CenturyLink Technology Solutions Service Guide

Intelligent Traffic Manager (ITM) Global Load Balancing Service

This Service Guide sets forth a description of the Intelligent Traffic Manager ("ITM") Service offered by CenturyLink Technology Solutions ("CenturyLink"), including technical details and additional requirements or terms, if any. This guide is subject to and incorporated into the Master Service Agreement and Service Schedule between the parties. The specific details of the Service ordered by Customer will be set forth on the relevant Service Order.

Table of Contents

Intelligent Traffic Manager

Overview

The Intelligent Traffic Manager (ITM) is a DNS-based, web-administered, global load balancing service ("Service" or "ITM Service").

CenturyLink provides ITM Service using the ITM infrastructure of Level 3 Communications. The ITM architecture is made up of an international network of custom name servers and monitoring agents.

Customer has the ability to specify how traffic is directed to applications at data centers and servers around the world, using policies to redirect user requests. ITM policies are Customer-created and managed and can be customized for specific business needs. Policies can be created to perform one or more of the following traffic management tasks:

Task	Description
Global Load Balancing	Traffic requests are distributed over multiple servers based on a policy that specifies the percentage of traffic to be sent to each server. Traffic can be directed based on set ratios or amount of traffic desired at each server based on individual server capacity.
Automatic Failover	Traffic requests are distributed based on availability of servers; ITM monitors application servers for unresponsiveness and responds automatically when a failure is detected. The IP address of the failed server is removed and requests are automatically routed to remaining application servers until the server starts responding again.
Automatic Overflow	An overflow policy is based on the amount of traffic shedding desired at each server; in the event of a flash crowd traffic may be shed to a preferred list of alternative servers. The shed fraction for a given server represents the fraction (from 0 to 1) of traffic that should be redirected away from the server.
Geographic Policies	Traffic is routed based on the location of the request. ITM detects where the end user is located and routes them to the closest and best-performing application server. If servers within a geographic region are unavailable; either off-line or shedding, the user is routed to the next-best server. A policy can be defined based on continent, country, US state, or US time zone of the requesting IP address.

ITM is a software-based service, therefore a monthly subscription model is used and no hardware is required at the Customer site. Customer selects the appropriate utilization level; Number of DNS Requests (in Millions), to meet their traffic distribution needs.

The ITM Service consists of:

- Access to ITM Network

- ITM software-as-a-service

- Subscriber chosen allowance

- Administration and Reporting website

- 24x7 Support

Service Description

Implementation Methods

Customer may choose to implement ITM in one of two methods; DNS CNAME or NS Delegation, based on their specific requirements. The implementation methods are described below:

Method	Description
DNS CNAME	DNS CNAME is the most preferred implementation method which provides name service for all DNS requests sent to a particular domain Name, i.e., www.subscriber.com.
NS Delegation	The NS Delegation implementation method is required to delegate subdomains to ITM; for example, if x.subscriber.com were delegated to ITM, then ITM would be authoritative for all subdomains of x.subscriber.com such as www.x.subscriber.com, ftp.x.subscriber.com, etc.
	This implementation method is also required if there are other DNS records in addition to A records for the domain name. For example, if the subscriber domain in question is mail.subscriber.com and this domain has one or more A records and MX records, then this domain, or the parent domain subscriber.com, must be delegated to ITM.

Service Implementation

A standard Service implementation has the following primary steps:

Step 1: Once a customer-signed service agreement is received and executed by CenturyLink, a Service Delivery Representative is assigned to the implementation. The Service Delivery Representative coordinates the implementation with the subscriber's technical contact.

Step 2: The Service Delivery Representative validates that required configuration information has been collected with the Service order; ITM Technical Questionnaire.

Step 3: The Service Delivery Representative facilitates the ITM account configuration.

Step 4: Customer receives via email an ITM Service Activation Notification which includes credentials for an Administrator account for the ITM Portal.

Step 5: The Service Delivery Representative facilitates introductory Service training over the phone if desired by subscriber.

Step 6: Customer constructs initial policy(ies) via the ITM Portal, with or without assistance from CenturyLink, and activates a policy.

Step 6: Customer initiates transfer of authority to ITM Service. (See Transfer of Authority section below for more detail.)

ITM Portal

A secure web-based graphical user interface is provided for Customer to administer their ITM service. The ITM Portal is access via *https://admin.nsatc.net*

An ITM Portal Administrator account is assigned to Customer; CenturyLink will provide a user name and password.

