



CEL-FI, BY NEXTIVITY INC.

How to install cell phone signal boosters ...

... for a 90,000sqft commercial space ...

... in less than 30 minutes.

Window Unit (WU)



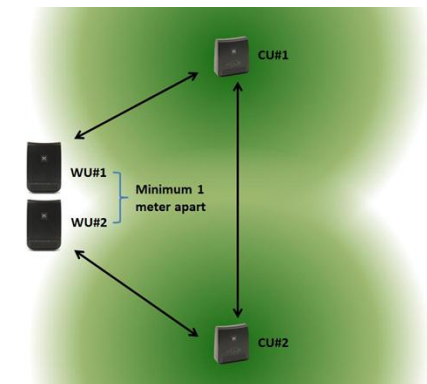
Coverage Unit (CU)



Cel-Fi consists of two wireless devices that work together to increase 3G and 4G mobile broadband connectivity

- The **Window Unit** receives the signal from the mobile phone network (even if only 1 bar of signal is available) and relays it to the Coverage Unit.
- The **Coverage Unit** converts the signal from the Window Unit and amplifies it throughout the building.

- **Cel-Fi is often used in SME and other similar commercial building environments.**
 - Open commercial architectures tend to result in larger than normal coverage areas per floor
 - A lack of RF propagation between floors tends to result in separate Cel-Fi systems per floor
 - No handset registration needed, quick to setup, large footprint, no handoff issues w/macro or between Cel-Fi systems
- **In some cases multiple Cel-Fi systems may be installed in the same location to:**
 - Add to capacity (two Cel-Fi's for same Operator)
 - Add another Operator (two Cel-Fi's for different Operators)
 - Use different single band Cel-Fi's
 - Serial linking of two systems to extend coverage deep into a structure (serial configuration)
 - Cover a much larger area (business complex, large store)
- **Special installations are outside of the scope of the Cel-Fi consumer Quick Install Guide.**



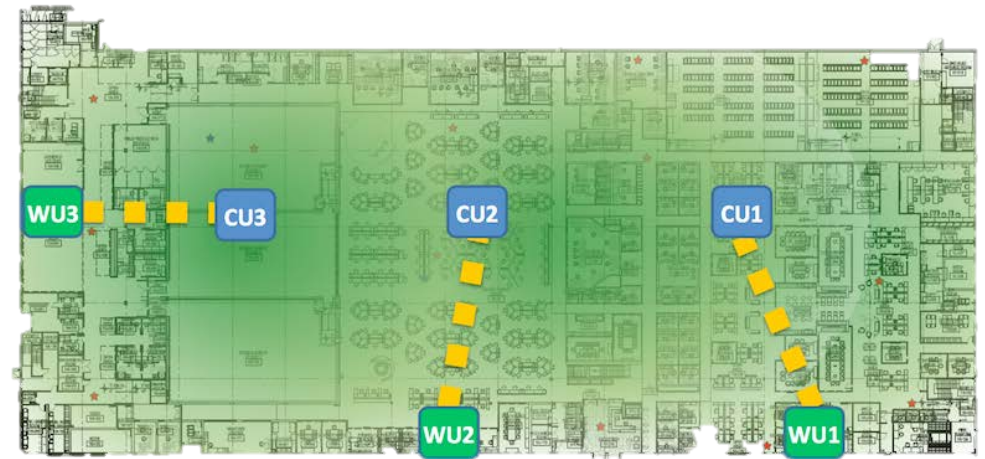
Add these rules when installing multiple Cel-Fi Systems

- Cel-Fi is unconditionally stable when deployed in mass (they will sense each other and mutually scale back on Gain to prevent feedback). So maximize each system potential by preventing feedback scenarios (WU1 close to CU2 etc., see examples).
- The WU-CU wireless link may be affected by high numbers of 5GHz Wi-Fi nodes if used. Separate Cel-Fi's and Wi-Fi nodes (1 meter minimum)
- Due to strong RF variations in commercial environments, a CU-7 may be better than an 8 or 9 (headroom for fluctuations)
- **Install one system at a time (others powered OFF) so the CU# properly references the coverage potential.**
- **No more than two WU's or two CU's should be placed next to each other (1 meter minimum separation)**
- **Longer UNII setup times may result as many channels are attempted and regulatory compliance completed on each.**
- If any red light indications occur, redeploy and test again.

Real case study - company in the East Coast.

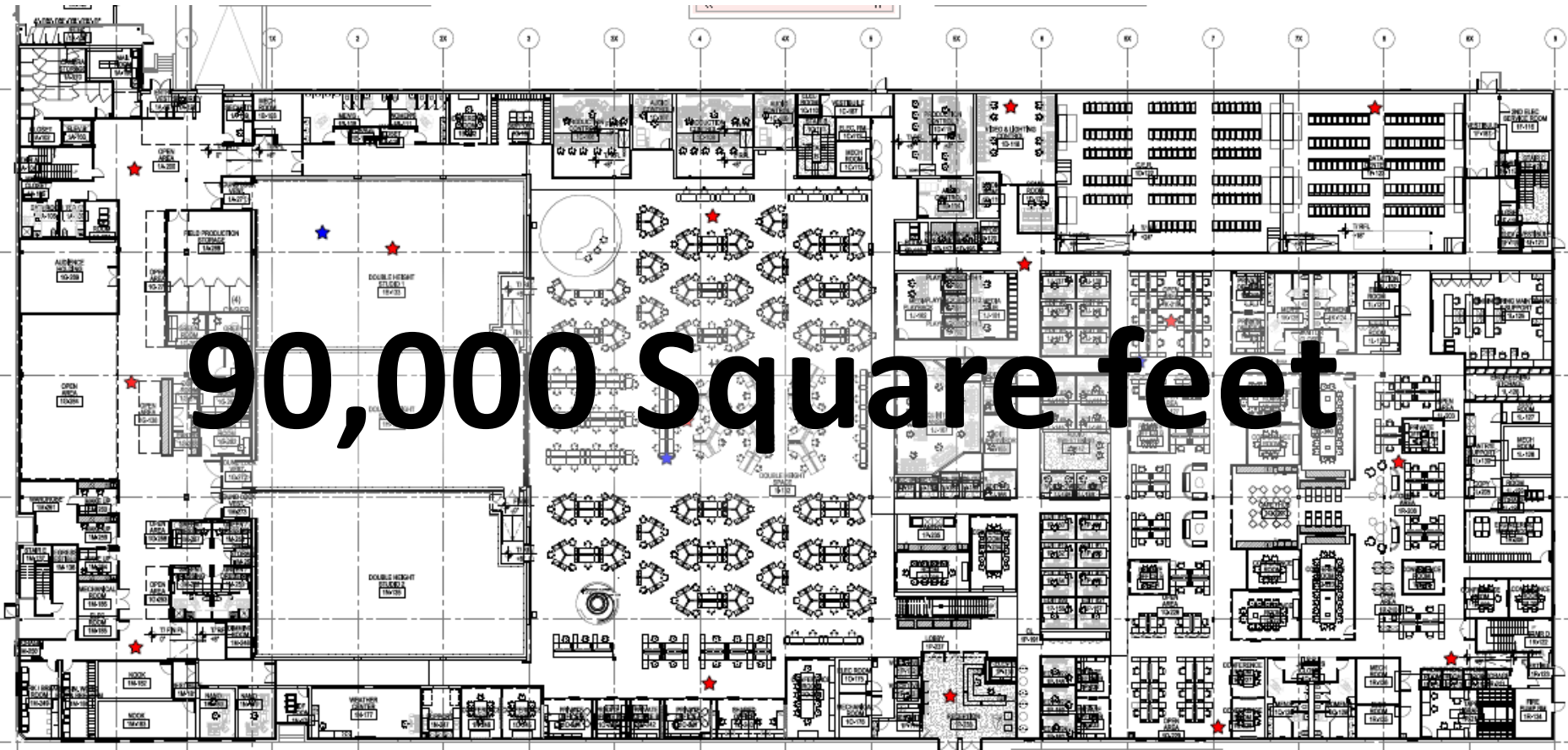
- The issue: nobody could make phone calls except near the windows on two sides of the building.
- From receiving Cel-Fi to using their mobile phones, it took our client **less than 30 minutes**.

