BlackBerry UEM Cloud

Architecture and Data Flows

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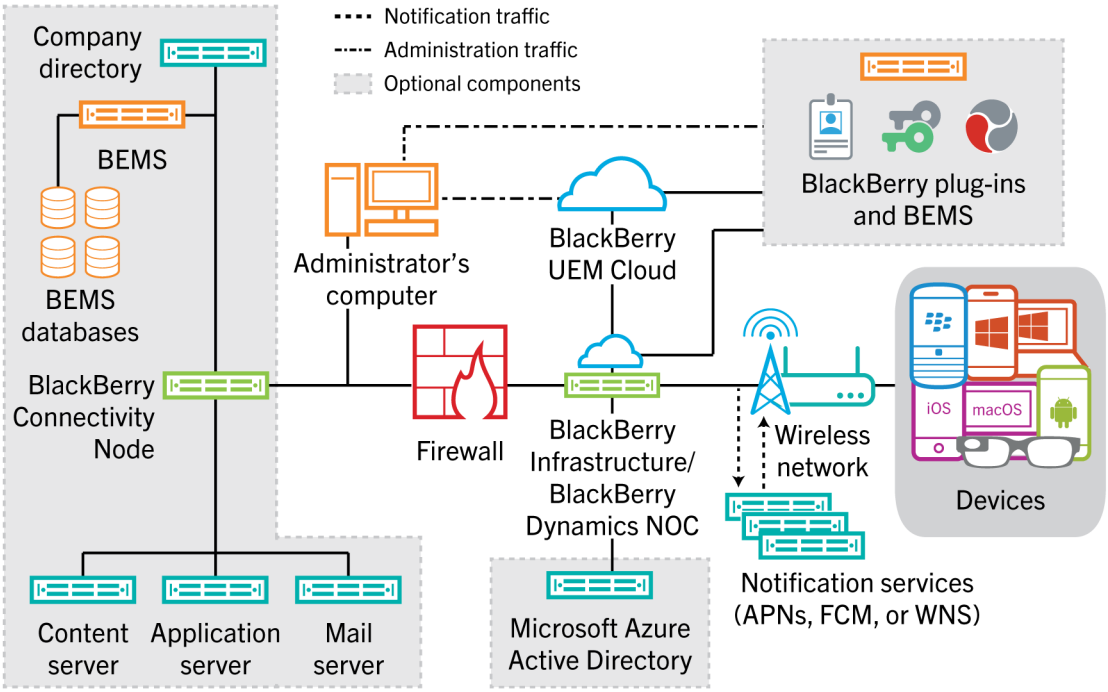
BlackBerry UEM Cloud architecture and data flows

BlackBerry UEM Cloud is a unified endpoint management solution from BlackBerry. With BlackBerry UEM Cloud you can manage iOS, macOS, Android, Windows 10, and BlackBerry 10 devices using a simple web-based interface and protect business information on BYOD, COPE, and COBO devices.

The BlackBerry UEM Cloud architecture was designed to help you manage mobile devices for your organization in a cloud environment and provide a secure link for data to travel between your organization's mail and content servers and your user's devices.

Architecture: BlackBerry UEM Cloud solution



Component	Description
BlackBerry UEM Cloud	BlackBerry UEM Cloud is a service that allows you to manage devices used in your organization's environment.
BlackBerry Infrastructure and BlackBer Dynamics NOC	The BlackBerry Infrastructure registers user information for device activation and validates licensing information for BlackBerry UEM Cloud. If you enable BlackBerry Secure Connect Plus or the BlackBerry Secure Gateway, data in transit that uses these services passes through the BlackBerry Infrastructure. The BlackBerry Dynamics NOC is a separately located NOC that provides secure communications between BlackBerry Dynamics apps on devices and BlackBerry Proxy installed behind the firewall as part of the BlackBerry Connectivity Node.

Component	Description
Devices	BlackBerry UEM Cloud supports iOS, macOS, Android, Windows 10, and BlackBerry 10 devices.
Notification services	BlackBerry UEM Cloud sends notifications to devices to contact BlackBerry UEM for updates and to report information for your organization's device inventory. These notifications are sent to the BlackBerry Infrastructure, where they are sent to the devices using the appropriate notification service: • APNs is a service that Apple provides to send notifications to iOS and macOS devices. • FCM is a service that Google provides to send notifications to Android devices. • WNS is a service that Microsoft provides to send notifications to Windows 10 devices.
BlackBerry Connectivity Node	The BlackBerry Connectivity Node is an optional component that you install inside your organization's firewall. It includes five components that add functionality to BlackBerry UEM Cloud: • The BlackBerry Cloud Connector connects BlackBerry UEM Cloud to your company directory behind the firewall to allow basic attribute synchronization, search functionality, and user authentication services. If you don't install the BlackBerry Connectivity Node and your company directory is behind the firewall, you must create local user accounts in BlackBerry UEM Cloud instead of using the user accounts in your company directory. The BlackBerry Cloud Connector is not required for BlackBerry UEM Cloud to connect to Microsoft Azure Active Directory. • BlackBerry Proxy maintains a secure connection between your organization and the BlackBerry Dynamics NOC, which allows BlackBerry Dynamics apps to communicate securely with your organization's resources behind the firewall. It also supports BlackBerry Dynamics Direct Connect, which allows app data to bypass the BlackBerry Dynamics NOC. • The BlackBerry Gatekeeping Service sends commands to Exchange ActiveSync to add devices to an allowed list when devices are activated on BlackBerry UEM Cloud. Unmanaged devices that try to connect to an organization's mail server can be reviewed, verified, and blocked or allowed by an administrator using the BlackBerry UEM management console. • BlackBerry Secure Connect Plus provides a secure IP tunnel between work apps on devices and your organization's network. One tunnel that supports standard IPv4 (TCP and UDP) data is established for each device through the BlackBerry Infrastructure. • The BlackBerry Secure Gateway provides a secure connection through the BlackBerry Infrastructure and BlackBerry UEM Cloud to your organization's mail server for iOS devices. The BlackBerry Connectivity Node uses port 3101 to communicate with BlackBerry UEM Cloud.

Component	Description
BlackBerry Enterprise Mobility Server	If you have installed the BlackBerry Connectivity Node, you can also install an on-premises BEMS. BEMS consolidates several services used to send work data to and from BlackBerry Dynamics apps: • BlackBerry Connect provides secure instant messaging, company directory look-up, and user presence information to iOS and Android devices. • BlackBerry Presence provides real-time presence status to BlackBerry Dynamics apps. • BlackBerry Docs lets your BlackBerry Dynamics app users access, synchronize, and share documents using their work file server, SharePoint, Box, and content management systems supporting CMIS, without the need for VPN software, firewall reconfiguration, or duplicate data stores.
BlackBerry Enterprise Mobility Server databases	The BEMS databases store user, app, policy, and configuration information.
Company directory	BlackBerry UEM Cloud supports connectivity with your organization's Microsoft Active Directory or LDAP company directory behind the firewall using the BlackBerry Connectivity Node.
Microsoft Azure Active Directory	Microsoft Azure Active Directory is a cloud-based directory management service. If your organization uses Azure Active Directory you can connect to it instead of, or in addition to, a company directory behind the firewall.
Content, application, and mail servers	When you enable BlackBerry Secure Connect Plus or when users have BlackBerry Dynamics apps, devices can connect to your organization's servers without requiring you to open a direct connection between the server and the Internet. Work data in transit between your servers and devices is sent through BlackBerry Secure Connect Plus and the BlackBerry Infrastructure. BlackBerry Dynamics app data is sent through BlackBerry Proxy and the BlackBerry Dynamics NOC. The BlackBerry Secure Gateway provides a secure connection through the BlackBerry Infrastructure and BlackBerry Connectivity Node between your organization's mail server and iOS devices.
BlackBerry plug-ins and BEMS	The cloud version of BlackBerry Enterprise Mobility Server provides BlackBerry Push Notifications, which accepts push registration requests from iOS and Android devices and then communicates with Microsoft Exchange to monitor the user's work mail account for changes. If Microsoft Exchange is behind your organization's firewall, you must open a port for BEMS to communicate with Microsoft Exchange. BlackBerry UEM Cloud works with additional BlackBerry enterprise products such as BlackBerry Enterprise Identity, BlackBerry 2FA, and BlackBerry Workspaces, to allow you to extend UEM capabilities in your organization.

