



Use of balloons for forest monitoring and machine data transmission

6th International Forest Engineering
Conference (FEC2018)

*"Quenching our thirst for new
knowledge"*

Smart Forest Program

Machine Data
(Telemetria)

Environmental Data
(Sensing)

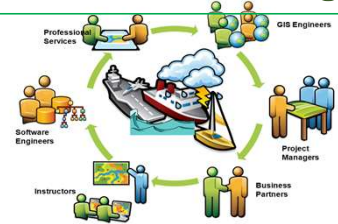
Communications



Integration



Decision Making



Mobility



Analytics (BigData)



Agenda

1. Objectives
2. Technology description
3. Results
4. Application Analysis
5. Conclusions





1 Objectives



The objective of this study was to evaluate use of balloons for



Fire Detection

Data transmission

Surveillance



2

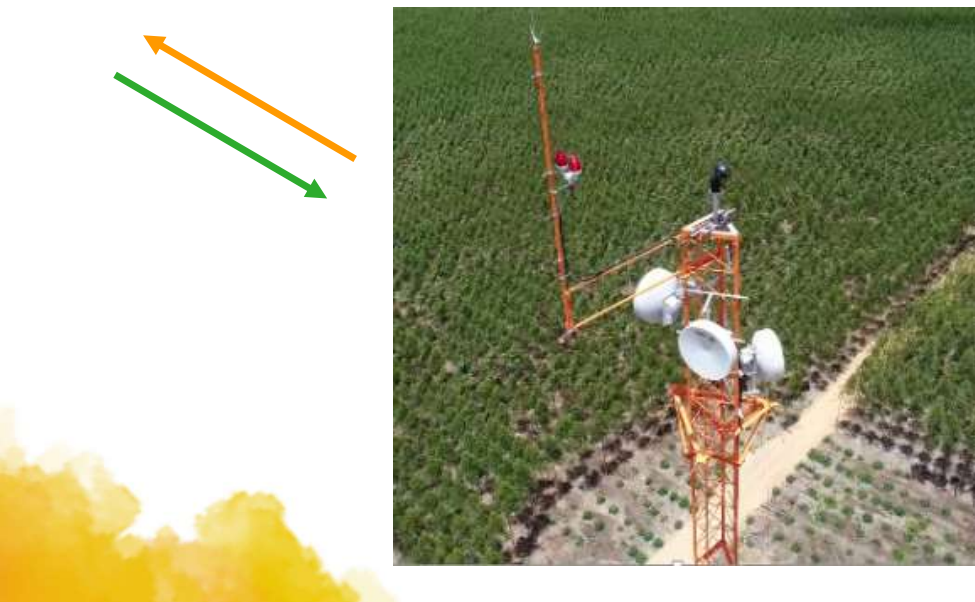
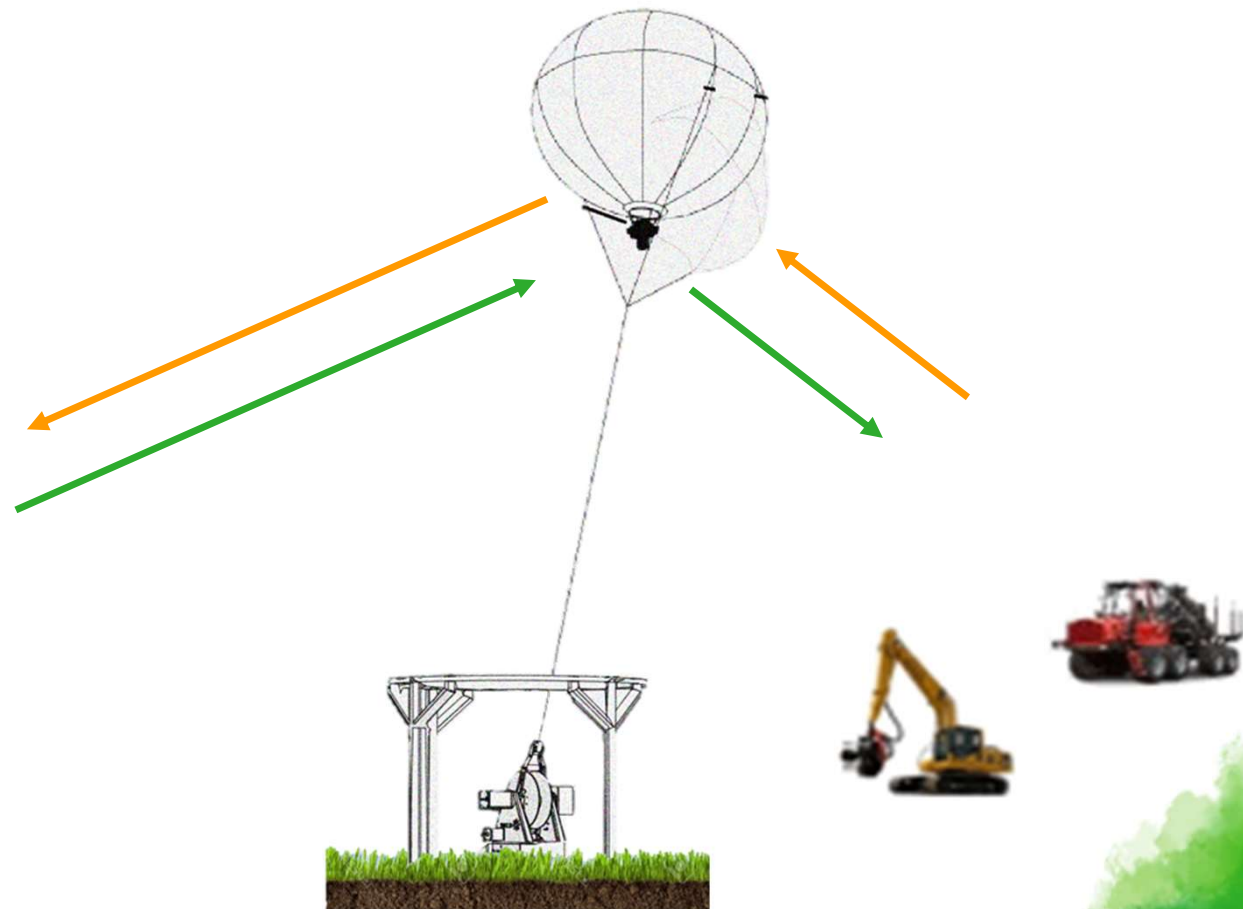
Technology Description

