



**Artillery Regimental Data System Advanced Development
Model**

ARDS ADM - Replication Issues

presented by

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NATO IST TG-12 WORKSHOP

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Plan

- ARDS ADM
- Constraints and design drivers
- Data Distribution & Replication
- Testing
- Conclusions



1. Some words on ARDS ADM

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ARDS ADM

Flash: 4 Immediate: 2 Priority: 0 Routine: 22 15 April 99 14:08:57 GMT
 Control Ops Planning Messages Tools Help

close support field artillery organization for the

Alerts Queue

Edit Options

Flash - 4 Immediate - 2 Priority - 0 Routine - 22

FROM	DTG	STATUS	A/I	MSGC-TYPE	MSGC-SUBTYPE	DE
1CD/61M/A/H/2	151407Z APR 99	NHD	A	FM 0	: Initial 0	
1CD/61M/A/H/2	151405Z APR 99	I	FC 0	: EOM		
1CD/61M/A/H/2	141359Z APR 99	HDL	A	FM 0	: Initial 0	
1CD/61M/A/H/2	131546Z APR 99	HDL	A	FM 0	: Initial 0	

Fire Mission Initial Order

Regiment: 61M Battery: A Callsign: T2 Target Number: ZP1100

Target Location

Method: Grid Direction: 1350 miles

Col	Row	Easting	Northing	Altitude	
18	T	3	64560	49 5652	0 m

Update

Target Description

Type: Target Subtype: Radar

Activity: River Crossing

Shape: Circular Radius: 100 m

Method of Engagement

Type of Engagement: Neutralization

Effects Desired: Damage Percent: 10 %

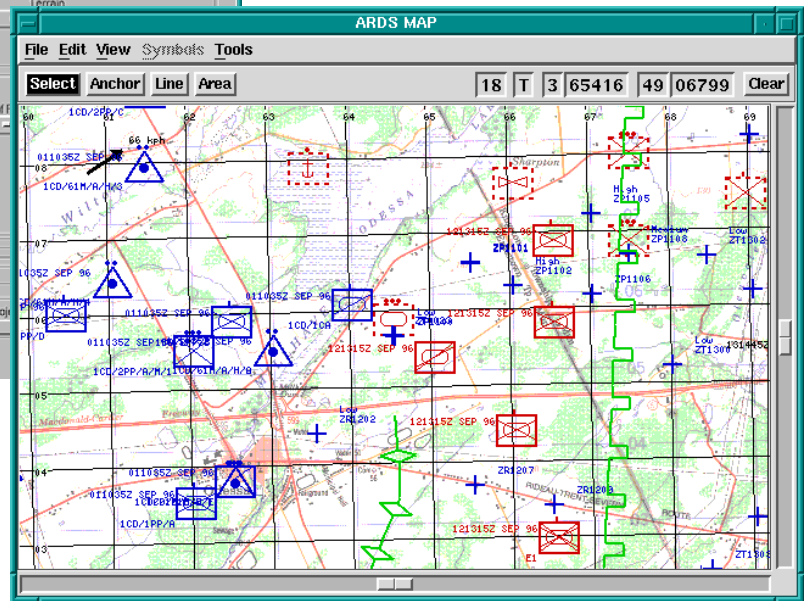
Method of Fire and Control

Fire Support Resources

Gun

Adjustment: Projectile: HE Fuse: VT

FFE: Reg: 61M Bty: A Gun Status: Proj:



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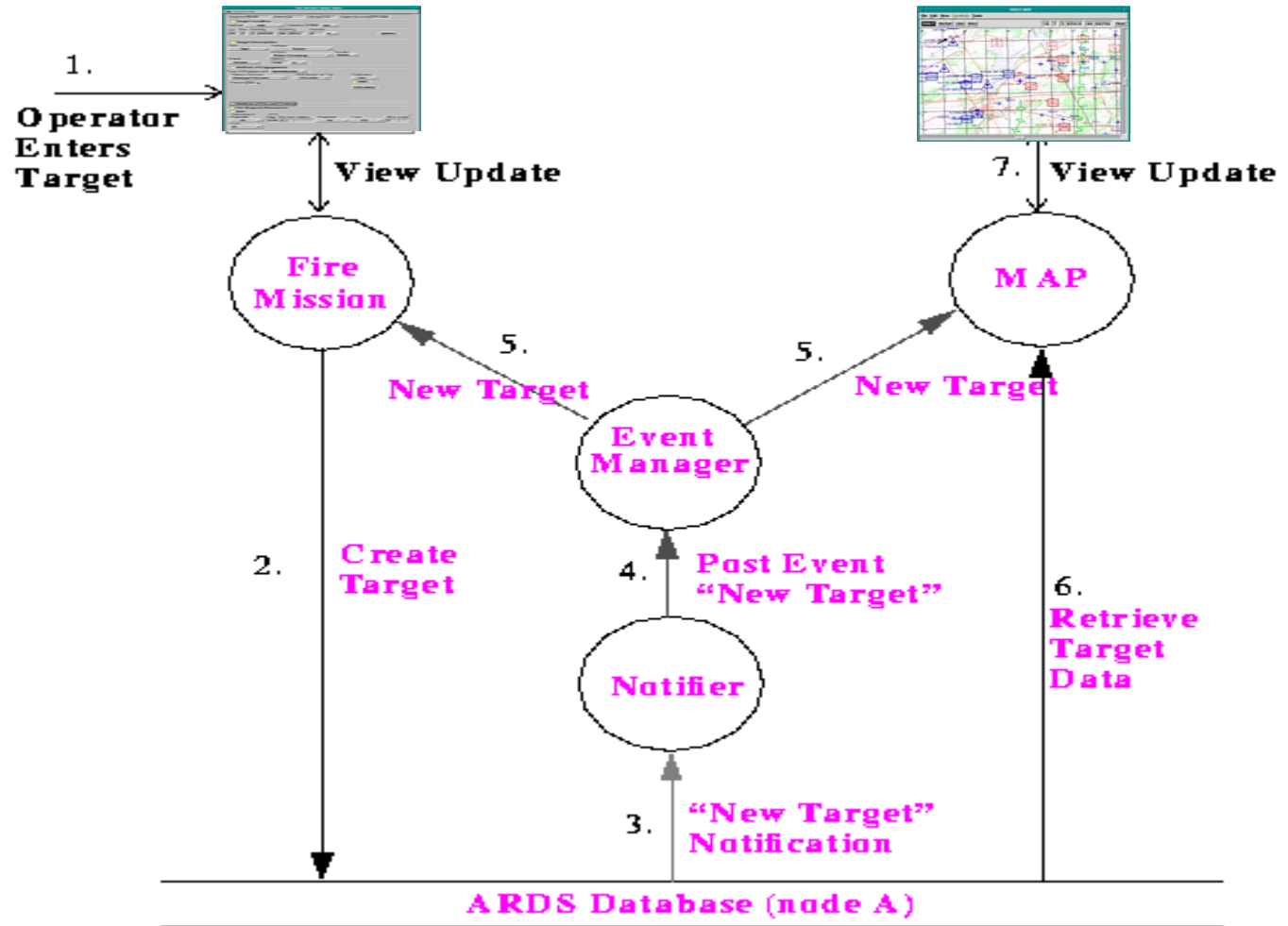


Data Model Based

- Represents and manipulates model elements which correspond to real entities
- Provides integrated view of the battlefield situation
- Allows straightforward definitions of new views
- Maximises the opportunities for integration and interoperation with other forces and nations systems



Active database





2- Constraints and design drivers



Operational Environment Constraints

- Time is critical
 - Prioritization
- Survivability
 - Site Independence
 - Elimination of single points of failure
- Communications
 - Limited throughput
 - Key-up time
 - Collisions
 - Network Failure



Design Drivers

- Broadcast medium
- Data redundancy
- Recovering of lost/destroyed data
- Use of COTS
- Modularity
- Configurability



3 – Data Distribution & Replication



Replication issues

- COTS Replication not suitable
 - 1500 vs 200 bytes
 - 9 network interactions (radio key-up)
 - COTS solution optimized for consistency
 - Peer to peer



Replication Issues (Cont.)

