

FAPESP 60 Anos

Computação: Ciência Engenharia e Arte

CLOUD | Data Centers

Thousands

FOG | Nodes

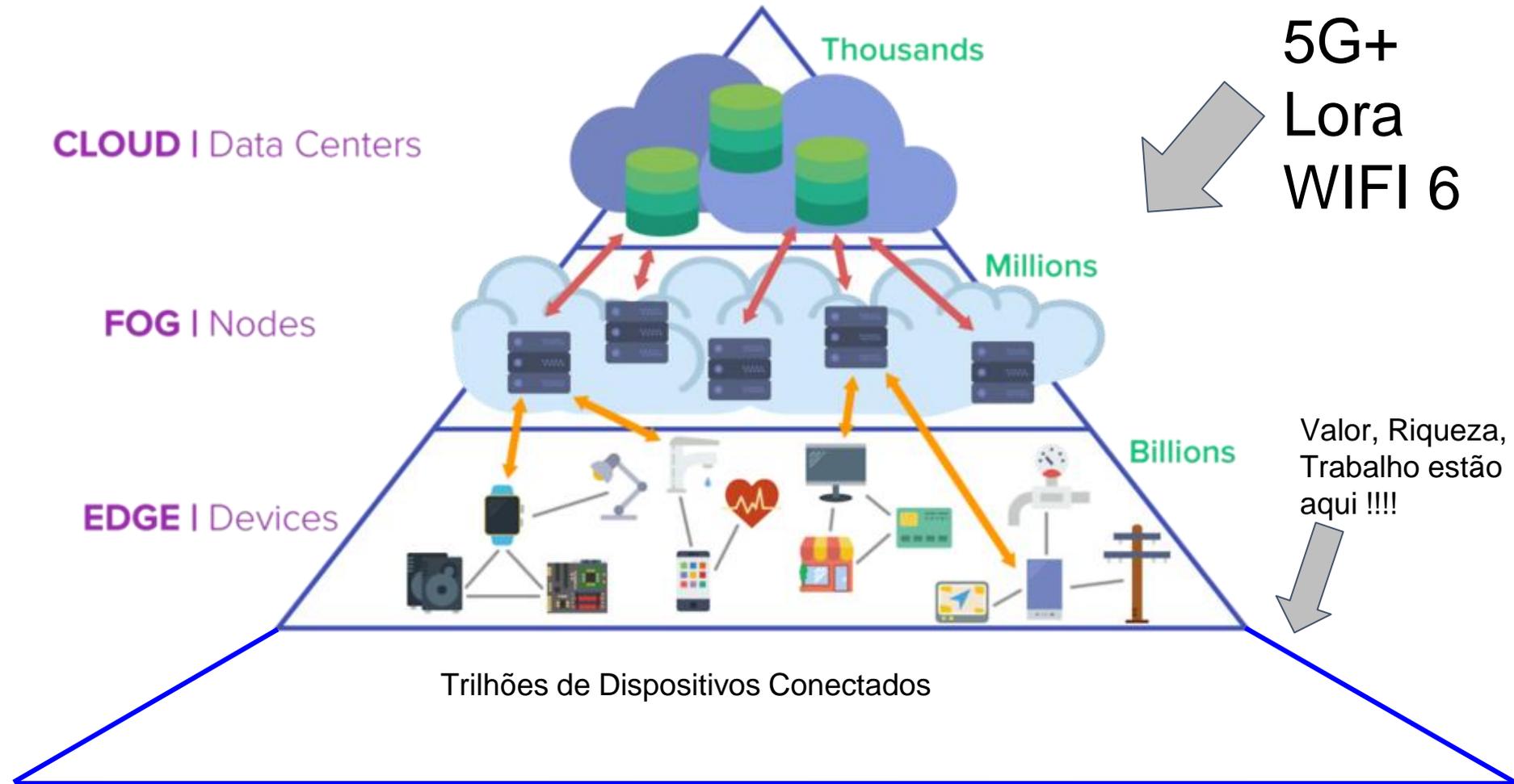
Millions

EDGE | Devices

5G+
Lora
WIFI 6

