REMOTE ATC SERVICES

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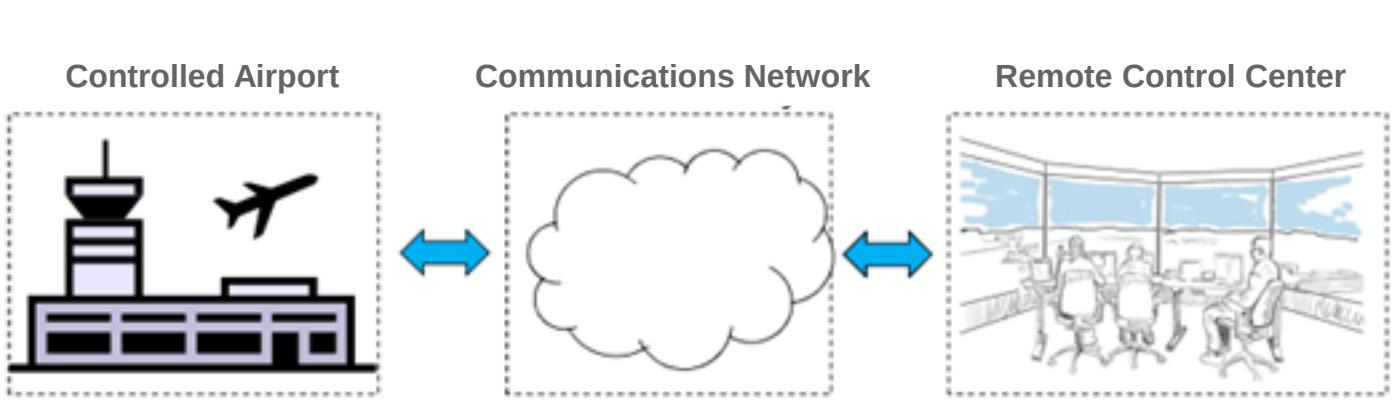
AGENDA

- Current Scenario
- The Concept
- Implementation Options
- Safety Enhancements
- Certification & Deployment References
- The Brazilian Scenario

CURRENT SCENARIO

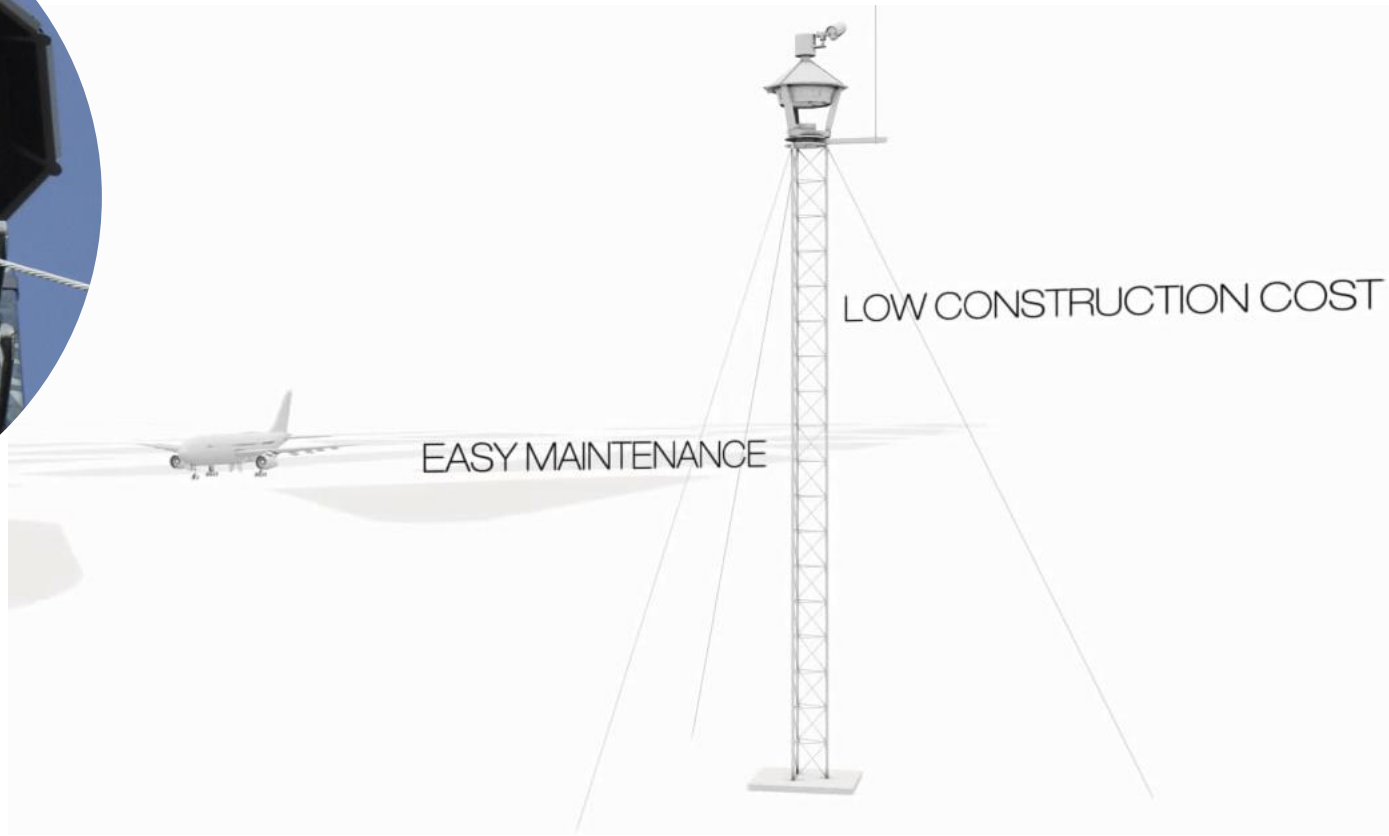
- National air traffic **accelerated growth** over the next few years. **New routes**, **new frequencies**
- Increase in the **number of cities served** by air transport
- Need to **increase** the number of **controlled airports**
  - Construction of **new EPTAs**
  - **Modernization** of existing EPTAs
  - **Contingency** for emergency situations
  - Cost and allocation of **qualified professionals**

