Government Baseline Experiment
&
Phase 2 Field Effort Introduction

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CenGen INC
Consulting & Engineering Next Generation Networks

Baseline Objectives

"The 'effective performance' of the Control –Based MANET will be rigorously evaluated by determining it can support the same offered load as a baseline MANET using a fraction (ultimately 10%) of the baseline bandwidth. This amounts to an assessment of spectral efficiency that measures all cost below the application layer, not just the costs at the physical. In order to enable scientific comparisons against a baseline network, the out-of-scope physical layer and out-of-scope application layer will be specified for all performers."

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Field Work

- Is expensive
- Hard to budget / price
- A lot of fun OR no fun

- *A required part of the CBMANET effort*

CBMANET …
"program excludes only the physical and application layers"
"… three thrust areas plus a system integration task"
"… level playing field … Government intends to … provide a common and standard Physical Layer"
"… Government plans to conduct a baseline performance test …"

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Nominal Baseline Experiment
Design Parameters and Node Configuration

- Initial node lay down of 30 mobile nodes over ~4 km x ~4 km
- Node-to-node distances: Variable from 100 m to 4 km
- Antenna characteristics: Omni (9 dBi stick);
- Frequency: ISM band (2.4 GHz)
- Radio: 802.11b (Orinoco)
- Transmit power per node: 6-10 W (FCC waiver)
- MANET Routing Protocol: OLSR (CenGen / NRL)
- Test Applications:
  - MGEN/DREC (NRL)
  - C2PC
  - FBCB2
  - Others

CURRENT THINKING – SUBJECT TO CHANGE
but
It is a good starting point for your proposal efforts

