Redundant Datacenter Configuration and Failover Procedure for Real-Time Seismic Networks

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- Catastrophic events require to move a seismic data center to a backup location in order to maintain critical operation and information dissemination capabilities.
- Intra-data center redundancy is rapidly progressing to virtual machines moving between two or more servers
- Such solution for inter-data center redundancy is currently hampered by
  - Bandwidth limitation of Wide Area Network (WAN) connections between the primary and secondary location
  - Database migration/synchronization
- An alternative solutions provides the implementation of failover procedures
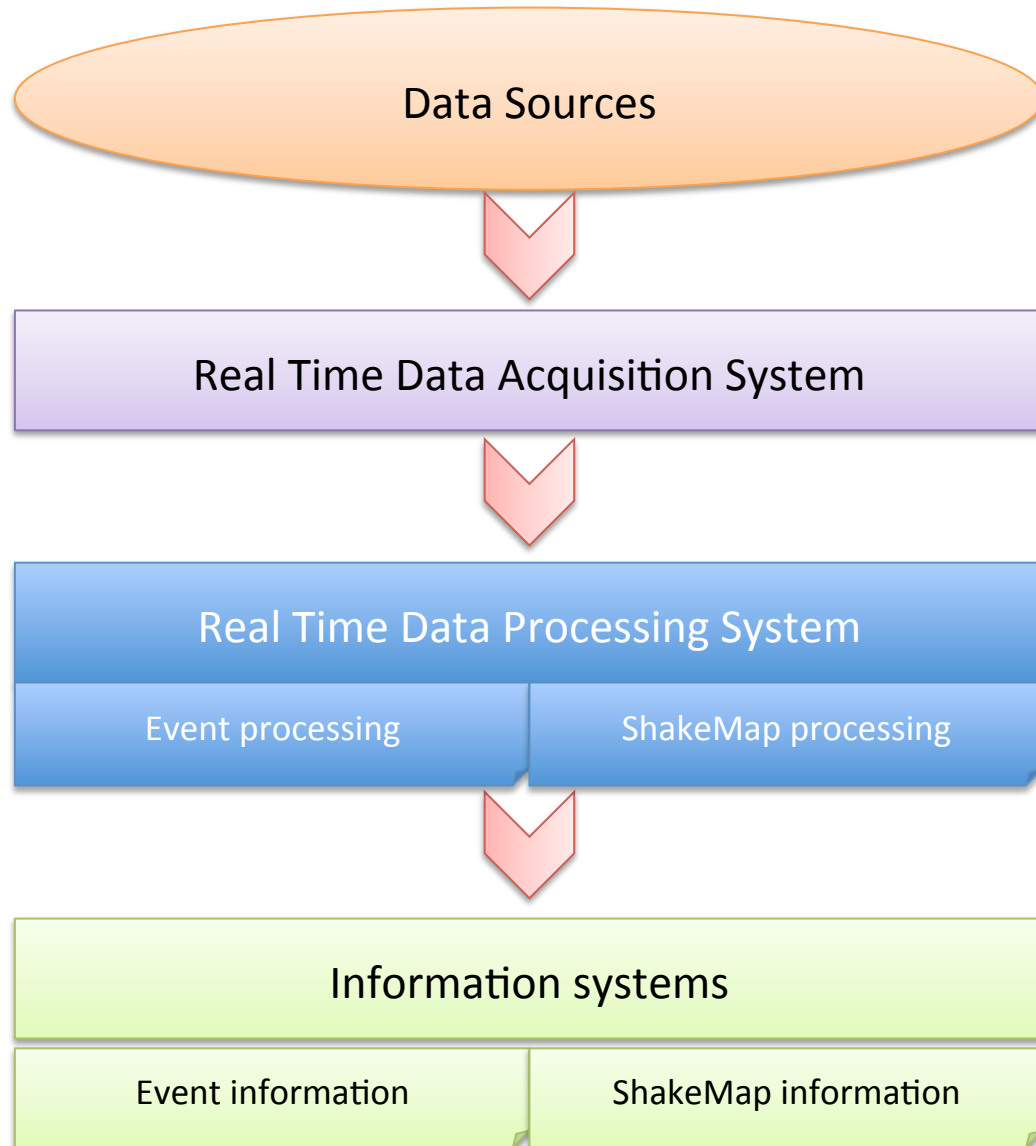
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0. **Normal operation**

1. **Failure detection of network and application**

2. **Failover procedure**

3. **Fencing operation**

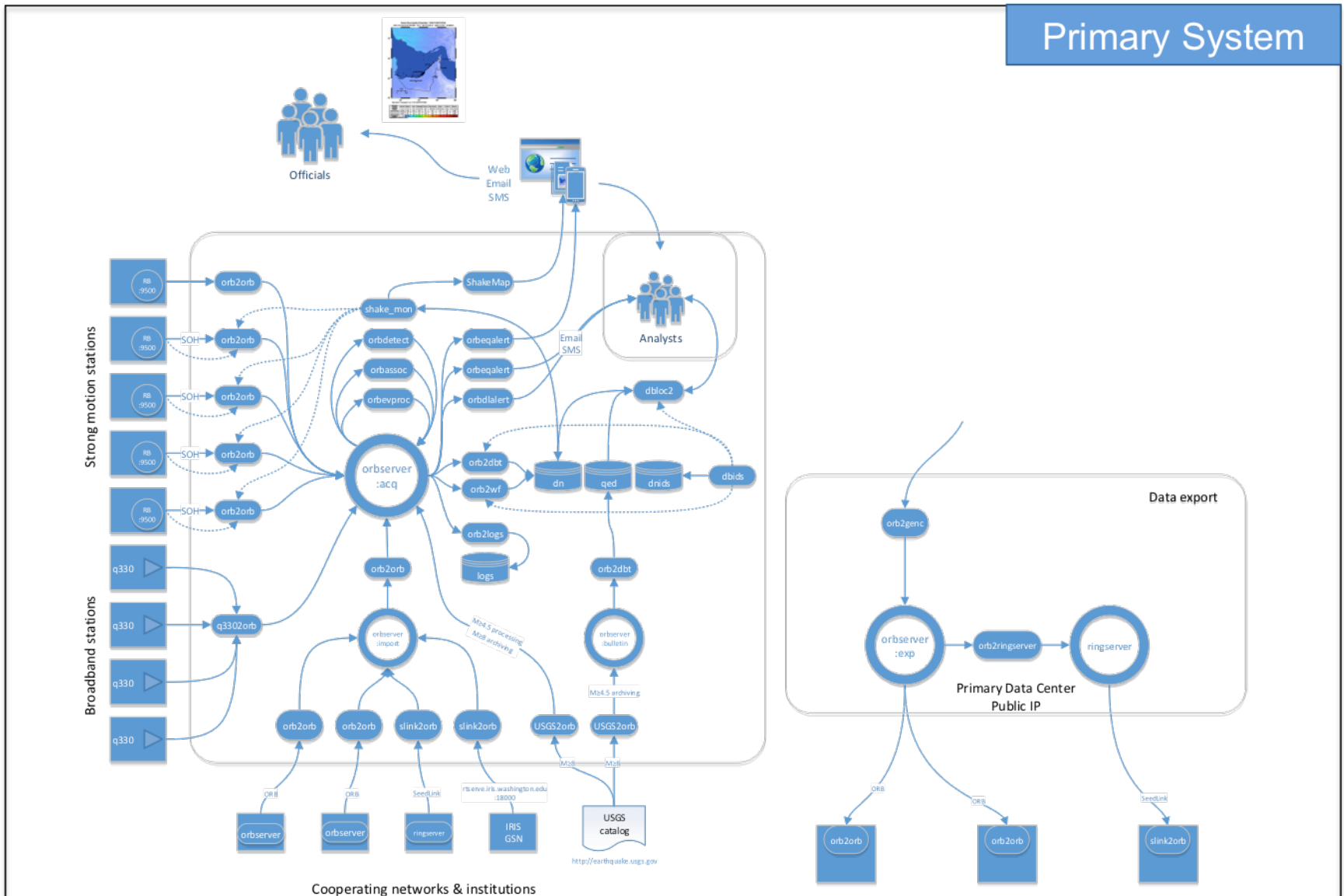4. **Failback procedure**

5. **Recovery**

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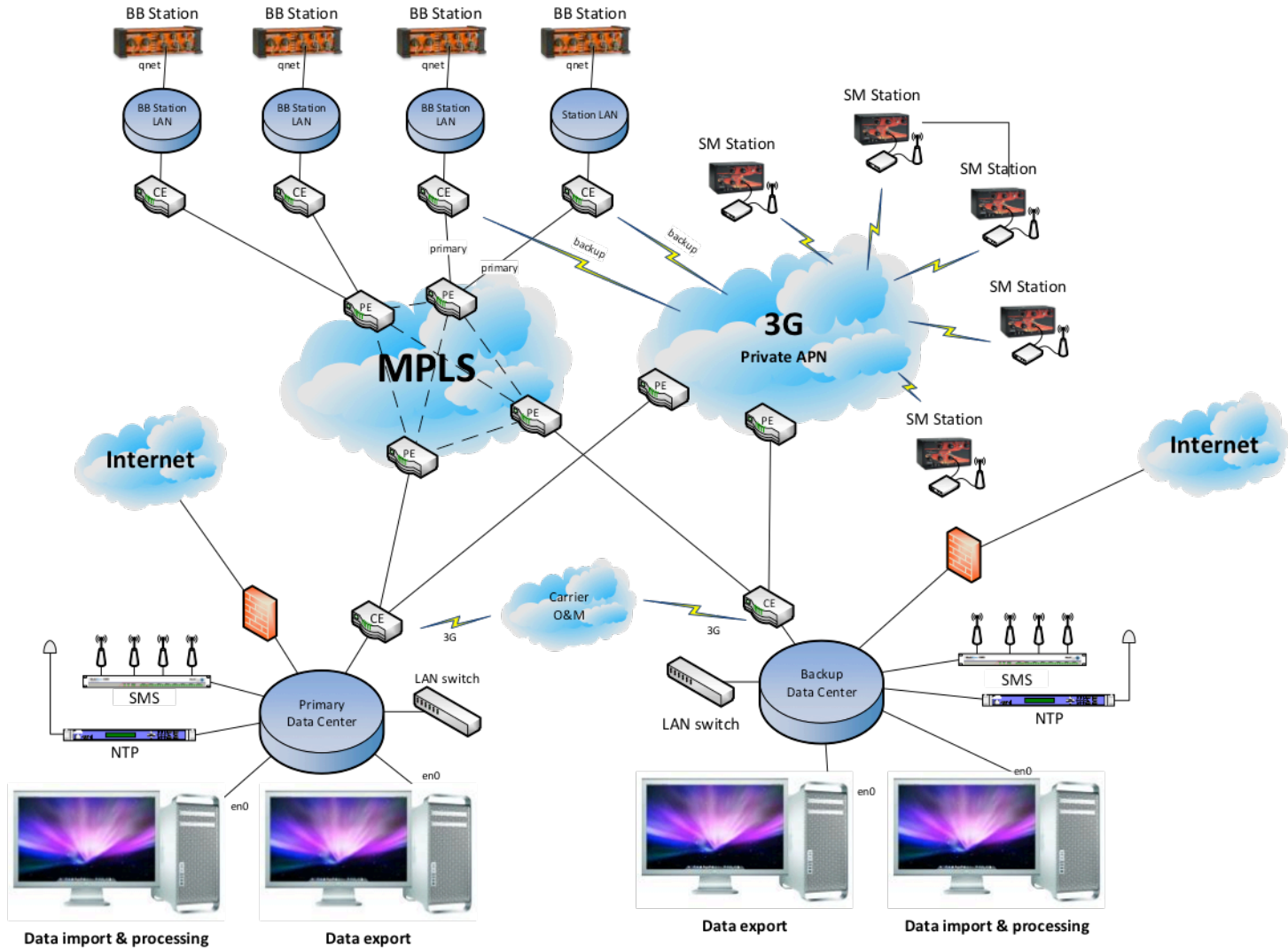
Application Failover: System Entities

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        ┌──────────────────────────────────────┐
