@Home Cable Deployment Experiences

or

My years without sleep.

Presented by
Cathy Wittbrodt
@Home Network
Routing Diva
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What this presentation is…

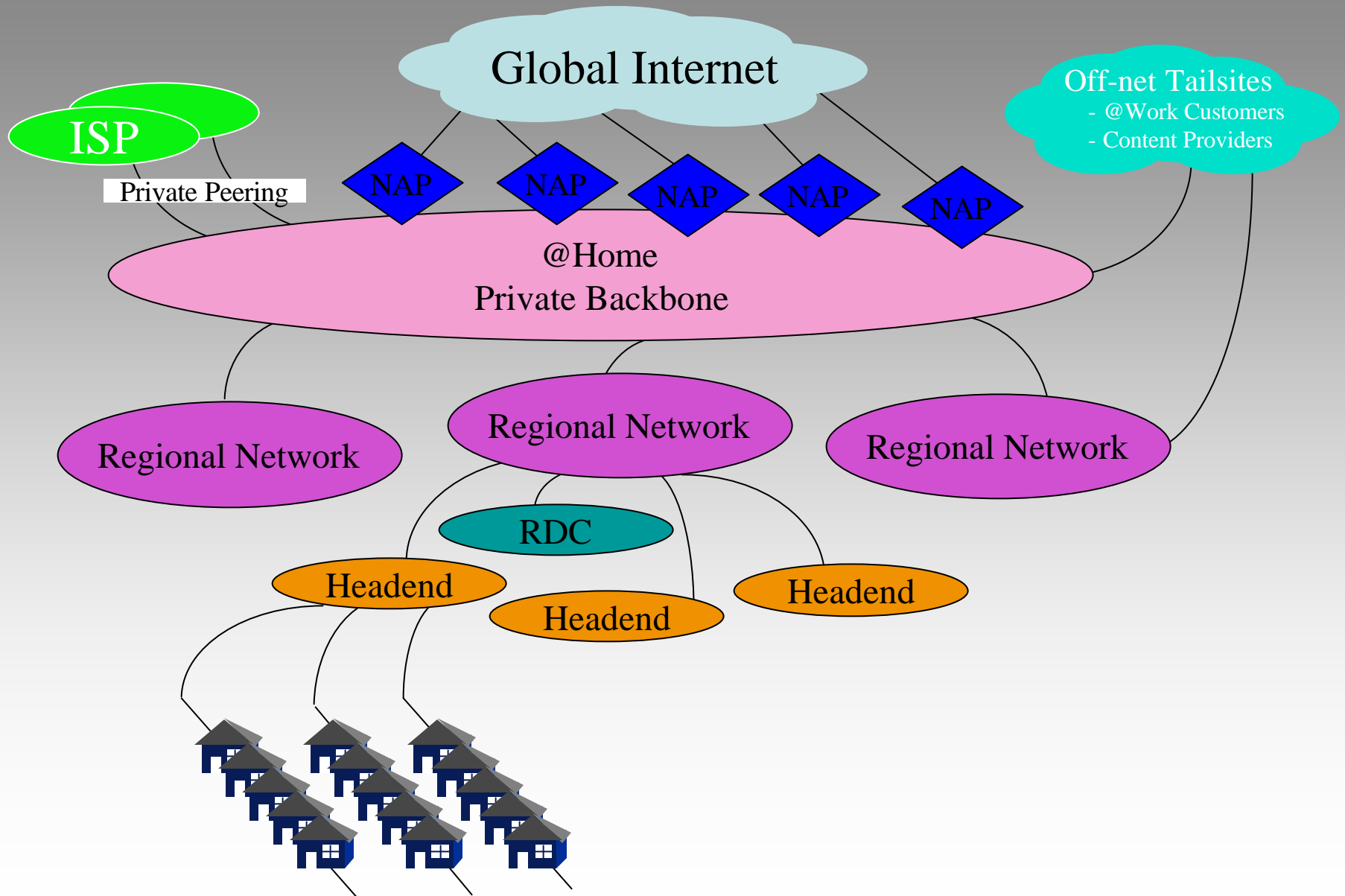- A look at some of the technical and other issues that occurred during the deployment of the @Home Network

