RIA: Promoviendo sinergias entre grandes observatorios españoles I
La Palma 2023

Gestión Efectiva del Departamento del Ingeniería Maximizando el Rendimiento en el OAJ

Axel Yanes – Head of Engineering and Control Systems at CEFCA

La Palma, Monday 23rd October 2023 at 17:40

V8.0

Loading our mindset concepts to show you our point of view

Axel Yanes – ayanes@cefca.es

DING
perspective

12 years
In
12 minutes

Outline

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1. **Introduction**
2. OAJ, CIA and GOCS
3. Management Challenges
4. Teamwork Optimization
5. Emerging Technologies
6. Conclusions

Picture: Solaiman Hossen at Unsplash

Boosting Observatory Operation Performance

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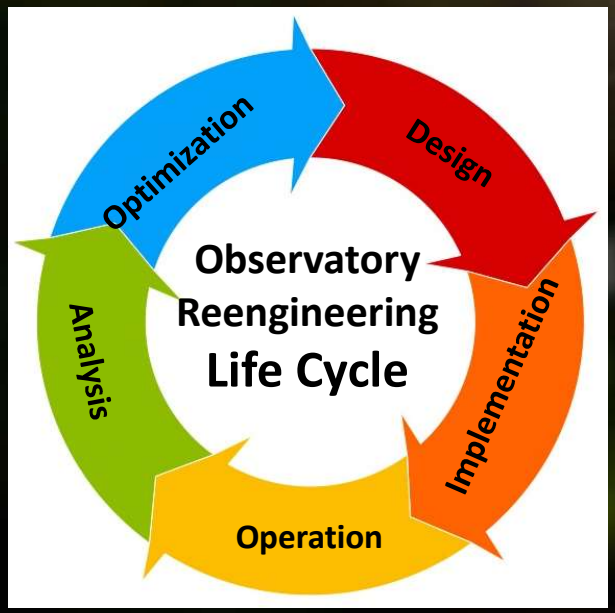

An Astrophysical Observatory is a Dynamic Complex Macro System that needs to be adapting continuously to updated demanding requirements

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The observatory is a dynamic system… It is alive!

Circumstances are changing continuously…

Needs, constrains and requirements are updated continuously…

Science

Technology

Staff

Problems

Fundings

Pandemic

Etc…

?

Boosting Observatory Operation Performance

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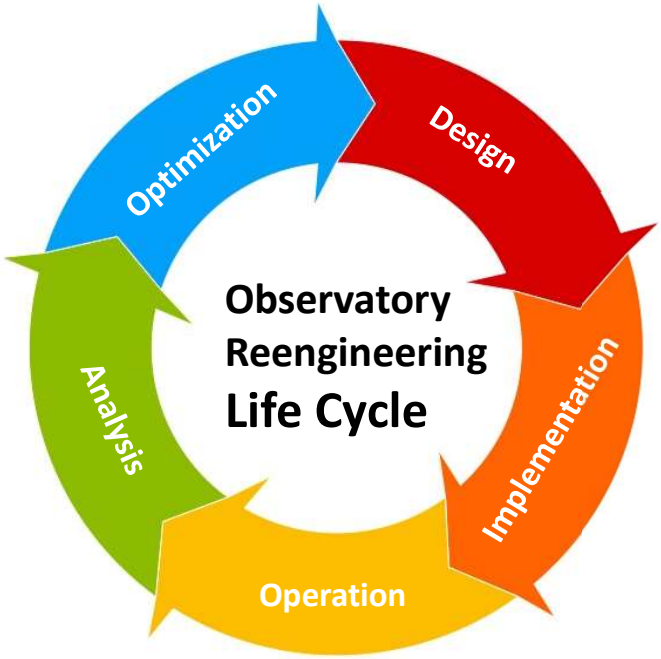

Tools for all staff profiles

Adapting continuously to:

- **Achieve Scientific Objetives**
- **Maintaining Quality Requirements**
- **Minimizing Material and Human Resources**

Outline

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Picture: Solaiman Hossen at Unsplash

The Observatorio Astrofísico de Javalambre

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Control Architecture for Observatory Operation

From Science to Support







POAJ







Boosting Observatory Operation Performance

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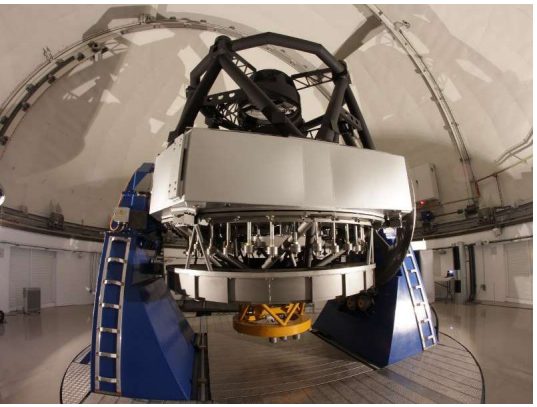

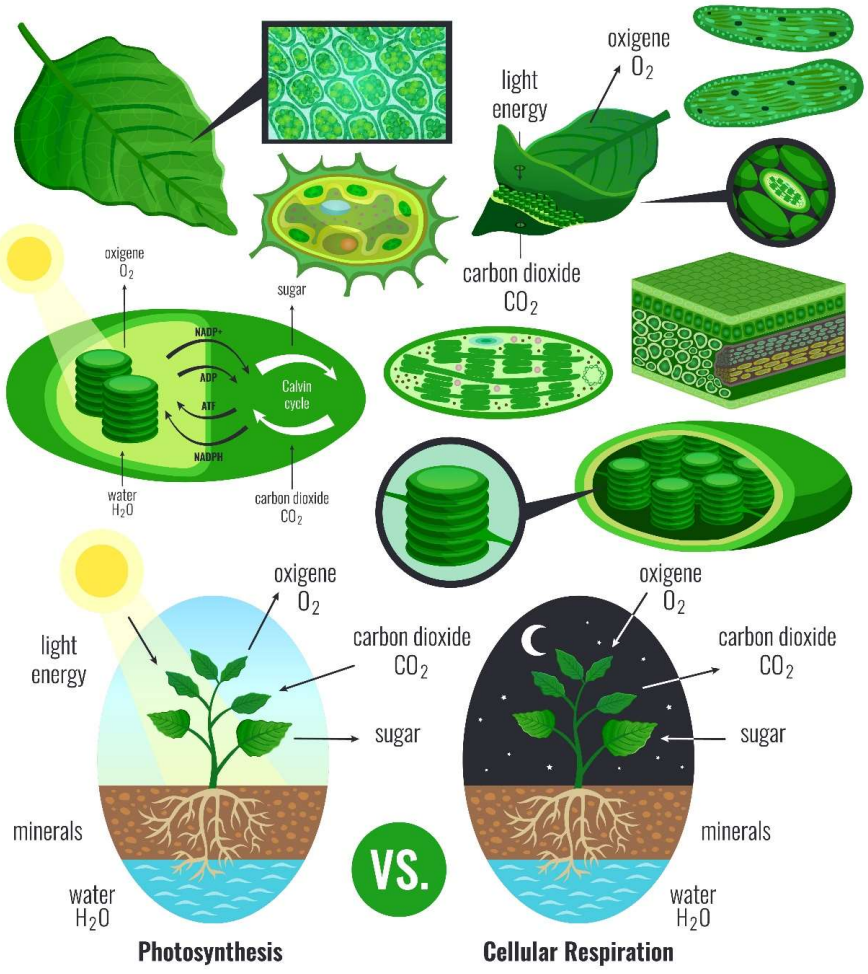

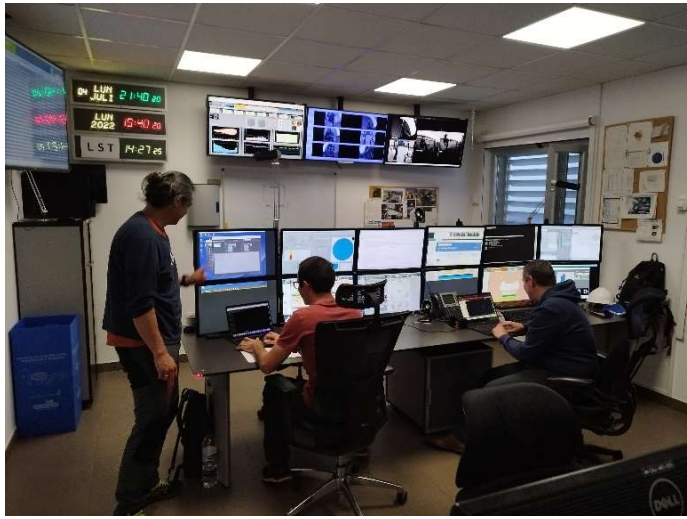

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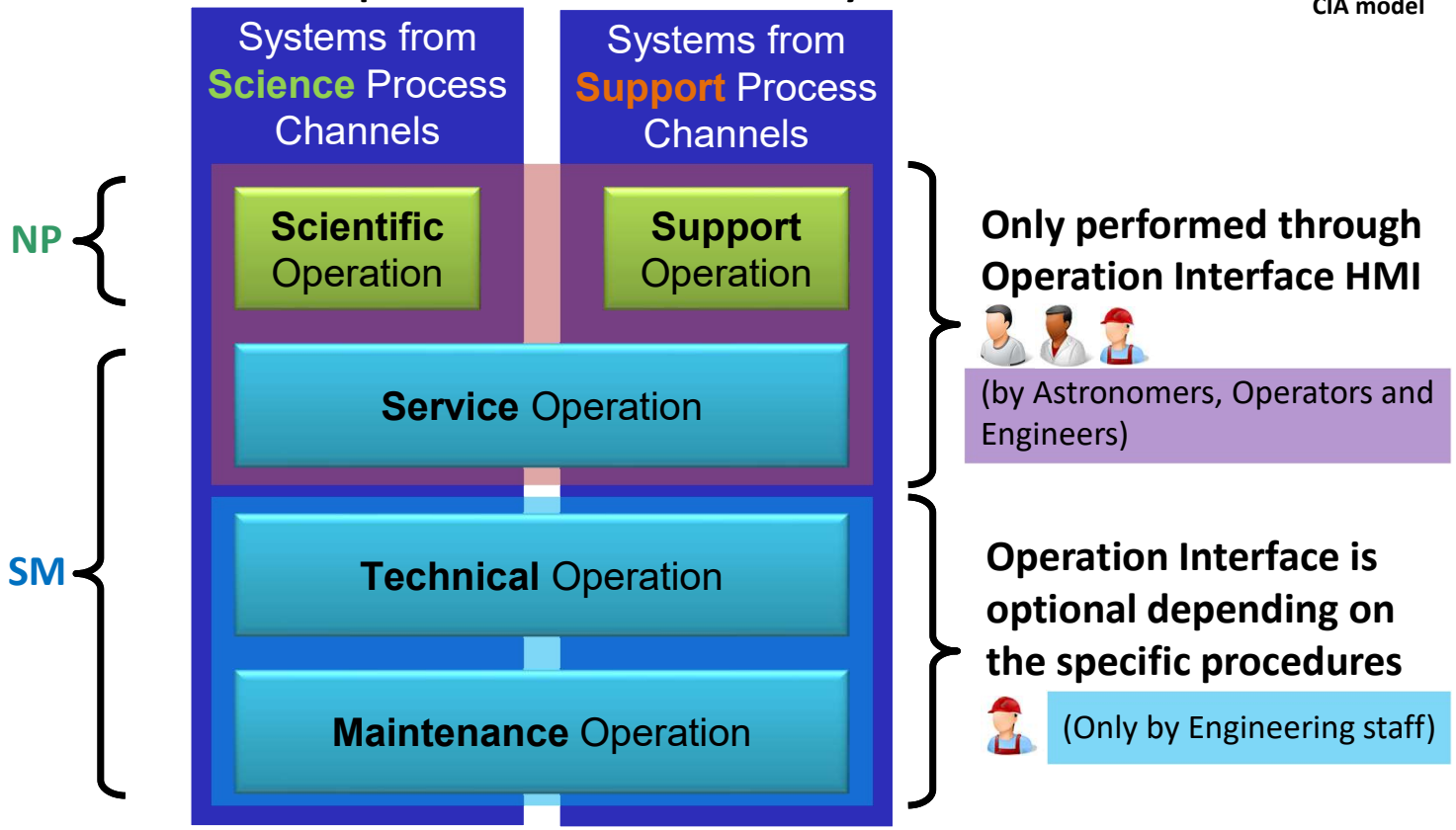
GOCS : Global Observatory Control System

Global Operation of the Observatory

CIA model



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Control Architecture for Observatory Operation

Science Process Channels working together with **Support** Proccess Channels

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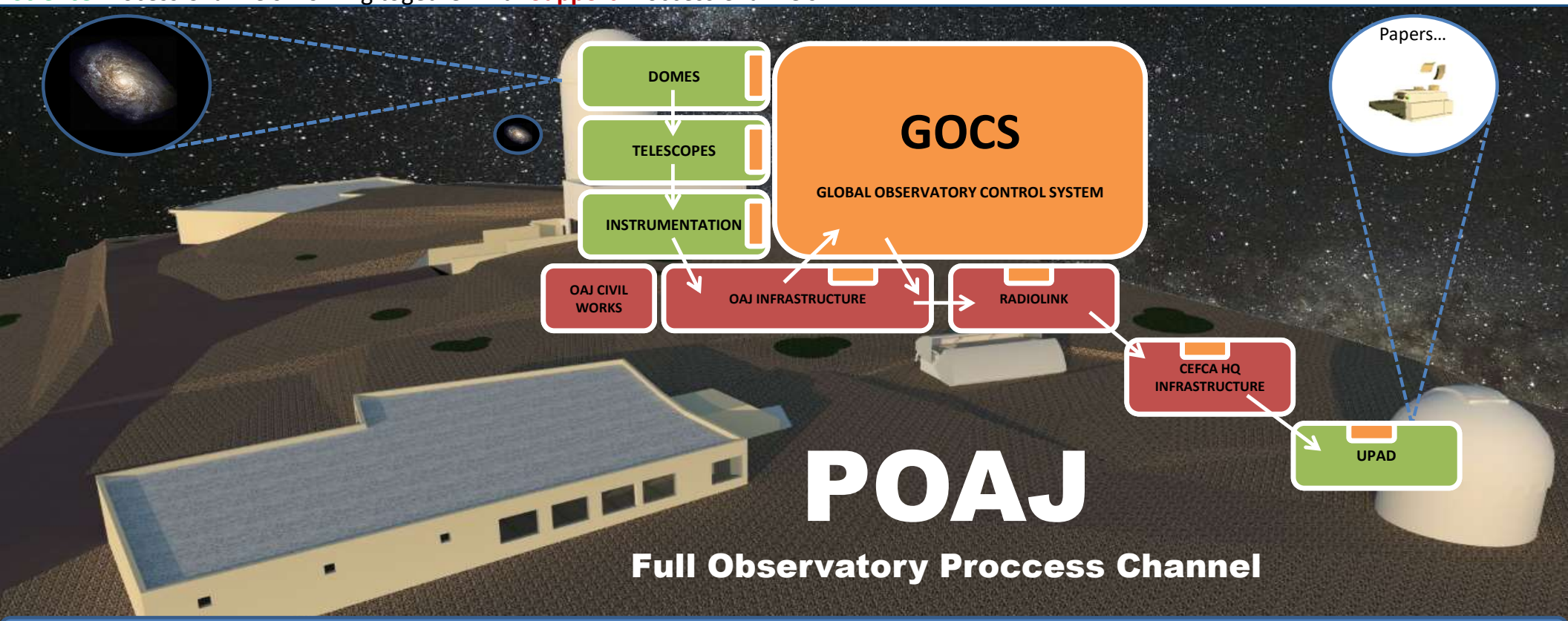

