Mobile Application Rankings Report
APRIL 2014

Source: Alcatel-Lucent Wireless Network Guardian (WNG), Network Analytics
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Summary

The Alcatel-Lucent Mobile Application Rankings Report examines the impact of leading mobile applications on service provider networks and on consumers’ data plan and device battery life. It also helps app developers understand how their app's cost and efficiency stack up against competitors within their category.

The analytics used to create this report reveal the applications' impact on mobile network operators and consumer devices by measuring, scoring and ranking their data volume and signaling consumption. Together, these two metrics provide the key to understanding the applications’ overall impact: Data volume drives the service providers’ bandwidth-related capital expenditures and the consumers’ data usage fees. Signaling uses spectral, hardware and processing resources in service providers’ networks and depletes battery life in consumers’ mobile devices. In addition, the ratio of signaling and data volume exposes each app's efficiency – in other words, its ability to utilize network resources proficiently through smart software design.

This report benefits three distinct yet interconnected stakeholders: service operators, consumers and app developers.

Service operators gain a list of apps that should be closely monitored for resource consumption and actively managed for optimization. Operators also get data that can help them engage in meaningful discussions with app developers. These discussions can lead both parties toward their common goal: capturing consumers and keeping them by delivering an enjoyable experience underpinned by great performance, low cost and longer-lasting battery life. The report also offers a “watch list” of applications that are not yet popular enough to create a significant impact, but whose delivery cost could impact operators as their popularity grows.

Operators’ marketing departments can use the framework presented in this report to understand which apps could be packaged in innovative ways to differentiate their offers. To craft a sustainable offer, an application must be popular and have a low signaling and data delivery cost on all devices and 2G/3G/LTE technologies. This report offers a blueprint for discovering apps that match these criteria.

Consumers learn which apps can derail their data plan budget and which ones will leave them looking for an electrical outlet more often. Battery meter apps can tell consumers how much battery life their apps are using. But they can’t tell consumers which competing apps could offer more efficiency or reduce battery drain. Similarly, some utility apps report on the data volume generated by an app installed on a user’s phone. But utility apps shed no light on its data efficiency compared to other similar apps. The report offers alternatives to these high-cost apps.

App developers learn whether their app’s efficiency in mobile networks leads or lags behind that of competitors. They gain an appreciation of the cost they pass on to both mobile operators and consumers. They also discover how developers at Facebook and Apple® have successfully reduced the impact of different apps on operator networks while positively enhancing the customer experience.
Key findings

- **The 5 apps with the highest network impact** – Google™ Search, Facebook, WhatsApp, Facebook Messenger and YouTube™ – are also the most popular apps. The rest of the top-ranking apps show diverse degrees of popularity, from obscure to well known. Optimizing these apps can create significant benefits. For example, Facebook successfully optimized signaling for Android devices, reducing the overall signaling load in some networks by 5 – 10%.

- **Apps that impact the network due to their high data volume** – a group that includes most video apps, along with iTunes®, Instagram, Pinterest, Apple Maps and Pandora – are targets for bandwidth optimization. One service provider reduced cell utilization by an average of 20% after introducing selective traffic optimization.

- **Low Impact apps** – a group that includes weather apps, Google Maps™, Dropbox™, Zynga gaming apps and select social media apps like Nimbuzz or Palringo – could be excellent candidates for flat-rating, zero-rating or other innovative packaging plans. However, packaging plans must also consider the per-user cost of low-impact apps on individual networks. The best apps for packaging are those with low network impact and low per-user cost.

- **The Watch List includes applications that do not yet have a great impact on networks.** However, these applications have a higher per-user delivery cost that could quickly increase their overall impact if they become more popular. The Watch List includes Tango, Nimbuzz, Palringo, Office 365™, Zynga, Netflix, Pandora, Pinterest, Facebook Channel, Kik and Skype™.

- **The top battery-draining apps** are Nimbuzz, Yahoo!® Messenger, Blackberry® Messenger, Facebook Messenger, Kik, Viber and Palringo.

- **The apps with the biggest impact on the consumer data plan** are YouTube, Netflix, Facebook Video, Pandora and Video on Instagram. The lowest-volume cost apps for consumers by category are Yahoo! Mail and Gmail™ (mail); Blogger™, QQ, Windows Live® Messenger and Viber (social media); and Video on Instagram (video).

- **The least “chatty”, or most signaling efficient, apps by category** are Blogger and Instagram (social media); Gmail (mail); The Weather Channel® (weather); and Yahoo! Search (search engine).

- **Geography introduces significant differences into the app rankings.** For example, Middle Eastern consumers use many different social apps. The popularity of these apps in that region brought them into this report, even though several of the apps do not appear in our sample networks outside the Middle East.

- **LTE can positively or negatively change an app’s impact ranking.** The same app could experience an increase or decrease in signaling, data volume or both. This unpredictability is influenced by many factors, including the pricing structure of LTE versus 3G, the cultural propensity for some app types, the economic maturity of the country, the provider’s market positioning and the time elapsed since the introduction of LTE.
Network Impact Rankings for Service Providers

The network impact rankings help service providers understand which apps consume the most network resources and, therefore, the most CAPEX. Often, the popularity of an app determines its overall share of data and signaling volume. But the app’s type and design implementation also influence its position in the rankings.

