Clavister Intelligent Mobile Offload

Intelligent and secure mobile data offloading

SOLUTION AT-A-GLANCE

- Clavister IMO is an affordable alternative to intelligent mobile data offloading that incorporates subscriber network slicing with help of application based traffic control

- Instead of aggregating offloaded traffic to a central network point in the operator network, or complementing existing solutions with additional hardware our solution is available as a software package that can be executed on existing Intel based hardware. The solution is also available as pre-packaged appliances.

- The Clavister IMO solution can be executed directly onto COTS x86 platforms and embedded in hypervisors such as VMware or KVM, supports Intel® Virtualization Technology including Intel® Virtualization Technology for Directed I/O (VT-d) that guarantees exceptional forwarding performance in virtual environments.

- Clavister IMO solution gives an insight into subscriber traffic and opens new revenue models with value added services to subscribers such as automatic web category blocking of specific page categories.

Executive Summary

Smartphone shipments are expected to surpass 1 billion units for the first time in a single year 2013. Total smartphone shipments are forecast to reach 1.7 billion units in 2017. Similarly, data traffic is expected to grow by 50% annually. (IDC).

Recent studies in Europe have shown that Wi-Fi networks are carrying a majority of smartphone data traffic. The proportion of data from smartphones and other SIM-enabled devices carried over Wi-Fi ranges between 50% and 80% of all traffic (Informa Media).

What's more, mobile data revenues have become decoupled from the increase in traffic, thanks to consumer-led all-you-can-eat data plans. So it's no surprise that new operators are entering the mobile arena with the approach of offering Wi-Fi as their primary network, and using mobile services as secondary add-ons. As a result, established operators are now faced with the need to invest in their own infrastructure, or risk missing out on significant revenue opportunities.

MNOs need to consider methods for delivering transparent, seamless interoperability between mobile and Wi-Fi networks. These solutions offer consumers the convenience of fast, reliable, widely-available data connectivity without the hassle of having to logon and authenticate to a range of different networks, while enabling the operator to offer a wider range of beneficial, sticky and billable mobile services.

However, current mobile data offloading (MDO) strategies to Wi-Fi networks (whether the operator's own network, or a partner's) are diverse and lack standardization, forcing operators to work with niche players to address the growing market demand.

An intelligent mobile data offloading solution from Clavister enables operators to generate more revenue through unlicensed 2.4 and 5GHz spectrum

Wi-Fi networks, while enabling them to retain control of every subscriber's whereabouts and data usage, with a single, unified billing structure.

It also supports new revenue models such as provisioning of Wi-Fi services for businesses and wholesale customers, and value-added offerings such as mobile Web parental controls, anti-virus for secure mobile banking services, and premium subscription services offering consumers higher available bandwidths.

By supporting seamless Wi-Fi data offloading, MNOs can boost revenues and build closer relationships with subscribers by meeting their needs for better, faster mobile connections. This document shows how operators can deploy an effective, standards-based mobile data offloading solution to their competitive advantage.

Challenges in a Connected World

Wi-Fi is nothing new to consumers. We use it to connect our devices to the Internet and we use it to access and share multimedia content including video within seconds. It's also the preferred means for consumers to connect their smartphones, tablets and laptops to the internet – and is leaving some mobile operators behind.

The industry has seen a decline in Average Revenue Per User (ARPU) for voice services, and smart operators are now looking to mobile data services traffic as a mechanism to strengthen their ARPU. Some, though, are still facing problems.

Combined voice and data ARPU continues to fall and, despite the substantial increase in data traffic, operators are charged with increasing network enhancement costs to accommodate the extra. Furthermore, subscribers will not accept costs based on their data usage either, and it is too late to introduce variable rates for data billing when operators have long promoted fixed data volumes as part of a user's subscriptions.

