Wireless Technology to Control and Monitor

Anything from Anywhere™

Bringing the world of machines into the age of the Internet

SYNAPSE

SYNAPSE WIRELESS
The Company

Synapse's award-winning mesh network operating system, SNAP®, offers Future the ability to provide its customers with a complete solution for embedded, module, software or custom designs. Due to SNAP's hardware and protocol-agnostic capabilities, Future has partnered Synapse with key semiconductor technologies and wireless protocols to form unique and scalable solutions for the low-power wireless market. Whether your design is embedded or module-based, 802.15.4 or sub-GHz, Synapse and Future Electronics have the easiest and quickest time-to-market solution for you.

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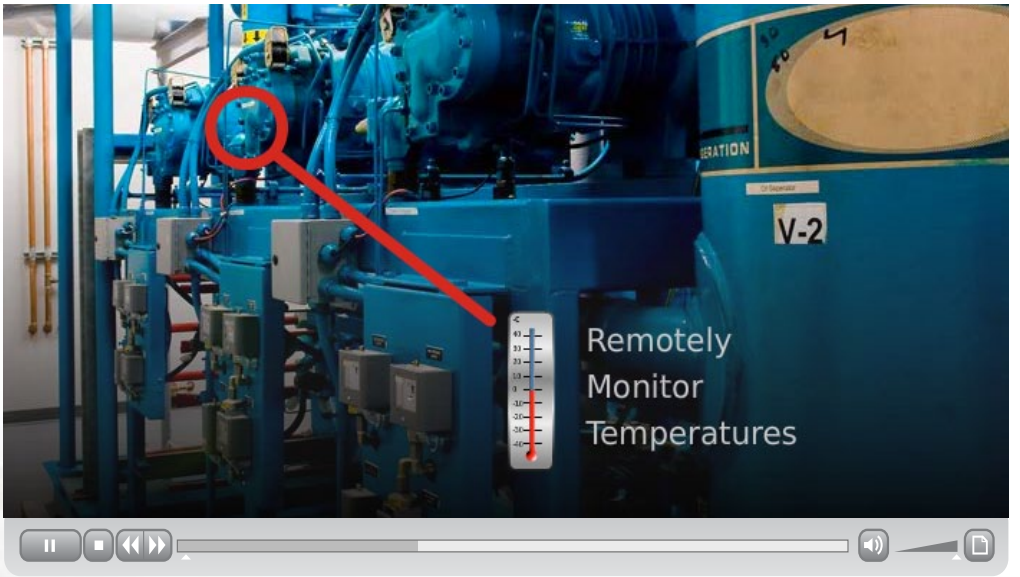
DISCOVER SYNAPSE SNAP

Wireless Technology to Control and Monitor Anything from Anywhere™



SYNAPSE'S TECHNOLOGY INCLUDES:

- **Synapse SNAP® that creates a low-power mesh network automatically**
- **Synapse Portal® for application development, network administration, data logging, and over-the-air code updates**
- **Synapse RF Engine® modules with node to node range of up to 3 miles**
- **Synapse SNAP® Connect, with TCP/IP interoperability, to translate between the Internet and the SNAP network**

Lighting the future to intelligent, wireless energy monitoring and control.

SYNAPSE AT THE MOVIES - TRON: LEGACY

Anything from Anywhere™

TABLE OF CONTENTS

SYNAPSE SNAP SOFTWARE

Instant-on, multi-hop mesh network operating system

Synapse's technology, called SNAP, is unprecedented in the industry. SNAP is a mesh network operating system combined with an embedded Python interpreter (supporting standard XML-RPC protocol) for running application code that can be updated wirelessly over-the-air.

Synapse's SNAP technology is an Internet-enabled, IEEE 802.15.4-based, auto-forming, multi-hop, mesh network operating system that is designed to run efficiently on cost-effective 8 and 32-bit microprocessors.

SNAP has a very small memory footprint, thereby leaving more space for user applications. The SNAP protocol can support up to 16 million nodes in a single network. Since these are full mesh networks, there is no single point of failure; any node can talk directly to any other node that is in range and any node can talk indirectly to any other node via intermediate nodes. SNAP-based networks are self-forming, instant-on, and self-healing. Users can interactively develop applications using a high-level English-like language called Python™. No embedded programming experience is required.

