Massive IoT Monitoring System for the South-to-North Water Diversion Project in China

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IoT Plays the Key Role in 5G Services

- **Unlimited experience**
  - >10 Gbps peak data rates
  - 100 Mbps whenever needed

- **Extreme Mobile Broadband**
  - 10,000 x more traffic

- **Massive Machine Communication**
  - M2M ultra low cost
  - 10-100 x more devices
  - 10 years on battery

- **Critical Machine Communication**
  - <1 ms radio latency
  - Ultra reliability

Source: Nokia
IoT Monitoring System for a 1400KM Water Diversion Project

100,000 IoT Sensors Monitor a 1,400-Kilometer Canal in China

Sensors installed along China’s South-to-North Water Diversion Project track water quality, watch for intruders, and detect structural damage

By Tracy Staedter

As an engineering feat, China’s massive South-to-North Water Diversion Project is a stunner. Three artificial canals, each more than 1000 kilometers long, are in various stages of completion and designed to reroute water from the country’s rainy south to its parched north.

The massive internet-of-things (IoT) network that has been quietly overseeing the middle route is impressive in its own right. More than 100,000 individual sensors

Source: IEEE Spectrum, 11 Jan 2018
About South-to-North Water Diversion Middle Route Project (SNWD)

- Artificial canal across Henan and Hebei provinces to Beijing and Tianjing
- Total length is 1432km
- Total Investment is RMB 200 billion
- Accomplished in 2014. Currently, more than 70% of residential water supply in Beijing is from SNWD project
Challenges for Canal Safety Monitoring

Numerous Engineering Entities
- Dam: 1277 Km
- Floodgates: 318
- Bridges: 1256
- Drainage culverts: 469
- …

Numerous Impacting Factors
- Leakage for dam
- Seepage for drainage culverts
- Settling for dam, floodgate
- …
Challenges for Water Safety Monitoring

High Quality Requirements

- Goal: the for water received in Beijing, the quality should be above grade II.
- Canal is too long crossing main industry areas in Hebei.
- Accidents may cause pollution.

High Quantity Requirements

- No reservoirs along the canal.
- Water level should be kept stable.
Challenges for Intrusion Monitoring

High Loss for Intrusions
• Many crossings with roads, railways, and rivers, through which it is easy to get in.
• People will get drought with high probability if fallen into the canal.

Limited Protection Methods
• Unattended and less on duty.
• Physic isolation fence is weak.
Key Challenges for the Safety Monitoring System

- Varying Monitoring Environments
- Enormous Types of Sensors
- Enormous Types of Data
- Complicate HetNet Architecture
- Complicate Integrated Platform
Safety Monitoring System for South-to-North Water Diversion (SNWD) Middle Route Project

- Design of a sensor network for the monitoring of South-to-North Water Diversion Middle Route project.
- Development of an integrated information platform for the management of the water diversion project.

Project & Partner

- National S&T Major Project (2014ZX03005001)
- Office of the South-to-North Water Diversion Project Commission of the State Council
Key Technologies: R&D on Smart Transmission Gateways

Configurations

- Wireless Communication Tech. 2G/3G/4G/WiFi/Zigbee/BLT/470
- Seamless Handover
- Remote Control and Configure
- DVI+HDMI+DisplayPort
- High Compression Rate for Data Preprocessing
Key Technologies: R&D on Integrated Web-and-GIS based Control and Display Platform

Application: Intrusion Monitoring System According to Web of Things Architecture
Application: Smart Video Monitoring System
Collaboration Opportunities
An Open Platform for IoT Industry

China • Fuzhou Internet of Things Open Lab
The Establishment

Fuzhou Municipal Government
Mawei District Government
Huawei
Construction of FIOT-LAB

- Equipped with the most advanced IoT testing equipment worldwide
- 600M RMB investment
- Total area: ~20,000 square meters
Management Team

Dr. WANG XI
Professor/Academician
FIOT-LAB Management Committee

Dr. GAO TENG EMBA
National “Thousand People Plan” Expert
FIOT-LAB President

Dr. YANG YANG
Professor
Chinese academy of sciences “Hundred People Plan”
FIOT-LAB CTO

8 doctors
18 masters
32.5% of total staffs

Oversea returnees
From Belgium, Netherlands, France, Singapore, USA, UK etc.
Two Keys of IoT Industry

- Industry Standards
- Cultivate Ecosystem
Vision and Mission

Take the opportunity of NB-IoT

Prepare for future IoT technology

The Champion of IoT Industry Application

Real Scene Testing and Certification

“One Stop” technology services

IoT Talent Training
Three Major Sectors
Technology Services

Help SMEs and traditional companies to reduce product development cost and risk.

Typical phase of PDDP (Project Development and Delivery Plan)

- Product concept
- Prototype verification
- Project incubation
- Productization
- Certification service
- Marketing

- Technology innovation
- Advanced technology
- Test certification
- Technology training
- Hardware & software
- Technology evaluation
- Customized application cloud
- Board-level development
- Industry certification
- Communication certification

Traditiona l industry → IoT industr y
Improves product development efficiency in our OPEN LAB

- In the Open Lab, customers can achieve the whole process of terminal product development, debugging and rectification of real network environment, various performance tests and product consistency test.

- Open Lab will build the software and hardware platform of IoT terminal application product development with upstream operators, chip module suppliers and test equipment suppliers.
Standardization Services

- **Focus on IoT vertical industry applications**

- **Technical strength**: A team with sound technical background and industry experience.

- **Neutrality**: A third-party, non-for-profit platform, supported by the government.

- **In depth**: Broad cooperation with industry in test certification, technical support and training, with better understanding of the industry.

**Fields we have participated in the development of standard related to NB-IoT**

- Smart water meter
- Smart gas meter
- Smart street light
- Smart fishery
- Smart Agriculture
- Smart scenic
- Smart city etc.
Test and Certification

Fuzhou IoT open lab test certification abilities

- Protocol analysis test
- Power consumption test
- Rf/protocol conformance test
- Power consumption test
- Channel simulation transmission performance test
- EMC test
- OTA test
- Network security test
- Safety test
- Environmental simulation test
- Field test

Ensure the reliability of iot chip, module, network, platform and application.
Training Service

National training center for IOT talent

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talent Training</td>
<td>The famous universities, institutions and industry leading enterprises cooperate to form the most perfect talent cultivation system</td>
</tr>
<tr>
<td>Industry Events</td>
<td>Convergence of the Internet of things innovation and entrepreneurship resources to create a first-class domestic Internet of things innovation and entrepreneurship competition brand.</td>
</tr>
<tr>
<td>Brain Gain</td>
<td>Relying on the talent base to promote high-end talents and teams</td>
</tr>
<tr>
<td>Build Think-tanks</td>
<td>Build a professional think tank for the international top Internet of things and build a team of leading experts</td>
</tr>
<tr>
<td>Career Fair</td>
<td>Develop Internet of things professional job fair brand, promote the employment rate of Internet of things professionals in Fuzhou</td>
</tr>
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<td>Entrepreneurs communication and forum activities</td>
<td>Iot industry of international and domestic exchanges forum, work closely with China association of small and medium-sized commercial enterprises, combined with the IoT industry and the area along the national strategy, promote good cooperation for enterprises and institutions to Fuzhou market</td>
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Our Partners
Thank you!

China · Fuzhou Internet of Things Open Lab