- ✓ 3 Cel-Fi's
- ✓ 90,000 sq-ft
- ✓ 30 minutes



In the following slides, we will explain how to best install multiple Cel-Fis in a building.

Example: Multiple Cel-Fi Systems in a large commercial space

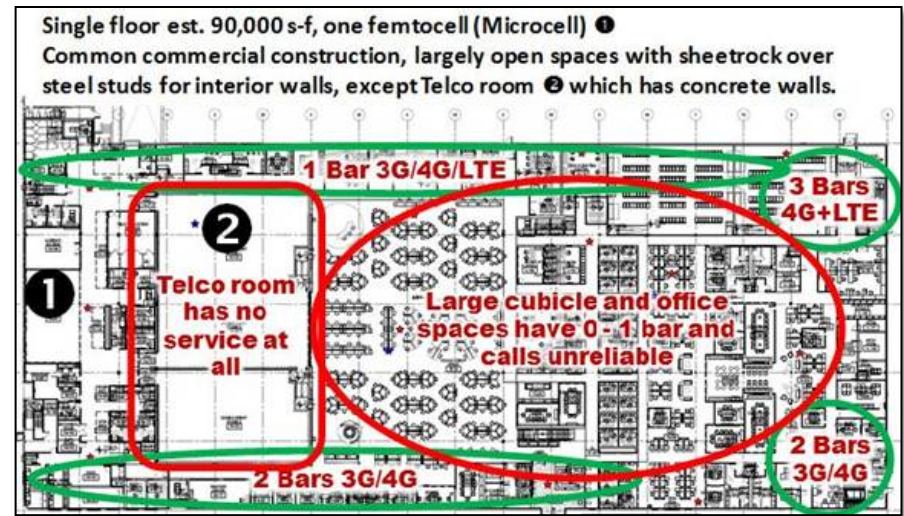


90,000 Square feet

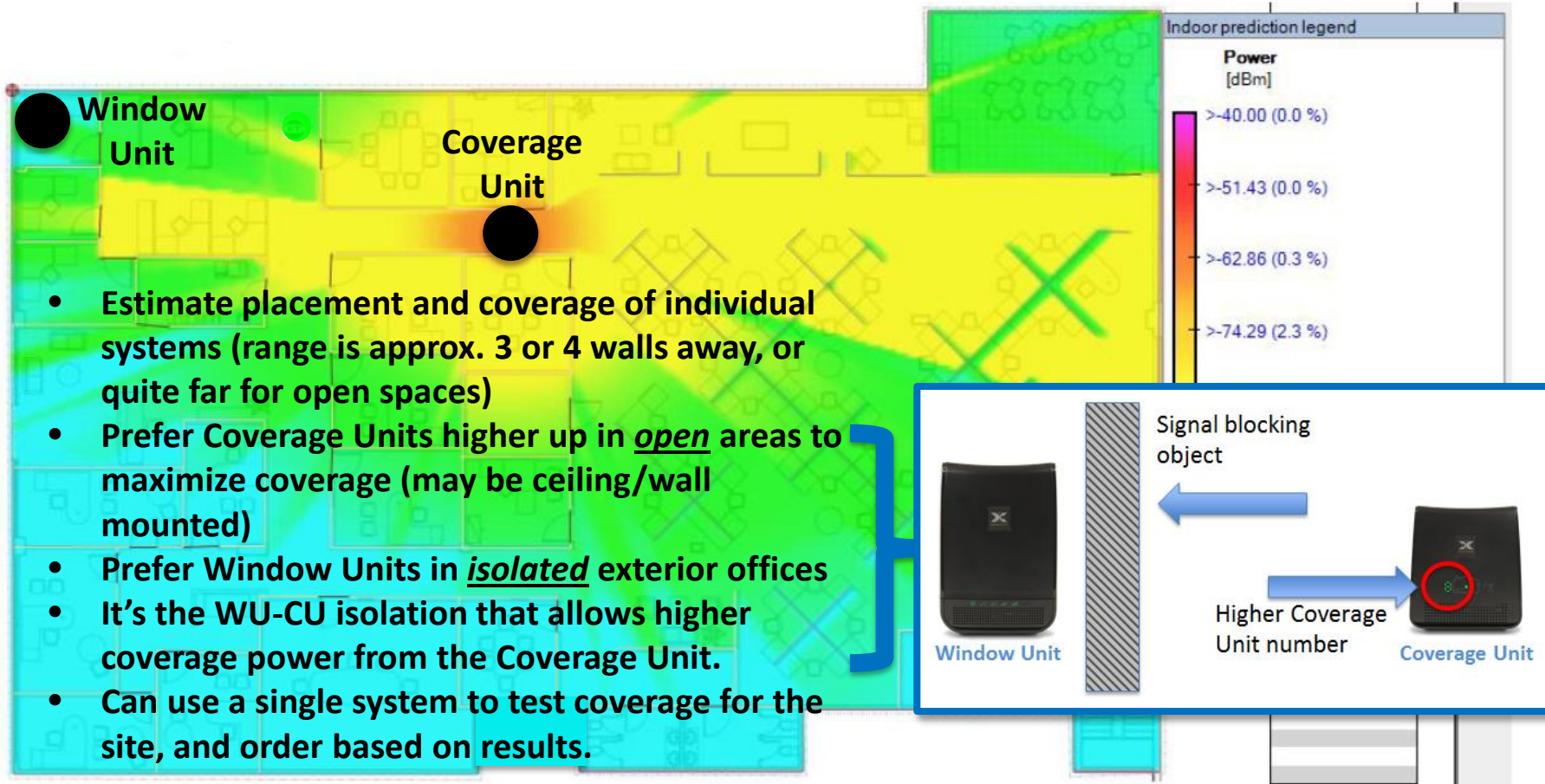
Step 1 – Evaluate the Installation Site

The following information is useful when determining Cel-Fi candidacy, and for estimating the number of Cel-Fi systems needed to cover a commercial building.

- What type of building & construction materials of interior walls etc... Typical is concrete exterior, with sheetrock interior walls.
- Square footage of the area needing coverage
- Hand drawing or layout or a schematic floor plan (showing offices, cubicles, and open area spaces).
- How many floors
- Current signal levels by area (may be “bars” of signal on an Android or Windows handset, and indicate Service[3G/4G/LTE])
- Describe any current solution that may be in place (DAS, Microcell, Booster, etc.)
- Note on current call issues, such as “No Service” zones, or areas where there is good signal but calls are not reliable.

