LOK FU MASS TRANSIT RAIL STATION *(MTR)*, **HONG KONG**

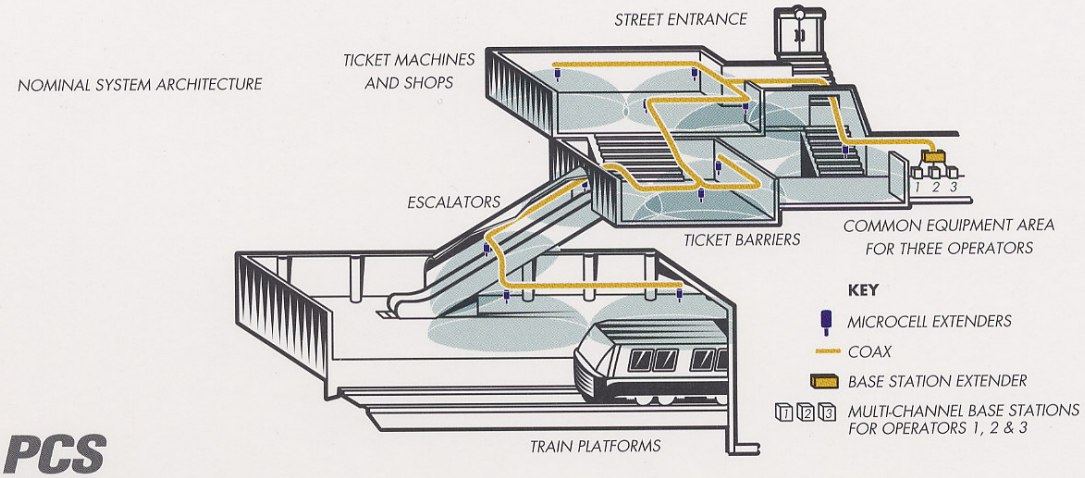
In Spring 1994, PCS Wireless, Inc. trialed the first distributed antenna array for Lok Fu Mass Transit Railway (MTR) Station in Hong Kong. The city has a busy population of 6 million who make daily use of 38 similar MTR stations. The three Operators of CT-2 public service cooperated to provide Lok Fu with single distributed arrays. This array "maps" the train platforms, escalators, ticket barriers, ticket halls and associated shops up to the street entrances. Seamless roaming is available throughout the mapped area.

Treating the shared antenna array as a common resource capable of supporting 14 simultaneous wireless voice circuits, the three Operators locate their base station equipment in a common, locked room. The advantages of this scheme include:

Simplified site access. Prior to the antenna arrays, the MTR site owner faced the possibility of having to accommodate three different networks, which collectively had the potential of causing a significant disruption to business.

Shared costs. Infrastructure and some recurring costs, such as site rental, are reduced for each Operator.

Seamless mobility for CT-2 users. Usually CT-2 users must stay within a small designated area to make a call. With a distributed antenna array they are free to roam throughout the system.



PCS WIRELESS, INC.

PCS Wireless, Inc.
Suite 95, 200 Granville Street
Vancouver, B.C., Canada V6C 1S4

SINGLE DISTRIBUTED ARRAY, SINGLE PUBLIC SERVICE OPERATOR

PCS WIRELESS, INC.

PCS TECHNOLOGY AT WORK

TWO WAY CT 2 SERVICE

Brisbane Airport, Australia is using a PCS Wireless distributed antenna for Telecom Australia's CT-2 service. Telecom Austrailia's service is fully "two-way", providing incoming and out-going calls in a public place.

Advantages of a Distributed Antenna in Two-Way Applications

- Simplified Mobility Management resulting in lower costs for the Operator

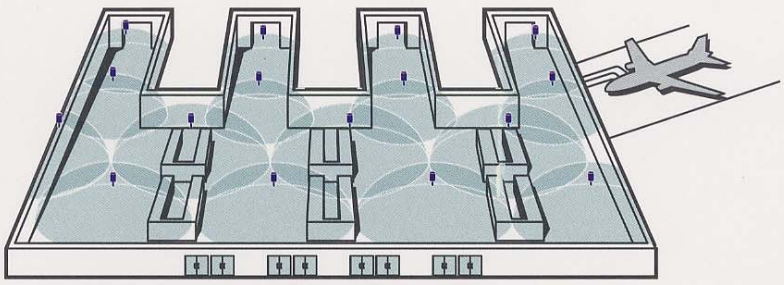
- Simplified caller registration, resulting in improved service quality for the public

BRISBANE AIRPORT, AUSTRALIA

Brisbane Airport, Australia has implemented a 16 MEX distributed antenna array from PCS Wireless, Inc. The array "maps" the airport so that a person who registers the handset with the mobility manager while standing in line at the Check-In desk, is still registered while waiting at the Airport departure Gates. Prior to the use of the distributed antenna arary, the person was required to manually register in each area, since they were distinct coverage zones. With the 16 element distributed antenna array there is only one coverage zone, allowing a single manual registration to deal with the whole building.

