

# THE STATE *of* MULTI-CLOUD ARCHITECTURE

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TURBONOMIC SURVEY REPORT

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# THE STATE OF MULTI-CLOUD ARCHITECTURE

## PART ONE

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# EXECUTIVE SUMMARY

Over the past decade, Information Technology has evolved at an unprecedented rate. Virtualization, in all its various forms and schools of thought, is in many ways the keystone enabling this evolution. Loosely defined, *virtualization* is the act of decoupling one entity from another entity. In our context, it is the practice of decoupling logic from infrastructure and defining infrastructure behavior entirely in software. Virtualization has introduced incredible efficiencies and economies of scale to the data center, and created a platform for automation and workload mobility.

Each wave heralds a new vernacular, which more often than not, takes root and spreads before the field agrees upon a singular notion of its meaning. Convergence, hyper-convergence, SDx, the list goes on - but perhaps no wave has engendered and propagated more butchering than "cloud": a word so nebulously vague and universally applicable that any IT newcomer can apply it as a noun (*the cloud*), verb (*cloudify*), or adjective (*cloud-built/native/ready*) with a high probability of passable usage.

The purpose of this report, **The State of Multi-Cloud Architecture, Part One**, is to establish a baseline understanding of the present and anticipated adoption of various cloud formats, and to explore both the approach and challenges organizations have faced in the endeavor. Analysts and pundits contend that IT, as a whole, is en route to a construct called hybrid cloud. Though these sources disagree in some aspects of the path to

hybrid cloud - namely the rate of adoption and the characteristics of adopters - they agree that it is an inevitable wave.

What this and subsequent surveys will strive to answer is, what is the truth? How are organizations pursuing the path to hybrid cloud, how long will it take them and how much will it cost them? As a starting point, we assume a bridge to hybrid cloud is a construct called multi-cloud.

To delineate between these models, a set of definitions is in order to ensure consistent and universal interpretation of the data herein.

## Definitions

- **Virtualization** is a construct that practices installing a hypervisor on traditional x86 servers such that multiple virtual machines running diverse operating systems may run on those servers.
- **Private Cloud** is a construct that practices using virtualization *plus* automated provisioning and orchestration to deliver a cloud service model, Infrastructure-as-a-Service (IaaS) or Platform-as-a-Service (PaaS), on infrastructure assets owned and maintained by the organization delivering these services.
- **Public Cloud** is a construct that offers IaaS and/or PaaS cloud service models as a utility, on infrastructure assets that can be accessed by any paying customer with appropriate credentials. Although the best-known examples

# EXECUTIVE SUMMARY

include Amazon Web Services and Microsoft Azure, there are many smaller public cloud providers offering similar services.

- **Infrastructure-as-a-Service (IaaS)** is a cloud service model that enables end-users to provision virtual computing resources on-demand through a self-service portal. The initial and ongoing maintenance, including anti-virus, monitoring and patching is the responsibility of the end-user.
- **Platform-as-a-Service (PaaS)** is a cloud service model that enables end-users, almost always application developers, to input or upload source code into a command-line interface (CLI) or destination folder, and the platform automates the deployment, capacity provisioning and orchestration of the application instance designed by the developer.
- **Multi-Cloud** is an architecture whereby an organization delivers application services out of multiple virtualized, private cloud and public cloud availability zones *without* actively porting workloads between these zones.
- **Hybrid Cloud** is an architecture whereby an organization delivers application services out of multiple virtualized, private cloud and public cloud availability zones *and* actively ports workloads between these zones for reasons including cost, performance and availability.

This installment is the first in a series of four survey reports, listed below, being published over the course of 2016. Collectively, they illustrate the reality facing IT organizations today. All reports will be available for download on [turbonomic.com](http://turbonomic.com).

1. *The State of Multi-Cloud Part One*
2. *The State of Multi-Cloud Part Two*
3. *The State of Open Source*
4. *The State of Hybrid Cloud*

## The Multi-Cloud Survey Series

# METHOD

## Purpose

Analysts and experts predict that the end state of the current IT evolution is an architecture called hybrid cloud, whereby an organization delivers application services out of multiple virtualized, private cloud, and public cloud availability zones and actively ports workloads between these zones for reasons including cost, performance, and availability. Despite this projection, few if any organizations have achieved this end state.

Verizon and Turbonomic have collaborated on a survey series, which will collectively establish a baseline for where organizations currently reside along the journey, and establish a framework for proceeding on the path to hybrid cloud over the next three years.

Our goal is that the results will instigate a data-driven conversation across the broader virtual and cloud community.

## Sample

The data in this report were collected through an online survey conducted from February 1, 2016 to February 29, 2016. The 1,362 survey respondents came from across the Enterprise IT and data center landscape. Respondents are of 18 years of age and older. In order to reveal the range in characteristics, respondents were identified demographically by their business and environment characteristics, such as role, business type, hosts in production and virtual machines in production. This sample represents organizations spanning SMB to large enterprise, with various roles and responsibilities in those organizations.

## Procedure

This survey recruited participants from an internal email database and on the social media platforms Facebook, LinkedIn and Twitter. Participants were given an opportunity to win a \$100 gift card (USD) by entering their email address and contact information at the completion of the survey. Additionally, participants

were given the option to participate in a follow-up conversation centered on the Verizon product Intelligent Cloud Control (ICC) subsequent to completing the survey. While the survey successfully recruited a significant sample size, the distribution of the sample weighs highly in System Administrator as a role and was well-distributed across business types. The survey itself was designed internally by product management, product marketing and subject matter experts.

## Survey Flow

Progression through the fifty-six survey questions depended on respondents' answers to cloud strategies and adoption rates. All respondents were asked the same demographic questions, but proceeded differentially based on responses. The survey took between 5 and 15 minutes to complete, depending on responses. Not all questions were mandatory, and participants could exit the survey at any time.

## Margin of Error

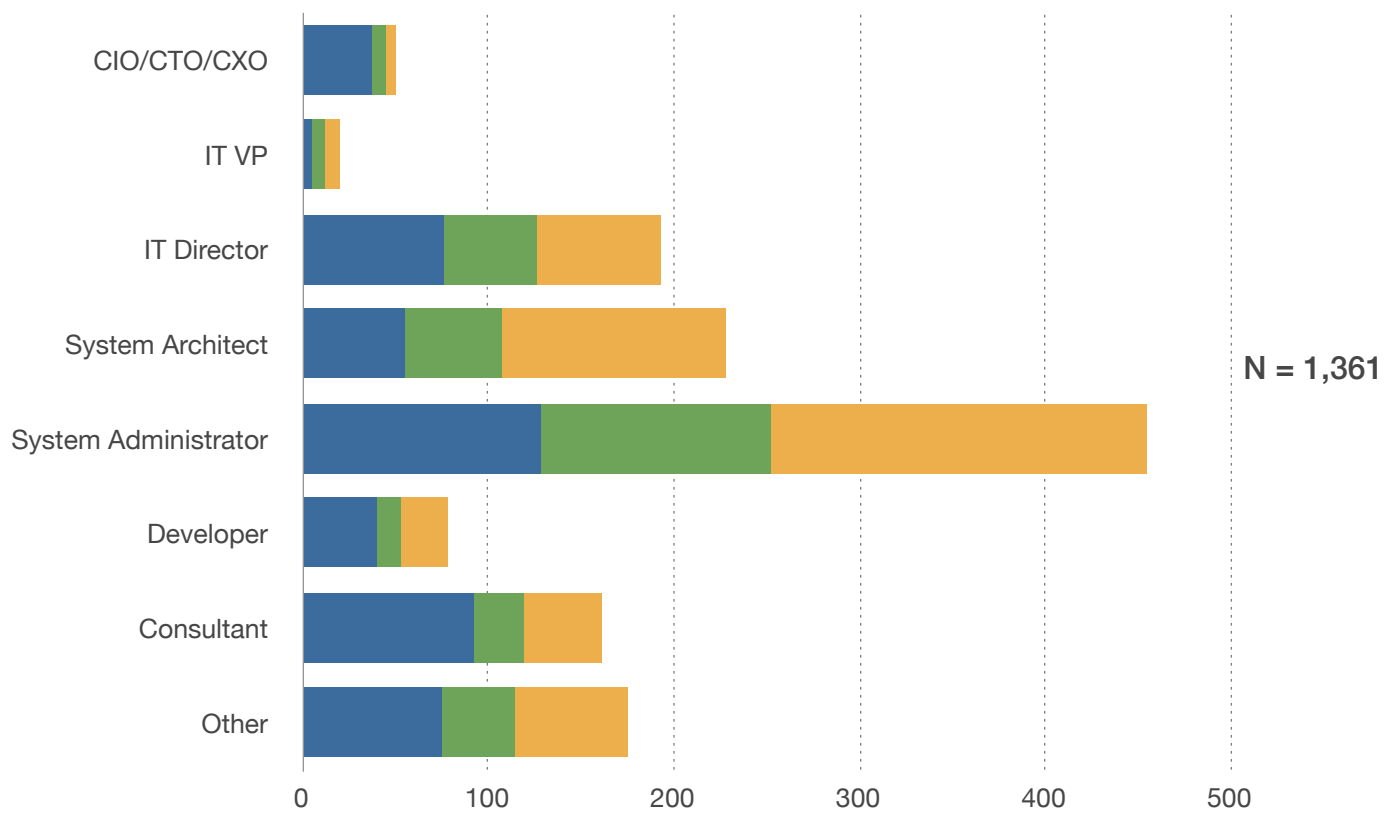
The margin of error on the initial participant sample is  $\pm 2.7\%$ . Due to question branching and optionality, the initially robust population of 1,362 did not respond to all questions. Additionally, responses are segmented by company size in this analysis (1-200 Employees; 201-1,000 Employees; 1,001+ Employees). Therefore, smaller sample sizes, particularly far into the question sequence, introduce a wider margin of error. Data should be interpreted with this in mind.

## Citing this Survey

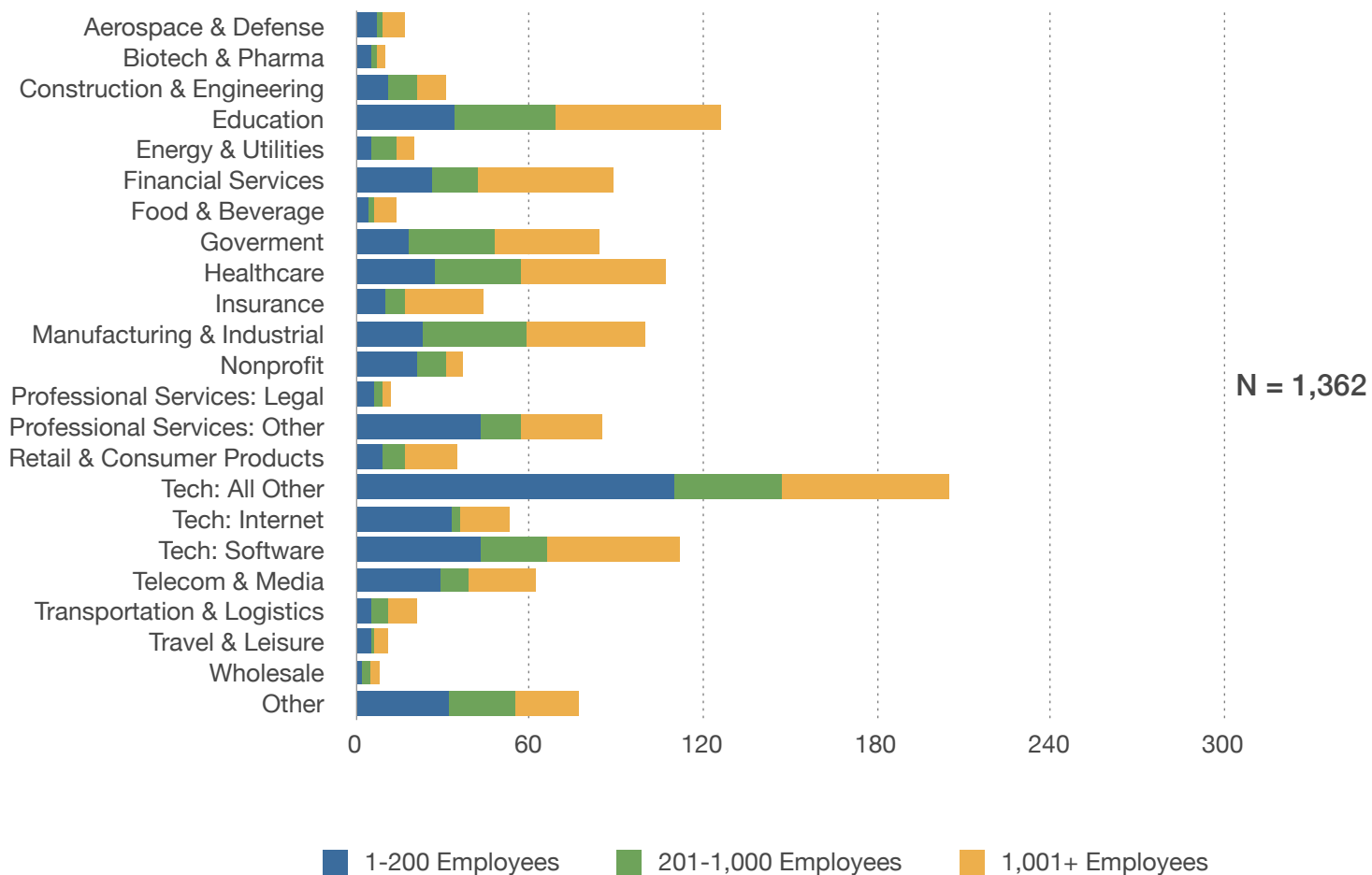
We welcome your use of the results in this survey as you share insights with members of the broader IT community. Please reference Turbonomic and include our homepage URL, [turbonomic.com](http://turbonomic.com) as you do so. A downloadable version of the complete dataset is available at [github.com/turbonomic/turbonomicsurvey](https://github.com/turbonomic/turbonomicsurvey).

# DEMOGRAPHICS

Which of the following best describes your role?

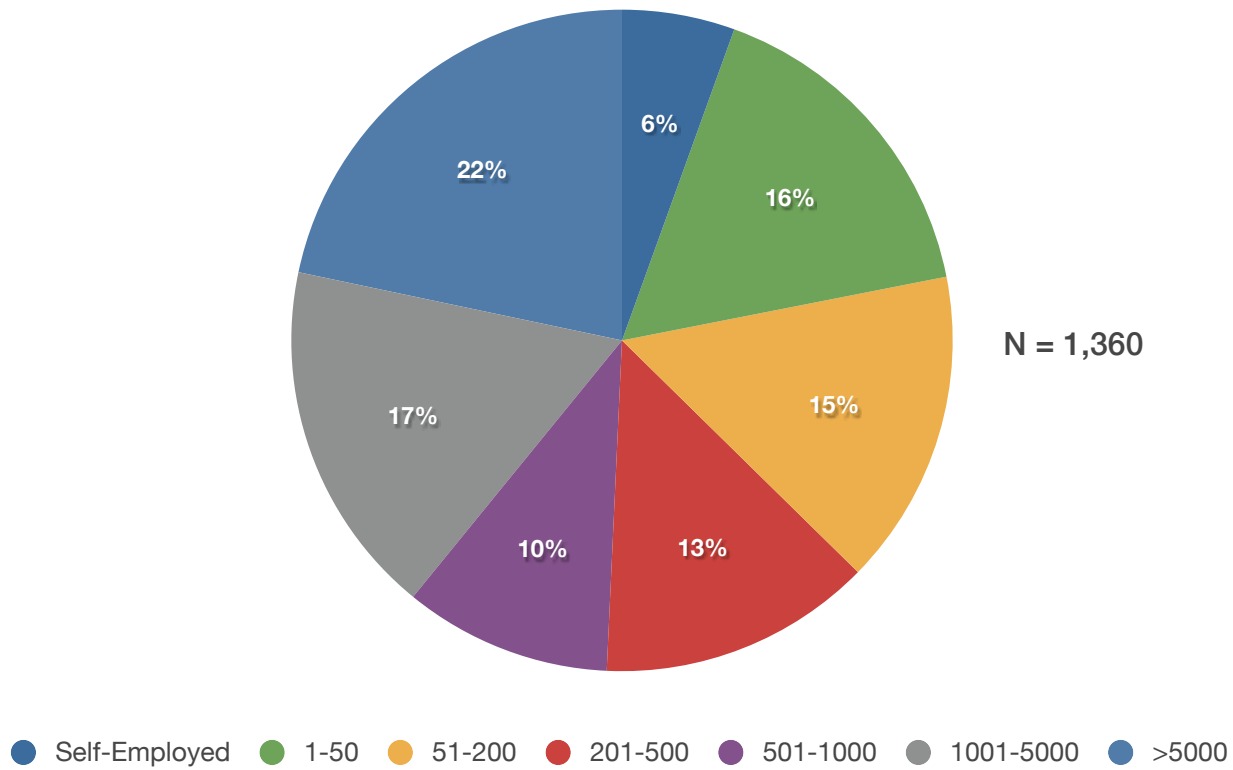


Which of the following best describes your industry?

