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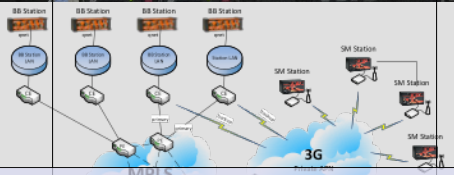

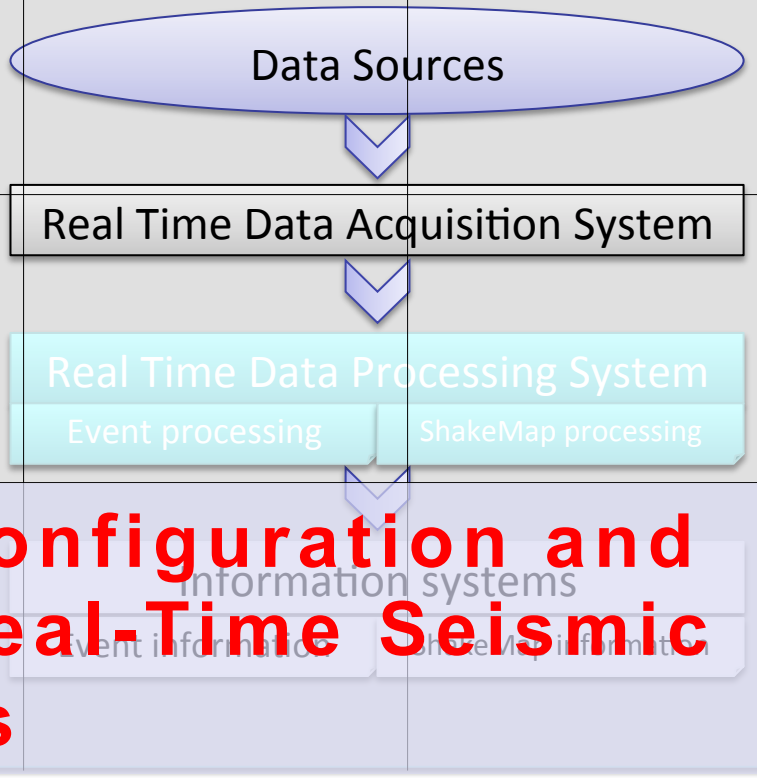

Redundant Datacenter Configuration and Failover Procedure for Real-Time Seismic Networks

Mathias Franke
Stefan Radman
Toufik Alilli
Kinemetrics, Inc
Open Systems & Services Department
www.kmioss.com

