

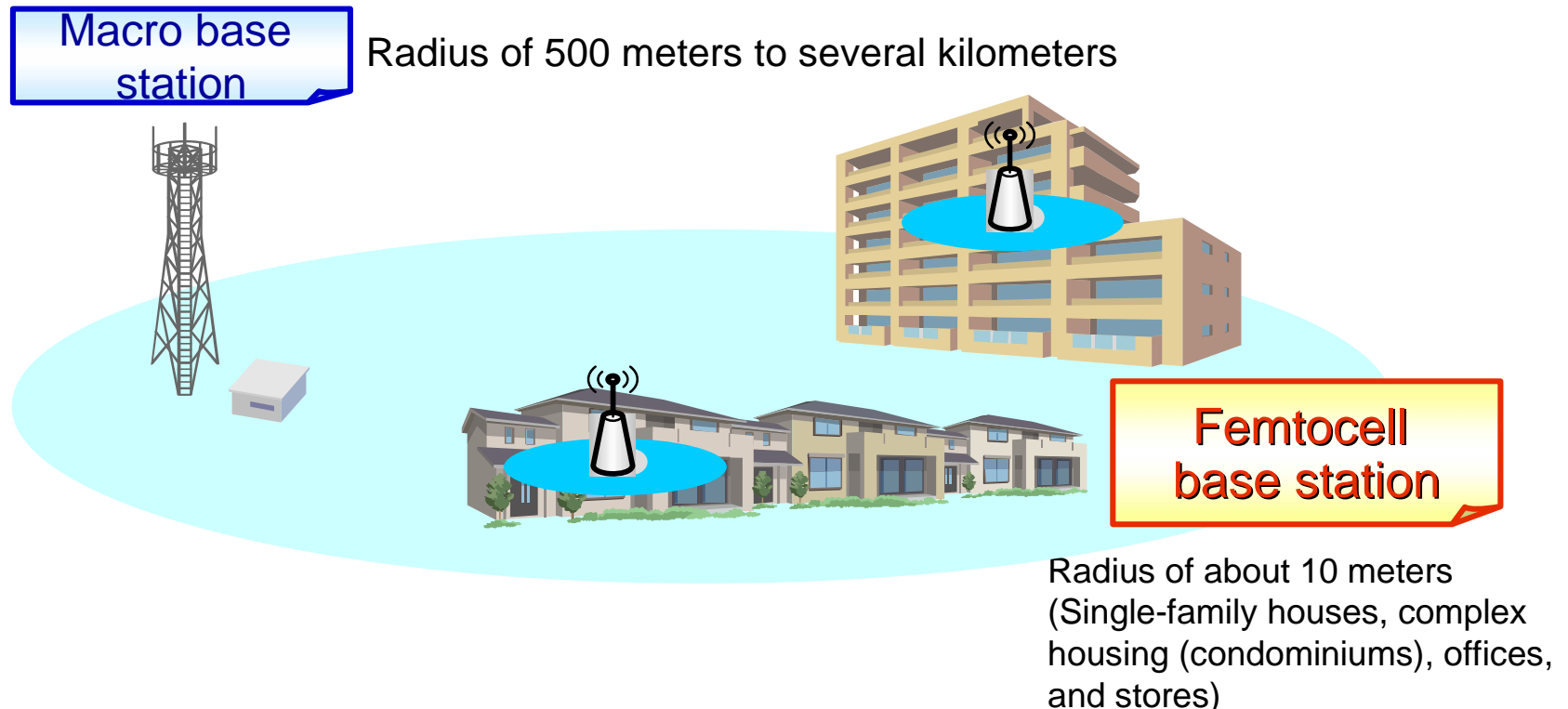
**NEC develops technologies for LTE femtocell base stations
that maximize transmission speed**
– **Enabling smooth communications anywhere by controlling
radio signal interference between base stations –
(Supplementary explanatory material)**

