Digital Tower for Budapest Airport

Indra Air Traffic Management

2025

We're the leading Spanish multinational in Defence, Aerospace and Advanced Digital Technologies

INDRA GROUP

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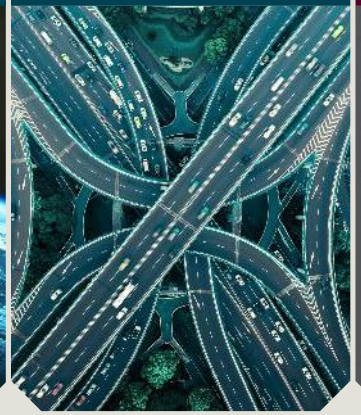
Defence	Air Traffic	Space	Mobility
			

MINSAIT

Digital and Information Technologies

Main magnitudes 2023

€4,343 M
in revenue

13%+
since the previous period

~58,000
professionals

140+
countries

€373 M
in R&D

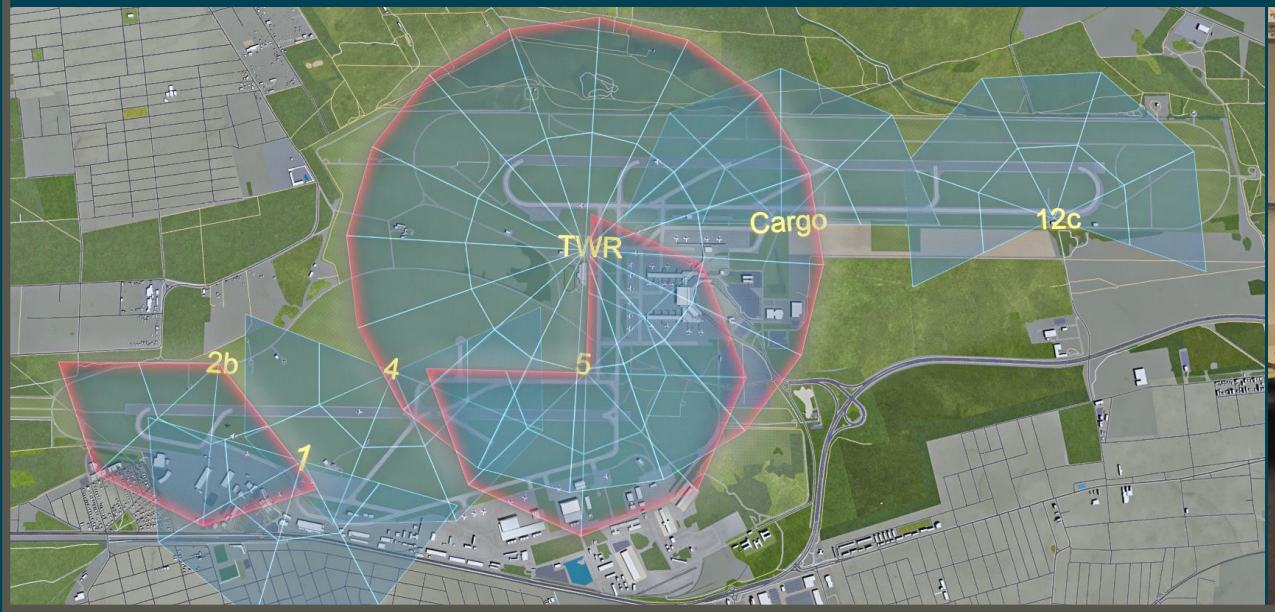
Indra ATM

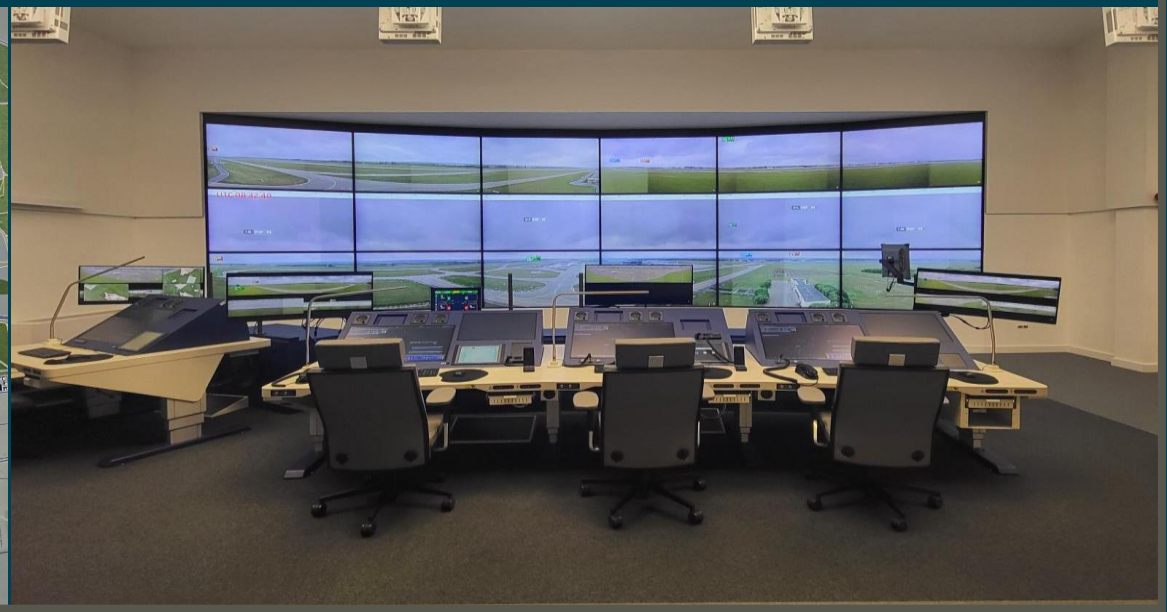
11,000+	Systems installed in over than 90% of the world's countries
100+	Years of experience in ATM solutions
85%+	Passengers worldwide travel making use of Indra ATM technology at some point during their flight
300+	Indra has more than 300 radar references worldwide: >220 MSSR Mode S, >40 PSR as well as mobile stations
3500+	Indra ILS have assisted so far 100 million landings in 3,500+ runways worldwide, in 120 countries

