



International Data Distribution

SAR Controllers Workshop 2018

March 2018

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- The current operational system includes LEOSAR/GEOSAR/MEOSAR data (LGM system)
 - LGM early operations began 13 December 2016
 - Only 3 MCCs in C/S System originate MEOSAR data and follow data distribution rules for LGM MCCs



MCC to MCC Data Distribution Changes

- MCC to MCC distribution changed for LGM
 - Stopped after position is confirmed (for L/G)
 - MCCs could ask for continued transmission for specific sites
 - For LGM MCCs, continued transmission is the default and
 - MCCs can ask for sites to be suppressed
- Change was made at C/S to ensure that MEOSAR data is available for all MCCs
 - not all MCCs will have MEOLUTs
 - ALL MCCs had LEOLUTs



MCC to MCC Data Distribution

Doppler vs DOA

- MEOLUTs send 1 position using multiple satellites
 - A single Difference of Arrival (DOA) position computed by MEOLUT
 - DOA position computed using differences in Time of Arrival (TOA) and/or Frequency of Arrival (FOA) data from multiple MEOSAR satellites
 - No inherent ambiguity
- LEOLUTs send 2 positions using 1 satellite
 - Doppler A/B positions
 - 1 real position and 1 image position
 - Inherent ambiguity
- New term – Position Confirmation for LGM vs. Ambiguity Resolved for LEO/GEO only (L/G)



MCC to MCC Data Distribution

- Data Distribution Procedures are described in the Cospas-SARSAT Data Distribution Plan (DDP), A.001
- Located alerts are usually distributed based on location
- Unlocated alerts are distributed based on beacon country code
- Notification of Country of Registry (NOCR) messages are distributed based on country code
 - Sent when the alert is not located in SRR of country of registration
- Ship security (SSAS) alerts are distributed based on country code
- Each beacon event (detect time / satellite / beacon) is only sent once



MCC to MCC Data Distribution

Position Confirmation

- Position confirmation requires independent positions that match within 20 km
- Positions can come from:
 - Independent Doppler positions
 - Independent DOA positions
 - A Doppler and DOA position
 - A Doppler and encoded position, or
 - A DOA and encoded position that match within 20 km
- Position confirmation alert sent to all previous alert recipients for beacon activation
- By default, messages are sent after position confirmation to the MCC associated with the real position



MCC to MCC Data Distribution

DOA Alert distribution

- New alert with DOA location distributed when:
 - DOA location first received
 - Subsequent DOA location has improved Expected Horizontal Error (EE):
 - Less than 150 nm (277.8 km) and
 - At least 2 nm (3.7 km) less than lowest previously sent DOA expected error and
 - At least 50% less than lowest previously sent DOA expected error
 - Before position confirmation, position update every 5 minutes*
 - Before position confirmation, position conflict occurs (20 km threshold)
 - Position confirmation is achieved; for 2 DOA positions this requires:
 - Each DOA alert to include data from one satellite not included on the other alert and time separation of at least 2 seconds in some portion of the periods for the two alerts (i.e., separate bursts); or
 - At least 30 minute time separation for the two DOA alerts.
 - Position can also be confirmed by DOA, with Doppler or encoded position
 - After position confirmation, position update every 15 minutes*
 - After position confirmation, position conflict as often as every 10 minutes*

* (based on latest data time of new vs. most recent DOA alert)



