



# TDMoIP

## Real - world issues

**PWE3 – 54<sup>rd</sup> IETF**

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# TDMoIP is *working code*

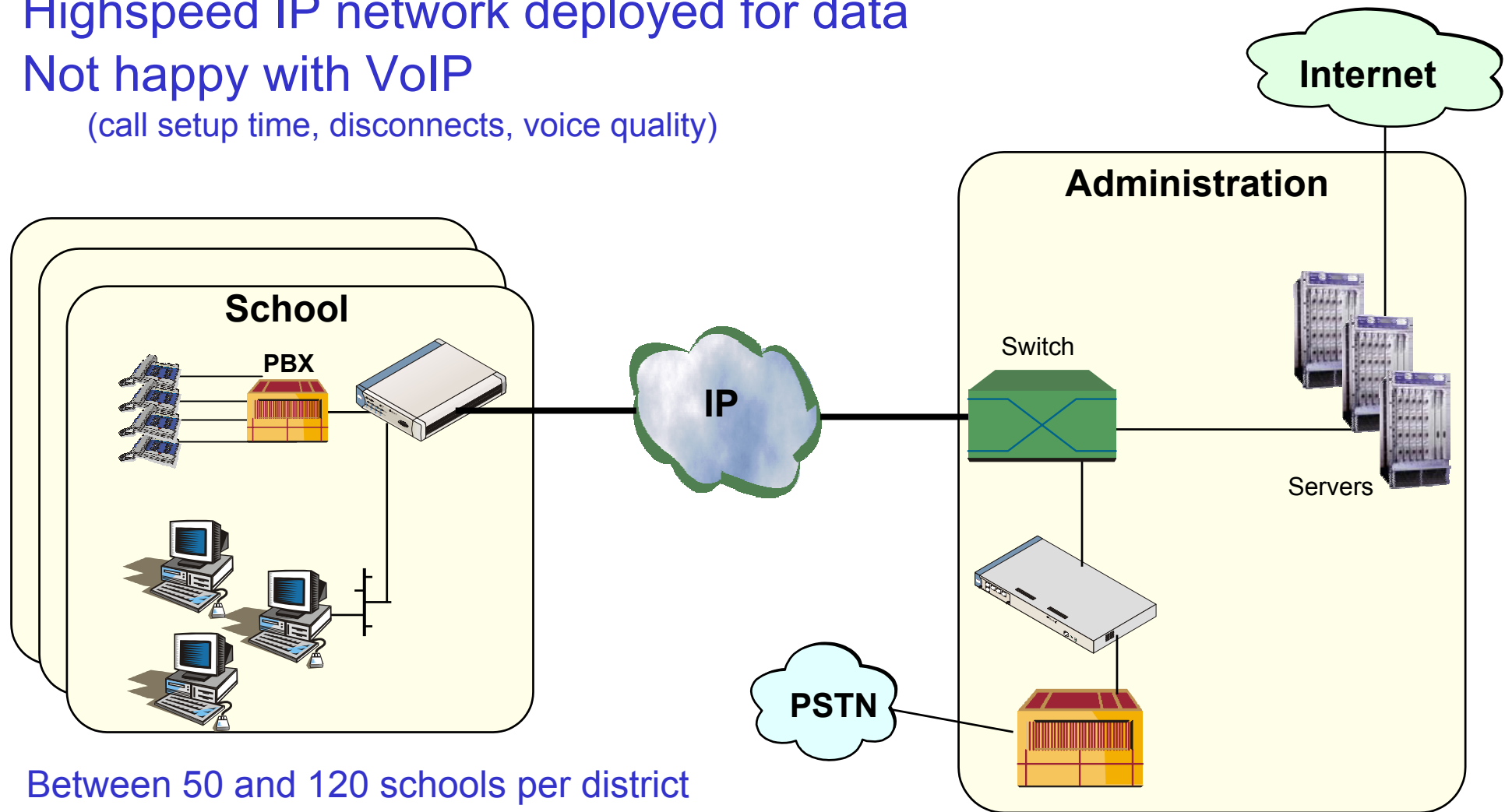
*Yes, PWE can really work!*

- Over 9000 TDMoIP ports deployed (some > 3 years)  
> 20 countries, over half of US states
- Average of 4 E1/T1 ports per edge device
- Less than 1% of ports were E3/T3
- 4 Interoperable AAL1-mode implementations
  - Pure SW for single E1/T1
  - AAL1 HW
  - ASIC
  - Second vendor
- 2 Interoperable AAL2-mode implementations
  - Pure SW for up to 16 E1/T1
  - ASIC
- Dozens of *different* applications (we'll look at a few)

