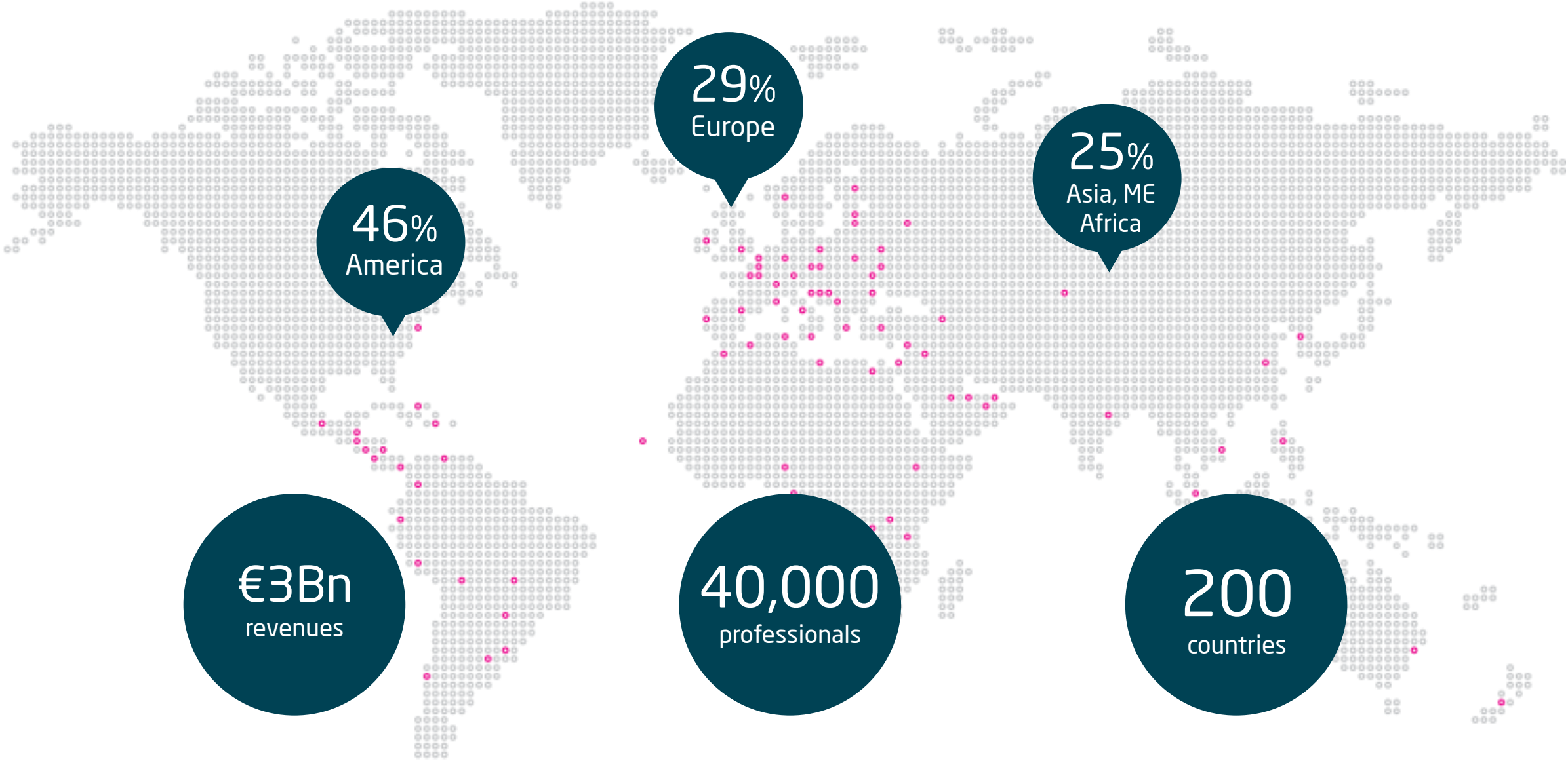
SESAR 2020

Integrated Airport Operations

Open Day, Hamburg
19 September 2019

Indra - worldwide IT leaders



Winner of Jane's ATC Award for Runway 2019 ARSI

3rd year in a row

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Alexander Berger, Ameline Gay-Perret, Andreas Gammel (FZAG), Andreas Koch, Andreas Nötz, Andreas Törnesen (Indra), Arne Schönhut, Bernhard Daenzer, Bertrand Petit, Björnar Askevold (Indra), Carlos Echeverría, Chris Arnold, Christian Egloff (Swiss), Christop Fässler, Christoph Lehmann, Christoph Lüönd, Christoph Zehnder, Daniel Gschwind (FZAG), Daniel Heutschi, Daniel Klöpfer (FZAG), Dario Romano (SkySoft), Dijana Pasic, Dominik Erdin (FZAG), Dominik Stoppok (SITA), Duncan Fletcher, Eirik Schultz (Indra), Elin Blakstad (Indra), Fabian Brühwiler (FZAG), Franck Delaval (SkySoft), Gerhard Jud (Swiss), Giovanni Russo (FZAG), Gregory Bevillard, Grzegorz Pietrzak (SkySoft), Guillermo García Concha (Indra), Hansrudi Spörri, Harry Baenninger (SWISS), Indrajit Tapadar (Indra), Jann Döbelin (FZAG), Jean-Marc Borer, Jeannine Angehrn, Jeff Thompson (SaabSensis), Jörn Winkler (Project Manager), Julien Piaser, Katrin Stark (SITA), Katrin Volkmer (Indra), Lars Fjelltun (Indra), Lisa Berry, Lisa Donne-Horvath, Luca Dalla Canova, Lutz Löffler, Marco Feller, Marco Sieber, Maria Aas Borkenhagen (Indra), Mario Müllner, Martin Brucker, Mathias Burtscher, Mathias Sieber, Michael Brempel, Mike Hofer, Montserrat Mendoza, Nestor Vincente Fernandez (Indra), Nick Stutz, Nicolas Guilbot (SkySoft), Nino Peterhans (FZAG), Oliver Anton, Olivier Baillif, Olivier Montani (SWISS), Pascal Heer, Pascal Wamister, Patrick Rosselet (SkySoft), Peter Flükiger, Peter Hagenlüke, Peter