



The Ultimate Guide to data mesh

Lessons from data leaders on scoping, planning
and building a data mesh.



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What is a data mesh?

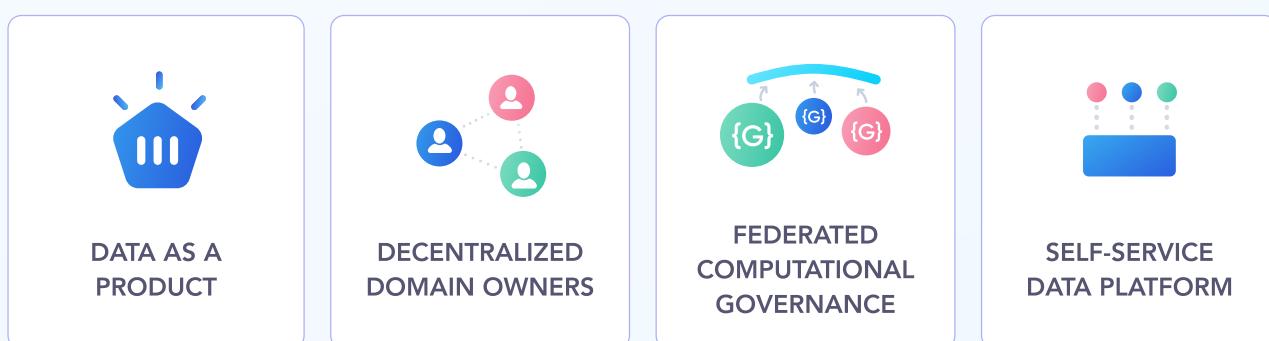
If you're engrossed in the data world, you've heard the buzzword before: **data mesh**. The concept made a splash when it was first proposed in **2019** by **Zhamak Dehghani**, but it has continued to evolve since — to the point that the common definition is a malleable one.

That could be because, while its core ideas are meaningful and logical, the data mesh concept remains almost as abstract as when it was introduced. Questions remain on the level of *"how does the data mesh work in practice?"* or *"what does it mean for my organization?"*

In basic terms, the data mesh is a modern organizational and architectural approach for supporting more decentralized domain ownership of data in a governed and scalable way.

The objective — to create a foundation for getting value from data by enabling those closest to the business challenges with the insights they need to make better decisions. In breaking down and opening up data structures, platforms, and teams — which all often fall prey to overcentralization — the approach is more personalized, more contextual, more democratized, and addresses the ongoing problem of data and analytics silos.

As a quick refresher, data mesh rests on four key pillars:



Diving deeper into each pillar, we see the importance of enriched and activated metadata. In a data mesh approach, **data needs to be more discoverable, trustworthy, secure**, and platform teams need to adapt to enabling a wide variety of data and analytics personas. The logical approach behind data mesh – balance data agility with data governance – is perhaps why the data mesh continues to intrigue the tech world, with many companies moving towards data mesh.

There is more data than ever before, and today's data teams are overwhelmed with the sheer amount of requests for data happening today. Data teams are not only analyzing structured data with batch refreshes, but also faced with growing use cases requiring semi-structured, unstructured, real-time/near-real-time, and streaming data, and each type requires new architectures and approaches. This means a greater load resting on a single centralized data team. In addition, as data literacy increases and easy-to-use analytics tools make data more accessible to the masses, more types of personas than ever before require data for their use cases. Being "data driven" is not exclusively reserved for the digital native companies born in the cloud, but equally, if not more, relevant for traditional companies changing their entire business processes during their digital transformation. Centralized models struggle to respond to this amount of requests for and about data, resulting in bottlenecks to stakeholders, yet decentralized models in traditional architectures tend to lack governance, which results in technical debt and business risk.

While the data mesh isn't concrete for many would-be users, there are organizations and data leaders taking advantage of the way this paradigm addresses some of the above obstacles. We spoke with **Abhi Sivasailam**, formerly of Flexport, now CEO at Levers Labs, **Akash Deep Verma**, Director of Data Engineering at Delhivery, and **Matheus Espanhol**, Data Engineering Manager at BairesDev about their use of data mesh to help solve their organizations' challenges.

They've each seen the data mesh in action because they brought it to life for their teams and others. What they discovered is that with the right underlying tech and cultural practices, a data mesh can create meaningful change. The potential the data mesh has for the future of data is simple: **better understanding and control of your data across domains, meaning more seamless scaling potential and better use of your team's collective intelligence.**



Chapter 1

How data mesh solves common data challenges

Data mesh offers a framework with which data leaders can address the all too familiar challenges in the data world. This chapter describes how data mesh can achieve common goals such as data discovery, self-service analytics, and scaled data governance.