MCC to MCC Data Distribution

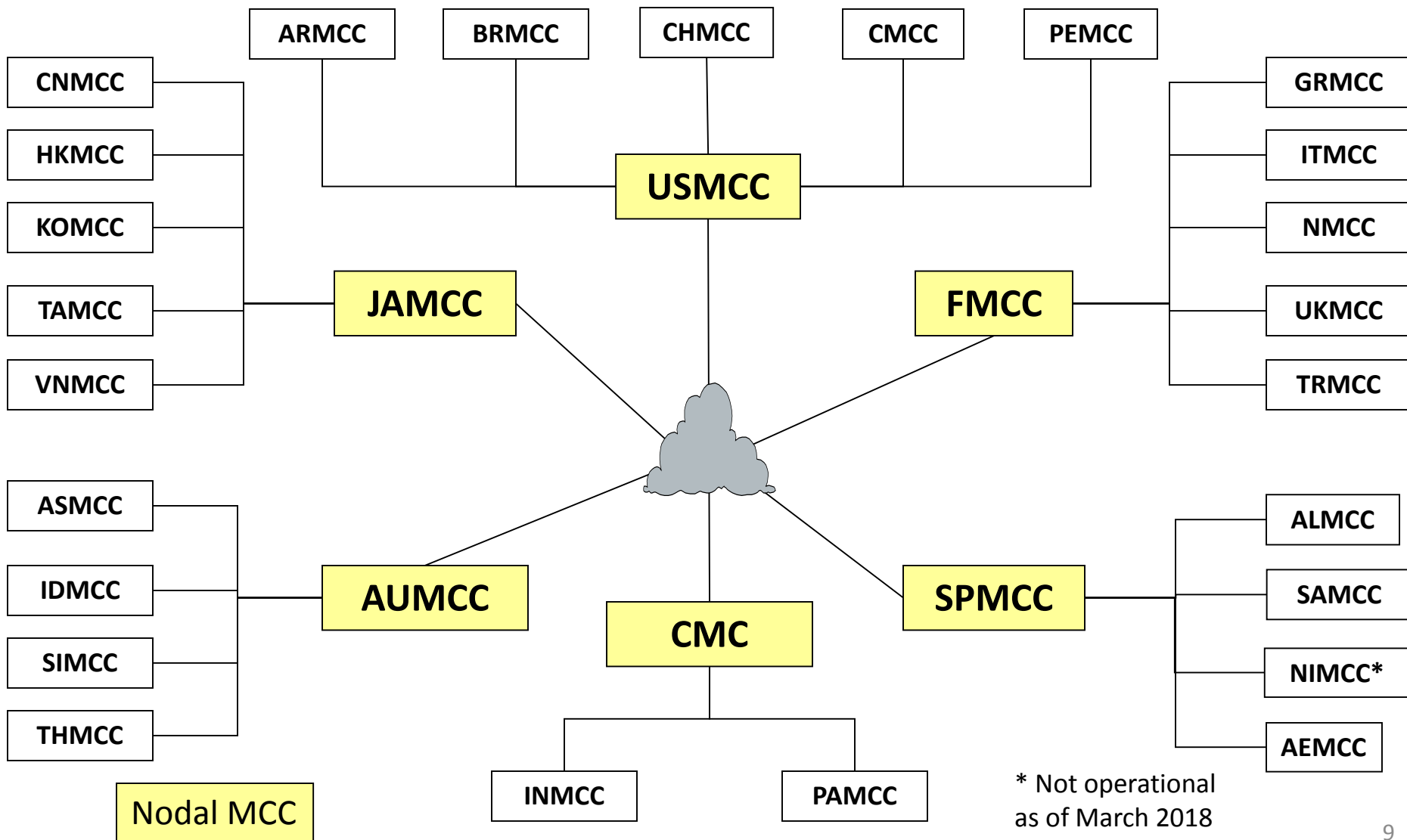
Nodal Distribution Network

- The USMCC is nodal for the Western Data Distribution Region
- Messages are sent between MCCs via nodal system
- There are 6 nodal MCCs in the C/S System
 - the nodal MCC distributes messages to all MCCs in its DDR and to all other nodal MCCs
 - non-nodal MCCs only distribute messages to the nodal MCC in its DDR
- Advantages of the nodal system:
 - 30 MCCs in C/S system as of March 2018
 - MCCs are not required to establish and maintain communication links with all MCCs
 - Enables nodal MCCs to perform monitoring for all MCCs in its DDR
 - MCC backups are simpler to implement (e.g., when the CMCC is down, only the USMCC needs to change its data distribution)



