INSTITUTO DE PESQUISAS TECNOLÓGICAS

COMUNICAÇÃO TÉCNICA

Nº 176759

Smart environment e COVID: IPT experiences using InterSCity plataforma for real cases

Igor Cunha Teixeira
Alessandro Santiago dos Santos

Palestra apresentada no Webinar de Cidades Inteligentes, Internet Avançada e Ciência de Dados do Projeto InterSCity, São Paulo, 2020. "on line"

Instituto de Pesquisas Tecnológicas do Estado de São Paulo S/A - IPT
Av. Prof. Almeida Prado, 532 | Cidade Universitária ou
Caixa Postal 0141 | CEP 01064-970
São Paulo | SP | Brasil | CEP 05508-901
Tel 11 3767 4374/4000 | Fax 11 3767-4099

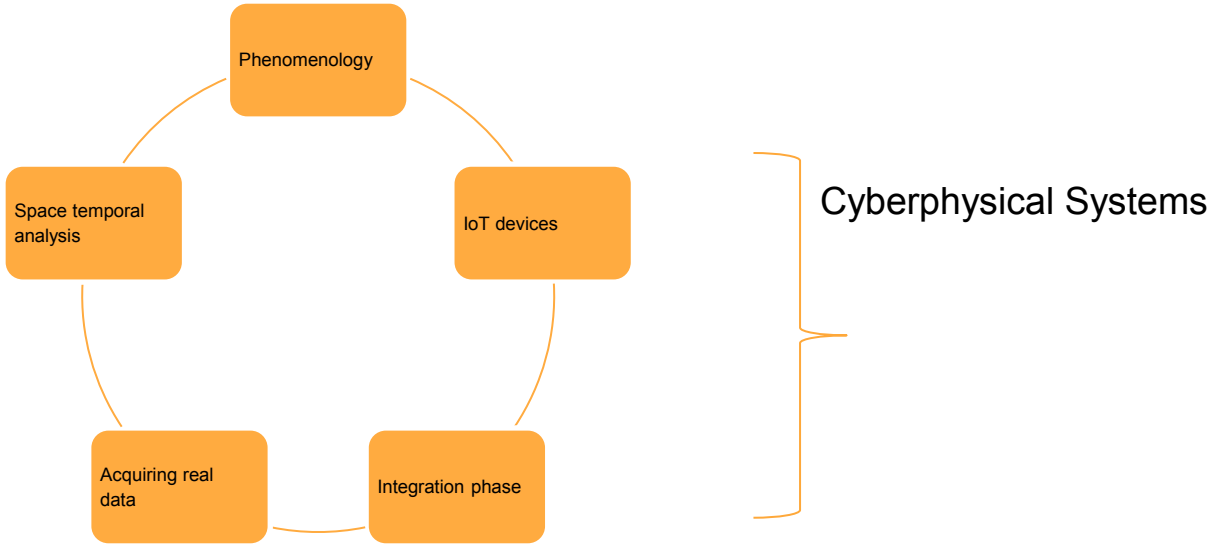
www.ipt.br

Smart Environment and COVID: IPT Experiences using InterSCity platform for real cases

Igor C. Teixeira
Alessandro S. Santos (supervisor)

Introduction

- Application of new digital technologies for monitoring and managing environmental pollution and natural disasters - focusing on the challenges and computational opportunities - must be integrated with phenomenology



