IBM Portable Modular Data Center Overview for Critical Facilities Round Table
Key messages

- Containers are not the only modular solution, but the containerized data center market has been growing for many years and continues to catch on.

- Containerized data centers must be flexible, modular, quick to deploy data center solutions for use in any environment, anywhere in the world.

- Identifying the intended use is the critical step in translating clients' needs to the data center design requirements.

- Operational considerations remain the key evaluation criteria for a data center:
  - Availability for continuous operations
  - Flexibility of design and location support
  - Quick to deploy data center solution

- Leverage a partner with vast data center design and build experience to help determine and implement your data center needs.
Design new data centers for flexibility
*IBM’s data center family™ solutions align to your business and cost objectives.*

**Scalable modular data center**
- Functional mid-size data center
- Improve availability & scalability
- Deploy in 8-12 weeks

**Enterprise modular data center**
- Flexible capabilities over 20 years
- 18x power and cooling growth
- Modules sizes starting at 5K sq ft

**Portable modular data center**
- Fully functional data center
- Implement anywhere, any climate
- Continuous operations during IT maintenance
- Deploy in 12-14 weeks

**High density zone**
- 35% lower cost than site retrofit
- New life to older data centers
- Minimal operations impact during upgrade

15-20% lower TCO than traditional data centers

Defer 40-50% of capex and opex cost

IBM PMDC includes the requirements for a new data center – Focused on providing continuous operations and flexibility

**Business objectives**
- Meet business and IT growth
- Align capital and operating costs
- Flexible to support new technology
- Faster time to deploy
- Reduce risk
- Security

**Data centre requirements**
- High availability
- Provide required capacity
- Optimize capital costs
- Maximize scalability
- Maximize flexibility for technology and computing model adoption
- Minimize capital and operational costs
- Interconnect IT, data centers and buildings for data centre operations management excellence
Perspective on containerized data center market

Based on discussions with over 1000 companies, we’ve seen the containerized data center market experience its own hype curve in the past few years.

Clients showed interest but did not understand the solution, how to apply it or how it would fit in their IT structure.

Same clients return with more educated inquiries to determine right fit for the right use.

More insightful proposals requested based on intended use and data center requirements.
IBM has global experience in modular data center design and build and containers

Over 500 implementations of modular data centers in the past 2-3 years
## A Snapshot of Some Successful IBM PMDC Engagements

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>COUNTRY</th>
<th>PMDC Configuration</th>
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<tbody>
<tr>
<td>Energy</td>
<td>Denmark</td>
<td>1 x 20'</td>
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<tr>
<td>Distribution (Heavy Equipment)</td>
<td>Australia</td>
<td>2 x 20'</td>
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<tr>
<td>IT</td>
<td>Spain</td>
<td>1 x 40' + 1 x 20'</td>
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<tr>
<td>Finance (Banking)</td>
<td>Poland</td>
<td>1 x 20'</td>
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<tr>
<td>Oil and Gas</td>
<td>Turkey</td>
<td>1 x 20'</td>
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<tr>
<td>Telecommunications</td>
<td>Canada</td>
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<tr>
<td>Military</td>
<td>USA</td>
<td>4 x 20' + 1 x 10'</td>
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<td>Finance (Banking)</td>
<td>Denmark</td>
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<td>Finance (Banking)</td>
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<td>Media</td>
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<td>Pharmaceutical</td>
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<td>Telecommunications</td>
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<td>Transportation / Distribution</td>
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<td>Retail</td>
<td>Netherlands</td>
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<tr>
<td>Chemical</td>
<td>China</td>
<td>1 x 20'</td>
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The “intended use” is the critical step in translating clients’ needs to the data center design requirements.

- Remote data center
  - Remote locations
    - Where building a data center is challenging
    - Emerging markets - critical skills may not be available
    - Space challenges
  - Disaster recovery
  - Business cycle coverage
  - Movie production
  - Disaster avoidance / recovery
  - Alternative to co-location
  - Take advantage of low energy cost areas
  - Remote users: Oil/gas exploration, mining, offices, manufacturing

- Temporary data center solutions
  - Address increased needs during construction

- Mobile Applications
  - Military needs
  - Sporting events
  - Military needs
  - Disaster avoidance
  - Disaster avoidance / recovery

- Data Center Expansion
  - Address space concerns
  - High density cooling solutions
  - Co-location alternative
  - Low cost real estate
  - Consolidation / Rationalization

- Cloud Computing
  - High performance computing applications
  - Point of use locations
  - Locate in low cost areas (lower TCO)
  - Specialized needs