Spengler, Petter Helsing (Indra), Pierre-Henri Guisan (SkySoft), Ray Ulinski (SaabSensis), Roar Nystad (Indra), Roger Mändli, Roland Kaps-Becker (FZAG), Roman Kistler (FZAG), Ronny Roth (FZAG), Ronny Scharf (FZAG), Ruud Rademaker, Sabina Buchli (FOCA), Salvatore Ferrato, Sandra Bodmer (FOCA), Sandro Maiolo, Saúl Castiello Barbas (Indra), Sergio Teiwes, Siegfried Ladenbauer (FZAG), SifraCorver, Simon Müller, Sindre Pedersen (Indra), Sira Martin (Indra), Stefan Reisswonger, Stefan Strasser, Stefan Walti, Stefan Zbinden, Sven-Erik Hennum-Johnsen (Indra), Sylvain Labussiere (SkySoft), Terje Dahlen (Indra), Thierry Bregou, Thierry Jaccon, Thomas Lehmann, Thomas Muhl, Thomas Poffet (FZAG), Thomas Pellegrin, Thomas Rudiger, Tom Rehwinkel, Tone Löveth Jörgensen (Indra), Toni Barreira, Toni Durschei, Urs Tobler, Urs von Däniken (FZAG), Vladi Barrosa, Yon Sanchez, Yves Grätzenger, Zoi Karagiorga

For safety and efficiency on the runway and final approach

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The airport

- Medium-sized airport with two parallel but dependent runways (13L-31R and 13R-31L) that are used simultaneously
- Default runway direction is 31
- Complex surface layout
- The main terminal (Terminal 2) is located between the two parallel runways

The demonstration setup

- Place of demonstration:
  Contingency room, Budapest
- Two tower working positions
  - Ground Controller (CDC/GRC)
  - Runway Controller (ADC)
- Passive shadow mode operation
- InNOVA Ground

The demonstration platform

- The industrial platform is InNOVA Ground, the evolution of the NOVA 9000 A-SMGCS, which is currently in use in Budapest both in the Tower and in the contingency room, with the SESAR1 functionalities.