The data mesh is an effective approach because it ties together so many existing ideas into one seamless structure. Consider a few common problem statements:

(!) Problem 1: Self-service is hard, and we've ended up with data silos

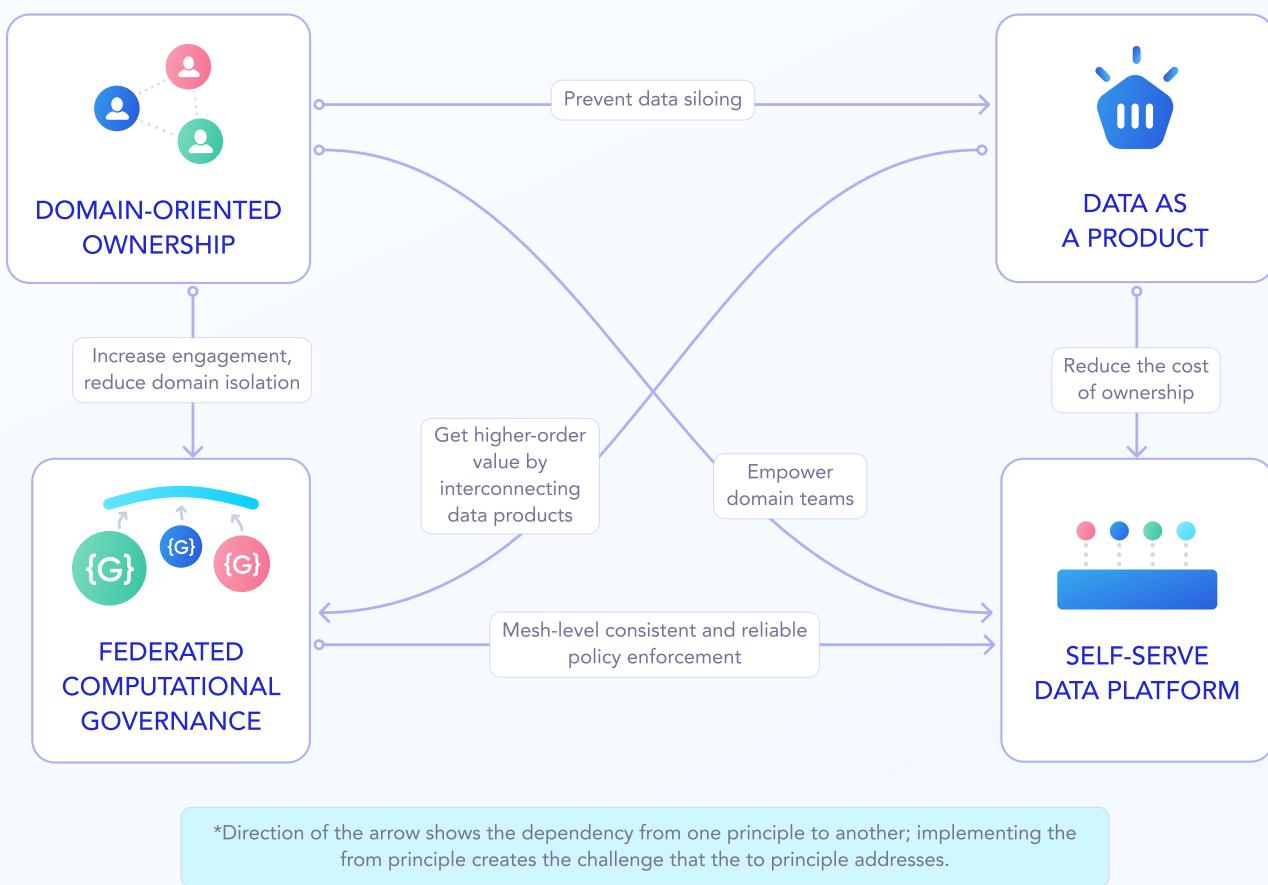
Self-service is intended to enable data and analytics users who are closer to the business problems with the tools necessary to find, query, and analyze data on their own. However, despite low-code/no-code analytics tools being the main driver of the self-service concept in the space, major gaps in data literacy and the knowledge/ownership of the underlying datasets turns self-service into a “wild west”. By bypassing the bottleneck of a centralized data team in an effort to make gains in agility, governance is lost, work is siloed, and multiple versions of the truth run rampant.

✓ Solution: Design a governed self-service data platform

With data mesh, “you will get only one answer because there is only one data corresponding to that problem statement,” says Delhivery’s Akash. “And that is the key problem when making a competent decision.”

Building better platforms doesn't come from keeping experts separate. "Rather than developing in silos, why not just build things collaboratively and have domain expertise?" asks BairesDev's Matheus. Usually, when data is decentralized, each domain is treated as an island. But **one unified data discovery platform, like the data mesh, both eliminates silos and retains domain context.** "The main benefit is to empower the team that really knows about the data produced," says Matheus.