CEFCA ENGINEERING SERVICES POWERING POAJ

OPTICS	MECHANICS	ELECTRONICS	CONTROL HARDWARE	CONTROL SOFTWARE	NETWORKS & COMUNICATIONS	LOGISTICS & MAINTENANCE

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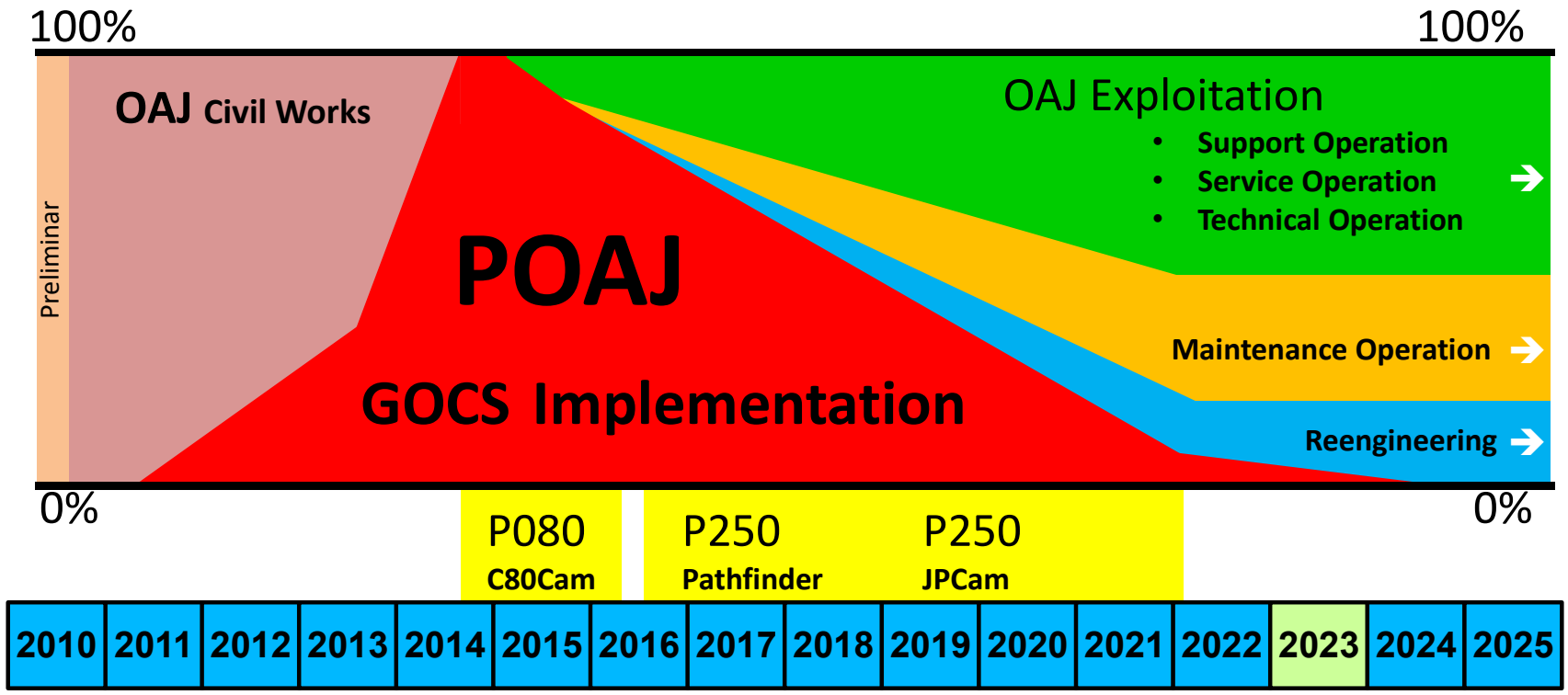
Fully Automated Observatory Dedication Distribution History (Control System Engineering)



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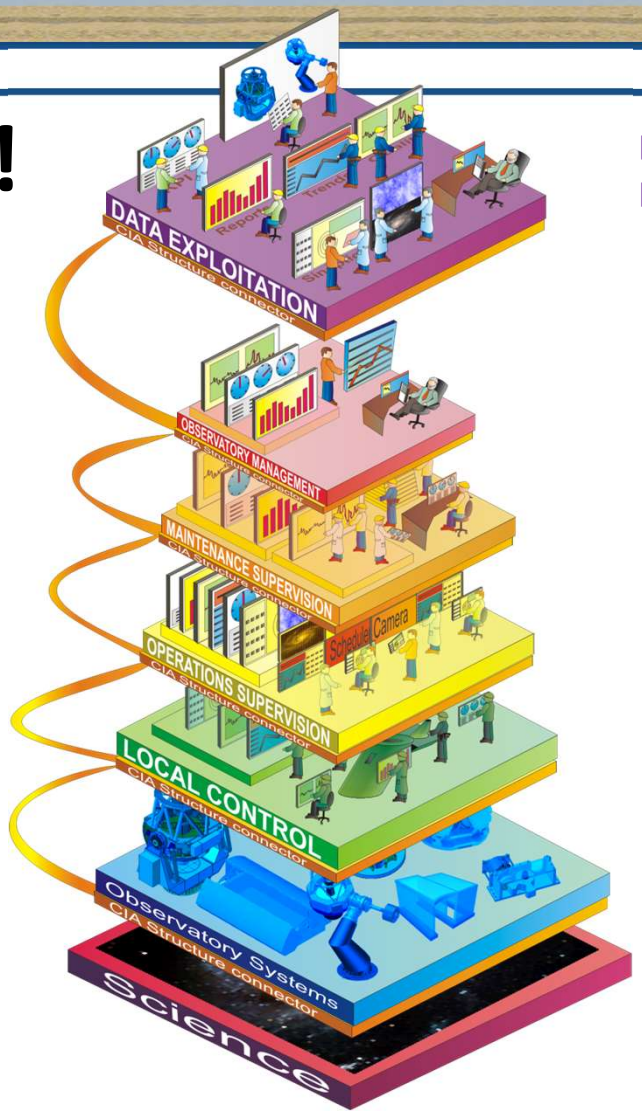
Current Status!!



LEVEL 6: EXPLOITATION
High Performance Processes
ERP & CMMS Reengineering = 85%

LEVEL 5: Global Management = 100%

LEVEL 4: Maintenance = 100%

LEVEL 3: Support = 100%
Control Integrated Architecture

LEVEL 2: Control = 100%

LEVEL 1: Observatory Systems = 100%

LEVEL 0: Nature

The Observatorio Astrofísico de Javalambre is a fully automated observatory based on CIA model

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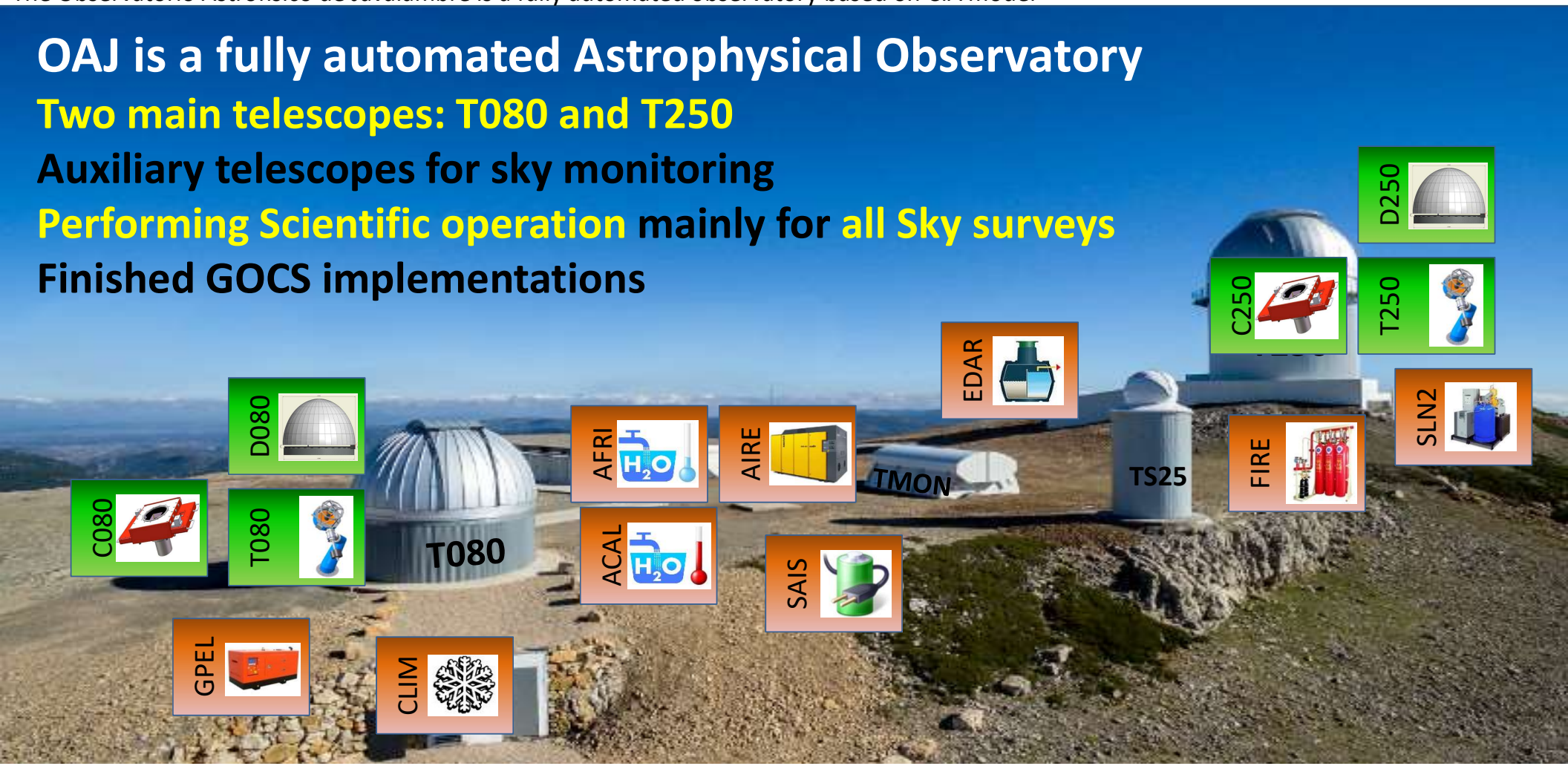
OAJ is a fully automated Astrophysical Observatory

Two main telescopes: T080 and T250

Auxiliary telescopes for sky monitoring

Performing Scientific operation mainly for all Sky surveys

Finished GOCS implementations



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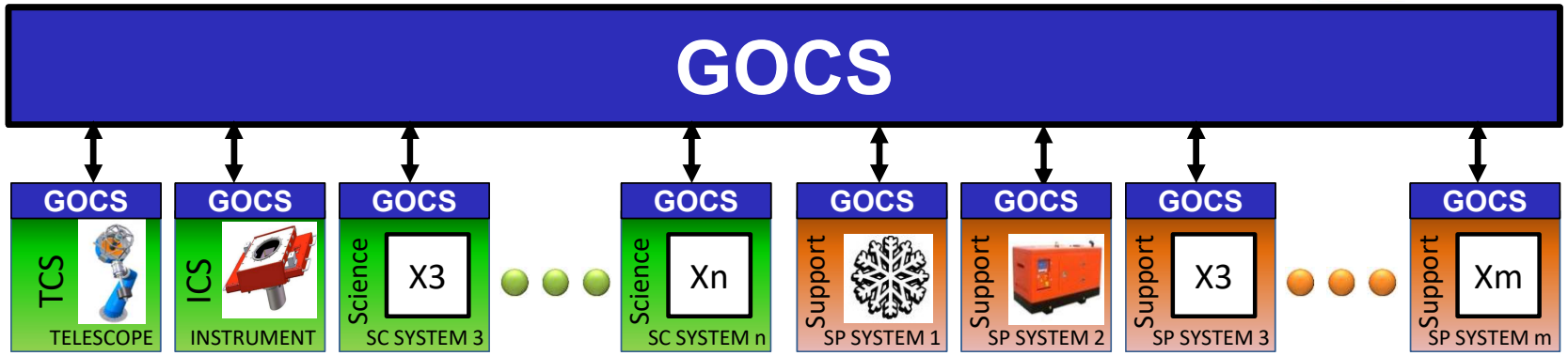
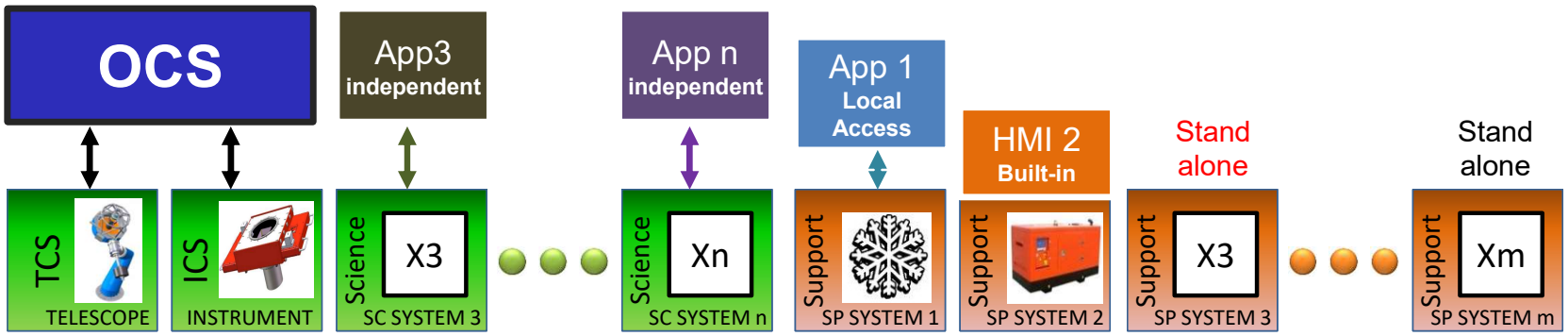
"GOCS" : Global Observatory Control System

