

# SIM-BID

## Metrología para la Transformación Digital como soporte a los Servicios de Salud en LAC



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Nov 08, 2023

# TEMARIO

DT Quién?	SIM
DT Por qué?	Sociedad
DT Qué?	Visión
DT Cómo?	Acción



# Quién? SIM

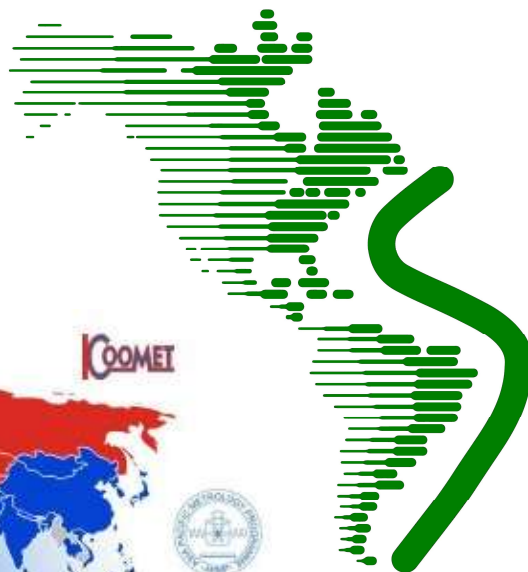
DIGITAL  
TRANSFORMATION  
Regional Awareness Event



Bureau  
International des  
Poids et  
Mesures

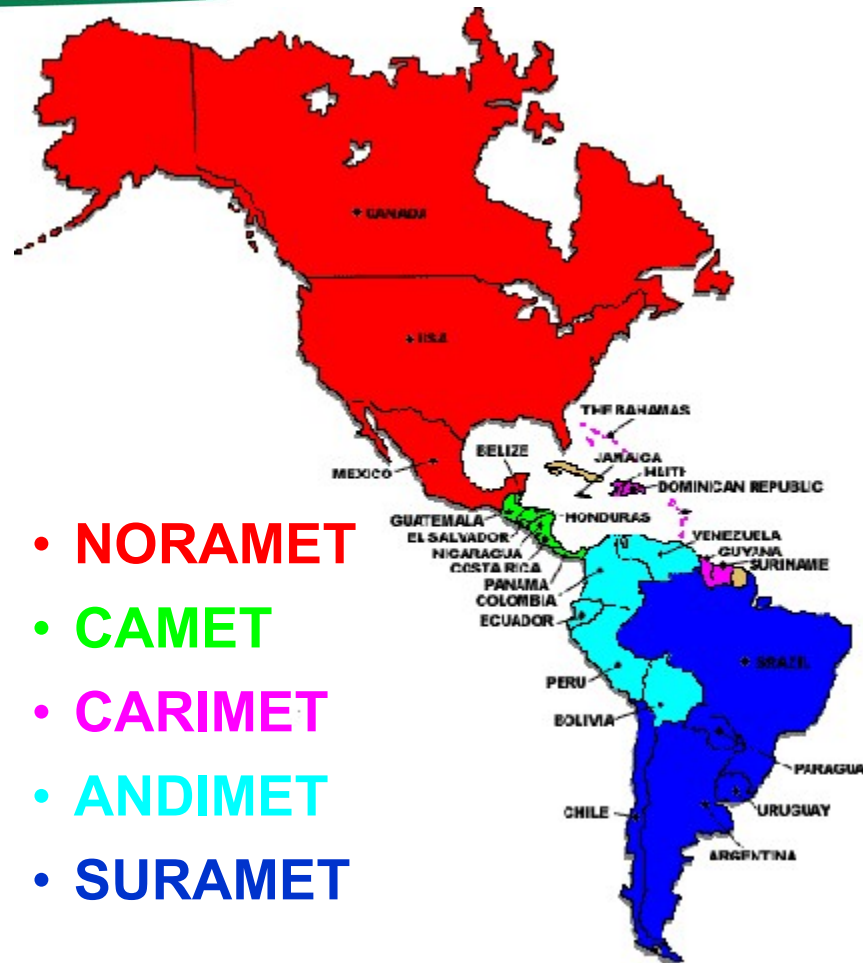


Organisation Internationale de  
Métrologie Légale  
International Organization of  
Legal Metrology



# SIM

SISTEMA  
INTERAMERICANO  
DE METROLOGÍA



- NORAMET
- CAMET
- CARIMET
- ANDIMET
- SURAMET



• 33 active members (NMIs) • 13 associate members (DIs)  
• 3 affiliate members (IAAC, COPANT, CARICOM)

