



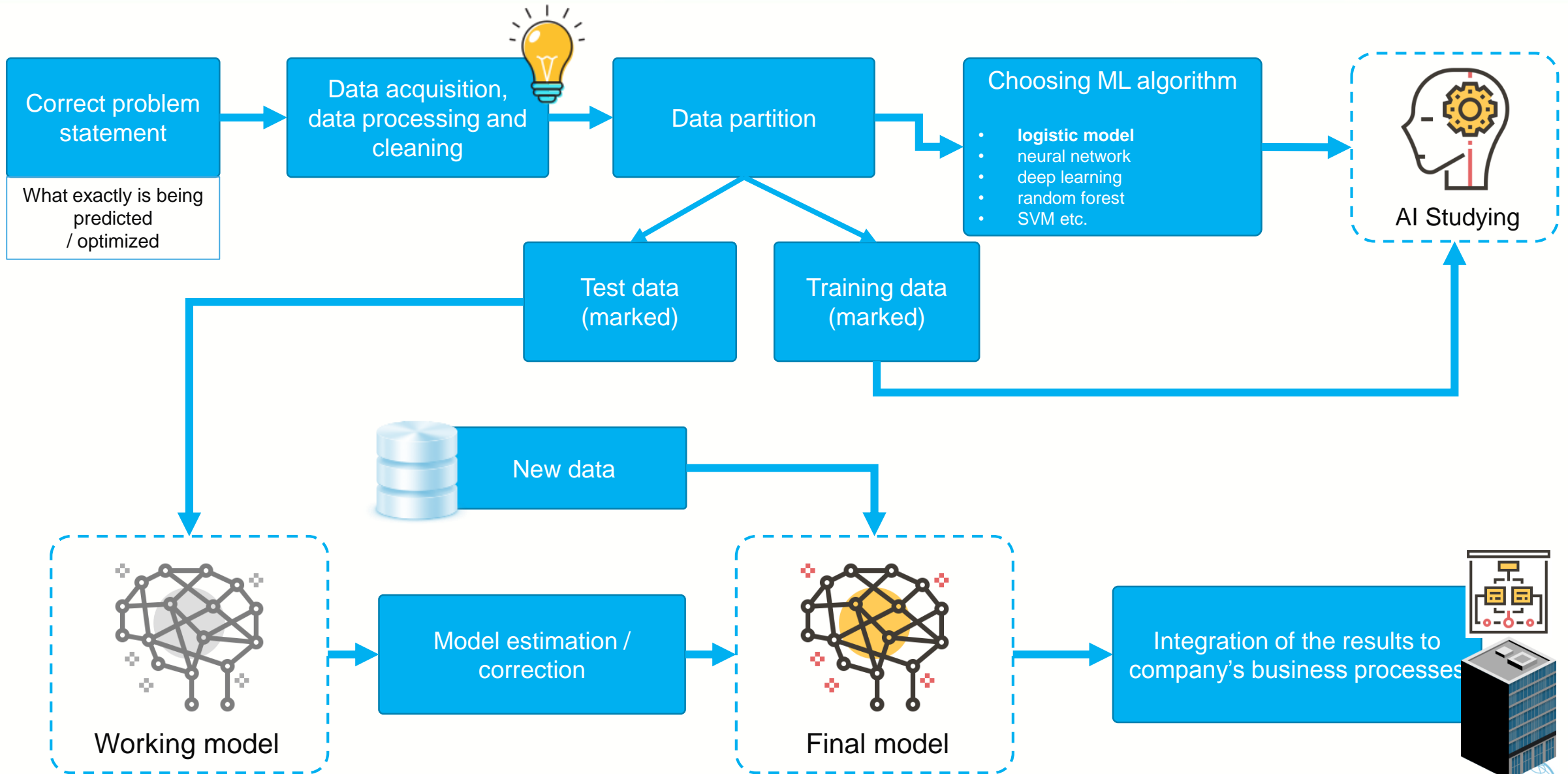
Dmitry CHASOVSKOY  
Head of project department, Rostelecom (IQMEN)

