate
- ☑ Establish structure and authorities
- ☑ Provide resources

When Assembling the Team, Consider the Following

- Local Governments/Regional Districts
- First Nations
- Local Internet Service Providers
- Community Development Representatives
- Businesses and Entrepreneurs
- Educators/youth with well-developed digital skills
- Health, Safety and Social Service Representatives
- Representation reflective of current and anticipated demographics

UNDERSTAND THE DIGITAL LANDSCAPE

Team members must be informed, aware and able to understand and navigate the interest, needs, misconceptions and misunderstandings endemic in any complex landscape. The list of topics below will get the team started:

Technology Trends

Awareness of how technologies like cell phone applications, data, analytics, and virtual and augmented reality can radically change how we work, live and play. Look beyond known applications to understand digital use throughout the value-chain, and how technology and use changes over time. Consider the value of data from different perspectives, such as a commodity, as well as a lever for improved quality of life. Local technology clubs, people working in high-technology jobs, high schools and colleges may have expertise to share.

Canada's Regulatory Environment

The tele-communications sector in Canada is federally regulated. This impacts how Internet Service Providers operate and shapes the roles of governments (Indigenous, provincial, regional, and municipal) in connectivity expansion and uptake. It is important to understand the relationship between the Canadian Radio-television and Telecommunications Commission's Universal Service Objective and federal connectivity funding.

Actions

- ☑ Share knowledge and expertise within the team
- ☑ Reach out to fill knowledge gaps
- ☑ Review rural transformation case studies and reach out to entrepreneurs, researchers, community development experts for exposure to local potential
- ☑ Understand the digital value-chain in healthcare, education, safety, sustainability, climate change.
- ☑ Explore possibilities for local change

The Industry

Telecommunications is a private industry where companies compete for market share. To set the table for equitable interaction and mutually-beneficial relationships, it is important to understand the business drivers, needs, challenges of local internet service providers, and to be aware of inter-industry business arrangements involved in service delivery.

The Economics of Broadband Infrastructure

Internet Service Providers and governments at all levels can choose a variety of roles and relationships in infrastructure building, ownership and service provision. Understanding the various models, costs, regulatory implications, risks and benefits informs relationships and business decisions.

Passive Infrastructure

Connectivity deployment relies on access to roadways, utility poles, rail lines, pipelines, underground conduits, and potentially any physical structure (building, lamp post, bus shelter) where cables, wireless antennas, and devices (i.e. cameras, temperature gauges) can be mounted. Understand the potential touch points between connectivity and local/municipal passive infrastructure. Consider the value of adopting digital best practices and guidelines to reduce barriers to connectivity development, such as comprehensive municipal access agreements, building permits which require digital pathways in new sewer, roadway and buildings, and policy alignment across jurisdictions.

The Technology

It is not necessary to become an IT expert. It is necessary to understand the pervasiveness of technology, such as cellular use and the extent of point-of-sale devices and why a mixture of wired and wireless technologies is required to provide services.

Infrastructure Funding

Infrastructure deployment costs are often shared among governments and industries, either as direct investment or in-kind investment (i.e. non-monetary right-of-way access agreements). Understand the end-to-end infrastructure costs, the extent and kinds of investment required, the potential partners involved and if investment is required in parallel or in succession. Consider where non-infrastructure investments may be required. If improved health is a community priority, direct and measurable improvements may require investments in digital health services in parallel with infrastructure builds. Explore where projects might leverage multiple types of funding to accelerate outcomes, as it may strengthen rationale for infrastructure investment and potentially increase the pool of partners, collaborators and investors.

INVENTORY YOUR STRENGTHS

Once key topics are understood, the planning team is ready to collect and analyse three categories of data that combine to drive connectivity need and options. The data includes:

Vision and Priorities

Connectivity is a means; the end is improved living. Scan economic development strategies, regional strategies for tourism, agriculture, climate adaption, etc., sustainability plans, Official Community Plans and similar planning documents to identify the priorities and themes that contextualize connectivity planning. The information can be verified through engagements with partners and stakeholders.