"It's the most intuitive and valuable out-of-the-box wireless development product our team has seen."
- Alex Edrington, VP Engineering, AdaptivEnergy

Software

Portal Software (page 12):

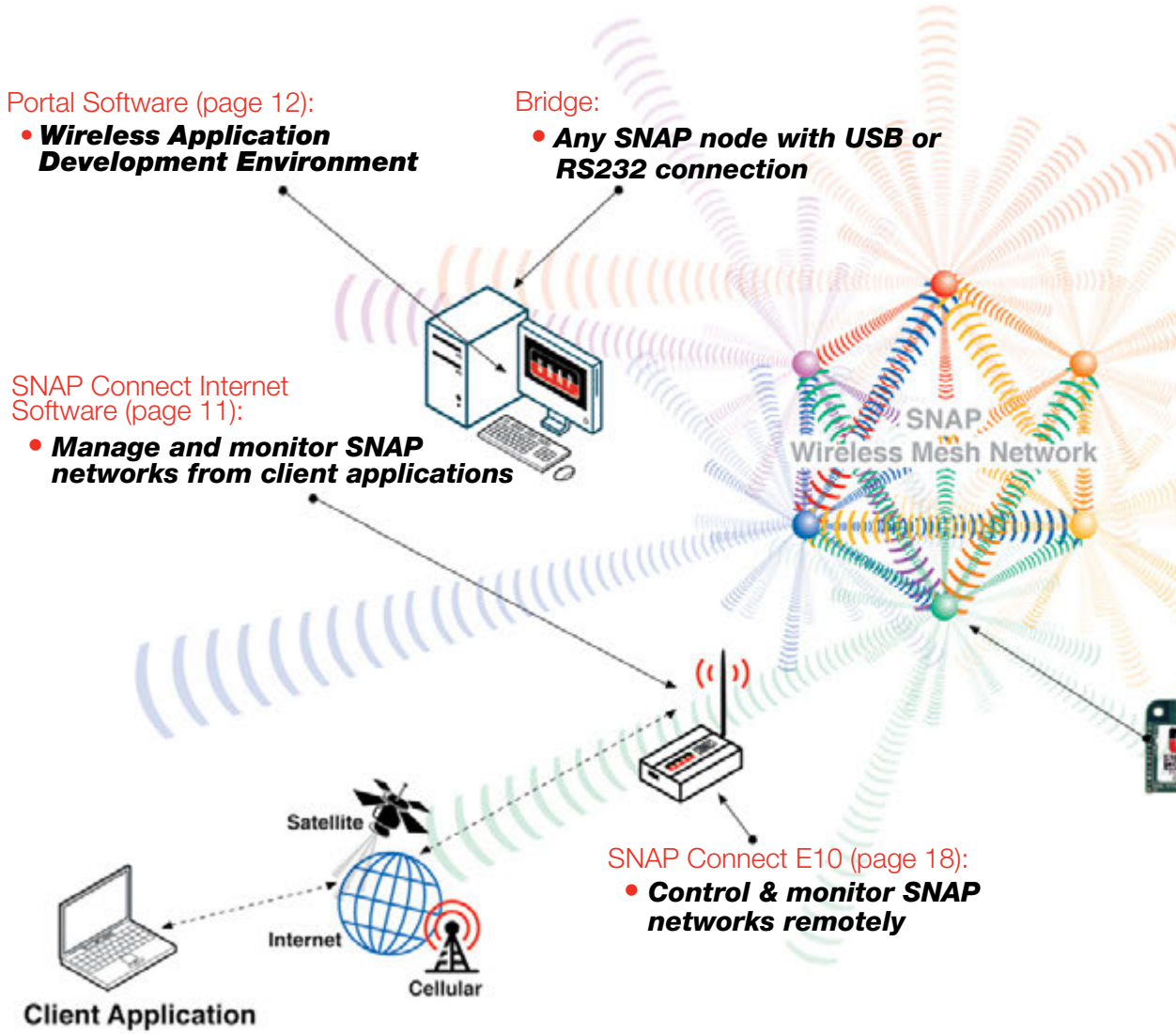
- ***Wireless Application Development Environment***

Bridge:

- ***Any SNAP node with USB or RS232 connection***

SNAP Connect Internet Software (page 11):

- ***Manage and monitor SNAP networks from client applications***



SNAP Connect E10 (page 18):

- ***Control & monitor SNAP networks remotely***

Synapse's SNAP network operating system supports battery-powered mesh (Sleepy Mesh®), AES encryption, over-the-air programming, and seamless connection to the Internet.

