

SYSTEMS DEVELOPING EXCEPTIONAL SYSTEMS SOLUTIONS

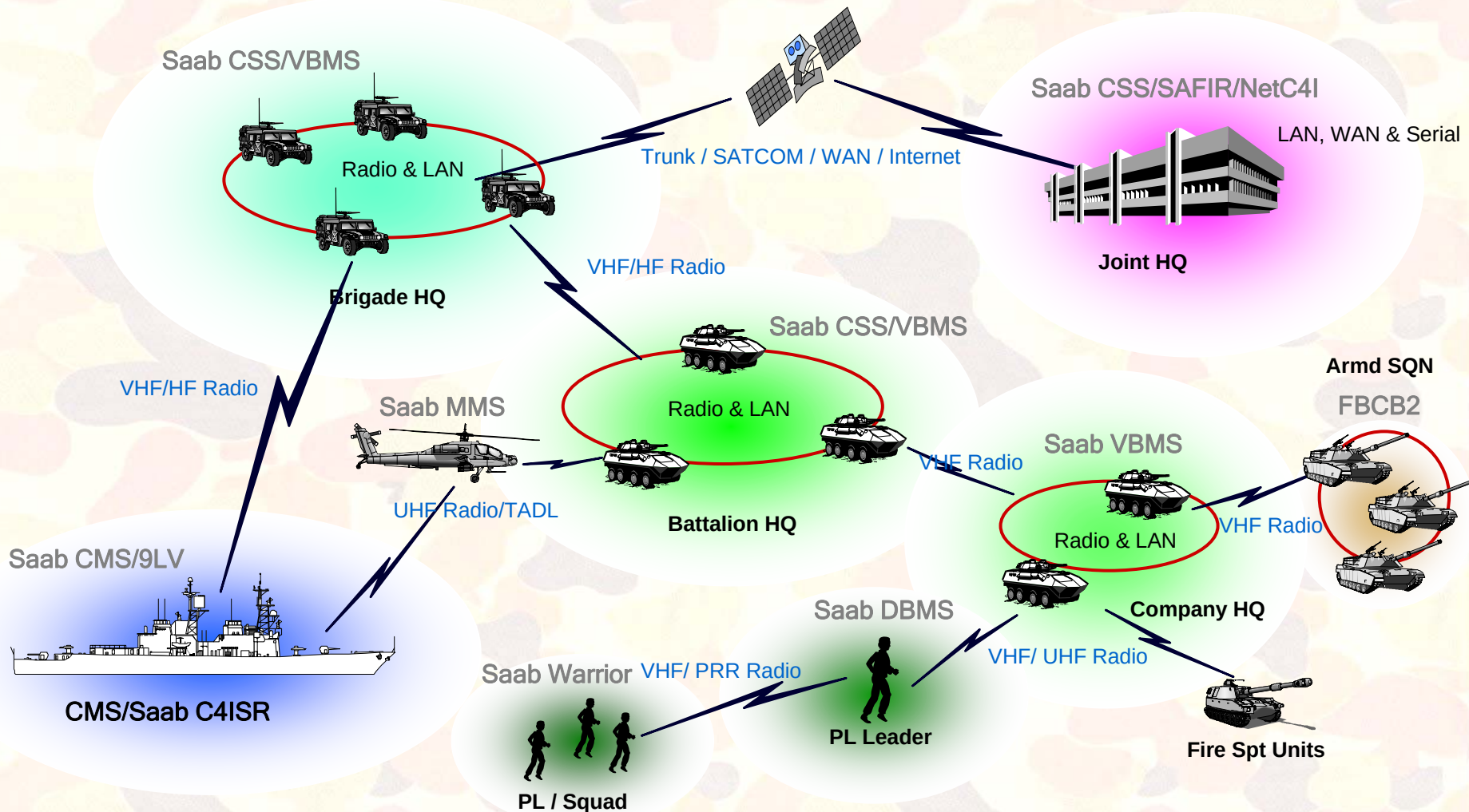
Presentation to QuestNet, July 2005

Information in the Battlespace

- Information is a potent weapon.
 - Presence can improve your decision making capability.
 - Absence can detract from your combat capability - and increase the risk of fratricide.
- Army operates in complex environment
 - Topography.
 - EN/other organisations.
 - Affiliations and Organisations.
 - Mobility.
 - Variety of media
 - Scarcity of resources.
- Primary communications mechanism is radio (CNR)
 - VHF & HF, low bit rate, high access cost.
 - Previously used for voice, not data.
 - But voice communication is an enduring requirement.