Our first step in ranking the impact of apps on mobile networks was to identify the 20 most popular consumer applications in a cross-section of networks in North America, the Middle East, and Asia. Since some of the most popular applications are unique to specific regions, we identified 39 distinct apps to form a composite set that captures trends across the selected geographical areas.

We averaged the daily volume and signaling share for each app across our sample networks. Within this data set, we assigned each app a signaling rank and a volume impact rank between 1 and 10. A higher rank indicates higher impact.

Signaling is a network-device exchange in which an idle device is assigned a radio channel to handle the sending or receiving of data. For example, LinkedIn would send a notification when a message arrives or a new connection is added. Signaling would occur to allocate a radio channel to the device, allowing the user’s device to receive the notification. Signaling contributes to radio resource depletion and battery drain. Data volume represents the bandwidth required by the service provider to deliver the app (which translates into CAPEX) along with how much the app itself contributes to consumer data plan depletion.

The final network impact score is based on a combination of the app’s signaling and volume impact rankings. We averaged the sum of these two rankings to form an overall network impact score out of 10 for each app. Figure 1 shows the overall network impact rankings based on the final scores for the top 39 apps. It also shows each app’s average daily subscriber share, which represents the percentage of total active subscribers who use the app at least once per day.

On average, the app with the highest network impact is Google Search, with a score of 9.50 out of a possible 10. It is followed closely by Facebook, WhatsApp, Facebook Messenger, and YouTube. Not surprisingly, the apps with the highest overall impact tend to be the most popular apps — in other words, those with the highest subscriber share. For example, the fact that 68% of subscribers use Google Search daily drives the app’s total signaling and data volume to the top of the rankings.

Figure 1. Network impact rankings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Mobile application</th>
<th>Score</th>
<th>Subscriber share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Google Search</td>
<td>9.50</td>
<td>68%</td>
</tr>
<tr>
<td>2</td>
<td>Facebook</td>
<td>9.38</td>
<td>53%</td>
</tr>
<tr>
<td>3</td>
<td>WhatsApp</td>
<td>8.75</td>
<td>37%</td>
</tr>
<tr>
<td>4</td>
<td>Facebook Messenger</td>
<td>8.25</td>
<td>37%</td>
</tr>
<tr>
<td>5</td>
<td>YouTube</td>
<td>8.25</td>
<td>25%</td>
</tr>
<tr>
<td>6</td>
<td>Twitter</td>
<td>7.88</td>
<td>21%</td>
</tr>
<tr>
<td>7</td>
<td>Mail (SMTP, POP3, IMAP...)</td>
<td>7.63</td>
<td>12%</td>
</tr>
<tr>
<td>8</td>
<td>Hotmail</td>
<td>7.13</td>
<td>8%</td>
</tr>
<tr>
<td>9</td>
<td>Gmail</td>
<td>6.63</td>
<td>11%</td>
</tr>
<tr>
<td>10</td>
<td>Yahoo! Mail</td>
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<td>8%</td>
</tr>
<tr>
<td>11</td>
<td>iTunes</td>
<td>6.38</td>
<td>21%</td>
</tr>
<tr>
<td>12</td>
<td>Kik</td>
<td>6.13</td>
<td>4%</td>
</tr>
<tr>
<td>13</td>
<td>Facebook Channel</td>
<td>6.00</td>
<td>5%</td>
</tr>
<tr>
<td>14</td>
<td>Instagram</td>
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<td>9%</td>
</tr>
<tr>
<td>15</td>
<td>Yahoo! Search</td>
<td>5.75</td>
<td>19%</td>
</tr>
<tr>
<td>16</td>
<td>Tango</td>
<td>5.63</td>
<td>7%</td>
</tr>
<tr>
<td>17</td>
<td>Pandora</td>
<td>5.38</td>
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<tr>
<td>18</td>
<td>Facebook Video</td>
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<tr>
<td>19</td>
<td>Apple Maps</td>
<td>4.88</td>
<td>15%</td>
</tr>
<tr>
<td>20</td>
<td>Blackberry Messenger</td>
<td>4.50</td>
<td>4%</td>
</tr>
<tr>
<td>21</td>
<td>Skype</td>
<td>4.50</td>
<td>5%</td>
</tr>
<tr>
<td>22</td>
<td>Netflix</td>
<td>4.00</td>
<td>0.4%</td>
</tr>
<tr>
<td>23</td>
<td>Viber</td>
<td>4.00</td>
<td>5%</td>
</tr>
<tr>
<td>24</td>
<td>Video on Instagram</td>
<td>3.75</td>
<td>5%</td>
</tr>
<tr>
<td>25</td>
<td>Windows Live Messenger</td>
<td>3.63</td>
<td>4%</td>
</tr>
<tr>
<td>26</td>
<td>QQ (QQ.com)</td>
<td>3.38</td>
<td>3%</td>
</tr>
<tr>
<td>27</td>
<td>Yahoo! Mobile</td>
<td>3.38</td>
<td>4%</td>
</tr>
<tr>
<td>28</td>
<td>AccuWeather</td>
<td>3.25</td>
<td>9%</td>
</tr>
<tr>
<td>29</td>
<td>Dropbox</td>
<td>3.25</td>
<td>4%</td>
</tr>
<tr>
<td>30</td>
<td>Pinterest</td>
<td>3.25</td>
<td>3%</td>
</tr>
<tr>
<td>31</td>
<td>The Weather Channel</td>
<td>3.25</td>
<td>4%</td>
</tr>
<tr>
<td>32</td>
<td>AOL Mail</td>
<td>3.13</td>
<td>1%</td>
</tr>
<tr>
<td>33</td>
<td>Office 365</td>
<td>3.13</td>
<td>0.7%</td>
</tr>
<tr>
<td>34</td>
<td>Google Maps</td>
<td>3.00</td>
<td>9%</td>
</tr>
<tr>
<td>35</td>
<td>Blogger</td>
<td>2.75</td>
<td>3%</td>
</tr>
<tr>
<td>36</td>
<td>Nimbuzz</td>
<td>2.50</td>
<td>1%</td>
</tr>
<tr>
<td>37</td>
<td>Yahoo! Messenger</td>
<td>2.50</td>
<td>0.6%</td>
</tr>
<tr>
<td>38</td>
<td>Pairingo</td>
<td>1.88</td>
<td>0.3%</td>
</tr>
<tr>
<td>39</td>
<td>Zynga gaming apps</td>
<td>1.38</td>
<td>0.6%</td>
</tr>
</tbody>
</table>
Some less popular apps also ranked high on our list. The way these apps are designed and used by subscribers contributes to the heavy load they place on networks, device batteries and data plans. For instance, Kik, Facebook Channel and Pandora have 4%, 5% and 1% share of subscribers, respectively, but they are among the 20 apps that have the greatest impact on mobile networks.