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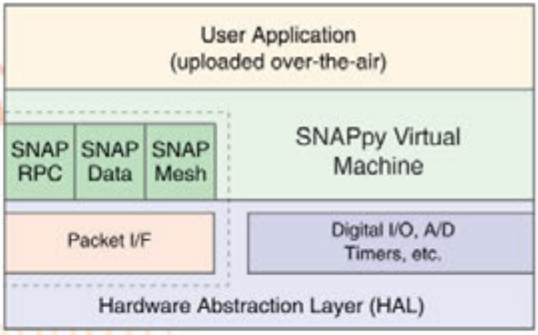


SNAP Network Operating System:

- ***Instant-on, self-healing mesh network***

RF Engine/Module (page 14):

- ***SNAP is preloaded on all RF Engines and SNAP SW licenses for non-module applications are available for RF Microcontrollers from leading Silicon Vendors***

SNAP FEATURES:

- Multi-hop Mesh
- Auto-forming
- Instant-On
- No Coordinator
- Peer-to-Peer
- 38.4K bps sustained throughput
- SNAPpy Application Scripts (Python)
- Over-the-air programming
- Remote Procedure Call Architecture
- Processor Independence
- Sleepy Mesh-battery operation on any device
- SNAPpy scripts are embedded
- Runs autonomously
- No central coordinator
- No single point of failure
- AES-128 encrypted version is available for applications requiring extra security


20 35

SNAP CONNECT INTERNET SOFTWARE

The fastest way to connect your app to SNAP

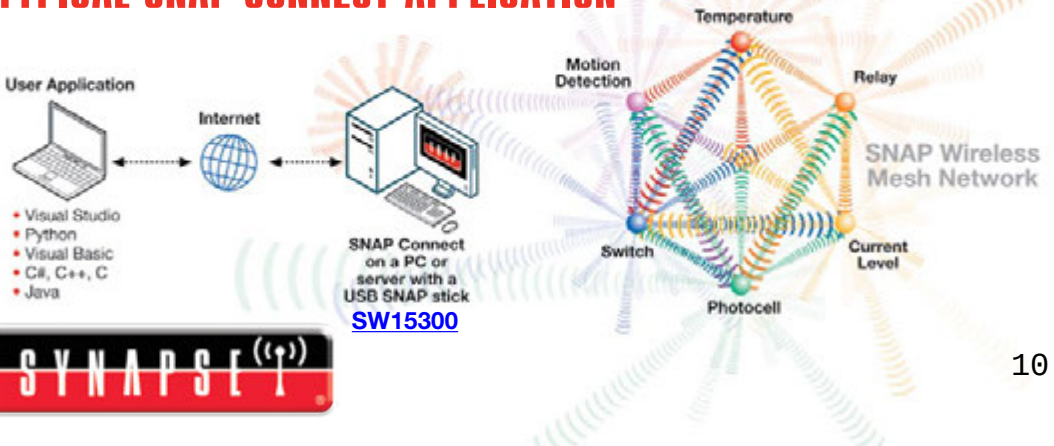
Synapse's SNAP Connect provides a seamless interface between devices on a wireless SNAP network and client applications. Hosted either locally (co-resident with application program) or across the Internet, your application is a full participant in the SNAP network. The SNAP Connect software is also embedded in the SNAP Connect E10. The E10 connects SNAP networks to the Internet using built-in Ethernet or USB Cell modem or Wi-Fi adapters.

Each application connected to SNAP Connect has a unique address and can both send and receive Remote Procedure Calls (RPC). Because SNAP is designed from the ground up with native RPC support, interaction between your application program and embedded wireless devices is simple and incredibly fast!