The following table provides an overview of the primary features of the ITM Portal:

| Feature	Description
Account Management:	
View policies	View the currently active policy and previously active and stored policies
Define Resources	Define resources, i.e., IP Addresses, CNAMES, Managed Servers, etc., for the creation of policies
Create policies	Create, save, activate and empty policies
Import/Export XML	Import/Export policies in XML format
Configure Monitoring and Load Feedback	Configure monitoring and load feedback for Managed Server resources
Change Password	Change ITM account password
Administration:	
Manage Sub-Origins	Enable, disable, modify and delete domain name sub-origins
Manage Logins	Create, modify and delete ITM user accounts
Monitoring:	
Launch Dashboard	Opens a Java™ applet that reports on current ITM traffic in either chart or table format
View Archived Logs	View archived Name Service logs in either chart or table format and/or export data in Excel format
View Server Status	View the status of servers configured to be monitored by ITM in the current active policy

ITM Policies

An ITM policy defines the rules that specify precisely how DNS requests are directed. ITM policies are Customer-created and managed and can be customized for specific business needs.

Default Policy

If desired, CenturyLink will facilitate the creation of a default policy as part of ITM account configuration and make that policy available to the subscriber.

Policy Decision Tree

A policy is created by generating a Decision Tree representing the ITM rules to be applied. The *branches* of the tree (Branch Nodes) specify the various decision criteria to be applied *and the leaves* of the tree (Resource Nodes) specify the answers that ITM provides in response to a DNS request. For instance, below is an example of a policy decision tree where the subscriber wants browser requests originating from within the US to be sent to a server in New York and all other browser requests to be sent to a server in London.
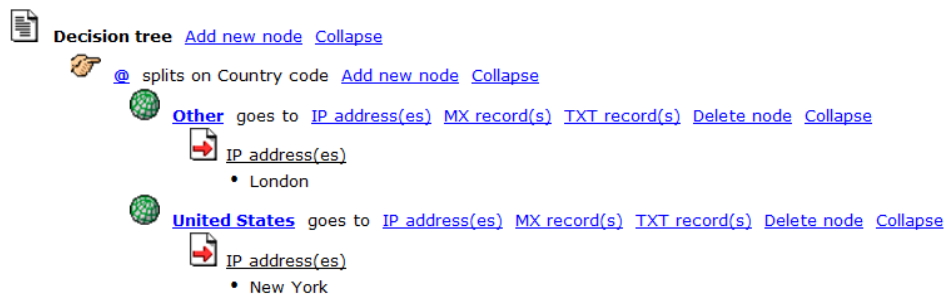
- **Branch Nodes:** Branches can be selected based upon five different criteria:

Solution	Specified by
Split on World zone	Drop down menu of world zones
Split on country	Drop down menu of countries
Split on US state	Drop down menu of US states
Split on US time zone	Drop down menu of US time zones
Split on block of IP addresses	specify using CIDR classless notation: e.g. 1.2.0.0/16, 1.2.3.4/32 (single IP), or 0.0.0.0/0 (any IP)

- **Resource Nodes:** Resources are selected to occupy the leaves of a Policy Decision Tree. Resources are used to specify the ITM answers to DNS queries. There are several types of resource nodes that can be selected in the policy decision tree:

Type	Description

IP Addresses	Option used when the decision tree leaf points to one or more fixed IP addresses
CNAME records	Option used when the decision tree leaf points to a single destination whose CNAME is known
Load Sharing Server Set	A load sharing server set is when the decision tree leaf points to a number of servers to load share and/or failover which may consist of Managed, Static and Overflow servers.
SRV records	Option used when the decision tree leaf points to one or more Service Locator records

Load Sharing Server Set

Load sharing sets are necessary to utilize the load share, tiered/overflow and failover rules. When ITM encounters a server set one or more answers are chosen based on several criteria; the load share of each server, the tier in which each server sits, the shed fraction of each server, and the monitoring results of each server.

Load sharing sets may include the following resources:

Type	Description
Managed servers	Managed servers are defined by IP address or CNAME and may include load share and shed fraction configuration as well as optionally be monitored for on/off status and load feedback
Static servers	Used to share load among a set of servers that do not expect to change over time
Overflow servers	Used to specify what should occur if no answers are selected by the Managed or Static server selection process in a load sharing server set. An overflow server by definition is the lowest tier in a load share set and cannot shed.

MX and TXT Records

MX and TXT records may also be defined as resources to be combined with IP addresses or load sharing sets as part of a Resource node.