THE CONCEPT



- **Remote** ATC service provision - **Greater efficiency / Lower Cost**
- Replacement of the traditional physical infrastructure by a set of remotely installed **Cameras** and **Sensors**, transmitting **image**, **sound** and **data** to a Control Center

THE CONCEPT



THE CONCEPT

- Saab´s Remote Tower model comprises **two major building blocks**
  - The Remotely Controlled Airports (**RCA**)
  - The Remote Tower Centre (**RTC**)
- Controllers reside in the RTC and provide air traffic services to **one or more RCAs**

THE CONCEPT

Infrastructure Requirements

Application	Protocol	Standard	Bandwidth (Mbit)	Application
Video	UDP	RTC/H.264 (RFC 3550)	100	Including 14 fixed color cameras, two zoom cameras and one PT IR camera
Audio	UDP	RTP (RFC 3550)	0,25	
General Monitoring	UDP	SNMP	0,03	
Fixed Camera Monitoring	UDP	SNMP	0,01	
Video Encoder Control and Monitoring	TCP	STI	0,02	
Audio Server Control and Monitoring	TCP	STI	0,01	

Application	Protocol	Standard	Bandwidth (Mbit)	Remark
Navigation Aid Control and Monitoring	TCP	STI	0,02	
Emergency distress alarm control and monitoring	TCP	STI	0,005	
PTZ server Control and Monitoring	TCP	STI	0,02	
Environmental protection control and monitoring	TCP	STI	0,02	
METREPORT	TCP	HTTPS	0,2	
MET Sensor data	TCP	STI	0,02	
MET System monitoring	TCP	STI	0,01	
VCS	TCP	VoIP	0,25	
VCS Monitoring	UDP	SNMP	0,01	
Time reference	UDP	NTP	0,03	
		Sum:	101	

THE CONCEPT

Remote Tower Center (RTC)

- **360 degree** Visualization System
- Airport´s **stereo sound**
- Audio, Video and Flight Data **Record & Replay**
- **Integrated systems control** - Navigation aids and communication systems
- Access to **meteorolocial data**

THE CONCEPT

Remotely Controlled Airport (RCA)

- **14** high-definition cameras
- **Pan/tilt/zoom** (PTZ) cameras (30x)
  - Electro-optical
  - Infrared (IR)
- Signal **light gun**
- **Acoustic** sensors

