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HNG-X Networks

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THE POSSIBILITIES ARE INFINITE

HNG-X
Network Architecture

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Agenda

- Current Horizon Network
  - Major Milestones / Performance / Overview
- HNG-X Network
  - Branch Access
  - Data centre {LAN, SAN, Inter Campus}
  - Wide Area Network
  - External interfaces
  - Migration
- Questions

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Current Horizon Network

- Major Milestones
  - 1998 to 2000 – rolled out over 17,000 branches with ISDN dial on demand (and satellite for those sites that couldn't get ISDN)
    Secured with VPN based on IPSEC technology
  - 2002 moved to "always on" ISDN service to support banking
  - 2004 Rollout of ADSL – 9,500 branches
  - 2005 Network Backup facility for branches provided
    - ISDN automatic backup for largest 2,000 branches
    - "On demand" backup using mobile technology (engineer turns up if fault lasts for more than 2 days)
  - 2006 / 2007 Moving to Fujitsu Services ADSL

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Current Horizon Network

- Measures
  - All online Transactions
    - per month - 35.5 million
    - Peak online TPS – 186
    - % Failure Rate – (Approximately) 0.33
  - DVLA Transactions
    - per month - 3.7 million
    - Peak online TPS – 33
    - % Failure Rate – 0.45 (but also includes any non Horizon DVLA failures)
    - DVLA services use Web services technology
    - Feedback to Post Master when network not available

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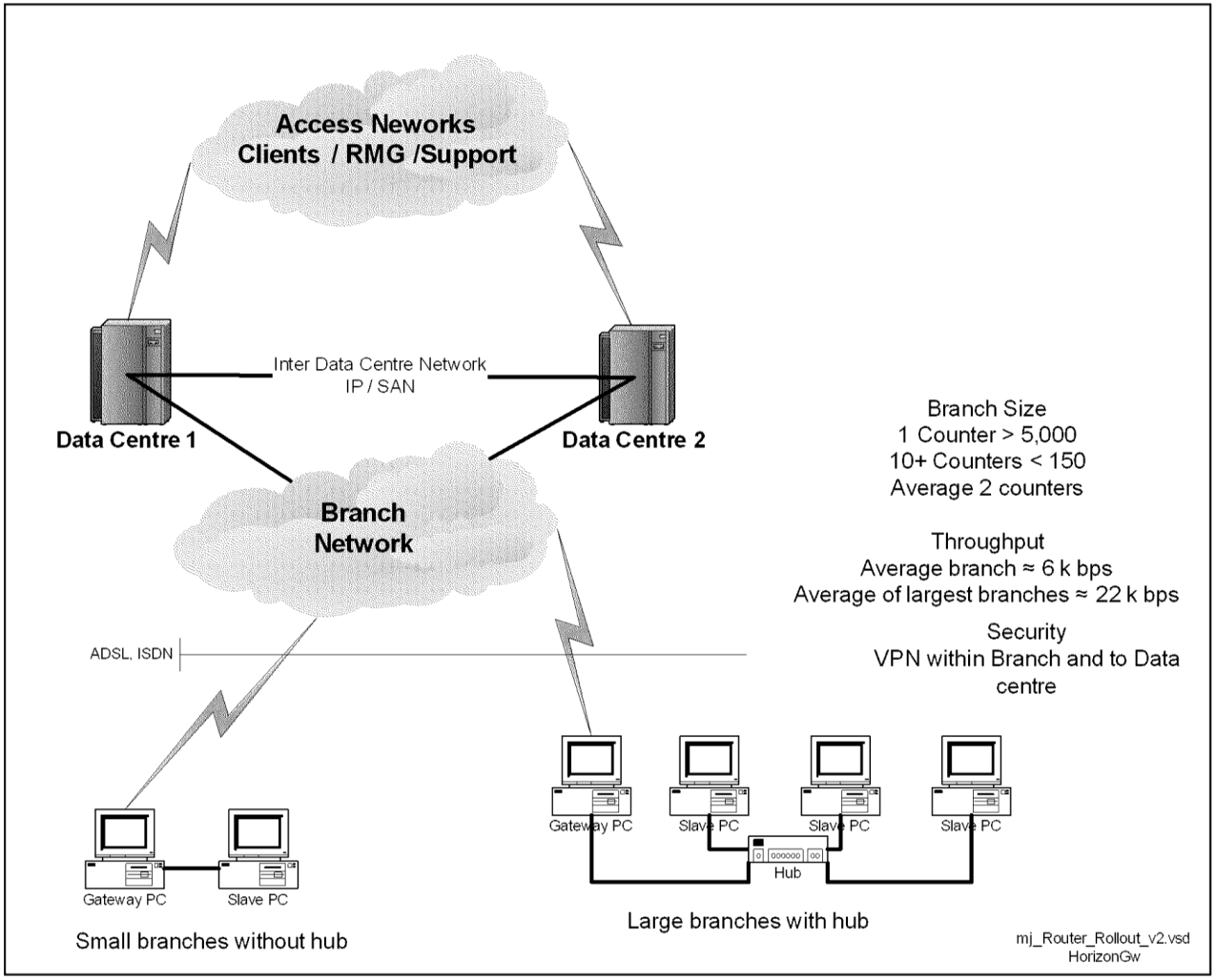
Current Horizon Network



