

Management for Professionals

Michael Missbach · Thorsten Staerk
Cameron Gardiner · Joshua McCloud
Robert Madl · Mark Tempes
George Anderson

SAP on the Cloud

Second Edition

 Springer

Management for Professionals

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Castles in the Clouds are Built by Visionaries, they give Home to Dreamers, but Psychiatrist cash in the Rental Fee*

*Wolkenschlösser werden von Visionären gebaut, Träumer bewohnen sie und Psychiater kassieren die Miete—German proverb.

Today's business demands agility, availability, and faster speed of execution to meet tighter SLAs. This is provided by the office of the CIO, which has the mission to provide more capabilities, but with less human and infrastructure resources.

Clearly, traditional architectures are no longer sufficient and thus new forms for deployment and management are necessary. These new Cloud architectures should not only be designed for the infrastructure but should also include whole ready-made solutions for the enterprise.

SAP solutions continue to be the most mission- and business-critical applications for an enterprise; with new technologies and solutions that can integrate into an existing SAP environment, the operational and management complexity can increase dramatically. SAP on the Cloud will allow your enterprise to do more with less and effectively meet increasing business demands at a lower operational cost.

While many have just begun their adventure and are stumbling through the “mist”-eries and hype around cloud computing, the authors will guide you through the crucial initial stages and beyond in this book. As the storm rolls in, they help clear the fog and provide guidance for your enterprise to navigate through the shallow waters and underwater obstacles on your journey to running SAP on the cloud. All aspects will pass the revue, from the basics of the infrastructure requirements to host complete SAP-based solutions to the service-level management processes and functions to best support these environments. With proper planning and navigation, the final destination of SAP on the Cloud will deliver the requirements of your enterprise, with a manageable and agile distributed architecture.

So enjoy reading and be guided.

Copenhagen, Denmark

Nick De Groof

Foreword

Today “the Cloud” is everywhere—analysts urge you to investigate in cloud technology and TV spots call to move all your private data to the cloud.

And the buzzwords sound great for your IT department—always enough resources on hand and a lot of money to save. The reality may be a far cry from slogans like “Put all of our services into the cloud and you will get rid of all problems.”

As a manager in an enterprise IT, you have to consider topics like security, governance, validations, release management, SLA, and legal issues. You also have to consider which of your IT services fit to what type of the numerous cloud flavors—if they fit at all?

Going cloud will also have an impact on the organization of your IT that breaks up established silos—organizational “kingdoms” have to be conquered to build a new federated union of collaborating teams.

This book is about SAP in the cloud. SAP solutions are among the most mission-critical applications of any company. Performance and stability of such systems often have priority over cost; nevertheless, costs are always a major issue. But to impair the business to save some money is not an option.

On the other side, the classical SAP architecture is “cloud friendly” and fits well to IaaS concepts because most SAP environments are very well standardized.

However, this is not true for all SAP solutions; appliances like HANA are examples of individual services that do not fit well to the cloud paradigm yet.

Knowing such nifty details and the technologies to overcome the obstacles offer a good chance to launch a successful SAP-on-cloud-project.

This book shows you how to move SAP into the cloud without ending up in fog.

Edinburgh, UK

Robert-Andreas Riemann

Preface

This book provides an overview of the various facets of building and operating SAP applications on public and private cloud infrastructures. It describes and discusses the latest developments, challenges, and suitable solutions and also outlines future trends where plausible or possible.

To ensure that this book is also useful to readers who do not consider themselves to be “gurus” in this area, this book explains in detail the backgrounds of several possible cloud solutions in the context of various SAP applications and components. Examples are provided throughout this book in order to make the reader aware of essential but perhaps less-obvious points. However, keep in mind that this book concentrates exclusively on the setup and operation of the SAP infrastructure; it does not give details related to installing and customizing the SAP software itself, nor does it deal with the much more complex tasks involved in business process implementation and reengineering.

Chapter 1, “The cloud demystified”, describes the different flavors of cloud computing and their relevance as a platform for the different SAP applications. This chapter enables readers to decipher the “SAP talk” on the cloud.

Chapter 2 deals with the technical characteristics of the most commonly used SAP solutions from ECC to HANA and simplified SAP and discusses how well they fit into the various cloud concepts described in the first chapter. This chapter gives you a good understanding of the very specific requirements of SAP systems and why not any cloud offering is a good fit for SAP.

