

U.S. Cellular's Mobile Broadband Internet Access Service and Open Internet Practices

Effective June, 2018

U.S. Cellular supports our country's national broadband goals by helping to preserve the Internet as an open platform for innovation, investment, job creation, economic growth, competition and free expression. The purpose of this disclosure is to provide transparency into U.S. Cellular's network management practices, performance characteristics and terms and conditions of our mobile broadband internet access service so that customers can make informed choices about mobile broadband internet access service and providers; and so that content, application, service and device providers have the information needed to develop, market, and maintain Internet offerings.

Frequently asked questions:

- A. What is mobile broadband internet access service?
- B. What are U.S. Cellular's mobile broadband network management practices?
- C. What are the performance characteristics of U.S. Cellular's mobile broadband internet access service for speed and latency?
- D. What are U.S. Cellular's device management practices?
- E. What are U.S. Cellular's application management practices?
- F. Does U.S. Cellular ever reduce speeds (throttle) of the mobile broadband internet access service it provides to customers?
- G. What are the current terms and conditions that pertain to U.S. Cellular's mobile broadband access service?
- H. What are U.S. Cellular's privacy policies concerning mobile broadband internet access service?
- I. Does U.S. Cellular block access to websites or applications or provide preferential treatment for the internet traffic of either affiliated companies or other content providers applications or websites?
- J. How do I you customer if I have questions or concerns about U.S. Cellular's mobile broadband internet access service open internet practices?
- K. Does U.S. Cellular provide usage notifications?

A. What is mobile broadband internet access service?

Mobile broadband internet access service refers to any of our data services that a customer may use with a Smartphone, aircard modem, tablet, or other wireless device that are appropriately configured to work on our network for connection to the Internet utilizing either the 4G LTE or 3G EVDO network. It provides the capability to transmit data to and receive data from all or substantially all Internet endpoints, including any capabilities that are incidental to and enable the operation of the service. Mobile broadband internet access service does not include services that use the internet for connectivity but which only provide access to limited Internet endpoints such as is common with many M2M services.

B. What are U.S. Cellular's mobile broadband network management practices?

U.S. Cellular employs reasonable network management practices that are appropriate and tailored to achieving a legitimate network management purpose. Legitimate network management purposes typically include reasonable security practices by providing: confidentiality, integrity and availability of network services, reasonable measures to address traffic that is harmful to the network and providing services or capabilities consistent with customer's choices regarding services offered.

U.S. Cellular only optimizes HTTP traffic. HTTP traffic consists of both watching video and Internet browsing. U.S. Cellular uses optimization methodologies described below:

Video Optimization (3G EVDO only)

Two types of optimization techniques are utilized by U.S. Cellular for video, Lossless Video Optimization and Lossy Video Optimization:

Lossless Video Optimization

Lossless Video Optimization reduces the amount of video traffic without changing the quality of the content—using the *Just-*

in-Time technique. Such technique manages the download of video over the network to match the rate at which it is being watched by the customer. This improves capacity utilization and performance by minimizing wasted traffic caused by video downloads to a buffer, which are terminated before viewing completion.

Lossy Video Optimization

Lossy Video Optimization removes inefficiencies in the encoding of video and optimizes the video to better suit the network and the device. It uses the following techniques:

- i. *Quality-Aware Transcoding* to deliver video in the most efficient codec without degrading quality. This reduces the video traffic load on the network.
- ii. *Dynamic Bandwidth Shaping* to match the video bit rate to the amount of bandwidth available in the network. This minimizes video stalling and improves the customer experience.
- iii. *Video Caching* to reduce the amount of bandwidth consumed in the packet core and the Internet backhaul. This improves the customer experience by moving content closer to the customer.

Web Optimization (3G EVDO only)

Web Optimization includes a vast array of techniques to streamline web page downloads and reduce the amount of data transmitted in the process. If the object is present in the cache, it is served from there. If not, the object is fetched from the content server to be optimized. The optimization process goes through four different optimization stages:

- i. *Object Optimizations*: Web pages consist of many objects (markup, images, scripts, video, etc.). Each supported object is individually optimized using a number of different techniques as applicable. For example, nonessential content (such as comments and white space) is removed, images may be compressed to reduce their size, text and other objects are compressed using Gzip, and so on.
- ii. *Page Optimizations*: The various objects are combined to make a web page. Many optimizations are performed during the combining process. Several objects are prefetched even before the browser requests them to speed up the download. The objects are also grouped together and sent in one package to reduce the back-and-forth traffic and time involved in downloading one object at a time. Further, the downloading of the objects that make up a page is scheduled so that the page starts rendering as soon as possible.
- iii. *Protocol Optimizations*: Once the page has been packaged, other optimizations are performed in its download to the device. For example, many objects may be downloaded simultaneously using pipelining. Sophisticated connection management techniques are used to control the number of connections used during the download to minimize connection overload while also decreasing page download time. Objects are downloaded in an optimal order for greater efficiency.
- iv. *Transport Optimizations*: Further optimizations are performed in the transport layer itself. A type of Transmission Control Protocol better suited for wireless networks is used. Multiple responses may be combined into one packet to reduce the packet overhead. All of these optimizations combine together to download a page that consumes far fewer network resources and loads significantly faster.

