

SESAR PJ05 validation Multi Remote Towers

Open Day

7th March 2019



indra



Open Day schedule

09:30	Registration and Coffee	
10:00	Welcome	Elin Blakstad, Director Towers, Indra Navia
10:10	Message from SESAR JU	Roberto Ghidini, SESAR JU
10:25	Avinor perspective on Multiple Remote TWR	Torbjørn Henriksen, Avinor
10:45	Validation Platform	Martin Hasselknippe, Indra Navia
11:15	Validation Execution	Espen Stokkeland, Avinor
11:45	Bus transport to Indra Navia	
	Light lunch	
12:15	Demonstrations start	
13:45	Q&A session	
15:00	End of session	

Welcome!

Elin Blakstad

Director, Tower Systems

Indra Navia

Avinor perspective on Multiple Remote Tower

Torbjørn Henriksen

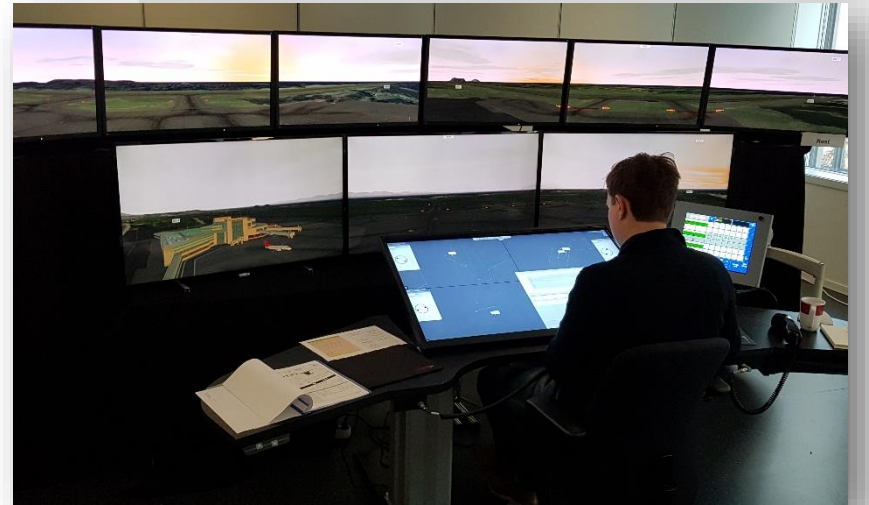
Avinor



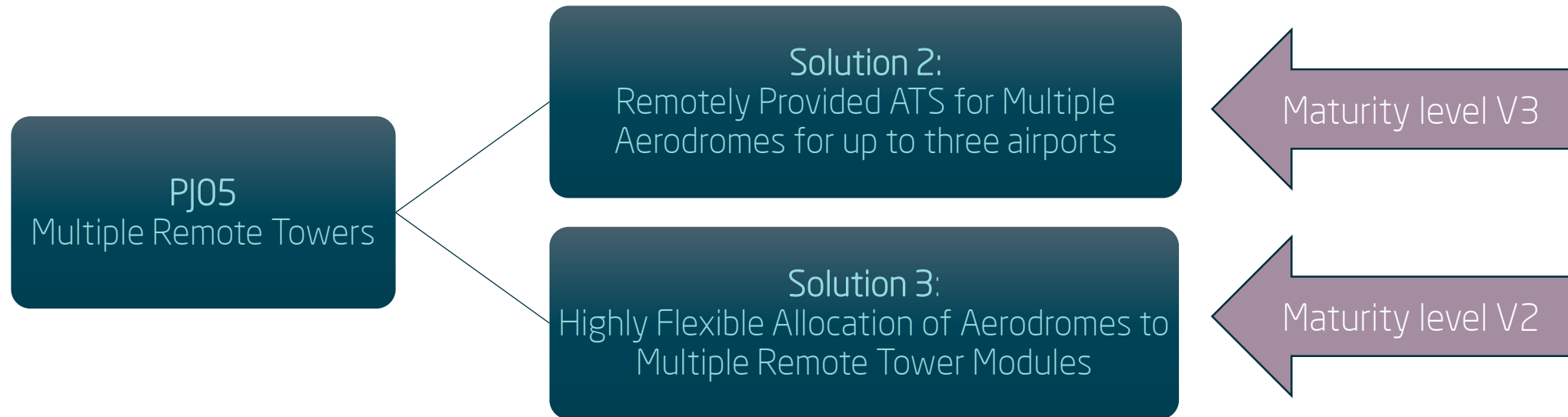
Validation Platforms

Martin Hasselknippe

Indra Navia



Project PJ05 Multiple Remote Towers



Solution 2

Validation with focus on MRTM

Validation overview

SDM-0207 “Remotely Provided Air Traffic Service for Multiple Aerodromes (up to three Aerodromes)”

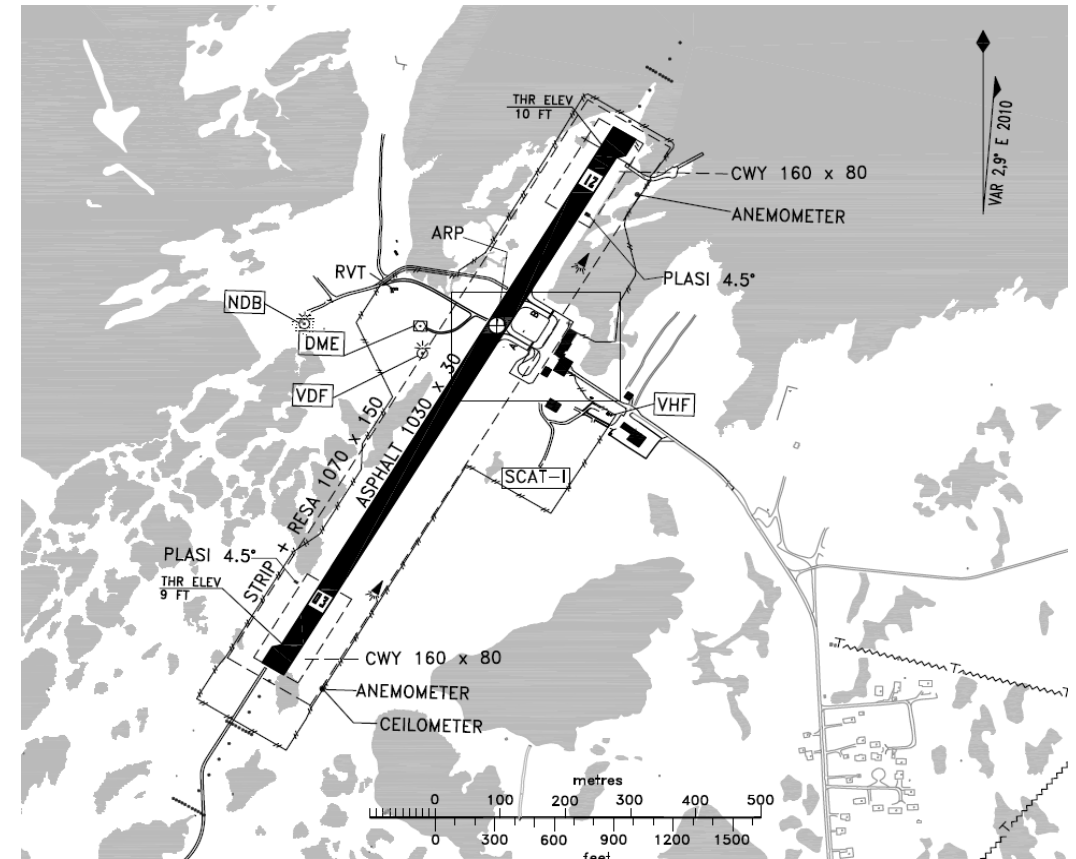
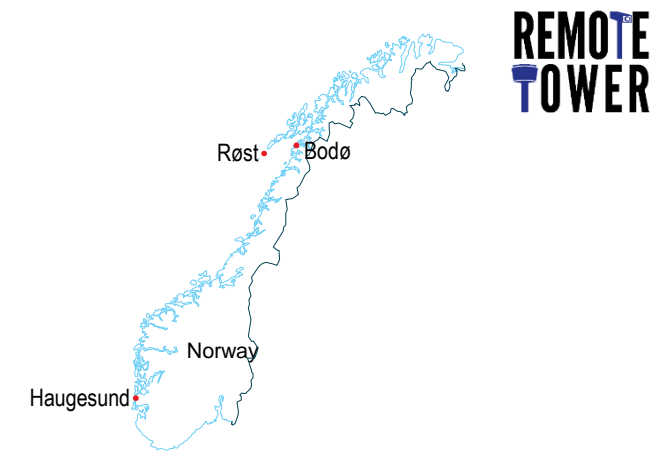
- Control of up to three medium sized aerodromes
- Real-time simulation
- Out the window view (Heads-Up) provided by three 3D TWR simulators
- MRTM provides an operational environment
- Operational scenarios of mixed traffic
- “Split and merge” of aerodromes
 - Move from three to two airports within an MRTM
 - Move from two to three airports within an MRTM