Conversely, AccuWeather™ and Google Maps are popular apps that appear further down the impact list. Their lower rankings point to the relatively lighter load they place on networks and devices.

The appearance of Hotmail® and Windows Live Messenger in the top 39 apps list might seem unlikely given that these apps are now discontinued and have been superseded by Outlook.com and Skype, respectively. However, subscribers continue to use these apps, and app developers continue to indulge them. The traffic generated by the new apps is increasing slowly, but the original apps still dominate.

The impact of some apps is related to the predominance of certain devices within certain networks. For example, the impact of iTunes is more significant in networks with a higher proportion of iOS devices.

Regional differences

The network impact rankings use supporting data that is averaged across many networks in different parts of the world. But a closer look at the data reveals some significant regional differences.

The Middle East has a much more diverse and widespread taste for social media apps than other regions. For example, the impact of WhatsApp is negligible in North America, but it is a top-impacting app in the Middle East, ranking alongside Facebook in that region. Social media apps like Blackberry Messenger, Kik, Nimbuzz, Palringo, Tango and Viber make our top network impact rankings list based solely on the combination of their resource-intensive profiles and popularity in the Middle East. These apps have relatively little impact in Asia and North America.

In contrast, a very small number of apps have the potential to impact networks and devices in APAC’s developing countries. These tend to be well-established apps like Google Search, Facebook, Twitter and WhatsApp. Consumers in developing countries often shy away from viewing videos on Facebook, YouTube, and Instagram, or listening to music on Pandora. As a result, these apps have a much lower network impact in developing countries.

Differences observed in North America center around three main app categories: weather, mail and music.

Differences observed in North America center around three main app categories: weather, mail and music. Weather apps are more popular and have more impact in this region than any other we study. North American service providers typically see a higher impact from enterprise-based mail apps than providers in other parts of the world. Also, Pandora Internet radio appeared in all networks, but US-based mobile users listen to Pandora much more than users in other regions.

The rankings provided in Figure 1 constitute a worthy “app watch list” for service providers. But the data must be refined further to provide the insights service providers need to decide which apps are good candidates for optimization or packaging into a data plan option.

The first step is to ask questions that will lead to a greater understanding of each app’s impact. For example, is it a signaling-intensive or bandwidth-intensive application? How does popularity affect its network impact?
A Closer Look at the Rankings

Figure 2 provides a framework for developing a deeper understanding of the network impact rankings. It visualizes app rankings using quadrants that represent four application categories: high impact, high signaling, high volume and low impact. Apps are positioned in the four quadrants based on how they rate out of 10 on signaling and volume impact. The marker size used for each application correlates to the application's popularity.

**Figure 2. Network impact rankings framework**

![Network Impact Rankings Diagram](image)

Apps in the **High Impact** quadrant are those that could be optimized for both traffic and signaling consumption.

Apps in the **High Volume** quadrant are targets for traffic optimization.

Apps in the **High Signaling** apps would benefit from service provider-app developer collaboration aimed at optimizing signaling usage.