What this presentation isn't…

- A discussion of why @Home went out of business
- An assessment of the merits of @Home Network buying Excite
- A discussion of what Milo is really like
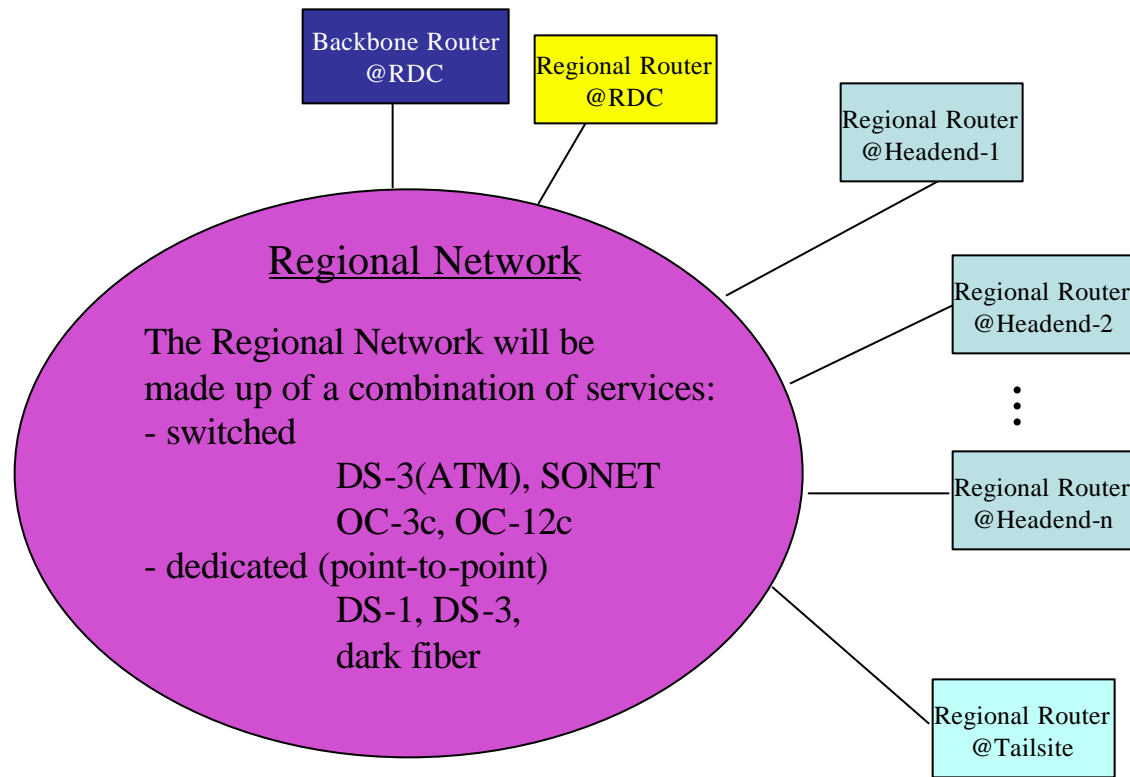- Any detailed discussion of cable company politics, etc, etc.

What was @Home Network?

- An organization that was created to do IP networking for cable companies.

- Provided end-to-end IP service for 20+ cable companies in the US, Canada, Asia and Europe

- Service included email, netnews, etc.