Digital Tower for Budapest Airport
Largest Project Of Remote Towers In The World

Remote Digital Tower for Budapest Airport

- Largest single-airport multi-mast project in the world
- 1 mast with 360 view + 6 additional masts (130-270)
- Full integration (info and functionality) with tower system (5 positions) and Digital Tower Simulation for training & Testing





Background & System Issues

History of LHBP rTWR

- 2016 Remote tower implementation (SESAR VLD)
- 2017 Authority approval for contingency rTWR

Technical content of LHBP rTWR

- Duplication or extension of existing conventional TWR systems + Video system
- 3 camera locations, 28 cameras (6 PTZs)
- Individual video displays + common video wall

Statistics

- 3 000+ hours live operations
- 15 000+ movements
- 90% IFR movements
- 90% in good visibility
- 60% in dual RWY operations
- Emergencies
- Training flights
- Airport and airspace restrictions
- In 2021 250+ hours without conventional TWR backup

Human factor difficulties

- Information overflow for ATCOs
- Too many independent systems
- Too many peripherials

Technical difficulties

- 2 “main” ATM systems developed parallelly
- Partial integration
- A-SMGCS capabilities not utilized
- Heritage systems in operation

Financial difficulties

- Main tower need to be refurbished

‘’The Decision’’ & Project Main Work Areas

mirTWR program goal: implementing the most advanced and integrated visual + A-SMGCS tower system in order to solve all the issues detected in the previous digital tower system while avoiding the need of a conventional tower for providing control services to Budapest airport

How to do it?

- Upgrading to a best in class A-SMGCS
- Better visual coverage of the airfield
- Implementing a state of the art visual system
- Full integration between heads-up and down systems
- Redesign of the CWP integrating most auxiliary systems into the TWR system HMI