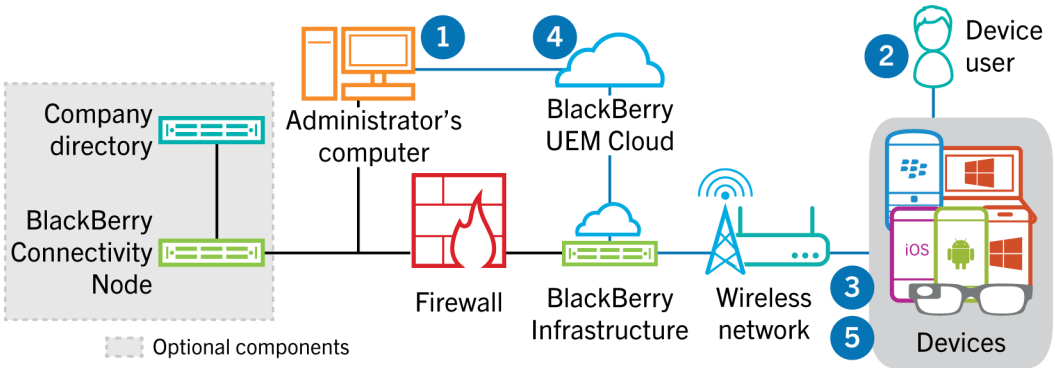
Activating devices and BlackBerry Dynamics apps

When a user activates a device with BlackBerry UEM, the device is associated with BlackBerry UEM so that you can manage devices, and users can access work data on their devices. Device activation types give you different degrees of control over the work and personal data on devices, ranging from full control over all data to specific control over work data only. For more information about activation types, see "Device activation" in the Administration content.

Depending on the device type and the activation type that you specify for it, the device and BlackBerry UEM must complete several steps during the activation process to authenticate to each other, secure a communication channel and, if needed, create a work space or encrypt the device before any configuration and work data is sent to the device. For instructions to activate devices, see "Steps to activate devices" in the Administration content.

BlackBerry Dynamics apps provide access to work resources on the device. After BlackBerry Dynamics apps are installed on a device, they must also be activated to allow them to securely access your work resources. For more information about activating BlackBerry Dynamics, see "Generate access keys for BlackBerry Dynamics apps" in the Administration content.

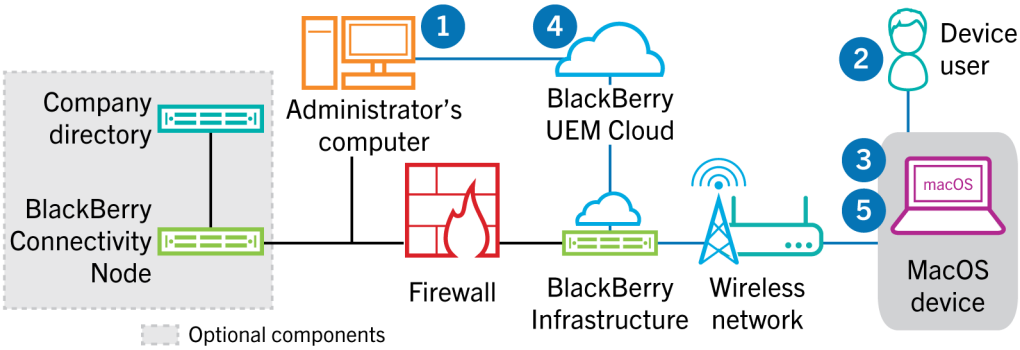
Data flow: Activating an iOS, Android, Windows 10, or BlackBerry 10 device



1. You perform the following actions:
   a. Add a user to BlackBerry UEM Cloud as a local user account or, if you installed the BlackBerry Connectivity Node, using the account information retrieved from your company directory.
   b. Assign an activation profile to the user.
   c. Depending on the device type and your organization's preferences, use one of the following options to provide the user with activation details:
      - Automatically generate a device activation password and, optionally, a QR code, and send an email message with activation instructions for the user.
      - Set a device activation password and communicate the username and password to the user directly or by email.
      - Don't set a device activation password and communicate the BlackBerry UEM Self-Service address to the user so that they can set their own activation password or view a QR code.
2. The user performs the following actions:
   a. If activating an iOS or Android device, downloads and installs the BlackBerry UEM Client.
   b. Enters their activation username and password or scans the QR code on their device.

3. The device sends an activation request to BlackBerry UEM.
4. BlackBerry UEM Cloud verifies the user's activation credentials and sends the activation details to the device, including device configuration information.
5. The device receives the activation details from BlackBerry UEM Cloud and completes the configuration. The device then sends confirmation to BlackBerry UEM Cloud that the activation was successful.

Data flow: Activating a macOS device

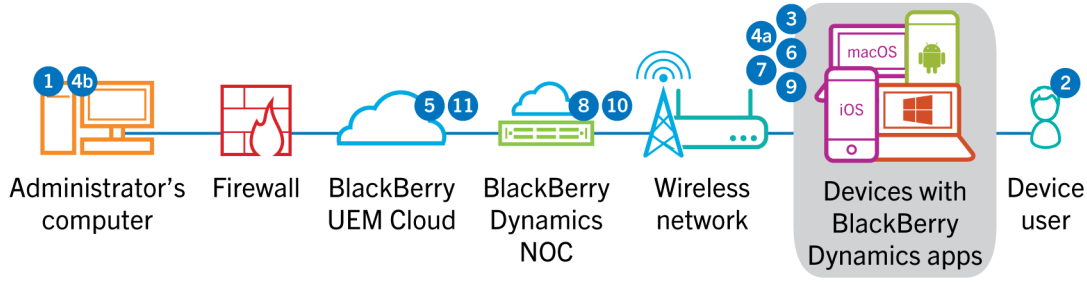


1. You perform the following actions:
   a. Add the user to BlackBerry UEM Cloud as a local user account or, if you installed the BlackBerry Connectivity Node, using the account information retrieved from your company directory.
   b. Assign an activation profile to the user.
   c. Make sure that the user has the login information for BlackBerry UEM Self-Service, including:
      - Web address for BlackBerry UEM Self-Service
      - Username and password
      - Domain name
2. The user logs in to BlackBerry UEM Self-Service on their macOS device and activates the device.
3. The device sends an activation request to BlackBerry UEM Cloud.
4. BlackBerry UEM Cloud verifies the activation credentials and sends the activation details to the device, including device configuration information.
5. The device receives the activation details from BlackBerry UEM Cloud and completes the configuration. The device then sends confirmation to BlackBerry UEM Cloud that the activation was successful.

