Technology Work Session for the South African Army; Hosted by the CSIR

Communications and Communications EW in the Battle Space

Future Static and Mobile Communication Systems

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Date: 2012-04-19

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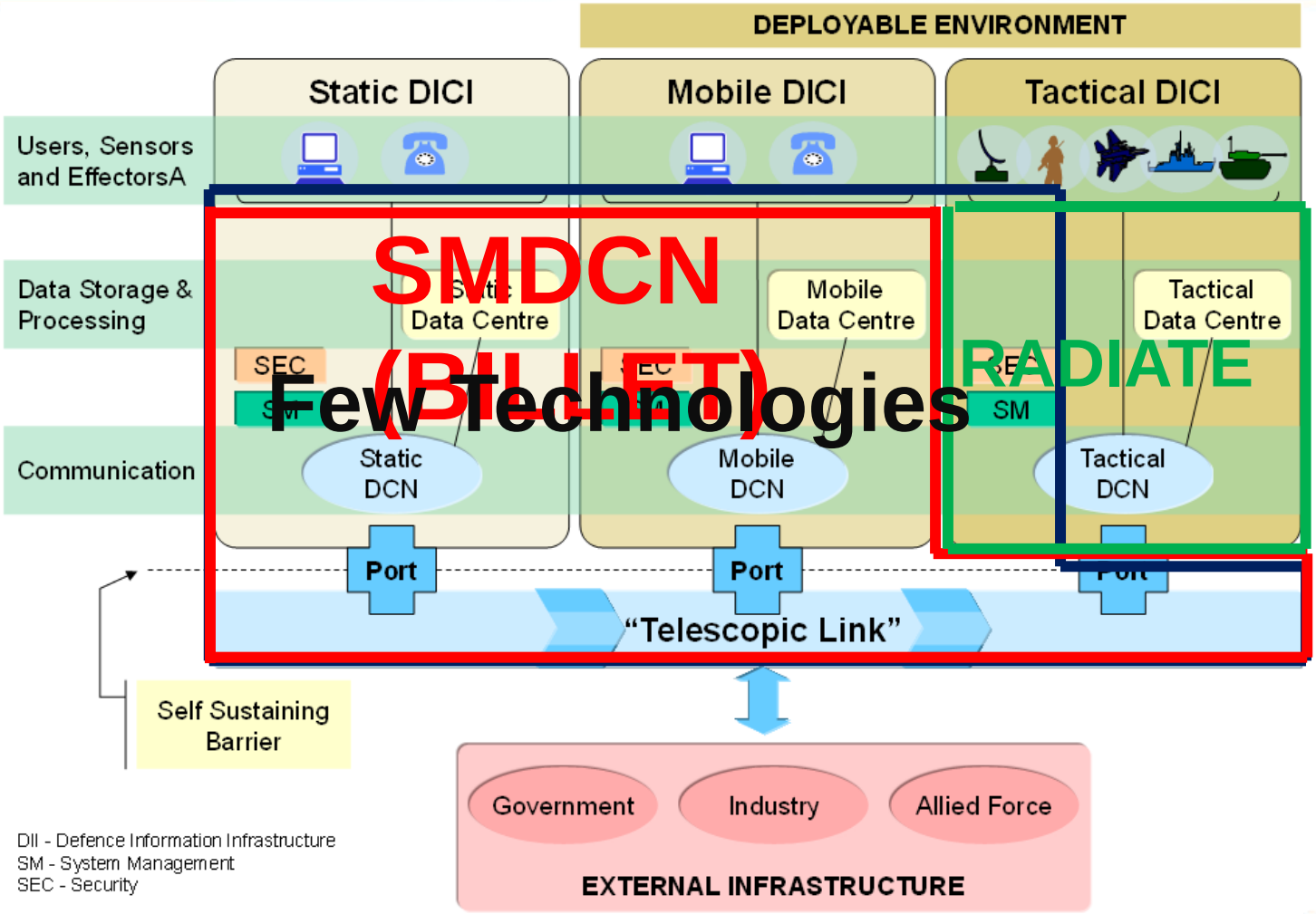
Introduction

