

# Cloud computing

## 10 dilemmaer

## - og anbefalinger til løsninger



**Many Danish companies and organizations work with cloud solutions. Dansk IT's professional council for Business & IT Alignment has learned that a number of central questions arise about how much, how and at what rate cloud solutions can be strategically and tactically used.**

*By the Professional Council for Business & IT Alignment*

The professional council for Business & IT Alignment in Danish IT has evaluated 10 specific dilemmas when using cloud computing - and has a number of recommendations on how to handle the dilemmas. These are cloud dilemmas that the council's members have encountered in their work with enterprise architecture and cloud in Danish companies and organisations.

The 10 dilemmas are described below under these headings:

1. Yes – of course I know what cloud is
2. Major changes in work tasks and roles and the need for new qualifications
3. Vendor lock-in
4. (De-)centralization of the purchase of cloud services
5. Are there challenges in Governance and integrations for SaaS solutions?
6. When Ops is forgotten in DevOps
7. How to secure a financial overview and overall budget for the use of IT in an organisation
8. Ownership of Data
9. The legacy system can be moved to the cloud, but is the company achieving the benefits?
10. Enterprise architect versus cloud architect

## Background

It can be tempting for a company to leave the design of the transition to the cloud or the choice of cloud services to its supplier. The arguments could be that the supplier is more knowledgeable and can make the design better, and that the supplier is also *responsible* for the technical solution. It is a truth with modifications.

In English, a distinction is made between *accountable*, which is the overall responsible party, and *responsible*, which is responsible for the execution. While the suppliers can be made *responsible* for making design decisions about the cloud, *accountability* cannot be outsourced to the supplier. Because it is the company that will have to live with the result of a bad design.

*“All architecture is design but not all design is architecture. Architecture represents the significant design decisions that shape a system, where significant is measured by cost of change”*

- Grady Booch

The responsible company makes sure to be on target for the cloud designs that will be the most difficult and expensive to change. In other words, the architecture decisions about cloud. The dilemmas in this article are about whether the difficult and expensive decisions for which the company is *accountable* are the right ones. Taking home the company's responsibility for those decisions will be good, timely IT management.

Taking responsibility home requires knowledge and insight. It is Dansk IT's hope with this publication to give a helping hand to be able to shoulder that responsibility.

## 10 dilemmas about cloud computing

The 10 dilemmas described focus on the fact that cloud as a technology and strategy places demands on companies. There is also a need for new skills, an updated view of security in connection with cloud solutions and an updated and adjusted governance and financial review, which the IT department must be on target for.

### 1. Yes – of course I know what cloud is

It is now rare that we discuss what the cloud actually is. Does this mean that we have solved the challenge and have a common language around cloud? Are we organized so that we can work effectively with the new methods and tools? Do we have a uniform model for cloud and integrations between clouds and the on-premise solutions?

No, we probably thought so.

Try looking at the definitions below from the American NIST (National Institute of Standards and Technology). They are freely interpreted by the professional council.

## Essential Characteristics

- *On-demand self-service*: It is a solution that the user (consumer) can buy and use himself use immediately.
- *Broad network access*: The solution is available from the Internet or within a large company domain.
- *Resource pooling*: Computing power, storage and other resources are shared with others and are not fixed size.
- *Rapid elasticity*: The solution can scale to peak periods and be completely at zero - both for quantity users, computing power and data volumes.
- *Measured service*: It can be measured who uses what. In many cases, it forms the basis for a payment / cost.

How many of the five essential characteristics have you considered the last time you discussed a cloud solution with your colleagues?

Essential Characteristics	Service Models	Deployment Models
On-demand self-service	Infrastructure as a Service (IaaS)	Private cloud
Broad network access	Platform as a Service (PaaS)	Public cloud
Resource pooling	Software as a Service (SaaS)	Community cloud
Rapid elasticity		Hybrid cloud
Measured service		

Source: [NIST](#)

**Recommendation:** When you work with the cloud dilemmas (both in everyday life and in the article) and have your own discussions, you should consider the five cloud characteristics, the three service models and what the deployment model looks like.