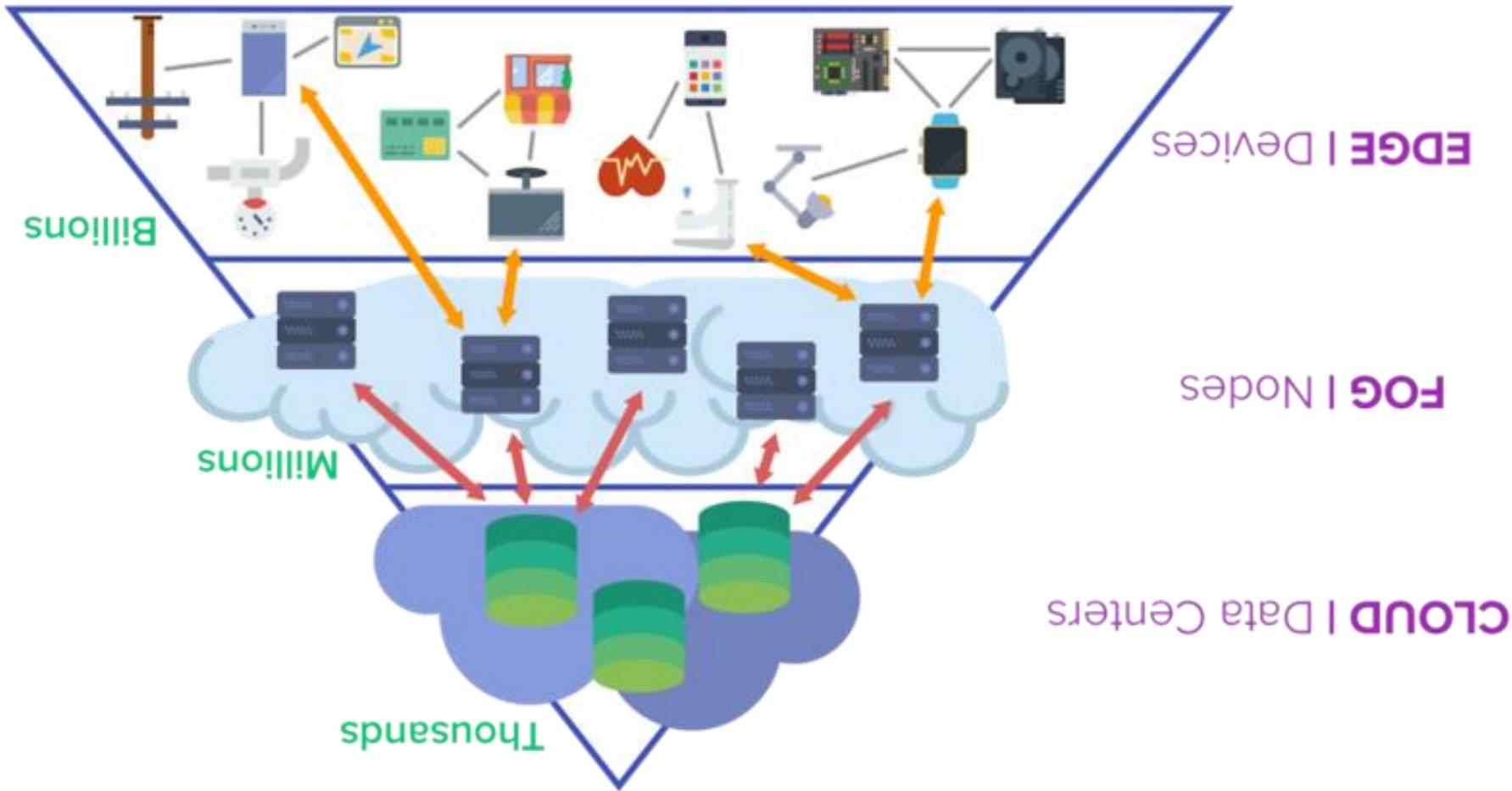
Valor, Riqueza,
Trabalho estão
aqui !!!!

Trilhões de Dispositivos Conectados



Cognitive Edge

Milhões de YottaBytes
30 Bilhões de CPUs



...



