Continua®
HEALTH ALLIANCE

Connecting people and technology for healthier living

Continua Use Cases 2007

Continua Use Cases

Contents

Document Control

Version	Date	Author	Change Description
1	January 29, 2014	Continua Administration	Initial draft
2	April 2nd 2014	Continua Administration	Final for release

Introduction

This document presents the Continua Use Case for external publication. It contains use cases that were originally titled 'Version 2' and later re-designated as the '2007' use cases. These use cases were submitted for approval for development by member ballot in 2008.

Continua's Interoperability Guidelines are developed to meet interoperability use cases which have been developed by the membership and approved at ballot. The procedures for the development and support of use cases are set out in the Continua Use Case Lifecycle Process (Section 4.3). Once approved at ballot, a use case would normally remain open to development of new Interoperability Guidelines for a period of 4 years, after which it becomes 'closed' unless there is a case put forward for an extension.

Once approved for development, a use case may be divided into one or more 'work items' which are the discrete increments of capability that are incorporated into the Interoperability Guidelines. In more complex cases, this means some Work Items may be completed and published as Guidelines while others remain in development.

This document provides details of all use cases that have been worked on by Continua and includes:

- **Closed, Not Approved** - Proposals for use cases that have been presented for ballot but not approved.
- **Open, In Development** - Use cases that have been approved and work to develop the supporting Interoperability Guidelines is underway. This includes Use Cases that have become time-expired but still have one or more Work Items already in development that have not yet time expired.
- **Open, Partially Complete** - Use cases for which some elements have been addressed in published Interoperability Guidelines while further aspects remain in development. This also includes Use Cases that have become time-expired but still have one or more Work Items already in development that have not yet time expired.
- **Open, In Service** - Use cases for which the Interoperability Guidelines have been published and are in use and no further development can be undertake. This includes use cases that may have been partially completed and then become time-expired for the remaining aspects of the requirements.
- **Closed, Time Expired** - Use cases that have been approved at ballot but are now closed as work to complete the interoperability Guidelines was not completed before the use case became time expired.

The use cases in this document are presented in date order and listed by the unique project identifier allocated by Continua for tracking the development.

As the nature and format for the use cases has evolved over the years the following notes will help in understanding the use cases presented in this document:

- These are interoperability use cases, and specify the requirements for interworking of different components. As such, they differ from typical end product use cases in that only essential details of the mode of use are provided. For example, the blood pressure monitoring device will specify the data to be transferred, and some aspects of usability, but does not further elaborate on the actual use case for blood pressure monitoring.
- The first round of development in 2006 started with a blank sheet of paper and the process was different from subsequent years. Proposals were developed into a series of 'archetypal use cases' which were ranked at ballot into relative priorities. The ballot for this round provided a priority ranking of the archetypal use cases and in some cases, development work further refined the requirements (e.g. specifying the initial range of device types that would be included in the first edition of the Design Guidelines)
- From 2007 onwards, use cases work from the established Continua end to end architecture and specify the additional interoperability requirements being requested.

- In 2012, Continua moved from an annual cycle for collecting new ideas to one that provided three opportunities each year.
- Some use cases are further supported by Feasibility Assessments. These are reviews provided by the various work groups to assist in the evaluation of the use case for the member ballot.

Use case status summary

Call	UCWG Project ID	Title	External Reporting Status	TWG Project or E2E Architecture Description
2006 V1	A001	Track Fitness Information	Open, In Service	Cardio and Strength fitness devices
2006 V1	A002	Configure Fitness Equipment	Closed, Time Expired	
2006 V1	A003	Exercise Gaming	Closed, Time Expired	
2006 V1	A004	Track Fitness Information for Multiple Users	Closed, Time Expired	HRN Interface
2006 V1	A005	Display and Record Streaming Fitness Sensor Data	Closed, Time Expired	
2006 V1	A006	Receive Fitness Reminders	Closed, Time Expired	
2006 V1	A007	Episodic Remote Patient Monitoring	Open, In Service	HRN Interface
2006 V1	A008	Continuous & Acute Remote Patient Monitoring	Closed, Time Expired	
2006 V1	A009	Asynchronous Patient - Medical Providier Interaction	Open, In Service	
2006 V1	A010	Sychronous Patient - Medical Provider Interaction	Closed, Time Expired	
2006 V1	A011	Share Health Data of Multiple Patients for Medical Research	Closed, Time Expired	
2006 V1	A012	Track_Elder_Information	Open, In Service	Independednt Living Activity device intermediary HRN Interface
2006 V1	A013	Receive Reminders for Important Activities	Closed, Time Expired	
2006 V1	A014	Monitor Activities of Daily Living	Open, In Service	Independent Living Activity device intermediary and supported
2006 V1	A015	Monitor Safety	Closed, Time Expired	
2006 V1	A016	Automate Household Activities	Closed, Time Expired	
2006 V1	A017	Respond to Emergency	Closed, Time Expired	
2006 V1	A018	Consult with Caregiver	Closed, Time Expired	
2007 V2	Pro01a	Simple EMR-EHR-PHR data import-export	Open, In Service	
2007 V2	Pro01b	Two-Way Communications on xHR Interface	Closed, Not Approved	
2007 V2	Pro01c	Clinical coding for xHR data exchange	Open, In Service	IEEE 11073 to SNOMED terminology concept mappings
2007 V2	Pro01d	Context sharing and patient dashboard	Closed, Not Approved	
2007 V2	Pro01e	Transfer visit summary to PHR	Closed, Not Approved	
2007 V2	Pro01f	Two-Way Communications Between Two xHR Systems	Closed, Not Approved	
2007 V2	Pro02	Advanced medication monitor	Open, In Service	Advanced medication monitor
2007 V2	Pro03	ECG & Respiration device	Open, Partially Complete	3-lead ECG device specialisation.
2007 V2	Pro04	Cross system alert management (previously Collective monitoring)	Closed, Time Expired	
2007 V2	Pro06	Activity Monitoring	Open, In Development	
2007 V2	Pro07	Real-time Transmission for HF	Closed, Time Expired	
2007 V2	Pro09a	Care and health information	Closed, Time Expired	
2007 V2	Pro09b	Social interaction	Closed, Not Approved	
2007 V2	Pro10	Information sharing and E2E security	Open, In Development	E2E Security SIG
2007 V2	Pro11	Data reliability and authenticity	Open, In Development	E2E Security SIG
2007 V2	Pro12	Data upload on the WAN	Open, In Development	E2E Security SIG - Measurement Device Gateway.
2007 V2	Pro13a	Low power LAN	Open, Partially Complete	Low power LAN (Zigbee)
2007 V2	Pro13b	Ultra-low power sensors on or near the body	Open, Partially Complete	Ultra low power BAN (BTLE)
2007 V2	Pro16	Integration as a service	Closed, Not Approved	
2007 V2	Pro19	Multiple new biometric devices	Closed, Time Expired	
2007 V2	Pro20	Complete Medication Tracking	Closed, Time Expired	
2007 V2	Pro21	Fluid Monitor Device	Closed, Time Expired	
2007 V2	Pro22	Peak Flow Device	Open, In Service	Peak Flow Device
2007 V2	Pro23	PT INR Device	Open, In Service	PT INR Device
2007 V2	Pro24	Insulin Pump Monitoring	Open, In Development	
2007 V2	Pro25	Track Disease Management Information for Multiple Users	Closed, Time Expired	
2007 V2	Pro27	IPLAN interface	Closed, Time Expired	
2007 V2	Pro30	Transport Home to Hospital	Closed, Not Approved	
2007 V2	Pro31	Remote Device Management	Closed, Time Expired	
2009 V2	Pro09 01	Telecare over IP WAN	Open, In Development	
2010	Pro10-04	Patient Reported Outcome Measures input device	Open, In Development	
2010	Pro10-05 A	Extension to PHMR	Open, In Development	
2010	Pro10-05 B	HRN Interface Implementation Requirements	Open, In Development	
2010	Pro10-06	Clinicians Response Message	Open, In Development	
2010	Pro10-07	PHMR Extension for Legacy Devices	Open, In Development	
2010	Pro10-08	Tap and Go device interface	Open, In Development	
2010	Pro10-10	Application portability across mobile platforms	Closed, Not Approved	
2010	Pro10-15	Use of modeling languages within Smart Homes	Closed, Not Approved	
2010	Pro10-16	AHD to CE (Consumer Electronic Device) Communication	Open, In Development	
2010	Pro10-17	Wearable Mobile Nurse Call	Closed, Not Approved	
2011	Pro11-01	Text based questionnaires	Open, In Development	
2011	Pro11-02	Sleep Measuring Device	Open, In Development	
2011	Pro11-03	Sleep Apnoea Measuring Device	Open, In Development	
2011	Pro11-04	Body composition analyzer	Open, In Service	
2011	Pro11-05	Remote Device Configuration	Open, In Development	
2011	Pro11-06	Legacy Data	Open, In Development	
2011	Pro11-07	Embedded Area Network	Open, In Development	
2011	Pro11-08	Mobile store and forward	Open, In Development	
2011	Pro11-09	Mobile Web Health API	Open, In Development	
2011	Pro11-10	Consumer Security Model	Open, In Development	
2011	Pro11-13	Location Services	Open, In Development	
2011	Pro11-14	Device calibration for alternative glucose meter	Open, In Development	
2012	Pro12-01	Sleep apnoea breathing therapy equipment	Open, In Development	
2012	Pro12-03	CGM (Continuous Glucose Monitoring)	Open, In Development	
2012	Pro12-04	Waveform	Open, In Development	
2012	Pro12-05	Streaming Video	Open, In Development	
2013	Pro13-01	Insulin Pump Command and Control	Open, In Development	

Use Cases:

1. Pro01a Simple EMR-EHR-PHR data import-export

Document Control

Version	Date	Change Description	Status
1	August 27, 2007	Abstract creation	
2	September 25, 2007	Made the Actor section more concise. Added notes on intent of the Minimal Guarantees section.	
3	October 4, 2007	Added more detail to clarify what extensions are being made to the v1 xHR interface and what is not being extended.	
4	October 18, 2007	Added reference to projects 10 and 11 Changed to be more application-to-application than only xHR-to-xHR	
5	December 3, 2007	Removed comments and unnecessary / redundant detail per others suggestions.	Open, In Service

Project Abstract

Title	UC 01a - Simple xHR Interoperability via "Sneaker-Net"
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☐ Local Area Network Interface (LAN-IF) ☐ Wide Area Network Interface (WAN-IF) ☒ x-Health Record Network Interface (xHRN-IF)
Relation with implemented V1 use case(s)	New Use Case An extension of the xHR Interface Extended to add the import and export data transmission method (sneaker-net) Extended to allow communication between xHR systems (i.e. EHR to PHR or PHR to EMR) The intent of this use case is ONLY to allow for file-based (Sneaker-Net) transfer of xHR information between applications. It is NOT intended to change the format or content of the data being exchanged. No change is made to the data format or content packaging of the xHR interface. Any changes to the data format or content packaging of the xHR interface accomplished by other use cases would be incorporated here as well.
Description	The intent of this use case is ONLY to allow for file-based (Sneaker-Net) transfer of xHR information between applications. It is NOT intended to change the format or content of the data being exchanged. Physicians and other care providers have EHRs and EMRs; patients have their own PHRs on which they track their health information and monitor their own health. There needs to be a simple, basic method for a patient and a physician to exchange pertinent medical history and treatment information between their

	PHR and EMR systems, without requiring either system to have any special internet connection. It is important that implementation of this use case maintain alignment with the following other use cases: • Project 10 "Information sharing and E2E security" • Project 11 "Data reliability and authenticity"
Scope	All Application to Applications interfaces, including xHR interface "Sneaker-Net" Transfer of Patient Data between Physician's EMR and Patient's PHR. The same could apply to transfers between various Domain Applications (Diseases Management, Health & Fitness, Aging Independently) and the Patient PHR or Physician EMR.
Actors	Jeff, a generally healthy man who does not have a primary care physician, but has a PHR that he has populated with information about his health history: some vital signs, evolution of temporary and persistent conditions as well as wellness, fitness and lifestyle information. Jeff has been experiencing head pain for two weeks, which he has been documenting in his PHR. Jeff has decided he needs to see a doctor about this head pain. Dr. Stafford, a family physician who will be treating Jeff for the first time. Dr. Stafford has an EMR at his office.
Minimal Guarantees	No inappropriate access is allowed to patient's medical information. Imported information is attached to the appropriate patient record in the xHR system. If the xHR system is not capable of import/export, the data storage file also permits printing of the information it contains, but only to authorized users.
Success Guarantees	Patient information is electronically transferred between the patient's PHR and the physician's EMR. Nothing is typed manually. The Patient is treated based on complete and accurate information (i.e. what the patient provides, with nothing left out and no transcription errors). Physician and physician office staff time are saved. Patient has complete record of visits in his PHR.
Trigger	Jeff gets sick enough to go to the doctor.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	1. Jeff is concerned and decides to visit a doctor (Dr. Stafford). Since he is generally well, he has not been to the doctor in years. He knows that the physician will need Jeff's medical history and any events that may be relevant to his current illness. Jeff selects the items from his PHR that the doctor will need and downloads them to his thumb drive, taking it to the doctor's office. 2. At the doctor's office, Jeff informs the office staff that he has his case file—history, demographics and related events—on his thumb drive. The assistant thanks him, noting how much the doctor appreciates patients that are to provide detailed information in electronic format. It really helps everything go much better, for both the patient and the physician. 3. The office assistant uploads Jeff's information into his new chart in the physician's EMR, returns to Jeff his thumb drive and asks him to take a seat. Soon Jeff is called in to see the physician. 4. Just before meeting with Jeff, Dr. Stafford reviews Jeff's medical information. He then enters the treatment room, electronic clipboard in hand, up-to-date on Jeff's condition and ready to discuss the details. 5. Jeff and Dr. Stafford discuss Jeff's concerns. Dr. Stafford checks Jeff's reflexes and performs a few other tests. Dr. Stafford orders an MRI of

	the head and prescribes some aspirin. 6. Two days later, Dr. Stafford's office emails Jeff an encrypted download of the Dr. Stafford's diagnosis, visit notes, instructions and medication orders. Jeff imports this into his PHR, which automatically creates medication reminders and updates Jeff's medical history file accordingly. 7. Jeff is feeling better now. Not only has his physician done a good job of taking care of his medical ailment; he has also given Jeff the information that he needs to maintain optimal health long-term, all with excellent accuracy and a minimal amount of effort.
Failure Modes	Success scenario—data is successfully imported to the systems as needed (physicians' EMRs and patient's PHR) Failure scenario—some or all of the data is not imported Failure handling—import procedure notes that not all the expected messages were imported, notifies user to print out the accompanying text document to account for any missing information and manually enter it.
Diagram (optional)	
Additional Details	All interoperability includes 5 parts: entities involved, selection criteria, transmission method, data formatting and content packaging. For this use case, they are detailed as follows: • Entities involved—all supported by the most recent xHR guidelines. This use case suggests no entity changes for the xHR interface. • Selection criteria— This use case suggests no selection criteria changes for the xHR interface. • Transmission method—Sneaker-net of encrypted file (sneaker-net is defined as export the data to a file, deliver file to other system (via portable device, email, ftp, or any other method) and then import file into receiving system). • Data formatting— This use case suggests no changes to data formatting for the xHR interface, except as required to accomplish file-based transmission, security and printing of the data exchanged. For example, PDF/Healthcare could be used as the container, enabling file-based transmission, security and printing; however the data contained in the PDF/Healthcare file would otherwise conform to the same data formatting guidelines as other xHR transmissions. • Content Packaging—This use case suggests no content packaging changes for the xHR interface.

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☒ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Assumptions/external dependencies: o This UC is primarily focused on the "transport aspect" of moving information into/out-of the xHR system via this SneakNet strategy. o The PHM document, out of the xHRN V1 work, is available) Strategy: 1) The PHM document, being an XML structure, should be almost trivial to write to a file. 2) I'd make this as simple as a Continua Interoperability Guideline that says we'll use, for the sake of argument, an MS-DOS file format. 3) Actual data import/export: a. We'd expect that the vendors of the existing xHR/xMR systems would have to support this PHM file format. b. These vendors would have their own user interface/GUI dialog box to initiate a "PHM export/import" function that identifies the appropriate patient. (Multiple patients??)
Additional Comments	Overall, we are moving a file of data provided by the EHR system to another EHR system. This file may need to be encrypted. UC as presented is contained within Continua xHR bounds. Technology for transfer mechanisms available (thumb drive, e-mail, FTP). Security and Encryption standards available.

	Can we facilitate transfer of selected information between different xHR related systems whilst ignoring the application which is used by the patient to populate and or filter their PHR? **Current understanding of the xHRN interface:** The current Continua V1 xHRN work (through HL7 as the SDO I believe) will result in an PHM document. I'll consider this the overall data model (i.e. a list of possible items, a definition of these items and a specific format/method to represent those items) for a personal medical record. Internally, the PHM is an XML document. The current V1 xHRN interaction model can be described as an single interaction scenario: 1) "an 'out-of-band' or a 'side-band' **Request** for a whole PHM for a particular patient" results in a **Response** "<the PHM>" At this point the V1 xHRN will result in a data model but there is no defined 'interaction model' or defined 'conversation model' to actually request a specific item of information and to receive a response to the request. In other words… 1) for long term interoperability we need to add/overlay a messaging or interaction model to this data model. 2) **Request** "A" results in **Response** "B" 3) **Request** "get patient number 1234" results in **Response** "<the PHM for patient number 1234>" **Request** "get patient number 1234, all tests on YYYYMMDD" results in **Response** "<any test on YYYYMMDD out of the PHM for patient number 1243>" Other observations: Not sure about availability/stability of format and content standards for PHRs - eg initiative by AHIP,BCBSA (US based). Moving forward, as the piece of PHM information to retrieve becomes more and more granular (Nurse -A calling for patient-xyz, all tests on YYYMMDD) and then (Nurse-A calling for patient-xyz, all test-123) and then (Nurse-A calling for patient-xyz, last diagnosis on condition <whatever>) the usefulness of a SneakNet interface is greatly diminished. General comment - Perhaps we need a UC section which explains how Continua is relevant and adds value. What is Continua promising and to who? In this case I am not clear what it is that gets the Continua "stamp" and who would take notice of it.

2. Pro01b Two-Way Communications on xHR Interface

Document Control

Version	Date	Change Description	Status
1	11/23/2007	Created	
2	11/27/2007	Updated after 11/27/2007 project 1 team meeting	
3	12/12/2007	Updated per suggestions from TWG reviewer (Frank)—change AHD to WAN device, removed medication monitor integration (already in project 9a)	Closed, Not Approved

Project Abstract

Title	Implement Two-Way Communications on the xHR Interface for Messages Requiring an Application-Level Response
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	Extension of the v1 xHR interface
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☐ Local Area Network Interface (LAN-IF) ☐ Wide Area Network Interface (WAN-IF) ☒ x-Health Record Network Interface (xHRN-IF)
Description	Provide a method for sending messages between Continua Applications or between a Continua Application and an xHR application when the initiating application expects an application-level response (not just a message receipt acknowledgement). Examples of these messages would include: • DM system sends a request for the EMR patient ID that the physician's EMR uses for this patient (patient provisioning). Patient Provisioning may also need to be initiated from the xHR system. o The physician's EMR sends back their patient ID to the DM system. • Physician EMR sends DM system a referral to treat and monitor a diabetes patient indefinitely or until a certain level of health is attained. o The DM system sends back the following status updates: acknowledgement of referral acceptance, patient contacted, patient enrolled, initial patient status, patient progress updates, patient attainment of health goal and request for release from care. • DM system sends HF system a referral to train and monitor patient's exercise and diet activities. o HF system sends back the following: acknowledgement of accepting referral, patient contacted, patient enrolled, initial patient status, status updates, patient attainment of health goal and request for release from care. • Physician EMR sends AI system a request to monitor patient's health-related daily activities.

