



National Institute of Information and Communications Technology

AFICT2009 in Thailand



PIAX: A Ubiquitous Service Platform based on Overlay Network Technologies

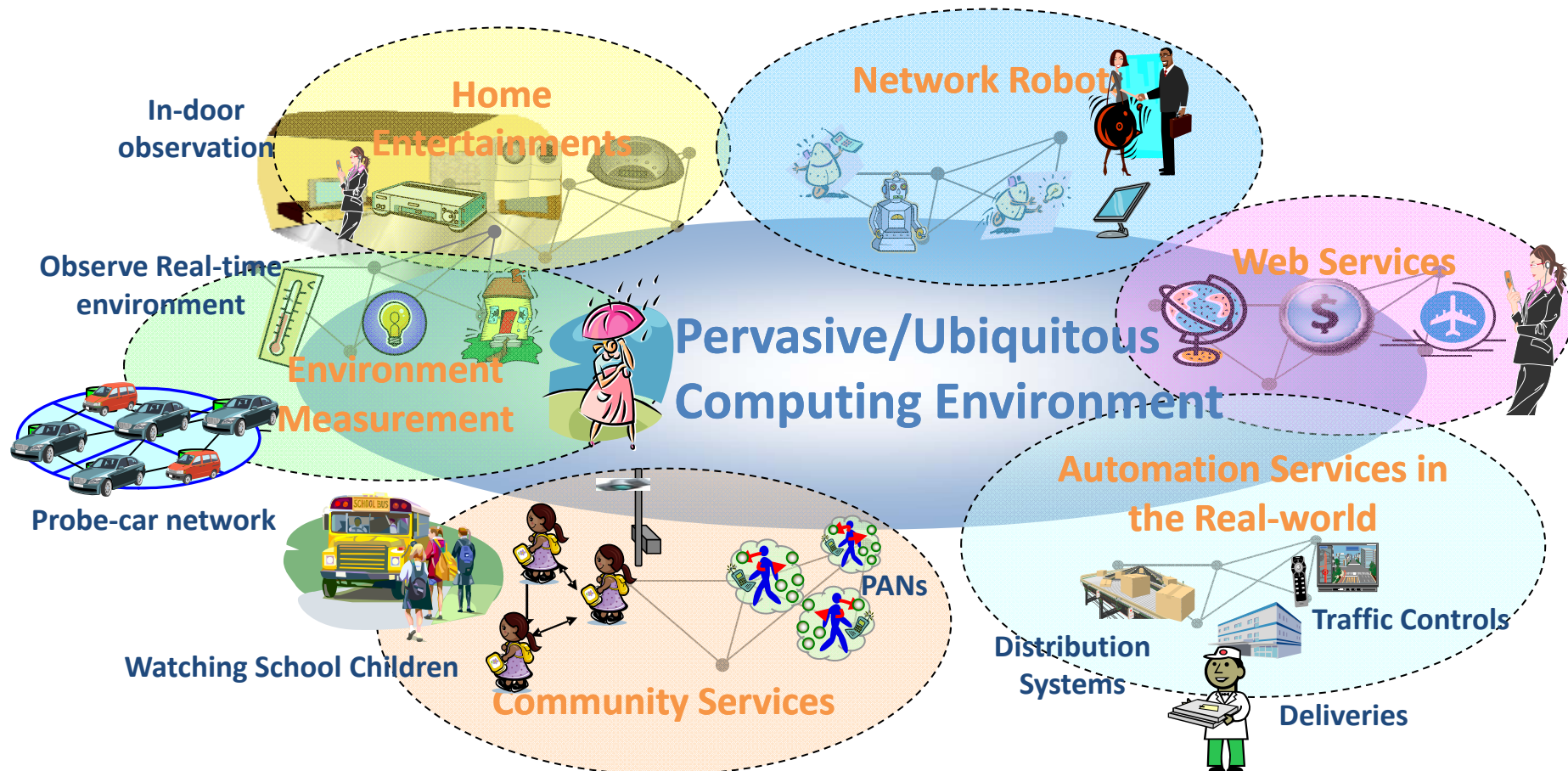


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Background

- Pervasive/Ubiquitous Computing Environment



Interoperability of Pervasive Systems

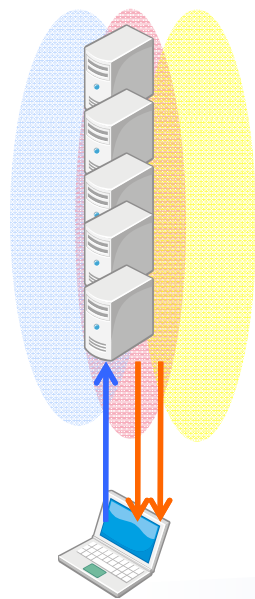
- Vertical Integration
 - Specialized, Closed System
 - Enormous cost for wide-area coverage
 - Centralized, uniformed