So to meet the surge in consumer demand for data, MNOs have three options:

- Purchase more licensed spectrum
- Improve the efficiency of their radio networks
- Boost technology in base stations

As buying more spectrum is expensive, and increasingly hard to do, and the efficiency of LTE is already approaching its upper limits, adding Wi-Fi as an access complement for data services is being increasingly adopted by operators. Some have introduced 802.1x EAP-SIM Wi-Fi data offloading services in an attempt to move traffic from 3G/LTE networks to lower-priced access media that offers comparable performance, and also to attract and retain customers.

The benefit with this method is that no user interaction is required to connect to the operator's Wi-Fi network with 802.1x EAP-SIM because their device will connect automatically. However, the challenge is controlling and managing subscribers and their data traffic.

Wi-Fi data offloading solutions from access point vendors often lack multifunctional networking features. Without an application control feature, for example, an operator is unable to control the traffic's content. Some are addressing this issue by complementing the Wi-Fi solution with two different approaches, but each has its own potential disadvantages:

Approach 1: Aggregate traffic to a central operator-controlled point with multifunctional networking features
- Not future proof: 802.11ac access point can generate 800 Mbps traffic. 1000 access points can require a maximum capacity of 800 Gbps
- Complex management: requires site-unique management
- Costly capacity build-out: complex and costly to add capacity at central point

Approach 2: Complement with appliance solutions for each site that offer multifunctional capabilities
- Increases CAPEX and OPEX costs, and product swap is required when limit is reached
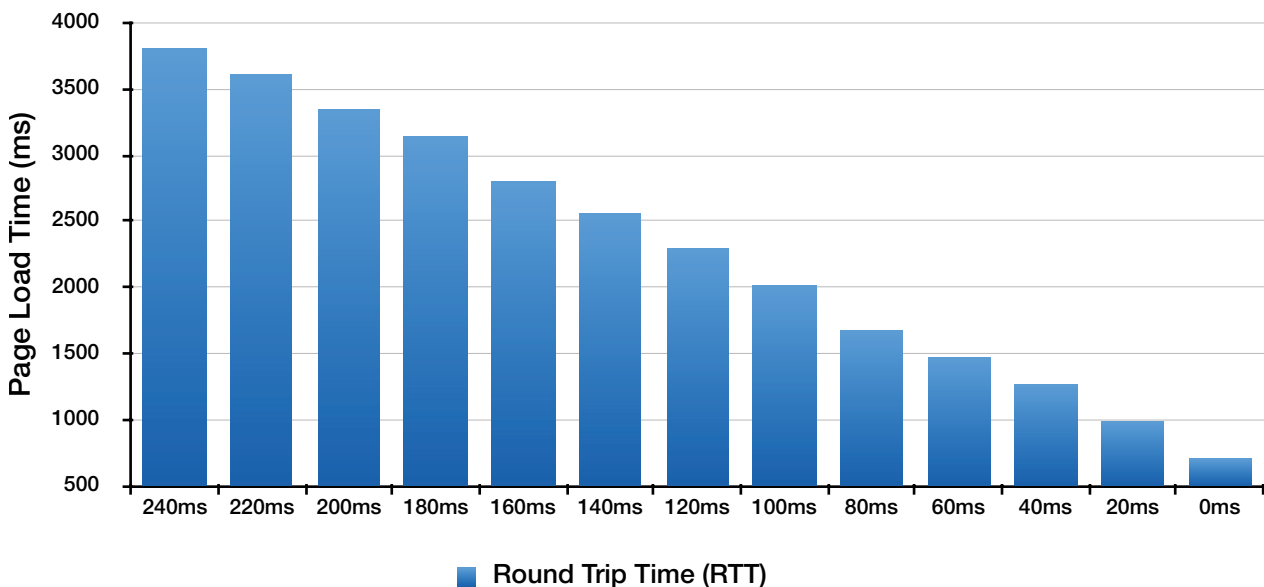
The Clavister IMO Solution

There is an alternative approach for forward-thinking operators. The solution offered by Clavister is an affordable alternative to either aggregating traffic to a central network point, or complementing existing solutions with additional hardware.