Data mesh suggests that centralized teams shift their focus from the never ending request/response loop, to enabling a more holistic self-service platform for all types of data personas. To do this, **clarity around the availability, quality, trustworthiness, and ownership of various data assets is crucial.**



This additional tier, often in the form of a modern data catalog, allows both data producers and data consumers to collaborate – data producers can view the technical and operational metadata most relevant to them, while in the same platform data consumers are also able to enrich data assets with the necessary business metadata, definitions, and context necessary for effective use of these data products.

Now, when analysts need to leverage their modern analytics and BI platforms, they can easily see which assets are verified, who they can ask (owners) if there are any questions around the data, and see what key business terms the data is associated with.

Additionally, lineage is an expected capability in this tier of the self-service platform, allowing users of the self-service architecture to easily see all the downstream dependencies a data asset may be associated with.



(!) Problem 2: Users struggle to find the data they need

Creating a central data architecture or team often leads to scaling issues because it's ripe for bottlenecks. In this model, teams that are further from the centralized data platform may be unaware of available data and likely will require significant help to extract and analyze data quickly and easily. Also, when there is a wide variety of domains, each team has its own analytical needs.

This fractured system of working halts data from being organized and analyzed quickly, and "time to value" is the ultimate metric of successful data delivery. On the other side of this, a central data function doesn't scale well over time because they don't have the business context they need to work with data quickly, leaving the data team dependent on many back and forth conversations with business stakeholders to try and align on what data is needed and how it will be used. (This collaboration will still be needed in a data mesh, but we'll share how data mesh can make this process easier for both parties 😊)

✓ Solution: Empower decentralized domain users to own data

Decentralizing the data system and its teams with the data mesh can help everything scale more quickly. Data and analytics personas within domains are both producers and consumers of data, which means ownership has multiple factors:

01

Domain owners must be the subject matter expert of the data they may produce – they are responsible for defining the meaning of data assets and influencing how the data should be organized, the expected shape and quality of the data.

02

Domain owners must be able to discover data quickly and easily – the data they are able to browse should be clearly defined, tagged, certified, etc. They should also be able to get in touch with other data owners as needed, request access to data, and analyze the data.

03

This also means that domain owners must consider how the data their domain produces will potentially be used by other domains. This is perhaps the most significant cultural shift. Domain teams can't create data silos, rather they set other domains up for success by clearly describing and documenting the assets they produce. This data asset enrichment adds business metadata to the technical metadata already produced by the underlying data systems. This is the first step towards data products, which will be mentioned below.

"Data mesh addresses the challenge of scalability," says Akash. "Nowadays, every company wants to collect as much data as they can to improve their operations with decisions backed by data." **Decentralizing means domains can independently scale their systems according to specific needs.**



(!) Problem 3: The quality and usability of data needs improving

Data quality is a term that is used so often in modern data use cases that it can sometimes feel like this esoteric concept that will never truly be solved. Part of the challenge with data quality is that historically this was looked at from a purely technical lens – am I expecting this data to contain NULL values, what is the cardinality of the column, what are the expected attribute values or range of numeric values, etc. However, data quality goes beyond this. Ultimately "data quality" is an engineer's way of saying "will the business trust and use this data?"

Data trust goes beyond schema validation and data distribution checks. Trust is established by the communication of these attributes to the SMEs residing in the domains. How can a domain user look at a data asset, very quickly see if there are any data quality alerts they should be aware of, but also see who owns the data, what tags are associated with it, where else is it being used, by who, and how often?

Poor data quality is often the result of misaligned expectations and lack of communication between a data team and the business users. One-off data requests are often delivered to business teams, but not supported for ongoing use. This project based approach not only lacks data quality standards, but it also leads to duplicative efforts and multiple versions of the truth.

✓ Solution: Treat data as a product

The data mesh suggests you treat data as a product, which applies the principles of product management to your data assets. "The data product mindset is the main player when it comes to increasing the quality and reliability of the data," says Matheus. "It's easy to find companies saying the data is the most important thing, but actually struggling to achieve the quality needed."



The outcome of treating data as a product is naturally data products themselves – data and analytics components that together clearly enable a business use case and deliver value. Data products should be clearly defined, trustworthy, owned and accessible. Data producers should be able to iterate and improve data products, and data consumers should be able to enrich data and analytics assets with the necessary business context. This is why a domain focused approach pairs well with data as a product.

When each domain can define rules for its own data, given they will understand best the value that data brings to their business domain, the trustworthiness of that data improves. "Those sorts of things need to be defined by the domain owners themselves," says Akash. Under the data mesh paradigm, **treating data as a product helps support more use cases for data, all while ensuring data quality, creating clear processes, and tracking product metrics for your data.**

"If you care about any of these outcomes — if you care about the quality, if you care about data usefulness, the expressiveness of some of these data models — what you really want to orient around is a philosophy of taking data products seriously," says Abhinav.

