Cloud Computing Service Security Management

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Definitions from the research papers

- "Cloud is a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers." -Buyya et al.

- "Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized Service Level Agreements." -Vaquero et al.

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Definition from NIST

- **Characteristics of Cloud**
  - on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service

- **Service Models**
  - software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS)

- **Deployment Models**
  - private cloud, community cloud, public cloud, and hybrid cloud

Current Status of Cloud Computing

- In the era of digital transformation
  - Lowering the CAPEX and replacing it with OPEX
  - Steep increases of usage should prepared (decreases either)
  - Security is still issues

- Massive data storage and AI/ML API
  - Fundamental for 4th Industrial revolution
  - IoT Services : generating massive raw data
  - AI/ML : Data Analysis and Deriving Knowledge from Data

Current Status of Cloud Computing
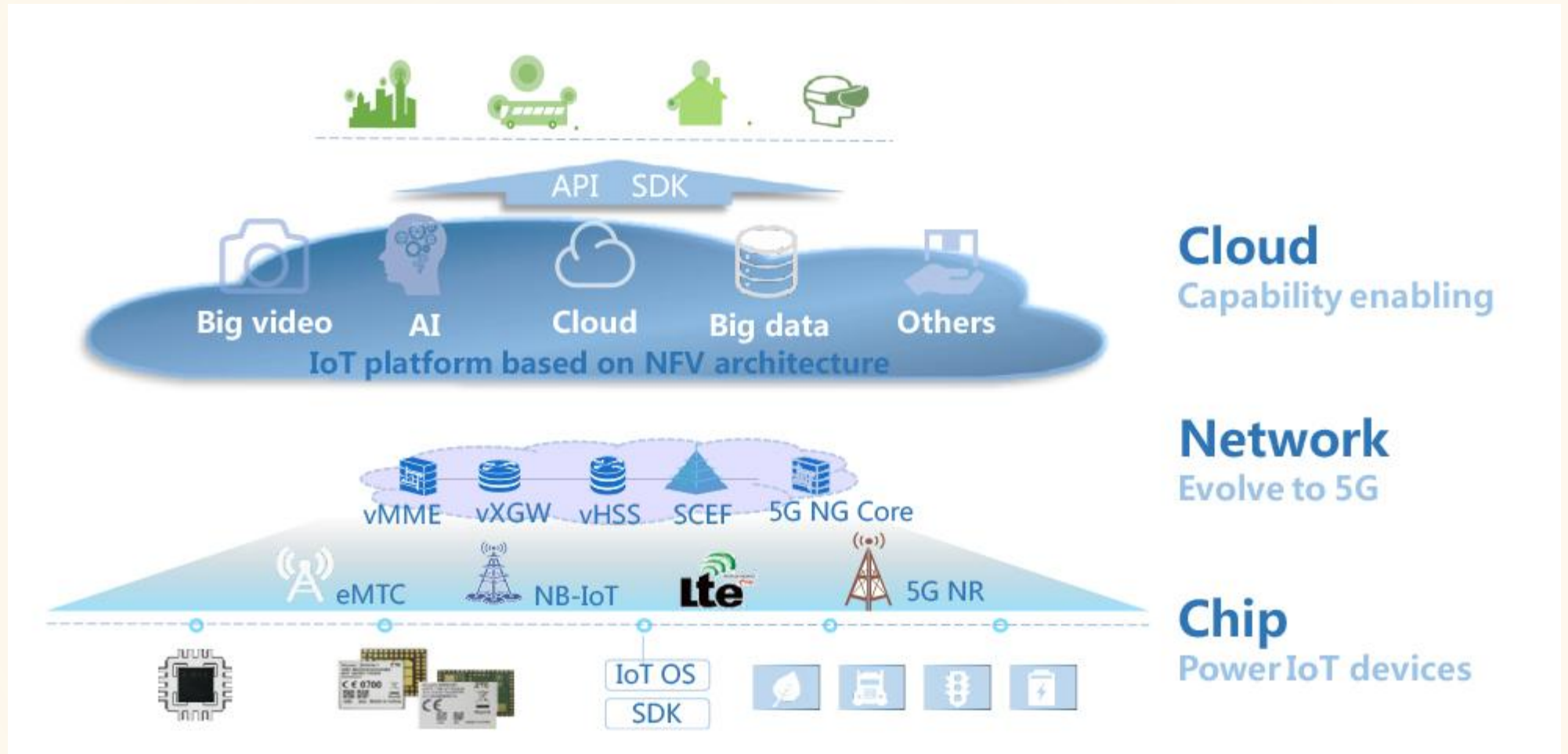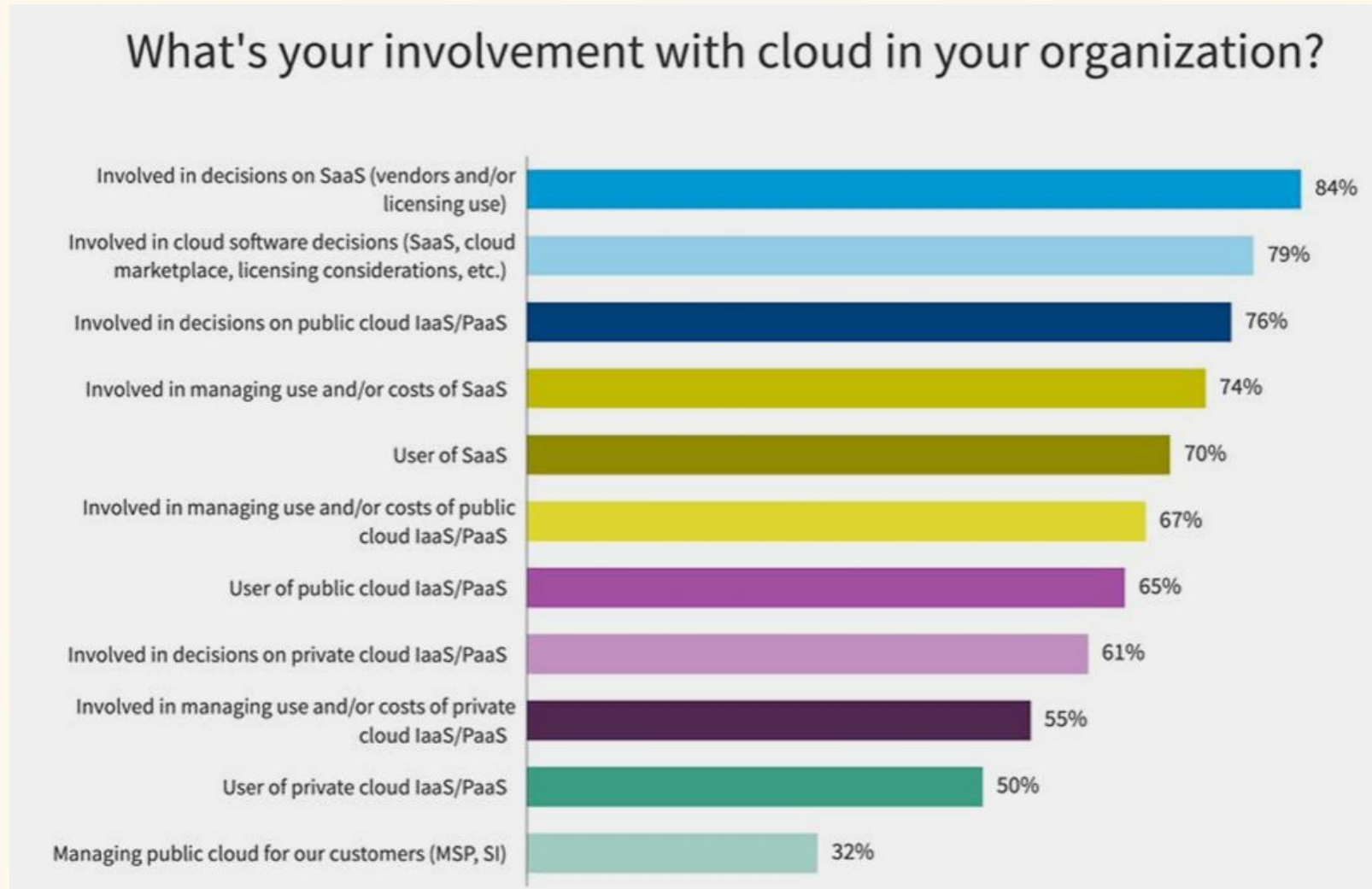
Current Status of Cloud Computing

