Architecting the Network

Part 4

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Service Management

- Use of router facilities to define service levels
  - form of bandwidth management:
    - transmission priority lists
    - bandwidth class scheduling
  - Can improve performance of defined services under load
- Effectively such measures are within the area of "congestion management"
  - The intent is to provide resources to some services when the bandwidth resource is under load

Service Management

- Priority Example:
  - High priority on packets to and from port 23 (telnet) and 513 (rlogin)
  - Low priority on packets to/from port 119 (net news)
- Class Scheduling
  - Allow telnet and rlogin up to 50% of available bandwidth when under contention
  - Allow nntp up to 2% of bandwidth when under contention
- Class Scheduling is a more stable approach to congestion management

Network Operation

- Management of IP numbers is critically important:
  - Ensure network number registration information is accurate
  - Publish correct IP numbers to external network peers
  - Ensure that correct IP numbers are routed
  - Ensure that end clients are using correctly allocated numbers

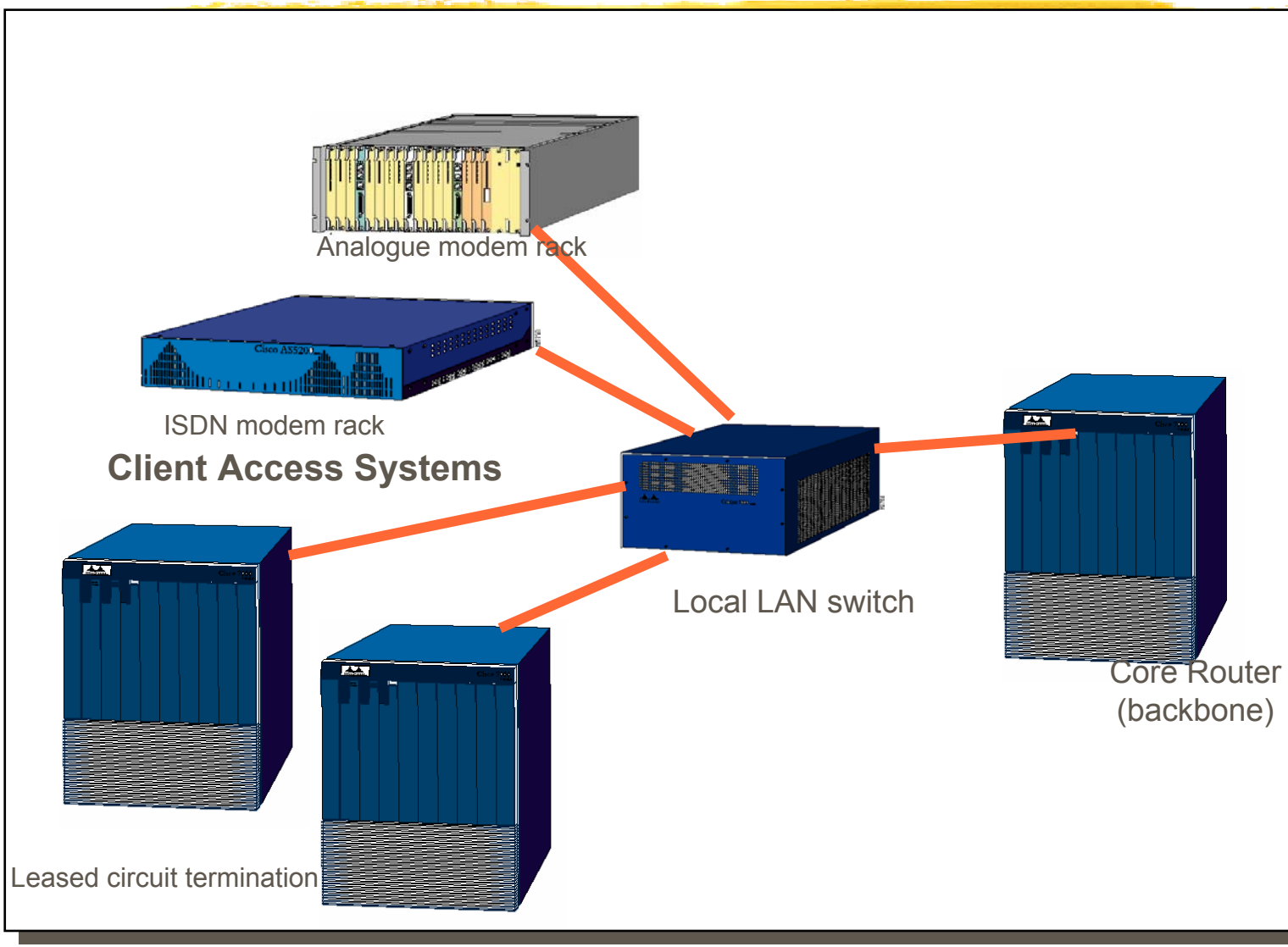
Operation of a Service

- Service Quality is achieved by a match of capability to demand:
  - technical capability to carry traffic load
  - financial capability to provide adequate resource
  - Accurate and fast activation and service assurance processes