Apps in the **Low Impact** quadrant are perfect for packaging with a data plan using flat- or zero-rating or other innovative options.

Two traffic optimization strategies can mitigate the data volume impact of apps. One strategy is to collaborate with the app developer to identify app streamlining opportunities. This collaboration can involve taking live-traffic measurements of the app’s costs and benchmarking them against competing apps. The other strategy is to develop in-network traffic optimizations — such as compressing video, caching popular content or throttling bandwidth-hungry users — that can be judiciously activated during peak hours to reduce demand on the network.

Service providers and app developers can take steps to alleviate the signaling load generated by apps by using traffic analysis techniques to understand which feature triggers the signaling. These techniques can answer some key questions. For example, what interaction contributes most to signaling for a given game? Is it pushing ads within the game, the need to connect to the game server or the search for friends to play with? Once the major contributors are known, the product and design teams can decide how to best tackle the optimization.
High Impact quadrant

Figure 3 shows the 12 apps that fall into the High Impact quadrant. These apps consume the highest share of bandwidth and signaling resources. The high overall signaling and data volume consumed by these apps makes them more likely to drastically and immediately change the service provider’s delivery costs when their developers add new features or make code design changes.

Google Search has the highest impact in this category. It is equally heavy on data and signaling volume, rating 9.5 out of 10 for both metrics. In contrast, Yahoo! Search barely crosses the signaling and data volume thresholds that define the high-impact category. Popularity certainly plays a role: Google’s mobile user base is more than 3 times the size of Yahoo!’s user base.

Twitter’s network impact profile is similar to that of Google Search – an equal balance of signaling and volume impact. But Twitter is less popular than Google Search, and occupies a lower position within the overall high impact quadrant.

Facebook Messenger has about the same impact as enterprise Mail apps for volume, but it grabs the top rank for signaling share. Of all the apps in this quadrant, it has the highest potential impact on signaling resources.

Not surprisingly, YouTube has the greatest impact of all on bandwidth and data plans, despite being less popular than Facebook and Google Search. What may be surprising is that YouTube has a much lower overall impact on the radio network: it places 14th in terms of signaling load share.
Four of the 12 apps in the High Impact quadrant are e-mail applications. They are the least popular apps in this quadrant, mainly because there is no one dominant e-mail app. Even so, new message notifications, attachments and sheer message volume push these apps into the High Impact quadrant.

**Tango** just makes it into the High Impact quadrant. Although it is less popular than the other apps in this quadrant, Tango is known for video calling (which explains its volume ranking) and messaging (which explains its signaling ranking). Our data shows that Tango is popular in the Middle East. It is an app to watch in that region.

So how can the impact of these 12 apps be mitigated? Does the popularity of each app drive it into the High Impact quadrant, or are there app design and human factors at play?

To answer these questions, we need to understand the cost profile associated with each app. The app cost profile takes popularity out of the equation by looking at each app’s average signaling and data volume consumption per user (rather than the total signaling and volume for all users). Figure 4 shows the app cost profile ranking of each of the 12 high-impact apps. The different colors indicate the cost associated with the apps, with red marking the highest-cost apps, green marking the lowest-cost apps and yellow marking a high volume or signaling cost, but not both.

**Figure 4. App Cost profile of High Impact apps**

Figure 4 makes it clear that the optimization focus should be on the highest-cost apps, which are represented by red markers. These apps could benefit from both bandwidth and signaling optimization.
The yellow markers represent signaling-intensive or volume-intensive apps. **Facebook Messenger** has the lowest data volume, but its popularity and high signaling cost drive it into the high-impact quadrant. Service providers and app developers alike would benefit from engaging in a collaborative effort to reduce signaling by optimizing code design for the Facebook Messenger app. **Hotmail** presents a similar optimization opportunity. In both cases, optimization would lower delivery costs for service operators and allow app developers to reduce the amount of battery life their app consumes. The challenge is different with **YouTube**, as it its high-impact status is primarily due to volume. Traffic optimization should be the focus of efforts to manage the YouTube app.

In general, mail apps have a lower cost profile than other high-impact apps. **Mail apps** were among the first apps to appear on mobile phones. Many design cycles have been devoted to optimizing mail distribution services. All stakeholders are now clearly reaping the benefits of having optimized mail apps through the years. Finally, popularity is clearly not the only factor that propels the impact of **Google Search** much higher than that of **Yahoo! Search**. The cost difference is stark: Google Search towers over Yahoo! Search in both signaling and data volume cost. Optimizing Google Search should be a higher priority than optimizing Yahoo! Search, even though both apps appear in the high-impact quadrant.

**High-impact app optimization success story: Facebook**

In mid-November 2012, **Facebook** introduced a new version of its mobile app. Overnight, service providers worldwide discovered a 5 – 0% OVERALL signaling increase. (See the Alcatel-Lucent Analytics Beat blog for more details.) Alcatel-Lucent brought the increase to **Facebook**’s attention via our Analytics Beat blog. It was determined that the Android version of the app (and not the iOS version) contributed all of the increase. A new Android version was released in March 2013, restoring signaling to pre-November 2012 levels.