71%   15%   14%

Heavy
Moderate
Light

N=753
Source: Flexera 2024 State of the Cloud Report (Figure 6)
flexera

Current Status of Cloud Computing

What's your involvement with cloud in your organization?

Involved in decisions on SaaS (vendors and/or licensing use)	84%
Involved in cloud software decisions (SaaS, cloud marketplace, licensing considerations, etc.)	79%
Involved in decisions on public cloud IaaS/PaaS	76%
Involved in managing use and/or costs of SaaS	74%
User of SaaS	70%
Involved in managing use and/or costs of public cloud IaaS/PaaS	67%
User of public cloud IaaS/PaaS	65%
Involved in decisions on private cloud IaaS/PaaS	61%
Involved in managing use and/or costs of private cloud IaaS/PaaS	55%
User of private cloud IaaS/PaaS	50%
Managing public cloud for our customers (MSP, SI)	32%

Current Status of Cloud Computing

What's your current annual public cloud spend?

All respondents

Up to $600K	10%
$600K+ to $1.2M	3rd 12%
$1.2M+ to $2.4M	3rd 12%
$2.4M+ to $6M	1st 16%
$6M+ to $12M	2nd 15%
$12M+ to $24M	10%
$24M+ to $60M	11%
More than $60M	8%
Did not disclose	4%

Enterprise

5%	
10%	
3rd 12%	
1st 17%	
1st 17%	
3rd 12%	
2nd 14%	
10%	
4%	

SMB

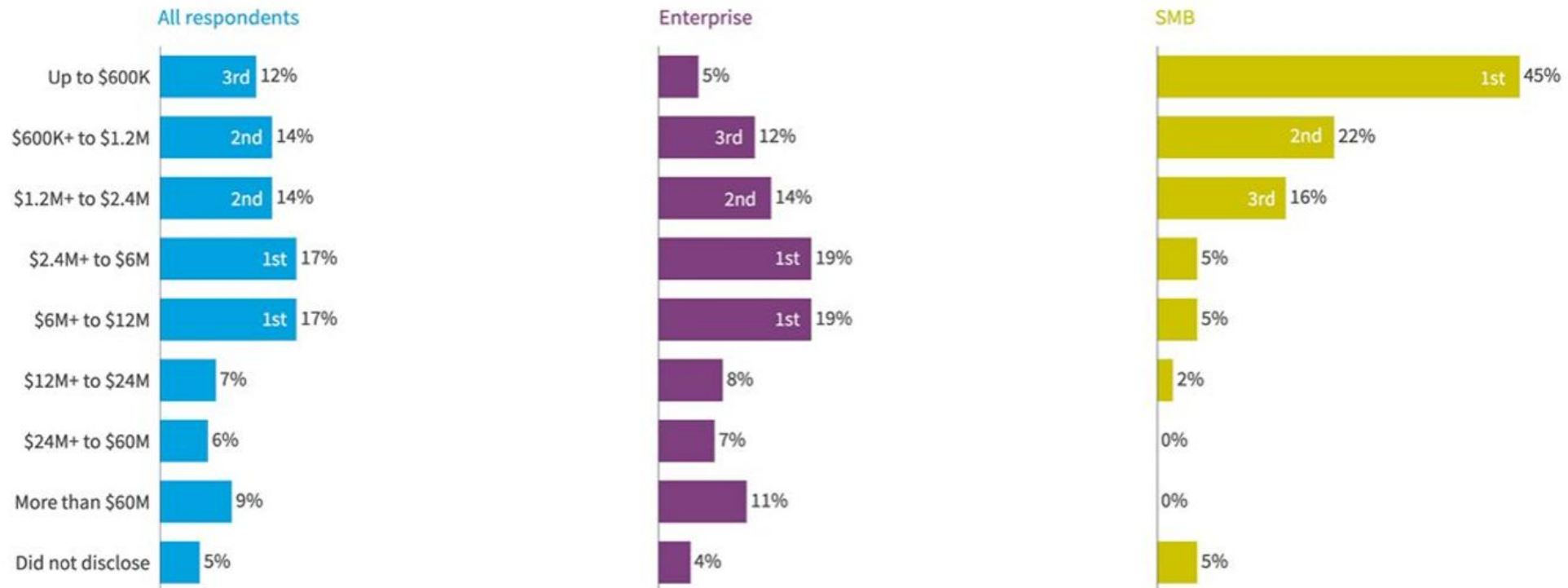|	
1st 36%	
2nd 25%	
12%	
3rd 14%	
5%	
2%	
0%	
1%	
5%	
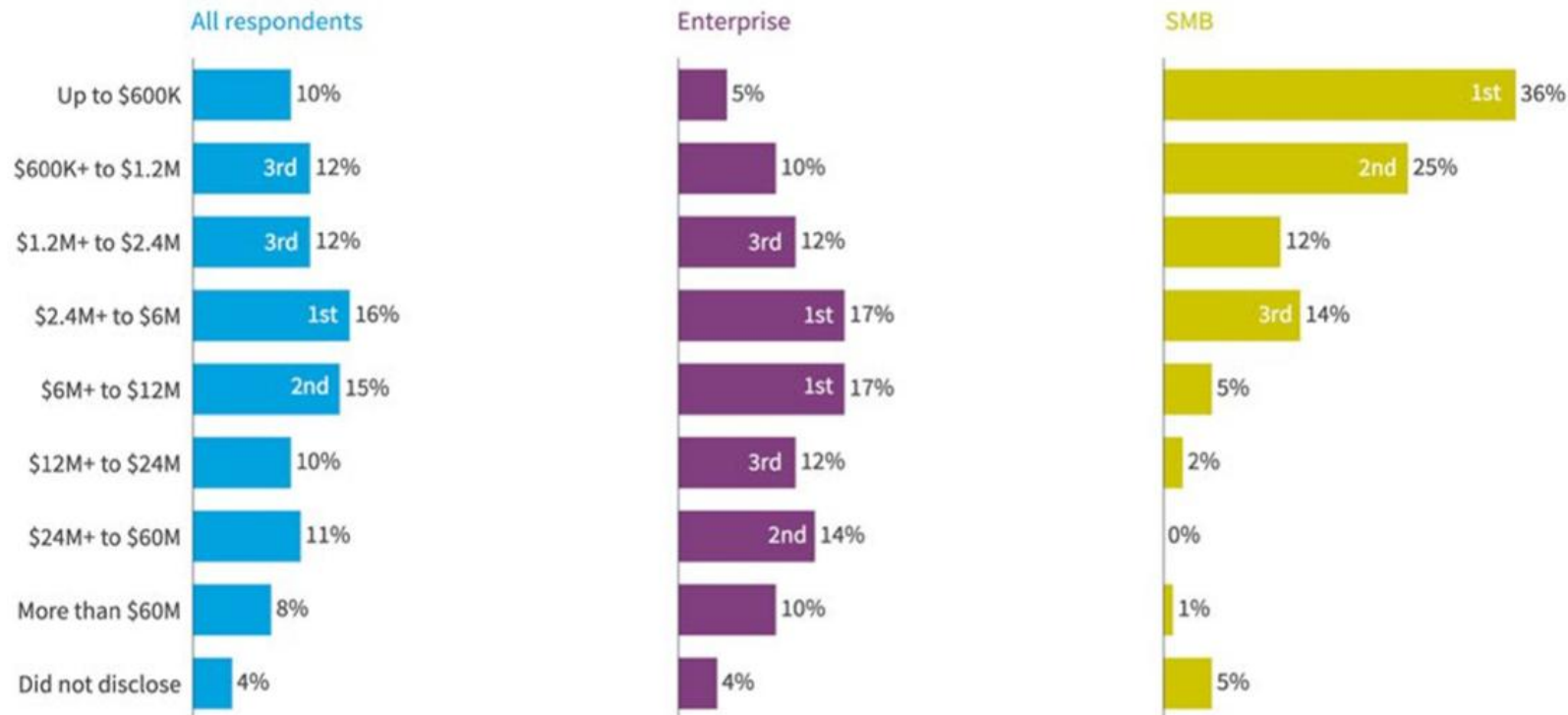
All: N=753, Enterprise: N=621, SMB: N=132
Source: Flexera 2024 State of the Cloud Report (Figure 13)
flexera

