Stanford University

A Study of the Evolution Process of PaaS Ecosystem: Introduction

-Abridged edition-

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Academic Research

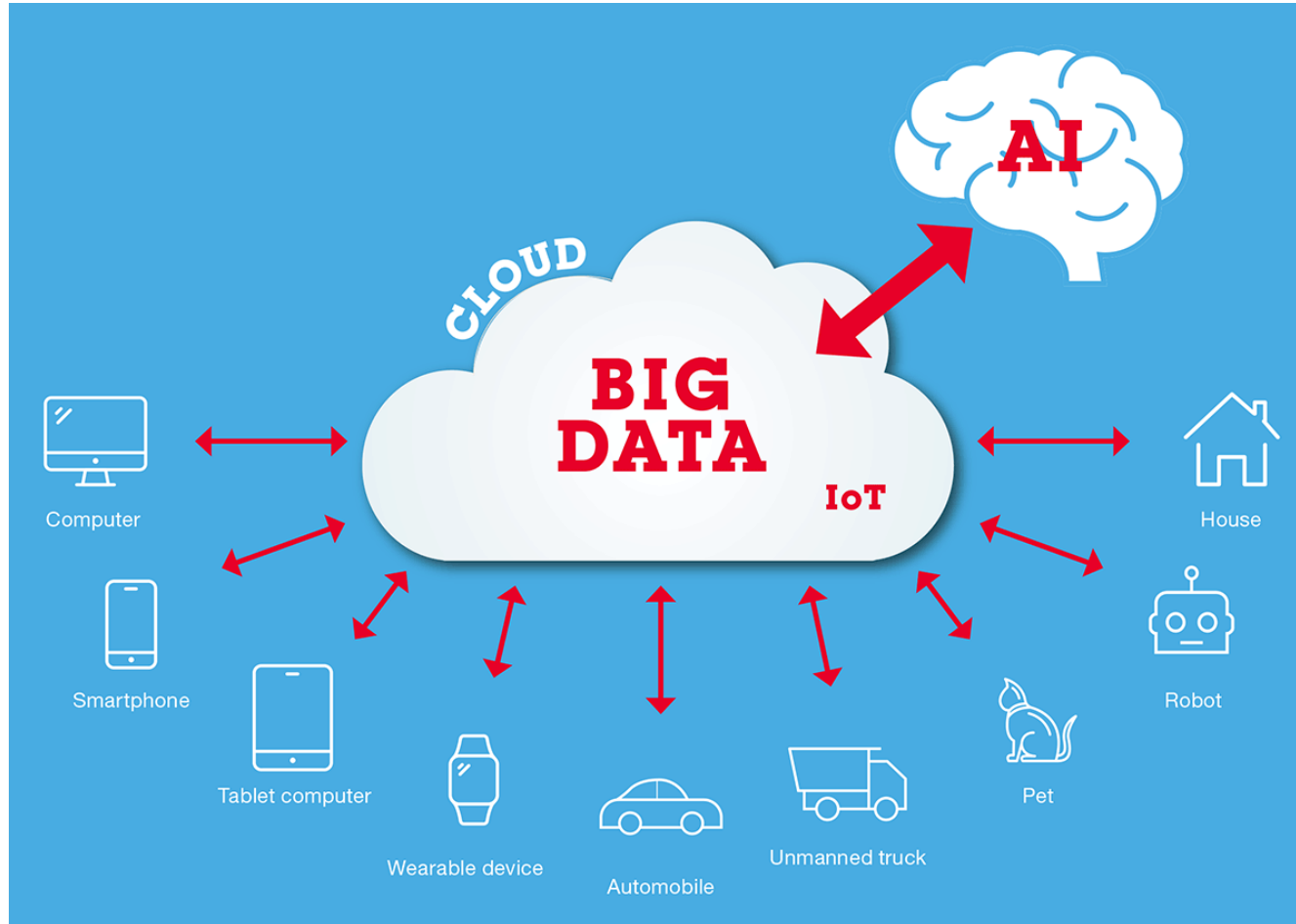"A Study of the Evolution Process of PaaS Ecosystem