# Quién? SIM



14 Metrology Working Groups  
16 Member Quality System Task Force - QSTF

Regional Projects with Intl Organizs.  
Bi or Multi Lateral Internal Projects

## SIM GA: elections 2022 - New Steering Council



**President**  
Javier Arias  
CENAMEP AIP  
Panama



**Vice President**  
Claire Saundry  
NIST  
USA



**TC Chair**  
Lucas Di Lillo  
INTI  
Argentina



**QSTF Chair**  
Sally Bruce  
NIST  
USA



**PDC**  
Rodrigo Costa-Felix  
INMETRO  
Brazil



**ANDIMET**  
José Dajes  
INACAL  
Perú



**CAMET**  
Fernando Andrés  
LCM  
Costa Rica



**CARIMET**  
Erica Caruth  
TTBS  
Trinidad & Tobago



**NORAMET**  
James Kushmerik I  
NIST - USA

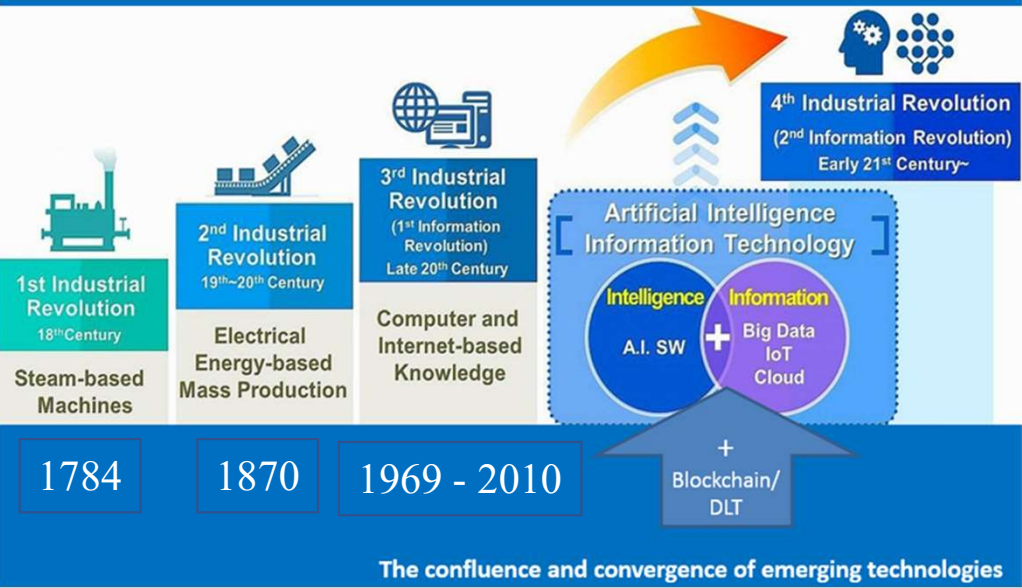


**SURAMET**  
Gregory Kyriazys  
INMETRO  
Brazil



- Apoyar el desarrollo de las Capacidades de Medición y la IC en América
- Promover la Ciencia y la innovación
- Procurar reconocimiento y apoyo internacional a los gobiernos locales y regionals a través de nuestros NMIs

## The Fourth Industrial Revolution



Vision de la 4<sup>ta</sup> Revolución Industrial

## THE DAWN OF THE **FOURTH INDUSTRIAL REVOLUTION**



Cómo afecta la 4<sup>ta</sup> Revolución Industrial a LOS USUARIOS

4<sup>ta</sup> RI y Tecnologías Emergentes

# DT Por qué? Sociedad

**DIGITAL  
TRANSFORMATION**  
Regional Awareness Event



## SCOPE

Discuss the role of metrology, sensors and smart measurements in advanced manufacturing. Challenges and opportunities of the NMIs to support their manufacturing base in the 4th industrial revolution

## VENUE

**CENAM facilities**  
Carretera a Los Cúes km  
4.5  
El Marqués, Querétaro  
México  
C.P. 76246  
www.cenam.mx

## Four Blocks:

### 1. General context:

Challenges in metrology for advanced manufacturing.

### 2. Industrial sectors:

Challenges in different application fields

Technology  
Health

### 3. Specific metrological disciplines:

Measurement technologies with special relevance for advanced manufacturing.

### 4. Additional fields and disciplines:

Metrological applications, IoT, AI, Innovation Technology

**JUNE 18 - 19/2019**

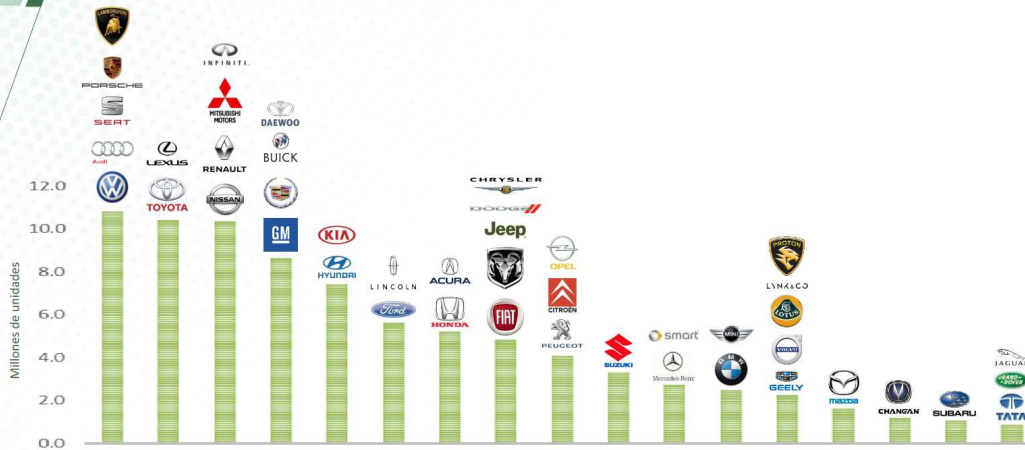
**CHALLENGES IN METROLOGY  
FOR ADVANCED  
MANUFACTURING AND THE  
4TH INDUSTRIAL REVOLUTION**



2018 - 2024

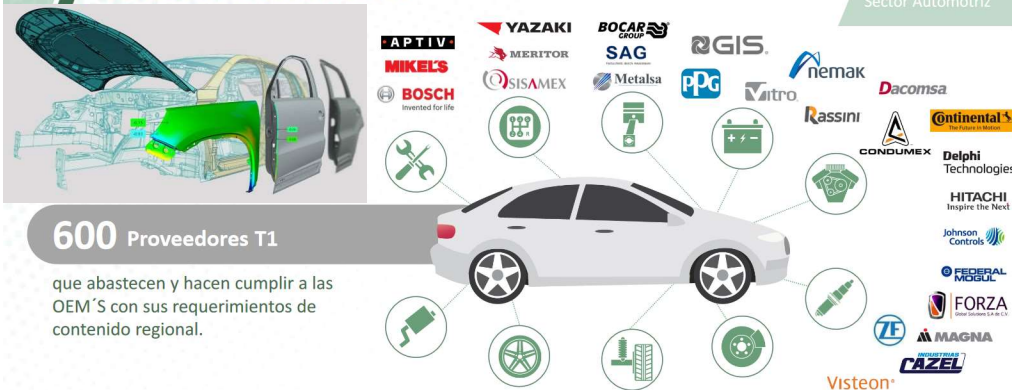
### Producción de Vehículos en el Mundo por Marca, 2018

Perspectiva del Sector Automotriz



### Variedad de Proveedores

Perspectiva del Sector Automotriz



600 Proveedores T1

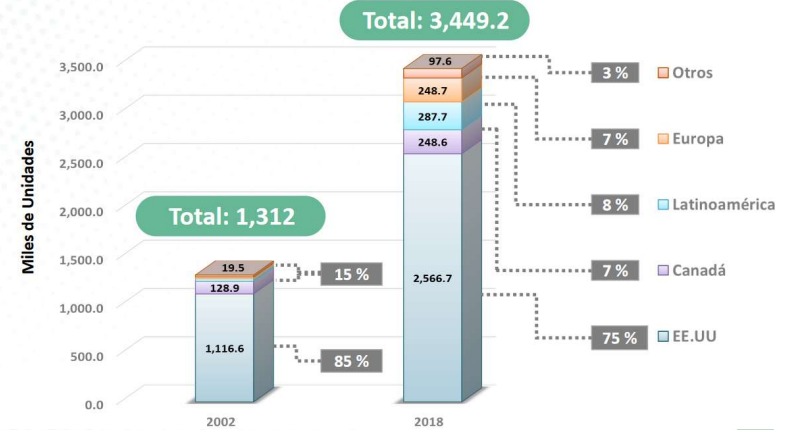
que abastecen y hacen cumplir a las OEM'S con sus requerimientos de contenido regional.



