ICAO UNITING AVIATION

Workshop on the Interconnection of Aeronautical Surveillance Systems
(Dakar, Senegal, 14 to 16 April 2014)

Planning criteria for the coordination of SSR Mode S Interrogator Identifier codes

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OUTLINE

I – Definitions

II –Acquisitions Principles

III –Clustering of interrogators

IV – Multiple II codes /1 single Mode S ground station

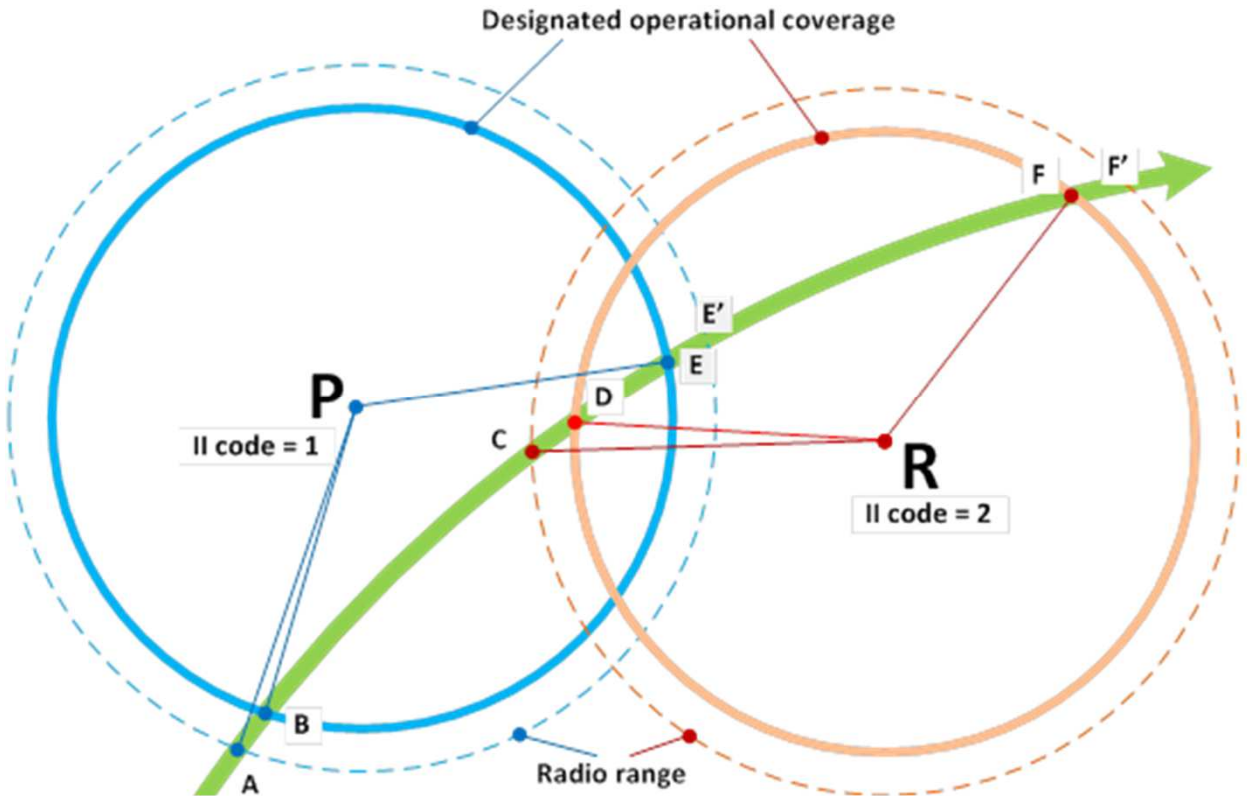
V– Sectorized use of II codes

VI – Conclusions

Definitions

Range: Maximum distance to the radio horizon (---- & -----)