SNAP CONNECT PROVIDES YOU WITH:

- A complete developers' environment
- Control and monitor a SNAP network from 3rd party client applications
- Supports remote administration of SNAP network using Portal
- Any TCP/IP system can join a SNAP network
- Client applications use standard XML-RPC protocol over HTTP

TYPICAL SNAP CONNECT APPLICATION



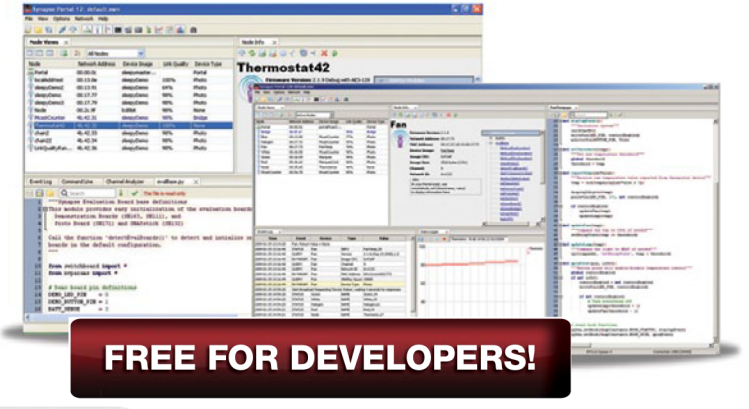
SYNAPSE Portal Software Tool

Wireless Application Development Environment

Synapse's Portal is an interactive, wireless application development environment that runs on Windows, Linux or Mac (beta). Users develop applications using a syntax-highlighted Python editor to create scripts to wirelessly download into SNAP nodes. Portal supports a fast, real time view of your SNAP network, configuration and monitoring of your devices, a channel analyzer, data and event logging, and more.

Portal takes you beyond traditional network commissioning tools by giving you an end-to-end view into your wireless application. It gives you complete access to all functions in every node on your SNAP network. Portal provides email logging of user-defined events and remote devices can access the full power of the PC – opening up the potential for virtually unlimited application functionality.

As a bridge between the SNAP network and the PC, Portal provides a simple and flexible Python-based interface. Remote nodes can invoke Python functions in Portal using built-in SNAPpy RPC call



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- Portal detects and automatically connects to a SNAP bridge device.
- Integrated Script Editor is a full featured, syntax-highlighted tool for creating and modifying SNAPpy scripts. Portal supports external editors too – the choice is yours.
- Upload new application functionality over the air – the ultimate fast development cycle.
- Configurable Node Views allow easy management, even with thousands of devices.
- Portal's Script Scheduler allows recurring calendar-time events to be controlled from a central management location.

PART NUMBERS

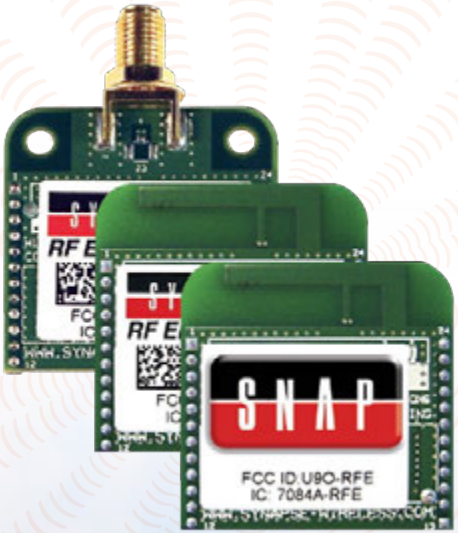
SW14001

PORTAL FEATURES:

- Portal Software is provided **free of charge** with any hardware purchase or is for sale for redistribution.
- Comprehensive administration tool for SNAP networks w/ node configuration editor
- Participates as a full-fledged peer on the network
- Invoke (RPC) script functions on any device in the network
- Quick and easy interface for modifying and uploading scripts
- Syntax-highlighted Python editor for developing SNAPpy scripts
- Event Log with timestamps and filtering
- Automatically scans for Synapse USB and RS-232 devices
- Intercepts STDOUT of selected remote devices for easy development / debug
- Runtime error detection highlights the line of script code where the error occurs
- Channel analyzer to find ideal channel for network
- Channel scanner to detect new or un-configured nodes

SYNAPSE RF ENGINES

IEEE 802.15.4 RF Modules



Synapse provides reliable RF Engines® that support a range of frequencies and bandwidths. These small, low-power, transceiver modules, running from sub-GHz to 2.4GHz, have a long range and the lowest power consumption in the industry.