# Experience on Big Data processing

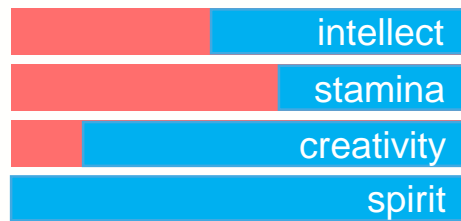
Saint Petersburg 2018



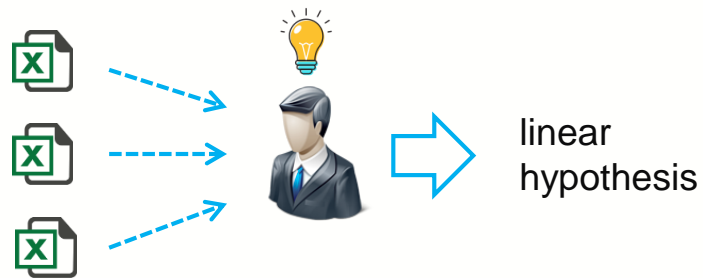
# Ingredients of Machine learning



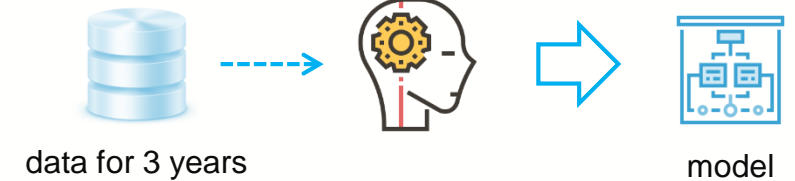
## Human - expert



## Artificial Intelligent



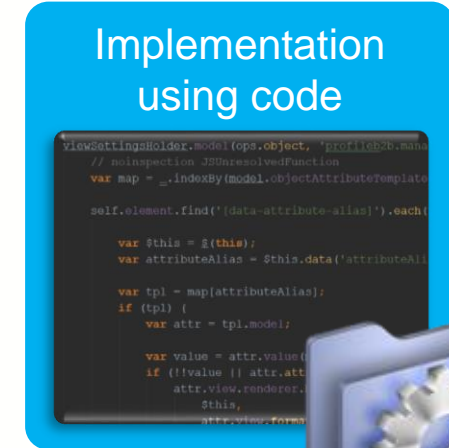
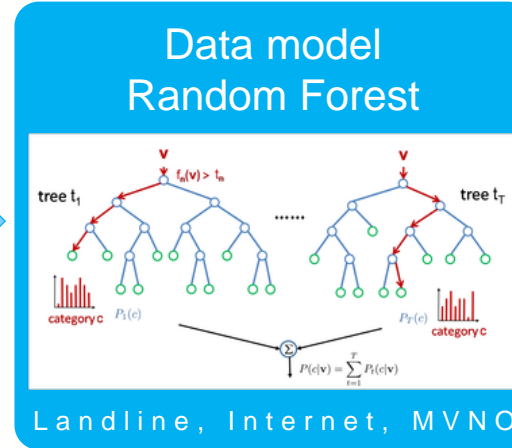
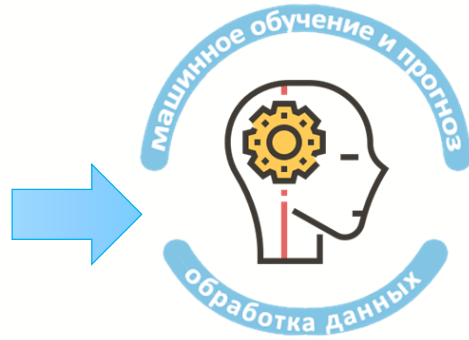
- human resources needed
- low forecast accuracy
- result depends on specific expert
- static model



- no human resources required
- forecast accuracy is much higher
- dynamic model, can be adapted to business's changes

# Forecasting the outflow of the client base

- Subscriber lifetime
- Voice and broadband traffic consumption
- Dynamics of payments
- Dynamics of account receivable
- Quantity/duration of contacts with technical support and complaints solving
- Presence of fails of broadband sessions
- etc.

