Moving Beyond One-Off

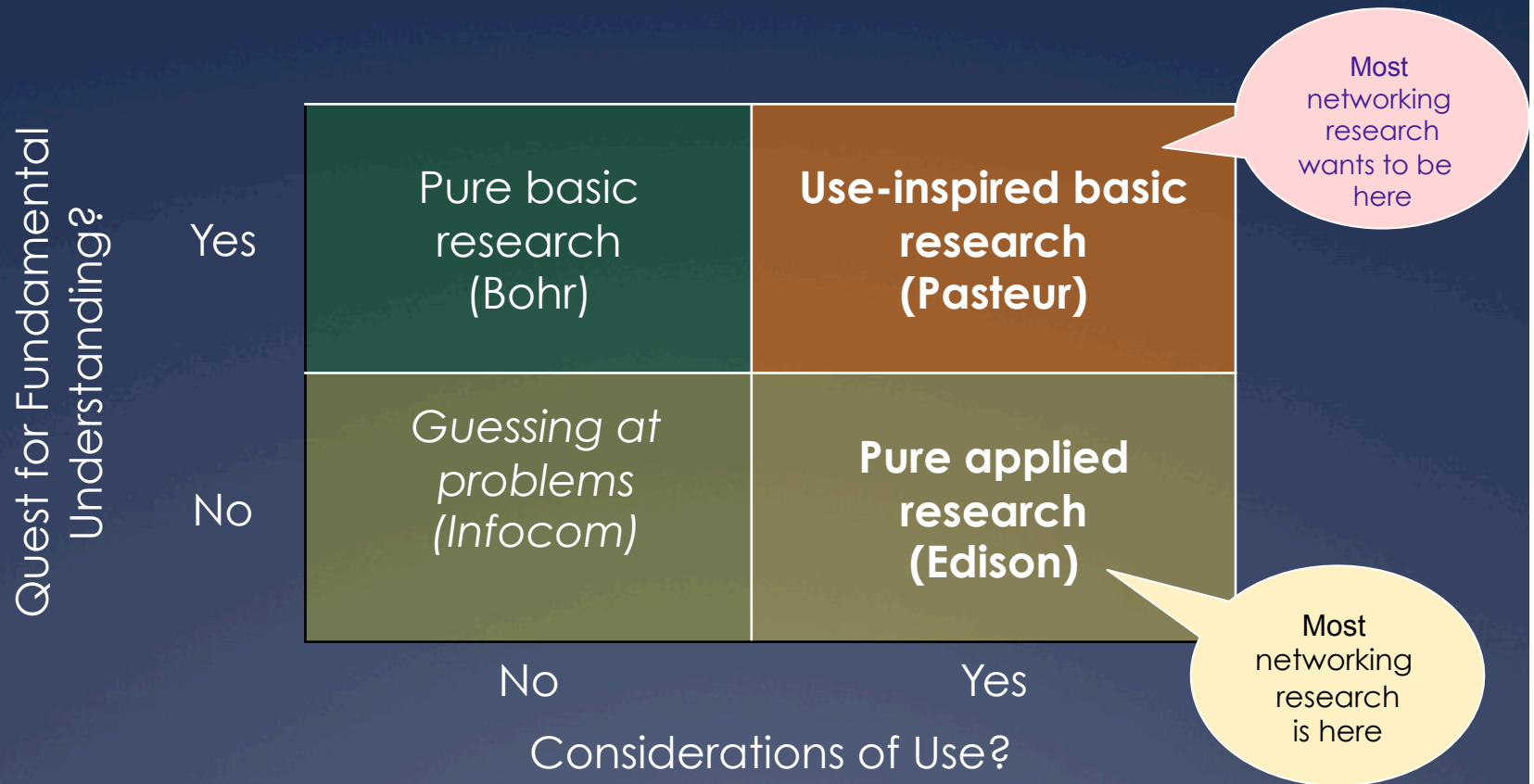# Ubiquitous Applications

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My assumptions

* We're an engineering discipline
  * "Engineering is the discipline, art and profession of acquiring and applying technical, scientific, and mathematical knowledge to design and implement materials, structures, machines, devices, systems, and processes that safely realize a desired objective or invention."

* Other (good) possibilities:
  * we train future engineers
  * we train future researchers

Pasteur's quadrant

Quest for Fundamental Understanding?