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HNG-X Network Branch Access 1

- Main changes
  - Branch Router replaces software Router on Gateway PC
  - GPRS / 3G backup everywhere & Wireless WAN service provider interconnect
  - Auto provisioning over ADSL
  - Simplification / consolidation as a result of reducing ISDN dial capacity
  - Application Support
    - Moving from UDP messaging to Web Services
  - Security
    - Removal of IPSEC VPN
  - Location – data centre delivery
- Reuse
  - Common ADSL infrastructure & Data centre handoff model

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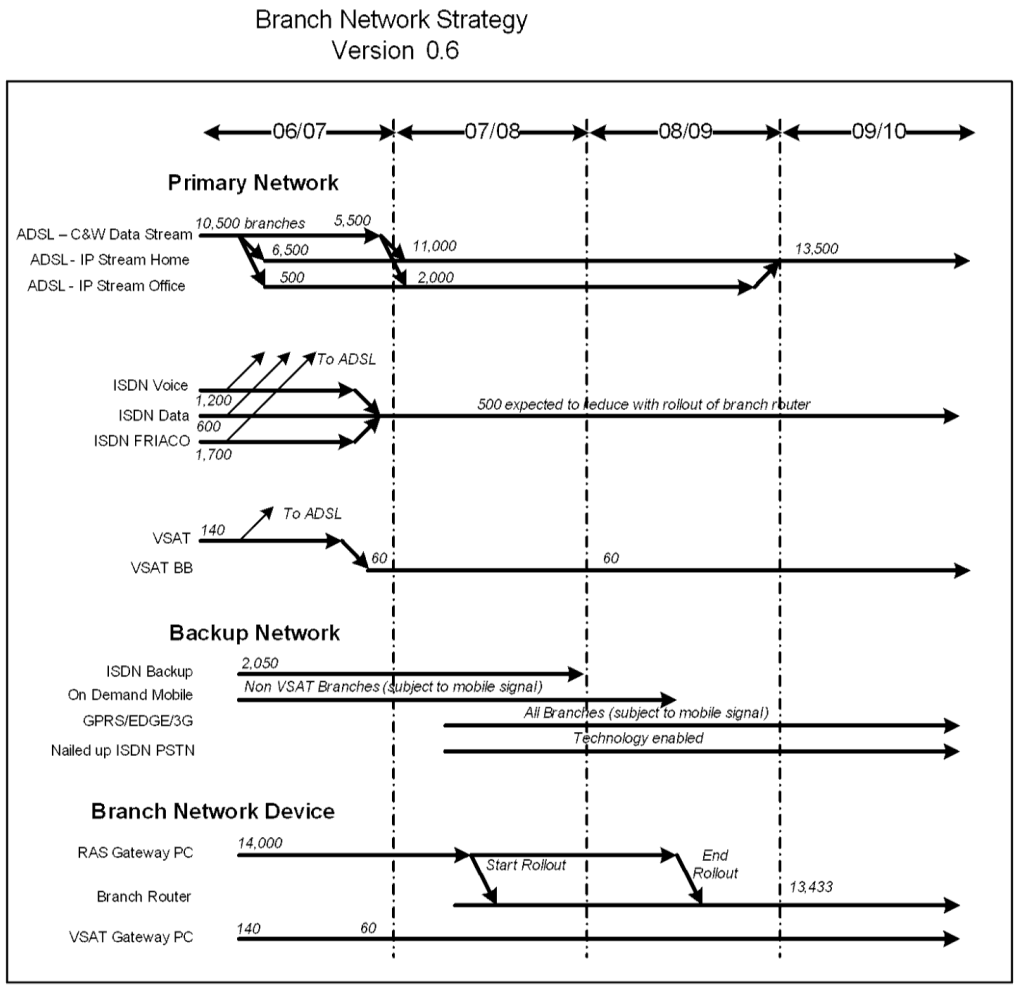
HNG-X Network Branch Access 2



