

Backhaul Solutions in Unlicensed Band

Dec 2, 2009



Agenda



- Introduction
- Backhaul Options
- Relative Merits & Demerits
- Wi-Fi based solution
- Example Deployments
- Roadmap
- Conclusion



What is Backhaul

- Intermediate links between the core, or [backbone](#), the small subnetworks at the "edge" of the entire hierarchical network
- Examples
 - cell phones connected with a single cell tower a local subnetwork,
 - **Backhaul:** connection between the [cell tower](#) and the core of the [telephone company's](#) network
 - Connecting [DSLAMs](#) to the nearest [ATM](#) or [Ethernet](#) aggregation node.
 - Connecting a large company's site to a [metro Ethernet](#) network
 - Connecting a [submarine communications cable](#) system [landing point](#) to the main land-based telecommunications network



Backhaul Options

- **Wired**
 - [DSL](#) variants, such as [ADSL](#) and [SHDSL](#)
 - [PDH](#) and [SDH/SONET](#) interfaces, such as (fractional) E1/T1, E3, T3, STM-1/OC-3, etc.
 - [Ethernet](#)
- **Wireless**
 - Point-to-point [microwave radio relay](#) transmission (terrestrial or, in some cases, by satellite)
 - [Point-to-multipoint](#) microwave access technologies, such as [LMDS](#), [Wi-Fi](#), [WiMAX](#), etc
- **Wired vs. Wireless**
- Licensed vs. unlicensed band



Advantages of Wireless Backhaul

- Rapid deployment
- Lower cost of deployment
 - Lower TCO and higher ROI
- Rapid disaster recovery
- Ease of upgrade
- Lower per user cost for smaller group of users



Wi-Fi Backhaul Advantages

- **Higher Throughput**
 - *Higher bandwidth and longer distances with the implementation of TDMA and link-aggregation technology.*
- **Highly Reliable Outdoor Unit**
 - *IP67 level enclosure & Level 17 beaufort scale ratings*
- **Highly Flexible Options**
 - *Solar power option*
 - *Optional external antenna connections for various coverage demands*
- **Cost Effective**
 - *Wi-Fi offers License-free technology and affordable per user cost*
 - *Better coverage and throughput reduce the installation cost with fewer units required*
 - *Easy to install for rapid deployment in business and commercial data services.*
- **Low Power Consumption**
 - *Less power consumption compared to other long distance infrastructure equipment*
- **Minimum Maintenance Effort**
 - *Centralized graphical tool for group control, batch management and real-time data flow monitoring and management on Google maps.*

SAI Broadband Wireless Products (BWP)



BWP series

Extreme

Power

Value

●MP

●NEW

●Future(TBD)



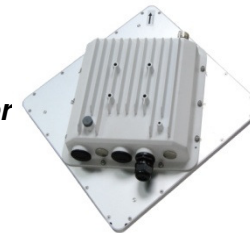
R2 Extender(ZC-3625-55-23)

- POE(19.2W)
- 23 dBi Built-in 5 GHz antenna
- One N type ext 5 Ghz ant. connector
 - SGS IP67 certified
- 5 GHz Backhaul + 5 GHz Relay



R4 Series

- POE(38.4W)
- 23 dBi default antenna
- Three N type external antenna
 - SGS IP67 certified



R2 Basestation(ZC-3625-52-23)

- POE(19.2W)
- 23 dBi default 5 GHz antenna
- One N type external connector for 2.4GHz antenna
 - SGS IP67 certificated
- 5 GHz Backhaul/2.4 Ghz Coverage



R1 Extender(ZC-3625-5-23)

- POE(19.2W)
- 23 dBi Built-in 5 GHz Ant.
- Single-radio value model
- SGS IP67 certificated
 - Backhaul