	No	Yes
Yes	Pure basic research (Bohr)	**Use-inspired basic research (Pasteur)**
No	*Guessing at problems (Infocom)*	**Pure applied research (Edison)**

Considerations of Use?

Most networking research wants to be here

Most networking research is here

WWIC 2010 & IWQoS 2010

Pasteur's Quadrant: Basic Science and Technological Innovation, Stokes 1997 (modified)

The $1B question

* How big a problem does your proposal solve?
  * Does it create new ones?
    * financial, management, …

* Can it be integrated into the existing Internet
  * or a plausible successor?
  * or 802.11, 802.16, …

* … without everybody changing their ways
  * the secret: **nobody** is in charge of the Internet

* Can it be understood by Cisco CNAs?
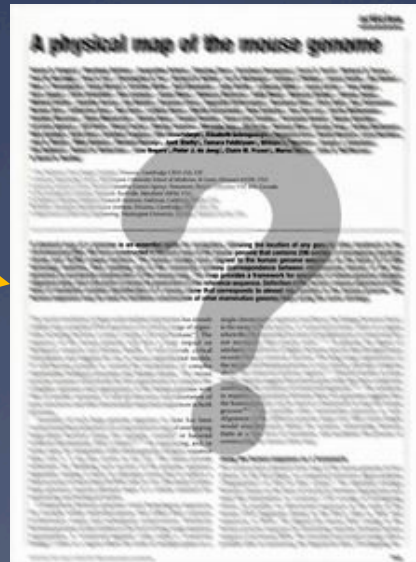 * see IP multicast, PIM-SM

Useful research outcomes

* Standards
  * unfortunately, rarely cite papers

* Get Cisco, Google, Microsoft, … to adopt it
  * 3-4 QoS papers?

* Show what doesn't work
  * counteract industry shills
  * e.g., recently web site privacy