MCC to MCC Data Distribution

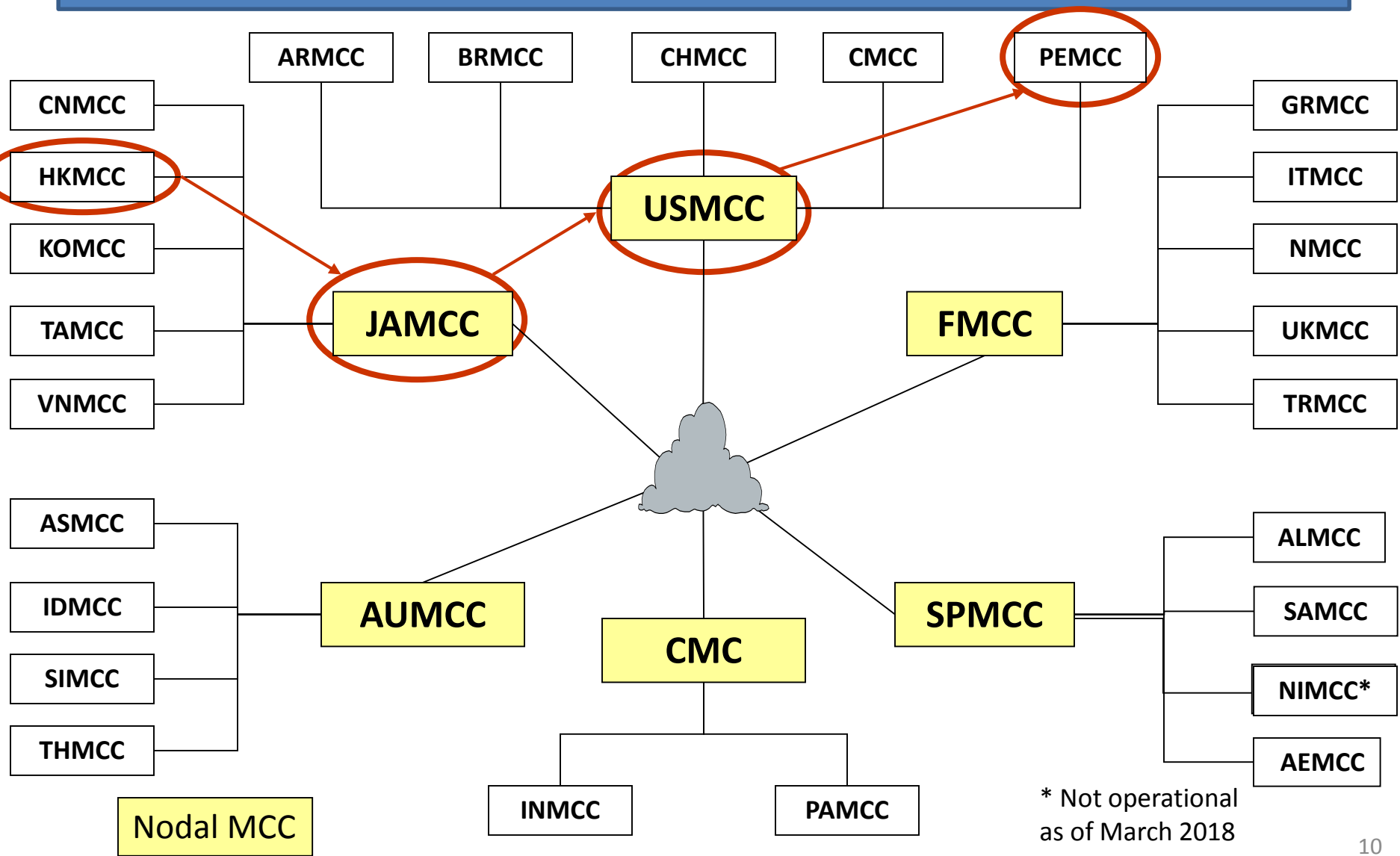
Nodal Distribution Network





MCC to MCC Data Distribution

Unlocated Alert with Peru country code detected by HKMCC



* Not operational as of March 2018



MCC to MCC Data Distribution

