

# Cloud middleware issues in 2018-2020

Please share your opinion on which are the challenges to be confronted with in 2018-2020 and beyond.

Several visions about the future are cited.

Please think about if their topics are tackled now, in the next years (2016-2017), in near future (2018-2020) or beyond.

The questions are organised in four categories (4 pages) :

1. Cloudware
2. Cloud model evolution
3. Datacentre
4. Market orientation.

Each category has associated seven or eight vision descriptions and corresponding mandatory questions.

Comments should be put to 'Other' (to be use also when you do not agree).

This questionnaire is an initiative of the cluster of projects mentioned at <http://eucloudclusters.wordpress.com/new-approaches-for-infrastructure-services/>.

Note that the topics of security, software engineering and multi-clouds/federations of clouds are not included in this questionnaire.

**\*Obligatoriu**

## Cloudware

### 1. Cloudware 1. Software moving away from hardware \*

"The software is expected to move away from hardware: in a highly abstracted space, software is written in such a way that it goes through several layers before it interacts with hardware. This means that front-end applications, or applications built on top of a platform-as-a-service, will be hardware agnostic"

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- It is a challenge to be tackle beyond 2020
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- It is a challenge to which my team/project works
- It is not/no more a challenge
- Altele: .....

### 2. How important is Cloudware 1 \*

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	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**3. Cloudware 2. Thin cloud connection \***

“Cloud applications will require a new programming mindset, especially as they interact with multiple clouds. Applications are not only going to be based in the cloud, but will hook into other clouds and various on-premise applications as well. In other words, different parts of applications will float around in and out of service providers. Assuring good service-level agreements for these complex software packages will be a challenge.”  
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- Altele: .....

**4. How important is Cloudware 2 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**5. Cloudware 3. Social-media like evolution \***

“Programs could form automatic, if fleeting, associations with bits of hardware and software according to their needs. It will be a social-media evolution. You will have an infrastructure. It'll look like a cloud, but we will engineer these things so that a database will 'like' a server, or will 'like' a storage array. In other words, the infrastructure and software of a datacentre will mould itself around the task required, rather than the other way around. Developers will no longer need to worry about provisioning storage, a server and a switch: all of this will happen automatically. Auto-tuning and automated configuration are also key topics in this context ”  
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- Altele: .....

**6. How important is Cloudware 3 \***

*Marcați un singur oval.*

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**7. Cloudware 4. Containers \***

“The most significant developments will be the use of containers around application distribution, cost effectiveness, security and portability. There will be a renewed focus on automation tools that deal with containers, including those that provide automated app or component portability based on pre-defined criteria. The value will be the ability to reduce complexity by using container abstractions. The rise of containers offers an alternative to achieve some of the same promise as currently offered by PaaS.”

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- Altele: .....

**8. How important is Cloudware 4 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**9. Cloudware 5. Continuous development of Cloud-ready applications \***

“The classic cloud model of long-term platforms and traditional approaches is quickly becoming outdated. Rapid development, agile and DevOps are now the standard. Continuous app development is an emerging trend. The idea is to constantly move new releases into production. Continuous application development is virtually identical to continuous application release, where each iteration of an application is staged for deployment once testing is completed. Each step in the process is usually small, so iterations move through the development pipeline quickly. As a result, a continuous application development model accelerates the overall development process and improves efficiency.”

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- Altele: .....

**10. How important is Cloudware 5 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**11. Cloudware 6. Event-driven architecture \***

"Lambda-like approach, in which code is triggered to run in response to an event, is an important step in the abstraction of computing models away from server-centric design. With Lambda, the cloud is becoming a generic compute engine; developers do not need to manage instances - they just run code."

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- Altele: .....

**12. How important is Cloudware 6 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**13. Cloudware 7. Modular Cloud applications \***

"With the growth in the size and complexity of individual programs, the software development process will place an emphasis on modular software — as in, large applications with components that can be modified without shutting down the program. This will require a new approach to technology."