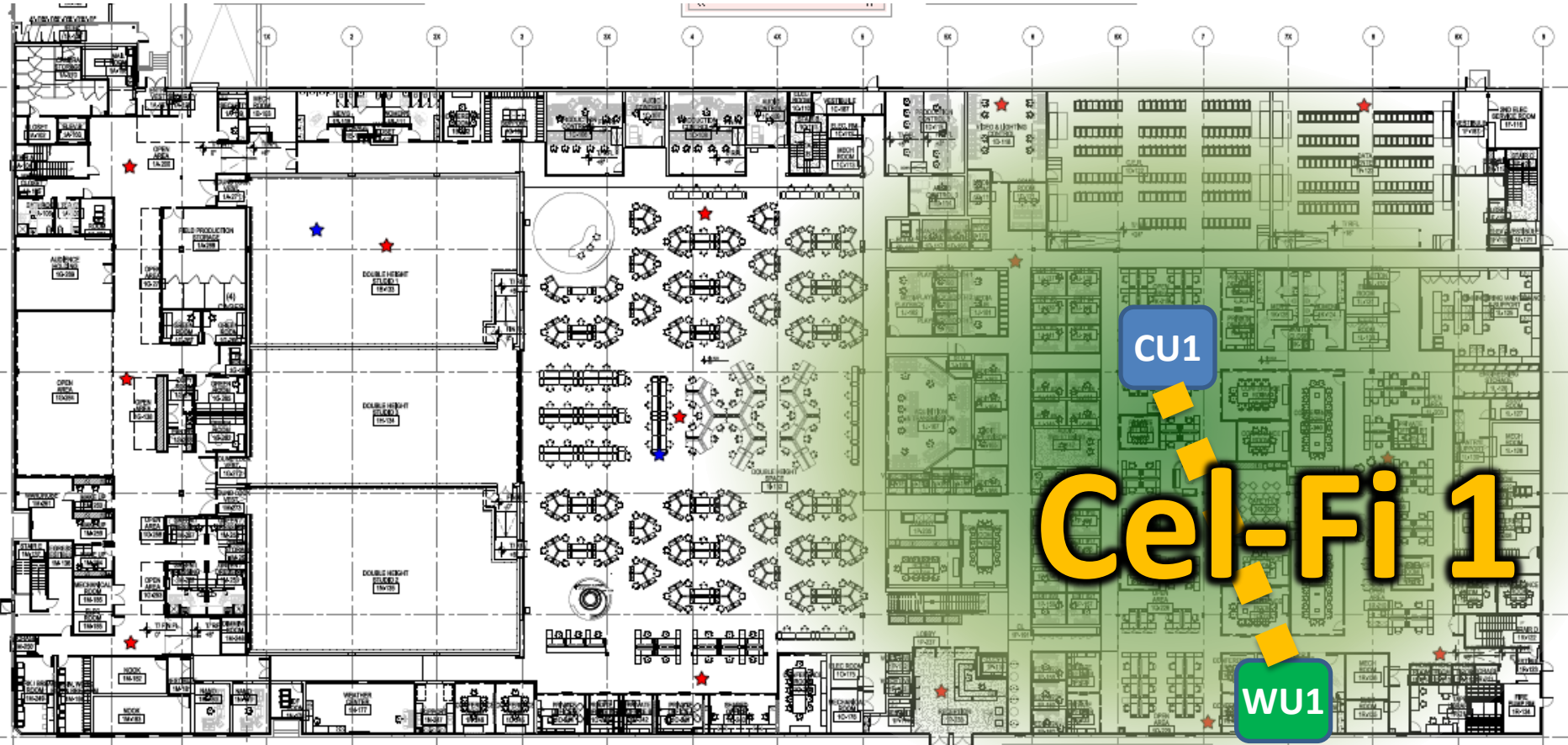


Step 2 – Estimate how many Cel-Fi's and where they might go

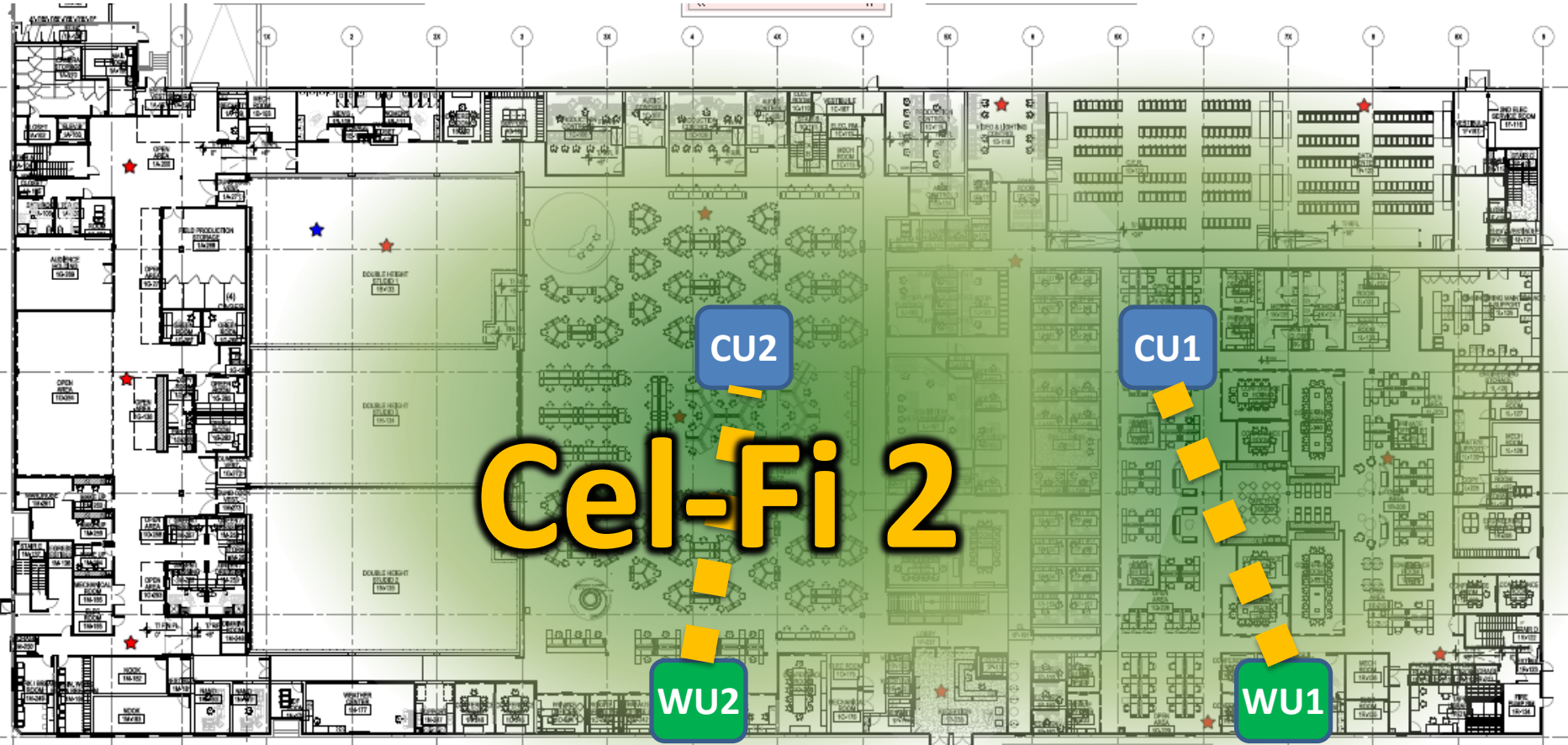


- Estimate placement and coverage of individual systems (range is approx. 3 or 4 walls away, or quite far for open spaces)
- Prefer Coverage Units higher up in open areas to maximize coverage (may be ceiling/wall mounted)
- Prefer Window Units in isolated exterior offices
- It's the WU-CU isolation that allows higher coverage power from the Coverage Unit.
- Can use a single system to test coverage for the site, and order based on results.

