NetCommWireless

Transition from dial-up to 3G white paper

30th August 2012

1. How it works: dial-up networking. PC World 2001.
2. NetComm Wireless: then named Banksia Technology

Introduction

The invention of the telegraph, telephone, radio and computer set the scene for a global communications revolution which is now encompassing countless peripheral devices, systems and pieces of equipment. The widespread availability of 3G network infrastructure and advances in wireless broadband technologies have enabled location flexibility and 'always-on' connectivity – the key drivers behind the proliferation of mobile consumer devices and wireless Machine-to-Machine (M2M) communications worldwide.

The global transition from dial-up to 3G is driven by the universal need for faster speeds, higher data throughput, improved capacity and, most importantly, increased mobility. While this mobility fuelled migration to 3G has significantly impacted the way individuals interact, this white paper focuses on the increasing influence that sustained investment into wireless technologies is having on M2M communications as government, industrial and commercial entities worldwide push for cost-effective improvements to efficiency, functionality and productivity across verticals such as health care, logistics, transport, Point of Sale (POS), automotive and utilities.

The dial-up environment

Dial-up networking can be described as the set of protocols and software used to connect a computer to an Internet service provider, an online service, or a remote device through an analogue modem and POTS (plain old telephone system). A dial-up network usually communicates with an ISP using the point-to-point protocol standard.

By the end of 2000, over quarter of a billion subscribers were dialling into the Internet, more than four times the number of users of other access methods, namely broadband DSL, cable and ISDN modems.[1] Prior to this, a diverse range of pre-Internet industrial and commercial M2M applications utilised dial-up modems developed by NetComm Wireless[2] to access, evaluate and share equipment data in real time.

Examples:

- Automatic Teller Machines (ATMs) for banks.
- EFTPOS terminals for various manufacturers who in turn sold to banks.
- Commercial car washes and service stations.
- TV data logging devices that captured what people watched.
- Commercial refrigeration for reporting faults.
- Vending machines for faults and refills.
- Poker machines for online communication and reporting.
- Pathology labs for remote reporting of results.
- Warehouse barcode scanners for logistics organisations reporting to freight companies.
- Weighing machines – Australia Post utilised 5,500 modems to connect their weighing machines for pricing updates.
- Photocopiers – photocopier companies installed dial-up modem modules into photocopiers for remote meter reading and service trouble-shooting.
- Cash registers – central computing for recording, reporting and POS transactions.
- Water level – dial-up modems were connected to water level gauges for river and dam reporting.
- Traffic lights – remote control for emergencies and traffic flow.
- Traffic roadside counters – modems were installed in the traffic counters on roadsides.
- Pipeline monitoring – modems were connected to sensors on pipelines for gas, water, waste water, water outfall systems. Sydney Water utilised 800 modems on the installation of their outfall system.
- Traditional currency exchange display panels.

Dial-up has successfully facilitated the flow of data between machines for many years, but, based on its architecture, 3G is proving to significantly enhance M2M efficiency in terms of speed, latency, scalability, location flexibility and operational costs.

While dial-up connectivity remains viable for a number of applications today, 3G is providing substantial new opportunities for applications that stand to benefit from remote monitoring, diagnosis and control from any location, using any computer at any time.

Speed & performance

Dial-up networking uses a modem with speeds of up to 56kbps, which equates to real life throughput speeds averaging 40kbps. In the dial-up setting connection speeds can be affected by factors such as the quality of the copper phone wire, the phone jack being used, phone line noise or electrical interference with speeds decreasing to 20kbps in environments with multiple extensions or in areas far removed from the phone exchange. With latency reaching as high as 300ms, dial-up connections typically do not support bandwidth-intensive activities such as image streaming in medical applications.

Driving the transition from dial-up to 3G

In addition to the vast number of devices that remain connected via dial-up, billions of pieces of equipment across diverse vertical industries still operate as unconnected devices. The challenge facing companies with legacy, or non-networked, equipment lies in determining the most practical and cost-effective way to add network intelligence to those products.

Wireless M2M connectivity has posed a major challenge to dial-up networking because of its ability to streamline operations, optimise efficiency and reduce costs by making field data accessible from any computer, wherever coverage exists. Maintenance and site visit costs can be significantly reduced by enabling live remote system monitoring, diagnostics, configuration and firmware upgrades over the air.