: Introduction"

Keywords:
- Cloud Computing, Platform as a Service (NIST, 2011)
- Sourcing(Yoda, 2013),
- Ecosystem, Co-evolution, Keystone (Iansiti and Leivian, 2004)
- Focal firm, Complementor (Adner and Kapoor, 2010)
- Open Innovation (Chesbrough, 2003)

(Reference) Cloud Computing (Image)

Shared Computing Resources via Network

Yuichi Yoda "Cloud Computing and AI changing the Business Landscape"
(http://www.ritsumei.ac.jp/research/radiant/eng/robot_ai/story6.html/)

(Reference) What is Cloud Computing?

● The Definition of Cloud Computing＊

a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources can be rapidly provisioned and released with minimal management effort or service provider interaction.
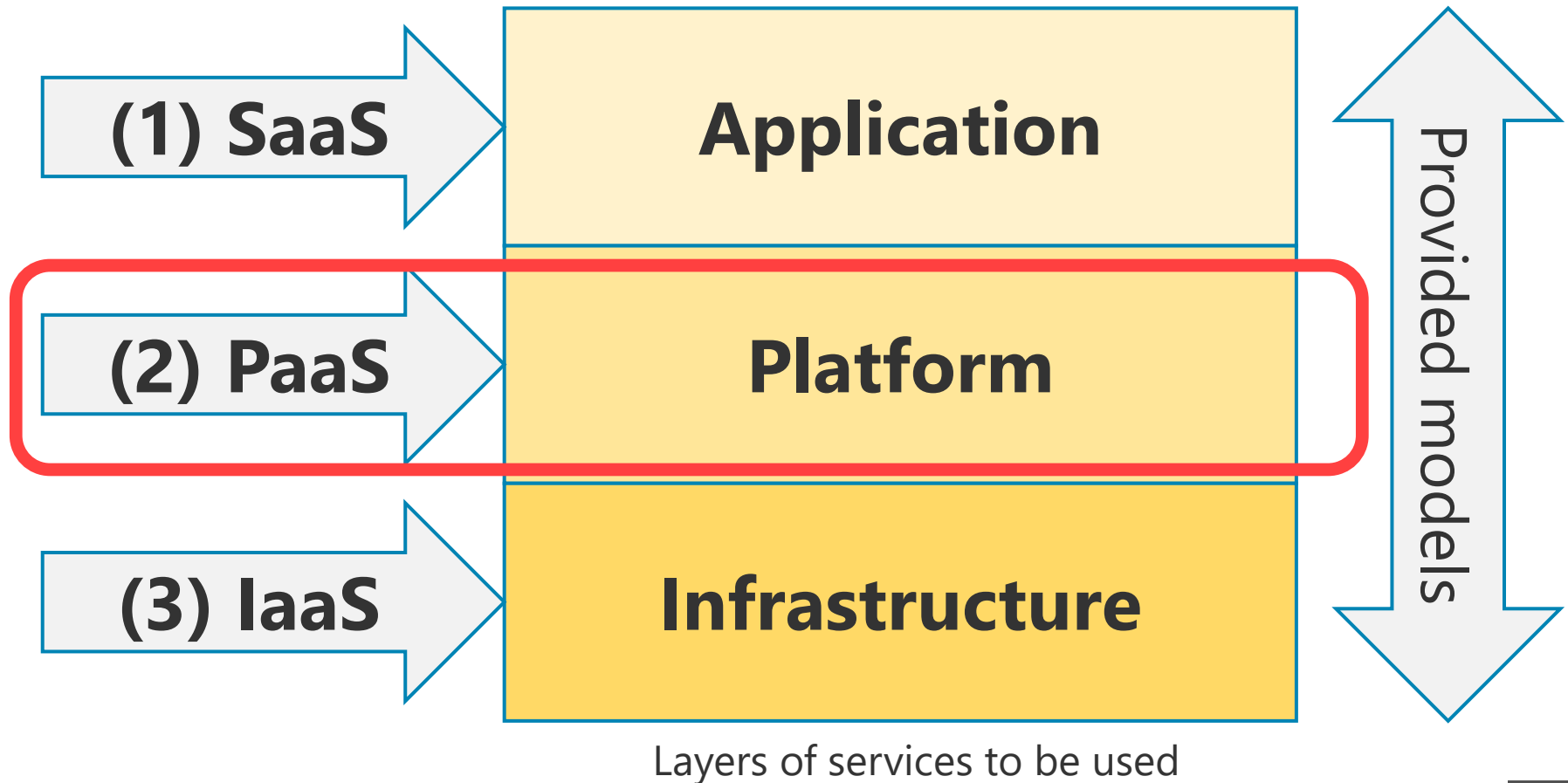
(e.g., networks, servers, storage, applications, and services)

