

DIEM

New business opportunities

NOKIA

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TIVIT Foresight Seminar

Nov 2nd, 2011

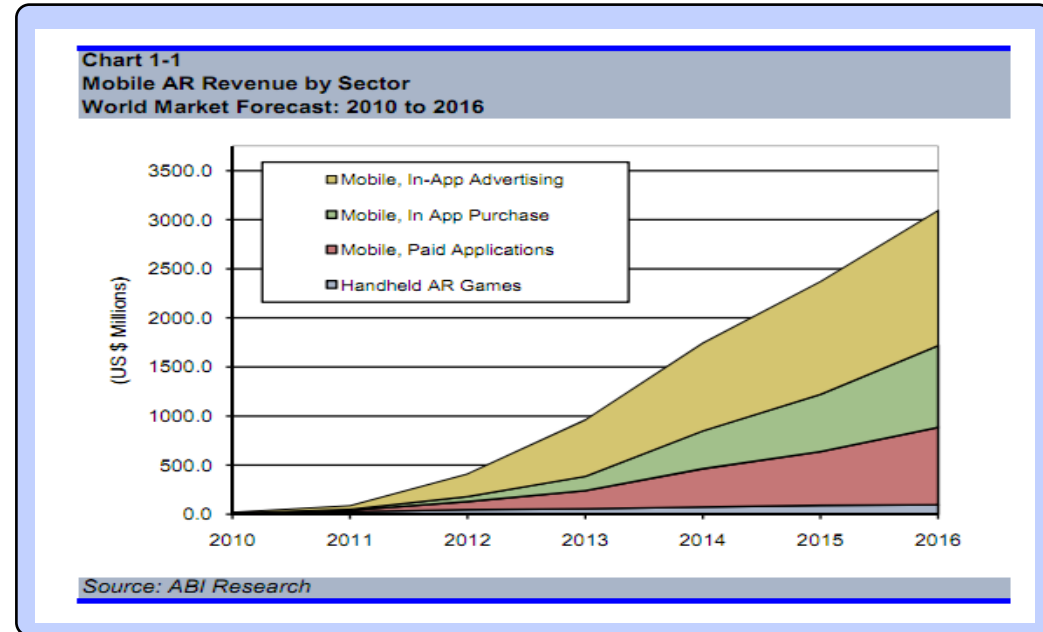
Augmented reality applications

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Data management

AR Landscape

- ❑ Market size of mobile AR speculated to grow from \$21 million in 2010 to \$3 billion in 2016
- ❑ Significant AR growth in 2012, as retailers and marketers fully embrace AR
- ❑ 2013 will reach critical mass when consumer apps with built-in AR capabilities
- ❑ Mobile in-app advertising will represent the largest revenue opportunity by 2016



Mobile Mixed Reality solutions from DIEM

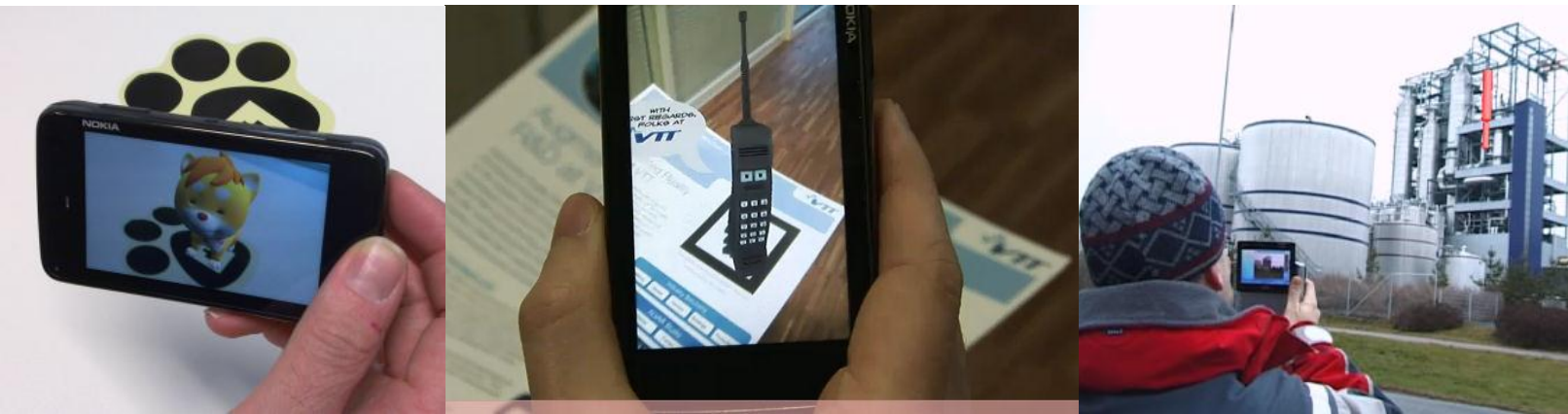
Vision Based Markerless Tracking, Sensor Fusion and 3D Reconstruction Algorithms

- Markerless visual tracking methods track the position of a camera based solely on video information in unprepared environments.
- They can be used for realistic placement of virtual objects into video in augmented reality, for example.
- Typical solutions use an automatically reconstructed 3D map containing the relative positions of some identifiable surface points in the scene to find and track the camera position.