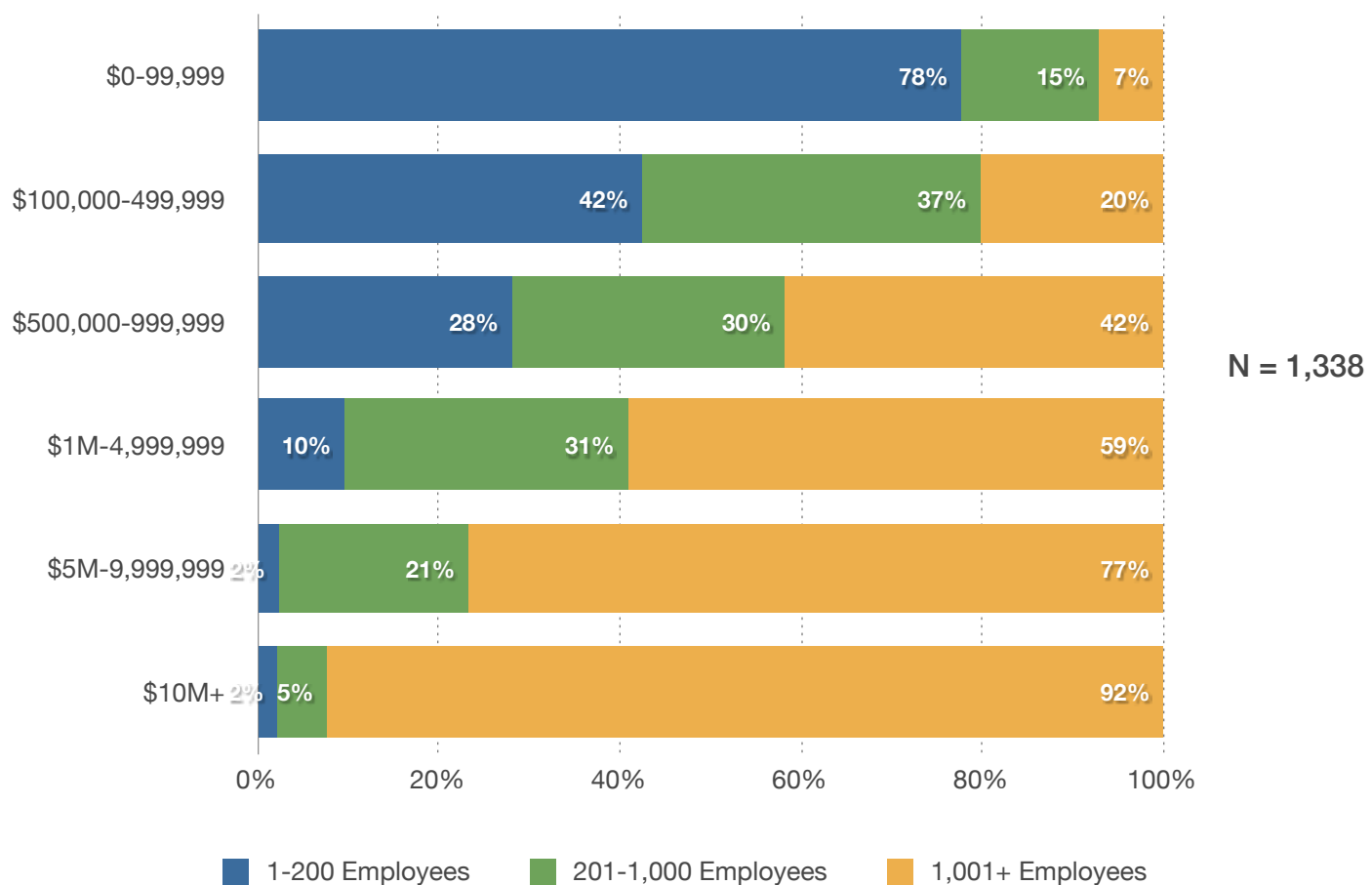


# DEMOGRAPHICS

What is your approximate company size?

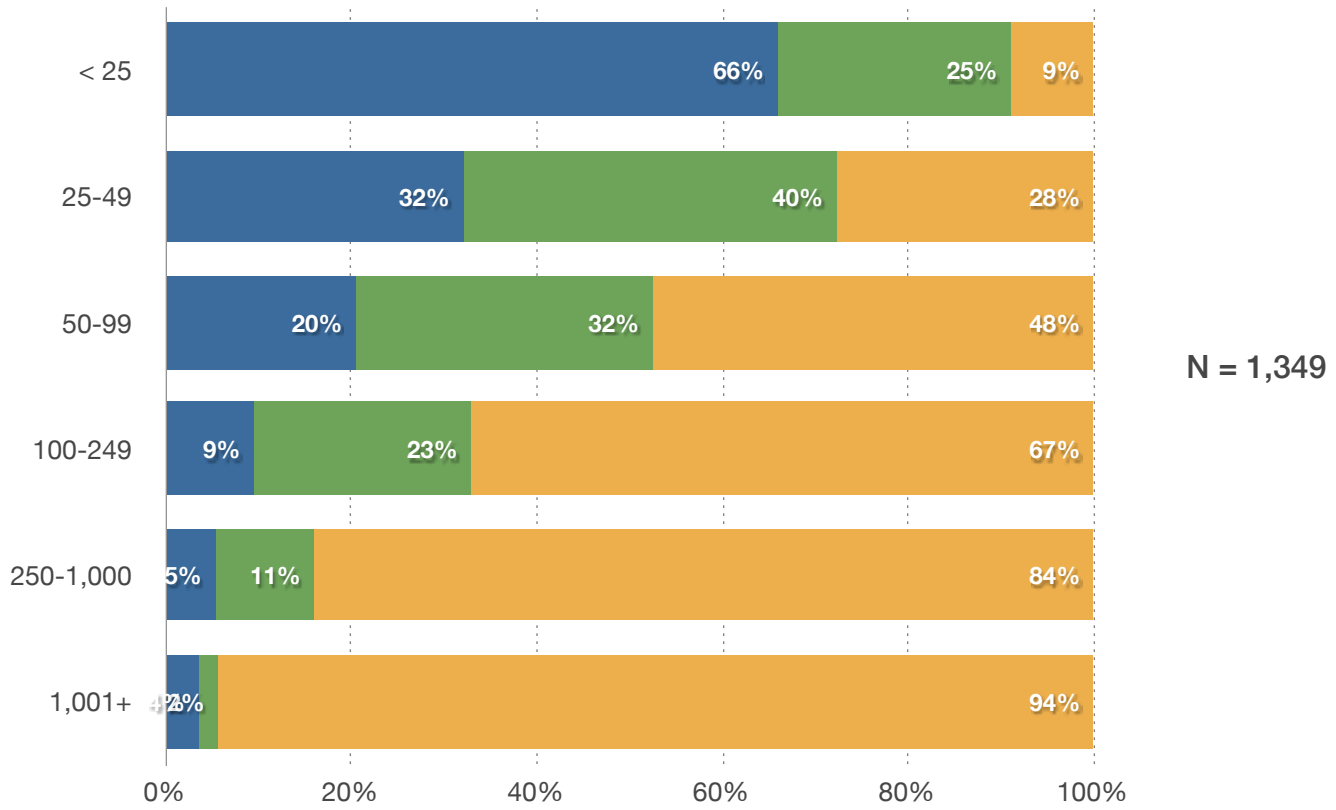


What is your approximate annual Information Technology budget (USD)?

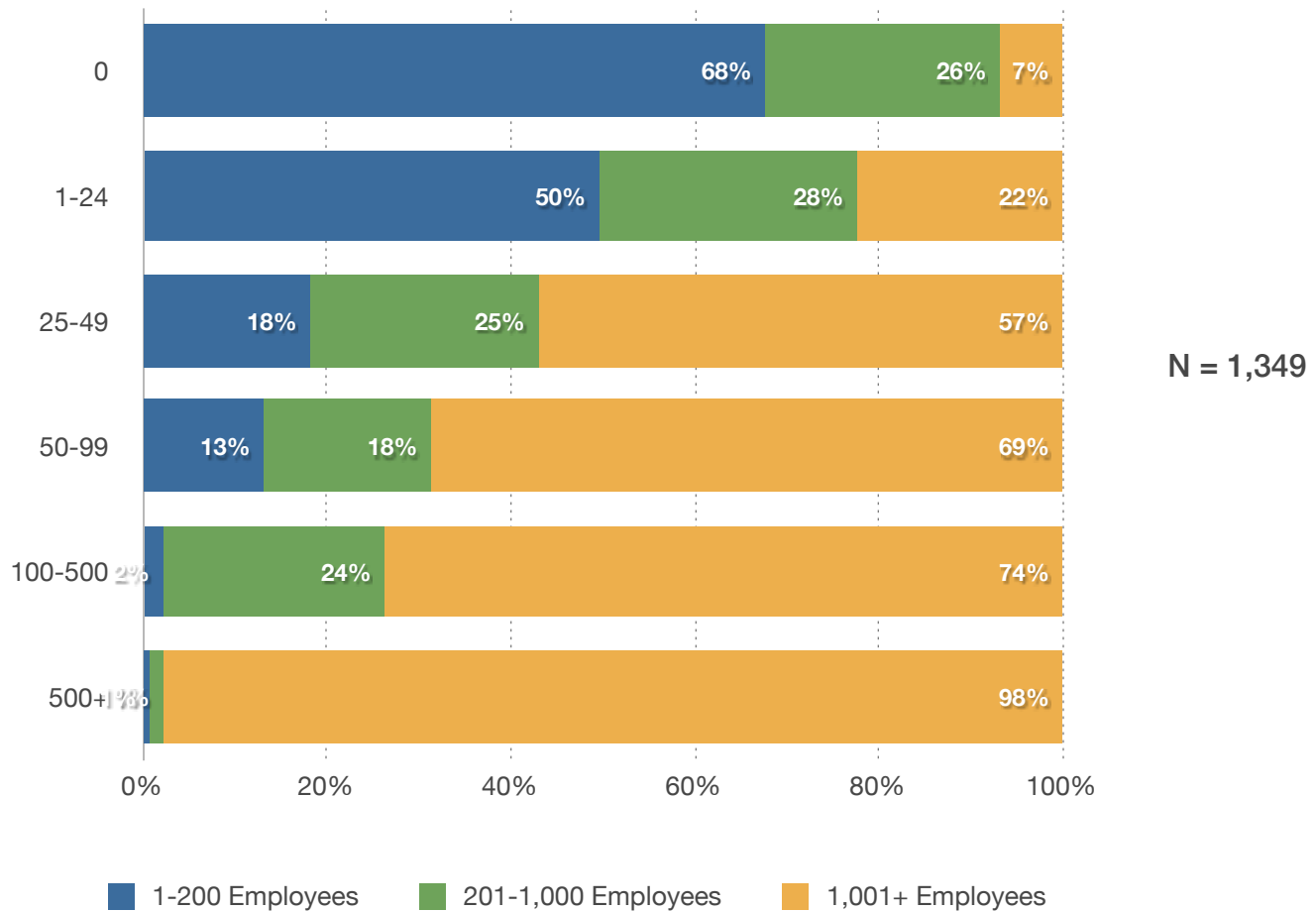


# DEMOGRAPHICS

How many physical servers are in your IT environment (All known on-premises and off-premises assets)?



How many developers does your organization employ?



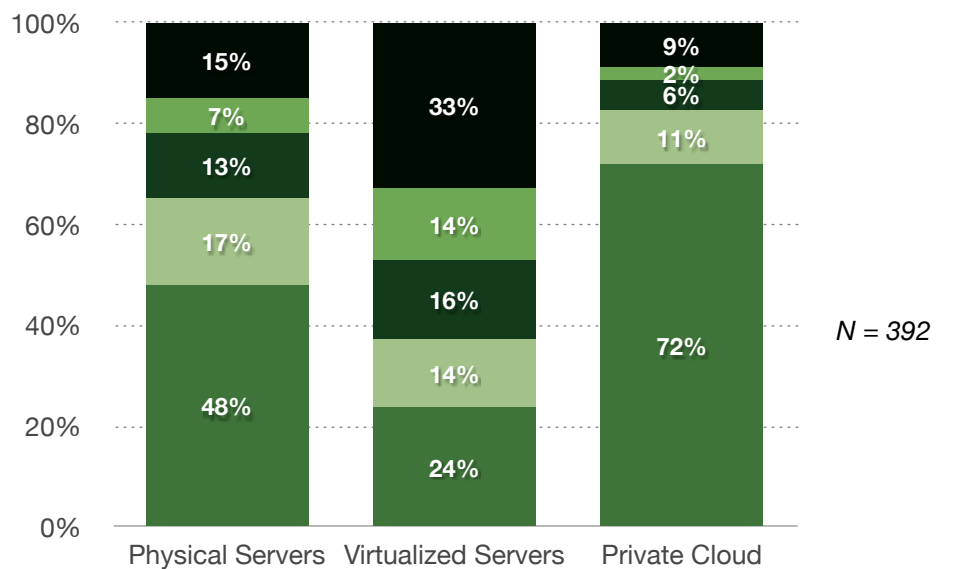


# DEMOGRAPHICS

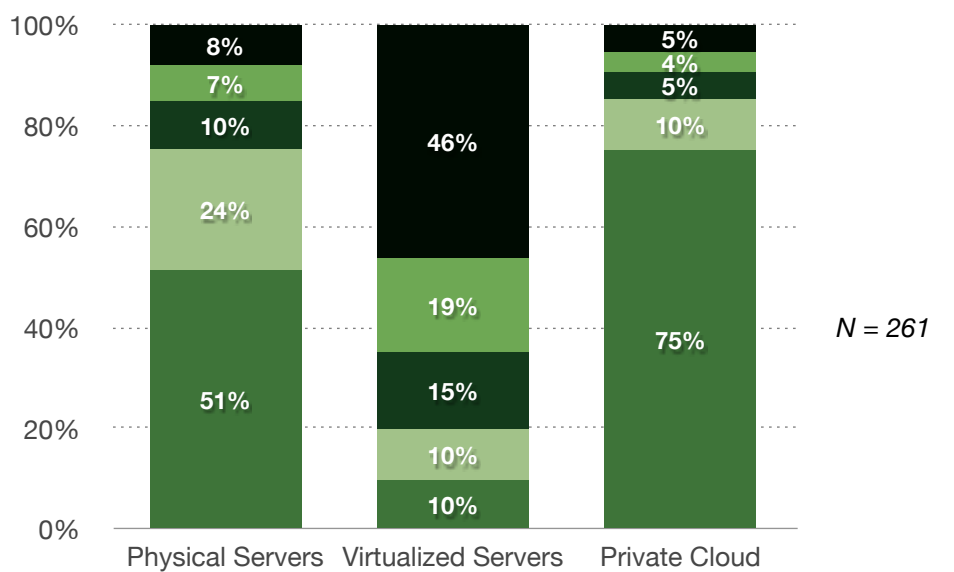
Of all physical servers in your private IT environment, identify the proportion dedicated to each of the following

1. *Physical, non-virtualized servers*
2. *Virtualized servers*
3. *Private Cloud servers supporting SaaS, PaaS or IaaS.*

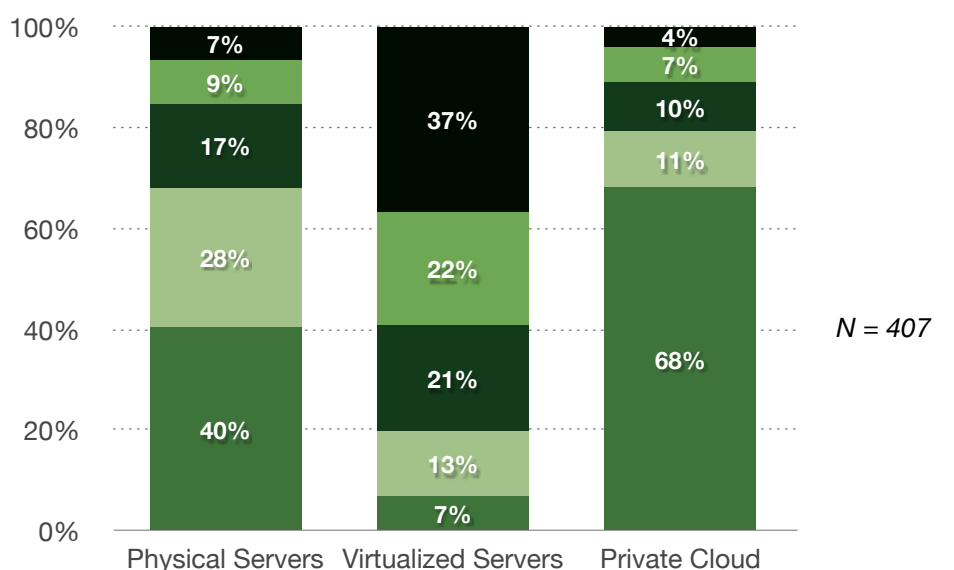
1-200 Employees



201-1,000 Employees



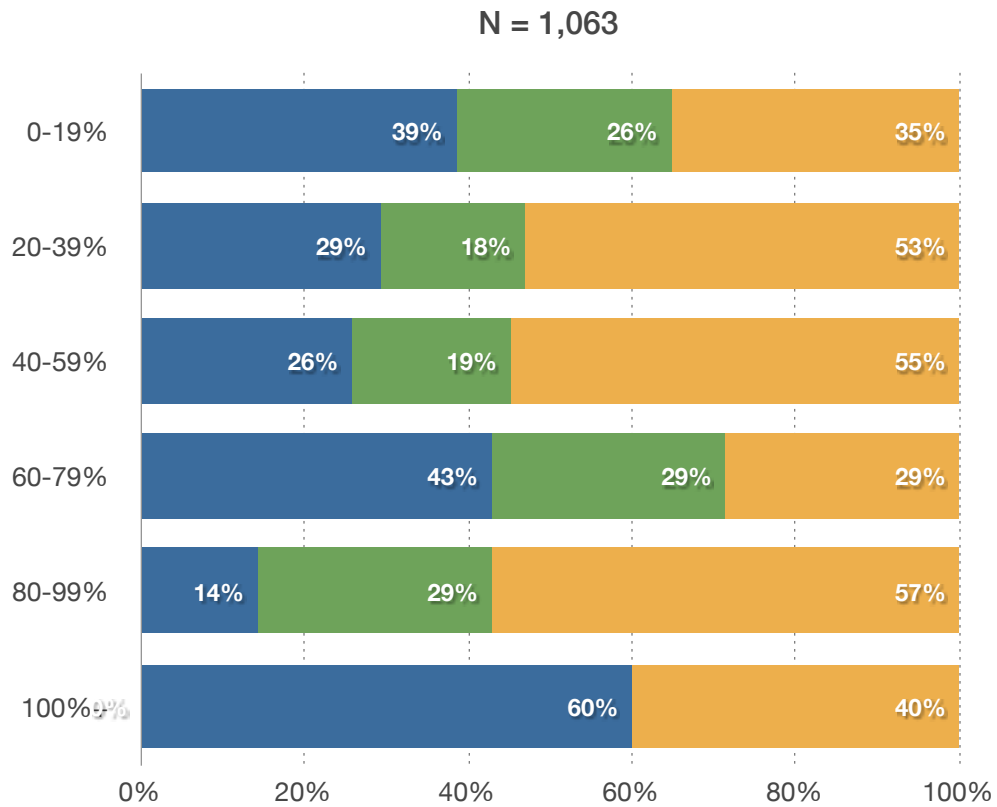
1,001+ Employees



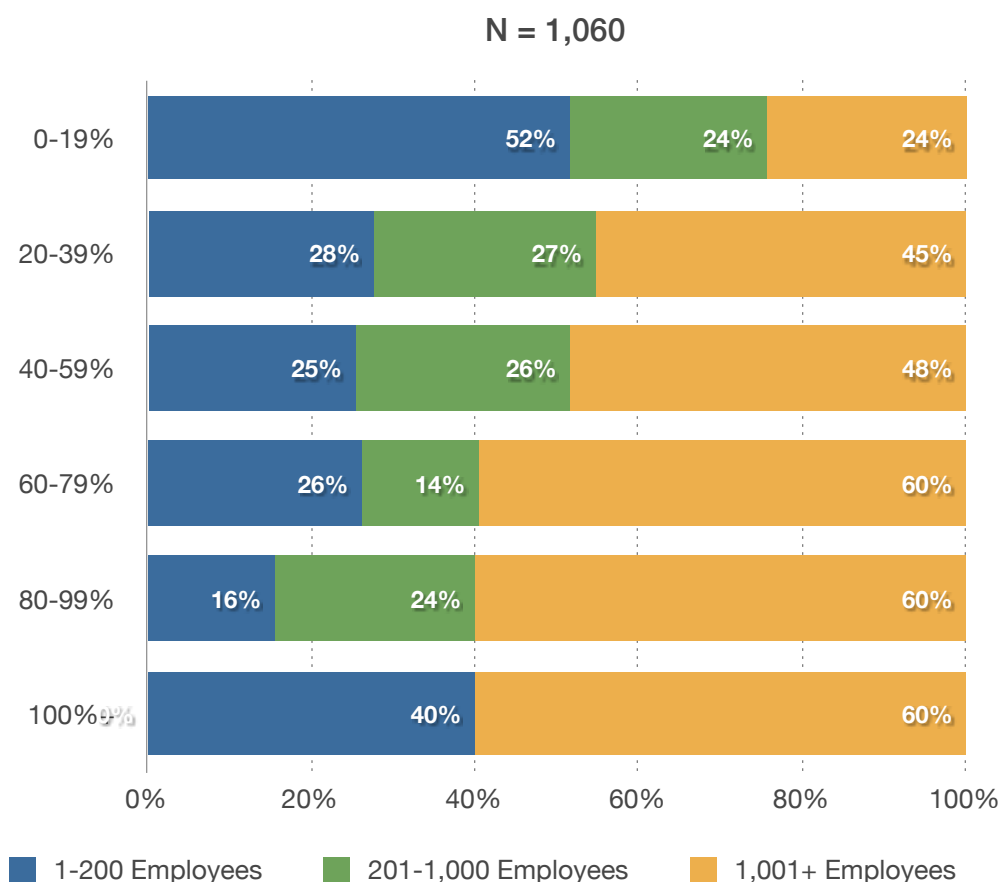
0-19%    20-39%    40-59%    60-79%    80-100%

# DEMOGRAPHICS

Please approximate your physical server growth rate as calculated by the percentage of new physical servers you add to your environment year over year.