- Cloud computing

- Cloud computing
IBM’s PMDC provides the operational features you expect in a fully functioning data center— in the form factor of our container solution

- **Continuous IT operations to meet availability needs**
  - Allow internal service and maintenance without operations disruption
  - Provide physically secure environment with complete IT and data center infrastructures
  - Improve internal service and maintenance with a low density rack rail system by removing potential aisle-way obstructions

- **Flexible designs to meet specific client needs**
  - Complete data center infrastructure designed and sized to meet your specific needs
  - IT environment designed to support open IT architecture with most any type IT rack
  - Improve energy efficiency while reducing risk of contamination with a 1.5 year payback with natural free cooling
  - Increase rack capacity by 15-20% with the motorized IT rack rail system

- **Quickly deploy a fully functional data center anywhere in the world**
  - Complete, flexible solutions with full data center infrastructure
  - Solutions provide complete installation flexibility in any environment anywhere in the world
  - Typical deployment in 12 – 14 weeks
Pelio and Associates chooses IBM PMDC containers for modular data center park to house clients at co-location facility

Business challenge:
- Client needs “on demand” data center capacity to meet needs of their co-location clients
- Ability to meet configuration and security needs of many clients
- Typical co-location space does not fit new business model
- Ability to defer capital and operating costs until business drives data center space needs

Solution:
- Flexible and scaleable designs to meet multiple client needs with varying levels of redundancy: N, N+1, 2N at the same site
- Open IT architecture to support any client IT equipment
- Quick to deploy solution which can be integrated into existing support infrastructure
- A ready-to-run data center solution for quick response to new clients

Benefits:
- Most capital- and energy-efficient solution customized to a specific user's requirements
- Defer capital and operating costs of data center space until needed
- Quick response to new client needs with ability to plug into existing power, cooling and connectivity at installation site
- Provide the data center capacity each client needs with individually secure areas
- Total solution fully tested prior to shipment
PMDC provides continuous IT operations to meet data center availability requirements

- **Allow internal service and maintenance without operations disruption**
  - IT rack rail system allows front and rear access to IT equipment
  - Easy access to all power and network distribution cabling
  - Environmental isolation maintained during IT operation, service, maintenance and moves/adds/changes

- **Provide complete IT and data center infrastructure**
  - Self-sufficient data center with complete infrastructure
  - Complete redundancy options for all sub-systems, allowing concurrent maintenance
  - Energy efficient designs with a PUE of 1.3 or better
  - Complete infrastructure and environmental monitoring

- **Physically secure data center environment**
  - Data center access control, multi levels available
  - Closed circuit television monitoring
  - Completely secure environment during operations, service and maintenance
IBM PMDC provides design flexibility to meet your specific IT and data center needs today and is scalable to meet future needs

- **Complete data center infrastructure**
  - Designed to meet IT capacity requirements
  - Infrastructure can include complete, self-sufficient solution or any sub-set required
  - Incorporate industry leading infrastructure equipment from IBM’s global partners

- **IT environment designed to support open IT architecture**
  - Support any manufacturer’s IT racks
  - Leverage copper and/or fiber cabling for network systems
  - Support non rack-mounted equipment as needed

- **Solutions provide complete installation flexibility in any environment**
  - Unique environmental isolation systems allows safe, continuous operation in any environment with no need for protective coverings or buildings
  - Multiple cooling systems including DX, chilled water and natural free cooling
  - Seismic isolation systems at either container or rack level allow worry-free installation in earthquake prone areas
Multiple PMDC configurations = flexible designs

**Single Container Solution**

- **All-in-one design**
  - IT equipment and infrastructure in a single container
  - Use when space for containers or IT equipment needs are limited
  - Lower cost, compact solution

**Multi-Container Solution**

- **IT Equipment Container (Server Container)**
  - IT equipment, cooling, power distribution, fire suppression, remote monitoring, physical security in one container
  - Use for maximized IT equipment installations
  - Supported by physical infrastructure container or existing building services

- **Physical Infrastructure Container (Services Container)**
  - UPS/batteries, power switchboard, chiller, fire detection/suppression, cooling, monitoring
  - Designed to support IT equipment container or traditional data center environment
  - 2(N+1), 2N, N+1 or N design
IBM PMDC can provide a complete, reliable and redundant data center solution quickly

- **Complete, flexible solutions with full data center infrastructure delivered quickly**
  - Designed and built within 12 – 14 weeks instead of 18 – 24 months
  - Complete data center infrastructure including chillers, condensers, UPS systems, fire and monitoring systems, etc.