	○ AI system sends physician EMR an advisory on patient status (decline in activity), suggesting physician review patient health accordingly. ▪ Physician EMR acknowledges suggestion, updates monitoring criteria, etc. ○ AI system advises physician EMR of call placed to Emergency Services because of patient fall and subsequent injuries. • DM system sends Physician EMR a referral to investigate abnormal vital signs and patient responses. ○ Physician EMR sends DM system an acknowledgement that the physician has reviewed and acknowledged the request.
Scope	All domains
Actors	Jeff—a patient with diabetes and cardiovascular disease Dr. Smith—Jeff's primary care physician Diabetter—a Diabetes Management service provider HealthToday—a Health, Fitness and Diet Club Life After 80—an Activity Monitoring service provider designed to help older citizens remain living at home St. Catherine Hospital—a hospital in the area
Minimal Guarantees	If only one-way communications are enabled (i.e. messages to the physician's EMR on the xHR interface, as currently allowed), physicians will not be able to send service providers patient orders and information. Service provider documents sent to the physician EMR will not have a reference point and future updates will not match up with previous ones.
Success Guarantees	Successful implementation of this use case will provide robust abilities for physicians to clearly, quickly and accurately communicate with other providers about patient needs and status changes, greatly increasing the quality of care provided, supporting the patient's goal of optimal health.
Trigger	Dr. Smith diagnoses Jeff with diabetes
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	1. Dr. Smith sends orders to Diabetter to help Jeff manage his diabetes. Order includes treatment's expected duration and goal. 2. Diabetter sends Dr. Smith a request for the patient ID that Dr. Smith uses to track Jeff's information. 3. Dr. Smith sends Jeff's patient ID back to Diabetter. 4. Diabetter sends back to Dr. Smith an acknowledgement and acceptance of Dr. Smith's referral. 5. Diabetter updates Dr. Smith that Jeff has agreed to the treatment plan, plan to begin on June 3rd, update includes baseline measurements and agreement to goal. 6. Diabetter sends Dr. Smith monthly updates of Jeff's progress. 7. Diabetter advises Dr. Smith that they will be referring Jeff to HealthToday for assistance with lifestyle modifications (as per Dr. Smith's standard protocol). 8. Diabetter sends orders to HealthToday to train, monitor and advise Jeff in the lifestyle modifications that he needs. 9. HealthToday notifies Diabetter that Jeff has begun treatment. 10. HealthToday notifies Diabetter that Jeff has completed his initial training in both exercise and healthy eating. 11. HealthToday advises Diabetter that Jeff is adhering well to his diet and exercise routine. Level 1 goal has been attained. Diabetter updates Dr. Smith accordingly.

	12. Diabetter sends Dr. Smith a status update on Jeff's condition, specifically noting Jeff's latest vital signs and sluggish activity; and asks Dr. Smith to assess Jeff's current health status. 13. Dr. Smith sends Diabetter an acknowledgement of their request and notifies Jeff (via his medication monitor) that he needs to schedule a visit. Dr. Smith schedules Jeff for a follow-up visit. 14. HealthToday advises Diabetter that Jeff has attained his final goal, requests release from Jeff's care. 15. Diabetter sends HealthToday a release from Jeff's treatment plan, and updates Dr. Smith accordingly. 16. Diabetter advises Dr. Smith that Jeff has attained the agreed upon diabetes treatment goal and requests release from care. 17. Dr. Smith sends Diabetter release from care for Jeff. 18. At Jeff's follow-up visit to Dr. Smith, Jeff expresses his concerns over his ability to care for himself. Nothing serious has happened; but Jeff is afraid that he will fall and not be able to get up and call an ambulance. 19. Noting Jeff's advanced age, Dr. Smith refers Jeff to Life After 80 for monitoring. After helping Jeff to understand the many ways that LA80 can help him, Jeff agrees to seek their help. 20. Dr. Smith sends Life After 80 an advisory concerning Jeff's needs and how they can help. 21. Life After 80 enrolls Jeff in their service, installs the needed sensors and equipment and begins monitoring Jeff's activities. 22. Life After 80 advises Dr. Smith that Jeff's is under active monitoring. 23. Life After 80 sends Dr. Smith monthly updates on Jeff's activity and status. 24. Life After 80 sends Dr. Smith notice that Jeff has fallen, been contacted to assess his state, LA80 called Emergency Services to send an ambulance and Jeff was taken to St. Catherine Hospital for treatment. 25. Life After 80 sends Dr. Smith an update on Jeff's activities. Jeff is not moving as much as before. Activity has reduced to 25% of baseline. LA80 advises health checkup. 26. Dr. Smith acknowledges receipt of LA80 update, then orders LA80 to change Jeff's monitoring criteria and update frequency. Dr. Smith schedules Jeff for another follow-up visit. 27. Jeff visits Dr. Smith, expresses his concerns since his fall. Dr. Smith reassures him that he is being closely watched by Life After 80. They will take care of him as before. Jeff, reassured, returns to normal activities. 28. As a precaution, Dr. Smith requests that Life After 80 make an extra visit to check on Jeff's local equipment and ensure that everything is functioning properly. 29. Life After 80 visits Jeff, confirms that his equipment is functioning properly, advises Dr. Smith accordingly. 30. Life After 80 updates Dr. Smith that Jeff's activities have now returned to 90% of baseline.
Failure Modes	<identify scenarios that would cause a success scenario (or flow) to fail> <optionally, identify steps or workarounds to handle the potential failure>
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☒ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months (if HL7 is already working on it) ☒ Longer than 18 months (if it has to be started in HL7)
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Are treatment plans and medication schedules part of HL7? If not this will need to be standardized. Is HL7 suitable to let two WAN devices interact? Otherwise we might need to look for another way to enable this interaction. There are potential technology issues with requests originating at the health records system. The xHR interface is intended for external access to health records; requests originating at the record system may require extensions to the WAN interface to support such requests.
Additional Comments	Connecting two WAN Devices using the xHR interface is currently not explicitly depicted in the architecture, but I think it is allowed. 1. The third bullet in the “Description” section is out-of-scope for this use case – it does not involve xHRN at all. 2. The “Applicable Interfaces” should include WAN, since that is the only access to xHRN

3. Pro01c Clinical coding for xHR data exchange

Document Control

Version	Date	Change Description	Status
1	Nov 23rd 2007	First draft synthesis of Project 1c	Open, In Service

Project Abstract

Title	UC 01c - Clinical coding for xHR data exchange
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	<indicate if this project relates to, depends on or is an extension of a specific use case that is implemented in V1> Develops XHR messaging capability from Version 1 standard. Extends coding standard beyond V1 use of SNOMED CT for vital signs data.
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☐ Local Area Network Interface (LAN-IF) ☐ Wide Area Network Interface (WAN-IF) ☒ x-Health Record Network Interface (xHRN-IF)
Rationale for Feature	<reason for introduction of the feature> 11073 and HL7 CCD enable data transfer but do not enable semantic interoperability with EHR systems or currently provide standardized data on medications and devices. A clinical coding standard(s) is required to convey key medical information between systems including: • Symptoms • Diagnoses • Vital signs data • Dictionary of medicines and devices • Medications Measurements/results • Wellness metrics (weight/diet) • Lifestyle tracking • Health History • Family Health History • Allergies • Immunizations • Lab results
Requirements	A clinical coding system that can cover terminology for: • Symptoms • Diagnoses • Vital signs data • Medications and devices

	• Medications measurements/results • Wellness metrics (weight/diet) • Lifestyle tracking • Health History • Family Health History • Allergies • Immunizations • Lab results Coding standard(s) should have international adoption, with active management of the standard.
Sample Scenarios	<provide example scenarios that would be affected by this new feature> Include: • Exchange of medications information with EHR system for reminders, advanced medication monitoring etc • Referral from telehealth system for further medical investigation e.g. 'Patient falling', patient reports chesty cough, COPD exacerbating, results exceeding goals set, etc. • Interface with content distribution service based on condition and/or clinical event • Exchange of results, symptoms and outcomes against treatment plans • Lifestyle tracking • Health history/family heath history data tracked and compared for risk stratification • Messaging for reminders for immunizations, regularly scheduled labs (HbA1c) and wellness/diet planning.

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion	Determine rules / guidelines for what is meant by Semantic Interoperability and how we will know if we accomplish it.

• New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Possibly produce a white paper on Semantic Interoperability that will guide all interface development, even beyond the xHR interface. Review what enhancements are to be made in the next Continua version. Discuss and determine what types of data needs a clinical coding standard. See list in use case as a starting point. Discuss and determine the appropriate clinical coding standard for each data type.
Additional Comments	Development time for the initial decision is probably 9-18 months. However, this is an iterative activity that needs to be reviewed as part of each enhancement made to the xHR interface.

4. Pro01d Context sharing and patient dashboard

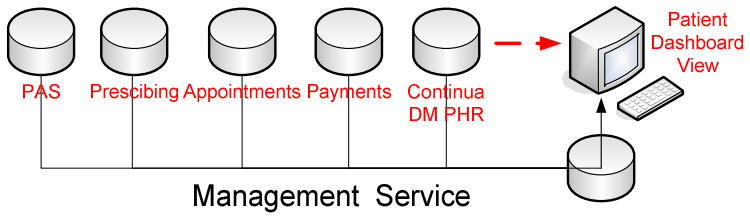
Document Control

Version	Date	Change Description	Status
1	Dec 2nd 2007	First draft synthesis of Project 1d, based on material generated for Project 4	Closed, Not Approved

Project Abstract

Title	UC 01d - Context sharing and patient dashboard
Theme(s)	☒ Disease management ☐ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	<indicate if this project relates to, depends on or is an extension of a specific use case that is implemented in V1> Version 2 Project proposals: Project 9a – User interaction, Care and Health Information: The patient-facing dashboard elements of Project 1d may also be covered in 9a.
Description	This use case covers 2 aspects supporting the integration of a 3rd party monitoring function: 1. Enabling simple context sharing between 2 applications, typically a Continua system (CDM) and an external EHR. Context sharing improves the clinical safety when clinicians to work across multiple systems relating to the same patient, particularly where there is limited or wider integration. 2. Enabling a holistic 'dashboard' view of a single patient by bringing together information across a range of different health information systems. Generating an 'open' dashboard across multiple systems is likely to involve: A. Common user access controls B. Context sharing based on a shared patient identifier (may be system-wide UID or patient ID mapping between components)
Scope	Sandy is a healthcare professional who currently has a number of different software packages that she uses to manage scheduling, online prescribing, insurance data and billing, lab requests and referral requests. This necessitates toggling from one program to another. A master dashboard view with content windows that display each program would facilitate easy access to the multiple programs and with single sign on handshake would require only one log in to access the programs. In addition other useful content windows could include their messages to see alerts about patients who have exceeded thresholds set for them and provide access to programs with new healthcare content such as Medline. Julia is a patient who has an online software program. She needs a dashboard view of the most important data upon login to her program. For example, as a diabetic she would want to have an immediate content window view of her blood glucose results, results against goal and Standard Modal day graphs. In addition the she could configure the dashboard to present her insurance balances, messages from her healthcare team, HRA's FSA's and useful and timely

	content about her condition. (Note, some the patient-facing dashboard may be covered in Project 9a – User interaction, Care and Health Information) To manage her workload and priorities Sandy needs to be able to see and manage the status of all her patients across the different systems. This requires that the component systems offer information in a standard format covering Patient ID Patient current status Appointment Scheduling Prescription refills Consultation referrals Clinic messaging Reference to external content links for healthcare and medication reference
Actors	Patient/users of CDM and AI systems - (From now on we will refer to this person as 'the patient' Routine care managers – typically care/case managers in primary or social care service Urgent care monitoring agent – contact and coordination centre agent in remote monitoring service, typically a shift worker in a 24/7 service
Minimal Guarantees	- Context shared between 2 systems. - Minimal guarantee of 1-way context sharing with 'slave' application displaying patient details from 'master' application - User unable to 'copy & paste' between applications where context not shared
Success Guarantees	Routine care managers – See patient information for a single patient across a range of applications when a new record is called up in the 'master' application – Able to track patient related actions across a range of information sources (personal health system, EHR, appointments scheduling/PAS etc)
Trigger	Clinical user calls up patient in CDM or AI system.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	<numbered steps of the use case> Pull up dashboard view 1. Agent logs into monitoring system 2. Agent identifies patient 3. Agent launched clinical application (such as HER 4. Agent calls up related patient information into a dashboard view 5. Agent completes action to respond to alert 6. Agent calls up next patient in monitoring system – related application also changes to new patient.
Failure Modes	<identify scenarios that would cause a success scenario (or flow) to fail> <optionally, identify steps or workarounds to handle the potential failure>

	Failure – Context not shared – details for Patient 1 showing in application 1 while details for a different patient are shown in application 2. – Agent is able to bypass access controls through shared context.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☒ Architectural Change/ Extension needed e.g. introduce unforeseen interface[1]
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☒ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☒ Standard used in the market[2]
Estimated development time	☐ Less than 9 months ☐ Between 9 and 18 months ☒ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Reviewer 1: This use case depends on application interoperability on a single system; while there are technologies that might support this (e.g., Web services, .NET remoting) such things are not really in scope for Continua as currently defined. Reviewer 2: Need to define/agree content/structure of data able to be accessed from individual sources, and report data that is returned. This may require standards development to define.

[1] The degree of architectural impact depends on whether inter-application communication on the same system is required. Currently, Continua does not include application interop. Even if we are talking solely about interoperability between multiple systems, extensions will be needed to the LAN-IF to define data formats.
[2] As above, inter-application interoperability is much less clear. Even in a "platform-neutral" environment like Java, application interop is hard.

	Need to develop minimum requirement guidelines relating to application implementation.
Additional Comments	Reviewer 2: Address WAN in order to access EHR dashboard from patient AHD? Data transfer and signalling - no "hard" technology requirements. Need to include security and privacy considerations. Standards exist for data exchange and security/privacy. Joint Comment: This use case may need some clarification and possibly may need to be split into multiple use cases. Based on the wording here, we can imagine different scenarios like: 1. Patient using the dashboard to view summary of their information from multiple remote and local sources 2. Used by a professional to view multiple sources of information both local and remote about a single patient 3. Used by a professional to view multiple sources of information about multiple patients 4. Data integration and update across multiple sources and applications on a single machine or on multiple machines 5. Conflict detection and resolution across multiple data sources Depending on which of these scenarios is intended, the scope can range from relatively small and low-impact to Continua (a dashboard integrating input from a few different devices and an HR system) to extremely difficult and a large architectural impact (the union of all the above).

5. Pro01e Transfer visit summary to PHR

Document Control

Version	Date	Change Description	Status
1	November 28, 2007	Document creation	
2	December 3, 2007	Added EMR->PHR and highlighted that the information being exchanged in machine understandable, not just text.	Closed, Not Approved

Project Abstract

Title	UC 01e - Visit summary to PHR
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	Extension to the v1 xHR interface
Description	Empowering patients requires that they have access to and control over their medical information. A key element to this information is summary information about their visits with health care professionals. Clinician EMR and EHR systems should provide information about a patient's visit to a patient-designated PHR system. Since the patient becomes the custodian of their medication information, they then become a source of relevant information to their clinicians if data could flow from the PHR to a clinician's EMR system.
Scope	Standardization of the data format, content and services for communication between Electronic Medical/Health Record (EMR/EHR) systems and Personal Health Record (PHR) systems.
Actors	James, a 42 year old in good health Dr. Smith, James' primary care physician Dr. Brown is a specialist to which a James is referred
Minimal Guarantees	There is no impact on the care received by the patient
Success Guarantees	The patient has a rich history of all relevant medical information from all health care sources aggregated in a single, patient-owned service.
Trigger	The patient arrives at his primary care physician's office for an annual checkup
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	1. James signs in at the front desk. Part of the paper work involves him specifying his PHR details so they can be updated with visit information. 2. Dr. Smith conducts a physical on James 3. Blood is taken and tests are performed 4. Dr. Smith suggests that James start a daily aspirin regimen 5. Dr. Smith tells James everything is looking Ok, but refers him to Dr. Brown. a cardiologist 6. Three days later, James receives an e-mail that new information has been added to his PHR 7. James logs onto his PHR and sees Dr. Smith's notes, including information about the aspirin regimen, and the results of his lab tests. 8. James's PHR recognizes the aspirin regimen, and sets appropriate

	reminders for James. 9. While still logged into his PHR, James looks up Dr. Brown's office and sees that they accept patient history information electronically. James selects a portion of his PHR to be sent to Dr. Brown ahead of his upcoming visit.
Failure Modes	The sending EMR/EHR is notified if the data could not be delivered, or if the PHR rejected the transactions.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☒ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	WAN-IF is required Possibly extension of xHR-IF Actuators Definition and adoption of interfacing standards for data content of PHRs Bring existing (US based) initiatives concerning PHR content under Continua umbrella?
Additional Comments	Building such a service is not trivial, but once Continua addressed WAN-IF the interoperable exchange of the data required for such a service should be possible. UC as presented is contained within Continua xHR bounds. Security and Encryption standards available. ?? - Not sure about availability/stability of format and content standards for PHRs - AHIP,BCBSA initiative? Can we facilitate transfer of information between different xHR related systems whilst ignoring the application which is used by

	the patient to populate their PHR? Seems to be a sub-project of 1a – ie same issues re data exchange, just ignores sneaker-net transport mechanism and assumes web based service? Part of this UC describes functionality that is currently outside the scope of Continua: EHR-to-PHR communication). The part that is in scope is communication to the patient (e.g. medication reminders). However this is already described in other UCs. Detailed analysis by Mark Schnell: Steps of Basic Flow 1. James signs in at the front desk. Part of the paper work involves him specifying his PHR details so they can be updated with visit information. The PHR details are the only touch point with the Continua eco-system. Being one of the 'end points' in Continua eco-system, this step does not involve a current Continua interface. (i.e. How the doctor's EHR communicates with James' PHR would entail an xHR-to-xHR interface. This xHR-to-xHR interface seems to better map to the HL7/IHE area of the healthcare IT space.) 2. Dr. Smith conducts a physical on James 3. Blood is taken and tests are performed 4. Dr. Smith suggests that James start a daily aspirin regimen 5. Dr. Smith tells James everything is looking Ok, but refers him to Dr. Brown. a cardiologist 2-5: no Continua interaction. 6. Three days later, James receives an e-mail that new information has been added to his PHR There are two sub-steps here. a) The doctor's EHR communicates with James' PHR to send the additional/new PHR information. (This would entail a non-Continua xHR-to-xHR interface.) b) Jame's PHR sends Jame's this notification email. This would be the first possible interaction with the Continua eco-system but it does not have to be. I see two options. Option 1) The PHR system, on it's own and outside of the Continua eco-system, sends a email to James. If the email is simple human readable text (i.e. a non-sensitive notification only (i.e. "Please visit <Jame's PHR portal> for a message."), then this likely the best solution. It is simple and requires no additional standardization. (Thus, be prepared for some PHR vendors to deploy solution this on their own.) Option 2) The PHR system, using some features & functions of the Continua eco-system, sends a email to James. If the email is more than just human readable text (i.e. perhaps, additionally, some sort of structured and machine parse-able information), then we'll need to extend the Continua

	"data/messaging" layer to encompass this type of info. The aspect of "Does this information exchange need to be secure (authenticated and encrypted)." will drive what is allowed in any structured/parse-able information. Thus, this step could be as simple as... Option 1) No Continua eco-system interaction. ...or could expand to... Option 2) New "data/messaging" layer, for structured email notifications, would have to be added to the xHRN, WAN and PAN/LAN interfaces. 7. James logs onto his PHR and sees Dr. Smith's notes, including information about the aspirin regimen, and the results of his lab tests. I'd see this as a simple web portal into the PHR. No Continua standardization needed here. 8. James's PHR recognizes the aspirin regimen, and sets appropriate reminders for James. From a overall concept, I see this as very similar to the email scenario of step 6, sub-step b. The biggest difference is the change from an 'email' to a 'reminder'. I liken this reminder to 'text messaging'. Option 1) The reminder can originate in the PHR, completely bypass the Continua eco-system entirely and go to the patient/user directly. (i.e. a standard text pager system and/or a cell phone 'text messaging'). As above, this would, likely, only be appropriate for "non-sensitive" information. This has the advantage of no necessary standardization work. (Thus, be prepared for some PHR vendors to deploy solution this on their own.) Option 2) Overall, I see option 1 being used early and quickly because it can be done now. Option 2, I see being eventually deploy, because of the fact that it will allow personalized/specific/(aka sensitive information like "James did you take your med-X.") reminders to be sent. I'd see the PHR then sending over the 'open/non-sensitive' text messaging path. And then having a 'sensitive' text messaging path for other info. This 'sensitive' text messaging path would need to have security features (authentication and encryption). Thus, we'd have to get 'closer' to the display function (i.e. a PAN actuator that makes announcements (textual, text-to-audio, ...)) to put in security features and/or put the security features into an AHD and then tolerant sending the text messaging around the home/personal space in a non-secure form. From a structure point of view, I see both 'direct to user'

	messages ("James, did you take your med-X.") and 'scheduling' messages (freq=daily, offset=9a, msg="James, did you take your med-X.") [One aspect that that would also want to be covered is the 'back channel' from the patient to a logging function some where. James needs to answer or acknowledgment the question. (i.e. James needs to be able to tell the system "Yes, I took my meds." so the reminder messages can stop bugging him.)] 9. While still logged into his PHR, James looks up Dr. Brown's office and sees that they accept patient history information electronically. James selects a portion of his PHR to be sent to Dr. Brown ahead of his upcoming visit. Again, I see this as a simple web portal into the PHR. No Continua standardizations here.

