

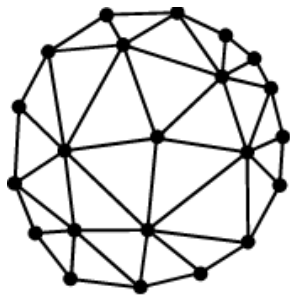
Cidades Inteligentes e Transporte

Como a Ciência da Computação
pode ajudar nos transportes



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Departamento de Ciência da Computação
IME-USP





INCT

InterSCity

Future Internet for Smart Cities

- Instituto Nacional de Ciência e Tecnologia (INCT) da
 - Internet do Futuro para Cidades Inteligentes
- Grande projeto de pesquisa financiado pelo CNPq/FAPESP/CAPES.
- 40 professores de 9 universidades
 - Duração: **2017 → 2022**

Nosso foco

Ao contrário de boa parte das iniciativas de cidades inteligentes ao redor do mundo, preferimos focar em:

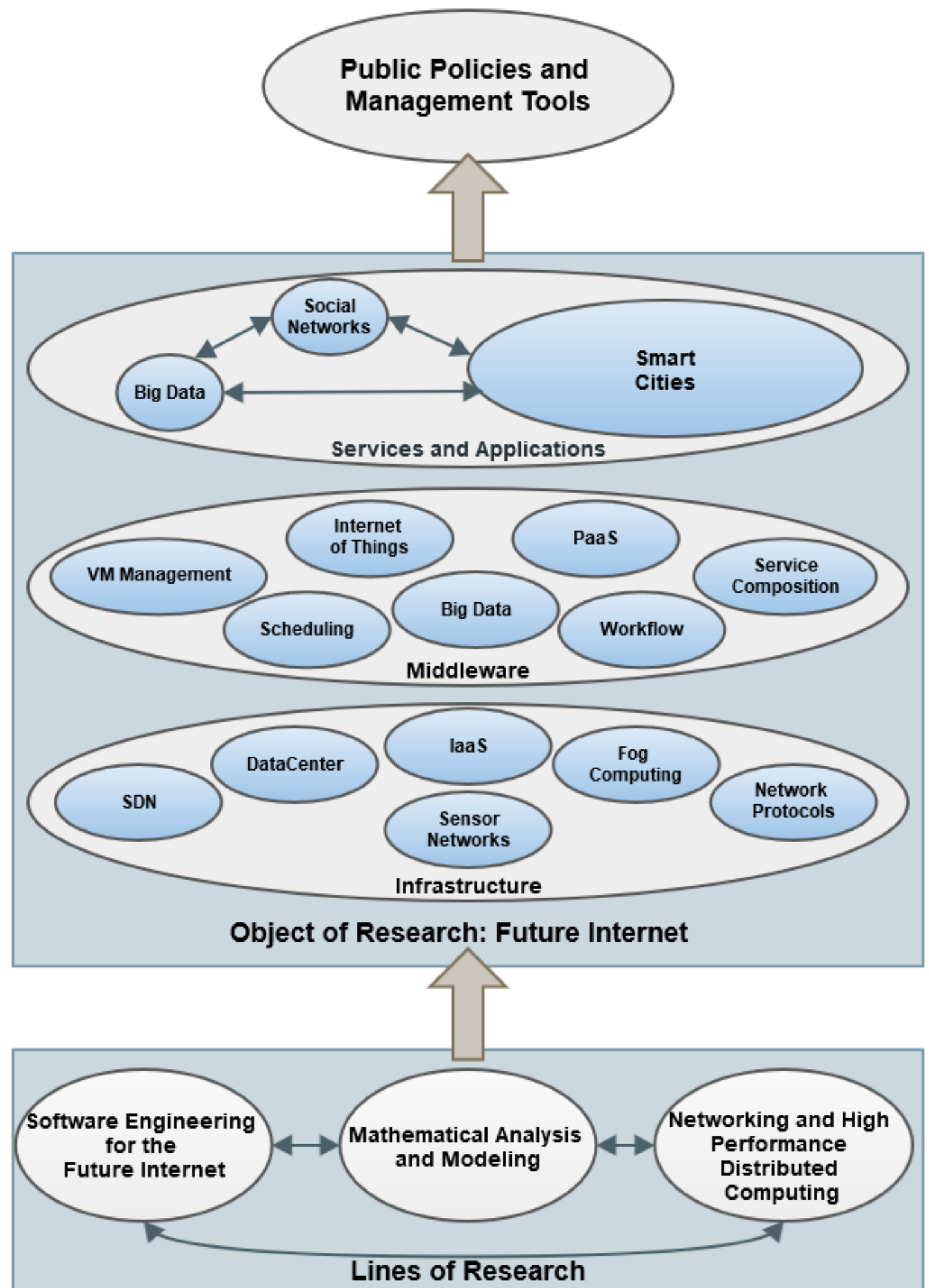
- países em desenvolvimento
- população de baixa renda
- bairros menos favorecidos
- problemas das grandes cidades



Colaborações

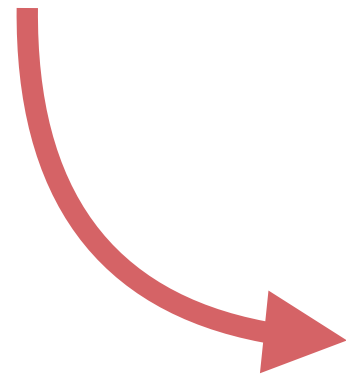
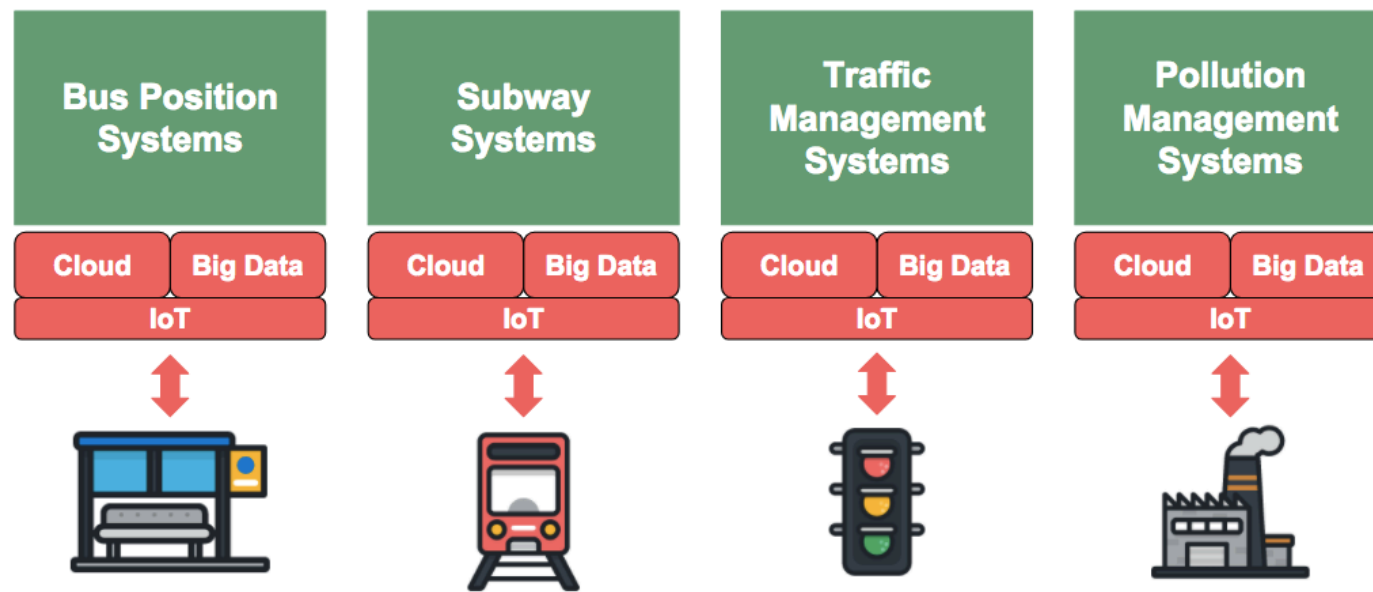
- 35 Cientistas da Computação +
 - Arquitetos, Urbanistas, Economistas, Profissionais de Saúde, Engenheiros de Transporte
- Prefeitura de São Paulo (SMIT)
- pontuais com cidades menores