* Understand the Internet better
  * but not just your campus network

* Prior art in patent disputes
  * patents don't have a 90% rejection rate…

WWIC 2010 & IWQoS 2010

CS research to reality

CS as science

CS as engineering

~~CS as a soccer league~~

Network tech transfer, mode 1

somebody else just waiting for your results

Network tech transfer, mode 2
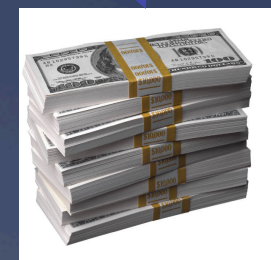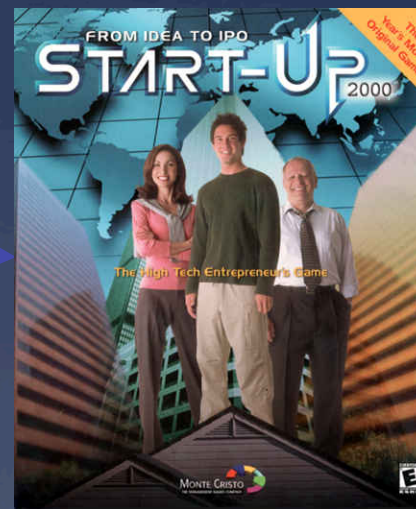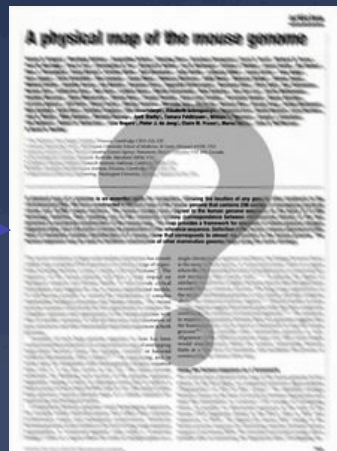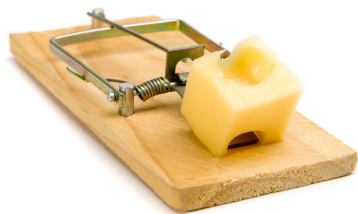
Or just measure citations
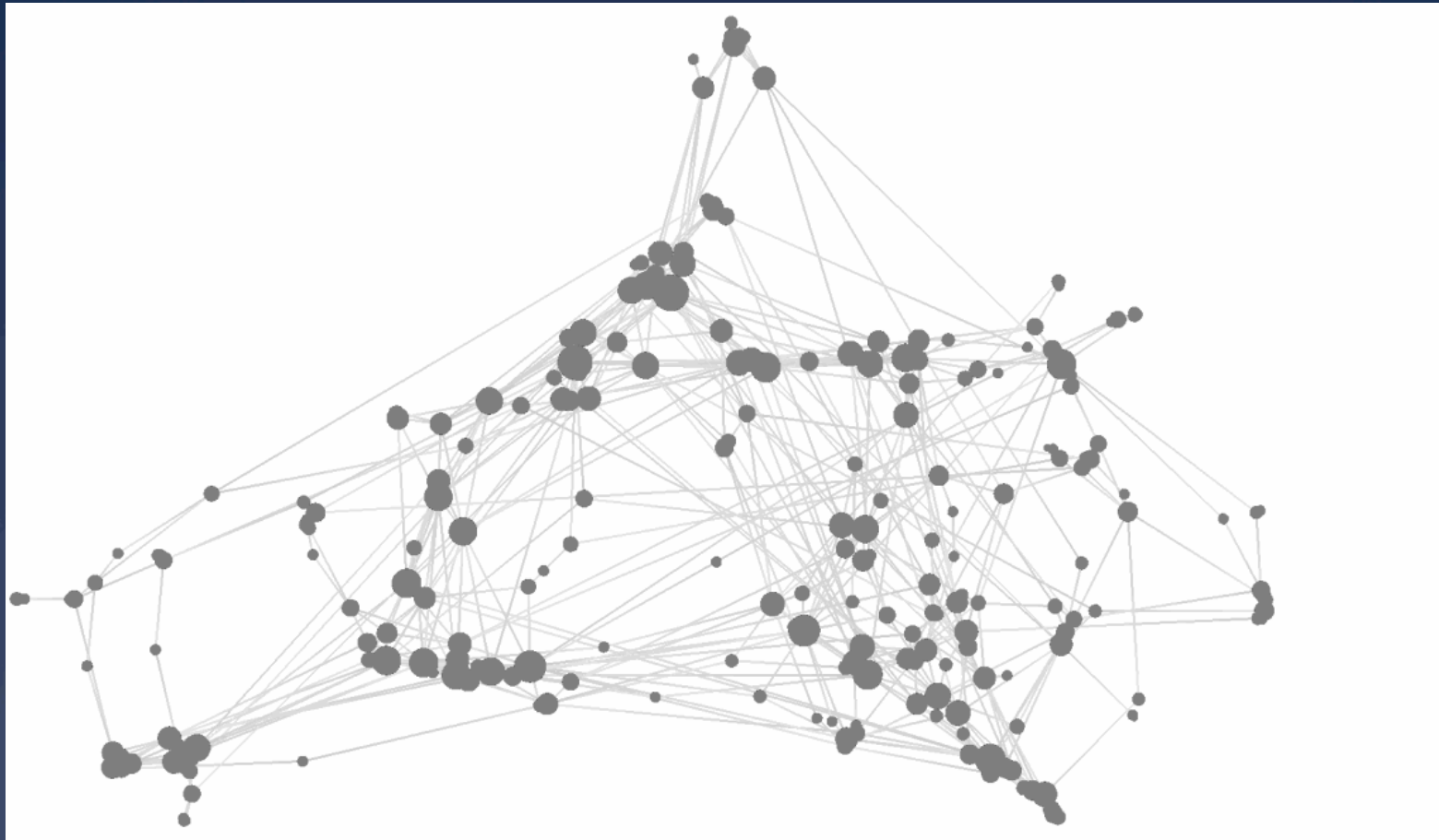
be sure to create enough conferences and workshops…

Caricature UbiComp application

* Installed on some set of mobile devices or local infrastructure
  * usually stand-alone

* Solves a (minor) problem familiar to the researcher
  * typically young, technically-focused
  * social interaction, searching, games, …

* Tested with < 10 users

* Disappears after the conference paper has been published
  * and nobody misses it ☺

Why is QoS attractive?

