

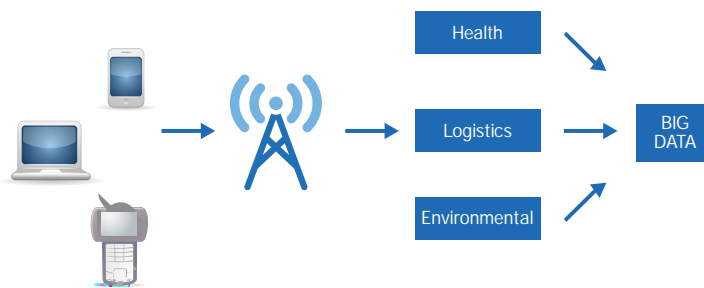


**Machine to Machine  
(m2m) Wholesale 3G  
Mobile Connectivity**  
*For a Smarter Connected Society*

# 1. Introduction, Background and Market Size

The need for machines to be able to communicate with each other-m2m, has been driven by the emergence of ‘The Internet of Things’ (IoT), the phrase used to describe anything which is connected to the internet which isn’t a human – sensors, traffic monitors, water meters for example.

## Schematic for Machine to Machine – m2m



Smart City

Analysts

Intelligent City

There are various estimations of the number of devices that are expected to be connected - one set of figures claims that there are 6 billion connected devices currently, with an anticipated 50 billion by 2020.\* This represents an estimated growth rate of over 700%.

Objects in the IoT will have sensory capabilities but will also be expected to perform actions, such as controlling on off switches, locks etc. They will also generate large amounts of data, which needs to be stored, transmitted and processed in a secure and reliable manner.

Revenue generated by m2m connectivity is currently is driven by large enterprise and public sector companies, with a view that by 2023, 11% of worldwide connectivity related revenue will be from SMEs. 20% of this revenue is expected to be generated by commercial fleet tracking, which represents a compound annual growth rate (CAGR) of 22%\*\*

In the Emerging Asia – Pacific market alone, there is belief that there will be 519 million connections by 2023, growing at a CAGR of 33%, with the growth being driven by utility and security sectors. Healthcare will account for only 3% of m2m device connections in 2023, but will grow at a CAGR of 32% over the next ten years. \*\*

\*Arthur D Little, 2010.

\*\* Analysys Mason, 2013

## 2. Vertical Market Opportunities

Vertical Market	Example
Environmental Monitoring	Monitoring air or water quality Monitoring movement of wildlife Water meters
Infrastructure Management	Scheduling repair and maintenance activities Monitoring of bridges, wind turbines, railway tracks
Medical Monitoring	Blood pressure Sugar levels Heart monitoring
Energy Management	Remotely powering on and off of heating, ovens, lighting Manage distribution devices, such as transformers
Building and Home Automation	Control mechanical and electrical systems in public and private, industrial and residential buildings, remote access, CCTV cameras
Transport Systems	Smart traffic control, smart parking, electronic toll collection, logistic and fleet management, road assistance,
Digital Signals	Motorway signs and information Updating retail outlet promotional signs

A major criticism of the Internet of Things (IoT), is one of security. The IoT is being developed rapidly without the appropriate consideration of the security challenges associated with the storage and transmission of large amounts of data that will be generated.

As a Regulated telecoms operator **aqi** operates to high levels of data governance and security, providing a secure environment for the storage and transmission of data, meaning they are highly qualified to securely host and protect the integrity of your data.

**aqi**'s biggest customer benefit is that our SIMs provide a static IP address, meaning that a real IP address is delivered to your device, enabling totally private two way communications.

