Pilot Metrology Cloud with IOT Sensor Network THB for SIM Region

SIM
SISTEMA INTERAMERICANO DE METROLOGÍA

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Pilot Metrology Cloud with IOT Sensor Network THB for SIM Region

Content

- Introduction and Context
- Key Components
- Metrology
- Sensors
- Computer Tools
- Practical Applications
- Examples under development
- BIPM
- Advantages and Challenges
- Conclusions

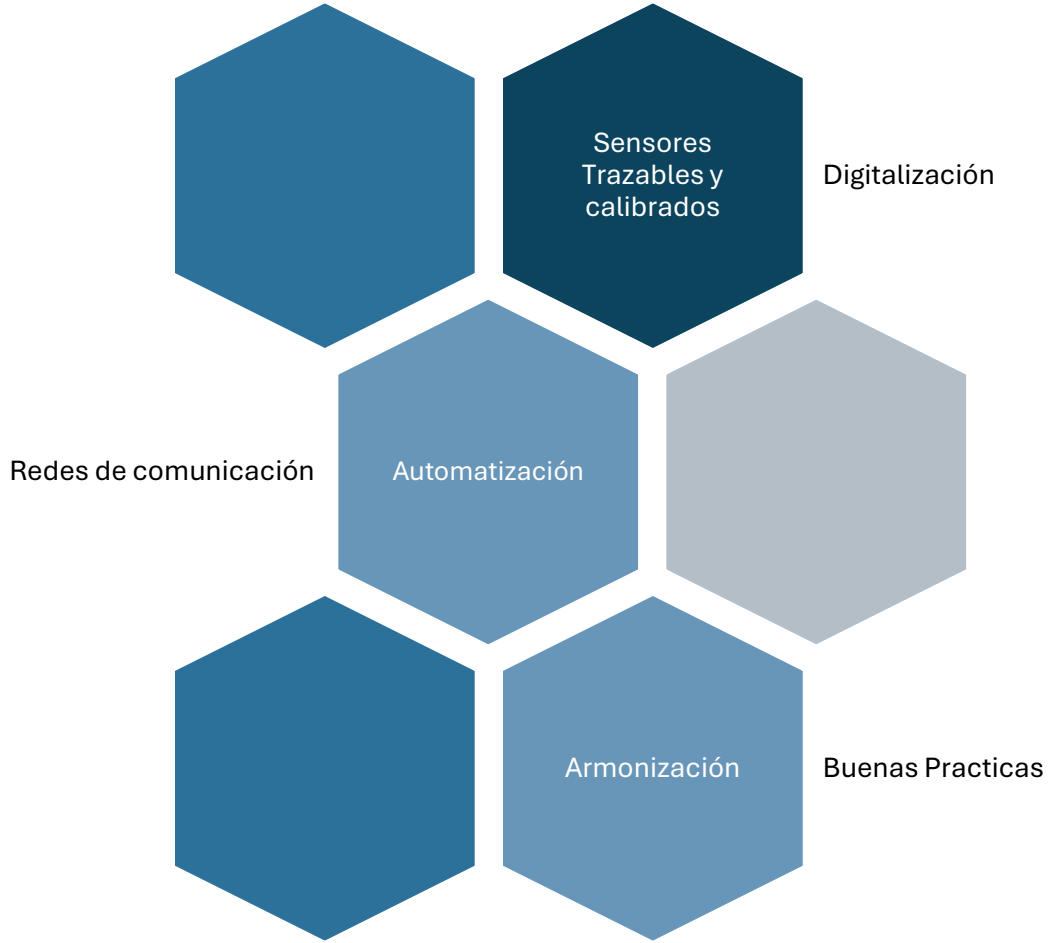
Introducción y Contexto

- Ciencia
- Tecnología
- Metrología
- Informática
- Redes de sensores complejas

Introducción y Contexto

- Tecnologías en la nube
- Redes de sensores complejas

Componentes Clave



Aplicaciones Prácticas-Sociedad 5.0

Monitoreo Ambiental

Las redes de sensores permiten medir la calidad del aire y la temperatura, cruciales para la salud y el medio ambiente.

Control Industrial

Se aplican en manufactura, garantizando estándares de calidad y precisión, vitales para la competitividad.

Sistemas de transporte

Se utilizan para medir flujos de tráfico y mejorar la seguridad vial, optimizando rutas y reduciendo accidentes.

Ejemplos desarrollados

Nube de metrología piloto con red de sensores IOT THB para la región SIM

BeeSmart: Innovación tecnológica aplicada al monitoreo de polinizadores clave en la producción sostenible de alimentos

No.	Nombre Completo	Adscripción	Rol	Área de especialidad
1	Dr. Ulises Olivares Pinto	ENES Unidad Juriquilla, UNAM	Líder de proyecto	Ciencias de la computación (Inteligencia Artificial)
2	Lic. Adriana García Ramos	ENES Unidad Juriquilla, UNAM	Responsable administrativo	Contaduría y administración de proyectos

Equipo y colaboración estratégica

- Equipo **multidisciplinario** compuesto por expertos en **inteligencia artificial, ecología, control** e **instrumentación**, así como colaboradores **internacionales** que garantizan un enfoque integral y exitoso
- Vinculación interinstitucional con la **UNAM, UAQ** y potencialmente con aliados industriales para la implementación efectiva del proyecto