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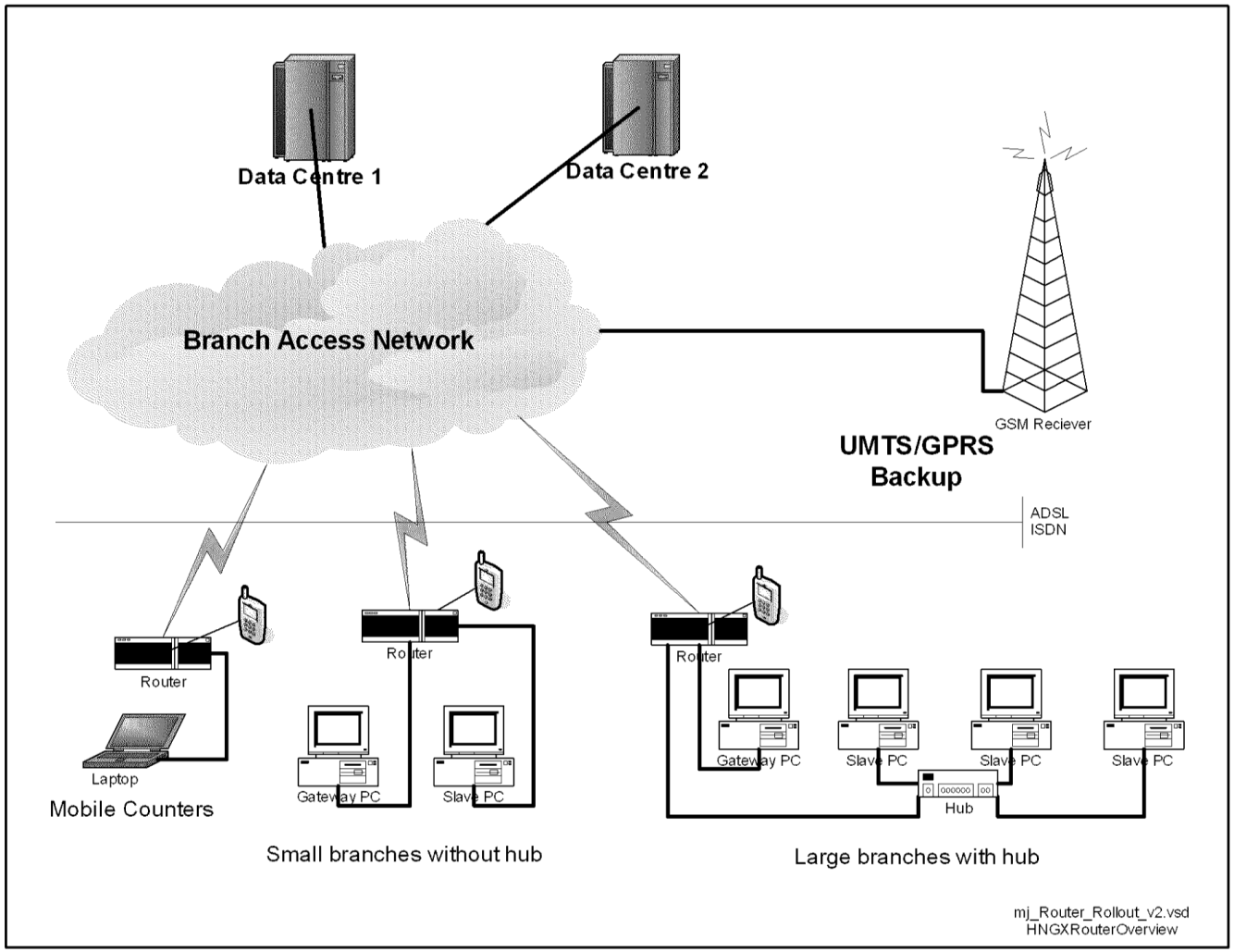
HNG-X Network Branch Access 3