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File View

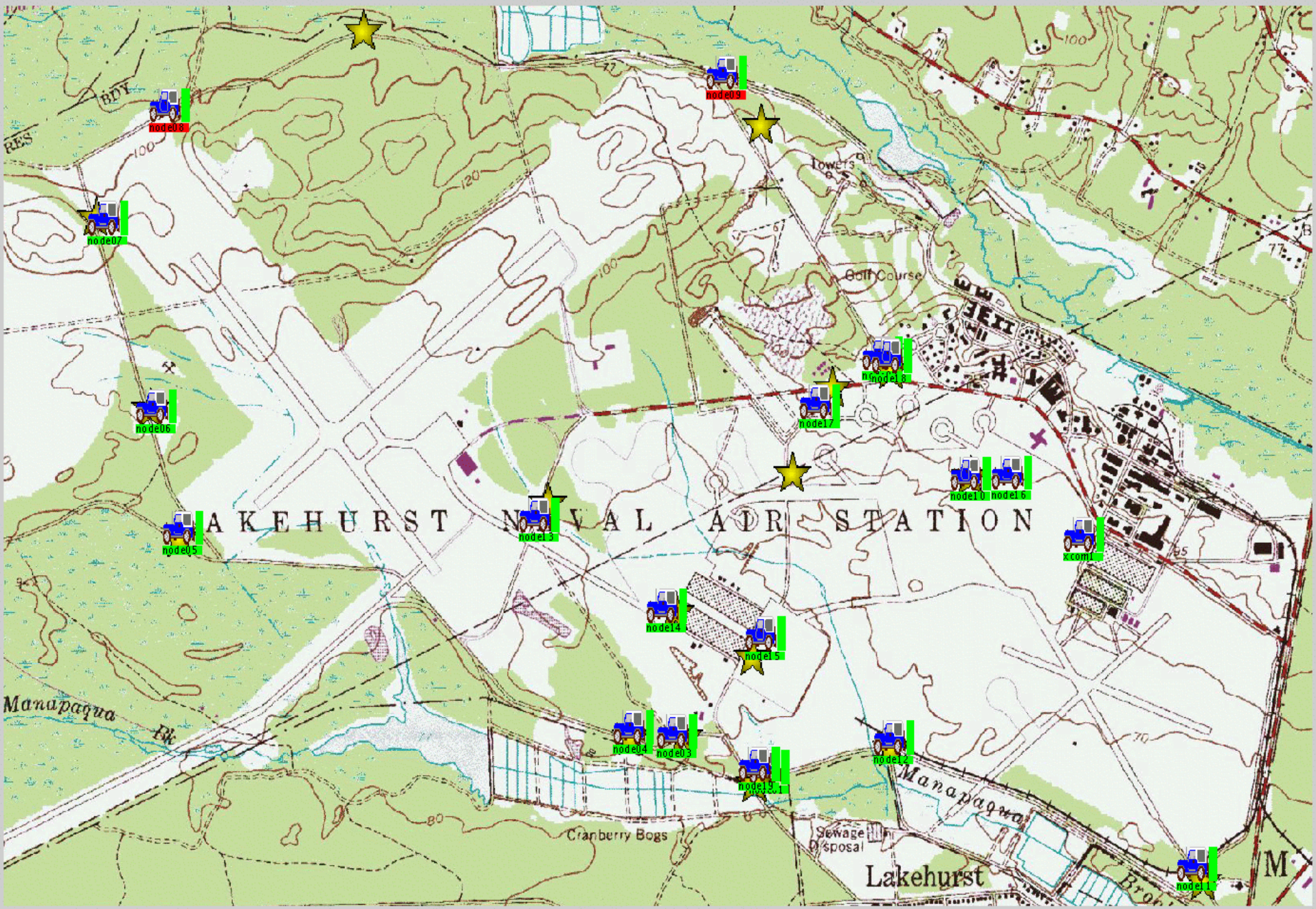
Image File: lakehurst.gif

Reading From: drec.log.XCom.11-09-01_08-38-59

Upper Left (lat, long): 40.048333, -74.375

Lower Right (lat, long): 40.015833, -74.305278

Time: 52006.77603



Waypoint Marker
TOYOTA

Demonstration Configuration

- All Nodes Have Government Application Running on Laptop
  - MGEN / DREC
    - Constant bit rate generator, time stamped
    - Real time display at Command Center of throughput, latency, packet loss for data sent to Command Center
      - Considering adding bytes to heart beat to include status information for other sink nodes
  - JMAP / GPS Logger
    - Constant bit rate generator that includes lat/long, timestamp in the payload
  - Video
  - Situational Awareness
  - TBD Applications

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Results from Prior Baseline Experiment

- **Is the Network Performance Repeatable?**
  - **Throughput**
  - **Packet delivery (loss)**
  - **Latency**