CONSORCIO DISTRITO QRO –INNOVACIÓN TECNOLÓGICA PARA LA SEGURIDAD ALIMENTARIA

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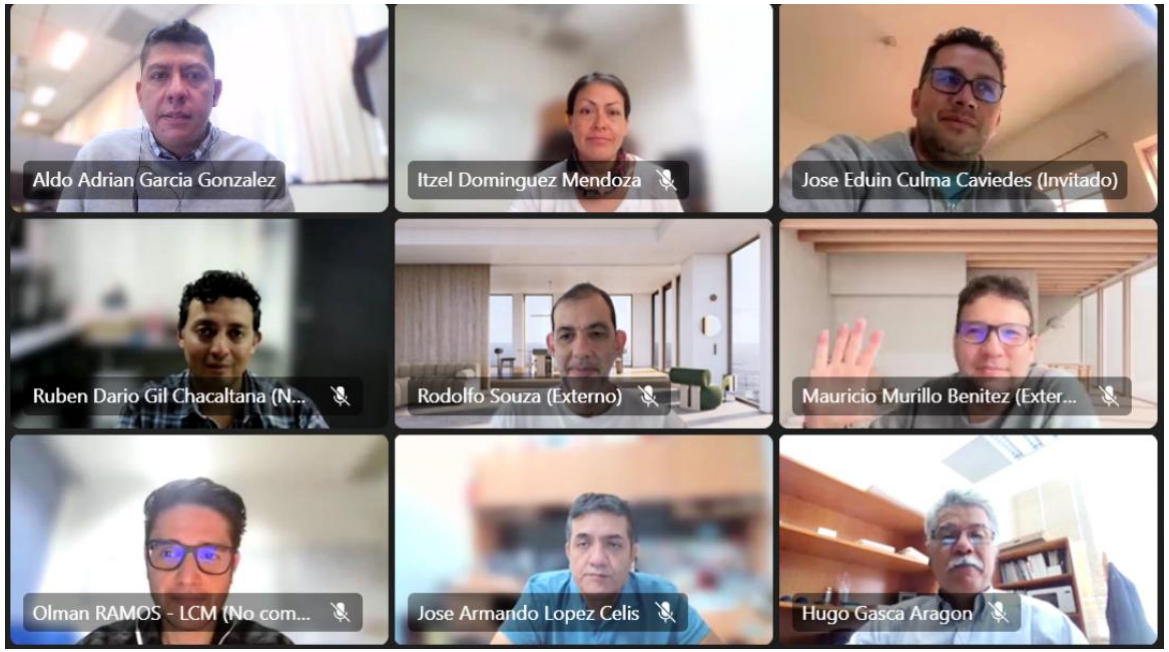
- IBMetro-Juan José Mendoza Aguirre
- INMETRO-Rodolfo Sousa

Consultor-Handshake-Mauricio Murillo

9 NMI´s



handshake
bright conversations

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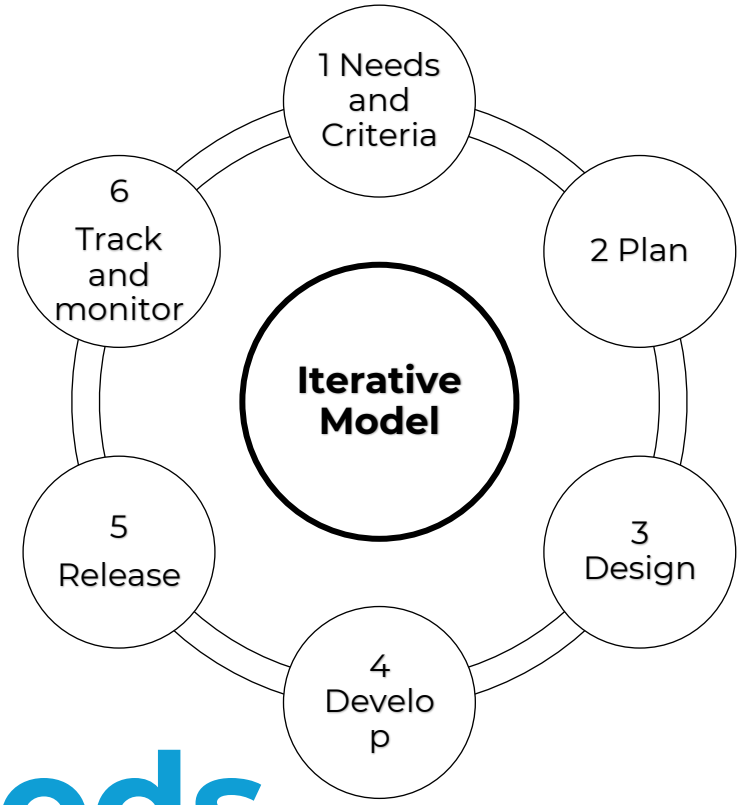
Digital Transformation

