Broadband - modern means of Internet access

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Executive Summary

This white paper discusses the business of providing broadband Internet access to subscribers either over DSL or Cable systems.

The white paper introduces basic hardware required to provide such service in both DSL and Cable cases. The white paper also discusses the hardware required on switch or server side and the hardware required on the customer premises.

After that the white paper discusses the role of billing in providing such a service and special challenges that a billing system must meet to offer such services. It introduces prepaid and post billing of data and mentions the challenges for billing system in both cases.

The whitepaper also points out areas of potential revenue loss and mentions strategies for your billing system must have to reduce them.

Introduction

Broadband means broad bandwidth. Bandwidth is the capacity of transferring data (bits or bytes/sec) via some medium. Hence, broadband access means providing a faster way of accessing the Internet. It allows huge amount of data transmission (like text, voice, images, video etc.) with great speed, much faster than dial-up connections.

Dial-up offers Internet connectivity at almost 56 Kbps whereas Broadband connection provides Internet access at 5 Mbps.

Broadband paves the way for modern techniques of communication and provides cost effective means to connect to the Internet. It offers following services that were beyond consideration in the dial-up connection:

- IPTV (Internet Protocol Television)
- VOD (Video On Demand)
- Video Conferencing
- VoIP (Voice over Internet Protocol)

Broadband Internet connection includes “DSL (Digital Subscriber Line)”, “Cable Modem”, “Fiber” and “Broadband over Power Line (BPL)”.

Ø DSL

DSL means Digital Subscriber Line/Loop. DSL is another way of accessing the Internet like modem, cable modem etc. It allows digital data transmission over the conventional telephone lines with a great speed.

Ø Cable Modem

Cable Modem is another way to access the Internet like DSL. It is a modem that uses normal cable system to transmit data (voice and video) instead of TV programs to your homes.

Ø Fiber

FTTH (Fiber to the home) is yet another way of accessing the Internet. A fiber optic cable is laid by operator to home subscribers and it offers theoretically very high speed, mostly up to Gigabytes that is much higher than any other technology for home-users. A very large scale of service opportunities may be availed using this technology.

Ø Broadband over Power Line (BPL)

Broadband over Power Line makes use of PLC (Power line communication)/Power band technology and transmits data (voice and video) on the typical utility power lines. BPL does not require any cable or phone or any type of connection. All it needs is a BPL modem to be connected with any device like PC. Subscribers pay for this service also just like they pay for any other service (DSL, Cable etc.)

These are various ways of accessing the Internet. Each of these types has few advantages and disadvantages over the other. This whitepaper focuses on DSL and Cable Modem in detail.

DSL

Digital Subscriber Line/Loop is a relatively faster way to access the Internet. It transmits digital data (voice and video) over the normal PSTN Lines. It is mainly preferred over the Dial-up connections as it offers high speed Internet connection and better quality comparatively. Following figure illustrates typical setup of DSL:

