Test Case Suite - VPN Battery Tests

Test Scenario	*Test Case No.*	*Test Case*	*Test Data*	*Pre-Conditions*	*Test Step*	*Analysis*	*Expected Results*	*Actual Results*	*Pass/Fail*
1. Test the impact of VPN app on a mobile device battery by streaming 1080p video for 30 minutes	1.1	- VPN App enabled to local country - Protocol Open VPN - UDP - Android mobile device	- Username and password for VPN App login - Username and password for Google Play Store	- Factory data reset device - Secure WiFi connection established - LTE disabled - Install VPN App onto device from Play Store - Enable VPN connection - Install Trepn Profiler app from Play Store - YouTube app installed - Charge to 100% - Set brightness to 100%	1. Open Trepn Profiler 2. Tap 'Profile System' 3. Press 'Home' button on device 4. Open YouTube app 5. Play 'video1' 6. After 30 minutes, reopen Trepn Profiler to 'Profiling System' page and tap back 7. Tap 'Save as .csv' 8. Record the battery percentage of the mobile device	Compare the .csv file results for test cases: - Plot a scatter graph using the .csv files - x axis: time (s) - y axis: battery power (mW) - Calculate average battery power (mW) for each - Caluclate maximum battery power (mW) for each Calculate battery drop per minute (Δ%/min)	- Graphs display similar battery power trends however with VPN enabled the battery power peaks are greater - Average battery power with VPN enabled is <5% greater than with VPN disabled (low impact) - Battery drop per minute with VPN enabled is <5% greater than with VPN disabled (low impact) - UDP protocol has less impact on battery than TCP protocol		
	1.2	- VPN App enabled to local country - Protocol Open VPN - TCP - Android mobile device							
	1.3	- VPN App not installed - Android mobile device	- Username and password for Google Play Store	- Factory data reset device - Secure WiFi connection established - LTE disabled - Install Trepn Profiler app from Play Store - YouTube app installed - Charge to 100% - Set brightness to 100%					
	1.4	- VPN App enabled to local country - Protocol Open VPN - UDP - iOS mobile device	- Username and password for VPN App login - Username and password for Apple Store	- Factory data reset device - Secure WiFi connection established - LTE disabled - Install VPN App onto device from Play Store - Enable VPN connection - YouTube app installed - Charge to 100% - Set brightness to 100%	1. Open YouTube app 2. Play 'video1' 3. After 30 minutes, record the battery percentage of the mobile device	Calculate battery drop per minute (Δ%/min)	- Battery drop per minute with VPN enabled is <5% greater than with VPN disabled (low impact) - UDP protocol has less impact on battery than TCP protocol - LT2P/IPsec has a greater impact on battery than OpenVPN protocols as it is less efficient		
	1.5	- VPN App enabled to local country - Protocol Open VPN - TCP - iOS mobile device							
	1.6	- VPN App enabled to local country - Protocol L2TP/IPsec - IKEv2 - iOS mobile device							
	1.7	- VPN App not installed - iOS mobile device	- Username and password for Apple Store	- Factory data reset device - Secure WiFi connection established - LTE disabled - YouTube app installed - Charge to 100% - Set brightness to 100%					
2. Test the battery impact of VPN App when the mobile device screen is off by leaving device uncharged for 2 hours	2.1	- VPN App enabled to local country - Protocol Open VPN - UDP - Android mobile device	- Username and password for VPN App login - Username and password for Google Play Store	- Factory data reset device - Root device - WiFi enabled but not connected - LTE enabled - Install VPN App from Play Store - Enable VPN connection - Install BetterBatteryStats app from Play Store - Charge to 100% and leave cable attached	1. Open BetterBatteryStats 2. Remove charging cable to reset the timer for 'Unplugged/Since Unplugged' to 0s 3. Set phone to sleep by turning off screen 4. Wake phone and open BetterBatteryStats 5. Wait 2 hours 6. Screenshot stats for (ensure screenshots scroll down where necessary): - Summary - Kernel Wakelock - Partial Wakelock - Network - CPU States 7. Record the battery percentage of the mobile device	Produce side by side comparisons for each of the 3 test cases using appropriate graphical methods. - Summary: Calculate ratio between 'Deep Sleep' and 'Awake (Screen Off)' - Highlight any large disparities or unusual results for Kernel Wakelock, Network and CPU States - Display all partial wakelock activity cause by VPN App Calculate battery drop per minute (Δ%/min)	Results with VPN enabled and disabled extremely similar. Minimal battery drain. Vast majority of time spend in Deep Sleep.		
	2.2	- VPN App enabled to local country - Protocol Open VPN - TCP - Android mobile device							
	2.3	- VPN App installed - Android mobile device	- Username and password for Google Play Store	- Factory data reset device - Root device - WiFi enabled but not connected - LTE enabled - Install BetterBatteryStats app from Play Store - Charge to 100% and leave cable attached					
	2.4	- VPN App enabled to local country - Protocol Open VPN - UDP - iOS mobile device	- Username and password for VPN App login - Username and password for Apple Store	- Factory data reset device - WiFi enabled but not connected - LTE enabled - Install VPN App from Play Store - Enable VPN connection - Charge to 100%	1. Set phone to sleep by turning off screen 2. Wait 2 hours 3. Record the battery percentage of the mobile device	Calculate battery drop per minute (Δ%/min)	Results with VPN enabled and disabled extremely similar. Minimal battery drain.		
	2.5	- VPN App enabled to local country - Protocol Open VPN - TCP - iOS mobile device							
	2.6	- VPN App enabled to local country - Protocol L2TP/IPsec - IKEv2 - iOS mobile device							
	2.7	- VPN App not installed - iOS mobile device	- Username and password for Apple Store	- Factory data reset device - WiFi enabled but not connected - LTE enabled - Charge to 100%					
3. Test the battery impact of VPN App when disconnecting and reconnecting back and forth between WiFi and LTE	3.1	- VPN App enabled to local country - Protocol Open VPN - UDP - Android mobile device	- Username and password for VPN App login - Username and password for Google Play Store	- Factory data reset device - Secure WiFi connection established - LTE enabled - Install VPN App onto device from Play Store - Enable VPN connection - Install Trepn Profiler app from Play Store - Charge to 100% - Set brightness to 100%	1. Set a timer and remove the mobile device from charge 2. Open Trepn Profiler 3. Tap 'Profile System' 4. After 60 seconds, disable WiFi, ensuring that a LTE connection is established 5. After another 60 seconds, enable WiFi and ensure that a connection is established 6. Repeat steps 4 and 5 until the timer reads 10 minutes 7. Open Trepn Profiler to 'Profiling System' page and tap back 8. Tap 'Save as .csv' 9. Record the battery percentage of the mobile device	Compare the .csv file results for test cases: - Plot a scatter graph using the .csv files - x axis: time (s) - y axis: battery power (mW) - Calculate average battery power (mW) for each - Caluclate maximum battery power (mW) for each Calculate battery drop per minute (Δ%/min)	- Graphs display similar battery power trends however with VPN enabled the battery power peaks are greater - Average battery power with VPN enabled is <5% greater than with VPN disabled (low impact) - Battery drop per minute with VPN enabled is <5% greater than with VPN disabled (low impact) - UDP protocol has less impact on battery than TCP protocol		
	3.2	- VPN App enabled to local country - Protocol Open VPN - TCP - Android mobile device							
	3.3	- VPN App not installed - Android mobile device	- Username and password for Google Play Store	- Factory data reset device - Secure WiFi connection established - LTE enabled - Install Trepn Profiler app from Play Store - Charge to 100% - Set brightness to 100%					