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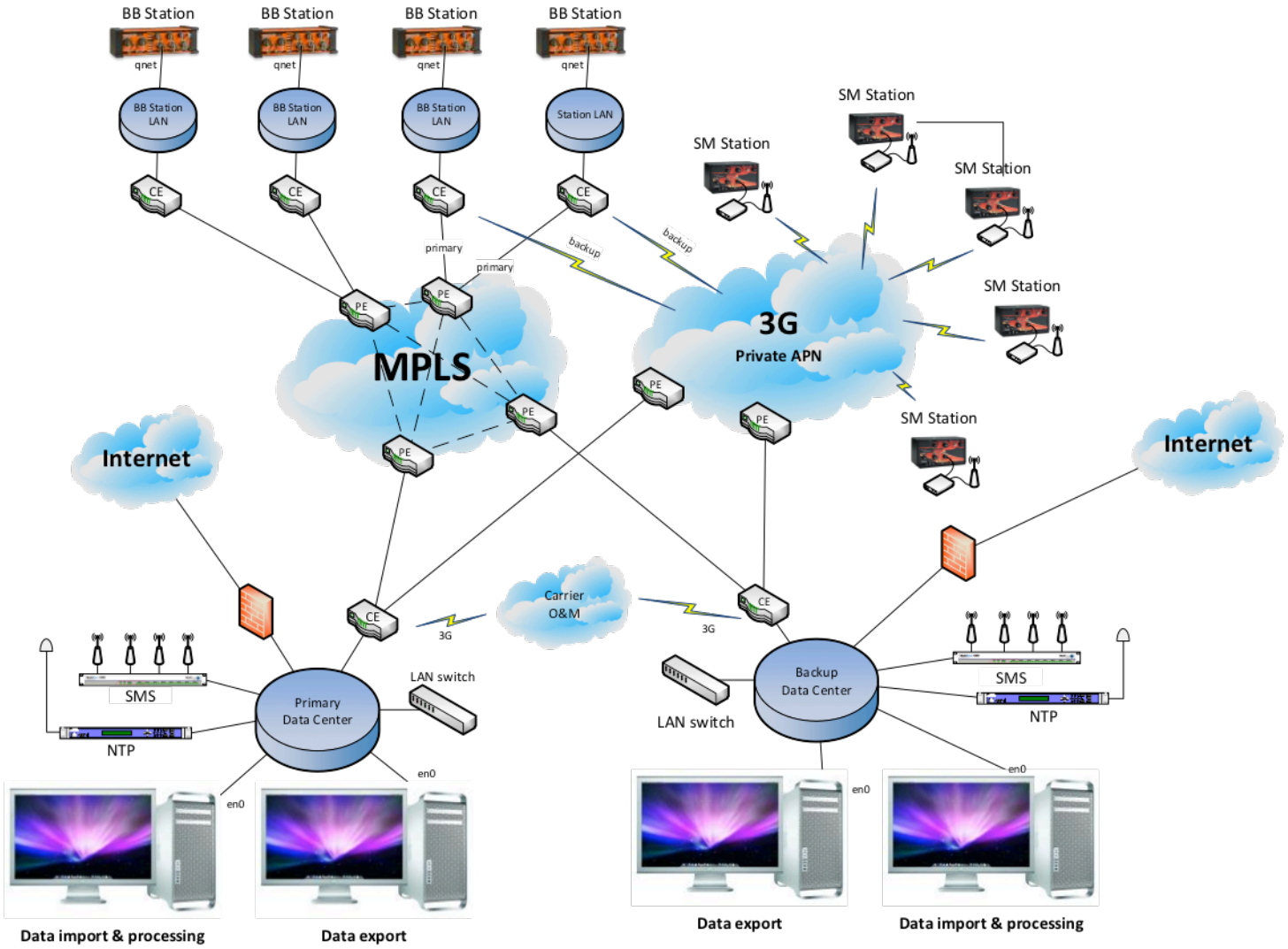
Motivation

- 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

Outline of Failover Implementation

0. Normal operation
1. Failure detection of network and application
2. Failover procedure
3. Fencing operation
4. Failback procedure
5. Recovery