### Exportaciones de Vehículos Ligeros por Región, 2002 vs 2018

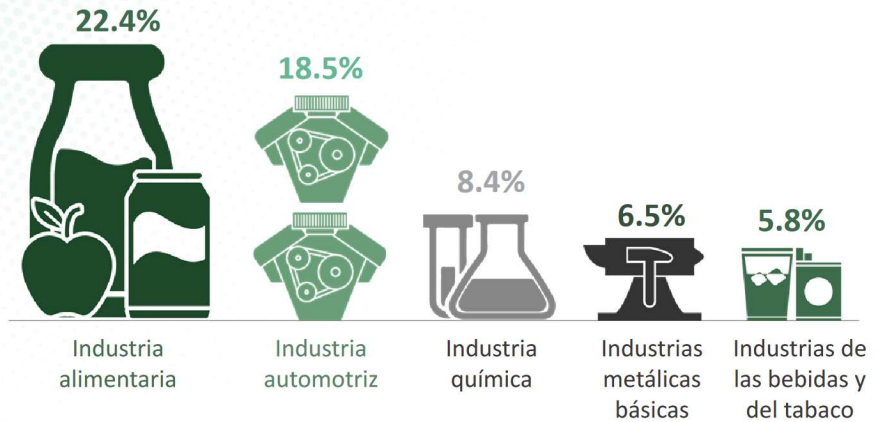
Perspectiva del Sector Automotriz

Se ha diversificado la exportación a otros mercados distintos de EUA.



### Aportación al PIB Manufacturero, 2018

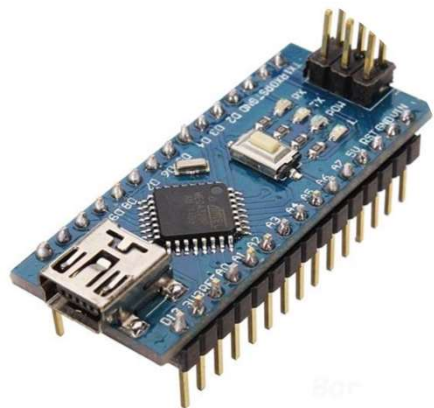
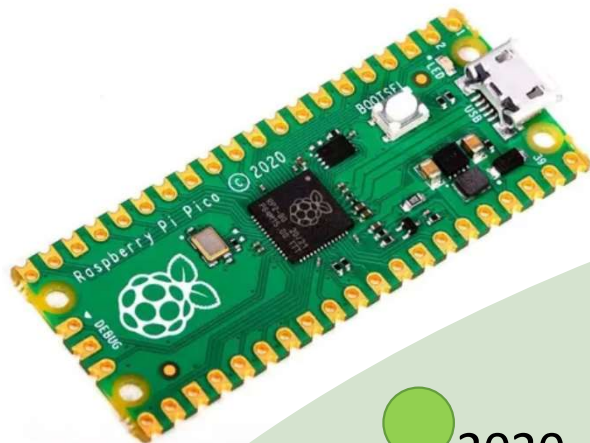
Perspectiva del Sector Automotriz



Fuente: INA con información de INEGI, no incluye autopartes que están consideradas en otras Ramas del código SCIAN

# DT Qué? Visión

DIGITAL  
TRANSFORMATION  
Regional Awareness Event



2018  
Análisis de  
Futuros  
Mercados

2020  
Vida después  
de la  
Pandemia

2022  
Visión  
Estratégica





# DT Qué? Visión

**DIGITAL  
TRANSFORMATION**  
Regional Awareness Event



Strategic Goals & Objectives	
<b>GOAL I: To advance SIM Members metrological capabilities</b>	<b>Improve the scientific &amp; technical capabilities of SIM NMIs...</b>
<b>OBJECTIVE I.1: To have a 5-year capacity building plan approved &amp; funded. The plan should be evaluated every year &amp; updated every two (2) years</b>	<b>Activities I.1.1 - I.1.5</b>
<b>OBJECTIVE I.2: To identify the upper &amp; lower key technical areas among SIM NMIs to help prepare the 5y plan &amp; level up knowledge within subregions</b>	<b>Activities I.2.1 - I.2.4</b>
<b>OBJECTIVE I.3 To support the implementation of an organized M4DT plan for the the next 5 years (Based on OBJECTIVE I.1)</b>	<b>Activities I.3.1 - I.3.3</b>
<b>GOAL II: To enhance SIM international standing as an RMO and as a pillar of the regional QI</b>	<b>Establish SIM as a worldwide leader in metrology at the international fora...</b>
<b>OBJECTIVE II.1: To Promote SIM Member's participation &amp; leadership within the SIM framework &amp; the international arena (including the CIPM-MRA)</b>	<b>Activities II.1.1 - II.1.4</b>
<b>OBJECTIVE II.2: To raise awareness on the importance of SIM as the America's RMO &amp; one of the 3 Quality Infrastructure Council of America's (QICA) pillars</b>	<b>Activities II.2.1 - II.2.3</b>
<b>OBJECTIVE II.3: To enhance SIM Sustainability &amp; growth</b>	<b>Activities II.3.1 - II.3.5</b>
<b>GOAL III: To address the measurement challenges of the future</b>	<b>Identify the scientific &amp; technical measurement needs that NMIs might face in the near by future...</b>
<b>OBJECTIVE III.1: Identify in a continuous way the challenges of the future and the needs to face them</b>	<b>Activities III.1.1 - III.1.3</b>
<b>OBJECTIVE III.2: To prepare a development plan for each identified need</b>	<b>Activities III.2.1 - III.2.4</b>

2022 – 2032 SIM Strategic Plan

## GOAL I: To advance SIM Members metrological capabilities

**OBJECTIVE I.3** To support the implementation of an organized M4DT plan for the the next 5 years  
(Based on OBJECTIVE I.1)