Data flow: Activating a BlackBerry Dynamics app

When users install a BlackBerry Dynamics app, the app must be activated to enable secure communication between the app and your organization's resources.

If the BlackBerry UEM Client is installed on the device, BlackBerry Dynamics apps can be activated with no administrator or user action. If the BlackBerry UEM Client is not installed, an administrator or user must request that BlackBerry UEM Cloud generate an access key and send it to the user.



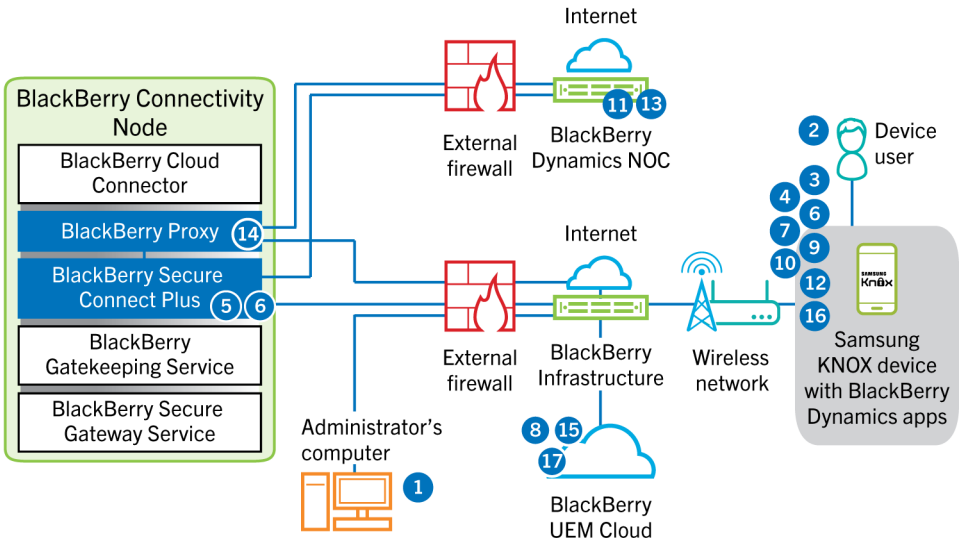
1. An administrator assigns one or more BlackBerry Dynamics apps to a user.
2. The user installs the app on the device.
3. If the device is not a Samsung Knox Workspace device and the BlackBerry UEM Client is installed on the device, the BlackBerry Dynamics app performs the following actions:
   a. Establishes a secure channel with the BlackBerry UEM Client on the device. Data exchanged over the secure channel is encrypted using an AES-CBC cipher.
   b. Asks the BlackBerry UEM Client to requests an access key for the new BlackBerry Dynamics app. The request includes a randomly generated nonce.
4. One of the following events occurs:
   - The BlackBerry UEM Client sends the access key request and the randomly generated nonce to BlackBerry UEM Cloud.
   - If the BlackBerry UEM Client is not installed on the device, or if the device uses Samsung Knox Workspace and this is the first BlackBerry Dynamics app activated, the administrator generates an access key to send to the user or the user logs into BlackBerry UEM Self-Service and generates an access key.
   - If the device or Knox Workspace already contains an activated BlackBerry Dynamics app, the activated app sends an access key request and the randomly generated nonce to BlackBerry UEM Cloud.
5. BlackBerry UEM Cloud performs one of the following actions:
   a. Sends the requested access key to the BlackBerry UEM Client.
   b. Sends the generated access key to the user in an email message.
6. The BlackBerry UEM Client or the user provides the access key to the BlackBerry Dynamics app.
7. The BlackBerry Dynamics app establishes an SSL connection with the BlackBerry Dynamics NOC and sends it a hash of the access key.
8. The BlackBerry Dynamics NOC verifies the access key and, if the verification is successful, sends provisioning data, including the master link key and connection information, to the BlackBerry Dynamics app.
9. The BlackBerry Dynamics app begins to establish a shared secret with BlackBerry UEM Cloud by sending a secure channel setup message to the BlackBerry Dynamics NOC over the SSL connection.

   The secure channel setup message contains a user identifier (email address), ephemeral ECDH public key, a salt value, a token, and a MAC of the message to authenticate the sender and guarantee the integrity of the message.
10. The BlackBerry Dynamics NOC forwards the secure channel setup message to BlackBerry UEM Cloud over an HTTPS connection.

11. BlackBerry UEM Cloud sends encrypted provisioning data, including the master session key, app configuration data, and, if one or more BlackBerry Connectivity Node instances is configured, a list of BlackBerry Proxy instances, to the BlackBerry Dynamics app to complete the activation.

Data flow: Activating a BlackBerry Dynamics app on a Samsung Knox Workspace device when BlackBerry Secure Connect Plus is enabled

This data flow describes how data travels when a BlackBerry Dynamics app in the work space on a Samsung Knox Workspace device is activated over a BlackBerry Secure Connect Plus connection.



1. An administrator assigns one or more BlackBerry Dynamics apps to a user.
2. The user installs the apps on the Samsung Knox device.
3. One of the following events occurs:
   a. If this is the first BlackBerry Dynamics app activated in the Knox Workspace, the administrator generates an access key to send to the user or the user logs into BlackBerry UEM Self-Service and generates an access key.
   b. If the Knox Workspace already contains an activated BlackBerry Dynamics app, the activated app sends an access key request and the randomly generated nonce to BlackBerry UEM Cloud.
4. The device sends a request through a TLS tunnel, over port 443, to the BlackBerry Infrastructure to request a secure tunnel to the work network. The signal is encrypted by default using FIPS-140 certified Certicom libraries. The signaling tunnel is encrypted end to end.
5. BlackBerry Secure Connect Plus receives the request from the BlackBerry Infrastructure through port 3101.
6. The device and BlackBerry Secure Connect Plus negotiate the tunnel parameters and establish a secure tunnel for the device through the BlackBerry Infrastructure. The tunnel is authenticated and encrypted end to end with DTLS.
7. The activated BlackBerry Dynamics app sends the access key request and the randomly generated nonce from BlackBerry Secure Connect Plus to BlackBerry UEM Cloud.
8. BlackBerry UEM Cloud sends the requested access key from BlackBerry Secure Connect Plus to the activated BlackBerry Dynamics app.
9. The activated BlackBerry Dynamics app provides the access key to the new BlackBerry Dynamics app.
10. The BlackBerry Dynamics app establishes a connection using BlackBerry Secure Connect Plus with the BlackBerry Dynamics NOC and sends it a hash of the access key.