Q1/09

Q2/09

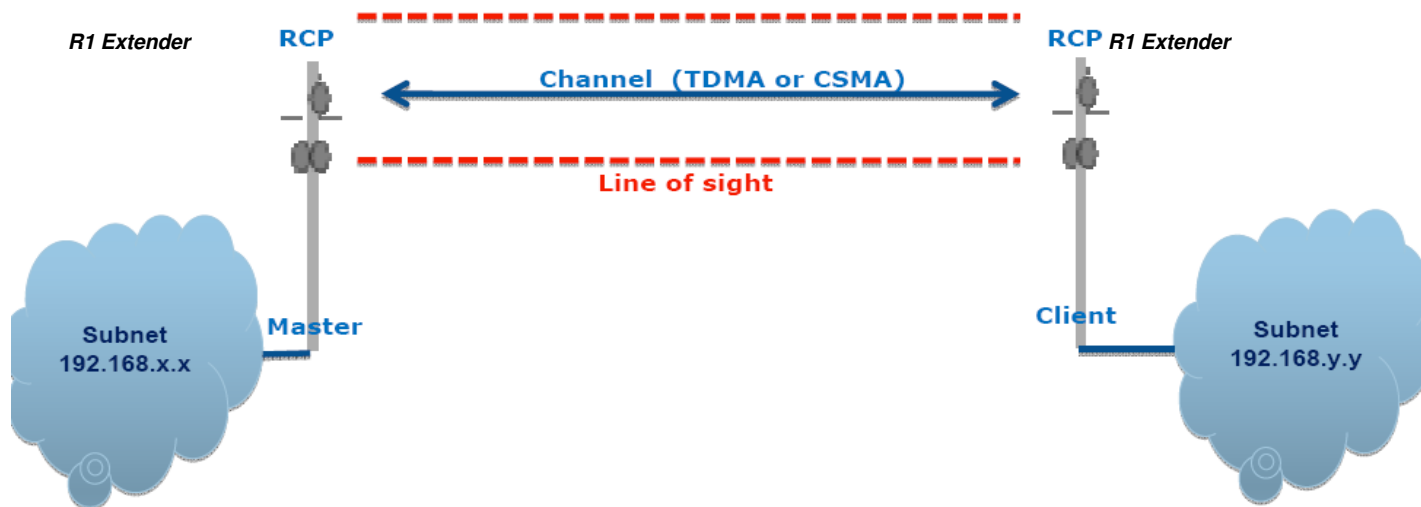
Connectivity Options



RCP – Point to Point Connectivity



- Allow peer connectivity between two locations.
- Enable bridging of networks
- TDMA or CSMA (depending upon distance)

