

Data Center Maintenance

MAINTENANCE NEEDS · STRATEGIES · MAINTENANCE TYPES · ENVIRONMENTAL FACTORS · PREVENTIVE & PREDICTIVE

STUDY & REVIEW

01 MUST KNOW

if you remember five things, remember these

- 01 Three strategies:** maintenance strategies fall into three categories — **predictive** (measurements and data analysis reveal trends or irregularities that could cause a failure, so staff act *before* it happens), **preventive** (regularly scheduled steps that prolong an equipment's lifecycle), and **corrective** (performed in response to a problem that has already occurred, such as repairing a leak). **Reliability-centered maintenance** combines predictive with the traditional preventive and corrective practices.
- 02 Four maintenance types:** regardless of strategy, a data center uses **hands-on** (qualified on-premise technicians for quick emergency fixes), **non-invasive** (specially designed software tracks manufacturer-prescribed routines), **scheduled** (planned in advance from manufacturer recommendations, historical records, experience, and business needs; run in shifts, rotations, or off-hours), and **condition-based** (a *type of corrective* maintenance triggered by malfunction symptoms — inspect → identify → rectify → test).
- 03 Inspect inside and out:** maintenance covers **internal** factors (circuit boards, cables/layout, capacitors, insulation, filters, ventilation, cooling, power backup, alarms, fire extinguishers, automated temperature/humidity checks) and **external** factors (cleanliness, corrosion, roof penetrations, noise, earthing cables, nearby construction, open windows/doors). On the knowledge check, *temperature and humidity levels* count as an **external** factor.
- 04 Preventive vs predictive:** both share one goal — **avoid unpredicted downtime**. **Preventive** is a *routine, scheduled* inspection performed even when equipment runs well; it extends equipment life. **Predictive** is *not* scheduled on a routine plan — this module initiates it when equipment shows **signs of malfunctioning** (noise, vibration, high temperature, increased power draw) and addresses it with a timely repair.
- 05 Plan, then budget:** a **master maintenance plan** delivers the benefits: increased reliability, enhanced equipment life, reduced risks/failures, performance efficiency, and compliance with regulations and **SLAs**. Prerequisites come first (prioritize infrastructure, clarify roles, stock tools, define KPIs, stay cost-effective *without* sacrificing safety and availability). Doing predictive + preventive well helps **avoid** costlier corrective work.

02 KEY TERMS

TERM	DEFINITION
Maintenance plan	Covers inspection, fault detection, and repair of faults and damages; implemented at regular intervals to track progress and find underlying causes before complete failure
Predictive maintenance	Uses measurements and data analysis to recognize trends or irregularities that can cause a failure, so staff address them before a failure occurs
Preventive maintenance	Prolongs an equipment's lifecycle by taking regularly scheduled steps to perform its required maintenance; done even when equipment runs well
Corrective maintenance	Maintenance performed in response to a problem that has already occurred, such as repairing a leak
Reliability-centered maintenance	Emerging strategy that combines predictive (data-driven) maintenance with traditional preventive and corrective maintenance
Hands-on maintenance	Employs qualified on-premise technicians who deliver quick solutions to emergency equipment failures or damages
Non-invasive maintenance	Specially designed software manages maintenance procedures and schedules and checks routines as prescribed by the manufacturer
Scheduled maintenance	Regular maintenance planned in advance from manufacturer recommendations, historical records, experience, and business needs; run in shifts, rotations, or off-hours

TERM	DEFINITION
Condition-based maintenance	A type of corrective maintenance that acts when equipment shows malfunction symptoms; inspect, identify, rectify, and test the equipment
Infrastructure maintenance	Overall strategies: analyze operations, maintain cleanliness, modify existing designs, replace equipment before it fails, and organize replacement plans
Equipment maintenance	Preventive, predictive, or corrective maintenance of all data center equipment: routine inspections, automated software, and equipment rotation
AI-driven flash drives	Storage with built-in sensors and AI telemetry that continuously monitor IT equipment and run predictive analytics to report anticipated problems

03 THE THREE MAINTENANCE STRATEGIES

the air-filter example is knowledge-check gold

STRATEGY	HOW IT DECIDES MAINTENANCE IS NEEDED	AIR-FILTER EXAMPLE
Predictive	Measurements and data analysis flag trends or irregularities before a failure	Replace the filter at a projected date based on air-quality measurements
Preventive	Regularly scheduled steps carried out on a plan	Replace the filter at the scheduled date
Corrective	Reacts after a problem has already occurred	Replace the filter after it caused an AC unit failure

