

A high-angle, blurred photograph of a crowd of people walking on a light-colored pavement, creating a sense of motion and a busy environment.

# Performance Evaluation of SaaS Services on the Cloud

*Yearly Team Meeting 2018*

***Abdallah Ali Z.A. IBRAHIM***

Nov 30, 2018

# Hello !

- I am Abdallah Ali
- Born in Suez, Egypt
- BSc. Computer Sciences (2010)
- Master 1, Computer Sciences (2012)
- Master 2, Computer Sciences (2015)
- Currently a PhD Student (3<sup>rd</sup> year)
- Interests:
  - Cloud Computing, Datacenters, SLAs, QoS, QoE and Communication Networks

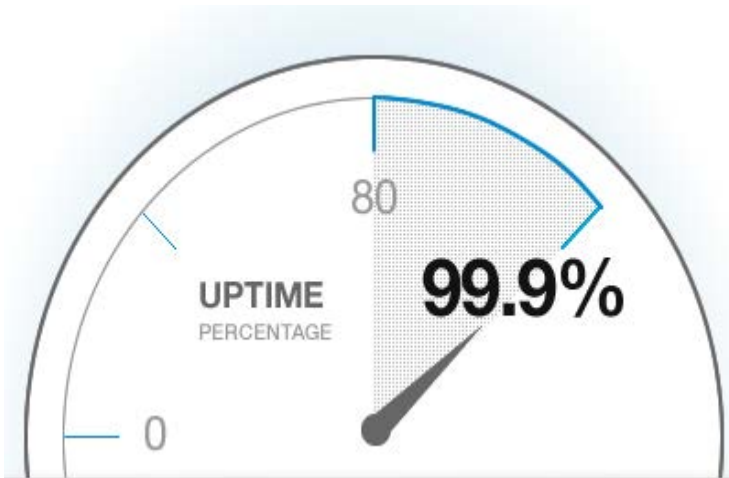


# Agenda

- Problem & Motivation
- Objective
- PRESEnCE Framework
- Further Directions & Future
- Other Activities

# Problem & Motivation

Up Time



Response Time



SaaS Services  
Performance QoS

Services Availability

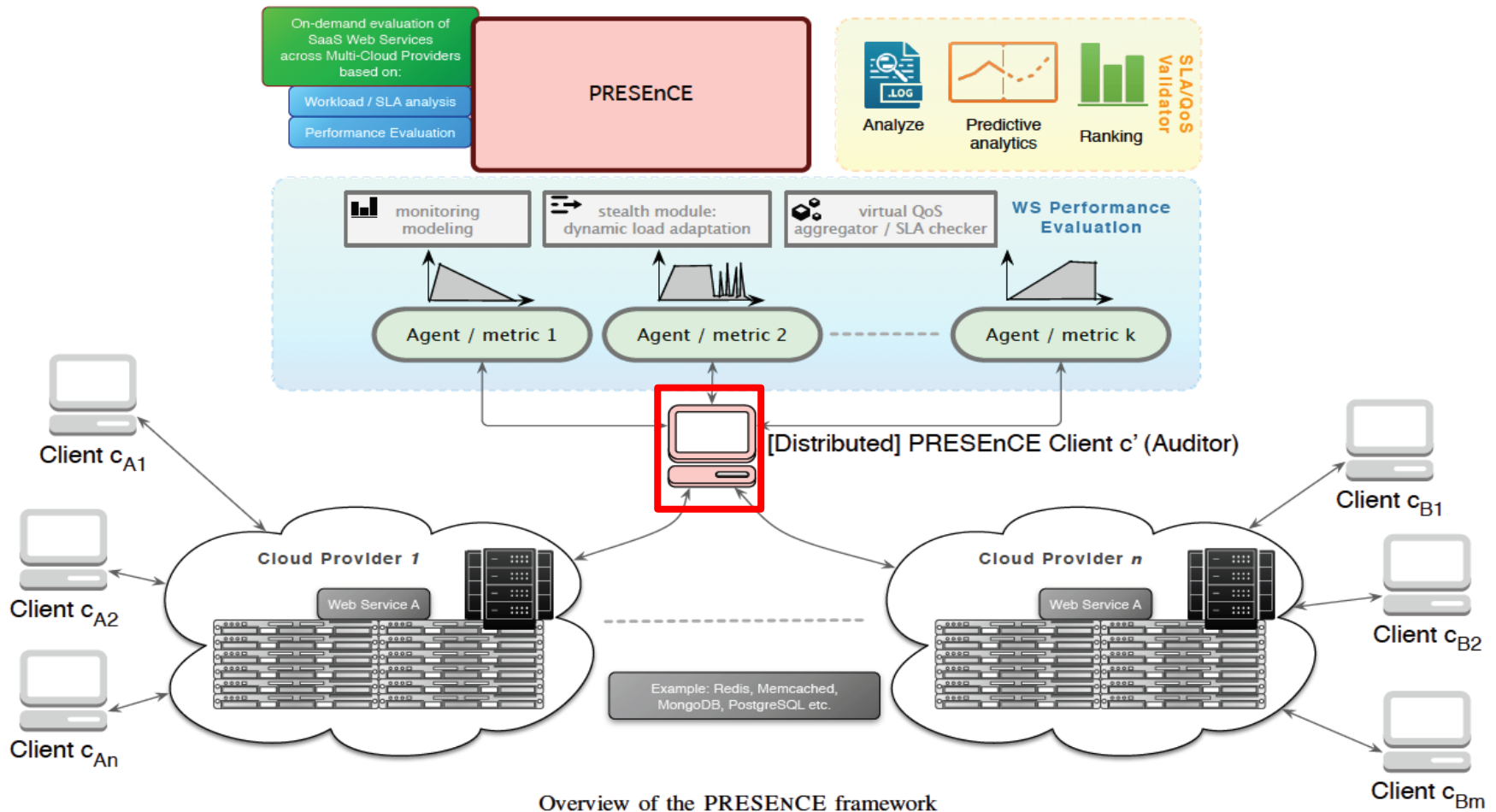
# Objective

- Propose a framework for evaluating
  - QoS and SLA compliance
  - For cloud SaaS services offered
    - Across several CSPs
- The framework should test SaaS services:
  - Real testing (benchmarking or monitoring)
  - Automatic way
  - Stealthy way, [why ?]