## 2. Major changes in work tasks and roles and the need for new qualifications

Is your company ready to say goodbye to certain, old skills during a changeover, is there still a critical mass of tasks that still need to be done - especially in transition? When the operating model changes from outsourced to the cloud, the responsibility in the company's "operations department" is changed from being technicians who ensure that the company as a customer has received the right service for outsourcing, to the department being able to manage IaaS and PaaS on e.g. Azure and be specialists in that area.

There will be work to readjust your employees to gain trust in a different form of technology and handling than you are used to. Myths have a way of sticking around - for example, that the cloud is more uncertain.

**Recommendation:** As an enterprise architect (EA), you must ensure that the company has an active cloud architect - or that you take on this role yourself. There must be knowledge of which technical solutions must be retained,

also when outsourcing, so that the right requirements and evaluations of suppliers can be made. The qualifications combined with knowledge of the company provide the value.

### 3. Vendor lock-in

For the IT tools you as a company use in your core business and your services/products to customers, there has always been a greater or lesser risk in relation to the dependence you have on suppliers, employees, partners, etc.

In the support processes, the aim is often for the tools to be standardized, if necessary, with a configuration. And if you need to change these tools, it can often be done more or less flexibly due to competition in the market and standardization in particular. But in relation to the core processes, how much do you get out of control by relying on a supplier and its software products? It is always a good idea to make it clear what the exit strategy looks like for the purchased product before entering into the contract.

Has it become different for cloud products? When looking at SaaS solutions, it is still important to consider how much dependence one's business development has on that particular product. The product roadmap from the supplier must satisfy one's own needs, such as is the product developed and maintained as one would like and is the roadmap updated stably?

The supplier's focus can also change and give completely different prerequisites as a customer to the product. Here, the exit strategy must therefore not be forgotten, and perhaps in terms of the ease of getting the product, you should continuously challenge yourself with the addiction.

If you use IaaS in a public cloud, you will have far greater independence in relation to the supplier - however, there is also more work to be done in building your business solution.

If you develop your application yourself in a PaaS environment, e.g. with a public cloud supplier, you gain more independence from suppliers in general. However, if you build your solution in its 'native' components, you again get a greater vendor lock-in for the specific cloud supplier. It costs, on the one hand, to have an architecture that supports the standard, and on the other hand, you pay for the benefits of a proprietary solution with lock-in.

**Recommendation:** Under non-functional requirements, you should therefore consider porting the solution.

The thoughts you have there will be a different way of looking at your risk. An application strategy that is based on native components can have an unintentional vendor lock-in, and it can be extensive to have to rebuild at a later stage if you want to port (parts of) the solution.

In general, one must be aware of what the consequences are for the strategies that are chosen in the direction of suppliers. Choosing a cloud supplier should have an overall business and technical assessment with significant supplier scenarios and response options. Build it possibly into a *cloud vendor assessment*.

#### 4. (De-)centralization of the purchase of cloud services

Purchasing IT services in the form of SaaS products can be done very easily by, for example, employees in the individual business functions, who can supplement or combine their IT support with independent components on the SaaS market. The individual components must be handled in the same way as the large enterprise systems when it comes to security, GDPR, business continuity, IT support, etc. This places demands on the individual employee who makes a purchase, who must ensure that nothing "slips" in terms of security, GDPR, etc. And this means that the individual employees who handle the purchases must ensure a suitably high quality of these parameters.

Since support for procurement is more necessary support skills than core business in most companies, and support is often provided with external specialists - for example from the cloud suppliers - it can be an advantage to centralize support for decentralized selection of IT solutions. In addition, the company's IT governance must also be built for this kind of handover from many sources - the individual employee - for decentralized support.