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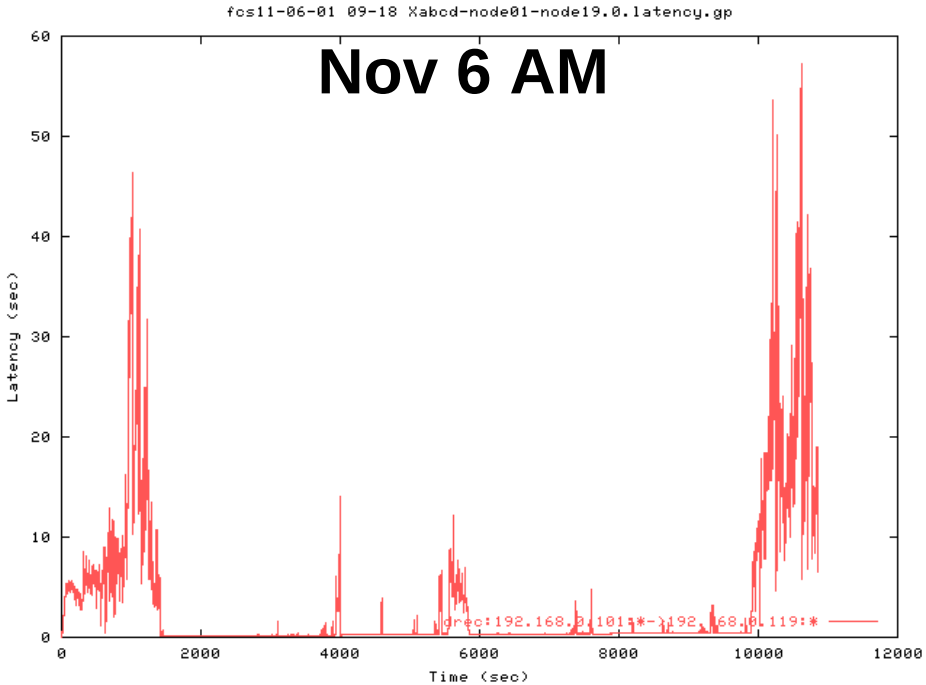
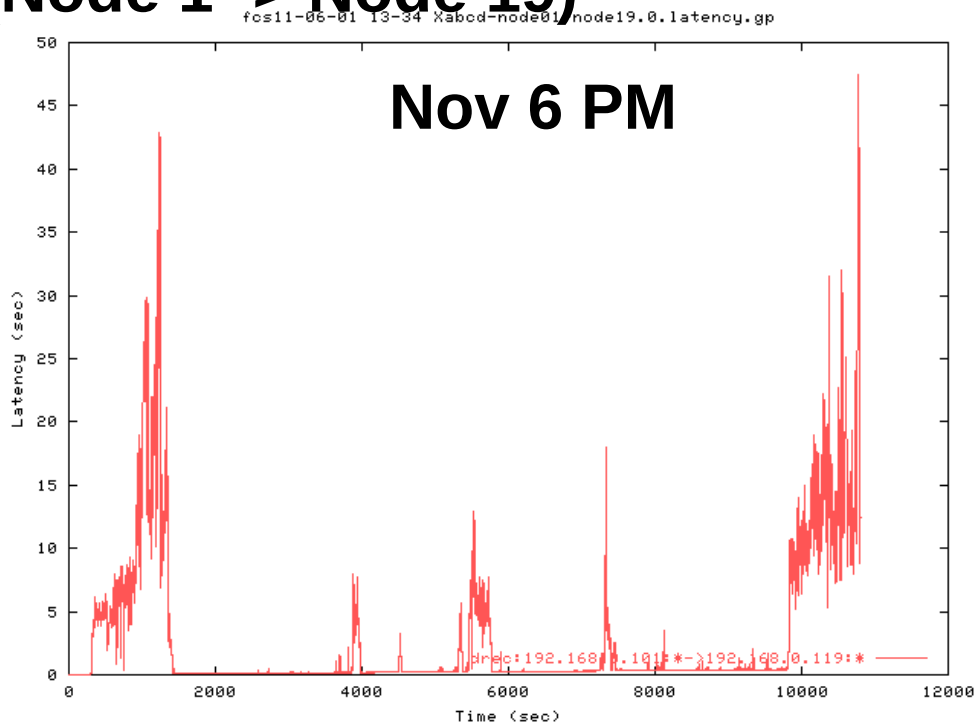
