The role of cloud computing in the service of Maqāṣid Al-sharī‘ah in problem solving.

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Abstract:
Cloud computing has emerged as one of the computing methods in which computer resources are presented as services, and users are available to access them via the Internet (the cloud) without the need to possess knowledge, experience, or control of the infrastructure that supports these services. Cloud computing is also viewed as a general concept that includes Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) in the world of technology that shares the idea of relying on the Internet to meet the computing needs of users. Thus, the research objectives are: the definition of cloud computing, its types and Maqāṣid Al-sharī‘ah, description of the role of cloud computing in the service of protection of Faith (Din), protection of lives (Nafs), protection of wealth (Mal), protection of intellect ('Aql) and protection of progeny (Nasl) to help solve problems in times of crisis.

***Keywords*:** Cloud Computing, Maqasid al-Shari`a, Problems Solving**.**

1. Introduction

Technologies such as cluster, grid, and now, cloud computing, have all aimed at allowing access to large amounts of compute power in a fully virtualized manner by aggregating resources and offering a single system view. In addition, an important aim of these technologies has been delivering computing as a utility.

Utility computing describes a business model for on-demand delivery of computing power; consumers pay providers based on usage (“pay-as-you-go”), like how we currently obtain services from traditional public utility services such as water, electricity, gas, and telephony (John Wiley & Sons, Inc, 2011). During the past few years, cloud computing has become key to the IT buzzword (Won Kim & et 2019). In our daily lives, we use cloud computing without noticing. We continuously use email, google, and other cloud services.