In addition to power amps to increase the transmit power, receive amps are also used to provide 10 dBm additional link margin. Synapse is very careful to ensure that the maximum RF energy gets to the antenna instead of being wasted with poor antenna matching.

Synapse's modules offer a broad range of computing performance. From the entry level 8051 CPU all the way up to an ARM7 CPU, you have plenty of options regarding compute speed as well as available memory sizes. Each module comes with basic encryption built in so that you can prevent casual attacks on the network and all modules have AES-128 encryption available.

And of course, all of our modules come with Synapse's SNAP, an award-winning, wireless mesh network operating system that is instant-on, self-healing, multi-hopping and supports over-the-air programming. The network is formed and managed for you automatically, and can even support wireless connectivity to Internet. SNAP provides an on-board Python interpreter for ease in writing applications, and the software development environment, Portal, is provided at no cost to developers.

PART NUMBERS

RF100PC6	RF150PC6	RF200P81	RF300PC1	RF100PD6
RF150PD6	SM301PC1	RF200PD1	RF300PD1	RF301PC1
SM300PC1	SM700PC1	SM200P81		

IEEE 802.15.4 RF Engine Specifications :

Synapse SNAP Modules	THROUGH-HOLE MODULES			
	RF100PC6	RF100PD6	RF200P81	RF200PD1
Production Availability	Now	Now	Now	Now
SNAP Mark™	11,400	11,400	39,240	39,240
User Application Scripts Uploadable Over-the-Air	Yes	Yes	Yes	Yes
Core SNAP Network Upgradeable Over-the-Air	No	No	No	No
Frequency Band	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz
Raw Bandwidth	250Kbps	250Kbps	Up to 2Mbps	Up to 2Mbps
Memory Size	60K	60K	128K	128K
RAM Size	4K	4K	16K	16K
Antenna	F	RP-SMA External	Chip	RP-SMA External
Receive Amp	Yes	Yes	No	Yes
Transmit Amp	Yes	Yes	No	Yes
Processor Size	8-bit	8-bit	8-bit	8-bit
Size	33.86mm x 33.86mm	33.86mm x 33.86mm	33.86mm x 33.86mm	33.86mm x 33.86mm
RF100 Pin Compatible	Yes	Yes	Yes	Yes
Distance (Open Field)	2.5 miles	3 miles	1500 ft	3 miles
Temperature Range	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Certifications	FCC,IC	FCC,IC	FCC,IC, CE	FCC,IC
I/O Pins	19	19	20	20
A/D Pins	8	8	8	7
A/D Bits	10	10	10	10
Memory available for applications	15K	15K	58.5K	58.5K
Basic encryption	Included	Included	Included	Included
AES encryption	RF150PC6	RF150PD6	Included	Included

RF100P86 users should migrate to RF100PC6 or RF200P81.
Specifications subject to change without notice - confirm that data is current.
Customized modules with different antenna types or amplifications can be made.