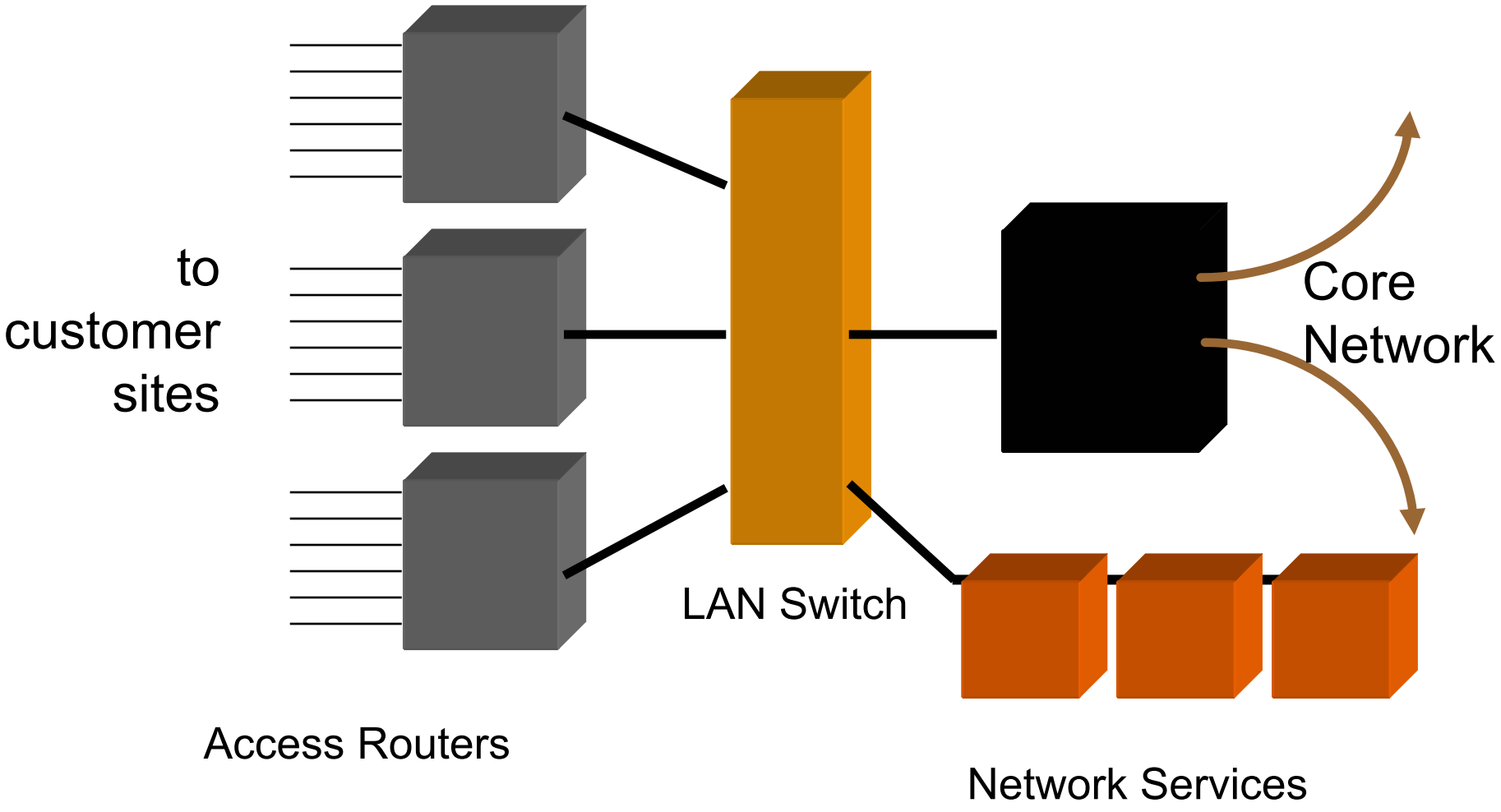
Stitching it all Together

- Site design and preparation
- shipping
- installation
- end site training / interaction