SIM

Agile Methods



Metrology 4.0

Multidisciplinary

Iterative

M4DT

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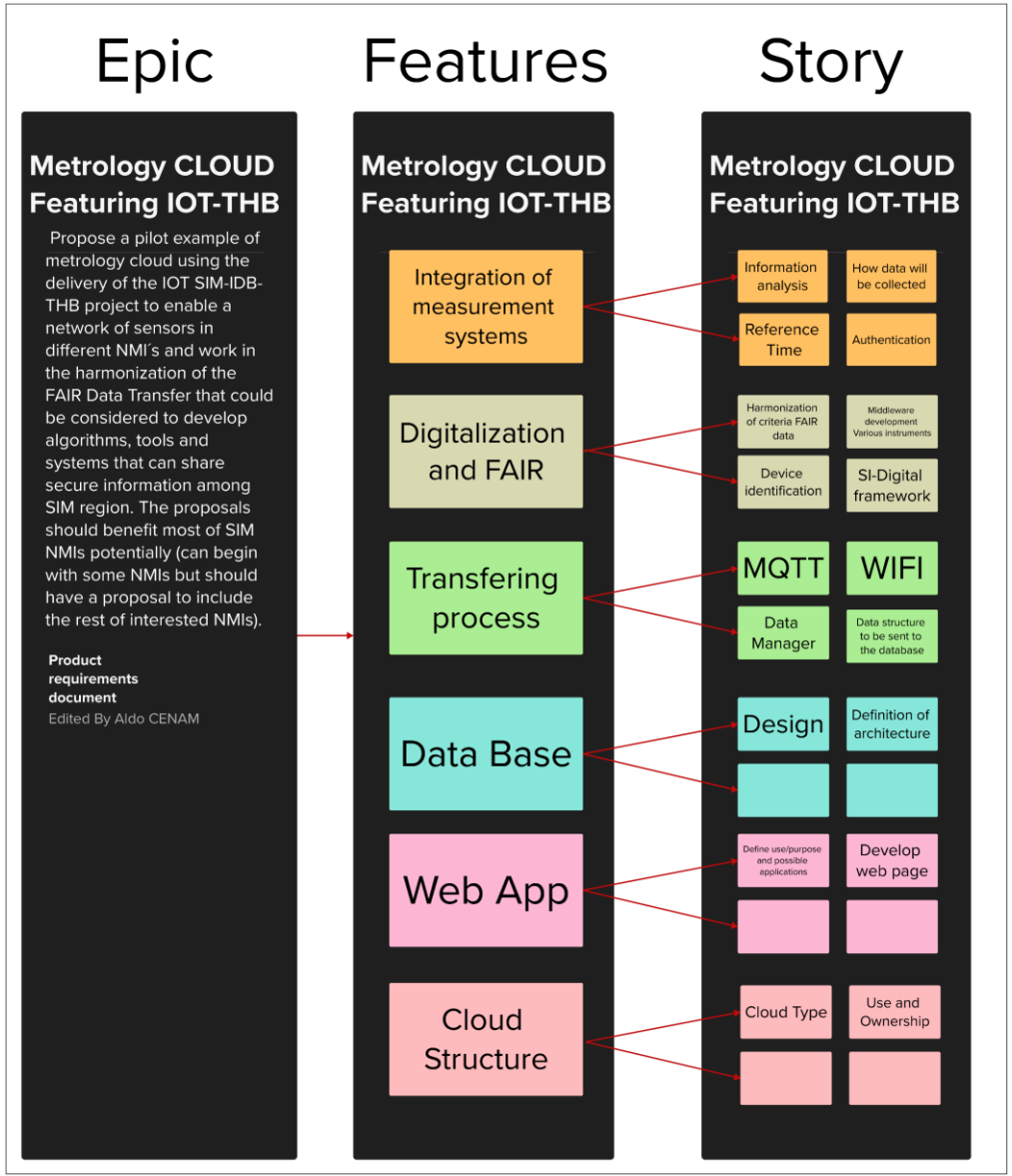