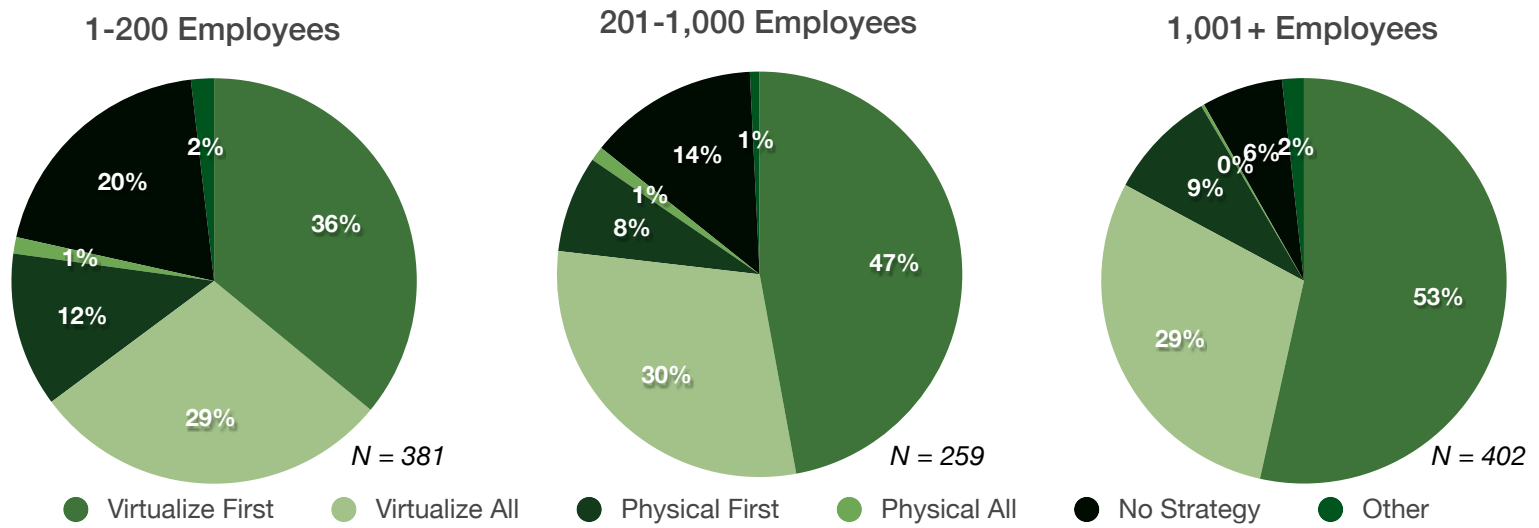


Please approximate your virtual machine growth rate as calculated by the percentage of new virtual machines you add to your environment year over year.

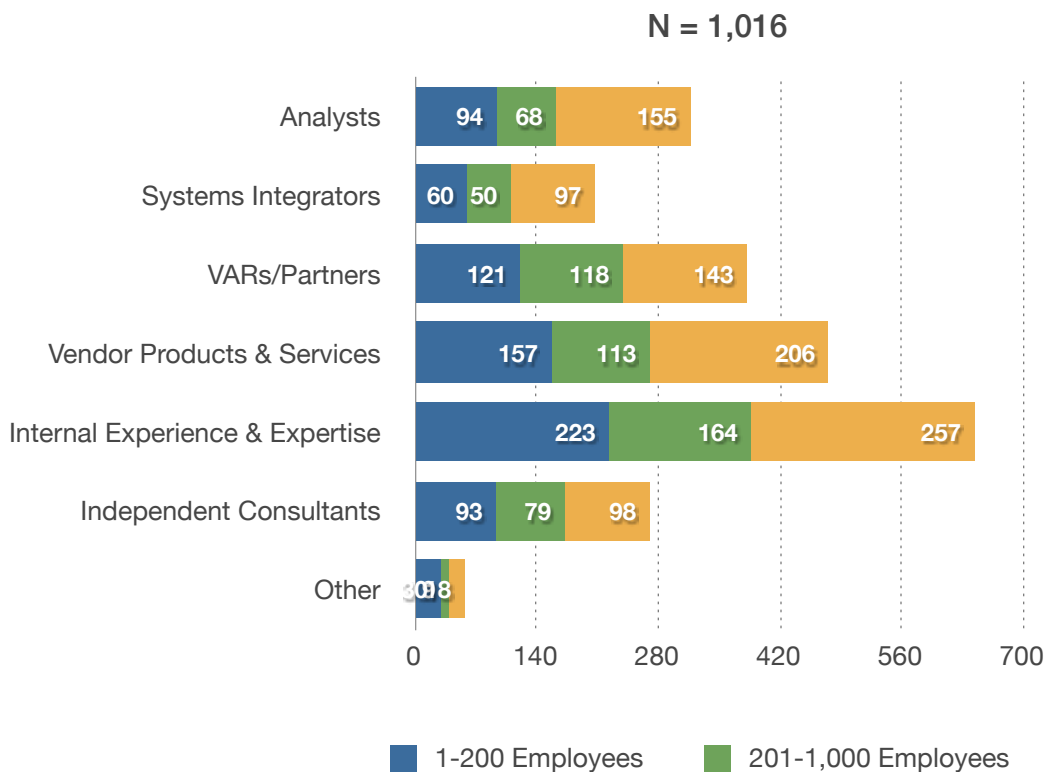
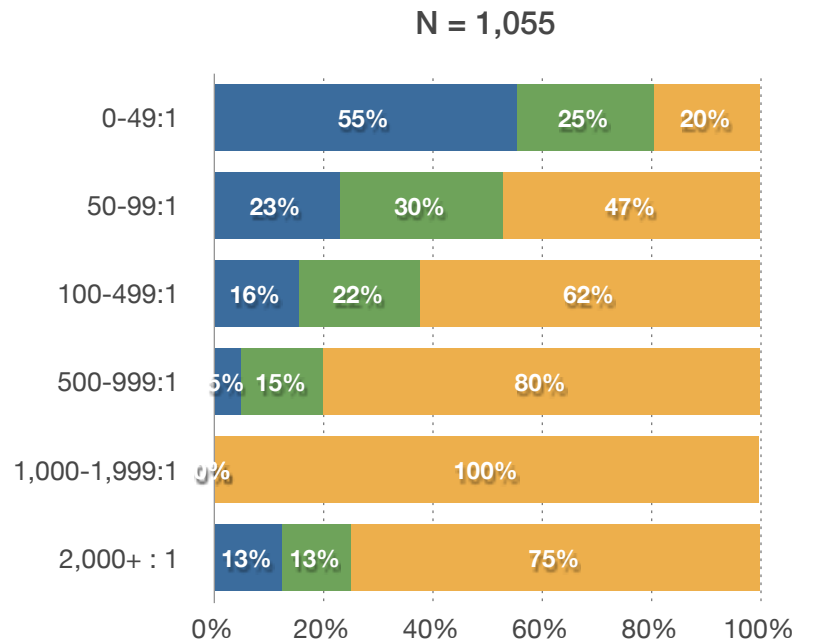


# DEMOGRAPHICS

Which of the following best describes your virtualization strategy?



Please approximate your virtual machine to administrator ratio.



What sources do you consult devising your virtualization strategy?

ON THE STATE OF  
**PUBLIC CLOUD**

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ANALYSIS

# ON THE STATE OF PUBLIC CLOUD

## ANALYSIS

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### **Adoption**

Survey participants were asked to identify as one of five public cloud strategy types: Public Cloud First, Public Cloud All, Public Cloud Mixed, No Public Cloud and No Strategy. Overall, 39.3% of participants use public clouds to some extent, with a majority of these practicing a Public Cloud Mixed strategy.

### **Public Cloud First**

The Public Cloud First strategy group comprised 5.8% of total respondents (8% of Small, 4% of Medium and 5% of Large organizations). This group relies heavily upon internal experience and expertise in implementing this strategy, followed by vendor product and service input. The conditions under which public clouds are not used are similar to those described by the No Public Cloud group, namely: data security and compliance such as HIPAA, application requirements and compatibility and customer preference (in the case of service providers).

### **Public Cloud Only**

The Public Cloud Only strategy group comprised 2.5% of total respondents (3% of Small, 3% of Medium, and 1% of Large organizations). The data suggests that this group's consumption is driven by Software-as-a-Service (SaaS) -based applications, followed by Platform-as-a-Service (PaaS). 49.4% of respondents in this group implemented or migrated to a public cloud only strategy in less than one year, with larger organizations taking longer. Median annual expenditures on public cloud resources are \$10,000; \$200,000; and \$1,000,000 among Small, Medium and Large organizations, respectively (USD). Although the reasons for

adopting a public cloud only strategy varied across segments, all three segments cited mandates to reduce cost/TCO as factoring into the decision. Interestingly, other groups discussed herein cite minimizing TCO as a reason to *not* use public clouds.

### **Public Cloud Mixed**

The Public Cloud Mixed group comprised 31.0% of total respondents (28% of Small, 28% of Medium, and 36% of Large organizations) and were routed within the survey to questions specifically around multi-cloud.

### **No Public Cloud**

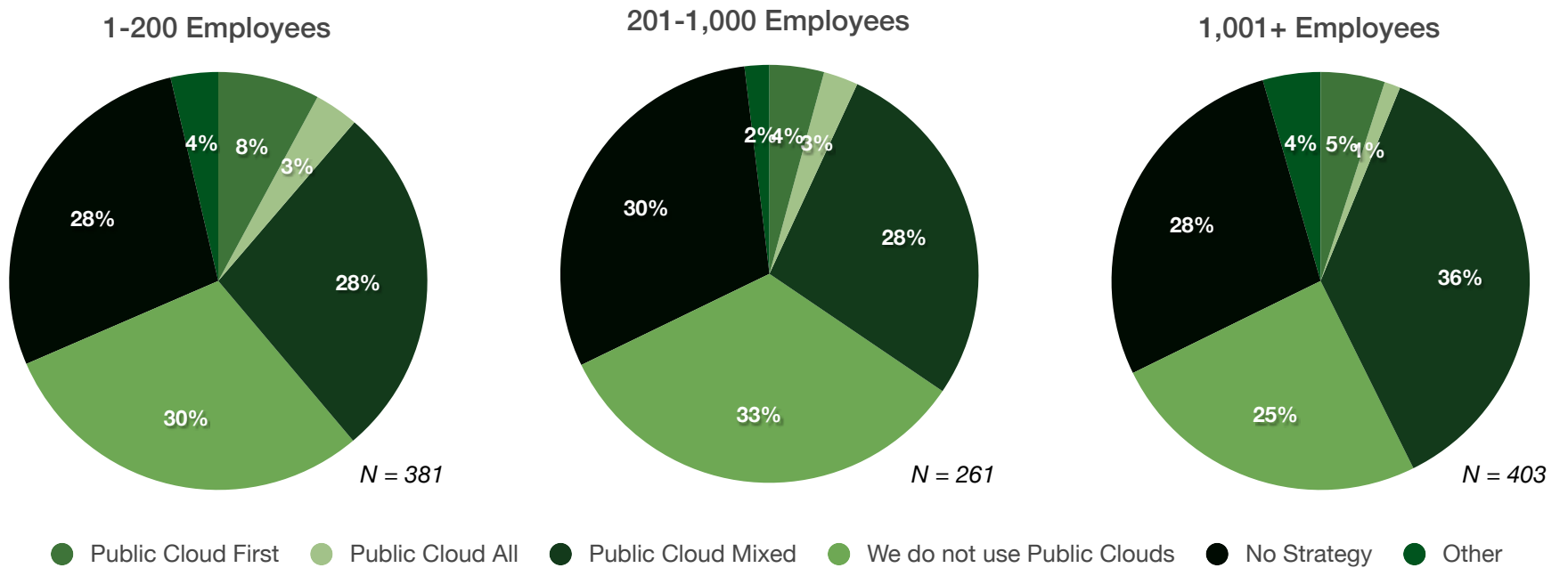
28.7% of participants do not use public clouds (30% of Small, 33% of Medium and 25% of Large organizations), with security, cost, compliance and compatibility being the leading reasons. Several respondents from Large organizations cited low-latency requirements as a reason against public cloud adoption.

### **No Strategy**

28.4% of participants do not have a public cloud strategy, distributed evenly among company-size segments (28% of Small, 30% of Medium and 28% of Large organizations). Though it is surprising that this proportion of organizations lack a public cloud strategy, even fewer have private or multi-cloud strategies, discussed later.

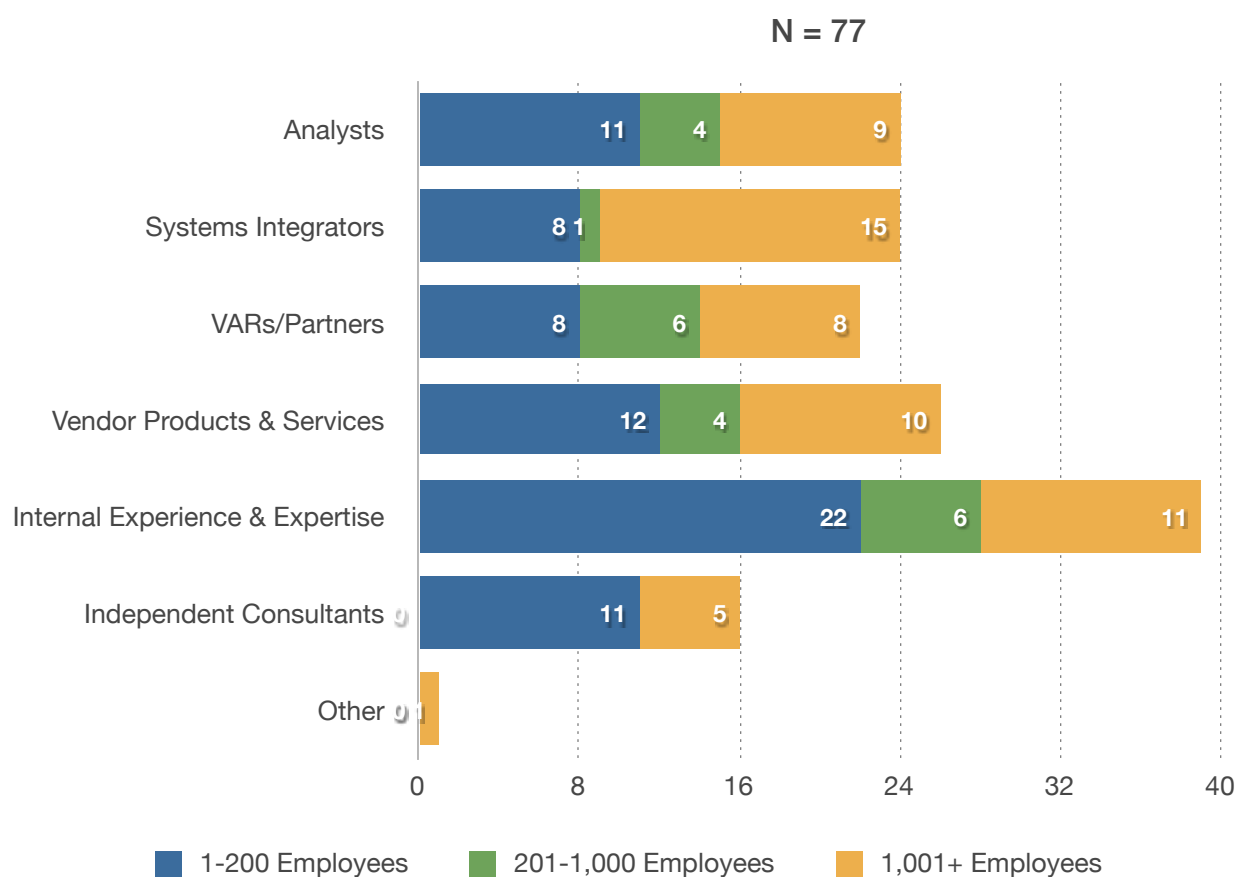
# ON THE STATE OF PUBLIC CLOUD

Which of the following best describes your public cloud strategy?