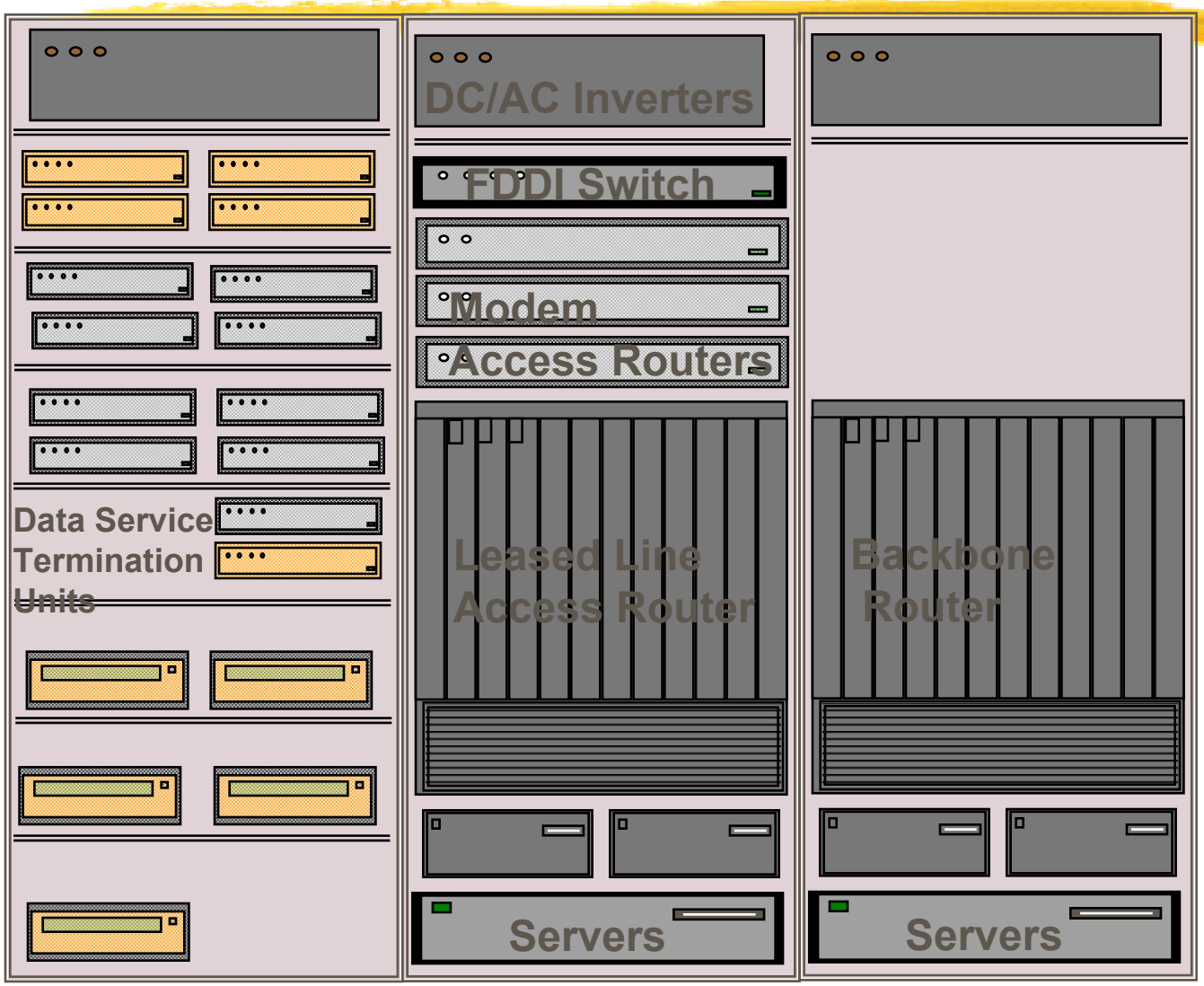
Site Design


Analogue modem rack
ISDN modem rack
Client Access Systems
Local LAN switch
Core Router
(backbone)
Leased circuit termination

Site Design


to
customer
sites
Core
Network
LAN Switch
Access Routers
Network Services

Site Design


DC/AC Inverters
FDDI Switch
Modem
Access Routers
Data Service Termination Units
Leased Line Access Router
Backbone Router
Servers
Servers

Site Design

- AC/DC power sources
- Stability of power
- Air Conditioning requirements
- Site security and access arrangements
- Access to spares
- Expansion space

Operational Management

- All active elements of the network centrally managed
- SNMP used as platform for management
- routers are the central component of operations

Operational Management

- snmp traps used for exception reporting
- never underestimate the power of ping !