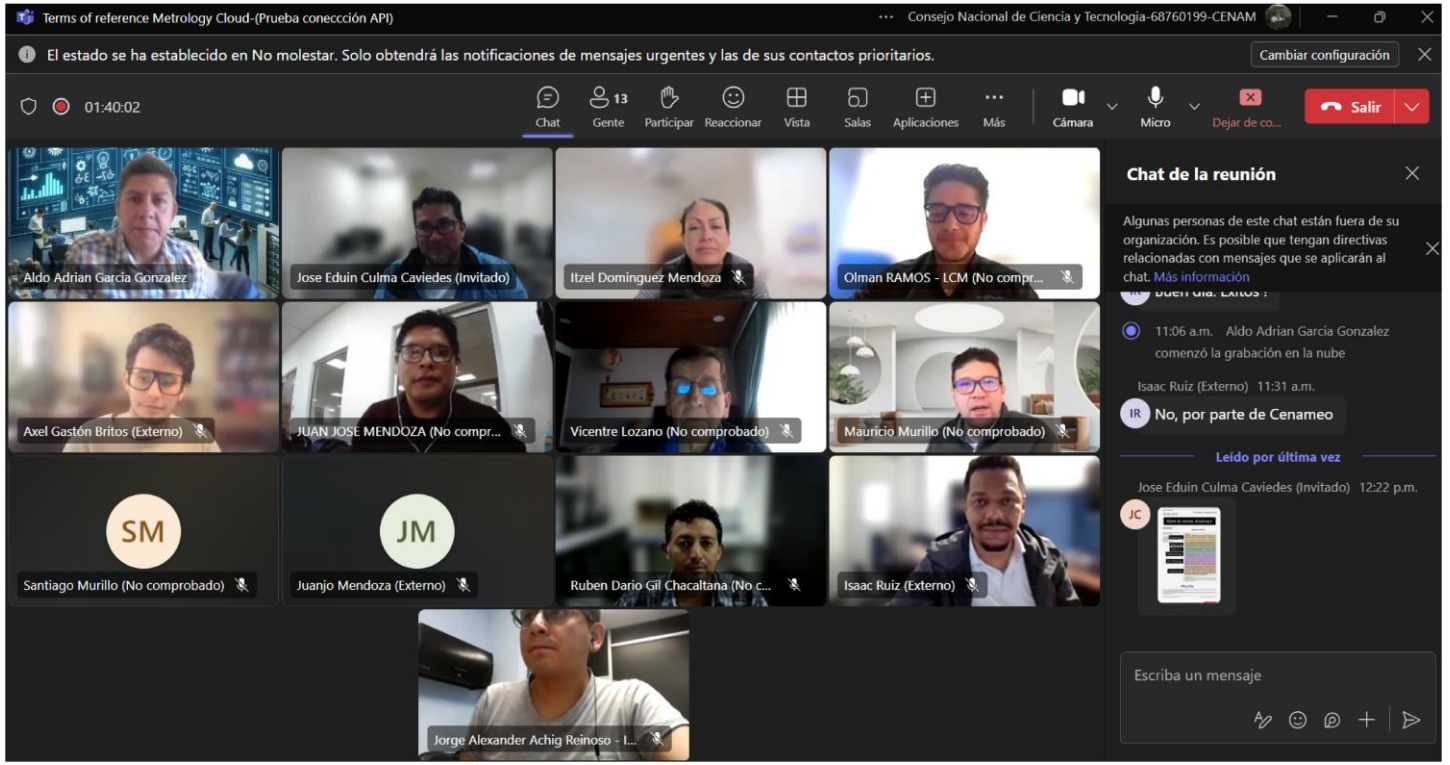

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THB

APP

Dispositivo comercial

Trama

$;ROR;THB-510-0004;Temperature;296.61;\kelvin;1970-01-01T00:04:51-05:00;*

$;ROR;THB-510-0004;Humedad;296.61;\Relative Humidity;1970-01-01T00:04:51-05:00;*

$;ROR;THB-510-0004;Pressure;296.61;\Pa;1970-01-01T00:04:51-05:00;*

CNM-THB-510-004

NMI

Device

Area

Consecutive number

MQTT

NMI

SIM

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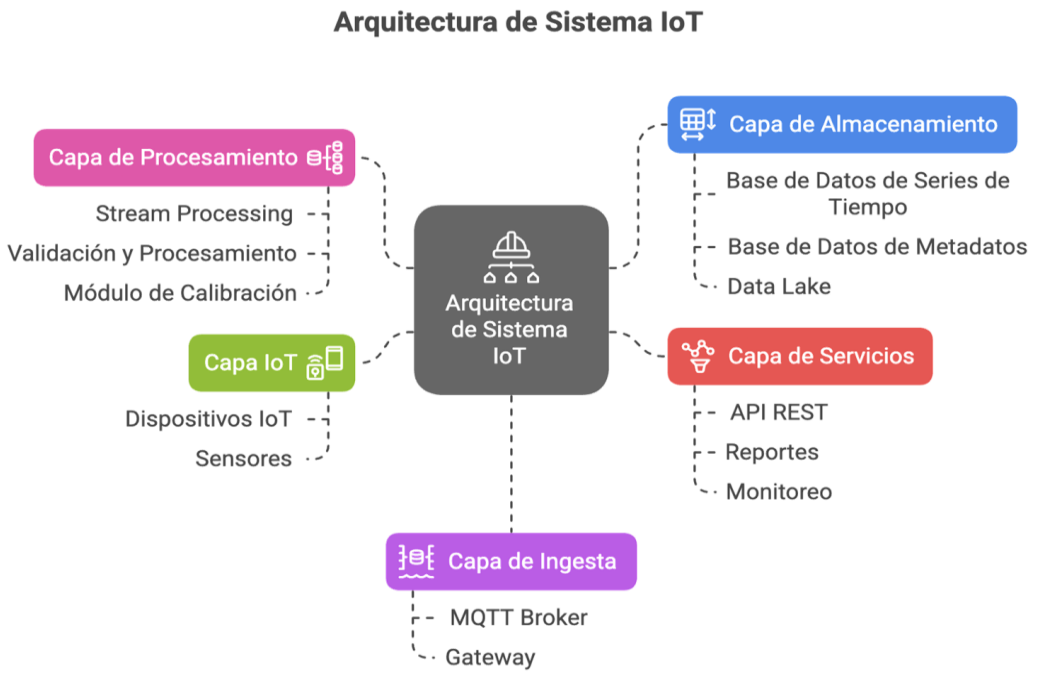
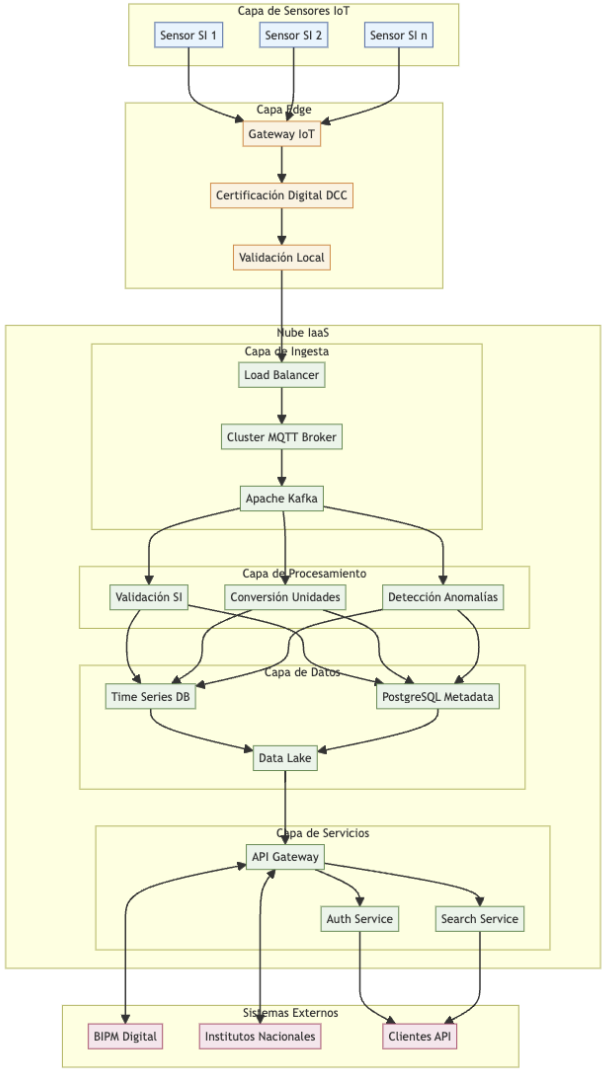
Design Architecture