(Trial Connection)

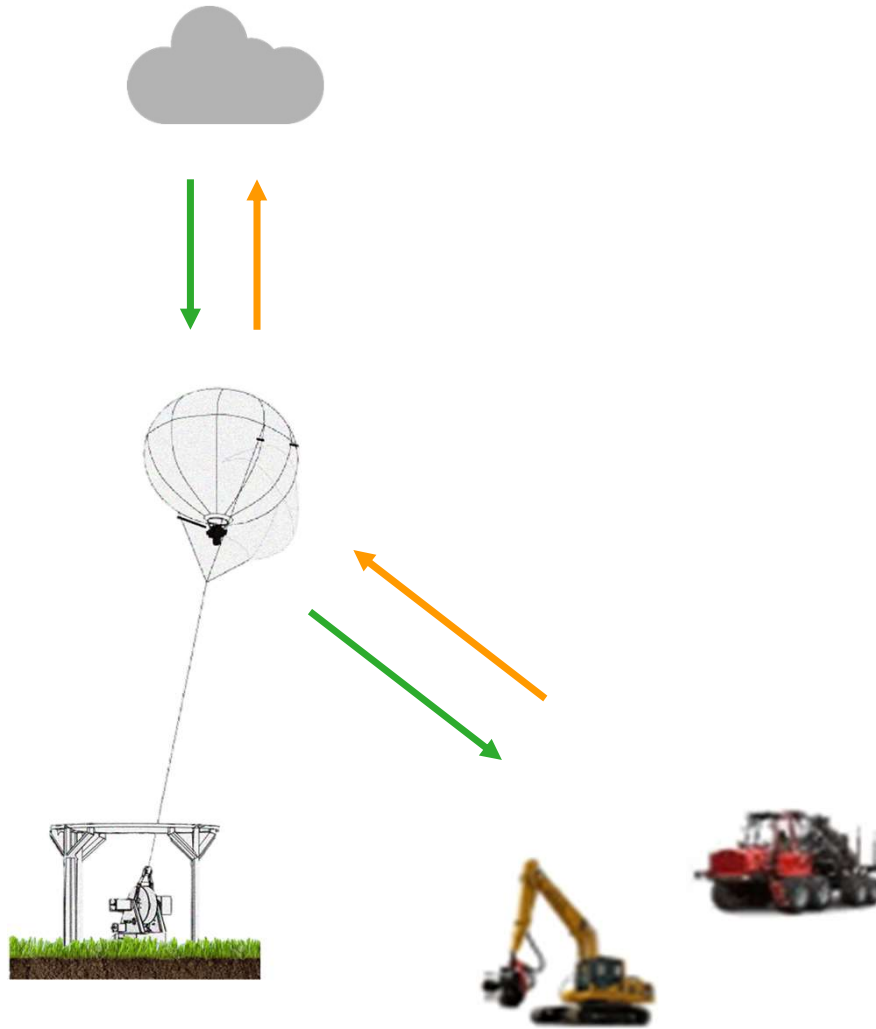


Signal transmission

Office - Machine
Machine - Office



(Direct Internet Connection)



On the balloon

LoRa
antenna

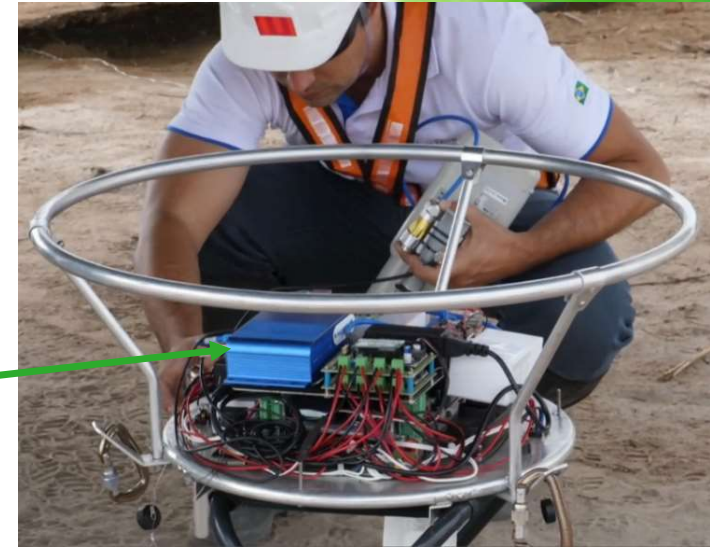


WiFi
antenna

Camera



LoRa
Radio



On the machines



Presence and doors sensors



Wifi antenna





Flight altitude 150 m (492 ft)