			SURFACE-MOUNT MODULES			
RF300PC1	RF300PD1	RF301PC1 / RF301PU1	SM300PC1	SM301PC1 / SM301PU1	SM700PC1	SM200P81
Now	Now	Now / Q3 2011	Now	Now / Q3 2011	Now	Now
3,952	3,952	3,952	3,952	3,952	50,000	39,240
Yes	Yes	Yes	Yes	Yes	Yes	Yes
No	No	No	No	No	Yes	No
915 MHz	915 MHz	868 MHz	915 MHz	868 MHz	2.4 GHz	2.4 GHz
150Kbps	150Kbps	150Kbps	150Kbps	150Kbps	250Kbps	Up to 2 Mbps
196K	196K	196K	64K	64K	128K	128K
4K	4K	4K	4K	4K	96K	16K
Chip	RP-SMA External	Chip / U.FL	Chip	Chip / U.FL	F	Chip
Yes	Yes	Yes	Yes	Yes	Yes	No
Yes	Yes	Yes	Yes	Yes	Yes	No
8-bit	8-bit	8-bit	8-bit	8-bit	32-bit	8 bit
33.86mm x 33.86mm	33.86mm x 33.86mm	33.86mm x 33.86mm	29.8mm x 19mm	29.8mm x 19mm	25mm x 36mm	29.8mm x 19mm
Yes	see Datasheet	Yes	No	No	No	No
1 mile	3 miles	1500ft / 1 mile	1 mile	1500ft / 1 mile	1.5 miles	1500ft
-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
FCC,IC	FCC,IC	CE	FCC,IC	CE	FCC,IC,CE	FCC,IC,CE
15	15	15	19	19	46	33
12	12	12	16	16	8	8
10	10	10	10	10	12	10
64K	64K	64K	64K	64K	45K	58.5K
Included	Included	Included	Included	Included	Included	Included
Included	Included	Included	Included	Included	Included	Included

OFFERING THE U.S. MILITARY
maximum flexibility for safe & accurate wireless inventory tracking.

HARDWARE

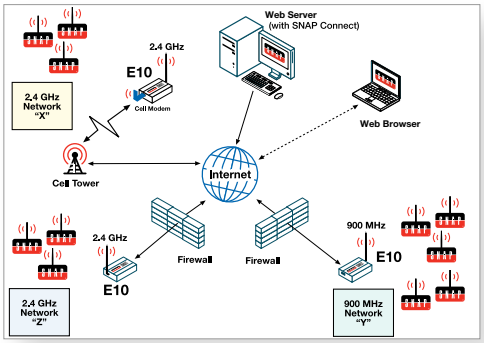
SNAP CONNECT E10

Embedded SNAP Connect Appliance

The SNAP® Connect E10 is a rugged, powerful, embedded connectivity appliance built to interface directly with SNAP mesh networks. The E10 can collect data from SNAP devices for centralized storage, database processing or application monitoring, making it extremely easy to view or control devices over the Internet. The E10 bridges SNAP networks across TCP/IP, without requiring firewall configuration or policy exceptions.

The flexibility of an open, Linux-based design provides a wide range of supported connectivity options, such as Wi-Fi, cellular modems and flash drives, using the built-in Ethernet and USB 2.0 host ports.

Full Linux services are also available to administrators and natively hosted applications.



The SNAP CONNECT E10 APPLIANCE connects SNAP networks to the Internet using built-in Ethernet or USB Cell modem or Wi-Fi adapter. Shown here, the web browser can monitor and control three remote SNAP networks in real time.

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BENEFITS AT A GLANCE:

- Control & monitor SNAP networks remotely
- Supports LAN & WAN remote administration using Synapse Portal (free download)
- Includes SNAP Connect Software & License
- Linux OS Services fully accessible
- 32-bit, RISC architecture, CPU running at 400MHz
- 256 MB Flash, expandable through external USB drives
- 64 MB RAM
- RP-SMA external antenna
- Synapse RF Engine, 2.4GHz, IEEE 802.15.4
- 10/100 Mb Ethernet & USB 2.0 ports

PART NUMBERS

SLE10-001	SLE10-900-001	SLE10-868-001

SYNAPSE EVALUATION TOOLS

EK2100, EK2500, EK2400 & EK2550

The EK2100 & EK2500 give you the out-of-the-box experience of an Instant-On mesh network and the full power of our RF Engine hardware, SNAP network firmware, and Portal desktop software. Plug in the SNAP Stick, power up the ProtoBoard, and immediately you'll get a sense of the speed and simplicity of SNAP networking. Install the Synapse Portal software on your Windows PC (2K, XP, Vista), and experience how easy it is to program your own applications – no need to spend time and money on complex development tools and programming languages.

The EK2100 Starter Kit is designed to guide the user through a basic SNAP network setup and a series of application demonstrations.

EK2400 Evaluation Kit for Internet control of an embedded application lets you monitor and control a wireless lighting system locally or over the.You control four, high-intensity, color LEDs as well as monitor the temperature and ambient light via sensors built onto each of the EK2400's two demonstration boards.