THE CONCEPT

Remotely Controlled Airport (RCA)

- Camera housing mitigates:
  - Rain, snow, hail, moisture and dust
  - Temperature extremes
  - Sunlight
  - Insects
  - Birds
- **Size**: 5’ diameter x 8’ height
- **Weight**: 600 lbs

THE CONCEPT

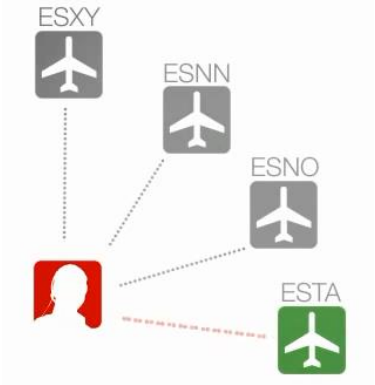
- **High cost-benefit solution** for different situations
  - **Low volume of operations** distributed over long periods
  - **High cost of operation** (infrastructure and personnel)
  - Difficulty of **attracting qualified Controllers**
- Possible **Scenarios**
  - Operation of **various towers** (RCAs) from a **single Center** (RTC)
  - TWR service in **new locations**
  - Replacement of **obsolete Towers**
  - **Back-up solution** for airports of great movement
  - **Contingency solution** to emergency situations

THE CONCEPT

- Cost Reduction **Elements** and **Estimates**
  - **Physical Infrastructure** deployment: **30%**
  - **Systems** Implementations: **25%**
  - Human Factors (**Controllers**): **50%**
  - **Maintenance**: **50%**