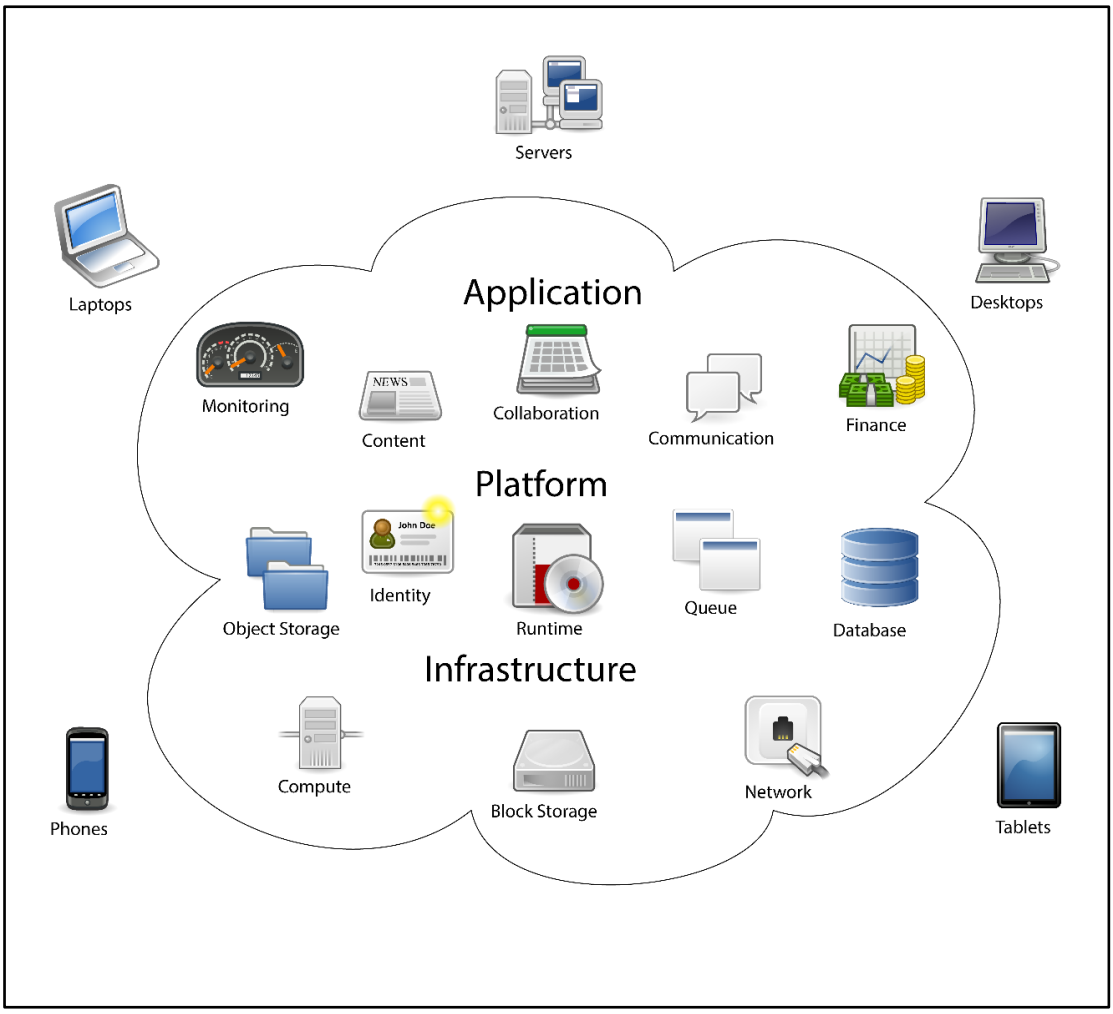

Figure 1. Cloud computing Concept

The paper contributes to the correct use of cloud computing to achieve the Maqasid al-Shari`ah and solve problems.

1. Clouds n the Quran and Sunnah

Clouds in the roots of the Arabic language:

> The cloud: from which rain comes, named because it withdraws into the air, and the combination is clouds, clouds, and clouds (bin Mnazor, 1994).
>
> Shb: (the cloud) the clouds and its combination (clouds) (Abdul Qader Al-Razi, 1418).

There are many verses in the Holy Quran about clouds such as:

{وَالسَّحَابِ الْمُسَخَّرِ بَيْنَ السَّمَاءِ وَالْأَرْضِ لَآيَاتٍ لِقَوْمٍ يَعْقِلُونَ} [البقرة: 164]

and clouds which are held between the sky and the earth, are indeed Ayat (proofs, evidences, signs, etc.) for people of understanding. [2:164].

{وَهُوَ الَّذِي يُرْسِلُ الرِّيَاحَ بُشْرًا بَيْنَ يَدَيْ رَحْمَتِهِ حَتَّى إِذَا أَقَلَّتْ سَحَابًا ثِقَالًا سُقْنَاهُ لِبَلَدٍ مَيِّتٍ فَأَنْزَلْنَا بِهِ الْمَاءَ فَأَخْرَجْنَا بِهِ مِنْ كُلِّ الثَّمَرَاتِ كَذَلِكَ نُخْرِجُ الْمَوْتَى لَعَلَّكُمْ تَذَكَّرُونَ} [الأعراف: 57].

And it is He Who sends the winds as heralds of glad tidings, going before His Mercy (rain). Till when they have carried a heavy-laden cloud, we drive it to a land that is dead, then We cause water (rain) to descend thereon. Then We produce every kind of fruit therewith. Similarly, we shall raise up the dead, so that you may remember or take heed. [7:57].

{هُوَ الَّذِي يُرِيكُمُ الْبَرْقَ خَوْفًا وَطَمَعًا وَيُنْشِئُ السَّحَابَ الثِّقَالَ} [الرعد: 12].

It is He who shows you the lightning, as a fear (for travellers) and as a hope (for those who wait for rain). And it is He Who brings up (or originates) the clouds, heavy (with water). [13:12]
{أَلَمْ تَرَ أَنَّ اللَّهَ يُزْجِي سَحَابًا ثُمَّ يُؤَلِّفُ بَيْنَهُ} [النور: 43].

See you not that Allah drives the clouds gently, then joins them together [24:43].
{اللَّهُ الَّذِي يُرْسِلُ الرِّيَاحَ فَتُثِيرُ سَحَابًا فَيَبْسُطُهُ فِي السَّمَاءِ كَيْفَ يَشَاءُ} [الروم: 48].