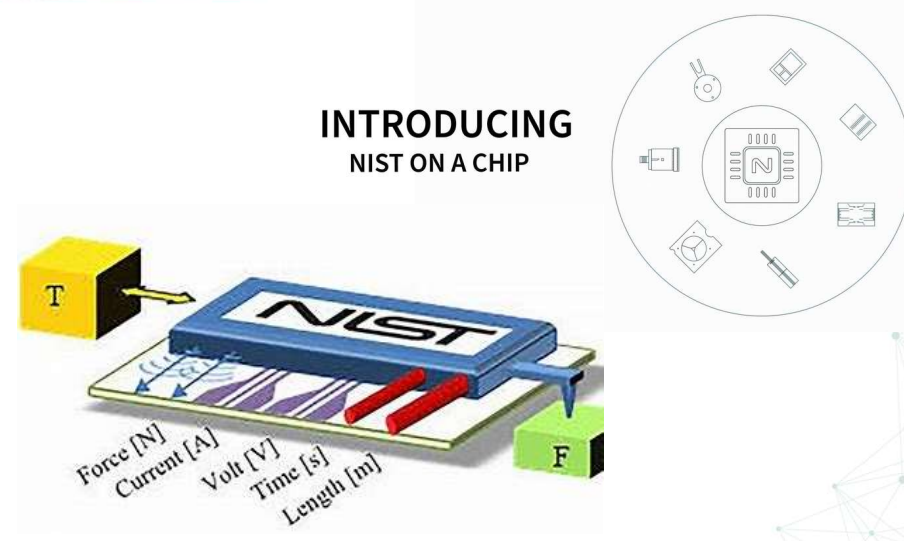
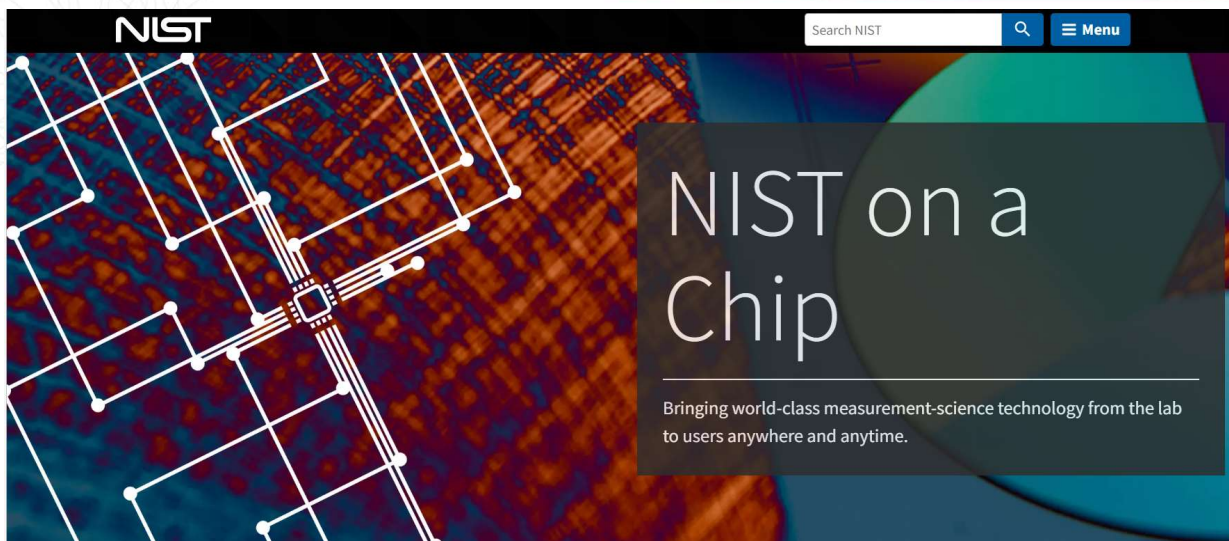
Resources: NIST Program, EURAMET-PTB M4DT Projects, BIPM Programs.

Responsible: PC, TC Chair, MWG # 14 Chair.

- **ACTION I.3.1:** TC & MWG14 Chairs **will coordinate the proper organization of the new MWG for Digital Transformation (MWG # 14).** This includes the needed subgroups, members & tasks.
- **ACTION I.3.2:** The PC, TC Chair & MWG Chair **will forecast the DT needs & prepare** the necessary awareness sessions & training projects to consolidate the initial steps for the M4DT process within the SIM region in the next 2 years.
- **ACTION I.3.3:** The PC, TC Chair & MWG Chair **will develop and implement a 3-year plan** to support an organized M4DT implementation process once at least 2 NMI of each subregion have adopted these new technologies.



**OBJECTIVE I.1:** To have a 5-year capacity building plan approved & funded.  
The plan should be evaluated every year & updated every two (2) years



## What is NIST on a Chip?

\$52,000,000,000.00

NIST has embarked on a revolutionary program that will bring cutting-edge measurement-science technology and expertise from our labs directly to users in commerce, medicine, defense and academia. We are developing a suite of inherently accurate measurement technologies that operate according to the precise, time-tested principles of quantum physics.

2018 - 2030

## PTB M4DT Workshop



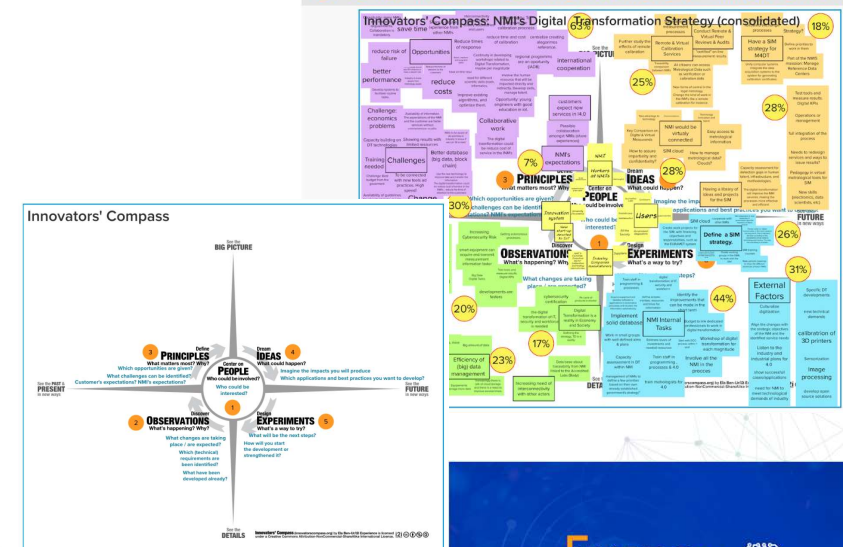
Metrology for Digital Transformation (M4DT) covers a broad range of topics. This workshop focused on the following five topics and instruments:

- Topic 1: Automation of laboratory processes
- Topic 2: Digitalization in legal metrology
- Topic 3: Digital Calibration Certificate
- Topic 4: Metrology for Industry 4.0
- Topic 5: NMI's digital transformation strategy

The objective of the workshop was to contribute to:

- a) inform on the possibilities offered by the digital transformation;
- b) organize an exchange between NMIs;
- c) improve the use of the digital transformation by the NMIs;
- d) accelerate the digital transformation of the NMIs;
- e) develop a digital transformation strategy for the NMIs.