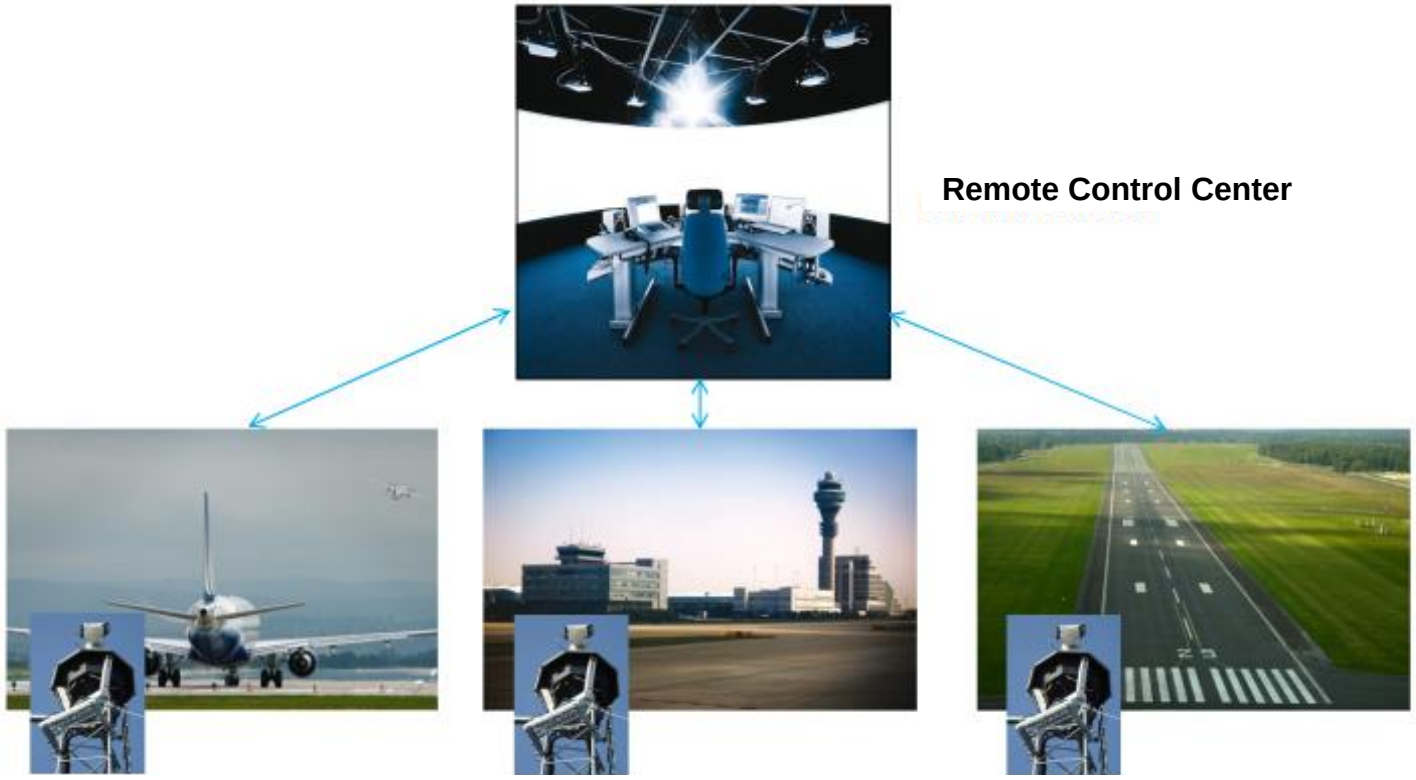
IMPLEMENTATION OPTIONS

- **Single** Airport
  - The controller working position (CWP) is connected to one specific remote airport
- **Switching** Between Airports
  - The CWP has the capability of switching between airports, so the air traffic controller can provider service to any of them, one at a time
- **Multiple** Airports Simultaneously
  - The CWP is connected to multiple remote airports simultaneously, allowing one operator to provide air traffic services at multiple airports at the same time



IMPLEMENTATION OPTIONS

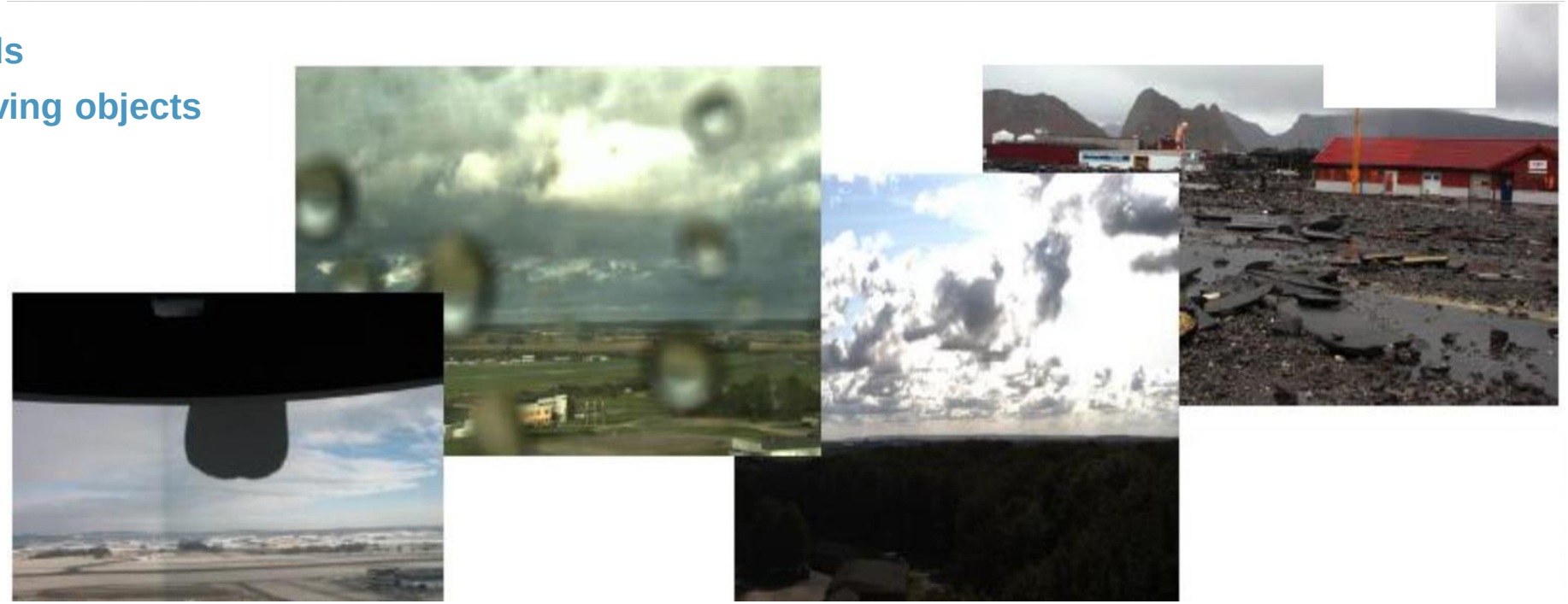
- With remote working positions, controllers can be centralized, manpower can be better balanced, and service can be offered on a scheduled / on-demand basis