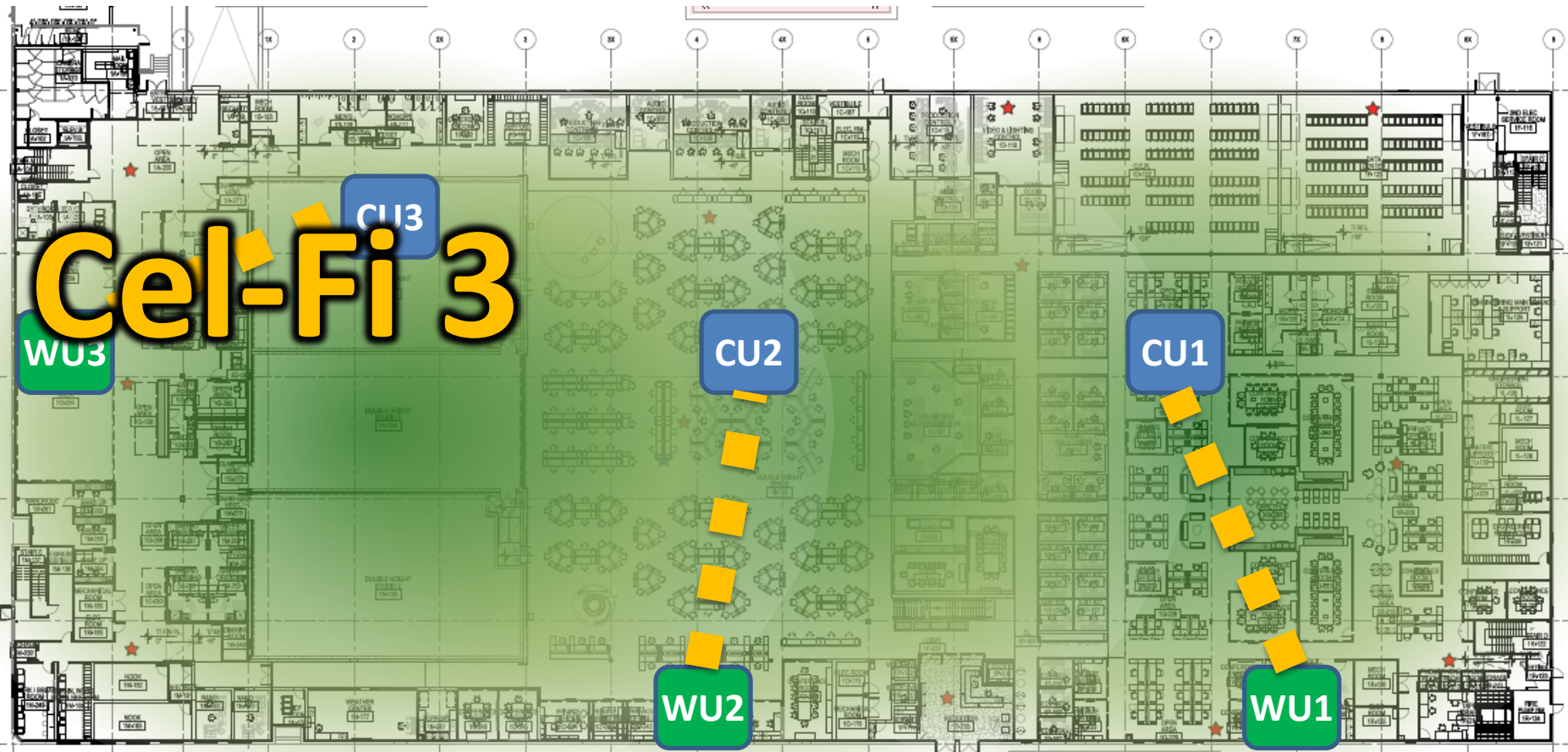
Now lets place the Cel-Fi Pairs
(Remember Cel-Fi Pairs have same Serial Number)



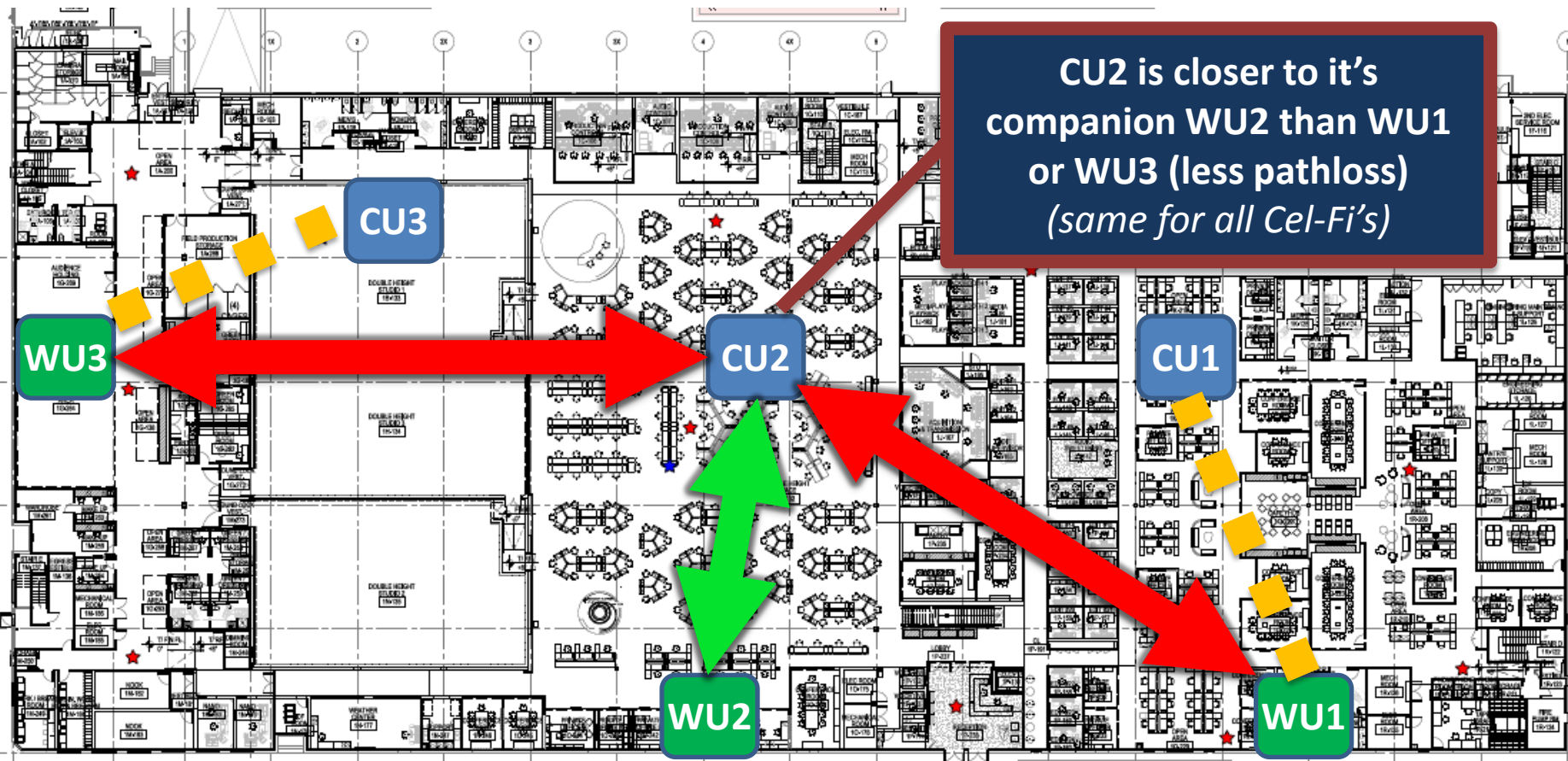
Now lets place the Cel-Fi Pairs
(Remember Cel-Fi Pairs have same Serial Number)



Now lets place the Cel-Fi Pairs
(Remember Cel-Fi Pairs have same Serial Number)



