CONCEPT PAPER

DAMM® – Benefits of Distributed Critical Communication Architecture

DAMM

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Distributed intelligence

A distributed infrastructure for critical communication systems offers some major advantages over centralized solutions. Key advantages in a decentralised network are:

- Network-wide data is available in all nodes
- All communication features are available, even if a node is isolated from the network
- Network-wide network management system is visible on any node
- Data logging (recording) can be activated on any node in the network
- Gateways to dispatchers and external networks can be activated in any node
- It is easy to add/remove nodes

In DAMM's distributed architecture, networks can be scaled up or down easily and seamlessly, ensuring that all basic network functions are present in each node, and all nodes are equal in terms of capabilities. All vital information is shared and replicated and exists on all nodes in the entire network.

This adds benefits such as availability, reliability, flexibility and scalability.

Flexible system scaling

DAMM® systems are fully scalable, with no limitations, regardless of the size of the network. The plug-and-play principle is effective in expanding network capacity to include more users and in extending the coverage of the network itself, with a predictable CAPEX.

This makes it possible to scale and expand the system based on growing needs. Adding a node to the network thus also adds extra intelligence and processing power to the system, so there is no upper limit for expanding the system in terms of coverage or capacity.

The IP-based technology platform gives full architectural network flexibility. You can increase capacity, extend network coverage or move capacity from one area to another, as required, even while the radio communications system is fully operational.

The IP-based DAMM platform connects all network components – including base stations, dispatchers, network management tools, external gateways and other applications – in one flat distributed IP architecture.

Bandwidth efficiency

All communication in the DAMM TetraFlex backbone is based on IP. Since each node is connected to the network via a router, only relevant data are forwarded

Group and individual calls are distributed efficiently as multicast IP traffic on a UDP-based protocol, with a minimum of data overhead.

The propagation of multicast messages is similar to the nature of radio group calls:

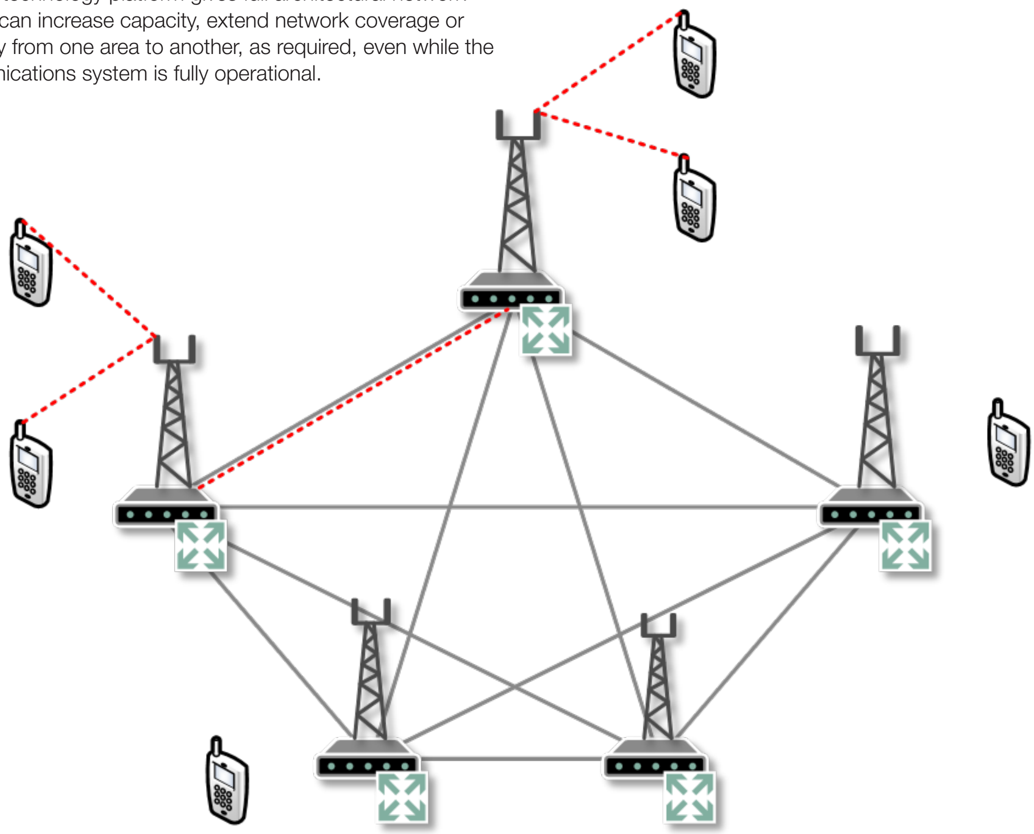
- Group calls are announced as multicast messages on the infrastructure
- Each node will join this particular multicast group and receive the data only if there are subscribers attached that belong to this distinct group
- When the call is ended the multicast groups are dissolved until the next call is established.

t is important to note that the backbone traffic is only directed to the relevant nodes.

This peer-to-peer connection between nodes means that there is no back-haul to a central core requiring high-capacity communication, and network load is distributed to the required branches only.

This also improves call setup time significantly, as the decision on call-reply is made locally in the network.

The bandwidth requirements are very low, only 22kbit/s per time slot for both upload and download. Only the actual time slots in use consume bandwidth.



Network management in distributed systems

All system-related information including the subscriber database is distributed to all nodes in the network. This means that they can be accessed from anywhere within the infrastructure using a single network management tool.

Any change to the system settings is replicated throughout the entire system. To keep the network load to a minimum, only the changes are replicated.

Software updates are also deployed from a single point and distributed to all nodes in the network.

System traffic load is thus not increasing as a result of growing networks. The number of sites and subscribers is not limited by the system architecture.

Building fault-tolerant networks

With all system information constantly replicated to all sites in the network, local call and data traffic will always continue uninterrupted, with all features intact, even if one or more local sites lose connection with the rest of the network. This is also the case for encrypted traffic.

Distributed network topology also allows for building more robust networks, compared to traditional centralized networks with star topology.

Building networks in mesh-topology provides redundant paths through the network and the use of IP routers continuously optimizes routing paths through the infrastructure.

Because of the distributed intelligence at each node, this type of topology makes the system less sensitive to latency and jitter in the IP network. This makes it possible to use a variety of different network technologies, e.g. microwave and satellite links.

Features like gateways, voice and data logging can be installed on any radio node and distributed throughout the network. These features can be configured for redundancy, making it possible to have geographical independence of critical functions, increasing system availability.

It is of course also possible to place certain functions such as voice and data logging at a central point, in a controlled environment like a server room.

Network security

In all critical communication systems, security is key.

In addition to the strong built-in security features like authentication and air interface encryption, distributed systems offer several solutions for adding additional security to the network.

The use of Generic Routing Encapsulation, in conjunction with IPsec Virtual Private Networks, ensures integrity of the infrastructure.

Data vital to maintain system security, such as key files and a subscriber database, are stored in encrypted form in the DAMM infrastructure.

As a further security feature, end-to-end encryption may be applied. This protects information as it passes through the system, both on the air interface as well as inside the infrastructure.

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