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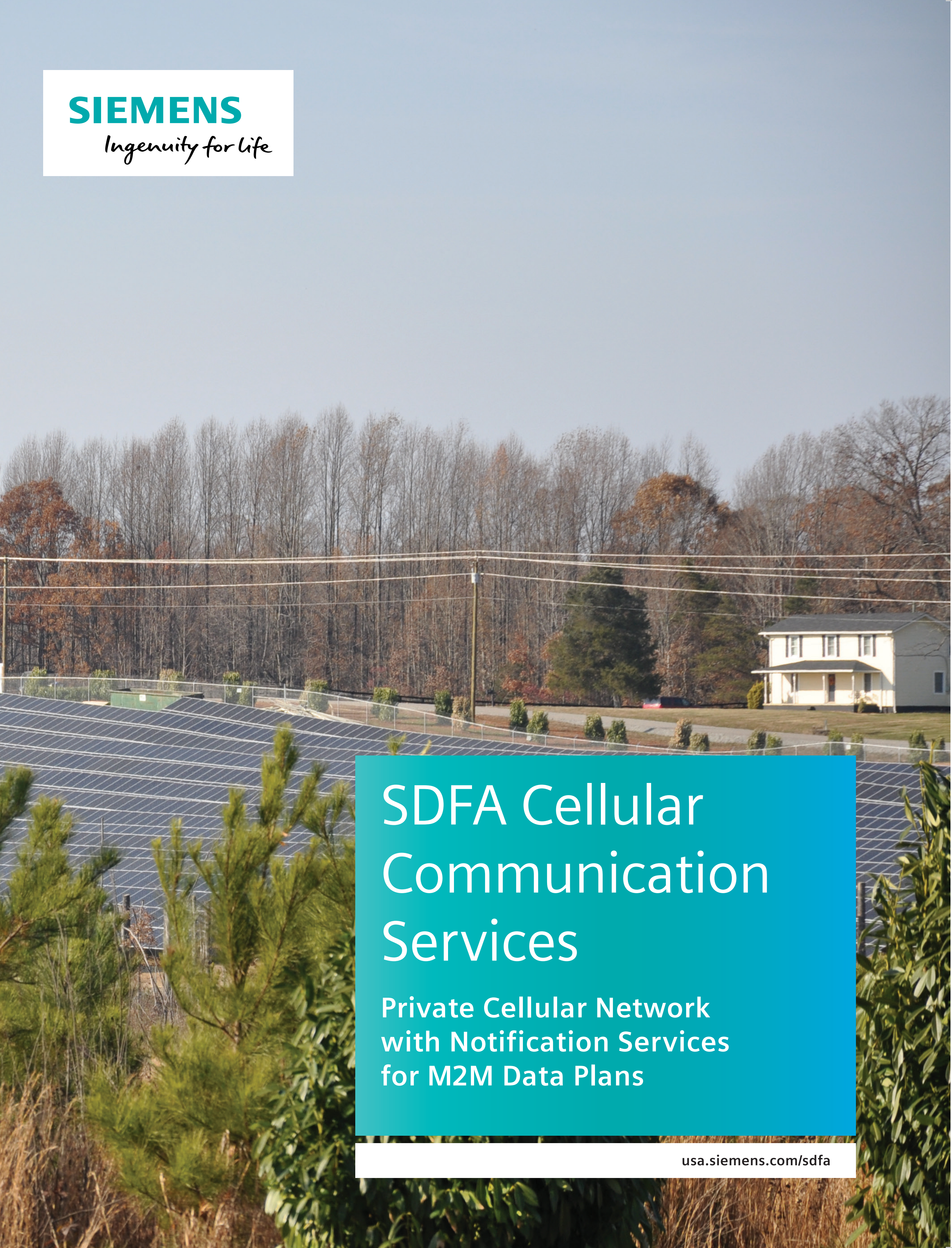

SDFA Cellular Communication Services

Private Cellular Network with Notification Services for M2M Data Plans

usa.siemens.com/sdfa

Cellular Communications for Distribution Automation Systems

Immediate notification if service is interrupted

■ Cellular Communication for Power Utilities

Using Cellular communication is not new to Power Utilities. This is typically an IT service used by many Utilities to communicate field device information data back to the Utility for use in various enterprise systems e.g. AMI.

If we however use cellular communication to transmit data between field devices for Direct Transfer Trip (DTT), Distribution Feeder Automation (FLISR), Automatic Transfer of Sources (ATS) or other mission critical applications we need to establish secure reliable communication links between the field device controllers.

This requires an OT type of service to support these systems with very unique requirements. The OT systems are deterministic in nature to be able to produce actions based on information received. The systems require security, dependable latency and reliability in accordance with typical substation protection standards. Cellular **ease of field deployment** makes this an attractive option for Utilities.