allows for sophisticated math

quality sounds good

extends to web, P2P, sensor networks, ad-hoc networks, 802.x, …

real problem

well-contained problem

can build lab prototypes

next workshop: QoS for social networks
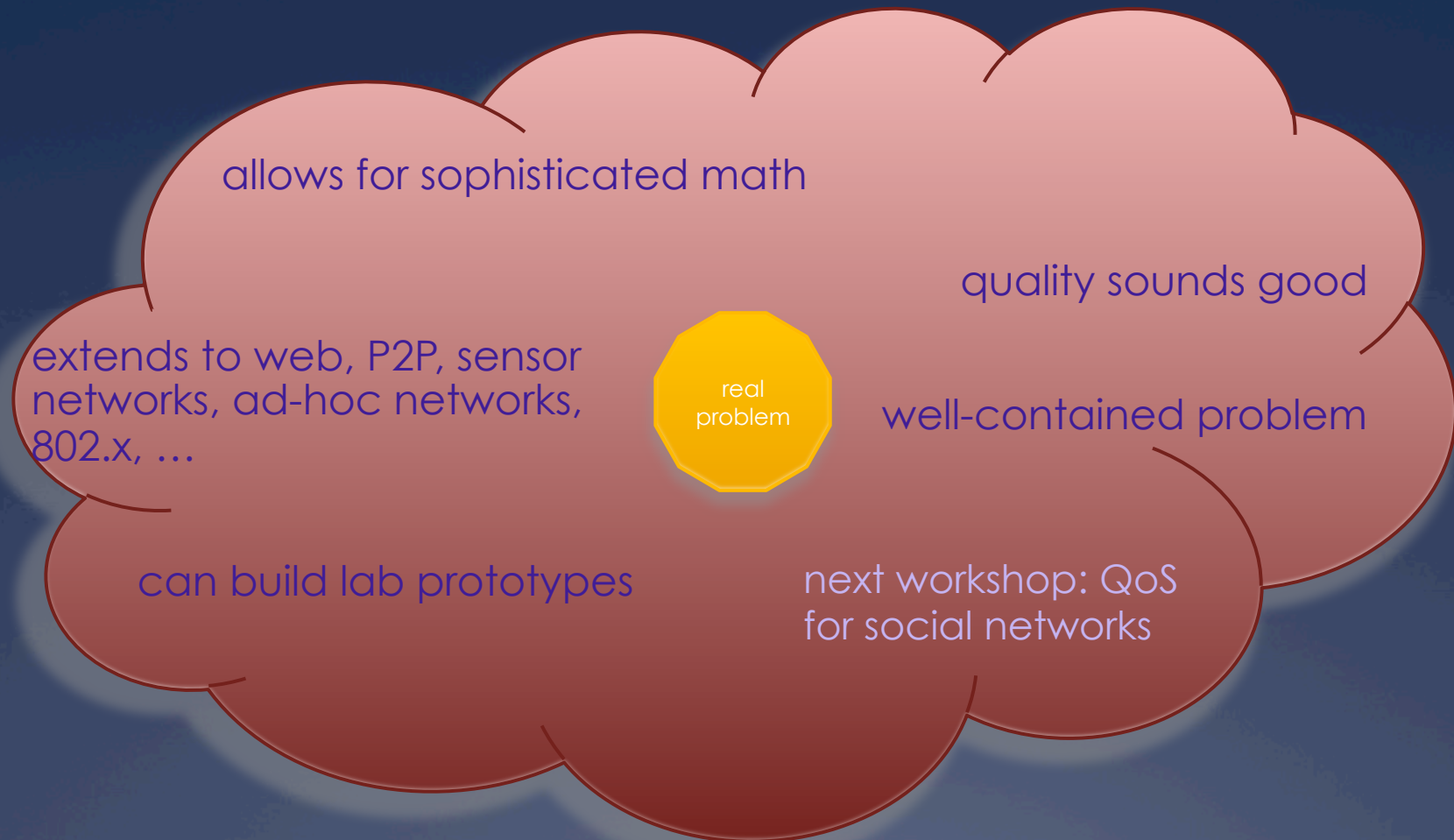
QoS research activity