Green Platform Research Laboratories
NEC Corporation

1. Macro base station and femtocell base station

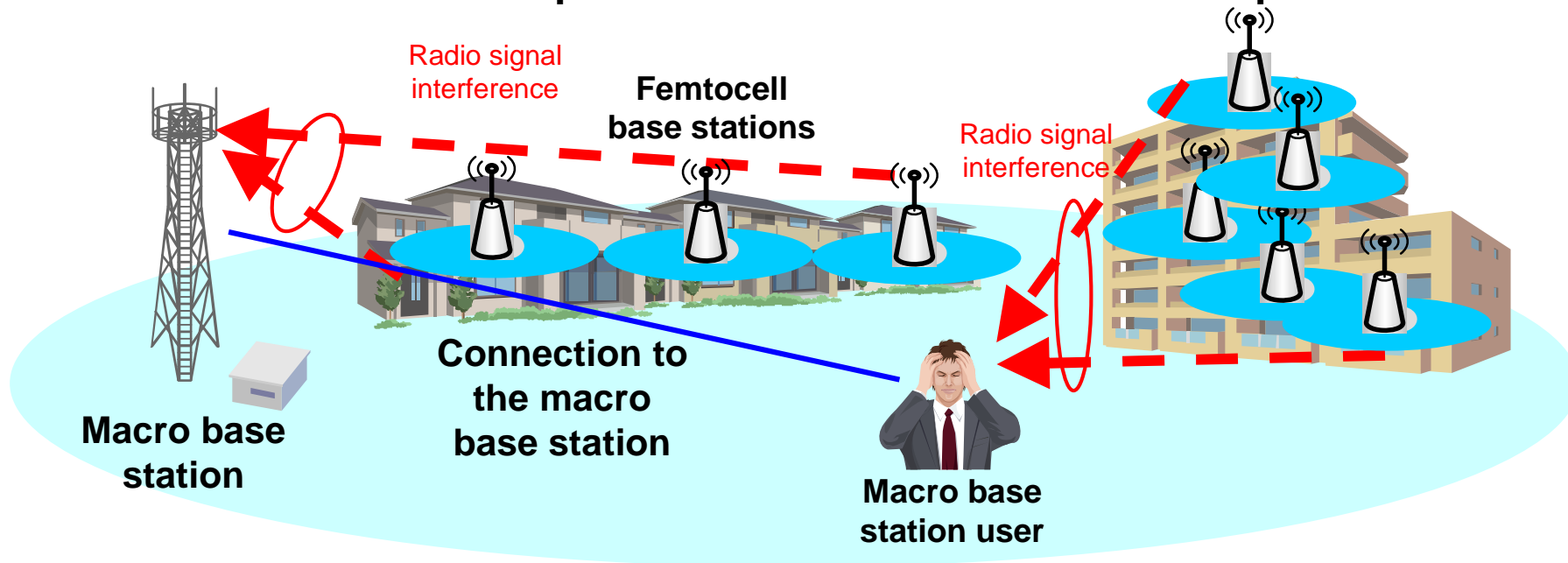
To respond to explosive growth in traffic, it is effective to install femtocell base stations at a high density in addition to macro base stations

- Macro base station: A single base station that efficiently covers a wide outdoor area.
- Femtocell base station: Intensively covers a narrow indoor area



2. Radio signal interference between macro base stations and femtocell base stations

When a large number of femtocell base stations are installed, **radio signals of the femtocell base stations and those of the macro base station interfere with each other**. This causes a problem of reduced transmission speed.