![Daily signaling share trends for Facebook](image-url)

Source: Alcatel-Lucent Wireless Network Guardian (WNG), Network Analytics
High Volume quadrant

The apps in the High Volume quadrant are characterized by high overall bandwidth consumption. They are excellent candidates for bandwidth optimization. Service providers already know that data consumption skyrockets when consumers download iTunes apps, watch movies on Netflix or post photos and videos on Facebook or Instagram. However, streaming radio with Pandora and collecting interesting items with Pinterest result in surprisingly high data volume.

Figure 5 reveals the varying levels of popularity for the apps in the High Volume quadrant. Netflix, Pandora and Pinterest entered the High Volume quadrant with relatively low levels of popularity. These apps are squarely in our Watch List: a small increase in their popularity could have major impact on the service provider’s network bandwidth.

**Figure 5. Apps in the High Volume quadrant**

Source: Alcatel-Lucent Wireless Network Guardian (WNG), Network Analytics
Bandwidth optimization success story: Selective traffic optimization

A service provider knew that the key to managing traffic cost was to manage the peak hour. The peak hour drives CAPEX investment, so logic dictated that reducing the load at that critical time would reduce the need for investment. Studies of peak-hour traffic revealed a surprising fact: that the typical heavy users were not active during this period. Each day, a different set of users topped the peak-hour volume chart. Throttling certain users during a certain period of the day would not help the service provider reduce utilization.

The service provider selected a two-part mechanism to optimize traffic. The first part involved using network analytics (specifically, an algorithm relying on utilization and subscriber QoE metrics) to determine when congestion occurred, relay the severity of the congestion, provide a list of subscribers currently attached to the cell, and rank these subscribers by data volume. The second component was to use a policy manager to decide whether specific users should be throttled, how many users should be throttled and for what period of time they should be throttled. The service provider reduced cell bandwidth by an average of 20% and reduced the amount of time cells spent in congested state each day by 60%.

High Signaling quadrant

The apps in the High Signaling quadrant are perfect candidates for code design optimization aimed at reducing the number of times the device and network must establish communications.

Social media apps dominate the High Signaling quadrant. These apps require the application server to notify a wide social circle when a friend comes online or posts content.

The social media apps shown in this quadrant have similar levels of popularity but present a wide range of radio consumption and battery depletion rates. Tango is the first of these apps to move into the high-impact quadrant. Facebook Channel, Kik and Skype could do the same if new features are introduced or their popularity increases. These 4 apps are on our Watch List.
**Signaling optimization success story: iOS**

Apple has improved its iOS update process over the years. The company has reduced signaling load by staggering iOS availability announcements over a period of a few days instead of using bulk notifications. In addition, it has alleviated release day congestion by enforcing a Wi-Fi-only upgrade path and restricting over-the-air app downloads to 100 MB or less.

Operators are not the only ones benefiting from Apple’s drive to reduce the load generated by its devices. The graph below clearly shows that Apple delivers the lowest signaling profile. This low signaling profile means that iOS users enjoy longer battery life compared to Android users. The gap is widening: the signaling profile for iOS 7.0 is lower than that measured for iOS 6.1.
Low Impact quadrant

Although they make our top 39 list, the 12 apps in the Low Impact quadrant (Figure 7) are characterized by low overall bandwidth and signaling consumption. The apps in this quadrant are network friendly, as they use the least network capacity for delivery. Some are also subscriber friendly, as they consume low amounts of battery life and data.

Source: Alcatel-Lucent Wireless Network Guardian (WNG), Network Analytics
These apps make a good starting point for investigating data plan packaging. Could they be sustainably offered for a flat rate or perhaps zero-rated as their popularity grows? The answer lies in the application delivery cost profiles shown in Figure 8.

Figure 8. Cost profile of Low Impact apps

The green markers in Figure 8 represent apps that could safely be packaged with data plans. Their costs sit at the lower end of the spectrum. Weather information apps and Google Maps are popular with consumers and offer low costs relative to radio resources and bandwidth. In some regions, they are ideal candidates for free-rating.

Apps with yellow markers may be reasonable options for packaging with some restrictions. For example, Dropbox is an interesting target for packaging schemes. Data mining and analytics could reveal whether Dropbox users are attached to corporate or consumer accounts, and whether they primarily use the application on home networks or in roaming scenarios. Based on this analysis, a service provider could decide to package Dropbox in on-network scenarios but not in scenarios that involve roaming over partner networks.

The apps marked in red are part of our Watch List because they have the potential to enter the high-impact quadrant if their popularity increases significantly. These apps may need to be optimized in some way before they can be packaged. Apps like Nimbuzz and Palringo present opportunities for providers and app developers to collaborate and achieve greater business success together. For instance, a service provider wanting to package Nimbuzz with its data plan could reach out to the app developer and express a desire to engage in optimization in return for pre-packaging the app to increase its popularity.
Some providers have already implemented pre-packaging strategies. In Brazil, operators teamed up with Facebook to offer free Facebook app services as competitive market differentiators. In return, Facebook gained an opportunity to boost its advertising revenues.

