



Integration Demonstrator for SEAS DTC CC Theme Communication Projects

CC022

SEAS DTC Conference 2009

Rationale

Robust and efficient communications within a mobile ad-hoc network are required to ensure that the available bandwidth is used effectively.

In the military environment, applications would include:

- Meshed UV deployments
- Deployments of manned vehicles/vessels/aircraft, where each unit can 'see' many others
- Intra-vehicle/vessel/aircraft communications

The key military benefits of such a network architecture are

- Survivability under difficult operating conditions
- Allocation of bandwidth according to utility.

Related DTC projects



CC001 (developed by Roke) provides robust transmission of data over dual paths with rapid re-routing.

Failover capability covers up to two points of failure within the mesh and eliminates the potential for loss of critical data.

CC004 (Roke) provides efficient sharing of capability information across a network.

CC005 (BAE Systems) provides innovative market based bandwidth allocation techniques.

CC007 (Roke) provides a controlling function to command the transport system provided by CC001 and CC005 to create and destroy application data streams between data sources and data sinks.

Nature of the work

To produce an integrated demonstrator of enhanced resilient communications in a resource constrained environment with a rapidly changing network topology.

The research is applicable to any network architecture which comprises a number of nodes interconnected via multiple communications links, and which utilises IP as the transport layer protocol.

Progress to date

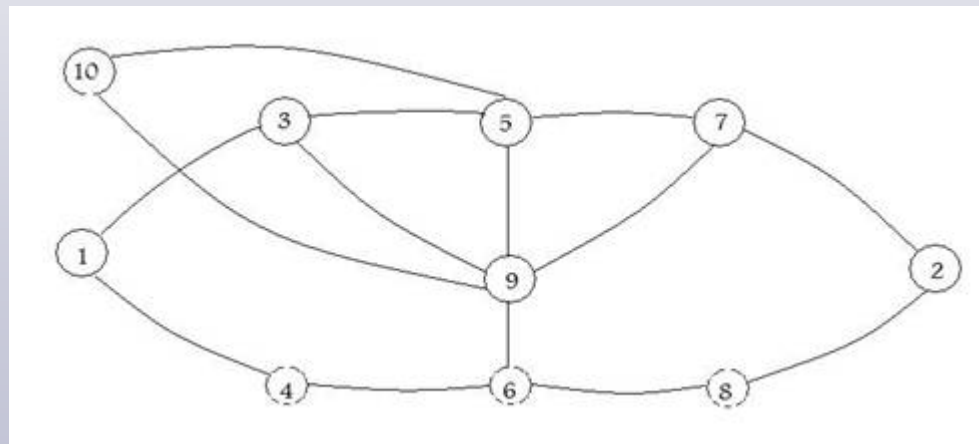


Discussions on how research outputs that were developed independently and without a requirement to be integrated with each other can be brought together (non-trivial!)

.... Architecture and interfaces agreed, developed and documented (Q2 2009)

Demo application selected (face recognition and counting), specified and implemented

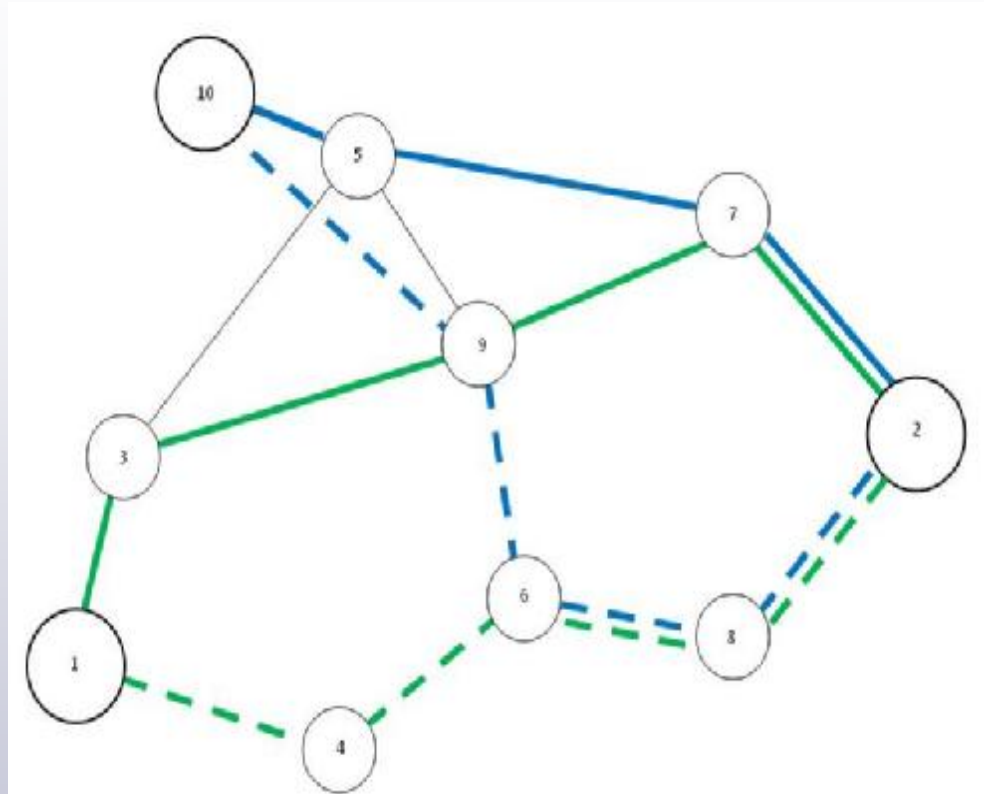
- Resilient network extended to 10 PC-based nodes
- Operating system upgraded for compatibility with CC005



Logical representation of network topology.
Source nodes 1 and 10, destination node 2.