Unlocated Alert Example

Unlocated Alert detected by HKMCC with Peru country code

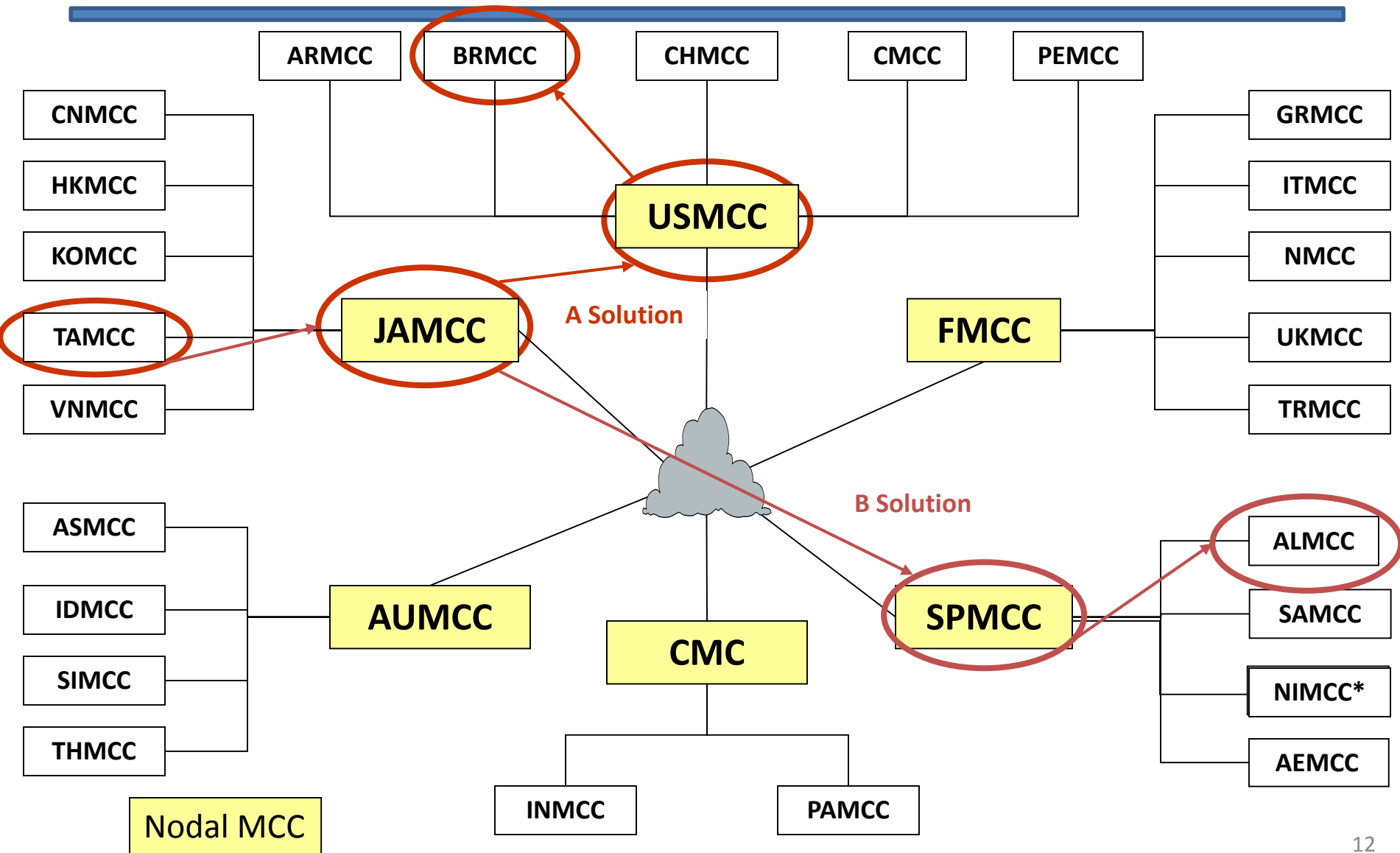
- HKMCC sends to JAMCC*
- JAMCC sends to USMCC*
- USMCC sends to PEMCC*
- PEMCC sends to RCC or SPOC based on national procedures*

