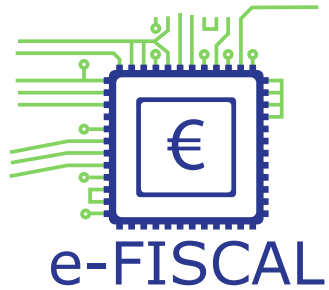


Business and Pricing Models

Sergio Andreozzi

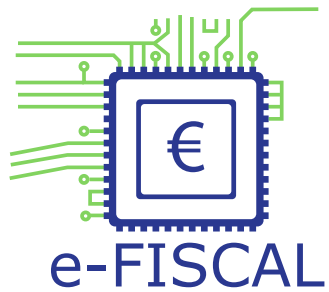
Strategy and Policy Manager, EGI.eu

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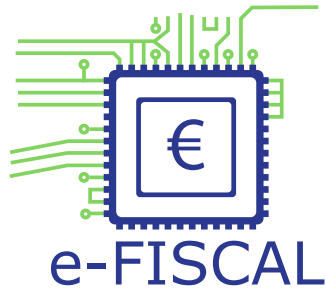


Outline

- **Business Models for Federated Infrastructures**
 - The role of the federator/broker
- **Integration scenarios** of e-infrastructure with commercial clouds
- **Pricing Models** for IaaS Compute services



- e-FISCAL provided a cost model and analysis of compute resources in distributed heterogeneous Infrastructures
- Considerations:
 - High utilization is key to maintaining economic efficiency in a market where services are becoming commodities
 - A broker role is essential to facilitate demand meeting the right suppliers

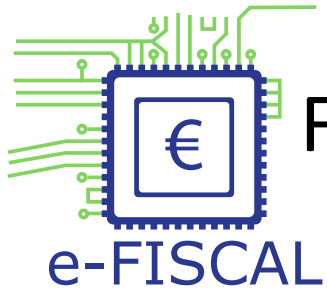


Federator Models in e-Infrastructures

Roles and Functions

- **Federator**
 - Provides the technology, processes and governance to enable access to an integrated set of services from autonomous organisations
 - e.g. EGI.eu on a European Level – NGIs on an national level
- **Resource Provider**
 - Offers access to ICT resources through service abstractions (e.g., computing power, storage)
- **Customer**
 - Negotiates the level of services and commissions the service provider or broker and may pay, doing so on behalf of a number of consumers (users)
- **Consumer**
 - The person actually using the service (user)

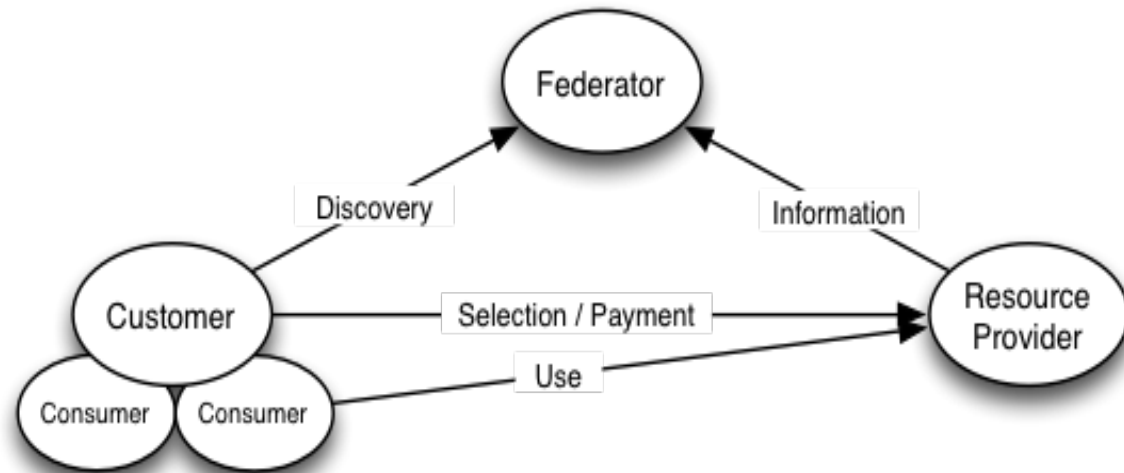
See <http://go.egi.eu/ponzd> for more detailed description with reference to service management