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- Altele: .....

**14. How important is Cloudware 7 \***

*Marcați un singur oval.*

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

15. **Cloudware 8: Failure proof systems \***

“Scale means there will be more hardware and software failures and dealing with these failures will be an important issue. This means new software systems will have to be developed to help deal with the likelihood of minute-to-minute failures in the underlying infrastructure. The core failure rate will be compounded by a reduction in memory bandwidth to each core, as we expect the number of cores developed to outpace the rise in bandwidth. This will increase the software issues that programmers face, and could force them to have to think about new ways of developing software. New software systems will have to be developed to help deal with the likelihood of minute-to-minute failures in the underlying infrastructure.”

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- Altele: .....

16. **How important is Cloudware 8 \***

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17. **Cloudware: What is missing? \***

Please describe your own vision of the challenges in 2018-2020

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## Cloud model evolution

18. **Evolution 1. Fat cloud server \***

"Cloud server technologies will include fatter servers that will allow larger instances or more virtual machines per server, in-memory database instances and remote direct access memory over Ethernet."

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- Altele: .....

19. **How important is Evolution 1 \***

*Marcați un singur oval.*

	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

20. **Evolution 2. Web-powered apps \***

“As efficiency and scalability are among the primary benefits of cloud computing, then it only makes sense to start developing cloud-based applications that are compatible with multiple platforms. With cutting edge initiatives bringing new life to HTML via JavaScript, it will not be long before the Internet becomes the main platform for these applications.”

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- Altele: .....

21. **How important is Evolution 2 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

22. **Evolution 3. Multi-tenancy in software \***

“Both from an organisational and a technical perspective, there is the challenge of developing true multi-tenant software applications. The problem is the production of true multi-tenant software by a software author. This is because as multiple organisations access a single piece of software from one cloud, the developer needs to make sure that data is kept separate, and charge back is being handled effectively.”

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- Altele: .....

23. **How important is Evolution 3 \***

*Marcați un singur oval.*

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**24. Evolution 4. Inverse cloud models \***

"Inverse cloud models (machine-to-machine computing or geo-distributed cloud), have been popping up as an alternative to the bandwidth-intensive cloud approach. Companies have been coming up with their own branded versions (fog computing, edge computing, Cloud 2.0, in-network distributed cloud). Like the cloud, machine-to-machine computing provides data, compute, storage, and application services to client endpoints. Unlike the cloud model, machine-to-machine computing can distribute some data transmission among routers and endpoints, rather than sending them to a server and back. However, it raise its own challenges, including: limited resources; limited network capacity; security challenges; and resource distribution."

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- Altele: .....

**25. How important is Evolution 4 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**26. Evolution 5: Fog nodes integration \***

"Fog nodes which will bring small computation and storage capabilities, supporting execution of applications that require low latency interactions with sensors, actuators, robots or end-users, will be implemented using embedded systems, typically existing hardware such as industrial control boards or home routers. The limited memory, storage and computation of such devices will represent the main challenge in their integration into the existing cloud architecture to enable the execution of application logic. Their integration will leverage containers as virtualization technology for application delivery and execution that offers many advantages such as a lightweight and resource-friendly structure, which accommodates the constrained nature of fog nodes, process and resource isolation and rapid and easy deployment. Speed of deployment, cost-effective scalability, and ease of management with limited resources are also main concerns."

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- Altele: .....

27. **How important is Evolution 5 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

28. **Evolution 6: Smart gateways \***

"The success of fog computing hinges directly on the resilience of the smart gateways directing countless tasks on an internet teeming with IoT devices. To produce a bulletproof end-user experience, this smartening of edge gateways will need to rely on features such as out-of-band access, automatic detection and recovery from outages, cellular connectivity, and military-grade security. Moving the intelligent processing of data to the edge only raises the stakes for maintaining the availability of these smart gateways and their communication path to the cloud. Resilience will be a necessity for the business continuity of IoT operations, with redundancy, security, monitoring of power and cooling and failover solutions in place to ensure maximum uptime."

