

Some Thoughts on Mobile Cloud

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The Cloud Era

- The cloud has entered into our daily life...
 - Dropbox, iCloud, SkyDrive,...



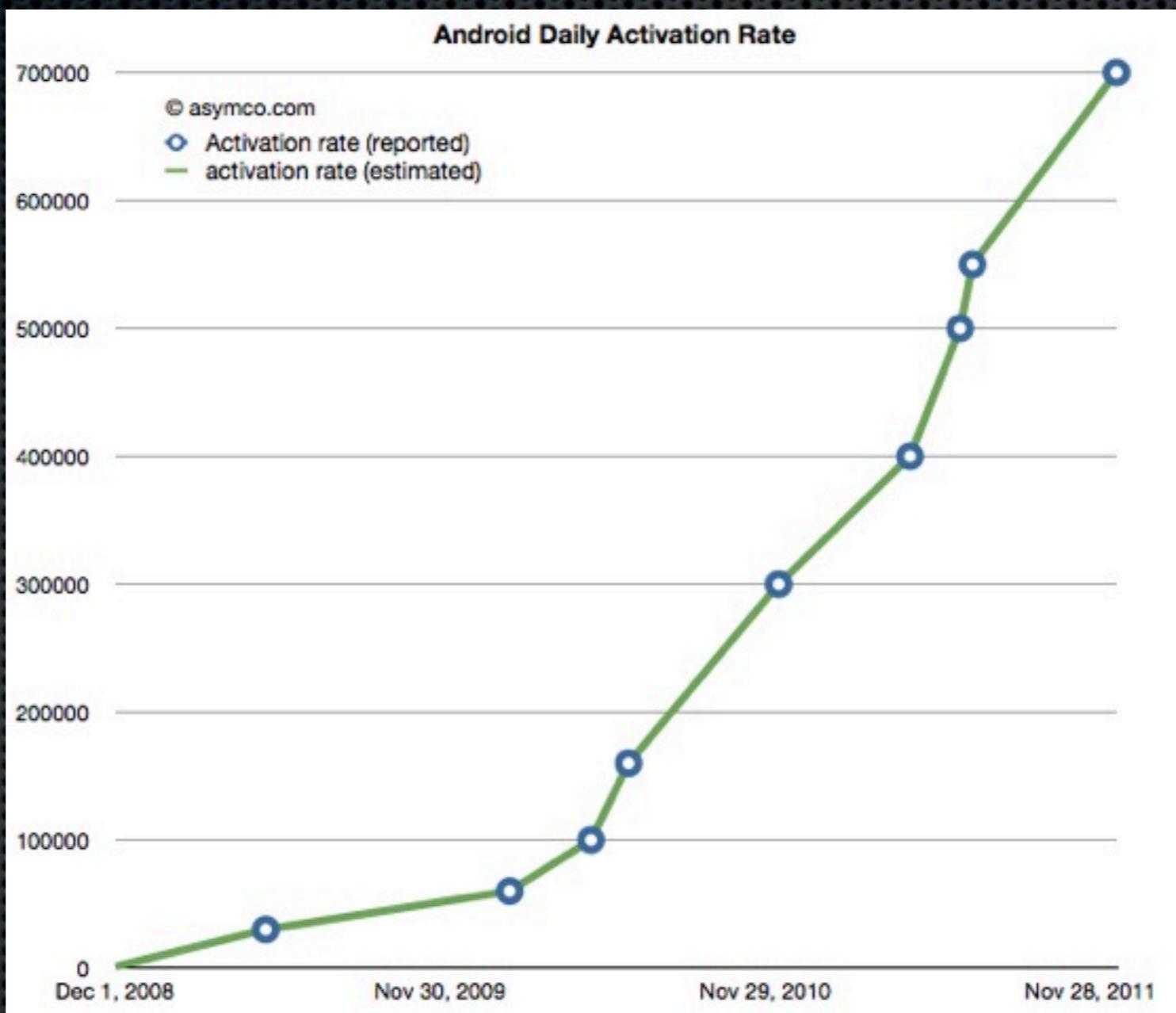
The Mobile Era

- iPhone, Android, Windows Phone, ...