- InNOVA Ground was improved with new SESAR solutions:
  - Full scope of automation: from surveillance and detection to clearance monitoring and automatic routing
  - Automatic support for workflow definition using ground and air mobile movements with enhanced setup of responsibilities
  - The new functions aim to reduce the controller's workload whilst providing excellent situational awareness
  - An integrated HMI solution saves time and gives the controllers a clearer view of everything that is happening and that could affect traffic movement

The demonstration platform

InNOVA Ground

- 1 Surveillance Data Server
- 2 Controller Working Positions with 2 different jurisdictions – Ground and Runway Controller
- 1 Technical Monitoring Position
- 1 Recording and Playback Position

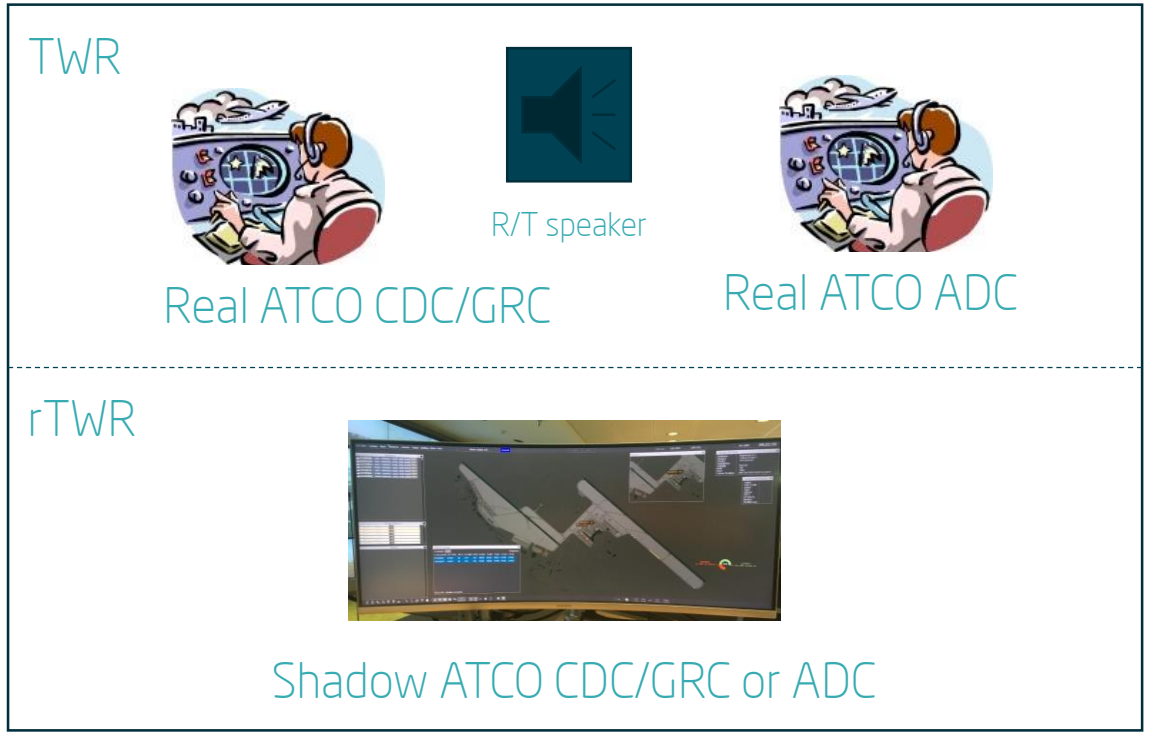
VLD sessions recorded

Logs saved

Shadow mode operation

- The functionalities were tested in passive shadow mode. Operational data was used in real time to feed into the system under test, but had no influence on the operational system

- Same interfaces as operational NOVA systems, both manned and remote
  - 3 x SMR
  - 2 x ASR
  - MLAT
  - OLDI
  - AFTN
- Live flight plan data
- No camera interface
- No CDM interface



The Very Large Scale Demonstration

The main objective of the demonstration is to disseminate and to de-risk the deployment of different SESAR1 solutions

Demonstration objectives

- Surface Movement Planning and Routing
- Airport Safety Nets
- Departure management synchronized with pre-departure sequencing

Duration

- 5 days – 8-12th April
- Open day – 11th April

The Very Large Scale Demonstration

Participants:

- 8 different Tower Controllers were trained on the dry-run week from HungaroControl
- 4 Tower Controllers participated in VLD
- Between >5 and <20 years of experience