- 3 linhas de pesquisa
- 3 níveis

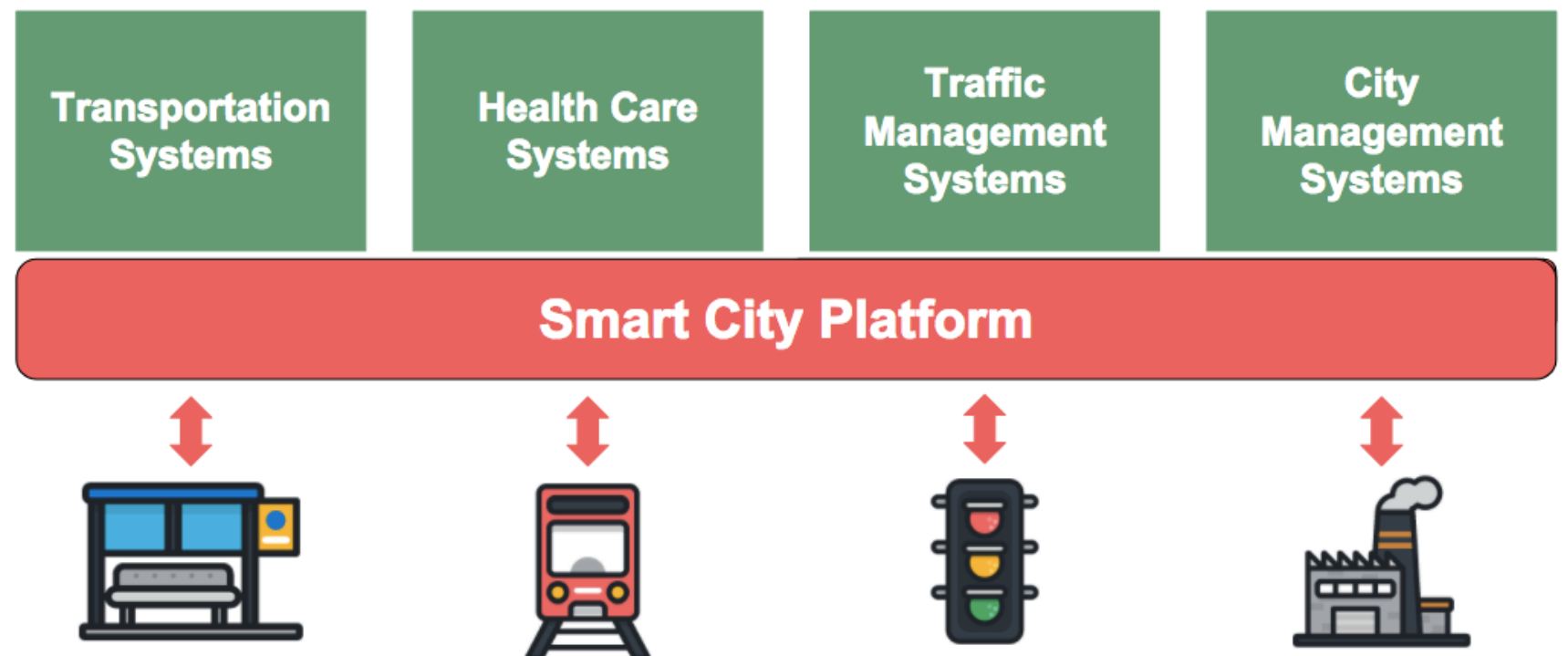


Uma plataforma genérica para Cidades Inteligentes

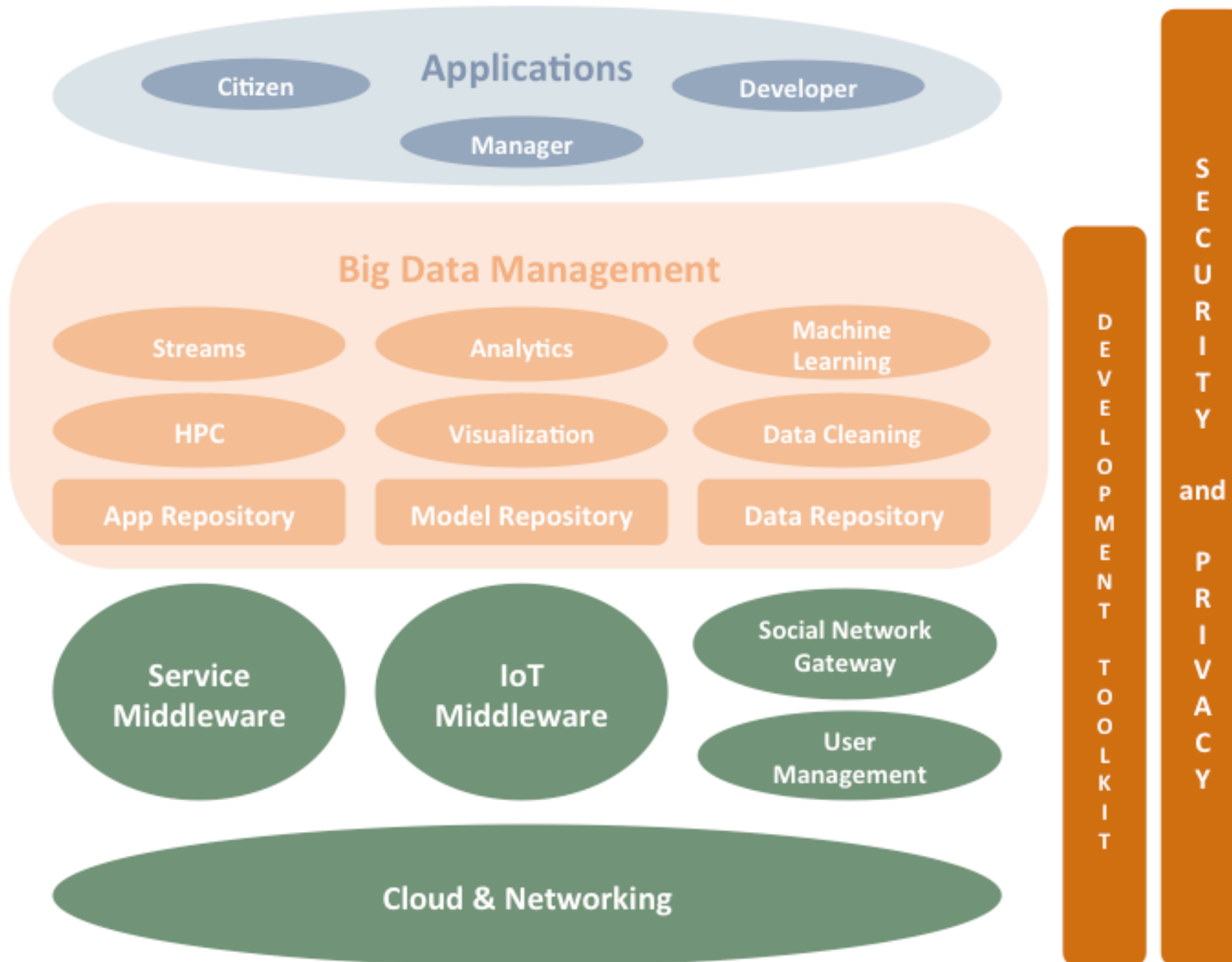
Traditional Solutions and Vertical Silos



Horizontal Solutions



Levantamento das principais plataformas existentes no mundo



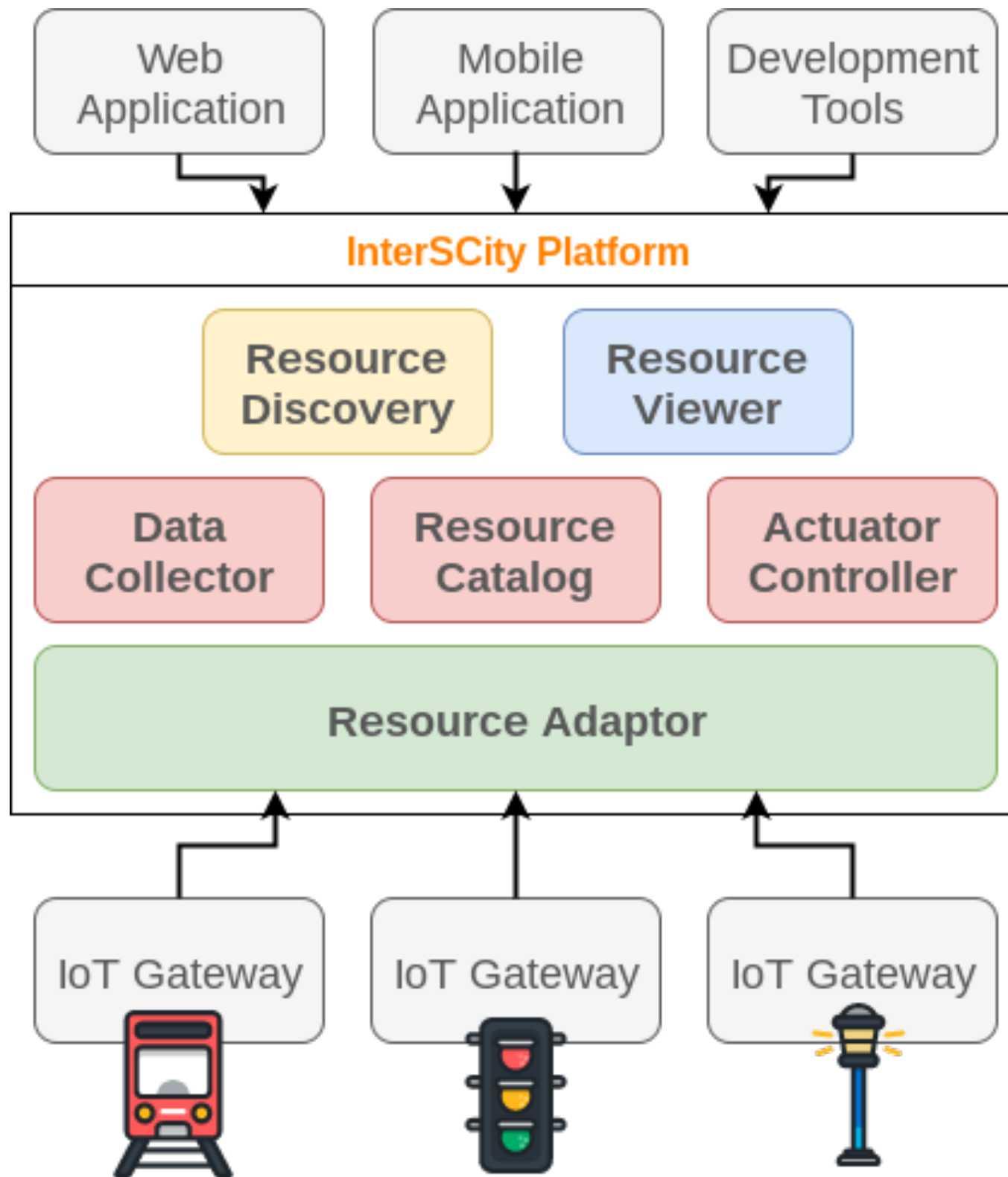
ACM Computing Surveys

Software Platforms for Smart Cities: Concepts, Requirements, Challenges, and a Unified Reference Architecture

Eduardo Felipe Zambom Santana, University of São Paulo
 Ana Paula Chaves, Federal Technological University of Paraná
 Marco Aurelio Gerosa, University of São Paulo
 Fabio Kon, University of São Paulo
 Dejan S. Milojicic, Hewlett Packard Labs Palo Alto

Making cities smarter help improve city services and increase citizens' quality of life. Information communication technologies (ICT) are fundamental for progressing towards smarter city environments. City software platforms potentially support the development and integration of Smart City applications. However, the ICT community must overcome current significant technological and scientific challenges before these platforms can be widely used. This paper surveys the state-of-the-art in software platforms for Smart Cities. We analyzed 23 projects with respect to the most used enabling technologies, functional and non-functional requirements, classifying them into four categories: Cyber-Physical Systems, Internet of Things, Big Data, and Cloud Computing. Based on these results, we derived a reference architecture.