"And that means moving to more of a data mesh model."



Chapter 2

Assessing data mesh readiness

Many data leaders are unsure if they can even adopt data mesh in their organizations. This chapter helps data leaders with their baseline assessment and prerequisites for pursuing a data mesh strategy.

Determining whether your organization is ready to make the transition to the data mesh is not a black-or-white situation. It all depends on where your company is planning to go in the future.

"Be mindful of where the puck is going," says Abhinav. "If you think, 'Our product strategy says we're going to have 10 teams and 10 interfaces here very shortly, and our budget for data isn't keeping up' well, it's time to get going. But even that might depend on your internal capacity."

One of the main concerns that might be holding you back is the idea that you just don't have enough data maturity to bother — it can be considered "too much" for small companies. However, "Those are not reasons to get away from the data mesh approach," says Matheus.

"Today we have so many options and tools in the data landscape that can help you to release a self-serve data platform fast enough to deliver results without compromising the tiny budget of small companies. It can be a solution to avoid common problems the businesses use to face when they start to scale."

When approaching this case-by-case with an eye towards making the switch, there are questions you can pose to determine if it's the right path for you.

Readiness Check



Can you define your domains, and can you assess maturity within those domains?

Create a list of your domains – think business units or functions such as Marketing, Finance, Product, or Supply Chain for example.

Certain domains may innately be more data driven or data literate than others. “The main concern is to deal with different levels of data maturity from each team,” says Matheus.

Data mesh does not have to be an “all or nothing” approach, but you should have 1-2 domains identified who would be good candidates for more self-serve data and analytics if enabled with the right platform and training. This will serve as your data mesh proof of concept. However, some organizations may remain in a more centralized data and analytics model until their domains/organization matures or are demanding faster time to insight.



Can you identify and align priorities of data owner(s) within your domains?

Data ownership can exist on multiple levels, and ensuring these are aligned is crucial before pushing for more decentralized ownership. There may be different types of ownership roles to consider when it comes to domain decision-making – technical data owners, operational data experts, and business decision owners for example. An example could be – IT “owns” your CRM platform implementation, but the Head of RevOps “owns” the use of the application, yet the Chief Revenue Officer “owns” the sales strategy and ultimately is responsible for the outcomes of the decisions taken by the other stakeholders.

"You have to draw clear lines, because if someone is the centralized authority, there could be a chance some of the decisions are going to have been taken centrally, which might result in some mis-alignment," says Akash. "That balance needs to be defined upfront: who is going to own what. Otherwise, there will be a lot of challenges."



Have you identified a group(s) that are active data users and willing to try a POC, and do you have a requirements gathering process?

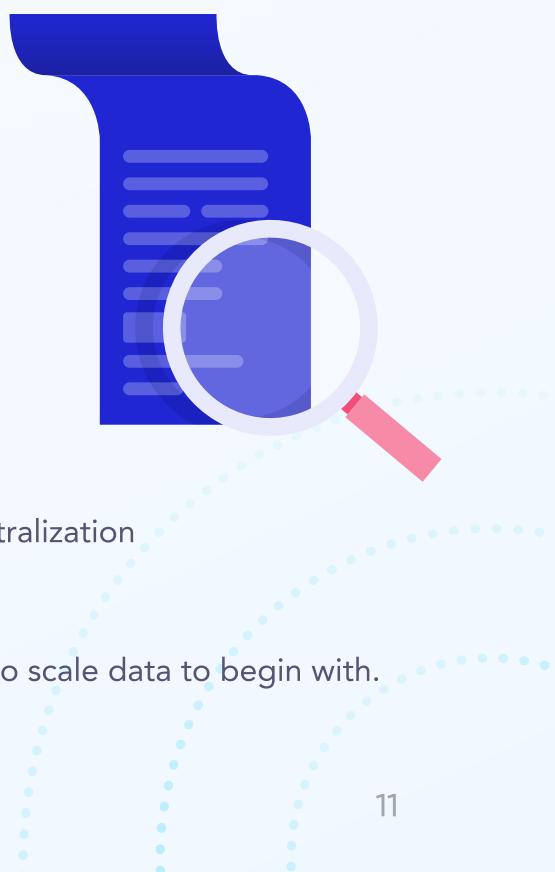
Before the data mesh journey can begin, you need people who are already invested in operating domains in a consistent and compatible way. "It really requires data stewards to kickstart domains, in my view," says Abhinav. "And it requires data stewards working together to ensure that the domain is interoperable from the outset."

Everything must be interoperable from design, and with that understanding, the steward-driven development can gear up after the process has started. "Then you can start bringing in data developers to be more decentralized," he says. "But it's hard to do that without that seed."

