DIGITAL REALTY™

Optimizing Manufacturing Data Exchange

Pervasive Datacenter Architecture (PDx™)

DESIGN GUIDE

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Current State Challenges

Data Gravity poses a significant challenge to traditional IT infrastructures within the manufacturing industry. Typical problems with current architectures include:

+ Fragmented architectures constraining performance;
+ Architecture not designed for hybrid-cloud data access;
+ Compliance is difficult to maintain with data sprawl;
+ And sources of data not being unlocked, impeding analytics

Call to Action

This design guide is intended as a companion to the Optimizing Manufacturing Data Exchange Blueprint found in the Pervasive Datacenter Architecture (PDX™) library.

Leverage this guide and the companion blueprint to build your centers of data exchange designed to:

+ Optimize data exchange between users, things, networks and clouds;
+ Maintain data compliance and sovereignty;
+ And enable real-time intelligence across workflows

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Overview

Executive summary

The explosion of data is reshaping the manufacturing industry, transforming and enhancing the consumer buying experience and creating new ways to optimize intelligence for competitive advantages that include greater efficiencies, scalability, quality and security.

To succeed, manufacturing companies require a business platform that:

+ Operates ubiquitously and on-demand;
+ Augments workflows with real-time intelligence;
+ And serves customers, partners and employees via digitally enabled interactions across all channels, business functions and points of business presence

To enable this business platform, manufacturing companies require a data-centric infrastructure architecture designed to:

+ Defy Data Gravity;
+ Secure data near the customer;
+ Enforce data compliance;
+ And be compatable with complex Artificial Intelligence (AI) systems

The global data center platform to enable this is PlatformDIGITAL®

This guide is intended for:

+ Business Strategists;
+ Technology Leaders;
+ IT Architects;
+ And those responsible for the design and implementation of technology solutions

This design guide is intended as a companion to the Optimizing Manufacturing Data Exchange Blueprint found in the Pervasive Datacenter Architecture (PDx™) content library.

The PDx™ library contains blueprints, architectural patterns and design guides for common building blocks and use cases.

Together, these guides provide a roadmap for the successful deployment of solutions in real-world digital transformation use cases. They cover critical steps and important considerations when architecting and implementing.

To obtain a copy of the blueprint and other documents related to PDx™, please visit:
digitalrealty.com/PDx-Library

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Storyboard

Set Context

Strategic considerations, recommendations and what is driving them

Current state constraints and challenges with data exchange

Future state capabilities and objectives of an optimized data exchange architecture

Apply Methodology

Introducing PDx™ methodology and aligning business requirements with technical objectives

Checklists to ensure PDx™ steps are executed and required information is collected

Point of presence strategy aligned to business requirements and objectives

Design Solution

PDx™, methodology and library to support activation of optimized data exchange

Advantages unlocked by optimizing data exchange

Experience and capabilities to assist you on your digital journey

Key takeaways

Manufacturing businesses, corporations, factories, agencies, vendors and firms require a new data infrastructure architecture that localizes data aggregation, staging, analytics, streaming and management at global points of business presence.

PDx™ methodology helps you to:

+ Triangulate business, infrastructure and architecture requirements to determine data availability and retention requirements by location;
+ Create portfolio view of applications and workloads with data sources to tailor infrastructure deployments for in-motion/ at-rest data exchange;
+ And enable global workflows and integrate ecosystems with distributed data management hosted at points of B2B data exchange

This can improve performance and data compliance control necessary to support exploding volume, variability and velocity of data creation, processing and storage to accommodate digital business.[1] The strategy brings the users, networks, systems and controls to the data, which removes barriers of Data Gravity and creates centers of data exchange to scale digital business.