A large number of devices are being activated

A large number of devices are being activated



Almost 700,000 devices are activated everyday!

A Huge Number...

- But ...
- relatively poor performance and limited battery life



Performance v.s. Battery life

Why not...?

- Using cloud to leverage mobile, we have :

Mobile Cloud

Mobile Cloud

- Mobile Assistance Using Infrastructure (MAUI) [1]
- CloneCloud [2]
- Odessa [3]
- ThinkAir [4]

[1] E. Cuervo, A. Balasubramanian, D. Cho, A. Wolman, S. Saroiu, R. Chandra, and P. Bahl, MAUI: Making Smartphones Last Longer with Code Offload, in ACM MobiSys 2010, 15 June 2010

[2] B. G. Chun, S. Ihm, P. Maniatis, M. Naik, A. Patti. CloneCloud: Elastic Execution between Mobile Device and Cloud. in Proceedings of the 6th European Conference on Computer Systems (EuroSys 2011), April 2011.

[3] M. R. Ra, A. Sheth, L. Mummert, P. Pillai and D. Wetherall, and R. Govindan (2011) Odessa: Enabling Interactive Perception Applications on Mobile Devices. In Proceedings of the 9th International Conference on Mobile Systems, Applications, and Services (MobiSys'11). June.

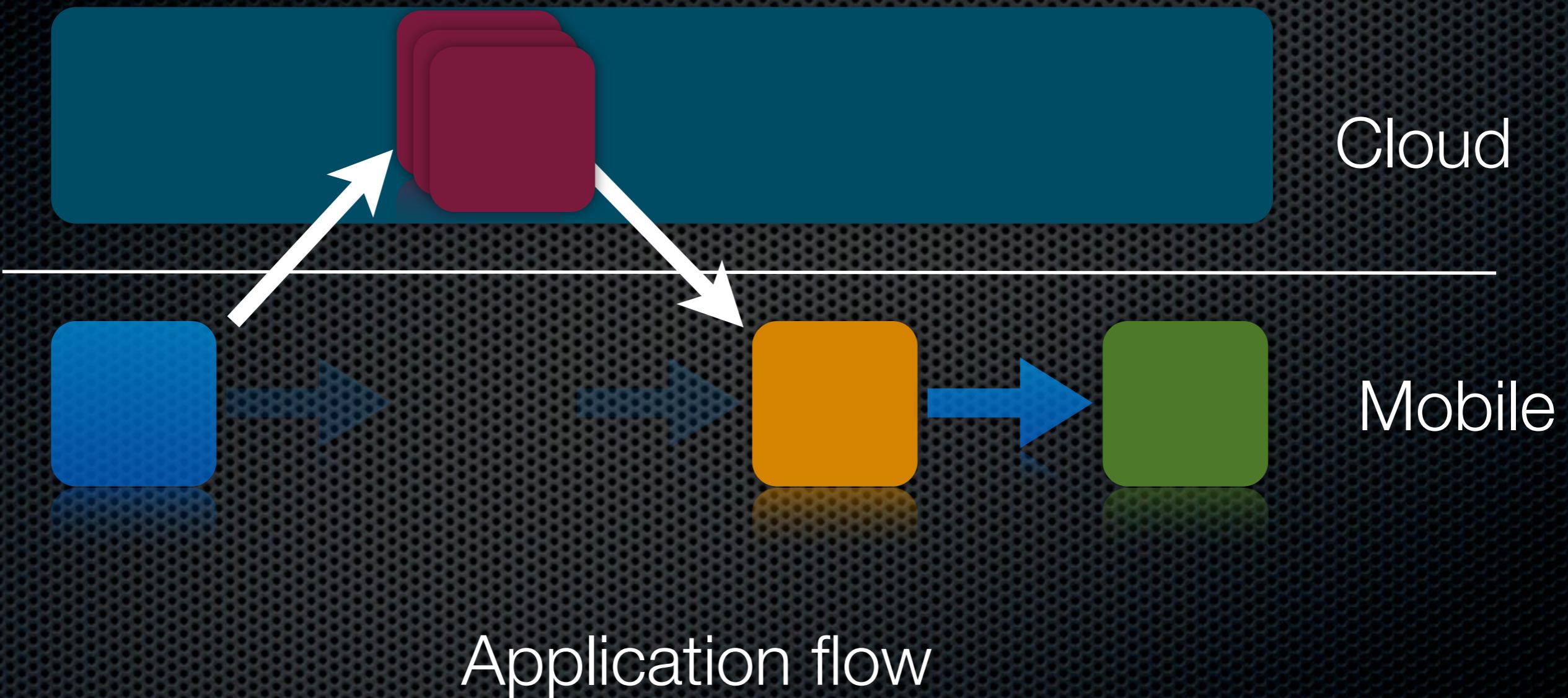
[4] S. Kosta, A. Aucinas, P. Hui, R. Mortier, and X. Zhang. ThinkAir: Dynamic resource allocation and parallel execution in the cloud for mobile code offloading. To appear in IEEE INFOCOM 2012.