* Each MCC only sends the alert (beacon event) once to the designated destination(s)



MCC to MCC Data Distribution

Doppler Alert detected by TAMCC with location in BRMCC and ALMCC Service Areas





MCC to MCC Data Distribution

First Doppler Located Alert Example

Alert detected by TAMCC with location in BRMCC and ALMCC service areas

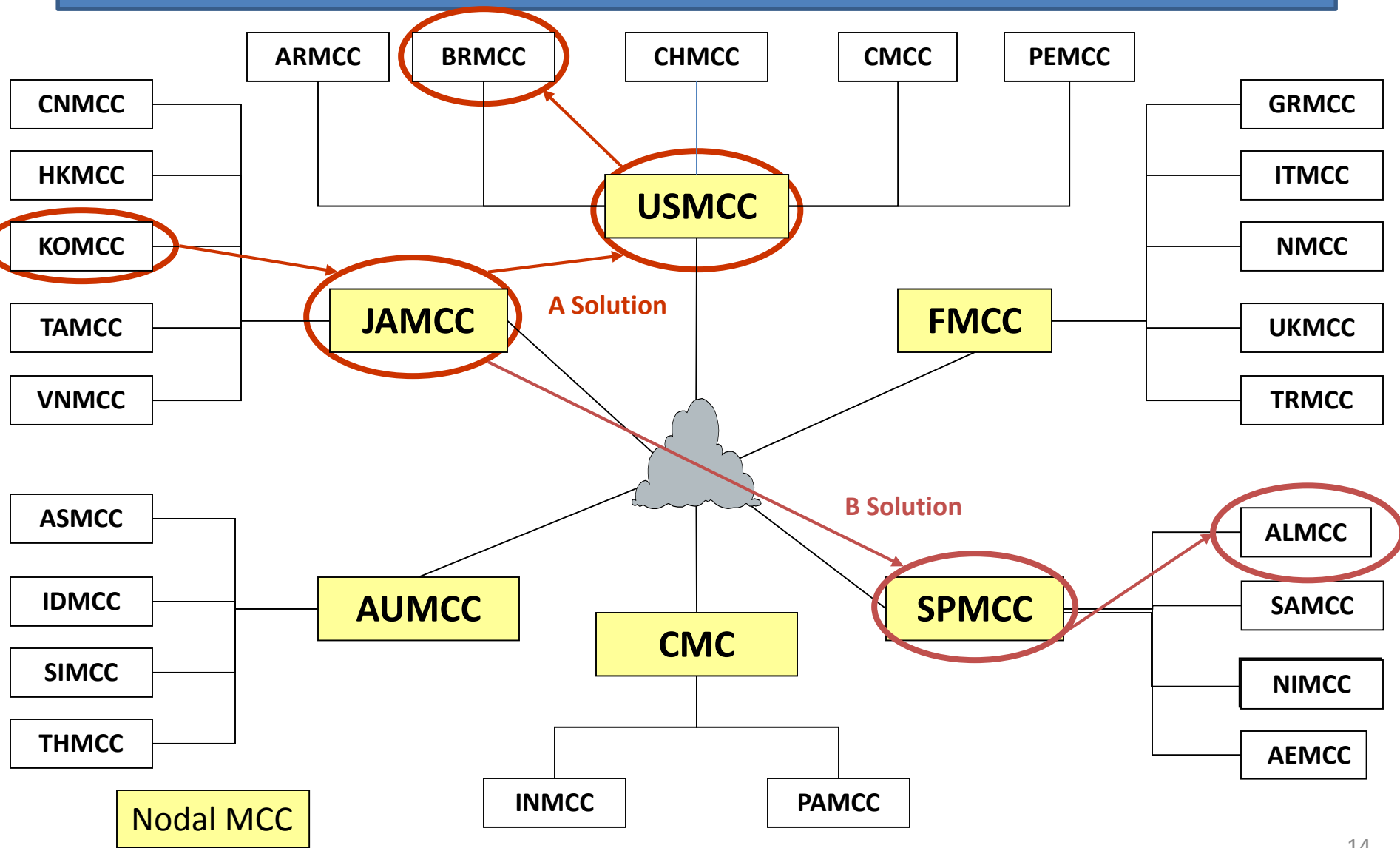
- TAMCC sends to JAMCC*
- JAMCC sends to USMCC and SPMCC*
- USMCC sends to BRMCC*
- SPMCC sends to ALMCC*
- BRMCC and ALMCC send to respective RCC or SPOC, based on national procedures*
- Procedure above also followed for encoded or DOA location