Share



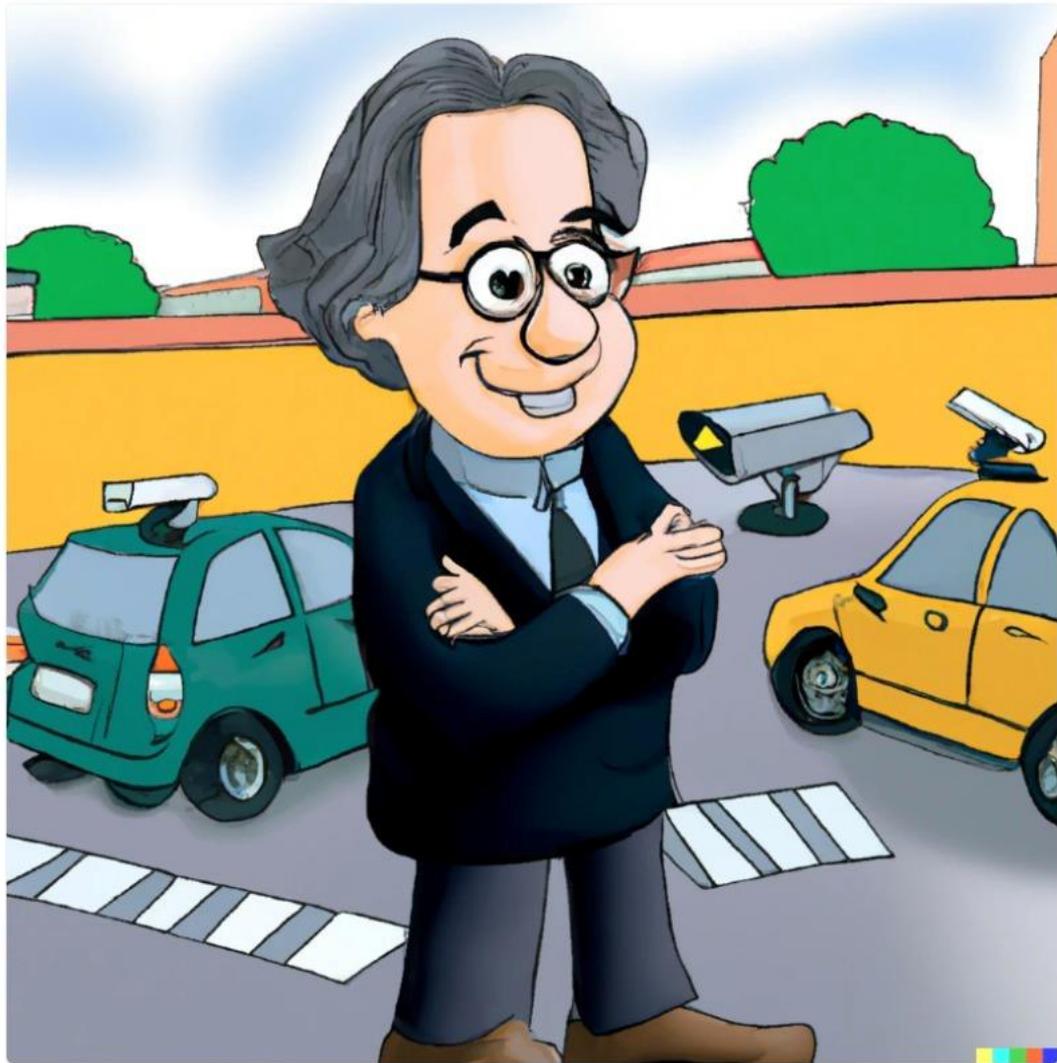
“a bandit holding a gun, cartoon”



Geovane × DALL-E

Human & AI





...



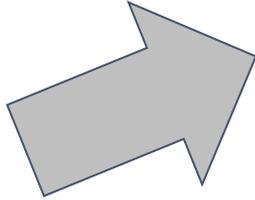
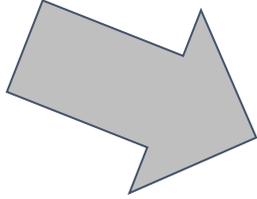
Share

“a happy and kind professor in the street, surrounded by cars. on top of each car there is a small security camera. the professor is 50 years old and has black hair. cartoon.”



