SuperJANET5

Service Model

Introduction

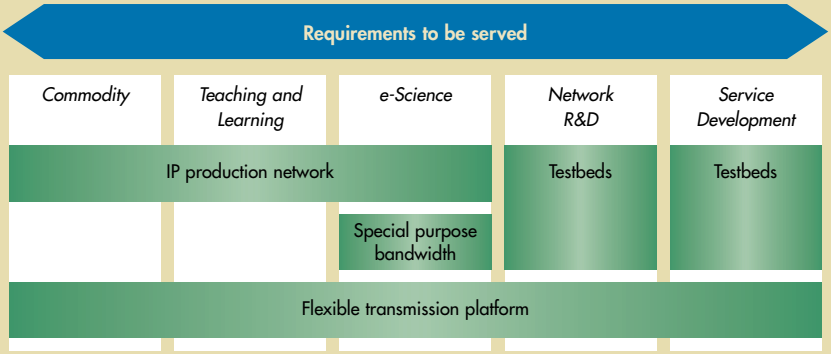
This document outlines the service model for SuperJANET5, the replacement for the current JANET backbone, and how it can be built. It describes how a flexible transmission platform can be constructed which will enable services to be deployed responsively and with predictable costs.

A more detailed technical report that complements this document is available at:
http://www.ja.net/SJ5/service-definition.doc

Background

The diagram below outlines an architecture that has been developed to meet the requirements for SuperJANET5 as expressed by the user community, a summary of which can be found in the report *An Architecture for Diversity* at:
http://www.ja.net/SJ5/requirementsanalysis/an-architecture-for-diversity.pdf

An Overall Architecture for SuperJANET5



The ability to build and scale separate network services at a predictable cost, and within timescales that are as responsive as possible to user requirements, is fundamental to building a reliable, world-class network that meets its users needs, now and into the future. The extent to which this will be achieved is dependent upon the amount of control that UKERNA, as the network operator of JANET, has over the basic network transmission infrastructure.

The key design criteria for SuperJANET5 that allow the requirements for the network to be met are as follows:

Requirement	Design Criteria
Reliability	Minimise single points of failure Reduce components and complexity
Scalability	UKERNA controls costs of adding large amounts of bandwidth when needed
Separability	Configure parallel purpose-built networks via control at the transmission level
Flexibility	UKERNA able to quickly change configuration of the network when needed
Visibility	Controlled access to network monitoring and measurement information by end users

It is clear that there is a continued need for SuperJANET to be operated, at least at the IP level, by UKERNA to satisfy the demanding and diverse requirements of the broad community served by JANET. However the network is built it must provide the following:

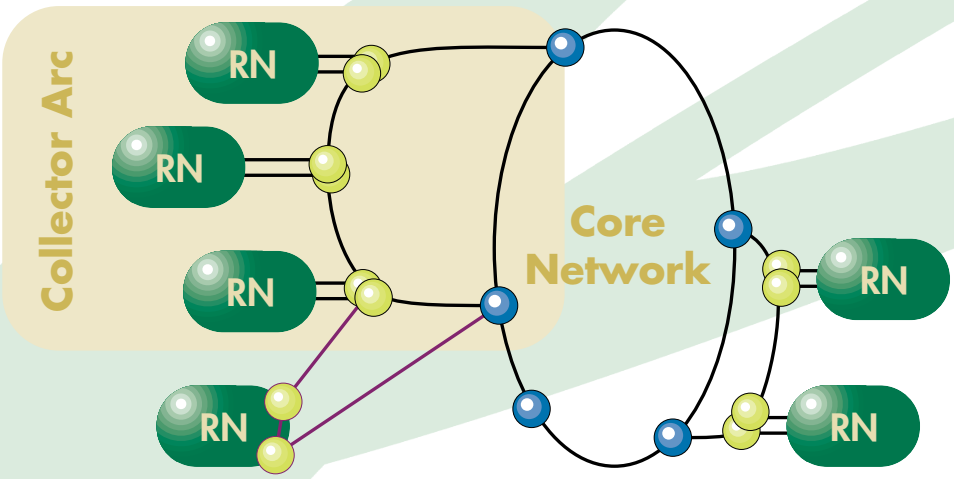
- Operational visibility of the transmission infrastructure by JANET Network Operations to improve reliability whilst reducing complexity.
- The ability to increase capacity at a predictable cost and to change the configuration of the network when needed in order to adapt to new demands within existing budgets.
- The ability to configure parallel purpose-built networks at the transmission level to allow mutual protection between production network traffic and research and development network traffic.
- The ability to adopt new optical technologies at an earlier stage than if UKERNA were to wait for the telecommunications services market to offer these. This will allow UKERNA to support the increasing high bandwidth demands predicted by the research community and also to position itself for SuperJANET6.

The Building Blocks

The basic building blocks of SuperJANET5 will be point-to-point bandwidth channels built on a flexible transmission platform. These may be provided as dedicated wavelengths over a WDM (Wave Division Multiplexed) system or as point-to-point SDH (Synchronous Digital Hierarchy) circuits. These two options are not necessarily exclusive and the service model is capable of supporting both implementations. The first network to be configured will be a pervasive, centrally operated national IP network (JANET), built to the highest operational standards. Additional networks may then be constructed using other channels.

Tansmission Architecture

The basic transmission architecture envisaged for SuperJANET5 splits the backbone into two components: a core network and a set of 'collector arc' networks to connect the Regional Networks and other aggregation points to the core network.