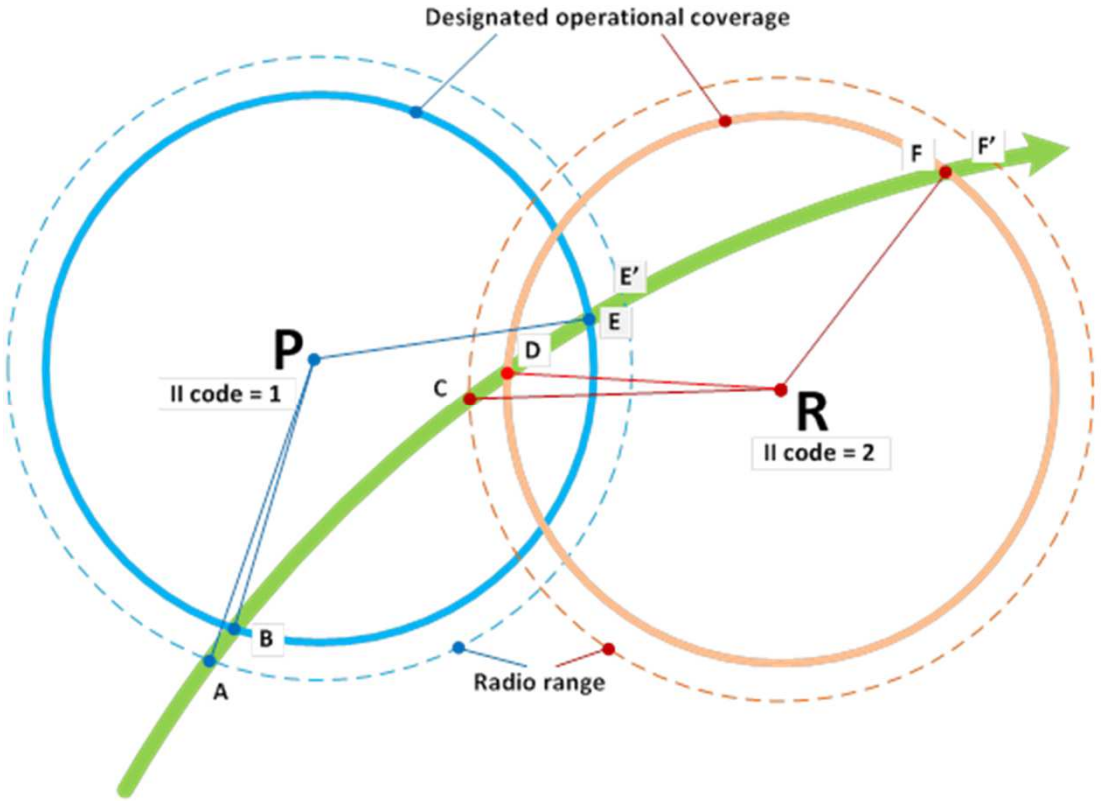
DOC (Designated operational Coverage): Coverage within which the station is designed to operate (——— & ———)



Definitions

Range: Maximum Radio Horizon distance from the station

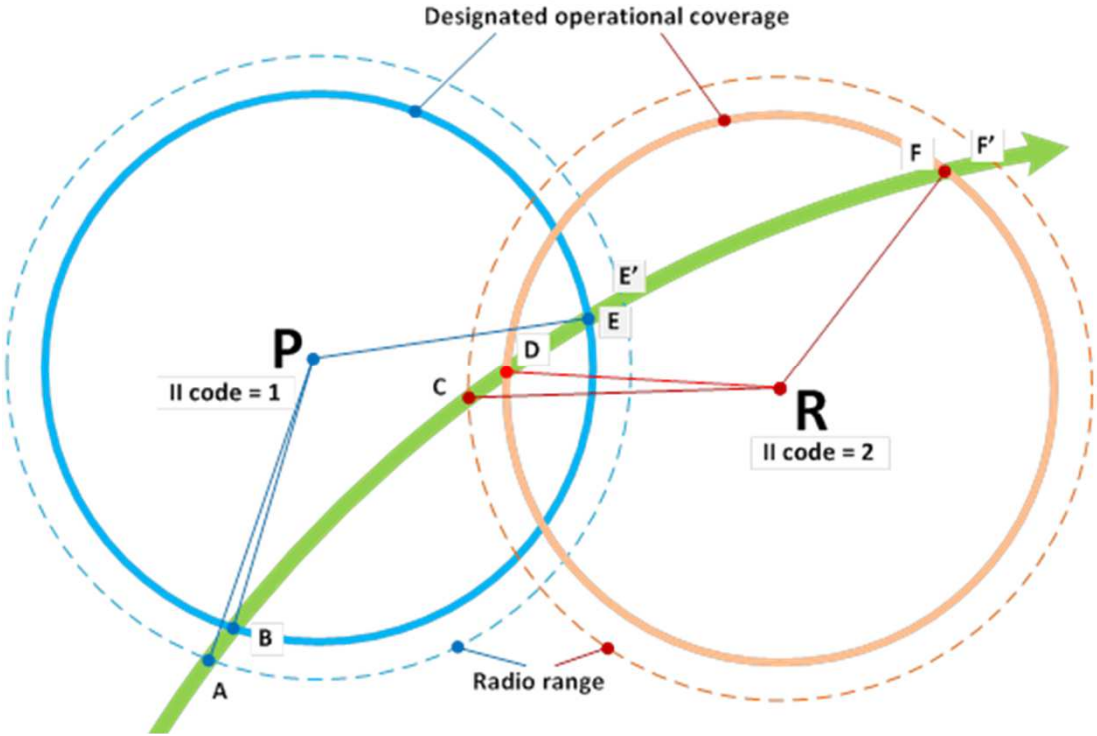
DOC:



