CenturyLink Technology Solutions Service Guide

Database Software 1.0

Managed DB2 Database Service

This Service Guide ("SG") sets forth a description of the Database Server Software 1.0: Managed IBM DB2 Database Service ("Service") offered by CenturyLink, including technical details and additional requirements or terms. This SG is subject to and incorporated into the Agreement and Hosting Service Schedule between the parties. The specific details of the Service ordered by Customer will be set forth on the relevant Service Order. For avoidance of doubt, any references in the Agreement, Schedules, or Service Orders to SSG, shall mean SG.

Version	Previous	Section Modified	Date
HOS-20140815-SG-ManagedDB2	HOS-20140430-SG-ManagedDB2	New Format	August 15, 2014

Table of Contents

Standard Service Description

1. **Standard Service Description**: Database Server Software 1.0: Managed IBM DB2 Database is a Managed Hosting product. The standard "Service" consists of the licensing, installation, configuration, administration, monitoring and maintenance and support for the software components listed in Section 1.1. The Service Level Agreement (SLA) associated with this Service Guide is the "Managed Hosting Services SLA."

    1.1. **Software Components:** The IBM DB2 Database Server software is available in the below supported versions and editions.

    1.1.1. **Supported Versions:**
        1.1.1.1. IBM DB2 9.5.x 64 bit
        1.1.1.2. IBM DB2 9.7.x 64 bit

    1.1.2. **Supported Editions:**
        1.1.2.1. Advanced Enterprise Edition
        1.1.2.2. Enterprise Edition

    1.2. **Licensing**

    1.2.1. **CenturyLink Provided**: As part of the standard service, CenturyLink obtains the software licenses required for the Software Components listed in section 1.1 under the IBM ASL Agreement.

    1.2.2. **Customer Provided**: Customer has the option to obtain software licenses for the Software Components listed in section 1.1 separately. If Customer chooses to obtain the licenses, CenturyLink will install them as part of the Service. CenturyLink requires that the Customer furnish the IBM Customer number, the Passport Advantage number and the IBM site number. Customer shall maintain both its licenses and a current Passport Advantage status for the duration of this Service. If Customer fails to furnish the information listed above, CenturyLink may, at its option, delay the deployment date or terminate the agreement.

    1.2.3. **Indemnification**: Except as otherwise provided by mandatory applicable law without possibility of contractual waiver and notwithstanding anything in the Master Service Agreement or elsewhere, CenturyLink and its affiliated companies shall not be liable to you or indemnify you for any claims of infringement of patent, copyright or other intellectual property right related to the Software Components in Section 1.1.

    1.3. **Installation**: CenturyLink will perform installation tasks marked with an "X" in the CenturyLink column in Table 1.0 Roles and Responsibilities for the supported operating systems and hosting CenturyLink platforms listed below.

    1.3.1. **Supported Operating Systems**:
        1.3.1.1. Red Hat Enterprise Linux AS5 version 5.x (64 bit)
        1.3.1.2. Red Hat Enterprise Linux AS6 version 6.x (64 bit)

    1.3.2. **Supported Hosting Platforms**:
        1.3.2.1. CenturyLink Cloud
        1.3.2.2. CenturyLink Dedicated Cloud
        1.3.2.3. Intelligent Hosting

    1.4. **Configuration**: CenturyLink will perform configuration tasks marked with an "X" in the CenturyLink column in Table 1.0 Roles and Responsibilities.

    1.4.1. **Advanced Features**: Customers may choose from a number of advanced features. Table 7.0 lists the advanced features that are available. Customer can choose to have these features enabled by notifying CenturyLink during the installation process or by submitted a ticket in the customer portal.

    1.5. **Administration**: CenturyLink will perform administration tasks marked with an "X" in the CenturyLink column in Table 1.0 Roles and Responsibilities.

1.5.1. **Security:** CenturyLink utilizes CIS Level 1 security benchmarks and NIST for additional security standards when deploying Managed IBM DB2 Database Server and will provide security policies for Managed IBM DB2 Server to Customer upon request.

1.5.2. **Production and staging environments**: CenturyLink maintains full root or administrator access on the managed server. Root logins are limited to console access only and logged. Full access to administrative functions by Customer is expressly prohibited in production and staging level environments.