GitLab Projects Groups Snippets Help

InterSCity Platform
Smart City Platform by the Software Systems Research Group - IMI
<http://interscity.org/>

Projects Subgroups Filter by name

- docs
Smart City Software Platform documentation
- dev-env
- kong-api-gateway

InterSCity: A Scalable Microservice-based Open Source Platform for Smart Cities

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Keywords: Smart Cities, Software Platform, Microservices, Scalability, Open Source Software

Abstract: Smart City technologies emerge as a potential solution to tackle common problems in large urban centers by using city resources efficiently and providing quality services for citizens. Despite the various advances in middleware technologies to support future smart cities, there are no universally accepted platforms yet. Most of the existing solutions do not provide the required flexibility to be shared across cities. Moreover, the extensive use and development of non-open-source software leads to interoperability issues and limits the collaboration among R&D groups. In this paper, we explore the use of a microservices architecture to address key practical challenges in smart city platforms. We present InterSCity, a microservice-based open source smart city platform that aims at supporting collaborative, novel smart city research, development, and deployment initiatives. We discuss how the microservice approach enables a flexible, extensible, and loosely coupled architecture and present experimental results demonstrating the scalability of the proposed platform.

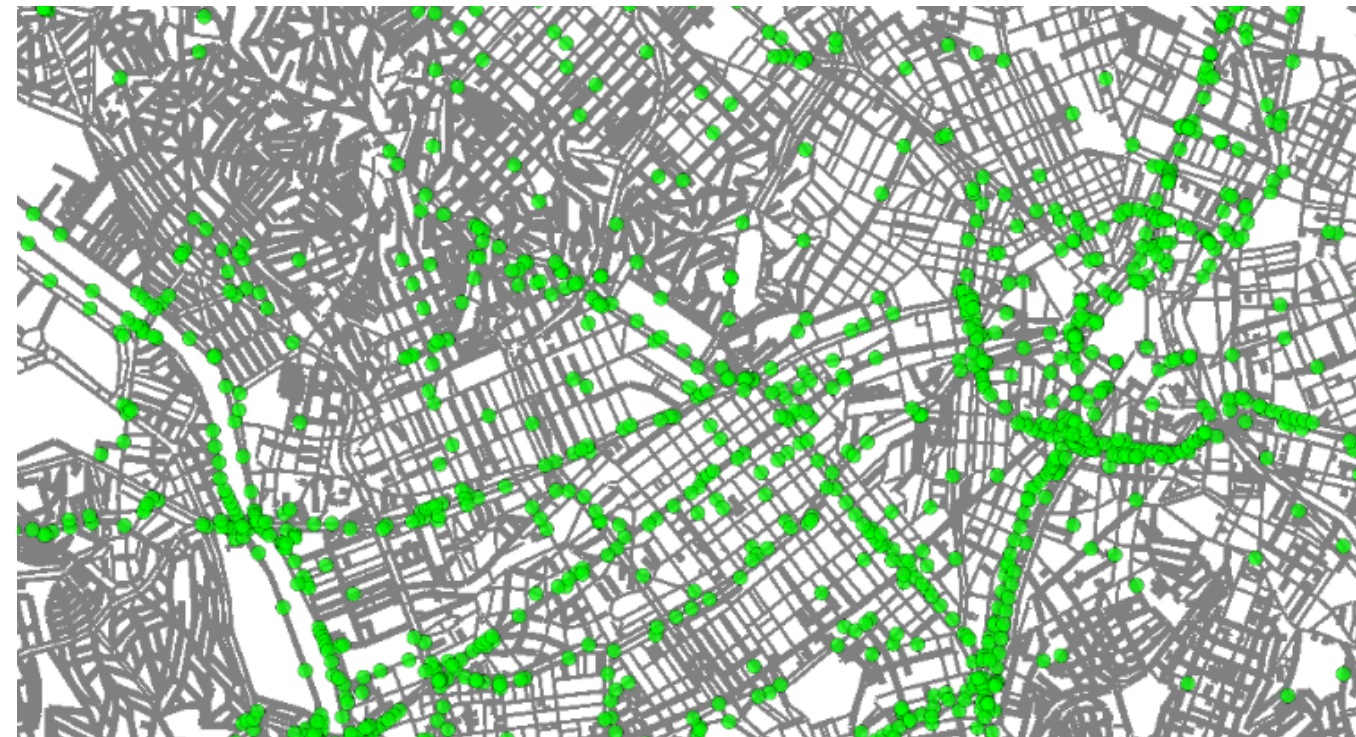
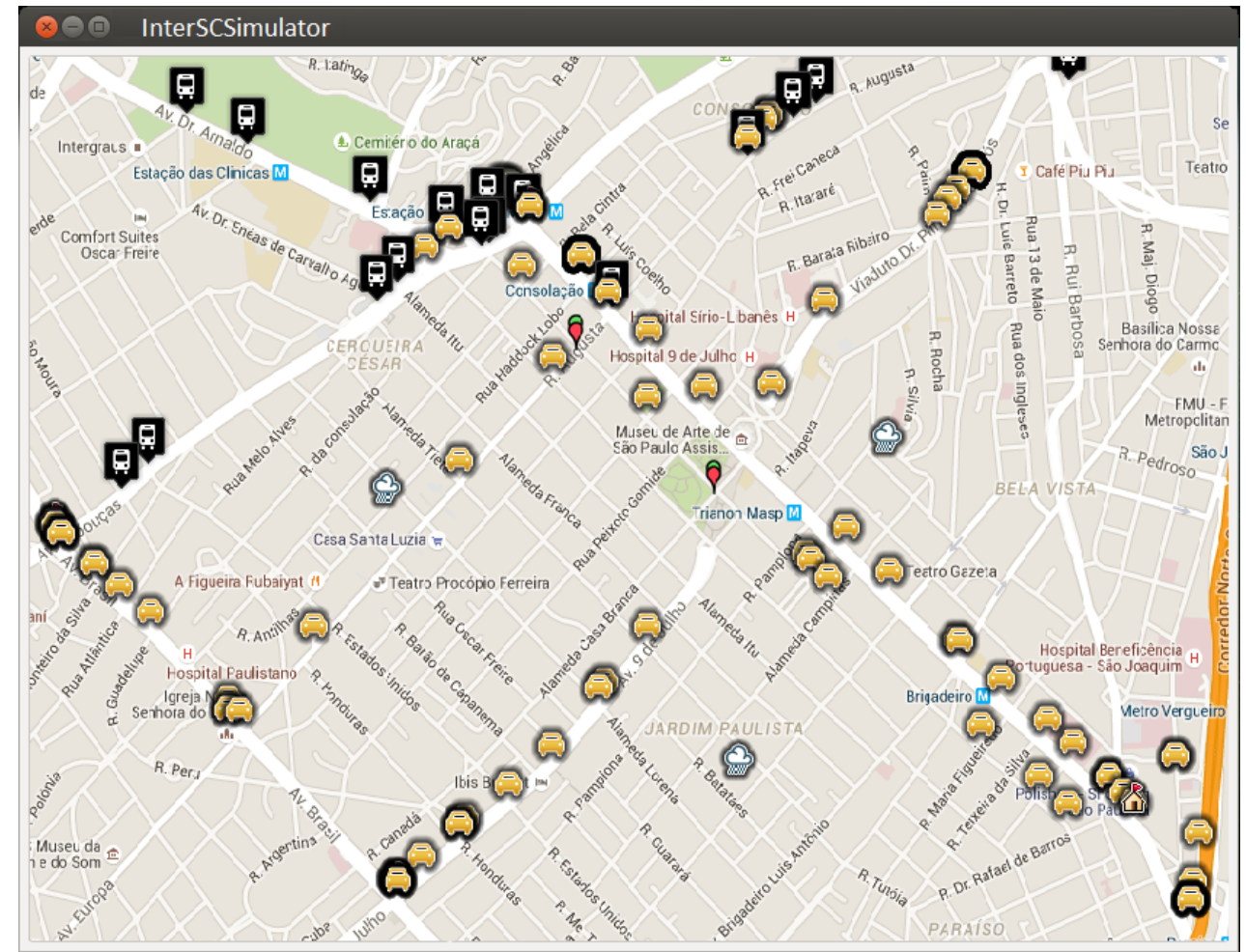
INTRODUCTION