[1]Digital Realty, *Data Gravity Index DGx*, November 2022

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Strategy Model: Optimize Data Exchange[1]

Scenarios	Drivers	Actions	Outcomes
Pressure to realize the benefits of data-driven business	High complexity and poor productivity across the data and analytics stack	Integrate public and private data sources across distributed workflows	Faster data-driven insights and decisions[2]
Need to improve performance of data-intensive business operations	Poorly performing mix of cloud and legacy apps frustrate users and partners impacting business	Distribute business applications near data to improve performance	Increased business productivity
Proliferation of applications, data, devices and service providers	Spiralling IT infrastructure costs, tech debt that are taxing the IT network	Deploy regional data hubs to modernize infrastructure and streamline app integration	Improved IT sustainability
Increased global compliance requirements for data residency	Grafting controls onto legacy data stores risks compliance failure	Geographically align data storage to satisfy compliance requirements	Increased compliance
	Factors to consider Existing centralized models not sufficient Current architectures do not address cost, performance, security and scalability	**Factors to consider** Locations of centers of Data Gravity Workflow requirements Performance requirements	

Key takeaways

The digital economy is remaking manufacturing businesses, corporations, factories, agencies, vendors and firms, transforming how they create and deliver value.

+ Operate ubiquitously - meet the customer in their market;
+ Service on-demand - real-time is the new reality;
+ And augment systems with real-time intelligence

Manufacturing companies need to serve customers, partners and employees across all channels, business functions and points of business presence. This is forcing IT to implement a decentralized infrastructure which removes Data Gravity barriers to accommodate distributed workflows which vary by participant, application, information and location specific needs. Companies who combine this strategy with PDx™ methodology may optimize data exchange, enabling distributed workflows at global points of presence.

[1]Digital Realty, *Enabling Connected Data Communities, An Industry Manifesto*, November 2022
[2]Digital Realty, *Data Gravity Index DGx*, November 2022

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Today: Current state challenges

1. Fragmented architectures constrain performance
2. Architecture is not designed for responsive hybrid-cloud data access
3. Compliance difficult to maintain with data sprawl
4. Sources of data not being unlocked

Key takeaways

Manufacturing companies are too often driven to point solutions that accumulate over time, resulting in fragmented architectures burdened by significant technical debt.

+ Cloud connectivity is typically inefficient, undermining the value of both cloud applications and local data;
+ Storage sprawl originates from conflicting cost and compliance challenges;
+ And siloed data creates barriers to new business opportunities and the analytics that enable them

Best practices

Architecture - has a consistent and coherent foundation to enable data exchange[1]

Cloud - uses efficient connectivity to connect data and applications

Storage - manages data storage and access methods to lower sprawl and cost

Analytics - data is unlocked to enable new business model based on data

[1]Digital Realty, *Data Gravity Index DGx*, November 2022

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Tomorrow: Future state capabilities

1. Distributed data for optimized exchange
2. Regionalized data storage for compliance
3. Integrated public and private data
4. Distributed business intelligence unlocking new opportunities

Key takeaways

+ Compute, storage, users, and data creation/consumption are integrated within proximity of centers of data exchange, optimizing workflow and experience;
+ Capacity deployment is aligned to cloud locations to create elasticity, maintain compliance and data sovereignty;
+ Public and private data sources are integrated, unlocking real time intelligence;
+ And proactive control over data estate enables new, secure B2B data exchange for business benefit

Best practices

True data exchange for digitally transformed manufacturing organizations, enabled by:

+ Hubs placed at business points of presence, where there are identified participants and centers of data exchange;
+ IT increases business responsiveness while ensuring data residency, compliance and security;
+ And plan data architectures intentionally with B2B data exchange in mind

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A proven approach: PDx™ methodology[1]

Plan zones

Plan distributed workflows at business points of presence requiring centers of data exchange

Identify participants

Identify the users, applications, data, and things that will participate in distributed workflows

Deploy footprints

Deploy fit for purpose footprints matched to workflow profiles and workload attributes interconnecting participants at centers of data exchange to enable distributed workflows

Map workloads

Map workload types with performance attributes required to support participants in distributed workflows

Key takeaways

PDx™ provides a methodology and repeatable strategy to enable manufacturing firms to:

+ Plan distributed workflows where their customers partners/employees engage;
+ Identify users, apps, data, and other devices that will participate in distributed workflows;
+ Map workload types with performance attributes to ensure a performant quality of experience;
+ And deploy fit for purpose footprints to support the organization

Best practices

+ The digital business supports new models that require a new IT architectural approach, incorporating a holistic view of business and technical requirements;
+ Apply this model to each use case to optimize data exchange for workflows that vary by location, type and participant;
+ And apply the output of the PDx™ approach against established architectural blueprints from the PDx™ library to create a tailored IT plan for optimizing data exchange