Normal Operation: System Layout



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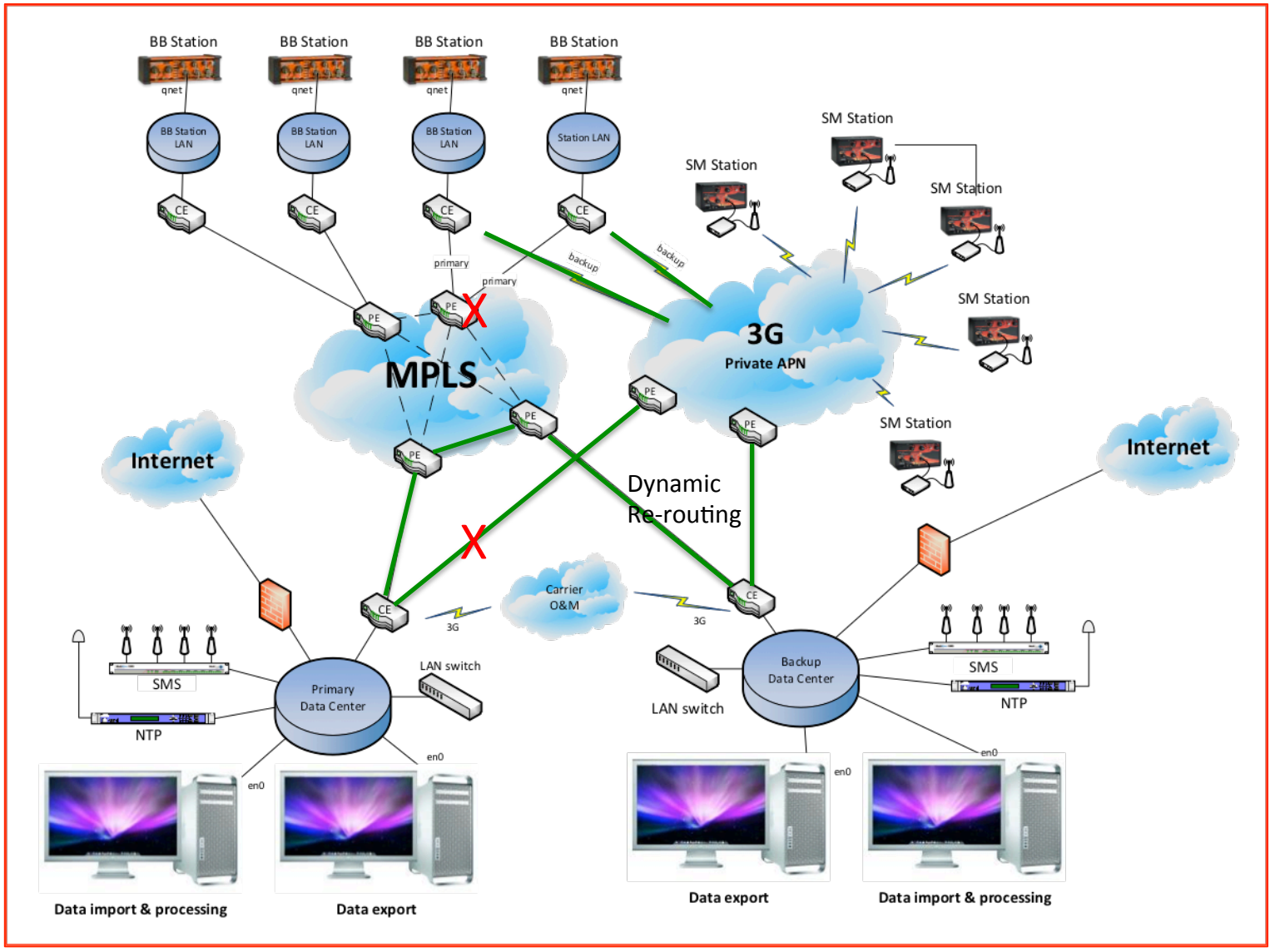
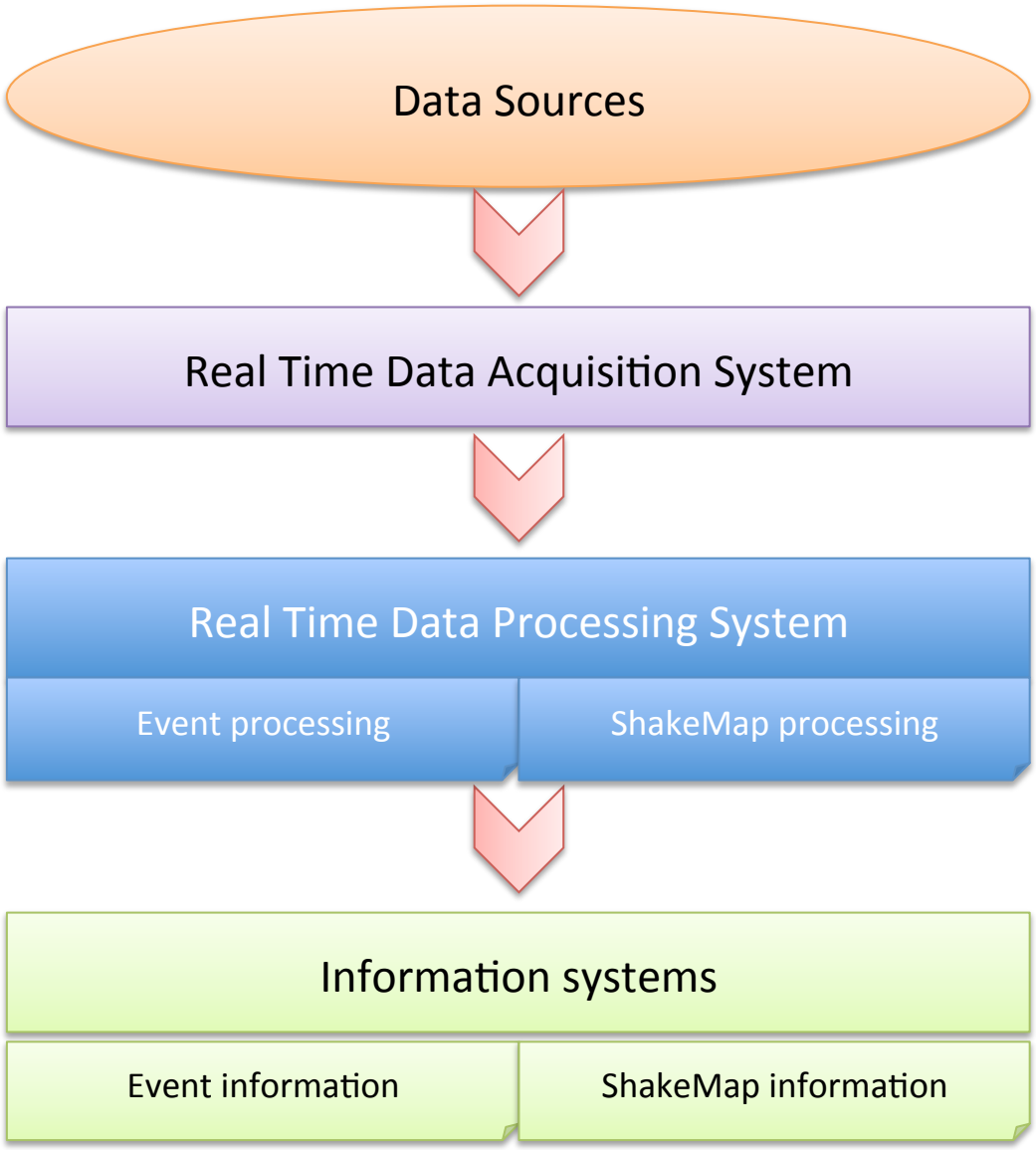