6. Pro01f Two-Way Communications Between Two xHR Systems

Document Control

Version	Date	Change Description	Status
1	11/23/2007	Created	
2	11/27/2007	Updated after 11/27/2007 project 1 team meeting	Closed, Not Approved

Project Abstract

Title	Implement Two-Way Between Two xHR Systems for Messages Requiring a Response
Theme(s)	☐ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	Extension of the v1 xHR interface
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☐ Local Area Network Interface (LAN-IF) ☐ Wide Area Network Interface (WAN-IF) ☒ x-Health Record Network Interface (xHRN-IF)
Description	Provide a method for sending messages between xHR systems and receiving back application-level responses to these messages. Examples of these messages would include: • Physician EMR (primary care provider) sends other physician EMR (specialist) a referral to treat patient with diagnosis information. o Physician EMR (specialists) sends back physician findings, treatment plan, status updates and final disposition • Physician EMR sends lab requests for lab tests to be performed on patient. o Lab sends patient results back to physician. Lab results automatically match up to original order in physician EMR showing complete status and test results. • Physician EMR sends request to hospital for a summary of care provide during patient's ER visit. o Hospital sends physician EMR summary of care provided. The reason why this use case is needed / important to Continua is that, while IHE does set standards for this type of interaction, they do not certify any applications to be compliant. Continua provides added value by certifying interoperability. Therefore, any interoperability that is important to successful Telehealth, Disease Management, Aging Independently or Health & Fitness should be important to Continua.
Scope	All domains
Actors	Jeff—a patient with diabetes and cardiovascular disease Dr. Smith—Jeff's primary care physician Dr. Jones—a Cardiologist St. Catherine Hospital—a hospital in the area St. Catherine Lab—hospital's lab department that performs lab tests for local physicians

	Life After 80—an Activity Monitoring service provider designed to help older citizens remain living at home
Minimal Guarantees	If only one-way communications are enabled (i.e. messages to the physician's EMR on the xHR interface, as currently allowed), physicians will not be able to send other providers patient orders and information. The other providers, in turn, will not have a reference point and future updates will not match up with previous ones.
Success Guarantees	Successful implementation of this use case will provide robust abilities for physicians to clearly, quickly and accurately communicate with other providers about patient needs and status changes, greatly increasing the quality of care provided, supporting the patient's goal of optimal health.
Trigger	Dr. Smith diagnoses Jeff with heart disease
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	31. Dr. Smith refers Jeff to Dr. Jones for treatment of heart disease. 32. Dr. Jones examines Jeff, sends him to St. Catherine Lab for blood tests. 33. Dr. Jones sends St. Catherine Lab orders for the blood tests that Jeff needs. 34. Jeff goes to St. Catherine Lab to have his blood drawn. St. Catherine Lab performs the tests and sends Jeff's results back to Dr. Jones. Since Dr. Jones' original order was electronic and included Dr. Jones' patient ID for Jeff, the results from St. Catherine Lab file immediately into Jeff's medical record in Dr. Jones' EMR system. 35. Dr. Jones sends Dr. Smith his initial findings and plan of care. 36. Dr. Jones advises Dr. Smith of Jeff's progress. 37. Dr. Jones sends Dr. Smith a final update on Jeff, showing his complete recovery from heart disease and Dr. Jones's recommendations for continued care. 38. At Jeff's follow-up visit to Dr. Smith, Jeff expresses his concerns over his ability to care for himself. Nothing serious has happened; but Jeff is afraid that he will fall and not be able to get up and call an ambulance. 39. Noting Jeff's advanced age, Dr. Smith also refers Jeff to Life After 80 for monitoring. After helping Jeff to understand the many ways that LA80 can help him, Jeff agrees to seek their help. 40. Dr. Smith sends Life After 80 an advisory concerning Jeff's needs and how they can help. 41. Life After 80 enrolls Jeff in their service, installs the needed sensors and equipment and begins monitoring Jeff's activities. 42. Life After 80 advises Dr. Smith that Jeff's is under active monitoring. 43. Life After 80 sends Dr. Smith monthly updates on Jeff's activity and status. 44. Life After 80 sends Dr. Smith notice that Jeff has fallen, been contacted to assess his state, LA80 called Emergency Services to send an ambulance and Jeff was taken to St. Catherine Hospital for treatment. 45. Dr. Smith sends a request to St. Catherine Hospital for a summary of Jeff's ER visit. St. Catherine Hospital sends Dr. Smith a summary of the care that they provided Jeff.
Failure Modes	<identify scenarios that would cause a success scenario (or flow) to fail> <optionally, identify steps or workarounds to handle the potential failure>
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact – i.e. don't do this UC in Continua e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available – HL7 and/or IHE ☒ Standard completed – don't know the HL7/IHE status on this type of UC. ☐ Standard used in the market
Estimated development time	☒ Less than 9 months – it would depend if the HL7/IHE has aready done work in this area… ☐ Between 9 and 18 months ☒ Longer than 18 months - …or if they have not.
Steps needed for completion New technology? Standards development? New Continua interfaces? Modification to Continua interfaces? Other changes?	Out of current Continua scope: By definition, the xHRN-IF is between a Continua WAN device and a xHR system. This UC describes an interface between two xHR systems. Thus, from the view of the current Continua architecture, it is a new interface. Don't do this UC in Continua: This UC seems to be more targeted to the HL7 & IHE focus of the 'back office' and 'enterprise' scope interfaces. Perhaps it is a better fit there and don't try to capture it in the Continua environment. IHE has already created interoperability profiles for communication between EHRs. Continua could just refer to IHE.
Additional Comments	This seams to be outside of the scope of Continua and entering the Hospital/Clinical domain. I believe that there are already standards available in the medical domain that address communication between EHR systems, for example in IHE. What would we like Continua to do on top of that? Any inter-xHR system interface will have to have an 'interaction model' or 'conversation model' to actually request a specific item of information and to receive a response to the request. Some example "interactions": Request "A" results in Response "B" Request "get patient number 1234" results in Response "<the health record for patient number 1234>"

	Request “get patient number 1234, all tests on YYYYMMDD” results in Response “<any test on YYYYMMDD out of the health record for patient number 1234>”

7. Pro02 Advanced medication monitor

Document Control

Version	Date	Change Description	Status
4	1 December 2007	Final Draft for TWG review prior to ballot: Intelligent Medication Monitor for V2 Use Cases	Open, In Service

Project Abstract

Title	UC 02 - Advanced Medication Monitor
Theme(s)	☐ Disease management - yes ☐ Health & Fitness – yes (for dietary supplements) ☐ Aging Independently - yes
Relation with implemented V1 use case(s)	Medication monitor devices are referenced in V1 A013 – AI Receive reminders for important activities principally for the reminder function.
Description	The Advanced Medication Monitor improves compliancy by: - reminding the patient to take medication - collecting and storing data about when medication is removed from the dispenser, - collecting additional data in the form of a questionnaire which can be use to reinforce correct behavior (eg take dissolved in water) or detect side-effects (ie headaches) which might indicate an intervention. - communicating stored data for further analysis to a remote server via an AHD, which may analyse the data to generate interventions from a healthcare specialist or call centre or carer - data can also be read by a local device for the direct benefit of the patient or carer While not wanting to restrict system implementations, the Advanced Medication Monitor is typically expected to have the following features: - a Pharmaceutical Dispenser (PD) containing unit doses of medication: for example, a blister pack of pills, a carded blister pack, or approved pill dispenser. - sensors to detect when a unit dose is dispensed. - timer to enable events to be time-stamped - memory to record the dispensing events and associated information - battery to enable mobile usage and retain data - reminder indicator (buzzer, led, other device) - program to store and execute dispensing reminders - communications capability to transfer information to and from a host system or network via an AHD The PD is typically a portable device (eg package of pills) which may often be used out-of-range from the AHD. For this reason it will be able to execute a reminder program and collect data independently. Stored data may be

	exchanged with an AHD when in-range and a communication session is initiated. In cases when medication is to be taken as needed, the reminder function may not be present but the act of opening the medication dispenser will be recorded. In cases when storage conditions are important, the package may have temperature and or humidity sensors to capture environmental data at regular intervals. In cases when medication should be taken in a prescribed way after removal from the package, for example, crushed and dissolved in water, or taken before/after meals, the user will be reminded to confirm compliant behavior by activating a sensor to record a yes/no answer to questions pre-printed on the package. In cases when patients subjective experience of their state of health should be captured, for example when side-effects are suspected or to otherwise help in diagnosis, the user will be reminded to confirm compliant behavior by activating a sensor to record a yes/no answer to questions pre-printed on the package. The PD is designed for use by the patient or primary carer. A standard program can be pre-programmed by the pharmaceutical company. The standard program may include parameters that can be programmed by an authorized medical professional or pharmacy to suit the individual patient circumstances and treatment. A pharmacy, for example, may be able to program the real-time clock to a local time-zone and input alert times such as “take before 6pm”, or that a unit dose for a particular patient might consist of two blister capsules. Once programmed, the reminder function and data storage capabilities are embedded with the PD to enable it to work stand-alone when the network is out of range. The PD records every event at which medication is removed from the package and may capture the answers to simple questions regarding the patient’s subjective experience of his/her state of health at the time medication is taken, and/or the context in which the medication is administered. The data is stored locally in the PD until the PD is connected to a network and the data can be uploaded to a remote server and/or local processing device such as a PC. The data can be analysed to detect compliancy patterns and, depending on the answers to questions, obtain indications regarding the outcome, side-effects, etc. Probably the data collected from the pharmaceutical dispenser will be combined with other time-stamped data from monitors, for example a blood pressure monitor, to provide the caregiver with a rich source of information on which to base follow-ups and interventions. Multiple Medications 40% of patients take more than one medication. This is handled in one of two ways.

	When each medication has a different schedule and different related issues, more than one Advanced Medication Monitor will be be supplied. For example, "steroids before 6pm, diuretics before 2pm". When the medications may be taken simultaneously, an Advance Medication Monitor may be pre-packed with the relevant pills which can be taken together. In this case, a "unit dose" consists of more than one drug and the stored data will associate one event with multiple drugs. Non unit-dose medications Some medications are not packed in unit doses, for example syrups, sprays, or when half-tablets are prescribed. In this case the Advanced Medication Monitor may implement a subset of the functionality, for example, providing a reminder service and recording the opening of the syrup bottle as a unit dose event. Interpretation of the data is left to the common sense of the health care professional. Take-as-required medication In the case of take-as-required medication, no reminder program is needed but the time-stamp and answers to questions are useful to record. The specification of a compliant Advanced Medication Monitor will be such that it is broadly applicable, and that features may be optional depending on the medication regime that is prescribed. Changing the reminder program after the PD is delivered In some cases the prescribing authority may wish to change the medication dose and reminder program after the PD is delivered. This is a "nice-to-have" feature which the working group decided NOT to include as a mandatory feature in V2 because of concerns about complexity, risk, and potential added cost for device manufacturers. The fall-back situation is that a new PD could be dispensed, or the current PD updated, by the pharmacist, either on-demand or at the next occasion the prescription is renewed. However, should the TWG consider that this feature can be included without burdensome complications, risks, and costs, then it should form part of the user case as an optional feature.
Scope	The Advanced Medication Monitor is a PAN device.
Actors	Patient: will be reminded when to take medication and may have the opportunity to record answers to questions on state of health and/or context and may be reminded on correct behavior regarding the medication (eg take dissolved in water, before/after meals, keep in fridge) Physician/Pharmacist: access to recorded data to aid intervention Response Center: may receive recorded data to aid intervention, for example, enabling carers or authorized family members to be informed about the patient's compliancy. Patient/Caregiver: should also have access to stored data via local pc, or other personal processing device such as a pda or mobile phone, or via a service center
Minimal Guarantees	In worst case, nothing changes. The functions in this use case are additional to current best practice.

	Minimum requirements should be established for battery lifetime in operation and shelf life, and for data retention period. Interface standard is capable of supporting a range of device technologies.
Success Guarantees	Compliancy improves, resulting in better efficacy and fewer side effects.
Trigger	The Doctor or pharmacy prescribes medication in an intelligent package because compliancy is vital to a successful outcome, and/or when a patient is prone to poor compliancy (eg bad memory), or when the patient chooses to receive medication in a compliancy package.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	- The Advanced Medication Monitor is programmed with reminder function - The user is reminded to take a dose. - The user dispenses a unit dose and the event is recorded and time-stamped. At the same time the user may be invited to record additional data such as feelings, before/after meal, presence/absence of specific symptoms. - The stored data may be communicated for the attention of a care-giver and/or response center and/or authorized family member. - The care-giver or response center may decide to intervene, for example contacting the user to provide additional advice.
Failure Modes	The Advanced Medication Monitor is designed to improve the current best practice by delivering additional features and possibilities. It is not designed to prevent problems which occur in conventional systems (for example, wrong drug/dosage being prescribed) or situations such as: - Someone other than the patient (eg a young child) removes a dose and the event is recorded and communicated - A reminder is missed. Should the patient be able to see/correct the status of the PD? - A tablet is dispensed but not ingested. - The PD is incorrectly programmed by the pharmacy or by remote update. - The PD stops working because of technical failure (immersion in water, battery empty, AHD communication fails, sensor tracks torn, etc) The Advanced Medication Monitor is not designed to be a foolproof system and is at least equivalent to current systems. The onus is on the device manufacturer to create a robust product, and on the pharma company/pharmacy/database provider to create robust processes and software. Continua needs to guard against the malfunctioning of new features: - data is kept private if the patient chooses - communication functions, and that the patient is alerted when it fails - equipment malfunction is signalled. Preventing failure should not increase the complexity of the system for the patient.

	Is should, however, be clear to the patient when data is communicated to the host system , whenever the PD ceases to function as an Advance d Medication Monitor, whether data is encyrypted, and to initiate that the stored data is erased when the pack is disposed of.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☒ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	As far as PAN device aspects the primary need is a IEEE-PHD std – this should be a straight forward exercise to accomplish. In fact the Independent Living Activity Hub has a rudimentary med dispenser function that would go a long way to covering the full function needs of this new device. Any need of the WAN-IF could be proprietary to start as all Continua devices are in V1 and track WAN-IF development in V2. Enhance PAN interface to allow robust two-way communication on devices that support it (i.e. not required for all devices), so that the AHD can send programming information to the medication monitor device.
Additional Comments	I could easily imagine implementations of this device that would find the 11073-10471 Independent Living Activity Hub an adequate standard which would mean it is doable even sooner.

8. Pro03 ECG & Respiration device

Document Control

Version	Date	Change Description	Status
1	November 28, 2007	Document creation.	Open, Partially Complete

Device Description

Title	UC 03 – ECG with respiration device
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Connectivity	☒ Wired ☒ Wireless
Device Type	☐ Actuator Device ☒ Measurement Device ☐ Display Device ☐ Other Device

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua	Develop appropriate standards as needed to support this new device and the data it will send on the PAN interface Likely SDO is 11073 PHD. Could inherit from the existing ECG device specializations of 11073.

interfaces? • Other changes?	
Additional Comments	Would it be necessary to have a different transport than USB or Bluetooth for ECG? If that is the case than the development time will be longer.

9. Pro04 Cross system alert management (previously collective monitoring)

Document Control

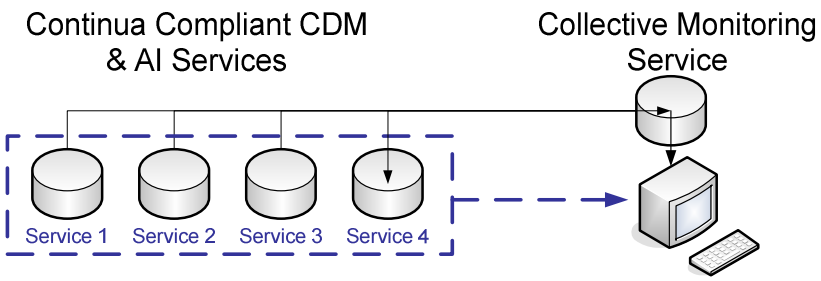
Version	Date	Change Description	Status
1.1	Sept 26th 2007	First draft synthesis of Project 4	
1.2	Oct 2nd 2007	Transfer to V2 Use Case Template. Develop description, steps, failure modes.	
2	Nov 23rd 2007	Split out 'collective monitoring' from 'dashboard view' following feedback from Boston F2F. 'Dashboard view' to become part of Project 1d – Context Sharing)	Closed, Time Expired

Project Abstract

Title	UC 04 - Collective monitoring
Theme(s)	☒ Disease management ☐ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	<indicate if this project relates to, depends on or is an extension of a specific use case that is implemented in V1> Develops XHR messaging capability from Version 1 standard Version 2 Project proposals: Project 1b – 2-way messaging. Project 1d – Context sharing
Description	This use case would enabling a 3rd party monitoring service as a separate, stand-alone offering by providing consolidated status for multiple patients into a single monitoring system. It involves 2-way messaging A. To provide status reporting from a PHR/Personal Health System into a third-party monitoring suite. B. To return acknowledgements and results reporting back from the monitoring system to the PHR.
Scope	**Jenny** is an agent in a contact centre is providing monitoring services on behalf of a care provider for a population of patients with chronic conditions (diabetes, CFH, COPD) and frail older people (dementia, risk of falls, mobility impairment) Jenny's work covers a range services from different providers and involves operating across several different telehealth & telecare systems. The separate systems meet the needs of different conditions, abilities or demographic groups (e.g. mobile phone base systems for younger diabetics). To manage her workload and priorities Jenny needs to be able to see and

	manage the status of all her patients across the different systems. This requires that the component systems offer information in a standard format covering Patient ID Date and time of alert Patient current status Alert priority (expressed as a response time for alert) Reason for alert including relevant summary information History of past alerts with time, date and result that prompted the alert Details of any pre-defined response protocols (including contact information) Location of source data Once Jenny has taken action, she needs to be able to inform the originating systems of the outcome and, where appropriate, 're-set' the patient status. The message will include: Patient ID Date and time of report Name, organization and contact details of person raising results report Patient status (if revised) Action taken Recommendations to service operator (e.g. review thresholds) **Sandy** is a healthcare professional who has day to day responsibility for a group of chronic disease management and aging independently service users. Sandy works regular office-style hours, and as part of her role she routinely reviews the status of her users. Sandy knows that any urgent alerts are handled by Jenny. As part of her routine workload, Sandy needs to be able to see what urgent alerts have been raised, and what action has been taken to resolve the incidents. On opening her system, Sandy should be able to see a list of: - All patients with alerts raised - All results returned by the monitoring service **Julia** is a user with a CDM and an AI service.
Actors	Patient/users of CDM and AI systems - (From now on we will refer to this person as 'the patient' Routine care managers – typically care/case managers in primary or social care service Urgent care monitoring agent – contact and coordination centre agent in remote monitoring service, typically a shift worker in a 24/7 service
Minimal Guarantees	- Patient/user status accurately and reliably passed to a 3rd-party monitoring service. - Results reports and status updates returned from the monitoring operation to the CDM/AI system - Continua service clearly defines what constitutes an alert and defines priorities. Typically for CDM this involves:

	a. Defining a range of threshold parameters for metrics b. Defining the logic for the severity of an alert – expressed as a maximum response time. c. Defining a routing logic for alerts (e.g. only raised when no user logged into system, or pre-defined working hours)
Success Guarantees	Patient – Confident that alerts are handled appropriately Routine care managers – Able to see information about alerts and response. – Able to track patient related actions across a range of information sources (personal health system, EHR, appointments scheduling/PAS etc) – Able to set up time-slots for divert to monitoring operation – Able to see history of past alerts and relevant details Urgent care monitoring agent – Able to receive alert and investigate information in originating CDM/AI system – Able to pull up patient related information from a range of information sources (personal health system, EHR, appointments scheduling/PAS etc) to support assessment and action planning – Does not duplicate response to alerts when routine care manager is available to respond – Able to see status of link to dependent CDM/AI systems
Trigger	CDM or AI system raises an alarm flag indicating need for urgent or routine review.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	<numbered steps of the use case> Monitor alert 1. Patient data triggers host CDM/AI system to change patient status 2. CDM/AI system sends alert message over xHR interface to monitoring system 3. Monitoring system sends acknowledgement of receipt back to CDM/AI system Pull up dashboard view 4. Agent logs into monitoring system 5. Agent identifies patient 6. Agent calls up related patient information 7. Agent completes action to respond to alert Close alert 8. Agent records action taken in monitoring service (may include changing the patient status) 9. Monitoring system send message over xHR interface with reports of action taken and revised status. 10. Monitoring system marks alert as ‘closed@ Review results 10. Routine carer reviews results 11. Routine carer actions recommendations in Monitoring service results

	message 12. Routine carer closes incident in Continua host system.
Failure Modes	<identify scenarios that would cause a success scenario (or flow) to fail> <optionally, identify steps or workarounds to handle the potential failure> Failure – Alarm/alert not received by monitoring operation – Inability to change patient status in monitoring centre, leading to repeated alerts – Unable to access source data to identify reason for alert – Routine care managers unable to see actions taken following alert – Alert inappropriately routed to monitoring system when routine care manager is able to handle business – Alerts not graded for urgency, meaning the monitoring centre is unable to triage alerts effectively during an 'alarm flood'. – System audit trails unable to clearly identify information accessed and actions taken by users across all systems integrated into a dashboard
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months

	☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Need to define/agree content/structure of data able to be accessed from individual sources, and report data that is returned. This may require standards development to define. Eg enhance HL7 PHM document standard to add the data needed for this use case. Need to develop interoperability guidelines relating to application functionality and implementation.
Additional Comments	Consolidates multiple sources through extension of existing EHR. Data transfer and signalling - no "hard" technology requirements. Need to include security and privacy considerations. Standards exist for data exchange and security/privacy. In terms of End to End communications architectural topology the collective monitoring system is a WAN device.