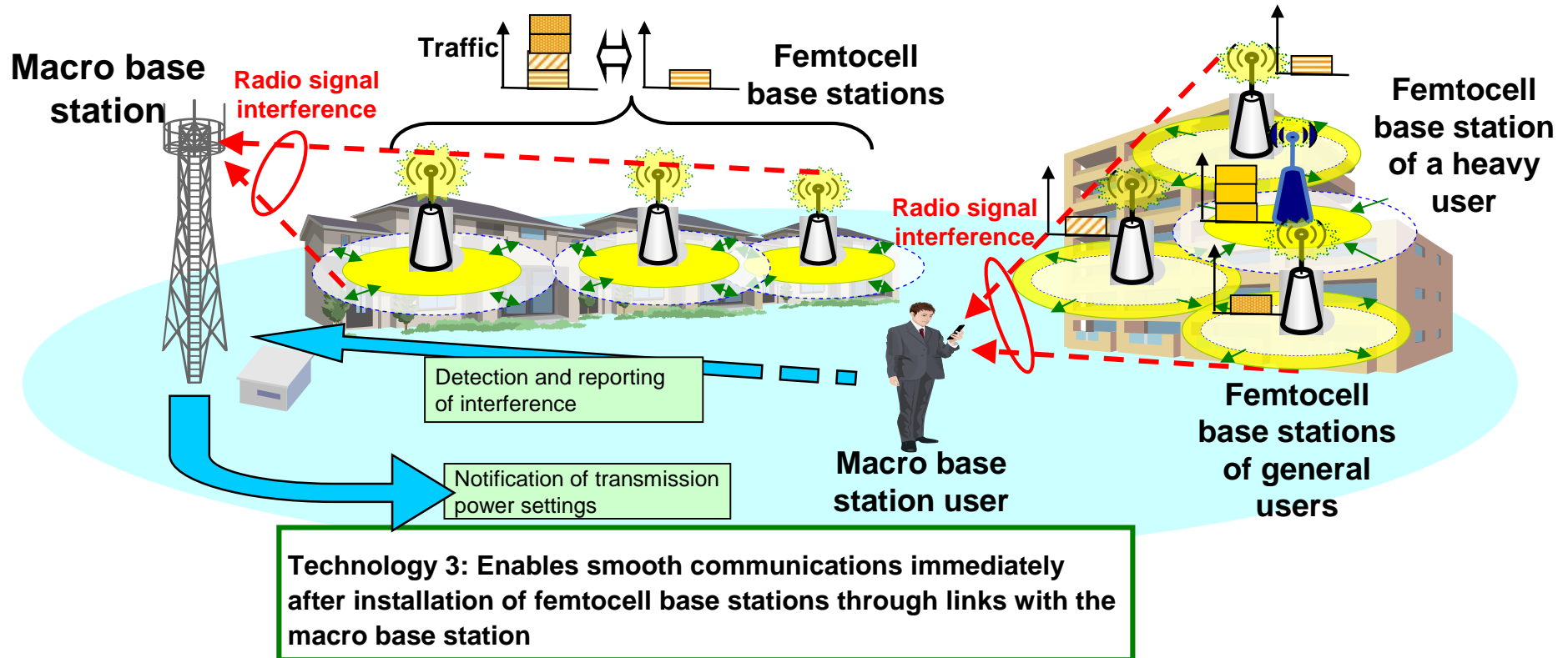
To enable high-density installation of femtocell base stations, it is important to reduce the impact of interference on macro base station transmission speeds to ensure that the speed remains within a tolerable range.

3. Outline of technologies developed by NEC

NEC has developed anti-interference technologies for femtocell base stations. These technologies maximize transmission