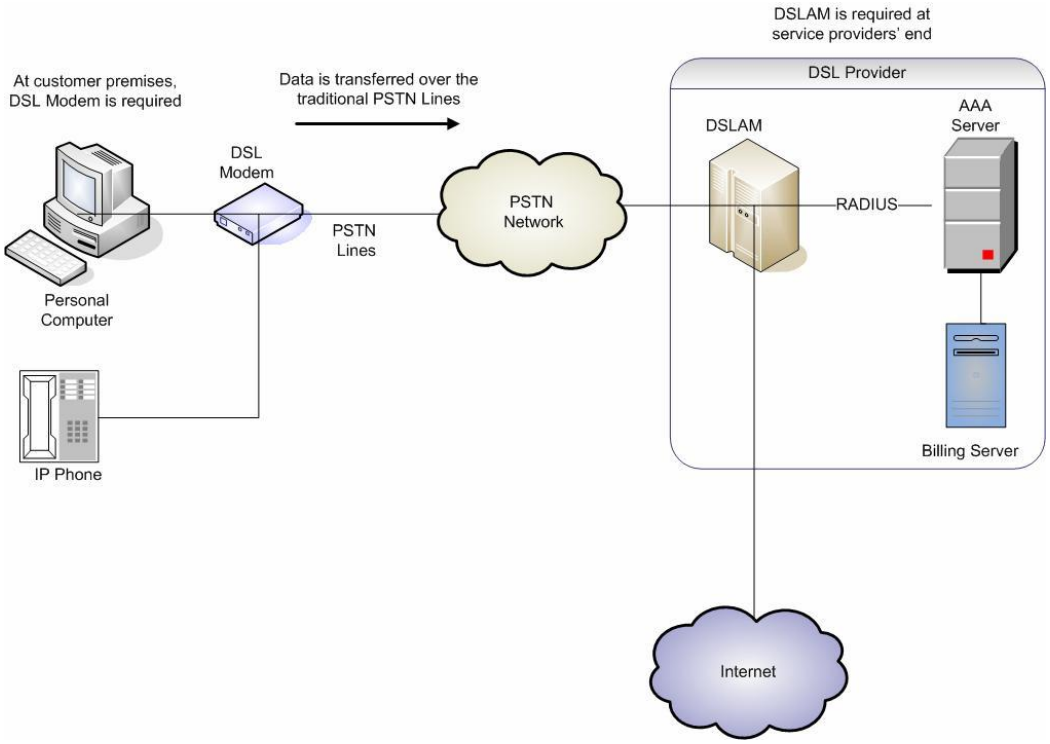

Figure 01: DSL Setup

DSL offer high speed for data receiving as compared to data sending. Also, the speed of Internet connection via DSL depends upon the distance between the DSL providers and the subscribers' place (home or office). The lesser the distance from the DSL provider, the better is the speed of the Internet connection.

Advantages

- The very first advantage of DSL is that it does not keep the telephone lines busy (like dial-up connection) and yet allows you to connect to the Internet.
- It offers secure Internet connection with better quality.
- DSL connections offer higher bandwidth that makes it a fast yet reliable access to the Internet.

Disadvantages

- DSL is distance dependant. As stated above, the lesser the distance from the DSL provider, the better is the speed of the Internet connection.
- One of its drawbacks is that it is not easily available everywhere.
- If users want to shift their place (home or office) they have to buy new equipment (DSL Modem).

DSL Types

DSL have different types like SDSL (Symmetric DSL), ADSL (Asymmetric DSL), RADSL (Rate Adaptive DSL), IDSL (ISDN Digital Subscriber Line), HDSL (High-bit-rate DSL) and VDSL (Very-high-bit-rate DSL).

- Symmetric DSL has same data transfer rate for upstream and downstream systems
- Asymmetric DSL provides lower upstream and higher downstream transfer rates. It was introduced by telephone companies to provide VOD (Video on Demand) service to their subscribers.
- RADSL is also like ADSL is RADSL but the hardware it used for transmitting data is rate adaptive and it adjusts the data transfer rate according to the quality of the media used to transmit data.
- ISDL makes use of the ISDN (Integrated Services Digital Network) for providing DSL to the subscribers
- HDSL and VDSL are considered as much faster mode of data transmission as compared to all these mentioned types.

As the world is searching faster and cost effective methods for communication and rushing towards the new technologies, demand for DSL connections is also rising. In past few years, numbers of DSL users have increased remarkably.

DSL Internet access is extensively used in the Telecommunications Industry. Many ISPs (Internet Service Providers) uses DSL to offer broadband (high speed Internet) access to their subscribers. It is also used by Network Service Providers and Telephone Companies. Other businesses/organizations that have multiple branch offices also use DSL for always on interconnectivity with other branches.

An operator requires a comprehensive customer care, billing and CPE provisioning solution that should be able to at least serve the followings:

- CPE provisioning for different types.
- CPE monitoring/controlling and access permissions.
- Allow user to modify bandwidth settings, provides more control over services and less dependency on customer service officers.
- Identification of any CPE going down or out-of-service to take quick actions to resume services resolving any network issues.
- Ability to monitor quality of service for guaranteed delivery.
- Monitor cost to benefit ratio.
- Offer prepaid/postpaid and any other business models support that may be required by the operator.

