IPConnect product features

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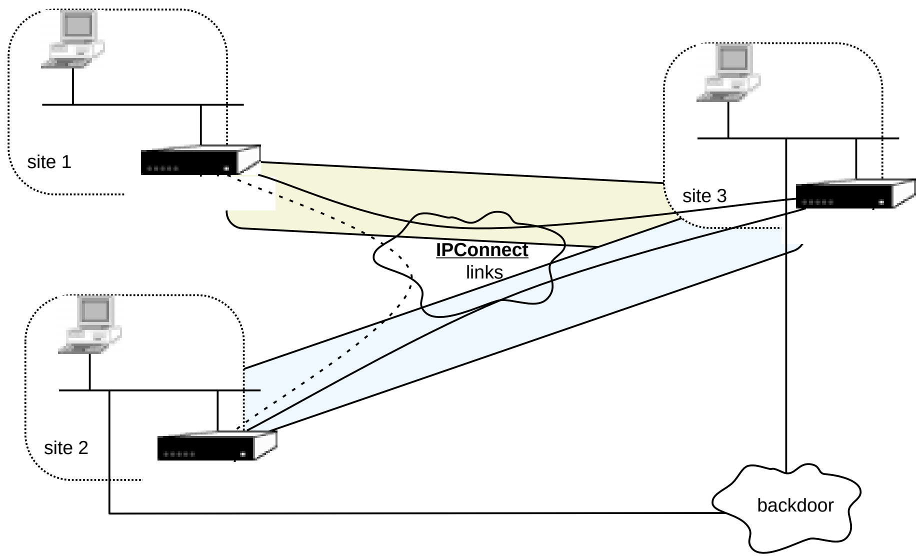
Introduction

IPConnect will have a rolling release schedule with interdependencies on other Astracon products and hardware vendor product offerings upon which it needs to be implemented.

Release 0 - Null

FIGURE 1. Supply of links only



The null functionality release incorporates the provision of

- an IP address allocator
- *Connect to provide PVCs for point to point links between customer routers
- binding of these PVCs to the IP address (which may be allocated by the above)

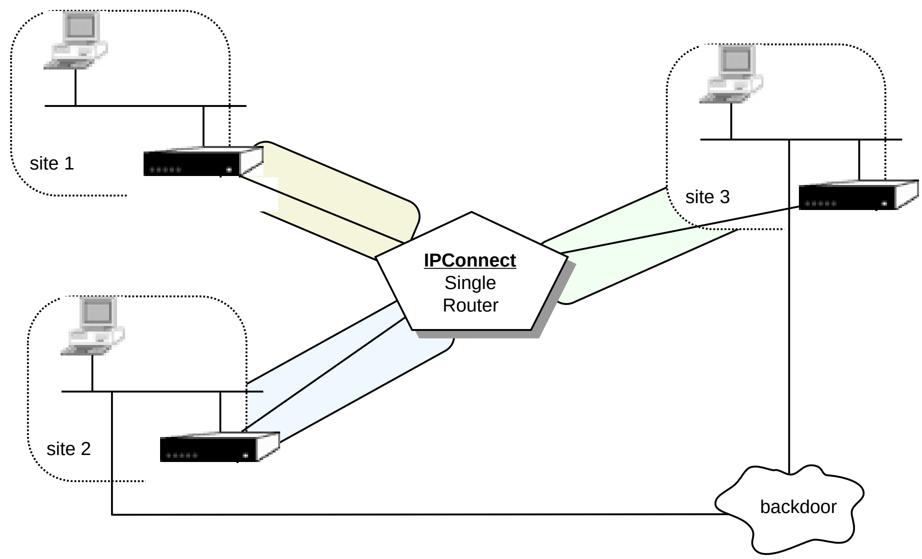
The network model is depicted in Figure 1, “Supply of links only,” on page 2 where all the IP routing functionality is performed within the customer network. It means that the IP network administration is done by the customer.

Specification

The Q_0 and Q_1 figure is probably not relevant since the PVCs are all edge to edge, and routing is done in the CPE. The Q_2 figures would need to be analyzed to see where the traffic volume (and latency) is insufficient to warrant a separate PVC, and so force routing traffic via another site. The Q_2 figures applicable for that PVC would then need to be increased to accommodate the additional transit traffic.