Allah is He Who sends the winds, so they raise clouds, and spread them along the sky as He wills [30:48].
{وَاللَّهُ الَّذِي أَرْسَلَ الرِّيَاحَ فَتُثِيرُ سَحَابًا فَسُقْنَاهُ إِلَى بَلَدٍ مَيِّتٍ فَأَحْيَيْنَا بِهِ الْأَرْضَ بَعْدَ مَوْتِهَا كَذَلِكَ النُّشُورُ} [فاطر: 9].

And it is Allah Who sends the winds, so that they raise up the clouds, and We drive them to a dead land, and revive therewith the earth after its death. As such (will be) the Resurrection! [35:9].

{وَإِنْ يَرَوْا كِسْفًا مِنَ السَّمَاءِ سَاقِطًا يَقُولُوا سَحَابٌ مَرْكُومٌ} [الطور: 44].
And if they were to see a piece of the heaven falling, they would say: "Clouds gathered in heaps!" [52:44].
{وَتَرَى الْجِبَالَ تَحْسَبُهَا جَامِدَةً وَهِيَ تَمُرُّ مَرَّ السَّحَابِ صُنْعَ اللَّهِ الَّذِي أَتْقَنَ كُلَّ شَيْءٍ إِنَّهُ خَبِيرٌ بِمَا تَفْعَلُونَ} [النمل: 88].

And you will see the mountains and think them solid, but they shall pass away as the passing away of the clouds. The Work of Allah, who perfected all things, verily! He is Well-Acquainted with what you do. [27:88]. And there is the difference between them. So, the raining from maybe benefit or harm. There is a duaa about raining from clouds:
عَنْ عَائِشَةَ قَالَتْ: إِنَّ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ كَانَ إِذَا رَأَى الْمَطَرَ قَالَ: «اللَّهُمَّ صيبا نَافِعًا» . رَوَاهُ الْبُخَارِيّ باب الاستسقاء - الفصل الأول.

'A'isha told that when God's Messenger saw rain he said, "O God, send a beneficial downpour." Bukhari transmitted it. Chapter: Prayer for Rain - Section 1.
عَنْ جَابِرٍ قَالَ: رَأَيْتُ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ يُوَاكِئُ فَقَالَ: «اللَّهُمَّ اسْقِنَا غَيْثًا مُغِيثًا مَرِيئًا مَرِيعًا نَافِعًا غَيْرَ ضَارٍّ عَاجِلًا غَيْرَ آجِلٍ» . قَالَ: فَأَطْبَقَتْ عَلَيْهِمُ السَّمَاءُ. رَوَاهُ أَبُو دَاوُد صَحِيح (الألباني).

Jabir said he saw God's Messenger raising his hands in supplication. Then he said, "O God, give us rain which will replenish us, abundant, fertilizing and profitable, not injurious, granting it now without delay." He said that thereupon the sky became overcast. Abu Dawud transmitted it.

Cloud computing can be used in the right or the wrong way, therefore we need to use it to benefit the community not harm it.
Allah said:
{ أَلَمْ تَرَ إِلَى الَّذِينَ بَدَّلُوا نِعْمَتَ اللَّهِ كُفْرًا وَأَحَلُّوا قَوْمَهُمْ دَارَ الْبَوَارِ } [إبراهيم: 28]

Have you not seen those who have changed the Blessings of Allah into disbelief (by denying Prophet Muhammad SAW and his Message of Islam), and caused their people to dwell in the house of destruction? [14:28].

2. The Meaning of Cloud Computing

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (Olivier Brian& et, 2012).

3. Types of Clouds

There are different types of clouds that you can subscribe to depending on your needs. As a home user or small business owner, you will most likely use public cloud services.

1. Public Cloud - A public cloud can be accessed by any subscriber with an internet connection and access to the cloud space.
2. Private Cloud - A private cloud is established for a specific group or organization and limits access to just that group.
3. Community Cloud - A community cloud is shared among two or more organizations that have similar cloud requirements.
4. Hybrid Cloud - A hybrid cloud is essentially a combination of at least two clouds, where the clouds included are a mixture of public, private, or community. (Alexa Huth and James Cebula, 2011).

4. Three Types of Service Models

Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). These three types differ in the amount of control that you have over your information, and conversely, how much you can expect your provider to do for you. Briefly, here is what you can expect from each type.