- Internet monitoring and control of intelligent lighting devices
- No configuration necessary - devices come pre-loaded, ready to control from the web
- Complete end-to-end solution, hardware and software - device to web-browser

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The EK2500 Network Evaluation Kit offers the easiest way to experience the full power of Synapse RF Engine hardware, SNAP network operating system and Portal desktop software.

- Interactively control & monitor all nodes on the network.
- Modify device behavior (embedded scripts) wirelessly.
- Design, test, verify and deploy your application in record time.

PART NUMBERS

EK2100	EK2500	EK2550
EK2400		

SNAP
Software making homes smarter for a greener world.

LIGHTING

the future to intelligent, wireless energy monitoring and control.

SYNAPSE

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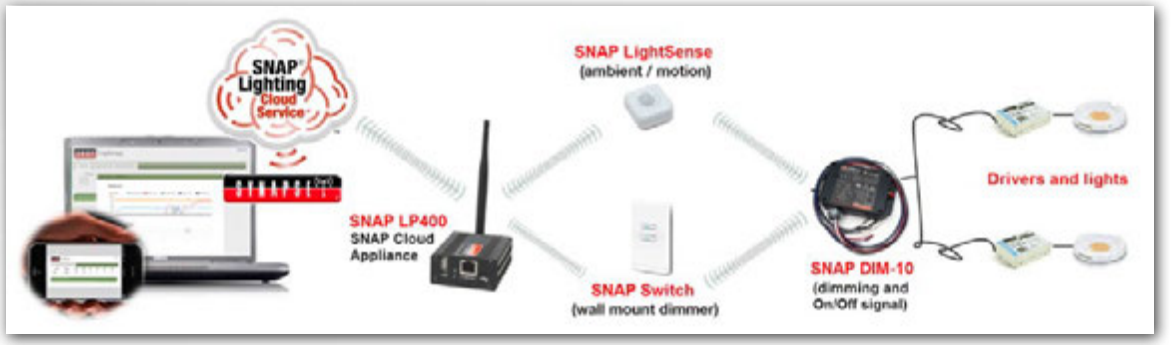
SYNAPSE INTERNET-CONTROLLED WIRELESS LIGHTING SYSTEM

Deploy and remotely manage LED Lighting locally or over the Internet.

Through simple Plug & Play products, Synapse offers a complete, reliable and easy to install wirelessly controlled lighting and energy management system for indoor and outdoor applications. The Synapse Wireless Lighting System is an integrated set of products that are reliably networked leveraging the SNAP Network Operating System. All of these products can easily be installed into your existing or new lighting and energy management system and become instantly operational – no predetermined routing or complex network programming is needed. It simply works.



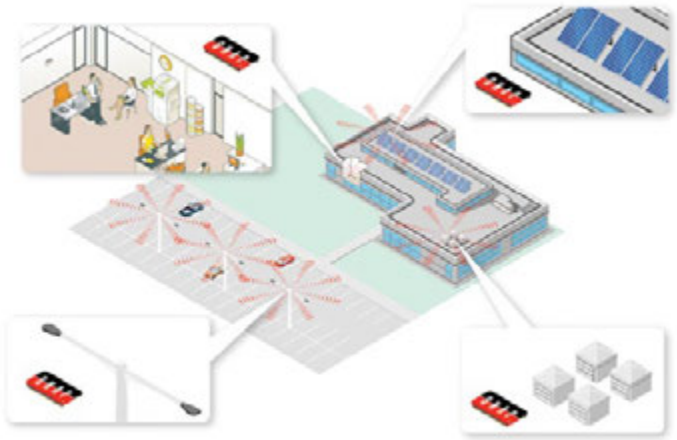
PART NUMBERS

LP001-001	LP410-001	LP201-002	LP511-001 (Worldwide)
LP400-001	LP500-001 (North America)	LP301-001	

Flexible Control and Monitoring System

Control and Monitor Anywhere in the World

Flexible and informative web-based GUI enables secure access to the lighting system from any Internet connection allowing remote control of any individual or group of luminaires. The GUI also enables the creation and modification of pre-programmed schedules or scenes.