A/C outside DOC of Interrogator P but within Range of P

Point A

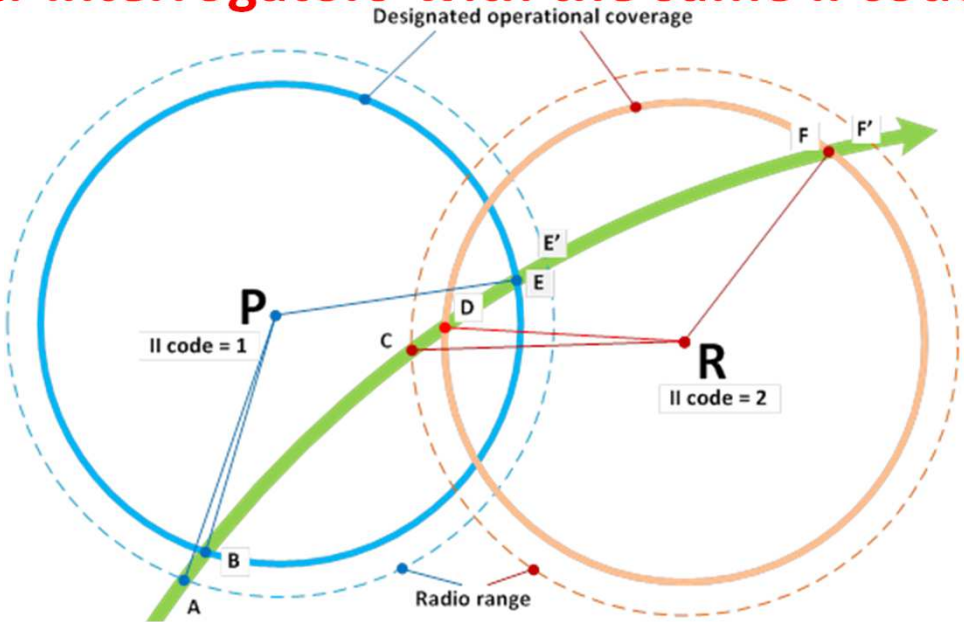
- Receives all-call interrogations from P
- Generates an all-call reply with P II code and A/C 24-bit address
- P will not accept this reply as long as the A/C is outside its DOC



A/C enters Interrogator P DOC

Point B

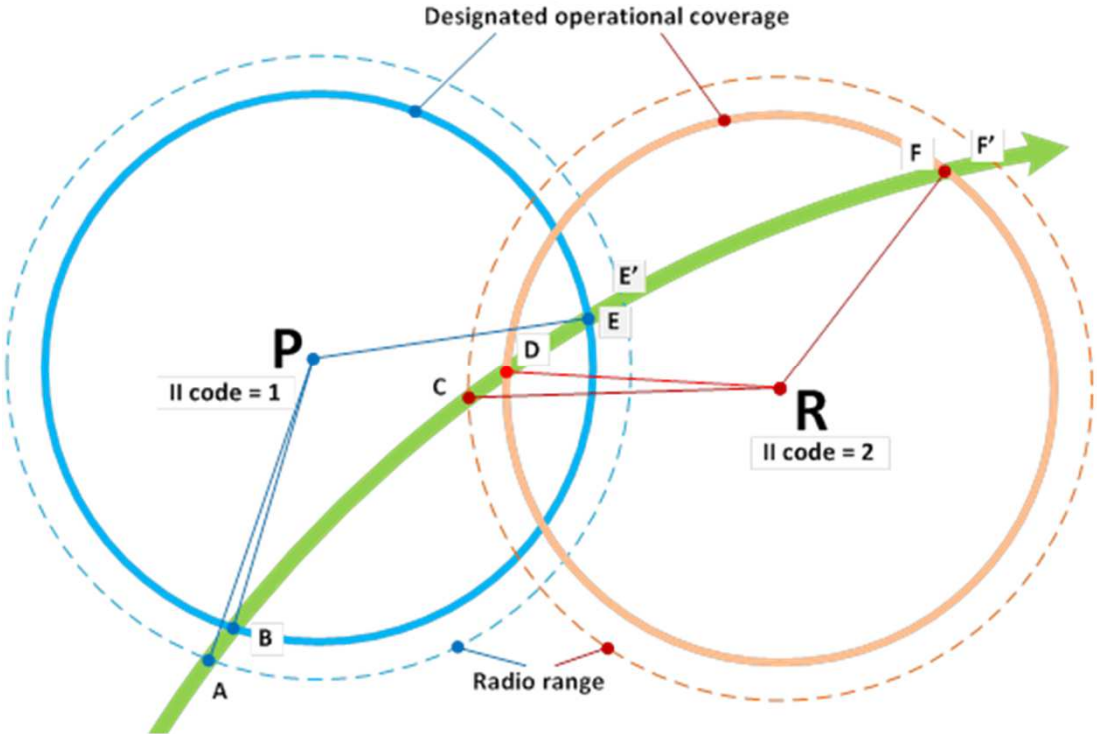
- A/C all-call reply with P II code and A/C 24-bit address is accepted by P
- A selective interrogation commanding lockout to II=1 sent to A/C
- A/C added to list of “acquired A/C” maintained by P
- A/C transponder will not respond to further all-call from P and from other interrogators with the same II code= 1).