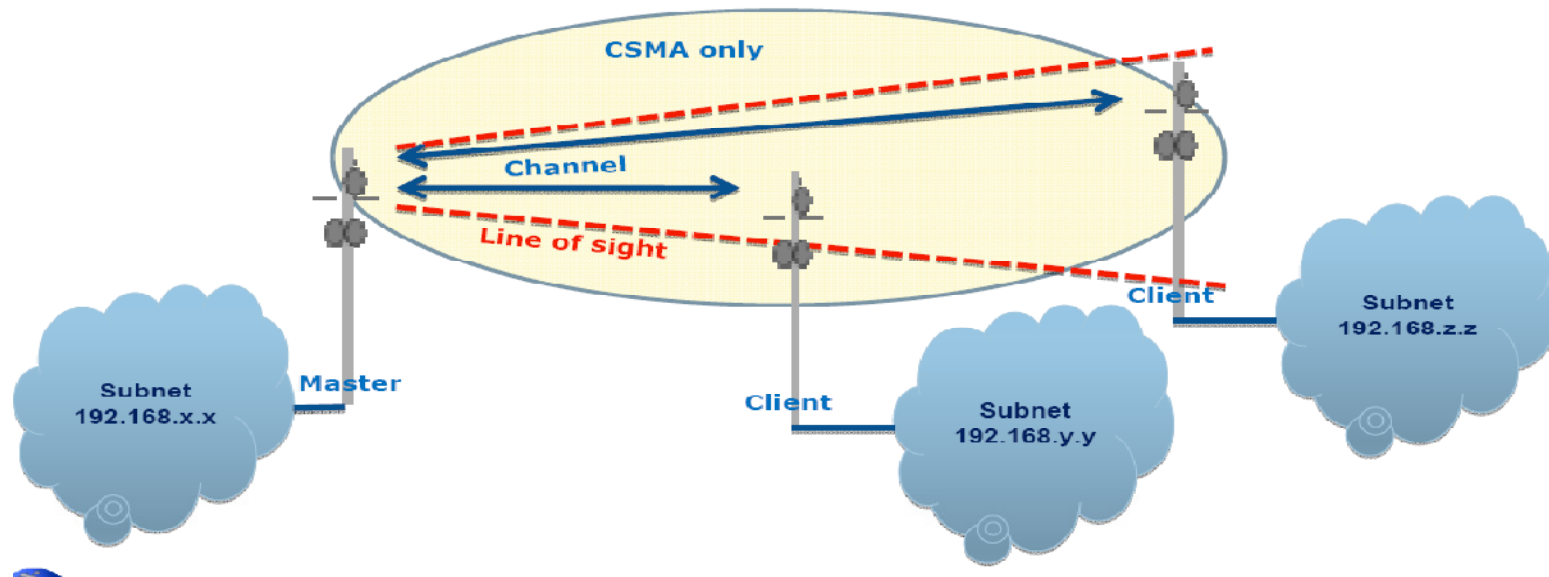


Connectivity Options



RCP Point to Multipoint

Allow a single point (eg. gateway to Internet) to provide connectivity or bridging to multiple sites.



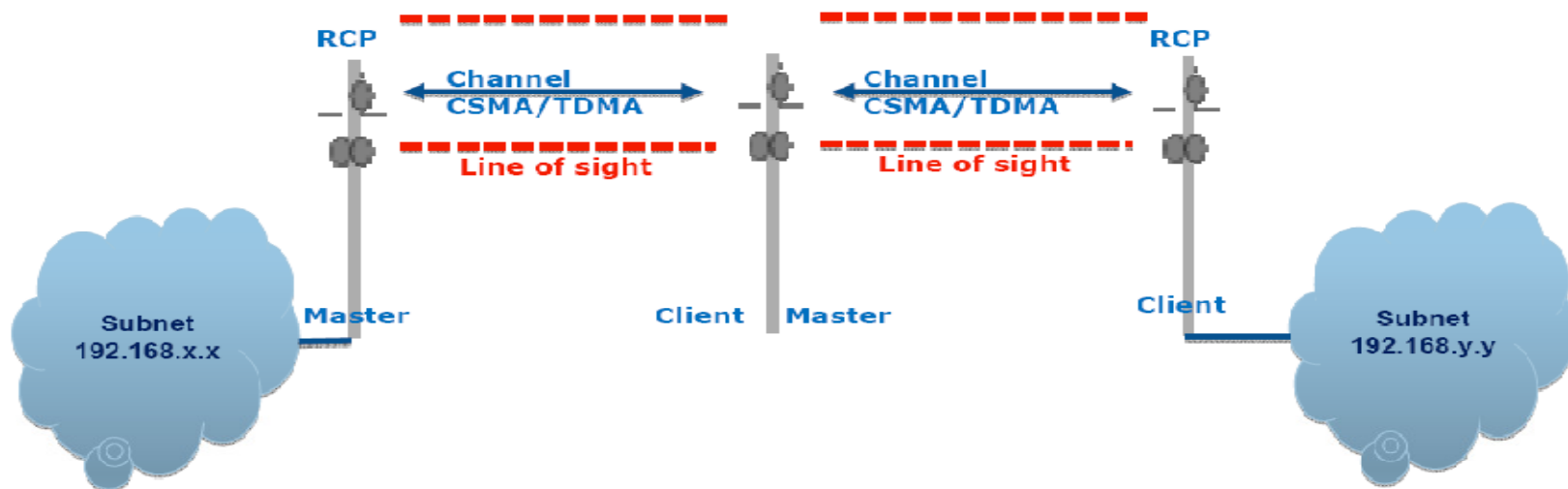
Connectivity Options



RCP Relay



RCP units are able to relay information over multiple hops providing a means to reach more remote locations or bypass obstacles like mountains and non-line of sight issues.