## PUBLIC CLOUD-ONLY ADOPTERS

Who was consulted in defining and executing the specifics of your public cloud?  
(select all that apply)



# ON THE STATE OF PUBLIC CLOUD

## PUBLIC CLOUD-FIRST ADOPTERS

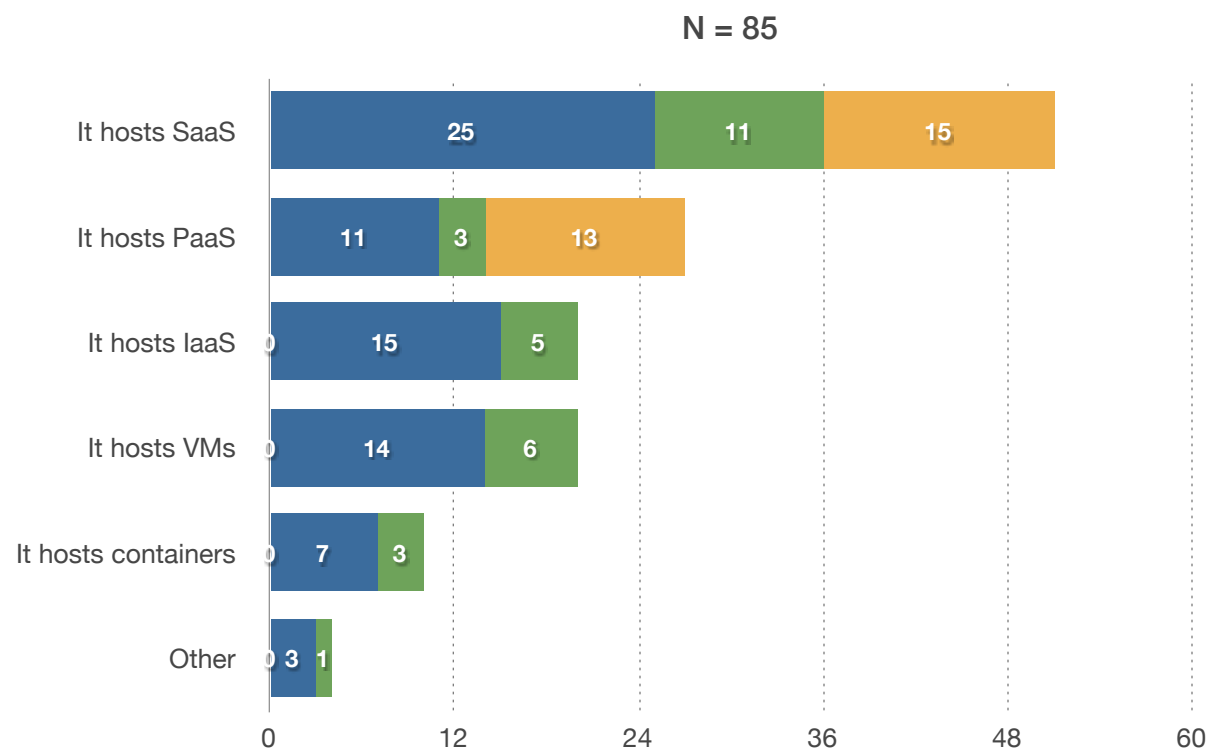
In your Public Cloud-First strategy, please explain the conditions under which public cloud resources are not used.

Company Size	Top Responses
<p>1-200 Employees</p> <p><i>N = 14 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Only when not allowed by regulation such as HIPAA</li> <li>• Customer preference/request</li> <li>• Testing and staging</li> <li>• Pricing, application complexity, and specific physical hardware requirements</li> <li>• PDC Domain Controller, Exchange, Backup Server</li> </ul>
<p>201-1,000 Employees</p> <p><i>N = 8 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• No data can reside in public cloud(s)</li> <li>• Customer preference/request</li> <li>• Non-backoffice applications</li> </ul>
<p>1,001+ Employees</p> <p><i>N = 14 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Pricing, application complexity, and specific physical hardware requirements</li> <li>• Confidentiality and speed</li> <li>• No data can reside in public cloud(s)</li> <li>• Only when not allowed by regulation such as HIPAA</li> <li>• Trading applications</li> </ul>

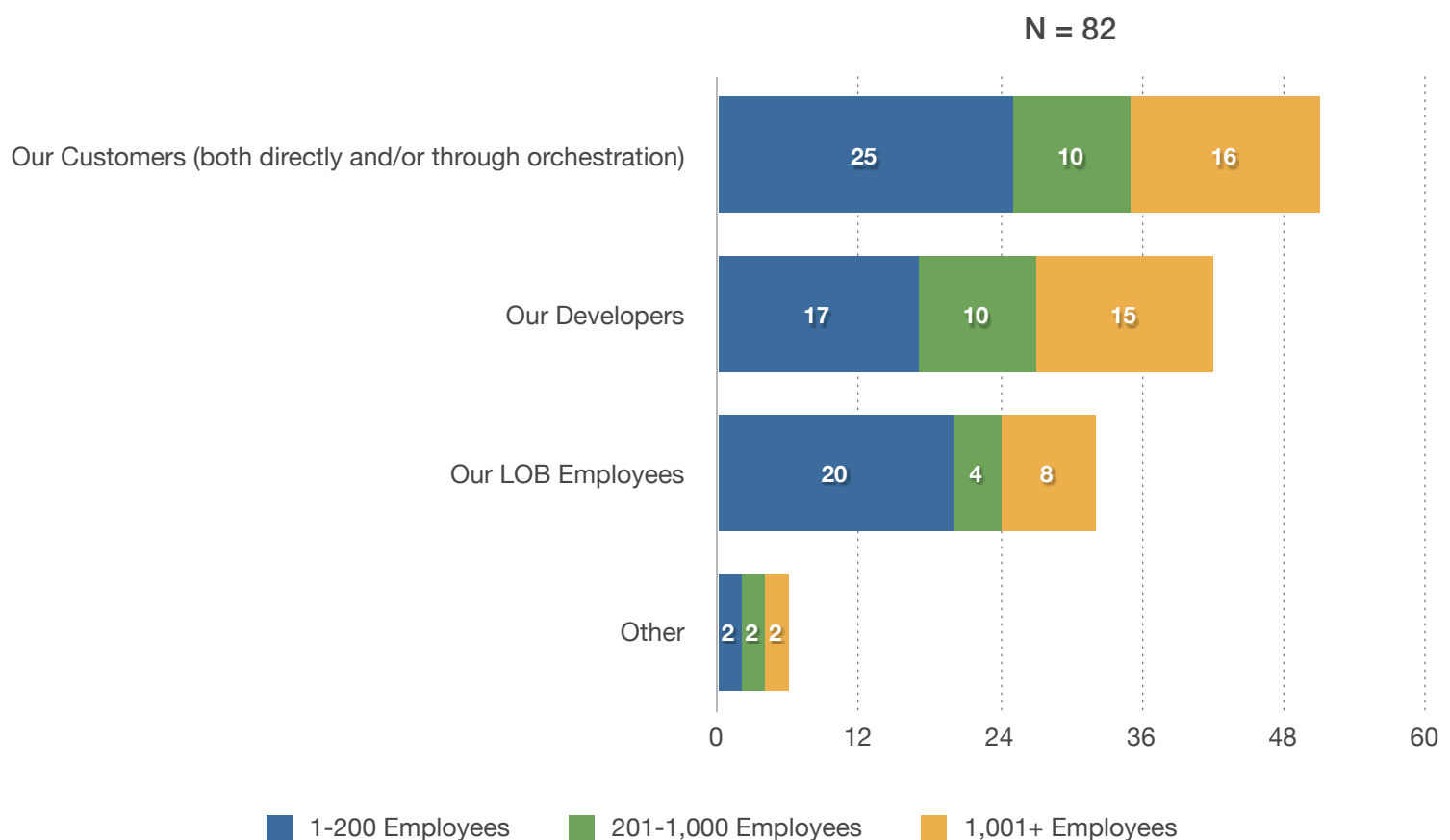
# ON THE STATE OF PUBLIC CLOUD

## PUBLIC CLOUD-ONLY ADOPTERS

Which of the following best describes your public cloud architecture? (select all that apply)



Which of the following best describes users of your public cloud assets? (select all that apply)

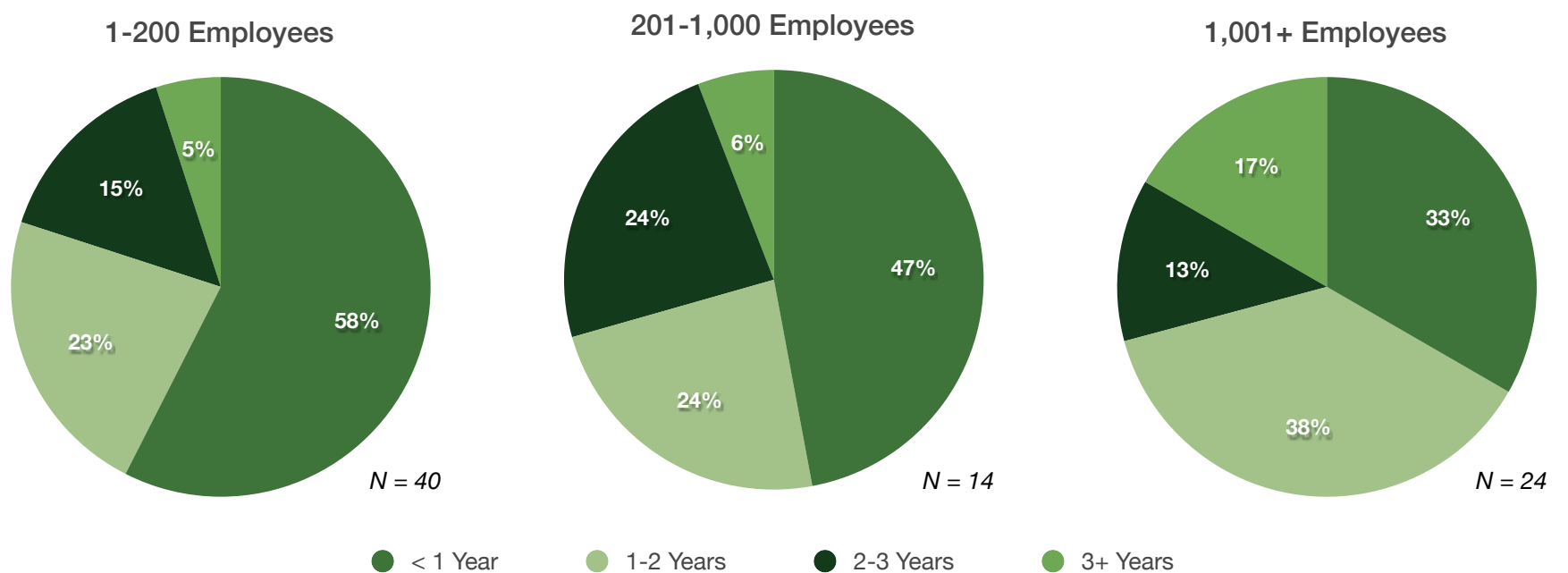




# ON THE STATE OF PUBLIC CLOUD

## PUBLIC CLOUD-ONLY ADOPTERS

How long did it take to plan and migrate workloads to your public cloud architecture?



What is the approximate budget spent annually on public cloud resources? (USD)

Company Size	Mean	Median
1-200 Employees <i>N = 25 write-in responses</i>	\$72,146	\$10,000
201-1,000 Employees <i>N = 11 write-in responses</i>	\$1,391,818	\$200,000
1,001+ Employees <i>N = 13 write-in responses</i>	\$3,050,769	\$1,000,000

# ON THE STATE OF PUBLIC CLOUD

## PUBLIC CLOUD-ONLY ADOPTERS

Please explain the business need(s) that drove the decision to use public cloud resources.

Company Size	Top Responses
<p>1-200 Employees</p> <p><i>N = 24 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Development environment</li> <li>• Scalability/elasticity</li> <li>• We scaled the business in SaaS from the beginning</li> </ul>
<p>201-1,000 Employees</p> <p><i>N = 7 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Physical IT space savings</li> <li>• We run a public cloud and use our own resources</li> <li>• We scaled the business in SaaS from the beginning</li> </ul>
<p>1,001+ Employees</p> <p><i>N = 18 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Employee cost reduction</li> <li>• Scalability/elasticity</li> </ul>

# ON THE STATE OF PUBLIC CLOUD

## PUBLIC CLOUD NO-GO'S

Please explain the decision to not use public cloud resources.

Company Size	Top Responses
<p>1-200 Employees <i>N = 87 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Compliance (HIPAA)</li> <li>• Cost exceeds private cloud</li> <li>• Our applications are not compatible with available public clouds</li> <li>• Security; we keep all data on-premises</li> <li>• We do not see the benefit of public cloud</li> </ul>
<p>201-1,000 Employees <i>N = 73 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Compliance (HIPAA)</li> <li>• Cost exceeds private cloud</li> <li>• Our applications are not compatible with available public clouds</li> <li>• Trust; we simply do not trust public clouds</li> <li>• Security; we keep all data on-premises</li> </ul>
<p>1,001+ Employees <i>N = 84 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Compliance (HIPAA)</li> <li>• Cost exceeds private cloud</li> <li>• Latency; our applications cannot tolerate latency</li> <li>• Our applications are not compatible with available public clouds</li> <li>• Security; we keep all data on-premises</li> </ul>

ON THE STATE OF  
**PRIVATE CLOUD**

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ANALYSIS

# ON THE STATE OF PRIVATE CLOUD

## ANALYSIS

### Adoption

Survey participants were asked to identify as one of five private cloud strategy types: Functional Private Cloud, Planned Private Cloud, Committed Private Cloud, No Private Cloud and No Strategy. Overall, 55.6% of participants own or plan to build a private cloud, with nearly half of these planned but not yet implemented.

### Functional Private Cloud Owners

The Functional Private Cloud Owners strategy group comprised 29.6% of total respondents (26% of Small, 26% of Medium, and 35% of Large organizations). This group relies heavily upon internal experience and expertise in implementing this strategy, followed by vendor product and services, and then input from partners/VARs. Their private clouds host predominantly VM-based SaaS and IaaS applications for nearly equal use by customers, line-of-business owners and application developers.

39.1% of respondents in this group planned and implemented their private cloud between one and two years, with larger organizations taking longer. Median expenditures to construct these clouds were \$100,000; \$190,000; and \$700,000 among Small, Medium and Large organizations, respectively (USD). The mean expenditures exhibit a more linear gradation at \$497,157; \$1,438,788 and \$2,209,405, respectively.

The business needs driving this group's early adoption of private cloud featured increasing agility and reducing time-to-market (referring to both product launches and internal application deployment), assuring performance and reliability and maximizing security.

### Private Cloud Pre-Owners

Private Cloud Pre-Owners, both planned with specific timelines and committed without specifics, comprised 26.0% of total respondents (23% of Small, 25% of Medium, and 31% of Large organizations). For the sake of this analysis, their data are combined due to prevalent similarities in their responses. This group relies on the same three sources as Functional Private Cloud Owners, but also consults analysts in their implementation. These planned private clouds will host similar workload types as existing functional private clouds, with 54.9% hosting SaaS and 45.1% hosting IaaS, up from 44.5% and 41.2% in existing private clouds. Significant for this group is that application developers are designated as primary users of planned private clouds, a need also reflected in the business drivers listed.

45.5% of respondents in this group expect to plan and build their private cloud in less than one year, with Medium organizations taking longer. Median expenditures to construct these clouds were \$50,000; \$100,000 and \$1,000,000 among Small, Medium and Large organizations, respectively (USD).

The business needs driving this group's planned adoption of private cloud are not dissimilar from those of Functional Private Cloud Owners. What is clear is that a discrepancy exists between the beliefs and realities of cost in private versus public cloud adoption.

### No Private Cloud

7.8% of participants have decided not to build a private cloud (9% of Small, 9% of Medium and 6% of Large organizations), citing cost, complexity and insufficient scale as the reasons against adoption. Several respon-

# ON THE STATE OF PRIVATE CLOUD *analysis*

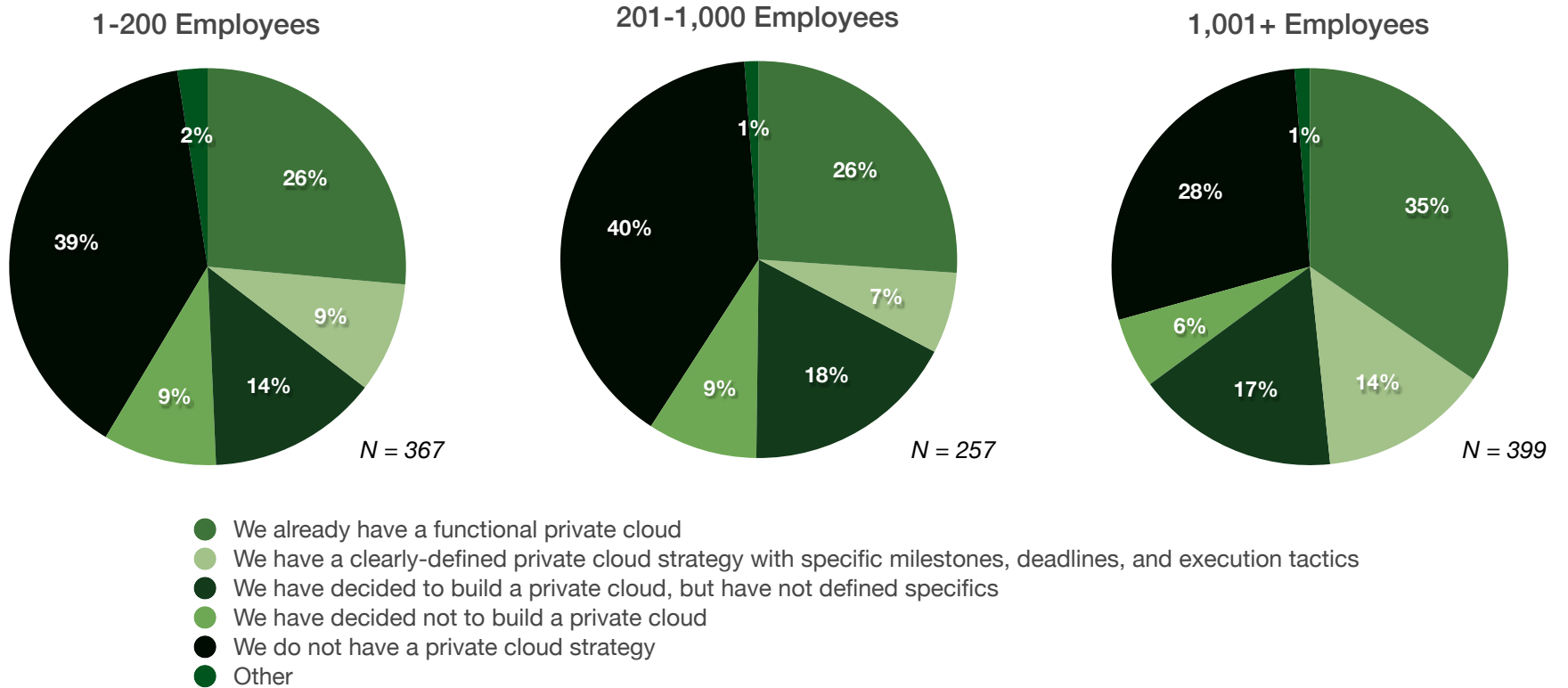
dents from Large organizations stated that their needs were met by public cloud capabilities.