Release 1 - Static

FIGURE 2. Single router



The static model assumes an IP network that uses only static routes. The model as seen by the end customer is of one large router as in Figure 2, “Single router,” on page 3. This provides management of (the above plus)

- the PVC from the customer premises to the ingress router
- internal PVCs between ingress routers to support the QoS requirements of the network including
    - PVC initial provisioning to support the required traffic volumes, and type to support latency etc
    - backup PVCs where required to be {IP router, ATM switch, cable duct} diverse
    - *Connect recovery of PVCs where required
- incorporation of routes as reachable through the customer network onto the ‘IPConnect’ router which includes
    - translating single router view as seen by through the customer access view to the implementation network of routers like in Figure 3, “Exposing internal VPN router overlay implementation,” on page 4
    - configuration of backup routes over backup PVCs
- partitioning of IP forwarding tables within the router(s) to be VPN specific. This could be achieved by dedicating routers to the VPN wherever they are needed in the overlaid network, or use of a virtual router which has forwarding/routing tables tagged (or separate tables) by VPN

Specification

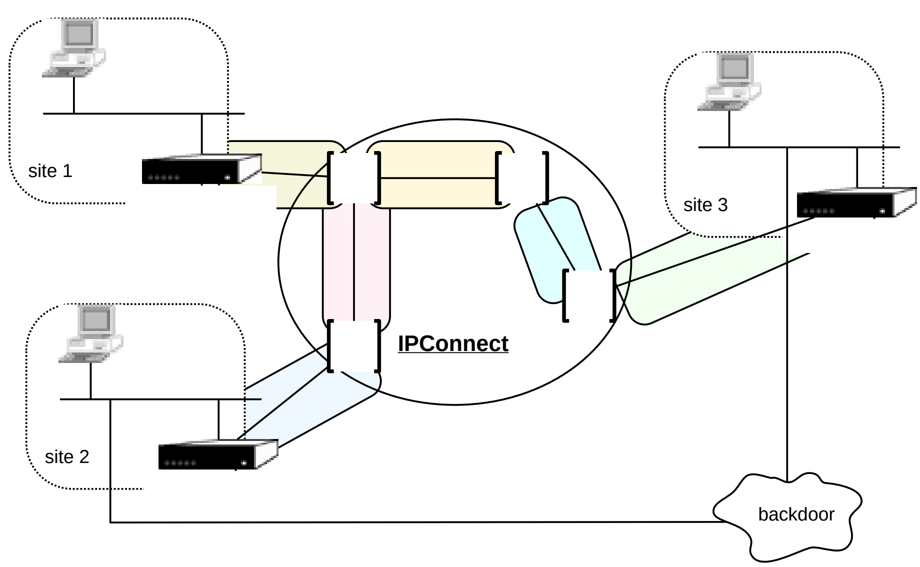
The Q_0, $Q_{1\ \mathrm{and}}$ Q_2 figures are all applicable. Additionally, at each NTU, there needs to be a list of IP prefixes reachable through that customer router/segment. Typically this will be a single subnet. Complexities will include connection points to extranets, including the ‘Internet’. ‘Internet’ attachment is an additional feature that the telco could supply. Extra features include firewalling configuration, WEB proxy/filtering, email gateway, tunnelling (See “Release 3 - Roaming” on page 5.).

These IP prefixes, plus the allocated IP addresses of the NTU (T&C), form the routing table of the ‘IPConnect’ router. The actual implementation of this router may be as a number of geographically spread routers connected by *Connect. The simple routing view would then need to be mapped to these routers.

In addition to the PVC layouts to accommodate the Q_* figures, IPConnect needs to consider the packet forwarding capacity of the router(s). This is especially relevant where there are virtual routers shared by a number of VPNs.

Release 2 - Dynamic

FIGURE 3. Exposing internal VPN router overlay implementation



Where there is more complexity in the customer network, e.g. other extranets, then an internal (or maybe external) routing protocol may be needed to handle link failures. In this case the internal structure of VPN’s router overlay may need to be exposed to the customer’s routers. (forcing an external routing protocol would probably partition the customer’s AD).

This requires the (virtual) routers to also partition the routing protocol exchanges to within the VPNs.

With the presence of external networks, it may be necessary to include some ‘policy routing’ to define transit and access rules to external traffic.