[1]Digital Realty, *Digital Realty Launches PlatformDIGITAL™ and Unveils Platform Roadmap to Underpin the Next Wave of Digital Transformation*, November 2022

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PDx™ Step 1: Plan zones of data exchange

Checklist

Action		Action step	Complete
1	**Document locations**	• Legal presence • Employee concentration/ branch office • Ecosystem partners • Regional headquarters	☐
2	**Document workflows**	• Revenue • Risk and regulatory • Collaboration/ decision support • General purpose	☐
3	**Build workflow operational profile**	• Priorities × workflow × location • Downtime acceptable • Data loss acceptable	☐

Key takeaways

To optimize data exchange, first plan distributed workflows at business points of presence requiring centers of data exchange.

Three main actions:

+ Document centers of data exchange;
+ Determine workflows;
+ And build workflow operational profile

Best practices

+ Location-based design enables the correct data source and sink placement for user, partner and customer facing use-cases;
+ Understanding workflows and placing emphasis on revenue, risk and regulator workflows and designing from that perspective solves for business requirements first instead of as an afterthought;
+ And an optimized data exchange architecture begins with an inversion of traditional architectures, bringing key people, applications and things to the data

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PDx™ Step 2: Identify distributed workflow participants

Checklist

Action	Action step	Complete
4 **Document users**	• Employees • Customers • Ecosystem • Things	☐
5 **Document applications**	• Applications and supporting services • Data repositories and data types	☐
6 **Determine workloads**	• Latency sensitive (i.e. Interactive) • Throughput sensitive (i.e. Distribution) • Scale sensitive (i.e. Analytic) • Security sensitive (i.e. Ecosystem)	☐

Key takeaways

Optimizing data exchange requires the identification of users, apps, data and other devices that will participate in distributed workflows.

Three main actions:

+ Document users (and user types);
+ Document applications (and supporting data repositories);
+ And document workloads (and their characteristics)

Best practices

+ Designing around users and what they are using is critical in order to avoid performance and security issues that can plaque legacy architectures;
+ Determining the workloads to be supported and to what data to which they require access is key to architecting for optimized data exchange in the environment;
+ And documenting the data requirements to ensure compliance with regulatory issues, and to ensure that all dependencies are satisfied before making deployment decisions

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PDx™ Step 3: Map workloads and performance attributes

Checklist

Action		Action step	Complete
7	**Work attributes**	• Concurrency and messaging behaviors • User or event driven workflow • Compute and I/O dependencies • Policy enforcement requirements	☐
8	**Size workload**	• Daily workload volumes • Size and variability of data sets, files, and content • Exception based processing needs • Response time, availability, priority tiers	☐
9	**Workload profile**	• Sensitivities × attributes × sizing • Cross reference with workflow profile • Combine reference with participant profile	☐

Key takeaways

Successfully optimizing data exchange requires mapping types with performance attributes to support participants in distributed workflows.

Three main actions:

+ Determine workload attributes;
+ Size workloads based on key characteristics;
+ And create workload profiles to inform infrastructure requirements

Best practices

+ Carefully consider the requirements for workloads (including dependencies between workloads) interaction with data to ensure that performance targets can be met;
+ Be mindful of data set sizes and time of day considerations to avoid performance problems that can result from concurrency or oversubscription;
+ And accounting for the business criticality of the workflow that a given workflow supports and considers the priority and performance

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PDx™ Step 4: Deploy fit for purpose footprint

Checklist

Action		Action step	Complete
10	**Profile details**	• Workflow Profile (type(s), priority, location, downtime, data loss) • Participant Profile (users, applications, data sources) • Workload Profile (type, attributes, sizing, dependencies)	☐
11	**Determine deployment**	• Public Cloud w/adjacent datacenter • Hybrid Cloud w/adjacent datacenter • Private Cloud w/adjacent datacenter	☐
12	**Select footprint**	• Network Hub • Control Hub • Data Hub • SX Fabric	☐

Key takeaways

Deploy fit for purpose footprints matched to workflow profiles and workload attributes interconnecting participants at centers of data exchange zones to enable distributed workflows.