The rapid growth of cities around the world has created large, densely populated urban centers characterized by complex interconnected structural, social and economic organizations. This urbanization phenomenon has led to several challenges, such as the need to

et al., 2014). The Internet of Things (IoT), Big Data, and Cloud Computing are key enabling technologies of smart cities that offer a wide range of opportunities and challenges, both in the academy and industry. To fully exploit the potential of these enablers, future smart cities will demand a unified ICT infrastructure to properly share their resources rather than relying

InterSCimulator

- Erlang-based large-scale simulator for Smart Cities
- Simulations with 10+ million agents in super-real-time
- Multimodal transportation
 - cars, pedestrians, buses, subway, (bicycles).
 - Impact analysis of changes in the transportation infrastructure and associated costs.
 - Population from Paraisópolis community in SP.



Collaboration with city governments

- São Paulo Secretary for Innovation
- Municipal Secretary of Health
- Municipal Secretary of the Environment
- Secretary of Transportation (Mobilab)
- Public IT Company (LabProdam)
- **Sharing of Data, Problems, and Challenges**

Como a CT&I pode ajudar nos transportes

Chave:

- Governo oferece **DADOS ABERTOS!!!**
- Sociedade busca soluções:
 - Universidades
 - **Startups**
 - Grandes Empresas

Exemplo

Startup Scipopulis =

Spin-off do nosso grupo de pesquisa

2 excelentes alunos de Ciência da Computação + 1
excelente Engenheiro + 1 excelente urbanista/designer

+ dados abertos

+ problema relevante

= solução inovadora e útil com grande potencial



Scipopulis' COLETIVO APP

(para os cidadãos)

ESPERÔMETRO
TEMPO DE ESPERA SEMANAL

30 min MÉDIA 1h30m TOTAL **30** min ATUAL 01

638H 0,05 24\$ 3x mais que o normal

45 min

JD. Maria Luiza

753H Como é que está esse ônibus?

2 Amigos

#euvoucommoto #daparasentar #lataardinha

Acidente na Rubem Berta, 978.

35 min

Vai de Metro que ônibus não dá!!

Salvando imagem da tela...

Coletivo 53

Ponto a 21 metros
Caio Prado C/B
24 linha(s)

7545-10
81125
JD. JOAO XXIII

Este ônibus já chegou? SIM

909T-10
82212
TERMINAL PINHEIROS

Este ônibus já chegou? SIM

909T-10
8705-10
FERNAO DIAS

HORA EXATA: 21 hrs :05

SCIPOPULIS São Paulo
Dia de referência 12/05/2017

RELATÓRIO DIÁRIO

RANKING DAS LINHAS MAIS LENTAS

Pico da manhã

1º	6008-21-0Term. Sto. Amaro	9.9 km/h
2º	5100-10-1Term. Pinheiros	10.4 km/h
3º	6805-10-0Term. João Dias	15.5 km/h

Pico da tarde

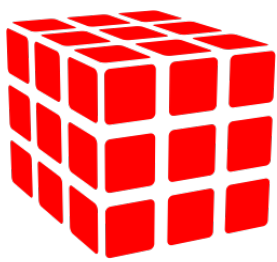
1º	5100-10-0Term. Pq. Dom Pedro II	8.4 km/h
2º	930P-10-0Term. Pinheiros	8.6 km/h
3º	6805-10-1Term. Capelinha	8.9 km/h