Specification

Some of the IP address reachability information that is static will be configured, but some will be learned dynamically. There would be configuration of the routing protocol, e.g. (router) peerings, administrative domain IDs, router IDs … There probably needs to be some guesstimate of the additional traffic demands that could be triggered through a network discontinuity (internal or external to the IPConnect network) that causes traffic pattern to change. The provisioning of this overload is also presumably chargeable.

Release 3 - Roaming

This provides the additional functionality of managing roaming connections tunnelling into the VPN. Implementations include PPTP, L2TP and proprietary protocols.

Vendor implementations

cisco

Uses VPNs in their MPLS implementation. Route/tag tables include VPN tag.

Nortel

Virtual router support. Webtone network, Virtual Network Switching(VNS), Multiple Virtual Routers(MVR). The technology also seems to be based on ‘label switching’ (aka MPLS, Tag switching?).

3Com

3Com’s VPN seem to be based around firewalling and tunnelling, rather than tagged VPNs as envisioned by some of the other vendors and Astracon.

Have virtual router redundancy protocol, but this seems to be more of a hot standby router (c.f. HSRP (RFC2281) implemented by cisco)

Ascend

‘IP Navigator’ is essentially a pre-standard implementation of MPLS.

> This VPN capability allows a single physical network running 'IP Navigator' to represent many separate logical networks. Each logical VPN provides identical functionality to buying and maintaining a totally separate routing network for each customer. The capability to create many 'virtual routers' on a single physical infrastructure yields savings in equipment and operations costs …

FORE

virtual router

Newbridge/Siemens

Carrier Scale Interworking (CSI), virtual private routing services (VPRS)[a]. It is unclear how the multiple customer services are delivered. There are relationships to 3Com.

Complexities

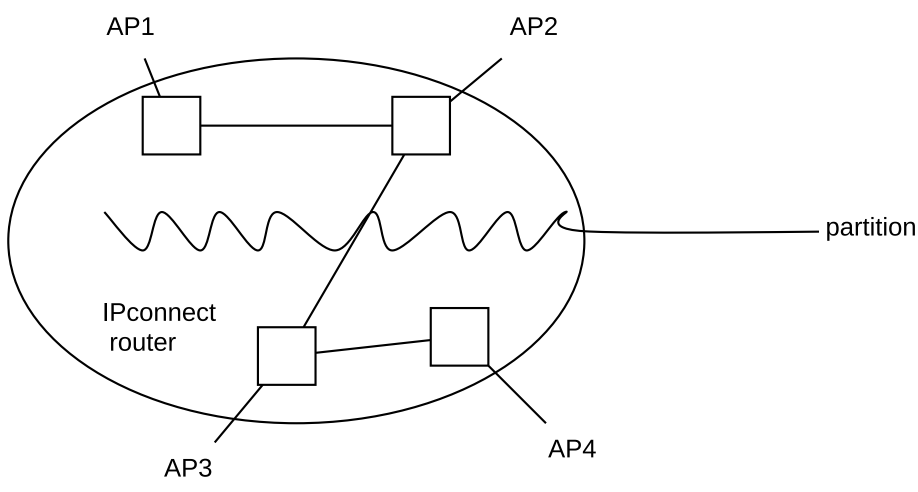
routes where there is a backdoor path between customer sites.

ICMP router functionality

IP fragmentation where MTU exceeded, and MTU setting

routing protocol implementation

abstract router view while not segmenting the customer administrative domain



a. http://prodweb.newbridge.com:80/technology/internetworking/index.jhtml

With the model that the infrastructure presents itself as a single router, what happens when there is an internal partition?

- to the advertised connectivity (view from outside how could access point 2 not be connected to access point 3). Can't report an NTU failure, since access point 1 is still accessible).
- to the QoS (Q1 & Q2)? for performance monitoring purposes.
- (Maybe some issues don't arise since at AP1 and AP2 the 'router' can report AP3 and AP4 as down, and vice versa).

route connectivity/adjacency when the IPConnect network itself is segmented

mapping onto vendor implementations

router packet forwarding capacity

usage measurement collection (billing, performance monitoring, capacity planning)

Interesting problems to be solved

Calculating PVC capacities to accommodate the Q_*

Planning locations of, or use of fabric routers to implement the IPConnect router in a way to meet the Q_* and optimize resource utilization in the fabric including routers, switches and bearers.

Trading off PVC recovery against IP routing around problems.