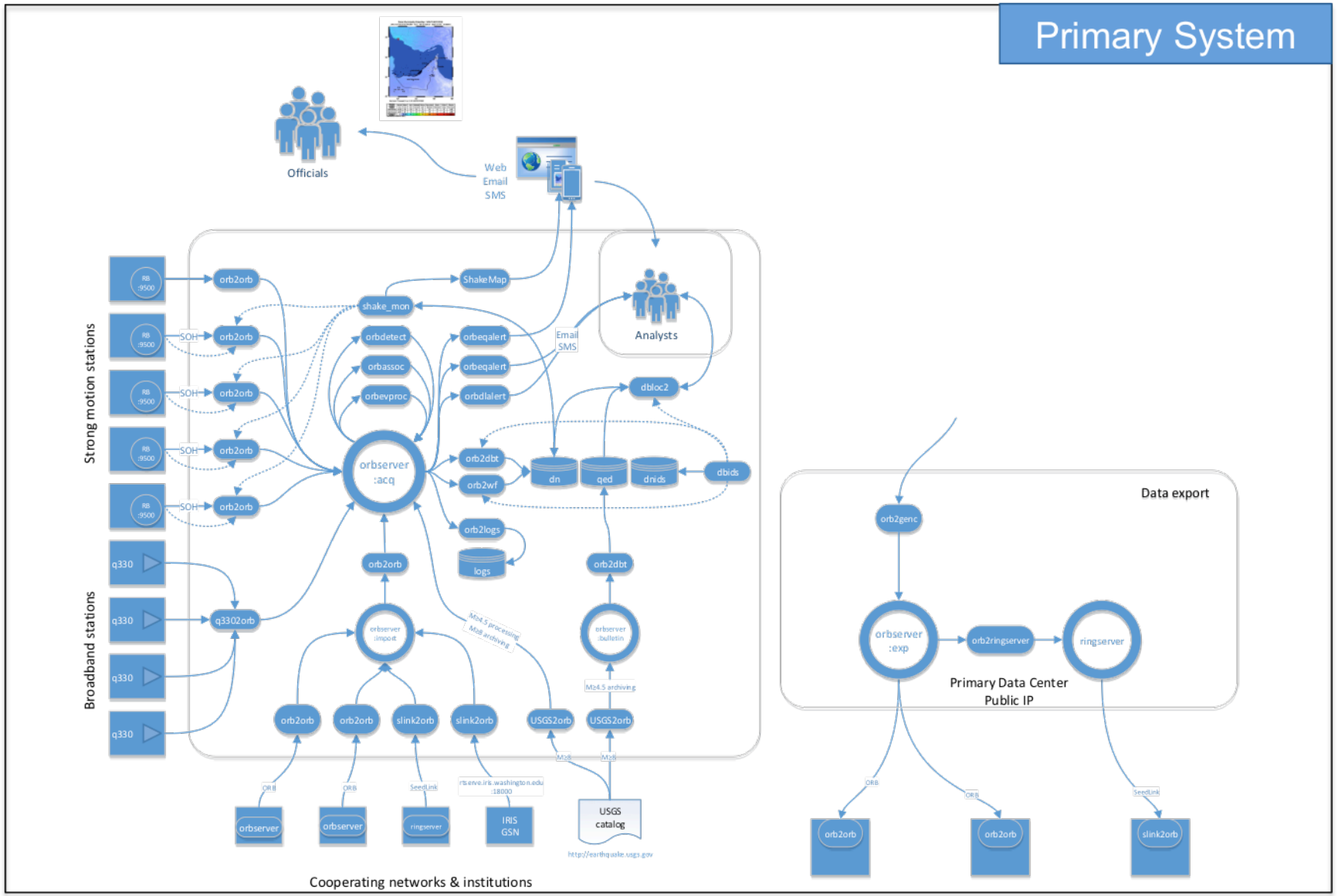
Network Failover