Geovane × DALL-E

Human & AI





Current IoT is **cloud-centric**



In the future it will be **decentralized** and will run in the **edge**





USP



A computing paradigm for **scalable resource sharing** among **autonomous, secure** and **intelligent** entities.



Living specimen Swarms perform complex tasks





Caninos Loucos

Project presentation



Caninos Loucos

- SBCs designed and manufactured in Brazil
- Open Hardware and Software
- Focus on edge computing

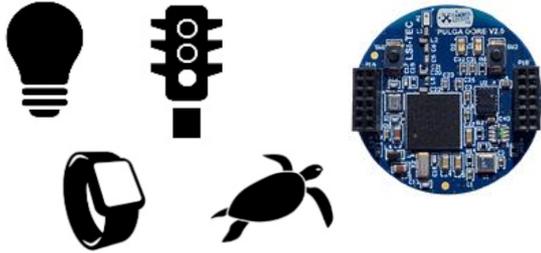


2018
prêmio MERCOSUL DE
CIÊNCIA E TECNOLOGIA



A Family of SBCs

TINY



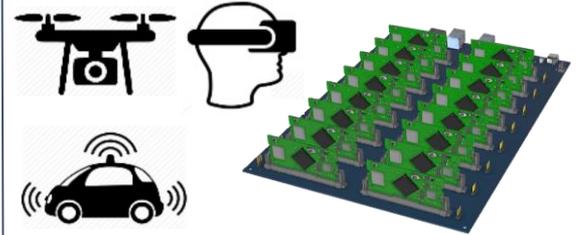
- **tiny**
- coin sized
- autonomous
 - low power
 - energy harvesting
- wireless communication
- built-in crypto

MID



- **mid-size**
- credit card sized
- PC equivalent processing
- general purpose computing
- audio and video processing
- broadband communication

HIGH



- **high-end**
- no size restriction
- high performance computing
- programmable co-processing
- multiple communication channels



CORE BOARD V3.0

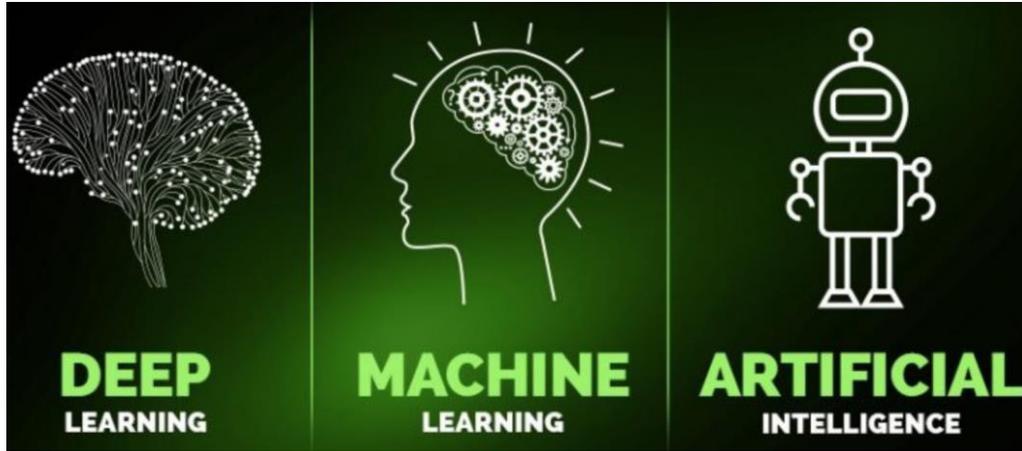
CPU	64-bit quad-Core ARM Cortex A53 1,3GHz CPU (ARM v8 instruction set)
GPU	ARM Mali450 MP6 (4PP + 2GP). Suporta: OpenGL-ES 1.1 e 2.0, OpenVG 1.1, EGL 1.5
Memória	2 GB LPDDR3 SDRAM 16GB eMMC
Sistema operacional	Debian 10 Linux Kernel 4.19
PMU	ATC2306C - Gerenciamento de energia e subsistema de áudio
Vídeo	2160p@30fps ou 1080p@60fps com suporte a codificação de vídeo (incluindo H264, H263, MPEG-4)
Interface de expansão	Conector DDR3 SODIMM 204 pinos (macho)
Botão	ADFU
Dimensões	67.6 x 31.0 mm
Peso	10.1g