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HNG-X Data Centre 1

- Main changes
  - Application Support
    - Moving from UDP messaging to Web services model
    - Provision of SSL Termination
  - Security
    - Intrusion Detection System and Intrusion Prevention System
  - Network Services
    - DNS / Naming support
    - Logging - EnVision Network logging platform
    - Move to Fujitsu Services Data Centres with Active / DR model
  - Network Workload
    - More connection setup / clear down but less data
      - 50 TCP connections / second to 800 TCP connections / second

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HNGX Network Data Centre 2

- Reuse
  - Cisco Catalyst switch for within data centre connections to servers
  - Fibre channel for extending SAN between Data centres
  - Web services – Global Load balancing approach
  - Internal Firewall module
  - Network Management solution / technology

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HNGX Network Data Centre 3

- Inter Campus Services
  - SAN extension (2 G Fibre channel)
  - IP Traffic (1 G Ethernet)
  - Interfaces from managed shared service
    - Resilient services based on two separate Dark Fibres between Data Centres each terminating on separate Component (DWDM)
    - Latency bounded as point to point services with max specified distance
- SAN
  - The SAN connectivity for HNG-x will be implemented using Cisco MDS9509 Director Class fibre channel switches in order to take advantage of the added availability and stability associated with this class of hardware.
  - There will be a two SAN Directors deployed at each HNG-X data centre. Both power and FC cabling will be fully resilient

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HNGX Network Data Centre 4

- LAN Design model
  - Logical
    - Network Layers - Core / Distribution / Access Layer
    - Security
      - Tiers (inner / outer / DMZ)
      - Traffic separation
    - Components
      - Load Balancer
      - SSL Termination
      - Inside Firewall
      - Outside Firewall
      - IDS / IPS

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HNGX Network Data Centre 5

- LAN Design model
  - Physical
    - Pair of Cisco Switches (6500) in Core / Distribution layer with Intercampus connectivity and for Firewall / Load balancing
    - Pair of Cisco Switches (6500) in Access layer with Intercampus connectivity and for SSL Termination
    - 3 Physical DMZ's each with dedicated outer firewall pair