1.5.3. **Non-production level environments**: CenturyLink understands that in certain cases, Customers need administration functions in order to effectively manage certain applications that are running on the server. In these cases CenturyLink will allow the Customer the necessary access; provided, however, such Customer access will be provided pursuant to separate terms defined by CenturyLink permitting such access.

1.5.4. **Notification**: CenturyLink will retain primary notification and resolution responsibilities for all automated environment alerts in the production environment.

1.6. Monitoring: CenturyLink will provide monitoring tasks marked with an "X" in the CenturyLink column in Table 1.0 Roles and Responsibilities. Tables 3.0 to 6.0 list metrics that are monitored as part of the Service. These monitors are subject to change as new monitors are released and old monitors are phased out.

1.7. Maintenance and Support: CenturyLink will provide all maintenance and support tasks with an "X" in the CenturyLink column in Table 1.0 Roles and Responsibilities.

1.7.1. **Software and Security Patch Release**: CenturyLink Managed DB2 Database service includes the patching of DB2. However, due to the level of integration some Customer environments have with DB2, CenturyLink prohibits DB2 from being patched on a regular basis. CenturyLink does test and approve patches for DB2, but CenturyLink relies on Customer to determine what fix pack level is required and compatible with their specific environment. CenturyLink does proactively notify and schedule patching for any security vulnerabilities that may be identified. Customer must submit a ticket to have patches applied. Upon receipt of Customer request, CenturyLink will complete the work. Any Outages directly caused by Customer's failure to accept the implementation of a patch will not be subject to SLA Service Credits.

1.7.2. **Fix Packs**: If requested by the Customer, CenturyLink will proactively notify and schedule patching for fix packs or updates.

1.7.3. **Maintenance Windows:** All times listed under the Scheduled Maintenance Windows are local times and subject to change. CenturyLink will use commercially reasonable efforts to perform routine maintenance only during the Saturday or Sunday defined maintenance windows. See Definitions for additional information.

1.7.4. **Change Management**: All changes to the CenturyLink managed applications; systems, network and facilities are subject to CenturyLink's change management process. This process is intended to confirm that work is reviewed for completeness (risk assessment, completed test procedure, metrics for measuring progress, back out procedure, etc.) and accuracy prior to scheduling and implementation.

1.7.5. **Support:** Support for the Service is provided through the project manager during installation, content migration and Customer validation. At the point of go-live the Service is passed from project management to CenturyLink Service Center for full 24x7 monitoring and management. The point of go-live is when Customer notifies CenturyLink project manager that the environment is ready to go-live.

2. Customer Responsibilities: Customer is responsible for all tasks marked with an "X" in the Customer column in Table 1.0 Roles and Responsibilities. Customer acknowledges and agrees that its failure to perform its

obligations set forth in Table 1.0 may result in CenturyLink's inability to perform the Services and CenturyLink shall not be liable for any failure to perform in the event of Customer's failure.

2.1. Licensing and support for other third party applications: Once the Service is installed, the Customer may supply their own application software and respective licenses to complete the solution to meet their business needs. CenturyLink does not provide any monitoring or management of Customer-provided software or services.

2.2. Provide Contact: Designate and maintain a Customer contact during the Service term (including current contact information). "Customer Contact" means a technical point of contact available 24 x 7 with sufficient knowledge, authority and access to address configuration issues, event notifications, system or infrastructure modifications and authentication of applicable CenturyLink systems.

2.3. Additional Services: At Customer's option and expense Customer can choose to have CenturyLink complete one or more of the tasks in Table 1.0 with an "X" in the Customer column and/or the services listed below. Customer can also add items in Table 3.0 Advanced Features. The items can be added to the standard Service (described in Section 1.0) for an additional fee described in a separate Statement of Work ("SOW") or Service Order. Contact a sales representative for additional information.

2.3.1. **Minor Releases**: Minor Releases (see Definitions) require a new installation of the software binaries, which is not included in this Service. CenturyLink recommends that Customer purchase a new managed server (via a Service Order) and migrate data (defined in a SOW) as a best practice.