        │            Data Sources              │
        └──────────────────────────────────────┘
                        ▼
   ┌─────────────────────────────────────────────┐
   │      Real Time Data Acquisition System       │
   └─────────────────────────────────────────────┘
                        ▼
   ┌─────────────────────────────────────────────┐
   │      Real Time Data Processing System        │
   ├────────────────────────┬────────────────────┤
   │     Event processing   │  ShakeMap processing│
   └────────────────────────┴────────────────────┘
                        ▼
   ┌─────────────────────────────────────────────┐
   │             Information systems               │
   ├────────────────────────┬────────────────────┤
   │    Event information   │ ShakeMap information │
   └────────────────────────┴────────────────────┘
```
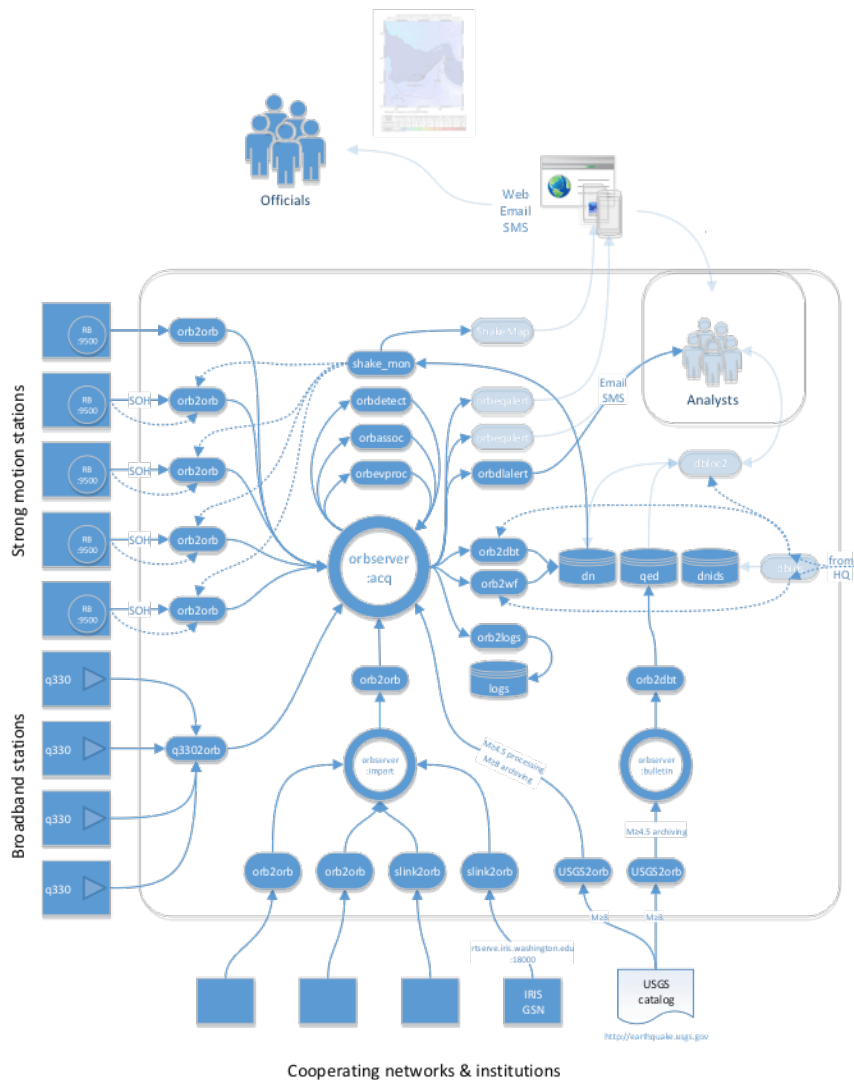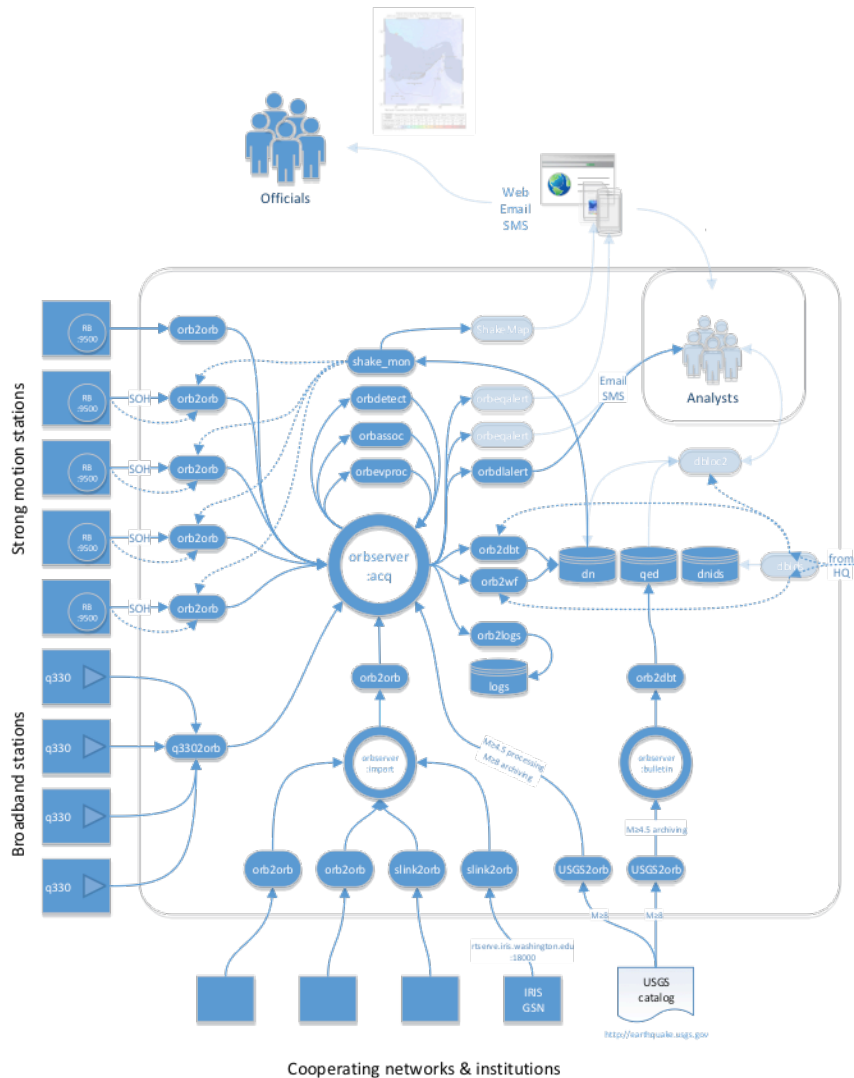
Backup System (BUS)
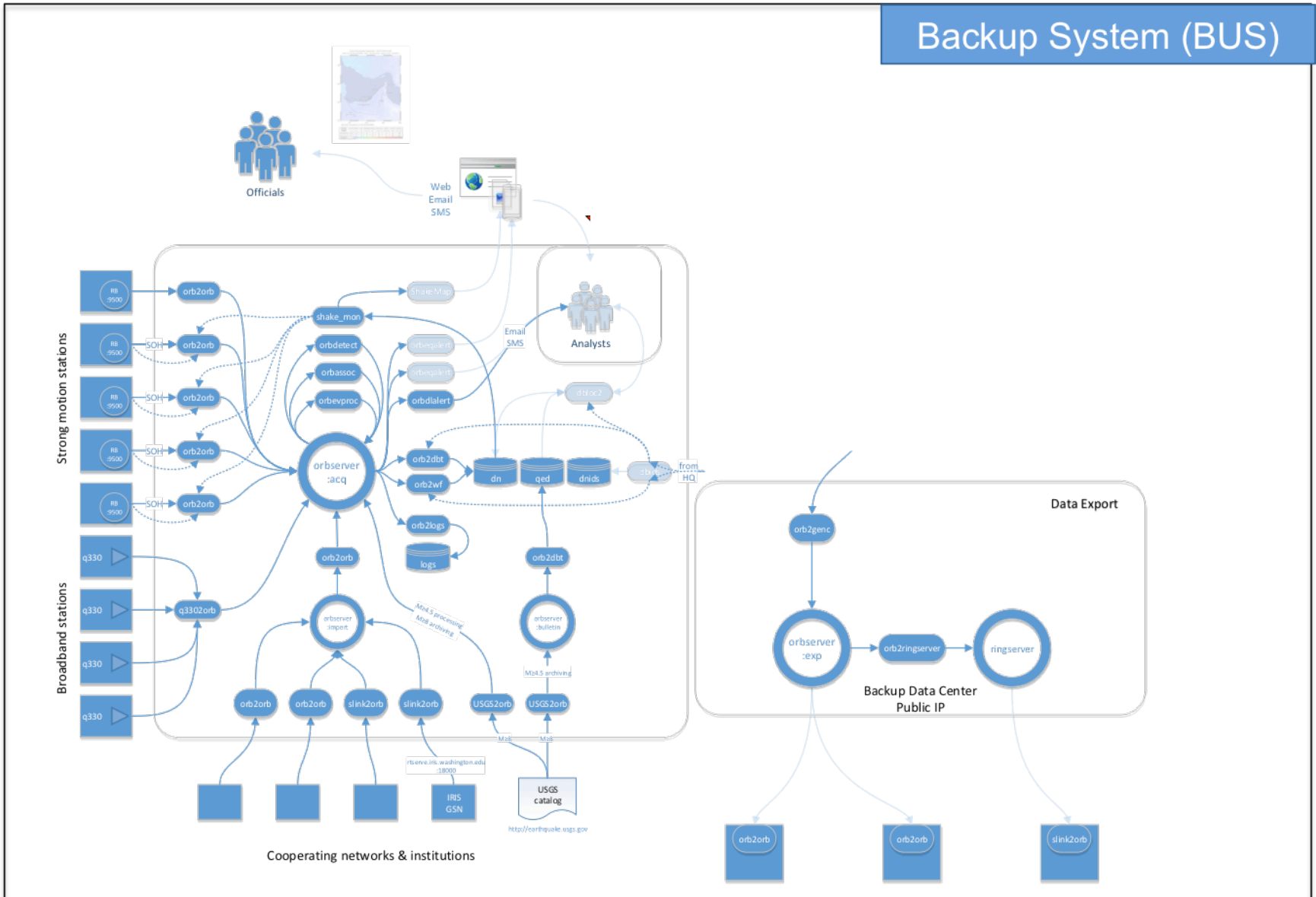
System characteristics

- Concurrent data acquisition

- Processing at both data centers

- Two production databases

- Unique IDs via ID server

- Replication of database IDs

- One active/authoritative