Cable Modem

In most areas of the world, cable system is well known for offering TV channels. In this case, it offers only one way communication i.e. TV programs to the viewers. This entire infrastructure can also be used to transmit data (voice and video). The device that makes this one way communication to two ways and allows data to be transmitted much faster is known as “Cable Modem”.

Cable system offers two channels for communication and each of these channels send data in opposite direction. Therefore, one channel is used to send users’ data and the other is used to receive data. Cable modem provides data transfer rate up to 1.5 Mbps and higher. Cable modems used at homes can usually support bandwidth from 3 Mbps to 15 Mbps.
It is very popular in VoIP users and is used for Video on Demand, Video Conferencing and Data Services etc. There are different manufacturers in the market like Cisco, Ericsson, Motorola and Toshiba etc. that offers Cable Modem to the users.

Advantages

- Ø Cable Internet access is cost effective
- Ø It offers high bandwidth
- Ø It provides secure and reliable Internet connection
- Ø No need to dial and connect to your ISP. Users can access the Internet any time they need
- Ø Suitable for streaming media

Disadvantages

- Ø Speed of Internet connection via cable modem depends on the number of users sharing the network. Less the number of users, better is the speed of the connection

Like DSL, cable modem is also gaining popularity among Internet users. Many companies that offer broadband access to different subscribers use cable technology for that. It is much preferably used by the VoIP (Voice over IP) users.

A comprehensive customer care and billing solution is required for an operator to effectively launch and operate. The minimum set of capabilities that a billing and management solution should provide is:

- Ø Ability to monitor active connections at any time
- Ø Analysis of bandwidth usage at anytime to verify if guaranteed quality of service is achieved.
- Ø Intelligent alarm-system to quickly notify for any problem occurred in network or at customer premises.
- Ø Support robust credit-control mechanism to minimize credit-risks and support for efficient payment-receiving methods.
- Ø Customer self care abilities to let him control over his/her service-set and bandwidth within limits defined by operator.
- Ø Fraud detection for any illegal resource utilization.
- Ø Support for point-of-sale operations and their account management.
- Ø Flexible bandwidth allocation schemes and provision of ability for a customer to change it.
- Ø Should support prepaid/postpaid subscribers at the same time.
- Ø One bill for all services.

Services

Subscribers having a broadband Internet access can be offered many services depending on the subscribers' requirements either personal or official. Some of these services are stated below:

IPTV

IPTV stands for Internet Protocol Television. A technology that transmits TV programs digitally using IP (Internet Protocol) is well known as IPTV. It can be a separate service offered to the subscribers or it can be a single part of a service known as Triple Play (Telephone, Television and high speed Internet access).

VOD

VOD means Video on Demand. As it is obvious from its name that this technology allows subscribers to request for videos, hence users can watch the videos online using their broadband Internet connection.
There are two possible scenarios for VOD systems i.e. "Stream" or "Download". Streamed content can be viewed, listened or heard while the demanded video has not been downloaded completely. It can be viewed in the form of clips (small portion of the data either audio or video). Whereas, Download option first download data (video file) completely and then allows users to view that video.

Video Conferencing

Video conferencing allows users having broadband Internet connection to communicate with each other, no matter where they are. It allows real-time video and audio transmission between users whether they are office employees or home users.

VoIP

VoIP stands for Voice over Internet Protocol. IP is the protocol over which the whole Internet is running. It can be assumed that anyone who can get online to Internet is already running IP.

When voice is carried over an IP network (Internet), the whole process is called VoIP. Since Internet is lot cheaper than the conventional telephony (TDM) process, the voice traffic is quickly converting to IP from the old TDM circuits.

Billing Challenges

Broadband service providers who are offering various services to their subscribers also need a billing system that should cater all the billing requirements for this business. Following are some challenges for a billing system that should be fulfilled to ensure accurate and robust billing.