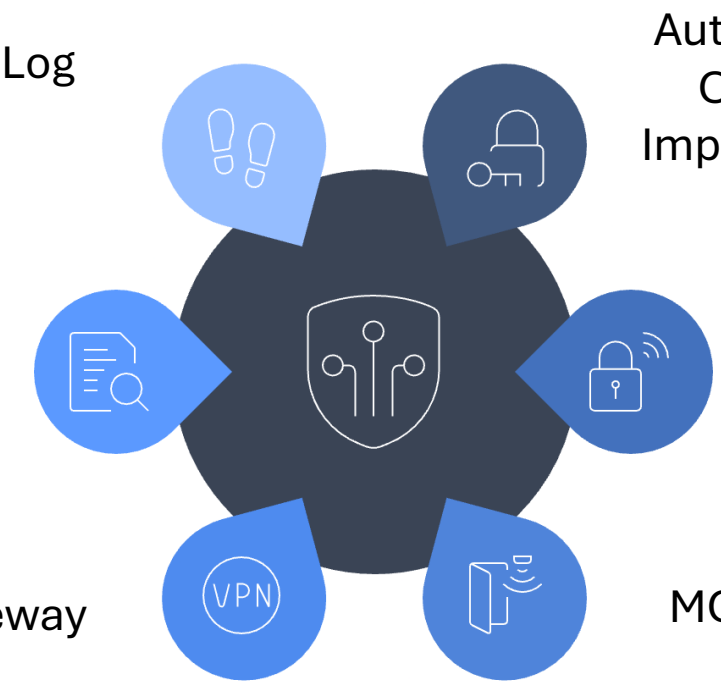




Each of these components is designed to work in harmony, providing a robust, scalable platform that conforms to international metrological standards. The architecture prioritizes measurement accuracy, traceability and reliability, while maintaining the flexibility to evolve with future needs.