CIA model



"OCS et al": Observatory Control System et al



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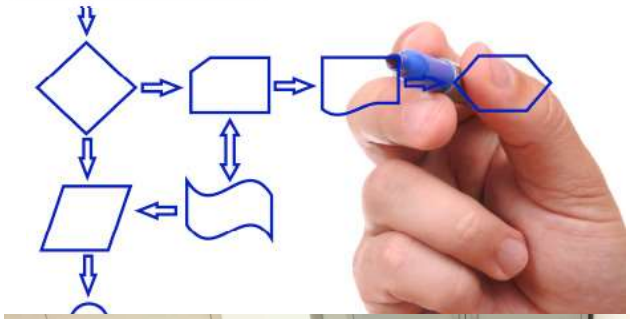
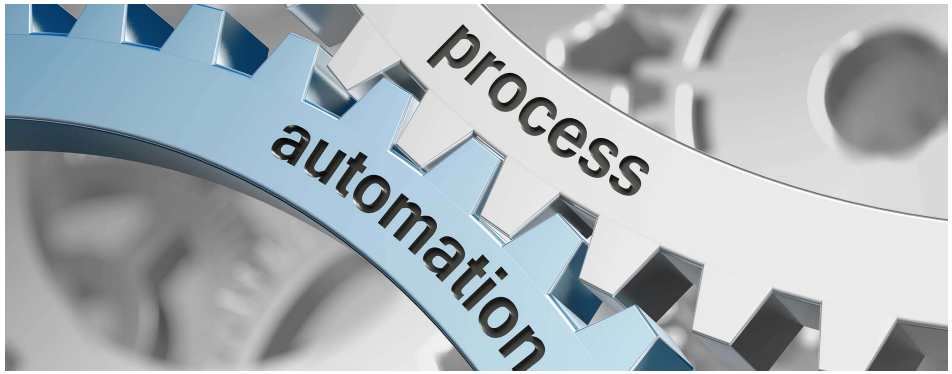
Control Integrated Architecture





It is a control engineering model for Astrophysical Observatories

CIA Concepts: Standard System Clasification Nomenclature

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Systems codification					Comp		Signals		
DESCRIPTION	PROCESS CHANNEL	SYSTEM	SUBSYSTEM	DIVISIONS	COMPONENTS	ITEMS	SIGNAL TYPE	NUMERATION	FUNCIONALITY
CODE	XXXX	XXXX	XXXX	XXXX	XX	XX	XX	XX	XX
DIGITS	4	4	4	4	2	2	2	2	2

Location codification					
DESCRIPTION	INFRASTRUCTURE	AREA	ZONE	SECTION	ENCLOSURE
CODE	XXXX	XXXX	XXXX	XXXX	XXXX
DIGITS	4	4	4	4	4

Global systems codification, components and signals

Group codification
4 digits XXXX

Sistem codification
8 digits XXXX XXXX

Subsystem codification
12 digits XXXX XXXX XXXX

Division codification
16 digits XXXX XXXX XXXX XXXX

Component codification
20 digits XXXX XXXX XXXX XXXX XX XX

Local PLCs signal codification

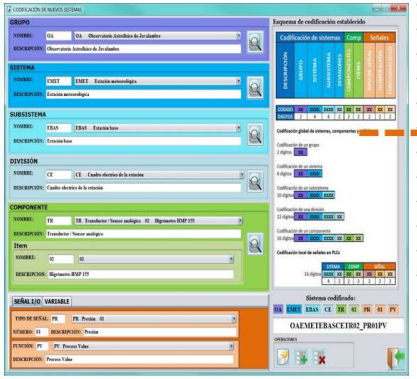
PLC / System		
XXXX	XXXX	XXXX
4	4	4

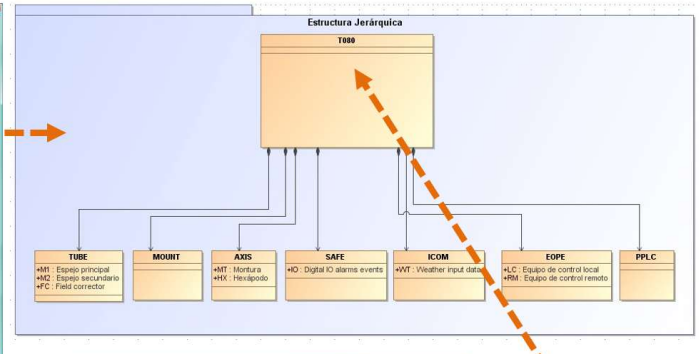
PLC Adress: 12 digits

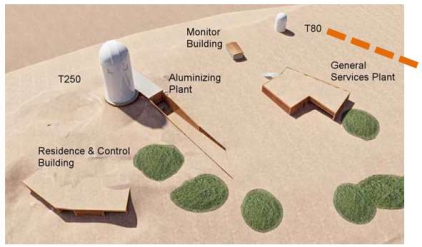
	COMP		SIGNAL		
XXXX	XX	XX	XX	XX	XX
4	2	2	2	2	2

Señal:14 digits

Control Integrated Architecture







- Create modeling guidelines for all system aspects, hierarchy levels and views.
- Build a comprehensive model, which serves as the basis for providing different views to different engineering aspects and subsequent activities.

CIA Concepts: GOCS Deployment Layers

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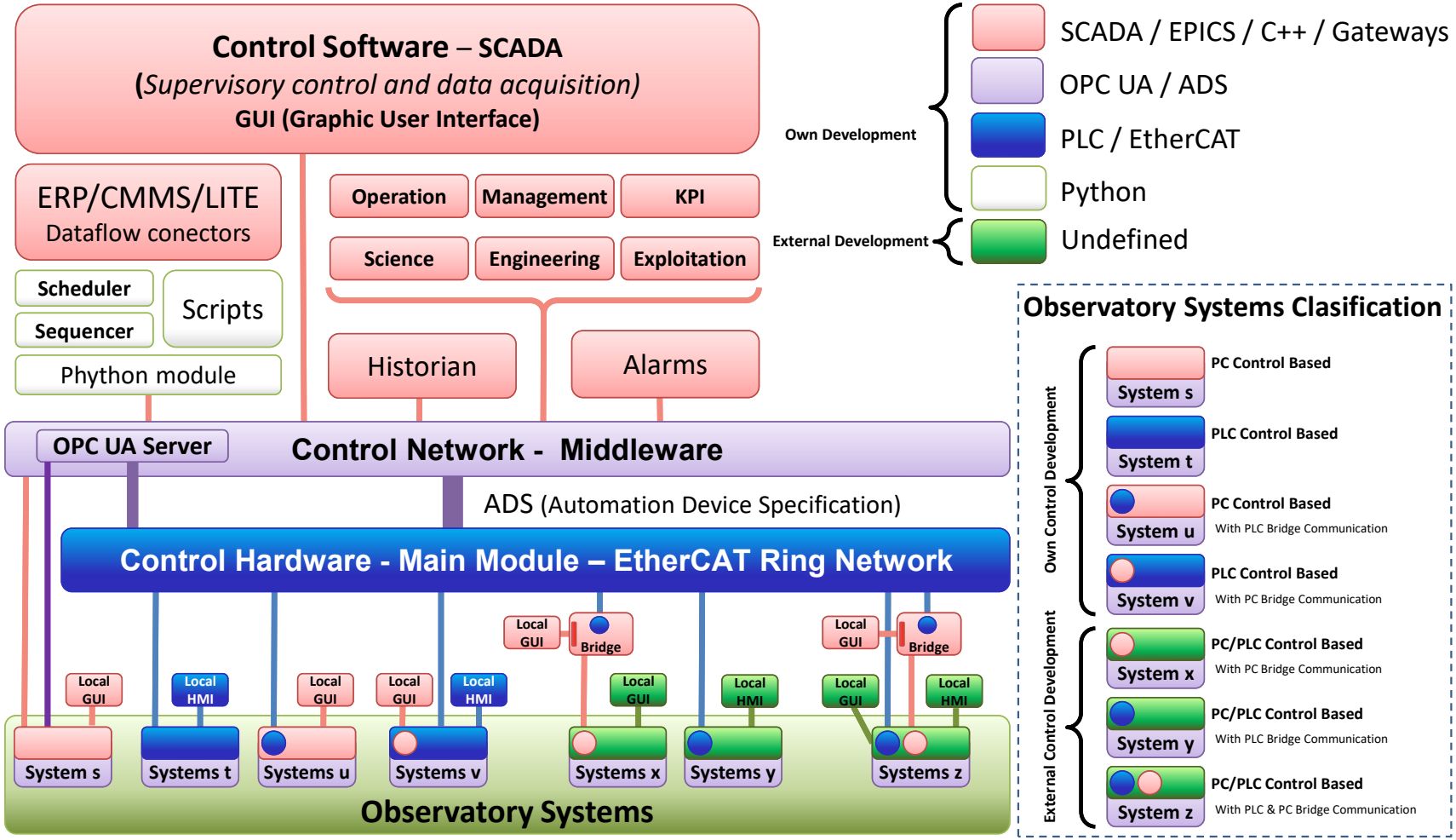

CIA Concept: Splitted view of GOCS levels

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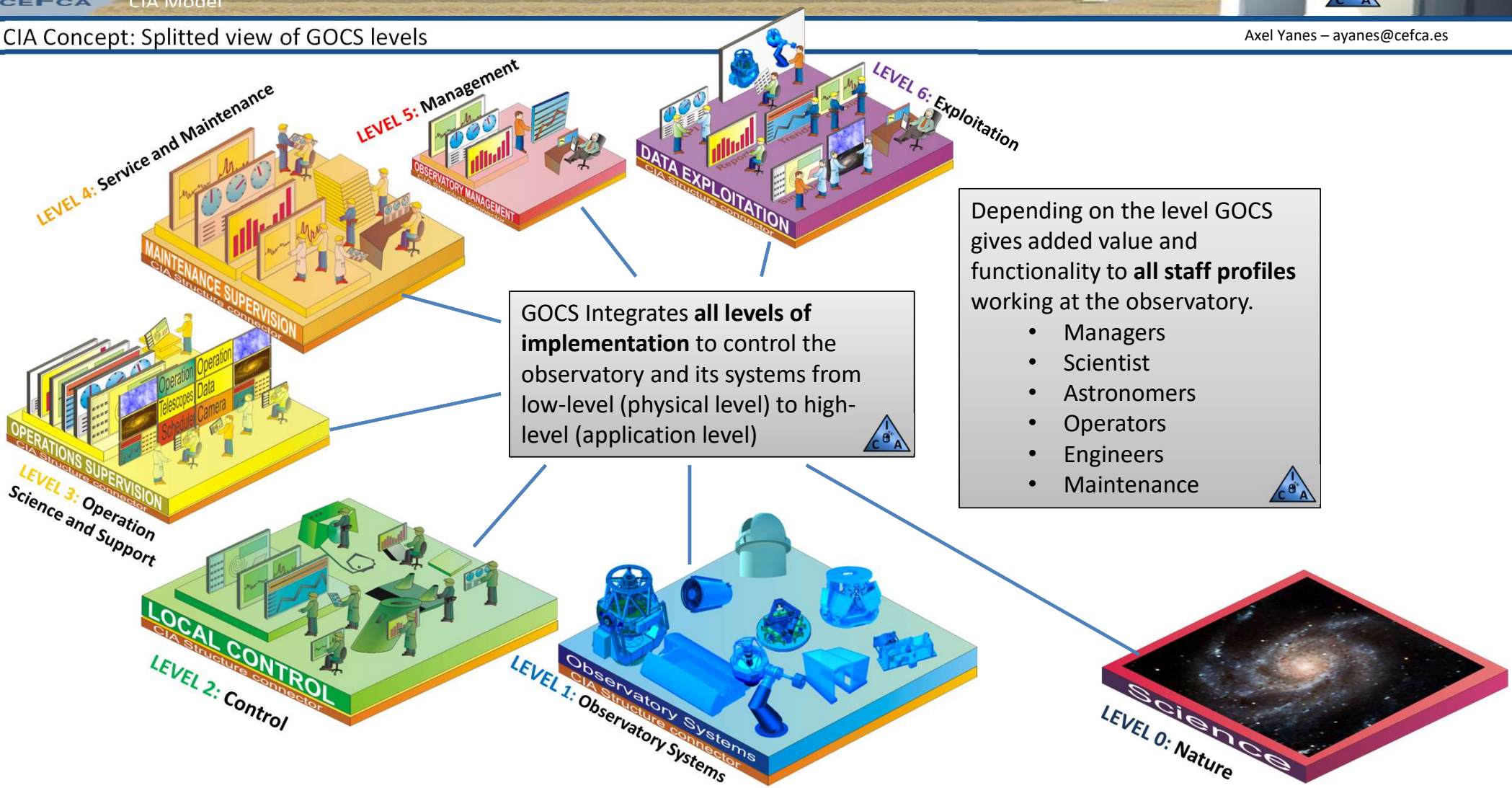

GOCS Integrates **all levels of implementation** to control the observatory and its systems from low-level (physical level) to high-level (application level)

Depending on the level GOCS gives added value and functionality to **all staff profiles** working at the observatory.