mirTWR program Schedule

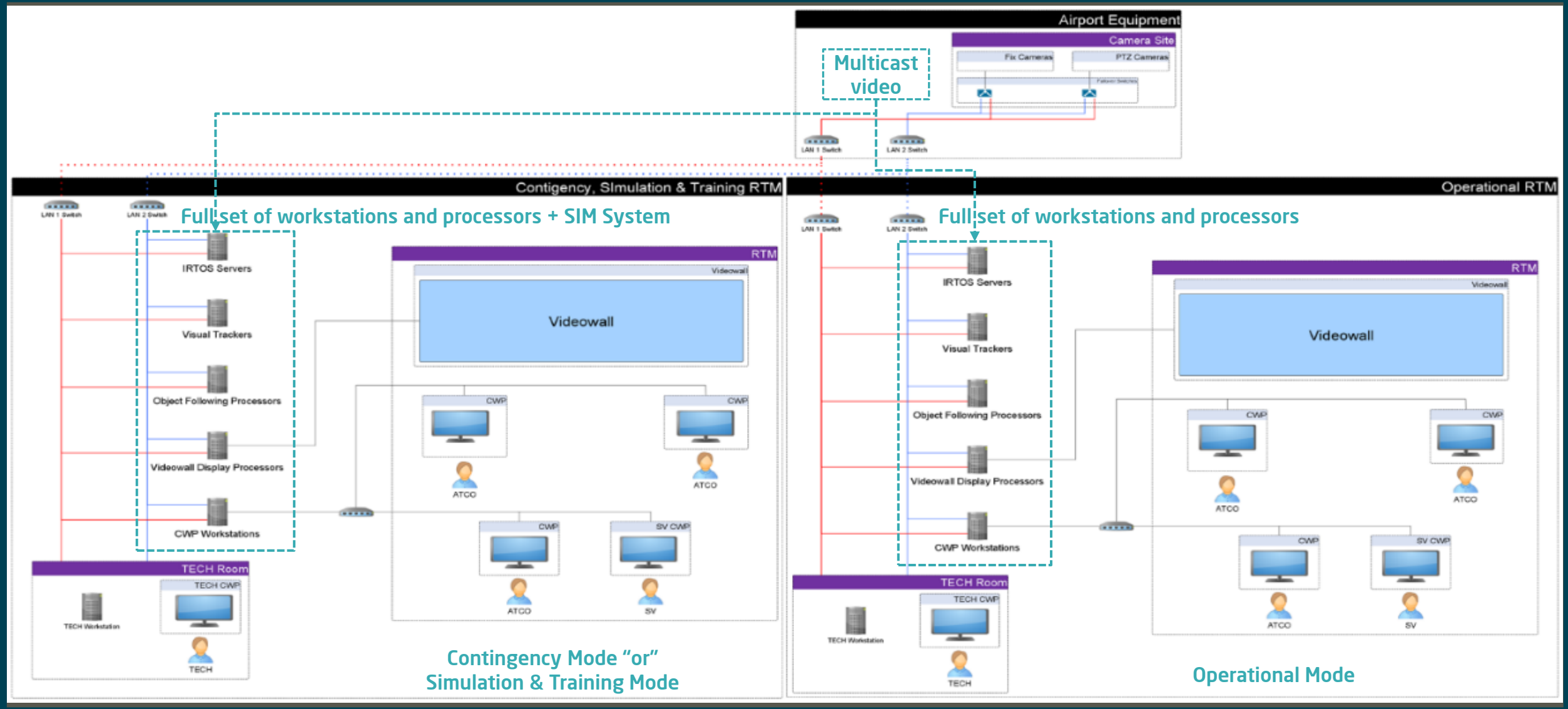
- Program launched 2017
- A-SMGCS interface upgrade 2019
- Video system upgrade 2020-2023
- A-SMGCS major upgrade 2020-2023
- MLAT upgrade 2021-2022
- ATSEP trainings 2022-2023
- ATCO trainings 2023-2024
- Live operations 2024

Better Visual Coverage Of The Airfield

Multi-mast digital tower visual system (1 mast with 360º view + 6 additional masts) for a perfect visual coverage of the airport

Location	Type	N	FOV
Mast 1	Fix Cameras (4K)	4	180º
Mast 2b	Fix Cameras (4K)	3	150º
Mast 12c	Fix Cameras (4K)	5	235º
	PTZ (FullHD)	3	
Mast 5	Fix Cameras (4K)	6	270º
	PTZ (FullHD)	1	
Mast 4	Fix Cameras (4K)	5	235º
	PTZ (FullHD)	2	
Mast (CARGO)	Fix Cameras (4K)	4	180º
	PTZ (FullHD)	1	
TWR	Fix Cameras (4K) Vertical	16	360º
	SLG PTZ (FullHD)	2	
	PTZ Thermal (FullHD+VGA)	1	
TOTAL		53	

Architecture & Working Modes



Main & Contingency Remote Tower Centre

Common video wall

- Views from multiple camera towers
- Controlled by Supervisor

Five fully integrated working positions

- Personal Video displays
- Jurisdictions and camera control according to role

Contingency centre with Training facilities

Multi Mast Videowall & Individual Video System

Two (2) different display systems

- Videowall
- CWP

Videowall controlled by Operational Supervisor.

Videowall can display any mast or combination of masts. Usually it presents:

- TWR (360º view)
- Mast 5 (270º view)
- Mast 4 (180º view)

Controllers can select single or multiple masts on their CWP

Individual video system can be split in any number of frames of any mast or combination

Controllers can select any PTZ of any mast under supervisor approval

Indra Tower Control ATM System

Full upgrade of existing system

- Remote tower and Approach OPS room
- Integrated displays with unified HMI
- Label based operations with flight list support
- Safety Nets
- Routing and Guidance
- AMAN/DMAN functionality
- MET and ATIS
- AGL and Stop bar control
- Camera Control HMI
- Extensive interfacing to HC systems

Integration Of TWR & Visual Module

Avoids the need of adding extra screens in CWP and simplifies the operation of the system

Advanced Integration (ICD+TWR Control System)

- Surveillance Information, etc
- Flight Plan Information, etc
- Visual HMI controlled from Tower control System

Fully operational Bidirectional actions

- Sectorisation
- Click&Point PTZ
- Click&Track
- TWY & RWY A-SMGCS maps
- Low Visibility maps
- Threshold monitoring function
- PTZ status on CWP

Digital Tower for Budapest Airport

Installation completed

Final SAT passed March 2025

- Visual functionalities
- Multi-mast capabilities
- Integration of Tower / A-SMGCS and Visual system
- Integration with simulator
- Performance with real cameras

System to be approved by regulator

DTW SOLUTIONS SINCE 2018
References & On Going Projects