NOMINAL SYSTEM ARCHITECTURE

16 MEX distributed array provides single antenna two-way calling capabilities from airport check-in desk to jet-way.



PCS WIRELESS, INC.

PATENTED TECHNOLOGY CHANGING THE WAY THE WORLD COMMUNICATES

PCS Wireless, Inc.
Suite 95, 200 Granville Street
Vancouver, B.C., Canada V6C 1S4

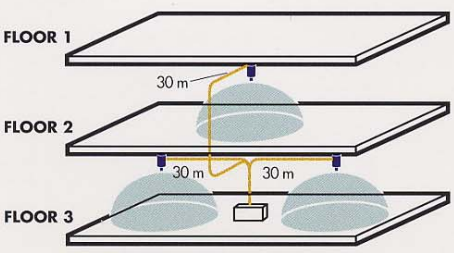
Golden Mile Tower Shopping Centre, Singapore uses a PCS Wireless distributed antenna array to replace the previous CT-2 network in the shopping mall.

GOLDEN MILE TOWER, SHOPPING CENTRE, SINGAPORE

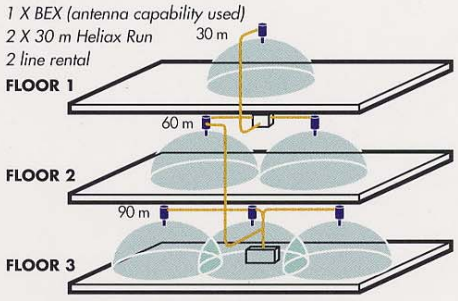
Singapore Telecom operates a CT-2 network throughout Singapore. In 1992/93 Singapore Telecom installed a distributed antenna array from PCS Wireless, to compare against its prior set up, in an indoor *(shopping mall)* **environment. Similar comparisons have been made in Malaysia's Sangei Wang shopping mall in Kuala Lumpur by Malaysia Telecom.**

CROSS SECTION OF SHOPPING CENTRE

PRIOR SYSTEM:
3 Dual voice Circuit Base Station
3 Heliax runs of 30 m to the antenna site
6 line rentals



DISTRIBUTED ANTENNA SYSTEM:
1 X Dual voice Circuit Base Station
3 X MEX
1 X BEX (antenna capability used)
2 X 30 m Heliax Run
2 line rental



The PCS Wireless Advantage

Distributed Antennas compared with the prior set-up:

- Distributed Antennas are lower in recurring and non-recurring costs
- Distributed Antennas support roaming
- Distributed Antennas may be easily upgraded to support more traffic
- Distributed Antennas allow wider choices of antenna sites which in practical terms result in better coverage areas

	PRIOR SYSTEM	*WITH DISTRIBUTED ANTENNAS*
Net Hardware Costs	*$12,000 US*	*$ 8,000 US*
Recurring Costs	*6 line rental*	*2 line rental*
% Coverage on Floors	*1 20%* *2 60%* *3 80%*	*1 60%* *2 90%* *3 90%*
Roamer Capability	*No Capability*	*Full Capability*
Maximum Traffic in a Locale	*2 Callers*	*2 Callers*

PCS WIRELESS, INC.

PATENTED TECHNOLOGY CHANGING THE WAY THE WORLD COMMUNICATES

PCS Wireless, Inc.
Suite 95, 200 Granville Street
Vancouver, B.C., Canada V6C 1S4

John Muir Hospital, Walnut Creek, California uses Ericsson Freeset handsets with software hand-off capability between different base stations and multiple PCS distributed arrays.

JOHN MUIR HOSPITAL IN WALNUT CREEK

The John Muir Hospital in Walnut Creek *(near San Fransico),* **California was used as an experimental site by Telesis Technologies Laboratory** *(a wholly owned subsidiary of Pacific Telesis),* **for PCS Wireless, Inc.'s Microcell Extender for Ericsson's Freeset wireless telephony system for office and work-site applications. After the tests were complete, the John Muir executives were sufficiently impressed by the worth of the system to procure the system and run it exclusively for their own benefit.**