• • •

Maturity Audit

Even though smaller companies can still benefit from the switch to data mesh, as Matheus said, there are still flags that will tell you your organization isn't in the right place to make the switch to the more decentralized mesh model. The two major considerations are:



1. You don't actually have that many domains, so decentralization wouldn't be as big of a win for you
2. You don't have a lot of pressure from your company to scale data to begin with.

While the list below presents ongoing challenges even for those actively pursuing data mesh, you should consider the health of the following areas of your organization when assessing your baseline:



Cultural readiness

Your organization needs a certain comfort working with data and related tools, which can be a big leap. "Data mesh requires a cultural shift towards autonomy, ownership, and accountability," says Akash. "It is really, really important to ensure that the organization is ready for the change."



Solid data governance

Data must be accurate, secure, and protected from incorrect use, all while still being accessible. "Data should be trusted, otherwise it will lead to wrong decision-making on the ground, and you don't want sensitive data to be available to just anyone in the organization if you're a public company," says Akash.



Technical readiness

For the data mesh to function properly and in real-time, you need the ability to automate and templatize that data, so technical readiness to deal with functions breaking is a must. "If anything breaks, you must know that people can act on it," says Akash.



Guidelines for access

Similar to the importance of good data governance, you must be able to lay out who can access what data, how it's getting sold, and to whom. "Those guidelines need to be defined right upfront," says Akash.

If you can answer all those questions, and have all your prerequisites in order, then you might be ready to implement a data mesh at your company.



Chapter 3

Preparing for a data mesh implementation

Data mesh is not just technology, in fact many key hurdles to overcome will be organizational and cultural. This chapter outlines the key steps to get people, process, and technology to better align.

If you want to implement a data mesh, you need to prepare on three fronts: your tech, your team, and your systems. If you've answered all the questions from the previous chapter, you should have a good idea about where your organization stands in this journey.

You also might be under the impression that everything needs to change. Not so.

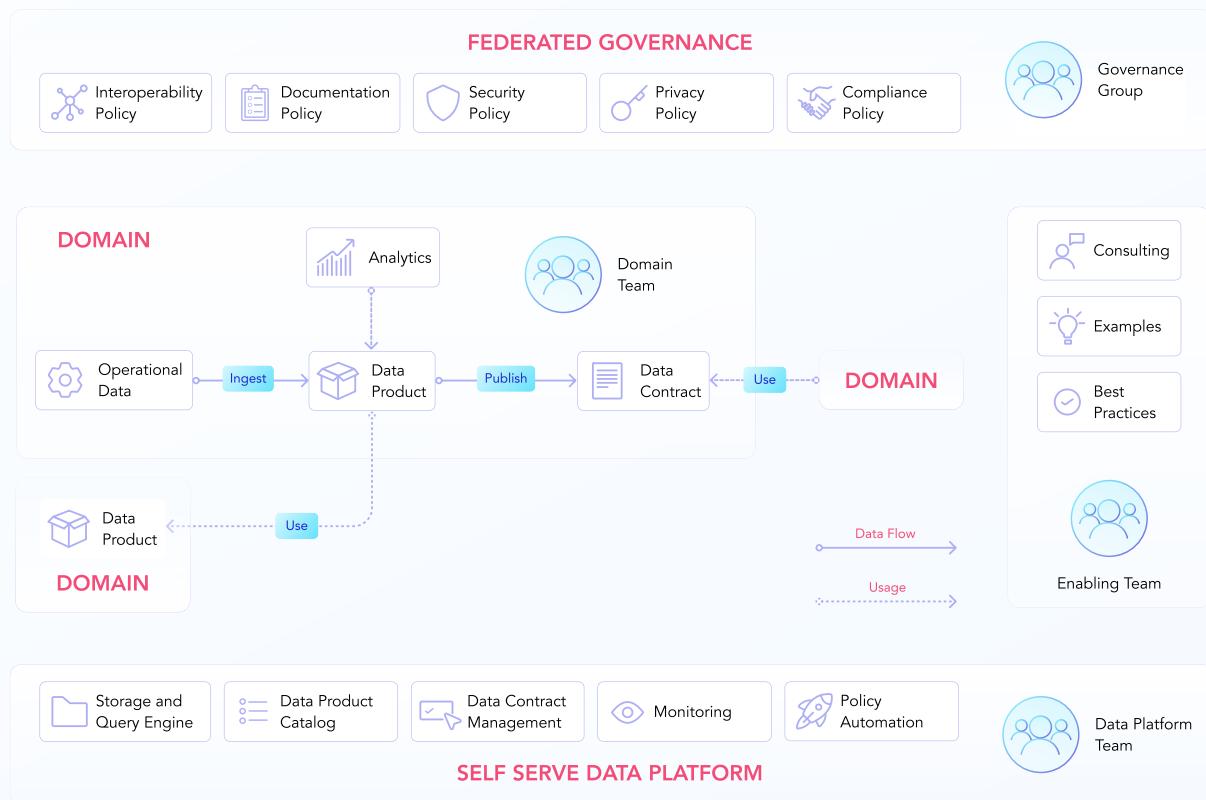
Team structure

Consider your team — it might seem like an internal breakup is needed to accommodate this architectural shift, but look at it from another lens. **Many of the roles you need for a data mesh approach already exist within your company, just under different titles. The structure is what's important here, as well as the support and enablement to bear that structure out.**

