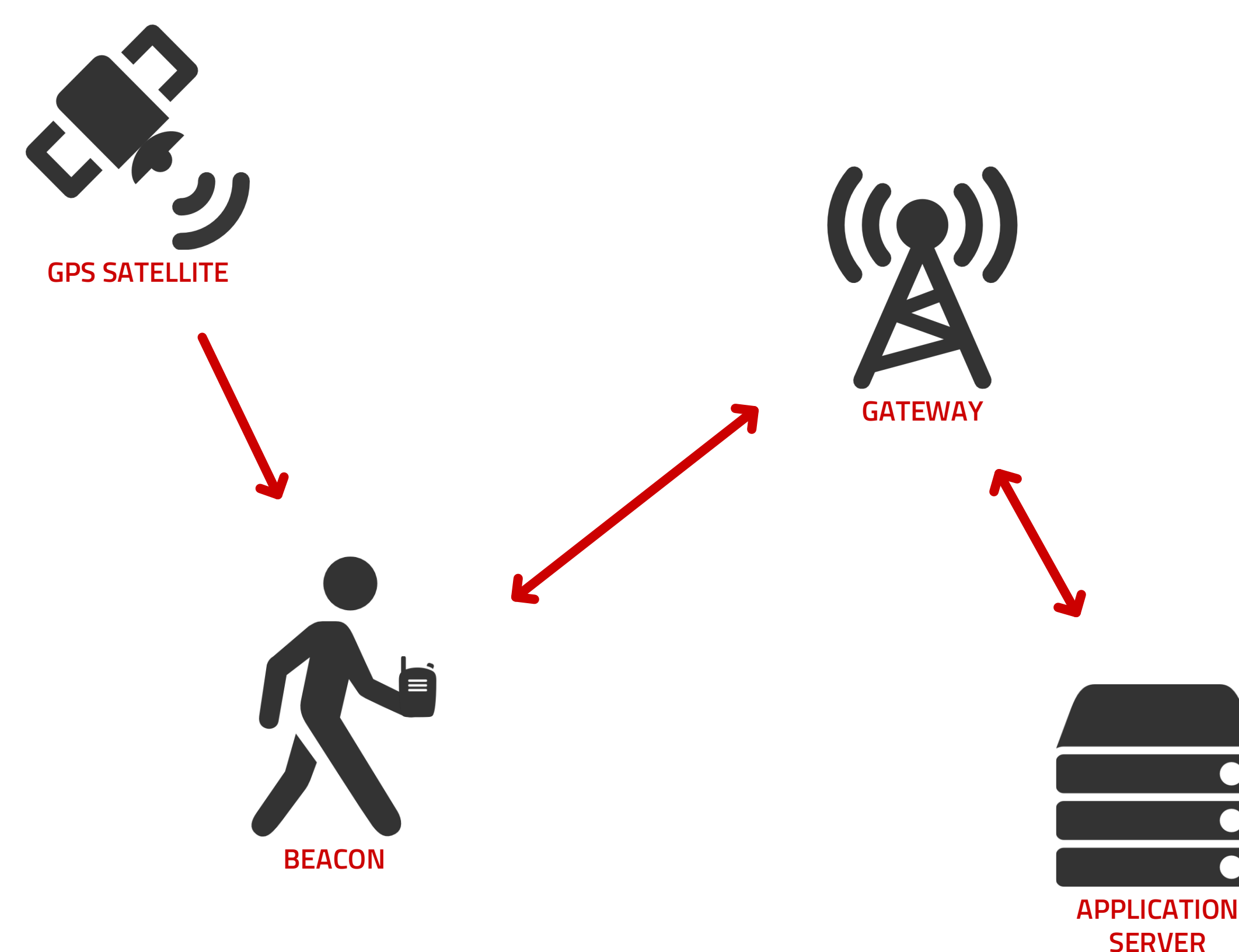


# GPS TRACKER WITH 15KM RANGE

## 1 ABSTRACT

“ The Aurora board is designed to be a light weight, low power tracker that is able to communicate location outside of any external networks such as Wi-fi or cell service. It is designed to run from USB or battery power, and requires no operator after powered on. This makes it ideal for unmanned aircraft, high altitude balloons, or drones. It can also be used for vehicle or human tracking. External antennas connectors allow Aurora to be used for a wide range of applications. ”

