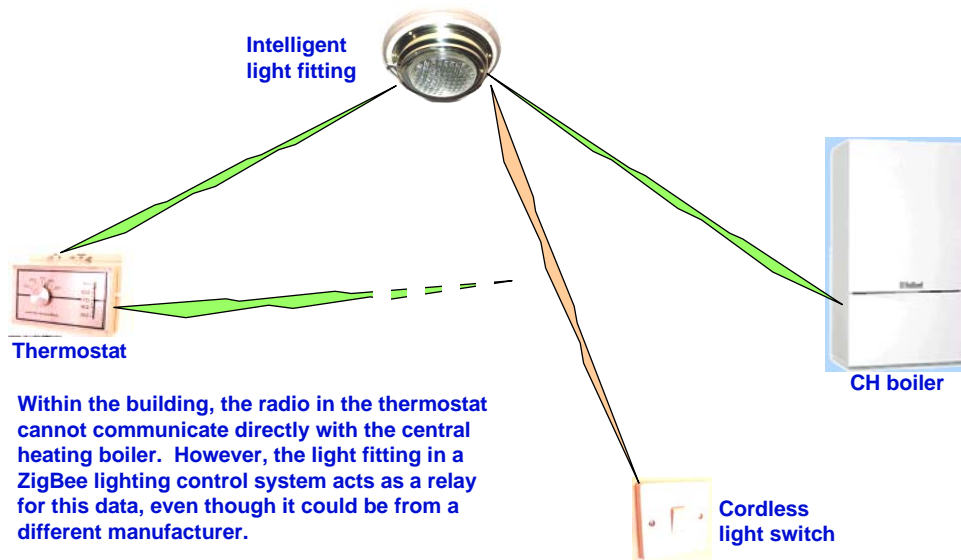


## Low Power Radio for Automation



Ultra low-power radio systems are now the subject of a new standard, ZigBee®. Because many large users and manufacturers have combined their forces, ZigBee® chips will be made in many millions per year. This makes low-power radio systems affordable – at a predicted cost of \$2 each – to a whole range of applications where a full-custom solution would have not been viable in the past.

Cambridge Consultants has developed ultra low-power radio solutions (including ZigBee®) for specialist applications for many years, using a combination of ASIC, embedded software and hardware skills to make efficient, power frugal designs. We have already made significant investments in ZigBee® silicon and software, and can offer application or product development (or both) to support your automation or telemetry application.

### ZigBee® application development

Cambridge Consultants is Ember Corporation's first application development partner in Europe, offering on-chip application software services. With a single-chip solution, we can offer the possibility of making the entire product, which might be a radio-linked thermostat or an industrial sensor, around a single chip costing two dollars in volume. We assisted Ember in its on-chip radio design, and they use our XAP™ embedded microcontroller, placing us in a unique position to extract the maximum performance from the Ember chip, for the lowest development cost.

As well as radio subsystem design, we can offer a full product development service: any or all of initial definition, feasibility, initial prototyping, full industrial, mechanical, electronic and software design and build, transfer to production, life-cycle support.

### What is ZigBee®?

ZigBee® is a radio standard based on the paradigm that outstations must be able to run for years on small, low-cost batteries. It is intended to support low data rates – which could be from a few bytes of application data per day up to tens of kilobits per second – with minimal overhead. The hardware and data-link software have been standardised in IEEE 802.15.4, and the ZigBee® Alliance is publishing standards for network control software and many applications.



Concept demonstrator: these toy monkeys have voice synthesisers and low-power radios, so they can 'converse' with each other

The networking capability of ZigBee® includes tree and mesh networks. That is to say, certain types of ZigBee® stations can relay data onward to other stations. This improves dramatically the reliability of communication, because a station that does not have good communication with its peer (like a house thermostat with the boiler) can have its message relayed by a station which has a different primary function.

Because the network layer of ZigBee® will be the same from every manufacturer, there is no need for the light fitting in this example to be made by the same company as the thermostat or boiler! Because of the power-saving functions of the ZigBee® standard, several years' operation is possible from a small battery. And when deployment (wiring, disruption etc.) costs are included in comparison with a wired solution, the wireless version offers significant savings.

### Low-cost products and development

When you buy ZigBee® chips, they will be bundled with the communication software, so the data transfer and networking functions described above are effectively free. This means that you need only develop the application software required for your particular sensor, control, actuator or other device – in many

cases only 20% of the complexity of the total solution.



Particle sensor and counter for oils using low-cost optical sensing and high-performance signal processing

ZigBee® chips are confidently predicted to sell in billions by 2010, which means that the unit cost will be \$2 or less. In turn, this suggests that wireless communication could be added to a whole range of products, ranging from toys, through electrical fittings (just unscrew that light-switch and put it somewhere else!) to complex industrial systems where it will be possible to deploy a hundred sensors in a day, perhaps just for commissioning, or perhaps permanently.

### Software with an impressive pedigree

Cambridge Consultants already develops standards-based on-chip radio software. As a member of the Bluetooth® Special Interest Group, Cambridge Consultants has

been involved from the early days of the development of the Bluetooth® standard. Today, our software forms the basis of over 65% of all qualified Bluetooth® designs including mobile telephones from Samsung, NEC and Alcatel. Since forming our 'spin-out' company, Cambridge Silicon Radio (CSR), the industry leading single-chip Bluetooth® vendor, we have continued to develop and extend our Bluetooth® software offering, enabling us to offer complete turnkey Bluetooth® development. We have also developed highly-integrated radio designs for ERMES pagers, GSM radio and others.

In addition, we have developed special-purpose sensors for a range of industrial applications, which have included wireless communications, often embedded on to the same chip as the instrument circuitry itself, for ultimate low cost in volume.

Whether you require our multi-discipline contract development services, or just a license to use our software, we are certain that our extensive experience of wireless technology will greatly assist the successful development of your product.

ZigBee® is a registered trademark of the ZigBee Alliance

Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

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