Runs

- Run 1 – main focus to demonstrate solution #2 (Safety Nets)
- Run 2 – main focus to demonstrate solution #2, solution #22 and solution #53 (All)
- Run 3 – main focus to demonstrate solution #22 and solution #53 (Extended Safety Nets, Departure Sequencing)
- Total 20 runs during the VLD, each between 1.5-2 hours
- 2 runs with one runway operation (due to planned maintenance)

Automated Assistance to Controller for Surface Movement Planning and Routing

SESAR Solution #22 consisting on the use of a Routing function to support controllers managing the taxi phase. The Routing function calculates suitable routes for any mobile in the surface according to any constraint (wingspan, taxiways configuration, etc.) and displays it in the controller HMI. The controller can interact with the system to edit the routes and to input clearances.

Routing Service

The routing function automatically assigns a proposed route to an aircraft when its flight plan is loaded, or a configurable time before arrival/departure.

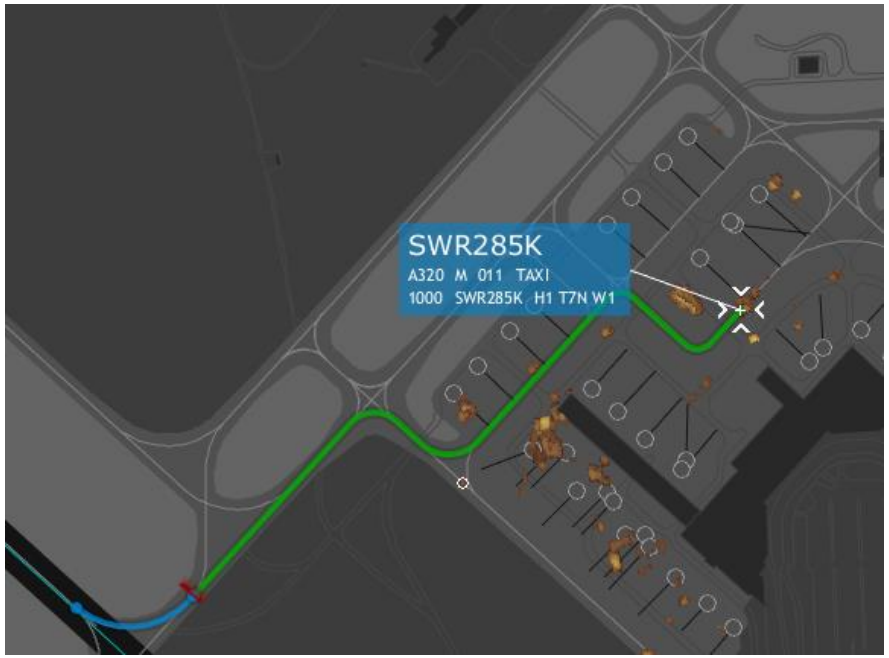
Calculation constrains

- Predefined standard routes
- Low visibility procedures
- Taxiway constraints
- Arrival/departure
- Push-back procedures
- De-icing