- **Tightly controlled construction**
  - Built in 1 of 3 controlled manufacturing facilities
  - Repeatable, tightly monitored process using fully trained, experienced personnel
  - No weather or resource delays and no local construction inspection delays

- **Full system testing prior to shipment**
  - Every PMDC is fully tested prior to shipment to client location
  - Witness testing is available if required
  - Shipped units are fully functional and ready to operate
Providing a flexible, cost-effective data center “Down Under” to meet immediate business needs

Business challenge:
- Needed additional data center capacity fuelled by unexpected increase in demand
- Unable to secure more data center space
- Co-location space did not meet needs
- Tight deadlines to implement

Solution:
- Open IT architecture to support client IT equipment
- Designed, built, tested and delivered as a complete solution
- Provided IT and infrastructure containers
- Complete infrastructure solution: UPS, batteries, chiller, RDHx cooling units, security, power distribution, fire systems, engine generator, switchgear, fuel tanks, etc.

Benefits:
- Addressed IT needs much faster (~8 weeks) than possible through other methods
- Allows for future disaster recovery operations
- Total solution fully tested prior to shipment
Utilizing a broad ecosystem of partners to combine the engineering and technical expertise of IBM and our partners to provide implementation choices.
IBM provides a complete solution and can help clients implement a solution anywhere and in any climate.

**DETERMINE REQUIREMENTS**

What are your data center requirements?
- Strategy
- Intended use
- Growth requirements
- Installation location
- Integration with existing systems

**DETAILED PLANNING / DESIGN**

Create a design based on the requirements.
- Flexibility to support multiple technologies
- Scalable to meet current and future needs
- Complete infrastructure systems
- Incorporate into existing or new facilities

**TURNKEY SOLUTION**

Turnkey solution:
- Installation site design
- Permit processes
- Site preparation and installation
- Security system design and installation
- Connections to existing or new utilities
- Incorporate into campus aesthetics

**START UP TESTING/ SITE TURNOVER**

Site turnover:
- IT equipment relocation and migration
- Start up / test complete solution
- Client operation training
- Ongoing maintenance and service coordination
IBM PMDC Installation – Brondby, Denmark (NFC Cooling)

Service container for Cooling and Power

Two diesel generators

NFC

NFC

Twin IT container
PMDC Brøndby specifications

- 100 kW IT load capacity at 80% redundant supply capacity
- Twin IT container with 14 racks and 8 positions for storage frames etc.
- Dual bus to dual cord IT hardware
- N+N electrical design and N+1 cooling design
- IBM standards for security and access control
- 24x7 operation and monitoring integrated with existing site systems and staff
- Highest PUE (Power Utilisation Efficiency) of any of the IBM Nordic data centers
- Interface to power, water and cabling for IT data, monitoring and access control
PMDC Brøndby design

- Two UPS's – one can carry the 100 kW IT load at 80%
- Dual bus fed by dual UPS – dual cord IT hardware connects across
- Two diesel generators – one can carry the 100 kW IT load and cooling load at 80%
- Three cooling systems for efficiency
  - NFC (Natural Free Cooling) running N+1 – the primary system
  - Evaporation – used for energy efficiency at higher temperatures
  - Chillers, dry coolers and thermal storage running N+1 – used at high temperatures
- Monitoring alarms for support systems and fire integrated into existing facility systems
- Two fiber cabling paths integrated into existing data center patch panels
- Monitoring and operation services by the same team for existing data center and PMDC
- Management, documentation and installation services by the same team for existing data center and PMDC
- End-to-end availability management of the physical infrastructure (IT and facility)
PMDC benefits

- Much faster from order to up and running over traditional data center builds
- End-to-end availability management of the physical infrastructure (IT and facility)
- Very efficient cooling technology compared to existing data centers – saves power and CO2
  - For one watt IT equipment the system only uses 0.13 watts to cool
- More efficient use of space for IT hardware with 2000W/m²
- Can be moved to where needed
- Quality system
US Military Application
IBM PMDC – Perth, Australia
IBM PMDC – Perth, Australia
IBM PMDC – Madrid, Spain
IBM PMDC – Sydney, Australia
NFC Traditional Data Center Configuration
NFC Application in Reykjavik, Iceland
Cold Air Supply Side
NFC Application in Reykjavik, Iceland
Hot Air Exhaust Side
NFC Application in Reykjavik, Iceland
Cold Aisle of IT Container
Leverage IBM’s experience to help

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