

## ULE - A Technology Overview

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### **ULE – A market perspective**

DECT (Digital Enhanced Cordless Telecommunications) in recent years has been considered by some to be past its “sell-by” date. With the success of CAT-iq (Cordless Advanced Technology, Internet Quality) as the next generation of HD voice technology, and now with the latest adaption of the data technology, ULE (Ultra Low Energy), DECT is proving its longevity, resilience and suitability for adoption to new applications, which speaks volumes for the depth and breadth of the technology’s capabilities.

Adoption of CAT-iq as the technology of choice for HD voice, by the key Broadband Service Providers (BSPs), and the resulting integration into home gateways by the major European BSPs, has provided the ideal springboard for ULE. With a simple in-life upgrade, these gateways become the nucleus for the ULE ecosystem, enabling a myriad of home control applications. The benefits in terms of cost, reliability, and convenience are clear allowing for true efficiency in the gateway operation, with no technology silos, the inevitable result of separate voice and data technology deployments.

So strong is the value proposition, the industry standardization is leaning towards incorporating it as the key input to the planned CAT-iq 4.0, “Internet ready” profile for superior voice/data applications. Although current main deployments are routed in xDSL, CAT-iq is backhaul agnostic, and as such adaptable to all IP interfaces, whether Fixed, Cable, Mobile or Satellite. This does not however diminish the stand-alone value proposition for simpler data-only devices, which can also be deployed in connection with PSTN networks or be independent of any communication technology.

The resurgence of the technology is rooted in the strong available industry support. Initially lead by the DECT Forum, and now strengthened by the foundation of the ULE Alliance, which will take specific care in addressing ULE technology. This gives rise to the expectation that the anticipated explosion of opportunities for this technology in the coming years will attract a plethora of new market entrants, in addition to added benefits for the traditional DECT manufacturers.

This paper explores the underlying technology advantages, the benefits which ULE can bring to home wireless networking and the applications which can be enabled in this new and exciting market opportunity.

### **DECT - The technology foundation**

DECT is a mass market technology, widely deployed in Europe, US and other countries worldwide. DECT is intended for the transmission of both speech and data, and allows for Internet integration.

DECT has its own protected dedicated license-exempt spectrum. The frequency band reserved in Europe is 1880–1900MHz. In the USA, Japan, and many other countries DECT frequency bands are used with slight country-specific frequency shift, although due to the underlying modularity of the chipset systems, the same devices can cover the frequency shift by a simple change in control parameters. European DECT provides for 10 carrier frequencies, spaced at intervals of 1728MHz. Each band is modulated with a physical bit rate of 1152Mbps in the GFSK process, and supports access to 12 duplex channels in the time division multiplex process. Enjoying the benefit of the interference-free spectrum provides a significant advantage over other competitive technologies, most of which have to share open and crowded frequency bands, such as 2.4 GHz or 900MHz.

## ULE – The enhanced data path

What could be more natural than the wish to make use of the excellent physical transmission properties of DECT for the configuration and controlling of sensors and actuators in the sector of home, building automation and security. Against this background, the ULE Alliance has been formed by the DECT Forum, in order to forge ahead with the further development of the existing DECT Standard. On the one hand, compatibility is maintained with existing DECT networks,

while on the other, the new Standard has been designed to be entirely suitable for the special technical requirements in these application areas. Key is the long-term partnership between the DECT Forum and ETSI, in the development of industry standards which bring true market value and applications. The expectation is that the ULE Alliance and ETSI will continue to build on this foundation, in partnership to the continuing development of the ULE standard. Another significant part of the eco-system, is the close cooperation between the DECT Forum and the HGI, an organization which primarily brings together the key requirements of the BSPs around the home gateway proposition, and which is driving significant work in the development of requirements for Smart Home. The expectation is that the ULE Alliance will engage in supporting and deepening this relationship with HGI to ensure the technology is developed towards the real and supportable market requirements of service providers.

With ULE, an enhanced standard has been created which re-uses the DECT physical layer specification, but has undergone a number of developments on the MAC level, which make for substantially better performance with regard to low power and reaction time. To achieve this, the performance for time and frequency synchronizations has been drastically cut on connection setup. This means that the MAC layer can, for example, set up a connection, send check and/or control data, and shut down the connection again, all within 50ms. In addition, the protocol has been functionally extended by a Sleep Mode, which allows for a rapid and efficient change between the sleep periods and radio transmissions. A ULE Module for a smoke alarm, for example, which must send a “Stay Alive“ message to the central unit every 7 minutes, if fitted with a CR123 battery (1500mAh), can be operated for about 18 years. All ULE communication is encoded and authenticated on the basis of the AES (Advanced Encryption Standard) using AES CCM.

Researchers see the greatest advantage in the compatibility with the traditional DECT Standard, which has been extensively proven, for the system installation of ULE products. With a straight-forward firmware update, an existing base station can be enabled to host and manage several hundred of ULE sensors. This means that millions of installed base stations worldwide have the best possible preconditions for implementing a DECT-ULE network rapidly and cost-effectively. According to Lisa Arrowsmith, Associate Director for Connectivity at IHS, “the ability of traditional DECT gateways that are already deployed in the field today to support DECT-ULE products with only a firmware update is a significant driving force behind the ULE technology. This can be a major advantage to operators looking to offer additional services based on low-power wireless technologies in order to increase user revenues or reduce customer churn,



as separate gateways do not have to be deployed. For example, in the emerging home control market, today many operators rely on separate gateways which connect to an existing home network via Ethernet or Wi-Fi; instead, this functionality could be enabled in existing DECT gateways with a simple firmware update, reducing the cost of deployment. Residential home control represents a major market for ULE technology: according to the latest research from IHS, over 30 million DECT gateways will be shipped with, or remotely upgraded to support ULE technology and offered as part of home control platforms within the next 4 to 5 years. This then drives the market for ULE-enabled peripheral devices, such as home monitoring devices, smart plugs or HVAC controls”.