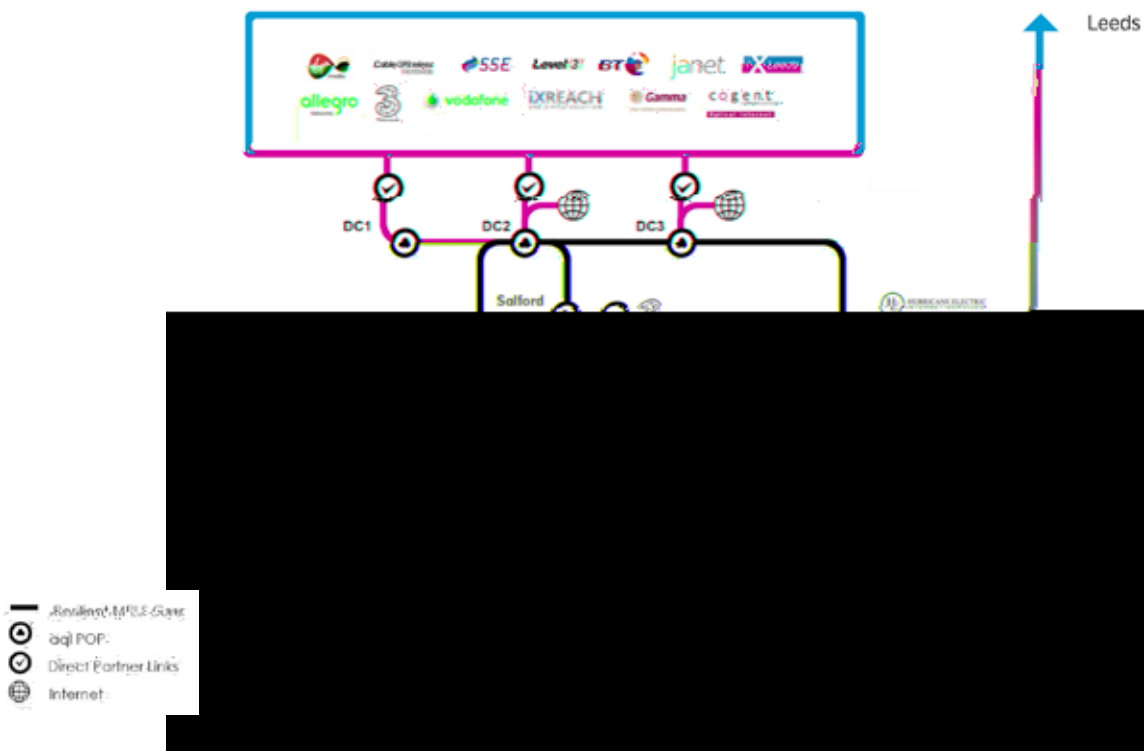
The **aqi** solution empowers you to create your own bespoke bundles or pay-as-you-go, with or without minimum usage charges and variable contract durations. This provides you with the flexibility to create your own mobile data bundles to suit a particular customer, usage profile or vertical market.

**aqi** wholesale mobile broadband allows the partners to aggregate all 3G data usage over their total reseller-base, thus maximising profits and retaining ownership of the customer base. **aqi** APIs enable partners to connect, disconnect and monitor usage in real time.

**aqi**'s white-label solutions give you the ability to brand the SIMs with your logos and even create your own branded (personalised) Access Point Name (APN). This means you no longer need to introduce 3rd

Ask Your Customer	Tell Your Customer
Are you considering m2m?	If so they should use <b>aqi</b> as they offer a secure reliable service able to cope with large peaks in demand.
Do you want to be able to brand?	<b>aqi</b> 's white label solutions give you the ability to promote your own brand. You can have your logo to the SIMS and even create your own branded Access Point Name (APN).
Do you need to have a reliable solution?	<b>aqi</b> 's global solution has a roaming agreement with all the UK Mobile Networks so the SIM will search for the strongest available signal at that location and has the ability to seamlessly switch between alternative networks for scenarios where 'always on' connectivity is required and more important than the most cost effective routing.
Would you like to trial this service?	A proof of concept demonstration is possible via the public internet. Our technical support team will be able to guide you through this process.
Do you need a trusted and reliable provider with high levels of security?	As a Regulated telecoms company, <b>aqi</b> operates to strict levels of security and data governance. <b>aqi</b> conforms to ISO 27001 and holds data at IL5 security levels.

### Datacentres and Connectivity



## 4. Technical Options available for Machine to Machine (m2m) Wholesale 3G Mobile Connectivity

## 5. Option 1 - Fully Managed services for enterprise, utilities and logistics: End to end service delivered by aql infrastructure

- a @ allocates and assigns IP addresses to SIMs.
- Three terminates and manages the Layer 2 Tunnelling Protocol (L2TP) session.
- Data from the device is sent to the internet via a @s core network.
- The device is presented on the internet as a single internet-routable IP address.
- The device uses a 's caching DNS servers.
- The IP address is unrewalled and not NATted.