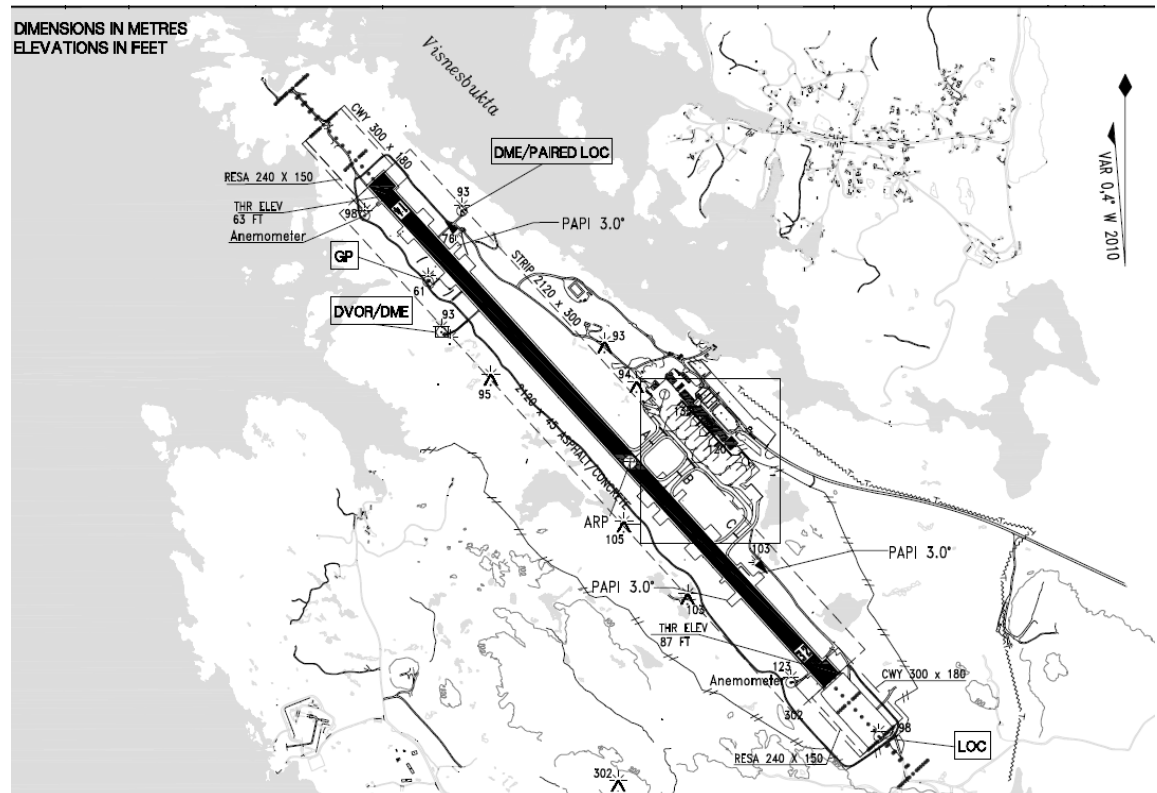
Røst Airport

- Røst - a small community on the island of Røst
 - Approx 600 inhabitants
- 1030 meters Runway
 - Backtrack on RWY is needed
- Served twice daily with Dash 8 by Widerøe
- Also served by rescue helicopters and GA traffic
- Approx 1500 movements per year
- In this validation traffic has been increased



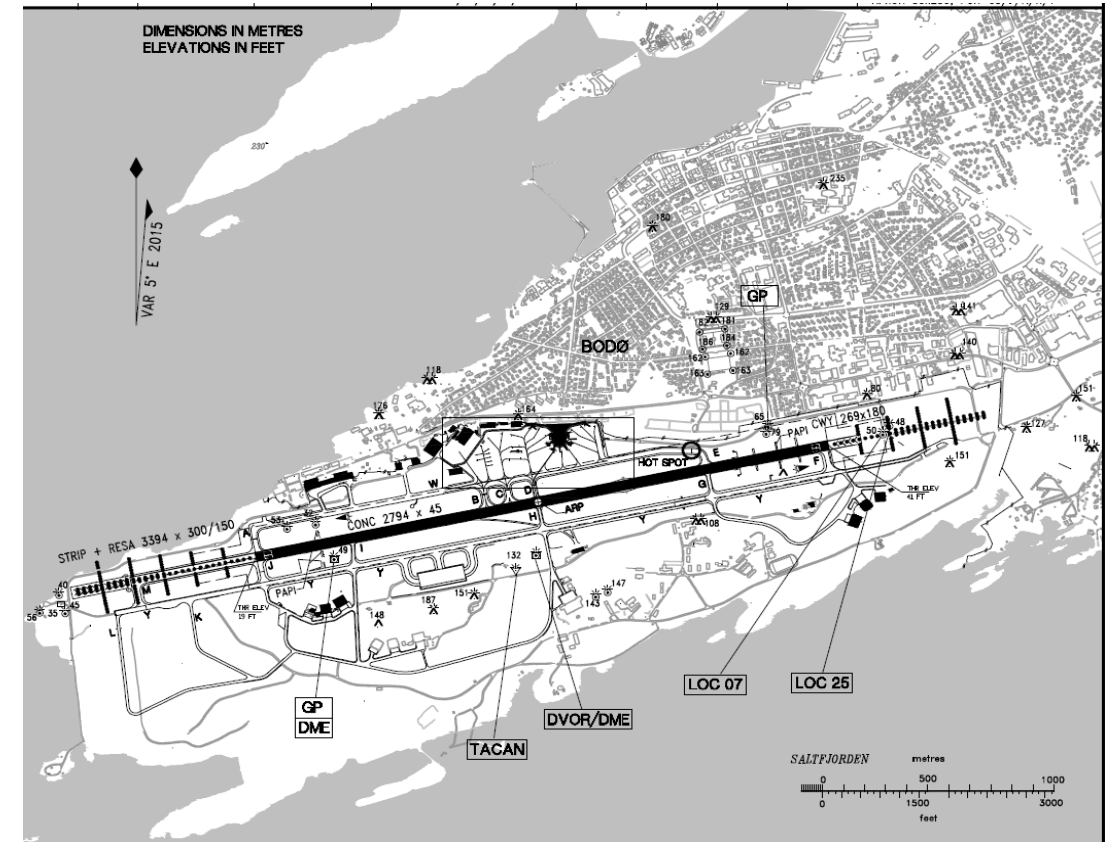
Haugesund Airport

- International airport in SW Norway
- Mainly Boeing 737 scheduled traffic
- Also helicopter traffic to oil rigs and GA
- 2120 meters Runway
 - Backtrack on RWY is needed
- 5 stands with pushback - four stands for GA
- Approx 10 000 movements per year