- Managers
- Scientist
- Astronomers
- Operators
- Engineers
- Maintenance

OAJ InterBuilding Control Communications

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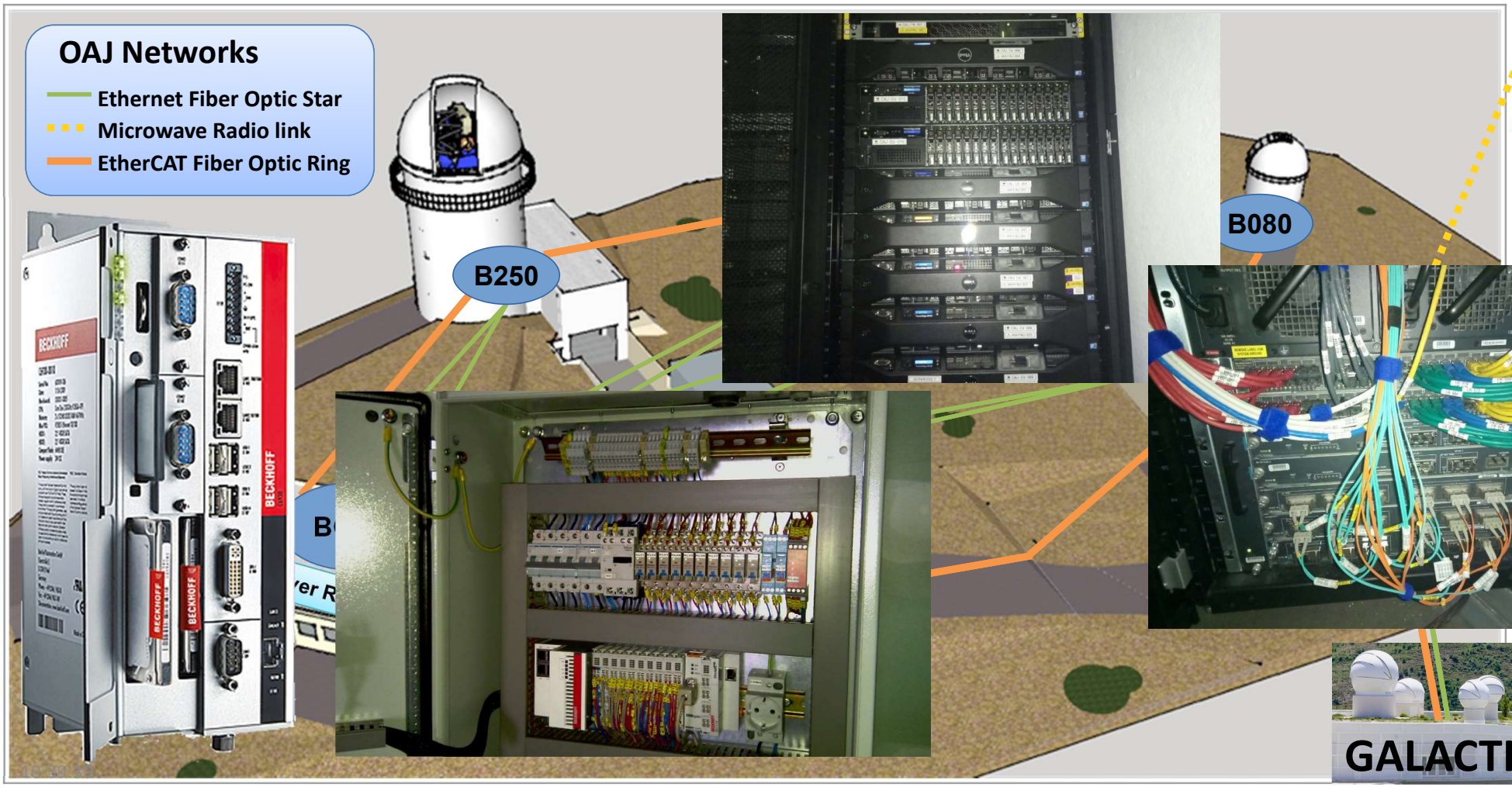

Architecture: PLC & fieldbus for OCSH: Deployment of Ethercat Protocol

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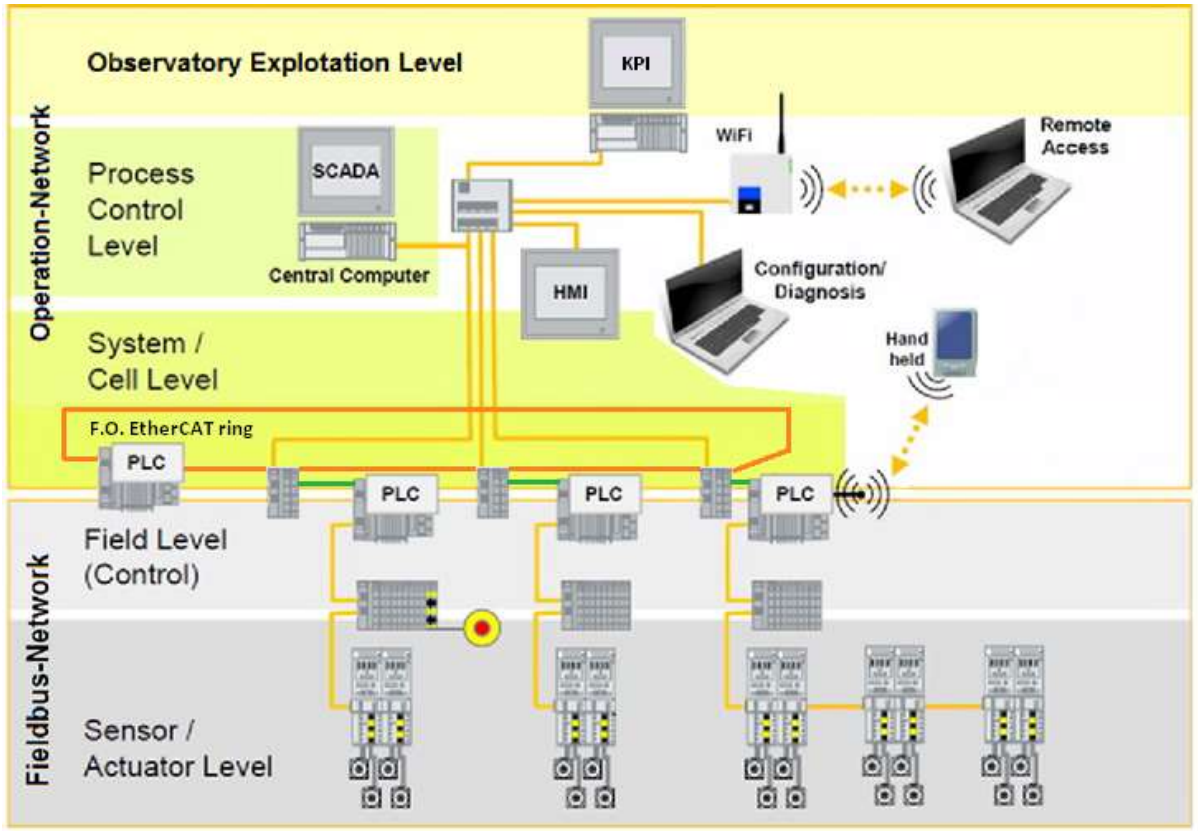
EtherCAT (Ethernet for Control of Automation Technology)



EtherCAT Device Protocol (processed on the fly)

- ✓ Connection to OCS
- ✓ Configuration/Diagnosis (also Remote)
- ✓ Control/Visualization
- ✓ Standard Ethernet Components
- ✓ Master-Master Communication
- ✓ Routing to any device connected
- ✓ Wireless device integration

EtherCAT Protocol

- ✓ Open Protocol: ISO, IEC and SEMI Standard
- ✓ Used at Field Level
- ✓ Hard Real-Time
  - Fast Cycle Times
  - Precise Sync.
- ✓ Flexible Topologies
- ✓ Standard Ethernet Components

Distributed Information System for Operation Support

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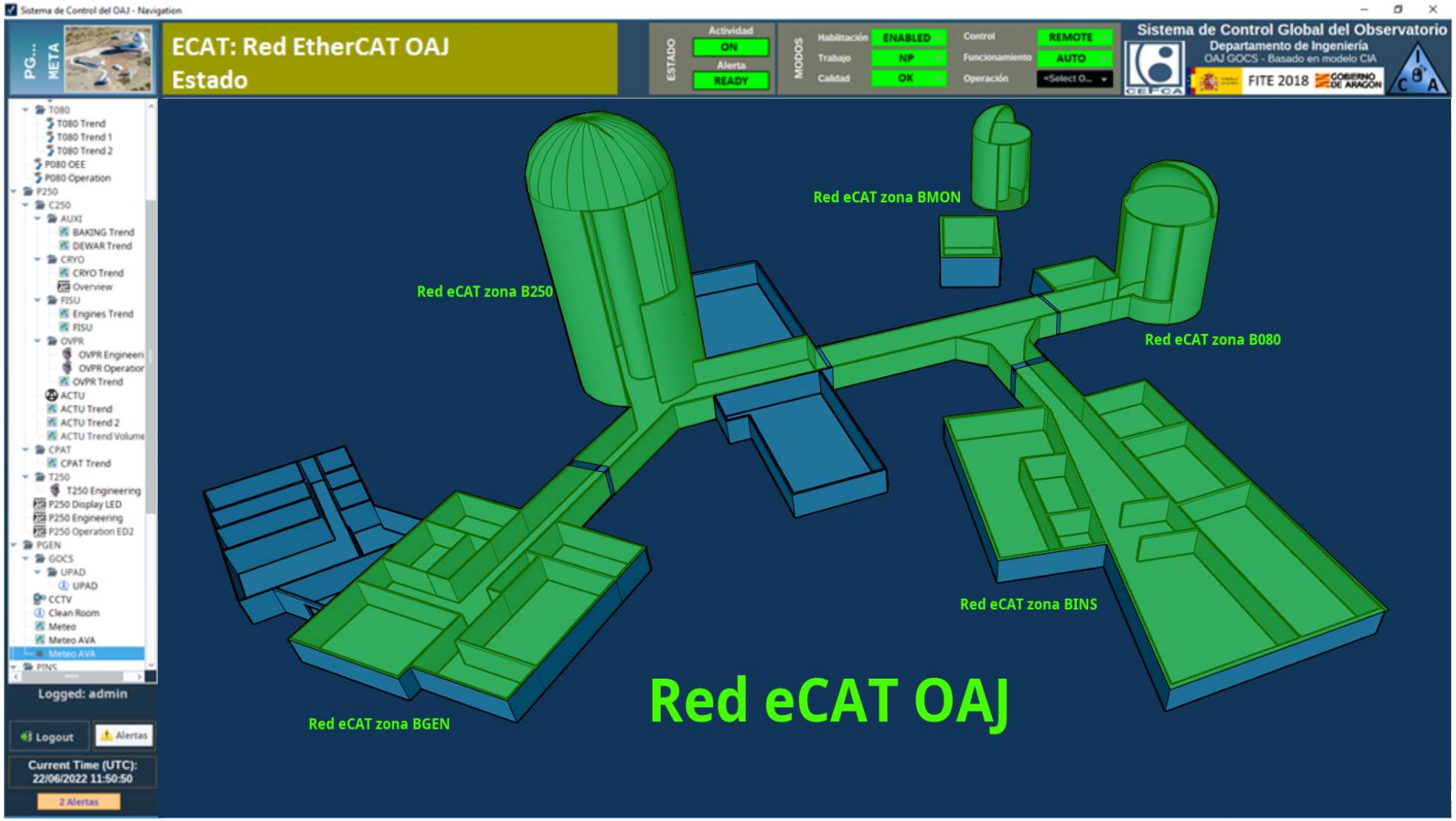

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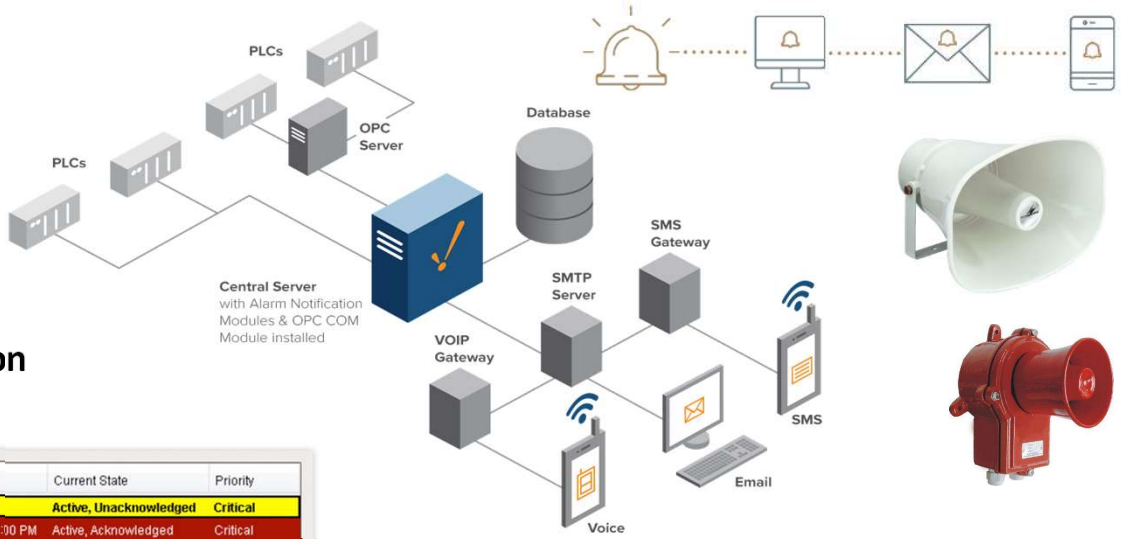
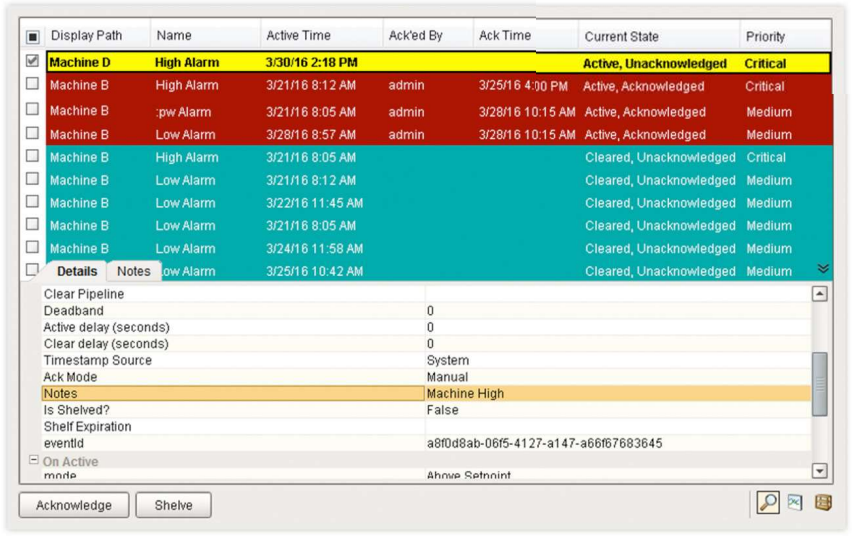
Global Alert System

