Operating a Sensor Network at 3500m Above Sea Level

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The PermaSense Project
Long-term environmental monitoring in remote locations and harsh conditions. Investigation of permafrost and climate change in the Swiss Alps on Matterhorn and Jungfraujoch.

Support for ~25 nodes

Different Sensors
Temperatures, conductivity, crack motion, ice stress, water pressure
1-60 min sensor duty-cycle

Environmental Extremes
-40 to +65°C, ΔT ≤ 5°C/minute
Rockfall, snow, ice, rime, avalanches
Near real-time data delivery

Long-Term Reliability
≥ 99% data yield
3 years unattended lifetime

Achieving ≥ 99% Data Yield over 3 Years – What does it mean?

Specialized system architecture – Reliability, redundancy, efficiency
Monitoring to understand behavior and trends;
Using proven, enterprise-scale solutions for 24/7 operation of IT equipment.

Data Collection/Storage
- Global Sensor Network (GSN) and MySQL database
- Data duplication at the source

Visualization/Trending
- Cacti and RRDtool
- Custom viewers for topology, system health and status
- Web mashups from public sources, e.g. weather service

Alerting/Error Reporting
- Zabbix distributed monitoring and alerting