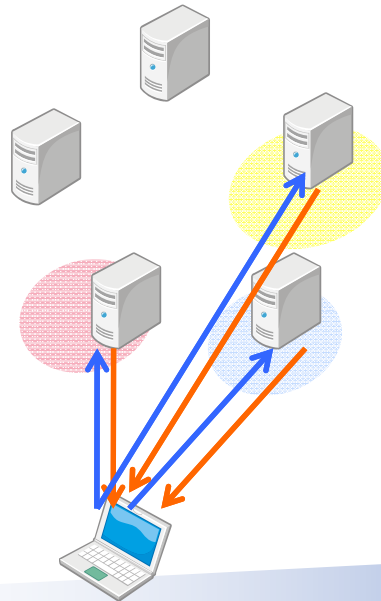
- Horizontal Integration
 - No limit the purpose, Open System
 - Cooperation for wide-area coverage
 - Distributed, diversified

Vertical & Horizontal Integration

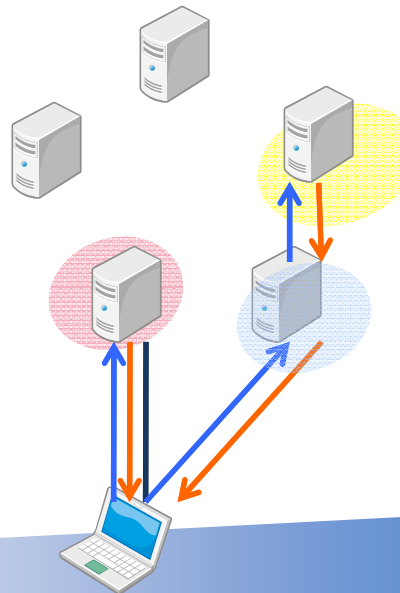
Large-scale
Web Services



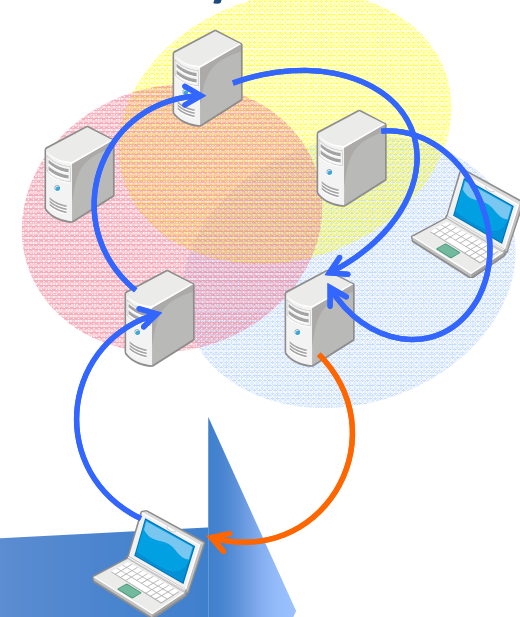
Traditional Web



Mash-up /
Web Services



Peer-to-Peer
Loose Syndicate