- **SCADA notification**
- **Beacons notification**
- **Acoustic buzzers notification**
- **Public Address notification**
- **e-mail notification**
- **Phone call notification**
- **SMS text message notification**





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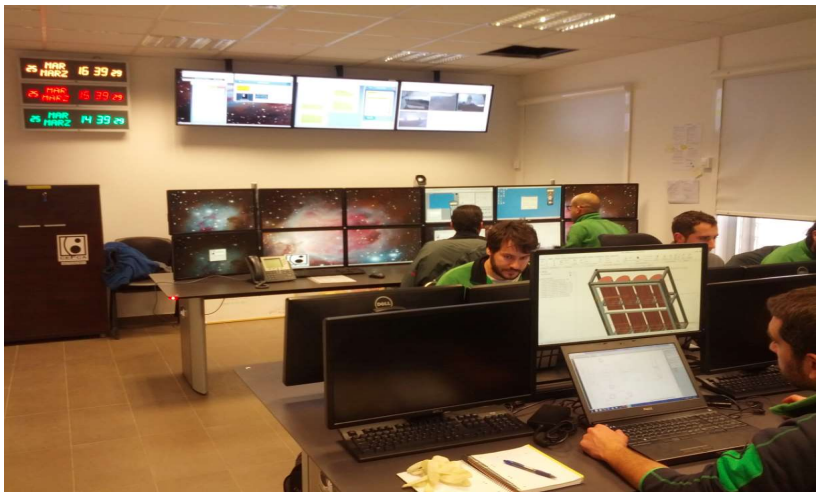
Distributed Information System for Operation Support



- Control rooms
- Video Walls
- Status Beacons
- PA system
- Support terminals
- Tablets
- Smartphones

Distributed Information System for Operation Support

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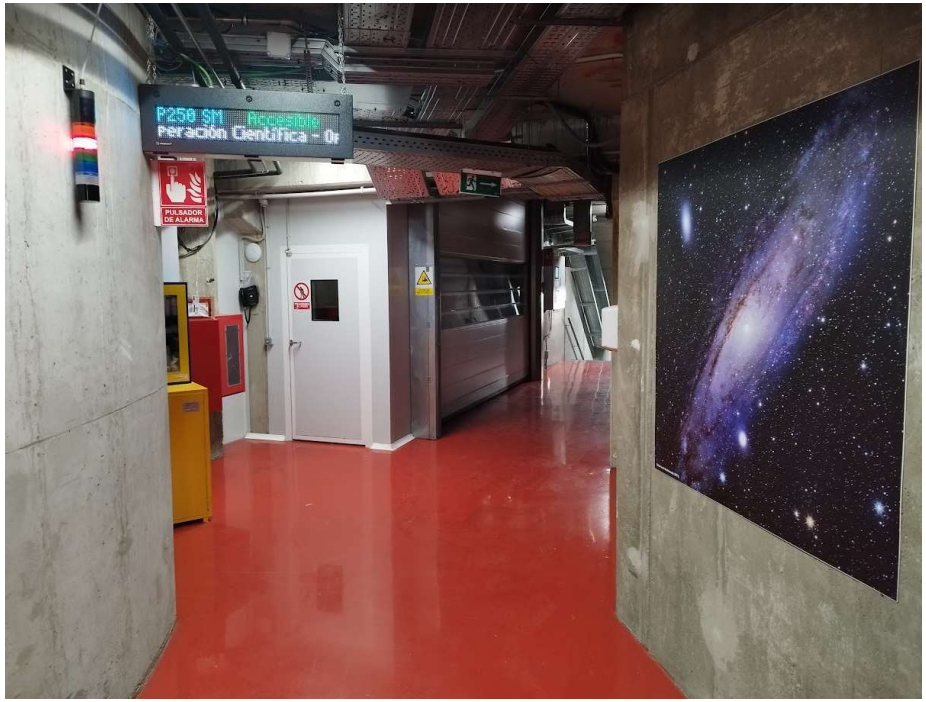

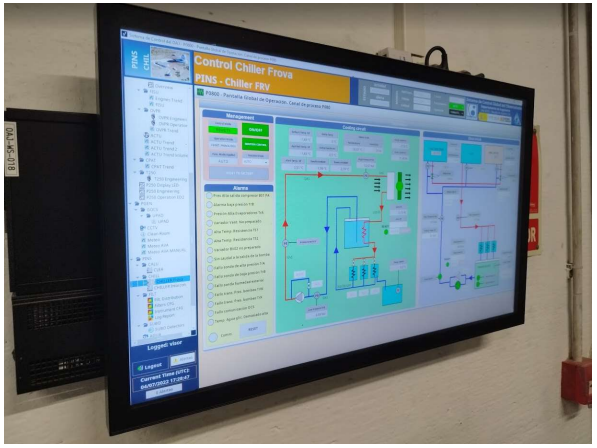

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Picture: Solaiman Hossen at Unsplash

ERP & CMMS integration

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GOCS

Global Observatory Control System

Observatory Operation

Investments & Operating Expenses

Developments & Maintenance

Purchase Orders

Working Orders

ERP

Enterprise Resource Planning

DB

Inventory

CMMS

Computerized Maintenance Management System

Costs – Workforce (FTE full-time equivalent)

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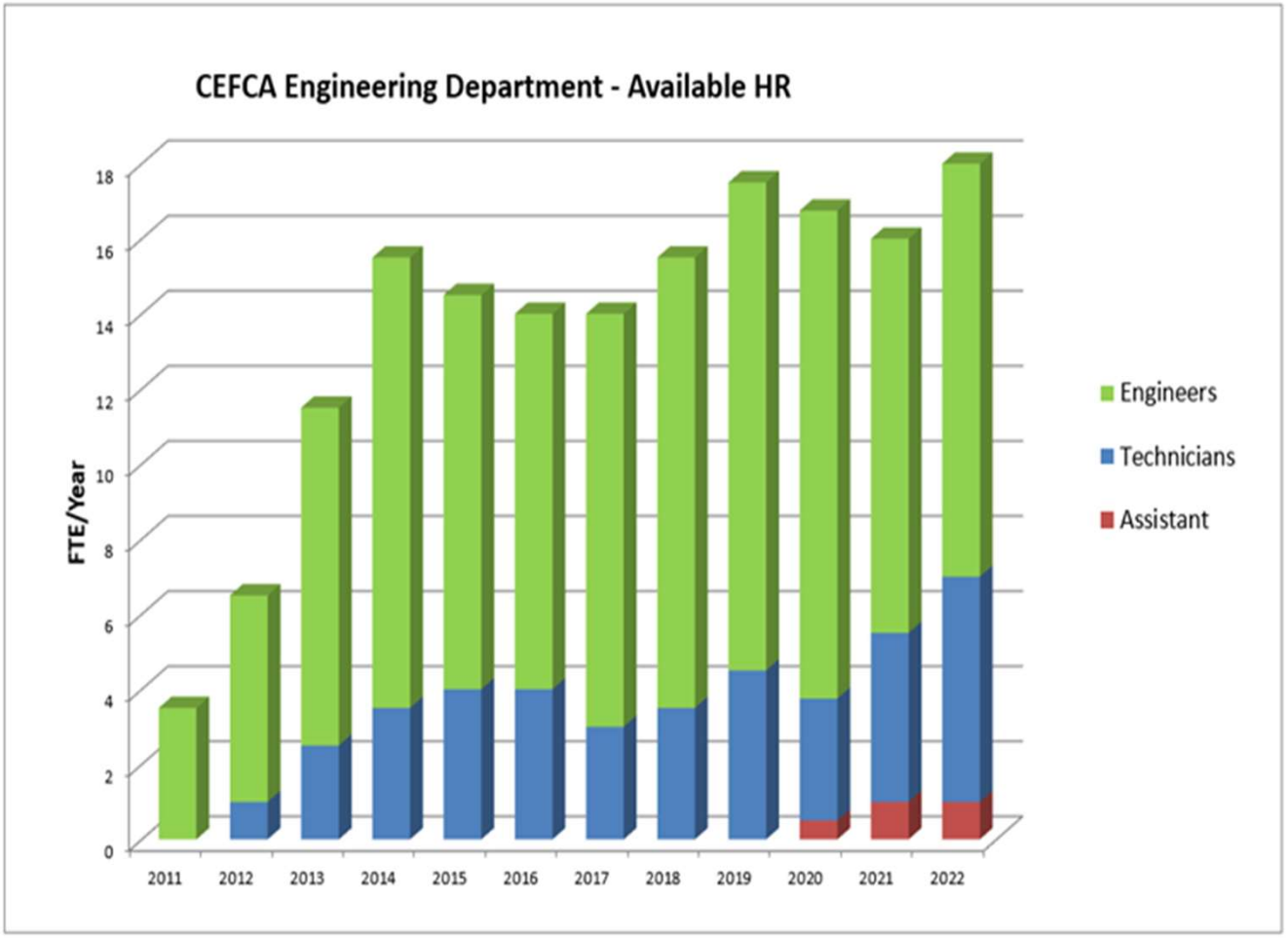

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Organización del servicio de Ingeniería de CEFCA

Organizarnos para remar en la misma dirección

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Organización del servicio de Ingeniería de CEFCA

Organizarnos para remar en la misma dirección

Servicio de calidad

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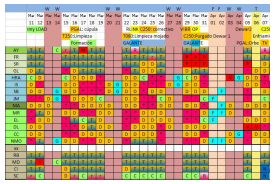
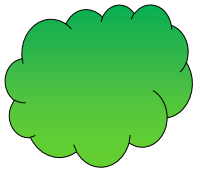
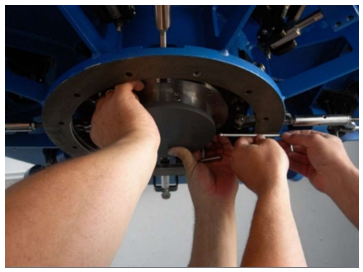
Características del Servicio de Ingeniería de CEFCA

- Servicio **Coordinado**
- Servicio **Planificado**
- Servicio **Profesional**
- Servicio **Cualificado**





Servicio de Calidad



Entre todos garantizamos la calidad del servicio de Ingeniería

Facilitar el trabajo al máximo posible

Dentro de las circunstancias intrínsecas al trabajo

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Picture: Solaiman Hossen at Unsplash

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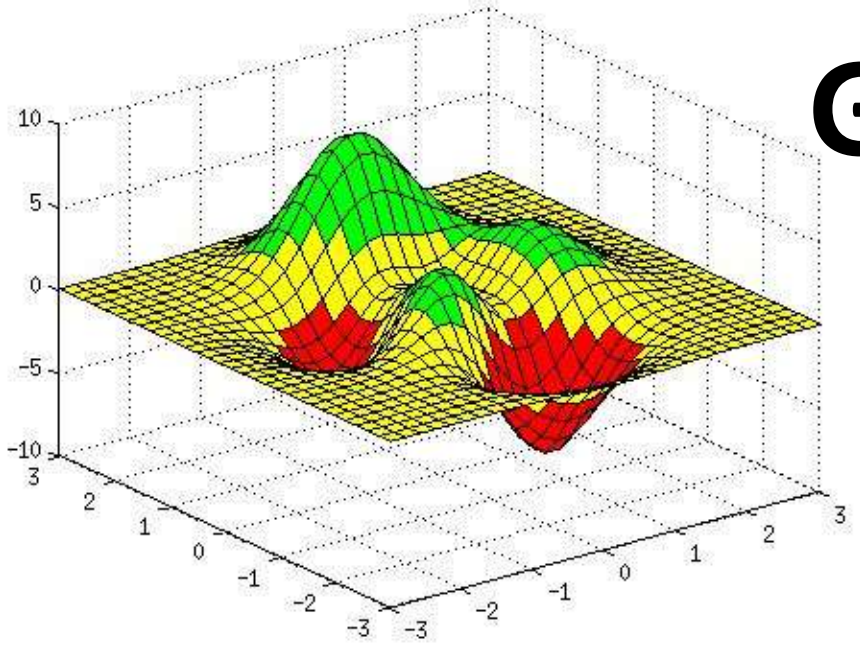
Como trabajadores….

¿Qué se espera de nosotros?

Servicio de calidad en Ingeniería

Servicio de Calidad

Necesitamos saber cuando estamos cumpliendo expectativas y cuando estamos por debajo de lo esperado



GMAO

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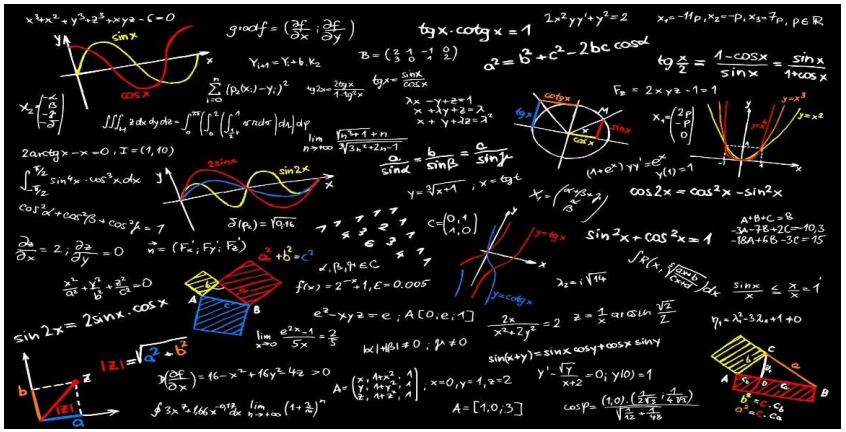
¿Cómo se valoran las tareas?