A/C outside DOC of Interrogator R but within Range of R

Point C

- Receives all-call interrogations from R
- Generates an all-call reply with R II code and A/C 24-bit address if the P &R II codes are different
- R will not accept this reply as long as the A/C is outside its DOC

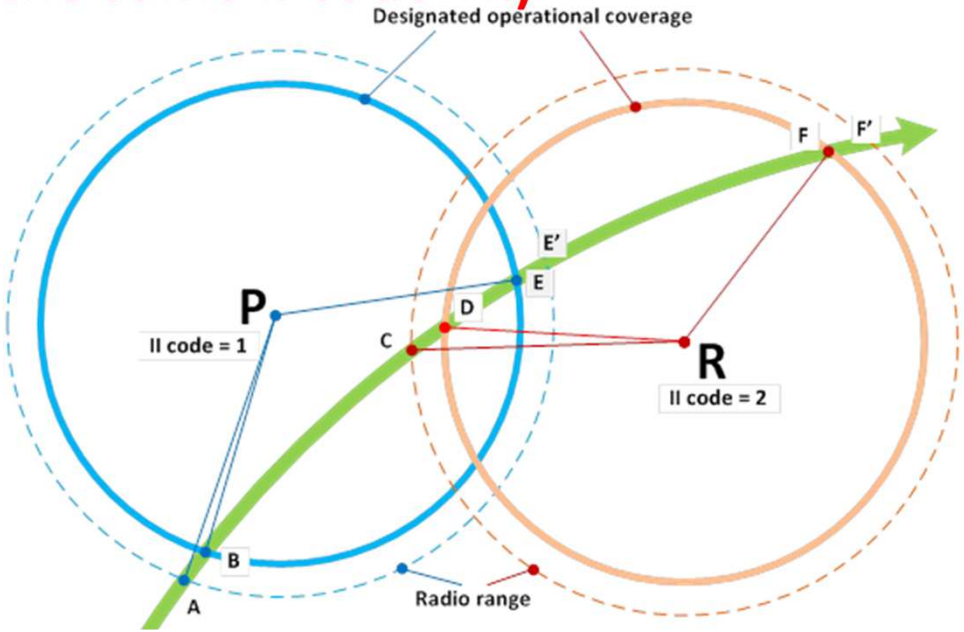


A/C enters Interrogator R DOC

Point D

- A/C all-call reply with P II code and A/C 24-bit address is accepted by R
- A selective interrogation commanding lockout to II=2 sent to A/C
- A/C added to list of "acquired A/C" maintained by R
- A/C transponder will not respond to further all-call from R and from other interrogators with the same II code= II)
- A/C now acquired by P & R

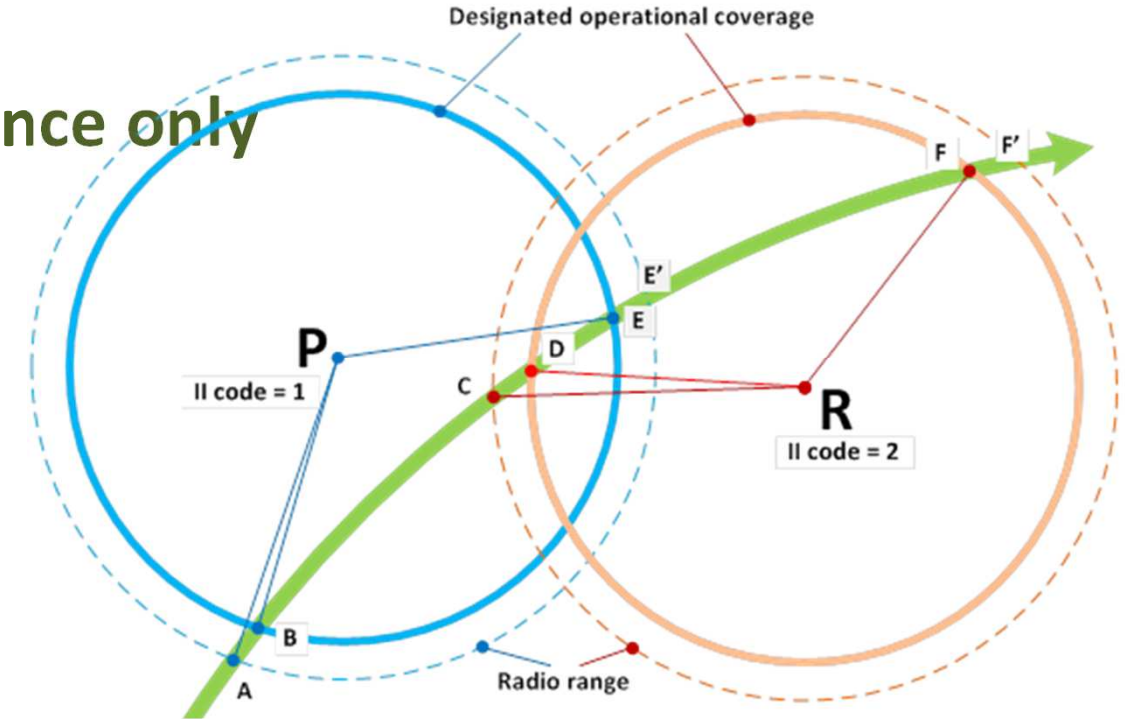
will respond to their selective Interrogations