Labrador Operating System



AI Tools



Keras
Theano
Tensor-flow
Torch*

Scikit-Learn
Pandas
Numpy
Scilab
OpenCV-contrib
R

Lisp
Prolog/Scheme
R
Python
C/C++/Java/Mono
(C#/.Net)

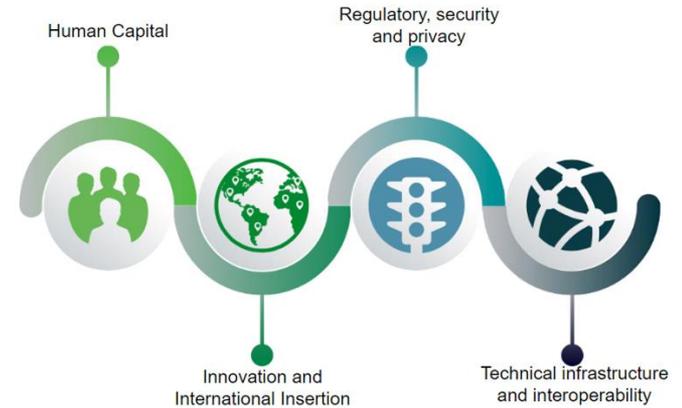
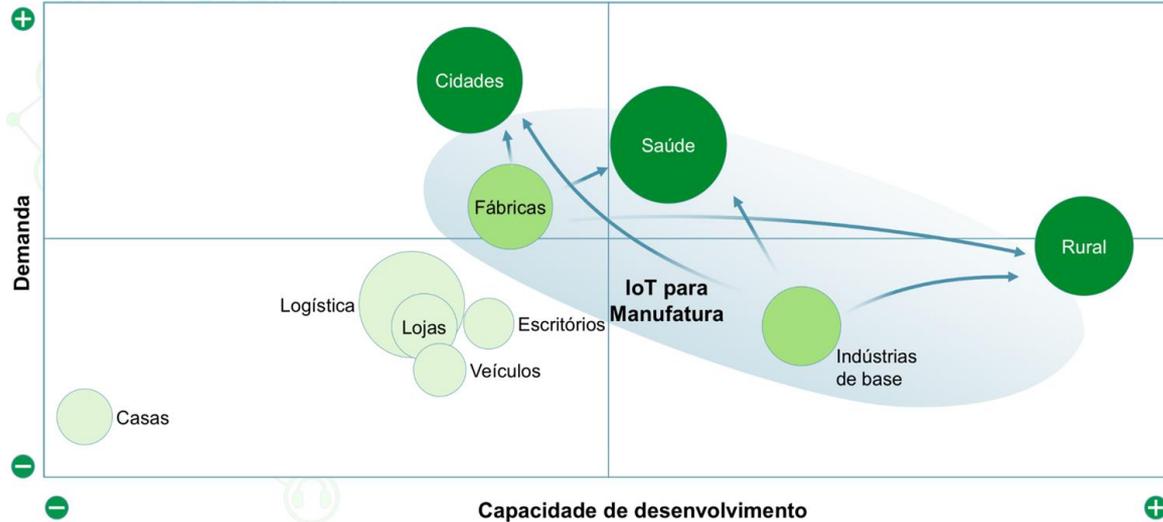


Large Scale Pilots

Brazilian National IoT plan

Demanda x Capacidade de desenvolvimento x Oferta (tamanho do círculo)

● Frente Prioritária ● Frente Mobilizadora



"Accelerate the IoT deployment as a developing as a tool for the sustainable development of Brazilian society, capable of increasing competitiveness of the economy, strengthening national productive chains and promoting the improvement of the quality of life."