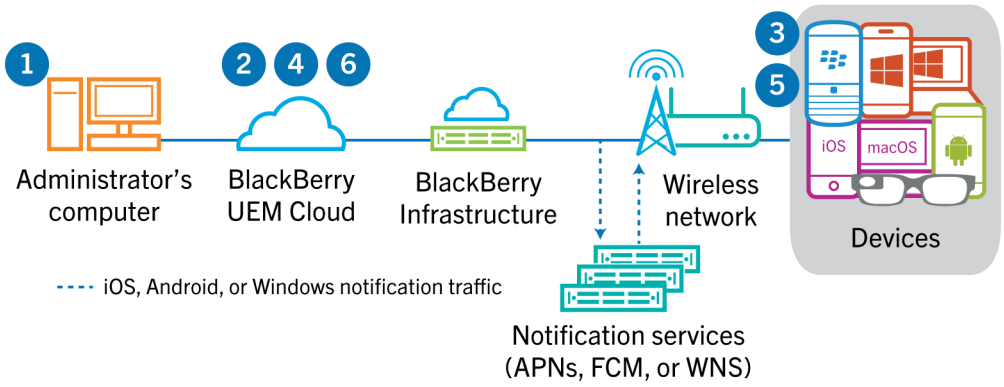
11. The BlackBerry Dynamics NOC verifies the access key and, if the verification is successful, sends provisioning data, including the master link key and connection information, using BlackBerry Secure Connect Plus to the BlackBerry Dynamics app.
12. The BlackBerry Dynamics app begins the process of establishing a shared secret with BlackBerry UEM Cloud by sending a secure channel setup message to the BlackBerry Dynamics NOC using BlackBerry Secure Connect Plus.

    The secure channel setup message contains a user identifier (email address), ephemeral ECDH public key, a salt value, a token, and a MAC of the message to authenticate the sender and guarantee the integrity of the message.
13. The BlackBerry Dynamics NOC forwards the secure channel setup message to BlackBerry Proxy over an HTTPS connection.
14. BlackBerry Proxy then forwards the secure channel setup message to BlackBerry UEM Cloud.
15. BlackBerry UEM Cloud responds to the BlackBerry Dynamics app using BlackBerry Secure Connect Plus. The response contains a new ephemeral ECDH public key and a MAC of the message.
16. The BlackBerry Dynamics app requests provisioning data from BlackBerry UEM Cloud. The request travels through BlackBerry Secure Connect Plus, the BlackBerry Dynamics NOC, and BlackBerry Proxy.
17. BlackBerry UEM Cloud sends encrypted provisioning data, including the master session key, app configuration data, and a list of BlackBerry Proxy instances, to the BlackBerry Dynamics app to complete the activation.

Data flow: Receiving configuration updates on a device

When you use the management console to send device commands, such as lock device or delete the work data, or when you perform other device management tasks, such as updates to IT policy, profile, and app settings or assignments, you trigger a configuration update for the device.

When a configuration update needs to be sent to a device, BlackBerry UEM Cloud notifies the device that a configuration update is pending. Devices also poll BlackBerry UEM Cloud regularly to ask for any actions that need to be run on the device to prevent any configuration update from being missed if a notification is not received on the device.



1. You use the management console to send device commands, such as lock device or delete the work data, or you perform device management tasks, such as updates to IT policy, profile, or app settings or assignments, and trigger a configuration update for the device.
2. BlackBerry UEM Cloud assigns the update and identifies the objects that must be shared with the device then performs one of the following actions:
   - For Android devices, BlackBerry UEM Cloud notifies the BlackBerry UEM Client on the device that an update is pending using the FCM. The FCM sends a notification to the device to contact BlackBerry UEM Cloud.
   - For iOS and OS X devices, BlackBerry UEM Cloud notifies the MDM Daemon on the device that an update is pending using the APNs. The APNs sends a notification to the device to contact BlackBerry UEM Cloud.
   - For Windows 10 devices, BlackBerry UEM Cloud notifies the MDM Daemon on the device that an update is pending using the WNS. The WNS sends a notification to the device to contact BlackBerry UEM Cloud.
   - For BlackBerry 10 devices, BlackBerry UEM Cloud notifies the Enterprise Management Agent on the device that an update is pending.
3. The device contacts BlackBerry UEM Cloud to request any pending actions that must be performed on the device.
4. BlackBerry UEM Cloud replies with the highest priority action.

   Priority is given to IT administration commands, such Lock device, followed by requests for device information, installed apps, and so on. BlackBerry UEM Cloud sends one command at a time. If necessary, additional information is included in the response.
5. The device performs the following actions:

   a. Inspects the response from BlackBerry UEM Cloud
   b. Schedules the command to be processed, and waits for the command to run
   c. Sends a response to BlackBerry UEM Cloud to update the command status. The status indicates whether the command ran successfully and provides an error message in the event of a failure.
6. If more actions or commands are pending for the device, BlackBerry UEM Cloud replies with the highest priority action.

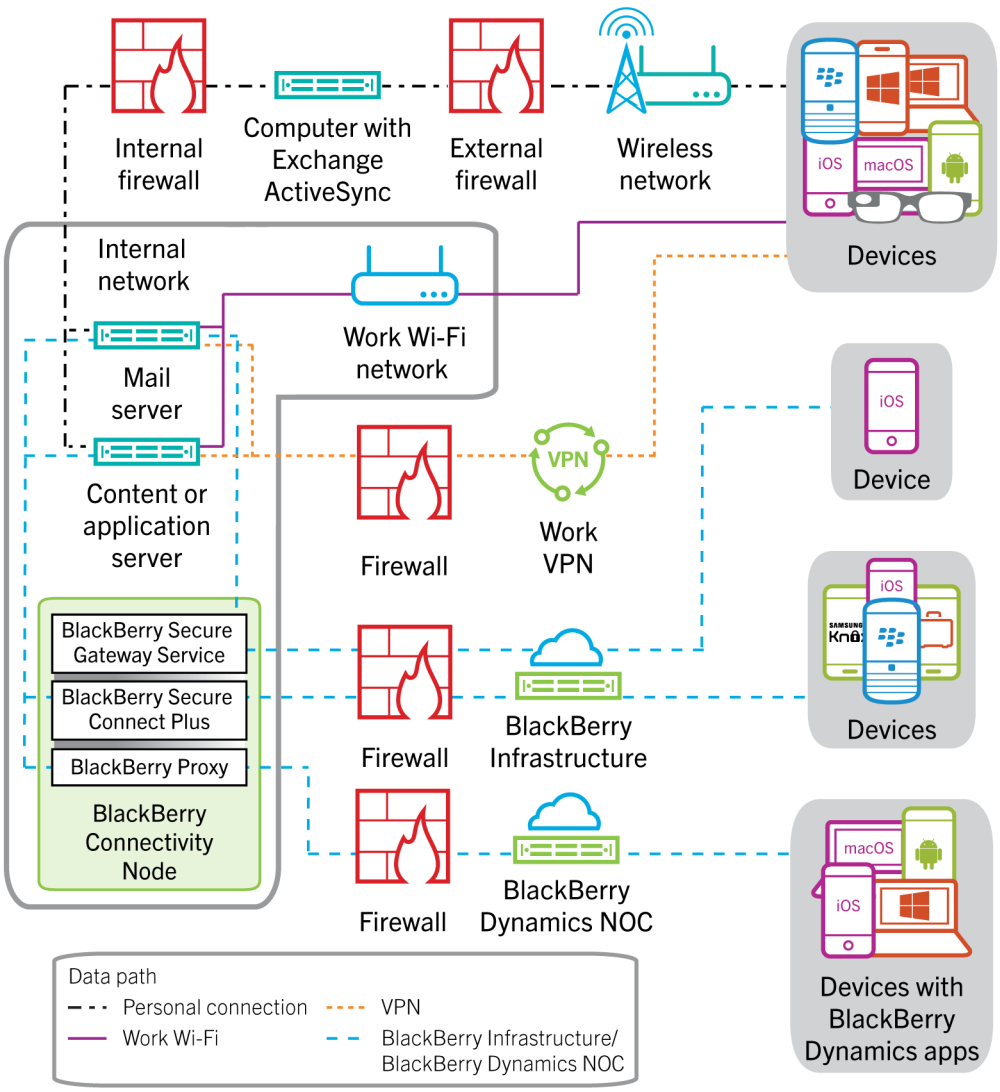
Steps 4 to 6 repeat until no more pending actions or commands must be performed and BlackBerry UEM Cloud replies with an idle command.