The Clavister IMO (Intelligent Mobile Offload) solution can be executed directly onto COTS x86 platforms and embedded in hypervisors such as VMware or KVM, supports Intel® Virtualization Technology including Intel® Virtualization Technology for Directed I/O (VT-d) that guarantees exceptional forwarding performance in virtual environments. This ensures data offloading can be rapidly deployed while reducing management complexity. By allocating resource to virtual machines, performance

can be scaled up and down effortlessly. Furthermore, as identical inner configurations are used, management time and effort is reduced by having each deployment follow a similar structure.

With this approach, mobile operators can adopt a flexible solution that scales, over a traffic bandwidth plane, up to 60 Gbps on x86 hardware with 4 processor cores. Resources can then be scaled up and down with remote management capabilities. The solution includes the following full-functionality features:

- SIM-based authentication

- Web based authentication

- Policy control

- User data transfer accounting

- Compliance logging

- Bandwidth management per application used

- Value-added services

  - Application control bandwidth limitation/guarantee or complete block
  - Web category blocking per subscriber level
  - Anti-virus scan per subscriber level
  - Subscriber or group based enterprise VPN access including point-to-point layer 2 connectivity from access point to enterprise

- CAPEX/OPEX is lowered with Clavister's solution, as COTS hardware is used instead of purpose-built, bespoke appliances. MNOs' existing COTS hardware can be used with this solution too.


Round Trip Time (RTT)

Figure 1: Page Load Time
The Clavister IMO solution offers a local Internet breakout Wi-Fi connectivity point closer to the subscriber instead of aggregating the traffic through a multi-hop mobile operator core network that increases the round trip time (RTT). This improves bandwidth utilization and RTT that in turn provides a better customer experience. The figure shows the impact on page load time by reducing the RTT measured in field tests.

Operational Benefits

Clavister IMO has the ability to work with any networking system and therefore allows operators to seamlessly authenticate mobile subscribers without any user interaction. MNOs can also deploy web portal-based authentication to increase the subscriber base.
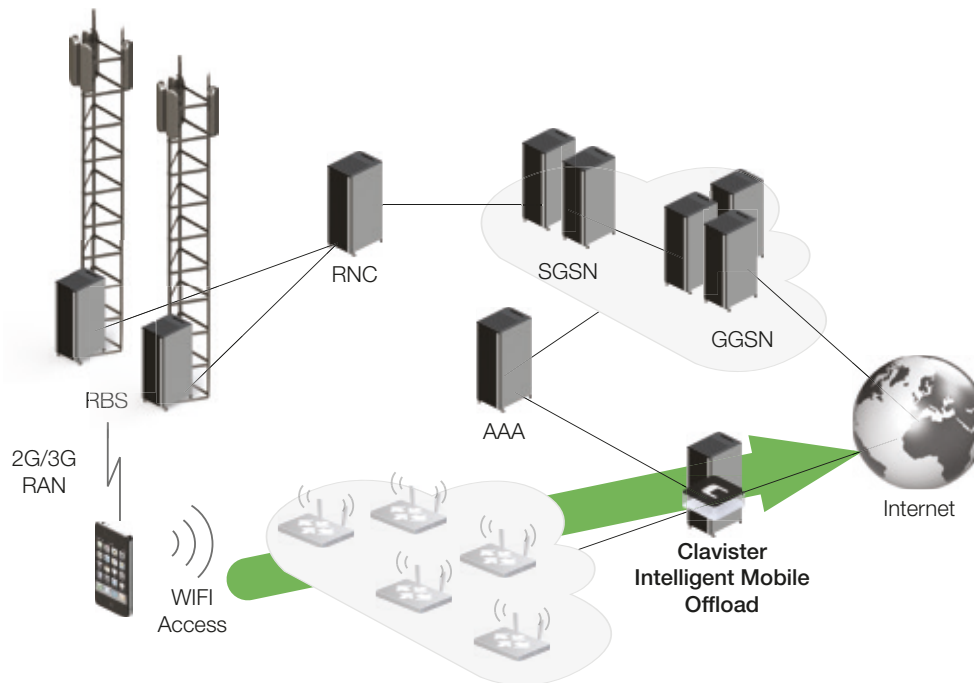
Figure 2: Prerequisites to deploy Clavister IMO:

- AAA server with access to operator HLR and RADIUS support
- Wi-Fi network with wireless access controller and 802.1x EAP-SIM compatible access points
- x86 COTS hardware with VMware or KVM hypervisor (optional)
- One time password generation system for web login (optional)

The foundation of the Clavister Intelligent Mobile Offload (IMO) solution originates from RADIUS-relay (RR). RR grants the security solution insight into the communication between access points and the operator's subscriber database when subscribers authenticate. This in turn gives the MNO insight into every subscriber's identity and subscription profile, and the basis for effective network management. The subscriber information collected includes:

- Application usage in the Wi-Fi network
- Data transferred in the Wi-Fi network
- Session duration in the Wi-Fi network
- Access point – IP – MAC-address – IMSI mappings for each subscriber
- Visited URLs
- Visited URL categories

The Clavister IMO solution is offered as virtual security gateway that operates on VMware or KVM. The solution can also be obtained as a pre-packaged appliance, based on an operator's personal requirements.

Benefits

Improvements to the user experience with controlled Wi-Fi offloading, and the corresponding traffic decrease in the core mobile network, provides subscribers with a range of advanced service options that go beyond simple connectivity. It also enables MNOs to introduce valuable over-the-top revenue streams.

These new service options based on the Clavister IMO solution can include:

- Management and control capabilities constructed on application usage and subscriber profiles: operators can access information on exactly what flows in the network, which can in turn be used to generate new revenue streams.
- Web category blocking service: a web page blocking service can be set for certain subscriber groups based on the web page category.
- Bandwidth management: Operators can limit or guarantee bandwidth to specific applications that the user has down-loaded, enabling premium services to be offered.
- Compliance logging: the solution allows for tracing subscribers for future Wi-Fi regulatory compliance claims including access point-IP-MAC-IMSI, visited URLs, and used applications.
- De-centralised solution: there is no requirement for site-unique management.

- Supports use-cases based on a complete feature set such as:
  - Encrypted L2/L3 connectivity to specific subscriber APN
  - Per user accounting

Conclusion

The mobile industry is changing, and operators are reaching a turning point. They need to be able to offer, manage and control Wi-Fi networks as a core part of their existing infrastructure, to retain subscribers and revenues, and to introduce new value-added services.

The challenge of retaining control of their subscribers is nothing new for operators. What's important is the ability to either keep the data traffic on their own Wi-Fi-built networks or, if they partner with a vendor to offload the data, to at least maintain a level of control.

Transparent mobile data offloading over Wi-Fi delivers real benefits to MNOs: it helps to better manage data traffic on the core mobile network; it reduces costs of upgrades and build-outs; and enables operators to offer a range of new services to subscribers.

From the subscriber's viewpoint, they enjoy a better overall data service with high-speed connectivity available anywhere, without the need to logon to multiple networks; all they have to do is switch on their device.

In the next few years, unified Wi-Fi and mobile networks will emerge, enabling MNOs to profit from integrated wireless and mobile broadband services. These networks will help operators to meet the increasing demands of a connected world – to everyone's benefit.

Clavister IMO solution ensures that you stay in control of your network with intelligent offload and initiates the potential for new revenue streams. The Clavister IMO solution is highly scalable due to close integration with any network equipment based on Intel hardware. As a result this provides a solution with strong throughput performance per CPU and small foot-print, leading to a cost effective deployment in a distributed environment.

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