Federator Models in e-Infrastructures

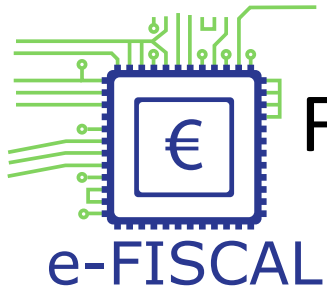
#1: Independent Advisor

- Services Provided
 - General listing of services
 - Facilitates Relationships
 - Lightweight service lifecycle support



- Customers Pros/Cons
 - (+) Find best solution
 - (-) Many-to-many relationship
 - (-) Own responsibility

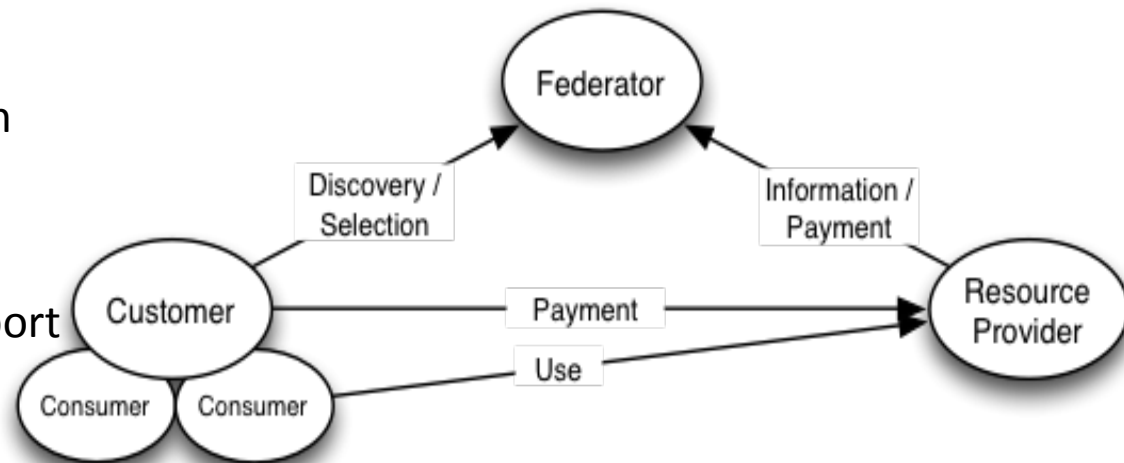
- Resource Provider Pros/Cons
 - (+) Promotion of services
 - (+) Receive targeted customers
 - (+) Full control of service delivery
 - (-) High overheads
 - (-) Complex CRM



Federator Models in e-Infrastructures

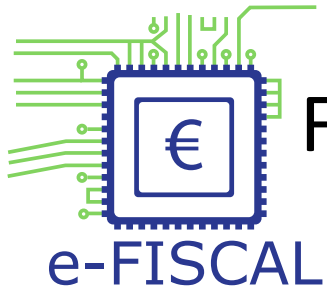
#2: Matchmaker

- Services Provided
 - Form of Resource Allocation Mgt.
 - Facilitates Agreements
 - Active service lifecycle support



- Customers Pros/Cons
 - (+) Find best solution
 - (+) Single point of contact for resource allocation
 - (-) Many-to-many relationship