The Complexity of Battlespace Nets

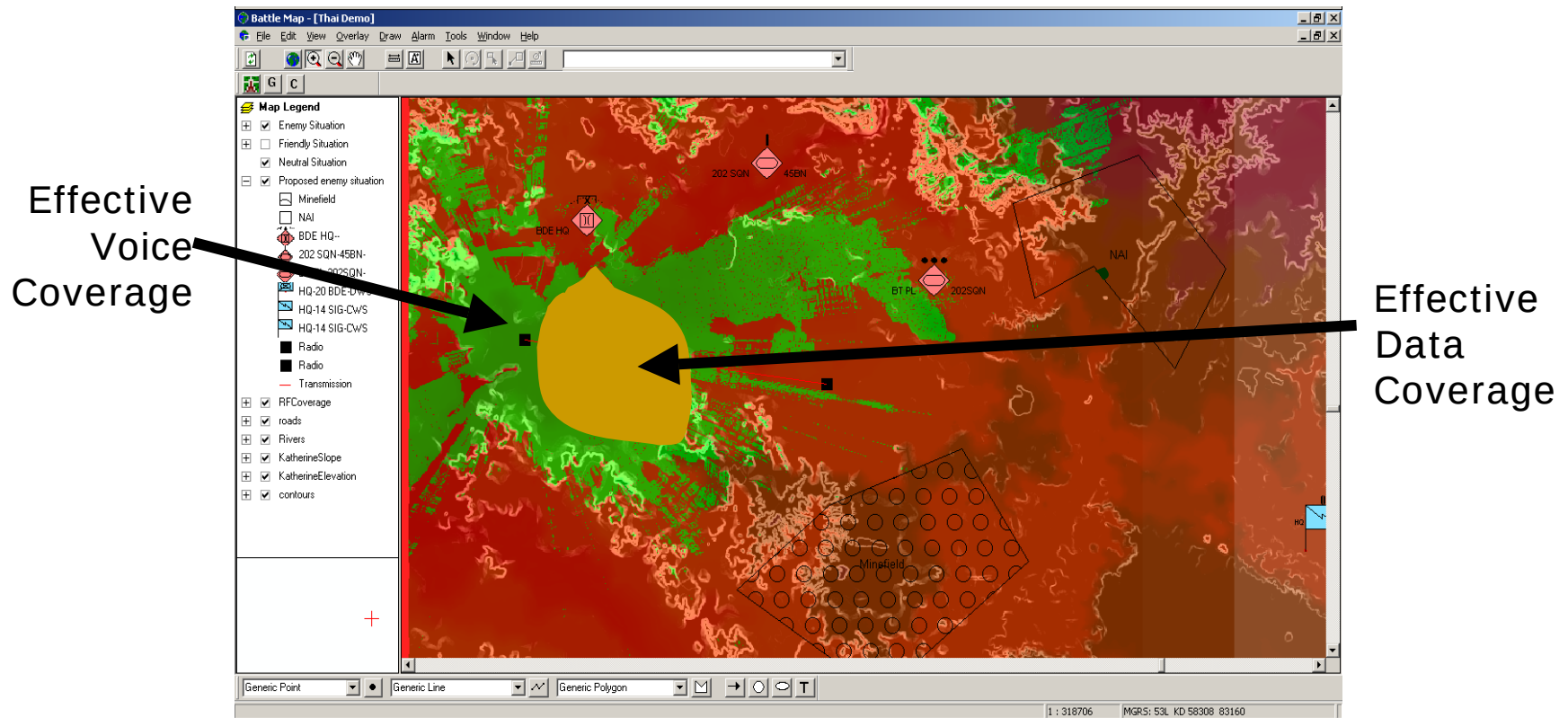


Environmental Challenges

- Warfighter needs are for reliability & redundancy but...
 - Radios not optimised for data.
 - Narrowband modulation means low bit rate channels for data transfer.
 - Radio channel may exhibit high bit error rates.
 - An inherently unreliable medium.
 - May be shared voice/data networks...
 - Data applications do not have a dedicated channel.
 - Interruptions can occur at any time.
- Mobility of nodes.
- Dynamic discovery of network entities required.
- Varying User experience levels.
- Possibility of hostile attack.