Current Status of Cloud Computing
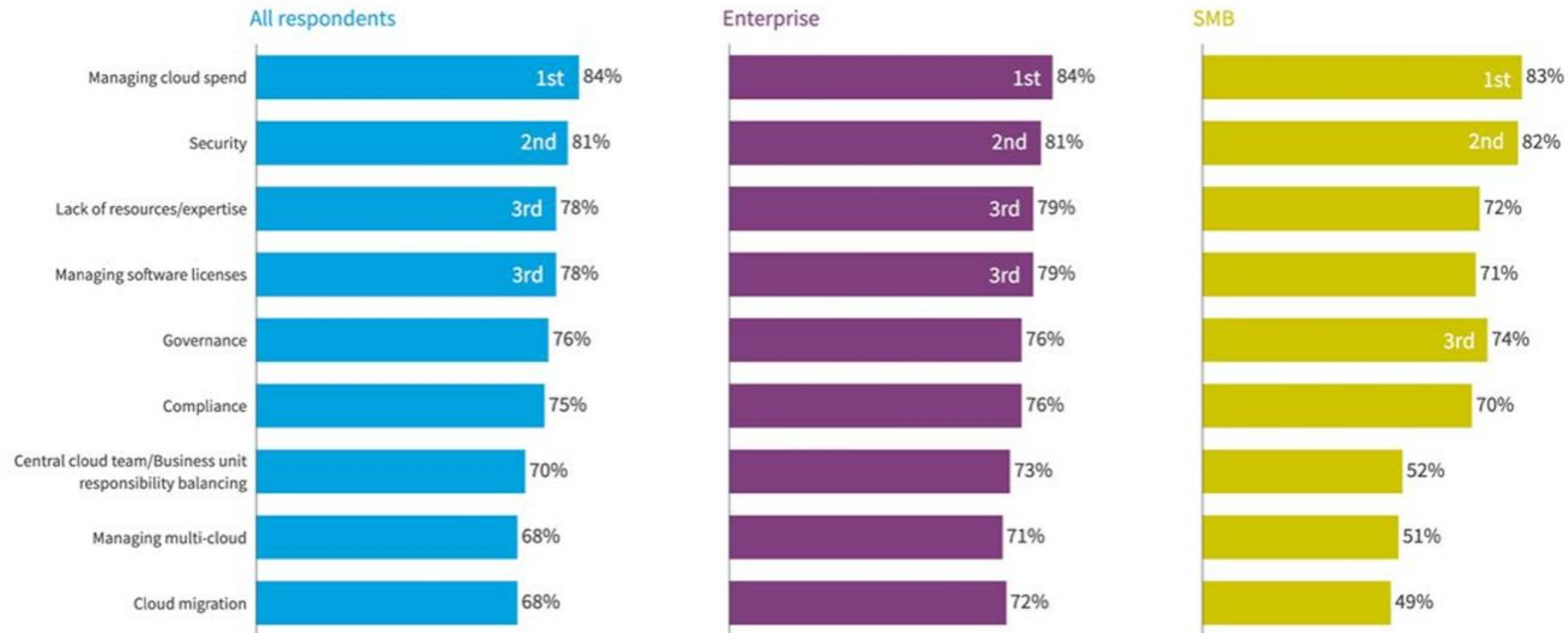

What's your current annual SaaS spend?