IMPLEMENTATION OPTIONS

SAFETY ENHANCEMENTS

- Environmental Challenges
  - Varying **light conditions**… sunrise/sunset, night, fog, bright lamps, strobe lights
  - Arctic to desert **temperatures**
  - **Precipitation**… various forms and intensity levels
  - **Salt** and **sand**
  - **Insects** and **birds**
  - Flickering of **moving objects**



SAFETY ENHANCEMENTS

- Signal Light Gun… Slaved to PTZ Camera as Radio Backup

SAFETY ENHANCEMENTS

- PTZ Camera… Replace Binoculars

SAFETY ENHANCEMENTS

- Filtering Techniques

With Filter

Without Filter

SAFETY ENHANCEMENTS

- Automatic Digital Brightness Adjustments

SAFETY ENHANCEMENTS

- Infrared Cameras - Supplement to optical cameras in darkness or in fog

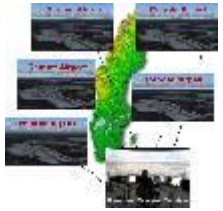
SAFETY ENHANCEMENTS

- Weather Overlay

Wind Rose

Runway Visual Range (RVR)

CERTIFICATION & DEPLOYMENT REFERENCES



r-TWR proof of concept project start

ART project start

Shadow mode validations at Sturup

ART validations at Sturup