SCALABLE SYSTEM

Once your SNAP network is installed to manage and control your lighting system, it is easy to extend the network to add monitoring and control for in-roof solar energy panels, HVAC systems, parking lights and many more functions throughout the facility. The SNAP operating system forms a true peer-to-peer mesh network, allowing no single points of failure, and unlimited expansion for intelligent, secure, flexible and cost-saving control.

SYNAPSE

WIRELESS LIGHTING SYSTEM FEATURES

Flexibility

- Based on the Synapse SNAP Network Operating System
- Internet enabled for mobile or desktop access
- Easy to integrate into new or existing lighting installations
- Secure login for specific users and locations

Floor Plan-based Interface

- Individual floor-plans can be uploaded
- Zone and fixture locations can be selected, customized and updated
- Create and modify scenes and schedules
- Navigation tree allows hierarchical selection of managed entities

Energy Management

- Measure and monitor heat, current, voltage
- View real-time or historical energy consumption

Manual Light Control

- Remotely access individual zones and fixtures for manual control, including On/Off, Dimming and Color
- Temporary override of scenes and scheduled events

Automated Control

- Motion controlled or timed dimming
- Automated adjustment to ambient light
- Zone control and failure detection


Helping
renewable
energy systems
become more
efficient through
intelligent,
wireless
control and
monitoring.
SYNAPSE

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SNAP DMX - WIRELESS LIGHTING CONTROL

Eliminates Cables • Fast Setup • Robust

Reliable. Long Distance. Wireless DMX.
When you need to connect DMX devices on stage, across the building or across the campus, SNAP DMX wireless adapters make it easy and cost-effective.

SNAP DMX- WIRELESS DMX CONTROL SYSTEM

Wirelessly Connect DMX Devices
SNAP DMX products easily and reliably replace expensive cabling between controllers, lights and other DMX devices without modification to existing equipment. The flexible terminal block is compatible with 3-Pin or 5-Pin DMX connections. Each unit autodetects its role, operating as either a transmitter or receiver - so there's only one model to stock. Combine multiple SNAP DMX units to span up to 16 Universes with up to 96 DMX channels for SNAP DMX, and up to 512 channels (and RDM support) for SNAP DMX Pro.

USB Controller Interface
Every SNAP DMX device supports an industry standard USB interface for PC-based controller software, and is compatible with many 3rd party software controllers and tools.

CLICK TO LEARN MORE

APPLICATION EXAMPLE:
Media/Entertainment Lighting Control

PART NUMBERS

LP500-001 (North America)	LP511-001 (Worldwide)

SYNAPSE

SNAPLINK SERIAL WIRELESS ADAPTERS

High Performance Wireless RS-232 and RS-485/422 Cable Replacement Devices supports ModBus

The SNAP ® Link family of robust, mesh networking, serial wireless adapters makes it easy and quick to connect RS-232 and RS-485/422 devices, increasing distance beyond physical wire constraints while reducing installation time and cost, ongoing maintenance costs, and line noise problems. Units are powered by USB or an external AC adapter included with the product.

Two Form Factors available:

- SNAP Link RS-232 (external antenna)
- SNAP Link RS-485/422 (external antenna)

Benefits:

- Highest bandwidth & longest distance in the industry (2 Mbps, 3 miles)
- Most reliable, robust mesh network
- Easiest setup and quickest configuration in the industry

PART NUMBERS

SL232K-001	SL485K-001

SNAPLINK FEATURES:

- SNAP - Instant-On, Self-Healing Mesh Network
- RS-232 version has a DB-9 port with full hardware flow control
- RS-485/422 supports two and four wire, half & full duplex
- Up to 3 mile range (line of sight)
- Spread Spectrum (DSSS) technology surmounts noisy environments
- Supports wireless ModBus
- LEDs show signal strength & data transmission activity
- Supports one-to-one and one-to-many relationship configurations
- -40 to 85 ℃ operating temperature, industrial use
- RP-SMA antenna connection on RS-232 and RS-485/422 models
- Mini-B USB port for easy connection to PCs (no serial-to-USB adapter required)
- Supports custom applications with embedded Python and free tools from Synapse
- Control and monitor SNAP nodes across the Internet with SNAP Connect (sold separately)
- Available with AES-128 encryption for added security