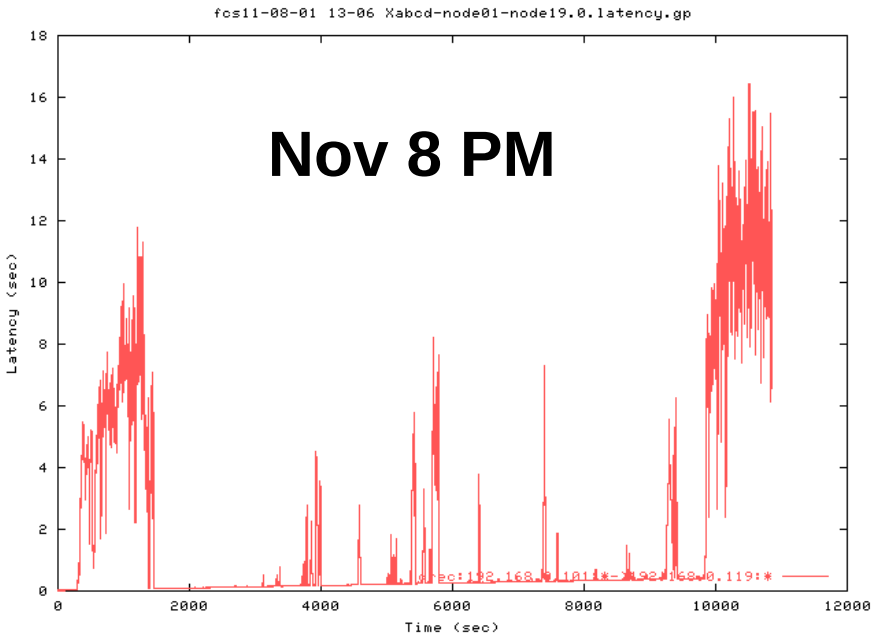
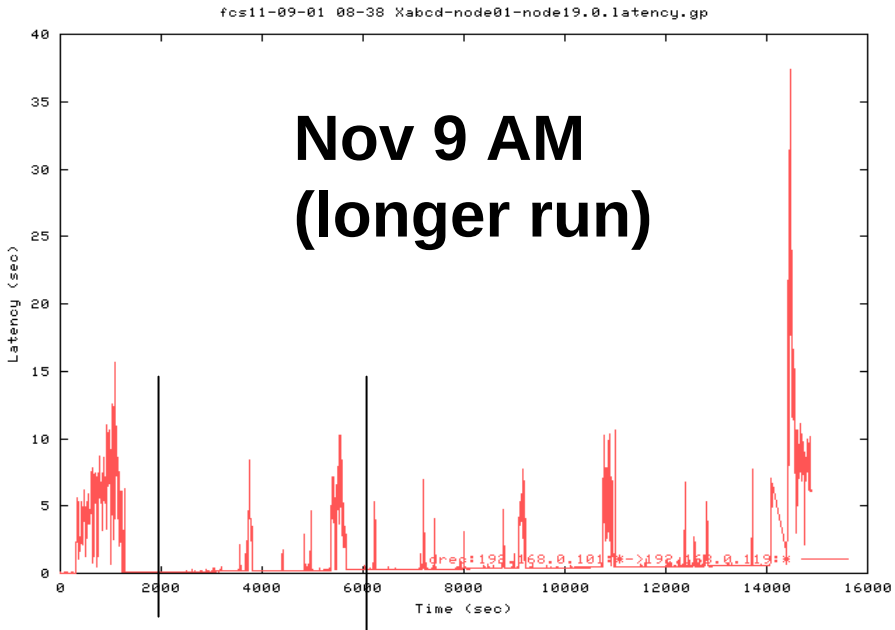
Latency A/B Pair (Node 1 -> Node 19)