1. Software as a Service - A SaaS provider gives subscribers access to both resources and applications. SaaS makes it unnecessary for you to have a physical copy of the software to install on your devices. SaaS also makes it easier to have the same software on all your devices at once by accessing it on the cloud. In a SaaS agreement, you have the least control over the cloud.

2. Platform as a Service - A PaaS system goes a level above the Software as a Service setup. A PaaS provider gives subscribers access to the components that they want to develop and operates applications over the internet.

3. Infrastructure as a Service - An IaaS agreement, as the name states, deals primarily with computational infrastructure. In an IaaS agreement, the subscriber completely outsources the storage and resources, such as hardware and software, that they need. (Alexa Huth & James Cebula, 2011). We will focus in this article on the role of cloud computing to achieve the objectives of shariah

5. The Role of Cloud Computing to Achieve the Objective of Protection of Faith (Din) in Solving Problems at a Time of Crisis

5.1 Fatwa

We can use cloud computing in keeping the data of questions and answers and use it in Fatwa to study the new issue in our life. We need to solve the disadvantages of cloud computing to satisfy our religion by using ii IT Ethics. There are many disadvantages of cloud computing including:

5.2 Security And Privacy

The integrity of personal information has become a major issue not only for cloud computing but also for on-premises computing. It is nearly impossible to guarantee 100% security and privacy protection against all possible sources of violation, including the inevitable software bugs, the growing sophistication of hackers, inadequate procedures, human malfeasance, and human errors. Cloud computing vendors must adopt the most sophisticated and up-to-date tools and procedures and strive to provide better security and privacy than is available for on-premises computing. (Won Kim & et 2019).

The information housed on the cloud is often seen as valuable to individuals with malicious intent. There is a lot of personal information and potentially secure data that people store on their computers, and this information is now being transferred to the cloud. This makes it critical for you to understand the security measures that your cloud provider has in place, and it is equally important to take personal precautions to secure your data. (Alexa Huth and James Cebula, 2011).

Alibaba Cloud provides end-to-end security services and has developed cutting-edge AI technology for security identification and risks analysis. Its accumulated experience from various and massive security attacks – that's 800 million attacks and 200 million passwords cracked every day – ensures that your business threats and attacks are minimized on the cloud. https://www.thestar.com.my/starpicks/2021/07/22/why-malaysian-businesses-should-adopt-cloud-computing (Thursday, 22 Jul 2021, 12:24 PM).

5.3 Support

Both enterprise users and end-users require support for problem resolution. This is the case for both cloud computing and on-premises computing. Today's free SaaS cloud users are left pretty much on their own. Enterprise users pay for support. Cloud computing vendors must hire and train adequate support staff to provide better support than what the users are accustomed to with on-premises computing. Cloud services should be designed for easier usability than on-premises computing in the first place. (Won Kim & et 2019).

5.4 Vendor Lock-in and Interoperability

Vendor lock-in is a concern that users always have but in practice. Interoperability and industry-wide standards have alleviated this concern in the case of other technologies. Interoperability means easy migration and integration of applications and data between different vendors' clouds. This does not seem to have received much press as a major concern yet, probably because the market is in its infancy and not many users have faced the problems yet. (Won Kim & et 2019).

5.5 Compliance

Enterprise users must maintain business legal documents and assure their integrity to comply with various laws, such as Sarbanes-Oxley (SOX) and the health insurance portability and accounting act (HIPAA). Cloud computing vendors must adopt technologies to ensure that their enterprise users' data satisfy their compliance requirements. Again, this does not seem to have received much press as a major concern yet. (Won Kim & et 2019).

The cloud makes it possible for you to access your information from anywhere at any time. While a traditional computer setup requires you to be in the same location as your data storage device, the cloud takes away that step. The cloud removes the need for you to be in the same physical location as the hardware that stores your data. Your cloud provider can both own and house the hardware and software necessary to run your home or business applications. (Alexa Huth & James Cebula, 2011).