Regional Network

Backbone Router @RDC

Regional Router @RDC

Regional Router @Headend-1

Regional Router @Headend-2

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Regional Router @Headend-n

Regional Router @Tailsite

Regional Network

The Regional Network will be made up of a combination of services:
- switched
    DS-3(ATM), SONET
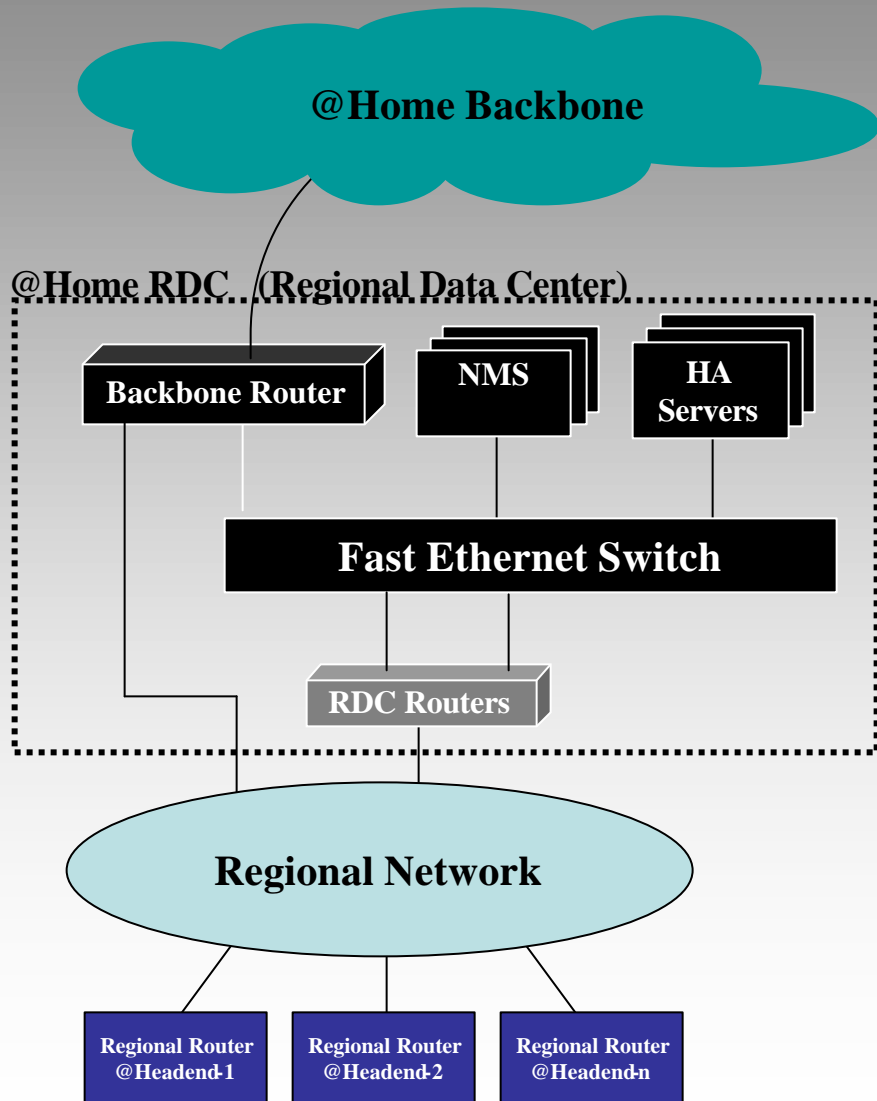   OC-3c, OC-12c
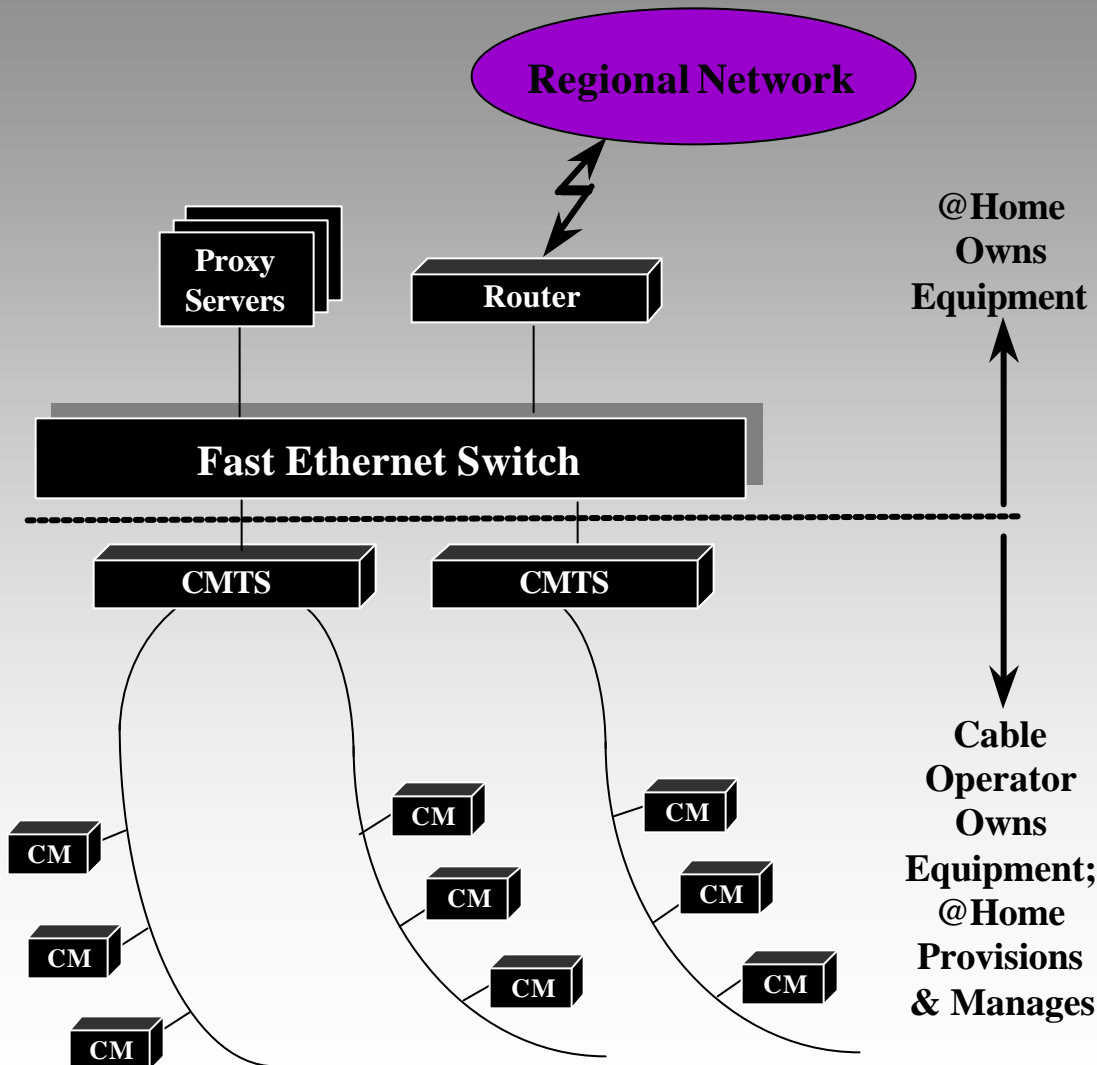- dedicated (point-to-point)
    DS-1, DS-3,
    dark fiber