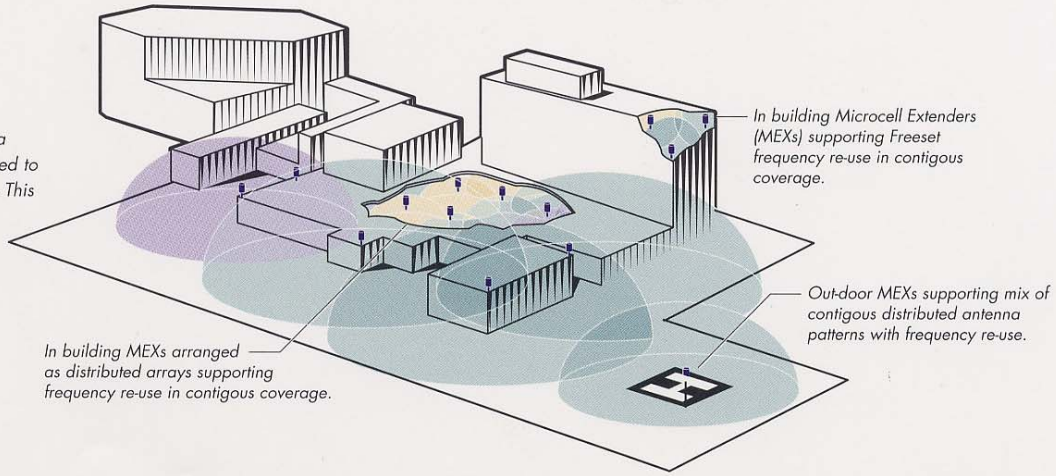
DISTRIBUTED ANTENNAS FOR FREESET

Advantages

- Allows net coverage area to be extended for a given base station investment
- Tolerant of surges in demand for wireless telephony, in any give locale
- Compatible with Ericsson's frequency re-use, switched antenna diversity and mobile management systems
- Reduced systems cost for given Grade of Service

TELESIS QUOTE "Coverage of the distributed antenna elements met TTL's design expectations and, when used to replace base stations, provided equivalent coverage. This trial use provides a further validation of the value of distributed antenna technology in PCS deployment, particularly in areas of low demand density."

Telesis Technologies Laboratory,
Experimental License Program Report,
February 1994.



PCS WIRELESS, INC.

PATENTED TECHNOLOGY CHANGING THE WAY THE WORLD COMMUNICATES

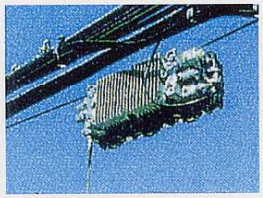
PCS Wireless, Inc.
Suite 95, 200 Granville Street
Vancouver, B.C., Canada V6C 1S4

A NEW ALTERNATIVE FOR MOBILE TELEPHONE NETWORKS

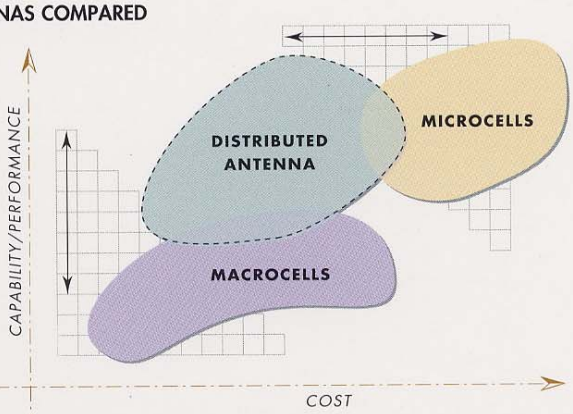
PCS WIRELESS, INC.

PCS TECHNOLOGY AT WORK

WIRELESS TELEPHONE NETWORKS TYPICALLY EMPLOY EITHER HIGH POWER MACROCELLS OR LOW POWER MICROCELLS. NOW PCS DISTRIBUTED ANTENNA ARRAY SYSTEMS PROVIDE THE BEST OF BOTH WORLDS FOR MOBILE TELEPHONE NETWORKS.

TECHNOLOGY	ADVANTAGES	DISADVANTAGES
MACROCELLS 	• Low cost approach to communicate with high power vehicular traffic over large distances	• Expensive approach for supporting very high traffic demands • Lower power "pocket phones", are less satisfactorily served inside the coverage zone • "Power and Tower" is inappropriate for many markets (e.g. wireless switchboards, PCS networks, etc.)
MICROCELLS 	• can support very high traffic demands • gives good support to low power "pocket phones" within the coverage zone	• Expensive approach for supporting low traffic demands • Cost of equipment is amortised over a small coverage zone • require a high cost mobility management capability to support roamers
DISTRIBUTED ANTENNAS 	• Lower cost than microcells • supports low power "pocket-phones" and low power vehicular traffic • lower cost than macrocells at very high traffic levels • greatly reduced mobility management requirements • can use pre-existing cable TV Plant to compete with macrocells	• does not cost compete with "power and tower" for vehicular traffic at lowest traffic densities

MACROCELLS, MICROCELLS AND DISTRIBUTED ANTENNAS COMPARED



PERFORMANCE ADVANTAGE: Distributed Antennas outperform macrocells for the same cost, when the macrocell structure matures towards high capability (e.g. local loop replacement PCS).

COST ADVANTAGE: Distributed Antennas are lower cost for the same or better performance Markets: PCS networks, and wireless worksite networks.

PCS WIRELESS, INC.

PATENTED TECHNOLOGY CHANGING THE WAY THE WORLD COMMUNICATES

PCS Wireless, Inc.
Suite 95, 200 Granville Street
Vancouver, B.C., Canada V6C 1S4