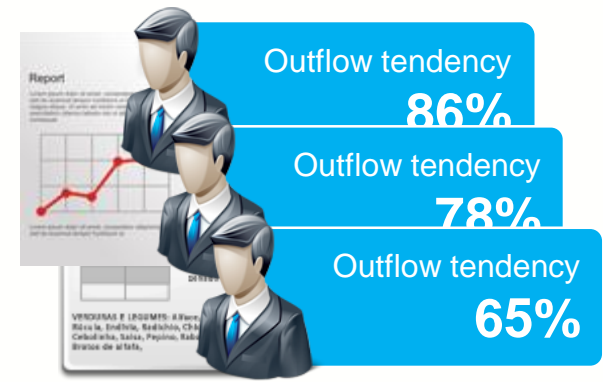


DB contains data for 2 years with subscribers outflow and their patterns of behavior

fresh data with subscribers' activity (monthly)

### Data views

Subscribers	Charges
Voice/Broadband traffic	Accounts receivable
TechSupport contacts	Fails of sessions



### APM оператора ГРЛ

Все филиалы МРФ Волга | Тимур Меджидов | Выход

Организация: ООО "ЭНЕРГОСТРОЙКОМПЛЕКТ"  
 ИНН: 7718183138  
 Л/СЧ: 356001002870  
 Идентификатор услуги: 35300022239  
 Услуга Абонента: ШПД  
 Адрес установки услуги: 462419 г. ОРСК пр-кт МИРА 14-0  
 Возможная причина оттока: Дебиторская задолженность

**Подключенные услуги**  
 • ШПД

**Опции**  
 Больше не беспокоить абонента  
 Задание передано менеджеру

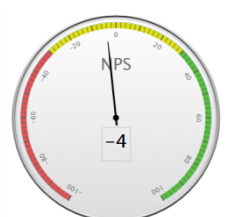
**Решение**  
 Нет ответа (отложить на сутки)  
 Перезвонить  
 НЕ СКЛОНЕН к оттоку  
 СКЛОНЕН к оттоку  
 Решение не принято

**Контакты**

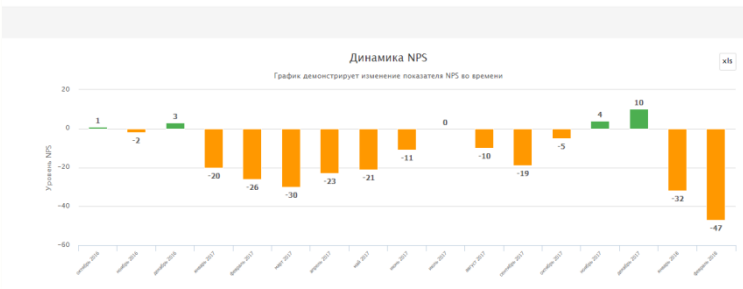
Контактный телефон	Некорректный номер	Некорректное лицо	Больше не беспокоить по номеру	номер контакта
9991097000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Возможна допродажа