Framework Interoperabilidad

Security



Data Log

Authentication
Certificate
Implementation

Integrity
validation

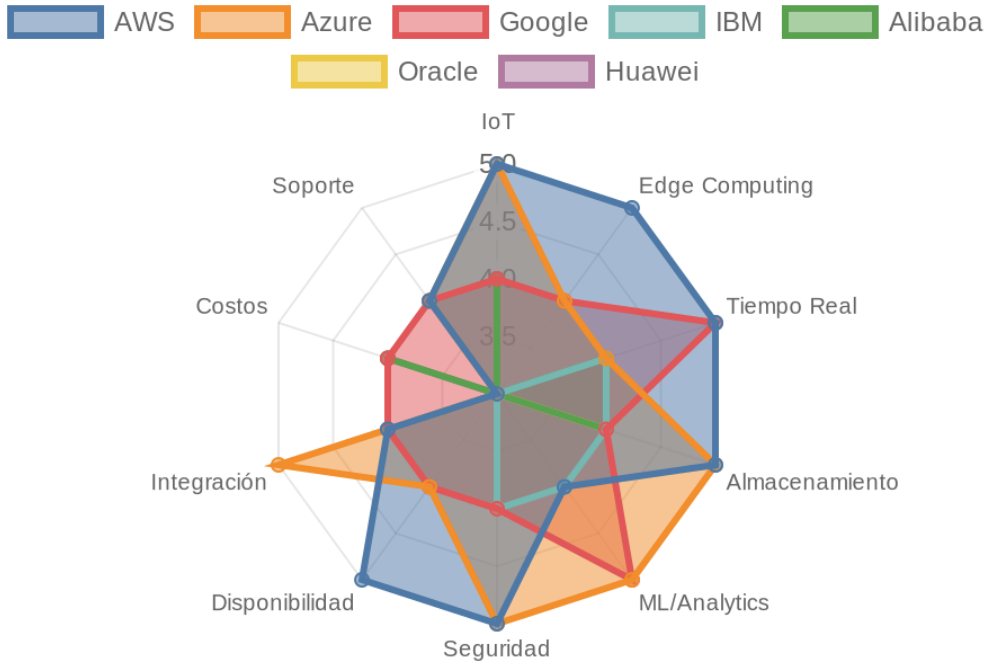
Communication
encryption

VPN Gateway

MQTT access
control

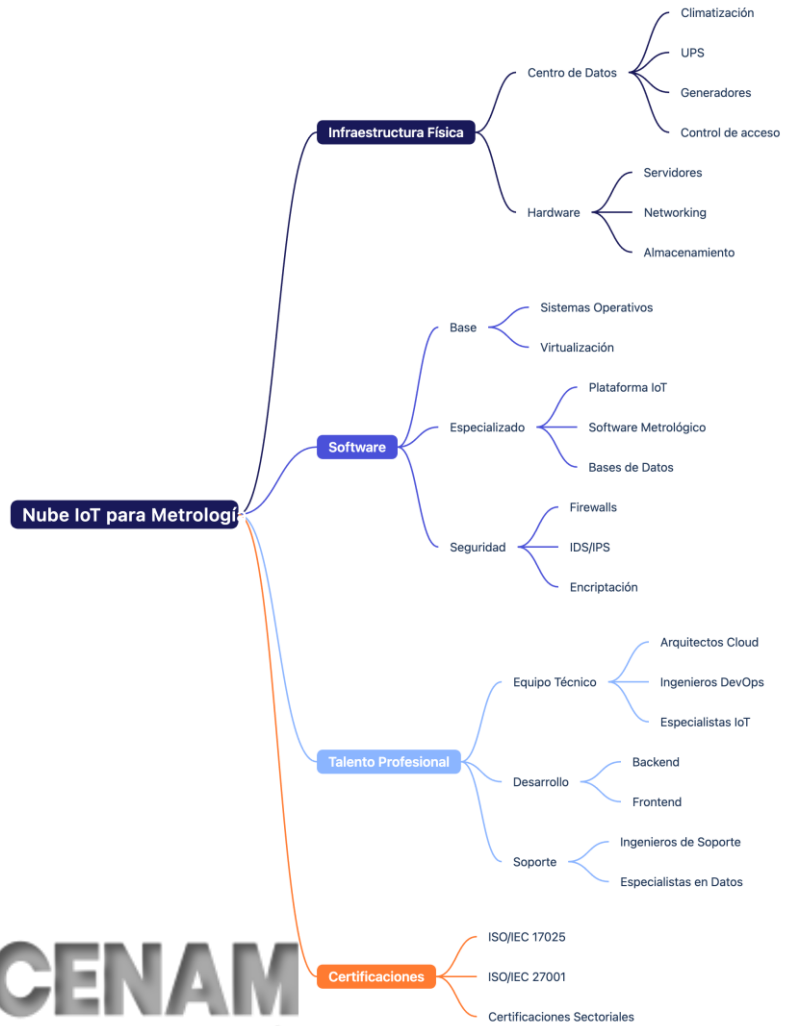
Cloud Infrastructure

https://www.gartner.com/en/documents/5851847



- AWS excels in IoT, Edge Computing and Real-Time Processing
- Azure excels in ML/Analytics and Integration
- Google Cloud maintains a more balanced performance across all categories
- The other vendors show specific strengths but lower overall performance

Cloud Infrastructure



Physical Infrastructure : Data center with climate control, UPS, and backup systems, including high availability servers and redundant network.

Base Hardware : Specialized servers for processing, storage and databases, along with network equipment (routers, switches, firewalls).

Core Software : Operating systems (Linux/Windows Server), IoT platform for device management, and specific metrology software.

Databases : Combination of Time-series, relational and NoSQL databases to handle different types of metrological data.

Security : IDS/IPS systems, firewalls, encryption and identity management to protect sensitive data.

Technical Team : Cloud architects, DevOps engineers, IoT specialists and metrology experts.

Development Team : Backend and frontend developers with expertise in APIs and data visualization.

Support : Team of support engineers and data specialists for maintenance and analysis.

Certifications : Compliance with ISO/IEC 17025 (laboratories) and ISO/IEC 27001 (security).

SIM - Nube Metrológica

Iniciar sesión

PLATAFORMA INTERAMERICANA

Calibración y Metrología

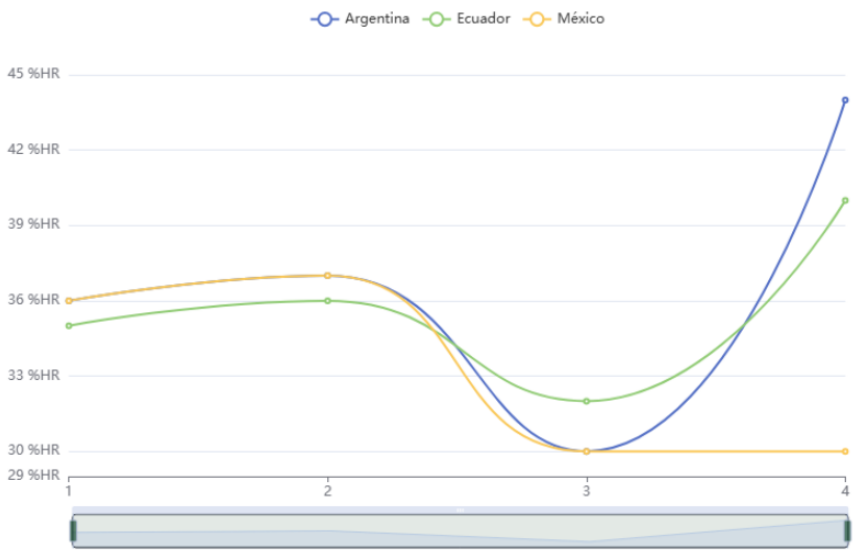
En trabajo conjunto con: INEN -ECUADOR

Eventos de calibración

Paises
Lista de participantes

Gráficas
Datos individuales y conjuntos

Reportes
Descarga de datos conjuntos



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Nube Metrológica

Inicio

Eventos

Usuarios

Mi cuenta

Crear nuevo evento

Nombre

DEMO-NUBE IOT

Descripción

PRUEBA DE RED DE SENSORES

Rango de evento

2/13/2025, 8:00 AM - 2/14/2025, 4:30 PM

Tipo equipo

Termohigrobarómetro

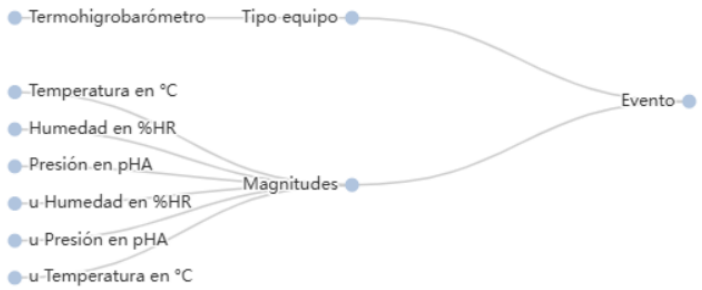
Magnitudes

Temperatura en °C, Humedad en %HR, Presión en pHA, u ...