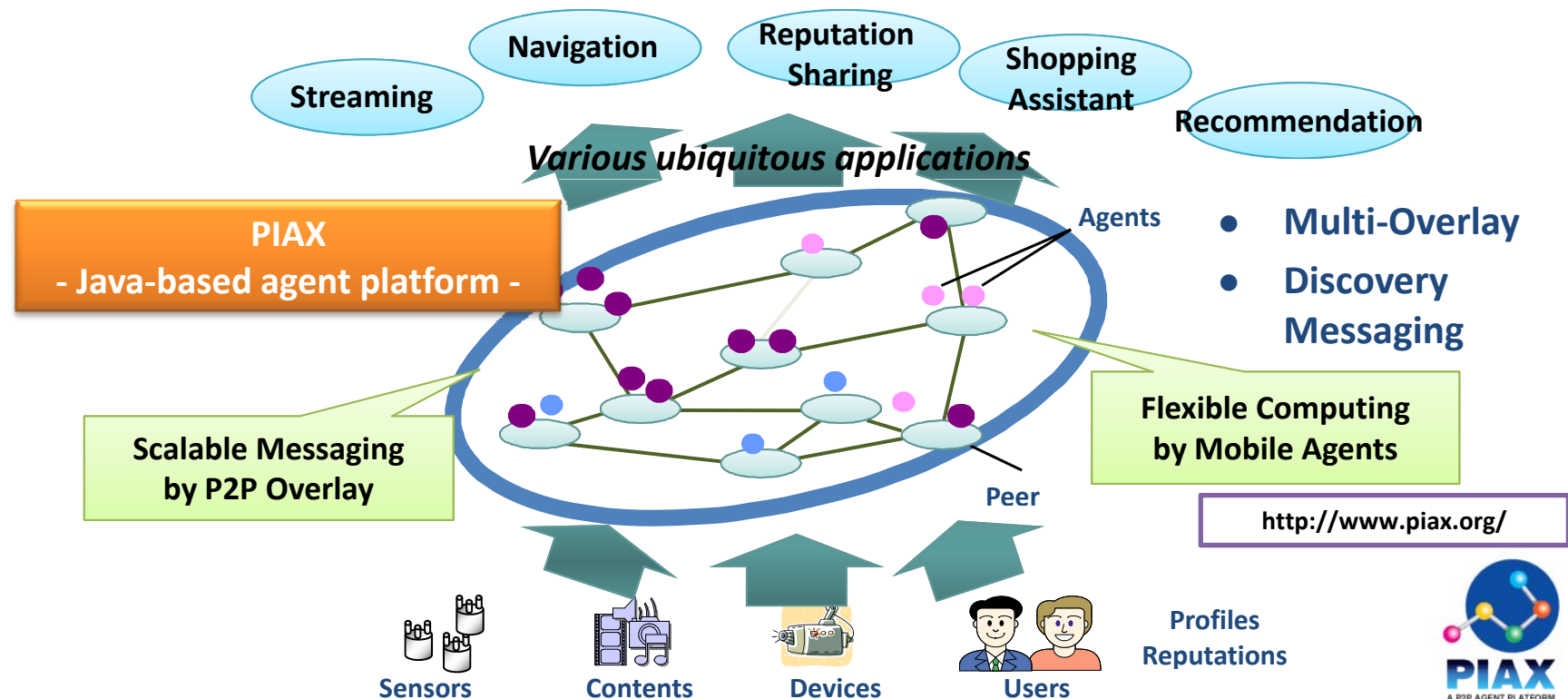


Vertical

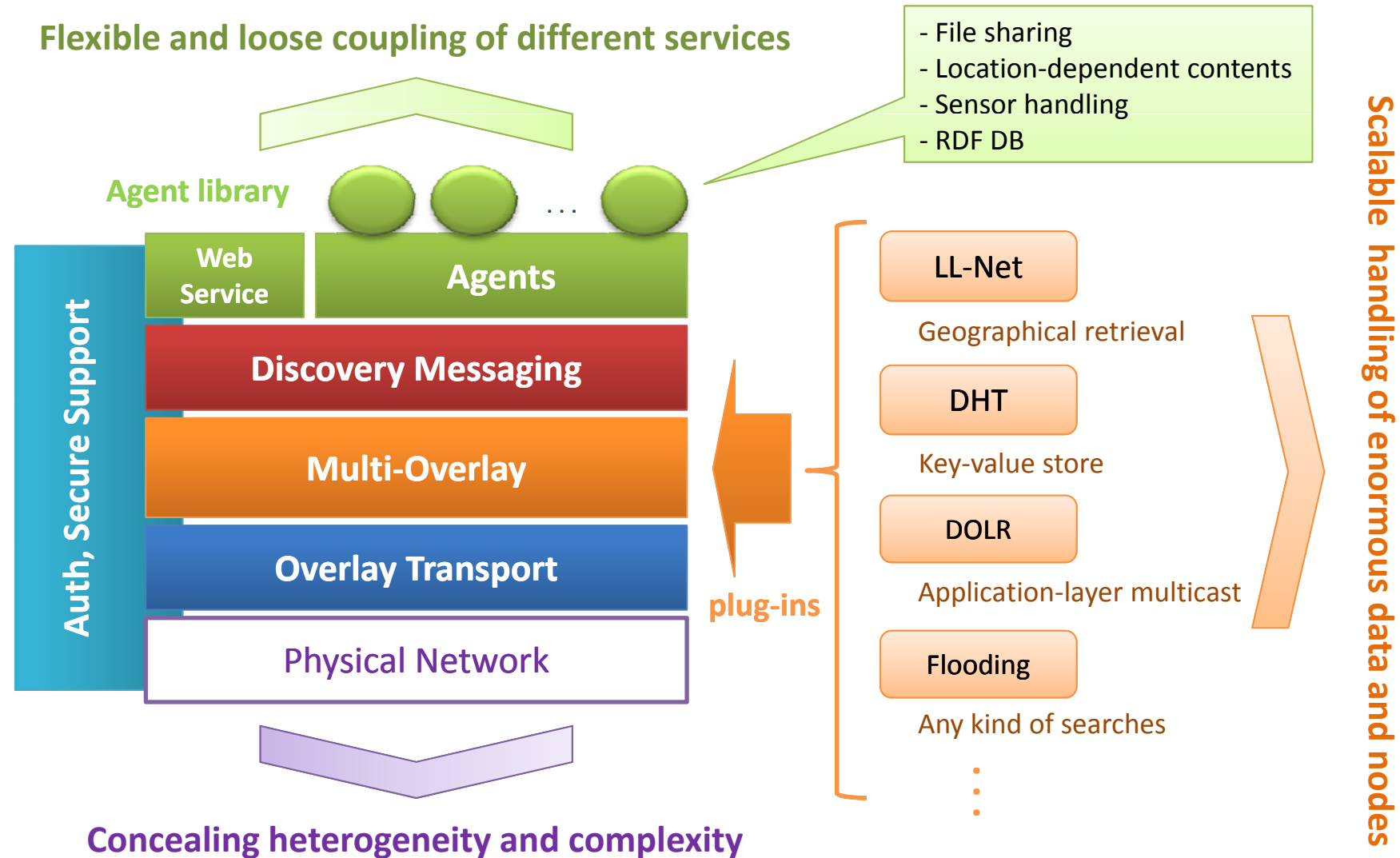
Horizontal

PIAX: P2P Interactive Agent eXtensions

- Java-based platform that integrates:
 - Multiple P2P overlay discovery functions
 - Mobile agent features



Software Structure of PIAX



Skip Graph

The core overlay network of PIAX is based on Skip Graph that can support range-query.