# PRESEnCE Framework

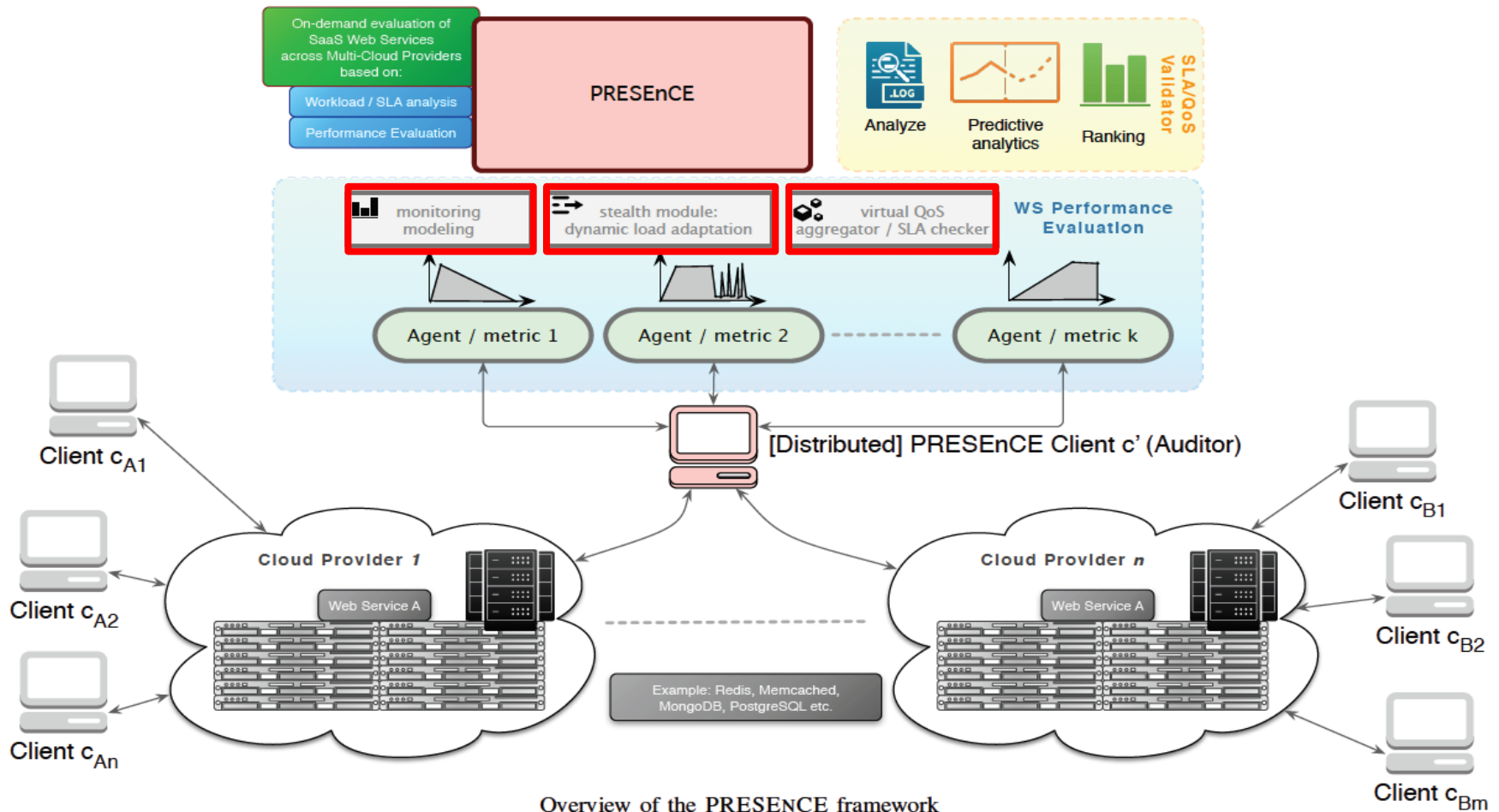
- **PRESEnCE:** Peformance Evaluation of SaaS Web Services across Multi-Cloud Providers
- Framework objective:
  - Evaluate the QoS and SLA compliance of Web Services offered
    - And across several Cloud providers.
- **How? By:**
  - Quantify in a fair and by stealth way the performance and scalability of the delivered Web Services.
  - Assess the claimed SLA and the corresponding QoS from a set of relevant performance metrics (response time).
  - Provide a multi-objective analysis of the gathered performance metrics to be able to classify cloud brokers