Assets

Think of assets in the broadest sense, from natural beauty to infrastructure to traditions and celebrations which can be a powerful attractor to increase population. Built assets such as movie theatres, machine maintenance facilities and local talent may have surprising potential when explored in the context of data and technology trends. Consider exploring assets through the eyes of residents, and non-residents to gain a diversity of perspectives, experiences and insights into emerging sectors. Also explore the value of passive infrastructure, land-use and by-laws as they relate to connectivity development. Some asset inventories may already exist as part of municipal or regional asset mapping exercises or emerge from regional tourism strategy development.

Actions

- ☑ Scan community and sectoral planning documents for vision statements, priorities and associated data
- ☑ Compile demographic data (age, health, education, attitudes, etc.)
- ☑ Think beyond physical assets to history, tradition and celebrations
- ☑ Inventory needs

Possible Assets

- Geographical (waterways; mountains; ecosystems, wildlife habitat, caves, cliffs, mineral deposits, attractive outcrops)
- Civic (health centres, fire stations, schools, community centres, commercial and industrial sites, campgrounds, airports, railways, trails)
- Passive infrastructure (roadways, utility poles, rail lines, pipelines, underground conduits, buildings, lamp post, bus shelters, etc.)
- Human-centred (leadership, history and associated values and norms, education/skill levels)

Service Needs

Understand the types of services that people of all ages and abilities require, which rely on connectivity. Consider how cellular phones, and devices like smart watches and personal safety buttons are enabling and expanding choice. These avenues of exploration will in due course reveal criteria that can be used to objectively assess the potential or value of connectivity investments.

Another important data set to compile is the current availability of connectivity services.

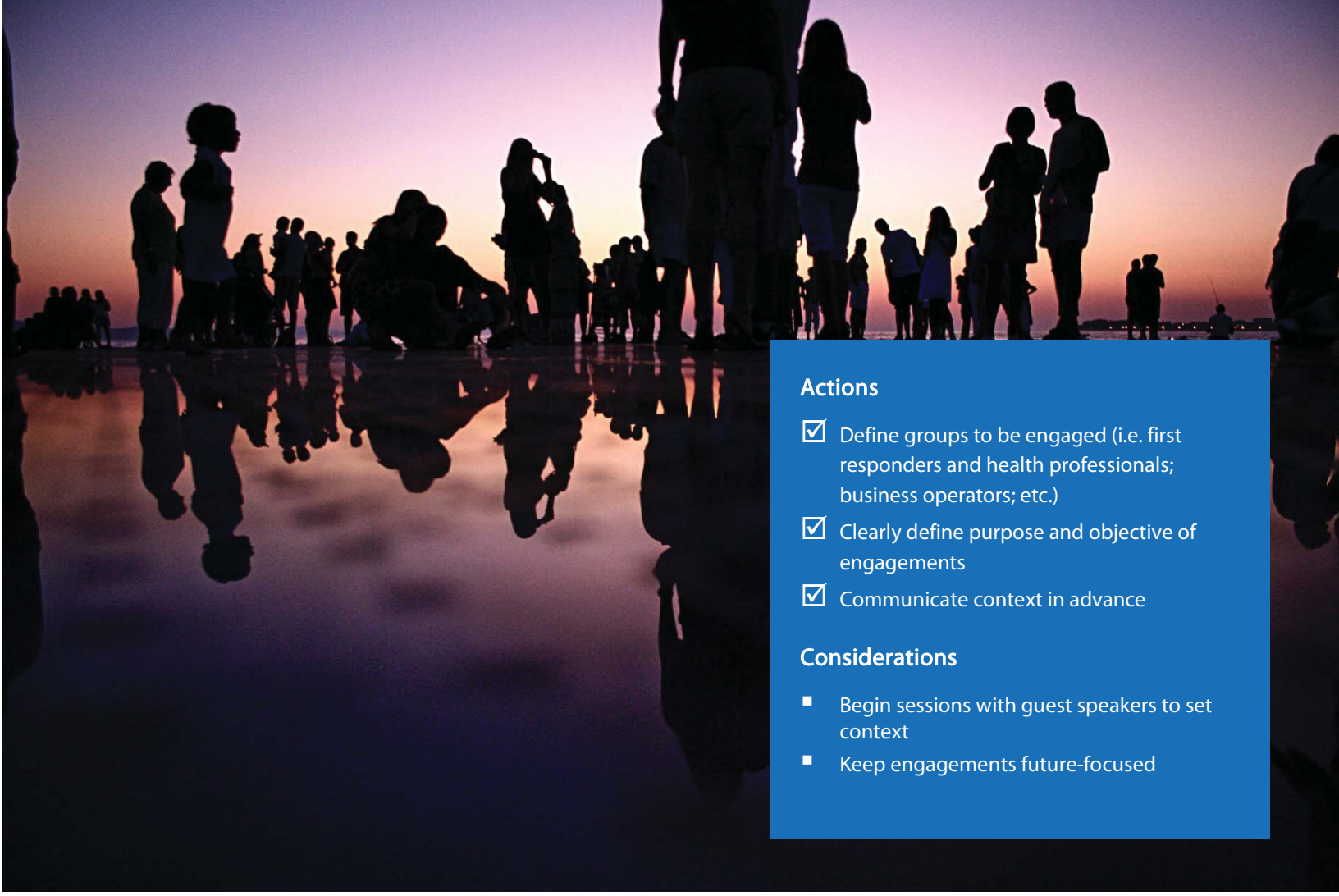
Local Internet service providers are best equipped to identify and inventory current service availability and gaps, which makes their participation on the core team very valuable.