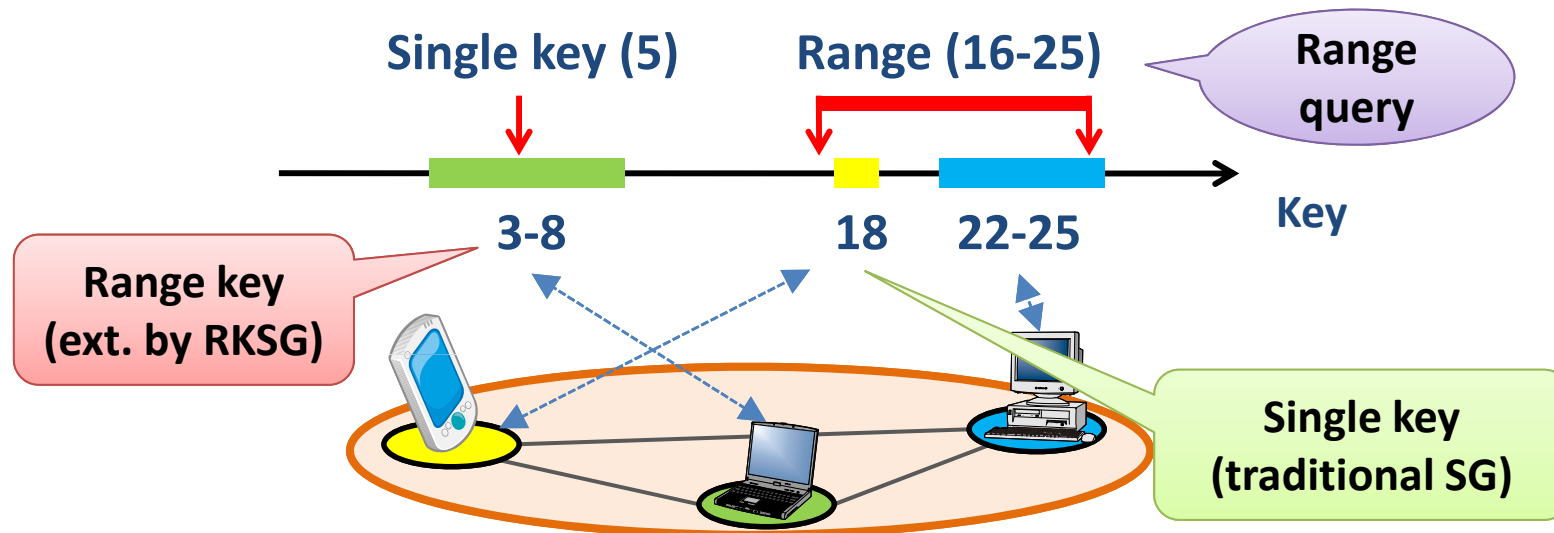
- Each peer has ONE key in the original Skip Graph, but Multi-key Skip Graph that can handle multiple keys in each peer is proposed and implemented in PIAX.



Forward query for key range of [1:3] from peer '110'