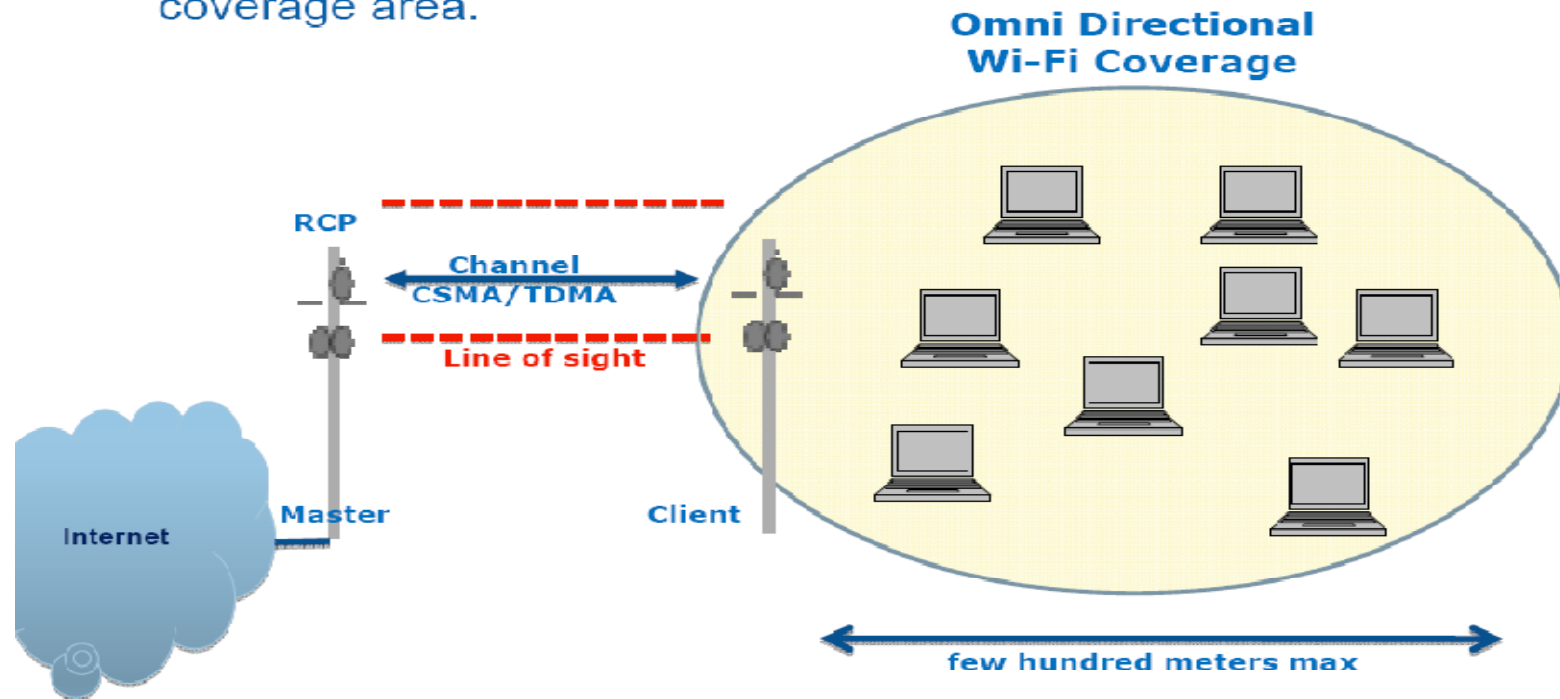
Connectivity Options



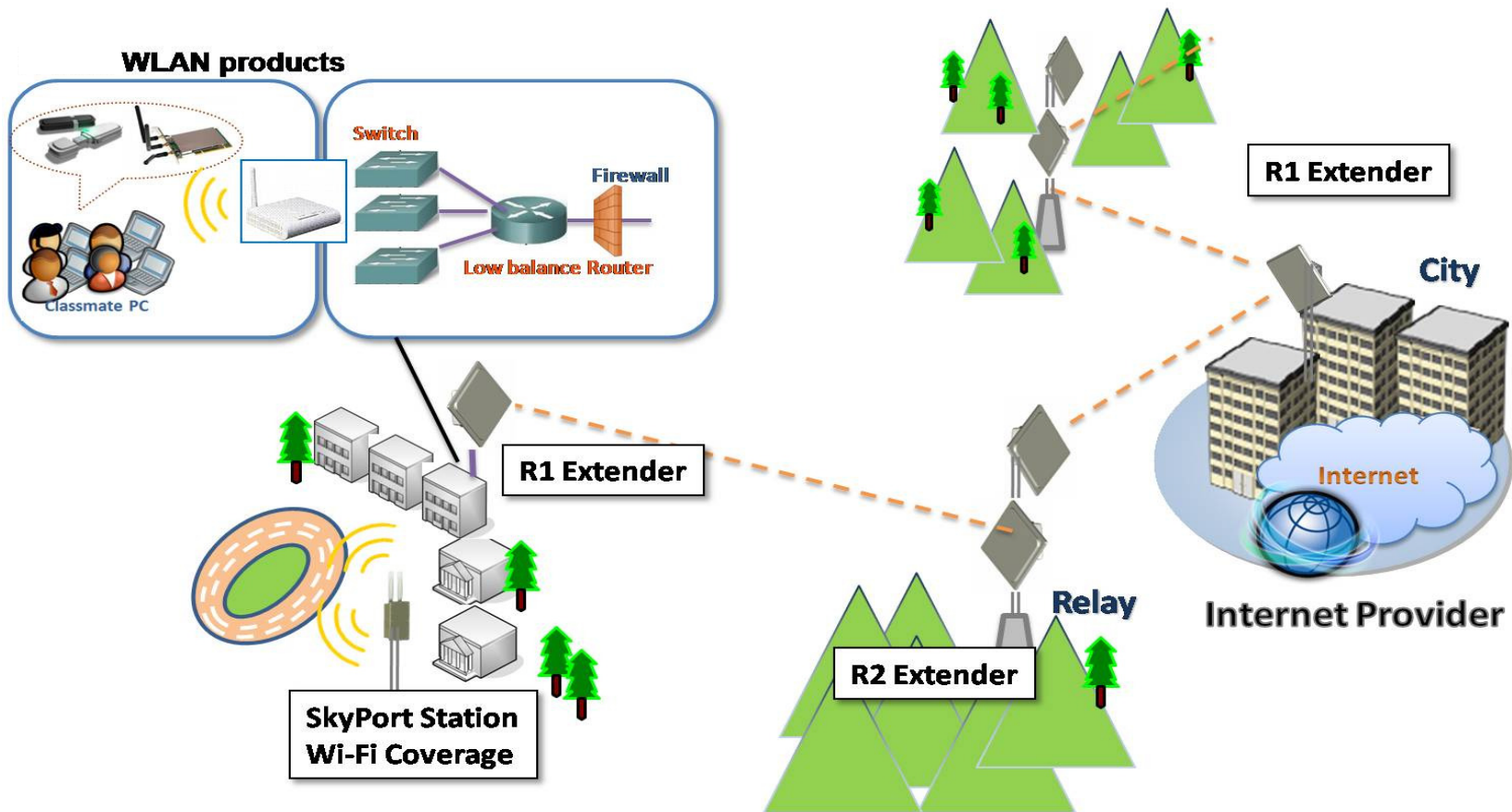