The collector arc networks would connect to two points on the core network, providing an additional level of resilience for each collector arc. Each would typically support between three to five Regional Networks. Each Regional Network would connect to a collector arc at two points, providing an additional level of resilience at the interconnect to the Regional Network level.

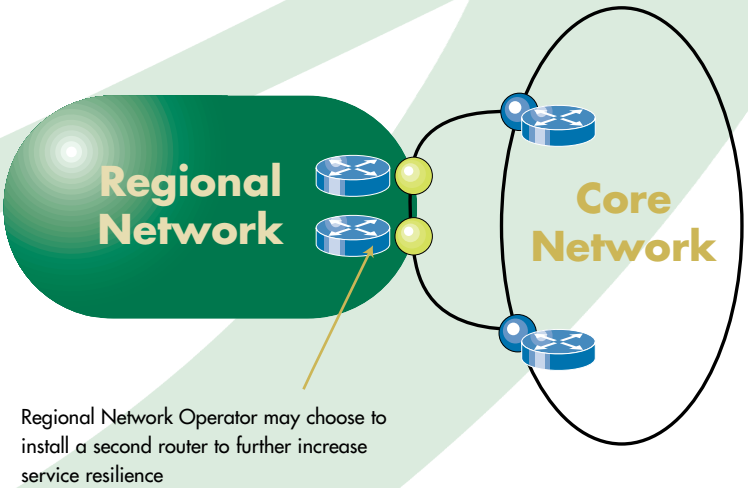
In some cases, it may not be possible to connect a Regional Network into a collector arc. In addition, there are many connections to JANET that are not part of a regional infrastructure; for example JANET access aggregation routers (often referred to as PoP routers), schools networks and external connectivity. In such cases the regional (or other) connection could be connected to the core network directly, or onto the back of an existing collector arc. These connections would most likely involve leased circuits from a telecommunications supplier, but could also use bandwidth channels on a flexible transmission platform where feasible.

National IP Network – JANET

The SuperJANET5 IP service will be provided to all JANET sites, whether via a Regional Network or via a JANET access aggregation router. The core network will initially be based on 10Gbit/s bandwidth channels with connectivity to the Regional Networks and aggregation points made using 2.5Gbit/s bandwidth channels over the collector arcs. Expansion of the regional/aggregation point to core access capacity will be made using further 2.5 or 10Gbit/s channels as required.

The SuperJANET5 IP service architecture moves away from the provision of centrally managed IP equipment at the border between the backbone and Regional Network. Where a Regional Network is connected via the collector arc, the presentation will be via optical interfaces on the flexible transmission platform, which connects the regional edge router directly to the core. The core IP routing equipment procured for SuperJANET5 will be capable of performing both edge (for example, packet and route filtering) and core (high performance packet switching) functions. This will be a change to current practice, where there are separate core and edge routers (Backbone Access Routers). The primary advantage of this model is that it will reduce the number of routers deployed, which means that initial capital and recurrent maintenance costs are reduced. Complexity is also reduced which in turn should lead to higher reliability. A smaller number of routers also means that any software upgrades that need to be made can be done in a shorter timescale.

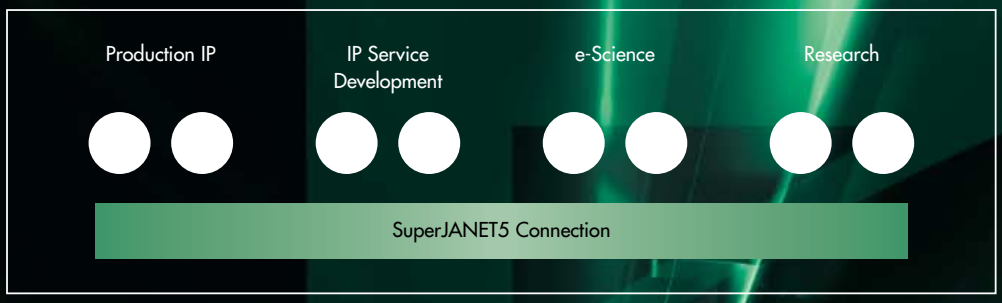
The concepts of the IP architecture are illustrated in the diagram below.



Additional Services

Other networks, such as a second centrally operated IP network for the development of new backbone IP services, could also be constructed from further bandwidth channels. Collaborative research projects across multiple sites could also use a bandwidth channel facility to provide hard segregated bandwidth for their own use (e.g. UKLight). Such networks would not necessarily have to be IP based and co-ordination beyond the provision of the bandwidth channels would rest with the requesters.

The concept of the provision of multiple services that could be delivered to JANET connected organisations is illustrated below:



Summary

The proposed service model for SuperJANET5 will meet the diverse needs of the community through an architecture that delivers the five key requirements of:

- Reliability – through design choices taken to build in resilience and to reduce management complexity
- Scalability – having the ability to add additional bandwidth channels
- Separability – through parallel purpose built networks
- Flexibility – having the ability to reconfigure the network to add additional bandwidth or to create separate networks
- Visibility – allowing users access to network monitoring and measurement information

UKERNA manages the networking programme on behalf of the higher and further education and research community in the United Kingdom. JANET, the United Kingdom's education and research network, is funded by the Joint Information Systems Committee (JISC).

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Availability:

Further copies of this document may be obtained from JANET Customer Service at the above address.

This document is also available electronically from:
http://www.ja.net/SJ5/servicemodel.pdf

Joint Information Systems Committee

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