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Up to $600K	3rd	12%
$600K+ to $1.2M	2nd	14%
$1.2M+ to $2.4M	2nd	14%
$2.4M+ to $6M	1st	17%
$6M+ to $12M	1st	17%
$12M+ to $24M		7%
$24M+ to $60M		6%
More than $60M		9%
Did not disclose		5%

Enterprise

5%	
3rd	12%
2nd	14%
1st	19%
1st	19%
8%	
7%	
11%	
4%	

SMB

1st	45%
2nd	22%
3rd	16%
5%	
5%	
2%	
0%	
0%	
5%	

All: N=753, Enterprise: N=621, SMB: N=132
Source: Flexera 2024 State of the Cloud Report (Figure 14)

flexera

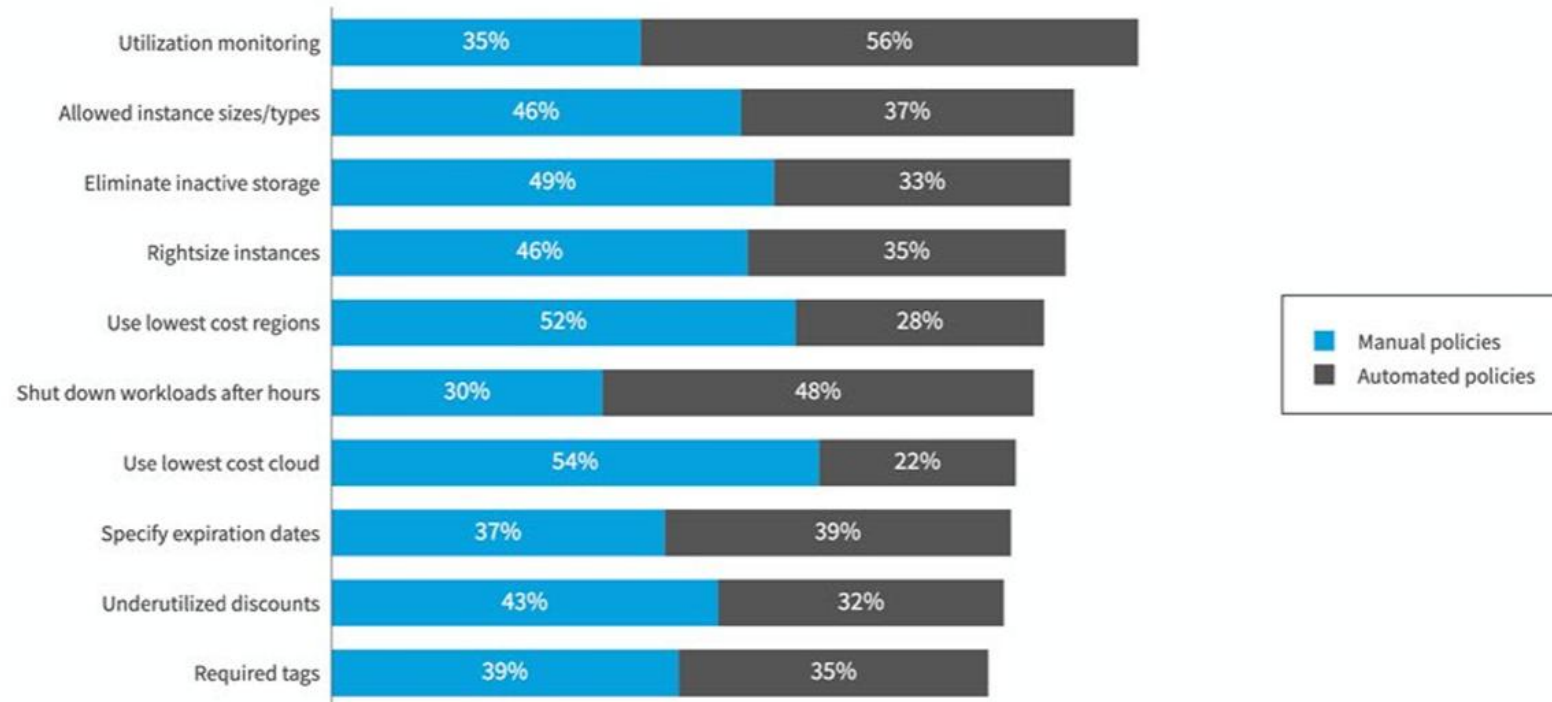# Current Status of Cloud Computing

Top cloud challenges

	All respondents	Enterprise	SMB
Managing cloud spend	1st 84%	1st 84%	1st 83%
Security	2nd 81%	2nd 81%	2nd 82%
Lack of resources/expertise	3rd 78%	3rd 79%	72%
Managing software licenses	3rd 78%	3rd 79%	71%
Governance	76%	76%	3rd 74%
Compliance	75%	76%	70%
Central cloud team/Business unit responsibility balancing	70%	73%	52%
Managing multi-cloud	68%	71%	51%
Cloud migration	68%	72%	49%

All: N=753, Enterprise: N=621, SMB: N=132
Source: Flexera 2024 State of the Cloud Report (Figure 30)

flexera

Current Status of Cloud Computing

What types of policies do you use to optimize cloud costs?

Policy	Manual policies	Automated policies
Utilization monitoring	35%	56%
Allowed instance sizes/types	46%	37%
Eliminate inactive storage	49%	33%
Rightsize instances	46%	35%
Use lowest cost regions	52%	28%
Shut down workloads after hours	30%	48%
Use lowest cost cloud	54%	22%
Specify expiration dates	37%	39%
Underutilized discounts	43%	32%
Required tags	39%	35%

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Source: Flexera 2024 State of the Cloud Report (Figure 35)
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Cloud Service Category- IaaS

<Source : https://www.ibm.com/cloud/learn/iaas-paas-saas>

Storage, Network and Servers for Services

Pay-as-you-go Model

User's Concerns:

What CSP solves:

Cloud Service Category- IaaS

<Source : https://www.ibm.com/cloud/learn/iaas-paas-saas>

Storage, Network and Servers for Services

Pay-as-you-go Model

User's Concerns:
- Cost and complexity for management of infra.
- Too small/too large computing resources

What CSP solves:
- CSP manages the Info. Infra.
- Elasticity based on the payment

Cloud Service Category- PaaS

<Source : https://www.ibm.com/cloud/learn/iaas-paas-saas>

Cloud environment for development of app.

Execution environment and APIs for app.

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Cloud Service Category- PaaS