A/C outside DOC of Interrogator P but within Range of P

Point E

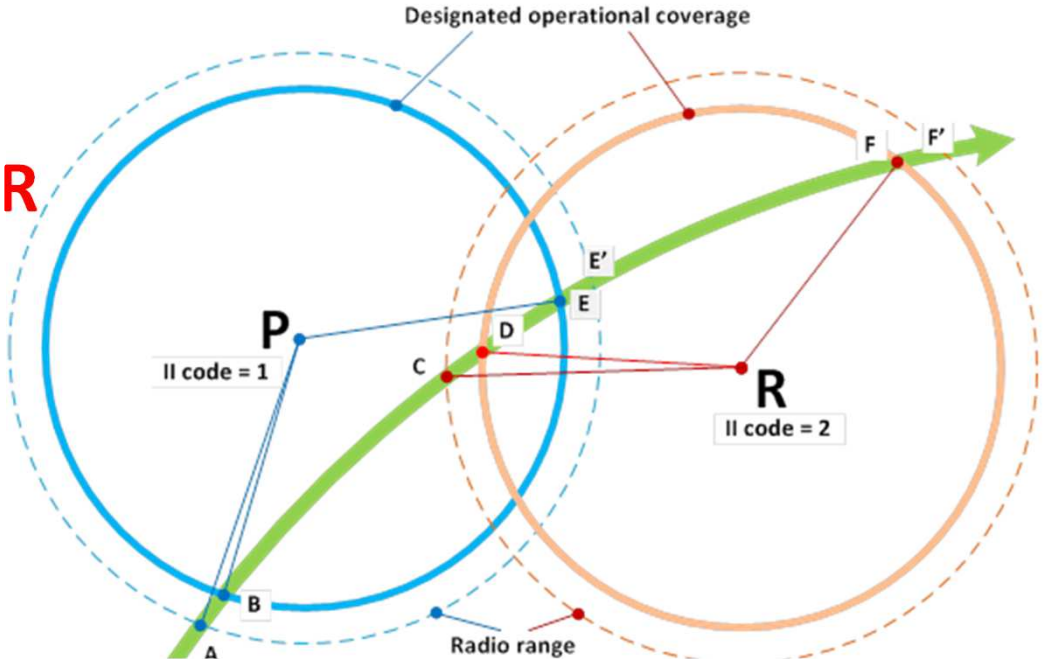
- P will no longer selectively interrogate the A/C
- A/C will lose its lock-out status with respect to interrogator P (II=1) after a period of 18 seconds
- All-call replies to P will not be accepted because the A/C is outside P DOC
- A/C under R surveillance only



A/C outside DOC of Interrogator R

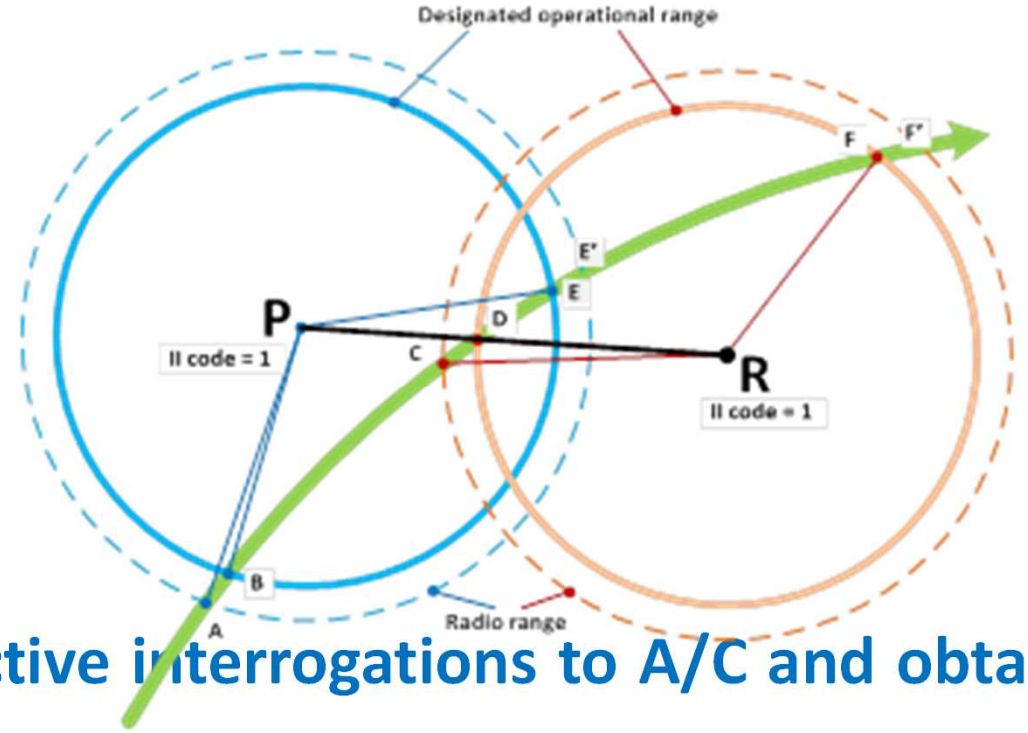
Point F

- R will no longer selectively interrogate the A/C
- A/C will lose its lock-out status with respect to interrogator R (II=2) after a period of 18 seconds
- All-call replies to R will not be accepted because the A/C is outside R DOC
- A/C no longer under surveillance of none of P&R