Dispositivos

Argentina - THB1L1D1, Colombia - INM-THB-001-001, Co...

Crear



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+ Nuevo usuario

- Inicio
- Eventos
- Usuarios

Jorge Achig
Ecuador - INEN

Aldo García
México - CENAM

Axel Britos
Argentina - INTI

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México2 - CENAM

Isaac Ruiz
Panamá - CENAMEP

Eduin Culma
Colombia - INM

Olman Ramos
Costa Rica - LACOMET

Ruben Gil
Perú - INACAL

William Paucar
Ecuador - INEN

Mi cuenta

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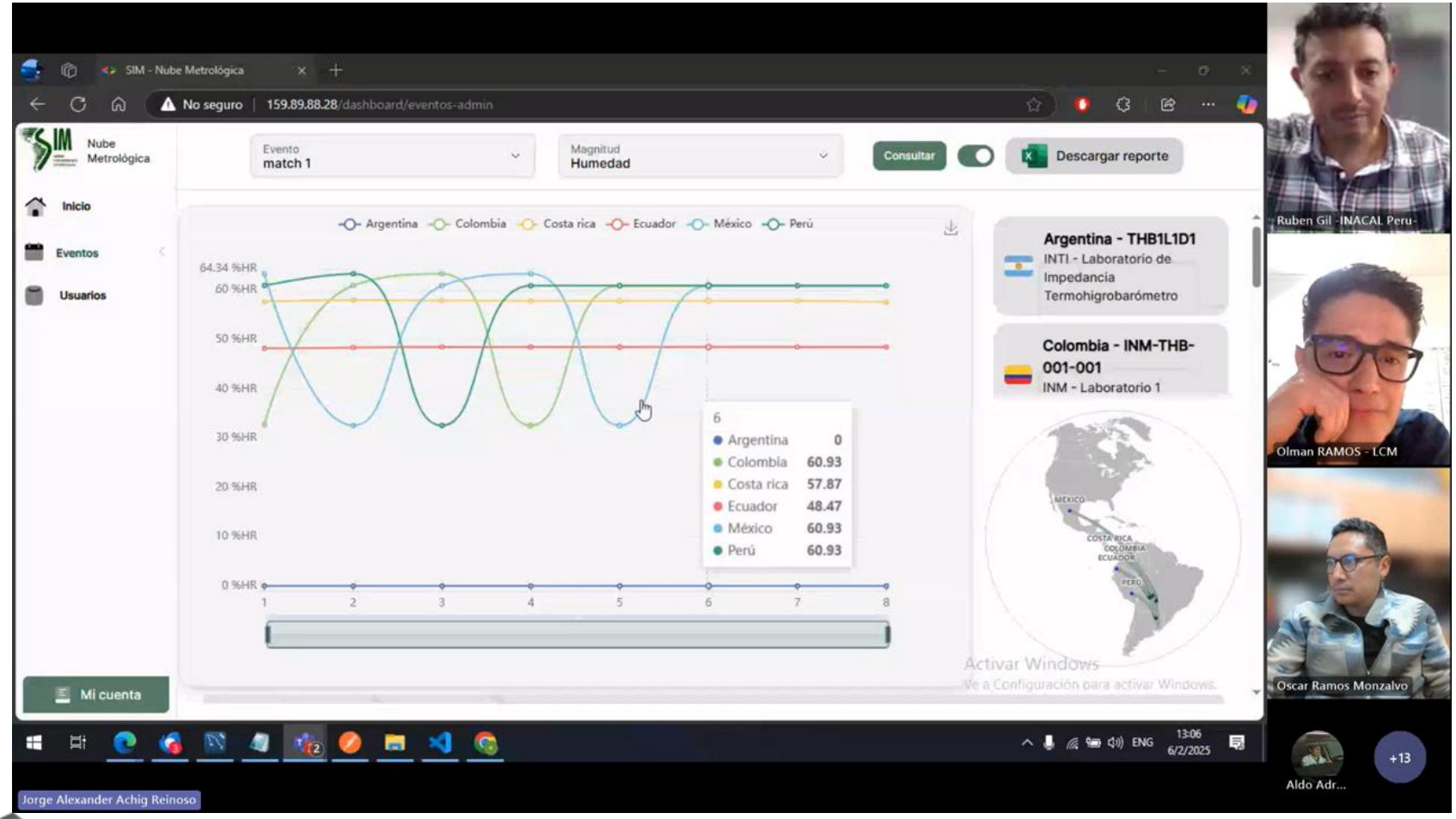

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Evento
match 1
Magnitud
Temperatura
Consultar
Descargar reporte
Argentina
Colombia
Costa rica
Ecuador
México
Panamá
Perú
26.940002 °C
25 °C
20 °C
15 °C
10 °C
5 °C
0 °C
-1 °C
1
2
3
4
5
6
7
8
Argentina - THB1L1D1
INTI - Laboratorio de Impedancia Termohigrobarómetro
Colombia - INM-THB-001-001
INM - Laboratorio 1
MÉXICO
PANAMÁ
COLOMBIA
ECUADOR
Argentina - THB1L1D1

Deliveries

Web APP- Metrology Cloud

- IoT Cloud Remote measurements (THB)

Integration of any kind of device

- Middelware

Integration of any kind of Quantity

- SI-Digital Framework
- DCC

6 Future Work

Implement different quantities and data analysis → Implement DCC and Features → Implement IA-Machine Learning → Propose a collaboration with IA → Enable web services Intercomparisons Remote Calibration