**Recommendation:** It would be beneficial to establish a virtual cloud assessment forum that is involved in supplier and solution evaluation as well as ensuring that governance and any 'whitelists' can facilitate the work. The forum must have a particular focus on being fast-working, decision-making and competent, as well as a decided part of governance. It can, for example, create a cloud vendor assessment for the organization, which can be used as a communication tool and in itself will give a greater awareness of the cloud.

#### 5. Are there challenges in Governance and integrations for SaaS solutions?

*"A service is a means of delivering value to customers by facilitating outcomes customers want to achieve, but without the ownership of specific costs and risks."*

- ITIL v/3

In the ultimate interpretation of Software as a Service, the responsibility lies with the supplier of the chosen service, but there is still a responsibility for the company regarding contexts in data classification and integration, user access and roles, as well as business continuity and risk management.

As a company/organisation, you do not have to optimize security, performance and ensure availability yourself – that is the supplier's responsibility (and also interest). But isn't that just spending loose? As a company and organisation, you still have the responsibility to ensure what is acceptable security, performance and availability in relation to the company's risk appetite. In addition, the software provided is often part of a larger context. But you only get what you pay for.

The first challenge comes already when the solution is purchased, without the connection to the other systems being thought through. "We just have to use the standalone solution". This is in addition to the integration of users and accesses via AD and then of course some master data from SAP, which also appears quite quickly as a need. For some SaaS solutions – small tools and niche solutions, that limits it

the challenge. But there are also solutions that must be integrated into two-way data and process flows – and where backup of both data and configuration is also not without importance.

Not all challenges are known in the on-premise world. An example is "Governor limits" on the SaaS solution. Because you share the resources with others, you cannot do as you like with the resources. In and of itself, a counterpart to the sustainability of the physical world, and something you may have forgotten/not been taught, because we have to go back 20-30 years in time to look at when people counted clock cycles and bits. The resources have for a period been immediately abundant, but never enough for bad algorithms and sloppy queries.

In addition, a lack of technical, data and compliance insight can give a glorified understanding of what it takes to do integration between systems. For example, it is not necessarily as trivial as it can be drawn on a Powerpoint.

**Recommendation:** As an EA, you can help promote a focus on governance around the SaaS solutions and ensure that both the users (the business) and IT take part in the ownership of the solutions and connections to the rest of the system landscape, including securing data, user roles and responsibilities, and last but not least finances and operating costs, which must be continuously monitored so that the SaaS solutions do not run wild financially and out of control in relation to the governance of the company's IT portfolio and use.

Follow up the conceptualization of the SaaS application with an uncovering of complexity, risks, dependencies and any economics both in relation to business and technology.

## 6. When Ops is forgotten in DevOps

Let's break down the wall between development and operation and let our developers work agilely with DevOps. It is a good and attractive thought, and there is a lot of help to be found in agile theories and from suppliers of PaaS/IaaS in particular - e.g. Microsoft Azure.

DevOps was created in a cloud foundation by certain companies with certain scenarios, and is now hailed as "the right thing", but is it also something that can even be used in all the scenarios that you think it should? The large suppliers and their ecosystem are what we as companies/users must adjust to. It must harmonize with the fact that we want to achieve essential cloud characteristics for our solutions (e.g. rapid release, elasticity, scalability) - otherwise is it worth the effort?

The whole thing is just slightly challenged by the fact that we do not change the decision-making model and the way in which IT is organized and allocated funds. We are still working on projects and this is also how our IT organization gets funding.

This is where the interest in Ops incl. security and other good operating virtues slide a bit into the background when we run too fast with DevOps.

Conversely, it is also difficult to take the leap to a DevOps and product focus – without projects and milestones – so we have to find a model that creates the balance. Otherwise, the cloud will just be a fog of bad solutions without clear ownership.