### TOPIC #5: NMI'S DIGITAL TRANSFORMATION STRATEGY



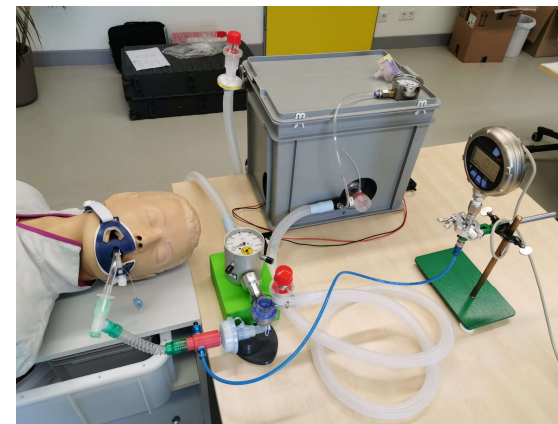
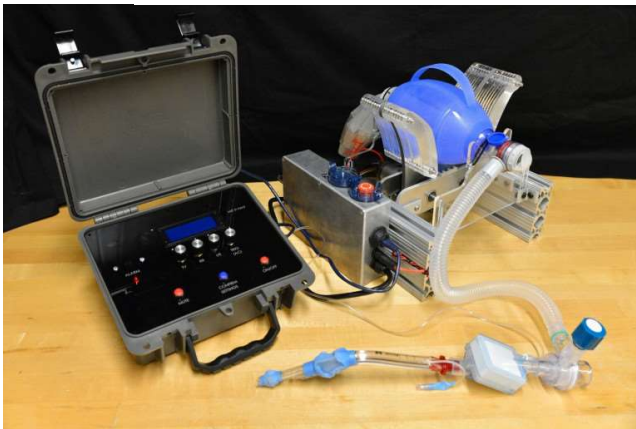
Results: DT DAY & MWG14



## SIM PTB Project

Development of a basic Metrology Infrastructure to support medical testing equipment (ventilators as a priority) 2020 - 2022

- N°1: Design and development of a Low-Cost Flowmeter for mechanical ventilators.
- N°2: Design and build a Lung Simulator for the testing of mechanical ventilators.
- N°3: Improve and strengthen the micro-volume calibration processes in LNM-INEN.
- N°4: Virtual workshop: Technical exchange and knowledge transfer related to the project.
- N°5: Low pressure gas flow and low volume comparisons between NMIs.
- N°6: Workshop including presential training, SIM MWG10 meeting, and Awareness event.



Results: New Competences & development of Digital products & services



NEW PTB PROJECT

### Virtual Workshop

FREE ACTIVITY

Technical exchange and knowledge transfer

**COVID-19** METROLOGISTS AND EXPERTS FROM AMERICA SHARE EXPERIENCES IN THE FIGHT AGAINST A WORLDWIDE HISTORICAL PANDEMIC CRISIS

- 1 Tuesday December 2<sup>nd</sup> 2020
- 2 14:00 to 16:30 UTC time
- 3 Inscription requested <https://forms.ae/G1nh0CvEW5D3UPto8>

Activity organized by SIM with support from PTB, included in recently approved project: Development of basic metrology infrastructure to support medical testing equipment, ventilators as a priority, in Americas



## BID Project: “Strengthening NMI in the Hemisphere, in Support of Emerging Technologies”

- The Project has four (4) Specific Objectives:
- **Promote** a climate of innovation, competitiveness and productivity by **enhancing the delivery of advanced measurement services needed** by firms for the development and adoption of digital technologies.
- **Facilitate the adoption of digital technologies** by the National Metrology Institutes of Latin America and the Caribbean (LAC) to increase their efficiency and impact.
- **Promote the mutual acceptance of measurement results** to facilitate trade.
- **Promote activities of virtual metrological control** of equipment between NMIs and industry, oriented to the development of **work methodologies for Industries 4.0** through the design and implementation of a **Regional Metrology Cloud**.



17 Project Proposals \$2,4 M = \$1,4 SIM + \$1.0 BID

# DT Cómo? Acción

**DIGITAL TRANSFORMATION**  
Regional Awareness Event



## BID Project: “Metrology for DT to Support health services in LAC & address measurement challenges associated with pandemics such as COVID-19”

The Project has three components:

- **I : Information & Awareness.**
- **II : Development of regional pilot projects to implement digitalización processes on calibration & verification services in health issues.**
- **III: Organizational Strengthening.**



Within SIM Taskforce #14 (DTIP) Leads agile project to develop metrologically assured and low-cost laboratory environmental condition measurement systems that will positively impact the upgrade of laboratories that want to integrate into their calibration process and address digital transformation (automation, DCC, connectivity, remote monitoring, security) in the SIM region.

Deliverables of stage 1. April-October 2022-INVESTED BUDGET \$ 20,000.0

- Survey with experts of temperature, humidity and atmospheric pressure magnitudes.
- 5 THB prototypes developed by different NMI integrating project requirements.
- Workshop with stakeholders, invited from PTB to address the issue of DCC integration in the THB.
- Presentations by the Sensors, Process and Integration working groups. Inclusion of new NMIs to the project: Panama and Brazil.

START OF STAGE 2. November 2022-August 2023

AVAILABLE BUDGET \$20,000.00



NAME	NMI	PROJECT ROL
1 ALDO AJALAN	CENAM MEXICO	AGILE COORDINATOR FEATURE OWNER PROCESS
2 Diego Coppin	INT- ARGENTINA	TECHNICAL FEATURE OWNER
3 HUGO GARCIA	CENAM MEXICO	PROJECT OWNER
4 Osian Ramos	LCM COSTA RICA	TECHNICAL/ INTEGRATION DEV OP
5 Ruben Gil	INACAL	SCRUM MASTER INTEGRATION DEV OP
6 Edwin Calera	COLOMBIA	TECHNICAL PROCESS DEV OP
7 ITZEL DOMINGUEZ	CENAM	SCRUM MASTER INTEGRATION DEV OP
8 Marcel Espinoza	SENTER CHILE	TECHNICAL/SENSORS DEV OP
9 Susana Hoyt	CENAM	TECHNICAL PROCESS DEV OP
10 Alex Rache	ECUADOR	TECHNICAL PROCESS DEV OP
11 Carolina Herrera	LCM	TECHNICAL FEATURE OWNER
12 St. Frank (Hiro)	PTB	DCC GUEST
13 Muhammad Ali	PTB	DCC GUEST
14 Thomas	PTB	DCC GUEST
15 CARLOS SALAMAN	CENAM	DCC GUEST