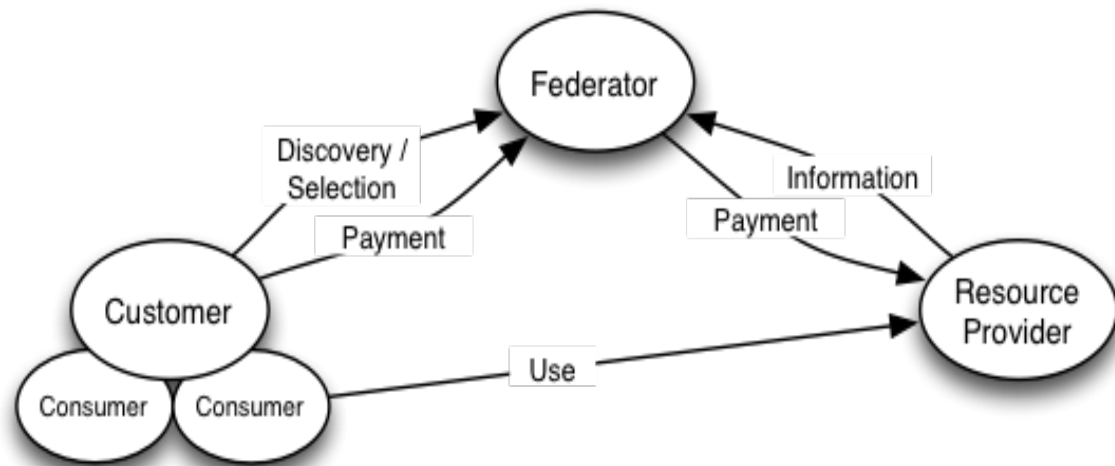
- Resource Provider Pros/Cons
 - (+) Promotion of services
 - (+) Receive targeted customers
 - (+) Balance of control over service delivery
 - (+) Shared Overheads/CRM
 - (-) Fragmented across borders



Federator Models in e-Infrastructures

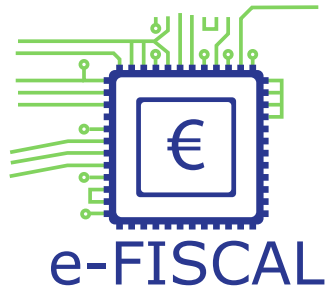
#3: One Stop Shop

- Services Provided
 - Service Publication
 - Contract/Agreement Negotiation
 - Handles financial transactions



- Customers Pros/Cons
 - (+) Find best solution
 - (+) Single contact point for resource allocation, contracts/SLA, payment

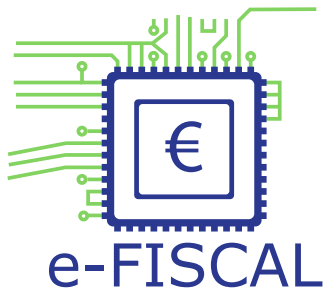
- Resource Provider Pros/Cons
 - (+) Promotion of services
 - (+) Receive targeted customers
 - (+) Single contact point for allocation, contracts/SLA, payments
 - (+) Streamlined Overhead/CRM
 - (-) 3rd party reliance