2.3.2. **Major Releases**: Major Releases (see Definitions) require a new installation of the software binaries, which is not included in this Service. CenturyLink recommends that Customer purchase a new managed server (via a Service Order) and migrate data (defined in a SOW) as a best practice.

Tables and Appendices

Table 1.0 Roles and Responsibilities

Type	Task	CenturyLink	Customer
License	Procure Licensing and License Management for CenturyLink provided Licenses	X	
	Procure Licensing and License Management for Customer provided Licenses		X
	Maintain Support Contract for vendor support provided by CenturyLink	X	
	Provide Access to DB2 Passport Advantage (Customer needs to provide access)		X
Installation	Install Software	X	
	Provide detailed, Customer-specific installation and configuration requirements		X
	Apply patches after receiving approval from customer	X	
	Create and configure a DB2 instance/database	X	
	Install and Configure CenturyLink Disk Backup	X	

Type	Task	CenturyLink	Customer
	Install and Configure CenturyLink tape backup Agents, if tape backup option is purchased	X	
	Create Data Objects (tables, views stored, procedures)		X
	Install third party software		X
	Create additional instance/database		X
Configuration	Configure/Prepare Server for Database Platform (OS Specific Parameters)	X	
	Configure server/instance/database based on information provided by Customer	X	
	Configure instance/database networking	X	
	Configure CenturyLink Monitoring	X	
	Perform validation, User Acceptance Testing (UAT), Site Acceptance Testing (SAT) of database and applications that comprise environment prior to going live.		X
	Configure non-CenturyLink Monitoring		X
	Configure database auditing		X
Administration	Perform backups to disk on a CenturyLink standard interval on an agreed to schedule	X	
	Perform backup outside the agreed schedule	X	
	Recovery in the event of corruption/failure	X	
	Perform and conduct DB2 recovery and validate the procedures	X	
	Client/Third Party Script Execution		X
	Non-standard Backup Procedures		X
	Non-standard Restore/Recovery Procedures		X
	Document and layout pre and post disaster recovery plan		X
	Identify the hosts/servers for disaster recovery (Alternate Servers)		X
	Database design		X
	Non-standard Backup Procedures		X
	Non-standard Restore/Recovery Procedures		X

Type	Task	CenturyLink	Customer
	Document and layout pre and post disaster recovery plan		X
	Identify the hosts/servers for disaster recovery (Alternate Servers)		X
	Database design		X
	Non-standard Backup Procedures		X
Monitoring	Monitor space utilization	X	
	Monitor database activity	X	
	Modify monitoring in database environment	X	
	Proactive Performance Monitoring		X
	Analyze and tune memory		X
	Analyze and tune disk I/O		X
	Analyze and tune third party/client application		X
	Segment statistics gathering		X
	Transaction analysis/tuning		X
Maintenance	Ad-hoc start-up and shutdown of server / instance / database	X	
	Modify server / instance / database	X	
	Verify database / data file integrity	X	
	Incident response	X	
	Manage database free space	X	
	Manage system scheduled tasks / jobs	X	
	Apply Fix pack	X	
	Apply Security Fix pack	X	
	Troubleshooting connection issues (CenturyLink Managed Applications)	X	
	Management of DBADMIN user permissions/privileges / roles		X
	Management of standard database users permissions/ privileges / roles		X

Type	Task	CenturyLink	Customer
	Table and Index Runstats		X
	Table and Index Re-Org		X
	Custom monitors		X
	Manage application schema(s) and Object(s)		X
	Manage application scheduled tasks/jobs		X
	Security configuration audit		X
	Major release software upgrade		X
	Troubleshoot connection issues (non-CenturyLink Managed Applications)		X
	Capacity planning		X
	Changing environment to clustered environment		X
	Data import / export / load		X