- Por **cuatro indicadores objetivos**:
  - **Automáticos**
    1. **Plazo de finalización**
    2. **Rendimiento del trabajo**
    3. **Comentarios**
  - **Manual**
    4. **Revisión de seguimiento**
       - **Realización las tareas asignadas por orden de prioridad**
       - **Notificación de problemas relevantes a los responsables**
       - **Interacción de coordinación**
       - **Adecuación de estado y % realizado**
       - **Adecuación de comentarios**
       - **Efectividad en la obtención de resultados**
         - **Focalización/dispersión hacia los criterios de éxito de las tareas**
       - **Documentación clara, concisa y completa**
       - **Aporte de fotografías sobre el trabajo realizado**

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¿Cómo se hace la valoración manual objetiva de las tareas?

Se realizan las siguientes preguntas para el conjunto de tareas que se están siguiendo
Son preguntas de tipo si o no. Cuantos más síes se contesten mejor será la valoración

- **¿Se están realizando las tareas por orden de prioridad?**
- **¿Se notifican los problemas relevantes a los responsables?**
- **¿Se está respondien[illegible] los coordinadores?**
- **¿Cuando se ha camb[illegible]xplica el motivo en un comentario?**
- **¿Los estados que tie[illegible]ente les tocan?**
- **No hay ninguna tare[illegible]se notifica con cierta periodicidad que el r[illegible]verdad?**
- **¿Está bien actualizad[illegible] tarea?**
- **¿Son adecuados los comentarios? Veremos esto con más detalle**
- **¿Está bien enfocado el trabajo hacia la obtención de resultados?**
- **¿Hay progresión adecuada hacia los criterios de éxito de las tareas?**
- **Podemos decir que la documentación es clara, concisa y completa ¿verdad?**
- **¿Se han aportado fotografías sobre el trabajo realizado?**
- **¿El trabajo realizado cumple los criterios de calidad y estándares establecidos?**

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ID	Tarea	Responsable	Coordinador	Prioridad	Fecha Límite	FechaFIN o Estimada	Plazo	Trab.	Ejecución del trabajo	Eficiencia	Adecuación	Estado
5418	CALU. Suministro Limpieza Espejos			Urgent	31/3/2021	9/4/2021	Complicado	880%	Excelente	135%	Ejemplar	WAIT
7560	MONI: Revisar sonda temperatura ASTMON (GL)			Urgent	11/4/2021	3/4/2021	En plazo	850%	Excelente	117%	Ejemplar	WAIT
7739	MONI: Revisión lama norte de cúpula Javadimm (SB)			Immediate	31/3/2021	3/4/2021	Complicado	815%	Excelente	89%	Muy Buena	WAIT
5965	GOCS Update licencias Ignition & Kepware (MUY URGENTE)			Immediate	30/4/2021	5/4/2021	En plazo	613%	Excelente	70%	Buena	WAIT
7366	POAJ.OCS: Comprar material FITE 18 a.7			Urgent	28/2/2021	3/4/2021	Fuera de plazo	614%	Excelente	117%	Ejemplar	WAIT
6375	SCAD: Gestión de integración de pantallas Ignition			Urgent	31/3/2021	6/4/2021	Complicado	396%	Excelente	131%	Ejemplar	WAIT
6567	TREE: Arbol de sistemas e ubicaciones MySQL			Urgent	31/7/2021	17/4/2021	En plazo	182%	Impecable	65%	Buena	WAIT
7588	GRAL: Reparación lamas persianas 2 (DHK)			Urgent	30/4/2021	1/4/2021	En plazo	299%	Excelente	82%	Muy Buena	WAIT
7595	C250.ACTU Caracterización rango movimiento operativo de Actuadores			Urgent	31/3/2021	13/4/2021	Complicado	339%	Excelente	68%	Buena	WAIT
7596	HARD Revisión equipos sala de control			Immediate	26/2/2021	13/4/2021	Fuera de plazo	307%	Excelente	292%	Excelente	WAIT
7469	LABS: Crear listado material a reponer (CC)			Urgent	30/4/2021	5/4/2021	En plazo	169%	Impecable	86%	Muy Buena	WAIT
7742	PGAL.Sanear rack			Urgent	31/3/2021	1/4/2021	Complicado	149%	Ejemplar	193%	Impecable	WAIT
7798	PGEN: Aislamiento puerta anexo muelle (CC)			Urgent	30/4/2021	17/4/2021	En plazo	100%	Ejemplar	222%	Excelente	WAIT
7677	GLIC. Caracterizar instalación glicol			Immediate	16/5/2021	26/5/2021	Complicado	104%	Ejemplar	300%	Excelente	WAIT
7727	RGBT. Rack Instalaciones Sanear (apoyo)			Immediate	30/3/2021	21/4/2021	Complicado	183%	Impecable	300%	Excelente	WAIT
7075	P250.C250 presupuestos, documentación y compra repuestos FITE (EL)			Urgent	31/3/2021	31/3/2021	En plazo	157%	Impecable	58%	Suficiente	WAIT
6352	LITE Upgrade Portal LITE integración PLAN V1.0 (MD)			Immediate	30/4/2021	6/4/2021	En plazo	41%	mejorable	131%	Ejemplar	WAIT
6781	INFO: Documento de normativa IT para staff			Immediate	30/4/2021	1/4/2021	En plazo	30%	Baja	117%	Ejemplar	WAIT
6682	SERV: Licitación cabina discos SEDE			Immediate	31/3/2021	2/4/2021	Complicado	49%	Suficiente	186%	Impecable	WAIT
7692	TREE: Instalar sistema en producción			Urgent	26/3/2021	28/4/2021	Fuera de plazo	100%	Ejemplar	300%	Excelente	WAIT
6502	CALU Comprobación de cálculos en APP limpieza			Urgent	26/2/2021	18/4/2021	Fuera de plazo	100%	Ejemplar	300%	Excelente	WAIT
7533	POAJ: Inventariar las compras FITE recibidas (EL)			Immediate	28/2/2021	4/4/2021	Fuera de plazo	96%	Destacable	118%	Ejemplar	WAIT
6549	GLIC.Verificar presencia de lodos y residuos (apoyo)			Urgent	29/3/2020	1/4/2021	Fuera de plazo	508%	Excelente	61%	Buena	WAIT
6480	SERV Renovación de CA en todos los servidores (MD)			Urgent	30/10/2020	5/5/2021	Fuera de plazo	96%	Destacable	83%	Muy Buena	WAIT

Outline

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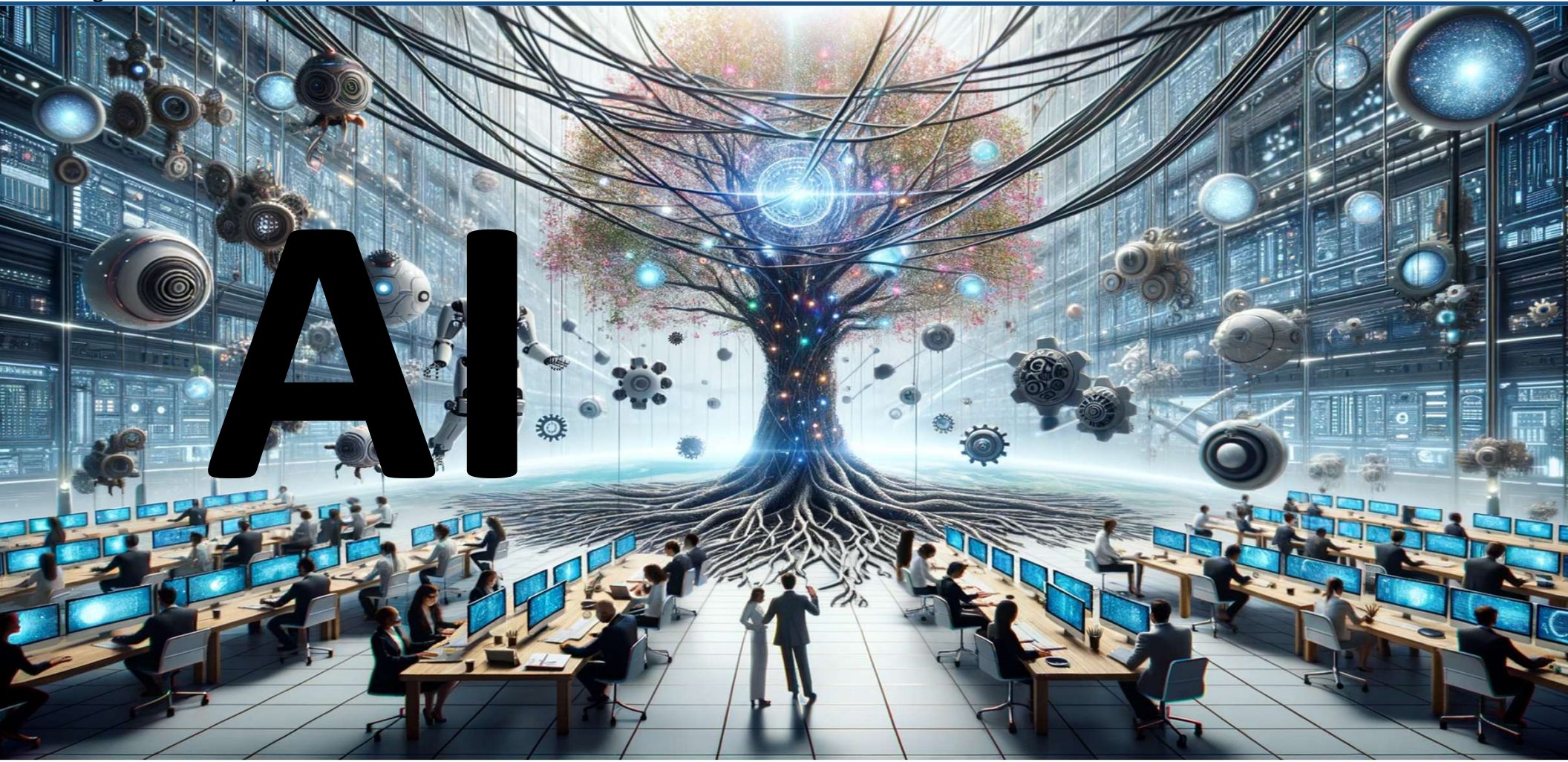
1. Introduction
2. OAJ, CIA and GOCS
3. Management Challenges
4. Teamwork Optimization
5. **Emerging Technologies**
6. Conclusions

Picture: Solaiman Hossen at Unsplash

Boosting Observatory Operation Performance

Axel Yanes – ayanes@cefca.es



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AI

Machine learning ➔ specific training for problem solving

ChatGPT

➔ Programming assistant

GitHub Copilot

LLAMA 2

➔ Text analysis

Gaussian Splatting ➔ 3D modeling

Outline

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Picture: Solaiman Hossen at Unsplash

Automation helps to upgrade continuosly observatory operation

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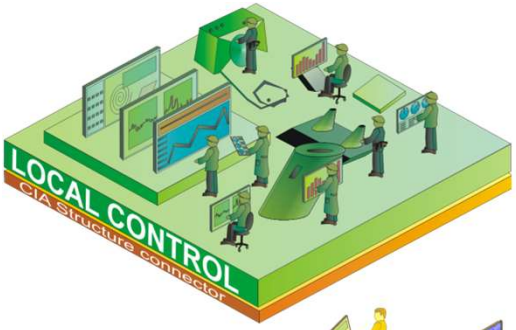
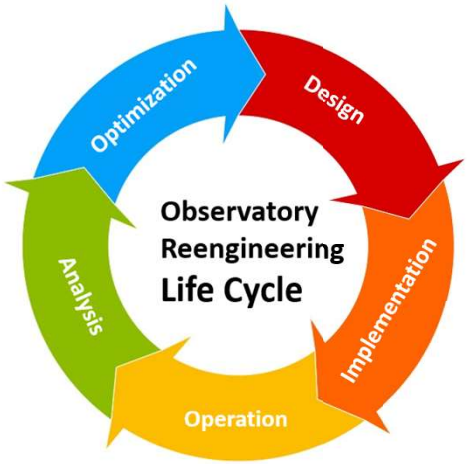
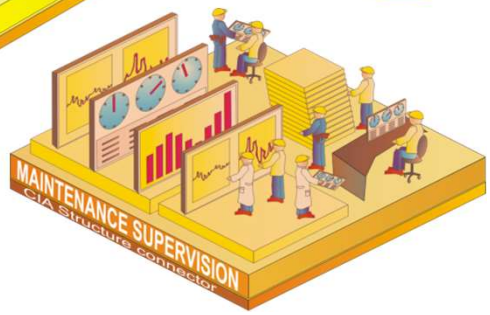
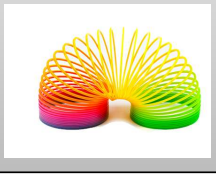
The flexibility of automation allows easy adaptation to the continuous observatory changes









Automation flexibility can easily update functionality for **all staff profiles**.