  information system

Backup System (BUS)

## Crucial components

- One Database ID Server

- Database ID Replication

- Monitoring of ID Server

  (*Failure Detection*)

- Failover time

  (*Failure Detection*)

- Authority (*Fencing*)

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Application Failover

Failover process (automatic)

- Initiated by BUS

- Synchronize local database IDs

- Activate ID Server

- Synchronize local database with local ID Server (*Fencing*)

- Restart database writers

- Activate/authorize information systems
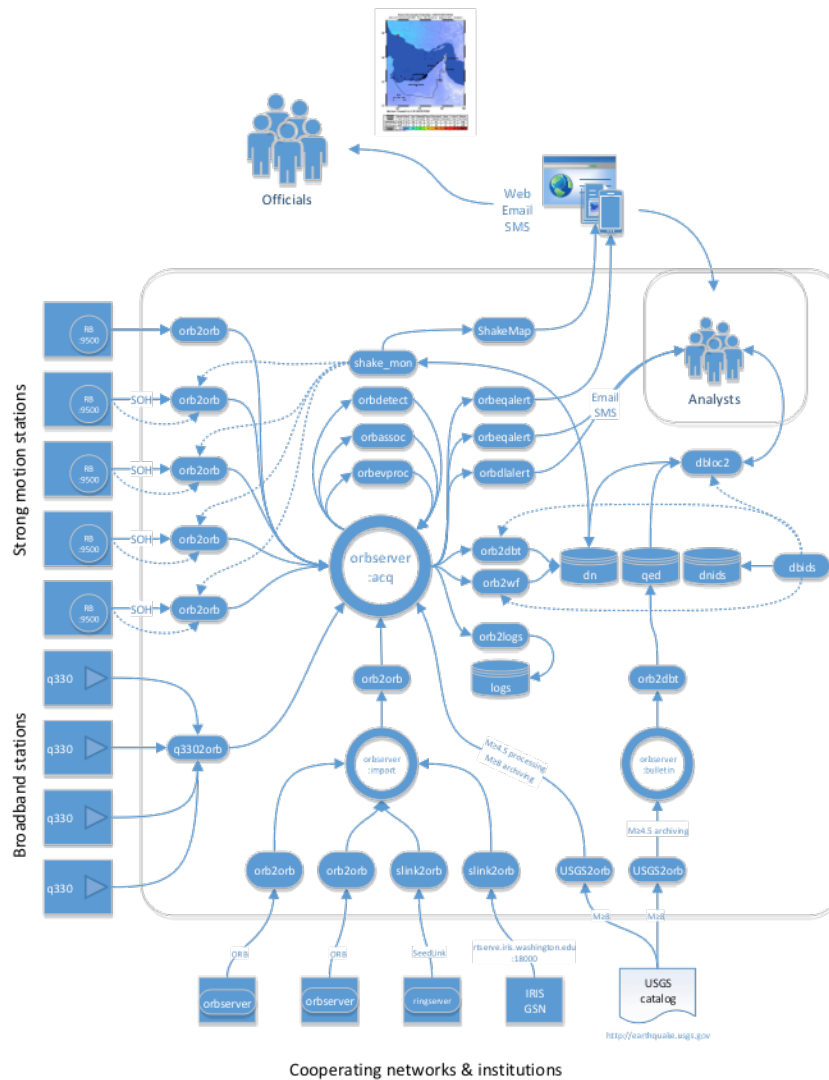
- Notify operators (Email, SMS)