RCP Point to Point with Local Coverage



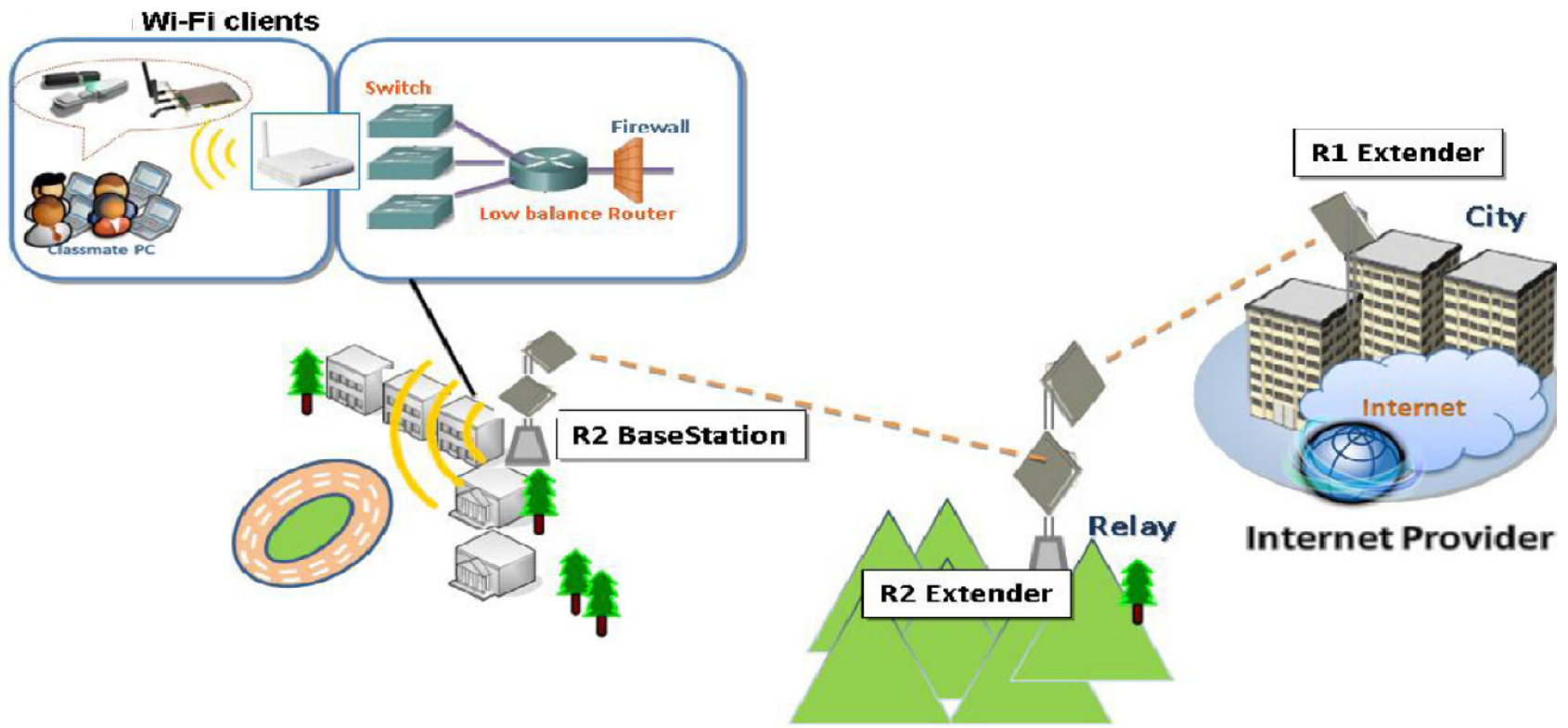
Provide local coverage from an RCP device to a specific coverage area.