The Zynga gaming apps could be a candidate for packaging. However, its volume cost profile is high. If left unchecked, it could eat up profits. Service providers could collaborate with the app developer to introduce a lighter-weight version optimized for data volume. Or, they could introduce traffic optimization concurrently with the packaging promotion to ensure that the app does not create congestion during peak time.

Each network has a different set of low-impact apps, but the analysis required to understand their impact and cost profile is the same. This low-impact app study framework presented above can be used as the basis for agile marketing, a process that includes the following steps:

1. Marketers define application usage parameters to specifically target a segment of consumers.
2. A real-time big network analytics solution compares each subscriber’s app usage with the promotion criteria.
3. When a match is found, an alert containing the offer’s rules, conditions and personalization requirements is sent to the policy engine.
4. The policy engine orchestrates the online charging and billing systems to ensure that the new package is reflected in the user’s account.
5. Analytics compares usage by the app’s regular and promotion users to determine whether the promotion parameters are sustainable.

A process like this can allow service providers to test a packaging offer on a smaller set of end users and analyze its network impact before deciding if the offer is sustainable for a wider target market. For more information, see the Motive Big Network Analytics for Service Creation solution sheet.
The LTE factor

The results presented in this report are based on 3G networks, which are in wide use in many countries. LTE is not yet widespread enough to provide comparisons across all of the regions we study. However, it is important to understand how different technologies can affect the impact of a given app. It is especially important in cases where service providers want to package a popular app. Providers must ensure that they do not package an app that has a completely different and unsustainable cost profile in LTE. They should also understand the app’s cost relative to each technology. This will ensure that their network planning assumptions accurately reflect reality.

We compared 3G and LTE usage in North America using a study previously reported in Alcatel-Lucent’s Analytics Beat blog. The comparison yielded the general observation that users consumed 2–3 times more data on LTE networks. In fact, LTE subscribers consumed more data in each app category, with video exhibiting the most pronounced difference.

We also brought the results of the North American study together with an international network sample that explores signaling and volume. However, we found too much divergence to derive meaningful conclusions. Each network revealed significantly different and often opposite trends. Several factors contribute to these varying trends. For example:

- Recently deployed LTE networks presented a less mature pattern due to their smaller network and subscriber footprints.
- Differing LTE and 3G pricing strategies influence what apps mobile users want to use most.
- Independent of network speed, cultural differences affect which apps take center stage.
- LTE-compatible devices influence app usage because they offer different screen sizes, pre-loaded apps and ease of use for various features.

Given all these factors, it was clear that averaging results from different networks would lead to uncertain conclusions. It proved more educational to show the variance of one app across a group of service providers. This exercise illustrates the need to get network-specific data before executing on a particular conclusion.

Figure 9 illustrates how LTE changes the impact of a select app. The marker shows Pinterest’s impact in 3G networks. The arrows show how this app marker would move within the ranking quadrants in LTE networks for three different service providers. The graph shows one service provider experiencing a decrease in signaling and volume impact. The other two service providers see an increase in volume and signaling, but with quite different orders of magnitude for signaling.

Based on this information, service provider 1 could successfully package Pinterest. Service providers 2 and 3 may wish to investigate optimization options or consider other apps. For service providers 2 and 3, Pinterest would remain an app to watch in the LTE network.
Network impact summary

Figure 10 offers a full-context view of the network impact of the top 39 apps and shows their respective locations in the 4 network impact quadrants. Figure 11 uses red markers to highlight the apps on our Watch List.

Figure 10. Overall network impact rankings

These applications do not yet have a great impact on networks, but they have a higher delivery cost that could quickly move them toward the High Impact quadrant of the chart.

Figure 11. The Watch List

Source: Alcatel-Lucent Wireless Network Guardian (WNG), Network Analytics
Application Cost Rankings for Consumers

This section uses the cost rankings of popular apps to help identify which apps have the most impact on battery drain and data plan consumption. It is important to note that the cost is derived from the average volume and signaling per user across our sample networks. While these comparisons help show each app’s cost relative to its peer, the way consumers use the apps also factors into their overall cost profiles. If an app is particularly enticing, users may be compelled to use it more and drive its cost higher. In other words, cost is not just a matter of design efficiency; it incorporates the human factor as well.

Figure 12 shows the app cost rankings. The order is determined by averaging the data volume and signaling rankings together. The table also shows the individual data volume and signaling rankings for each app. Palringo, Office 365, Nimbuzz, WhatsApp and Facebook top the rankings for highest overall cost per user relative to combined data plan and battery cost.

The following sections break down cost by app category. Comparing the cost of apps that perform similar tasks and have similar goals helps consumers make smarter and more economical app choices.

Comparing the cost of apps that perform similar tasks and have similar goals helps consumers make smarter and more economical app choices.
Mail app costs

A comparison of mail apps immediately reveals that Yahoo! Mail, Gmail and AOL® Mail are lower-cost mail applications. The developers of these apps have clearly taken pains to understand how best to balance notification and signaling volume in a mail application. For example, many have reduced signaling volume by downloading mail when the user opens a device instead of continuously sending notifications as new messages arrive. Offering on-demand viewing of sent and trashed mail also helps reduce signaling volume.