＊ by NIST:National Institute of Standards and Technology (http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf)

(Reference) Three Service Models

- Services Utilizing Cloud Computing can Largely be Categorized into Three Models*:

(1) SaaS	**Application**	
(2) PaaS	**Platform**	Provided models
(3) IaaS	**Infrastructure**	

Layers of services to be used

(Reference @NIST) Three Service Models

● The Following is the Definition for Each Service:

1 **SaaS: Software as a Service**

The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure

2 **PaaS: Platform as a Service**

The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, Services, and tools supported by the provider

3 **IaaS: Infrastructure as a Service**

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications.
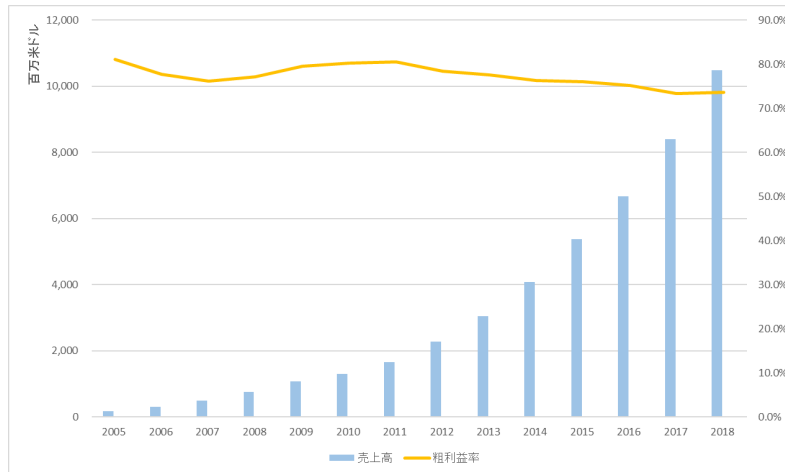
Background of Research Interest

Cloud service providers have been growing in market.

- They have been financially successful.

- They seem to try to be a keystone (Iansiti and Leivian, 2004) of PaaS Ecosystem.

- They have invested to arrange layers of platform.

- Additionally, they have competed and collaborated in a fine balance.

(Reference) Revenue Growth of Cloud

Financially, cloud service providers have been growing rapidly.

Salesforce.com (Source IR)

	Q1.2015	Q2.2015	Q3.2015	Q4.2015	Q1.2016	Q2.2016	Q3.2016	Q4.2016	Q1.2017	Q2.2017	Q3.2017	Q4.2017
Net sales	1,566	1,824	2,085	2,406	2,566	2,886	3,231	3,536	3,661	4,100	4,584	5,113
Segment operating income (loss)	265	391	521	686	716	718	861	926	890	916	1,171	1,354