Long Range BWP Connectivity



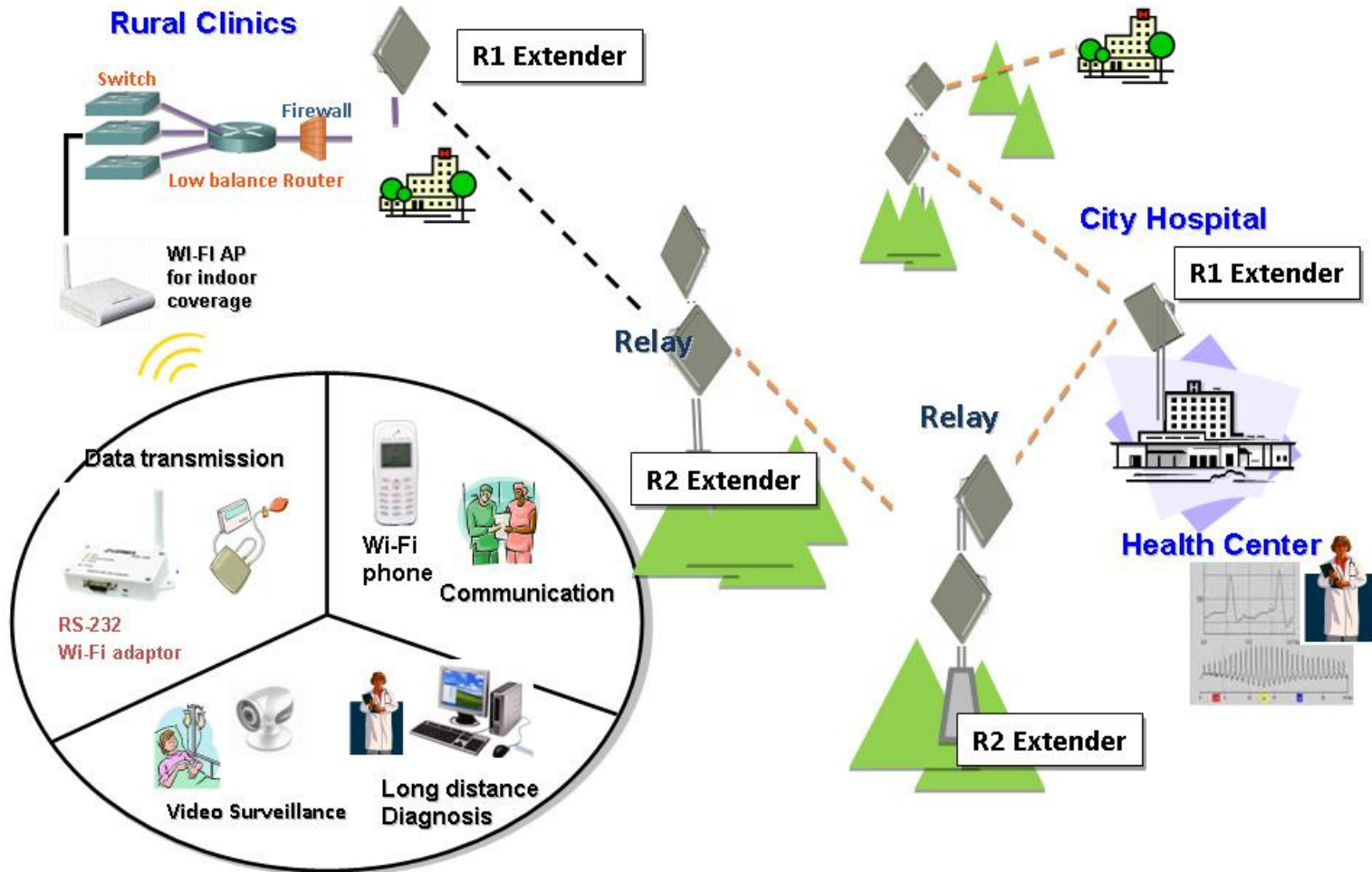
Education Connectivity



Telemedicine Applications



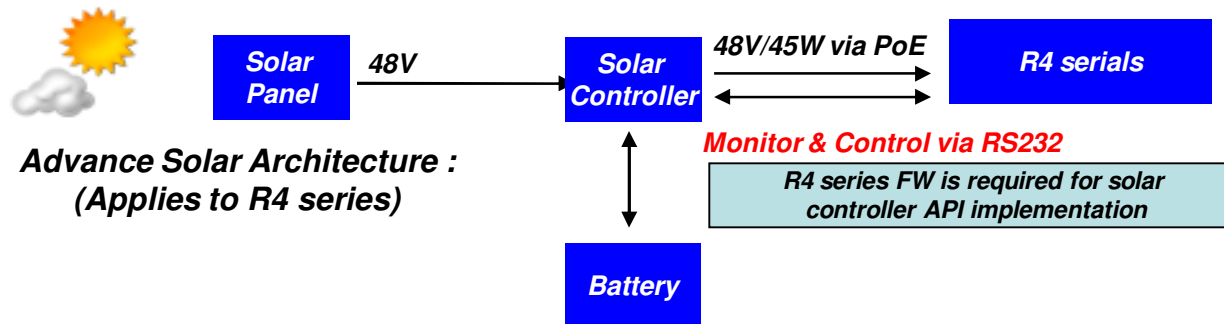
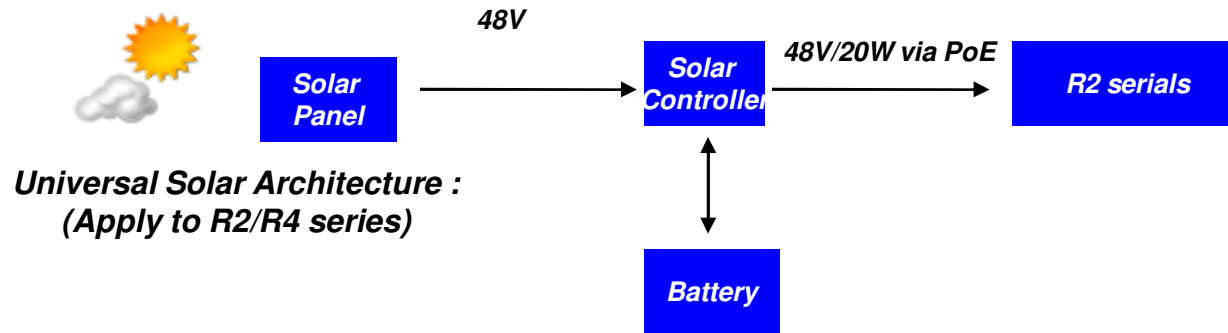
Telemedicine Wireless Application



Fresno County : CA Central Valley



Solar Power Option for BWP



BWP Performance Reference



Product Name		10km	20km	40km
		Throughput	Throughput	Throughput
CE	R1E	10 Mbps	NA	
	R2E	20 Mbps	Suggest use relay solution	
FCC	R1E	15 Mbps	15 Mbps	20 Mbps
	R2E	30 Mbps	20 Mbps	20 Mbps (one channel)

Above data just for reference only, real throughput depend on different environment and setting

Relay Solution: Reliable



Product Name		Throughput	Relay distance	Mode
FCC	R2E Relay	10Mbps	20km	CSMA
		9Mbps	20km+20km	CSMA
		9Mbps	20km+20km+20km	CSMA
		9Mbps	40km	TDMA
		9Mbps	40km+40km	TDMA
		7.9Mbps	40km+40km+40km	TDMA

Above data just for reference only, real throughput depend on different environment and setting

Summary



- Wi-Fi is a viable and cost-effective solution
 - for wireless links at distances of hundreds of kilometers when SAI BWP is deployed in a good LOS condition
- BWP (TDMA) has shown 20x throughput increase
 - over other Wi-Fi outdoor devices in over 20 km distance
- BWP with Link Aggregation Technology
 - improves throughput 200% over other Wi-Fi products in 10 km distance.
- Next generation solution can provide upto **150 Mbps** throughput