Table 2.0 Monitors for DB2 Service

Monitor	Description	Trap Frequency
db2_db_status	Verifies the database is connectable.	5 Min
db2_ts_status	Checks that tablespaces are in normal state.	5 Min
prc_db2sysc	Checks to verify the DB2 system process is running.	5 Min
port_db2	Checks for the DB2 port to be listening.	5 Min
db2_free_ts	Monitors free space availability for each tablespace.	15 Min
db2_total_percent_free_log	Percent of transaction log space available.	15 Min
db2_alloc_num_sec_logs	Number of secondary logs that are allocated.	15 Min
db2_buffer_pool_hit_data	Check for bufferpool hit ratio for data.	5 Min
db2_buffer_pool_hit_index	Check for bufferpool hit ratio for indexes.	5 Min
db2_buffer_pool_hit_total	Check for bufferpool hit ratio for data and indexes.	5 Min
db2_mon_buffer_pool	Verifies switch for bufferpool statistics gathering is enabled.	5 Min
db2_mon_lock	Verifies switch for Lock statistics gathering is enabled.	5 Min

Monitor	Description	Trap Frequency
db2_mon_sort	Verifies switch for Sort statistics gathering is enabled.	5 Min
db2_mon_stmt	Verifies switch for Statements statistics gathering is enabled.	5 Min
db2_mon_table	Verifies switch for Table statistics gathering is enabled.	5 Min
db2_mon_uow	Verifies switch for Unit of Work statistics gathering is enabled.	5 Min
db2_deadlock	Checks for the number of deadlocks that have occurred.	5 Min
db2_lock_escalation	Checks number of row-to-table lock escalations.	5 Min
db2_sort_overflows	Checks for Sorts spilling out of allocated memory.	5 Min
Online backup	Check for weekly online backup status.	daily
Offline backup	Manual process during planned maintenance window.	Daily
Incremental backup	Check daily incremental backup and alert on failure.	Daily
Incremental delta backup	Check daily incremental backup and alert on failure.	Daily
Tablespace backup	Manual process during planned maintenance window.	Daily
Export backup	Manual process during planned maintenance window.	Daily

Table 3.0 Advanced Features

Features	Advanced Enterprise Edition	Enterprise Edition
HADR	✓	✓
HADR Reads on Standby	✓	✓
Label-based access control	✓	Requires additional licenses
Oracle Compatibility	✓	✓
SQL Replication	✓	✓

Definitions

CenturyLink Service Center: The primary organization for resolving infrastructure issues that is staffed 24/7/365 to respond in a timely manner to incidents and requests pertaining to Customer IT infrastructure.

CIS: Center for Internet Security develops and distributes consensus-based and internationally recognized solutions that help organizations improve their cyber security and compliance posture.

CIS Level I Benchmarks define minimum standards for securing various operating systems including Windows, and variations of Unix. These standards should be used to improve the "out of the box" security of common operating system software to a prudent "due care" minimum level. By definition, the security actions included in CIS Level I Benchmarks satisfy three conditions: (1) they can be safely implemented by a system administrator of any level of technical security skill, (2) they will generally "do no harm" to functionality commonly required by everyday users, and (3) they can be scored by an associated software tool. This document is an example of a Level I Benchmark.

Fix pack: (A specific fix 'package' that is a cumulative collection of all fixes available up to that point for the base release. A fix pack can include fixes that have not been previously released and can span multiple products or components. A fix pack can be applied on top of any previously shipped maintenance to bring the system up to the current fix pack level.

High Availability Disaster Recovery (HADR): DB2 database high availability disaster recovery (HADR) is a database replication feature that provides a high availability solution for both partial and complete site failures. HADR protects against data loss by replicating data changes from a source database, called the primary, to a target database, called the standby. A database that does not use HADR is referred to as a standard database.

HADR Reads on Standby: Customers can use the reads on standby capability to run read-only operations on the standby database in the High Availability and Disaster Recovery (HADR) solution. Read operations running on a standby do not affect the standby's main role of replaying logs shipped from the primary database. The reads on standby feature reduces the total cost of ownership of the HADR setup. This expanded role of the standby database allows the Customer to utilize the standby in new ways, such as running some of the workload that would otherwise be running on the primary database, which frees up the primary for additional workloads.

Label-Based Access Control: Label-based access control (LBAC) greatly increases Customer control over who can access data. LBAC lets the Customer decide exactly who has write access and who has read access to individual rows and individual columns. The LBAC capability is very configurable and can be tailored to match a Customer's particular security environment. All LBAC configuration is performed by a security administrator, which is a user that has been granted the SECADM authority. A security administrator configures the LBAC system by creating security label components. A security label component is a database object that represents a criterion the Customer wants to use to determine if a user should access a piece of data. For example, the criterion can be whether the user is in a certain department, or whether they are working on a certain project. A security policy describes the criteria that will be used to decide who has access to what data. A security policy contains one or more security label components. Only one security policy can be used to protect any one table but different tables can be protected by different security policies.