Three main actions:

+ Aggregate profile details;
+ Determine deployment strategy;
+ And select footprints

Best practices

+ Determine whether a given workload will be supported by public, private or hybrid cloud, and what scale will be required to support the workload profile;
+ Determine what services are needed to support the workloads, including network and security services, and whether they will be in-cloud or adjacent to the cloud;
+ And select the footprint required to support the deployment (whether in addition to deploying a Data Hub, one should deploy a Control Hub for security and a Network Hub for optimized access)

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Design model: Optimized digital workplace deployment

Map demand profile → Match supply deployment configuration → Deploy zones

Set prioritization

Workflows

- Revenue
- Risk / Regulatory
- Collaboration
- Decision Support
- General Purpose

Identify scope

Participants

- Users
- Applications
- Data
- Things

Size demand

Workloads

- Latency Sensitive
- Throughput Sensitive
- Scale Sensitive
- Security Sensitive

Select deployments

Deployments

	App	Data	Complete	Interconnects	Controls
Public Cloud	●	●	●	○	○
Adjacent Datacenter	○	○	○	●	●
Hybrid Cloud	●	○	●	○	○
Adjacent Datacenter	○	●	○	●	●
Private Cloud	●	●	●	○	○
Adjacent Datacenter	●	●	○	●	●

Match configuration

Footprints

- Network Hub
- Control Hub
- Data Hub
- SX Fabric

Install hubs

Places

Key takeaways

In the previous steps, you have mapped the demand profile of the workflows, participants and workloads. Now you must select deployments and match the configuration of supporting footprints. Use the design model to select appropriate footprints and be certain to factor in the architectural standards of your organization in the deployment. With this data, you now can deploy complete digital points of presence in key centers of data exchange. It is typical to have multiple footprints deployed in multiple zones in order to support the demands of your workloads and couple complimentary or supporting services. This point of presence strategy that incorporates these elements is how the PDx™ methodology drives success.

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Toolkit: Methodology and blueprints

PDx™ Methodology

PDx™ Optimizing Manufacturing Data Exchange Blueprint

Key takeaways

Optimizing Manufacturing Data Exchange requires leveraging the entire PDx™ Toolkit, a library of strategy, methodology, blueprints and architectural patterns designed to inform, codify and expedite your IT deployments. The Optimizing Manufacturing Data Exchange Blueprint outlines the three simple steps needed to enable a digital workplace:

+ Implement data staging/aggregation to maintain compliance and data sovereignty;
+ Integrate public/private data sources to optimize data exchange between users, other devices, networks and clouds;
+ And host data and analytics adjacent to network ingress/egress points to enable real-time intelligence across distributed workflows locally and globally by applying the PDx™ methodology along with using the Optimizing Manufacturing Data Exchange Blueprint, in order to tailor to your specific requirements

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Value impact[1]

Optimize data exchange between users, other devices, networks and clouds

- Host secure data lakes/warehouses
- Integrate public/private data sources
- Eliminate network-centric backhaul challenges

Maintain data compliance and sovereignty, improve privacy and security

- Provide a single global data platform of secure and compliant data centers
- Host data locally between cloud and edge
- Lower risk and reduce effort required for audit and compliance validation activities
- Reduce risk with secure data exchange

Enable real-time intelligence across workflows

- Host data and analytics adjacent to network control points
- Remove performance limitations with data-centric architecture
- Distribute business intelligence within proximity of users and data

Key takeaways

Using the Optimizing Manufacturing Data Exchange Design Guide and Blueprint to determine data placement and interconnection, helps achieve this type of value. Data Gravity forces a new architecture - one that inverts traffic flow and brings users, networks and clouds to privately hosted enterprise data. This means that data needs to be hosted locally whether it is in the public or a private domain. With this new architecture, Data Gravity barriers are removed, and new capabilities and growth opportunities are unlocked.