Clustering of Interrogators -Ground stations networking

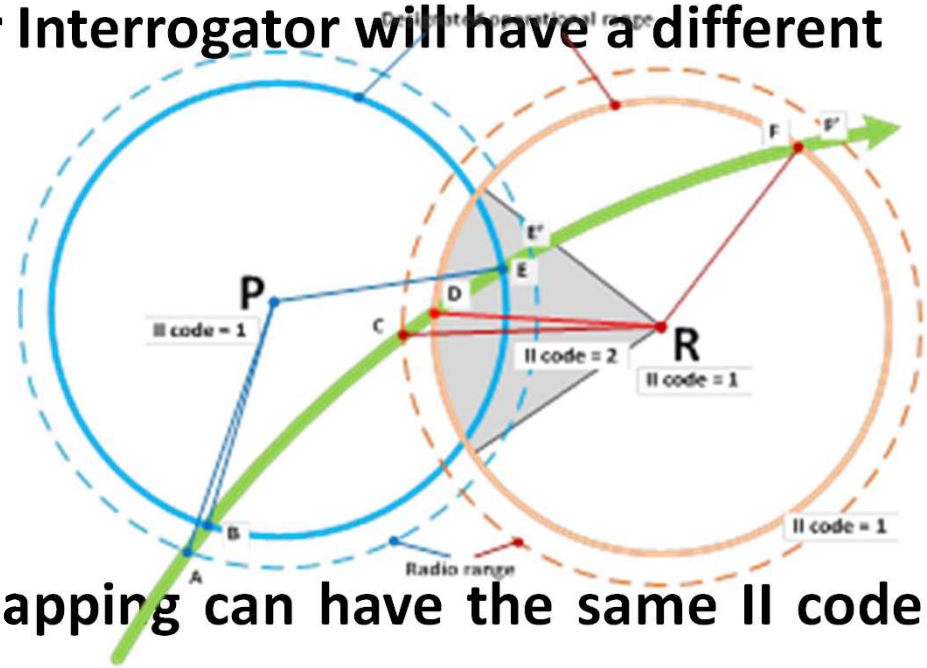
- **Sharing of the same II (II=1) by SSR Mode S Stations P & R**
- **Sharing of tables of acquired A/C (24-bit Addr. & approximate acquired A/C location)**



- **Both P & R 4 send selective interrogations to A/C and obtain valid responses**
- **Allow use of the same II by two (or more) stations with overlapping coverage areas (Clustering)**

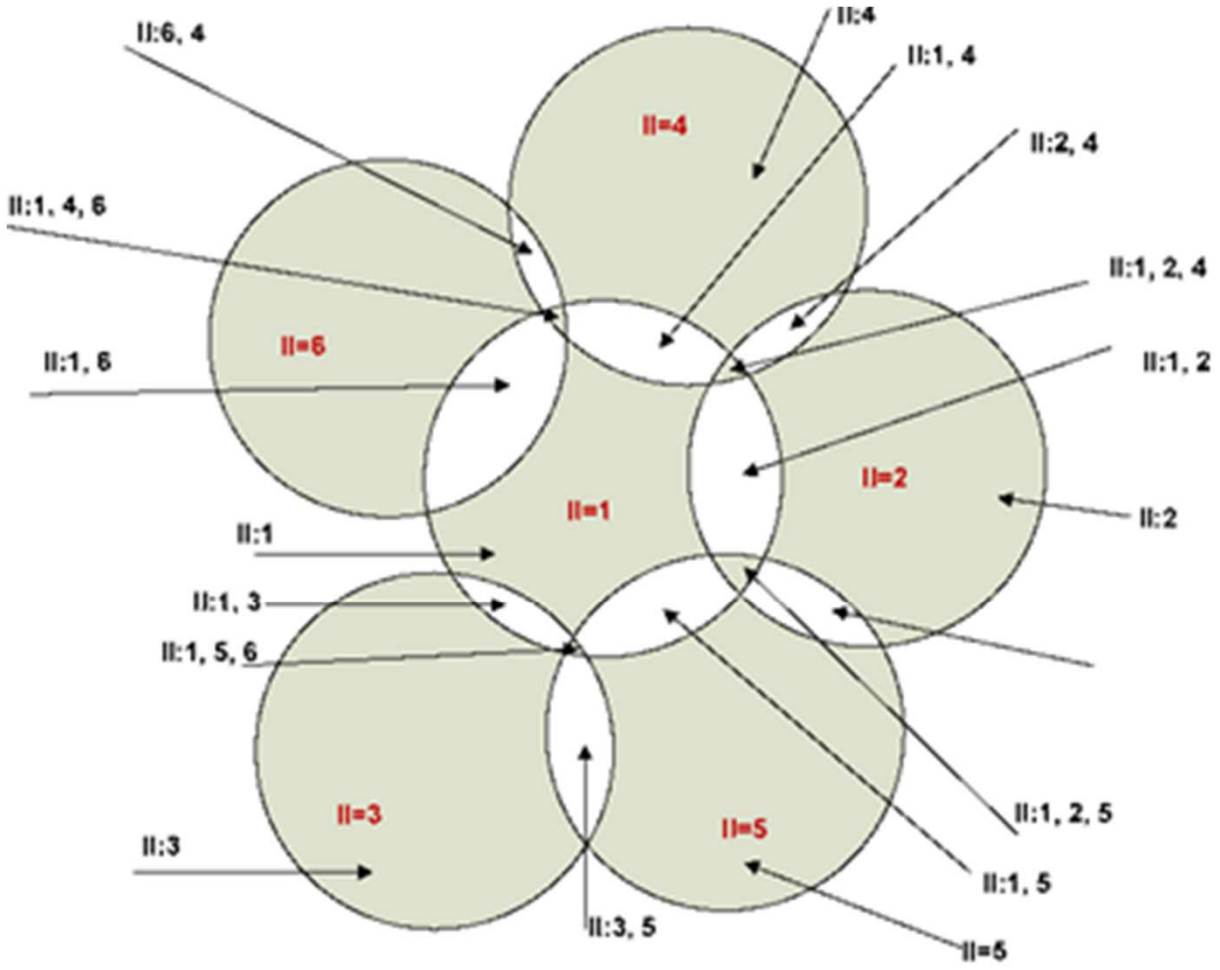
Multiple II codes by a single Mode S ground station: Sectorization (1)