2020 – Feb 2024

\$1,1 M = \$0,6 SIM + 0,5 BID

# COMPONENTE I: INFORMACIÓN Y SENSIBILIZACIÓN

## 1. Sesiones de Sensibilización

ANDIMET: INM - Colombia – Mayo 23, 2023

CAMET: CIM – El Salvador – Agosto 18, 2023

SURAMET: INTN – Paraguay – Noviembre 08, 2023

CARIMET: QI, 2024

## 2. Desarrollo de un estudio de Diagnóstico y Plan de Acción sobre Metrología y TD para la SALUD en LAC.



## COMPONENTE II:

# TALLERES TÉCNICOS Y SOPORTE A GRUPOS REGIONALES PARA IMPLEMENTAR LA DIGITALIZACIÓN EN METROLOGÍA

- 4 PROYECTOS PILOTOS CONJUNTOS DE I+D EN TD

# P1- Desarrollo de un termo-higro-barómetro con criterios de digitalización



Bolivia



Chile



México



Trinidad y Tobago



Argentina



Ecuador



Perú



Costa Rica



Panamá



## P1- Desarrollo de un termohigrobarómetro con criterios de digitalización

Objetivos:

- Desarrollar capacidades en la construcción de un termohigrobarómetro IoT de bajo costo
- Diseñar e implementar su calibración
- Diseñar e implementar el protocolo de su Certificado de Calibración Digital (colaboración)
- Avance en la red de sensores
- Avance en el esquema de su calibración remota (colaboración)





Brazil



Chile



México



Argentina



Bolivia

P2

- SISTEMAS ÓPTICOS DE MEDICIÓN 3D
- Trazabilidad dimensional para aplicaciones industriales y médicas



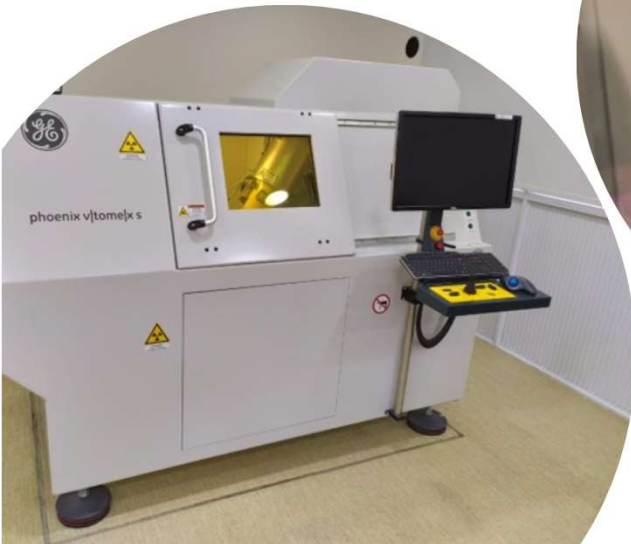
## P2 - SISTEMAS ÓPTICOS DE MEDICIÓN 3D

- Trazabilidad dimensional para aplicaciones industriales y médicas

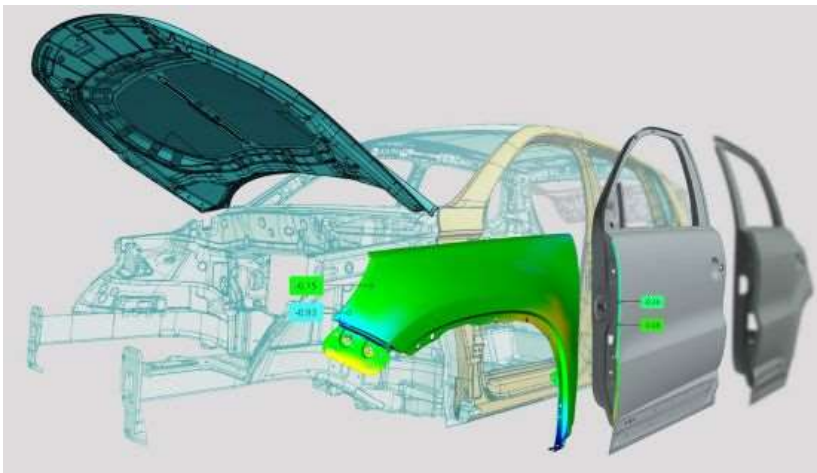


### MOTIVACIÓN DEL PROYECTO

- El cambio de la medición como herramienta de control de calidad a un paso completamente integrado en el proceso de producción.
- Los procesos de fabricación industrial están cambiando: impresión 3D / tecnologías de fabricación adaptativas
- Los sistemas de medición ahora pueden medir y adaptar su proceso de medición en tiempo real



## P2 - SISTEMAS ÓPTICOS DE MEDICIÓN 3D - Trazabilidad dimensional para aplicaciones industriales y médicas



### *El objetivo general:*

- Estudio de sistemas ópticos de medida 3D

### *Objetivos específicos*

1. Estudio de la trazabilidad y de las normas o directrices utilizadas
2. Patrones requeridos para la evaluación del desempeño según estándares o lineamientos
3. Estudio de fuentes típicas de errores
4. Grupos de trabajo con empresas que utilizan metrología óptica 3D
5. Desarrollo de patrones especiales para aplicaciones específicas