04 THE FOUR MAINTENANCE TYPES

match type ↔ description for KC 1

TYPE	WHAT IT IS	KNOWLEDGE-CHECK MATCH
Hands-on	Qualified on-premise technicians for quick emergency fixes	Employing adept technicians on-premise
Non-invasive	Specially designed software tracks manufacturer routines	Implementing specially designed computer software
Scheduled	Planned in advance from manufacturer recs, history, experience, business needs	Deciding well beforehand with strategic planning
Condition-based	A <i>type of corrective</i> maintenance triggered by symptoms	Corrective — inspect, identify, rectify, test

05 ENVIRONMENTAL FACTORS TO INSPECT

temperature & humidity levels → external

INTERNAL FACTORS <i>inside the facility and equipment</i> — Circuit boards; cables and layout — Capacitors and assembled parts — Insulation and filters — Ventilation and cooling systems — Power backup system — Alarm system and fire extinguishers — Automated temperature and humidity checks; calibration	EXTERNAL FACTORS <i>around and outside the site</i> — Cleanliness and corrosion — External fitting leaks; roof penetrations — Noise — Temperature and humidity levels — Earthing cables and connections — Open windows, doors, and nearby construction — Concurrent activity; safety and security precautions
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06 PREVENTIVE MAINTENANCE PROCESS FLOW

select → test → next-or-fix

01 Select the equipment to inspect → **02** Run it and let it complete its function → **03** Good, no malfunction → move to next equipment → **04** Issue found → identify and fix; repeat until resolved

- ✗ Temperature and humidity are only an internal factor. — The deck lists *automated checks for temperature and humidity* under internal factors, but the knowledge check classifies **temperature and humidity levels** as an **external** factor. Watch the exact wording.
- ✗ Condition-based maintenance is its own strategy, separate from corrective. — Condition-based maintenance **is a type of corrective maintenance**: it reacts to a malfunction symptom (overheating, vibration, noise, leaks) by inspecting, identifying, rectifying, and testing.
- ✗ Redundancy and software efficiency are benefits of maintenance. — On the knowledge check the benefits are increased **reliability**, reduced **risks**, and increased **compliance with regulations and SLAs** — not *increases redundancy* and not *software efficiency* (the deck says **performance efficiency**).
- ✗ Cutting cost can outweigh safety. — A prerequisite is cost-effectiveness **without compromising the safety and availability** of the data center; the distractor that ignores safety to save money is wrong.
- ✗ Predictive maintenance is the routinely scheduled, always-monitoring one. — In this module predictive is **initiated when equipment shows signs of malfunctioning**, cannot be pre-scheduled, and does **not** involve regular monitoring and care — the opposite of preventive.
- ✗ Preventive maintenance runs only when equipment looks faulty. — Preventive is a **routine, scheduled** process performed **even when equipment is running well** and shows no symptoms; that is exactly what extends equipment life.
- ✗ Predictive maintenance costs more than preventive. — The module calls predictive a **cost-effective** process, and doing predictive + preventive well helps you **avoid** the more expensive corrective repairs.

08 SELF-QUIZ

answers are upside-down below

- Q1** Name the three categories that maintenance strategies fall into.
- Q2** Which emerging strategy combines predictive (data-driven) maintenance with traditional preventive and corrective maintenance?
- Q3** List the four maintenance types used in a data center.
- Q4** Condition-based maintenance is a type of which strategy?
- Q5** Which maintenance type uses specially designed software to track manufacturer-prescribed routines?

- Q6** In the air-filter example, which strategy replaces the filter on a projected date based on air-quality measurements?
- Q7** On the knowledge check, are temperature and humidity levels classified as an internal or external factor?
- Q8** What single goal do preventive and predictive maintenance share?
- Q9** Which storage technology uses built-in sensors and AI telemetry to continuously monitor equipment and run predictive analytics?
- Q10** Name any three benefits of a data center maintenance master plan.

ANSWER KEY (rotate the page)

Q1 predictive, preventive, corrective **Q2** reliability-centered maintenance **Q3** hands-on, non-invasive, scheduled, condition-based **Q4** corrective maintenance **Q5** non-invasive maintenance **Q6** predictive maintenance **Q7** external **Q8** to avoid unpredicted downtime that disrupts business **Q9** AI-driven flash drives **Q10** any three of: increased reliability, enhanced equipment life, reduced risks/failures, performance efficiency, compliance with regulations and SLAs