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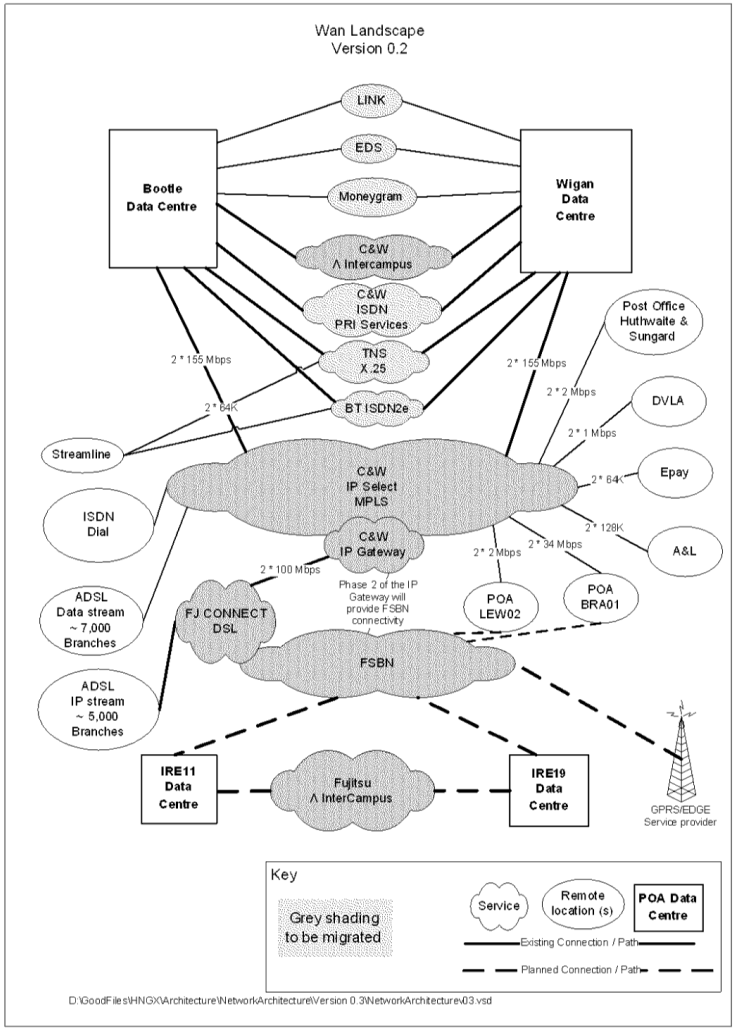
HNGX Network Data Centre WAN 1



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HNGX Network Data Centre WAN 2

- Reuse
  - Same approach to Wide area network services, specifically use of MPLS clouds
  - Use of existing circuits and interconnects where appropriate

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HNGX Network External Interfaces 1

- Interface between HNG-X and third party
  - Not just connection but formal interface e.g. EPAY, DVLA
- Two classes
  - Interface is remote from data centre
    - Examples DVLA, RMG, EPAY
  - Interface is local to HNGX data centre
    - Examples Streamline, Link and EDS
  - General approach
    - Remote interfaces;- no change to Physicals, IP routing and IP addressing
    - Local interfaces;- Agree Interface changes to support new data centres
    - All interfaces;- Agree operational acceptance method & criteria

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HNGX Network Migration 1

- Data Centre Phasing
  - New Data centres join network
  - 4 Data centre working phase (single network)
  - Old Data Centres leave network
  - Examples of Techniques being used
    - Traffic steering via IP Routing for Branches
    - Subnet migration resulting from constraint on keeping IP addresses the same to simplify data centre move

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HNGX Network Migration 2

- Application Phasing
  - All Branches on Horizon
  - Some Branches on Horizon and some on HNGX (application perspective)
  - Network changes during application switch
    - Removal of Horizon VPN between data centre and branch and removal of within branch Horizon VPN
    - New Branch LAN IP address
- Branch Network
  - Introduction of New network services to branches; Mobile (GPRS/EDGE/3G)
  - Removal of Satellite service to branches
  - Migration of ISDN sites to ADSL
  - Branch Router replaces Gateway PC Software Router

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- Questions?

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Load Balancer

- Cisco Content switching module
- Performance
  - 1 million concurrent TCP connections (Design target is 34,954)
  - 165,000 connection setups per second at Layer 4 (Design target is 828)
  - Total combined throughput of 4 Gbps (client to server and server to client) (Design target is < 32 Mbps)
  - 1.25 million packets per second (Design target is <17,000)
  - 16,384 Real servers (Design Target < 40)
- Currently used today in Horizon (DVLA, PAF and LINK banking)

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SSL Offload

- Cisco SSL Module
- Performance
  - 3000 new connections per second (Design Target is 583)
  - 60,000 simultaneous connections (Design Target is 34,954)
  - The SSL Module can support up to 300 Mbytes /sec of bulk encryption (design target is 4 Mbytes /sec)

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Firewall

- The Cisco FWSM provides;
- * 100,000 connections per second (design target is 828)
- * 5 G bps throughput (design target is 35 M bps)
- * 1million concurrent connections (design target is 34,954)