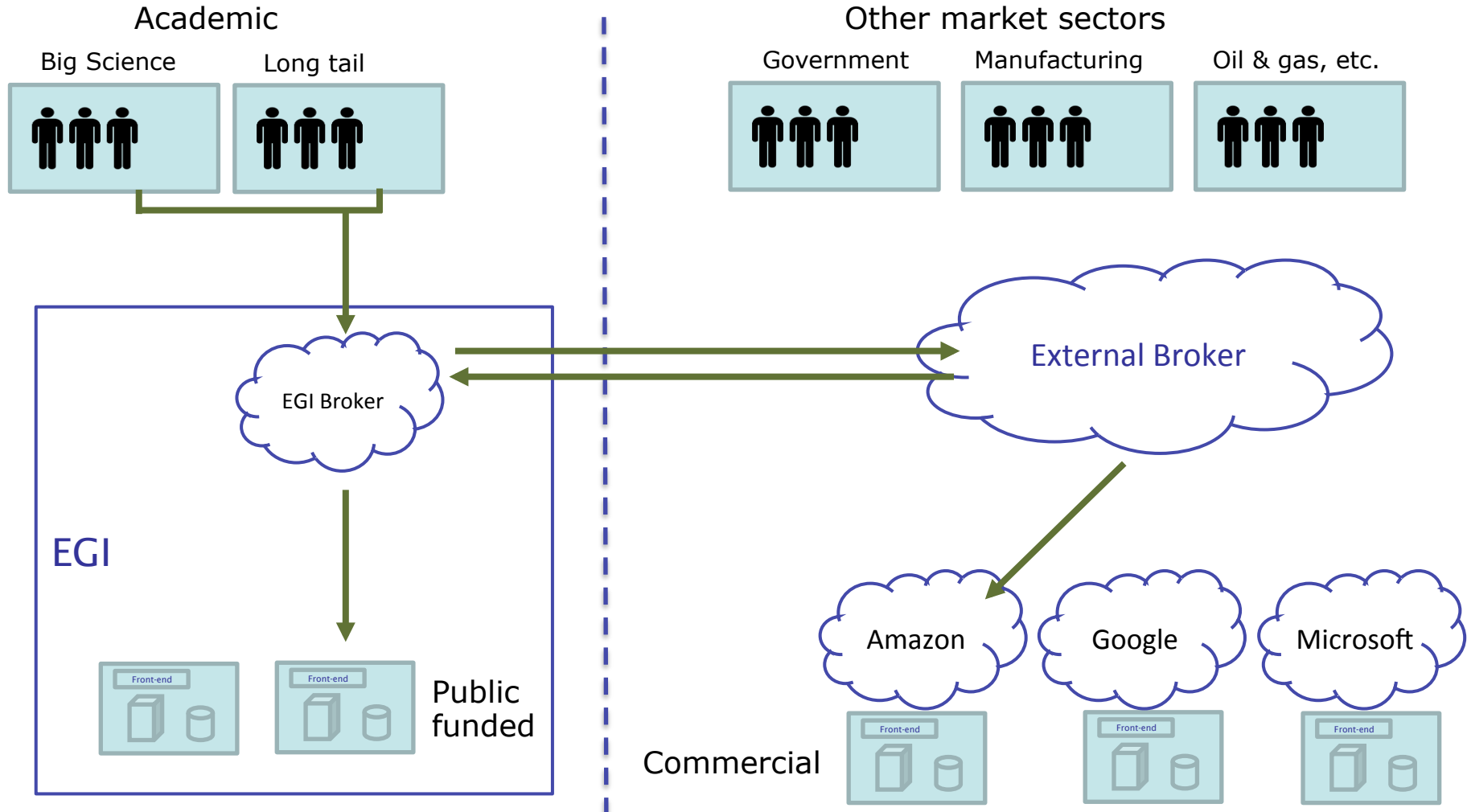
Integration of e-Infrastructures with commercial cloud providers

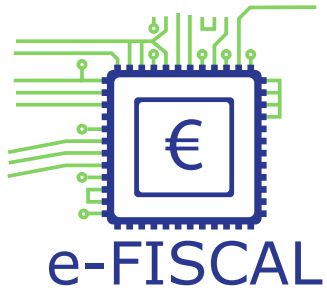
- Commercial cloud services are becoming appealing for the research sector
 - Especially in low-end computing
 - To access different types of resources/features or service levels
 - For more elasticity i
- The role of Cloud Service Brokers (CSB) is emerging in different sectors
 - E.g.: Helix Nebula, EGI Federated Cloud
- What are the integration scenarios that can be useful to research communities?