**Комментарии**



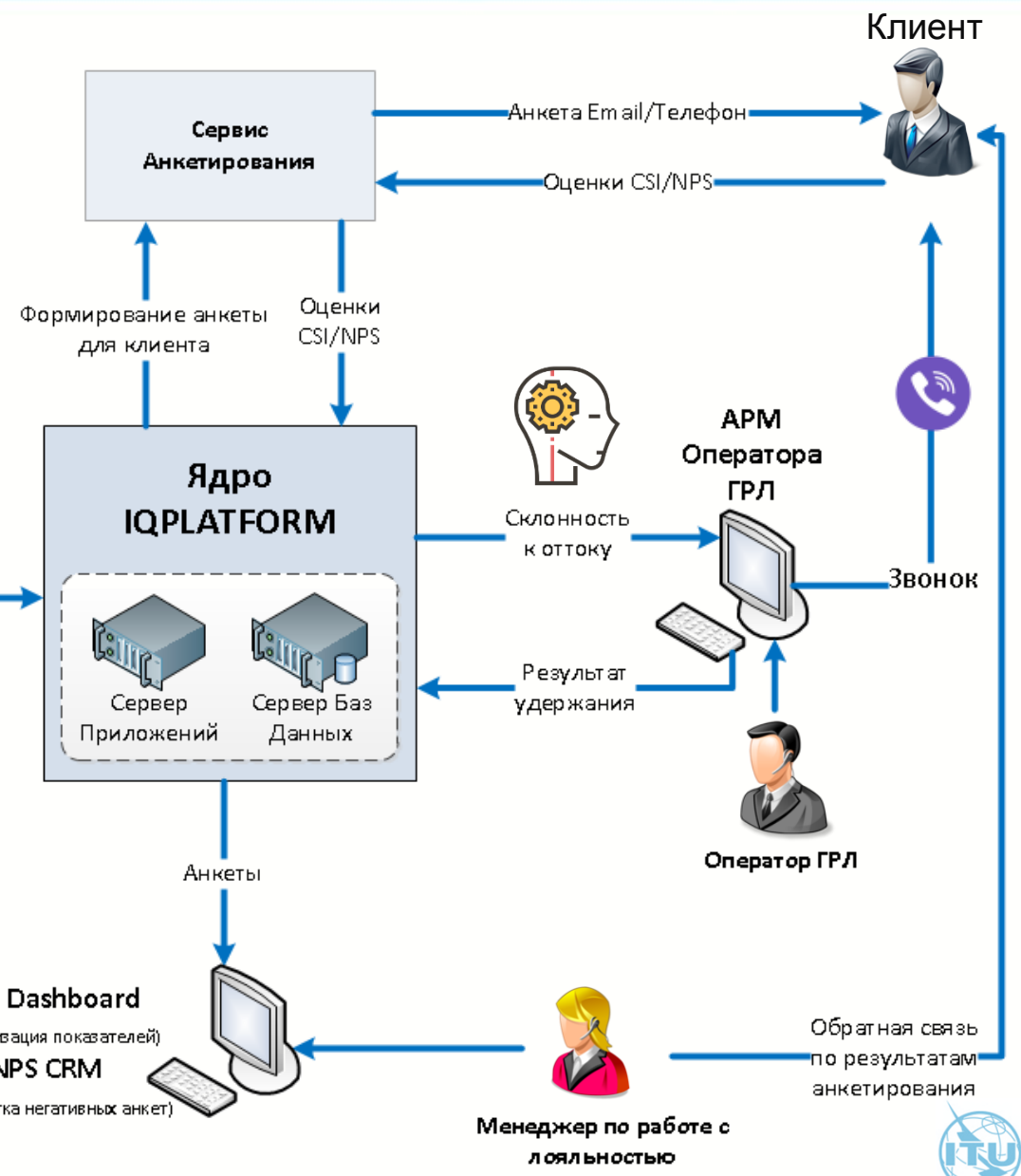
Категория	Процент	Количество	Процент
Анкет в расчете	100%	19879	
Промоутеры	38%	7569	
Нейтралы	20%	3937	
Деструкторы	42%	8373	



### ВИТРИНЫ ДАННЫХ

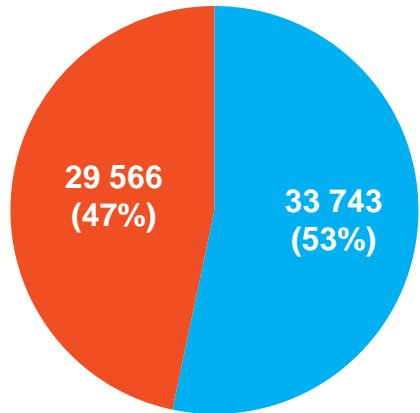
- Абоненты
- Начисления
- Трафик ШПД/ОТА
- Дебиторская задолженность
- Обращения и наряды
- Звонки конкурентам