VELOCIDADE DOS ÔNIBUS NO DIA

CIRCULAÇÃO DE ÔNIBUS

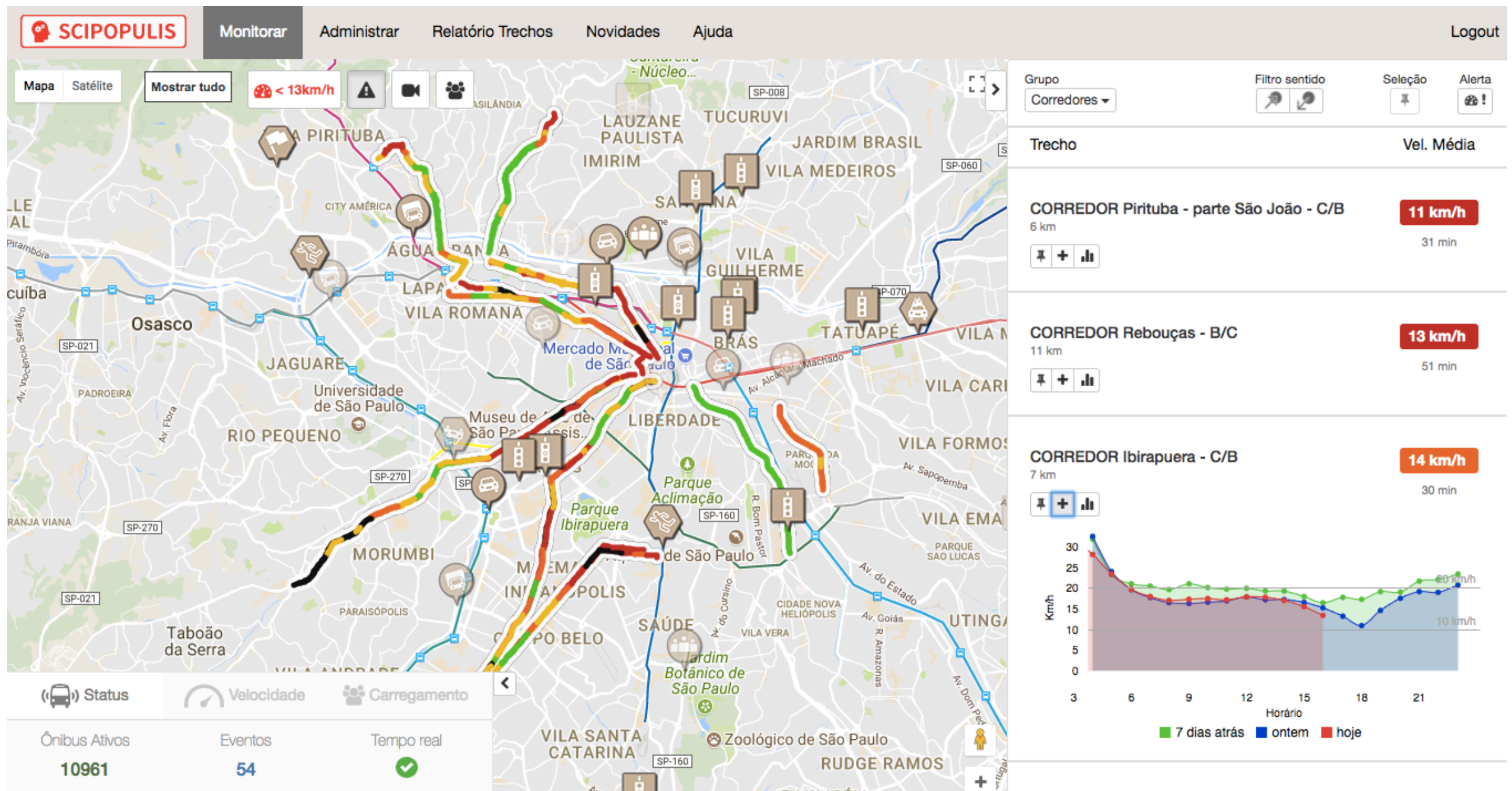
fale@scipopulis.com



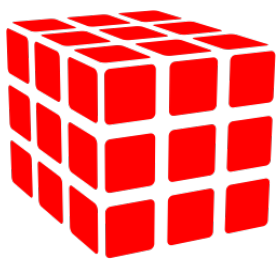


REAL TIME DASHBOARD

(para operadores do sistema)



- In use by the São Paulo secretary of transportation/SPTrans
- in test at: Rio de Janeiro, Curitiba, Santiago (Chile), Brasilia, etc.



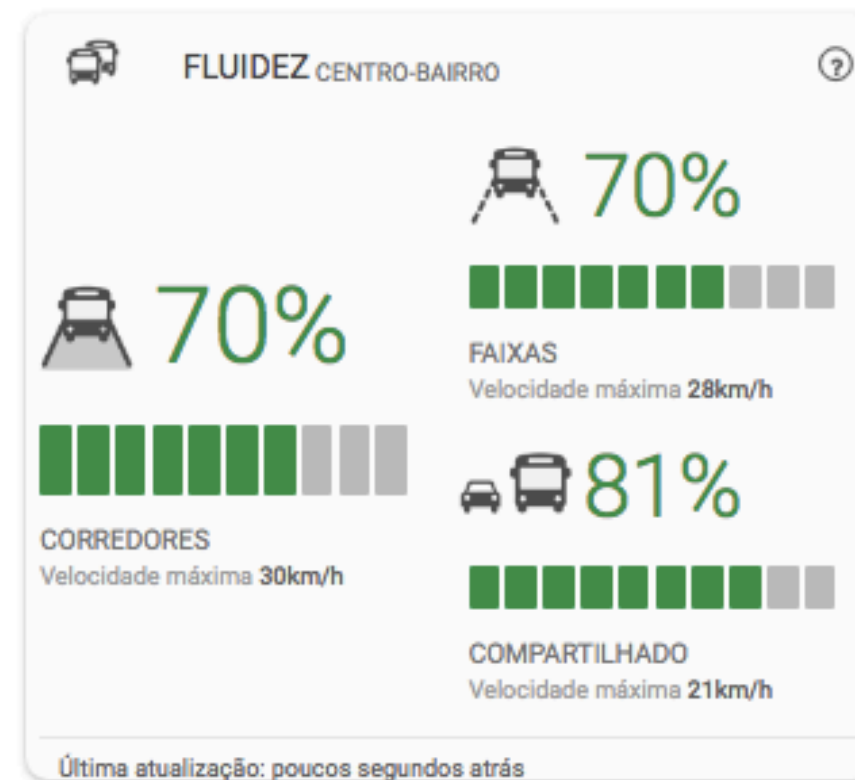
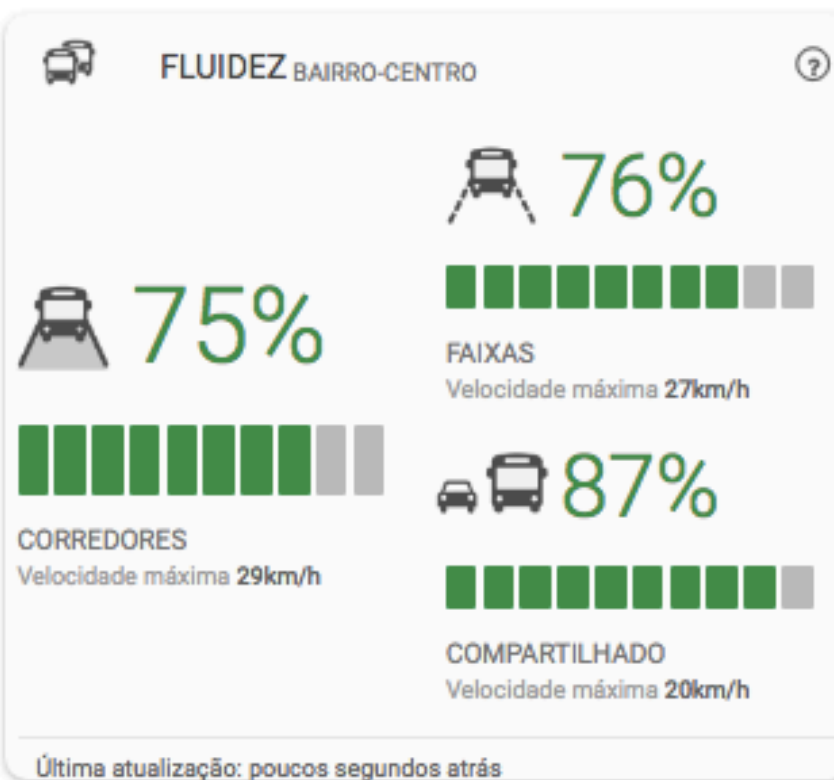
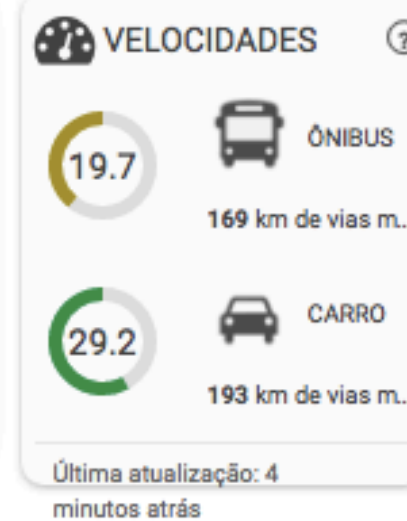
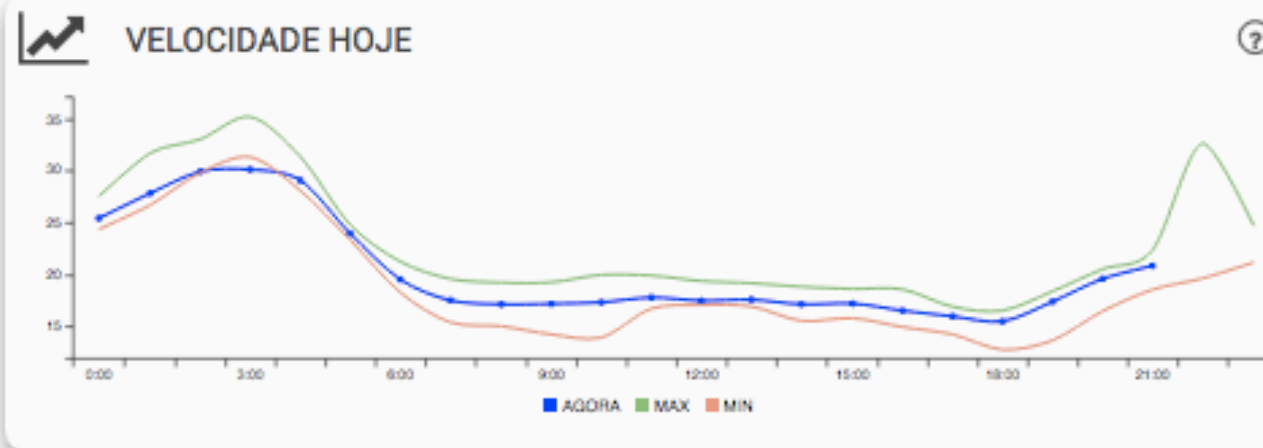
PAINEL DA MOBILIDADE