Automated Assistance to Controller for Surface Movement Planning and Routing

Lessons learned

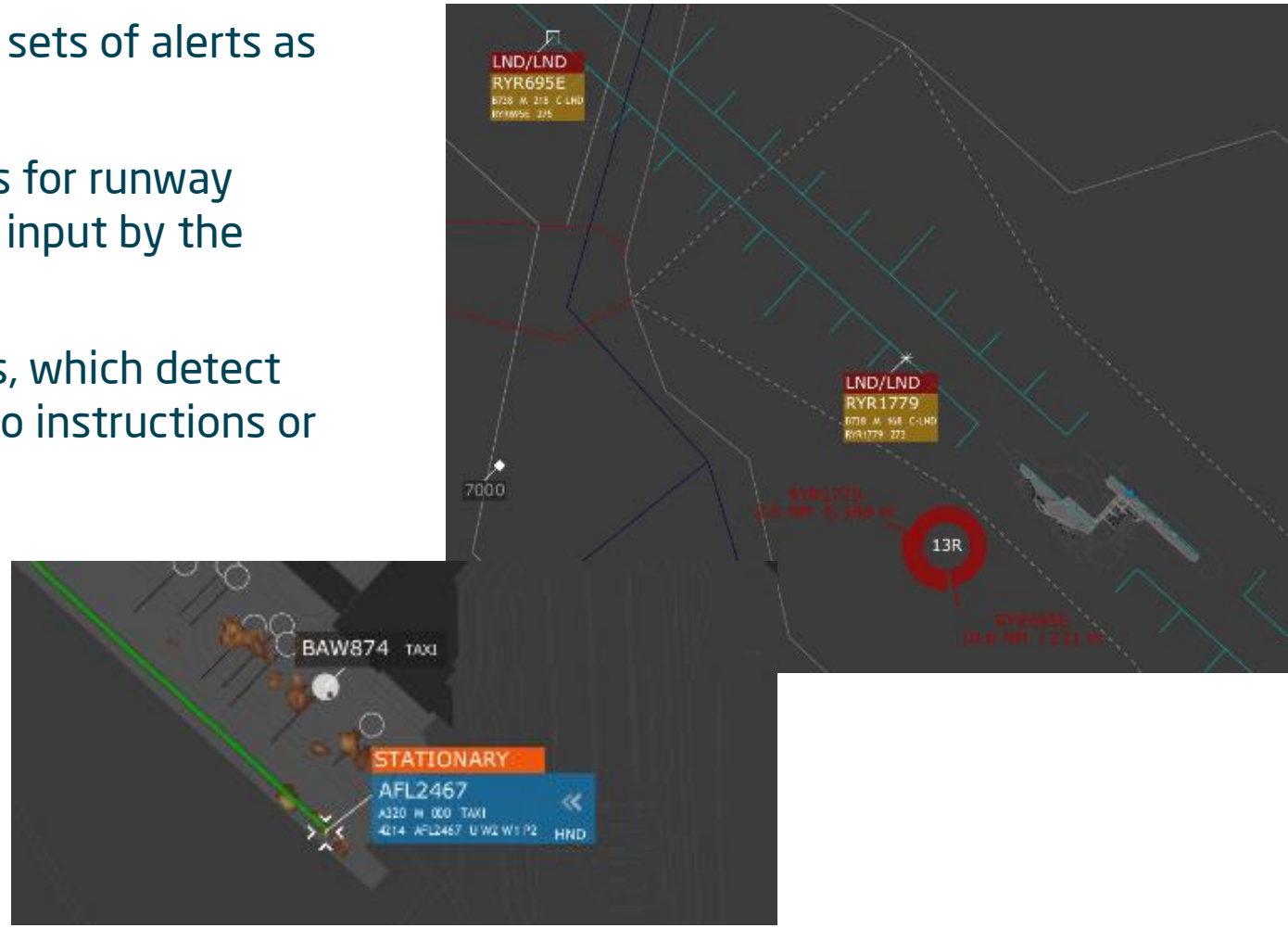
- Published routes often not followed – workload increased
- Different push-back procedures – impact on the calculated taxi time
- Each ATCO has their own preferences for one runway operation
- Hard to optimize preferred entry/exit point
- Shortest route is not always the best route – fewer turns preferred
- Clearances given by VHF should be updated on the HMI by the controllers – more heads-down time
- Route modification outside of controllers' Area of Responsibility – need for coordination between the controllers



Airport Extended Safety Nets: Conformance Monitoring Alerts and Conflicting ATC Clearances

SESAR Solution #02 consisting of two different sets of alerts as safety support tools for the controllers:

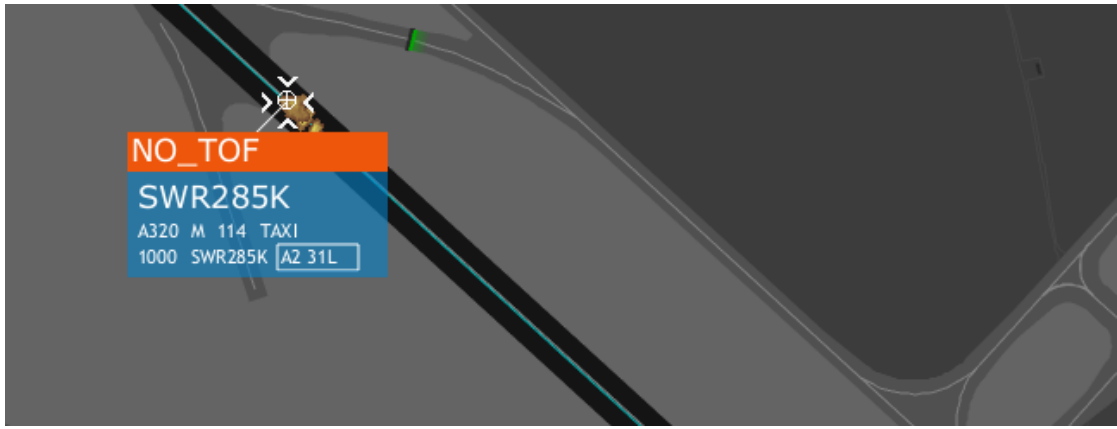
- A set of Conflicting ATC Clearance (CATC) alerts for runway operations, detecting contradictory clearances input by the controller to the system
- A set of Conformance Monitoring (CMAC) alerts, which detect and warn the controllers of non-conformance to instructions or clearances by aircraft or vehicles