# PRESEnCE: Methodology



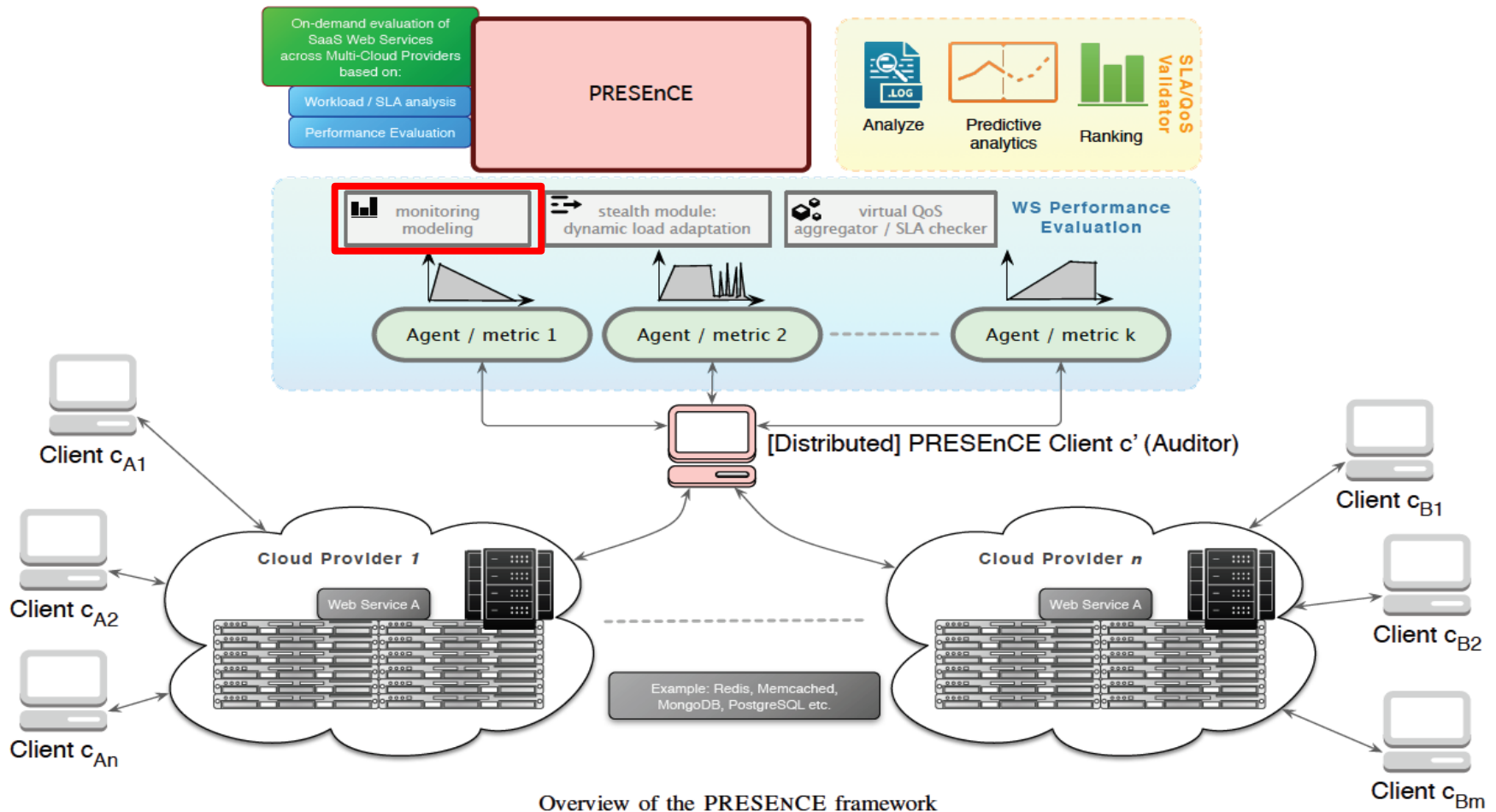
[A1] **A. Ibrahim**, S. Varrette and P. Bouvry "PRESENCE: Toward a Novel Approach for Performance Evaluation of Mobile Cloud SaaS Web Services," **32<sup>nd</sup> International Conference on Information Networking (ICOIN)- 2018**

# PRESEnCE: Methodology[cont.]



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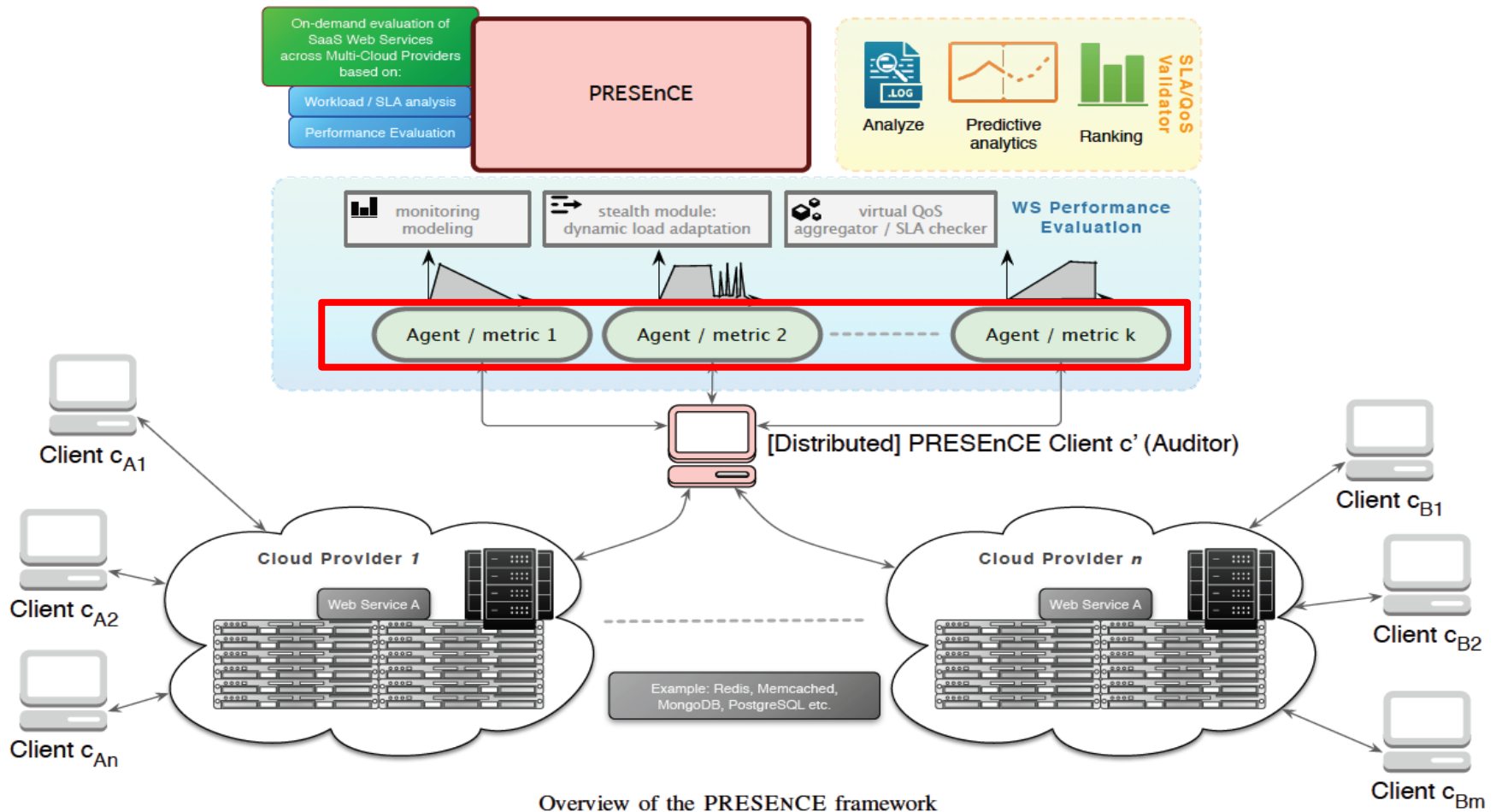
# PRESEnCE: Methodology[cont.]