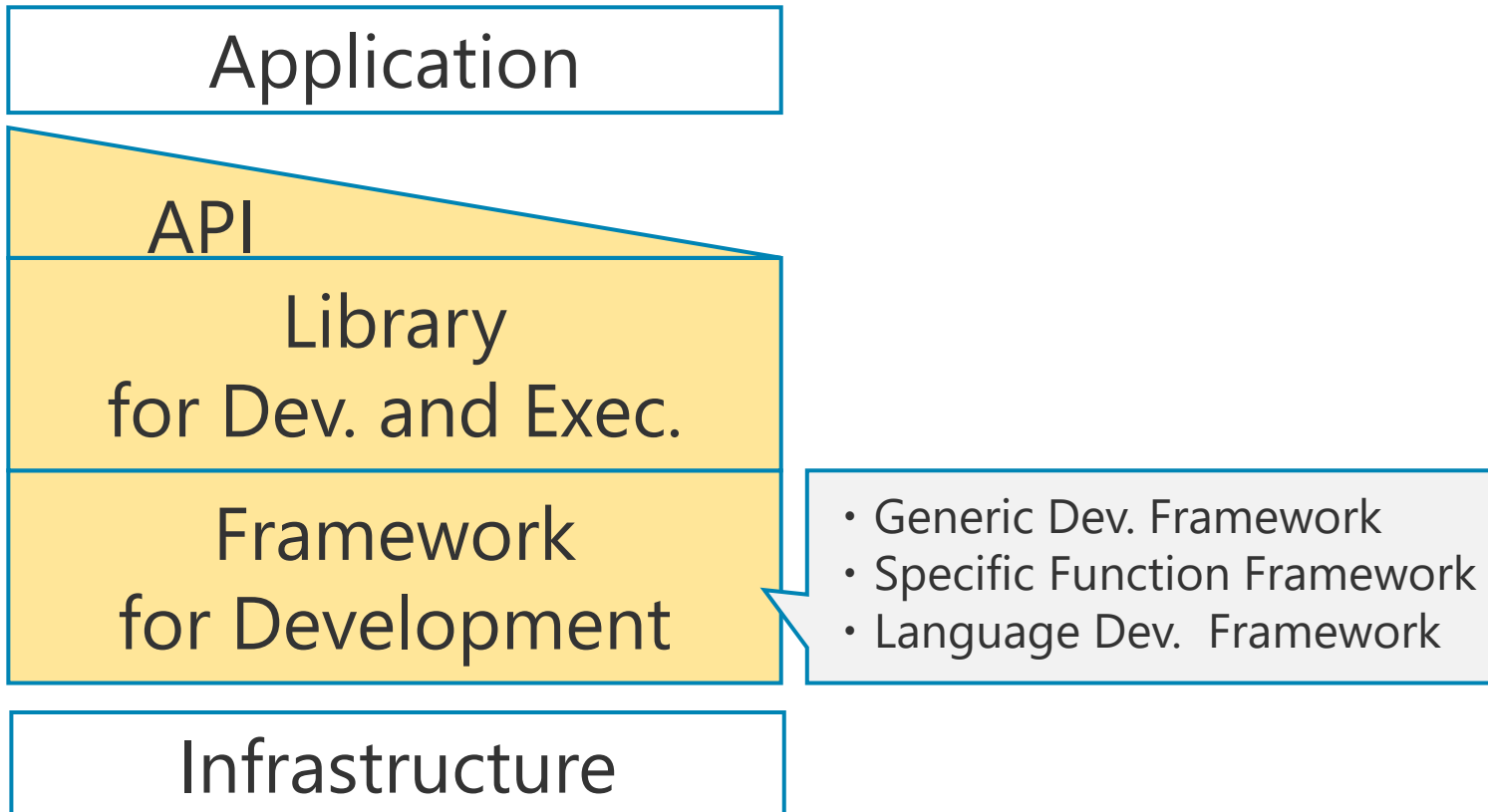Amazon Web Services (Source IR)
(Segment of AWS at Amazon.com)

This also applies to Google cloud platform and Microsoft Azure.

Each of the 4 companies has generated the revenue of over 10 billon us dollars per year.

Platform as a Service (in summary)

✓ PaaS practically supports for development and execution.
✓ My assumption is that there are 3 abstract layers of PaaS,
✓ Under the category of Framework, my assumption is that there are 3 abstract sublayers
✓ APIs, Libraries and Frameworks are provided as services.

Application

API
Library for Dev. and Exec.
Framework for Development

- Generic Dev. Framework
- Specific Function Framework
- Language Dev. Framework

Infrastructure

Research Interest for Practical Implication

Practical research questions as follows:

– How did large companies develop the ecosystem?

   (based on the cases of Force.com, AWS, GCP and MS)

– How have PaaS providers been competing and collaborating among one another?