* Each MCC only sends the alert (beacon event) once to the designated destination(s)



MCC to MCC Data Distribution

Doppler Alert detected by KOMCC with location in BRMCC and PEMCC service areas -
Position is confirmed to BRMCC





MCC to MCC Data Distribution

Position Confirmation Example

Alert detected by KOMCC with location in BRMCC and PEMCC service areas
Position is confirmed to BRMCC (same Beacon ID as previous example)

- KOMCC sends to JAMCC*
- JAMCC sends to USMCC and SPMCC*
- USMCC sends to BRMCC*
- SPMCC sends to ALMCC* (so that ALMCC knows the alert is not in its SRR)
- BRMCC & ALMCC send to respective RCC or SPOC based on national procedures*

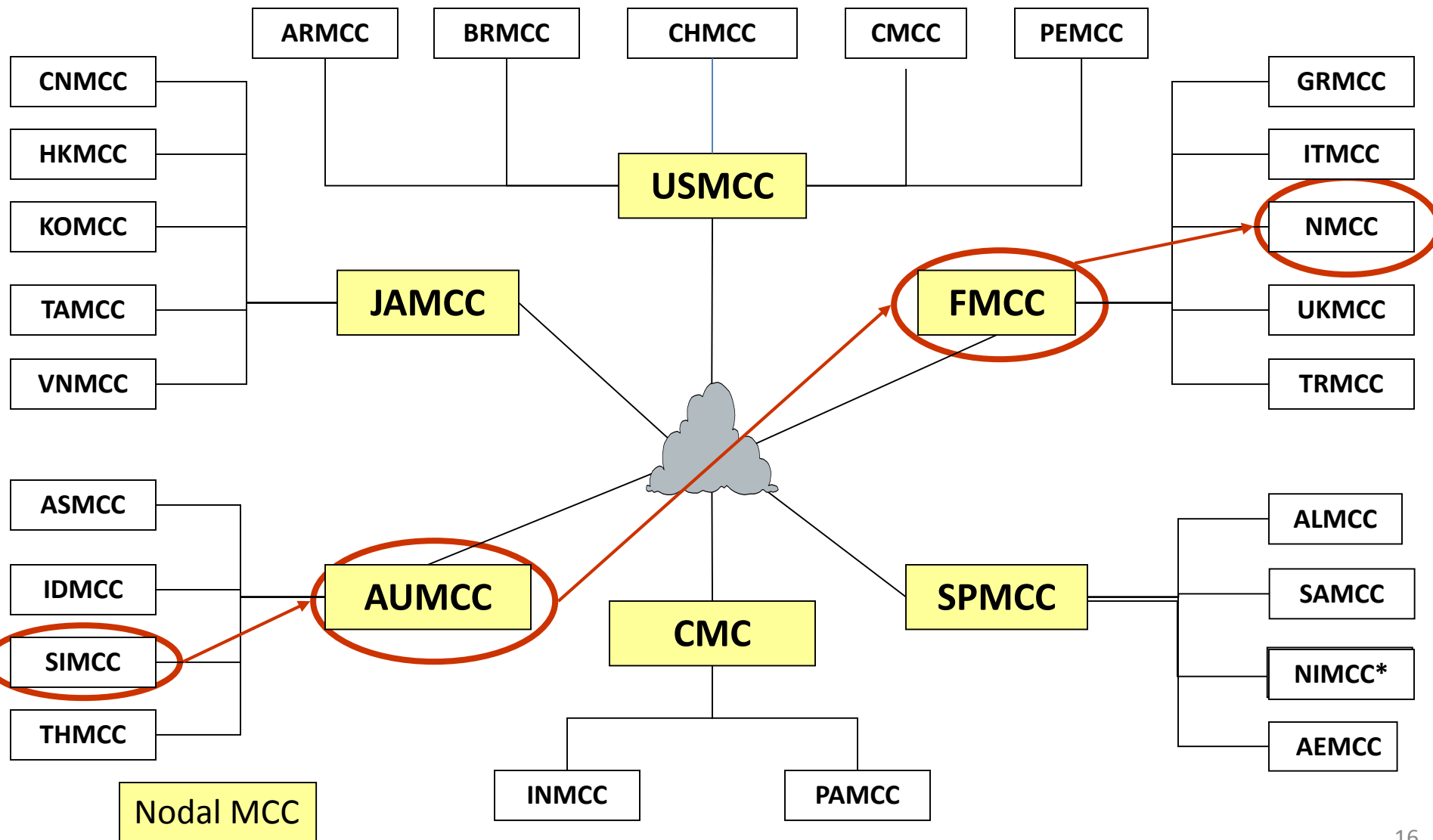
* Each MCC only sends the alert (beacon event) once to the designated destination(s)