Overview of the PRESEnCE framework

[A1] **A. Ibrahim**, S. Varrette and P. Bouvry "PRESEnCE: Toward a Novel Approach for Performance Evaluation of Mobile Cloud SaaS Web Services," **32<sup>nd</sup> International Conference on Information Networking (ICOIN)- 2018**

# PRESEnCE: Methodology



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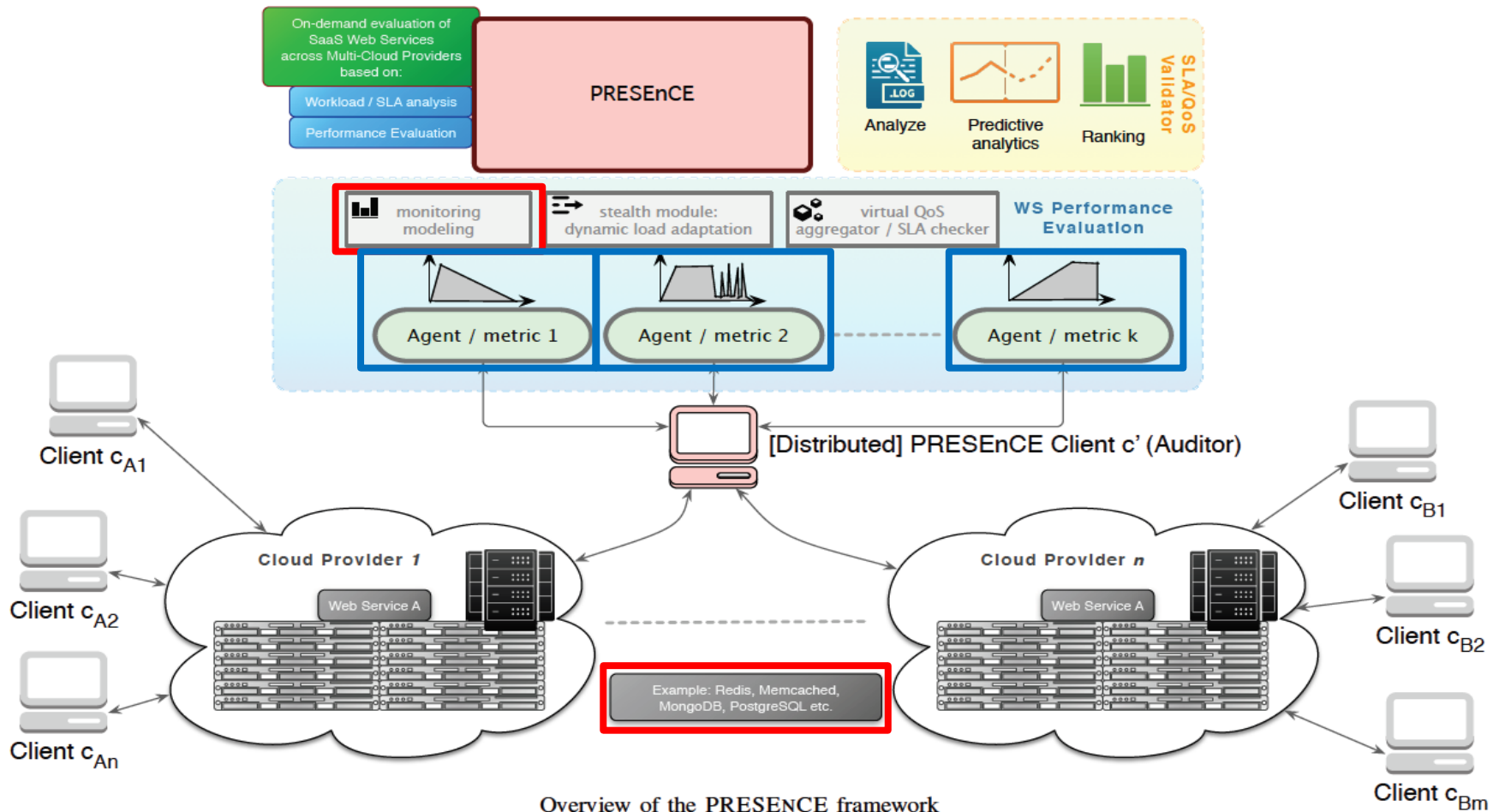
# PRESEnCE: Metrics

## CLOUD SERVICES PERFORMANCE METRICS IN PRESENCE.

Domain	Metric / Implementation Status	Metric Type
<i>Scalability</i>	Number of Transactions	✓
	Number of Requests	✓
	Number of Operations	✓
	Number of Records	✓
	Number of Fetches	✓
<i>Reliability</i>	Parallel connections (Clients)	✓
	Number of Pipes	✓
	Number of Threads	✓
	Work Load Size	✓
<i>Availability</i>	Response Time	×
	Up Time	×
	Down Time	×
	Load Balancing	×
<i>Performance</i>	Latency	✓
	Throughput	✓
	Transfer Rate	✓
	Miss/Hit rate	✓
<i>Costs</i>	Installing Costs	×
	Running Costs	×
<i>Security</i>	Authentication	✓
	Encryption	✓
	Auditability	✓