"In my opinion, these positions can be built in-house by picking the right set of folks, having the right business context, as well as the skill," says Akash. "That's how, instead of hiring, we can build it in-house."

"There needs to be a data owner, and a data steward for each domain, at a minimum," says Abhinav. Data owners can be categorized as roles with knowledge of the business subject matter, understanding of semantic meaning, and data security, whereas data stewards are accountable for the quality and interoperability of the data, as well as usage and utilization monitoring. In more advanced organizations, domain teams will also have more technical talent such as data engineers and/or analytics engineers embedded or aligned with the domains.

Data Mesh Architecture



In the modern data stack, elevating roles such as the analytics engineer can be an important step to success. "I think I see their role [the analytics engineer] more akin to modeling knowledge and structuring knowledge," says Abhinav. "Whatever your title is, that's what we need you to do."

Core data platform roles, like data engineers and data product people, will be naturally comfortable implementing the mesh.

This core group that has typically been a centralized development group or “hub” now must transition to more of an enabling role for the decentralized domains or “spokes” to help fill gaps in process or technical knowledge.

“Deploying data platform components can scare other roles in the domains, so we hear things like ‘I can’t prioritize this’, ‘it’s much more than we need now’, ‘the learning curve will be huge’ or even ‘we don’t have enough people to run it now’,” says Matheus. “So we helped the teams to hire the right people for those new roles, and in some cases, we allocated data engineers from the Data Platform team to help them to grow in adoption.”

It’s important these structures are well defined and supported because using data under a data mesh system needs to be simple enough, or you risk opening the door to even more asks of your data team going forward. Teams must be enabled with easy tools, support, and context so they feel confident taking ownership of the data.



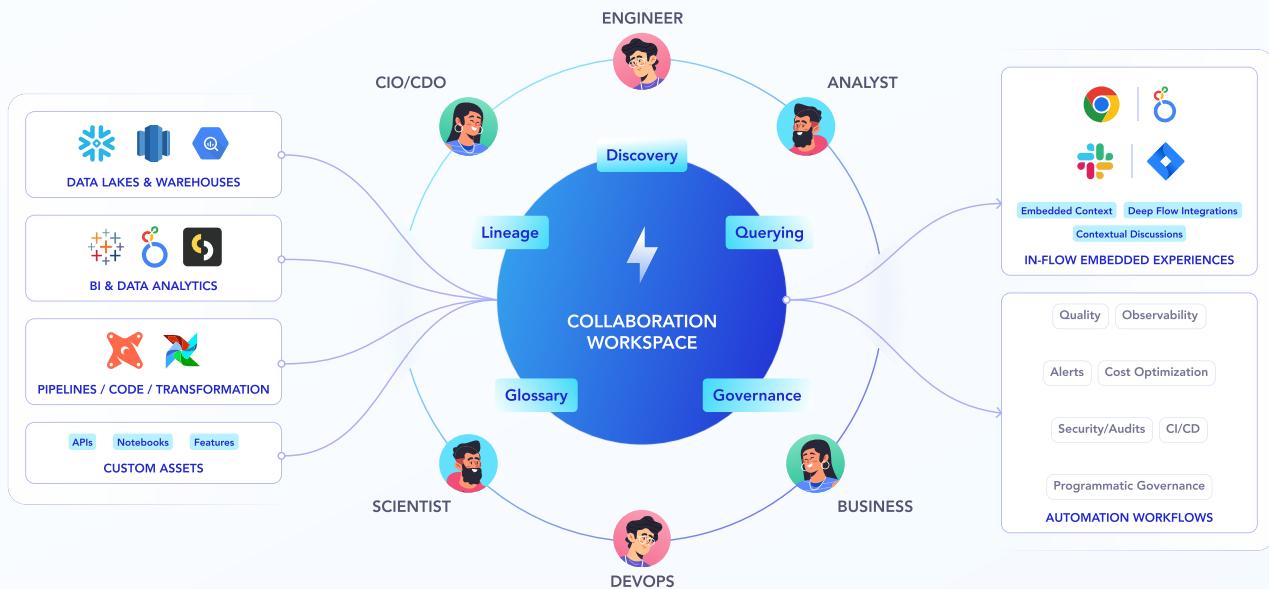
Mapping out the architecture

Once your prep work is complete, your next step is the process of actually mapping out your data mesh architecture. **The core idea to keep in mind here is to balance efficiency and consistency.** Data mesh is about building bridges between siloed teams and data resources. So if you already have siloed teams operating with their own tools and processes, you shouldn’t make them start over from scratch by adopting 100% new tools. Rather, **build a platform of packaged components that any domain can tap into to enhance their data and analytics maturity.**