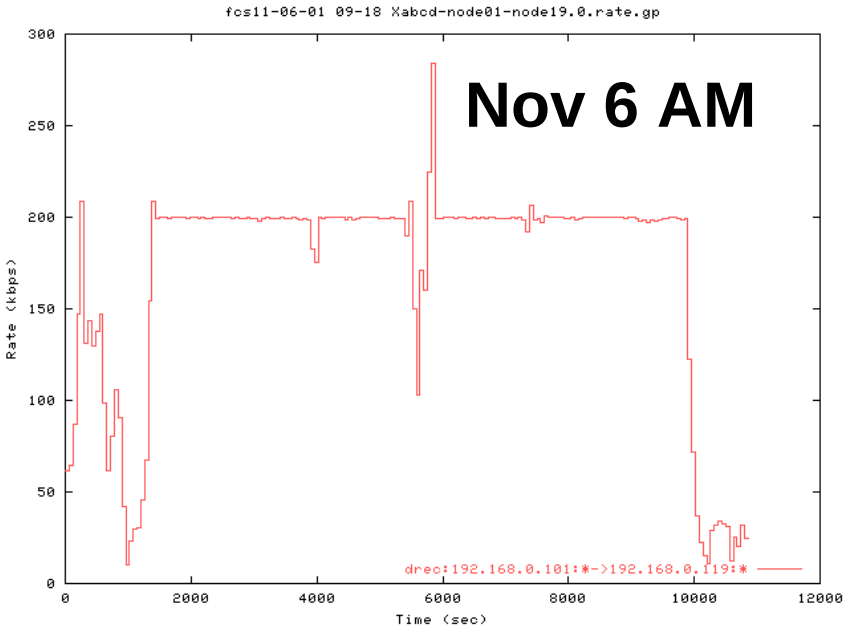


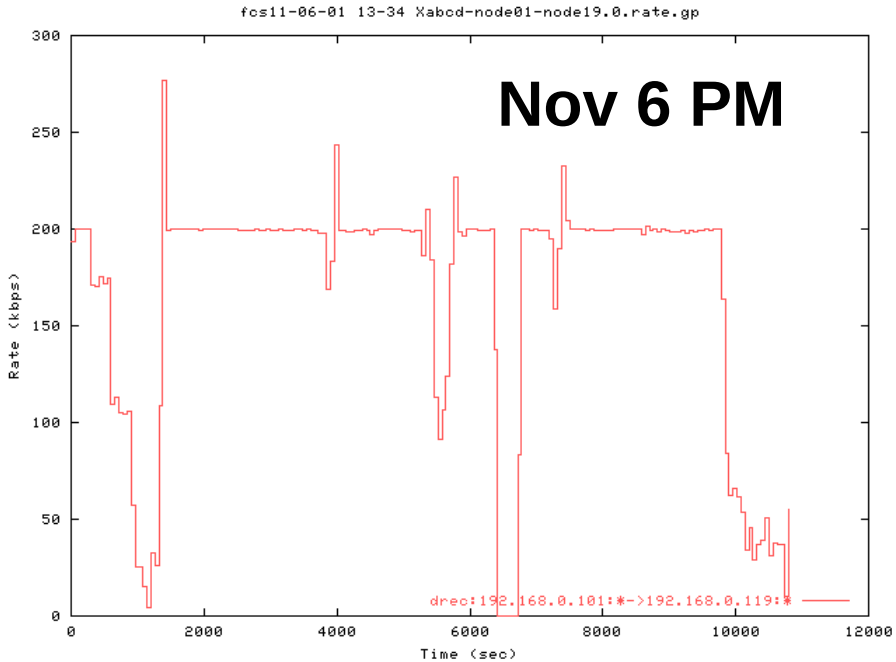


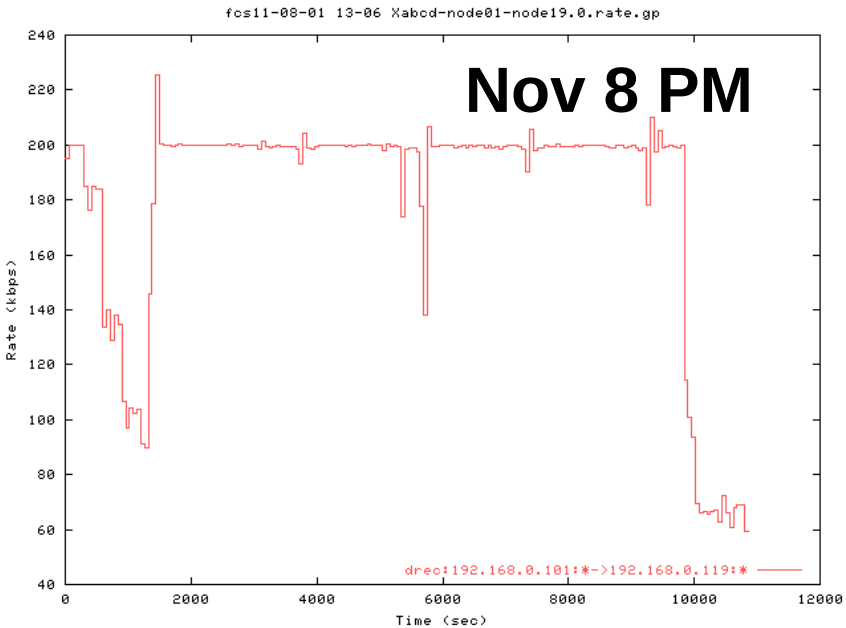


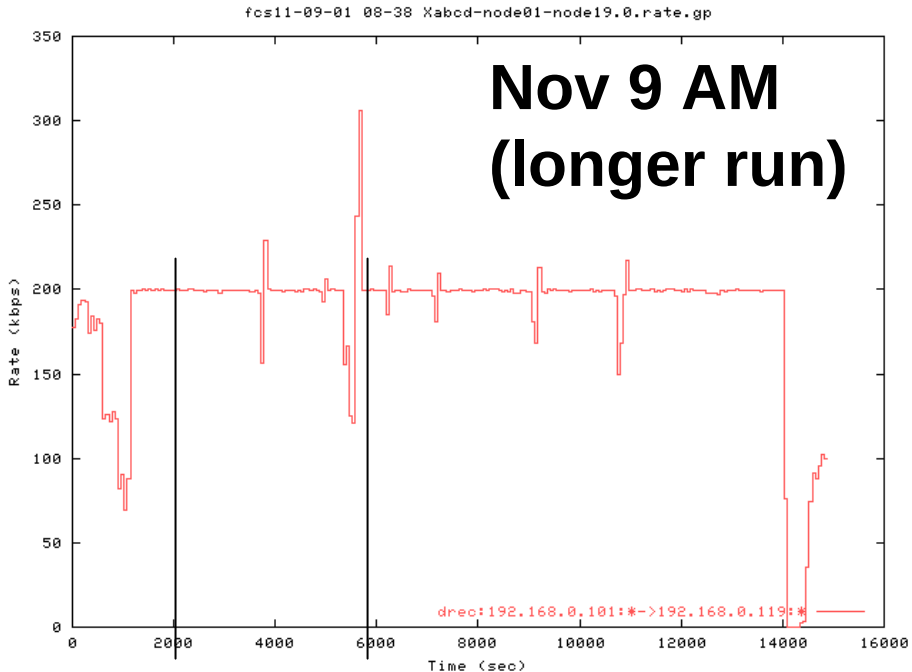


Throughput A/B Pair (Node 1 -> Node 19)