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# Proposed Evaluation Setup



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# Benchmarking tools

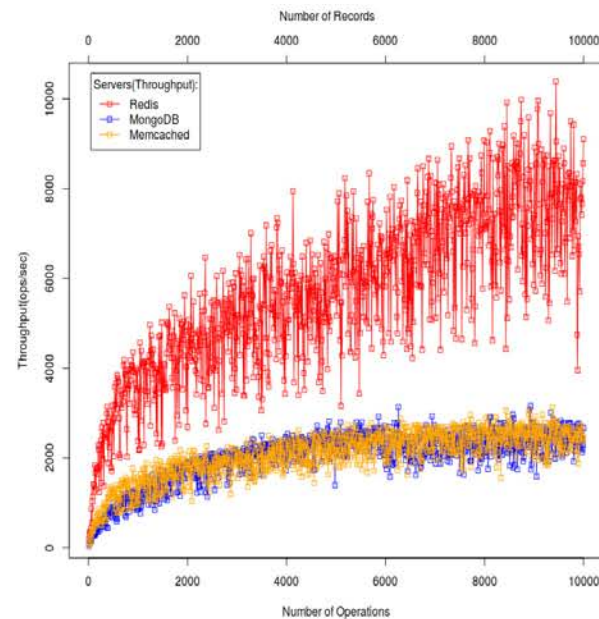
## BENCHMARKING TOOLS USED BY PRESENCE AGENTS.

Benchmark Tool	Version	Targeted WS
<i>YCSB</i>	0.12.0	Redis, MongoDB, Memcached, DynamoDB, ..etc
<i>Memtire-Bench</i>	1.2.8	Redis, Memcached
<i>Redis-Bench</i>	2.4.2	Redis
Twitter RPC-Perf	2.0.3-pre	Redis, Memcached, Apache
PgBench	9.4.12	Postgresql
Apache AB	2.3	Apache
HTTP Load	1	Apache
Iperf	v1, v3	Iperf Server

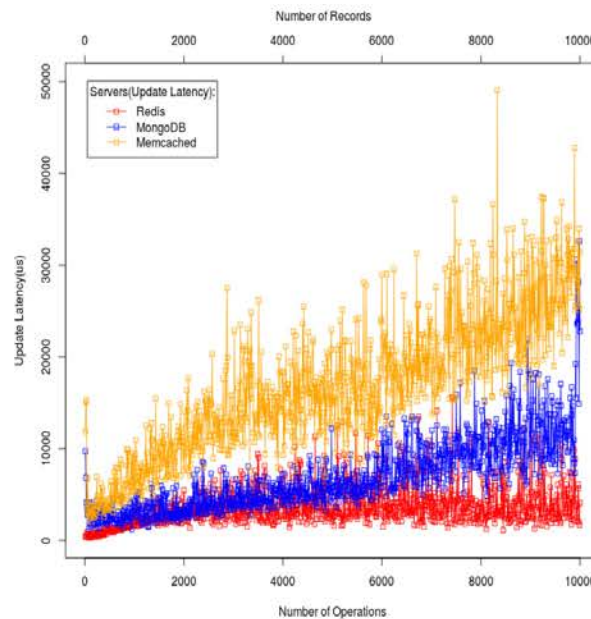
## INPUT/OUTPUT METRICS FOR EACH PRESENCE AGENT

PRESENCE Agent	INPUT Parameters									OUTPUT Parameters								
	#Transactions	#Requests	#Operations	#Records	#Fetches	#Parallel Clients	#Pipes	#Threads	Workload Size	Throughput	Latency	Read Latency	Update Latency	Cleanup Latency	Transfer Rate	Response Time	Miss	Hits
<i>YCSB</i>			✓	✓				✓	✓	✓		✓	✓	✓			✓	✓
<i>Memtire-Bench</i>		✓				✓		✓	✓	✓	✓				✓		✓	✓
<i>Redis-Bench</i>		✓				✓	✓		✓	✓								
<i>Twitter RPC-Perf</i>		✓							✓	✓	✓						✓	✓
<i>PgBench</i>	✓					✓		✓		✓	✓							
<i>Apache AB</i>		✓				✓				✓					✓			
<i>HTTP Load</i>					✓	✓				✓	✓				✓			
<i>Iperf</i>								✓							✓			

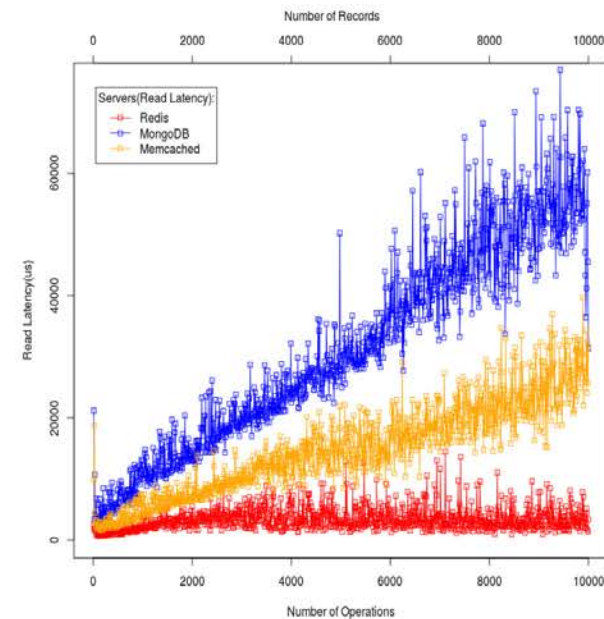
# PRESEnCE's Monitoring & Modeling Performance