Something in common...



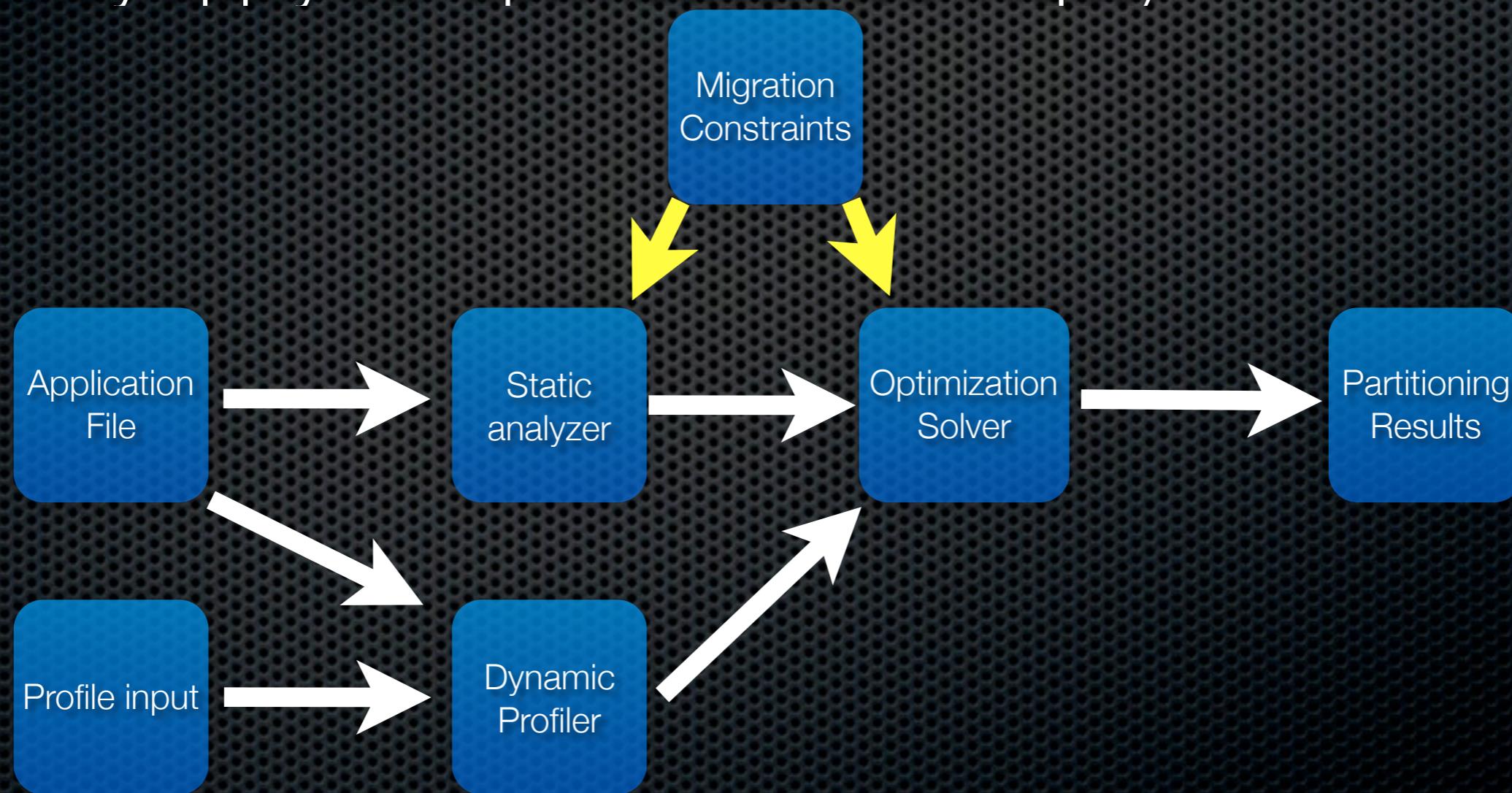
Application flow

Something in common...



Something in common...

- All frameworks are involving partitioning decision (we may apply our optimization technique)

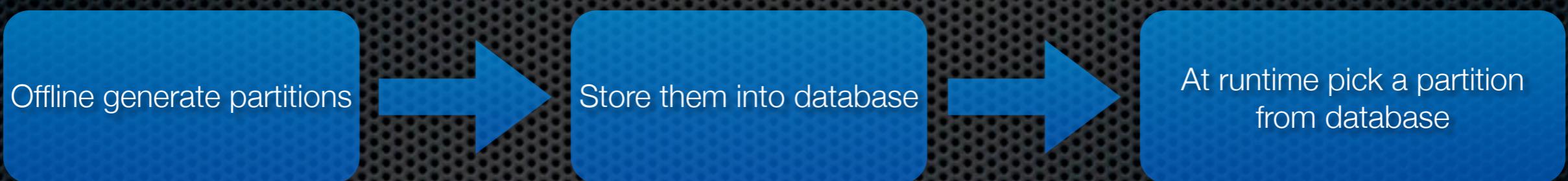


More about partitioning...

- MAUI proposes 0-1 ILP
 - Full knowledge about call stack
 - Call stack depends on input data, especially interactive application
 - Developers indicate the initial partitioning using `@remoteable`
 - Partitioning level: method-level

More about partitioning...

- Clone Cloud
- Off-line:



- Developers do not need to show @remoteable
- Thread-level

More about partitioning...

- Odessa:
 - Relies on estimates, a decision may need to be reversed at the next decision point
 - Stage-level
 - For specified application

More about partitioning...

- ThinkAir:
 - First, the decision is based only on environmental parameters such as network quality
 - For the following times, the decision on partitioning is based on the method's past invocations, e.g. time and power consumption
- Method-level

A few comparisons

- Some need developers' help to identify the remoteable parts, e.g. MAUI, ThinkAir. Some do not need, e.g. CloneCloud
- Some support the specific applications, e.g. Odessa supports Interactive perception application: face recognition, object and pose recognition etc.

A few comparisons

- Some support advanced features, e.g. scalability, parallelism. (ThinkAir)
- Implemented in different technologies.
- Some claim that they can provide source codes on requests, e.g. ThinkAir

Inspirations

- Modeling on dynamic process
- Online algorithm to avoid myopia solver.
- No consideration on cloud cost.
- Similar to ...

Q & A

- Thanks for your attention!