Chapter 3 takes you through the definition of appropriate service levels for SAP systems in cloud environments. It focuses on the prediction of the necessary resources to fulfill the SLA and how to measure and bill their actual consumption. Additional topics include service guarantees and availability as well as billing tools for SAP systems.

Chapter 4 deals with security aspects—one of the key topics for the decision between public and private cloud computing where safeguarding information is even more critical. The chapter describes how modern hackers launch attacks and discuss the Legal and Regulatory Aspects of cloud computing. To mitigate the risks

and comply with the rules, the Threat-Centric Security Model is introduced. The design of scalable security architecture is described as well as innovative hybrid cloud and Application-Centric Infrastructure design models. Real live examples and hints are given how to harden the x86 operating systems typical for clouds.

Chapter 5 discusses the topic of lifecycle management of ever-changing business processes in cloud environments. It focuses on cloud-specific constructs such as resource pools, failure domains, scale units, health models, stateless computing, service profiles, and more in the context of SAP.

Chapter 6 introduces the Internet of Things and fog computing as the next hype in IT. More and more, the sources of data fed into SAP systems triggering business processes are not human users but cloud-enabled sensors integrated into “things.” Therefore, even SAP systems on-premise need to have secure connections to the cloud.

Chapter 7 explores the new hybrid approach to cloud computing and discusses organizational changes within IT departments. It explains the necessity of IT departments to become service brokers. A decision matrix for categorizing cloud services is introduced and the benefit of having a service catalogue is explained.

Chapter 8 discusses the controversial topics of governance, control, and security of highly shared, multi-tenant computing environments. This chapter also provides an overview on a current cloud infrastructure offering for SAP and eventually presents an outlook on new developments.

Chapter 9 demonstrates how companies that prefer to retain their mission-critical SAP systems and sensitive data in-house or in their own premises can benefit from infrastructures boasting cloud attributes. This chapter introduces new developments as well, including lossless Ethernet, converged networks, and unified computing.

Chapter 10 describes how innovative concepts like unified computing and service profiles enable full flexibility for SAP on public and private cloud implementations and how this influences the organizational structure of SAP operations.

Within the chapter containerized datacenters as well as block- and pod-based datacenter concepts are discussed. The chapter closes with a discussion on how green clouds can be.

Chapter 11 explores which of the numerous promises of cloud computing may actually be realized for different organizations. This chapter indicates how business applications in the future will offer enterprises a competitive edge by enabling them to “fail fast.” In doing so, cloud-enabled organizations will benefit from their ability to pilot and change their business processes faster than their traditionally hosted counterparts.

Prerequisites

The solutions presented in this book generally refer to the latest versions of the relevant SAP products at the time of writing. While new hardware and software solutions are developed increasingly quickly, the underlying technologies and architectures change more slowly. Therefore, the cloud solutions or techniques described in this book will likely prove useful for future SAP releases. Also, many of the technical solutions and techniques presented here should be suitable for other enterprise-critical software systems, both off the shelf and custom developed.

This book has intentionally taken a neutral stance in terms of products. However, because most of the authors and contributors are employees of Cisco, Microsoft, HP, and VCE, much of their expertise draws on the concepts and best practices developed in these companies through their partnerships with SAP and customers. For example, Cisco solutions are used as best practice examples of technologies that proved their worth in thousands of installations.

Where the name of a specific product is mentioned, this is intended only as an example of a class of solutions and does not represent a value judgment of that product.

Acknowledgments

This book is the product of voluntary work done in our free time over many nights and weekends. We therefore dedicate this work to our wives and children, who have had to spend more time than usual without our full attention.

We would also like to thank all of our customers and colleagues who selflessly provided much help in the form of tips, contributions, reviews, and constructive criticism. Without their support, we would not have been able to write this book.

In particular, we would like to call out the following people: Oliver Widhoelzl from Egger Holz; Joseph Caruso from Pfizer; Nick de Groof from Maersk; Otto Bruggeman from Intel, Tobias Brandl from Grand Consult; Joachim Weide from Avato-consulting; Peter Klewinghaus from Amazon; Alexander Georgievskiy from Xerox; Michael Weber from Munich-Re; Harald Sogl from TDS; and Andrew Smallridge, Mahmud Mirza, Barbara Miller, Gerd Pflueger, and Ulrich Kleidon from Cisco.

The practical experience of all our advisors greatly added to the value of this book, and their support was a great source of encouragement.

A special mention, however, must also go to Christian Rauscher, our editor at Springer Heidelberg, for his involvement in the production of this book. It is due to his expert feedback that only unavoidable errors remain in this book. Mr. Rauscher has been a constant and much-welcomed partner and supporter in this regard.