Contexto de segurança no Brasil

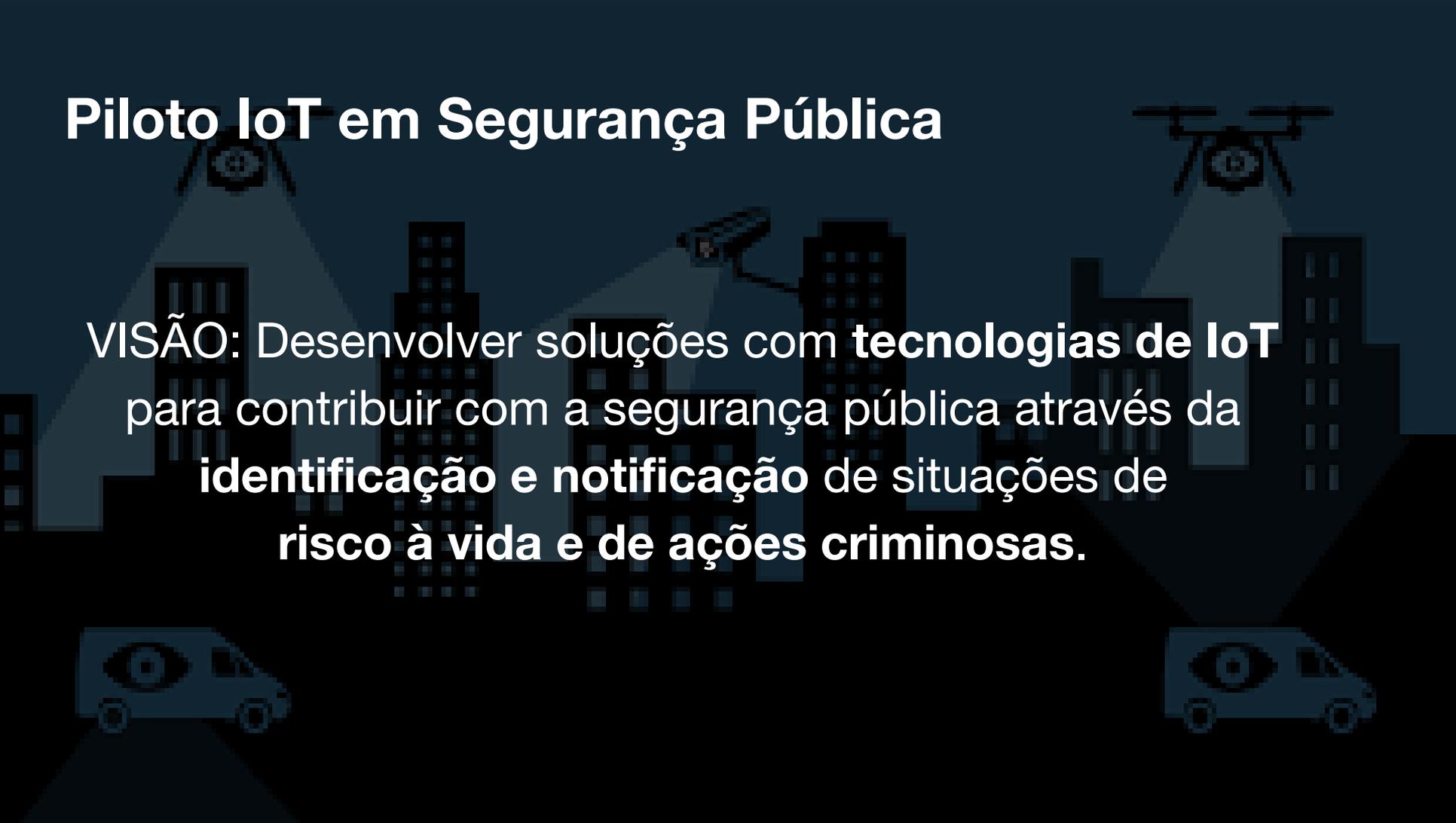
- Altos índices de violência e criminalidade (7º no mundo)¹
- Taxa de homicídios crescentes²
- Sequestros relâmpagos
- Impacto no GDP: R\$ 82 Bi (~ 4%)³
- Perdas em São Paulo: ~ R\$ 10 Bi