**Recommendation:** As an EA or EA function, you can contribute in two places:

- First of all, you can help mature a product's focus – of course in areas that are suitable. These are typically areas that can be defined and delimited without many dependencies and without the need for a fully defined process.
- If there is no maturity and willingness to organize according to the DevOps organization's many new roles and division of responsibilities, then as EA you can focus on how the Ops organization is involved at the right time, trained and also automates their work.

## 7. How to ensure a financial overview and overall budget for the use of IT in one organization

With the growing use of cloud solutions in the organizations and companies and the easy approach for new users to be able to use cloud solutions, there is a growing need to be able to follow up on the use of cloud solutions in the companies and the financial cost, which it imposes on the companies and organisations.

The possibilities to access the SaaS solutions are often easy and without immediate obstacles for the users to create and access these solutions, so the ease of access is an immediate advantage for the users.

The price consequences of cloud use are often opaque, because you do not already have a 100 percent overview of what your current and future consumption is. How is the cost picture screwed up in relation to expected consumption?

Paying for a service according to consumption, can it be a bigger job to keep an eye on consumption, which may be about to exceed the budget? Should you actually prevent resource use, if you can at all?

When migrating from on-premise to the cloud, there will easily be a period when the company still has the full on-premise configuration running, while adjusting to the right level of cloud use.

And it is not certain that everything will be included in the cloud, so settlement of this part, which goes in the cloud in relation to the existing system landscape, must also be carried out in order to achieve savings.

Gaining insight into the exact cost increase or decrease can be a complex task.

The challenges for the IT department and the rest of the organization are to be able to get an overview of the application and ensure that parallel solutions are not purchased for uniform requirements, and that you can comply with both

security and data compliance on the data that is placed in the cloud, and which exit criteria have been agreed with the SaaS supplier in the event of bankruptcy or that the company wishes to take the solution back.

With EA eyes, there is a continued desire to be able to see the cloud solutions as part of the application portfolio, so that the total use across the company can be calculated, so that business needs and also non-functional requirements and support are met across the cloud and on premise operation.

Many small streams make a big river, and with IT services such as time registration, templates for Office, digital signature solutions, project overviews and more, IT costs can grow exponentially, and an effort must be made to maintain an overview of the expense.

**Recommendation:** Establish a process in the company to acquire cloud solutions, where IT continues to be an active partner, so that every cloud acquisition can be made from a central business and security point of view, and that IT procurement gets an active role in assessing the expense and ongoing costs of the cloud applications. Last but not least, the company's security department must be involved to ensure that no internal data is exposed and how compliance with applicable regulations can be ensured.

## 8. Ownership of Data

"Data as the new gold" is a recurring theme, but what about ownership and access to data when you store it with a cloud provider? Basically, you don't quite know where it ends up, but it is stored in a physical place. And data can in principle be replicated indefinitely, and who has the right to access your data? It applies to data such as processes, functionality, SLA etc. that *accountability* cannot be outsourced to the supplier.

As a company - whether you describe data as a precious metal of one caliber or not - you yourself must ensure that you have or purchase the skills to be able to face risks when placing data. Not all data is gold either - some are downright crown jewels, and others are very ordinary. Classifying data can ensure the right focus on the right data - let internal roles be responsible for and take ownership of all data.

Legislation for countries is certainly not the same. As a Danish company of a certain size, you are typically well-versed in Danish and EU legislation - or can get assistance with it. If you store data in countries outside the EU, you should pay special attention to the ownership and whether you may even send data out of the country if you need to. Access to data can be uncertain - do the authorities in the country in question have access to data; and if so, could you be nervous about it being exploited?

For example, a company can also encrypt its own data - either via the cloud provider's service; which is there to protect against accidental access but also against a government access? Alternatively, you can also develop and encrypt data (or significant parts of it), which, however, may cost more consumption when unpacking and packaging.

**Recommendation:** Be clear about where the cloud provider stores (and replicates) your data, and be clear about what the legislation is in the country in question. Uncover the strategy in case of exit, acquisition, bankruptcy and the like.