Cloud Technologies

Complex Sensor Networks

Human as a Sensor – Measuring Well-Being

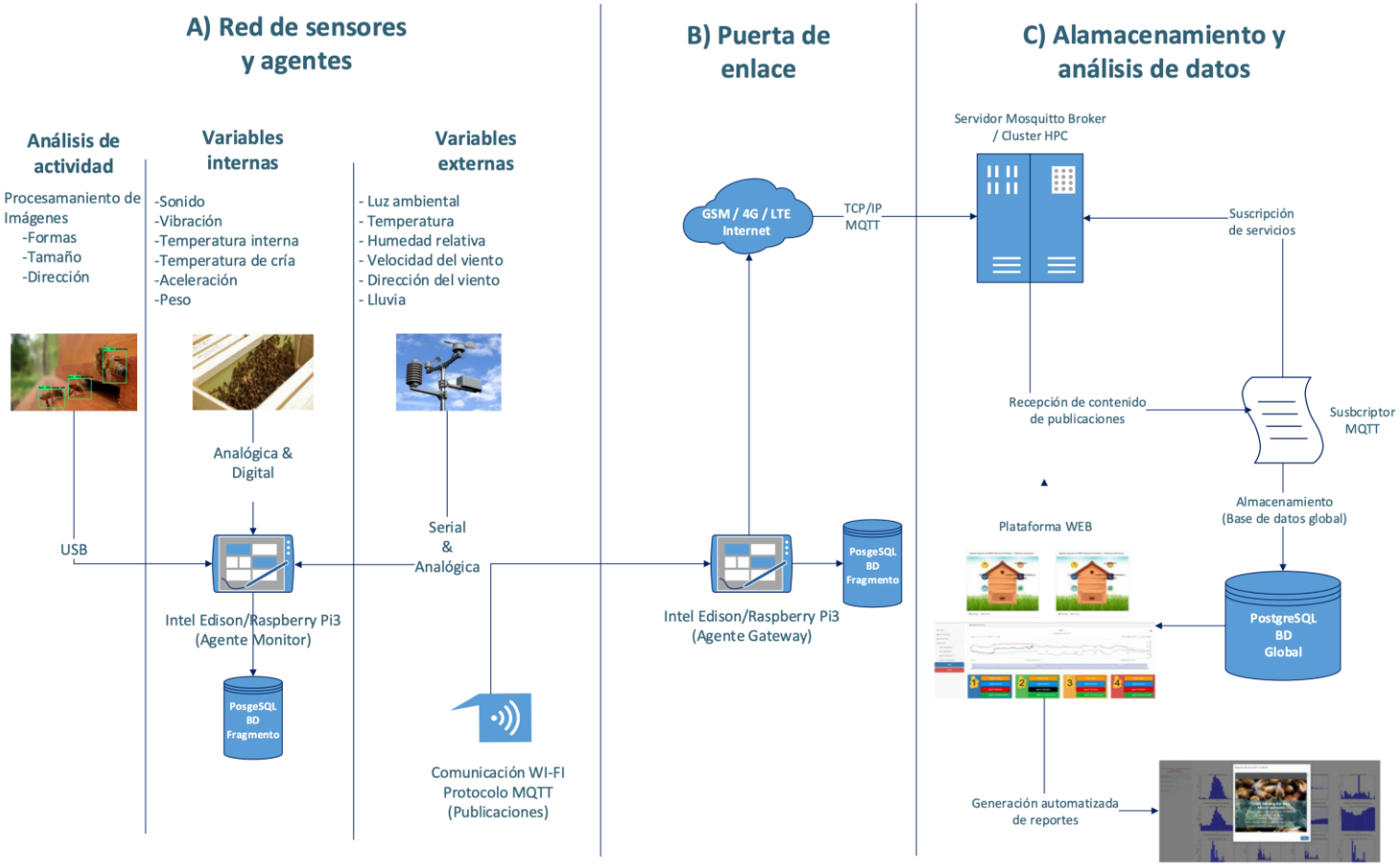
- Environmental sensor network information as characterization of office conditions
- Psycho-metric methods for assessing reliability of human feedback

7 ACKNOWLEDGMENTS

The project outlined in this article was executed using an adapted Agile methodology and developed with collaboration and commitment from technical personnel across various NMI's within SIM, and Inter-American Development Bank (IDB).


22.72°C

Examples developed-Architecture-Structure



BIPM 150 1875 - 2025

SIGN IN | Français

Developing the SI Digital Framework as the anchor of trust for metrology in the digital era

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Working Groups

Select

View

Discussion Group on Sensor Networks (FORUM-MD-DG-SN)

Co-Chairs

Dr Shan Cui
National Metrology Centre, Agency for Science, Technology and Research
Singapore

Dr Wan-Ho Cho
Korea Research Institute of Standards and Science
Korea (Republic of)

Terms of Reference

- to advise the FORUM-MD on matters relating to metrology for sensor networks;
- to facilitate knowledge transfer relating to the field;
- to harmonize the terms and definitions related to the field.

Advantages and Challenges

Advantages	Description
Accuracy	High accuracy in data measurement.
Efficiency	Time reduction in information gathering.
Flexibility	Adaptable to different applications and conditions.
Costs	High initial investments.

Challenges
Harmonization
FAIR
Security
Energy Consumption
Normativity

Conclusions

- Sensor networks will play a fundamental role in the evolution of metrology towards the 5.0 society.
- The integration of Artificial Intelligence will require regulations and best practices for its correct use.
- The importance of including metrology in the development of sensor networks is becoming increasingly evident.

Contact

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