This is especially helpful for businesses that cannot afford the same amount of hardware and storage space as a bigger company. Small companies can store their information in the cloud, removing the cost of purchasing and storing memory devices (Alexa Huth & James Cebula, 2011).

6. The Role of Cloud Computing to Achieve the Objective of Protection of Life (Nafs) in Solving Problems at a Time of Crisis

6.1 Cloud Computing in Medical

Many services have been made in healthcare when we use cloud technology. Community clouds can be considered a subset of public clouds offering a range of services (including infrastructure-, software- or platform-as-a-service) that are tailored to a specific vertical industry (such as government, healthcare, or finance). The National Institute for Standards and Technology defines them as "an infrastructure shared by several organizations that supports a specific community that has shared concerns." (Olivier Brian& et, 2012).

6.2 Solve The Crisis

We can solve the crisis of Covid-19 by using the data in cloud computing. Countries will decide how to use cloud computing to treat Covid-19 by setting up the right rules. Data can also be uploaded to the healthcare facility's dedicated cloud technology and the user's private data in the cloud. All in all, cloud technology is an excellent approach to patient care.

6.3 Speed

Cloud computing will help in protecting our lives with its speed. When needing new medicine for the patients, we will find it in the data with cloud computing.

7. The Role of Cloud Computing to Achieve the Objective of Protection of Reason ('Aql) in Solving Problems at a Time of Crisis

7.1 Cloud Computing in Education

A shared community cloud would provide multiple benefits to education and research: a cost reduction resulting from economies of scale and a decrease in the number of isolated applications; improved agility and scalability via frictionless access to a large pool of resources; easy evaluation of new services through a shared environment; and higher efficiency and effectiveness through improved cooperation between institutions (Olivier Brian & et, 2012).

Education and research clouds as platforms for sharing vertical applications. Many academia-specific applications have been successfully implemented on an individual campus level. Occasionally, they are shared with other institutions on an ad-hoc basis. A shared (community) cloud platform would significantly facilitate this exchange as such applications could be offered to other institutions as Software as a Service (SaaS). A research and education app store? An app store can be defined as a marketplace for the sharing and reuse of online business applications, services, and components between academic institutions or institutions in primary or secondary education.

It can be thought of as a portal where commissioners or purchasers of services can browse a catalog of available services. The app store will also provide detailed information relating to the costs, capacity, service levels, and lead times for getting a particular service live. As a key part of the community cloud, the app store must be fully resilient and fault-tolerant. The long-term vision for the organization of academic IT infrastructure Academic IT systems could soon be composed of a wide spectrum of infrastructures at different levels. In the end, large parts of the computing and storage requirements in research, teaching, and administration could be carried out cost-effectively on public clouds.

On the other end, on-site private clouds could be used for highly specialized or security-sensitive applications. In between, community clouds could provide trusted platforms supporting cooperation and community-driven innovation. National academic communities are clear candidates for pioneering community clouds, but other concepts are equally viable: nationwide public-sector clouds, such as the French Andromede project, or pan-European sector-specific clouds) Olivier Brian& et, 2012).

7.2 Cloud Computing in Research and Science

As the research and education community have special needs, we should focus on the sector-specific and pertinent challenges, not just "duplicate" commercial clouds.

- Establish and maintain an up-to-date legal framework for cloud services that delineates which cloud services (private, community, and public) can be used under what conditions and establishes the conditions and limitations for cloud services provision out of Switzerland to foreign users.
- Preserve and leverage the important investments made in ID management (SWITCHaai, Shibboleth), to provide a transparent single sign-on to cloud services for the Research & Education community.
- Increase the reusability of data across projects and time. Upcoming national initiatives for the management of scientific information will create new opportunities or obligations for researchers concerning data management, long-term archiving, and other access by third parties.
- Implement related processes and systems for supporting the new approach.) Olivier Brian& et, 2012).

8. The Role of Cloud Computing to Achieve the Objective of Protection of Property (Mal) in Solving Problems at a Time of Crisis

8.1 Cloud Computing Zakat

We can also use cloud computing in zakat. We have many data on the people that may need the zakat and the money from rich people. In this way, the company can use cloud computing to help the poor.