Progress to date

- CC001 Development environment extended with remote testing and backup scripts.
- Protocol and algorithm extended to handle dynamic links, including intelligent allocation of endpoint addresses.
- Multiple data sources require additional message parameters.
- Overlapping data paths within mesh required modification of cleanup routine.
- Additional monitor output



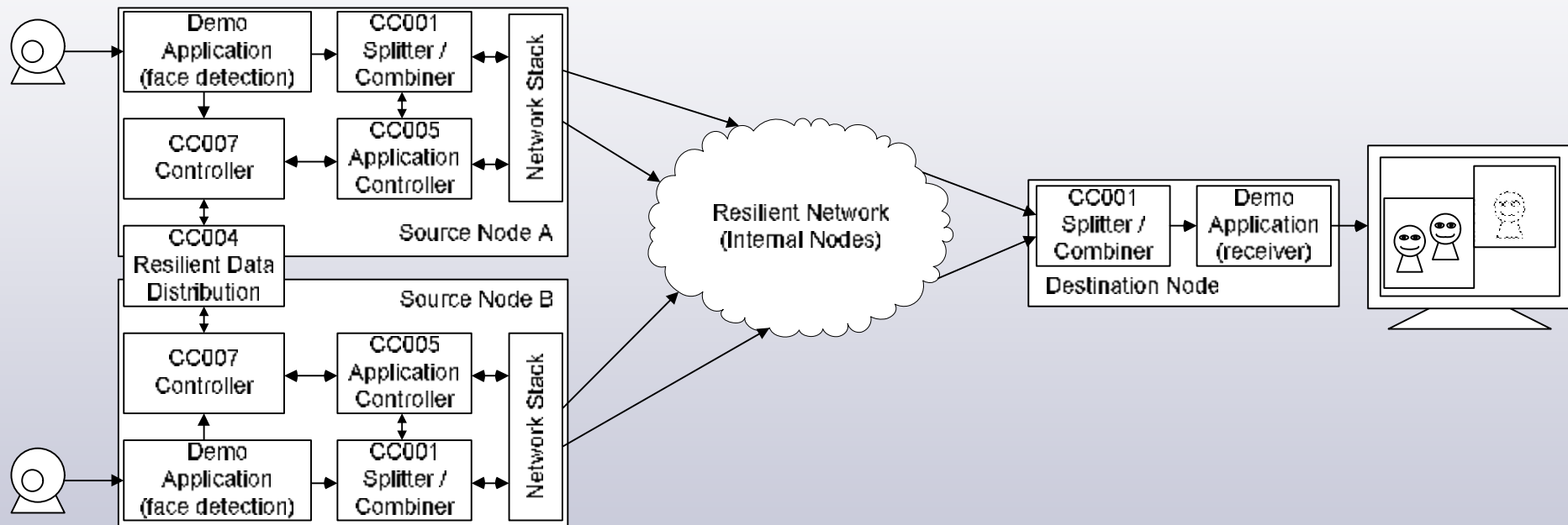
Resilient comms between two sources (1&10) and one destination (2). Paths between different source/destination keyed by colour, partner paths keyed by dashed lines.

Progress to date



- CC005: Initial development to support multiple interfaces and multiple flows.
- Specification of CC007 control interface agreed and implemented, ready for integration testing.
- Application changed to daemon to facilitate dynamic establishment of links.
- Filter mechanism established to snoop bandwidth utilisation packets and enable route discovery.
- Virtual machine demonstrator replica in development to test MPLS flows with CC005.
- Visualisation tool is being developed.

The Demonstrator



The Demonstrator



Two end nodes run a demo application to perform face detection (using OpenCV) on video inputs.

CC007 Controller is informed of the current number of faces detected by the local demo application.

This information is distributed among instances of CC007 on every node (using CC004) and used to calculate the relative priority for each application.

The priority is sent to CC005 (Application Bandwidth Controller) as a priority for that application's data flow.

CC005 will calculate a bandwidth to allocate to the data flow and send this to CC007 which will in turn tell the demo application to set its data rate accordingly.

Visualiser will show the difference in quality of the two data streams.

CC001/CC005 underlying infrastructure operation demonstrated with separate visualisation tools (developed jointly by Roke and BAE).

Expected outcomes

The expected outcomes of this project are:

- Architecture specification (delivered Q2 2009)
- Demonstrator (Q4 2009)
- Technical report (Q1 2010)
- Presentation at the DTC Conference (Q3 2010)