Let internal employees take responsibility for the security and availability of data within the framework of what is possible - including the possibility of common functionality such as retrieving, editing, deleting - also in relation to GDPR. Let it be part of your supplier assessment before choosing a cloud.

## 9. The legacy system can be moved to the cloud, but does the company achieve the benefits?

Several examples have been seen of requests to move from a specially developed, on-premise system to the cloud. The reasons have been several at the same time: to save money, increase the speed of development or increase flexibility. Technically speaking, it is often possible - and sometimes even simple - to move the system in what the suppliers call a "lift-and-shift": The system is moved by virtualizing the servers the system is currently on or after code conversion of e.g. COBOL for Java, which is then subsequently operated in the cloud.

However, the question is whether a lift-and-shift move to the cloud will achieve the desired benefits? Lift-and-shift can seem appealing in its simple concept. Simple and quick provisioning of additional servers can - ideally - quickly get rid of congestion and long response times. But the realities are often more varied.

Legacy systems are rarely built to be able to take advantage of the opportunities in the cloud, such as on-demand horizontal scaling and automatic throttling outside of peak periods. In practice, performance bottlenecks and difficulties in separating storage space into expensive and cheap partitions often arise. Therefore, the operating costs of moving to the cloud can run the risk of becoming surprisingly high without the benefits materializing.

From an EA point of view, the question of moving a legacy system to the cloud is a question of what benefits the business wants. A good enterprise architecture does not necessarily require the use of the cloud. The right enterprise architecture is the one that supports the company's needs, and a move to the cloud is not always a good idea either.

**Recommendation:** Have a dialogue with the business and the supplier by asking the right questions and clarifying the complex motivations behind the desire to move to the cloud.

- Increased development speed is often not dependent on whether the system is operated in the cloud or not. If increased development speed is desired, focus instead on establishing automatic testing and automatic deployment (CI/CD). Cloud technology can help, but is not a prerequisite for success.
- Cost reduction *can be* achieved, but only if the system's architecture allows it. There can be gains if the system resources are currently oversized and can instead be replaced by a few

and small cloud resources outside of peak periods, or if the company faces investment in new system resources, which can thus be avoided.

- Legacy systems can be of a technically poor quality and have high technical debt. To move it to the cloud in its current state does not solve the problems that characterize legacy IT. If so, consider alternatives to moving legacy systems to the cloud as a "lift & shift":

- o Recoding the system with various well-tested, modern tools and techniques, o Replacing the system with a combination of standard systems, which may can be cloud-based,

- o Encapsulating the system and instead exposing its data and functionality as APIs, which allowing other systems to gradually take over the IT support, as well

- o Establishing a "digital platform", which can remove some of the pressure for change from the legacy system.

## 10. Enterprise architect versus cloud architect

There are differing views on whether the EA architect and the cloud architect are the same person or role.

You often see a job posting asking for an enterprise architect, but where the first bullet under tasks is a transformation of the company's IT application to the cloud.

The enterprise architect must know enough about cloud advantages and the possible service models for cloud solutions (IaaS, PaaS and SaaS) advantages and the possible use in the company.

There will be a need to involve both infrastructure architects and solution architects (applications) if the company bets on a distinct mix of IaaS, PaaS and SaaS, as detailed knowledge is needed to be able to ensure the cloud solutions' collaboration and data exchange with the on premise solutions .

Likewise, the security architects will have a great interest in risk assessing the cloud solutions in relation to compliance and mitigation of risks.

It will be necessary to be able to document the chosen solutions, which have been made to ensure the company's use of cloud solutions.

**Recommendation:** Strengthen the collaboration between the enterprise architects, the solution architects, the infrastructure architects and the security architects, so that a process can be created for how the cloud solutions are evaluated, risk assessed and mitigated, at the same time as knowledge about cloud use in the company is expanded , and the architecture skills are built up so that the cloud architect role can be shared/ supported jointly.

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