# School Districts

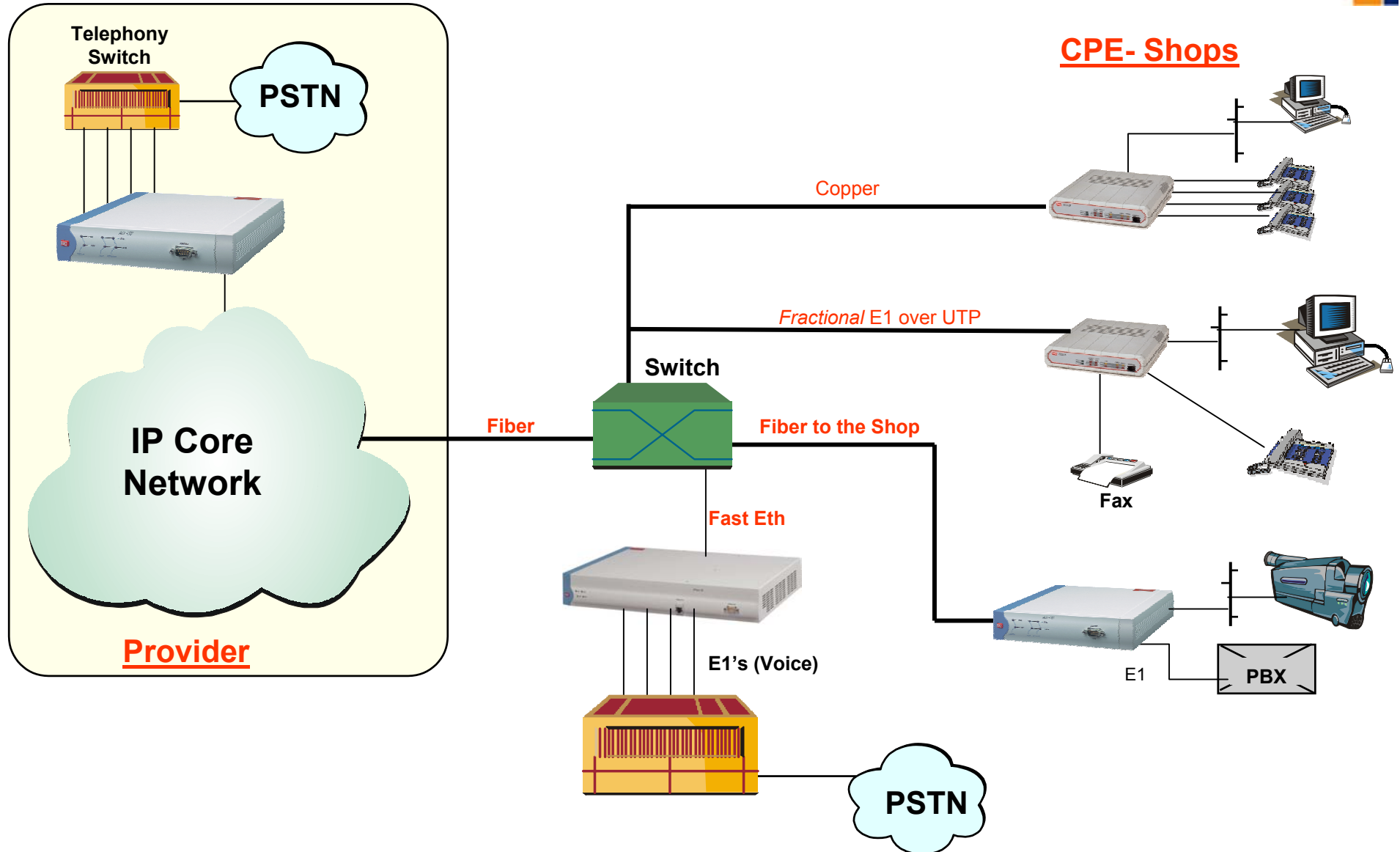
## Replacing VoIP

Highspeed IP network deployed for data  
Not happy with VoIP  
(call setup time, disconnects, voice quality)