C. What are the performance characteristics of U.S. Cellular's mobile broadband internet access service for download and upload speeds and latency?

U.S. Cellular gathers data about the performance of its Mobile Broadband Internet Access Service periodically for both the 4G LTE and 3G EVDO networks it operates within its licensed footprint. Recent network performance for download and upload speeds and latency can be reviewed by Cellular Market Areas using the chart below. U.S. Cellular will update this data periodically.

Technology	Long Term Evolution (4G LTE)						
Month-Year	First Quarter 2018						
Peak Usage Period	6:00-12:00 A.M CST						
CMA_Market_Name	CMA_State	Downlink Throughput in Mbits/sec		Uplink Throughput in Mbits/sec		Latency in msecs	
		25th Percentile	75th Percentile	25th Percentile	75th Percentile	25th Percentile	75th Percentile
Appleton	WI	1.495	9.03	0.938	4.742	38	45
Cedar Rapids	IA	1.506	9.445	1.393	8.527	46	64
Columbia	MO	1.501	5.703	0.462	3.155	41	56
Des Moines	IA	1.491	7.429	1.608	8.98	51	68
Green Bay	WI	1.541	8.485	2.641	8.892	38	54
Hagerstown	MD	1.354	1.468	6.093	8.225	79	86
Kenosha	WI	1.492	5.204	1.835	6.383	35	45
Knoxville	TN	1.597	14.129	1.79	5.764	35	50
Lincoln	NE	3.041	18.024	2.743	14.203	91	100
Madison	WI	1.469	10.867	1.003	6.644	35	52
Manchester	NH	1.509	8.474	2.013	6.005	110	114
Milwaukee	WI	1.592	17.201	1.777	8.928	31	40
Oklahoma City	OK	1.546	9.398	1.402	6.382	79	93
Omaha	NE	1.654	6.51	1.402	6.687	89	98
Portland	ME	0.758	3.498	0.939	7.019	101	110
Racine	WI	0.169	4.612	0.221	5.817	33	42
Rockford	IL	1.829	24.787	0.992	8.01	31	41
Springfield	MO	1.522	14.538	1.849	6.12	96	108
Wilmington	NC	1.528	15.612	0.982	7.736	78	90
All Others		1.531	10.904	1.471	8.021	46	70

*** All other CMAs within the U.S. Cellular footprint have a population density of less than 250 people per square mile and the results for these CMAs and have been combined**

*** Generally, over 90% of U.S. Cellular's data traffic is carried by our 4G LTE network. Only approximately 10% of our data traffic is carried by our 1X-EVDO ("EVDO") network. When customers' devices use our EVDO network, the typical speed range that can be expected is between 600 kbps and 1.2 Mbps download and between 400 kbps and 600 kbps upload throughputs. This information is the best approximation available to U.S. Cellular of the actual speeds experienced by our customers.**

The network performance is expressed as a range of speeds, based on actual network performance as measured by a third-party vendor. The speed within the range that an individual customer should expect to receive is influenced by many factors, including but not limited to, the customer's distance from a cell site, the number of customers accessing the network or a specific cell site at a given point in time, the amount of data consumed by applications run by a customer, and other factors affecting mobile wireless network performance. Performance may also drop below speed range at peak usage times. Also, certain price plans provide data services that are capped at the speeds provided for in the terms and conditions associated with such plans and so such plans should not exceed the advertised caps. The usage from plans with speed caps are included in the matrix disclosed above and so it is possible for customers on non-speed cap plan to experience speeds in excess of what is disclosed in the above charts.

D. What are U.S. Cellular's device management practices?

Customers may activate devices on our network that have been purchased through U.S. Cellular or one of its agents or that they have acquired elsewhere, but which were originally purchased through U.S. Cellular or one of its agents. Customers may also activate certain unlocked devices on our network that were purchased elsewhere.