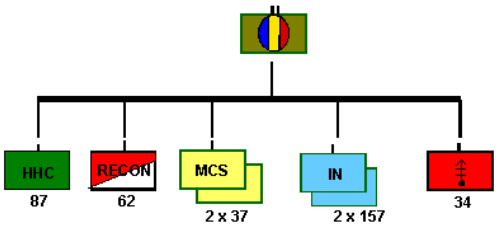




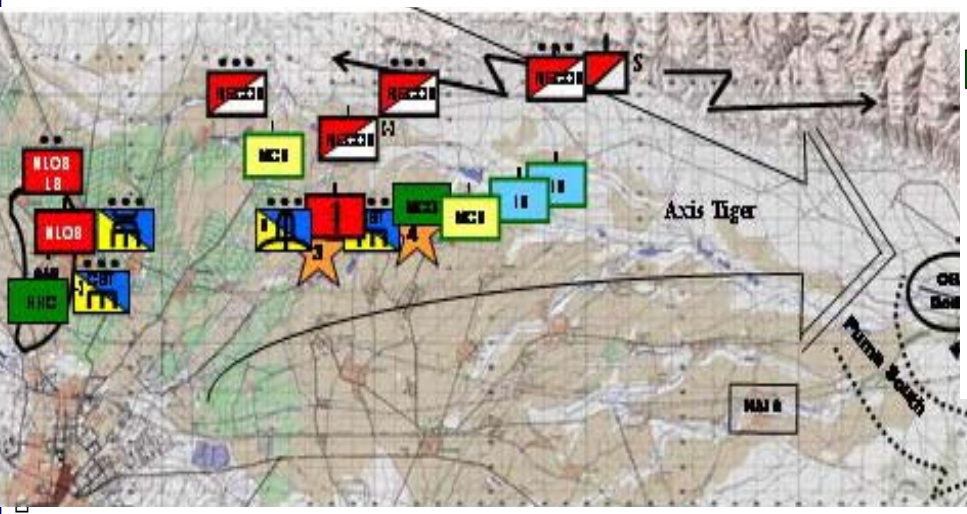


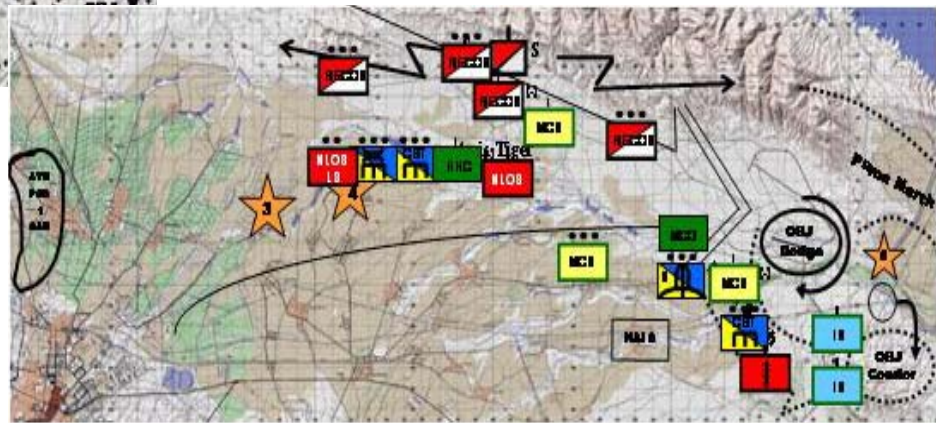
M&S and Field Scenario – SIMILAR (not identical)

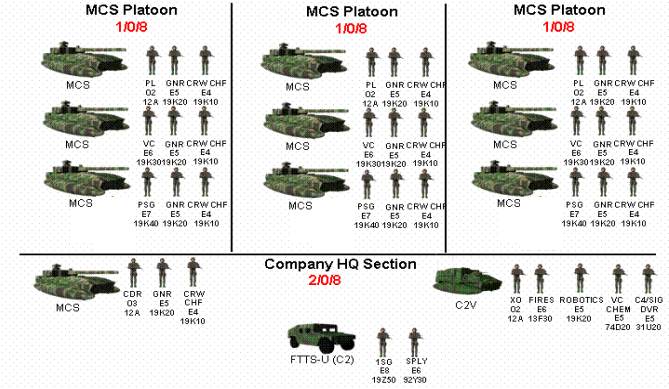
Combined Arms Battalion



571	TOE Personnel
33	FCS Infantry Carrier (ICV)
20	FCS Mounted Combat System (MCS)
10	C2 Vehicle (C2V)
8	NLOS Mortar
10	FCS R&S V
9	ARV-RSTA
6	ARV-Assault
6	ARV-A(L)
15	FTTS-MS (Class III bulk/V)
8	FTTS-U (C2)
4	FTTS-U (SPT)
7	FCS MV (5 MV-E/2 MV-T)
15	UAV CL I L/C Units
	30 Aerial Vehicles
12	UAV CL II L/C Units
	12 Aerial Vehicles
3	UAV CL III L/C Units
	12 Aerial Vehicles
4	81mm Mortar
18	MULE
27	Small UGV