“To be able to get aboard to the data mesh, the teams can deploy in their own infrastructure the components they need from the Data Platform,” says Matheus. “The components [behind the scenes could] include event bus, ingestion, lakehouse, transformation, observability, quality, and orchestration.”

Through this approach, you can help those teams incorporate the data mesh components and tools they'd need to be viable within the workflow they're already using. The goal here is to get everyone connected, even if they're not all approaching it the same way.

Metadata that your data mesh platform generates begins to play a vital role in transparency and consistency across domains. **Having a metadata platform acts as the bridge between data producers and consumers – combining technical metadata about your data assets, the crucial business context that consumers enrich the assets with, and the usage and utilization metadata around your data products.**



"The metadata component is a central component where the teams can get visibility about the corporate data assets, and the consumers can interact with the owners of each data product," says Matheus. This is why an active metadata platform is crucial for data mesh success.

With the structure and roadmap in place, all that remains is securing buy-in across your organization as a whole.



Chapter 4

Getting buy-in and getting started

Data mesh will not happen overnight. This chapter will help data leaders get started fast, gain buy-in from executives and the business, and use quick wins to expand your organization's data mesh.

If converting to the data mesh seems like the right move for your organization, you might be wondering how to convince stakeholders of the same thing. Data mesh is a concept that typically originates from more of a technical focused audience. However, as we discussed —

...data mesh is much more than just the tools and platform you can build. You can't code your way into data mesh buy-in. Consider how the business can benefit from the principles of data mesh. What is the business value of allowing domains to own their data?

If your domain stakeholders are not convinced, you may end up with a cutting edge data platform that simply isn't utilized to its full potential, and your centralized group will fall back into the bottleneck that is never-ending requests from the business. If domains are not on board, success will be nearly impossible. "Fifty percent of viable domains is a 0% viable mesh," says Abhinav. An emphasis on business value during your engagements with stakeholders is the best way forward.



Start small, then prove it

If you want to prove the data mesh is a success in your particular domain, it's helpful to start small by picking a problem statement and proving it to show value to stakeholders. "Once you go through that experience it will help in building things out at scale, where the data mesh platform really evolves," says Akash.

But how do you choose the right kind of problem statement to begin with?

One option is to start with the easiest domain or use case. "Sometimes it's just the organizational path of least resistance," says Abhinav. "Where we know that we have lots of expressed, not tacit, context about the domain so that the requirements gathering is going to be really easy, we have the right partnership with a data owner, we have data developers ready to go, and we have data stewards that are well integrated."

Another way to win over leadership is to prove your point using the most important business-critical domain or use case. Maybe profitability is the most integral task of the moment, which requires a look at a finance domain.

When Abhinav was working at Flexport, they went the second route, taking a data-driven approach to prioritizing where they started their data mesh journey. "We actually looked at the data and the producer systems as a graph," he says. "There are lots of tables that already exist, which can be assigned to domains. Then, from a basic network analysis, we could see which domain was highly central — what we call the shipment execution coordinator."

Pinpointing the most centrally utilized data asset and working from there meant going where the architectural shift was most needed. "That is ideal," adds Abhinav.

Whether you choose a high-value area or a domain that's most set up for success, the key is to deliver results quickly to promote the value of the data mesh. "Deliver the first use cases fast enough to help other domains to understand the benefits of the data mesh and guarantee future investments in the project," says Matheus. "Avoid a never-ending data platform or having the complete architecture and components in place to start delivering value to the domains."

One of the most effective ways to prove value is to determine a key metric that will speak to your team about the changes the data mesh has made to the business. For Abhinav at Flexport, that north star was “time to reliable insights” (TTR). “There’s some subtext there — we care about speed, we care about quality, about insights — those are all the pieces that go qualitatively into this notion of reliable insights,” says Abhinav.