1) Multiple Services

As stated earlier that a broadband access provider offers multiple services to their subscribers (like IPTV, VOD, and VoIP etc.) therefore, a billing system should be capable enough to manage different types of services offered to different subscribers. It should also keep track the level of services offered to the subscribers. Service levels are certain limits for charging different customers according to the service they avail.

NOTE: Such types of services like VOD are billed according to the value of data/content and not on the basis of resource utilized network resource.

2) Customer Types

Billing system should be capable of differentiate, in case of any service usage that either the subscriber is a prepaid or postpaid customer and then charge accordingly. A billing system should identify the service mode of the subscriber.

Service Modes

These are two different methods of payment rather than any service or technology. Users can pay in any way either before or after the service used. However there are certain pros and cons of each.

1) Prepaid Service

   In case of prepaid, there is no need of any contract or long term commitment. Users do not have to worry about the payment of monthly bills. It allows users to manage their payments efficiently and there are no hidden charges for that. It is best for those whose usage varies from month to month. It is ideal for occasional users and travelers.

2) Postpaid Service

   As far as Postpaid is concerned, it provides less usage charges, involves line-rent and other connection charges but mostly guarantee better service is.

3) Corporate Accounts

Corporate accounts are usually companies, who buy accounts in bulk and are offered cheaper rates and good service is guaranteed. They require better support and service level than other subscribers and system should allow special handling for them.

4) Customer Control over Service-Access

Customers are not granted full access/control to the service provided by the service providers. They always impose certain kind of restriction on the customers. The billing system should keep track of the level of control given to the subscribers and monitor any illegal operations, if it ever happens.

5) Customer Control over Payment Options

Service providers mostly offer different payment options to the subscribers (like scratch card, credit-card, auto-recharge credit-card, balance transfer etc). The system should be able to provide different such options of payments.

6) Credit-Risk Assessment and Control

As stated earlier that service providers offers two types of service modes either “prepaid” or “postpaid”. Credit risk is a term mostly related to postpaid customers as users pay after service usage. A billing system, along with tracking service mode of the customers, should also capable of controlling issues related to credit risk.

7) Reseller Network Support

Many service providers have their sales channels in various locations or they implement reseller network for their business. A billing system should support such type of network and ensures synchronization between all the locations as far as billing activities are concerned.

8) Sources of Revenue Leakage

The revenue generated against the service usage can be easily missed if the billing system is not capable of tracking few things efficiently like:

1) Incorrect provisioning

   There can be some customers for whom certain part of a service is blocked e.g. a postpaid customer has not paid the bill, therefore all the outgoing calls for that user has been blocked. Here we need a billing system that should be proficient enough to keep track of the status of every subscriber. On the other hand, if the billing system does not block the outgoing calls then it can be a source of revenue leakage for the service providers.

2) Unauthorized provisioning

   If the billing system is not capable enough to provide secure authorization then any unsubscribed user can access the service. It can also cause revenue leakage.

3) Missing CDRs

   A billing system generates CDRs (Call Detail Record) for each call generated. If these CDRs are not maintained properly and any of these gets missed then it can also be a source of revenue leakage because CDRs are used in generating bills for the subscribers.

4) Improper charge definitions

   By improper charge definitions we mean that the charge defined by the service providers are not valid and therefore becomes the source of revenue leakage.

5) Improper risk assessments

   If the billing system is not efficient enough to assess the risk related factors properly then it can also cause revenue leakage.

6) Insecure connection of CPE with service provider

   There should be complete synchronization between the billing server and the CPE (Customer Premises Equipment) to avoid possible number of faults and failures. Otherwise, it can be a source of revenue loss.

Another challenge for a billing solution is not only to maintain the required data but also to keep it accurate and absolutely error free. Therefore, the billing system should efficient enough to keep track of all the services being used and should notify on time about the credit limit of the subscriber.

