mPhone: Asynchronous Messages for Developing Regions

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Asynchrony

- Messages rather than direct communications

  - Email vs Phone Call

- Why Asynchrony?

  - Advantages for providers

  - Advantages for users

Provider Advantages

- Networks currently wildly overprovisioned

    - They have to provision for *peak* rather than *average* usage.

    - This means that most of the time, there's a ton of wasted resources
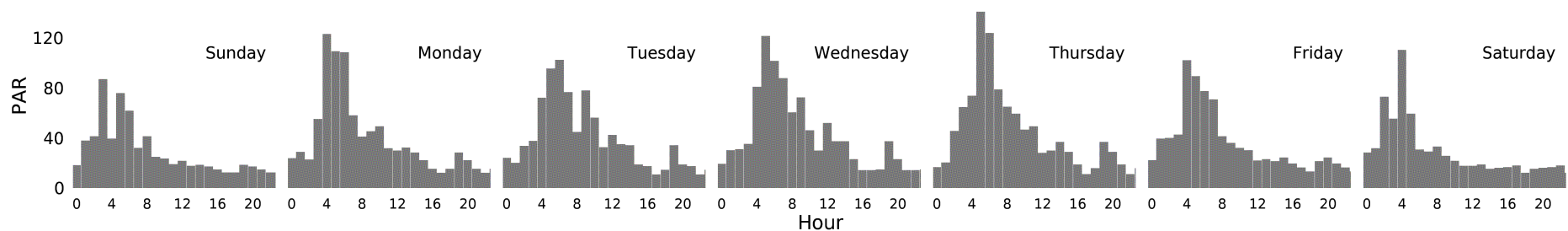
Provider Advantages, cont

- Ok, so how does asynchrony help?

  - If the messages are asynchronous, we can delay communication until the network is free.

  - This allows us to provision for *average* case!

  - This means better utilization of existing equipment

    - Scaling to new users

  - Also means it's cheaper to install new infrastructure

    - Less demand, as we're provisioning more intelligently

User Advantages

- Extended operating range

    - Users in rural areas travel a lot

        - This may be into and out of coverage (fields, for example)

        - Coverage is generally concentrated around population centers

    - Asynchrony allows a user to communicate even outside of network coverage

        - Send a message out of coverage, push it to the network when you gain connectivity.

User Advantages, cont

- Cost benefits
  - Direct calls can be very expensive
    - ~$0.20 per minute in Uganda, on MTN.
  - As evidenced before, providers will get benefits from moving their users to asynchronous communication.
  - Presumably, the providers will pass these gains onto the consumer by allowing for low cost asynchronous communication

Existing Asynchronous Mechanisms - SMS

- Cheap compared to direct calls (~$.03 per message)

- Almostly wholly unusable

  - Literacy, reliability, effectiveness, ...

- Regardless, SMS is highly utilized, as the users are very price sensitive.

  - They use direct calls until budgeting becomes a problem, then send SMS until all funds are gone

- Lacks many of the advantages of true asynchrony!

  - No range extension on most phones, as messages are not stored.

Design

- So we want all of the advantages, with none of the disadvantages.

- Voice messages!