(a) Throughput



(b) Update Latency

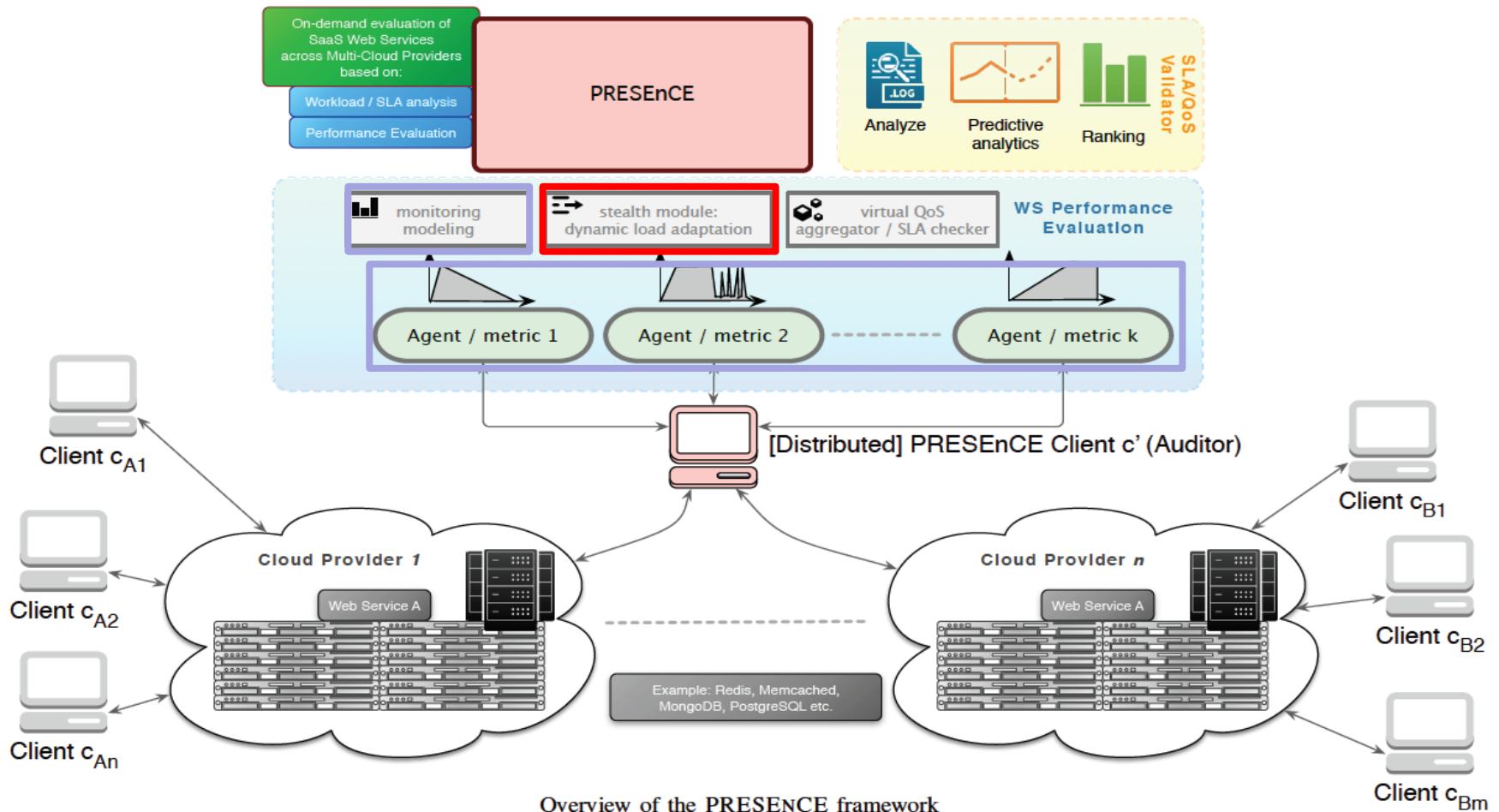


(c) Read Latency

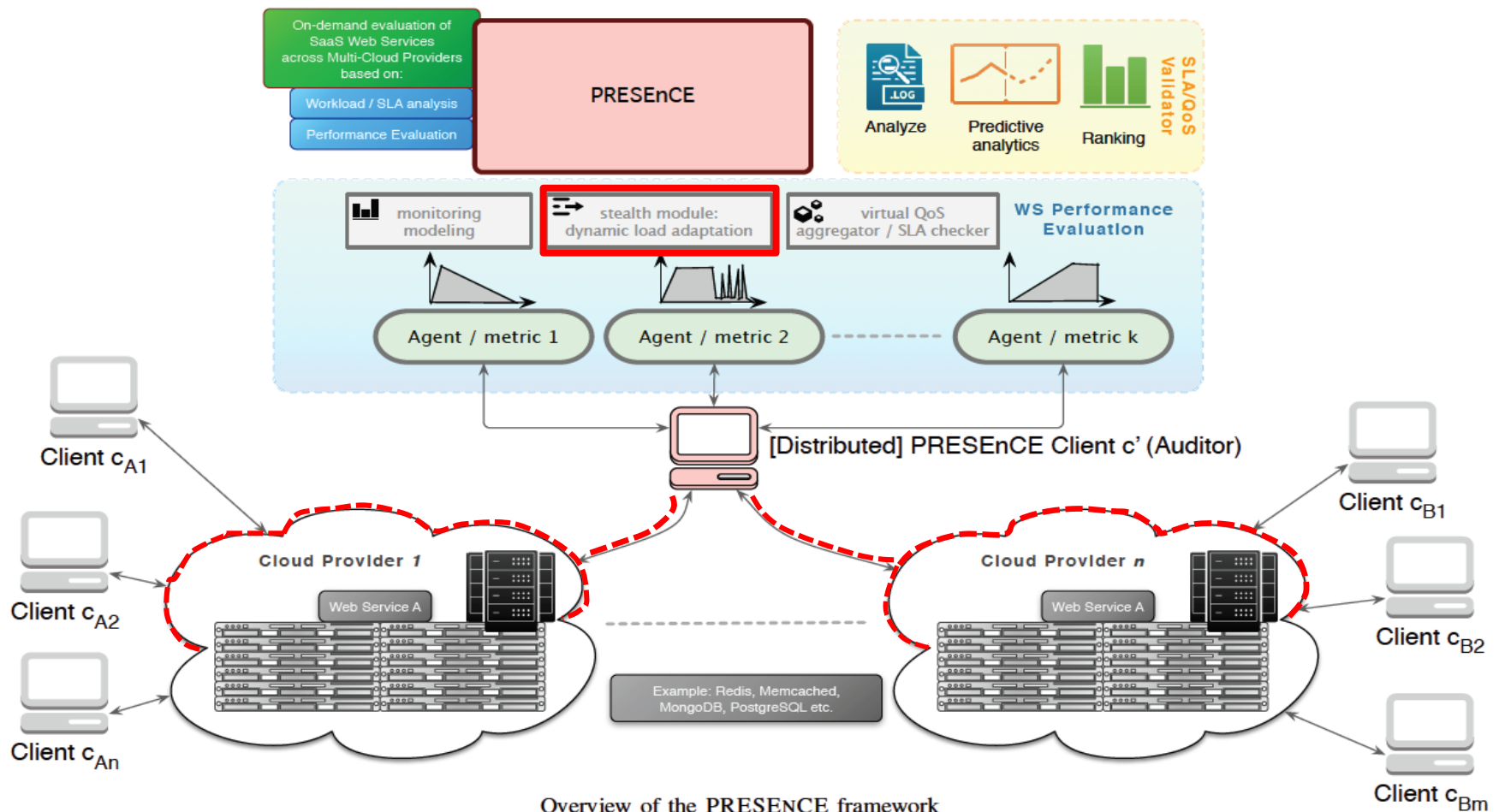
YCSB Agent Evaluation of the NoSQL DB WS