Agenda and Challenges to Smart Environment

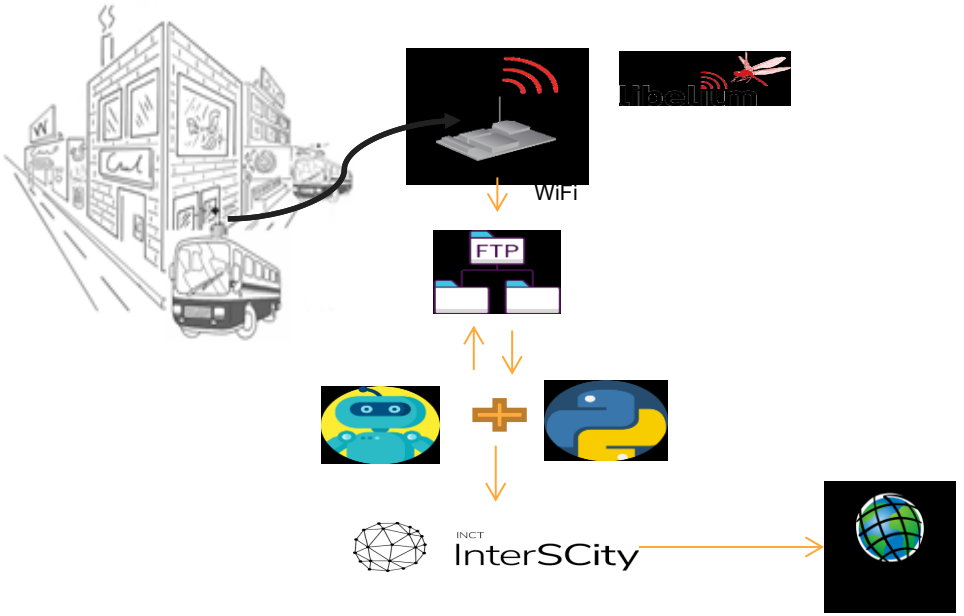
- Air Pollution
  - Increase the spatial resolution of monitoring. The cost of automatic air quality monitoring stations is high ($ 350,000). Therefore, there is a demand for the validation of low-cost monitoring devices and its dissemination to various areas of the city.
- Noise Pollution
  - Increase the spatial resolution of monitoring and validation of low-cost monitoring tools that can determine the sound profile of different parts of the city.
- Natural Disasters
  - The cost of automatic landslide monitoring stations is very high.
  - Flood monitoring has communication and power supply problems. Today level and flow rate measure depend on manual data collection.
- Worldwide biologic natural disaster
  - Rapid response to decision support to combat the coronavirus pandemic in São Paulo

Smart Environment for Air pollution

- Target: Air quality Monitoring to increase quality of life by deployment of intelligent public polices

- Main Parameters
  - NO_2, CO, O_3
  - Temperature, air humidity, atmospheric pressure

- Technological approach



Results and perspectives

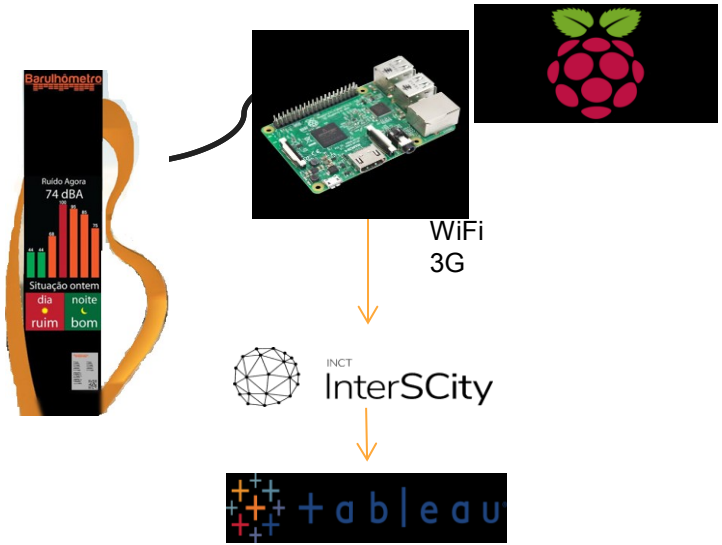
- Infrastructure to improve air quality monitoring systems
- Information to decision support for feet replacement by Eletric
- Policies evaluation for restricting urban transport vehicles (i.e. create exclusive region for electric vehicles)

Smart Environment for Sound pollution

- Target: noise monitoring to increase quality of life by deployment intelligent public polices