10. Pro06 Activity Monitoring

Document Control

Version	Date	Change Description	Status
1	September 24, 2007	Initial version based on abstracts	
2	September 26, 2007	Add more details.	
3	October 11, 2007	Add AI example.	
4	November 13, 2007	Modifications based on teleconf. Highlighted the basic parameters. Removed the estimated/calculated data. Refined the use cases.	
5	November 15, 2007	Some rewording Add DM reeducation	
6	November 19, 2007	Divided the basic parameters into 3 categories. Other modifications based on the teleconf.	
7	November 28, 2007	Modified the text in those fields which were not meant for our project.	Open, In Development

Project Abstract

Title	UC 06 – Physical Activity Monitoring Develop a device profile enabling the Continua ecosystem to access the user's physical activity in an interoperable way.
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	Leading to new use cases, as well as contributing to the V1 use cases: - HF: A001, A003, A005 - DM: A007 - AI: A012, A014
Description	The proposed devices measure part or all of the following basic parameters during user's physical movement. They can be divided into three categories: Category 1 – Movement Information - Velocity in 3D space (m/s) - Acceleration in 3D space (m/s^2) - Angular velocity along pre-defined axis (rad/s) - Angular acceleration along pre-defined axis (rad/s^2) Category 2 – Orientation Information - Orientation in pre-defined 3D coordinate (Cartesian, Spherical, Cylindrical) Category 3 – Location Information - Location information (global latitude/longitude/altitude combination, or location within a building)

	The data format of above basic parameters will be properly standardized to ensure interoperability. Based on above parameters, intelligent analyzing or processing can be utilized to support following applications: - On-body Parkinson's monitoring - Internet-based Parkinson's Personal Care Application - Remote patient monitoring - Sleeping quality monitoring and analysis - Support the disabled people - Monitoring the rehabilitation process - Virtual exercise gaming - Realtime fitness and sports training guidance - Realtime tracking for players during public sports game
Scope	This project proposes a set of devices capable of sensing and transmitting the basic parameters describing the user's physical activity. The scope of this project is limited to - define different parameters for the above targeted applications, - define suitable data formats compatible with the Continua ecosystem, and satisfying corresponding requirements such as memory size and processing power. Utilizing and transmitting the sensed basic parameters are outside the scope of this UC.
Primary Actors	The physical activity sensors
Supporting Actors	Users, care provider, coach, friends & family, mobile and stationary fitness devices, compute engines and services.
Minimal Guarantees	The sensor devices are not harmful to the human body, nor do they hamper user's movements nor performances.
Success Guarantees	The measured data defined in this project is inter-exchangeable within the Continua ecosystem.
Trigger	Continua-compliant devices wish to exchange the measured data which are defined in this project.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Example I (DM): A patient with Parkinson's Disease is remotely monitored with on-body sensors (in-home and mobile monitoring). The patient's body movement is measured, stored (up to several days of data) and transmitted to Manager device. Further processing and analyzing can be made by intelligent system or care giver, in order to understand patient's body condition. Example II (DM): Reeducation after injury. After trauma and accidents patients need to reeducate limbs, e.g. learning to walk. Instrumented prosthesis or reeducation tools will help recording progress and collect scientific measurements hopefully leading to quicker convalescence and to a successful recovery, and/or an efficient compensation for lost capabilities. The collected measurements can serve the reeduction specialists, as well as surgeons in case of future corrective surgery. Example III (HF): Jack is playing tennis. He wears a physical activity sensor and another one is implanted in his racket. Both sensors transmit their data to a Manager device

	near the playground. Jack's coach can visualize this information in real-time, as well as to replay and analyze it at will. The audience can obtain in real-time some interesting information, such as the strength of hit, running distance and speed. Likewise we can imagine Baseball, Golf examples, with speed of ball, type of throw, angle, etc. Example IV (HF): Bike trainer and racing game. The same content as in the V1 proposal – A003. Example V (AI): Mary is in her late 70's and lives independently. Like many people of her age, she suffers from chronic health conditions. Her clinicians keep reminding her that it is important to remain active and mobile, but not to be over-energetic (she is not as stable as she used to be and sometimes become dizzy if she stands-up too fast). She wears a physical activity sensing device clipped to her waist band during the daytime and its accumulated activity helps her and her care givers to assess her activity level and mobility. This sensor can help to determine how likely she is to fall. Furthermore, such sensor can help to identify Mary's movement between the rooms of her home.
Failure Modes	The defined contents in this project cannot ensure interoperability within Continua ecosystem.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua	New device specialization in 11073 can be created to transfer physical activity information. Lower-layer technologies available; particular devices and app layers will require development.

interfaces? • Other changes?	
Additional Comments	Accumulated activity and fall risk estimation (example V) are not mentioned in the description section of the use case. If it is the intent to transfer such information, it should be added as separate categories in the description section. In “Supporting Actors”, the phrase “compute engines” has been deprecated. I believe it is now “Application Hosting Device”.

11. Pro07 Real-time Transmission for HF

Document Control

Version	Date	Change Description	Status
1	August 23, 2007	Abstract creation	Closed, Time Expired

Project Abstract

Title	Allow Realtime Transmission from HF Devices
Theme(s)	☐ Disease management ☒ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	This project has no direct relation with v1 use cases. It adds new functional requirements to the V1 HF devices. It can be utilized by HF use cases A001, A003, A004 and A005. It may also be applied to some DM and AI use cases, such as A008 and A014.
Abstract	**Proposed Requirement** Allow Realtime Transmission from HF Devices **Reason** HF V1 only supports non-realtime transmission from HF devices, which significantly limits the use cases. Allowing realtime transmission can provide much more opportunities to introduce new use cases.

12. Pro09a Care and health information

Document Control

Version	Date	Change Description	Status
1	September 18, 2007	Initial draft version based on abstracts	
2	September 24, 2007	Incorporates feedback on the first version	
3	December 3, 2007	Minor updates	Closed, Time Expired

Project Abstract

Title	UC 09a - Enable access to remote care & health information
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	V1 does not implement the WAN interface, which is needed to enable access to remote care & health information. However the concept of remote access is at the heart of Continua and was present in many V1 use cases: A006 – receive fitness reminders A009 – interaction with medical care provider in non-real-time A013 – receive reminders for important activities
Description	Enable the exchange of care related information (medication schedules, educational content, messages, journal entries, surveys, images/videos ...) between the service and the consumer in a way that is generic (suitable for devices from mobile phones to TVs to dedicated devices), scalable and does not limit the richness and control over the actual displaying of the data (how data is actually displayed is a very strong differentiator). When privacy sensitive data is transferred, proper security measures should be in place.
Scope	This use case addresses the WAN interface of the Continua eco-system. On the consumer side devices like mobile phones, TVs, set top boxes and computers are involved. On the professional (service) side computer servers are involved. This use case might also affect the LAN interface.
Actors	Consumer Service Professional
Minimal Guarantees	Privacy sensitive data is not inappropriately shared with others.
Success Guarantees	Reduced administrative overhead for service Professionals, improved treatment outcomes and increased independent living for Consumers
Trigger	Professional defines a care plan/service for the Consumer, and enters starting data in to a calendar and feedback survey to track the progress of the care plan.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Aging Independently Edward is living alone and independently despite his age and associated frailties, but he is becoming increasingly forgetful. Medication and healthcare appointments are of particular concern in this respect. He is naturally a very sociable person, but his arthritis increasingly reduces his

	mobility, and discourages him from leaving home. One consequence is that life increasingly revolves around the TV. Edward needs regular information to help him live a normal, healthy and happier life. This information needs to be provided through services or interface devices that he would be happy to engage with. (eg. regular calls from carers, and/or TV-based alerts, Edward is not a competent PC user) The required information content includes: - reminders on medication and schedules ; this needs to be consistent with Edward's current care plan - assistance with nutrition ; ordering food through service provider, advice on food preparation, assistance with food preparation where necessary - access to local community and care service web information, to understand and engage with activities ; this information needs to be simpler and arguably more secure than standard web content. Health & Fitness Health minded consumers can subscribe to a health service that keeps track of their performance and gives them guidance and support by providing useful health & fitness information. Examples of such information are personalized training schedules, reminders, nutrition advice and supportive messages from their fitness professionals. Having easy, immediate access to this information on everyday home or mobile devices will empower consumers to take better care of their health. Disease Management Managing patients with mental health conditions can be challenging. Conditions like depression, bi-polar disorder, anxiety and motor tics have no test that is objective to diagnose and manage treatment and medications. A patients sense of how they are feeling on a given monthly appointment might be very subjective and may not reflect their condition over that month, but just the recent few days prior to the appointment Having access to a mobile phone/device based survey tool that sends a daily short and simple survey for gauging levels of depression against medication and trends of past levels of depression can assist the patient by identifying a regimen that may no longer be working or highlight the efficacy of a new regimen. The patients are able to remotely access their personal data and look at their results as well as view treatment plans and reports and graphs to track their progress over time.
Failure Modes	• Using the care & health information service is too difficult. • Privacy sensitive data is inappropriately shared with others.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	This relies on the WAN Service interface (UC 12). The underlying standards for the basic capability (HTML, Video) can probably be profiled in 9 months (e.g., existing WS-related standards) once the specific requirements have been identified. However, if there are new features or capabilities required, it might take longer than 9 months in groups like W3C. Also, if this ends up as a harmonization with other medical related standards (e.g., HL7 SOA), the timeframes are typically longer than 9 months. Actuators are needed for the reminders
Additional Comments	The scope of this UC is potentially very broad. It would be useful to narrow it down further and possibly work as separate projects. For example: 1.) Streaming Video requirements 2.) HTML-based forms and exchanges 3.) Specific data requirements depending on the domain (e.g., Aging Independently Medication Monitoring) We need to carefully consider whether full support for cell phones is required as that may reduce our options and increase development time.

13. Pro09b Social Interaction

Document Control

Version	Date	Change Description	Status
1	September 18, 2007	Initial version based on abstracts	
2	September 24, 2007	Incorporates feedback on the first version	Closed, Not Approved

Project Abstract

Title	UC 09b - Enable social interaction with care providers, friends & family
Theme(s)	☒ Disease management ☐ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	V1 does not implement the WAN interface, which is needed to enable social interaction as described in this use case. However the concept of social interaction was present in multiple V1 use cases: A010 – interaction with medical care provider in real-time A018 – consult with caregiver
Description	Enable the consumer to engage in interaction with care providers, friends & family and others in a generic and standardized way. Examples of interaction are messaging, chatting, calling and video chatting. For the biggest impact the solution should cooperate with existing interaction facilities that are already being used (e.g. email and computer based instant messaging clients). When privacy sensitive data is transferred, proper security measures should be in place.
Scope	This use case addresses the WAN interface of the Continua eco-system. On the consumer side devices like mobile phones, TVs, set top boxes and computers are involved. On the service side computer servers are involved. The other party in the interaction will also be using devices like mobile phones and computers; however this is probably outside of the Continua eco-system. This use case might also affect the LAN interface.
Actors	Consumer Care provider Friends & family
Minimal Guarantees	Privacy sensitive data is not inappropriately shared with others.
Success Guarantees	Consumers feel connected with their support network (friends, family, peers). Service providers also realized better clinical outcomes from reduced depression, communication of best practices, etc.
Trigger	Consumer feels isolated or alone, either because of increased difficulty in moving around in and outside of their home, or because of the increased stress of the diagnosis of a disease.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if	Aging Independently & Disease Management Mary already has a range of services which, assisted by technology, enable her to live independently despite the onset of several long-term health conditions. Mary has less need to visit her physician and the local clinic than previously. When combined with her reduced mobility this has the effect of reducing her

applicable)	contact with other people; she has lost contact with the bridge club and several long-standing friends. Mary's only daughter, Alex, leads a busy life and lives 6 hours travel away. They meet every month or so, and at her last visit Alex found her mother changed, and showing signs of depression. To some extent the introduction of remote monitoring technology has increased a sense of social isolation. This needs to be re-balanced. Mary requires an easy-to-use means of maintaining contact with formal and informal carers (the latter including family, friends, associates). A mixture of video and voice connections is desired, depending on the person and the context. Disease Management Jane has been diagnosed with cancer (or heart disease, etc), and has a difficult time dealing with her new life as she undergoes treatment. She needs to visit a clinic every few days, and in the beginning, didn't know what to expect. Luckily, her care provider has a support group that not only can meet in person, but can connect over the Internet to get help, share stories, or just chat when she is feeling down or lonely. Jane no longer feels alone as she is going through treatment, and can share her experience, both good and bad, with others, in real time or by posting messages.
Failure Modes	• Using the social interaction service is too difficult. • Privacy sensitive data is inappropriately shared with others.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability[3]	☐ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time[4]	☐ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months

[3] We were not comfortable providing a rating here because of the breadth of the use case. SDOs and standards exist in different degrees for different subareas.

[4] We were not comfortable providing a rating here because of the breadth of the use case. The development time will depend on which sub-area is chosen.

Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	First reviewer: This use case fits within the Continua architecture as currently defined. There are numerous technologies and nascent standards for on-line collaboration/cooperation. The issue with this use case will be picking among the plethora of options, and then tailoring the choice to the medical application domain.

Additional Comments	Second reviewer:
	For proper review UC09b will have to be split into numerous UCs. I'd would use these four technology areas as the basis to split up UC09b:
	1. textual.email
	  1. <std>
	  2. secure
	2. textual.text-message
	  1. point-to-point
	  2. multipoint
	3. interactive-audio
	  1. point-to-point
	  2. multipoint
	4. interactive-video
	  1. point-to-point
	  2. multipoint
	I'm afraid that the state of the technologies and the available standards bodies are different for many of these.
	
	<sidebar>
	We might also want to think about what we do with...
	1. broadcast-mixed-media (aka a web page)
	  1. documents
	  2. audio
	  3. video
	There are a lot of "social networking" sites that exist now and these are all based straight forward web technologies. However, these are rapidly and continuously changing. My first thought is that we might want to make some sort of reference to these web technologies and how they are expected to be used by many healthcare products and services, but that Continua will _not_ try and put guidelines around them. (i.e. specifically exclude any Continua work in the web page area at this point.)
	</sidebar>
	
	As an overall summary at this point, I say:
	1. 'textual.email' is the only technology that is open and interoperable. (And even that has a few exceptions.) If you throw in "secure" messaging, then the answer becomes less clear.
	2. 'interactive-audio' is on the edge of interoperability (mostly driven by the need to be interoperable with the existing telephony network). But even there there are easy to use "island of interoperability" that tend to keep

	this area isolated too. (Skype audio is an example. But it is a closed, non-standard technology anyway.) 3. 'textual.text-message' and 'interactive-video' are interoperable but only within a given product or technology boundary. (i.e. a operate within a "wall garden" environment.) • IBMs Sametime instant messaging service can talk to AOL IM service • SMS texting can't talk to Yahoo's IM service • Sykpe's video service can't talk to Microsoft's NetMeeting application • Tanburg's video conf system can't talk to <whatever> • (the underlying, base technologies are similar, but there are company specific features that are added to keep the environment closed) I think that this shows how much investigation needs to happen within each technology area. Joint comment: This use case as defined covers a huge amount of ground. Our recommendation is that it be split into multiple sub-cases.

14. Pro10 Information sharing and E2E security

Document Control

Version	Date	Change Description	Status
1	14-Sep-2007	Initial version	
2	25-Sep-2007	Integrated comments from member.	
3	1-Oct-2007	Added a few hints at mechanisms to be used	
4	17-Oct-2007	Integrated project 5 from NHS on “Misuse of personal data”	
5	19-Nov-2007	Final polishing	
6	30-Nov-2007	Add comments on cross-border implications and success criteria	Open, In Development

Project Abstract

Title	UC 10 - Controlled information sharing and end-to-end security
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	This use case is related to data upload for DM, H&F, AI. More specifically to V1 core disease management use case 007 “Authentication System 2 System”, and generic versions of use cases 015 “E2E Diabetes Use Case” , 027 “Objective Remote Health Monitoring”, 030 “Participate in Medical Research”, 033 “Receive Alerts When Measurements are Abnormal” and 044 “Server-Services to EHR-EMR.”. Among the rest it addresses (1) xHR interface WAN -> third party and (2) WAN interface: App host dev. -> WAN device. The intention is to further improve security and ensure end-to-end security.
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☐ Local Area Network Interface (LAN-IF) ☒ Wide Area Netowrk Interface (WAN-IF) ☒ xHealth Record Network Interface (xHRN-IF)
Rationale for Feature	When medical data is shared over any interface, but most notably over (1) the WAN interface between the application hosting device and a WAN device or (2) the xHR interface between a WAN device and a third party server (e.g. EHRs/PHRs), confidentiality and data authenticity must be assured. Furthermore, according to privacy laws (such as European Directive 95/46 and HIPAA), the patient should be empowered to have control over the data distribution path and usage. In particular, patients should be able to give or deprive consent for the usage (or re-usage) of sensitive health data for special purposes such as risk analysis (or stratification). To track the usage of data and allow monitoring of conformance to the access restrictions imposed by the user, audit logs of all actions must be recorded.