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29. **How important is Evolution 6 \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important



**30. Evolution 7: Integration with operational technologies \***

“An exciting new area where fog computing will make a huge difference is in the merger of IT and OT (information technology with operational technology). IT networking is solidified around the TCP/IP and open-source protocols and international standards. OT, an organization's industrial controller and automation infrastructure, is characterized by proprietary standards and non-cross functional equipment. This includes the hardware (HW such as sensors and end devices) and the software (SW) that is used to control and monitor the manufacturing equipment and processes. Most communication in OT is accomplished between machines (M2M). The two groups, IT & OT, are alien to one another—with separate technology stacks, network architectures, protocols, standards, governance models, and organizations. By converging IT and OT systems in one solution, organizations can create better products, achieve cost and risk reductions, and improve performance, flexibility and efficiency.”

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- Altele: .....

**31. How important is Evolution 7 \***

*Marcați un singur oval.*

	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**32. Evolution: What is missing?**

Please describe your own vision of the challenges in 2018-2020

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**Datacentre**





**41. Datacentre 5: New services \***

“There will be a boom in building new cloud services, such as high-performance storage, supercomputers on demand, and new ways of storing and processing data. We are likely to see low-power processors crunching many workloads in the cloud, housed in highly automated datacentres and supporting massively federated, scalable software architecture. The rapid increases in processing power will make cloud projects even cheaper, while technologies currently limited to supercomputing will make it into the mainstream. Energy-aware services are also necessary to be designed in order to cope with the increasing number of datacentre clients.”

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- Altele: .....

**42. How important is Datacentre 5? \***

*Marcați un singur oval.*

	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**43. Datacentre 6: Orchestration through network awareness \***

“The operational complexity of advanced cloud services increases exponentially, especially when you deploy large-scale applications with thousands of VMs across multiple data centers where SLAs need to be enforced and software usage (license) and faults needs to be monitored and managed. Operators are in a unique position to add value to cloud orchestration through network awareness (e.g. orchestrate according to network status) and integrating cloud orchestration with their network management platforms. Today, there is no way to orchestrate down to network management. So, cloud management and orchestration needs to be aligned with various products and services.”

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- Altele: .....

**44. How important is Datacentre 6? \***

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	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**45. Datacentre 7: Dynamic workflow management \***

"The workflow paradigm is a challenging approach to develop flexible, adaptive, and scalable cloud-based solutions through the concatenation of tasks and resources on the fly. Several actors and entities can be involved in a workflow, but their scope is strictly related to their assignments and depends on the evolution of the workflow itself. The setup of federated environments allows to deploy complex time-limited workflows across multi-tenant datacenters able to fulfill specific requirements."

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- Altele: .....

**46. How important is Datacentre 7? \***

*Marcați un singur oval.*

	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

**47. Datacentre: What is missing? \***

Please describe your own vision of the challenges in 2018-2020

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## Market orientation

48. **Market 1: BYOD \***

"The future of cloud computing is mobile. Instead of being tied to desks in an office, today's workers can use their mobile devices to do their jobs at any time from just about anywhere. The flexibility demanded by the mobile workforce is one of the key reasons cloud computing is on the rise. The anytime, anywhere access that cloud-based applications provide is ideal for workers who are always on the go. More and more companies are realizing the convenience and productivity benefits of using mobile-friendly cloud computing applications to manage business data. Since the vast majority of consumer electronics in the world are mobile devices, 'bring your own device' (BYOD) is more relevant than ever in the world of cloud computing. End users are using their mobile devices to put more and more of their own data into personal cloud services for streaming, storage, and syncing. This means that IT departments must find the means to integrate personal cloud services for their employees in a BYOD environment with tools such as Mobile Device Management."

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- Altele: .....