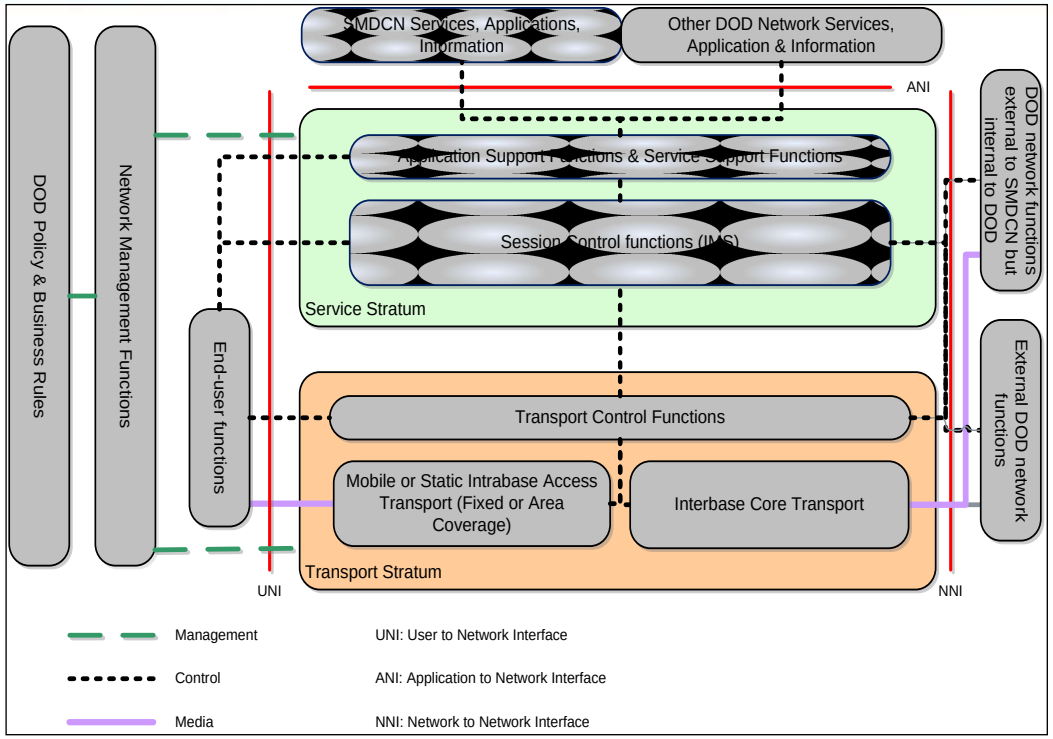
- Defence Information and Communication Infrastructure (DICI)
- Next Generation Network (NGN) Architecture
- Impact of a Service Based Network
- Tactical, Mobile and Static Network Convergence
- Area Coverage
- Network Modelling and Simulation