Between 50 and 120 schools per district

# Shopping Malls



# Common features

Deployments are access or corporate  
not carrier or *carrier's carrier*

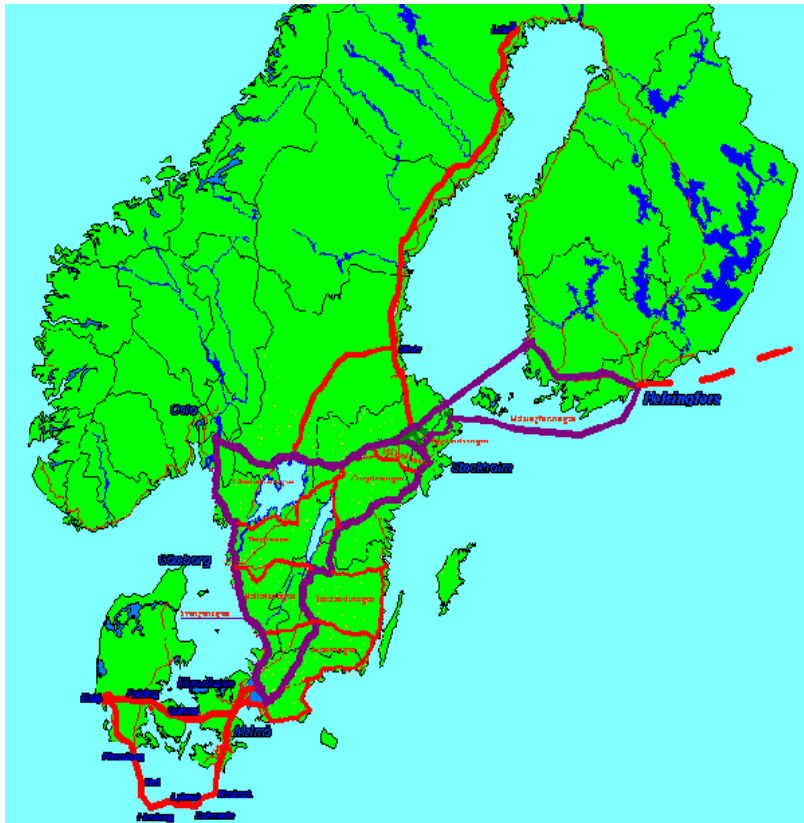
## CAS

- > 90% of access network (PBX interconnect)
- > 10% of backbone networks are still CAS
- Hooking, pulse dialing (especially *fast*) requires transparency