Panamá



México



Colombia



Argentina



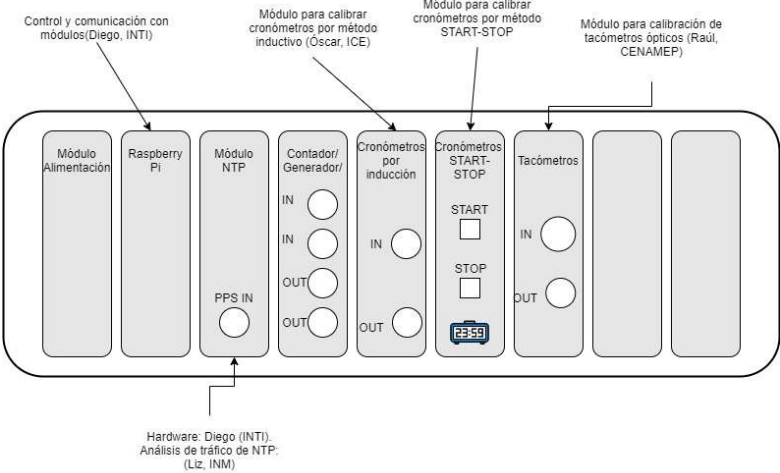
Costa Rica

P3

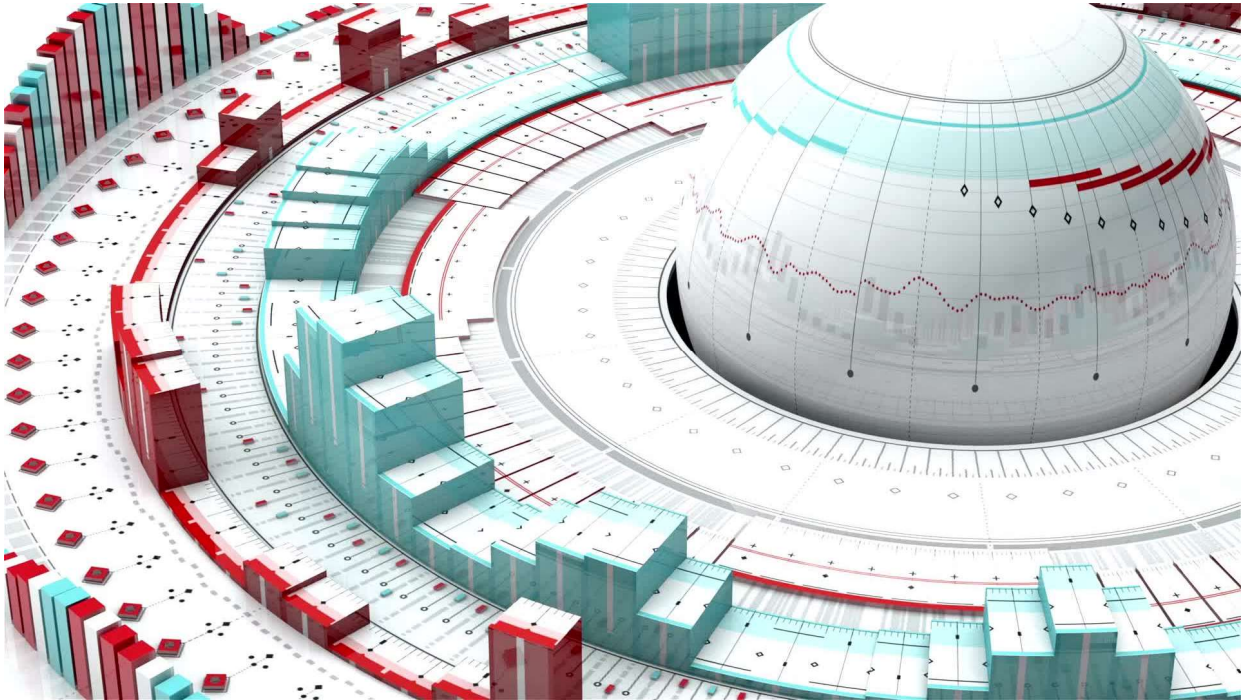
– Plataforma digital de tiempo y frecuencia

# P3 - Plataforma digital de tiempo y frecuencia

- Este proyecto tiene como objetivo conceptualizar, diseñar e implementar una plataforma económica y abierta para medidas de tiempo y frecuencia.
- El objetivo principal de este proyecto es proponer y construir un sistema de medida modular y económico capaz de realizar medidas de tiempo y frecuencia con trazabilidad a una referencia conocida.



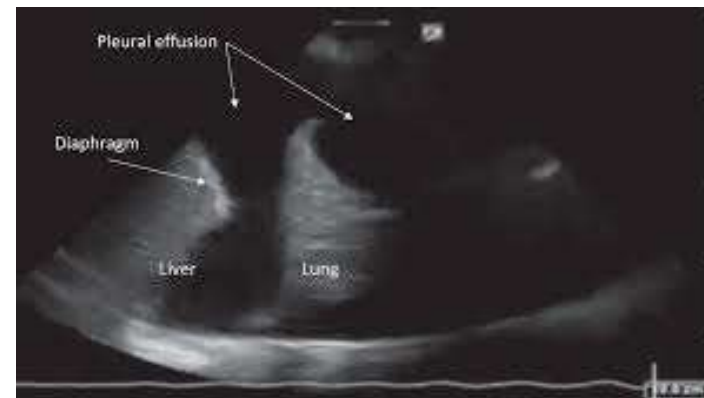
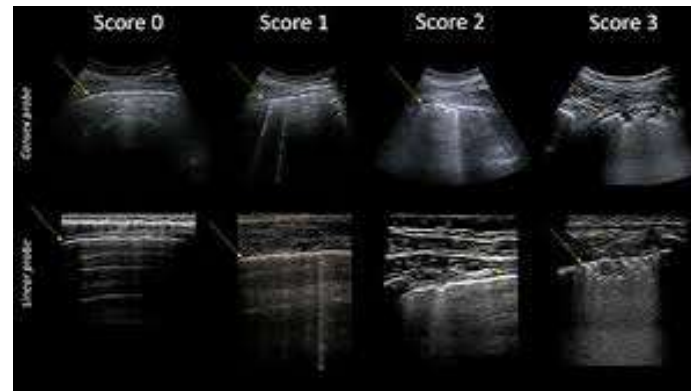
Hardware: Diego (INTI).  
Análisis de tráfico de NTP.  
(Liz. INM)