PAINEL DA MOBILIDADE

FLUIDEZ

VELOCIDADES

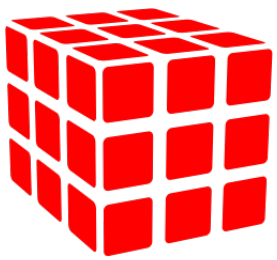
TEMPO



Semáforos em funcionamento 6246 (99.24%)

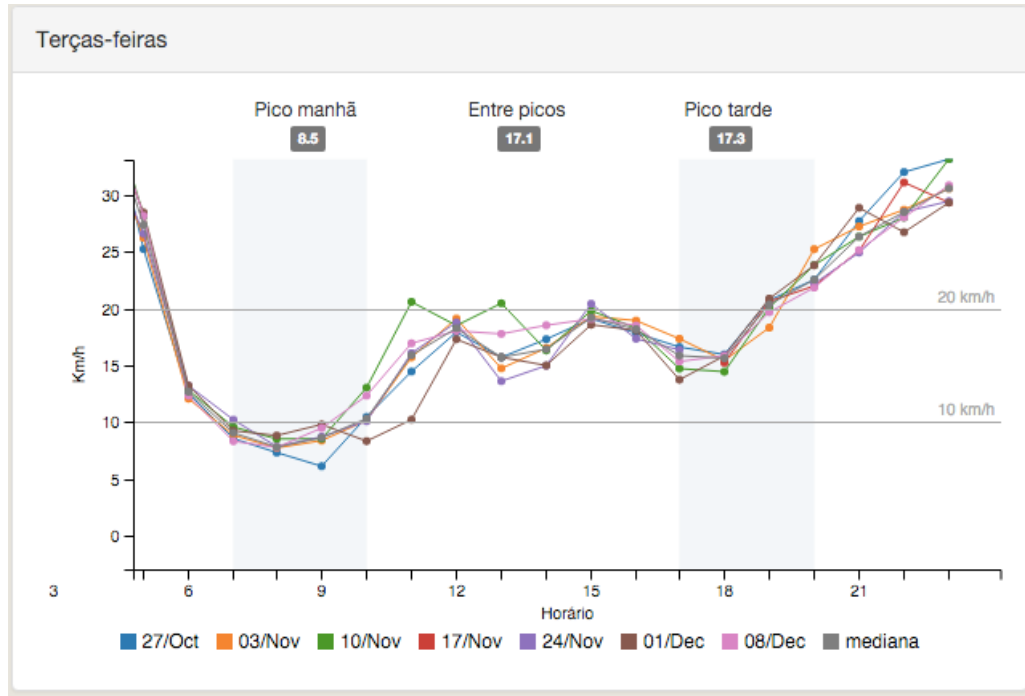
Total de ocorrências de trânsito hoje 214 / Média de ocorrências 130



