

## Data centre monitoring rationale

Monitored Parameter	Recommended Practice		Expected Benefits	Relevance and Priority against Business Objectives				
	Monitoring	Control		Energy Monitoring	Energy Management	Equipment Protection	Service Level Compliance	Warranty support
<b>Ambient Temperature</b>	Static or mobile wireless sensors level with top of rack doors. U.S. ASHRAE guidelines also stipulate top, middle and bottom of rack. Sensor spacing depends on objectives.	Static wireless sensors level with top of rack doors. U.S. ASHRAE guidelines also stipulate top, middle and bottom of rack. Average or maximum temperatures used via BMS as CRAC cooling set-point	Battery-powered wireless sensors permit easy reconfiguration with equipment moves. Data used for hot spot detection and CRAC closed loop control. When used for control allows improved air cooling management, reducing costs.	High	High	High	High	High
<b>Ambient Humidity</b>	Static or mobile wireless sensors distributed throughout raised floor area and in AHU return ducts. Often combined with temperature sensors.	Static or mobile wireless sensors distributed throughout raised floor area and in AHU return ducts. Average humidity used via BMS as AHU set-point	Wireless sensors permit easy reconfiguration with equipment moves. Data used to improve equipment protection against static and for AHU closed loop control. When used for control allows improved humidity management, reducing costs.	High	High	High	High	High
<b>Chilled water energy delivered</b>	Meter water flow and in/out temperature differential values to compute direct cooling kWh. Non-invasive flow sensors to ease installation. Wireless transmission of meter data. Monitor main manifolds, key branches, down to individual CRAC's, depending on objectives		Chilled water system efficiency optimisation. Early warning of equipment degradation or failure. Apportionment of cooling energy delivered by area in shared facilities	High	High	High	Mid	Mid
<b>Electrical power consumption</b>	Meter main and sub-circuits. Existing meters with pulse or Modbus outputs can be read wirelessly. Install non-invasive retrofit sub-meters to DB's or individual PDU's to understand power usage across raised floor and facility as a whole		Real-time calculation of PUE or DCIE. Comply with CRC regulations. Electrical power usage optimisation. Manage phase imbalance or circuit overload issues. Re-bill power usage in shared or tenanted facilities.	High	High	Mid	Low	Low

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<b>Sub-floor air pressure</b>	Install wireless differential pressure sensors in sub-floor or in specially equipped floor tiles. Wireless mobility allows a few sensors to be deployed across the entire facility.	Install wireless differential pressure sensors in sub-floor or in specially equipped floor tiles. If being used for control the wireless flexibility allows easy optimisation of sensor placement. Use for control normally requires more sensors.	Improve cooling efficiency. Ensure correct distribution of cool air to occupied racks. Resolve causes of pressure imbalance such as blocked filters. Speed-control CRAC fans. Highlight losses due to incorrectly fitted floor tiles and open spaces around cable ducts.	Low	Low	High	Mid	Low
<b>Airborne dust contamination</b>	Install wireless dust detection sensors. Usually a type of particle counter. Various levels of sophistication are available. Wireless data allows easy mobility so a few sensors can cover large areas	Management of dust levels usually involves manual intervention to correct causes of dust generation. Monitored data is used to direct activity	Lower the risks of equipment failure due to dust build-up. Ensure air filtration maintenance regime is correct and optimal. Reduce costs associated with both. Manage effectiveness and risks of air-side economisers in dusty outside environments.	Low	Low	Mid	High	High
<b>Water leak detection</b>	Install water leak detection sensors in vulnerable locations. Can be zoned. Wirelessly transmit sensor status to monitoring system	Management of water leaks usually involves manual intervention to correct cause of leak. Monitored data is used to direct activity	Protect equipment, improve reaction time to occurrence of problem and therefore reduce outages. Water accounts for 27% of incidents.	Low	Low	High	High	High
<b>Smoke detection</b>	Install smoke detectors in desired locations such as AHU return ducts, CRAC unit plenums, in sub floor and/or raised floor area. Wirelessly transmit data to monitoring system	Install smoke detectors in AHU return ducts, CRAC unit plenums, in sub floor and/or raised floor area. Wirelessly transmit data to relevant control system	Early detection of smoke as a result of equipment failure or fire. Mitigate risk of event escalation or catastrophic fire. Protect personnel. Note that in some countries use of a wireless system as the sole fire alarm may be regulated	Low	Low	High	High	Low

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<b>Personnel presence detection</b>	Install wireless battery-powered PIR detectors in any area where personnel presence is of concern. Wireless battery-powered sensors allow easy installation and optimisation of placement. Wireless integration of 'man down' and lone-worker protection systems is also possible. Feed data into monitoring or control systems depending on objectives		Protection of personnel working in specific areas. Awareness of personnel entering unauthorised areas. Combine with access control systems to more fully manage and protect staff on site	Low	Low	Mid	Low	Low