Defence Information and Communication Infrastructure



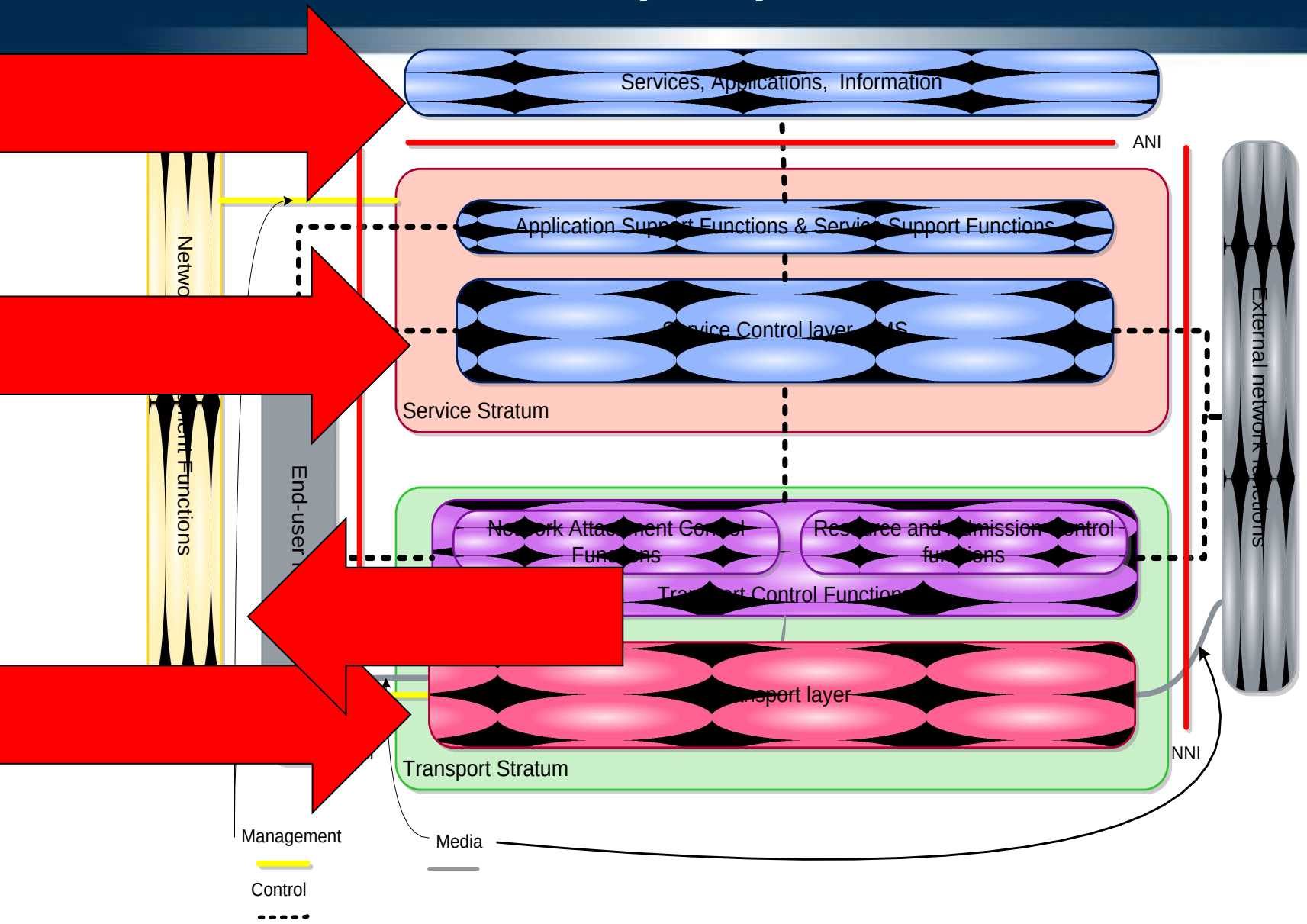
DII - Defence Information Infrastructure
SM - System Management
SEC - Security

Next Generation Network (NGN) Architecture



"*A Next Generation Networks (NGN) is a packet-based network able to provide Telecommunication Services to users and able to make use of multiple QoS-enabled transport technologies and in which service-related functions are independent of the underlying transport-related technologies.....*" ***ITU***

Next Generation Network (NGN) Architecture Overview



NGN as a Service Based Network

- The Next Generation architecture has also created a new paradigm from managing networks in terms of the transport layer into managing networks in terms of services.

- The one goal of the NGN architecture is to provide an environment that can support multiple types of services and provisioned across multiple types of transport.

- The Next Generation Service Architecture will support a wide variety of services which includes the following:
    a) Voice
    b) Data (Connectivity) Services
    c) Multimedia Services
    d) Virtual Private Networks (VPNs)

So what are services?