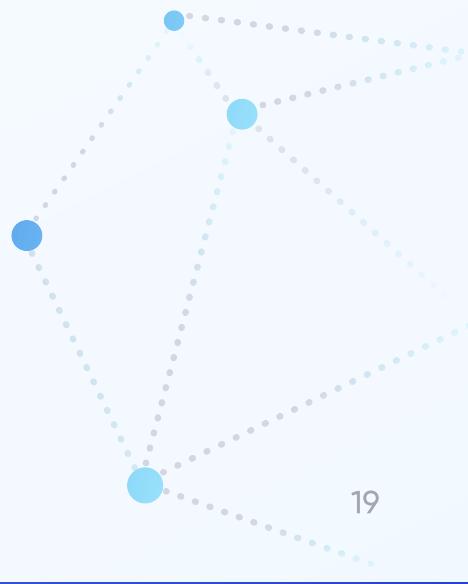
Those pieces were further broken down into how quickly you can publish data pipelines, how quickly you can aggregate, publish, and resolve issues. “So what we’re able to do is create these north star metrics that determine what the success of a data platform looks like. And then we tied data mesh success to TTR.”



Be an internal translator

You know your team best and what metrics and use cases best suit the organization. Speaking the language of leadership means getting out of pure technical speak and into the realm of business value and social proof. Not everyone can keep up with exactly why certain solutions are better, but they want to know why you think it’s better and they want to see that it can be done.

This means that great leaders implementing data mesh are often great translators. Align on challenges the business is facing and identify key metrics they are already prioritizing and tracking against. Then translate these challenges into more technical solutions. Success is not measured by the completion of the technical solution, rather the impact on the business metrics you have already agreed upon.



Chapter 5

Data mesh outcomes

Your data mesh will constantly be evolving. In this chapter, hear how real data teams implemented and got results from pursuing a data mesh strategy.

Data mesh isn't a silver bullet. Moving to a new architecture alone won't change your company, but changing the way you think about data can be a catalyst for innovation.

"It's not about technology, it's about organizational shifts, data maturity, and building an analytical culture," says Matheus. "But the self-serve data platform is core to making this possible."

Because the move to the data mesh requires changing the way your company thinks about data in general, it results in organizations understanding their data better. Making this information accessible to teams that might not have previously used data to its full potential means teams are better equipped to come to the table and collaborate across departments. This increase in collaboration leads to more innovation, and the cycle continues.

"I don't think anything about the mesh itself breaks down silos, what breaks down silos is thinking about your data as a product," says Abhinav. "Thinking that way means that you're thinking about the end users. You're thinking about who's going to consume this data? What did they expect? You know, what patterns are they using? And that necessarily means that you're not just thinking about your data as something that you own, but you're thinking of your data as something you serve."

Since data mesh changes a company's relationship with data altogether, implementing this framework allows organizations to take the time they previously spent struggling to work with data and use it to tackle bigger, more impactful data problems. "Data mesh encourages teams to develop a deep understanding of data, which can derive better decision making and innovation," says Akash. "This increased sharing and collaboration between teams also helps define the holistic and effective use of data in the organization."

"Data product thinking is orthogonal to data mesh thinking," adds Abhinav. "But data meshes can help accelerate, or are maybe necessary sometimes to accelerate, the development of data products in certain types of companies."



How real teams saw the impact of data mesh

When Matheus helped implement the data mesh at BairesDev, he saw a series of real impacts across the business:

- 01** Since teams were able to self-serve with the data platform rather than waiting on a central team to extract and analyze for them, everyone was able to actually work with the company's data better and faster.
- 02** Being able to directly help teams work with the data themselves allowed them to create new products and increase revenue — knowledge is power, and data can lead to new ideas.
- 03** Due to a greater understanding of data's role across the organization, teams began working with the central data team in a more effective way. Some teams even requested their own data workers as hires to continue the work for their department.

"Just providing tools that bring scalability to analytical workloads enabled some domains to increase their revenue and pave the way for new products," says Matheus. "In the past, teams had a massive dependency on a centralized data team — now, they want to deploy components from the data platform in their own infrastructure and use a dedicated data role to deliver analytics."

For Akash at Delhivery, implementing a data mesh resulted in a reduction of silos. Because the team used Atlan as their common repository of all data products, anyone could go to one place to understand the company's data, which meant definitions weren't getting redefined, and work wasn't getting redone.

"If there is already a data product available, someone can further enrich it with another set of problem statements," says Akash. "The collaboration increases when they're able to post their data onto a concrete discoverability platform like Atlan."

Since moving to data mesh, Delhivery's data products now also have a "credit rating" to assess their quality, which makes a big difference when a company drives decisions with data. "If we have one common definition, we can clearly define the data quality and they can trust that data quality," says Akash.

Akash's team was even able to take on a dream project because of the data mesh. Their goal was to determine their unit economics of shipping goods — how much it cost to complete a single shipment. Because the question required information from so many different domains, it was a difficult one to answer. "Asking 10 questions to 10 different teams becomes really difficult because you get 10 different answers," says Akash.

The data mesh enabled them to get consistent definitions of all the many factors that went into shipping, all in one place, with each angle answered by the team that knows it best.



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