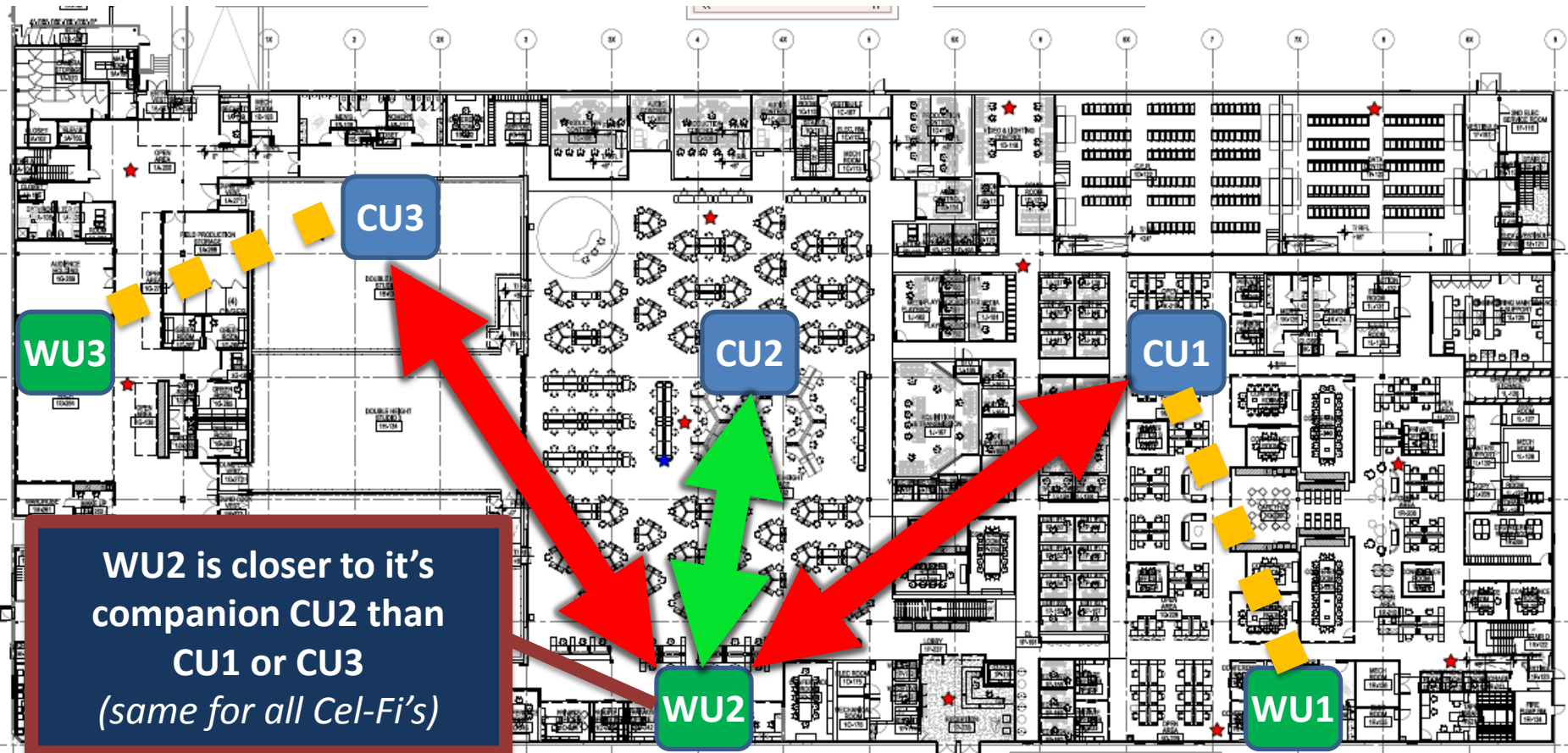
**GOOD! Systems well placed in pairs
(Performance is maximum for each system)**