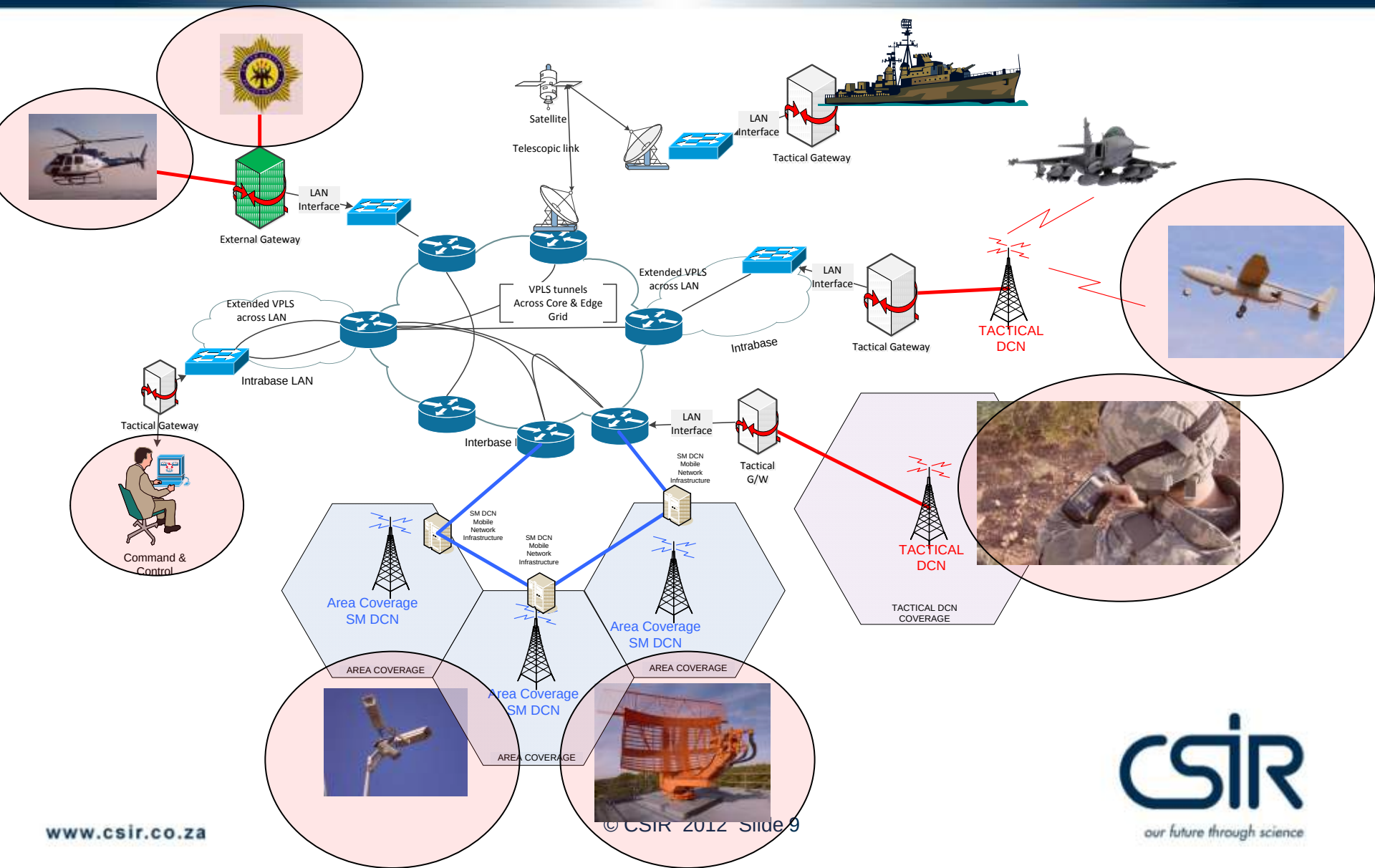
SMS
Voice Calls
Video Calls
Internet
SMS to Fax
Fax to email
……

Cloud Services

Why are services important?