49. **How important is Market 1? \***

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	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

50. **Market 2: Cloud-ready \***

"There will be an explosion in the use of true hybrid clouds driven mainly by major external trends—namely, big data, IoT, and mobility. The emphasis on this phase will also be to modernize the in-house applications and make them cloud-ready. E.g.: Typically, running high-end graphics applications requires substantial hardware infrastructure investment. However, cloud computing is changing this reality. There are a number of new cloud-based graphics technologies from prominent graphics companies, that allow end users to run high-end graphic design applications with a simple web browser"

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- Altele: .....

51. **How important is Market 2? \***

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	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

52. **Market 3: Connecting cloud services \***

“There will be more emphasis on connecting cloud services such that companies can effectively manage their assets. Most enterprises will become like cloud service brokers, so IT can keep a close watch on which providers offer the most cost-efficient and resilient services, and which ones fall behind. This will ultimately change buying behaviors. The ability to build agile hybrid clouds will trickle down to the mid-tier and boost cloud adoption.”

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- Altele: .....

53. **How important is Market 3? \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

54. **Market 4: Users as service providers \***

“Social tools will bring increased collaboration to the cloud. Today, users expect to have social tools such as chat and micro-blogging to improve collaboration. As people become more accustomed to these tools—and start to prefer them to traditional tools like email—customers will want to use them to communicate with fellow employees, customers, and prospects. Will become less about technology and more about business transformation. The face of cloud is expected to change into a hybrid IT solution which will be delivered as a service for traditional IT, private, public and hybrid cloud solutions - with end users behaving more like service providers as a result.”

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- Altele: .....

55. **How important is Market 4? \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

56. **Market 5: Personal cloud - data services \***

"The novel data access, storage and sync avenues have turned personal cloud imperative and cost-effective storage option. The proliferation of mobile devices such as smartphone and its extensive penetration among users has escalated the data generation activities, globally. This manifold increase in data generation activities among users and the need to access this data from anywhere using any device has propelled the demand for personal cloud for real-time data access and its sharing. Additionally, the growing need to create a backup of critical data, along with provisions for data recovery and planning for digital contingency, is boosting the personal cloud adoption consideration among enterprises as well as individuals."

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- Altele: .....

57. **How important is Market 5? \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

58. **Market 6: Personal cloud - configurable services \***

" In the years to come, the personal cloud providers are expected to focus on business users along with offering superior value added services for users, supplemented by the integration of wearable technologies. The users will pay to easily deploy configurations and services they are acquainted to use. The exploitation of containers in embedded and resource constrained devices gives the opportunity to encapsulate user preferences, applications and services in virtual environments and to deploy them (through the Cloud) in one or many personal devices."

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- Altele: .....



59. **How important is Market 6? \***

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Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

60. **Market 7: Specialised clouds \***

“Big data processing and video editing will create expanding markets for large instances and specialized GPU clouds. These will be positioned to handle spike loads in hybrid environments, but the ability to avoid high hardware acquisition costs and outdated equipment will make a strong case to move all the work to the specialty clouds.”

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- Altele: .....

61. **How important is Market 7? \***

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	1	2	3	4	5	
Not important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly important

62. **Market: What is missing? \***

Please describe your own vision of the challenges in 2018-2020

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## Final remarks

63. **Which category is missing?**

Note that security, multi-clouds/federations, software engineering are not subject for this questionnaire.

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**64. Which key developments you envision that are not reflected in this form?**

Note that the question is referring to the services and applications that are linked to infrastructure services

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**65. Which keyword or phrase will drive the funds for research and development in 2018-2020?**

Please refer those using infrastructure services

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**66. Which is your experience in the field? \***

*Bifați toate variantele aplicabile.*

- Developer
- Software architect
- Researcher
- Manager
- Altele: .....

**67. Involvement in the community \***

*Bifați toate variantele aplicabile.*

- Participant to project(s) funded by E2 unit of European Commission
- Participant to project(s) funded by ICT programme of European Commission (not E2)
- Participant to project(s) funded by other programmes of European Commission (not ICT)
- Participant to national projects related to the topics of the questionnaire
- Altele: .....