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User's Concerns:
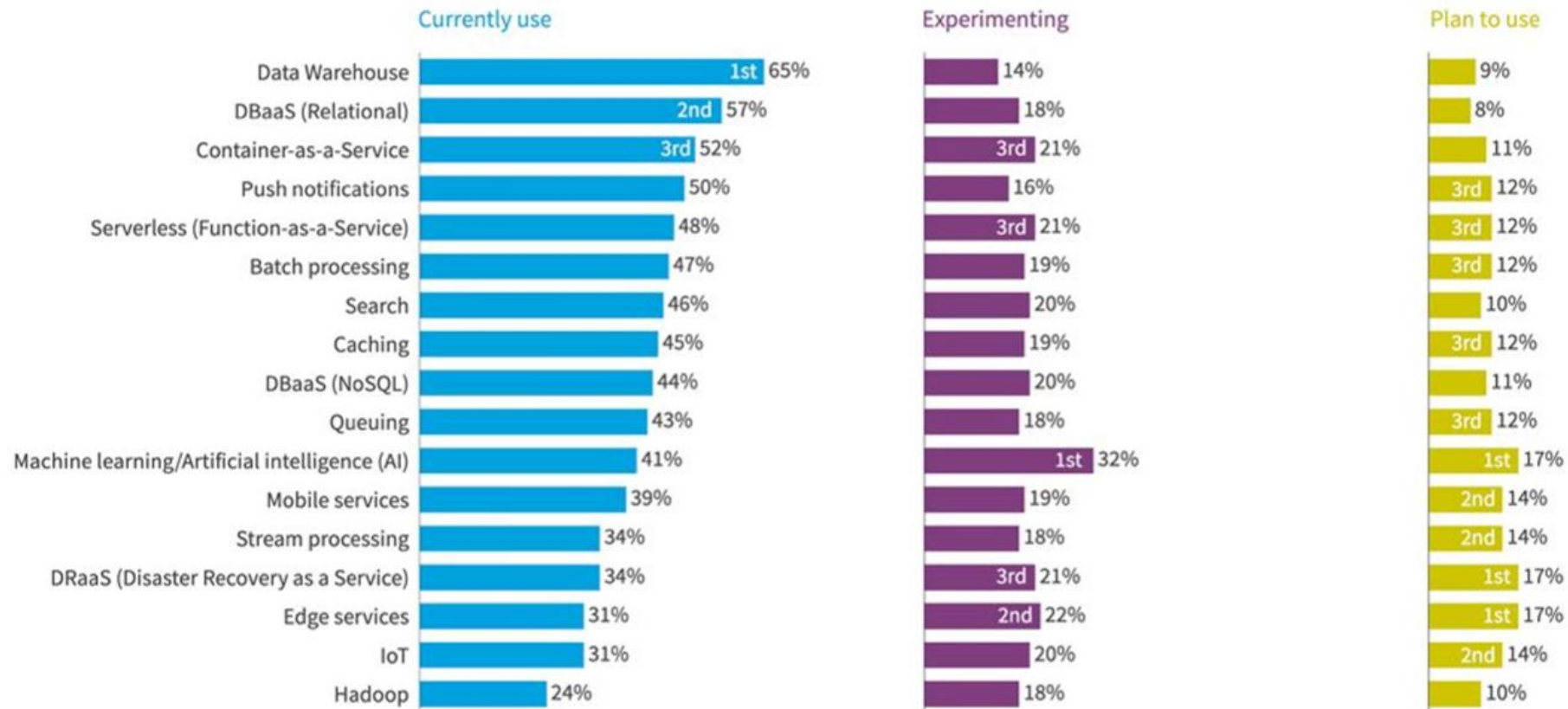- Purchasing resource for execution of App.
- Needs of OS for developed Apps.

What CSP solves:
- Provide various OS as the execution platform
- OS and system software as the platform

Public Cloud, PaaS Usage Statistics


Public cloud services used by all organizations

Service	Currently use	Experimenting	Plan to use
Data Warehouse	1st 65%	14%	9%
DBaaS (Relational)	2nd 57%	18%	8%
Container-as-a-Service	3rd 52%	3rd 21%	11%
Push notifications	50%	16%	3rd 12%
Serverless (Function-as-a-Service)	48%	3rd 21%	3rd 12%
Batch processing	47%	19%	3rd 12%
Search	46%	20%	10%
Caching	45%	19%	3rd 12%
DBaaS (NoSQL)	44%	20%	11%
Queuing	43%	18%	3rd 12%
Machine learning/Artificial intelligence (AI)	41%	1st 32%	1st 17%
Mobile services	39%	19%	2nd 14%
Stream processing	34%	18%	2nd 14%
DRaaS (Disaster Recovery as a Service)	34%	3rd 21%	1st 17%
Edge services	31%	2nd 22%	1st 17%
IoT	31%	20%	2nd 14%
Hadoop	24%	18%	10%

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Source: Flexera 2024 State of the Cloud Report (Figure 48)

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Cloud Service Category - SaaS
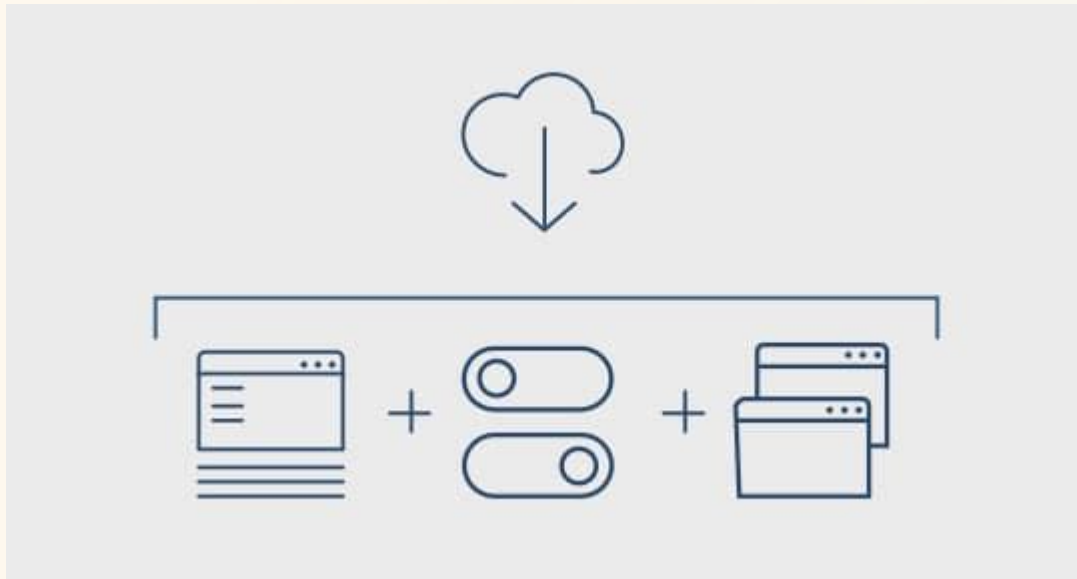
<Source : https://www.ibm.com/cloud/learn/iaas-paas-saas>
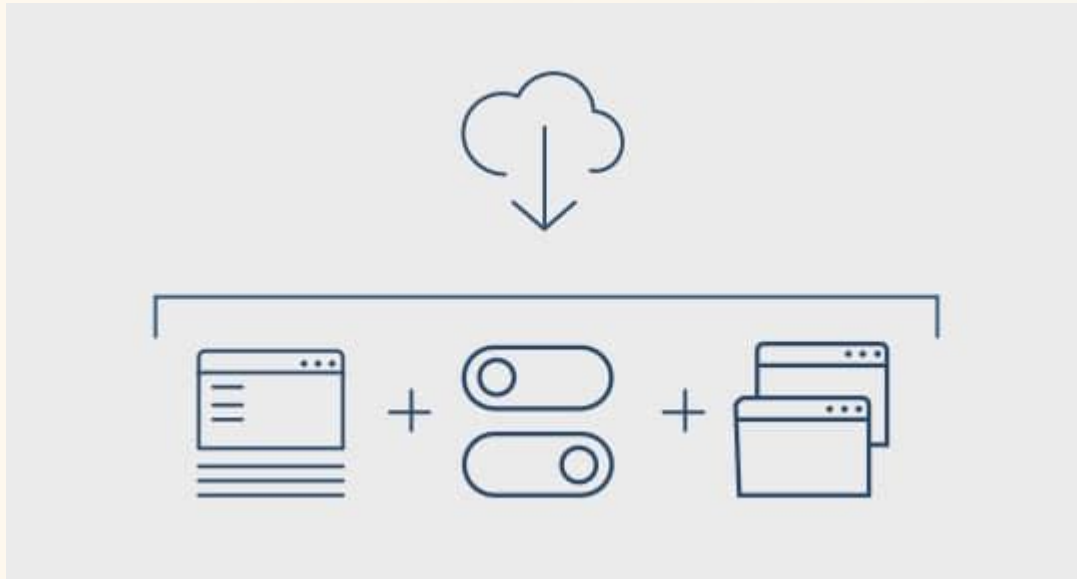
Software and Apps are provided as Services