Обогащение данными



## Impact on revenue

### Sample size<sup>1</sup>



### State of contact

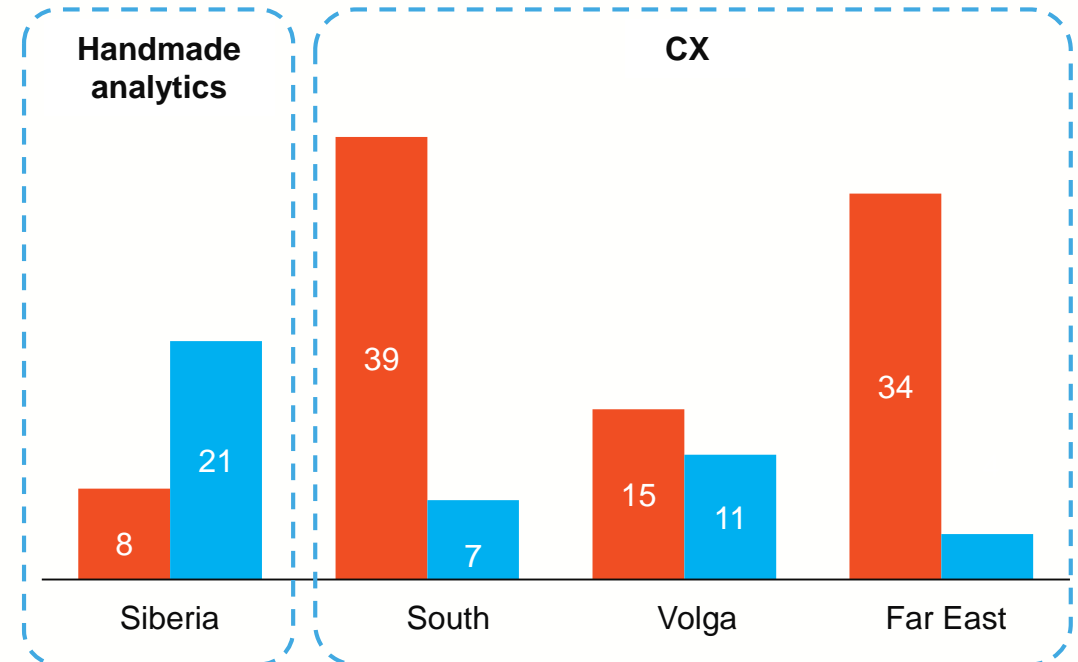
State of contact	% gone from sample
Haven't made a call	9.1%
Have made a call / inclined	6.6% (-2,5 пп)