### Advantages:

- No partner equipment or infrastructure is required (excluding provisioning and billing).
- Very little technical knowledge is required.
- No technical management of the service is required.
- Almost immediate activation and deployment.
- A truly plug-and-play solution (similar to a standard 3G internet service).
- No firewall or port restrictions.

### Disadvantages:

- The partner has no control over IP address assignment.
- The partner has no control over the DNS servers used by the devices.
- Partner needs firewall or access lists.



## 6. Option 2 - For Systems Integrators & Operators with their own Service Network Platform

- Each SIM has a private RFC 1918 address.
- a ④ allocate and assign IP addresses to SIMs within a range pre-agreed with the partner.
- The IP addresses assigned to SIMs are static and unique (i.e. when assigned to a SIM they are not then assigned to any other SIMs).
- ④ terminates and manages the L2TP session.
- The data passes from the device into the partner's network via a private interconnect.
- The data is presented with the private address of the SIM. There is no NATing between the device and the partner's network) and is routed to the partner based on decisions made by aqi's routers (source IP address based policy routing, setting the next-hop per assigned IP address range).
- The partner has complete control of the routing of the traffic, once it has entered their network via the private interconnect. This can then be routed as required, i.e. direct to the internet or onwards to private networks.
- The device may use DNS servers provided by the partner.

### Advantages:

- More simple than layer-2 with lower technical knowledge and infrastructure requirements.
- Data is delivered direct to the partner and does not traverse the Internet.
- Unfiltered two-way communications between the partner and the device.
- No NAT prior to the delivery of the data to the partner.
- Provides a private and secure enclave 3G mobile broadband network.
- The partner may provide their devices with specific DNS server IP addresses (upto two DNS server IP addresses per private interconnect).
- The partner can capture traffic before it is routed to the internet, which will support the deployment of value-added services.

### Disadvantages:

- The partner has no control over IP address assignment, although they do know the IP address range associated with the SIMs that will enter their network via the private interconnect.
- The partner must have a private interconnect with a ④ (at a suitable point-of presence) that can be connected into aqi's internal routers.
- The partner must provide a gateway into their network from the private interconnect (i.e. a 'next-hop', which may be the VRRP IP address of a pair of routers).
- The partner must have an infrastructure capable of receiving and routing the data.



## 7. Option 3 - For Fixed Line ISPs to provide Seamless 3G Mobile Connectivity

- a @hand over the entire L2TP session to the partner (one session per MSISDN).
- The partner terminates and manages the L2TP session.
- The partner may assign any IP address to connecting devices using their own equipment.
- The equipment typically required by a layer-2 partner would include a Layer-2 Network Server (LNS) with associated RADIUS server to manage L2TP tunnel attributes and IP address assignment (a database would also be required).
- IP addresses assigned by the partner do not have to be pre-registered with aql and can be allocated dynamically and as required.
- The partner has complete control of the routing between the device, their network and any onward connections.
- The same IP address can be assigned to multiple devices. This is useful if a partner has two customers that require identical IP addresses (e.g. MPLS, business broadband back-up).
- The partner controls DNS server IP address assignment.

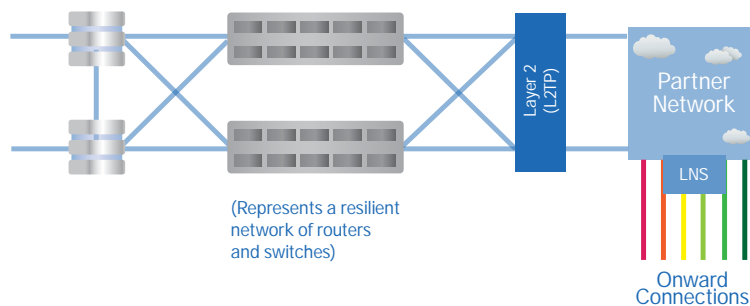
### Advantages:

- Provides a static IP address that enables private two way communications.
- The partner controls all IP address assignment and routing, including DNS.
- 1-to-1 static IP address mappings, including internet-routable IP addresses.
- A device can be assigned a single IP address.
- The same IP address can be assigned to multiple devices.
- No Network Address Translation (NAT) prior to the delivery of the data to the partner.
- Direct two-way communications between the partner and the device.