Range-key Skip Graph

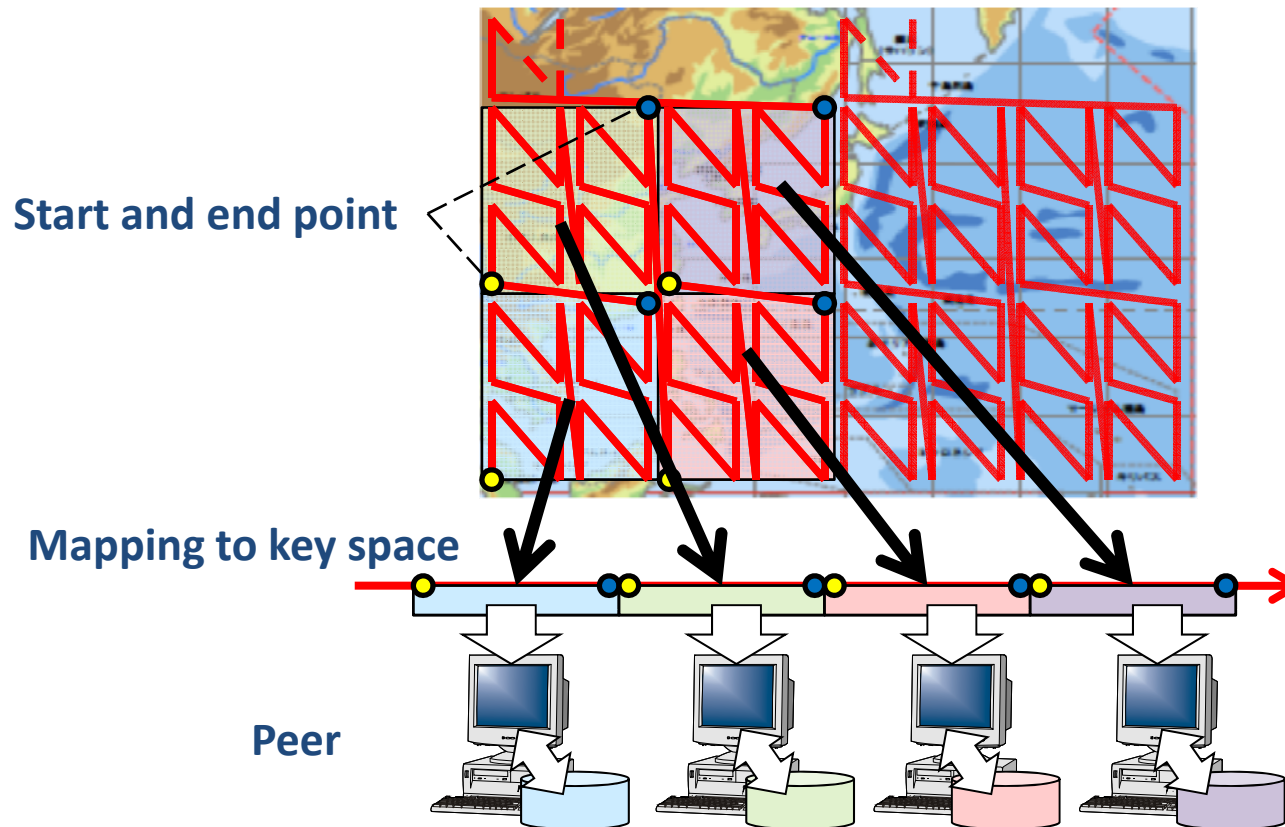
- Handle a 'range' as a key in Skip Graph



- Usage examples:
 - Discover a provider that covers a certain place as a service area
 - Connect and federate intra-resources among the different organizations (e.g., databases, sensor networks)

Geographical Key-value Store

- RKSG's range-query enables distributed peers to manage location-dependent contents



Summarized Features of PIAX

- The features of PIAX are:

- ■ Flexibility

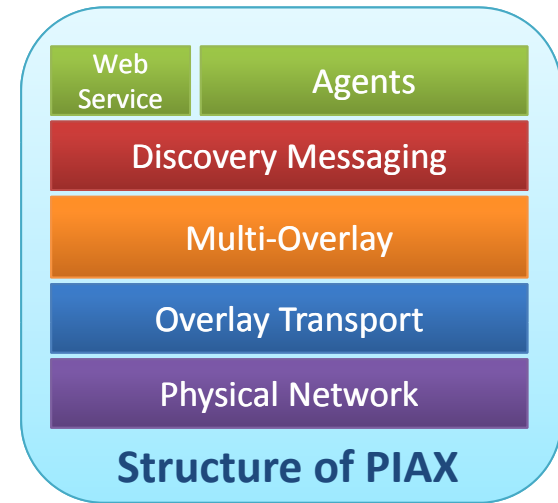
- Different kinds of services can be cooperated