The cellular communication services provided by Siemens as a Verizon Vertical Solution Partner are aimed to provide this OT Communication services.

The Siemens Cellular Service consists of 3 different services and substation class communication hardware.

■ Private Network

Siemens as a Verizon Vertical Solution Provider establish a Siemens private network within the Verizon network. The basic premise of a private network is that there is no connection to the internet, unlike a public plan. In this network Siemens customers can acquire a pool of allocated Machine to Machine (M2M) Data Plans.

■ Machine To Machine Data Plans (M2M)

The M2M data plans for the Siemens SDFA solutions are well defined and tested to support the applications. The SDFA systems use small IEC61850 "GOOSE" Messages to communicate information between field controller devices/servers. The basic M2M data plans are designed to support the SDFA applications (DTT, FLISR and ATS).

The Siemens Machine to Machine Data Plans is based on a **flat rate structure**. Data Plans for other applications e.g. Substation Backhaul are available.

■ Notification Services

Automation systems rely on communications availability to perform as designed. If Siemens detect that a modem was abnormally disconnected from the Verizon network we will notify our customers that a link is down. This service ensures our customers can better maintain their communications systems that support important OT applications.

■ Siemens Cellular Modems

Siemens provide the Siemens RuggedComm cellular modems/routers preconfigured to support the SDFA and other applications. The router configutation include data routing, preconfigured IPSec tunnles, firewall and special filtering to securely transmit data between field devices. Minimal customer field settings are required during deployment.

SDFA FLISR system deployed at this very remote mountain top neighborhood in Central Virginia USA to improve system reliability. Cellular communication was the only cost-effective option.

SDFA Cellular Services

Supporting OT Applications

The RM1224 above is used for Field device control and Substation backhaul applications. Supports and DNP3 IP The RM1224 is a mobile wireless router with 4G LTE connectivity and automatic fallback to 3G UMTS or EVDO cellular networks. It is ideally suited for providing data communication to and from remote locations.

Private Network

On public networks unsolicited Internet traffic is data sent to a wireless device that was not solicited by the wireless device owner. This data could be a result of random queries from unknown third parties, or it could be malicious in nature, attempting to cause a service disruption. On a private network no unauthorized traffic can travel over this network, eliminating the risk of unsolicited traffic from external sources.

All data sent to and from devices configured for a specific Private Network is segregated from all other traffic. Each pool will consist of a number of M2M data plans that will be allocated to a specific customer. This total number must be communicated to Siemens in order to configure the segregated Customer Pool within the Siemens Private network.

- A one-time service charge to setup a private network pool will apply.

Easily deploy communications to remote locations.

M2M Data Plans

The Siemens M2M data plan is based on a negotiated monthly flat monthly flat rate charge to our customers.

An annual contract will be required and early termination fees apply.

The flat rate will be dependent on the Data that a customer needs to transport through a Modem. For a basic M2M plan to transport IEC61850 “GOOSE” traffic between Siemens SDFA controllers a base plan will be required. ”GOOSE’ messages are very small and can be controlled by sending messages at predefined intervals during steady state conditions.

Should there be a requirement to provide DNP3 and fault recording traffic back to the SCADA system or RTU a different plan should be selected.

A Different M2M data plan will be required to connect the SDFA field devices to the customer network. The M2M data plans for these access points will depend on the number of field Devices and type of data that will be transported through the access point.

Available Flat Rate Data Plans:

- SDFA FLISR / DTT to support IEC61850 “GOOSE” Traffic
- Substation Backhaul Plans
  - 1.5 GBit / Month
  - 5 Gbit / Month
- Custom Data Plans per customer unique requirements.

All data plans include the 24/7 customer notification service.

Data Plan Activation:

The activation of all data plans will be done by Siemens. A data activation form must be completed and supplied to Siemens prior to activation.

Information required will be location information, IMEI and SIM number. Activation will take approximately 5 to 24 Hours.

If Siemens modems are supplied, the modems will be delivered with the necessary modem configuration for the intended application including Verizon SIM Cards.

Siemens can provide SIM Cards for 3rd party 4G capable modems. The modem type and model information must be supplied to Siemens to ensure the correct SIM card will be supplied. The modems must be Verizon certified devices.

Siemens will supply SIM cards to customer assigned 3rd party hardware vendors.

The RX1400 below is used for SDFA FLISR, DTT and Substation backhaul applications. Support IEC61850 “GOOSE” and DNP3 IP / Serial Combining Ethernet switching, wireless LAN, routing and firewall functionality in one, the RUGGEDCOM RX1400 holds its own in the most demanding industrial environments. As a cellular router, it eliminates the need for extensive communication infrastructures. In addition to providing IP40 protection, it requires no internal fans for cooling to operate reliably in an extended temperature range of -40° C to +85° C.

Secure Direct Transfer Trip (DTT) system implemented Cost-effectively to provide DTT from Substation and Feeder Reclosers to remote Distributed Energy Sites located in Virginia USA.