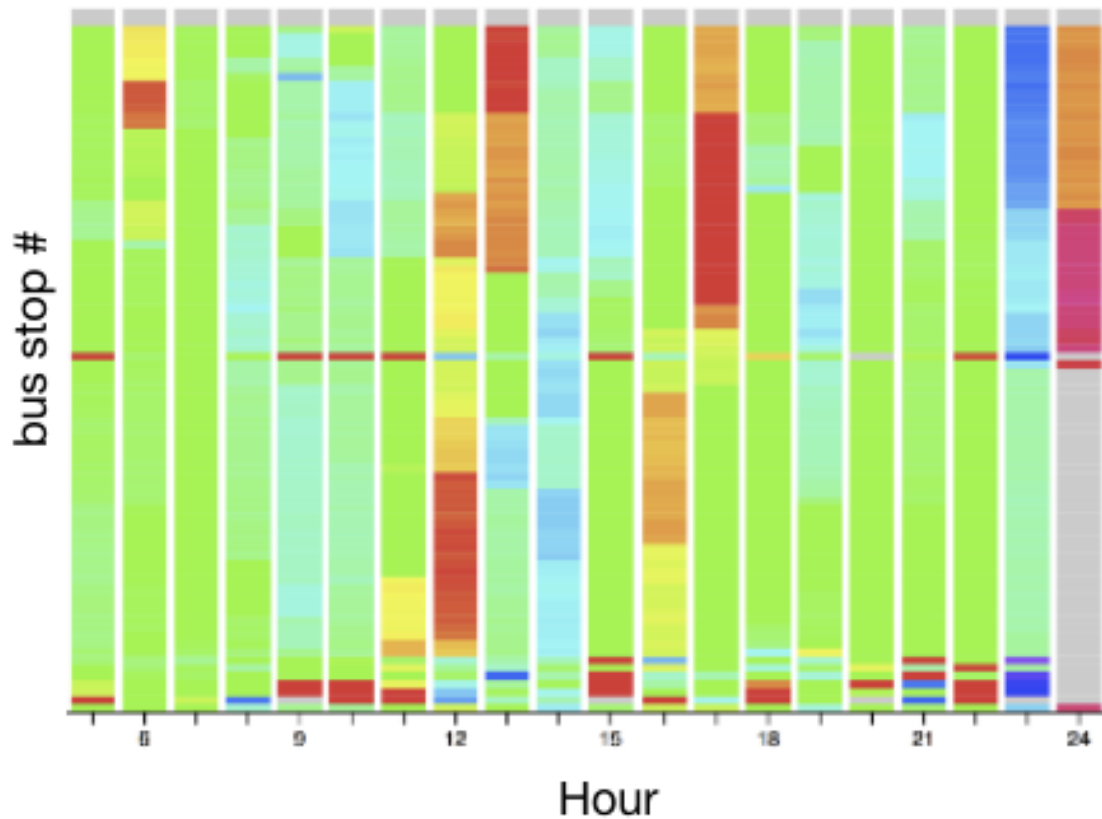


ANÁLISE DE DADOS e VISUALIZAÇÃO

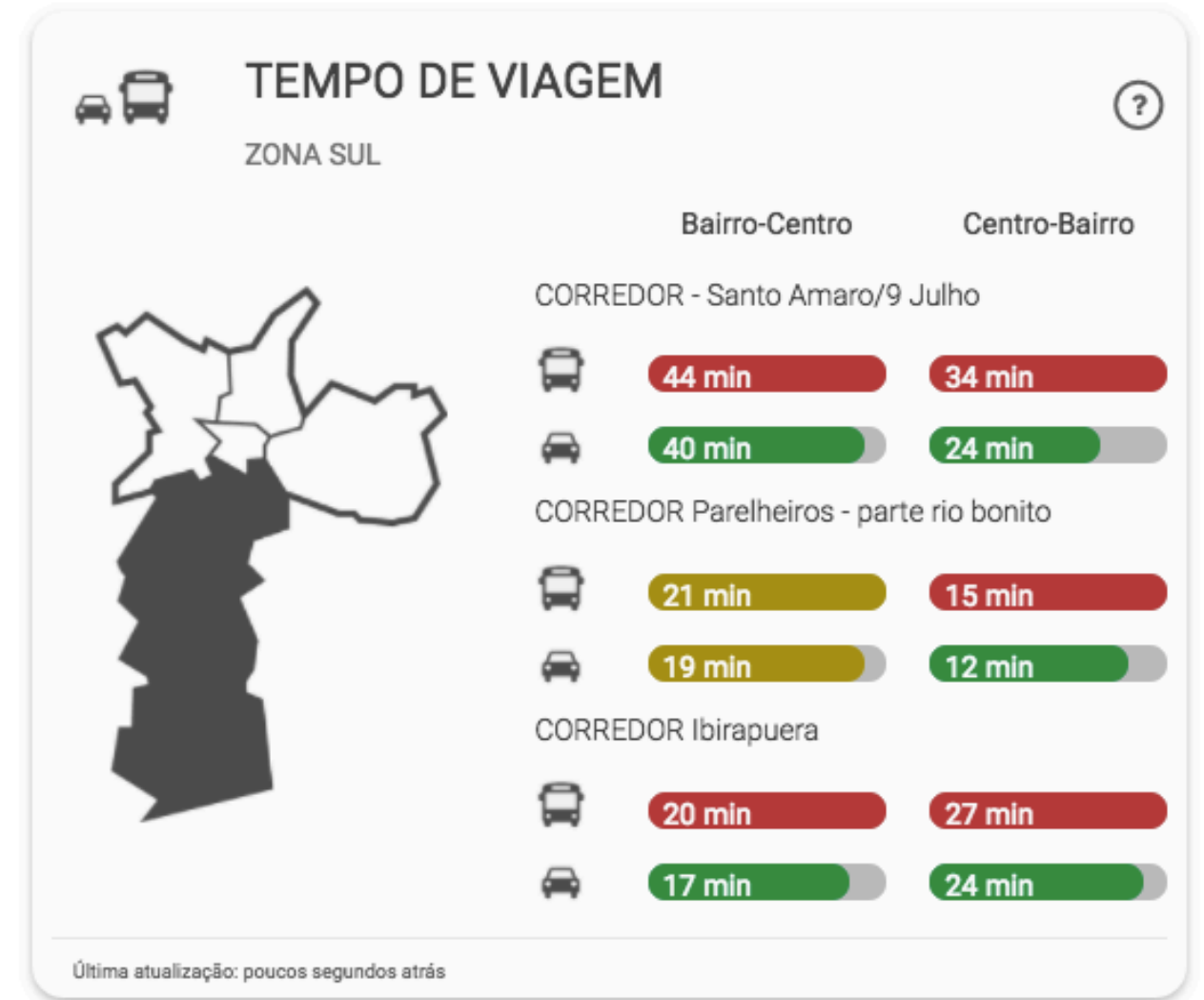
Historical data



Headway discrepancy per bus stop



Comparing bus x auto



TIETE LOCAL

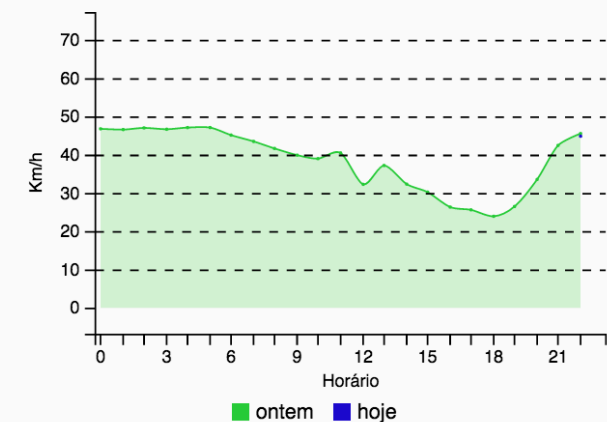
45.9

TEMPO REAL

Trecho: PTEDOLIMAO_PTEFRANC...

Sentido: AYRTONSENNA

2Km em 2 minutos



Receita para o futuro

- Colaborações com academia
 - Engenheiros de Transportes, Cientistas da Computação (Big Data, Machine Learning e Software)
- **Abertura de dados**
- Oportunidades para Startups

Contato

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