Vision:
mclouds-Computing on clouds of Mobile Devices
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Outline:

1. Background & Motivation

2. Introduction of the Design of Mcloud

3. User incentive scheme for mclouds
Background & Motivation

Tablets and Smartphones → powerful → pc

※mobile devices become a core component of mobile cloud computing.
## Background & Motivation

Mobile devices today and in ten years from now

<table>
<thead>
<tr>
<th>Feature</th>
<th>2012</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>dual-core 1.2 GHz</td>
<td>16 cores</td>
</tr>
<tr>
<td>MEMORY</td>
<td>RAM: 1 GB</td>
<td>RAM: 32 GB</td>
</tr>
<tr>
<td></td>
<td>storage: 32 GB</td>
<td>storage: 1 TB</td>
</tr>
<tr>
<td>NETWORK</td>
<td>WiFi / 4G</td>
<td>WiFi / xG</td>
</tr>
<tr>
<td>BATTERY</td>
<td>8 h talk time, 270 h stand-by</td>
<td>-</td>
</tr>
</tbody>
</table>
Background & Motivation

Mobile cloud computing now

Mobile is a thin layer of the application:

1. Collect the data
2. Send the data to cloud

Drawbacks:

It can suffer from network scalability issues when millions of devices engage in backend communication for cloud processing.

This problem will have an even larger impact in the future, because there will be more and more smart devices. Iphone 7, iphone 8......
Mcloud

Nebula Vs Mclouds
1. Single Processing
No support from the back-end, just do it on the mobile device.

PocketSphinx:

It is a successful effort of speech recognition engine implementation for mobile devices without backend interaction.

Problem?

Energy!
CPU!
Memory
2. Distributed Processing

The task will be split into $m$ subtasks which can be safely executed independently from each other.
Mcloud Management:

- Resource Discovery: master device need to identify the nearby devices that potentially form a mcloud.

- Formation: the devices that willing to join respond to the master by sending there unique id. The master maintains a list of id of the sub devices and the tasks assigned to them.

- Maintenance: the sub devices may move in and move out of the short-range radio coverage.

- Release: when a sub device send a release message, the master must find some other devices to deal with this task or invoke the backend cloud to complete this sub task.
3

USER INCENTIVE SCHEME
u – utility of a mobile service, a measure of satisfaction perceived by the mobile user, which may be indirectly revealed by the price the user is “willing to pay”;

T – time to complete the service without using mClouds; This can be seen as delay.

w – cost of waiting per second, which reduces the satisfaction and is highly dependent on the application;

p – cellular usage payment to carrier without using mClouds.

When \( u - w \times T - p > 0 \), user will consider this mobile service useful.
A mobile user with the master mDev will consider a mobile service with mClouds useful:

\[ u - w*t - q - m*s > 0 \]

\( t \rightarrow \) time to completion with mClouds (smaller than \( T \))
\( m \rightarrow \) number of sub servers
\( s \rightarrow \) average payment to each of the sub server
mClouds provides real cost savings if:

\[ w^*T + p > w^*t + m^*s + q \]
For the volunteer devices:

\[ \text{si} > \text{vi} + \text{bi} \]

**si** : the receiving payment
**vi** : cellular cost
**bi** : battery cost
Example: real-time attendance
Conclusion
Running processing and storage-intensive applications on increasingly resourceful mobile devices would reduce demands on rapidly saturating cellular data networks. However, there still many problems with mclouds.
Questions?
THANK YOU!