[1]Digital Realty, *Enabling Connected Data Communities, An Industry Manifesto*, November 2022

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Your partner: Platform and enablement

Fit for purpose infrastructure

Tailor infrastructure deployments to any size, scale or configuration to meet business needs on PlatformDIGITAL®

Fit for purpose interconnection

Optimize right-size connectivity via a fabric of physical and virtual direct interconnections to whom they need on PlatformDIGITAL®

Mission critical expertise

Harness the expertise from operationalizing the most complex global data center facilities on PlatformDIGITAL®

Global coverage

6	Continents
27	Countries
50+	Global metros
310+	Data centers

Interconnected systems

700+	Network and content providers
600+	Cloud and IT providers
800+	Enterprises

Always on, always available

24/7	Support
365	Days per year
47	Metros
99.999%	Uptime

Platform DIGITAL®

Proven experience: PDx™ Blueprint Solution enablement workshop[1]

PDx™ Toolkit

Design guide

Blueprint

Platform DIGITAL®

Methodology

PDx™ Workshop

Scope
+ Pre workshop call
+ ½ day workshop
+ 2 week elapsed time

Deliverables
+ Tailored blueprint
+ Value model strawman

Benefits
+ Identify optimization opportunities
+ Accelerate time to value
+ Compress time to execute

Combining our PDx™ methodology, blueprints, and the power of PlatformDIGITAL® can solve for the needs of digital transformation.

Our expert Solution Architects can help accelerate your transformation with workshops built to leverage the PDx™ methodology, customized to your unique requirements.

Send an email to **workshop@us.digitalrealty.com** to coordinate your workshop (include “workshop” as subject line).

[1]Digital Realty, *Digital Realty Launches PlatformDIGITAL™ and Unveils Platform Roadmap to Underpin the Next Wave of Digital Transformation*, November 2022

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Process model

Plan

Plan distributed workflows at business points of presence requiring centers of data exchange.

Identify

Identify the users, applications, data and other devices that will participate in distributed workflows.

Map

Map workload types with performance attributes required to support participants in distributed workflows.

Deploy

Deploy fit for purpose footprints matched to workflow profiles and workload attributes interconnecting participants at centers of data exchange zones to enable distributed workflows.

Pervasive Datacenter Architecture (PDx™) Process Model

The steps to create colocated and interconnected infrastructure at centers of data exchange tailored by workload and matched to a deployment configuration is outlined in the PlatformDIGITAL® Architecture Process Model.

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Integrated Checklist[1]

Action		Action steps		Complete
1	**Document locations**	• Legal presence • Employee concentration/branch office	• Ecosystem partners • Regional headquarters	☐
2	**Determine workflows**	• Revenue • Risk and regulatory	• Collaboration/decision support • General purpose	☐
3	**Build workflow operational profile**	• Priorities x workflow x location • Downtime acceptable	• Data loss acceptable	☐
4	**Document users**	• Employees • Ecosystem	• Customers • Things	☐
5	**Document applications**	• Applications and supporting service • Data repositories and data types		☐
6	**Determine workflows**	• Latency sensitive (i.e. Interactive) • Throughput sensitive (i.e. Distribution)	• Scale sensitive (i.e. Analytic) • Security sensitive (i.e. Ecosystem)	☐
7	**Workload attributes**	• Concurrency and messaging behaviors • User or event driven workflow	• Compute and I/O dependencies • Policy enforcement requirements	☐
8	**Size workload**	• Daily workload volumes • Size and variability of data sets, files, content	• Exception based processing needs • Response time, availability, priority tiers	☐
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10	**Profile details**	• Workflow profile (type(s), priority, location, downtime, data loss) • Participant profile (users, applications, data sources)	• Workload profile (type, attributes, sizing, dependencies)	☐
11	**Determine employment**	• Public Cloud w/adjacent datacenter • Hybrid Cloud w/adjacent datacenter	• Private Cloud w/adjacent datacenter	☐
12	**Select footprint**	• Network hub • Control hub	• Data hub • SX fabric	☐

[1]The materials set forth herein do not constitute legal or compliance advice; rather, they constitute the opinions of Digital Realty

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About Digital Realty

Digital Realty brings companies and data together by delivering the full spectrum of data center, colocation and interconnection solutions. PlatformDIGITAL®, the company's global data center platform, provides customers with a secure data meeting place and a proven Pervasive Datacenter Architecture (PDx™) solution methodology for powering innovation and efficiently managing Data Gravity challenges. Digital Realty gives its customers access to the connected data communities that matter to them with a global data center footprint of 310+ facilities in 50+ metros across 27 countries on six continents. To learn more about Digital Realty, please visit **digitalrealty.com** or follow us on **LinkedIn** and **Twitter**.

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