QoS in IEEE Explore
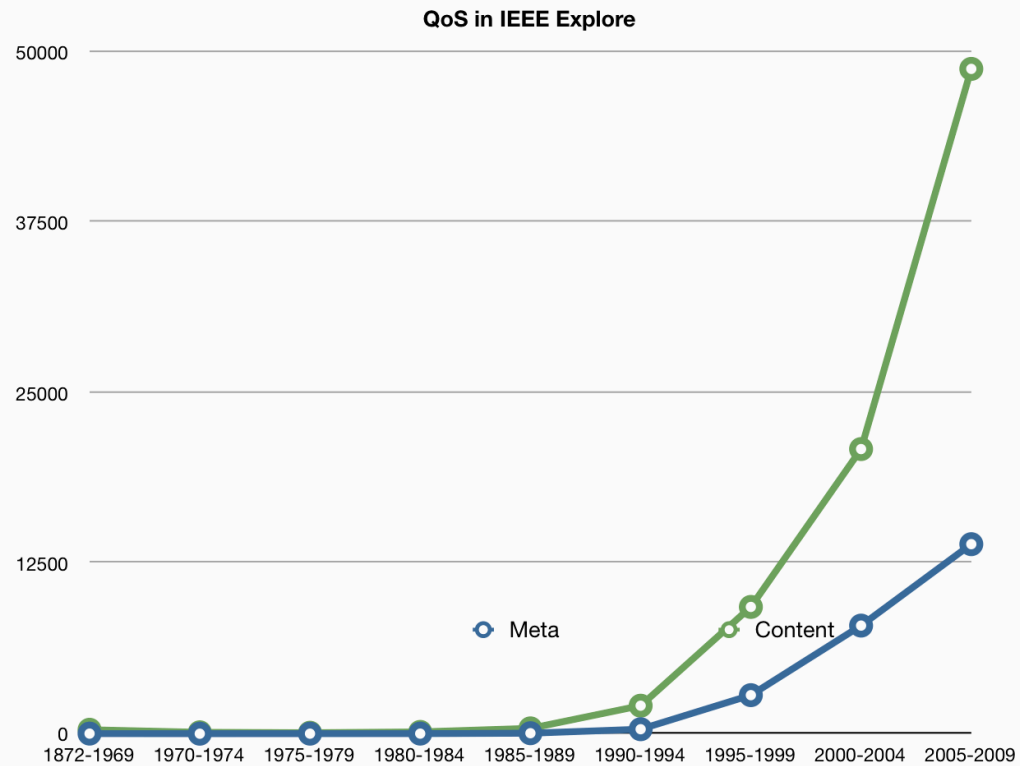
QoS research

* IEEE: 25,583 papers with "QoS" in metadata through 5/2010
  * 84,257 with QoS in meta data or text

* 2 papers/PhD year

* $50,000/PhD year

* → $640M in QoS research

Reflective research needed

* Which applications (and tools) from the UbiComp community have had lasting impact?
  * Some may have inspired other, at-scale applications
  * But did these applications rely draw on the paper?

Questions

* "Just apps"?
  * leave to professional app developers – scale, refinement, maintenance
  * but good educational opportunities
    * student motivation, impact
    * 2008: own web app → 2010: own mobile app

* "Cute toys"
  * need to scale beyond demo
    * how do good ideas get picked up for scaling?
  * real value – sustained use?
    * business model

* Infrastructure vs. carry-along
  * scaling, initial and incremental deployment cost, sustainability

Adoption

Jamie Rector for The New York Times

For safety's sake, Marsha Collier checks in on Foursquare only when she is leaving a place.

Mark Schiefelbein for The New York Times

Elizabeth Aley scanning the bar code on laundry detergent to get points on Shopkick.

But while a home on the beach will always be an easy sell, it may be more difficult to persuade people to start using location-based Web services.

Big companies and start-ups alike — including Google, Foursquare, Gowalla, Shopkick and most recently Facebook — offer services that let people report their physical location online, so they can connect with friends or receive coupons.

Venture capitalists have poured $115 million into location start-ups since last year, according to the National Venture Capital Association, and companies like Starbucks and Gap have offered special deals to users of such services who visited their stores.

But for all the attention and money these apps and Web sites are getting, adoption has so far been largely confined to pockets of young, technically adept urbanites. Just 4 percent of Americans have tried location-based services, and 1 percent use them weekly, according to Forrester Research. Eighty percent of those who have tried them are men, and 70 percent are between 19 and 35.

RECOMMEND
E-MAIL
SEND TO PHONE
PRINT
REPRINTS
SHARE

BLACK SWAN DEC. 1

Scaling UbiComp

"Proof of concept"