Gas Helium or Hydrogen

Refilling 2%/day

Capacity 75 m³

25 kg payload

Remote control Winch

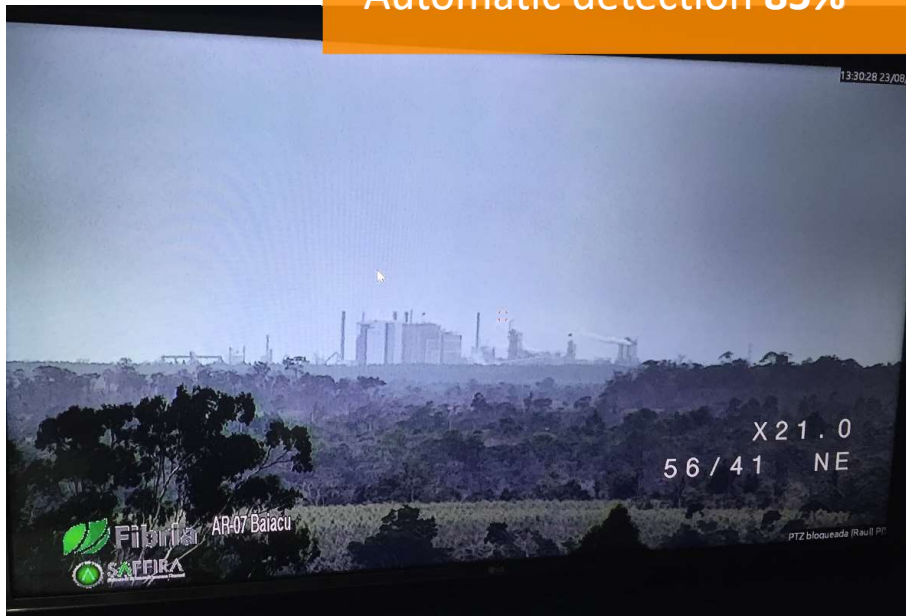
Wind speed limit 40 Km/h 25 mph



Results

Fire Detection

* Automatic detection **85%**



Tower view



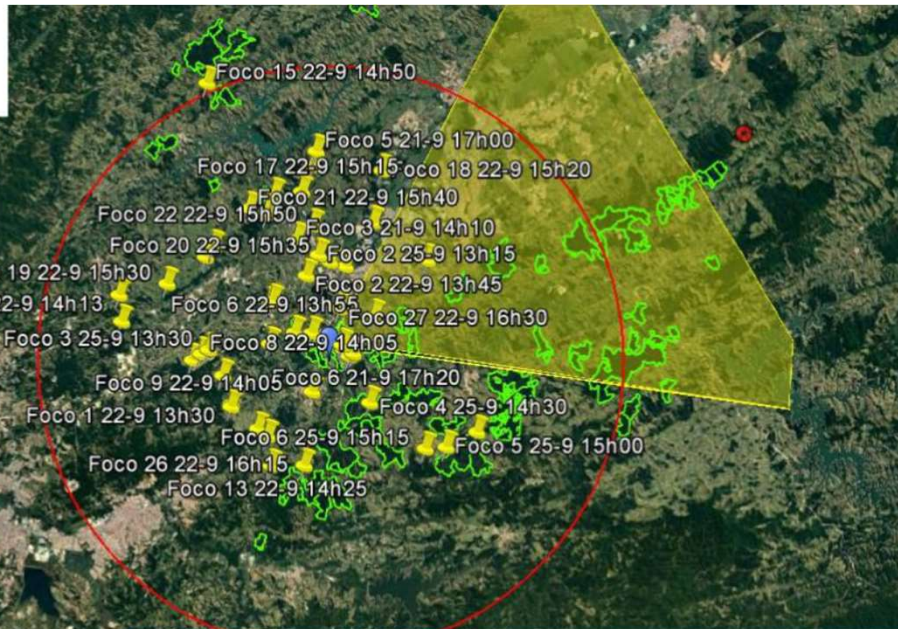
* Automatic Detection **51%**



Balloon view stabilization software version2

* Automatic detection done by specific algorithm

Fire Detection



Direction indication

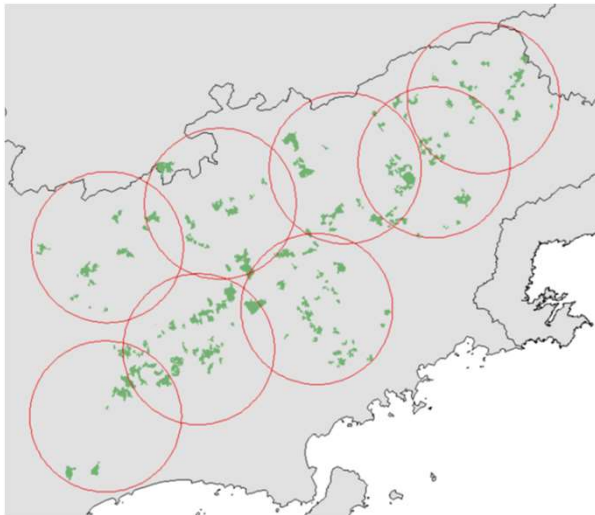


Fire Detection

Fibria Unit: Parahyba Valley

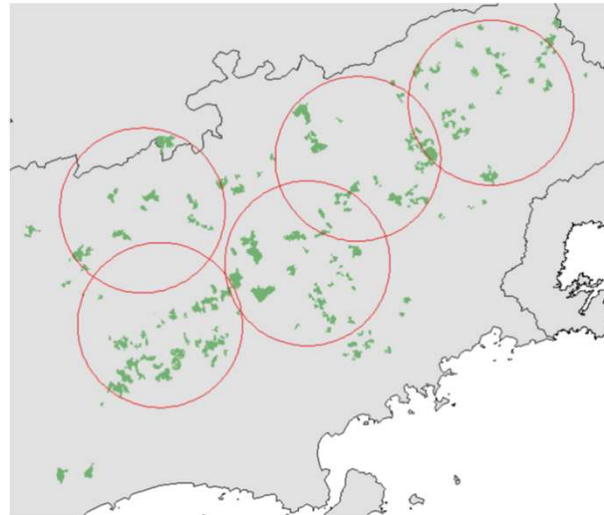
Area: 15.000 há

Coverage radius: 25 Km (15.5 miles)