Augmented Reality Applications on Mobile Phones

- AR multimedia player implementation on N900 for Nokia's stand in Finland Pavillion at Shanghai World Expo 2010. Contains touch interaction with animated 3D characters, launching of video etc.
- "Gorba" demo with an animated 3D character augmented on image marker. Contains a highly optimized AR computation loop for the N900 phone.
- "AR4BC" demo system for outdoors augmented reality on N900. Contains an efficient and stable markerless tracking algorithm implemented by VTT, based on initial work by Nokia and Stanford.
- Future: New industry applications making use of augmented reality.



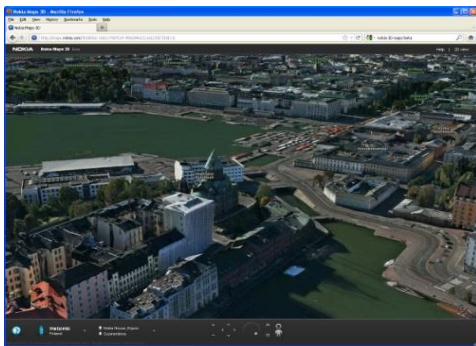
Nokia AR



Nokia LiveView provides a powerful, direct visual interface to information on current location – an instant window to surroundings.



Nokia CityScene provides a detailed street-level experience, allowing exploration and navigation of detailed locales from wherever a user may be.



Nokia 3D Maps is a compelling new visual city map, enabling city exploration, route discovery, and visiting points of interest around the globe.

Location and maps based services

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Data management

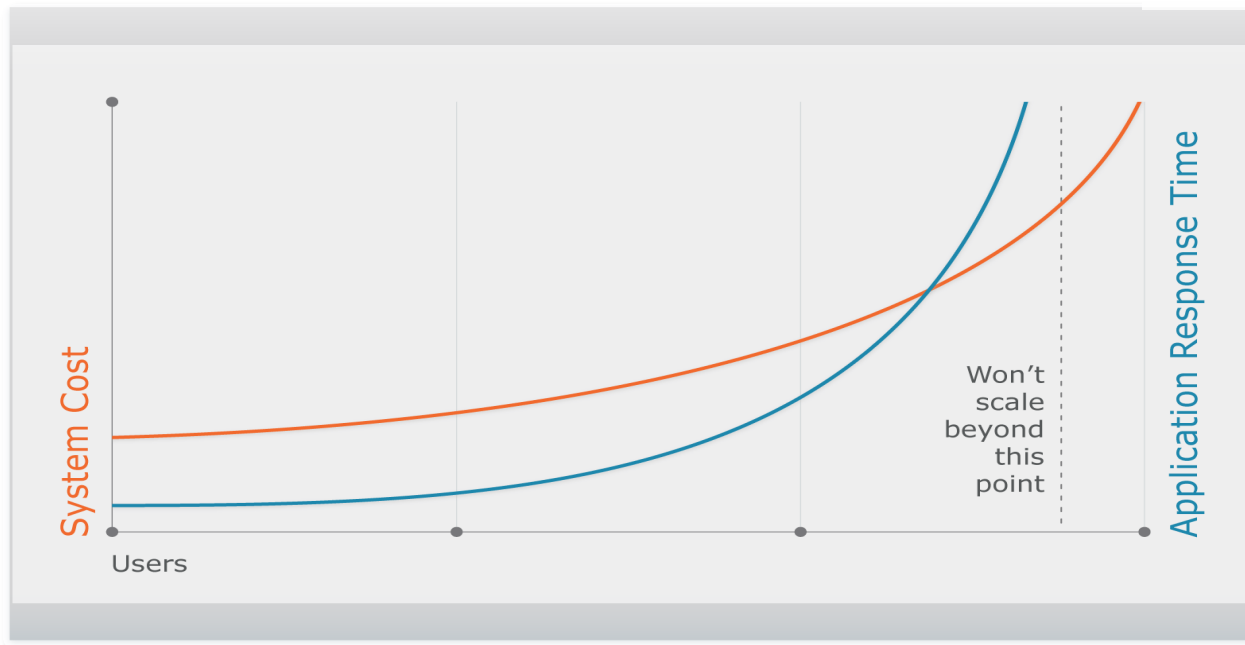
Data management - location and maps based services

As we scale, the cost curve is driven by:

- Growth of data per user
- Complexity to scale and sharing data across silos
- Non-linear data layer scaling
- Less efficient resource utilization
- Globalization – data traffic & legal restrictions

Issues:

1. Vertical scalability
2. Underutilization
3. Too many integrations
4. Duplicated data
5. Duplicated development effort
6. Ineffective and lengthy deployment model



Paradigm Shift needed, the M3

Old World

Enterprise data model

Data on the phone

Data only

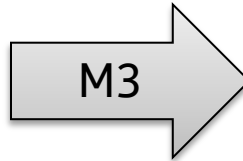
Silos of data

Fragmented data views

Architectural diversity

Scalability barriers

Generic data



DataOS

Cloud data model

Data in the cloud

Knowledge and visibility

Integrated and shared data

Cross services unified data views

Uniformed data architecture

Near linear scalability

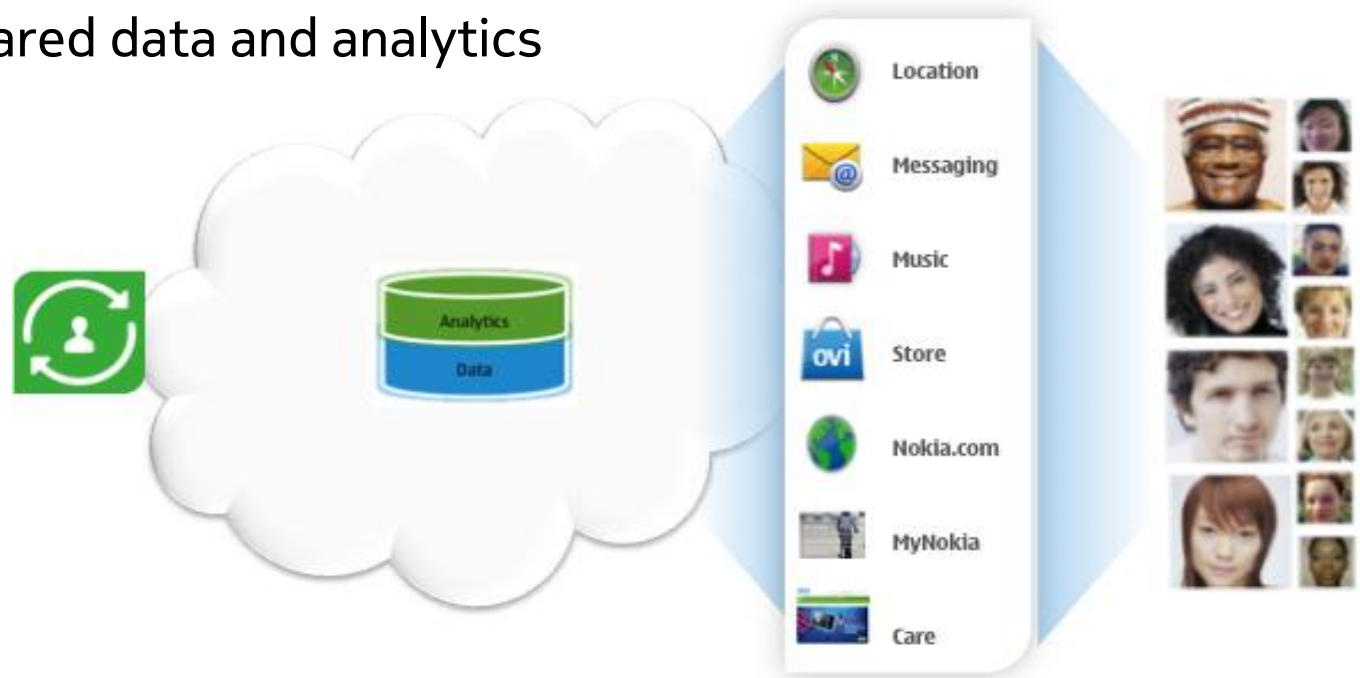
Personal, Contextual, Relevant

DataOS

The Data OS is a key component in addressing listed issues, providing

- a performant,
- scalable,
- low-cost

platform for shared data and analytics



DataOS has adopted **core M3** principles

1. Decouple data from applications

- Users own their own data
- Data is shared between all applications
- Generic data collection are done independently of applications that consume the data
- Enabled generic operations on data to allow infrastructure to participate in data integration, distribution and other tasks

2. All data is universally addressable

- Driven by integration demands implied by #1

3. Divide into fast and slow world and conquer

- Separate real-time transactions from slower back-ends

M3 Architecture Foundation in DataOS

- Distributed Data Management
- High availability
- High performance, low latency
- Incremental scalability
- Eventual consistency
- Self Managing : rebalancing, self healing
- Data grid, bring algorithm to data
- Robust data recovery
- Low total cost of ownership
- Minimal administration, full automation