All devices must be unlocked and approved by us as being compatible with our network. To determine whether a device is eligible to be activated on the U.S. Cellular network please go to <https://www.uscellular.com/bring-your-own-device>

E. What are U.S. Cellular’s application management practices?

U.S. Cellular’s application management practices apply to three types of business models:

- i. Third-party applications where U.S. Cellular has a direct relationship with the application developer are selected based on a business case that includes consideration for customer needs and customer experience. U.S. Cellular-specific applications are tested by us for customer experience and device compatibility.
- ii. U.S. Cellular also distributes third-party Android applications through a partnership with Digital Turbine Inc., using their DT Ignite platform. We have a direct relationship with Digital Turbine, who shares with us the revenue generated through such application marketing campaigns. These applications are tested for customer experience by a third-party vendor, WMC Global.
- iii. U.S. Cellular manages an Open API Platform that makes available a limited set of APIs for third-party application developers to use in their apps and services – SMS, MMS, Location, Customer Profile, and Payment. U.S. Cellular requires all developers to sign and agree to U.S. Cellular’s standard terms and conditions. Additionally, developers using the Location, Customer Profile, and Payment APIs must also agree to and adhere to testing for customer experience, usability, and device compatibility.

There are other mechanisms for third-party applications that are not selected by U.S. Cellular to be distributed on devices that have Android™, Apple, Windows® Mobile, or BlackBerry® operating systems. These applications are certified through the following parties:

- Android™ – certified by Google Inc.
- Apple – certified by Apple, Inc.
- Windows® Mobile – certified by Microsoft®
- BlackBerry® – certified by Blackberry, Inc.

We will promptly inform device and application providers of any decisions to deny access to our network or of a failure to approve their particular devices or applications.

F. Does U.S. Cellular ever reduce speeds (throttle) the mobile broadband internet access service it provides to customers?

U.S. Cellular may intentionally reduce speed for mobile broadband internet access service under the following circumstances;

- i. When the terms and conditions of the data plan that the customer has subscribed to provides that data usage will be provided at a reduced or capped speed. By way of example and not limitation, U.S. Cellular currently offers a postpaid plan in which the terms of the plan provide that data streams at standard definition speeds which is slower than the speeds that may be offered by U.S. Cellular on certain other postpaid data plans.
- ii. When the terms and conditions of the data plan that the customer has subscribed to permits U.S. Cellular to reduce speeds after a specified amount of data usage has occurred. For example, U.S. Cellular currently offers a pre-paid plan with unlimited voice and text and a fixed amount of high speed data. When the amount of high speed data contained in the plan is consumed, any remaining data consumed in the month, both downloads and uploads, may be reduced to a slower speed.
- iii. In the exercise of reasonable network management practices to address network congestion as further described in Section B.
- iv. When the customer exceeds a certain amount of data while roaming as provided for under the terms and conditions of the plan that the customer has subscribed to, or as specified in the customer service agreement that governs the provisioning of mobile broadband internet access service by U.S. Cellular.

While U.S Cellular reserves the right to take reasonable actions to reduce data speeds or to prioritize traffic to alleviate significant network congestion, U.S Cellular does not do so for either the 3G EVDO or LTE networks that it operates

currently. Should circumstance dictate a change in this policy, U.S. Cellular will revise its posted mobile broadband internet access services open internet practices accordingly.

G. What are the current terms and conditions that pertain to U.S. Cellular's mobile broadband access service?

Terms, conditions and details regarding U.S. Cellular plans and services may be found at www.uscellular.com/plans and www.uscellular.com/legal.

H. What are U.S. Cellular's privacy policies concerning mobile broadband internet access service?

See www.uscellular.com/site/privacy to review U.S. Cellular's privacy statement.

I. Does U.S. Cellular block access to websites or applications or provide preferential treatment for the internet traffic of either affiliated companies or other content providers applications or websites?

No, U.S. Cellular does not block customers from accessing lawful websites or applications nor does it favor access to certain applications or websites over others. Customers may elect to block access to certain websites or applications through their device settings. Further, U.S. Cellular does not provide preferred access to any websites or applications through its mobile broadband internet access service, including for any internet traffic of affiliated companies, nor does it currently provide preferred treatment in the provisioning of any non-broadband Internet access service such as in the support of M2M services except that Voice over LTE traffic will be prioritized over other data traffic. U.S. Cellular does, however, reserve the right to take all actions it deems appropriate to protect its network and customers from malicious Internet-based attacks and other cybersecurity risks which may include blocking access to websites and applications deemed to provide an unacceptable level of risk.

J. How do I contact you if I have questions or concerns about U.S. Cellular's mobile broadband open internet practices?

U.S. Cellular welcomes customer comments regarding our mobile broadband open Internet practices. If customers have questions, comments or complaints, please contact us via email at the following address:

legaldept@uscellular.com

K. Does U.S. Cellular provide usage notifications?

Yes, Overage Protection is a service that provides U.S. Cellular customers with a text message alert prior to the close of their billing cycle. Alerts for Voice, Messaging and Data are sent notifying customers that they have reached 75% and/or 100% of their respective plan allotments. These alerts are intended to help customers monitor their usage and avoid unexpected overages. For more detail on usage notifications see <https://uscellular.com/overage-protection>