Conclusively, at minimal a billing system should capable enough to cater the followings:

1) CPE Provisioning
2) Customer Self Care
3) Flexible Billing Plans
4) Real-Time Usage Reporting
5) Revenue Assurance
6) Subscriber Management

AdvOSS.com realizes the need of a billing system and offers a comprehensive billing solution that efficiently fulfills all these requirements. For more information regarding the billing system offered by AdvOSS, please visit Advanced Broadband Billing.

DSL Vs Cable Modem

DSL and Cable are both beneficial for the user (business or home customers). In DSL, all the users share the same bandwidth and are connected to DSLAM (Digital Subscriber Line Access Multiplexer). In case of cable, all the users are connected to CMTS (Cable Modem Termination System) and share the same bandwidth.

As far as speed issues are concerned, Cable Modem is theoretically much faster than DSL. It supports almost 30 Mbps of bandwidth while most of the forms of DSL support 10 Mbps except VDSL (Very high bit-rate DSL). Cable modem speed is slowed down only if many people simultaneously access the Internet.

In terms of popularity, both are accepted and common ways for Internet access but in US cable modem technology is much preferred than DSL. On the other hand, customers are more satisfied with DSL rather than cable modem technology.
Both DSL and Cable modem technology provides secure Internet access to its users but DSL is more secured than cable modem technology. Users prefer DSL because it offers great speed and assure access to higher bandwidths even on busy networks. Some users still prefer Cable modem technology as it is easy to install and cheaper than DSL setup.

Conclusively, both methods to access Internet are equally popular and provides secure connections but DSL is recommended for business purposes while Cable Modem for web surfing and e-mailing. Also, both these ways of accessing Internet are comparatively better than Dial-up connections in terms of speed, security and quality of the connection.

In Future

Observing the enormous growth of broadband subscribers, it can be expected that for next few years broadband connection (DSL or Cable Modem) will gain popularity in most parts of the world and will be the fastest growing business in the Telecommunications industry.

Another variant of broadband service is wireless broadband or Wi-MAX, which is also gaining popularity.

Summary

Broadband means faster way to access the Internet. It is secure, reliable and offers comparatively good quality for different services like VOD (Video on Demand), IPTV (Internet Protocol Television), Video Conferencing and VoIP (Voice over Internet Protocol). There are different types of broadband connection. They are:

1) DSL (Digital Subscriber Line/Loop)
2) Cable Modem
3) Fiber
4) BPL (Broadband over Power Line)

Digital Subscriber Line/Loop is a relatively faster way to access the Internet. It transmits digital data (voice and video) over the normal PSTN Lines.

In most areas of the world, cable system is well known for offering TV channels. In this case, it offers only one way communication i.e. TV programs to the viewers. The device that makes this one way communication to two ways and allows data to be transmitted much faster is known as “Cable Modem”.

Both these ways of accessing Internet are comparatively better than Dial-up connections in terms of speed, security and quality of the connection. DSL and Cable are both beneficial for the user (business or home customers). In DSL, all the users share the same bandwidth and are connected to DSLAM (Digital Subscriber Line Access Multiplexer). In case of cable, all the users are connected to CMTS (Cable Modem Termination System) and share the same bandwidth.

Subscribers having a broadband Internet access can be offered many services depending on the subscribers’ requirements either personal or official. Broadband service providers who are offering various services to their subscribers also need a billing system that should cater all the billing requirements for this business.

Following are some of the challenges for a billing system. An efficient billing system should monitor and keep track of all these billing related activities to ensure error free billing.

- Multiple Services
- Customer Types
- Corporate Accounts
- Customer control over service-access
- Customer control over payment options
- Credit-Risk assessment and control
- Reseller Network Support
- Sources of Revenue Leakage

Conclusively, at minimal a billing system should capable enough to cater the followings:

- CPE Provisioning
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Contact Information

In case of any ambiguity regarding the concept, explained in the whitepaper, please feel free to contact us at support@AdvOSS.com or please, visit http://www.AdvOSS.com/voip_contact.html

For further information please, visit www.AdvOSS.com

We welcome your suggestions

Thank You for reading this whitepaper. We will be pleased to receive your response and suggestions.