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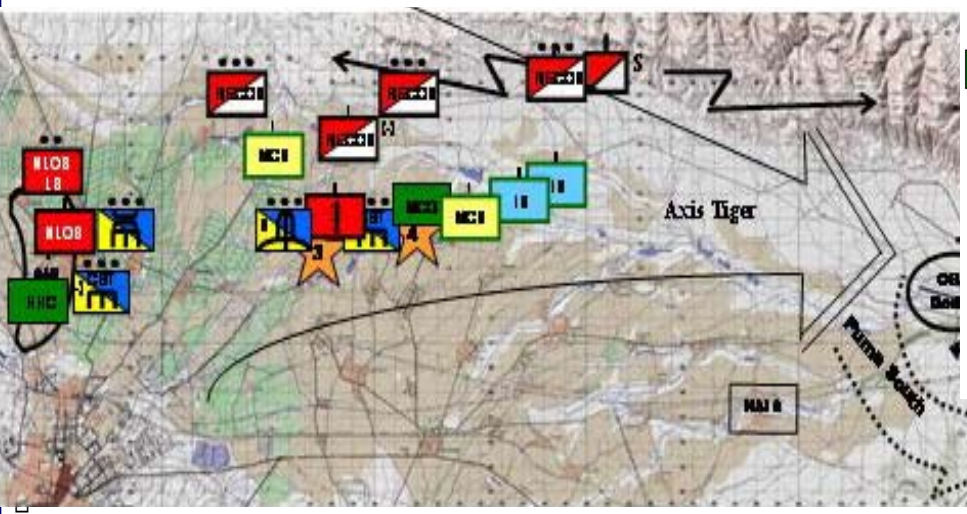
M&S and Field Scenario – SIMILAR (not identical)

Scare you? Me too.



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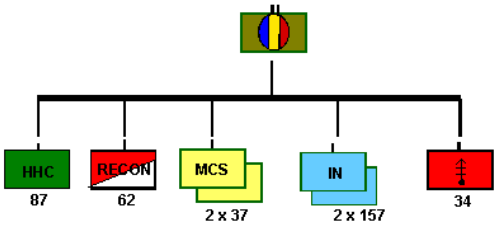

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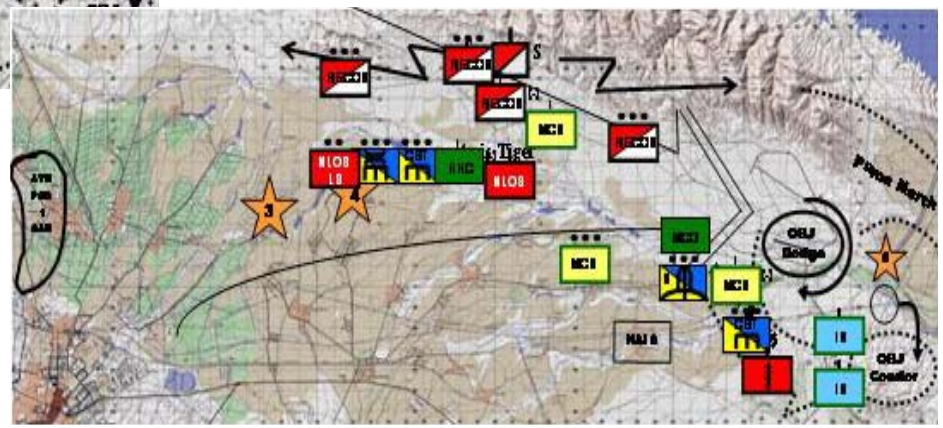