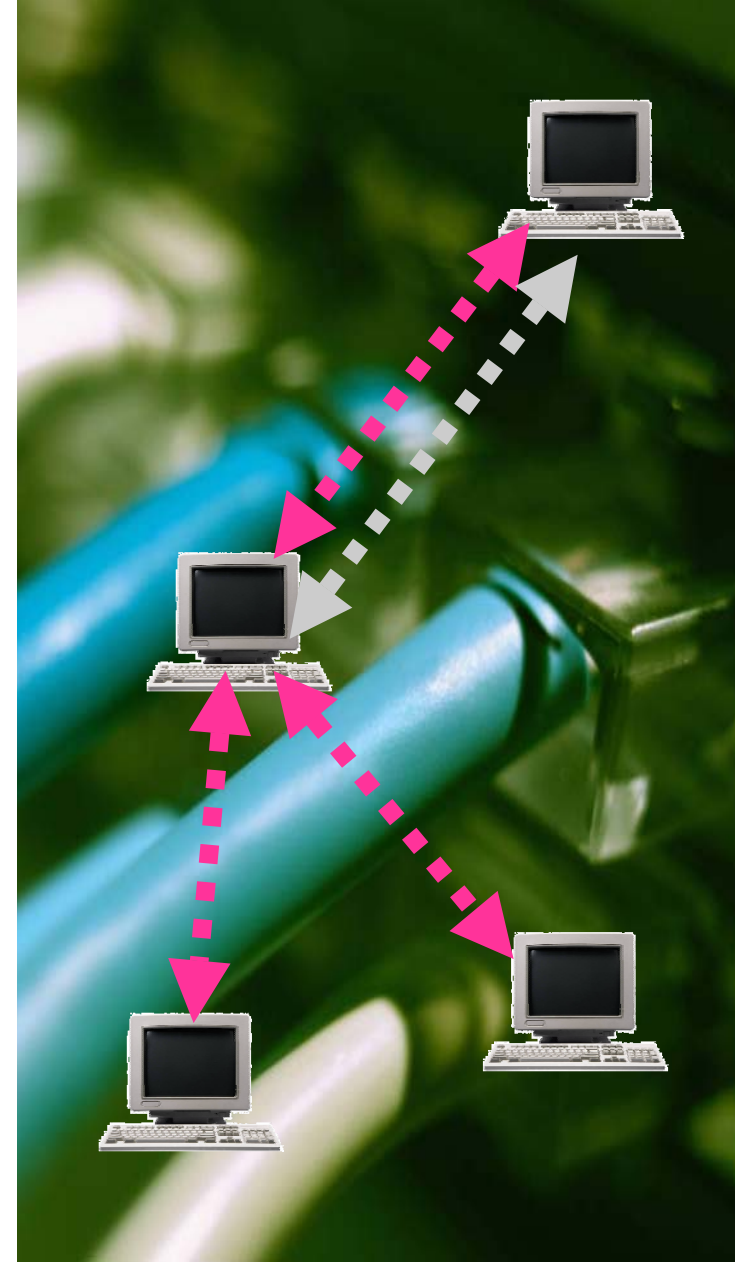
Bandwidth Challenges

- Data throughput is sensitive to the Bit Error Rate & latency.
- CNR provides limited bandwidth, high error rates and 'difficult' interfaces.