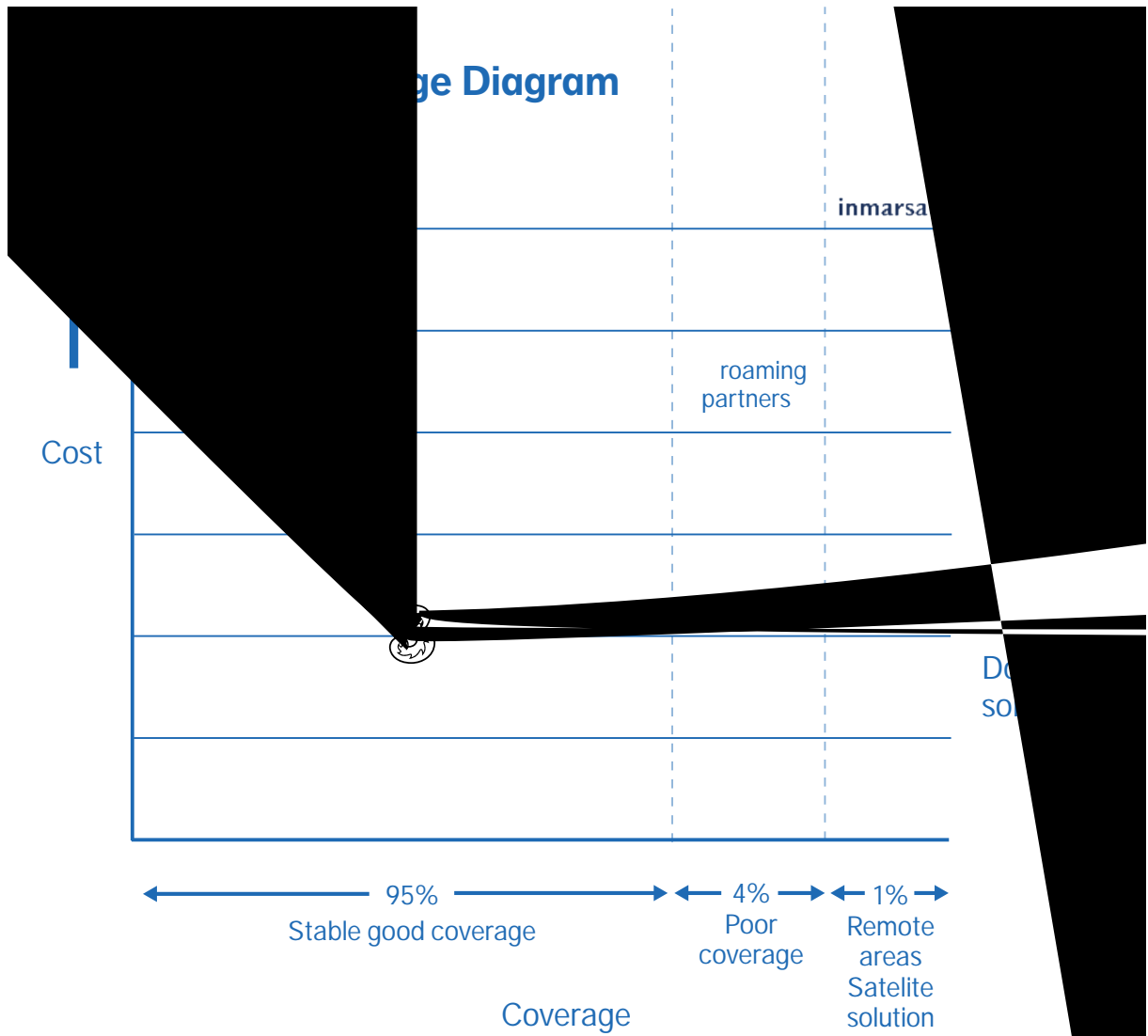
### Disadvantages:

- The partner must have an infrastructure and equipment capable of terminating the L2TP sessions (LNS, RADIUS server, database), managing IP addresses and routing the data.
- Resources required to develop, manage and configure the infrastructure and equipment.
- A greater level of technical knowledge is required.

# 7. Option 3 - Schematic



# 8. Cost Coverage Diagram



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