Type	Description
MX records	Used when the decision tree leaf points to one or more Mail Exchange records
TXT records	Option used when the decision tree leaf points

			to one or more Text records				

<u>Resource Definition and Configuration</u>

Resources must be predefined before making them available for policy creation. The following resources may be defined with the following configuration values:

Type	Nickname	CNAME	IP Address	Exchang	Pref	TTL	Tier	Load Share	Shed Fraction	Target	Priority	Weight	Port	Text
IP Address	optional		●			●								
CNAME	optional	●				●								
SRV record	optional					●				●	●	●	●	
MX record	optional			●	●	●								
TXT record	optional					●								●
Managed Server	optional	●	●			●	●	●	●					
Static server	optional		●			●	●	●	●					
Overflow server	optional	●	●			●		●						

The configuration parameters are defined as follows:

Configuation Value	Definition
Nickname	Optional parameter; alphanumeric value, 16 characters maximum
IP Address	IP Address in dotted decimal format; i.e., 10.0.0.1
CNAME	The true, or canonical, host name for the resource
Exchange	Domain name of the host which will receive mail
Pref	The preference order of the host; a numeric value where lowest number takes precedence, 3 characters maximum
TTL	Time To Live; a parameter that limits the lifetime of a cached record before it is purged, expressed as a number followed by an alpha value where "s" is for seconds, "m" for minutes, "h" for hours, and "d" for days. For example 1h would be 1 hour and 5m would be 5 minutes.
Tier	The order in which servers are selected to answer any DNS requests in a load sharing set; defined once a load sharing set has been selected, options are "Exclude" or a tier from 1-9 where 1 is the highest tier
Load Share	Represents the amount of traffic that will be sent to the server within the

	same tier of a server set; expressed as a numeric value, 12 characters maximum
Shed Fraction	Represents the fraction (from 0 to 1) of traffic that should be redirected away from the server following the initial decision based on Load Share
Target	The canonical hostname of the Service Locator Record
Priority	The priority of the target host, a numeric value where lowest number takes precedence, 3 characters maximum
Weight	A relative weight for SRV Records with the same priority; a numeric value where lowest number takes precedence, 3 characters maximum
Port	Port number for the Service Locator, or SRV, Record
Text	Free form text associated with a TXT Record

Policy Editor

The Policy Editor in the ITM Portal provides the means to construct policies by way of creating a Decision Tree consisting of nodes; combination of any number of Branch and Resource nodes.

Any number of policies may be created and stored, but only one policy may be active at a time.

Downloading/Uploading Policies

In addition to creating and modifying policies through the ITM web interface, it is also possible to create and modify policies in a plain text XML format. For example, below is the sample policy shown earlier in this document but in XML format.

```xml
<?xml version="1.0" ?>
<!DOCTYPE POLICY (View Source for full doctype...)>
- <POLICY>
  - <BRANCH label="@" variable="$(CC)">
    - <NODE label="*">
        <RESOURCE id="_2" />
      </NODE>
    - <NODE label="us">
        <RESOURCE id="_1" />
      </NODE>
    </BRANCH>
    <A name="London" id="_2" ipAddr="10.0.0.1" ttl="5m" />
    <A name="New York" id="_1" ipAddr="10.0.0.2" ttl="5m" />
  </POLICY>
```

Transfer of Authority to ITM

Following policy activation, ITM will not serve any DNS requests until authority is transferred to ITM. Transfer of authority remains entirely in Customer's control. Once authority has been transferred ITM will instantly respond to any DNS requests.

The means to transfer authority is based on the implementation method:

Method	Steps to Transfer Authority
DNS CNAME	• Turn off recursion on authoritative name server(s) to ensure that ITM will provide the best possible performance • Add a CNAME record to the DNS zone file to point to ITM, for example: **www.subscriber.com. 1H IN CNAME www.subscriber.com.nsatc.net** *Note: If the zone file has existing A records for www.subscriber.com, they need to be cloaked or deleted at the same time the CNAME is added. A CNAME time to live (TTL) of one hour (1H) is used in this example representing how often end user resolvers must refresh the CNAME from the subscriber.com nameservers. Longer times improve DNS performance due to reduced average DNS latency, while shorter times enable faster DNS restructuring, such as CNAME removal or modification.*
NS Delegation	• The delegation in the zone file would look similar to the following: x.subscriber.com. 1H IN NS a.ns.nsatc.net. x.subscriber.com. 1H IN NS b.ns.nsatc.net. x.subscriber.com. 1H IN NS c.ns.nsatc.net. x.subscriber.com. 1H IN NS d.ns.nsatc.net. x.subscriber.com. 1H IN NS e.ns.nsatc.net. *Note: The authoritative list of nameservers is subject to change, so the records must be confirmed with Level 3 Communications before delegating. A time to live (TTL) of one hour (1H) is used in this example. Longer times improve DNS performance due to reduced average DNS latency, while shorter times enable faster DNS restructuring, such as delegation removal or modification.*

ITM Turn Down

For both CNAME and NS Delegation implementation methods the procedure to turn down ITM is similar, Customer will edit the DNS zone file to remove the records (CNAME or NS) that point authority to ITM, and re-establish any A records in the zone file that were cloaked or deleted in the case of DNS CNAME implementation.