8.2 Cloud Computing Waqf

One of the new ways to use cloud computing in Alwaqaf is to save the data in cloud computing and use the data and the money to serve the community across the waqf.

8.3 Cloud Computing in Islamic Banks

It is very important nowadays to use cloud computing in Islamic banking and save the data in the cloud using good security.

8.4 Innovate

These days, cloud computing will enable us to analyze huge data easily. This will help us minimize costs and be able to innovate for a better tomorrow.

8.5 Application Development

We can speed up application development time by using cloud computing to analyze data across the business. Using cloud computing will help us in storing, backing up, and recovering data quickly and easily without worrying about encountering any issues with the data.

8.6 Reduced Data Storage Costs

By using cloud computing we will reduce costs due to the lack of need for multiple buildings to save the data.

8.7 Robust Security of Information

Some many Cyber-attacks and thefts have been on the rise in companies, so we need to make robust security by keeping our data in cloud computing. All the companies' businesses should adopt cloud computing to reduce costs. Instead of building many buildings for storing the data, they can put it in cloud computing. For example, they can use Alibaba Cloud. Founded in 2009, Alibaba Cloud is a global leader in cloud computing and artificial intelligence (AI), providing services to thousands of enterprises, developers, and government organizations in over 200 countries and regions.

https://www.thestar.com.my/starpicks/2021/07/22/why-malaysian-businesses-should-adopt-cloud-computing (Thursday, 22 Jul 2021, 12:24 PM).

8.8 Flexibility

Cloud computing helps employees to be more **flexible** in their job practices. Cloud computing can be used online anywhere at any time. This means that employees do not need special buildings to finish their tasks.

8.9 No Worry About Hardware and Software

You will not need to worry about your hardware and software. All you need to do is focus on the cloud and your data. Cloud computing refers to a computing platform that can dynamically provide, configure, and reconfigure servers to address a wide range of needs, ranging from scientific research to e-commerce (Paul T. Jaeger, Jimmy Lin & Justin M. Grimes, 2008).

ROOTS OF CLOUD COMPUTING: We can track the roots of clouds computing by observing the advancement of several technologies, especially in hardware (virtualization, multi-core chips), Internet technologies (Web services, service-oriented architectures, Web 2.0), distributed computing (clusters, grids), and systems management (autonomic computing, data center automation (John Wiley & Sons, Inc, 2011).

Like most technologies, cloud computing evolved from a need. The tremendous growth of the Web over the last decade has given rise to a new class of "Web-scale" problems—challenges such as supporting thousands of concurrent e-commerce transactions or millions of searches queries a day. The natural response of technology companies has been to build increasingly large data centers to handle the ever-growing load; these data centers consolidate a great number of servers (hundreds, if not thousands) with associated infrastructure for storage, networking, cooling, etc. Over the years, technology companies, especially Internet companies such as Google, Amazon, eBay, or Yahoo!, have acquired a tremendous amount of expertise in operating these large data centers. (Paul T. Jaeger, Jimmy Lin & Justin M. Grimes, 2008).

8.10 Scalability

Cloud services can scale elastically. This means that they can provide the right number of resources when needed, and businesses never have to pay for more than they need. With a traditional on-site data center, a company typically has either more or fewer resources than they need.

8.11 Productivity

Because a business's IT professionals no longer need to set up the hardware for servers, patch software, or perform other time-consuming tasks, they can spend more time achieving business-advancing goals.

8.12 Performance

Cloud providers have a worldwide network of servers and resources that are updated regularly to the latest hardware and technologies. This means that services running on the cloud have less network latency and a greater economy of scale.

8.13 Reliability

Cloud computing makes data backup simple, quick, and less expensive. A business's data and services can be mirrored across different sites within a cloud provider's network, so data is never lost and can be recovered in a matter of seconds or minutes.
https://www.codecademy.com/resources/blog/what-is-cloud-computing/.

