

ULTRABLOGGING
Light of Day
or
Fantasy/Voyeurism/Big Brother

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What Seems Inevitable

- Personal/Public Information Upload
 - Text
 - Photo
 - Voice/Video
- GPS (location-aware services)
- Sharing & Tagging (news atoms)
- Cited Commentary (news molecules)
- Lurching toward real time

VISION & QUESTIONS

Liberty, Justice & E Pluribus Unum?

OR

Technological Fantasy?

Voyeurism?

Big Brother?

Can It Be Done?

- **Memory Capacity**
 - Requirements?
 - Possible?
- **Communications Capacity**
 - Requirements?
 - Possible?

How Much Information?

Cell Phone Call: 10 kbps

MPEG Music: 5MB = 5minutes \rightarrow 133 Kbps

DVD Video: 5GB = 2 hours \rightarrow 5.55 Mbps

Personal Memory

Cell Phones: $10 \text{ Kbps} \times 1 \text{ day} \rightarrow \approx 900 \text{ Mb}$

MPEG Music: $1.33 \text{ Kbps} \times 1 \text{ day} \rightarrow \approx 10 \text{ Gb}$

DVD Video: $5.55 \text{ Mbps} \times 1 \text{ day} \rightarrow \approx 500 \text{ Gb}$

NY Metro Zeitgeist

(10 million folks)

Cell Phones: $100 \text{ Gbps} \times 1 \text{ day} \rightarrow \approx 9 \text{ Pb}$ (petabit)

MPEG Music: $1.33 \text{ Tbps} \times 1 \text{ day} \rightarrow \approx 100 \text{ Pb}$

DVD Video: $55.5 \text{ Tbps} \times 1 \text{ day} \rightarrow \approx 5 \text{ Eb}$ (exabit)

Theoretically Maximum Data Rates

SHANNON

$$C = W \log_2 \left(\frac{P_r}{N_0 W} + 1 \right)$$

- $P_r = P A_r / R^\alpha$ (propagation constant α)
- $N_0 = kT = 1.38 \times 10^{-23} \times 300 = 4.14 \times 10^{-21}$ Watts/Hz
- Moderate handheld radiated power: $P = 1W$.
- Typical Range (cellular): $100m$
- Typical aperture (uplink): $1m^2$.
- Maximum data rate with $W = 100MHz$ (one of the U-NII bands):
 - ≈ 1.9 Gbps ($\alpha = 2$)
 - ≈ 1 Gbps ($\alpha = 4$)

Wireless Serpents

- **Mutual interference:**
 - Spatial reuse: factor of ≈ 10 penalty
 - Buying more spectrum is *expensive*
- **Fading** can attenuate signals by many factors of 10
 - Non-line-of-sight can increase propagation loss by lots
 - Destructive interference can create *nulls*
 - It all varies *randomly*

Technological Bows of Burning Gold

- **MIMO:**
 - exploits fading environment (effectively “increases” W)*
- **Transceiver Cooperation:**
 - mitigates mutual interference
 - increases reliability
 - *Network Information Theory* still a gray area

CAVEATS: lots of them, but ...

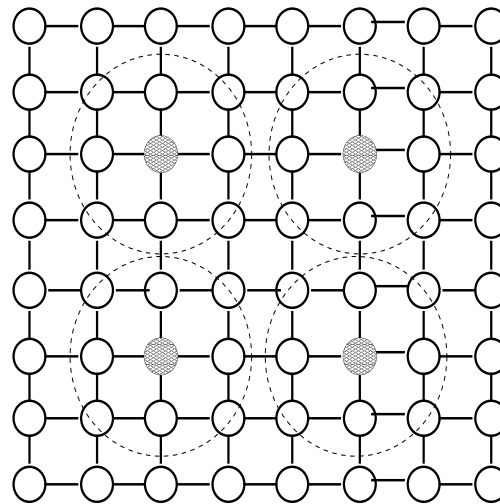
PUNCHLINE: Theory Says

Many hundreds of simultaneous 5 Mbps streams within few-hundred- m^2 “cells” of a wireless network not unthinkable.

BUT who's gonna build the necessary (expensive) infrastructure?

On the Cheap: 802.11 meshes

- Grids of disparately owned 802.11 base stations
- Periodic fixed network access points

