Using Cloud Services

... to Build an IT Infrastructure for a Sustainable Smart City

Hans Viehmann
Product Manager
Oracle Corporation

@SpatialHannes
Spatial Data in Energy Management

What you cannot measure, you cannot manage

- Data Acquisition and Data Management
- Spatial Data Analysis
- on Cloud Platforms
  - IoT Cloud Service, Big Data Cloud Service
  - Database Cloud Service, Analytics Cloud Service
Cloud Computing is more than hosted servers and online Geo-portals.
Oracle Cloud
Integrated Cloud Platform

Platform-as-a-Service helps to reduce cost, reduce risk, reduce time-to-innovation
Spatial Data in Energy Management

Spatial Data for Analysis
- Streams of Sensor Data
- Real-time Decisioning
- Machine Learning
- Predictive Analytics

Spatial Data for Context

- Master Data
- Network Data Model
- 3D City Model
- Historical Data
Real-time Analysis of Sensor Data

Continuous streams of sensor data, measurements, location, timestamp

Integrate sensors, build data pre-processing pipeline

Event-driven architecture, detecting patterns, correlations in real-time

Raise alert, notify business applications
Build Your Own or Use Cloud Service

- Oracle IoT Cloud Service
- Simplified application development, no coding required
- Geospatial design patterns included
  - Location-related events pre-defined (enter, exit, near, stay)
  - Definition of areas-of-interest integrated
Extend with More Cloud Services

- Oracle Big Data Cloud Service
- Predictive Analytics, Machine Learning
- Hadoop, Spark, Hive, Graph Analytics
- Geospatial processing integrated
- Preparation, Validation, Cleansing
- Data Harmonization
- Categorization

Diagram:
- Data Providers
  - Discovery
  - Kafka
  - Hadoop
  - Spark
  - Database
- Prepare
- Analyze
- Data Consumers
  - R
  - Enterprise Apps
  - Sensor Data
  - Data Infrastructure
Spatial Data in Energy Management

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Spatial Data for Context

Master Data
Network Data Model
3D City Model
Historical Data
3D City Model for Context

• Analysis requires semantically structured model

• CityGML is established standard for this purpose
  • Information model to represent relevant 3D urban objects
  • Standardized by OGC, currently in version 2.0

• 3DCityDB – open source data model
Build Your Own or Use Cloud Service

- Oracle Database Cloud Services
- Use only what you need and scale on demand
- Enterprise-grade security and availability
- 3DCityDB on Oracle used by Berlin, Brussels, Frankfurt, Helsinki, ...
Context for Oracle Analytics Cloud

• Insight from Interactive Maps
• Integrated Geocoding and Data Enrichment
• Using AI to Derive Semantics of Data
• Actionable Results using Spatial Data in Workflows
• Business Value from Using Spatial Data
Extending the Analytics Platform

New levels of connections, engagement and innovation

• Conversational AI, chatbots, for improved field service & customer interaction
• Blockchain to extend result workflows on the basis new trust models
• Linked Data to publish results based on RDF for use with semantic technologies through SPARQL/GeoSPARQL
Evolution

Silos
- Dedicated Hardware
- File-based Systems
- Proprietary Solution

Cloud Services
- Self Running, Healing and Securing
- Usability, Usability, Usability
- New Integration Capabilities

Databases
- Open Standards
- Integrated Spatial Analysis
- Geospatial Workflows