Airport Safety Nets: Conformance Monitoring Alerts and Conflicting ATC Clearances

Lessons learned

- Difficult to cover all alerts in Shadow Mode
- Different push-back procedures (even on a same stand) – need to improve stand maneuvers
- Some alerts are less relevant then others
- Tuning is very important to optimize alert activation/de-activation and to avoid nuisance alerts



Pre-Departure Sequencing supported by Route Planning

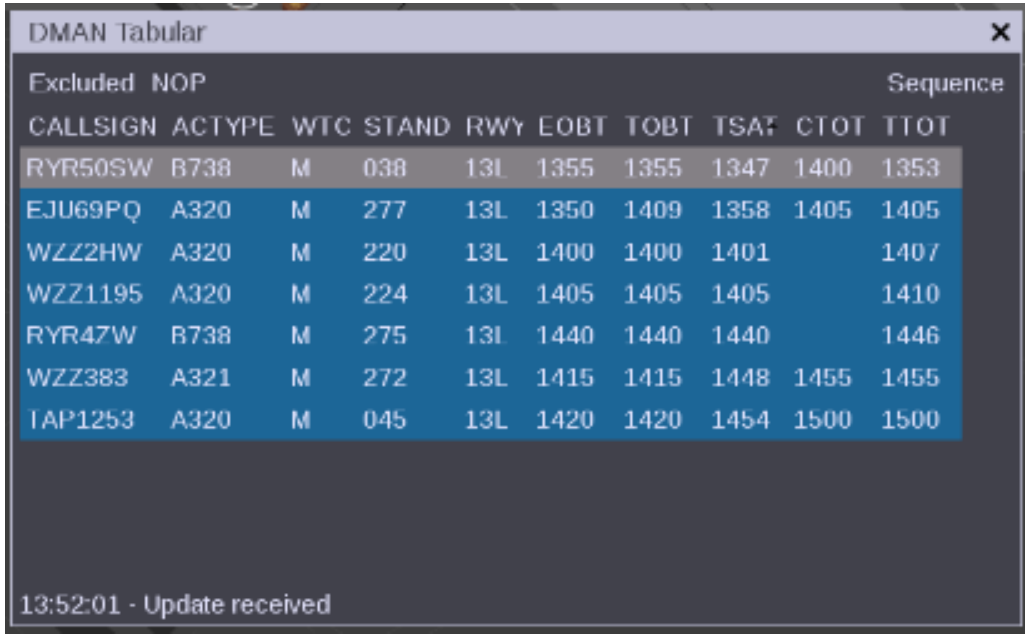
Solution #53 consisting of improving the runway departure sequence provided by the DMAN with pre-departure sequencing using TSAT and with the use of routing and planning information

- InNOVA DMAN is a sequencer developed by INDRA and integrated with Surface Routing
  - Provides pre-departure (TSAT) and departure (TTOT) sequences
- The sequences will be displayed in the integrated InNOVA Ground HMI
  - Tabular window – for Ground Controller, sequence is based on TSAT
  - Timeline – for Runway Controller, sequence is based on TTOT

Pre-Departure Sequencing supported by Route Planning

Lessons learned

- Difficult to cover in Shadow Mode – TOBT was not available, all calculation was based on EOBT=TOBT
- Real taxi times may differ significantly from the planned
- Push-back procedures have a significant impact on the taxi time

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At the core