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Network Layout

- Same approach to Wide area network services and reuse of circuits
- Data centre core components same as in Horizon
  - Cisco Catalyst switch for within data centre connections to servers
  - Cisco Fibre channel switch for extending SAN between Data centres

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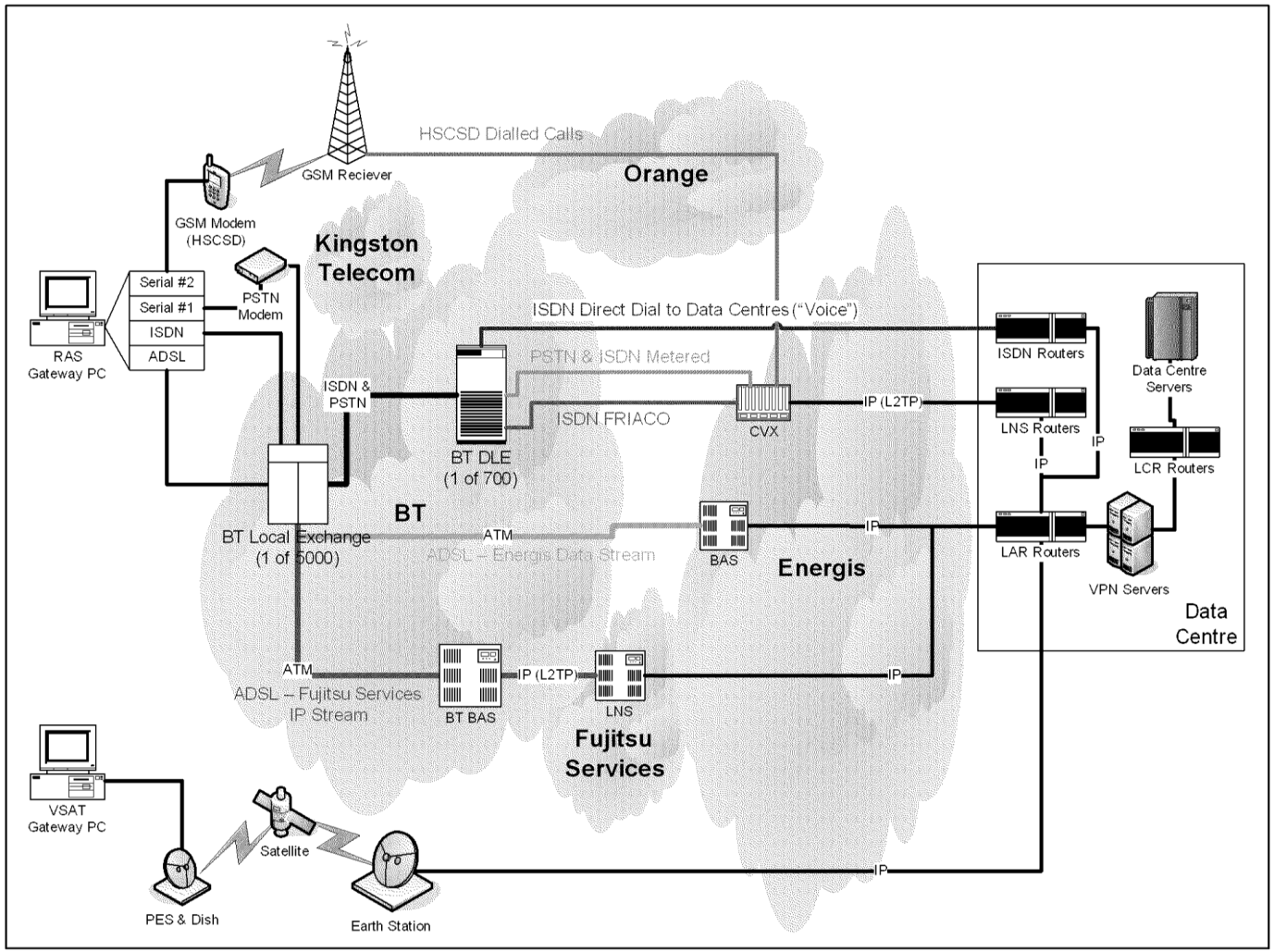
Horizon Branch - Gateway PC (Software Router)