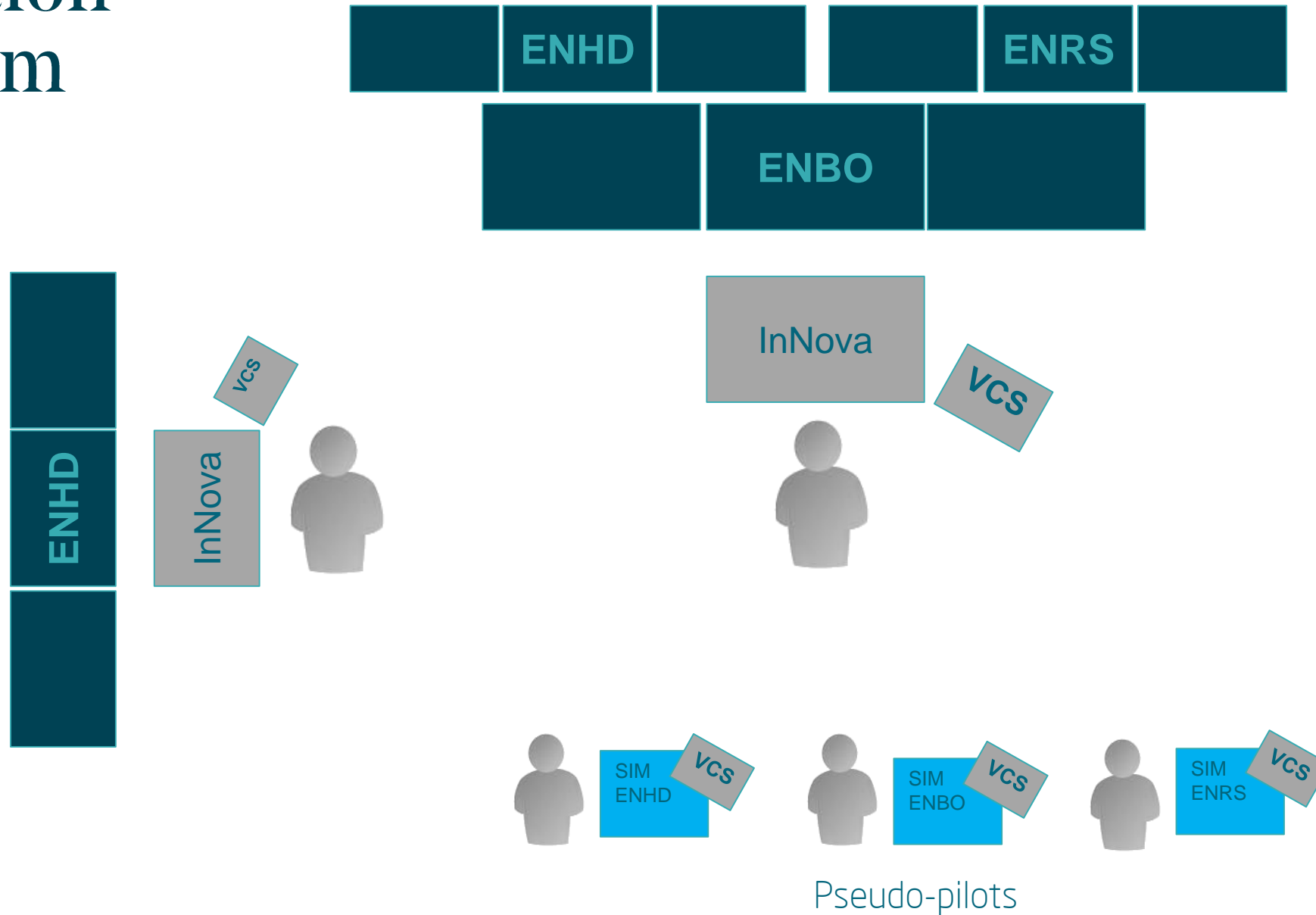


Bodø

- International 24H Combined Civil and Military airport
 - Fighter base and base for Search and Rescue
- Scheduled traffic with mainly B737, helicopters and Dash 8
- 2794 meters runway
- Parallel taxiways on both sides of RWY
- No military traffic in the validation
- Approx 50 000 movements per year



Validation platform



Multi layout



Multiple Remote Tower Module



Heads-Up Display (HUD)

Indra 3D TWR Simulator

VCS

Indra GAREX 230 VCS

Heads-Down Display (HDD)

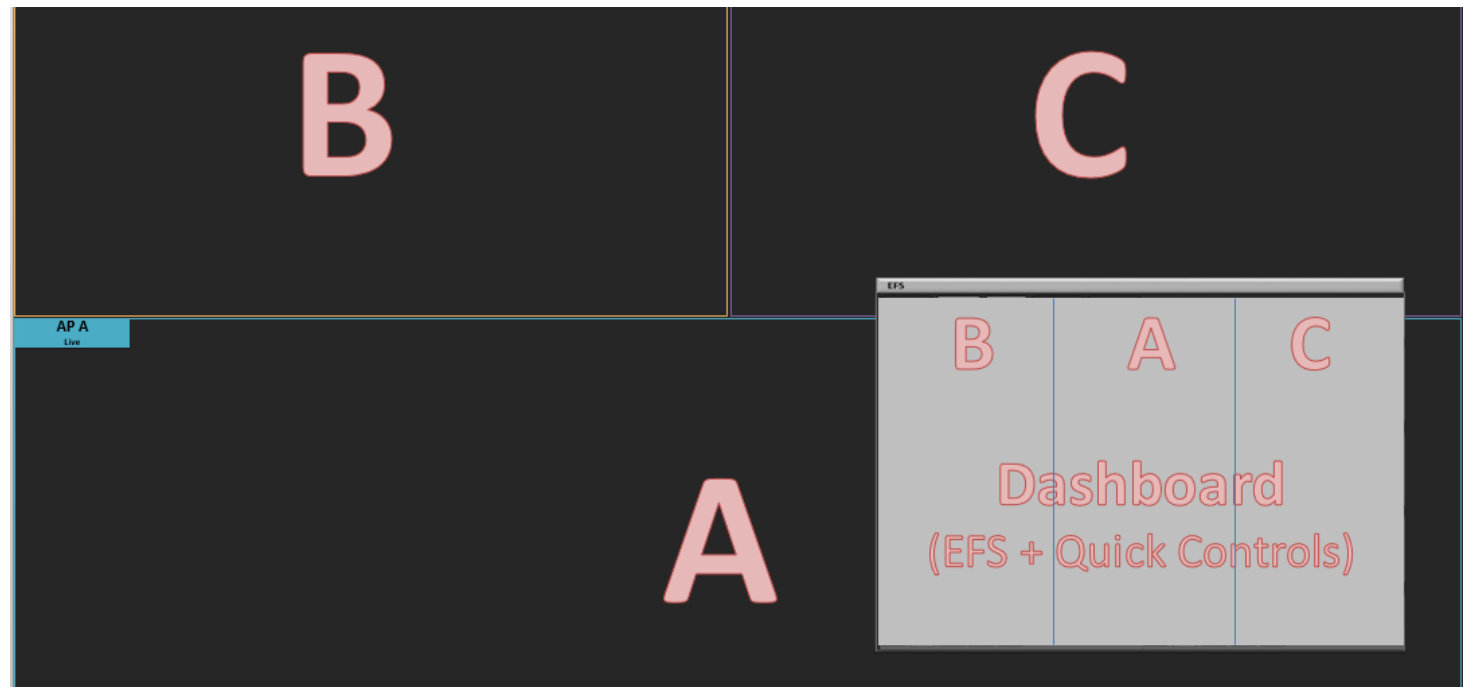
Indra InNOVA AIR



Multi layout HDD

- Traffic Situation Display (TSD) on background
- HUD and TSD have similar split
- EFS split side-by-side
- When B (Haugesund) move out, C will expand to cover the vacant space