Sending and receiving work data

When users send and receive work data on a device, data can travel between the device and your resources using the following connections:

- The device can use a direct connection over the or mobile network from the device to the mail, content, or application server (for example, an Exchange ActiveSync server that is placed in a DMZ or is exposed to the public network).
- The device can use a direct connection through your organization's VPN or work Wi-Fi network to the mail, content, or application server. The device VPN or Wi-Fi profile may be configured by you or by the users.
- If you install the BlackBerry Connectivity Node, BlackBerry Secure Connect Plus can provide a secure IP tunnel through the BlackBerry Infrastructure between apps on BlackBerry 10, iOS, Android Enterprise , and Samsung Knox Workspace devices and your organization's network.
- If you install the BlackBerry Connectivity Node, BlackBerry Proxy can provide a secure connection between BlackBerry Dynamics apps on devices and your organization's network.
- If you install the BlackBerry Connectivity Node, the BlackBerry Secure Gateway can provide a secure connection through the BlackBerry Infrastructure and BlackBerry UEM to your organization's mail server for iOS devices.

This diagram shows the possible data paths.

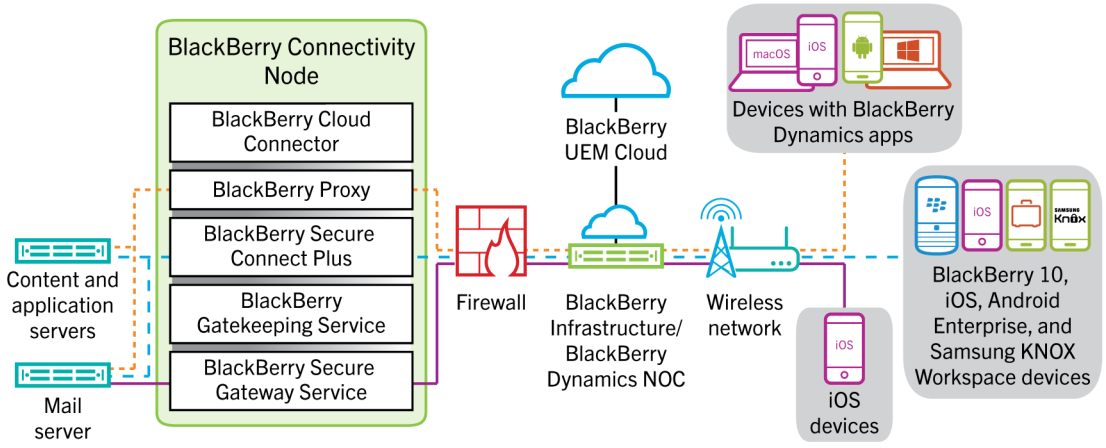

Internal firewall
Computer with Exchange ActiveSync
External firewall
Wireless network
iOS
macOS
Devices
Internal network
Work Wi-Fi network
Mail server
Content or application server
Firewall
VPN
Work VPN
iOS
Device
BlackBerry Secure Gateway Service
BlackBerry Secure Connect Plus
BlackBerry Proxy
BlackBerry Connectivity Node
Firewall
BlackBerry Infrastructure
iOS
Devices
Firewall
BlackBerry Dynamics NOC
macOS
iOS
Devices with BlackBerry Dynamics apps
Data path
Personal connection
VPN
Work Wi-Fi
BlackBerry Infrastructure/ BlackBerry Dynamics NOC

Sending and receiving work data using BlackBerry UEM Cloud and the BlackBerry Infrastructure

If you install the BlackBerry Connectivity Node, devices can connect to your organization's resources through BlackBerry UEM Cloud and the BlackBerry Infrastructure or the BlackBerry Dynamics NOC using the following services:

Service	Description
BlackBerry Secure Connect Plus	BlackBerry Secure Connect Plus provides a secure IP tunnel through the BlackBerry Infrastructure to transfer data between apps and your organization's network. For BlackBerry 10 and Android Enterprise devices, BlackBerry Secure Connect Plus provides a secure tunnel between all work space apps and your organization's network. For Samsung Knox Workspace devices, BlackBerry Secure Connect Plus can provide a secure tunnel between your organization's network and all work apps or only specified work apps. For iOS devices, BlackBerry Secure Connect Plus can provide a secure tunnel between your organization's network and all apps or only specified apps.
BlackBerry Proxy	BlackBerry Proxy provides a secure connection between BlackBerry Dynamics apps on devices and your organization' resources behind the firewall. It also supports BlackBerry Dynamics Direct Connect, which allows app data to bypass the BlackBerry Dynamics NOC.
BlackBerry Secure Gateway	The BlackBerry Secure Gateway provides a secure connection through the BlackBerry Infrastructure and BlackBerry UEM to your organization's mail server for iOS devices.

The following diagram shows how devices can connect to your organization's resources through the BlackBerry Infrastructure and BlackBerry UEM Cloud.

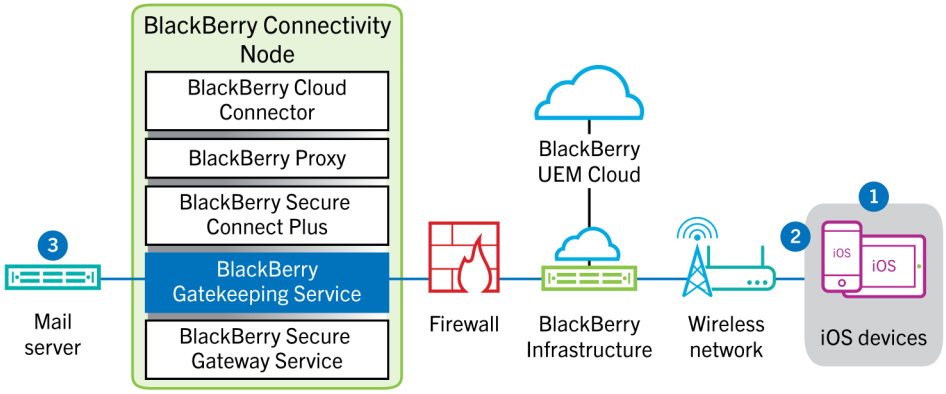


For more information about enabling BlackBerry Secure Connect Plus, see "Enabling and configuring BlackBerry Secure Connect Plus" in the Administration content.

For more information about enabling the BlackBerry Secure Gateway, see "Protecting email data using the BlackBerry Secure Gateway" in the Administration content.