- ■ Scalability

- Enormous peers and data can be managed

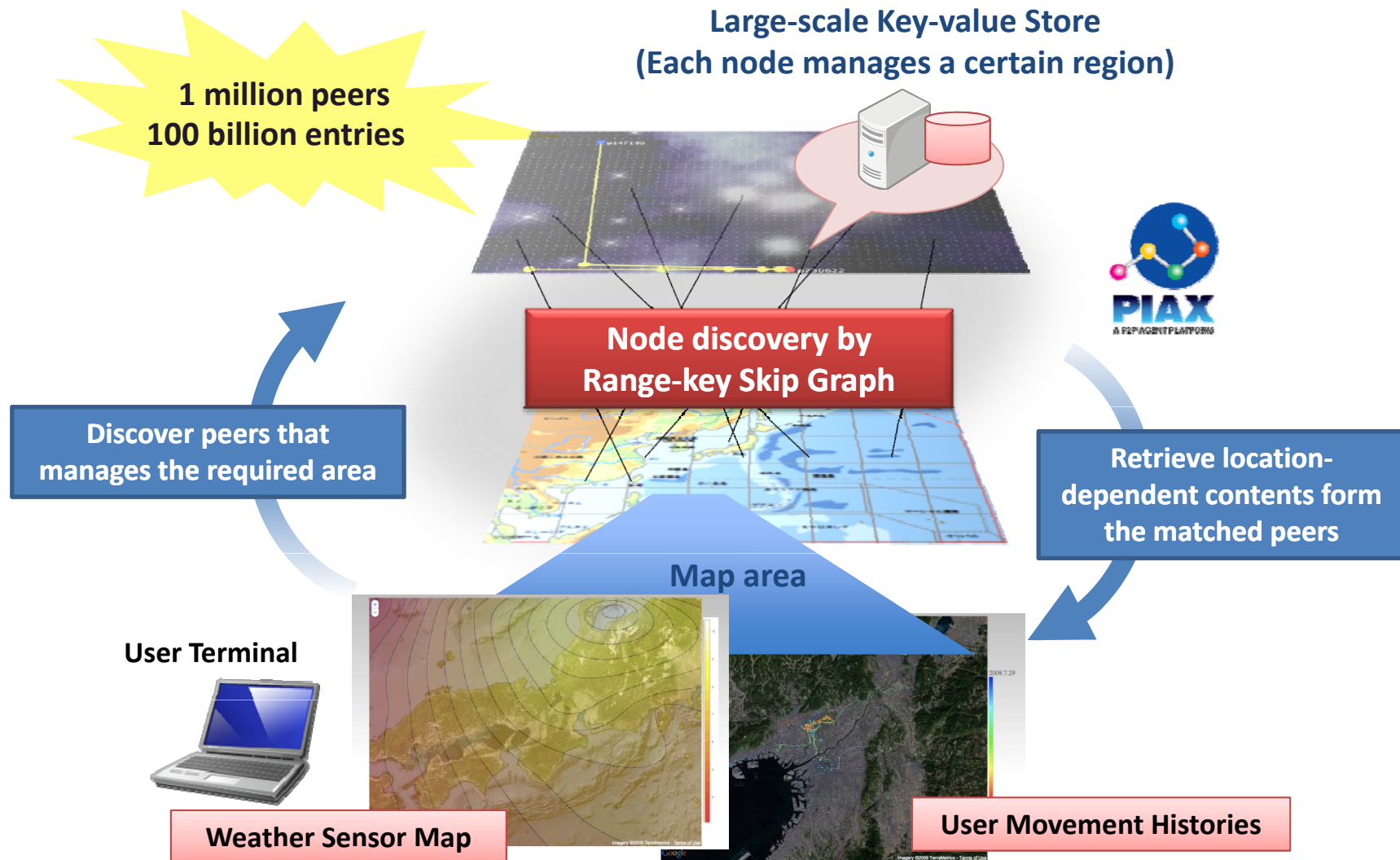
- ■ Tolerance

- Heterogeneous protocols and devices can be federated

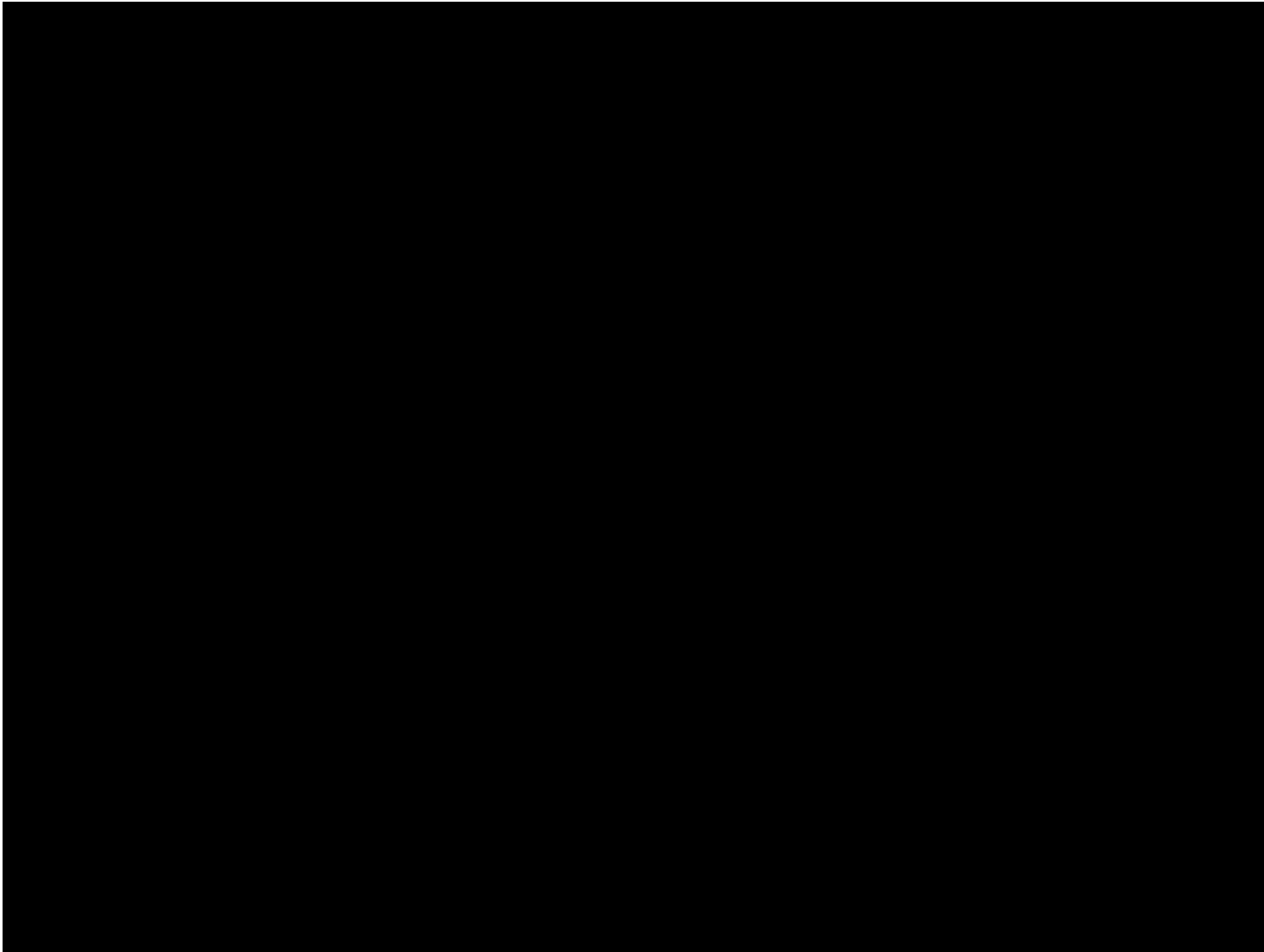