## **No Strategy**

34.9% of participants do not have a private cloud strategy, skewed toward Small and Medium organizations (39% of Small, 40% of Medium and 28% of Large organizations).

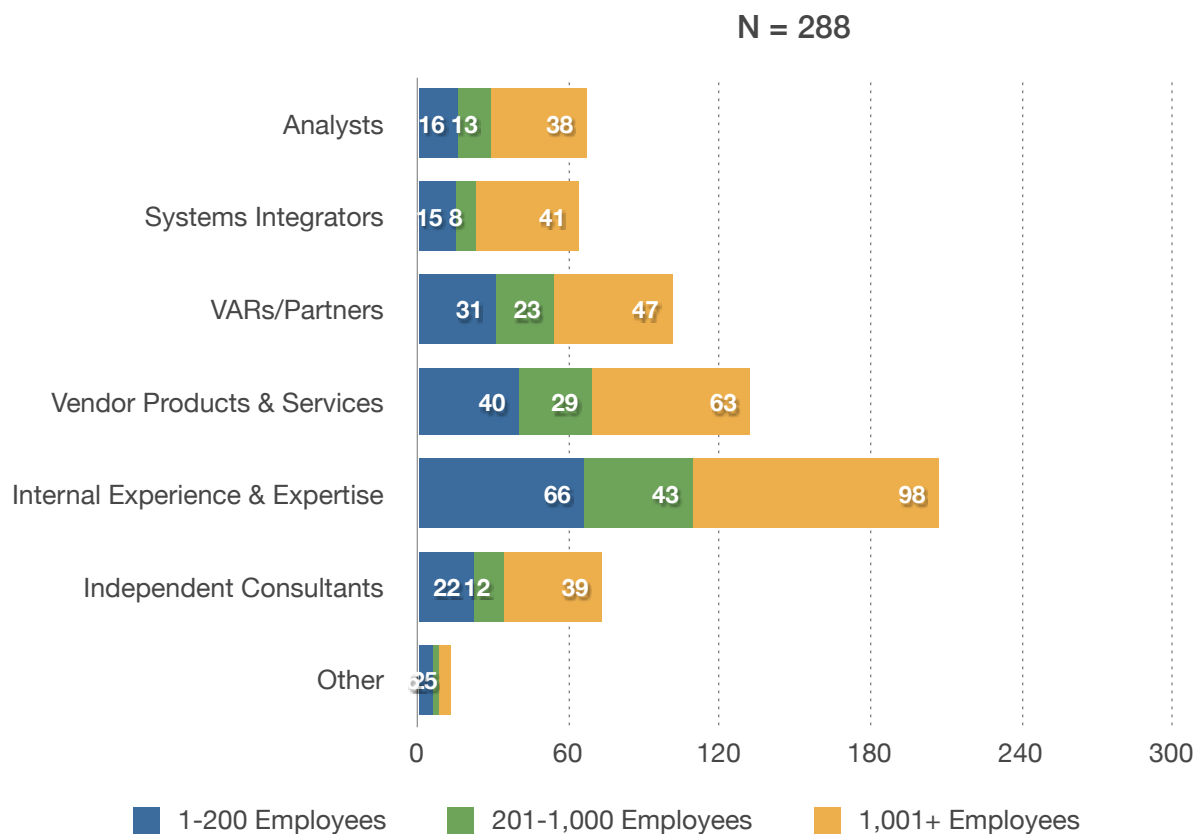
# ON THE STATE OF PRIVATE CLOUD

Which of the following best describes your private cloud strategy?



## FUNCTIONAL PRIVATE CLOUD OWNERS

Who was consulted in defining and executing the specifics of your private cloud?  
(select all that apply)

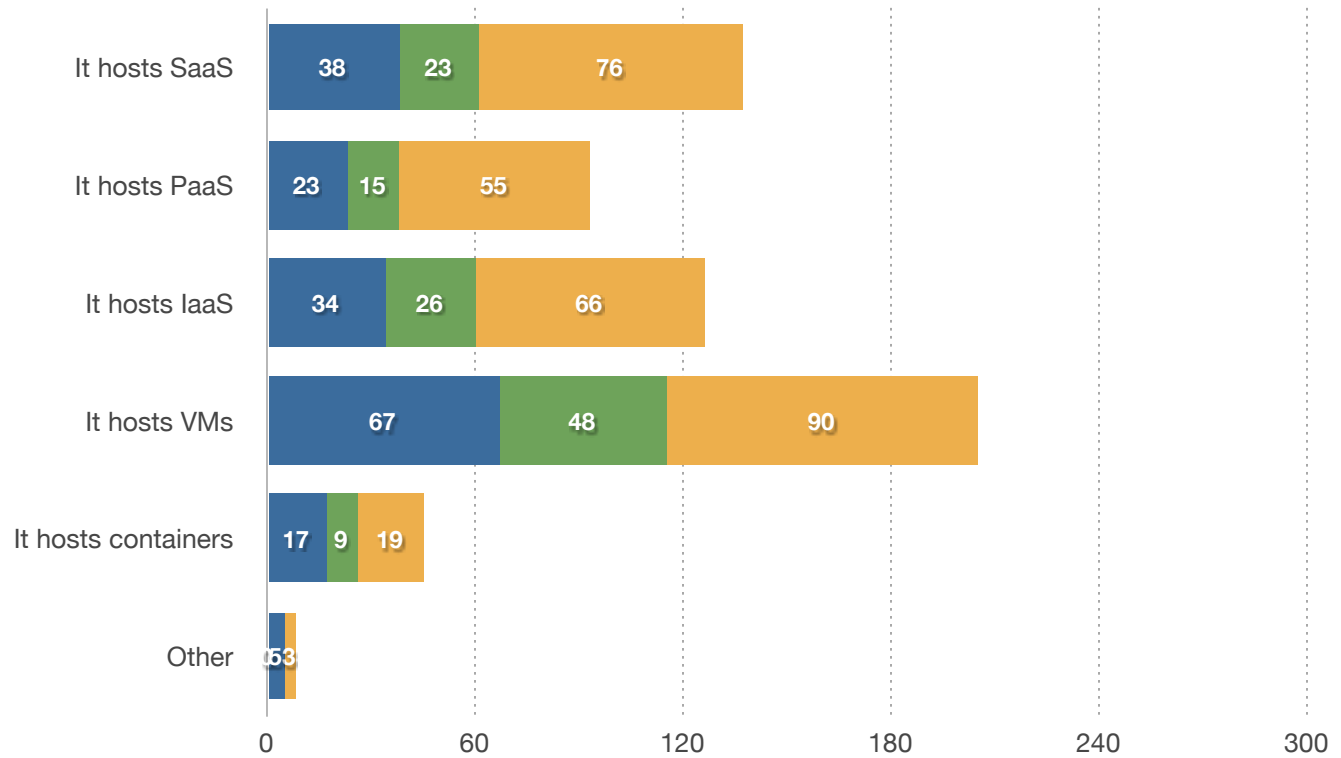


# ON THE STATE OF PRIVATE CLOUD

## FUNCTIONAL PRIVATE CLOUD OWNERS

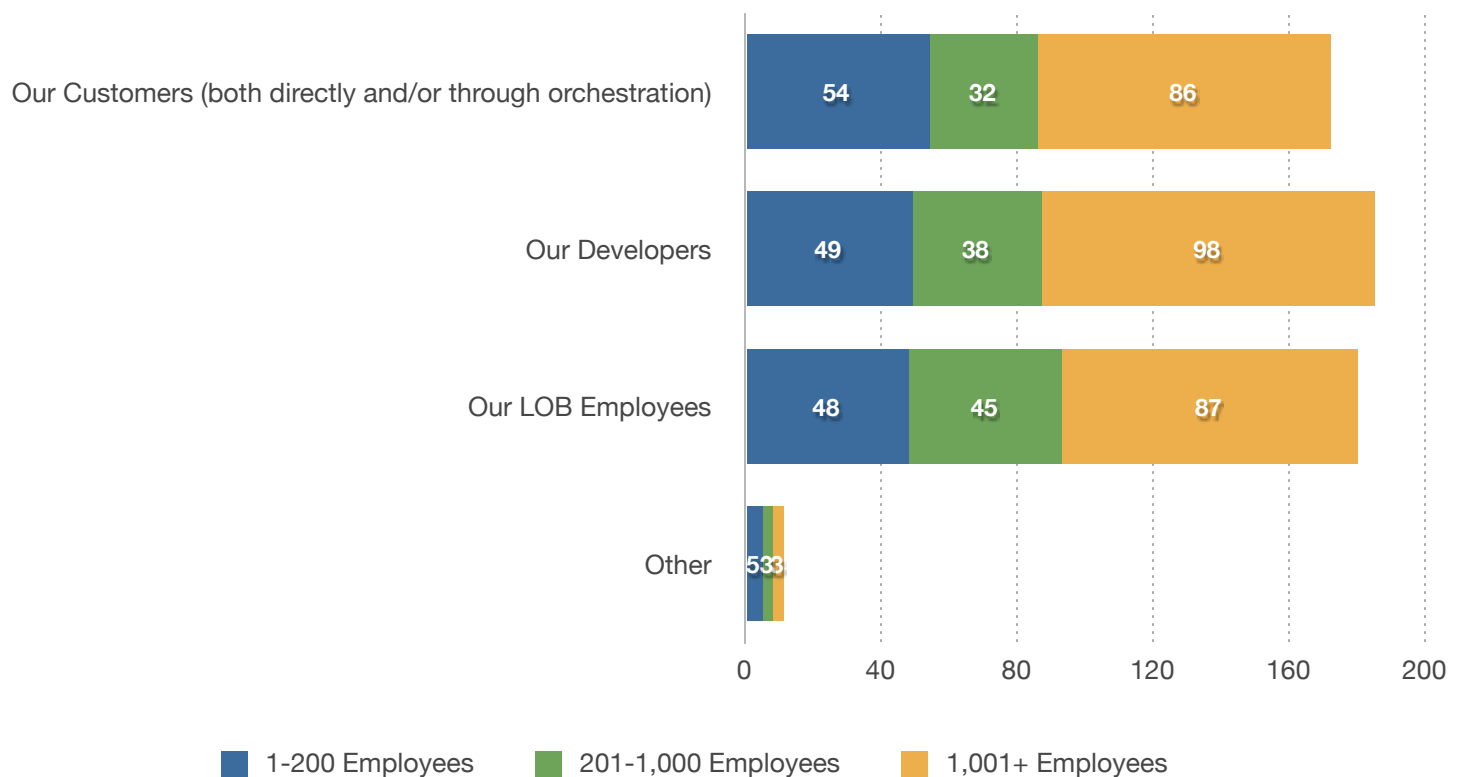
Which of the following best describes your private cloud architecture? (select all that apply)

N = 307



Which of the following best describes users of your private cloud resources? (select all that apply)

N = 298

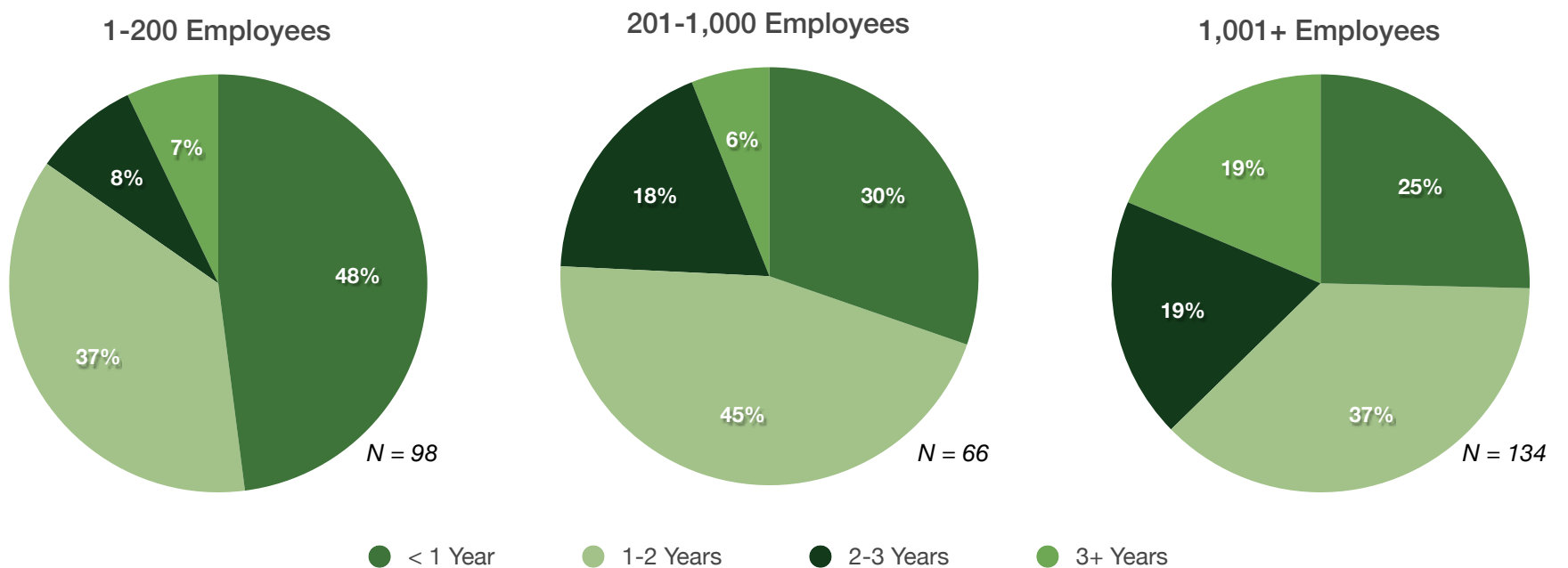




# ON THE STATE OF PRIVATE CLOUD

## FUNCTIONAL PRIVATE CLOUD OWNERS

How long did it take to plan and build your private cloud?



What was the approximate budget expended to build this private cloud? (USD)

Company Size	Mean	Median
1-200 Employees <i>N = 70 write-in responses</i>	\$497,157	\$100,000
201-1,000 Employees <i>N = 52 write-in responses</i>	\$1,438,788	\$190,000
1,001+ Employees <i>N = 84 write-in responses</i>	\$2,209,405	\$700,000

# ON THE STATE OF PRIVATE CLOUD

## FUNCTIONAL PRIVATE CLOUD OWNERS

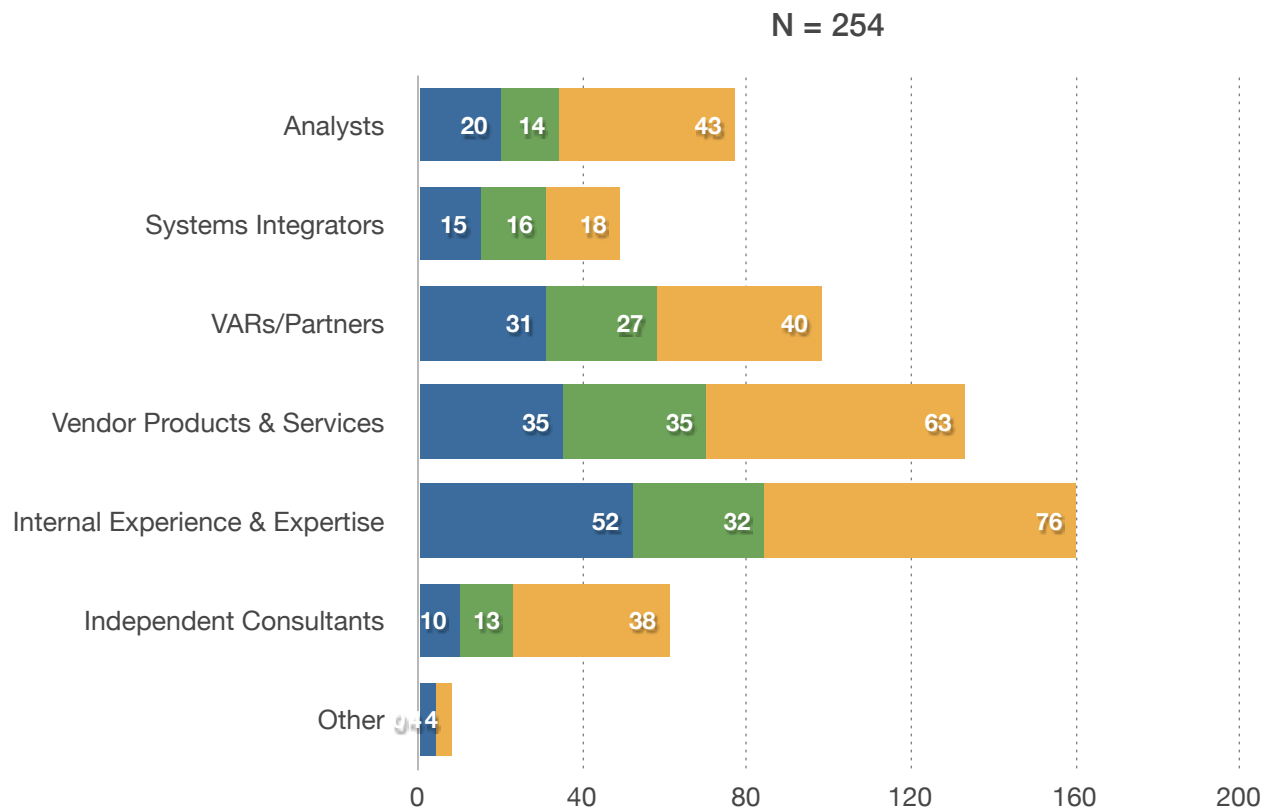
Please explain the business need(s) that drove the decision to build a private cloud.