If multiple providers operate in the area, ensure each contributes to a combined inventory of service availability. There is a natural tendency to assume that high-speed Internet requires fibre; wireless or cellular may be the practical and or affordable solution and a comprehensive view of all options provides a basis for discussion.

Internet service providers are also best positioned to point out key considerations, like the importance of network redundancy as climate change (floods, storms, landslides) impacts infrastructure.

Service Inventory Data

- ☑ Population, households, businesses and institutions
- ☑ Service coverage for cellular and internet services
- ☑ Location of existing backbone/transport (regardless of owner)
- ☑ Location of existing last-mile infrastructure (regardless of user)
- ☑ Types of infrastructure (e.g., fibre, cable, fixed wireless) and capacity for 50/10Mbps
- ☑ Where bottlenecks exist and where upgrades are required for 50/10Mbps
- ☑ Location of upgrades in process or pending
- ☑ Permit requirements (i.e. rights-of-way)



Actions

- ☑ Define groups to be engaged (i.e. first responders and health professionals; business operators; etc.)
- ☑ Clearly define purpose and objective of engagements
- ☑ Communicate context in advance

Considerations

- Begin sessions with guest speakers to set context
- Keep engagements future-focused

ENGAGE PARTNERS AND STAKEHOLDERS

Engagement with a broad group of partners, stakeholders and the public help to verify, understand and interpret the data and information that has already been collected.

Engagement can take many forms including formal community meetings, informal coffee shop chats, worksite visits, informational interviews and community surveys. Since connectivity enables services and new ways of working and achieving goals, consider how to engage people who are traditionally marginalized, or who would not think of themselves as experts. These perspectives may be key to fully understanding how connectivity can solve real and current problems that improve lives in the short-term, while creating a digital foundation to enable future community building.

Diversity of insight may lead to opportunities not apparent from the data, such a unique perspective on the value of a local asset, or the emergence of new businesses models that may favour the existence of skills or knowledge that local people take for granted.

Begin engagement sessions with some basic education as a foundation for conversations about the potential of connectivity. For example, how is drone technology advancing agriculture; how is access to global markets, ideas, talent and collaboration

changing business operations and opportunities; and how are other communities using data, technology and the presence of connectivity to advance their public interests?

Consider beginning engagement sessions with guest speakers or information that sets the context for the objective of the session. A session with emergency responders might begin with case studies about how other towns or jurisdictions are using technology to improve planning, response or mitigation to set the stage for exploring how and where technology and connectivity can have a marked impact locally.

A profile of the community may also be useful. Demographics, comfort with using technology and economic indicators are a few types of data that could foster dialogue. Themes emerging from analysis of data, when building the inventory of strengths, can also be useful.

Transparency is important. Ensure the purpose of each engagement is clear, sessions are structured to achieve a specific objective, participants understand how and where their input will be used and how they can monitor the process.

Surveys

Planners may choose to conduct surveys as one means of engagement. To make connectivity surveys beneficial to the process, it is important to consider how the results of each question will be used in development of a plan.