- [A3] U.Wasim, **A. Ibrahim**, P. Bouvry and T. Limba "Law as a Service (LaaS): Enabling Legal Protection over a Blockchain Network," **14th International Conference on Smart Cities: Improving Quality of Life using ICT & IoT (HONET-ICT 17)- 2017**
- [A2] U.Wasim, **A. Ibrahim**, P. Bouvry and T. Limba "Self-Regulated Multi-criteria Decision Analysis: An Autonomous Brokerage-Based Approach for Service Provider Ranking in the Cloud," **9th IEEE International Conference on Cloud Computing Technology and Science (CloudCom)- 2017**
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# PRESEnCE: The Stealth Module



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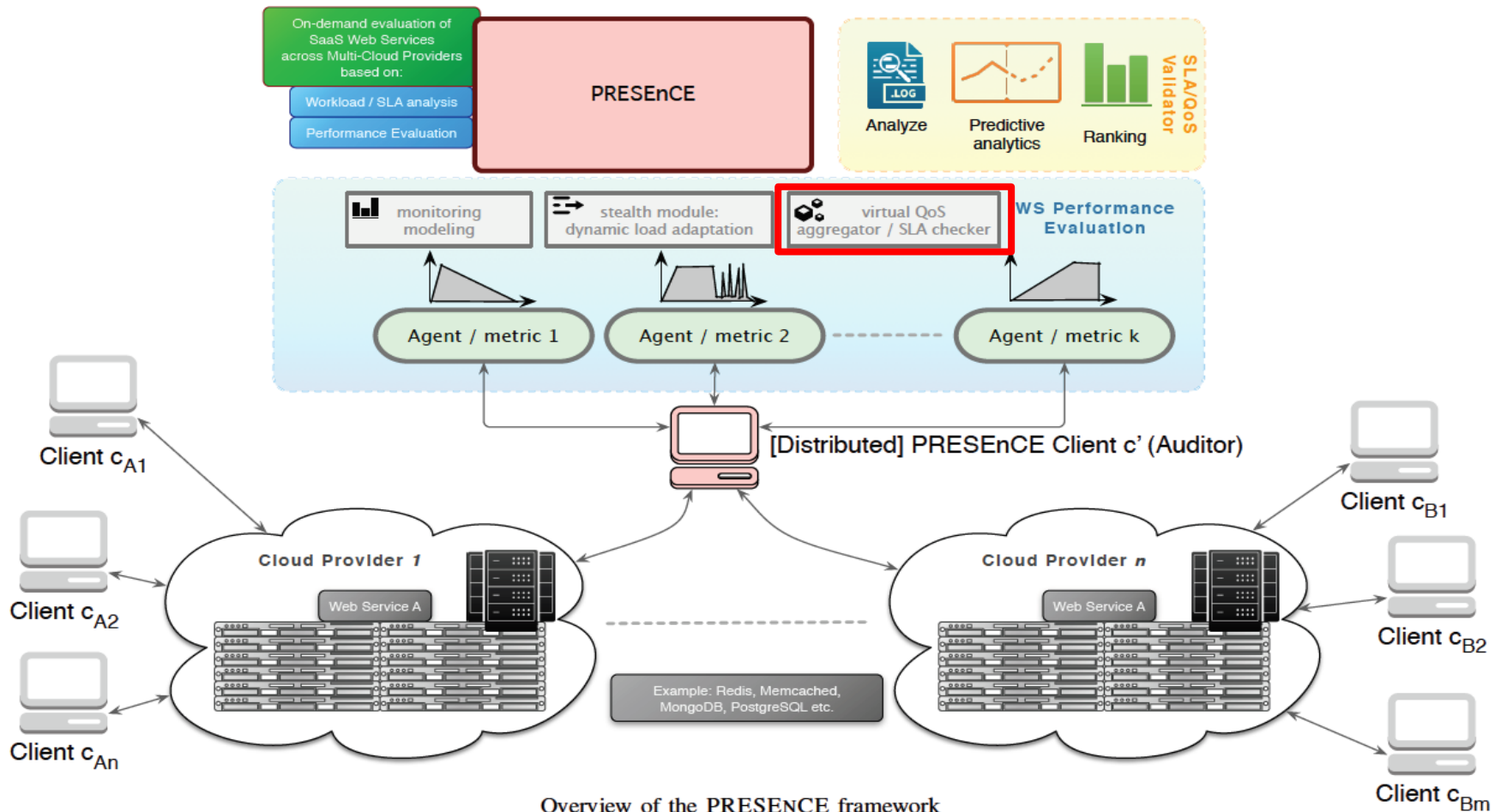
# PRESEnCE: The Stealth Module