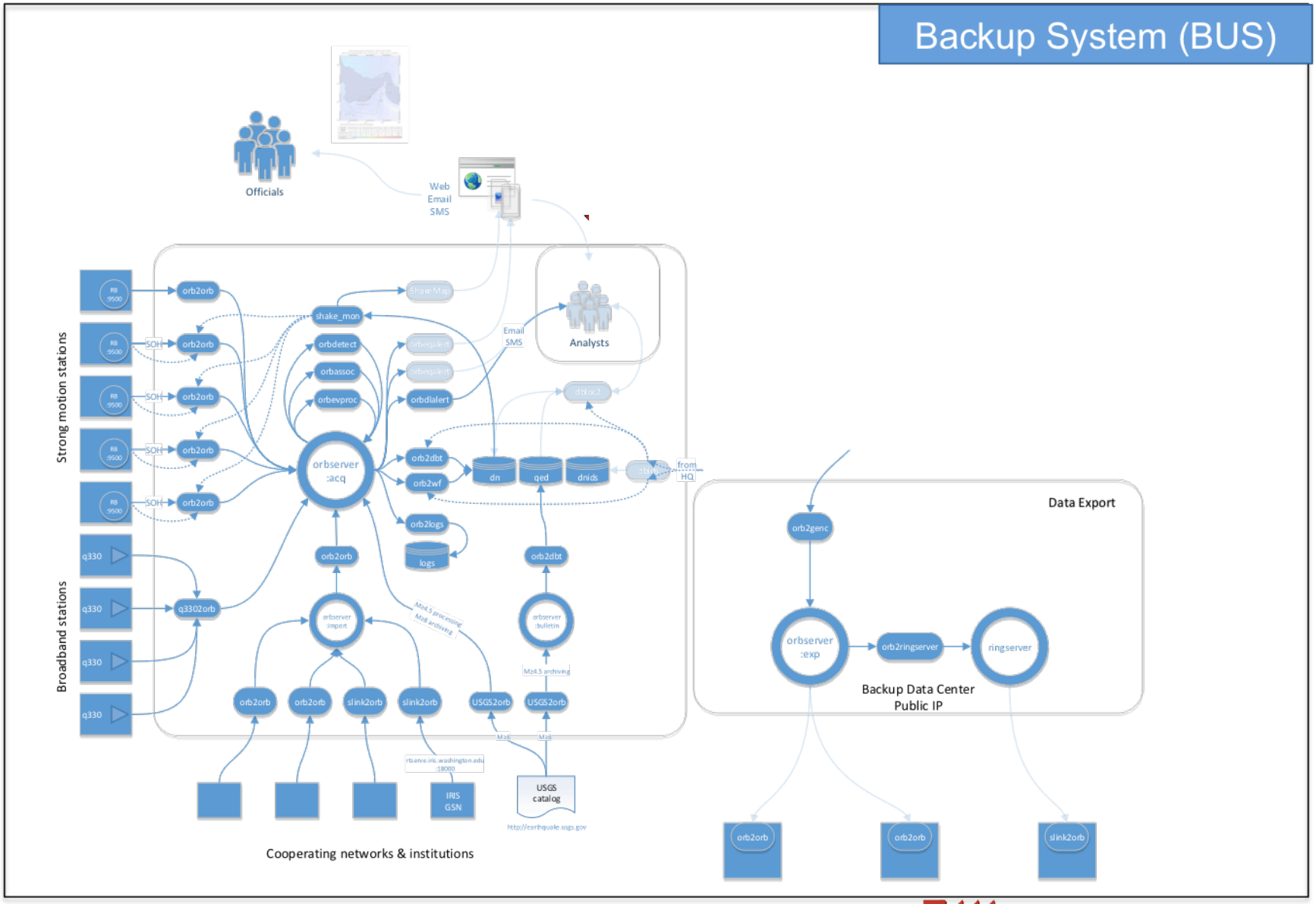
Application Failover: System Entities



Normal Operation: Data Flow - PS

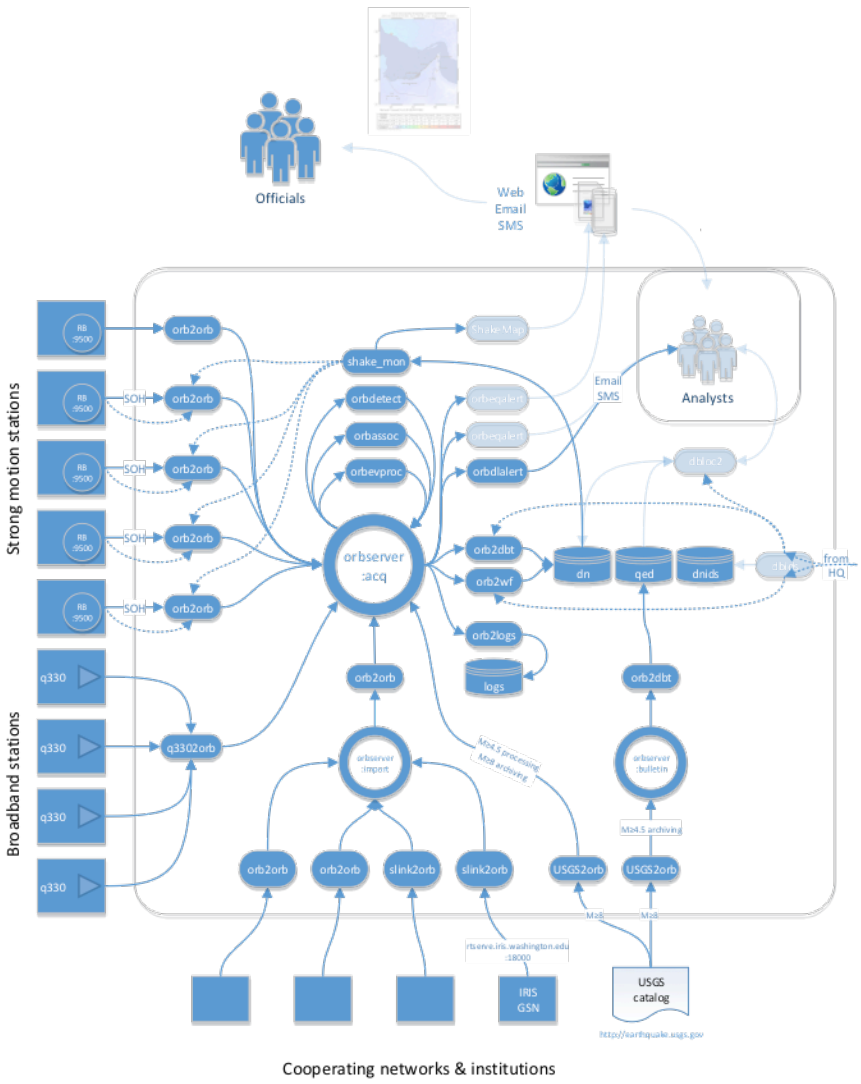


Normal Operation: Data Flow - BUS



Normal Operation

Backup System (BUS)