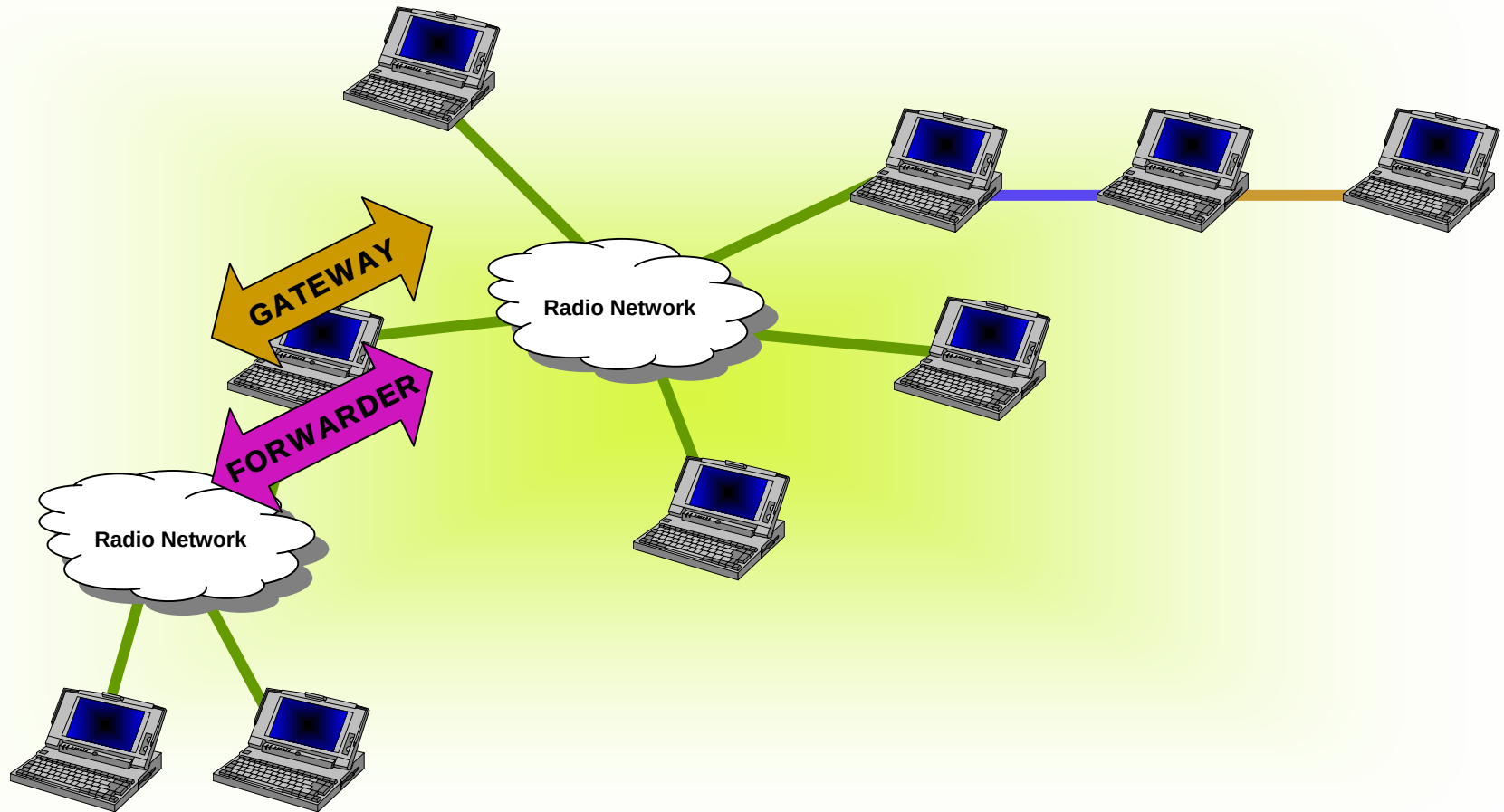


Networking Issues

- Self-Forming Networks
 - Mobile, Static and Fixed
 - No COG/CPOF
 - Minimal to no Infrastructure
- Address Assignment
- Low Bit rates / High Error Rates / High Latency
- Shared voice and data on the same channel
- Net nodes not known in advance.
- Network Robustness
 - Nodes can join/leave at any time
 - Self healing capability
 - Expects that nodes will be unreachable at times
 - Nets can be jammed or fail
- User Administration
- Joining networks
- Roaming & visibility