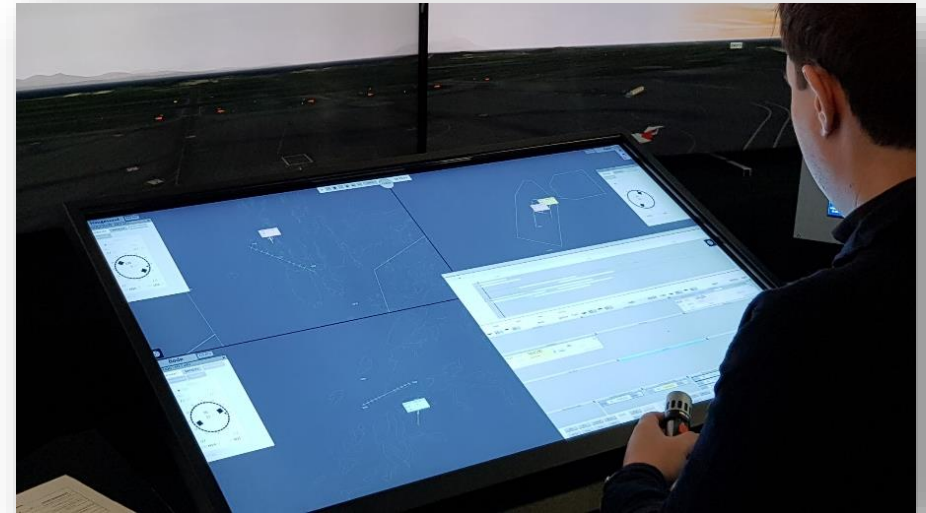
A = Bodø
B = Haugesund
C = Røst



Heads-Down Display

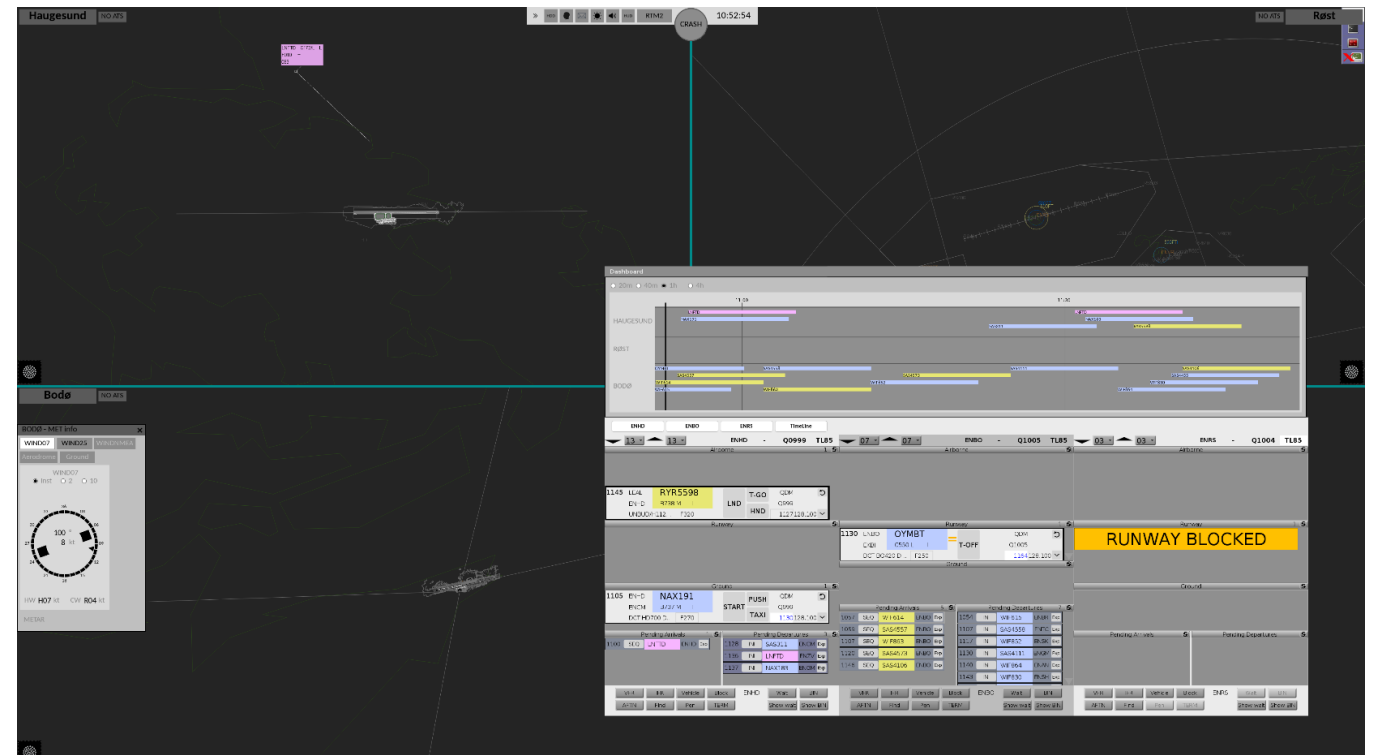
Based on Indra InNOVA ATM system

- All ATM tools combined on a single 43" display
 - Traffic Situation Display (Air only)
 - Electronic Flight Strips
 - MET (wind, QNH)
 - Planning tool (timeline)
- Combined functions for up to three aerodromes
- Focus on HMI development to focus on important elements to increase Situational Awareness

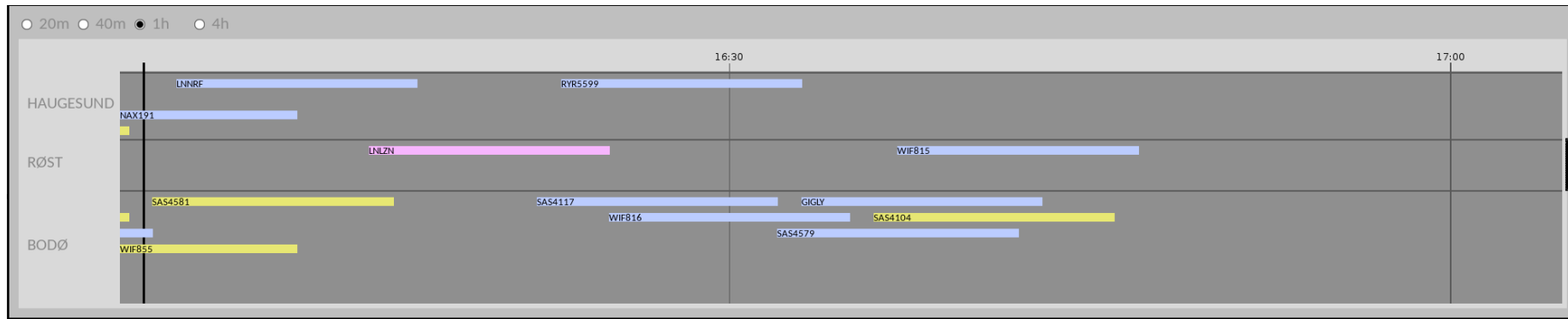


HDD layout

- Background is the TSD (Traffic Situation Display)
- Dashboard is floating and contains
 - EFS
 - Timeline
- Additional functions appear as floating windows



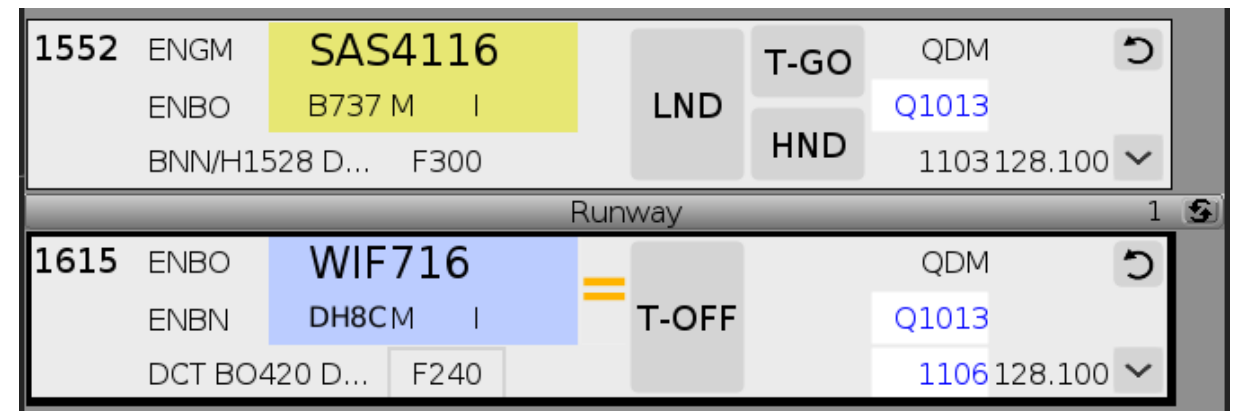
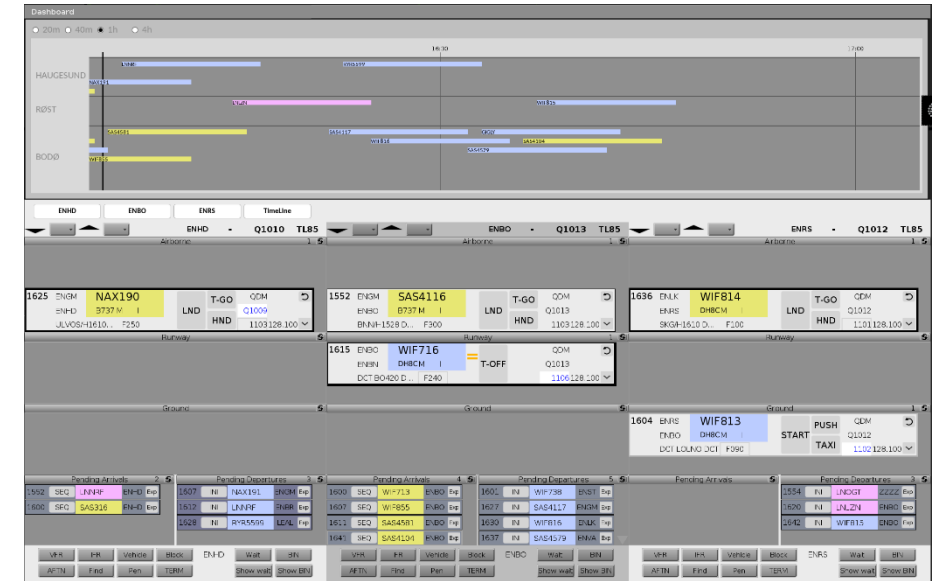
Timeline – Short term planning tool



- Used by ATCO to plan traffic for the next period and assess the expected workload
- Indicating all flights on a timeline of a configurable period
- Same colour coding as flight strips and flight labels
- Length of line indicate the expected time the ATCO will work with flight
- When activating a flight strip in the EFS, the line will move to the 'now' line
- When selecting a flight in Timeline, EFS or TSD, the same flight will be highlighted everywhere

Electronic Flight Strips (EFS)

