



15/11/2011 HKUST Develops Smarter Multi-hop Wi-Fi Network Software Greatly Improved in Signal Strength and Coverage

A research team led by Prof Gary Chan, Associate Professor of the Department of Computer Science and Engineering in the Hong Kong University of Science and Technology (HKUST), has developed a multi-hop wireless mesh network to greatly improve the data access of Wi-Fi networks. The software of the network LAviNet (Lean Aviation Network) implements a set of innovative channel selection and routing algorithms which effectively avoid traffic congestion and reduce signal interference. With LAviNet, user data rate is measurably increased by more than two times and the signal strength significantly enhanced by 100 times. This tremendously improves wireless data transmission efficiency and coverage. LAviNet has been successfully commercialized and well received by the industry and end users.



(From left) HKUST Prof Gary Chan and Modern Terminals Limited Mr Chung-keung Cheng elaborating the distinctive performance of LAviNet.

Current Wi-Fi networks suffer from limited coverage range, high interference and costly setup. In some harsh environments such as airports and container terminals, cabling is very costly or sometimes even impossible, making Wi-Fi access challenging. To overcome these problems, Prof Chan's team invented and developed LAviNet, a software enabling an adaptive and high-performance multi-hop Wi-Fi network. LAviNet can be simply installed into most Wi-Fi access points and wireless routers without the need of replacing the existing costly infrastructure. A Wi-Fi client in the network, without installing any software, can connect to the network to enjoy reliable and fast Wi-Fi data service. LAviNet intelligently searches and assigns optimal wireless channels and routing paths. This greatly enhances its performance and maximizes the wireless coverage areas.

Prof Chan explained, "Most of the existing wireless solutions are based on installing access points fixed in some places. In environments or terrains with obstructions and dynamic blind spots, such fixed access points no longer work well. Whilst there has been much academic research on wireless mesh, we seamlessly integrate applied research with actual implementation to innovate a wireless mesh solution for practical deployment with the support from Hong Kong Government and industry. We develop LAviNet with the research goal to minimize interference and maximize throughput, so that it always chooses the best channels and paths. To address the dynamic blind spot problem, LAviNet has a flexible routing algorithm to fast switch to a backup path based on the wireless link quality measured in real time."

Mr Chung-keung Cheng, Information Technology Services Manager of the Modern Terminals Limited, added, "Because of the vast area and many moving metallic cranes in our container terminals, offering pervasive Wi-Fi service is very challenging. For a long time, we have been interested in uninterrupted wireless coverage for real-time logistic management. The

multi-hop wireless technology developed by Prof Chan's team provides us a timely and effective solution. Trials have shown that their technology achieves substantially better performance, user satisfaction and cost-efficiency over other existing products. It is an exemplary demonstration of the transfer of world-class research results to practical industrial deployment. We would like to continue collaborating with Prof Chan to develop advanced and proven wireless solutions to enhance our network and increase Hong Kong's competitiveness in the container terminal business."

Prof Joseph Hun-wei Lee, Vice-President for Research and Graduate Studies, pointed out, "Innovative technology holds the key to Hong Kong's transformation into knowledge-based economy. HKUST has long been promoting social and economic development in Hong Kong through innovative research. LAviNet is one successful example in which the University, Innovation and Technology Commission and the industrial companies join hands in commercializing scientific research outputs. I have high hopes for LAviNet to be extensively applied in enhancing the industry's efficiency and competitiveness."

Currently, the LAviNet project team led by Prof Chan consists of about 20 graduates, postgraduates and undergraduates from the Department of Computer Science and Engineering and the Department of Electronic and Computer Engineering. The research and development work on LAviNet started in 2007. The Technology Transfer Center of HKUST has been offering initial proof-of-concept seed funding and industrial contractual advice. The project has been supported by the Innovation and Technology Commission (ITC) of Hong Kong Government for technology transfer and commercialization. It has also been sponsored by industrial companies including the Boeing Company, Hong Kong Aircraft Engineering Company (HAECO), OpenPlatform Technology, Modern Terminals Limited, Ruckus Wireless and Altai Technologies Ltd in terms of funding, technical advice, facilities and trial supports. Through innovative applied research with the feedback from actual implementation and deployment, the team has completed numerous trials and software improvements under real industrial settings to successfully bring LAviNet to commercial use.

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For media enquiries, please feel free to contact :

Brenda Yau

Tel: 2358 6317 / 9103 2928

Email: brendayau@ust.hk

Mavis Wong

Tel: 2358 6306

Email: maviswong@ust.hk