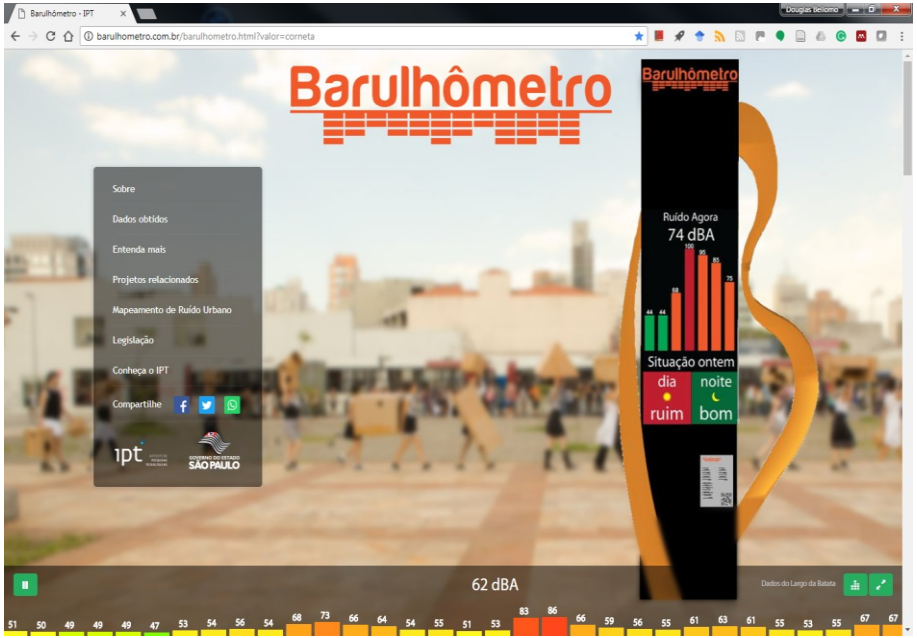
- Main Parameters
  - *Audio, pluviometry*

- Technological approach



Results and perspectives

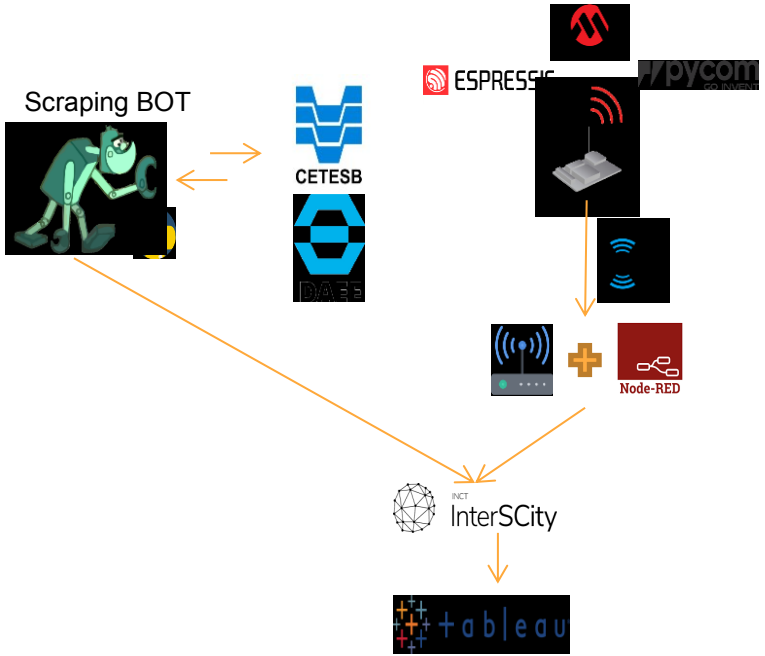
- Graphic representation of the noise level distribution and the sound waves propagation in a given region for a defined period.
  - Barulhômetro (https://barulhometro.com.br/)
- Waiting mayor decision to deployment



Smart Environment for Natural Disasters

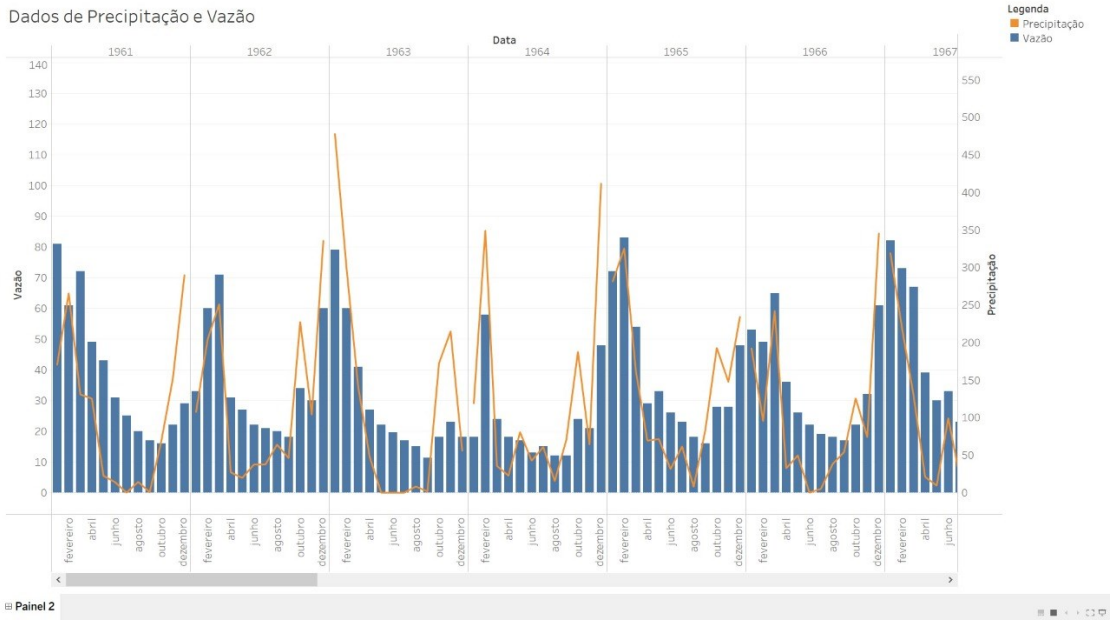
- Target:
  - For flooding: river flow and level to avoid economic damage and loss of life.
  - For landslide: rainfall data and displacement data.
- Main parameters
  - for flooding: *movement, pluviometry, air humidity, river flow and level data*
  - for landslide: *pluviometry, movement, temperature, air humidity, atmospheric pressure*