- Prototype
  - Detector “Oracle”
    - Probability Model “Analytical way”
    - Gaussian Process “Machine learning”
  - Obfuscate on the detector
    - Find the combination of parameters values “workload”

INPUT/OUTPUT METRICS FOR EACH PRESENCE AGENT

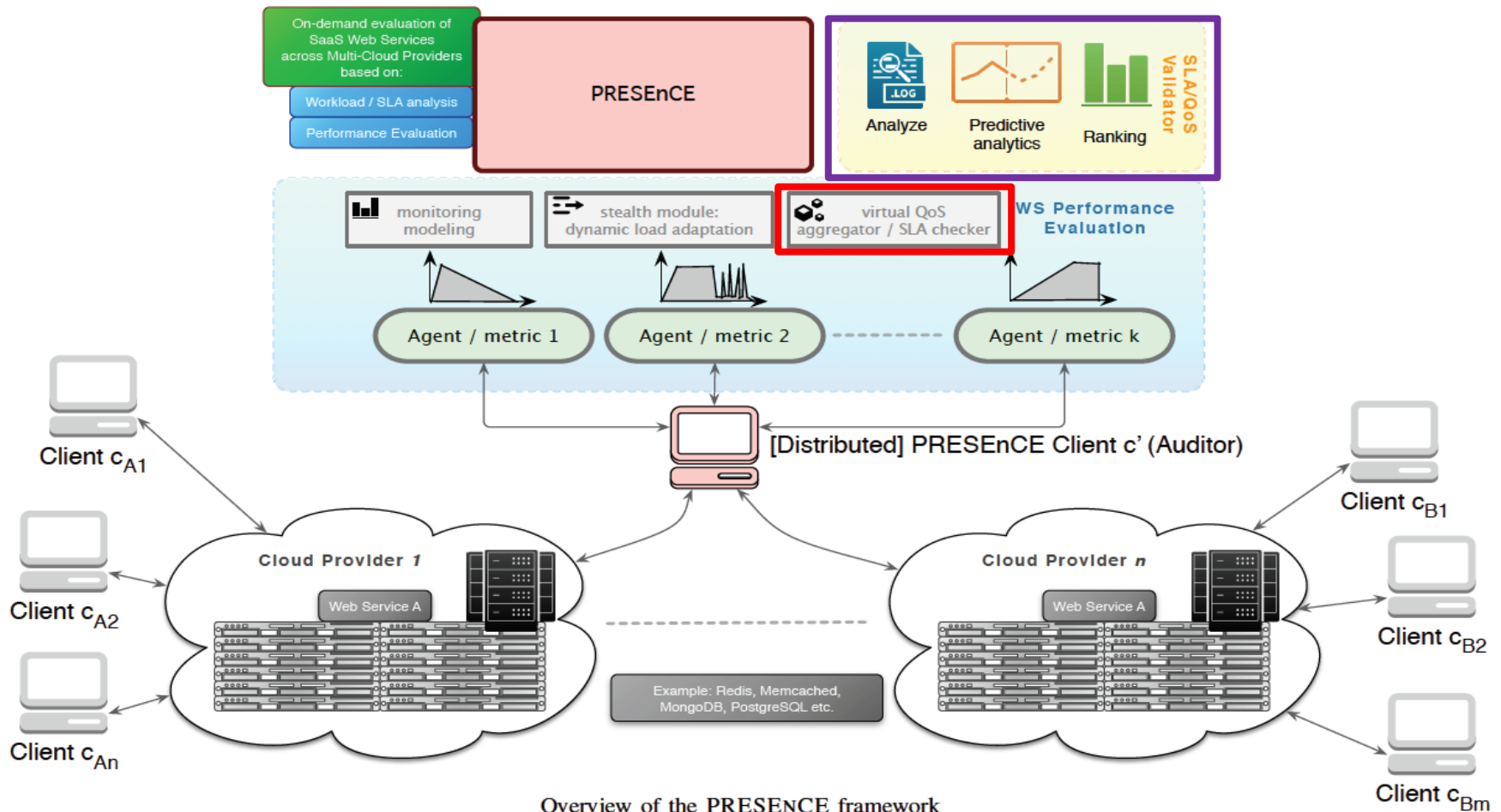
PRESENCE Agent	INPUT Parameters								OUTPUT Parameters									
	#Transactions	#Requests	#Operations	#Records	#Fetches	#Parallel Clients	#Pipes	#Threads	Workload Size	Throughput	Latency	Read Latency	Update Latency	CleanUp Latency	Transfer Rate	Response Time	Miss	Hits
YCSB			✓	✓				✓	✓	✓		✓	✓	✓			✓	✓
Memtire-Bench		✓				✓		✓	✓	✓	✓				✓		✓	✓
Redis-Bench		✓				✓	✓		✓	✓								
Twitter RPC-Perf		✓							✓	✓	✓						✓	✓
PgBench	✓					✓		✓		✓	✓							
Apache AB		✓				✓				✓					✓			
HTTP Load					✓	✓				✓	✓				✓			
Iperf								✓							✓			

# PRESEnCE: SLA Verification



Overview of the PRESENCE framework

# PRESEnCE: SLA Verification



Overview of the PRESENCE framework

# Further Directions & Future

- Further directions for PRESEnCE:
  - Law as a Service (LaaS) [A3]
  - Self-Regulated MCDA for CSP ranking [A2]
    - Evaluate Redis, MongoDB and Memcached by PRESEnCE
- Extend PRESEnCE's experiments:
  - SaaS deployed on {amazon, MS, etc.}

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# Other activities

- Publications
- Teaching
  - Distributed System and Middleware, 5<sup>th</sup> Sem.
- Smart ICT
  - Project: Analysis the path to the Cloud and Cloud-phobia





*Thank you for your attention*