### ULE – Advantages at a glance

There are many advantages to using ULE technology, but the key benefits can be clearly identified.

- Global Standardization:** Unlike some of its competitive technologies, ULE benefits from being an open standard. The standardization of ULE was initiated by the DECT Forum, in conjunction with ETSI, focusing initially on the transport layer, which has now been published by ETSI. The responsibility for the application layer standardization is now taken care of by the ULE Alliance, who continues to work closely with ETSI to enhance the ULE standard. The ULE Alliance will also be responsible for the ULE certification program, which will ensure conformity to the standard, enabling full interoperability, quality and consistent user experience for end products deploying ULE.
- Interference Free Band:** A protected frequency band guarantees that DECT & ULE products installed today will still be working reliably many years from now. Technologies which operate on more congested frequency bands struggle to make such a guarantee, due both to the interference from multiple technologies and applications, and potential conflicts if new equipment also using the same frequency is installed in the home, which may interfere with existing installations of sensors and actuators. This can be a complicated, inconvenient and time-consuming issue for the end consumer, where previously working existing devices in the home cease to function for no explicable reason. Not so in the protected DECT band.
- Superior Secure Range:** The long range achievable by ULE, at least 50 meters in buildings and over 600 meters in the open air is combined critically with high security, thanks to the very latest encoding technologies and signatures. All communication is encrypted (no unencrypted mode), all communication/all packets are authenticated. The range is well proven with DECT technology, including the ability to handle thick walls as seen in many traditional houses, significantly further and reliable than competitive home networking technologies



- **Lowest Cost of Ownership:** There are a number of considerations which need to be taken into account when evaluating system cost. ULE benefits from a star topology, which results in fewer nodes in the system and longer achievable range from an individual device, without the need for a repeater, reducing total system cost. Building on the underlying DECT technology provides key additional benefits for the reduced system costs in two significant ways. Firstly, the install base of DECT, with over 820million sold worldwide, which continues to increase at over 100 million per annum (source DECT Forum/MZA), provides a secure supply chain, with multiple source semiconductors with high volume impact on the resulting chipset costs. Secondly, the re-use of the simple plug and play mechanisms deployed by DECT products, will benefit ULE in ease of installation for the end consumer, without the need for a truck roll, which is time consuming and costly. This simple home installation function is also expected to improve the rate of end user adoption. Last but not least, ULE will benefit from the existing install base of DECT/CAT-iq in home gateways. Due to the nature of the ULE standard, which re-uses the base DECT protocol, the existing component hardware is already capable of running ULE, leaving a low cost software upgrade, which can be implemented in-life for the gateway, and without any interruption to the existing user service. The cost saving benefit is most significant to the BSPs, with no need to develop new hardware or integrate another technology, combined with the ability to introduce new services on the existing install base of gateway, makes ULE a very strong candidate for this market.
- **Video/Audio:** This unique advantage of ULE allows for parallel video and audio applications, and can re-utilize the native communication connectivity to PSTN or IP backbone, providing immediate SMS or voice notifications of events happening within the home to the outside world.

## **ULE – Potential applications**

ULE is the ideal radio standard for sensors and actuators, such as for use in smoke, movement, and temperature detectors, or in ventilation, air conditioning, and heating systems. As well as these applications, ULE also allows many other applications to be addressed, and makes different business models possible. These range from operator enabled services, closed systems for the security services, solutions marketed and installed by electricians, and components which are available from retail outlets, all of which can be integrated seamlessly into existing infrastructures.

Here are some of the **most important applications**:

- Home Automation
  - Smart Plugs
  - Energy Consumption Awareness
  - Lighting Control
  - Remote Smart Metering
  - White Goods/Appliance Control
- Security
  - Access Control – Door Phone
  - Window/Door Sensors
  - Glass Break Detector
  - Smoke Detector
  - Water/Gas Detector
  - Baby Monitor
  - Security Camera
- Climate Control
  - Thermostats/Heating Control
  - Ventilation
  - Window Blinds
  - Air-Conditioning
- Healthcare
  - Patient Monitoring
  - Remote Medical Access
  - Emergency Helpline

## **The DECT-ULE Network**

### **The Concentrator:**

For setting up a home network with ULE, a base station is required, which represents the concentrator for the various different nodes in the system (sensors and actuators).

For more information and to read about DSP Group solutions, please reference “ULE: The Concentrator - Addressing the ideal technology solution”.

### **The Network Nodes:**

Populating the home network, sensors and actuators can be developed and simply configuration to connect.

For more information about DSP Groups’ advanced technology, please reference “ULE: The Network Nodes - Addressing the ideal technology solution”.



### **About DSP Group**

DSP Group<sup>®</sup>, Inc. (NASDAQ: DSPG) is a leading global provider of wireless chipset solutions for converged communications. Delivering semiconductor system solutions with software and reference designs, DSP Group enables OEMs/ODMs, consumer electronics (CE) manufacturers and service providers to cost-effectively develop new revenue-generating products with fast time to market. At the forefront of semiconductor innovation and operational excellence for over two decades, DSP Group provides a broad portfolio of wireless chipsets integrating DECT/CAT-iq, ULE, Wi-Fi, PSTN, HDClear™, video and VoIP technologies. DSP Group enables converged voice, audio, video and data connectivity across diverse mobile, consumer and enterprise products – from mobile devices, connected multimedia screens, and home automation & security to cordless phones, VoIP systems, and home gateways. For more information, please visit [www.dspg.com](http://www.dspg.com).



**DSP Group is a Promoter Member of the ULE Alliance**

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