- Services provide value to the user, the network is just an enabler
- Applications are moving to the cloud.
  - No need for the development of clients
  - Services can be delivered on almost any device (PC, Tablet, Smart Phone…)
  - Data is processed in the cloud and users devices need less processing power.
- Application Maintenance becomes easier
- DoD can save Millions in Licensing fees

Impact of a Service Based Network



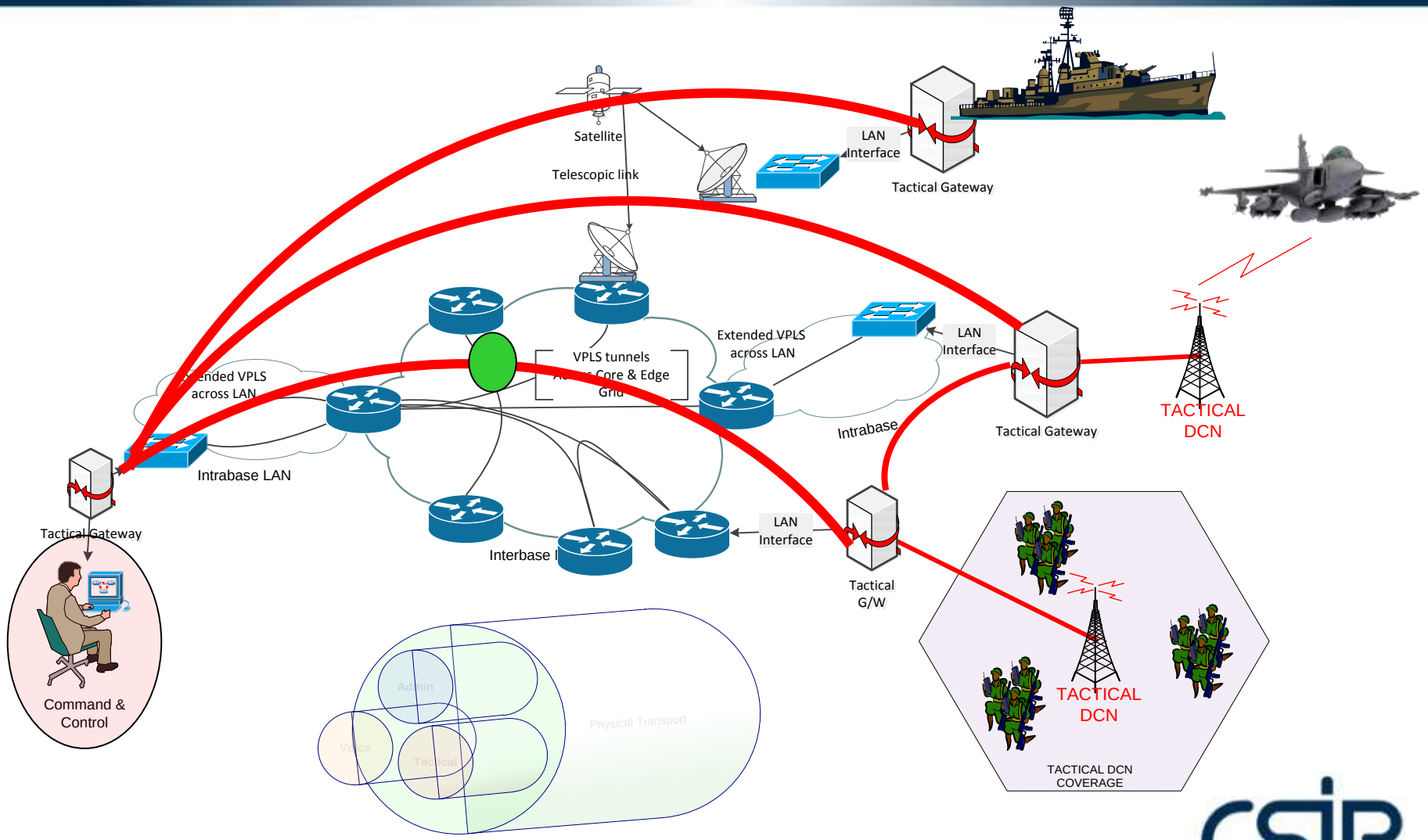
Tactical, Mobile and Static Seamless Network Convergence

- The adoption of next generation networks has the potential to change the way defence forces use static, mobile and tactical networks.
- Tactical, mobile and static networks are converging into seamless defence networks utilising the same services, where services are delivered independent of different transport technologies.
- Static and tactical networks can no longer be distinguished bases of technology, but the split is rather on a virtual network level.
  - E.g. WiMax is used provide static wireless infrastructure on bases but also utilise as a battle space network technology. The South African police force for the 2010 World Cup deployed a WiMax network on top of their Tetra Network in the Eastern Cape to provide high speed data services in their vehicles.