Design the survey based on how answers to each question will be compared or combined to produce a better understanding of the publics' experiences and needs. Think about the following when designing the survey:

1. Ask specific questions. Generic questions elicit generic answers, which may not clarify or verify anything.
2. Ask relevant questions. Choose questions that either contribute specific data to be analysed; provide data not available through data sources like Statistics Canada; enable assumptions to be verified; or enable opinions and attitudes to be assessed.
3. Ask answerable questions. Questions like 'what do you do online' are more productive that 'what service speeds do you require'. The former can inform discussions with Internet Service Providers who have the technical expertise to verify the latter.
4. Ask comparable questions. Questionnaire responses that create contradictions or poor narrative outcomes do not add value.
5. Ask feedback questions. Surveys can provide an opportunity for planners to confirm, verify or rank information, such as public assets and priorities.

For more information and best practices for public engagement surveys for connectivity planning, please contact us by emailing to ConnectedCommunitiesBC@gov.bc.ca

PUTTING IT ALL TOGETHER

Connectivity planning is an iterative process of analysis, learning, engagement and refinement.

The ideal outcome is a deep understanding of a complex challenge and highlighting where collaboration to align investment and policy can support and strengthen connectivity business cases.

It may make sense to share the results of each stage of your process (i.e. survey results, data reports, highlights and themes emerging from data analysis, reports from public consultations, etc.) if continued input and feedback is part of your process design.

Alternatively, a final report with appendices can articulate the context, learnings and actions.

Below are key elements to consider in the plan:

Overview: the values, vision and qualities of the community, area or region that make it unique; what matters to the people and the strategic advantage this creates for the future.

Priorities: The nature of key priorities and how and where connectivity comes into play to preserve, protect, enhance or promote what matters most.

Roles: Roles of various stakeholders, how they can potentially support or contribute to connectivity development, and mutual benefits of collaborating for public good.

Service and Infrastructure Requirements: The options and considerations involved in infrastructure projects. Investments required, over time, to achieve priorities regionally and at the community level.

Investment Requirements: Prioritized infrastructure investments, and investments in related areas such as health, emergency or digital literacy programs required to ensure infrastructure investments are maximized.

Opportunities: Where collaboration and pooled investment serves the interests of many or multiple communities, or an area of shared interest, such as a tourism transportation corridor or regional agricultural adaption to climate change.

Actions: Actions required to achieve priorities and roles and responsibilities of collaborators.

Setting a Foundation

Ideally, the final report is a comprehensive view of connectivity reframed as community development, providing a foundation for long-term collaborations that advance public good, while identifying immediate investment opportunities to be pursued.

RESOURCES

BC Data Catalogue
https://catalogue.data.gov.bc.ca/

BC Statistics
https://www2.gov.bc.ca/gov/content/data/statistics

Canada's Connectivity Strategy
https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html

CIRA Internet Performance Test
https://performance.cira.ca

Connectivity in B.C.
https://www2.gov.bc.ca/gov/content/governments/connectivity-in-bc

CRTC Broadband Internet Coverage Map
https://crtc.gc.ca/cartovista/internetcanada-en/

Federation of Canadian Municipalities: Broadband Publications
https://fcm.ca/en/resources?f%5B0%5D=filter_by_topic%3ABroadband

List of Registered Telecommunications Providers
https://applications.crtc.gc.ca/telecom/eng/registration-list

National Broadband Internet Service Availability Map
https://www.ic.gc.ca/app/sitt/bbmap/hm.html?lang=eng

Statistics Canada: Census Profiles
https://www12.statcan.gc.ca/census-recensement/index-eng.cfm

Telecommunications Right-of-Ways: A handbook for Municipalities
https://data.fcm.ca/documents/members_only/handbook-telecommunications-row.pdf

GLOSSARY

Definitions

Dark Fibre: Unused Fibre Optic Cable

Download speed: The speed at which the user receives data from the Internet – for example, the speed at which a large file can be downloaded from a website.

Fibre optic line: A type of cable that uses glass threads or plastic fibres to transmit data using pulses of light. Fibre can offer much faster speeds than, for example, copper wires.

Fixed wireless: This is service for providing high-speed Internet to a fixed location, such as a home or business. The wireless signal is typically transmitted from a tower to an antenna installed on the roof of the home or business in question.

Gigabits per second is 1,000 megabits per second. Therefore, 1 gigabit per second means 1,000 megabits per second.

Latency: Delay between transmission and receipt of signal.

Long-Term Evolution: is a standard for wireless communications (e.g. for smartphones and other devices). LTE is commonly referred to as 4G (fourth generation) cellular technology.