¹ https://www.numbeo.com/crime/rankings_by_country.jsp

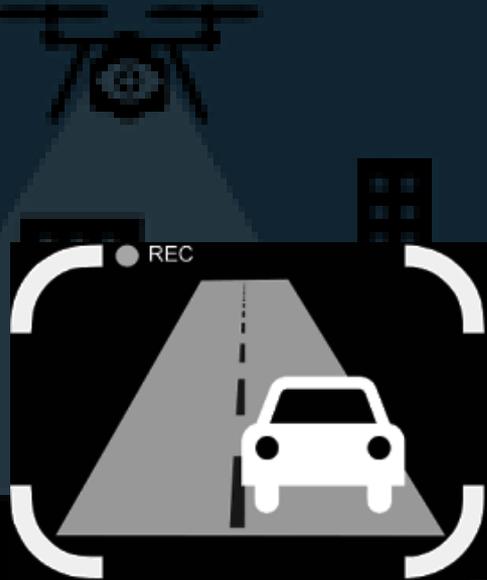
² <http://databank.worldbank.org/data/reports.aspx?source=2&series=VC.IHR.PSRC.P5&country=>

³ <https://g1.globo.com/politica/noticia/brasil-tem-o-maior-gasto-com-violencia-entre-os-paises-da-america-latina-e-caribe.ghtml>

Piloto IoT em Segurança Pública

The background features a dark blue city skyline with various IoT-enabled devices. At the top, two drones with camera lenses are positioned on the left and right. In the center, a security camera is mounted on a building. At the bottom, two vans with large eye-like sensors on their sides are shown. The overall theme is smart city security.

VISÃO: Desenvolver soluções com **tecnologias de IoT** para contribuir com a segurança pública através da **identificação e notificação** de situações de **risco à vida e de ações criminosas.**