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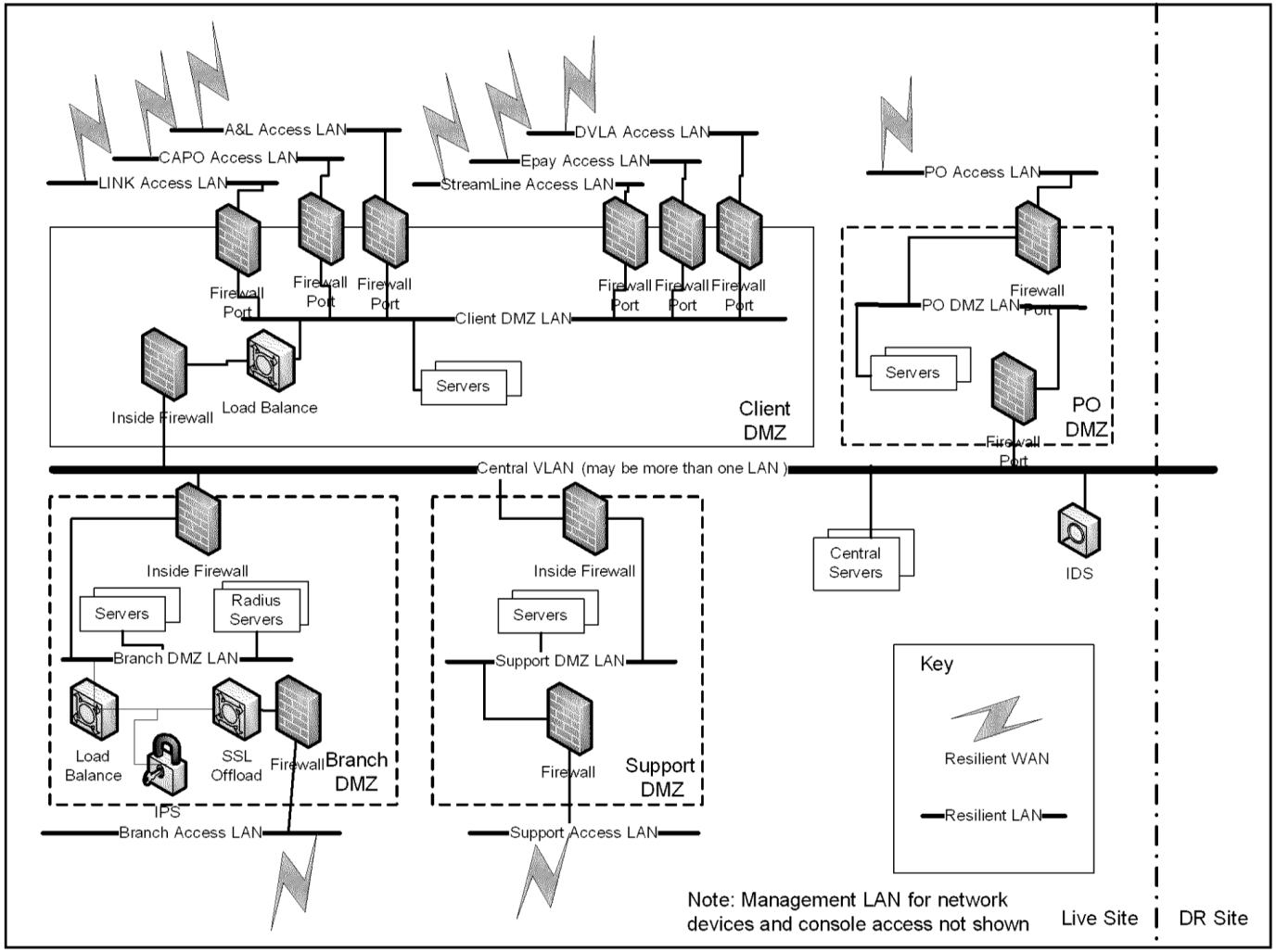
HNG-X Data Centre



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