Hotmail clearly uses signaling more heavily than its peers. Efforts to optimize the Hotmail app for mobile networks would be beneficial for all parties. “Mail” – mail sent directly to an enterprise POP or IMAP server, such as an Outlook Exchange server – is heavy on volume and signaling. Its relatively high cost is probably not attributable to app design. Rather, it can be attributed to the large file exchanges and heavy usage that are typical of enterprise mail customers.

Figure 13 shows the cost profiles for the most popular mail apps.

Figure 13. App cost profiles for mail apps
Social media app costs

The busy social media category is characterized by the widest spread of signaling and volume cost, as shown in Figure 14.

The most expensive social media apps for consumers and service providers (top-right quadrant) are Nimbuzz, Palringo, WhatsApp, Facebook and Tango. All but WhatsApp currently offer voice calls in addition to the typical array of text, picture, video and audio messaging. Whether users send more multimedia messaging or use these platforms for free calling (or both), these social media apps have a higher cost than their peers.

Several social media apps carry very little data but are signaling intensive (top-left quadrant). These tend to be text-based messenger apps like Yahoo!, Windows Live Messenger and Facebook, Blackberry Messenger, and Kik. Skype is in this category because it carries a text feature. However, its voice features bring it closer to the High Volume quadrant.

Instagram and Twitter rate relatively low on the signaling scale but lean more heavily toward the high-volume quadrant. With its propensity for photo and video sharing, Instagram’s cost profile makes sense. But Twitter’s position in the cost rankings was a surprise: We expected its cost profile to match those of the lightweight messaging apps, but its data volume per user is the fifth highest in this category.

The Blogger app proves that exposing one’s life to others need not cost a bundle in terms of data and battery life. What makes social apps expensive is their propensity to send updates to everyone in a possibly very large circle with no consideration of whether people will actually read the updates. A blog exposes the information provided by its author, but does not replicate the information to hundreds of people.
The exposure of cost profiles adds another dimension to the decision to download and use a specific social media app. To date, the decision has been influenced by a desire for convenience. Consumers typically select the app most used by their friends and family. With a better understanding of each app’s cost, consumers can select a less-expensive social media app. It is in each consumer’s interest to try a few apps within a given category and choose the one that combines low cost and desirable functionality.

Service providers can also play a significant role in steering consumers’ app choices. By bundling lower-cost social apps, they can encourage more consumers to adopt these apps over more costly apps. A service provider equipped with app cost profile data from analytics can engage an app developer at the business level to define mutually beneficial terms.

Video app costs

The video app market is dominated by YouTube. While all video apps are data intensive, YouTube depletes device battery life fastest. This effect is likely due to usage patterns: YouTube users typically jump from one video to the next and watch multiple videos in sequence. By contrast, Netflix subscribers typically settle in to watch a longer video. This behavior generates relatively little signaling between the device and the network. Figure 15 shows the cost profiles for the video apps in our top 39 list.

With a better understanding of each app’s cost, consumers can select a less-expensive social media app. It is in each consumer’s interest to try a few apps within a given category and choose the one that combines low cost and desirable functionality.
Traffic optimization offers the only path to savings relative to video. Choosing a more compressed video format is an excellent way for consumers to watch videos without quickly consuming their data allocations. Compressed video formats also alleviate congestion during peak hours and contribute to a better user experience. In 2013, service providers began deploying selective optimization mechanisms to reduce peak-hour congestion. Another strategy is to bypass peak-hour bottlenecks with caching strategies that involve storing copies of popular videos in strategic locations within the radio access network (RAN).

**Costs for other top apps**

Figure 16 plots the cost profiles for the remaining apps in our top 39 rankings.

![Figure 16. App cost profiles for other top 39 apps](image)

This figure highlights three notable trends:

1. The cost disparity between Yahoo and Google. Google far exceeds its peers in both signaling and data volume. This gap can be explained in part by the higher number of web searches executed by Google users. Search Engine Watch finds that the click-through rate for Google AdWords is “2.4 to 5.9 times higher than those on Yahoo! Bing.” The end result is higher data volume and signaling costs because Google users will spend more time searching and navigating the ads.

2. The costly data volume associated with Pandora. It far exceeds that of file storage apps like Dropbox.

3. Office 365 and Dropbox have similar data volume cost, but Office 365 far exceeds Dropbox for signaling. Either the subscribers are making use of the mail and messaging features of Office 365 (which would drive signaling up), or the app is significantly less efficient. A look at the chattiness index in the next section will be helpful to understand why the signaling gap is so vast.
App cost rankings summary

Figure 17 shows the cost profile of all of the apps in the top 39 list. This view makes it clear that mail and video apps are largely homogeneous with respect to cost. It also shows that social media app costs vary significantly. This variance is created by the wide array of features packed into the social media category. Some apps offer messaging only while others include video calling. Support for these features will impact a social media app’s cost and placement in the rankings.