Networking Example

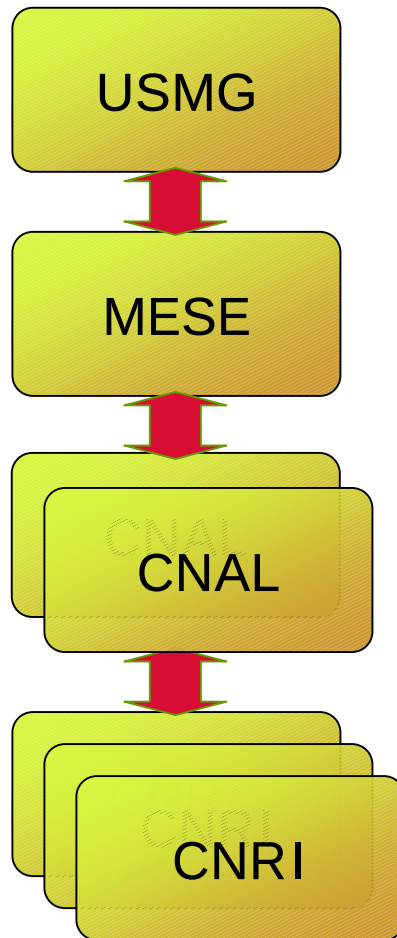


Implementation

- Peer-to-peer mechanisms.
- Situational Awareness distribution.
- Network routers & gateways
 - Allows for duplicate paths with some load sharing
- Link Management
 - Graphical easy-to-use network status.
- Address Book Management
- Different Transmission Types:
 - Singlecast, Multicast, Broadcast, Netcast.
- Reliable/Unreliable Transmission Protocols.



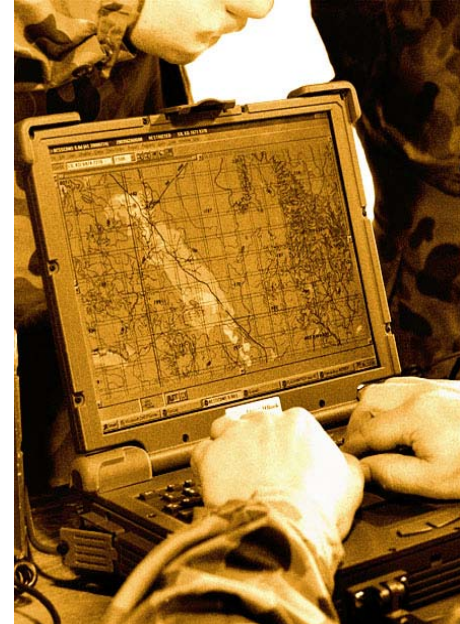
Communications Architecture



- A layered architecture.
- Addresses network characteristics and provides a flexible communications stack
 - Not bound to particular radio types or protocols
 - Design allows maximum flexibility within the systems
 - Seeks to integrate as much radio capability as possible to assist human operators and improve system performance.
 - Allows run-time reconfiguration.
- API provided to other applications to allow intelligent workflow applications.

Network Congestion Controls

- Since the radio net is a valuable asset - you need to control access to it.
- Automatic mechanisms:
 - Acknowledgements piggybacked onto other traffic.
 - Data hold times to fill MTU capacity.
 - Use made of the broadcast nature of radio.
 - Position reporting made based on particular criteria.
 - Minimum retransmit times to prevent overloading the net.
 - Nodes can control their visibility within the net.
- User warnings if large messages are to be transmitted.
 - However this does not block bandwidth for other users.



Core Applications

User Messaging

Reported or manual Enemy position

Friendly position automatically updated

The interface includes a map with various units and terrain features. A messaging window titled 'Messaging - Outbox' is open, showing a list of messages. A status panel at the bottom right displays unit information and communication status.

Type	Callsign	Subject	Date	Progress
S F R ACK	ADHO-HQ S...	ACK: ACK ME...	130311ZJAN05	100%
S F R ACK	PAC-MAN-CP	ACK: This is a ...	120631ZJAN05	100%
S F R MSG	All	Contact - AA ...	140119ZJAN05	100%
S F R MSG	All	Contact - DES...	140058ZJAN05	100%
S F R MSG	All	Contact - HEL...	140059ZJAN05	100%
S F R MSG	All	Contact - INF...	140121ZJAN05	100%
S F R MSG	All	Contact - NBC-	140123ZJAN05	100%
S F R MSG	All	Contact - NEU...	140054ZJAN05	100%
S F R MSG	All	Contact - PLA...	140120ZJAN05	100%
S F R MSG	All	Contact - TAN...	140052ZJAN05	100%
S R U MSG	All	ack	130117ZJAN05	100%
S F R MSG	All	dfgdfg	070139ZJAN05	100%
S P R MSG	All	test	130117ZJAN05	100%
S R U MSG	PAC-MAN-CP	test numbers	120628ZJAN05	100%