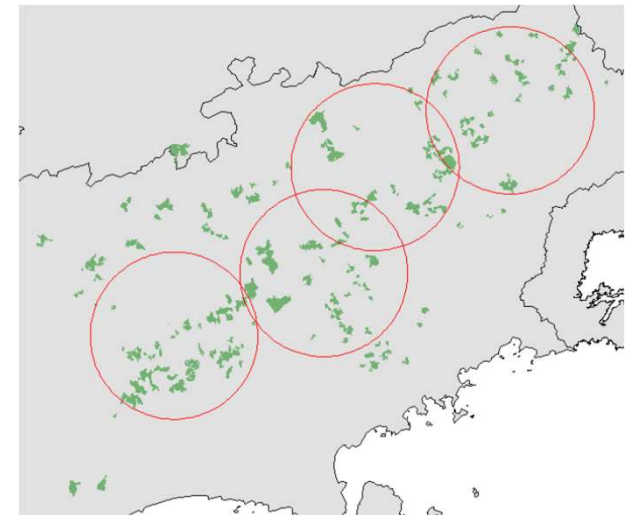
100% Coverage

8 Balloons



90% Coverage

5 Balloons



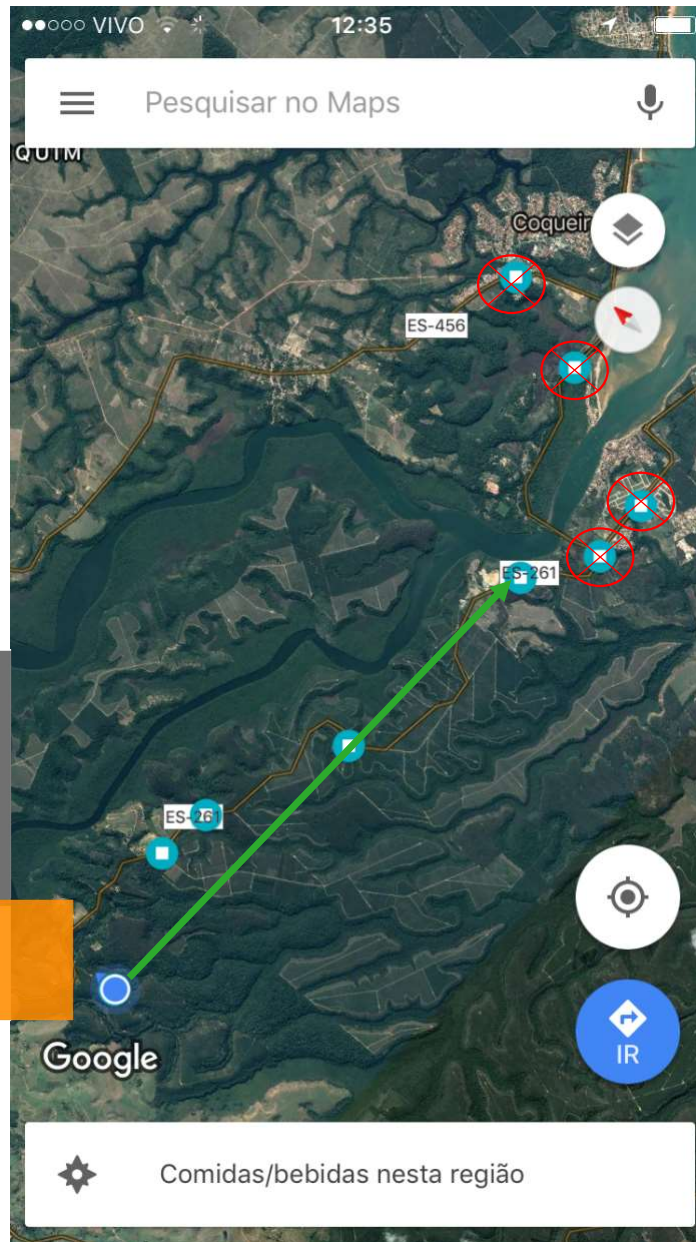
80% Coverage

4 Balloons

Data Transmission

Sensors and Wifi
reach

7-10 Km



Data Transmission

Sensors data

LoRa radio

The SmartForest mobile application interface displays a map of a forest area with a blue location pin and a yellow excavator icon. Below the map, there is a table titled "Informações" (Information) showing sensor data for three "Forwarder" devices. The table has four columns: "Dispositivo" (Device), "Bateria" (Battery), "Alarme" (Alarm), and "Tipo do Alarme" (Alarm Type).

Dispositivo	Bateria	Alarme	Tipo do Alarme
Forwarder		24/7/2017 - 14:38	Porta Fechada / Sensor de porta violado
Forwarder		24/7/2017 - 14:13	Sem presença de movimento
Forwarder		24/7/2017 - 14:13	Sem presença de movimento

Production and downtimes data

Wifi system

The SmartForest mobile application interface displays a list of received data under the heading "Dados Recebidos" (Received Data). The list has three columns: "Máquina" (Machine), "Data Coleta" (Collection Date), and "Tipo Coleta" (Collection Type). The data shows production events for two different machines on August 25, 2017.

Máquina	Data Coleta	Tipo Coleta
7250022	25/08/2017 10:35:50	Produção
7250022	25/08/2017 10:35:49	Produção
7250022	25/08/2017 10:29:38	Produção
7239002	25/08/2017 10:29:30	Produção
7239002	25/08/2017 10:29:29	Produção
7239002	25/08/2017 10:29:27	Produção