Data flow: Sending email from an iOS device using the BlackBerry Secure Gateway

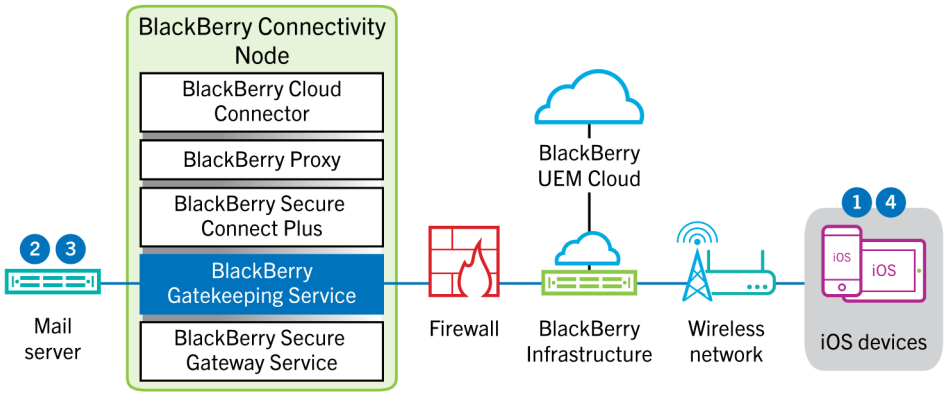
This data flow describes how work email and calendar data travels from iOS devices to the Exchange ActiveSync server using the BlackBerry Secure Gateway.



1. A user creates an email or updates an organizer item in the work space.
2. The device sends the new or changed item through the BlackBerry Infrastructure and the BlackBerry Secure Gateway to the mail server.
3. The mail server updates the organizer data on the user's mailbox or sends the mail item to the recipient and sends a confirmation to the device.

Data flow: Receiving email on an iOS device using the BlackBerry Secure Gateway

This data flow describes how work email and calendar data travels between iOS devices and the Exchange ActiveSync server using the BlackBerry Secure Gateway.

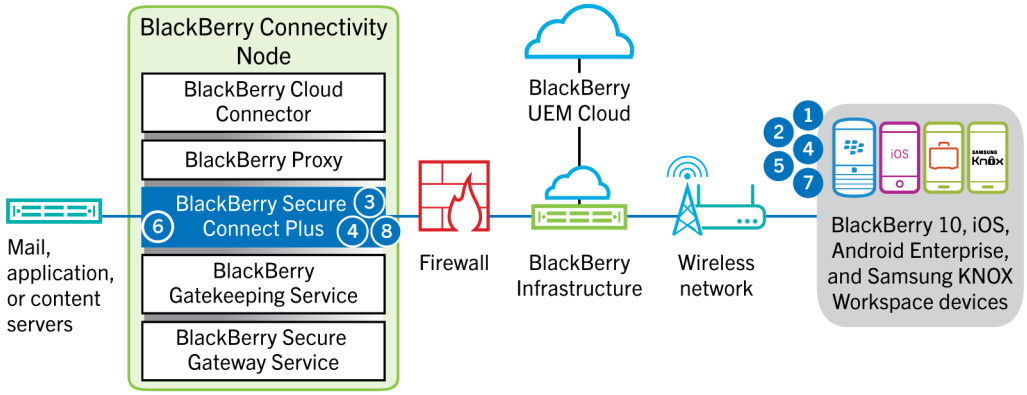


1. The device issues an HTTPS request to the mail server and requests that the mail server notify the device when any items change in the folders that are configured for synchronization. The request travels through the encrypted and authenticated channel between the BlackBerry Infrastructure and the BlackBerry Secure Gateway to the mail server.
2. If there are no new or changed items during this interval, the mail server sends an "HTTP 200 OK" message to the device. The device issues a new request and the process starts over.
3. When there are new or changed items for the device, such as a new email or updated calendar entry, the mail server sends the updates to the device through the secure channel between the BlackBerry Secure Gateway and the BlackBerry Infrastructure to the email or organizer app on the device.

4. When the synchronization is complete, the device issues another request to restart the process.

Data flow: Sending and receiving work data using BlackBerry Secure Connect Plus

This data flow describes how data travels when an app on a device that is configured to use BlackBerry Secure Connect Plus accesses an application or content server in your organization.



1. The user opens an app to access work data from a content or application server behind your organization's firewall.
   - On BlackBerry 10, Android Enterprise, and Samsung Knox Workspace devices, all work apps can use BlackBerry Secure Connect Plus.
   - On iOS devices, you specify whether all apps or only specified apps can use BlackBerry Secure Connect Plus.
2. The device determines that a secure IP tunnel is the most direct, cost-efficient method available to connect to the application or content server to retrieve the data and sends a requests through a TLS tunnel, over port 443, to the BlackBerry Infrastructure for a secure tunnel to the work network. By default, the signal is encrypted using FIPS-140 certified Certicom libraries. The signaling tunnel is encrypted end-to-end.
3. BlackBerry Secure Connect Plus receives the request from the BlackBerry Infrastructure through port 3101.
4. The device and BlackBerry Secure Connect Plus negotiate the tunnel parameters and establish a secure tunnel for the device through the BlackBerry Infrastructure. The tunnel is authenticated and encrypted end-to-end with DTLS.
5. The app uses the tunnel to connect to the application or content server using standard IPv4 protocols (TCP and UDP).
6. BlackBerry Secure Connect Plus transfers the IP data to and from your organization's network. BlackBerry Secure Connect Plus encrypts and decrypts traffic using FIPS-140 certified Certicom libraries.
7. The app receives and displays the data on the device.
8. As long as the tunnel is open, supported apps use it to access network resources. When the tunnel is no longer the best available method to connect to your organization's network, BlackBerry Secure Connect Plus terminates it.

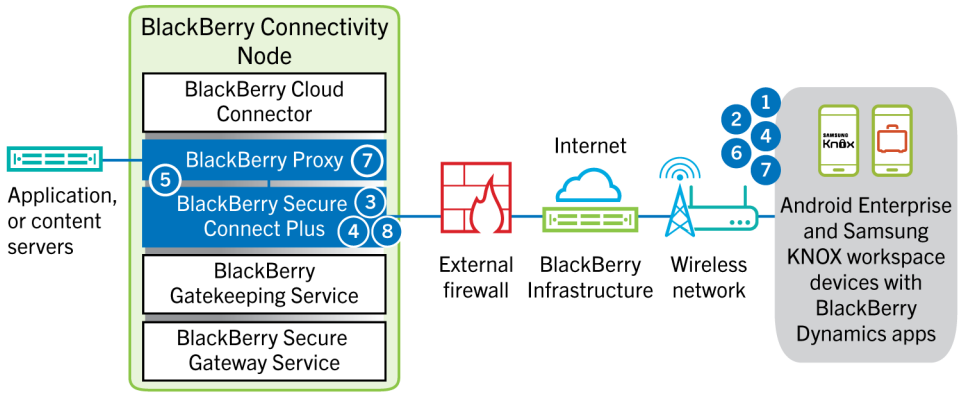
   For iOS devices, if you configure per-app VPN for BlackBerry Secure Connect Plus, the tunnel eventually terminates when none of the configured apps are in use.

Data flow: Sending and receiving work data from a BlackBerry Dynamics app on an Android device using BlackBerry Secure Connect Plus

This data flow describes how data travels when a BlackBerry Dynamics app on an Android Enterprise or Samsung Knox Workspace device uses BlackBerry Secure Connect Plus.