	Modern consumer healthcare architectures tend to be open, interconnected and flexible. They expand from clinical to home healthcare and involve emerging telehealth services. In such an architecture, measurement devices and the application hosting device should be able to connect to different services (WAN devices) in a more or less *ad hoc* manner. Sensitive patient data is collected throughout the patient's life, and measurements performed by DM, H&F and AI services are included in the patient's health records. On its journey though a number of open and interoperable systems, sensitive health data should be used only for the purpose(s) that the patient has consented to. Furthermore, the data should be used according to privacy laws and ethical norms defined by privacy and security policies of related countries and healthcare providers. Therefore, end-to-end security techniques that ensure the enforcement of patient's/organization's privacy and security policies and facilitate controlled data sharing are of utmost importance. Special considerations apply for cross-border movement of healthcare data where different jurisdictions may operate. While the Continua V1 standard has adopted the view that security is a matter for the service provider, the Continua interface standard may need to consider whether it is necessary to identify whether there are jurisdictional limits applied in the consent to share data. Finally, it is important to establish an end-to-end audit trail of data/information as it passes through the Continua eco-system to enable investigation into potential misuse of protected data in each aggregation layer (home aggregator, PHR, xHR and other Continua-enabled monitoring and recording systems). This use case is closely related to projects 1 and 12 as it addresses the security issues that are relevant for these use cases.
Requirements	<u>Basic Data Flow:</u> 1. The patient collects health data (either using sensors or by sourcing from a professional EHR system) and stores them on the application hosting device. Alternatively the data is stored on a WAN system. 2. The patient selects policies for his data – these policies can either be defined in advance for all data items/types or be specified individually for each intended purpose of use. 3. The data is sent by the patient/WAN system to a third party; for transmission, the data is encrypted and accompanied with the access control/usage policies imposed by the patient (patient consent or his privacy policy) and/or WAN system (organization security or privacy policy). 4. The third party can access the data received from the patient/WAN system according to the accompanied policies. The third party commits itself to respecting the policies received (i.e. has a custodian role under a comprehensive information governance policy). During normal usage of the data, an audit management function of the third party creates an audit log of accesses to the data. 5. Optionally, this access and use control can be 'technologically enforced' by so-called Privacy-Enhancing Technologies (PETs). In this case, technological measures (such as encryption and cryptographically enforced access control) are present to make sure that decrypted patient data is only available to the intended third party and is not further transferable.

	To track the usage of health data, an audit facility can create an audit log of the usage of critical data. Upon knowledge of a potential security breach, an investigator can send requests for audit logs to all parties who have accessed records of a certain (class of) patients. The received audit logs are collated and exported in a standard format, suitable for import to an audit management tool. Potential fields for inclusion in the audit log are: user ID and name, user access rights, authorization approver, date of approval, patient record ID, date and time of access, terminal of access and information on the confidentiality status of information viewed. Investigators may then assess the incident type, severity and course of action. The technical requirements: • The basic requirement is to securely link or embed policies related to access and usage control (including patient consent) with the data itself. This can be done by making provisions within the related data exchange standards to support embedding or linking of policies. It should be noted that some standards, such as EHRcom (CEN13606), already support similar features. • The structure of policies, policy language/model and/or patient consent should be defined to support interoperability (see IHE profiles for an example) • An additional requirement is to provide a legal proof that the data receiver is aware of the access control policies which it will enforce. This can be done by extending related messaging standards. • Audit logs of all potential security critical actions (views, additions of data, corrections, etc.) must be kept. This functionality can easily and unobtrusively be implemented in special document handling software. • It might be required to specify methods and technical means in the form of encryption, key management and policy management technology to enforce the access and usage control. This can be an optional feature. Specifications of several IHE profiles that can be used as a basis for this use case and its extensions are referenced below.
Sample Scenarios	1. *Fitness Coach.* During her daily workout, Mary monitors (among other variables) her heart rate and collects the data in the application hosting device. On an *ad hoc* basis, she is able to share the measurement data, in combination with other parameters such as her weight data, with different services, such as a fitness coach, stress management service or weight management services. She can do that in a controlled way, selecting which data is shared with which service. Furthermore, she can define a privacy policy that will be enforced by the downstream services. 2. *Third party opinion.* Alice is under disease management (DM) program. She has a specific condition. Therefore, the nurse from the DM program wants to consult a specialist. As Alice has already specified in her privacy policy that her data can be used for legitimate healthcare purposes, the nurse can share her data in a secure and private way with a remote specialist asking for the third party opinion, subject to a stringent role definition and data access policy. 3. *Consultation of Experts.* Joe is under disease management (DM) program. Based on the advice, he obtained from the nurse of the DM program, he has to visit a specialist. Although Joe brought the summary

	of his health data obtained from the DM program, the specialist needs more detailed information. He connects and log in to the portal of the DM program. There, he is able to access the required information in a secure and a controlled way in accordance with Joe's privacy policy. 4. *Investigation of a security breach.* An investigator, who suspects a breach of privacy for records of a group of patients, sends requests for audit logs to all parties who have potentially accessed the records in question. Based on the audit logs and an analysis tool, he is able to assess the severity of the breach and notify the affected patients. 5. *On-line access to patient information.* In a 'patient-centered' information system (as opposed to an institution-centered system) data gathering occurs on a continuous timeline. Wherever the patient is – when visiting clinic, when at-home or when mobile – the patient-proximal device ecosystem is accessible through a data hub which communicates with the patient's PHR/EHR. This always-on feature enables 'push and pull' of information as required by the care plan or pathway. Patient data may be submitted *ad hoc* (at the patient's own volition) from devices to a server, or a data request statement may be sent (server-side) to a patient-proximal display device – e.g. to remind him/her to send data on a schedule, generally in accordance with an agreed monitoring frequency plan. Despite the dynamic nature of the data, the patient does not need to specify policies each time data is transmitted, as policies can be automatically defined based on user preferences and embedded in the data stream. Expansion of the use case requires convergence with a sample information governance model for consent and confidentiality.
Minimal Guarantees	• Data is tagged with a 'Yes/No' consent to share marker • Consent information is passed across all Continua interfaces.
Success Guarantees	• Continua interfaces recognize data sets with a 'no consent to share' flag. • Audit data is traceable across all Continua interfaces Desirable • Consent to share markers are enhanced with additional information, including: o Policies on access and usage control specifying services/individuals authorized to access data o Specific datasets enabled for sharing o Additional consents on wider sharing such as anonymisation or pseudonimisation of data for research purposes. • Legal proofs that the data receiver is aware of consent information and the access control policies which it should enforce.

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☒ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Constraints on definition of the WAN-IF. Change xHR-IF By far the hardest aspect of this is that you are constructing an eco-system which involves altering behavior far beyond the Continua boundaries. Technologies exist to implement the various functions but the governmental, legislative, legal, and even user comprehension/usage issues are immense. First step is to attempt to fragment the problem into concrete incremental steps that can be worked in parallel. One suggestion might be to focus first on altering the Continua interfaces so that they support the meta-data additions needed to implement the core plumbing. Work separately on the backend server infrastructure and the AHD/user infrastructure.
Additional Comments	This is more a requirement on the overall E2E solution than a use case. This requirement affects a number of interfaces. There solutions available and used in the market (also in other domains). While this is a huge problem and feel it will take a lot of time and energy I feel it is one of the most important problems Continua should address. Drafting behind any prior efforts (IHE, Canada's Infoway, NHS, etc) would not only save time and effort but very well may make the final structures more acceptable in those environments.

15. Pro11 Data reliability and authenticity

Document Control

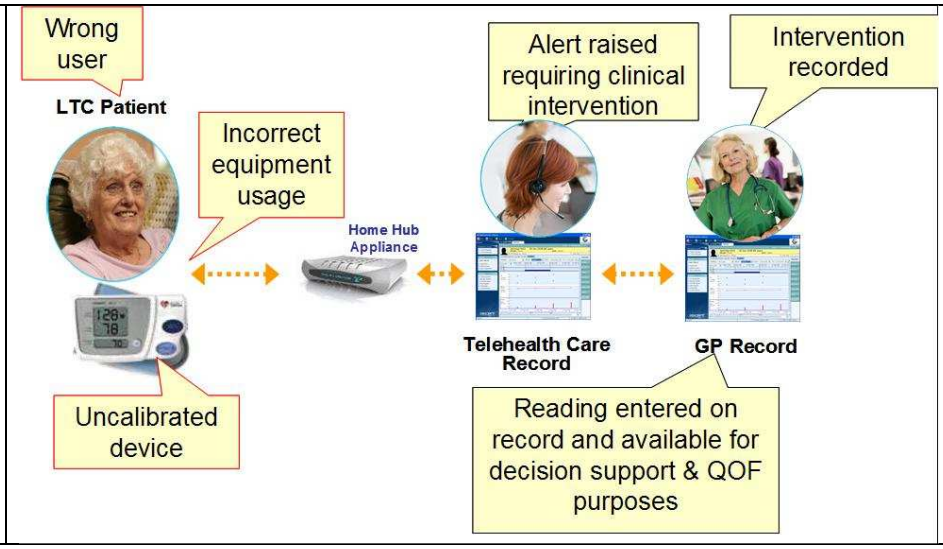
Version	Date	Change Description	Status
1	20-Sep-2007	Initial version	
2	17-Oct-2007	Added patient authenticity and a slide from presentation to visualize the problems	
3	19-Nov-2007	Final polishing	
4	30-Nov-2007	Add comments on interface implications and success criteria	Open, In Development

Project Abstract

Title	UC 11 - Information reliability and device and data authenticity
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	This project proposes an extension of the data upload use cases (each interface) plus non-functional features such as device and data authentication For example, it can be seen as an extension of A007, Episodic & Non-Actute Remote Patient Monitoring (data upload for DM).
Applicable Interfaces	☒ Personal Area Network Interface (PAN-IF) ☒ Local Area Network Interface (LAN-IF) ☒ Wide Area Network Interface (WAN-IF) ☒ xHealth Record Network Interface (xHRN-IF)
Rationale for Feature	When data measured by patients is used in the medical professional world, the healthcare professionals will need to place greater trust in information that patients' report. This also holds for the data coming from emerging PHR services. Then data quality and reliability is of utmost importance. Consider a user that takes a blood pressure measurement; crucial for data quality is that the measurement was taken with a certified device, under standardized conditions (e.g., with the blood pressure cuff on the arm at the heart level) and that it is not obtained as a result of device malfunctioning. So, user authenticity, device authenticity, but also data authenticity must be supported. Therefore, at the same time trust to the data source has to be ensured, while unauthorized modifications of the data have to be prevented. If medication advice is based on patient-taken measurements, major injuries can be caused due to low quality data or human errors during the measurement process. Therefore, next to ensuring the device and data authenticity the healthcare providers could be provided with a data quality indication. This can allow the healthcare providers to decide whether they will reuse patient-taken measurements, which in turn will result in reduced costs (no need to repeat measurements). Furthermore, regularly taken measurements by patients can often help the healthcare provider to make more accurate diagnoses. To summarize, the most important benefits of the proposed approach are: 1. Patient safety (diagnosis and health decisions are based on reliable data) 2. Reduction of costs (reuse of patient provided data in the consumer health and the professional healthcare domain) 3. Convenience for the patient (they can take healthcare measurements at

	home) This use case is closely related to projects 1 and 12 as it addresses security issues, which are relevant for these use cases. There is perhaps some overlap with project 25 with respect to one element of this use case (patient authentication).
Requirements	It is required to: 1. Ensure device authenticity. This can be done through a certification process. Bluetooth device authentication, IHE ATNA and/or other related standards depending on a device class can be reused. 2. Ensure patient authenticity. Assure that data is associated with the correct patient. 3. Ensure data integrity. Appropriate standards for data integrity can be reused for different Continua interfaces. 4. Optionally provide an indication of data quality. Besides data on the quality of the measurement process (e.g., the placement of the device on the body or the activity level of the patient during the measurement), information about the measurement device itself (e.g., manufacturer, certification, device calibration level, etc.) can be used during assessment. Next to metadata about the measurement, information about the patient is also valuable in judging the expected overall data quality – e.g. if the patient had a medical training, then he is expected to provide better quality data or if a measurement was repeated in a clinical setting and shows enough correlation with the self-made measurement. To achieve this, data exchange standards have to be extended to support interoperable exchange of meta data and quality indication.
Steps of Basic Flow	<u>Basic Data Flow:</u> 6. The patient collects health data using sensors and stores them on the application hosting device; the sensors (or the application hosting device) authenticate the user and add provenance data as well as meta-data allowing to judge the data quality. 7. Integrity of measured data is protected. The data is stored in the application hosting device. In addition, the device maintains information about the user over time, allowing a medical professional to assess the overall quality of the data the patient supplies. 8. A medical professional has access to the measured data linked to corresponding meta data and quality indication which allows him to be sure in patient/device/data authenticity as well as to judge the quality of the data received. 9. Optionally, the medical professional can himself feed data related to quality back to the system in order to influence future quality indications.
Sample Scenarios	1. Mary is under disease management program. Her grandchild Tom is visiting her. Tom is playful and he takes a few blood pressure and heart rate measurements with grandma devices while exercising on her stationary bike. His heart rate was very high. However, as he was authenticated, these measurements will not be uploaded in the systems in the profile of Mary. 2. Mary is under disease management program. One day, she was taking her blood pressure while the device was malfunctioning. As the result her blood pressure was very high. However, as the device was authenticated and extra information about device status was collected, this measurement will not be taken into account and she will be advised to fix the problem. 3. Mary monitors her blood pressure and weight daily with a blood pressure meter and a weight scale. Besides the raw measurement, the measurement

	devices send metadata on the measurement process (e.g. time, measurement accuracy, device battery level, status, etc.). Mary as well as the measurement device are also authenticated and data integrity is provided. The metadata is combined in an overall indication of the measurement quality. When Mary's GP reviews the data, he can distinguish between reliable and unreliable measurements. However, he can also, if necessary, look at the details and determine for example whether the measurement was performed with an FDA-approved device (or Continua certified device). 4. Mary's GP sometimes supervises Mary while she measures her vital functions (e.g. blood pressure). Occasionally he repeats measurements during visitations. If he is satisfied with the way Marry is taking measurements or his measurement conforms to the measurement taken by Mary, he can explicitly rate her measurement as trustworthy. Mary collects these ratings and can use them in the future to convince others that she is capable of providing high-quality data.
Minimal Guarantees	Minimum: Data flagged as taken either in a Continua or a clinical environment Device provenance established – Continua compliant yes/no Patient ID status verified Desirable: Further metadata on to support data quality requirements available. If this use case is not completed successfully, the data created/measured by patients neither the aggregation/summaries of this data obtained in the three Continua scenarios (DM, AI, H&F) will not be used in the regulated healthcare domain. This will result in the increase of cost of healthcare as the measurements will be repeated.
Success Guarantees	• xHR users are clearly able to identify the provenance of Continua-originated data • Messages are optimized to ensure metadata transferred at XHR interface is relevant. • Solution is compatible with V1 adopted clinical coding standards adopted for transfer of vital signs and other data (SNOMED) Intended system benefits: • Patient safety is improved (diagnosis and health decisions are based on reliable data) • Healthcare becomes more convenient for the patient • Insurers and governments benefit of the decreased cost of healthcare • Doctor's liability is protected as he can base his decision on reliable data

Diagram	

Continua TWG feasibility review

Date	2008.01.02
Comment	I split this UC into two parts. 1) Meta-data origination: this 1st part deals with any needed meta-data originating from a healthcare device (i.e. over the PAN-IF) 2) Data "provenance": and a 2nd part for the provenance aspect (aka the "chain of custody" aspect) of the UC. i.e. when the data from the healthcare device flows over a sequence of Continua interfaces. (PAN to WAN to xHRN)
Meta-data origination: PAN-IF:	
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion New technology? Standards development? New Continua interfaces? Modification to Continua interfaces?	1) Strategy: define new PHD "device specializations" that list any specific "quality characteristic" meta-data information (i.e. body site of measurement, body position, "measurement taker" skill, …) that is required. Note: we could also define 2nd iteration device specializations for the devices we already have in place.

Other changes?	2) Some of the nomenclature terms (e.g. body site) are already defined. 3) Given the limited user interface on many healthcare devices, it is likely that much of this "quality characteristic" meta-data information will need to be attached to the PHD data model at the Continua Application Hosting Device (AHD).
Additional Comments	1) The existing IEEE 11073-20601 base spec (i.e. PHD spec) currently supports the exchange of data attributes which, for this discussion, can be thought of "quality characteristic" meta-data. 2) The <9 month time interval is completely dependant upon limiting the scope/richness of the required "quality characteristic" meta-data.. The fewer the number of required "quality characteristic" attributes the faster a "device specialization" team will close on a solution. 3) Note: Some of the descriptive text and diagram text implies overall system behaviors beyond that of a simple PAN-IF. In other words, the PAN-IF does not know if it is the "wrong user", an "incorrect equipment usage" or an "un calibrated device". The PAN-IF can only report the data that the healthcare device claims is the "users" identification, the "equipments usage" and the status of the device's calibration. It will be a combination of application hosting device (AHD) SW intelligence and healthcare device user interface design that enforces and screens for "wrong things".
Data "provenance": sequences of Continua interfaces:	
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available – WAN-IF ☐ Suitable SDO available – xHRN-IF ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion New technology? Standards development? New Continua interfaces? Modification to Continua	If "provenance" is only a "significant event" post mortem or forensic analysis sort of goal, then existing E2E architecture requirements of logging are all that is necessary and we are mostly done.

interfaces? Other changes?	However, if “provenance” is a more “run time’ or “for this specific message at this specific instance in time”, then we need to extend the data model flowing over the WAN (as yet, undefined) and xHRN interfaces to include attributes that describe the authenticated identity of the device that is sending the information.
Additional Comments	In the current Continua Requirements there are currently “logging” and “non-repudiation” type requirements in the E2E section that are intended to cover some of these information reliability and authenticity issues.

Date	12/30/07
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Development of standards (or extensions thereof) for: 1.) PAN Device Capability 2.) PAN – AHD Interface 3.) AHD Device Capability It really depends on the final requirements (as discussed below). For example, Patient Authenticity can range from a simple user interaction to an RFID integration.
Additional Comments	The challenge of this Use Case is not so much the technical aspect of it as much as it is in garnering industry-wide support for a particular approach as it impacts organizations across the Continua spectrum (i.e., PAN Device to Service Consumer). Before serious standards work can start, it will be necessary to refine the vision using white papers and requirements. The scope of this UC is potentially very broad. It would be useful to narrow it down further and possibly work as separate projects. For example: 1.) Device Authentication 2.) Patient Authentication 3.) Data Integrity 4.) Data Quality

	I think the items mentioned below are comprehended in the current V1 standards: 1.) Data flagged as taken either in a Continua or a clinical environment 2.) Device provenance established – Continua compliant yes/no

16. Pro12 Data upload on the WAN

Document Control

Version	Date	Change Description	Status
1	September 19, 2007	Initial version based on abstracts	
2	October 4, 2007	Added some additional detail	
3	October 9, 2007	Added detail on usage flow to AHD from server	Open, In Development

Project Abstract

Title	UC 12 - Enable the upload of measurement data on the WAN interface
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	V1 does not implement the WAN interface, which is needed to enable data upload on the WAN interface as described in this use case. However the concept of getting the measurement data from the user to the service/professional is the basic functionality of telemonitoring and was present in multiple V1 use cases: A001 – track fitness information A004 – track fitness information for multiple users A007 – episodic and non-acute remote patient monitoring A008 – continuous and acute remote patient monitoring A012 – track elder information A014 – monitor activities of daily living
Description	Enable the upload of measurement data (or alarms) from the home/mobile to one or more services in a generic way that works across the different domains (HF, AI, DM), that is scalable and puts minimal constraints on the home side of the connection. As well as enabling the download of commands and alerts from the remote server to the home/mobile AHD. Special attention is needed for security and privacy since we will be transferring personal health data across a very insecure medium. It is important to have alignment/cooperation with project teams • 10 “Information sharing and E2E security” • 11 “Data reliability and authenticity”
Scope	This use case addresses the WAN interface of the Continua eco-system. On the consumer side devices like mobile phones, TVs, set top boxes, computers, and Telecare units are involved. On the service side computer servers are involved.
Actors	Consumer Service Care provider
Minimal Guarantees	In case of failure, the data would not be off loaded from the AHD and the remote server would not receive the data. Or for download the AHD and device would never receive a desired command.
Success Guarantees	In the case of success, the remote server would receive the data in its complete and accurate form, and the AHD could take its appropriate action knowing the transmission was completed successfully. Or for download, the AHD would receive the desired command and take the corresponding action.