Company Size	Top Responses
<p>1-200 Employees <i>N = 33 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Cost beats public cloud</li> <li>• Hybrid cloud preparation</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Performance and reliability</li> <li>• Security; we keep all data on-premises</li> </ul>
<p>201-1,000 Employees <i>N = 50 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Company mandate to reduce cost/TCO</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Performance and reliability</li> <li>• Scalability/elasticity</li> <li>• Security; we keep all data on-premises</li> </ul>
<p>1,001+ Employees <i>N = 102 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• Centralization of client-based applications</li> <li>• Company mandate to reduce cost/TCO</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Scalability/elasticity</li> <li>• Security; we keep all data on-premises</li> </ul>

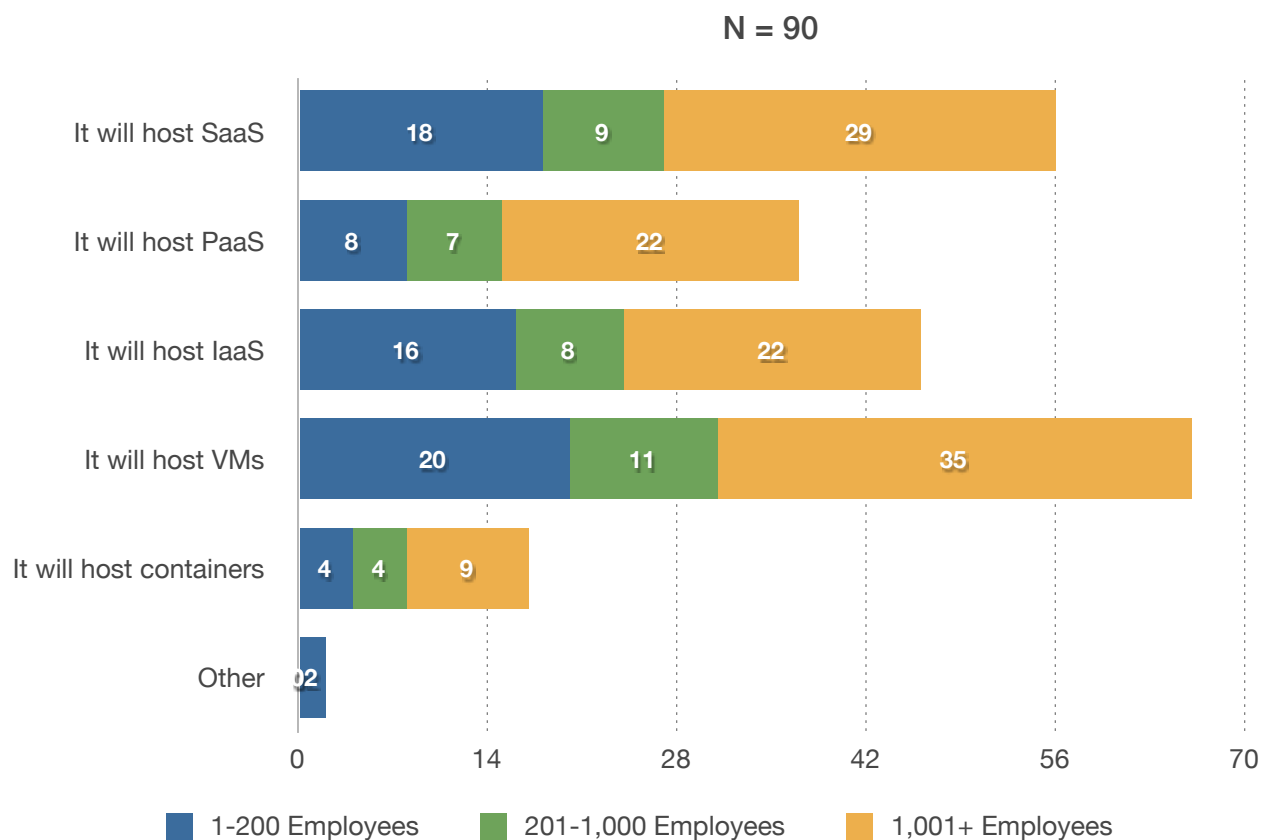
# ON THE STATE OF PRIVATE CLOUD

## PRIVATE CLOUD PRE-OWNERS (PLANNED & COMMITTED)

Who was consulted in defining and executing the specifics of your private cloud?  
(select all that apply)



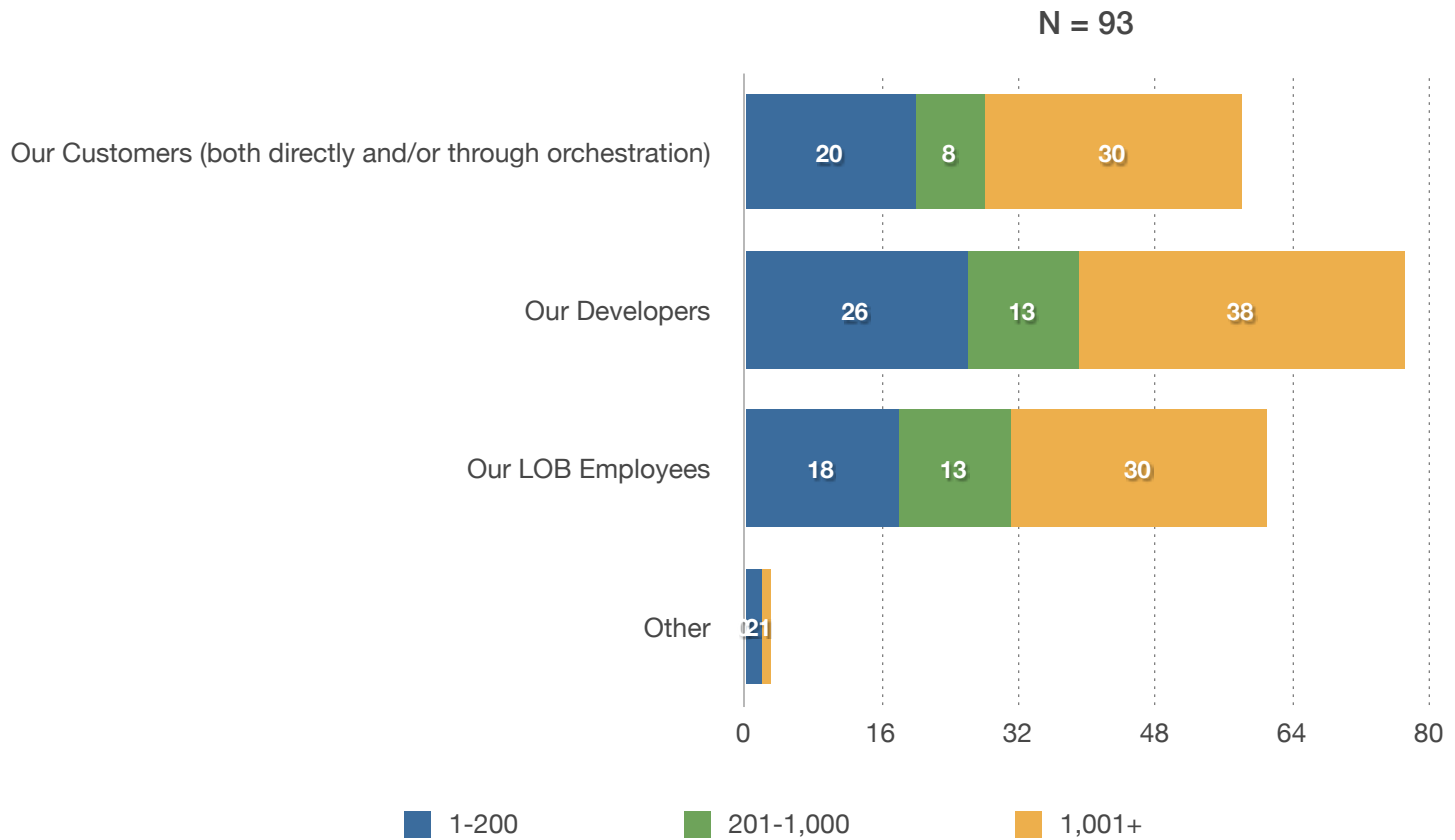
Which of the following best describes your planned cloud architecture? (select all that apply)



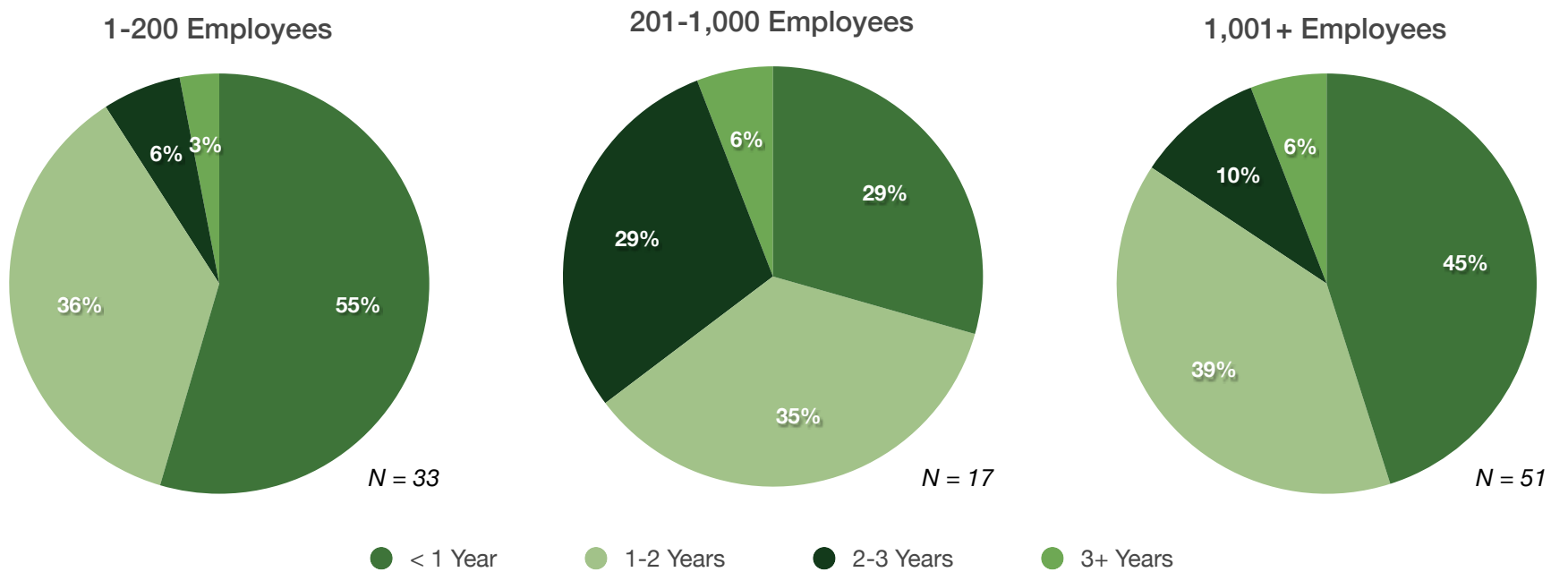
# ON THE STATE OF PRIVATE CLOUD

## PRIVATE CLOUD PRE-OWNERS (PLANNED & COMMITTED)

Which of the following best describes who will use your public cloud resources? (select all that apply)



What is the projected timeline to plan and build your private cloud?



# ON THE STATE OF PRIVATE CLOUD

## PRIVATE CLOUD PRE-OWNERS (PLANNED & COMMITTED)

What is the approximate budget allocated to build this private cloud? (USD)

Company Size	Mean	Median
1-200 Employees <i>N = 22 write-in responses</i>	\$112,591	\$50,000
201-1,000 Employees <i>N = 16 write-in responses</i>	\$198,125	\$100,000
1,001+ Employees <i>N = 29 write-in responses</i>	\$2,386,897	\$1,000,000

# ON THE STATE OF PRIVATE CLOUD

## PRIVATE CLOUD PRE-OWNERS (PLANNED & DEDICATED)

Please explain the business need(s) that drove the decision to build a private cloud.

Company Size	Top Responses
<p>1-200 Employees</p> <p><i>N = 73 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Cost beats public cloud</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Scalability/elasticity</li> <li>• Security; we keep all data on-premises</li> </ul>
<p>201-1,000 Employees</p> <p><i>N = 48 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Company mandate to reduce cost/TCO</li> <li>• Hybrid cloud preparation</li> <li>• Performance and reliability</li> <li>• Scalability/elasticity</li> <li>• Security; we keep all data on-premises</li> </ul>
<p>1,001+ Employees</p> <p><i>N = 89 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Hybrid cloud preparation</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Scalability/elasticity</li> <li>• Security; we keep all data on-premises</li> </ul>

# ON THE STATE OF PRIVATE CLOUD

## PRIVATE CLOUD NO-GO'S

Please explain the decision to not build a private cloud.

Company Size	Top Responses
<p>1-200 Employees <i>N = 19 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Complexity of implementation and management</li> <li>• Cost prohibitive/not cost-effective</li> <li>• Public cloud suits needs</li> <li>• Unnecessary at small scale</li> </ul>
<p>201-1,000 Employees <i>N = 16 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Complexity of implementation and management</li> <li>• Cost prohibitive/not cost-effective</li> <li>• No business need</li> <li>• Public cloud suits needs</li> </ul>
<p>1,001+ Employees <i>N = 15 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Cost prohibitive/not cost-effective</li> <li>• No business need</li> <li>• Public cloud suits needs</li> <li>• Too many risks</li> </ul>

ON THE STATE OF  
**MULTI-CLOUD**

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ANALYSIS



# ON THE STATE OF MULTI-CLOUD ANALYSIS

## Adoption

Survey participants were asked to identify as one of five private cloud strategy types: Functional Multi-Cloud, Planned Multi-Cloud, Committed Multi-Cloud, No Multi-Cloud and No Strategy. Overall, 31.1% of participants use own or plan to build a multi-cloud, with two-thirds of these planned but not yet implemented.

This data is expected, and suggests that over three-quarters of Public Cloud First, Only and Mixed (39.3% of respondents) groups are working to construct a larger strategic framework that binds their public cloud usage to their private cloud usage. This endeavor bears considerable challenges, as evidenced by the data in this survey. Numerous contradictory responses on each side claimed the reason for adopting public/private cloud was that private/public cloud was too expensive or cost prohibitive. What is clear from the data is that differences in organizational structure, asset inheritance and application requirements all impact the financial effect of public and private cloud adoption.

Multi-cloud, and eventually hybrid cloud, must of necessity reconcile these tradeoffs to strike the optimal blend of capital and operational expense; application availability, reliability and performance; security and compliance and manageability. The task is tall, and as suggested by the data, organizations are split on how to address it.

## Functional Multi-Cloud Owners

The Functional Multi-Cloud Owners strategy group comprised 10.4% of total respondents (10% of Small, 8% of Medium and 13% of Large organizations). This is the assumed current adoption rate of multi-cloud. This

group relied heavily on internal experience and expertise, followed by vendors and analysts in planning and executing their multi-cloud. 44.1% of these use a two-cloud model and 26.5% use a three-cloud model, skewed toward Large organizations. Amazon Web Services and Microsoft Azure are the leading public clouds used, although Medium organizations use a long-tail of public clouds which suit their needs including Citrix and Digital Ocean.

Workload residence policies (user-based, workload-based, cost-based and performance-based) are highly fragmented and distributed evenly across company-size segments, with workload-based policies prevailing as a majority at 27.4% of the group.

87.1% of respondents planned and completed their multi-cloud in two years or less, with 47.5% taking between one and two years. Large organizations tended to take longer in their implementation. Median expenditures to construct these clouds were \$22,000; \$32,500 and \$400,000 among Small, Medium and Large organizations, respectively (USD). The mean expenditures exhibit a more pronounced gradation at \$125,455; \$845,071 and \$1,949,677, respectively.

The business needs driving this group's early adoption of multi-cloud are similar to those of public and private cloud adopters, but also add a couple of noteworthy drivers: preparation for hybrid cloud and solution diversification.

## Multi-Cloud Pre-Owners

Multi-Cloud Pre-Owners, both planned with specific timelines and committed without specifics, comprised 20.7% of total respondents (15% of Small, 19% of Me-

# ON THE STATE OF MULTI-CLOUD *analysis*

dium and 28% of Large organizations). For the sake of this analysis, their data are combined due to consistent similarities in their responses. This group relies heavily on internal experience and expertise, followed by vendors and partners/VARs in planning and executing their multi-cloud. 39.7% of these use a two-cloud model and 28.8.% use a three-cloud model, skewed toward Large organizations. Of note is that 24% of Large organizations plan to use more than five clouds. Microsoft Azure and Amazon Web Services are the leading public clouds planned for usage.

74.3% of respondents expect to complete their multi-cloud in two years or less, with 39.2% taking between one and two years. Median expenditures to construct these clouds were \$20,000; \$135,000 and \$850,000 among Small, Medium and Large organizations, respectively (USD). The mean expenditures exhibit a more pronounced gradation at \$103,400; \$466,167 and \$1,671,722, respectively. On average, organizations project it will cost less and take less time to implement multi-cloud than those that have already implemented it.

The business needs driving this group's planned adoption of private cloud are not dissimilar from those of Functional Multi-Cloud Owners.

## **No Multi-Cloud**

11.4% of participants have decided not to build a multi-cloud (13% of Small, 13% of Medium and 10% of Large organizations), citing cost, security and insufficient scale as the reasons against adoption.

## **No Strategy**

A full 56.7% of participants do not have a multi-cloud strategy, skewed toward Small and Medium organizations (61% of Small, 62% of Medium and 49% of Large organizations).

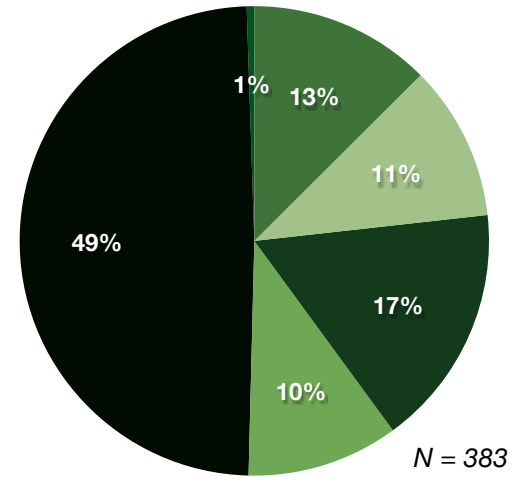
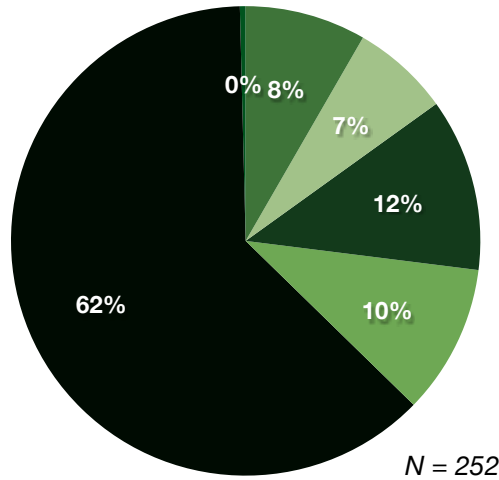
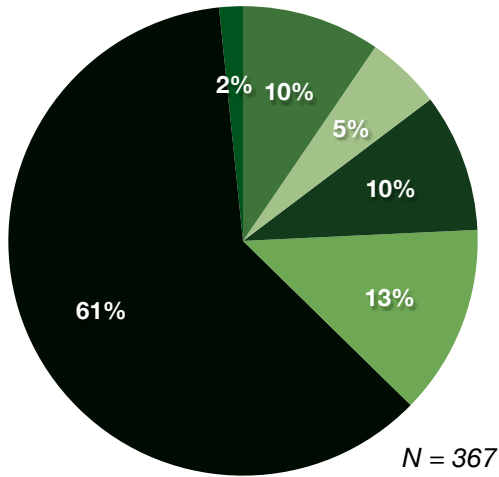
# ON THE STATE OF MULTI-CLOUD

Which of the following best describes your multi-cloud strategy?