24 Messages Sorted: Status (Descending)

Unit sighted at: 55K DU 89009 49995 (-19.444, 146.895)
 Distance: 10.5 metres
 Bearing: 2.035degrees
 From: 55K DU 89000 50000 (-19.444, 146.895)

16:04 10 Feb 05
 55K DU 21500 42800
 Inbox 0 0 0
 Outbox 0 0 0

Other Applications

Location Status Display

LOCSTAT Board		
Unit ID	Location	Last Update
 CWS HQ 14 SIG MAIN	53L KD 55500 55500	281840ZJUN05
 DWS HQ 20 BDE MAIN	53L KD 55500 55500	281900ZJUN05

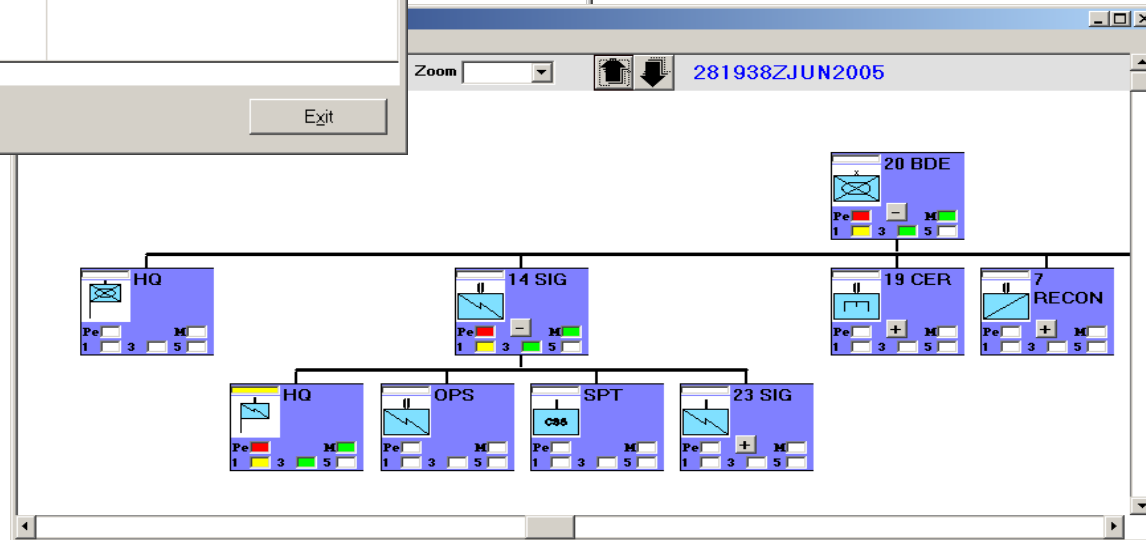
Sorted by: Last update (ascending) Exit

Command Post Logs

CP Log - Chris (mm2013)						
Serial	Logged DTG	Event DTG	From	To	Description	
33	021515IK May20...	171050IK Apr2...	S2	S6	Free Text Message	
CB	021508IK May2001	181108IK Apr2001	Capt Bro...	Capt Gre...	Situation overlay	
CB	021509IK May2001	111052IK Apr2001	2 Cav	CSSB	Unit Admin State	
31	021510IK May20...	110958IK Apr2...	S2	S6	Int Rep	
25	021511IK May2001	100911IK Apr2001	1CER	1Bde HQ	Eng Rep	
24	021512IK May20...	100857IK Apr2...	S6	S2	OPORD	

Description: Free Text Message
From: S2 **To:** S6
Logged Date/Time: 021515IK May2001 **Event Date/Time:** 171050IK Apr2001
Details:
 Fire in ammo bay. 50 rounds detonated. Request ammo resupply