Walldorf, Germany
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Cloud Computing is the latest buzzword in IT. In an SAP context its meaning overlaps with Internet, virtualization, outsourcing and hosting. With S4HANA and HANA Cloud Platform, SAP is betting their future on the cloud. This chapter helps you understand SAP's cloud strategy and ask the right questions about SAP on the cloud offerings on the market.

► **Today, the cloud enables everything—or is everything just labeled “cloud”?**

In today's world we take pictures with our smartphones and look at them on our tablets or show them to friends by hooking our notebooks up to a data projector. Once a picture has been taken with one device, it is available on all of them. The same is true for SAP development; with HANA Cloud Platform, you can start developing an app at your office and then continue using the same development environment from any Internet cafe. When explaining this situation, we say that the data—pictures, the app or documents like this book—is in the “cloud”. However, this term has been hyped up and overused of late; it is currently applied to so many different concepts that it is hard to find a definition. For engineers, the term “cloud” seems very “cloudy” because it does not describe any particular technology, but a user experience, a business opportunity and a place to store data or run virtual machines.

The mind map in Fig. 1.1 is this chapter's topic “cloud”:

After reading this chapter, you will be able to:

- explain the mind map
- read and understand SAP notes about the cloud
- give examples of SAP's cloud strategy
- know what questions to ask and what information to look for when evaluating cloud offerings.

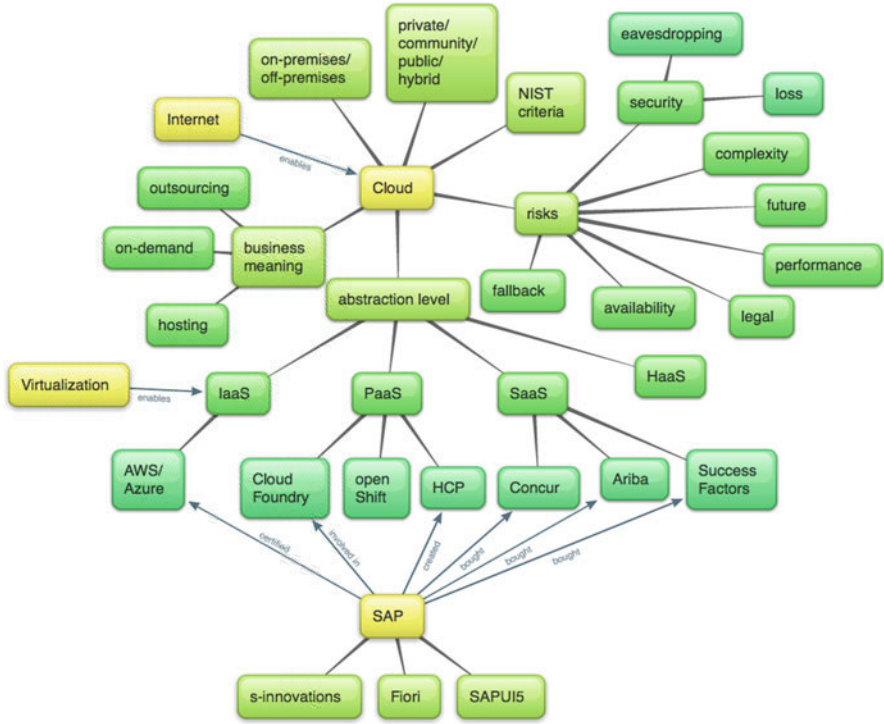


Fig. 1.1 Cloud definition mind map

1.1 What Is the Cloud?

► **Services must meet five criteria to be labeled “cloud”.**

In the introduction, we saw some examples of services that are being considered a part of cloud computing. Generally, virtual machines, online storage and websites are thought to be a part of it, but these are completely different technologies. How can they all possibly fall under the same umbrella?