If you are using BlackBerry Secure Connect Plus with BlackBerry Dynamics apps on an Android Enterprise device, it is recommended that you restrict BlackBerry Dynamics apps from using BlackBerry Secure Connect Plus to avoid network latency. You can't restrict specific apps on Samsung Knox Workspace devices.

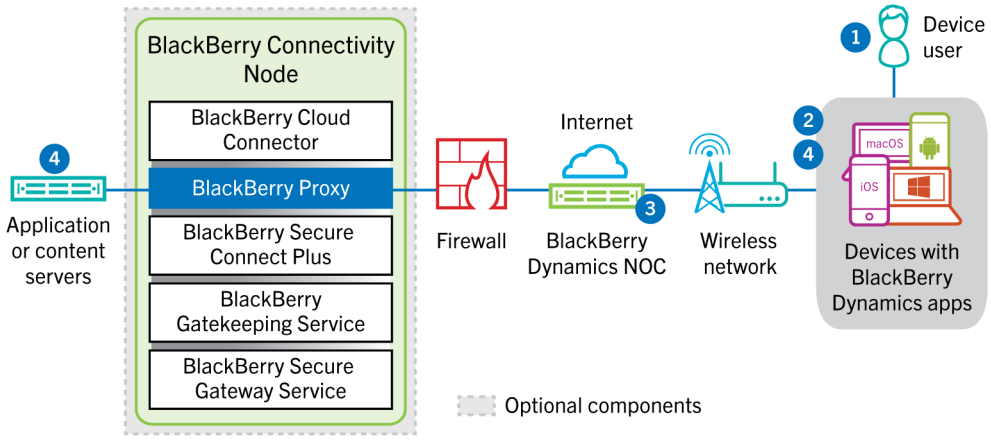
If you are using BlackBerry Secure Connect Plus with BlackBerry Dynamics apps on an Android Enterprise device or a Samsung Knox Workspace device, it is recommended that you configure BlackBerry UEM not to send BlackBerry Dynamics app data through the BlackBerry Dynamics NOC to reduce network latency.



1. The user opens a BlackBerry Dynamics app to access work data.
2. The device sends a request through a TLS tunnel, over port 443, to the BlackBerry Infrastructure to request a secure tunnel to the work network. The signal is encrypted by default using FIPS-140 certified Certicom libraries. The signaling tunnel is encrypted end to end.
3. BlackBerry Secure Connect Plus receives the request from the BlackBerry Infrastructure through port 3101.
4. The device and BlackBerry Secure Connect Plus negotiate the tunnel parameters and establish a secure tunnel for the device through the BlackBerry Infrastructure. The tunnel is authenticated and encrypted end to end with DTLS.
5. BlackBerry Secure Connect Plus establishes a connection with BlackBerry Proxy.
6. The BlackBerry Dynamics app establishes a connection to BlackBerry Proxy using the BlackBerry Secure Connect Plus tunnel.
7. BlackBerry Proxy authenticates with the BlackBerry Dynamics app using its server certificate. BlackBerry Proxy validates the app using a MAC keyed with a session key known only to BlackBerry Proxy and the app.
8. When the secure connection is established between BlackBerry Proxy and the app, work data can travel between the device and application or content servers behind the firewall using the BlackBerry Secure Connect Plus tunnel to BlackBerry Proxy. BlackBerry Secure Connect Plus encrypts and decrypts traffic using FIPS-140 certified Certicom libraries.

Data flow: Sending and receiving work data from a BlackBerry Dynamics app

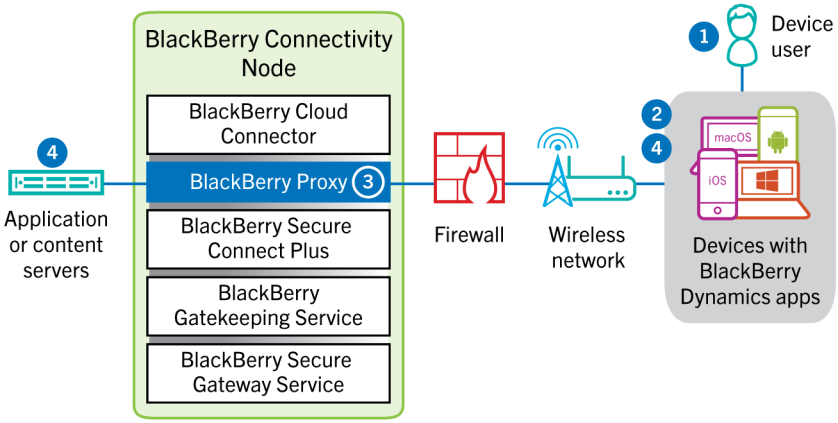
This data flow describes how data travels when a BlackBerry Dynamics app accesses an application or content server in your organization.



1. The user opens a BlackBerry Dynamics app to access work data.
2. The BlackBerry Dynamics app establishes a connection to the BlackBerry Dynamics NOC. The connection is authenticated with the master link key that was created when the app was activated.
3. The BlackBerry Dynamics NOC performs one of the following actions:
   a. Communicates with BlackBerry Proxy over a pre-established secure connection to establish an end-to-end connection over port 443 between the BlackBerry Dynamics app and BlackBerry Proxy that carries the work data. The work data is encrypted with a session key that is not known to the BlackBerry Dynamics NOC.
   b. If the BlackBerry Connectivity Node is not configured, communicates directly with your application or content servers through a port you have opened in your organization's firewall.
4. If the BlackBerry Connectivity Node is configured, once the secure end-to-end connection is established between the BlackBerry Dynamics NOC and BlackBerry Proxy, work data can travel between the device and application or content servers behind the firewall via BlackBerry Proxy.

Data flow: Sending and receiving work data from a BlackBerry Dynamics app using BlackBerry Dynamics Direct Connect

This data flow describes how data travels when a BlackBerry Dynamics app accesses an application or content server in your organization through BlackBerry Dynamics Direct Connect and BlackBerry Proxy.



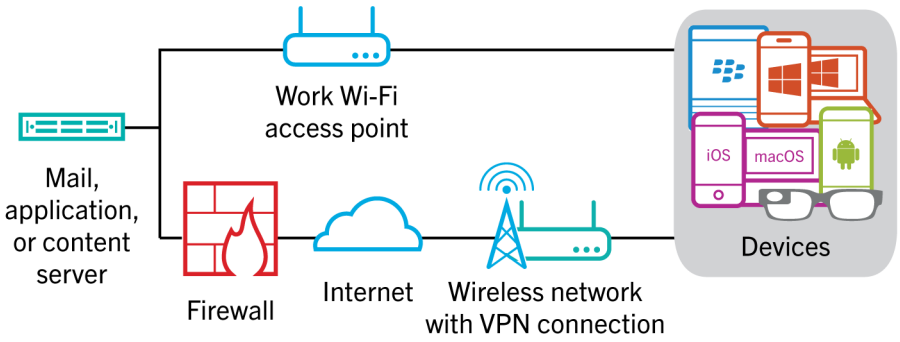
1. The user opens a BlackBerry Dynamics app to access work data.
2. The BlackBerry Dynamics app establishes a TLS connection to BlackBerry Proxy over port 17533.
3. BlackBerry Proxy authenticates with the BlackBerry Dynamics app. BlackBerry Proxy authenticates with the app using its server certificate. BlackBerry Proxy validates the app using a MAC keyed with a session key known only to BlackBerry Proxy and the app.