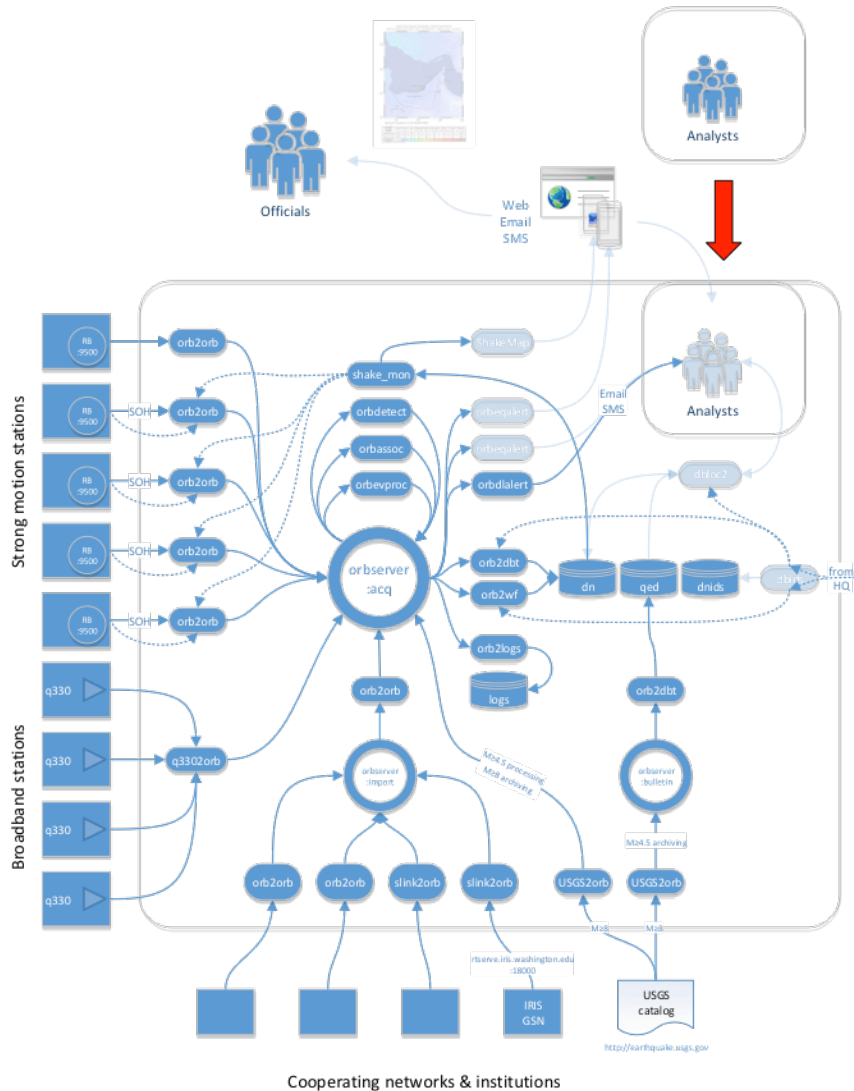
Backup System (BUS)

Post failover

- BUS providing database IDs

- BUS has authoritative database

- BUS feeding information to the world

- BUS prevents activation of ID Server at PS (Fencing)

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Failback (manual)

PS	BUS

- Check db consistency
- Start real-time data acquisition
- Start real-time data processing
- Verify data flow

        - Stop db writers

        - Stop ID server

        - Replicate IDs to PS

        - Synchronize local db to remote ID-Server (change db descriptor)

        - Stop monitoring/fencing PS

- Check db consistency replicated IDs
- Start ID-Server

        - Start db writers

        - Start Monitoring PS

        - Stop information systems

- Start information systems

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BUS

- Extract data to temporary database

PS

- Stop database writers
- Merge data from temporary database
- Start database writers

Important

- Written procedures for stressful situations
- Drills and dry-runs for application and network failover test
- At least once a year
- Revise procedures if needed

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THANK YOU