Combat Status Display



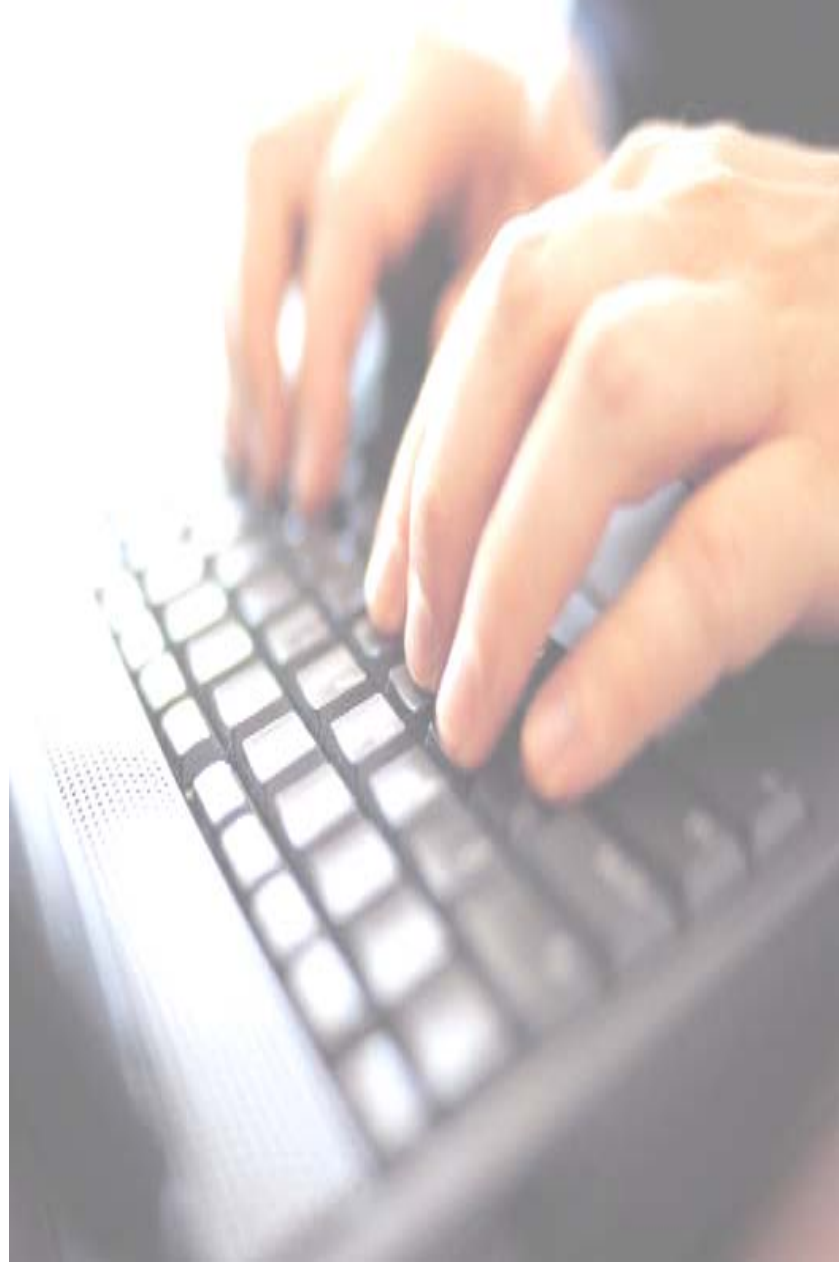
Additional Applications

- The achievement of effective battlespace communications allows for more complex applications of IT in the battlespace.
 - Indirect Fire Support
 - Remote Sensor Coverage
 - Sophisticated Training and Simulation
 - Automated logging and analysis
 - UAV mission payload data distribution



Future Work

- Coalition interoperability:
 - Network Level MIL-STD-188-220
 - Envelope Level MIL-STD-2045-47001
 - Message Level MIL-STD-6017
- Use over new media: EPLRS, JTRS, MBITR.
- Enhancing reliability, range and throughput.
- Reduced network congestion with routing announcements.
- Provision of client/server capability for Joint HQ, higher Command and Civil environments.



In Conclusion

- Successful Australian development with selected components from Australia & overseas.
- Successful battlespace digitisation with a third generation CSS.
- 7 successful major Releases on time, on budget.
- Operating successfully over in-service narrowband single channel voice/data radios.
- In active use, over 6000 users trained to date.

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