Theme E: Cyber Physical Testbeds and Large Scale Deployments

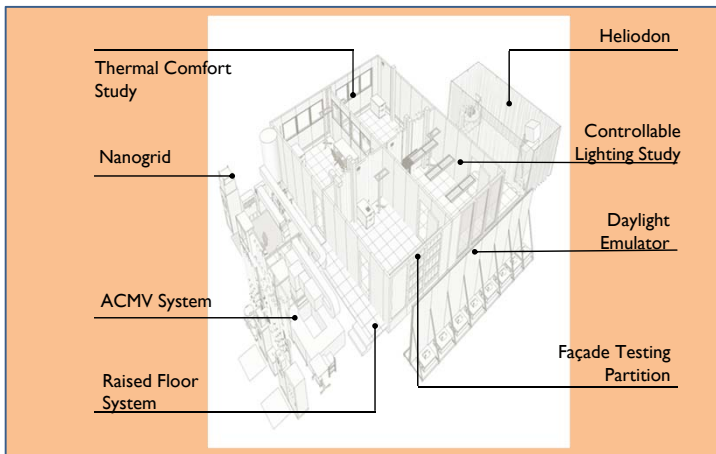Costas Spanos, Sanjib Panda, Adrian Chong, Khalid Mosalam, Edwin Goh

Experimental Capabilities and Support through Cyber-Physical Test Bed

The SinBerBEST Cyber-Physical is an invaluable crucible for proposed technological innovations, migrating technologies from concept to robust prototype and eventually to commercialization within a streamlined framework. It is used to verify the in vivo performance, efficiency and effectiveness of technology innovations developed in Themes A through D.

Thermal Comfort Study

Heliodon

Nanogrid

Controllable Lighting Study

ACMV System

Daylight Emulator

Raised Floor System

Façade Testing Partition

The Testbed offers:

1) the capability to execute real-time operation and control within the regulated indoor environments to support a wide range of research missions.

2) diverse capabilities including a Daylight Emulator, an artificial sky, a fully controlled Air Conditioning and Mechanical Ventilation (ACMV) test-bed, a Nano-grid, and a Façade Management System;

3) industry participation

Thermal Comfort and Ventilation Chamber for human subjects participation in environment perception, sensation and productivity studies

Daylight Emulator

Chamber used for controlled lighting studies

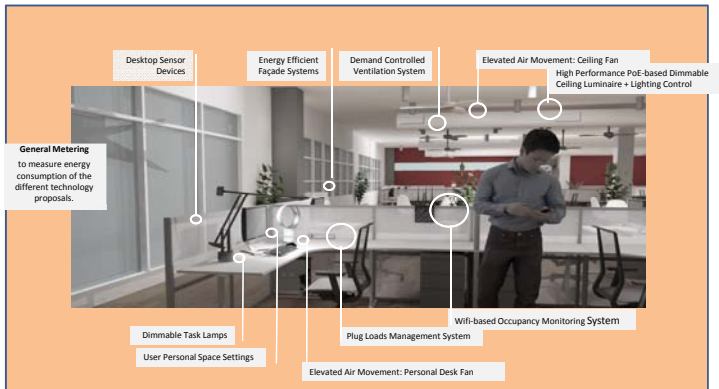Nanogrid system: Centralized monitoring system and mitigate power fluctuation

Experimental Opportunities and Support in the Community

The final goal is to transition SBB technologies and innovations to the marketplace. After validation at the Cyber-physical Testbed stage, the next stage involves deploying technologies in the field. In this way, technologies will be hardened through exposure to actual real-world uncertain conditions.
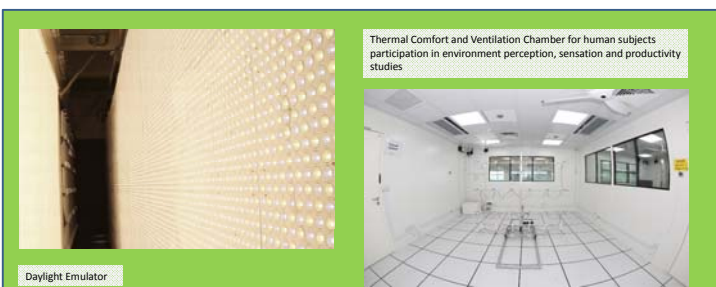

Desktop Sensor Devices

Energy Efficient Façade Systems

Demand Controlled Ventilation System

Elevated Air Movement: Ceiling Fan

High Performance PoE-based Dimmable Ceiling Luminaire + Lighting Control

General Metering to measure energy consumption of the different technology proposals.

Dimmable Task Lamps

User Personal Space Settings

Plug Loads Management System

Elevated Air Movement: Personal Desk Fan

Wifi-based Occupancy Monitoring System

An example of a field deployment involves a large scale activity at the Building and Construction Authority (BCA) Academy Zero Energy Building. This exercise involves a complete, integrated deployment of sensing, control, lighting, ACMV, façade and data visualization technologies into a space for office workers. This project is meant to create and operate a 'living laboratory'.