1-200 Employees

201-1,000 Employees

1,001+ Employees



- We already have a functional multi-cloud
- We have a clearly-defined multi-cloud strategy with specific milestones, deadlines, and execution tactics
- We have decided to adopt multi-cloud, but have not defined specifics
- We have decided not to adopt multi-cloud
- We do not have a multi-cloud strategy
- Other

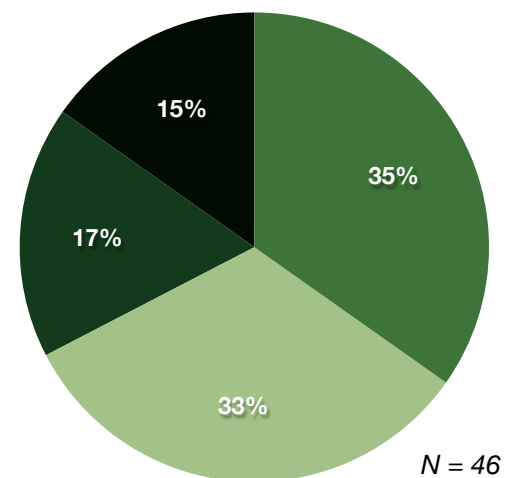
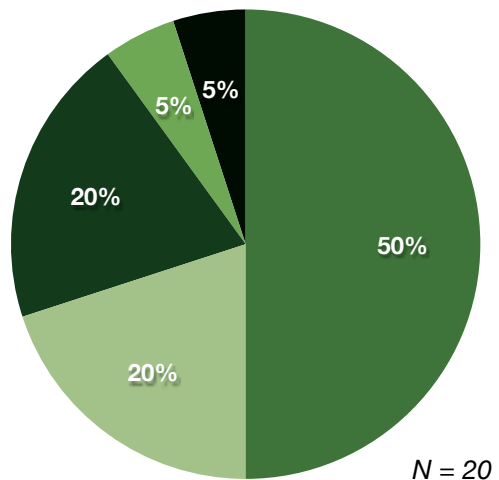
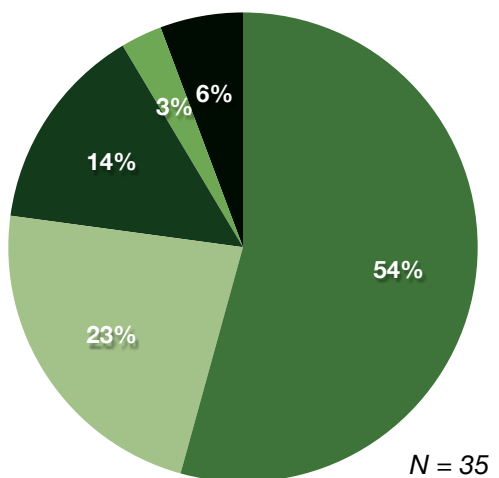
## FUNCTIONAL MULTI-CLOUD OWNERS

How many clouds are used in your multi-cloud architecture? (including your private cloud)

1-200 Employees

201-1,000 Employees

1,001+ Employees

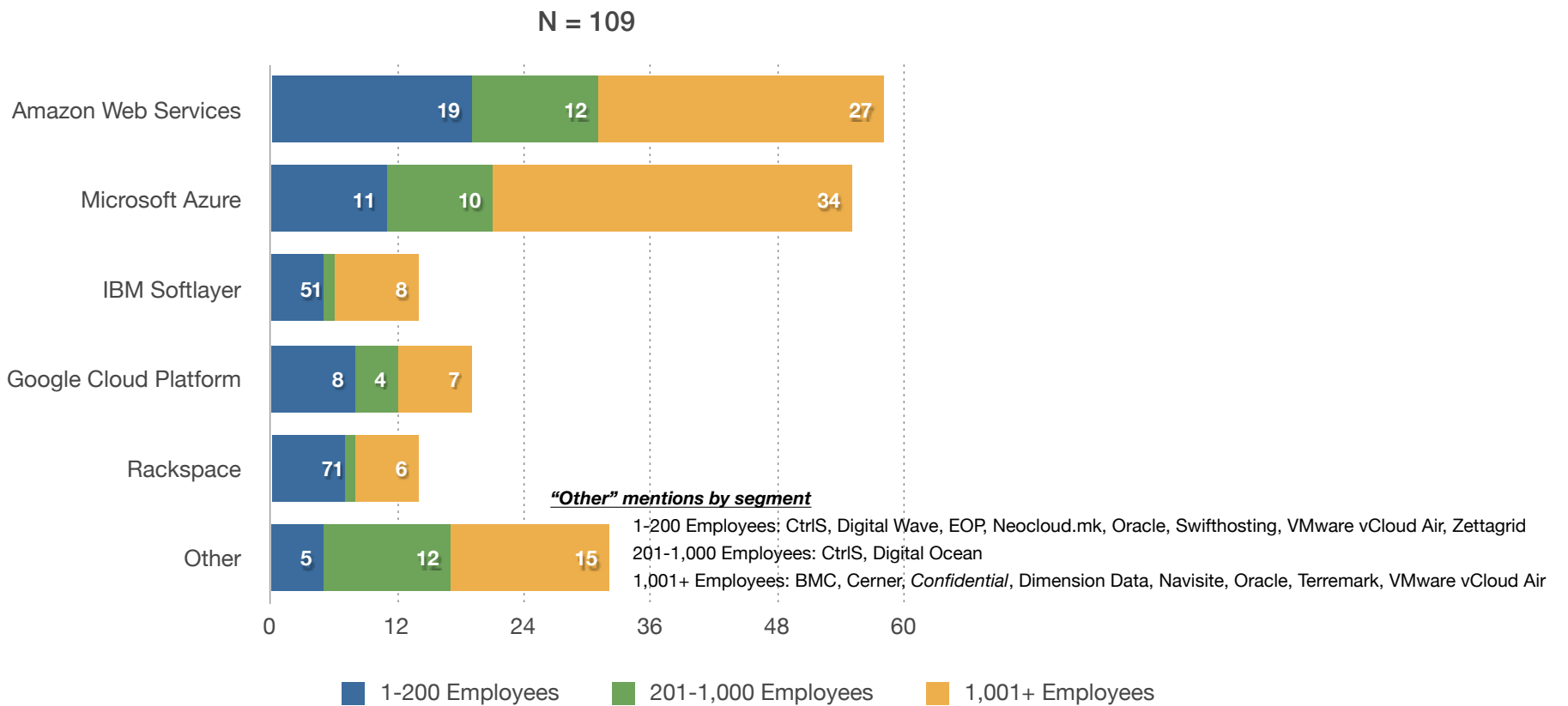


- 2 clouds
- 3 clouds
- 4 clouds
- 5 clouds
- > 5 clouds

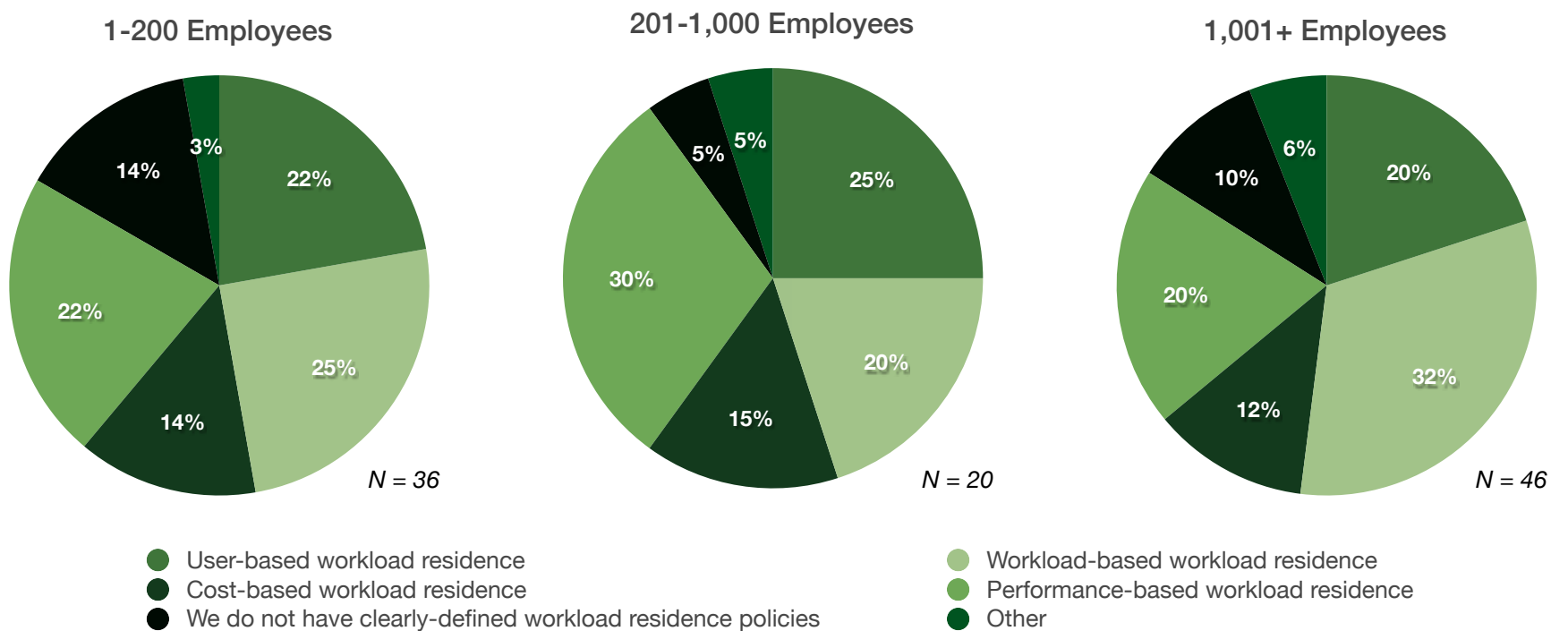
# ON THE STATE OF MULTI-CLOUD

## FUNCTIONAL MULTI-CLOUD OWNERS

Which public clouds are used in your multi-cloud architecture?  
(select all that apply)



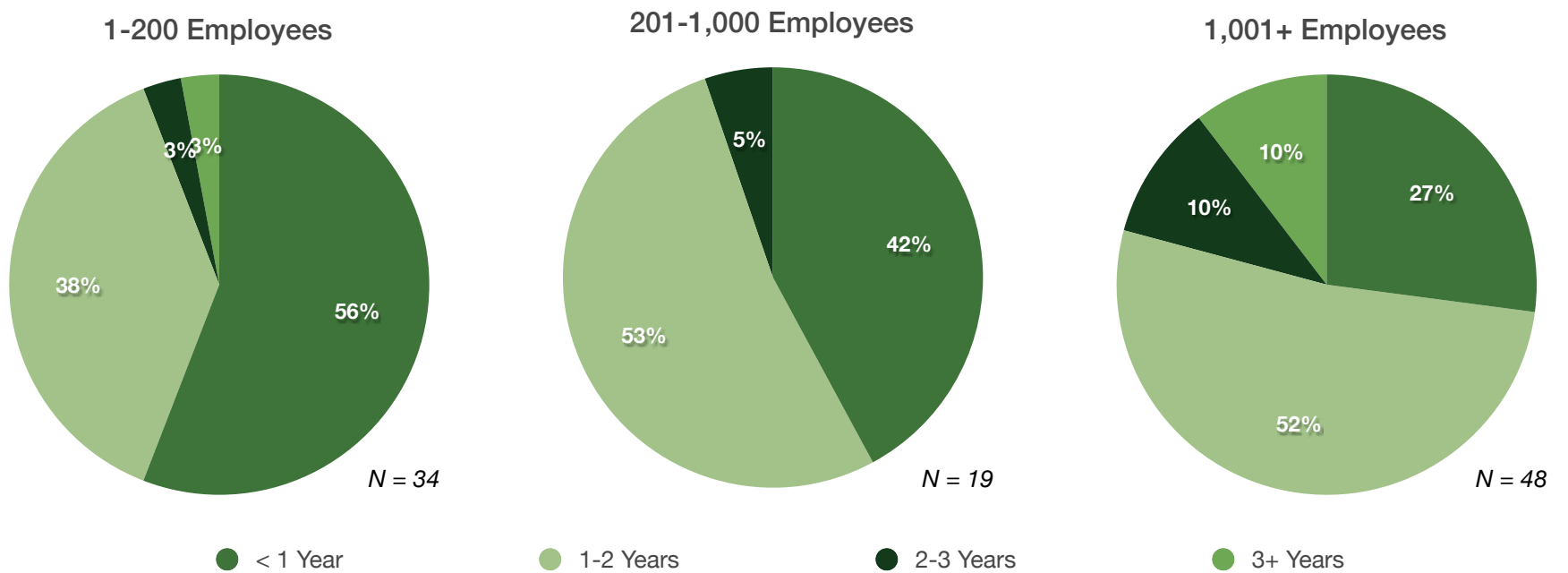
Which of the following best describes the workload residence policies of your multi-cloud architecture?



# ON THE STATE OF MULTI-CLOUD

## FUNCTIONAL MULTI-CLOUD OWNERS

How long did it take to plan and build your multi-cloud?



What was the approximate budget expended to build this multi-cloud? (USD)

Company Size	Mean	Median
1-200 Employees <i>N = 22 write-in responses</i>	\$125,455	\$22,000
201-1,000 Employees <i>N = 17 write-in responses</i>	\$845,071	\$32,500
1,001+ Employees <i>N = 31 write-in responses</i>	\$1,949,677	\$400,000

# ON THE STATE OF MULTI-CLOUD

## FUNCTIONAL MULTI-CLOUD OWNERS

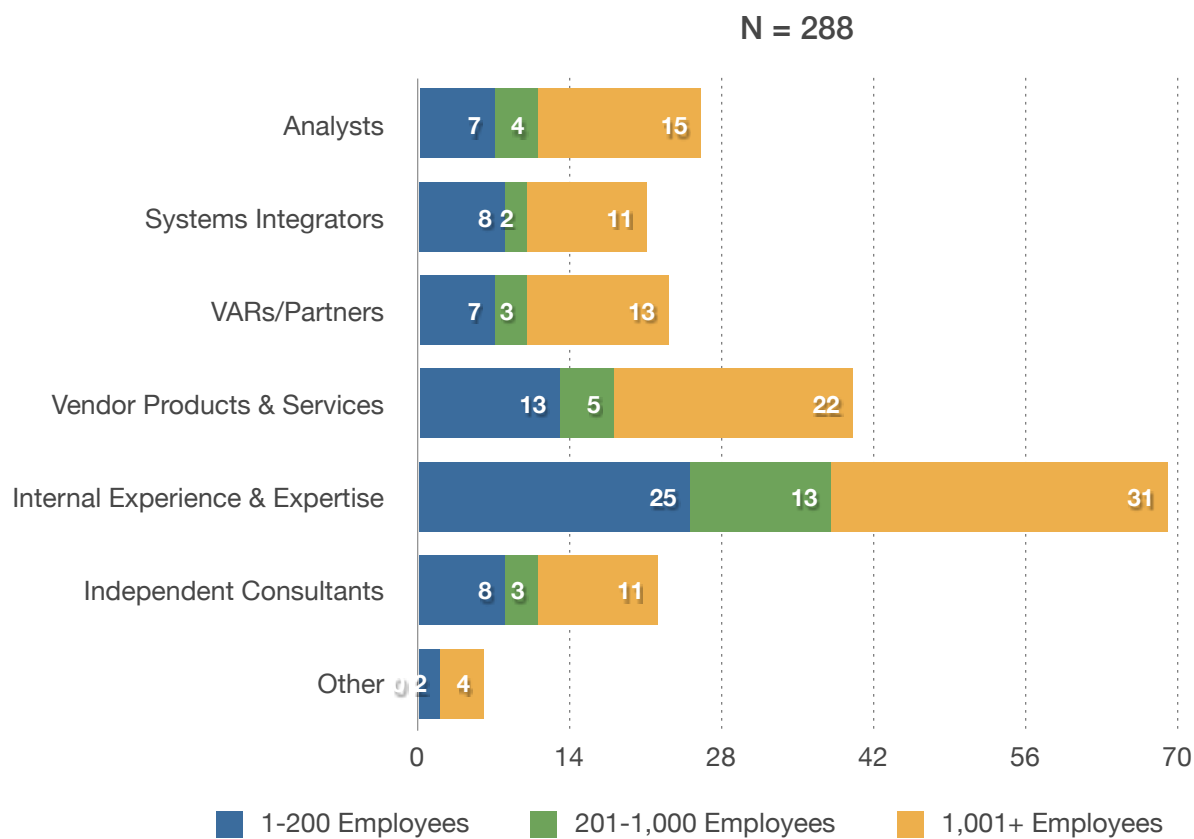
Please explain the business need(s) that drove the decision to build a multi-cloud.