Trigger	This event is triggered by an application running on the AHD that desires to send data to the remote server. Or in the case of download, the remote server application desires to send a command to the AHD. Either of these may or may not be in reaction to some external event.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Aging Independently There is no current standardized protocol for transferring AI related data over an IP based WAN link. Existing Social Alarm and Telecare systems typically utilize analogue transfer techniques over POTS PSTN links. Some AI data may not be considered real-time critical (eg batched Activities of Daily Living data, reminder configuration information etc) which can be stored and forwarded later should a link not be available. However, other AI data may need to be transferred to support a real-time critical alarm situations (such as for A017 – respond to emergency). In such cases, link availability and reliability are major considerations (possibly requiring contingency solutions). This project would seek to establish Continua endorsed requirements for, and specification of, an open protocol for transport of both the above data categories over IP data links. Health & Fitness There is a need to extend the data produced by fitness devices to software and services that may reside outside of the home. Additionally, this data may need to be sent to more than one destination service. Destinations may include PHRs, coaching and personal trainer services, employer wellness programs and others. Disease Management The Healthcare professional has a large panel of 4000 patients to manage, all diabetics in varying stages of control. His office is able to manage that large a population by utilizing an interactive internet based software program that tracks each patient's remote biometric data. When that data is uploaded it is presented in reports and graphs that indicate how well that individual is managing his/her condition as well as managing the population as a whole looking at aggregate analytics. The professional can utilize the online software to check alerts for patients that are exceeding healthy thresholds, and look at flagged lists of patients who are the next less severe level based on results. These views allow the healthcare team to triage and more efficiently manage the large number of patients in their care Generic It is recognized that the bulk work that needs to be accomplished in these examples is independent of the domain. Or in other words, the primary work being done is independent of the payload. In the standards work that was done to build the device interface base there has been a body of thought developed on how to characterize and discuss payload transfers from one device to another. As almost all data that is to be transmitted across the WAN interface originated from communication with a PAN device, it is strongly suggested to consider the IEEE PHD format when evaluating the standards for the WAN interface.

	In the foremost case or at least the beginning case the AHD will do minimal or no processing of the data. So larger the mission becomes taking a PHD payload, appending a few tidbits of relevant AHD data (timestamp, device ID, etc.), and transmitting the data safely and securely to the specific target remote server. Even though the data payload is viewed generically like this it is still useful to characterize the data as it has been discussed in the PHD work into 5 fundamental types: • Episodic – data for single asynchronous incident • Streaming – continuous stream of real time data • Document – arbitrary large collection of data • Control – communication that commands the receiver to alter its behavior • Alarms – communication that carries a variable sense of urgency By this categorization we can fragment the problem, as the mechanisms chosen to move the payload would have to match the underlying needs of each category. For the chosen scope of this project, the data types would be mapped to communication means that have the needed corresponding QOS properties expected by each data type. Further project discussions would encompass: • Requisite security and privacy for the particular category • Information model conversion(s) if desired. • Data format (binary, XML, etc) As it is general purpose, this work could also serve as a basis for other Continua uses. Basic Flow 1) AHD → Remote Server Fundamentally the flow is to deliver data contained on the AHD to an arbitrary server via a WAN interface. The precise steps to accomplish this would be determined as part of this work but would be probably consist be along the lines of: 1) AHD has data that it wants to communicate to a remote server. This data probably comes from attached devices but could be other data as well. It may be a single data point or a collection of many data points. 2) The data is augmented. The specifics of this would have to be ironed out but it would probably entail augmenting the data with some additional data such as device ID, timestamp, PID, or any other needed relevant data for this flow. 3) The data is prepared for transmission. Here the data could be converted (information model and/or format). Then the required security and privacy measures would be enacted (the required security may also be done by the transport utilized). 4) The data is sent. 5) Optionaly there could be an acknowledgement that the data was received successfully by the remote server

	2) Remote Server → AHD Typically this flow is to deliver low volume traffic such as command data from a remote server to the AHD via a WAN interface. The precise steps to accomplish this would be determined as part of this work but would be probably consist be along the lines of: 1) The remote server has command data that it wants to communicate to an AHD. This command may be for use by the AHD or could be ultimately for use by a device attached to the AHD. 2) The data is augmented. The specifics of this would have to be ironed out but it would probably entail augmenting the data with some additional data such as remote server ID, timestamp, target AHD ID, or any other needed relevant data for this flow. 3) The data is prepared for transmission. Here the data could be converted (information model and/or format). Then the required security and privacy measures would be enacted (the required security may also be done by the transport utilized). 4) The data is sent. 5) Optionaly there could be an acknowledgement back to the remote server that the data was received successfully by the AHD.
Failure Modes	Failure could be caused by any number of failures in the transportation of the data. This could be.. • At the AHD – memory limitations, transport connectivity, hardware failure • In transit – any of a wide range of failures that may happen in any intermediate node and equipment used in the communication path • At the remote server - memory limitations, transport connectivity, hardware failure This system impact of this failure depends on the importance of the particular data being transported. It can be alleviated by any number of means to improve the connectivity system path. From an application level, the employment of some manner of application acknowledgements can be employed so that the AHD software knows for certain that the data arrived before it does any processing that may delete or alter the internal copy of the transmitted data
Diagram (optional)	

Continua TWG feasibility review

Date	1/10/2008
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available

	☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	This is the WAN Service interface- some of this work was started earlier but set aside. This is a new interface but the current architecture already comprehends. Probably useful to split problem of payload definition from problem of payload delivery and work issues separately. Theoretical steps: i. select an existing standard to use for delivery mechanism i. decide PHD to WAN payload mapping – decide meta-data needs i. decide whether a new payload profile is required – may not be if a simple encapsulation of PHD data with some simple meta-data approach is used – then Continua guideline can describe constrain chosen standard and provide payload description v. if new payload profile is required then form and launch that group asap as this will be the schedule gating factor
Additional Comments	Probably need to fragment problem into at least three pieces and work them in parallel on their own schedules: 1) (episodic) AHD->server – first priority is to cover current V1 PAN needs 2) (control/alarms) AHD->server->AHD – probably next simplest problem 3) (streaming) AHD->server – more complex mechanism and requirements

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market

Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	1) select an existing standard to use for delivery mechanism 2) decide PHD to WAN payload mapping – decide meta-data needs 3) decide whether a new payload profile is required – may not be if a simple encapsulation of PHD data with some simple meta-data approach is used – then Continua guideline can describe constrain chosen standard and provide payload description 4) if new payload profile is required then form and launch that group asap as this will be the schedule gating factor his is the WAN Service interface- some of this work was started earlier but set aside. This is a new interface but the current architecture already comprehends. This might take longer than 9 months if done in groups like W3C. Also, if this ends up as a harmonization with other medical related standards (e.g., HL7 SOA), the timeframes are typically longer than 9 months.
Additional Comments	Probably need to fragment problem into at least three pieces and work them in parallel: 1) (episodic) AHD->server – first priority is to cover V1 PAN needs 2) (control/alarms) server->AHD – probably next simplest problem 3) (streaming) AHD->server – more complex mechanism and requirements One of the reasons this interface was set aside for V1 was the lack of vendor support. In order for this to be implemented, there must be a market and business model that supports companies interoperating on both sides of this interface. The UC voting will hopefully provide some insight in this regard.

17. Pro13a Low power LAN

Document Control

Version	Date	Change Description	Status
1	September 20, 2007	Initial draft version based on abstracts	
2	September 24, 2007	Incorporates feedback on the first version	
3	October 8, 2007	Updates to focus more on the actual usage	
4	November 25, 2007	Defined new requirement to distinguish the 13a and 13b. Other minor refinements.	
5	November 29, 2007	Minor updates	
6	December 3, 2007	Minor updates	Open, Partially Complete

Project Abstract

Title	UC 13a - Enable connectivity with sensor devices in a whole house, fitness centre or on a campus (Low Power LAN)
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	V1 does not implement an interface that is suitable to be used for battery operated sensors that are placed around the house, fitness centre or on a campus and should have a battery life of months to years. V1 has specified a device proxy for AI that is related to this topic; however that is not enough to enable true interoperability.
Description	Enable sensor devices in and around a residence/living facilities campus/fitness centre to be integrated into the Continua eco system. Important aspects are: • Range of such a network is in the order of 10s of meters to 100s of meters • Number of devices on the same network is in the order of 10s to 1000s. • The sensor devices are either connected to the power or battery operated, while the data collectors are usually connected to power. • The location of sensor devices can be fixed or mobile (up to walking/running speed), while the location of data collectors are usually fixed. • Flexible quality of service settings. Some use cases require very high reliability while other use cases require low latency with less focus on reliability. • Battery operated devices should consume very little power for transmission and related operation, solutions for reducing power consumptions can be duty cycling, fast connection time, etc … • Security should be taken into account, since the data might be privacy sensitive (e.g. some use cases require link security). • Coexistence under external interferences is important, both with other

	networks and RF technologies (home & medical environment: e.g. MRI, X-ray, 802.11, microwave oven, portable phones, cellular, WLAN),, but also with the same network type used in adjacent residences • The network should be "body friendly" (not harmful to humans) • For non-buffered data uploading, the required raw data rate per sensor varies between a few Bytes per hour (e.g. a door sensor that indicates when a door is opened) up to a few KBytes per second (e.g. continuous streaming of fitness data in a fitness centre). • The solution should support localization, both indoor and outdoor.
Scope	This use case addresses the LAN interface of the Continua eco-system. So far the LAN interface discussion in Continua has evolved around the concept of an IP LAN (Ethernet/wifi). However demanding IP capabilities from small devices is probably not feasible. Therefore this use case proposes a Low Power LAN that is more suitable for small sensor devices with limited processing and energy capabilities around the house or on a campus. One or more suitable wireless transport solutions are expected to be chosen by the TWG to meet these requirements, as well as to support wide availability and connectivity to managers, hubs and gateways. The chosen technology should be approved by international regulatory bodies, and must be able to operate at an appropriate frequency for the geographical location of use. This project does not concern how the data is measured, structured and stored by the sensing devices, that is considered to be internal to the sensing devices. The focus of this project is to enable new use cases in Continua by adopting a more power efficient and larger range transmission method than currently available within Continua.
Actors	User
Minimal Guarantees	Privacy sensitive data is not inappropriately shared with others.
Success Guarantees	The captured data is transmitted to the appropriate devices and privacy sensitive data is not inappropriately shared with others. The user is not constantly replacing batteries.
Trigger	The user is interested in capturing data from sensors around the house/campus/fitness centre.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Aging Independently 1 Lifestyle Reassurance utilises telecare sensors in conjunction with additional sensors which record, for example, the use of electrical appliances, how often cupboard or fridge doors have been opened, and how often certain areas of a property have been accessed. This enables a number of indices to be derived relating, for example, to mobility, nutrition and bathroom usage, and a pattern of normal activities of daily living to be established. These patterns can be monitored over time to interpret improvement or decline in a person's condition, or as part of assessment to inform the development of a support plan. All of these sensors need to be connected to the mentioned telecare unit. The sensors can be connected to the power, but can also be operated by batteries (e.g. when there is no power outlet nearby or when the sensor is mobile/body worn) Aging Independently 2 Mary, a 75 year old lady, recently moved to a grouped housing facility. She is

	able to take care of herself most of the time, but due to her aging she likes the reassurance of having support nearby in case she needs it. She lives by herself in one of the apartments on the grouped housing campus. Her apartment contains a number of sensors (smoke, gas, flood and fall sensors) that signal the support staff when an accident happens. She also carries a pendant that includes an emergency button. When she pushes the button, help will be called. During the day Mary likes to take a stroll on the campus and in the evening she often plays domino with a few of her friends in the main building on the campus. She knows that her emergency button will always work when she is on the campus, also when taking a stroll or when playing domino in the main building. The support staff told her that whenever she pushes the emergency button, they will immediately be notified and can also see where on the campus she exactly is. This gives her a very comfortable feeling and because of that she keeps doing her daily stroll, trying a new route every day. Health & Fitness Fitness centres can put sensors in all the fitness equipment. Many devices will not be connected to the power outlet and are either battery operated or powered by the energy generated by the exerciser. These devices will report their data to a central device in the fitness centre (application hosting device). In order to connect all of these devices a proper network needs to be in place. Disease Management It would be most convenient if the measurement devices that are used in DM can be put in their "normal" place: weight scale in bathroom, blood pressure cuff in the living room, etc). The technologies that are adopted in Continua V1 might not be able to support this, due to range limitations. A network that covers the whole house will be better able to support this usage scenario.
Failure Modes	• Network configuration is too complex and the data is not communicated to the appropriate devices. • Network is insecure and privacy sensitive data is inappropriately shared with others. • Network is not co-existent and communication fails when other networks are in the vicinity. • The sensor device cannot continue its proper operating status for a sufficiently long time, due to the unaffordable power consumption of transmission
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF

	☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	While some technology is available, it is difficult to speculate on the timeframe and effort until we decide on a specific technology. For example: Z-Wave: available today ULP: available ~ 1 year Low Power WiFi: TBD availability If a different technology is selected for different domains, then the UC may need to be split out as they will become different efforts with different requirements / timeframes. The use case fits within the overall architecture. The only potential technology issue is localization, and how it is coordinated among different techniques. For example, existing technologies may not support LAN-based localization while outdoors, but GPS does not work indoors. How is the hand-off to be managed when the patient enters a building?

Additional Comments	The UC description uses the term “LAN”, but also notes that IP is not likely. It might be useful to drop LAN from this UC as this already has several connotations and is defined as a different interface in our architecture (e.g., IP based; wall powered, service rich, AHD-AHD)- see UC #27. It would be useful to clarify the following UC requirements: 1.) The chosen technology should be approved by international regulatory bodies [which ones?] 2.) The chosen technology must be able to operate at an appropriate frequency for the geographical location of use. [which geographies]? The UC states *“This project does not concern how the data is measured, structured and stored by the sensing devices, that is considered to be internal to the sensing devices.”* It makes sense that we would not care about the device internals, but is this also further stipulating that we disregard the protocol / data that is sent over the network? If so, how do we obtain interoperability? The UC calls out several requirements that can be orthogonal to each other (e.g., low power, high range, excellent co-existence). It would be useful to get a sense of priority around these or perhaps some discussion about minimal acceptance (e.g., are 100 meters and 10000 devices hard requirements?).

18. Pro13b Ultra-low power sensors on or near the body

Document Control

Version	Date	Change Description	Status
1	September 20, 2007	Initial version based on abstracts	
2	September 24, 2007	Incorporates feedback on the first version	
3	September 24, 2007	Refined the requirements.	
4	October 10, 2007	Incorporating more usage related content, supplied by the various members	
5	November 14, 2007	Highlight the requirements for ultra low power transmission. Removed irrelevant or unnecessary parts, in order to make the doc looks simple and straightforward.	
6	November 25, 2007	Defined new requirement to distinguish the 13a and 13b. Other minor refinements.	
7	November 28, 2007	Refined the requirements and text.	
8	November 29, 2007	Minor updates and resolving open comments	
9	December 3, 2007	Minor updates	Open, Partially Complete

Project Abstract

Title	UC 13b - Enable ultra low power connectivity with small and unobtrusive sensors on and near the body (Ultra low power BAN)
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	When defining the PAN interface in V1, the demands of on- and near-body sensor devices, which usually have small size, unobtrusive battery and limited resource, were not properly considered. Such demands include low energy consumption, low cost of stack implementation, small memory size, low latency of connection, etc. To satisfy these demands, as well as to extend the scope of the Continua architecture, new requirements about ultra low power connectivity will be defined in this project. One or more suitable transport solutions are expected to be chosen by the TWG to meet these requirements.
Description	Enable on- and near-body sensor devices, which usually have small size, unobtrusive battery and limited resource, to be integrated into the Continua eco system. These devices usually cannot afford the energy consumption caused by the normal local wireless communication (e.g. Bluetooth or WLAN), or/nor the normal cost of memory size and stack implementation. They need a specifically designed ultra low power transmission solution to transmit the data, while at the same time minimizing the energy and cost towards an affordable range.

Below is a collection of typical features or requirements which the targeted sensors usually have. However, this does not mean every sensor within the scope of this project possesses all the listed items. Due to different implementations, some sensors might have only a subset of the listed items which specifically need ultra low power connectivity.

- Range of such a network is in the order of meters
- Number of devices on the same network is in the order of 1-10s.
- Typically, both the sensor device and the data collector use battery for power supply. In some use cases (e.g., watch is involved), both of them use specially designed power supplier which provides extremely limited power resource. The examples of such power suppliers include: environmentally friendly button-cell batteries, thin flexible batteries and energy scavenging power. This inherently puts strict requirements on power consumption over both sides.
- Devices can survive with ultra low power consumption for a sufficiently long period (battery operated or energy scavenging?). Here, only the consumption caused by transmission and related operations are taken into consideration. This can be achieved by, e.g., solutions include duty cycling and fast connection/fast transmission.
- Flexible quality of service settings. Some use cases require very high reliability while other use cases require low latency with less focus on reliability.
- Privacy aspects should be taken into account, since the data might be privacy sensitive for some use cases (e.g. some use cases require link security).
- Coexistence under external interferences is important, not only with other networks and RF technologies (home & medical environment: e.g. MRI, X-ray, 802.11, microwave oven, portable phones, cellular, WLAN), but also with the same network type used by other persons in the vicinity.
- The network should be “body friendly” (not harmful to humans) for the on- and near-body areas.
- For non-buffered data uploading, the required raw data rate per sensor varies between a few Bytes per hour (e.g. body temperature measurement once per hour) up to a few KBytes per second (e.g. beat-to-beat heart-rate data at 200 measurements per second).
- For buffered data uploading, the required raw data rate per sensor is up to 1Mbps, (e.g. a collection of limb movement data for the whole night of sleeping, one measurement per second per limb for 10 hours).
- The network shall support at least the following three transmission modes which are often used by the use cases within the scope of this project. (Although there are no clear definitions of the following terms, such as high, low, and moderate, but one may always refer to either the above data rate or the use case examples below to get a rough idea of them.)

	frequency of sending data burst	size of each data burst	overall transmission (radio) time	UC example
1	moderate	moderate	short	HF2 DM1
2	high	small	moderate	HF1 DM1
3	low	large	very short	AI1 HF3 DM2

Scope	This project addresses the on- and near-body sensor devices which have special demands for ultra low power connectivity. An ultra low power transmission solution shall be specifically defined to minimize the transmission power, the related stack implementation cost and the corresponding memory consumption. One or more suitable wireless transport solutions are expected to be chosen by the TWG to meet these requirements, as well as to support wide availability and connectivity to managers, hubs and gateways. The chosen technology should be approved by international regulatory bodies, and must be able to operate at an appropriate frequency for the geographical location of use. This project does not concern how the data is measured, structured and stored by the sensing devices. This project does not concern how the data is further processed by the hosting device. This project does not concern how the data is uploaded to WAN interface. This project only concern how the measured data can be transmitted to host with limited resource.
Actors	Sensors, data collectors and users.
Minimal Guarantees	Privacy sensitive data is not inappropriately shared with others.
Success Guarantees	User is able to monitor body parameters without being hampered by the sensors he is using. The measured data is transmitted to the appropriate devices and privacy sensitive data is not inappropriately shared with others. The device can survive for a sufficiently long period with limited power resource for transmission. The communication unit of the device can be implemented with cheap cost.
Trigger	The user wants to monitor body parameters with minimally-obtrusive sensors, often for a prolonged period of time (e.g. not just one single measurement).
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Aging Independently 1 An elderly person with Parkinson's Disease is remotely monitored with on-body sensors (in-home and mobile monitoring). The patient's movement and muscle rigidity data is stored (up to several days of data). For monitoring purpose, such data can be collected aperiodically by intelligent program or care giver. Each data transmission can be completed within a very short time. Health & Fitness 1 Jack is doing his long-distance running exercise. A group of sensors (heart rate, breath, step counter, speedometer, accelerometer, etc.) have been attached on his body to monitor his activity. In order not to hamper his movement, these sensors are built with unobtrusive size and limited resources. These sensors periodically transmit the measured data to the mobile phone or watch carried by Jack. Health & Fitness 2 Jack is playing in a tennis game. He has wearable sensor on his body, and has implanted sensor in his racket. His motion and action during each play are measured and stored. During the resting time interval or as requested, these data are uploaded to a receiving device near the playground. His coach and the surrounding audience can browse such data whenever they want.