Tactical, Mobile and Static Seamless Network Convergence

- That does not mean tactical radios are out-dated, but rather that tactical radios should converge into the next generation networks and where possible be extended by other high bandwidth technologies to enable the defence force to enter the net-centric era.
- Tactical radios can be seen as a tactical access technology, just as 3G and LTE can be seen as a mobile access technology.

Tactical, Mobile and Static Seamless Network Convergence



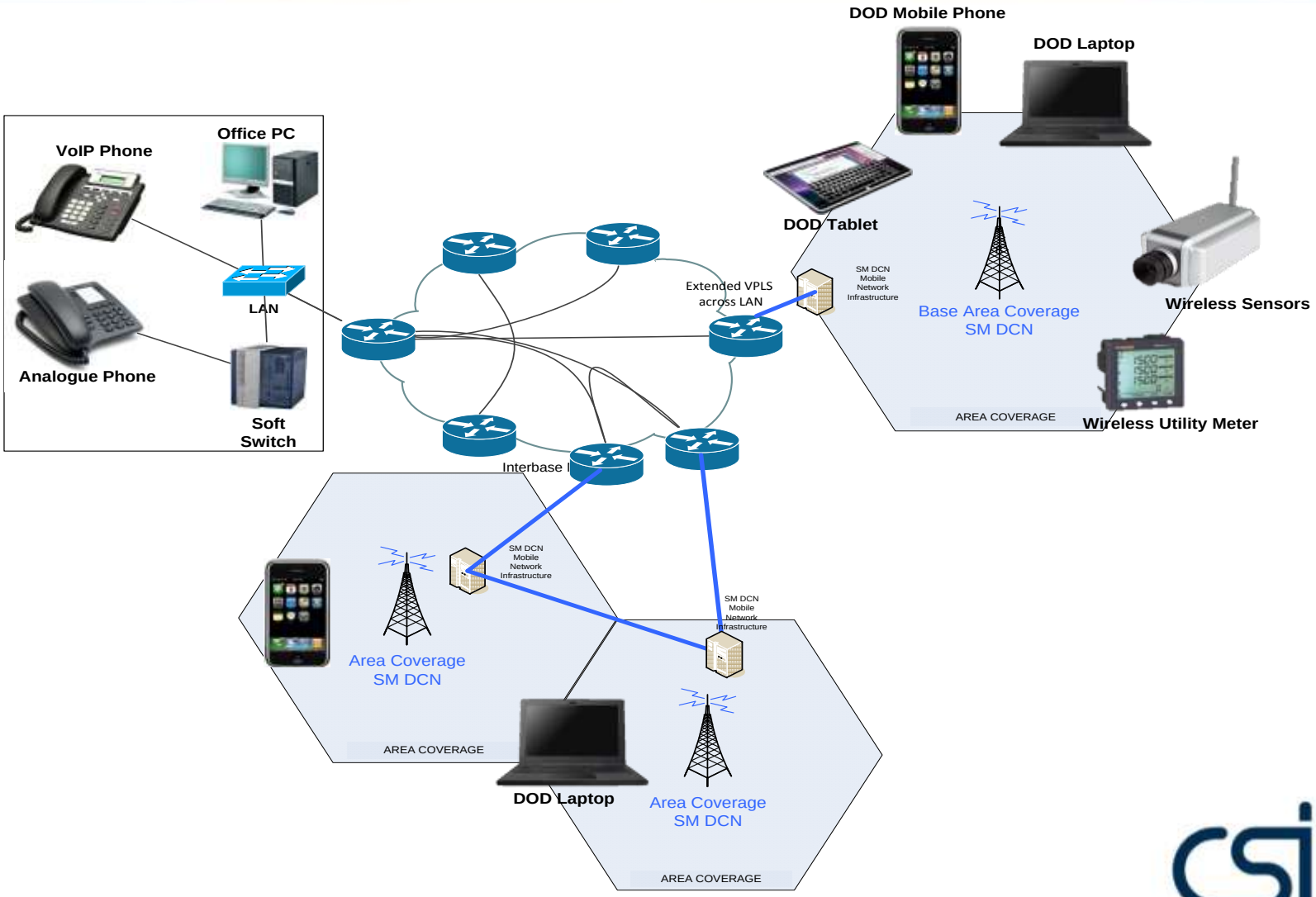
Area Coverage

- Area Coverage is a key component of the SMDCN to extend the mobility of DOD personnel within the SMDCN.
- Although all tactical mobile communications are achieved via project RADIATE, the ability for support personnel to have mobile communications, both within the bases they are deployed to, and outside the bases over the entire South African countryside is the goal of area coverage.
- Area Coverage will be build using one, or many, of the Next Generation technologies including 3G, LTE and WiMAX.
- Legacy technologies like the current HF, VHF and UHF radio repeater systems that the DOD currently utilises for their mobile radio communications can be integrated via gateways.