Web interfaces are used for the services

User's Concerns:

What CSP solves:

Cloud Service Category - SaaS

<Source : https://www.ibm.com/cloud/learn/iaas-paas-saas>

Software and apps are provided as Services

Web interfaces are used for the services

User's Concerns:

- Managing Apps is not easy (update/fix)
- Execution environment mismatch
- Reliable data management

What CSP solves:

- CSP update and fix the apps
- CSP deals with the execution environment (SLA)
- Managing data with redundant storage

Public Cloud Adoption

What public cloud providers does your organization use?

Provider	Running significant workloads	Running some workloads	Experimenting	Plan to use
AWS	49%	29%	8%	4%
Azure	45%	35%	9%	3%
Google Cloud Platform	21%	29%	17%	6%
IBM Cloud	7%	14%	13%	7%
Oracle Cloud Infrastructure	8%	17%	14%	9%
Alibaba Cloud		8%	8%	5% / 2%
Other	4%	7%	4%	2%
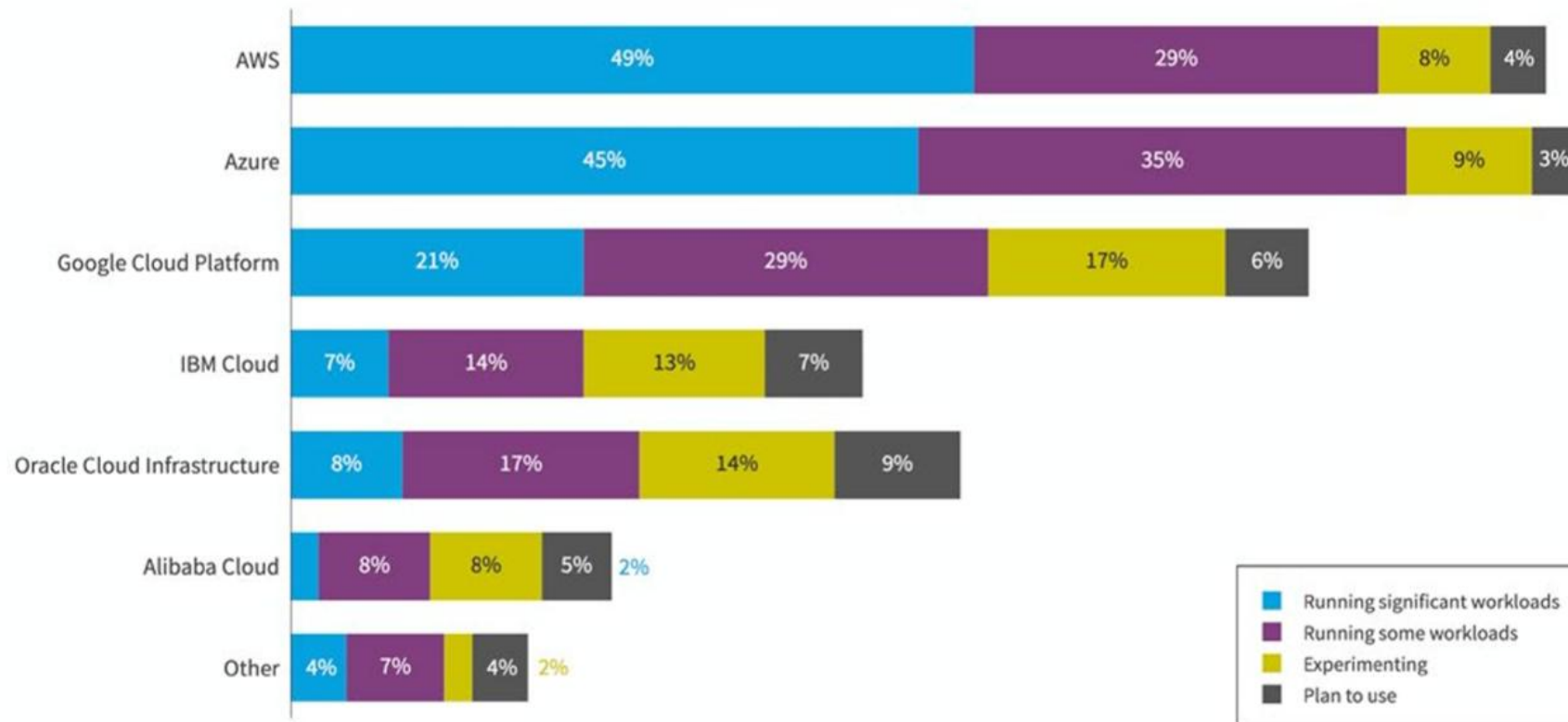
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Source: Flexera 2024 State of the Cloud Report (Figure 38)

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Cloud Deployment Model

- Public Cloud
- Private Cloud
- Hybrid Cloud
- Multi-Cloud

Public Cloud

- Subscribing public cloud services
  - AWS, AZURE, Google, Naver Cloud and so on.
- Users only have the terminals for accessing cloud service provider
  - Ideally, only keyboard, monitor and low spec. computing machine
  - In real situation, users are accessing cloud using high performance computers
- Ownership of the data issues
  - Even essential and critical data/information are located in cloud(remote place) inevitably
  - When leakage of essential data occur, handling the incident would be tricky

Private Cloud

- Installing cloud computing infrastructure locally(on-premise)
  - Computing resources, storages, hypervisors, VMM and so on.
- Users access the cloud computing env. Located in on-premise
  - Do not have to worry about broadband Internet connection to outside of the company
  - Critical and essential information is located on-premise
- Cloud computing environment management issues
  - Should consider the cost for installation the cloud computing infra.
  - Need to hire experts of cloud computing env. especially virtualization infra. Experts