Projeto de Vigilância Móvel Colaborativa



Identificação de cenários diversos



violence



accidents



forgotten baby



crime



car tracking



forgotten pet



natural disasters



express kidnapping



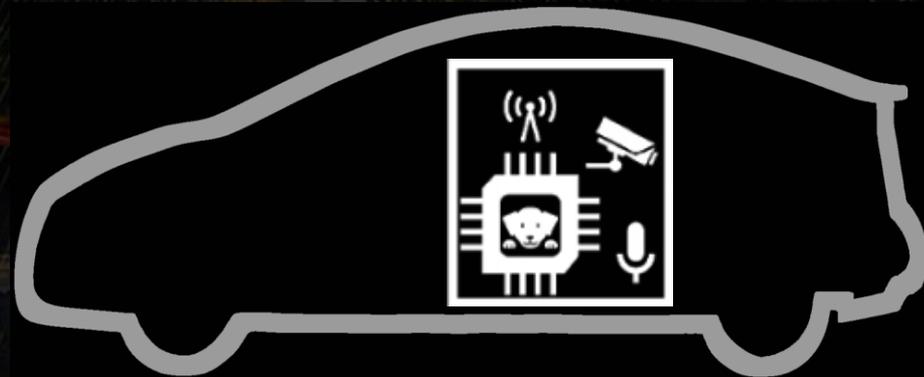
crime map



police/rescue

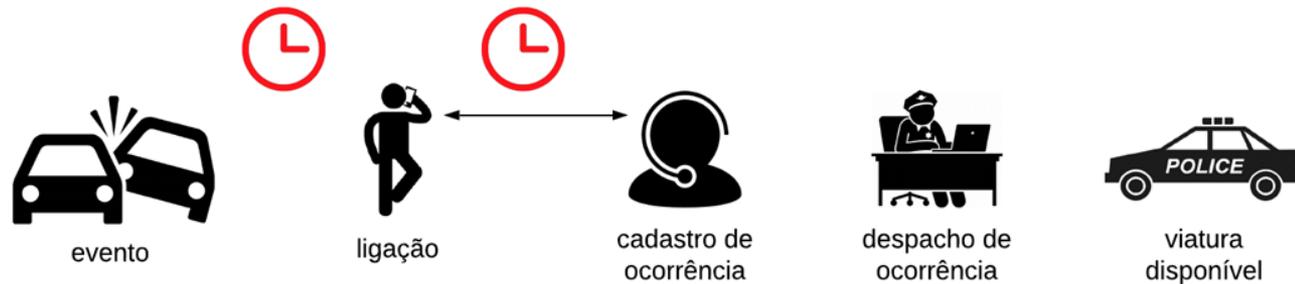


other cars



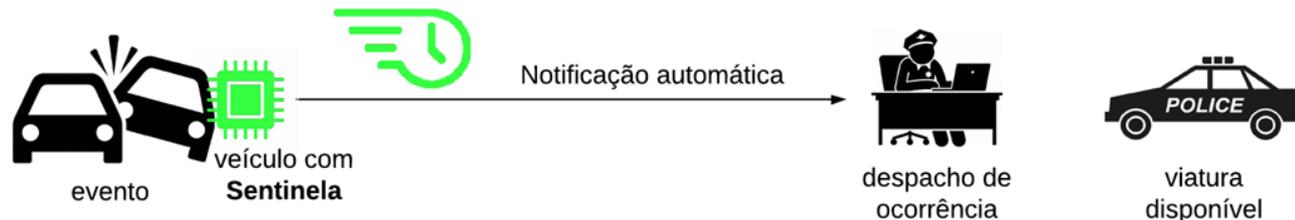
Acionamento de serviços de segurança pública

Hoje



Tempo

Com
CMSS



Tempo

PM Trial 100 Cars

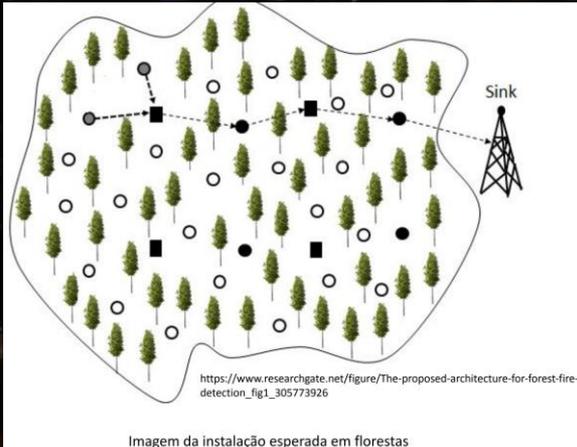
Prova de conceito funcional com t



Internet of Trees CO₂ USP-PIPAE

Monitoramento de florestas urbanas

- Sensores IoT manufacturados e em teste
 - CO₂
 - Umidade
 - Temperatura
 - Incidência UV



LongRange ~40Km

ShortRange ~200M
Sensor 4.0
Sensor Co2

(PPM)
(%)
©
o

H2O
Temp
Pressa
UV (Ix)

Bateria
LiPo ~1 Ano



Antenas (curto alcance - bluetooth e longo alcance - LoRa)

Cameras para detecção de condições climáticas e objetos

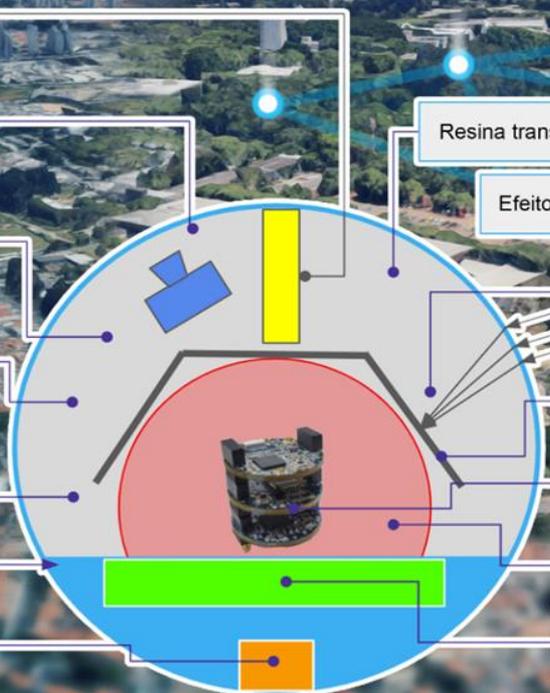
Isolamento térmico, transparente para captação da luz pelos painéis solares

Superfície resistente a radiação UV, sal e neve

Temperatura, Co2, UV, Luz, GPS, Pressão, Magnetometro, Umidade

Nível de Flutuação

Plugue para fonte de alimentação adicional



Resina transparente

Efeito Lente

Painéis Solares

3D AME Pulga Pronto p/ Swarm

Proteção térmica

Baterias



6,5 cm

Obrigado

BNDES IoT Pilots for Smart Cities