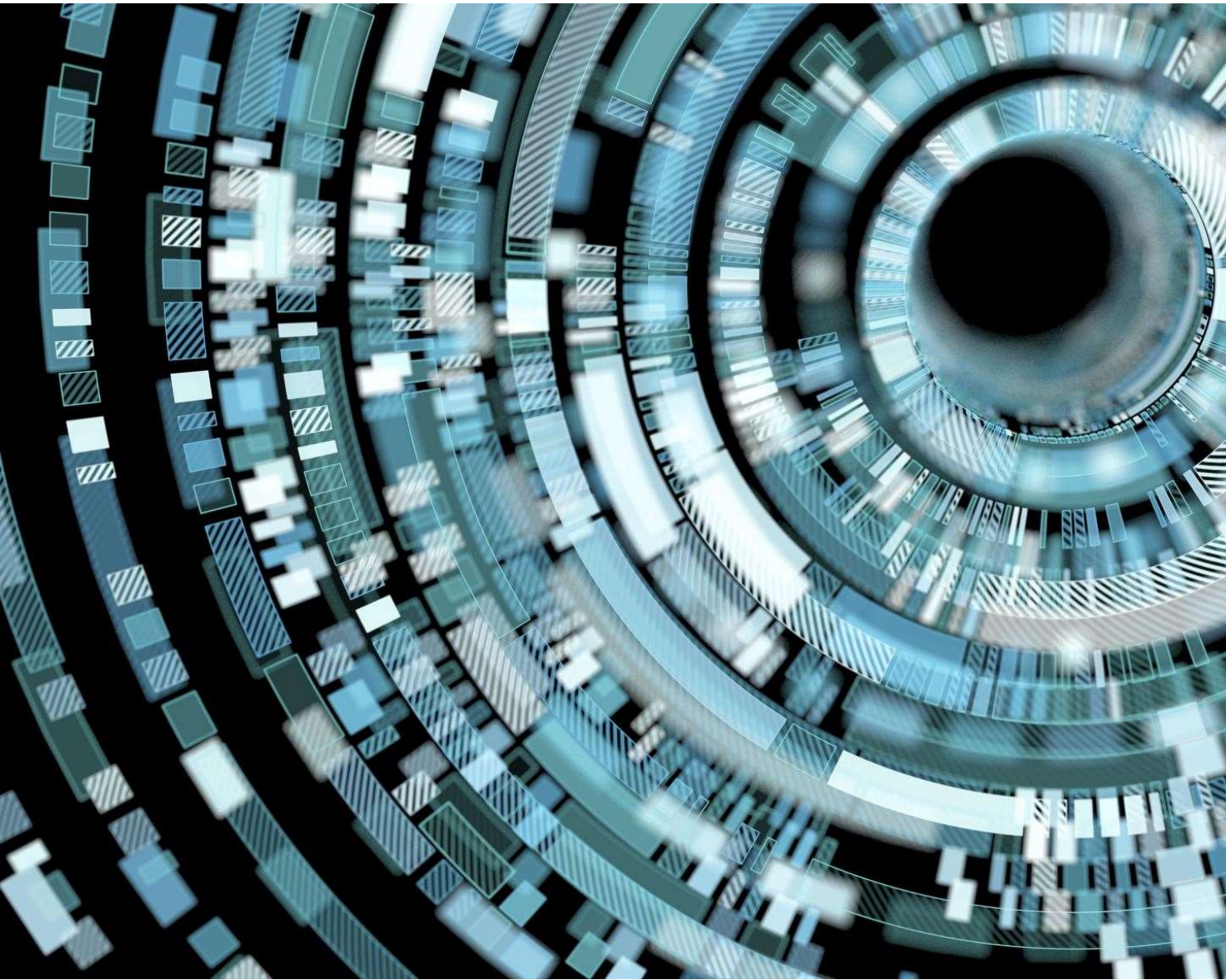




# P4 - Evaluación metrológica de la ecografía pulmonar mediante máquina vectorial virtual para el diagnóstico del síndrome de dificultad respiratoria aguda (SDRA)

- Ultrasonido pulmonar (LUS)
- Ultrasonografía de pulmones LUS “scores” (LUSS)
- Puntuación semicuantitativa que mide la pérdida de aireación pulmonar provocada por diferentes condiciones patológicas (SDRA, por ejemplo)





## Objetivo principal

- Descubrir la aplicabilidad de VVM para ayudar en el diagnóstico de ARDS (DARDS) basado en imágenes LUS - Máquina de vectores virtuales (VVM)
- Modelos de aprendizaje supervisado con algoritmos de aprendizaje asociados que analizan datos para clasificación y análisis de regresión VVM -Machine Learning - Inteligencia Artificial



## Resultados principales

- Una herramienta automatizada para diagnosticar ARDS basada en diferentes puntajes LUS
  - Validado tecnológicamente
  - Validado metrológicamente
  - Gratis para usar en todo el mundo
- Difundir el conocimiento de LUS, ARDS, VVM entre los INM del SIM
  - Intercambio técnico
  - Pasantías
  - Culturalización sobre M4DT respecto a la utilidad de los ultrasonidos

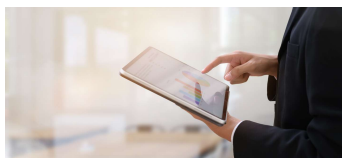
## COMPONENTE III

# FORTALECIMIENTO INSTITUCIONAL

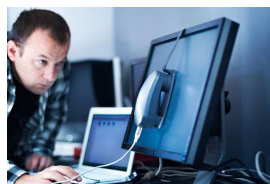
- CAPACITY BUILDING on TD  
(CABUREK TD)

# CAPACITY BUILDING REGIONAL EXCHANGE OF KNOWLEDGE

CABUREK SIM-M4DT



**WG1 CERTIFICADOS DE  
CALIBRACIÓN DIGITAL**



**WG2 AUTOMATIZACIÓN  
DE LABORATORIOS Y  
CALIBRACIONES  
REMOTAS**



**WG3: DIGITALIZACIÓN DE  
SISTEMAS DE GESTIÓN Y  
ATENCIÓN AL CLIENTE EN  
LOS NMIs**

INTERCAMBIO REGIONAL

COMITÉ TÉCNICO



# DT Cómo? Acción

DIGITAL  
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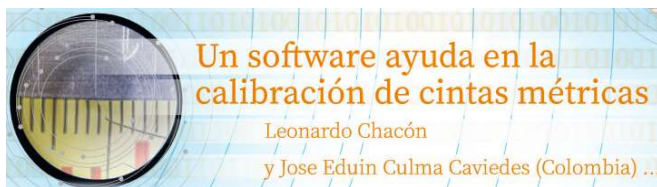


## SIM DT Communication

Regional Magazine (De acuerdo) & World Metrology Day (WMD)



2021 & 2022  
¡De acuerdo!  
magazines & the  
WMD talked  
about Health & DT



Results: over 30 projects, papers or articles related to new DT products or services in the field of Metrology

## Other Related Activities

- SIM - BIPM MoU e-Learning - March 2023
- SIM - NIST MoU Loan for research equipment (receiver calibration system ) - TBD
- SIM - IMEKO MoU – Digital Transformation knowledge exchange - TBD



## KEY NOTES

- SIM se ha venido preparando para la TD en los últimos 5 años.
- La TD en LAC avanza más rápido que los cambios en los NMI.
- SIM ha necesitado adaptar su estrategia a los cambios en TD.
- SIM ha logrado presentar sobre 30 papers o proyectos en TD.
- SIM necesita enfocarse en las nuevas competencias en TICS.
- Cooperación Regional será clave para la TD en la región SIM.



DIGITAL  
TRANSFORMATION  
Regional Awareness Event



*¡Muchas Gracias!*

Mgter. Javier A. Arias Real  
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