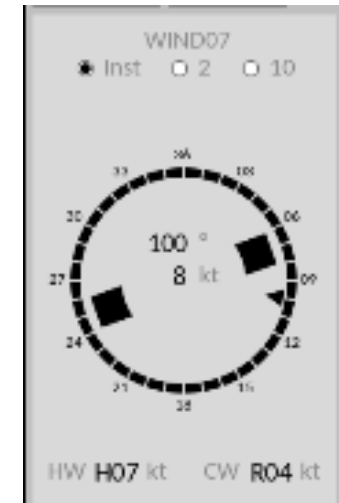
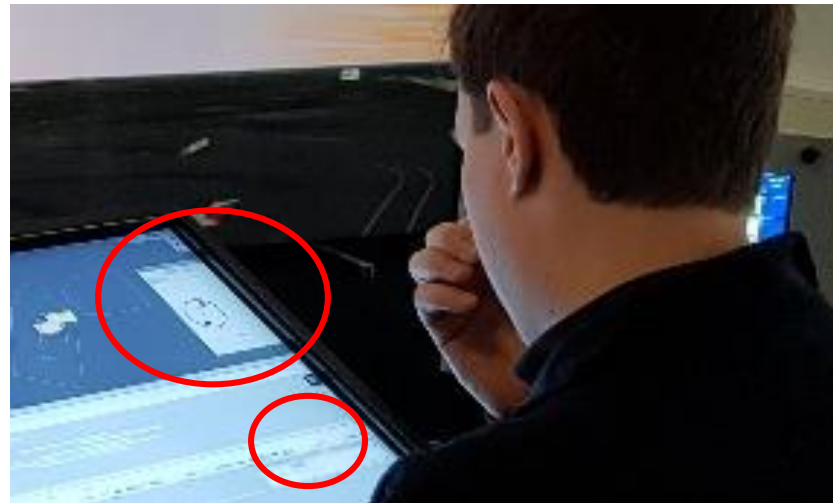
- Access to all flight plan data through a suitable strip layout
- Tailored layout for each type of flight (IFR, VFR, arrivals departures etc.)
- Separate EFS for each aerodrome - side by side
- Clearances given on strips
- Flight status flow through strip bays
- Provides ATCO with increased situational awareness



MET indications

Wind and QNH used in validation

- Wind presented
 - As numbers on both RWY thresholds on HUD
 - As optional wind rose on HDD
- QNH presented
 - On HUD
 - On top of EFS





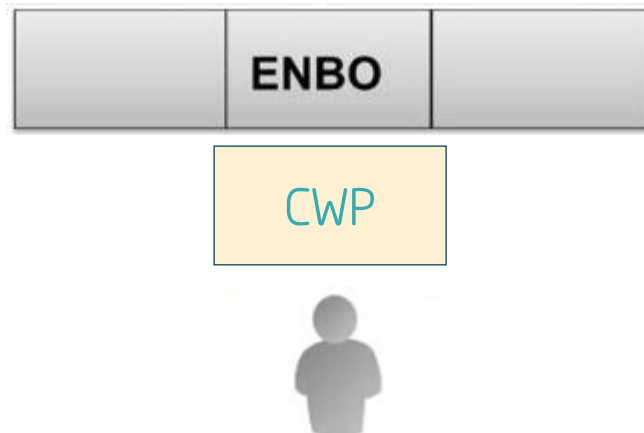
Solution 3

Validation with focus on
Supervisor Planning Tool for
Remote Tower Centre

New operating methods

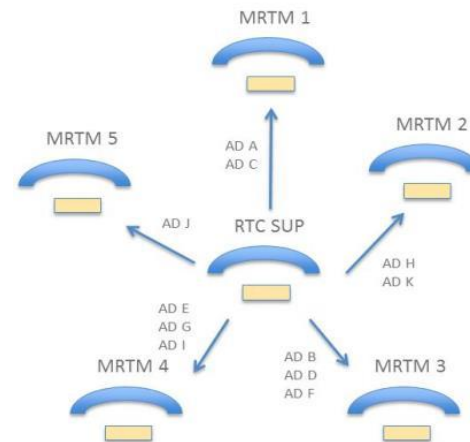
Previous operating method

- Single Remote Towers

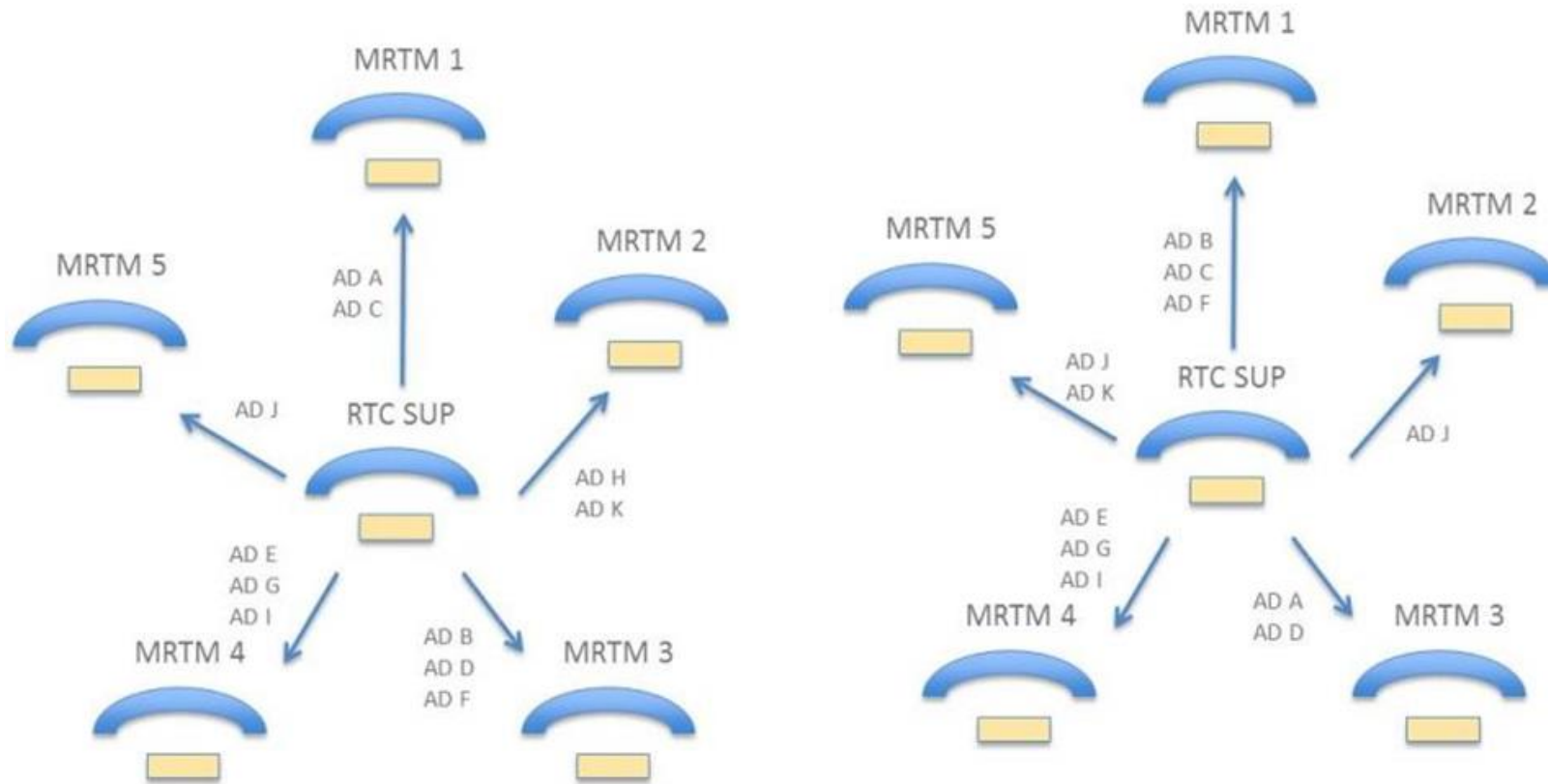


New operating method

- New role: RTC Supervisor
- Remote Tower Planner tool
- Simultaneous operations
- Flexible allocation of aerodromes



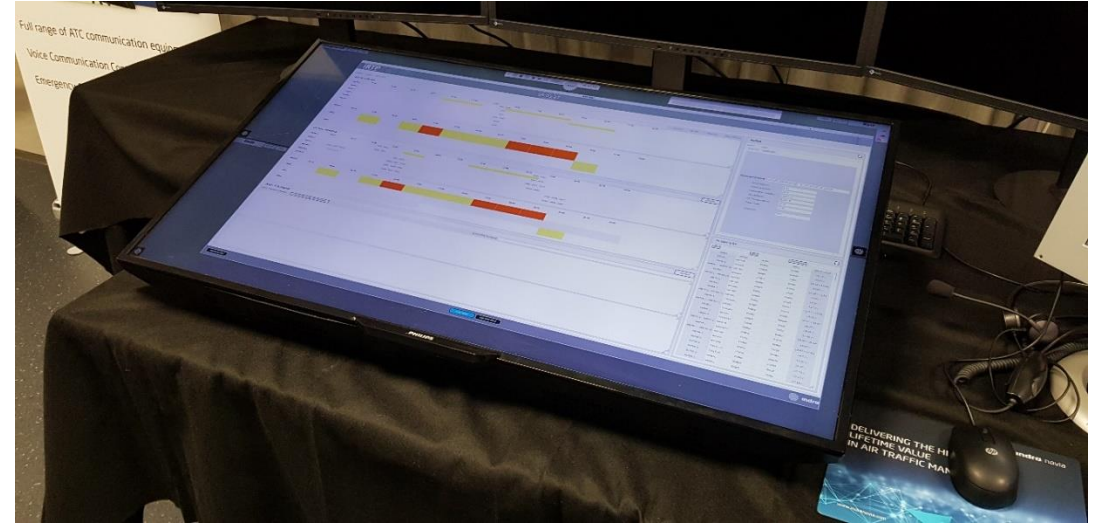
Flexible allocation of aerodromes to MRTMs