– Why does this mechanism happen and how does it work?

– What are the key factors of the evolution of the ecosystem?

Yoda (2011)

"A Compatible Business System between Scalability and Customization of IT Services : A Case Study of "Force.com" "

I suggested to reconsider Cusumano's framework (2004) by the case of Force.com's innovation of PaaS: Multitenant architecture of Meta Data.

➢ By utilizing the standard component of software that is provided, the user entity can develop its own application through its original coding.

➢ Platform-related administrative tasks that are technical in nature can be handled by cloud service providers, allowing the user entity to focus on application development. When this is compared to the conventional on-premise type application development.

➢ The entity can reduce the labor in the development maintenance process for the 6 areas, and cut down on costs:

Yoda, Tateiwa, Matsunaga (2014)

Concentrating Resources for High Value-Added Application Development

| Main tasks of System Construction	Conventional Software Development	PaaS Utilization
Environmental procurement/construction (hardware, middleware, network)	●	(Labor reduction)
Release management (management, release application)	●	(Labor reduction)
System environment maintenance (back-up, security, hardware)	●	(Labor reduction)
Capacity management (performance, volume addition)	●	(Labor reduction)
Software maintenance (version upgrade, security)	●	(Labor reduction)
Development environment preparation (hardware, middleware, network, development tool)	●	(Labor reduction)
Application development (functional development)	●	◎

Source: Yoda, Tateiwa, Matsunaga (2014)

Research Interest from an Academic Perspective

Critical literature review in the scope of ecosystem

– What could be different from the generic schema of the ecosystem by Adner and Kapoor (2010) in SMJ?   And why?

– What could be any different mechanisms from Adner's research? Why? What is the logic?

Generic schema of an ecosystem in SMJ (Adner and Kapoor, 2010 p.309)
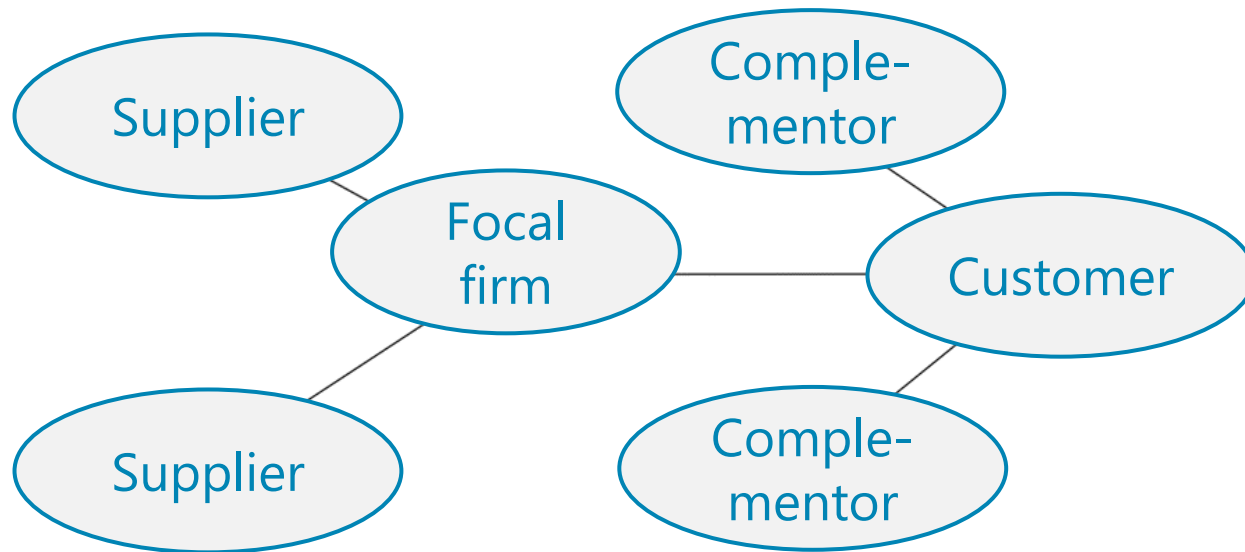
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THANK YOU

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