Large-scale intelligent services with heterogeneous devices can be realized over wide-area

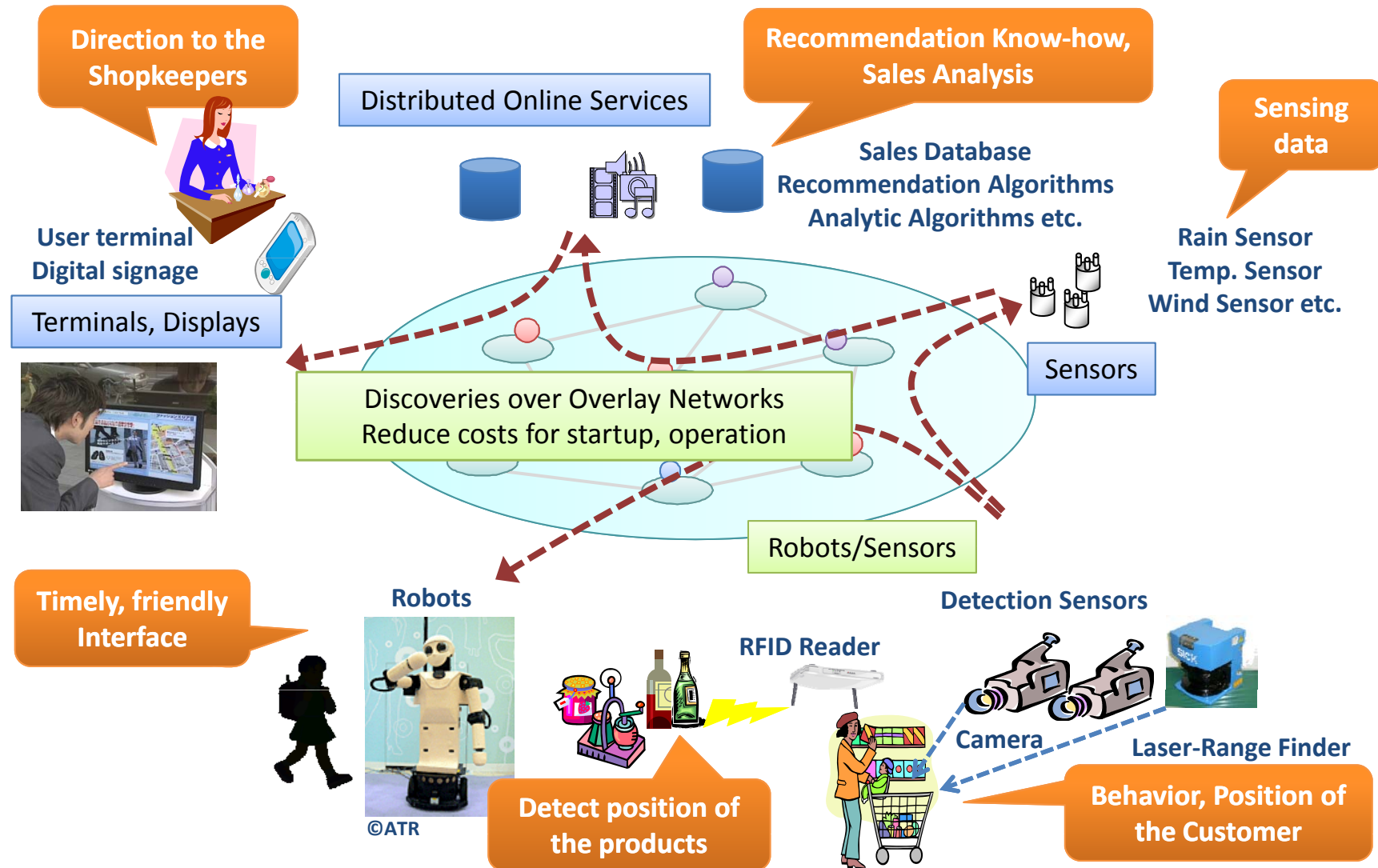
Ex.1) Large-scale & Wide-area Data Sharing