	Health & Fitness 3 Jack is conducting a tennis training. He has wearable sensors on his body, and has implanted sensors in his racket. His motion and action are measured and stored. Once he has finished his training and is approaching his mobile phone, the stored data will be automatically and quickly uploaded to it. Disease Management 1 For certain diseases it is important to measure specific vital signs (e.g. non-invasive blood pressure) for a prolonged period of time (days to weeks or even longer). Such sensors should be very small and unobtrusive (e.g. sensors integrated into a bandage). The devices should consume very little power and use a battery as small as possible (maybe even no battery, but only energy scavenging?). The data from these sensors will be communicated to a device on or near the body (e.g. mobile phone), which will distribute the data further in the Continua eco-system. Disease Management 2 John uses a small, hand-sized, portable, personal medical device which is capable of collecting, storing, and transmitting health data (Example: a blood glucose meter). Throughout the course of his day, John is away from his home base but uses his portable device to collect and store his health data points (Example: blood glucose measurements). When John comes into the operable proximity of a Continua device which is hosting an ultra low power radio network, he can transmit his health data to the device using the ultra low power mode. Variations: The transfer of the data might be initiated by any one of the following: • John (patient) • John's Health Care Professional • automatically upon the device sensing the network and authenticating itself (this assumes John has previously configured/authenticated for the network). The data transferred may be: • batch transfer of all the data resident on the portable device • batch transfer of data as it is being collected, presumably on the order of seconds/minutes between data points (NOT on the order of milliseconds)
Failure Modes	• Network configuration is too complex and the data is not communicated to the appropriate devices. • Network is insecure and privacy sensitive data is inappropriately shared with others. • Network is not co-existent and communication fails when other networks are in the vicinity. • The device cannot continue its proper operating status for a sufficiently long time, due to the unaffordable power consumption of transmission.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☒ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Need time to select transports within Continua. Meanwhile you could be building corresponding med profile std for all competing transports. I'm not sure if a satisfactory SDO is available for all transports under consideration. Need to double check that transport and 20601 are compatible, otherwise it would need 20601 extensions. Develop BAN interface and Interoperability Guidelines
Additional Comments	Would still need to build the standards/guidelines for the devices that would use this interface Could RF be used to accomplish this?

19. Pro16 Integration as a service

Document Control

Version	Date	Change Description	Status
1 2 3 4 5	4 Sep 07 26 Sep 07 1 Oct 07 4 Oct 07 1 Dec 07	1. Initial version. 2a. Use case expansion 2b. Peer review feedback incorporation 2c. Illustration (embedded and separate .pps) 3a. Third version: peer review feedback incorporation, further use case illustration, applicable B2B scaleable computing / infrastructure model, scale/timeline for company/end-user recruitment and pilot build 3b. Compaction and clarification for readability. 4. Separation of short illustrative proposal (abstract, annotated headings and illustrations) from extended proposal with full details. Short document to be submitted to UCWG. 5. Simplification of the UC to its essential purpose, post Boston meeting feedback.	Closed, Not Approved

Project Abstract

Title	UC 16 – Integration as a Service (IaaS)
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Purpose	The Continua Health Alliance faces a significant issue of complexity control. Interoperability, which is confounded by complexity, is a formidable problem to solve where large numbers of participants, devices, guidelines, information systems, use cases, local policies, etc. interact. There is currently lack of simple, scaleable reference mechanisms that can constrain real-world choices that are required to make Continua-based interoperability 'scale' in the field with high reliability. To fill this gap, this use case proposes the concept of an integration service (IaaS) operating over a simple web client. The purpose of the Continua IaaS would be to 'fit' a precise combination of Continua devices/service specifications to structured 'needs' described by end-users. As part of doing this, IaaS would provide a key assurance policy for (i) preventing implementation of non-recommended combinations of Continua devices or services in a given application/location or (ii) ensuring devices or services currently in development are constrained to one set of interoperability specifications. The integration service is underpinned by understanding of the origins and prevention of complexity in interoperable systems. Applying this learning*, the proposed service uses a reference algorithm that can be used at local, regional, national or global level to minimize complexity and promote interoperability. **Published in Benson, T. (2007) Prevention of Errors and User Alienation in Healthcare IT Integration Programmes, Informatics in Primary Care 15: 1-7.*

Relation with implemented V1 use case(s)	None.
Aim	To progress, this use case requires a number of Continua participants to come forward who are directly interested in the problem of complexity reduction and/or development of a systematic approach to safety. The aim is to proceed to a proof-of-principle, pilot-scale build of the integration service called IaaS. It is proposed on a mutual benefit, vendor-neutral basis. The pilot requires submission of approx. 30 Continua device descriptions and approx. 30 end-user 'need' profiles that are highly-differentiated to be valid. Participation in the trial will be free and is intended to be part of a risk reduction strategy for sustaining the Continua 'ecosystem' principle. Progression is also subject to a successful funding case (initially, from public agencies promoting interoperable health technology systems). Demonstrating interest from a number of Continua companies would be essential to credibility and hence success of this funding case. The integration model will be rigorously multi-vendor and end-user neutral and covers data devices, supporting information services and associated platform technologies applicable to the assistive care, personal H&F and disease management domains. A more detailed description of the proposal can be supplied along with illustrations.
The case for an integration service.	1. Creation of robust, scalable mechanisms for controlling system complexity in future device-service networks is a strategic consideration for Continua. The impacts of unforeseen complexity have been discussed in UCWG and form one focus for the interoperability risk subgroup. More recently, the TWG has discussed its concerns for the Continua mission (citing how *making choices more restrictive* across available network technologies, messaging schemes, and data models is vital: http://www.continuaalliance.org/apps/org/workgroup/twg/download.php/2232/How%20about%20our%20objectives.doc). But then there is the massive *additional* variety of potential *domain end-user derived complexity* from device/service functionalities represented in the Continua space - so much so that many future applications are difficult to predict now (e.g. USB interfaces that are currently applied in many ways unanticipated by its designers). When an untrained end-user selects a set of cross-vendor devices and services to combine 'in the field' (towards solving a specific, real-world problem) there is no real understanding or evidence of the application scenario's emergent risks. From a medical device (risk analysis) point of view, the *precise* scope-of-application (with its individual end-user scenario details) needs a simple, consistent method to evaluate choices/combinations of devices and services that are available to them. Issues of unplanned complexity are likely to increase as the number of devices increases. In these cases, the point of an integration service (e.g. as part of a system deployment step practiced by end-users) can act as an assurance to proactively identify and eliminate 'non-recommended' combinations of devices and services. A free-for-all 'ecosystem' presents natural barriers to 'scalability'. 2. The integration service could be set up to deliver devices or services that adhere to specified local policy requirements, and can evaluate all complex factors that apply to the local implementation. These local policies can refer to regional, national, continental or global policies automatically if the policies are electronically captured and stored on accessible servers. 3. The integration service could (i) analyze detailed end-user requirements, policy definitions of the operating environment including (if relevant) competence certification of frontline staff, specialist purchasing staff, independently-commissioning

	healthcare professionals, or individual self-carers. (ii) Execute logical data statements (evidence-based algorithms) to identify the best 'fit-to-need' of hardware and software combinations whilst retaining positive selection pressure for device-to-information system-level interoperability. 4. The integration service could 'shield' the end-user from too much information in keeping with Continua's aim for end-user simplicity. Complex evaluation-based policies can be routinely applied in the background, including ones that are not in use yet. For example, the integration service could apply a future policy for reducing waste in the Continua supply chain, evaluating data for carbon footprint scoring, energy efficiency and recycling – and presenting to the end-user only those devices/systems that meet the policy criteria. 5. The integration service could be used to evaluate interoperability compliance for large numbers of devices in circulation *versus* those in development – such a service is useful to make "plug & play" work, especially across Continua release versions (V1.x, 2.x, 3.x etc.). 6. The integration service could more reliably bring consumers and suppliers together with ecosystem constraint/complexity control, but this will require Continua device and service specifications to be consistently defined (e.g. in structured XML statements) to enable the integration service algorithms to work. 7. The integration 'service' could operate as standalone software package or as part of an enterprise service bus (ESB) to support a scalable 'ecosystem' of devices available to the service bus. Although the IaaS is not *dependent* on a service-oriented architecture approach, it would clearly be made more efficient if *integrated to* a scaleable ESB/multi-vendor platform/SOA. 8. As part of the proposed pilot, the integration service would compare device or service profiles submitted as XML-based descriptions on a secure form to capture demand-side (procurer / practitioner / end-user / patient) requests as "articulated needs". All transactions would be monitored and acknowledged appropriately (e.g. submission steps, device database entries, queuing, prioritization, security mechanisms). Updated device specifications from participating suppliers would be automatically handled *via* the integration service. The service could efficiently address/publicize known errors, device / application incompatibilities or safety issues. If a safety issue arises anywhere in the world, end-users would have the capability to raise an alert through their normal requisitioning / procurement system. Safety alerts would be immediately exposed as a potential / likely / known / solved issue to all affected suppliers. 9. User benefits for participation include improved patient safety through complexity reduction, simplified field interoperability testing with early warning of problems and error reduction (e.g. ordering or specification errors). Supplier benefits include an additional protection mechanism from litigation (e.g. in the safety reporting example) and testing for compatibility issues in planned market offerings. 10. To progress, the integration service concept requires Continua company interest, participation in the pilot and support in the V2 ballot.

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☐ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months (simple list on the website) ☒ Between 9 and 18 months (web based decision support tool) ☒ Longer than 18 months (real time checking)
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	In order to enable this the appropriate device descriptions and end-user 'need' profiles will need to be identified and standardized. This is a non-trivial assignment! A "design-time" Integration as a Service can be realized separately from the Continua architecture (e.g. a database with all device descriptions). A "run-time" IaaS that in real-time determines if a device can/should be used with the existing devices already in use will need to be integrated with the Continua architecture and is considerably more complex. Define structure of component definition tables – (base on requirements and inter-op guidelines?) Define compatibility scenarios and associated rule-sets Define UI minimum requirements.
Additional Comments	This UC can be improved by sketching an implementation roadmap (or splitting the use case into various separate use cases). It could start as simple as a list on the Continua website and become as complex as a real time check when a user connects a new device to his existing set of devices. By sketching a roadmap it will become clearer how this can be implemented and in what timeframe. Do we have 30 devices? This is a support/configurator tool and falls outside architecture and development scope as currently considered.

	Need to consider scope in terms of cross-theme as well as inter-version applicability and support. Could be extended to support equipment tracking/service records?

20. Pro19 Multiple new biometric devices

Document Control

Version	Date	Change Description	Status
1	September 7, 2007	First draft synthesis of Project 2 Modified to focus on devices not covered in V1	Closed, Time Expired

Project Abstract

Title	Unified device communication protocol for heath care monitoring
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Abstract	Create a unified device communication protocol for heath care monitoring that includes a comprehensive library of remote biometric devices that are uploaded into PHR records. For this V2 version these devices can include exercise keys (TechnoGym) that collect exercise data to be uploaded to the PHR and PT-INR for coagulation monitoring. This scenario is agnostic to brand and type of device Communication can occur via serial or USB cable, IrDA link, POTS or Bluetooth.

21. Pro20 Complete Medication Tracking

Document Control

Version	Date	Change Description	Status
1	September 7, 2007	Abstract creation	Closed, Time Expired

Project Abstract

Title	ECG Device
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Abstract	Complete medication tracking, from ordering to filling to administration. The solution should extend beyond prescriptions and include over-the-counter medicine and supplements.

22. Pro21 Fluid Monitor Device

Document Control

Version	Date	Change Description	Status
1	November 29, 2007	Document creation	Closed, Time Expired

Device Description

Title	UC 21 – Fluid monitor device
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Connectivity	☒ Wired ☒ Wireless
Device Type	☐ Actuator Device ☒ Measurement Device ☐ Display Device ☐ Other Device

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua	Develop appropriate standards as needed to support this new device and the data it will send on the PAN interface Create new x73 device specialization

interfaces? • Other changes?	
Additional Comments	

23. Pro22 Peak Flow Device

Document Control

Version	Date	Change Description	Status
1	November 29, 2007	Document creation	Open, In Service

Device Description

Title	UC 22 – Peak flow device
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Connectivity	☒ Wired ☒ Wireless
Device Type	☐ Actuator Device ☒ Measurement Device ☐ Display Device ☐ Other Device

Continua TWG feasibility review

Date	2007.12.21
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua	First Reviewer: Not enough detail to perform a review. Second Reviewer: All that would be needed is to define an IEEE Device Specialization for this.

interfaces? • Other changes?	
Additional Comments	Second Reviewer: □ In spite of the lack of complete documentation, from earlier conversations with folks, I believe that UC22 Peak flow meter, might be intended to be a spirometer (http://en.wikipedia.org/wiki/Spirometer). If that is the case, I see this as simply a new measurement device and it would be straight forward to support. □ Even if this is really a simple, regular peak flow meter (http://en.wikipedia.org/wiki/Peak_flow_meter), it is still just a new measurement device and would be straight forward to support.

24. Pro23 PT INR Device

Document Control

Version	Date	Change Description	Status
1	November 29, 2007	Document creation	Open, In Service

Device Description

Title	UC 23 – PT INR Device
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	Extends v1 use case A007, the core Disease Management use case.
Connectivity	☒ Wired ☒ Wireless
Device Type	☐ Actuator Device ☒ Measurement Device ☐ Display Device ☐ Other Device

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces?	Create new x73 device specialization I think the basic problem is building the requisite PHD specialization standard. This should be a fairly quick and straightforward work item.

• Other changes?	
Additional Comments	

25. Pro24 Insulin Pump Monitoring

Document Control

Version	Date	Change Description	Status
1	9/25/2007	Initial Draft	Open, In Development

Project Abstract

Title	UC 24 - Insulin Pump Monitoring
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	- Extension of "A007 – Episodic & Non-Acute Remote Patient Monitoring" - Incorporate Insulin Pump data in addition to other data - Compared to the measurement devices (e.g. blood glucose) that are collecting data upon request, an Insulin Pump is an actor (infusing insulin) and collects data while in operation. The additions (changes) to the A007 UC are marked in bold
Description	The cornerstone of a chronic disease management ecosystem is the ability to remotely collect data about the patient in an episodic fashion for non-acute purposes and share it with their caregivers. Being able to track this data is the first step towards managing a patient with one or more chronic diseases. The collection of data will take place in the personal and home setting of the patient (e.g. at home, at work, on the move). Typical patients would include those with a medium to low severity condition where immediate communication of data and streaming data is not required.
Scope	Mobile and residential health devices, compute engines and services. The scope of this use cases includes the collection of data on and around a patient and the distribution of this data to the patient's caregivers. Patient feedback & interaction (either automatic or from a professional) is not included in this use case. This is part of a vote-able use case. Continuous and high acuity monitoring (e.g. for emergency response) are out of scope of this use case. This is part of a vote-able use case.
Actors	Primary Actor: James has multiple chronic conditions (CHF, Diabetes, Hypertension), is 65 years old and retired; ~~he has some declined cognitive and motor skills.~~ He has insulin-dependent diabetes mellitus and is running either a CSII (Continuous Subcutaneous Insulin Infusion – Insulin Pump) or ICT (Intensified Conventional Therapy – Insulin Pen) Therapy. Successful operation of an insulin pump requires sufficient vision and hearing. Supporting Actors: Remote Patient Monitoring service James' caregiver
Minimal Guarantees	All device values are able to be read locally, no interference with operation of insulin pump.
Success Guarantees	User's device values, including insulin pump values are available to the user and to the remote disease management service and health care professionals

Trigger	Initiation by user
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Precondition: James is enrolled in a remote patient monitoring program. James has access to required utilities (e.g. telephony (mobile/fixed), Internet connection, power, etc) Sample Basic Flow: 1. The necessary devices are being configured and the proper working of the devices is verified (either self install or assisted install) 2. In case he is using an insulin pump, the device is constantly in use and running (subcutaneous infusion of insulin and collecting and storing therapy relevant data) 3. Upon usage James activates the devices. If a device is multi-user or requires identification, James identifies himself. 4. James performs the required measurements (e.g. blood glucose, blood pressure, weight, heart rate, SpO_2, etc) 5. The measurement devices and the insulin pump will upload the measurement / insulin pump data to the Remote Patient Monitoring (RPM) service at the earliest convenience (store & forward model). 6. The measurement / insulin pump data is stored in the RPM service 7. The RPM service makes James' data available to authorized parties in James' care community (e.g. James' caregivers such as clinical parties or friends & family). Alternate Flow: In addition to upload data from the measurement device and the insulin pump simultaneously, James has the possibility to upload: a) the data of each device for its own b) collect all relevant data on one master device and upload all the data from the master device
Failure Modes	Failure of network Failure of device connectivity
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☒ No Architectural Impact e.g. add new PAN measurement device ☐ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☐ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Strategy: define an IEEE 11073 device specialization for monitoring Insulin Pump information This may be accommodated by an extension to the ISO/IEEE 11073 PHD Glucose Meter specialization spec or as a new specialization spec.
Additional Comments	• It is a new device and a reasonably complex device (with respect to our current V1 devices, perhaps on the order of a PulseOx) • Quite a bit of work, but a straight forward job for those knowledgeable in the domain of Insulin Pumps

26. Pro25 Track Disease Management Information for Multiple Users

Document Control

Version	Date	Change Description	Status
1	9/24/2007	Initial Draft	
2	10/4/2007	Revision based upon inputs from Frank Wartena	
3	10/24/2007	Revision based upon input from Horst Merkle	Closed, Time Expired

Project Abstract

Title	UC 25 - Track Disease Management Information for Multiple Users
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	This use case is similar from a use-case standpoint to the voted archetype "A004 – Track Fitness Information for Multiple Users". However, there are elements which are not fully considered by the A004 use case that are specific to handling Personal Health Information while in a public setting, such as that used in disease management. Some of the issues not considered in the Fitness use case include: 1. Security (encryption) of Personal Health Information data in a public venue. 2. Handling multiple patient ID in a public venue, across multiple devices For clarity, the V1 A004 Use case has been mirrored, and the V2 Use Case differences have been highlighted in grey.
Description	V1 Health and Fitness A004 Use Case: "Many components of a fitness tracking system are used by more than one person. It is important to attribute the appropriate workout information with the correct person." V2 Disease Management Use Case: Components of a Disease Management system are often/sometimes used by more than one patient, often in the setting of a public health-care provider site. In this case, multiple patient use the same device. The device will be connecting via a common interface. It is critical to take the steps necessary to ensure patient data is secure (e.g. the device data is correctly assigned to the right patient) and private.
Scope	V1 Health and Fitness A004 Use Case: "Stationary fitness devices, compute engines and services being used by more than one person." V2 Disease Management Use Case: Devices, gateways, compute engines, and application servers which are being accessed by multiple users for the purpose of Disease Management.
Actors	Primary Actor: V1 Health and Fitness A004 Use Case: "Joe and Mary"

	V2 Disease Management Use Case: a.) Joe and Mary, each of whom are diagnosed diabetics with their own blood glucose meters and who are each enrolled in a Disease Management program b.) Joanna & Brian are scheduled for a doctors visit to have their glucose level checked. In the doctors office a glucose meter is used and operated by nurse for testing the visiting patients Secondary Actor: Health Care Provider (HCP) – in this case, Joe and Mary have the same HCP Insurance Company (Payer) – in this case, Joe and Mary have separate payers
Minimal Guarantees	V2 Disease Management Use Case: 1. All devices are operational and functioning. 2. Connectivity between device and gateway/compute engine/application host is available. 3. Connectivity between gateway/compute engine/application host is available. 4. Medical data is available for stakeholders involved in Joe's and Mary's health care.
Success Guarantees	Healthcare data is captured and provided in a secure and private manner to authorized stakeholders involved in Joe's and Mary's healthcare.
Trigger	a.) Joe or Mary interfaces their medical device with a gateway/compute engine/application host located at a public health care provider site. b.) Nurse interfaces the blood glucose meter with a gateway/compute engine/application host located at the HCP site.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Precondition: V1 Health and Fitness A004 Use Case: Joe and Mary have a treadmill in their home that they both use. Both have their own running computer they use on the treadmill. Both have accounts with a fitness analysis service, and they share the same home PC to which the treadmill shares data. V2 Disease Management Use Case: Joe and Mary each have a personal blood glucose meter that they both use. Each have their own gateway device they use to upload data from their blood glucose meter. Each are participants in a Disease Management program with the same HCP. When visiting the office of their HCP, they use the gateway/compute engine/application host located at the HCP site to upload their blood glucose data. Joanna and Brian do NOT have a personal blood glucose meter (yet) Both rely on the HCP's meter and infrastructure for data upload and storage. Joanna and Brian are use the same HCP. They are invited to have their blood glucose level checked for diagnosis of a potential diabetes. . When visiting the office of their HCP, the nurse uses a (one) blood glucose meter, a gateway/compute engine/application host located at the HCP site to upload the blood glucose data of Joanna & Brian. Basic Flow:

	V1 Health and Fitness A004 Use Case: 1. Mary gets on the treadmill Joe just got done using to go for a run. 2. The treadmill detects Mary's running computer and prompts her with a list of treadmill programs based on her stored preferences (see Configure Fitness Equipment). 3. Mary selects a program and commences her run. At the end of her run, she goes to the computer and logs into her fitness analysis service and sees only the activity she has done, even though Joe has been using the same treadmill. V2 Disease Management Use Case: 1. Independently of one another, Joe and Mary use their blood glucose meters throughout their days 2. Independently of one another, Joe and Mary use their own gateway devices to connect their blood glucose meters and to transfer their medical data over public networks (example: the internet) to their HCP 3. During their independent visits on site with their HCP, Joe and Mary each bring their blood glucose meters to the HCP site, and use the same gateway/compute engine/application host located at the HCP site to transfer data from their blood glucose meters. 1 a) Independently of one another a nurse checks blood glucose levels of Joanna and Brian as part od the diagnostics process at the time of their office visit. 2 a) Independently of one another the nurse transfers the data using one gateway/compute engine / application host located at the HCP site. Special Requirements and Technical Issues: 1. Tom's, Mary's, Joe's, Joanna's, Brian's identifications must have been correctly verified and associated with their respective medical data clusters (authentication). 2. Tom's, Mary's, Joe's, Joanna's, Brian's medical data is transmitted in a secure environment and remains confidential in accordance with HIPPA. (data encryption, security) 3. Tom, Mary, Joe, Joanna, Brian have each given consent to electronically distribute their medical information to their HCP and Payer. 4. The system creates an audit log of data transmissions. Support Function Use Cases: Consent module Identification/authentication module Secure data transmission module Audit log module
Failure Modes	If the device network fails, the medical data is saved for delayed re-transmission. If the device network fails, the medical data can be entered manually.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device

	☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Clarifications Determine patient ID mechanism and standards Implement inter-operability with ID device standards 1. adjust all interfaces to allow for multiple users – basically a meta-data adjustment? 2. need to ensure upcoming work reflects this need also (WAN/LAN)
Additional Comments	Hard part probably remains the device mechanism used to assure the ID of the current user Depending on the granularity of the privacy desired, there will be increasing complexity in the encryption, key management, and other issues needed to implement May need new identification/authentication device to be added. WAN could now be considered necessarily within Continua scope – though this covered in other V2 UCs so not identified as extension here. Patient ID standards – will need to link records to user, and also link user identification device (assuming required) to user. Need clarification on ID/authentication method expectations – eg manual (ID/PIN/Password) or device based (smartcard/USB key, +PIN etc). This is likely to be the significant new aspect of implementing this UC. Any limits regarding distance/persistence? Eg remote wireless weigh scales in house with multiple occupants? Limit persistence to single value/session/time period to avoid inadvertent second user appended to previous? Many existing systems have secure authenticated ID transaction functionality – eg ATM, chip&pin. Assume consent/audit/secure data transmission common to other/existing UCs – but need to check scope.

27. Pro27 IPLAN Interface

Document Control

Version	Date	Change Description	Status
1	November 29, 2007	Document creation	
2	July 18, 2008	Update after discussion at the Continua Summer Summit	Closed, Time Expired

Project Abstract

Title	UC 27 – IP-LAN Interface
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	This project restarts the IPLAN Interface discussion that the V1 Continua scoping chose to delay. The LAN interface is currently addressed by two use cases: • Low Power LAN • IP-LAN
Applicable Interfaces	☐ Personal Area Network Interface (PAN-IF) ☒ Local Area Network Interface (LAN-IF) ☐ Wide Area Network Interface (WAN-IF) ☐ xHealth Record Network Interface (xHRN-IF)
Rationale for Feature	The Low Power LAN is specifically targeted at sensors that can be connected through a network, such as smoke detectors, stationary presence sensors (e.g. passive infrared sensors), door sensors, chair/bed occupancy sensors, etc. The common feature of these sensors is that they are almost always battery powered and should be very energy efficient to optimize battery life. The radio of these sensors will probably not be active continuously and thus the sensors will not always be reachable. These sensors are most likely to operate in a "push" model, the sensors will push data into the network at their own discretion. The IP-LAN is oriented at data sharing between "powerful" application hosting devices (AHDs) such as mobile phones, PDAs, computers and settop boxes. These AHDs are often wall powered or will be charged regularly. These devices are also much more likely to always be connected/active on the network. The Low Power LAN will be used to get data from the sensors to powerful AHDs. These powerful AHDs can then cache/store the sensor data (possibly from multiple sensors) and make it available to other powerful AHDs through the IP-LAN. This means that the IP-LAN will enable a "pull" model where powerful AHDs can search for relevant sensor data on other powerful AHDs. This model is already in use in the entertainment domain where "Media Servers" make music/pictures/videos available on the home network to various "Media Clients(renderers)". Applicable technologies in the entertainment domain to enable this are Universal Plug & Play (UPnP), Digital Living Network Alliance (DLNA), Device Profile for Web Services (DPWS), etc.

Requirements	• Enable the "proxying" of Healthcare Device data, connected via Continua PAN Interfaces, to/from an IP based LAN. • Enable the sharing Healthcare Device data between powerful AHDs such as mobile phones, PDAs, computers and settop boxes (i.e. multiple users of the same Healthcare Device data) via an IP based LAN
Sample Scenarios	In general terms, the project would be the definition of an IP Interoperability Framework that would support Continua Healthcare Device information exchange. More specifically, the project would make recommendations for some or all of the following types of features and functions: 1. IP address assignment mechanism How are IP addresses assigned to all the devices in a Continua IP-LAN communications system? 2. Service discovery (w/ service attribute matching) How are the various "services" of a given device advertised and discovered by other devices in the Continua IP-LAN communications system? 3. Service definition mechanism How are the various "services" of a given device actually described and defined such that the "service" is usable & understandable by other devices in a Continua IP-LAN communications system? 4. Control mechanism (aka request/response mechanism) How is a generic "request" sent to a device and how is a response (if any) returned to the caller? 5. Notification mechanism (aka subscribe/notify mechanism) (aka subscribe to async events) How does an "interested party" register with a device such that it will be notified when a particular event occurs? 6. Data transport How is the specific healthcare data transported over the IP network… a. Streaming – continuous stream of real time data b. Episodic – data for single asynchronous incident c. Document – arbitrary large collection of data d. Control – communication that commands the receiver to alter its behavior e. Alarms – communication that carries a variable sense of urgency ….such that their specific and different latency & reliability requirements are met?

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☐ Technology exist, but is not yet used in the market ☐ No, this is currently not possible

Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☒ Less than 9 months ☒ Between 9 and 18 months ☐ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	This likely consists of profiling or extending existing standards. The timeframe will depend on the technology selected. For example, if UPnP is chosen as the primary standard then many of the required capabilities are readily available as a standard in an SDO (e.g., discovery, eventing, service mechanism, control mechanism). However, if WS is chosen, the timeframe will be impacted by the initial SDO work. There are multiple standards available that can be selected to enable this use case, e.g. UPnP, DPWS, and others (less likely). None of them are currently equipped to the specific needs of health data; however this should be possible within a reasonable time frame.
Additional Comments	Overlap in terms of functionality (transferring health data throughout the house) exists with UC 13a Low Power LAN.

28. Pro30 Transport Home to Hospital

Document Control

Version	Date	Change Description	Status
1.0	20070907	Abstract of new use case.	
2.0	20071130	Transfer to V2 Use Case Template and expand to full use case.	Closed, Not Approved

Project Abstract

Title	UC 30 - Transport Home to Hospital for the Chronic to Emergently Critical Patient Already Monitored via Continua Compliant Devices
Theme(s)	☒ Disease management ☐ Health & Fitness ☐ Aging Independently
Relation with implemented V1 use case(s)	This use case leverages and potentially extends all Continua use cases that involve the use of physiologic monitoring devices as well as some therapeutic (e.g., infusion pumps and ventilators) and other combination devices (e.g., video/EEG).
Description	Primary Scenario: A patient being monitored in the home using Continua-compliant devices, e.g., ECG and pulse oximetry devices, experiences a critically significant event requiring transport to a hospital, e.g., stroke. The ambulance may or may not incorporate Continua capable data acquisition and communications systems in order to continue recording and store and/or forward information to the ED, where it is viewed in real time and merged into the patient record. At the ED, monitoring with the Continua-compliant equipment continues while hospital-provided medical devices are setup. Ideally, transfer from Continua-compliant devices to standards-based hospital devices should be seamless. Variation 1: The ambulance may provide non-Continua NIBP (and/or other devices). Variation 2: The ambulance services may provide patient data storage and/or communication systems that are not Continua compliant. Extension 1: A patient similarly monitored in the home experiences and reports symptoms to his physician, who checks the patient's most recent data that was accessed from her office. Connecting in real time to his monitors, the physician sees no indication of an emergent condition but based on his symptoms asks him to come to the clinic for assessment and requests he remain monitored at least until she sees him. On seeing him and reviewing the physiological data gathered during his travel from home, she is concerned that he is experiencing an evolving MI and arranges immediate transport via ACLS ambulance to the local hospital. She requires that real-time monitoring continue to be provided until completion of transport.

Scope	The use case spans the spectrum of care and represents a system of systems: Home: Transport: Hospital:
Actors	Patient Home caregiver EMTs Emergency nurses and physicians
Minimal Guarantees	- Patient data and status accurately and reliably passed from Continua compliant home-based monitors to Continua compliant ambulance-based patient monitoring service. - Patient data and status accurately and reliably passed from Continua compliant home-based monitors and Continua compliant ambulance-based patient monitoring service to hospital Continua compliant patient monitoring system. - Continua services clearly defines what constitutes an alert and defines priorities.
Success Guarantees	Patient and home caregiver(s): 1. Confident that system works across spectrum of care 2. No additional steps required to prepare system for transport EMTs (and/or other responders): Continua compliant devices will automatically associate and communicate with Continua compliant transport system, e.g., ambulance Hospital staff: Continua compliant out-of-hospital system can communicate with in-hospital Continua compliant systems from moment need for transport identified, whether from the home or from the ambulance. Monitoring is continuous and seamless. Transfer of patient from out-of-hospital Continua compliant to in-hospital Continua compliant monitoring system is seamless and results in no loss of data.
Trigger	Decision to transport potentially critically ill patient requiring real-time physiological monitoring from home to hospital.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Wireless system 1. Patient being monitored using Continua compliant wireless real-time ECG and SpO2 experiences stroke symptoms; caregiver calls 911 for ambulance services using a service available with the Continua home hub. 2. While the ambulance is responding, the central service establishes a connection between the home hub, the responding ambulance, and the hospital. 3. EMTs respond and transport patient from home to ambulance. Using a wireless controller, they associate the patient with the Continua-compliant ambulance system and dissociate with the home hub. This simultaneously adapts the communication path with the hospital as well.

	4. On reaching the hospital, EMTs transport patient from ambulance to ER. Using a wireless controller, hospital staff associates the patient with the Continua-compliant in-hospital system and dissociate with the ambulance. Wired System 1. Patient being monitored using Continua compliant wireless real-time ECG and SpO2 experiences cardiac symptoms; caregiver calls 911 for ambulance services using a service available with the Continua home hub. 2. While the ambulance is responding, the central service establishes a connection between the home hub, the responding ambulance, and the hospital. 3. EMTs respond and transport patient from home to ambulance. They disconnect all wires between the patient and home hub and then reconnect to Continua jacks in the ambulance. Both the home and ambulance hub will need to be able to recognize and manage order of plugging and unplugging of devices to disestablish and reestablish the monitoring configuration. The communication path with the hospital must be reestablished as well. 4. On reaching the hospital, EMTs transport patient from ambulance to ER. They and/or the hospital staff disconnect all wires between the patient and ambulance hub and then reconnect the patient to the hospital based monitoring system, probably via different patient leads. Note: During wiring transitions, the patient may not be monitored.
Failure Modes	All communications failures modes known to exist for wireless and wired physiological monitoring systems could be manifest here. 1. Provision of redundant components and subsystems at key points could help. 2. Storage of events and information during loss of communications for later download could help. Critically ill patients are as at risk during transport as at any time during a critical illness. During the transport from home to hospital, the presence of monitoring capabilities enables detection of immediately threatening events as well as capture of information to guide subsequent actions. That said, in-hospital transport of critically-ill monitored patients is currently hampered by the need to disconnect and reconnect signal acquisition, communications, and power cables from the source-to- transport and then transport-to-target monitoring systems. A sample of problems: 1. Connector incompatibilities 2. Connector confusions. 3. Connectors and cables damaged by more frequent plugging and unplugging. 4. Cables and connectors damaged during transport.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☐ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☐ Between 9 and 18 months ☒ Longer than 18 months
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	Determine optimal method for accomplishing desired functionality—the ability for ambulances and ERs to view data from Continua-certified devices until hospital devices are connected. Resolve issues surrounding ad-hoc transfer of devices between in-home AHD and ambulance/ER systems. Develop, if needed, any new technology for functionality. Develop, if needed, any new standards for functionality. Develop detailed Interoperability Guidelines to accomplishing this functionality working closely with manufacturers of Continua, ambulance and ER systems to pilot, accomplish and market functionality.
Additional Comments	There are many ways to implement this functionality, and the answers to the questions above depend on how you accomplish it. The best way to allow EMT/ER physicians to view/access data captured on the AHD prior to patient transportation needs to be considered. This could be through opening up a WAN link or by physically transporting the AHD devices data or a subcomponent with the patient. There are significant potential issues with ad-hoc pairing of devices (wireless) whilst equipment in use. An alternative approach might be rather than disassociating the PAN or BAN devices from the AHD, the Bluetooth receiver on the AHD could be detachable and able to be plugged into another AHD (in the ambulance, and then again in the hospital). Once plugged into the other AHD (possibly via USB or LAN), the data resumes streaming data. But now the receiver of the data is the ambulance system. This method reduces the technology and battery requirements of the PAN / BAN devices and increases the capabilities of also giving the new care-givers (EMTs or ER

	physicians) recent historical data. The need to establish patient/data relation and dependencies on ad-hoc basis compared to typical home use scenario could be a significant issue, especially when external ambulance/hospital systems are involved. Continua compliant hospital/ambulance systems – valid extension of Continua scope?

29. Pro31 Remote Device Management

Document Control

Version	Date	Change Description	Status
2	November 30, 2007	Final Draft	Closed, Time Expired

Project Abstract

Title	UC 31 - A remote management service interface for Healthcare Devices
Theme(s)	☒ Disease management ☒ Health & Fitness ☒ Aging Independently
Relation with implemented V1 use case(s)	V1 does not implement the WAN Upload and LAN interface, which is needed to enable remote device management. These are being considered for v2. The E2E Architecture currently defines Installers (3.1.3) and Service Providers (3.1.4) as Continua stakeholders, and they would be interested in this use case. The E2E Interaction View (3.2.5) also defines cases such as Failure Detection (3.2.5.3) or Identification (3.2.5.5) that span across the architecture.
Description	Even for sophisticated consumer electronics users, managing the devices can be difficult – updates need to be made, problems occur that need to be diagnosed, etc. This use case defines remote management of devices in the Continua ecosystem across the WAN and LAN interfaces in an interoperable way. This reduces the burden on the consumer by allowing the service provider to work with the devices from a remote location. Remote management use cases could include: • Provisioning a new devices on a telehealth network • Collecting usage statistics from a device • Receiving non-healthcare related alerts from the device (e.g. low battery) • Setting or retrieving the measurement units that are used on a device • Setting a device clock • Potentially pushing configuration updates to a device (e.g. new firmware that supports a new Continua version). This remote management interface could be enabled from the device to the service provider (upstream), or optionally from the service provider to the device (downstream). The scope of the implementation of this use case will need to be able to conform to a particular device's FDA requirements.
Scope	This use case addresses the WAN and LAN interface and devices of the Continua architecture.
Actors	Consumer Care provider
Minimal Guarantees	Care providers will manage a set of devices from multiple vendors that can exchange healthcare data in an interoperable way, but need to be managed separately in a proprietary way. Alternately, the consumer would be responsible for managing the devices, which would lead to lower usage compliance over time.

Success Guarantees	Care providers are able to proactively respond to potential problems with devices, and reduce costs by reducing in-person or telephone service calls. Consumers have a better experience using their healthcare devices because they do not need to maintain or configure the devices themselves.
Trigger	A new device is added to the telehealth network, triggering registration in the remote management service. Device state information (e.g. low battery, update required) is shared with the remote management service, which may trigger a specific management action to the device.
Steps of Basic Flow (Include flow descriptions from multiple actor perspectives, if applicable)	Leila receives a new Continua remote health monitoring device from her care provider, and she attaches it (pairs it) to her computer. The new device registers with her care service provider. Pablo, an operations specialist at Leila's care provider, sees that Leila has successfully attached the device to the computer. This is because the computer has contacted the service provider over the LAN and WAN interfaces when the device was attached. Basic information about the device is stored in the remote management information base, which has a data schema specific to the device. In the case of Disease Management, the Continua device is a Bluetooth glucometer. Time passes, and Leila is using her glucometer daily according to her care plan. Over time, the battery runs down, but she does not notice the tiny low battery indicator. She receives a message from her care provider giving her instructions on how to correctly charge the device. One time, the glucometer seemed to be having trouble retrieving measurements. Leila called Pablo on the phone, and Pablo determined that resetting the device was the best way to resolve the problem. The reset controls on the glucometer are tiny and Leila would have trouble using them. Pablo issued a command to reset and reboot the device remotely, without Leila having to do anything. When the device came active on the network again, Pablo was able to verify that it was working correctly. In the case of Aging Independently, the Continua device is an activity monitoring hub device. Leila accidentally unplugs the power from the activity monitoring hub device. Pablo gets an alert that he can no longer see Leila's activity, and calls Leila on the phone before she has a problem in her home (e.g. a fall). Pablo instructs Leila to plug the hub device back in, and Pablo runs a quick diagnostic test to make sure it is functioning correctly. For Health & Fitness devices, similar management use case steps can be imagined. Note that this example covers PAN devices, but it could eventually cover the remote management of a LAN device or Application Hosting device, either by the care provider, or a 3rd party managed service provider.
Failure Modes	Sometimes the remote management of a device requires some interaction with a user (e.g. a phone call), and this can't always be guaranteed. In this case, an in-person service visit of some sort is required instead.
Diagram (optional)	

Continua TWG feasibility review

Date	15-01-08
Architectural Impact	☐ No Architectural Impact e.g. add new PAN measurement device ☒ Architectural Scope Extension Needed e.g. address WAN-IF or LAN-IF ☐ Architectural Change/ Extension needed e.g. introduce unforeseen interface
Technology availability	☒ Yes, technology to do this is abundantly available ☒ Technology exist, but is not yet used in the market ☐ No, this is currently not possible
Standard availability	☐ No suitable SDO available ☒ Suitable SDO available ☐ Standard completed ☐ Standard used in the market
Estimated development time	☐ Less than 9 months ☒ Between 9 and 18 months (device monitoring only) ☒ Longer than 18 months (medical device provisioning)
Steps needed for completion • New technology? • Standards development? • New Continua interfaces? • Modification to Continua interfaces? • Other changes?	A standard for remote device management needs to be chosen and/or created. A possible standard to link up with is the DSL CPE WAN management standard (TR-069) For real remote medical device provisioning there are many security and safety barriers that will need to be addressed, this will take a considerable amount of time. The use case fits within the overall architecture, but there are two major issues that will affect implementation: 1) There are regulatory concerns with provisioning medical devices. In particular, by existing rules every software application involved in provisioning a medical device becomes a regulated device. 2) This will require provisioning messages on existing protocols; this may require some standards development.
Additional Comments	The scope section indicates LAN and WAN, however the example also addresses PAN interface. The scope section should be extended with the PAN interface.