Common to all these experiences is that they hide the technical details that enable them (just like a cloud is opaque) and are available via the Internet (traditionally, the symbol for the Internet in diagrams is a cloud). Further, the U.S. National Institute of Standards and Technology (NIST) has published criteria generally agreed upon for defining the term “cloud”:

- On-demand self-service
There is no need for human interaction to access the service. Think of the “password reset” functionality in websites.
- Broad network access
Access is not only obtained via the network, it is also open to a variety of devices like mobile phones and desktop computers. This is the “mobile apps” part of the cloud.
- Resource pooling
That is the “virtualization” part of the cloud—servers, storage and network components are abstracted. The customers may not even know which datacenter they are using.
- Rapid elasticity
The platform must be able to scale up and down quickly. With SAP, the most prominent examples for this requirement are the use cases “I need more Sales & Distribution capacity for Christmas business” and “I need to run payroll at the end of a month”.
- Measured service
A cloud service will typically be offered on the market (as opposed to staying in-house) and invoiced per-use. So a sensible performance indicator is needed, like SAPS consumption measured by SAPSmeter.

1.2 IaaS to HaaS

► ***The four service models span from Infrastructure as a Service (IaaS) to Human as a Service (HaaS)***

In today’s public discussion, cloud services are divided into the *service models*

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)
- Human as a service (HaaS)

One example of **IaaS** are virtual machines that can be provisioned in less than 5 min at the respective cloud providers like Azure and Amazon Web Services. Customers can choose the operating system and it will be their responsibility to take care of operating system patches and operation. For SAP customers, IaaS largely overlaps with hosting. In case of pure IaaS, responsibility for SAP installation and maintenance would remain with the customer.

Closer to the user, more abstract in terms of hardware is **PaaS**, which provides software development and publishing environments like CloudFoundry, OpenShift or HANA Cloud Platform. Arguably, databases also count as platforms in this

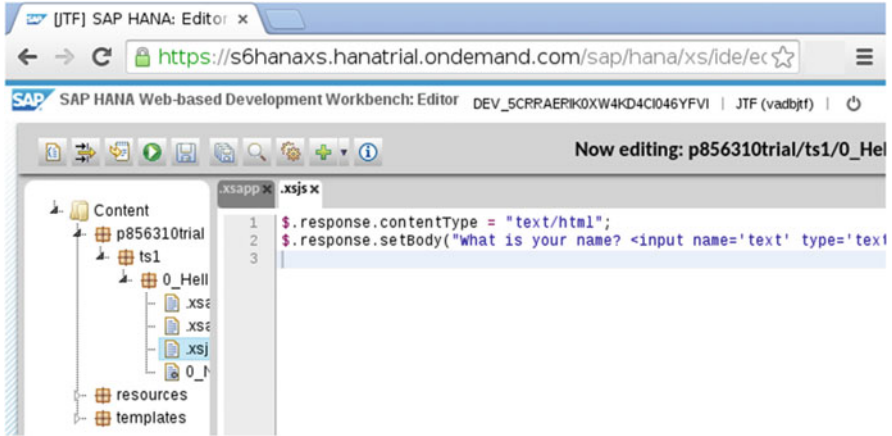


Fig. 1.2 A “hello world” example in HANA Cloud Platform. Note that the entire development environment is in a browser

context. These services are not for the end user. A typical SAP example would be a hosted environment where the customer just needs to take care of the SAP License, SAP Basis work and above (Fig. 1.2).

One step further from the hardware is *SaaS*. These are tools for the end user that can be used without any IT-knowledge. Since the software is served via the Internet, they are transmitted as websites. Examples of these are SAP’s acquisitions *successfactors* (an HR tool) and *Concur* (for travel and expense management), as well as file sharing via Dropbox.

Finally, *HaaS* are human services offered over the Internet. For example, many Internet vendors offer translations as a service performed by humans. The new thing is that the cloud definition requires an automated approach that goes as far as self-service. With this system, micro-fulfillments like “pay \$10 and get a text with up to 50 words translated” become possible. This concept also profits on the fact that the sun never sets on the Internet, so there is always a place where people are working at business hours. It will be interesting to see if SAP as an organization will integrate HaaS into their portfolio.

► **How to draw your own diagram**

We have defined IaaS as compute power and SaaS as services that are consumable by the end user. Then there are many PaaS (services) depending on your business. Here is how you would draw a diagram for the “pizza business”:

To compare offerings on the market it helps to draw an overview like Fig. 1.3. For SAP your layers may be “virtual machine provided”, “operating system provided”, “SAP installed and updated”, “SAP license managed”, “SAP Basis managed” and so on. When comparing offers from various cloud providers you may be able to find more layers of service that match with your individual needs.