4. When the secure end-to-end connection is established, work data can travel between the device and application or content servers behind the firewall via BlackBerry Proxy.

Sending and receiving work data using a VPN or work Wi-Fi network

Devices that have VPN or Wi-Fi profiles configured by you or by the users, may be able to access your organization's resources using your organization's VPN or work Wi-Fi network. To use your organization's VPN, users with an Android device with the MDM controls activation type or Samsung Knox Workspace must manually configure a VPN profile on their devices.

This diagram shows how data can travel when a device connects to your organization's resources using your organization's VPN or work Wi-Fi network.

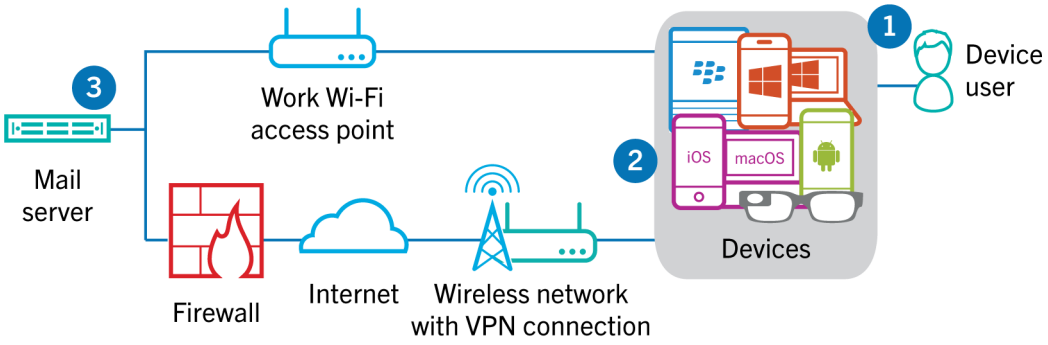


The following table describes when devices use your organization's VPN or work Wi-Fi network to connect to your organization's network.

Device type	Description
Android Enterprise devices and Knox Workspace devices	By default, Android Enterprise and Knox Workspace devices use your organization's VPN or work Wi-Fi network to send and receive work data only when BlackBerry Secure Connect Plus is not enabled.
Windows and macOS devices, and Android devices with the MDM controls activation type	Windows and macOS devices and Android devices with the MDM controls activation type your organization's VPN or work Wi-Fi network to send and receive work data. To use your organization's VPN, Android device users must manually configure a VPN profile on their devices.
iOS	iOS devices use your organization's VPN or work Wi-Fi network to send and receive Exchange ActiveSync data if the BlackBerry Secure Gateway is not enabled. All other work data uses your organization's VPN or work Wi-Fi network.
BlackBerry 10	BlackBerry 10 devices use your organization's VPN or work Wi-Fi network to send and receive work data when this is the most direct, cost-efficient route available. BlackBerry 10 devices use only VPN and Wi-Fi profiles configured by you, not by the user, when accessing work data.

Data flow: Sending email from a device using a VPN or work Wi-Fi network

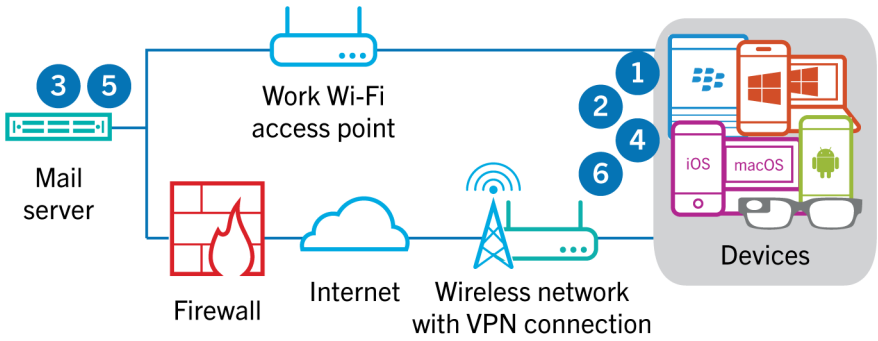
This data flow describes how work email and calendar data travels from the device to the mail server over your organization's VPN or work Wi-Fi network using Exchange ActiveSync.



1. A user creates an email or updates an organizer item in the work space.
2. The device sends the new or changed item to the mail server over your organization's VPN or work Wi-Fi network.
3. The mail server updates the organizer data on the user's mailbox or sends the mail item to the recipient and sends a confirmation to the device.

Data flow: Receiving email on a device using a VPN or work Wi-Fi network

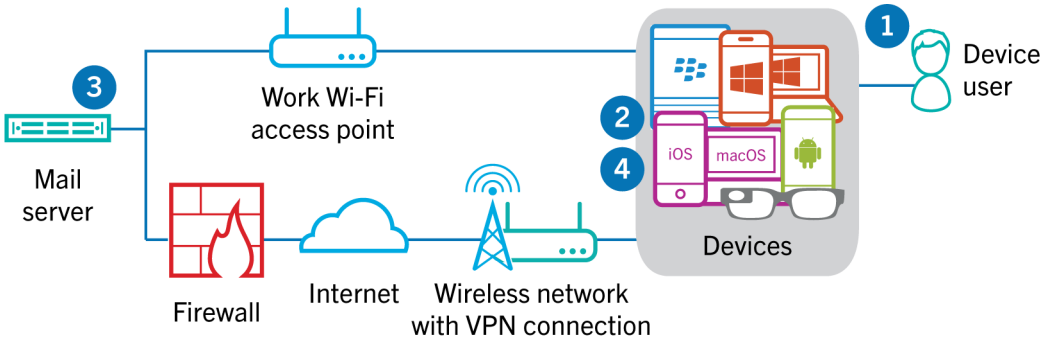
This data flow describes how work email and calendar data travels from the device to the mail server over your organization's VPN or work Wi-Fi network using Exchange ActiveSync.



1. The device issues an HTTPS request to the mail server and requests that the mail server notify the device when any items change in the folders that are configured to synchronize. The request travels through your organization's VPN or work Wi-Fi network to the mail server.
2. The device stands by.
3. When there are new or changed items for the device, such as a new email or updated calendar entry, the mail server sends the updates to the device. The new or changed items travel through your organization's VPN or work Wi-Fi network to the email or organizer data app on the device.
4. When the synchronization is complete, the device issues another request to restart the process.
5. If there are no new or changed items during this interval, the mail or application server sends a message to the device using the Exchange ActiveSync protocol.
6. The device issues a new request and the process starts over.

Data flow: Accessing an application or content server using a VPN or work Wi-Fi network

This data flow describes how data travels between an application or content server in your organization and an app on a device using a VPN connection or a work Wi-Fi network.



1. The user opens a work app to view work data. For example, the user opens the work browser to navigate the intranet or uses an internally developed app to access your organization's customer data.
2. The app establishes a connection to the application or content server to retrieve the data. The request travels through your VPN or work Wi-Fi network to the application or content server.
3. The application or content server replies with the work data. The work data travels through your VPN or work Wi-Fi network to the app on the work space of the device.
4. The app receives and displays the data on the device.

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