- **Notes:**
 - Procedure above is also followed for encoded or DOA location.
 - No message is sent to PEMCC (new position in PEMCC SRR known to be incorrect)
 - Further alerts sent to BRMCC, unless BRMCC opts out of continued transmission
 - To confirm position, at least one Doppler or DOA position is required

MCC to MCC Data Distribution



NOCR Distribution - Beacon with Sweden country code is detected by SIMCC with one location of Doppler solution in SIMCC service area
[Alert for beacon Event could have been received from another MCC]





MCC to MCC Data Distribution

Notification of Country of (Beacon) Registration (NOCR) Example

Beacon with Sweden country code is detected by SIMCC with one side of Doppler location in SIMCC service area [Alert for event could have been received from another MCC]

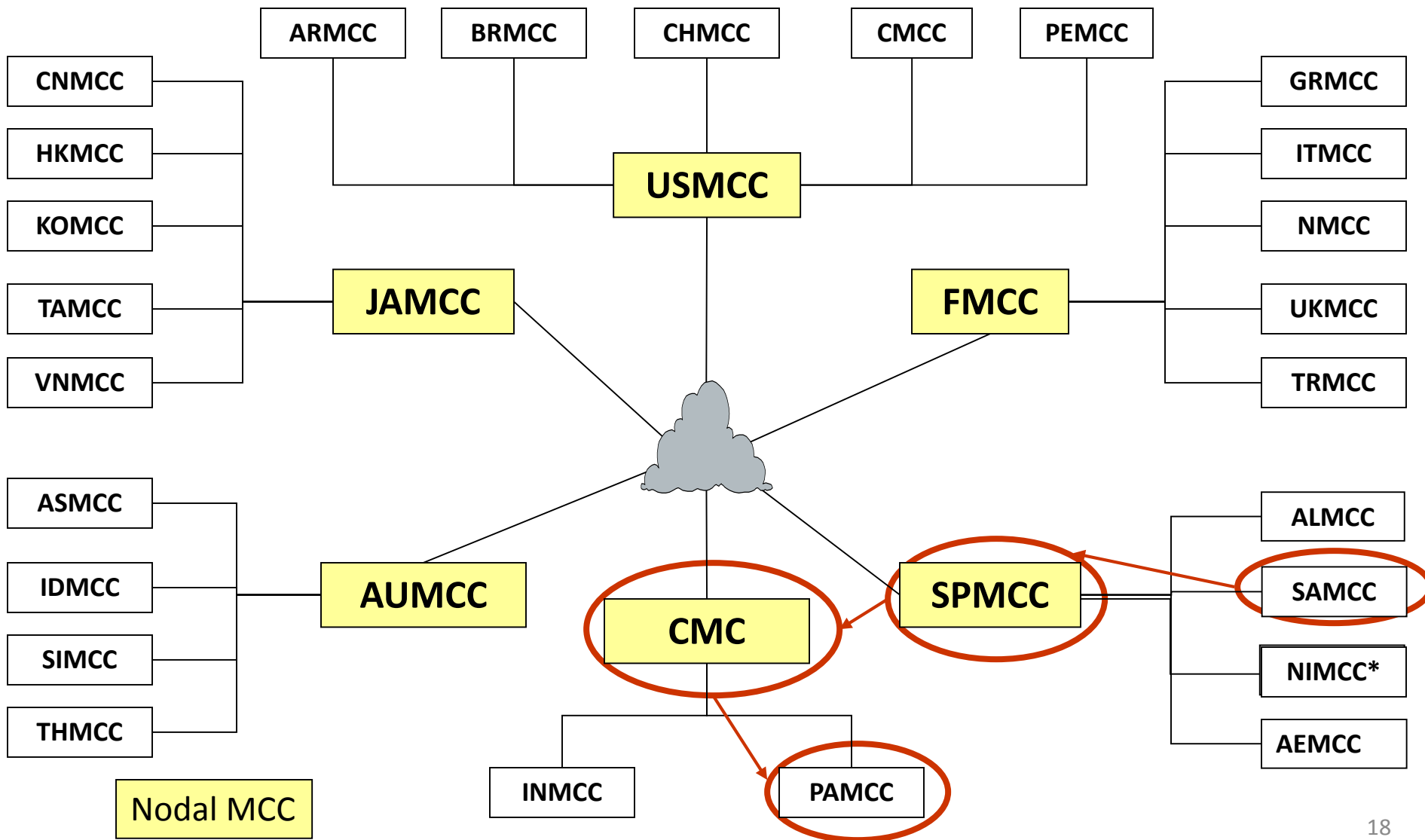
- Location is required for NOCR - encoded, Doppler or DOA
- SIMCC sends NOCR to AUMCC*
- AUMCC sends NOCR to FMCC*
- FMCC sends NOCR to NMCC*
- NMCC sends NOCR to Sweden SPOC*

* Each MCC will only send one NOCR per beacon activation



MCC to MCC Data Distribution

SAMCC detects a Ship Security beacon with a Pakistan country code, with or without location





MCC to MCC Data Distribution

SSAS Example

SAMCC detects a Ship Security beacon with a Pakistan country code, with or without location

- SAMCC sends the alert to SPMCC*
- SPMCC sends the alert to CMC*
- CMC sends the alert to PAMCC*