speed by controlling the radio signal interference with the outdoor macro base station in accordance with the traffic.

Technology 1: Maximizes the transmission speed by controlling the power in accordance with the data traffic of the entire femtocell base station

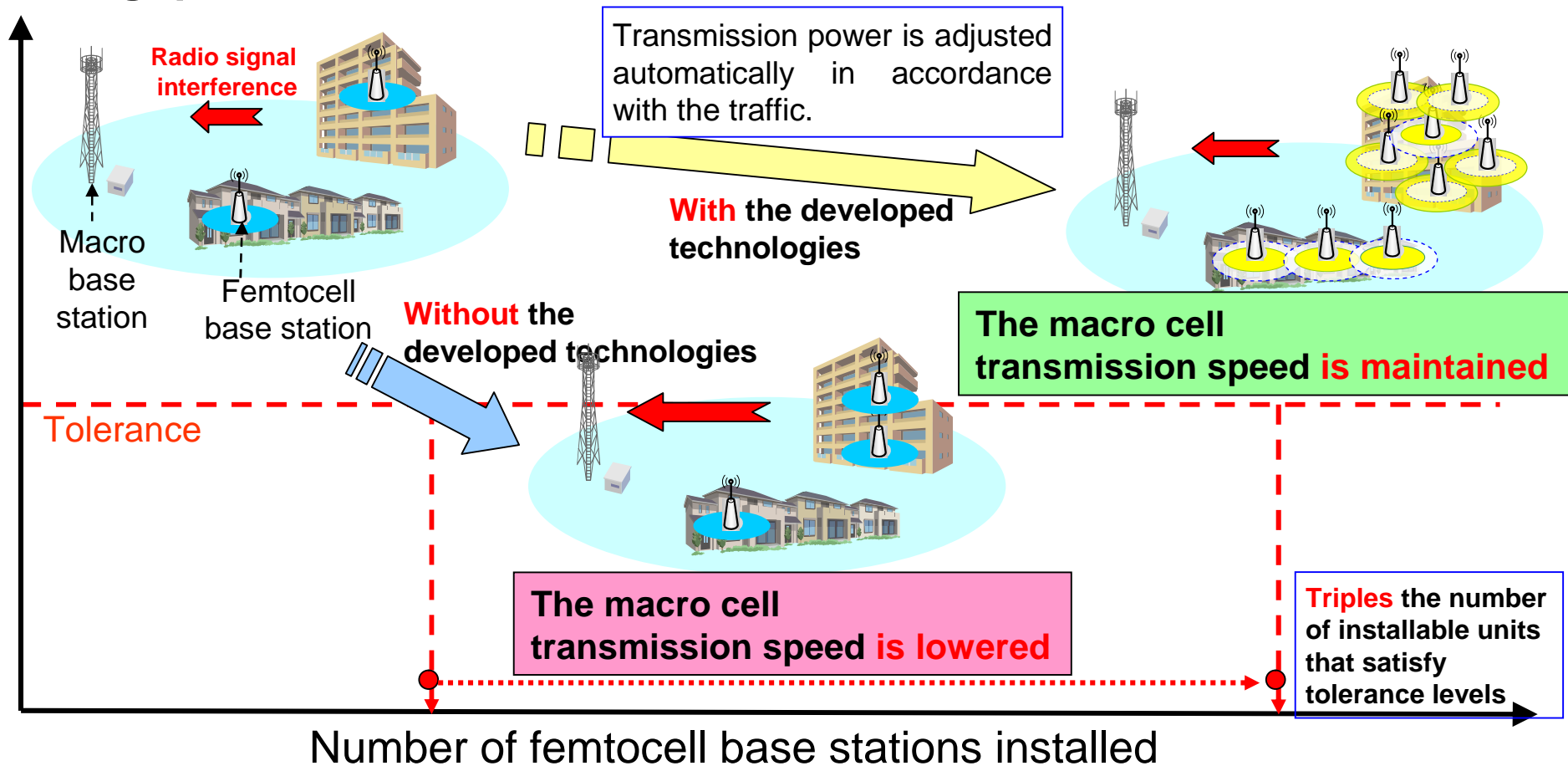
Technology 2: Minimizes the impact of heavy users by controlling the power of individual femtocell base stations