See <http://go.egi.eu/sjsk> for the results from the Venus-C project

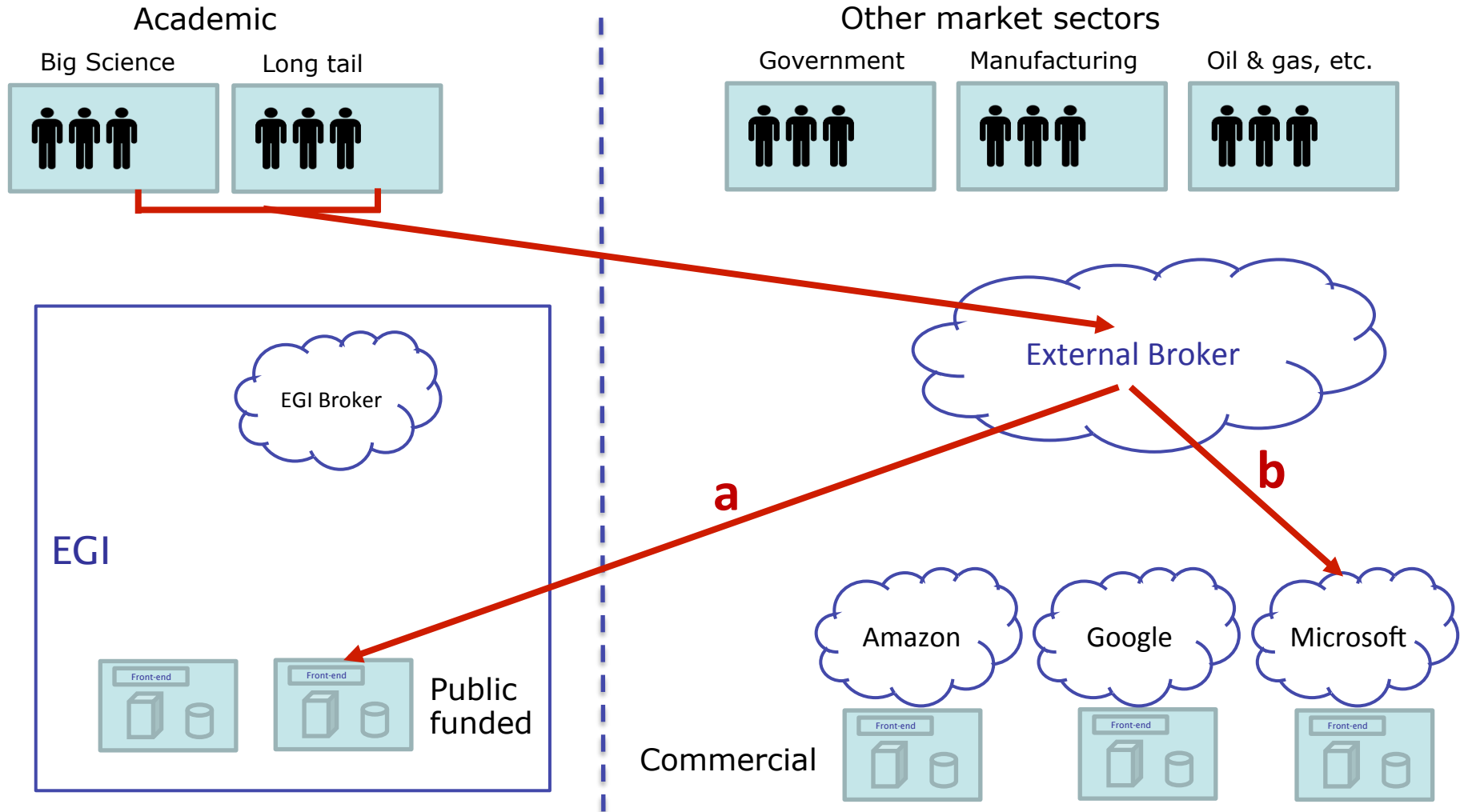


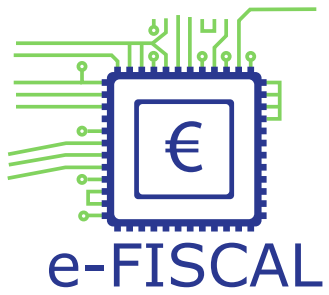
Integration Use Case #1 Federated Infrastructure Bursting