## 2 SYSTEM DIAGRAM



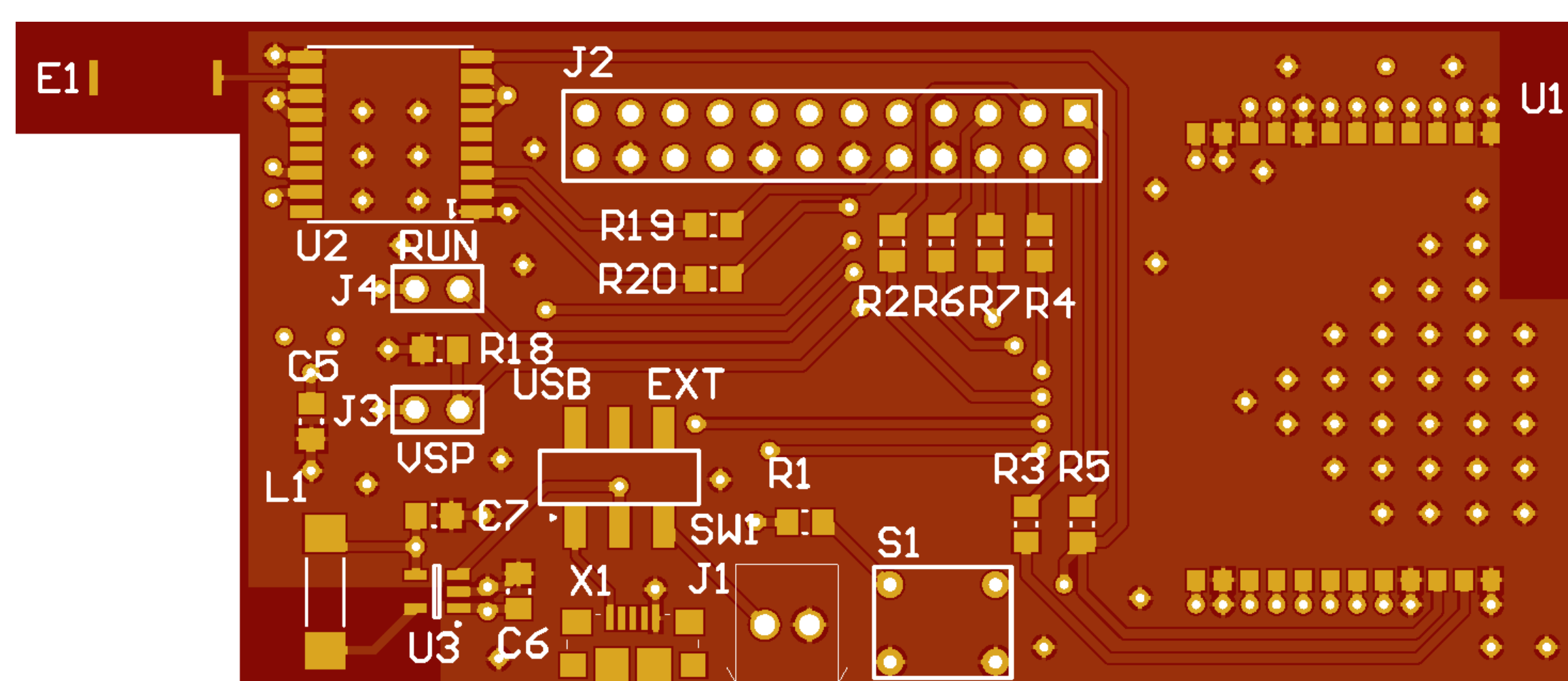
## 3 PACKET PROTOCOL

LoraWAN is an extremely efficient protocol that uses chirp modulation to transmit great distances with conservative power requirements. To achieve such distances, packet sizes are heavily restricted. The following is the packet protocol used on the Aurora board. It contains all need location parameters in under 14 bytes.

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
HOUR				MIN		SEC									
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
LATDEG				LATMIN				LATDEC				NS			
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
LONGDEG				LONGMIN				LONGDEC				EW			
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
ALT				HVEL				VVEL							
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
HACC				VACC											
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
SAT															

## 4 PCB

The Aurora PCB is a custom made four layer board with integrated GPS antenna. It includes a U-blox GPS and a Laird transceiver. An on board switching regulator allows a wide input voltage range, perfect for USB and batteries. Can operate from -40 to 85 C.



## 5 TESTING

Through extensive testing, the Aurora board is able to reliably lock onto GPS satellites, and transmit location data through LoraWAN compliant gateways. Even in non-line of sight situations, the board is able to consistently send and receive packets.

The Lora transceiver was tested on 'The Things Network' backend, where packets were sent at predefined intervals. Even high dense areas, the transceiver was able to send and receive Lora packets.

The GPS receiver was tested against a commercial GPS board. Within minutes, both modules were able to obtain a lock, and keep a consistent 3D fix.