3.1 Effects of the technologies developed by NEC

Enables installation of a large number of femtocell base stations without significantly lowering the transmission speed of the macro base station

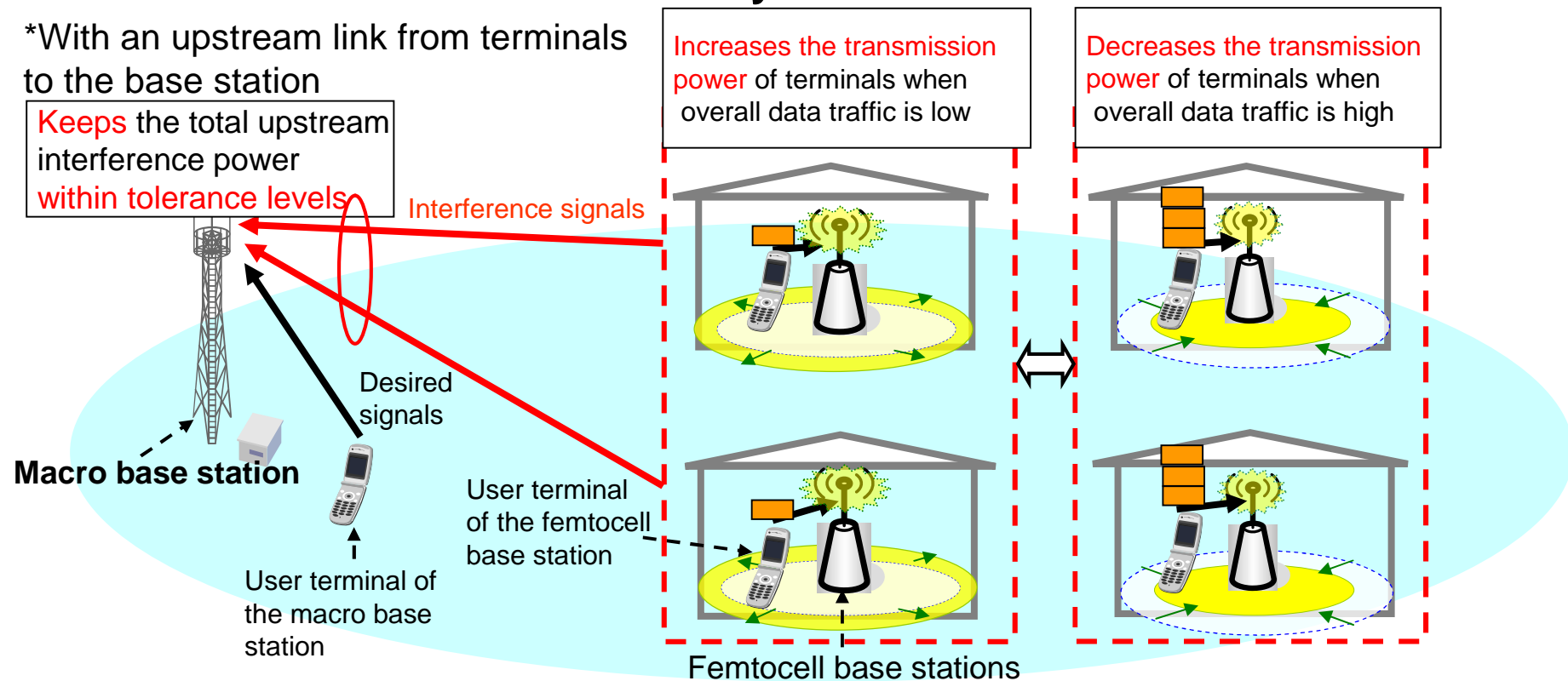
Throughput of the macro base station



3.2 Technology for Feature 1

Controls the transmission power of each femtocell base station in accordance with **the data traffic load of all femtocell base stations** located within an area covered by a macro base station

*With an upstream link from terminals to the base station

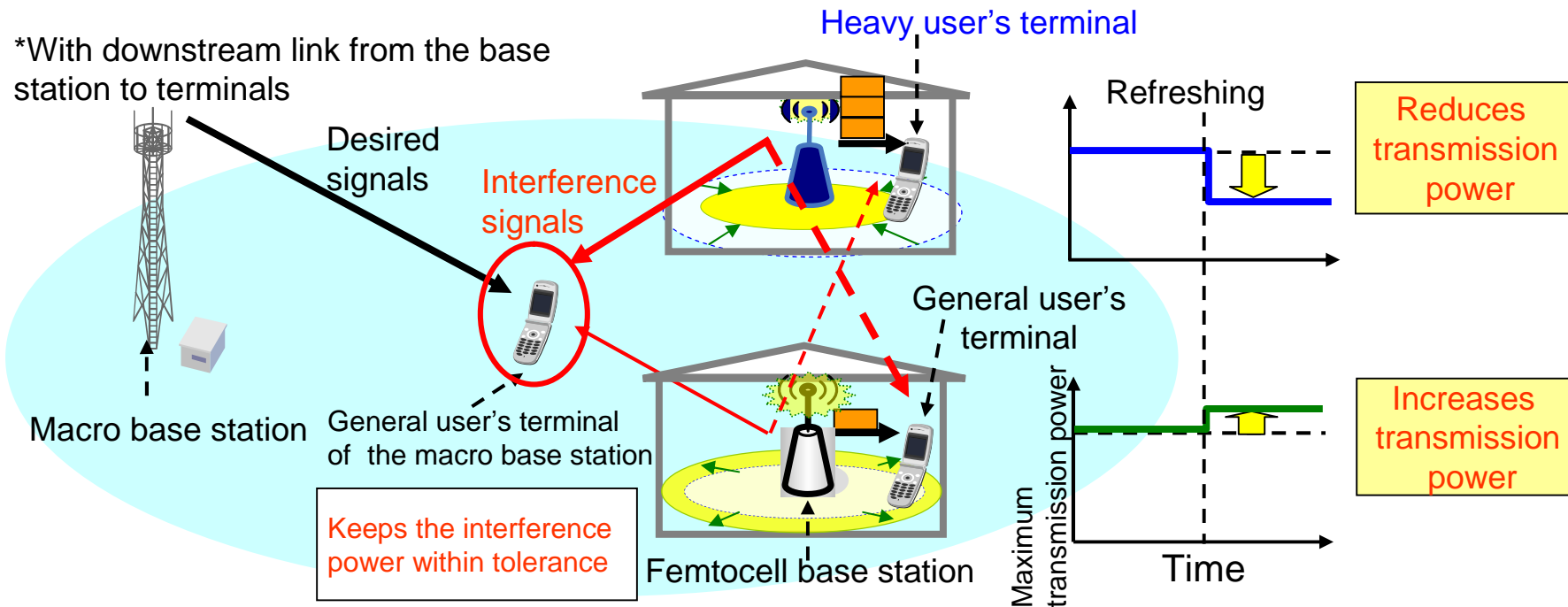


Improves the transmission speed of femtocells at times of low overall data traffic, while also allowing high-density installation of femtocell base stations