- PAMCC sends the alert to “Competent Authority” based on national procedures*
- Distribution of SSAS alerts is independent of the beacon’s location

* Each MCC only sends the alert (beacon event) once to the designated destination(s)



Glossary (1 of 2)

- Beacon Event – Unique beacon ID/Satellite/TCA (LEOSAR),
Unique beacon Id / Satellites / Detect Time (MEOSAR)
- Encoded location – Location encoded in beacon ID (30 hex) – usually from internal GPS for EPIRBs and PLBs, but may be:
 - from ship navigation system for EPIRBs or
 - from aircraft navigation system for ELTs
- SRR – Search and Rescue Region
- Service Area - SRRs of an MCC and the SPOCs it supports
- DDR – Data Distribution Region, made up of service areas of MCCs assigned to a nodal MCC



Glossary (2 of 2)

- NOCR – Notification of Country of (beacon) Registration
- DOA (Difference of Arrival) position - computed using differences in Time of Arrival (TOA) and/or Frequency of Arrival (FOA) data from multiple MEOSAR satellites
- Position Confirmation – Real solution determination
- Position conflict – distance separation of at least 20 km of a new Doppler, *DOA* or encoded position vs. a reference position, where the reference position is:
 - An encoded, Doppler or *DOA* position, prior position confirmation
 - The confirmed position, after position confirmation
- SSAS – Ship Security Alert System
- TCA – Time of closest approach of LEOSAR satellite to a beacon



Conclusion

Questions?