DNS requests will continue to be served by ITM in accordance with the current active policy until the TTLs have expired on the appropriate delegations.

ITM remains available to serve traffic at any time by re-editing the zone files to one again transfer authority.

Managing Origins

The configuration of Parent Domain Names accessible in ITM is managed by CenturyLink and cannot be disabled or deleted, or any additional added, unless a request is made by contacting CenturyLink Technical Support. The configuration of sub-origins of a parent domain is managed by the subscriber. Access to the sub-origin can be limited to certain logins through group permissions.

Managing User Accounts

As part of the ITM Implementation process, Customer is provided credentials for an Administrator account for the ITM Portal. Customer may change the password for this account but may not delete this account. This account can only be deleted by CenturyLink.

An Administrator may create new user accounts and delete existing accounts. User accounts are configured with the following parameters and options:

Type	Description
Login	The username
Group	Optional Group to limit access of certain logins to certain sub-origins
Real Name	Used in policy activation notification emails sent from ITM
Password	Passwords must be at least 6 characters. Will appear as asterisks on the screen.
Access Permission	Yes/No regarding Full Access. If No, then Read-Only access is provided.
Login Restrictions	Logins, both Full Access and Read-Only, may be restricted from certain ITM features: Subscriber Guide, Viewing Logs, Viewing the ITM Dashboard

Access Permissions

Users with an ITM account have the following access permissions:

Feature	Admin	Full Access	Read-Only Access
Account Management:			
View policies	●	●	●
Define Resources	●	●	
Create policies	●	●	

Import/Export XML	●	●	
Configure Monitoring and Load Feedback	●	●	
Change Password	●	●	●
View Subscriber Guide	●	optional	optional
Administration:			
Manage Sub-Origins	●	●	
Manage Logins	●	●	
Monitoring:			
Launch Dashboard	●	optional	optional
View Archived Logs	●	optional	optional
View Server Status	●	●	●

ITM Dashboard

The ITM Dashboard is a browser-accessible Java applet that provides real-time traffic data reports in chart and table format.

The Chart window will graphically display traffic in answers per minute, or answers per minute percent, for the current active policy. The Chart is updated every 2 minutes and displays a graphic timeline of up to four hours. The Table window lists answers per minute, and/or percentage of total answers per minute, for a selected site.

Both the Chart and Table displays may be configured for the following parameters:

Configuration Parameter	Description
Chart Format:	
Name	User defined name for chart; alphanumeric value
Selected Nodes	Checkbox selection of nodes to be included in chart
Value	Reporting value; options include "replies per minute" or "replies per minute %". Configurable for both left and right axis.
Type	Type of chart; options include "area" or "line". Configurable for both left and right axis.
Color	Color scheme for chart; options include swatches, HSB and RGB colors. Configurable for both left and right axis.
Anchor axis to minimum of zero	Checkbox option for both left and right axis.
Table Format:	
Compute totals based on selected data	Checkbox selection to indicate whether totals are computed
Selected Nodes	Checkbox selection of nodes to be included in chart

Data Columns	Checkbox selection for "Replies per minute" and/or "Replies per minute %"
Thresholds	Defines the threshold as well as color scheme for 10% change above and below threshold

Archived Logs

Customer logs include the total number of domain name lookups that have processed for each domain name and the number of replies ITM has given for each of the resource nodes.

Customer is able to configure the display of the archived logs by specifying the following:

Type	Description
Domain Name Origin	Select one or more domain names from the list provided
Output Style	Separate or Combined in the event multiple selected domain names

Display Separate or Totals	Defines the output for the following:
	    IPC/CNAME query: replies with answers
	    IPC/CNMAE query: replies without answers
	    NS,SOA, etc. query: replies with answers
	    NS,SOA, etc. query: replies without answers

Time Resolution	Dropdown list ranging from one minute to one week
Time Range	**Absolute time range –** to specify a Month, Day, Year, Hour and Minute for Start time and End Time. **Relative Time range –** to specify a time period ranging from the last hour to the last 26 weeks
Graph/Table	Archived Logs may be displayed in either Graph or Table format

Archived Logs may be exported in Excel format.