- Routers carry @Home routes only
- Point "default" at Backbone Router
- Transport varies by region
- Average bandwidth : 100Mbps

Regional Data Center

- Backbone connection made at RDC
- High Availability (HA) servers
  - Offer subscriber services: Mail, news, FTP
  - Replicates data from content providers
  - Reduces load on Backbone and Internet
  - Provides WWW transaction processing capabilities
  - Can bill through @Home backoffice for services or content
- Network Management System (NMS) collects and summarizes regional events
- Fast Ethernet switch (100Mbps)
- RDC Routers used for aggregation of headends
- Each regional network is made up of a combination of services:
  - switched (ATM): 45Mbps, 155Mbps
  - dedicated (point-to-point):100Mbps, 155Mbps with dark fibre, leased lines

Headend

Regional Network

Proxy Servers

Router

Fast Ethernet Switch

CMTS   CMTS

CM   CM   CM   CM   CM   CM   CM   CM

@Home Owns Equipment

Cable Operator Owns Equipment; @Home Provisions & Manages

- IP Router connects to Regional Network
- Proxy Servers
  - Cache WWW content, dramatically improving response time
  - Greatly reduce network load "up" from the head end system (e.g. the broader Internet)
  - Provides detailed WWW access statistics
  - Can be proactively primed with content
- Fast Ethernet Switch (100 Mbps)
- CMTS is the cable modem termination system in the headend
- Cable Modem (CM) delivers Ethernet access in subscribers' homes

Key Points

- Three layers of network
  - Backbone
  - Regional
  - Headend
- Built-in intelligence
  - Caching (Headend)
  - Replication (RDCs)
- @Home controls the infrastructure
  - Multicast
  - Quality of Service (QOS)

@Home Network Assertions

- Fat pipes won't solve the problem
- The network must have intelligence built in
- Push data closer to the user
- Push compute function closer to the user (e.g. Java)
- Multicast is a perfect fit
- Proactive network management is vital
- You'll be able to go to Fry's buy a modem and connect

"Let's use client ID"

- Good
  - You know who is doing what
  - Easier to bill
- Bad
  - Made readdressing very difficult
  - Not all hosts did client ID
  - Even worse when splitting nodes

"If you look around you'll see that there are some channels that could be shall we say, re-allocated"

- Use another channel
  - Limited by number of channels
  - Potential loss of TV revenue
- Split Nodes
  - Add a new node and move some homes to one and some to the other
  - Requires some readdressing

Cable meets IP

- Cable companies in the US (around 1996)
    - Lots of little fiefdoms
    - IP experience varied significantly from fiefdom to fiefdom
    - A good data modem is one that handles RF well

"Just point default at me"

- Is it a router or is it a bridge?
- Isn't CIDR made of apples?
- Routing? Isn't RIP routing?
- You mean modems will have to filter?
  - Why don't folks want their neighbors to print to their printer?
  - Don't want to share files with your neighbor?