3.3 Technology for Feature 2

Controls the transmission power in accordance with the **data traffic of each femtocell base station**

- Identifies a femtocell base station with a heavy user terminal and lowers the transmission power
- Increases the transmission power of femtocell base stations for general users' terminals

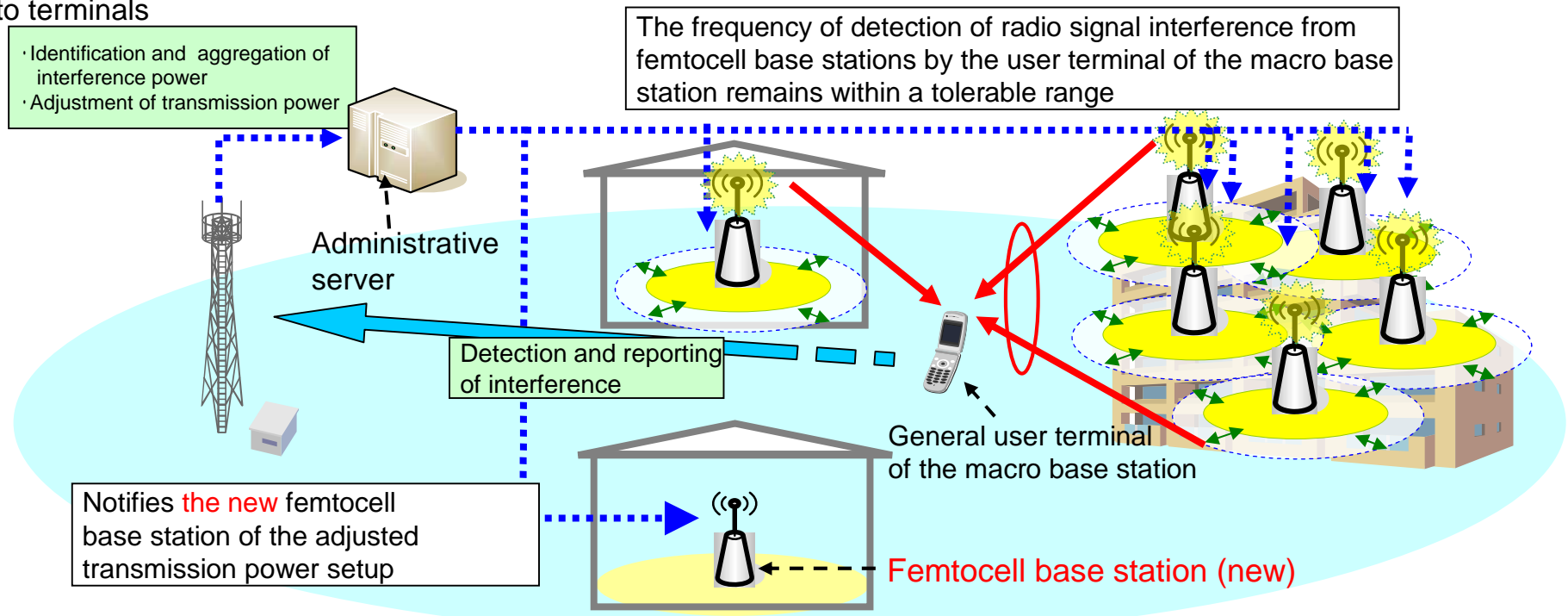


Improves the transmission speed of general users' terminals while also allowing high-density installation of femtocell base stations

3.4 Technology for Feature 3

- Identifies the power from femtocell base stations interfering with radio signals via user terminals of the macro base station and aggregates the volume of that power
- Adjusts the transmission power of all femtocell base stations within the macro cell range automatically and collectively

*With a downstream link from the base station to terminals



Provides smooth communications to user terminals immediately after installation of femtocell base stations, while controlling the impact of radio signal interference through links with the macro base station

4. Summary

NEC has developed anti-interference technologies for femtocell base stations. These technologies maximize transmission speed by controlling radio signal interference with outdoor macro base stations in accordance with the traffic.

Features of the technologies

- **Maximizes transmission speed by controlling power based on the data traffic of all femtocell base stations**
- **Minimizes the impact of heavy users by controlling the power of each femtocell base station for transmitting radio signals**
- **Enables smooth communications immediately after installation of femtocell base stations through links with the macro base station**

NEC Group Vision 2017

**To be a leading global company
leveraging the power of innovation
to realize an information society
friendly to humans and the earth**



Empowered by Innovation

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