Viewing Server Status

Customer can view the status of load feedback and monitoring URLs configured for Managed Server(s) defined in the current active policy. The ITM name servers each poll monitored servers every 30 seconds, resulting in a poll hit every 1-2 seconds. The monitoring URL is either OK or unavailable. URL unavailability can be caused by several factors; network time-out, connection failure, bad hostname, etc. Additionally, the overall server status is provided; on-line or off-line, along with a relevant status message. If a server changes state, an email alert is sent detailing the event. The email alert is sent to the email addressed configured for the Admin account at the time of service implementation.

Maintenance and Support

Maintenance

Scheduled Maintenance includes any foreseen, predictable need to make a change to the current state of the ITM network, including upgrades and augments.

If scheduled maintenance is reasonably expected to produce a Service interruption, advanced notification will be provided by email. The email notification will provide the date and time (GMT) of activity, description and duration of activity, scope of event, possible effect on ITM network, and a completion date, if needed. Notifications are provided 14 calendar days in advance of the maintenance activity.

Maintenance activities deemed necessary to prevent or restore network failure may occur at any time. For high-risk and service-threatening outages, Customer will be notified as early as possible. The notification lead time and maintenance window for these types of events vary based on the degree of customer impact.

If determined that an emergency security change is required, CenturyLink, or its underlying vendor, will make the changes deemed necessary as soon as reasonably possible and will notify the Customer by email of the changes as soon as practicable.

Support

CenturyLink provides 24x7 phone and email support in English.

CenturyLink Service Center's frontline associates will respond to Incidents and Requests with case creation and escalate promptly to the appropriate internal or external resource. CenturyLink serves as the single point of contact and will initiate cases and escalate externally with its underlying vendor on behalf of the CenturyLink customer. CenturyLink provides a streamlined escalation process to help manage service issues with the appropriate resources and the proper sense of urgency.

CenturyLink Support can be reached by phone or email:

> Toll Free: 1-888-638-6771
> Phone: 1-314-628-7758
> Email: Incident@Savvis.com

Equipment

Customer is solely responsible for any equipment, facilities and/or other materials used in connection with the Service which are not provided by CenturyLink, including any related applications, systems and software ("Customer Equipment").

Charges

The manner of billing and applicable charges shall be set forth in the Customer Order and shall remain in effect during the Service Term.

Charges for ITM Service consist of three components: (1) a non-recurring implementation charge; (2) a monthly recurring charge based on service level; and (3) monthly usage charges to the extent usage exceeds allowances in the service level where applicable.

Telecom Administrative Fee (TAF)

A Telecom Administration Fee (TAF) of 16.9% is applied to the total recurring monthly service and usage fees for the ITM service. This Fee is associated with various telecommunication Fees assessed by telecommunication providers, which CenturyLink incurs in providing Services. TAF may include charges such as: Federal Universal Service fund, State Universal Services fees, FCC Approved Customer Line Charge, State development fees, Intrastate surcharge, Public Utilities Commission service fee, number portability service charges, Infrastructure maintenance fees and various other surcharges and fees. TAF is not applicable to Installation Fees or other one-time fees.

Additional Requirements

If any third party software, including any corresponding documentation, is provided to Customer by CenturyLink in connection with the Service, Customer agrees to use such third party software strictly in accordance with all applicable licensing terms and conditions. CenturyLink makes no representations or warranties whatsoever with regard to such third party software.

Customer must comply with all of its responsibilities under this CenturyLink Service Guide or CenturyLink' obligation to provide this service in accordance with this CenturyLink Service Guide will be suspended until Customer does so.

Roles and Responsibilities

The following table defines a high level overview of CenturyLink' roles and responsibilities in providing the ITM Service as well as those responsibilities of the Customer.

Certain roles and responsibilities are performed by both parties, or may be performed by either party, depending on the specific configuration and customer requirements.

Roles and Resonsibilities	Century Link	Customer
Service Implementation		
Technical Review: Configuration Specifications and Requirements	●	●
Service Configuration and Activation	●	
Initial Portal Access Administrator Account Creation	●	
Construct and activate ITM policy	●	●
Authorize/Delegate Traffic to ITM		●
Service Management		
Portal: Access User Management		●
Policies Management		●

Roles and Resonsibilities	Century Link	Customer
Log Reporting Access		●
Maintenance & Support		
Network Management, Monitoring and Repair	●	
Troubleshooting Service Issues	●	●
Architecture and Software Upgrades	●	
Service Cancellation and Termination		
Notice of Service Cancellation as set forth in MSA		●
Service Deactivation	●	