



# **How Brazil is Supporting the Development of 6G Networks?**

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# Why do we need a 6G Network?

- Very high expectation created for 5G networks.

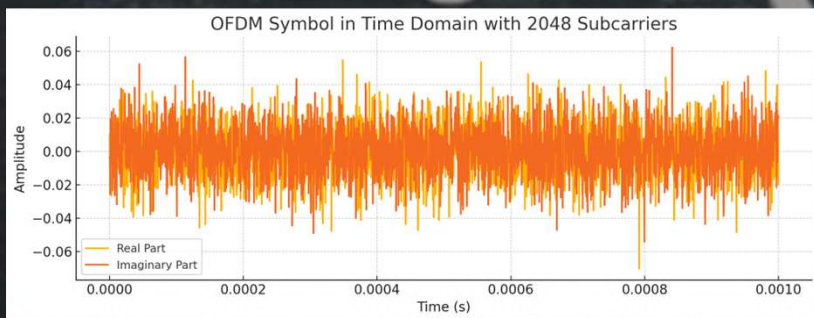




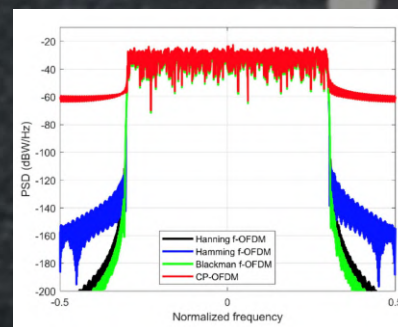
# Why do we need a 6G Network?

- 5G-NR has improved the RAN flexibility, but still based on OFDM.

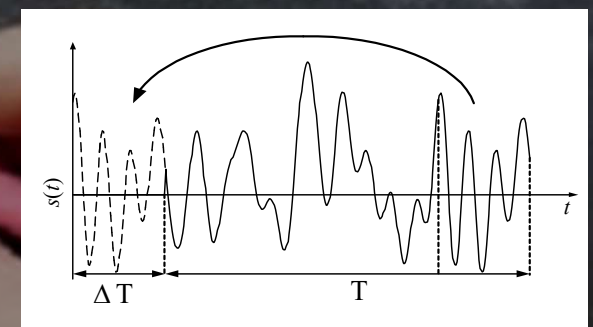
Why?



High PAPR



High ACLR



Short CP

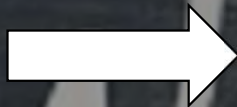
# Why do we need a 6G Network?

- Odd generations innovate, even generations deliver!



1G

Personal communications



2G

Mass adoption of mobile services



3G

Internet Access



4G

Full broadband access experience



5G

New services exploiting the innovative operation modes



6G

Best support for the innovative applications



# What else will 6G bring?



Communication



Sensing  
Imaging  
Positioning  
Artificial Intelligence

6G will not be just a communication network



# Important verticals for Brazil



Smart farming and mining



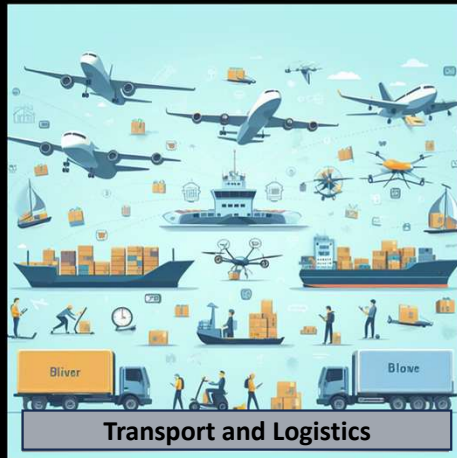
Digital Twins



Health care



Education



Transport and Logistics



Smart cities

Requirement	Value
Peak Capacity	>500 Gbps
User data rate	Up to 100 Gbps
Latency	< 1 ms
Outage Probability	$10^{-7}$ - $10^{-9}$
Spectrum efficiency	10 x 5G
IoT Battery lifespan	Up to 20 years
Number of slices	10.000
Device density	100/m <sup>3</sup> or 10 <sup>5</sup> /km <sup>2</sup>
Spatial precision	1 cm to 100 cm



*Inatel*

# *Brasil* 6G

**RINIP**  
ORGANIZAÇÃO SOCIAL DO MCTI

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**BRASIL**  
UNIÃO E RECONSTRUÇÃO



# Inatel

Instituto Nacional de Telecomunicações



## RNP



UNIVERSIDADE  
FEDERAL DO CEARÁ

INF  
INSTITUTO DE  
INFORMÁTICA



UFG  
UNIVERSIDADE  
FEDERAL DE GOIÁS



UNIVERSIDADE FEDERAL  
DO RIO DE JANEIRO



UFSC

ELDORADO  
Brazil Tech Innovation Institute

UNISINOS



UNICAMP



# Brasil 6G Goals

Long-term scientific research to meet the requirements imposed on 6G networks.

To make Brazil an internationally recognized hub for generating knowledge in 6G networks.

To coordinate scientific efforts among universities and research centers, increasing the impact of 6G network research.

To create an experimental environment to implement the contributions under real operating conditions.

# **Achievements – Fase I**

**Use cases for 6G networks.**

**Knowledge on the main enabling technologies.**

**Survey of network architectures around the globe.**

**Survey of requirements to meet national demands.**

**Specification of the Brasil 6G Platform.**



## **Achievements – Fase II**

**New technologies for all layers of 6G networks.**

**Architecture for the 6G network.**

**Demonstration and testing platform — the Brazil 6G Platform.**

**Contributions to the standardization process based on use cases.**

**Applications for verticals considered priorities for Brazil.**

21  
Transactions  
Papers

19  
Conference  
Papers

## Fase II – current activities

1. Contributions to the physical, link, and core layers of the 6G network.
2. Applications for 6G networks
3. Operationalization of the Brazil 6G Platform
4. Dissemination, workshops, and seminars

24  
Transactions  
Papers

32  
Conference  
Papers





**xGMobile**

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Inatel em Redes 5G e 6G

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E INOVAÇÃO**



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***Inatel***

**Create a new ecosystem for the 5G and 6G networks in Brazil.**

Improve the TRL  
in research up to  
level 6

Development of  
highly qualified  
professionals in  
mobile networks

Create an  
innovation  
environment for  
business  
development

Stimulus for new  
startups

Provide a state-  
of-the-art  
infrastructure for  
R&D



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**xGMobile pillars**

**Research  
Development  
Innovation**

**Talent  
Development  
and  
Management**

**Technological  
Association**

**Startup  
Development**

**R&D  
Infrastructure**



# Main Projects Areas



**THz Communications**



**Metamaterials  
Smart Surfaces**



**New Waveforms**



**Artificial  
Intelligence  
Machine Learning**



**New Spectrum  
Allocation**



**IoT Applications**



# Brazil 6G and xGMobile

Complementary actions needed to meet national demands and position Brazil as a leading player on the international stage



# Other Important Initiatives





# Conclusions

**Significant investments are being realized in Brazil for the development of 5G and 6G networks.**

**Current researches**

# Obrigado!

<http://www.inatel.br/xgmobile>

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