Scalable applications

- software (kind of) works
- 10 users
- no content model
- single domain
- no privacy & security model
- no business model
- "cool demo"
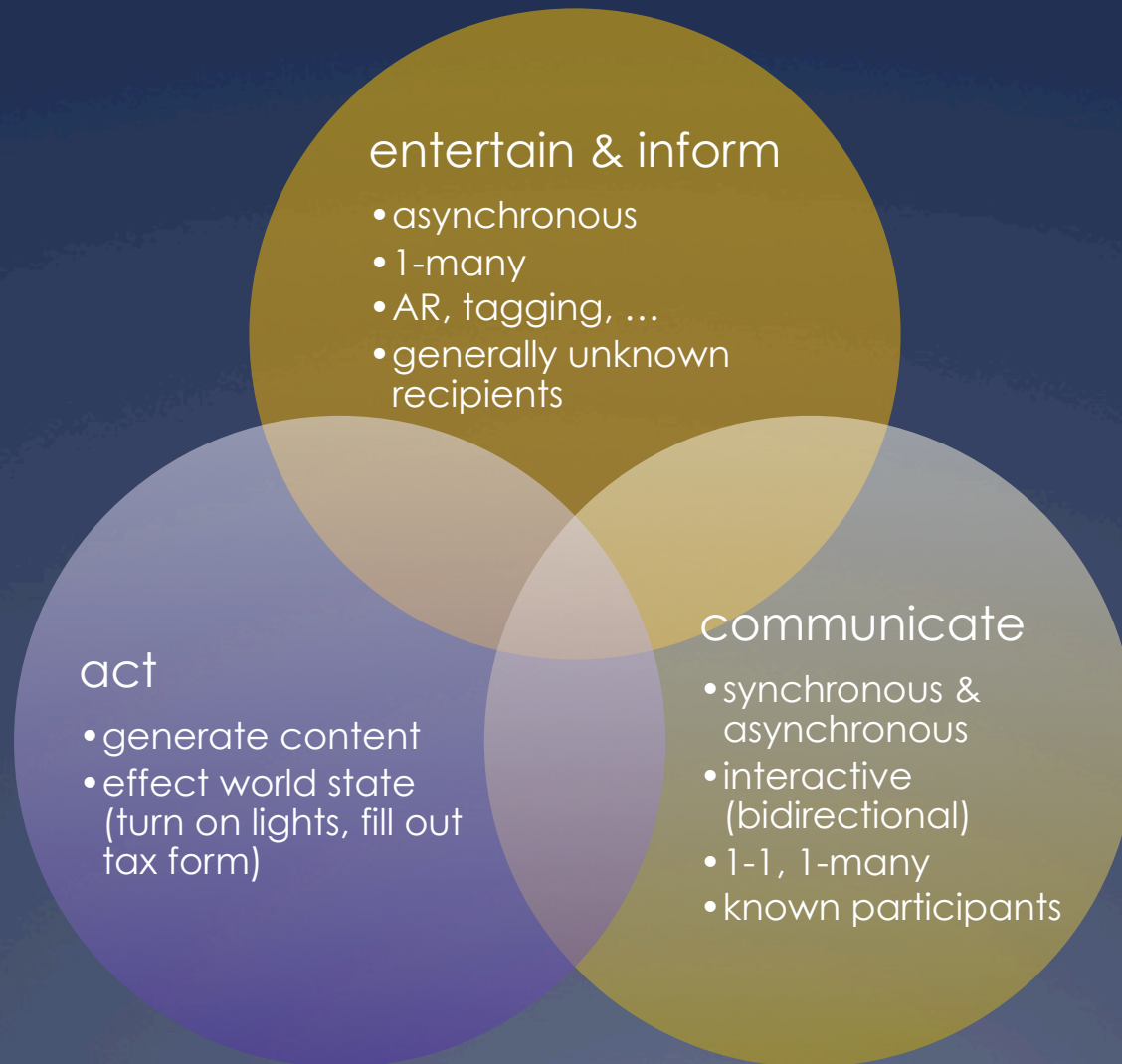
- robust, managed
- 10^6 users
- content generation & maintenance
- can be easily customized to different communities
- financial sustainability
- "hot application"

Content

* Little content → little usage

* Part of scalable design

* Kinds:
  * self-generated (sensors, derived content)
  * user-generated
    * validation, policing, …?
  * custom-generated

3 broad areas

entertain & inform

- asynchronous
- 1-many
- AR, tagging, …
- generally unknown recipients

act

- generate content
- effect world state (turn on lights, fill out tax form)

communicate

- synchronous & asynchronous
- interactive (bidirectional)
- 1-1, 1-many
- known participants

CS = tool builders

* What would make building applications easier, faster, more reliable?
  * management (cf. PanOulu displays)
  * image processing?
  * disruption-prone computing
  * autonomous scaling to millions of users
  * ?

Grand (?) challenges

* What societal problems can UbiComp address?
  * health care (cost, availability, effectiveness)
  * educational challenges
  * safety (vehicles)
  * social and civic engagement
  * limited gov't resources
  * "emerging economies" problems