Solution 3 validation

Remote Tower Planner (RTP)

- Supervisor tool for medium to long term planning
- Remote Tower Center (RTC) with Multiple Remote Tower Modules (MRTM)
- Tool provides proposed combination of aerodromes to each MRTM within the RTC
- Based on specific input
 - Planned traffic (flight plans)
 - Weather (present and forecasted)
 - Airport complexity



Validation

Three scenarios with various traffic load and weather conditions

15 airports (4 ATC, 11 AFIS)

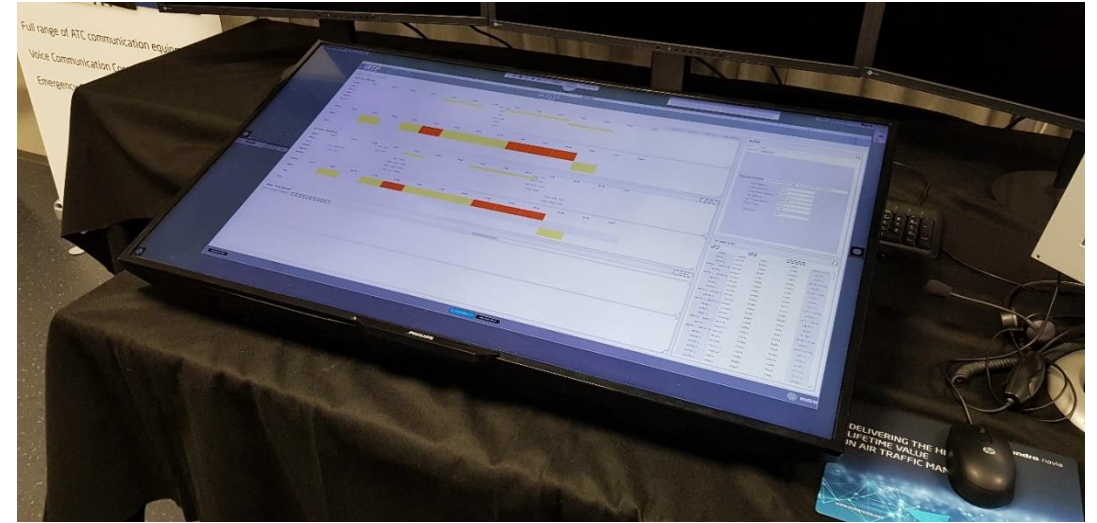
- ENRS - Røst
- ENSH - [Svolvær](#)
- ENRO - Røros
- ENML - Molde
- ENMH - Mehamn
- ENHD - [Haugesund](#)
- ENBV - Berlevåg
- ENBO - [Bodø](#)
- ENHK - Hasvik
- ENNA - [Lakselv](#)
- ENNM - Namsos
- ENRM - Rørvik
- ENSG - Sogndal
- ENBL - Førde
- ENSS - Vardø

Traffic: Simultaneous movements mix of VFR, IFR and Vehicles

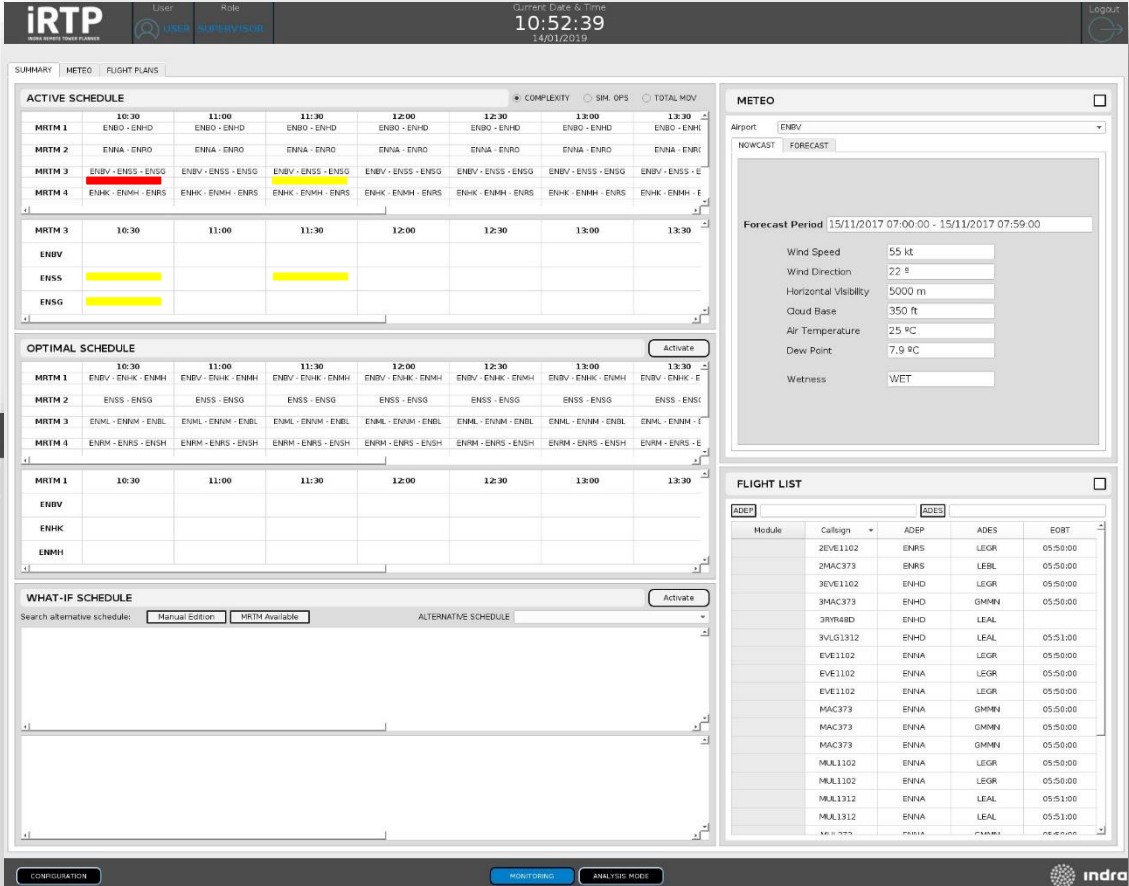
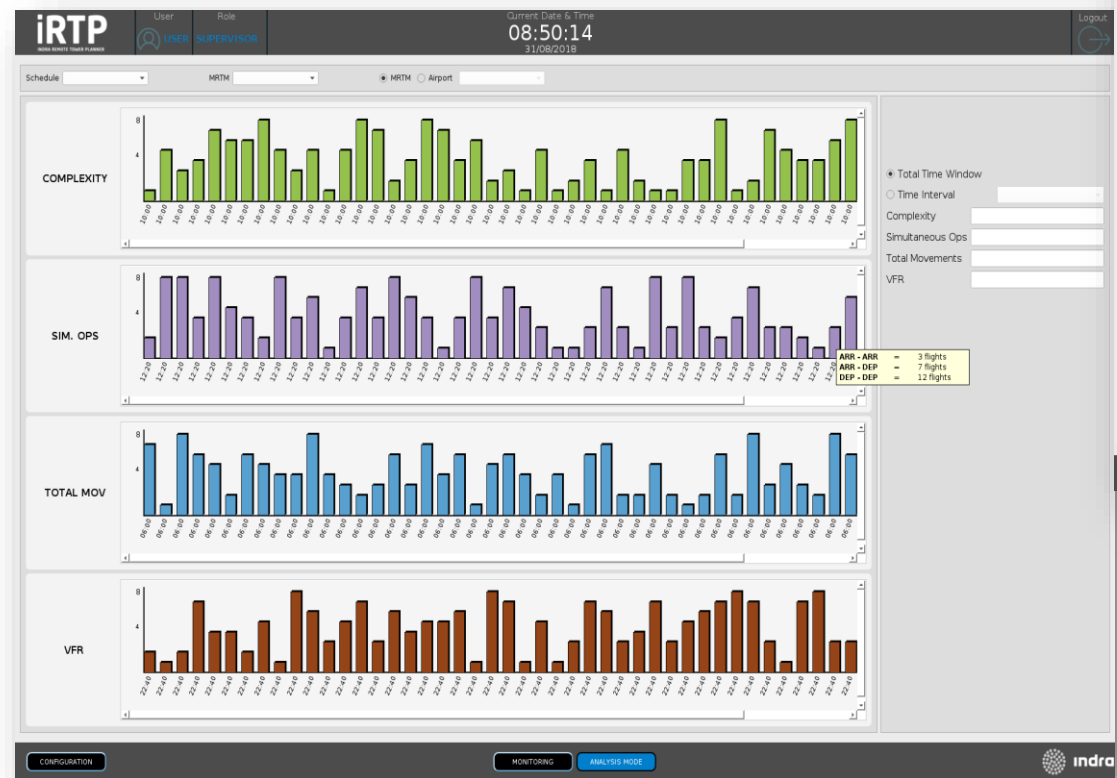