NOTE: It is really RF Pathloss and not distance that matters

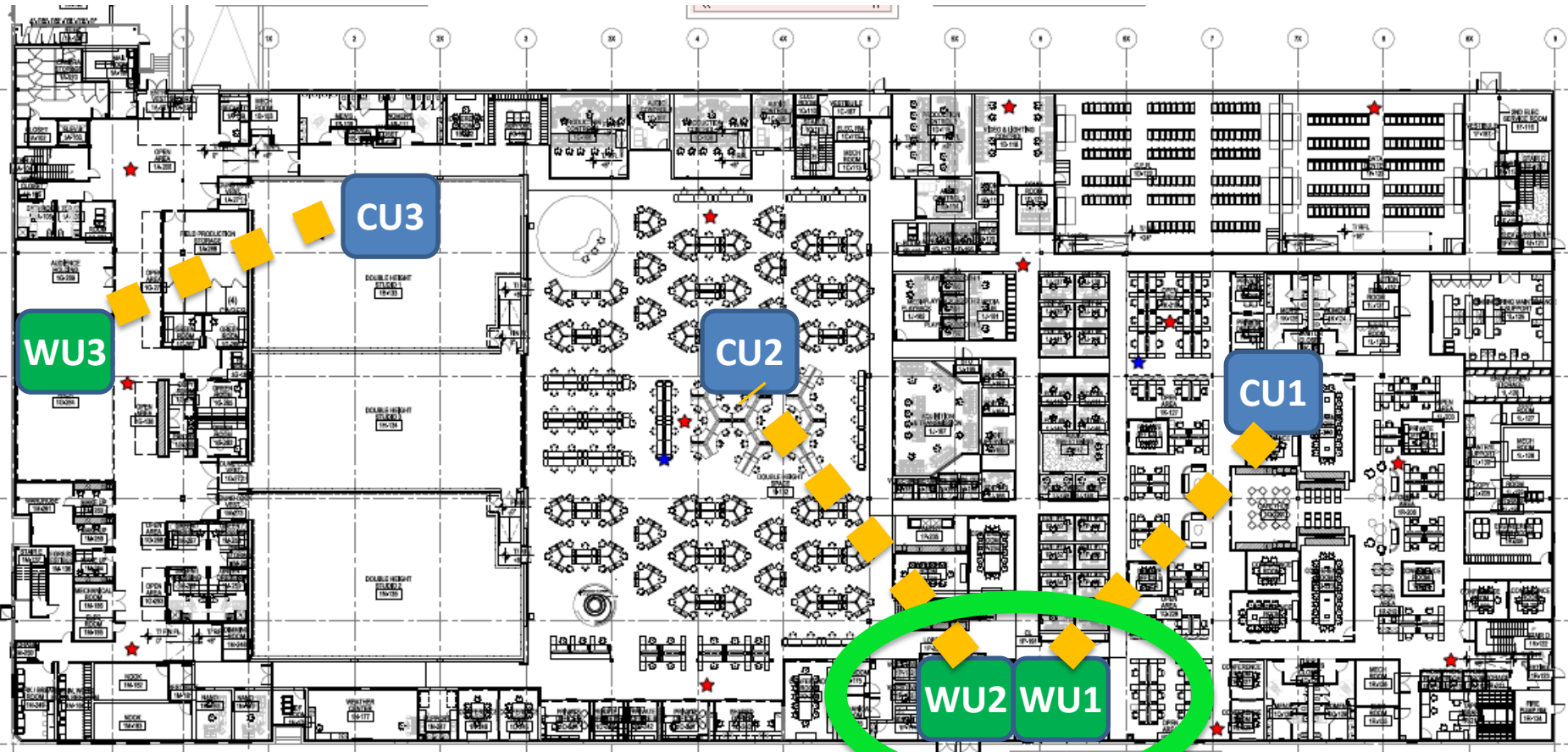
Example: Multiple Cel-Fi Systems

**GOOD! Systems well placed in pairs
(Performance is maximum for each system)**



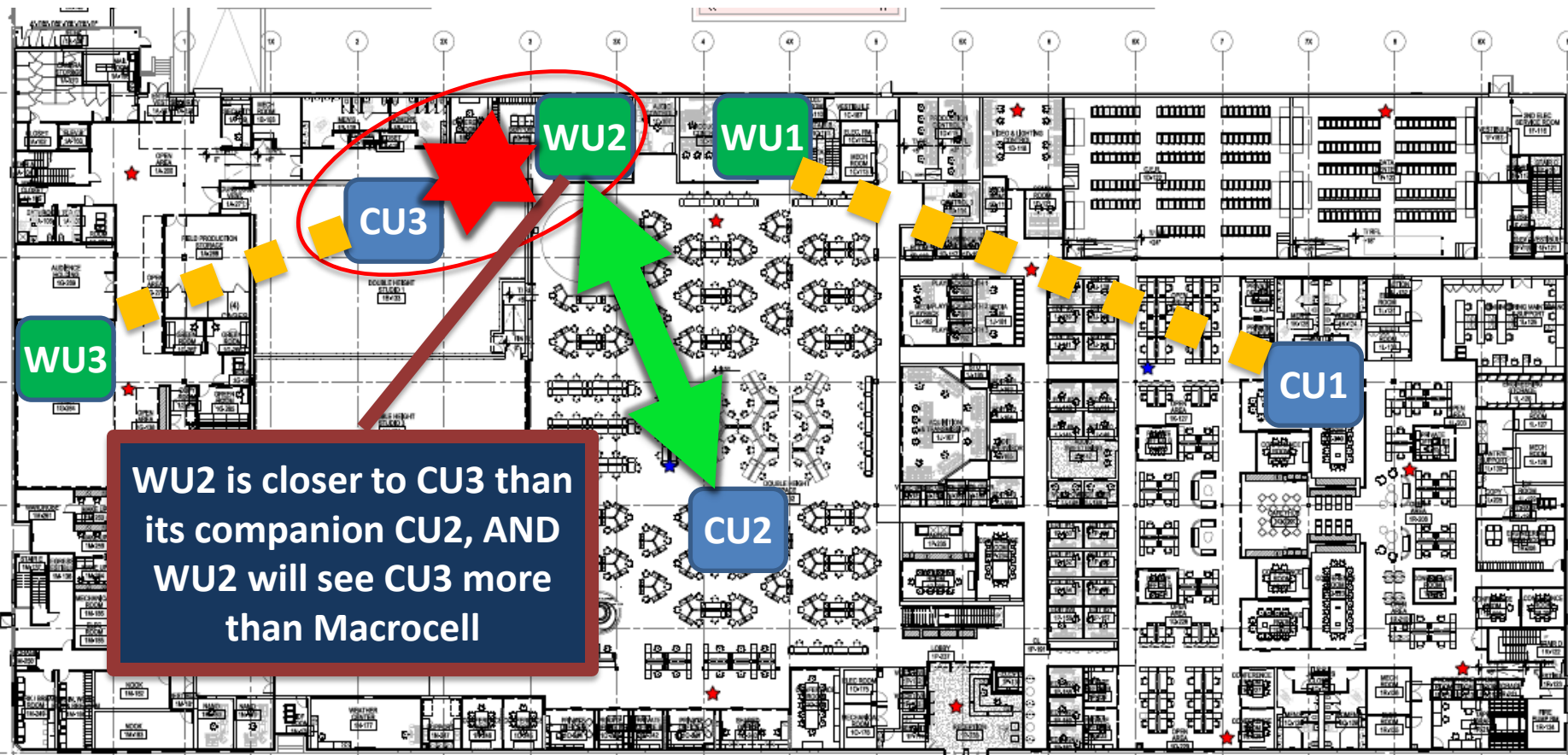
WU2 is closer to its companion CU2 than CU1 or CU3
(same for all Cel-Fi's)

**GOOD! Systems well placed in pairs
(OK to have up to two same devices together)**

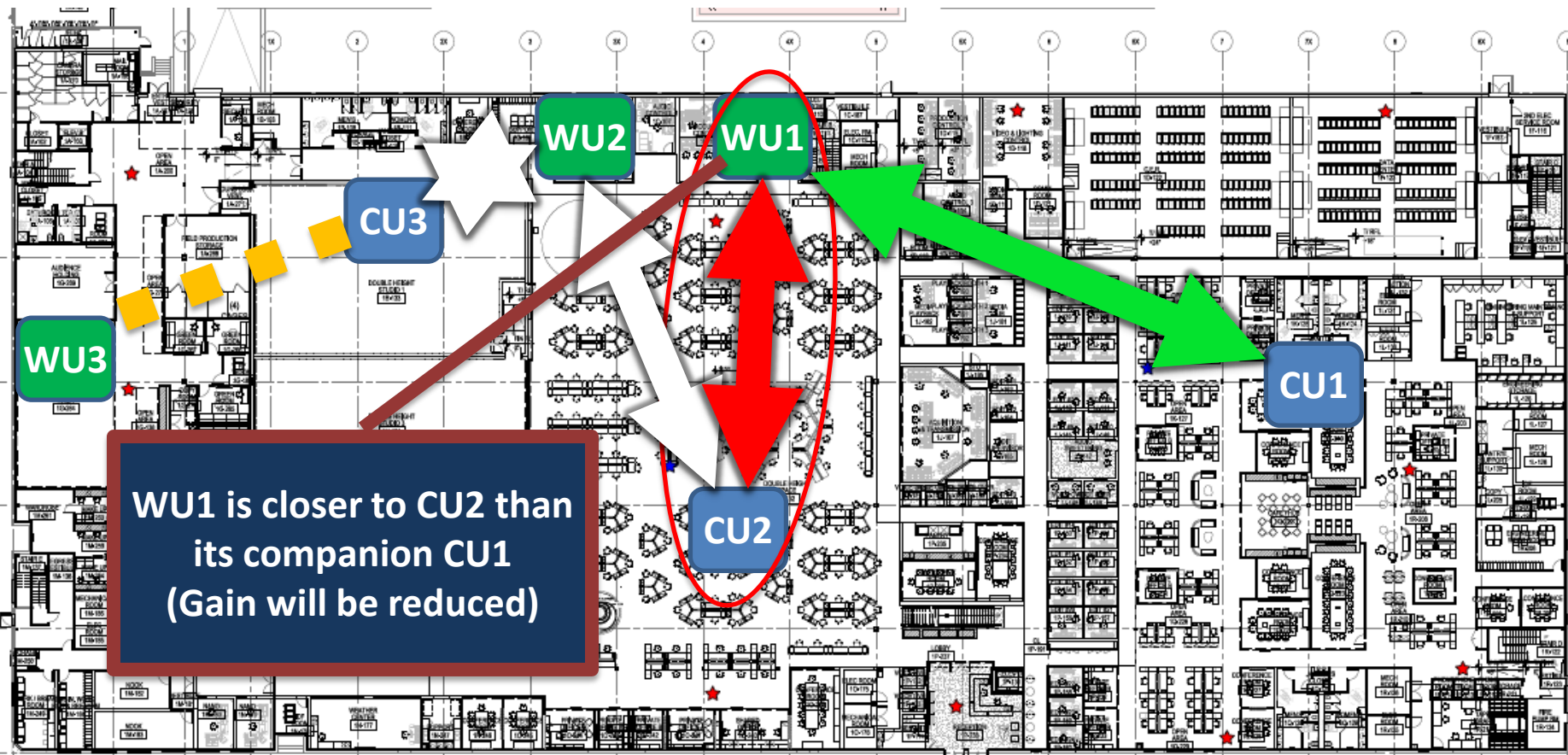


OK (2 max with ≥ 1 meter apart)

**NOT AS GOOD! Coupling: Reduces Performance to prevent feedback
(Performance is NOT maximum for each system)**

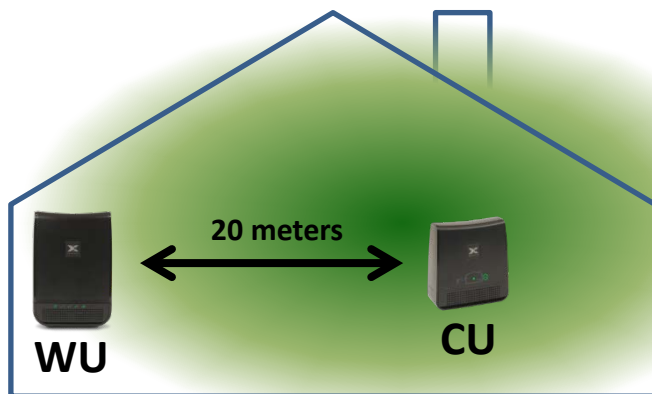


**NOT AS GOOD! Coupling: Reduces Performance to prevent feedback
(Performance is NOT maximum for each system)**



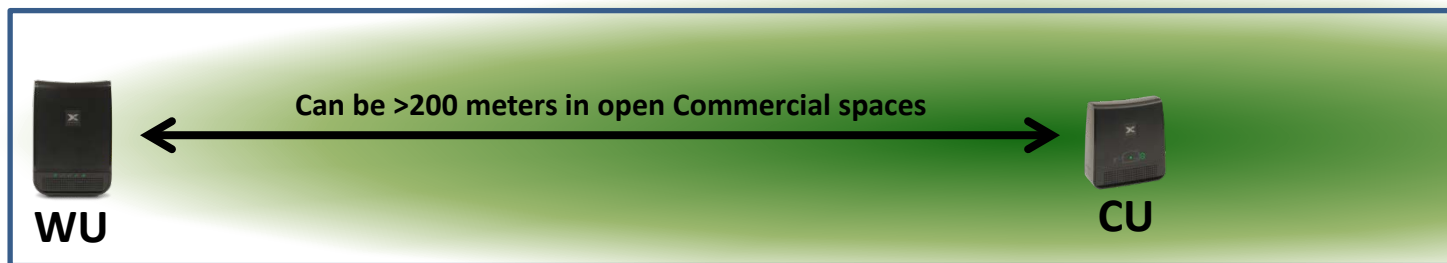
**WU1 is closer to CU2 than its companion CU1
(Gain will be reduced)**

WU – CU separation distance can be extended due to reflective metal in commercial building floors and ceilings, as compared to a house. While this extends coverage, it can also limit signal penetration between floors.