**Figure 17. Overall app cost rankings summary**

The app cost profile rankings provide excellent insights into how different apps affect consumer data plans and device battery life. But we need more than cost profiles to assess the design efficiency of different apps in mobile networks. As presented in the previous section, the cost of an app depends on two key factors: how much data the user consumes with the app and how efficiently the app interacts with the network to handle the user’s data (signaling).

The amount of signaling represents the app’s “chattiness,” or how often the app needs to re-establish a connection to the network to send or receive data. We provide chattiness rankings because the repeated setting of the app–network communication channel

App chattiness score: the ratio of signaling to data volume transferred. The least efficient apps, from the radio network’s perspective, are the most.
directly correlates to device battery drain. App chattiness is the most misunderstood source of waste in mobility. Other than simple data compression, it represents the best option for optimizing apps and reducing data volume.

To better isolate the signaling optimization opportunity, we need an app chattiness score: the ratio of signaling to data volume transferred. This score represents the number of times an app must communicate with the network per unit of data volume. A higher chattiness score represents a less efficient app because the least efficient apps, from the radio network’s perspective, are the most chatty ones.

That said, it is important to note that simple score comparisons do not tell the whole story. Comparisons must be made within app categories. It is not effective to compare a video app with a social media app. By nature, video apps will have much better chattiness scores than social media apps because they transmit much higher volumes of data while requiring far fewer interactions with the network.

On average, the chattiest app categories are social media and mail. These are followed by the weather, search and maps categories, all of which are closely matched.

Our App Chattiness rankings (Figure 18) provide some notable highlights:

- In compiling our app cost rankings, we found that that Google Maps and Apple Maps had very similar signaling costs, with Apple Maps consuming more data. However, the rankings in this section uncover Google Maps as the chattier app. A deeper look reveals that Google Maps generates 14 signaling event per MB of data whereas Apple Maps signals 9 times for each MB of data. Our conclusion: Google Maps will deplete battery life at a higher rate, but Apple Maps will consume more data.

- Social media apps have a broad a range of chattiness scores, with the top ten scores all above 30. The average data underlying the signaling–data volume ratio provides further insights. The chattiest app, Blackberry Messenger, signals 343 times per MB of data. The app in 10th position, Windows Live Messenger, signals almost 5 times less – 72 times per MB. Given the chatty nature of messaging apps, it is important to optimize signaling to reduce battery drain. Bulk delivery of several messages at once, especially when users are chatting with several friends at the same time, could help preserve battery life. Optimization requires interaction with app developers, but understanding the behavior of the app is an important first step.

- The chattiness rankings provide insights on the Google and Yahoo! search engines. Google signals 18 times per MB of data whereas Yahoo! signals 11 times. Google signals almost twice as much during searches and internet browsing. We can speculate as to the reasons behind this difference, but collaboration with the app developer is the only way to learn the true differentiators and identify an optimization path.

Figure 18. App Chattiness rankings

<table>
<thead>
<tr>
<th>App category</th>
<th>Rankings</th>
<th>App name</th>
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</table>
What information do service providers need to engage developers and optimize apps?

As illustrated by the Facebook success story, service providers need to gather information on the volume and signaling profile of each app and break it down by devices and mobile technologies (2G/3G/LTE). Deep packet inspection (DPI) technology is not sufficient for performing this task, as it only provides visibility of application- and user-specific volume. It does not provide insights about the radio network technology and device type used each time the app is operated by a subscriber.

Being able to correlate user and IP flows with app, signaling, device and network path information (what we call the 6 dimensions of mobile intelligence, or m.IQ®) opens up even more possibilities for app optimization. For instance, it allows operators to discover how apps behave on different devices to learn how device-specific features impacts an app’s performance.
Conclusion

A greater understanding the impact of mobile applications can benefit consumers and service providers alike. Consumers can use app cost and efficiency comparisons to make smarter choices about the apps they use. Service providers can benefit in several key ways. For example, they can determine which apps to monitor proactively and plan network growth more accurately. They can engage app developers in meaningful discussions about how to optimize apps for mobile networks and devices. And they can create app-specific packages that their customers will be willing to pay for and that they can offer at acceptable operational costs.

This study highlights the power of knowledge with respect to the impact of mobile apps. But each network has a unique app impact ranking that is influenced by market coverage, data plan variety, population demographics and cultural preferences. To fully harness the possibilities offered by app impact rankings, service providers need to conduct their own studies based on the data derived from their own networks.

Service providers can gain powerful insights with the Wireless Network Guardian, a network analytics solution that can correlate the 6 key dimensions of mobile intelligence: application, user, IP flows, signaling, device and network (location, path and technology). They can act on these insights using Big Network Analytics, a solution that has the power to trigger individualized usage-based offers and proactively benchmark and monitor each app's performance, volume share and signaling share trend.

Each network has a unique app impact ranking. To fully harness the possibilities offered by app impact rankings, service providers need to conduct their own studies based on data derived from their own networks.