  - Few of the usability issues of SMS

  - All of the asynchrony benefits of message systems

Implementation

- mPhone

  - Asynchronous message platform

    - Send voice/text to other mPhones, traditional telephones, email addresses

    - Receive messages from these sources as well

    - Store messages locally allowing for asynchrony gains

Screen 1

soacp

| 5 | Units | 465 |

Sindika Message | **Message zo (2)** | **Amanya**

Erinya

3:3 ⌄

Enamba

Sangula   Kuba Simu

Number Empya

Screen 2

soacp

| 5 | Units | 465 |

Sindika Message | **Message zo (2)** | **Amanya**

◉ Amalobozi   ○ Messegi

Ebikwata Ku Bwokola   Elinda

Likodinga   Lekerawo   Saako   Ssindika

Screen 3

soacp

| 5 | Units | 465 |

Sindika Message | **Message zo (2)** | **Amanya**

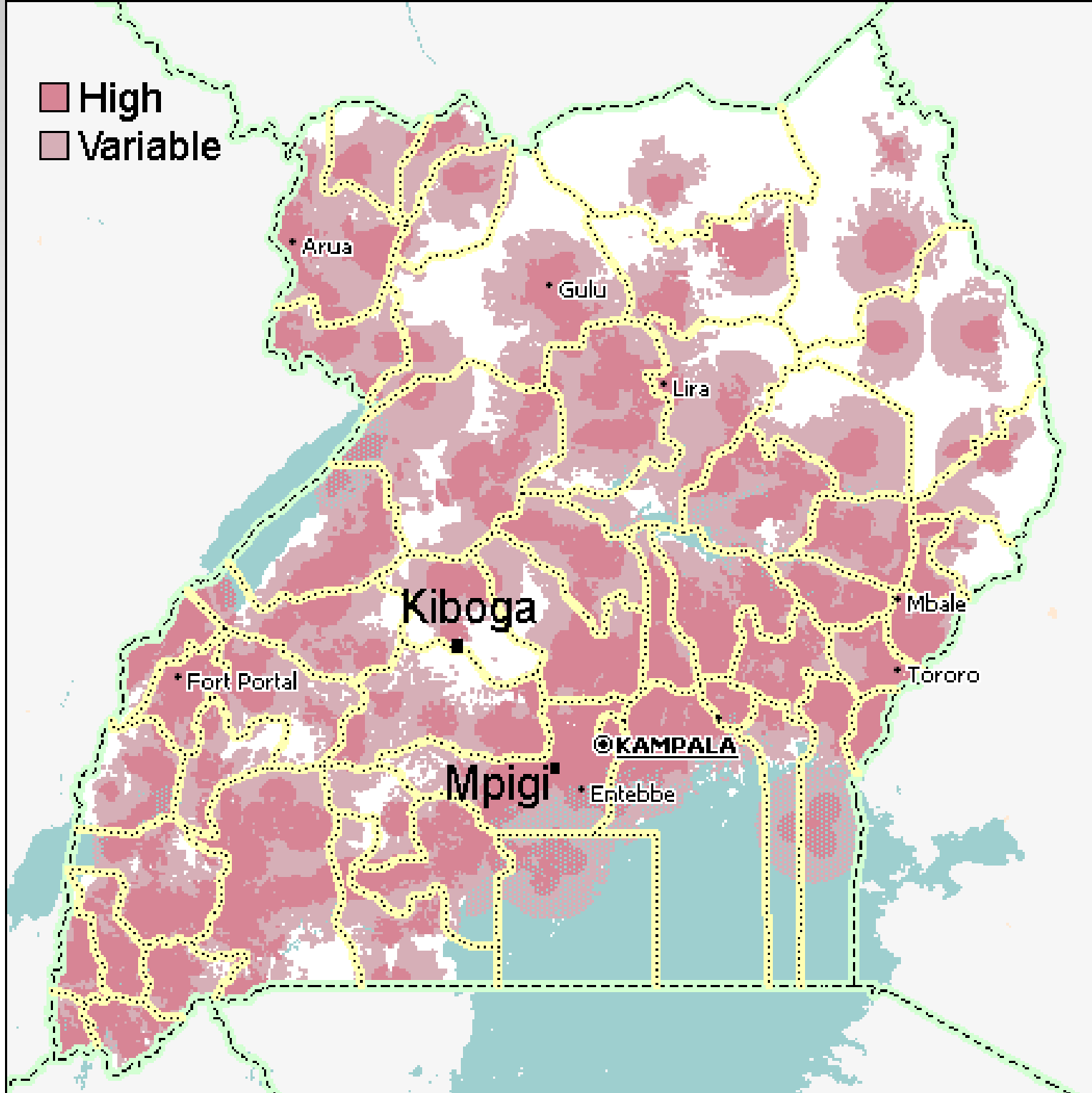From:2 Type:wave ⌄

4.425 Seconds

Saako   Lekerawo   Sangula   Ddamu

Deployment

- Summer 2008, Uganda

- Aim to test usability in villages with intermittent cellular coverage and without any coverage

- Two rural trading areas

  - Mpigi: 1 Hour from Kampala

    - 1 Disconnected Village, 3 Intermittent Villages

  - Kiboga: 3 Hours north of Kampala

    - 1 Disconnected Village, 5 Intermittent Villages

Legend:
- High
- Variable

Map labels: Arua, Gulu, Lira, Kiboga, Fort Portal, Mbale, Tororo, KAMPALA, Mpigi, Entebbe

Results

- Users hate SMS

  - Still commonly used

    - Price concerns

    - Granularity of Communications

- Users love Voice Messages

  - Usability is much better than SMS

  - High granularity of communications

Results, cont

- Users can understand range extension

  - They currently use asynchrony to deal with the *receiver*'s disconnection

    - Send SMS when the other user is unavailable

- Granularity important

  - Users would find great utility in per-second voice messages rather than per-message pricing.

- Generally, voice messages are of great value in the developing world.

Future Work

- We've demonstrated that users get an advantage out of asynchrony.

- Now, we need to demonstrate that providers do.

  - Create a small GSM station deployment

  - Show that messages allow us greater utilization of the hardware

Questions?