The second remote tower symposium

SESAR validation 2 single

Delivery of SESAR r-TWR prototype Værøy - Bodø

Delivery of r-TWR test system to Airservices

SESAR validation Contingency Landvetter

2006 2007 2008 2009 2010 2011 2012 2013 2014

r-TWR installed at Ängelholm airport

ATC Global 2009 & r-TWR rollout

Start of SESAR r-TWR projects

SESAR validation 1 single

Delivery of 1st operational r-TWR system

SESAR validation AFIS Værøy - Bodø

Start of operational certification in Sweden

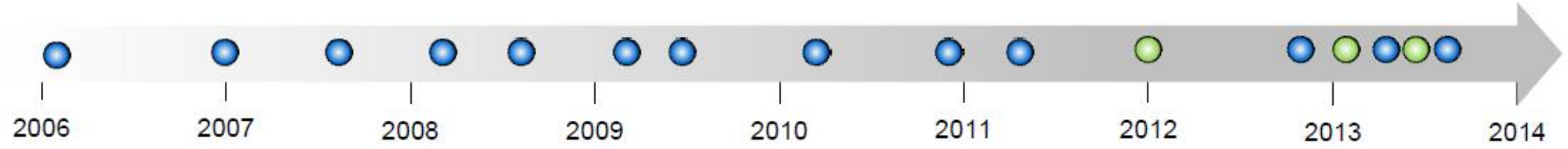
Delivery to Røst

CERTIFICATION & DEPLOYMENT REFERENCES

Delivery Sundsvall & Örnsköldsvik

Test system to Air Services

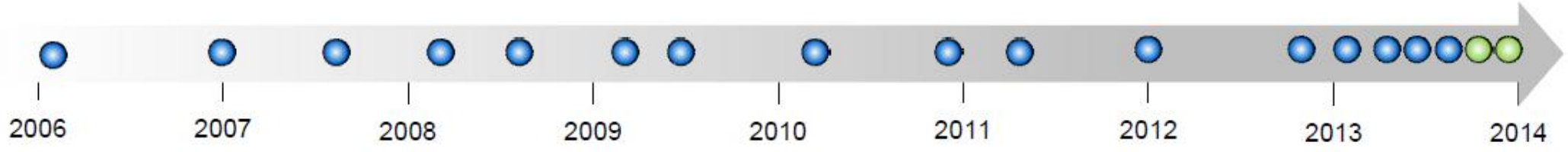
Start of certification, Sweden



CERTIFICATION & DEPLOYMENT REFERENCES

Delivery to Røst airport, Norway

Start of trial&evaluation phase, Australia



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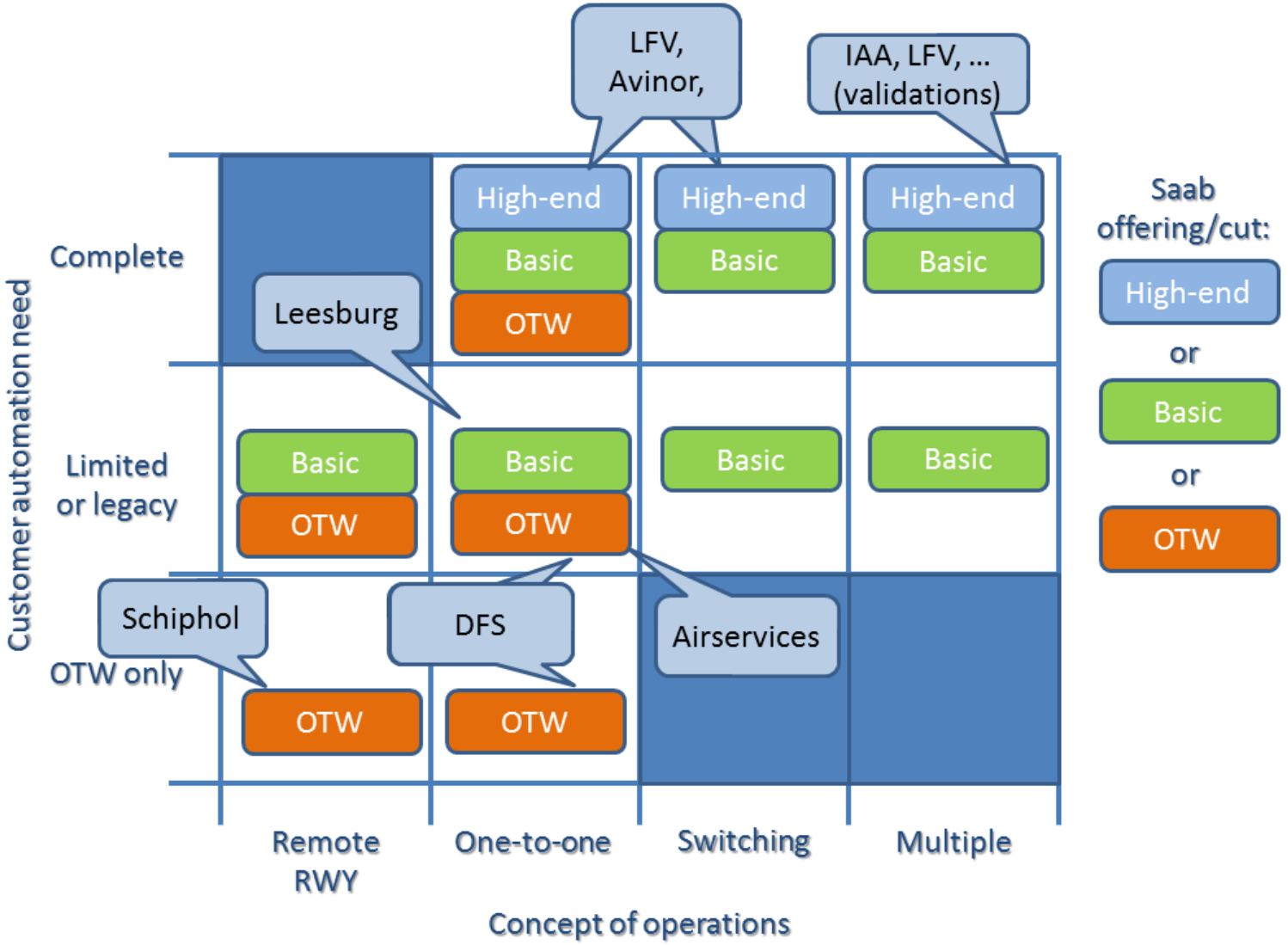
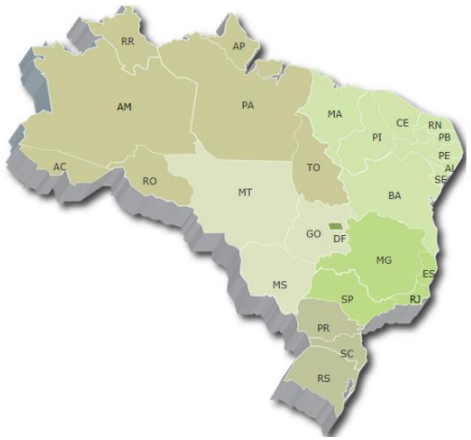