Siemens Supplied Modems

RX1400 Features

Communication interfaces

- 2 SMA ports for Wireless WAN Interface (4G/3G/2G) with up to 100 Mbit/s bandwidth
- 4 x 10/100 Mbits/s ports (10/100TX)
- 2 x 1000 Mbit/s SFP ports (1000LX) for long reach fiber optic connections (up to 100 km)
- 2 Serial Ports RS232 / RS422/RS485 (DB9)
- 2 R-SMA ports for Wireless LAN Interface supporting IEEE 802.11a/b/g/n with up to 100 Mbit/s bandwidth

Other Interfaces

- SMA port for GPS
- RS232 console port for local management / diagnostics on the device
- Isolated built-in power input (12-24 VDC)

Rugged Rated for harsh environments

- –40° C to +85° C operating temperature (no fans)
- CSA/UL 60950 safety approved to +85° C
- Reliable operation in harsh electrical environments
- IEC 61850-3 and IEEE 1613 (electric power substations)
- IEC 61000-6-2 and IEC 61800-3 (industrial environments)
- NEMA TS-2 (traffic control equipment)
- EN 50121-4 (railway applications)
- Error-free operation in high EMI environments
- Zero-Packet-Loss technology for fiber-based networking devices
- IEEE 1613 class 2 error-free performance under EMI stress

Management tools

- Web-based, SSH, CLI management interfaces
- SNMP v1/v2/v3
- Remote Syslog
- Rich set of diagnostics with logging and alarms
- Loopback diagnostic tests
- Raw and interpreted real time line traces

Software features

- Running ROX II Operating System
- Virtualization allows a full Linux image (with dedicated storage media and I/O ports) to run in parallel with the ROX II operating system.
- Enhanced security / reliability through data and control path separation
- Single file configuration automation ensures easy installation and configuration control
- Automatic rollback in the event of configuration errors
- NETCONF configuration interface supports powerful remote configuration and status features
- Port rate and Broadcast Storm Limiting
- Port configuration, status, statistics, mirroring
- Routing Protocols OSPF, BGP, RIPv1 and v2
- Virtual Router Redundancy Protocol (VRRP)
- NTP time synchronization (client and server)
- Redundancy protocols MSTP 802.1Q-2005, RSTP (802.1w) and Enhanced Rapid Spanning Tree (eRSTP) for network fault recovery
- Quality of service (802.1p) for real-time traffic

SDFA ATS system deployed at this very remote distribution system in North Carolina USA to improve system reliability. Cellular communication was the only cost-effective option at this location.

Siemens Supplied Modems

RX1400 Features

Cyber security features

- IPSEC – the integrated hardware encryption engine delivers high performance IPSEC traffic without using the main processor
- Passwords – compliant with NERC guidelines including provision for RADIUS based authentication
- SSH / SSL – extends capability of password protection to add encryption of passwords and data as they cross the network
- Enable / disable ports – capability to disable ports so unauthorized devices can't connect to unused ports
- 802.1Q VLAN – provides the ability to logically segregate traffic between predefined ports on switches
- SNMPv3 – encrypted authentication
- and access security
- HTTPS – for secure access to the
- web interface
- 802.1x – to ensure only permitted devices can connect to the device
- MAC access list – control access to devices that do not support RADIUS

RM1224 Features

Communication interfaces

- 2 SMA ports for Wireless WAN Interface (4G/3G/2G) with uplink speeds up to 100 Mbit/s
- 4 x 10/100 Mbits/s ports (10/100TX)

Other interfaces

- C-/KEY-PLUG Slot for configuration storage
- Digital Input and Digital Output
- Integrated 24 VDC power supply

Environmental

- -40 °C to +75 °C operating temperature (no fans)
- CSA/UL 60950 safety approved to +70 °C
- ATEX and FM for hazardous locations

Management Features

- Web-based and Command Line Interface (CLI) management interfaces
- SNMP v1/v2c/v3
- Remote Syslog
- Rich set of diagnostics with logging and alarms

Software features

- NAT/NAPT (Network Address and Port Translation)
- Integrated DHCP Server

Cyber security features

- VPN – OpenVPN and IPSec IPSEC for reliable authentication (identification) of the network stations, data encryption and verification of data integrity
- Stateful Inspection Firewall: Filters data packets and disables or enables communication links in accordance with the filter list.
- SSH / SSL – extends capability of password protection to add encryption of passwords and data as they cross the network
- Enable / disable ports – capability to disable ports so unauthorized devices can't connect to unused ports
- 802.1Q VLAN – provides the ability to logically segregate traffic between predefined ports on switches
- SNMPv3 – encrypted authentication and access security for secure access via Network Management Systems
- HTTPS – for secure access to the web interface

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Printed in USA
Subject to change without prior notice

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