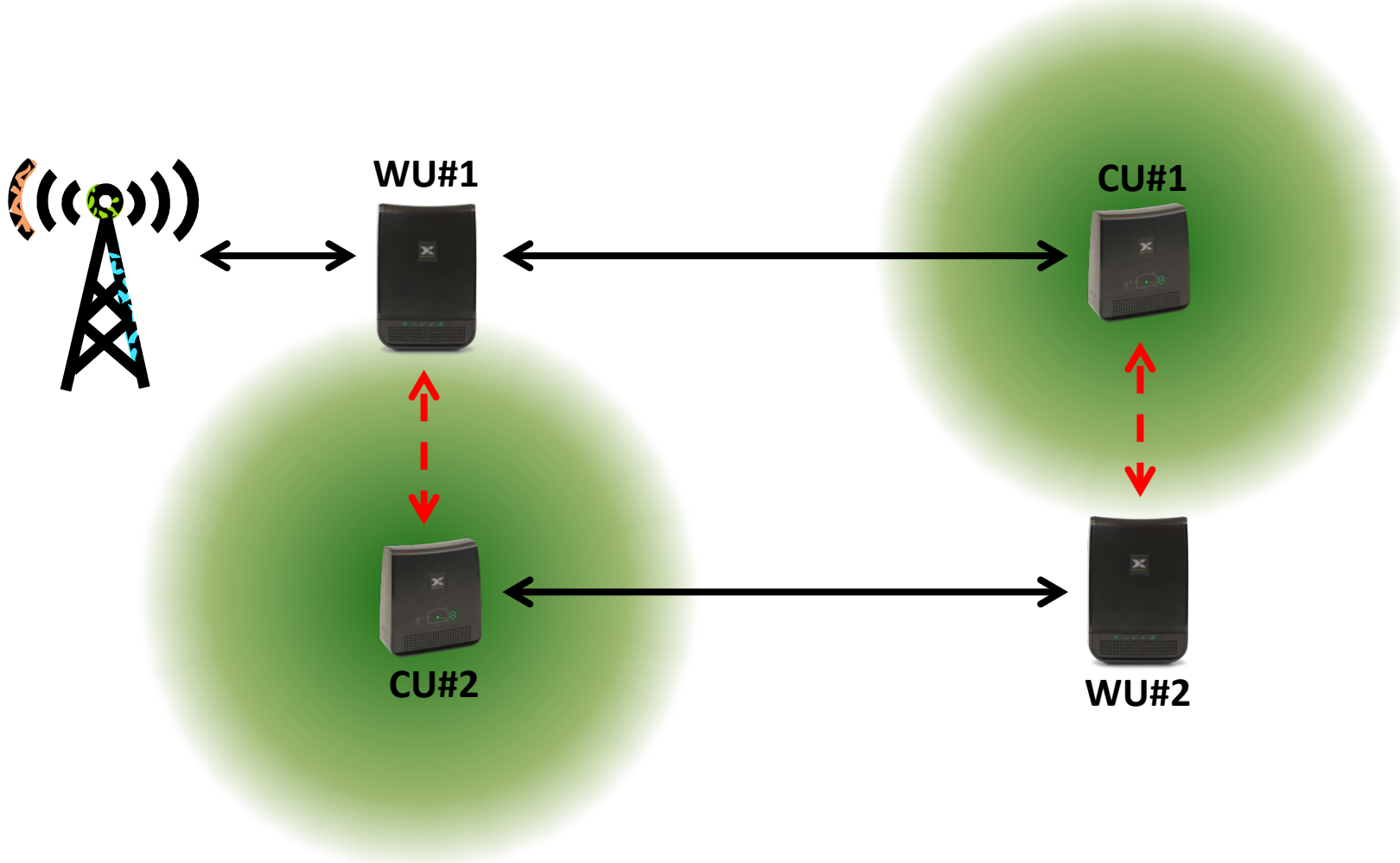


Typical Home with 20 meters between units for maximum boost.