- The requirement is also to integrate the TETRA/TETRA2 and radio systems of the South African Police Services and Emergency Services for Joint Operations purposes.

Area Coverage Technologies

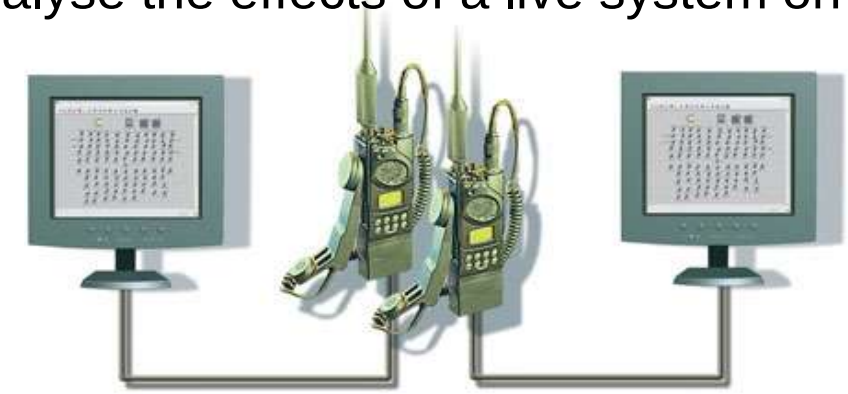
	Peak Download Rate	Peak Upload Rate	Coverage(Cell) Size	Frequency	Note
3G - HSDPA	14.4 Mbps	5.7 Mbps	5-50km	900 MHz - 2100 MHz	This is the achieved speeds and not the standards predicted speeds
3G – HSPA +	21.6 Mbps 42 Mbps (2x2 MIMO)	5.8 Mbp 11.52 Mbps (2x2 MIMO)	5-50km	900 MHz - 2100 MHz	This is the achieved speeds and not the standards predicted speeds
WiMax - 802.16d	3.7 to 6Mbps	1 to 2Mbps	5-30 km degradation after 10km	2.3 GHz to 3.5 GHz 5.5	Does not support mobility and only used for point to point links like backhaul.
WiMax - 802.16e	3.7 to 6Mbps	1 to 2Mbps	5-30 km degradation after 10km	2.3 GHz to 3.5 GHz	This is the achieved speeds and not the standards predicted speeds
WiMax - 802.16m (WiMax 2)	100Mbps (mobile) 1 Gbit/s (fixed)	50Mbps	5-30km degradation after 10km	698-960 MHz 2.3 GHz to 3.6 GHz	This is standard indicated speeds.
LTE	100Mbps (mobile) 1 Gbit/s (fixed)	50Mbps	5 – 100km with slight degradation after 30km	700 MHz - 2.6 GHz	This is the standards indicated speeds. Achieved speeds is about 70Mbit/s