Hybrid Cloud

- Making use of both public and hybrid cloud
  - Locating critical and essential info. and data in private cloud
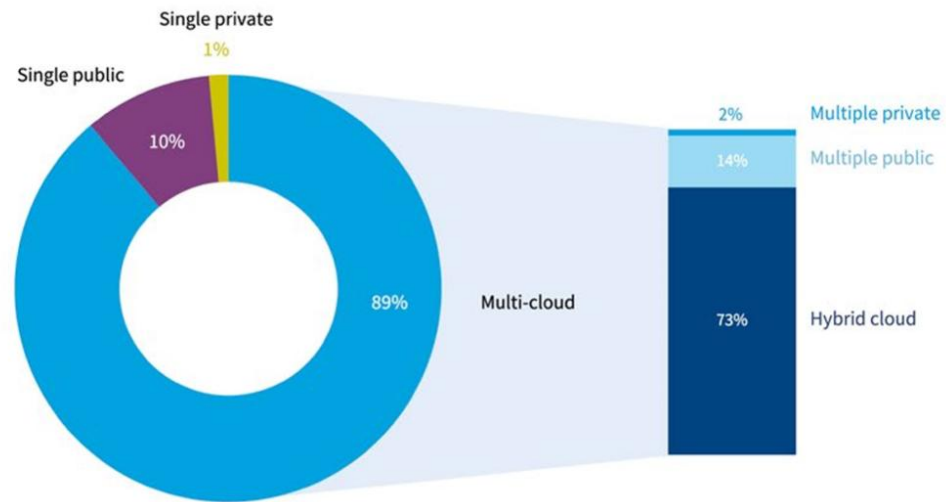 - The others can be lifted and move to the public cloud
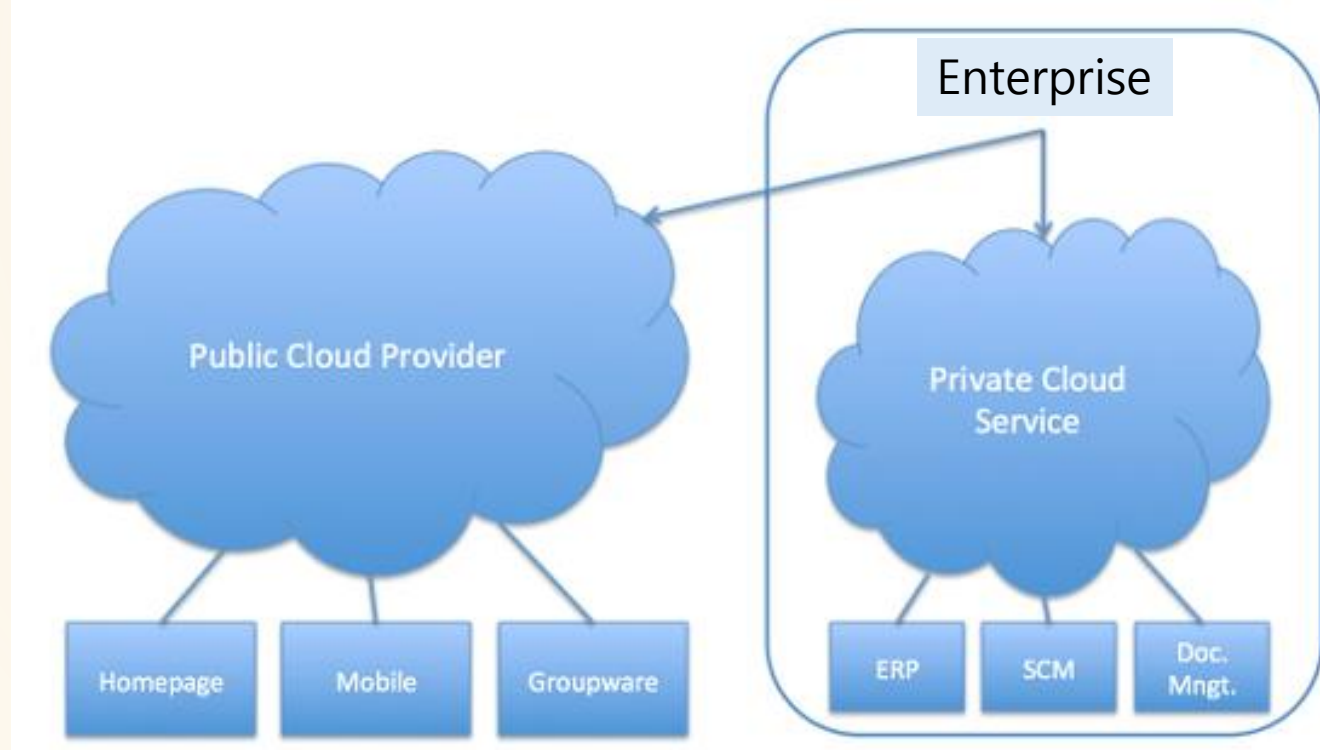
Multi-Cloud