- **Assignment of different II codes to different sectors of an Interrogator**
- **Sector overlapping with another Interrogator will have a different II code while (II=2)**



- **Parts coverage that is not overlapping can have the same II code (II=1)**
- **However, it is recommended to use the minimum possible number of Interrogation Identifiers by one single Mode S ground station**

Practical examples of II code assignments



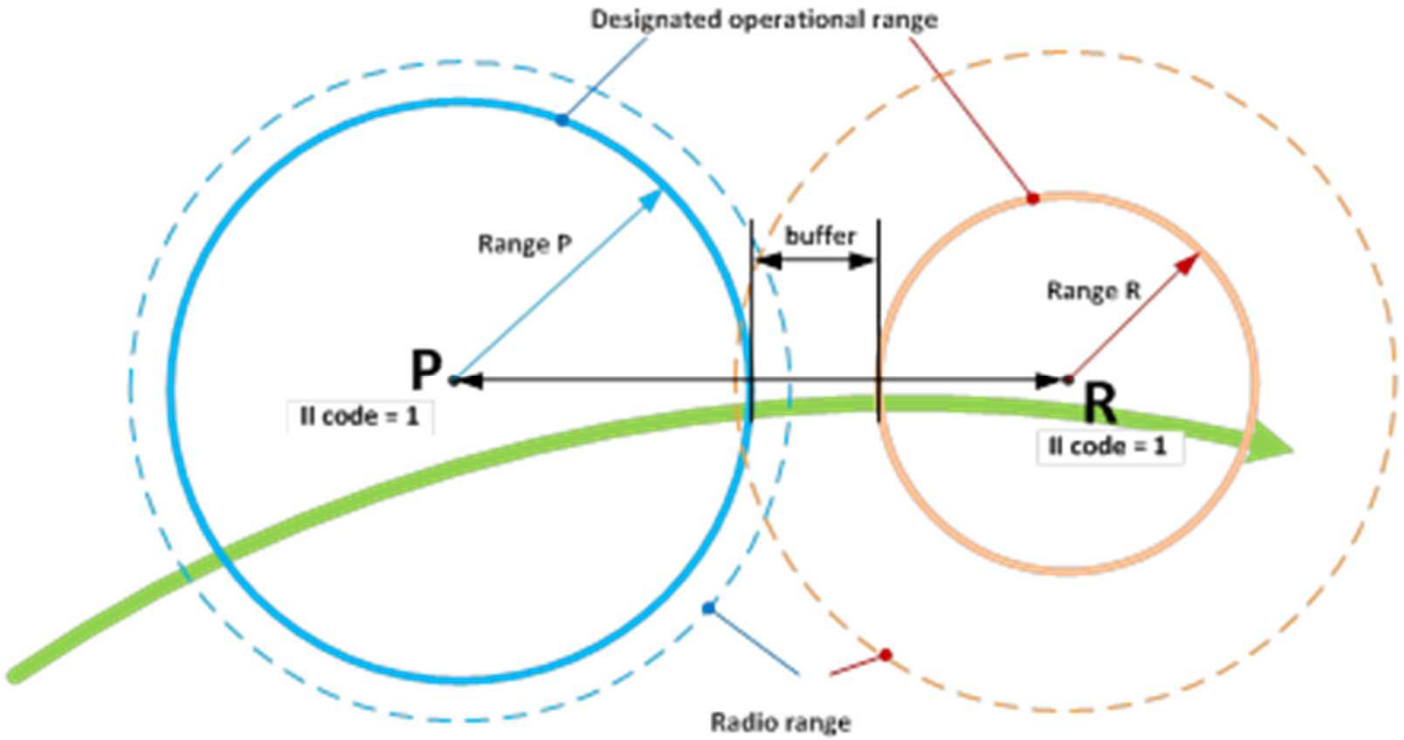
II=Interrogator Identifier

II=1; Interrogator Indentifier code assigned to MODE S ground station

II:1, 2, 5: Interrogator Identifier codes used in coverage area, including overlapping areas

Planning parameters for SSR Mode S ground stations.