Validation

- Two experienced Avinor Supervisors in validation
 - One from large TWR operations
 - One from ACC operations
- Tool configured for 15 aerodromes and 15 MRTMs
- Three scenarios with variable traffic load and weather conditions
- One day validation with run-through of the scenarios
- Observations, questionnaires, interviews, brainstorming



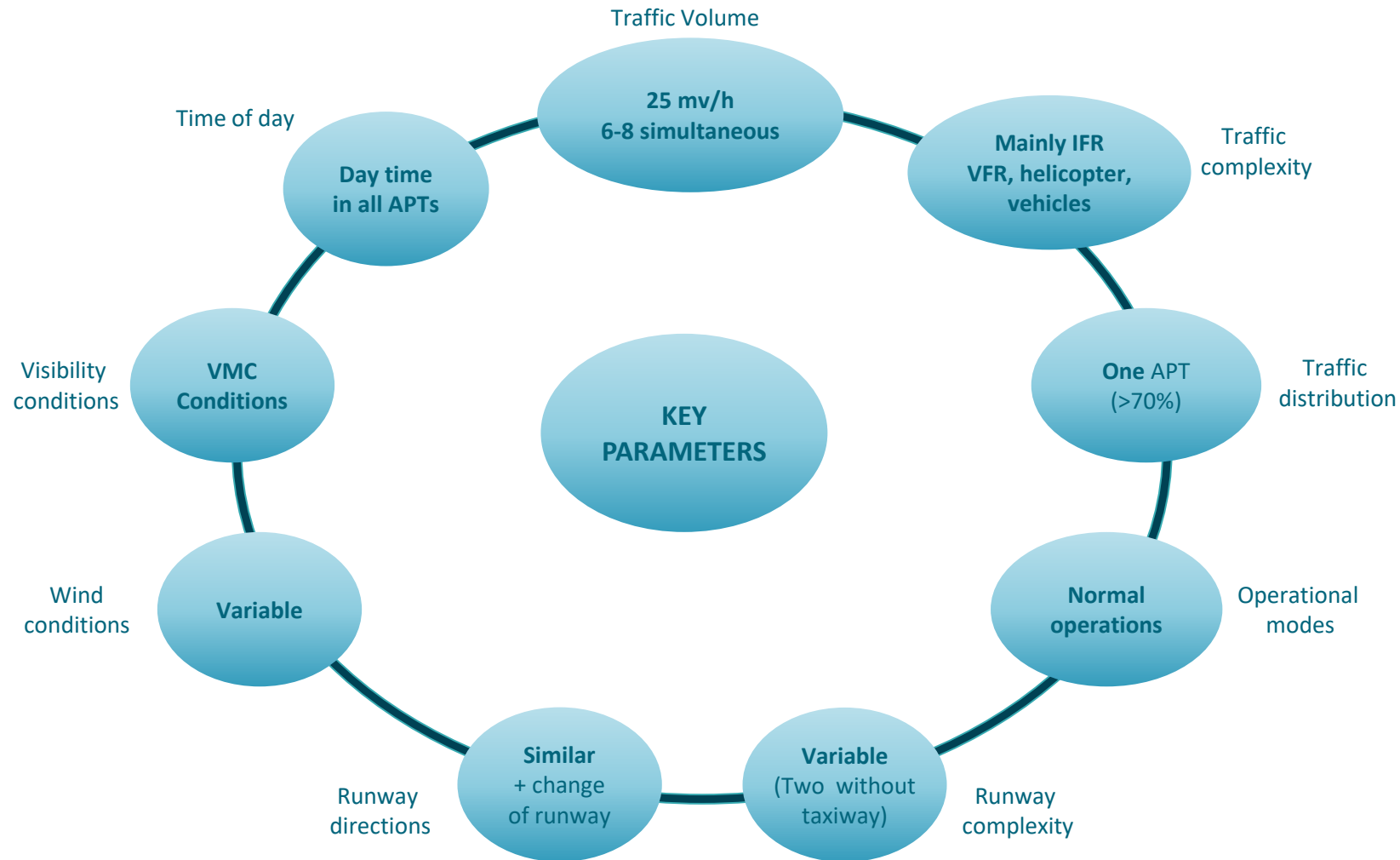
RTP tool



Validation Execution

Espen Stokkeland, Avinor

Key Parameters



Validation Objectives – Human Performance

- **Situation Awareness** when providing ATS to multiple aerodromes
- **Workload** when providing ATS to multiple aerodromes
- **Usability and Utility of Human-Machine Interface** when providing ATS to multiple aerodromes
- **Acceptance of operating methods** when providing ATS to multiple aerodromes
- **Safety** and the capability to achieve tasks in a **safe** manner; Potential threats to Safety

...through Observations, Questionnaires, Debriefings

Validation execution

- Four Avinor ATCOs
- One Training Day with all ATCOs
- One Validation Day for each ATCO
 - Three Runs per day
 - Each Run lasts one hour
 - Various traffic and situations per run

Run	
1	Three aerodromes IFR, VFR, Helicopter, Vehicles QNH and wind changes Local helicopter operations at ENRS
2	Three aerodromes – split out one IFR, VFR, Helicopter, Vehicles Wind change leads to RWY change Aircraft need to return due to technical
3	Two aerodromes – merge in third IFR, VFR, Vehicles QNH changes VFR doing circuit training on ENRS VFR not following clearance

Conduct

Run 1, 2, 3

- Focus on the run as if under realistic conditions
- Over-the-Shoulder Observers
- No “conversation”, but point out malfunction/issue, situation to debrief
- Video Recording as back-up (consulted as needed)
- Data handled confidentially, reported in an aggregated way

Run 1: 3 AD

Run 2: 3 AD → 2 AD

Run 3: 2 AD → 3 AD

Post-run questionnaire

- Workload & SA: fill in directly after
- Short break

Debriefing HF & OPS

After Run 3: Post-exercise questionnaire

- More general and additional feedback
- Controller Acceptance Rating Scale
- Safety Questionnaire



Split and Merge

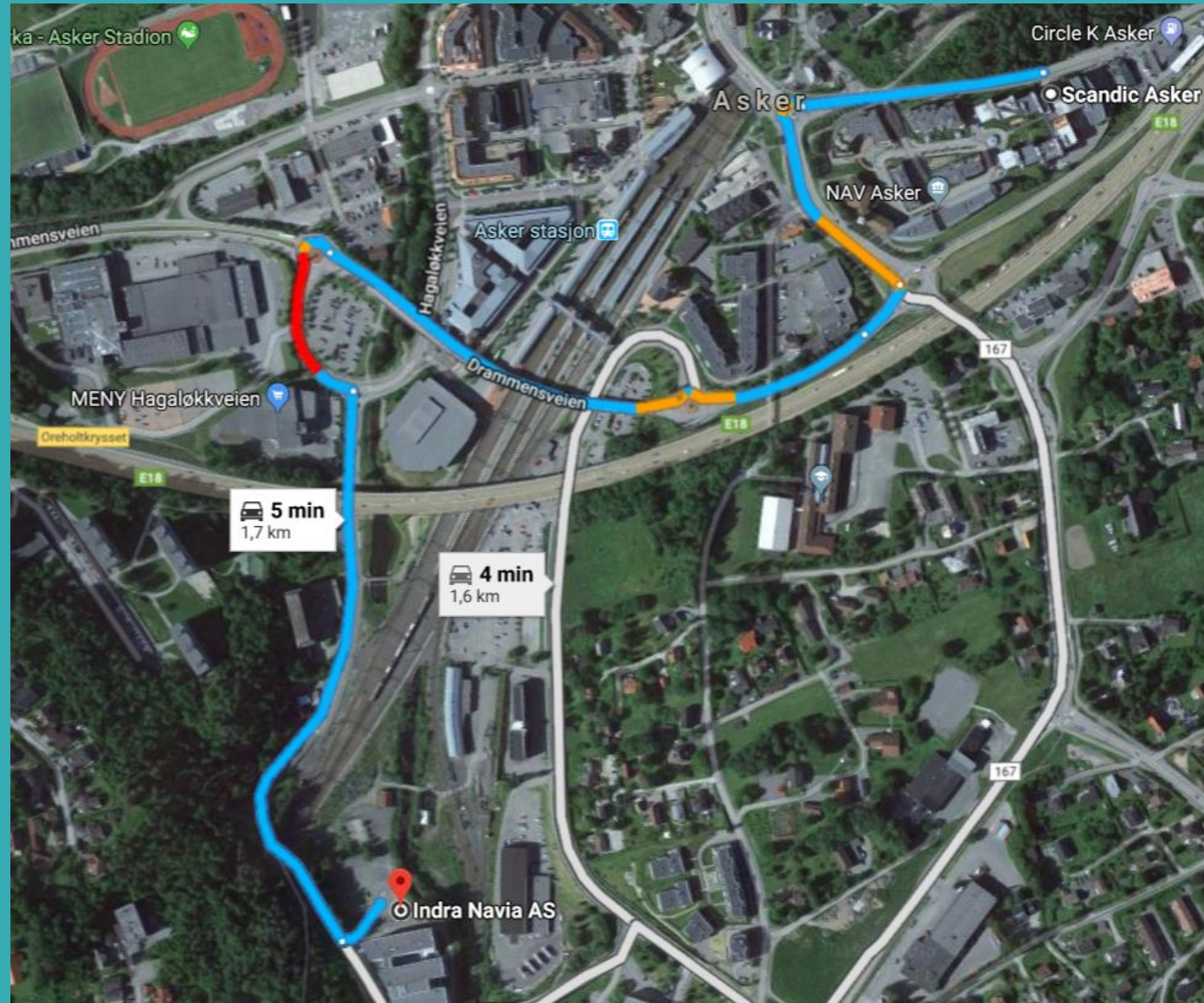
Move one airport to another MRTM while maintaining operations