- traceroute - the route reporter
- dig - DNS diagnosis

Operational Management

- Each management environment has particular requirements
- Routers are the most reliable network element
- carrier services are the greatest point of vulnerability
- careful router configuration will isolate LAN faults

Operational Management

- Internet issues - working within a larger multi-provider environment:
  - NOC obligations
  - trouble ticket management

Reporting

- Goals of data collections and reporting:
  - operational management
  - trend analysis of traffic volumes
  - monitor levels of delivered service
  - monitor usage patterns
  - marketing material!

Reporting

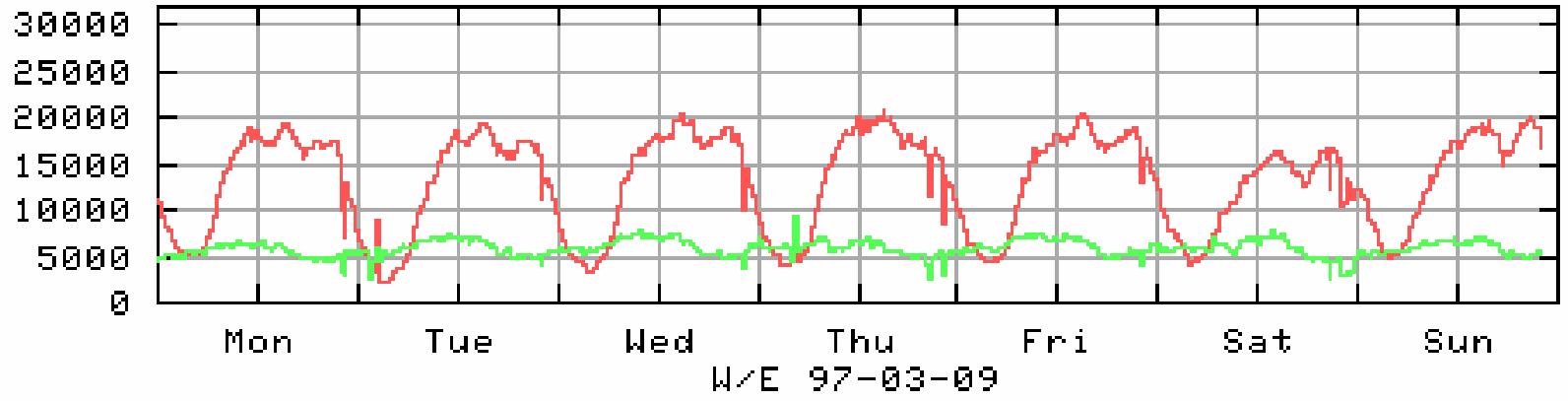
- Balance of cost of data collection and analysis against benefit of resultant data sets
- Data collection points affect ability to gather data