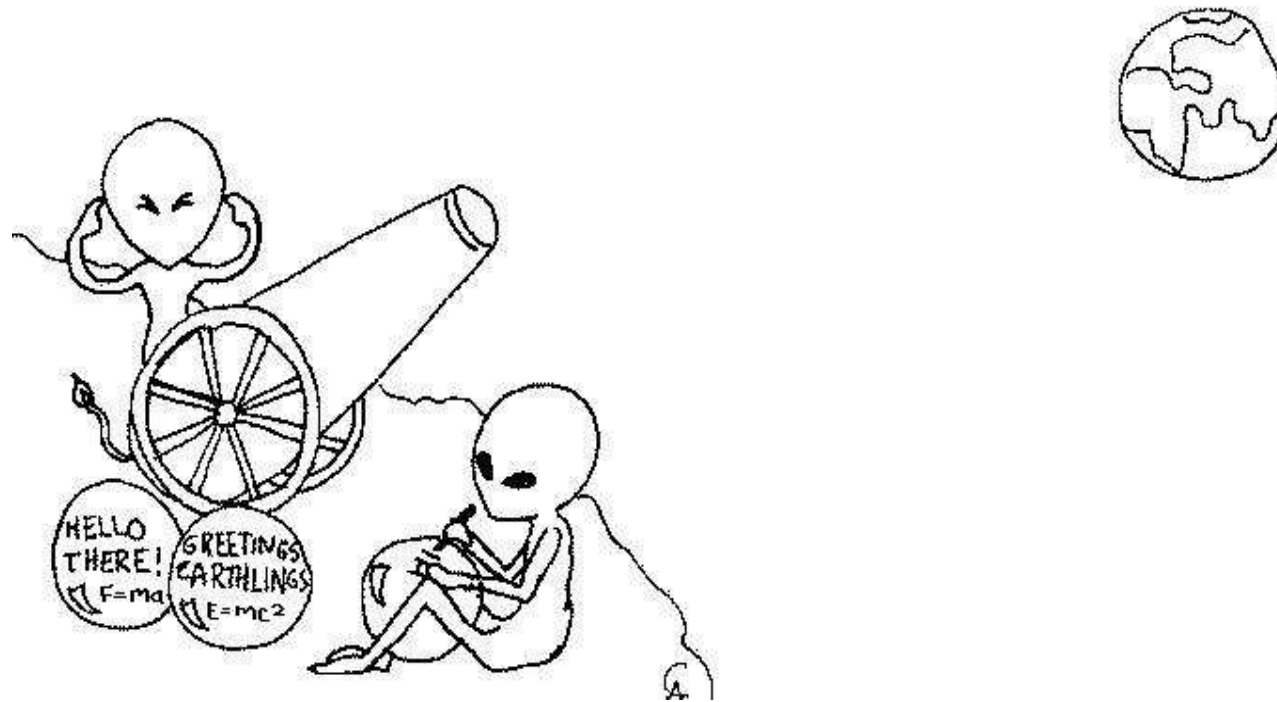


- Lots of fun research questions
- Divide rates by 10 (interference/reuse)
- Not for high bandwidth apps

Common Exotica: inscribed matter channels

- Practical real time “backhaul”: doable but tough
- Tolerate delay?
 - Can you even *index* large streams for search in real time?
 - How many users need true real time?
- Try a FedEx (or Netflix) approach
 - Store information on memory chips
 - Drop off (or toss) periodically at local repositories for upload
- **SURPRISE:** . Can be *incredibly* more energy-efficient than radio!

IN FACT: ET Might Write, Not Radiate



But that's a story for another day...

Technology Push vs. Application Pull

- Internet was a (publicly subsidized) beast of *accretion*
- Yahoo, Google, etc. came LATER
- How might an ultrablogging society *evolve*?
 - What are the “killer apps”?
 - Where does it all start?

START WAVING HANDS VIGOROUSLY



iPod Revolution

- 60GB iPod
 - 12 2-hour DVDs
 - 12000 5-minute songs
 - 5000 days cell-quality voice
- 14 million sold Q4 2005
- 43 million projected for 2006
- Add mic, camera, GPS, wireless link & keyboard?

iPod Convergence

- Text-messaging
- IM
- Cell phone
- Stored/streamed media consumption
- Event tagging & upload
- Micro-news/social Pod-casting

GEN 1

- Memex
- Domestic Discord Damper
- Little need for verifiability
- Useful Tags:
 - Date/Time, Place, Actors, Transcript (A & V)
- **Key Issues:**
 - Big Brother *in utero*, Voyeurism seem manageable

GEN 2

- Selected sharing of personal info
- What IS Truth?
 - Objective Correlates
 - What the majority agrees is truth?
 - Truth “certificates”
- Voyeurism, Cyberstalkers, Nascent Big Brother
- **Key Issues:**
 - Indexing, verifiability, security, info provenance-tracking

GEN 3

- Global A/V-information economy
 - Tier 0: Primary sources
 - Tier 1: Aggregators
 - Tier N : News Services, Public Safety, Government
- *Directed* requests for (real time?) A/V news
 - Find and direct amenable Tier 0 sources to “the action”
- **Key Issues:**
 - Indexing writ large, verifiability, security, info provenance-tracking, reputation & trust (Netflix Prize!)
 - Big Brother has potentially arrived

Should It Be Done?

- Interpersonal Dealings
- Social Intercourse
- What's Public? What's Private?
- Legal Structures
- Civil Rights
- Truth in Government

ULTRABLOGGING SUMMARY

- **Realtime Wireless:** doable with effort/capital
 - But unclear WHO would do ...
 - Meshes probably won't cut it
- **More Interesting (my areas of ignorance):**
 - Can there be secrecy?
 - Can information *usage* be tracked?
 - Truth vs. Fiction: can we reliably tell the difference?
 - Interpersonal Relations
 - What's Public/Private?
- **Social/Society Issues:**
 - Seem manageable if writ small
 - Unclear writ large

REGARDLESS

**Communications Theory Touches It All
(great sabbatical topic)**