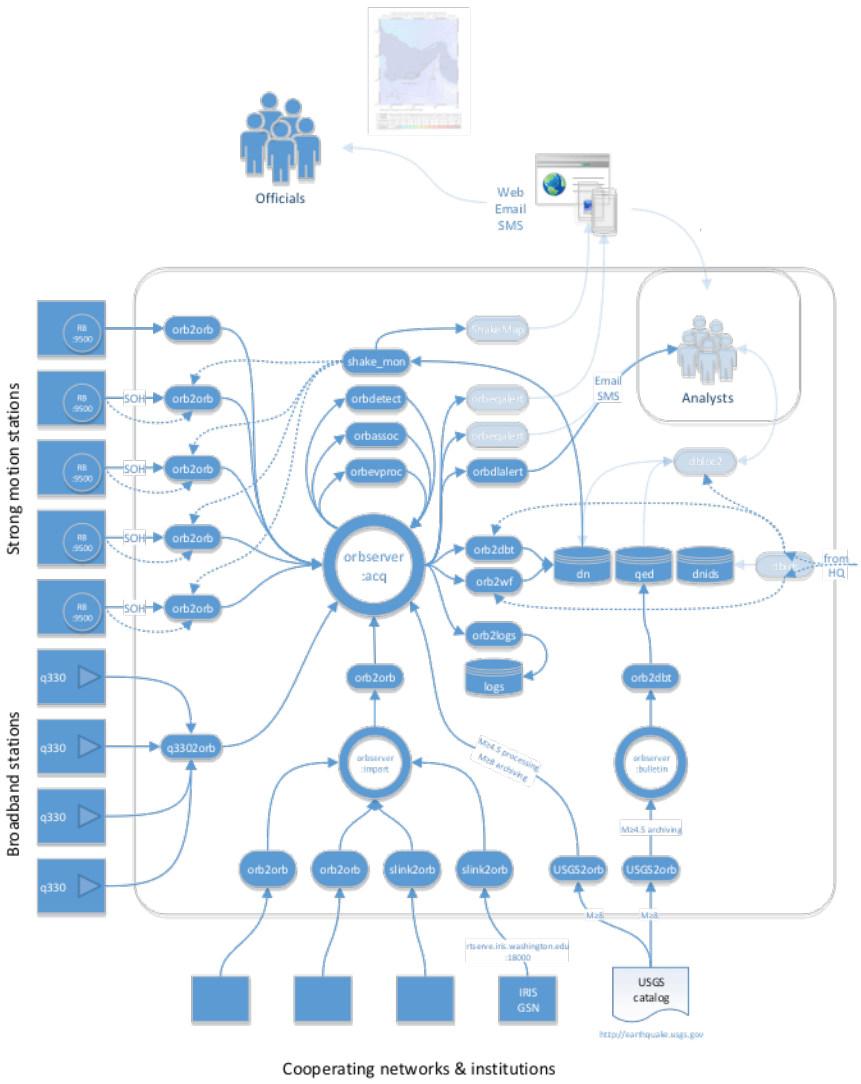


System characteristics

- 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

Application Failover: Detection

Backup System (BUS)