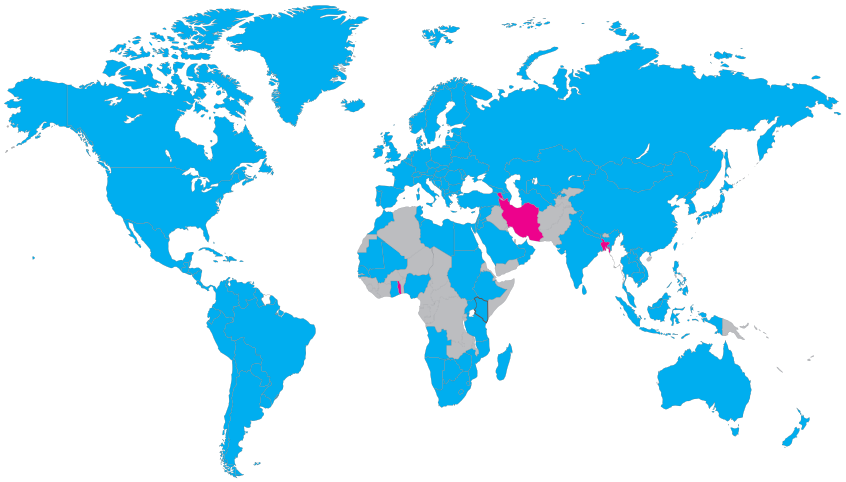
The primary drivers behind the transition from dial-up to 3G include: mobility restrictions; the length of time it takes to establish a telephone connection; an inability to access the phone line for other purposes; incremental costs incurred for each connection; low data transfer speeds and longer latency. As phone rates apply, dialling internationally can also be costly. The critical need for ‘always on’ connectivity is not properly supported by a dial-up connection which requires an Internet Service Provider (ISP), a server, telephone line, modem and remote equipment to work together.

3G is fulfilling the need for fast and reliable wireless connectivity in rural and remote areas where dial-up is still being used due to a lack of access to broadband (ADSL/cable) infrastructure. Using a 3G M2M modem, any serial based device can benefit from point-to-point or point-to-multi-point communications over a local or wide area network (LAN/WAN).

3. GSA HSPA Operator Commitments report – July 18, 2012
4. GSA HSPA Operator Commitments report – July 18, 2012

3G reach

Today, 100% of WCDMA operators have launched HSPA (3G); and almost 50% of HSPA operators have commercially launched HSPA+ networks. 234 commercial HSPA+ networks have been launched in 112 countries, and 90 operators have commercially launched DC-HSPA+ systems with the GSA forecasting at least 115 DC-HSPA+ networks will be in commercial service by end 2012.[3]



446 HSPA network commitments in 170 countries

Countries with 3G/HSPA Operators

Countries with 3G/HSPA network commitments / deployments

Prior to the extraordinary growth of wireless networks, a dial-up connection was the only option for assets, equipment and systems located in areas that lie beyond the reach of fixed line (ADSL, cable, fibre) infrastructure. The extensive availability of 3G has further extended connectivity to geographically isolated regions without access to the copper phone line network, thereby facilitating exceptional M2M growth in new areas.

By using a 3G M2M device to exchange data between remote assets and central data terminals or more complex back-end systems, equipment and systems can be monitored and/or serviced across the globe.

3G speed

- 137 commercial networks support a peak downlink data speed of 21 Mbps using 64QAM
- 7 commercial networks support 28 Mbps peak downlink data speed
- 89 commercial 42 Mbps DC-HSPA+ networks
- 1 commercial 84 Mbps DC-HSPA+ with MIMO network[4]

In Australia, Telstra launched its 21Mbps network in February 2009 and its 42Mbps in June 2010; and plans to evolve to 84Mbps. Canada's seven major carriers launched 21Mbps networks between 2009-2010, and of these three have commercial 42Mbps networks in service. Of North America's five leading carrier networks, one has deployed its 42Mbps.Both major networks in the United Arab Emirates (UAE), and South Africa's principal network, offer speeds of both 21Mbps and 42Mbps.

According to research by PricewaterhouseCoopers (PwC), demand on mobile networks in the United States is nearly doubling every year so operators cannot afford to stay idle. The results of this year's PCWorld study clearly indicate that most wireless network operators are continuing to invest significantly in their 3G networks, adding capacity to ensure speeds remain competitive.

5. Harbor Research Inc.
6. Berg Insight: The Global Wireless M2M Market – 4th Edition
7. ABI Research: The Market Opportunity for Mobile Operators, MVNOs and Other Connectivity Service Providers (Q1, 2012)
8. Strategy Analytics report: "Global M2M Connections Market Forecasts & Analysis
9. Analysys Mason: M2M device connections, revenue and ARPU: worldwide forecast 2011-2021
10. © Maravedis 2012
11. Berg Insight report: Shipments of NFC-ready POS terminals doubled to 2.5 million in 2011 (06/2012)

Uptime

Machine and system downtime can be extremely costly in terms of productivity and output for businesses, and can be life threatening in the health care and meteorological verticals.

A 3G M2M modem featuring multi-system monitoring will ensure business continuity by keeping communication lines open in all circumstances. If a user has an ADSL and 3G connection available, modems offering automatic failover will switch from ADSL to 3G by constantly sending a signal to an outside IP address to determine whether the fixed connection is active. If the router notices that the fixed connection has failed for any reason it will revert to 3G, ensuring that the user is always online.

The uptime benefits of a dial-up connection are realised in cases where an electrical outage occurs or where DSL or cable access from major carriers goes down as the phone line will still work in these instances.