Demonstration in CEATEC Japan 2009

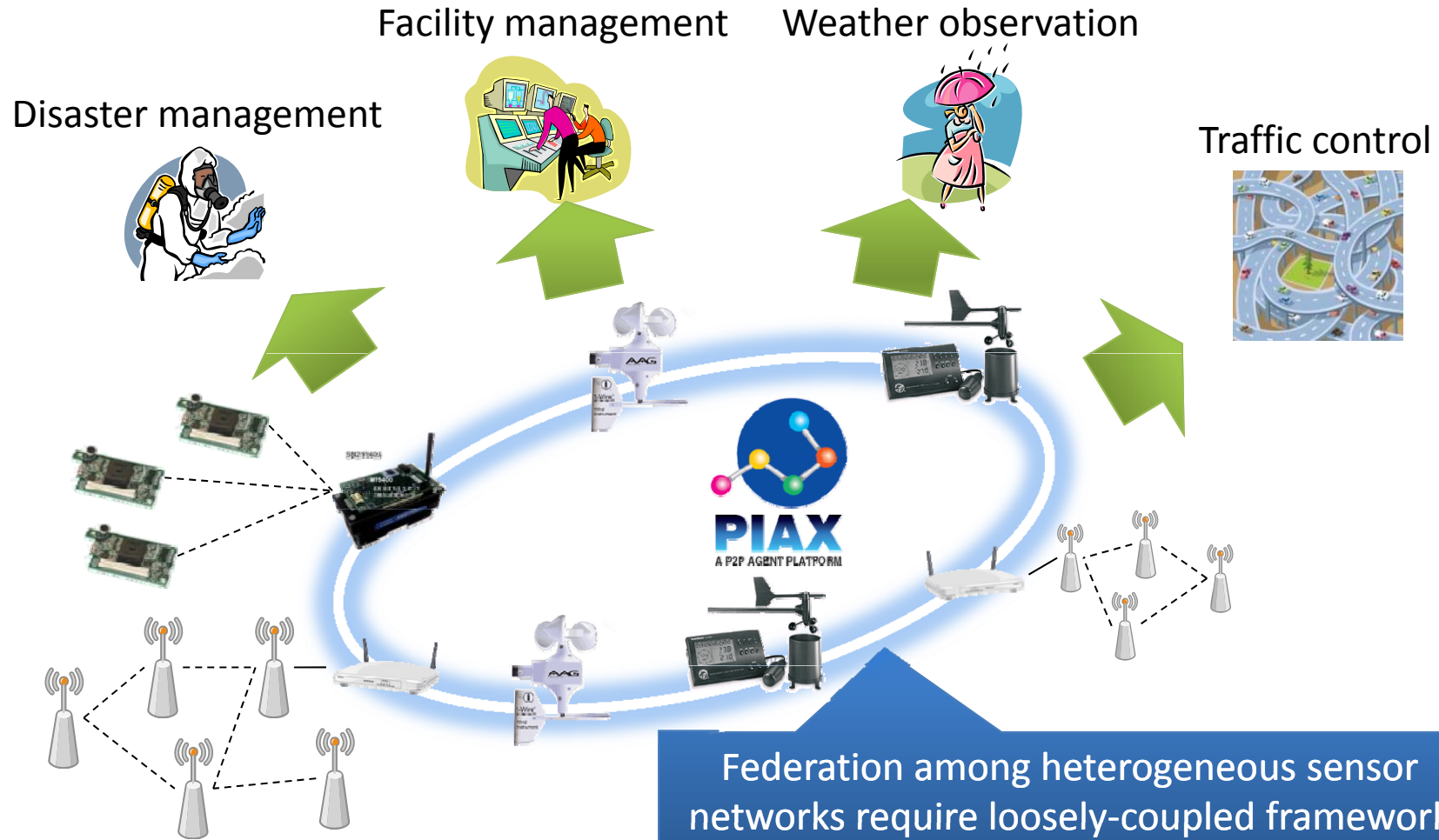


Ex.2) Recommendation for Shopping Centers



Ex.3) Sensor Network Federation

Wide-area and large-scale applications



Conclusion

- PIAX: A P2P Agent Platform
 - Integrate P2P structured overlay network with mobile agent platform
 - Coupling services flexibility and scalability with concealing heterogeneity and complexity of networks and devices
 - Examples:
 - Large-scale and wide-area data sharing
 - Various resources federation for intelligent services
- Please visit <http://www.piax.org/en/> for more information.