Area Coverage

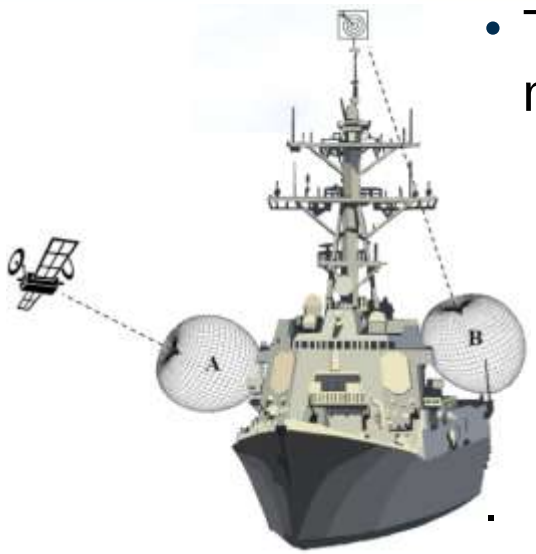


Network Modelling and Simulation

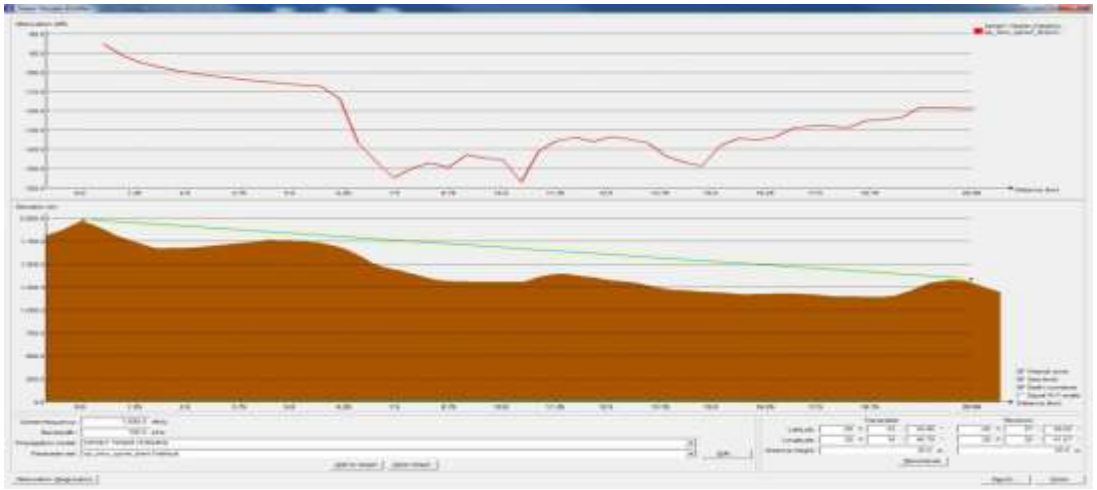
- Network modelling and simulation has become an extremely valuable tool in today's complex networks and their protocols, architectures, and dynamic topologies.
- The relatively lower costs that modelling and simulation offer, along with enabling rapid development and increasing productivity, make these capabilities invaluable.
- Specific operational scenarios can be simulated to determine the effects of moving platforms (including antenna position) on the communication links as well as influences of different co-located transceivers on the same platform.
- Testing live network hardware or software applications connected to simulated networks to analyse the effects of a live system on the future networks and vice versa.



Tactical Network Simulation



- The modelling environment includes the following modules to ensure simulation accuracy:
  - Radio frequency propagation models
  - Effects of terrain on wireless communication
  - Antenna modelling
  - Interference and jamming
  - Network element mobility
  - Wired and wireless links



Conclusion

- The projects currently within the DICI domain need to be integrated on a higher systems level to ensure that proper convergence takes place.
- Project BILLET and RADIATE will be procuring new telecommunication technologies in the near future that will impact the future SANDF strategy and operations.
  - The SANDF needs to consider the future operation concepts, and the impact the projects will have on other SCAMP projects.
- A service approach should be followed for the future development and upgrades of applications.
- The NGN should increase productivity of the DOD to better achieve the goal of providing a national defence service. Thus DOD should be capable of delivering better and more services with the same amount of personnel or deliver the same service with fewer personnel.

Questions

Thank You

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