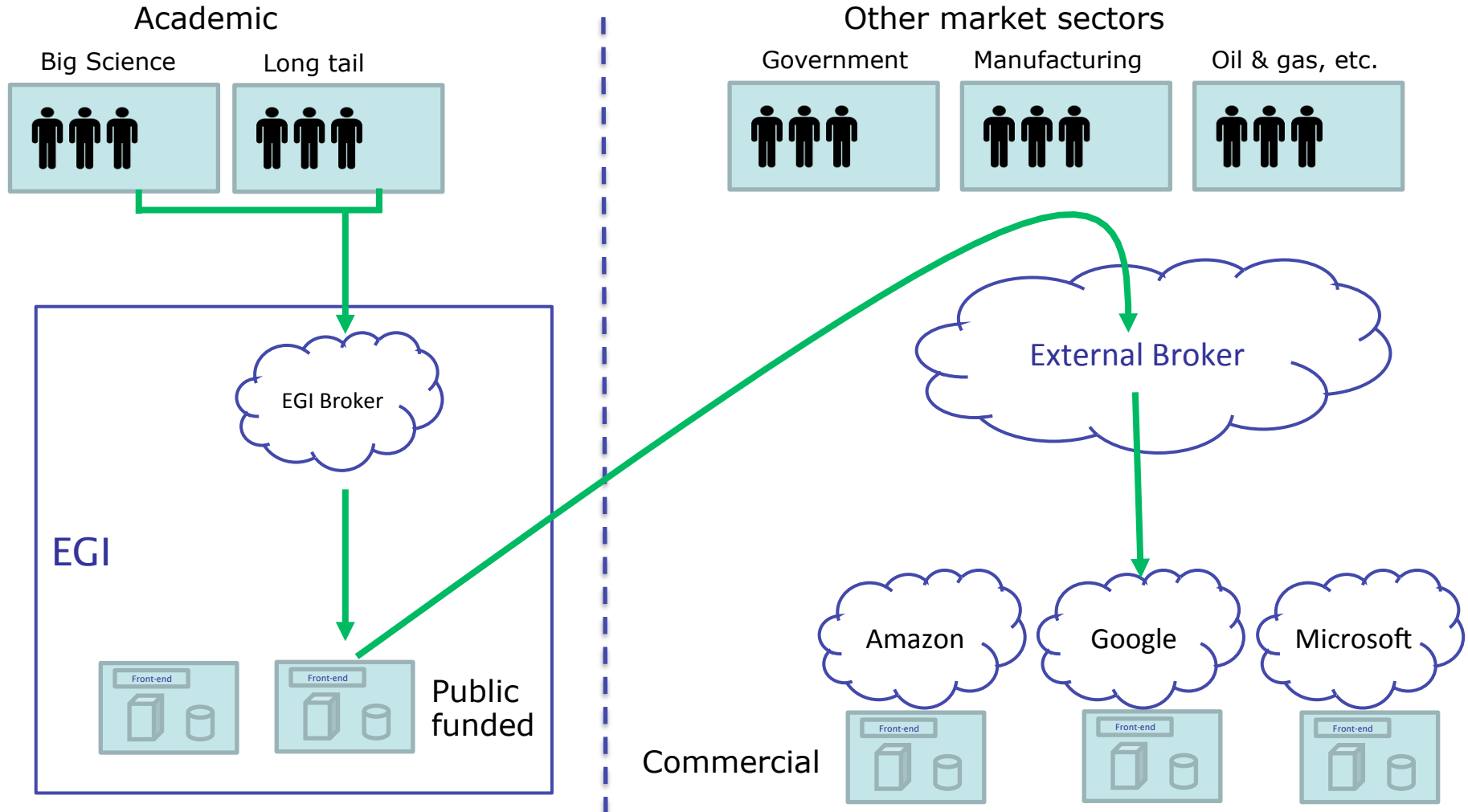


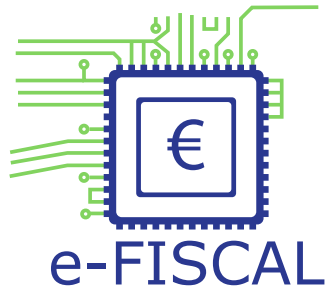
Integration Use Case #2 Integration with External Broker





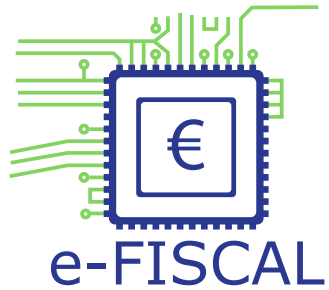
Integration Use Case #3 Single Provider Bursting





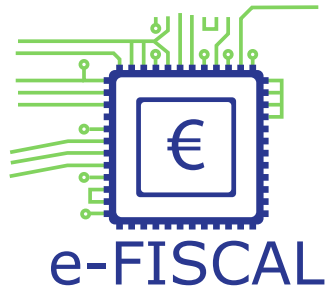
Need to Evolve Funding Streams

- Commonly, research groups receive:
 1. Budget for buying resources (CAPEX) to be installed and operated by public-funded data centers
 2. Usage quota on public-funded infrastructures
- Option 1
 - needs to be revisited to meet the paradigm change of cloud services: CAPEX->OPEX
 - Several questions need to be investigated
 - How to reconcile the budget planning cycle for research computing to the pay-as-you go or subscription pricing models of cloud?
 - What if a budget is not renewed? Or is approved late?
 - Who should own the budget? (research group, institution)
- Option 2
 - To revisit how quota are defined