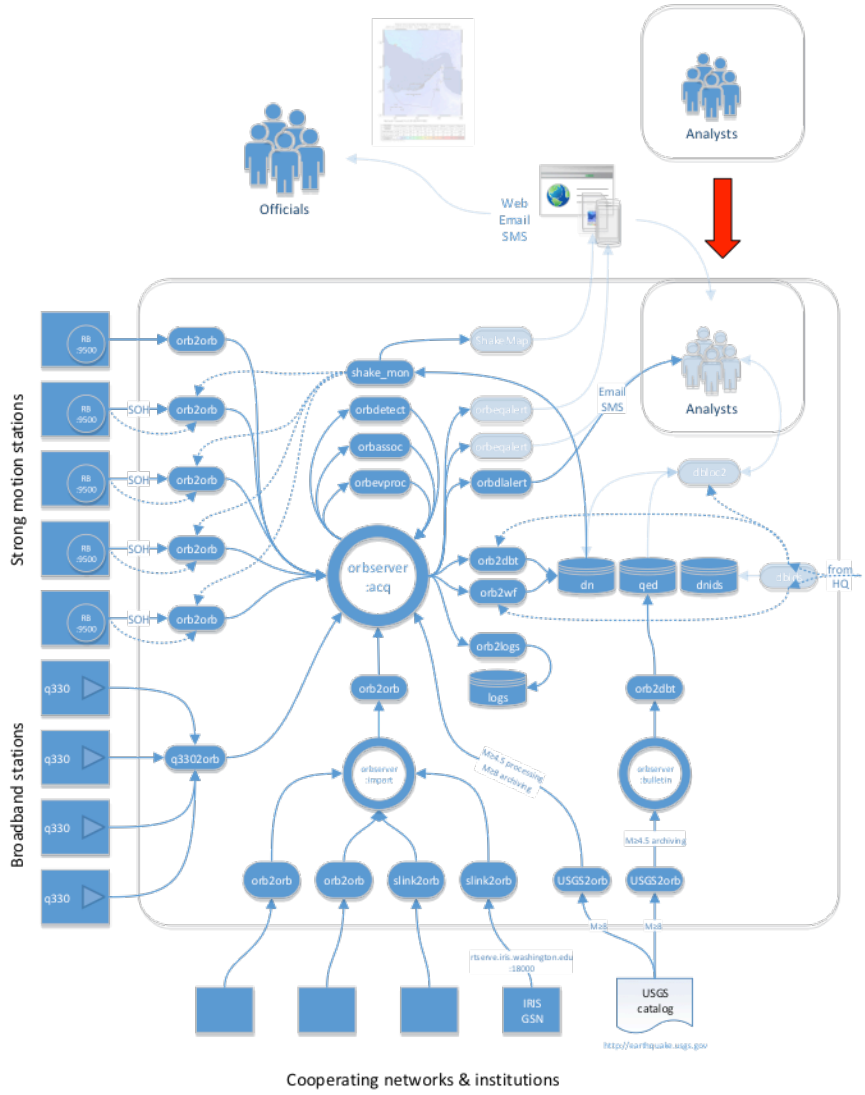


Crucial components

- One Database ID Server
- Database ID Replication
- Monitoring of ID Server (*Failure Detection*)
- Failover time (*Failure Detection*)
- Authority (*Fencing*)

Application Failover

Backup System (BUS)

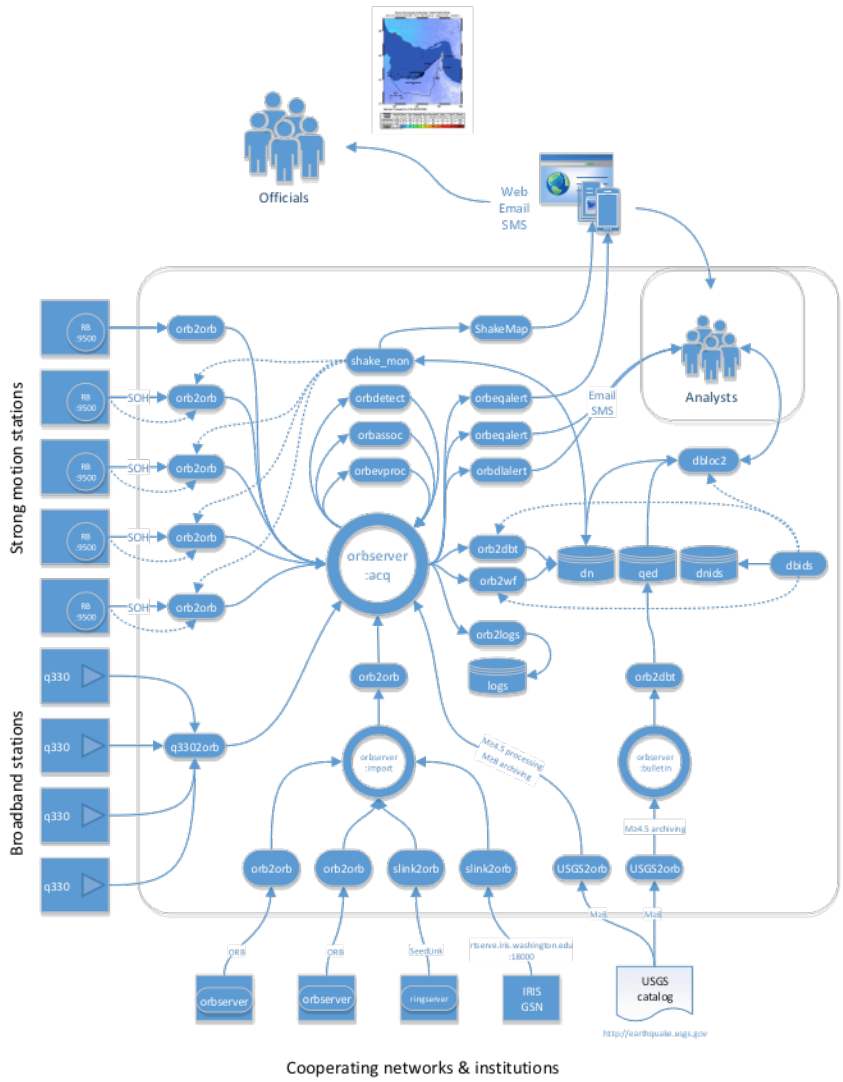


Failover process (automatic)

- 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)

Application Failover

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)

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	

Application Failover: Data Recovery

BUS

- Extract data to temporary database

PS

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

System Failover: Final Note

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

THANK YOU