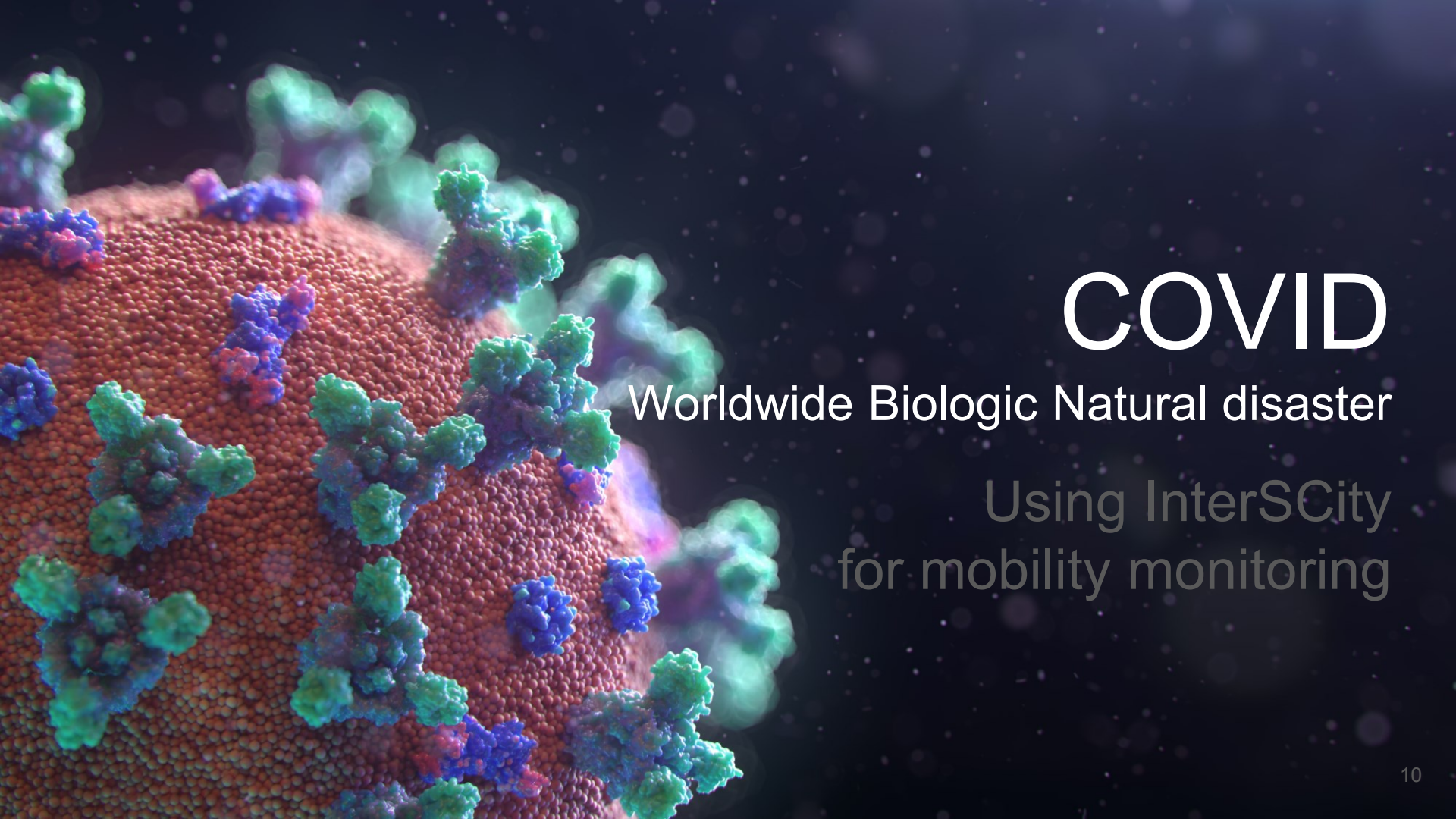
- Technological approach



Results expected

- Historical data (1937-2020) to analysis values that trigger landslides and floods.
- Predict and real-time detect natural disasters avoiding economic damage and loss of life;

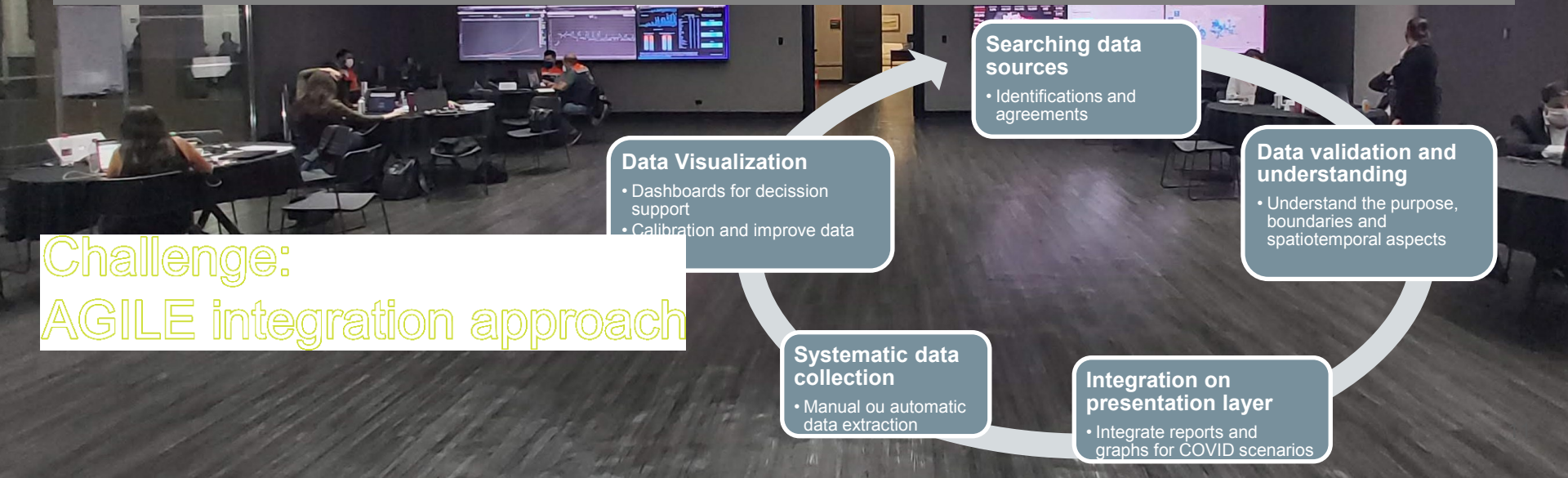



COVID
Worldwide Biologic Natural disaster
Using InterSCity
for mobility monitoring

COVID-19 Crisis Control Center – São Paulo

“An computing environment supplies the São Paulo State Government with information aggregated and anonymized data on mobility, health, economy and others, supporting public authorities in strategic actions to confront the COVID-19”

decreto nº 64.963, maio 2020

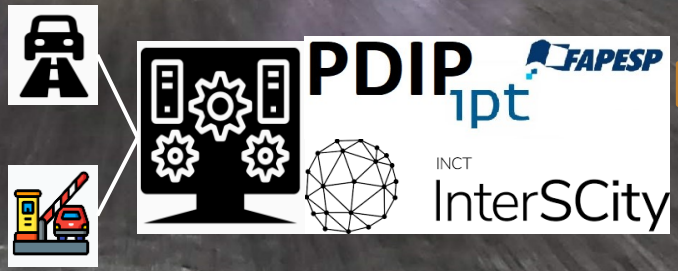


Challenge:

AGILE integration approach

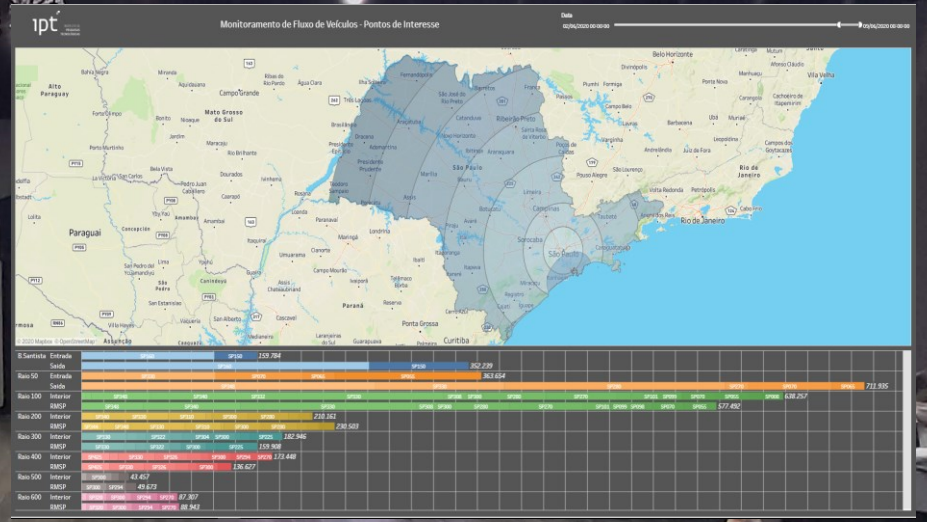
COVID-19 Crisis Control Center – São Paulo

- InterSCity support the Control Center with agile integration for mobility scenarios
- Intelligent Transportation Systems (hardware's and software's) are the information suppliers



InterSCity supporting São Paulo Control Center

- Main Sensors and System
  - Traffic counters
  - Speed camera
  - Automatic Vehicle identification (AVI)
- Target for analyses
  - Traffic Flow
  - Matrix O-D (Origin-Destination)
  - Spread map for SARS-COV-2



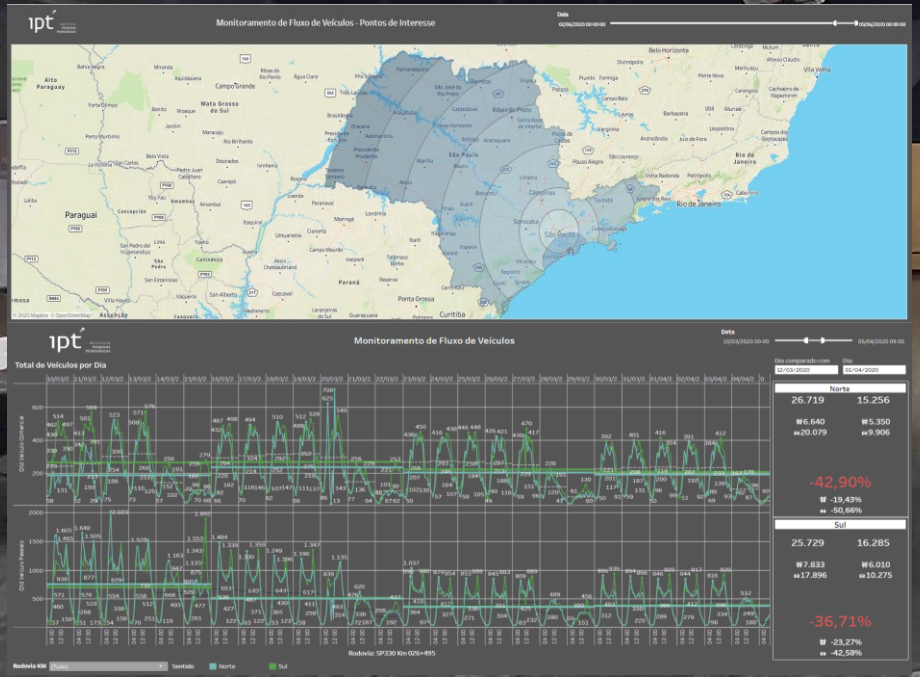
ARTESP
WRITESYS Traffic Systems
DER Departamento de Estradas de Rodagem