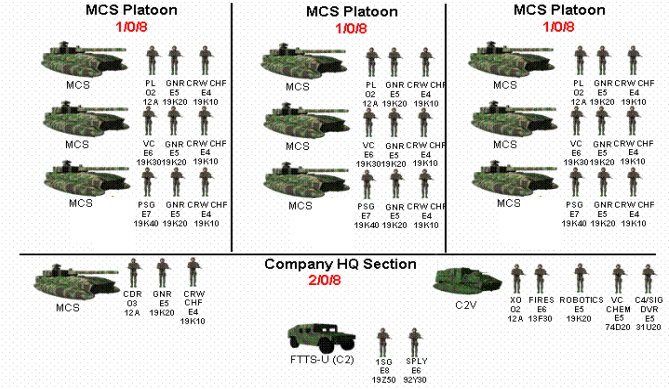

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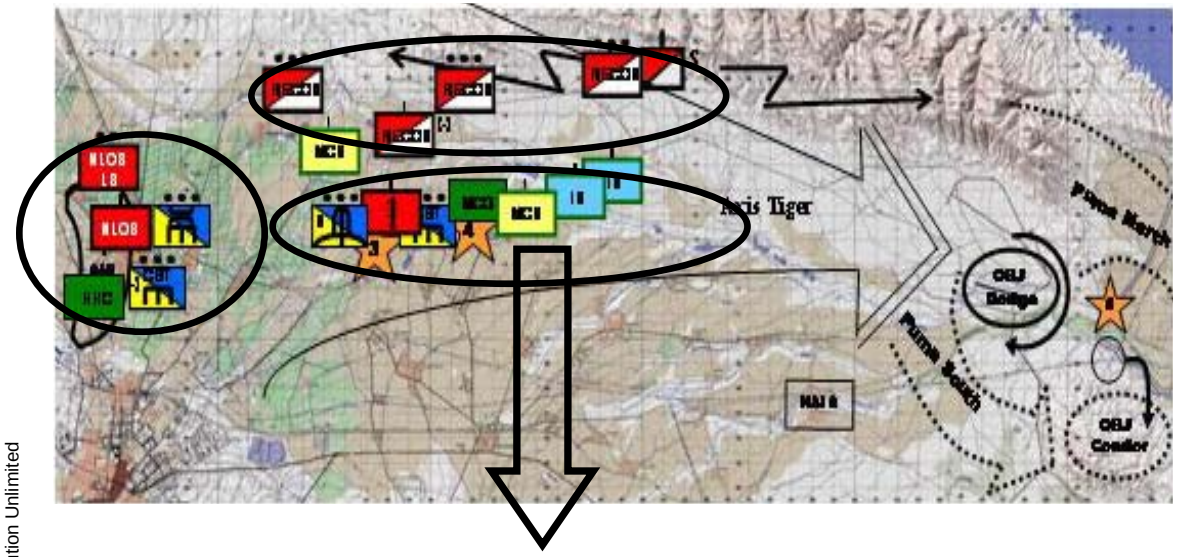
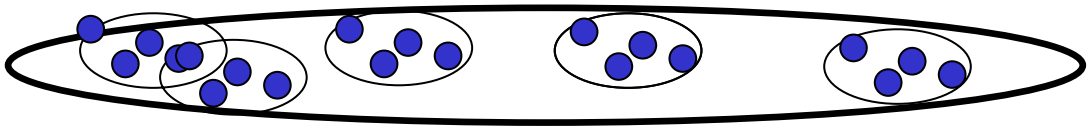
M&S and Field Scenario – SIMILAR (not identical)

Really just three "maneuver" elements – Linked via one or two hops (SATCOM)



Each maneuver element is made up of a number (who cares?) of elements



Where each element is a number of nodes (who cares)
Nodes within an element are "pretty" well connected (1-2 hop likely)
AND
Elements are connected by another "hop" (or two)

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Field Scenario

- Groups of nodes (element) that are “pretty” well connected
  - Lower echelon
  - Reasonably high density of node
    - Soldiers
      - M-16 range 200m
- A maneuver elements is made up of several “groups of nodes”
  - Connectivity between groups of nodes is a little less “rich”
    - Network not as well connected
      - fewer paths source – destination
      - UAV based ? / Advantaged node / SATCOM
- Scenario made up of several maneuver elements
  - Connectivity between maneuver elements is a little less “rich”
    - UAV? / SATCOM
- Applications will require connectivity from lowest echelon to highest
- PHY connectivity *potential* same
  - Data rate / Power adjustable by CBMANET
  - Links formed by CBMANET (or OLSR in Govt Baseline)

CBMANET
covers the entire tactical network

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Logistics

- Mobile Vehicles (SUVs / airborne)
  - GFE Provided
    - Laptop (and user) w/ applications
    - Driver for vehicle
    - Antennas will be mounted
    - AC/DC power available
  - Performer provides a “box” and integrates it into the SUV
    - “BOX” contains CBMANET “magic” and GFE PHY
    - “interface” (ENET) to GFE laptop with the apps
- Place to work
  - 1 Trailer per performer
    - 120/208V, 100 amps
  - LAN Connection
    - Internet connection
  - Phones
    - 2 POTS lines into one trailer of each Performer team

We’ll work with you wrt the “integration” – but in the end you are responsible

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Logistics

- Food
  - Arranged food ($10/day/person) for the government support team
    - We have been requested by base security to minimize entrances to base due to added burden and delays (i.e. don't plan on departing base for lunch)
- Lodging
  - block off hotel rooms
- Security
  - Obtain badge form to receive picture ID
  - No cameras or videos
    - Except by exception

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Summary

- Government furnished
  - Radios (physical layer)
  - Applications
  - Vehicles (mobile nodes)
  - Scenario
  - Baseline test
    - Results for comparative analysis
  - Data collection for performer runs
    - Comparison against baseline
  - "Group" Logistics
    - Frequency clearances
    - Safety releases
    - Access to base
    - Food, water on site

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I'm with the Government and I'm here to help…
Trust us, we have done this before