■ have made a call 
 ■ haven't made a call

## Impact on operational efficiency

### Handmade analytics

### CX

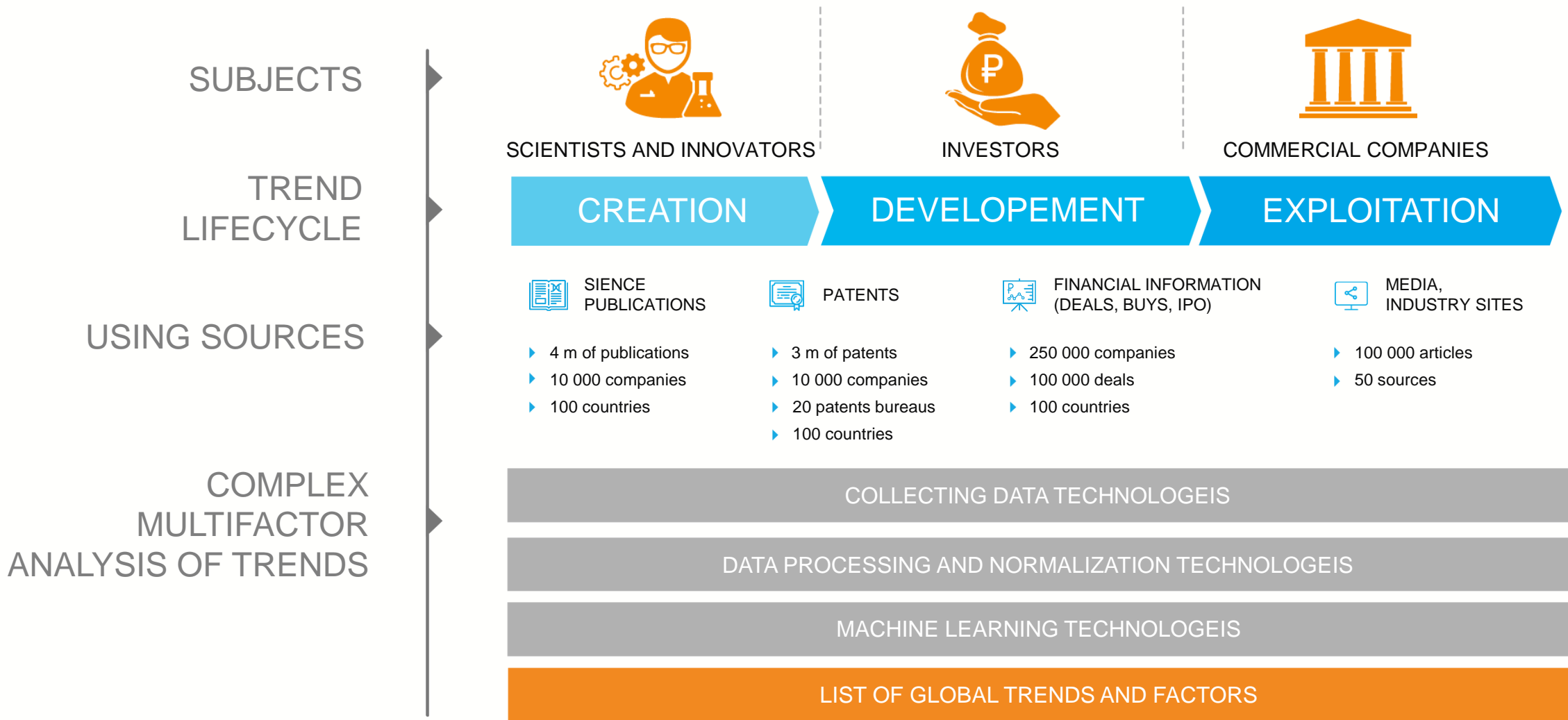


■ Efficiency<sup>2</sup>

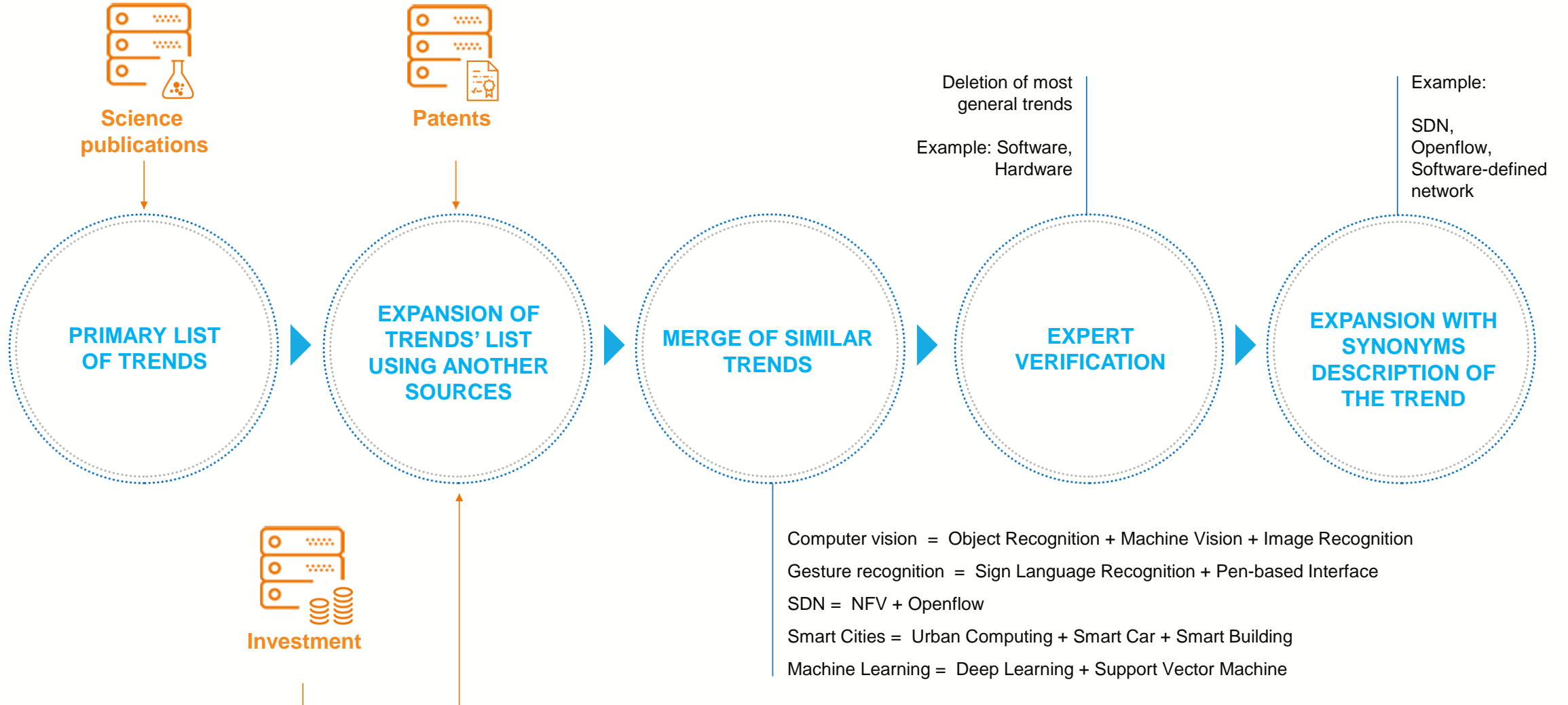
■ Number of call-center employees

<sup>1</sup> Period is July 2017 - February 2018

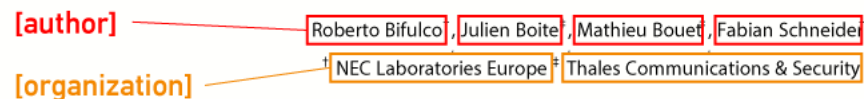
<sup>2</sup> Efficiency.% - percentage of reaching the client that is inclined to outflow to the sample to total quantity of made contacts







## HIGHLIGHTING OF ENTITIES



### ABSTRACT

In SDN, complex protocol interactions that require forging network packets are handled on the controller side. While this ensures flexibility, both performance and scalability are impacted, introducing serious concerns about the applicability of SDN at scale. To improve on these issues, without infringing the SDN principles of control and data planes separation, we propose an API for programming the generation of packets in SDN switches. Our InSP API allows a programmer to define in-switch packet generation operations, which include the specification of triggering conditions, packet's content and forwarding actions. To validate our design, we implemented the InSP API in an OpenFlow software switch and in a controller, requiring only minor modifications. Finally, we demonstrate that the application of the InSP API, for the implementation of a typical ARP-handling use case, is beneficial for the scalability of both switches and controller.

### CCS Concepts

• Networks ☒ Programming interfaces; Bridges and switches; Programmable networks; Packet-switching networks; Network performance evaluation; Network manageability;

### Keywords

Software-defined Networking; Programming abstractions; Open-Flow

[keywords]

[key objects]

[source]

[date]

[location]

### 1. INTRODUCTION

The last few years have seen the establishment of SDN as a concrete approach to build better networks and to introduce innovation in an ossified field [24], with a growing number of deployments certifying this success [15]. Nonetheless, despite the good behind the intuitions that led to the design of the SDN principles [9], the SDN architecture and technologies are iteratively being updated to address the issues that are highlighted by the production deployments [28]. On the one hand, the current generation offorwarding devices, i.e., switches, is not ready to support the flexible switch's programming model introduced with SDN. Limited forwarding table

put in control messages handling [25], and slow synchronization between data and control planes [21] are just some of the issues that are being addressed on the switch side. Likewise, a number of problems are being addressed on the controller side, i.e., where the network's control plane is implemented. Controller scalability [8], reliability [3], as well as fundamental questions about controller placement [12, 13], network policy consistency [34] and network view consistency [20] can be mentioned as relevant examples of work dealing with the SDN's control plane implementation.

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## NORMALIZATION OF DATA

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## HIERARCHICAL CLUSTERING