Initial Cable Equipment

- Motorola
  - RIPv1 (sort of)
  - Only subnet recognized /24
  - Can put 20 /24s on a CMTS
- Lan City
  - It's a bridge
- Later on there were others…
- The good news is/was DOCSIS
- @Home cable head end gear and modems were picked by MSO NOT by @Home.

The first @Home Deployment

- "I save time, I don't zip anymore I have @Home" - 1st @Home Customer

- Why not plug my ISDN modem into the ethernet port of my LanCity cable modem?

- Is it data or is it noise?

- "I only get 800k"

"Why don't we just tell ARIN we're good guys and get a /8?"

- @Home was allocated 24.0.0.0/14 NOT 24.0.0.0/8

- Sprint would only listen to announcements for 24.0.0.0/8

- IP classless anyone?

- No mechanism to apply for more when required

"You mean RFC1918 space isn't infinite?"

- "I didn't mean to use all of 10.0.0.0/8"
- "Can't we ask ARIN to assign another block to RFC1918 space?"
- Lots of overlapping RFC1918 space issues

"Is there more world hunger or more brokenness in the BOS?"

- Not all Back Office Systems created equal.
- Database folks didn't all understand subnetting or allowing for addresses to be reused after churn
- Each MSO required a huge database integration.
- We never had all the functionality that all the MSOs wanted.

Open Access

- Allowing more than one ISP access to the cable subscribers

- Mandated by the government in Canada

- Fought furiously by MSOs in the US

Open Access

- IP address space
  - Multiple organizations applying based on same homes passed
  - New gear leaves space stranded on old gear
  - Government mandates (US vs Canada)
- Routing
  - Does the ISP put a circuit into each Head End?
  - Does the MSO use a different channel for each ISP?
  - Does the MSO backhaul the ISP traffic to some larger POP for distribution to the ISP's network?
  - Most options involved source routing and all sorts of weirdness.

"What do you mean cable guys have access to the routers?"

- Who manages the OSPF network?
- Do you let multiple organizations manage routers in your OSPF network?
- Do you let multiple organizations manage equipment on your RF network?
  - Cable folks needed to manage the RF
  - IP folks needed to manage the IP routing

"Would you like routes with that?"

- OSPF externals killed my network
  - No dynamic routing to CMTS
    - Many kinds of CMTS with many kinds of "routing"
    - Many folks managing them
  - "Why don't we just redistribute connected?"

All you can eat for $39.95

- Caching was supposed to reduce load on interconnects
  - Subscribers could turn off caching
- Limiting up/down stream not in line with original design goals
- "no, nntp traffic is not cacheable due to our customers' diversity of perversity."

"We can do CAR as long as we put in plenty of bandwidth"

- @H subscribers' traffic was mostly downloads (downstream to subscriber)
- Most QOS mechanisms
  - Aren't really end-to-end
  - Helped in optimizing upstream traffic
- Difficult to sell different levels of service while maintaining on-net performance

"@Home isn't changing the world, we're just facilitating existing vices"

- Configure it yourself NAT and open mail relays
- Is it or isn't it child pornography?
- Post your own personal 900 number
- Live sex cam in Sunnyvale
- I can kill them before they see me!!!
- The child in Oklahoma upsetting folks on IRC
- "Because you can does not mean you are authorized"

"We're in business planning mode, no need to worry about technology"

- @Work was born
- Used leased lines to connect businesses
- Traffic balanced out our mostly one-way cable traffic
- Remarkably successful considering…
- "Sorry for the delay …been occupied for the last 24 hours with a turn-key customer"

"They are not mistaken about what they want, it just conflicts with what they are going to get"

- MSOs with lots of different systems and requirements
- @Work customers with lots of requirements
- Cable subscribers putting lots of different stresses on the network

"If it doesn't work manually there's no need to automate"

- Scaling OSPF
- Getting the right peers
- Keeping up with demand for peering bandwidth
- Lots of interesting regional peering with MSOs and other entities

Why don't we just….

- … reboot it and see what happens?

- … redistribute full Internet routes into OSPF?

- … put all of @Work's T1's into area 0 so we'll know when they flap?

- … hook them together and see what breaks?

- … augment our backbone connection to the local POP with a load balanced cable modem link?