## Fractional trunks

- 4, 8, and 12 timeslot systems are common

# Utfors backbone network



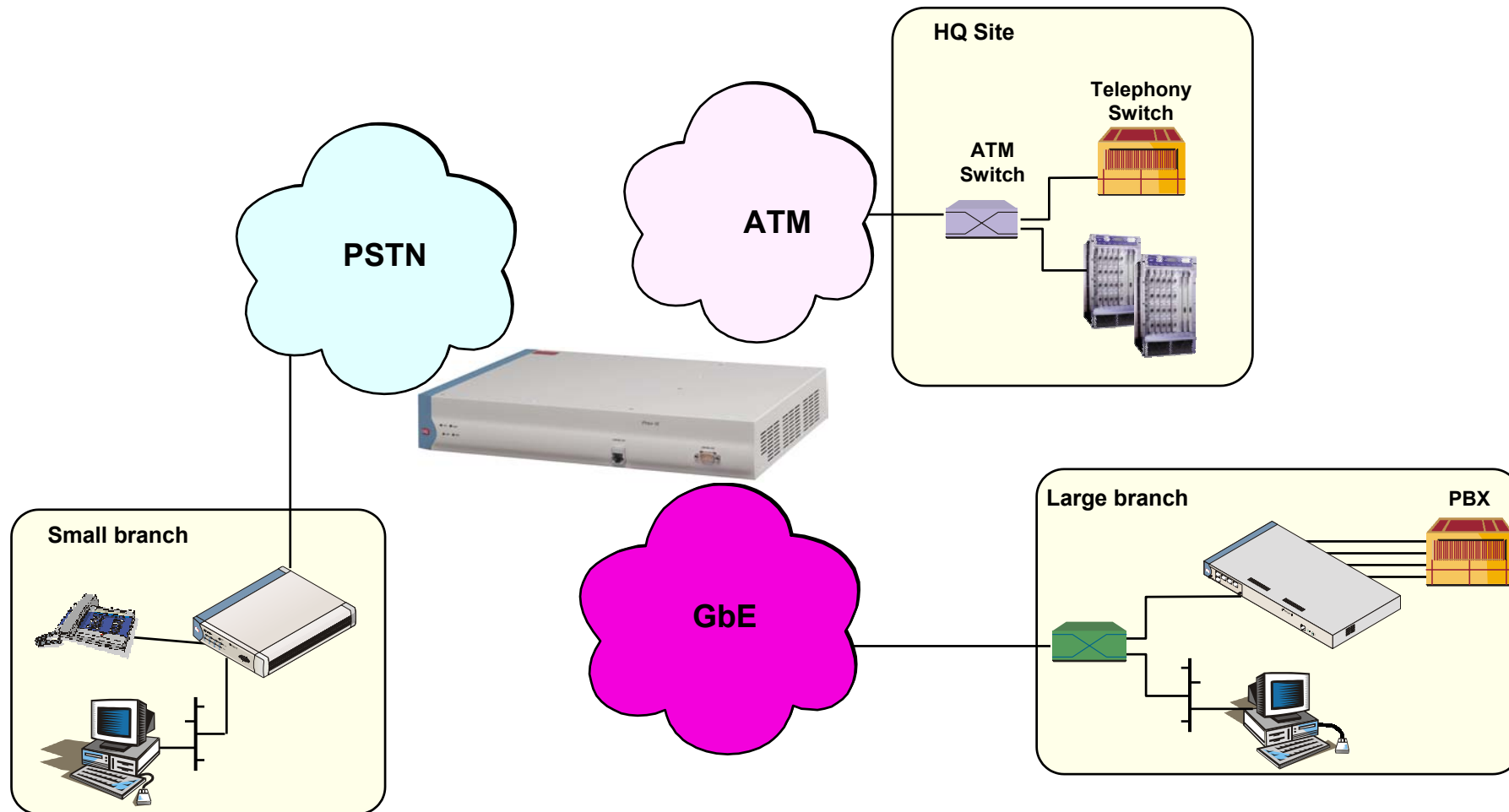
## The Nordic Network

- Built along national roads
- Links up most large and medium-sized cities and towns
- Integration with all existing metropolitan networks
- Always-on connections for data VPN access and voice – 100 Mbps IP *and* voice at leased line (2 Mbps) rates.
- No per-minute charge for voice within the network

“We can deliver as much as 25 times the capacity for the same price as our competitors charge just for Internet access”

Sten Nordell, CTO, Utfors

# Enterprise MAN Communications



Simple service interworking is crucial

# A word about AAL1

AAL1 is pre-existing PW carrying TDM over ATM networks

## In core network

- *Despite statements to the contrary in this WG there have been major deployments*
- Growth rate of 40 % per year (even now)  
*“AAL1 is flourishing in the backbone”*
- 2G cellular backbone

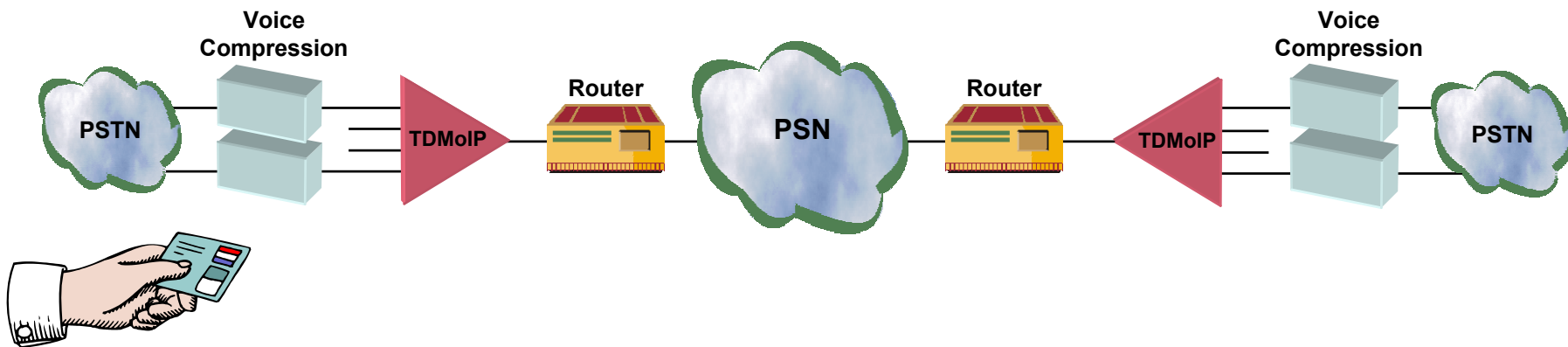
## In access network (DLC)