INCT InterSCity

+ableau

InterSCity supporting São Paulo Control Center

- Traffic Flow



- Matrix O-D

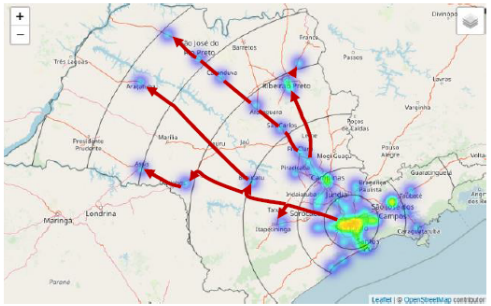
- **Automatic vehicle Identification**
- **Toll Plaza with Lat/Long identification**
- **Several rotes by vehicle kind**

Results and perspectives

- Mapping spread of COVID-19 using transport models
- Rapid integration using JSON
- Scalable and stable

Dispersão regional da Covid-19 no Estado de SP

SÃO PAULO
GOVERNO DO ESTADO
Secretaria de Logística e Transportes



- Atinge faixas radiais até **500 km** a partir da RMSP
- Segue pelo sistema rodoviário principal do Estado de SP que conecta as principais cidades do interior

10ª semana epidemiológica 10/03 a 17/03

Primeiros sintomas de **635 novos casos**, posteriormente confirmados e internados no ESP (SIVEP/Gripe).

Esta dispersão **não era visível na 10ª semana**, sendo constatada posteriormente, quando os contaminados foram internados na 11ª semana (fato determinante para o início da quarentena em 24/mar).

Eixo: Rodovia Castelo Branco e Raposo Tavares

Eixo: Rodovia Marechal Rondon

Eixo: Rodovia Washington Luiz

Eixo: Anhanguera

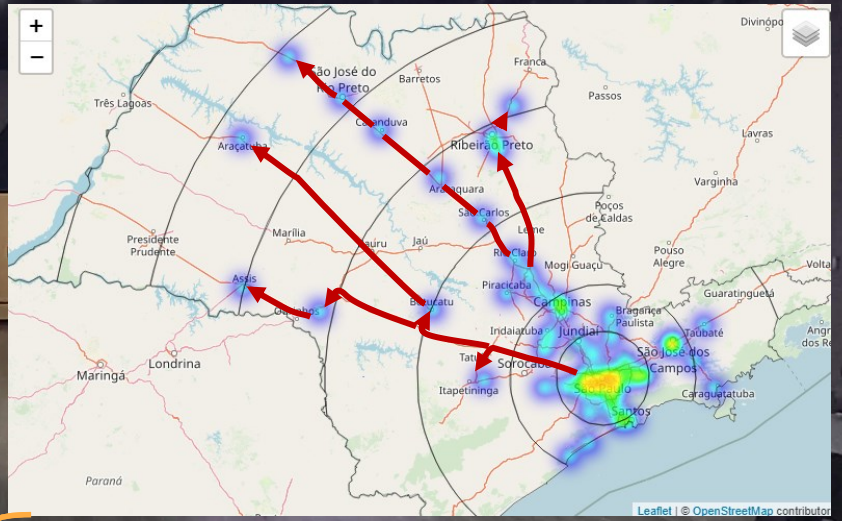
Além da distribuição até 200 km pelos Sistemas Anhanguera-Bandeirantes, Anchieta-Imigrantes, e Rodovias próximas à RMSP

Elaboração: DERSA e SLT

Fonte: SIVEP-Gripe

Results and perspectives

- Mapping spread of COVID-19 using transport models
- Rapid integration using JSON
- Scalable and stable



Contágio na 10ª semana seguiu rodovias do Estado de SP que conecta as principais cidades do interior

Eixo: Rod. Castelo Branco e Raposo Tavares

Eixo: Rod. Marechal Rondon

Eixo: Rod. Washington Luiz

Eixo: Anhanguera

Além da distribuição até 200 km pelos Sistemas Anhanguera-Bandeirantes, Anchieta-Imigrantes, e Rodovias próximas à RMSP

Conclusions

- We are collecting data to supply bases to new computing approach
- Future works
  - New aspects from smart environment
  - Calibration aspects

INCT InterSCity

Thank you!!!

igort@ipt.br
alesan@ipt.br

ipt INSTITUTO DE PESQUISAS TECNOLÓGICAS 120 anos

CAPES

FAPESP

CNPq