Maintenance Windows: A period of time designated in advance by CenturyLink, during which preventive maintenance that could cause disruption of service may be performed. Current Scheduled Maintenance windows are:

- Americas: Saturday 00:00AM to 5:00AM; Sunday 00:00AM to 5:00AM
- EMEA: Saturday 02:00AM to 6:00AM
- APAC (Except Japan): Saturday 21:00 (GMT) AM to Sunday 01(GMT)
- Japan: Sunday 04:00 (JST) to 8:00 (JST)

Major Release: Major Releases (X.y.z) are vehicles for delivering major and minor feature development and enhancements to existing features. They incorporate all applicable error corrections made in prior Major Releases, Minor Releases, and Patch Releases. Software Provider typically has one Major Release per year.

Minor Release: Minor Releases (x.Y.z) are vehicles for delivering minor feature developments, enhancements to existing features, and defect corrections. They incorporate all applicable error corrections made in prior Minor Releases, and Patch Releases.

NIST: National Institute of Standards and Technology is the federal technology agency that works with industry to develop and apply technology, measurements, and standards.

Non-Production Environment: A product is still being used theoretically. Users, typically engineers, look for bugs or design flaws.

Oracle Compatibility: With Oracle databases, Version IBM DB2 9.7 contains many new enhancements that make the DB2 products more familiar to Customers. These enhancements also make it particularly easy to enable Oracle applications to run quickly in DB2 environments.

Patch Release: A patch is a small piece of software that is used to correct a problem with a software program or an operating system. Patches are often called "Patch Updates" and are Critical or Security related.

Passport Advantage: Passport Advantage is a comprehensive program that covers software license maintenance options all under a single, common set of agreements, processes, and tools. It features specific solutions designed to match the way different businesses acquire software and maintenance services. Customers can order a single platform or many platforms; one product or an entire suite; for one location or a network of offices around the world. Passport Advantage offers consistent worldwide features and pricing, simplified acquisition, and multilingual licensing.

Production Environment: A production environment can be thought of as a real-time setting where programs are run and hardware setups are installed and relied on for organization or commercial daily operations.

Service Pack: A service pack contains all Hotfixes or Cumulative Updates since the last Service Pack or the initial Release to Manufacturing (RTM) version of the software.

Side-by-Side Upgrade: The installation of an operating system or application on the computer without removing the older version first and without saving any data beyond normal precautions.

SLA Credit: Service Level Agreement Credits are refunds given by CenturyLink to a Customer if the service falls below a contractually agreed service levels. See Section 1.0 for the SLA agreement associated with this service.

Software Binary: A binary file is a file whose content must be interpreted by a program or a hardware processor that understands in advance exactly how it is formatted.

Software: The database server software in binary form, any other machine-readable materials (including, but not limited to, libraries, source files, header files, and data files).

Software Provider: The third party that makes and sells software products described in section 1.0.

SQL Replication: SQL replication allows a Customer to replicate data from DB2 sources to targets by using two programs: Capture and Apply. The Capture program runs on the source system. The Capture program reads DB2 recovery logs for changed source data and saves the committed changed data to staging tables. The Apply program typically runs on the target system. The Apply program retrieves captured data from staging tables and delivers the

data to targets. Both programs use a set of DB2 tables to track the information that they require to do their tasks and to store information that they generate themselves, such as information that Customers can use to find out how well they are performing. A Customer creates these tables before telling SQL replication what the replication sources and targets are. For each supported operating system or platform that is supported by DB2 and for each non-DB2 relational database management system that is supported by SQL replication, you can set your own default specifications for the table spaces that will be used by control tables.

Statement of Work: A statement of work (SOW) is a formal document that captures and defines the work activities, deliverables, and timeline a vendor must execute in performance of specified work for a client. The SOW usually includes detailed requirements and pricing, with standard regulatory and governance terms and conditions.

Upgrades: Upgrades mean a Major Release or Minor Release of the software.