- **Minimum Separation Distance (MSD) between stations with the same II code: MSD = Range P + 10NM + Range R**



- **P & R with different II codes, no separation criteria need to be applied.**

Summary

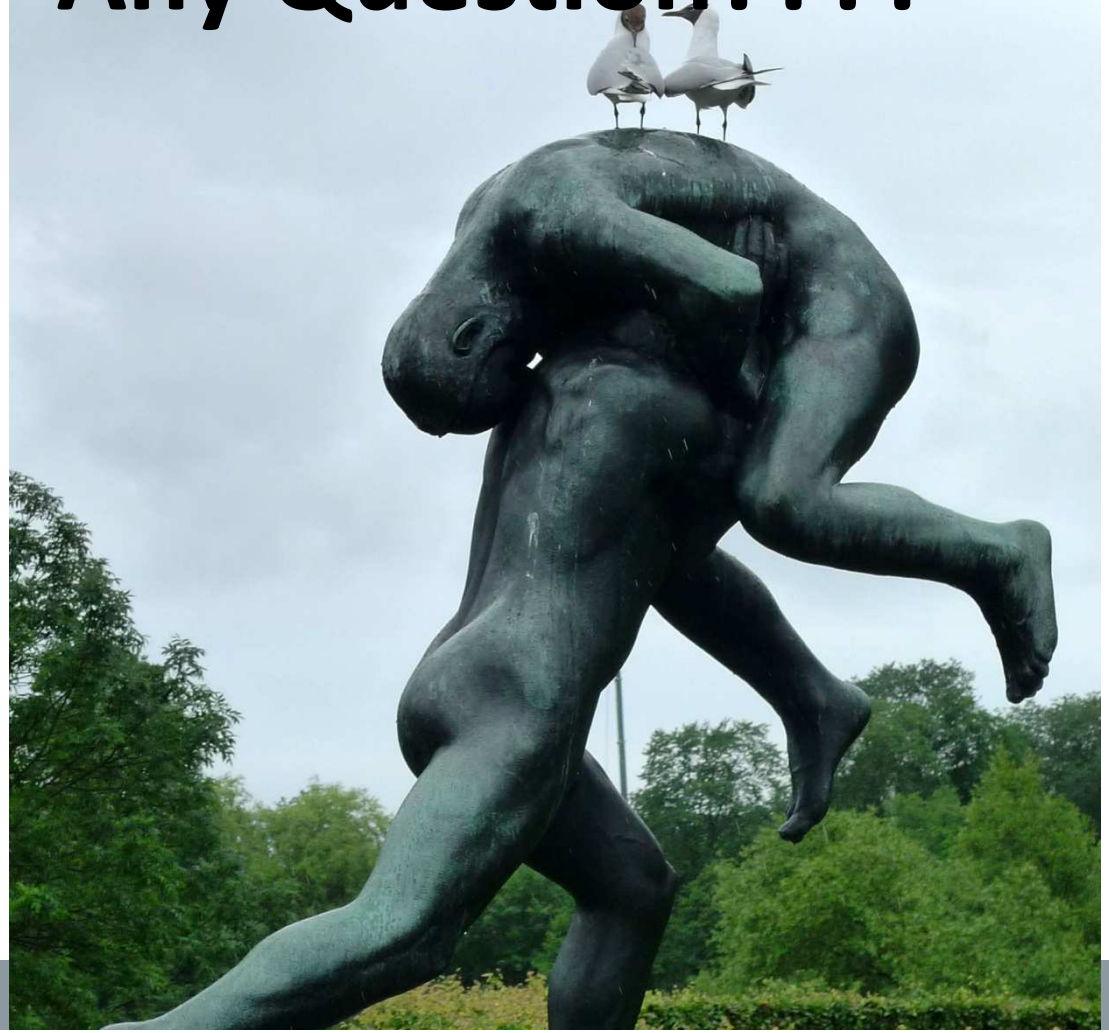
- SSR Modes S Range
- SSR Mode S Designated Operational Coverage (DOC)
- A/C 24 bits Address
- Interrogator Identifier code (II) four digits (1-15) code
- A/C acquisition principles Based on :
  - Range and DOC
  - All-call (lock out) & Selective (Roll)-call
- SSR Modes S II code assignment principles & techniques

Conclusion

- The Seamless ATM provision requires Surveillance capability to support PBN, CCO, CDO implementation to ensure agreed level of separation minima;
- Aeronautical Surveillance Systems interconnection can be a solution for seamless surveillance capability
- Need of Regional coordination;
- Need of Interregional coordination (AFI/EUR);
- Need of updated data on SSR Mode S ground stations
- ICAO Regional Offices and HQs are working to assist States harmonize their implementation projects

Thank you for your Kind attention !

Any Question????



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