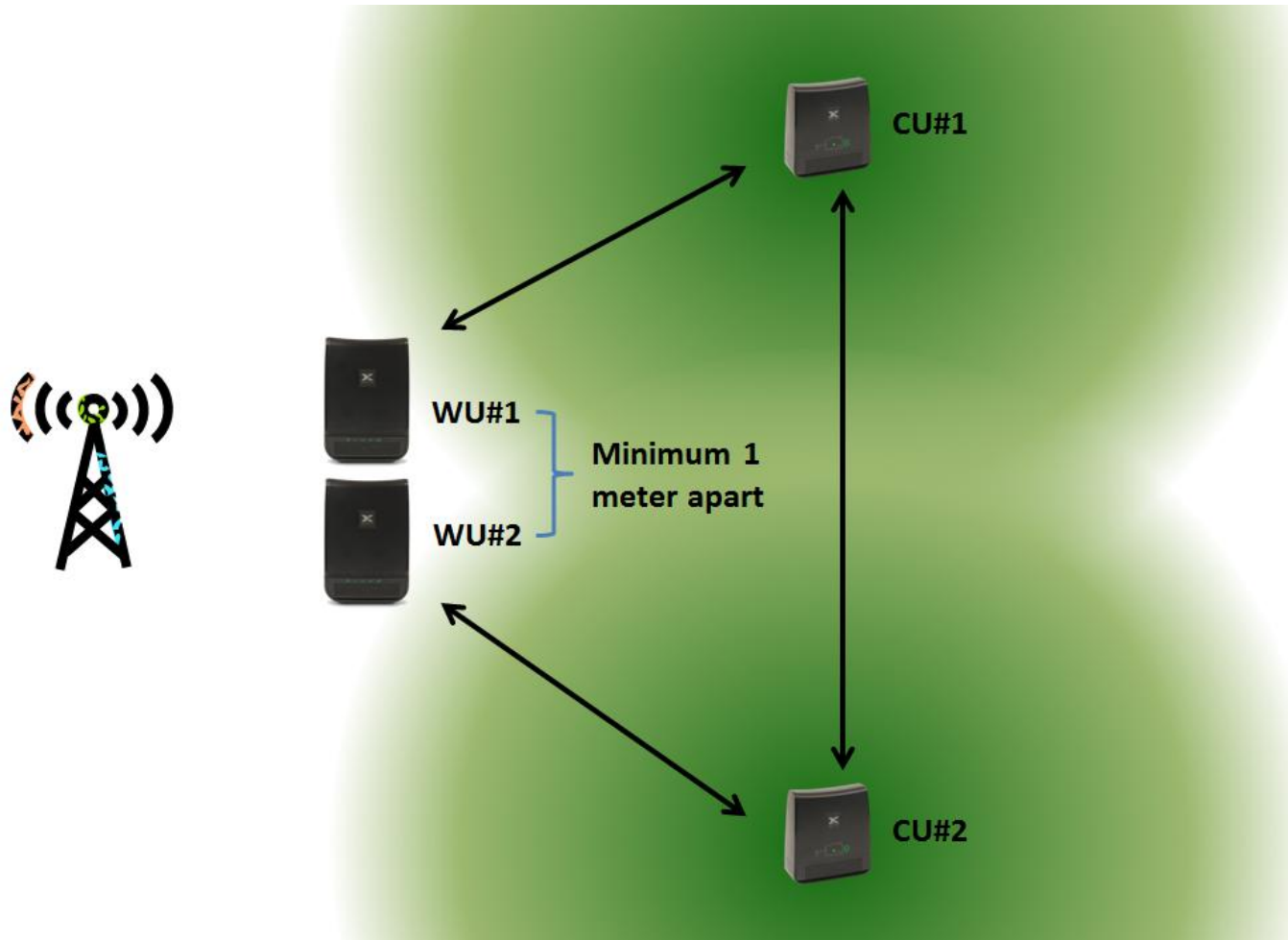
Commercial construction



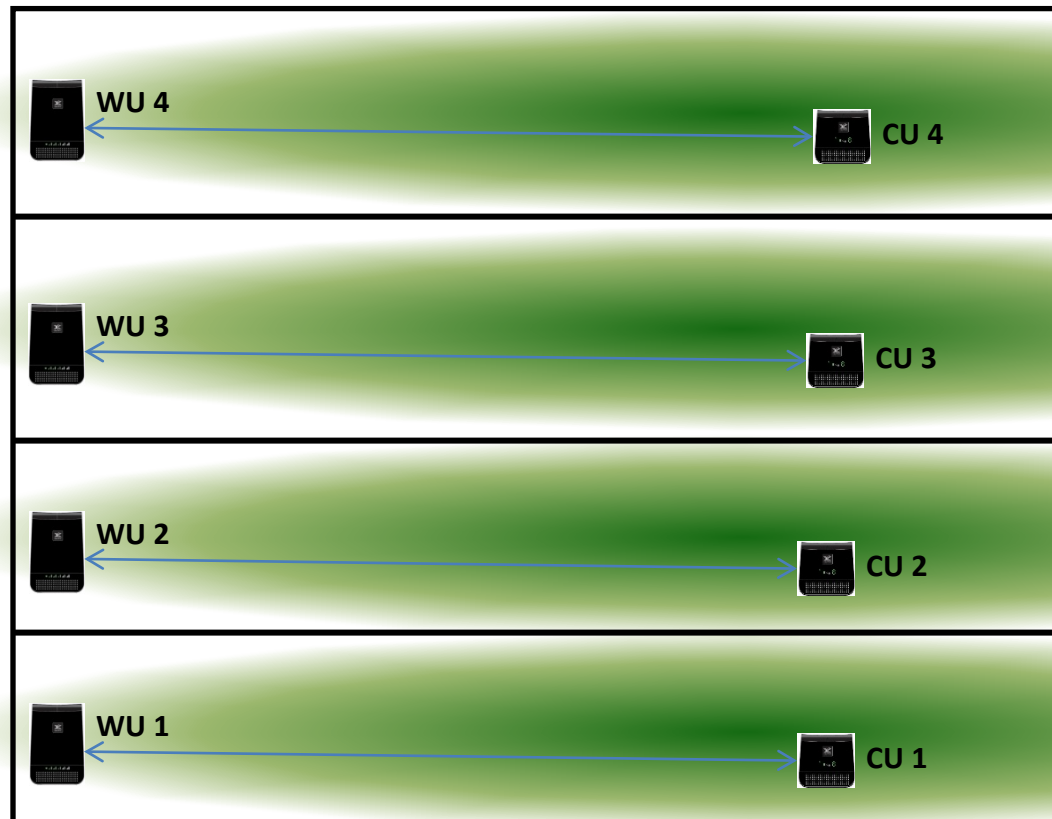
A loop is where a signal goes through Cel-Fi 1, into Cel-Fi 2 then back into Cel-Fi 1. In this situation Cel-Fi will still work but the coverage footprint will be reduced.



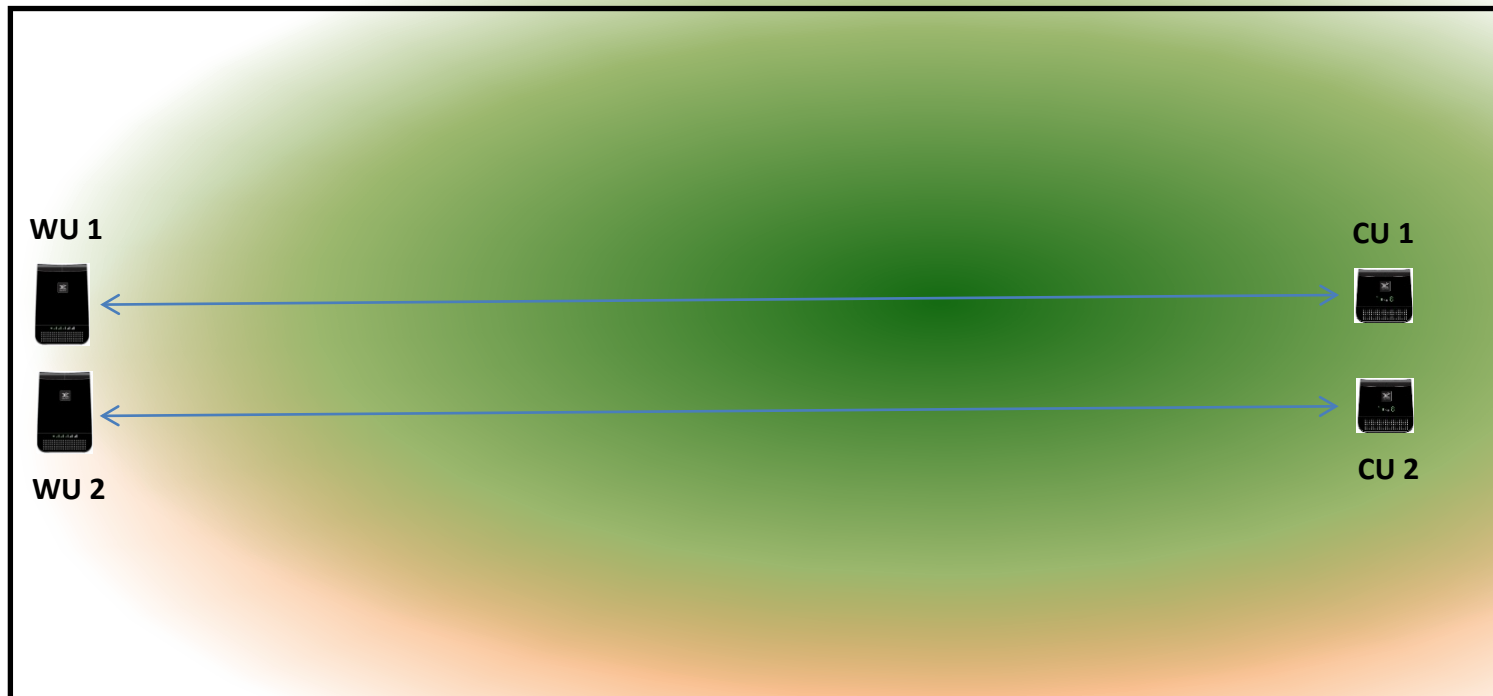
Two Window Units may be collocated if separated by 1 meter. Also install each system such that their CU# is roughly the same.



Commercial construction techniques usually employ concrete and metal flooring structures that can greatly reduce radio propagation between the floors. The solution is to deploy one or more Cel-Fi units on each floor or every other floor.



Each Cel-Fi system is for a different Operator



U.S. Headquarters: Cel-Fi, by Nextivity Inc.

12230 World Trade Drive, Suite 250

San Diego, CA 92128, USA

+1 858.485.9442 tel

+1 858.485.9445 fax