Low-Earth orbit constellation: is a system of satellites that orbit much closer to the earth than traditional communications satellites. A LEO constellation can have hundreds of satellites.

Megabits per second is the most common unit of measurement for describing the speed of high-speed Internet connections.

Network resiliency: The ability of a network to provide "back-up" service in the event of an issue with normal network operation.

Packet: A unit of data formatted for transmission on a network. Data is broken up into packets for sending over a packet switching network. Each packet has a header containing its source and destination, a block of data content, and an error-checking code. All the data packets related to a message may not take the same route to get to their destination; they are reassembled once they have arrived.

Passive infrastructure: The non-electrical elements needed for network deployment. Examples of passive infrastructure include telephone poles, underground ducts or conduit, and wireless towers.

Peering: A settlement-free exchange of routing announcements between two Internet service providers for the purpose of ensuring that traffic from the first can reach customers of the second, and vice-versa.

Scalability: The ability of network infrastructure to be upgraded later to offer higher speeds.

Spectrum: Airwaves used to transmit sound and data wirelessly

Telehealth: A method of providing health care services remotely using digital technology including computers and mobile devices.

Upload speed: The connection speed at which the user can send data, such as the speed to upload a video to a social media website.

Voice over Internet Protocol: VoIP is a digital communications technology that makes use of IP packets carried over packet-switched network(s). There are generally two types of networks used for VoIP services. The first is the open/public Internet and the other is dedicated or managed IP networks operated by carriers such as cable companies, usually referred to as access-dependent VoIP. When the public Internet network is used for VoIP service, this is referred to as access-independent VoIP.

Wi-Fi hotspot: A physical location that offers, through a local area wireless computer networking (Wi-Fi) technology, Internet access over a wireless local area network through the use of a router connected to a link to an Internet service provider.

Wireless: A connection using wireless signals rather than wiring. For example, a signal can be transmitted from a wireless tower to mobile devices such as phones or to fixed locations such as houses.

Wireline: An Internet connection provided directly to a home or business using some form of wire or cable.

Acronyms

ACL: Access Control List

ADSL: Asymmetric Digital Subscriber Line

API: Application Programming Interface

ARP: Address Resolution Protocol

BGP: Border Gateway Protocol

BSS: Business Support Systems

CIDR: Classless Inter-Domain Routing

CIRA: Canadian Internet Registration Authority

CNC: Computer Numerical Control

CO: Central Office

CPE: Customer Premise Equipment

CRTC: Canadian Radio-television and Telecommunications Commission

DES: Data Encryption Standard

DHCP: Dynamic Host Configuration Protocol

DNS: Domain Name Service

DTE: Data Terminal Equipment

DWDM: Dense Wave Division Multiplexer

FDH: Fibre Distribution Hub

FO: Fibre Optic

FOC: Fibre Optic Cable

FOSC: Fibre Optic Splice Case

FPP: Fibre Optic Patch Panel

FTTB: Fibre to the Building

FTTD: Fibre to the Desktop

FTTH: Fibre to the Home

FTTN: Fibre to Node

FTTO: Fibre to the Office

FTTP: Fibre to the Premise

Gbps: Gigabits per second (see definitions)

GHGs: Greenhouse Gases

GIS: Geographic Information System

GPON: Gigabit Passive Optical Network

HTTP: Hypertext Transfer Protocol

HTTPS: Hypertext Transfer Protocol Secure

ICT: Information and Communications Technology

IP: Internet Protocol

ISP: Internet Service Provider

IT: Information Technology

K-12: Kindergarten to Grade 12

LAN: Local Area Network

LEO: Low-Earth Orbit (see definitions)

LTE: Long-Term Evolution (see definitions)

LTS: Long-Term Support

MAC: Media Access Control

MB: Megabyte

Mbps: Megabits per second (see definitions)

MS: Millisecond

NAT: Network Address Translation

PoP: Point of Presence

SSL: Secure Socket Layer

TCP: Transmission Control Protocol

TLS: Transport Layer Security

VDSL: Very High-Speed Digital Subscriber Line

VLAN: Virtual Local Area Network

VoIP: Voice over Internet Protocol

VPN: Virtual Private Network

WAN: Wide-Area Network

WISP: Wireless Internet Service Provider

WPA: Wi-Fi Protected Access