- Subscribing multiple public cloud services
  - Private cloud can be a part of multi-cloud
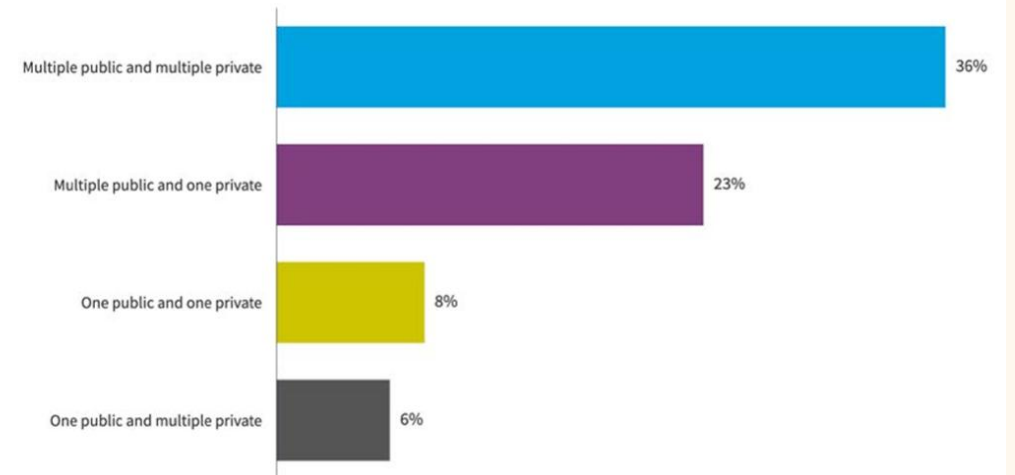 - Needs of deploying management tools for multi-cloud
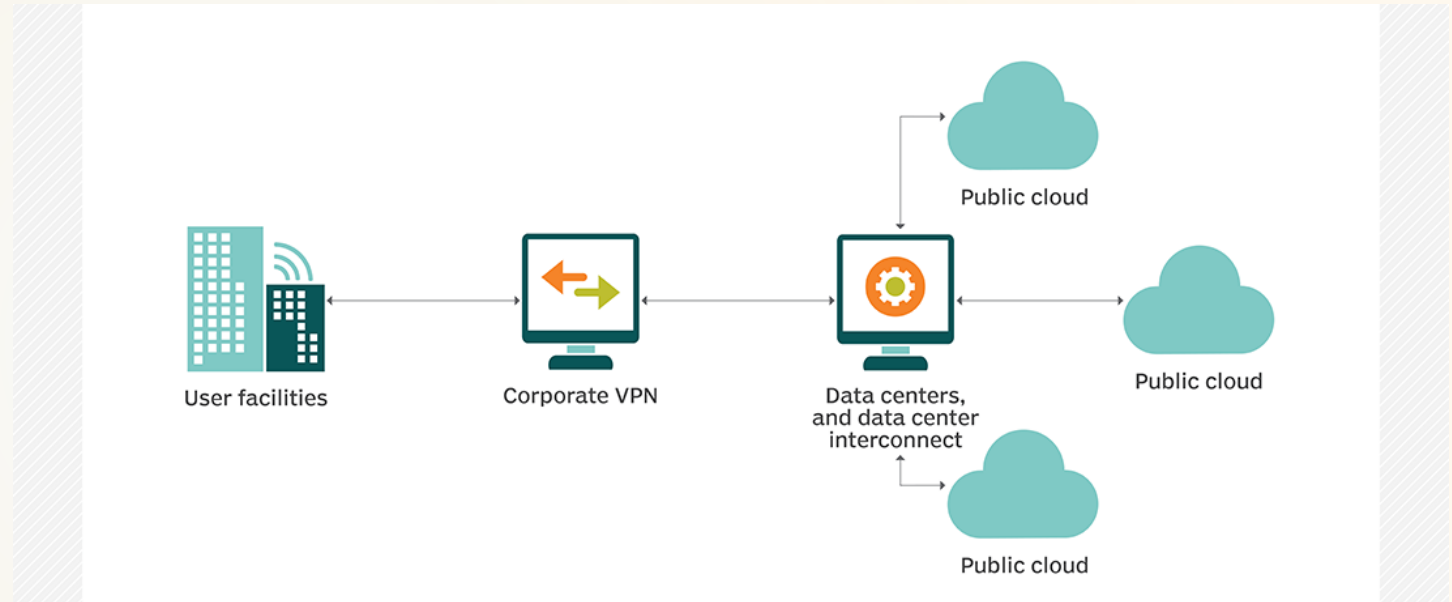
Cloud Strategy
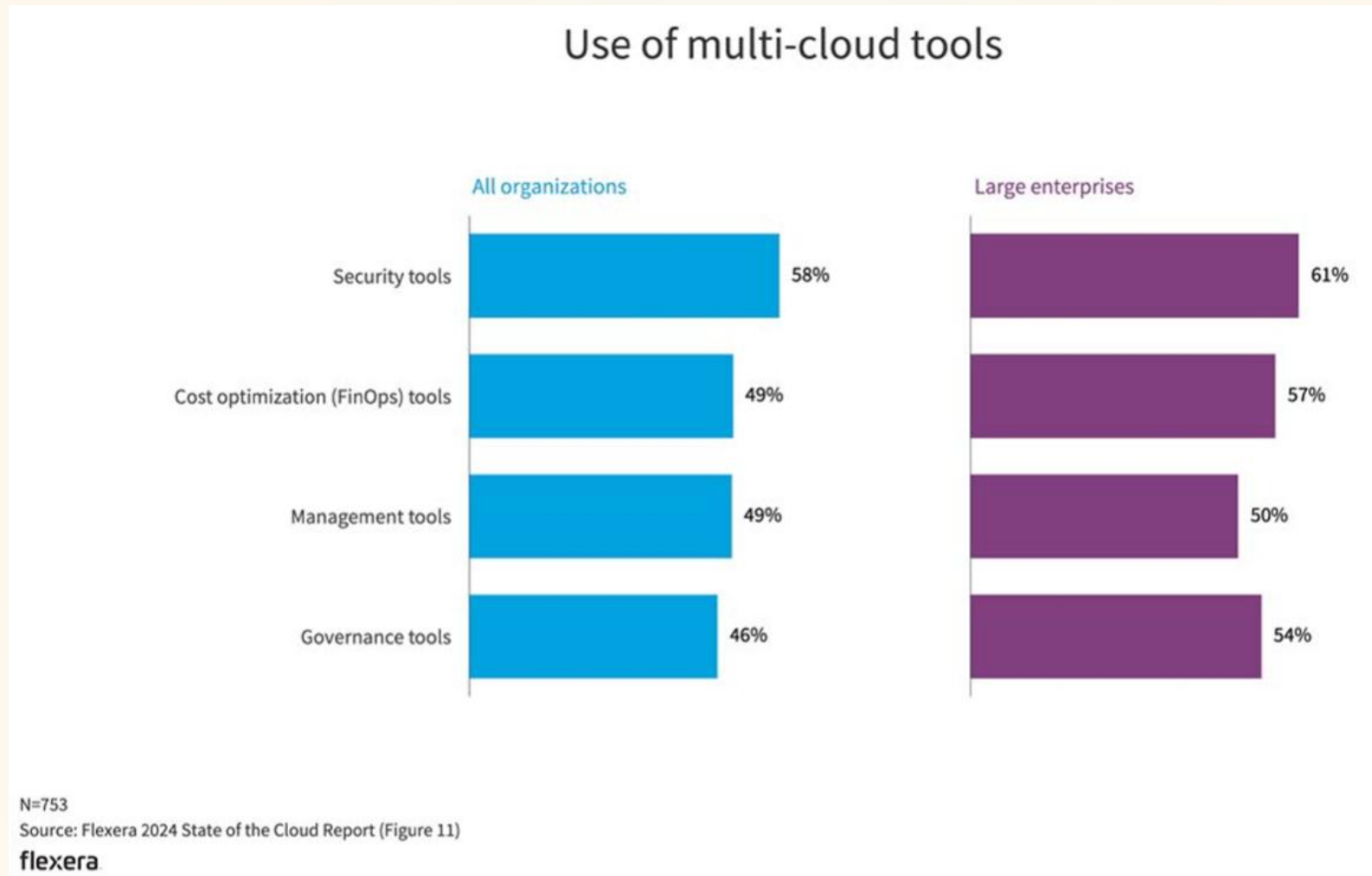
Cloud Strategy

Use of multi-cloud tools

All organizations | Large enterprises
Security tools — 58% | 61%
Cost optimization (FinOps) tools — 49% | 57%
Management tools — 49% | 50%
Governance tools — 46% | 54%

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Source: Flexera 2024 State of the Cloud Report (Figure 11)
flexera

Pros and Cons

- Public Cloud vs Private Cloud

	Public Cloud	Private Cloud
CAPEX		
Business Size		
Vendor lock-in		
Maintenance/ Resource Management		

Pros and Cons

- Public Cloud vs Private Cloud

	Public Cloud	Private Cloud
CAPEX	Low	High
Business Size	Proper to SMB	Proper to Enterprises
Vendor lock-in	Low	High
Maintenance/ Resource Management	Relatively Easy	Difficult

Statistics of Cloud Usages

Public vs. private cloud usage

24% Public cloud only

73% Hybrid

3% Private cloud only

97% Public

76% Private

N=753
Source: Flexera 2024 State of the Cloud Report (Figure 12)
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