8.14 The Interests

The unique nature of cloud computing—and the potential for it to become a truly ubiquitous technology employed by individuals, academic institutions, corporations, and perhaps even government agencies—provides an opportunity to consider essential issues of technology and policy that seem destined to continue to grow in significance as technology continues to evolve. (Paul T. Jaeger, Jimmy Lin & Justin M. Grimes ,2008). Computing as you know it is about to change, your applications and documents are going to move from the desktop into the cloud. (Shivaji P. Mirashe, Dr. N.V. Kalyankar, 2010).

Cloud computing isn't network computing. With network computing, application or documents are hosted on a single company's server and accessed over the company's network. Cloud computing is a lot bigger than that. It encompasses multiple companies, multiple servers, and multiple networks. Plus, unlike network computing, cloud services and storage are accessible from anywhere in the world over an Internet connection; with network computing, access is over the company's network only. (Shivaji P. Mirashe, N.V. Kalyankar, 2010).

9. The Role of Cloud Computing to Achieve the Objective of Protection of Offspring (Nasl) in Solving Problems at a Time of Crisis

9.1 Cloud Computing for the Family

Centralizing Email Communications 2) Collaborating on Schedules 3) Collaborating on Grocery Lists 4) Collaborating on To-Do Lists 5) Collaborating on Household Budgets 6) Collaborating on Contact Lists 7) Collaborating on School Projects 8) Sharing Family Photos (Shivaji P. Mirashe, N.V. Kalyankar, 2010)

9.2 Cloud Computing for the Community

1) Communicating Across the Community.
2) Collaborating on Schedules.
3) Collaborating on Group Projects and Events (Shivaji P. Mirashe, N.V. Kalyankar, 2010).

9.3 Cloud Computing for the Corporation

1) Managing Schedules
2) Managing Contact Lists

3) Managing Project
4) Collaborating on Reports
5) Collaborating on Marketing Materials
6) Collaborating on Expense Reports.
7) Collaborating on Budgets
8) Collaborating on Financial Statements
9) Collaborating on Presentation (Shivaji P. Mirashe, Dr. N.V. Kalyankar, 2010)

For example, cloud computing can be used to determine the family budget, monthly expenses, and financial statements for each family member, make a monthly report for each individual and specify family shopping requirements.
Undoubtedly, just as there are advantages to using cloud computing to achieve Maqasid al-Shari`ah, there are also disadvantages, such as data theft or online attacks that cause harm to users.

10. Conclusion

- Cloud computing is very important in solving problems in times of crisis.
- There are many roles of cloud computing that achieve the objectives of Islam (Maqasid al-Shari`a): Protection of Faith (Din), Life (Nafs), Reason ('Aql), Property (Mal), and offspring (Nasl).

The recommendation: We need to develop cloud computing in our lives and use it to achieve the objectives of shari'ah (Maqasid Al-Shari`ah).

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12. Biodata

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13. Abstract in Arabic

دور الحوسبة السحابية في خدمة مقاصد الشريعة الإسلامية في حل المشكلات

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الملخص:

ظهرت الحوسبة السحابية كإحدى طرق الحوسبة، حيث يتم تقديم موارد الكمبيوتر كخدمات ، ويتاح للمستخدمين الوصول إليها عبر الإنترنت (السحابة) ، دون الحاجة إلى امتلاك المعرفة أو الخبرة أو حتى التحكم في البنية التحتية التي تدعم هذه الخدمات، ويمكن أيضًا اعتبار الحوسبة السحابية كمفهوم عام يتضمن البرمجيات كخدمة (SaaS) ، والنظام الأساسي كخدمة(PaaS) ، والبنية التحتية كخدمة (LaaS) في عالم التكنولوجيا التي تشترك في فكرة الاعتماد على الإنترنت لتلبية احتياجات الحوسبة للمستخدمين، ومن ثم فإن أهداف البحث هي: تعريف الحوسبة السحابية وأنواعها ومقاصد الشريعة، وبيان دور الحوسبة السحابية في خدمة مقصد حفظ الدين، مقصد حفظ النفس، مقصد حفظ المال، مقصد حفظ العقل، ومقصد حفظ النسل، لكي تساعد على حل المشكلات في وقت الأزمات .

الكلمات المفتاحية: الحوسبة السحابية ، مقاصد الشريعة، حل المشكلات.