Company Size	Top Responses
<p>1-200 Employees</p> <p><i>N = 19 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Disaster recovery</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Performance diversity</li> </ul>
<p>201-1,000 Employees</p> <p><i>N = 14 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Disaster recovery</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Scalability/elasticity</li> </ul>
<p>1,001+ Employees</p> <p><i>N = 40 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• CapEx reduction</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Disaster recovery</li> <li>• Hybrid cloud preparation</li> <li>• Security with flexibility</li> <li>• Solution diversification</li> </ul>

# ON THE STATE OF MULTI-CLOUD

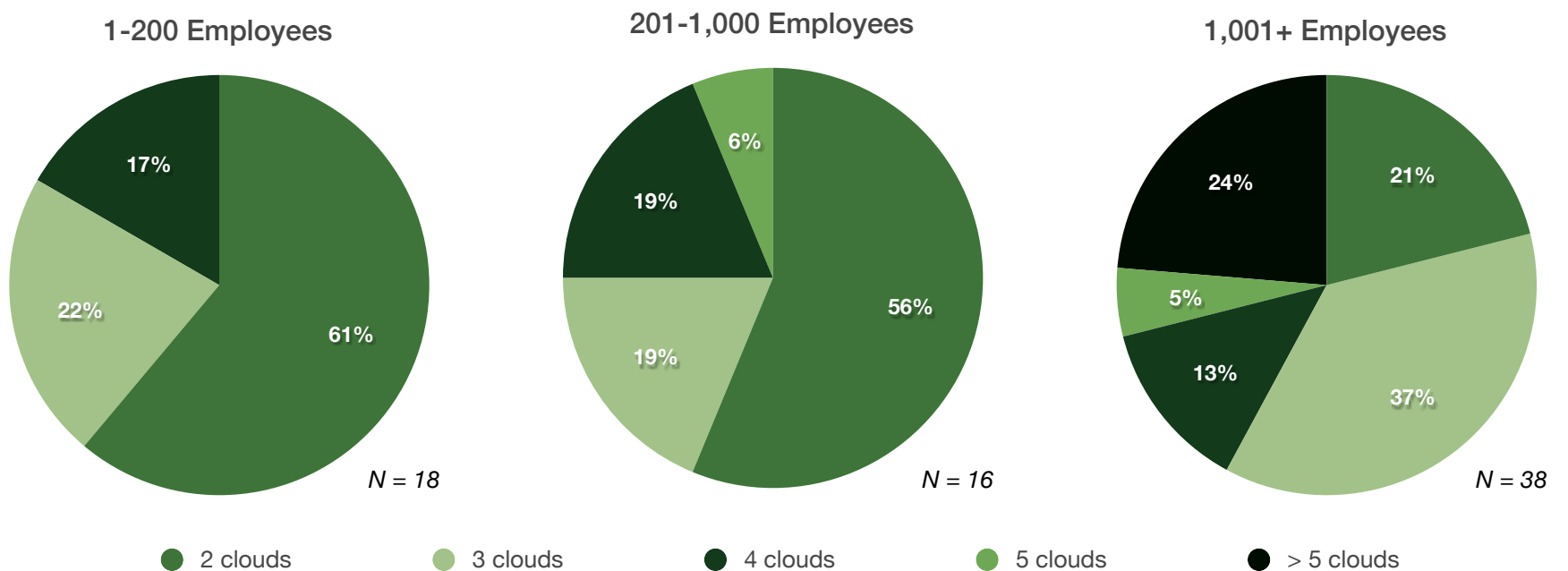
## FUNCTIONAL MULTI-CLOUD OWNERS

Who was consulted in defining and executing the specifics of your multi-cloud?  
(select all that apply)



## MULTI-CLOUD PRE-OWNERS (PLANNED & COMMITTED)

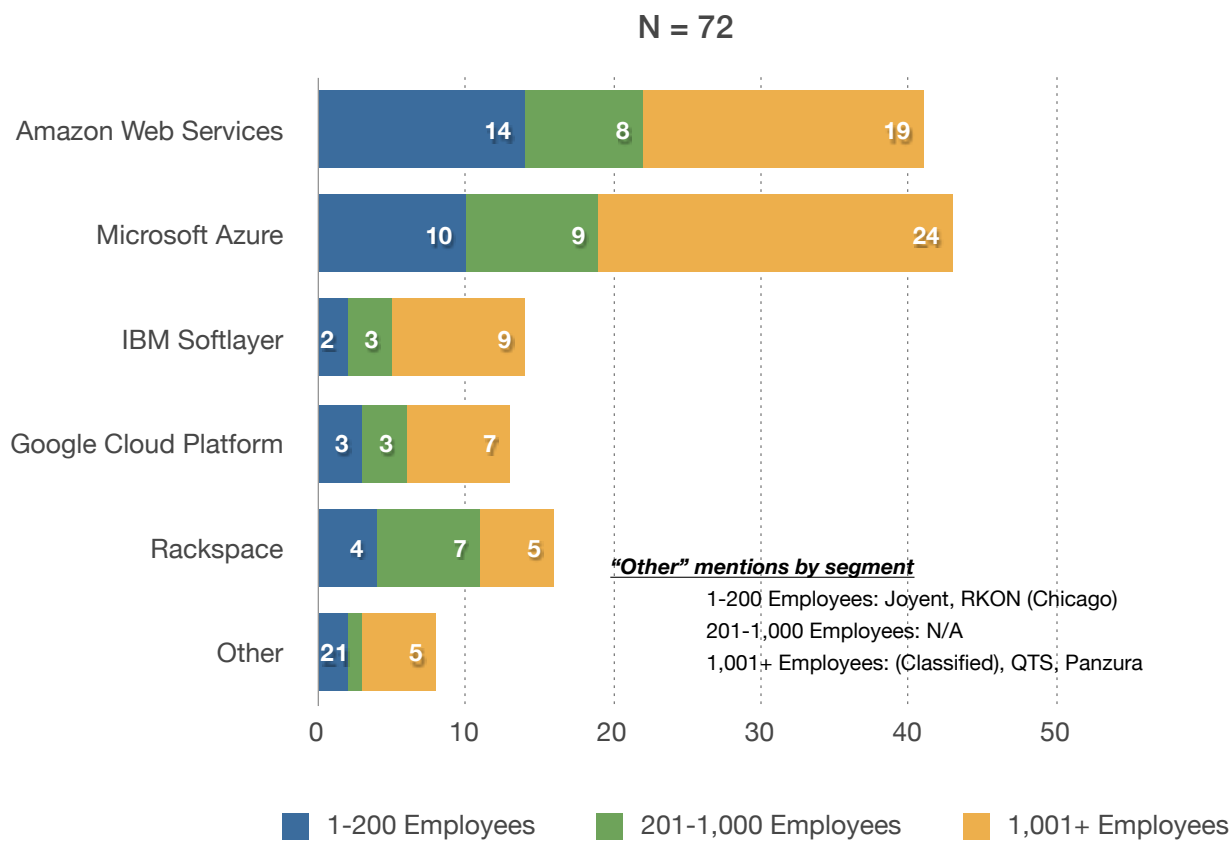
How many clouds will be used in your multi-cloud architecture? (including your private



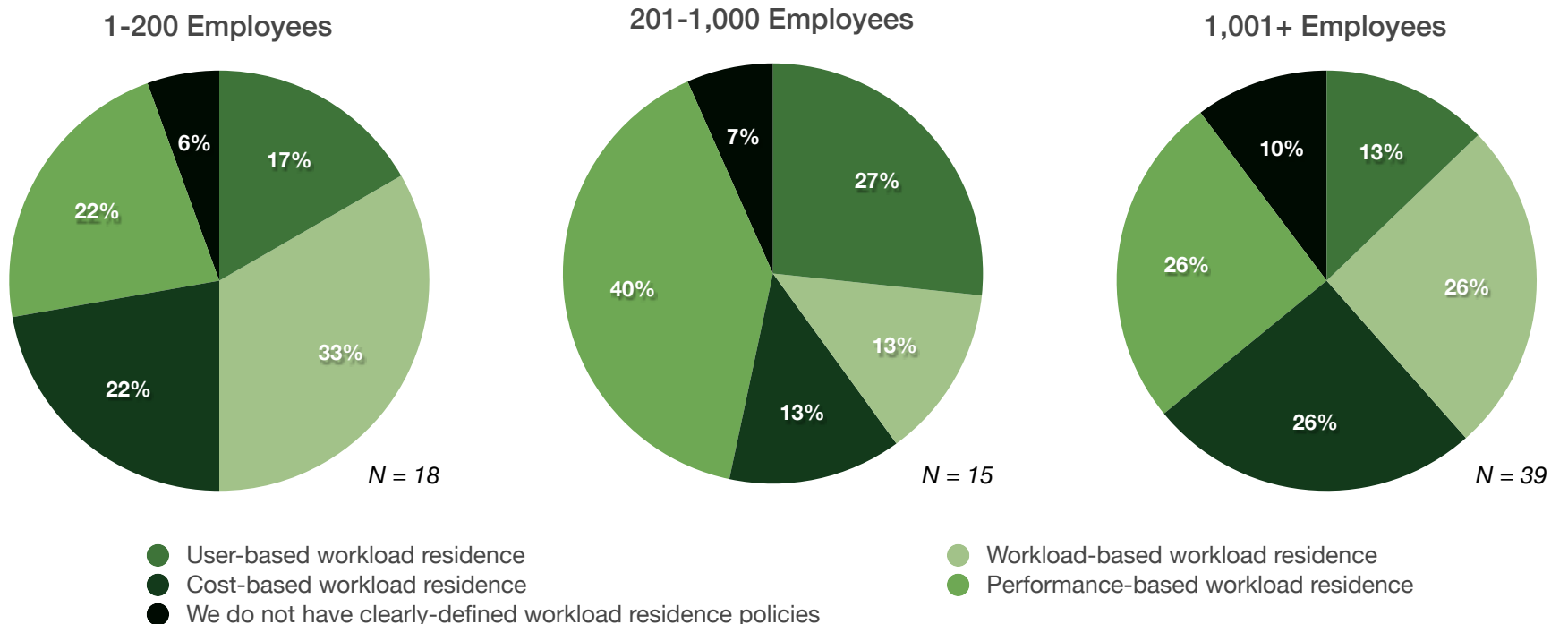
# ON THE STATE OF MULTI-CLOUD

## MULTI-CLOUD PRE-OWNERS (PLANNED & COMMITTED)

Which public clouds will be used in your multi-cloud architecture?  
(select all that apply)



Which of the following best describes the workload residence policies your multi-cloud architecture will enforce?

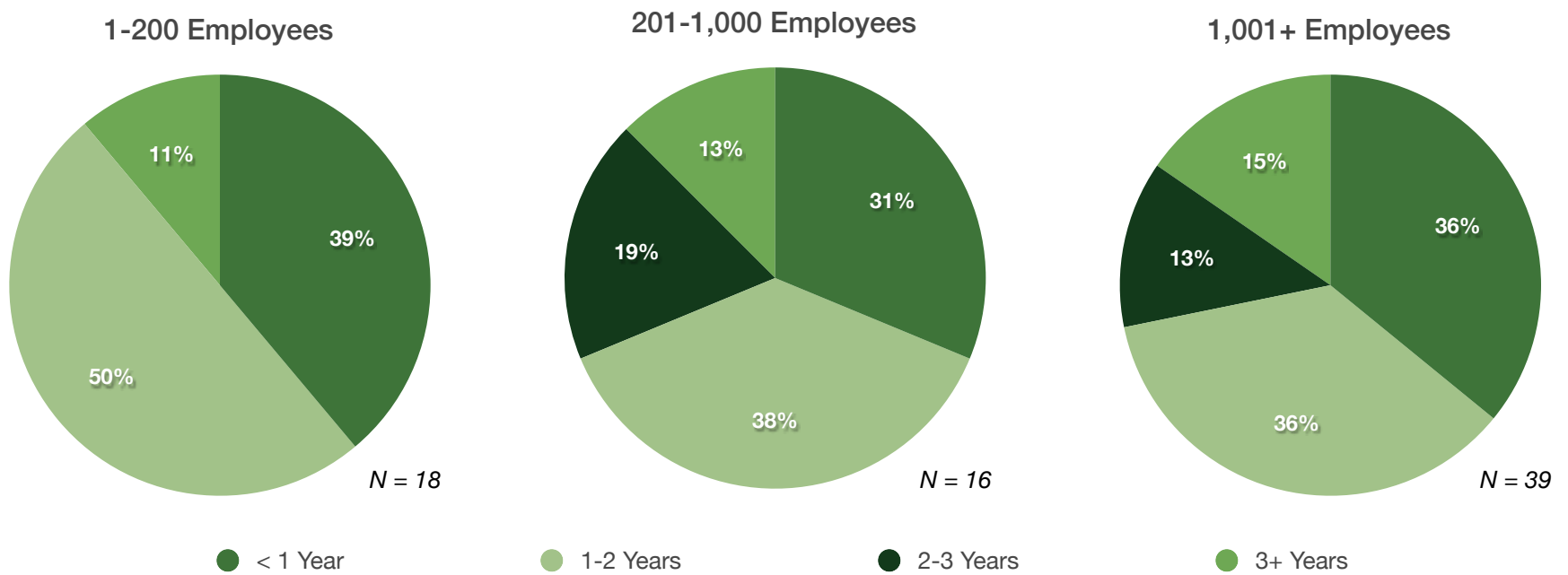




# ON THE STATE OF MULTI-CLOUD

## MULTI-CLOUD PRE-OWNERS (PLANNED & COMMITTED)

How long will it take to plan and build your multi-cloud?



What is the approximate budget allocated to build this multi-cloud? (USD)

Company Size	Mean	Median
1-200 Employees <i>N = 10 write-in responses</i>	\$103,400	\$20,000
201-1,000 Employees <i>N = 12 write-in responses</i>	\$466,167	\$135,000
1,001+ Employees <i>N = 18 write-in responses</i>	\$1,671,722	\$850,000

# ON THE STATE OF MULTI-CLOUD

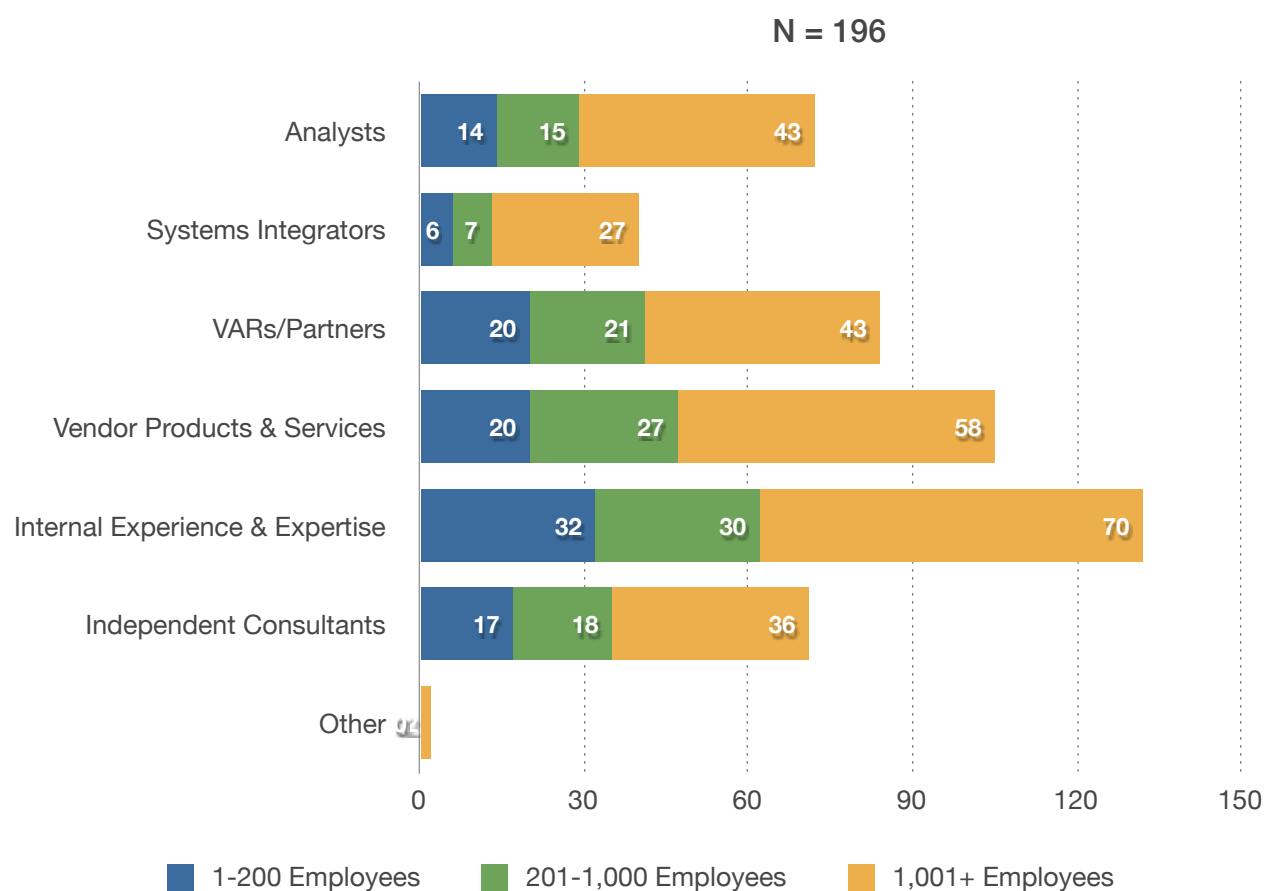
Please explain the business need(s) driving the decision to build a multi-cloud.

Company Size	Top Responses
<p>1-200 Employees <i>N = 28 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Company mandate to reduce cost/TCO</li> <li>• Disaster recovery</li> <li>• Solution diversification</li> </ul>
<p>201-1,000 Employees <i>N = 36 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Disaster recovery</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Scalability/elasticity</li> <li>• Security with flexibility</li> <li>• Solution diversification</li> </ul>
<p>1,001+ Employees <i>N = 70 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Agility and Time-to-Market</li> <li>• Availability</li> <li>• Company mandate to reduce cost/TCO</li> <li>• Coverage (Geographical)</li> <li>• Disaster recovery</li> <li>• Hybrid cloud preparation</li> <li>• On-demand provisioning for Dev/Test</li> <li>• Performance and reliability</li> <li>• Scalability/elasticity</li> <li>• Solution diversification</li> </ul>

# ON THE STATE OF MULTI-CLOUD

## MULTI-CLOUD PRE-OWNERS (PLANNED & COMMITTED)

Who was consulted in defining and executing the specifics of your multi-cloud?  
(select all that apply)



# ON THE STATE OF MULTI-CLOUD

## MULTI-CLOUD NO-GO'S

Please explain the decision to not build a multi-cloud.

Company Size	Top Responses
<p>1-200 Employees</p> <p><i>N = 28 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Cost prohibitive/not cost-effective</li> <li>• Security; we keep all data on-premises</li> <li>• Unnecessary at small scale</li> </ul>
<p>201-1,000 Employees</p> <p><i>N = 16 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Cost prohibitive/not cost-effective</li> <li>• No business need</li> <li>• Public cloud suits needs</li> </ul>
<p>1,001+ Employees</p> <p><i>N = 28 write-in responses</i></p>	<ul style="list-style-type: none"> <li>• Compliance</li> <li>• Cost prohibitive/not cost-effective</li> <li>• Security; we keep all data on-premises</li> <li>• Too many risks</li> </ul>

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# THE STATE OF MULTI-CLOUD ARCHITECTURE

## PART ONE

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**The State of Multi-Cloud Architecture Part Two** is the second installation of this four-part survey series and investigates the implementation challenges, vendor selection, and technical and business requirements facing organizations adopting multi-cloud. It addresses the question *What can go wrong, and what does go wrong when implementing Multi-Cloud?*



### ABOUT TURBONOMIC

Turbonomic delivers an autonomic platform where virtual and cloud environments self-manage in real-time to assure application performance. Turbonomic's patented decision engine dynamically analyzes application demand and allocates shared resources to maintain a continuous state of application health.

Launched in 2010, Turbonomic is one of the fastest growing technology companies in the virtualization and cloud space. Turbonomic's autonomic platform is trusted by thousands of enterprises to accelerate their adoption of virtual, cloud, and container deployments for all mission critical applications.



### ABOUT VERIZON INTELLIGENT CLOUD CONTROL (ICC)

Verizon Intelligent Cloud Control generates intelligent decisions on which workloads to run on which public cloud services, based on your specific performance, price and resource needs – all of which can be automated to reduce your personal workload. Helping you rest at night, knowing Intelligent Cloud Control has your apps exactly where they need to be to deliver the productivity your business needs.