- Receiving MRTM opens Aerodrome in “View only” mode, monitors traffic and comms
- When ready, contacts Giving RTM to initiate process
- Handover checklist of information
 - Runway status, traffic, weather etc.
- Receiving MRTM takes control
- Giving MRTM keep aerodrome in “view only” for a while before removing aerodrome from MRTM



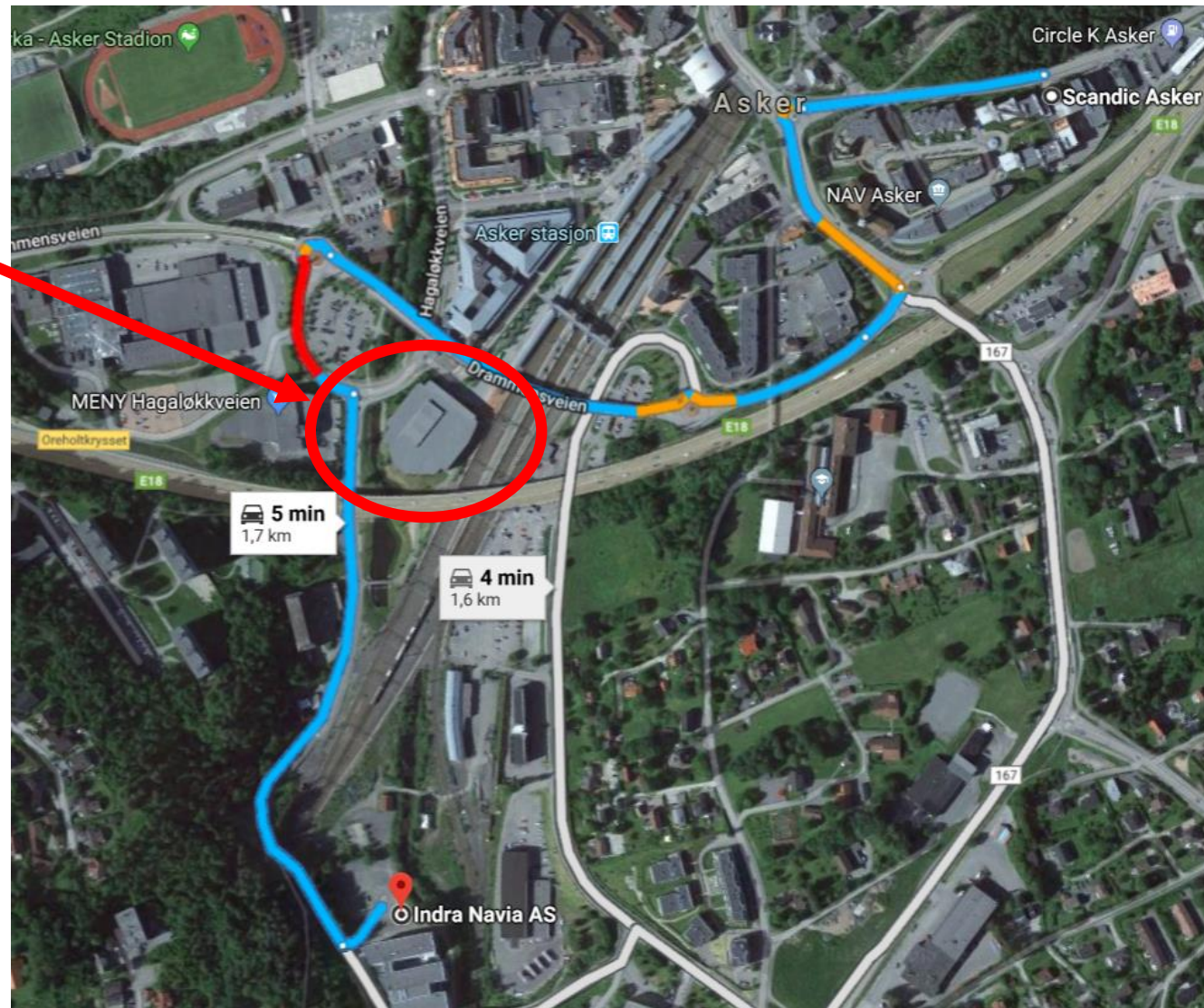
Practicalities

Bus leaves for Indra Navia at 11:45



Limited parking

If car is needed, use
parking house by railway
station



Please note

- Wardrobe available
 - Room is not locked – storage on own responsibility
- Light lunch served
 - Will be available all through the demonstrations
 - In case of allergies or other there are items to be purchased in the restaurant
- Photographs will be taken during the day
- A participant list will be distributed after the event

Demonstrations

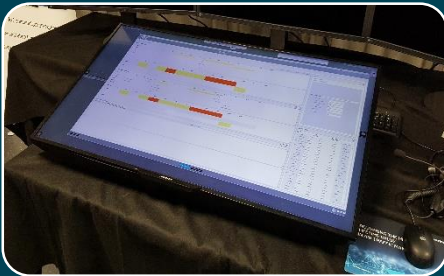
- Three possible demonstrations will run in parallel
 - Each demonstration lasts approx. 20 minutes
- Three groups with approx. 25 persons in each
 - See colour coding on your badge
- Rotates among the demonstrations every 30 minutes

Demonstrations



Solution 2 – Multiple Remote Tower Module

- Real-time simulation with three airports
- 20 minute scenario with Avinor ATCO controlling traffic



Solution 3 – Remote Tower Planner tool

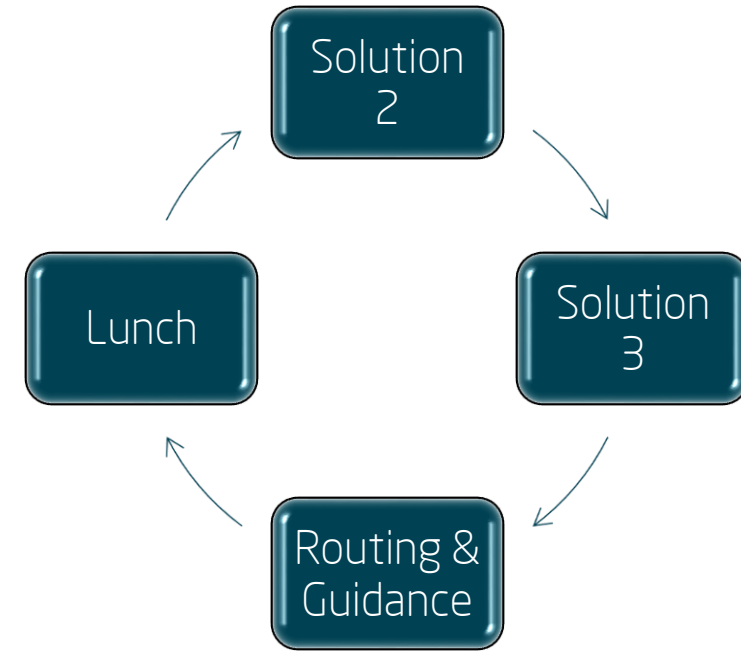
- Demonstration of RTP tool
- Planning for a Remote center with 15 MRTMs and 15 airports



Ground Routing and Guidance (SESAR PJ03)

- Demonstration of routing and guidance
- Strip-free operation. Clearances given on labels.
- Optional attendance

Groups and demo schedule



Group	Colour	12:15	12:45	13:15
Group 1	Green	Solution 2	Solution 3	Lunch/demo
Group 2	Red	Lunch/demo	Solution 2	Solution 3
Group 3	Blue	Solution 3	Lunch/demo	Solution 2

Open Day schedule

09:30	Registration and Coffee	
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indra
At the core