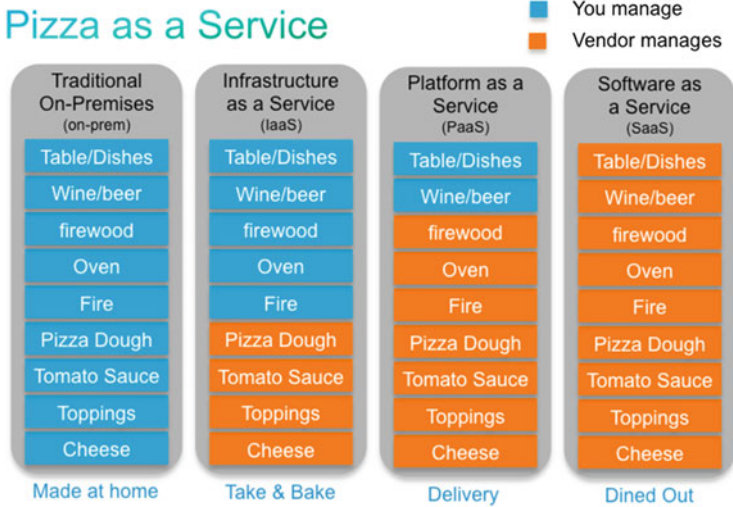


Fig. 1.3 “Pizza as a Service”

1.3 The Cloud as a Way to Do Business

► ***The cloud is not a single technology, but a development driven by business needs.***

A good way to criticize what we have discussed so far would be to say:

IaaS is nothing new; it’s just hardware virtualization with a self-service mechanism.

It’s hosting the servers.

PaaS is nothing new; it’s a software development environment in a browser or hosting the SAP installation.

SaaS are just websites with a self-service mechanism.

HaaS are just broker services on websites.

We want to take these ideas one step further. We think the evolution from virtual machines, Internet and metering systems (like SAPSmeter) to the cloud is unavoidable because it contributes to the value chain. The cloud is a development driven by business. At the beginning of Industrial Age, factories had to produce their own electricity. But later on, electricity became standardized (voltage and frequency) and outsourced. The same will happen with IT service. The cloud is a type of outsourcing (Fig. 1.4).

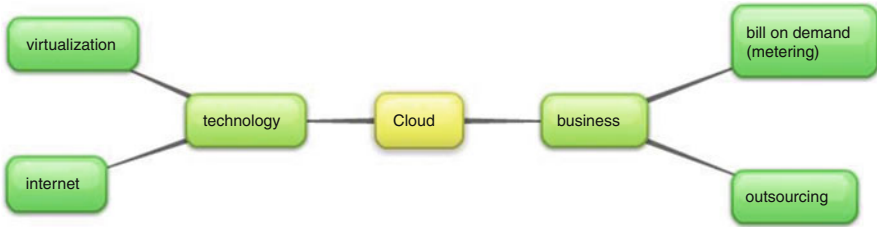


Fig. 1.4 Mind map: The cloud from a technology and business view

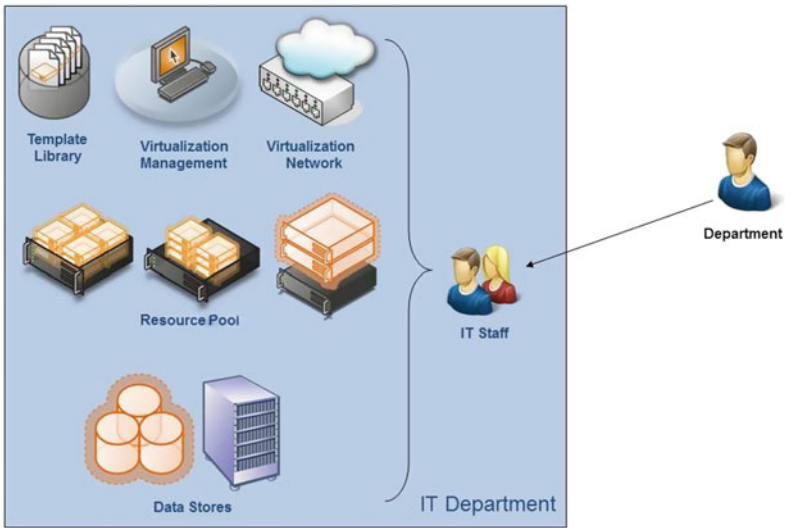


Fig. 1.5 The traditional role of the IT department

► **IT consumption will change—and the way IT departments operate.**

With cloud computing, your expenses will typically shift from CAPEX (capital expenses) to OPEX (operational expenses)—just like when you buy electricity instead of producing it. This also means that in-house IT departments have to develop—IT services can be bought anywhere on the Internet by anyone with a credit card. The IT consumption behavior within corporations will change from a “centralized, indirect model,” depicted here (Fig. 1.5):

To a “modular” model, pictured below (Fig. 1.6):

Following the trend of service delivery, it will be much easier in the future to replace the corporate IT department with cloud service providers. Chapter 6 gives some perspective on how IT departments can manage this change for their best interests and those of their companies.

