Leica GeoMoS Monitoring Solution
From any data to final information
JISDM Vienna, 30. March 2016

Michael Rutschmann, Senior Product Management, Structural Monitoring

- when it has to be right
Leica GeoMoS – Monitoring Solution

From any data to final information

- Intro Monitoring
  - Risk Management
  - Applications
- Create your monitoring system
- Monitoring software platform
- Outlook
- Summary
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Risk Management

Reduce your risk
- Visual and manual inspection
- Manual monitoring (campaign)
- Automatic monitoring
- Generate early and quick information
- Take timely action
- Safety
- Cost reduction
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Risk Management

When is monitoring required?

- Potential problem
- Instability
- Long-term deformation
- Ageing Infrastructure - Maintenance
- Extended life time
- Climate changes
- Seismic Event
- Preservation of evidence
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Applications

- Landslides
- Rock falls
- Crustal deformation
- Subsidence
- Environmental
- Bridges
- Buildings
- Construction
- Dams
- Open pit mining
- Underground mining

Natural hazard monitoring | Structural monitoring | Mining monitoring
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Application – Bridge Monitoring, (Nanjing – Shanghai)

Precise 3D GNSS Monitoring

- All bridges between Nanjing – Shanghai
- Taizhou Yangtze River Bridge
- Information (Real-time)
- 20 to 30 GNSS sensors per bridge
- 20 Hz data
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Application – Large Dam, Yunnan, China
Leica GeoMoS – Monitoring Solution
Application – Large Dam, Yunnan, China

Precise 3D Monitoring (TPS/GNSS)

- 52 GM10 sensors
- Co-located GNSS on prisms
- 7 TM50 and 100 prisms
- Check Deformation
- Extreme Engineering
- Safety/Risk
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Application – Landslide Preonzo, Ticino, CH

May 2012 – A Total Station and several prisms in 2 km distance
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Application – Landslide Preonzo, Ticino, CH

Instable?
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Application – Landslide Preonzo, Ticino, CH

Real data 14 days – predict the date of slope failure
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Application – Landslide Preonzo, Ticino, CH

After the event – May 2012
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Application – Chemical Industry, Italy

Multiple TM50 for precise prism monitoring
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Application – Copper Mine, Chile

Energy equipment - Precise prism monitoring (Elevation 4’500m)
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Create your monitoring system

Who is involved?

- Provider of the solution and products
- Monitoring Service Provider
  - Management
  - System Operator
- User Groups
  - People in critical area
  - Experts
  - Authority – Make decisions
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Create your monitoring system

The monitoring service provider

- On premises installation or cloud version
- **Automatic visualisation and reporting**
- Flexible licensing – from small to large projects
- Flexible and secure user access
- Manage multiple projects in a single system
- Easy integration of 3rd party systems – link to any channel of monitoring information – Open Interfaces
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Create your monitoring system

The users of the information

- Simply UI, Mobile Web Site
- Use any browser on any device (office or mobile)
- Nice customized tables, graphs, maps images and reports
- Simply inform anywhere and anytime
- Show notifications
- Use your own device
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Create your monitoring system

Depending on the monitoring problem you combine a set of sensors

<table>
<thead>
<tr>
<th>Geodetic sensors TM50/GNSS</th>
<th>Remote sensing MultiStation</th>
<th>Geotechnical, Environmental sensors</th>
<th>Energy Comms Accessories</th>
<th>Software On premises Cloud</th>
<th>Service &amp; Support</th>
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Offline Import

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Create your monitoring system

Distributed monitoring system

(1) Site / Project
(2) Service Provider
(3) User Groups
(4) Leica Cloud
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The software platform

Monitoring & Analysing and Visualising

- All included
- From raw measurement to final report
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The software platform

<table>
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<tr>
<th>Monitoring – Process (24/7)</th>
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<tbody>
<tr>
<td>Acquire Any Data (1 to 3)</td>
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<tr>
<td>Direct, Logger, File, Software, Images</td>
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<tr>
<td>SQL Server, Centralized data management</td>
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<tr>
<td>Combine Sensors and Data</td>
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<tr>
<td>Any Result</td>
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<tr>
<td>Process</td>
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<tr>
<td>Inform with Limit Check and Messaging (Email / SMS) and Action (4), System health</td>
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<tr>
<td>Connect GeoMoS to any Software (5)</td>
</tr>
</tbody>
</table>

1. TPS, GNSS, Scanning (1)
2. Data Logger (2)
3. AnyData (FTP Server), any sensor, any image (3)
4. Messaging EMail/SMS/Action (4)
5. API (any Software) (5)
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The software platform

GeoMoS concept to distribute the information to the users
Similar to Web Content Management Systems

Multiple DB’s
- Project_1
- Project_n

Unlimited Views
- View_1
- View_n

Easy and flexible User access
- Administrator
- Pool of users
  - User Role Editor
  - User Role Observer

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## Leica GeoMoS – Monitoring Solution

The software platform

<table>
<thead>
<tr>
<th><strong>Analyzing, Visualization Process and automatic Reporting</strong></th>
<th><strong>Datapush from GeoMoS Monitor (1)</strong></th>
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<tbody>
<tr>
<td><strong>Data Push from GeoMoS Monitor (1)</strong></td>
<td>Any Web Link (4)</td>
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<tr>
<td><strong>Inform all involved User Groups (2, 3, 4)</strong></td>
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<td><strong>API to connect to 3rd party Web Page (5)</strong></td>
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<tr>
<td><strong>Easy access for all user groups, with any Web Browser</strong></td>
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<tr>
<td><strong>Create specific information for any user group</strong></td>
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**Leica Geosystems**

June 2015
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The software platform
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Outlook

Technical trends – more automatic monitoring! – more Apps!

- Internet enabled sensors
- MEMS, sensors with low energy use
- Communication everywhere
- Fusion of modern monitoring techniques
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Summary

Benefits of a long year proven monitoring solution

- Modular & Flexible & Reliable (small to large, 24/7/365)
- Scalable customisable (individual project requirements)
- Combine Monitoring & Inspection
- We inform you
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Summary

GeoMoS Open Interfaces paving the way to the Internet of Things (IoT)

Any Data
- Sensors (InternetEnabled)
- Loggers
- Files
- Images
- Databases
- Software

Leica GeoMoS

Any Information

LAN
INTRANET

CLOUD
INTERNET
Many Thanks for Your Attention.

Leica Geosystems AG Switzerland, Heerbrugg
Geomatics Division
GNSS Reference Stations and Structural Monitoring Group