- Managers
- Scientist
- Astronomers
- Operators
- Engineers
- Maintenance

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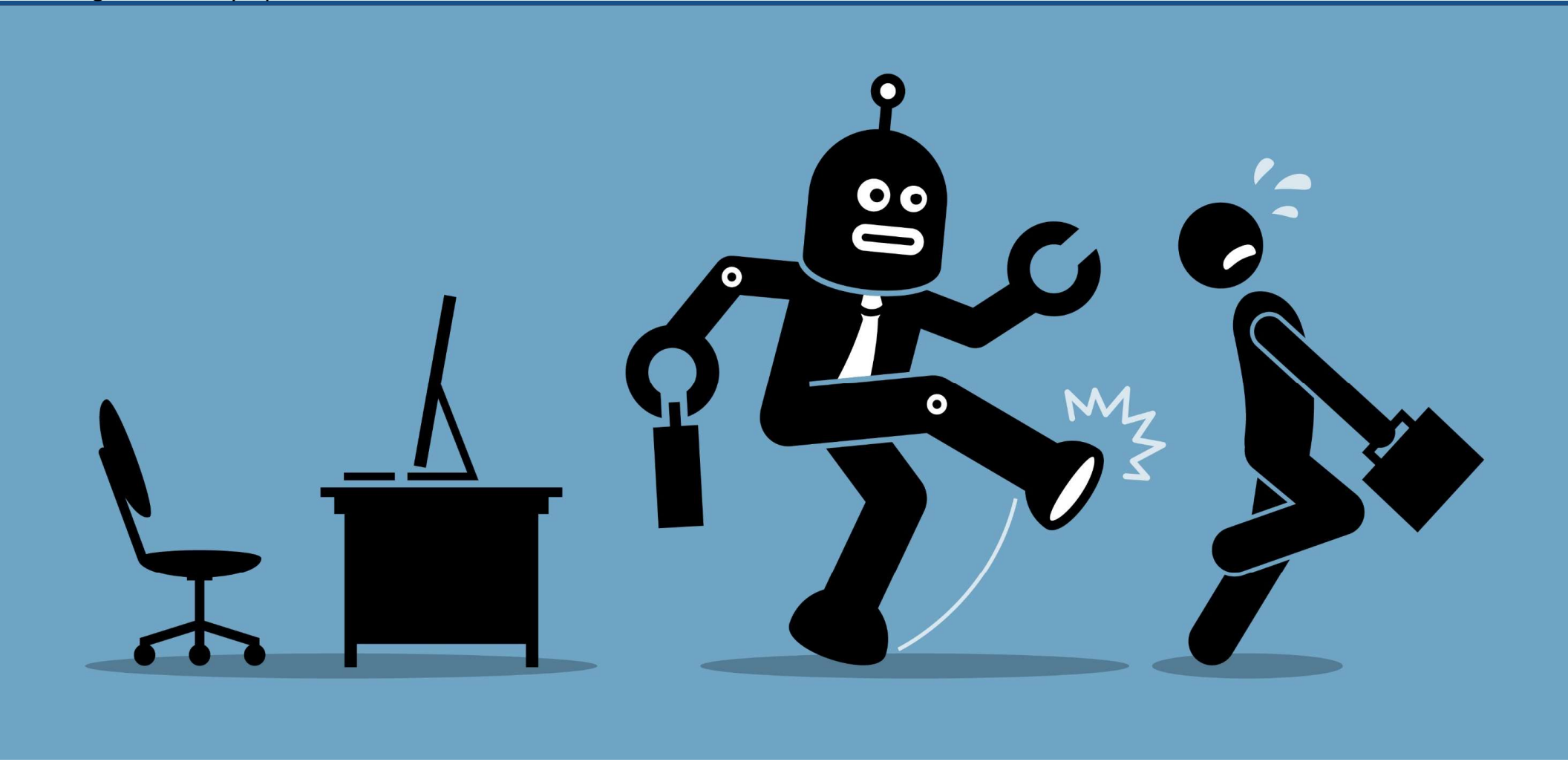

Boosting Observatory Operations Performance

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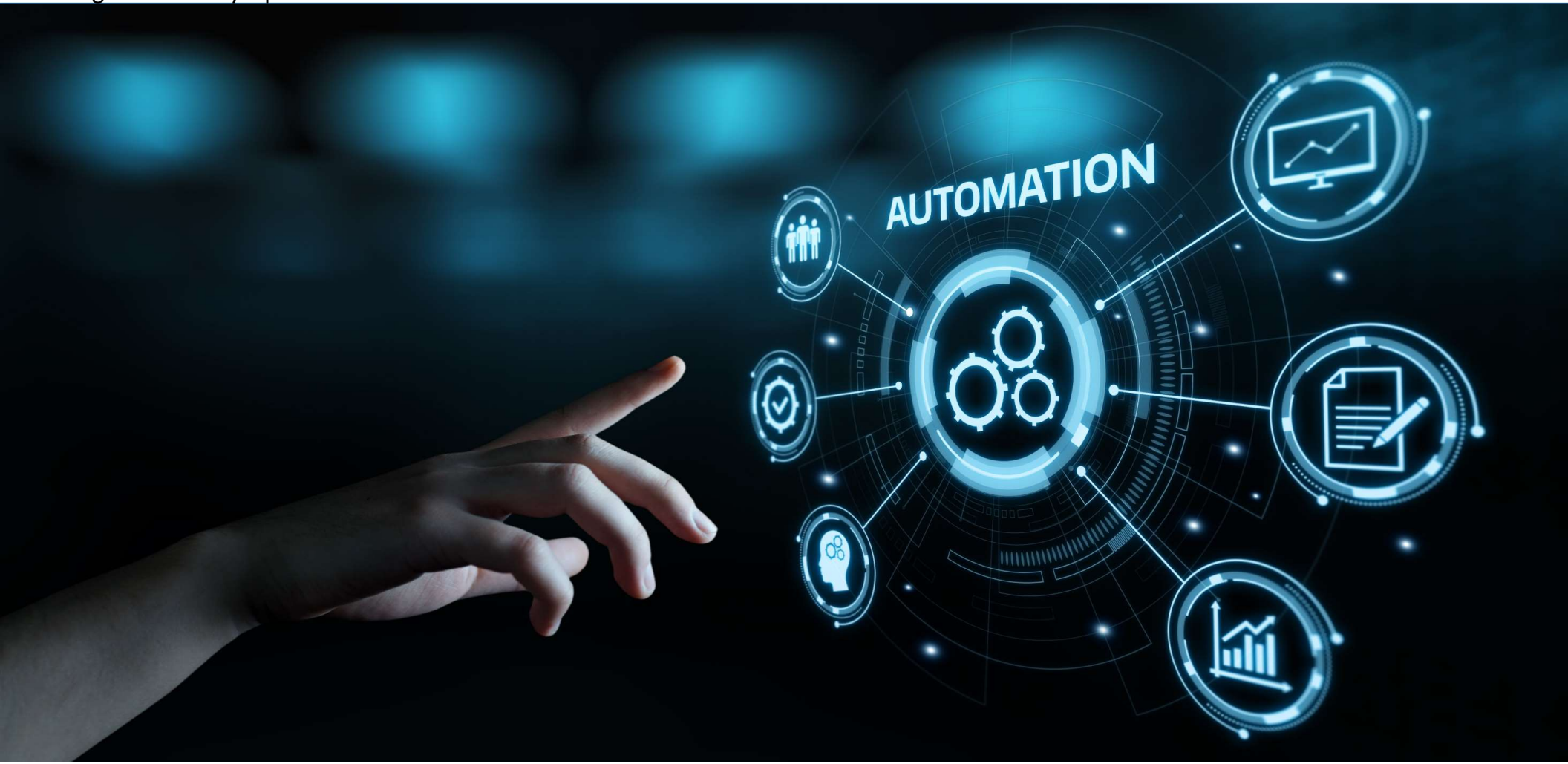

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Organización del trabajo **Calidad del Servicio**

No se trata de exprimir a los trabajadores con sobrecarga de trabajo, tiempos asfixiantes o plazos imposibles de cumplir.

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Organización del trabajo

No se trata de exprimir a los trabajadores con sobrecarga de trabajo, tiempos asfixiantes o plazos imposibles de cumplir.

Al contrario… Tan solo queremos que se trabaje bien el tiempo disponible…

Sin sobrecargas, ni agobios, con calma, con tiempo y plazos suficientes para hacer las cosas bien… Sin mayores pretensiones.

Gestión efectiva del Departamento de Ingeniería – La Palma 2023

Available Data Releases

Data Releases: https://archive.cefca.es/catalogues

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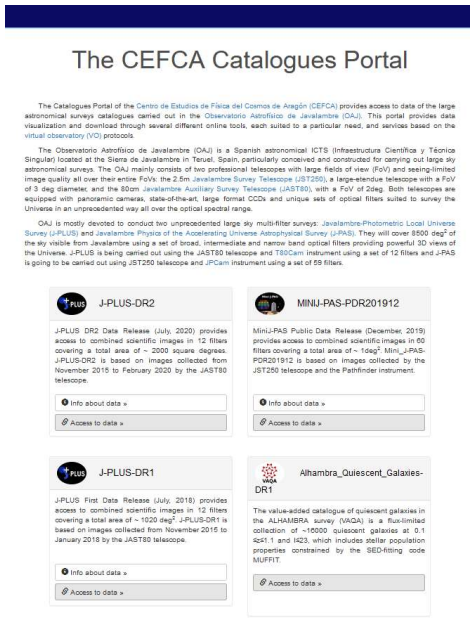