7239002	25/08/2017 10:29:24	Produção
7250022	25/08/2017 10:29:23	Produção



Application Analysis

Application

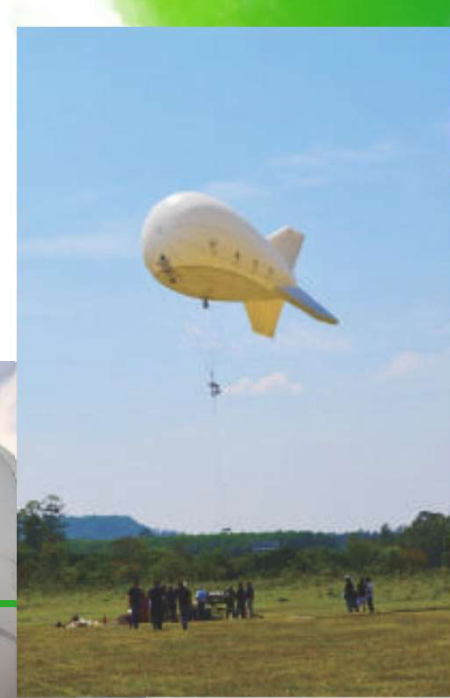
- Main function **Mobile Tower**
- Application potencial **Temporary Demands**

To be improved

- **Mobility**
- **Remote operation**
- Maximize **Autonomous operation**

Mobility

Necessary different **Structure** or **Shape**





Conclusions

Suggestions

- **Images stabilization** necessary to improve, mainly when “zoom in” is applied
- **Camera Round system** suggested for automatic monitoring
- **Autonomous Operation** suggested development of a protection system to turn on an automatic return, in case of alerts of strong winds
- **Lightning rod** important to have on-board
- **Operational cost**
 - Development of gas return to cylinders
 - Transport the balloon filled
 - Use of Hydrogen (flammable)

Conclusions



- **High operational cost**, due to **transportation** and **human interface**
- **Opportunity to identify fire targets**, from only one view, without Crossing points
- **System was approved for data and images transmission**
- At this moment, **considered not economically feasible**, due to operational costs. But recommended **for** specific demands in **remote rural areas**

Thank you!!!

Acknowledgments

Fibria's Harvesting and IT teams

Gilson Soares
+55 12 98163-0801
gilson.soares@altave.com.br



Esthevan Gasparoto
+55 12 98139-2336
esthevan@treevia.com.br



Angelo Moura
amoura@fibria.com.br

www.fibria.com.br