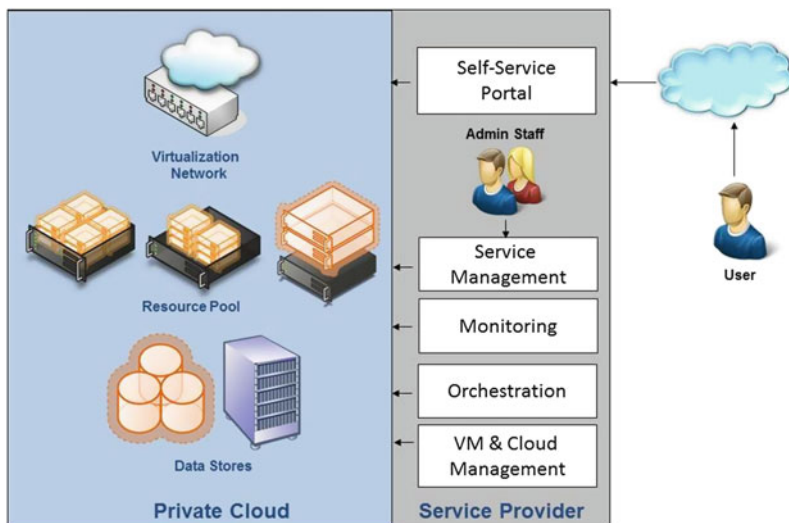


Fig. 1.6 Service procurement in the Cloud era

1.4 Public, Hybrid and Private Cloud

► **Cloud services can be deployed as public, community or private. Mixing this makes a hybrid cloud strategy.**

The cloud’s main disadvantage is the real or perceived lack of data security. People don’t want to put their lives on the Facebook “cloud” and organizations don’t want to have their mission-critical data mixed with their competitor’s. Private clouds address this concern. The customer’s equipment will be hosted in their own private datacenter. There are companies whose business model is to help their customers build up a private cloud with all their (soft) requirements.

Community Clouds are clouds dedicated to a special purpose or community that share one or more concerns.

If you combine different cloud approaches (public, private or community) and allow for portability between the clouds, this is called a hybrid cloud strategy. Chapter 6 goes into great detail here.

Obviously, with each service, the customer will evaluate if it needs dedicated (or private) resources, or if shared resources are enough. This will require a customized table like the one below. The reason for implementing a hybrid cloud approach can be legal requirements. In particular, personal data like vacation dates

Table 1.1 Public cloud vs. private cloud advantages

Advantage	Public cloud	Private cloud
On-demand self-service	Yes	Yes
Broad network access	Yes	Yes
Resource pooling	Yes	Limited to resources in the datacenter
Rapid elasticity	Yes	Limited to resources in the datacenter
Measured service	Yes	Yes
Legal restrictions	May prohibit storing data abroad	Data will not leave the datacenter
CAPEX to OPEX conversion	Yes	No
Availability of service	Higher	Lower

must be secured against eavesdropping in many European countries. In some of them, patient data is not allowed to leave the physical boundaries of a hospital group. SAP customers tend to migrate their test and development systems to the public cloud first to gain experience first.

One reason for putting a service into the public cloud may be cost efficiency. Some services are not available to be installed anywhere outside the service provider, they are cloud-only. The public cloud is also great at converting CAPEX (capital expenses) to OPEX (operational expenses)—you are renting a service with the infrastructure that delivers it (Table 1.1).

1.5 On-Premises vs. Off-Premises

► *A private cloud needn't be on the customer's premises.*

Typically, a private cloud will reside on the customer's premises, and a public cloud off-premises. But the meaning of “hosting”, “outsourcing”, “virtualization” and “private cloud” overlaps a great deal, and at this point in the industry, the hype-label “cloud” is applied wherever possible. Many providers dedicate parts of their datacenter exclusively to customers. This is often called a “hosted” cloud. Or the service provider may operate one or more datacenters on the customer's premise. The hardware can be owned by the customer or service provider. This may have legal implications. For example, when using SAP IS/H (Industry Solution for Healthcare), patient data cannot be stored outside of the hospital complex (Fig. 1.7).