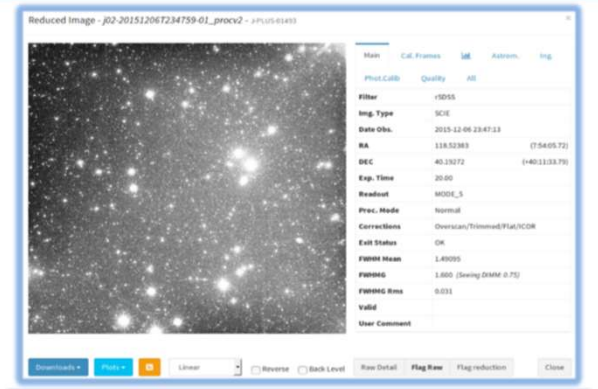

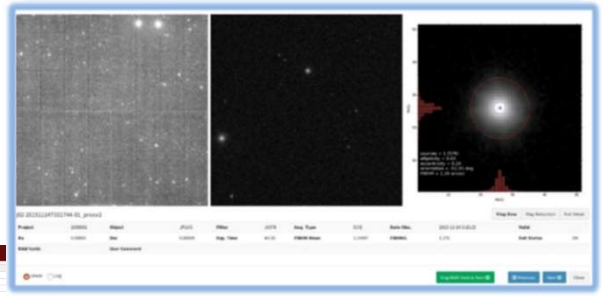

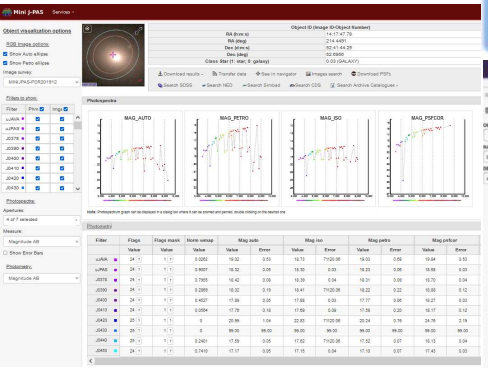

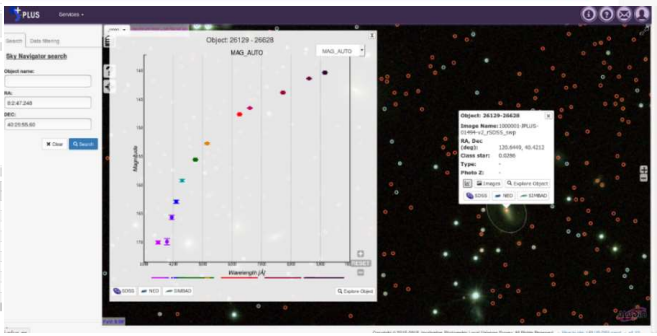

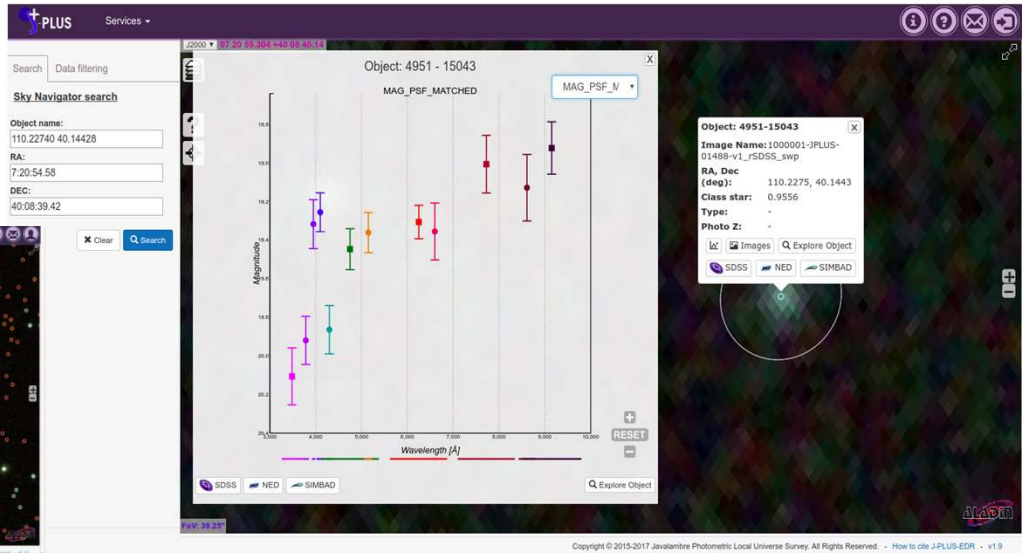

Data Releases: http://http://www.cefca.es/divulgacion/navegador_de_imagenes

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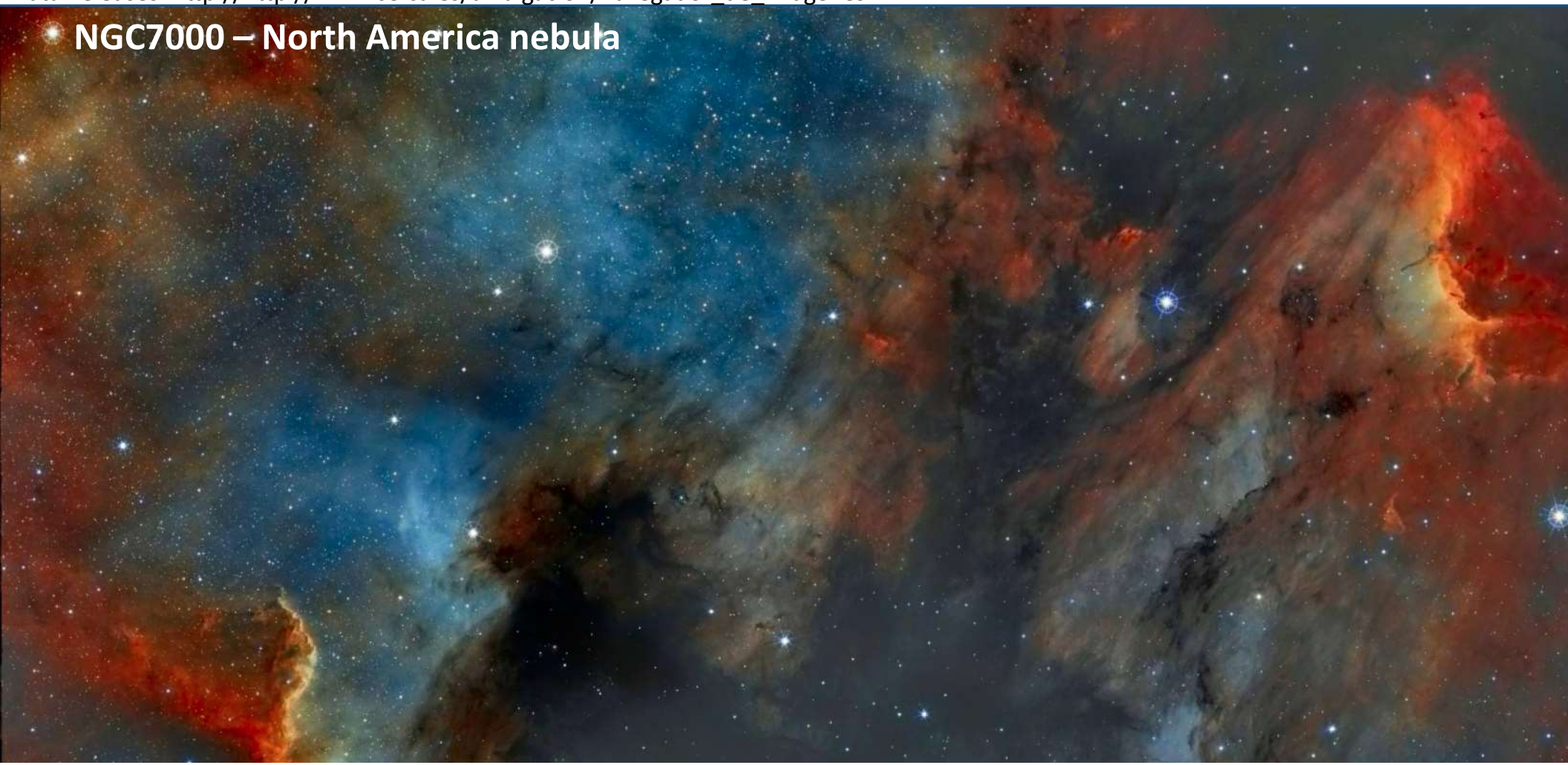
NGC7000 – North America nebula



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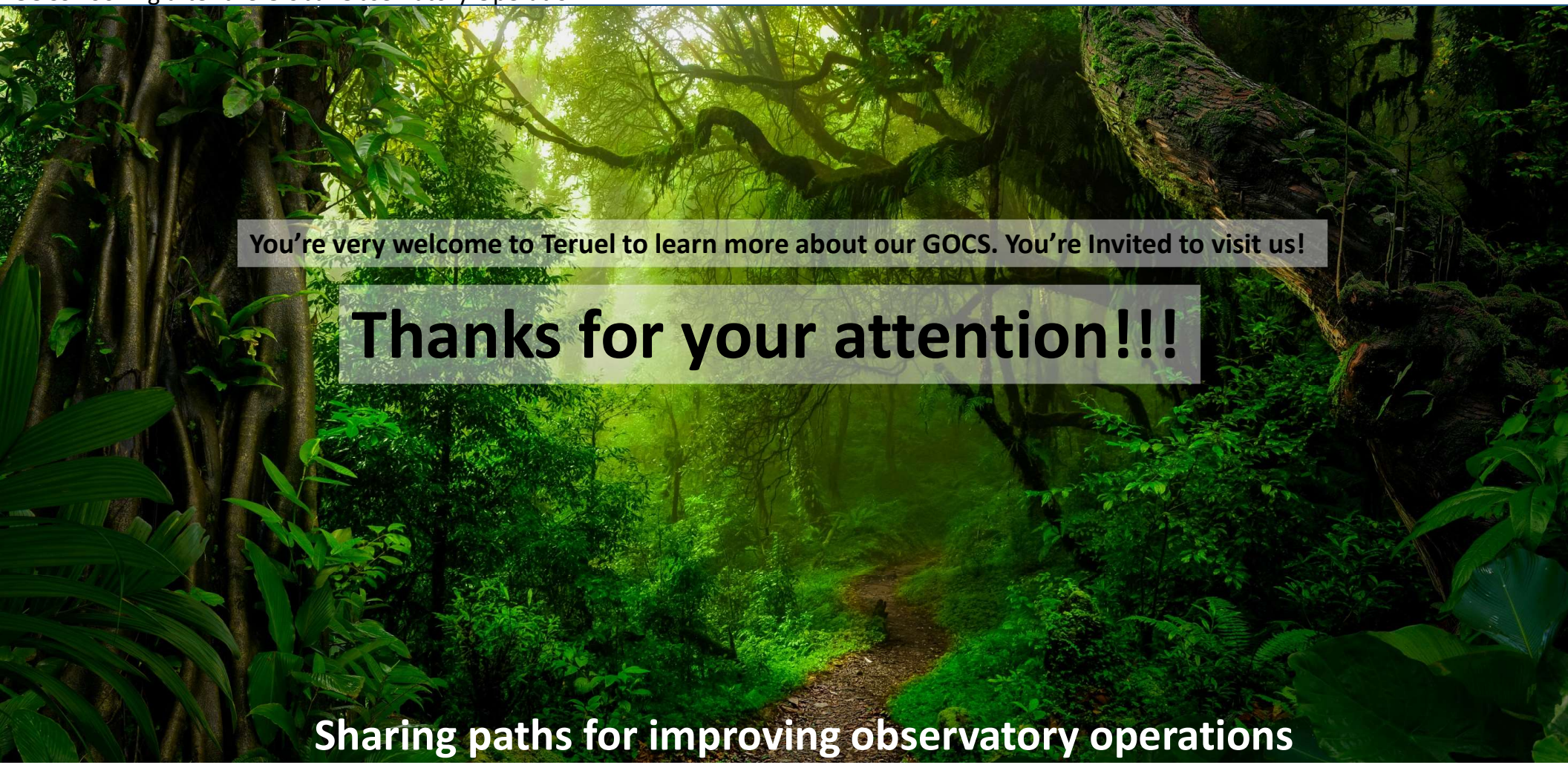
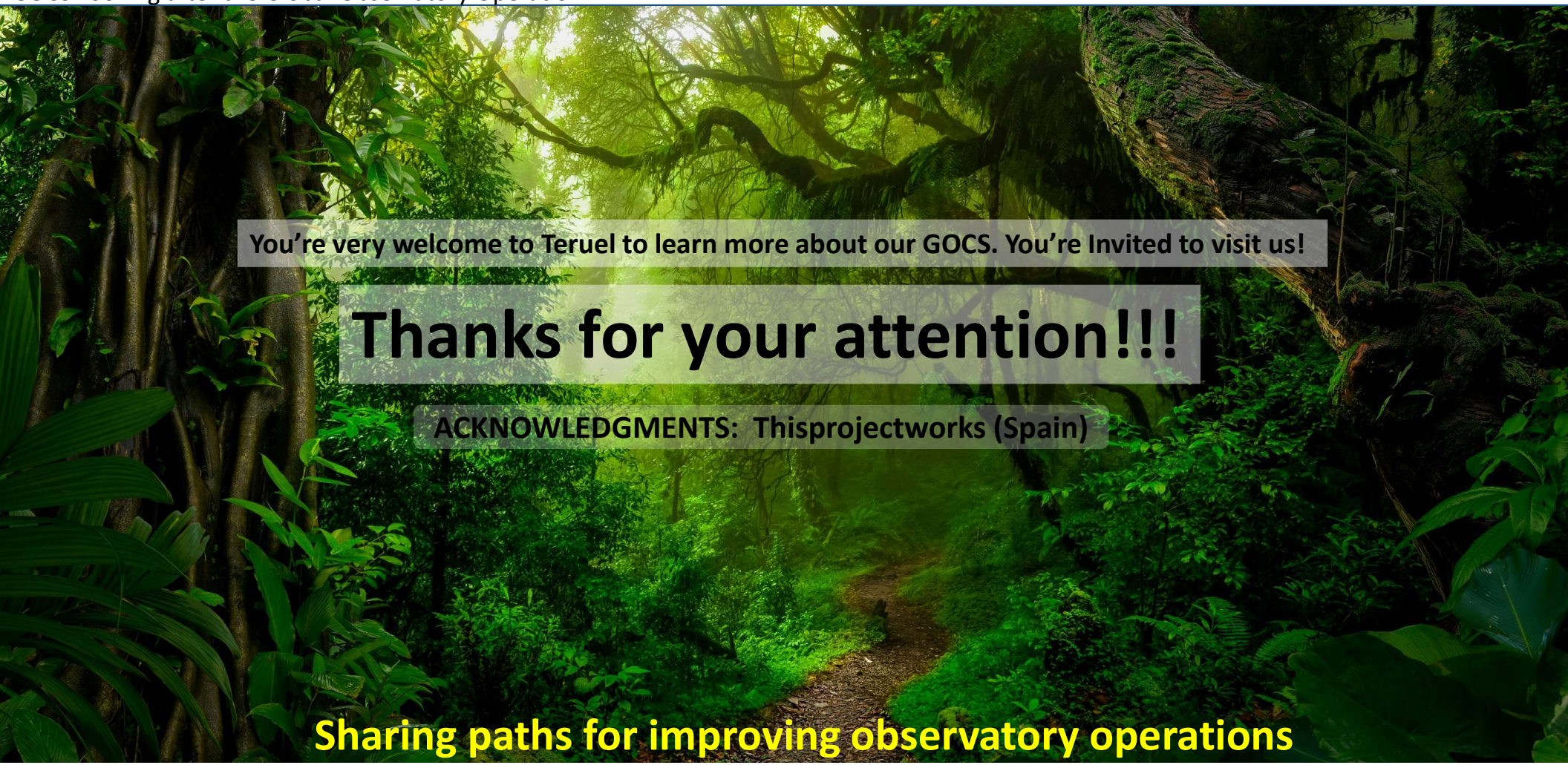


You're very welcome to Teruel to learn more about our GOCS. You're Invited to visit us!

Thanks for your attention!!!

Sharing paths for improving observatory operations



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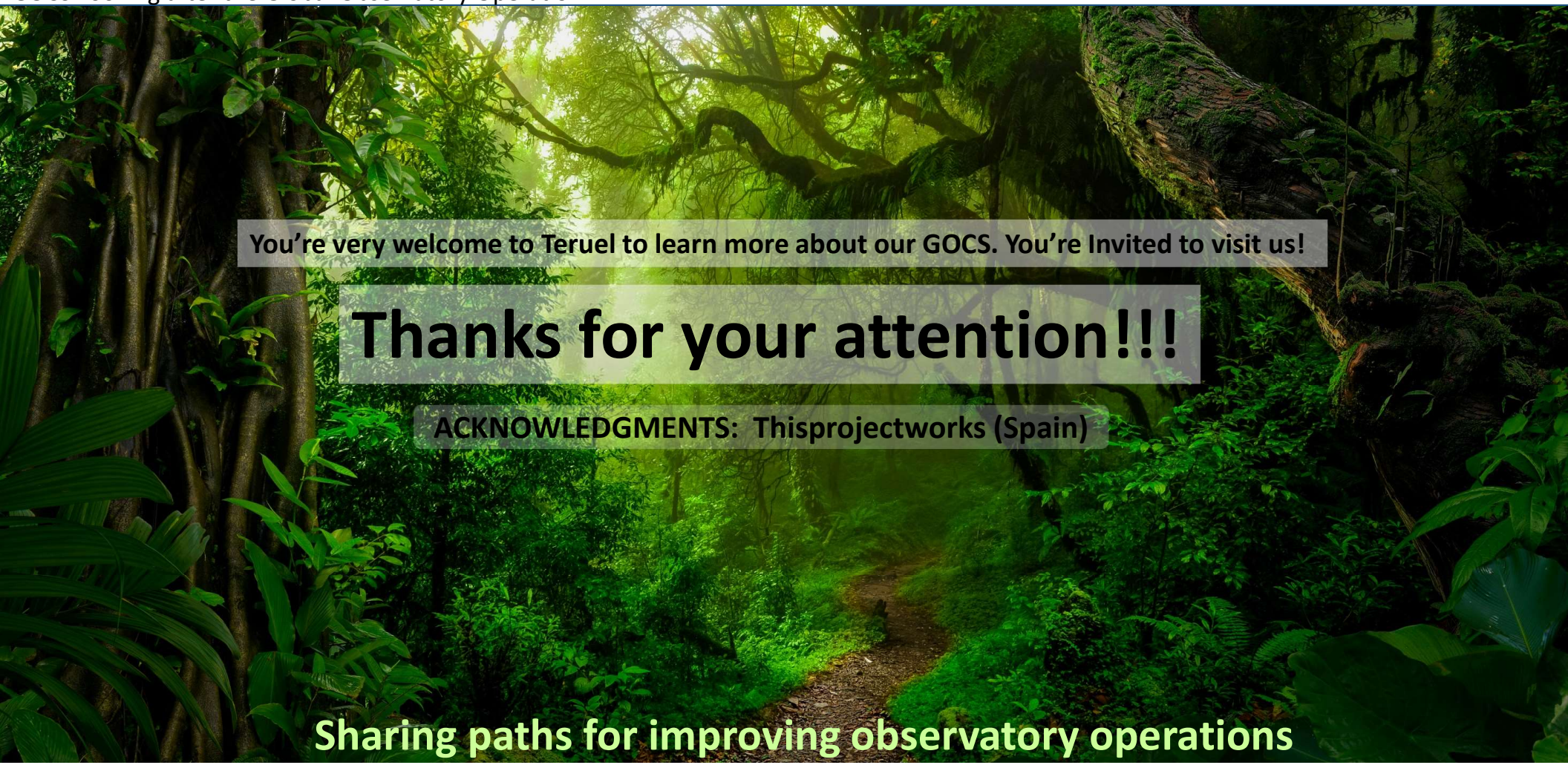

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