The growth of wireless M2M

Comparison Table

Research Company	M2M yesterday	M2M today	M2M tomorrow
Harbor Research[5]			390 million (2014)
Berg Insight[6]	78.7 million (2010)	108 million (2011)	359.3 million (2016)
ABI Research[7]	87.7 million (2010)	110.6 million (2011)	364.5 million (2016)
Strategy Analytics[8]		277 million (2012)	2.5 billion (2020)
Analysys Mason[9]		100.4 million (2011)	2.1 billion (2021)

Unlike other technological markets which typically progress through a cycle of emerging, growth and consolidation phases which result in peaks, troughs and an eventual levelling out as maturity is reached, the vertically integrated nature of the M2M market ensures it will always remain diversified because of the significant differences between vertical sectors and the related machines and connected devices. As a result, consolidation to a just a few end-to-end players is not likely to occur, as is often the case in other market segments.[10]

Accelerating the phenomenal growth of wireless M2M communications are factors including the worldwide expansion of mobile network coverage, expanded mobile network operator data service offerings, advances in wireless broadband technology and the vastly improved operational efficiency and increased revenue offered by telematics and telemetry.

Wireless M2M and retail

As previously discussed, ATM machines, EFTPOS terminals, vending machines and cash registers / POS terminals are among the many commercial applications that utilised a dial-up connection for real time point-to-point M2M communications in the 1990s.

Today, applications that maintain a dial-up connection face a number of difficulties including slower transaction speeds, costly phone line rental costs and the inability to operate at different locations such as trade fairs or outdoor events. Wireless connectivity enables the fast and economical setup of retail applications at new locations where fixed line infrastructure is unavailable or impractical.

These benefits have translated into massive growth for the retail sector with Berg Insight forecasting that the number of wireless M2M connections in the retail industry is growing at a CAGR of 21.6 per cent from 10.3 million in 2011 to 33.2 million connections worldwide in 2017.

Shipments of wireless M2M devices for retail applications will at the same time increase at a CAGR of 10.7 per cent from 5.2 million units in 2011 to 9.6 million units in 2017. POS terminals are expected to experience the largest growth in the retail sector over the forecast period, and the vending machine segment will present a major opportunity for wireless connectivity in the long term with vending telemetry solutions named the fastest rising segment during the next six years.[11]

While the possibilities are almost endless for industries using wireless Internet connectivity to remotely monitor and manage end-to-end processes, reliable M2M communications can only be achieved using an 3G M2M modem / router that supports undisrupted wireless network access from almost any location, even in harsh and demanding environments. The long-term success of M2M communications is therefore closely aligned with the timely deployment of rugged industrial 3G broadband devices customised to meet specific requirements.

Transitioning from dial-up to 3G

A 3G M2M device supports the continuous management and monitoring of remote equipment, assets and complex site processes in real-time from any computer using the speed and coverage of 3G networks. With electrical power and access to a 3G network being the only requirements for connectivity, users can control multi-level systems and instantly respond to equipment malfunction warnings using point-to-point or point-to-multi-point wireless data communications over vast distances without the need for fixed line infrastructure.

Key transition considerations:

Legacy equipment: A serial port is required to interface with legacy devices such as emergency and manufacturing equipment for a seamless and reliable connection between old and new technology. Developed for diverse installation environments, NetComm Wireless' NTC-4000 Series modems cost-effectively connect serial devices to 3G.

Ethernet connectivity: Digital signs, CCTVs, smart meters, climate control systems and other wired devices can be connected to the 10/100 Ethernet port of a 3G M2M router for reliable wired access to high-speed mobile broadband. NetComm Wireless NTC-5000 Series routers have the capacity to deliver real-time 3G broadband connectivity to Ethernet-enabled devices with downlink speeds of up to 7.2Mbps and up to 5.76Mbps uplink for the fast transfer of large files.

Customisation: Industrial or commercial applications requiring a tailored M2M solution will require a 3G M2M router with the ability to address specific requirements. The NetComm Wireless NTC-6000 Series devices incorporate features including an embedded Linux OS, dual system management with multi-level administrator accounts, substantial read-writable flash memory and a software development kit (SDK) to allow for the cost-effective deployment of custom applications with remote installation.

Robust housing and components: The extensive reach of 3G has enabled connectivity to isolated applications often located in harsh environments. Endurance in these conditions requires a 3G M2M router with industrial strength components capable of operating effectively in temperatures ranging from -30˚C to 70˚C.

Another important features for modern telemetry, M2M communication, WAN and legacy serial applications include: compatibility with most networks and service types; multi-system monitoring; integrated GPS support for real-time asset tracking; advanced SMS diagnostics and the latest security features with VPN support for a secure connection over public networks.

Conclusion

Although industrial and commercial applications have long benefited from the ability to collect, control and share equipment data via a dial-up connection, mission critical applications that depend on leased phone line services or other forms of fixed line infrastructure face a number of limitations, particularly in terms of mobility, efficiency and cost.

The widespread availability of 3G networks is enabling the unrestricted deployment of countless applications in temporary, fixed or remote locations. Reliable access to global 3G networks can be achieved using a NetComm Wireless M2M Series device specifically designed to integrate with new or existing assets, equipment and systems for location flexibility, reduced costs and increased throughput and speed.