Reporting

- Routers:
  - Interface volumes
  - Line errors
  - routing tables
  - router resource use
- Routers
  - 15 minute interface volumes and error count

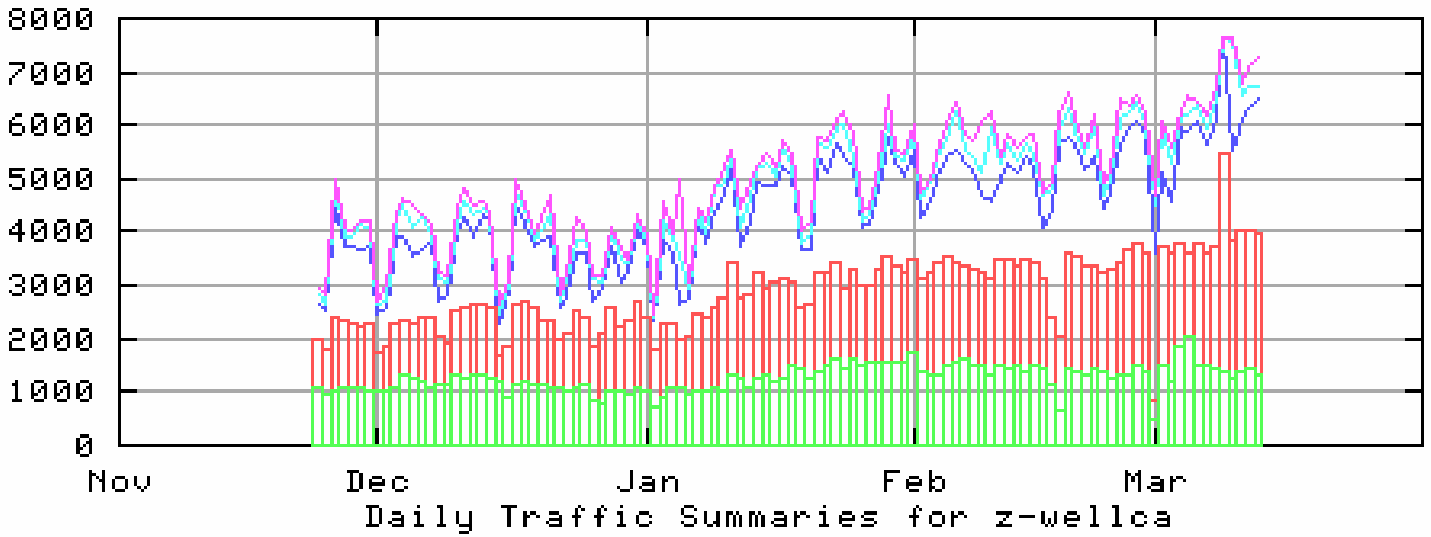
Network Reports

- weekly report of 15 minute link load levels

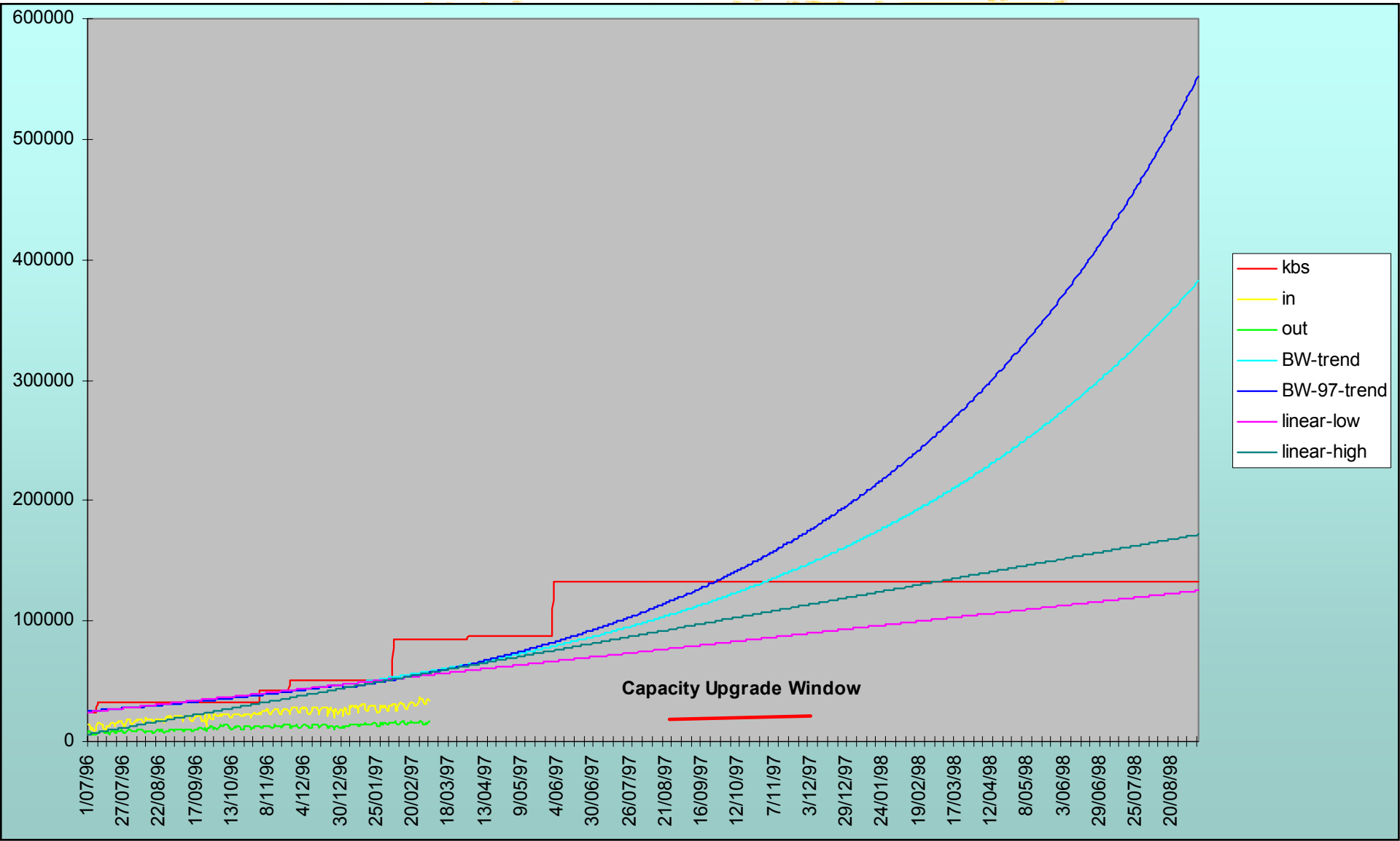


Network Reports

- monthly reports
- quarterly trend reports and projections



Network Reports



Policy Considerations

- The technology base of the network must match the commercial objectives of the enterprise – this match is often termed ‘policy’, where the network is configured to meet business demands
  - Such business demands will vary network by network

Summary

- Network Design defined by router interaction
  - Client Service interface
  - Network Peer interface
  - Internal network design
- Operational Considerations
- Policy Considerations