CERTIFICATION & DEPLOYMENT REFERENCES

Leesburg, Virginia (USA)

SAC / DECEA / Infraero Visit - Jun 2015

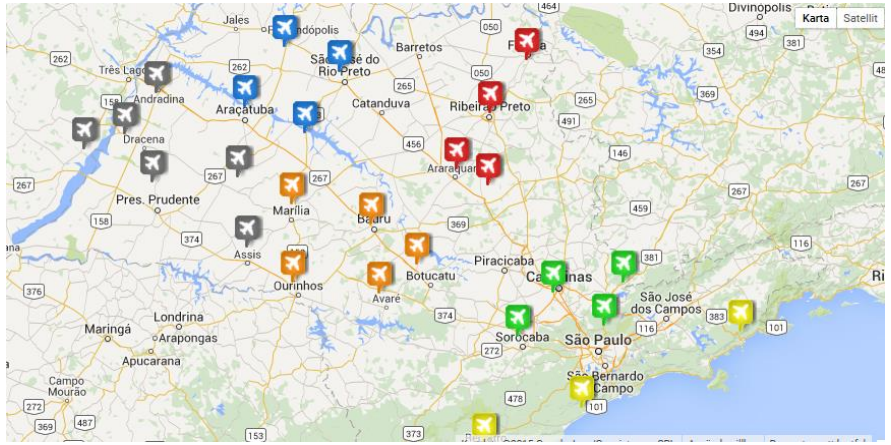
THE BRAZILIAN SCENARIO



- **62 > 58** Aeroportos em território nacional
- **Different operation volumes** and **specific requeriments**

THE BRAZILIAN SCENARIO

SÃO PAULO AEROPORTOS



- **22** Regional Airports with **similar characteristics**
- Frequent need for deployment of control towers in **economically adverse scenarios**

THE BRAZILIAN SCENARIO

- **Regional Aviation Program**, part of **SAC-PR´s** Logistic Investment Plan (**PIL**)

Estado	1ª Fase	Investimento Previsto (R$ mi)
Acre	4	76,5
Amazonas	25	838,4
Amapá	2	74,5
Pará	24	442,1
Rondônia	6	83,2
Roraima	3	100,0
Tocantins	3	65,2
Total:	**67**	**1.679,9**

Estado	1ª Fase	Investimento Previsto (R$ mi)
Alagoas	2	125,6
Bahia	20	548,0
Ceará	9	363,0
Maranhão	11	270,5
Paraíba	3	131,6
Pernambuco	9	216,8
Piauí	7	159,1
Rio Grande do Norte	2	218,2
Sergipe	1	42,3
Total:	**64**	**2.075,1**

Estado	1ª Fase
Acre	4
Amazonas	25
Amapá	2
Pará	24
Rondônia	6
Roraima	3
Tocantins	3
Total de aeroportos:	67
Investimento total:	R$ 1,7 bi

Região	1ª Fase	Investimento Previsto (R$ bi)
Norte	67	1,7
Nordeste	64	2,1
Centro-Oeste	31	0,9
Sudeste	65	1,6
Sul	43	1,0
Total:	**270**	**7,3**

THE BRAZILIAN SCENARIO

- For Saab, **Remote EPTAs** (TWR and AFIS) are **not a concept**, but rather a **certified product** "in operation".
- **Clear demands** for the solution have been identified in Brazil
- Saab is **in search of**:
  - A potential **user** (**Infraero**, **DAESP** ...)
  - A viable **Business Model**
  - Support from **Regulatory** and **Certification** entities
- **Certification** should be treated as a regular **project deliverable**, following a detailed **Due Dilligence** activity to be performed by Saab

THE BRAZILIAN SCENARIO

In addition, Saab reiterates its unconditional commitment to support any projects or technical feasibility studies, conducted by the Brazilian Regulatory and Certification authorities.