SOURCE ROUTING
FOR
CAMPUS NETWORKS

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CAMPUS

~100 subnets
~100 nodes ea
~10000 nodes total

1-2 km
CHARACTERISTICS OF
CAMPUS ENVIRONMENT

1. HIGH BANDWIDTH
   - 1-10 Mb/sec
   - Technology can be deployed
   - NO "common carrier" (P.T.T.) required

2. LOW-PROFILE ADMINISTRATION
   - Primary purchase consideration is this application's need, not comm. with other appls.
   - Confederation of private subnetworks
CHARACTERISTICS OF
CAMPUS ENVIRONMENT

1. HIGH BANDWIDTH
   - OPTIMAL USE CAN BE SECOND PRIORITY

2. LOW-PROFILE ADMINISTRATION
   - NET MUST BE SELF-SURVIVING
   - UNATTENDED GATEWAY
   - TROUBLE ISOLATION BY CUSTOMER
   - INADEQUATE MONITORING
   - UNOFFICIAL GATEWAYS
Gateway Function:

Hop-by-Hop Route: Gateway chooses next step based on destination and its own best judgement.

Source Route: Gateway finds next step inside packet.

Source Route -> Simple Gateway.
MECHANICS

IP PACKET

IP HEADER

IP CONTENTS

DESTINATION FIELD

HOP-BY-HOP: INTERNET IDENT OF DESTINATION

SOURCE ROUTE: LIST OF LOCAL NET ADDRESSES TO USE ALONG THE WAY

3 1 20 5 24

route next hop hop hop hop

count hop 1 2 3

source route
MECHANICS

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HOP-BY-HOP: INTERNET IDENTIFICATION OF DESTINATION

SOURCE ROUTE: LIST OF LOCAL NET ADDRESSES TO USE ALONG THE WAY

TARGET ACTIVITY IN TARGET HOST

route next hop hop hop hop
count hop 1 2 3 4
EXAMPLE (REVERSE ROUTE CONSTRUCTION)
WHERE ROUTES COME FROM

SOURCE PLACES THEM IN PACKET

SMART SOURCE

SOURCE ASKS ROUTING SERVICE

--

HOST MUST FIND ROUTE TO NEAREST ROUTING SERVICE (SUPPLIED BY NEAREST GATEWAY/BROADCAST)
WHERE ROUTES COME FROM

SOURCE PLACES THEM IN PACKET

SOURCE ASKS ROUTING SERVICE

HOST MUST FIND ROUTE TO NEAREST ROUTING SERVICE
(SUPPLIED BY NEAREST GATEWAY/BROADCAST)
ADVANTAGES OF SOURCE ROUTE

- Separates Internet identification from Internet routing mechanics

- Simplifies Gateways

- Allows route control

- Solves several minor problems
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DISADVANTAGES

- Less dynamic -- performance loss

- Extra protocol step
SEPARATING ROUTING FROM TARGET IDENTIFICATION

HOW - BECAUSE GATEWAYS NEVER EXAMINE TARGET IDS. ONLY ROUTING SERVICES DO.

VIRTUES -

- CAN HAVE SEVERAL ID RESOLUTION TECHNIQUES OPERATING AT ONCE (INCL. PRIVATE AGREEMENTS)

- CAN IMPROVE ID ASSIGNMENT PLAN WITHOUT TOUCHING EVERY GATEWAY

- LINK/PLATFORM IDENTIFICATION ARGUMENTS VANISH (LAST STEP OF ROUTE + UNIQUE CONNECTION ID)
SIMPLIFIED GATEWAYS

WHY SIMPLE?
- NO DECISIONS
- NO MEMORY

VIRTUES -
- TRIVIAL RECOVERY / POWER-UP
- HIGH BANDWIDTH
- LOW FAILURE RATE, EASY MAINTENANCE
- QUICK IMPLEMENTATION
- SAFE TO INSTALL INSIDE KERNEL (FOR PERFORMANCE)
ALLOWS ROUTE CONTROL

USES -

- TROUBLE ISOLATION -- OUT-AND-BACK PACKETS, SOURCE TRACING

- POLICY COMPLIANCE (e.g. "GOVT BUSINESS ONLY" ON NET 15)

- CLASS-OF-SERVICE -- ERROR RATE, DELAY, PRIVACY

- DIPD STREAMS

- PRIVATE GATEWAYS
Solves Minor Problems

- No worry about loops, stability, hop counts, or consistency of gateway tables

- Fragmentation strategy not frozen in to gateway implementations

- Multi-homing problem (hosts on several nets) moves from gateways to routing service.

- Variations on service do not require updating all gateways
CONCLUSIONS

DIVERSITY OR ADMINISTRATION

GOOD MATCH

SOURCE ROUTING

BETTER MODULARITY

DECOUPLES GATEWAY FROM ARGUMENTS