

The screenshot shows the IET website interface. At the top, there is a navigation menu with links like 'Login or Register', 'Join The IET', 'Shop', 'Help', 'A-Z', 'Contacts', and 'Home'. A search bar is located on the right. Below the menu, the main header includes the IET logo and the text 'ENGINEERING COMMUNITIES Communications Engineering'. A sidebar on the left lists 'Industry Sectors' and 'Communications Engineering sector' with sub-links for 'Technical Articles', 'Industry News', 'Events & Training', 'iet.tv - Event Webcasts', 'Website Directory', and 'Jobs & Career Development'. The main content area features a blue banner for 'Rural' by Rohde & Schwarz, and a 'News' section with the text 'by Communications Engineering -Feb/Mar 2007'. A 'Communication Engineer' link is also visible, dated 'February 2007'.

Clocking on to better time

A low-cost time source, accurate to one second in 30,000 years could improve the capacity of wireless networks, boost the quality of wired communications systems, protect financial transactions, and make positioning with 20cm resolution possible.

The source is in development by OptiSynx, an early-stage company based in Cambridge, UK. The company says it is working towards offering the accuracy of caesium-based atomic clocks, widely used as reference standards, at the price of the GPS-based alternatives in use today.

Caesium atomic clocks work by bombarding boiling caesium atoms with microwave radiation, whose frequency is adjusted to match the very precisely defined frequency at which caesium atoms change between two energy states. Once the two match, users can derive highly accurate time signals from the microwave signal. Such sources are expensive and complex, so are often substituted with rubidium-based clocks, which are less accurate, or timing derived from the atomic clocks carried on GPS satellites.

OptiSynx says its alternative derives its accuracy from directly converting a source signal running at thousands of gigahertz (terahertz or THz) down to megahertz frequencies. The fact this conversion is done in one step using optical, rather than electronic, conversion techniques avoids introducing the jitter and phase-noise components that reduce the accuracy of clocks based on multiple electronic conversion stages.

OptiSynx isn't revealing how its technology works, although co-founder and chief technology officer Dr Jeremy Sosabowski applied for a patent entitled 'Optical comb frequency source' in November 2005. The technology has been prototyped in the 'OptiBox', and the company hopes to shrink it into a hybrid 'OptiChip' if it can find the funding it needs to do so.

Dr Dominic Mikulin, CEO of OptiSynx, says the company plans to build OptiBoxes and calibrate them to a factory reference time standard, so that every OptiBox will carry exactly the same time, to the same accuracy. Once the boxes are distributed they could be used in financial applications, to ensure that when shares are traded the buy and sell signals are kept in strict order.

Mikulin says that improving the accuracy of time signals will also enable wireless network operators to squeeze more channels out of a fixed spectrum. This will be possible because operators currently have to allow 'guardbands' to stop interference between channels whose centre frequencies may shift due to poor clock accuracy.

"Effectively you could get three basestations for the price of two," said Mikulin.

Mikulin believes that putting OptiBoxes or, later, OptiChips in cellular basestations will create a shared time reference that will enable mobile handsets to be positioned by triangulation with 20cm resolution, without having to alter the handset hardware.

OptiSynx was founded in April 2006 and has had seed funding from the Cambridge Enterprise Pathfinder fund, the Gatsby Foundation, and as a winner of the Cambridge University Entrepreneurs Business Creation Competition in 2004. It is now seeking £300,000 of first-round funding to develop its technology demonstrator and start marketing it. Mikulin says OptiSynx has had such strong interest in the OptiChip idea that it will try and develop the part in parallel with the OptiBox if it can raise sufficient funding.