- Transaction Integrity
- Data Ownership
- Connectionless
- Limited bandwidth

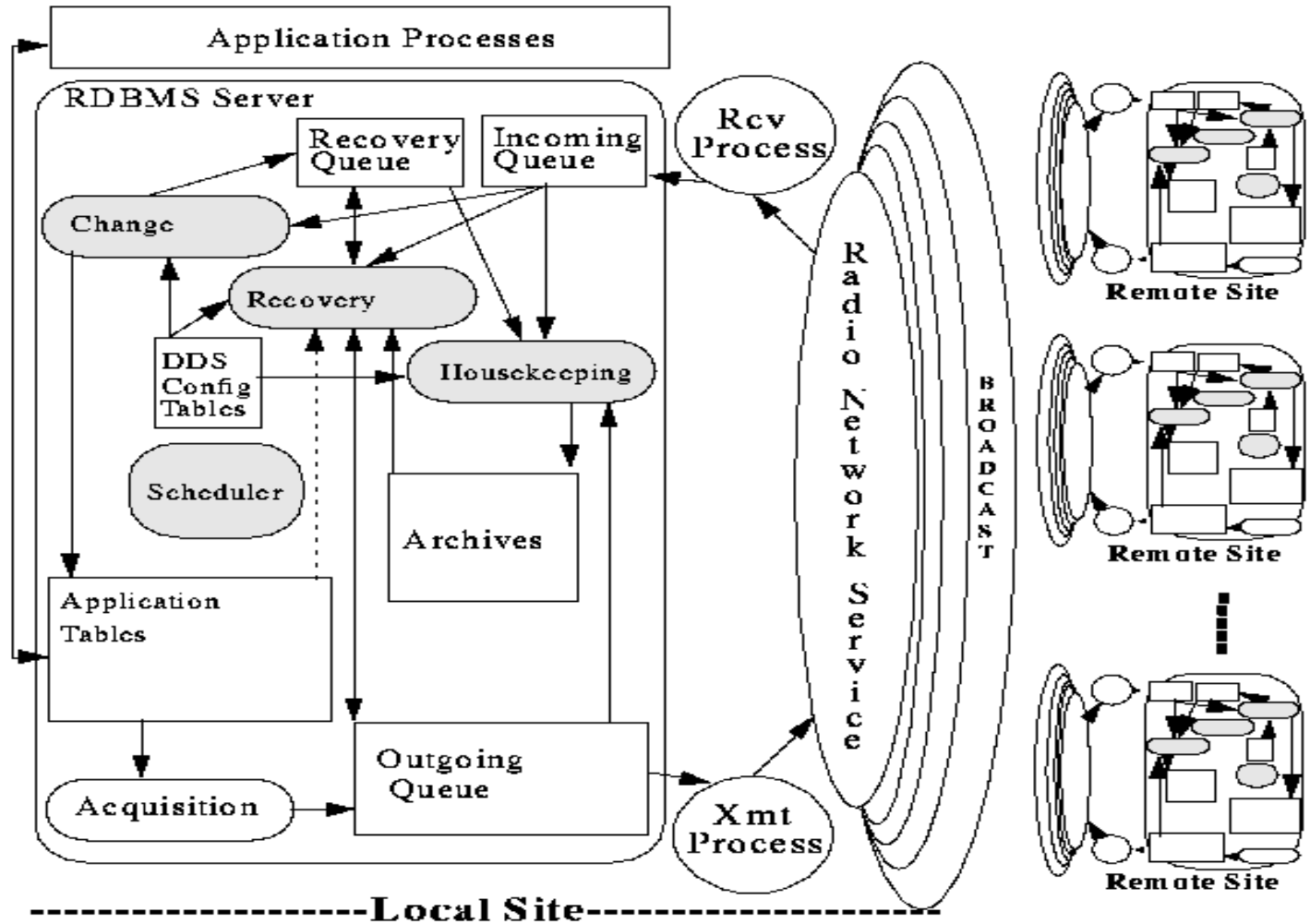


Replication Characteristics

- Solution layered on top COTS DBMS
- Trigger based post transaction
- Negative acknowledgment
- Store and forward
- Recovery
- Data Ownership models
 - Single, dynamic and shared



Data Distribution System (DDS)





4 - Testing

Description	Number of Tables	Number of Rows	DDS Message Size (bytes) <i>(Compressed)</i>	NET Tx Data Size (bytes)	Tx Time (secs) PRC25+RTU (@<100 bytes/sec)
Simple Transaction	2	2	110 (104)	144	3
Standard Transaction	6	10	551 (385)	441	6
Complex Transaction	12	22	1355 (776)	874	9



5 - Conclusions

- Tactical communications had limited throughput
- COTS Replication not adapted to military environment
- ARDS/ADM DDS is optimized for timeliness and for continued operations but data base consistency can not be guaranteed

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