Pricing Models for IaaS

- There are different classification of pricing models to support business models definitions
- What are those suitable for IaaS?
 - Usage Based Pricing
 - Subscription Pricing
 - Market Based Pricing
 - Strategy Based

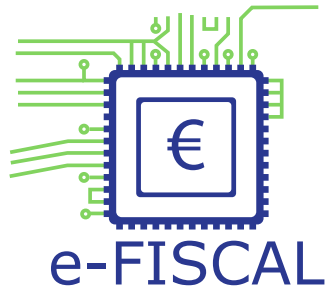


Usage based

Variables	Description	A	G	M
Resources	Price depends on type of configuration (e.g., number of core, performance, RAM size)	✓	✓	✓
Features	Price depends on features (e.g., SLA, OS type)	✓	✓	✓
Region	Price depends on data center/geographical location	✓	✓	✗
Tier-based*	Depends on segments of consumed time units	✓	✓	✓

* Used for storage A=Amazon G=Google M=Microsoft

- No up-front costs
- Change risk-sharing between service provider and consumer with less commitment from users
- Can impact negatively the cash flow of the service provider

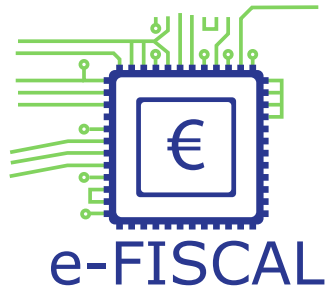


Subscription based

Variables	Description	A	G	M
Resources	Price depends on type of configuration (e.g., number of core, performance, RAM size)	✓	✓	✓
Features	Price depends on features (e.g., SLA, OS type)	✓	✓	✓
Region	Price depends on data center/geographical location	✓	✓	✗
Usage volume	Price depends on volume; higher volume commitment leads to lower price	✓	✓	✓
Overage	Price changes if exceeding usage	✓	✓	✓

A=Amazon G=Google M=Microsoft

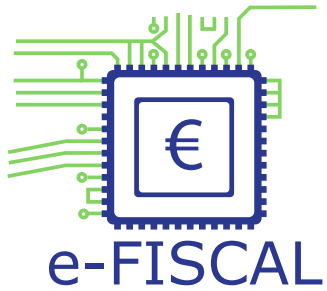
- Commitment from customers
- Helps suppliers in capacity planning



Market based

Variables	Description	A	G	M
Auction	Buyers bid in increasing increments of price	✓	✗	✗
Market Based	Large number of buyers and sellers indicate their preferred price, but cannot influence it individually	✓	✗	✗

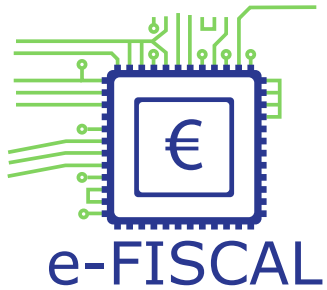
A=Amazon G=Google M=Microsoft



Strategy based

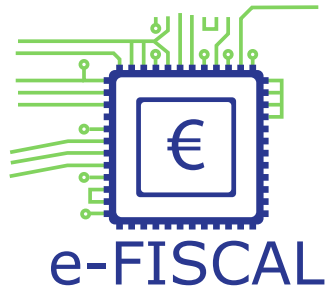
Variables	Description	A	G	M
Penetration pricing	To target market segments very sensitive to price			
Skim pricing	To target market segments relatively insensitive to price	✘	✘	✘

A=Amazon G=Google M=Microsoft



Considerations on Pricing Models

- IaaS has complex pricing model if compared to SaaS
 - PaaS still developing
- IaaS compute has more complex pricing model than storage/network
 - richer configuration options
- With the evolution of the market, pricing models for compute should become more simple and with differentiation happening at the level of support, SLA, performance
- The emergence of federated cloud marketplace and brokers will lead to heavy price competition or service differentiation



Conclusion

- Cloud brokers are emerging in both public and private sector
- Presented three broker models for federated e-Infrastructures being considered in EGI
- Described integration scenarios with brokers from commercial sectors
- Presented pricing models for IaaS compute