- AAL1 DLC deployment is growing
- Collector network for DSL



# Toll Bypass over IP

- Voice resellers offering long-distance voice services
- 5-nines reliability not critical or expected
- Bandwidth conservation imperative
- Solution : AAL2-mode

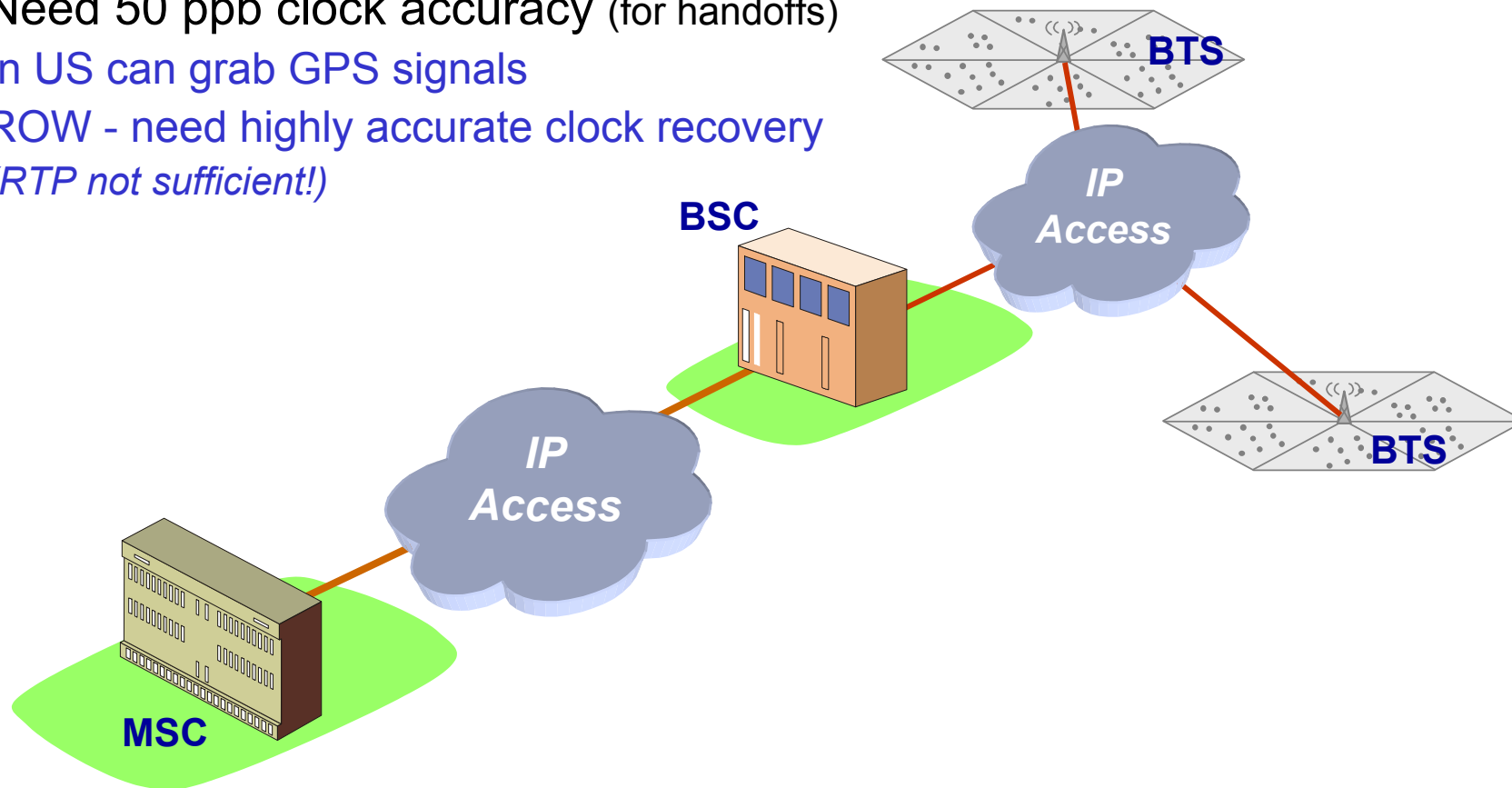


# Cellular Telephony Connectivity

Need 50 ppb clock accuracy (for handoffs)

In US can grab GPS signals

ROW - need highly accurate clock recovery  
(RTP not sufficient!)



Cellular 2/2.5/3<sub>(ATM)</sub>G networks based on leased line, AAL1, or AAL2.  
With TDMoIP seamless migration to IP/MPLS transport.